

Notice for TAIYO YUDEN products

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- Please conduct validation and verification of products in actual condition of mounting and operating environment before commercial shipment of the equipment.

- All electronic components or functional modules listed in this catalog are developed, designed and intended for use in general electronics equipment.(for AV, office automation, household, office supply, information service, telecommunications, (such as mobile phone or PC) etc.). Before incorporating the components or devices into any equipment in the field such as transportation,(automotive control, train control, ship control), transportation signal, disaster prevention, medical, public information network (telephone exchange, base station) etc. which may have direct influence to harm or injure a human body, please contact TAIYO YUDEN CO., LTD. for more detail in advance.

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- The contents of this catalog are applicable to the products which are purchased from our sales offices or distributors (so called "TAIYO YUDEN' s official sales channel").

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



WAVE REFLOW

■ PARTS NUMBER

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

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| F | B | △ | M | J | 3 | 2 | 1 | 6 | H | S | 8 | 0 | 0 | - | T | △ |
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ | | | | | | | | |

△ = 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 |
| 4532 | 4532(1812) | 4.5 × 3.2 |

⑤ Material

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

⑥ Nominal impedance

| Code (example) | Nominal impedance [Ω] |
|----------------|-----------------------|
| 330 | 33 |
| 111 | 110 |
| 132 | 1300 |

⑦ Impedance tolerance

| Code | Impedance tolerance |
|------|---------------------|
| - | ±25% |
| N | ±30% |

⑧ Packaging

| Code | Packaging |
|------|-----------|
| T | Taping |

⑨ Internal code

| Code | Internal code |
|------|---------------|
| △ | Standard |

■ 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 |
| FB MH4532 | 1.75 | 3.5 | 3.7 |

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) | 1.1±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 |
| FB MH4532 (1812) | 4.5±0.4 (0.177±0.016) | 3.2±0.3 (0.126±0.012) | 3.2±0.3 (0.126±0.012) | 0.9±0.6 (0.035±0.024) | - | 2000 |

Unit: mm (inch)

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■ PARTS NUMBER

Standard type

● FB MJ1608

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MJ1608HS280NT | RoHS | 28 | ±30% | 100 | 0.007 | 4.0 | 0.8 ±0.2 |
| FB MJ1608HM230NT | RoHS | 23 | ±30% | 100 | 0.007 | 4.0 | 0.8 ±0.2 |

● FB MJ2125

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MJ2125HS250NT | RoHS | 25 | ±30% | 100 | 0.004 | 6.0 | 0.85 ±0.2 |
| FB MJ2125HS420-T | RoHS | 42 | ±25% | 100 | 0.008 | 4.0 | 0.85 ±0.2 |
| FB MJ2125HM210NT | RoHS | 21 | ±30% | 100 | 0.004 | 6.0 | 0.85 ±0.2 |
| FB MJ2125HM330-T | RoHS | 33 | ±25% | 100 | 0.008 | 4.0 | 0.85 ±0.2 |
| FB MJ2125HL8R0NT | RoHS | 8 | ±30% | 100 | 0.008 | 4.0 | 0.85 ±0.2 |

● FB MJ3216

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MJ3216HS480NT | RoHS | 48 | ±30% | 100 | 0.005 | 6.0 | 1.1 ±0.2 |
| FB MJ3216HS800-T | RoHS | 80 | ±25% | 100 | 0.010 | 4.0 | 1.1 ±0.2 |
| FB MJ3216HM380NT | RoHS | 38 | ±30% | 100 | 0.005 | 6.0 | 1.1 ±0.2 |
| FB MJ3216HM600-T | RoHS | 60 | ±25% | 100 | 0.010 | 4.0 | 1.1 ±0.2 |
| FB MJ3216HL160NT | RoHS | 16 | ±30% | 100 | 0.012 | 4.0 | 1.1 ±0.2 |

● FB MJ4516

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MJ4516HS720NT | RoHS | 72 | ±30% | 100 | 0.007 | 6.0 | 1.1 ±0.2 |
| FB MJ4516HS111-T | RoHS | 110 | ±25% | 100 | 0.014 | 4.0 | 1.1 ±0.2 |
| FB MJ4516HM560NT | RoHS | 56 | ±30% | 100 | 0.007 | 6.0 | 1.1 ±0.2 |
| FB MJ4516HM900-T | RoHS | 90 | ±25% | 100 | 0.014 | 4.0 | 1.1 ±0.2 |
| FB MJ4516HL230NT | RoHS | 23 | ±30% | 100 | 0.014 | 3.5 | 1.1 ±0.2 |

High impedance type

● FB MH1608

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MH1608HM470-T | RoHS | 47 | ±25% | 100 | 0.020 | 3.5 | 0.8 ±0.1 |
| FB MH1608HM600-T | RoHS | 60 | ±25% | 100 | 0.025 | 3.0 | 0.8 ±0.1 |
| FB MH1608HM101-T | RoHS | 100 | ±25% | 100 | 0.035 | 2.5 | 0.8 ±0.1 |
| FB MH1608HM151-T | RoHS | 150 | ±25% | 100 | 0.050 | 2.1 | 0.8 ±0.1 |
| FB MH1608HM221-T | RoHS | 220 | ±25% | 100 | 0.070 | 1.8 | 0.8 ±0.1 |
| FB MH1608HM331-T | RoHS | 330 | ±25% | 100 | 0.130 | 1.2 | 0.8 ±0.1 |
| FB MH1608HM471-T | RoHS | 470 | ±25% | 100 | 0.150 | 1.0 | 0.8 ±0.1 |
| FB MH1608HM601-T | RoHS | 600 | ±25% | 100 | 0.170 | 0.9 | 0.8 ±0.1 |
| FB MH1608HM102-T | RoHS | 1000 | ±25% | 100 | 0.350 | 0.6 | 0.8 ±0.1 |
| FB MH1608HL300-T | RoHS | 30 | ±25% | 100 | 0.028 | 2.6 | 0.8 ±0.1 |
| FB MH1608HL600-T | RoHS | 60 | ±25% | 100 | 0.045 | 2.1 | 0.8 ±0.1 |
| FB MH1608HL121-T | RoHS | 120 | ±25% | 100 | 0.130 | 1.2 | 0.8 ±0.1 |
| FB MH1608HL221-T | RoHS | 220 | ±25% | 100 | 0.170 | 0.9 | 0.8 ±0.1 |
| FB MH1608HL331-T | RoHS | 330 | ±25% | 100 | 0.210 | 0.8 | 0.8 ±0.1 |
| FB MH1608HL471-T | RoHS | 470 | ±25% | 100 | 0.350 | 0.6 | 0.8 ±0.1 |
| FB MH1608HL601-T | RoHS | 600 | ±25% | 100 | 0.450 | 0.5 | 0.8 ±0.1 |

● FB MH2012

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MH2012HM800-T | RoHS | 80 | ±25% | 100 | 0.025 | 2.7 | 0.85 ±0.2 |
| FB MH2012HM121-T | RoHS | 120 | ±25% | 100 | 0.032 | 2.5 | 0.85 ±0.2 |
| FB MH2012HM221-T | RoHS | 220 | ±25% | 100 | 0.060 | 2.0 | 0.85 ±0.2 |
| FB MH2012HM331-T | RoHS | 330 | ±25% | 100 | 0.080 | 1.8 | 0.85 ±0.2 |

● FB MH2016

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MH2016HM121NT | RoHS | 120 | ±30% | 100 | 0.015 | 4.5 | 1.6 ±0.2 |
| FB MH2016HM251NT | RoHS | 250 | ±30% | 100 | 0.050 | 2.0 | 1.6 ±0.2 |

● FB MH3216

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MH3216HM221NT | RoHS | 220 | ±30% | 100 | 0.020 | 4.0 | 1.6 ±0.2 |
| FB MH3216HM501NT | RoHS | 500 | ±30% | 100 | 0.070 | 2.0 | 1.6 ±0.2 |

● FB MH3225

| Parts number | EHS | Nominal impedance (Ω) | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|-----------------------|---------------------|---------------------------|--------------------------|--------------------------|----------------|
| FB MH3225HM601NT | RoHS | 600 | ±30% | 100 | 0.042 | 3.0 | 2.5 ±0.3 |
| FB MH3225HM102NT | RoHS | 1000 | ±30% | 100 | 0.100 | 2.0 | 2.5 ±0.3 |
| FB MH3225HM202NT | RoHS | 2000 | ±30% | 100 | 0.130 | 1.2 | 2.5 ±0.3 |

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■ PARTS NUMBER

● FB MH4516

| Parts number | EHS | Nominal impedance [Ω] | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|--------------------------|---------------------|------------------------------|-----------------------------|-----------------------------|-------------------|
| FB MH4516HM851NT | RoHS | 850 | ±30% | 100 | 0.100 | 1.5 | 1.6 ±0.2 |

● FB MH4525

| Parts number | EHS | Nominal impedance [Ω] | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|--------------------------|---------------------|------------------------------|-----------------------------|-----------------------------|-------------------|
| FB MH4525HM102NT | RoHS | 1000 | ±30% | 100 | 0.060 | 3.0 | 2.5 ±0.3 |
| FB MH4525HM162NT | RoHS | 1600 | ±30% | 100 | 0.130 | 2.0 | 2.5 ±0.3 |

● FB MH4532

| Parts number | EHS | Nominal impedance [Ω] | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|------------------|------|--------------------------|---------------------|------------------------------|-----------------------------|-----------------------------|-------------------|
| FB MH4532HM681-T | RoHS | 680 | ±25% | 100 | 0.028 | 4.0 | 3.2 ±0.3 |
| FB MH4532HM132-T | RoHS | 1300 | ±25% | 100 | 0.060 | 3.0 | 3.2 ±0.3 |
| FB MH4532HM202-T | RoHS | 2000 | ±25% | 100 | 0.130 | 1.3 | 3.2 ±0.3 |

● High current type

| Parts number | EHS | Nominal impedance [Ω] | Impedance tolerance | Measuring frequency [MHz] | DC Resistance [Ω] (max.) | Rated current [A] (max.) | Thickness [mm] |
|-------------------|------|--------------------------|---------------------|------------------------------|-----------------------------|-----------------------------|-------------------|
| FB MJ1608HS220NTR | RoHS | 22 | ±30% | 100 | 0.004 | 7.5 | 0.8 ±0.2 |
| FB MJ1608HS280NTR | RoHS | 28 | ±30% | 100 | 0.006 | 6.0 | 0.8 ±0.2 |
| FB MJ1608HM180NTR | RoHS | 18 | ±30% | 100 | 0.004 | 7.5 | 0.8 ±0.2 |
| FB MJ1608HM230NTR | RoHS | 23 | ±30% | 100 | 0.006 | 6.0 | 0.8 ±0.2 |

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FB MJ1608



FB MJ2125



FB MJ3216



FB MJ4516



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Standard type

FB MH1608



FBMH2012



FB MH2016



FB MH3216



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Standard type

FB MH3225



FB MH4516



FB MH4525

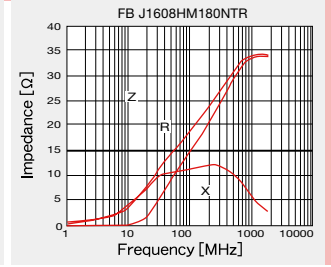
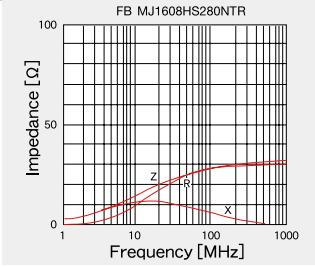
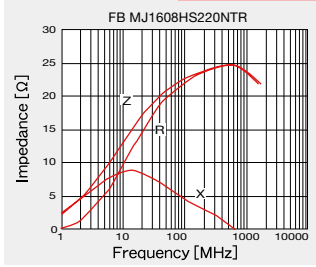


FB MH4532



NOISE SUPPRESSION COMPONENTS \ FERRITE BEAD INDUCTORS

High current type



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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) |
| FBMH4525 (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 | | | 14.0±1.5 (0.551±0.059) | |
| FBMH2016 | | | | |
| FBMH3216 | | | | |
| 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 |

| 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> | 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 |
| 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 | | | | | | | | | | | | | |
| | 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. | | | | | | | | | | | | | | |

| 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 | <p>Warp : 2mm Testing board : Glass epoxy-resin substrate Thickness : 0.8mm</p>  <p>(Unit: mm)</p> |

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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 described in this specification are intended for use in general electronic equipment, (office supply equipment, telecommunications systems, measuring equipment, and household equipment). They are not intended for use in mission-critical equipment or systems requiring special quality and high reliability (traffic systems, safety equipment, aerospace systems, nuclear control systems and medical equipment including life-support systems,) where product failure might result in loss of life, injury or damage. For such uses, contact TAIYO YUDEN Sales Department in advance. ◆ 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 0~40°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. 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. |

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