

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TOSHIBA CORPORATION,

Petitioner,

vs.

Case: IPR2014-00113

U.S. Patent No. 6,058,045

INTELLECTUAL VENTURES I LLC,

Patent Owner.

/

VIDEOTAPED DEPOSITION OF

ROBERT J. MURPHY

Tuesday, June 17, 2014

REPORTED BY: RACHEL FERRIER, CSR 6948

(SF-002971)

IPR2014-00113

Toshiba Corporation v.
Intellectual Ventures I LLC
IV 2003

1 INDEX OF EXAMINATIONS

2	EXAMINATION BY	PAGE
3	Mr. Heinz	6, 126
4	Mr. Limbach	198

5

6 EXHIBITS MARKED FOR IDENTIFICATION

7	NO.	DESCRIPTION	PAGE
8	Exhibit 10	Notice of Deposition of Robert Murphy	8
9	Exhibit 11	Petition for an Inter Partes Review	8
10	Exhibit 12	Declaration of Robert J. Murphy	9
11	Exhibit 13	United States Patent No. 6,058,045	9
12	Exhibit 14	United States Patent No. 5,297,029	9
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

17 ---o0o---

1 BE IT REMEMBERED that, pursuant to the
2 laws governing the taking and use of depositions, on
3 Tuesday, June 17, 2014, commencing at 9:31 a.m.
4 thereof, at DLA Piper LLP, 2000 University Avenue,
5 Room 107, Palo Alto, California 94303-2214, before
6 me, RACHEL FERRIER, a Certified Shorthand Reporter,
7 personally appeared ROBERT J. MURPHY, called as a
8 witness by Patent Owner, who, being by me first duly
9 sworn, was thereupon examined as a witness in said
10 action.

11 APPEARANCES OF COUNSEL

12 For the Patent Owner:

13 DESMARAIS LLP
14 BY: ANDREW G. HEINZ, Attorney at Law
230 Park Avenue
New York, NY 10169
15 Telephone: 212.351.3402
Email: aheinz@desmaraisllp.com
16

17 For the Petitioner TOSHIBA CORPORATION:

DLA PIPER.
18 BY: ALAN A. LIMBACH, Attorney at Law
2000 University Avenue
19 East Palo Alto, CA 94303
Telephone: 650.833.2433
20 Email: alan.limbach@dlapiper.com
21
22
23
24
25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

APPEARANCES (Continued)

For INTELLECTUAL VENTURES I LLP

STERNE, KESSLER, GOLDSTEIN & FOX P.L.L.C
BY: RAYMOND WERNER, Attorney at Law
JON WRIGHT, Attorney at Law (via phone)
CHRISTIAN CAMARCE, Attorney at Law (via
phone)
1100 New York Avenue, N.W.
Washington, D.C. 2005
Telephone: 206.371.2600
Email: rwerne@skgf.com
jwright@skgf.com
ccamarce@skgf.com

ALSO PRESENT: TED HOPPE, Videographer
DON COULMAN, Intellectual Ventures
JOHN BIRD, Intellectual Ventures

---o0o---

1 PALO ALTO, CALIFORNIA

2 TUESDAY, JUNE 17, 2014

3 9:31 A.M.

4 ---o0o---

5 PROCEEDINGS

6 09:30:29

7 THE VIDEOGRAPHER: Video is going, so let's 09:31:16

8 begin. 09:31:18

9 Here begins Video 1 in the deposition of 09:31:18

10 Robert Murphy in the matter of Toshiba Corporation 09:31:22

11 versus Intellectual Properties (sic) in the United 09:31:28

12 States Patent and Trade Office, Case 09:31:31

13 No. IPR 2014-00113. 09:31:40

14 Today's date is June 17th, 2014. The time on 09:31:42

15 the video monitor is 9:31. 09:31:48

16 The video operator today is Ted Hoppe. 09:31:51

17 This video deposition is taking place at the 09:31:54

18 Law Offices of DLA Piper, 2000 University Avenue, 09:31:57

19 Palo Alto. 09:32:02

20 Counsel, could you please voice identify 09:32:03

21 yourselves for the record. 09:32:06

22 MR. HEINZ: Andrew Heinz from Desmarais LLP 09:32:08

23 on behalf of the patent owner. 09:32:11

24 MR. LIMBACH: Al Limbach for Petitioner, 09:32:14

25 Toshiba Corporation. 09:32:17

1	MR. COULMAN: Don Coulman for Intellectual	09:32:20
2	Ventures.	09:32:22
3	MR. WERNER: Ray Werner of Sterne, Kessler	09:32:23
4	for Intellectual Ventures.	09:32:26
5	MR. BIRD: John Bird for Intellectual	09:32:27
6	Ventures.	09:32:37
7	MR. HEINZ: Ray, can you -- can you introduce	09:32:37
8	the people on the phone.	09:32:38
9	MR. WERNER: Oh, yes, of course.	09:32:40
10	And on the phone Jon Wright of Sterne,	09:32:41
11	Kessler and Christian Camarce, Sterne, Kessler, both	09:32:45
12	for Intellectual Ventures.	09:32:49
13	THE VIDEOGRAPHER: Rachel, could you please	09:32:49
14	swear the witness in.	09:27:22
15	---o0o---	09:27:22
16	ROBERT J. MURPHY	09:27:22
17	_____	09:27:22
18	called as a witness, having been	09:27:22
19	first duly sworn, was examined and	09:27:22
20	testified as follows:	09:27:22
21	---o0o---	09:27:22
22	THE VIDEOGRAPHER: Please proceed.	09:33:14
23	EXAMINATION	09:33:15
24	BY MR. HEINZ:	09:33:15
25	Q Good morning.	09:33:15

1	A	Good morning.	09:33:16
2	Q	Can you please state your name.	09:33:17
3	A	My name is Robert J. Murphy.	09:33:18
4	Q	Mr. Murphy, by whom are you employed?	09:33:20
5	A	I am employed -- in this -- with respect to	09:33:22
6		this matter or my -- my firm?	09:33:27
7	Q	Your firm, just your general employment.	09:33:29
8	A	Oh, my general employment is I have my own	09:33:31
9		business, Firenza, LLC.	09:33:35
10	Q	What is your business address?	09:33:36
11	A	My business does basically two types of	09:33:38
12		things. It does design consulting for sem- -- the	09:33:42
13		semiconductor business, and it also does legal --	09:33:46
14		legal work for patent cases, mostly.	09:33:51
15	Q	What's the -- the street address of your	09:33:54
16		business? Where is it located?	09:33:56
17	A	It's 72 Fairview Plaza, Los Gatos, California	09:33:57
18		95030.	09:34:03
19	Q	Mr. Murphy, have you been deposed before?	09:34:06
20	A	I have.	09:34:09
21	Q	Approximately how many times?	09:34:09
22	A	I don't remember the exact number. More than	09:34:14
23		ten, I think.	09:34:16
24	Q	So you know the rules of the road; you are	09:34:17
25		familiar with the process?	09:34:19

1	A	I am.	09:34:20
2		MR. HEINZ: I've premarked some exhibits, and	09:34:22
3		I would like to go ahead and -- and hand you that	09:34:23
4		now.	09:34:25
5		Hand you Exhibit 10.	09:34:26
6		(Exhibit 10 was marked for	09:34:27
7		identification by the Reporter.)	09:34:33
8	BY MR. HEINZ:		09:34:33
9	Q	And Exhibit 10 is entitled "Notice of	09:34:34
10		Deposition of Robert Murphy"?	09:34:36
11	A	Yes, it is.	09:34:41
12	Q	That's you; right?	09:34:41
13	A	That is me.	09:34:42
14		MR. HEINZ: All right. That's what brought	09:34:43
15		us here today.	09:34:45
16		Okay. Looks like 11.	09:34:49
17		(Exhibit 11 was marked for	09:34:49
18		identification by the Reporter.)	09:34:49
19	BY MR. HEINZ:		09:34:49
20	Q	Do you recognize Exhibit 11?	09:34:49
21	A	I do.	09:35:05
22	Q	What is it?	09:35:05
23	A	It's a petition for an inter partes review.	09:35:06
24	Q	And it's the petition we're here to talk	09:35:10
25		about today; right?	09:35:12

Merrill Corporation - San Francisco
(800) 869-9132 www.merrillcorp.com/law

1 discussion, so in this matter, you understand that 09:36:19
2 Toshiba alleges that Exhibit -- the '045 patent that 09:36:22
3 you mentioned before, 6,058,045, is the Intellectual 09:36:31
4 Ventures patent that's being challenged, and the 09:36:36
5 Nakai patent, which bears the number 5,297,029, is 09:36:40
6 the asserted prior art reference in this case? 09:36:46

7 A Yes. 09:36:49

8 Q And it's your view that the -- can we -- let 09:36:49
9 me strike that. 09:36:52

10 For the purposes of this deposition, is it 09:36:54
11 okay if we refer to those as the "'045 patent" and 09:36:56
12 the "'029 patent," respectively? 09:36:58

13 A Yes. 09:37:00

14 Q And it's your view that the '029 patent 09:37:01
15 anticipates claims 1 and 4 of the '045 patent; is 09:37:04
16 that right? 09:37:08

17 A Yes, it is. 09:37:08

18 Q I would like to start out by asking about 09:37:09
19 some terminology that I expect is going to come up 09:37:19
20 in the questioning today, and I would like to start 09:37:22
21 out by asking you about EEPROM and flash. 09:37:26

22 A Yes. 09:37:32

23 Q Are those the same thing? 09:37:32

24 A No, I don't believe they are the same thing. 09:37:38

25 Q What's the difference? 09:37:40

1 A The difference is related to how many -- how 09:37:42
2 many cells you can erase at the same time. That's 09:37:47
3 probably, I think, the big- -- I think the biggest 09:37:52
4 difference. 09:37:54

5 Q Is it the case that flash is a subset of 09:38:01
6 EEPROM, but not the -- the reverse of that? 09:38:05

7 A Is it the case -- I don't know whether I 09:38:07
8 would call it a subset of it or not. It's 09:38:27
9 definitely different. 09:38:30

10 Q Let me ask you to refer to your declaration, 09:38:30
11 which is which exhibit number? Is that up? Sorry. 09:38:33

12 A 12. 09:38:35

13 Q 12. 09:38:37

14 And to paragraph 22, please. 09:38:42

15 The first sentence of paragraph 22 reads: 09:38:51

16 It was well known to those skilled 09:38:55
17 in the art that NAND-type EEPROMs 09:38:57
18 were commonly referred to as "flash 09:39:05
19 memory" for their ability to program 09:39:06
20 and erase multiple memory cells at 09:39:09
21 once. 09:39:11

22 Is that statement accurate? 09:39:13

23 A I believe it is, yes. 09:39:14

24 Q So it's your view that NAND-type EEPROMs were 09:39:15
25 commonly referred to as "flash memory"? 09:39:21

1	A	Yes.	09:39:23
2	Q	Are there other types of EEPROMs that are	09:39:24
3		referred to as "flash memory"?	09:39:30
4	A	There are -- there are NOR types.	09:39:41
5	Q	So there would be NOR-type EEPROMs that would	09:39:42
6		also be referred to as "flash memory"?	09:39:45
7	A	Yes, they could.	09:39:48
8	Q	Any others?	09:39:49
9	A	Nothing comes to mind right now, no.	09:39:50
10	Q	Other than the NAND-type EEPROMs and the	09:39:54
11		NOR-type EEPROMs, are there other types of memory	09:40:00
12		that would be referred to as "flash memory"?	09:40:05
13	A	I think in the normal usage of the term for	09:40:09
14		one of ordinary skill in the art, those two types	09:40:21
15		define most of the flash memory that one of ordinary	09:40:24
16		skill in the art would -- would talk about.	09:40:26
17	Q	Can you think of any other types that would	09:40:28
18		be corner cases or would be an exception to that	09:40:30
19		rule?	09:40:33
20	A	No, not right now at this time.	09:40:33
21	Q	Next I would like to ask you about the term	09:40:41
22		"boosted," which shows up in the patent and one of	09:40:47
23		the claim -- some of the claim constructions.	09:40:51
24		What does "boosted" mean in the -- in this	09:40:52
25		context?	09:40:55

1 A In the context of the '045?

09:40:55

2 Q Yes.

09:40:58

3 A Boosted is talked about in the patent in the
4 specification. Let me see if I can find the exact
5 spot for you.

09:40:59

09:41:17

09:41:25

6 With respect to -- at least one of ordinary
7 skill in the art would understand that boosted is
8 talked about in the patent with respect to the
9 programming operation, around column 7 at line 26,
10 where it says, "The programming operation is done by
11 applying a high voltage (for example, 15 to
12 20 volts) on the selected word line (WL1)."

09:41:35

09:41:38

09:41:40

09:41:43

09:41:48

09:41:52

09:41:56

13 And, generally, one of ordinary skill in the
14 art understands that, in this time frame, that was
15 not -- the 15 to 20 volts applied was not an
16 external voltage applied to the part. It was a
17 voltage created within the part and generally by
18 circuits called "boost circuits" or "pump circuits"
19 that raised that voltage up above the normal
20 operating voltage of the part.

09:42:04

09:42:06

09:42:10

09:42:15

09:42:17

09:42:21

09:42:25

09:42:29

21 Q So just to make sure the record is clear, so
22 I think I understood you, but what does the term
23 "boosted" mean, then, in the context of the '045?

09:42:32

09:42:36

09:42:39

24 A Well, in terms of the '045, a -- a boosted
25 voltage is called out specifically, for example, at

09:42:42

09:42:54

1 the -- at the end of claim 1 where it says, "while a 09:43:00
2 boosted positive voltage is applied to a selected 09:43:05
3 word line." 09:43:07

4 And the -- the same almost -- the same 09:43:13
5 language is found in claim 4, at the end of claim 4, 09:43:16
6 where it says, "while a boosted positive voltage is 09:43:20
7 applied to a selected word line." 09:43:23

8 And with reference to those two cites in the 09:43:26
9 claims, one of ordinary skill in the art would look 09:43:32
10 to the specification and see that, as I talked about 09:43:35
11 before, column 7, line 26, "The programming 09:43:40
12 operation is done by applying a high voltage (for 09:43:44
13 example, 15 to 20 volts) on the selected word line 09:43:50
14 (WL1) and grounding the selected bit line (BL0), 09:43:57
15 while the unselected bit lines (BL1-BL15) are at 09:44:10
16 Vcc," and that specifically shows that that -- that 09:44:22
17 that voltage, 15 to 20 volts, is applied to the 09:44:29
18 selected word line during programming. 09:44:33

19 And then referencing back to claim 1, we look 09:44:35
20 to the language that prefaces the application of the 09:44:42
21 voltages, and we see a phrase that says, "wherein, 09:44:47
22 during" program (sic), and then the last phrase, "a 09:44:51
23 logic high voltage is applied to unselected word 09:44:59
24 lines, while a boosted positive voltage is applied 09:45:00
25 to a selected word line." 09:45:03

1 from the old days, the "collector voltage," but 09:46:42
2 it's -- it's the main power supply voltage of the 09:46:45
3 part. 09:46:47

4 Q Then I would like to ask you about volatile 09:46:49
5 versus non-volatile memory. 09:46:52

6 First let me ask you: What's the difference 09:46:55
7 between those terms? 09:46:58

8 A A volatile memory is one in which the data 09:46:58
9 stored in the device is lost either when the device 09:47:05
10 is operating, because you didn't operate the device 09:47:14
11 correctly, or is lost when the device has its power 09:47:21
12 removed and the data is lost. 09:47:26

13 Q How about a non-volatile memory? 09:47:29

14 A A non-volatile memory is a memory that 09:47:32
15 actually will store the data that's been placed into 09:47:36
16 it even when the power is removed from the device. 09:47:39

17 Q Can you provide some examples of volatile 09:47:41
18 memories? 09:47:44

19 A A volatile memory of the type I first 09:47:44
20 described, where if you operate the part 09:47:51
21 incorrectly, you lose the data, would be a DRAM in 09:47:55
22 that if you don't refresh it every so often, the 09:48:00
23 data will go away. 09:48:03

24 The second type I mentioned would be like an 09:48:05
25 SRAM. It doesn't require refresh, but if you remove 09:48:08

1 the power from actually either the SRAM or the DRAM, 09:48:14
2 the data will disappear. 09:48:18

3 And those are two examples of volatile 09:48:22
4 memory. 09:48:24

5 Q How about some examples of non-volatile 09:48:25
6 memory? 09:48:28

7 A Well, there can be many types of non-volatile 09:48:28
8 memory. I guess it depends upon how broadly you 09:48:38
9 want to -- how broadly you want to let memory be. 09:48:41

10 Q Please explain the -- the distinction there. 09:48:49

11 A Well, I think one of ordinary skill in the 09:48:50
12 art understands that a memory is something you put 09:48:52
13 data into and then you get data back from, and there 09:48:56
14 can be many devices which are memory. And over the 09:49:00
15 50- or 60-odd years that we have in the business 09:49:03
16 doing this stuff, there are lots of various ways to 09:49:06
17 do it. 09:49:10

18 For instance, you can put information on a 09:49:12
19 magnetic tape and retrieve it later. That may 09:49:14
20 qualify as a memory from that point of view. You -- 09:49:18
21 there used to be an old way -- I've heard of 09:49:24
22 recording information on a wire. I think it was 09:49:26
23 magnetic, but I don't really recall that well. 09:49:31
24 That -- that would be another way of memory. You 09:49:34
25 know, this is using the very broad concept of a 09:49:42

1 memory device, so a CD-ROM, for instance, could be a 09:49:45
2 memory, if -- if you wanted to interpret it that 09:49:49
3 way. It -- it -- you write data on it somehow and 09:49:54
4 you read the data back later. 09:49:57

5 A read-only memory is a type of chip that you 09:50:01
6 put data into, usually, but not always, through a 09:50:03
7 manufacturing process, and then you read it back 09:50:08
8 later. 09:50:10

9 Some memories are electrically programmable, 09:50:13
10 like a UV-EEPROM, written electrically, erased with 09:50:16
11 ultraviolet light, so there are some examples. 09:50:23

12 Q So the examples you provided included 09:50:26
13 CD-ROMs, magnetic tapes. 09:50:29

14 Those were two examples you just provided; 09:50:30
15 right? 09:50:32

16 A I did, yes. 09:50:32

17 Q Computer hard drive, would that be an example 09:50:33
18 of non-volatile memory? 09:50:36

19 A Yes, I think so. It -- you write data to it, 09:50:37
20 and as long as you don't -- as long as you don't 09:50:41
21 mistreat it, it will still be there when you come 09:50:46
22 back to get it, hopefully. 09:50:48

23 Q The old floppy disks we might have carried in 09:50:50
24 the 1980s, those are non-volatile too; right? 09:50:53

25 A Well, yeah. You don't have to continuously 09:50:56

1 apply power to them to have them remember the 09:50:58
2 information stored on them, correct. 09:51:00

3 Q And flash memory is non-volatile memory too; 09:51:01
4 is that correct? 09:51:05

5 A Yes. It doesn't -- it doesn't lose the data 09:51:05
6 when you take the power away. 09:51:08

7 Q When you -- a few minutes ago, when we first 09:51:10
8 started talking about these memories, you had some 09:51:19
9 hesitation about the term "memory" and how broad or 09:51:22
10 narrow it should be. 09:51:24

11 In the context of the '045 patent and what we 09:51:25
12 are talking about today, do you feel that the 09:51:28
13 context we described is the appropriate breadth or 09:51:30
14 that it should be something different? 09:51:33

15 A Given the context of this patent, I think 09:51:34
16 the -- the -- the context is better served with the 09:51:41
17 concept of an integrated circuit type of memory, and 09:51:48
18 I think, in all of the claims, they specifically 09:51:54
19 talk about flash memory cells. So it seems like, 09:52:01
20 limiting it to one of ordinary skill in the art, I 09:52:05
21 think would -- would limit it to an integrated 09:52:09
22 circuit memory that has flash memory cells on it. 09:52:12

23 Q What's the -- maybe I'm just not 09:52:18
24 understanding, but what's the -- when you say an 09:52:20
25 integrated circuit memory that has flash memory on 09:52:23

1 it, is that different -- are you trying to draw a 09:52:26
2 distinction between that and flash memory, or is 09:52:29
3 it -- I just want to make sure there's no 09:52:31
4 distinction there. 09:52:33

5 A Well, I don't know of a way you can create 09:52:34
6 flash memory without having it integrated onto a 09:52:38
7 chip. It -- it's possible that you could build a 09:52:42
8 single cell of flash memory, right? And -- that's 09:52:46
9 possible, but I don't -- I'm not aware of any other 09:52:51
10 flash memory cells that are built that are not 09:52:55
11 integrated circuits. 09:52:59

12 Q That's -- I was -- I think my -- I understand 09:53:04
13 the question now. 09:53:05

14 So we listed some examples of non-volatile 09:53:06
15 memory, but the non-volatile memory that's germane 09:53:11
16 here is particularly flash memory? 09:53:14

17 A Yes, I believe so. 09:53:18

18 Q I would like to draw your attention back to 09:53:19
19 your declaration, which is Exhibit 12. 09:53:30

20 So on page 3 of that exhibit in paragraph 7, 09:53:34
21 you describe some of the things you have worked on 09:53:41
22 during the course of your -- your career there. 09:53:44

23 Do you see that? 09:53:46

24 A I do. 09:53:47

25 Q I just want to make sure I understand what 09:53:47

1 all those acronyms mean, because I was a little 09:53:50
2 unclear on those. So let -- I just want to walk 09:53:54
3 through them one at a time and just make sure we are 09:53:56
4 on the same page. 09:53:59

5 So the first one is E2CMOS and BiCMOS PALs; 09:53:59
6 is that right? 09:54:05

7 A Yes. 09:54:05

8 Q Can you explain what those are, please? 09:54:05

9 A So you previously were using EEPROM. 09:54:07

10 Q Uh-huh. 09:54:14

11 A Normally another term -- not normally, but 09:54:14
12 another term that people use is "e-squared," 09:54:17
13 electrically erasable. So the first one is 09:54:20
14 electrically erasable CMOS PAL, which is a 09:54:24
15 Programmable Array Logic element, so it's a chip 09:54:28
16 that actually implements logic using an array of 09:54:32
17 flash cells. Okay? And because of the particular 09:54:37
18 structure of that part, the configuration typically 09:54:42
19 chosen for that was a NOR-type configuration. 09:54:47

20 A BiCMOS PAL is made with a completely 09:54:52
21 different technology. It has both bipolar 09:54:56
22 transistors on it and CMOS transistors on it, and 09:55:01
23 they are mixed together. In fact, I'm -- I was 09:55:04
24 lucky enough to make the first ever BiCMOS PAL, and 09:55:08
25 so you use a CMOS transistors in that to get 09:55:12

1 functionality, and in certain places you use bipolar 09:55:17
2 transistors, like in the sense amplifiers and some 09:55:21
3 of the driver circuits because they are more 09:55:25
4 appropriate there, and so they are both Programmable 09:55:27
5 Array Logic types. 09:55:30

6 Q Are those memories, or would they be used as 09:55:32
7 memories? 09:55:36

8 A A PAL is not normally -- well, I got to be 09:55:39
9 careful about this, because the PALs actually have 09:55:43
10 registers on them, so you can actually store things 09:55:46
11 in them and then get them back later. So you could 09:55:49
12 use them as a memory. They would be very small, not 09:55:55
13 a lot of elements, but the function of what we 09:56:01
14 talked about in the broad sense of could you put a 09:56:04
15 piece of information in and then hold it there and 09:56:07
16 then retrieve it later, the answer is yes. But the 09:56:09
17 majority of the chip is logic-oriented. 09:56:14

18 Q What's a typical use case for one of those 09:56:18
19 components? 09:56:21

20 A A typical use case would be to take -- do you 09:56:22
21 know the term "TTL"? 09:56:28

22 Q No. 09:56:30

23 A Okay. So there was an older technology 09:56:31
24 called Transistor Transistor Logic which a lot of 09:56:35
25 systems that were built in the '70s and the '80s and 09:56:41

1 the '60s even were built around TTL, and so TTL came 09:56:44
2 in the same little integrated circuit chip fashion, 09:56:49
3 and they were as small as four logic gates per chip, 09:56:57
4 so -- so you had a whole chip, meaning you needed a 09:57:03
5 power supply and you had power expended and you got 09:57:06
6 four whole gates. 09:57:10

7 So PALs came along when people decided, hey, 09:57:12
8 there's another way to do logic, and I can take 20 09:57:15
9 or 30 of these TTL guys and stick the logic function 09:57:18
10 into one PAL. 09:57:23

11 And so the -- the function for PALs -- the 09:57:25
12 general usage is what you asked for -- was mostly as 09:57:29
13 a replacement for multiple of these other TTL parts 09:57:32
14 to make the system less expensive, and because all 09:57:36
15 the logic was done on the integrated circuit itself, 09:57:45
16 the logic ended actually -- actually ended up being 09:57:48
17 faster. You didn't have to take a signal out of the 09:57:51
18 chip, drive it down the board, and then get it back 09:57:54
19 onto another chip. And you did that all in one chip 09:57:56
20 and it goes faster. 09:57:59

21 Q Are you aware of anybody using these PALs 09:58:00
22 that you worked on as memory devices? 09:58:03

23 A As a memory device. I don't think they would 09:58:07
24 call it a memory device. I think they would call it 09:58:15
25 a PAL. If you -- especially if you -- you are 09:58:19

1 talking about comparing today or back then or? 09:58:23

2 Q Back then, either way. 09:58:27

3 A Either way. 09:58:28

4 Q What I'm -- what I'm trying to get at is: 09:58:29

5 Would you consider this to be a memory device or a 09:58:31

6 logic device? 09:58:34

7 A It's -- it's -- it's generally considered to 09:58:36

8 be a logic device; although, as I talked about 09:58:38

9 before, they have registers on them, and the 09:58:41

10 registers are memory elements, so. 09:58:43

11 Q If I was somebody around the time that you 09:58:47

12 were working on these things -- so they were 09:58:51

13 contemporary -- would I use that if I had a large 09:58:53

14 number of data files I needed to store somewhere 09:58:58

15 instead of a hard drive, for example? 09:59:00

16 A Oh, no. No. You wouldn't consider that. As 09:59:01

17 I said already, they have a few registers on them, 09:59:06

18 and those registers can store the result of a logic 09:59:10

19 operation and then deliver it later, so, no. 09:59:14

20 Q But they wouldn't be used for large-scale 09:59:19

21 storage, that type of thing? 09:59:22

22 A No. 09:59:23

23 Q The next thing you list is CMOS and NMOS 09:59:23

24 SRAMs? 09:59:30

25 A Yes. 09:59:31

1 Q Can you describe what those are, please? 09:59:31

2 A So an SRAM is a Static Random Access Memory. 09:59:33

3 It is a device -- and these -- and these, by the 09:59:39

4 way, are all integrated circuits. This is a device 09:59:43

5 that you put information into, and then later you 09:59:46

6 draw it out and it -- it's a memory. 09:59:51

7 "Random access" basically means that you can 09:59:55

8 pick in the -- in the space of the number of 09:59:58

9 addresses that the product has, you can pick any 10:00:03

10 address and sort of jump to any other address 10:00:06

11 without regard to how or where you jumped. Okay? 10:00:11

12 S- -- static RAM is unlike dynamic. It's 10:00:18

13 a -- a part that does not need to be refreshed, so 10:00:22

14 it -- as long as the power is applied, it will hold 10:00:26

15 the data basically forever, barring some other 10:00:29

16 upset, like a cosmic ray, but it's -- it's -- you 10:00:34

17 don't have to -- a DRAM, you have to go back to 10:00:41

18 every so often and refresh the data; otherwise, it 10:00:45

19 will leak away. SRAMs don't have that problem. 10:00:48

20 And the two words in front of this word, 10:00:51

21 "CMOS," is a technology that involves having both an 10:00:53

22 N-channel device and a P-channel transistor. Those 10:00:58

23 two devices are both available to make the 10:01:02

24 functionality work. And an NMOS SRAM, it's a 10:01:04

25 simpler process, so it's less expensive, but you 10:01:09

1 only get N-channel transistors to work with. 10:01:12

2 And so, for example, this is another area 10:01:16

3 that because of speed issues, for instance, you 10:01:26

4 might have occasion to use boosting circuits or pump 10:01:28

5 circuits in an NMOS SRAM. 10:01:32

6 Q Why would you need to use boosting circuits 10:01:35

7 in an NMOS SRAM? 10:01:39

8 A Well, the first reason is that the devices -- 10:01:41

9 the N-channel transistors will draw more current the 10:01:47

10 higher the gate voltage goes. So there are -- there 10:01:55

11 are circuit tricks that you can use to take the 10:02:00

12 normal power supply that's applied -- let's just 10:02:05

13 take an example of 5 volts -- and boost the 5 volts 10:02:08

14 up to 7 and a half or 8 volts and make the circuit 10:02:13

15 go faster. It's possible to do that. People -- 10:02:17

16 especially in the early days, people did do that. 10:02:21

17 The second was something that's probably more 10:02:25

18 common for or more often used for NMOS SRAMs, and 10:02:28

19 that is a pump circuit to provide a negative back 10:02:32

20 bias to the substrate of the part to literally make 10:02:37

21 the transistors have a better-controlled threshold 10:02:42

22 voltage and to make the transistors have higher 10:02:47

23 breakdown voltages. 10:02:53

24 So we would take in the external supply, 10:02:54

25 which was normally -- the SS would normally have 10:02:58

1 been ground, and the Vcc or Vdd, depending upon 10:03:02
2 which terminology you want to use, it might be, 10:03:05
3 let's say, 5 volts. And then, from that, we would 10:03:08
4 create a minus-one-and-a-half volts that would be 10:03:11
5 put on the substrate of the device that would change 10:03:15
6 the characteristics of the transistors and make them 10:03:18
7 faster, as I said, and then also raise their 10:03:21
8 breakdown voltage. 10:03:25

9 Q So it was for performance reasons and also 10:03:25
10 control reasons; is that -- 10:03:31

11 A Yeah, I would -- I would say that's probably 10:03:35
12 the best match, yeah. 10:03:37

13 Q Is -- is 5 volts a common value for Vcc, in 10:03:38
14 your experience? 10:03:42

15 A It's one of them. There are many others. 10:03:43

16 Q You just picked 5 there. 10:03:46

17 Why did you pick 5? 10:03:51

18 A I picked 5 -- it's the -- it's the original 10:03:52
19 common voltage for TTL parts, and we talked about 10:03:59
20 TTL earlier. 10:04:02

21 If -- depending upon how far back you want to 10:04:06
22 go in history, original voltages probably were 15 or 10:04:09
23 12, and the technology wasn't NMOS, it was PMOS, and 10:04:15
24 so it wasn't 12 positive, it was 12 negative. 10:04:20

25 And then as the technology moves forward, the 10:04:24

1 devices get smaller and smaller and smaller, so they 10:04:27
2 can support -- they can't support such big voltages 10:04:31
3 because the distance keeps getting smaller, so 10:04:36
4 the -- over -- over time, the -- well, over time, 10:04:41
5 starting from the old days moving forward, the power 10:04:43
6 supplies have consistently just gone down. 10:04:46

7 So today, for example, you might see people 10:04:52
8 using .7 volts or .75 volts as the Vcc or Vdd. 10:04:54

9 Q So, generally, as the components have gotten 10:05:01
10 smaller, the voltages, the Vcc-type voltages, have 10:05:05
11 gotten smaller as well? 10:05:09

12 A Yes, and that all comes from scaling theory. 10:05:10

13 Q SRAM is volatile memory; is that correct? 10:05:13

14 A Yes. If you take the power away, it forgets. 10:05:19

15 Q The last item here -- and I'm not sure if 10:05:22
16 this is one or two items, so bear with me. 10:05:30

17 Is CCDS something different from the second 10:05:33
18 thing? 10:05:37

19 A Yes. 10:05:37

20 Q So what is "CCDS"? 10:05:37

21 A Okay. Sorry. It's "CCDs" -- 10:05:39

22 Q Oh, I'm sorry. 10:05:42

23 A -- and they are charge-coupled displays, so 10:05:43
24 I've done both surface channel and buried channel. 10:05:47

25 This is where you put packets of charge into the 10:05:52

1 device and you -- it's -- it's a memory. And you -- 10:05:57
2 you store the charge in -- usually in a -- in a 10:06:07
3 linear fashion, so it goes in here, and then you 10:06:13
4 move it along, and then you can only detect it at 10:06:17
5 the end. 10:06:21

6 Q Like a register? 10:06:21

7 A Yeah, like a series of registers, actually, 10:06:23
8 correct. 10:06:26

9 But it's -- for instance, it's not random 10:06:29
10 access, because since I only have one detector, I 10:06:31
11 have to wait till the right address gets to here, 10:06:35
12 and then I can actually see the data. And then -- 10:06:39
13 so they used to operate them in a group of different 10:06:42
14 races. One was a race track. You put the data in 10:06:46
15 here and then it went down here. And then if you 10:06:48
16 wanted to remember it, you just put it around in a 10:06:51
17 circle and fed it back to the input and went back in 10:06:54
18 again. 10:06:58

19 So, effectively, you could see that bit. 10:06:58
20 Maybe the register was 512 bits long or 256 bits. 10:07:01
21 They had various, but you could only see that after 10:07:06
22 clocking that piece all the way around. 10:07:09

23 And the other thing that's unique about them 10:07:12
24 is they -- they don't just store digital memory, 10:07:15
25 they store analog memory also. So the -- you -- you 10:07:18

1 literally could put an analog -- effectively, put an 10:07:23
2 analog voltage in by adjusting how much charge you 10:07:27
3 put into the input of the CCD and then save it until 10:07:30
4 later. 10:07:34

5 One example -- an easy example would be, you 10:07:36
6 can think of them as a delay line, right? So in 10:07:41
7 audio work, you awful (sic) -- you often hear of, 10:07:44
8 like, an echo effect where you shout into a canyon 10:07:49
9 and it comes back. Well, when you do that, you get 10:07:52
10 the -- you get the first audio instantly, and the 10:07:56
11 echo takes a certain amount of time to come back to 10:08:01
12 you and get another. 10:08:04

13 So the way they do that is they -- they give 10:08:05
14 you the first audio and they stick it into one of 10:08:07
15 these long shift-register CCDs. Then let it go 10:08:09
16 around in a circle and then present it back to you 10:08:13
17 and it sounds like an echo. 10:08:16

18 Q What would be a use case, a typical use case, 10:08:18
19 for a CCD? 10:08:21

20 A Oh, man, there are lots of uses. 10:08:22

21 So I've worked on hundred-megahertz radar 10:08:25
22 data in the '70s. I've worked on a projection 10:08:31
23 device, of all things; like, you know, you buy a 10:08:41
24 projector and you -- so in -- 10:08:45

25 Q Wait. 10:08:45

1 Like for PowerPoints in a room and that type 10:08:47
2 of thing? 10:08:49

3 A Correct. And we were doing that in maybe '76 10:08:49
4 or '77? 10:08:52

5 We -- we -- so we made a -- we made a CCD, 10:08:56
6 and it had a serial register, and then you could 10:09:00
7 take that data and dump it into another set of 10:09:05
8 parallel registers going down, and then there was 10:09:09
9 another serial register at the bottom, so the -- the 10:09:14
10 term for them are "serial, parallel serial." 10:09:17

11 And so what we did is we filled up the front 10:09:22
12 register, the input register, and then stored it 10:09:24
13 into the array. And then once the array was full, 10:09:27
14 we pushed all that charge to the backside of the 10:09:31
15 wafer, and then on that side of the wafer, we read 10:09:36
16 the amount of charge using a laser. 10:09:39

17 Q And what was the -- the purpose was a 10:09:47
18 projection system; is that -- 10:09:49

19 A Well, that -- the laser was for the 10:09:50
20 hundred-megahertz radar data, and you could do real 10:09:52
21 time for a transform on that data with the system. 10:09:55

22 And then somebody else figured out that 10:09:56
23 instead of reading them with a laser, they could 10:09:59
24 just slap an LCD onto the back and the charge would 10:10:02
25 light up spots on the LCD and then you could hit 10:10:06

1 it -- that with lamp and a lens, and on the wall 10:10:10
2 would be a TV picture. 10:10:13

3 So those are just two of the wacky examples 10:10:16
4 that I did at Hughes that -- so CCDs are a separate 10:10:21
5 thing. 10:10:25

6 The RAD Hard SOS/CMOS was specifically 10:10:26
7 radiation-hardened logic chips for outer space. 10:10:32
8 SO- -- so RAD Hard means they are 10:10:43
9 radiation-hardened. You can put them in space; they 10:10:46
10 will still work. SOS is silicon on sapphire, so the 10:10:48
11 underlying material here is not a P-wafer or an 10:10:54
12 N-wafer, it's a piece of sapphire onto which a thin 10:10:57
13 EPI is built, and then the transistors are built on 10:11:02
14 the top. And it was well known that the sapphire 10:11:05
15 could take much more radiation than a regular wafer 10:11:08
16 and the -- and the parts would still function. 10:11:12

17 And so those were logic parts developed for 10:11:13
18 the Hughes Aircraft Company for some of their 10:11:16
19 spacecraft. 10:11:21

20 Q The CCDs, you mentioned that they had this 10:11:21
21 register concept, and you mentioned the use case. 10:11:26

22 Would people use CCDs as memory devices? 10:11:30

23 A Oh, yeah. Yeah. They -- well, for instance, 10:11:33
24 I gave an example of them as a memory device in the 10:11:37
25 delay line. You are remembering the actual analog 10:11:42

1 information over a period of time and then 10:11:46
2 delivering it back to the user. 10:11:50

3 Now, it was a type of memory that occupied 10:11:53
4 its particular marketplace. Was it standard usage 10:11:57
5 in a PC, for example? No. Was it standard usage in 10:12:01
6 systems that required its unique properties as a 10:12:06
7 memory? Yes. 10:12:09

8 Q And what were those unique properties that 10:12:10
9 enabled it to have certain use cases but not, for 10:12:13
10 example, be germane to the PC world? 10:12:18

11 A Probably the most unique property would have 10:12:19
12 been the ability of a CCD memory to deal with 10:12:25
13 electrical signals as elements of charge. 10:12:34

14 So, for instance, a good example would be 10:12:38
15 that CCDs were also used for filter functions and 10:12:43
16 a -- like a cone filter. I don't know if you know 10:12:48
17 what a cone filter is, but it's a -- it's a -- it's 10:12:51
18 an elec- -- filter of electrical signals that has a 10:12:54
19 certain characteristic. And they were very 10:12:57
20 common -- they have very common usage in the '70s 10:13:00
21 and '80s for -- for that type of thing. 10:13:04

22 And to implement that filter, you put the 10:13:07
23 information in. You put the signal in, and you have 10:13:09
24 to store it for a while, and you have to break the 10:13:12
25 charge up into various packets, see if it matches 10:13:17

1 the filter function, so it's a very unique type of 10:13:20
2 device. You wouldn't -- well, it was the '70s, so 10:13:25
3 nobody was storing music like in a flash device 10:13:30
4 today. You wouldn't ever store music in a CCD. And 10:13:35
5 CCDs are volatile. They -- they are built on DRAM 10:13:40
6 technology, basically -- well, sort of DRAM, dynamic 10:13:44
7 technology. And so you had to have the power 10:13:48
8 applied, so as soon as you turn the power off, it 10:13:51
9 forgets. 10:13:53

10 Q So CCDs are volatile; is that right? 10:13:54

11 A Yes. 10:14:02

12 Q And you said they are built on DRAM 10:14:03
13 technology; is that right? 10:14:05

14 A They're -- they're -- they're built on the 10:14:06
15 same concept that -- well, sort of the same concept. 10:14:09

16 DRAM stores its charge on a capacitor that is 10:14:14
17 literally built as a capacitor. 10:14:20

18 A CCD stores its charge in a potential well 10:14:23
19 that you create by manipulating the voltage on the 10:14:27
20 gate. So you put this voltage on the gate. You get 10:14:31
21 a potential well below it, and you either allow or 10:14:34
22 don't allow a certain measured amount of charge to 10:14:37
23 go into that potential well. So it's similar to, 10:14:39
24 let's just say. 10:14:47

25 Q So it's similar to but has some differences 10:14:48

1 than DRAM technology -- 10:14:51

2 A Yes. 10:14:52

3 Q -- the CCD technology you mentioned? 10:14:52

4 A Correct. 10:14:54

5 Q The radiation-hardened SOS/CMOS, that's not a 10:14:55
6 memory, is it? 10:15:04

7 A Well, here again, it's a logic -- it's a 10:15:04
8 logic part. But we built logic parts that had 10:15:08
9 pieces of memory on them, so it could be -- the 10:15:11
10 memory on them could be a group of registers, for 10:15:14
11 instance. I really don't remember if we built a 10:15:17
12 part that was just a memory. It's been too long 10:15:22
13 now. There's no reason we couldn't have. I just 10:15:25
14 can't remember if we did or not. 10:15:28

15 Q To the extent it would have had memory, to 10:15:32
16 the extent you remember, would it have been volatile 10:15:34
17 memory? 10:15:37

18 A Oh, yeah, it's a -- it's another -- it's 10:15:37
19 another part that's volatile. It's -- it's a part 10:15:40
20 where if you take the power away, the information 10:15:47
21 disappears. 10:15:49

22 Q I would like to move on to paragraph 29 of 10:15:58
23 your declaration. 10:16:02

24 You with me there? 10:16:17

25 A I am. 10:16:17

1 Q The first sentence, in part, reads: 10:16:18
2 I have reviewed, had input into, and 10:16:24
3 adopt the analysis and claim charts 10:16:26
4 in the accompanying Petition for 10:16:29
5 Inter Partes Review of U.S. Patent 10:16:32
6 6,058,045. 10:16:34
7 Do you see that? 10:16:37
8 A I do. 10:16:38
9 Q I would like to ask you: What -- what did 10:16:38
10 you review? What did you have input into? And if 10:16:56
11 you can explain to me how that process worked in 10:16:59
12 putting this together. 10:17:02
13 A Well, the process began with -- well, the -- 10:17:04
14 the whole process began when I got hired and then 10:17:12
15 proceeded with me reviewing the documents, and then 10:17:16
16 that involved back and forth, give and take with 10:17:24
17 counsel about their perceptions of certain things 10:17:29
18 and my perceptions of certain things -- 10:17:34
19 Q And let me just caution, I'm not asking about 10:17:36
20 the conversations you had with your counsel. 10:17:38
21 A -- and then they -- they started to coalesce 10:17:40
22 their ideas and talk to me about them as far as 10:17:58
23 whether or not I would see one of ordinary skill in 10:18:03
24 the art seeing the same thing that they were looking 10:18:09
25 at. 10:18:11

1 There were times when -- that I change -- 10:18:19
2 that I changed some of the stuff for them in that -- 10:18:21
3 you know, adjusted the understanding and explained 10:18:25
4 why I thought one of ordinary skill in the art would 10:18:30
5 see something different than maybe what they had. 10:18:34

6 And then, eventually, that got to -- I don't 10:18:38
7 know how many rounds we went on that. I don't 10:18:43
8 remember, but, eventually, that -- that document -- 10:18:45
9 the inter -- the petition sort of started coming 10:18:49
10 together, and it was given to me to review and make 10:18:53
11 sure that -- that it was accurate from my 10:18:56
12 understanding from one of ordinary skill in the art 10:19:01
13 and what somebody would -- would come to when -- 10:19:03
14 when reading the -- the '045 patent. 10:19:07

15 And then, eventually, it was -- it was done 10:19:11
16 to their liking and my liking and off it went. 10:19:14

17 Q And when you say you "adopt the analysis and 10:19:22
18 claim charts in the petition," does that mean you 10:19:24
19 are adopting the whole petition, or is that 10:19:29
20 statement meant to cabin the portion that you are 10:19:31
21 adopting? 10:19:34

22 A No. There's no cabining. It's the whole 10:19:35
23 petition. 10:19:39

24 Q I would like to ask you to go back to the 10:19:52
25 petition here. 10:19:52

1	A	Yes.	10:19:52
2	Q	Page 2?	10:19:53
3	A	Page 2, yes.	10:19:54
4	Q	The bottom of that page has a section	10:19:54
5		entitled "Grounds for Standing." Oh, I'm sorry.	10:19:57
6	A	Oh, I'm on ii. Sorry.	10:20:00
7	Q	Yeah, the numeral 2.	10:20:03
8	A	Yes.	10:20:05
9	Q	You see that section?	10:20:10
10	A	I do.	10:20:12
11	Q	Do you know independently whether Toshiba has	10:20:13
12		grounds for standing?	10:20:17
13	A	Independently, I don't know, no.	10:20:19
14	Q	You didn't do anything to determine one way	10:20:22
15		or another whether Toshiba had standing in this	10:20:25
16		case, did you?	10:20:29
17	A	No. I relied on counsel for that	10:20:30
18		information.	10:20:32
19	Q	So you adopted this portion of the petition,	10:20:33
20		but you don't really know one way or the other	10:20:36
21		whether it's correct; is that right?	10:20:38
22	A	I don't -- well, if -- if -- if Toshiba	10:20:39
23		doesn't have -- if Toshiba doesn't have grounds for	10:20:52
24		standing, you know, from what I know about it, then	10:20:59
25		we wouldn't be here today.	10:21:04

24	In general, the '045 patent	10:22:42
25	describes a scalable flash memory	10:22:45

1	cell structure and a method of	10:22:47
2	manufacture.	10:22:49
3	Do you see that?	10:22:49
4	A I do.	10:22:50
5	Q Is that statement accurate?	10:22:50
6	A I believe it is.	10:22:52
7	Q Let me ask you just about the rest of the	10:22:58
8	statements in paragraph 10 regarding the subject	10:23:01
9	matter of the '045 patent.	10:23:04
10	All of paragraph 10 is accurate, as you sit	10:23:07
11	here today? You don't have any amendments or	10:23:10
12	adjustments to that?	10:23:12
13	A Right now, no.	10:23:13
14	Q So moving on to page 5, the last sentence of	10:23:15
15	that paragraph says:	10:23:23
16	I have been informed that only	10:23:26
17	claims 1 and 4 of the '045 patent	10:23:28
18	are subject to the inter -- this	10:23:30
19	inter partes review.	10:23:32
20	I'll stop there.	10:23:34
21	That's your understanding; right?	10:23:35
22	A It is.	10:23:37
23	Q And it's also your understanding that	10:23:37
24	claims 1 and 4 are, continuing on:	10:23:41
25	Directed to the structural	10:23:44

1 configuration of an array of flash 10:23:46
2 memory cells and the application of 10:23:50
3 certain voltages on various memory 10:23:51
4 array lines of the array to 10:23:54
5 implement memory cell program. 10:23:56

6 That's right; right? 10:24:02

7 A I believe it is, yes. 10:24:03

8 Q And you agree with that statement -- it's 10:24:04
9 your statement; is that right? 10:24:06

10 A That's right. 10:24:06

11 Q So that represents your opinion about what 10:24:07
12 claims 1 and 4 are directed to? 10:24:09

13 A Yes. 10:24:11

14 Q Do you want to take a break? I'm about ready 10:24:12
15 to switch gears, but if you -- happy to keep going. 10:24:24

16 A I'm cool. 10:24:26

17 Q Okay. I would like to go ahead and walk 10:24:27
18 through your CV, which you have attached to your 10:24:29
19 declaration. 10:24:31

20 And just for the record, this is Exhibit 10:24:42
21 1006, and I believe it's corrected Exhibit 1006; is 10:24:47
22 that right? 10:24:54

23 Your CV was originally not attached as filed, 10:24:55
24 and then the corrected exhibit was filed, so just 10:24:57
25 for the record, I want to make sure we have the 10:25:00

1	right Exhibit 6 (sic) --	10:25:02
2	MR. LIMBACH: This appears to be the correct	10:25:03
3	one.	10:25:05
4	BY MR. HEINZ:	10:25:05
5	Q Okay. So, Mr. Murphy, can you peruse that	10:25:05
6	and let me know if that's your CV?	10:25:10
7	A Looks like it is, yes.	10:25:18
8	Q All right. Before I start out, let me just	10:25:19
9	ask you: You mentioned earlier you have been hired	10:25:22
10	to -- to work on this case on behalf of Toshiba.	10:25:25
11	What's your hourly rate that you are	10:25:28
12	charging?	10:25:30
13	A 450.	10:25:30
14	Q Does it vary based on whether you are	10:25:32
15	testifying or whether you are doing general work?	10:25:36
16	A No.	10:25:38
17	Q Does it vary for any reason?	10:25:38
18	A No.	10:25:41
19	Q How much total time have you put in on this	10:25:41
20	case so far, just an estimate?	10:25:45
21	A I don't -- I don't have an estimate.	10:25:46
22	Q Is it more than a hundred hours?	10:25:57
23	A I don't think it's more than a hundred, no.	10:25:59
24	Q Is it more than 50?	10:26:03
25	A It might be, but I -- I haven't -- I haven't	10:26:05

1 added it up. 10:26:11

2 Q But in the ballpark, somewhere 50 to a 10:26:12

3 hundred hours? Is that a reasonable estimate based 10:26:16

4 on what you know today? 10:26:19

5 A That would be a guess, yes. 10:26:20

6 Q Have you done work for Toshiba before? 10:26:22

7 A I believe I worked on one other Toshiba 10:26:28

8 thing. It's too long ago for me to remember what it 10:26:33

9 was. 10:26:40

10 Q What was the general nature of it, just to 10:26:40

11 the extent you remember? 10:26:42

12 A Some sem- -- semiconductor thing, of course. 10:26:42

13 But it never went anywhere because the parties 10:26:47

14 settled, so that's why I don't really have a big -- 10:26:50

15 I remember -- I remember doing a very small expert 10:26:55

16 report, but I don't even know that it got filed, and 10:26:59

17 the next thing I heard was that, you know, the 10:27:02

18 case -- the case got settled and it went away and I 10:27:05

19 never did any more work on it than that. 10:27:09

20 Q So you have been an expert witness for 10:27:11

21 Toshiba once before; is that right? 10:27:15

22 A I believe only once, yeah. That's my 10:27:17

23 recollection. 10:27:20

24 Q Do you remember who the opposing party was? 10:27:20

25 A No. 10:27:23

1 Q Have you ever worked for DLA Piper before? 10:27:24

2 A Yeah, I have. 10:27:27

3 Q How many times? 10:27:28

4 A Maybe two or three, I think. I don't keep 10:27:29

5 track of it. Sorry. 10:27:43

6 Q Were those all litigation consulting? 10:27:44

7 A As opposed to? 10:27:46

8 Q Semiconductor consulting. 10:27:48

9 A I haven't done any semiconductor consulting 10:27:52

10 for -- at least what I consider semiconductor 10:27:55

11 consulting for DLA Piper, no. 10:28:01

12 Q So your work for DLA Piper has been 10:28:04

13 litigation consulting, and you estimate you have 10:28:08

14 worked for them before two or three times? 10:28:10

15 A That's my recollection, yes. 10:28:13

16 Q I'd like to start out with your resume and go 10:28:15

17 through it chronologically, starting from the 10:28:16

18 earliest date, which would be on page 5, I believe 10:28:17

19 of your CV? 10:28:20

20 A Sure. 10:28:22

21 Sorry. I just saw something on page 1. 10:28:26

22 Q Sure. 10:28:28

23 A Well, there's a Toshiba versus Hynix ITC case 10:28:30

24 listed there. 10:28:36

25 Q This is toward the bottom of page 1 -- 10:28:36

1	A	Towards the bottom --	10:28:39
2	Q	-- you're identifying?	10:28:39
3	A	-- towards the bottom of page 1. It says --	10:28:40
4	Q	Is that the case you were referring to	10:28:41
5		earlier?	10:28:45
6	A	Maybe. I mean, this is -- this is in	10:28:45
7		chronological order, so it -- it was a while ago.	10:28:48
8	Q	It's a candidate, at least?	10:28:52
9	A	It is a candidate, yeah. I don't see any	10:28:53
10		other Toshiba matters placed there, so.	10:28:56
11		I'm sorry. You wanted to start at 5?	10:29:00
12	Q	Yeah, let's start at the -- the earliest in	10:29:02
13		time, and then we'll come forward to the present.	10:29:04
14	A	Okay.	10:29:07
15	Q	I would like to start out with your	10:29:10
16		education.	10:29:12
17	A	Sure.	10:29:12
18	Q	You have a B.S.E.E. from Drexel University?	10:29:13
19	A	I do.	10:29:17
20	Q	That you received in June 1974?	10:29:18
21	A	Correct.	10:29:20
22	Q	M.S.E.E. from UCLA?	10:29:21
23	A	Yes.	10:29:24
24	Q	Received in 1976?	10:29:24
25	A	Correct.	10:29:26

1 Q Beyond the electrical engineering degree, did 10:29:26
2 you specialize in any particular fields during your 10:29:33
3 master's work, or was it more of a general 10:29:36
4 electrical engineering degree? 10:29:39

5 A It was specifically in electronics in -- 10:29:40
6 in -- at Drexel. And at UCLA, it was -- it was a 10:29:45
7 master's in EE in solid-state devices. 10:29:52

8 Q Did you study memory while you were there as 10:29:54
9 part of your work with either the electronics or 10:30:06
10 solid-state devices work? 10:30:09

11 A I'm sure there was some course matter that 10:30:10
12 had memory in it, certainly at the register level. 10:30:17
13 Whether we did -- whether we did full-blown memory 10:30:23
14 design at the time, I don't think that was part of 10:30:30
15 the course material, but you are -- you know, you 10:30:33
16 are asking me about something 40 years ago. So -- 10:30:36
17 so I would probably, if I was answering this, say 10:30:46
18 that I -- at that point in time at university, I got 10:30:48
19 maybe a slight introduction to memory, but I don't 10:30:55
20 think I got more than that. 10:30:58

21 Q So in the course of your education, you got a 10:31:01
22 slight introduction to memory, but not more than 10:31:04
23 that? 10:31:07

24 A I don't -- I don't believe so. I mean, they 10:31:07
25 may have described what memories were at very 10:31:11

1 high-levels, but probably never down into the 10:31:15
2 details that I learned later. 10:31:18

3 Q We talked earlier about flash memory, which 10:31:20
4 is the subject of the patents that we are talking 10:31:27
5 about today. 10:31:30

6 When was flash memory invented, just a best 10:31:30
7 estimate? 10:31:33

8 A I think, generally, 1984. 10:31:33

9 Q So flash memory hadn't been invented yet at 10:31:36
10 the time you did your studies at UCLA and Drexel? 10:31:39

11 A That's right. 10:31:45

12 Q So, correspondingly, you didn't study flash 10:31:46
13 memory during your academic career because it hadn't 10:31:48
14 been invented yet; right? 10:31:52

15 A Correct. 10:31:53

16 Q So after your bachelor's degree, it looks 10:31:55
17 like you started at Hughes and then went to school 10:31:57
18 while you were working; is that right? 10:32:00

19 A Sort of. Drexel is a work/study school, so 10:32:02
20 first year and last year of a five-year school is 10:32:08
21 full-time school work. The other three years are 10:32:13
22 part-time; six months in school, six months in 10:32:17
23 industry, and I spent my time at the FAA facility -- 10:32:20
24 NAFEC, it was called at the time. I don't know if 10:32:27
25 it still exists -- at -- near Atlantic City, so -- 10:32:29

1 and then when I left Drexel, I won a Hughes master's 10:32:33
2 fellowship, and I worked part-time at Hughes and I 10:32:36
3 got my master's degree at UCLA. 10:32:40

4 Q And in the course of your work at Hughes, 10:32:42
5 this is where you worked on the CCD memories that we 10:32:52
6 talked about earlier? 10:32:55

7 A Among other things, yes. 10:32:55

8 Q Did you work on any other memories while you 10:32:57
9 were at Hughes, beyond the CCD memories? 10:33:03

10 A Any other memories. I don't recall that I 10:33:05
11 did. I think mostly just the CCD memories. 10:33:16

12 Q And what rough percentage of your time from 10:33:24
13 June of 1974 to February of 1978 did you spend 10:33:30
14 working on those CCD memories? 10:33:34

15 A Well, let's see. We did a full chip design. 10:33:36
16 It's at least -- it's at least nine months of that 10:33:46
17 time. Might be longer than that. As I said, we may 10:33:51
18 have designed some -- some memory for this -- this 10:33:57
19 LSI using SOS/CMOS in a standard cell approach. I 10:34:02
20 just don't remember. 10:34:09

21 And -- let's see. The work in Canoga Park 10:34:10
22 was almost all analog or a mixed -- mixed-signal 10:34:17
23 work, so that was not memory per se. So I would say 10:34:22
24 9 to 12 months. 10:34:27

25 Q So 9 to 12 months of your period at Hughes 10:34:29

1 were working on memory? 10:34:32

2 A Yes. 10:34:33

3 Q And it was the CCD memory that we already 10:34:34
4 discussed? 10:34:37

5 A I believe it was mostly that, yes. 10:34:37

6 Q And that CCD memory is volatile memory; is 10:34:39
7 that right? 10:34:44

8 A That's correct. 10:34:44

9 Q Let me move on to your next position, which, 10:34:45
10 as it says here, is SRAM design manager at National 10:34:56
11 Semiconductor? 10:34:59

12 A Yes. 10:34:59

13 Q You were there from February of 1978 to April 10:34:59
14 of 1982? 10:35:03

15 A Yes. 10:35:04

16 Q Can you please describe your -- your duties, 10:35:05
17 generally, in that position? 10:35:10

18 A Well, I was originally hired to do CCD 10:35:11
19 memories, but that program didn't last very long. 10:35:19
20 National killed it, wanting to spend more effort on 10:35:27
21 DRAMs, but in between, we tried to -- we tried to 10:35:31
22 get the CCDs to be what you see there, called a 10:35:36
23 pseudostatic DRAM. 10:35:40

24 And then when that project died, I moved over 10:35:44
25 into the SRAM group, and I designed the first 4-T 10:35:47

1 cell SRAM product for National. Part came out. 10:35:52
2 Worked the first time. Went to production on a 10:35:57
3 10 percent shrink, and I was promoted to be the 10:36:02
4 section head of the static RAM group. 10:36:05

5 Later, I took a -- the promotion required a 10:36:13
6 transfer, and so I transferred to the West Jordan 10:36:16
7 facility in Utah, and I was responsible for all the 10:36:20
8 static RAMs built in that fab, so it was a fab 10:36:25
9 downstairs and the design community upstairs. I 10:36:30
10 think peak production was 90,000 4-inch wafers a 10:36:36
11 month, of which SRAM I was responsible for about 10:36:39
12 30,000 designs that were for -- about 30,000 wafers 10:36:42
13 a month. 10:36:49

14 Q So when you began there, you were actually 10:36:49
15 designing the chips; is that right? 10:36:52

16 A When I began at National in -- I was in 10:36:55
17 Santa Clara, and I was actually designing chips, 10:36:57
18 correct. 10:37:00

19 Q When you moved to your management role, were 10:37:00
20 you continuing to do the design yourself, or were 10:37:04
21 you overseeing other designers who did the design? 10:37:07

22 A Yes. Both. 10:37:10

23 Q Okay. Both. 10:37:11

24 A Yes. 10:37:12

25 Q And you mentioned you worked on SRAM there 10:37:12

1 and also, at the beginning, the pseudostatic DRAM 10:37:16
2 memory? 10:37:21

3 A Yeah, so that's what it was called, but 10:37:21
4 internally it was called a C- -- CCD. 10:37:23

5 Q And both of those are volatile memories. We 10:37:25
6 already talked about that; right? 10:37:28

7 A That's correct. 10:37:29

8 Q Did you work on anything other than memories 10:37:30
9 while you were at National Semiconductor? 10:37:35

10 A You mean this time at National? 10:37:37

11 Q Is there another National Semiconductor? 10:37:40

12 A Oh, yeah. 10:37:43

13 Q Oh, there is. Okay. Yeah, let's just -- 10:37:44
14 let's cabinet to this time -- 10:37:46

15 A Sure. 10:37:46

16 Q -- the one from '78 to '82. 10:37:49

17 A I worked on other things, but more from a 10:37:53
18 point of view of -- how would you call this? How 10:38:01
19 would you call this? Assistance rather than owning 10:38:05
20 the design. So the -- the -- the -- the group 10:38:08
21 involved SRAMs, DRAMs, UV-EPROMs, NMOS first, then 10:38:12
22 CMOS. 10:38:23

23 And there was a group next door that did 10:38:24
24 microprocessor parts. And it was a small design 10:38:27
25 community. Let's see, my manager had maybe, I'm 10:38:32

1 going to say, tops, 20 people, and the 10:38:37

2 microprocessor group maybe had another 15 or so. 10:38:44

3 The reason I say other things is that when 10:38:52

4 parts got into problem in the production line, 10:38:55

5 almost always everybody in the design community was 10:38:59

6 available to help, so I often got called in to, 10:39:03

7 effectively, consult on other people's problems, so 10:39:10

8 you not only learned about the products you were 10:39:15

9 making, you helped other people solve problems in 10:39:19

10 their products, right? 10:39:22

11 So I would say more intimately in the memory 10:39:23

12 group that I was in, so SRAMs, which was mine, DRAMs 10:39:29

13 and EPROMs, and then less -- less occasionally for 10:39:35

14 the microprocessor area. 10:39:42

15 Q What percentage of your time, roughly, would 10:39:43

16 you say was spent on SRAM and DRAM, your primary job 10:39:46

17 versus these other -- these other activities? 10:39:51

18 A Well, DRAM wasn't my primary job, but -- so 10:39:54

19 it was a -- another activity. I would say, in the 10:39:58

20 memory group itself, I probably spent up to an 10:40:01

21 average of 20 percent of my time on other products. 10:40:07

22 Usually all occurred in the same week, which meant 10:40:13

23 everything in SRAM stopped. We have a problem in 10:40:17

24 DRAM or we have a problem in E- -- in the EPROM 10:40:20

25 area, and we throw all the resources over there and 10:40:23

1 then we go fix it. 10:40:27

2 So they are estimates. I don't -- I don't -- 10:40:28

3 I don't believe it would be more than 20 percent. 10:40:34

4 Q Beyond the -- the DRAM project you mentioned 10:40:35

5 and the SRAM, which was your primary responsibility, 10:40:40

6 did you ever do any design work on EPROMs? 10:40:45

7 A Well, I definitely would say that I helped 10:40:51

8 with the sense amps, probably, and participated in 10:40:58

9 design reviews. So every -- when you are in such a 10:41:05

10 small community and you are sort of betting the 10:41:08

11 company that the design is going to work right. 10:41:12

12 Usually people like to get other people involved and 10:41:14

13 examine -- it's like -- sort of like having somebody 10:41:17

14 else read your brief. Same kind of thing. 10:41:20

15 Q Happens all the time. 10:41:25

16 A Same kind of thing, and so we would take all 10:41:27

17 the guys in the group, and there would be a 10:41:30

18 designer, so I sat through many design reviews of 10:41:30

19 EPROMs, CMOS EPROMs, and since the CMOS EPROM stuff 10:41:35

20 is in some ways -- some of the circuits are similar 10:41:40

21 to SRAMs -- we would try and collaborate -- like 10:41:43

22 especially on the sense amplifiers and the output 10:41:48

23 drivers and input buffers, we tried not to reinvent 10:41:50

24 them every time, because the schedules were so tight 10:41:53

25 that you didn't have time to reinvent them anyway, 10:41:56

1 so. 10:41:59

2 Q So you participated in design reviews on the 10:42:02
3 EPROMs, but you weren't the primary designer of the 10:42:06
4 EPROMs? 10:42:08

5 A No, but I was the resident -- I was the 10:42:08
6 resident sense amplifier guru, so I -- I -- "Come 10:42:10
7 over here and talk to me," you know. 10:42:14

8 Q So this period here, this -- this position 10:42:15
9 you left in 1982; right? 10:42:22

10 A Yes. 10:42:23

11 Q And that was before, we established, that 10:42:23
12 flash memory had been invented? 10:42:29

13 A That's correct. 10:42:29

14 Q So when you're -- the EPROMs you are talking 10:42:29
15 about were not flash memory per se; is that right? 10:42:31

16 A They were not at all. They were all U- -- 10:42:34
17 UV-EPROMs. 10:42:35

18 Q Are UV-EPROMs memory? 10:42:36

19 A Oh, of course. 10:42:44

20 Q And can you explain how those work? 10:42:45

21 A Sure. They -- they -- you -- you program 10:42:47
22 them -- well, actually, first you erase them, so 10:42:55
23 unlike other semiconductors, they have a clear lid 10:42:59
24 on them. At the beginning, I think it was quartz, 10:43:02
25 but I don't really -- I'm not positive, but I think 10:43:06

1 it was quartz, and so you could literally see the 10:43:08
2 chip, right? And so you would put them in a small 10:43:12
3 unit that had an ultraviolet light in it, and that 10:43:18
4 light energy would go through the quartz cover and 10:43:21
5 it would erase the device. 10:43:26

6 Then you would take the device and put it in 10:43:30
7 a programming box, add your file that you wanted 10:43:32
8 programmed, and then it would program the device, 10:43:35
9 and then forever -- it was non-volatile forever. 10:43:38
10 Until it got hit with a lot of UV energy, it would 10:43:43
11 remember what you programmed it with, so that was 10:43:46
12 definitely a memory and definitely non-volatile. 10:43:49

13 Q And it was programmed with ultraviolet light; 10:43:51
14 is that right? 10:43:55

15 A No. I thought I told you it was erased. 10:43:55

16 Q Oh, erased with ultraviolet light -- 10:43:59

17 A Right. 10:43:59

18 Q -- but programmed through some other means? 10:44:02

19 A Right, because when you hit -- when you hit 10:44:04
20 the device with ultraviolet light, it goes 10:44:05
21 everywhere, so all the cells get to see the 10:44:08
22 ultraviolet light, so they all become the same, and 10:44:10
23 they are all erased, and then you specifically go in 10:44:13
24 and change certain of the other ones to enable the 10:44:16
25 pattern that you want in the memory to be resident. 10:44:21

1 Q What was a typical use case back in that time 10:44:24
2 from EPROM? 10:44:31

3 A The typical use case, I think, would have 10:44:33
4 probably been for booting information. 10:44:36

5 Q Like in a computer? 10:44:44

6 A Like in a computer, right, depending upon -- 10:44:45
7 depending -- another usage would have been that your 10:44:52
8 whole -- if you could fit it, your whole program was 10:44:55
9 stored in -- in -- in this UV-EPROM, because they 10:44:58
10 were able to be changed relatively quickly. It took 10:45:02
11 about 20 minutes, I think, to erase them. Maybe a 10:45:06
12 half an hour. 10:45:09

13 But if you were building a product where, for 10:45:10
14 instance, the -- you wanted the ability to modify 10:45:12
15 the code later on, you literally just had to pull 10:45:15
16 the device out, erase it, reprogram it, stick it 10:45:22
17 right back in the socket and off you go. You would 10:45:26
18 have either new features or changes implemented into 10:45:27
19 the product you had. 10:45:31

20 So computer rebooting is one and -- and -- 10:45:33
21 and code adjustable or changeable code storage would 10:45:41
22 be another, I think. 10:45:43

23 Q Did they use EPROMs for data that needed to 10:45:44
24 get read and written very often? 10:45:54

25 A Well, in the case of a boot PROM, it 10:46:02

1 doesn't -- maybe once a day. It doesn't get written 10:46:04
2 very often, no. 10:46:06

3 And in the case of a variable code type of 10:46:07
4 thing, I guess it might depend upon the usage. So, 10:46:14
5 for instance, if you are trying to develop a system 10:46:18
6 and the code is stored in these EPROMs, you might 10:46:21
7 rewrite the code four, five times a day, for 10:46:25
8 example. Once the product was finished, you know, 10:46:30
9 maybe you changed the code once a year, once every 10:46:32
10 six months, or whenever you needed to. 10:46:37

11 Q So you could -- 10:46:40

12 A So it depends upon what you mean by "often." 10:46:41

13 Q It wasn't the case that it was marketed to 10:46:50
14 consumers as a memory device they could read and 10:46:51
15 write and store files on and erase files and that 10:46:53
16 type of thing? Is that the -- is that the case? 10:46:55

17 A So this is an integrated circuit that, at 10:46:56
18 that time, and even still today, requires that it 10:47:03
19 goes into a socket on a circuit board. They were 10:47:08
20 generally not marketed to consumers at all, but that 10:47:14
21 didn't make any difference because there weren't any 10:47:20
22 consumer uses at the time anyhow, so. 10:47:23

23 Q Fair enough. 10:47:25

24 Let's move on to your next position with RCA. 10:47:31

25 A Mm-hmm. 10:47:35

1 Q And that was from April of 1982 to October of 10:47:36
2 1983; is that right? 10:47:39

3 A Correct. 10:47:40

4 Q Can you briefly describe your duties while 10:47:41
5 you were at RCA? 10:47:45

6 A So I was the project manager for a 64k-SRAM 10:47:46
7 product, and I had responsibility for the design, 10:47:50
8 the process, the preproduction, production, and 10:47:56
9 delivery of the part to the corporation so they 10:48:04
10 could sell it. So all of those -- all of those 10:48:07
11 activities -- actually, when I got there, all those 10:48:12
12 activities were -- were -- had people on them, but 10:48:15
13 they were all in different divisions, and so the -- 10:48:22
14 the CEO of the solid-state division at RCA hired me 10:48:26
15 in to knit all these people together as a single 10:48:31
16 entity and then make it happen. 10:48:38

17 Q How big was your team, was the team you just 10:48:41
18 mentioned? 10:48:45

19 A Well, around 15. That's my recollection. 10:48:45

20 Q So here you say you were responsible for the 10:48:49
21 team -- oh, 15 people. I see -- who developed the 10:48:57
22 process, did modeling, designed the circuits, 10:49:00
23 created the layout, and performed the testing. 10:49:02

24 So you oversaw those activities? 10:49:05

25 A Yeah, it's -- RCA had a very unique way of 10:49:08

1 doing things, so none of those people reported to me 10:49:12
2 directly, but they all worked on my program. So I 10:49:15
3 told them what the program needed, and they told me 10:49:19
4 what they could do, and then we haggled about when 10:49:22
5 it would get done, and -- but, yeah, I -- I had 10:49:25
6 done -- I had done very close -- I had a very close 10:49:33
7 interaction with the process development people at 10:49:38
8 National. Because to be a memory designer at 10:49:40
9 National, you had to know what the process was. You 10:49:43
10 just couldn't design memory and not know what the 10:49:46
11 process was. 10:49:49

12 And so I would -- the -- the guys developing 10:49:49
13 the process were actually at the David Sarnoff 10:49:55
14 Research Center in Princeton, and we talked. We 10:49:57
15 talked often. And I also -- the circuit designers 10:50:03
16 were there also. I was often in Princeton talking 10:50:09
17 to them, explaining to them how things were done 10:50:14
18 somewhere else versus how they were doing them. The 10:50:18
19 layout was done in Somerville. The preproduction 10:50:22
20 was done in Somerville. The manufacturing was 10:50:27
21 planned to be done in Florida, and the testing at 10:50:31
22 the beginning was done in Somerville, so I knit all 10:50:35
23 that together. 10:50:39

24 Q So you oversaw all those activities in your 10:50:40
25 role? 10:50:43

1 A Yes. The -- the administrative aspects of 10:50:44
2 those people were still done in their own division. 10:50:49

3 Q Right. 10:50:52

4 They had their own division for that, but you 10:50:53
5 oversaw their work with regard to this product? 10:50:55

6 A That's correct. 10:50:57

7 Q Did you, personally, do any of the design 10:50:57
8 work for this product? 10:51:01

9 A Oh, yes. 10:51:02

10 Q Please explain. 10:51:04

11 A So I did most of the test chip work with 10:51:05
12 respect to teaching people things that were well 10:51:11
13 known on the West Coast but weren't known on the 10:51:16
14 East Coast, and so I was involved heavily in the 10:51:18
15 test chip. 10:51:24

16 Then I was involved heavily in the circuit 10:51:26
17 design for the real product, for the -- so the test 10:51:29
18 chip was a 4k, and the final product was a 64k. I 10:51:33
19 also -- I also taught people about polyfuses, and 10:51:40
20 that stuff that had been done at National before 10:51:48
21 hadn't been done at RCA yet. Same is true for 10:51:51
22 polyresistors. 10:51:55

23 So, yeah, I was sort of like a working 10:52:00
24 program manager, which is the way some people like 10:52:03
25 it, actually, but. 10:52:07

1 Q What percentage of your time would you say, 10:52:08
2 roughly, you spent doing this design work versus the 10:52:10
3 management responsibilities you had for the group? 10:52:12

4 A I would say I prob- -- at least in the 10:52:15
5 beginning, I would say I probably did -- 60 percent 10:52:18
6 of my time was design work and 40 percent was 10:52:22
7 managing. And towards the end of it, because we 10:52:25
8 were getting ready to move the product to its final 10:52:30
9 production facility, then it was -- you know, by 10:52:33
10 then we had a working test chip and the 64k design 10:52:37
11 was doing pretty well, so I was doing less 10:52:41
12 managing -- I mean less circuit design and more 10:52:44
13 managing. 10:52:47

14 Q Because the design was effectively done by 10:52:48
15 that point, because you were building the new chip? 10:52:50

16 A Well, it wasn't done, but I think the -- I 10:52:53
17 think the -- sort of like any -- let's take an 10:52:58
18 example in your -- in your world. 10:53:00

19 You read a brief. You think about, in your 10:53:02
20 history, all the things that could go wrong or could 10:53:05
21 be a problem with briefs. You input that to the 10:53:08
22 people who actually wrote the brief, and you explain 10:53:12
23 why, and you are, effectively, giving them your view 10:53:14
24 of the elephant and as much as you can teaching, 10:53:20
25 right? 10:53:23

1 I had done something at -- at -- at National 10:53:26
2 that the people -- all of the people at RCA had 10:53:29
3 never done. I had products in production at 10:53:32
4 National where, when we started a product, we 10:53:34
5 started 10,000 wafers. Nobody at RCA had ever done 10:53:39
6 that. None -- none of these people. They were more 10:53:44
7 in the -- well, the David Sarnoff Research Center at 10:53:46
8 Princeton was all research guys. If they made two, 10:53:50
9 they were doing really well. 10:53:53

10 But -- so the ins and outs of -- of the sort 10:53:56
11 of "gotchas" when you move to volume -- right? -- is 10:54:03
12 something that I could teach, and that also applies 10:54:05
13 to, "That's a really nice circuit, but in 10:54:10
14 production -- in production it won't work, and let 10:54:13
15 me show you why," right? 10:54:15

16 And, you know, that involves understanding 10:54:17
17 the circuitry, making sure the models of the 10:54:20
18 circuitry are right, making sure that they ran the 10:54:22
19 simulations correctly, and so it's a combin- -- for 10:54:25
20 me, it was a combination of teaching, right? And 10:54:31
21 then -- and both ways. You guys do it this way. 10:54:35
22 Tell me why. Why did you do it that way? What was 10:54:38
23 special about it? You know, did you ever take it to 10:54:40
24 production? How many wafers a month did you run? 10:54:43
25 You get very jaded when you are in a factory that 10:54:46

1 runs so many wafers, because just one little thing 10:54:49
2 can make your life a nightmare. 10:54:55

3 You walk in one day in the factory and you 10:54:57
4 see that there's -- the factory is running 90,000 10:54:59
5 wafers and 60,000 wafers are stuck at poly, and 10:55:03
6 it's, like, oh, no. No, no. No, no. You sort of 10:55:07
7 want to turn around and go home. 10:55:10

8 So it was this constant mix of doing circuit 10:55:12
9 design and doing managing and making sure the people 10:55:15
10 had the -- what they needed and then dealing with 10:55:20
11 the RCA hierarchy. 10:55:21

12 Q So the -- you did a little more design-level 10:55:23
13 work when you got there. I think you said 10:55:29
14 60 percent design level, and then that transitioned 10:55:31
15 as the products became closer to being produced to 10:55:34
16 more of this teaching and oversight role? 10:55:37

17 A No, the other -- the other way around. The 10:55:39
18 teaching was more in the beginning, and just like 10:55:41
19 the -- the -- the example with the brief, once you 10:55:44
20 have taught it all -- right? -- then, you know, you 10:55:47
21 don't -- I've told you that already, you know. If 10:55:52
22 you implement it right and it works and we test it 10:55:55
23 right and I'm -- I'm done. You know, we move on to 10:55:58
24 the next thing. 10:56:00

25 And so I would say, at the end, I spent more 10:56:01

1 time doing management-oriented things, trying to get 10:56:05
2 everything aligned so that the part could actually 10:56:09
3 move into production, because at the time, the 10:56:12
4 production facility in Florida wasn't very good. 10:56:16

5 Q So at the beginning, you spent more time 10:56:21
6 designing and being involved in the design and 10:56:26
7 teaching, and then, toward the end, you transitioned 10:56:28
8 into more management-level things, making sure the 10:56:31
9 product got done -- 10:56:33

10 A Right. 10:56:33

11 Q -- is that fair? 10:56:34

12 A Yeah. 10:56:35

13 Q Other than the SRAM project that we have 10:56:36
14 discussed, did you work on any other projects at 10:56:43
15 RCA? 10:56:46

16 A I did -- not on a project per se, but I 10:56:47
17 had -- so this gets back to a knowledge sort of 10:56:52
18 thing, so I had more knowledge about ESD circuits 10:56:54
19 than the people at RCA did. They had some really 10:56:59
20 good ESD circuits for TV sets, because TV, you tend 10:57:02
21 to get pretty archy-type electrical characteristics, 10:57:07
22 but everything they had was not very amenable to a 10:57:12
23 standard integrated circuit flow. 10:57:16

24 And from National, because of the products I 10:57:19
25 made, they all had to be ESD robust, and so that was 10:57:22

1 another area where I -- so pretty soon people found 10:57:29
2 out, oh, you know about -- you know about contract 10:57:33
3 law. Next thing you know, you get a phone call, and 10:57:38
4 so I know I did some of that. But it was never from 10:57:41
5 my project because I had already told my guys how to 10:57:44
6 do that. And that's the biggest thing -- the 10:57:48
7 biggest other thing in RCA that I can remember 10:57:50
8 doing. It was something I did do at National, and 10:57:53
9 then I also -- so I helped other -- and -- and very 10:57:55
10 much like what I talked about in -- in Salt Lake 10:57:59
11 City, in West Jordan -- right? -- when you had a 10:58:03
12 problem, you started to seek out, well, who knows -- 10:58:05
13 who knows about this or who knows about that, and 10:58:07
14 once people found out I worked on these things, I 10:58:10
15 was -- I would be consulted. It's not a big deal. 10:58:13
16 I mean -- but it's not my project. 10:58:16
17 Q So just so the record is clear, ESD is 10:58:17
18 electrostatic discharge; is that right? 10:58:21
19 A Correct. Mm-hmm. 10:58:23
20 Q And other than that project, nothing comes to 10:58:24
21 mind in terms of other things you worked on at RCA? 10:58:27
22 A There wasn't really anything. This was -- 10:58:31
23 this was a lot. 10:58:33
24 Q And during this period -- this is still 10:58:33
25 before flash memory was invented; right? 10:58:44

1 A Correct. 10:58:47

2 Q And SRAM is volatile memory, as we already 10:58:48
3 talked about; right? 10:58:51

4 A That's correct. 10:58:51

5 Q You didn't work on any non-volatile memory 10:58:52
6 during your time at RCA? 10:58:57

7 A At RCA, non-volatile memory. I don't believe 10:58:59
8 so. 10:59:06

9 Andy Dingwall, I think, did most of that for 10:59:06
10 the labs, which is the Princeton -- the David 10:59:11
11 Sarnoff Research Center. Other than potentially 10:59:18
12 having some conversations, no. 10:59:23

13 Q Let's move on to your next position, which is 10:59:23
14 back to National Semiconductor. 10:59:27

15 A Yes. 10:59:29

16 Q And that position is senior engineering 10:59:29
17 manager, and you were there from October of 1983 to 10:59:34
18 February of 1989; is that right? 10:59:38

19 A That's correct. 10:59:40

20 Q Can you briefly describe your duties in that 10:59:40
21 position? 10:59:43

22 A So, originally, I came back into the speech 10:59:43
23 group at National, and I seem to have this talent 10:59:53
24 for picking groups that were about to die. 10:59:58

25 Q What was the speech group? What do you mean 11:00:01

1 by that? 11:00:03

2 A Literally, it was speech recognition. They 11:00:03
3 were going to make -- actually, they did make chips 11:00:06
4 that did both things. 11:00:08

5 So at the time, they would -- one example 11:00:09
6 would be they used phonetics, and they would a 11:00:14
7 computer voice that would say things for you. You 11:00:20
8 could program into it what you wanted to say and 11:00:22
9 phonetically it would say it. 11:00:24

10 And then the other corollary was: Okay. We 11:00:26
11 are going to have people speak into it and -- or 11:00:29
12 into a different chip, and it was going to recognize 11:00:31
13 what they said. So that was what I was originally 11:00:33
14 hired for, and National got out of that business 11:00:38
15 maybe six months after I got there. So a bunch of 11:00:42
16 people that I knew from my first tour there had now 11:00:52
17 moved on into a PAL group where they were doing 11:00:56
18 bipolar PALs, so this would be TTL and ECL PALs. 11:01:00

19 Q Like we talked about earlier when we were 11:01:05
20 talking about the technologies; is that right? 11:01:07

21 A Correct. ECL is Emitter Coupled Logic. 11:01:09

22 And at the time, they were -- what a great 11:01:15
23 group. They were printing money, selling bipolar 11:01:20
24 PALs. I mean, costs were really low. Product value 11:01:23
25 was really high, and they were one of the biggest 11:01:27

1 contributors to the profitability of National that 11:01:30
2 they had. 11:01:35

3 The trouble was, some guys over here in the 11:01:35
4 valley had just invented CMOS PALs using ultraviolet 11:01:38
5 cells, and they were -- they could sort of see the 11:01:42
6 future that they needed to -- they needed to have 11:01:50
7 something. And their first entry into it was this 11:01:54
8 BiCMOS PAL. 11:01:59

9 So basically I ran that project to begin 11:02:04
10 with, and I took -- I stole as much as I could from 11:02:07
11 the bipolar arena and then wrapped it in a CMOS 11:02:13
12 wrapper, so it still had metal fuses in the core and 11:02:21
13 it still was a logic device, mostly, with registers, 11:02:27
14 and -- but it used a bipolar transistor to blow up 11:02:31
15 the fuses in the core, and that's how you programmed 11:02:36
16 the logic into it, but the ins and the outs were all 11:02:38
17 CMOS. 11:02:46

18 And then I stole -- from the SRAM world, I 11:02:46
19 stole a power-down feature, which bipolar PALs 11:02:49
20 didn't have, and so this part, the part we made, it 11:02:54
21 would actually power down -- you could power it 11:03:00
22 down. Like when you weren't using it, it drew 11:03:02
23 almost no power because it's CMOS. And so that part 11:03:05
24 was made, and I was -- I wrote a paper about it, and 11:03:09
25 it was presented at the ISSCC, which is the 11:03:15

1 International Solid State Circuits Conference in 11:03:18
2 San Francisco, and that was the first portion of my 11:03:22
3 stay here. 11:03:27

4 The second portion was that National had done 11:03:31
5 a deal with -- sorry. I'll have to remember the 11:03:34
6 name -- Lattice Semiconductor to be a second source, 11:03:40
7 and Lattic made an e-squared PAL, so it was 11:03:47
8 e-squared CMOS. It was electrically erasable, and 11:03:50
9 National had arranged this deal to second-source -- 11:03:53
10 first of all, second-source their products and 11:03:59
11 then -- and replicate, so replicate the process that 11:04:05
12 they used at the National facility in Salt Lake City 11:04:10
13 and -- let's see. Lattic was the foun- -- fabless 11:04:19
14 semiconductor, and their foundry was Seiko Epsom, so 11:04:27
15 we replicated Seiko Epsom's process in -- first in 11:04:31
16 Santa Clara and then in the foundry -- in our 11:04:36
17 foundry in Salt Lake City, and -- and then on the 11:04:40
18 second part of the deal -- so that was the first 11:04:44
19 thing. 11:04:46

20 The first thing was to make Lattic's parts 11:04:46
21 using Seiko Epsom's process in -- at National, and 11:04:49
22 so we did that, and -- and you will see here, we 11:04:53
23 went from zero revenue to a million dollars a month 11:04:57
24 in 12 months, which wasn't bad. 11:04:59

25 And then the second part of it was to design 11:05:03

1 new products that we would co-license with Lattic, 11:05:07
2 so we would design new products, and so I 11:05:11
3 participated. And by that time, I was running this 11:05:13
4 group, doing e-squared PALs. 11:05:17

5 Q So just to take those in chronological order, 11:05:19
6 so at the beginning, the BiCMOS PAL, it sounds like 11:05:24
7 you were heavily involved in the design of that one; 11:05:28
8 is that right? 11:05:32

9 A There was -- there was my -- I was the lead 11:05:32
10 engineer, and I had one junior guy and one layout 11:05:38
11 person -- or two layout people, yeah, so I was 11:05:42
12 pretty much everything. 11:05:46

13 Q And then in the -- the second-sourcing aspect 11:05:46
14 of that position, those were designs you got from 11:05:51
15 another company; right? 11:05:53

16 A That's right. 11:05:55

17 Q And then, finally, in the last portion that 11:05:55
18 you mentioned, when you were making the different 11:06:00
19 designs and, by that time, had been promoted, how 11:06:03
20 active were you in the design of those products? 11:06:06

21 A Yes, active, because you couldn't -- as a 11:06:09
22 manager at this level, even at senior engineering 11:06:14
23 manager, you still had to know all of this technical 11:06:18
24 stuff. 11:06:21

25 And then the part that you sort of glossed 11:06:22

1 over was the concept of: Oh, you got these designs 11:06:24
2 from somebody else? Well, the process that those 11:06:28
3 designs ran in was at Seiko Epsom in Japan. That 11:06:33
4 process had to be transferred to the facility in 11:06:40
5 Salt Lake City -- I mean in Santa Clara first and 11:06:43
6 then Salt Lake City. 11:06:46

7 So we actually had to build some test chips 11:06:47
8 first, see if we could get our parameters to match 11:06:52
9 as closely to the parameters in Japan. Then we had 11:06:55
10 to take the design that was given to us from Lattic 11:07:00
11 and rework it all to make sure that it worked right, 11:07:04
12 given what our fab looked like versus what the Seiko 11:07:08
13 Epsom fab looked like. 11:07:13

14 So we actually reworked the -- the designs 11:07:14
15 given to us. You couldn't just make something with 11:07:17
16 them. You had to literally -- well, you had to 11:07:20
17 prove to the management that they were going to work 11:07:24
18 right, and that meant you had to do it all over 11:07:26
19 again. So that's what I did. It wasn't just the 11:07:28
20 simple, oh, yeah, get the designs and throw them in 11:07:30
21 and, hey, you are all done. 11:07:34

22 Q Ultimately, were the chips made in Japan and 11:07:35
23 the chips made by you the same? Were those fungible 11:07:40
24 or not? 11:07:44

25 A Well, they all met the same spec. You could 11:07:45

1 probably have an interesting discussion with people 11:07:50
2 about which one was better, but -- but they all sold 11:07:53
3 to the same specification in the data book. 11:07:59

4 Q Earlier, we talked about flash being invented 11:08:02
5 circa 1984. 11:08:09

6 Do you remember that? 11:08:11

7 A Yes. 11:08:11

8 Q That's during this period you were in this 11:08:11
9 position at National Semiconductor; is that right? 11:08:15

10 A That's correct. 11:08:17

11 Q Were you involved in flash memory during this 11:08:18
12 period? In other words, did you have any job duties 11:08:22
13 at National Semiconductor while you were here 11:08:29
14 related to flash memory, or were you involved in 11:08:32
15 some way in the initial designs of flash memory or 11:08:34
16 anything of that nature? 11:08:37

17 A Well, the product that I worked on is not a, 11:08:38
18 quote/unquote, flash memory, but the underlying 11:08:44
19 technology is all pretty much identical. So you 11:08:47
20 couldn't have -- you couldn't have designed a flash 11:08:54
21 memory without knowing everything I had to know for 11:08:58
22 the e-squared PAL. It still gets programmed and it 11:09:02
23 gets erased. Then you have bit lines and select 11:09:07
24 lines and boost circuits. They are all -- they are 11:09:11
25 all there. 11:09:15

1 Q So you worked on technology that's related or 11:09:18
2 used in flash memory; is that right? 11:09:22

3 A I don't think it's just related. I think 11:09:24
4 it's the same technology. I mean, the -- the -- for 11:09:27
5 ex- -- for example, some of the flash devices we 11:09:35
6 talked about earlier have a NOR configuration on the 11:09:38
7 bit line. These PALs have a NOR configuration on 11:09:41
8 the bit line. Okay? 11:09:46

9 The -- the difference, if there is one, is 11:09:46
10 that they are not storing individual bits of data to 11:09:50
11 be read as data. They are storing indi- -- 11:09:55
12 individual bits of information that will be used as 11:09:59
13 logic elements, if you will. 11:10:03

14 Q You did not work on flash memory at National 11:10:12
15 Semiconductor Corporation during this period of 1983 11:10:18
16 to 1989, did you? 11:10:19

17 A Well, no. This doesn't say that I worked on 11:10:21
18 flash memory. It says I worked on e-squared CMOS 11:10:26
19 PALs, which is what the products -- what they -- 11:10:29
20 what they built. 11:10:32

21 What I've told you is that the underlying 11:10:33
22 technology for the e-squared PAL in a flash device 11:10:35
23 are not different. 11:10:40

24 Q So it's your opinion that the underlying 11:10:42
25 technology of the e-squared CMOS PAL and flash 11:10:44

1 memory are the same? 11:10:48

2 A Correct. 11:10:49

3 Q But you did not work on flash memory during 11:10:50

4 this period at National Semiconductor, did you? 11:10:55

5 A Not a product that was called flash memory 11:10:57

6 specifically, no, but the devices were the same 11:11:00

7 types of cells. They had thin oxide. They had a 11:11:05

8 select gate. They had bit lines. They were 11:11:08

9 organized on the bit lines. They had programming 11:11:10

10 voltages, so. 11:11:13

11 Q So the answer to my question is no? 11:11:16

12 A They were not called flash memories, that's 11:11:18

13 correct. 11:11:21

14 Q Did you work on any NAND devices while you 11:11:21

15 were at National Semiconductor? 11:11:26

16 A The only place that I think we may have used 11:11:27

17 a NAND would have been in the test circuitry put on 11:11:37

18 this PAL device, but as a NAND device, no, I did 11:11:40

19 not. 11:11:43

20 Q Let's move on to Weitek. 11:11:43

21 MR. LIMBACH: Would now be a good time for a 11:11:53

22 break? 11:11:55

23 MR. HEINZ: Sure. 11:11:56

24 THE WITNESS: If you guys want, that's fine. 11:11:57

25 THE VIDEOGRAPHER: Very good. 11:11:58

1	Going off the record, the time now is 11:12.	11:11:59
2	(Recess taken.)	11:12:02
3	THE VIDEOGRAPHER: Back on the record.	11:32:59
4	The time now is 11:32. This also marks the	11:33:01
5	beginning of Video 2.	11:33:04
6	Please continue.	11:33:06
7	BY MR. HEINZ:	11:33:07
8	Q Mr. Murphy, before the break, we were going	11:33:07
9	through your CV.	11:33:09
10	A Yes.	11:33:10
11	Q And I believe we were up to the Weitek --	11:33:10
12	A Weitek, yes.	11:33:14
13	Q -- position, and you held that position from	11:33:15
14	February of 1989 to June of 1992; is that right?	11:33:18
15	A That's correct.	11:33:22
16	Q Your title was director of engineering?	11:33:23
17	A Yes.	11:33:26
18	Q Please describe your duties in that role.	11:33:26
19	A Well, my duties here were, in many ways,	11:33:28
20	similar to places -- other places I had been. I	11:33:33
21	started out as a design manager and had a	11:33:39
22	responsibility for an individual chip. It was a, as	11:33:42
23	they say, working design manager position, meaning	11:33:48
24	that I still did circuit design and still helped	11:33:51
25	people understand the best ways to design their	11:33:57

1 circuits, so for this device, I did some memory 11:34:01
2 portions of it, the output drivers and the ESD. The 11:34:12
3 device was a floating point co-processor. 11:34:18

4 And then, after that, I was promoted to 11:34:26
5 director, and then I had circuit design architecture 11:34:28
6 and the layout groups, and the products included a 11:34:31
7 microcontroller for printers or -- or small 11:34:40
8 microprocessor, whichever way you want to look at 11:34:44
9 it, floating -- floating point chips and eventually 11:34:49
10 a -- eventually a -- a three-way-designed floating 11:34:54
11 point for supercomputer made in combination with 11:35:03
12 Toshiba and SGI and NEC. Sorry. Forgot them. 11:35:07

13 Q Just so I make sure I have the right product 11:35:12
14 list, so the first one was a floating point 11:35:16
15 co-processor? 11:35:18

16 A Mm-hmm. 11:35:19

17 Q And the next one was a printer? 11:35:19

18 A It's a microprocessor controller for a 11:35:23
19 printer. 11:35:25

20 Q And then the subsequent ones were also 11:35:26
21 related to floating point, but were they different 11:35:29
22 projects from the first one? 11:35:32

23 A They were different projects, yes. 11:35:33

24 Q And they were also floating point 11:35:34
25 co-processors? 11:35:36

2	Q	What are floating point co-processors used	11:35:37
---	---	--	----------

4	A	So numbers can be -- numbers can be	11:35:45
---	---	-------------------------------------	----------

6 ways. One of those unique ways is scientific

7	notation, and a floating point co-processor is one	11:35:59
---	--	----------

8	that processes numbers, so typical arithmetic	11:36:05
---	---	----------

9	operations; add, subtract, multiply, divide. They	11:36:11
---	---	----------

```
10 are -- they are the easiest to do, and they are done | 11:36:15
```

```
11    on floating point numbers. 11:36:17
```

12	A floating point number is a number who has a	11:36:19
----	---	----------

13	single digit to the left of the decimal point and	11:36:22
----	---	----------

14	then multiple digits to the right of the decimal	11:36:28
----	--	----------

15	point, and then that number gets multiplied by ten	11:36:31
----	--	----------

```
16      raised to a power, and so you store -- you store | 11:36:34
```

```
17 the -- it's called the mantissa and the exponent, 11:36:40
```

```
18      and you work on them inside this chip to -- to 11:36:45
```

19	provide accurate mathematical answers.	11:36:49
----	--	----------

20 So, for instance, if you are dealing with 11:36:53

21	numbers that are both very large and very small, a	11:36:55
----	--	----------

```
22 floating -- a floating point is the normal
```

23 methodology used to deal with those numbers. 11:37:01

24	A good example would be things in space. You	11:37:05
----	--	----------

25 know, they are hundreds of millions of light years 11:37:09

1 away, and then you have something that's sort of 11:37:12
2 right next door. One is a very large number, and 11:37:14
3 the other is a very small number, effectively, and 11:37:17
4 yet you can still do math with them and still be 11:37:20
5 relatively -- have good relative accuracy. 11:37:22

6 Q Is it called a co-processor because there's a 11:37:25
7 main processor and then that offloads these floating 11:37:29
8 point calculations to the floating point processor; 11:37:32
9 is that right? 11:37:37

10 A That's correct. 11:37:37

11 And then -- and back in this time, the 11:37:38
12 product that I worked on was for a 486 Intel chip, 11:37:39
13 and that Intel chip actually had its own floating 11:37:47
14 point co-processor on board, and so our chip was 11:37:50
15 external to that and actually looked very much like 11:37:55
16 a memory. You addressed it as a memory. You know, 11:37:58
17 you -- you -- you basically -- you usually wrote 11:38:02
18 three things into it. You wrote operand A, 11:38:05
19 operand B and then a command, like multiply. 11:38:13

20 And even though we were off chip compared to 11:38:16
21 the floating point that was placed in the Intel 486 11:38:18
22 chip, we provided 2x the performance. 11:38:22

23 So if you were doing something that had a lot 11:38:26
24 of floating point numbers in it, the boards, 11:38:29
25 computer PC boards, were made with an extra socket 11:38:33

1 for this floating point chip that you added in. 11:38:37

2 Some -- some people put it -- in some models, put it 11:38:42

3 there automatically; in others, it was an upgrade. 11:38:47

4 Q And it would provide better performance for 11:38:51

5 these floating point calculations if you included 11:38:53

6 the chip? 11:38:55

7 A That -- that's correct. 11:38:56

8 Q Were your subsequent floating point 11:38:56

9 co-processor projects -- obviously they had 11:39:00

10 different applications, but were they conceptually 11:39:04

11 similar to what you just described? 11:39:07

12 A Yes. 11:39:08

13 Q What about the printer microcontroller? 11:39:08

14 A The printer -- the -- the -- the 11:39:11

15 microcontroller for the printer is a project that I 11:39:15

16 managed when I became director. It was one of the 11:39:19

17 projects that was in the group, and then I became 11:39:21

18 the manager of it, so I didn't do very much circuit 11:39:23

19 design on that. It was more management only. 11:39:27

20 Q What did that do? I mean obviously it has 11:39:30

21 something to do with printers, but what was the 11:39:34

22 purpose of that component? 11:39:37

23 A It literally is the brain in a printer. Any 11:39:37

24 printer that you use has a brain. It gets 11:39:41

25 information from the host, and then it turns it into 11:39:43

1 printed information on the page, and so the format 11:39:48
2 that you get the data in from the host is not the 11:39:52
3 format that you need to spit the ink out, if you 11:39:55
4 will, in the right place on the page. 11:39:59

5 Q So it does that translation? 11:40:00

6 A Correct, among other things. 11:40:03

7 Q The floating point co-processors, being that 11:40:04
8 they are co-processors, can we agree those weren't 11:40:15
9 memories? 11:40:18

10 A Generally, I think people would talk about 11:40:19
11 them not as memories, right. They would talk about 11:40:28
12 them as -- even -- like I said, even though our 11:40:31
13 floating -- our floating point co-processor in the 11:40:33
14 Intel system occupied a position in memory space, it 11:40:36
15 wasn't really a memory. It was doing math. 11:40:41

16 Q Right. 11:40:44

17 Its purpose was to do these calculations, not 11:40:45
18 to store data, for example? 11:40:47

19 A That's correct. 11:40:48

20 Q The microcontroller for the printers, that 11:40:54
21 wasn't a memory either; right? 11:40:57

22 A No. 11:40:58

23 Q To the extent -- 11:40:58

24 A I'm sorry. It had memory in it, but it 11:41:03
25 wasn't -- its main function was not as a memory. 11:41:06

1 Q To the extent the floating point co-processor 11:41:08
2 had memory in it, was that memory volatile or 11:41:11
3 non-volatile? 11:41:14

4 A In a floating point co-processor, the memory 11:41:15
5 was all volatile. 11:41:21

6 Q Was the same true for microcontroller for 11:41:23
7 printers? 11:41:27

8 A For the printers, we did -- I believe it was. 11:41:27
9 Not all printer microcontrollers were the same way, 11:41:37
10 I don't believe. 11:41:42

11 Q But to the extent you remember -- 11:41:43

12 A For the ones we did, I don't -- I don't 11:41:44
13 believe that they were -- I believe they were all 11:41:46
14 volatile. 11:41:47

15 Q So during your career at Weitek, you did not 11:41:47
16 design any memories; is that right? 11:41:52

17 A Well, I thought I said in the beginning that 11:41:54
18 I designed a -- memory blocks for the floating 11:41:59
19 point -- floating point co-processor, so it's not a 11:42:02
20 memory chip, but it's a block inside a bigger thing, 11:42:06
21 and -- like a register file is a memory. It just 11:42:10
22 happens to be a sub-component in a floating point 11:42:15
23 co-processor. 11:42:17

24 Q So you may have designed subcomponents that 11:42:18
25 were memories, but you did not design memory chips? 11:42:21

1	A	I would probably say that's pretty accurate,	11:42:27
2		yeah.	11:42:30

3	Q You didn't work with any non-volatile	11:42:30
4	memories when you were at Weitek?	11:42:35

5 A I -- I don't believe so, no.

11:42:39

6	Q So you didn't work with any flash memory	11:42:42
7	while you were at Weitek?	11:42:45

8 A No, I don't believe so.

11:42:46

9	Q	Let's move on to the next position, which was	11:42:50
10		at Silicon Graphics. This was on page -- spanning	11:42:58
11		between pages 2 and 3 of your CV.	11:43:02

12	A	I see it, yes.	11:43:03
----	---	----------------	----------

13	Q You are also director of engineering at	11:43:04
14	Silicon Graphics?	11:43:07

15	A	Yes.	11:43:08
----	---	------	----------

16	Q And you held that position from June of 1992	11:43:08
17	to April of 1998; is that right?	11:43:12

18	A	In general, yes.	11:43:15
----	---	------------------	----------

19	Q Can you please describe your duties while you	11:43:16
20	were at Silicon Graphics?	11:43:20

21	A So I was originally hired in during the time	11:43:21
22	that Weitek, SGI, NEC, and Toshiba had this --	11:43:29
23	effectively, it was a three-way deal to build a	11:43:37
24	floating point -- a standalone floating point chip	11:43:43
25	to work with a standalone integer unit that,	11:43:45

1 effectively, implemented a supercomputer, and so I 11:43:51
2 was responsible for the circuit design, the 11:44:01
3 architecture of the floating point unit, the layout. 11:44:06
4 All the pieces for the floating point unit 11:44:12
5 originally reported to me, and I had to staff and 11:44:14
6 manage. 11:44:23

7 Q So you played a design role during this time, 11:44:23
8 though; is that right? 11:44:26

9 A Also still, yeah. 11:44:26

10 Q And, in addition, you had these staffing and 11:44:27
11 management responsibilities? 11:44:30

12 A I did. 11:44:31

13 Q What would you say, roughly, your percentage 11:44:31
14 of time was between those different duties? 11:44:34

15 A Maybe 60/40. 60 percent in management, 11:44:38
16 40 percent in technical design issues. 11:44:44

17 Q Other than the -- the floating point 11:44:49
18 co-processor project that you mentioned, I see 11:44:53
19 several things listed on here. 11:44:58

20 Are those all floating point co-processors, 11:44:59
21 or were there other projects that you worked on 11:45:02
22 during that time? 11:45:05

23 A No, there were other projects. 11:45:05

24 So the -- the floating point co-processor 11:45:07
25 project I talked about is listed here as the TFP, 11:45:12

1 which stands for two floating points. And there was 11:45:16
2 a -- an integer unit that went along with that. 11:45:20
3 The -- eventually that product finished, went into 11:45:26
4 production, and the T5 was the internal name for the 11:45:30
5 R10K, or the R10,000, which was a full-blown 11:45:36
6 microprocessor with a floating point on it, and that 11:45:43
7 project had started to bog down, so they took people 11:45:49
8 from the old Twin Peaks group and put it on the T5 11:45:52
9 group, and so I went over and -- and managed three 11:45:57
10 of the units, which is about 10 percent of the total 11:46:01
11 chip. I managed those people for that. 11:46:04

12 Then after that chip taped out, I was in 11:46:07
13 charge of all of the circuit design for the next 11:46:12
14 microprocessor, which was called Beast at the time, 11:46:15
15 and that was a 500-megahertz design, and about that 11:46:22
16 time is when Silicon Graphics started to have 11:46:29
17 problems, and that project actually never got 11:46:32
18 finished, but we almost got there. 11:46:37

19 Q So the projects here that are listed, the 11:46:41
20 Beast is the latest in time, and then the TFP is the 11:46:45
21 earliest in time -- 11:46:49

22 A Yeah -- 11:46:50

23 Q -- is that right? 11:46:50

24 A -- it's chronological, correct. 11:46:51

25 Q So during your time at Silicon Graphics, you 11:46:53

1 worked on floating point co-processors and 11:46:55
2 potentially the integer mate of them and then also 11:46:57
3 microprocessors; is that right? 11:47:00

4 A Well, yeah, the -- the -- 11:47:02

5 Q You mentioned an integer aspect to that too. 11:47:08
6 I wasn't sure how much you worked on that, but just 11:47:10
7 in the interest of completeness. 11:47:13

8 A Well, the -- the -- okay. So in the early 11:47:14
9 days, because of what we were building, because it 11:47:17
10 was a supercomputer, you couldn't get enough 11:47:26
11 performance on a single chip, so it was multiple 11:47:28
12 chips. It was -- it was the integer unit, which did 11:47:31
13 all of the function -- well, not all, but most of 11:47:35
14 the functions of a microprocessor, and it had an 11:47:38
15 off-board tag RAM, and it had a -- and it had a -- 11:47:42
16 and it had two floating point units. 11:47:51

17 In -- in combination, that was equivalent to 11:47:54
18 a Cray Y-M- -- we were equivalent to a Cray Y-MP 11:47:56
19 machine, which, at the time, sold for about 11:48:01
20 \$3 million, and you could buy our machine for, what 11:48:05
21 I recall, about \$90,000 per -- per -- per CPU, so -- 11:48:10
22 and the T5 was not a -- not a microprocessor 11:48:20
23 targeted at a supercomputer market, rather had at a 11:48:23
24 regular box market, regular, you know, PC box market 11:48:28
25 or -- you know, or engineering workstation market, 11:48:31

1 and it so it had the floating point built into it, 11:48:35
2 and it had -- everything was on a single chip, 11:48:38
3 except for, you know, the system controller and the 11:48:41
4 memory and what you would expect today with an Intel 11:48:43
5 Pentium, for example. And Beast was to be yet 11:48:48
6 another mainstream microprocessor project. 11:48:51

7 Q Beyond those microprocessor projects and the 11:48:55
8 floating point projects you mentioned, and to the 11:49:03
9 extent there's an integer unit involved there, I'll 11:49:08
10 include that too, beyond those projects, did you 11:49:10
11 work on anything else while you were at Silicon 11:49:14
12 Graphics? 11:49:16

13 A Well, I ended up fixing the phase-locked-loop 11:49:16
14 problems that all of SGI had, because they didn't 11:49:21
15 know how to do a phase-locked loop, and I had done 11:49:24
16 one of them at Weitek. 11:49:27

17 Q Can you just describe what a 11:49:29
18 phase-locked-loop problem is for the record. 11:49:31

19 A Oh, sorry. A phase -- a phase-locked loop is 11:49:33
20 a circuit that takes an incoming signal and where 11:49:35
21 that signal changes from low to high, for example, 11:49:41
22 it takes an internal signal and matches the timing 11:49:45
23 of those two waveforms together so that when the 11:49:51
24 external waveform switches low to high, the internal 11:49:55
25 waveform switches at approximately the same time, so 11:49:58

1 their phase, if you will, is locked to each other. 11:50:03

2 Q Like a synchronization type of thing? 11:50:06

3 A It is a synchronization-type thing, yes. 11:50:08

4 Q Gotcha. Okay. 11:50:10

5 Please continue with your other projects. 11:50:11

6 A So -- so the campus, meaning SGI campus, had 11:50:13
7 some parts that came from other people off campus, 11:50:20
8 and the phase-locked loops did not work correctly, 11:50:22
9 and I had some background there, and I had some 11:50:28
10 smart kids I had hired from Stanford who were 11:50:33
11 working for me, and we went and debugged the 11:50:36
12 problem, showed this outside vendor why the 11:50:41
13 circuitry they built wouldn't work correctly and 11:50:44
14 then what they had to do to fix it. And also the 11:50:47
15 part of the three units that I managed here on the 11:50:54
16 T5 project, the -- the internal PLL is -- is in 11:50:57
17 that -- is in that -- one of those three blocks. So 11:51:02
18 that -- so that was one of the things. 11:51:06

19 The other one was that I also repaired the 11:51:07
20 Toshiba tag RAM for SGI, so that's down in the TFP 11:51:15
21 R8K program. 11:51:20

22 So the tag RAM is an external memory for an 11:51:23
23 integer unit that holds information about where to 11:51:26
24 go get the data in -- in main memory, and so if -- 11:51:31
25 if -- if -- you -- basically, it's effectively like 11:51:40

1 a look-up table. You look to see if you have -- 11:51:42
2 maybe you -- maybe you ask the machine to multiply A 11:51:45
3 times B or add A times B, and you have to have A and 11:51:49
4 B around to do that. So the -- the -- the tag is 11:51:54
5 part of a look-up table that let's you know whether 11:51:59
6 you have it locally or it's over there in the hard 11:52:01
7 drive or in the main memory or it's not resident on 11:52:05
8 the chip or not -- 11:52:08

9 Q Like -- 11:52:10

10 A -- okay? 11:52:10

11 Q -- in a cache or something like that? 11:52:10

12 A Like it's part of a -- it's part of a cache 11:52:12
13 system, yes. 11:52:15

14 Q Oh, so the tag RAM is part of the cache 11:52:15
15 system? 11:52:18

16 A Effectively, yes. 11:52:19

17 Q Okay. 11:52:20

18 A Yeah. 11:52:20

19 But for a supercomputer, tags can be pretty 11:52:21
20 big, so we didn't have room to put it on the same 11:52:24
21 silicon. Had to be its own piece of silicon. 11:52:27

22 So Toshiba designed that for SGI, and when 11:52:31
23 all the chips came back, we put the board together 11:52:34
24 and they powered it up and turned it on and ran the 11:52:36
25 tests and it was broken. And it was broken because 11:52:39

1 the tag RAM didn't work correctly. So being the 11:52:44
2 resident sort of memory guy, I go, "Well, this is 11:52:48
3 your problem now. Go fix it," so -- and we already 11:52:53
4 had guys on the team from -- part of this three-way 11:53:00
5 deal agreement was that NEC engineers and Toshiba 11:53:03
6 engineers would be resident at Silicon Graphics 11:53:08
7 working on -- working on this design. 11:53:11

8 And so I knew some of them, and I had -- for 11:53:17
9 Weitek, I had been to Japan more than a few times, 11:53:19
10 and -- so they sent me to Japan to go do an analysis 11:53:22
11 and find out what it was and how to fix it, and so I 11:53:27
12 did that, and we worked with the guys from Japan. 11:53:34
13 Actually even brought some of them to the U.S. and 11:53:39
14 worked through the issues and fixed it and turned 11:53:42
15 the product around and got it working. So I did 11:53:46
16 that also. 11:53:49

17 And then the rest is mostly hiring and 11:53:53
18 development of people skills and then also working 11:53:59
19 with the two Japanese partners to understand, 11:54:08
20 because I had worked in a big fab. Both Toshiba and 11:54:12
21 NEC had big fabs, and so it's like, well, you are a 11:54:17
22 good guy to do this, and I don't want to go to 11:54:21
23 Japan, so you go, so I did that too. 11:54:24

24 Q So with regard to this tag RAM, I think you 11:54:26
25 said Toshiba originally designed it, and then you 11:54:29

1 fixed it once you realized -- 11:54:31

2 A I helped them -- 11:54:31

3 Q -- there were shortcomings? 11:54:34

4 A -- I helped them fix it, yeah, and it was 11:54:35

5 also BiCMOS. 11:54:38

6 Q "BiCMOS" referring to the technology we 11:54:39

7 talked about earlier that you worked on at Hughes? 11:54:41

8 A National. 11:54:44

9 Q National. 11:54:45

10 A Yes. 11:54:47

11 Q Other than the -- the tag RAM project that we 11:54:48

12 just discussed, did you work on any projects that 11:54:52

13 were developing memory? 11:54:56

14 A Well, yes, because in -- in -- in the Beast 11:54:57

15 program, I was -- I had all of the circuit 11:55:04

16 designers, so the people designing the caches on 11:55:06

17 that project reported to me, so ICache, DCache, the 11:55:10

18 tags, the register files, they were all under my 11:55:17

19 tutelage. 11:55:25

20 Q What types of memories were those? 11:55:25

21 A They were all static RAMs. 11:55:28

22 Q Is the tag RAM static RAM? 11:55:33

23 A Yes. 11:55:36

24 Q And I believe we established earlier that 11:55:36

25 these static RAMs are volatile memories? 11:55:38

1	A	That's correct.	11:55:42
2	Q	Did you work with any flash memory while you	11:55:43
3		were at Silicon Graphics?	11:55:45
4	A	No, I don't believe I did.	11:55:46
5	Q	After the Silicon Graphics position, that's	11:55:47
6		when you started your consulting company where you	11:55:57
7		work today; is that right?	11:56:00
8	A	That's correct.	11:56:01
9	Q	I'm going to apologize if we talked about	11:56:01
10		this earlier, but your company, Firenza, is that	11:56:06
11		just you or is that other people too?	11:56:09
12	A	As an LLC, it requires two people, so my wife	11:56:11
13		and I are the owners.	11:56:18
14	Q	Okay.	11:56:19
15	A	We don't have any employees. Everybody who	11:56:19
16		works with me works as a contractor, and so I do	11:56:24
17		circuit design things or -- circuit designs that	11:56:32
18		usually you can't find anywhere else.	11:56:36
19	Q	Have you ever had any employees?	11:56:39
20	A	No. Never.	11:56:41
21	Q	Just your wife and yourself?	11:56:43
22	A	Correct.	11:56:45
23	Q	Is your wife an engineer?	11:56:45
24	A	She's an ex-layout person, so no -- no to an	11:56:46
25		engineer, but she's been in the business. She was	11:56:54

1 on the bipolar side previously. 11:56:56

2 Q So my next question was going to be: Is she 11:56:58
3 kind of a silent partner in this, or is she actually 11:57:02
4 doing this technical work? 11:57:05

5 A No, she's a silent partner. 11:57:07

6 Q Okay. Fair enough. 11:57:09

7 So you are doing the heavy lifting for 11:57:10
8 Firenza? 11:57:12

9 A Yeah. 11:57:13

10 Q Over the years, it looks like you have done 11:57:13
11 some amount of this litigation consulting work and 11:57:15
12 then some amount of other work. 11:57:18

13 And let me first ask you, you know: Other 11:57:22
14 than litigation consulting, what would you generally 11:57:24
15 call the other types of work that you do? 11:57:26

16 A What would I call it. 11:57:28

17 Q I just want to get some way we can talk about 11:57:32
18 it. 11:57:35

19 A Sure. Sure. 11:57:35

20 So, generally, I'm called to do -- people 11:57:36
21 call me to do usually one of two things: The first 11:57:39
22 thing is to fix silicon that they have that's broken 11:57:44
23 and doesn't work right. So they did their design. 11:57:46
24 They put it into the fab. It came back and 11:57:50
25 (unreportable sound), and since I have multiple 11:57:57

1 years of experience doing that at multiple places, 11:57:59
2 it's something that I continue to do and get calls 11:58:03
3 for it. I don't know -- I don't know about often, 11:58:07
4 but more than one call a year. More than two calls 11:58:11
5 a year usually is to go make an assessment of what's 11:58:16
6 wrong with some piece of silicon and try and help 11:58:19
7 people fix it quickly. 11:58:22

8 The second part is to design for people 11:58:24
9 things that they -- things that they do not or 11:58:29
10 cannot get elsewhere. 11:58:35

11 So, for instance, generally I've always 11:58:38
12 worked in the very high-speed memory area. My work, 11:58:43
13 especially at National, was the fastest thing you 11:58:50
14 could literally buy at the time, and if it wasn't -- 11:58:54
15 if we weren't the fastest, we were, like, No. 2 or 11:58:57
16 we were making a compatible product. So I've always 11:59:00
17 sort of lived on the bleeding edge, but my 11:59:05
18 background is in technology, and especially with 11:59:10
19 memory, working so close with the process engineers, 11:59:14
20 you end up learning a lot of things about processes 11:59:19
21 and why things happen, and you are guided by the 11:59:22
22 physics of all of that, and that's the background I 11:59:28
23 had in school, in solid-state devices. 11:59:31

24 So, for example, there's a non-volatile 11:59:32
25 memory here shown in line one, two -- three from the 11:59:40

1 bottom, and it says, Designed an EFUSE circuit for 11:59:44
2 another 65-nanometer microprocessor. So this is a 11:59:47
3 sub-block of a microprocessor that has programmable 11:59:51
4 fuses in it in which information is stored about the 11:59:56
5 device. You might store -- you might store, for 12:00:00
6 instance, which wafer lot it was. You might store 12:00:08
7 characteristics of a circuit that you want to 12:00:14
8 electrically trim, and -- and basically this is -- 12:00:19
9 this is a memory which it comes unprogrammed. You 12:00:23
10 program it when you do the testing of the device, 12:00:29
11 and then it remembers that information forever. 12:00:32
12 Power on, power off doesn't make a difference. 12:00:36
13 Q Is that -- I'm just trying to see where that 12:00:39
14 kind of fits in what we are talking about. 12:00:44
15 So sounds like it's non-volatile? 12:00:46
16 A It's definitely non-volatile, and it's 12:00:48
17 definitely a memory. 12:00:51
18 Q Is it a -- reprogrammable once it's been 12:00:52
19 programmed? 12:00:55
20 A No. 12:00:56
21 Q So it's programmed once and then non-volatile 12:00:56
22 and it never forgets? 12:00:58
23 A Correct. 12:01:00
24 Q So it's not a memory in the sense of, like, a 12:01:00
25 consumer read/write type of memory; it's more of a 12:01:04

1 single-purpose type of memory? 12:01:07

2 A Well, actually, no. The technology -- the 12:01:09
3 exact same technology was being pursued for, oh, 12:01:13
4 gosh, I'm going to say four or five years by -- I 12:01:18
5 might have the name wrong -- I think, Matrix 12:01:25
6 Semiconductor, and what they were trying to make was 12:01:30
7 a one-time programmable what you would call 12:01:31
8 flashcard. So for -- this would be one-time 12:01:37
9 programable card that you would put in your camera, 12:01:43
10 much like a flashcard, but inexpensive enough that 12:01:46
11 you -- it was so cheap that you would program it 12:01:50
12 once and it would store your pictures forever and 12:01:55
13 you didn't care, and they -- and they -- you know, 12:01:57
14 they obtained funding, and I'm pretty sure they were 12:02:05
15 alive for four or five years trying to do this. 12:02:08

16 Their unique part was that they figured out 12:02:11
17 how to stack these cells in multiple layers 12:02:14
18 vertically so that the magnitude of the file size 12:02:17
19 that you could store was very large for the size of 12:02:23
20 the silicon that you used, and that was -- and that 12:02:27
21 literally was, as I recall, an EFUSE-type circuit. 12:02:31

22 Q Was that the trade name for it? What was 12:02:35
23 the -- 12:02:38

24 A The trade -- I don't -- 12:02:39

25 Q What would people have -- 12:02:39

1 the way you program them is with a laser as opposed 12:03:56
2 to actually blowing the silicon up. 12:03:59

3 Q Was -- 12:04:00

4 A This was -- this was electrically 12:04:03
5 programmable, so we literally blew the links with 12:04:04
6 programming circuitry. 12:04:09

7 Q For this EFUSE project, first of all, you 12:04:10
8 talked about the consumer version that maybe never 12:04:13
9 took off, but just so the record is clear, you 12:04:16
10 didn't work on that consumer version -- 12:04:19

11 A Mm-hmm. 12:04:19

12 Q -- did you? 12:04:22

13 A That's correct. I did not work on that. I 12:04:22
14 was merely saying that the same technology had been 12:04:24
15 used in a product like that. 12:04:27

16 Q And with regard to this EFUSE circuit that 12:04:30
17 you designed, where did you get the silicon for 12:04:33
18 that? I mean, did you buy it somewhere, or did you 12:04:35
19 design it and have it built from scratch, or where 12:04:38
20 did that come from? 12:04:41

21 A So the company that Firenza did this for was 12:04:41
22 Montalvo, and I don't think they went public either. 12:04:46
23 I think they eventually were purchased by Sun 12:04:48
24 Microsystems, and they were building a 12:04:57
25 486-compatible microprocessor, and -- where did they 12:04:59

1 get this. I don't remember where they got the 12:05:06
2 silicon. They were -- they were fabless, so 12:05:08
3 somebody, I believe in Japan -- my best recollection 12:05:12
4 is Fujitsu -- was operating as the foundry. 12:05:17
5 MR. LIMBACH: I'm going to caution the 12:05:21
6 witness to be careful not to divulge anything that's 12:05:23
7 confidential to another party. You are talking a 12:05:26
8 lot of -- 12:05:29
9 THE WITNESS: Oh -- 12:05:29
10 MR. LIMBACH: -- old -- 12:05:29
11 THE WITNESS: -- sure. 12:05:29
12 MR. LIMBACH: -- old history. There's no 12:05:30
13 Protective Order in this case, so I'll caution you 12:05:30
14 that if you think of something that you -- that is 12:05:33
15 responsive to an answer that may be confidential to 12:05:35
16 let counsel know and then he will proceed 12:05:39
17 accordingly. 12:05:41
18 MR. HEINZ: Sure. Yeah, don't tell me 12:05:42
19 anything secret. 12:05:44
20 THE WITNESS: I don't believe that I have, 12:05:45
21 and most of this is more than five years old, so -- 12:05:47
22 MR. LIMBACH: Just as you get -- 12:05:49
23 THE WITNESS: -- and a lot of companies are 12:05:53
24 now defunct. 12:05:53
25 MR. LIMBACH: Right. 12:05:56

1 THE WITNESS: But, no, I haven't given away 12:05:56
2 any secrets. 12:06:00
3 MR. LIMBACH: I don't think you have. I just 12:06:00
4 want to caution you, because as you get closer in 12:06:01
5 time -- 12:06:03
6 THE WITNESS: Yeah, as you get closer in 12:06:03
7 time -- 12:06:03
8 MR. LIMBACH: -- it might be an issue. 12:06:03
9 MR. HEINZ: Yeah. If we get there, let me 12:06:07
10 know and then we'll -- we'll deal with it at that 12:06:07
11 point. 12:06:07
12 THE WITNESS: Got it. 12:06:07
13 BY MR. HEINZ: 12:06:07
14 Q So let me ask you -- 12:06:13
15 A Let -- let me -- 12:06:15
16 Q Okay. 12:06:15
17 A -- so let me finish. 12:06:16
18 Q Yeah, yeah. 12:06:16
19 A So part of my work that's nonlegal is repair 12:06:17
20 work. De- -- "debug" would be the official name. 12:06:20
21 And then the other part of it is design work 12:06:27
22 for things that you can't get anywhere else. 12:06:29
23 So, for instance, today in the valley, as far 12:06:34
24 as I'm aware of, if you are looking for an 12:06:37
25 independent person to build you a 3-gigahertz SRAM, 12:06:40

1 I'm probably one of the only people still in 12:06:46
2 business doing that that's not associated with Intel 12:06:48
3 or AMD or some other big house. So if you -- you 12:06:52
4 have a -- you know, if you are a fabless kind of guy 12:06:58
5 and you can't find the memory that you want from the 12:07:01
6 standard memory block suppliers, then you could get 12:07:04
7 that type of block from Firenza. Firenza would do 12:07:08
8 the design for you. 12:07:13

9 Q So just to -- to kind of summarize our -- our 12:07:13
10 groupings, you have the legal work, the debug work, 12:07:18
11 and the design work. 12:07:21

12 Is that a fair assessment? 12:07:22

13 A Design and debug? 12:07:23

14 Q Or design and debug and the legal aspect? 12:07:30

15 A Yeah. 12:07:32

16 Q What percentage would you estimate that you 12:07:33
17 spend on the legal work and the design and debug 12:07:36
18 work? 12:07:40

19 A It really depends upon which month you ask 12:07:40
20 me. 12:07:43

21 Q Let me ask you from 1998 to the present. 12:07:43

22 A Oh, gosh. 12:07:43

23 Q Just a rough estimate. 12:07:47

24 A Well, here's what I can tell you, because I 12:07:48
25 can't -- I don't really think I can answer that, but 12:07:52

1 I can tell you the following: I try very, very hard 12:07:55
2 not to have an engineering project going on and then 12:08:00
3 legal work on top of it, because legal guys kind of 12:08:03
4 think they can just call you up at any moment and 12:08:09
5 say, "Okay. For the next eight days, you are mine," 12:08:14
6 and that doesn't fit with doing engineering work 12:08:16
7 that you have committed to that will take five or 12:08:18
8 six months to get done. So I have had periods of 12:08:21
9 overlap. They have been very painful. 12:08:23

10 So from a -- from a percentage point of view, 12:08:28
11 man, I would probably say that it's -- in the 12:08:34
12 beginning, it was much more circuit-type work, debug 12:08:40
13 and circuit design, than it was legal. In fact, it 12:08:44
14 was all because I started doing that before I 12:08:51
15 started doing legal. And even when I was doing 12:08:54
16 legal in the beginning, it just wasn't -- you know, 12:08:56
17 it sort of came and went. 12:08:59

18 But there have been other times where, like, 12:09:06
19 when the industry has gotten really slow, that there 12:09:08
20 was no circuit design work and all I had was legal, 12:09:10
21 and sometimes there were times -- luckily I'm 12:09:11
22 only -- I have no employees, so sometimes there was 12:09:14
23 no money. There was no work. Didn't make any 12:09:16
24 difference whether it was legal or not. So it -- it 12:09:20
25 really sort of varies all over -- all over the 12:09:24

1 place.

12:09:26

2 Firenza, as a company right now, is presently
3 designing a memory for somebody else, and -- and you
4 can't know about it because I am covered under
5 NDA --

12:09:28

12:09:30

12:09:38

12:09:40

6 Q Sure.

12:09:41

7 A -- so -- but -- so and -- and because of some
8 personal issues, I don't participate in that. I
9 mean, I keep track of the project, but I have a
10 friend of mine as a contractor who's doing most of
11 it, and we talk, but he's still doing most of the
12 work.

12:09:42

12:09:48

12:09:53

12:09:56

12:10:00

12:10:04

13 So -- I mean, so, like, if we took a point in
14 time right now, it might be 50/50. It's just that
15 I'm doing all the legal stuff and he's doing all the
16 design stuff.

12:10:05

12:10:10

12:10:14

12:10:17

17 Q So let me ask you: You, personally, in the
18 last year or so, how much of your personal time has
19 been litigation consulting versus the design and
20 debug work?

12:10:18

12:10:22

12:10:26

12:10:29

21 A In the last year, I have had two -- I think
22 two design types of things. One is the one I talked
23 about right now, and one is something previous which
24 was a debug.

12:10:30

12:10:39

12:10:43

12:10:46

25 And then from a legal point of view, last

12:10:48

1 year I was involved in an ITC case, the last one on 12:10:53
2 my list, the Ericsson one -- well, it doesn't say 12:11:03
3 Ericsson there. 12:11:10

4 Q So the one that says "Certain Wireless 12:11:11
5 Communications Equipment"? 12:11:13

6 A Correct. 12:11:14

7 Q Okay. 12:11:14

8 A And -- and this matter, which you already 12:11:17
9 know what my estimate on hours is for that. And I 12:11:29
10 don't think much of -- not much of anything else. 12:11:33
11 Nothing significant, I would say. 12:11:36

12 Q And just to clarify, I think this is probably 12:11:38
13 clear from the document, but the expert-witness-work 12:11:42
14 cases are listed from earliest in time on page 1 in 12:11:45
15 chronological order? 12:11:49

16 A As best I could remember them all, yes. 12:11:50

17 Q Sure. 12:11:53

18 A But, yes. NeoMagic was my first case. 12:11:54

19 Q And as far as you know, this is a complete 12:11:58
20 list of your expert witness work; is that right? 12:12:00

21 A I believe as far as the -- anything that ever 12:12:03
22 went to either deposition or expert testimony. But 12:12:08
23 like -- as I said before, I think that -- I think 12:12:17
24 that Toshiba/Hynix thing actually settled before we 12:12:20
25 actually did anything, but here it is on the list, 12:12:25

1 so it might actually be everything I worked on. 12:12:27

2 Q I was going to comment that, on page 2, 12:12:29

3 several of these are re-examination proceedings? 12:12:33

4 A Oh, yes. 12:12:35

5 Q And those typically, I believe, would not 12:12:36

6 involve your testimony or your being deposed or 12:12:39

7 testifying in a proceeding; is that right? 12:12:43

8 A Well, certainly it's no testimony in court. 12:12:45

9 I've definitely been deposed for some of those 12:12:52

10 things, and I have done -- some of them were 12:12:55

11 ex parte, and I have done ex parte meetings with the 12:13:03

12 PTO, which I don't think is -- qualifies as 12:13:11

13 testimony, but I'm not an expert in that, so I don't 12:13:14

14 really know. Two guys down from you might be able 12:13:17

15 to help you with the answer. 12:13:23

16 Q I think we can figure that one out. 12:13:24

17 A Yeah, I think so. 12:13:26

18 Q So you believe, just so the record is clear, 12:13:27

19 that this is a complete list, or this is a list of 12:13:33

20 only ones you have testified in or -- or is a list 12:13:38

21 that's been cabined in some way? 12:13:41

22 A I don't -- I don't think I've left anything 12:13:45

23 out on purpose. I think it is a complete list, and 12:13:46

24 I would just have to -- I would just have to -- I 12:13:54

25 don't think there's anything other than this that 12:13:57

1	I've done.	12:13:59
2	Q You mentioned the EFUSE circuit project	12:14:01
3	earlier, which was a non-volatile memory --	12:14:05
4	A Mm-hmm.	12:14:05
5	Q -- in your view; is that right?	12:14:07
6	A Yes.	12:14:09
7	Q Have you worked on any other projects at	12:14:09
8	Firenza relating to non-volatile memories?	12:14:14
9	A So to get back to your statement, EFUSE is	12:14:17
10	not just -- it's not just my opinion that EFUSE is	12:14:22
11	non-volatile. EFUSE is non-volatile, and it's not	12:14:26
12	just my belief; that the industry understands that	12:14:30
13	EFUSE is non-volatile.	12:14:34
14	Q Okay. Recognizing that position about	12:14:37
15	EFUSE --	12:14:37
16	A Yeah.	12:14:37
17	Q -- other than EFUSE, have you worked on any	12:14:37
18	other non-volatile memories since you have been at	12:14:40
19	Firenza?	12:14:45
20	A The only other non-volatile work that I have	12:14:45
21	done at Firenza is the ITC matter listed on page 2.	12:14:51
22	Q In the Matter of Certain MLC Flash Memory	12:15:04
23	Devices and Products Containing Same?	12:15:05
24	A Correct.	12:15:07
25	Q And that was a litigation consulting project;	12:15:08

1 is that right? 12:15:14

2 A That's correct. 12:15:14

3 Q The EFUSE memory was non-volatile memory, but 12:15:15
4 it was not flash memory; is that right? 12:15:30

5 A That's correct. We talked about one-time 12:15:32
6 programmable. 12:15:35

7 Q In the ITC case, that was MLC flash memory; 12:15:37
8 is that right? 12:15:49

9 A That's correct, yes. 12:15:49

10 Q Other than this ITC case -- now that we have 12:15:50
11 been through your CV here, other than that case, 12:15:52
12 have you worked on flash memory? 12:15:57

13 A The only -- the only parts of it -- the only 12:16:01
14 parts of flash that I've worked on is the -- like I 12:16:14
15 said, the flash technology that's used in an 12:16:20
16 e-squared CMOS PAL, and that is -- given the way you 12:16:22
17 are defining flash memory, that's not flash memory 12:16:28
18 per se, and I've told you that we -- we definitely 12:16:31
19 had some individual flash cells, specifically on 12:16:39
20 the -- on the test chips, for those things that we 12:16:49
21 could operate individually, but as a commercial, 12:16:52
22 quote/unquote, flash memory product, I think that 12:16:58
23 what's here is -- is -- is all I've done. 12:17:04

24 Q So you worked on the E2CMOS PALs, which had 12:17:07
25 flash memory technology, but as we already 12:17:13

1 established, I believe, those were not flash memory? 12:17:16

2 A The device was a logic device, correct. 12:17:19

3 Q And you worked on this ITC case regarding 12:17:21

4 flash memory, but other than that and the -- to the 12:17:26

5 extent the E2CMOS PAL bears on it, beyond that, you 12:17:29

6 don't have any flash memory experience; is that 12:17:35

7 right? 12:17:38

8 A Beyond that, I don't think there's anything 12:17:38

9 else, no. 12:17:41

10 Q I would like to go back to your CV here and 12:17:41

11 ask you about paragraph 5 on page 2? 12:18:10

12 A I'm confused, because my CV doesn't have 12:18:20

13 paragraphs. 12:18:24

14 Q Oh, I'm sorry. Your declaration. 12:18:24

15 A Okay. 12:18:26

16 Q Sorry. The declaration that's attached to 12:18:26

17 the front of that, it's the same -- 12:18:28

18 A Oh -- 12:18:29

19 Q -- exhibit. 12:18:29

20 A -- it's the same thing. Yeah. Okay. 12:18:30

21 Q So the second sentence in paragraph 5 reads: 12:18:43

22 As set forth in my curriculum vitae, 12:18:45

23 I have over 39 years of experience 12:18:48

24 with memory devices. 12:18:50

25 Do you see that? 12:18:52

1 A I do. 12:18:53

2 Q Is that statement accurate? 12:18:53

3 A I believe it is. If you are asking me did I 12:18:55

4 work on memory devices every day of the 39 years, 12:19:08

5 then I think my answer would be no, but I think that 12:19:12

6 I have done memory off and on over that 39 years of 12:19:19

7 experience, and I've done it in multiple 12:19:22

8 technologies and I'm -- I'm happy with that 12:19:24

9 sentence. 12:19:26

10 Q But in -- in your view, the meaning of this 12:19:27

11 sentence is that, in the 39 years, you have worked 12:19:33

12 with memory off and on, not that you have worked on 12:19:35

13 memory continuously for 39 years; is that right? 12:19:37

14 A Well, it's clear from my CV that I haven't 12:19:40

15 worked on memory every day of my 39 years, so I 12:19:44

16 don't think I've expressed it as anything other than 12:19:50

17 I have 39 years of experience with memory devices. 12:19:54

18 As I've already stated, oftentimes when I'm working 12:19:58

19 on a project, the fact -- just the fact that I have 12:20:01

20 made memory before made people find me and ask me 12:20:05

21 about a memory device that they are working on or 12:20:11

22 a memory -- how -- how does this work or how did you 12:20:15

23 do this. So that reservoir of knowledge, to my 12:20:18

24 mind, has been constantly tapped for 39 years, so. 12:20:21

25 Q And if I'm doing the math right, the 39 years 12:20:25

1 here, since this declaration was filed in 2013, 12:20:29
2 spans the entire period from the time you graduated 12:20:33
3 with your bachelor's degree until the time you did 12:20:36
4 this declaration; is that right? 12:20:38

5 A Oh, I'm sorry, I haven't done the math. 12:20:40

6 Q 1974 to 2013? 12:20:42

7 A Well, that math works, so, yeah. 12:20:56

8 Q So -- and this is meant to refer to your 12:20:58
9 entire span of experience? 12:21:05

10 A I -- you -- you seem to have decided that 12:21:12
11 unless a memory device is a standalone product, that 12:21:17
12 it's not a memory device. And many products have 12:21:22
13 memory in them, and they -- and they are -- that 12:21:25
14 particular block is called a memory -- could be 12:21:30
15 called a memory device, so I don't agree with your 12:21:32
16 assessment of how that comes about, but I still 12:21:39
17 stand by the statement I have here. 12:21:42

18 Q I'm not trying to assess anything. I'm just 12:21:44
19 trying to figure out what you meant by the 12:21:46
20 statement. 12:21:48

21 A I think I've told you. 12:21:48

22 Q If this statement said designing memory 12:21:53
23 devices, what would the time frame be? 12:22:00

24 MR. LIMBACH: Objection; form. 12:22:07

25 THE WITNESS: If this said designing -- gee, 12:22:10

1 I -- I don't know exactly because, as I've told you, 12:22:21
2 there were, oftentimes, where I did some memory 12:22:23
3 thing in some device. Let's take the example of a 12:22:28
4 floating point unit. 12:22:32

5 A floating point unit has memory in it, 12:22:33
6 right? I helped people design those things. Is it 12:22:36
7 a memory device? Well, that's a good question. 12:22:42
8 It's certainly -- its main function is as a floating 12:22:44
9 point unit, but it has memory in it. You have to 12:22:47
10 design it. I helped do the design. I think that 12:22:50
11 counts. 12:22:53

12 So I have -- would have a very hard time 12:22:54
13 figuring out over, effectively, 40 years how many 12:22:57
14 days I actually spent doing the design of an 12:23:03
15 individual piece of memory for someone or consulting 12:23:07
16 with them on that memory versus doing other work. 12:23:10

17 BY MR. HEINZ: 12:23:17

18 Q But we can agree that number is not 12:23:17
19 100 percent? 12:23:19

20 A Yeah, I think we can agree that's not 12:23:21
21 100 percent. 12:23:23

22 Q I would like to move to your declaration and 12:23:53
23 ask you about paragraph 8 and paragraph 9, which are 12:23:53
24 on page 4. 12:23:54

25 A Yes. 12:23:55

1 Q Here you discuss one of ordinary skill in the 12:23:56
2 art, and in paragraph 9 in particular, you give your 12:24:00
3 opinion about the level of ordinary skill in the art 12:24:05
4 related to the '045 patent. 12:24:08

5 Do you see that? 12:24:10

6 A I do. 12:24:11

7 Q Are you one of ordinary skill in the art for 12:24:11
8 the '045 patent? 12:24:15

9 A I believe I have more than ordinary skill in 12:24:16
10 the art for the '045 patent. 12:24:28

11 Q Based on what? 12:24:33

12 A Based on of my knowledge of the underlying 12:24:34
13 technology, based on my memory knowledge at a 12:24:37
14 minimum. 12:24:44

15 Q So you have a master's of science degree in 12:24:45
16 electrical engineering; right? 12:24:47

17 A I do. 12:24:48

18 Q And, in your view, one of ordinary skill in 12:24:53
19 the art needed to have a master's degree in 12:24:56
20 electrical engineering and three years of relevant 12:24:59
21 experience working in the field of non-volatile 12:25:00
22 memory devices? 12:25:02

23 A Yes. 12:25:03

24 Q What's your three years of relevant 12:25:08
25 experience or more working in the field of 12:25:10

1 non-volatile memory devices? 12:25:13

2 A So you have the EFUSE work. You have the -- 12:25:14
3 memory devices. You have the work that I did in 12:25:38
4 unison with the people designing the EPROMs at 12:25:43
5 National Semiconductor in Utah. You have -- you 12:25:45
6 have the work done on the ITC matter. You have the 12:26:01
7 work done for the e-squared CMOS PAL devices. You 12:26:23
8 have the BiCMOS PAL devices, which are also 12:26:30
9 non-volatile. You have the test chip work done for 12:26:33
10 the e-squared CMOS PAL. You have the test chip work 12:26:41
11 done for the EFUSE part, the EFUSE block. I think 12:26:47
12 that is more than enough to cover the requirements. 12:27:05

13 Q Do you think that adds up to three years? 12:27:07

14 A I do. 12:27:11

15 Q If this definition, rather than saying as it 12:27:11
16 does now, "working in the field of non-volatile 12:27:27
17 memory devices" -- 12:27:29

18 A Mm-hmm. 12:27:29

19 Q -- said "working in the field of flash 12:27:32
20 memory," would you be one of skill in the art then? 12:27:35

21 A I don't see that I would clear the hurdle if 12:27:37
22 that was where the bar was set. However, that would 12:28:13
23 seem to me to be very narrow definition. 12:28:18

24 Q I recognize it's different than the 12:28:21
25 definition you had here. 12:28:23

1 A Mm-hmm. 12:28:27

2 Q But you would agree with me that if 12:28:27

3 paragraph 9 was the same except the last clause said 12:28:29

4 "working in the field of flash memory devices" 12:28:35

5 instead of just "non-volatile memory devices," you 12:28:37

6 would not clear that bar; is that right? 12:28:40

7 A If you are -- if you are defining a flash 12:28:43

8 memory device as a device that their only -- the 12:28:48

9 only function of that device is to store data and 12:28:53

10 give the data back, if that's the definition of a 12:28:58

11 flash memory device and the -- and the underlying 12:29:02

12 technology has nothing to do with it, then I would 12:29:07

13 agree. 12:29:11

14 Q Let me ask you in a way that one of ordinary 12:29:11

15 skill in the art would have understood the term 12:29:16

16 "flash memory" in the concept -- in the context of 12:29:18

17 the '045 patent. 12:29:22

18 With that understanding of the term "flash 12:29:23

19 memory," in other words, not the restrictive 12:29:25

20 definition you just said, which I believe is more 12:29:31

21 restrictive than that, if the last clause said 12:29:33

22 "working in the field of flash memory devices," 12:29:36

23 would you be over that bar or not? 12:29:39

24 MR. LIMBACH: Objection; form. 12:29:42

25 THE WITNESS: Well, what do you mean when you 12:29:44

1 say a "flash memory device"? 12:29:47

2 BY MR. HEINZ: 12:29:50

3 Q What I want -- what I'm intending to ask 12:29:51

4 is -- the '045 patent is entitled "Serial Flash 12:29:53

5 Memory." 12:30:00

6 Do you see that? 12:30:03

7 A I do. 12:30:03

8 Q So you understand what the flash memory part 12:30:04

9 of that means; right? 12:30:07

10 A I do. 12:30:08

11 Q So going back to my earlier question in 12:30:09

12 paragraph -- regarding paragraph 9, with that 12:30:13

13 understanding of flash memory, if paragraph 9, the 12:30:18

14 last clause, said "working in the field of flash 12:30:22

15 memory devices," would you clear that hurdle or not? 12:30:25

16 A Well, part of my confusion comes in the fact 12:30:32

17 that there are other ways to work on flash devices 12:30:34

18 that are not literally flash memory. Flash memory 12:30:39

19 is often or can be a component of a bigger device, 12:30:44

20 like a block, like I talked about earlier. Like, 12:30:50

21 for instance, the EFUSE block that I talked about, 12:30:54

22 it's -- it's -- every time you have talked today 12:30:57

23 about a flash memory, you have talked about a 12:30:59

24 consumer-oriented flash memory, and yet, they are 12:31:02

25 not the only ones out there. Flash memory blocks 12:31:05

1 are often put on semiconductor devices that their 12:31:09
2 main function is just not a generic consumer flash 12:31:13
3 memory device. 12:31:17

4 Q I haven't been meaning to restrict flash 12:31:18
5 memory to the consumer application at all. And I 12:31:22
6 don't believe I've asked any questions that had that 12:31:24
7 as a predicate. So I would disagree with your 12:31:27
8 statement, and I will ask you again. 12:31:30

9 With the flash memory as it's defined or as 12:31:32
10 that term is used in the title of the '045 patent, 02:14:13
11 which is entitled "Serial Flash Memory," with that 02:14:13
12 understanding of flash memory as it's used in the 02:14:13
13 '045 patent, are you one of ordinary skill in the 02:14:13
14 art with three years of relevant experience working 02:14:13
15 in the field of flash memory or not? 02:14:13

16 MR. LIMBACH: Objection; form. 02:14:13

17 THE WITNESS: Are you specifically limiting 02:14:13
18 this to the example shown in the -- the embodiment 02:14:13
19 shown here -- 02:14:13

20 MR. HEINZ: No. 02:14:13

21 THE WITNESS: -- and -- but -- but you are 02:14:13
22 limiting yourself to the claims shown here. 02:14:13

23 MR. HEINZ: No. 02:14:13

24 Q I'm just asking you about the word -- or the 02:14:13
25 term "flash memory" as that term is used in the 02:14:13

1 patent, and I believe it's used more broadly than 02:14:13
2 the specific embodiment in the patent, wouldn't you 02:14:13
3 agree? 02:14:13

4 A Specific embodiment in the patent. I do -- I 02:14:13
5 do agree it's used broadly. It's -- the part I seem 02:14:13
6 to be unable to have you understand is that if a 02:14:13
7 flash memory array stores logic information, that 02:14:13
8 the storage of that information is still done in a 02:14:13
9 flash memory. 02:14:13

10 You seem to be continuing to say that if the 02:14:13
11 device -- the whole device is in a flash memory, 02:14:13
12 then it doesn't -- then it doesn't apply or my 02:14:13
13 experience doesn't apply, and I disagree with that. 02:14:13

14 The -- the reality here, if you look at -- if 02:14:13
15 you look at the way the cells store the information, 02:14:13
16 the way the cells are constructed according to the 02:14:13
17 embodiment, this is not any different from how it's 02:14:13
18 done in an e-squared CMOS PAL. It's just that the 02:14:13
19 information stored is different information. 02:14:13

20 So if -- if your -- if your suggestion is 02:14:13
21 accurate that the patentee believes that flash 02:14:13
22 memory is a very broad thing, then I definitely meet 02:14:13
23 the requirements, because the information stored in 02:14:14
24 a CMOS PLD is stored in a flash memory array. It's 02:14:14
25 not consumer data, as you've talked about before, 02:14:14

1 but it's still information stored in a flash array, 02:14:14

2 so I think I don't have a problem with this. 02:14:14

3 Q The only thing I'm asking is: Would you 02:14:14

4 clear the bar or not? 02:14:14

5 A And I think I do and for the reasons I just 02:14:14

6 said. 02:14:14

7 Q So let me ask you this: You understand what 02:14:14

8 memory devices are; right, because you wrote that in 02:14:14

9 your declaration in paragraph 9? 02:14:14

10 A Yes. 02:14:14

11 Q What's a memory device? 02:14:14

12 A Well, that's a very big subject. 02:14:14

13 Q Well, what did you mean when you wrote it in 02:14:14

14 paragraph 9? 02:14:14

15 A I -- I meant any -- any type of a device that 02:14:14

16 stores memory. So it could be a whole device. It 02:14:14

17 could be a portion of a device. It's a device. 02:14:14

18 It's a -- it's a --- it's a -- it's a thing that 02:14:14

19 performs a certain function. 02:14:14

20 Q So if I said "flash memory device," what does 02:14:14

21 that mean to you? 02:14:14

22 A It means a device that remembers something, 02:14:14

23 and where I mean device -- when I say "device," I 02:14:14

24 mean it could be a whole device; it could be a 02:14:14

25 portion of a device which stores -- stores 02:14:14

1 information. Therefore, it's memory and it uses a 02:14:14
2 flash technique to do it. 02:14:14

3 Q And is all non-volatile memory with regard to 02:14:14
4 this discussion we are having now flash memory? Are 02:14:14
5 those co-terminus? 02:14:14

6 A No. All non-volatile memory is not flash 02:14:14
7 memory. We have covered that pretty much earlier, I 02:14:14
8 believe. 02:14:14

9 Q So this last clause that we have been 02:14:14
10 discussing, "the working in the field of 02:14:14
11 non-volatile memory devices," if that said "working 02:14:14
12 in the field of flash memory devices," the flash 02:14:14
13 memory devices version would be narrower. 02:14:14

14 Would you agree with that? 02:14:14

15 A Of flash memory -- yes, I would agree with 02:14:14
16 that. 02:14:14

17 Q And it's your testimony that you have three 02:14:14
18 years or more of relevant experience working in the 02:14:14
19 field of flash memory devices? 02:14:14

20 A As I've said -- as I've said before, the 02:14:14
21 storage of information in a CMOS -- e-squared CMOS 02:14:14
22 PAL is done in a flash memory array. The fact that 02:14:14
23 the data is logical configuration is -- doesn't make 02:14:14
24 any difference. The underlying technology is still 02:14:14
25 flash cells in an organization with word lines and 02:14:14

1 bit lines and columns and rows, same thing. And, 02:14:14
2 yes, that would -- that qualifies -- that, along 02:14:14
3 with my other experience, qualifies me easily. 02:14:14

4 Q Is the CMOS memory array, the one you are 02:14:14
5 referring to, the one you worked on at Hughes? 02:14:14

6 A No. 02:14:14

7 Q Is a CMOS memory array -- which CMOS memory 02:14:14
8 array are you referring to in the statement that you 02:14:14
9 just said? 02:14:15

10 A The e-squared CMOS PAL devices were done at 02:14:15
11 National. 02:14:15

12 Q Those devices were done before flash memory 02:14:15
13 was even invented; isn't that right? 02:14:15

14 A They were done before individual flash memory 02:14:15
15 chips were invented, yes. 02:14:15

16 Q So you are relying on that experience to get 02:14:15
17 you over the three-years-of-relevant-experience 02:14:15
18 barrier? 02:14:15

19 A Yes. It had thin gate oxide. It was 02:14:15
20 programmed electrically. It was erased 02:14:15
21 electrically, and it was a flash array. 02:14:15

22 Q I believe we said earlier -- we asked about 02:14:15
23 when flash memory was invented, and you said circa 02:14:15
24 1984; is that right? 02:14:15

25 A Yes. 02:14:15

1 Q Since 1984, have you had three years or more 02:14:15
2 of relevant experience working in the field of flash 02:14:15
3 memory devices? 02:14:15

4 A So I think there's something that you missed 02:14:15
5 here. The -- the -- the -- the e-squared-CMOS-PAL 02:14:15
6 work continued through '89, which is after when 02:14:15
7 flash was invented. 02:14:15

8 Q So let me ask the same question: Since 1984, 02:14:15
9 do you have three years or more of relevant 02:14:15
10 experience working in the field of flash memory 02:14:15
11 devices? 02:14:15

12 A Yes, I believe I do. 02:14:15

13 Q And what is that three years composed of? 02:14:15

14 A It's composed of the time I spent doing the 02:14:15
15 e-squared CMOS PAL. 02:14:15

16 Q Anything else? 02:14:15

17 A For flash. 02:14:15

18 Q Right. 02:14:15

19 A I don't believe so, other than the work at 02:14:15
20 the ITC. 02:14:15

21 Q With regard to the work you did at the ITC 02:14:15
22 related to the flash memory, we already mentioned 02:14:15
23 that was a litigation consulting project; right? 02:14:15

24 A Yes. 02:14:15

25 Q It didn't involve any design of memory? 02:14:15

1 A Didn't involve any design. Well, it depends 02:14:15
2 upon what you mean by "design." 02:14:15

3 Q Let me ask a different question. 02:14:15

4 In connection with that project, you did not 02:14:15
5 design any flash memory; is that right? 02:14:15

6 A Do you -- do you consider analyzing -- 02:14:15
7 analyzing programming circuits for multilevel flash 02:14:15
8 cells to be design? 02:14:15

9 Q No. 02:14:15

10 A So you don't think design has any analyzation 02:14:15
11 portion to it? 02:14:15

12 Q I'm not trying to define design. I'm just 02:14:15
13 asking a question. 02:14:15

14 And my question is: Did you do any memory 02:14:15
15 design in connection with that ITC project? 02:14:15

16 MR. LIMBACH: Objection; form. 02:14:15

17 THE WITNESS: And I'm -- and I'm only trying 02:14:15
18 to answer the question. There are many different 02:14:15
19 aspects to doing a design. One of the aspects is 02:14:15
20 analysis. You analyze things. You see how they 02:14:15
21 work. You may do some simulations. That's part of 02:14:15
22 design. 02:14:15

23 Did I do that type of work with respect to 02:14:15
24 the ITC matter that we are presently talking about? 02:14:15

25 The answer is yes. I did analysis to understand 02:14:15

1 what the patent was talking about and how the patent 02:14:15
2 work -- worked and how the prior art that was 02:14:16
3 involved in that matter worked also. 02:14:16

4 BY MR. HEINZ: 02:14:16

5 Q Did you do any simulations in connection with 02:14:16
6 that ITC case? 02:14:16

7 A I don't recall right now that I did, but I 02:14:16
8 may have. I don't -- I don't remember. I don't 02:14:16
9 remember. 02:14:16

10 Q Beyond analyzing the patents and doing the 02:14:16
11 analysis work you just mentioned, did you do any 02:14:16
12 other design of flash memory in connection with your 02:14:16
13 ITC project? 02:14:16

14 A Well, I actually had an interesting idea, 02:14:16
15 having been involved in that -- in that memory at 02:14:16
16 the ITC and spent some time looking at potential 02:14:16
17 ways to increase the endurance of multilevel flash 02:14:16
18 cells compared to ways that I saw in other patents 02:14:16
19 that I pulled -- after the ITC case was over, I 02:14:16
20 pulled some patents from SanDisk because it had come 02:14:16
21 to my attention that retention and endurance seemed 02:14:16
22 to be very big problems for the multilevel cell 02:14:16
23 flash, and I thought maybe there would be some -- 02:14:16
24 given my background as a device guy, maybe there 02:14:16
25 would be some insights that I could find and maybe 02:14:16

1 come up with something new and exciting that I 02:14:16
2 could -- that I could sell. So I did do that, but I 02:14:16
3 didn't -- I didn't do, like, an end-to-end design 02:14:16
4 if -- if -- you know, from beginning to -- to 02:14:16
5 finished product, no. 02:14:16

6 Q Did you come up with anything as a result of 02:14:16
7 that exercise? 02:14:17

8 A I -- I came up with something, but I -- I 02:14:17
9 wasn't sure -- I wasn't sure it was going to make 02:14:17
10 that much of a difference. But it continues to be a 02:14:17
11 problem in the industry in that for every -- every 02:14:17
12 time they move the technology, the endurance level 02:14:17
13 of these cells, the new cells in the new technology, 02:14:17
14 goes down, down, down, down, down. 02:14:17

15 So in the old days, cell programmability was 02:14:17
16 maybe you get 100,000 write/erase cycles. Now those 02:14:17
17 numbers are down to about a thousand, so it 02:14:17
18 continues to be a problem. If I had a good 02:14:17
19 solution, I could probably make a lot of money, but. 02:14:17

20 Q Maybe some day. 02:14:17

21 A I don't know. 02:14:17

22 Q Mr. Murphy, in any of these expert witness 02:14:17
23 cases that you have worked on that are listed on 02:14:17
24 page 1 to 2 of your CV -- 02:14:17

25 A Yes. 02:14:17

1 Q -- that we talked about earlier, in any of 02:14:17
2 those cases, have you had any opinions rejected by 02:14:17
3 the Court or by the Patent Office? 02:14:17

4 MR. LIMBACH: Objection; form. 02:14:17

5 THE WITNESS: Not to my knowledge, no. 02:14:17

6 BY MR. HEINZ: 02:14:17

7 Q Do you know what a Daubert motion is? 02:14:17

8 A I have heard the name. Is it -- sorry. Not 02:14:17
9 a lawyer. Is it a move-to-strike testimony? I 02:14:17
10 don't -- you will have to describe it to me. That's 02:14:17
11 how little I know. 02:14:17

12 Q It's a challenge to an expert's opinion that 02:14:17
13 they didn't do the proper analysis or they don't 02:14:17
14 have the proper foundation to opine on the issue. I 02:14:17
15 mean, generally, that is what it is. 02:14:17

16 A Okay. 02:14:17

17 Q And a successful Daubert motion would cause 02:14:17
18 you not to be able to testify about certain things. 02:14:17

19 A Yeah, I don't know if I was involved in one 02:14:17
20 of those or not. 02:14:17

21 Q You may be; you may not be. You just don't 02:14:17
22 know one way or the other? 02:14:17

23 A Nobody specific that I -- that I recall, 02:14:17
24 nobody specifically came to me and said, "You can't 02:14:17
25 testify about this." 02:14:17

1 MR. HEINZ: Is this a good time for lunch? 02:14:17

2 MR. LIMBACH: Sure. 02:14:17

3 THE VIDEOGRAPHER: Going off the record, the 02:14:17

4 time now is 12:47. 02:14:17

5 (Lunch recess taken.) 02:14:18

6 ---o0o--- 02:14:18

7 02:14:18

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

1	AFTERNOON SESSION	2:15 P.M.	02:14:18
2			02:16:06
3	THE VIDEOGRAPHER: Very good. The video is		02:16:06
4	rolling.		02:16:06
5	The time now is 2:15. This also marks the		02:16:07
6	beginning of Tape 3.		02:16:10
7	Please proceed.		02:16:12
8	BY MR. HEINZ:		02:16:14
9	Q Welcome back.		02:16:14
10	A Thank you.		02:16:15
11	Q I would like to ask a few more questions just		02:16:15
12	to follow up on some points we were talking about		02:16:20
13	before lunch regarding paragraphs 8 and 9 in your		02:16:22
14	declaration. Get those out, please.		02:16:26
15	A Yes.		02:16:34
16	Q Do you have any experience working with NAND		02:16:34
17	flash?		02:16:41
18	A No, I don't believe I do.		02:16:42
19	Q So if in paragraph 9 the last clause said		02:16:49
20	"working in the field of NAND flash memory devices,"		02:16:57
21	you would not be one of ordinary skill in the art;		02:17:02
22	is that right?		02:17:04
23	A And you are dropping non-volatile?		02:17:04
24	Q Right.		02:17:08
25	If I replaced -- let me -- let me just ask		02:17:10

1 the question again.

02:17:12

2 A Yes.

02:17:13

3 Q In paragraph 9 of your declaration you give
4 an opinion about the level of ordinary skill in the
5 art related to the '045 patent; is that right?

02:17:13

02:17:18

02:17:20

6 A Yes.

02:17:23

7 Q And the last clause, which relates to the
8 relevant experience, reads "working in the field of
9 non-volatile memory devices"?

02:17:24

02:17:30

02:17:32

10 A It does.

02:17:35

11 Q And, in your view, the level of skill of
12 ordinary skill in the art would either be a Bachelor
13 of Science Degree in electrical engineering and five
14 years of relevant experience or a Master of Science
15 degree in electrical engineering and three years of
16 relevant experience working in the field of
17 non-volatile memory devices?

02:17:36

02:17:42

02:17:46

02:17:47

02:17:51

02:17:54

02:17:55

18 A Yes. That's what it says here in
19 paragraph 9.

02:17:58

02:18:00

20 Q And you have a Master of Science in
21 electrical engineering?

02:18:01

02:18:03

22 A I do.

02:18:03

23 Q So if the last clause, instead of saying

02:18:04

24 "working in the field of non-volatile memory

02:18:09

25 devices" read "working in the field of NAND flash

02:18:12

1 memory devices," would you be one of ordinary skill 02:18:16
2 in the art or not? 02:18:22

3 MR. LIMBACH: Objection; form. 02:18:23

4 THE WITNESS: I -- I don't have three years 02:18:24
5 of relevant experience on NAND flash memory devices, 02:18:28
6 so, no, I would not be. 02:18:33

7 BY MR. HEINZ: 02:18:34

8 Q I would like to move on and talk about some 02:18:44
9 of the claim constructions in this case. 02:18:46

10 A Okay. 02:18:48

11 Q They start on page 6 of your declaration -- 02:18:49
12 or the section about claim construction starts on 02:18:58
13 page 6 of the declaration. 02:19:01

14 Are you with me there? 02:19:02

15 A I am. 02:19:05

16 Q How did you go about coming up with these 02:19:10
17 constructions? 02:19:13

18 A Well, first, I read the patent and the -- and 02:19:14
19 the application and the parent patent, except for 02:19:26
20 the specification in the parent is identical to the 02:19:31
21 child, so only the claims are different there. And 02:19:35
22 then once I had the background of the patent, then I 02:19:40
23 came into discussion with counsel about what the 02:19:47
24 claim terms should be. 02:19:52

25 Q And you arrived at the constructions that you 02:19:57

1 offered in your declaration; is that right? 02:19:59

2 A I did. 02:20:00

3 Q In paragraph 13 of your declaration, you 02:20:03

4 first explain that, in order to properly evaluate 02:20:12

5 the '045 patent, the terms of the claims must first 02:20:16

6 be interpreted? 02:20:19

7 A Yes. 02:20:23

8 Q And you go on to say that it's your 02:20:23

9 understanding that they are to be given their 02:20:26

10 broadest reasonable interpretation in light of the 02:20:28

11 specification? 02:20:29

12 A Yes. 02:20:29

13 Q And it's your further understanding that 02:20:33

14 claim terms are given their ordinary and accustomed 02:20:35

15 meaning as would be understood by one of ordinary 02:20:37

16 skill in the art unless the inventor acts as his own 02:20:40

17 lexicographer? 02:20:45

18 A Correct. 02:20:46

19 Q And is that what you did here? 02:20:47

20 A Yes. 02:20:49

21 Q And, in your view, the inventor did not act 02:20:49

22 as a lexicographer with regard to any of these 02:20:55

23 terms; is that right? 02:20:58

24 A That's correct. 02:20:59

25 Q I would like to start out with the term 02:20:59

1 "logic low voltage," which is on page 7, starting at 02:21:01
2 paragraph 16 -- or, actually, take that back. It's 02:21:07
3 just paragraph 16 of your declaration. 02:21:12

4 A I'm there. 02:21:16

5 Q In your view, a person of ordinary skill in 02:21:17
6 the art would understand that the term "logic low 02:21:21
7 voltage," as used in the '045 patent, means a low 02:21:26
8 voltage such as ground or Vss; is that right? 02:21:30

9 A Yes. 02:21:33

10 Q With regard to your construction, the portion 02:21:34
11 after the comma, the "such as ground or Vss" 02:21:40
12 portion? 02:21:43

13 A Yes. 02:21:44

14 Q Is that limiting, in your view? 02:21:44

15 A I don't think it's limiting because it -- 02:21:48
16 it's -- the words "such as" are words that define 02:22:05
17 what an example would be. 02:22:08

18 Q So the "such as ground or Vss" just provides 02:22:10
19 nonlimiting examples; is that right? 02:22:14

20 A Yes. 02:22:16

21 Q Let me move on to logic high voltage, which 02:22:16
22 is paragraph 17 of your declaration? 02:22:28

23 A I have it. 02:22:33

24 Q And for logic high voltage, in your view, the 02:22:34
25 proper construction is a positive voltage higher 02:22:40

1 than the logic low voltage such as Vcc. 02:22:43

2 Do you see that? 02:22:46

3 A I do. 02:22:47

4 Q Is the "such as Vcc" in this construction 02:22:47

5 also a nonlimiting example? 02:22:52

6 A Yes. 02:22:53

7 Q So neither of the "such as" clauses limits 02:22:55

8 the scope of those definitions? 02:23:00

9 A I don't believe that it does, no. It just 02:23:08
10 gives an example. 02:23:11

11 Q Now, going back to logic low voltage, which 02:23:12
12 is on the previous page, paragraph 16. 02:23:16

13 A Yes. 02:23:21

14 Q The term you are construing, "logic low 02:23:21
15 voltage," the first wor- -- word in there is 02:23:24

16 "logic." 02:23:26

17 Do you see that? 02:23:28

18 A I do. 02:23:29

19 Q In your definition, it just begins with: A 02:23:29
20 low voltage, and then gives the nonlimiting 02:23:35

21 examples. 02:23:39

22 So it appears that the term "logic" is not 02:23:40
23 included in your proposed construction; is that 02:23:43

24 right? 02:23:45

25 A Well, I don't necessarily think that's true. 02:23:45

1 Two of the -- the two examples given for logic low 02:24:14
2 voltage, ground and Vss, are well known to one of 02:24:19
3 ordinary skill in the art to be a logic low voltage. 02:24:24

4 Q But those are nonlimiting examples, as we 02:24:27
5 just established; is that right? 02:24:30

6 A That's correct. So in the case of a ground 02:24:31
7 signal, the voltage could be a .01 volts or .1 volts 02:24:34
8 or 50 millivolts. I think one of ordinary skill in 02:24:42
9 the art would still understand that it doesn't have 02:24:46
10 to be exactly ground or exactly Vss to be a low 02:24:49
11 voltage and that the two examples there are voltages 02:24:53
12 commonly understood to be related to logic levels to 02:24:59
13 one of ordinary skill in the art. 02:25:02

14 Q But since those examples are nonlimiting, all 02:25:04
15 it needs to do to satisfy your construction is be a 02:25:09
16 low voltage; is that right? 02:25:13

17 A Well, I think this term is -- is broad enough 02:25:14
18 to meet the scope of how it's used in the claim, 02:25:23
19 and -- and if you -- if you do much more than this, 02:25:29
20 then you are going to be importing limitations from 02:25:44
21 the specification, and I don't think that's proper. 02:25:47

22 Q In the original term "logic low voltage," 02:25:51
23 what does the "logic" word mean? 02:25:55

24 A Well, "logic," to one of ordinary skill in 02:25:59
25 the art, is a form of usage of the devices to 02:26:08

1 implement logic.

02:26:13

2 The term "logic low voltage" actually doesn't
3 appear in the specification anywhere, so one of
4 ordinary skill reading the claim and then reading
5 the specification will use their knowledge of what a
6 logic low voltage is, and it's a low voltage such as
7 ground or Vss. It doesn't -- it's not limited to
8 ground or Vss. It just needs to be a low voltage
9 and -- and -- and that's all.

02:26:14

02:26:17

02:26:21

02:26:23

02:26:30

02:26:36

02:26:39

02:26:44

10 Q So to the ex- -- let me start over.

02:26:49

11 So the original term "logic low voltage,"
12 what would the difference be between a logic low
13 voltage and a low voltage if you omitted the word
14 "logic" from the phrase, if any?

02:26:54

02:27:02

02:27:04

02:27:09

15 A Well, I think the only thing that the word
16 "logic" brings to the other two words in logic low
17 voltage is that the level is low enough so as to
18 effectively be a logic 0.

02:27:12

02:27:26

02:27:33

02:27:40

19 Q But that's not reflected in your proposed
20 construction, is it?

02:27:43

02:27:46

21 A Well, it is when you look at the examples
22 that are given.

02:27:46

02:27:49

23 Q But the examples are nonlimiting, so they
24 don't --

02:27:50

02:27:52

25 A But there aren't --

02:27:55

1 Q I'm sorry. 02:27:56

2 Because the examples are nonlimiting, they 02:27:57

3 don't limit the scope to a low voltage that 02:27:59

4 represents a logic low. 02:28:01

5 Would you agree with that? 02:28:03

6 A Well, I agree that the phrase "a low voltage 02:28:04

7 such as ground or Vss" is very broad, but I also 02:28:10

8 understand that one of ordinary skill in the art is 02:28:16

9 going to be looking at these terms and understanding 02:28:18

10 from the specification how they are to be used. And 02:28:24

11 when I apply a broadest reasonable interpretation, 02:28:31

12 then this is what I came to. 02:28:38

13 Q How high could a voltage be and still be a 02:28:39

14 low voltage in accordance with the construction that 02:28:45

15 you have provided in paragraph 16? 02:28:50

16 A Well, it cannot be so high as to be 02:28:52

17 considered a high voltage, which I identified in 02:28:58

18 column -- sorry, paragraph 17. So it is -- it's 02:29:02

19 also a number that varies depending upon which 02:29:11

20 technology you are using, how -- if you are -- if 02:29:15

21 you are asking what an absolute number would be, it 02:29:19

22 varies for different process technologies. 02:29:22

23 Q Let me confine my question to the '045 patent 02:29:28

24 and the technology in the '045 patent. 02:29:36

25 With that, how high could a voltage be and 02:29:41

1 still be a low voltage in accordance with your 02:29:44
2 proposed construction? 02:29:48

3 A And you are looking at -- and you are looking 02:29:49
4 for a number here? 02:29:53

5 Q Yes. 02:29:55

6 A Well, given the embodiment, it would have to 02:29:58
7 be a voltage -- well, given the embodiment and 02:30:09
8 the -- well, the -- the embodiment says -- so the 02:30:22
9 embodiment specifically says a low voltage as 02:30:50
10 grounded; for example, column 7, line 34, "With BL0 02:30:53
11 grounded." So that's the only -- that's the only 02:30:58
12 definition we see from the embodiment itself. 02:31:08

13 There's no definition in the claim. The 02:31:12
14 claims language -- as I've already stated, a logic 02:31:17
15 low voltage, that phrase is only used in the claim. 02:31:20
16 It's never used in the patent. So the -- you would 02:31:25
17 have to -- for the particular embodiment shown in 02:31:29
18 the patent, you would have to look at the things 02:31:33
19 that are controlled by this low logic -- logic low 02:31:37
20 voltage. 02:31:46

21 So, for example, if we go to claim 1, the 02:31:51
22 next two elements from the bottom, it says "a logic 02:31:57
23 low voltage is applied to source select control line 02:32:01
24 to turn off source select transistors." So the 02:32:08
25 voltage must be below a voltage that the transistors 02:32:11

1 would turn on at, commonly called the VT. 02:32:16

2 So I don't recall seeing in the patent what 02:32:21

3 the VT of a very -- of a specific NMOS transistor is 02:32:27

4 in this technology. So it's very difficult to say 02:32:33

5 what that logic low voltage absolutely is, but it 02:32:42

6 clearly, from the claims language, has to be a 02:32:48

7 voltage low enough so that the source select 02:32:50

8 transistors, for example, are off. 02:32:54

9 Q Your construction doesn't say any of that, 02:32:57

10 though; is that right? 02:33:00

11 A My construction doesn't say that. It's a 02:33:00

12 very broad construction. 02:33:06

13 Q If I was trying to determine whether a 02:33:06

14 particular product fell within the scope of these 02:33:09

15 claims using your construction, how would I know 02:33:13

16 whether the voltage was low enough to fit within the 02:33:18

17 scope of your proposed construction? 02:33:21

18 A Well, the reason that the proposed 02:33:24

19 construction is the way it is, is that the 02:33:26

20 definition that you just asked for actually comes in 02:33:29

21 the rest of the line of the sentence of the claim. 02:33:34

22 So the -- the sentence in the claim says: A 02:33:37

23 logic low voltage is applied to source select 02:33:41

24 control line. That tells you where it goes. It's 02:33:44

25 the next portion of the claim that tells you, 02:33:48

1 effectively, how low that voltage has to be. It has 02:33:51
2 to turn off source select transistors. 02:33:54

3 Now, if we weave that information to turn off 02:33:59
4 the source select transistors into the claims term, 02:34:02
5 then, effectively, it's duplicated and the rest of 02:34:07
6 the sentence there is redundant; you don't need it. 02:34:10
7 So I didn't feel it was appropriate to put it into 02:34:14
8 the claim term for a logic low voltage. 02:34:16

9 Q But you felt it was appropriate to provide a 02:34:19
10 construction for logic low voltage, which is a 02:34:21
11 construction that's in paragraph 16 of your 02:34:24
12 declaration; isn't that right? 02:34:26

13 A Yes. 02:34:27

14 Q And your construction redefines logic low 02:34:28
15 voltage to be a low voltage and then includes a 02:34:32
16 nonlimiting example; isn't that right? 02:34:36

17 A Yes. As we have talked about, there is -- 02:34:38
18 there's no limitation to the voltage. Either of the 02:34:45
19 two voltages expressed in my construction would 02:34:50
20 qualify to satisfy the second portion of the 02:34:57
21 sentence in the claims term. 02:35:01

22 Q Is it your view now that your construction 02:35:03
23 can be either ground or Vss, but not other values? 02:35:07

24 A No. The -- the language is "such as." They 02:35:11
25 are given as -- as examples. It's -- it's still 02:35:22

1 nonlimiting, it just gives -- most people understand 02:35:24
2 ground or Vss to be the same thing, especially 02:35:30
3 read -- when read in light of this patent. But as I 02:35:34
4 talked about before, a number of very close to 02:35:38
5 ground would qualify just as well, and it's not 02:35:41
6 actually ground. It's maybe 10 millivolts. 02:35:45

7 Q How close? 02:35:49

8 A Close enough to meet the requirements for the 02:35:52
9 rest of the sentence that is listed in the claim. 02:35:54

10 Q And what -- what number is that? If you 02:35:58
11 don't know, you don't know. 02:36:03

12 A Well, the -- the -- the term generally used 02:36:04
13 by a person of ordinary skill is a number below the 02:36:08
14 threshold of the transistor of the source select 02:36:12
15 transistors. 02:36:16

16 Q So is your -- oh -- 02:36:17

17 A So -- 02:36:17

18 Q -- I'm sorry. Go ahead. 02:36:18

19 A -- given that the patentee didn't describe 02:36:19
20 any of this, one of ordinary skill in the art would 02:36:21
21 understand that, you know, given -- given the other 02:36:24
22 technological details they see here, that the 02:36:27
23 threshold is probably somewhere -- of those 02:36:30
24 transistors, is probably lower than a volt, but 02:36:34
25 it's -- it -- it is not apropos, I don't think, to 02:36:40

1 bring specific voltages into this patent claim, 02:36:48
2 given that it's written so broadly. 02:36:51

3 Q Well, didn't you in your analysis apply these 02:36:53
4 exact constructions to specific voltages in the 02:36:57
5 Nakai reference and then opine that the Nakai 02:37:01
6 reference anticipates on that basis? 02:37:03

7 A Well, that's just the easiest way to make the 02:37:06
8 comparison. 02:37:10

9 Q I -- I understand that. 02:37:11
10 Is that why you did it? 02:37:11

11 A No. I did it because the -- the -- 02:37:12
12 the reference -- the Nakai reference has the very 02:37:15
13 same structure, the -- almost the very same voltage 02:37:19
14 levels as defined in the specification here on the 02:37:23
15 '045. Okay? They are applied in the same way, and 02:37:28
16 they are used to generate actions that are identical 02:37:30
17 to what's shown here in claims 1 and claims 4. 02:37:36

18 Q Is there any upper limit, in your view, on 02:37:39
19 your construction for logic low voltage which is a 02:37:44
20 low voltage such as ground or Vss? 02:37:48

21 A Yes, there is. 02:37:50

22 Q What is it? 02:37:53

23 A Well, I've tried to explain this before, that 02:37:54
24 in the element claim that's in -- in the element of 02:37:58
25 claim 1 that says, "a logic low voltage is applied 02:38:05

1 to a source select control line to turn off source 02:38:08
2 select transistors." So there are voltages that 02:38:12
3 will not turn off those source select transistors, 02:38:15
4 and so those voltages would not qualify as logic low 02:38:18
5 voltages. 02:38:22

6 Q So you need the rest of the claim, then, in 02:38:23
7 order to determine whether a logic low voltage falls 02:38:26
8 within the scope of your definition? 02:38:30

9 MR. LIMBACH: Objection; form. 02:38:33

10 THE WITNESS: Well, it is true that if I pick 02:38:39
11 a voltage and arbitrarily declare it to be a logic 02:38:41
12 low voltage and then I apply it to the selected bit 02:38:47
13 lines or the selected control line, is the example I 02:38:52
14 was using, and it does not turn off the source 02:38:56
15 select transistors, then, first of all, this claim 02:38:59
16 wouldn't be met, and, secondly, since the claim 02:39:03
17 wouldn't be met and it requires this, the claim 02:39:08
18 requires this, that would lead one of ordinary skill 02:39:11
19 in the art to understand that that voltage is not a 02:39:14
20 logic low voltage, because it didn't turn the 02:39:17
21 transistors off. 02:39:20

22 BY MR. HEINZ: 02:39:21

23 Q And, again, none of that is reflected in your 02:39:21
24 construction? 02:39:25

25 A The construction is appropriate for the 02:39:27

1 broadness of the claim, and --

02:39:30

2 Q Right.

02:39:32

3 A -- and it has in it what it has in it.

02:39:33

4 Q I understand.

02:39:36

5 But I -- my question is: That entire

02:39:37

6 explanation you gave about turning on, turning off,

02:39:40

7 whatever the case may be, none of that's in your

02:39:43

8 construction; is that right?

02:39:46

9 A And it doesn't have to be.

02:39:47

10 Q I'm not asking whether it has to be or not,

02:39:49

11 in your opinion. I'm just saying, it's not there.

02:39:52

12 Can we agree on that?

02:39:54

13 A Yeah, it's -- it's not there.

02:39:55

14 Q And if I was trying to evaluate a particular

02:39:57

15 voltage in a particular product, I would have no way

02:40:00

16 of knowing whether it was low enough or not to fall

02:40:04

17 within your definition of logic low voltage other

02:40:07

18 than whether it had the aspects of the rest of the

02:40:10

19 claim you pointed to; is that right?

02:40:15

20 A Given how broadly the claim is written, yes,

02:40:16

21 that's correct.

02:40:22

22 Q Let me move on to logic high voltage, which

02:40:22

23 is in paragraph 17 of your declaration.

02:40:34

24 You with me?

02:40:46

25 A I am.

02:40:47

1 Q So here, again, we have the "such as" clause, 02:40:47
2 and I believe we already discussed that that's also 02:40:52
3 a nonlimiting example; is that right? 02:40:54

4 A Yes. 02:40:56

5 Q So logic high voltage does not have to be 02:40:56
6 Vcc? 02:40:59

7 A That is correct. 02:41:00

8 Q Could be higher. Could be lower; is that 02:41:01
9 right? 02:41:04

10 A It's possible, yes. 02:41:04

11 Q How high could a voltage be and still fall 02:41:05
12 within the scope of your construction? 02:41:13

13 A Well, it wouldn't be so high as to force 02:41:17
14 programming to happen in the flash cells, so it 02:41:36
15 would have -- it would have to be less than that. 02:41:40

16 Q And, again, that's not reflected in your 02:41:44
17 construction here, is it? 02:41:47

18 A I wrote the construction based on what I see 02:41:48
19 was needed from the claim, and I didn't see that 02:41:53
20 that was needed, so it's not in there. 02:41:57

21 Q Again, your construction omits the word 02:41:59
22 "logic" in the sense that it references it relative 02:42:09
23 to the logic low voltage we have talked about, but 02:42:14
24 not in relation to the high voltage; is that right? 02:42:16

25 MR. LIMBACH: Objection; form. 02:42:19

1	THE WITNESS: I'm sorry. Could you read	02:42:21
2	that --	02:42:23
3	BY MR. HEINZ:	02:42:23
4	Q Let me -- let me ask -- let me ask a	02:42:23
5	different question.	02:42:25
6	So, before, we discussed the base term "logic	02:42:26
7	low voltage."	02:42:31
8	Do you remember that?	02:42:32
9	A Yes.	02:42:33
10	Q This base term is "logic high voltage"?	02:42:33
11	A Yes.	02:42:38
12	Q How is the logic part of that base term	02:42:38
13	reflected in your construction, if at all?	02:42:41
14	A Well, it's reflected in the fact that it's a	02:42:43
15	positive voltage higher than the logic low voltage,	02:42:54
16	so logic low would, in -- in generic terms, be	02:42:57
17	something that is a zero, and logic high would be a	02:43:02
18	positive voltage that doesn't give you a logic load;	02:43:06
19	gives you a one.	02:43:09
20	Q But you don't have a number for me?	02:43:10
21	A There are no numbers in the claims. Why --	02:43:12
22	why does this term need a number? And if I gave it	02:43:17
23	a number, that would really limit this patent;	02:43:20
24	because as soon as the technology changed, then this	02:43:26
25	claim would be stuck with a number that somebody	02:43:29

1 else could easily get around by just changing the 02:43:33
2 technology, and that's not what anybody does when 02:43:36
3 they are writing broad patent claims. 02:43:42

4 Q So you don't have a number for me? 02:43:43

5 A No. 02:43:47

6 Q How much higher than the logic low voltage 02:43:47
7 does this need to be? Could it be a .1 volt? Does 02:43:55
8 it need to be at least a volt? What's that delta, 02:43:59
9 in your view, as a minimum? 02:44:02

10 A Well, the delta would be understood by one of 02:44:04
11 ordinary skill in the art as being related to the 02:44:08
12 particular logic low voltage that you are using, the 02:44:12
13 trip point of the circuitry that you are giving it 02:44:18
14 to, and the magnitude of additional voltage that you 02:44:20
15 would need, for instance, to cover noise margin, 02:44:25
16 etc. 02:44:30

17 So if you had a very -- a very sharp trip 02:44:33
18 point, the number could be quite small. It could 02:44:40
19 be, like you say, as a -- as low as a 10th of a 02:44:43
20 volt. And it -- if you have something that has not 02:44:48
21 such a sharp trip point function, it would require a 02:44:53
22 bigger -- a bigger voltage, so it's -- it's not easy 02:44:56
23 to say what exact voltage it is. 02:45:04

24 Q You don't have a number for me again; is that 02:45:09
25 right? 02:45:12

1 A No; although, I've given an example in the -- 02:45:12
2 in the -- in the claims term. 02:45:18

3 Q Right, in that limited example, in your view? 02:45:19

4 A It's a -- it's a good example. 02:45:25

5 Q But it doesn't limit the scope of the 02:45:27
6 construction? 02:45:29

7 A No. It could be Vcc. It could be Vcc plus a 02:45:30
8 10th or minus a 10th, and they are all voltages that 02:45:35
9 will work in the -- in the claims language we 02:45:39
10 have -- in the claim elements we have at hand. 02:45:40

11 Q How high could this voltage be? Could it be 02:45:42
12 a hundred volts? 02:45:47

13 A For the technology shown in the patent, the 02:45:49
14 answer to that is no. 02:45:53

15 Q What's the highest it could be, in your view? 02:45:54

16 A Well, we talked -- or I talked about, 02:45:56
17 earlier, the fact that this voltage level needs to 02:46:01
18 be less than the voltage level to elicit 02:46:04
19 programming. Programming voltage in the preferred 02:46:08
20 embodiment is talked about as 15 to 20 volts, so I 02:46:11
21 think one of ordinary skill in the art reading the 02:46:16
22 material here in the patent would understand that 02:46:19
23 this -- that this number wouldn't be north of 02:46:22
24 15 volts; would not be higher than 15 volts. 02:46:26

25 Q But they would have to understand that 02:46:31

1 because that's not reflected in your construction;
2 is that right?

3 A Well, I didn't realize that constructions 02:46:35
4 were required to explain every possible element of 02:46:39
5 the claim language. It was my understanding that, 02:46:44
6 in fact, you do not bring specifics out of the 02:46:47
7 specification into the claims language so as to 02:46:55
8 limit the claims language, and the aspect of these 02:46:59
9 claim terms is the broadest reasonable definition, 02:47:06
10 and that's what I've used. 02:47:12

11 Q In your view, do the terms, as used in the 02:47:13
12 claim, "logic high voltage" and "logic low voltage" 02:47:22
13 limit the scope of the claim at all? 02:47:28

14 A Yes, they do. 02:47:33

15 So, for example, a logic -- the logic high 02:47:42
16 voltage in the claims language specifically is used 02:47:49
17 in sentences where it turns on transistors, and the 02:47:57
18 logic low voltage specifically is used in claims -- 02:48:04
19 in the claims in sentences that turn off 02:48:08
20 transistors. So the -- the limitation there is that 02:48:13
21 a logic low voltage is lower than a logic high 02:48:21
22 voltage is, and that's -- that's the limitation that 02:48:25
23 they bring to -- to the claims language. 02:48:32

24 Q Just that the logic low voltage has to be 02:48:34
25 lower than the logic high voltage? 02:48:37

24	Q And what I'm getting at is, if you took out	02:50:04
25	"high voltage" and just put in "a voltage," you	02:50:12

1 would still have the definition that comes from the 02:50:15
2 subsequent claim language, wouldn't you? 02:50:17

3 MR. LIMBACH: Objection; form. 02:50:19

4 THE WITNESS: Well, actually, no, I don't -- 02:50:22
5 I don't think that's true, because when you do -- 02:50:24
6 when you change "logic high voltage" to just 02:50:27
7 "voltage" and you change "logic low voltage" to just 02:50:29
8 "voltage," you now have no connection between the 02:50:32
9 two. The words "high" and "low" disappear, and so 02:50:36
10 it's less defining to do it that way than it is to 02:50:44
11 do it the way it was done. 02:50:47

12 BY MR. HEINZ: 02:50:50

13 Q But wouldn't one of skill in the art know 02:50:50
14 that one voltage had to be lower than the other from 02:50:52
15 the context of the claim? 02:50:56

16 A Context of the claim. I don't think just 02:50:57
17 from the context of the claim, no. 02:51:26

18 Q What if the term "logic low voltage" was 02:51:34
19 replaced with the term "a low voltage"? 02:51:44

20 A A -- 02:51:49

21 MR. LIMBACH: Objection; form. 02:51:51

22 BY MR. HEINZ: 02:51:52

23 Q Let me ask the same question except for, 02:51:52
24 instead of replacing "logic low voltage" and "logic 02:51:54
25 high voltage" in the claim, we replace those with 02:51:58

1 the terms "low voltage" and "high voltage" 02:52:02
2 respectively. 02:52:06

3 Would that change the scope of the claim? 02:52:07

4 MR. LIMBACH: Objection; form. 02:52:08

5 THE WITNESS: I think it would. I think it 02:52:10
6 would remove from the reader the -- the concept that 02:52:20
7 it was -- that it was a specific voltage that they 02:52:28
8 wanted to put on these lines. 02:52:36

9 For a part like a CMOS part, logic high 02:52:44
10 voltage is very often the -- the most positive power 02:52:49
11 supply rail that you have, and a logic low voltage 02:52:57
12 is the lowest power supply rail that you have, being 02:53:00
13 that CMOS is used to generate signals that go rail 02:53:03
14 to rail. 02:53:09

15 So if you change the words like that, I think 02:53:11
16 you -- I think you remove information from the 02:53:15
17 specification -- I mean the -- the claims language 02:53:20
18 that impart a certain type of knowledge to the 02:53:26
19 reader, and without them, then I believe the 02:53:30
20 knowledge just wouldn't be the same. 02:53:33

21 BY MR. HEINZ: 02:53:35

22 Q So if I replaced "logic low voltage" with 02:53:35
23 just "low voltage," that would deprive the reader of 02:53:39
24 the knowledge regarding the scope of the claim like 02:53:44
25 you said; is that right? 02:53:47

1 A I think so.

02:53:48

2 And -- and, of course, you know, we have the
3 situation here where the patentee had all the
4 language in the world available to him, and he
5 didn't use terms that are in the specification. He
6 used unique terms in the claims, and he had the
7 opportunity, for instance, to say -- instead of
8 saying "a logic high voltage," he -- the patentee
9 could have said "a Vcc voltage is applied to said
10 bit line select control line to turn on the bit line
11 select transistors," and the patentee chose not to
12 do that.

02:53:51

02:53:53

02:53:56

02:54:02

02:54:05

02:54:10

02:54:14

02:54:17

02:54:22

02:54:24

02:54:27

13 So the patentee here specifically avoided
14 using specific voltage numbers, I believe, in an
15 effort to make the claim broad, and I believe that's
16 exactly -- that's true for the -- the "logic high
17 voltage" term and the "logic low voltage" term, and
18 I believe that's -- that's what the patentee
19 intended. Clearly, the patentee could have written
20 in a Vcc voltage or a Vss voltage and didn't.

02:54:28

02:54:32

02:54:38

02:54:42

02:54:46

02:54:49

02:54:53

02:54:56

21 And in -- in -- in keeping with that, the --
22 the constructions that -- that I've come up with
23 follow that broadness and preserve, I think, to the
24 best of our ability, the -- the intent of what the
25 patentee wrote in the claims.

02:55:02

02:55:07

02:55:10

02:55:14

02:55:17

1 Q So if you replaced the term "logic low 02:55:18
2 voltage" in the claim with just "low voltage," would 02:55:32
3 that have the same scope or not? 02:55:38

4 MR. LIMBACH: Objection; form. 02:55:42

5 THE WITNESS: The same scope. And when you 02:55:43
6 refer to "scope," you are referring to? 02:55:47

7 MR. HEINZ: The scope of the claim. 02:55:50

8 MR. LIMBACH: Same objection. 02:55:52

9 THE WITNESS: And -- sorry. One more time. 02:55:55
10 You want to replace "logic low voltage" with? 02:56:06

11 MR. HEINZ: "Low voltage." I want to omit 02:56:10
12 the word "logic." 02:56:11

13 THE WITNESS: You want to omit the word 02:56:12
14 "logic." 02:56:13

15 BY MR. HEINZ: 02:56:13

16 Q And I'm asking you if the claim would have 02:56:14
17 the same scope if we omit the word "logic" from 02:56:15
18 "logic low voltage" as it does in the form you see 02:56:18
19 right there? 02:56:22

20 A Yeah, I think -- 02:56:23

21 MR. LIMBACH: Objection; form. 02:56:25

22 THE WITNESS: I think it does change the 02:56:27
23 scope, and -- and part of the reason that I say that 02:56:29
24 is the patentee could have left the word "logic" 02:56:33
25 out, easily, and just said a low voltage is applied 02:56:37

1 to this guy and high voltage is applied to that guy. 02:56:40
2 Either way, had the patentee done that, we -- he 02:56:43
3 still didn't specify what the voltage level was, 02:56:46
4 right? But the fact that the patentee chose to 02:56:50
5 include that word means it meant something to the 02:56:55
6 patentee, and I think it's -- you know, it's 02:57:00
7 understandable for one of ordinary skill in the art 02:57:04
8 to understand what a logic high voltage level is and 02:57:06
9 a logic low voltage level is. 02:57:09

10 And very commonly, as I've said -- and I've 02:57:12
11 put in the -- the claims terms -- there's "such as 02:57:15
12 ground or Vss" or "such as Vcc." 02:57:18

13 BY MR. HEINZ: 02:57:23

14 Q But it could be something different than 02:57:23
15 that, in your view? 02:57:24

16 A It is possible to be something different, 02:57:25
17 yes. It's not nailed down to be exactly Vcc or Vss 02:57:27
18 or ground. 02:57:31

19 Q So just to summarize, you agree that the 02:57:32
20 scope would be different if we replaced the term 02:57:35
21 "logic low voltage" in the claim with "low voltage"? 02:57:39

22 MR. LIMBACH: Objection; form. 02:57:44

23 THE WITNESS: I think it would be, yes. 02:57:45

24 BY MR. HEINZ: 02:57:47

25 Q Same question with regard to "logic high 02:57:49

1 voltage"; if we replace that with just "high 02:57:50

2 voltage," would the scope of the claim be different? 02:57:54

3 A I think it does change -- change the scope, 02:57:55

4 yes. 02:58:02

5 Q Let me ask you about boosted positive 02:58:02

6 voltage, which you address at paragraph 18 of your 02:58:10

7 declaration. 02:58:14

8 A Yes, I have it. 02:58:15

9 Q What does "boosted" mean in "boosted positive 02:58:16

10 voltage," in your view? 02:58:22

11 A In my view, it's the -- the "boosted" term is 02:58:23

12 a term that identifies to one of ordinary skill in 02:58:32

13 the art how that voltage is created and the fact 02:58:34

14 that it is above other positive voltages in -- in 02:58:39

15 the part. 02:58:46

16 Q Does it require that the voltage comes out of 02:58:46

17 a booster? 02:58:51

18 A I think one of ordinary skill in the art 02:58:52

19 in -- this was provision '96 -- in 96, reading this 02:59:18

20 claim, would understand that that boosted positive 02:59:24

21 voltage did come from a circuit that boosts voltage, 02:59:32

22 the reason being that the industry tried very hard 02:59:40

23 to get away from products that had two or three 02:59:43

24 power supplies required, and -- and there was a very 02:59:48

25 hard push to go to chips that ran off a single-power 02:59:52

1 supply. So if you needed plus 12 inside and the 02:59:58
2 power supply you had to work with was five, you had 03:00:00
3 to find a way to create the 12-volt supply inside 03:00:03
4 the chip, and a boosting circuit -- it's not the 03:00:08
5 only use for a boosting circuit, but it's one of the 03:00:12
6 uses for a boosting circuit. 03:00:14

7 And so I believe that's -- that's what one of 03:00:17
8 ordinary skill in the art understands from the word 03:00:20
9 "boosted" in that positive voltage, the fact that 03:00:23
10 it's -- you know, it's created with a boosting 03:00:29
11 circuit and that it -- and that it's higher than the 03:00:31
12 other voltages that are considered high in the part. 03:00:36

13 Q You propose a construction for boosted 03:00:40
14 positive voltage of a positive voltage higher than 03:00:44
15 the logic high voltage. 03:00:48

16 Do you see that? 03:00:49

17 A I do. 03:00:50

18 Q So your proposed construction doesn't reflect 03:00:50
19 the -- the boosting concept that you just discussed; 03:00:53
20 is that right? 03:00:56

21 A It doesn't have that in it, but I didn't feel 03:00:56
22 that it needed to be limited to -- to any particular 03:01:02
23 boosting circuit, so I didn't include it. 03:01:04

24 Q Does it need to be limited to a boosting 03:01:06
25 circuit, no matter what kind? 03:01:10

1 A No. I'm happy with the construction I have. 03:01:12

2 I think it just has to be a positive higher voltage 03:01:15

3 than the logic high voltage. 03:01:19

4 Q The original base term has the word "boosted" 03:01:20

5 in it, and that concept does not appear, at least 03:01:28

6 that I can see, in the construction you have 03:01:34

7 provided. 03:01:36

8 Would you agree with that? 03:01:38

9 A That the term has the word "boosted" and 03:01:39

10 the -- and the construction does not have any 03:01:46

11 acknowledgment of the boosting? Is that what you 03:01:51

12 are asking about? 03:01:54

13 Q Close enough. 03:01:55

14 A Sorry. Yeah, I think -- I think -- I think 03:01:56

15 that's an accurate characterization. 03:02:17

16 Q So if in the claim we replace "boosted 03:02:18

17 positive voltage" with your proposed construction, 03:02:25

18 the concept of the boosting or the boosted aspect 03:02:26

19 would be lost. 03:02:29

20 Do you agree with that? 03:02:31

21 A It would be lost literally in the language, 03:02:32

22 but it wouldn't be lost to a person of ordinary 03:02:39

23 skill in the art who builds these devices. 03:02:42

24 Q Why not? 03:02:44

25 A Because they understand that to have only a 03:02:45

1 single-power-supply product and yet provide a 03:02:47
2 voltage in the range of 15 to 20 volts to do 03:02:51
3 programming, it requires some sort of a boosting 03:02:54
4 circuit. 03:02:57

5 Q So you think boosting is implicit in the 03:02:58
6 remainder of the claim language? 03:03:04

7 A Once you have removed -- oh, you mean once 03:03:05
8 you have taken the boosted positive voltage claim 03:03:08
9 out and substituted in my construction. 03:03:11

10 Q That's right. 03:03:15

11 A Yes. I think it is because of -- this is the 03:03:21
12 high voltage -- this is the boosted voltage that's 03:03:26
13 applied to a selected word line, and it's during 03:03:28
14 programming, and that description is very succinctly 03:03:33
15 laid out in the programming operation of the patent 03:03:38
16 in column 7, starting around line 26. 03:03:40

17 Q So the answer to my question is, it is 03:03:43
18 implicit in the remainder of the claim if you were 03:03:51
19 to replace "boosted positive voltage" with your 03:03:54
20 proposed construction? 03:03:56

21 A Yes. 03:03:57

22 Q Getting back to logic high voltage that we 03:03:59
23 talked about a minute ago, could a logic high 03:04:03
24 voltage fall within the scope of the claim and be 03:04:07
25 boosted? 03:04:12

1 MR. LIMBACH: Objection; form. 03:04:24

2 THE WITNESS: And so -- so the part of the 03:04:29

3 hypothetical you are asking that I don't understand 03:04:43

4 is boosted from what? 03:04:44

5 MR. HEINZ: Vcc. 03:04:52

6 MR. LIMBACH: Objection; form. 03:04:52

7 THE WITNESS: Well, I think -- I think the 03:04:54

8 answer to that is that no one of ordinary skill in 03:05:08

9 the art would understand that to be viable or useful 03:05:11

10 in that Vcc is already a logic high voltage. You 03:05:17

11 don't need to boost it any more to be another logic 03:05:25

12 high voltage, and so I don't -- I don't think 03:05:29

13 that's -- I don't think that's a -- a reasonable 03:05:35

14 hypothetical at all, no. 03:05:37

15 BY MR. HEINZ: 03:05:38

16 Q So if I had a voltage that was boosted from 03:05:41

17 Vcc, that couldn't be a logic high voltage in the 03:05:47

18 scope -- within the scope of the claim? 03:05:50

19 A Well, one of the boosted high voltages is the 03:05:52

20 one called "boosted positive voltage" -- 03:06:00

21 Q Right. 03:06:03

22 A -- which is -- which is the one provided or 03:06:04

23 applied to a selected word line to enforce or make 03:06:05

24 programming happen. 03:06:11

25 Q So we agree that could be boosted and be 03:06:12

1 within the scope of the claim? 03:06:15

2 A Yes. 03:06:16

3 Q Because the base term says "boosted"? 03:06:16

4 A Yes. 03:06:20

5 Q The other term is "logic high voltage," which 03:06:21
6 does not say "boosted." 03:06:24

7 Could you have a boosted voltage that meets 03:06:27
8 the requirements of logic high voltage in the claim, 03:06:32
9 in your view? 03:06:36

10 MR. LIMBACH: Objection; form. 03:06:36

11 THE WITNESS: Well, the -- the boosted 03:06:43
12 positive voltage is associated with programming from 03:06:45
13 the claims language, so if you -- if you take -- if 03:06:49
14 you take a logic high voltage and you boost it, but 03:06:58
15 it's not high enough to provide programming, I just 03:07:05
16 don't see why anybody would do that. I -- it -- it 03:07:10
17 just doesn't -- there's no logical sense to ever do 03:07:14
18 that. I already have a logical high voltage. Why 03:07:18
19 would I boost it unless I'm going to use it for 03:07:22
20 programming; because, in these devices, that's the 03:07:25
21 only place where boosted voltages are used, in the 03:07:27
22 programming cells or circuits. 03:07:31

23 BY MR. HEINZ: 03:07:32

24 Q So in this context, the only place boosted 03:07:33
25 voltages are used as boosted positive voltage and 03:07:36

1 not with logic high voltage? 03:07:39

2 A The boosted positive voltage is -- is -- is 03:07:41

3 used, and it's only applied to the selected word 03:07:44

4 line, which we know from the specification goes to 03:07:47

5 15 to 20 volts to elicit programming of the cell. 03:07:51

6 If you just put a logic high voltage there, that 03:07:57

7 would not program the cell, so by definition, 03:08:00

8 logic -- a logic high voltage won't work there. 03:08:07

9 Q My question is a little different than that. 03:08:09

10 Could you have a logic high voltage that came 03:08:14

11 out of a booster that was boosted to a higher level 03:08:20

12 than Vcc? 03:08:24

13 A But not so high as to be a programming 03:08:26

14 voltage? 03:08:33

15 Q Yes. 03:08:33

16 A Is it possible to do? 03:08:34

17 Q What I'm asking, not is it possible, but 03:08:38

18 would that fall within the scope of the claim? 03:08:40

19 A I don't -- I don't think it's part of the -- 03:08:42

20 part of the claim in that the claim doesn't talk 03:08:47

21 anywhere about boosted logic high voltages, so it's 03:08:59

22 not part from that aspect. If I look at the 03:09:03

23 function of what a logic high voltage is, I don't 03:09:06

24 need to boost it any more to get a logic high. I 03:09:10

25 already have one. So I just don't see that as being 03:09:14

1 part of the claim. 03:09:25

2 Q Let me ask another question. 03:09:31

3 Could -- strike that. Let me ask a different 03:09:35

4 question. 03:10:02

5 With regard to boosted positive voltage, your 03:10:02

6 definition is a positive voltage higher than the 03:10:09

7 logic high voltage; is that right? 03:10:12

8 A Correct. 03:10:14

9 Q How much higher does it need to be than the 03:10:15

10 logic high voltage? 03:10:21

11 A Well, it needs to be high enough to -- to -- 03:10:23

12 to force programming to occur. 03:10:29

13 Q Do you have a number for me? 03:10:34

14 A Tell me the technology you want me to give 03:10:36

15 you the number in. 03:10:38

16 Q The scope of the '045 patent. If I have a 03:10:40

17 certain technology, how do I tell if I'm in or out? 03:10:42

18 A Well, you have to know what the programming 03:10:45

19 voltage is. In this -- in this -- in the scope of 03:10:48

20 this patent it -- for example, 15 to 20 volts; 03:10:51

21 column 7, line 27. 03:10:55

22 Q So the definition of boosted positive voltage 03:10:56

23 would change depending on the technology you applied 03:11:00

24 it to? 03:11:03

25 A Oh, absolutely. And, in fact, I believe 03:11:03

1 that's why this claim was written this way, so that 03:11:07
2 it was broad enough so that as the technology 03:11:10
3 changed, you -- you would still have a boosted 03:11:13
4 positive voltage from somewhere. 03:11:18

5 So, for instance, in -- in these particular 03:11:22
6 cases, if you look at -- sorry. I have to find it. 03:11:25
7 An example is given in column 7, around line 22. It 03:11:37
8 talks about erase as opposed to programming, but the 03:11:42
9 numbers are similar: "The erase speed is primarily 03:11:45
10 a function of the field across the tunnel oxide 03:11:48
11 which can be, for example, approximately 8.5 to 10 03:11:52
12 megavolts per centimeter to achieve block erasure in 03:11:58
13 less than for example 1 millisecond." 03:12:03

14 So for this technology, which I believe the 03:12:07
15 tunnel oxide is given in column 5 at line 6: "The 03:12:20
16 next step involves forming the tunnel oxide by 03:12:26
17 growing a high quality thermal oxide, of for example 03:12:29
18 75 to 80 Angstroms to cover the whole wafer." For 03:12:32
19 that technology, the programming pulse to generate 03:12:38
20 the right number of megavolts per centimeter across 03:12:44
21 that oxide to create Fowler-Nordheim tunneling is 15 03:12:48
22 to 20 volts. 03:12:56

23 From a technology point of view, as you 03:12:56
24 shrink the power supply, you must also shrink the 03:12:59
25 tunnel oxide so that you don't have to create -- 03:13:03

1 it's very difficult to create boosted voltages that 03:13:09
2 are, let's say, orders of magnitude bigger than the 03:13:11
3 starting voltage. Okay? 03:13:15

4 In -- in the case -- in the -- in the case of 03:13:17
5 this patent, the Vcc is 5 volts and the programming 03:13:21
6 voltage is 5 -- 15 to 20, so you are boosting up by 03:13:25
7 roughly a factor of four or five. 03:13:30

8 In a newer technology where the transistors 03:13:33
9 require a maximum Vcc of 3.3 volts, because of the 03:13:38
10 way the boosting circuits work, you actually have to 03:13:44
11 lower the gate -- the tunnel oxide even smaller so 03:13:47
12 that you can program them in a relatively scaled 03:13:51
13 voltage level. 03:13:55

14 So this is why I understand there are no -- 03:13:59
15 there are no numbers in -- in the patent claim 03:14:02
16 because it would be so limiting that once the 03:14:06
17 technology moved, the patent would be worthless, so 03:14:09
18 the examples given in the specification are just for 03:14:13
19 this technology. When you move to a different 03:14:18
20 technology, the absolute numbers change. 03:14:21

21 Q If I was designing a NAND flash memory that 03:14:23
22 did not yet exist, is it possible that I could meet 03:14:29
23 the other requirements of the claim but design 03:14:36
24 around the logic low voltage, logic high voltage, 03:14:39
25 and boosted positive voltage, or is that impossible? 03:14:43

1 MR. LIMBACH: Objection; form. 03:14:48

2 THE WITNESS: Sorry. I'll have to think 03:14:49

3 about that before I answer. 03:14:52

4 BY MR. HEINZ: 03:14:55

5 Q Do you understand my question? 03:14:55

6 A I think so. 03:14:56

7 Q In other words, if I met every requirement of 03:14:56

8 that claim except for these three terms, is there 03:14:59

9 any way that I could design around that claim by 03:15:02

10 falling outside the scope of logic low voltage, 03:15:06

11 logic high voltage, and boosted positive voltage 03:15:10

12 only? 03:15:12

13 MR. LIMBACH: Objection; form. 03:15:12

14 THE WITNESS: Well, that certainly sounds 03:15:14

15 like it calls for an opinion from me that I haven't 03:15:21

16 studied. And I don't think I have the time here to 03:15:24

17 do it justice. It's -- it's -- it's a complicated 03:15:35

18 question that you ask, and I think, at this point, I 03:15:43

19 would say that I can't answer without studying it 03:15:53

20 more. 03:15:55

21 BY MR. HEINZ: 03:15:55

22 Q Let me just ask the question with regard to 03:15:58

23 logic low voltage. 03:16:01

24 A Yes. 03:16:03

25 Q If you satisfied the rest of those claim 03:16:03

1 elements -- and let's assume that you had a flash 03:16:07
2 memory that actually worked -- could you do it 03:16:10
3 without a logic low voltage in terms of the patent? 03:16:14

4 MR. LIMBACH: Objection; form. 03:16:20

5 THE WITNESS: A logic low voltage. Without a 03:16:21
6 logic low voltage. I don't think you can, no. 03:16:39

7 BY MR. HEINZ: 03:16:40

8 Q Let me ask the same question with logic high 03:16:41
9 voltage. 03:16:42

10 MR. LIMBACH: Same objection. 03:16:47

11 THE WITNESS: No, I don't think -- I don't 03:17:00
12 think you can do it without a logic, but -- because 03:17:01
13 once you remove those portions of the terms, you -- 03:17:10
14 you -- you end up with less information being given 03:17:30
15 to the person who is trying to interpret the claims. 03:17:33

16 We talked about this earlier, by -- where you 03:17:37
17 asked if you changed "logic high voltage" to just "a 03:17:41
18 voltage." I -- I think -- I think you change them 03:17:44
19 in a fashion that you don't give enough information 03:17:51
20 to -- to -- to follow the claim. 03:17:59

21 BY MR. HEINZ: 03:17:59

22 Q Beyond the fact that the logic low voltage is 03:18:17
23 lower than the logic high and the logic high voltage 03:18:21
24 is lower than the boosted positive, do those three 03:18:25
25 claim phrases add any other limitations besides that 03:18:30

1 relative order? 03:18:35

2 A I think the only other thing added is the -- 03:18:52

3 is the -- oh, I'm sorry, you wanted me to limit it 03:19:03

4 to just those snippets; is that correct? 03:19:07

5 Q No. 03:19:11

6 A A log- -- a logic low, a logic high, and a 03:19:11

7 boosted positive voltage and their relationships 03:19:13

8 between each other? 03:19:17

9 Q Let me ask a different question. 03:19:18

10 A Okay. 03:19:20

11 Q So it appears that your constructions for 03:19:21

12 logic low voltage, logic high voltage, and boosted 03:19:24

13 positive voltage are defined in such a way that the 03:19:28

14 only limiting aspect is that low is lower than high 03:19:32

15 and boosted positive is higher than high; is that 03:19:37

16 right? Or is there some other limiting aspect that 03:19:41

17 I'm missing? 03:19:43

18 A No, I believe that is -- that is the 03:19:44

19 limitations -- or those are the limitations. 03:19:47

20 Q And based on just those constructions -- and 03:19:49

21 right now putting aside the rest of the claim 03:19:53

22 language -- there's no magnitude requirements? 03:19:55

23 We talked about whether there was a number 03:20:00

24 associated with those, and I believe we established 03:20:02

25 that there was not; is that right? 03:20:03

1 A That's correct.

03:20:05

2 Q And, finally, with regard to boosted positive
3 voltage, you could have a logic high voltage that
4 was -- I'm sorry. Strike that.

03:20:06

03:20:17

03:20:27

5 With regard to also those three terms, is
6 there any limitation on how close or far they need
7 to be in terms of a number?

03:20:45

03:20:50

03:20:56

8 In other words, how much higher than a logic
9 low voltage does a logic high voltage need to be and
10 how much higher than a boosted positive voltage --
11 or, I'm sorry, how much -- let me start over.

03:20:59

03:21:03

03:21:06

03:21:10

12 So we are getting back to these three terms.

03:21:14

13 A Yes.

03:21:17

14 Q Okay?

03:21:17

15 A Got 'em.

03:21:19

16 Q Logic high voltage, logic low voltage, and
17 boosted, and you can think of those as defining two
18 ranges where logic low is on one end, logic high is
19 in the middle, boosted positive on the top.

03:21:19

03:21:23

03:21:27

03:21:30

20 A Yes.

03:21:33

21 Q You with me?

03:21:34

22 A Yes.

03:21:34

23 Q And that's what's reflected in your proposed
24 constructions.

03:21:34

03:21:38

25 A Correct.

03:21:38

1 Q There's an interval between logic low voltage 03:21:38
2 and logic high voltage? 03:21:42

3 A Yes. 03:21:44

4 Q And there's another interval between logic 03:21:44
5 high voltage and boosted positive voltage? 03:21:47

6 A Correct. 03:21:50

7 Q Is there any limitation on how large or small 03:21:51
8 those intervals can be, in your view? 03:21:54

9 MR. LIMBACH: Objection; form. 03:21:56

10 THE WITNESS: Well, there's certainly no 03:21:58
11 limitations shown to us in absolute magnitude of 03:22:01
12 voltages from the claims language. 03:22:06

13 BY MR. HEINZ: 03:22:09

14 Q Nor is there in your construction; right? 03:22:10

15 A Nor is there in my construction. There is 03:22:11
16 only a single-preferred embodiment shown for a 03:22:14
17 particular technology, and as I've talked about 03:22:19
18 before, these voltages will vary as the technology 03:22:23
19 varies, so I think -- I think it's inappropriate to 03:22:26
20 put in specifics with respect to logic high voltage 03:22:36
21 or boosted positive voltage simply because it limits 03:22:39
22 the scope of the claim and -- and it's -- it's just 03:22:45
23 improper, at least how I've been explained how 03:22:50
24 patents work. And I don't think the patentee would 03:22:55
25 want that either because it -- you know -- okay? So 03:22:59

1 maybe you have a patent from one generation of 03:23:03
2 technology, but then the next generation your 03:23:07
3 patent's out. That's -- that's not a -- that's not 03:23:10
4 a -- a broadly written patent. 03:23:12

5 So I -- I don't believe there's any value to 03:23:15
6 anybody to put numerical values on these -- on these 03:23:22
7 individual terms. And -- and as I said before, each 03:23:29
8 of the terms is then qualified by other language 03:23:33
9 that follows in the same sentence. 03:23:37

10 Q So those terms don't impart a limitation on 03:23:39
11 the respective magnitudes of those voltages other 03:23:47
12 that they be in relative order? 03:23:50

13 A I think that's correct, yes. 03:23:52

14 MR. WERNER: Can we take a short break? 03:24:07

15 THE WITNESS: Yeah, let's take a break. 03:24:11

16 MR. HEINZ: Sure. 03:24:13

17 THE VIDEOGRAPHER: Going off the record, the 03:24:13
18 time now is 3:24. 03:24:14

19 (Recess taken.) 03:24:15

20 THE VIDEOGRAPHER: Back on the record, the 03:47:22
21 time now is 3:47. 03:47:23

22 BY MR. HEINZ: 03:47:26

23 Q Welcome back. 03:47:26

24 A Thank you. 03:47:27

25 Q I would like to ask a couple questions now 03:47:28

1 that kind of relate to several of these exhibits 03:47:30
2 that you have in front of you, but let's start out 03:47:33
3 with the '045 patent. 03:47:35

4 A Got it. 03:47:37

5 Q You got that in front of you? 03:47:37

6 A I do. 03:47:39

7 Q Claim 1, which is one of the claims we are 03:47:39
8 talking about today? 03:47:41

9 A Yes. 03:47:42

10 Q So, earlier, we were talking about the "logic 03:47:42
11 high voltage" term, and that actually appears twice 03:47:44
12 in the claim, once at approximately line 41 and once 03:47:47
13 at approximately line 48. 03:47:52

14 A Correct. 03:47:55

15 Q And the first logic high voltage is applied 03:47:56
16 to said bit line select control line, and the second 03:48:00
17 logic -- instance of logic high voltage is applied 03:48:06
18 to unselected word lines. 03:48:09

19 Do you see that? 03:48:10

20 A I do. 03:48:11

21 Q In your view, does -- 03:48:11

22 MR. LIMBACH: Go ahead. I didn't mean to cut 03:48:19
23 you off. 03:48:22

24 BY MR. HEINZ: 03:48:22

25 Q In your view, does the logic high voltage at 03:48:22

1 41 refer to the same voltage as the logic high 03:48:24
2 voltage at approximately line 48, or can those be 03:48:28
3 different voltages? 03:48:32

4 MR. LIMBACH: Objection; form. 03:48:33

5 THE WITNESS: In -- in my view, they can be 03:48:34
6 different voltages. Had they been the same voltage, 03:48:37
7 I would have expected language in the second one to 03:48:43
8 say "the logic high voltage." 03:48:46

9 BY MR. HEINZ: 03:48:51

10 Q Or "said" would be another? 03:48:52

11 A Or "said," yes, would be another example. 03:48:53

12 Q So the absence of the words "the" or "said" 03:48:56
13 and the use of the word "a" indicates to you that 03:49:00
14 those could be different voltages? 03:49:02

15 A Yes, from the claims language. It's also -- 03:49:03
16 I would -- I would understand and one of ordinary 03:49:09
17 skill in the art would also understand that those 03:49:12
18 voltages may not be exactly identical in the chip 03:49:15
19 either. 03:49:17

20 Q Could they be? 03:49:17

21 A I think the right answer to that is it's 03:49:20
22 possible on the chip, but often not probable. 03:49:25

23 Q Why is that? 03:49:29

24 A Because making two voltages on a chip be 03:49:30
25 absolutely the same is actually quite difficult to 03:49:36

1 do. 03:49:38

2 Q Would these two voltages, in the context that 03:49:40
3 we are talking about here, putting aside the 03:49:49
4 whatever variation -- let me strike that. 03:49:52

5 So the logic high voltage at approximately 03:49:57
6 line 41 and the logic high voltage at approximately 03:50:00
7 line 48, could you design a flash memory where those 03:50:03
8 were nominally the same, even though they might have 03:50:07
9 some variation of a circuit like you were talking 03:50:10
10 about? 03:50:13

11 A I think, potentially, you might be able to, 03:50:13
12 yes. 03:50:16

13 Q Is there an advantage to having those be the 03:50:16
14 same versus two different values? 03:50:19

15 A I don't believe so because they provide two 03:50:21
16 different functions. That voltage provides two 03:50:27
17 different functions for the different connections 03:50:30
18 that it's made. 03:50:33

19 Q Let me draw your attention to Toshiba's 03:50:36
20 Petition for Inter Partes Review. 03:50:51

21 A Exhibit 11? 03:50:57

22 Q Exhibit 11, that's right -- 03:50:58

23 A Yes. 03:51:00

24 Q -- and, in particular, page 16. There's a 03:51:00
25 table there on the top of the page. 03:51:14

1	Do you see it?	03:51:15
2	A I do.	03:51:16
3	Q And it compares voltages in the '045 patent	03:51:16
4	to claims 1 and 4 with voltages in Nakai?	03:51:20
5	A Yes.	03:51:24
6	Q So in your view -- I'm sorry, and there's one	03:51:27
7	more column that lists the array element on the left	03:51:31
8	side.	03:51:34
9	A Correct.	03:51:34
10	Q And those array elements correspond to	03:51:37
11	limitations in the claims?	03:51:40
12	A Yes.	03:51:42
13	Q So, again, as we looked with the claims, the	03:51:42
14	"logic high" shows up twice in the '045 patent	03:51:47
15	column?	03:51:51
16	A Yes.	03:51:51
17	Q Related to the BSL, which is the bit line	03:51:51
18	select -- well, BSL is bit line select control line	03:51:57
19	in the claim; right?	03:52:02
20	A Correct.	03:52:04
21	Q And, again, with unselected -- or, I'm sorry,	03:52:04
22	with unselected word lines is the second time?	03:52:07
23	A That we see what?	03:52:13
24	Q That "logic high" shows up in the '045 patent	03:52:14
25	column.	03:52:20

1	MR. LIMBACH: Objection; form.	03:52:20
2	THE WITNESS: Oh, I'm sorry, in the '04- --	03:52:21
3	so we have BSL. We have unselected word lines, you	03:52:23
4	said?	03:52:27
5	MR. HEINZ: Yeah, let me -- let me -- let me	03:52:27
6	start over.	03:52:28
7	Q So in the '045 column, "logic high" shows up	03:52:30
8	three different times.	03:52:34
9	A Correct.	03:52:37
10	Q And it shows up in connection, now looking at	03:52:37
11	the array element column, with BSL, with unselected	03:52:39
12	bit lines, and unselected word lines.	03:52:44
13	A Correct.	03:52:46
14	Q And, in your view, the voltage in Nakai for	03:52:46
15	the bit select line is 12 volts, which is a logic	03:52:53
16	high voltage, in your view; is that right?	03:52:58
17	A Yes.	03:53:00
18	Q And for the unselected bit lines and the	03:53:00
19	unselected word lines, the voltages are 10 volts?	03:53:04
20	A Correct.	03:53:09
21	Q Now, obviously you don't need to be an	03:53:10
22	engineer to see that 10 is different than 12.	03:53:18
23	A Yes.	03:53:21
24	Q So those are different voltages; right?	03:53:21
25	A Correct.	03:53:23

1	Q	But both of those different voltages are	03:53:24
2		logic highs.	03:53:25
3	A	Correct.	03:53:26
4	Q	In the Nakai patent --	03:53:27
5	A	I'm sorry. Wasn't that -- weren't we talking	03:53:32
6		about the Nakai?	03:53:35
7	Q	Yes. I'm sorry.	03:53:35
8	A	Oh.	03:53:35
9	Q	I'm predicating another question.	03:53:38
10	A	Sorry.	03:53:38
11	Q	So I just -- I just wanted to get this table	03:53:40
12		out there so we had some common frame of reference.	03:53:41
13	A	Okay.	03:53:44
14	Q	And then I'm going to ask you a little bit	03:53:44
15		about these values in the Nakai patents, the 12 volt	03:53:46
16		and the 10 volt.	03:53:50
17	A	Okay.	03:53:50
18	Q	So, first of all, with regard -- before we	03:53:50
19		get into the specification, with regard to that,	03:53:52
20		let's -- I kind of want to ask you about the table	03:53:55
21		and the patent.	03:53:57
22	A	Okay.	03:53:58
23	Q	So let's kind of -- maybe if you can kind of	03:53:58
24		keep both of those in front of you there, then it	03:54:00
25		would be a little easier. Perfect.	03:54:03

1 So I would like to start out just with regard 03:54:05
2 to the table. We talked about the logic high is a 03:54:07
3 12-volt value in Nakai, and then it shows up twice 03:54:12
4 as 10 volts in the table. 03:54:16

5 A Yes. 03:54:18

6 Q Let me ask you about the 12-volt number in -- 03:54:20
7 in Nakai. 03:54:24

8 Is that 12 volts in Nakai boosted? 03:54:25

9 MR. LIMBACH: Objection; form. 03:54:28

10 THE WITNESS: I don't believe Nakai 03:54:59
11 specifically quotes it as being boosted. 03:55:38

12 BY MR. HEINZ: 03:55:43

13 Q Is the 12 volts Vcc in Nakai? 03:55:43

14 A No, it's not Vcc. Hold on. So my 03:55:46
15 recollection is that I don't recall Vcc being talked 03:57:01
16 about in Nakai, and I'm trying to see if there is a 03:57:06
17 location that I've missed or -- I don't see Vcc 03:57:10
18 specifically being quoted as what voltage it is. 03:58:35
19 And I don't recall reading that it was set at a 03:58:52
20 specific voltage. I'm sure it is. It just whether 03:58:54
21 the patentee put it in the spec or not. 03:58:58

22 Q Before we dive in, let me ask you about the 03:59:05
23 Nakai. 03:59:09

24 Is that boosted? 03:59:10

25 MR. LIMBACH: Objection; form. 03:59:10

1 THE WITNESS: So the 10 volts is boosted as 03:59:24
2 identified in the specification in column 20, around 03:59:27
3 line 18, and the -- 03:59:31

4 BY MR. HEINZ: 03:59:31

5 Q Okay. Let me -- I think the -- the portion 04:00:21
6 you were looking at here in column 20 is similar to 04:00:23
7 the portion I was looking at. 04:00:26

8 Let me, just for the record, read in the 04:00:27
9 portion you identified around line 18. 04:00:30

10 A Okay. 04:00:33

11 Q The potential of the power source VBITH of 04:00:37
12 the latch circuitry for the data register changes 04:00:41
13 from the external power source potential Vcc to the 04:00:44
14 power source VDPI potential 10 volts supplied from 04:00:48
15 the voltage booster built into the chip. 04:00:53

16 That's the part you were looking at; right? 04:00:57

17 A Correct. 04:00:58

18 Q So you would agree with me that the 10-volt 04:00:58
19 value is boosted from Vcc because it's supplied from 04:01:02
20 a voltage booster? 04:01:08

21 A That's -- 04:01:13

22 MR. LIMBACH: Objection; form. 04:01:14

23 THE WITNESS: That's correct. 04:01:15

24 BY MR. HEINZ: 04:01:18

25 Q And then if you look down a little further -- 04:01:18

1	and now I'm looking at line 26.	04:01:21
2	A 26.	04:01:26
3	Q The sentence reads:	04:01:26
4	The power source potential VDPI	04:01:28
5	supplied from the voltage booster	04:01:32
6	has a small current supply	04:01:34
7	capability generally of 1 milliamp	04:01:36
8	or smaller; therefore, as the	04:01:39
9	leakage current flows through the	04:01:42
10	defective bit line, the power source	04:01:44
11	VDPI potential becomes lower than	04:01:46
12	12 volts.	04:01:50
13	A So I think you misread that. That's VBDI.	04:01:51
14	Q Oh, VBDI. I'm sorry.	04:01:54
15	A There's two. There's VPDI and a VBDI.	04:01:57
16	Q Okay. Gotcha.	04:02:05
17	A The -- but that still doesn't identify how	04:02:06
18	many volts the Vcc is.	04:02:10
19	Q Right.	04:02:12
20	A The -- the -- the only other thing that I'm	04:02:20
21	aware of is Figure 1, which has VPP, VPI, VDPI,	04:02:22
22	voltage generator circuit as a block for the device,	04:02:35
23	but I --	04:02:43
24	Q Is that a booster?	04:02:43
25	A Well, it's a voltage generator. It doesn't	04:02:46

1 really tell you if they -- they use boosting it or 04:02:48
2 not, but since the voltages are -- I think most 04:02:51
3 everybody generally agrees that this was probably a 04:02:53
4 5-volt Vcc part, so I would expect that they are all 04:02:56
5 boosted, yes. 04:03:00

6 Q And this voltage generator circuit is a 04:03:02
7 booster; is that right? 04:03:04

8 A Sorry. One second. 04:03:56

9 Yes, it's a booster circuit, but I think you 04:03:56
10 have -- you have missed the portion of the 04:03:59
11 description. You skipped over column 20, line 21 04:04:00
12 where it says: 04:04:05

13 Under these conditions, the node BLJ 04:04:06
14 of the data register connected to 04:04:10
15 the defective bit line becomes H 04:04:12
16 level by the preset operation, which 04:04:15
17 would basically be voltage high 04:04:19
18 level. 04:04:23

19 Q But we can agree that Vcc is lower than 10 04:04:23
20 and that both the 10-volt value and the 12-volt 04:04:30
21 value come from a booster. 04:04:33

22 Can we agree on that part? 04:04:38

23 A I believe that's correct, yes. 04:04:43

24 Q So with regard to the table -- I'm sorry. 04:04:44
25 Back in the -- the petition? 04:04:55

1	A	Yes.	04:04:57
2	Q	And, actually, I kind of want to ask a	04:04:57
3		question about the constructions again. Here, let's	04:05:03
4		get the -- the table in front of you and your	04:05:06
5		declaration again.	04:05:09
6	A	Okay. And paragraph?	04:05:13
7	Q	17 and 18.	04:05:17
8	A	17. Yes.	04:05:19
9	Q	Okay. We there?	04:05:19
10	A	Yes.	04:05:21
11	Q	So let me ask you about the 12-volt value in	04:05:21
12		Nakai, which appears adjacent to the VSL line in the	04:05:26
13		table, first of all.	04:05:31
14	A	Yes.	04:05:32
15	Q	So we agree that value is boosted, and since	04:05:33
16		12 volts is bigger than 10 volts, 12 volts is a	04:05:38
17		positive voltage higher than at least a logic high	04:05:42
18		voltage; is that right?	04:05:47
19		MR. LIMBACH: Objection; form.	04:05:48
20		THE WITNESS: 12 volts is higher than a logic	04:05:50
21		high voltage -- well, no. 12 volts is just another	04:05:53
22		logic high voltage.	04:06:01
23		BY MR. HEINZ:	04:06:02
24	Q	So 10 volts is logic high voltage?	04:06:02
25	A	Also, yes.	04:06:04

1	Q	Right.	04:06:05
2		But 10 volts is logic high voltage?	04:06:06
3	A	Yes.	04:06:08
4	Q	12 volts is more than 10; right?	04:06:08
5	A	Yes.	04:06:10
6	Q	And the 12-volt value is boosted?	04:06:11
7	A	That's correct.	04:06:15
8	Q	So with regard to your construction of	04:06:17
9		boosted positive voltage, which is a positive	04:06:22
10		voltage higher than the logic high voltage, why	04:06:26
11		doesn't 12 volts fit that construction?	04:06:34
12	A	Because it won't work in that claim.	04:06:38
13		12 volts in Nakai will not program the devices.	04:06:48
14		So the claim specifically states -- the '045	04:06:51
15		states that -- the preface of the section that we	04:06:52
16		are talking about says "wherein, during	04:06:55
17		programming," and so the 12-volt level is -- is not	04:06:58
18		a level that's applied to the selected word line	04:07:11
19		during programming, so it can't be what -- I mean,	04:07:14
20		the claim says "a boosted positive voltage is	04:07:23
21		applied to a select word line." From -- from here,	04:07:26
22		the selected word line in the -- under the array	04:07:33
23		amount -- element column is down one, two, three,	04:07:37
24		four -- five. It says "selected word line," and	04:07:39
25		when we look at the voltages under Nakai, it says	04:07:43

1 that level is 20 volts. 04:07:45

2 Q So the -- the determinative aspect of whether 04:07:47

3 it's a boosted positive voltage or not is whether 04:07:51

4 it's applied to the selected word line and not the 04:07:54

5 magnitude or something that's related to the 04:07:58

6 construction you provided for boosted positive 04:08:01

7 voltage? 04:08:03

8 A No. I don't think that's the right 04:08:04

9 characterization. I think that if we -- or one of 04:08:06

10 ordinary skill in the art looks at this -- and 04:08:12

11 "looks at this" being the '045, claim 1 -- and looks 04:08:15

12 at Nakai and says, "Okay. I'm looking for a boosted 04:08:20

13 positive voltage which is applied to a selected word 04:08:23

14 line during programming," and there's only one 04:08:26

15 answer in Nakai that meets that, and it's the VPP of 04:08:32

16 20 volts, so that -- that in Nakai has to be the 04:08:38

17 boosted positive voltage. 04:08:41

18 Q Why would -- 04:08:45

19 A The -- 04:08:45

20 Q -- oh, I'm sorry. Go ahead. 04:08:48

21 A The -- the other voltages, 10 volts and 04:08:49

22 12 volts, won't work there, and one of ordinary 04:08:52

23 skill in the art in these devices would know that. 04:08:55

24 Q So the 12-volt value on the bit select line 04:09:00

25 is not a boosted positive voltage, in your view, 04:09:07

1 why?

04:09:12

2 A Because in the claim, the only boosted
3 positive voltage is applied to a very specific spot
4 and used during a very specific operation. It's
5 only applied to the selected word line, and it's
6 only supplied at that boosted level, that boosted
7 positive voltage level during programming.

04:09:13

04:09:18

04:09:23

04:09:27

04:09:31

04:09:35

8 During other portions of the operation, it is
9 not allowed to go that high for fear of incorrectly
10 programming other cells.

04:09:38

04:09:40

04:09:45

11 Q So the fact that the -- the 12 volts comes
12 from a booster is not determinative one way or the
13 other as to whether it's boosted positive?

04:09:50

04:09:57

04:10:02

14 A Boosted positive voltage. No. I don't
15 think -- I don't believe it is, no.

04:10:06

04:10:11

16 And as -- and as we talked about before, a
17 logic high voltage doesn't have -- in this claim,
18 they don't have to be the same logic high voltage
19 based on the language of the claim.

04:10:20

04:10:23

04:10:27

04:10:30

20 And as I also talked about, the -- there are
21 two different functions of the voltage applied to
22 the two different places that you identified in
23 claim 1, about line 41 and about line 48. The first
24 logic high voltage is used to turn on bit line
25 select transistors, while the second logic high

04:10:33

04:10:38

04:10:41

04:10:45

04:10:53

04:10:58

1 voltage is applied to the unselected word lines 04:11:01
2 such -- such that, effectively, they will not be 04:11:07
3 misprogrammed during a program function. 04:11:11

4 Q In the '045 patent, does it use two different 04:11:14
5 logic high voltages in any of the embodiments? 04:11:54

6 A Two different -- so if we look at -- the 04:11:56
7 answer, I believe is, yes. If we look at column 6, 04:12:21
8 line 50 -- well, it starts at 48 under the title of 04:12:27
9 "Erase Operation." It says, "In the exemplary 04:12:32
10 biasing convention described herein, cells are 04:12:37
11 erased by the action of applying negative gate 04:12:40
12 voltage of, for example, minus 12 to minus 15 volts 04:12:43
13 on the selected word lines or a single word line 04:12:49
14 (WL1), and applying a voltage approximately equal to 04:12:57
15 Vcc (e.g., Vcc minus 2Vtn to Vcc) on the selected 04:13:04
16 bit lines or a single bit line (e.g., BL0)." 04:13:24

17 So it clearly says here that Vcc can span 04:13:38
18 from Vcc minus 2Vtn to Vcc, and those voltages would 04:13:42
19 be, effectively, logic high voltages; because if we 04:13:57
20 actually turn to claim 2, we see that the very same 04:14:01
21 terms, "a logic high voltage," is listed in claim 2, 04:14:12
22 which is the erase claim at -- starting at line 2, 04:14:18
23 and "a logic high voltage" is also listed at 04:14:23
24 line 10. 04:14:28

25 And so, in that case, the patentee has used 04:14:28

1 the words "logic high voltage" in the erase mode to 04:14:34
2 specifically talk about voltage levels between Vcc 04:14:38
3 minus 2Vn -- Vtn and Vcc. 04:14:43

4 Q What is "Vtn"? 04:14:47

5 A "Vtn" is the threshold voltage of an 04:14:49
6 end-channel transistor, roughly about 7/10ths of a 04:14:54
7 volt. So if Vcc was 5 minus 2Vtn would span from, 04:14:57
8 if I can do the math in my head, 3.6 to 5 volts. 04:15:04

9 Q So you agree that, in this example, in the 04:15:13
10 context of the patent, the logic high could be in 04:15:16
11 the range of Vcc to Vcc minus 2Vtn? 04:15:19

12 A I wouldn't normally express it that way. 04:15:26
13 Lower voltages first -- 04:15:28

14 Q Okay. Sorry. 04:15:28

15 A -- upper -- upper voltages second -- 04:15:32

16 Q Yeah, let me -- 04:15:33

17 A -- so -- 04:15:33

18 Q -- let me fix that. 04:15:34

19 So you would agree in the patent, a logic 04:15:34
20 high voltage could be between Vcc minus 2Vtn and 04:15:36
21 Vcc, which would be a higher voltage? 04:15:42

22 A Correct. That's what this example in 04:15:44
23 column 6 tells us. 04:15:48

24 Q And this example is for erase, but you would 04:15:49
25 apply that same reasoning to the claims at issue; 04:15:53

1 right, the claims 1 and 4? 04:15:55

2 A I -- I would believe so, yes. 04:15:57

3 Q Let me go back to your declaration now, which 04:15:58

4 is -- I believe it's that one. I would like to ask 04:16:13

5 you about paragraph 24, which begins on page 11 and 04:16:23

6 spans through to page 12. 04:16:25

7 A Yes. 04:16:39

8 Q So in that section you say: 04:16:40

9 One skilled in the art would also 04:16:47

10 have understood, as inherent from 04:16:50

11 Nakai, that the additional bit lines 04:16:51

12 beyond BL2 in Figures 22A and 23A 04:16:52

13 that were not intended to be 04:16:58

14 programmed would have the same 04:17:00

15 voltage (i.e., VDPI) as that being 04:17:04

16 applied to BL2 so that memory cells 04:17:10

17 in those columns (i.e., non-right 04:17:15

18 cells) are not programmed. 04:17:20

19 Do you see that? 04:17:23

20 A I do. 04:17:23

21 Q So it's your view that it's inherent that 04:17:24

22 those would all have the same voltage in the context 04:17:41

23 of that sentence I just read? 04:17:46

24 A That they would have the same voltage applied 04:17:47

25 to them, VDPI, within the restrictions, as we talked 04:17:59

1 about before, that it's impossible in a chip to make 04:18:06
2 all the voltages be exactly identical. 04:18:09

3 Q Okay. That -- that was my first question. 04:18:11

4 When you say the "same" here, do you mean 04:18:13
5 exactly the same or you mean they could be different 04:18:15
6 within some variation? 04:18:17

7 A I mean that as a normal engineer would 04:18:18
8 understand it, that he intended to apply VDPI, and 04:18:23
9 with -- within the limitations of the circuitry he 04:18:28
10 has to work with, he did apply VDPI or thereabouts 04:18:31
11 that, in effect, makes all of the bit lines work in 04:18:37
12 the same fashion. 04:18:43

13 Q Could you design one where you did not use 04:18:44
14 the same voltage for every bit line and it would 04:18:47
15 still work? 04:18:51

16 MR. LIMBACH: Object to the form. 04:18:51

17 THE WITNESS: So if you are asking me, "Is it 04:18:57
18 possible to do?" my first answer would be no, given 04:19:06
19 that your intention is to make a product that's the 04:19:18
20 same size as the product you started with, the 04:19:22
21 reason being is that this voltage is applied across 04:19:29
22 many places in the -- in the array, and if you now 04:19:38
23 suggest to me that, "Well, I want to build one where 04:19:42
24 that voltage is different in all of those places" -- 04:19:46
25 BY MR. HEINZ: 04:19:48

1 Q Well, let's just say different in at least 04:19:49
2 two places. Half of them could be one voltage; half 04:19:51
3 of them could be the other. 04:19:55

4 In other words, they don't all have to be 04:19:56
5 different. There just has to be any one that's 04:19:58
6 different than any other one. 04:20:01

7 A Hold on a second. 04:20:02

8 MR. LIMBACH: Objection; form. 04:20:11

9 THE WITNESS: And -- and what is your 04:20:12
10 definition of different? 04:20:23

11 MR. HEINZ: Any voltage greater than the 04:20:28
12 minor variation that you discussed with regard to 04:20:30
13 your use of the same voltage. 04:20:34

14 THE WITNESS: And you simply want to know if 04:20:43
15 it's possible to do? 04:20:45

16 MR. HEINZ: Yes. 04:20:46

17 THE WITNESS: I need more information about 04:21:06
18 the hypothetical. 04:21:08

19 Are we talking about within one page of 04:21:10
20 memory or multiple pages of memory within the same 04:21:16
21 array, within different arrays, sub-arrays? 04:21:22

22 BY MR. HEINZ: 04:21:22

23 Q So in paragraph 23 of your declaration, you 04:21:28
24 point out that Nakai only shows a memory array with 04:21:36
25 two columns of cells but that one would -- of skill 04:21:39

1 in the art would understand that's only a portion of 04:21:43
2 the full array. 04:21:45

3 Do you see that? 04:21:46

4 A That's correct. 04:21:47

5 Q So what I want to know is: For the portion 04:21:47
6 that's not shown, which you contend one of skill in 04:21:53
7 the art would know it existed, is it possible to 04:21:58
8 design the rest of that missing portion such that it 04:22:01
9 includes different voltages for the additional bit 04:22:06
10 lines? 04:22:13

11 MR. LIMBACH: Objection; form. 04:22:15

12 THE WITNESS: And we are talking about a 04:22:16
13 program operation; right? 04:22:38

14 MR. HEINZ: Yes, I believe. It's whatever 04:22:42
15 the operation is you are referring to in 04:22:44
16 paragraph 24 of your declaration. 04:22:46

17 THE WITNESS: Yes. Yeah, so it is a program 04:22:48
18 operation, not intended to be programmed, at the 04:22:53
19 bottom of the page. 04:22:57

20 So the problem is the -- the problem with the 04:23:05
21 hypothetical that you have is the following: If you 04:23:23
22 will turn to Figure 23A, which is the programming 04:23:27
23 figure of -- 04:23:31

24 BY MR. HEINZ: 04:23:31

25 Q Of Nakai? 04:23:32

1 A -- Nakai, you will see one of the word lines 04:23:33
2 specifically connected to VPP, which is the 04:23:37
3 program -- it will be the programming voltage. 04:23:40

4 Q Right. 04:23:43

5 A Okay? 04:23:43

6 Now, the bit lines that we are talking about, 04:23:46
7 Bit Line 1 there is held to zero volts, it says, and 04:23:49
8 Bit Line 2 is held to the voltage VDPI. 04:23:52

9 So the function of the VDPI voltage is to 04:24:03
10 guarantee that the memory cells circled in the 04:24:10
11 right-hand column of cells, which you will follow an 04:24:15
12 arrow to the right to Figure 23C, and you will see 04:24:21
13 that the -- the label on the drain of that -- or 04:24:25
14 source of that transistor, the fact that it has VDPI 04:24:29
15 voltage connected to that drainer source. It also 04:24:34
16 have VPP connected to the gate. And right next to 04:24:39
17 that it says "non-right cell." 04:24:43

18 So the intent here is to never program those 04:24:48
19 cells that are, effectively, not selected. 04:24:53

20 Q Right. 04:24:59

21 And then VDPI, it points out, is the 04:25:00
22 right-inhibited drain voltage, which is consistent 04:25:03
23 with what you just said; right? 04:25:05

24 A Correct. And it guarantees that you don't 04:25:07
25 get enough voltage across the stack of polys and 04:25:11

1 over the thin oxide so as to induce Fowler-Nordheim 04:25:16
2 injection. Okay? 04:25:22

3 So to answer your question, one of the most 04:25:24
4 difficult things in this type of design is to make 04:25:31
5 sure that you don't partially write cells that are 04:25:34
6 unselected. So that means that, to the best of the 04:25:38
7 designer's ability, you want to ensure that the VDPI 04:25:46
8 voltage for all the columns that are next to 04:25:51
9 column 2 that are not selected all have the same or 04:25:54
10 as close to possible as the same exact voltage. 04:25:59

11 Okay? Because if you don't do that, you have the 04:26:03
12 problem of -- so you talked about, Couldn't I supply 04:26:08
13 that from two sources; correct? 04:26:12

14 Q Yes. 04:26:15

15 A So the problem with that is unless those two 04:26:16
16 voltages are absolutely matched, these portions of 04:26:20
17 that array -- so now let's say we have a left 04:26:25
18 portion and a right portion. I may not get the same 04:26:28
19 performance out of those two portions of the array 04:26:32
20 because I have partially written some of the cells 04:26:36
21 that I didn't intend to. 04:26:41

22 So your question to me was, Is it possible to 04:26:44
23 do? And the answer I have for you is that if you -- 04:26:49
24 in -- in the example I've given, if you wanted to 04:26:55
25 really use bad design form, it is possible. It is 04:26:57

1 not, however, standard practice or a good practice 04:27:04
2 within the array of cells that you are trying to 04:27:09
3 program at that point. 04:27:13

4 Q So it's possible that you could have 04:27:15
5 different voltages, but it wouldn't be the preferred 04:27:18
6 practice? 04:27:20

7 A It -- it's -- I -- I don't know that I've 04:27:24
8 ever seen that done or discussed in any literature 04:27:26
9 about flash memories I've ever read, so it's -- I 04:27:30
10 don't -- I don't consider that preferred practice an 04:27:37
11 equivalent statement. It -- it's -- at a minimum, 04:27:44
12 would be frowned upon. 04:27:50

13 Q But it's possible? 04:27:51

14 A But if you wanted to be -- if you wanted to 04:27:52
15 be so poorly selective, you might choose it. 04:27:59

16 Q So it's possible? 04:28:06

17 A I don't know what kind of -- I don't think 04:28:09
18 you will get anywhere near as good a performance, 04:28:11
19 but it -- it's -- it's possible to do anything once. 04:28:14
20 Well, sometimes. 04:28:19

21 Q Let me go back and I would like to ask you 04:28:20
22 about the petition again, and this time I would like 04:28:29
23 to ask you a few questions about the Nakai claim 04:28:33
24 chart, which I believe begins on page 17. 04:28:36

25 A Yes, it does. 04:28:44

1	Q	On page 18, you include a diagram from Nakai.	04:28:45
2		It's Figure 22A.	04:28:55
3		Do you see that?	04:28:56
4	A	Yes.	04:28:57
5	Q	Figure 22A has a series of H's and L's along	04:28:57
6		the left side.	04:29:10
7		Do you see that?	04:29:11
8	A	Yes.	04:29:11
9	Q	What do those H's and L's signify?	04:29:11
10	A	They refer to logic high and logic low	04:29:15
11		voltage levels applied to the array.	04:29:18
12	Q	This Figure 22A in Nakai, is that for program	04:29:20
13		operation?	04:29:26
14	A	No, it's for read operation.	04:29:27
15	Q	Claim 1 is directed to programming, is it	04:29:29
16		not?	04:29:34
17	A	Oh, that's correct. Yes.	04:29:35
18	Q	Why did -- and Nakai does have a programming	04:29:36
19		figure, doesn't it?	04:29:39
20	A	It does.	04:29:40
21	Q	Figure 23 that we just looked at; right?	04:29:41
22	A	It does, yes.	04:29:43
23	Q	Then why did you include the figure for the	04:29:44
24		read operation in support of your analysis of	04:29:47
25		Figure 1 for claim element 1a?	04:29:51

1 A Well, claim element 1a deals specifically 04:29:54
2 with structure, not functionality or operation 04:29:59
3 that's occurring at that time, and -- and this 04:30:04
4 figure has more things on it identified with labels 04:30:07
5 than does the figure in 23. 04:30:13

6 In fact, you will look -- 22A is used on 04:30:19
7 18 -- page 18, page 19, page 20, page 21, and the 04:30:22
8 elements of the claim that are listed there 04:30:31
9 generally are all elements of structure, and so we 04:30:37
10 chose this as being more -- more enlightening from 04:30:42
11 a -- from a structure point of view. That's all. 04:30:50
12 It has more things that are labeled, no other 04:30:52
13 reason. 04:30:57

14 Q But you would agree with me that Figure 22A 04:30:57
15 from Nakai is directed to a read operation; whereas, 04:30:59
16 Figure 23A of Nakai is directed to a program 04:31:02
17 operation? 04:31:06

18 A That's correct. Yes. 04:31:07

19 Q Now, if we look at Figure 23A, which, as you 04:31:08
20 pointed out, is reproduced on page 22. 04:31:14

21 A Yes. 04:31:17

22 Q And, actually, if we just compare page 21 and 04:31:17
23 22, that has Figures 22A on page 21 and Figure 23 on 04:31:21
24 page 22. 04:31:26

25 Do you see that? 04:31:27

1 A Yes. 04:31:34

2 Q And with regard to Figure 22, we already 04:31:34
3 talked about the H's and L's indicating logic high 04:31:36
4 and logic low in Nakai; right? 04:31:39

5 A Mm-hmm. Yes. 04:31:41

6 Q So in Figure 23A, it doesn't have H's and 04:31:41
7 L's, does it? 04:31:44

8 A No, it does not. 04:31:45

9 Q So in Nakai, they knew how to use H's and L's 04:31:45
10 for logic high and logic low, but they elected not 04:31:53
11 to use that with regard to Figure 23A, did they? 04:31:57

12 MR. LIMBACH: Objection; form. 04:31:59

13 THE WITNESS: We have already talked about 04:32:00
14 the fact that a logic high voltage can be more than 04:32:04
15 one -- more than one voltage, and the claim is drawn 04:32:07
16 to programming, and that's why we use 23A in this -- 04:32:11
17 in this page 22. 04:32:17

18 BY MR. HEINZ: 04:32:18

19 Q Why, in your view, does Nakai include H's and 04:32:20
20 L's in connection with the read operation but does 04:32:25
21 not include H's and L's with respect to the program 04:32:29
22 operation? 04:32:33

23 A Because of the particular voltages Nakai 04:32:37
24 wants to put on the program operation. That doesn't 04:32:42
25 mean that they are not a logic high or a logic low, 04:32:47

1 it just means they are a different absolute value. 04:32:50

2 Q Why would the different absolute value 04:32:52

3 necessitate a different symbol? Because as we 04:33:09

4 talked about before, the concept of logic high and 04:33:14

5 logic low is, I believe, in your view, agnostic to 04:33:16

6 the particular number. 04:33:20

7 A I think in -- in -- with respect to the '045, 04:33:21

8 it is, yes. 04:33:25

9 Q But it's not with respect to Nakai? 04:33:25

10 MR. LIMBACH: Objection; form. 04:33:28

11 THE WITNESS: Well, we are looking for 04:33:29

12 evidence of whether this is prior art to the '045, 04:33:36

13 and "this" being Nakai, and the action of the 04:33:39

14 voltages applied in Figure 23A are -- those voltages 04:33:46

15 are required to perform the programming, and, at the 04:33:53

16 same time, those voltages are required to elicit 04:33:57

17 states of the transistors much like a logic high or 04:34:06

18 a logic low, and that's why we identify them the 04:34:13

19 same way. 04:34:17

20 For example, if you look at 23A, the level 04:34:21

21 VPPI is applied to the two-word line -- actually, 04:34:29

22 multiple of the word lines there. Had -- had Nakai 04:34:36

23 simply applied the Vcc power supply, it's well known 04:34:44

24 that, in programming, this would have had problems. 04:34:49

25 So it is -- it's -- it's a high -- a logic high 04:34:53

1 voltage level that's appropriate for the operation 04:34:59
2 at hand. 04:35:01

3 BY MR. HEINZ: 04:35:03

4 Q You mentioned, if Nakai would have applied 04:35:03
5 Vcc in Figure 23, it would have had problems. 04:35:06

6 Can you please explain what -- what the 04:35:09
7 problems would be? 04:35:11

8 A Well, since you are putting -- since you are 04:35:11
9 putting 20 volts on the VPP voltage, or thereabouts, 04:35:20
10 you want to make sure that the substrate under 04:35:25
11 the -- the substrate under the transistor to be 04:35:29
12 programmed is as close to ground as possible, and 04:35:31
13 that means that you want the -- one -- one issue is 04:35:36
14 that you want the series resistance of all the other 04:35:41
15 transistors in the stack to be small. So one way to 04:35:44
16 get the series resistance to be smaller is to raise 04:35:47
17 the voltage on it. 04:35:51

18 The other is that it -- it -- it keeps -- it 04:35:51
19 keeps next-door-neighbor issues, I think, at -- 04:35:59
20 at -- more controlled by using the VPI voltage. 04:36:05

21 Q So Nakai had structural -- structural reasons 04:36:11
22 that you wouldn't want to use Vcc as the logic high 04:36:15
23 during programming -- 04:36:19

24 A Nakai -- 04:36:19

25 Q -- is that -- 04:36:20

1 A -- Nakai structure is not any different than 04:36:20
2 the '045 patent. It has the same sort of issues to 04:36:23
3 deal with. The difference, mostly, is the fact that 04:36:27
4 they are not the same technology. 04:36:32

5 Q And how are they different? I'm sorry. 04:36:35

6 A Well, they don't -- this is -- sorry. Nakai 04:36:37
7 is -- is -- sorry. Nakai is built at Toshiba, and I 04:36:44
8 don't know where this other part is built, but 04:37:00
9 the -- as we talked about before, the voltages are 04:37:09
10 very much dependent upon which technology you use, 04:37:12
11 right? And so Nakai felt that -- and as shown in 04:37:15
12 Figure 23, that this was the best way to run the 04:37:20
13 part, and the numbers in -- not the numbers, but the 04:37:22
14 language in the claims of the '045 patent, they -- 04:37:32
15 they seem like they were able to build a -- a part 04:37:41
16 that was able to use lower voltages than the Nakai 04:37:46
17 part. 04:37:51

18 An example of that is found in column 6 where 04:37:53
19 it says "the voltage applied to the bit line can be 04:38:06
20 as low as Vcc." So that means sometimes it's higher 04:38:10
21 than Vcc, but it can be as low as Vcc. 04:38:15

22 And it was a pretty common occurrence through 04:38:19
23 this period where people were trying to get lower 04:38:22
24 voltages on the parts and also to make sure they 04:38:25
25 didn't overstress the gate oxides; otherwise, they 04:38:28

1	would lose performance.	04:38:32
2	MR. HEINZ: I hate to say it, but we have to	04:38:33
3	change our tape.	04:38:35
4	THE VIDEOGRAPHER: Thank you.	04:38:36
5	Going off the record, the time now is 4:38.	04:38:37
6	(Recess taken.)	04:38:42
7	THE VIDEOGRAPHER: Video is rolling.	04:53:00
8	The time now is 4:53. We are back on the	04:53:17
9	videotape record.	04:53:22
10	Please proceed.	04:53:23
11	MR. HEINZ: I have no further questions.	04:53:24
12	MR. LIMBACH: Okay. I have a few.	04:53:27
13	EXAMINATION	04:53:29
14	BY MR. LIMBACH:	04:53:29
15	Q Mr. Murphy, do you remember a discussion you	04:53:34
16	had with counsel earlier today regarding a boosting	04:53:39
17	circuit?	04:53:43
18	A Yes.	04:53:44
19	Q What is a boosting circuit?	04:53:44
20	A A boosting circuit, effectively, is a	04:53:46
21	DC-to-DC converter.	04:53:50
22	Q And what does it convert?	04:53:59
23	A It converts voltage from one level to	04:54:00
24	another, so you will have an incoming voltage, and	04:54:04
25	then a different voltage will be converted out of	04:54:08

1	it.	04:54:11
2	Q Okay. So the purpose is to create a second	04:54:15
3	voltage that's different than the first?	04:54:18
4	A Correct.	04:54:20
5	Q And is it -- when you say "boosting voltage,"	04:54:20
6	does that mean it's a higher voltage or lower	04:54:25
7	voltage, or how does that work?	04:54:27
8	A Generally, from what I remember and my	04:54:28
9	history, boosting generally emit higher in voltage.	04:54:33
10	Another name for a type of circuit, which is also	04:54:39
11	DC-to-DC converter, is a pump circuit, and pump	04:54:42
12	circuits are pretty well known. You can pump above	04:54:46
13	or below, so depends upon which voltage -- which	04:54:49
14	type voltage you need.	04:54:52
15	Q Is a boosting circuit the only way to get a	04:54:54
16	second voltage on a chip?	04:54:58
17	A No.	04:55:00
18	Q Can you name another way?	04:55:05
19	A You can provide a second voltage from an	04:55:07
20	external pin. You can simply take a -- an incoming	04:55:10
21	voltage and use, for example, a resistive divider,	04:55:17
22	which is not a boosting or a pumping circuit, and	04:55:22
23	create a new voltage that way, so there are multiple	04:55:25
24	ways to do it.	04:55:30
25	Q Could you supply a second power supply?	04:55:31

1	A	Yeah, you could.	04:55:36
2	Q	If you could go to your declaration on	04:55:41
3		page 8, please.	04:55:46
4	A	I have it.	04:55:53
5	Q	And this is -- paragraph 18 is the	04:55:54
6		construction for boosted positive voltage.	04:55:58
7		Do you see that?	04:56:00
8	A	I do.	04:56:01
9	Q	And the construction is a positive voltage	04:56:02
10		higher than the logic high voltage.	04:56:05
11		Do you see that?	04:56:08
12	A	I do.	04:56:08
13	Q	Does that construction require the use of a	04:56:09
14		boosting circuit?	04:56:13
15	A	Does it require the use of -- no.	04:56:16
16	Q	Can you go to the patent now, claim 1.	04:56:21
17	A	Yes.	04:56:27
18	Q	And if you go to the end, the last phrase	04:56:30
19		is -- or last paragraph of claim 1 is "a logic high	04:56:38
20		voltage is applied to unselected word lines, while a	04:56:42
21		boosted positive voltage is applied to a selected	04:56:46
22		word line."	04:56:50
23		Do you see that?	04:56:51
24	A	I do.	04:56:51
25	Q	Does that claim language require the use of a	04:56:52

1 boosting circuit?

04:56:55

2 A No.

04:56:56

3 MR. LIMBACH: Counsel, that's all I have.

04:57:14

4 MR. HEINZ: I have nothing further.

04:57:16

5 MR. LIMBACH: Okay. Great.

04:57:18

6 THE VIDEOGRAPHER: Going off the record, the

04:57:20

7 time now is 4:57.

04:57:23

8 (Whereupon, the deposition was

9 concluded at 4:57 p.m.)

10 ---o0o---

11 I declare under penalty of perjury that the

12 foregoing is true and correct. Subscribed at

13 _____, California, this _____ day of

14 _____, 2014.

15

16

17 _____
Signature of the witness

18

19

20

21

22

23

24

25

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25

CERTIFICATE OF REPORTER

I, RACHEL FERRIER, a Certified Shorthand Reporter, hereby certify that the witness in the foregoing deposition was by me duly sworn to tell the truth, the whole truth, and nothing but the truth in the within-entitled cause;

That said deposition was taken down in shorthand by me, a disinterested person, at the time and place therein stated, and that the testimony was thereafter reduced to typewriting by computer under my direction and supervision and is a true record of the testimony given by the witness;

That before completion of the deposition, review of the transcript [X] was [] was not requested. If requested, any changes made by the deponent (and provided to the reporter) during the period allowed are appended hereto.

I further certify that I am not of counsel or attorney for either or any of the parties to the said deposition, nor in any way interested in the event of this cause, and that I am not related to any of the parties thereto.

DATED: June 25, 2014


RACHEL FERRIER, CSR No. 6948

1 June 25, 2014

2 Robert J. Murphy
3 Firenza LLC
4 72 Fairview Plaza
5 Los Gatos, California 95030

6 Re: Toshiba Corp v Intellectual Ventures I LLC

7 Dear Robert J. Murphy:

8 Please be advised that the original transcript of
9 your deposition taken June 17, 2014 in the
10 above-entitled matter is available for reading and
11 signing. The original will be held at the offices
12 of Merrill Legal Solutions, 135 Main Street, 4th
13 Floor, San Francisco, California 94105 (415)
14 357-4300, for thirty (30) days in accordance with
15 Federal Rules of Civil Procedure Section 30(e). If
16 you do not sign your deposition within 30 days, it
17 may be used as fully as though signed.

18 If you are represented by counsel in this matter,
19 you may wish to ask your attorney how to proceed.
20 If you are not represented by counsel and wish to
21 review your transcript, please contact our office
22 for a mutually convenient appointment to review your
23 deposition.

24 Thank you for your cooperation in this matter.

25 Sincerely yours,

Rachel Ferrier, CSR 6948

cc: Original transcript
All Counsel

Merrill Legal Solutions



INSTRUCTIONS FOR READING/CORRECTING YOUR DEPOSITION

To assist you in making changes and /or corrections to your deposition testimony, please follow the directions below. If additional pages are necessary, please furnish them and attach the pages to the back of the errata sheet.

Please read your transcript carefully. If you find any errors or changes you wish to make, insert the changes and/or corrections on the errata sheet by listing the page and the line number reference and then the change you wish to make.

Please do not make any changes and /or corrections on the face of the transcript.

Please do NOT change any of the questions.

After completing your review, please sign the last page of the errata sheet, above the designated "Signature."

ERRATA SHEET

Page Line

_____ _____ Change: _____

Reason: _____

_____ _____ Change: _____

Reason: _____

_____ _____ Change: _____

Reason: _____

Page Line

_____	_____	Change:_____
		Reason:_____
_____	_____	Change:_____
		Reason:_____
_____	_____	Change:_____
		Reason:_____
_____	_____	Change:_____
		Reason:_____
_____	_____	Change:_____
		Reason:_____
_____	_____	Change:_____
		Reason:_____

_____ Subject to the above changes, I certify that the transcript is true and correct.

_____ No changes have been made. I certify that the transcript is true and correct.

(signature)

(date)

A			
ability 11:19 33:12 56:14 150:24 190:7	139:16 active 70:20,21	adopting 37:19,21	allow 34:21,22
able 56:10 104:14 124:18 147:3,4 171:11 197:15,16	activities 52:17 58:11,12,24 59:24	advantage 171:13	allowed 182:9 202:17
above-entitled 203:8	activity 52:19	advised 203:7	Alto 3:5,19 5:1,19
absence 170:12	acts 129:16	AFTERNOON 126:1	AMD 100:3
absolute 134:21 162:20 167:11 195:1,2	actual 32:25	agnostic 195:5	amenable 64:22
absolutely 136:5 160:25 170:25 190:16	add 55:7 77:9 88:3 164:25	ago 19:7 43:8 45:7 46:16 156:23	amendments 40:11
academic 47:13	added 43:1 79:1 165:2	agree 41:8 80:8 109:15 110:18,20 113:2,13 116:3,5 118:14,15 134:5,6 141:12 152:19 155:8,20 157:25 176:18 178:19,22 179:15 184:9,19 193:14	amount 30:11 31:16 34:22 92:11,12 180:23
access 25:2,7 29:10	addition 83:10		amplifier 54:6
accompanying 36:4	additional 144:14 185:11 188:9	agreement 89:5	amplifiers 22:2 53:22
accomplished 15:4	address 7:10,15 25:10,10 29:11 153:6	agrees 178:3	amps 53:8
accuracy 78:5	addressed 78:16	ahead 8:3 41:17 138:18 169:22 181:20	analog 29:25 30:1,2 32:25 48:22
accurate 11:22 37:11 40:5,10 77:19 82:1 108:2 116:21 155:15	addresses 25:9	aheinz@desmaraisll... 3:15	analysis 36:3 37:17 89:10 121:20,25 122:11 124:13 139:3 192:24
accustomed 129:14	adds 112:13	Aircraft 32:18	analyzation 121:10
achieve 161:12	adjacent 179:12	Al 5:24	analyze 121:20
acknowledgment 155:11	adjustable 56:21	ALAN 3:18	analyzing 121:6,7 122:10
acronyms 21:1	adjusted 37:3	alan.limbach@dlap... 3:20	Andrew 3:13 5:22
act 129:21	adjusting 30:2	aligned 64:2	Andy 66:9
action 3:10 183:11 195:13	adjustments 40:12	alive 95:15	and/or 96:23
actions	administrative 60:1	alleges 10:2	Angstroms 161:18
	adopt 36:3 37:17		answer 22:16 74:11 98:15 100:25 104:15 108:5
	adopted 38:19 39:1		

121:18,25 145:14 156:17 157:8 163:3 163:19 170:21 181:15 183:7 186:18 190:3,23 answering 46:17 answers 77:19 anticipates 10:15 139:6 anti-fuse 96:17 anybody 23:21 144:2 158:16 168:6 anyway 53:25 apologize 91:9 APPEAL 1:3 appear 133:3 155:5 APPEARANCES 3:11 4:1 appeared 3:7 appears 15:1 42:2 131:22 165:11 169:11 179:12 appended 202:17 application 14:20 41:2 115:5 128:19 applications 79:10 applied 13:15,16 14:2,7,17,23 14:24 15:25 25:14 26:12 34:8 135:23 136:23 139:15,25 150:9 151:25 152:1	156:13 157:23 159:3 160:23 169:15,17 180:18,21 181:4,13 182:3,5,21 183:1 185:16,24 186:21 192:11 195:14,21,23 196:4 197:19 200:20 200:21 applies 62:12 apply 15:13 19:1 116:12,13 134:11 139:3 140:12 184:25 186:8,10 applying 13:11 14:12 183:11,14 appointment 203:14 appreciate 15:5 approach 48:19 appropriate 19:13 22:4 137:7,9 140:25 196:1 approximately 7:21 86:25 161:11 169:12,13 170:2 171:5,6 183:14 April 49:13 58:1 82:17 apropos 138:25 arbitrarily 140:11 architecture 76:5 83:3 archy-type 64:21 area 26:2 52:14,25 65:1 93:12 arena 68:11 arithmetic	77:8 arranged 69:9 array 21:15,16 22:5 31:13 31:13 41:1,4,4 116:7 116:24 117:1 118:22 119:4,7,8,21 172:7 172:10 173:11 180:22 186:22 187:21,24 188:2 190:17,19 191:2 192:11 arrays 187:21 arrived 128:25 arrow 189:12 art 9:24 10:6 11:17 12:14 12:16 13:7,14 14:9 15:18,22 17:12 19:20 36:24 37:4,12 111:2 111:3,7,10,19 112:20 113:15 115:14 122:2 126:21 127:5,12 128:2 129:16 130:6 132:3,9,13,25 134:8 138:20 140:19 144:11 145:21 148:13 152:7 153:13 153:18 154:8 155:23 157:9 170:17 181:10 181:23 185:9 188:1,7 195:12 aside 165:21 171:3 asked 23:12 115:6 119:22 136:20 164:17 asking 10:18,21 36:19 46:16 108:3 115:24 117:3 121:13 134:21	141:10 151:16 155:12 157:3 159:17 186:17 aspect 70:13 85:5 100:14 146:8 155:18 159:22 165:14,16 181:2 aspects 60:1 121:19,19 141:18 asserted 10:6 assess 109:18 assessment 93:5 100:12 109:16 Assistance 51:19 associated 100:2 158:12 165:24 assume 164:1 Atlantic 47:25 attached 41:18,23 107:16 attention 20:18 122:21 171:19 attorney 3:13,18 4:3,4,4 202:19 203:13 audio 30:7,10,14 automatically 79:3 available 25:23 52:6 150:4 203:8 Avenue 3:4,14,18 4:5 5:18 average 52:21 avoided 150:13 aware 20:9 23:21 99:24
--	---	---	---

177:21 awful 30:7 a.m 3:3 5:3	143:6,10,12 155:4 158:3 based 42:14 43:3 111:11,12 111:13 142:18 165:20 182:19 basic 15:1 basically 7:11 25:7,15 34:6 68:9 78:17 87:25 94:8 178:17 basis 139:6 beam 96:24 bear 28:16 bears 10:5 107:5 Beast 84:14,20 86:5 90:14 began 36:13,14 50:14,16 beginning 51:1 54:24 59:22 61:5 63:18 64:5 70:6 75:5 81:17 101:12,16 123:4 126:6 begins 5:9 131:19 185:5 191:24 behalf 5:23 42:10 belief 105:12 believe 10:24 11:23 15:16 20:17 40:6 41:7,21 43:7,22 44:18 46:24 49:5 53:3 66:7 75:11 81:8,10,13,13 82:5,8 90:24 91:4 98:3,20 103:21 104:5,18 107:1 108:3 111:9	113:20 115:6 116:1 118:8 119:22 120:12 120:19 126:18 131:9 142:2 149:19 150:14 150:15,18 154:7 160:25 161:14 165:18,24 168:5 171:15 175:10 178:23 182:15 183:7 185:2,4 188:14 191:24 195:5 believes 116:21 best 27:12 47:6 75:25 98:3 103:16 150:24 190:6 197:12 better 19:16 72:2 79:4 better-controlled 26:21 betting 53:10 beyond 46:1 48:9 53:4 86:7,10 107:5,8 122:10 164:22 185:12 bias 26:20 biasing 183:10 BiCMOS 21:5,20,24 68:8 70:6 90:5,6 112:8 big 11:3 28:2 43:14 58:17 65:15 88:20 89:20,21 100:3 117:12 122:22 bigger 81:20 114:19 144:22 144:22 162:2 179:16 biggest 11:3 65:6,7 67:25 bipolar 21:21 22:1 67:18,23	68:11,14,19 92:1 Bird 4:11 6:5,5 bit 14:14,15 29:19 72:23 73:7,8 74:8,9 119:1 140:12 150:10,10 169:16 172:17,18 173:12,15,18 174:14 177:10 178:15 181:24 182:24 183:16,16 185:11 186:11,14 188:9 189:6,7,8 197:19 bits 29:20,20 73:10,12 96:12 bleeding 93:17 blew 97:5 BLJ 178:13 block 81:20 100:6,7 109:14 112:11 114:20,21 161:12 177:22 blocks 81:18 87:17 114:25 blow 68:14 96:25 blowing 97:2 blown 96:14 BL0 14:14 135:10 183:16 BL1-BL15 14:15 BL2 185:12,16 board 1:3 23:18 57:19 78:14 88:23 boards
B B 78:19 88:3,3,4 Bachelor 127:12 bachelor's 47:16 109:3 back 14:19 17:13 18:4,7,22 20:18 22:11 23:18 24:1,2 25:17 26:19 27:21 29:17,17 30:9 30:11,16 31:24 33:2 36:16 37:24 39:14 56:1,17 64:17 66:14 66:22 75:3 78:11 88:23 92:24 105:9 107:10 113:10 114:11 126:9 130:2 131:11 156:22 166:12 168:20,23 178:25 185:3 191:21 198:8 background 39:19 87:9 93:18,22 122:24 128:22 backside 31:14 bad 69:24 190:25 ballpark 43:2 bar 112:22 113:6,23 117:4 barrier 119:18 barring 25:15 base			

78:24,25	bottom	53:23	calculations
bog	31:9 38:4 44:25 45:1,3	build	78:8 79:5 80:17
84:7	94:1 135:22 188:19	20:7 71:7 82:23 99:25	California
book	box	186:23 197:15	3:5 5:1 7:17 201:13
72:3	55:7 85:24,24	building	203:3,9
boost	brain	56:13 61:15 85:9	call
13:18 26:13 72:24	79:23,24	97:24	11:8 23:24,24 51:18
157:11 158:14,19	breadth	builds	51:19 65:3 92:15,16
159:24	19:13	155:23	92:21 93:4 95:7 96:4
boosted	break	built	101:4
12:22,24 13:3,7,23,24	33:24 41:14 74:22	20:10 22:25 23:1	called
14:2,6,24 15:9,11	75:8 168:14,15	32:13,13 34:5,12,14	3:7 6:18 13:18,25
153:5,9,9,11,20	breakdown	34:17 35:8,11 50:8	15:25 22:24 47:24
154:9,13 155:4,9,16	26:23 27:8	73:20 86:1 87:13	49:22 51:3,4 52:6
155:18 156:8,12,19	brief	97:19 176:15 197:7,8	74:5,12 77:17 78:6
156:25 157:4,16,19	53:14 61:19,22 63:19	bunch	84:14 92:20 109:14
157:20,25 158:3,6,7	briefly	67:15	109:15 136:1 157:20
158:11,21,24,25	58:4 66:20	buried	calling
159:2,11,21 160:5,22	briefs	28:24	96:5
161:3 162:1,25	61:21	business	calls
163:11 164:24 165:7	bring	7:9,10,11,13,16 17:15	93:2,4 163:15
165:12,15 166:2,10	139:1 146:6,23	67:14 91:25 100:2	Camarce
166:17,19 167:5,21	brings	buy	4:4 6:11
175:8,11,24 176:1,19	133:16	30:23 85:20 93:14	camera
178:5 179:15 180:6,9	broad	97:18	95:9
180:20 181:3,6,12,17	17:25 19:9 22:14	B.S.E.E	campus
181:25 182:2,6,6,13	116:22 132:17 134:7	45:18	87:6,6,7
182:14 200:6,21	136:12 144:3 150:15		candidate
booster	161:2		45:8,9
153:17 159:11 176:15	broaden	C	Canoga
176:20 177:5,24	147:15,17	51:4	48:21
178:7,9,21 182:12	broadest	CA	canyon
boosting	129:10 134:11 146:9	3:19	30:8
26:4,6 154:4,5,6,10,19	broadly	cabin	capability
154:23,24 155:11,18	17:8,9 116:1,5 139:2	37:20	177:7
156:3,5 162:6,10	141:20 168:4	cabined	capacitor
178:1 198:16,19,20	broadness	104:21	34:16,17
199:5,9,15,22 200:14	141:1 150:23	cabinet	card
201:1	broken	51:14	95:9
boosts	88:25,25 92:22	cabining	care
153:21	brought	37:22	95:13
boot	8:14 89:13	cache	career
56:25	BSL	88:11,12,14	20:22 47:13 81:15
booting	172:17,18 173:3,11	caches	careful
56:4	buffers	90:16	22:9 98:6

carried 18:23	95:17 106:19 116:15 116:16 118:25 121:8	143:24 161:3 164:17	81:25 85:12 88:23
case 1:7 5:12 10:6 11:5,7 22:18,20 30:18,18 32:21 38:16 42:10,20 43:18,18 44:23 45:4 56:1,3,25 57:3,13,16 98:13 103:1,18 106:7 106:10,11 107:3 122:6,19 128:9 132:6 141:7 162:4,4 183:25	122:18 123:13,13 142:14 158:22 182:10 183:10 185:16,18 187:25 189:10,11,19 190:5 190:20 191:2	changes 56:18 86:21 176:12 202:15 changing 144:1 channel 28:24,24 characteristic 33:19 characteristics 27:6 64:21 94:7 characterization 155:15 181:9 charge 28:25 29:2 30:2 31:14 31:16,24 33:13,25 34:16,18,22 84:13 charge-coupled 28:23 charging 42:12 chart 191:24 charts 36:3 37:18 cheap 95:11 child 128:21 chip 18:5 20:7 21:15 22:17 23:2,3,4,18,19,19 48:15 55:2 60:11,15 60:18 61:10,15 67:12 75:22 77:18 78:12,13 78:14,20,22 79:1,6 81:20 82:24 84:11,12 85:11 86:2 88:8 112:9,10 154:4 170:18,22,24 176:15 186:1 199:16 chips 32:7 50:15,17 67:3 71:7,22,23 76:9	106:20 119:15 153:25 choose 191:15 chose 150:11 152:4 193:10 chosen 21:19 Christian 4:4 6:11 chronological 45:7 70:5 84:24 103:15 chronologically 44:17 circa 72:5 119:23 circle 29:17 30:16 circled 189:10 circuit 15:12 19:17,22,25 23:2,15 26:11,14,19 57:17,19 59:15 60:16 61:12 62:13 63:8 64:23 75:24 76:5 79:18 83:2 84:13 86:20 90:15 91:17,17 94:1,7 95:21 97:16 101:13,20 105:2 153:21 154:4,5,6,11 154:23,25 156:4 171:9 177:22 178:6,9 198:17,19,20 199:10 199:11,15,22 200:14 201:1 circuitry 62:17,18 74:17 87:13 97:6 144:13 176:12 186:9 circuits 13:18,18,18 20:11 22:3 25:4 26:4,5,6
cases 7:14 12:18 33:9 103:14 123:23 124:2 161:6	Center 59:14 62:7 66:11 centimeter 161:12,20 CEO 58:14 certain 22:1 30:11 33:9,19 34:22 36:17,18 41:3 55:24 103:4 105:22 117:19 124:18 147:3 149:18 160:17 certainly 46:12 104:8 110:8 163:14 167:10 CERTIFICATE 202:1 Certified 3:6 202:2 certify 202:3,18 CFR 39:6 challenge 124:12 challenged 10:4 change 27:5 37:1 55:24 148:6 148:7 149:3,15 151:22 153:3,3 160:23 162:20 164:18 198:3 changeable 56:21 changed 15:3 37:2 56:10 57:9		
cause 124:17 202:6,21			
caution 36:19 98:5,13 99:4			
cc 203:19			
ccamarce@skgf.com 4:8			
CCD 30:3,19 31:5 33:12 34:4,18 35:3 48:5,9 48:11,14 49:3,6,18 51:4			
CCDs 28:17,20,21 30:15 32:4,20,22 33:15 34:5,10 49:22			
CD-ROM 18:1			
CD-ROMs 18:13			
cell 20:8 40:1 41:5 48:19 50:1 122:22 123:15 159:5,7 189:17			
cells 11:2,20 15:3 19:19,22 20:10 21:17 41:2 55:21 68:5 74:7			

53:20 58:22 64:18,20 69:1 72:24 76:1 121:7 158:22 162:10 199:12 circuit-type 101:12 cites 14:8 City 47:25 65:11 69:12,17 71:5,6 Civil 203:10 claim 12:23,23 14:1,5,5,19 15:2 36:3 37:18 128:9,12,24 129:14 132:18 133:4 135:13 135:15,21 136:21,22 136:25 137:8 138:9 139:1,24,25 140:6,15 140:16,17 141:1,19 141:20 142:19 143:25 145:10 146:5 146:9,12,13 147:8,9 147:12,16,22 148:2 148:15,16,17,25 149:3,24 150:15 151:2,7,16 152:21 153:2,20 155:16 156:6,8,18,24 157:18 158:1,8 159:18,20,20 160:1 161:1 162:15 162:23 163:8,9,25 164:20,25 165:21 167:22 169:7,12 172:19 180:12,14,20 181:11 182:2,17,19 182:23 183:20,21,22 191:23 192:15,25 193:1,8 194:15 200:16,19,25 claims 10:15 14:9 19:18 40:17,24 41:12	115:22 128:21 129:5 135:14 136:6,15 137:4,21 139:17,17 143:21 144:3 145:2,9 146:7,8,16,18,19,23 149:17 150:6,25 152:11 158:13 164:15 167:12 169:7 170:15 172:4,11,13 184:25 185:1 197:14 Clara 50:17 69:16 71:5 clarify 103:12 clause 113:3,21 114:14 118:9 126:19 127:7,23 142:1 clauses 131:7 clear 13:21 54:23 65:17 97:9 103:13 104:18 108:14 112:21 113:6 114:15 117:4 clearly 136:6 150:19 183:17 clocking 29:22 close 59:6,6 93:19 138:4,7,8 155:13 166:6 190:10 196:12 closely 71:9 closer 63:15 99:4,6 CMOS 21:14,22,25 24:23 25:21 51:22 53:19,19 68:4,11,17,23 69:8 73:18,25 106:16 112:7,10 116:18,24 118:21,21 119:4,7,7 119:10 120:15 149:9	149:13 coalesce 36:21 Coast 60:13,14 code 56:15,21,21 57:3,6,7,9 collaborate 53:21 collector 16:1 column 13:9 14:11 134:18 135:10 156:16 160:21 161:7,15 172:7,15,25 173:7,11 176:2,6 178:11 180:23 183:7 184:23 189:11 190:9 197:18 columns 119:1 185:17 187:25 190:8 combin 62:19 combination 62:20 76:11 85:17 come 10:19 18:21 30:11 37:13 45:13 54:6 96:24 97:20 122:20 123:1,6 150:22 153:21 178:21 comes 12:9 28:12 30:9 65:20 94:9 109:16 114:16 136:20 148:1 153:16 182:11 coming 37:9 128:16 comma 130:11 command 78:19 commencing 3:3	comment 104:2 commercial 106:21 committed 101:7 common 26:18 27:13,19 33:20 33:20 174:12 197:22 commonly 11:18,25 15:25 132:12 136:1 152:10 Communications 103:5 community 50:9 51:25 52:5 53:10 companies 98:23 company 32:18 53:11 70:15 91:6,10 97:21 102:2 compare 193:22 compared 78:20 122:18 compares 172:3 comparing 24:1 comparison 139:8 compatible 93:16 complete 103:19 104:19,23 completely 21:20 completeness 85:7 completion 202:13 complicated 163:17 component 79:22 114:19
---	--	---	---

components 22:19 28:9 composed 120:13,14 computer 18:17 56:5,6,20 67:7 78:25 202:10 concept 17:25 19:17 32:21 34:15,15 71:1 96:14 113:16 149:6 154:19 155:5,18 195:4 conceptually 79:10 concluded 201:9 conditions 178:13 cone 33:16,17 Conference 69:1 confidential 98:7,15 configuration 21:18,19 41:1 73:6,7 118:23 configurations 96:13 confine 134:23 confused 107:12 confusion 114:16 connected 178:14 189:2,15,16 connection 121:4,15 122:5,12 148:8 173:10 194:20 connections 171:17 consider 24:5,16 44:10 121:6 191:10	considered 24:7 134:17 154:12 consistent 189:22 consistently 28:6 constant 63:8 constantly 108:24 constructed 116:16 construction 128:12 130:10,25 131:4,23 132:15 133:20 134:14 135:2 136:9,11,12,15,17,19 137:10,11,14,19,22 139:19 140:24,25 141:8 142:12,17,18 142:21 143:13 145:6 146:1 154:13,18 155:1,6,10,17 156:9 156:20 167:14,15 180:8,11 181:6 200:6 200:9,13 constructions 12:23 128:9,17,25 139:4 146:3 150:22 165:11,20 166:24 179:3 construing 131:14 consult 52:7 consulted 65:15 consulting 7:12 44:6,8,9,11,13 91:6 92:11,14 102:19 105:25 110:15 120:23 consumer 57:22 94:25 97:8,10 115:2,5 116:25	consumers 57:14,20 consumer-oriented 114:24 contact 203:14 Containing 105:23 contemporary 24:13 contend 188:6 context 12:25 13:1,23 19:11 19:13,15,16 113:16 148:15,16,17 158:24 171:2 184:10 185:22 continue 75:6 87:5 93:2 continued 4:1 120:6 continues 123:10,18 continuing 40:24 50:20 116:10 continuously 18:25 108:13 contract 65:2 contractor 91:16 102:10 contributors 68:1 control 27:10 135:23 136:24 140:1,13 150:10 169:16 172:18 controlled 135:19 196:20 controller 76:18 86:3 convenient 203:14 convention 183:10	conversations 36:20 66:12 convert 198:22 converted 198:25 converter 198:21 199:11 converts 198:23 cool 41:16 cooperation 203:16 core 68:12,15 corner 12:18 corollary 67:10 Corp 203:4 corporation 1:5 3:16 5:10,25 58:9 73:15 correct 9:1 19:2,4 28:13 29:8 31:3 35:4 38:21 39:9 42:2 45:21,25 47:15 49:8 50:18 51:7 54:13 58:3 60:6 65:19 66:1,4,19 67:21 72:10 74:2,13 75:15 77:1 78:10 79:7 80:6,19 84:24 91:1,8,22 94:23 97:13 103:6 105:24 106:2,5,9 107:2 129:18,24 132:6 141:21 142:7 160:8 165:4 166:1,25 167:6 168:13 169:14 172:9 172:20 173:9,13,20 173:25 174:3 176:17 176:23 178:23 180:7
---	--	---	---

184:22 188:4 189:24 190:13 192:17 193:18 199:4 201:12 corrected 41:21,24 correctly 16:11 62:19 87:8,13 89:1 correspond 172:10 correspondingly 47:12 cosmic 25:16 costs 67:24 Coulman 4:10 6:1,1 counsel 3:11 5:20 36:17,20 38:17 98:16 128:23 198:16 201:3 202:18 203:12,13,20 counsel's 39:8,11 counts 110:11 couple 168:25 Coupled 67:21 course 6:9 20:22 39:5 43:12 46:11,15,21 48:4 54:19 96:9 150:2 court 104:8 124:3 cover 55:4 112:12 144:15 161:18 covered 102:4 118:7 co-license 70:1 co-processor	76:3,15 77:7 78:6,14 79:9 80:13 81:1,4,19 81:23 83:18,24 co-processors 76:25 77:2 80:7,8 83:20 85:1 co-terminus 118:5 CPU 85:21 Cray 85:18,18 create 20:5 27:4 34:19 154:3 161:21,25 162:1 199:2,23 created 13:17 58:23 96:19 153:13 154:10 CSR 1:24 202:25 203:18 current 26:9 177:6,9 curriculum 107:22 cut 169:22 CV 41:18,23 42:6 44:19 75:9 82:11 106:11 107:10,12 108:14 123:24 cycles 123:16 D data 16:8,12,15,21,23 17:2 17:13,13 18:3,4,6,19 19:5 24:14 25:15,18 29:12,14 30:22 31:7 31:20,21 56:23 72:3 73:10,11 80:2,18 87:24 113:9,10 116:25 118:23	176:12 178:14 date 5:14 44:18 DATED 202:23 Daubert 124:7,17 David 59:13 62:7 66:10 day 57:1,7 63:3 108:4,15 123:20 201:13 days 16:1 26:16 28:5 85:9 101:5 110:14 123:15 203:10,11 DCache 90:17 DC-to-DC 198:21 199:11 De 99:20 deal 33:12 65:15 69:5,9,18 77:23 82:23 89:5 99:10 197:3 dealing 63:10 77:20 deals 193:1 Dear 203:6 debug 99:20 100:10,13,14,17 101:12 102:20,24 debugged 87:11 decided 23:7 109:10 decimal 77:13,14 declaration 2:11 9:7 11:10 20:19 35:23 39:14 41:19 107:14,16 109:1,4	110:22 117:9 126:14 127:3 128:11,13 129:1,3 130:3,22 137:12 141:23 153:7 179:5 185:3 187:23 188:16 200:2 declare 140:11 201:11 defective 177:10 178:15 define 12:15 121:12 130:16 147:20,21 defined 115:9 139:14 165:13 defining 106:17 113:7 148:10 166:17 definitely 11:9 53:7 55:12,12 94:16,17 104:9 106:18 116:22 definition 112:15,23,25 113:10 113:20 131:19 135:12,13 136:20 140:8 141:17 146:9 148:1 159:7 160:6,22 187:10 definitions 131:8 defunct 98:24 degree 46:1,4 47:16 48:3 109:3 111:15,19 127:13,15 delay 30:6 32:25 deliver 24:19 delivering 33:2 delivery 58:9
---	---	---	---

delta 144:8,10 depend 57:4 dependent 197:10 depending 27:1,21 56:6,7 134:19 160:23 depends 17:8 57:12 100:19 121:1 199:13 deponent 202:16 deposed 7:19 104:6,9 deposition 1:13 2:8 5:9,17 8:10 10:10 103:22 201:8 202:4,7,13,20 203:7 203:11,15 depositions 3:2 deprive 149:23 describe 20:21 25:1 49:16 58:4 66:20 75:18 82:19 86:17 124:10 138:19 described 16:20 19:13 46:25 79:11 183:10 describes 39:25 description 2:7 156:14 178:11 design 7:12 46:14 48:15 49:10 50:9,20,21 51:20,24 52:5 53:6,9 53:11,18 54:2 58:7 59:10 60:7,17 61:2,6 61:10,12,14 63:9,14 64:6 69:25 70:2,7,20 71:10 75:21,23,24,25	76:5 79:19 81:16,25 83:2,7,16 84:13,15 89:7 91:17 92:23 93:8 97:19 99:21 100:8,11,13,14,17 101:13,20 102:16,19 102:22 110:6,10,10 110:14 120:25 121:1 121:2,5,8,10,12,15 121:19,22 122:12 123:3 162:23 163:9 171:7 186:13 188:8 190:4,25 designed 48:18 49:25 58:22 72:20 81:18,24 88:22 89:25 94:1 97:17 designer 53:18 54:3 59:8 designers 50:21 59:15 90:16 designer's 190:7 designing 50:15,17 64:6 90:16 102:3 109:22,25 112:4 162:21 designs 50:12 70:14,19 71:1,3 71:14,20 72:15 91:17 design-level 63:12 Desmarais 3:13 5:22 details 47:2 138:22 detect 29:4 detector 29:10 determinative 181:2 182:12 determine 38:14 136:13 140:7 develop	57:5 developed 32:17 58:21 developing 59:12 90:13 development 59:7 89:18 device 16:9,9,10,11,16 18:1 23:23,24 24:5,6,8 25:3,4,22 27:5 29:1 30:23 32:24 34:2,3 55:5,6,8,20 56:16 57:14 68:13 73:22 74:18,18 76:1,3 94:5 94:10 107:2,2 108:21 109:11,12,15 110:3,7 113:8,8,9,11 114:1 114:19 115:3 116:11 116:11 117:11,15,16 117:17,17,20,22,23 117:23,24,25 122:24 177:22 devices 17:14 23:22 25:23 26:8 28:1 32:22 46:7 46:10 73:5 74:6,14 93:23 105:23 107:24 108:4,17 109:23 111:22 112:1,3,7,8 112:17 113:4,5,22 114:15,17 115:1 117:8 118:11,12,13 118:19 119:10,12 120:3,11 126:20 127:9,17,25 128:1,5 132:25 155:23 158:20 180:13 181:23 diagram 192:1 die 66:24 died 49:24	difference 10:25 11:1,4 16:6 57:21 73:9 94:12 101:24 118:24 123:10 133:12 197:3 differences 34:25 different 11:9 19:14 20:1 21:21 28:17 29:13 37:5 58:13 67:12 70:18 73:23 76:21,23 77:5 77:5 79:10 83:14 112:24 116:17,19 121:3,18 128:21 134:22 143:5 147:10 147:13 152:14,16,20 153:2 159:9 160:3 162:19 165:9 170:3,6 170:14 171:14,16,17 171:17 173:8,22,24 174:1 182:21,22 183:4,6 186:5,24 187:1,5,6,10,21 188:9 191:5 195:1,2 195:3 197:1,5 198:25 199:3 difficult 136:4 162:1 170:25 190:4 digit 77:13 digital 29:24 digits 77:14 Dingwall 66:9 directed 15:24 40:25 41:12 192:15 193:15,16 direction 202:11 directly 59:2
---	---	--	--

director 75:16 76:5 79:16 82:13	3:4,17 5:18 44:1,11,12	drive 18:17 23:18 24:15 88:7	easily 119:3 144:1 151:25
disagree 115:7 116:13	document 37:8 103:13	driver 22:3	East 3:19 60:14
disappear 17:2 148:9	documents 36:15	drivers 53:23 76:2	easy 30:5 144:22
disappears 35:21	doing 17:16 31:3 42:15 43:15 59:1,18 61:2 61:11,11 62:9 63:8,9 64:1 65:8 67:17 70:4 78:23 80:15 92:4,7 93:1 100:2 101:6,14 101:15,15 102:10,11 102:15,15 108:25 110:14,16 120:14 121:19 122:10	dropping 126:23	echo 30:8,11,17
discharge 65:18	dollars 69:23	duly 3:8 6:19 202:4	ECL 67:18,21
discuss 111:1	Don 4:10 6:1	dump 31:7	edge 93:17
discussed 49:4 64:14 90:12 142:2 143:6 154:19 187:12 191:8	door 51:23 78:2	duplicated 137:5	education 45:16 46:21
discussing 118:10	downstairs 50:9	duties 49:16 58:4 66:20 72:12 75:18,19 82:19 83:14	EE 46:7
discussion 10:1 72:1 118:4 128:23 198:15	drain 189:13,22	dynamic 25:12 34:6	EEPROM 10:21 11:6 21:9
disinterested 202:8	drainer 189:15	D.C 4:6	EEPROMs 11:17,24 12:2,5,10,11
disks 18:23	DRAM 16:21 17:1 25:17 34:5 34:6,12,16 35:1 49:23 51:1 52:16,18 52:24 53:4	E	effect 30:8 96:13 186:11
displays 28:23	DRAMs 49:21 51:21 52:12	E 52:24	effectively 29:19 30:1 52:7 61:14 61:23 78:3 82:23 83:1 87:25 88:16 110:13 133:18 137:1 137:5 183:2,19 189:19 198:20
distance 28:3	draw 20:1,18 25:6 26:9 171:19	earlier 27:20 42:9 45:5 47:3 48:6 67:19 72:4 73:6 90:7,24 91:10 96:16 105:3 114:11,20 118:7 119:22 124:1 145:17 147:20 164:16 169:10 198:16	effort 49:20 150:15
distinction 17:10 20:2,4	drawn 194:15	earliest 44:18 45:12 84:21 103:14	EFUSE 94:1 96:19,20 97:7,16 105:2,9,10,11,13,15 105:17 106:3 112:2 112:11,11 114:21
dive 175:22	drew 68:22	early 26:16 85:8	EFUSE-type 95:21
divide 77:9	Drexel 45:18 46:6 47:10,19 48:1	easier 174:25	eight 101:5
divider 199:21		easiest 77:10 139:7	either 16:9 17:1 24:2,3 34:21 46:9 56:18 80:21 97:22 103:22 127:12 137:18,23 152:2
division 58:14 60:2,4			
divisions 58:13			
divulge 98:6			
DLA			

167:25 170:19 202:19 elec 33:18 elected 194:10 electrical 33:13,18 46:1,4 64:21 111:16,20 127:13,15 127:21 electrically 18:9,10 21:13,14 69:8 94:8 96:23 97:4 119:20,21 electronics 46:5,9 electrostatic 65:18 element 21:15 139:24,24 146:4 172:7 173:11 180:23 192:25 193:1 elements 22:13 24:10 33:13 73:13 135:22 145:10 164:1 172:10 193:8,9 elephant 61:24 elicit 145:18 159:5 195:16 em 166:15 Email 3:15,20 4:7 embodiment 15:24 115:18 116:2,4 116:17 135:6,7,8,9 135:12,17 145:20 167:16 embodiments 183:5 emit 199:9 Emitter 67:21	employed 7:4,5 employees 91:15,19 101:22 employment 7:7,8 enable 55:24 enabled 33:9 ended 23:16,16 86:13 endurance 122:17,21 123:12 end-channel 184:6 end-to-end 123:3 energy 55:4,10 enforce 157:23 engineer 70:10 91:23,25 173:22 186:7 engineering 46:1,4 66:16 70:22 75:16 82:13 85:25 101:2,6 111:16,20 127:13,15,21 engineers 89:5,6 93:19 enlightening 193:10 ensure 190:7 entire 109:2,9 141:5 entitled 8:9 38:5 114:4 115:11 entity 58:16 entry 68:7 EPI	32:13 EPROM 52:24 53:19 56:2 EPROMs 52:13 53:6,19,19 54:3 54:4,14 56:23 57:6 112:4 Epsom 69:14 71:3,13 Epsom's 69:15,21 equal 183:14 Equipment 103:5 equivalent 85:17,18 191:11 erasable 21:13,14 69:8 erase 11:2,20 54:22 55:5 56:11,16 57:15 161:8 161:9 183:9,22 184:1 184:24 erased 18:10 55:15,16,23 72:23 119:20 183:11 erasure 161:12 Ericsson 103:2,3 ESD 64:18,20,25 65:17 76:2 especially 23:25 26:16 53:22 93:13,18 138:2 established 54:11 90:24 107:1 132:5 165:24 estimate 42:20,21 43:3 44:13 47:7 100:16,23 103:9 estimates 53:2	evaluate 129:4 141:14 event 202:21 eventually 37:6,8,15 76:9,10 84:3 97:23 everybody 52:5 91:15 178:3 evidence 195:12 ex 73:5 104:11,11 133:10 exact 7:22 13:4 95:3 139:4 144:23 190:10 exactly 110:1 132:10,10 150:16 152:17 170:18 186:2,5 EXAMINATION 2:2 6:23 198:13 EXAMINATIONS 2:1 examine 53:13 examined 3:9 6:19 example 13:11,25 14:13 18:17 24:15 26:2,13 28:7 30:5,5 32:24 33:5,10 33:14 57:8 61:18 63:19 67:5 73:5 77:24 80:18 86:5,21 93:24 110:3 115:18 130:17 131:5,10 135:10,21 136:8 137:16 140:13 142:3 145:1,3,4 146:15 160:20 161:7,11,13 161:17 170:11 183:12 184:9,22,24 190:24 195:20 197:18 199:21
---	--	---	--

examples 16:17 17:3,5 18:11,12 18:14 20:14 32:3 130:19 131:21 132:1 132:4,11,14 133:21 133:23 134:2 137:25 162:18	128:5 expert 43:15,20 103:20,22 104:13 123:22 expert's 124:12 expert-witness-work 103:13 explain 17:10 21:8 36:11 54:20 60:10 61:22 129:4 139:23 146:4 196:6 explained 37:3 167:23 explaining 59:17 explanation 141:6 exponent 77:17 express 184:12 expressed 108:16 137:19 extent 35:15,16 43:11 80:23 81:1,11 86:9 107:5 external 13:16 26:24 78:15 86:24 87:22 176:13 199:20 extra 78:25 ex-layout 91:24 e-squared 21:12 69:7,8 70:4 72:22 73:18,22,25 106:16 112:7,10 116:18 118:21 119:10 120:15 e-squared-CMOS-P... 120:5 e.g	183:15,16 E2CMOS 21:5 106:24 107:5 F FAA 47:23 fab 50:8,8 71:12,13 89:20 92:24 fabless 69:13 98:2 100:4 fabs 89:21 facility 47:23 50:7 61:9 64:4 69:12 71:4 fact 21:23 101:13 108:19 108:19 114:16 118:22 143:14 145:17 146:6 152:4 153:13 154:9 160:25 164:22 182:11 189:14 193:6 194:14 197:3 factor 162:7 factory 62:25 63:3,4 fair 57:23 64:11 92:6 100:12 Fairview 7:17 203:3 fall 141:16 142:11 156:24 159:18 falling 163:10 falls 140:7 familiar 7:25 far	27:21 36:22 42:20 99:23 103:19,21 166:6 fashion 23:2 29:3 164:19 186:12 faster 23:17,20 26:15 27:7 fastest 93:13,15 fear 182:9 feature 68:19 features 56:18 February 48:13 49:13 66:18 75:14 fed 29:17 Federal 203:10 feel 19:12 137:7 154:21 fell 136:14 fellowship 48:2 felt 137:9 197:11 Ferrier 1:24 3:6 202:2,25 203:18 field 96:4 111:21,25 112:16 112:19 113:4,22 114:14 115:15 118:10,12,19 120:2 120:10 126:20 127:8 127:16,24,25 161:10 fields 46:2 figure 104:16 109:19 177:21
--	--	---	--

188:22,23 189:12 192:2,5,12,19,21,23 192:25 193:4,5,14,16 193:19,23 194:2,6,11 195:14 196:5 197:12 figured 31:22 95:16 Figures 185:12 193:23 figuring 110:13 file 55:7 81:21 95:18 filed 41:23,24 43:16 109:1 files 24:14 57:15,15 90:18 filled 31:11 filter 33:15,16,17,18,22 34:1 final 60:18 61:8 finally 70:17 166:2 find 13:4 89:11 91:18 100:5 108:20 122:25 154:3 161:6 fine 74:24 finish 99:17 finished 57:8 84:3,18 123:5 Firenza 7:9 91:10 92:8 97:21 100:7,7 102:2 105:8 105:19,21 203:2 firm 7:6,7 first 3:8 6:19 11:15 16:6,19 19:7 21:5,13,24 26:8	30:10,14 36:1 47:20 49:25 50:2 51:21 54:22 67:16 68:7 69:2,10,15,18,20 71:5,8 76:14,22 92:13,21 96:1 97:7 103:18 128:18 129:4 129:5 131:15 140:15 169:15 174:18 179:13 182:23 184:13 186:3,18 199:3 fit 56:8 101:6 136:16 180:11 fits 94:14 five 57:7 95:4,15 98:21 101:7 127:13 154:2 162:7 180:24 five-year 47:20 fix 53:1 87:14 89:3,11 90:4 92:22 93:7 184:18 fixed 89:14 90:1 fixing 86:13 flash 10:21 11:5,18,25 12:3 12:6,12,15 19:3,19 19:22,25 20:2,6,8,10 20:16 21:17 34:3 39:25 41:1 47:3,6,9 47:12 54:12,15 65:25 72:4,11,14,15,18,20 73:2,5,14,18,22,25 74:3,5,12 82:6 91:2 105:22 106:4,7,12,14 106:15,17,17,19,22 106:25 107:1,4,6 112:19 113:4,7,11,16	113:18,22 114:1,4,8 114:13,14,17,18,18 114:23,24,25 115:2,4 115:9,11,12,15,25 116:7,9,11,21,24 117:1,20 118:2,4,6 118:12,12,15,19,22 118:25 119:12,14,21 119:23 120:2,7,10,17 120:22 121:5,7 122:12,17,23 126:17 126:20 127:25 128:5 142:14 162:21 164:1 171:7 191:9 flashcard 95:8,10 flashcards 96:6 floating 76:3,9,9,10,14,21,24 77:2,7,11,12,22,22 78:7,8,13,21,24 79:1 79:5,8 80:7,13,13 81:1,4,18,19,22 82:24,24 83:3,4,17 83:20,24 84:1,6 85:1 85:16 86:1,8 110:4,5 110:8 Floor 203:9 floppy 18:23 Florida 59:21 64:4 flow 64:23 flows 177:9 follow 126:12 150:23 164:20 189:11 following 101:1 188:21 follows 6:20 168:9	force 142:13 160:12 foregoing 201:12 202:4 forever 25:15 55:9,9 94:11 95:12 forgets 28:14 34:9 94:22 Forgot 76:12 form 109:24 113:24 115:16 121:16 124:4 128:3 132:25 140:9 142:25 147:11 148:3,21 149:4 151:4,18,21 152:22 157:1,6 158:10 163:1,13 164:4 167:9 170:4 173:1 175:9,25 176:22 179:19 186:16 187:8 188:11 190:25 194:12 195:10 format 80:1,3 forming 161:16 forth 36:16 107:22 forward 27:25 28:5 45:13 foun 69:13 found 14:5 65:1,14 197:18 foundation 124:14 foundry 69:14,16,17 98:4 four 23:3,6 57:7 95:4,15 162:7 180:24 Fowler-Nordheim
---	--	--	--

161:21 190:1 FOX 4:3 frame 13:14 109:23 174:12 framework 9:25 Francisco 69:2 203:9 friend 102:10 front 25:20 31:11 107:17 169:2,5 174:24 179:4 frowned 191:12 Fujitsu 98:4 full 31:13 48:15 188:2 fully 203:11 full-blown 46:13 84:5 full-time 47:21 function 22:13 23:9,11 32:16 34:1 80:25 85:13 110:8 113:9 115:2 117:19 144:21 159:23 161:10 183:3 189:9 functionality 22:1 25:24 193:2 functions 33:15 85:14 171:16,17 182:21 funding 95:14 fungible 71:23 further 129:13 176:25 198:11 201:4 202:18	fuse 96:14,17,17,21 fuses 68:12,15 94:4 96:19 future 68:6 G G 3:13 gate 26:10 34:20,20 74:8 119:19 162:11 183:11 189:16 197:25 gates 23:3,6 Gatos 7:17 203:3 gears 41:15 gee 109:25 gen 39:3 general 7:7,8 23:12 39:24 42:15 43:10 46:3 82:18 generally 13:13,17 24:7 28:9 39:3 47:8 49:17 57:20 80:10 92:14,20 93:11 124:15 138:12 177:7 178:3 193:9 199:8,9 generate 139:16 149:13 161:19 generation 168:1,2 generator 177:22,25 178:6 generic 115:2 143:16 germane	20:15 33:10 getting 28:3 61:8 96:3 147:24 156:22 166:12 give 30:13 36:16 111:2 113:10 127:3 143:18 160:14 164:19 given 19:15 37:10 71:10,12 71:15 99:1 106:16 122:24 129:9,14 132:1 133:22 135:6,7 137:25 138:19,21,21 139:2 141:20 145:1 161:7,15 162:18 164:14 186:18 190:24 202:12 gives 131:10,20 138:1 143:19 giving 61:23 144:13 glossed 70:25 go 8:3 16:23 25:17 26:15 27:22 30:15 34:23 37:24 39:14 41:17 44:16 53:1 55:4,23 56:17 61:20 63:7 87:24 89:2,3,10,22 89:23 93:5 107:10 128:16 129:8 135:21 138:18 149:13 153:25 169:22 181:20 182:9 185:3 191:21 200:2,16,18 goes 23:20 26:10 29:3 55:20 57:19 123:14 136:24 159:4 going 5:7 10:19 31:8 41:15 52:1 53:11 67:3,11	67:12 71:17 75:1,8 91:9 92:2 95:4 98:5 101:2 104:2 114:11 123:9 125:3 131:11 132:20 134:9 158:19 168:17 174:14 198:5 201:6 GOLDSTEIN 4:3 good 6:25 7:1 33:14 64:4,20 74:21,25 77:24 78:5 89:22 110:7 123:18 125:1 126:3 145:4 191:1,18 gosh 95:4 100:22 Gotcha 87:4 177:16 gotchas 62:11 gotten 28:9,11 101:19 governing 3:2 graduated 109:2 Graphics 82:10,14,20 84:16,25 86:12 89:6 91:3,5 great 67:22 201:5 greater 187:11 ground 15:19 27:1 130:8,11 130:18 132:2,6,10 133:7,8 134:7 137:23 138:2,5,6 139:20 152:12,18 196:12 grounded 135:10,11 grounding 14:14 grounds
---	---	---	---

38:5,12,23 group 29:13 35:10 49:25 50:4 51:20,23 52:2 52:12,20 53:17 61:3 66:23,25 67:17,23 70:4 79:17 84:8,9 groupings 100:10 groups 66:24 76:6 growing 161:17 guarantee 189:10 guarantees 189:24 guess 17:8 43:5 57:4 guided 93:21 guru 54:6 guy 70:10 89:2,22 100:4 122:24 152:1,1 guys 23:9 53:17 59:12 62:8 62:21 65:5 68:3 74:24 89:4,12 101:3 104:14	53:15 81:22 happy 41:15 108:8 155:1 hard 18:17 24:15 32:6,8 88:6 101:1 110:12 153:22,25 hate 198:2 head 50:4 184:8 hear 30:7 heard 17:21 43:17 124:8 heavily 60:14,16 70:7 heavy 92:7 Heinz 2:3 3:13 5:22,22 6:7 6:24 8:2,8,14,19 9:2 9:5,8,11,16,20 42:4 74:23 75:7 98:18 99:9,13 110:17 114:2 115:20,23 122:4 124:6 125:1 126:8 128:7 140:22 143:3 147:19 148:12,22 149:21 151:7,11,15 152:13,24 157:5,15 158:23 163:4,21 164:7,21 167:13 168:16,22 169:24 170:9 173:5 175:12 176:4,24 179:23 186:25 187:11,16,22 188:14,24 194:18 196:3 198:2,11 201:4 held 75:13 82:16 189:7,8 203:8 help 52:6 93:6 104:15 helped	52:9 53:7 65:9 75:24 90:2,4 110:6,10 hereto 202:17 hesitation 19:9 hey 23:7 71:21 hierarchy 63:11 high 13:11 14:12,23 67:25 86:21,24 130:21,24 134:13,16,17,25 141:22 142:5,11,13 142:24 143:10,17 145:11 146:12,15,21 146:25 147:2,6,15,25 148:6,9,25 149:1,9 150:8,16 152:1,8,25 153:1 154:12,15 155:3 156:12,22,23 157:10,12,17,19 158:5,8,14,15,18 159:1,6,8,10,13,21 159:23,24 160:7,10 160:11 161:17 162:24 163:11 164:8 164:17,23,23 165:6 165:12,14,15 166:3,9 166:16,18 167:2,5,20 169:11,15,17,25 170:1,8 171:5,6 172:14,24 173:7,16 175:2 178:17 179:17 179:21,22,24 180:2 180:10 182:9,17,18 182:24,25 183:5,19 183:21,23 184:1,10 184:20 192:10 194:3 194:10,14,25 195:4 195:17,25,25 196:22 200:10,19 higher 26:10,22 130:25 142:8	143:15 144:6 145:24 154:11,14 155:2 159:11 160:6,9 165:15 166:8,10 179:17,20 180:10 184:21 197:20 199:6 199:9 200:10 highest 145:15 highs 174:2 high-levels 47:1 high-speed 93:12 hired 36:14 42:9 49:18 58:14 67:14 82:21 87:10 hiring 89:17 history 27:22 61:20 98:12 199:9 hit 31:25 55:10,19,19 hold 22:15 25:14 175:14 187:7 holds 87:23 home 63:7 hopefully 18:22 Hoppe 4:10 5:16 host 79:25 80:2 hour 56:12 hourly 42:11 hours 42:22 43:3 103:9
H			
H 178:15 haggled 59:4 half 26:14 56:12 187:2,2 hand 8:3,5 145:10 196:2 happen 58:16 93:21 142:14 157:24 happens			

house 100:3	impart 149:18 168:10	individual 73:10,12 75:22 106:19 110:15 119:14 168:7	93:11 94:6 99:23 114:21 144:15 147:2 150:7 161:5 169:17
Hughes 32:4,18 47:17 48:1,2,4 48:9,25 90:7 119:5	implement 33:22 41:5 63:22 133:1	individually 106:21	instantly 30:10
hundred 42:22,23 43:3 145:12	implemented 56:18 83:1	induce 190:1	integer 82:25 84:2 85:2,5,12 86:9 87:23
hundreds 77:25	implements 21:16	industry 47:23 101:19 105:12 123:11 153:22	integrated 19:17,21,25 20:6,11 23:2,15 25:4 57:17 64:23
hundred-megahertz 30:21 31:20	implicit 156:5,18	inexpensive 95:10	Intel 78:12,13,21 80:14 86:4 100:2
hurdle 112:21 114:15	importing 132:20	information 17:18,22 19:2 22:15 25:5 33:1,23 35:20 38:18 56:4 73:12 79:25 80:1 87:23 94:4,11 116:7,8,15 116:19,19,23 117:1 118:1,21 137:3 149:16 164:14,19 187:17	Intellectual 1:8 4:2,10,11 5:11 6:1 6:4,5,12 10:3 203:4
Hynix 44:23	impossible 162:25 186:1	informed 40:16	intend 190:21
hypothetical 157:3,14 187:18 188:21	improper 167:23	inherent 185:10,21	intended 150:19 185:13 186:8 188:18
H's 192:5,9 194:3,6,9,19 194:21	inappropriate 167:19	initial 72:15	intending 114:3
I	include 86:10 152:5 154:23 192:1,23 194:19,21	injection 190:2	intent 150:24 189:18
ICache 90:17	included 18:12 76:6 79:5 131:23	ink 80:3	intention 186:19
idea 122:14	includes 137:15 188:9	input 29:17 30:3 31:12 36:2 36:10 53:23 61:21	inter 2:9 8:23 36:5 37:9 40:18,19 171:20
ideas 36:22	incoming 86:20 198:24 199:20	ins 62:10 68:16	interaction 59:7
identical 72:19 128:20 139:16 170:18 186:2	incorrectly 16:21 182:9	inside 77:18 81:20 154:1,3	interest 85:7
identification 2:6 8:7,18 9:4,10,19	increase 122:17	insights 122:25	interested 202:20
identified 77:5 134:17 176:2,9 182:22 193:4	independent 99:25	instance 17:18 18:1 26:3 29:9 32:23 33:14 35:11 56:14 57:5 77:20	interesting 72:1 122:14
identifies 153:12	independently 38:11,13		internal 84:4 86:22,24 87:16
identify 5:20 177:17 195:18	INDEX 2:1		internally 51:4
identifying 45:2	indi 73:11		International
ii 38:6	indicates 170:13		
	indicating 194:3		

69:1	44:23 103:1 105:21	keep	181:23 187:14 188:5
interpret	106:7,10 107:3 112:6	41:15 44:4 102:9	188:7 191:7,17 197:8
18:2 164:15	120:20,21 121:15,24	174:24	knowing
interpretation	122:6,13,16,19	keeping	72:21 141:16
129:10 134:11	item	150:21	knowledge
interpreted	28:15	keeps	64:17,18 108:23
129:6	items	28:3 196:18,19	111:12,13 124:5
interval	28:16	Kessler	133:5 149:18,20,24
167:1,4	i.e	4:3 6:3,11,11	known
intervals	185:15,17	kids	11:16 32:14 60:13,13
167:8		87:10	132:2 195:23 199:12
intimately		killed	knows
52:11	J	49:20	65:12,13,13
introduce	1:14 2:11 3:7 6:16 7:3	kind	
6:7	203:2,6	53:14,16 92:3 94:14	L
introduction	jaded	96:3 100:4,9 101:3	label
46:19,22	62:25	154:25 169:1 174:20	189:13
invented	Japan	174:23,23 179:2	labeled
47:6,9,14 54:12 65:25	71:3,9,22 89:9,10,12	191:17	9:23 193:12
68:4 72:4 119:13,15	89:23 98:3	knew	labels
119:23 120:7	Japanese	39:3 67:16 89:8 194:9	193:4
inventor	89:19	knit	labs
129:16,21	job	58:15 59:22	66:10
involve	52:16,18 72:12	know	laid
104:6 120:25 121:1	John	7:24 11:7 17:25 20:5	156:15
involved	4:11 6:5	22:21 30:23 33:16,16	Lake
36:16 51:21 53:12	Jon	37:3,7 38:11,13,20	65:10 69:12,17 71:5,6
60:14,16 64:6 70:7	4:4 6:10	38:24,24 39:1,3,6	lamp
72:11,14 86:9 103:1	Jordan	42:6 43:4,16,17	32:1
122:3,15 124:19	50:6 65:11	46:15 47:24 54:7	language
involves	jump	57:8 59:9,10 61:9	14:5,20 15:1,2 135:14
25:21 62:16 161:16	25:10	62:16,23 63:20,21,23	136:6 137:24 145:9
IPR	jumped	65:2,2,3,4 70:23	146:5,7,8,16,23
5:13	25:11	72:21 77:25 78:16	147:22 148:2 149:17
IPR2014-00113	June	85:24,25 86:3,15	150:4 155:21 156:6
1:7	1:16 3:3 5:2,14 45:20	88:5 92:13 93:3,3	158:13 165:22
ISSCC	48:13 75:14 82:16	95:13 96:12 98:16	167:12 168:8 170:7
68:25	202:23 203:1,7	99:10 100:4 101:16	170:15 182:19
issue	junior	102:4 103:9,19	197:14 200:25
99:8 124:14 184:25	70:10	104:14 110:1 123:4	large
196:13	justice	123:21 124:7,11,19	24:13 77:21 78:2
issues	163:17	124:22 136:15	95:19 167:7
26:3 83:16 89:14	jwright@skgf.com	138:11,11,21 148:13	large-scale
102:8 196:19 197:2	4:7	150:2 152:6 154:10	24:20
ITC		159:4 160:18 167:25	laser
	K		

31:16,19,23 96:24,25 97:1 latch 176:12 latest 84:20 Lattic 69:7,13 70:1 71:10 Lattice 69:6 Lattic's 69:20 law 3:13,18 4:3,4,4 5:18 65:3 laws 3:2 lawyer 124:9 layers 95:17 layout 58:23 59:19 70:10,11 76:6 83:3 LCD 31:24,25 lead 70:9 140:18 leak 25:19 leakage 177:9 learned 47:2 52:8 learning 93:20 left 48:1 54:9 77:13 104:22 151:24 172:7 190:17 192:6 legal 7:13,14 100:10,14,17 101:3,3,13,15,16,20 101:24 102:15,25 203:9	lens 32:1 let's 5:7 26:12 27:3 34:24 45:12 48:15,21 51:13 51:14,25 57:24 61:17 66:13 69:13 74:20 82:9 88:5 110:3 162:2 164:1 168:15 169:2 174:20,23 179:3 187:1 190:17 level 46:12 63:14 70:22 111:3 123:12 127:4 127:11 133:17 145:17,18 152:3,8,9 159:11 162:13 178:16,18 180:17,18 181:1 182:6,7 195:20 196:1 198:23 levels 132:12 139:14 184:2 192:11 lexicographer 129:17,22 lid 54:23 life 63:2 lifting 92:7 light 18:11 31:25 55:3,4,13 55:16,20,22 77:25 129:10 138:3 liking 37:16,16 Limbach 2:4 3:18 5:24,24 42:2 74:21 98:5,10,12,22 98:25 99:3,8 109:24 113:24 115:16 121:16 124:4 125:2 128:3 140:9 142:25 147:11 148:3,21	149:4 151:4,8,21 152:22 157:1,6 158:10 163:1,13 164:4,10 167:9 169:22 170:4 173:1 175:9,25 176:22 179:19 186:16 187:8 188:11 194:12 195:10 198:12,14 201:3,5 limit 19:21 134:3 139:18 143:23 145:5 146:8 146:13 165:3 limitation 137:18 146:20,22 166:6 167:7 168:10 limitations 132:20 164:25 165:19 165:19 167:11 172:11 186:9 limited 133:7 145:3 154:22,24 limiting 19:20 115:17,22 130:14,15 162:16 165:14,16 limits 131:7 167:21 line 13:9,12 14:3,7,11,13 14:14,18,25 15:14 30:6 32:25 52:4 73:7 73:8 93:25 135:10,23 136:21,24 140:1,13 150:10,10,10 156:13 156:16 157:23 159:4 160:21 161:7,15 169:12,13,16,16 170:2 171:6,7 172:17 172:18,18 173:15 176:3,9 177:1,10 178:11,15 179:12 180:18,21,22,24 181:4,14,24 182:5,23	182:23,24 183:8,13 183:16,22,24 186:14 189:7,8 195:21 197:19 200:22 linear 29:3 lines 14:15,24 41:4 72:23 72:24 74:8,9 118:25 119:1 140:13 149:8 169:18 172:22 173:3 173:12,12,18,19 183:1,13,16 185:11 186:11 188:10 189:1 189:6 195:22 200:20 link 96:9 links 96:10,25 97:5 list 24:23 76:14 103:2,20 103:25 104:19,19,20 104:23 listed 20:14 44:24 83:19,25 84:19 103:14 105:21 123:23 138:9 183:21 183:23 193:8 lists 172:7 literally 26:20 30:1 34:17 55:1 56:15 67:2 71:16 79:23 93:14 95:21 96:20 97:5 114:18 155:21 literature 191:8 litigation 44:6,13 92:11,14 102:19 105:25 120:23 little 21:1 23:2 63:1,12 124:11 159:9 174:14
--	--	---	---

174:25 176:25 lived 93:17 LLC 1:8 7:9 91:12 203:2,4 LLP 3:4,13 4:2 5:22 load 143:18 locally 88:6 located 7:16 location 175:17 locked 87:1 log 165:6 logic 14:23 21:15,16 22:5 22:24 23:3,8,9,15,16 24:6,8,18 32:7,17 35:7,8,8 67:21 68:13 68:16 73:13 96:11,13 107:2 116:7 130:1,6 130:21,24 131:1,11 131:14,16,22 132:1,3 132:12,22,23,24 133:1,2,6,11,12,14 133:16,16,18 134:4 135:14,19,19,22 136:5,23 137:8,10,14 139:19,25 140:4,7,11 140:20 141:17,22 142:5,22,23 143:6,10 143:12,15,16,17,18 144:6,12 146:12,12 146:15,15,18,21,21 146:24,25 147:2,4,6 147:7,14,15,15 148:6 148:7,18,24,24 149:9 149:11,22 150:8,16 150:17 151:1,10,12 151:14,17,18,24	152:8,9,21,25 154:15 155:3 156:22,23 157:10,11,17 158:5,8 158:14 159:1,6,8,8 159:10,21,23,24 160:7,10 162:24,24 163:10,11,23 164:3,5 164:6,8,12,17,22,23 164:23 165:6,6,12,12 166:3,8,9,16,16,18 166:18 167:1,2,4,20 169:10,15,17,17,25 170:1,8 171:5,6 172:14,24 173:7,15 174:2 175:2 179:17 179:20,22,24 180:2 180:10 182:17,18,24 182:25 183:5,19,21 183:23 184:1,10,19 192:10,10 194:3,4,10 194:10,14,25,25 195:4,5,17,18,25 196:22 200:10,19 logical 118:23 158:17,18 logic-oriented 22:17 long 18:20,20 25:14 29:20 30:15 35:12 43:8 49:19 96:10 longer 48:17 look 14:9,19 76:8 88:1 116:14,15 133:21 135:18 147:21 159:22 161:6 176:25 180:25 183:6,7 193:6 193:19 195:20 looked 71:12,13 78:15 172:13 192:21 looking 36:24 99:24 122:16	134:9 135:3,3 173:10 176:6,7,16 177:1 181:12 195:11 looks 8:16 42:7 47:16 92:10 181:10,11,11 look-up 88:1,5 loop 86:15,19 loops 87:8 Los 7:17 203:3 lose 16:21 19:5 198:1 lost 16:9,11,12 155:19,21 155:22 lot 22:13,24 55:10 65:23 78:23 93:20 94:6 98:8,23 123:19 lots 17:16 30:20 low 67:24 86:21,24 130:1 130:6,7 131:1,11,14 131:20 132:1,3,10,16 132:22 133:2,6,6,8 133:11,12,13,16,17 134:3,4,6,14 135:1,9 135:15,19,19,23 136:5,7,16,23 137:1 137:8,10,14,15 139:19,20,25 140:4,7 140:12,20 141:16,17 142:23 143:7,15,16 144:6,12,19 146:12 146:18,21,24 147:4,7 147:16 148:7,9,18,19 148:24 149:1,11,22 149:23 150:17 151:1 151:2,10,11,18,25 152:9,21,21 162:24	163:10,23 164:3,5,6 164:22 165:6,12,14 166:9,16,18 167:1 192:10 194:4,10,25 195:5,18 197:20,21 lower 138:24 142:8 146:21 146:25 148:14 162:11 164:23,24 165:14 177:11 178:19 184:13 197:16,23 199:6 lowest 149:12 LSI 48:19 luckily 101:21 lucky 21:24 lunch 125:1,5 126:13 L's 192:5,9 194:3,7,9,20 194:21 M machine 85:19,20 88:2 magnetic 17:19,23 18:13 magnitude 95:18 144:14 162:2 165:22 167:11 181:5 magnitudes 168:11 main 16:2 78:7 80:25 87:24 88:7 110:8 115:2 203:9 mainstream 86:6 majority 22:17 making
---	--	---	--

52:9 62:17,18 63:9 64:8 70:18 93:16 170:24 man 30:20 101:11 manage 83:6 managed 79:16 84:9,11 87:15 management 50:19 61:3 71:17 79:19 83:11,15 management-level 64:8 management-oriented 64:1 manager 49:10 51:25 58:6 60:24 66:17 70:22,23 75:21,23 79:18 managing 61:7,12,13 63:9 manipulating 34:19 manners 96:18 mantissa 77:17 manufacture 40:2 manufacturing 18:7 59:20 margin 144:15 marked 2:6 8:6,17 9:3,9,18 market 85:23,24,24,25 marketed 57:13,20 marketplace 33:4 marks 75:4 126:5 Master	127:14,20 master's 46:3,7 48:1,3 111:15 111:19 match 27:12 71:8 matched 190:16 matches 33:25 86:22 mate 85:2 material 32:11 46:15 145:22 math 78:4 80:15 108:25 109:5,7 184:8 mathematical 77:19 Matrix 95:5 matter 5:10 7:6 9:7,15,24 10:1 40:9 46:11 103:8 105:21,22 112:6 121:24 122:3 154:25 203:8,12,16 matters 45:10 maximum 162:9 mean 12:24 13:23 15:9 21:1 37:18 45:6 46:24 51:10 57:12 61:12 65:16 66:25 67:24 71:5 73:4 79:20 97:18 102:9,13 113:25 117:13,21,23 117:24 121:2 124:15 132:23 149:17 153:9 156:7 169:22 180:19 186:4,5,7 194:25 199:6 meaning	23:4 75:23 87:6 108:10 115:4 129:15 means 15:11 25:7 32:8 55:18 114:9 117:22 130:7 152:5 190:6 195:1 196:13 197:20 meant 37:20 52:22 71:18 109:8,19 117:15 152:5 measured 34:22 meet 116:22 132:18 138:8 162:22 meetings 104:11 meets 158:7 181:15 megavolts 161:12,20 memories 16:18 18:9 19:8 22:6,7 46:25 48:5,8,9,10,11 48:14 49:19 51:5,8 74:12 80:9,11 81:16 81:25 82:4 90:20,25 105:8,18 191:9 memory 11:19,20,25 12:3,6,11 12:12,15 15:3 16:5,8 16:13,14,14,19 17:4 17:6,8,9,12,14,20,24 18:1,2,5,18 19:3,3,9 19:17,19,22,22,25,25 20:2,6,8,10,15,15,16 22:12 23:22,23,24 24:5,10 25:2,6 28:13 29:1,24,25 32:22,24 33:3,7,12 35:6,9,10 35:12,15,17 39:25 41:2,3,5 46:8,12,13 46:19,22 47:3,6,9,13 48:18,23 49:1,3,6,6	51:2 52:11,20 54:12 54:15,18 55:12,25 57:14 59:8,10 65:25 66:2,5,7 72:11,14,15 72:18,21 73:2,14,18 74:1,3,5 76:1 78:16 78:16 80:14,15,21,24 80:25 81:2,2,4,18,20 81:21,25 82:6 86:4 87:22,24 88:7 89:2 90:13 91:2 93:12,19 93:25 94:9,17,24,25 95:1 96:12 100:5,6 102:3 105:3,22 106:3 106:3,4,7,12,17,17 106:22,25 107:1,4,6 107:24 108:4,6,12,13 108:15,17,20,21,22 109:11,12,13,14,15 109:22 110:2,5,7,9 110:15,16 111:13,22 112:1,3,17,20 113:4 113:5,8,11,16,19,22 114:1,5,8,13,15,18 114:18,23,24,25 115:3,5,9,11,12,15 115:25 116:7,9,11,22 116:24 117:8,11,16 117:20 118:1,3,4,6,7 118:11,12,13,15,19 118:22 119:4,7,7,12 119:14,23 120:3,10 120:22,25 121:5,14 122:12,15 126:20 127:9,17,24 128:1,5 162:21 164:2 171:7 185:16 187:20,20,24 189:10 mentioned 10:3 16:24 32:20,21 35:3 42:9 50:25 53:4 58:18 70:18 83:18 85:5 86:8 105:2 120:22 122:11 147:20 196:4
---	--	--	---

merely 97:14 Merrill 203:9 met 71:25 140:16,17 163:7 metal 68:12 method 40:1 methodology 77:23 microcontroller 76:7 79:13,15 80:20 81:6 microcontrollers 81:9 microprocessor 51:24 52:2,14 76:8,18 84:6,14 85:14,22 86:6,7 94:2,3 97:25 microprocessors 85:3 Microsystems 97:24 middle 166:19 milliamp 177:7 million 69:23 85:20 millions 77:25 millisecond 161:13 millivolts 132:8 138:6 mind 12:9 65:21 108:24 mine 52:12 101:5 102:10 minimum 111:14 144:9 191:11 minor 187:12	minus 145:8 183:12,12,15,18 184:3,7,11,20 minus-one-and-a-half 27:4 minute 156:23 minutes 19:7 56:11 misprogrammed 183:3 misread 177:13 missed 120:4 175:17 178:10 missing 165:17 188:8 mistreat 18:21 mix 63:8 mixed 21:23 48:22 mixed-signal 48:22 MLC 105:22 106:7 Mm-hmm 57:25 65:19 76:16 97:11 105:4 112:18 113:1 194:5 mode 184:1 modeling 58:22 models 62:17 79:2 modify 56:14 moment 101:4 money 67:23 101:23 123:19 monitor 5:15	Montalvo 97:22 month 50:11,13 62:24 69:23 100:19 months 47:22,22 48:16,24,25 57:10 67:15 69:24 101:8 morning 6:25 7:1 motion 124:7,17 move 29:4 35:22 49:9 57:24 61:8 62:11 63:23 64:3 66:13 74:20 82:9 110:22 123:12 128:8 130:21 141:22 162:19 moved 49:24 50:19 67:17 162:17 moves 27:25 move-to-strike 124:9 moving 28:5 40:14 multilevel 121:7 122:17,22 multiple 11:20 23:13 77:14 85:11 92:25 93:1 95:17 108:7 187:20 195:22 199:23 multiplied 77:15 multiply 77:9 78:19 88:2 Murphy 1:14 2:8,11 3:7 5:10 6:16 7:3,4,19 8:10 42:5 75:8 123:22 198:15 203:2,6	music 34:3,4 mutually 203:14 M.S.E.E 45:22 N NAFEC 47:24 nailed 152:17 Nakai 10:5 139:5,5,12 172:4 173:14 174:4,6,15 175:3,7,8,10,13,16 175:23 179:12 180:13,25 181:12,15 181:16 185:11 187:24 188:25 189:1 191:23 192:1,12,18 193:15,16 194:4,9,19 194:23 195:9,13,22 196:4,21,24 197:1,6 197:7,11,16 name 7:2,3 69:6 84:4 95:5 95:22 99:20 124:8 199:10,18 NAND 74:14,17,18 126:16,20 127:25 128:5 162:21 NAND-type 11:17,24 12:10 narrow 19:10 112:23 narrower 118:13 National 49:10,20 50:1,16 51:9 51:10,11 59:8,9 60:20 62:1,4 64:24 65:8 66:14,23 67:14 68:1 69:4,9,12,21 72:9,13 73:14 74:4
--	---	--	---

74:15 90:8,9 93:13 112:5 119:11 nature 43:10 72:16 NDA 102:5 near 47:25 191:18 NEC 76:12 82:22 89:5,21 necessarily 131:25 necessitate 195:3 need 25:13 26:6 80:3 137:6 140:6 143:22 144:7,8 144:15 154:24 157:11 159:24 160:9 166:6,9 173:21 187:17 199:14 needed 23:4 24:14 56:23 57:10 59:3 63:10 68:6,6 111:19 142:19 142:20 154:1,22 needs 132:15 133:8 145:17 160:11 negative 26:19 27:24 183:11 neither 131:7 NeoMagic 103:18 never 43:13,19 47:1 62:3 65:4 84:17 91:20 94:22 96:7,7 97:8 135:16 189:18 new 3:14 4:5 56:18 61:15 70:1,2 123:1,13,13 199:23 newer	162:8 next-door-neighbor 196:19 nice 62:13 nightmare 63:2 nine 48:16 NMOS 15:24 24:23 25:24 26:5,7,18 27:23 51:21 136:3 node 178:13 noise 144:15 nominally 171:8 nonlegal 99:19 nonlimiting 130:19 131:5,20 132:4 132:14 133:23 134:2 137:16 138:1 142:3 non-right 185:17 189:17 non-volatile 16:5,13,14 17:5,7 18:18,24 19:3 20:14 20:15 55:9,12 66:5,7 81:3 82:3 93:24 94:15,16,21 105:3,8 105:11,11,13,18,20 106:3 111:21 112:1,9 112:16 113:5 118:3,6 118:11 126:23 127:9 127:17,24 normal 12:13 13:19 26:12 77:22 186:7 normally 15:19,21 21:11,11 22:8 26:25,25 184:12 north	145:23 NOR-type 12:5,11 21:19 notation 77:7 Notice 2:8 8:9 number 7:22 10:5 11:11 24:14 25:8 77:12,12,15 78:2,3 110:18 134:19 134:21 135:4 138:4 138:10,13 143:20,22 143:23,25 144:4,18 144:24 145:23 160:13,15 161:20 165:23 166:7 175:6 195:6 numbers 77:4,4,8,11,21,23 78:24 123:17 143:21 147:21 150:14 161:9 162:15,20 197:13,13 numeral 38:7 numerical 168:6 NY 3:14 N-channel 25:22 26:1,9 N-wafer 32:12 N.W 4:5 O Object 186:16 objection 109:24 113:24 115:16 121:16 124:4 128:3 140:9 142:25 147:11 148:3,21 149:4 151:4 151:8,21 152:22	157:1,6 158:10 163:1 163:13 164:4,10 167:9 170:4 173:1 175:9,25 176:22 179:19 187:8 188:11 194:12 195:10 obtained 95:14 obviously 79:9,20 173:21 occasion 26:4 occasionally 52:13 occupied 33:3 80:14 occur 160:12 occurred 52:22 occurrence 197:22 occurring 193:3 October 58:1 66:17 offered 129:1 office 1:1 5:12 124:3 203:14 offices 5:18 203:8 official 99:20 offloads 78:7 off-board 85:15 oftentimes 108:18 110:2 oh 6:9 7:8 15:7 24:16 28:22 30:20 32:23 35:18 38:5,6 51:12 51:13 54:19 55:16
---	---	--	--

58:21 60:9 63:6 65:2 71:1,20 86:19 88:14 95:3 96:3 98:9 100:22 104:4 107:14 107:18 109:5 138:16 156:7 160:25 165:3 173:2 174:8 177:14 181:20 192:17	ones 55:24 76:20 81:12 96:22 104:20 114:25 one-time 95:7,8 96:6 106:5 operand 78:18,19 operate 16:10,20 29:13 106:21 operating 13:20 16:10 98:4 operation 13:9,10 14:12 24:19 156:15 178:16 182:4 182:8 183:9 188:13 188:15,18 192:13,14 192:24 193:2,15,17 194:20,22,24 196:1 operations 77:9 operator 5:16 opine 124:14 139:5 opinion 41:11 73:24 105:10 111:3 124:12 127:4 141:11 163:15 opinions 124:2 opportunity 150:7 opposed 44:7 97:1 161:8 opposing 43:24 order 45:7 70:5 98:13 103:15 129:4 140:7 165:1 168:12 orders 162:2 ordinary 12:14,15 13:6,13 14:9 15:18,21 17:11 19:20	36:23 37:4,12 111:1 111:3,7,9,18 113:14 115:13 126:21 127:4 127:12 128:1 129:14 129:15 130:5 132:3,8 132:13,24 133:4 134:8 138:13,20 140:18 144:11 145:21 152:7 153:12 153:18 154:8 155:22 157:8 170:16 181:10 181:22 organization 118:25 organized 74:9 original 27:18,22 132:22 133:11 155:4 203:7,8 203:19 originally 41:23 49:18 66:22 67:13 82:21 83:5 89:25 outer 32:7 output 53:22 76:2 outs 62:10 68:16 outside 87:12 163:10 overlap 101:9 oversaw 58:24 59:24 60:5 overseeing 50:21 oversight 63:16 overstress 197:25 owner 1:9 3:8,12 5:23 owners	91:13 owning 51:19 oxide 74:7 119:19 161:10,15 161:16,17,21,25 162:11 190:1 oxides 197:25 ooo 2:17 4:12 5:4 6:15,21 125:6 201:10
okay 8:16 10:11 21:17 22:23 25:11 28:21 41:17 42:5 45:14 50:23 51:13 67:10 73:8 85:8 87:4 88:10 88:17 91:14 92:6 96:3 99:16 101:5 103:7 105:14 107:15 107:20 124:16 128:10 139:15 162:3 165:10 166:14 167:25 174:13,17,22 176:5,10 177:16 179:6,9 181:12 184:14 186:3 189:5 190:2,11 198:12 199:2 201:5 old 16:1 17:21 18:23 28:5 84:8 98:10,12,21 123:15 older 22:23 omit 151:11,13,17 omits 142:21 omitted 133:13 once 11:21 31:13 43:21,22 57:1,8,9,9 63:19 65:14 90:1 94:18,21 95:12 128:22 156:7,7 162:16 164:13 169:12,12 191:19			P packets 28:25 33:25 page 2:2,7 20:20 21:4 38:2 38:3,4 39:15 40:14 44:18,21,25 45:3 80:1,4 82:10 103:14 104:2 105:21 107:11 110:24 123:24 128:11,13 130:1 131:12 171:24,25 185:5,6 187:19 188:19 191:24 192:1 193:7,7,7,7,20,22,23 193:24 194:17 200:3 pages 82:11 187:20 painful 101:9 PAL 21:14,20,24 22:8 23:10,25 67:17 68:8 69:7 70:6 72:22 73:22,25 74:18 106:16 107:5 112:7,8 112:10 116:18 118:22 119:10 120:15 Palo 3:5,19 5:1,19 PALs

21:5 22:9 23:7,11,21 67:18,18,24 68:4,19 70:4 73:7,19 106:24 paper 68:24 paragraph 11:14,15 20:20 35:22 39:16,23 40:8,10,15 107:11,21 110:23,23 111:2 113:3 114:12 114:12,13 117:9,14 126:19 127:3,19 129:3 130:2,3,22 131:12 134:15,18 137:11 141:23 153:6 179:6 185:5 187:23 188:16 200:5,19 paragraphs 107:13 126:13 parallel 31:8,10 parameters 71:8,9 parent 128:19,20 Park 3:14 48:21 part 13:16,17,20 15:23,25 16:3,20 21:18 25:13 26:20 35:8,12,19,19 36:1 46:9,14 50:1 58:9 64:2 68:20,20 68:23 69:18,25 70:25 87:15 88:5,12,12,14 89:4 93:8 95:16 99:19,21 112:11 114:8,16 116:5 121:21 143:12 149:9 149:9 151:23 153:15 154:12 157:2 159:19 159:20,22 160:1 176:16 178:4,22 197:8,13,15,17 parte	104:11,11 partes 2:10 8:23 36:5 40:19 171:20 partially 190:5,20 participate 102:8 participated 53:8 54:2 70:3 particular 15:13 21:17 33:4 46:2 109:14 111:2 135:17 136:14 141:14,15 144:12 154:22 161:5 167:17 171:24 194:23 195:6 particularly 20:16 parties 43:13 202:19,22 partner 92:3,5 partners 89:19 parts 23:13 27:19 32:16,17 35:8 51:24 52:4 69:20 87:7 106:13,14 197:24 party 43:24 98:7 part-time 47:22 48:2 patent 1:1,3,7,9 2:12,14 3:8 3:12 5:12,23 7:14 9:13,14,22,23,24 10:2,4,5,11,12,14,15 12:22 13:3,8 15:10 19:11,15 36:5 37:14 39:20,24 40:9,17 111:4,8,10 113:17 114:4 115:10,13 116:1,2,4 122:1,1	124:3 127:5 128:18 128:19,22 129:5 130:7 134:23,24 135:16,18 136:2 138:3 139:1 143:23 144:3 145:13,22 156:15 160:16,20 162:5,15,17 164:3 168:1,4 169:3 172:3 172:14,24 174:4,21 183:4 184:10,19 197:2,14 200:16 patentee 116:21 138:19 150:3,8 150:11,13,18,19,25 151:24 152:2,4,6 167:24 175:21 183:25 patents 15:16 47:4 122:10,18 122:20 167:24 174:15 patent's 168:3 pattern 55:25 PC 33:5,10 78:25 85:24 peak 50:10 Peaks 84:8 penalty 201:11 Pentium 86:5 people 6:8 21:12 23:7 26:15 26:16 28:7 32:22 52:1,9 53:12,12 58:12,15,21 59:1,7 60:2,12,19,24 61:22 62:2,2,6 63:9 64:19 65:1,14 67:11,16 70:11 72:1 75:25	79:2 80:10 84:7,11 87:7 89:18 90:16 91:11,12 92:20 93:7 93:8 95:25 96:4 100:1 108:20 110:6 112:4 138:1 197:23 people's 52:7 percent 50:3 52:21 53:3 61:5,6 63:14 83:15,16 84:10 110:19,21 percentage 48:12 52:15 61:1 83:13 100:16 101:10 perceptions 36:17,18 Perfect 174:25 perform 195:15 performance 27:9 78:22 79:4 85:11 190:19 191:18 198:1 performed 58:23 performs 117:19 period 33:1 48:25 54:8 65:24 72:8,12 73:15 74:4 109:2 197:23 202:17 periods 101:8 perjury 201:11 person 70:11 91:24 99:25 130:5 138:13 155:22 164:15 202:8 personal 102:8,18 personally 3:7 60:7 102:17 peruse
--	--	---	---

42:5	3:4,17 5:18 44:1,11,12	193:11	200:9,21
petition	place	pointed	possible
2:9 8:23,24 36:4 37:9	5:17 74:16 80:4 102:1	141:19 193:20	20:7,9 26:15 142:10
37:18,19,23,25 38:19	158:21,24 202:9	points	146:4 152:16 159:16
39:2,10 171:20	placed	84:1 126:12 189:21	159:17 162:22
178:25 191:22	16:15 45:10 78:21	poly	170:22 186:18
Petitioner	places	63:5	187:15 188:7 190:10
1:6 3:16 5:24	22:1 75:20,20 93:1	polyfuses	190:22,25 191:4,13
phase	182:22 186:22,24	60:19	191:16,19 196:12
86:19 87:1	187:2	polyresistors	potential
phase-locked	planned	60:22	34:18,21,23 122:16
86:15,19 87:8	59:21	polys	176:11,13,14 177:4
phase-locked-loop	played	189:25	177:11
86:13,18	83:7	poorly	potentially
phone	Plaza	191:15	66:11 85:2 171:11
4:4,5 6:8,10 65:3	7:17 203:3	portion	power
phonetically	PLD	37:20 38:19 69:2,4	15:22 16:2,11,16 17:1
67:9	96:11 116:24	70:17 117:17,25	19:1,6 23:5,5 25:14
phonetics	please	121:11 130:10,12	26:12 28:5,14 34:7,8
67:6	5:20 6:13,22 7:2 11:14	136:25 137:20 176:5	35:20 68:21,21,23
phrase	17:10 21:8 25:1	176:7,9 178:10 188:1	77:16 94:12,12
14:21,22 133:14 134:6	49:16 60:10 75:6,18	188:5,8 190:18,18	149:10,12 153:24
135:15 147:8 200:18	82:19 87:5 126:7,14	portions	154:2 161:24 176:11
phrases	196:6 198:10 200:3	76:2 164:13 182:8	176:13,14 177:4,10
147:6 164:25	203:7,14	190:16,19	195:23 199:25
physics	PLL	position	powered
93:22	87:16	49:9,17 54:8 57:24	88:24
pick	plus	66:13,16,21 70:14	PowerPoints
25:8,9 27:17 140:10	145:7 154:1	72:9 75:13,13,23	31:1
picked	PMOS	80:14 82:9,16 91:5	power-down
27:16,18	27:23	105:14	68:19
picking	point	positive	practice
66:24	17:20 46:18 51:18	14:2,6,24 27:24 54:25	191:1,1,6,10
picture	61:15 76:3,9,11,14	130:25 143:15,18	predicate
32:2	76:21,24 77:2,7,11	149:10 153:5,9,14,20	115:7
pictures	77:12,13,15,22 78:8	154:9,14,14 155:2,17	predicating
95:12	78:8,14,21,24 79:1,5	156:8,19 157:20	174:9
piece	79:8 80:7,13 81:1,4	158:12,25 159:2	preface
22:15 29:22 32:12	81:19,19,22 82:24,24	160:5,6,22 161:4	180:15
88:21 93:6 110:15	83:3,4,17,20,24 84:6	162:25 163:11	prefaces
pieces	85:1,16 86:1,8 99:11	164:24 165:7,13,15	14:20
35:9 83:4	101:10 102:13,25	166:2,10,19 167:5,21	preferred
pin	110:4,5,9 144:13,18	179:17 180:9,9,20	145:19 191:5,10
199:20	144:21 161:23	181:3,6,13,17,25	premarked
Piper	163:18 187:24 191:3	182:3,7,13,14 200:6	8:2

preproduction 58:8 59:19	probably 11:3 26:17 27:11,22 33:11 46:17 47:1	64:9 67:24 72:17 74:5 76:13 78:12 84:3 89:15 93:16 97:15 106:22 109:11 123:5 136:14 141:15 156:1 186:19,20	97:6 121:7 142:14 145:19,19 156:3,14 156:15 157:24 158:12,15,20,22 159:5,13 160:12,18 161:8,19 162:5 180:17,19 181:14 182:7,10 188:22 189:3 192:15,18 194:16 195:15,24 196:23
present 4:10 30:16 45:13 100:21	52:20 53:8 56:4 61:5 72:1 82:1 100:1 101:11 103:12 123:19 138:23,24 178:3	production 50:2,10 52:4 58:8 61:9 62:3,14,14,24 64:3,4 84:4	project 49:24 53:4 58:6 64:13 64:16 65:5,16,20 68:9 79:15 83:18,25 84:7,17 86:6 87:16 90:11,17 97:7 101:2 102:9 105:2,25 108:19 120:23 121:4 121:15 122:13
presented 68:25	problem 25:19 52:4,23,24 61:21 65:12 86:18 87:12 89:3 117:2 123:11,18 188:20,20 190:12,15	products 52:8,10,21 62:3 63:15 64:24 69:10 70:1,2 70:20 73:19 76:6 105:23 109:12 153:23	projection 30:22 31:18
presently 102:2 121:24	problems 52:7,9 84:17 86:14 122:22 195:24 196:5 196:7	profitability 68:1	projector 30:24
preserve 150:23	Procedure 203:10	program 11:19 14:22 41:5 49:19 54:21 55:8 56:8 59:2,3 60:24 67:8 87:21 90:15 94:10 95:11 96:23,23 97:1 159:7 162:12 180:13 183:3 188:13 188:17 189:3,18 191:3 192:12 193:16 194:21,24	projects 64:14 76:22,23 79:9 79:17 83:21,23 84:19 86:7,8,10 87:5 90:12 105:7
preset 178:16	proceed 6:22 98:16 126:7 198:10 203:13	programable 95:9	PROM 56:25
pretty 61:11 64:21 65:1 70:12 72:19 82:1 88:19 95:14 118:7 197:22 199:12	proceeded 36:15	programmability 123:15	promoted 50:3 70:19 76:4
previous 102:23 131:12	proceeding 104:7	programmable 18:9 21:15 22:4 94:3 95:7 96:8,10,11 97:5 106:6	promotion 50:5
previously 21:9 92:1	proceedings 5:5 104:3	programmed 55:8,11,13,18 68:15 72:22 94:19,21 119:20 185:14,18 188:18 196:12	proper 124:13,14 130:25 132:21
primarily 161:9	process 7:25 18:7 25:25 36:11 36:13,14 58:8,22 59:7,9,11,13 69:11 69:15,21 71:2,4 93:19 134:22	programming 13:9,10 14:11,18 15:2 15:3,14 55:7 74:9	properties 5:11 33:6,8
primary 52:16,18 53:5 54:3	processes 77:8 93:20		property 33:11
Princeton 59:14,16 62:8 66:10	processor 78:7,8		propose
printed 80:1	produced 63:15		
printer 76:17,19 79:13,14,15 79:23,24 81:9	product 15:23 25:9 50:1 56:13 56:19 57:8 58:7 60:5 60:8,17,18 61:8 62:4		
printers 76:7 79:21 80:20 81:7 81:8			
printing 67:23			
prior 9:23 10:6 122:2 195:12			
prob 61:4			
probable 170:22			

154:13 proposed 131:23 133:19 135:2 136:17,18 154:18 155:17 156:20 166:23 Protective 98:13 prove 71:17 provide 9:25 16:17 26:19 77:19 79:4 137:9 156:1 158:15 171:15 199:19 provided 18:12,14 78:22 134:15 155:7 157:22 181:6 202:16 provides 130:18 171:16 provision 153:19 pseudostatic 49:23 51:1 PTO 104:12 public 96:1,7 97:22 pull 56:15 pulled 122:19,20 pulse 161:19 pump 13:18 26:4,19 199:11 199:11,12 pumping 199:22 purchased 97:23 purpose 31:17 79:22 80:17 104:23 199:2	purposes 10:10 pursuant 3:1 pursued 95:3 push 153:25 pushed 31:14 put 17:12,18 18:6 22:14 25:5 27:5 28:25 29:14,16 30:1,1,3 32:9 33:22,23 34:20 42:19 55:2,6 74:17 79:2,2 84:8 88:20,23 92:24 95:9 115:1 137:7 147:25 149:8 152:11 159:6 167:20 168:6 175:21 194:24 putting 36:12 165:21 171:3 196:8,9 P-channel 25:22 P-wafer 32:11 P.L.L.C 4:3 p.m 126:1 201:9	question 9:14 15:6,8,23 20:13 74:11 92:2 110:7 114:11 120:8 121:3 121:13,14,18 127:1 134:23 141:5 143:5 148:23 152:25 156:17 159:9 160:2,4 163:5,18,22 164:8 165:9 174:9 179:3 186:3 190:3,22 questioning 10:20 questions 115:6 126:11 168:25 191:23 198:11 quickly 56:10 93:7 quite 144:18 170:25 quoted 175:18 quotes 175:11 quote/unquote 72:18 106:22	raise 27:7 196:16 raised 13:19 77:16 RAM 25:12 50:4 85:15 87:20,22 88:14 89:1 89:24 90:11,22,22 RAMs 50:8 90:21,25 ran 62:18 68:9 71:3 88:24 153:25 random 25:2,7 29:9 range 156:2 184:11 ranges 147:21 166:18 rate 42:11 ray 6:3,7 25:16 RAYMOND 4:3 RCA 57:24 58:5,14,25 60:21 62:2,5 63:11 64:15,19 65:7,21 66:6,7 read 18:4,7 31:15 53:14 56:24 57:14 61:19 73:11 127:25 128:18 138:3,3 143:1 176:8 185:23 191:9 192:14 192:24 193:15 194:20 reader 149:6,19,23 reading 31:23 37:14 133:4,4 145:21 153:19 175:19 203:8 reads
	Q	R	
	qualified 168:8 qualifies 104:12 119:2,3 qualify 17:20 137:20 138:5 140:4 quality 161:17 quartz 54:24 55:1,4	race 29:14 races 29:14 Rachel 1:24 3:6 6:13 202:2,25 203:18 RAD 32:6,8 radar 30:21 31:20 radiation 32:15 radiation-hardened 32:7,9 35:5 rail 149:11,12,13,14	

11:15 36:1 107:21 127:8 177:3 ready 41:14 61:8 read-only 18:5 read/write 94:25 real 31:20 60:17 reality 116:14 realize 146:3 realized 90:1 really 17:23 35:11 38:20 43:14 54:25 62:9,13 64:19 65:22 67:24,25 80:15 96:6 100:19,25 101:19,25 104:14 143:23 178:1 190:25 reason 26:8 35:13 39:4 42:17 52:3 136:18 151:23 153:22 186:21 193:13 reasonable 43:3 129:10 134:11 146:9 157:13 reasoning 184:25 reasons 27:9,10 117:5 196:21 rebooting 56:20 recall 17:23 39:12 48:10 85:21 95:21 122:7 124:23 136:2 175:15 175:19 received 45:20,24 recess	75:2 125:5 168:19 198:6 recognition 67:2 recognize 8:20 9:6,12,21 67:12 112:24 Recognizing 105:14 recollection 43:23 44:15 58:19 98:3 175:15 record 5:21 13:21 41:20,25 65:17 75:1,3 86:18 97:9 104:18 125:3 168:17,20 176:8 198:5,9 201:6 202:11 recording 17:22 redefines 137:14 reduced 202:10 redundant 137:6 refer 10:11 11:10 109:8 151:6 170:1 192:10 reference 10:6 14:8 139:5,6,12 139:12 174:12 references 142:22 referencing 14:19 referred 11:18,25 12:3,6,12 referring 45:4 90:6 119:5,8 151:6 188:15 reflect 154:18 reflected 133:19 140:23 142:16	143:13,14 146:1 166:23 refresh 16:22,25 25:18 refreshed 25:13 regard 25:11 60:5 89:24 97:16 118:3 120:21 129:22 130:10 152:25 160:5 163:22 166:2,5 174:18,19 175:1 178:24 180:8 187:12 194:2,11 regarding 40:8 107:3 114:12 126:13 149:24 198:16 register 29:6,20 31:6,9,12,12 32:21 46:12 81:21 90:18 176:12 178:14 registers 22:10 24:9,10,17,18 29:7 31:8 35:10 68:13 regular 32:15 85:24,24 reinvent 53:23,25 rejected 124:2 relate 169:1 related 11:1 72:14 73:1,3 76:21 111:4 120:22 127:5 132:12 144:11 172:17 181:5 202:21 relates 127:7 relating 105:8 relation 142:24	relationships 165:7 relative 78:5 142:22 165:1 168:12 relatively 56:10 78:5 162:12 relevant 111:20,24 115:14 118:18 120:2,9 127:8 127:14,16 128:5 relied 38:17 relying 119:16 remainder 156:6,18 remember 7:22 19:1 29:16 35:11 35:14,16 37:8 43:8 43:11,15,15,24 48:20 55:11 65:7 69:5 72:6 81:11 98:1 103:16 122:8,9 143:8 198:15 199:8 REMEMBERED 3:1 remembering 32:25 remembers 94:11 117:22 remove 16:25 149:6,16 164:13 removed 16:12,16 156:7 repair 99:19 repaired 87:19 replace 148:25 151:10 153:1 155:16 156:19 replaced 126:25 147:7 148:19 149:22 151:1 152:20
---	---	---	---

replacement 23:13	resident 54:5,6 55:25 88:7 89:2	69:23	107:7 108:13,25
replacing 148:24	89:6	reverse 11:6	109:4 110:6 111:16
replicate 69:11,11	resistance 196:14,16	review 2:10 8:23 36:5,10	113:6 114:9 117:8
replicated 69:15	resistive 199:21	37:10 40:19 171:20	119:13,24 120:18,23
report 43:16	resources 52:25	202:14 203:14,14	121:5 122:7 126:22
reported 1:24 59:1 83:5 90:17	respect 7:5 13:6,8 60:12	reviewed 36:2	126:24 127:5 129:1
reporter 3:6 8:7,18 9:4,10,19	121:23 167:20	reviewing 36:15	129:23 130:8,19
202:1,3,16	194:21 195:7,9	reviews 53:9,18 54:2	131:24 132:5,16
represented 203:12,13	respective 168:11	rework 71:11	136:10 137:12,16
represents 41:11 134:4	respectively 10:12 149:2	reworked 71:14	141:2,8,19 142:3,9
reproduced 193:20	responsibilities 61:3 83:11	rewrite 57:7	142:24 144:25 145:3
reprogram 56:16	responsibility 53:5 58:7 75:22	re-examination 104:3	146:2 149:25 151:19
reprogrammable 94:18	responsible 50:7,11 58:20 83:2	right 8:12,14,25 10:16 12:9	152:4 154:20 156:10
requested 202:15,15	responsive 98:15	12:20 18:15,24 20:8	157:21 160:7 161:20
require 16:25 144:21 153:16	rest 40:7 89:17 136:21	21:6 29:11 30:6	165:16,21,25 167:14
162:9 200:13,15,25	137:5 138:9 140:6	34:10,13 38:21 39:13	170:21 171:22
required 33:6 50:5 146:4	141:18 147:22	39:20 40:13,21 41:6	172:19 173:16,24
153:24 195:15,16	163:25 165:21 188:8	41:6,9,10,22 42:1,8	176:16 177:19 178:7
requirement 163:7	restrict 115:4	43:21 47:11,14,18	179:18 180:1,4 181:8
requirements 112:12 116:23 138:8	restrictions 185:25	49:7 50:15 51:6	185:1 188:13 189:4
158:8 162:23 165:22	restrictive 113:19,21	52:10 53:11 54:9,15	189:12,16,20,23
requires 57:18 91:12 140:17,18	result 24:18 123:6	55:2,14,17,19 56:6	190:18 192:21 194:4
156:3	resume 44:16	56:17 58:2 60:3	197:11
research 59:14 62:7,8 66:11	retention 122:21	61:25 62:11,15,18,20	right-hand 189:11
reservoir 108:23	retrieve 17:19 22:16	63:20,22,23 64:10	right-inhibited 189:22
	revenue	65:11,18,25 66:3,18	road 7:24
		67:20 70:8,15,16	Robert 1:14 2:8,11 3:7 5:10
		71:11,18 72:9 73:2	6:16 7:3 8:10 203:2
		75:14 76:13 77:14	203:6
		78:2,9 80:4,11,16,21	robust 64:25
		81:16 82:17 83:8	role 50:19 59:25 63:16
		84:23 85:3 91:7	75:18 83:7
		92:23 98:25 102:2,14	rolling 126:4 198:7
		102:23 103:20 104:7	room 3:5 31:1 88:20
		105:5 106:1,4,8	rough 48:12 100:23
			roughly

52:15 61:2 83:13 162:7 184:6 rounds 37:7 rows 119:1 rule 12:19 rules 7:24 203:10 run 62:24 197:12 running 63:4 70:3 runs 63:1 rwerner@skgf.com 4:7 R10K 84:5 R10,000 84:5 R8K 87:21	132:15 137:20 save 30:3 saw 44:21 122:18 saying 97:14 112:15 127:23 141:11 150:8 says 13:10 14:1,6,21 39:23 40:15 45:3 49:10 73:18 94:1 103:4 127:18 135:8,9,22 136:22 139:25 158:3 178:12 180:16,20,24 180:25 181:12 183:9 183:17 189:7,17 197:19 scalable 39:25 scaled 162:12 scaling 28:12 schedules 53:24 school 47:17,19,20,21,22 93:23 science 111:15 127:13,14,20 scientific 77:6 scope 131:8 132:18 134:3 136:14,17 140:8 142:12 145:5 146:13 147:9,12,16 149:3,24 151:3,5,6,7,17,23 152:20 153:2,3 156:24 157:18,18 158:1 159:18 160:16 160:19 163:10 167:22 scratch	97:19 se 48:23 54:15 64:16 106:18 second 16:24 26:17 28:17 39:22 69:4,6,18,25 93:8 107:21 137:20 169:16 170:7 172:22 178:8 182:25 184:15 187:7 199:2,16,19,25 secondly 140:16 second-source 69:9,10 second-sourcing 70:13 secret 98:19 secrets 99:2 section 38:4,9 39:7,19 50:4 128:12 180:15 185:8 203:10 see 13:4 14:10,21 15:8 20:23 28:7 29:12,19 29:21 33:25 36:7,23 37:5 38:9 40:3 45:9 48:15,21 49:22 51:25 55:1,21 58:21 63:4 68:5 69:13,22 71:8 82:12 83:18 88:1 94:13 107:25 111:5 112:21 114:6 121:20 131:2,17 135:12 138:22 142:18,19 151:18 154:16 155:6 158:16 159:25 169:19 172:1,23 173:22 175:16,17 183:20 185:19 188:3 189:1,12 192:3,7 193:25 200:7,11,23	seeing 36:24 136:2 seek 65:12 seen 191:8 Seiko 69:14,15,21 71:3,12 select 72:23 74:8 135:23,24 136:7,23 137:2,4 138:14 140:1,2,3,15 150:10,11 169:16 172:18,18 173:15 180:21 181:24 182:25 selected 13:12 14:2,7,13,14,18 14:25 15:14 140:12 140:13 156:13 157:23 159:3 180:18 180:22,24 181:4,13 182:5 183:13,15 189:19 190:9 200:21 selective 191:15 sell 58:10 123:2 selling 67:23 sem 7:12 43:12 semiconductor 7:13 43:12 44:8,9,10 49:11 51:9,11 66:14 69:6,14 72:9,13 73:15 74:4,15 95:6 112:5 115:1 semiconductors 54:23 senior 66:16 70:22 sense 22:2,14 53:8,22 54:6 94:24 142:22 158:17
S			
S 25:12 Salt 65:10 69:12,17 71:5,6 San 69:2 203:9 SanDisk 122:20 Santa 50:17 69:16 71:5 sapphire 32:10,12,14 Sarnoff 59:13 62:7 66:11 sat 53:18 satisfied 163:25 satisfy			

sent 89:10	show 62:15	silicon-based 96:21	134:8 138:13,20 140:18 144:11
sentence 11:15 36:1 39:23 40:14 107:21 108:9 108:11 136:21,22 137:6,21 138:9 168:9 177:3 185:23	showed 87:12	similar 34:23,25 53:20 75:20 79:11 161:9 176:6	145:21 148:13 152:7 153:12,18 154:8 155:23 157:8 170:17 181:10,23 187:25 188:6
sentences 146:17,19	shown 93:25 115:18,19,22 135:17 139:17 145:13 167:11,16 188:6 197:11	simple 71:20	skilled 11:16 185:9
separate 32:4	shows 12:22 14:16 15:16 172:14,24 173:7,10 175:3 187:24	simpler 25:25	skills 89:18
serial 31:6,9,10,10 114:4 115:11	shrink 50:3 161:24,24	simply 167:21 187:14 195:23 199:20	skipped 178:11
series 29:7 192:5 196:14,16	sic 5:11 14:22 30:7 42:1	simulations 62:19 121:21 122:5	slap 31:24
served 19:16	side 31:15 92:1 172:8 192:6	Sincerely 203:17	slight 46:19,22
SESSION 126:1	sign 203:11	single 20:8 58:15 77:13 85:11 86:2 183:13,16	slow 101:19
set 31:7 107:22 112:22 175:19	signal 23:17 33:23 86:20,21 86:22 132:7	single-power 153:25	small 22:12 23:3 43:15 51:24 53:10 55:2 76:7 77:21 78:3 144:18 167:7 177:6 196:15
sets 64:20	signals 33:13,18 149:13	single-power-supply 156:1	smaller 28:1,1,1,3,10,11 162:11 177:8 196:16
settled 43:14,18 103:24	Signature 201:17	single-preferred 167:16	smart 87:10
SF-002971 1:25	signed 203:11	single-purpose 95:1	snippets 165:4
SGI 76:12 82:22 86:14 87:6,20 88:22	sign 192:9	sit 40:10	socket 56:17 57:19 78:25
sharp 144:17,21	signifying 192:9	situation 150:3	sold 72:2 85:19
shift-register 30:15	signing 203:8	size 95:18,19 186:20	Solid 69:1
short 168:14	silent 92:3,5	skill 12:14,16 13:7,13 14:9 15:18,22 17:11 19:20 36:23 37:4,12 111:1 111:3,7,9,18 112:20 113:15 115:13 126:21 127:4,11,12 128:1 129:16 130:5 132:3,8,13,24 133:4	solid-state 46:7,10 58:14 93:23
shortcomings 90:3	silicon 32:10 82:10,14,20 84:16,25 86:11 88:21 88:21 89:6 91:3,5 92:22 93:6 95:20 97:2,17 98:2		solution 123:19
shorthand 3:6 202:2,8			Solutions 203:9
shout 30:8			solve

52:9	176:11,13,14 177:4	152:3	Stanford
somebody	177:10 189:14,15	speech	87:10
24:11 31:22 37:13	sources	66:22,25 67:2	start
39:4 53:13 71:2 98:3	190:13	speed	10:18,20 39:15,22
102:3 143:25	space	26:3 161:9	42:8 44:16 45:11,12
Somerville	25:8 32:7,9 77:24	spend	45:15 128:11 129:25
59:19,20,22	80:14	48:13 49:20 100:17	133:10 166:11 169:2
somewheres	spacecraft	spent	173:6 175:1
138:23	32:19	47:23 52:16,20 61:2	started
soon	span	63:25 64:5 110:14	19:8 36:21 37:9 47:17
34:8 65:1 143:24	109:9 183:17 184:7	120:14 122:16	62:4,5 65:12 75:21
sorry	spanning	spit	84:7,16 91:6 101:14
11:11 28:21,22 38:5,6	82:10	80:3	101:15 186:20
44:5,21 45:11 69:5	spans	spot	starting
76:12 80:24 86:19	109:2 185:6	13:5 182:3	28:5 44:17 130:1
107:14,16 109:5	speak	spots	156:16 162:3 183:22
124:8 134:1,18	67:11	31:25	starts
138:18 143:1 147:14	spec	SRAM	128:12 183:8
151:9 155:14 161:6	71:25 175:21	16:25 17:1 25:2,24	state
163:2 165:3 166:4,11	special	26:5,7 28:13 49:10	7:2 69:1
172:6,21 173:2 174:5	15:12 62:23	49:25 50:1,11,25	stated
174:7,10 177:14	specialize	52:16,23 53:5 64:13	108:18 135:14 202:9
178:8,24 181:20	46:2	66:2 68:18 99:25	statement
184:14 197:5,6,7	specific	SRAMs	11:22 37:20 40:5 41:8
sort	116:2,4 124:23 136:3	24:24 25:19 26:18	41:9 105:9 108:2
25:10 34:6,15 37:9	139:1,4 149:7 150:14	51:21 52:12 53:21	109:17,20,22 115:8
47:19 53:10,13 60:23	175:20 182:3,4	SS	119:8 191:11
61:17 62:10 63:6	specifically	26:25	statements
64:17 68:5 70:25	13:25 14:16 19:18	stack	40:8
78:1 89:2 93:17	32:6 46:5 55:23 74:6	95:17 189:25 196:15	states
101:17,25 156:3	106:19 115:17	staff	1:1 2:12,14 5:12 9:13
197:2	124:24 135:9 146:16	83:5	9:22 180:14,15
SOS	146:18 150:13	staffing	195:17
32:10	175:11,18 180:14	83:10	static
SOS/CMOS	184:2 189:2 193:1	stand	25:2,12 50:4,8 90:21
32:6 35:5 48:19	specification	109:17	90:22,25
sound	13:4 14:10 72:3	standalone	stay
92:25	128:20 129:11	82:24,25 109:11	69:3
sounds	132:21 133:3,5	standard	step
30:17 70:6 94:15	134:10 139:14 146:7	33:4,5 48:19 64:23	161:16
163:14	149:17 150:5 159:4	100:6 191:1	steps
source	162:18 174:19 176:2	standing	15:4
69:6 135:23,24 136:7	specifics	38:5,12,15,24 39:7	Sterne
136:23 137:2,4	146:6 167:20	stands	4:3 6:3,10,11
138:14 140:1,1,3,14	specify	84:1	stick

23:9 30:14 56:16 stole 68:10,18,19 stop 40:20 stopped 52:23 storage 24:21 56:21 116:8 118:21 store 16:15 22:10 24:14,18 29:2,24,25 33:24 34:4 57:15 77:16,16 80:18 94:5,5,6 95:12 95:19 113:9 116:15 stored 16:9 19:2 31:12 56:9 57:6 94:4 96:13 116:19,23,24 117:1 stores 34:16,18 116:7 117:16 117:25,25 storing 34:3 73:10,11 96:12 street 7:15 203:9 strike 10:9 160:3 166:4 171:4 structural 40:25 196:21,21 structure 21:18 40:1 139:13 193:2,9,11 197:1 stuck 63:5 143:25 studied 163:16 studies 47:10 study 46:8 47:12 studying 163:19	stuff 17:16 37:2 39:5 53:19 60:20 70:24 102:15 102:16 subcomponents 81:24 subject 40:8,18 47:4 117:12 Subscribed 201:12 subsequent 76:20 79:8 148:2 subset 11:5,8 substituted 156:9 substituting 147:13 substrate 26:20 27:5 196:10,11 subtract 77:9 sub-arrays 187:21 sub-block 94:3 sub-component 81:22 successful 124:17 succinctly 156:14 suggest 186:23 suggestion 116:20 summarize 100:9 152:19 Sun 97:23 supercomputer 76:11 83:1 85:10,23 88:19 supervision 202:11	supplied 176:14,19 177:5 182:6 suppliers 100:6 supplies 28:6 153:24 supply 15:22 16:2 23:5 26:12 26:24 149:11,12 154:1,2,3 161:24 177:6 190:12 195:23 199:25,25 support 28:2,2 192:24 sure 13:21 20:3,25 21:3 28:15 37:11 41:25 44:20,22 45:17 46:11 51:15 54:21 62:17,18 63:9 64:8 71:11 74:23 76:13 85:6 92:19,19 95:14 98:11 98:18 102:6 103:17 123:9,9 125:2 168:16 175:20 190:5 196:10 197:24 surface 28:24 swear 6:14 switch 41:15 switches 86:24,25 sworn 3:9 6:19 202:4 symbol 195:3 synchronization 87:2 synchronization-type 87:3 system 23:14 31:18,21 57:5 80:14 86:3 88:13,15	systems 22:25 33:6 T table 88:1,5 171:25 174:11 174:20 175:2,4 178:24 179:4,13 tag 85:15 87:20,22 88:4 88:14 89:1,24 90:11 90:22 tags 88:19 90:18 take 19:6 22:20 23:8,17 26:11,13,24 28:14 31:7 32:15 35:20 36:16 41:14 53:16 55:6 61:17 62:23 70:5 71:10 101:7 110:3 130:2 158:13 158:14 168:14,15 199:20 taken 75:2 125:5 156:8 168:19 198:6 202:7 203:7 takes 30:11 86:20,22 talent 66:23 talk 8:24 12:16 19:19 36:22 54:7 80:10,11 92:17 102:11 128:8 159:20 184:2 talked 13:3,8 14:10 22:14 24:8 27:19 47:3 48:6 51:6 59:14,15 65:10 66:3 67:19 72:4 73:6 83:25 90:7 91:9 97:8 102:22 106:5 114:20 114:21,22,23 116:25
---	---	---	---

124:1 137:17 138:4 142:23 145:16,16,20 156:23 164:16 165:23 167:17 175:2 175:15 182:16,20 185:25 190:12 194:3 194:13 195:4 197:9	21:21 22:23 25:21 27:23,25 34:6,7,13 35:1,3 72:19 73:1,4 73:22,25 90:6 93:18 95:2,3 96:8 97:14 106:15,25 111:13 113:12 118:24 123:12,13 134:20,24 136:4 143:24 144:2 145:13 160:14,17,23 161:2,14,19,23 162:8 162:17,19,20 167:17 167:18 168:2 197:4 197:10	10:19 27:2 terms 13:24 16:7 65:21 128:24 129:5,14,23 134:9 143:16 146:9 146:11 149:1 150:5,6 152:11 163:8 164:3 164:13 166:5,7,12 168:7,8,10 183:21 test 60:11,15,17 61:10 63:22 71:7 74:17 96:25 106:20 112:9 112:10 testified 6:20 104:20 testify 124:18,25 testifying 42:15 104:7 testimony 103:22 104:6,8,13 118:17 124:9 202:9 202:12 testing 58:23 59:21 94:10 tests 88:25 TFP 83:25 84:20 87:20 Thank 126:10 168:24 198:4 203:16 theory 28:12 thereabouts 186:10 196:9 thereof 3:4 thereto 202:22 thermal 161:17 thin 32:12 74:7 119:19	190:1 thing 10:23,24 24:21,23 28:18 29:23 31:2 32:5 33:21 36:24 43:8,12,17 53:14,16 57:4,16 63:1,24 64:18 65:3,6,7 69:19 69:20 81:20 87:2,3 92:22 93:13 96:9 103:24 107:20 110:3 116:22 117:3,18 119:1 133:15 138:2 165:2 177:20 things 7:12 20:21 22:10 24:12 30:23 36:17,18 48:7 51:17 52:3 59:1 59:17 60:12 61:20 64:1,8 65:14,21 67:4 67:7 77:24 78:18 80:6 83:19 87:18 91:17 92:21 93:9,9 93:20,21 99:22 102:22 104:10 106:20 110:6 121:20 124:18 135:18 190:4 193:4,12 think 7:23 11:3,3 12:13,17 13:22 17:11,22 18:19 19:15,18,21 20:12 23:23,24 30:6 39:12 39:13 42:23 44:4 46:14,20 47:8 48:11 50:10 54:24,25 56:3 56:11,22 61:16,17,19 63:13 66:9 73:3,3 74:16 80:10 89:24 95:5 96:1 97:22,23 98:14 99:3 100:25 101:4 102:21 103:10 103:12,23,23 104:12 104:16,17,22,23,25 106:22 107:8 108:5,5
talking 19:8,12 24:1 47:4 54:14 59:16 67:20 94:14 96:16 98:7 121:24 122:1 126:12 169:8,10 171:3,9 174:5 180:16 187:19 188:12 189:6 talks 161:8 tape 17:19 126:6 198:3 taped 84:12 tapes 18:13 tapped 108:24 targeted 85:23 taught 60:19 63:20 teach 62:12 teaching 60:12 61:24 62:20 63:16,18 64:7 team 58:17,17,21 89:4 technical 70:23 83:16 92:4 technique 118:2 technological 138:22 technologies 67:20 108:8 134:22 technology	Ted 4:10 5:16 Telephone 3:15,19 4:6 tell 62:22 98:18 100:24 101:1 160:14,17 178:1 202:4 telling 15:5 tells 136:24,25 184:23 ten 7:23 77:15 tend 64:20 term 12:13,21 13:22 15:9 15:11,15 19:9 21:11 21:12 22:21 31:10 113:15,18 115:10,25 115:25 129:25 130:6 131:14,22 132:17,22 133:2,11 137:4,8,21 138:12 143:6,10,12 143:22 145:2 147:15 148:18,19 150:17,17 151:1 152:20 153:11 153:12 155:4,9 158:3 158:5 169:11 terminology		

108:16 109:21 110:10,20 112:11,13 117:2,5 120:4 121:10 130:15 131:25 132:8 132:17,21 133:15 138:25 145:21 147:12,17 148:5,16 149:5,5,15,16 150:1 150:23 151:20,22 152:6,23 153:3,18 155:2,14,14,14 156:5 156:11 157:7,7,12,13 159:19 163:2,6,16,18 164:6,11,12,18,18 165:2 166:17 167:19 167:19,24 168:13 170:21 171:11 176:5 177:13 178:2,9 181:8 181:9 182:15 191:17 195:7 196:19	52:25 71:20 tight 53:24 till 29:11 time 5:14 11:2 12:20 13:14 21:3 24:11 28:4,4 30:11 31:21 33:1 39:15 42:19 45:13 46:14,18 47:10,23,24 48:12,17 50:2 51:10 51:14 52:15,21 53:15 53:24,25 56:1 57:18 57:22 61:1,6 64:1,3,5 66:6 67:5,22 70:3,19 74:21 75:1,4 78:11 82:21 83:7,14,22 84:14,16,20,21,25 85:19 86:25 93:14 96:10 99:5,7 102:14 102:18 103:14 109:2 109:3,23 110:12 114:22 120:14 122:16 123:12 125:1 125:4 126:5 151:9 163:16 168:18,21 172:22 191:22 193:3 195:16 198:5,8 201:7 202:8 times 7:21 37:1 44:3,14 57:7 88:3,3 89:9 101:18 101:21 173:8 timing 86:22 title 75:16 115:10 183:8 today 5:16 8:15,25 10:20 19:12 24:1 28:7 34:4 38:25 40:11 43:4 47:5 57:18 86:4 91:7 99:23 114:22 169:8 198:16	Today's 5:14 told 55:15 59:3,3 63:21 65:5 73:21 106:18 109:21 110:1 top 32:14 101:3 166:19 171:25 tops 52:1 Toshiba 1:5 3:16 5:10,25 10:2 38:11,15,22,23 39:7 42:10 43:6,7,21 44:23 45:10 76:12 82:22 87:20 88:22 89:5,20,25 197:7 203:4 Toshiba's 171:19 Toshiba/Hynix 103:24 total 42:19 84:10 tour 67:16 track 29:14 44:5 102:9 trade 5:12 95:22,24 TRADEMARK 1:1 transcript 202:14 203:7,14,19 transfer 50:6 transferred 50:6 71:4 transform 31:21 transistor 22:24,24 25:22 68:14 136:3 138:14 184:6 189:14 196:11	transistors 21:22,22,25 22:2 26:1 26:9,21,22 27:6 32:13 135:24,25 136:8 137:2,4 138:15 138:24 140:2,3,15,21 146:17,20 147:3,5 150:11 162:8 182:25 195:17 196:15 transitioned 63:14 64:7 translation 80:5 TRIAL 1:3 tricks 26:11 tried 49:21,21 53:23 139:23 153:22 trim 94:8 trip 144:13,17,21 trouble 68:3 true 60:21 81:6 131:25 140:10 148:5 150:16 201:12 202:11 truth 202:5,5,6 try 53:21 93:6 101:1 trying 20:1 24:4 57:5 64:1 94:13 95:6,15 109:18 109:19 121:12,17 136:13 141:14 164:15 175:16 191:2 197:23 TTL 22:21 23:1,1,9,13 27:19,20 67:18 Tuesday
--	---	--	---

1:16 3:3 5:2	type	116:6 117:7 121:25	14:15,23 169:18
tunnel	16:19,24 18:5 19:17	130:6 132:9 134:8	172:21,22 173:3,11
161:10,15,16,25	24:21 31:1 33:3,21	138:1,21 139:9	173:12,18,19 183:1
162:11	34:1 57:3,16 87:2	140:19 141:4 145:22	190:6 200:20
tunneling	94:25 95:1 96:9,9	145:25 152:8 153:20	upgrade
161:21	100:7 117:15 121:23	155:25 157:3,9	79:3
turn	149:18 190:4 199:10	162:14 163:5 170:16	upper
34:8 63:7 135:24	199:14	170:17 186:8 188:1	139:18 184:15,15
136:1 137:2,3 140:1	types	understandable	upset
140:3,14,20 146:19	7:11 12:2,4,11,14,17	152:7	25:16
147:3,4 150:10	17:7 22:5 74:7 90:20	understanding	upstairs
182:24 183:20	92:15 102:22	19:24 37:3,12 40:21	50:9
188:22	typewriting	40:23 62:16 113:18	usage
turned	202:10	114:13 115:12 129:9	12:13 23:12 33:4,5,20
88:24 89:14	typical	129:13 134:9 146:5	56:7 57:4 132:25
turning	22:18,20 30:18 56:1,3	understands	use
141:6,6	77:8	13:14 15:18 17:12	3:2 21:12,25 22:1,12
turns	typically	105:12 154:8	22:18,20 24:13 26:4
79:25 146:17	21:18 104:5	understood	26:6,11 27:2 30:18
tutelage	T5	13:22 15:21 113:15	30:18 32:21,22 33:9
90:19	84:4,8 85:22 87:16	129:15 132:12	56:1,3,23 79:24
TV		144:10 185:10	133:5 150:5 154:5
32:2 64:20,20	U	unique	158:19 170:13 178:1
twice	U	29:23 33:6,8,11 34:1	183:4 186:13 187:13
169:11 172:14 175:3	54:16	58:25 77:6 95:16	190:25 194:9,11,16
Twin	UCLA	150:6	196:22 197:10,16
84:8	45:22 46:6 47:10 48:3	unison	199:21 200:13,15,25
two	Uh-huh	112:4	useful
7:11 12:14 14:8 17:3	21:10	unit	157:9
18:14 25:20,23 28:16	Ultimately	55:3 82:25 83:3,4 84:2	user
32:3 44:4,14 62:8	71:22	85:12 86:9 87:23	33:2
70:11 84:1 85:16	ultraviolet	110:4,5,9	uses
86:23 89:19 91:12	18:11 55:3,13,16,20	United	30:20 57:22 118:1
92:21 93:4,25 102:21	55:22 68:4	1:1 2:12,14 5:11 9:13	154:6
102:22 104:14 132:1	unable	9:22	usually
132:1,11 133:16	116:6	units	18:6 29:2 52:22 53:12
135:22 137:19 147:6	unclear	84:10 85:16 87:15	78:17 91:18 92:21
148:9 153:23 166:17	21:2	university	93:5
170:24 171:2,14,15	underlying	3:4,18 5:18 45:18	Utah
171:16 177:15	32:11 72:18 73:21,24	46:18	50:7 112:5
180:23 182:21,22	111:12 113:11	unprogrammed	UV
183:4,6 187:2,25	118:24	94:9	55:10
190:13,15,19	understand	unreportable	UV-EPROM
two-word	10:1 13:7 20:12,25	92:25	18:10 56:9
195:21	75:25 89:19 114:8	unselected	UV-EPROMs

51:21 54:17,18	196:5,22 197:20,21	145:3,15 146:11	147:6,7,8,14,15,16
U.S	197:21	152:15 153:10,11	147:25,25 148:6,7,7
1:7 36:5 89:13	Vcc-type	158:9 161:23 167:8	148:8,14,18,19,24,25
V	28:10	169:21,25 170:5	149:1,1,7,10,11,22
v	Vdd	172:6 173:14,16	149:23 150:8,9,14,17
203:4	27:1 28:8	181:25 185:21	150:17,20,20 151:2,2
valley	VDPI	193:11 194:19 195:5	151:10,11,18,25
68:4 99:23	176:14 177:4,11,21	vitae	152:1,3,8,9,21,21
value	185:15,25 186:8,10	107:22	153:1,2,6,10,13,16
27:13 67:24 168:5	189:8,9,14,21 190:7	voice	153:21,21 154:9,14
175:3 176:19 178:20	vendor	5:20 67:7	154:14,15 155:2,3,17
178:21 179:11,15	87:12	vol	156:2,8,12,12,19,22
180:6 181:24 195:1,2	Ventures	147:4	156:24 157:10,12,16
values	1:8 4:2,10,11 6:2,4,6	volatile	157:17,20 158:5,7,8
137:23 168:6 171:14	6:12 10:4 203:4	16:4,8,17,19 17:3	158:12,14,18,25
174:15	version	28:13 34:5,10 35:16	159:1,2,6,8,10,14,23
variable	97:8,10 118:13	35:19 49:6 51:5 66:2	160:5,6,7,10,19,22
57:3	versus	81:2,5,14 90:25	161:4 162:3,6,13,24
variation	5:11 16:5 44:23 52:17	volt	162:24,25 163:10,11
171:4,9 186:6 187:12	59:18 61:2 71:12	138:24 144:7,8,20	163:11,23 164:3,5,6
varies	102:19 110:16	174:15,16 184:7	164:9,17,18,22,23
101:25 134:19,22	171:14	voltage	165:7,12,12,13 166:3
167:19	vertically	13:11,16,17,19,20,25	166:3,9,9,10,16,16
various	95:18	14:2,6,12,17,23,24	167:1,2,5,5,20,21
17:16 29:21 33:25	viable	15:12,13,25 16:1,2	169:11,15,17,25
41:3 96:18,18	157:9	26:10,22 27:8,19	170:1,2,6,8 171:5,6
vary	video	30:2 34:19,20 130:1	171:16 173:14,16
42:14,17 167:18	5:7,9,15,16,17 75:5	130:7,8,21,24,25	175:18,20 176:15,20
VBDI	126:3 198:7	131:1,11,15,20 132:2	177:5,22,25 178:6,17
177:13,14,15	Videographer	132:3,7,11,16,22	179:17,18,21,22,24
VBITH	4:10 5:7 6:13,22 74:25	133:2,6,6,8,11,13,13	180:2,9,10,10,20
176:11	75:3 125:3 126:3	133:17 134:3,6,13,14	181:3,7,13,17,25
Vcc	168:17,20 198:4,7	134:17,25 135:1,7,9	182:3,7,14,17,18,21
14:16 15:20,21,25	201:6	135:15,20,23,25,25	182:24 183:1,12,14
27:1,13 28:8 131:1,4	videotape	136:5,7,16,23 137:1	183:21,23 184:1,2,5
142:6 145:7,7 150:9	198:9	137:8,10,15,15,18	184:20,21 185:15,22
150:20 152:12,17	VIDEOTAPED	139:13,19,20,25	185:24 186:14,21,24
157:5,10,17 159:12	1:13	140:7,11,12,19,20	187:2,11,13 189:3,8
162:5,9 175:13,14,15	view	141:15,17,22 142:5	189:9,15,22,25 190:8
175:17 176:13,19	10:8,14 11:24 17:20	142:11,23,24 143:7	190:10 192:11
177:18 178:4,19	51:18 61:23 101:10	143:10,15,15,18	194:14,15 196:1,9,17
183:15,15,15,17,18	102:25 105:5 108:10	144:6,12,14,22,23	196:20 197:19
183:18 184:2,3,7,11	111:18 127:11	145:11,17,18,19	198:23,24,25 199:3,5
184:11,20,21 195:23	129:21 130:5,14,24	146:12,12,16,18,21	199:6,7,9,13,14,16
	137:22 139:18 144:9	146:22,24,25 147:2,4	199:19,21,23 200:6,9

200:10,20,21	VSL	49:20	126:9 168:23
voltages	179:12	wants	went
14:21 26:23 27:22	Vss	194:24	29:15,17 37:7,16
28:2,10,10 41:3	15:16,17,19 130:8,11	Washington	43:13,18 47:17 50:2
74:10 132:11 137:19	130:18 132:2,10	4:6	69:23 84:2,3,9 87:11
139:1,4 140:2,4,5	133:7,8 134:7 137:23	wasn't	96:1,7 97:22 101:17
145:8 153:14 154:12	138:2 139:20 150:20	27:23,24 52:18 57:13	103:22
157:19 158:21,25	152:12,17	61:16 64:4 65:22	weren't
159:21 162:1 167:12	VT	69:24 71:19 80:15,21	54:3 57:21 60:13
167:18 168:11 170:3	136:1,3	80:25 85:6 93:14	68:22 80:8 93:15
170:6,14,18,24 171:2	Vtn	101:16 123:9,9 174:5	174:5
172:3,4 173:19,24	184:3,4,5	waveform	Werner
174:1 178:2 180:25		86:24,25	4:3 6:3,3,9 168:14
181:21 183:5,18,19	W	waveforms	West
184:13,15 186:2	wacky	86:23	50:6 60:13 65:11
188:9 190:16 191:5	32:3	way	we'll
194:23 195:14,14,16	wafer	17:21,24 18:3 20:5	45:13 99:10,10
197:9,16,24	31:15,15 32:15 94:6	23:8 24:2,3 25:4	we're
volts	96:25 161:18	29:22 30:13 38:14,20	8:24
13:12,15 14:13,17	wafers	58:25 60:24 62:21,22	whichever
26:13,13,14 27:3,4	50:10,12 62:5,24 63:1	63:17 72:15 76:8	76:8
27:13 28:8,8 132:7,7	63:5,5	81:9 92:17 97:1	wife
145:12,20,24,24	wait	104:21 106:16	91:12,21,23
156:2 159:5 160:20	29:11 30:25	113:14 116:15,16	wire
161:22 162:5,9	walk	124:22 136:19 139:7	17:22
173:15,19 175:4,8,13	21:2 41:17 63:3	139:15 141:15	Wireless
176:1,14 177:12,18	wall	148:10,11 152:2	103:4
179:16,16,16,20,21	32:1	154:3 161:1 162:10	wish
179:24 180:2,4,11,13	want	163:9 165:13 182:12	203:13,13
181:1,16,21,22	17:9,9 20:3,25 21:2	184:12 195:19	within-entitled
182:11 183:12 184:8	27:2,21 41:14,25	196:15 197:12	202:6
189:7 196:9	55:25 63:7 74:24	199:15,18,23 202:20	witness
volume	76:8 89:22 92:17	ways	3:8,9 6:14,18 43:20
62:11	94:7 99:4 100:5	17:16 53:20 62:21	74:24 98:6,9,11,20
VPDI	114:3 151:10,11,13	75:19,25 77:5,6,6	98:23 99:1,6,12
177:15	160:14 167:25	114:17 122:17,18	103:20 109:25
VPI	174:20 179:2 186:23	199:24	113:25 115:17,21
177:21 196:20	187:14 188:5 190:7	weave	121:17 123:22 124:5
VPP	196:10,13,14,22	137:3	128:4 140:10 143:1
177:21 181:15 189:2	wanted	week	147:12 148:4 149:5
189:16 196:9	18:2 29:16 45:11 55:7	52:22	151:5,9,13,22 152:23
VPPI	56:14 67:8 149:8	Weitek	157:2,7 158:11 163:2
195:21	165:3 174:11 190:24	74:20 75:11,12 81:15	163:14 164:5,11
vs	191:14,14	82:4,7,22 86:16 89:9	167:10 168:15 170:5
1:7	wanting	Welcome	173:2 175:10 176:1

176:23 179:20 186:17 187:9,14,17 188:12,17 194:13 195:11 201:17 202:3 202:12 WL1 13:12 14:14 183:14 won 48:1 wor 131:15 word 13:12 14:3,7,13,18,23 14:25 15:14 25:20 39:8,11 115:24 118:25 131:15 132:23 133:13,15 142:21 147:8 151:12 151:13,17,24 152:5 154:8 155:4,9 156:13 157:23 159:3 169:18 170:13 172:22 173:3 173:12,19 180:18,21 180:22,24 181:4,13 182:5 183:1,13,13 189:1 195:22 200:20 200:22 words 25:20 72:12 113:19 130:16,16 133:16 147:14 148:9 149:15 163:7 166:8 170:12 184:1 187:4 work 7:14 25:24 26:1 30:7 32:10 42:10,15 43:6 43:19 44:12 46:3,9 46:10 47:21 48:4,8 48:21,23 51:8 53:6 53:11 54:20 60:5,8 60:11 61:2,6 62:14 63:13 64:14 66:5 71:17 73:14 74:3,14 77:18 82:3,6,25 86:11 87:8,13 89:1	90:12 91:2,7 92:4,11 92:12,15,23 93:12 97:10,13 99:19,20,21 100:10,10,11,17,18 101:3,6,12,20,23 102:12,20 103:20 105:20 108:4,22 110:16 112:2,3,6,7,9 112:10 114:17 120:6 120:19,21 121:21,23 122:2,11 145:9 154:2 159:8 162:10 167:24 180:12 181:22 186:10,11,15 199:7 worked 20:21 23:22 30:21,22 36:11 43:7 44:1,14 48:2,5 50:2,25 51:17 59:2 65:14,21 71:11 72:17 73:1,17,18 78:12 83:21 85:1,6 89:12,14,20 90:7 93:12 104:1 105:7,17 106:12,14,24 107:3 108:11,12,15 119:5 122:2,3 123:23 164:2 working 24:12 47:18 48:14 49:1 60:23 61:10 75:23 87:11 89:7,7 89:15,18 93:19 108:18,21 111:21,25 112:16,19 113:4,22 114:14 115:14 118:10,11,18 120:2 120:10 126:16,20 127:8,16,24,25 works 63:22 91:16,16 109:7 workstation 85:25 work/study 47:19 world 33:10 61:18 68:18	96:11,11 150:4 worthless 162:17 wouldn't 24:16,20 34:2,4 38:25 87:13 116:2 140:16 140:17 142:13 145:23 148:2,13 149:20 155:22 184:12 191:5 196:22 wrapped 68:11 wrapper 68:12 Wright 4:4 6:10 write 18:3,19 57:15 190:5 write/erase 123:16 writing 144:3 written 18:10 56:24 57:1 77:5 139:2 141:20 147:18 150:19 161:1 168:4 190:20 wrong 61:20 93:6 95:5 wrote 61:22 68:24 78:17,18 117:8,13 142:18 150:25 X X 202:14 Y yeah 18:25 27:11,12 29:7 32:23,23 35:18 38:7 43:22 44:2 45:9,12 51:3,12,13 58:25 59:5 60:23 64:12 70:11 71:20 82:2	83:9 84:22 85:4 88:18 90:4 92:9 96:15 98:18 99:6,9 99:18,18 100:15 104:17 105:16 107:20 109:7 110:20 124:19 141:13 151:20 155:14 168:15 173:5 184:16 188:17 200:1 year 47:20,20 57:9 93:4,5 102:18,21 103:1 years 17:15 46:16 47:21 77:25 92:10 93:1 95:4,15 98:21 107:23 108:4,6,11,13,15,17 108:24,25 110:13 111:20,24 112:13 115:14 118:18 120:1 120:9,13 127:14,15 128:4 York 3:14 4:5 Y-M 85:18 Y-MP 85:18 Z zero 69:23 143:17 189:7 \$ \$3 85:20 \$90,000 85:21 0 0 133:18 01 132:7 029
--	---	--	--

10:12,14	100,000	162:6 183:12	190:9
04	123:16	16	2Vn
173:2	1006	130:2,3 131:12 134:15	184:3
045	41:21,21	137:11 171:24	2Vtn
10:2,11,15 13:1,23,24	10169	17	183:15,18 184:7,11,20
15:9 19:11 37:14	3:14	1:16 3:3 5:2 130:22	2x
39:20,24 40:9,17	107	134:18 141:23 179:7	78:22
111:4,8,10 113:17	3:5	179:8 191:24 203:7	2:15
114:4 115:10,13	11	17th	126:1,5
127:5 129:5 130:7	2:9 8:16,17,20 171:21	5:14	20
134:23,24 139:15	171:22 185:5	18	13:12,15 14:13,17
160:16 169:3 172:3	11:12	153:6 176:3,9 179:7	23:8 52:1,21 53:3
172:14,24 173:7	75:1	192:1 193:7,7 200:5	56:11 145:20 156:2
180:14 181:11 183:4	11:32	19	159:5 160:20 161:22
195:7,12 197:2,14	75:4	193:7	162:6 176:2,6 178:11
	1100	1974	181:1,16 193:7 196:9
1	4:5	45:20 48:13 109:6	2000
5:9 10:15 14:1,19	12	1976	3:4,18 5:18
40:17,24 41:12 44:21	2:11 9:2,3,6 11:12,13	45:24	2005
44:25 45:3 103:14	20:19 27:23,24,24	1978	4:6
123:24 132:7 135:21	48:24,25 69:24 154:1	48:13 49:13	2013
139:17,25 144:7	173:15,22 174:15	198	109:1,6
161:13 169:7 172:4	175:8,13 177:12	2:4	2014
177:7,21 181:11	179:16,16,20,21	1980s	1:16 3:3 5:2,14 201:14
182:23 185:1 189:7	180:4,11,13 181:22	18:24	202:23 203:1,7
192:15,25 200:16,19	182:11 183:12 185:6	1982	2014-00113
1a	12-volt	49:14 54:9 58:1	5:13
192:25 193:1	154:3 175:3,6 178:20	1983	206.371.2600
10	179:11 180:6,17	58:2 66:17 73:15	4:6
2:8 8:5,6,9 39:16,23	181:24	1984	21
40:8,10 50:3 84:10	12:47	47:8 72:5 119:24	178:11 193:7,22,23
138:6 161:11 173:19	125:4	120:1,8	212.351.3402
173:22 174:16 175:4	126	1989	3:15
176:1,14 178:19	2:3	66:18 73:16 75:14	22
179:16,24 180:2,4	13	1992	11:14,15 161:7 193:20
181:21 183:24	2:12 9:8,9,12 129:3	75:14 82:16	193:23,24 194:2,17
10th	135	1998	22A
144:19 145:8,8	203:9	82:17 100:21	185:12 192:2,5,12
10,000	14		193:6,14,23
62:5	2:14 9:17,18,21	2	23
10-volt	15	38:2,3,7 75:5 82:11	187:23 192:21 193:5
176:18 178:20	13:11,15 14:13,17	93:15 104:2 105:21	193:23 196:5 197:12
100	27:22 52:2 58:19,21	107:11 123:24	23A
110:19,21	145:20,24,24 156:2	183:20,21,22 189:8	185:12 188:22 193:16
	159:5 160:20 161:21		193:19 194:6,11,16

195:14,20	107:23 108:4,6,11,13	27:17,18 40:14 44:18	1:24 202:25 203:18
23C	108:15,17,24,25	45:11 107:11,21	
189:12		161:15 162:5,6 184:7	7
230	4	184:8	7
3:14	4	5,297,029	13:9 14:11 20:20
24	10:15 14:5,5 15:2	2:14 9:23 10:5	26:14 28:8 130:1
185:5 188:16	39:15 40:17,24 41:12	5-volt	135:10 156:16
25	110:24 139:17 172:4	178:4	160:21 161:7
202:23 203:1	185:1	50	7/10ths
256	4k	17:15 42:24 43:2	184:6
29:20	60:18	132:8 183:8	70s
26	4th	50/50	22:25 30:22 33:20
13:9 14:11 156:16	203:9	102:14	34:2
177:1,2	4-inch	500-megahertz	72
27	50:10	84:15	7:17 203:3
160:21	4-T	512	75
29	49:25	29:20	28:8 161:18
35:22	4:38		76
	198:5	6	31:3
3	4:53	6	77
20:20 82:11 126:6	198:8	2:3 42:1 128:11,13	31:4
3-gigahertz	4:57	161:15 183:7 184:23	78
99:25	201:7,9	197:18	51:16
3.3	40	6,058,045	8
162:9	46:16 61:6 83:16	1:7 2:13 9:14 10:3	8
3.6	110:13	36:6	8
184:8	41	60	2:8,10 26:14 110:23
3:24	169:12 170:1 171:6	61:5 63:14 83:15	126:13 200:3
168:18	182:23	60s	8.5
3:47	415	23:1	161:11
168:21	203:9	60,000	80
30	42.104(a)	63:5	161:18
23:9 203:10,11	39:7	60-odd	80s
30(e)	450	17:15	22:25 33:21
203:10	42:13	60/40	82
30,000	48	83:15	51:16
50:12,12	169:13 170:2 171:7	64k	89
34	182:23 183:8	60:18 61:10	120:6
135:10	486	64k-SRAM	9
357-4300	78:12,21	58:6	9
203:10	486-compatible	65-nanometer	9
37	97:25	94:2	2:11,13,14 48:24,25
39:6	5	650.833.2433	110:23 111:2 113:3
39	26:13,13 27:3,13,16	3:19	114:12,13 117:9,14
		6948	126:13,19 127:3,19
			9:31

3:3 5:3,15 90,000 50:10 63:4 94105 203:9 94303 3:19 94303-2214 3:5 95030 7:18 203:3 96 153:19,19			
--	--	--	--