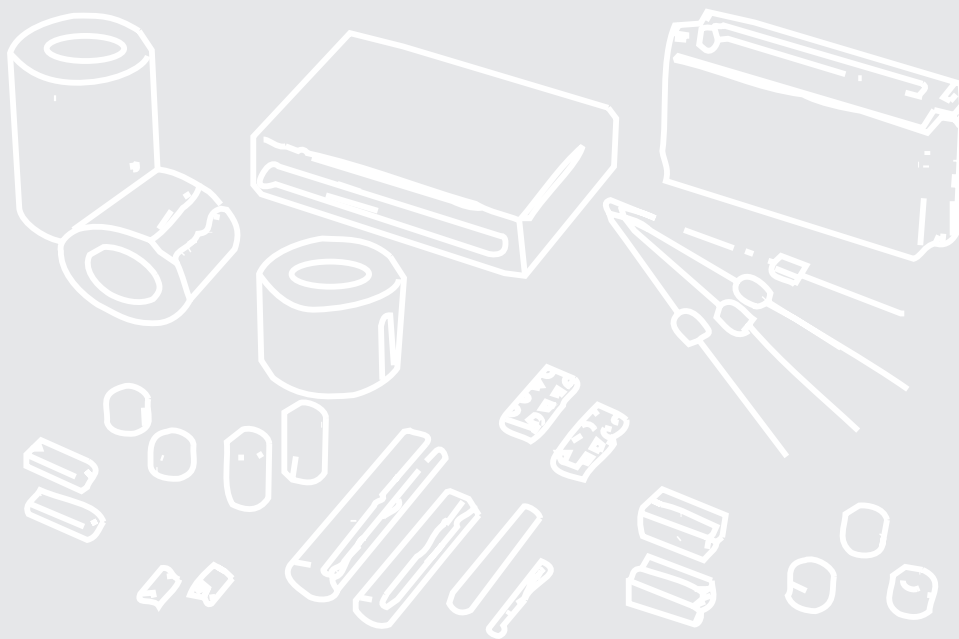


3S4 a new Soft Ferrite for EMI-suppression



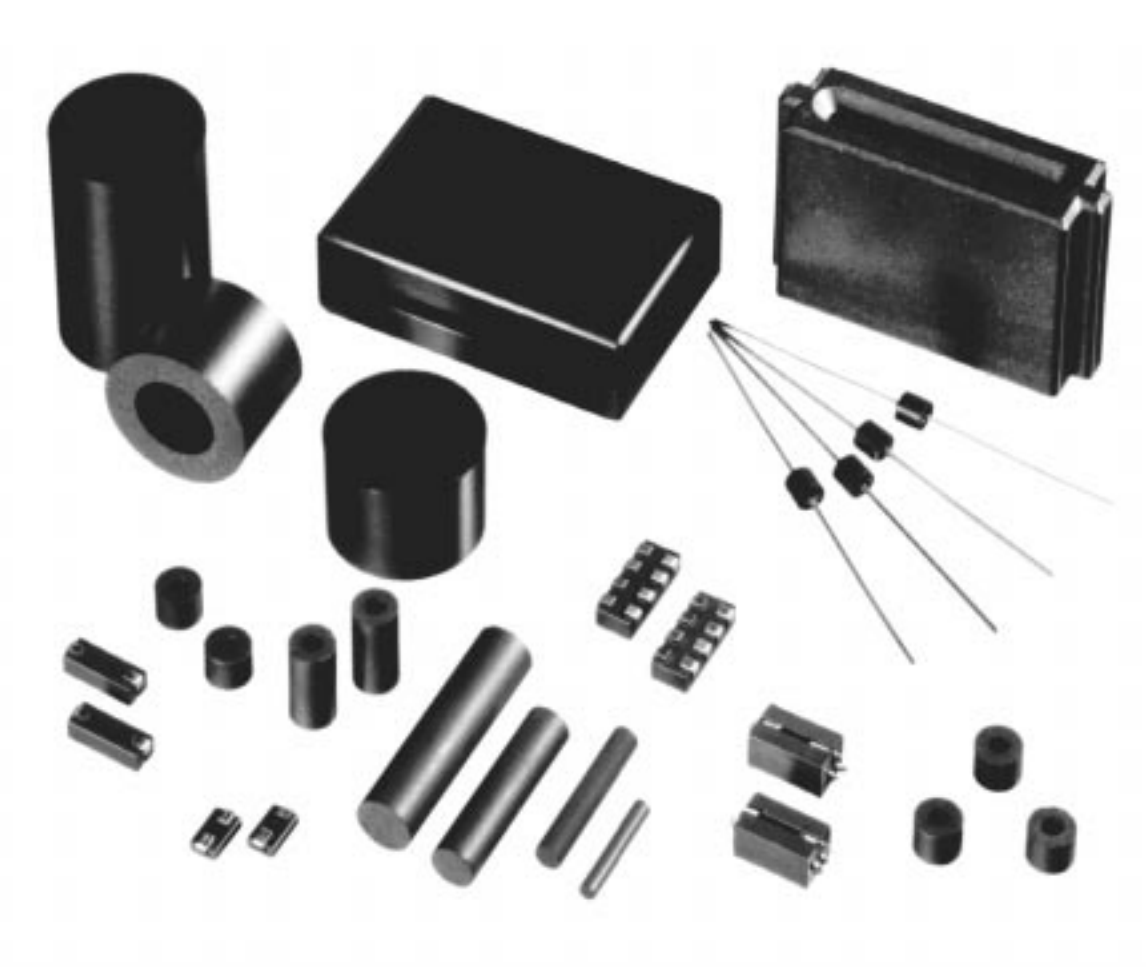
Let's make things better.

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	3S1	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.

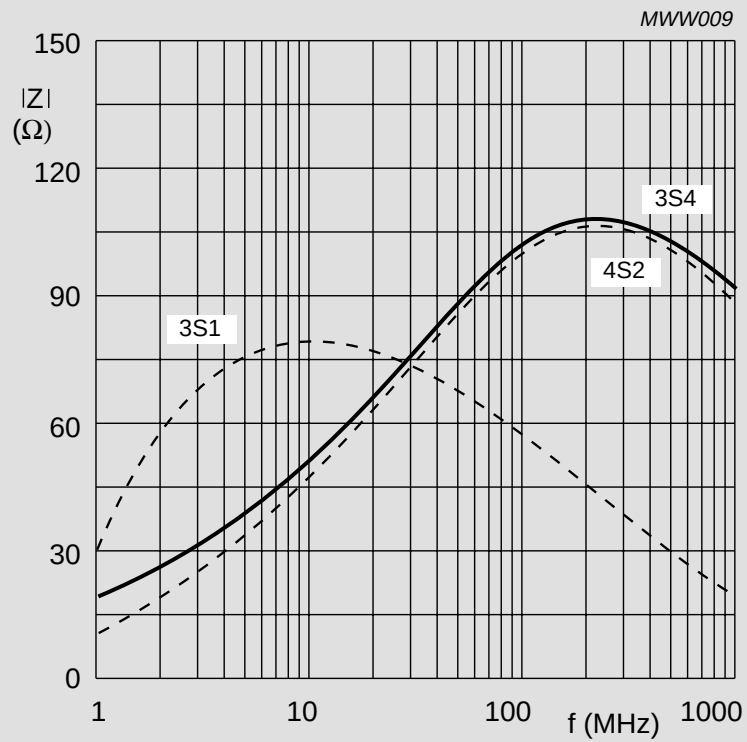


Fig. 1 Typical impedance curves of 3S4 compared to existing material grades, measured on bead BD5/2/10.

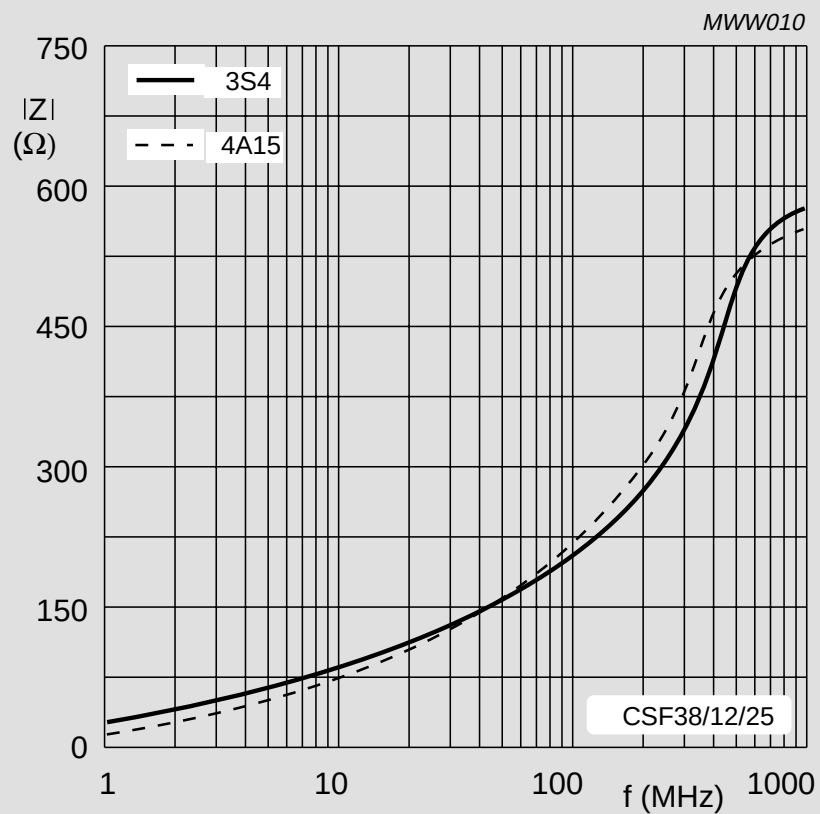


Fig. 2 Typical impedance curves of 3S4 compared to 4A15, measured on flat cable shield CSF38/12/25.

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



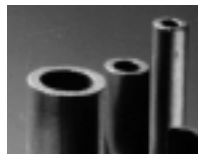
Beads-on-wire



SMD beads



Ring cores



Tubes



Multi-hole cores



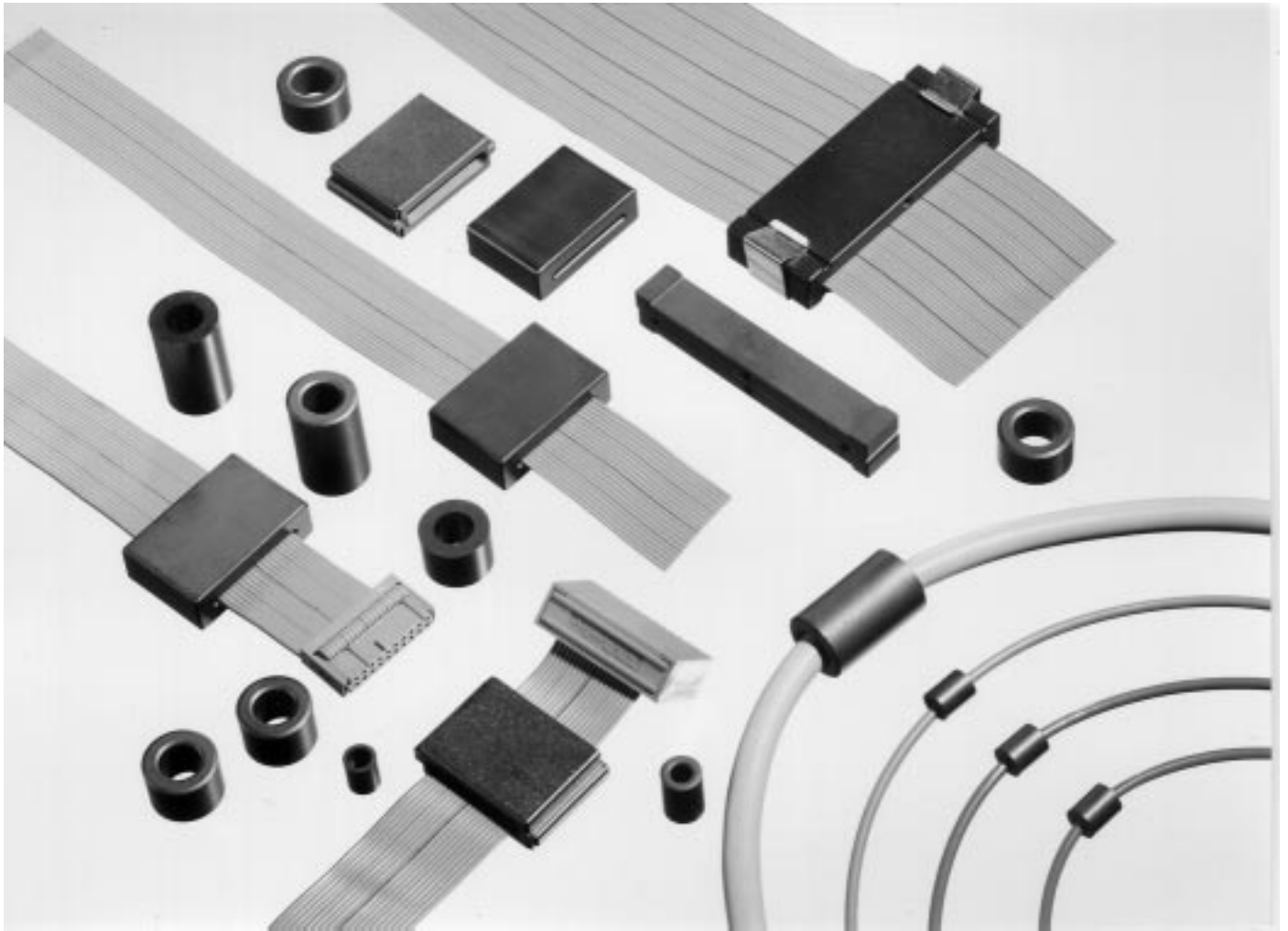
Wide-band chokes



Round cable shields



Flat cable shields



Range of Cable Shields

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Puerto Rico	Max Anderson Co., Caperra Heights, PR	(809) 783-6544
Virgin Islands	Max Anderson Co., Caperra Heights, PR	(809) 783-6544

Philips Components – a worldwide company

Australia: Philips Components Pty Ltd., NORTH RYDE,
Tel. +61 2 9805 4455, Fax. +61 2 9805 4466

Austria: Österreichische Philips Industrie GmbH, WIEN,
Tel. +43 1 60 101 12 41, Fax. +43 1 60 101 12 11

Belarus: Philips Office Belarus, MINSK,
Tel. +375 172 200 924/733, Fax. +375 172 200 773

Benelux: Philips Nederland B.V., EINDHOVEN, NL,
Tel. +31 40 2783 749, Fax. +31 40 2788 399

Brazil: Philips Components, SÃO PAULO,
Tel. +55 11 821 2333, Fax. +55 11 829 1849

Canada: Philips Electronics Ltd., SCARBOROUGH,
Tel. +1 416 292 5161, Fax. +1 416 754 6248

China: Philips Company, SHANGHAI,
Tel. +86 21 6354 1088, Fax. +86 21 6354 1060

Denmark: Philips Components A/S, COPENHAGEN S,
Tel. +45 32 883 333, Fax. +45 31 571 949

Finland: Philips Components, ESPOO,
Tel. +358 9 615 800, Fax. +358 9 615 80510

France: Philips Composants, SURESNES,
Tel. +33 1 4099 6161, Fax. +33 1 4099 6493

Germany: Philips Components GmbH, HAMBURG,
Tel. +49 40 2489-0, Fax. +49 40 2489 1400

Greece: Philips Hellas S.A., TAVROS,
Tel. +30 1 4894 339/+30 1 4894 239, Fax. +30 1 4814 240

Hong Kong: Philips Hong Kong, KOWLOON,
Tel. +852 2784 3000, Fax. +852 2784 3003

India: Philips India Ltd., MUMBAI,
Tel. +91 22 4930 311, Fax. +91 22 4930 966/4950 304

Indonesia: P.T. Philips Development Corp., JAKARTA,
Tel. +62 21 794 0040, Fax. +62 21 794 0080

Ireland: Philips Electronics (Ireland) Ltd., DUBLIN,
Tel. +353 1 7640 203, Fax. +353 1 7640 210

Israel: Rapac Electronics Ltd., TEL AVIV,
Tel. +972 3 6450 444, Fax. +972 3 6491 007

Italy: Philips Components S.r.l., MILANO,
Tel. +39 2 6752 2531, Fax. +39 2 6752 2557

Japan: Philips Japan Ltd., TOKYO,
Tel. +81 3 3740 5135, Fax. +81 3 3740 5035

Korea (Republic of): Philips Electronics (Korea) Ltd., SEOUL,
Tel. +82 2 709 1472, Fax. +82 2 709 1480

Malaysia: Philips Malaysia SDN Berhad,
Components Division, PULAU PINANG,
Tel. +60 3 750 5213, Fax. +60 3 757 4880

Mexico: Philips Components, EL PASO, U.S.A.,
Tel. +52 915 772 4020, Fax. +52 915 772 4332

New Zealand: Philips New Zealand Ltd., AUCKLAND,
Tel. +64 9 815 4000, Fax. +64 9 849 7811

Norway: Norsk A/S Philips, OSLO,
Tel. +47 22 74 8000, Fax. +47 22 74 8341

Pakistan: Philips Electrical Industries of Pakistan Ltd., KARACHI,
Tel. +92 21 587 4641-49, Fax. +92 21 577 035/+92 21 587 4546

Philippines: Philips Semiconductors Philippines Inc.,
METRO MANILA, Tel. +63 2 816 6345, Fax. +63 2 817 3474

Poland: Philips Poland Sp. z o.o., WARSZAWA,
Tel. +48 22 612 2594, Fax. +48 22 612 2327

Portugal: Philips Portuguesa S.A.,
Philips Components: LINDA-A-VELHA,
Tel. +351 1 416 3160/416 3333, Fax. +351 1 416 3174/416 3366

Russia: Philips Russia, MOSCOW,
Tel. +7 95 755 6918, Fax. +7 95 755 6919

Singapore: Philips Singapore Pte Ltd., SINGAPORE,
Tel. +65 350 2000, Fax. +65 355 1758

South Africa: S.A. Philips Pty Ltd., JOHANNESBURG,
Tel. +27 11 470 5911, Fax. +27 11 470 5494

Spain: Philips Components, BARCELONA,
Tel. +34 93 301 63 12, Fax. +34 93 301 42 43

Sweden: Philips Components AB, STOCKHOLM,
Tel. +46 8 5985 2000, Fax. +46 8 5985 2745

Switzerland: Philips Components AG, ZÜRICH,
Tel. +41 1 488 22 11, Fax. +41 1 481 7730

Taiwan: Philips Taiwan Ltd., TAIPEI,
Tel. +886 2 2134 2900, Fax. +886 2 2134 2929

Thailand: Philips Electronics (Thailand) Ltd., BANGKOK,
Tel. +66 2 745 4090, Fax. +66 2 398 0793

Turkey: Türk Philips Ticaret A.S., GÜLTEPE/ISTANBUL,
Tel. +90 212 279 2770, Fax. +90 212 282 6707

United Kingdom: Philips Components Ltd., DORKING,
Tel. +44 1306 512 000, Fax. +44 1306 512 345

United States:

- Display Components, ANN ARBOR, MI,
Tel. +1 734 996 9400, Fax. +1 734 761 2776
- Magnetic Products, SAUGERTIES, NY,
Tel. +1 914 246 2811, Fax. +1 914 246 0487
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Tel. +1 408 570 5600, Fax. +1 408 570 5700

Yugoslavia (Federal Republic of): Philips Components, BELGRADE,
Tel. +381 11 625 344/373, Fax. +381 11 635 777

Internet:

- Display Components: www.dc.comp.philips.com
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For all other countries apply to:

Philips Components, Building BF-1, P.O. Box 218, 5600 MD EINDHOVEN,
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