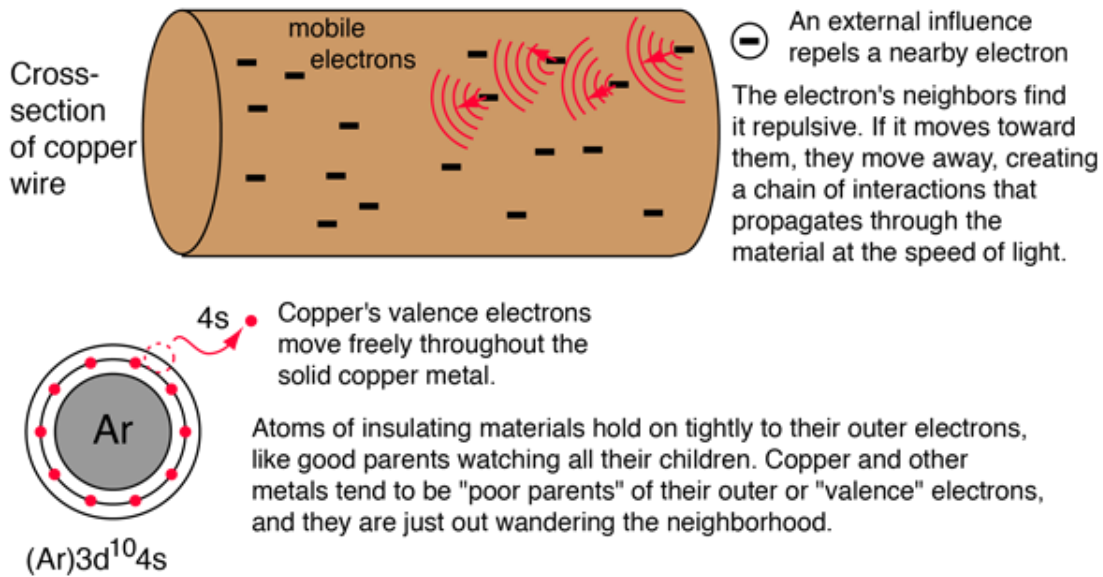


Conductors and Insulators


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In a conductor, electric current can flow freely, in an [insulator](#) it cannot. Metals such as copper typify conductors, while most non-metallic solids are said to be good insulators, having extremely high resistance to the flow of charge through them. "Conductor" implies that the [outer electrons](#) of the atoms are loosely bound and free to move through the material. Most atoms hold on to their electrons tightly and are insulators. In copper, the valence electrons are essentially free and strongly repel each other. Any external influence which moves one of them will cause a repulsion of other electrons which propagates, "domino fashion" through the conductor.

Simply stated, most [metals](#) are good electrical conductors, most nonmetals are not. Metals are also generally good [heat conductors](#) while nonmetals are not.

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Insulators

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Most solid materials are classified as insulators because they offer very large [resistance](#) to the flow of electric [current](#). Metals are classified as [conductors](#) because their [outer electrons](#) are not tightly bound, but in most materials even the outermost electrons are so tightly

bound that there is essentially zero electron flow through them with ordinary [voltages](#). Some materials are particularly good insulators and can be characterized by their high [resistivities](#):

	Resistivity (ohm m)
Glass	10^{12}
Mica	9×10^{13}
Quartz (fused)	5×10^{16}

This is compared to the resistivity of copper:

	Resistivity (ohm m)
Copper	1.7×10^{-8}

[Energy band model](#) [Dielectric insulators](#)

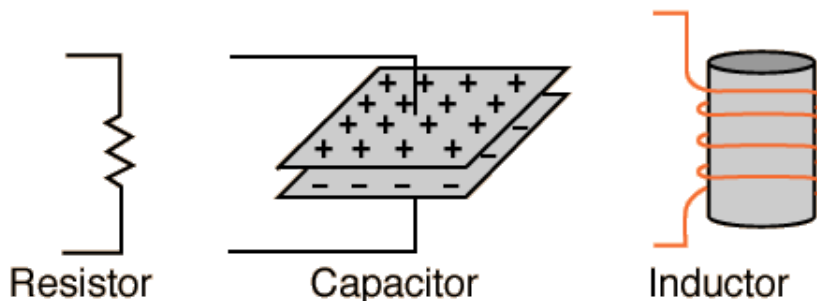
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Circuit Elements

[Electric circuits](#) are considered to be made up of localized circuit elements connected by [wires](#) which have essentially negligible resistance. The three basic circuit elements are [resistors](#), [capacitors](#), and [inductors](#). Only these passive elements will be considered here; active circuit elements are the subject of [electronics](#).



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