VOLTAGE, CHARGE AND CURRENT

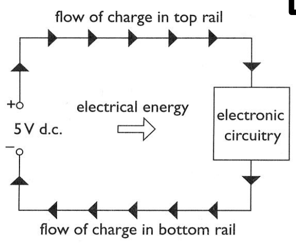


Figure 1.1 Power supply arrangements for a typical electronic system.

$R = \frac{V}{I}$ — R is the resistance in ohms (Ω); V is the voltage drop in volts (V); I is the current in amps (A)

$P = VI$ — P is power in watts (W); V is voltage drop in volts (V); I is current in amps (A)

$$\text{current (in amps)} = \frac{\text{charge transferred (in coulombs)}}{\text{time taken (in seconds)}}$$

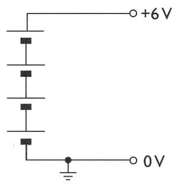


Figure 1.2 Using a battery of four 1.5 V cells to make a 6 V d.c. supply.

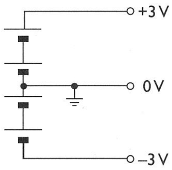


Figure 1.3 Split supply rails; note the use of an earth connection to fix 0 V.

$f = \frac{1}{T}$ — f is the frequency in hertz (Hz); T is the period in seconds (s)

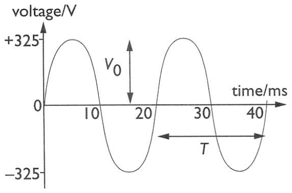
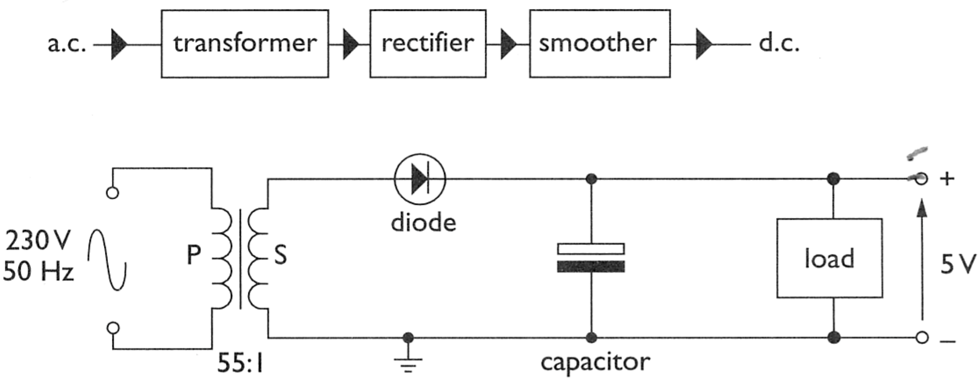


Figure 1.5 A voltage–time graph for a typical mains alternating voltage.

MAINS POWER SUPPLIES

Figure 1.7 Block and circuit diagrams for a simple smoothed power supply.



$$\frac{\text{primary voltage}}{\text{secondary voltage}} = \frac{\text{primary coils}}{\text{secondary coils}}$$

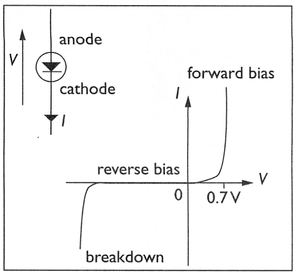


Figure 1.8 The *I*–*V* characteristic for a silicon diode.

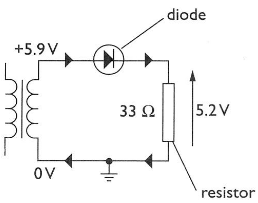


Figure 1.9 There is a current in the diode when it is forward biased.

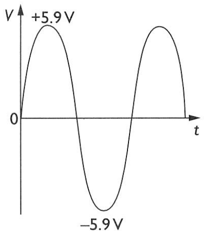


Figure 1.11 The voltage at the anode of the diode goes both positive and negative.

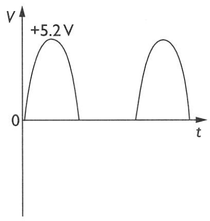


Figure 1.12 The voltage at the cathode is only positive or zero.

$V_r = \frac{It}{C}$ — V_r is the ripple voltage (V); I is current in the load (A); t is the period of the rectified signal (s); C is the capacitance of the capacitor (F)

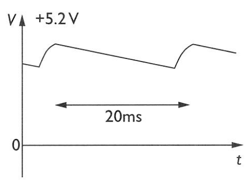


Figure 1.15 The voltage across the load fluctuates up and down as the capacitor charges and discharges.

$I = \frac{Q}{t}$ — I is current in amps (A); Q is charge in coulombs (C); t is time in seconds (s)

$$V_0 = \sqrt{2} \times V_{rms}$$