

# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

## MMZ Series 0402 Type



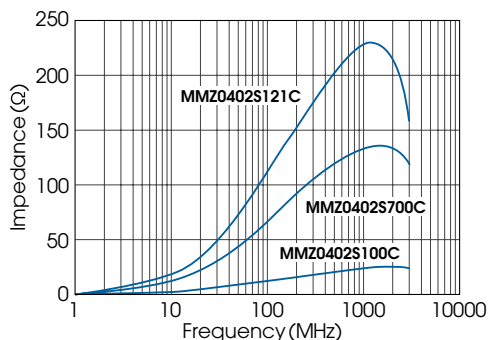
### Development concept/Features and advantages

Multilayer chip beads of the world's smallest\* 0402 type for downsized, lighter, and stronger advanced the latest-condensed circuit such as the PA modules of cellular phones.

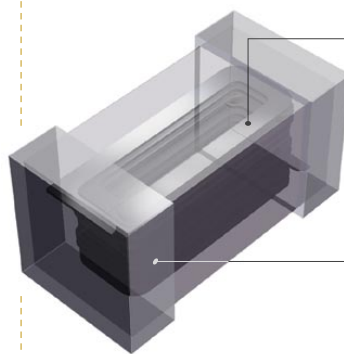
\*As of April 30, 2010 (based on our survey)

**The MMZ Series trademark EMI suppression and low Rdc performance have, of course, managed to maintain position as the world's topnotch standard.**

TDK-EPC original material S type designed for chip beads, which is recognized for its "effectiveness", offers a line-up of three impedance frequency characteristics for the high-loss effect of resistivity in the 50 - 700MHz band. It allows selection of an optimal EMI depressing effect depending on developmental noise and signal waveforms.



Also, with advanced lamination process technologies accurately controlling the micro-structure of the internal conductors, the advantage of low-Rdc is maintained, reducing the electrical power loss, and driving the circuit to a minimum.



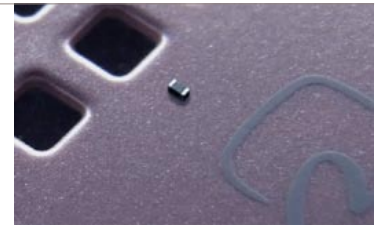
Structured with minute, low Rdc, internally laminated conductors condensed in the world's smallest chip, the product has been realized through control technology applied to submicron-order mass-production lines.

With Ni + high-purity tin-plated processed electrodes, the product complies with lead-free soldering and high-temperature reflow processes.

### Typical applications

In addition to making high-density circuit boards for cellular phones, digital camcorders, and digital cameras, the chip beads offer advantages which significantly exceed those of conventional materials, reinforcing the reliability and minimization, slimming, and weight-saving of condensed circuit units such as power amplifier modules.

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## MMZ Series 0402 Type

### Example of electrical characteristics

Part No.	Impedance ( $\Omega$ ) at 100MHz	DC resistance Rdc ( $\Omega$ )	Rated current Idc (mA)
<b>MMZ0402S100C</b>	10 $\pm$ 5 $\Omega$	0.1 max.	500 max.
<b>MMZ0402S700C</b>	70 $\pm$ 25%	0.5 max.	260 max.
<b>MMZ0402S121C</b>	120 $\pm$ 25%	0.8 max.	210 max.

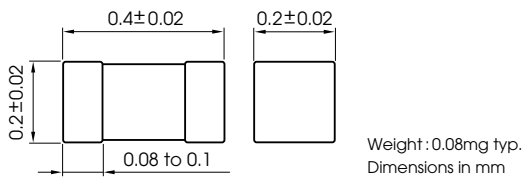
Measuring Instruments  
 Impedance : Agilent E4991A Impedance analyzer or equivalents  
 16197A Test fixture or equivalent products  
 DC resistance : YOKOGAWA 755611 or equivalents

### Environmental characteristics

Operating temperature range : -55 to +125°C

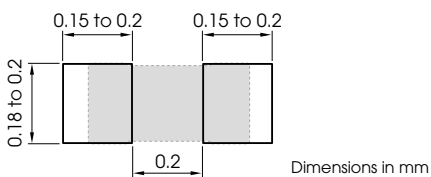
Storage temperature range : -55 to +125°C

### Shapes and dimensions



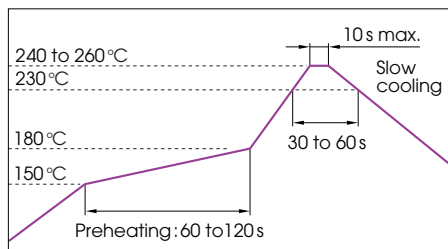
### Recommended PC board pattern

(Reflow process)



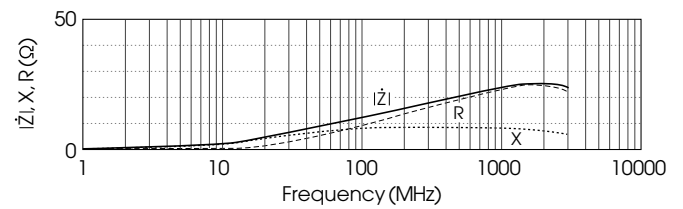
### Recommended soldering conditions

Lead-free solder/High-temperature reflow process

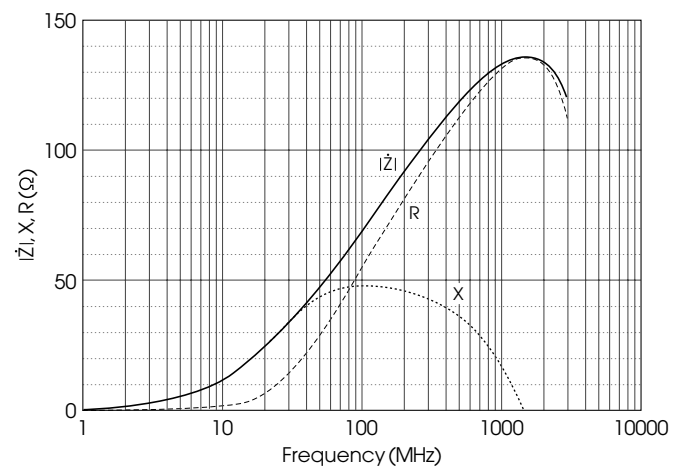


### $|Z|, X, R$ vs. frequency characteristics

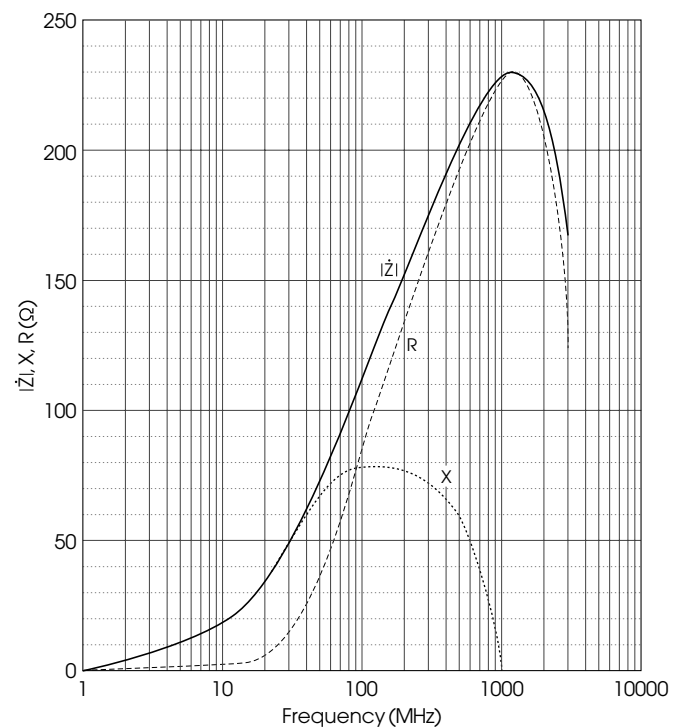
#### MMZ0402S100C



#### MMZ0402S700C



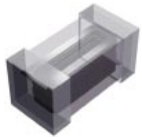
#### MMZ0402S121C



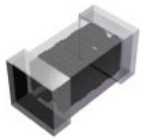
## Main products of multilayer chip beads and multilayer chip bead arrays Product lineup/Advantages of applied materials


### For signal lines Multilayer chip beads

**MMZ Series**     **0402 Type**     **0603 Type**     **1005 Type**     **1608 Type**     **2012 Type**



Enriched variation of size and impedance frequency characteristics allowing the use of the right material at the right place for optimized effects



 **1005-E Type**

Wide-range "GIGASPIRA multilayer structure" type maintaining high impedance which greatly exceeds the conventional level through a GHz range

### For signal lines Multilayer chip beads arrays

**MZA Series**

For 2 lines  **1210 Type**    For 2 lines  **2010 Type**



### For audio lines / USB1.1 signal lines Multilayer chip beads arrays

**MCZ Series**




For 2 lines  **1210 Type**

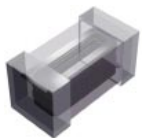
Countermeasured against common-mode noise



### For DC power lines Multilayer chip beads

**MPZ Series**

 **1005 Type**     **1608 Type**     **2012 Type**



From 0.15Ω/1A through 0.01Ω/6A, a full-fledged product lineup with 27 products in three sizes with optimized high current support and low Rdc

**B**<sup>material</sup> This super-high loss material has a crosspoint set around 5MHz where the R and X elements of the beads are equal, reducing the overshoot, undershoot, and ringing of high-speed digital signals, and possessing excellent deterrent effects on higher harmonics.

**R**<sup>material</sup> This material supports wide frequency ranges with broad band impedance characteristics. It is designed for digital signal lines where waveform quality is important, offering effective impedance characteristics between 10-200MHz.

**S**<sup>material</sup> A standard material with wide band impedance characteristics similar to those of general ferrite cores. Dedi-

cated to the signal lines of a 100MHz countermeasure band, an impedance characteristic that is effective to around 40-300MHz is provided.

**Y**<sup>material</sup> This material supports a wide band range and offers effective impedance characteristics around 80-400MHz and is the most suitable for signal lines where the original signal and countermeasure band stand off from one another.

**A**<sup>material</sup> This high impedance material is based on the impedance vs. frequency characteristics of the Y material. It has a very high impedance — over 2500Ω around 100MHz (MMZ 1608A252B).

# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

Information on related products

## MMZ Series 0402 Type



### Q material

This material supports a wide band range and provides effective impedance characteristics in the range between around 100MHz and 800MHz.

### D material

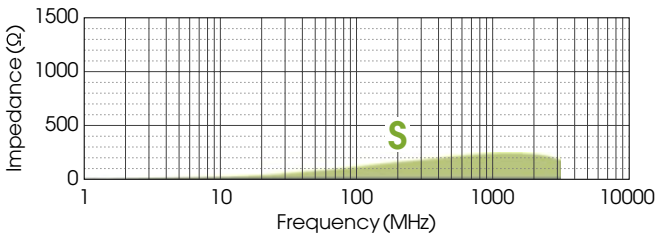
This material supports high frequency waves with low loss in the range below 50MHz and impedance values which suddenly increase from around 100MHz. It is dedicated to signal lines where pulse height value is important, offering effective impedance characteristics in the 200-500MHz range.

### F material

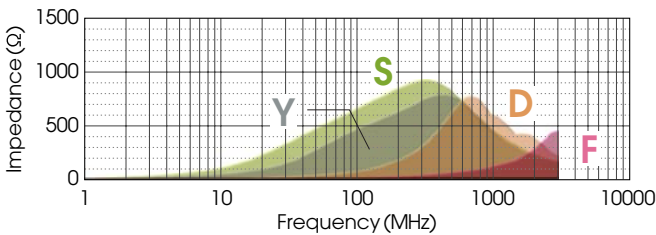
This material succeeds the D material in its characteristic steep impedance increase by further shifting the impedance peak frequency to the high-frequency (GHz band) side, offering superb noise reduction in the high-frequency range between 600MHz and GHz band.

## Actual examples of applied materials' features and impedance vs. frequency characteristics tendencies

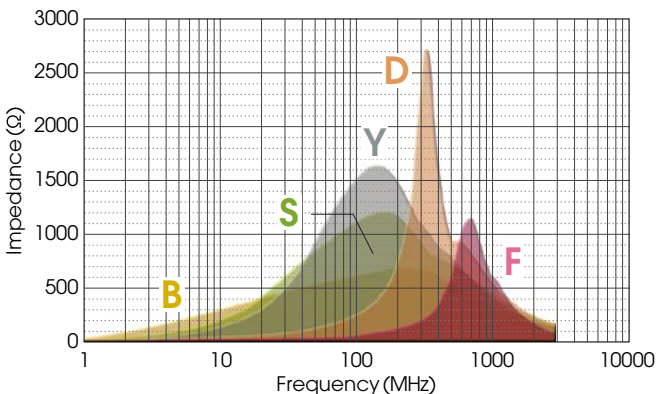
MMZ Series 0402 Type



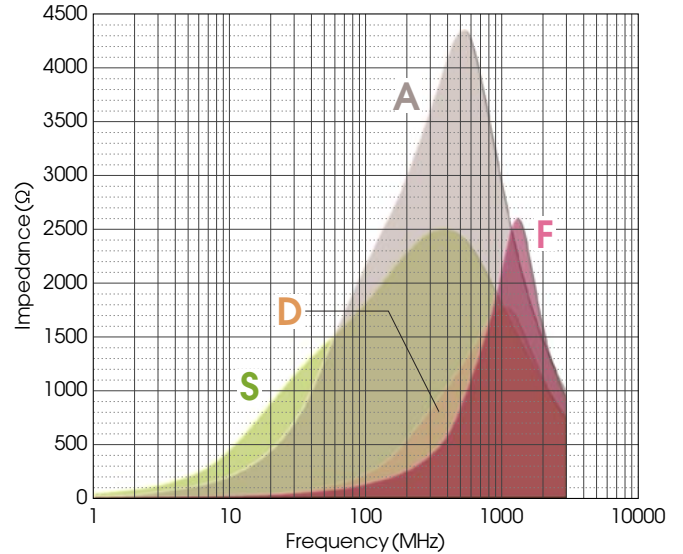
MMZ Series 0603 Type



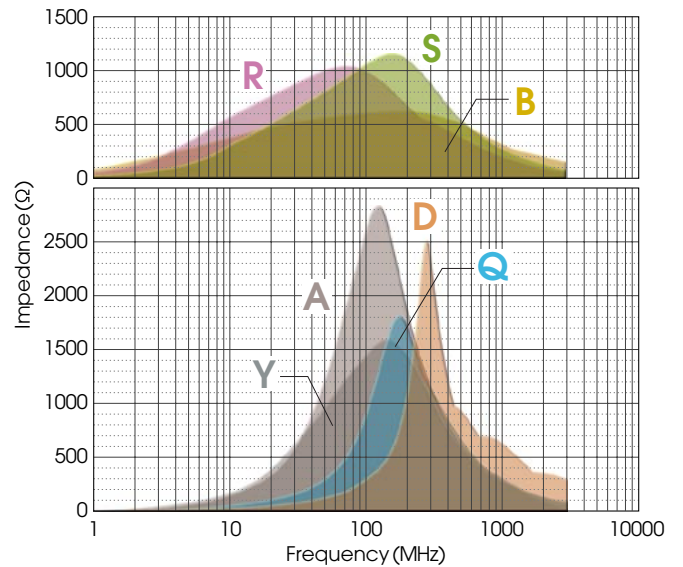
MMZ Series 1005 Type



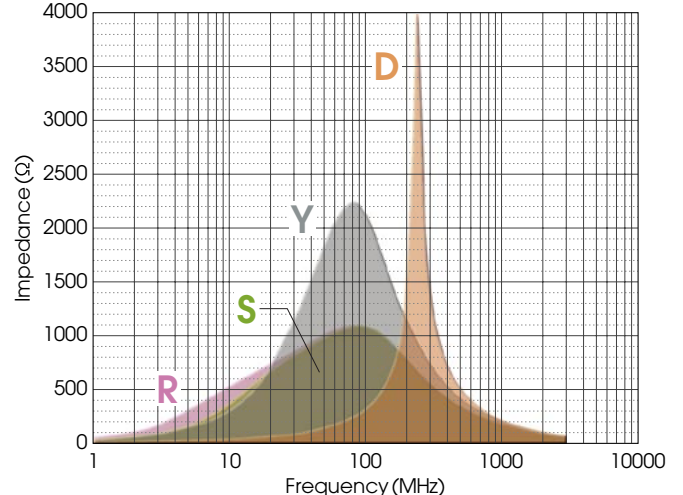
MMZ Series 1005-E Type



MMZ Series 1608 Type



MMZ Series 2012 Type



## Main products of multilayer chip beads and multilayer chip bead arrays

### Electrical characteristics

#### Common properties of all items

Operating / Storage temperature range: -55 to +125°C

Measuring instruments (Measuring temperature: 25±10°C)

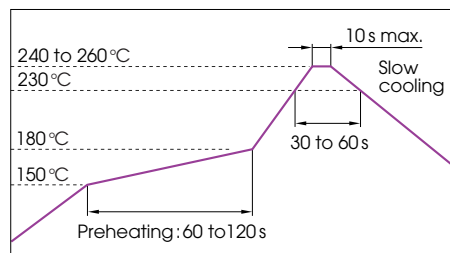
Impedance: Agilent E4991A Impedance analyzer or equivalents

Test fixture Agilent 16197A: MMZ0402, 0603 Agilent 16192A: MMZ1005, 1608, 2012 / MPZ1005, 1608, 20122 / MZA1210, 2010 / MCZ1210-D

DC resistance: YOKOGAWA 755611 or equivalents

#### Recommended soldering conditions

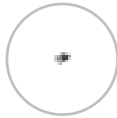
Lead-free solder/High-temperature reflow process



#### For signal lines

MMZ Series **0402** Type

Shape: L0.4×W0.2×T0.2mm Weight: 0.08mg typ.

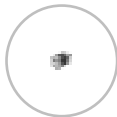


Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ0402S100C	10±5Ω	0.1	500
MMZ0402S700C	70±25%	0.5	260
MMZ0402S121C	120±25%	0.8	210

#### For signal lines

MMZ Series **0603** Type

Shape: L0.6×W0.3×T0.3mm Weight: 0.3mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ0603S100C	10±5Ω	0.12	500
MMZ0603S800C	80±25%	0.37	200
MMZ0603S121C	120±25%	0.45	200
MMZ0603S241C	240±25%	0.75	200
MMZ0603S471C	470±25%	1.3	100
MMZ0603S601C	600±25%	1.45	100
MMZ0603Y121C	120±25%	0.75	200
MMZ0603Y241C	240±25%	0.85	100
MMZ0603Y471C	470±25%	1.4	50
MMZ0603D330C	33±25%	0.85	100
MMZ0603D560C	56±25%	1.05	100
MMZ0603D800C	80±25%	1.4	100
MMZ0603F100C	10±5Ω	0.6	200

#### For signal lines

MMZ Series **1005** Type

Shape: L1.0×W0.5×T0.5mm Weight: 1mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ1005B800C	80±25%	0.2	450
MMZ1005B121C	120±25%	0.25	400
MMZ1005B601C	600±25%	0.85	200
MMZ1005S800C	80±25%	0.2	500
MMZ1005S121C	120±25%	0.25	500
MMZ1005S241C	240±25%	0.4	400
MMZ1005S601C	600±25%	0.6	300
MMZ1005S102C	1000±25%	1.0	200
MMZ1005Y400C	40±25%	0.12	550
MMZ1005Y800C	80±25%	0.17	450
MMZ1005Y121C	120±25%	0.21	400
MMZ1005Y241C	240±25%	0.33	300
MMZ1005Y301C	300±25%	0.38	250
MMZ1005Y471C	470±25%	0.5	250
MMZ1005Y601C	600±25%	0.56	250
MMZ1005Y102C	1000±25%	0.74	200
MMZ1005Y152C	1500±25%	1.15	100
MMZ1005D100C	10±5Ω	0.1	500
MMZ1005D220C	22±25%	0.2	400
MMZ1005D330C	33±5%	0.35	400
MMZ1005D680C	68±25%	0.55	400
MMZ1005D121C	120±25%	0.75	350
MMZ1005D241C	240±25%	1.2	200
MMZ1005F330C	33±25%	0.6	200
MMZ1005F470C	47±25%	0.8	100
MMZ1005F560C	56±25%	0.8	100

# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

Information on related products

## MMZ Series 0402 Type



### For signal lines

#### MMZ Series 1005-E Type

Shape: L1.0×W0.5×T0.5mm Weight: 1mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ1005S601E	600±25%	0.7	300
MMZ1005S102E	1000±25%	1.1	250
MMZ1005S182E	1800±25%	1.65	200
MMZ1005A601E	600±25%	0.85	300
MMZ1005A102E	1000±25%	1.25	250
MMZ1005A152E	1500±25%	1.7	230
MMZ1005A182E	1800±25%	2.2	200
MMZ1005A222E	2200±25%	2.3	150
MMZ1005D121E	120±25%	0.7	300
MMZ1005D221E	220±25%	1.0	250
MMZ1005F470E	47±25%	0.7	300
MMZ1005F750E	75±25%	1.0	250
MMZ1005F121E	120±25%	1.5	200

### For signal lines

#### MMZ Series 1608 Type

Shape: L1.6×W0.8×T0.6mm Weight: 3mg typ.

Shape: L1.6×W0.8×T0.8mm Weight: 4mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ1608B121C*	120±25%	0.15	600
MMZ1608B301C*	300±25%	0.25	500
MMZ1608B601C*	600±25%	0.4	500
MMZ1608R150A	15±25%	0.05	1500
MMZ1608R300A	30±25%	0.05	1500
MMZ1608R600A	60±25%	0.1	800
MMZ1608R121A	120±25%	0.18	500
MMZ1608R301A	300±25%	0.25	500
MMZ1608R601A	600±25%	0.4	500
MMZ1608R102A	1000±25%	0.5	400
MMZ1608S400A	40±25%	0.1	600
MMZ1608S800A	80±25%	0.15	500
MMZ1608S121A	120±25%	0.2	500
MMZ1608S181A	180±25%	0.2	500
MMZ1608S301A	300±25%	0.3	500
MMZ1608S601A	600±25%	0.4	500
MMZ1608S102A	1000±25%	0.5	400
MMZ1608Y150B	15±25%	0.05	1500

Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ1608Y300B	30±25%	0.05	1500
MMZ1608Y600B	60±25%	0.15	500
MMZ1608Y121B	120±25%	0.2	500
MMZ1608Y301B	300±25%	0.3	500
MMZ1608Y601B	600±25%	0.4	500
MMZ1608Y102B	1000±25%	0.5	400
MMZ1608Y152B	1500±25%	0.6	300
MMZ1608A252B	2500±25%	0.8	200
MMZ1608Q121B	120±25%	0.3	500
MMZ1608Q221B	220±25%	0.4	500
MMZ1608Q471B	470±25%	0.7	300
MMZ1608Q601B	600±25%	0.8	200
MMZ1608Q102B	1000±25%	1	200
MMZ1608D050C	5±2Ω	0.1	700
MMZ1608D100C*	10±5Ω	0.15	500
MMZ1608D220C*	22±25%	0.2	500
MMZ1608D500C*	50±25%	0.3	500
MMZ1608D800C*	80±25%	0.35	500
MMZ1608D800B	80±25%	0.35	500
MMZ1608D121C*	120±25%	0.45	400
MMZ1608D121B	120±25%	0.45	400
MMZ1608D241C	240±25%	0.6	300
MMZ1608D301B	300±25%	0.7	300

\*Product thickness (T): 0.6mm (others are 0.8mm)

## Main products of multilayer chip beads and multilayer chip bead arrays

### Electrical characteristics

#### For signal lines

##### MMZ Series 2012 Type

Shape: L2.0×W1.25×T0.85mm Weight: 8mg typ.

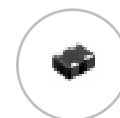


Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MMZ2012R150A	15±25%	0.05	1500
MMZ2012R300A	30±25%	0.05	1500
MMZ2012R600A	60±25%	0.1	1000
MMZ2012R121A	120±25%	0.12	800
MMZ2012R301A	300±25%	0.15	600
MMZ2012R601A	600±25%	0.2	500
MMZ2012R102A	1000±25%	0.3	500
MMZ2012S400A	40±25%	0.1	1000
MMZ2012S800A	80±25%	0.1	800
MMZ2012S121A	120±25%	0.15	800
MMZ2012S181A	180±25%	0.15	600
MMZ2012S301A	300±25%	0.2	600
MMZ2012S601A	600±25%	0.3	500
MMZ2012S102A	1000±25%	0.35	500
MMZ2012Y150B	15±25%	0.05	1500
MMZ2012Y300B	30±25%	0.05	1500
MMZ2012Y600B	60±25%	0.1	1000
MMZ2012Y121B	120±25%	0.12	800
MMZ2012Y301B	300±25%	0.15	600
MMZ2012Y601B	600±25%	0.2	500
MMZ2012Y102B	1000±25%	0.3	500
MMZ2012Y152B	1500±25%	0.4	500
MMZ2012Y202B	2000±25%	0.5	400
MMZ2012D800B	80±25%	0.3	500
MMZ2012D121B	120±25%	0.3	500
MMZ2012D301B	300±25%	0.5	400

#### For signal lines/Arrays for 2 lines

##### MZA Series 1210 Type

Shape: L1.25×W1.0×T0.5mm Weight: 3mg typ.  
Terminal pitch: 0.65mm Terminal width: 0.35mm  
Rated voltage: 5V max.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MZA1210D330C	33±25%	0.3	50
MZA1210D680C	68±25%	0.5	50
MZA1210D121C	120±25%	0.8	50
MZA1210D241C	240±25%	1.2	50

#### For signal lines/Arrays for 4 lines

##### MZA Series 2010 Type

Shape: L2.0×W1.0×T0.5mm Weight: 5mg typ.  
Terminal pitch: 0.5mm Terminal width: 0.25mm  
Rated voltage: 5V max.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MZA2010B241C	240±25%	0.45	100
MZA2010S800C	80±25%	0.22	100
MZA2010S121C	120±25%	0.25	100
MZA2010S241C	240±25%	0.35	100
MZA2010S601C	600±25%	0.5	100
MZA2010S102C	1000±25%	0.75	100
MZA2010Y800C	80±25%	0.3	100
MZA2010Y121C	120±25%	0.4	100
MZA2010Y241C	240±25%	0.6	100
MZA2010Y601C	600±25%	0.8	100
MZA2010Y102C	1000±25%	1	100
MZA2010D330C	33±25%	0.3	50
MZA2010D680C	68±25%	0.5	50
MZA2010D121C	120±25%	0.8	50
MZA2010D241C	240±25%	1.2	50
MZA2010F330C	33±25%	0.6	100
MZA2010F470C	47±25%	0.8	100
MZA2010F560C	56±25%	0.8	100

# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

Information on related products

## MMZ Series 0402 Type



### For audio lines / USB1.1 signal lines

#### MCZ Series 1210-D Type

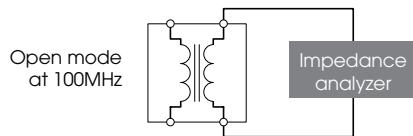
Shape: L1.25×W1.0×T0.5mm Weight: 3mg typ.  
Shape: L1.25×W1.0×T0.8mm Weight: 4mg typ.  
Terminal pitch: 0.65mm Terminal width: 0.35mm



Part No.	MCZ1210AD102T	MCZ1210AD221T
Impedance	1000Ω±25%	220Ω±25%
DC resistance	0.75Ω max.	0.3Ω max.
Insulation resistance	1MΩ min	1MΩ min
Rated current	50mA max.	350mA max.
Rated voltage	5V max.	5V max.
Thickness	0.85mm	0.85mm

Part No.	MCZ1210AD121T002	MCZ1210AD900T002
Impedance	120Ω±25%	90Ω±25%
DC resistance	0.2Ω max.	0.2Ω max.
Insulation resistance	1MΩ min.	1MΩ min
Rated current	500mA max.	500mA max.
Rated voltage	5V max.	5V max.
Thickness	0.5mm	0.5mm

\*The impedance values were measured in the open mode.



### For DC power lines

#### MPZ Series 1008 Type

Shape: L1.0×W0.5×T0.5mm Weight: 1mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MPZ1005S100C	10±5Ω	0.045	2
MPZ1005S300C	30±10Ω	0.05	1.7
MPZ1005S600C	60±25%	0.075	1.5
MPZ1005S121C	120±25%	0.09	1.2
MPZ1005Y900C	90±25%	0.1	1.2

### For DC power lines

#### MPZ Series 1608 Type

Shape: L1.6×W0.8×T0.6mm Weight: 3mg typ.  
Shape: L1.6×W0.8×T0.8mm Weight: 4mg typ.



Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MPZ1608B471A	470±25%	0.15	1
MPZ1608S300A*	30±10Ω	0.01	5
MPZ1608S600A*	60±25%	0.02	3.5
MPZ1608S101A*	100±25%	0.03	3
MPZ1608S121A*	120±25%	0.045	2
MPZ1608S181A*	180±25%	0.05	2
MPZ1608S221A	220±25%	0.05	2.2
MPZ1608S331A	330±25%	0.08	1.7
MPZ1608R391A	390±25%	0.12	1.2
MPZ1608S471A	470±25%	0.15	1
MPZ1608S601A	600±25%	0.15	1
MPZ1608Y600B	60±25%	0.03	2.3
MPZ1608Y101B	100±25%	0.04	2
MPZ1608Y151B	150±25%	0.05	1.8
MPZ1608D300B	30±10Ω	0.06	1.8
MPZ1608D600B	60±25%	0.1	1.2
MPZ1608D101B	100±25%	0.15	1

\*Product thickness (T): 0.6mm (others are 0.8mm)

### For DC power lines

#### MPZ Series 2012 Type

Shape: L2.0×W1.25×T0.85mm Weight: 8mg typ.



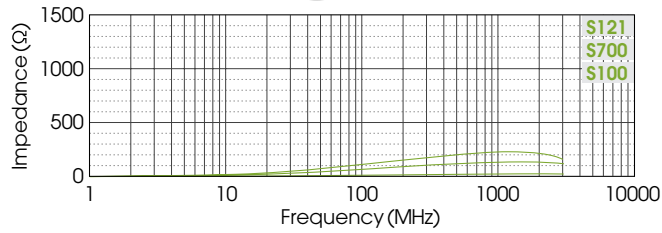
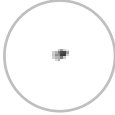
Part No.	Impedance (Ω) at 100MHz	DC resistance Rdc (Ω)	Rated current Idc (mA)
MPZ2012S300A	30±10Ω	0.01	6
MPZ2012S101A	100±25%	0.02	4
MPZ2012S221A	220±25%	0.04	3
MPZ2012S331A	330±25%	0.05	2.5
MPZ2012S601A	600±25%	0.1	2
MPZ2012S102A	1000±25%	0.15	1.5

# Product Update File

Main products of multilayer chip beads and multilayer chip bead arrays  
**Impedance vs. frequency characteristics** (by each material)

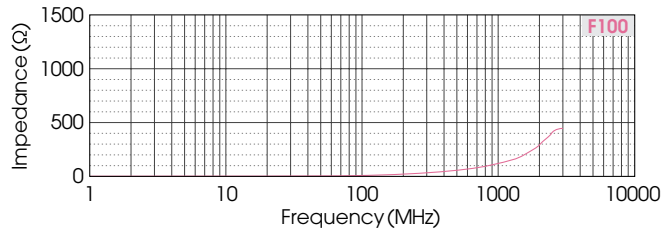
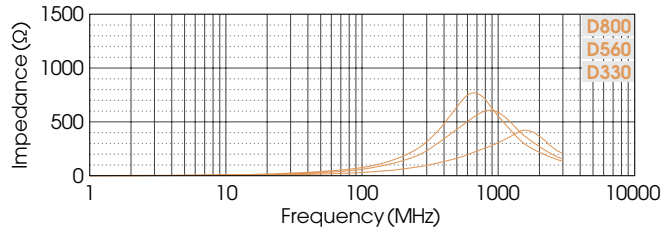
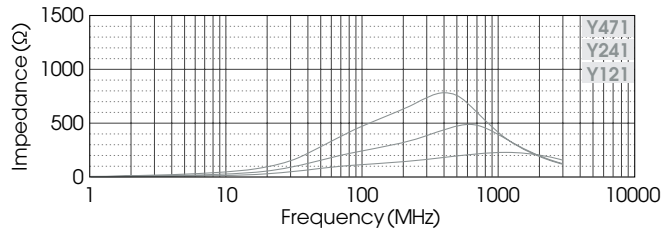
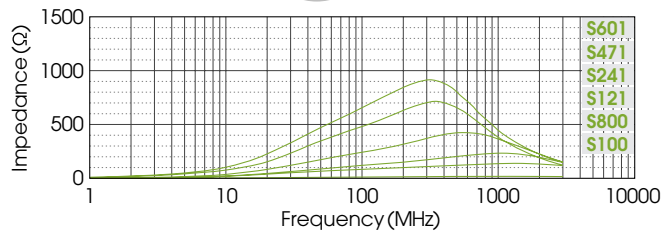
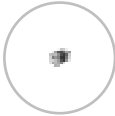
For signal lines

**MMZ Series 0402** Type



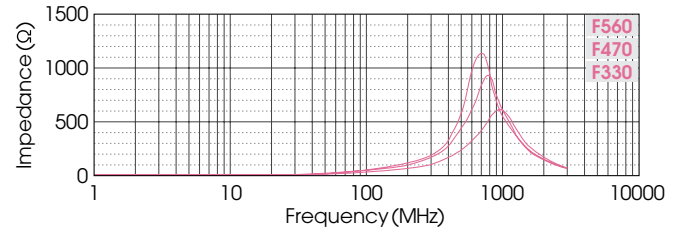
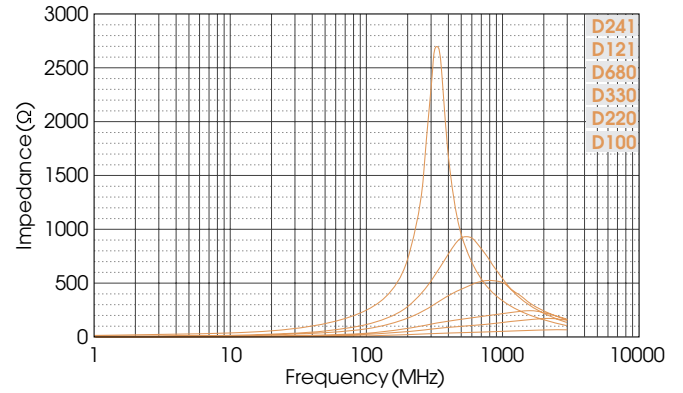
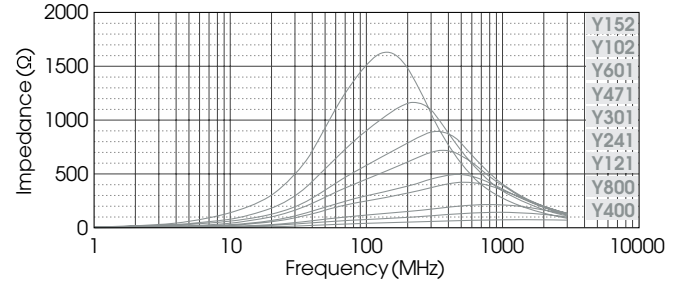
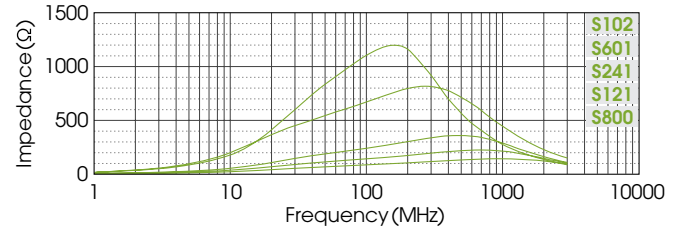
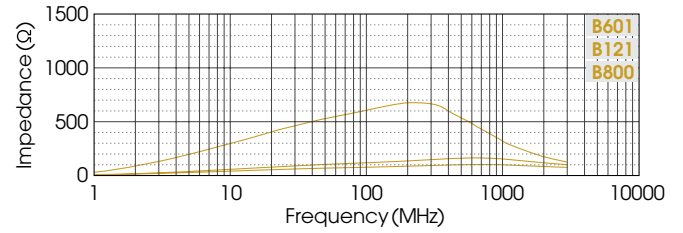
For signal lines

**MMZ Series 0603** Type



For signal lines

**MMZ Series 1005** Type



# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

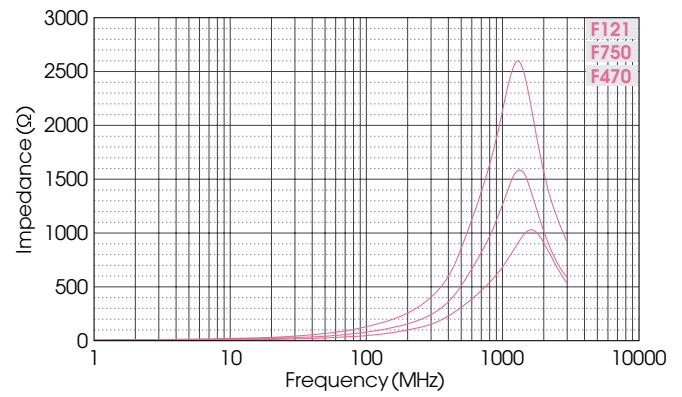
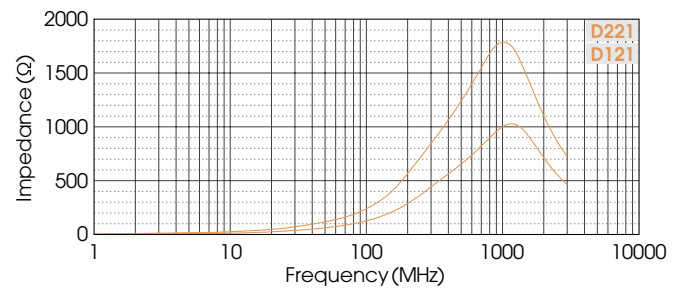
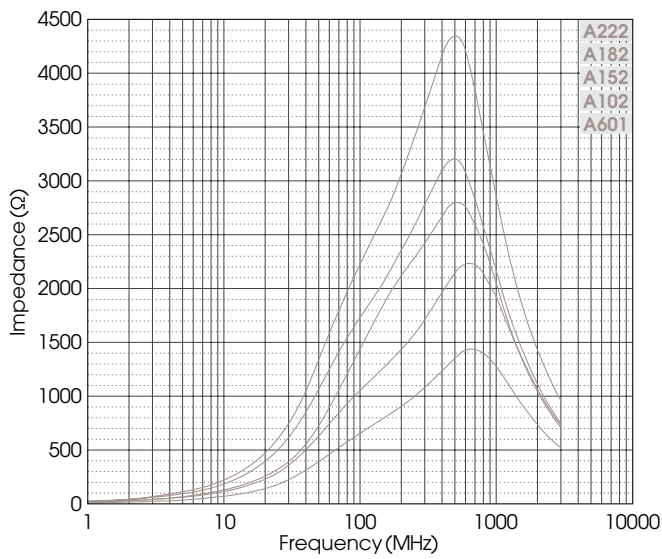
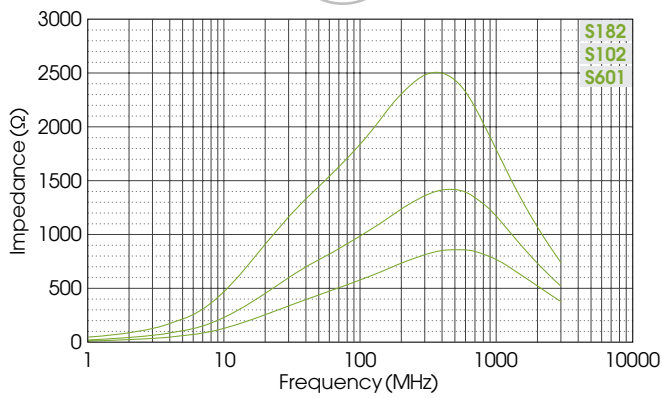
Information on related products

## MMZ Series 0402 Type



For signal lines

MMZ Series 1005-E Type

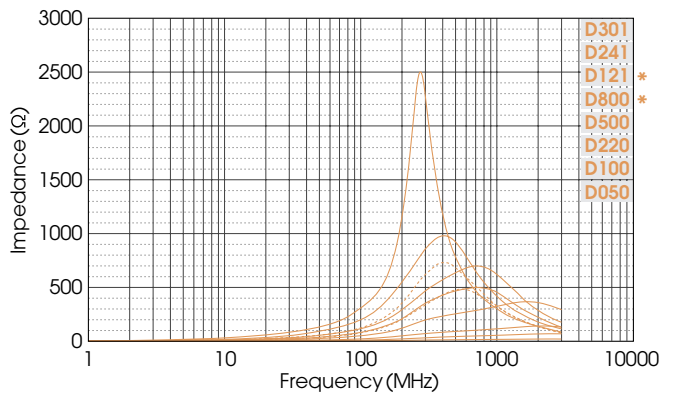
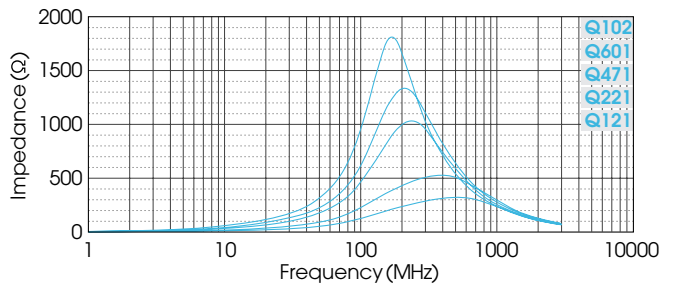
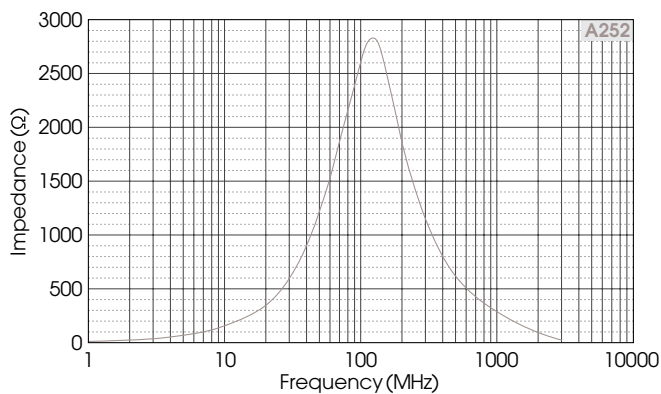
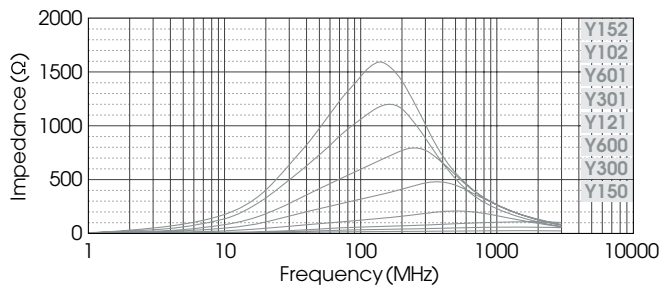
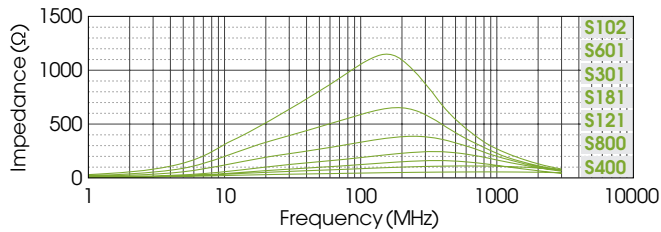
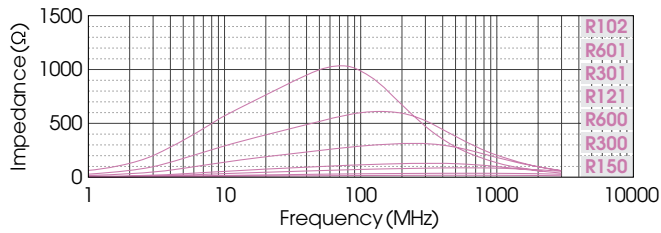
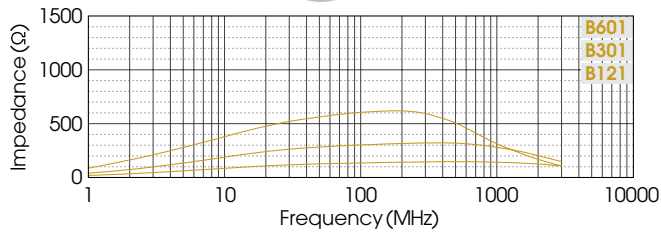


# Product Update File

Main products of multilayer chip beads and multilayer chip bead arrays  
**Impedance vs. frequency characteristics** (by each material)

For signal lines

MMZ Series 1608 Type



\*Both D800 and D121 have two product types of different frequency characteristics and thicknesses.

Type C: 0.6mm thick

Type B: 0.8mm thick (shown as broken lines)

# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

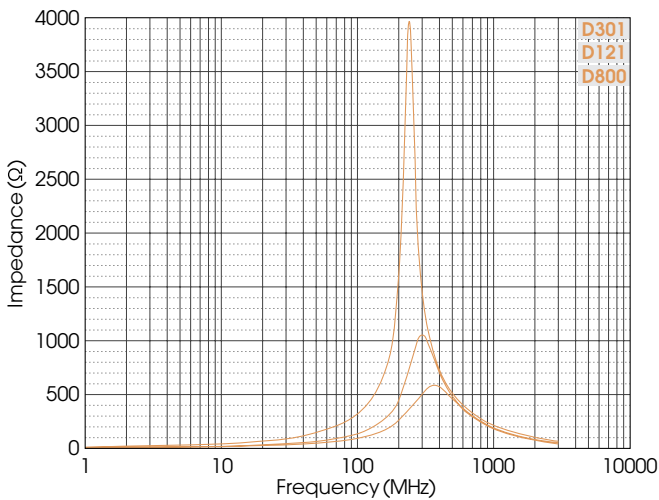
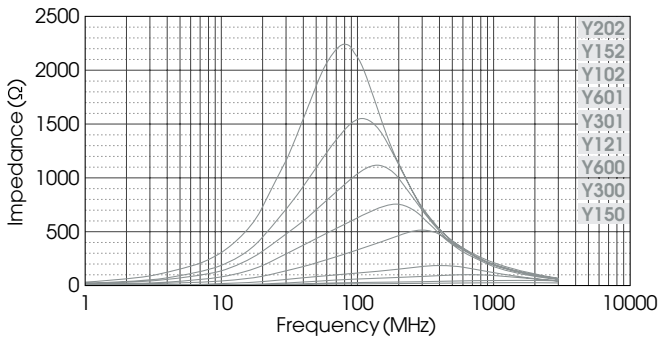
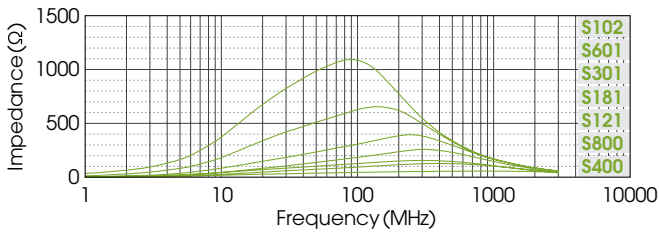
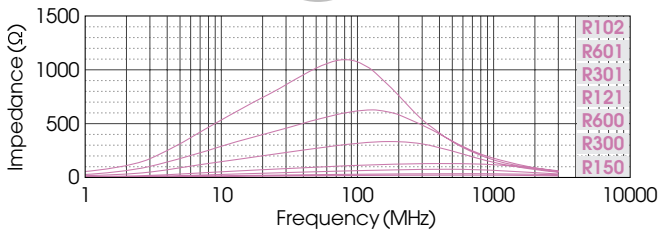
Information on related products

## MMZ Series 0402 Type



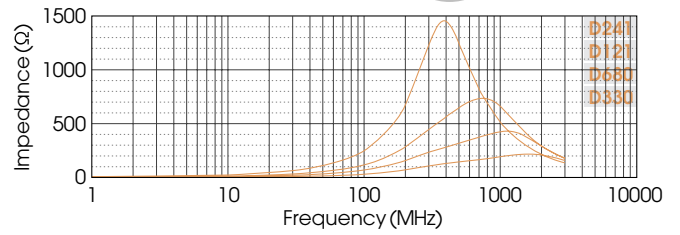
For signal lines

MMZ Series 2012 Type



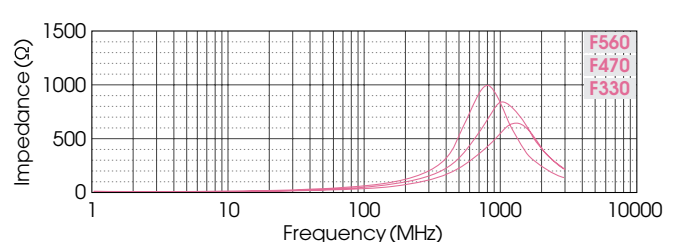
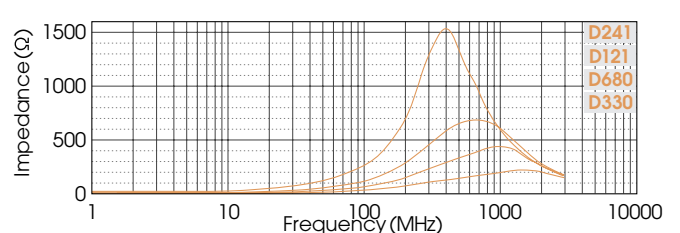
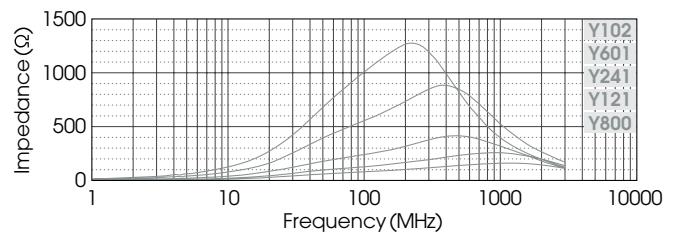
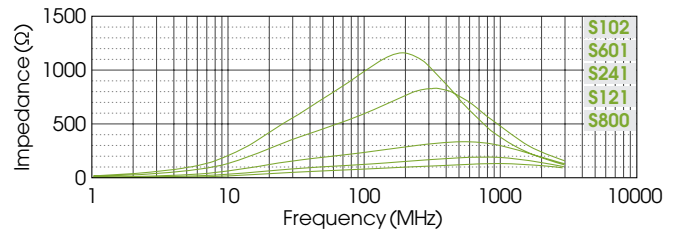
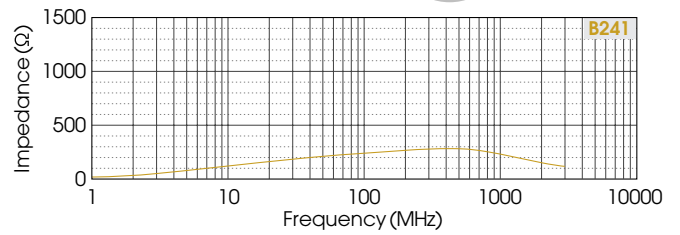
For signal lines/Arrays for 2 lines

MZA Series 1210 Type



For signal lines/Arrays for 4 lines

MZA Series 2010 Type



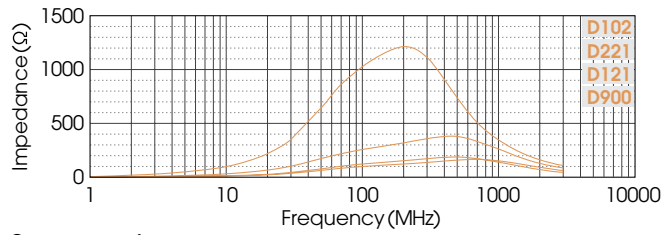
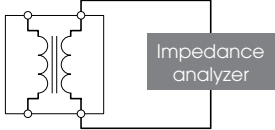
# Product Update File

Main products of multilayer chip beads and multilayer chip bead arrays  
**Impedance vs. frequency characteristics** (by each material)

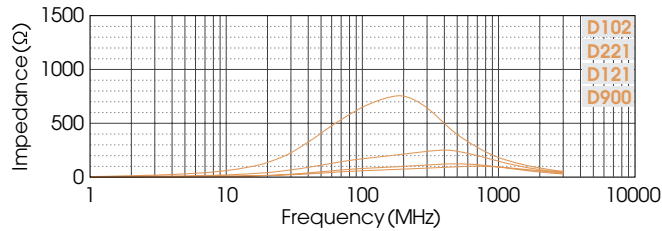
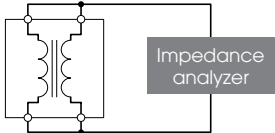
For audio lines / USB1.1 signal lines  
**MCZ Series 1210-D Type**



Open mode

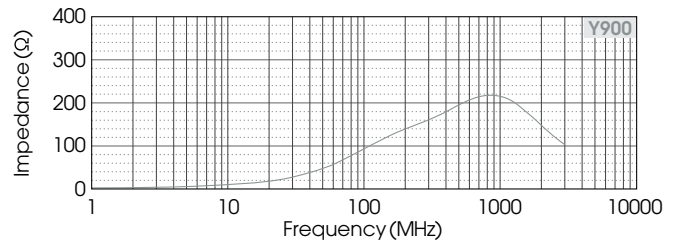
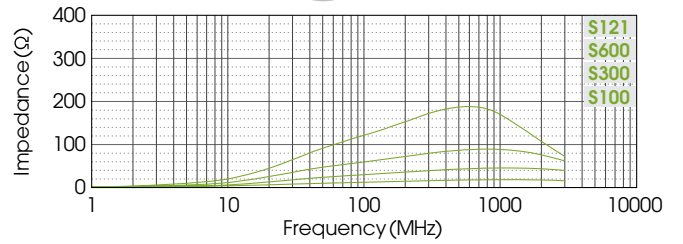
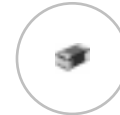


Common mode



For DC power lines

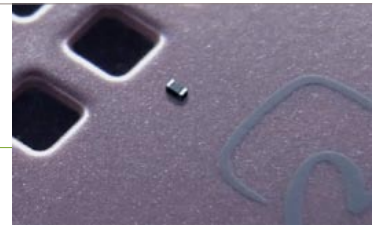
**MPZ Series 1005 Type**



# Low-Rdc And High-Impedance Multilayer Chip Beads For Signal Lines

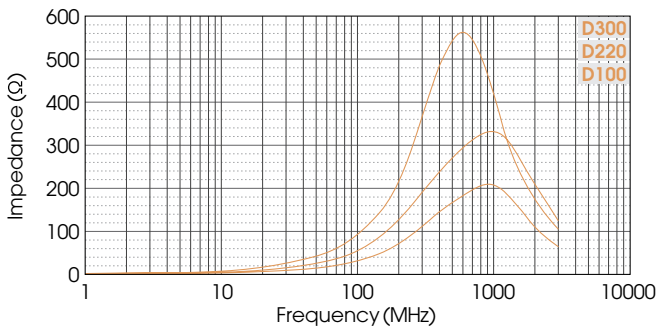
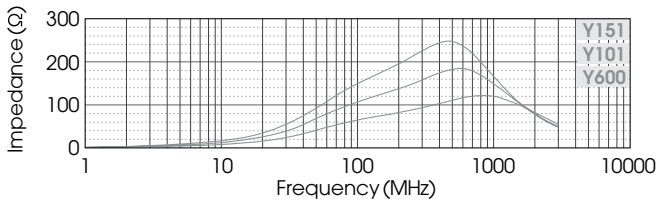
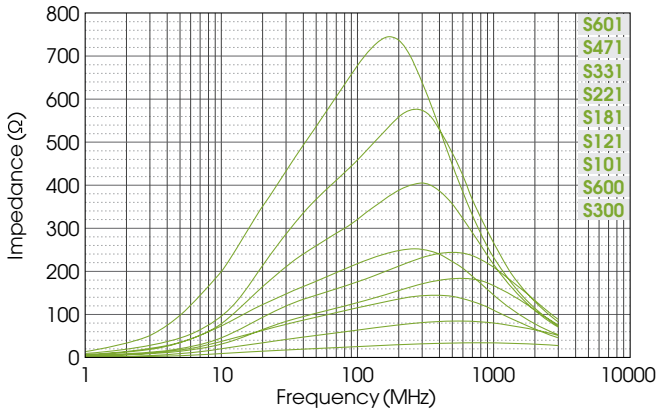
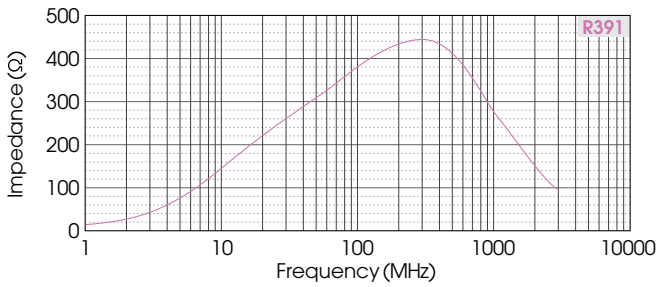
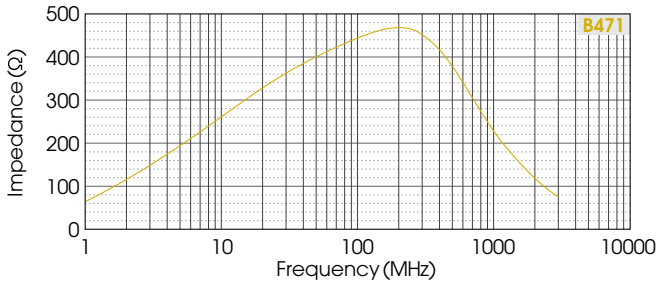
Information on related products

## MMZ Series 0402 Type



For DC power lines

MPZ Series 1608 Type



For DC power lines

MPZ Series 2012 Type

