

Australia: Contact Ferroxcube Taiwan
Tel: +886 3 599 5886, Fax: +886 3 599 5882

Austria: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Benelux: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Bosnia: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

Brazil: Richardson Electronics, Sao Paulo
Tel: +55 11 5186 9672, Fax: +55 11 5186 9678

Canada east: Contact Ferroxcube, USA
Tel: +1 (915) 599 2328, Fax: +1 (915) 599 2555

China: Ferroxcube South of China
Tel: +86 769 87382420, Fax: +86 769 87339561
Ferroxcube Suzhou
Tel: +86 512 68095048, Fax: +86 512 68097128

Colombia: Richardson Electronics
Tel: +57 1 636 1028, Fax: +57 1 636 1005

Croatia: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

Czech Republic: Contact Ferroxcube Poland
Tel: +48 46 834 00 07, Fax: +48 46 834 00 35

Denmark: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Finland: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

France: Ferroxcube France, SURESNES
Tel: + 33 (0) 1 46 14 87 91, Fax: + 33 (0) 1 46 14 87 92

Germany: Ferroxcube Germany, HAMBURG
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Greece: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

Hungary: Contact Ferroxcube Poland
Tel: +48 46 834 00 07, Fax: +48 46 834 00 35

Indonesia: Contact Ferroxcube Singapore
Tel: +65 6244 7815, Fax: +65 6449 0446

Ireland: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Israel: Arrow/Rapac Ltd., PETACH TIKVA
Tel: +972 3 9203480, Fax: +972 3 9203443

Italy: Ferroxcube Italy, CINISELLO BALSAMO (MI)
Tel: +39 02 660454 69, Fax: +39 02 612917 39

Korea: Contact Ferroxcube Taiwan
Tel: +886 3 599 5886, Fax: +886 3 599 5882

Malaysia: Contact Ferroxcube Singapore
Tel: +65 6244 7815, Fax: +65 6449 0446

Mexico (excl. Baja): R.V. Componentes, Guadalajara, Mx
Tel: +52 (33) 31 65 55 70, Fax: +52 (33) 31 65 46 63

Mexico (Baja): Contact Ferroxcube USA
Tel: +1 619 207 0061, Fax: +1 619 207 0062

Montenegro: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

New Zealand: Contact Ferroxcube Taiwan
Tel: +886 3 599 5886, Fax: +886 3 599 5882

Norway: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Philippines: Contact Ferroxcube Singapore
Tel: +65 6244 7815, Fax: +65 6449 0446

Poland: Ferroxcube Polska, SKIERNIEWICE
Tel: +48 46 834 00 07, Fax: +48 46 834 00 35

Portugal: Contact Ferroxcube Hispano Ferritas S.A., SPAIN
Tel: +34 949 247 153, Fax: +34 949 247 146

Serbia: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

Singapore: Ferroxcube Singapore, SINGAPORE
Tel: +65 6244 7815, Fax: +65 6449 0446

Slovak Republic: Contact Ferroxcube Poland
Tel: +48 46 834 00 07, Fax: +48 46 834 00 35

Slovenia: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

South-Africa: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Spain: Ferroxcube Hispano Ferritas S.A., SPAIN
Tel: +34 949 247 153, Fax: +34 949 247 146

Sweden: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Switzerland: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

Taiwan: Ferroxcube Taiwan, HSINCHU
Tel: +886 3 599 5886, Fax: +886 3 599 5882

Turkey: Contact Ferroxcube Italy
Tel: +39 02 660454 69, Fax: +39 02 612917 39

United Kingdom: Contact Ferroxcube Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308

United States: Ferroxcube USA, EL PASO (TX)
Tel: +1 915 599 2328/2533, Fax: +1 915 599 2555

For all other countries apply to closest regional sales office:

• HAMBURG, Germany
Tel: +49 40 52728 302, Fax: +49 40 52728 308
e-mail: saleseurope@ferroxcube.com

• EL PASO (TX), USA
Tel: +1 915 599 2328/2533, Fax: +1 915 599 2555
e-mail: salesusa@ferroxcube.com

• HSINCHU, Taiwan
Tel: +886 3 599 5886, Fax: +886 3 599 5882
e-mail: salesasia@ferroxcube.com

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Run efficiently, run with
FERROXCUBE
all temperature ferrites

3 C 97

Extreme ferrites
for extreme conditions

3C97

FERROXCUBE's new all temperature power ferrite. 3C97

FERROXCUBE extends its all temperature power ferrite range with a new power material: 3C97. This new grade complements our well known 3C95 in the search for high efficiency power conversion, especially in applications where large variations in operating temperatures occur.

Power conversion systems provided with FERROXCUBE 3C97 will not only offer high power density and reduced volume, but also increased efficiency when used in harsh environment applications with high ambient temperatures and wide temperature fluctuations.

Losses in power conversion systems based on ferrite transformers are mainly a consequence of copper windings and ferrite core losses themselves. Regarding the ferrite core losses, these are mainly determined by the magnetic flux density, frequency and by the operating temperature. Designers, by calculating such losses, predict transformer temperature rise at a determinate loading rate, then choosing the most appropriate conventional ferrite material minimize losses at the expected operating temperature.

FERROXCUBE, as the leading manufacturer in the ferrite industry, has been providing to the power conversion industry ferrite cores with the lowest power losses and highest saturation magnetic flux density over a wide range of operating frequencies (20KHz - 10MHz). This has allowed us to support today's manufacturers of power conversion systems in their drive for greater miniaturization, lower weight and reduced power consumption in applications where the temperature rise and maximum achievable temperature can be estimated.

However, in the last years countless power conversion applications, for

which a narrow operating temperature range cannot be assumed, are arising. Some examples are:

- Outdoors Solar inverters, Power-charging systems for electric vehicles.
- DC/DC converters for electric and hybrid cars, automotive electronics in general.
- Rugged systems suited to railway, heavy industry as well as others applications in adverse environments.

In the same way, since winding losses depend on the square of the current, power transformers efficiency varies depending on how much power is being given off. At reduced loads, the contribution of winding losses to the temperature rise of the transformer is minimum and since typical transformer designs are directed to minimize losses at steady state under full load, conventional ferrite materials will be out of their optimum loss point being the main cause for transformers reduced efficiency at low loads or stand-by states.

FERROXCUBE's all temperature power ferrite range will make the design of true high energy-efficient products possible, since the transformer will keep the industry's lowest loss levels independently of environmental temperature and loading.

New 3C97 power material is characterized by a flat Power density vs. Temperature curve between 60°C and 140°C achieving an improved efficiency over 3C95 in this temperature range.

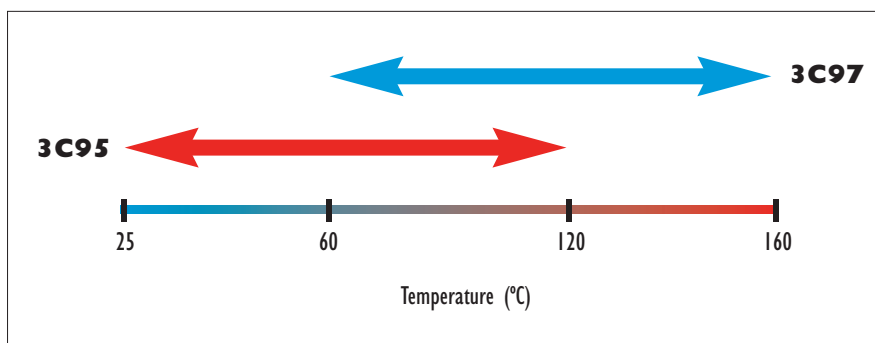


Figure 1. Recommended operating temperature for FERROXCUBE's all temperature power ferrites.

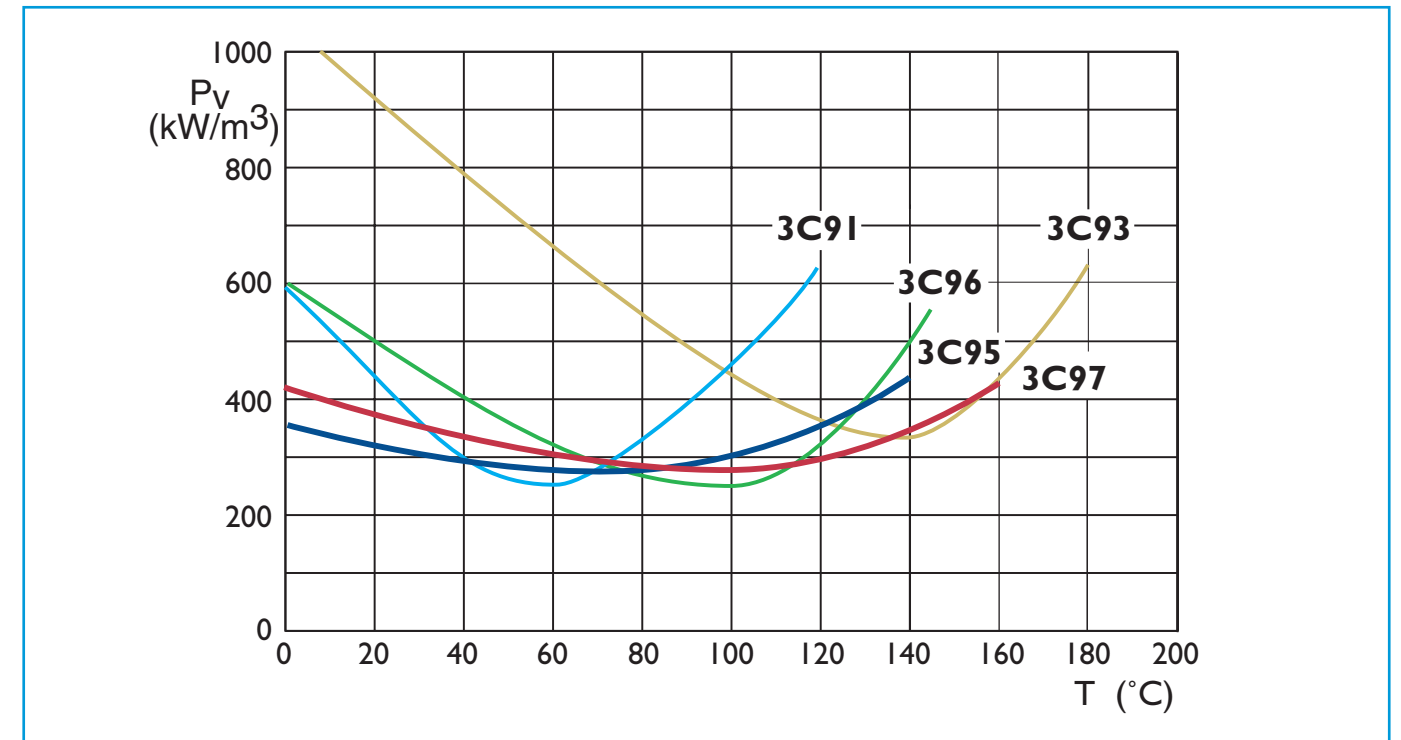


Figure 2. Loss density (100 kHz, 200mT) versus temperature for FXC's conventional power materials and new all temperature power ferrites (3C95, 3C97).

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤ 10 kHz; 0,25 mT	$3000 \pm 20\%$	
μ_a	100 °C; 25 kHz; 200 mT	≈ 5000	
B	25 °C; 10 kHz; 1200 A/m	≈ 530	mT
	100 °C; 10 kHz; 1200 A/m	≈ 410	
P_v	60 °C; 100 kHz; 200 mT	≈ 320	kW/m³
	120 °C; 100 kHz; 200 mT	≈ 320	
	140 °C; 100 kHz; 200 mT	≈ 380	
ρ	DC, 25 °C	≈ 5	Ωm
T_c		≥ 215	°C
density		≈ 4800	kg/m³

Figure 3. Material Characteristics.

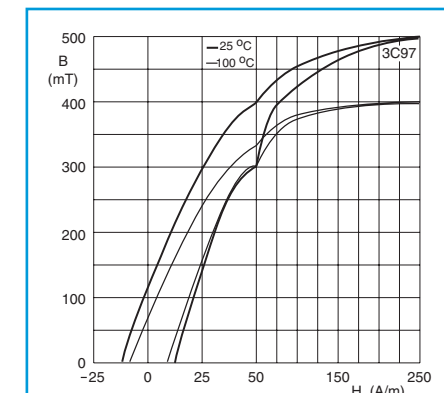


Figure 4. Typical B-H loops

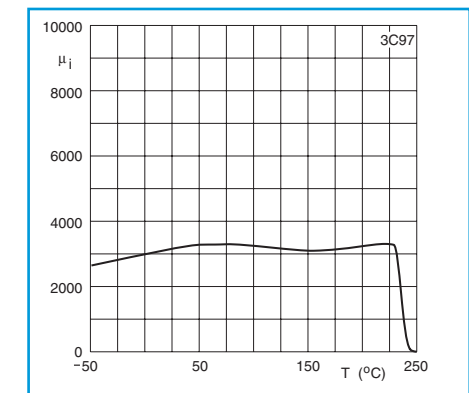


Figure 5. Initial permeability as function of temperature

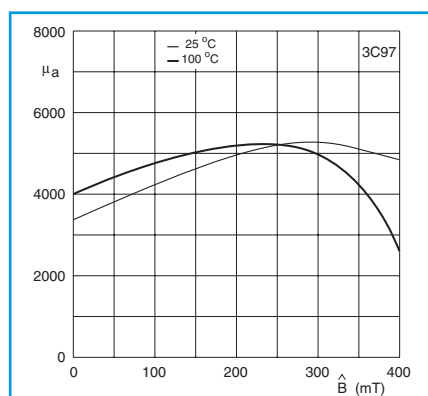


Figure 6. Amplitude permeability as function of peak flux density

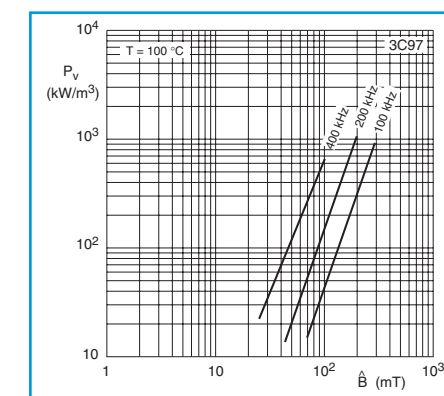


Figure 7. Specific power loss as function of peak flux density with frequency as a parameter

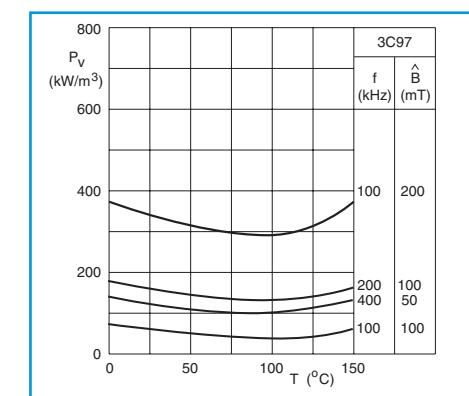


Figure 8. Specific power losses for several frequency/flux density combinations as a function of temperature