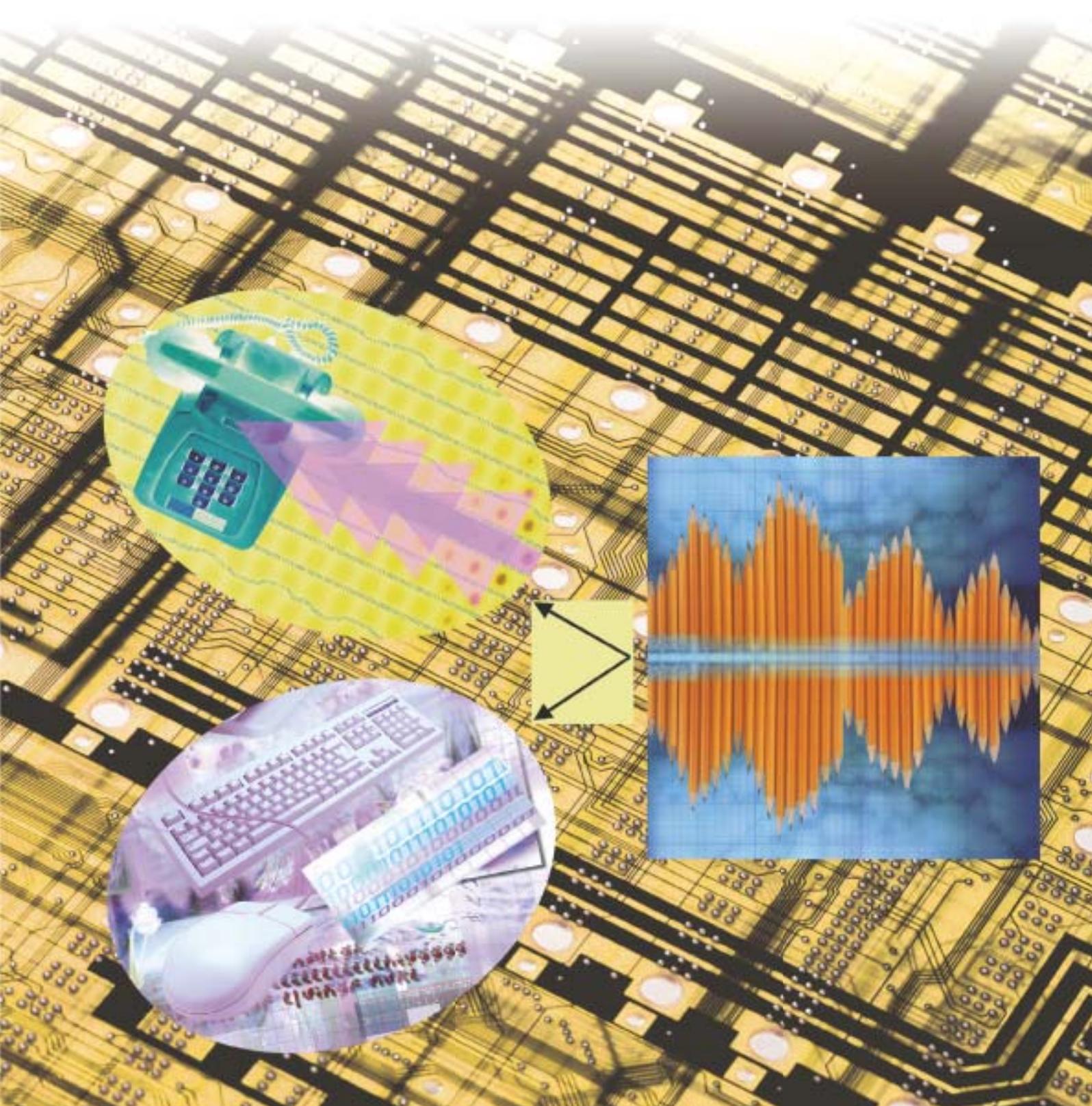


3B46

The new high permeability filter ferrite for bias current conditions



3B46 - The new standard for filtering with bias current

FERROXCUBE drives towards higher bias current capabilities in filter inductors with the new material 3B46. In part of the filter applications there is no bias current. In such case, all effort can be put in intrinsic properties that determine the frequency response : high permeability for low frequency effectiveness, good linearity for low distortion and high Q for sharply defined pass bands. In a gapped core the high permeability still improves the linearity and high Q through shearing of the hysteresis loop. The presence of a bias current requires also higher saturation flux density to avoid inductance loss and shift in frequency response. A typical example is a POTS splitter inductor that must show high inductance while carrying the supply current of up to 200 mA. Necessarily, power materials were applied which are not ideal for the frequency response.

FERROXCUBE has now introduced the high permeability filter material 3B46

for filter applications with bias current. It has a higher Curie temperature than other filter materials and considerably higher than materials with comparable initial permeability. As a result, the saturation flux density is higher, especially at elevated temperatures. Meanwhile, permeability is much higher than for other power materials.

Bias current performance

In the graph of incremental permeability, the current carrying capability of 3B46 is shown.

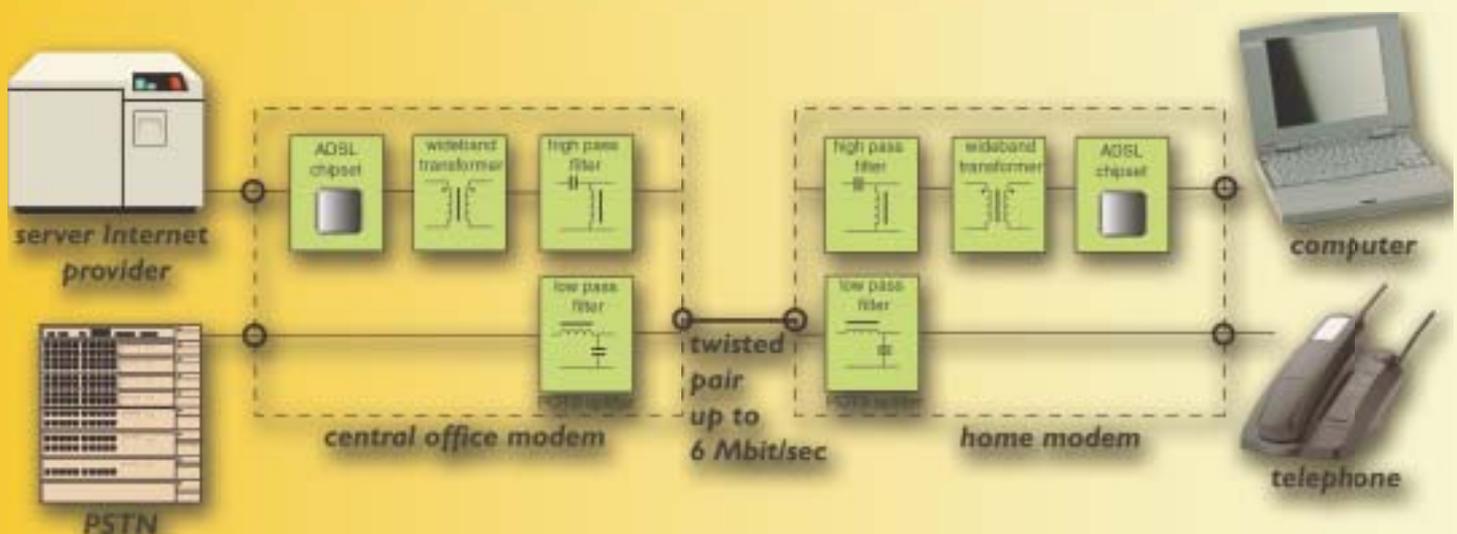
The magnetic field strength H is proportional to the current I and the applicable permeability μ_{Δ} is proportional to the inductance L . Compared with regular high permeability materials with the same initial permeability the threshold current has clearly improved. This relates to an optimised raw material composition and improved technologies of material processing which enables Ferroxcube to control the desired properties over the

temperature range.

Preferred application :

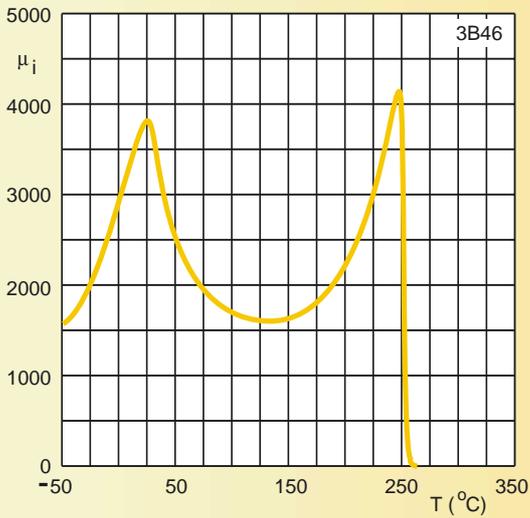
- POTS splitter in XDSL modem
- The low bandwidth of an analogue telephone channel requires a high inductance. Still there is a supply current of 100 mA. On top of this, reasonable linearity and low loss factor are required. A gapped core in the 3B46 grade can comply all these requirements in one and the same inductor..

POTS splitter function in XDSL application

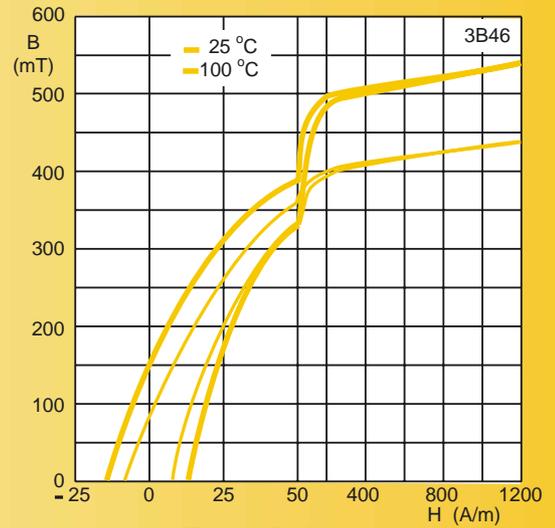


3B46 - Material Characteristics

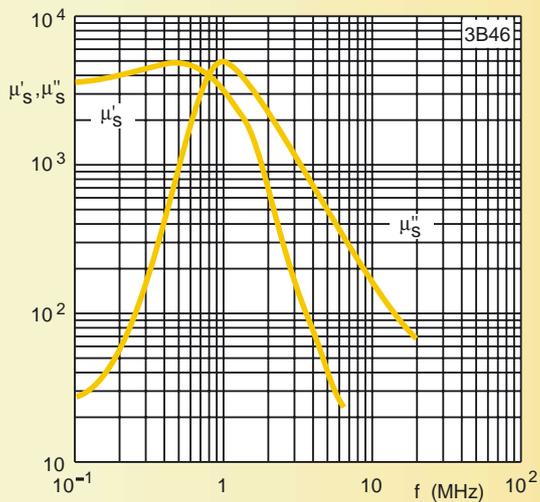
	CONDITIONS	VALUE	UNIT
μ_i	25 °C, ≤ 10 kHz, 0.1 mT	$3800 \pm 20 \%$	
B	25 °C, 10 kHz, 1200 A/m 100 °C, 10 kHz, 1200 A/m	≈ 545 ≈ 435	mT
$\text{tg}\delta/\mu$	25 °C, 10 kHz, 0.1 mT 25 °C, 100 kHz, 0.1 mT	≈ 0.6 ≈ 1.6	10^{-6}
η_B	25 °C, 10 kHz, 1.5–3.0 mT	≈ 0.12	$10^{-6}/\text{mT}$
α_F	5–25 °C, 10 kHz, 0.1 mT 25–55 °C, 10 kHz, 0.1 mT	≈ 4.4 ≈ -2.2	$10^{-6}/\text{K}$
ρ	DC, 25 °C	≈ 10	Ωm
T_C		≥ 255	°C
density		≈ 4800	kg/m^3



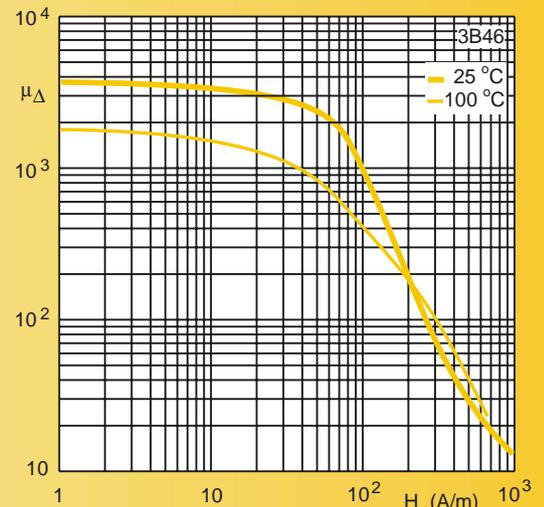
Initial permeability as a function of temperature



Typical B-H loops



Complex permeability as a function of frequency



Incremental permeability as a function of magnetic field strength