

Resistivity

Physics

The material property behind resistance, and what changes it.

Resistance is proportional to length and inversely proportional to cross-sectional area.

$$R = \rho L / A$$

Double the length

Double the resistance

Double the diameter

Area scales with r^2 .

Quarter the resistance

Temperature rise, metal

More lattice vibration.

Resistivity increases

THE COMMON MISTAKE

✗ **Doubling diameter halves resistance**

✓ **It quarters it**

Area is proportional to the square of the radius, so doubling the diameter quadruples the area.

Semiconductors behave oppositely to metals: resistivity falls with temperature, because more charge carriers are freed.