

It should be noted that the α_{\max} must be kept below 50%, so that when the transformer voltage is clamped through the tertiary winding, the integral of the volt-seconds between the input voltage, when Q_1 is ON, and the clamping level, when Q_1 is OFF, amounts to zero. Duty cycles above 50 per cent, will upset the volt-seconds balance, driving the transformer into saturation, which in turn produces high collector current spikes that may destroy the switching transistor.

Also, care must be taken during construction to couple the tertiary winding tightly to the primary (bifilar wound) to eliminate fatal voltage spikes caused by leakage inductance.

16.3.2.2 Two-Transistor Forward Converters

Figure 16.15(a) shows the circuit diagram of the two-transistor forward converter, and the associated waveforms are shown in Fig. 16.15(b). This configuration reduces the voltage ratings of the transistor to $E_{dc(max)}$ instead of $2 E_{dc(max)}$ (Single-ended configuration). The circuits operate as follows:

(i) Mode I (Q_1 , Q_2 and D_3 ON): At $t = 0$, transistors Q_1 and Q_2 are turned on simultaneously. The supply voltage E_{dc} is connected across the primary winding. The primary current starts increasing linearly from I_{\min} to $I_{\max} + I_{mg}$, where I_{mg} is the magnetizing component shown by shaded area in the primary current waveform. Due to the specific winding directions, the induced voltage in the tertiary winding will reverse bias diode D_m and the induced voltage in the secondary winding will forward bias the rectifying diode D_3 . The secondary will deliver power to the inductance L , capacitor C and the load as shown in Fig. 16.15(b).

(ii) Mode II (Q_1 , Q_2 , OFF and D_4 , D_m): At $t = t_1$, both the transistors Q_1 and Q_2 are turned-off simultaneously. Due to the sudden interruption of primary current, the induced voltage across the primary winding will change its polarities as shown in Fig. 16.15(b). This voltage will forward bias the diodes D_1 , D_2 and they will clamp the primary voltage to E_{dc} volts.

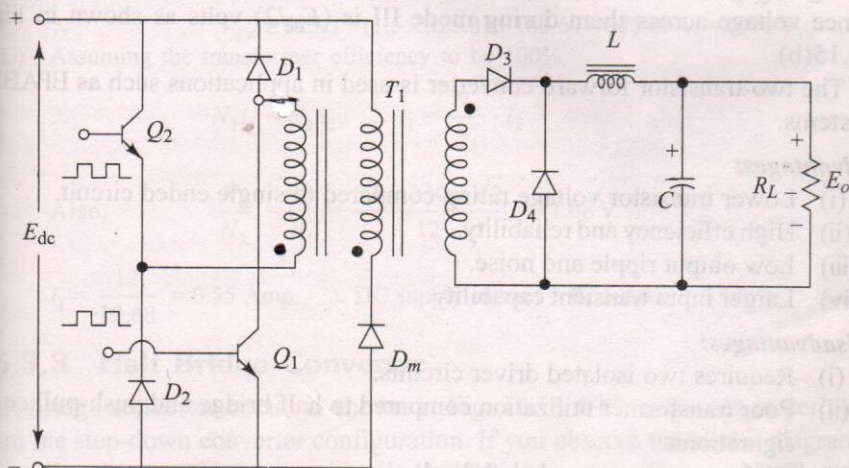


Fig. 16.15(a) Two-transistor forward converter