# Notice for TAIYO YUDEN products

Please read this notice before using the TAIYO YUDEN products.

## ⚠ REMINDERS

- Product information in this catalog is as of October 2015. All of the contents specified herein are subject to change without notice due to technical improvements, etc. Therefore, please check for the latest information carefully before practical application or usage of the Products.

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

- Please contact TAIYO YUDEN CO., LTD. for further details of product specifications as the individual specification is available.

- 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.
  Do not incorporate the products into any equipment in fields such as aerospace, aviation, nuclear control, submarine system, military, etc. where higher safety and reliability are especially required.

  In addition, even electronic components or functional modules that are used for the general electronic equipment, if the equipment or the electric circuit require high safety or reliability function or performances, a sufficient reliability evaluation check for safety shall be performed before commercial shipment and moreover, due consideration to install a protective circuit is strongly recommended at customer's design stage.

- 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").
  It is only applicable to the products purchased from any of TAIYO YUDEN's official sales channel.

- Please note that TAIYO YUDEN CO., LTD. shall have no responsibility for any controversies or disputes that may occur in connection with a third party's intellectual property rights and other related rights arising from your usage of products in this catalog. TAIYO YUDEN CO., LTD. grants no license for such rights.

- Caution for export
  Certain items in this catalog may require specific procedures for export according to "Foreign Exchange and Foreign Trade Control Law" of Japan, "U.S. Export Administration Regulations", and other applicable regulations. Should you have any question or inquiry on this matter, please contact our sales staff.

# AXIAL LEADED CERAMIC CAPACITORS

WAVE

## ■PARTS NUMBER

| U | P | 0 2 5 | △ B | 1 0 4 | K − | A − | B | △ Z |
|---|---|---|---|---|---|---|---|---|
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ | ⑧ | ⑨ |

△=Blank space

①Rated voltage

| Code | Rated voltage[VDC] |
|---|---|
| L | 10 |
| E | 16 |
| T | 25 |
| G | 35 |
| U | 50 |

②Series name

| Code | Series name |
|---|---|
| P | Axial leaded capacitor |

③Dimensions(L×φD)

| Code | Dimensions(L×φD)[mm] |
|---|---|
| 025 | 2.3×2.0 (Multilayer type) |
| 050 | 3.2×2.2 (Multilayer type) |
| 075 | 4.2×3.2 (Multilayer type) |

④Temperature characteristics

| Code | Temperature characteristics |
|---|---|
| CH | 0±60(ppm/℃) |
| SL | +350～−1000(ppm/℃) |
| △B | ±10% |
| B5 | ±15% |
| △F | +30/−85% |

⑤Nominal capacitance

| Code (example) | Nominal capacitance[pF] |
|---|---|
| 010 | 1 |
| 1R2 | 1.2 |
| 103 | 10000 |

※R=Decimal point

⑥Capacitance tolerance

| Code | Capacitance tolerance |
|---|---|
| D− | ±0.5pF |
| J− | ±5% |
| K− | ±10% |
| M− | ±20% |
| Z− | +80/−20% |

⑦Lead Configurations

| Code | Lead Configurations |
|---|---|
| A− | 26mm lead space, ammo pack |
| B− | 52mm lead space, ammo pack |
| KF | 5.0mm pitch formed lead bulk |
| KE | 7.5mm pitch formed lead bulk |
| NA | Axial lead, bulk |

⑧Packaging

| Code | Packaging |
|---|---|
| B | Ammo |
| C | Bulk |

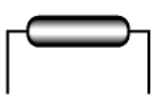
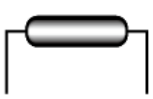
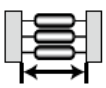
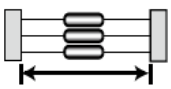
⑨Internal code

| Code | Internal code |
|---|---|
| △△ | Multilayer type (Standard) |
| △Z | |
| △J | Multilayer type (Low voltage type) |

## ■STANDARD EXTERNAL DIMENSIONS／MINIMUM QUANTITY

| Type | L | φD | φd | Minimum quantity[pcs] | | | |
|---|---|---|---|---|---|---|---|
| | | | | Bulk | | | Taping |
| | | | | NA | KF | KE | A−/B− |
| Multilayer type 025 | 2.3max (0.09max) | 2.0max (0.079max) | 0.45±0.05 (0.018±0.002) | 1000 | 4000 | — | 5000 |
| Multilayer type 050 | 3.2max (0.126max) | 2.2max (0.087max) | 0.45±0.05 (0.018±0.002) | 1000 | 3000 | — | 3000 |
| Multilayer type 075 | 4.2max (0.165max) | 3.2max (0.126max) | 0.55±0.05 (0.022±0.002) | 1000 | — | 3000 | 2000 |

Unit:mm(inch)

| Bulk | | | Taping | |
|---|---|---|---|---|
| Straight | Formed | | Straight | |
| NA | KF | KE | A− | B− |
|  |  Pitch:5.0(0.197) |  Pitch:7.5(0.295) |  26(1.024) |  52(2.047) |

Unit:mm(inch)

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

■PARTS NUMBER

●Multilayer 025 type Class 1

| Parts number | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | Q | Insulation resistance [MΩ](min.) |
|---|---|---|---|---|---|---|
| UP025△010D-□ Z ● | 50 | RoHS | 1.0 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△1R2D-□ Z ● | 50 | RoHS | 1.2 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△1R5D-□ Z ● | 50 | RoHS | 1.5 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△1R8D-□ Z ● | 50 | RoHS | 1.8 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△2R2D-□ Z ● | 50 | RoHS | 2.2 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△2R7D-□ Z ● | 50 | RoHS | 2.7 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△3R3D-□ Z ● | 50 | RoHS | 3.3 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△3R9D-□ Z ● | 50 | RoHS | 3.9 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△4R7D-□ Z ● | 50 | RoHS | 4.7 | ±0.5pF | Q≧400+20C | 10,000 |
| UP025△5R6K-□ Z ● | 50 | RoHS | 5.6 | ±10% | Q≧400+20C | 10,000 |
| UP025△6R8K-□ Z ● | 50 | RoHS | 6.8 | ±10% | Q≧400+20C | 10,000 |
| UP025△8R2K-□ Z ● | 50 | RoHS | 8.2 | ±10% | Q≧400+20C | 10,000 |
| UP025△100J-□ Z ● | 50 | RoHS | 10 | ±5% | Q≧400+20C | 10,000 |
| UP025△120J-□ Z ● | 50 | RoHS | 12 | ±5% | Q≧400+20C | 10,000 |
| UP025△150J-□ Z ● | 50 | RoHS | 15 | ±5% | Q≧400+20C | 10,000 |
| UP025△180J-□ Z ● | 50 | RoHS | 18 | ±5% | Q≧400+20C | 10,000 |
| UP025△220J-□ Z ● | 50 | RoHS | 22 | ±5% | Q≧400+20C | 10,000 |
| UP025△270J-□ Z ● | 50 | RoHS | 27 | ±5% | Q≧400+20C | 10,000 |
| UP025△330J-□ Z ● | 50 | RoHS | 33 | ±5% | Q≧1000 | 10,000 |
| UP025△390J-□ Z ● | 50 | RoHS | 39 | ±5% | Q≧1000 | 10,000 |
| UP025△470J-□ Z ● | 50 | RoHS | 47 | ±5% | Q≧1000 | 10,000 |
| UP025△560J-□ Z ● | 50 | RoHS | 56 | ±5% | Q≧1000 | 10,000 |
| UP025△680J-□ Z ● | 50 | RoHS | 68 | ±5% | Q≧1000 | 10,000 |
| UP025△820J-□ Z ● | 50 | RoHS | 82 | ±5% | Q≧1000 | 10,000 |
| UP025CH101J-□ Z | 50 | RoHS | 100 | ±5% | Q≧1000 | 10,000 |
| UP025CH151J-□ Z | 50 | RoHS | 150 | ±5% | Q≧1000 | 10,000 |
| UP025CH221J-□ Z | 50 | RoHS | 220 | ±5% | Q≧1000 | 10,000 |
| UP025CH331J-□ Z | 50 | RoHS | 330 | ±5% | Q≧1000 | 10,000 |
| UP025CH471J-□ Z | 50 | RoHS | 470 | ±5% | Q≧1000 | 10,000 |
| UP025CH681J-□ Z | 50 | RoHS | 680 | ±5% | Q≧1000 | 10,000 |
| UP025CH102J-□ Z | 50 | RoHS | 1 000 | ±5% | Q≧1000 | 10,000 |

・△Please specify the temperature characteristics
・□ Please specify the lead configuration code.
・●□ Temperature characteristics has CH and SL.

●Multilayer 025 type Class 2

| Parts number | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | tan δ | Insulation resistance [MΩ](min.) |
|---|---|---|---|---|---|---|
| UP025 B101K-□ Z | 50 | RoHS | 100 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B121K-□ Z | 50 | RoHS | 120 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B151K-□ Z | 50 | RoHS | 150 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B181K-□ Z | 50 | RoHS | 180 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B221K-□ Z | 50 | RoHS | 220 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B271K-□ Z | 50 | RoHS | 270 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B331K-□ Z | 50 | RoHS | 330 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B391K-□ Z | 50 | RoHS | 390 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B471K-□ Z | 50 | RoHS | 470 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B561K-□ Z | 50 | RoHS | 560 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B681K-□ Z | 50 | RoHS | 680 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B821K-□ Z | 50 | RoHS | 820 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B102K-□ Z | 50 | RoHS | 1 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B122K-□ Z | 50 | RoHS | 1 200 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B152K-□ Z | 50 | RoHS | 1 500 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B222K-□ Z | 50 | RoHS | 2 200 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B332K-□ Z | 50 | RoHS | 3 300 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B472K-□ Z | 50 | RoHS | 4 700 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B682K-□ Z | 50 | RoHS | 6 800 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B103K-□ Z | 50 | RoHS | 10 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B153K-□ Z | 50 | RoHS | 15 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B223K-□ Z | 50 | RoHS | 22 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B333K-□ Z | 50 | RoHS | 33 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP025 B473K-□ Z | 50 | RoHS | 47 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP025 B683K-□ Z | 50 | RoHS | 68 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP025 B104K-□ Z | 50 | RoHS | 100 000 | ±10% | tan δ ≦5.0% | 1,000 |
| EP025 B224K-□ Z | 16 | RoHS | 220 000 | ±10% | tan δ ≦5.0% | 500 |
| EP025 B474K-□ Z | 16 | RoHS | 470 000 | ±10% | tan δ ≦5.0% | 200 |
| EP025 B105K-□ Z | 16 | RoHS | 1 000 000 | ±10% | tan δ ≦7.5% | 100 |
| UP025B5105K-□ Z | 50 | RoHS | 1 000 000 | ±10% | tan δ ≦12.5% | 100 |
| UP025 F103Z-□ Z | 50 | RoHS | 10 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP025 F223Z-□ Z | 50 | RoHS | 22 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP025 F473Z-□ Z | 50 | RoHS | 47 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP025 F104Z-□ Z | 50 | RoHS | 100 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| EP025 F224Z-□ Z | 16 | RoHS | 220 000 | +80/-20% | tan δ ≦10.0% | 500 |
| EP025 F474Z-□ Z | 16 | RoHS | 470 000 | +80/-20% | tan δ ≦10.0% | 500 |
| EP025 F105Z-□ Z | 16 | RoHS | 1 000 000 | +80/-20% | tan δ ≦17.5% | 250 |
| EP025 B122M-□ J | 16 | RoHS | 1 200 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B152M-□ J | 16 | RoHS | 1 500 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B182M-□ J | 16 | RoHS | 1 800 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B222M-□ J | 16 | RoHS | 2 200 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B272M-□ J | 16 | RoHS | 2 700 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B332M-□ J | 16 | RoHS | 3 300 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B392M-□ J | 16 | RoHS | 3 900 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B472M-□ J | 16 | RoHS | 4 700 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B562M-□ J | 16 | RoHS | 5 600 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B682M-□ J | 16 | RoHS | 6 800 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B822M-□ J | 16 | RoHS | 8 200 | ±20% | tan δ ≦3.5% | 5,000 |

・□ Please specify the lead configuration code.

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■PARTS NUMBER

| Parts number | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | tan δ | Insulation resistance [MΩ] (min.) |
|---|---|---|---|---|---|---|
| EP025 B103M-□ J | 16 | RoHS | 10 000 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B123M-□ J | 16 | RoHS | 12 000 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B153M-□ J | 16 | RoHS | 15 000 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B183M-□ J | 16 | RoHS | 18 000 | ±20% | tan δ ≦3.5% | 5,000 |
| EP025 B223M-□ J | 16 | RoHS | 22 000 | ±20% | tan δ ≦3.5% | 5,000 |
| TP025 F103Z-□ J | 25 | RoHS | 10 000 | +80/−20% | tan δ ≦7.5% | 1,000 |
| TP025 F223Z-□ J | 25 | RoHS | 22 000 | +80/−20% | tan δ ≦7.5% | 1,000 |
| TP025 F473Z-□ J | 25 | RoHS | 47 000 | +80/−20% | tan δ ≦7.5% | 1,000 |

・□ Please specify the lead configuration code.

●Multilayer 050 type Class 1

| Parts number | | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | Q | Insulation resistance [MΩ] (min.) |
|---|---|---|---|---|---|---|---|
| UP050CH220J-□ Z | | 50 | RoHS | 22 | ±5% | Q≧400+20C | 10,000 |
| UP050CH240J-□ Z | ★ | 50 | RoHS | 24 | ±5% | Q≧400+20C | 10,000 |
| UP050CH270J-□ Z | | 50 | RoHS | 27 | ±5% | Q≧400+20C | 10,000 |
| UP050CH300J-□ Z | ★ | 50 | RoHS | 30 | ±5% | Q≧1000 | 10,000 |
| UP050CH330J-□ Z | | 50 | RoHS | 33 | ±5% | Q≧1000 | 10,000 |
| UP050CH360J-□ Z | ★ | 50 | RoHS | 36 | ±5% | Q≧1000 | 10,000 |
| UP050CH390J-□ Z | | 50 | RoHS | 39 | ±5% | Q≧1000 | 10,000 |
| UP050CH430J-□ Z | ★ | 50 | RoHS | 43 | ±5% | Q≧1000 | 10,000 |
| UP050CH470J-□ Z | | 50 | RoHS | 47 | ±5% | Q≧1000 | 10,000 |
| UP050CH510J-□ Z | ★ | 50 | RoHS | 51 | ±5% | Q≧1000 | 10,000 |
| UP050CH560J-□ Z | | 50 | RoHS | 56 | ±5% | Q≧1000 | 10,000 |
| UP050CH620J-□ Z | ★ | 50 | RoHS | 62 | ±5% | Q≧1000 | 10,000 |
| UP050CH680J-□ Z | | 50 | RoHS | 68 | ±5% | Q≧1000 | 10,000 |
| UP050CH750J-□ Z | ★ | 50 | RoHS | 75 | ±5% | Q≧1000 | 10,000 |
| UP050CH820J-□ Z | ★ | 50 | RoHS | 82 | ±5% | Q≧1000 | 10,000 |
| UP050CH910J-□ Z | ★ | 50 | RoHS | 91 | ±5% | Q≧1000 | 10,000 |
| UP050CH101J-□ Z | | 50 | RoHS | 100 | ±5% | Q≧1000 | 10,000 |
| UP050CH111J-□ Z | ★ | 50 | RoHS | 110 | ±5% | Q≧1000 | 10,000 |
| UP050CH121J-□ Z | ★ | 50 | RoHS | 120 | ±5% | Q≧1000 | 10,000 |
| UP050CH131J-□ Z | ★ | 50 | RoHS | 130 | ±5% | Q≧1000 | 10,000 |
| UP050CH151J-□ Z | | 50 | RoHS | 150 | ±5% | Q≧1000 | 10,000 |
| UP050CH161J-□ Z | ★ | 50 | RoHS | 160 | ±5% | Q≧1000 | 10,000 |
| UP050CH181J-□ Z | ★ | 50 | RoHS | 180 | ±5% | Q≧1000 | 10,000 |
| UP050CH201J-□ Z | ★ | 50 | RoHS | 200 | ±5% | Q≧1000 | 10,000 |
| UP050CH221J-□ Z | | 50 | RoHS | 220 | ±5% | Q≧1000 | 10,000 |
| UP050CH241J-□ Z | ★ | 50 | RoHS | 240 | ±5% | Q≧1000 | 10,000 |
| UP050CH271J-□ Z | ★ | 50 | RoHS | 270 | ±5% | Q≧1000 | 10,000 |
| UP050CH301J-□ Z | ★ | 50 | RoHS | 300 | ±5% | Q≧1000 | 10,000 |
| UP050CH331J-□ Z | | 50 | RoHS | 330 | ±5% | Q≧1000 | 10,000 |
| UP050CH361J-□ Z | ★ | 50 | RoHS | 360 | ±5% | Q≧1000 | 10,000 |
| UP050CH391J-□ Z | ★ | 50 | RoHS | 390 | ±5% | Q≧1000 | 10,000 |
| UP050CH431J-□ Z | ★ | 50 | RoHS | 430 | ±5% | Q≧1000 | 10,000 |
| UP050CH471J-□ Z | | 50 | RoHS | 470 | ±5% | Q≧1000 | 10,000 |
| UP050CH511J-□ Z | ★ | 50 | RoHS | 510 | ±5% | Q≧1000 | 10,000 |
| UP050CH561J-□ Z | ★ | 50 | RoHS | 560 | ±5% | Q≧1000 | 10,000 |
| UP050CH621J-□ Z | ★ | 50 | RoHS | 620 | ±5% | Q≧1000 | 10,000 |
| UP050CH681J-□ Z | | 50 | RoHS | 680 | ±5% | Q≧1000 | 10,000 |
| UP050CH751J-□ Z | ★ | 50 | RoHS | 750 | ±5% | Q≧1000 | 10,000 |
| UP050CH821J-□ Z | ★ | 50 | RoHS | 820 | ±5% | Q≧1000 | 10,000 |
| UP050CH911J-□ Z | ★ | 50 | RoHS | 910 | ±5% | Q≧1000 | 10,000 |
| UP050CH102J-□ Z | | 50 | RoHS | 1 000 | ±5% | Q≧1000 | 10,000 |

・□ Please specify the lead configuration code.
★ : Option

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■PARTS NUMBER

●Multilayer 050 type Class 2

| Parts number | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | tan δ | Insulation resistance [MΩ](min.) |
|---|---|---|---|---|---|---|
| UP050 B122K-□ Z ★ | 50 | RoHS | 1 200 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B152K-□ Z | 50 | RoHS | 1 500 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B182K-□ Z ★ | 50 | RoHS | 1 800 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B222K-□ Z | 50 | RoHS | 2 200 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B272K-□ Z ★ | 50 | RoHS | 2 700 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B332K-□ Z | 50 | RoHS | 3 300 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B392K-□ Z ★ | 50 | RoHS | 3 900 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B472K-□ Z | 50 | RoHS | 4 700 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B562K-□ Z ★ | 50 | RoHS | 5 600 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B682K-□ Z | 50 | RoHS | 6 800 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B822K-□ Z ★ | 50 | RoHS | 8 200 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B103K-□ Z | 50 | RoHS | 10 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B123K-□ Z ★ | 50 | RoHS | 12 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B153K-□ Z | 50 | RoHS | 15 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B183K-□ Z ★ | 50 | RoHS | 18 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B223K-□ Z | 50 | RoHS | 2 2000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B273K-□ Z ★ | 50 | RoHS | 27 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B333K-□ Z | 50 | RoHS | 33 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B393K-□ Z ★ | 50 | RoHS | 39 000 | ±10% | tan δ ≦3.5% | 5,000 |
| UP050 B473K-□ Z | 50 | RoHS | 47 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP050 B563K-□ Z ★ | 50 | RoHS | 56 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP050 B683K-□ Z | 50 | RoHS | 68 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP050 B823K-□ Z ★ | 50 | RoHS | 82 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP050 B104K-□ Z | 50 | RoHS | 100 000 | ±10% | tan δ ≦5.0% | 1,000 |
| UP050 B224K-□ Z | 50 | RoHS | 220 000 | ±10% | tan δ ≦5.0% | 500 |
| UP050 B474K-□ Z | 50 | RoHS | 470 000 | ±10% | tan δ ≦5.0% | 200 |
| GP050 B105K-□ Z | 35 | RoHS | 1 000 000 | ±10% | tan δ ≦5.0% | 100 |
| EP050 B225K-□ Z | 16 | RoHS | 2 200 000 | ±10% | tan δ ≦7.5% | 50 |
| EP050 B475K-□ Z | 16 | RoHS | 4 700 000 | ±10% | tan δ ≦12.5% | 20 |
| EP050 B106K-□ Z | 16 | RoHS | 10 000 000 | ±10% | tan δ ≦12.5% | 20 |
| UP050 F103Z-□ Z | 50 | RoHS | 10 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP050 F223Z-□ Z | 50 | RoHS | 22 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP050 F473Z-□ Z | 50 | RoHS | 47 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP050 F104Z-□ Z | 50 | RoHS | 100 000 | +80/-20% | tan δ ≦7.5% | 1,000 |
| UP050 F224Z-□ Z | 50 | RoHS | 220 000 | +80/-20% | tan δ ≦10.0% | 500 |
| UP050 F474Z-□ Z | 50 | RoHS | 470 000 | +80/-20% | tan δ ≦10.0% | 500 |
| UP050 F105Z-□ Z | 50 | RoHS | 1 000 000 | +80/-20% | tan δ ≦15.0% | 250 |
| EP050 F225Z-□ Z | 16 | RoHS | 2 200 000 | +80/-20% | tan δ ≦15.0% | 125 |
| LP050 F475Z-□ Z | 10 | RoHS | 4 700 000 | +80/-20% | tan δ ≦17.5% | 50 |
| LP050 F106Z-□ Z | 10 | RoHS | 10 000 000 | +80/-20% | tan δ ≦17.5% | 25 |

・□ Please specify the lead configuration code.
★ : Option

●Multilayer 075 type Class 2

| Parts number | Rated voltage[V] | EHS | Nominal capacitance[pF] | Capacitance tolerance | tan δ | Insulation resistance [MΩ](min.) |
|---|---|---|---|---|---|---|
| UP075 B105K-□ | 50 | RoHS | 1 000 000 | ±10% | tan δ ≦5.0% | 100 |
| GP075 B225K-□ | 35 | RoHS | 2 200 000 | ±10% | tan δ ≦7.5% | 50 |
| GP075 B475K-□ | 35 | RoHS | 4 700 000 | ±10% | tan δ ≦7.5% | 20 |
| TP075 B106K-□ | 25 | RoHS | 10 000 000 | ±10% | tan δ ≦12.5% | 20 |
| UP075B5225K-□ | 50 | RoHS | 2 200 000 | ±10% | tan δ ≦12.5% | 40 |
| UP075B5475K-□ | 50 | RoHS | 4 700 000 | ±10% | tan δ ≦12.5% | 10 |
| GP075B5106K-□ | 35 | RoHS | 10 000 000 | ±10% | tan δ ≦12.5% | 10 |
| GP075 F106Z-□ | 35 | RoHS | 10 000 000 | +80/-20% | tan δ ≦17.5% | 25 |

・□ Please specify the lead configuration code.

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

# Axial Leaded Ceramic Capacitors

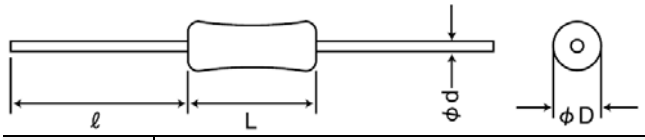
## ■PACKAGING

### ①Minimum Quantity

| Type | Lead configuration code | Minimum Quantity [pcs] | |
|---|---|---|---|
| | | Bulk | Taping |
| Multilayer type (075, 050, 025) | A－(1.024 inch wide) | － | 2000(075)<br>3000(050)<br>5000(025) |
| | B－(2.047 inches wide) | | |
| | NA | 1000 | － |
| | KE(075) | 3000 | |
| | KF(050) | 3000 | |
| | KF(025) | 4000 | |

### ②Dimensions of Bulk Products

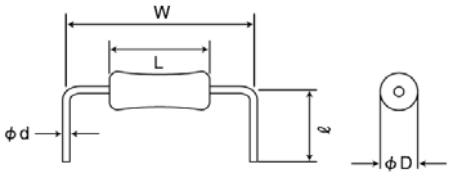
●NA configuration




| Type | Dimensions(mm) | | | |
|---|---|---|---|---|
| | ϕD | L | ϕd | ℓ |
| Multilayer type 025 | 2.0max.<br>(0.079max.) | 2.3max.<br>(0.09max.) | 0.45±0.05<br>(0.018±0.002) | 20.0min.<br>(0.787min.) |
| Multilayer type 050 | 2.2max.<br>(0.087max.) | 3.2max.<br>(0.126max.) | 0.45±0.05<br>(0.018±0.002) | 20.0min.<br>(0.787min.) |
| Multilayer type 075 | 3.2max.<br>(0.126max.) | 4.2max.<br>(0.165max.) | 0.55±0.05<br>(0.022±0.002) | 20.0min.<br>(0.787min.) |

Unit:mm(inch)

●KF/KE configuration

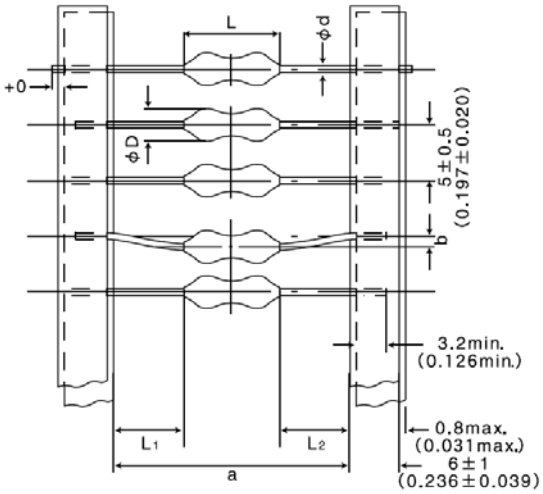



| Type | Lead configuration code | Dimensions(mm) | | | | |
|---|---|---|---|---|---|---|
| | | ϕD | L | W | ϕd | ℓ |
| Multilayer type 025 | KF | 2.0max.<br>(0.079max.) | 2.3max.<br>(0.09max.) | 5.0±0.5<br>(0.197±0.020) | 0.45±0.05<br>(0.018±0.002) | 6.5±0.5<br>(0.256±0.020) |
| Multilayer type 050 | KF | 2.2max.<br>(0.087max.) | 3.2max.<br>(0.126max.) | 5.0±0.5<br>(0.197±0.020) | 0.45±0.05<br>(0.018±0.002) | 6.5±0.5<br>(0.256±0.020) |
| Multilayer type 075 | KE | 3.2max.<br>(0.126max.) | 4.2max.<br>(0.165max.) | 7.5±0.5<br>(0.295±0.020) | 0.55±0.05<br>(0.022±0.002) | 6.5±0.5<br>(0.256±0.020) |

Unit:mm(inch)

## ③Taping Dimensions

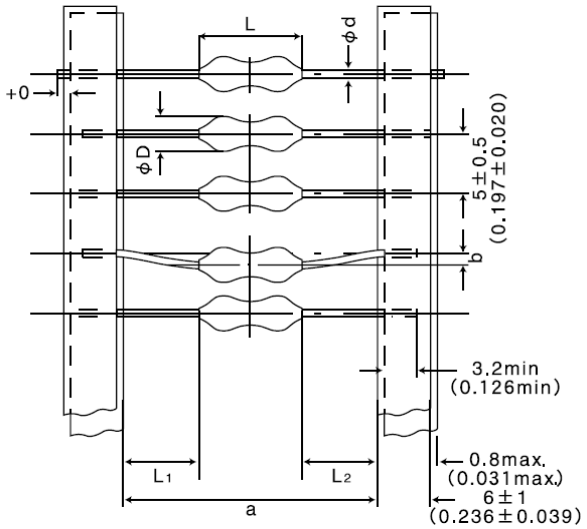
●A－(a：1.024 inch wide) configuration




| Type | Dimensions (mm) | | | | | | Minimum insertion pitch |
|---|---|---|---|---|---|---|---|
| | φD | L | a | b | \| L1－L2 \| | φd | |
| Multilayer type 025 | 2.0max. (0.079max.) | 2.3max. (0.09max) | 26＋0.5/－0 (1.024＋0.020/－0) | 0.8max. (0.031max.) | 0.5max. (0.020max.) | 0.45±0.05 (0.018±0.002) | 5.0 (0.197) |
| Multilayer type 050 | 2.2max. (0.087max.) | 3.2max. (0.126max.) | | | | 0.45±0.05 (0.018±0.002) | |
| Multilayer type 075 | 3.2max. (0.126max.) | 4.2max. (0.165max.) | | | | 0.55±0.05 (0.022±0.002) | 7.5 (0.295) |

Unit：mm (inch)

●B－(a：2.047 inches wide) configuration




| Type | Dimensions (mm) | | | | | | Minimum insertion pitch |
|---|---|---|---|---|---|---|---|
| | φD | L | a | b | \| L1－L2 \| | φd | |
| Multilayer type 025 | 2.0max. (0.079max.) | 2.3max. (0.09max.) | 52＋2/－1 (2.047＋0.079/－0.039) | 1.2max. (0.047 max.) | 1.0max. (0.039max.) | 0.45±0.05 (0.018±0.002) | 5.0 (0.197) |
| Multilayer type 050 | 2.2max. (0.087max.) | 3.2max. (0.126max.) | | | | 0.45±0.05 (0.018±0.002) | |
| Multilayer type 075 | 3.2max. (0.126max.) | 4.2max. (0.165max.) | | | | 0.55±0.05 (0.022±0.002) | 7.5 (0.295) |

Unit：mm (inch)

※Radial taping is available for 075 type (Optional)

# Axial Leaded Ceramic Capacitors

## ■RELIABILITY DATA

### 1. Operating Temperature Range

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | −25 to +85℃ |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | |
| | | Multilayer type (Characteristics : F) | |

### 2. Storage Temperature Range

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | −25 to +85℃ |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | |
| | | Multilayer type (Characteristics : F) | |

### 3. Rate Voltage

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | 50VDC |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | 16VDC, 25VDC, 35VDC, 50VDC |
| | | Multilayer type (Characteristics : F) | 10VDC, 16VDC, 25VDC, 35VDC, 50VDC |

### 4. Withstanding Voltage

Between terminals

| | | |
|---|---|---|
| Specified Value | No abnormality | |
| Test Methods and Remarks | Applied voltage | : Rate Voltage × 3 (Class 1)<br>: Rate Voltage × 2.5 (Class 2) |
| | Duration | : 1 to 5 sec. |
| | Charge/discharge current | : 50mA max. (Class 1,2) |

Between terminals and body

| | | | |
|---|---|---|---|
| Specified Value | No abnormality | | |
| Test Methods and Remarks | Metal globule method | Applied voltage | : Rate Voltage × 2.5 |
| | | Duration | : 1 to 5 sec. |
| | | Charge/Discharge current | : 50mA max. |

### 5. Insulation Resistance

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | 10000MΩ min. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | Rate voltage : 16VDC |
| | | | 1200pF～22000pF (Item△J) : 5000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF : 20MΩ min |
| | | | 10000000pF : 20MΩ min |
| | | | Rate voltage : 25VDC |
| | | | 10000000pF : 20MΩ min |
| | | | Rate voltage : 35VDC |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF : 20MΩ min |
| | | | 10000000pF : 10MΩ min |
| | | | Rate voltage : 50VDC |
| | | | 100pF～39000pF : 5000MΩ min |
| | | | 47000pF～100000pF : 1000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 40MΩ min |

| | | | |
|---|---|---|---|
| | | | 4700000pF : 10MΩ min |
| | | Multilayer type (Characteristics:F) | Rate voltage : 10VDC |
| | | | 4700000pF : 50MΩ min |
| | | | 10000000pF : 25MΩ min |
| | | | Rate voltage : 16VDC |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 500MΩ min |
| | | | 1000000pF : 250MΩ min |
| | | | 2200000pF : 125MΩ min |
| | | | Rate voltage : 25VDC |
| | | | 10000pF～47000pF(ItemΔJ) : 1000MΩ min |
| | | | Rate voltage : 35VDC |
| | | | 10000000pF : 25MΩ min |
| | | | Rate voltage : 50VDC |
| | | | 10000pF～100000pF : 1000MΩ min |
| | | | 220000pF～470000pF : 500MΩ min |
| | | | 1000000pF : 250MΩ min |
| Test Methods and Remarks | Applied voltage : Rate voltage<br>Duration : 60±5 sec. | | |

## 6. Capacitance

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | ±0.5pF<br>±5%<br>±10% |
| | Class2 (High Dielectric) | Multilayer type (Characteristics:B, B5) | ±10%, ±20%(ItemΔJ) |
| | | Multilayer type (Characteristics:F) | +80/−20% |
| Test Methods and Remarks | Measuring frequency | : 1MHz±10% | (Class1 : C≦1000pF) |
| | | : 1kHz±10% | (Class1 : C>1000pF) |
| | | : 1kHz±10% | (Class2 : C≦10μF) |
| | | : 120Hz±10% | (Class2 : C>10μF) |
| | Measuring voltage | : 1.0±0.5Vrms | (Class1 : C≦1000pF) |
| | | : 1.0±0.2Vrms | (Class1 : C>1000pF) |
| | | : 1.0±0.2Vrms | (Class2 : C≦10μF) |
| | | : 0.5±0.1Vrms | (Class2 : C>10μF) |
| | Bias application | : None | |

## 7. Q or Tangent of Loss Angle (tanδ)

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | 30pF or under : Q≧400+20C<br>33pF or over : Q≧1000<br>C:Nominal Capacitance[pF] |
| | Class2 (High Dielectric) | Multilayer type (Characteristics:B, B5) | Rate voltage : 16VDC |
| | | | 1200pF～22000pF(ItemΔJ) : 3.5% max |
| | | | 220000pF～470000pF : 5.0% max |
| | | | 1000000pF～2200000pF : 7.5% max |
| | | | 4700000pF～10000000pF : 12.5% max |
| | | | Rate voltage : 25VDC |
| | | | 10000000pF : 12.5% max |
| | | | Rate voltage : 35VDC |
| | | | 1000000pF : 5.0% max |
| | | | 2200000pF～4700000pF : 7.5% max |
| | | | 10000000pF : 12.5% max |
| | | | Rate voltage : 50VDC |
| | | | 100pF～39000pF : 3.5% max |
| | | | 47000pF～1000000pF : 5.0% max |
| | | | (1000000pF/B5 : 12.5% max) |
| | | | 2200000pF～4700000pF : 12.5% max |
| | | Multilayer type (Characteristics:F) | Rate voltage : 10VDC |
| | | | 4700000pF～10000000pF : 17.5% max |
| | | | Rate voltage : 16VDC |
| | | | 220000pF : 10.0% max |
| | | | 470000pF : 10.0% max |
| | | | 1000000pF : 17.5% max |
| | | | 2200000pF : 15.0% max |
| | | | Rate voltage : 25VDC |
| | | | 10000pF～47000pF(ItemΔJ) : 7.5% max |
| | | | Rate voltage : 35VDC |

| | | | |
|---|---|---|---|
| | | | 10000000pF : 17.5% max<br>Rate voltage : 50VDC<br>10000pF～100000pF : 7.5% max<br>220000pF～470000pF : 10.0% max<br>1000000pF : 15.0% max |
| Test Methods and Remarks | Measuring frequency<br><br><br><br>Measuring voltage<br><br><br><br>Bias application | : 1MHz±10%<br>: 1kHz±10%<br>: 1kHz±10%<br>: 120Hz±10%<br>: 1.0±0.5Vrms<br>: 1.0±0.2Vrms<br>: 1.0±0.2Vrms<br>: 0.5±0.1Vrms<br>: None | (Class1 : C≦1000pF)<br>(Class1 : C＞1000pF)<br>(Class2 : C≦10 μF)<br>(Class2 : C＞10 μF)<br>(Class1 : C≦1000pF)<br>(Class1 : C＞1000pF)<br>(Class2 : C≦10 μF)<br>(Class2 : C＞10 μF) |

## 8. Capacitance : Change due to Temperature or Rate of Capacitance Change

When voltage is not applied

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | CH : 0±60<br>SL : －350～＋1000 [ppm/℃] |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | ±10% (B5 : ±15%) |
| | | Multilayer type (Characteristics : F) | ＋30/－85 % |

Test Methods and Remarks

Measurement of capacitance at 20℃ and 85℃, －25℃ shall be made to calculate temperature characteristic by the following equation.
(Class 1)

$$\frac{(C_{85}-C_{20})}{C_{20}\times\Delta T}\times 10^{6}\ (\mathrm{ppm/℃})$$

Change of maximum capacitance deviation in step 1 to 5 (Class2)

| Step | Temperature (℃) |
|---|---|
| 1 | 20 |
| 2 | －25 |
| 3 | 20 (Reference temperature) |
| 4 | 85 |
| 5 | 20 |

※In the B5 characteristics is, the Temperatures of step 1,3, and 5 are 25℃.

## 9. Terminal Strength

Tensile

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | No abnomalities, such as cuts or looseness of terminals. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | |
| | | Multilayer type (Characteristics : F) | |

Test Methods and Remarks

Apply the stated tensile force progressively in the direction to draw terminal.

| Nominal wire diameter [mm] | Tensile force [N] | Duration [s] |
|---|---|---|
| 0.45・0.55 | 19.6 | 5 |

Torsional

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | No abnomalities, such as cuts or looseness of terminals. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | |
| | | Multilayer type (Characteristics : F) | |

Test Methods and Remarks

Suspend a weight of specified mass at the end of the terminals and incline the body through the angle of 90 degrees and return it to the initial position.
This operation is done over a period of 5 sec. Then second bend in the opposite direction shall be made.
Number of bends : 2 times

| Nominal wire diameter [mm] | Bending force [N] | Mass weight [kg] |
|---|---|---|
| 0.45・0.55 | 2.45 | 0.25 |

## 10. Resistance to Vibration

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality |

| | | | |
|---|---|---|---|
| | | | Capacitance : |
| | | | 4.7pF or under : Within ±0.5pF |
| | | | 5.6pF～8.2pF : Within±10% |
| | | | 10pF or over : Within±5% |
| | | | Q : |
| | | | 30pF or under : Q≧400+20C |
| | | | 33pF or over : Q≧1000 |
| | | | Insulation resistance : 10000MΩ min |
| | | | C : Nominal Capacitance [pF] |
| | Class2(High Dielectric) | Multilayer type (Characteristics:B, B5) | Appearance : No significant abnomality |
| | | | Withstanding Voltage : No abnomality |
| | | | Rate Voltage : 16VDC |
| | | | Capacitance |
| | | | 1200pF～22000pF(ItemΔJ) : Within ±20% |
| | | | 220000pF~10000000pF : Within ±10% |
| | | | tanδ : |
| | | | 1200pF～22000pF(ItemΔJ) : 3.5% max |
| | | | 220000pF～470000pF : 5.0% max |
| | | | 1000000pF～2200000pF : 7.5% max |
| | | | 4700000pF～10000000pF : 12.5% max |
| | | | Insulation Resistance : |
| | | | 1200pF～22000pF(ItemΔJ) : 5000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF～10000000pF : 20MΩ min |
| | | | Rate Voltage : 25VDC |
| | | | Capacitance : Within ±10% |
| | | | tanδ : |
| | | | 10000000pF : 12.5% max |
| | | | Insulation Resistance : |
| | | | 10000000pF : 20MΩ min |
| | | | Rate Voltage : 35VDC |
| | | | Capacitance : Within ±10% |
| | | | tanδ : |
| | | | 1000000pF : 5.0% max |
| | | | 2200000pF～4700000pF : 7.5% max |
| | | | 10000000pF : 12.5% max |
| | | | Insulation Resistance : |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF : 20MΩ min |
| | | | 10000000pF : 10MΩ min |
| | | | Rate Voltage : 50VDC |
| | | | Capacitance : Within ±10% |
| | | | tanδ : |
| | | | 100pF～39000pF : 3.5% max |
| | | | 47000pF～1000000pF : 5.0% max |
| | | | (1000000pF/B5 : 12.5% max) |
| | | | 2200000pF～4700000pF : 12.5% max |
| | | | Insulation Resistance : |
| | | | 100pF～39000pF : 5000MΩ min |
| | | | 47000pF～100000pF : 1000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 40MΩ min |
| | | | 4700000pF : 10MΩ min |
| | | Multilayer type (Characteristics:F) | Appearance : No significant abnomality |
| | | | Withstanding Voltage : No abnomality |
| | | | Rate Voltage : 10VDC |
| | | | Capacitance : Within +80/−20% |
| | | | tanδ : |
| | | | 4700000pF～10000000pF : 17.5% max |
| | | | Insulation Resistance : |
| | | | 4700000pF : 50MΩ min |
| | | | 10000000pF : 25MΩ min |
| | | | Rate Voltage : 16VDC |

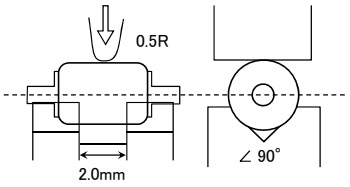
| | | | |
|---|---|---|---|
| | | | Capacitance : Within ＋80/－20%<br>tan δ :<br>220000pF : 10.0% max<br>470000pF : 10.0% max<br>1000000pF : 17.5% max<br>2200000pF : 15.0% max<br>Insulation Resistance :<br>220000pF : 500MΩ min<br>470000pF : 500MΩ min<br>1000000pF : 250MΩ min<br>2200000pF : 125MΩ min<br>Rate Voltage : 25VDC<br>Capacitance : Within ＋80/－20%<br>tan δ :<br>10000pF～47000pF(ItemΔJ) : 7.5% max<br>Insulation Resistance :<br>10000pF～47000pF(ItemΔJ) : 1000MΩ min<br>Rate Voltage : 35VDC<br>Capacitance : Within ＋80/－20%<br>tan δ :<br>10000000pF : 17.5% max<br>Insulation Resistance<br>10000000pF : 25MΩ min<br>Rate Voltage : 50VDC<br>Capacitance : Within ＋80/－20%<br>tan δ :<br>10000pF～100000pF : 7.5% max<br>220000pF～470000pF : 10.0% max<br>1000000pF : 15.0% max<br>Insulation Resistance :<br>10000pF～100000pF : 1000MΩ min<br>220000pF～470000pF : 500MΩ min<br>1000000pF : 250MΩ min |
| Test Methods and Remarks | According to JIS C 5101-1<br>Vibration type : A<br>Directions : 2 hrs each in X, Y and Z directions<br>Total : 6 hrs<br>Frequency range : 10 to 55 to 10Hz(1min)<br>Amplitude : 1.5mm<br>Mountin method : Soldering onto the PC board | | |

| 11. Free Fall | | | |
|---|---|---|---|
| Specified Value | Class1(Temperature Compensating) | Multilayer type | Appearance:No significant abnomality<br>Withstanding Voltage:No abnomality<br>Capacitance<br>4.7pF or under : Within ±0.5pF<br>5.6pF～8.2pF : Within ±10%<br>10pF or over : Within ±5%<br>Q :<br>30pF or under : Q≧400+20C<br>33pF or over : Q≧1000<br>Insulation resistance : 10000MΩ min<br>C : Nominal Capacitance [pF] |
| | Class2(High Dielectric) | Multilayer type<br>(Characteristics:B, B5) | Appearance:No significant abnomality<br>Withstanding Voltage:No abnomality<br>Rate Voltage:16VDC<br>Capacitance:<br>1200pF～22000pF(ItemΔJ) :Within ±20%<br>220000pF～10000000pF :Within ±10%<br>tan δ:<br>1200pF～22000pF(ItemΔJ) :3.5% max<br>220000pF～470000pF :5.0% max<br>1000000pF～2200000pF :7.5% max<br>4700000pF～10000000pF :12.5% max<br>Insulation resistance:<br>1200pF～22000pF(ItemΔJ) :5000MΩ min<br>220000pF :500MΩ min<br>470000pF :200MΩ min<br>1000000pF :100MΩ min |

| | | | |
|---|---|---|---|
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF～10000000pF : 20MΩ min |
| | | | Rate Voltage : 25VDC |
| | | | Capacitance : Within ±10% |
| | | | tan δ: |
| | | | 10000000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 10000000pF : 20MΩ min |
| | | | Rate Voltage : 35VDC |
| | | | Capacitance : Within ±10% |
| | | | tan δ: |
| | | | 1000000pF : 5.0% max |
| | | | 2200000pF～4700000pF : 7.5% max |
| | | | 10000000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF : 20MΩ min |
| | | | 10000000pF : 10MΩ min |
| | | | Rate Voltage : 50VDC |
| | | | Capacitance : Within ±10% |
| | | | tan δ: |
| | | | 100pF～39000pF : 3.5% max |
| | | | 47000pF～1000000pF : 5.0% max |
| | | | (1000000pF/B5 : 12.5% max) |
| | | | 2200000pF～4700000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 100pF～39000pF : 5000MΩ min |
| | | | 47000pF～100000pF : 1000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 40MΩ min |
| | | | 4700000pF : 10MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnomality |
| | | | Withstanding Voltage : No abnomality |
| | | | Rate Voltage : 10VDC |
| | | | Capacitance : Within +80/−20% |
| | | | tan δ: |
| | | | 4700000pF～10000000pF : 17.5% max |
| | | | Insulation resistance : |
| | | | 4700000pF : 50MΩ min |
| | | | 10000000pF : 25MΩ min |
| | | | Rate Voltage : 16VDC |
| | | | Capacitance : Within+80/−20% |
| | | | tan δ: |
| | | | 220000pF : 10.0% max |
| | | | 470000pF : 10.0% max |
| | | | 1000000pF : 17.5% max |
| | | | 2200000pF : 15.0% max |
| | | | Insulation resistance : |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 500MΩ min |
| | | | 1000000pF : 250MΩ min |
| | | | 2200000pF : 125MΩ min |
| | | | Rate Voltage : 25VDC |
| | | | Capacitance : Within +80/−20% |
| | | | tan δ: |
| | | | 10000pF～47000pF (ItemΔJ) : 7.5% max |
| | | | Insulation resistance : |
| | | | 10000pF～47000pF (ItemΔJ) : 1000MΩ min |
| | | | Rate Voltage : 35VDC |
| | | | Capacitance : Within +80/−20% |
| | | | tan δ: |
| | | | 10000000pF : 17.5% max |
| | | | Insulation resistance : |
| | | | 10000000pF : 25MΩ min |
| | | | Rate Voltage : 50VDC |
| | | | Capacitance : Within +80/−20% |

| | | | |
|---|---|---|---|
| | | | tan δ:<br>10000pF～100000pF : 7.5% max<br>220000pF～470000pF : 10.0% max<br>1000000pF : 15.0% max<br>Insulation resistance:<br>10000pF～100000pF : 1000MΩ min<br>220000pF～470000pF : 500MΩ min<br>1000000pF : 250MΩ min |
| Test Methods and Remarks | Drop Test : Free fall<br>Impact material : Floor<br>Height : 1 m<br>Total number of drops : 5 times | | |

## 12. Body Strength

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | No abnomality such as damage. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics: B, B5) | |
| | | Multilayer type (Characteristics: F) | |
| Test Methods and Remarks | Applied force : 19.6N<br>Duration : 5 sec.<br>Speed : Shall attain to specified force in 2 sec.<br>  <br><br>1.5mm (025type) | | |

## 13. Solderability

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | At least 75% of lead surface is covered with new solder. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics: B, B5) | |
| | | Multilayer type (Characteristics: F) | |
| Test Methods and Remarks | Solder temperature : 230±5℃<br>Duration : 2±0.5 sec. (This test may be applicable after 6 months storage.) | | |

## 14. Soldering

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | Appearance: No significant abnomality<br>Withstanding Voltage: No abnomality<br>Capacitance change:<br>8.2pF or under : Within ±0.25pF<br>10pF or over : Within ±2.5%<br>Q:<br>30pF or under : Q≧400+20C<br>33pF or over : Q≧1000<br>Insulation resistance : 10000MΩ min<br>C: Nominal Capacitance [pF] |
| | Class2 (High Dielectric) | Multilayer type (Characteristics: B, B5) | Appearance: No significant abnomality<br>Withstanding Voltage: No abnomality<br>Rate Voltage: 16VDC<br>Capacitance change:<br>1200pF～22000pF (Item△J) : Within±7.5%<br>220000pF～10000000pF : Within±10.0%<br>tan δ:<br>1200pF～22000pF (Item△J) : 3.5% max<br>220000pF～470000pF : 5.0% max<br>1000000pF～2200000pF : 7.5% max<br>4700000pF～10000000pF : 12.5% max<br>Insulation resistance:<br>1200pF～22000pF (Item△J) : 5000MΩ min<br>220000pF : 500MΩ min |

| | | | |
|---|---|---|---|
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF～10000000pF : 20MΩ min |
| | | | Rate Voltage : 25VDC |
| | | | Capacitance change : |
| | | | 10000000pF : Within ±10.0% |
| | | | tan δ: |
| | | | 10000000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 10000000pF : 20MΩ min |
| | | | Rate Voltage : 35VDC |
| | | | Capacitance change : |
| | | | 1000000pF～10000000pF : Within ±10.0% |
| | | | tan δ: |
| | | | 1000000pF : 5.0% max |
| | | | 2200000pF～4700000pF : 7.5% max |
| | | | 10000000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 50MΩ min |
| | | | 4700000pF : 20MΩ min |
| | | | 10000000pF : 10MΩ min |
| | | | Rate Voltage : 50VDC |
| | | | Capacitance change : |
| | | | 100pF～39000pF : Within ±7.5% |
| | | | 47000pF～1000000pF : Within ±10.0% |
| | | | tan δ: |
| | | | 100pF～39000pF : 3.5% max |
| | | | 47000pF～1000000pF : 5.0% max |
| | | | (1000000pF/B5 : 12.5% max) |
| | | | 2200000pF～4700000pF : 12.5% max |
| | | | Insulation resistance : |
| | | | 100pF～39000pF : 5000MΩ min |
| | | | 47000pF～100000pF : 1000MΩ min |
| | | | 220000pF : 500MΩ min |
| | | | 470000pF : 200MΩ min |
| | | | 1000000pF : 100MΩ min |
| | | | 2200000pF : 40MΩ min |
| | | | 4700000pF : 10MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnormality |
| | | | Withstanding Voltage : No abnormality |
| | | | Rate Voltage : 10VDC |
| | | | Capacitance change : Within ±20% |
| | | | tan δ: |
| | | | 4700000pF～10000000pF : 17.5% max |
| | | | Insulation resistance : |
| | | | 4700000pF : 50MΩ min |
| | | | 10000000pF : 25MΩ min |
| | | | Rate Voltage : 16VDC |
| | | | Capacitance change : Within ±20% |
| | | | tan δ: |
| | | | 220000pF～470000pF : 10.0% max |
| | | | 1000000pF : 17.5% max |
| | | | 2200000pF : 15.0% max |
| | | | Insulation resistance : |
| | | | 220000pF～470000pF : 500MΩ min |
| | | | 1000000pF : 250MΩ min |
| | | | 2200000pF : 125MΩ min |
| | | | Rate Voltage : 25VDC |
| | | | Capacitance change : Within ±20% |
| | | | tan δ: |
| | | | 10000pF～47000pF (Item△J) : 7.5% max |
| | | | Insulation resistance : |
| | | | 10000pF～47000pF (Item△J) : 1000MΩ min |
| | | | Rate Voltage : 35VDC |
| | | | Capacitance change : Within ±20% |
| | | | tan δ: |
| | | | 10000000pF : 17.5% max |

| | | | |
|---|---|---|---|
| | | | Insulation resistance:<br>10000000pF : 25MΩ min<br>Rate Voltage : 50VDC<br>Capacitance change:<br>10000pF～1000000pF : Within 20.0%<br>tan δ:<br>10000pF～100000pF : 7.5% max<br>220000pF～470000pF : 10.0% max<br>1000000pF : 15.0% max<br>Insulation resistance:<br>10000pF～100000pF : 1000MΩ min<br>220000pF～470000pF : 500MΩ min<br>1000000pF : 250MΩ min |
| Test Methods and Remarks | Solder temperature : 270±5℃<br>Duration : 5±0.5 sec.<br>Immersed conditions : Inserted into the PC board (with t=1.6mm, hole=1.0mm diameter)<br>Preconditioning : 1 hr of preconditioning at 150 +0/−10℃ followed by 48±4 hrs of recovery under the standard condition.<br>Recovery : Recovery for the following period under the standard condition after the test.<br>24±2 hrs (Class 1)<br>48±4 hrs (Class 2) | | |

## 15. Resistance to Solvent

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | No significant abnormality in appearance and legible marking. |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | |
| | | Multilayer type (Characteristics : F) | |
| Test Methods and Remarks | According to JIS C 5101-1<br>Type of test : Method 1<br>Solvent temperature : 20 to 25℃<br>Duration : 30±5 sec.<br>Solvent Type : A in Table 23, Isopropyl alcohol | | |

## 16. Thermal Shock

| | | | |
|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality<br>Capacitance change:<br>8.2pF or under : Within ±0.5pF<br>10pF or over : Within ±5.0%<br>Q:<br>8.2pF or under : Q≧200+10C<br>10pF～30pF : Q≧275+2.5C<br>33pF or over : Q≧350<br>Insulation resistance : 1000MΩ min<br>C : Nominal Capacitance [pF] |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality<br>Rate voltage : 16VDC<br>Capacitance change:<br>1200pF～22000pF (ItemΔJ) : Within ±12.5%<br>220000pF～10000000pF : Within ±15.0%<br>tan δ:<br>1200pF～22000pF (ItemΔJ) : 5.0% max<br>220000pF～470000pF : 7.5% max<br>1000000pF～2200000pF : 10.0% max<br>4700000pF～10000000pF : 22.5% max<br>Insulation resistance:<br>1200pF～22000pF (ItemΔJ) : 1000MΩ min<br>220000pF : 125MΩ min<br>470000pF : 50MΩ min<br>1000000pF : 25MΩ min<br>2200000pF : 12.5MΩ min<br>4700000pF～10000000pF : 5MΩ min<br>Rate voltage : 25VDC<br>Capacitance change:<br>10000000pF : Within ±15.0% |

| | | | |
|---|---|---|---|
| | | | tan δ: |
| | | | 10000000pF : 15.0% max |
| | | | Insulation resistance: |
| | | | 10000000pF : 5MΩ min |
| | | | Rate voltage : 35VDC |
| | | | Capacitance change: |
| | | | 1000000pF : Within ±15.0% |
| | | | 2200000pF～4700000pF : Within ±15.0% |
| | | | 10000000pF : Within ±15.0% |
| | | | tan δ: |
| | | | 1000000pF : 7.5% max |
| | | | 2200000pF～4700000pF : 10.0% max |
| | | | 10000000pF : 22.5% max |
| | | | Insulation resistance: |
| | | | 1000000pF : 50MΩ min |
| | | | 2200000pF : 25MΩ min |
| | | | 4700000pF～10000000pF : 5MΩ min |
| | | | Rate voltage : 50VDC |
| | | | Capacitance change: |
| | | | 100pF～39000pF : Within ±12.5% |
| | | | 47000pF～4700000pF : Within ±15.0% |
| | | | (1000000pF/B5 : Within ±22.5%) |
| | | | tan δ: |
| | | | 100pF～39000pF : 5.0% max |
| | | | 47000pF～1000000pF : 7.5% max |
| | | | (1000000pF/B5 : Within ±17.5%) |
| | | | 2200000pF～47000000pF : 22.5% max |
| | | | Insulation resistance: |
| | | | 100pF～39000pF : 1000MΩ min |
| | | | 47000pF～100000pF : 500MΩ min |
| | | | 220000pF : 250MΩ min |
| | | | 470000pF : 100MΩ min |
| | | | 1000000pF : 50MΩ min |
| | | | 2200000pF : 20MΩ min |
| | | | 4700000pF : 5MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnomality |
| | | | Withstanding Voltage : No abnomality |
| | | | Rate voltage : 10VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 4700000pF～10000000pF : 20.0% max |
| | | | Insulation resistance: |
| | | | 4700000pF : 10MΩ min |
| | | | 10000000pF : 5MΩ min |
| | | | Rate voltage : 16VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 220000pF～470000pF : 15.0% max |
| | | | 1000000pF : 22.5% max |
| | | | 2200000pF : 17.5% max |
| | | | Insulation resistance: |
| | | | 220000pF : 100MΩ min |
| | | | 470000pF : 50MΩ min |
| | | | 1000000pF : 25MΩ min |
| | | | 2200000pF : 25MΩ min |
| | | | Rate voltage : 25VDC |
| | | | Capacitance change : Within ±30% |
| | | | tan δ : |
| | | | 10000pF～47000pF (Item△J) : 12.5% max |
| | | | Insulation resistance: |
| | | | 10000pF～47000pF (Item△J) : 500MΩ min |
| | | | Rate voltage : 35VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 10000000pF : 20.0% max |
| | | | Insulation resistance: |
| | | | 10000000pF : 5MΩ min |
| | | | Rate voltage : 50VDC |
| | | | Capacitance change: |

| | | | |
|---|---|---|---|
| | | | 10000pF～1000000pF : Within ±30.0%<br>tan δ:<br>10000pF～100000pF : 12.5% max<br>220000pF～470000pF : 15.0% max<br>1000000pF : 17.5% max<br>Insulation resistance:<br>10000pF～100000pF : 500MΩ min<br>220000pF～470000pF : 250MΩ min<br>1000000pF : 50MΩ min |
| Test Methods and Remarks | Conditions for 1 cycle<br>Step / Temperature[℃] / Duration[min.]<br>1 / Room temperature / Within 3<br>2 / −25+0/−3 / 30±3<br>3 / Room temperature / Within 3<br>4 / +85+3/−0 / 30±3<br>5 / Room temperature / Within 3<br><br>Number of cycles : 5<br>Preconditioning : 1 hr of preconditioning at 150 +0/−10℃ followed by 48±4 hrs of recovery under the standard condition.<br>Recovery : Recovery for the following period under the standard condition after the removal from test chamber.<br>24±2 hrs( Class 1)<br>48±4 hrs( Class 2) | | |

17. Damp Heat(steady state)

| | | | |
|---|---|---|---|
| Specified Value | Class1(Temperature Compensating) | Multilayer type | Appearance:No significant abnomality<br>Withstanding Voltage:No abnomality<br>Capacitance change:<br>8.2pF or under : Within ±0.5pF<br>10pF or over : Within ±5.0%<br>Q:<br>8.2pF or under : Q≧200+10C<br>10pF～30pF : Q≧275+2.5C<br>33pF or over : Q≧350<br>Insulation resistance : 1000MΩ min<br>C : Nominal Capacitance [pF] |
| | Class2(High Dielectric) | Multilayer type<br>(Characteristics:B, B5) | Appearance:No significant abnomality<br>Withstanding Voltage:No abnomality<br>Rate voltage:16VDC<br>Capacitance change:<br>1200pF～22000pF(ItemΔJ) : Within ±12.5%<br>220000pF～10000000pF : Within ±15.0%<br>tan δ:<br>1200pF～22000pF(ItemΔJ) : 5.0% max<br>220000pF～470000pF : 7.5% max<br>1000000pF～2200000pF : 10.0% max<br>4700000pF～10000000pF : 22.5% max<br>Insulation resistance:<br>1200pF～22000pF(ItemΔJ) : 1000MΩ min<br>220000pF : 125MΩ min<br>470000pF : 50MΩ min<br>1000000pF : 25MΩ min<br>2200000pF : 12.5MΩ min<br>4700000pF～10000000pF : 5MΩ min<br>Rate voltage:25VDC<br>Capacitance change:<br>10000000pF : Within ±15.0%<br>tan δ:<br>10000000pF : 15.0% max<br>Insulation resistance:<br>10000000pF : 5MΩ min<br>Rate voltage:35VDC<br>Capacitance change:<br>1000000pF : Within ±15.0%<br>2200000pF～4700000pF : Within ±15.0%<br>10000000pF : Within ±15.0%<br>tan δ:<br>1000000pF : 10.0% max<br>2200000pF～4700000pF : 10.0% max<br>10000000pF : 22.5% max |

| | | | |
|---|---|---|---|
| | | | Insulation resistance: |
| | | | 1000000pF : 50MΩ min |
| | | | 2200000pF : 25MΩ min |
| | | | 4700000pF～10000000pF : 5MΩ min |
| | | | Rate voltage : 50VDC |
| | | | Capacitance change: |
| | | | 100pF～39000pF : Within ±12.5% |
| | | | 47000pF～4700000pF : Within ±15.0% |
| | | | (1000000pF/B5 : Within ±22.5%) |
| | | | tan δ: |
| | | | 100pF～39000pF : 5.0% max |
| | | | 47000pF～1000000pF : 7.5% max |
| | | | (1000000/B5 : 17.5% max) |
| | | | 2200000pF～4700000pF : 22.5% max |
| | | | Insulation resistance: |
| | | | 100pF～39000pF : 1000MΩ min |
| | | | 47000pF～100000pF : 500MΩ min |
| | | | 220000pF : 250MΩ min |
| | | | 470000pF : 100MΩ min |
| | | | 1000000pF : 50MΩ min |
| | | | 2200000pF : 20MΩ min |
| | | | 4700000pF : 5MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnomality |
| | | | Withstanding Voltage : No abnomality |
| | | | Rate voltage : 10VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 4700000pF～10000000pF : 20.0% max |
| | | | Insulation resistance: |
| | | | 4700000pF : 10MΩ min |
| | | | 10000000pF : 5MΩ min |
| | | | Rate voltage : 16VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 220000pF～470000pF : 15.0% max |
| | | | 1000000pF : 22.5% max |
| | | | 2200000pF : 17.5% max |
| | | | Insulation resistance: |
| | | | 220000pF : 100MΩ min |
| | | | 470000pF : 50MΩ min |
| | | | 1000000pF : 25MΩ min |
| | | | 2200000pF : 25MΩ min |
| | | | Rate voltage : 25VDC |
| | | | Capacitance change : Within ±30% |
| | | | tan δ: |
| | | | 10000pF～47000pF (Item△J) : 12.5% max |
| | | | Insulation resistance: |
| | | | 10000pF～47000pF (Item△J) : 500MΩ min |
| | | | Rate voltage : 35VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ: |
| | | | 10000000pF : 20.0% max |
| | | | Insulation resistance: |
| | | | 10000000pF : 5MΩ min |
| | | | Rate voltage : 50VDC |
| | | | Capacitance change: |
| | | | 10000pF～1000000pF : Within ±30.0% |
| | | | tan δ: |
| | | | 10000pF～100000pF : 12.5% max |
| | | | 220000pF～470000pF : 15.0% max |
| | | | 1000000pF : 17.5% max |
| | | | Insulation resistance: |
| | | | 10000pF～100000pF : 500MΩ min |
| | | | 220000pF～470000pF : 250MΩ min |
| | | | 1000000pF : 50MΩ min |

| | | |
|---|---|---|
| Test Methods and Remarks | Temperature | : 40±2℃ |
| | Humidity | : 90 to 95 % RH |
| | Duration | : 500hrs+24/−0 hrs |
| | Preconditioning | : 1 hr of preconditioning at 150+0/−10 ℃ followed by 48±4 hrs of recovery under the standard condition. |

| | | |
|---|---|---|
| | Recovery | : 24±2 hrs of recovery under the standard condition after the removal from test chamber. (Class 1)<br>: 1 hr of preconditioning at 150+10/−0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2) |

| 18. Loading under Damp Heat | | | | |
|---|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality | |
| | | | Capacitance change : | |
| | | | 8.2pF or under | : Within ±0.75pF |
| | | | 10pF or over | : Within ±7.5% |
| | | | Q : | |
| | | | 30pF or under | : Q≧100+10/3*C |
| | | | 33pF or over | : Q≧200 |
| | | | Insulation resistance | : 500MΩ min |
| | | | C : Nominal Capacitance [pF] | |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality | |
| | | | Rate voltage : 16VDC | |
| | | | Capacitance change : | |
| | | | 1200pF～22000pF (Item△J) | : Within ±12.5% |
| | | | 220000pF～470000pF | : Within ±15.0% |
| | | | 1000000pF～10000000pF | : Within ±22.5% |
| | | | tan δ : | |
| | | | 1200pF～22000pF (Item△J) | : 5.0% max |
| | | | 220000pF～470000pF | : 7.5% max |
| | | | 1000000pF～2200000pF | : 10.0% max |
| | | | 4700000pF～10000000pF | : 22.5% max |
| | | | Insulation resistance : | |
| | | | 1200pF～22000pF (Item△J) | : 500MΩ min |
| | | | 220000pF | : 50MΩ min |
| | | | 470000pF | : 25MΩ min |
| | | | 1000000pF | : 12.5MΩ min |
| | | | 2200000pF | : 5.0MΩ min |
| | | | 4700000pF～10000000pF | : 2.5MΩ min |
| | | | Rate voltage : 25VDC | |
| | | | Capacitance change : | |
| | | | 10000000pF | : Within ±22.5% |
| | | | tan δ : | |
| | | | 10000000pF | : 22.5% max |
| | | | Insulation resistance : | |
| | | | 10000000pF | : 2.5MΩ min |
| | | | Rate voltage : 35VDC | |
| | | | Capacitance change : | |
| | | | 1000000pF | : Within ±15.0% |
| | | | 2200000pF | : Within ±15.0% |
| | | | 4700000pF～10000000pF | : Within ±22.5% |
| | | | tan δ : | |
| | | | 1000000pF | : 10.0% max |
| | | | 2200000pF～4700000pF | : 10.0% max |
| | | | 10000000pF | : 22.5% max |
| | | | Insulation resistance : | |
| | | | 1000000pF | : 12.5MΩ min |
| | | | 2200000pF | : 5.0MΩ min |
| | | | 4700000pF～10000000pF | : 2.5MΩ min |
| | | | Rate voltage : 50VDC | |
| | | | Capacitance change : | |
| | | | 100pF～39000pF | : Within ±12.5% |
| | | | 47000pF～1000000pF | : Within ±15.0% |
| | | | (1000000pF/B5 | : Within ±22.5%) |
| | | | 2200000pF～4700000pF | : Within ±22.5% |
| | | | tan δ : | |
| | | | 100pF～39000pF | : 5.0% max |
| | | | 47000pF～1000000pF | : 7.5% max |
| | | | (1000000pF/B5 | : 17.5% max) |
| | | | 2200000pF～4700000pF | : 22.5% max |
| | | | Insulation resistance : | |
| | | | 100pF～39000pF | : 500MΩ min |
| | | | 47000pF～100000pF | : 250MΩ min |

| | | | | |
|---|---|---|---|---|
| | | | 220000pF | : 125MΩ min |
| | | | 470000pF | : 25MΩ min |
| | | | 1000000pF | : 12.5MΩ min |
| | | | 2200000pF | : 10MΩ min |
| | | | 4700000pF | : 2.5MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality | |
| | | | Rate voltage : 10VDC | |
| | | | Capacitance change | : Within ±30.0% |
| | | | tan δ: | |
| | | | 4700000pF～10000000pF | : 20.0% max |
| | | | Insulation resistance : | |
| | | | 4700000pF | : 5MΩ min |
| | | | 10000000pF | : 2.5MΩ min |
| | | | Rate voltage : 16VDC | |
| | | | Capacitance change | : Within ±30.0% |
| | | | tan δ: | |
| | | | 220000pF～470000pF | : 15.0% max |
| | | | 1000000pF | : 22.5% max |
| | | | 2200000pF | : 17.5% max |
| | | | Insulation resistance : | |
| | | | 220000pF | : 50MΩ min |
| | | | 470000pF | : 25MΩ min |
| | | | 1000000pF | : 12.5MΩ min |
| | | | 2200000pF | : 12.5MΩ min |
| | | | Rate voltage : 25VDC | |
| | | | Capacitance change | : Within ±30.0% |
| | | | tan δ: | |
| | | | 10000pF～47000pF (Item△J) | : 12.5% max |
| | | | Insulation resistance : | |
| | | | 10000pF～47000pF (Item△J) | : 250MΩ min |
| | | | Rate voltage : 35VDC | |
| | | | Capacitance change | : Within ±30.0% |
| | | | tan δ: | |
| | | | 10000000pF | : 20.0% max |
| | | | Insulation resistance : | |
| | | | 10000000pF | : 2.5MΩ min |
| | | | Rate voltage : 50VDC | |
| | | | Capacitance change | : |
| | | | 10000pF～1000000pF | : Within ±30.0% |
| | | | tan δ: | |
| | | | 10000pF～100000pF | : 12.5% max |
| | | | 220000pF～470000pF | : 15.0% max |
| | | | 1000000pF | : 17.5% max |
| | | | Insulation resistance : | |
| | | | 10000pF～100000pF | : 250MΩ min |
| | | | 220000pF～470000pF | : 125MΩ min |
| | | | 1000000pF | : 25MΩ min |
| Test Methods and Remarks | Temperature : 40±2℃<br>Humidity : 90 to 95 % RH<br>Duration : 500 +24/−0 hrs<br>Applied voltage : Rate voltage<br>Preconditioning : 1 hr of preconditioning at 150 +0/−10 ℃ followed by 48±4 hrs of recovery under the standard condition.<br>Recovery : 24±2 hrs of recovery under the standard condition after the removal from test cham-ber. (Class 1)<br>: 1 hr of preconditioning at 150+10/−0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2) | | | |

19. High Temperature Lading Test

| | | | | |
|---|---|---|---|---|
| Specified Value | Class1 (Temperature Compensating) | Multilayer type | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality | |
| | | | Capacitance change : | |
| | | | 8.2pF or under | : Within ±0.3pF |
| | | | 10pF or over | : Within ±3.0% |
| | | | Q : | |
| | | | 8.2pF or under | : Q≧200+10C |
| | | | 10pF～30pF | : Q≧275+2.5C |
| | | | 33pF or over | : Q≧350 |
| | | | Insulation resistance | : 1000MΩ min |

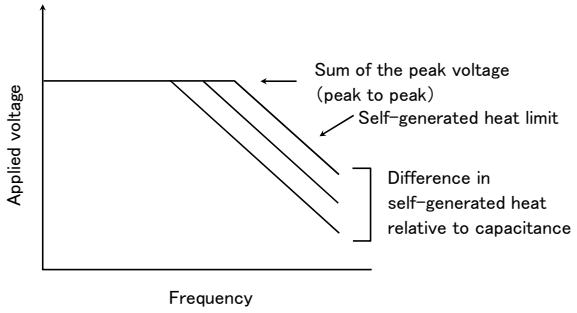
| | | | |
|---|---|---|---|
| | | | C : Nominal Capacitance [pF] |
| | Class2 (High Dielectric) | Multilayer type (Characteristics : B, B5) | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality |
| | | | Rate voltage : 16VDC |
| | | | Capacitance change :<br>1200pF～22000pF (Item△J) : Within ±12.5%<br>220000pF～470000pF : Within ±15.0%<br>1000000pF～10000000pF : Within ±22.5% |
| | | | tan δ :<br>1200pF～22000pF (Item△J) : 5.0% max<br>220000pF～470000pF : 7.5% max<br>1000000pF～2200000pF : 10.0% max<br>4700000pF～10000000pF : 22.5% max |
| | | | Insulation resistance :<br>1200pF～22000pF (Item△J) : 1000MΩ min<br>220000pF : 125MΩ min<br>470000pF : 50MΩ min<br>1000000pF : 25MΩ min<br>2200000pF : 12.5MΩ min<br>4700000pF～10000000pF : 5.0MΩ min |
| | | | Rate voltage : 25VDC |
| | | | Capacitance change :<br>10000000pF : Within ±22.5% |
| | | | tan δ :<br>10000000pF : 22.5% max |
| | | | Insulation resistance :<br>10000000pF : 5MΩ min |
| | | | Rate voltage : 35VDC |
| | | | Capacitance change :<br>1000000pF : Within ±15.0%<br>2200000pF : Within ±15.0%<br>4700000pF～10000000pF : Within ±22.5% |
| | | | tan δ :<br>1000000pF : 10.0% max<br>2200000pF～4700000pF : 10.0% max<br>10000000pF : 22.5% max |
| | | | Insulation resistance :<br>1000000pF : 25MΩ min<br>2200000pF : 25MΩ min<br>4700000pF～10000000pF : 5MΩ min |
| | | | Rate voltage : 50VDC |
| | | | Capacitance change :<br>100pF～39000pF : Within ±12.5%<br>47000pF～1000000pF : Within ±15.0%<br>(1000000pF/B5 : Within ±22.5%)<br>2200000pF～4700000pF : Within ±22.5% |
| | | | tan δ :<br>100pF～39000pF : 5.0% max<br>47000pF～1000000pF : 7.5% max<br>(1000000/B5 : 17.5% max)<br>2200000pF～4700000pF : 22.5% max |
| | | | Insulation resistance :<br>100pF～39000pF : 1000MΩ min<br>47000pF～100000pF : 500MΩ min<br>220000pF : 250MΩ min<br>470000pF : 100MΩ min<br>1000000pF : 50MΩ min<br>2200000pF : 20MΩ min<br>4700000pF : 5MΩ min |
| | | Multilayer type (Characteristics : F) | Appearance : No significant abnomality<br>Withstanding Voltage : No abnomality |
| | | | Rate voltage : 10VDC |
| | | | Capacitance change : Within ±30.0% |
| | | | tan δ :<br>4700000pF～10000000pF : 20.0% max |
| | | | Insulation resistance :<br>4700000pF : 10MΩ min<br>10000000pF : 5MΩ min |
| | | | Rate voltage : 16VDC |

| | | | |
|---|---|---|---|
| | | | Capacitance change : Within ±30.0%<br>tan δ:<br>220000pF～470000pF : 15.0% max<br>1000000pF : 22.5% max<br>2200000pF : 17.5% max<br>Insulation resistance:<br>220000pF : 100MΩ min<br>470000pF : 50MΩ min<br>1000000pF : 25MΩ min<br>2200000pF : 25MΩ min<br>Rate voltage:25VDC<br>Capacitance change : Within ±30%<br>tan δ:<br>10000pF～47000pF(ItemΔJ) : 10.0% max<br>Insulation resistance:<br>10000pF～47000pF(ItemΔJ) : 500MΩ min<br>Rate voltage:35VDC<br>Capacitance change : Within ±30.0%<br>tan δ:<br>10000000pF : 20.0% max<br>Insulation resistance:<br>10000000pF : 5MΩ min<br>Rate voltage:50VDC<br>Capacitance change:<br>10000pF～1000000pF : Within 30.0%<br>tan δ:<br>10000pF～100000pF : 10.0% max<br>220000pF～470000pF : 12.5% max<br>1000000pF : 17.5% max<br>Insulation resistance:<br>10000pF～100000pF : 500MΩ min<br>220000pF～470000pF : 250MΩ min<br>1000000pF : 50MΩ min |
| Test Methods and Remarks | Temperature : 85 ＋3/－0 ℃<br>Duration : 1000 ＋48/－0 hrs<br>Applied voltage : Rate voltage × 2<br>: Rate voltage × 1.5<br>Class 2: B,B5 1000000pF(025Type)<br>: B,B5 220000pF～10000000pF(050Type, 075Type)<br>Preconditioning : 1 hr of preconditioning at 150 ＋10－0 ℃ followed by 48±4 hrs of recovery under the standard condition.<br>Recovery : 24±2hrs of recovery under the standard condition after the removal from test chamber. (Class1)<br>: 1 hr of preconditioning at 150＋10－0 ℃ followed by 48±4 hrs of recovery under the standard condition after the removal from chamber. (Class 2) | | |

Note on standard condition: "standard condition" referred to herein is defined as follows:
5 to 35℃ 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±2℃ 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."
Withstanding voltage is also referred to as "voltage proof" under IEC specifications.

# Precautions on the use of Axial Leaded Ceramic Capacitors

■PRECAUTIONS

| 1. Circuit Design | |
|---|---|
| Precautions | ◆Verification of operating environment, electrical rating and performance<br>1. A malfunction in medical equipment, spacecraft, nuclear reactors, etc. may cause serious harm to human life or have severe social ramifications. As such, any capacitors to be used in such equipment may require higher safety and/or reliability considerations and should be clearly differentiated from components used in general purpose applications.<br>◆Verification of Rated voltage( DC rated voltage)<br>1. The operating voltage for capacitors must always be lower than their rated values.<br>If an AC voltage is loaded on a DC voltage, the sum of the two peak voltages should be lower than the rated value of the capacitor chosen. For a circuit where both an AC and a pulse voltage may be present, the sum of their peak voltages should also be lower than the capacitor's rated voltage.<br>◆Self-generated heat (Verification of Temperature)<br>1. If the capacitors specified only for DC use are used in AC or pulse circuits, the AC or a pulse current can generate heat inside the capacitor so the self-generated temperature rise should be limited to within 20℃. The surface temperature measured should include this self-temperature rise. Therefore, it is required to limit capacitor surface temperature including self -generated heat should not exceed the maximum operating temperature of +85℃.<br>◆Operating Environment precautions<br>1. Capacitors should not be used in the following environments:<br>(1)Environmental conditions to avoid<br>a. exposure to water or salt water.<br>b. exposure to moisture or condensation.<br>c. exposure to corrosive gases (such as hydrogen sulfide, sulfurous acid, chlorine, and ammonia) |
| Technical considerations | 1-1. When an AC or a pulse voltage is applied to capacitors specified for DC use, even if the voltage is less than the rated voltage, the AC current or pulse current running through the capacitor will cause the capacitor to self-generate heat because of the loss characteristics.<br>The amount of heat generated depends on the dielectric materials used, capacitance, applied voltage, frequency, voltage waveform, etc. The surface temperature changes due to emitted heat which differs by capacitor shape or mounting method.<br>Please contact Taiyo Yuden with any questions regarding emitted heat levels in your particular application. It is recommended the temperature rise be measured in the actual circuit to be used.<br>1-2. For capacitors, the voltage and frequency relationship is generally determined by peak voltage at low frequencies, and by self-generated heat at high frequencies. (Refer to the following curve.)<br>  <br> |

| 2. PCB Design | |
|---|---|
| Precautions | ◆Design of the capacitor mount<br>1. When capacitors are mounted onto a PC board, hole dimensions on the board should match the lead pitch of the component, if not it will cause breakage of the terminals or cracking of terminal roots covered with resin as excess stress travels through the terminal legs. As a result, humidity resistance performance would be lost and may lead to a reduction in insulation resistance and cause a withstand voltage failure. |

| 3. Considerations for automatic insertion | |
|---|---|
| Precautions | ◆Adjustment Automatic Insertion machines( leaded components)<br>1. When inserting capacitors in a PC board by auto-insertion machines the impact load imposed on the capacitors should be minimized to prevent the leads from chucking or clinching. |
| Technical considerations | 1. When installing products, care should be taken not to apply distortion stress as it may deform the products.<br>2. Our company recommends the method to place the lead with fewer loads that join the product. |

| 4. Soldering |
|---|

| | |
|---|---|
| Precautions | ◆Selection of Flux<br>1. When soldering capacitors are on the board, flux should be applied thinly and evenly.<br>2. Flux used should be with less than or equal to 0.1 wt% (equivalent to Chlorine) of halogenated content. Flux having a strong acidity content should not be applied.<br>3. When using water-soluble flux, special care should be taken to properly clean the boards.<br>◆Wave Soldering<br>1. Temperature, time, amount of solder, etc. are specified in accordance with the following recommended conditions.<br>2. Do not immerse the entire capacitor in the flux during the soldering operation. Only solder the lead wires on the bottom of the board.<br>◆Recommended conditions for using a soldering iron:<br>1. Put the soldering iron on the land-pattern.<br>Soldering iron's temperature – below 350℃<br>Duration – 3 seconds or less<br>Numbers of times – 1 times<br>The soldering iron should not directly touch the capacitor. |
| Technical considerations | ◆Selection of Flux<br>1. Flux is used to increase solderability in wave soldering, but if too much is applied, a large amount of flux gas may be emitted and may detrimentally affect solderability. To minimize the amount of flux applied, it is recommended to use a flux-bubbling system.<br>2. With too much halogenated substance (Chlorine, etc.) content is used to activate the flux, an excessive amount of residue after soldering may lead to corrosion of the terminal electrodes or degradation of insulation resistance on the surface of the capacitors.<br>3. Since the residue of water-soluble flux is easily dissolved by water content in the air, the residue on the surface of capacitors in high humidity conditions may cause a degradation of insulation resistance and therefore affect the reliability of the components. The cleaning methods and the capability of the machines used should also be considered carefully when selecting water-soluble flux.<br>◆Wave Soldering<br>1. If capacitors are used beyond the range of the recommended conditions, heat stresses may cause cracks inside the capacitors, and consequently degrade the reliability of the capacitors.<br>2. When the capacitors are dipped in solder, some soldered parts of the capacitor may melt due to solder heat and cause short-circuits or cracking of the ceramic material. Deterioration of the resin coating may lower insulation resistance and cause a reduction of withstand voltage.<br>◆Recommended conditions for using a soldering iron:<br>1. If products are used beyond the range of the recommended conditions, heat stress may deform the products, and consequently degrade the reliability of the products. |

| 5. Cleaning | |
|---|---|
| Precautions | ◆Board cleaning<br>1. When cleaning the mounted PC boards, make sure that cleaning conditions are consistent with prescribed usage conditions. |
| Technical considerations | 1. The resin material used for the outer coating of capacitors is occasionally a wax substance for moisture resistance which can easily be dissolved by some solutions.<br>So before cleaning, special care should be taken to test the component's vulnerability to the solutions used.<br>When using water-soluble flux please clean the PCB with purified water sufficiently and dry thoroughly at the end of the process.<br>Insufficient washing or drying could lower the reliability of the capacitors. |

| 6. Post-cleaning-process | |
|---|---|
| Precautions | ◆Application of resin molding, etc. to the PCB and components.<br>1. Please contact your local Taiyo Yuden sales office before performing resin coating or molding on mounted capacitors. Please contact your local Taiyo Yuden sales office in case of sealing the capacitor with resin or molding it on mounted capacitors. Please verify that the sealing or molding does not affect on the actual application in quality. |
| Technical considerations | 1-1. The thermal expansion and coefficient of contraction of the molded resin are not necessarily matched with those of the capacitor. The capacitors may be exposed to stresses due to thermal expansion and contraction during and after hardening. This may lower the specified characteristics and insulation resistance or cause reduced withstanding voltage by cracking the ceramic or separating the coated resin from the ceramics.<br>1-2. With some types of mold resins, the resin's decomposition gas or reaction gas may remain inside the resin during the hardening period or while left under normal conditions, cause a deterioration of the capacitor's performance.<br>1-3. Some mold resins may have poor moisture proofing properties. Please verify the contents of the resins before they are applied.<br>1-4. Please contact Taiyo Yuden before using if the hardening process temperature of the mold resins is higher than the operating temperature of the capacitors. |

| 7. Handling | |
|---|---|
| Precautions | ◆Mechanical considerations<br>1. Be careful not to subject the capacitors to excessive mechanical shocks. Withstanding voltage failure may result.<br>2. If ceramic capacitors are dropped onto the floor or a hard surface they should not be used. |
| Technical considerations | 1. Because the capacitor is made of ceramic, mechanical shocks applied to the board may damage or crack the capacitors.<br>2. Ceramic capacitors which are dropped onto the floor or a hard surface may develop defects and have a higher risk of failure over time. |

| 8. Storage conditions |
|---|

| | |
|---|---|
| Precautions | ◆Storage<br>1. To maintain the solderability of terminal electrodes and to keep the packaging material in good condition, care must be taken to control temperature and humidity in the storage area. Humidity should especially be kept as low as possible. Recommended conditions: Ambient temperature Below 40 ℃ Humidity Below 70% RH.<br>Products should be used within 6 months after delivery. After the above period, the solderability should be checked before using the capacitors.<br>2. Capacitors should not be kept in an environment filled with decomposition gases such as sulfurous hydrogen, sulfurous acid, chlorine, ammonia, etc.<br>3. Capacitors should not be kept in a location where they may be exposed to moisture, condensation or direct sunlight. |
| Technical considerations | 1. Under high temperature/high humidity conditions, the decrease in solderability due to the oxidation of terminal electrodes and deterioration of taping and packaging characteristics may be accelerated. |