

Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

REMINDERS

- Product information in this catalog is as of October 2016. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or use of our products.

Please note that TAIYO YUDEN shall not be in any way responsible for any damages and defects in products or equipment incorporating our products, which are caused under the conditions other than those specified in this catalog or individual specification.

- Please contact TAIYO YUDEN for further details of product specifications as the individual specification is available.
- Please conduct validation and verification of our products in actual condition of mounting and operating environment before using our products.
- The products listed in this catalog are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment), general medical equipment, industrial equipment, and automotive interior applications, etc. Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., specially controlled medical equipment, transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment).

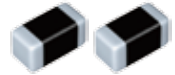
Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, nuclear control equipment, undersea equipment, military equipment).

When our products are used even for high safety and/or reliability-required devices or circuits of general electronic equipment, it is strongly recommended to perform a thorough safety evaluation prior to use of our products and to install a protection circuit as necessary.

Please note that unless you obtain prior written consent of TAIYO YUDEN, TAIYO YUDEN shall not be in any way responsible for any damages incurred by you or third parties arising from use of the products listed in this catalog for any equipment requiring inquiry to TAIYO YUDEN or prohibited for use by TAIYO YUDEN as described above.

- Please note that TAIYO YUDEN shall have no responsibility for any controversies or disputes that may occur in connection with a third party's intellectual property rights and other related rights arising from use of our products. TAIYO YUDEN grants no license for such rights.
- Please note that unless otherwise agreed in writing, the scope of warranty for our products is limited to the delivered our products themselves and TAIYO YUDEN shall not be in any way responsible for any damages resulting from a fault or defect in our products.
- The contents of this catalog are applicable to our products which are purchased from our sales offices or authorized distributors (hereinafter "TAIYO YUDEN's official sales channel"). Please note that the contents of this catalog are not applicable to our products purchased from any seller other than TAIYO YUDEN's official sales channel.
- Caution for Export
Some of our products listed in this catalog may require specific procedures for export according to "U.S. Export Administration Regulations", "Foreign Exchange and Foreign Trade Control Law" of Japan, and other applicable regulations. Should you have any questions on this matter, please contact our sales staff.

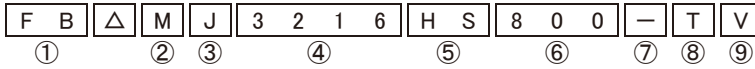
CHIP BEAD INDUCTORS FOR POWER LINES (FB SERIES M TYPE)



REFLOW
AEC-Q200

■ PART NUMBER

*Operating Temp. : -40~125°C (Including self-generated heat)



△ = Blank space

① Series name

Code	Series name
FB	Ferrite bead

② Shape

Code	Shape
M	Rectangular chip

③ Characteristics

Code	Characteristics
J	Standard
H	High Impedance type

④ Dimensions (L × W)

Code	Type (inch)	Dimensions (L × W) [mm]
1608	1608 (0603)	1.6 × 0.8
2125	2125 (0805)	2.0 × 1.25
2012	2012 (0805)	
2016	2016 (0806)	2.0 × 1.6
3216	3216 (1206)	3.2 × 1.6
3225	3225 (1210)	3.2 × 2.5
4516	4516 (1806)	4.5 × 1.6
4525	4525 (1810)	4.5 × 2.5

⑤ Material

Code	Material
HS	Refer to impedance curves for material differences
HM	
HL	

⑥ Nominal impedance

Code (example)	Nominal impedance [Ω]
330	33
221	220
102	1000

⑦ Impedance tolerance

Code	Impedance tolerance
-	±25%
N	±30%

⑧ Packaging

Code	Packaging
T	Taping

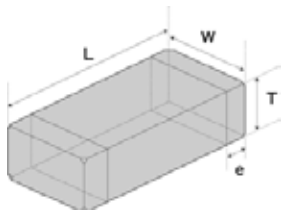
⑨ Internal code

Code	Internal code
V	Bead Inductor for Industrial and Automotive
W	

■ FEATURES

- HS: For broadband applications
- HM: For upper MHz range applications
- HL: For GHz range applications

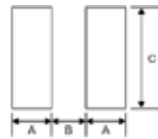
■ STANDARD EXTERNAL DIMENSIONS / STANDARD QUANTITY



Recommended Land Patterns

Surface Mounting

• Mounting and soldering conditions should be checked beforehand.



Type	A	B	C
FB MJ1608	1.0	1.0	1.0
FB MJ2125	1.4	1.2	1.65
FB MJ3216	1.4	2.2	2.0
FB MJ4516	1.75	3.5	2.0
FB MH1608	1.0	1.0	1.0
FB MH2012	1.4	1.2	1.65
FB MH2016	1.4	1.2	2.0
FB MH3216	1.4	2.2	2.0
FB MH3225	1.4	2.2	2.9
FB MH4516	1.75	3.5	2.0
FB MH4525	1.75	3.5	2.9

Unit: mm

Type	L	W	T	e	Standard quantity [pcs]	
					Paper tape	Embossed tape
FB MJ1608 (0603)	1.6±0.2 (0.063±0.008)	0.8±0.2 (0.031±0.008)	0.8±0.2 (0.031±0.008)	0.3±0.2 (0.012±0.008)	4000	-
FB MJ2125 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	0.85±0.2 (0.033±0.008)	0.5±0.3 (0.020±0.012)	4000	-
FB MJ3216 (1206)	3.2±0.3 (0.126±0.012)	1.6±0.2 (0.063±0.008)	1.6±0.2 (0.043±0.008)	0.5±0.3 (0.020±0.012)	-	2000
FB MJ4516 (1806)	4.5±0.3 (0.177±0.012)	1.6±0.2 (0.063±0.008)	1.1±0.2 (0.043±0.008)	0.5±0.3 (0.020±0.012)	-	2000
FB MH1608 (0603)	1.6±0.1 (0.063±0.004)	0.8±0.1 (0.031±0.004)	0.8±0.1 (0.031±0.004)	0.3±0.15 (0.012±0.006)	4000	-
FB MH2012 (0805)	2.0±0.2 (0.079±0.008)	1.25±0.2 (0.049±0.008)	0.85±0.2 (0.033±0.008)	0.5±0.3 (0.020±0.012)	4000	-
FB MH2016 (0806)	2.0±0.2 (0.079±0.008)	1.6±0.2 (0.063±0.008)	1.6±0.2 (0.063±0.008)	0.5±0.3 (0.020±0.012)	-	2000
FB MH3216 (1206)	3.2±0.3 (0.126±0.012)	1.6±0.2 (0.063±0.008)	1.6±0.2 (0.063±0.008)	0.5±0.3 (0.020±0.012)	-	2000
FB MH3225 (1210)	3.2±0.3 (0.126±0.012)	2.5±0.3 (0.098±0.012)	2.5±0.3 (0.098±0.012)	0.5±0.3 (0.020±0.012)	-	1000
FB MH4516 (1806)	4.5±0.3 (0.177±0.012)	1.6±0.2 (0.063±0.008)	1.6±0.2 (0.063±0.008)	0.5±0.3 (0.020±0.012)	-	2000
FB MH4525 (1810)	4.5±0.4 (0.177±0.016)	2.5±0.3 (0.098±0.012)	2.5±0.3 (0.098±0.012)	0.9±0.6 (0.035±0.024)	-	1000

Unit: mm (inch)

▶ This catalog contains the typical specification only due to the limitation of space. When you consider the purchase of our products, please check our specification. For details of each product (characteristics graph, reliability information, precautions for use, and so on), see our website (<http://www.ty-top.com/>).

PART NUMBER

• All the Multilayer Chip Bead Inductors of the catalog lineup are RoHS compliant.

Note)

• The exchange of individual specifications is necessary depending on the application and circuit condition. Please contact Taiyo Yuden sales channels.

• *1: Automotive (AEC-Q200 Qualified) products

< **AEC-Q200** : AEC-Q200 qualified >

All the Multilayer Chip Bead Inductors of *1 marks are tested based on the test conditions and methods defined in AEC-Q200 by family item.

Please consult with TAIYO YUDEN's official sales channel for the details of the product specification and AEC-Q200 test results, etc.,

and please review and approve TAIYO YUDEN's product specification before ordering.

• *2: Industrial products and Medical products

Standard type

● FB MJ1608

Part number	Nominal impedance [Ω]	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MJ1608HS280NTV	28	±30%	100	0.007	4.0	0.8 ±0.2	*1 *2
FB MJ1608HM230NTV	23	±30%	100	0.007	4.0	0.8 ±0.2	*1 *2

● FB MJ2125

Part number	Nominal impedance [Ω]	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MJ2125HS250NTV	25	±30%	100	0.004	6.0	0.85 ±0.2	*1 *2
FB MJ2125HS420-TV	42	±25%	100	0.008	4.0	0.85 ±0.2	*1 *2
FB MJ2125HM210NTV	21	±30%	100	0.004	6.0	0.85 ±0.2	*1 *2
FB MJ2125HM330-TV	33	±25%	100	0.008	4.0	0.85 ±0.2	*1 *2
FB MJ2125HL8R0NTV	8	±30%	100	0.008	4.0	0.85 ±0.2	*1 *2

● FB MJ3216

Part number	Nominal impedance [Ω]	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MJ3216HS480NTV	48	±30%	100	0.005	6.0	1.1 ±0.2	*1 *2
FB MJ3216HS800-TV	80	±25%	100	0.010	4.0	1.1 ±0.2	*1 *2
FB MJ3216HM380NTV	38	±30%	100	0.005	6.0	1.1 ±0.2	*1 *2
FB MJ3216HM600-TV	60	±25%	100	0.010	4.0	1.1 ±0.2	*1 *2
FB MJ3216HL160NTV	16	±30%	100	0.012	4.0	1.1 ±0.2	*1 *2

● FB MJ4516

Part number	Nominal impedance [Ω]	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MJ4516HS720NTV	72	±30%	100	0.007	6.0	1.1 ±0.2	*1 *2
FB MJ4516HS111-TV	110	±25%	100	0.014	4.0	1.1 ±0.2	*1 *2
FB MJ4516HM5360NTV	56	±30%	100	0.007	6.0	1.1 ±0.2	*1 *2
FB MJ4516HM900-TV	90	±25%	100	0.014	4.0	1.1 ±0.2	*1 *2
FB MJ4516HL230NTV	23	±30%	100	0.014	3.5	1.1 ±0.2	*1 *2

High impedance type (GHz Band)

● FB MH1608

Part number	Nominal impedance Measuring frequency 100 [MHz]		Nominal impedance Measuring frequency 1 [GHz]		DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
	[Ω]	tolerance	[Ω]	tolerance				
FB MH1608HM470-TV	47	±25%	75	±40%	0.020	3.5	0.8 ±0.1	*1 *2
FB MH1608HM600-TV	60	±25%	100	±40%	0.025	3.0	0.8 ±0.1	*1 *2
FB MH1608HM101-TV	100	±25%	170	±40%	0.035	2.5	0.8 ±0.1	*1 *2
FB MH1608HM151-TV	150	±25%	270	±40%	0.050	2.1	0.8 ±0.1	*1 *2
FB MH1608HM221-TV	220	±25%	370	±40%	0.070	1.8	0.8 ±0.1	*1 *2
FB MH1608HM331-TV	330	±25%	520	±40%	0.130	1.2	0.8 ±0.1	*1 *2
FB MH1608HM471-TV	470	±25%	750	±40%	0.150	1.0	0.8 ±0.1	*1 *2
FB MH1608HM601-TV	600	±25%	900	±40%	0.170	0.9	0.8 ±0.1	*1 *2
FB MH1608HM102-TV	1000	±25%	1200	±40%	0.350	0.6	0.8 ±0.1	*1 *2
FB MH1608HL300-TV	30	±25%	120	±40%	0.028	2.6	0.8 ±0.1	*1 *2
FB MH1608HL600-TV	60	±25%	220	±40%	0.045	2.1	0.8 ±0.1	*1 *2
FB MH1608HL121-TV	120	±25%	540	±40%	0.130	1.2	0.8 ±0.1	*1 *2
FB MH1608HL221-TV	220	±25%	950	±40%	0.170	0.9	0.8 ±0.1	*1 *2
FB MH1608HL331-TV	330	±25%	1200	±40%	0.210	0.8	0.8 ±0.1	*1 *2
FB MH1608HL471-TV	470	±25%	1500	±40%	0.350	0.6	0.8 ±0.1	*1 *2
FB MH1608HL601-TV	600	±25%	1800	±40%	0.450	0.5	0.8 ±0.1	*1 *2

※) The rated current is the value of current at which the temperature of the element is increased by 40 deg.

PART NUMBER

High impedance type

● FB MH2012

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH2012HM800-TV	80	±25%	100	0.025	2.7	0.85 ±0.2	*1 ,*2
FB MH2012HM121-TV	120	±25%	100	0.032	2.5	0.85 ±0.2	*1 ,*2
FB MH2012HM221-TV	220	±25%	100	0.060	2.0	0.85 ±0.2	*1 ,*2
FB MH2012HM331-TV	330	±25%	100	0.080	1.8	0.85 ±0.2	*1 ,*2

● FB MH2016

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH2016HM121NTV	120	±30%	100	0.015	4.5	1.6 ±0.2	*1 ,*2
FB MH2016HM251NTV	250	±30%	100	0.050	2.0	1.6 ±0.2	*1 ,*2

● FB MH3216

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH3216HM221NTV	220	±30%	100	0.020	4.0	1.6 ±0.2	*1 ,*2
FB MH3216HM501NTV	500	±30%	100	0.070	2.0	1.6 ±0.2	*1 ,*2

● FB MH3225

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH3225HM601NTV	600	±30%	100	0.042	3.0	2.5 ±0.3	*1 ,*2
FB MH3225HM102NTV	1000	±30%	100	0.100	2.0	2.5 ±0.3	*1 ,*2
FB MH3225HM202NTV	2000	±30%	100	0.130	1.2	2.5 ±0.3	*1 ,*2

● FB MH4516

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH4516HM851NTV	850	±30%	100	0.100	1.5	1.6 ±0.2	*1 ,*2

● FB MH4525

Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MH4525HM102NTV	1000	±30%	100	0.060	3.0	2.5 ±0.3	*1 ,*2
FB MH4525HM162NTV	1600	±30%	100	0.130	2.0	2.5 ±0.3	*1 ,*2

High current type

● FB MJ1608

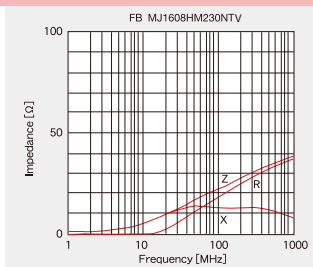
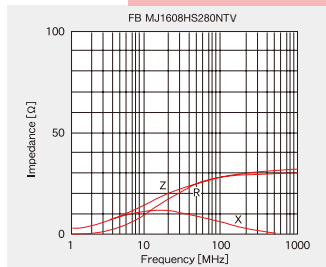
Part number	Nominal impedance (Ω)	Impedance tolerance	Measuring frequency [MHz]	DC Resistance [Ω] (max.)	Rated current [A] (max.)	Thickness [mm]	Note
FB MJ1608HS220NTW	22	±30%	100	0.004	7.5	0.8 ±0.2	*1 ,*2
FB MJ1608HS280NTW	28	±30%	100	0.006	6.0	0.8 ±0.2	*1 ,*2
FB MJ1608HM180NTW	18	±30%	100	0.004	7.5	0.8 ±0.2	*1 ,*2
FB MJ1608HM230NTW	23	±30%	100	0.006	6.0	0.8 ±0.2	*1 ,*2

※) The rated current is the value of current at which the temperature of the element is increased by 40 deg.

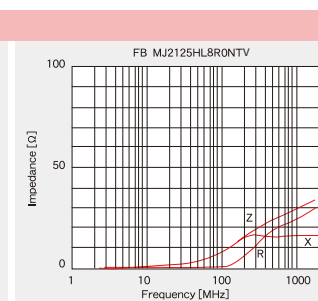
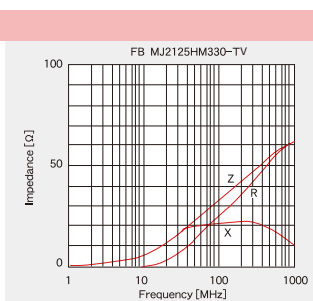
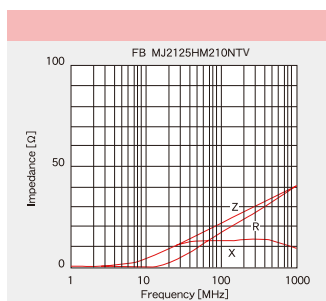
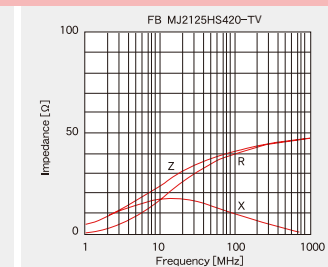
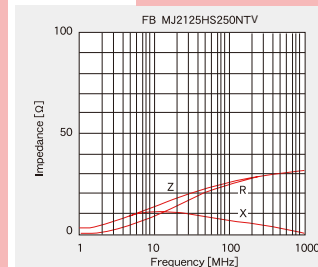
ELECTRICAL CHARACTERISTICS

Standard type

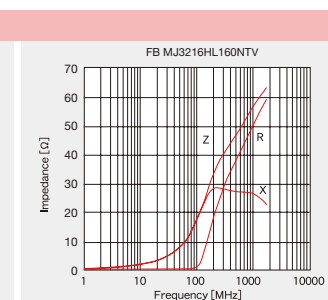
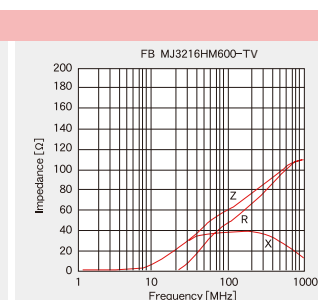
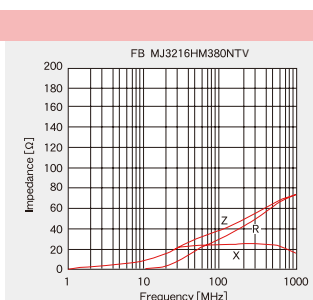
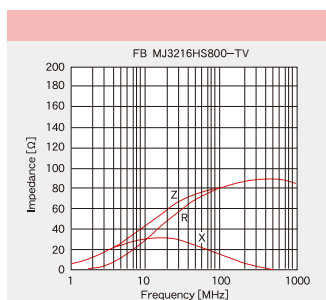
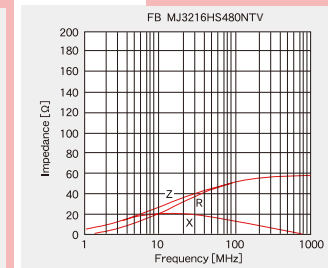
FB MJ1608



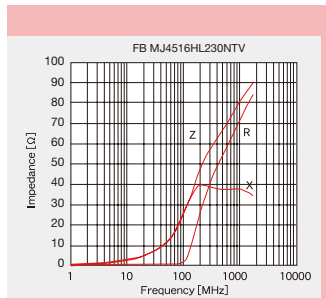
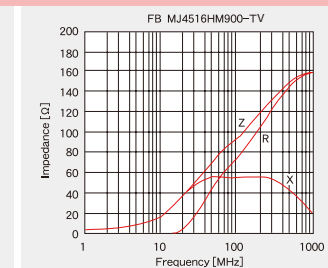
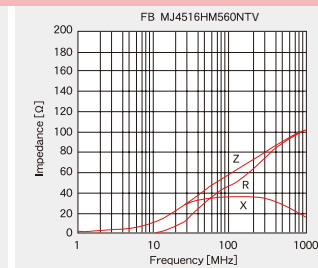
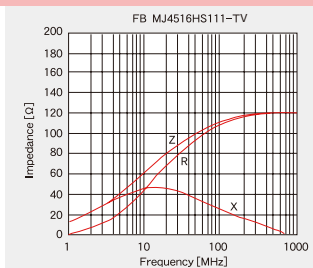
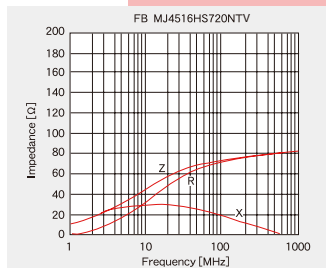
FB MJ2125



FB MJ3216



FB MJ4516

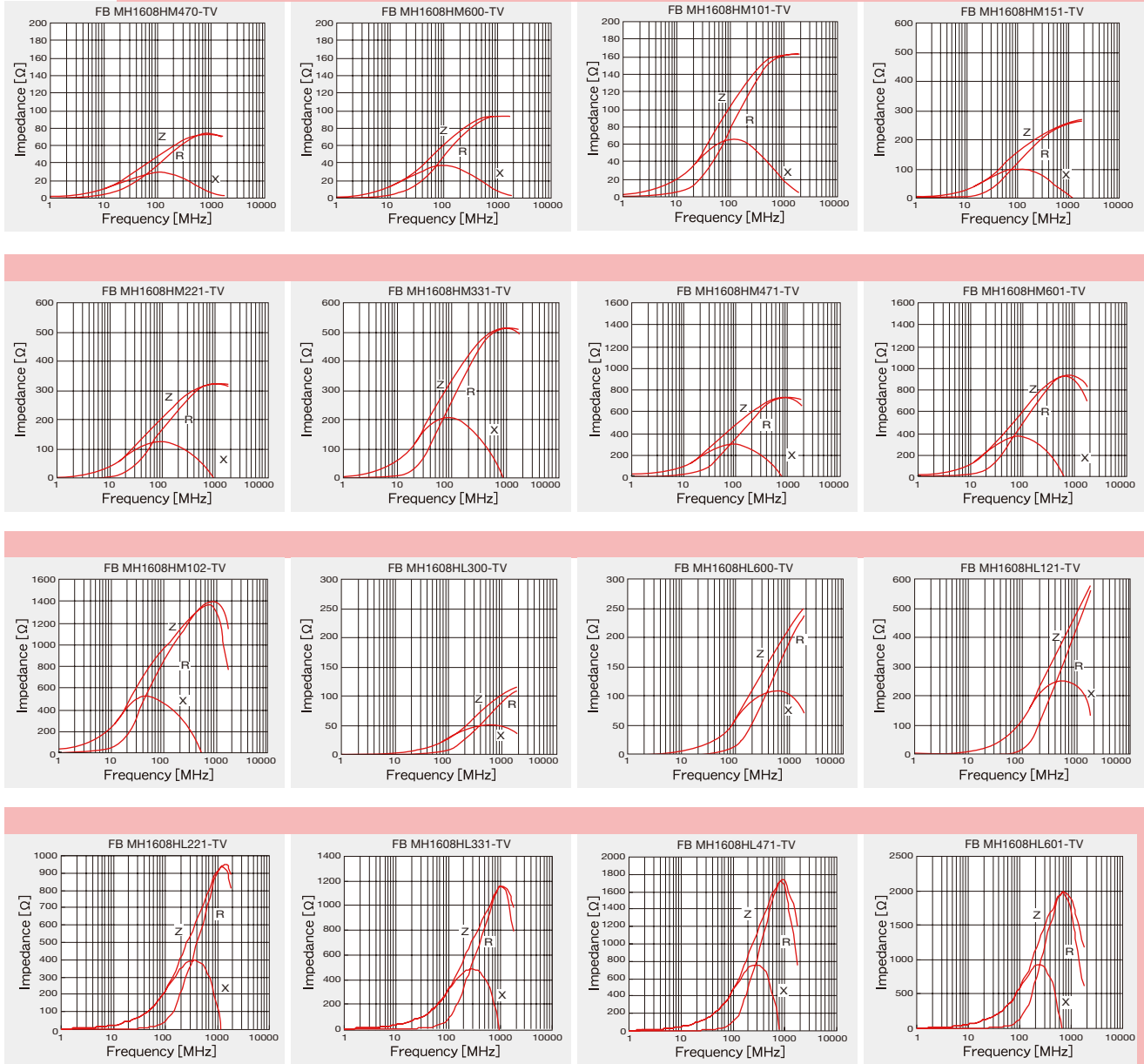


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ELECTRICAL CHARACTERISTICS

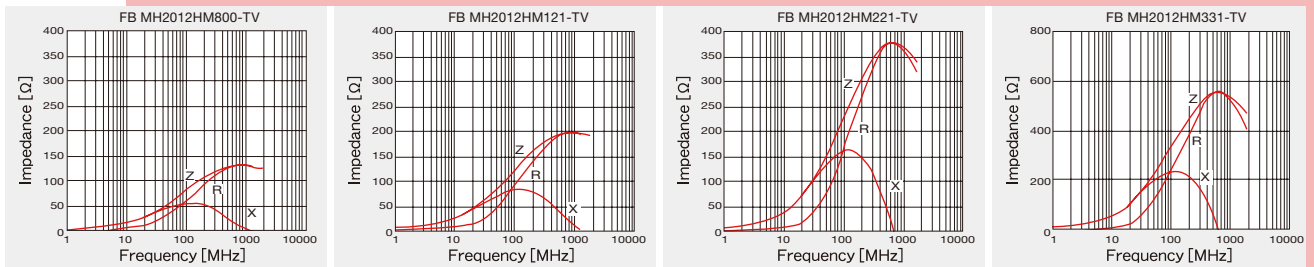
High impedance type(GHz Band)

FB MH1608

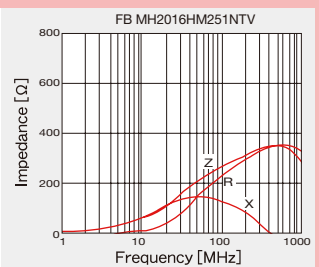
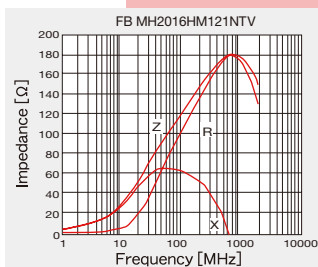


High impedance type

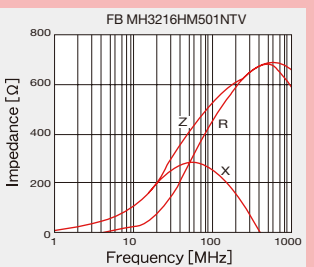
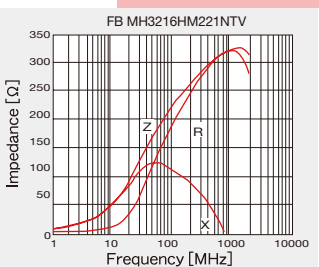
FB MH2012



FB MH2016



FB MH3216

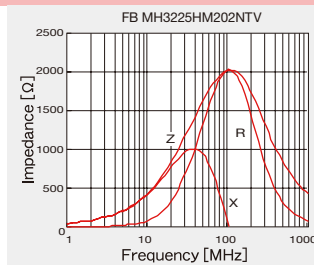
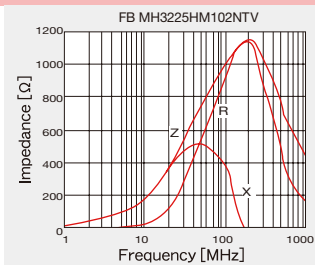
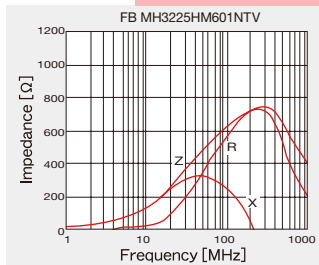


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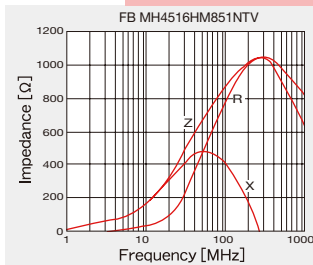
ELECTRICAL CHARACTERISTICS

High impedance type

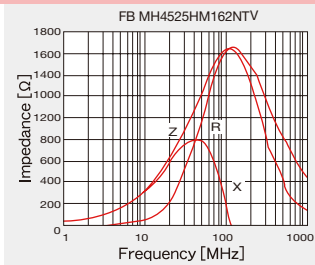
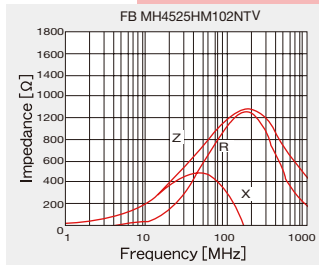
FB MH3225



FB MH4516

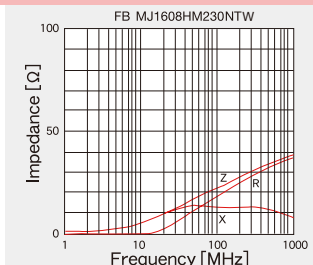
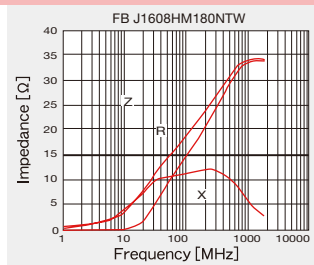
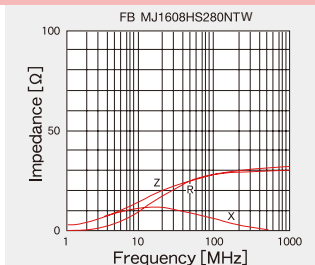
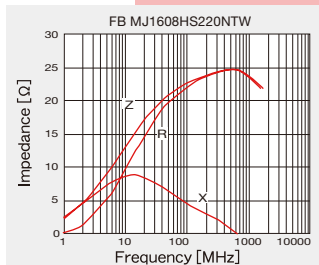


FB MH4525



High current type

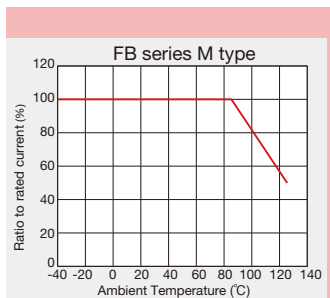
FB MJ1608



Derating of Rated Current

FB series M type

Derating of current is necessary for FB series M type depending on ambient temperature. Please refer to the chart shown below for appropriate derating of current.



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CHIP BEAD INDUCTORS FOR POWER LINES (FB SERIES M TYPE)

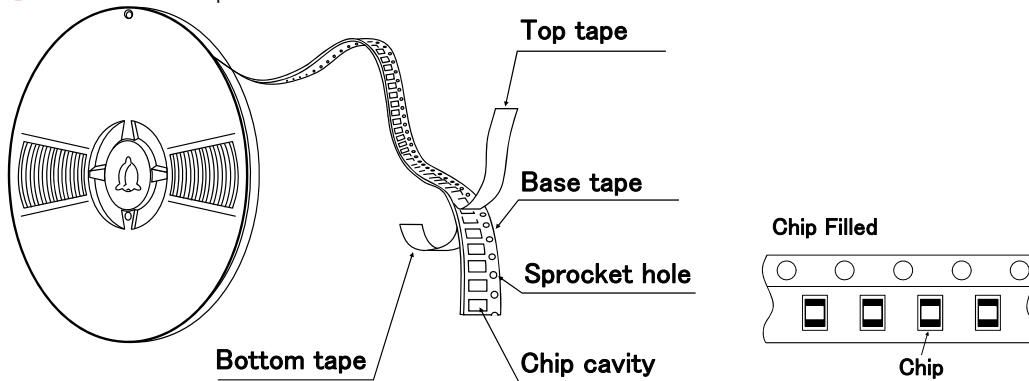
PACKAGING

① Minimum Quantity

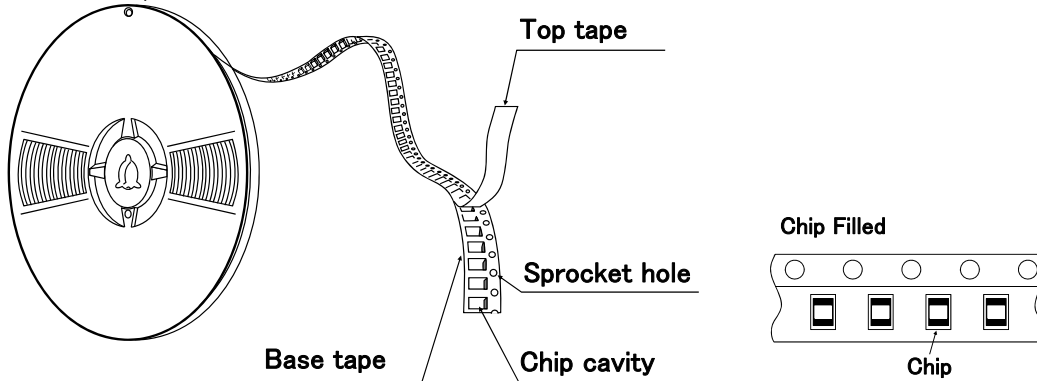
Type	Standard Quantity [pcs]	
	Paper Tape	Embossed Tape
1608 (0603)	4000	—
2125 (0805)	4000	—
2012 (0805)	4000	—
2016 (0806)	—	2000
3216 (1206)	—	2000
3225 (1210)	—	1000
4516 (1806)	—	2000
4525 (1810)	—	1000
4532 (1812)	—	2000

② Tape Material

● Card board carrier tape

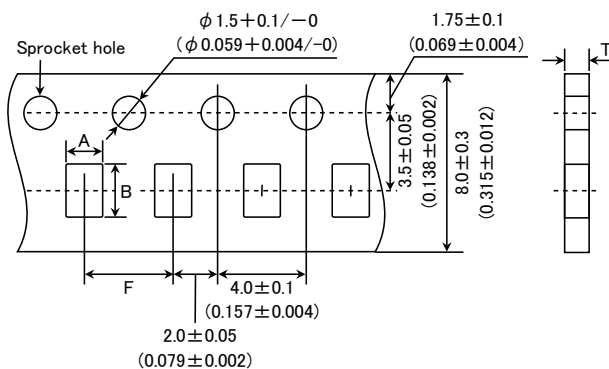


● Embossed tape



③ Taping Dimensions

● Paper tape (0.315 inches wide)

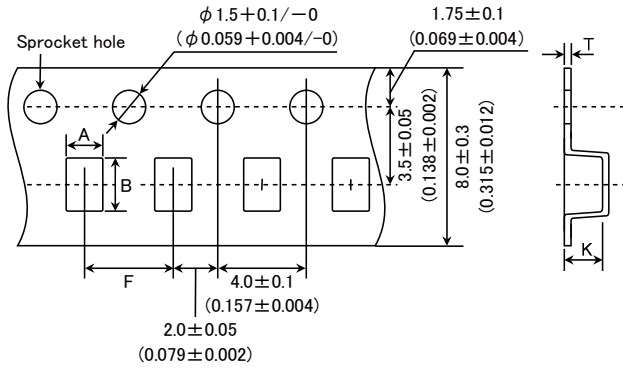


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Type	Chip Cavity		Insertion Pitch	Tape Thickness
	A	B	F	T
FBMJ1608 FBMH1608 (0603)	1.0±0.2 (0.039±0.008)	1.8±0.2 (0.071±0.008)	4.0±0.2 (0.157±0.008)	1.1max (0.043max)
FBMJ2125 FBMH2012 (0805)	1.5±0.2 (0.059±0.008)	2.3±0.2 (0.091±0.008)	4.0±0.2 (0.157±0.008)	1.1max (0.043max)

Unit : mm (inch)

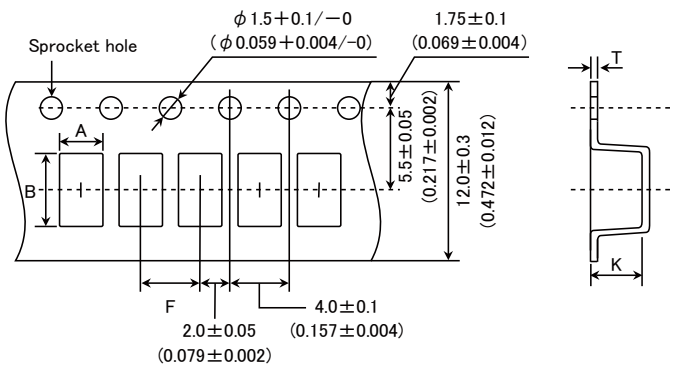
● Embossed tape (0.315 inches wide)



Type	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
FBMH2016 (0806)	1.8±0.2 (0.071±0.008)	2.2±0.2 (0.087±0.008)	4.0±0.2 (0.157±0.008)	2.6max (0.102max)	0.6max (0.024max)
FBMJ3216 (1206)	1.9±0.2 (0.075±0.008)	3.5±0.2 (0.138±0.008)	4.0±0.2 (0.157±0.008)	1.5max (0.059max)	0.3max (0.012max)
FBMH3216 (1206)	1.9±0.2 (0.075±0.008)	3.5±0.2 (0.138±0.008)	4.0±0.2 (0.157±0.008)	2.6max (0.102max)	0.6max (0.024max)
FBMH3225 (1210)	2.8±0.2 (0.110±0.008)	3.5±0.2 (0.138±0.008)	4.0±0.2 (0.157±0.008)	4.0max (0.157max)	0.6max (0.024max)

Unit : mm (inch)

● Embossed tape (0.472 inches wide)

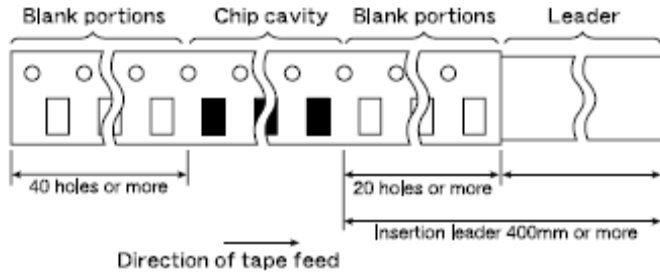


Type	Chip Cavity		Insertion Pitch	Tape Thickness	
	A	B	F	K	T
FBMJ4516 (1806)	1.9±0.2 (0.075±0.008)	4.9±0.2 (0.193±0.008)	4.0±0.2 (0.157±0.008)	1.5max (0.059max)	0.3max (0.012max)
FBMH4516 (1806)	1.9±0.2 (0.075±0.008)	4.9±0.2 (0.193±0.008)	4.0±0.2 (0.157±0.008)	2.6max (0.102max)	0.6max (0.024max)
FBMJ4525 (1810)	2.9±0.2 (0.114±0.008)	4.9±0.2 (0.193±0.008)	4.0±0.2 (0.157±0.008)	4.0max (0.157max)	0.6max (0.024max)
FBMH4532 (1812)	3.6±0.2 (0.142±0.008)	4.9±0.2 (0.193±0.008)	8.0±0.2 (0.315±0.008)	4.0max (0.157max)	0.6max (0.024max)

Unit : mm (inch)

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④ Leader and Blank portion



Insertion leader is 400 mm or more (including 20 empty cavities)
Empty cavities at end of reel: 40 holes or more

⑤ Reel size



Type	ϕD	ϕd	W	t
FBMJ1608	180+0/-3 (7.09+0/-0.118)	60+1/-0 (2.36+0.039/-0)	10.0±1.5 (0.394±0.059)	2.5max (0.098max)
FBMJ2125			14.0±1.5 (0.551±0.059)	
FBMJ3216				
FBMJ4516			10.0±1.5 (0.394±0.059)	
FBMH1608				
FBMH2012				
FBMH2016				
FBMH3216			14.0±1.5 (0.551±0.059)	
FBMH3225				
FBMH4516			330±2.0 (12.99±0.080)	100±1.0 (3.94±0.039)
FBMH4525				
FBMH4532				

Unit : mm (inch)

⑥ Top tape strength



The top tape requires a peel-off force of 0.1 to 0.7N in the direction of the arrow as illustrated below.

CHIP BEAD INDUCTORS FOR POWER LINE (FB SERIES M TYPE)

RELIABILITY DATA

1. Operating Temperature Range	
Specified Value	-40°C ~ +125°C (Including self-generated heat)
Test Methods and Remarks	Including self-generated heat

2. Storage Temperature Range	
Specified Value	-40°C ~ +85°C
Test Methods and Remarks	*Note: -5 to +40°C in taped packaging

3. Impedance	
Specified Value	Within the specified tolerance
Test Methods and Remarks	Measuring equipment : Impedance analyzer (HP4291A) or its equivalent Measuring frequency : 100±1 MHz

4. DC Resistance	
Specified Value	Within the specified range
Test Methods and Remarks	Four-terminal method Measuring equipment : Milliohm High-Tester 3226 (Hioki Denki) or its equivalent

5. Rated Current	
Specified Value	Within the specified range

6. Vibration	
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value
Test Methods and Remarks	According to JIS C 0040. Vibration type : A Time : 2 hrs each in X,Y, and Z directions Total: 6 hrs Frequency range : 10 to 55 to 10Hz (/min.) Amplitude : 1.5 mm (shall not exceed acceleration 196m/s ²) Mounting method : Soldering onto PC board

7. Solderability	
Specified Value	90% or more of immersed surface of terminal electrode shall be covered with fresh solder.
Test Methods and Remarks	Solder temperature : 230±5°C Immersion time : 4±1 sec. Preconditioning : Immersion into flux. Immersion and Removal speed : 25mm/sec.

8. Resistance to Soldering Heat	
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value
Test Methods and Remarks	Preheating : 150°C for 3 min. Resistance to Soldering Heat : 260±5°C Duration : 10±0.5 sec. Preconditioning : Immersion into flux. Immersion and Removal speed : 25mm/sec. Recovery : 2 to 3 hrs of recovery under the standard condition after the test.

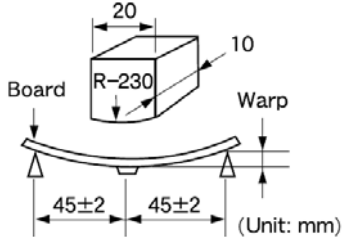
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9. Thermal Shock																
Specified Value	Appearance : No significant abnormality Impedance change : Within +50/−10% of the initial value															
Test Methods and Remarks	According to JIS C 0025. Conditions for 1 cycle <table border="1"> <thead> <tr> <th>Step</th> <th>Temperature (°C)</th> <th>Duration (min.)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>−40±3°C</td> <td>30±3</td> </tr> <tr> <td>2</td> <td>Room Temperature</td> <td>Within 3</td> </tr> <tr> <td>3</td> <td>85±2°C</td> <td>30±3</td> </tr> <tr> <td>4</td> <td>Room Temperature</td> <td>Within 3</td> </tr> </tbody> </table> Number of cycles : 100 Mounting method : Soldering onto PC board Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.	Step	Temperature (°C)	Duration (min.)	1	−40±3°C	30±3	2	Room Temperature	Within 3	3	85±2°C	30±3	4	Room Temperature	Within 3
Step	Temperature (°C)	Duration (min.)														
1	−40±3°C	30±3														
2	Room Temperature	Within 3														
3	85±2°C	30±3														
4	Room Temperature	Within 3														

10. Resistance to Humidity (steady state)	
Specified Value	Appearances : No significant abnormality Impedance change : Within ±30% of the initial value
Test Methods and Remarks	Temperature : 40±2°C Humidity : 90 to 95% RH Duration : 500+24/−0 Mounting method : Soldering onto PC board Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.

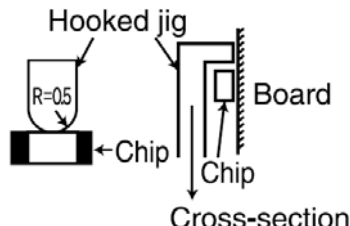
11. Loading under Damp Heat	
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value
Test Methods and Remarks	Temperature : 40±2°C Humidity : 90 to 95%RH Applied current : Rated current Duration : 500+24/−0 hrs Mounting method : Soldering onto PC board Recovery : 2 to 3hrs of recovery under the standard condition after the removal from test chamber.

12. High Temperature Loading Test	
Specified Value	Appearance : No significant abnormality Impedance change : Within ±30% of the initial value
Test Methods and Remarks	Temperature : 85±2°C Duration : 500+24/−0 hrs Applied current : Rated current Mounting method : Soldering onto PC board Recovery : 2 to 3 hrs of recovery under the standard condition after the removal from test chamber.

13. Bending Strength	
Specified Value	Appearance : No mechanical damage.
Test Methods and Remarks	Warp : 2mm Testing board : Glass epoxy-resin substrate Thickness : 0.8mm  (Unit: mm)

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14. Adhesion of Electrode

Specified Value	No separation or indication of separation of electrode.
Test Methods and Remarks	<p>Applied force : 5N Duration : 10 sec.</p> 

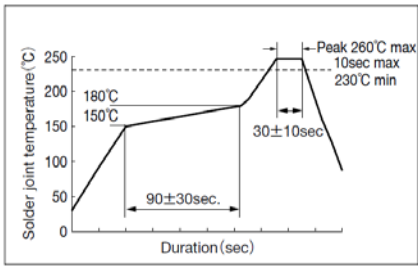
Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35°C of temperature, 45 to 85% relative humidity and 86 to 106kPa of air pressure.

When there are questions concerning measurement results:

In order to provide correlation data, the test shall be conducted under condition of $20 \pm 2^\circ\text{C}$ of temperature, 60 to 70% relative humidity and 86 to 106kPa of air pressure. Unless otherwise specified, all the tests are conducted under the "standard condition."

CHIP BEAD INDUCTORS FOR POWER LINE (FB SERIES M TYPE)

PRECAUTIONS

1. Circuit Design	
Precautions	<ul style="list-style-type: none"> ◆ Operating environment <ol style="list-style-type: none"> 1. The products listed in this catalogue are intended for use in general electronic equipment (e.g., AV equipment, OA equipment, home electric appliances, office equipment, information and communication equipment), general medical equipment, industrial equipment, and automotive interior applications, etc. <p>Please be sure to contact TAIYO YUDEN for further information before using the products for any equipment which may directly cause loss of human life or bodily injury (e.g., specially controlled medical equipment, transportation equipment including, without limitation, automotive powertrain control system, train control system, and ship control system, traffic signal equipment).</p> <p>Please do not incorporate our products into any equipment requiring high levels of safety and/or reliability (e.g., aerospace equipment, aviation equipment, nuclear control equipment, undersea equipment, military equipment, etc.).</p> <ul style="list-style-type: none"> ◆ Rated current <ol style="list-style-type: none"> 1. Rated current of this product is shown in this catalogue, but please be sure to have the base board designed with adequate inspection in case of the generation of heat becomes high within the rated current range when the base board is in high resistance or in bad heating conditions.
2. PCB Design	
Precautions	<ul style="list-style-type: none"> ◆ Land pattern design <ol style="list-style-type: none"> 1. Please refer to a recommended land pattern.
3. Considerations for automatic placement	
Precautions	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. Excessive impact load should not be imposed on the products when mounting onto the PC boards. 2. Mounting and soldering conditions should be checked beforehand.
Technical considerations	<ul style="list-style-type: none"> ◆ Adjustment of mounting machine <ol style="list-style-type: none"> 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.
4. Soldering	
Precautions	<ul style="list-style-type: none"> ◆ Wave soldering <ol style="list-style-type: none"> 1. Please refer to the specifications in the catalog for a wave soldering. ◆ Reflow soldering <ol style="list-style-type: none"> 1. Please contact any of our offices for a reflow soldering, and refer to the recommended condition specified. ◆ Lead free soldering <ol style="list-style-type: none"> 1. When using products with lead free soldering, we request to use them after confirming adhesion, temperature of resistance to soldering heat, etc. sufficiently. ◆ Preheating when soldering <p>Heating : The temperature difference between soldering and remaining heat should not be greater than 150°C.</p> <p>Cooling : The temperature difference between the components and cleaning process should not be greater than 100°C.</p> ◆ Recommended conditions for using a soldering iron <p>Put the soldering iron on the land-pattern.</p> <p>Soldering iron's temperature – Below 350°C</p> <p>Duration – 3 seconds or less</p> <p>The soldering iron should not directly touch the inductor.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Wave, Reflow, Lead free soldering <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products. <p>【Recommended reflow condition】</p>  ◆ Preheating when soldering <ol style="list-style-type: none"> 1. There is a case that products get damaged by a heat shock. ◆ Recommended conditions for using a soldering iron <ol style="list-style-type: none"> 1. If products are used beyond the range of the recommended conditions, heat stresses may deform the products, and consequently degrade the reliability of the products.

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5. Handling	
Precautions	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. Keep the inductors away from all magnets and magnetic objects. ◆ Setting PC boards <ol style="list-style-type: none"> 1. When setting a chip mounted base board, please make sure that there is no residual stress to the chip by distortion in the board or at screw part. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. When splitting the PC board after mounting inductors, care should be taken not to give any stresses of deflection or twisting to the board. 2. Board separation should not be done manually, but by using the appropriate devices. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. Please do not give the inductors any excessive mechanical shocks.
Technical considerations	<ul style="list-style-type: none"> ◆ Handling <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with magnetic influence. ◆ Setting PC boards <ol style="list-style-type: none"> 1. There is a case that a characteristic varies with residual stress. ◆ Breakaway PC boards (splitting along perforations) <ol style="list-style-type: none"> 1. Planning pattern configurations and the position of products should be carefully performed to minimize stress. ◆ Mechanical considerations <ol style="list-style-type: none"> 1. There is a case to be damaged by a mechanical shock.
6. Storage conditions	
Precautions	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled. <ul style="list-style-type: none"> • Recommended conditions <ul style="list-style-type: none"> Ambient temperature -5~40°C Humidity Below 70% RH <p>The ambient temperature must be kept below 30°C. Even under ideal storage conditions, solderability of products electrodes may decrease as time passes.</p> <p>For this reason, inductors should be used within 6 months from the time of delivery.</p>
Technical considerations	<ul style="list-style-type: none"> ◆ Storage <ol style="list-style-type: none"> 1. Under a high temperature and humidity environment, problems such as reduced solderability caused by oxidation of terminal electrodes and deterioration of taping/packaging materials may take place.