# Temperature Compensating (TC) Capacitors 50 (160) ~ 6000WVDC

EIA RS 198 (Class I)
JIS C 6423 (Type I)
GB 5966-86 ($CC_1$ )

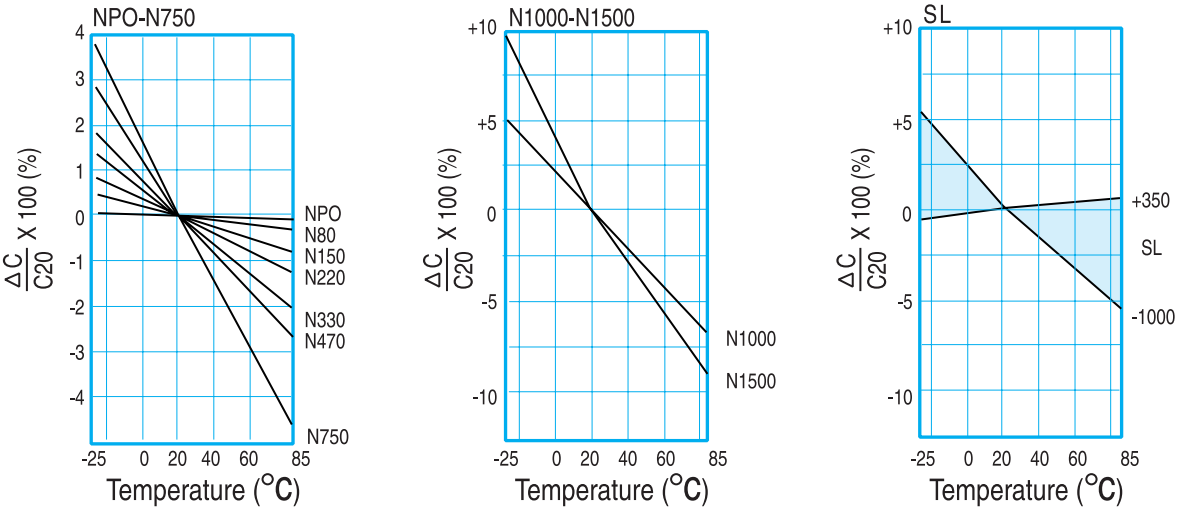
Features:
Δ Application for Resonant, Coupling, Matching CKT
Δ High Stability and High Q Requirement
Δ Low Loss at Wide Range of Frequency
Δ Linear Temperature Coefficient of Capacitance

## Specifications:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Operating Temp. Range** | | –25°C to +85°C | | | | | | | | |
| **Capacitance** | Range | 0.5 to 1000PF measured at 1MHz±10%, 1Vrms, 25°C | | | | | | | | |
| | tolerance | ±0.25PF (C), ±0.5PF (D), ±5% (J), ±10% (K) | | | | | | | | |
| **Test Voltage** | | <1000VDC: 3 times of Working Voltage for 1~5 seconds | | | | | | | | |
| | | ≥1000VDC: 2 times of Working Voltage for 1~5 seconds | | | | | | | | |
| **Quality Factor (Q.F.)** | NPO~N750, SL | C <30PF | Q ≥400+20xC | | | | | | | |
| | | C ≥30PF | Q ≥1000 | | | | | | | |
| | N1000, N1500 | C <30PF | Q ≥200+10xC | | | | | | | |
| | | C ≥30PF | Q ≥500 | | | | | | | |
| **Insulation Resistance (I.R.)** | 10000MΩ min. at working voltage for 1 minute | | | | | | | | | |
| **Temperature Characteristic –25°C ~ +85°C (Fig.3)** | Cap. change PPM/°C | NPO ±60 | N150 ±60 | N220 ±60 | N330 ±60 | N470 ±60 | N750 ±60 | N1000 ±250 | N1500 ±250 | +350~ –1000 |
| | EIA RS 198 | C0H | P2H | R2H | S2H | T2H | U2J | V2K | W2K | S2L |
| | JIS C 6423 | CH | PH | RH | SH | TH | UJ | VK | WK | SL |
| | GB 5966-86 | C | P | R | S | T | U | Q | V | SL |
| **Effect of Soldering** | Cap. change within: ±2.5% or ±0.25PF. To be measured after 4~24 hours (Solder Temp.: 270±5°C, Dipping duration: 3±0.5 sec.) | | | | | | | | | |
| **Life Test** | Cap. change : within ±3% or ±3PF.<br>Q.F. : Under 10PF, Q ≥200+10C<br>: 10PF~30PF Q ≥275+5/2C<br>: Over 30PF Q ≥350<br>I.R. : >1000MΩ | | | | | | | Test Condition and Method:<br>1. Temp.: 85±3°C<br>2. Test Duration: 1000 hours at 2 times W.V.<br>3. To be measured after 1~2 hours at room temp. | | |
| **Solderability** | It does not remains unsoldered area over 1/4 of the circumference of the lead. (Solder Temp.: 235±5°C, Dipping duration: 2±0.5 sec.) | | | | | | | | | |

**Fig. 3**

## TEMPERATURE CHARACTERISTICS



# High Dielectric Constant (Hi-K) Capacitors 50 (160) ~ 6000WVDC

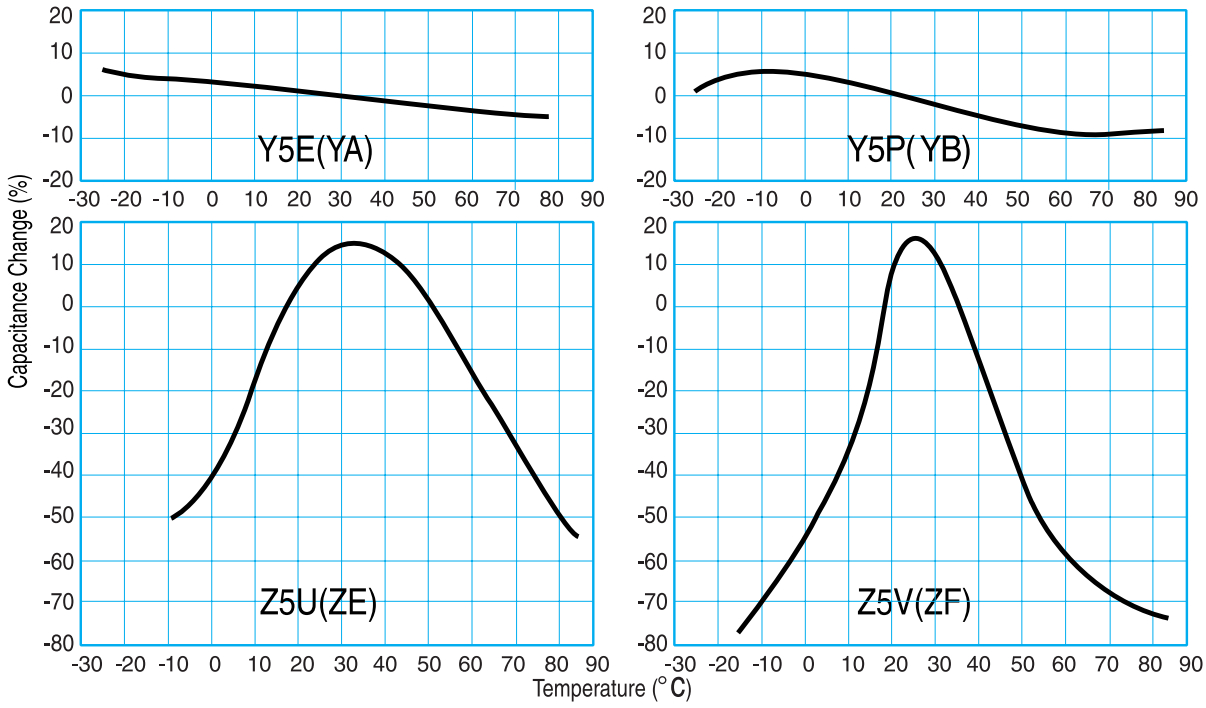
EIA RS 198 (Class II)
JIS C 6422 (Type II)
GB 5968-86 ($CT_1$ )

Features:
Δ Application for Band Filter, By-pass, Coupling CKT
Δ Low dissipation factor and high insulation resistance
Δ Freq. discriminating which Q and stability of cap. char. are not major importance
Δ Non Linear temperature coefficient of capacitance

## Specifications:

| | | | | | | |
|---|---|---|---|---|---|---|
| **Operating Temp. Range** | | +10°C to +85°C for ZE, ZF | | –25°C to +85°C for YA, YB | | |
| **Capacitance** | Range | 100PF to 0.1 UF measured at 1KHz±10%, 1Vrms, 25°C | | | | |
| | Tolerance | ±5% (J) for YA, ±10% (K) for YA, YB, ±20% (M) for YB, ZE, $^{+80}_{-20}$% (Z) for ZE, ZF | | | | |
| **Test Voltage** | | <1000VDC: 2.5 times of Working Voltage for 1~5 seconds | | | | |
| | | ≥1000VDC: 2 times of Working Voltage for 1~5 seconds | | | | |
| **Dissipation Factor (D.F.)** | | 2.5% Max. for YA, YB, ZE at 1KHz, 1Vrms, 25°C | | | | |
| | | 5% Max for ZF at 1KHz, 1Vrms, 25°C | | | | |
| **Insulation Resistance (I.R.)** | | 10000MΩ min. at working voltage for 1 minute | | | | |
| **Temperature Characteristic –25°C ~ +85°C (Fig.4)** | | Cap. change within | ±5% | ±10% | +20/–55% | +30/–80% |
| | | EIA RS 198 | Y5E | Y5P | Z5U | Z5V |
| | | JIS C 6422 | YA | YB | ZE | ZF |
| | | GB 5968-86 | | $2B_4$ | $2E_4$ | $2F_4$ |
| **Effect of Soldering** | | Cap. change within: ±3.5% (YA), ±5% (YB), ±15% (ZE), ±20% (ZF) To be measured after 4~24 hours (Solder Temp.: 270±5°C, Dipping duration: 3±0.5 sec.) | | | | |
| **Life Test** | | Cap. change: within ±5% (YA), ±10% (YB) ±20% (ZE), ±30% (ZF)<br>D.F. : 5% Max for YA, YB, ZE 7.5% Max for ZF<br>I.R. : >1000MΩ | | Test Condition and Method:<br>1. Temp.: 85±3°C<br>2. Test Duration: 1000 hrs at 2 times W.V.<br>3. To be measured after 1~2 hours at room temp. | | |
| **Solderability** | | It does not remain unsoldered area over 1/4 of the circumference of the lead. (Solder Temp.: 235±5°C, Dipping duration: 2±0.5 sec.) | | | | |

## Fig. 4



## Semi-Conductive (S.C.) Capacitors 12 (16) ~ 50 (100)WVDC
## (Surface Layer Type)

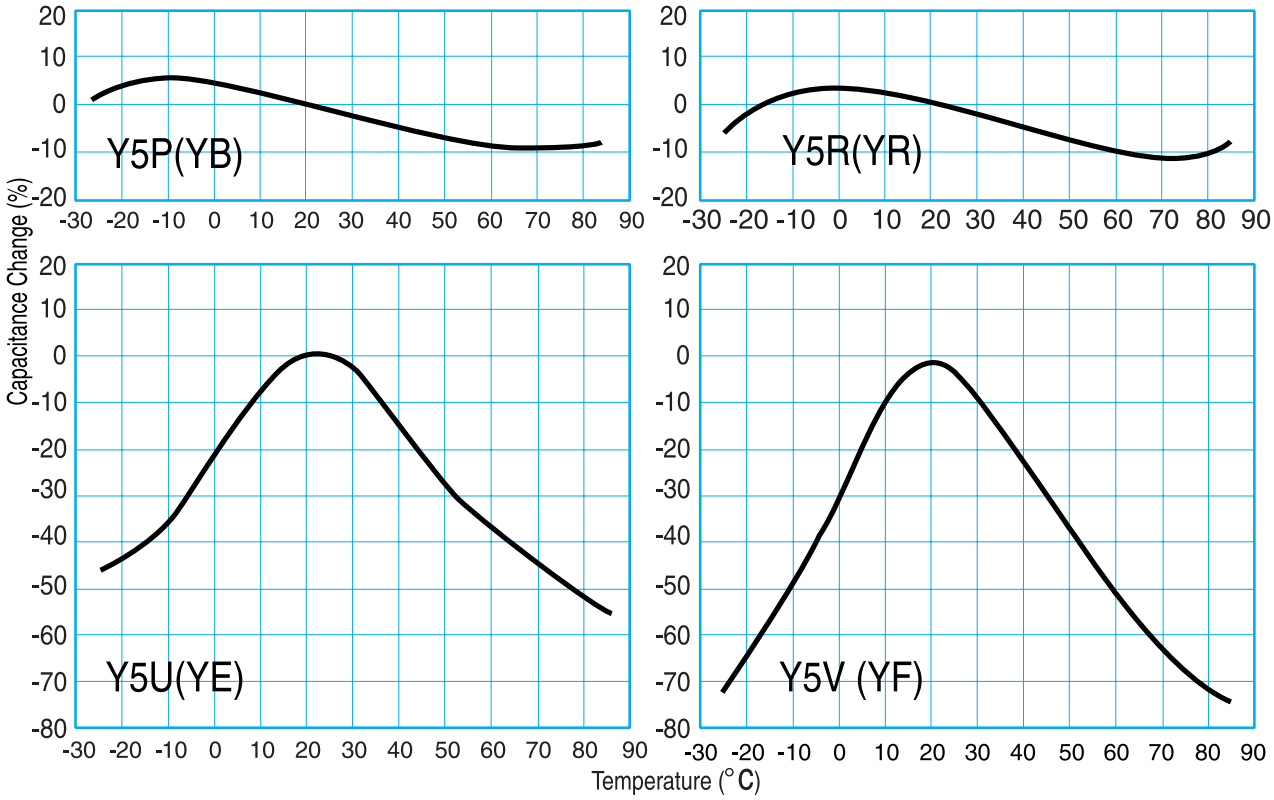
EIA RS 198 (Class III)
JIS C 6422 (Type III)

Features:
- Δ Application for By-pass, Coupling CKT
- Δ Frequency determination, in which dielectric losses (Dissipation Factor) and Insulation Resistance and Cap. Stability are not major importance.
- Δ Large capacitance in small size (Transistorized)

# Specifications:

| | | | | |
|---|---|---|---|---|
| **Operating Temp. Range** | –25°C to +85°C | | | |
| **Capacitance** Range | 0.0027 μF to 0.47 μF measured at 1KHz±10%, 0.1Vrms, 25°C | | | |
| **Capacitance** Tolerance | ±10% (K) for YB, ±20% (M) for YB, YE, $^{+80}_{-20}$% (Z) for YE, YF | | | |
| **Test Voltage** | 2.5 times of Working Voltage for 1~5 seconds | | | |
| **Dissipation Factor (D.F.)** | 16V <7% ; 25V–50V <5% at 1KHz ±10%, 0.1 Vrms, 25°C | | | |
| **Insulation Resistance (I.R.)** | 16V >100MΩ ; 25V–50V >1000MΩ at working voltage for 1 minute | | | |
| **Temperature Characteristic –25°C ~ +85°C (Fig.5)** | Cap. change within | ±10% | +20/–55% | +30/–80% |
| | EIA RS 198 | Y5P | Y5U | Y5V |
| | JIS C 6422 | YB | YE | YF |
| **Effect of Soldering** | Cap. change within: ±5% (YB), ±15% (YE), ±20% (YF), To be measured after 4~24 hours (Solder Temp.: 270±5°C, Dipping duration: 3±0.5 sec.) | | | |
| **Life Test** | Cap. change: within ±10% (YB), ±20% (YE) ±30% (ZF)<br>D.F. : 16V <10%, 25V-50V <7.5%<br>I.R. : 16V >50MΩ, 25V-50V >500MΩ | Test Condition and Method:<br>1. Temp.: 85±3°C<br>2. Test Duration: 1000hrs at 1.5 times W.V.<br>3. To be measured after 1~2 hours at room temp. | | |
| **Solderability** | It does not remain unsoldered area over 1/4 of the circumference of the lead. (Solder Temp.: 235±5°C, Dipping duration: 2±0.5 sec.) | | | |

## Fig. 5



# Range Chart (Capacitance in pF)

## CLASS I / TYPE I / CC1

| T.C. / W.V.DC | CH NPO | PH N150 | RH R220 | TH N470 | UJ N750 | SL +350~-100 | DIMENSION MAX (MM) |
|---|---|---|---|---|---|---|---|
| 50V/100V | 0.5-47 | 1-33 | | 1-50 | | 1-200 | 5.5 |
| | 50-82 | 34-56 | | 51-82 | | 200-220 | 6.5 |
| | 100-120 | 60-82 | | 85-120 | | 240-330 | 7.5 |
| | 130-180 | 85-110 | | 130-180 | | 340-470 | 8.5 |
| | 200-220 | 120-150 | | 200-220 | | 500-680 | 9.5 |
| | 230-270 | 160-220 | | 230-270 | | 820-1000 | 10.5 |
| | 280-330 | - | | - | | - | 11.5 |
| | 340-390 | - | | - | | - | 12.5 |
| | 470 | - | | - | | - | 14.5 |

## CLASS II / TYPE II / CT1

| T.C. / W.V.DC | B ±10% | E +20~-55% | F +30~-80% | DIMENSION MAX (MM) |
|---|---|---|---|---|
| 50V/100V | 100-2200 | 1000-5600 | 1000-10000 | 5.5 |
| | 2700-3300 | 6800-10000 | 10000 | 6.5 |
| | 3900-4700 | 12000 | 15000, 18000 | 7.5 |
| | 5600-6800 | 15000 | 20000, 220000 | 8.5 |
| | 8200-10000 | 18000-22000 | 30000, 330000 | 9.5 |
| | - | - | 390000, 50000 | 10.5 |

## CLASS III / TYPE III / S.C.

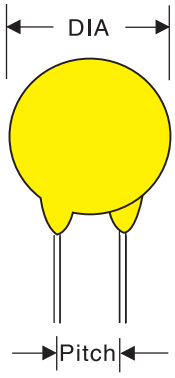
| T.C. / W.V.DC | YB ±10% | YE +20~-55% | YF +30~-80% | DIMENSION MAX (MM) |
|---|---|---|---|---|
| 16V | 3300-10000 | 3300-22000 | - | 5.5 |
| | 15000-22000 | 30000-50000 | 68000-100000 | 6.5 |
| | 22000-50000 | 68000-100000 | 150000-180000 | 7.5 |
| | 68000-100000 | - | 200000-220000 | 9.5 |
| | - | 220000 | 330000-470000 | 10.5 |
| 25V | 3300-10000 | 3300-22000 | 10000-47000 | 5.5 |
| | 15000-22000 | 30000-50000 | 68000-100000 | 6.5 |
| | 22000-47000 | 68000-100000 | 150000-180000 | 7.5 |
| | - | - | 200000-220000 | 10.5 |
| 50V | 3300-10000 | 3300-22000 | 10000-47000 | 5.5 |
| | 15000-22000 | 30000-40000 | 680000 | 6.5 |
| | 22000-33000 | 47000-50000 | 100000 | 7.5 |
| | 47000 | 68000-100000 | - | 8.5 |
| | - | - | 220000 | 10.5 |

# Range Chart (Capacitance in pF)

| T.C. / W.V.DC | CH NPO | SL +350~-1000 | B ±10% | E +20~-55% | F +30~-80% | DIMENSION MAX (MM) |
|---|---|---|---|---|---|---|
| 500V | 0.5-27 | 15-68 | 100-470 | 1000-1500 | 1000-3300 | 5.5 |
| | 30-47 | 82-100 | 560-1000 | 2000-3300 | 4700-5000 | 6.5 |
| | 56-68 | 120-180 | 1500, 1800 | 3900-5000 | 5600-6800 | 7.5 |
| | 82-100 | 200-270 | 2000, 2200 | 5600, 6800 | 10000 | 8.5 |
| | - | 300-330 | 2700, 3300 | 8200 | - | 9.5 |
| | - | 340-390 | 3900, 4700 | 10000 | - | 10.5 |
| | - | - | 5600, 6800 | 15000 | 20000, 22000 | 12.5 |
| | - | - | 8200, 10000 | 20000, 22000 | 47000 | 14.5 |
| | - | - | - | - | 100000 | 20.5 |
| 1KV | 1-22 | 1-68 | 100-500 | 1000 | 1000-3300 | 5.5 |
| | - | - | 560-1000 | 1500-2200 | 4700-5000 | 6.5 |
| | 25-39 | 75-110 | 1200-1500 | 2700 | 5600 | 7.5 |
| | - | - | 1800-2000 | 3000-3900 | 6800 | 8.5 |
| | 47, 50 | 120-200 | 2200 | 4700-5600 | - | 9.5 |
| | 51-100 | 220-300 | 2700, 3000 | 6800, 8200 | 10000 | 10.5 |
| | 100-120 | 330-390 | 3300, 4700 | 10000 | - | 12.5 |
| | 150 | 470-560 | 5600, 6800 | 15000 | 22000 | 14.5 |
| | 220 | 620-750 | 8200, 10000 | - | - | 18.5 |
| | 330 | 820-1000 | - | - | 47000 | 20.5 |
| 2KV | 1-22 | 1-47 | 100-150 | 1000, 1200 | 1000, 1200 | 7.5 |
| | - | 68-100 | 180-470 | - | 1500, 1800 | 8.5 |
| | - | - | 500-680 | 1500, 1800 | 2000-2700 | 9.5 |
| | - | - | 820, 1000 | 2000-2700 | 3000-3900 | 10.5 |
| | - | - | 1200-2200 | 3000-3900 | 4700-5600 | 11.5 |
| | - | - | 2700, 3000 | 4700-5000 | 6800-10000 | 13.5 |
| | - | - | 2700, 3000 | 5600 | - | 15.5 |
| | - | - | 3300 | 6800 | - | 16.5 |
| | - | - | 3900-5000 | 8200, 10000 | 15000 | 17.5 |
| | - | - | 5600, 6800 | - | - | 20.5 |
| | - | - | 8200, 10000 | - | 22000 | 23.5 |

# Lead pitch v.s. body size

| pitch \ DIA | ≤6 Ø | 7 Ø | 8 Ø | 9 Ø | 10 Ø | 11 Ø | 12 Ø | 14 Ø above |
|---|---|---|---|---|---|---|---|---|
| 2.5 mm | ✓ | | | | | | | |
| 5 mm | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | – | – |
| 7.5 mm | – | ★ | ★ | ★ | ◯ | ◯ | ✓ | ✓ |
| 10.0 mm | – | – | – | – | – | ◯ | ✓ | ✓ |




" ✓ " Standard pitch for each size. " ★ " Standard pitch for w.v. 2kv & above.
" ◯ " available for customers' reguirement

# Marking principle

**Line 1 : Temperature characteristic**

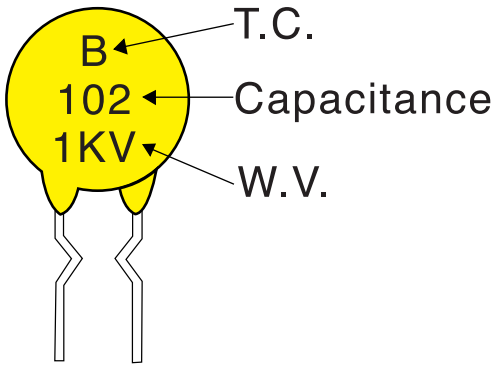
| | NPO | N220 | N750 | SL | Y5P | Y5U (Z5U) | Y5V (Z5V) |
|---|---|---|---|---|---|---|---|
| **Code** | CH | RH | UJ | S | B | E | F |
| **Mark** | Black dot | Yellow dot | Violet dot | None | B | E | F |

**Line 2 : Capacitance**

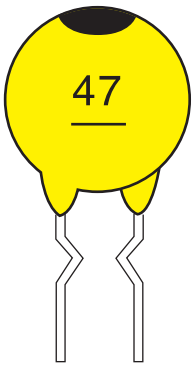
1. show with EIA code
   101=100pf 472=4700pf 104=0.1uf
   221=220pf 563=56000pf
2. show actual value in pf
   which capacitance below 100pf.

**Line 3 : Working voltage**

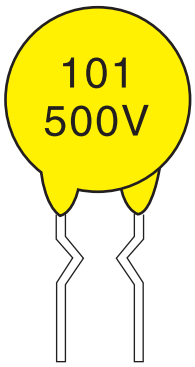
Mark a bar (---) for 50V-100V
otherwise mark the exact volt.



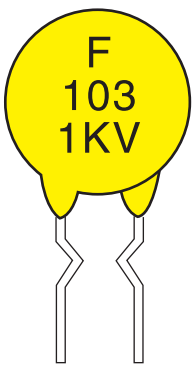

**EX:**




NPO
47 pf
50V




SL
100 pf
500V




Y5V
10,000pf
1KV

# Low D.F. Type

* Low D.F performance v.s. high temperature
* Low power loss in linear circuit "power supply" "monitor" "T.V set"

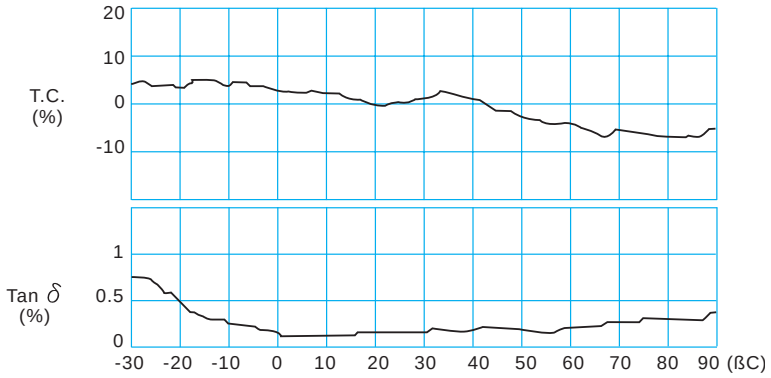
# Range Chart

| T.C. | D.F | Capacitance | Pitch | Dia. (mm) |
|---|---|---|---|---|
| Y5P (2KV) | 0.5% (max) | 100 - 390pF | 5, 7.5 | 7 |
| | | 470 - 680pF | 5, 7.5 | 9 |
| | | 820 - 1000pF | 5, 7.5 | 11 |
| | | 1200pF | 7.5, 10 | 12 |
| | | 2700pF | 7.5, 10 | 15 |

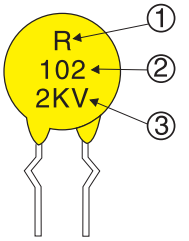
# Electrical Specification

| | Specification | Test condition |
|---|---|---|
| Capacitance | To be within the spec tolerance. | to be measured at 25°C±1°C at 1±0.2 Vrms 1KHz |
| Dissipation factor | D.F.≤0.5% | |
| Insulation resistance | I.R.≥10GΩ | To be measured at 500 VDC |
| Dielectric strength | With Standing 200% W.V. | 200% working voltage applied |

## Temperature characteristic and D.F. curves

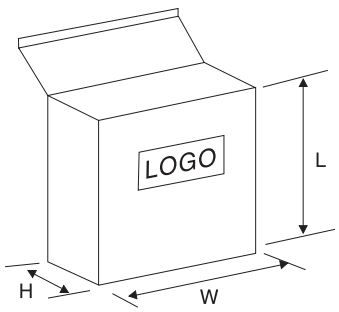



## Marking Principle



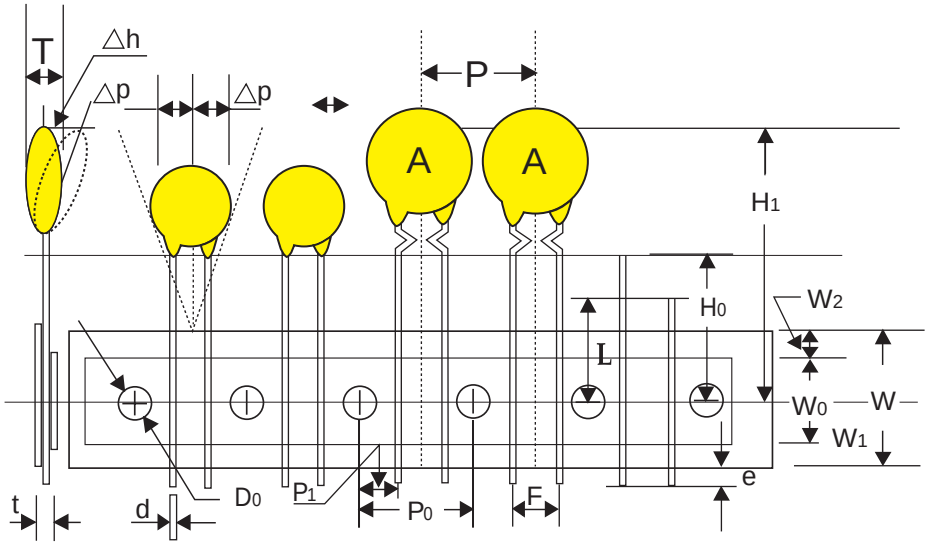

(1) Low D.F. (Y5P) type
(2) Capacitance
(3) Working voltage

## Package quantity




Box size: 330×250×50mm (W × L × H)
Ammo : 2000pcs/box
Bulk : 1000pcs/bag

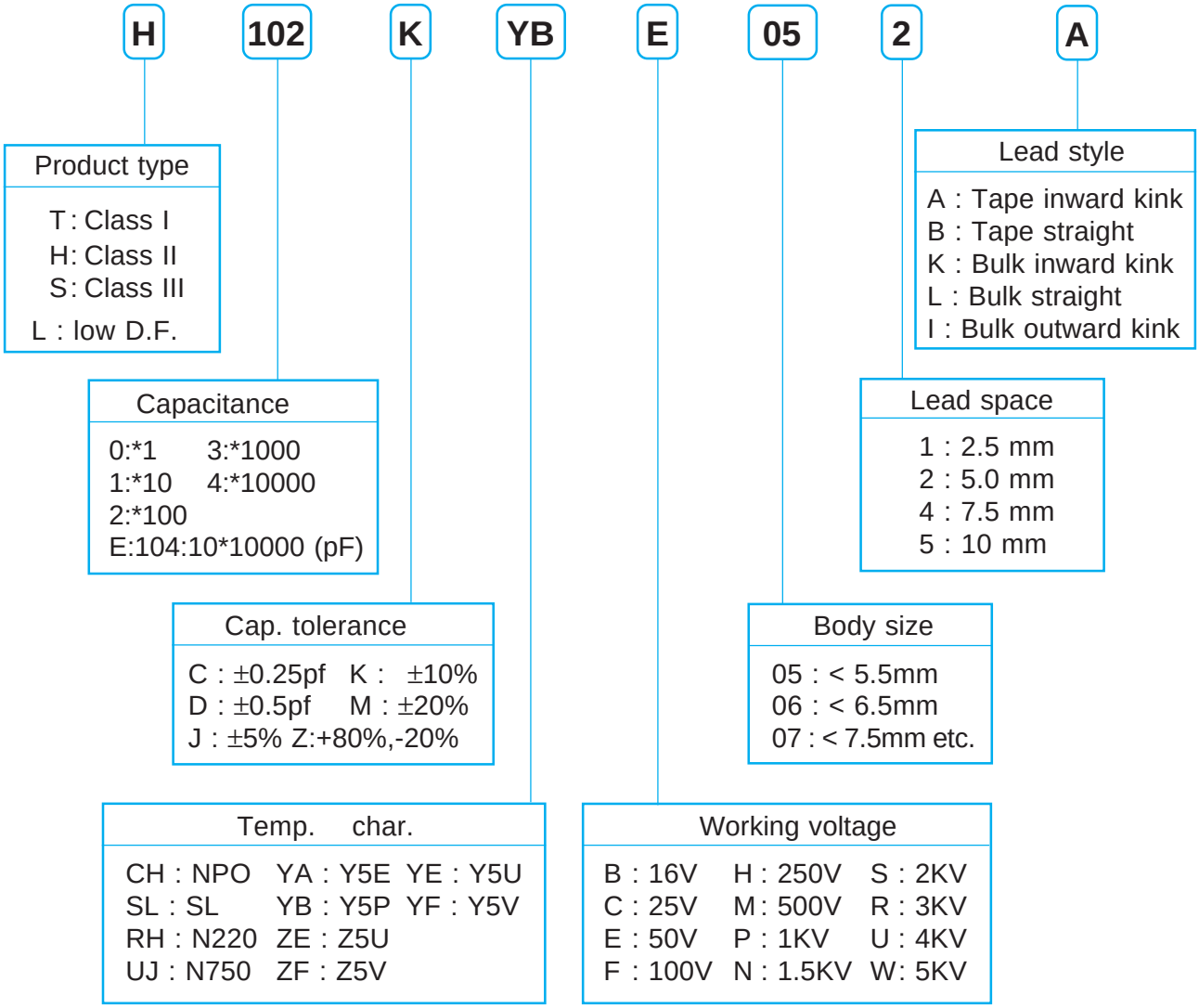
# Packing Specification




| | | unit:mm | unit:inch |
|---|---|---|---|
| Body Dimension | A | 11.0*11.0 Max | 0.43*0.43 Ref |
| Body Thickness | T | 4.0 Max | 0.157 Ref |
| Wire Lead Dia. | d | 0.60±0.05 | #24 AWG |
| Taping Pitch | P | 12.7 Ref | 0.05 Ref |
| Feed Hole Pitch (Note:1) | P0 | 12.7±0.3 | 0.5 Ref |
| Plane Deviation | ΔP | +1.0 Max | 0.0394 Ref |
| Feed Hole Off Alignment (2e) | P1 | 3.81±0.7 | 0.15 Ref (F=5.08) |
| (1e) | P1 | 5.08±0.7 | 0.20 Ref (F=2.54) |
| Lead Spacing | F | 5.08±0.5 | 0.2 Ref |
| | F | 2.54±0.5 | 0.10 Ref |
| Body Inclination | Δh | 0±1.0 | 0±0.39 Ref |
| Carrier Tape Width | W | 18.0±1.0/-0 | 0.709 Ref |
| Adhesive Tape Width | W0 | 13.0 Ref | 0.512 Ref |
| Feed Hole Ht Off Alignment | W1 | 9.0+0.75/-0.5 | 0.354 Ref |
| Adhesive Tape Width | W2 | 3.0 Ref | 0.118 Ref |
| Straight Lead Height (Note:2) | H | 20.0±0.5 | 0.787 Ref |
| Lead Crimp Height | H0 | 16.0 or 18.0±0.5 | 0.63 Ref |
| Top of Component Height | H1 | 32.0 Max | 1.20 Ref |
| Lead End Protrusion | e | 1.0 Max | 0.039 Ref |
| Feed Hole Diameter | D0 | 4.0±0.3 | 0.157 Ref |
| Overall Tape Thickness | t | 0.9 Max | 0.035 Ref |
| Rejected Component Cut Height | L | 10.0 Max | 0.394 Ref |

Note :
1. Cumnlative pitch tolerance over 20 consecutive units not to exceed ±1.0 mm
2. H=20.0±0.5 for lead style. L, Ho=16 or 18.0±0.5 mm for lead style K, I
3. Dimensions meet requirement defined in EIA RS468

# Part number system




*Please contact with us if your design has a special requirement.

# Lead style

| Lead Style | M (max) | A |
|---|---|---|
| L | 2 mm | 5 mm ↓ 25 mm |
| I | 5 mm | |
| K | 5 mm | |