4.0 CHIP BEADS FOR INTERFERENCE SUPPRESSION

Ferroxcube ferrite beads are well known to suppress unwanted interference. They are supplied as:

- Suppression bead for shifting on a wire
- Bead-on-wire for through-hole mounting on a PCB

In response to market demands for smaller lighter and more integrated electronic devices FERROXCUBE added a series of SMD-type chip beads to the bead families. The ferrite chip bead EMI-suppressor provide a powerful means of EMI / RFI attenuation for electronic equipment. Four compact sizes are standardized and available in suppression material grades 3S1, 4S2, 4S3, 3S5 and 4S60 according to impedance/frequency requirements at each application.

4.1 PRODUCT APPLICATION

Chip beads have the sample application area as beads-on-wire, but in addition they offer the full advantages of SMD technology like economical mounting, high packing density of components, reliable soldering etc. Applications for these components can be found in e.g.:

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

4.2 PRODUCT SPECIFICATION

4.2.1 GENERAL SPECIFICATION

Chip beads are available in four standard sizes and five suppression material grades. A chip bead is made of a ferrite tube with a rectangular cross section and a fead through flat tinned copper wire, which is bending around the edges and forms the terminals of the component. This design offers many superior mechanical and electrical features.

FEATURES:

- Low magnetic leak inductance due to magnetic closed circuit
- Resistant to mechanical shocks and pressure
- Excellent solder ability (reflow soldering, flow soldering, iron soldering)
- Terminals are highly resistant to pull forces
- Low tolerances of mechanical dimensions enable automatic mounting

APPLICATIONS:

- EMI-suppression
- Decoupling
- Damping parasitic oscillations

APPLICABLE MATERIALS:

- 3S5 for frequencies up to 30 MHz
- 3S1 for frequencies up to 100 MHz
- 4S60 for frequencies up to 300 MHz
- 4S2 for frequencies up to 1000 MHz
- 4S3 for frequencies up to 1200 MHz

TYPE DESCRIPTION:

e.g. BDS3/1.8/5.3-3S1-Z
(1)(2) (3) (4) (5) (6)

(1) Product type
(BDS = Bead for Surface mounting)
(2) Width (in mm)
(3) Height (in mm)
(4) Length (in mm)
(5) Material grade (e.g. 3S1)
(6) -Z lead-free version*

***Note:** Not lead-free old version available depending on stock. All new codes are leadfree (not -Z included on type description)

ORDERING CODE (12 NC):

e.g. 433003036301

The first 11 digits of the 12NC are sufficient to order the desired chip bead. The type description is additional information.

4.2.2 SHAPE AND DIMENSIONS

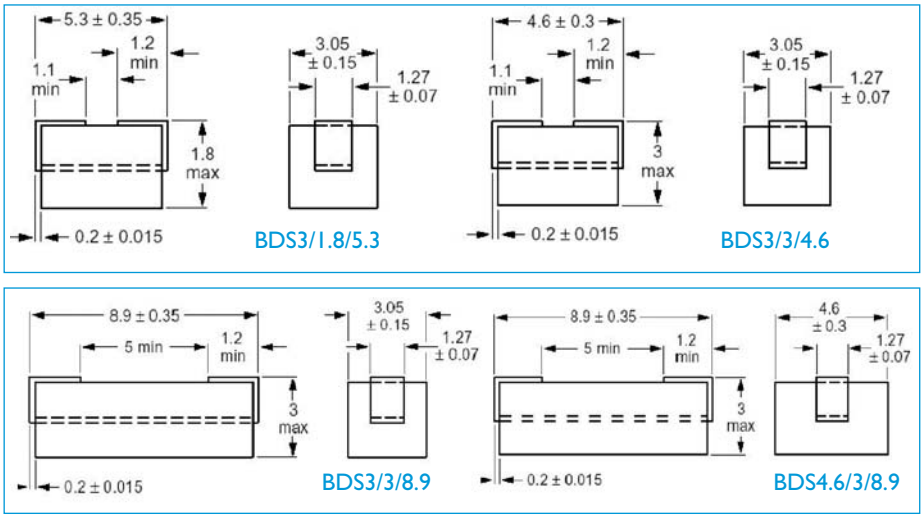

Figure 4. Chip bead dimensions (in millimeters)

4.2.3 ELECTRICAL CHARACTERISTICS

TYPE	IMPEDANCE [Ω] AT FREQUENCY [MHz]								Mass
	1	3	10	25	30	100	300	700	(g)
BDS3/1.8/5.3-3S1	-	-	28	33	-	25	-	-	≃ 0.15
BDS3/1.8/5.3-4S2	-	-	-	25	-	38	45	-	≃ 0.3
BDS3/3/4.6-3S1	-	25	45	35	-	-	-	-	≃ 0.15
BDS3/3/4.6-4S2	-	-	-	30	-	50	55	-	≃ 0.3
BDS3/3/4.6-3S5	15	-	35	-	30	-	-	-	≃ 0.15
BDS3/3/4.6-4S60	-	-	25	-	35	38	-	-	≃ 0.3
BDS3/3/4.6-4S3	-	-		-	-	47	66	70	≃ 0.3
BDS3/3/8.9-3S1	-	55	80	55	-	-	-	-	≃ 0.5
BDS3/3/8.9-4S2	-	-	-	65	-	100	110	-	≃ 0.5
BDS4.6/3/8.9-4S2	-	-	-	65	-	100	110	-	≃ 0.5

Table 5. Chip bead Z characteristics*

***Note:** Typical impedance values measured at 25°C with Agilent-4191A impedance analyzer. |Z|min is -20% typical specified.

TYPE	Maximum Vdc	DC resistance	Isat*	Imax (A)	
	Volts	(mΩ)	mA	25°	125°
BDS3/1.8/5.3-3S1	60	< 0.6	≃ 300	10	8.5
BDS3/1.8/5.3-4S2	60	< 0.6	≃ 500	10	8.5
BDS3/3/4.6-3S1	60	< 0.6	≃ 300	10	8.5
BDS3/3/4.6-4S2	60	< 0.6	≃ 1000	10	8.5
BDS3/3/4.6-3S5	60	< 0.6	≃ 1500	10	8.5
BDS3/3/4.6-4S60	60	< 0.6	≃ 500	10	8.5
BDS3/3/4.6-4S3	60	< 0.6	≃ 500	10	8.5
BDS3/3/8.9-3S1	80	< 1.0	≃ 300	10	8.5
BDS3/3/8.9-4S2	80	< 1.0	≃ 1000	10	8.5
BDS4.6/3/8.9-4S2	80	< 1.0	≃ 1000	10	8.5

Table 6. Chip bead electrical characteristics*

***Note:** Isat is defined with DC bias value at which Z specification decreases around 50%.

4.2.4 PACKAGING AND ORDERING CODES

TYPE	PACKING QUANTITY [PCS / REEL]	ORDERING CODE [12 NC]	RoHS complaint
BDS3/1.8/5.3-3S1-Z	3000	43300305573_	yes
BDS3/1.8/5.3-4S2-Z	3000	43300305566_	yes
BDS3/3/4.6-3S5	3000	43300307237_	yes
BDS3/3/4.6-4S60	3000	43300307238-	yes
BDS3/3/4.6-4S3	3000	43300307239_	yes
BDS3/3/4.6-3S1-CZ	3000	43300305561_	yes
BDS3/3/4.6-4S2-Z	3000	43300305550_	yes
BDS3/3/8.9-3S1-CZ	2800	43300305564_	yes
BDS3/3/8.9-4S2-Z	2800	43300305547_	yes
BDS4.6/3/8.9-4S2-Z	2400	43300305551_	yes
BDS3/1.8/5.3-3S1	3000	43300303685_	no*
BDS3/1.8/5.3-4S2	3000	43300303682_	no*
BDS3/3/4.6-4S2	3000	43300303629_	no*
BDS3/3/8.9-4S2	2800	43300303630_	no*
BDS4.6/3/8.9-4S2	2400	43300303652_	no*

* Check disponibility. Upon request

The chip beads are delivered taped and reeled, ready for use in automatic mounting machines. The packaging is according to IEC 286-A and EIA 481-A

Table 7. Chip bead packaging quantities and ordering code

4.2.5 BLISTER TAPE AND REEL DIMENSIONS

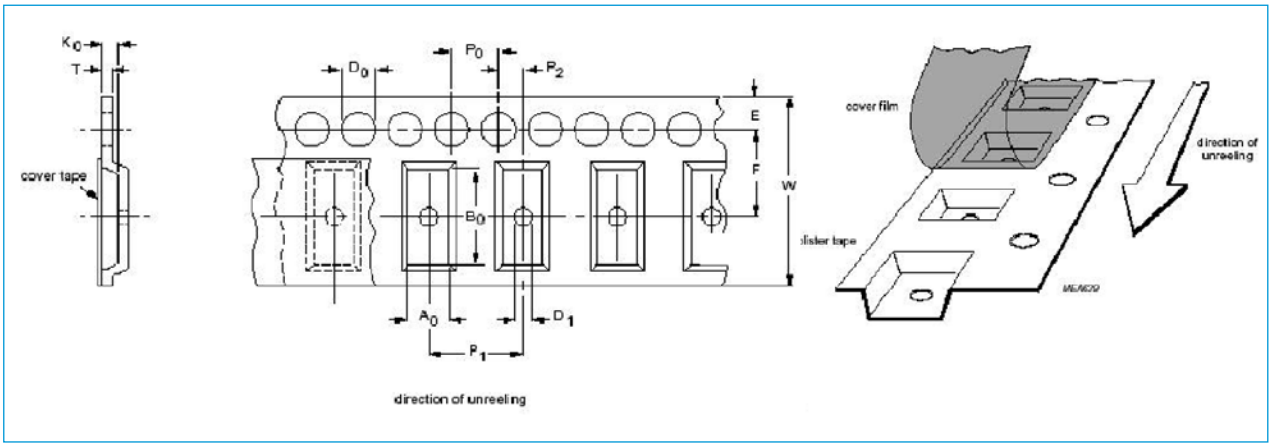

Figure 5. Blister tape

SIZE	DIMENSIONS (mm)			
	BDS3/1.8/5.3	BDS3/3/4.6	BDS3/3/8.9	BDS4.6/3/8.9
A0	3.25 ± 0.1	3.45 ± 0.1	3.45 ± 0.1	3.25 ± 0.1
B0	5.85 ± 0.1	5.1 ± 0.1	9.4 ± 0.1	9.4 ± 0.1
K0	2.0 ± 0.1	3.1 ± 0.1	3.1 ± 0.1	3.1 ± 0.1
T	0.3 ± 0.05	0.25 ± 0.05	0.35 ± 0.1	0.3 ± 0.05
W	12.0 ± 0.3	12.0 ± 0.3	16.0 ± 0.3	16.0 ± 0.3
E	1.75 ± 0.1	1.75 ± 0.1	1.75 ± 0.3	1.75 ± 0.1
F	5.5 ± 0.05	5.5 ± 0.05	7.5 ± 0.1	7.5 ± 0.05
D0	1.5 + 0.1	1.5 + 0.1	1.5 ± 0.1	1.5 + 0.1
D1	> 1.5	> 1.5	1.5 + 0.1	> 1.5
P0	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1	4.0 ± 0.1
P1	8.0 ± 0.1	8.0 ± 0.1	8.0 ± 0.1	8.0 ± 0.1
P2	2.0 ± 0.1	2.0 ± 0.05	2.0 ± 0.1	2.0 ± 0.1

Table 8. Physical dimensions of blister tape (in millimeters)

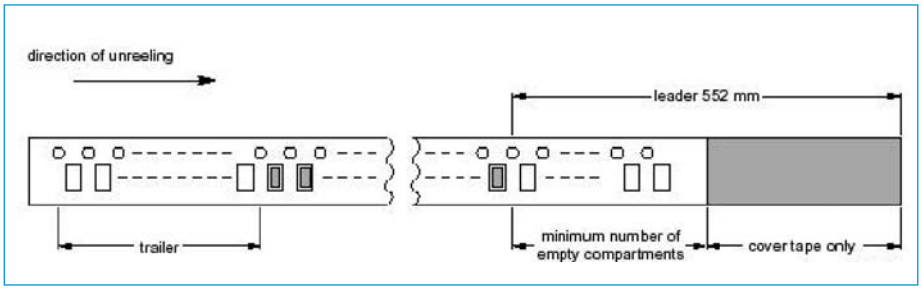

Figure 6. Tape leader and trailer*

Note*: trailer contains 75 empty compartments minimum (secured with tape)
Leader: length of leader is 500 mm minimum and covered with covertape

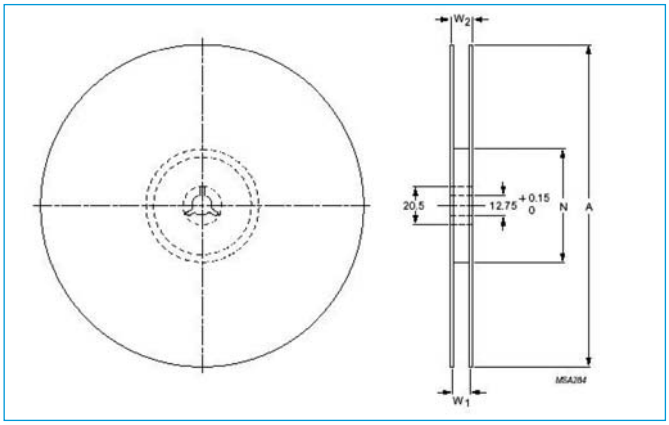

Figure 7. Reel dimensions (in millimeters)

SIZE	DIMENSIONS (mm)			
	A	N	W1	W2
12	330	100 ± 0.5	12.4	≤ 16.4
16	330	100 ± 0.5	16.4	≤ 20.4

Table 9. Physical dimensions of reel (in millimeters)

4.2.6 RECOMMENDED SOLDER LANDS

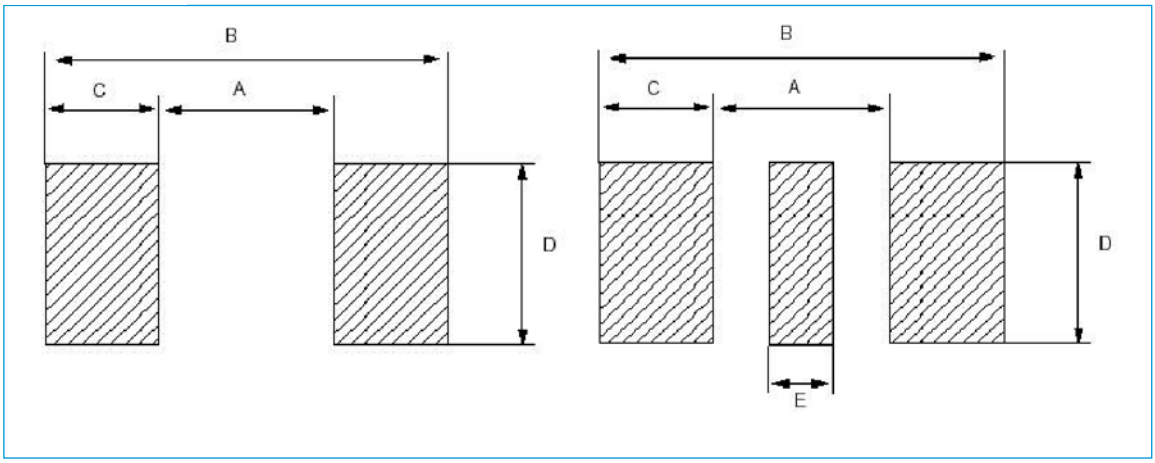

Figure 8a. Solder lands reflow soldering

Figure 8b. Solder lands wave soldering

SHAPE	Reflow soldering				Wave soldering				
	A	B	C	D	A	B	C	D	E
BDS3/3/8.9	7.0	10.8	1.9	3.3	6.0	12.2	3.1	3.0	2.5
BDS3/3/4.6	2.8	6.4	1.8	3.3	2.0	6.4	2.2	3.0	0.8
BD4.6/3/8.9	7.0	10.8	1.9	3.3	6.0	12.2	3.1	3.0	2.5
BDS3/1.8/5.3	2.8	7.2	2.2	3.3	2.0	7.2	2.6	3.0	0.8

Table 10. Dimensions of solder lands (in millimeters)
For recommended temperature/time profiles see 8.0 soldering curves

4.2.7 TYPICAL IMPEDANCE CURVES

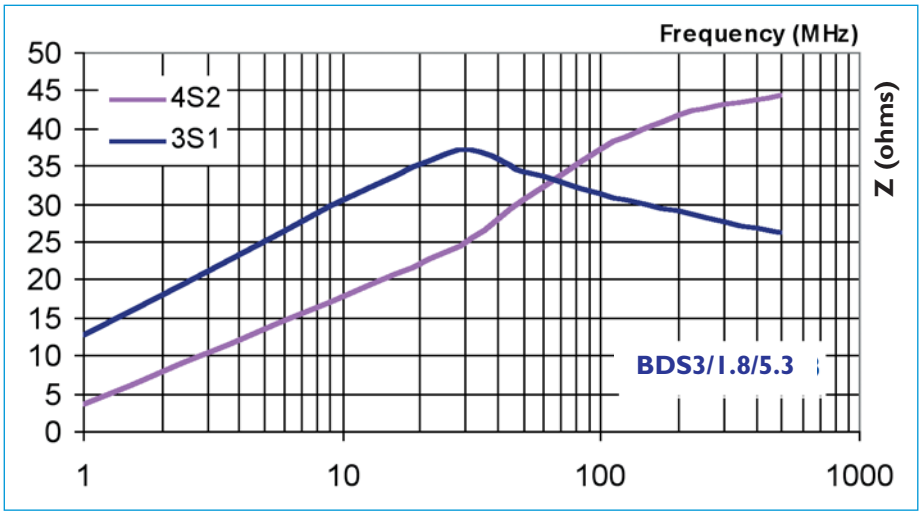

Figure 9. Z graph BDS3/1.8/5.3-3S1 and BDS3/1.8/5.3-4S2

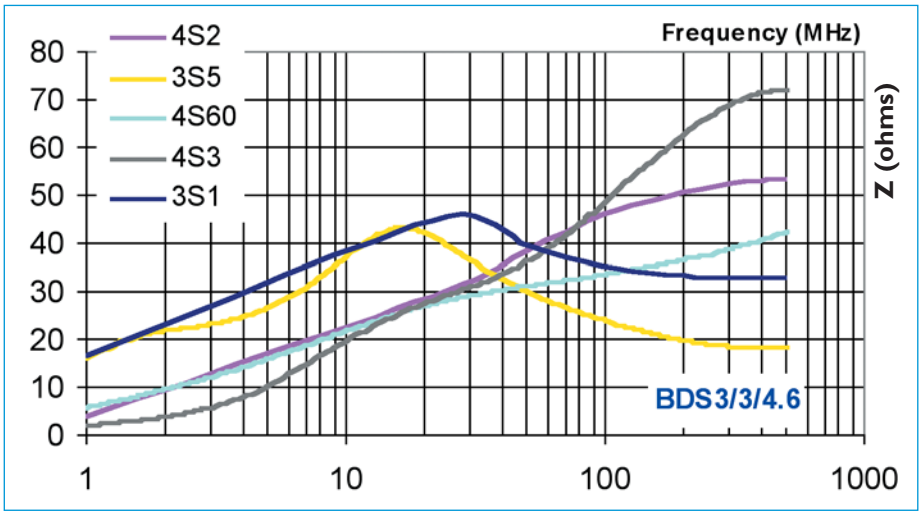

Figure 10. Z graph BDS3/3/4.6 in 3S1, 4S2, 3S5, 4S60 and 4S3 materials

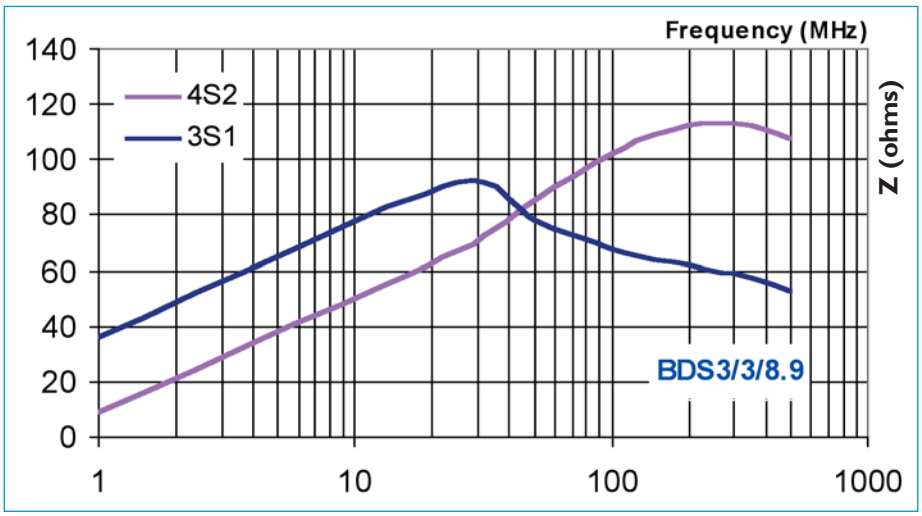

Figure 11. Z graph BDS3/3/8.9-3S1 and BDS3/3/8.9-4S2

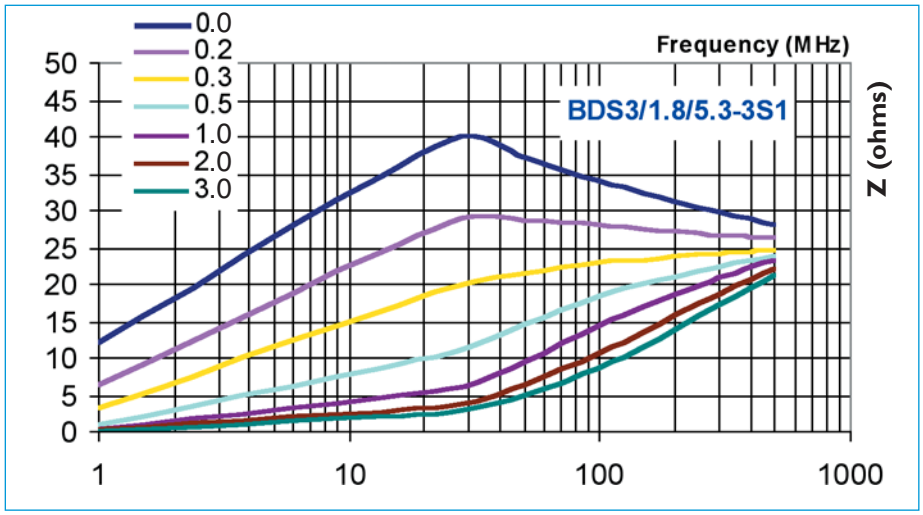

Figure 12. Impedance vs. frequency for BDS3/1.8/5.3-3S1 under DC-premagnetization

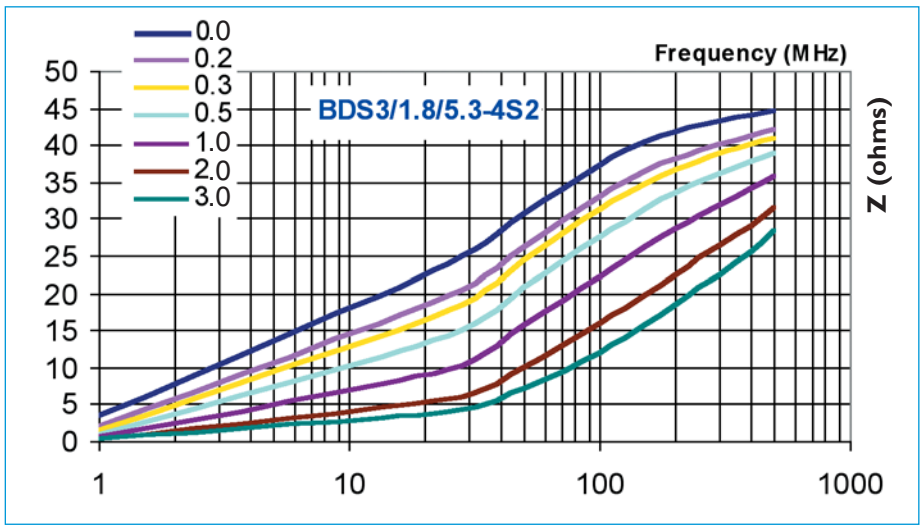

Figure 13. Impedance vs. frequency for BDS3/1.8/5.3-4S2 under DC-premagnetization

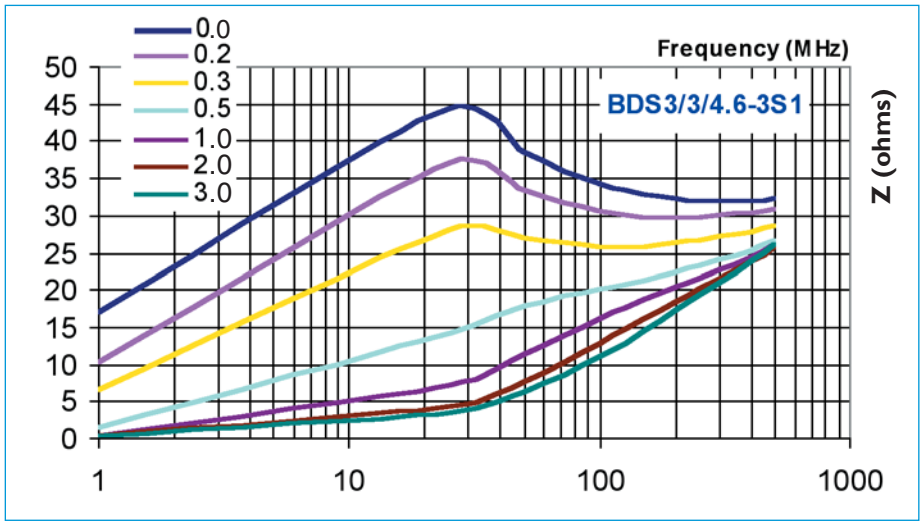

Figure 14. Impedance vs. frequency for BDS3/3/4.6-3S1 under DC-premagnetization

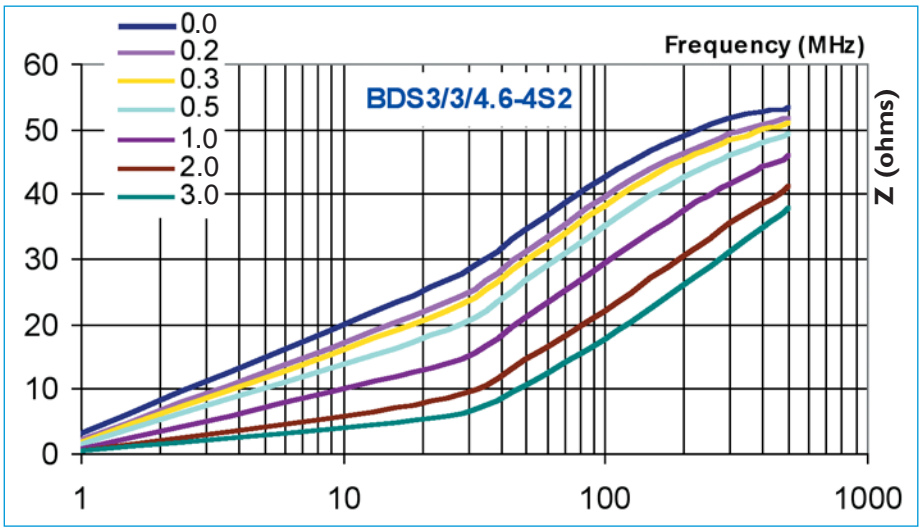

Figure 15. Impedance vs. frequency for BDS3/3/4.6-4S2 under DC-premagnetization

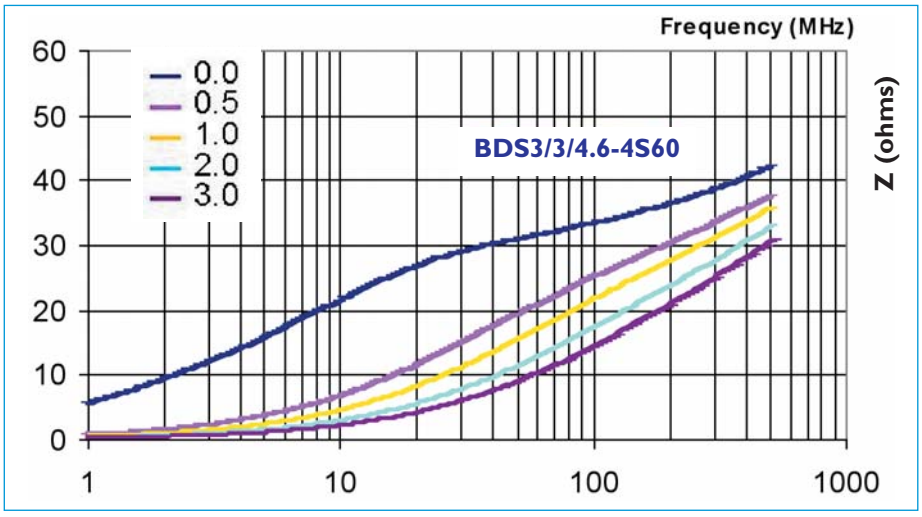

Figure 16. Impedance vs. frequency for BDS3/3/4.6-4S60 under DC-premagnetization

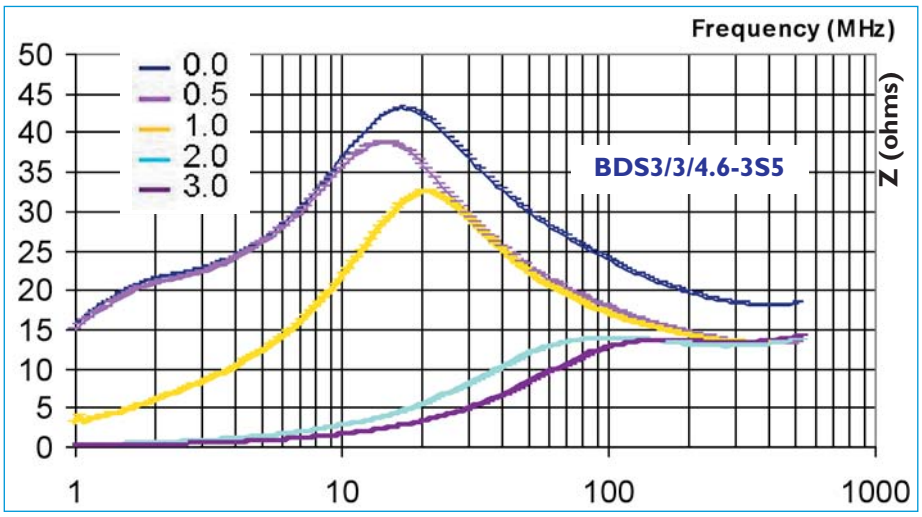

Figure 17. Impedance vs. frequency for BDS3/3/4.6-3S5 under DC-premagnetization

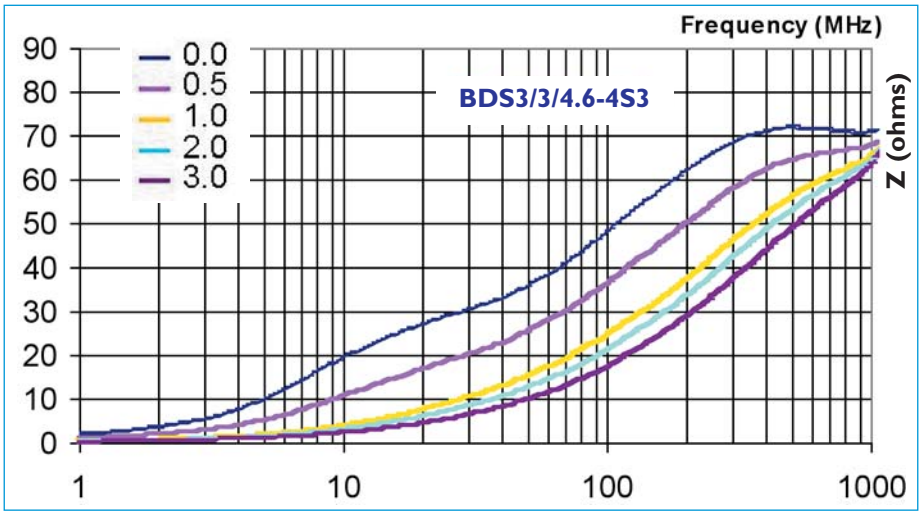

Figure 18. Impedance vs. frequency for BDS3/3/4.6-4S3 under DC-premagnetization

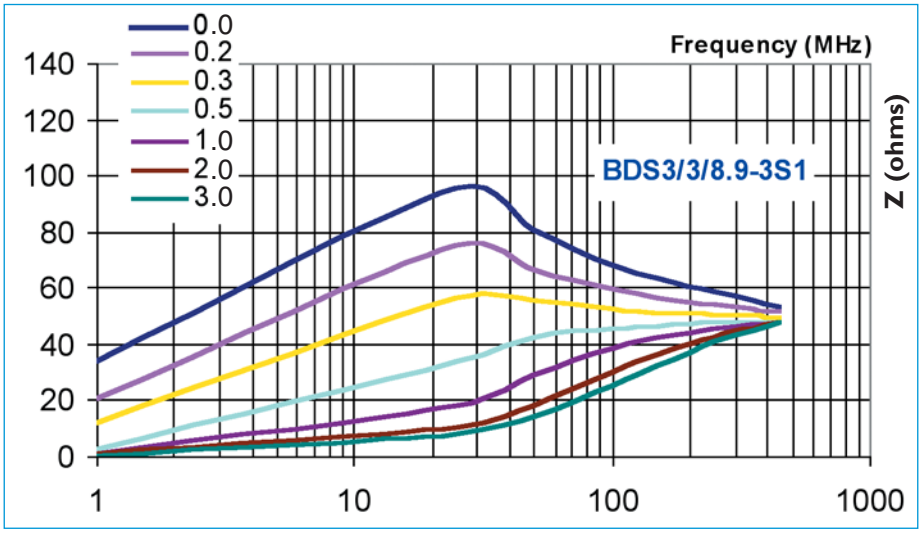

Figure 19. Impedance vs. frequency for BDS3/3/8.9-3S1 under DC-premagnetization

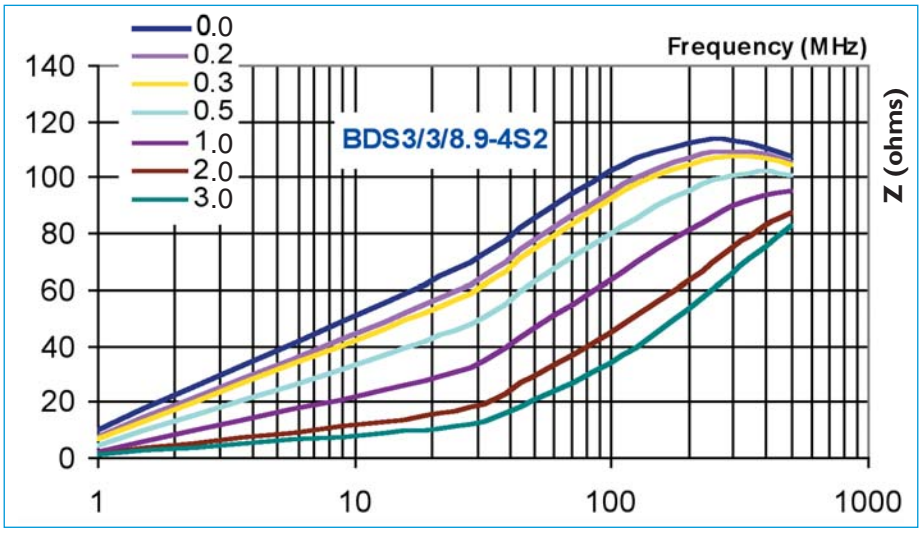

Figure 20. Impedance vs. frequency for BDS3/3/8.9-4S2 under DC-premagnetization

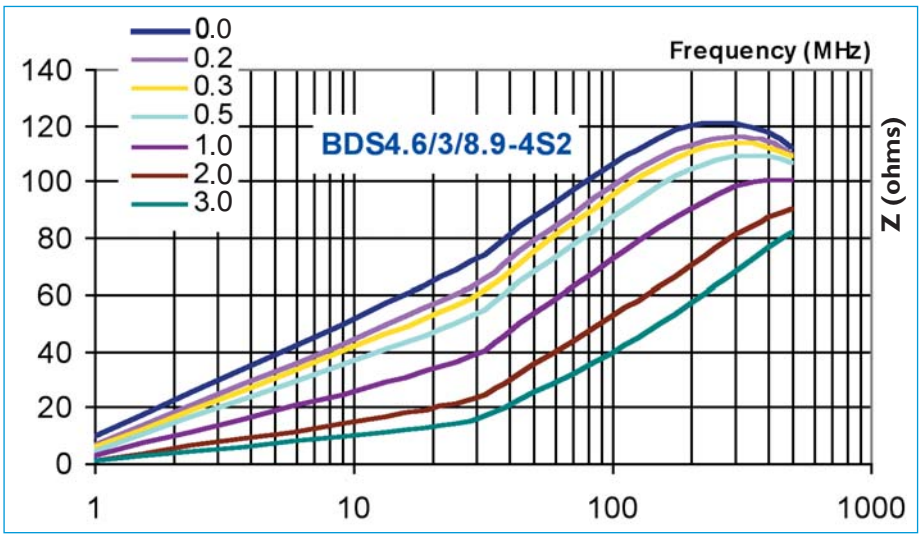

Figure 21. Impedance vs. frequency for BDS4.6/3/8.9-4S2 under DC-premagnetization

4.2.7 TYPICAL DAMPING CURVES

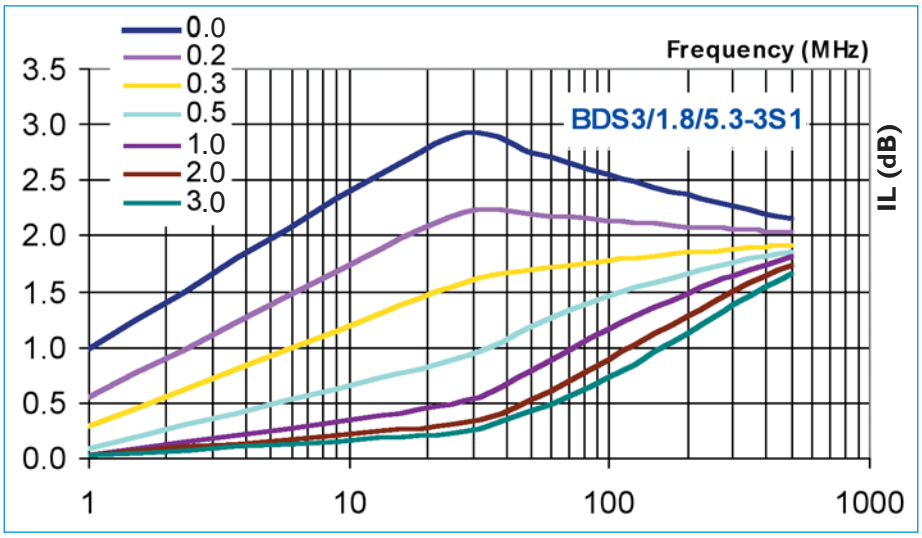

Figure 22. Attenuation vs. frequency for BDS3/1.8/5.3-3S1 under DC-premagnetization

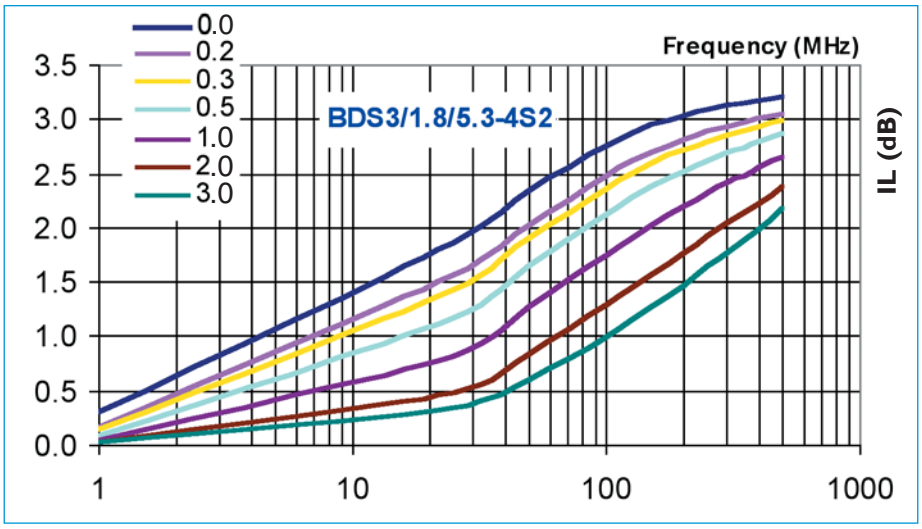

Figure 23. Attenuation vs. frequency for BDS3/1.8/5.3-4S2 under DC-premagnetization

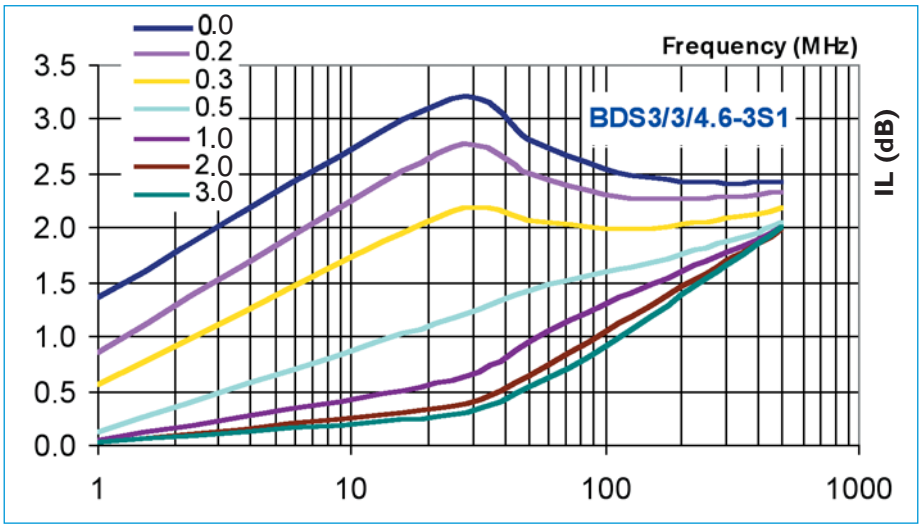

Figure 24. Attenuation vs. frequency for BDS3/3/4.6-3S1 under DC-premagnetization

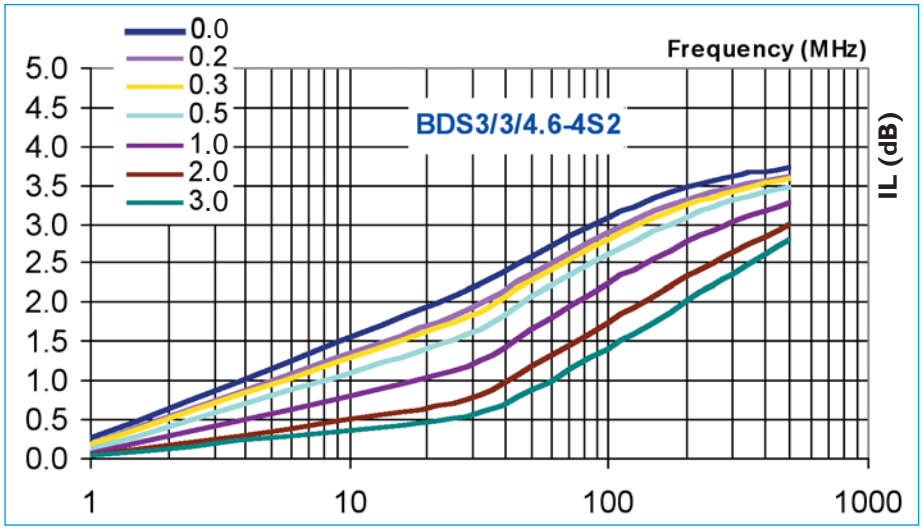

Figure 25. Attenuation vs. frequency for BDS3/3/4.6-4S2 under DC-premagnetization

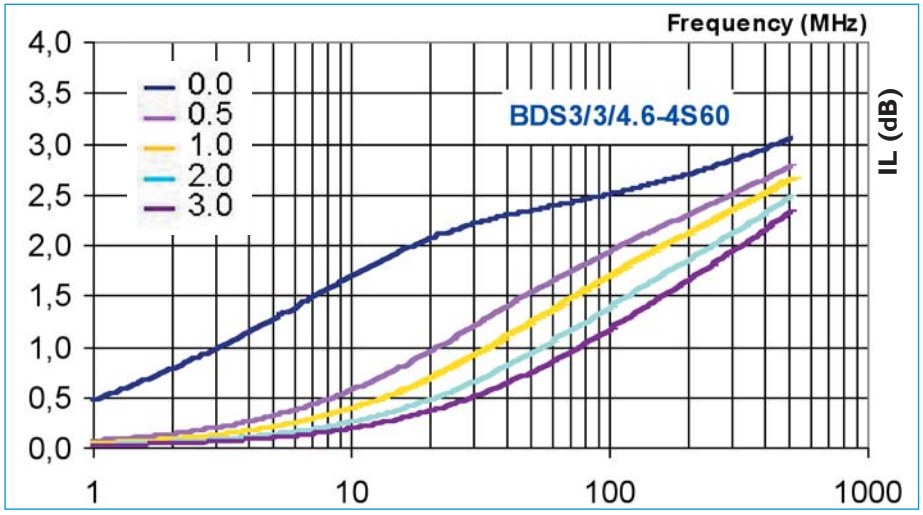

Figure 26. Attenuation vs. frequency for BDS3/3/4.6-4S60 under DC-premagnetization

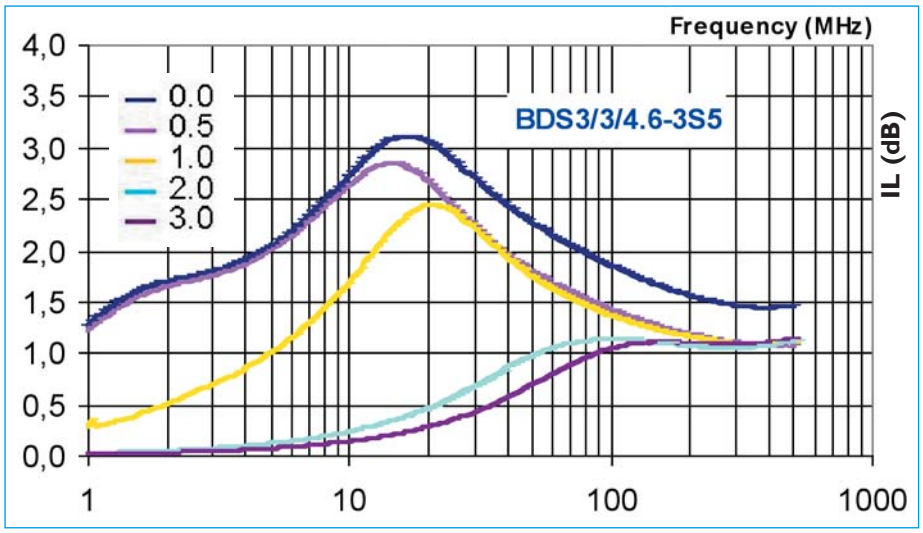

Figure 27. Attenuation vs. frequency for BDS3/3/4.6-3S5 under DC-premagnetization

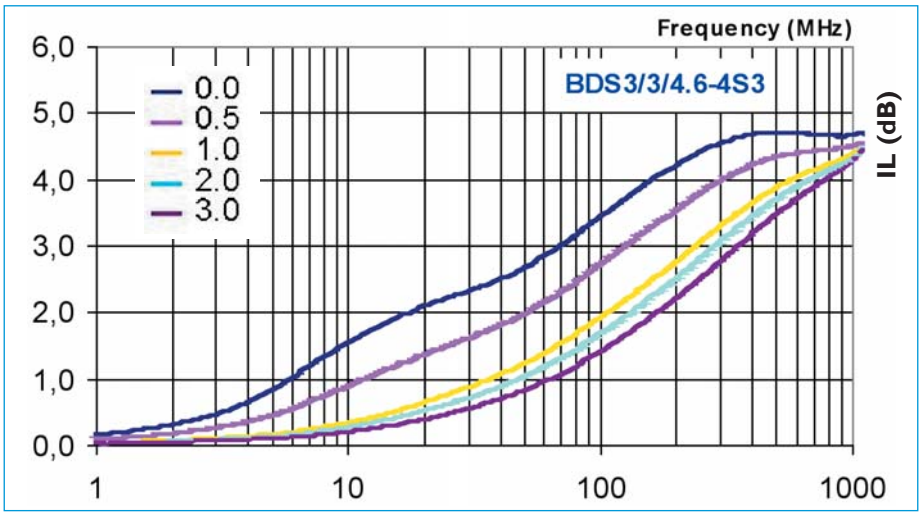

Figure 28. Attenuation vs. frequency for BDS3/3/4.6-4S3 under DC-premagnetization

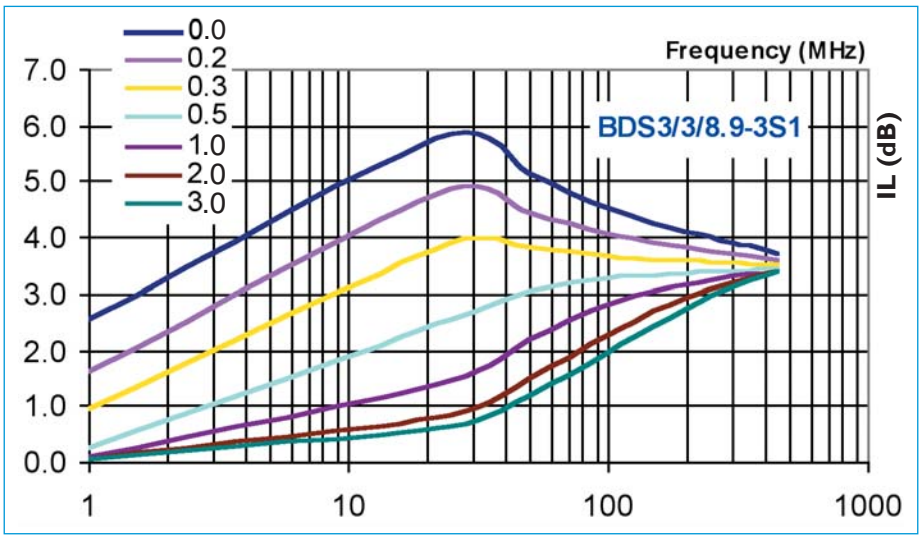

Figure 29. Attenuation vs. frequency for BDS3/3/8.9-3S1 under DC-premagnetization

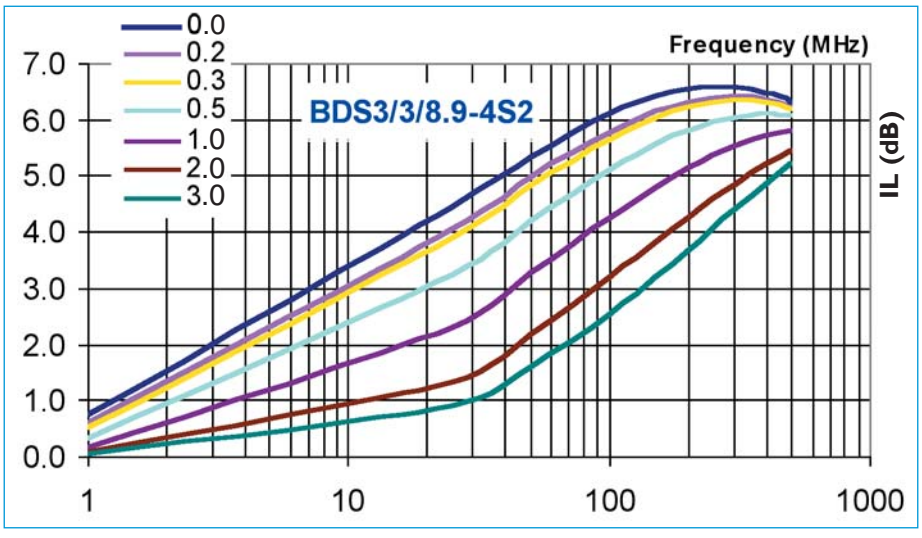

Figure 30. Attenuation vs. frequency for BDS3/3/8.9-4S2 under DC-premagnetization

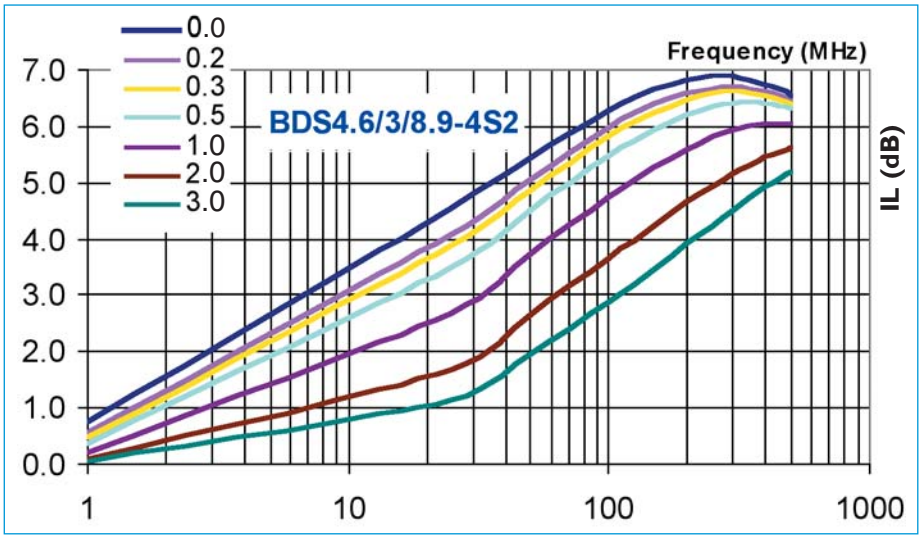

Fig 31. Attenuation vs. frequency for BDS4.6/3/8.9-4S2 under DC-premagnetization