Part Numbering

(Part Number)

DL	W	21	S	N	371	S	Q	2	L
❶	❷	❸	❹	❺	❻	❼	❽	❾	❿

❶Product ID

Product ID	
DL	Chip Common Mode Choke Coils

❷Structure

Code	Structure
W	Wire Wound Type
M	Multilayer Type
P	Film Type

❸Dimensions (L×W)

Code	Dimensions (L×W)	EIA
0Q	0.65×0.5mm	025020
0N	0.85×0.65mm	03025
11	1.25×1.0mm	0504
1N	1.5×0.65mm	05025
21	2.0×1.2mm	0805
2A	2.0×1.0mm	0804
31	3.2×1.6mm	1206
43	4.5×3.2mm	1812
5A	5.0×3.6mm	2014
5B	5.0×5.0mm	2020

❹Features (1)

Code	Type
S	Magnetically Shielded One Circuit Type
D	Magnetically Shielded Two Circuit Type
H	Open Magnetic One Circuit Type
G	Magnetically Shielded Audio Type
R/T	One Circuit Low Profile Type

❺Category

Code	Category
A	Expressed by a letter.
B	
C	
H	
M	
N	
R	

❻Impedance

Typical impedance at 100MHz is expressed by three figures. The unit is in ohm (Ω). The first and second figures are significant digits, and the third figure expresses the number of zeros that follow the two figures.

❻Inductance (DLW43SH)

Expressed by three figures. The unit is micro-henry (μH). The first and second figures are significant digits, and the third figure expresses the number of zeros which follow the two figures.

❼Circuit

Code	Circuit
S	Expressed by a letter.
M	
H	
U	
T	
X	

❽Features (2)

Code	Features
D	Expressed by a letter.
K	
P	
L	
Q	
Y	

❾Number of Signal Lines

Code	Number of Signal Lines
2	Two Lines
4	Four Lines

❿Packaging

Code	Packaging	Series
K	Embossed Taping (ø330mm Reel)	**DLW5AH/DLW5BS/DLW5BT**
L	Embossed Taping (ø180mm Reel)	All Series
B	Bulk	All Series
D	Paper Taping (ø180mm Reel)	**DLP0QS/DLM11G**

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DL□ Chip Common Mode Choke Coil Series Line Up

Type	Size Code in inch (in mm)	Thickness (mm)	Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	New	Kit	≥1A ≥3A	HD UD	Zmatch	Flow	ReFlow
Multilayer Type for Audio Lines	0504(1210) p184	0.5	DLM11GN601SD2	600ohm±25%	100mA							ReFlow
Multilayer Type for Differential Signal Lines	p185 0504(1210)	0.5	DLM11SN450HY2	45ohm±25%	100mA		Kit		HD	Zmatch		ReFlow
		0.5	DLM11SN900HY2	90ohm±25%	100mA		Kit		HD	Zmatch		ReFlow
Film Type for Differential Signal Lines	p186 025020(0605)	0.3	DLP0QSN600HL2	60ohm±25%	50mA		Kit		HD	Zmatch		ReFlow
		0.3	DLP0QSA070HL2	7ohm±2ohm	100mA		Kit		UD	Zmatch		ReFlow
		0.3	DLP0QSA150HL2	15ohm±5ohm	100mA		Kit		UD	Zmatch		ReFlow
		0.3	DLP0QSA350HL2	35ohm±10ohm	100mA		Kit		UD	Zmatch		ReFlow
	p187 03025(0806)	0.45	DLP0NSC280HL2	28ohm±20%	100mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP0NSN350HL2	35ohm±10ohm	100mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP0NSN670HL2	67ohm±20%	110mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP0NSN900HL2	90ohm±20%	100mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP0NSN121HL2	120ohm±20%	90mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP0NSA070HL2	7ohm±2ohm	100mA		Kit		UD	Zmatch		ReFlow
		0.45	DLP0NSA150HL2	15ohm±5ohm	100mA		Kit		UD	Zmatch		ReFlow
	p189 0504(1210)	0.82	DLP11SN670SL2	67ohm±20%	180mA		Kit		HD			ReFlow
		0.82	DLP11SN121SL2	120ohm±20%	140mA		Kit		HD			ReFlow
		0.82	DLP11SN161SL2	160ohm±20%	120mA		Kit		HD			ReFlow
		0.82	DLP11SN900HL2	90ohm±20%	150mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP11SN201HL2	200ohm±20%	110mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP11SN241HL2	240ohm±20%	100mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP11SN281HL2	280ohm±20%	90mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP11SN331HL2	330ohm±20%	80mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP11SA350HL2	35ohm±20%	170mA		Kit		UD	Zmatch		ReFlow
		0.82	DLP11SA670HL2	67ohm±20%	150mA		Kit		UD	Zmatch		ReFlow
		0.82	DLP11SA900HL2	90ohm±20%	150mA		Kit		UD	Zmatch		ReFlow
	p190	0.5	DLP11RN450UL2	45ohm±25%	100mA		Kit		HD	Zmatch		ReFlow
		0.5	DLP11RB150UL2	15ohm±5ohm	100mA		Kit		UD	Zmatch		ReFlow
		0.5	DLP11RB400UL2	40ohm±10ohm	100mA		Kit		UD	Zmatch		ReFlow
	p191	0.3	DLP11TB800UL2	80ohm±25%	100mA		Kit		UD	Zmatch		ReFlow
	p192 1206(3216)	1.15	DLP31SN121ML2	120ohm±20%	100mA				HD			ReFlow
		1.15	DLP31SN221ML2	220ohm±20%	100mA				HD			ReFlow
		1.15	DLP31SN551ML2	550ohm±20%	100mA				HD			ReFlow
Film Array Type for Differential Signal Lines	p193 05025(1506)	0.45	DLP1NDN350HL4	35ohm±20%	100mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP1NDN670HL4	67ohm±20%	80mA		Kit		HD	Zmatch		ReFlow
		0.45	DLP1NDN900HL4	90ohm±20%	60mA		Kit		HD	Zmatch		ReFlow
	p194 0804(2010)	0.82	DLP2ADA350HL4	35ohm±20%	150mA		Kit		UD	Zmatch		ReFlow
		0.82	DLP2ADA670HL4	67ohm±20%	130mA		Kit		UD	Zmatch		ReFlow
		0.82	DLP2ADA900HL4	90ohm±20%	120mA		Kit		UD	Zmatch		ReFlow
		0.82	DLP2ADN670HL4	67ohm±20%	140mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN900HL4	90ohm±20%	130mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN121HL4	120ohm±20%	120mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN161HL4	160ohm±20%	100mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN201HL4	200ohm±20%	90mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN241HL4	240ohm±20%	80mA		Kit		HD	Zmatch		ReFlow
		0.82	DLP2ADN281HL4	280ohm±20%	80mA		Kit		HD	Zmatch		ReFlow
	p196 1206(3216)	1.15	DLP31DN900ML4	90ohm±20%	160mA				HD			ReFlow
		1.15	DLP31DN131ML4	130ohm±20%	120mA				HD			ReFlow
		1.15	DLP31DN201ML4	200ohm±20%	100mA				HD			ReFlow
		1.15	DLP31DN321ML4	320ohm±20%	80mA				HD			ReFlow
		1.15	DLP31DN441ML4	440ohm±20%	70mA				HD			ReFlow
Wire Wound Type for Differential Signal Lines	p197 0805(2012)	1.2	DLW21SN670SQ2	67ohm±25%	400mA		Kit		HD			ReFlow
		1.2	DLW21SN900SQ2	90ohm±25%	330mA		Kit		HD			ReFlow
		1.2	DLW21SN121SQ2	120ohm±25%	370mA		Kit		HD			ReFlow
		1.2	DLW21SN181SQ2	180ohm±25%	330mA		Kit		HD			ReFlow
		1.2	DLW21SN261SQ2	260ohm±25%	300mA		Kit		HD			ReFlow
		1.2	DLW21SN371SQ2	370ohm±25%	280mA		Kit		HD			ReFlow
		1.2	DLW21SN501SK2	500ohm±25%	250mA		Kit		HD			ReFlow
		1.2	DLW21SN670HQ2	67ohm±25%	320mA		Kit		UD	Zmatch		ReFlow
		1.2	DLW21SN900HQ2	90ohm±25%	280mA		Kit		UD	Zmatch		ReFlow
		1.2	DLW21SN121HQ2	120ohm±25%	280mA		Kit		UD	Zmatch		ReFlow
	p198	1.2	DLW21SN181XQ2	180ohm±25%	240mA	New	Kit		HD			ReFlow
		1.2	DLW21SN261XQ2	260ohm±25%	220mA	New	Kit		HD			ReFlow

Continued on the following page.

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Type	Size Code in inch (in mm)	Thickness (mm)	Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	New	Kit	≥1A ≥3A	HD UD	Zmatch	Flow	ReFlow
Wire Wound Type for Differential Signal Lines	p198	1.2	DLW21SN491XQ2	490ohm±25%	190mA	New	Kit		HD			ReFlow
	p197	1.2	DLW21SR670HQ2	67ohm±25%	400mA		Kit		UD	Zmatch		ReFlow
	p199	0.9	DLW21HN670SQ2	67ohm±25%	330mA		Kit		HD			ReFlow
		0.9	DLW21HN900SQ2	90ohm±25%	330mA		Kit		HD			ReFlow
	0805(2012)	0.9	DLW21HN121SQ2	120ohm±25%	280mA		Kit		HD			ReFlow
		0.9	DLW21HN181SQ2	180ohm±25%	250mA		Kit		HD			ReFlow
		0.9	DLW21HN670HQ2	67ohm±25%	240mA		Kit		UD	Zmatch		ReFlow
		0.9	DLW21HN900HQ2	90ohm±25%	220mA		Kit		UD	Zmatch		ReFlow
		0.9	DLW21HN121HQ2	120ohm±25%	200mA		Kit		UD	Zmatch		ReFlow
	p200	1.9	DLW31SN900SQ2	90ohm±25%	370mA				HD			ReFlow
		1.9	DLW31SN161SQ2	160ohm±25%	340mA				HD			ReFlow
		1.9	DLW31SN261SQ2	260ohm±25%	310mA				HD			ReFlow
	1206(3216)	1.9	DLW31SN601SQ2	600ohm±25%	260mA				HD			ReFlow
		1.9	DLW31SN102SQ2	1000ohm±25%	230mA				HD			ReFlow
		1.9	DLW31SN222SQ2	2200ohm±25%	200mA				HD			ReFlow
Wire Wound Type for Differential Signal Lines Automotive Type	p201	2.6	DLW43SH110XK2	-	360mA							ReFlow
		2.6	DLW43SH220XK2	-	310mA							ReFlow
	1812(4532)	2.6	DLW43SH510XK2	-	230mA							ReFlow
		2.6	DLW43SH101XK2	-	200mA							ReFlow
		2.7	DLW43SH101XP2	-	170mA							ReFlow
Wire Wound Type for Power Lines and Signal Lines	p177	4.3	DLW5AHN402SQ2	4000ohm (Typ.)	200mA		Kit					ReFlow
	p179	2.2	DLW5ATN111SQ2	110ohm (Typ.)	5000mA		Kit	≥3A				ReFlow
		2.2	DLW5ATN401SQ2	400ohm (Typ.)	2000mA		Kit	≥1A				ReFlow
		2.2	DLW5ATN501SQ2	500ohm (Typ.)	1500mA		Kit	≥1A				ReFlow
		2.2	DLW5ATN851SQ2	850ohm (Typ.)	1500mA		Kit	≥1A				ReFlow
		2.2	DLW5ATN272SQ2	2700ohm (Typ.)	1000mA		Kit	≥1A				ReFlow
	p182	2.2	DLW5ATN500MQ2	50ohm (Typ.)	6000mA		Kit	≥3A			Flow	ReFlow
	2014(5036)	2.2	DLW5ATN151MQ2	150ohm (Typ.)	5000mA		Kit	≥3A			Flow	ReFlow
		2.2	DLW5ATN331MQ2	330ohm (Typ.)	4000mA		Kit	≥3A			Flow	ReFlow
		2.2	DLW5ATN501MQ2	500ohm (Typ.)	2500mA	New	Kit	≥1A			Flow	ReFlow
		2.2	DLW5ATN112MQ2	1100ohm (Typ.)	2000mA		Kit	≥1A			Flow	ReFlow
		2.2	DLW5ATN111TQ2	100ohm (Typ.)	5000mA		Kit	≥3A				ReFlow
		2.2	DLW5ATN231TQ2	230ohm (Typ.)	4000mA		Kit	≥3A				ReFlow
		2.2	DLW5ATN401TQ2	400ohm (Typ.)	2500mA	New	Kit	≥1A				ReFlow
		2.2	DLW5ATN501TQ2	500ohm (Typ.)	2000mA		Kit	≥1A				ReFlow
	p177	4.5	DLW5BSM501TQ2	500ohm (Typ.)	1000mA	New	Kit	≥1A				ReFlow
		4.5	DLW5BSM601TQ2	600ohm (Typ.)	1400mA	New	Kit	≥1A				ReFlow
		4.5	DLW5BSM801TQ2	800ohm (Typ.)	2000mA	New	Kit	≥1A				ReFlow
		4.5	DLW5BSM191SQ2	190ohm (Typ.)	5000mA		Kit	≥3A				ReFlow
		4.5	DLW5BSM351SQ2	350ohm (Typ.)	2000mA		Kit	≥1A				ReFlow
		4.5	DLW5BSM102SQ2	1000ohm (Typ.)	1500mA		Kit	≥1A				ReFlow
		4.5	DLW5BSM152SQ2	1500ohm (Typ.)	1000mA		Kit	≥1A				ReFlow
		4.5	DLW5BSM302SQ2	3000ohm (Typ.)	500mA		Kit					ReFlow
	p179	2.35	DLW5BTM101SQ2	100ohm (Typ.)	6000mA		Kit	≥3A				ReFlow
	2020(5050)	2.35	DLW5BTM251SQ2	250ohm (Typ.)	5000mA		Kit	≥3A				ReFlow
		2.35	DLW5BTM501SQ2	500ohm (Typ.)	4000mA		Kit	≥3A				ReFlow
		2.35	DLW5BTM102SQ2	1000ohm (Typ.)	2000mA		Kit	≥1A				ReFlow
		2.35	DLW5BTM142SQ2	1400ohm (Typ.)	1500mA		Kit	≥1A				ReFlow
	p182	2.35	DLW5BTM101TQ2	100ohm (Typ.)	6000mA		Kit	≥3A				ReFlow
		2.35	DLW5BTM251TQ2	250ohm (Typ.)	5000mA		Kit	≥3A				ReFlow
		2.35	DLW5BTM501TQ2	500ohm (Typ.)	4000mA		Kit	≥3A				ReFlow
		2.35	DLW5BTM102TQ2	1000ohm (Typ.)	2500mA	New	Kit	≥1A				ReFlow
		2.35	DLW5BTM142TQ2	1400ohm (Typ.)	2000mA		Kit	≥1A				ReFlow

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Type	Size in inch (in mm)	Thickness (mm)	Part Number	Common Mode Impedance (at 10MHz/20°C)	Rated Current	New / Kit / ≧3A ≧10A / HD UD / Zmatch / Flow / ReFlow
Large Current Common Mode Choke Coil for Automotive Available	p202 (12.9x6.6)	9.4	**PLT10HH450180PN**	45ohm (Typ.)	18A	Kit ≧10A ReFlow
		9.4	**PLT10HH101150PN**	100ohm (Typ.)	15A	Kit ≧10A ReFlow
		9.4	**PLT10HH401100PN**	400ohm (Typ.)	10A	Kit ≧10A ReFlow
		9.4	**PLT10HH501100PN**	500ohm (Typ.)	10A	Kit ≧10A ReFlow
		9.4	**PLT10HH9016R0PN**	900ohm (Typ.)	6A	Kit ≧3A ReFlow
		9.4	**PLT10HH1026R0PN**	1000ohm (Typ.)	6A	Kit ≧3A ReFlow

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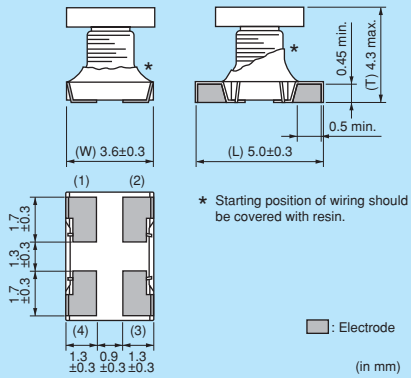
DLW5AH/DLW5BS Series 2014/5036 (inch/mm) 2020/5050 (inch/mm)

Hi Power Reflow OK

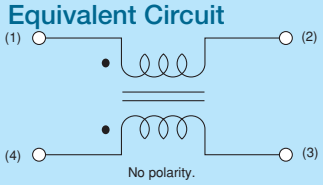
5A max., common mode choke coil for power lines.

DLW5AH

■ Dimensions



■ Equivalent Circuit

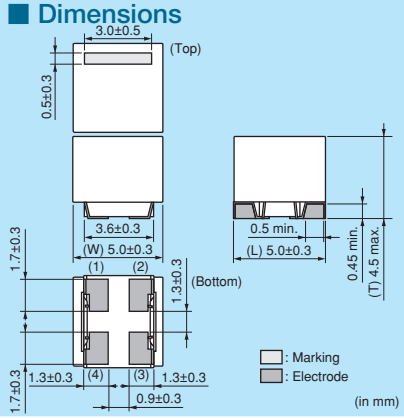


■ Packaging

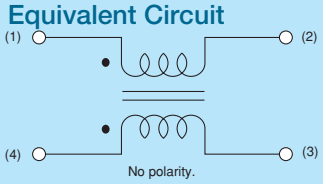
Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	400
K	330mm Reel Embossed Tape	1500
B	Bulk(Bag)	100

DLW5BS

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	400
K	330mm Reel Embossed Tape	1500
B	Bulk(Bag)	100

Refer to pages from p.205 to p.209 for mounting information.

■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 10MHz/20°C)	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW5AHN402SQ2□	-	4000ohm (Typ.)	200mA	50Vdc	10M ohm	125Vdc	3.0ohm max.	Kit
DLW5BSM501TQ2□	2800ohm ±40%	500ohm (Typ.)	1000mA	50Vdc	10M ohm	125Vdc	0.23ohm max.	New Kit ≧1A
DLW5BSM601TQ2□	1200ohm ±40%	600ohm (Typ.)	1400mA	50Vdc	10M ohm	125Vdc	0.12ohm max.	New Kit ≧1A
DLW5BSM801TQ2□	550ohm ±40%	800ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	New Kit ≧1A
DLW5BSM191SQ2□	-	190ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.02ohm max.	Kit ≧3A
DLW5BSM351SQ2□	-	350ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.04ohm max.	Kit ≧1A
DLW5BSM102SQ2□	-	1000ohm (Typ.)	1500mA	50Vdc	10M ohm	125Vdc	0.06ohm max.	Kit ≧1A
DLW5BSM152SQ2□	-	1500ohm (Typ.)	1000mA	50Vdc	10M ohm	125Vdc	0.1ohm max.	Kit ≧1A
DLW5BSM302SQ2□	-	3000ohm (Typ.)	500mA	50Vdc	10M ohm	125Vdc	0.3ohm max.	Kit

Operating Temperature Range: -25°C to +85°C (DLW5AH), -40°C to +105°C (DLW5BS_TQ2), -40°C to +85°C (DLW5BS_SQ2) Number of Circuit: 1

Continued on the following page.

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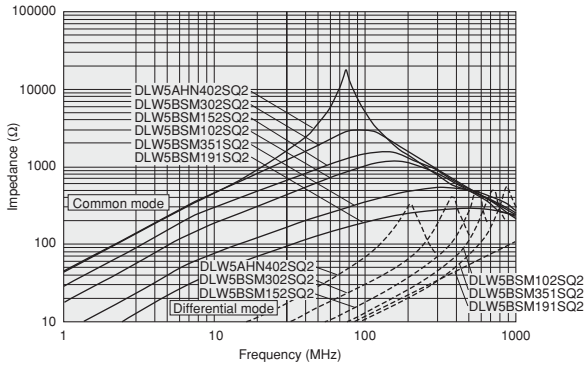
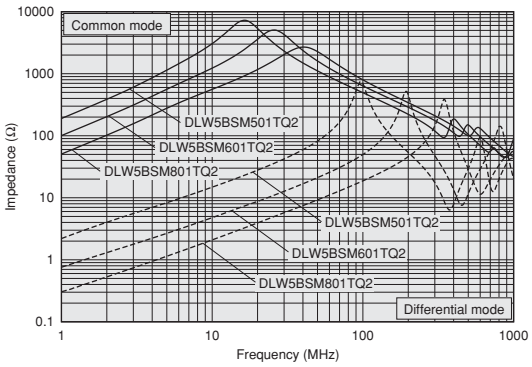
■ Impedance-Frequency Characteristics

DLW5AH_SQ2/DLW5BS_SQ2 Series



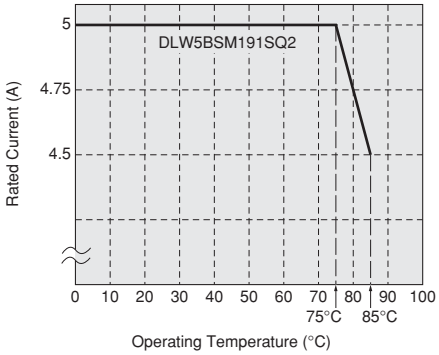
DLW5BS_TQ2 Series



■ Notice (Rating)

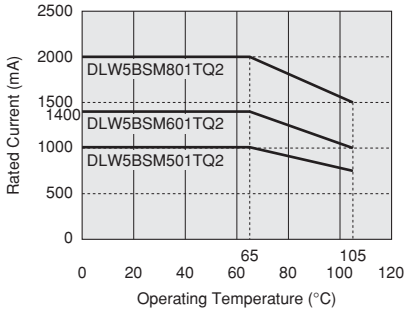
In operating temperature exceeding +75°C, derating of current is necessary for DLW5BSM191SQ2.
Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



In operating temperature exceeding +65°C, derating of current is necessary for DLW5BS_TQ2 series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



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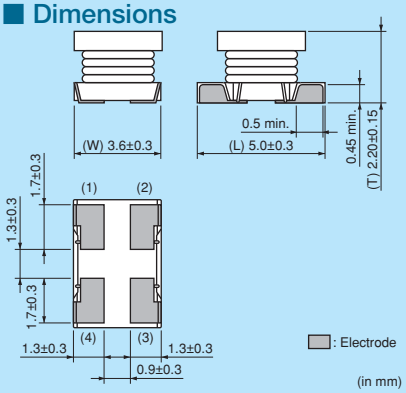
DLW5AT/DLW5BT Series 2014/5036 (inch/mm) 2020/5050 (inch/mm)

Hi Power Reflow OK

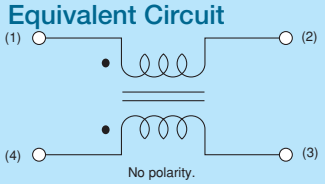
Low profile wire-wound common choke coil for power lines.

DLW5AT

■ Dimensions



■ Equivalent Circuit

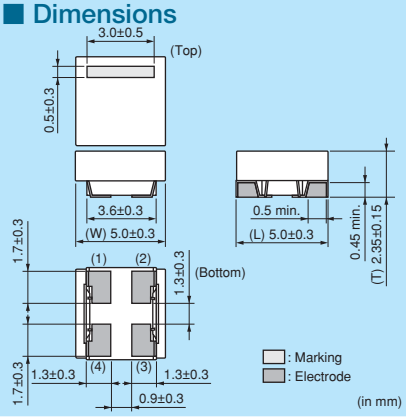


■ Packaging

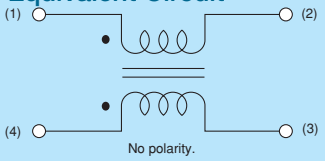
Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	700
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

DLW5BT

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	700
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

Refer to pages from p.205 to p.209 for mounting information.

■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW5ATN111SQ2□	110ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.020ohm max.	Kit ≧3A
DLW5ATN401SQ2□	400ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.034ohm max.	Kit ≧1A
DLW5ATN501SQ2□	500ohm (Typ.)	1500mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	Kit ≧1A
DLW5ATN851SQ2□	850ohm (Typ.)	1500mA	50Vdc	10M ohm	125Vdc	0.073ohm max.	Kit ≧1A
DLW5ATN272SQ2□	2700ohm (Typ.)	1000mA	50Vdc	10M ohm	125Vdc	0.12ohm max.	Kit ≧1A
DLW5BTM101SQ2□	100ohm (Typ.)	6000mA	50Vdc	10M ohm	125Vdc	0.013ohm max.	Kit ≧3A
DLW5BTM251SQ2□	250ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.020ohm max.	Kit ≧3A
DLW5BTM501SQ2□	500ohm (Typ.)	4000mA	50Vdc	10M ohm	125Vdc	0.027ohm max.	Kit ≧3A
DLW5BTM102SQ2□	1000ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.034ohm max.	Kit ≧1A
DLW5BTM142SQ2□	1400ohm (Typ.)	1500mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	Kit ≧1A

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1

Continued on the following page.

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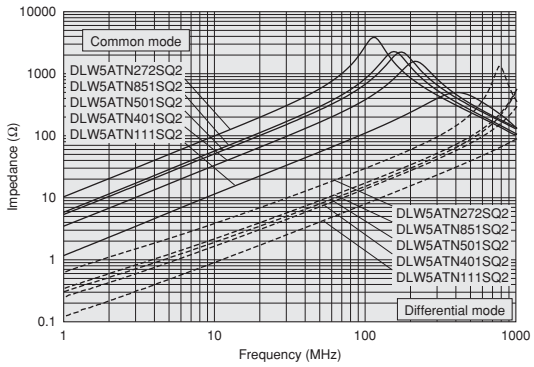
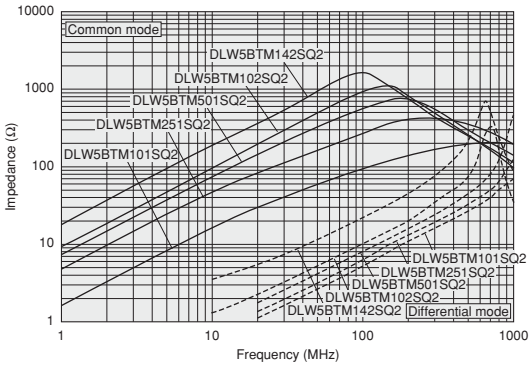
■ Impedance-Frequency Characteristics

DLW5AT Series



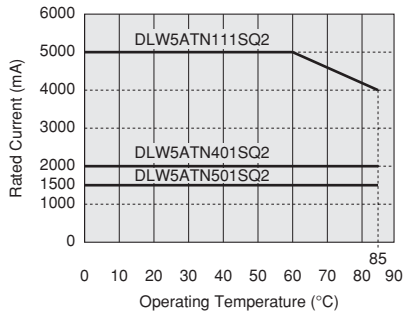
DLW5BT Series

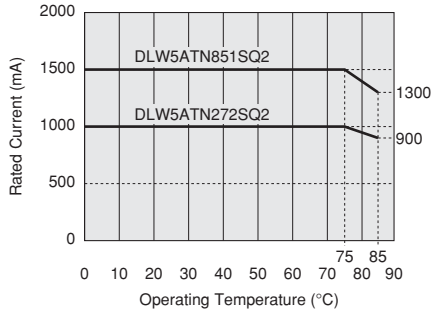


■ Notice (Rating)

In operating temperature exceeding +60°C, derating of current is necessary for DLW5AT series. Please apply the derating curve shown in chart according to the operating temperature.

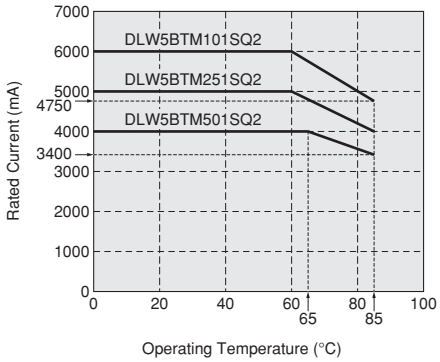
Derating of Rated Current





In operating temperature exceeding +60°C, derating of current is necessary for the following part name of DLW5BT series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



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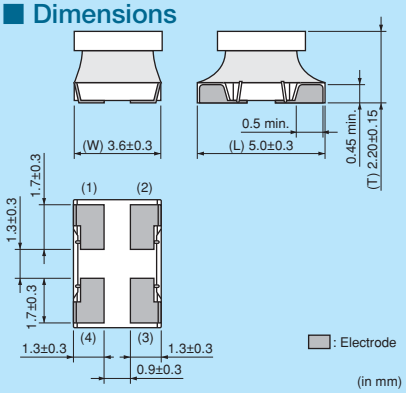
DLW5AT/DLW5BT Series (105degreeC available type)

Hi Power

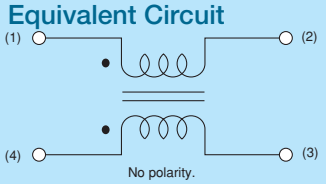
Low profile wire-wound common choke coil for power lines. (105degreeC available type)

DLW5AT_MQ2

Dimensions



Equivalent Circuit

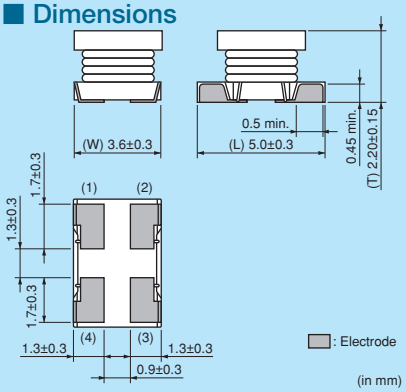


Packaging

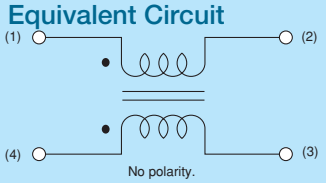
Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	700
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

DLW5AT_TQ2

Dimensions



Equivalent Circuit

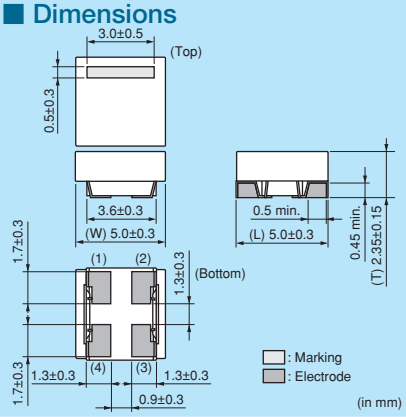


Packaging

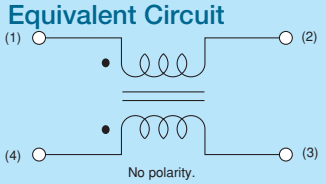
Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	700
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

DLW5BT_TQ2

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	700
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

Refer to pages from p.205 to p.209 for mounting information.

Continued on the following page.

DLW5AT/DLW5BT Series (105degreeC available type)

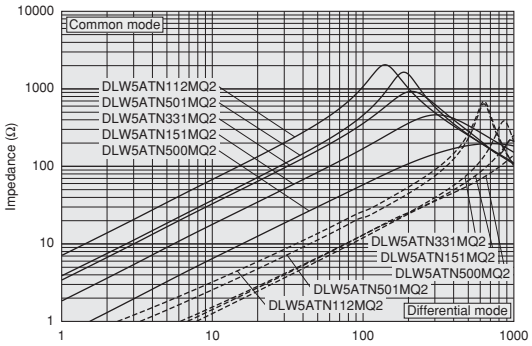
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW5ATN500MQ2□	50ohm (Typ.)	6000mA	50Vdc	10M ohm	125Vdc	0.013ohm max.	Kit ≧3A Flow ReFlow
DLW5ATN151MQ2□	150ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.020ohm max.	Kit ≧3A Flow ReFlow
DLW5ATN331MQ2□	330ohm (Typ.)	4000mA	50Vdc	10M ohm	125Vdc	0.027ohm max.	Kit ≧3A Flow ReFlow
DLW5ATN501MQ2□	500ohm (Typ.)	2500mA	50Vdc	10M ohm	125Vdc	0.034ohm max.	New Kit ≧1A Flow ReFlow
DLW5ATN112MQ2□	1100ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	Kit ≧1A Flow ReFlow
DLW5ATN111TQ2□	110ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.020ohm max.	Kit ≧3A ReFlow
DLW5ATN231TQ2□	230ohm (Typ.)	4000mA	50Vdc	10M ohm	125Vdc	0.027ohm max.	Kit ≧3A ReFlow
DLW5ATN401TQ2□	400ohm (Typ.)	2500mA	50Vdc	10M ohm	125Vdc	0.034ohm max.	New Kit ≧1A ReFlow
DLW5ATN501TQ2□	500ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	Kit ≧1A ReFlow
DLW5BTM101TQ2□	100ohm (Typ.)	6000mA	50Vdc	10M ohm	125Vdc	0.013ohm max.	Kit ≧3A ReFlow
DLW5BTM251TQ2□	250ohm (Typ.)	5000mA	50Vdc	10M ohm	125Vdc	0.020ohm max.	Kit ≧3A ReFlow
DLW5BTM501TQ2□	500ohm (Typ.)	4000mA	50Vdc	10M ohm	125Vdc	0.027ohm max.	Kit ≧3A ReFlow
DLW5BTM102TQ2□	1000ohm (Typ.)	2500mA	50Vdc	10M ohm	125Vdc	0.034ohm max.	New Kit ≧1A ReFlow
DLW5BTM142TQ2□	1400ohm (Typ.)	2000mA	50Vdc	10M ohm	125Vdc	0.056ohm max.	Kit ≧1A ReFlow

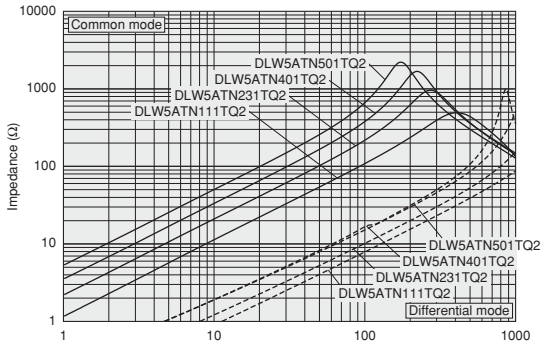
Operating Temperature Range: -40°C to +105°C Number of Circuit: 1

■ Impedance-Frequency Characteristics

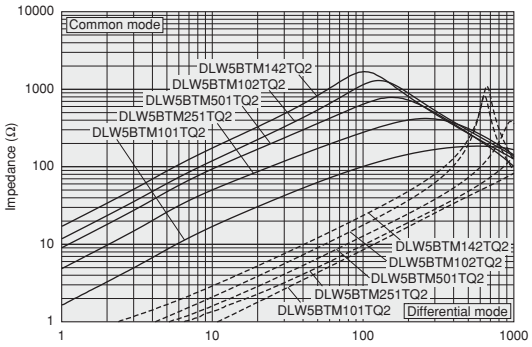
DLW5AT_MQ2 Series



DLW5AT_TQ2 Series



DLW5BT_TQ2 Series



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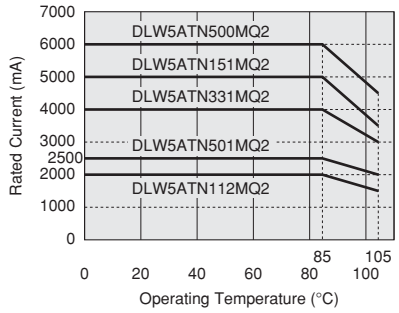
■ Notice (Rating)

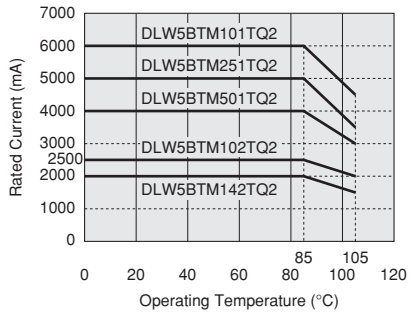
In operating temperature exceeding +85°C, derating of current is necessary for DLW5AT series (105 degree C available type). Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



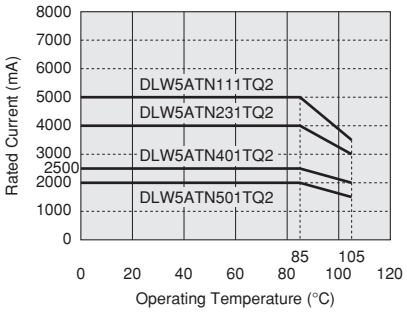
In operating temperature exceeding +85°C, derating of current is necessary for DLW5BT series (105 degree C available type). Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



In operating temperature exceeding +85°C, derating of current is necessary for DLW5AT series (105 degree C available type). Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current

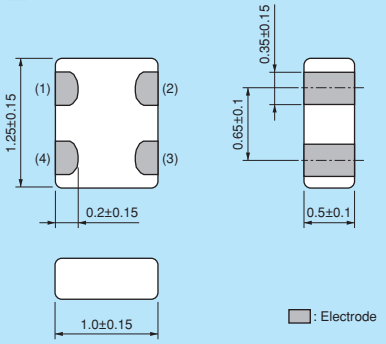


DLM11G Series 0504/1210 (inch/mm)

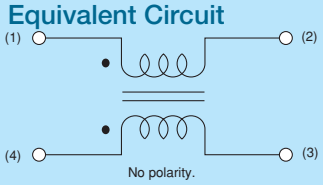
Reflow OK

Audio line common choke also effective to differential mode.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
D	180mm Reel Paper Tape	10000
B	Bulk(Bag)	1000

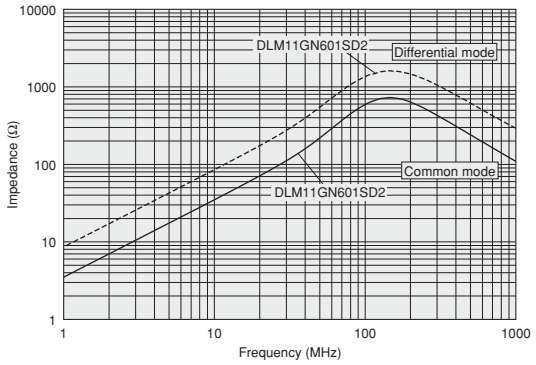
Refer to pages from p.205 to p.209 for mounting information.

■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	Operating Temperature Range
DLM11GN601SD2□	600ohm ±25%	100mA	5Vdc	100M ohm	25Vdc	0.8ohm max.	-40°C to +85°C

Number of Circuit: 1

■ Impedance-Frequency Characteristics



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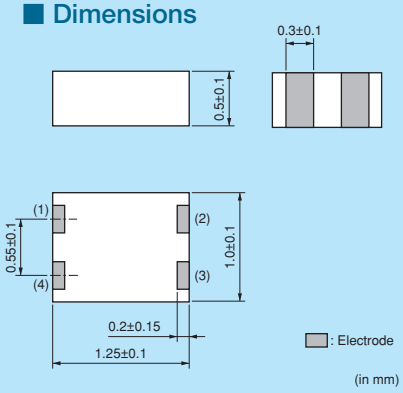
DLM11S Series 0504/1210 (inch/mm)

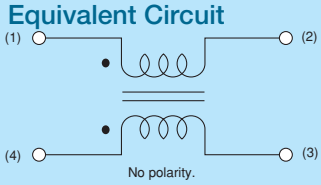
Reflow OK

0504 size multilayer type chip common mode choke coil.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	4000
B	Bulk(Bag)	500

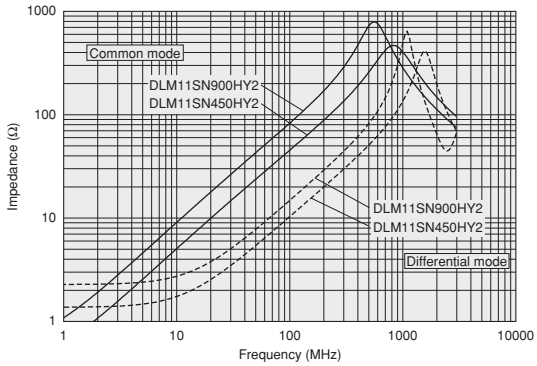
Refer to pages from p.205 to p.209 for mounting information.

■ Rated Value (□: packaging code)

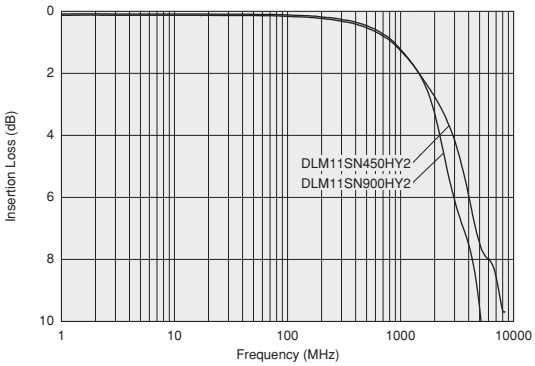
Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLM11SN450HY2□	45ohm ±25%	100mA	5Vdc	100M ohm	12.5Vdc	0.7ohm±25%	Kit HD Imp Match
DLM11SN900HY2□	90ohm ±25%	100mA	5Vdc	100M ohm	12.5Vdc	1.1ohm±25%	Kit HD Imp Match

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1

■ Impedance-Frequency Characteristics



■ Differential Mode Transmission Characteristics (Typ.)



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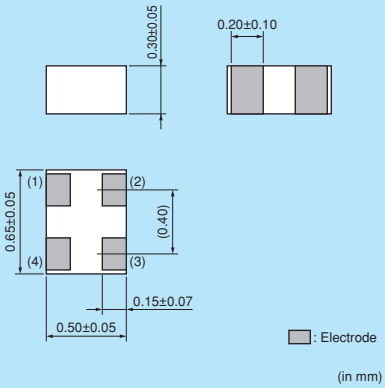
DLP0QS Series 025020/0605 (inch/mm)

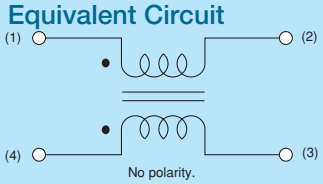
Reflow OK

025020 size, very small chip common mode choke coil, Cut-off frequency 8GHz max. Some of them are ready for Display port or SATA.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
D	180mm Reel Paper Tape	15000
B	Bulk(Bag)	500

Refer to pages from p.205 to p.209 for mounting information.

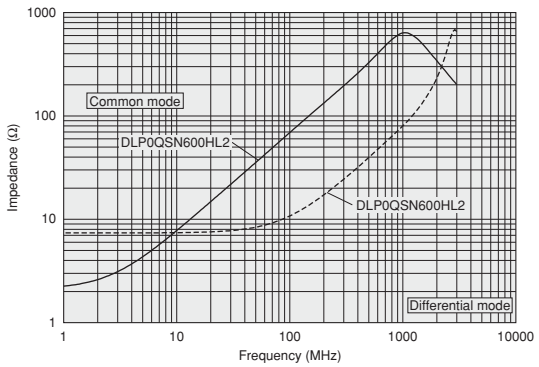
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP0QSN600HL2□	60ohm ±25%	50mA	5Vdc	100M ohm	12.5Vdc	3.8ohm±25%	Kit HD Imp Match
DLP0QSA070HL2□	7ohm ±2ohm	100mA	5Vdc	100M ohm	12.5Vdc	0.7ohm±25%	Kit UD Imp Match
DLP0QSA150HL2□	15ohm ±5ohm	100mA	5Vdc	100M ohm	12.5Vdc	0.8ohm±25%	Kit UD Imp Match
DLP0QSA350HL2□	35ohm ±10ohm	100mA	5Vdc	100M ohm	12.5Vdc	2.2ohm±25%	Kit UD Imp Match

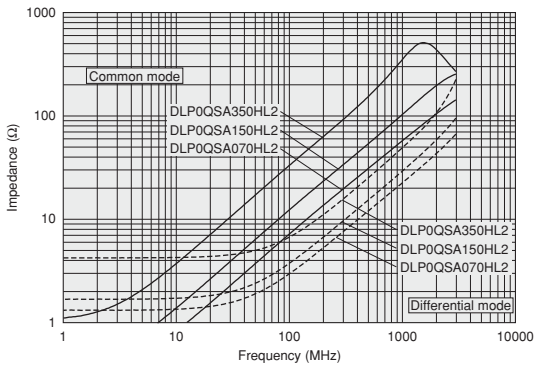
Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

■ Impedance-Frequency Characteristics

DLP0QSN Series

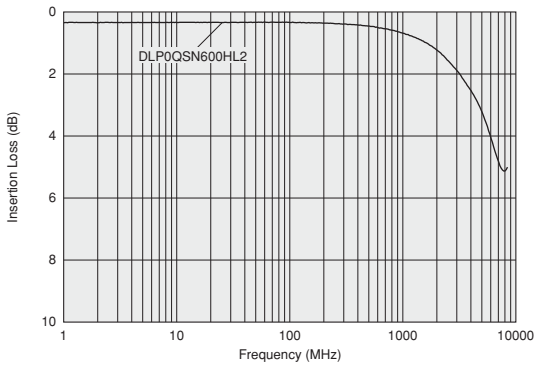


DLP0QSA Series

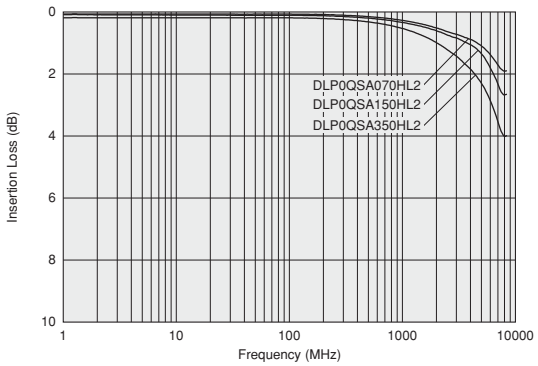


■ Differential Mode Transmission Characteristics (Typ.)

DLP0QSN Series



DLP0QSA Series



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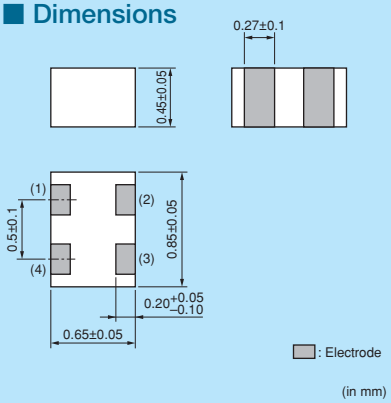
DLP0NS Series 03025/0806 (inch/mm)

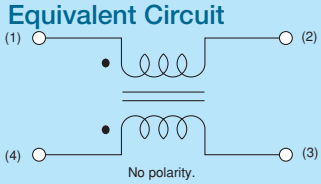
Reflow OK

03025 size, very small chip common mode choke coil, Cut-off frequency 8GHz max. Some of them are ready for mipi, Display port or SATA.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	10000
B	Bulk(Bag)	500

Refer to pages from p.205 to p.209 for mounting information.

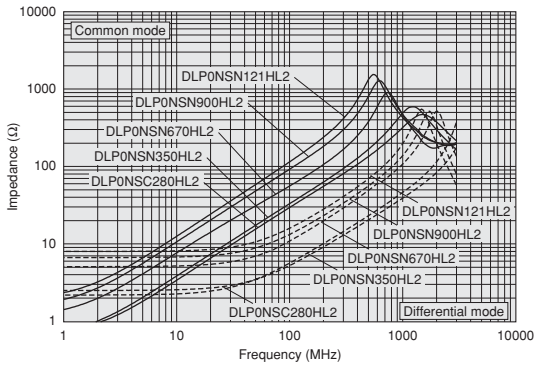
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP0NSC280HL2□	28ohm ±20%	100mA	5Vdc	100M ohm	12.5Vdc	1.3ohm±25%	Kit HD Imp Match
DLP0NSN350HL2□	35ohm ±10ohm	100mA	5Vdc	100M ohm	12.5Vdc	1.2ohm±25%	Kit HD Imp Match
DLP0NSN670HL2□	67ohm ±20%	110mA	5Vdc	100M ohm	12.5Vdc	2.4ohm±25%	Kit HD Imp Match
DLP0NSN900HL2□	90ohm ±20%	100mA	5Vdc	100M ohm	12.5Vdc	3.0ohm±25%	Kit HD Imp Match
DLP0NSN121HL2□	120ohm ±20%	90mA	5Vdc	100M ohm	12.5Vdc	3.8ohm±25%	Kit HD Imp Match
DLP0NSA070HL2□	7ohm ±2ohm	100mA	5Vdc	100M ohm	12.5Vdc	0.6ohm±25%	Kit UD Imp Match
DLP0NSA150HL2□	15ohm ±5ohm	100mA	5Vdc	100M ohm	12.5Vdc	0.95ohm±25%	Kit UD Imp Match

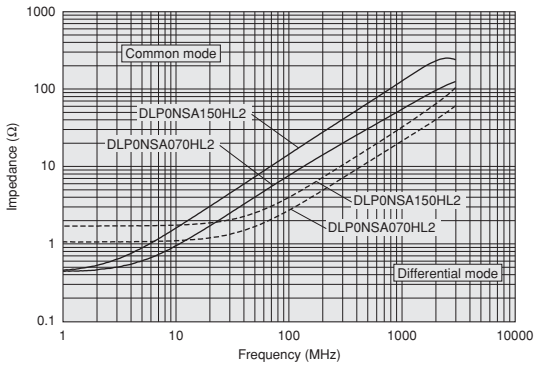
Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

■ Impedance-Frequency Characteristics

DLP0NSC/DLP0NSN Series



DLP0NSA Series



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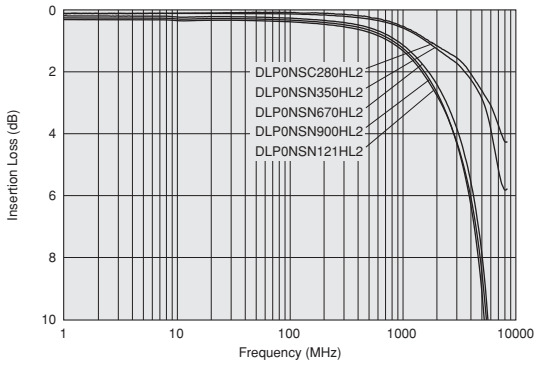
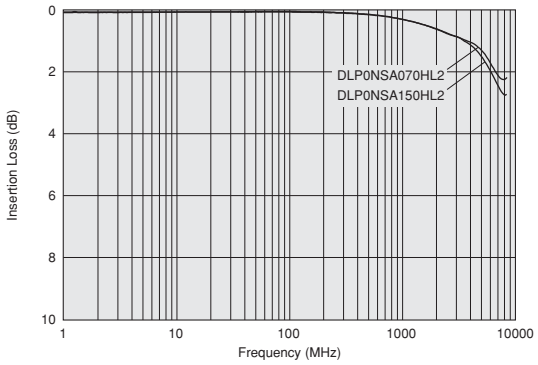
■ Differential Mode Transmission Characteristics (Typ.)

DLP0NSC/DLP0NSN Series



DLP0NSA Series



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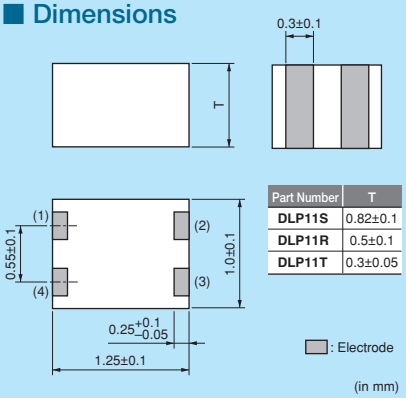
DLP11S/DLP11R/DLP11T Series 0504/1210 (inch/mm)

Reflow OK

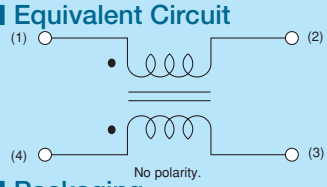
8GHz cut-off frequency (for HDMI/USB3.0) is available.

■ Dimensions



Part Number	T
DLP11S	0.82±0.1
DLP11R	0.5±0.1
DLP11T	0.3±0.05

■ Equivalent Circuit



No polarity.

■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	3000 (DLP11S)
		4000 (DLP11RN/RB)
		5000 (DLP11T)
B	Bulk(Bag)	500

Refer to pages from p.205 to p.209 for mounting information.

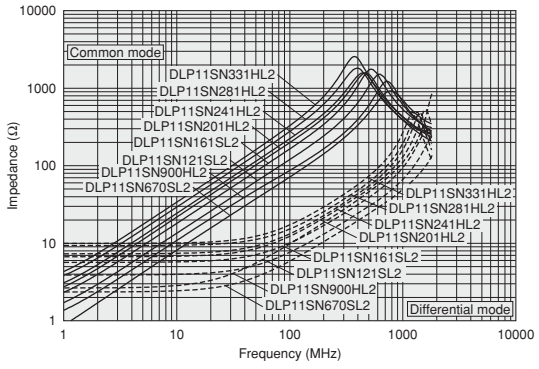
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP11SN670SL2□	67ohm ±20%	180mA	5Vdc	100M ohm	12.5Vdc	1.3ohm±25%	Kit HD
DLP11SN121SL2□	120ohm ±20%	140mA	5Vdc	100M ohm	12.5Vdc	2.0ohm±25%	Kit HD
DLP11SN161SL2□	160ohm ±20%	120mA	5Vdc	100M ohm	12.5Vdc	2.7ohm±25%	Kit HD
DLP11SN900HL2□	90ohm ±20%	150mA	5Vdc	100M ohm	12.5Vdc	1.5ohm±25%	Kit HD Imp. Match
DLP11SN201HL2□	200ohm ±20%	110mA	5Vdc	100M ohm	12.5Vdc	3.1ohm±25%	Kit HD Imp. Match
DLP11SN241HL2□	240ohm ±20%	100mA	5Vdc	100M ohm	12.5Vdc	3.5ohm±25%	Kit HD Imp. Match
DLP11SN281HL2□	280ohm ±20%	90mA	5Vdc	100M ohm	12.5Vdc	4.2ohm±25%	Kit HD Imp. Match
DLP11SN331HL2□	330ohm ±20%	80mA	5Vdc	100M ohm	12.5Vdc	4.9ohm±25%	Kit HD Imp. Match
DLP11SA350HL2□	35ohm ±20%	170mA	5Vdc	100M ohm	12.5Vdc	0.9ohm±25%	Kit UD Imp. Match
DLP11SA670HL2□	67ohm ±20%	150mA	5Vdc	100M ohm	12.5Vdc	1.2ohm±25%	Kit UD Imp. Match
DLP11SA900HL2□	90ohm ±20%	150mA	5Vdc	100M ohm	12.5Vdc	1.4ohm±25%	Kit UD Imp. Match

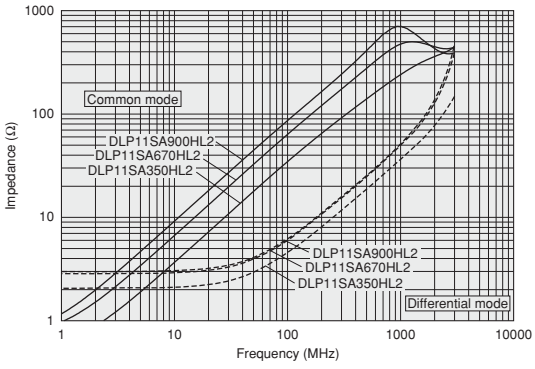
Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

■ Impedance-Frequency Characteristics

DLP11SN Series



DLP11SA Series



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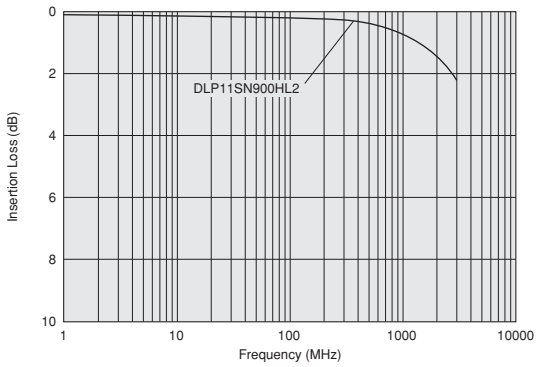
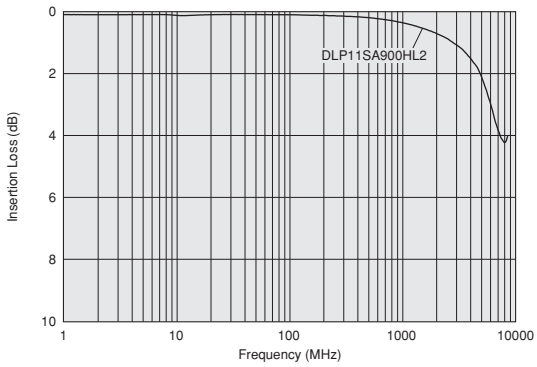
■ Differential Mode Transmission Characteristics (Typ.)

DLP11SN Series



DLP11SA Series



■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP11RN450UL2□	45ohm ±25%	100mA	5Vdc	100M ohm	12.5Vdc	0.8ohm±25%	Kit HD Imp Match
DLP11RB150UL2□	15ohm ±5ohm	100mA	5Vdc	100M ohm	12.5Vdc	0.8ohm±25%	Kit UD Imp Match
DLP11RB400UL2□	40ohm ±10ohm	100mA	5Vdc	100M ohm	12.5Vdc	1.3ohm±25%	Kit UD Imp Match

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Differential mode to common mode conversion characteristic (Scd21) at 2.5GHz

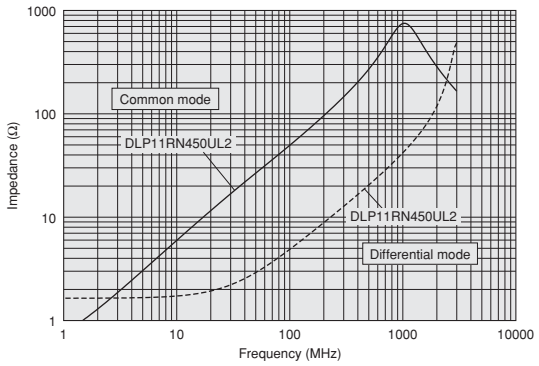
DLP11RB: -40dB

Impedance Characteristics between signal lines Z0 (TDR at 50ps)

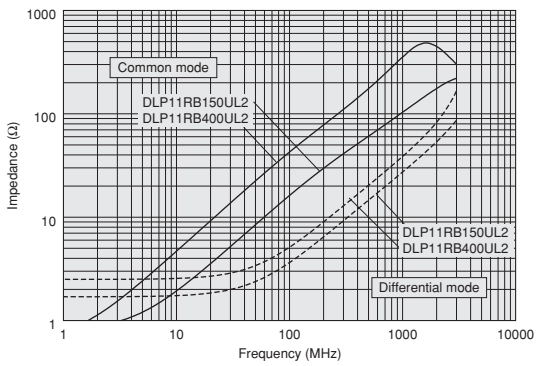
DLP11RB: 90ohm±15ohm

■ Impedance-Frequency Characteristics

DLP11RN Series

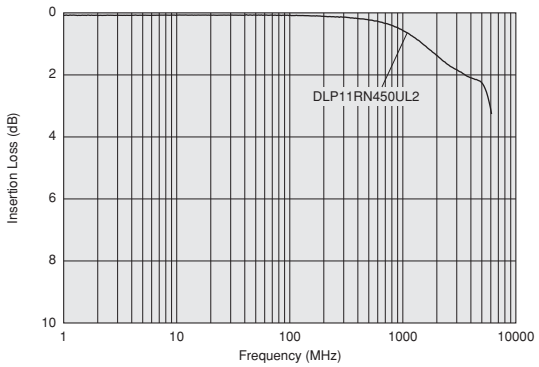


DLP11RB Series

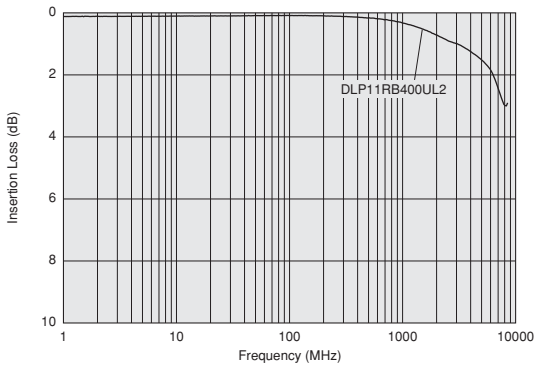


■ Differential Mode Transmission Characteristics (Typ.)

DLP11RN Series



DLP11RB Series



Continued on the following page.

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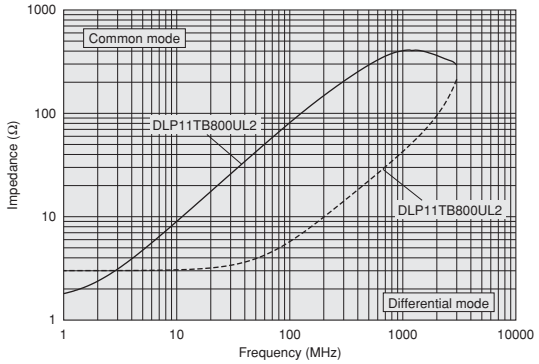
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP11TB800UL2□	80ohm ±25%	100mA	5Vdc	100M ohm	12.5Vdc	1.5ohm±25%	Kit UD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines
Differential mode to common mode conversion characteristic (Scd21) at 2.5GHz
DLP11TB: -40dB
Impedance Characteristics between signal lines Z0 (TDR at 50ps)
DLP11TB: 90ohm±15ohm

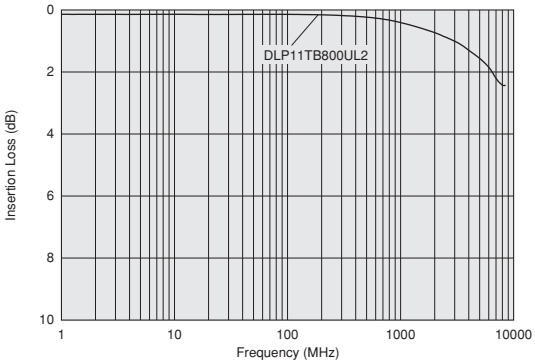
■ Impedance-Frequency Characteristics

DLP11TB Series



■ Differential Mode Transmission Characteristics (Typ.)

DLP11TB Series

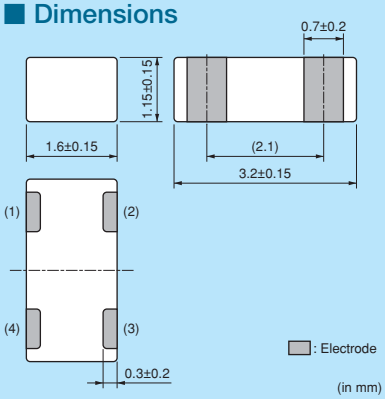


DLP31S Series 1206/3216 (inch/mm)

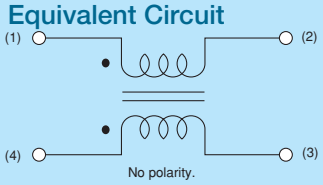
Reflow OK

1206 size film type chip common mode choke coil.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	3000
B	Bulk(Bag)	500

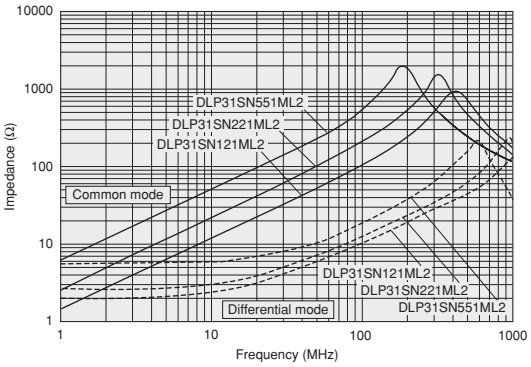
Refer to pages from p.205 to p.209 for mounting information.

Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP31SN121ML2□	120ohm ±20%	100mA	16Vdc	100M ohm	40Vdc	2.0ohm max.	HD
DLP31SN221ML2□	220ohm ±20%	100mA	16Vdc	100M ohm	40Vdc	2.5ohm max.	HD
DLP31SN551ML2□	550ohm ±20%	100mA	16Vdc	100M ohm	40Vdc	3.6ohm max.	HD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics



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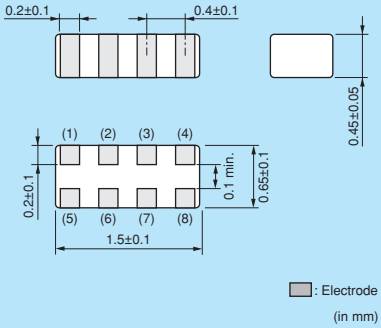
DLP1ND Series 05025/1506 (inch/mm)

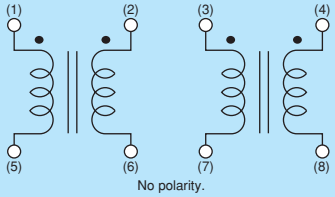
Reflow OK

2 circuits in 05025 size, adapt to HDMI line.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	5000
B	Bulk(Bag)	500

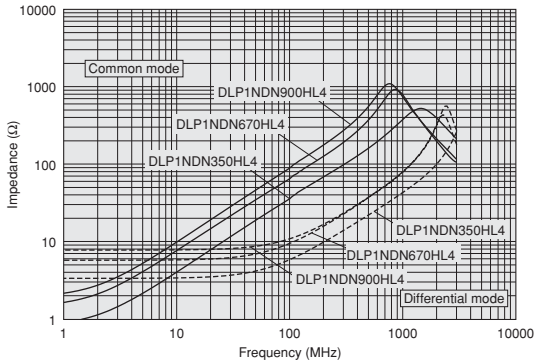
Refer to pages from p.205 to p.209 for mounting information.

Rated Value (□: packaging code)

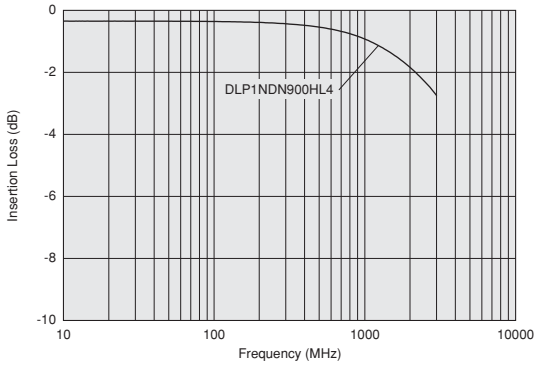
Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP1NDN350HL4□	35ohm ±20%	100mA	5Vdc	100M ohm	12.5Vdc	1.8ohm±25%	Kit HD Impedance Match
DLP1NDN670HL4□	67ohm ±20%	80mA	5Vdc	100M ohm	12.5Vdc	2.9ohm±25%	Kit HD Impedance Match
DLP1NDN900HL4□	90ohm ±20%	60mA	5Vdc	100M ohm	12.5Vdc	3.7ohm±25%	Kit HD Impedance Match

Operating Temperature Range: -40°C to +85°C Number of Circuit: 2 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics



Differential Mode Transmission Characteristics (Typ.)



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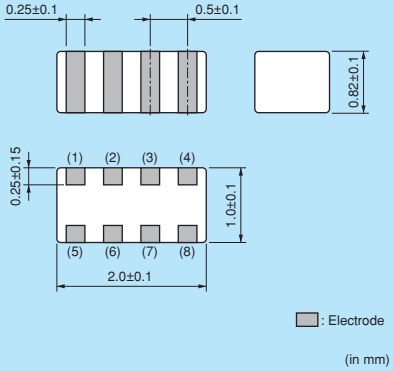
DLP2AD Series 0804/2010 (inch/mm)

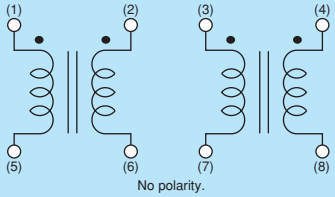
Reflow OK

2 circuit built-in, 0804 size, HDMI adapted type available, cut-off frequency 6GHz max.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	3000
B	Bulk(Bag)	500

Refer to pages from p.205 to p.209 for mounting information.

■ Rated Value (□: packaging code)

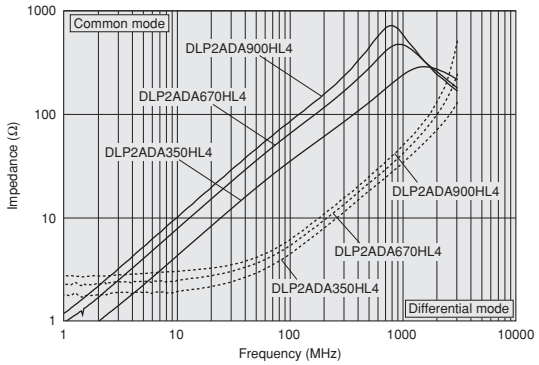
Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP2ADA350HL4□	35ohm ±20%	150mA	5Vdc	100M ohm	12.5Vdc	0.8ohm±25%	Kit UD Impedance Match
DLP2ADA670HL4□	67ohm ±20%	130mA	5Vdc	100M ohm	12.5Vdc	1.0ohm±25%	Kit UD Impedance Match
DLP2ADA900HL4□	90ohm ±20%	120mA	5Vdc	100M ohm	12.5Vdc	1.4ohm±25%	Kit UD Impedance Match
DLP2ADN670HL4□	67ohm ±20%	140mA	5Vdc	100M ohm	12.5Vdc	1.3ohm±25%	Kit HD Impedance Match
DLP2ADN900HL4□	90ohm ±20%	130mA	5Vdc	100M ohm	12.5Vdc	1.7ohm±25%	Kit HD Impedance Match
DLP2ADN121HL4□	120ohm ±20%	120mA	5Vdc	100M ohm	12.5Vdc	2.0ohm±25%	Kit HD Impedance Match
DLP2ADN161HL4□	160ohm ±20%	100mA	5Vdc	100M ohm	12.5Vdc	2.5ohm±25%	Kit HD Impedance Match
DLP2ADN201HL4□	200ohm ±20%	90mA	5Vdc	100M ohm	12.5Vdc	3.2ohm±25%	Kit HD Impedance Match
DLP2ADN241HL4□	240ohm ±20%	80mA	5Vdc	100M ohm	12.5Vdc	3.8ohm±25%	Kit HD Impedance Match
DLP2ADN281HL4□	280ohm ±20%	80mA	5Vdc	100M ohm	12.5Vdc	4.6ohm±25%	Kit HD Impedance Match

Operating Temperature Range: -40°C to +85°C Number of Circuit: 2

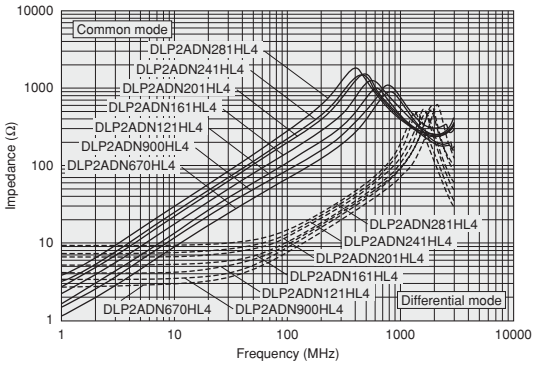
HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

■ Impedance-Frequency Characteristics

DLP2ADA Series



DLP2ADN Series



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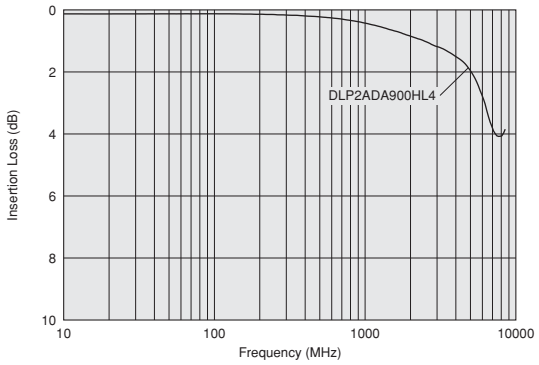
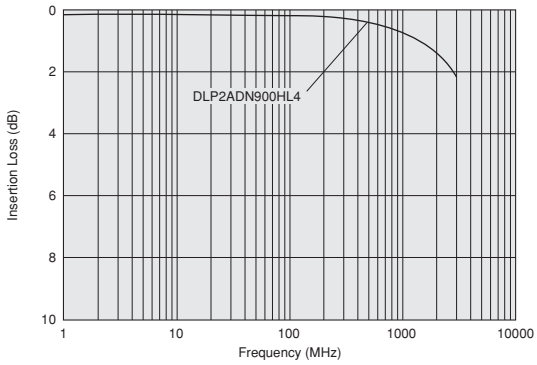
muRata

■ Differential Mode Transmission Characteristics (Typ.)

DLP2ADA Series



DLP2ADN Series

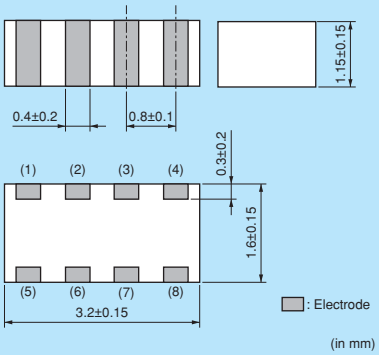


DLP31D Series 1206/3216 (inch/mm)

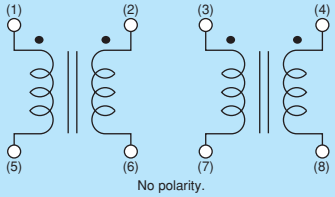
Reflow OK

2 circuit built-in, 1206 size, meet IEEE1394, USB, LVDS.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	3000
B	Bulk(Bag)	500

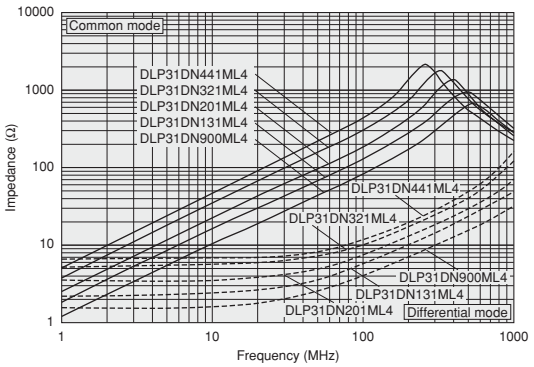
Refer to pages from p.205 to p.209 for mounting information.

Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLP31DN900ML4□	90ohm ±20%	160mA	10Vdc	100M ohm	25Vdc	1.1ohm max.	HD
DLP31DN131ML4□	130ohm ±20%	120mA	10Vdc	100M ohm	25Vdc	1.1ohm max.	HD
DLP31DN201ML4□	200ohm ±20%	100mA	10Vdc	100M ohm	25Vdc	2.2ohm max.	HD
DLP31DN321ML4□	320ohm ±20%	80mA	10Vdc	100M ohm	25Vdc	3.5ohm max.	HD
DLP31DN441ML4□	440ohm ±20%	70mA	10Vdc	100M ohm	25Vdc	4.3ohm max.	HD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 2 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics



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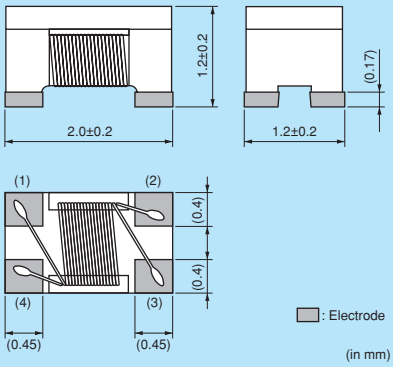
DLW21S Series 0805/2012 (inch/mm)

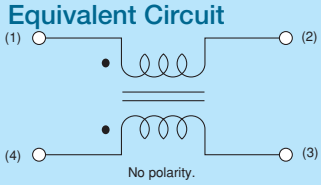
Reflow OK

Wire-wound common choke, HDMI available type prepared.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	2000
B	Bulk(Bag)	500

Refer to pages from p.205 to p.209 for mounting information.

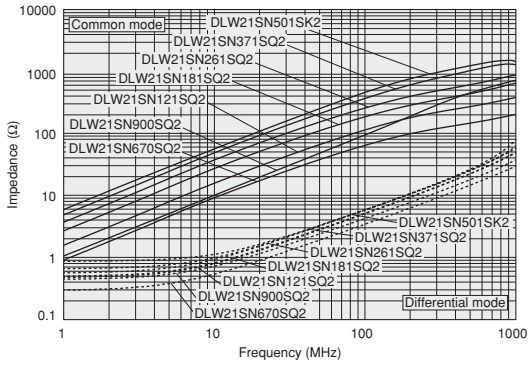
Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW21SN670SQ2□	67ohm ±25%	400mA	50Vdc	10M ohm	125Vdc	0.25ohm max.	Kit HD
DLW21SN900SQ2□	90ohm ±25%	330mA	50Vdc	10M ohm	125Vdc	0.35ohm max.	Kit HD
DLW21SN121SQ2□	120ohm ±25%	370mA	50Vdc	10M ohm	125Vdc	0.30ohm max.	Kit HD
DLW21SN181SQ2□	180ohm ±25%	330mA	50Vdc	10M ohm	125Vdc	0.35ohm max.	Kit HD
DLW21SN261SQ2□	260ohm ±25%	300mA	50Vdc	10M ohm	125Vdc	0.40ohm max.	Kit HD
DLW21SN371SQ2□	370ohm ±25%	280mA	50Vdc	10M ohm	125Vdc	0.45ohm max.	Kit HD
DLW21SN501SK2□	500ohm ±25%	250mA	50Vdc	10M ohm	125Vdc	0.5ohm max.	Kit HD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics

DLW21SN_SQ2/SK2 Series



Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW21SN670HQ2□	67ohm ±25%	320mA	20Vdc	10M ohm	50Vdc	0.31ohm max.	Kit UD Impedance Match
DLW21SN900HQ2□	90ohm ±25%	280mA	20Vdc	10M ohm	50Vdc	0.41ohm max.	Kit UD Impedance Match
DLW21SN121HQ2□	120ohm ±25%	280mA	20Vdc	10M ohm	50Vdc	0.41ohm max.	Kit UD Impedance Match
DLW21SR670HQ2□	67ohm ±25%	400mA	20Vdc	10M ohm	50Vdc	0.25ohm max.	Kit UD Impedance Match

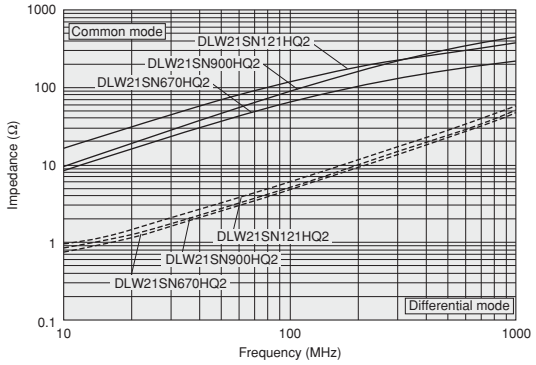
Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

DLW21SR670HQ2 is designed to correct line impedance when ESD protection device is also used.

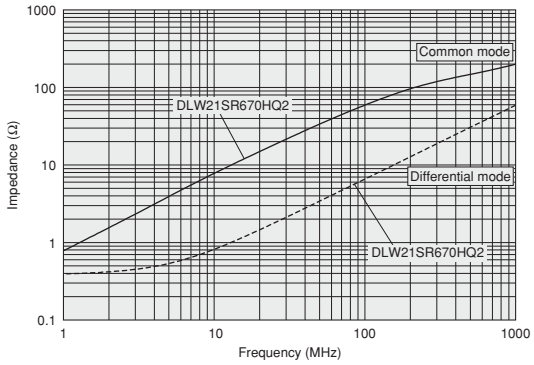
Continued on the following page.

■ Impedance-Frequency Characteristics

DLW21SN_HQ2 Series

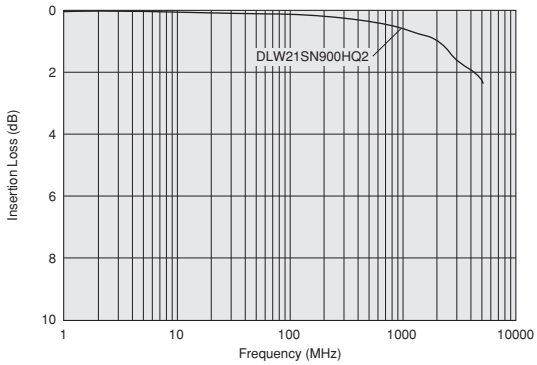


DLW21SR_HQ2 Series



■ Differential Mode Transmission Characteristics (Typ.)

DLW21SN_HQ2 Series



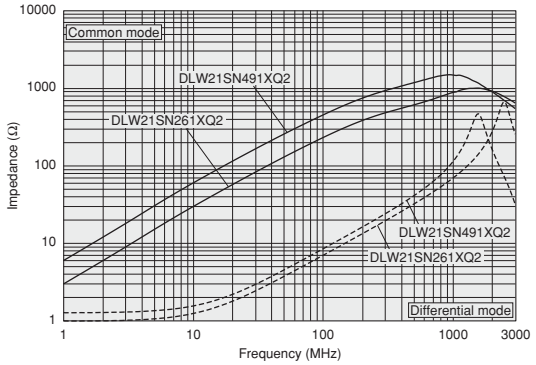
■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW21SN181XQ2□	180ohm ±25%	240mA	20Vdc	10M ohm	50Vdc	0.39ohm max.	New Kit HD
DLW21SN261XQ2□	260ohm ±25%	220mA	20Vdc	10M ohm	50Vdc	0.59ohm max.	New Kit HD
DLW21SN491XQ2□	490ohm ±25%	190mA	20Vdc	10M ohm	50Vdc	0.77ohm max.	New Kit HD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

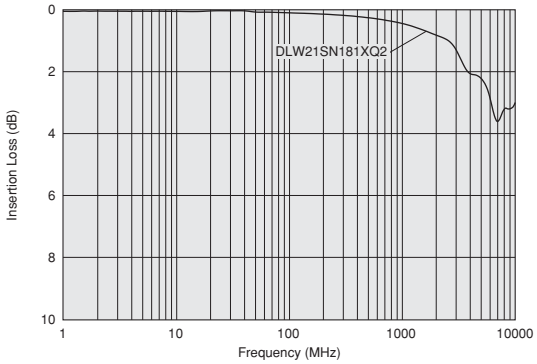
■ Impedance-Frequency Characteristics

DLW21SN_XQ2 Series



■ Differential Mode Transmission Characteristics (Typ.)

DLW21SN_XQ2 Series



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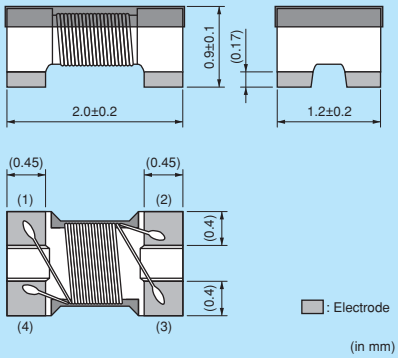
DLW21H Series 0805/2012 (inch/mm)

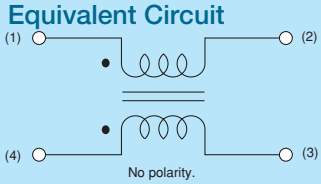
Reflow OK

Low profile wire-wound common choke coil, HDMI available type prepared.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	3000
B	Bulk(Bag)	500

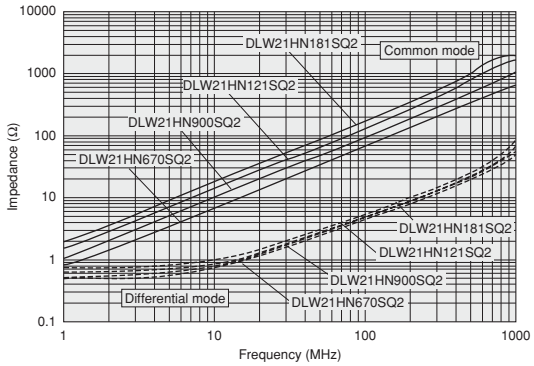
Refer to pages from p.205 to p.209 for mounting information.

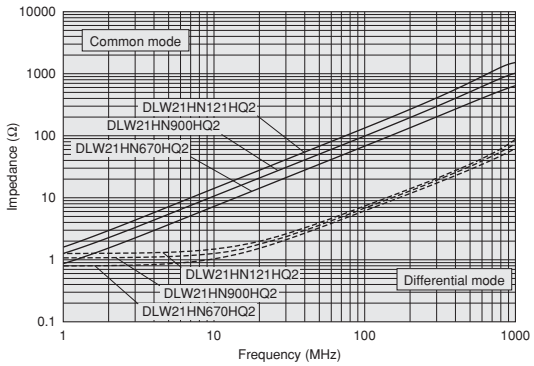
Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW21HN670SQ2□	67ohm ±25%	330mA	50Vdc	10M ohm	125Vdc	0.35ohm max.	Kit HD
DLW21HN900SQ2□	90ohm ±25%	330mA	50Vdc	10M ohm	125Vdc	0.35ohm max.	Kit HD
DLW21HN121SQ2□	120ohm ±25%	280mA	50Vdc	10M ohm	125Vdc	0.45ohm max.	Kit HD
DLW21HN181SQ2□	180ohm ±25%	250mA	50Vdc	10M ohm	125Vdc	0.50ohm max.	Kit HD
DLW21HN670HQ2□	67ohm ±25%	240mA	20Vdc	10M ohm	50Vdc	0.49ohm max.	Kit UD Imp Match
DLW21HN900HQ2□	90ohm ±25%	220mA	20Vdc	10M ohm	50Vdc	0.59ohm max.	Kit UD Imp Match
DLW21HN121HQ2□	120ohm ±25%	200mA	20Vdc	10M ohm	50Vdc	0.68ohm max.	Kit UD Imp Match

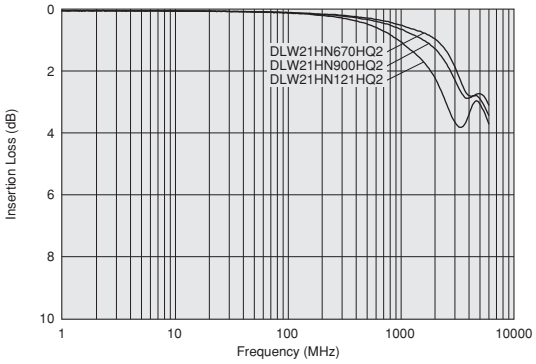
Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics





Differential Mode Transmission Characteristics (Typ.)



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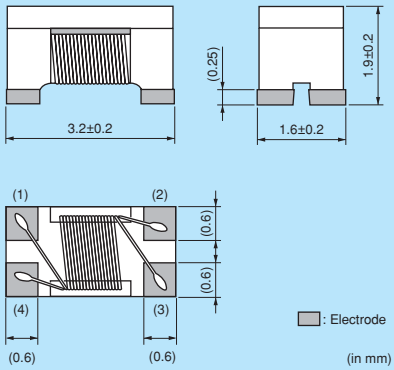
DLW31S Series 1206/3216 (inch/mm)

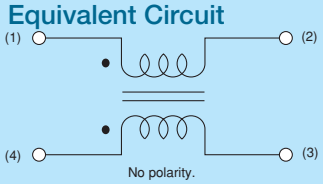
Reflow OK

1206 size wire-wound common mode choke coil.

Dimensions



Equivalent Circuit



Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	2000
B	Bulk(Bag)	500

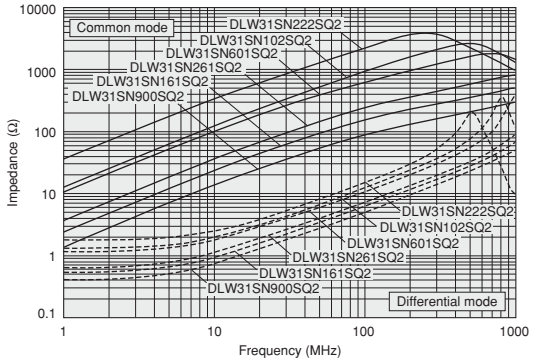
Refer to pages from p.205 to p.209 for mounting information.

Rated Value (☐: packaging code)

Part Number	Common Mode Impedance (at 100MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	
DLW31SN900SQ2☐	90ohm ±25%	370mA	50Vdc	10M ohm	125Vdc	0.3ohm max.	HD
DLW31SN161SQ2☐	160ohm ±25%	340mA	50Vdc	10M ohm	125Vdc	0.4ohm max.	HD
DLW31SN261SQ2☐	260ohm ±25%	310mA	50Vdc	10M ohm	125Vdc	0.5ohm max.	HD
DLW31SN601SQ2☐	600ohm ±25%	260mA	50Vdc	10M ohm	125Vdc	0.8ohm max.	HD
DLW31SN102SQ2☐	1000ohm ±25%	230mA	50Vdc	10M ohm	125Vdc	1.0ohm max.	HD
DLW31SN222SQ2☐	2200ohm ±25%	200mA	50Vdc	10M ohm	125Vdc	1.2ohm max.	HD

Operating Temperature Range: -40°C to +85°C Number of Circuit: 1 HD: for high speed differential signal lines UD: for ultra high speed differential signal lines

Impedance-Frequency Characteristics



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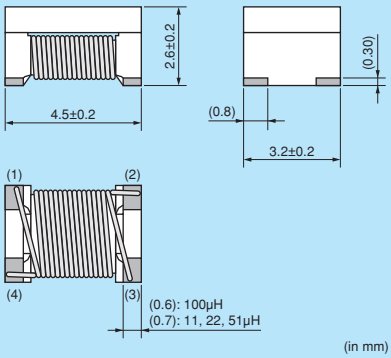
DLW43S Series 1812/4532 (inch/mm)

Reflow OK

1812 size wire-wound common choke, Automotive Type.

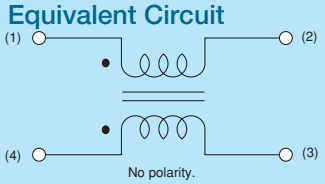
DLW43S_XK

■ Dimensions



(in mm)

■ Equivalent Circuit

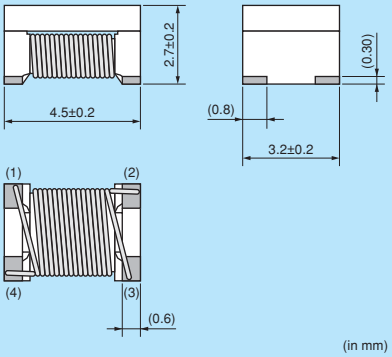


■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	500
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

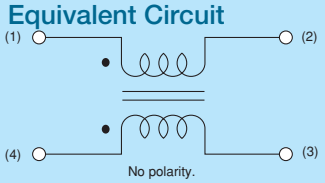
DLW43S_XP

■ Dimensions



(in mm)

■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	500
K	330mm Reel Embossed Tape	2500
B	Bulk(Bag)	100

Refer to pages from p.205 to p.209 for mounting information.

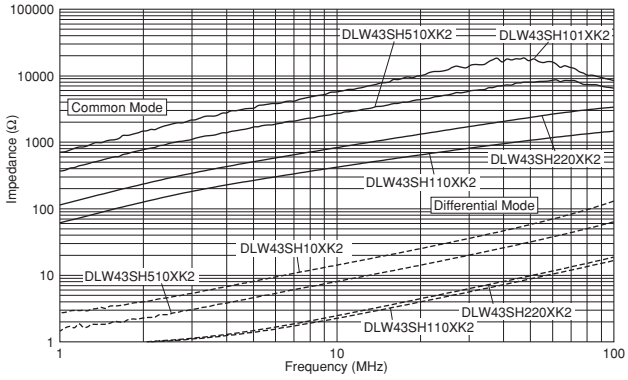
■ Rated Value (□: packaging code)

Part Number	Common Mode Inductance	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	Operating Temperature Range
DLW43SH110XK2□	11µH -30%/+50% (at 0.1MHz)	360mA	50Vdc	10M ohm	125Vdc	0.5ohm max.	-40°C to +125°C
DLW43SH220XK2□	22µH -30%/+50% (at 0.1MHz)	310mA	50Vdc	10M ohm	125Vdc	0.6ohm max.	-40°C to +125°C
DLW43SH510XK2□	51µH -30%/+50% (at 1MHz)	230mA	50Vdc	10M ohm	125Vdc	1.0ohm max.	-40°C to +125°C
DLW43SH101XK2□	100µH -30%/+50% (at 1MHz)	200mA	50Vdc	10M ohm	125Vdc	2.0ohm max.	-40°C to +125°C
DLW43SH101XP2□	100µH -30%/+80% (at 0.1MHz)	170mA	50Vdc	10M ohm	125Vdc	2.0ohm max.	-40°C to +125°C

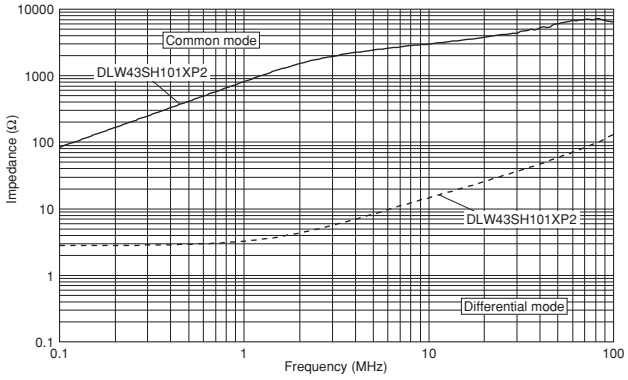
Number of Circuit: 1

■ Impedance-Frequency Characteristics

DLW43S_XK Series



DLW43S_XP Series



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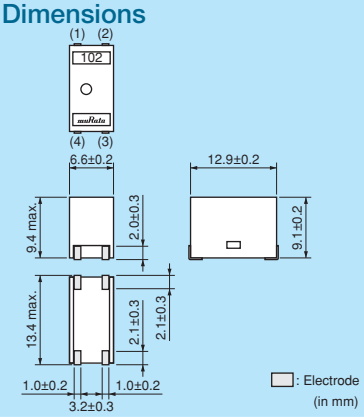
PLT10H Series (12.9x6.6mm)

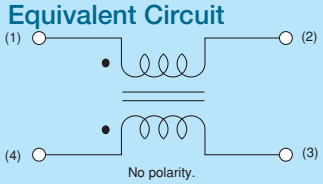
Hi Power Reflow OK

Automotive application available, up to 18A.

■ Dimensions



■ Equivalent Circuit



■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	125
K	330mm Reel Embossed Tape	500
B	Bulk(Bag)	50

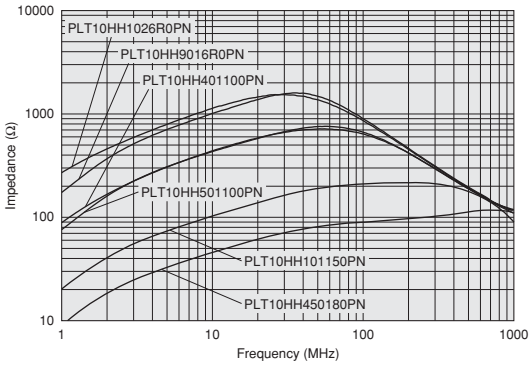
Refer to pages from p.210 to p.211 for mounting information.

■ Rated Value (□: packaging code)

Part Number	Common Mode Impedance (at 10MHz/20°C)	Rated Current	Rated Voltage	Insulation Resistance (min.)	Withstand Voltage	DC Resistance	Inductance	
PLT10HH450180PN□	45ohm (Typ.)	18A	300Vdc	10M ohm	750Vdc	1.3m ohm±0.5m ohm	0.8µH min.	Kit ≧10A
PLT10HH101150PN□	100ohm (Typ.)	15A	300Vdc	10M ohm	750Vdc	1.8m ohm±0.5m ohm	2.0µH min.	Kit ≧10A
PLT10HH401100PN□	400ohm (Typ.)	10A	100Vdc	10M ohm	250Vdc	3.6m ohm±0.5m ohm	6µH min.	Kit ≧10A
PLT10HH501100PN□	500ohm (Typ.)	10A	100Vdc	10M ohm	250Vdc	3.6m ohm±0.5m ohm	9µH min.	Kit ≧10A
PLT10HH9016R0PN□	900ohm (Typ.)	6A	100Vdc	10M ohm	250Vdc	8.0m ohm±0.5m ohm	14µH min.	Kit ≧3A
PLT10HH1026R0PN□	1000ohm (Typ.)	6A	100Vdc	10M ohm	250Vdc	8.0m ohm±0.5m ohm	20µH min.	Kit ≧3A

Operating Temperature Range (Self-temperature rise is included): -55°C to +105°C (PLT10HH 501100/1026R0 PN), -55°C to +125°C (PLT10HH 450180/101150/401100/9016R0 PN) Number of Circuit: 1

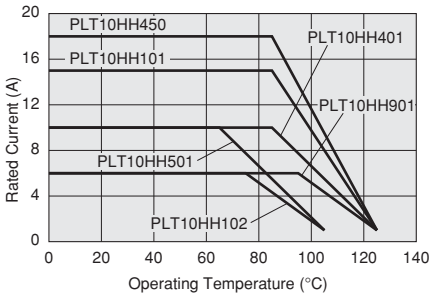
■ Impedance-Frequency Characteristics



■ Notice (Rating)

In operating temperature exceeding +65°C, derating of current is necessary for PLT10H series.
Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



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• This catalog has only typical specifications. Therefore, please approve our product specifications or transact the approval sheet for product specifications before ordering.

muRata

⚠Caution

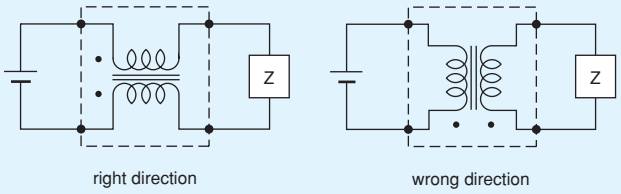
● Rating

Do not use products beyond the rated current and rated voltage as this may create excessive heat and deteriorate the insulation resistance. Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure our product.

● Soldering and Mounting

1. Self-heating
   Please provide special attention when mounting chip common mode choke coils DLW5 series in close proximity to other products that radiate heat.
   The heat generated by other products may deteriorate the insulation resistance and cause excessive heat in this component.

2. Mounting Direction
   Mount Chip Common Mode Choke Coils in right direction. Wrong direction, which is 90 degrees rotated from right direction, causes not only open or short circuit but also flames or other serious trouble.



right direction　　wrong direction

Notice

● Storage and Operating Conditions

<Operating Environment>
Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.
Do not use products in the environment close to the organic solvent.
<Storage and Handling Requirements>
1. Storage Period
   DLM11G series should be used within 6 months, the other series should be used within 12 months. Solderability should be checked if this period is exceeded.
2. Storage Conditions
   (1) Storage temperature: -10 to +40˚C
   Relative humidity: 15 to 85%
   Avoid sudden changes in temperature and humidity.
   (2) Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

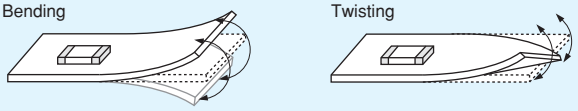
● Notice (Soldering and Mounting)

1. Cleaning
   Failure and degradation of a product are caused by the cleaning method. When you clean in conditions that are not in mounting information, please contact Murata engineering.
2. Soldering
   Reliability decreases with improper soldering methods. Please solder by the standard soldering conditions shown in mounting information.
3. Other
   Noise suppression levels resulting from Murata's EMI suppression filters EMIFIL® may vary, depending on the circuits and ICs used, type of noise, mounting pattern, mounting location, and other operating conditions. Be sure to check and confirm in advance the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

● Handling

1. Resin Coating (Except for DLW Series.)
   Using resin for coating/molding products may affect the products performance.
   So please pay careful attention in selecting resin.
   Prior to use, please make the reliability evaluation with the product mounted in your application set.
2. Resin Coating (DLW Series)
   The impedance value may change due to high cure-stress of resin to be used for coating/molding products. An open circuit issue may occur by mechanical stress caused by the resin, amount/cured shape of resin, or operating condition etc. Some resin contains some impurities or chloride possible to generate chlorine by hydrolysis under some operating condition may cause corrosion of wire of coil, leading to open circuit.
   So, please pay your careful attention in selecting resin in case of coating/molding the products with the resin.
   Prior to use the coating resin, please make sure no reliability issue is observed by evaluating products mounted on your board.
3. Caution for Use (DLW Series)
   When you hold products with a tweezer, please hold by the sides. Sharp materials, such as a pair of tweezers, should not touch the winding portion to prevent breaking the wire. Mechanical shock should not be applied to the products mounted on the board to prevent breaking the core.
4. Brushing
   When you clean the neighborhood of products such as connector pins, bristles of cleaning brush shall not be touched to the winding portion of this product to prevent the breaking of wire.
5. Handling of a Substrate
   After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate. Excessive mechanical stress may cause cracking in the Product.

Bending　　Twisting



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⚠Caution

● Rating

1. Do not use products beyond the rated current and rated voltage as this may create excessive heat and deteriorate the insulation resistance.
2. Be sure to provide an appropriate fail-safe function on your product to prevent a second damage that may be caused by the abnormal function or the failure our product.

● Soldering and Mounting

1. Self-heating
   Please provide special attention when mounting chip common mode choke coils in close proximity to other products that radiate heat.
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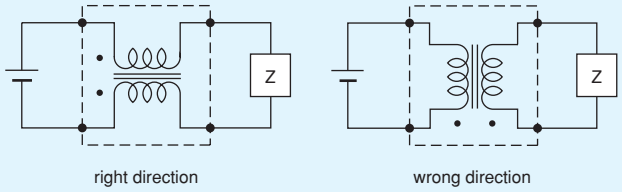
2. Mounting Direction
   Mount Chip Common Mode Choke Coils in right direction. Wrong direction, which is 90 degrees rotated from right direction, causes not only open or short circuit but also flames or other serious trouble.



right direction　　wrong direction

Notice

● Storage and Operating Conditions

<Operating Environment>
Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.
Do not use products in the environment close to the organic solvent.
<Storage and Handling Requirements>
1. Storage Period
   PLT10H series should be used within 12 months. Solderability should be checked if this period is exceeded.
2. Storage Conditions
   (1) Storage temperature: -10 to +40˚C
   Relative humidity: 15 to 85%
   Avoid sudden changes in temperature and humidity.
   (2) Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

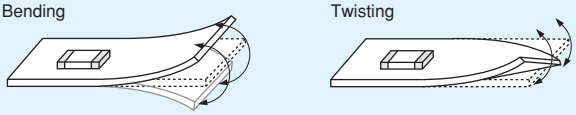
● Notice (Soldering and Mounting)

1. Cleaning
   Failure and degradation of a product are caused by the cleaning method. When you clean in conditions that are not in mounting information, please contact Murata engineering.
2. Soldering
   Reliability decreases with improper soldering methods. Please solder by the standard soldering conditions shown in mounting information.
3. Other
   Noise suppression levels resulting from Murata's EMI suppression filters EMIFIL® may vary, depending on the circuits and ICs used, type of noise, mounting pattern, mounting location, and other operating conditions. Be sure to check and confirm in advance the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

● Handling

1. Handling of a Substrate
   After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate.
   Excessive mechanical stress may cause cracking in the Product.

Bending　　Twisting



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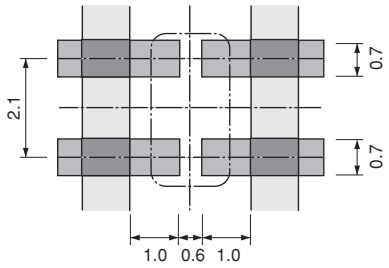
1. Standard Land Pattern Dimensions

Land Pattern + Solder Resist
Land Pattern
Solder Resist
(in mm)

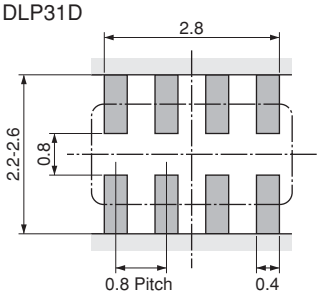
DLM11S
DLM11G
DLP0QS
DLP0NS
DLP11S
DLP11R
DLP11T
DLP1ND
DLP2AD
DLP31S
DLP31D
DLW21S
DLW21H
DLW31SN
DLW43S
DLW5A
DLW5B

●Reflow and Flow

DLP31S

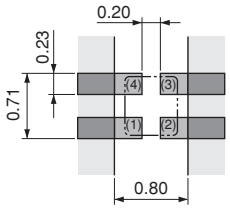


DLP31D

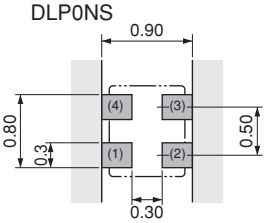


●Reflow Soldering

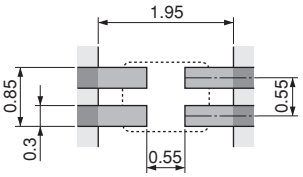
DLP0QS



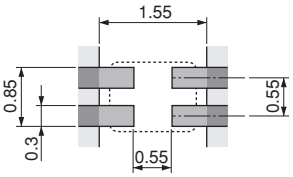
DLP0NS



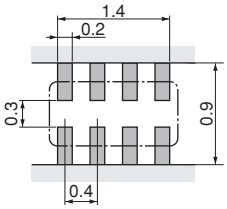
DLP11S/DLM11S



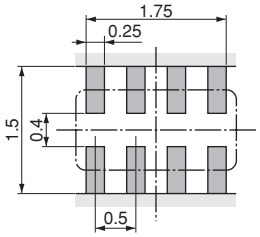
DLP11R/11T



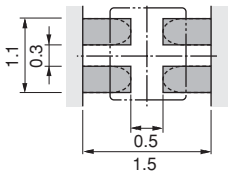
DLP1ND



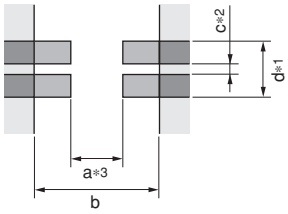
DLP2AD



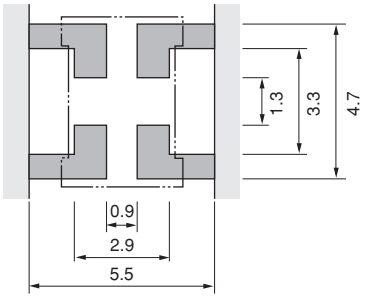
DLM11G



DLW21S/21H/31SN/43S



DLW5A/5B (Except for DLW5AT_MQ2)



Series	a	b	c	d
DLW21S/H	0.8	2.6	0.4	1.2
DLW31SN	1.6	3.7	0.4	1.6
DLW43SH110/220/510	3.0	5.9	1.6	3.4
DLW43SH101	3.2	5.9	1.6	3.4

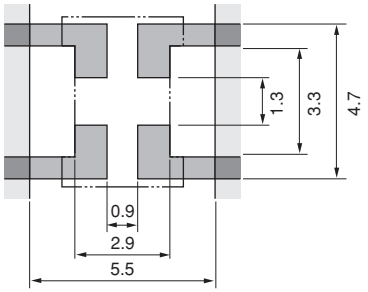
*1: If the pattern is made with wider than 1.2mm (DLW21) / 1.6mm (DLW31S) it may result in components turning around, because melting speed is different. In the worst case, short circuit between lines may occur.
*2: If the pattern is made with less than specified dimensions, in the worst case, short circuit between lines may occur due to spread of soldering paste or mount placing accuracy.
*3: If the pattern is made with wider than 0.8mm (DLW21) / 1.6mm (DLW31SN), the bending strength will be reduced.
Do not use gild pattern; excess soldering heat may dissolve metal of a copper wire.

Land Pattern + Solder Resist
Land Pattern
Solder Resist
(in mm)

DLW5AT_MQ2

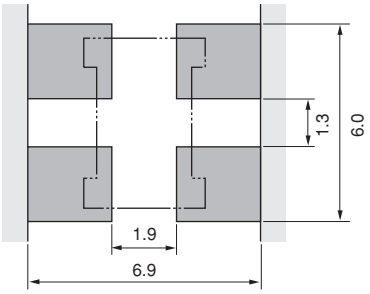
●Reflow Soldering Chip Mounting Side

DLW5AT_MQ2



●Flow Soldering Chip Mounting Side

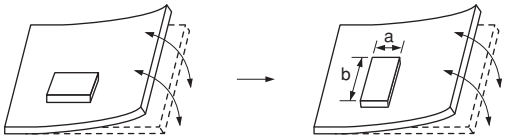
DLW5AT_MQ2



● PCB Warping

PCB should be designed so that products are not subjected to the mechanical stress caused by warping the board.

Products should be located in the sideways direction (Length: a<b) to the mechanical stress.



2. Solder Paste Printing and Adhesive Application

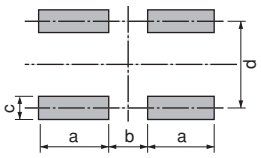
When reflow soldering the chip common mode choke coils, the printing must be conducted in accordance with the following cream solder printing conditions.
If too much solder is applied, the chip will be prone to damage by mechanical and thermal stress from the PCB and may crack.
Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the chip common mode choke coils, apply the adhesive in accordance with the following conditions.
If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

(in mm)

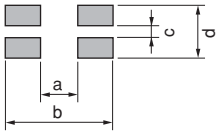
Series	Solder Paste Printing	Adhesive Application
DLP **DLW** **DLM**	●Guideline of solder paste thickness: 80-100μm: DLP0QS 100-150μm: DLW21S/21H/31S, DLP0NS/11S/11R/11T/1ND/2AD/DLM11S/11G 150μm: DLW43S 150-200μm: DLP31D/31S, DLW5A/5B *Solderability is subject to reflow conditions and thermal conductivity. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.	■ DLP31S/DLP31D/DLW5AT_MQ2 Apply 0.3mg of bonding agent at each chip.

DLP0QS/0NS/11S/11R/11T/31S/DLM11S/11G



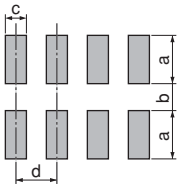
Series	a	b	c	d
DLP0QS	0.3	0.2	0.23	0.48
DLP0NS	0.3	0.3	0.3	0.5
DLM11S/DLP11S	0.7	0.55	0.3	0.55
DLP11R/T	0.5	0.55	0.3	0.55
DLP31S	1.0	0.6	0.7	2.1
DLM11G	0.5	0.5	0.4	0.7

DLW21S/21H/31S



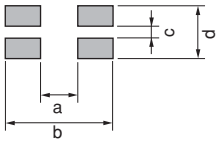
Series	a	b	c	d
DLW21S/H	0.8	2.6	0.5	1.2
DLW31S	1.6	3.7	0.4	1.6

DLP1ND/2AD/31D



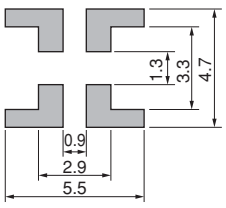
Series	a	b	c	d
DLP1ND	0.3	0.3	0.2	0.4
DLP2AD	0.55	0.4	0.25	0.5
DLP31D	1.0	0.8	0.4	0.8

DLW43S

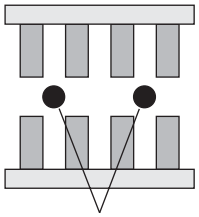


Series	a	b	c	d
DLW43S	3.0 (110/220/510)	5.9	1.6	3.4
	3.2 (101)			

DLW5A/5B

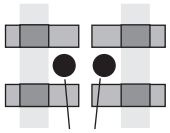


DLP31D



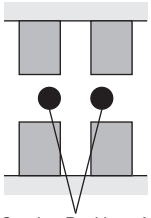
Coating Position of Bonding Agent

DLP31S



Coating Position of Bonding Agent

DLW5AT_MQ2



Coating Position of Bonding Agent

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3. Standard Soldering Conditions

(1) Soldering Methods

Use flow and reflow soldering methods only.
Use standard soldering conditions when soldering chip common mode choke coils.
In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

Solder: Use Sn-3.0Ag-0.5Cu solder. Use of Sn-Zn based solder will deteriorate performance of products.
If using DLP/DLM series with Sn-Zn based solder, please contact Murata in advance.

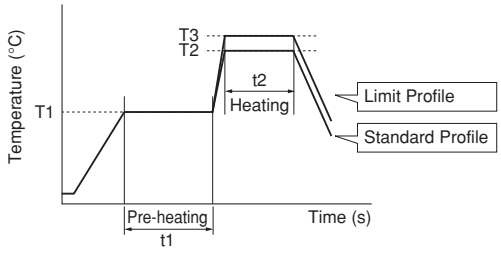
Flux:

- Use Rosin-based flux.
  In case of DLW21/31 series, use Rosin-based flux with converting chlorine content of 0.06 to 0.1wt%.
  In case of using RA type solder, products should be cleaned completely with no residual flux.
- Do not use strong acidic flux (with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

For additional mounting methods, please contact Murata.

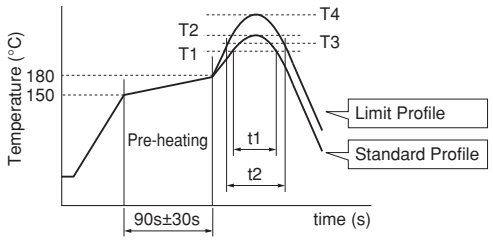
(2) Soldering Profile

●Flow Soldering Profile
(Sn-3.0Ag-0.5Cu Solder)



Series	Pre-heating		Standard Profile			Limit Profile		
			Heating		Cycle of Flow	Heating		Cycle of Flow
	Temp. (T1)	Time. (t1)	Temp. (T2)	Time. (t2)		Temp. (T3)	Time. (t2)	
DLW5AT_MQ2 DLP31D/31S	150°C	60s min.	250°C	4 to 6s	2 times max.	265±3°C	5s max.	2 times max.

●Reflow Soldering Profile
(Sn-3.0Ag-0.5Cu Solder)



Series	Standard Profile				Limit Profile			
	Heating		Peak Temperature (T2)	Cycle of Reflow	Heating		Peak Temperature (T4)	Cycle of Reflow
	Temp. (T1)	Time. (t1)			Temp. (T3)	Time. (t2)		
DLM/DLP DLW21/31	220°C min.	30 to 60s	245±3°C	2 times max.	230°C min.	60s max.	260°C/10s	2 times max.
DLW43S	220°C min.	30 to 60s	245±3°C	2 times max.	240°C min.	30s max.	260°C/10s	2 times max.
DLW5A/5B	220°C min.	30 to 60s	250±3°C	2 times max.	230°C min.	60s max.	260°C/10s	2 times max.

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(3) Reworking with Solder Iron

The following conditions must be strictly followed when using a soldering iron.

Pre-heating: 150°C 60s min.

Soldering iron power output / Tip diameter:

30W max. / ø3mm max.

Temperature of soldering iron tip / Soldering time / Times:

350°C max. / 3-4s / 2 times*1

*1 DLP0QS, DLP0NS, DLP11S, DLP11T, DLP1ND, DLP2AD: 380°C max. / 3-4s / 2 times
DLW43S: 350°C max. / 3s / 2 times

Do not allow the tip of the soldering iron to directly contact the chip.

For additional methods of reworking with a soldering iron, please contact Murata engineering.

4. Cleaning

Following conditions should be observed when cleaning chip EMI filter.

(1) Cleaning Temperature: 60°C max. (40°C max. for alcohol type cleaner)

(2) Ultrasonic

Output: 20W/liter max.

Duration: 5 minutes max.

Frequency: 28 to 40kHz

(3) Cleaning agent

The following list of cleaning agents have been tested on the individual components. Evaluation of final assembly should be completed prior to production.

Do not clean DLW (Except for DLW21H) series.

Before cleaning, please contact Murata engineering.

(a) Alcohol cleaning agent

Isopropyl alcohol (IPA)

(b) Aqueous cleaning agent

Pine Alpha ST-100S

(4) Ensure that flux residue is completely removed.

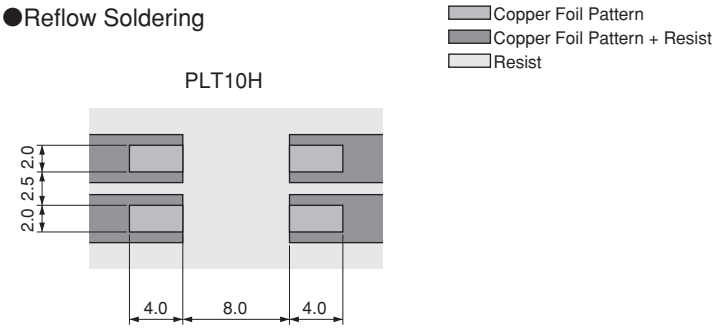
Component should be thoroughly dried after aqueous agent has been removed with deionized water.

1. Standard Land Pattern Dimensions

(in mm)

PLT10H

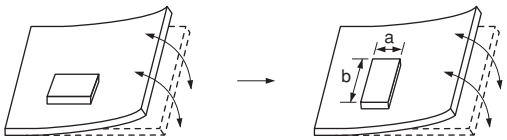
●Reflow Soldering



● PCB Warping

PCB should be designed so that products are not subjected to the mechanical stress caused by warping the board.

Products should be located in the sideways direction (Length: a<b) to the mechanical stress.



2. Solder Paste Printing and Adhesive Application

When reflow soldering the chip common mode choke coils, the printing must be conducted in accordance with the following cream solder printing conditions.
If too much solder is applied, the chip will be prone to damage by mechanical and thermal stress from the PCB and may crack.
Standard land dimensions should be used for resist and copper foil patterns.

When flow soldering the chip common mode choke coils, apply the adhesive in accordance with the following conditions.
If too much adhesive is applied, then it may overflow into the land or termination areas and yield poor solderability. In contrast, if insufficient adhesive is applied, or if the adhesive is not sufficiently hardened, then the chip may become detached during flow soldering process.

Series	Solder Paste Printing
PLT10H	●Guideline of solder paste thickness: 150-200μm: PLT10H For the solder paste printing pattern, use standard land dimensions. *Solderability is subject to reflow conditions and thermal conductivity. Please make sure that your product has been evaluated in view of your specifications with our product being mounted to your product.

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3. Standard Soldering Conditions

(1) Soldering Methods

Use reflow soldering methods only.
Use standard soldering conditions when soldering chip common mode choke coils.
In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

Solder: Use Sn-3.0Ag-0.5Cu solder. Use of Sn-Zn based solder will deteriorate performance of products.

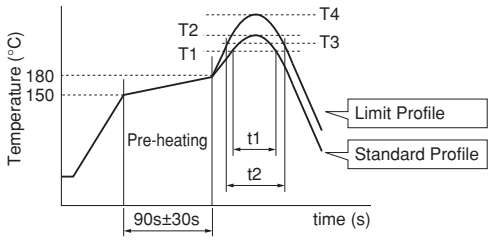
Flux:

- Use Rosin-based flux.
- Do not use strong acidic flux (with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

For additional mounting methods, please contact Murata.

(2) Soldering Profile

●Reflow Soldering Profile
(Sn-3.0Ag-0.5Cu Solder)



Series	Standard Profile				Limit Profile			
	Heating		Peak Temperature (T2)	Cycle of Reflow	Heating		Peak Temperature (T4)	Cycle of Reflow
	Temp. (T1)	Time. (t1)			Temp. (T3)	Time. (t2)		
PLT10H	220°C min.	30 to 60s	250±3°C	2 times max.	230°C min.	60s max.	260°C/10s	2 times max.

(3) Reworking with Solder Iron

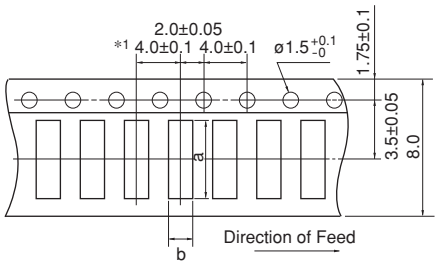
The following conditions must be strictly followed when using a soldering iron.
Pre-heating: 150°C 60s min.
Soldering iron power output / Tip diameter:
80W max. / ø3mm max.
Temperature of soldering iron tip / Soldering time / Times:
400°C max. / 5s / 2 times

Do not allow the tip of the soldering iron to directly contact the chip.
For additional methods of reworking with a soldering iron, please contact Murata engineering.

4. Cleaning

Do not clean after soldering. If cleaning, please contact us.

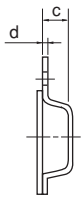
■ Minimum Quantity and Dimensions of 8mm Width Paper / Embossed Tape



*1 DLM11G/DLP0QS: 2.0±0.05
DLP0NS: 2.0±0.1

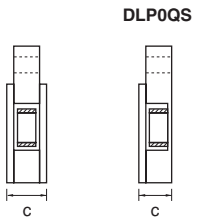
Dimension of the cavity of embossed tape is measured at the bottom side.

<Embossed>



c: Depth of Cavity
(Embossed Tape)

<Paper>

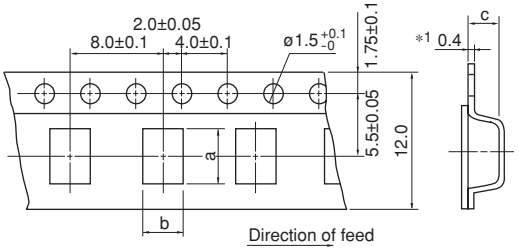


c: Total Thickness of Tape
(Paper Tape)

Part Number	Dimensions				Minimum Qty. (pcs.)				
					ø180mm Reel		ø330mm Reel		Bulk
	a	b	c	d	Paper Tape	Embossed Tape	Paper Tape	Embossed Tape	
DLM11G	1.45	1.2	0.8 max.	-	10000	-	-	-	1000
DLM11S	1.4	1.15	0.65	0.25	-	4000	-	-	500
DLP0QS	0.73	0.6	0.55 max.	-	15000	-	-	-	500
DLP0NS	0.95	0.75	0.55	0.25	-	10000	-	-	500
DLP11S	1.4	1.2	0.98	0.25	-	3000	-	-	500
DLP11R	1.4	1.15	0.7	0.25	-	4000	-	-	500
DLP11T	1.35	1.1	0.45	0.25	-	5000	-	-	500
DLP1ND	1.7	0.84	0.57	0.25	-	5000	-	-	500
DLP2AD	2.2	1.2	0.98	0.25	-	3000	-	-	500
DLP31D/31S	3.5	1.9	1.3	0.25	-	3000	-	-	500
DLW21S	2.25	1.45	1.4	0.3	-	2000	-	-	500
DLW21H	2.3	1.55	1.1	0.25	-	3000	-	-	500
DLW31S	3.6	2.0	2.1	0.3	-	2000	-	-	500

(in mm)

■ Minimum Quantity and Dimensions of 12mm Width Embossed Tape



*1 DLW43/DLW5AT: 0.3 c: Depth of Cavity

Dimension of the cavity is measured at the bottom side.

Part Number	Dimensions			Minimum Qty. (pcs.)		
	a	b	c	ø180mm Reel	ø330mm Reel	Bulk
DLW43SH_XK	4.9	3.6	2.7	500	2500	100
DLW43SH_XP	4.9	3.6	2.9	500	2500	100
DLW5AH	5.4	4.1	4.4	400	1500	100
DLW5AT	5.4	4.1	2.7	700	2500	100
DLW5BS	5.5	5.4	4.7	400	1500	100
DLW5BT	5.5	5.5	2.7	700	2500	100

(in mm)

"Minimum Quantity" means the number of units of each delivery or order. The quantity should be an integral multiple of the "Minimum Quantity."

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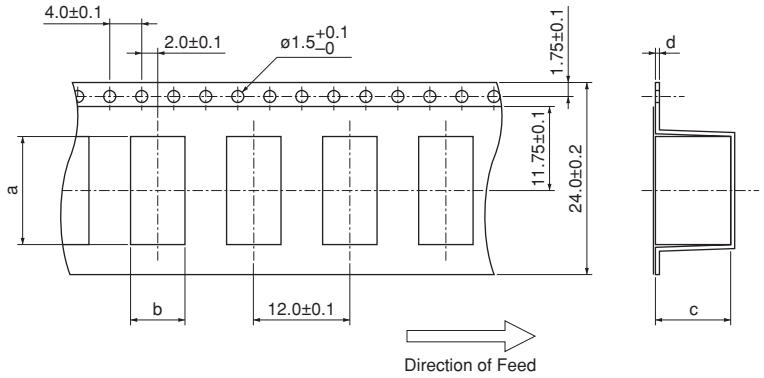
■ Minimum Quantity and Dimensions of 24mm Width Embossed Tape



Dimension of the cavity is measured at the bottom side.

Part Number	Dimensions				Minimum Qty. (pcs.)		
	a	b	c	d	ø180mm Reel	ø330mm Reel	Bulk
PLT10H	13.5	6.8	9.4	0.5	125	500	50

(in mm)

●EKEMDL21AQ-KIT (Chip Common Mode Choke Coils)

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 100MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (mA)
1	DLW21HN670SQ2	10	67Ω±25%	50	330
2	DLW21HN900SQ2	10	90Ω±25%	50	330
3	DLW21HN121SQ2	10	120Ω±25%	50	280
4	DLW21HN181SQ2	10	180Ω±25%	50	250
5	DLW21HN670HQ2	10	67Ω±25%	20	240
6	DLW21HN900HQ2	10	90Ω±25%	20	220
7	DLW21HN121HQ2	10	120Ω±25%	20	200
8	DLW21SN501SK2	10	500Ω±25%	50	250
9	DLW21SN670SQ2	10	67Ω±25%	50	400
10	DLW21SN900SQ2	10	90Ω±25%	50	330
11	DLW21SN121SQ2	10	120Ω±25%	50	370
12	DLW21SN181SQ2	10	180Ω±25%	50	330
13	DLW21SN261SQ2	10	260Ω±25%	50	300
14	DLW21SN371SQ2	10	370Ω±25%	50	280
15	DLW21SN670HQ2	10	67Ω±25%	20	320
16	DLW21SN900HQ2	10	90Ω±25%	20	280
17	DLW21SN121HQ2	10	120Ω±25%	20	280
18	DLW21SR670HQ2	10	67Ω±25%	20	400
19	DLW21SN181XQ2	10	180Ω±25%	20	240
20	DLW21SN261XQ2	10	260Ω±25%	20	220
21	DLW21SN491XQ2	10	490Ω±25%	20	190
22	DLP0NSC280HL2	10	28Ω±20%	5	100
23	DLP0NSN350HL2	10	35Ω±10Ω	5	100
24	DLP0NSN670HL2	10	67Ω±20%	5	110
25	DLP0NSN900HL2	10	90Ω±20%	5	100
26	DLP0NSN121HL2	10	120Ω±20%	5	90
27	DLP0NSA070HL2	10	7Ω±2Ω	5	100
28	DLP0NSA150HL2	10	15Ω±5Ω	5	100
29	DLP0QSN600HL2	10	60Ω±25%	5	50
30	DLP0QSA070HL2	10	7Ω±2Ω	5	100
31	DLP0QSA150HL2	10	15Ω±5Ω	5	100
32	DLP0QSA350HL2	10	35Ω±10Ω	5	100
33	DLP1NDN350HL4	10	35Ω±20%	5	100
34	DLP1NDN670HL4	10	67Ω±20%	5	80
35	DLP1NDN900HL4	10	90Ω±20%	5	60
36	DLP11SA350HL2	10	35Ω±20%	5	170
37	DLP11SA670HL2	10	67Ω±20%	5	150
38	DLP11SA900HL2	10	90Ω±20%	5	150
39	DLP11SN670SL2	10	67Ω±20%	5	180
40	DLP11SN121SL2	10	120Ω±20%	5	140
41	DLP11SN161SL2	10	160Ω±20%	5	120
42	DLP11SN900HL2	10	90Ω±20%	5	150
43	DLP11SN201HL2	10	200Ω±20%	5	110
44	DLP11SN241HL2	10	240Ω±20%	5	100
45	DLP11SN281HL2	10	280Ω±20%	5	90
46	DLP11SN331HL2	10	330Ω±20%	5	80
47	DLP11RB150UL2	10	15Ω±5Ω	5	100
48	DLP11RB400UL2	10	40Ω±10Ω	5	100
49	DLP11RN450UL2	10	45Ω±25%	5	100
50	DLP11TB800UL2	10	80Ω±25%	5	100
51	DLP2ADA350HL4	10	35Ω±20%	5	150
52	DLP2ADA670HL4	10	67Ω±20%	5	130
53	DLP2ADA900HL4	10	90Ω±20%	5	120
54	DLP2ADN670HL4	10	67Ω±20%	5	140
55	DLP2ADN900HL4	10	90Ω±20%	5	130

Continued on the following page.

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Continued from the preceding page.

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 100MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (mA)
56	DLP2ADN121HL4	10	120Ω±20%	5	120
57	DLP2ADN161HL4	10	160Ω±20%	5	100
58	DLP2ADN201HL4	10	200Ω±20%	5	90
59	DLP2ADN241HL4	10	240Ω±20%	5	80
60	DLP2ADN281HL4	10	280Ω±20%	5	80
61	DLM11SN450HY2	10	45Ω±25%	5	100
62	DLM11SN900HY2	10	90Ω±25%	5	100

●EKEMDCC5AF-KIT (Chip Common Mode Choke Coils for DC Power Lines / SMD Block Type EMIFIL® for Power Lines)

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 100MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (mA)
1	DLW5AHN402SQ2	5	4000Ω (Typ.)	50	200
2	DLW5ATN111SQ2	5	110Ω (Typ.)	50	5000
3	DLW5ATN401SQ2	5	400Ω (Typ.)	50	2000
4	DLW5ATN501SQ2	5	500Ω (Typ.)	50	1500
5	DLW5ATN851SQ2	5	850Ω (Typ.)	50	1500
6	DLW5ATN272SQ2	5	2700Ω (Typ.)	50	1000
7	DLW5BSM501TQ2	5	500Ω (Typ.)	50	1000
8	DLW5BSM601TQ2	5	600Ω (Typ.)	50	1400
9	DLW5BSM801TQ2	5	800Ω (Typ.)	50	2000
10	DLW5BSM191SQ2	5	190Ω (Typ.)	50	5000
11	DLW5BSM351SQ2	5	350Ω (Typ.)	50	2000
12	DLW5BSM102SQ2	5	1000Ω (Typ.)	50	1500
13	DLW5BSM152SQ2	5	1500Ω (Typ.)	50	1000
14	DLW5BSM302SQ2	5	3000Ω (Typ.)	50	500
15	DLW5BTM101SQ2	5	100Ω (Typ.)	50	6000
16	DLW5BTM251SQ2	5	250Ω (Typ.)	50	5000
17	DLW5BTM501SQ2	5	500Ω (Typ.)	50	4000
18	DLW5BTM102SQ2	5	1000Ω (Typ.)	50	2000
19	DLW5BTM142SQ2	5	1400Ω (Typ.)	50	1500

●EKEMDL5AAC-KIT (Chip Common Mode Choke Coils for DC Power Lines / SMD Block Type EMIFIL® for Power Lines / 105 degree C available Type)

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 100MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (mA)
1	DLW5ATN500MQ2	5	50Ω (Typ.)	50	6000
2	DLW5ATN151MQ2	5	150Ω (Typ.)	50	5000
3	DLW5ATN331MQ2	5	330Ω (Typ.)	50	4000
4	DLW5ATN501MQ2	5	500Ω (Typ.)	50	2500
5	DLW5ATN112MQ2	5	1100Ω (Typ.)	50	2000
6	DLW5ATN111TQ2	5	110Ω (Typ.)	50	5000
7	DLW5ATN231TQ2	5	230Ω (Typ.)	50	4000
8	DLW5ATN401TQ2	5	400Ω (Typ.)	50	2500
9	DLW5ATN501TQ2	5	500Ω (Typ.)	50	2000
10	DLW5BTM101TQ2	5	100Ω (Typ.)	50	6000
11	DLW5BTM251TQ2	5	250Ω (Typ.)	50	5000
12	DLW5BTM501TQ2	5	500Ω (Typ.)	50	4000
13	DLW5BTM102TQ2	5	1000Ω (Typ.)	50	2500
14	DLW5BTM142TQ2	5	1400Ω (Typ.)	50	2000
15	DLW5BSM501TQ2	5	500Ω (Typ.)	50	1000
16	DLW5BSM601TQ2	5	600Ω (Typ.)	50	1400
17	DLW5BSM801TQ2	5	800Ω (Typ.)	50	2000

●EKEPBLCKAD-KIT

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 10MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (A)
1	PLT10HH450180PN	2	45Ω (Typ.)	300	18
2	PLT10HH101150PN	2	100Ω (Typ.)	300	15
3	PLT10HH401100PN	2	400Ω (Typ.)	100	10
4	PLT10HH501100PN	2	500Ω (Typ.)	100	10
5	PLT10HH9016R0PN	2	900Ω (Typ.)	100	6
6	PLT10HH1026R0PN	2	1000Ω (Typ.)	100	6

No.	Part Number	Quantity (pcs.)	Insertion Loss	Rated Voltage (Vdc)	Rated Current (A)
7	BNX002-01	1	1MHz to 1GHz : 40dB min.	50	10
8	BNX003-01	1	5MHz to 1GHz : 40dB min.	150	10
9	BNX005-01	1	1MHz to 1GHz : 40dB min.	50	15
10	BNX012-01	1	1MHz to 1GHz : 40dB min.	50	15
11	BNX016-01	1	100kHz to 1GHz : 40dB min.	25	15
12	BNX022-01	2	1MHz to 1GHz : 35dB min.	50	10
13	BNX023-01	2	1MHz to 1GHz : 35dB min.	100	15
14	BNX024H01	2	100kHz to 1GHz : 35dB min.	50	15
15	BNX025H01	2	50kHz to 1GHz : 35dB min.	25	15

BNX

Block Type EMIFIL®

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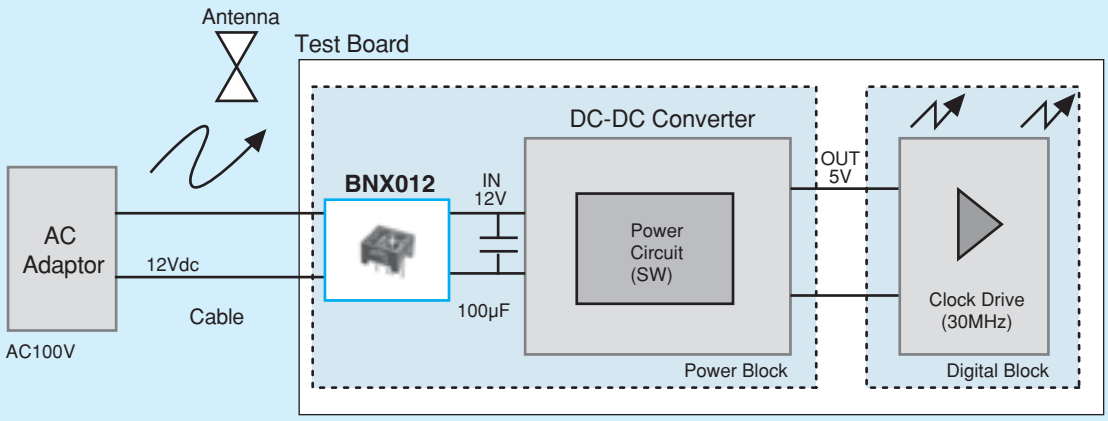
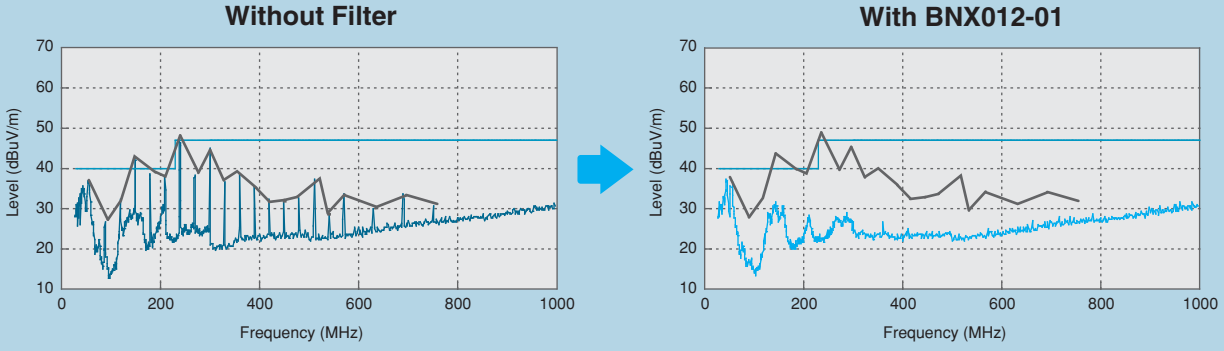
Type	Part Number	Thickness (mm)	Rated Voltage	Effective Frequency Range	Rated Current	Kit ≥3A Flow ReFlow
SMD Type for Power Lines p221	**BNX022-01**	3.1	50Vdc	1MHz to 1GHz:35dB min.	10A	Kit ≥3A ReFlow
	BNX023-01	3.1	100Vdc	1MHz to 1GHz:35dB min.	15A	Kit ≥3A ReFlow
	BNX024H01	3.5	50Vdc	100kHz to 1GHz:35dB min.	15A	Kit ≥3A ReFlow
	BNX025H01	3.5	25Vdc	50kHz to 1GHz:35dB min.	15A	Kit ≥3A ReFlow
Lead Type for Power Lines p223	**BNX002-01**	18.0	50Vdc	1MHz to 1GHz:40dB min.	10A	Kit ≥3A Flow
	BNX003-01	18.0	150Vdc	5MHz to 1GHz:40dB min.	10A	Kit ≥3A Flow
	BNX005-01	18.5	50Vdc	1MHz to 1GHz:40dB min.	15A	Kit ≥3A Flow
Lead Type Low Profile for Power Lines p224	**BNX012-01**	8.0	50Vdc	1MHz to 1GHz:40dB min.	15A	Kit ≥3A Flow
	BNX016-01	8.0	25Vdc	100kHz to 1GHz:40dB min.	15A	Kit ≥3A Flow

Suppression of Radiation Noise from Power Line Cable



■Test Result



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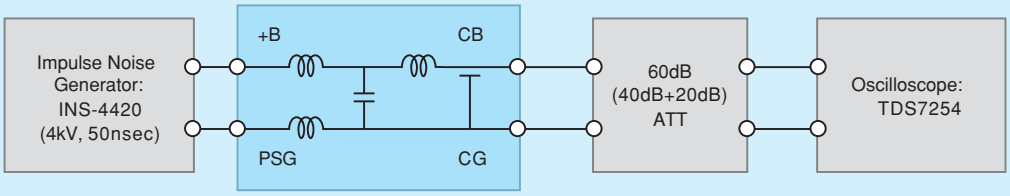
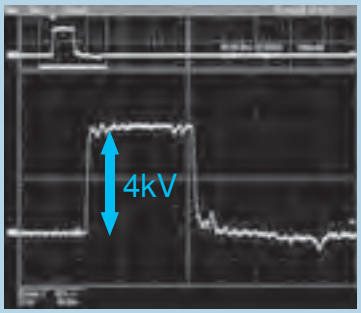
Impulse Noise Countermeasure



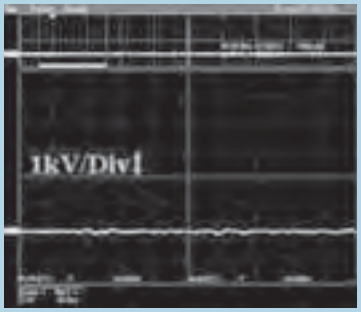
BNX

■Without Filter

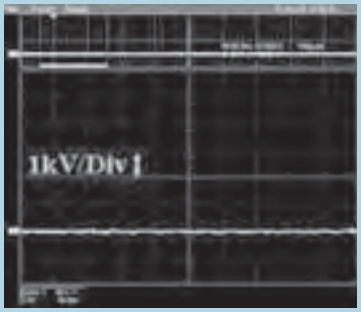


Applied Impulse Voltage: 4kV/50nS
Y-AXIS: 1kV/div

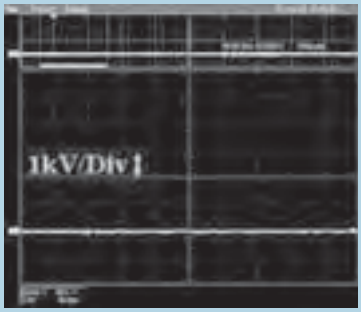
■With Filter



BNX002-01

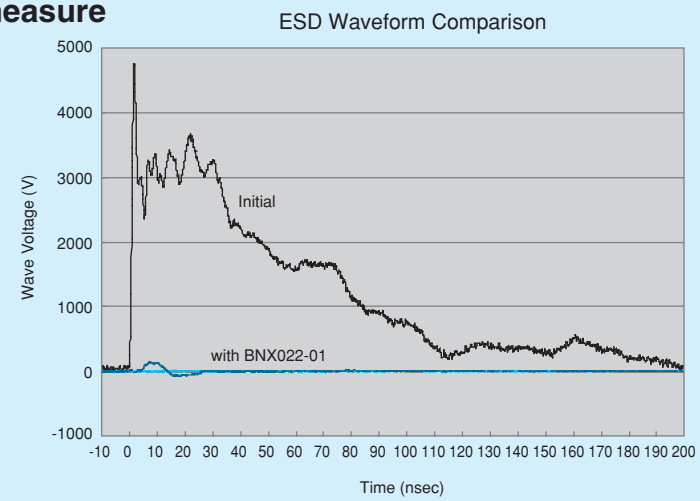


BNX012-01



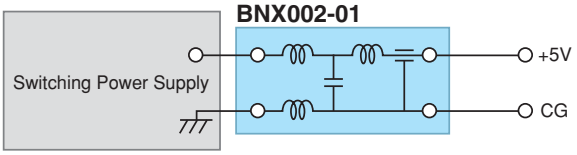
BNX022-01

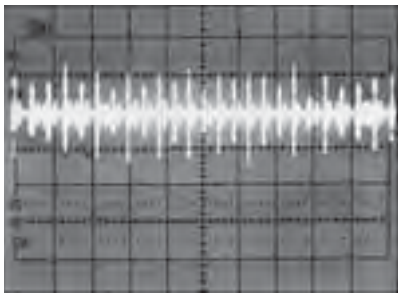
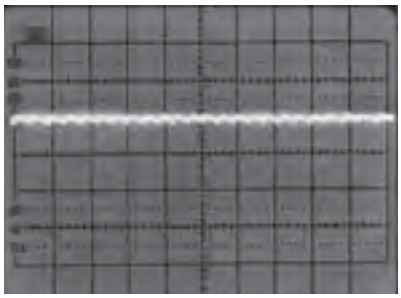
ESD Countermeasure



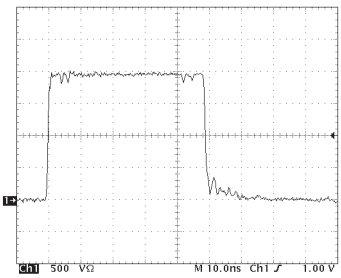
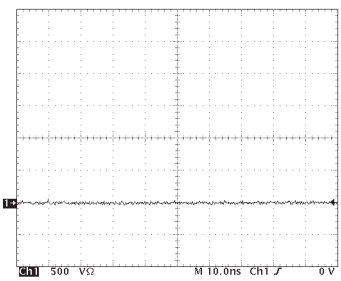
Suppression of Ripple Noise of DC Side in the Switching Power Supply

Test Circuit



Type of Filter	EMI Suppression Effect / Description
Without Filter	+5.0V→ 50µs/div 0.2V/div  There is high frequency noise of 0.5V maximum.
When **BNX002-01** is used	+5.0V→ 50µs/div 0.2V/div  BNX002-01 can suppress most of the noise.

Example of Impulse Noise Suppression

Type of Filter	EMI Suppression Effect
Without Filter	 Impulse Noise 2000V/50ns Y-axis: 500V/div X-axis: 10ns/sec
When **BNX002** is used	 Y-axis: 500V/div X-axis: 10ns/sec

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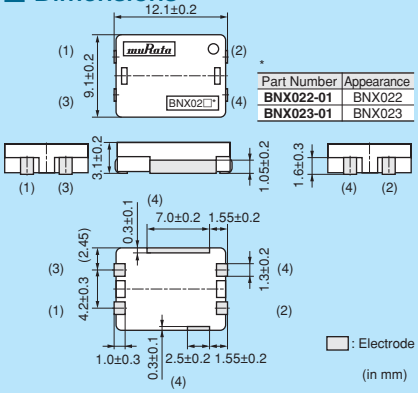
BNX02□ Series

Hi Power Reflow OK

SMD package of block type EMIFIL®.

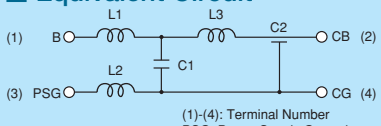
BNX022/BNX023

■ Dimensions



Part Number	Appearance
BNX022-01	BNX022
BNX023-01	BNX023

■ Equivalent Circuit



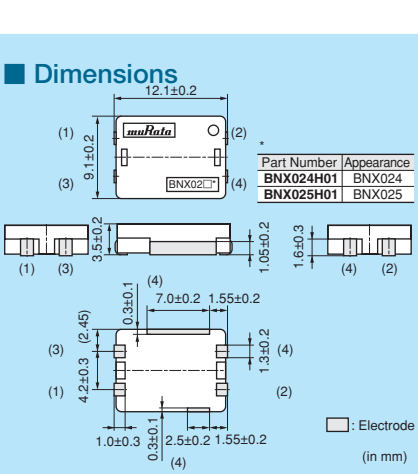
(1)-(4): Terminal Number
PSG: Power Supply Ground
CG: Circuit Ground
CB: Circuit+B

■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	400
K	330mm Reel Embossed Tape	1500
B	Bulk(Bag)	100

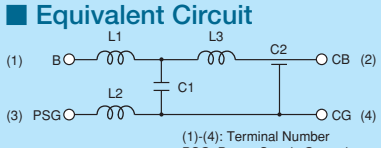
BNX024H/BNX025H

■ Dimensions



Part Number	Appearance
BNX024H01	BNX024
BNX025H01	BNX025

■ Equivalent Circuit



(1)-(4): Terminal Number
PSG: Power Supply Ground
CG: Circuit Ground
CB: Circuit+B

■ Packaging

Code	Packaging	Minimum Quantity
L	180mm Reel Embossed Tape	400
K	330mm Reel Embossed Tape	1500
B	Bulk(Bag)	100

Refer to pages from p.227 to p.228 for mounting information.

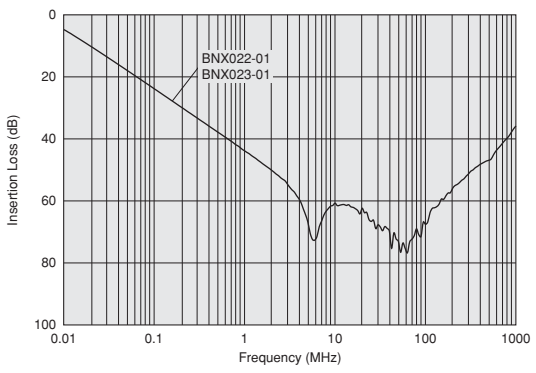
■ Rated Value (□: packaging code)

Part Number	Rated Voltage	Withstand Voltage	Rated Current	Insulation Resistance (min.)	Insertion Loss (Line impedance=50 ohm)	
BNX022-01□	50Vdc	125Vdc	10A	500M ohm	1MHz to 1GHz:35dB min.	Kit ≧3A
BNX023-01□	100Vdc	250Vdc	15A	500M ohm	1MHz to 1GHz:35dB min.	Kit ≧3A
BNX024H01□	50Vdc	125Vdc	15A	100M ohm	100kHz to 1GHz:35dB min.	Kit ≧3A
BNX025H01□	25Vdc	62.5Vdc	15A	50M ohm	50kHz to 1GHz:35dB min.	Kit ≧3A

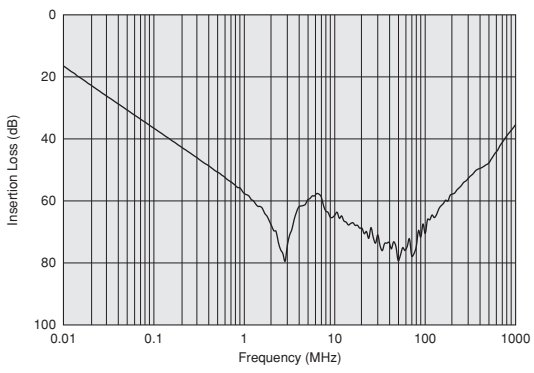
Operating Temperature Range: -40°C to +125°C (BNX022/BNX023), -55°C to +125°C (BNX024H/BNX025H)

■ Insertion Loss Characteristics

BNX022/023



BNX024H01



Continued on the following page.

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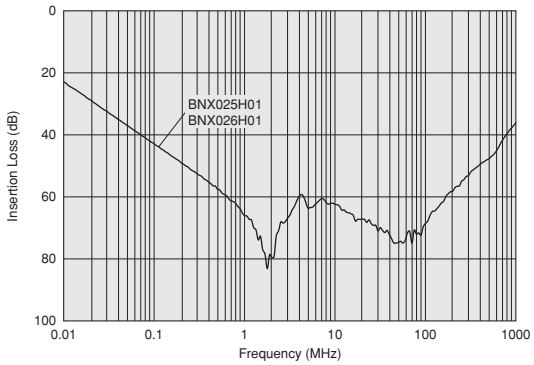
■ Insertion Loss Characteristics

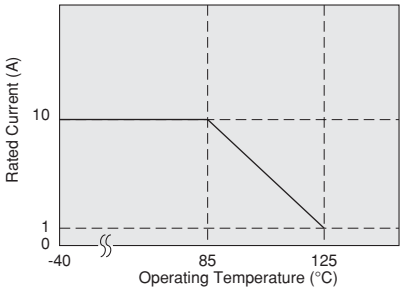
BNX025H01



■ Notice (Rating)

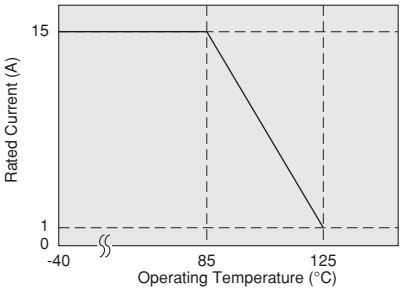
In operating temperature exceeding +85°C, derating of current is necessary for BNX022 series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



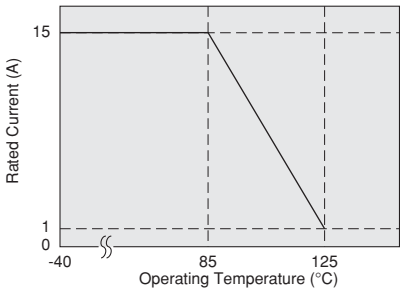
In operating temperature exceeding +85°C, derating of current is necessary for BNX023 series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



In operating temperature exceeding +85°C, derating of current is necessary for BNX024H/025H series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



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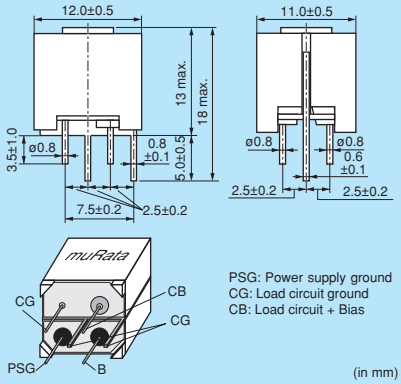
BNX00□ Series

Hi Power Flow OK

Large insertion loss from several hundred kHz to several GHz.

BNX002/BNX003

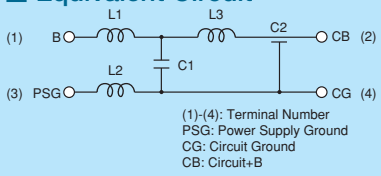
■ Dimensions



PSG: Power supply ground
CG: Load circuit ground
CB: Load circuit + Bias

(in mm)

■ Equivalent Circuit



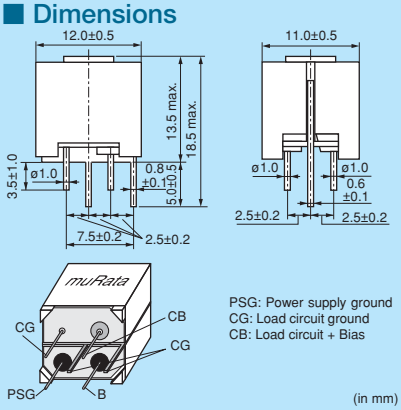
(1)-(4): Terminal Number
PSG: Power Supply Ground
CG: Circuit Ground
CB: Circuit+B

■ Packaging

Code	Packaging	Minimum Quantity
-	Box	100

BNX005

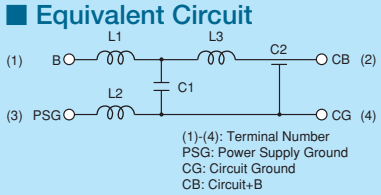
■ Dimensions



PSG: Power supply ground
CG: Load circuit ground
CB: Load circuit + Bias

(in mm)

■ Equivalent Circuit



(1)-(4): Terminal Number
PSG: Power Supply Ground
CG: Circuit Ground
CB: Circuit+B

■ Packaging

Code	Packaging	Minimum Quantity
-	Box	100

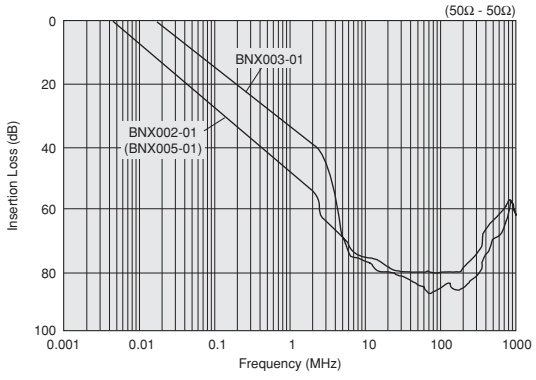
Refer to pages from p.229 to p.230 for mounting information.

■ Rated Value

Part Number	Rated Voltage	Withstand Voltage	Rated Current	Insulation Resistance (min.)	Insertion Loss (Line impedance=50 ohm)	
BNX002-01	50Vdc	125Vdc	10A	100M ohm	1MHz to 1GHz:40dB min.	Kit ≧3A
BNX003-01	150Vdc	375Vdc	10A	100M ohm	5MHz to 1GHz:40dB min.	Kit ≧3A
BNX005-01	50Vdc	125Vdc	15A	100M ohm	1MHz to 1GHz:40dB min.	Kit ≧3A

Operating Temperature Range: -30°C to +85°C

■ Insertion Loss Characteristics



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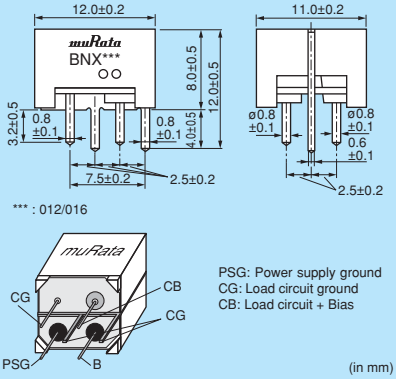
BNX01□ Series

Hi Power Flow OK

Low profile version of BNX series.

■ Dimensions

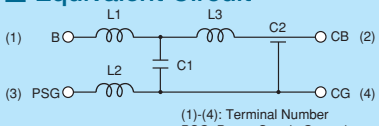


*** : 012/016

PSG: Power supply ground
CG: Load circuit ground
CB: Load circuit + Bias

(in mm)

■ Equivalent Circuit



(1)-(4): Terminal Number
PSG: Power Supply Ground
CG: Circuit Ground
CB: Circuit+B

■ Packaging

Code	Packaging	Minimum Quantity
-	Box	150

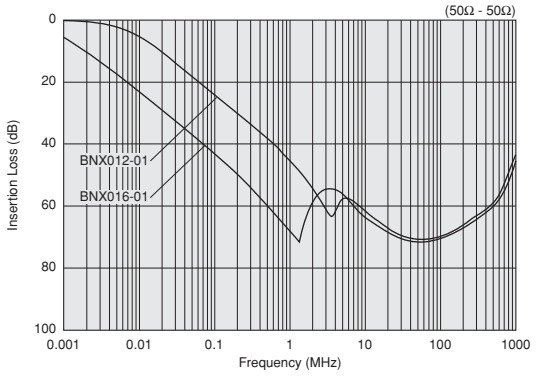
Refer to pages from p.229 to p.230 for mounting information.

■ Rated Value

Part Number	Rated Voltage	Withstand Voltage	Rated Current	Insulation Resistance (min.)	Insertion Loss (Line impedance=50 ohm)	
BNX012-01	50Vdc	125Vdc	15A	500M ohm	1MHz to 1GHz:40dB min.	Kit ≧3A
BNX016-01	25Vdc	62.5Vdc	15A	50M ohm	100kHz to 1GHz:40dB min.	Kit ≧3A

Operating Temperature Range: -40°C to +125°C

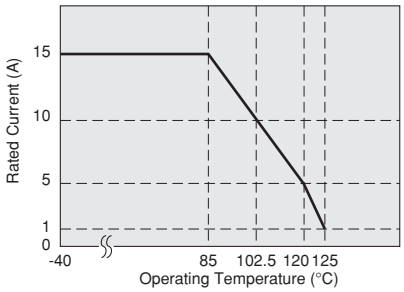
■ Insertion Loss Characteristics



■ Notice (Rating)

In operating temperature exceeding +85°C, derating of current is necessary for BNX01□ series. Please apply the derating curve shown in chart according to the operating temperature.

Derating of Rated Current



● Connecting ± power line

In case of using ± power line, please connect to each terminal as shown.

Power Supply (BNX Input)	BNX		Circuit (BNX Output)
Power Supply +Bias	B	CB	Load Circuit +Bias
Power Supply Ground	PSG	CG	Load Circuit Ground
Power Supply -Bias	B	CB	Load Circuit -Bias
Power Supply Ground	PSG	CG	Load Circuit Ground

⚠Caution

● Rating

Do not use products beyond the rated current and rated voltage as this may create excessive heat and deteriorate the insulation resistance.

Notice

● Storage and Operating Conditions

<Operating Environment>
Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.
Do not use products in the environment close to the organic solvent.
<Storage and Handling Requirements>
1. Storage Period
   BNX series should be used within 12 months. Solderability should be checked if this period is exceeded.
2. Storage Conditions
   (1) Storage temperature: -10 to +40°C
   Relative humidity: 15 to 85%
   Avoid sudden changes in temperature and humidity.
   (2) Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

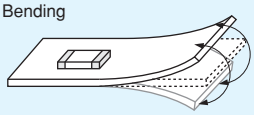
● Notice (Soldering and Mounting)

1. Cleaning
   Do not clean BNX series (SMD Type).
   Before cleaning, please contact Murata engineering.
2. Soldering
   Reliability decreases with improper soldering methods. Please solder by the standard soldering conditions shown in mounting information.
3. Other
   Noise suppression levels resulting from Murata's EMI suppression filters EMIFIL® may vary, depending on the circuits and ICs used, type of noise, mounting pattern, mounting location, and other operating conditions. Be sure to check and confirm in advance the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

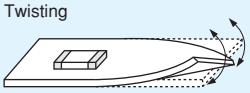
● Handling

1. Resin Coating
   Using resin for coating/molding products may affect the products performance.
   So please pay careful attention in selecting resin.
   Prior to use, please make the reliability evaluation with the product mounted in your application set.
2. Handling of a Substrate (for BNX02☐)
   After mounting products on a substrate, do not apply any stress to the product caused by bending or twisting to the substrate when cropping the substrate, inserting and removing a connector from the substrate or tightening screw to the substrate.
   Excessive mechanical stress may cause cracking in the Product.

Bending



Twisting



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⚠Caution

● Rating

Do not use products beyond the rated current and rated voltage as this may create excessive heat and deteriorate the insulation resistance.

Notice

● Storage and Operating Conditions

<Operating Environment>

1. Do not use products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.
2. Do not use products near water, oil or organic solvents.

<Storage and Handling Requirements>

1. Storage Period
   BNX Series should be used within 12 months. Solderability should be checked if this period is exceeded.
2. Storage Conditions
   (1) Storage temperature: -10 to +40°C
   Relative humidity: 15 to 85%
   Avoid sudden changes in temperature and humidity.
   (2) Do not store products in a chemical atmosphere such as chlorine gas, acid or sulfide gas.

● Notice (Soldering and Mounting)

1. Cleaning
   Failure and degradation of a product are caused by the cleaning method. When you clean in conditions that are not in mounting information, please contact Murata engineering.
2. Soldering
   Reliability decreases with improper soldering methods. Please solder by the standard soldering conditions shown in mounting information.
3. Other
   Noise suppression levels resulting from Murata's EMI suppression filters "EMIFIL" may vary, depending on the circuits and ICs used, type of noise, mounting pattern, lead wire length, mounting location, and other operating conditions. Be sure to check and confirm in advance the noise suppression effect of each filter, in actual circuits, etc. before applying the filter in a commercial-purpose equipment design.

● Notice (Appearance)

Although some part of the product surface seems to be white in some cases, do not care because it is the result of waxing process for humidity resistance improvement. This wax does not make bad affection to mechanical or electrical performance, reliability of the product.

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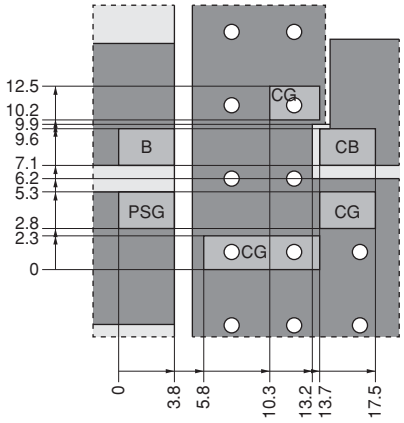
1. Standard Land Pattern Dimensions

Land Pattern + Solder Resist
Land Pattern
Solder Resist
Through Hole
(in mm)

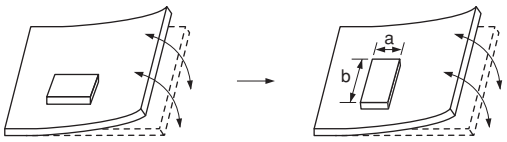
BNX022
BNX023
BNX024
BNX025



(1) A double-sided print board (or multilayer board) as shown in the left figure is designed, and please apply a soldering Cu electrode with a product electrode to a "Land Pattern", apply resist to a "Land Pattern + Solder Resist" at Cu electrode.
(2) This product is designed to meet large current. Please design PCB pattern which is connected to this product not to become too hot by applied large current.
(3) Please drop CG on a ground electrode on the back layer (the same also in a multilayer case) by the through hole. And a surface to ground electrode layer may also take a large area as much as possible.
(4) It is recommended to use a double-sided printed circuit board with BNX mounting on one side and the ground pattern on the other in order to maximize filtering performance, multiple feed through holes are required to maximize the BNX's connection to ground.
(5) The ground pattern should be designed to be as large as possible to achieve maximum filtering performance.

● PCB Warping (for BNX02□)
PCB should be designed so that products are not subjected to the mechanical stress caused by warping the board.

Products should be located in the sideways direction (Length: a<b) to the mechanical stress.

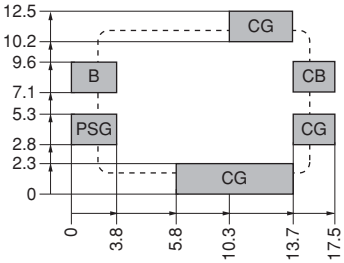


Poor example　　Good example

2. Solder Paste Printing and Adhesive Application

When reflow soldering the block type EMIFIL®, the printing must be conducted in accordance with the following cream solder printing conditions.
If too much solder is applied, the chip will be prone to damage by mechanical and thermal stress from the PCB and may crack.
Standard land dimensions should be used for resist and copper foil patterns.

Series	Solder Paste Printing	Adhesive Application
BNX022 **BNX023** **BNX024** **BNX025**	●Guideline of solder paste thickness: 150-200μm	



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3. Standard Soldering Conditions

(1) Soldering Methods

Use reflow soldering methods only.
Use standard soldering conditions when soldering block type EMIFIL® SMD type.
In cases where several different parts are soldered, each having different soldering conditions, use those conditions requiring the least heat and minimum time.

Solder: Use Sn-3.0Ag-0.5Cu solder. Use of Sn-Zn based solder will deteriorate performance of products.

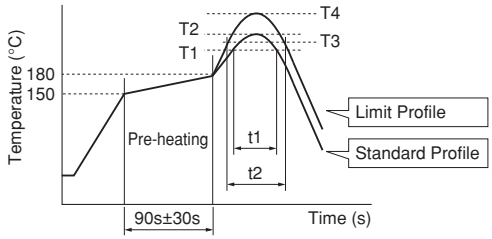
Flux:

- Use Rosin-based flux.
  In case of using RA type solder, products should be cleaned completely with no residual flux.
- Do not use strong acidic flux (with chlorine content exceeding 0.20wt%)
- Do not use water-soluble flux.

For additional mounting methods, please contact Murata.

(2) Soldering Profile

●Reflow Soldering Profile
(Sn-3.0Ag-0.5Cu solder)



Series	Standard Profile				Limit Profile			
	Heating		Peak Temperature (T2)	Cycle of Reflow	Heating		Peak Temperature (T4)	Cycle of Reflow
	Temp. (T1)	Time. (t1)			Temp. (T3)	Time. (t2)		
BNX022/023/024/025	220°C min.	30 to 60s	250±3°C	2 times max.	230°C min.	60s max.	260°C/10s	2 times max.

(3) Reworking with Solder Iron

The following conditions must be strictly followed when using a soldering iron.
Pre-heating: 150°C 60s min.
Soldering iron power output: 100W max.
Temperature of soldering iron tip / Soldering time / Times:
450°C max. / 5s max. / 2 time

Do not allow the tip of the soldering iron to directly contact the chip.
For additional methods of reworking with a soldering iron, please contact Murata engineering.

4. Cleaning

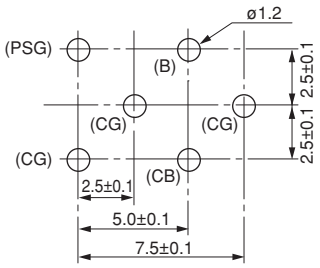
Do not clean BNX022/023/024/025 series. In case of cleaning, please contact Murata engineering.

1. Mounting Hole

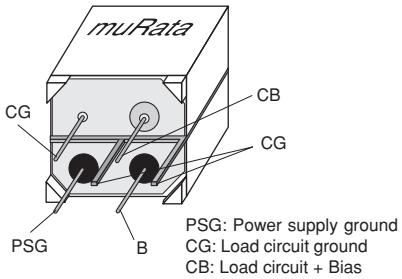
■ Mounting holes should be designed as specified below.

BNX00□/01□

Component Side



Terminal Layout (Bottom figure)



2. Using the Block Type EMIFIL® (Lead Type) Effectively

(1) How to use effectively

This product effectively prevents undesired radiation and external noise from going out / entering the circuit by grounding the high frequency components which cause noise problems. Therefore, grounding conditions may affect the performance of the filter and attention should be paid to the following for effective use.

(a) Design maximized grounding area in the P.C. board, and grounding pattern for all the grounding terminals of the product to be connected. (Please follow the specified recommendations.)

(b) Minimize the distance between ground of the P.C. board and the ground plate of the product. (Recommend using the through hole connection between grounding area both of component side and bottom side.)

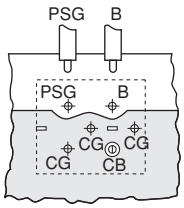
(c) Insert the terminals into the holes on P.C. board completely.

(d) Don't connect PSG terminal with CG terminal directly. (See the item 1. Terminal Layout)

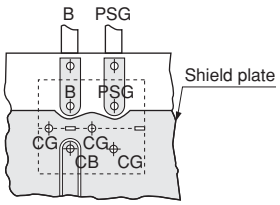
P. C. Board Patterns

Use a bilateral P.C. board. Insert the BNX into the P.C.board until the root of the terminal is secured, then solder.

(1) Component Side View



(2) Bottom View



Copper foil pattern

(2) Self-heating

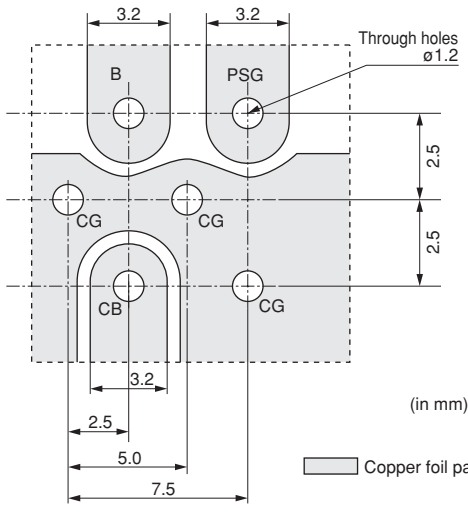
Though this product has a large rated current, localized selfheating may be caused depending on soldering conditions. To avoid this, attention should be paid to the following:

(a) Use P.C. board with our recommendation on hole diameter / land pattern dimensions, mentioned in the right hand drawing, especially for 4 terminals which pass current.

(b) Solder the terminals to the P.C. board with soldercover area at least 90%. Otherwise, excess self-heating at connection between terminals and P.C. board may lead to smoke and / or fire of the product even when operating at rated current.

(c) After installing this product in your product, please make sure the self-heating is within the rated current recommended.

Recommended Land Pattern



Copper foil pattern

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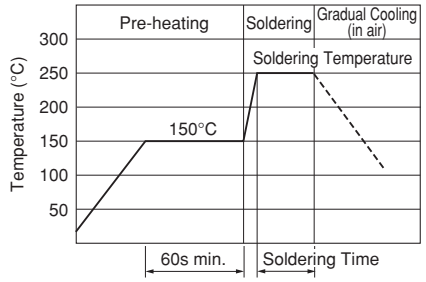
3. Soldering

(1) Use Sn-3.0Ag-0.5Cu solder.
(2) Use Rosin-based flux. Do not use strong acidic flux with halide content exceeding 0.2wt% (chlorine conversion value).
(3) Products and the leads should not be subjected to any mechanical stress during the soldering process, or while subjected to the equivalent high temperatures.
(4) Standard flow soldering profile

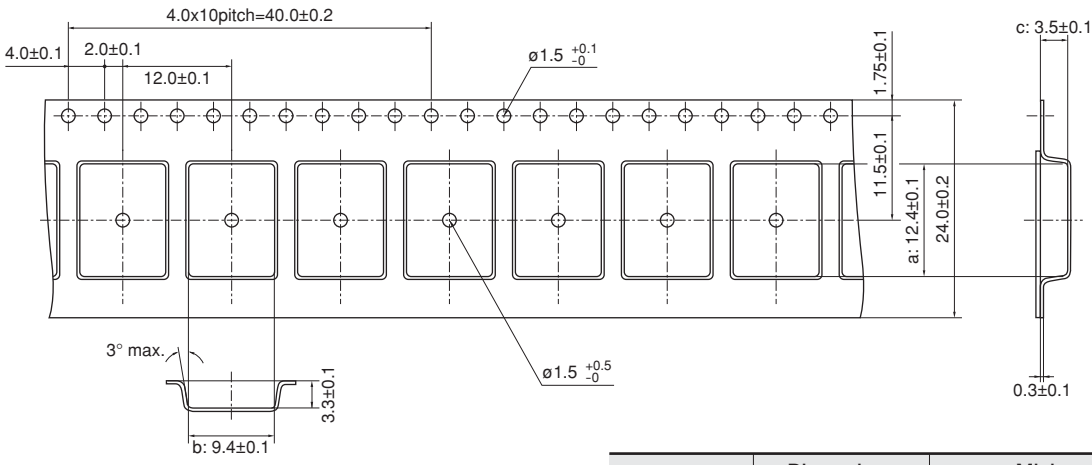


Solder	Soldering Temperature	Soldering Time
Sn-3.0Ag-0.5Cu solder	250 to 260°C	4 to 6s

4. Cleaning

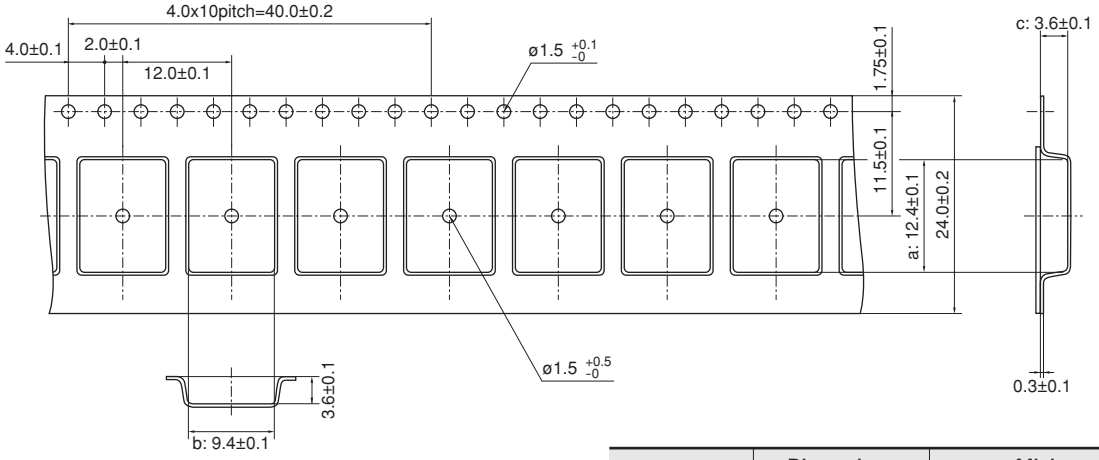
Clean the block Type EMIFIL®(Lead Type) in the following conditions.
(1) Cleaning temperature should be limited to 60°C max. (40°C max for alcohol type cleaner).
(2) Ultrasonic cleaning should comply with the following conditions, avoiding the resonance phenomenon at the mounted products and P.C.B.
Power: 20W/liter max.
Frequency: 28 to 40kHz
Time: 5 min. max.
(3) Cleaner
(a) Alcohol type cleaner
Isopropyl alcohol (IPA)
(b) Aqueous agent
Pine Alpha ST-100S
(4) There should be no residual flux or residual cleaner left after cleaning.
In the case of using aqueous agent, products should be dried completely after rinsing with de-ionized water in order to remove the cleaner.
(5) The surface of products may become dirty after cleaning, but there is no deterioration on mechanical, electrical characteristics and reliability.
(6) Other cleaning: Please contact us.

■ Minimum Quantity and Dimensions of 24mm Width Embossed Tape



Dimension of the cavity is measured at the bottom side.

Part Number	Dimensions			Minimum Qty. (pcs.)		
	a	b	c	ø180mm Reel	ø330mm Reel	Bulk
BNX022/023	12.4	9.4	3.5	400	1500	100



Dimension of the cavity is measured at the bottom side.

Part Number	Dimensions			Minimum Qty. (pcs.)		
	a	b	c	ø180mm reel	ø330mm reel	Bulk
BNX024/025	12.4	9.4	3.6	400	1500	100

(in mm)

"Minimum Quantity" means the number of units of each delivery or order. The quantity should be an integral multiple of the "Minimum Quantity."

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●EKEPBLCKAD-KIT

No.	Part Number	Quantity (pcs.)	Common Mode Impedance (at 10MHz, 20 degrees C)	Rated Voltage (Vdc)	Rated Current (A)
1	**PLT10HH450180PN**	2	45Ω (Typ.)	300	18
2	**PLT10HH101150PN**	2	100Ω (Typ.)	300	15
3	**PLT10HH401100PN**	2	400Ω (Typ.)	100	10
4	**PLT10HH501100PN**	2	500Ω (Typ.)	100	10
5	**PLT10HH9016R0PN**	2	900Ω (Typ.)	100	6
6	**PLT10HH1026R0PN**	2	1000Ω (Typ.)	100	6

No.	Part Number	Quantity (pcs.)	Insertion Loss	Rated Voltage (Vdc)	Rated Current (A)
7	**BNX002-01**	1	1MHz to 1GHz : 40dB min.	50	10
8	**BNX003-01**	1	5MHz to 1GHz : 40dB min.	150	10
9	**BNX005-01**	1	1MHz to 1GHz : 40dB min.	50	15
10	**BNX012-01**	1	1MHz to 1GHz : 40dB min.	50	15
11	**BNX016-01**	1	100kHz to 1GHz : 40dB min.	25	15
12	**BNX022-01**	2	1MHz to 1GHz : 35dB min.	50	10
13	**BNX023-01**	2	1MHz to 1GHz : 35dB min.	100	15
14	**BNX024H01**	2	100kHz to 1GHz : 35dB min.	50	15
15	**BNX025H01**	2	50kHz to 1GHz : 35dB min.	25	15

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EA

Microwave Absorber

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(Part Number) EA 1026 A 160 M 200 200
❶ ❷ ❸ ❹ ❺ ❻ ❼

❶Product ID

Product ID	
EA	Microwave Absorber

❷Sheet Type

Code	Sheet Type
10□□	Iron carbonyl type (UL certified type/Halogen Free type)
2070	Metal Flake Powder (Halogen Free type)
2100	Metal Flake Powder (UL certified type)
3008	Magnetic material (UL certified type/Halogen Free type)

❸Adhesive Tape Type

Code	Adhesive Tape Type
A	Standard tape type (Halogen Free type)
B	Thin Adhesive tape type (Halogen Free type)
L	No tape type
U	UL certified type (Halogen Free type)

❹Sheet Thickness
Expressed by 3 digits including the second decimal place in mm.

Ex.)

Code	Sheet Thickness
020	0.20mm

❺Unit of Dimension
One capital letter expresses Unit of Dimension (❻) and Dimensions Length (❼).

Code	Unit of Dimension
M	in mm (Standard)
C	in cm (Standard)

Standard shape is a rectangle.
Please contact us for other shapes.

❻Dimension (Length)
Expressed by 3 digits including the first decimal place.

❼Dimension (Width)
Expressed by 3 digits including the first decimal place.

Ex.)

Code	Dimension (Length × Width)
M300150	30.0×15.0 mm
C150100	15.0×10.0 cm

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EA10 Series

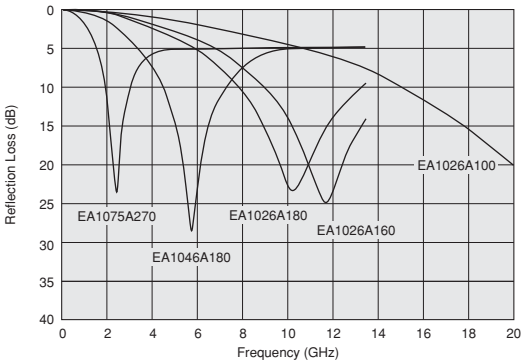
■ Packaging

When inquiring, please contact us with size code,
refering to "Part Numbering."

■ Rated Value

Part Number	Applicable Frequency (Typ.)	Thickness (Typ.)	Flame Class	Halogen	Operating Temperature Range
EA1026A100	20.0GHz	1.0mm	UL94V-0	Halogen Free	-40°C to +80°C
EA1026A160	11.5GHz	1.6mm	UL94V-0	Halogen Free	-40°C to +80°C
EA1026A180	10.0GHz	1.8mm	UL94V-0	Halogen Free	-40°C to +80°C
EA1046A180	5.8GHz	1.8mm	UL94V-0	Halogen Free	-40°C to +80°C
EA1075A270	2.5GHz	2.7mm	UL94V-0	Halogen Free	-40°C to +80°C

■ Reflection Loss (Typ.)



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EA20/EA21 Series

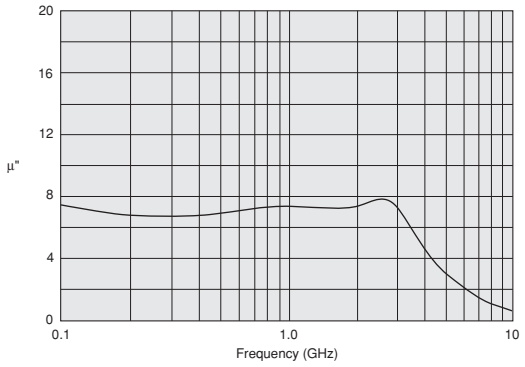
■ Packaging

When inquiring, please contact us with size code, refering to "Part Numbering."

■ Rated Value

Part Number	Applicable Frequency (Typ.)	Thickness (Typ.)	Flame Class	Halogen	Operating Temperature Range
EA2070A020	0.1 to 3.0GHz	0.20mm	-	Halogen Free	-40°C to +120°C
EA2070A050	0.1 to 3.0GHz	0.50mm	-	Halogen Free	-40°C to +120°C
EA2070A100	0.1 to 3.0GHz	1.00mm	-	Halogen Free	-40°C to +120°C
EA2070B005	0.1 to 3.0GHz	0.05mm	-	Halogen Free	-40°C to +120°C
EA2070B010	0.1 to 3.0GHz	0.10mm	-	Halogen Free	-40°C to +120°C
EA2070B013	0.1 to 3.0GHz	0.13mm	-	Halogen Free	-40°C to +120°C
EA2070B020	0.1 to 3.0GHz	0.20mm	-	Halogen Free	-40°C to +120°C
EA2070B050	0.1 to 3.0GHz	0.50mm	-	Halogen Free	-40°C to +120°C
EA2100A020	0.1 to 3.0GHz	0.20mm	UL94V-0	-	-40°C to +120°C
EA2100A050	0.1 to 3.0GHz	0.50mm	UL94V-0	-	-40°C to +120°C
EA2100A100	0.1 to 3.0GHz	1.00mm	UL94V-0	-	-40°C to +120°C
EA2100B020	0.1 to 3.0GHz	0.20mm	UL94V-0	-	-40°C to +120°C
EA2100B050	0.1 to 3.0GHz	0.50mm	UL94V-0	-	-40°C to +120°C
EA2100B100	0.1 to 3.0GHz	1.00mm	UL94V-0	-	-40°C to +120°C

■ Magnetic Permeability-Reluctance



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EA30 Series

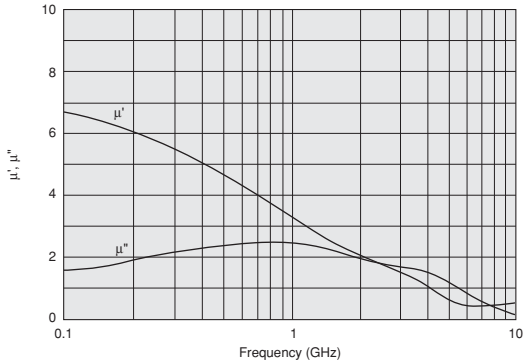
■ Packaging

When inquiring, please contact us with size code,
refering to "Part Numbering."

■ Rated Value

Part Number	Applicable Frequency (Typ.)	Thickness (Typ.)	Flame Class	Halogen	Operating Temperature Range
EA3008U025	0.1 to 3.0GHz	0.25mm	UL94V-0	Halogen Free	-40°C to +120°C
EA3008U035	0.1 to 3.0GHz	0.35mm	UL94V-0	Halogen Free	-40°C to +120°C
EA3008U050	0.1 to 3.0GHz	0.50mm	UL94V-0	Halogen Free	-40°C to +120°C
EA3008U100	0.1 to 3.0GHz	1.00mm	UL94V-0	Halogen Free	-40°C to +120°C
EA3008U250	0.1 to 3.0GHz	2.50mm	UL94V-0	Halogen Free	-40°C to +120°C

■ Magnetic Permeability-Reluctance



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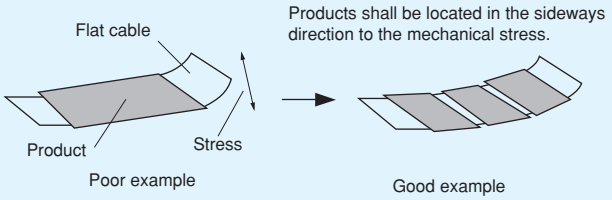
Notice

● Storage and Operating Conditions

1. Adhesive Tape Stress
   This product is designed to use adhesive tape to hold itself to the object.
   And please avoid causing mechanical stress by bending or variation of the object.



2. Cleaning
   Avoid cleaning this product.
3. Handling of the Product
   Adhesive tape must be clean to maintain the quality of adhesion.
   Please wipe off any dirt, dust and any kind of oil from the surface of the object before use.
4. Storage Conditions
(1) Storage period
   Products that were inspected by Murata over 6 months ago should be examined and used. This can be confirmed by the inspection No. marked on the container.
   Adhesiveness should be checked if this period is exceeded.
(2) Storage conditions
   · Products should be stored in the warehouse in the following conditions:
      Temperature: -10 to +40˚C
      Humidity: 30 to 70% relative humidity
      No rapid change of temperature or humidity
   · Products should be stored in the warehouse without heat shock condition, vibration, direct sunlight and so on.

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Product Guide by Size

Which Size? inch (mm)	Inductor Type	Capacitor Type: Simple Capacitor	Capacitor Type: LC(RC) Combined	Capacitor Type: T Circuit Filter Feed Through Type	Common Mode Choke Coils	Block Type L×W×T(mm)
01005 (0402)	BLM02AX p24 BLM02BX p26					
0201 (0603)	BLM03AG p32 BLM03AX p30 BLM03B p34 BLM03E p87 BLM03P p27 BLM03H p85					
025020 (0605)					DLP0QS p186	
03025 (0806)					DLP0NS p187	
0402 (1005)	BLM15AG p42 BLM15AX p40 BLM15B p44 BLM15HD p88 BLM15P p36 BLM15HB p88 BLM15E p90 BLM15GG p91 BLM15HG p88 BLM15GA p91	NFM15CC p134 NFM15PC p123	NFL15ST p140			
05025 (1506)					DLP1ND p193	
0504 (1210)					DLM11G p184 DLM11S p185 DLP11S/11R/11T [p188 p190 p191]	
0603 (1608)	BLM18A p56 BLM18E p96 BLM18T p62 BLM18HE p92 BLM18B p58 BLM18HG p92 BLM18R p63 BLM18HD p92 BLM18P p50 BLM18HB p92 BLM18K p52 BLM18HK p92 BLM18S p54 BLM18G p98	NFM18CC p135 NFM18PS p125 NFM18PC p126	NFL18ST [p141 p142] NFL18SP p143			
Array			NFA18SL [p145 p146] NFA18SD p147			
0804 (2010) Array	BLA2AA p80 BLA2AB p80				DLP2AD p194	
0805 (2012)	BLM21A p68 BLM21R p73 BLM21B p70 BLM21P p66	NFM21CC p136 NFM21PS p128 NFM21PC p129	NFL21SP p144 NFR21GD p152		DLW21S p197 DLW21H p199	
Array			NFA21SL [p148 p149]			
1205 (3212)		NFM3DCC p137 NFM3DPC p130				
1206 (3216)	BLM31P p75	NFM31PC p131 NFM31KC p132	NFW31SP p150	NFE31PT p121	DLP31S p192 DLW31S p200	
Array	BLA31A p83 BLA31B p83		NFA31CC p139 NFA31GD p153		DLP31D p196	
1210 (3225)	BLE32P p79					
1806 (4516)	BLM41P p77	NFM41CC p138 NFM41PC p133				
1812 (4532)					DLW43S p201	
2014 (5036)					DLW5AH p177 DLW5AT [p179 p181]	
2020 (5050)					DLW5BS p177 DLW5BT [p179 p181]	
2606 (6816)				NFE61PT p122		

12×11×max13 p223 — BNX002-01 BNX003-01 — Lead

12×11×max13.5 p223 — BNX005-01 — Lead

12×11×max8.5 p224 — BNX012-01 BNX016-01 — Lead

9.1×12.1×max3.3 p221 — BNX022-01 BNX023-01 — SMD

9.1×12.1×max3.7 p221 — BNX024H01 BNX025H01 — SMD

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Part Number Quick Reference

Alphabetic Product Name Index

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Please refer to catalogs below for ferrite cores, Microwave Absorber and leaded EMIFIL®.

Ferrite Core, Microwave Absorber

Ferrite Corefor EMI Suppression Microwave Absorber

Contents
- Thin Type Sandwich Core <FSSA>
- Core for Flat Cables <FSRC>
- Beads Core <FSRH>
- Ring Core <FSRB>
- Microwave Absorber <EA>

This Catalog is PDF version only. Please refer to following URL.
http://www.murata.com/products/catalog/pdf/o63e.pdf

Lead Type EMIFIL®

EMI Suppression Filters (Lead Type EMIFIL®)

Contents
- Ferrite Beads Inductors <BL01/02/03>
- Disc Type EMIFIL®<DS□6/DS□9>
- EMIGUARD®(EMIFIL® with Varistor Function) <VF□3/VF□6/VF□9>
- Common Mode Choke Coils <PLT>

EMICON-FUN!

Please check Murata's newsletter!
You can learn about electric parts with fun.
http://www.murata.com/products/emicon_fun/

EMICON-FUN! disseminated widely from basics (principles, characteristics, mounting, etc.) of capacitors, EMI suppression filters and inductors to information can practically be used.
Updated information is also distributed via the mail magazine.

Click here to register as reader → http://go.murata.co.jp/Email_Newsletter_EN.html

You can register from Murata Manufacturing Web site page TOP.
http://www.murata.com/products/

This banner is the entrance of register form

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Cat. No. C31E-26

Global Locations

For details please visit www.murata.com

⚠Note

1 Export Control

For customers outside Japan:

No Murata products should be used or sold, through any channels, for use in the design, development, production, utilization, maintenance or operation of, or otherwise contribution to (1) any weapons (Weapons of Mass Destruction [nuclear, chemical or biological weapons or missiles] or conventional weapons) or (2) goods or systems specially designed or intended for military end-use or utilization by military end-users.

For customers in Japan:

For products which are controlled items subject to the "Foreign Exchange and Foreign Trade Law" of Japan, the export license specified by the law is required for export.

2 Please contact our sales representatives or product engineers before using the products in this catalog for the applications listed below, which require especially high reliability for the prevention of defects which might directly damage a third party's life, body or property, or when one of our products is intended for use in applications other than those specified in this catalog.

1. *Aircraft equipment*
2. *Aerospace equipment*
3. *Undersea equipment*
4. *Power plant equipment*
5. *Medical equipment*
6. *Transportation equipment (vehicles, trains, ships, etc.)*
7. *Traffic signal equipment*
8. *Disaster prevention / crime prevention equipment*
9. *Data-processing equipment*
10. *Application of similar complexity and/or reliability requirements to the applications listed above*

3 Product specifications in this catalog are as of March 2014. They are subject to change or our products in it may be discontinued without advance notice. Please check with our sales representatives or product engineers before ordering. If there are any questions, please contact our sales representatives or product engineers.

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7 No ozone depleting substances (ODS) under the Montreal Protocol are used in our manufacturing process.

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