EPCOS

# Ferrites

## Innovations in Power Materials

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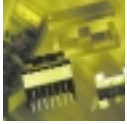


# Power Material N97

New Level of Power Density

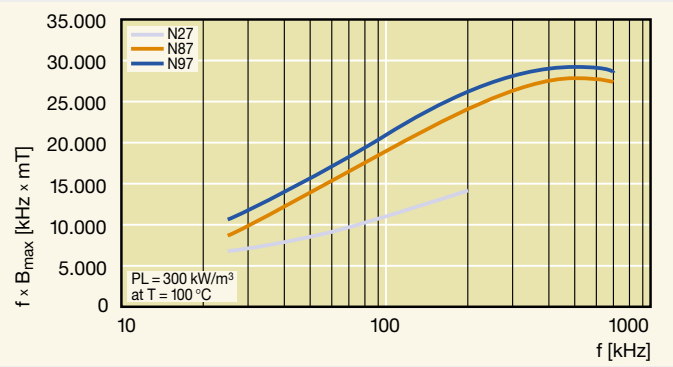
## Innovations in power materials

Thanks to the very low power dissipation of the new N97 ferrite material developed by EPCOS for power applications, transformers can now be designed with highest power density. The performance factor (f × B), which is proportional to the throughput power, is 10% higher at 100 kHz than that of the standard high-performance power material N87. Saturation is 5% higher than in material N87. Transformers with higher flux swings $\Delta B_{ac}$ or output chokes with higher DC currents can thus be designed. Therefore it is possible to design transformers with higher flux swing $\Delta B_{ac}$ or output chokes with higher DC currents.

## Features and core shapes

- Typical core loss of 300 kW/m³ at 100 kHz, 200 mT, 100 °C
- Minimum core loss around 100 °C
- Frequency range up to 500 kHz
- Saturation of 410 mT at 100 °C
- Special core shapes for power applications

## Performance factor vs. frequency

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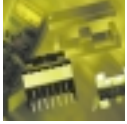


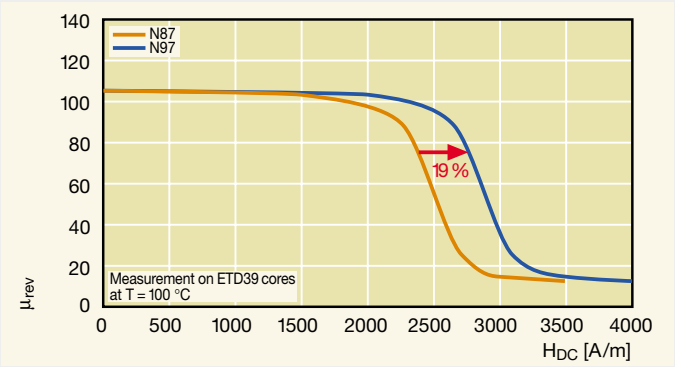
# Power Material N97

New Level of Power Density

## Material data

| | | | | |
|---|---|---|---|---|
| **Initial permeability** | 25 °C | $\mu_i$ | | 2300 ± 25% |
| **Flux density, dyn.** | 25 °C | $B_{max}$ | [mT] | 510 |
| **10 kHz, 1200 A/m** | 100 °C | $B_{max}$ | [mT] | 410 |
| **Coercive field strength** | 25 °C | $H_C$ | [A/m] | 21 |
| **f=10 kHz** | 100 °C | $H_C$ | [A/m] | 12 |
| **Curie temperature** | | $T_C$ | [°C] | >230 |
| **Relative core losses** | | $P_V$ | | |
| | 100 °C | 25 kHz 200 mT | [kW/m³] | 45 |
| | 100 °C | 100 kHz 200 mT | [kW/m³] | 300 |
| | 100 °C | 300 kHz 100 mT | [kW/m³] | 340 |
| | 100 °C | 500 kHz 50 mT | [kW/m³] | 205 |
| **Resistivity** | | ρ | [Ωm] | 8 |
| **Density** | | | [kg/m³] | 4920 |

## Reversible permeability vs. DC magnetic field

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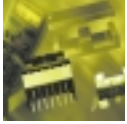


# Power Material N92

Pushing the Limits in Saturation

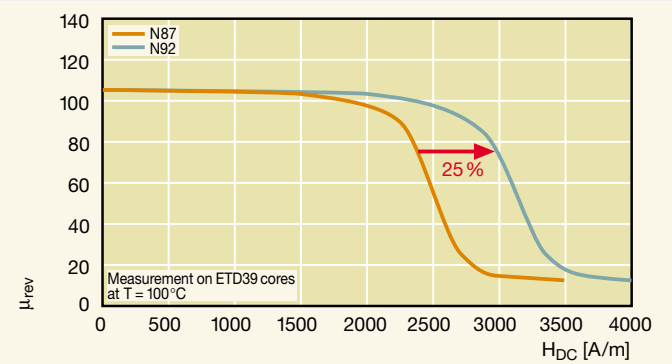
## Innovations in power materials

Ferrite material N92 meets the demand for increased output currents. With N92 it is possible to increase the rated current of output chokes by 25% against N87. At the same time the losses at 100 °C are comparable to N87.

## Features and typical core shapes

- Saturation of 440 mT at 100 °C
- Typical core loss of 410 kW/m³ at 100 kHz, 200 mT, 100 °C
- Minimum core loss around 100 °C
- Frequency range up to 500 kHz
- Low-profile cores

## Reversible permeability vs. DC magnetic field

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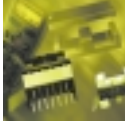


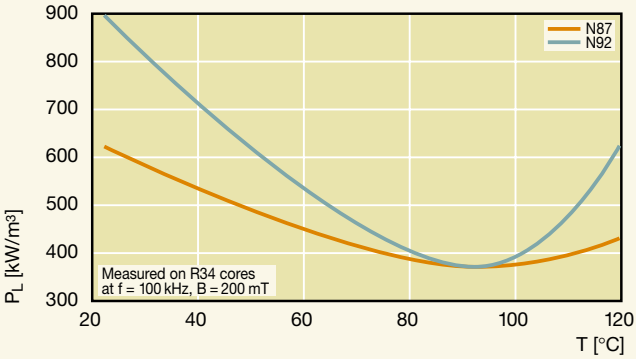
# Power Material N92

Pushing the Limits in Saturation

## Material data

| | | | | |
|---|---|---|---|---|
| **Initial permeability** | 25 °C | $\mu_i$ | | 1500 ± 25% |
| **Flux density, dyn.** | 25 °C | $B_{max}$ | [mT] | 500 |
| **10 kHz, 1200 A/m** | 100 °C | $B_{max}$ | [mT] | 440 |
| **Coercive field strength** | 25 °C | $H_C$ | [A/m] | 24 |
| **f=10 kHz** | 100 °C | $H_C$ | [A/m] | 13 |
| **Curie temperature** | | $T_C$ | [°C] | >280 |
| **Relative core losses** | | $P_V$ | | |
| | 100 °C | 25 kHz 200 mT | [kW/m³] | 70 |
| | 100 °C | 100 kHz 200 mT | [kW/m³] | 410 |
| | 100 °C | 300 kHz 100 mT | [kW/m³] | 410 |
| | 100 °C | 500 kHz 50 mT | [kW/m³] | 230 |
| **Resistivity** | | ρ | [Ωm] | 8 |
| **Density** | | | [kg/m³] | 4850 |

## Core loss vs. temperature

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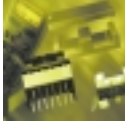


# Power Material N49

The Solution for High-Frequency Transformer

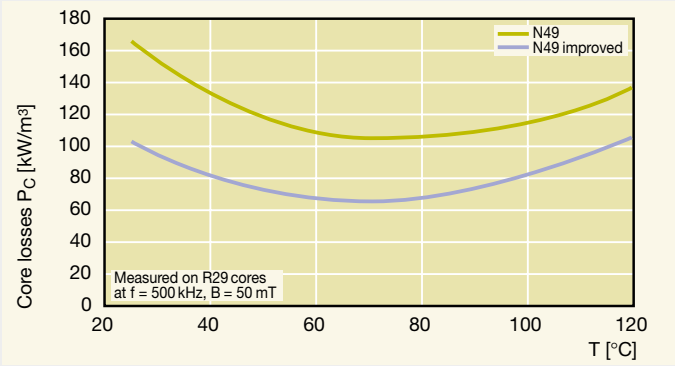
## Innovations in power materials

The properties of the existing high-frequency material N49 have been improved to meet the rising performance requirements of DC/DC converters. The principal aim was to reduced losses dramatically while increasing saturation. At 500 kHz, 50 mT, 100 kHz, losses have been reduced by 30 %, and saturation at 100 °C has been increased by 10 %.

## Features and typical core shapes

- Typical core loss of 80 kW/m³ at 500 kHz, 50 mT, 100 °C
- Minimum core loss around 80 °C
- Saturation of 400 mT at 100 °C
- Frequency range from 300 kHz up to 1 MHz
- Low-profile cores

## Core loss vs. temperature

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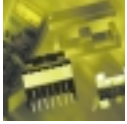


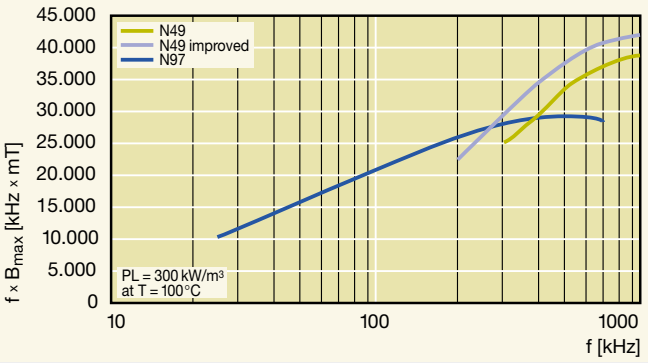
# Power Material N49

The Solution for High-Frequency Transformer

## Material data

| | | | | |
|---|---|---|---|---|
| **Initial permeability** | 25 °C | $\mu_i$ | | 1500 ± 25% |
| **Flux density, dyn.** | 25 °C | $B_{max}$ | [mT] | 490 |
| **10 kHz, 1200 A/m** | 100 °C | $B_{max}$ | [mT] | 400 |
| **Coercive field strength** | 25 °C | $H_C$ | [A/m] | 38 |
| **f=10 kHz** | 100 °C | $H_C$ | [A/m] | 33 |
| **Curie temperature** | | $T_C$ | [°C] | >240 |
| **Relative core losses** | | $P_V$ | | |
| | 100 °C | 300 kHz 100 mT | [kW/m³] | 330 |
| | 100 °C | 500 kHz 50 mT | [kW/m³] | 80 |
| | 100 °C | 1000 kHz 50 mT | [kW/m³] | 475 |
| **Resistivity** | | ρ | [Ωm] | 17 |
| **Density** | | | [kg/m³] | 4800 |

## Performance factor vs. frequency

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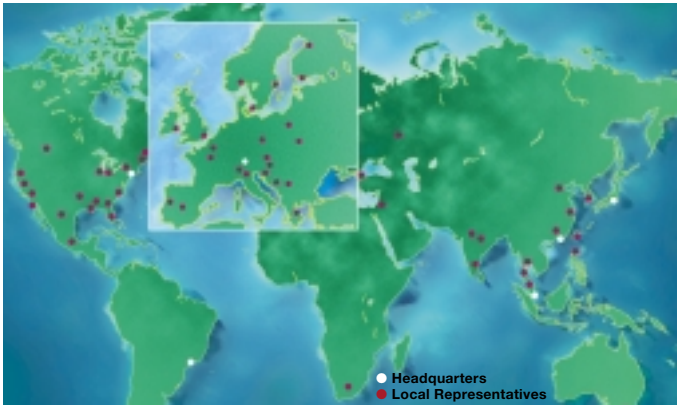
# Contacts

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## Literature

**Short Form Catalog**

- Ferrites and Accessories
  (German/English, Ordering No. EPC:61001-7400)

**Product Profile**

- Ferrite Toroids for LAN and EMI Applications
  (English, Ordering No. EPC:61004-7600)
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