CORE SELECTION

Table 2 shows which core type could be considered suitable for the different types of converter design.

The power-handling capability of a given core is determined by frequency and material grade, its geometry and available winding area, and by other factors which depend on the specific application.

Table 2 Converter design selection chart (II)

FUNCTION	TYPE OF CONVERTER CIRCUIT(1)		
	FLYBACK	FORWARD	PUSH-PULL
E cores	+	+	0
Planar E cores	–	+	0
EFD cores	–	+	+
ETD cores	0	+	+
ER cores	0	+	+
U cores	+	0	0
RM cores	0	+	0
EP cores	–	+	0
P cores	–	+	0
Ring cores	–	+	+

Note

1. '+' = favourable; '0' = average; '–' = unfavourable.

Operating frequency

The preferred operating frequency of a Switched Mode Power Supply is greater than 20 kHz to avoid audible noise from the transformer. With modern power ferrites the practical upper limit has shifted to well over 1 MHz.

Ambient temperature

Ambient temperature, together with the maximum core temperature, determines the maximum temperature rise, which in turn fixes the permissible total power dissipation in the transformer. Normally, a maximum ambient temperature of 60 °C has been assumed. This allows a 40 °C temperature rise from the ambient to the centre of the transformer for a maximum core temperature of 100 °C. There is a tendency however towards higher temperatures to increase power throughput densities. Our new material 3C93 meets these increased temperature requirements with a loss minimum around 140 °C

Flux density

To avoid saturation in the cores the flux density in the minimum cross-section must not exceed the saturation flux density of the material at 100 °C. The allowable total flux is the product of this flux density and the minimum core area and must not be exceeded even under transient conditions, that is, when a load is suddenly applied at the power supply output, and maximum duty factor occurs together with maximum supply voltage. Under steady-state conditions, where maximum duty factor occurs with minimum supply voltage, the flux is reduced from its absolute maximum permissible value by the ratio of the minimum to maximum supply voltage (at all higher supply voltages the voltage control loop reduces the duty factor and keeps the steady-state flux constant).
The minimum to maximum supply voltage ratio is normally taken as 1 : 1.72 for most applications.