

**4.47** A  $4 \times 10^{-3}$ -mm-thick square sheet of aluminum has  $5 \text{ cm} \times 5 \text{ cm}$  faces. Find the following:

- (a) The resistance between opposite edges on a square face.
- (b) The resistance between the two square faces. (See Appendix B for the electrical constants of materials.)

**Solution:**

(a)

$$R = \frac{l}{\sigma A}.$$

For aluminum,  $\sigma = 3.5 \times 10^7 \text{ (S/m)}$  [Appendix B].

$$l = 5 \text{ cm}, \quad A = 5 \text{ cm} \times 4 \times 10^{-3} \text{ mm} = 20 \times 10^{-2} \times 10^{-6} = 2 \times 10^{-7} \text{ m}^2,$$

$$R = \frac{5 \times 10^{-2}}{3.5 \times 10^7 \times 2 \times 10^{-7}} = 7 \quad (\text{m}\Omega).$$

(b) Now,  $l = 4 \times 10^{-3} \text{ mm}$  and  $A = 5 \text{ cm} \times 5 \text{ cm} = 2.5 \times 10^{-3} \text{ m}^2$ .

$$R = \frac{4 \times 10^{-6}}{3.5 \times 10^7 \times 2.5 \times 10^{-3}} = 45.6 \text{ p}\Omega.$$

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