Expression for voltage amplitude in resistor in ac

$$V_R = IR$$

Derivation of instantaneous voltage in resistor in ac

$$\begin{aligned} i &= I\cos(\omega t) \\ v_R &= iR \\ v_R &= I\cos(\omega t)R \\ v_R &= V_R\cos(\omega t) \end{aligned}$$

Expression of instantaneous voltage in resistor in ac

$$v_R = v_R \cos \omega t$$

Relation of voltage and current in resistor in ac

Voltage and current are in phase

Graphical representation of voltage and current in resistor in ac

[Illustration Missing]

Same position of crest and trough in x axis of voltage and current

Phasor diagram of voltage and current in resistor in ac

[Illustration Missing]

Voltage and current overlap