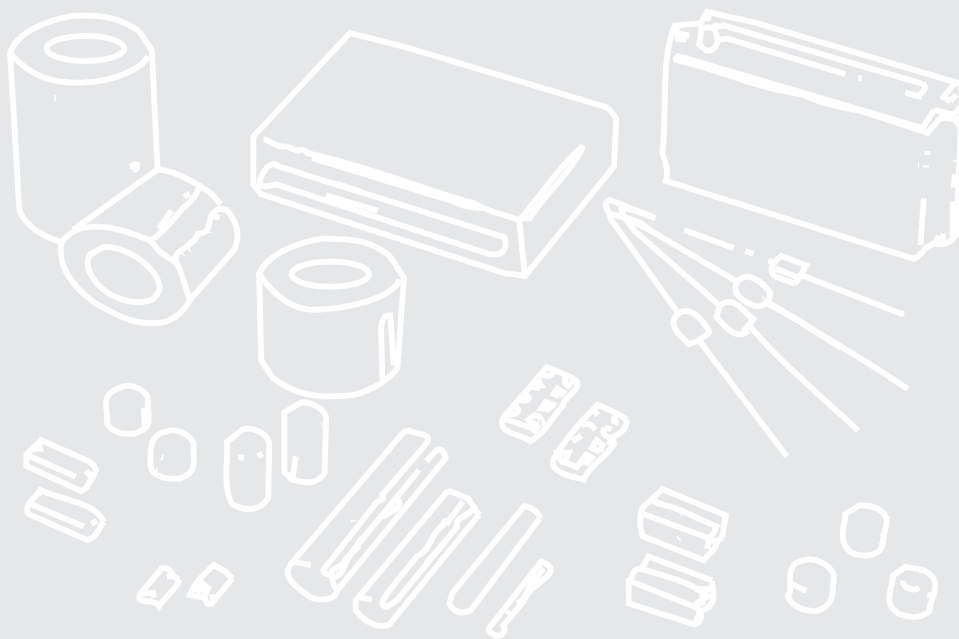


3S4 a new Soft Ferrite for EMI-suppression



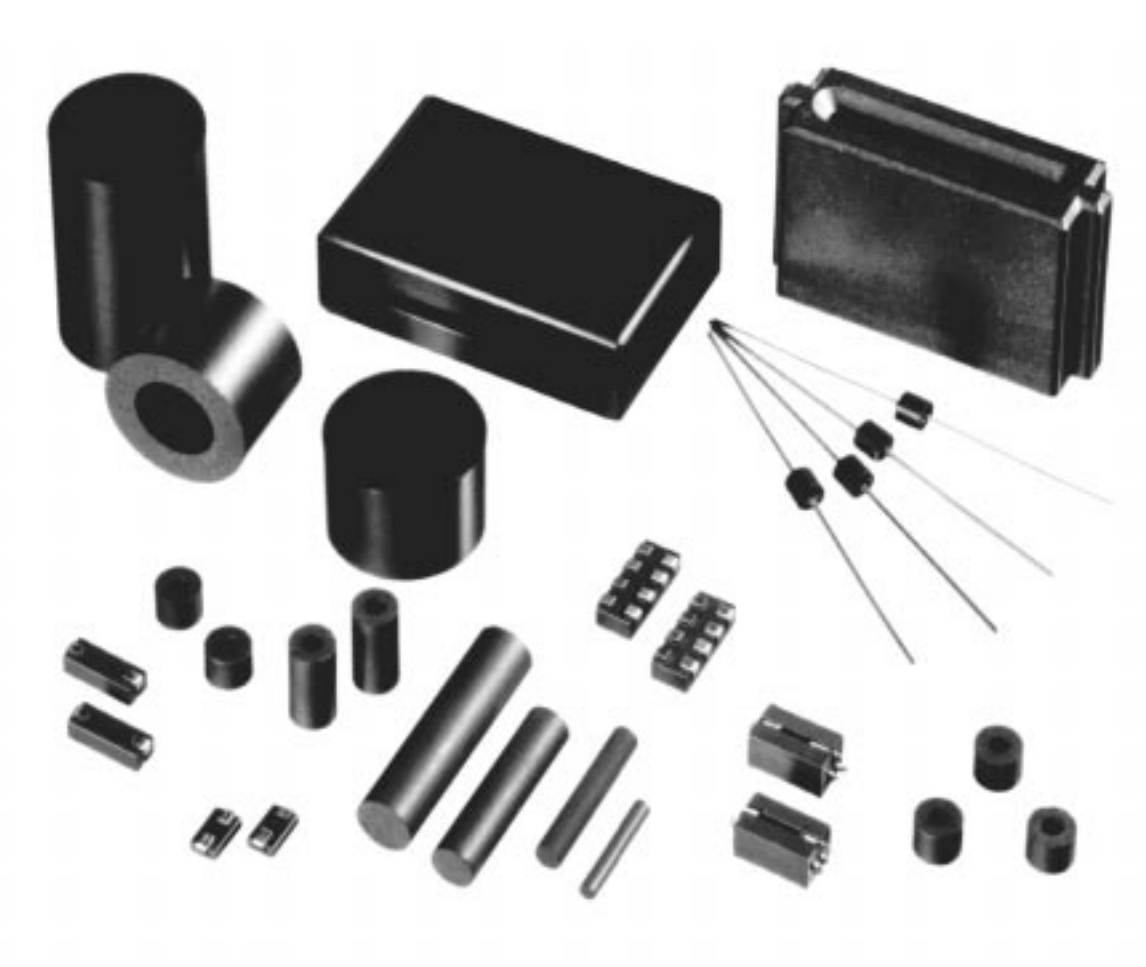
Let's make things better.

3S4

a new Soft Ferrite for EMI-Suppression

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A selection of EMI-suppression products

3S4

a new Soft Ferrite for EMI-suppression

This new manganese-zinc (MnZn) ferrite grade from Philips Components can suppress EMI up to frequencies of 1 GHz making it an attractive alternative to nickel-zinc (NiZn) materials.

Formerly, NiZn ferrite beads or chokes have been necessary for EMI suppression up to gigahertz frequencies. Extremely high resistivity ($10^5 \Omega\text{m}$) means that eddy currents can never be induced in these ferrites which can thus maintain their magnetic properties up to very high frequencies.

NiZn ferrites have several disadvantages however. Relatively low permeability severely limits their low-frequency performance. In addition, nickel is an expensive raw material. And since it is a heavy metal and therefore a potential hazard to the environment, its use is currently being discouraged on environmental grounds.

MnZn ferrites are the usual alternative principally because they present no hazard to the environment, and their high permeability (up to 10 000) gives them excellent low-frequency characteristics. Until now, however, low resistivity (1 to $10 \Omega\text{m}$) has limited their frequency of operation to a maximum of 30 MHz.

This has now changed with the introduction of Philips' new 3S4 MnZn ferrite grade. Precise control of material composition has resulted in an **increase in resistivity** to a value of around $10^3 \Omega\text{m}$, intermediate between the standard MnZn and NiZn grades but high enough for effective RFI-suppression up to 1 GHz rivalling the performance of NiZn.

Moreover 3S4 with a permeability of around 1700 has a low-frequency behaviour superior to that of NiZn. This grade is accordingly an ideal replacement for NiZn in wide-band applications.

Material grade specification of 3S4

The following table shows the properties of the new grade together with those of some existing materials. It is clear from these data that 3S4 can compete with the NiZn grades over the whole frequency range up to 1 GHz.

Main application areas for EMI-suppression products made of this material are e.g.:

- *Office automation equipment*
- *Electronic data processing equipment (EDP)*
- *Telecommunication*
- *Automotive*
- *Consumer electronic products (audio/video)*
- *Domestic appliances*

Property	Symbol	Unit	Conditions	Material grade			
				3S4	3SI	4A15	4S2
Initial permeability	μ_i		<10 kHz, 0.1 mT, 25 °C	≈1700	≈ 4000	1200 ± 20%	≈ 700
Flux density	B	mT	10 kHz, 250 A/m, 25 °C	≈ 300	≈ 350	≈ 300	≈ 270
			10 kHz, 250 A/m, 100 °C	-	≈ 180	≈ 180	≈ 180
Relative loss factor	$\tan\delta/\mu_i$		1 MHz, <0.1mT, 25 °C	-	-	< 250.10 ⁻⁶	-
			3 MHz, <0.1mT, 25 °C	-	-	< 1500.10 ⁻⁶	-
Typical impedance	Z	Ω	3 MHz, 25 °C	30	60	-	-
			30 MHz, 25 °C	75	60	-	60
			300 MHz, 25 °C	110	45	-	110
Resistivity	ρ	Ω m	DC, 25 °C	≈ 10 ³	≈ 1	≈ 10 ⁵	≈ 10 ⁵
Curie temperature	T _c	°C	<10 kHz, 0.1 mT	≥ 110	≥125	≥125	≥125
Density		kg/m ³	25 °C	≈ 4800	≈ 4900	≈ 5100	≈ 5000

Characteristics refer to:

- A standard , non-finished, ring core of dimensions 25/15/10 mm for all properties except impedance.
- A bead of dimensions 5/2/10 on a short wire for impedance values.

Properties of other products made from this material grade may be different, depending on shape, size or finishing.

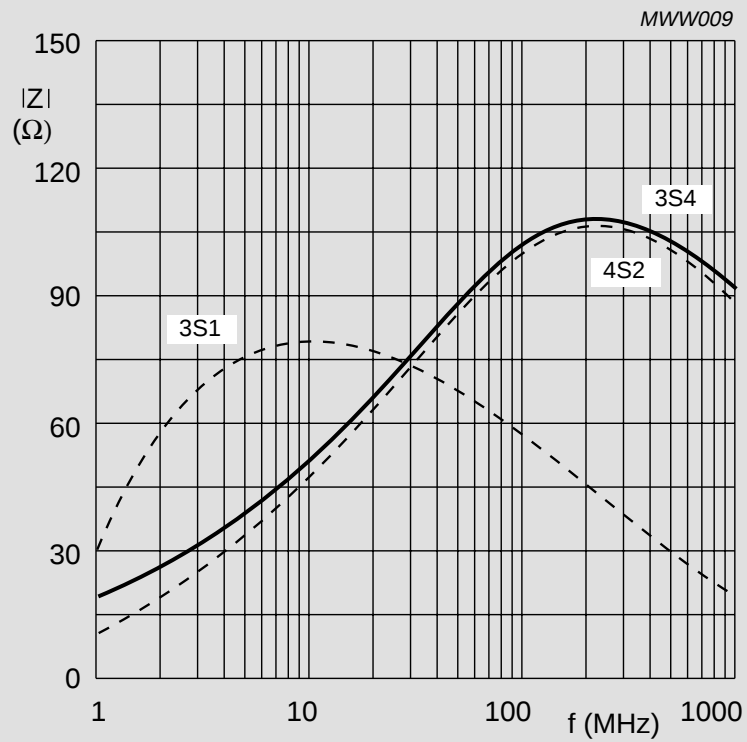


Fig. 1 Typical impedance curves of 3S4 compared to existing material grades, measured on bead BD5/2/10.

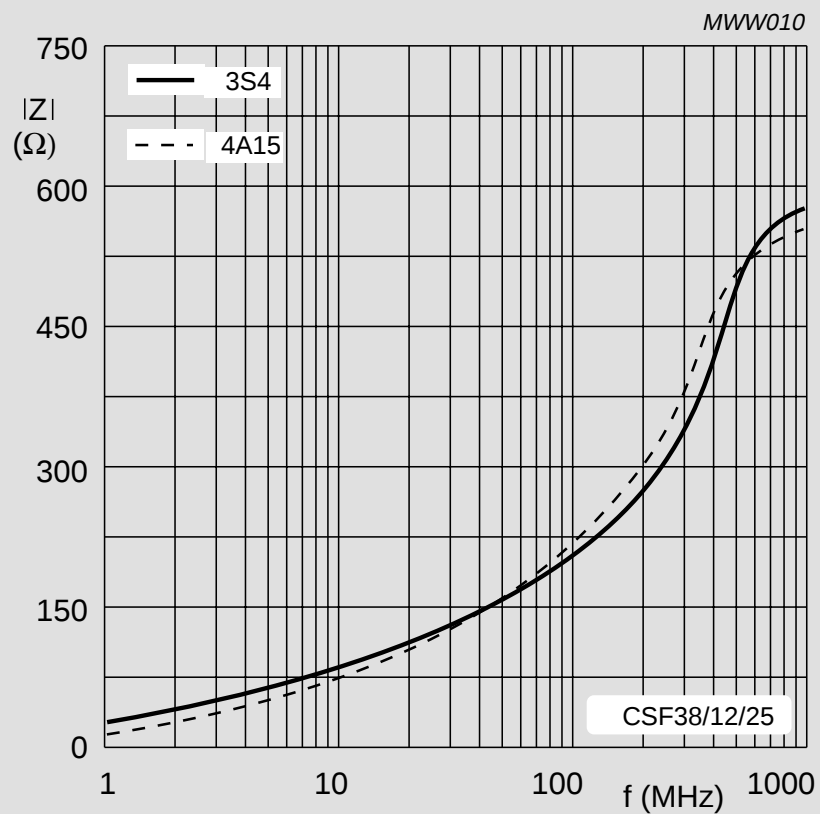


Fig. 2 Typical impedance curves of 3S4 compared to 4A15, measured on flat cable shield CSF38/12/25.

Product range in 3S4 material

The following standard product shapes will be available in the new grade 3S4. Additional, customized, designs can be manufactured on request.



Beads



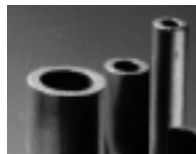
Beads-on-wire



SMD beads



Ring cores



Tubes



Multi-hole cores



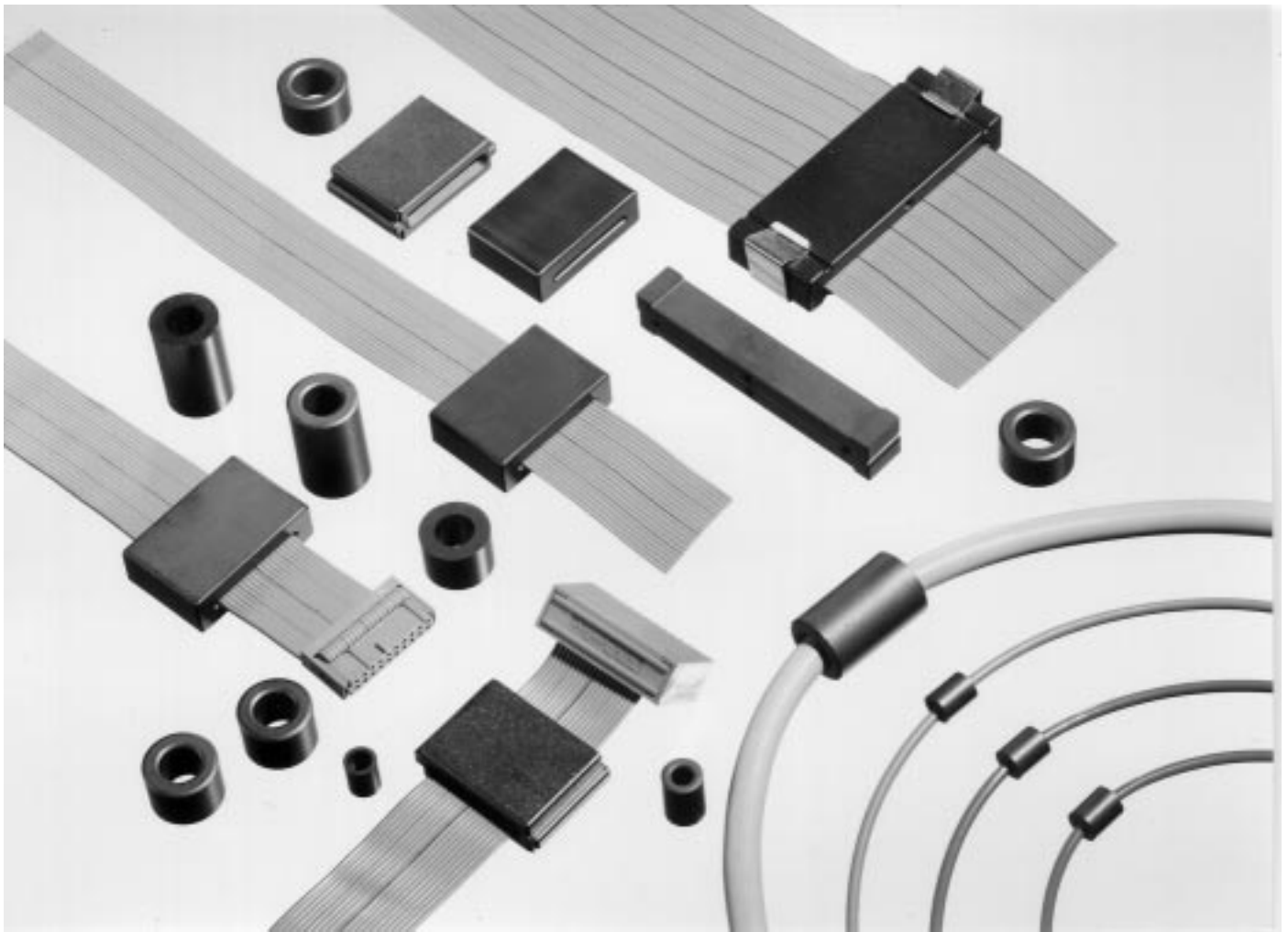
Wide-band chokes



Round cable shields



Flat cable shields



Range of Cable Shields

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