rms current

the value of alternating current that gives the same heating effect that the corresponding value of direct current does

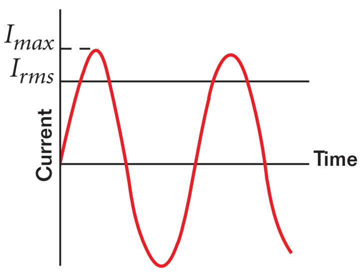

Figure 16
The rms current is a little more than two-thirds as large as the maximum current.

An important measure of the current in an ac circuit is the **rms current.** The rms (or *root-mean-square*) current is the same as the amount of direct current that would dissipate the same energy in a resistor as is dissipated by the instantaneous alternating current over a complete cycle.

Figure 16 shows a graph in which instantaneous and rms currents are compared. **Table 2** summarizes the notations used in this chapter for these and other ac quantities.

The equation for the average power dissipated in an ac circuit has the same form as the equation for power dissipated in a dc circuit except that the dc current I is replaced by the rms current (I_{rms}).

$$P = (I_{rms})^2 R$$

This equation is identical in form to the one for direct current. However, the power dissipated in the ac circuit equals half the power dissipated in a dc circuit when the dc current equals I_{max}.

$$P = (I_{rms})^2 R = \tfrac{1}{2}(I_{max})^2 R$$

From this equation you may note that the rms current is related to the maximum value of the alternating current by the following equation:

$$(I_{rms})^2 = \frac{(I_{max})^2}{2}$$

$$I_{rms} = \frac{I_{max}}{\sqrt{2}} = 0.707\ I_{max}$$

This equation says that an alternating current with a maximum value of 5 A produces the same heating effect in a resistor as a direct current of $(5/\sqrt{2})$ A, or about 3.5 A.

Alternating emfs are also best discussed in terms of their rms values, with the relationship between rms and maximum values analogous to the one for currents. The rms and maximum values are related as follows:

$$\Delta V_{rms} = \frac{\Delta V_{max}}{\sqrt{2}} = 0.707\ V_{max}$$

Table 2 Notation Used for ac Circuits

	Induced or Applied emf	Current
Instantaneous values	Δv	i
Maximum values	ΔV_{max}	I_{max}
rms values	$\Delta V_{rms} = \frac{\Delta V_{max}}{\sqrt{2}}$	$I_{rms} = \frac{I_{max}}{\sqrt{2}}$