

1 Scope

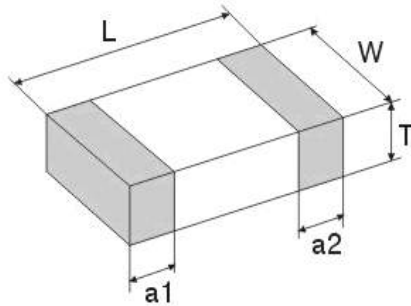
This specification applies to the HDGB series of multilayer chip ferrite bead.

2 Product Identification

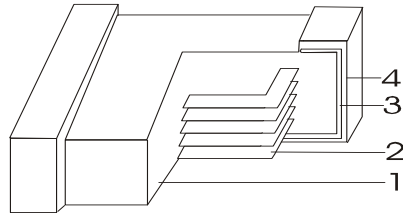
<u>HDGB</u>	<u>1608</u>	<u>M</u>	<u>101</u>	<u>H</u>	<u>T</u>	<u>LF</u>
①	②	③	④	⑤	⑥	⑦

- ① Product Symbol HDGB:
- ② Dimensions(3)
- ③ Material Code (G M、 D)
- ④ Impedance Value 100:10Ω, 101: 100Ω, 102: 1000Ω
- ⑤ Characteristic
- ⑥ Packaging Style (B: Bulk; T: Tape & Reel)
- ⑦ Lead Free

3 Appearance, Dimensions and Material



Type	Dimensions (mm) [inch]			
	L	W	T	a1, a2
1005 [0402]	1.00±0.15 [0.04±0.006]	0.50±0.15 [0.02±0.006]	0.50±0.15 [0.02±0.006]	0.25±0.10 [0.01±0.004]
1608 [0603]	1.60±0.15 [0.063±0.006]	0.80±0.15 [0.031±0.006]	0.80±0.15 [0.031±0.006]	0.30±0.20 [0.012±0.008]
2012 [0805]	2.00±0.20 [0.079±0.008]	1.25±0.20 [0.049±0.008]	0.85±0.20 [0.033±0.008]	0.50±0.30 [0.02±0.012]
3216 [1206]	3.20±0.20 [0.126±0.008]	1.60±0.20 [0.063±0.008]	1.10±0.30 [0.043±0.012]	0.50±0.30 [0.02±0.012]



	Composition	Material	Supplier
1	Base Material	Ferrite	Japan
2	Internal Conductor	Ag	Japan
3	Terminal Electrode	Ag	Japan
4	Terminal Electrode	Ni-Sn	USA

4 Testing Conditions

<Unless otherwise specified>

Temperature : Ordinary Temperature (5 to 35°C)

Humidity : Ordinary Humidity (25 to 85% RH)

<In case of doubt>

Temperature : 20±2°C

Humidity : 60 to 75% RH

Atmospheric Pressure : 86 to 106 kPa

5 Rating

Operating Temperature Range : -55 to +125°C

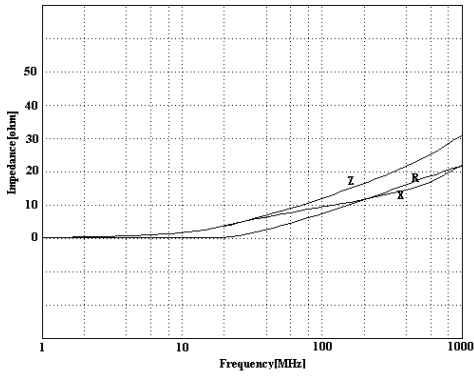
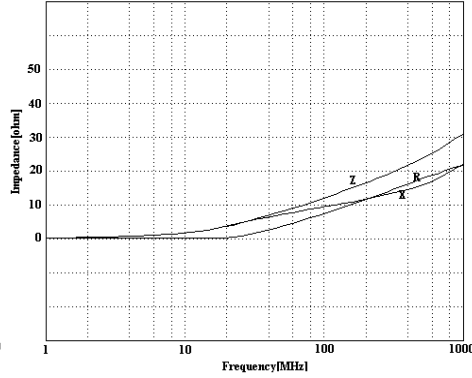
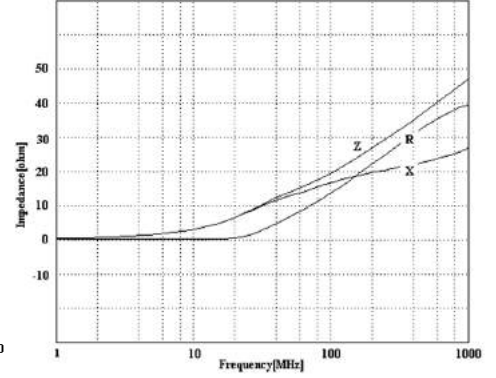
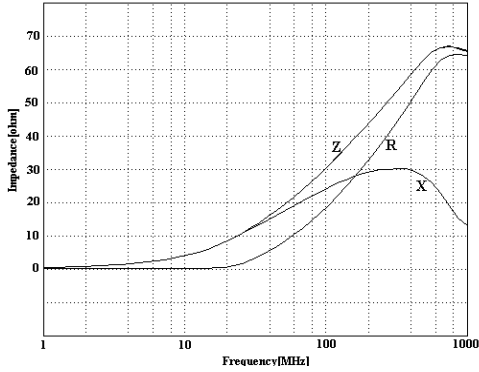
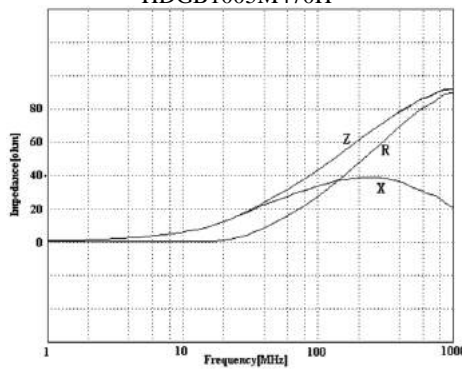
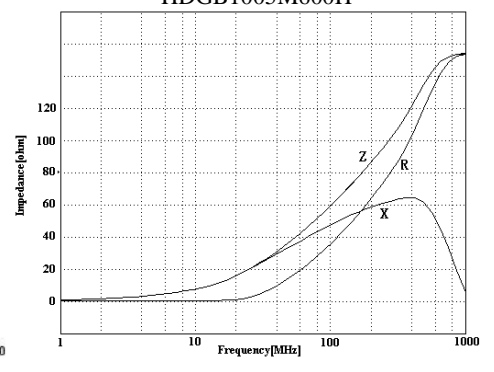
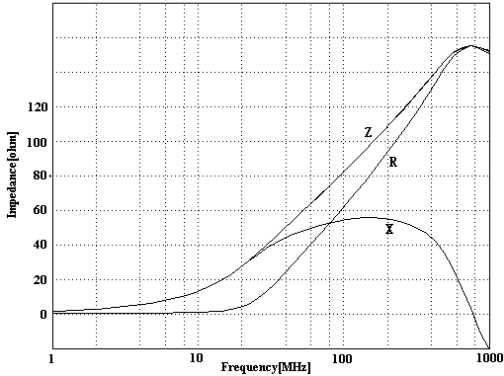
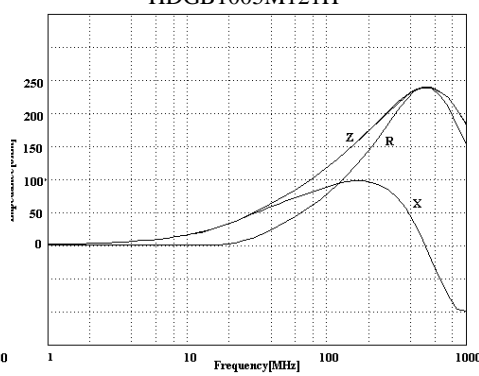
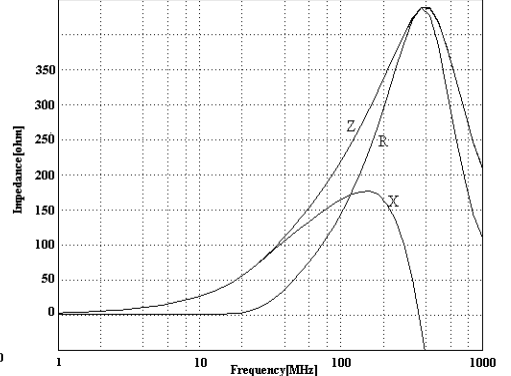
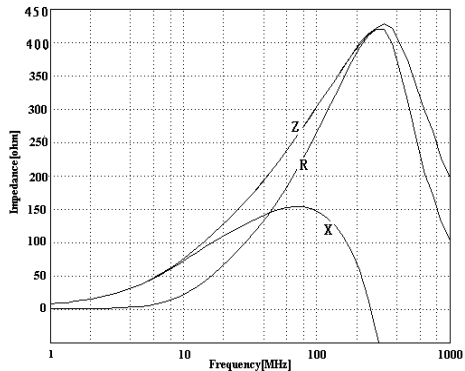
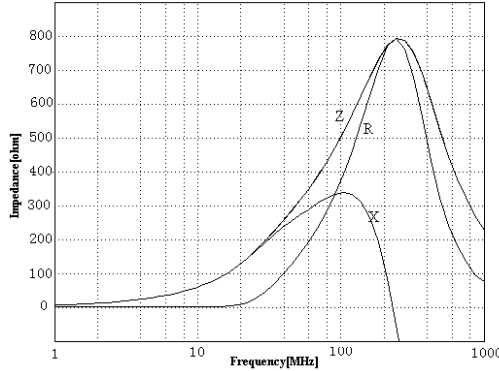
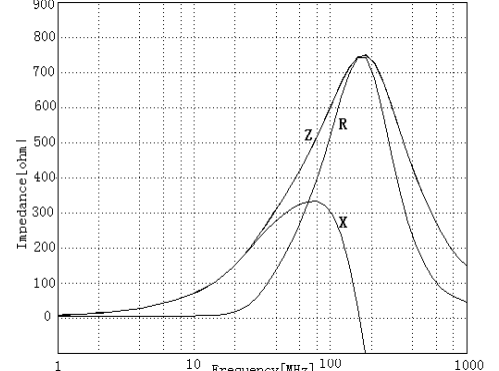
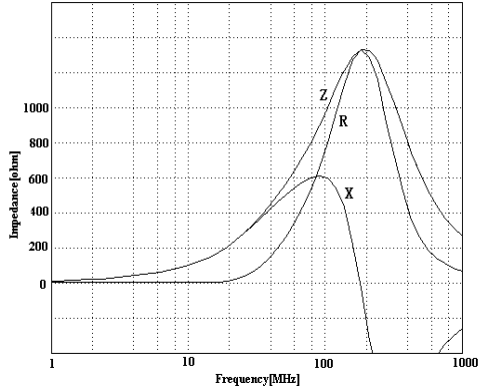
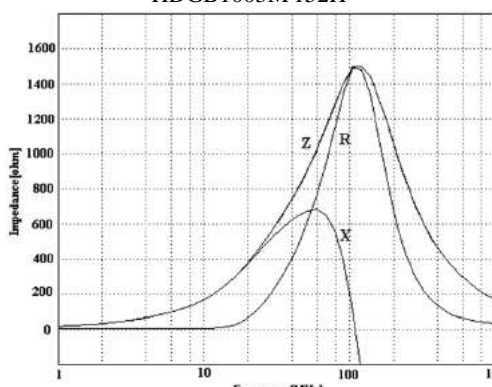
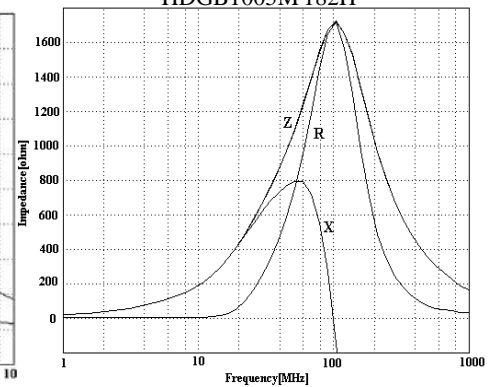
Storage Temperature Range : -55 to +125°C

HDGB1005 Series

Part No.	Impedance (Ω) $\pm 25\%$	Z Test Frequency (MHz)	Rdc (Ω) max	Rated Current (mA) max
HDGB1005M070H	7	100	0.05	500
HDGB1005M110H	11	100	0.05	500
HDGB1005M190H	19	100	0.05	300
HDGB1005M310H	31	100	0.20	300
HDGB1005M470H	47	100	0.20	300
HDGB1005M600H	60	100	0.30	200
HDGB1005M800H	80	100	0.30	200
HDGB1005M121H	120	100	0.40	150
HDGB1005M181H	180	100	0.50	150
HDGB1005M301H	300	100	0.65	100
HDGB1005M501H	500	100	0.80	100
HDGB1005M601H	600	100	1.00	100
HDGB1005M102H	1000	100	1.30	100
HDGB1005M152H	1500	100	1.40	100
HDGB1005M182H	1800	100	1.40	100
HDGB1005M241H	240	100	0.50	150

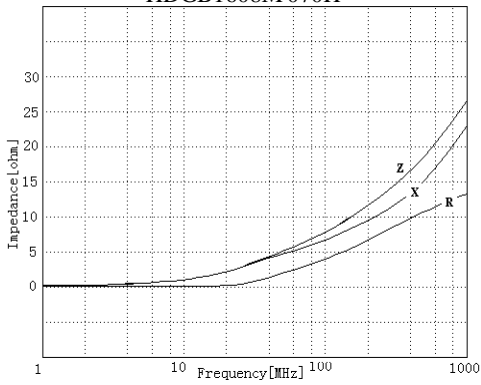
HDGB1608 Series

Part No.	Impedance (Ω) $\pm 25\%$	Z Test Frequency (MHz)	Rdc (Ω) max	Rated Current (mA) max
HDGB1608M070H	7	100	0.05	1000
HDGB1608M110H	11	100	0.05	1000
HDGB1608M190H	19	100	0.05	1000
HDGB1608M310H	31	100	0.05	500
HDGB1608M470H	47	100	0.08	500
HDGB1608M600H	60	100	0.12	300
HDGB1608M800H	80	100	0.16	200
HDGB1608M121H	120	100	0.20	200
HDGB1608M181H	180	100	0.30	200
HDGB1608M221H	220	100	0.30	200
HDGB1608M301H	300	100	0.35	200
HDGB1608M501H	500	100	0.45	200
HDGB1608M601H	600	100	0.50	200
HDGB1608M751H	750	100	0.55	150
HDGB1608M102H	1000	100	0.60	100
HDGB1608M152H	1500	100	0.80	100
HDGB1608M182H	1800	100	1.00	100
HDGB1608M202H	2000	100	1.20	100
HDGB1608M252H	2500	100	1.50	50
HDGB1608M101H	100	100	0.50	200

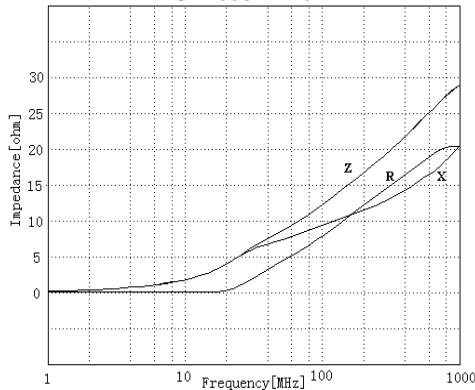
HDGB1005M070H

HDGB1005M110H

HDGB1005M190H

HDGB1005M310H

HDGB1005M470H

HDGB1005M600H

HDGB1005M800H

HDGB1005M121H

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HDGB1005M501H

HDGB1005M601H

HDGB1005M102H

HDGB1005M152H

HDGB1005M182H




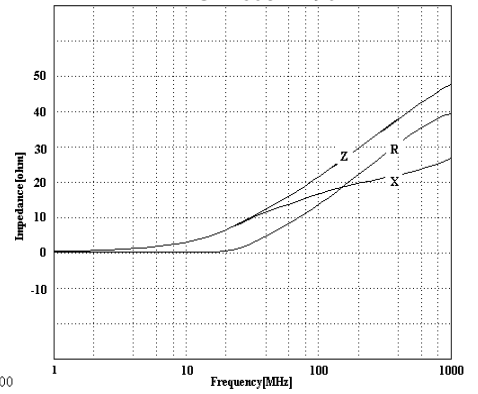
HDGB1608M 070H



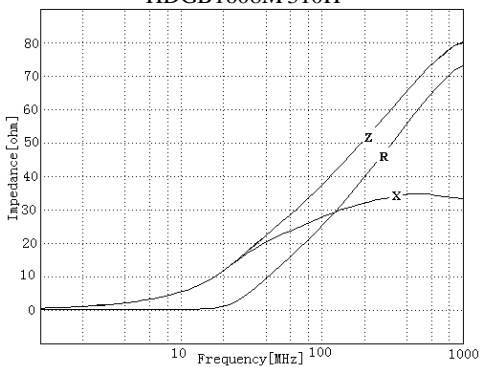
HDGB1608M 110H



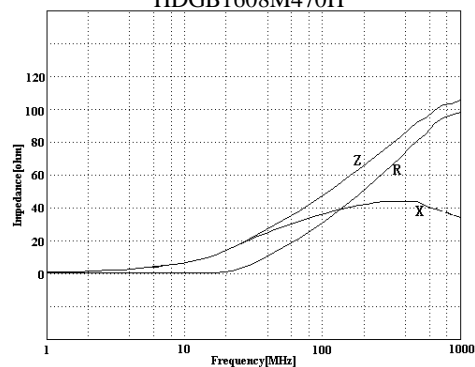
HDGB1608M 190H



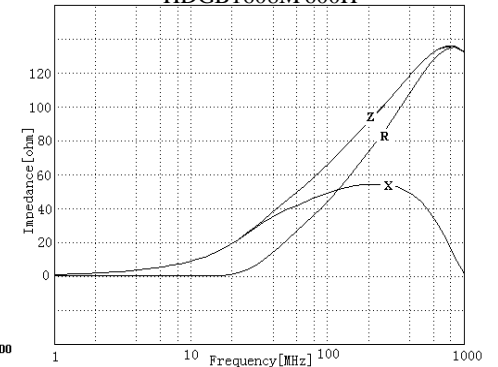
HDGB1608M 310H



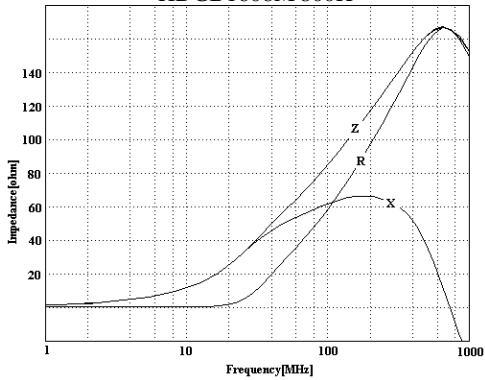
HDGB1608M 470H



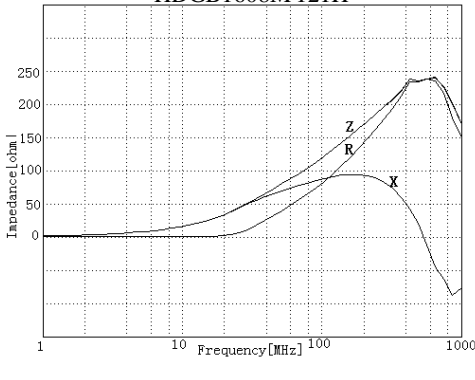
HDGB1608M 600H



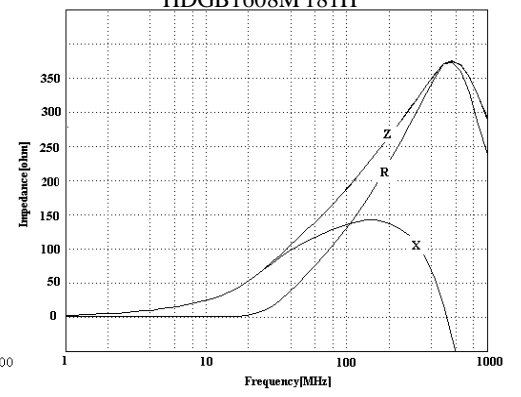
HDGB1608M 800H



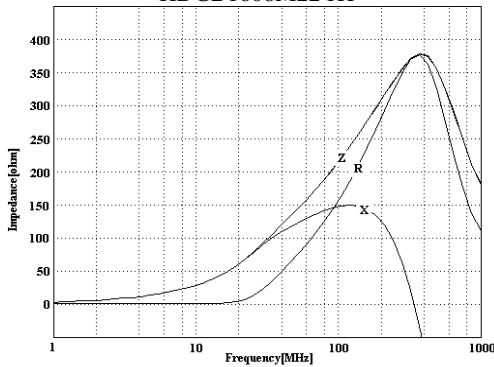
HDGB1608M 121H



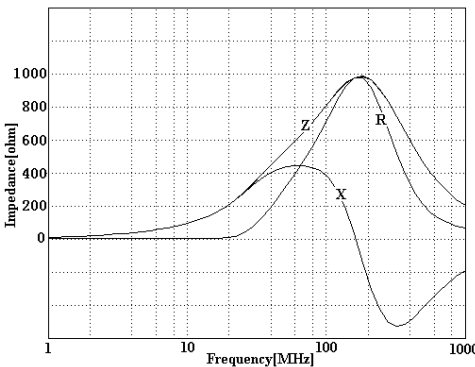
HDGB1608M 181H



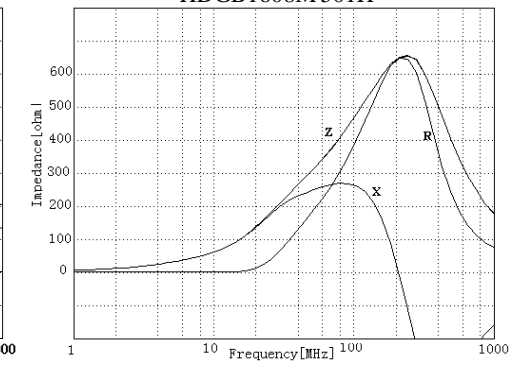
HDGB1608M 221H



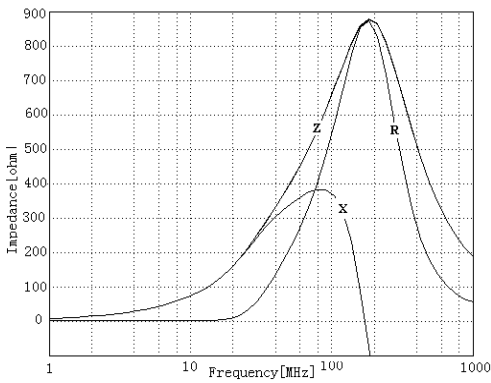
HDGB1608M 301H



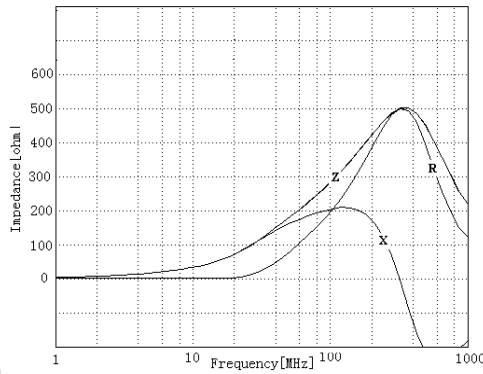
HDGB1608M 501H



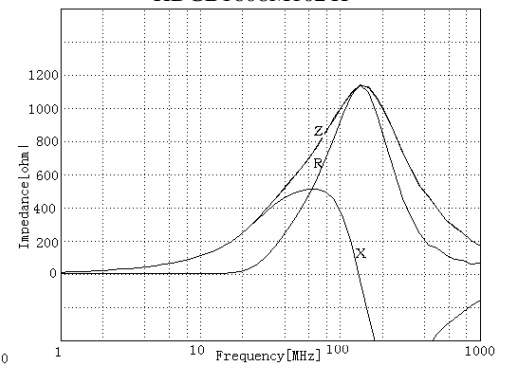
HDGB1608M 601H



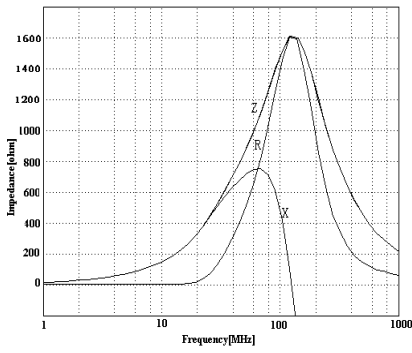
HDGB1608M75 1H



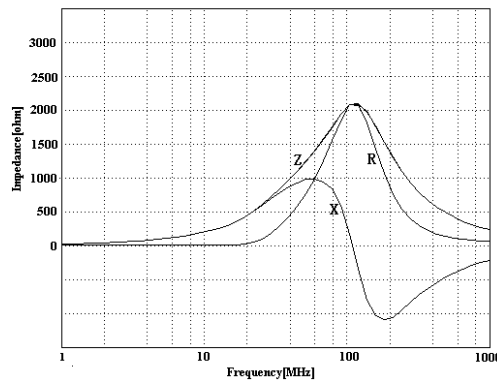
HDGB1608M102 H



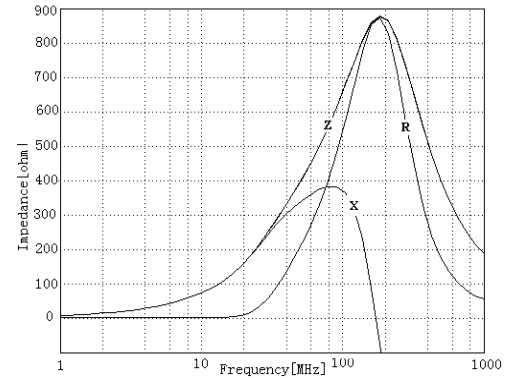
HDGB1608M1 52H



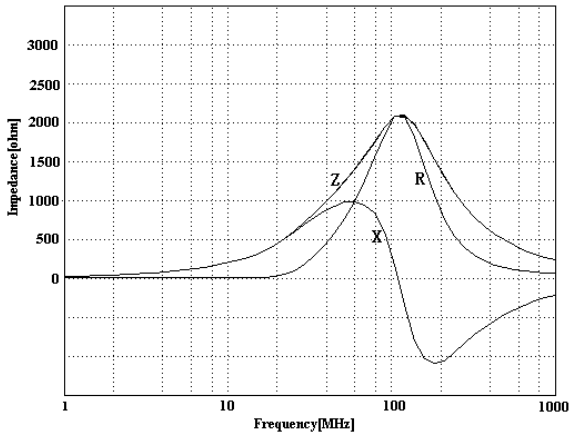
HDGB1608M1 82H



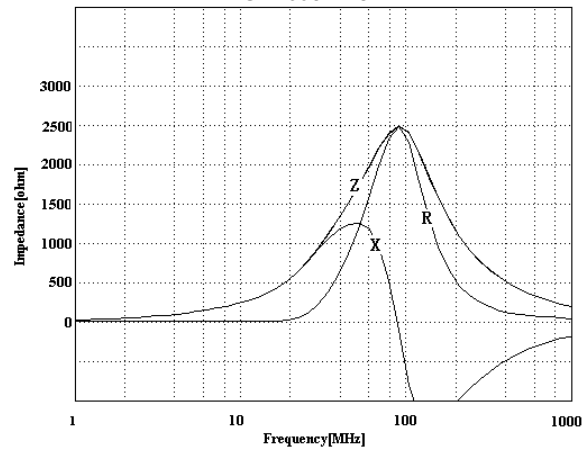
HDGB1608M 101H



HDGB1608M 202H



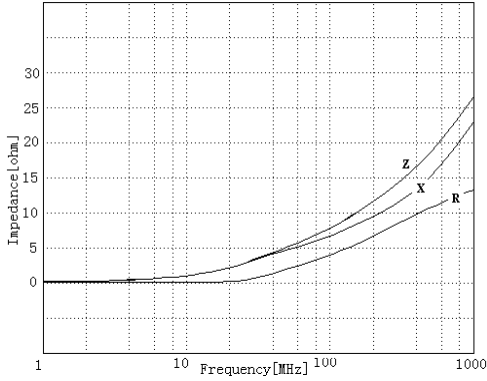
HDGB1608M 252H



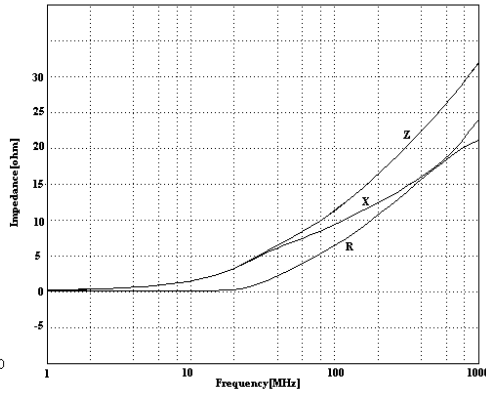
HDGB2012 Series

Part No.	Impedance (Ω) $\pm 25\%$	Z Test Frequency (MHz)	Rdc (Ω) max	Rated Current (mA) max
HDGB2012M 070H	7	100	0.05	2200
HDGB2012M110H	11	100	0.05	2000
HDGB2012M 190H	19	100	0.05	2000
HDGB2012M 260H	26	100	0.05	1500
HDGB2012M 310H	31	100	0.05	1500
HDGB2012M 360H	36	100	0.05	1500
HDGB2012M 600H	60	100	0.05	1000
HDGB2012M 700H	70	100	0.08	1000
HDGB2012M 800H	80	100	0.10	1000
HDGB2012M101H	100	100	0.12	1000
HDGB2012M 121H	120	100	0.15	800
HDGB2012M 151H	150	100	0.15	800
HDGB2012M 181H	180	100	0.20	600
HDGB2012M 221H	220	100	0.20	600
HDGB2012M 301H	300	100	0.25	500
HDGB2012M 501H	500	100	0.30	500
HDGB2012M 601H	600	100	0.35	500
HDGB 2012M751H	750	100	0.35	300
HDGB2012M 102H	1000	100	0.45	300
HDGB2012M 122H	1200	50	0.50	200
HDGB2012M 152H	1500	50	0.65	200
HDGB2012M 202H	2000	50	0.80	200
HDGB2012M 222H	2200	50	1.50	200
HDGB2012M 252H	2500	50	1.50	200

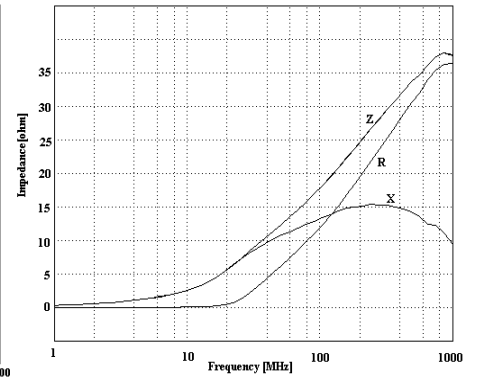
HDGB2012M 070H



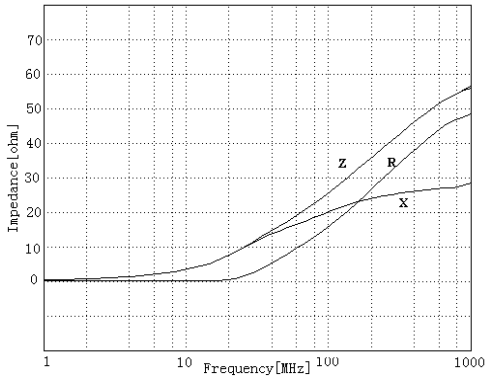
HDGB2 012M110H



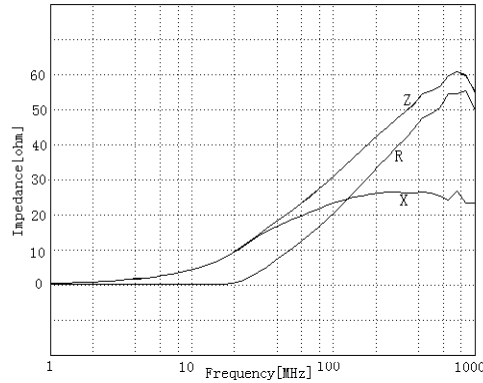
HDGB2012M 190H



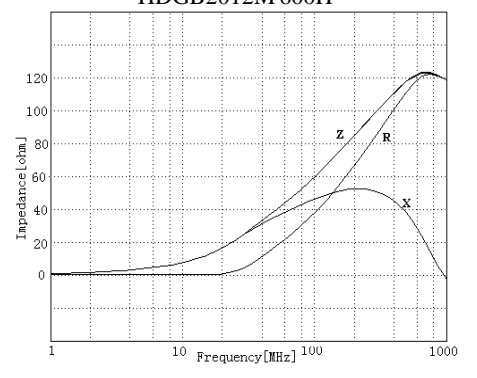
HDGB2012M 260H



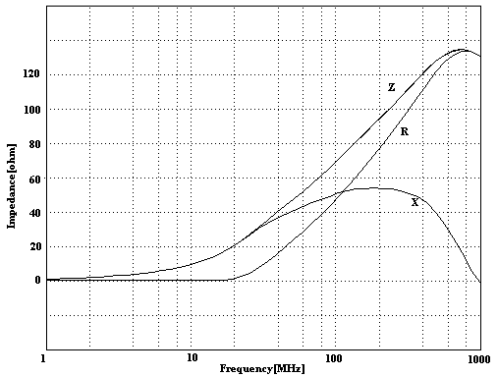
HDGB2012M 310H



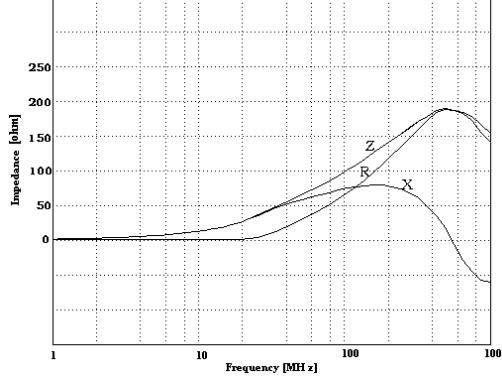
HDGB2012M 600H



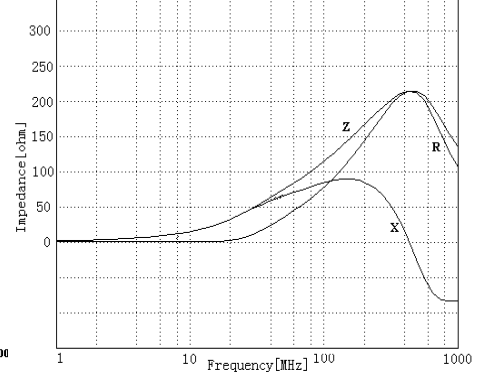
HDGB2012M 700H



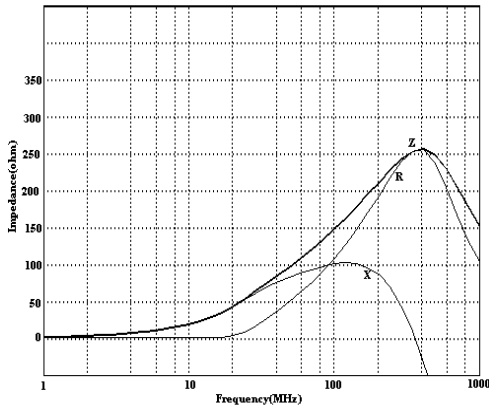
HDGB2 012M101H



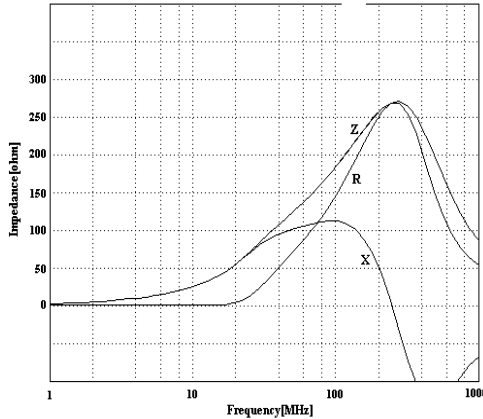
HDGB2012M 121H



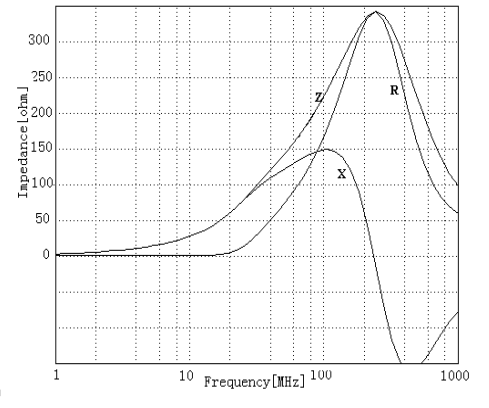
HDGB2012M 151H



HDGB2012M 181H

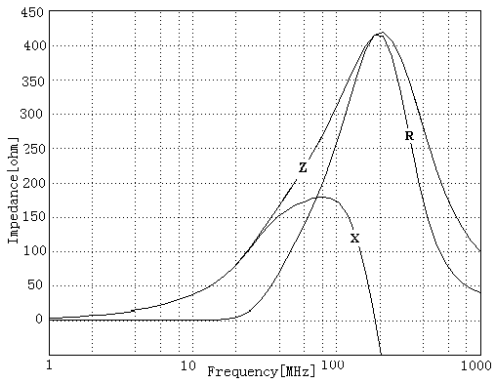


HDGB2012M 221H

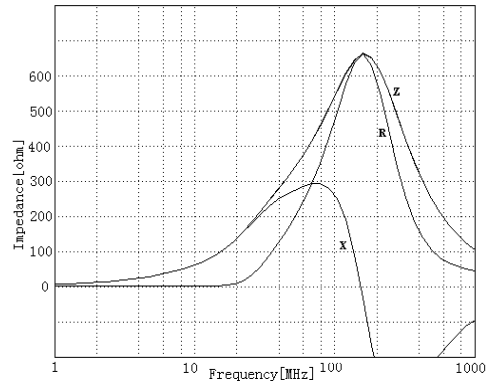




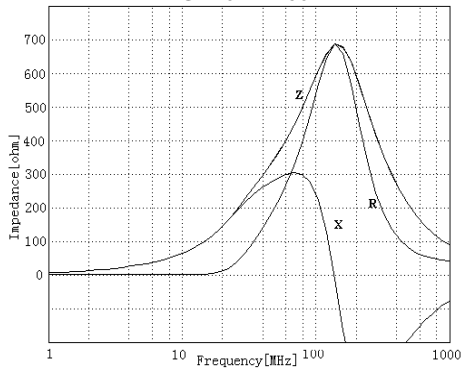
HDGB2012M 301H



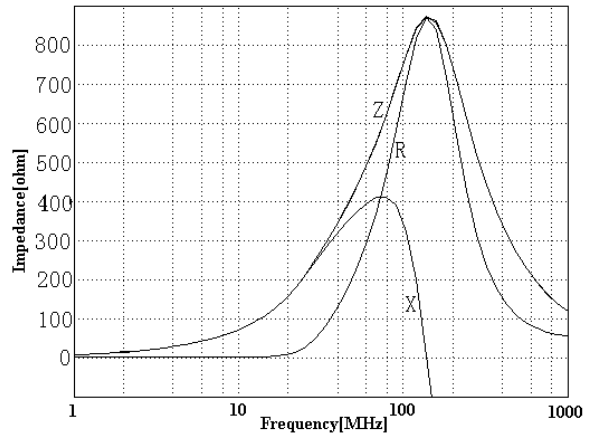
HDGB2012M 501H



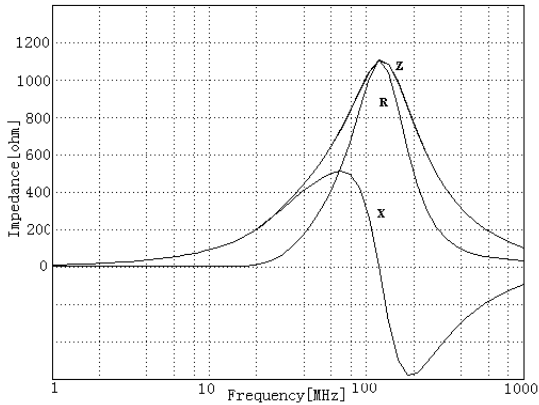
HDGB2012M 601H



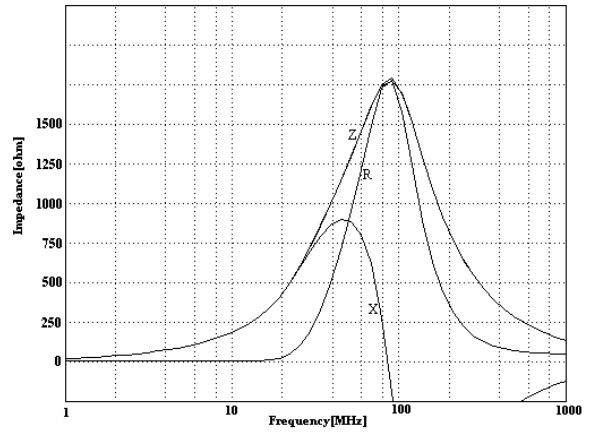
HDGB 2012M751H



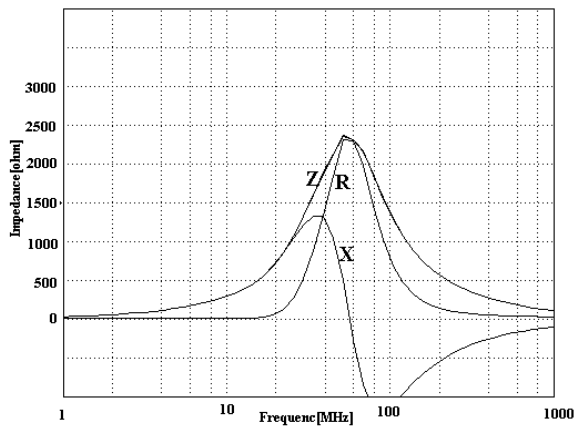
HDGB2012M 102H



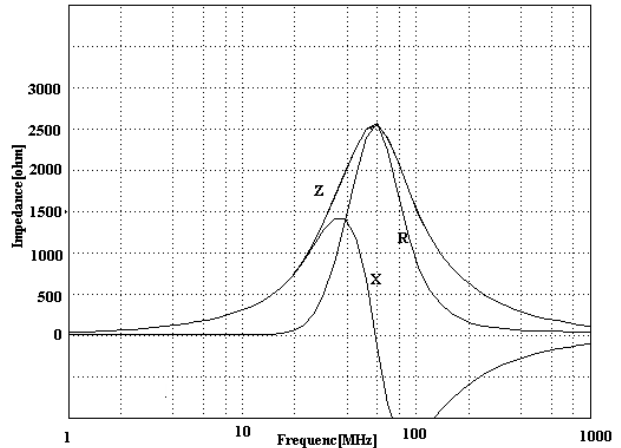
HDGB2012M 122H



HDGB2012M 222H



HDGB2012M 252H

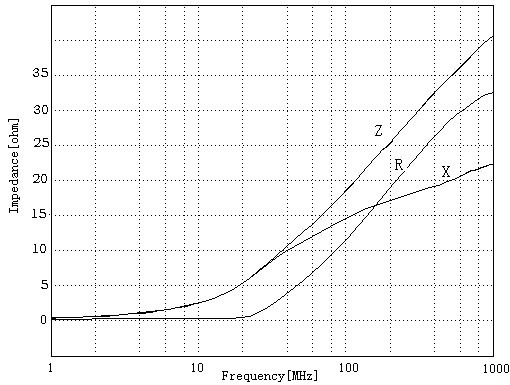




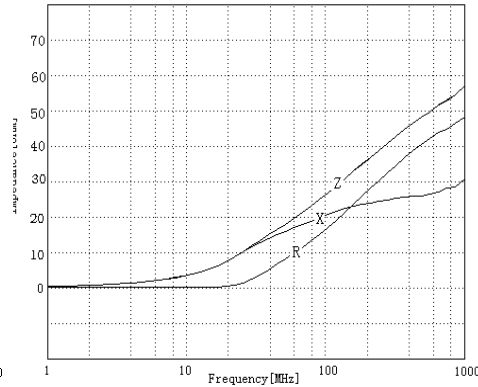
HDGB3216 Series

Part No.	Impedance (Ω) $\pm 25\%$	Z Test Frequency (MHz)	Rdc (Ω) max	Rated Current (mA) max
HDGB 3216M190H	19	100	0.05	2000
HDGB 3216M260H	26	100	0.05	2000
HDGB3216M310H	31	100	0.05	2000
HDGB3216M360H	36	100	0.05	2000
HDGB3216M600H	60	100	0.08	1000
HDGB3216M800H	80	100	0.08	1000
HDGB3216M101H	100	100	0.10	1000
HDGB3216M121H	120	100	0.10	600
HDGB3216M151H	150	100	0.15	600
HDGB3216M181H	180	100	0.15	600
HDGB3216M301H	300	100	0.20	600
HDGB3216M391H	390	100	0.20	600
HDGB3216M501H	500	100	0.30	600
HDGB3216M601H	600	100	0.30	600
HDGB3216M751H	750	100	0.30	600
HDGB3216M102H	1000	100	0.40	500
HDGB3216M122H	1200	50	0.50	300
HDGB3216M152H	1500	50	0.60	200
HDGB3216M202H	2000	50	0.70	200
HDGB3216M252H	2500	50	0.70	200
HDGB3216M302H	3000	50	1.00	200

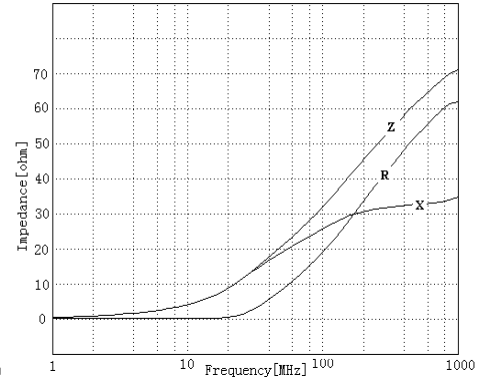
HDGB 3216M190H



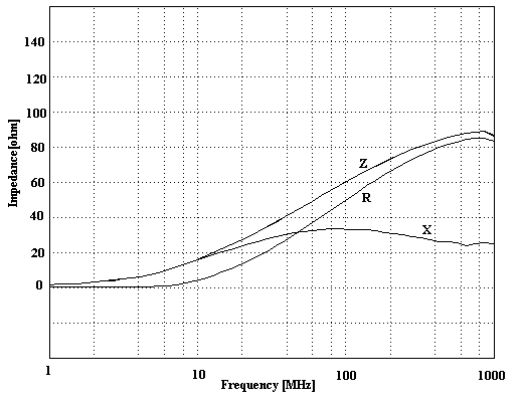
HDGB 3216M260H



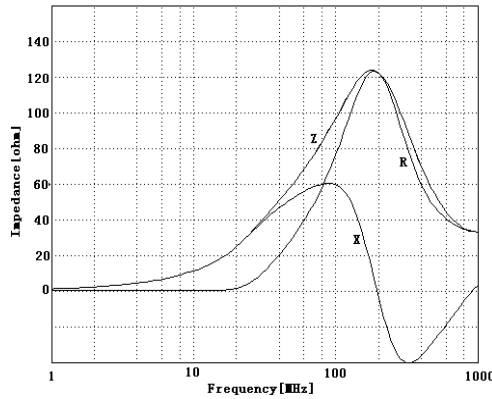
HDGB3216M 310H



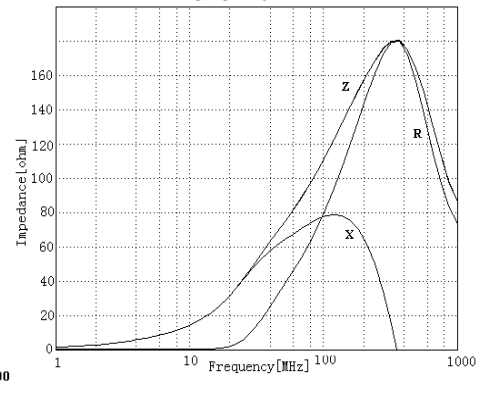
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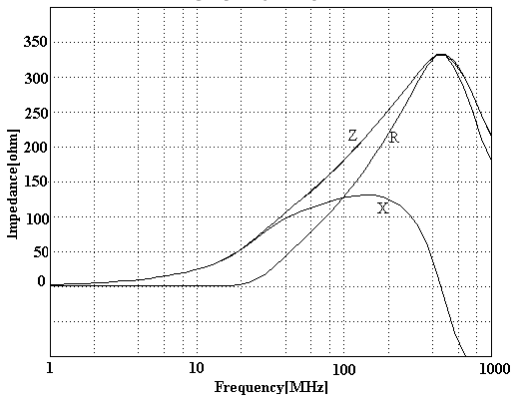
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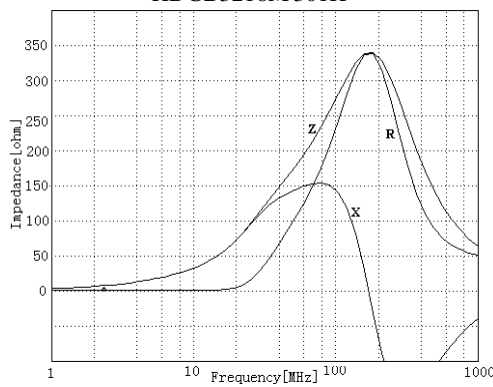
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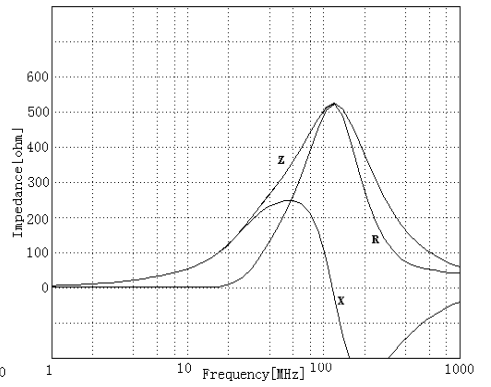
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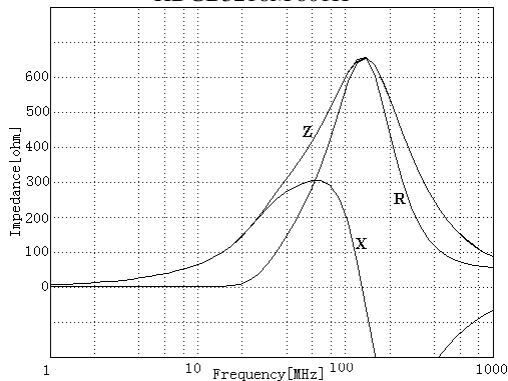
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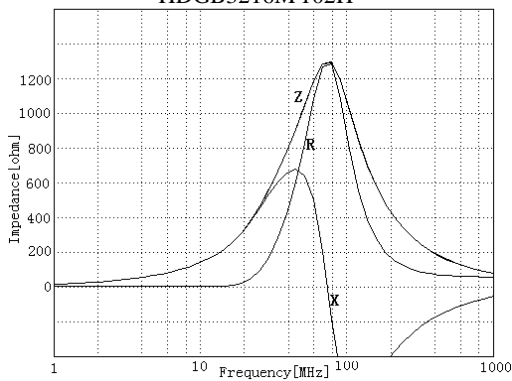
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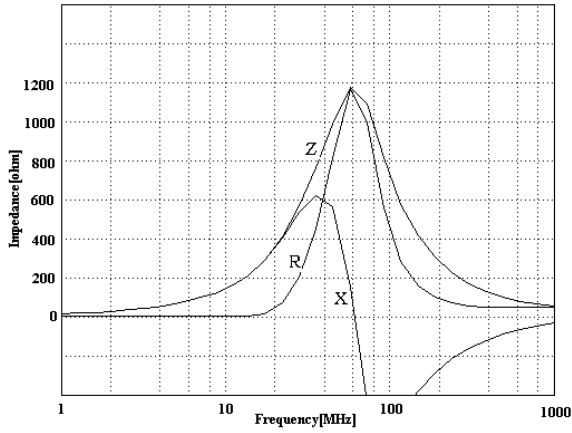


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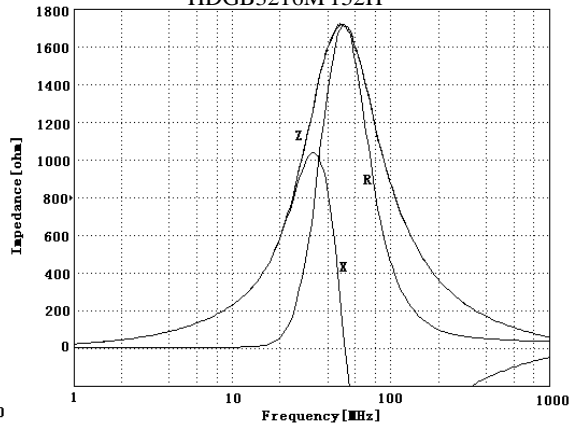




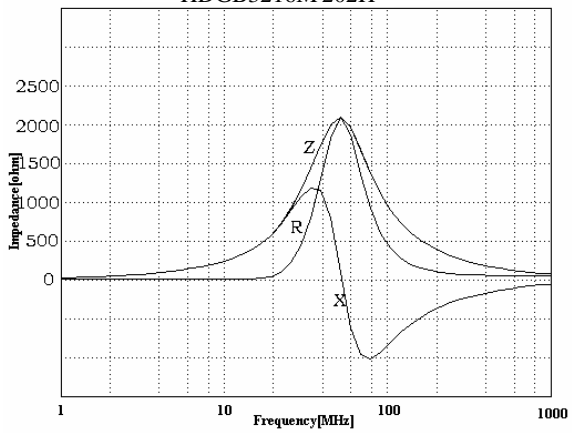
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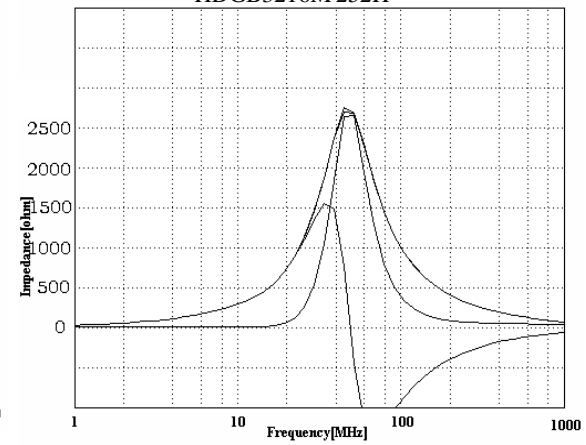
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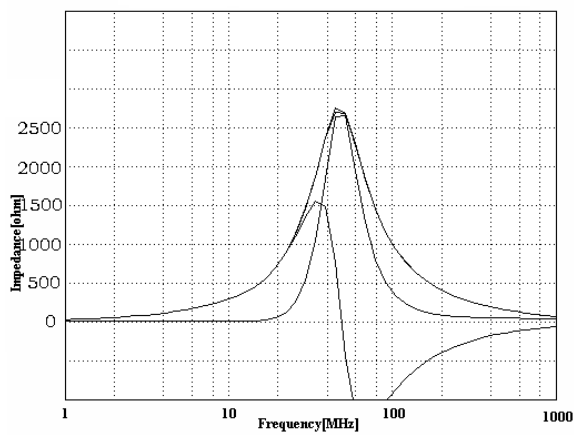
HDGB3216M 202H



HDGB3216M 252H



HDGB3216M 302H





6 Electrical Performance

6.1 Impedance

Impedance shall meet item 5 when measured on the condition of Table 1.

Table 1

Measuring Equipment	Impedance analyzer HP4291 or equivalent
Measuring Frequency	(see item 5)
Measuring signal level	50mV

6.2 DC Resistance

D.C Resistance shall meet item 5 when measured on the condition of Table 2.

Table 2

Measuring Equipment	LCR Meter HP4263A or equivalent
---------------------	---------------------------------

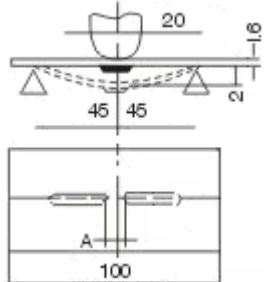
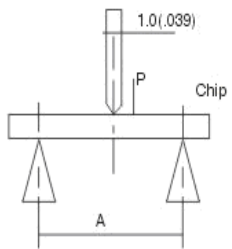
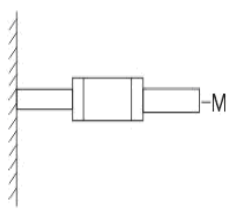
6.3 Rated current

Chip surface temperature rise just 20°C against chip surface temperature when the allowable current (which is mentioned in item 5) is applied.

Table 3

Measuring Equipment	Electric Power Supplier, Electric Current Meter, Thermometer
---------------------	--

7 Reliable Performance

NO.	Item	Specifications	Test Methods															
1	Solder-Ability	More than 90% of termination should be covered with new solder.	Solder : Sn Temperature : 255°C+5°C/-0°C Flux: rosin Duration : 3.5±0.5s															
2	Leaching Resistance	More than 75% of termination Should be covered with new solder.	Solder: Sn Temperature : 270°C+2°C/-0°C Flux : rosin Duration : 10±0.5s															
3	Bending Strength	No mechanical damage should be noticed	When the board curve to 2mm(0.079 inches) <table border="1" data-bbox="965 862 1204 1108"> <thead> <tr> <th>Size</th> <th>A(mm)</th> </tr> </thead> <tbody> <tr> <td>1005</td> <td>0.5</td> </tr> <tr> <td>1608</td> <td>0.7</td> </tr> <tr> <td>2012</td> <td>1.0</td> </tr> <tr> <td>3216</td> <td>1.0</td> </tr> </tbody> </table> 	Size	A(mm)	1005	0.5	1608	0.7	2012	1.0	3216	1.0					
Size	A(mm)																	
1005	0.5																	
1608	0.7																	
2012	1.0																	
3216	1.0																	
4	Body Strength	No mechanical damage should be noticed	Applied specified pull strength in axial direction <table border="1" data-bbox="965 1265 1236 1534"> <thead> <tr> <th>Size</th> <th>A/mm</th> <th>P/N</th> </tr> </thead> <tbody> <tr> <td>1005</td> <td>0.7</td> <td>4.9</td> </tr> <tr> <td>1608</td> <td>1.0</td> <td>4.9</td> </tr> <tr> <td>2012</td> <td>1.4</td> <td>9.8</td> </tr> <tr> <td>3216</td> <td>1.4</td> <td>9.8</td> </tr> </tbody> </table> 	Size	A/mm	P/N	1005	0.7	4.9	1608	1.0	4.9	2012	1.4	9.8	3216	1.4	9.8
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1005	0.7	4.9																
1608	1.0	4.9																
2012	1.4	9.8																
3216	1.4	9.8																
5	Terminal Strength	The terminal and body should be no damage	Applied specified pull strength in axial <table border="1" data-bbox="965 1691 1236 1960"> <thead> <tr> <th>Size</th> <th>Pull Strength</th> <th>Time (s)</th> </tr> </thead> <tbody> <tr> <td>1005</td> <td>3 N</td> <td>5±1</td> </tr> <tr> <td>1608</td> <td>5 N</td> <td>5±1</td> </tr> <tr> <td>2012</td> <td>10 N</td> <td>5±1</td> </tr> <tr> <td>3216</td> <td>10 N</td> <td>5±1</td> </tr> </tbody> </table> 	Size	Pull Strength	Time (s)	1005	3 N	5±1	1608	5 N	5±1	2012	10 N	5±1	3216	10 N	5±1
Size	Pull Strength	Time (s)																
1005	3 N	5±1																
1608	5 N	5±1																
2012	10 N	5±1																
3216	10 N	5±1																



NO.	Item	Specifications	Test Methods
6	Drop	<p>1.No mechanical damage shall be noticed</p> <p>2.Impedance shall be within $\pm 20\%$ of the initial value</p>	Drop 10 times on a concrete floor from a height of 1m.
7	Vibration		<p>Frequency : 10 to 55Hz</p> <p>Amplitude : 1.52mm</p> <p>Direction and time : X, Y and Z directions for 2 hours each.</p>
8	Humidity resistance		<p>a. Test condition</p> <p>Temp. : $60 \pm 2^\circ\text{C}$</p> <p>Humidity : 90%~95%</p> <p>Test time : 1000 h</p> <p>b. Measurement method :</p> <p>The component should be stabilized at normal condition for 24 hours before test.</p>
9	High temperature resistance		<p>a. Test condition</p> <p>Applied rated current</p> <p>Temp. : $125 \pm 2^\circ\text{C}$</p> <p>Test time : 1000 h</p> <p>b. Measurement method :</p> <p>The component should be stabilized at normal condition for 24 hours before test.</p>
10	Low temperature resistance		<p>a. Test condition</p> <p>Temp. : $-55 \pm 2^\circ\text{C}$</p> <p>Test time : 1000 h</p> <p>b. Measurement method :</p> <p>The component should be stabilized at normal condition for 24 hours before test.</p>
11	Thermal shock		<p>a. Test condition</p> <p>1) Temp.: -55°C, time : $30 \pm 3\text{min}$</p> <p>2) Temp. : $+125^\circ\text{C}$, time : $30 \pm 3\text{min}$</p> <p>100 cycles</p> <p>b. Measurement method :</p> <p>The component should be stabilized at normal condition for 24 hours before test.</p>

8 Recommended Soldering Conditions

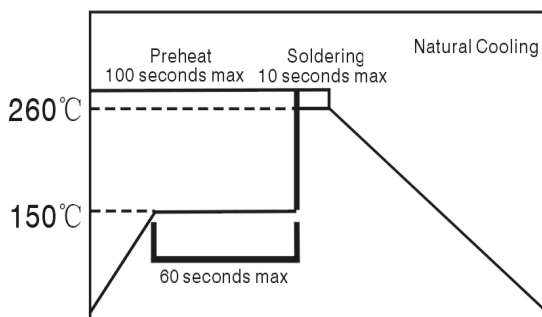
Product can be applied to flow and reflow soldering.

(1) Flux, Solder

- ① Use rosin-based flux. Don't use highly acidic flux with halide content exceeding 0.2wt% (chlorine conversion value).
- ② Use Sn solder.

(2) Flow soldering conditions

- ① Pre-heating should be in such a way that the temperature difference between solder and product surface is limited to 150°C max. Cooling into solvent after soldering also should be in such a way that temperature difference is limited to 100°C max. Unwrought pre-heating may cause cracks on the product, resulting in the deterioration of products quality.
- ② Standard soldering profile.



Pre-heating	150°C, 1 minute min
Peak	260°C, 10 seconds max

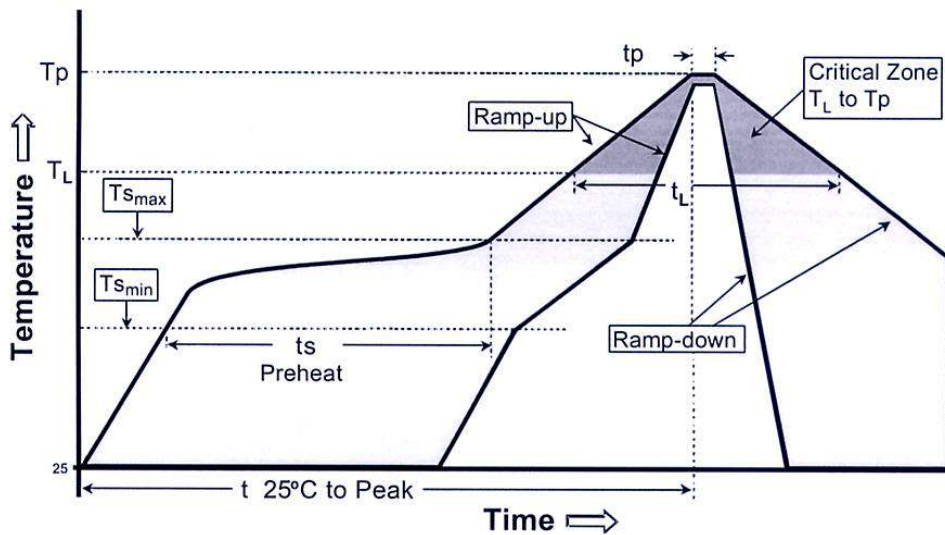
(3) Reflow soldering conditions

Profile Feature	Lead-Free Assembly
Average Ramp-Up Rate (T _{max} to T _p)	3°C /second max.
Preheat Temperature Min (T _{min}) Temperature Max (T _{max}) Time (t _{min} to t _{max}) min to t _{max})	150 °C 200 °C 60-180 seconds

Profile Feature	Lead-Free Assembly
Time maintained above: Temperature (TL) Time (tL)	217 °C 60-150 seconds
Peak/Classification Temperature (Tp) Peak/Classification Time (Tp)	260 °C 3-4 seconds
Time within 5 °C of actual Peak Temperature (tp)	20-40 seconds
Ramp-Down Rate	6 °C/second max.
Time 25 °C to Peak Temperature	8 minutes max.

Note 1: All temperatures refer to topside of the package, measured on the package body surface.

Standard soldering profile



(4) Reworking with soldering iron

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

Pre-heating	150°C, 1 minute
Tip temperature	350°C max
Soldering iron output	80w max
End of soldering iron	φ 1mm max
Soldering time	3 seconds max

9 Cleaning Conditions

Products shall be cleaned on the following conditions.

(1) Cleaning temperature shall be limited to 60°C max.(40°C max for fluoride and alcohol type cleaner.)

(2) Ultrasonic cleaning shall comply with the following conditions with avoiding the resonance phenomenon at the mounted products and P.C.B.

Power : 20W/t max

Frequency: 40 kHz

Time : 5 minutes max

(3) Cleaner

a) Alternative cleaner

Isopropyl alcohol (IPA) HCFC -225

b) Aqueous agent

Surface Active Agent Type (CLEANTHROUGH 750H)

Hydrocarbon Type (TECHNOCLEANER 335)

Higher Alcohol Type (PINE ALPHA ST -100S)

Alkali Saponification Type (*AQUACLEANER 240)

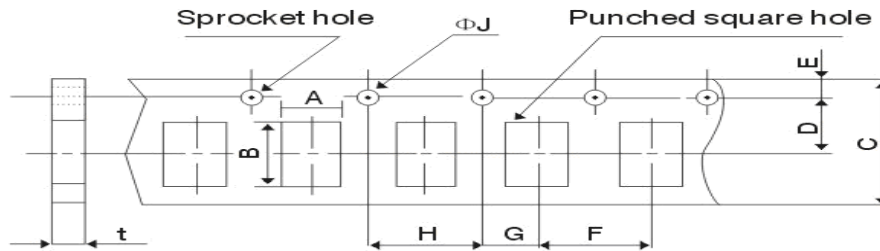
(4) There shall be no residual flux and residual cleaner after cleaning. In the case of using aqueous agent, products shall be dried completely after rinse with de-ionized water in order to remove the cleaner.

(5) Other cleaning Please contact us.

10 Packaging

(1) Dimensions of Tape:

Paper / Embossed carrier tape:



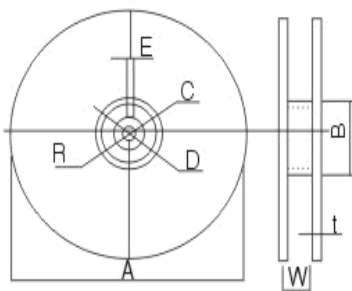
Unit: mm

Type	3216		2012		1608		1005		0603	
T*	1.1±0.3		0.85±0.2		0.8±0.15		0.5±0.15		0.3±0.05	
	Paper carrier tape	Embossed carrier tape	Paper carrier tape		Paper carrier tape		Paper carrier tape		Paper carrier tape	
A	2.0±0.2	2.0±0.2	1.5±0.15		1.05±0.15		0.65±0.10		0.4±0.05	
B	3.6±0.2	3.6±0.2	2.5±0.2		1.9±0.15		1.15±0.10		0.7±0.05	
C	8.0±0.3	8.0±0.3	8.0±0.3		8.0±0.3		8.0±0.3		8.0±0.3	
D	3.5±0.05	3.5±0.05	3.5±0.05		3.5±0.05		3.5±0.05		3.5±0.05	
E	1.75±0.1	1.75±0.1	1.75±0.1		1.75±0.1		1.75±0.1		1.75±0.1	
F	4.0±0.1	4.0±0.1	4.0±0.1		4.0±0.1		2.0±0.05		2.0±0.05	
G	2.0±0.05	2.0±0.05	2.0±0.05		2.0±0.05		2.0±0.05		2.0±0.05	
H	4.0±0.1	4.0±0.1	4.0±0.1		4.0±0.1		4.0±0.1		4.0±0.1	
ΦJ	1.5+0.1/-0	1.5+0.1/-0	1.5+0.1/-0		1.5+0.1/-0		1.5+0.1/-0		1.5+0.1/-0	
t(max)	1.1±0.05	2.0±0.05	1.1±0.05		1.0±0.05		0.8±0.05		0.55±0.05	

T*: Product thickness

(2) Dimensions of Reel

Unit: mm



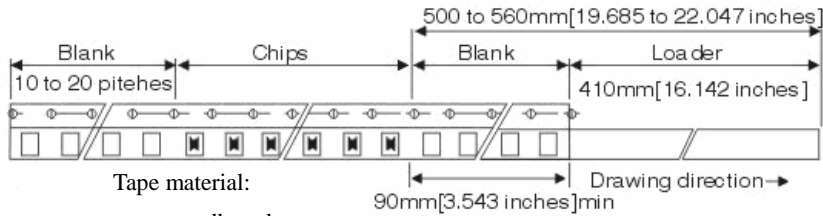
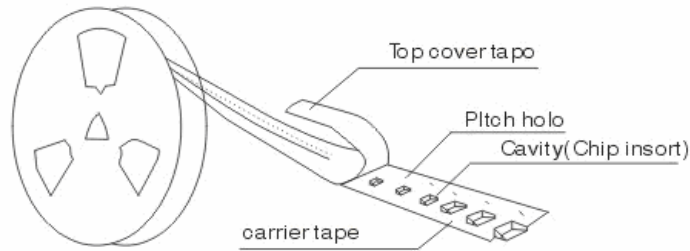
Reel material: PS (Polystyrene)

A	178±2
B	60±2
C	13.0±0.5
D	21.0±0.8
E	2.0±0.5
W	10.0±1.15
t	1.2±0.2
R	1.0±0.25

(3) Pulling strength of tapes

Carrier tape	10N or more (1kgf or more)
Cover tape	5N or more (0.5kgf or more)

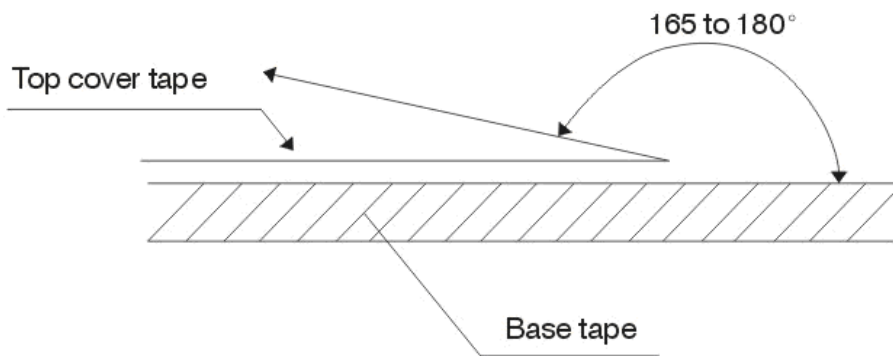
(4) Taping figure and drawing direction



Tape material:
 Base tape: cardboard
 Cover tape: polyethylene

(5) Peeling strength of cover tape

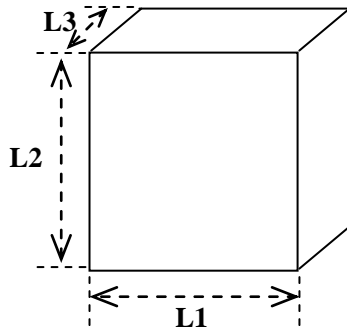
Cover tape	0.3~0.7N (30gf~70gf)
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Test condition:

- 1) peel angle: 160 °~180 °vs. carrier tape.
- 2) peel speed: 300 mm/min±10%.

(6) Box and case dimensions



Type	L1	L2	L3
Box	180±2	180±2	75±1
Box	180±2	180±2	120±2
Case	400±2	400±2	200±2

- A 6 reels in a box.
 B 10 boxes in a case.

(7) Packaging quantities

Type	Thickness(mm)	Bulk	Tape and reel
3216	1.10±0.30	----	3000pcs
2012	0.85±0.20	----	4000pcs
1608	0.8±0.15	----	4000pcs
1005	0.5±0.15	----	10000pcs
0603	0.3±0.05	----	15000pcs

11 Storage

(1) Storage period

Products which inspected in over 6 months ago should be examined and used, which can be confirmed with inspection No. marked on the container. Solder ability should be checked if this period is exceeded.

(2) Storage conditions

① Products should be storage in the warehouse on the following conditions

Temperature: $\leq 40^{\circ}\text{C}$

Humidity : $\leq 70\%$ relative humidity

No rapid change on temperature and humidity

② Don't keep products in corrosive gases such as sulfur, chlorine gas or acid, or it may cause oxidization of electrode, resulting in poor solder ability.



- ③ Products should be storage on the palette for the prevention of the influence from humidity, dust and so on.
- ④ Products should be storage in the warehouse without heat shock, vibration, and direct sunlight and soon.
- ⑤ Products should be storage under the airtight packaged condition.

12 Usage of Nonflammable Material

For these materials listed below, we don't use in process.

Cd, Hg, As and its compound, PCB, etc.

PBBS, PBBOs, PBDO, PBDE, PBB.

13 Usage of ODS

For ODS listed below, we don't use in process. ODS: CCL₄, HCFC, etc. ODS。

14 Flammability Class

UL 94V-1

15 Note

- ① This product specification guarantees the quality of our product as a single unit. Please make sure that your product is evaluated and confirmed against your specifications when our product is mounted to your product.
- ② We cannot warrant against failure caused by any use of our product that deviates from the intended use as described in this product specification.
- ③ Please return our copy of this product specification in two month after issued date with your signature of receipt. If the copy is not returned by the date, this product specification will be deemed to have been received.