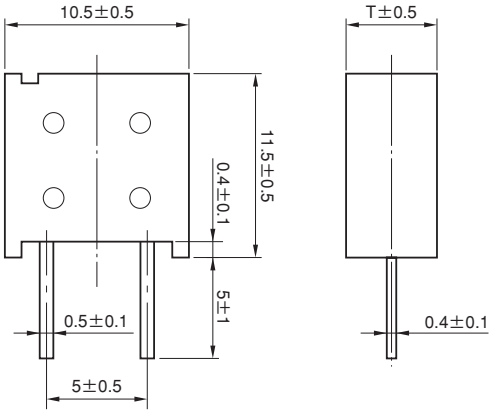
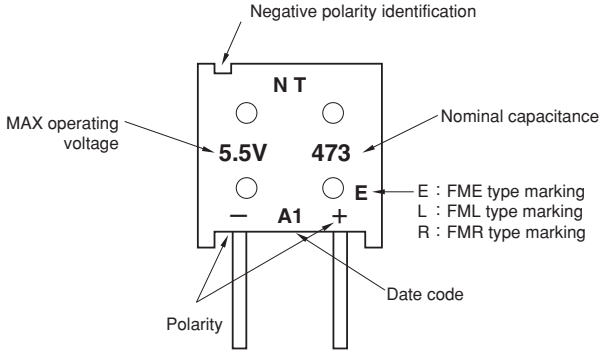
# 6.2 FM Series

## Dimensions

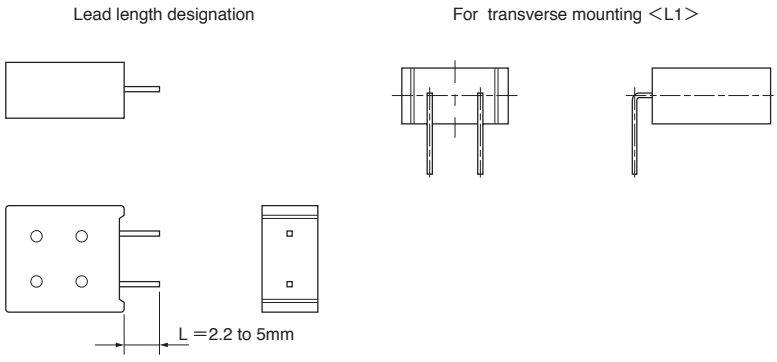



(Unit : mm)

## Markings




## Lead terminal forming example





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# Specifications

## ● 5.5V Type

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | Voltage holding characteristics (V) | T (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | | |
| FM0H103ZF | FM0H103ZFTP（） | 5.5 | 0.01 | 0.014 | 300 | 0.015 | 4.2 | 5.0 | 1.3 |
| FM0H223ZF | FM0H223ZFTP（） | 5.5 | 0.022 | 0.028 | 200 | 0.033 | 4.2 | 5.0 | 1.3 |
| FM0H473ZF | FM0H473ZFTP（） | 5.5 | 0.047 | 0.06 | 200 | 0.071 | 4.2 | 5.0 | 1.3 |
| FM0H104ZF | FM0H104ZFTP（） | 5.5 | 0.10 | 0.13 | 100 | 0.15 | 4.2 | 6.5 | 1.6 |
| FM0H224ZF | FM0H224ZFTP（） | 5.5 | — | 0.22 | 100 | 0.33 | 4.2 | 6.5 | 1.6 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"

## ● 3.5V Type

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | T (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | |
| FM0V473ZF | FM0V473ZFTP（） | 3.5 | 0.047 | 0.06 | 200 | 0.042 | 5.0 | 1.3 |
| FM0V104ZF | FM0V104ZFTP（） | 3.5 | 0.10 | 0.13 | 100 | 0.090 | 5.0 | 1.3 |
| FM0V224ZF | FM0V224ZFTP（） | 3.5 | 0.22 | 0.30 | 100 | 0.20 | 6.5 | 1.6 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"

## ● 6.5V Type

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | T (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | |
| FM0J473ZF | FM0J473ZFTP（） | 6.5 | 0.047 | 0.062 | 200 | 0.071 | 6.5 | 1.6 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"

## ● FME, FML Type (Buckup Large Current, mA Order)

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | T (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | |
| FME0H223ZF | FME0H223ZFTP（） | 5.5 | 0.022 | 0.028 | 40 | 0.033 | 5.0 | 1.3 |
| FME0H473ZF | FME0H473ZFTP（） | 5.5 | 0.047 | 0.06 | 20 | 0.071 | 5.0 | 1.3 |
| FML0H333ZF | FML0H333ZFTP（） | 5.5 | | 0.033 | 6.5 | 0.050 | 5.0 | 1.3 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"

## ● FMR Type (MAX Operating Temperature 85℃ Type)

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | Voltage holding characteristics (V) | T (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | | |
| FMR0H473ZF | FMR0H473ZFTP（） | 5.5 | 0.047 | 0.062 | 200 | 0.071 | 4.2 | 6.5 | 1.6 |
| FMR0H104ZF | FMR0H104ZFTP（） | 5.5 | 0.10 | | 50 | 0.15 | 4.2 | 6.5 | 1.6 |
| FMR0V104ZF | FMR0V104ZFTP（） | 3.5 | 0.10 | | 50 | 0.090 | — | 6.5 | 1.6 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"





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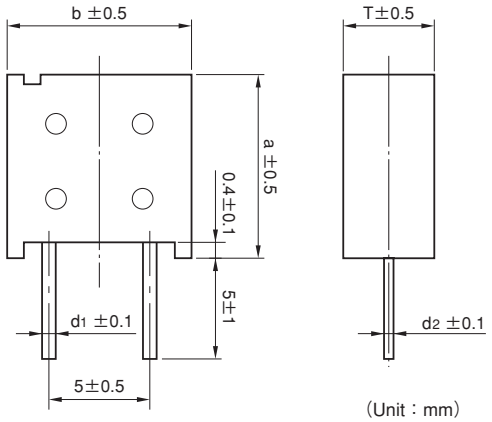
● **FMC Type**

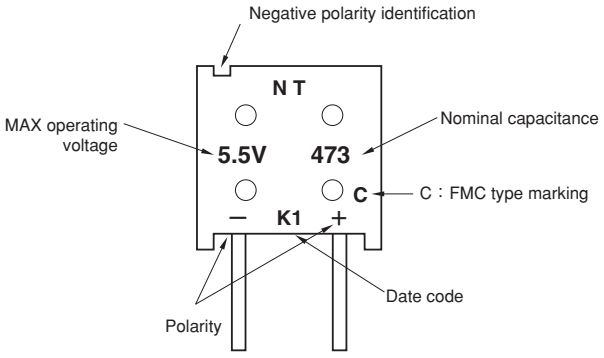
**Chip parts applicable to treatment in bond hardening furnace (160±5℃ for 120±10 seonds)**

## Dimensions




(Unit：mm)

## Markings




## Specifications

| Part Number | | MAX operating voltage (Vdc) | Nominal capacitance | | MAX ESR (at 1 kHz) (Ω) | MAX current at 30 min. (mA) | Voltage holding characteristics (V) | a (mm) | b (mm) | T (mm) | $d_1$ (mm) | $d_2$ (mm) | Weight (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulk | Ammo pack | | Charge system(F) | Discharge system(F) | | | | | | | | | |
| FMC0H473ZF | FMC0H473ZFTP（ ） | 5.5 | 0.047 | 0.06 | 100 | 0.071 | 4.2 | 11.5 | 10.5 | 5.0 | 0.5 | 0.4 | 1.3 |
| FMC0H104ZF | FMC0H104ZFTP（ ） | 5.5 | 0.10 | 0.13 | 50 | 0.15 | 4.2 | 11.5 | 10.5 | 6.5 | 0.5 | 0.4 | 1.6 |
| FMC0H334ZF | FMC0H334ZFTP（ ） | 5.5 | – | 0.33 | 25 | 0.50 | 4.2 | 15.0 | 14.0 | 9.0 | 0.6 | 0.6 | 3.5 |

To complete the part number, insert lead length (16mm or 18mm) in to the "( )"





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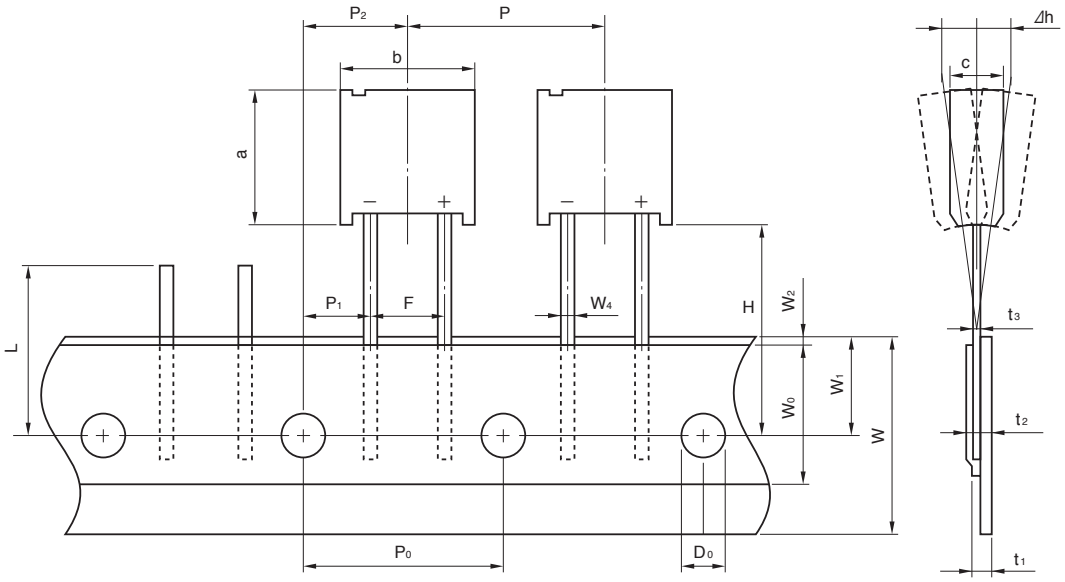
## Taping Specification [except FMC0H334ZFTP( )]




(Unit : mm)

| Item | Symbol | Value | Tolerance | Remarks |
|---|---|---|---|---|
| Component Height | a | 11.5 | ±0.5 | |
| Component Width | b | 10.5 | ±0.5 | |
| Component Thickness | c | — | ±0.5 | 5.5 V type : 5.0/0.010F to 0.047F, 6.5/0.047F<br>3.5 V type : 5.0/0.047F to 0.10F, 6.5/0.22F<br>FME type : 5.0/0.022F to 0.047F<br>FML type : 5.0/0.033F<br>6.5 V type : 6.5/0.047F, 0.10F<br>FMR type : 6.5/0.047F<br>FMC type : 5.0/0.047F, 6.5/0.10F |
| Lead-wire Width | $W_4$ | 0.5 | ±0.1 | |
| Lead-wire Thickness | $t_3$ | 0.4 | ±0.1 | |
| Pitch between Component | P | 12.7 | ±1.0 | |
| Sprocket Hole Pitch | $P_0$ | 12.7 | ±0.3 | |
| Sprocket Hole to Lead | $P_1$ | 3.85 | ±0.7 | |
| 〃 | $P_2$ | 6.35 | ±1.3 | |
| Lead Spacing | F | 5.0 | ±0.5 | |
| Component Alignment | Δh | 2.0 Max. | — | Including tilting caused by bending lead wire. |
| Tape Width | W | 18.0 | +1.0<br>−0.5 | |
| Hold-down tape Width | $W_0$ | 12.5 Min. | — | |
| Sprocket Hole Position | $W_1$ | 9.0 | ±0.5 | |
| Hold-down Tape Position | $W_2$ | 3.0 Max. | — | No protrusion of tape. |
| Component's Bottom Line Position | H | 16.0 | ±0.5 | |
| 〃 | | 18.0 | ±0.5 | |
| Sprocket Hole Diameter | $D_0$ | φ4.0 | ±0.2 | |
| Total tape Thickness | $t_1$ | 0.7 | ±0.2 | |
| 〃 | $t_2$ | 1.5 Max. | — | |
| Defect Component Cut-off Position | L | 11.0 Max. | — | |





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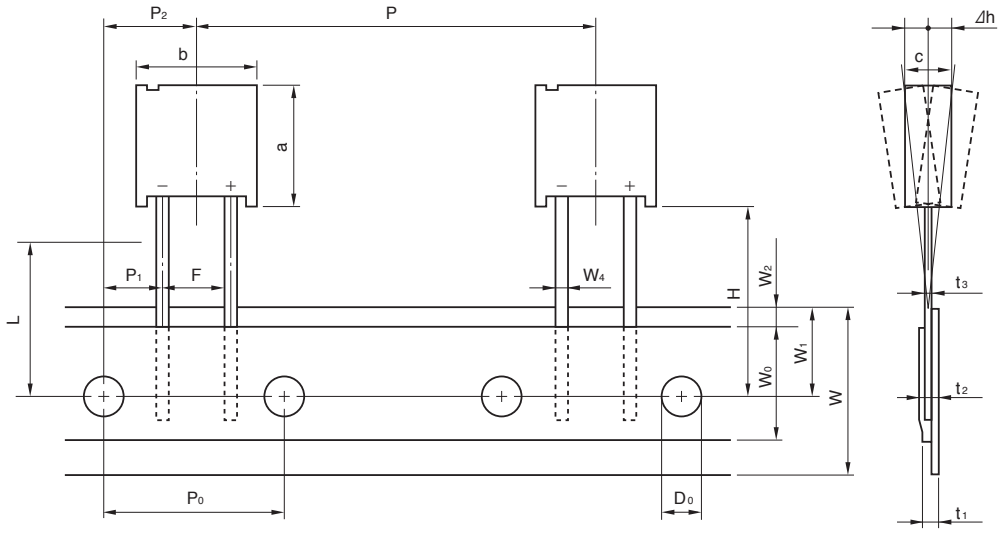
## Taping Specification [except FMC0H334ZFTP ( )]




(Unit : mm)

| Item | Symbol | Value | Tolerance | Remarks |
|---|---|---|---|---|
| Component Height | a | 15.0 | ±0.5 | |
| Component Width | b | 14.0 | ±0.5 | |
| Component Thickness | c | 9.0 | ±0.5 | |
| Lead-wire Width | $W_4$ | 0.6 | ±0.1 | |
| Lead-wire Thickness | $t_3$ | 0.6 | ±0.1 | |
| Pitch between Component | P | 25.4 | ±1.0 | |
| Sprocket Hole Pitch | $P_0$ | 12.7 | ±0.3 | |
| Sprocket Hole to Lead | $P_1$ | 3.85 | ±0.7 | |
| 〃 | $P_2$ | 6.35 | ±1.3 | |
| Lead Spacing | F | 5.0 | ±0.5 | |
| Component Alignment | ⊿h | 2.0 Max. | — | Including tilting caused by bending lead wire |
| Tape Width | W | 18.0 | +1.0<br>−0.5 | |
| Hold-down tape Width | $W_0$ | 12.5 Min. | — | |
| Sprocket Hole Position | $W_1$ | 9.0 | ±0.5 | |
| Hold-down Tape Position | $W_2$ | 3.0 Max. | — | No protrusion of tape |
| Component's Bottom Line Position | H | 16.0 | ±0.5 | |
| 〃 | | 18.0 | ±0.5 | |
| Sprocket Hole Diameter | $D_0$ | φ4.0 | ±0.2 | |
| Total tape Thickness | $t_1$ | 0.67 | ±0.2 | |
| 〃 | $t_2$ | 1.7 Max. | — | |
| Defect Component Cut-off Position | L | 11.0 Max. | — | |





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## Specifications

| Item \ Series name | | 5.5V type, 3.5V type, 6.5V type FMC type | | FML, FME type | | Test conditions (conforming to JIS C 5160-1) |
|---|---|---|---|---|---|---|
| Category temperature range | | −25℃ to +70℃ | | −25℃ to +70℃ | | |
| MAX operating voltage | | 5.5Vdc, 3.5Vdc, 6.5Vdc | | 5.5Vdc | | |
| Capacitance | | 5.5V：0.010F to 0.33F<br>3.5V：0.047F to 0.22F<br>6.5V：0.047 | | 0.022F, 0.033F, 0.047F | | Refer to “Measurement Conditions” |
| Capacitance allowance | | +80 %, −20 % | | +80 %, −20 % | | Refer to “Measurement Conditions” |
| ESR | | Refer to standard ratings | | Refer to standard ratings | | Measured at 1kHz, 10mA ; See also “Measurement Conditions” |
| Current (30-minutes value) | | Refer to standard ratings | | Refer to standard ratings | | Refer to “Measurement Conditions” |
| Surge | Capacitance | More than 90% of initial ratings | | More than 90% of initial ratings | | Surge voltage：4.0V (3.5V type)<br>：6.3V (5.5V type)<br>：7.4V (6.5V type)<br>Charge：30 sec.<br>Discharge：9min 30sec.<br>Number of cycles：1000<br>Series resistance：0.010F 1500Ω<br>：0.022F 560Ω<br>：0.033F 510Ω<br>：0.047F 300Ω<br>：0.068F 240Ω<br>：0.10F 150Ω<br>：0.22F 56Ω<br>：0.33F 51Ω<br>Discharge resistance：0Ω<br>Temperature：70±2℃ |
| | ESR | Not to exceed 120% of initial ratings | | Not to exceed 120% of initial ratings | | |
| | Current (30 minutes value) | Not to exceed 120% of initial ratings | | Not to exceed 120% of initial ratings | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| Characteristics in different temperature | Capacitance | Phase 2 | 50% or higher than initial value | Phase 2 | 50% or higher than initial value | Conforms to 4.17<br>Phase1：+25±2℃<br>Phase2：−25±2℃<br>Phase4：+25±2℃<br>Phase5：+70±2℃<br>Phase6：+25±2℃ |
| | ESR | | 400% or less than initial value | | 400% or less than initial value | |
| | Capacitance | Phase 3 | | Phase 3 | | |
| | ESR | | | | | |
| | Capacitance | Phase 5 | 200% or less than initial value | Phase 5 | 200% or less than initial value | |
| | ESR | | Satisfy initial ratings | | Satisfy initial ratings | |
| | Current (30 minutes value) | | 1.5CV (mA) or below | | 1.5CV (mA) or below | |
| | Capacitance | Phase 6 | Within ±20% of initial value | Phase 6 | Within ±20% of initial value | |
| | ESR | | Satisfy initial ratings | | Satisfy initial ratings | |
| | Current (30 minutes value) | | Satisfy initial ratings | | Satisfy initial ratings | |
| Lead strength (tensile) | | No terminal damage | | No terminal damage | | Conforms to 4.9 |
| Vibration resistance | Capacitance | Satisfy initial ratings | | Satisfy initial ratings | | Conforms to 4.13<br>Frequency：10 to 55 Hz<br>Testing time：6 hours |
| | ESR | | | | | |
| | Current (30 minutes value) | | | | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| Solderability | | Over 3/4 of the terminal should be covered by the new solder | | Over 3/4 of the terminal should be covered by the new solder | | Conforms to 4.11<br>Solder temp：245±5℃<br>Dipping time：5±0.5 sec.<br>1.6mm from the bottom should be dipped. |
| Solder heat resistance | Capacitance | Satisfy initial ratings | | Satisfy initial ratings | | Conforms to 4.10<br>Solder temp：260±10℃<br>Dipping time：10±1 sec.<br>1.6mm from the bottom should be dipped. |
| | ESR | | | | | |
| | Current (30 minutes value) | | | | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| Temperature cycle | Capacitance | Satisfy initial ratings | | Satisfy initial ratings | | Conforms to 4.12<br>Temperature condition：−25℃→Room temperature→+70℃→Room temperature<br>Number of cycles：5 Cycles |
| | ESR | | | | | |
| | Current (30 minutes value) | | | | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| High temp. and high humidity resistance | Capacitance | Within ±20% of initial value | | Within ±20% of initial value | | Conforms to 4.14<br>Temperature：40±2℃<br>Relative humidity：90 to 95 %RH<br>Testing time：240±8 hours |
| | ESR | Not to exceed 120% of initial ratings | | Not to exceed 120% of initial ratings | | |
| | Current (30 minutes value) | Not to exceed 120% of initial ratings | | Not to exceed 120% of initial ratings | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| High temperature load | Capacitance | Within ±30% of initial value | | Within ±30% of initial value | | Conforms to 4.15<br>Temperature：70±2℃<br>Voltage applied：MAX operating voltage<br>Series protection resistance：0Ω<br>Testing time：1000$^{+48}_{0}$Hours |
| | ESR | Below 200% of initial ratings | | Below 200% of initial ratings | | |
| | Current (30 minutes value) | Below 200% of initial ratings | | Below 200% of initial ratings | | |
| | Appearance | No obvious abnormality | | No obvious abnormality | | |
| Self discharge characteristics (voltage holding characteristics) | | 5.5V type: Voltage between terminal leads higher than 4.2V<br>3.5V type: Not specified<br>6.5V type: Not specified | | | | Charging condition：Voltage applied：5.0Vdc (Terminal at the case's side be negative)<br>Series resistance：0Ω<br>Charging time：24 hours<br>Storage：Let stand for 24 hours in condition described below with terminals opened.<br>Ambient temperature：Lower than 25℃<br>Relative humidity：Lower than 70%RH |





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# Specifications

| Item \ Series name | | FMR type | | Test conditions (conforming to JIS C 5160-1) |
|---|---|---|---|---|
| Category temperature range | | −40℃ to +85℃ | | |
| MAX operating voltage | | 5.5Vdc, 3.5Vdc | | |
| Capacitance | | 0.047F, 0.10F | | Refer to “Measurement Conditions” |
| Capacitance allowance | | +80 %, −20 % | | Refer to “Measurement Conditions” |
| ESR | | Refer to standard ratings | | Measured at 1kHz, 10mA ; See also “Measurement Conditions” |
| Current (30-minutes value) | | Refer to standard ratings | | Refer to “Measurement Conditions” |
| Surge | Capacitance | More than 90% of initial ratings | | Surge voltage：4.0V (3.5V type)<br>：6.3V (5.5V type)<br>Charge：30 sec.<br>Discharge：9min 30sec.<br>Number of cycles：1000<br>Series resistance：0.047F 300Ω<br>：0.10F 150Ω<br>Discharge resistance：0Ω<br>Temperature：85±2℃ |
| | ESR | Not to exceed 120% of initial ratings | | |
| | Current (30 minutes value) | Not to exceed 120% of initial ratings | | |
| | Appearance | No obvious abnormality | | |
| Characteristics in different temperature | Capacitance | Phase 2 | 50% or higher than initial value | Conforms to 4.17<br>Phase1：+25±2℃<br>Phase2：−25±2℃<br>Phase3：−40±2℃<br>Phase4：+25±2℃<br>Phase5：+70±2℃<br>Phase6：+25±2℃ |
| | ESR | | 400% or less than initial value | |
| | Capacitance | Phase 3 | 30% or higher than initial value | |
| | ESR | | Below 700% of the initial value | |
| | Capacitance | Phase 5 | 200% or less than initial value | |
| | ESR | | Satisfy initial ratings | |
| | Current (30 minutes value) | | 1.5CV (mA) or below | |
| | Capacitance | Phase 6 | Within ±20% of initial value | |
| | ESR | | Satisfy initial ratings | |
| | Current (30 minutes value) | | Satisfy initial ratings | |
| Lead strength (tensile) | | No terminal damage | | Conforms to 4.9 |
| Vibration resistance | Capacitance | Satisfy initial ratings | | Conforms to 4.13<br>Frequency：10 to 55 Hz<br>Testing time：6 hours |
| | ESR | | | |
| | Current (30 minutes value) | | | |
| | Appearance | No obvious abnormality | | |
| Solderability | | Over 3/4 of the terminal should be covered by the new solder | | Conforms to 4.11<br>Solder temp：245±5℃<br>Dipping time：5±0.5 sec.<br>1.6mm from the bottom should be dipped. |
| Solder heat resistance | Capacitance | Satisfy initial ratings | | Conforms to 4.10<br>Solder temp：260±10℃<br>Dipping time：10±1 sec.<br>1.6mm from the bottom should be dipped. |
| | ESR | | | |
| | Current (30 minutes value) | | | |
| | Appearance | No obvious abnormality | | |
| Temperature cycle | Capacitance | Satisfy initial ratings | | Conforms to 4.12<br>Temperature condition：−40℃→Room temperature→+85℃→Room temperature<br>Number of cycles：5 Cycles |
| | ESR | | | |
| | Current (30 minutes value) | | | |
| | Appearance | No obvious abnormality | | |
| High temp. and high humidity resistance | Capacitance | Within ±20% of initial value | | Conforms to 4.14<br>Temperature：40±2℃<br>Relative humidity：90 to 95 %RH<br>Testing time：240±8 hours |
| | ESR | Not to exceed 120% of initial ratings | | |
| | Current (30 minutes value) | Not to exceed 120% of initial ratings | | |
| | Appearance | No obvious abnormality | | |
| High temperature load | Capacitance | Within ±30% of initial value | | Conforms to 4.15<br>Temperature：85±2℃<br>Voltage applied：MAX operating voltage<br>Series protection resistance：0Ω<br>Testing time：$1000^{+48}_{0}$Hours |
| | ESR | Below 200% of initial ratings | | |
| | Current (30 minutes value) | Below 200% of initial ratings | | |
| | Appearance | No obvious abnormality | | |
| Self discharge characteristics (voltage holding characteristics) | | 5.5V type: Voltage between terminal leads higher than 4.2V<br>3.5V type: Not specified | Charging condition | Voltage applied：5.0Vdc (Terminal at the case's side be negative)<br>Series resistance：0Ω<br>Charging time：24 hours |
| | | | Storage | Let stand for 24 hours in condition described below with terminals opened.<br>Ambient temperature：Lower than 25℃<br>Relative humidity：Lower than 70%RH |





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