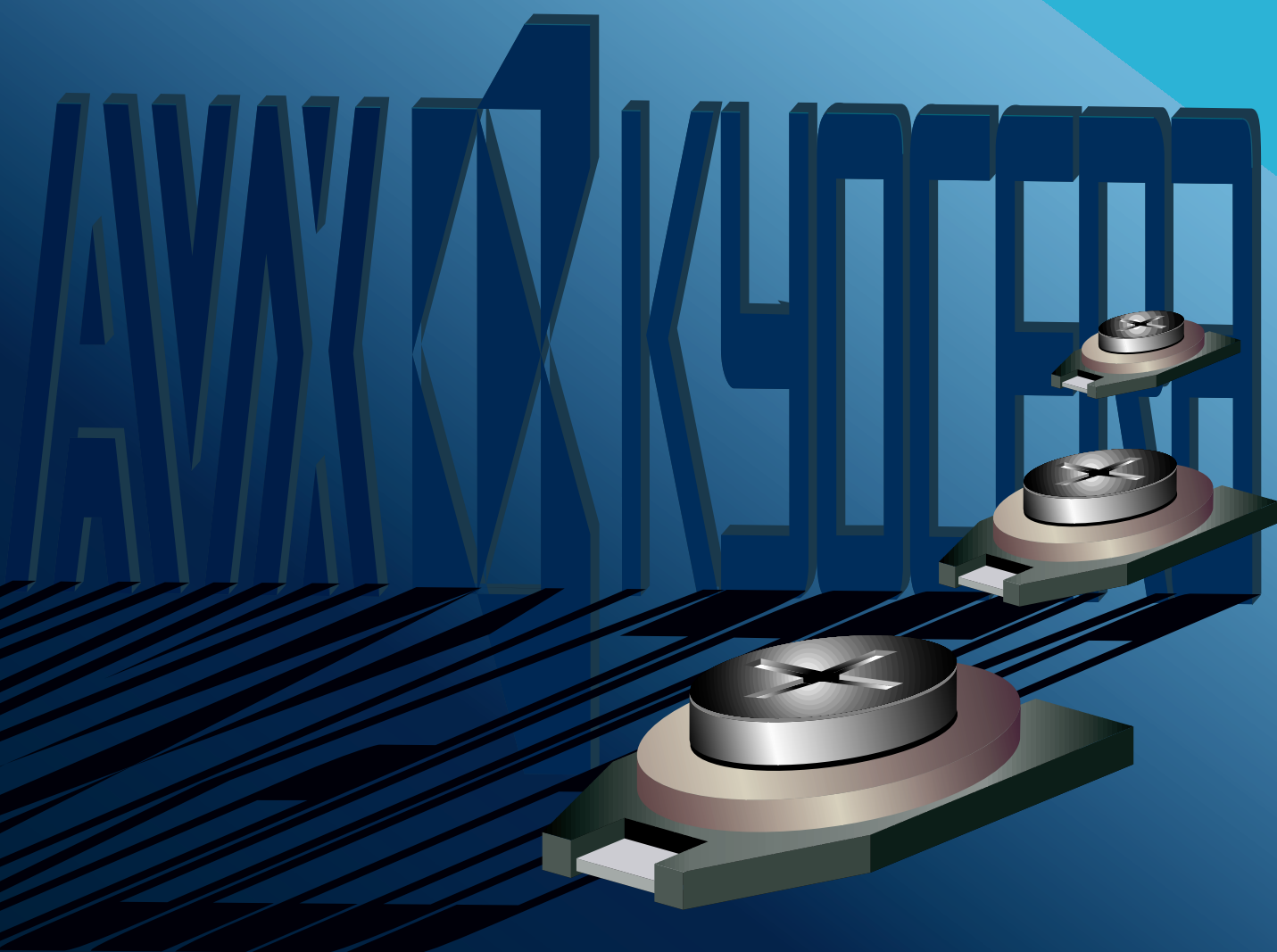




Trimmer Capacitors and Chip Potentiometers



Trimmer Capacitors

| | |
|--|-------|
| Multilayer Ceramic Chip Trimmer Capacitors | |
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| Ultraminiature Trimmer Capacitors | |
| TCX, TCF, TSR, TSX, TSF, TSW Series | 14-16 |

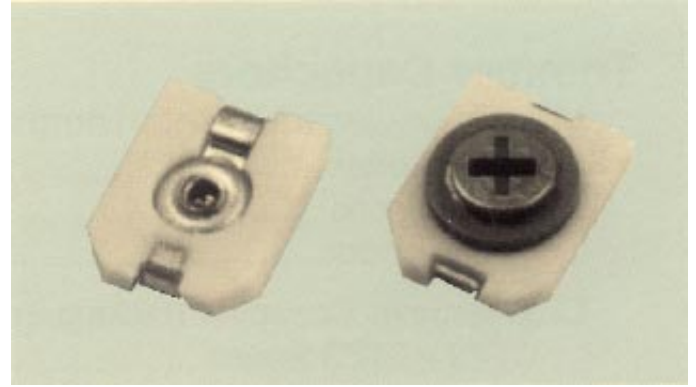
Potentiometers

| | |
|--|-------|
| Thick Film Chip Trimmer Potentiometers | |
| CVR-32 / CVR-42 / CVR-43 Series | 17-21 |

CTZ2 Series

Four Basic Types:

| | | |
|---------|----------------------------|--|
| CTZ2-P | — [CTZ2S-P CTZ2E-P] | Philips Adjust. |
| CTZ2-A | — [CTZ2S-A CTZ2E-A] | Setting drift 1% w/ Philips Adjust. |
| CTZ2-P1 | — [CTZ2S-P1 CTZ2E-P1] | Low profile w/ Philips Adjust. |
| CTZ2-PR | — [CTZ2S-PR CTZ2E-PR] | Reverse ultra thin w/ Philips Adjust. |



How To Order:

CTZ2 E - 03 A - W 2 - P

Optional

- P = Philips adjust
- A = Setting drift $\pm 1\%$ (Philips adjust)
- P1 = Ultra thin 1.0mm max.
- PR = Reverse type (Bottom adjust)

Standard Packaged Quantity

2 = 2000 pcs

Packaging Method

- B = Bulk
- W = Taping (W direction)
- X = Taping (X direction)

Temperature Characteristic

- A = NPO ± 500 ppm/ $^{\circ}$ C
- C = N750 ± 500 ppm/ $^{\circ}$ C

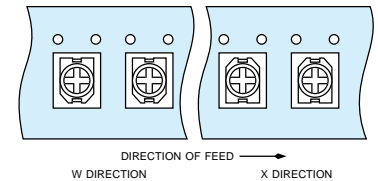
Maximum Capacitance

- 03 = 3pF, +100, -0%
- 05 = 5pF, +100, -0%
- 10 = 10pF, +100, -0%
- 20 = 20pF, +100, -0%
- 30 = 30pF, +100, -0%

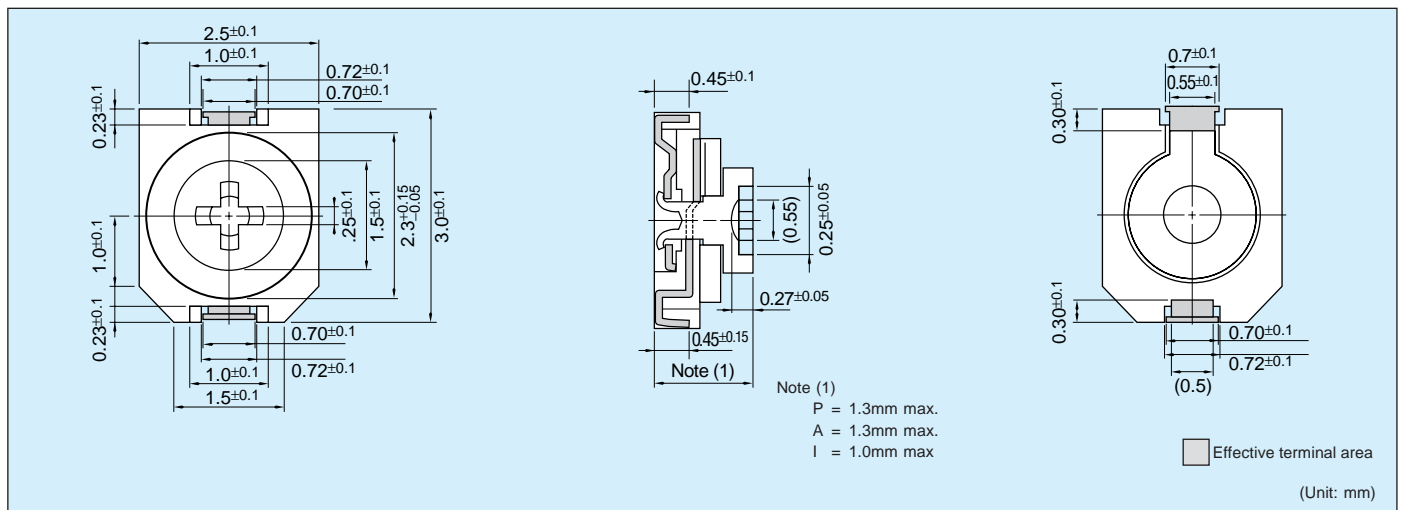
Type

- S = Reflow non-washable type
- E = Reflow washable type

CTZ2 Series



Philips Adjustment Dimensions



CTZ2 Series

Specifications

Type CTZ2-A (max. height 1.3mm, 1% setting drift)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ2□-03A | 2 | 3 | NP0±500 |
| CTZ2□-05A | 3 | 5 | NP0±500 |
| CTZ2□-05C | 2.5 | 5 | N750±500 |
| CTZ2□-10A | 3 | 10 | NP0±500 |
| CTZ2□-10C | 5 | 10 | N750±500 |
| CTZ2□-20C | 5.5 | 20 | N750±500 |
| CTZ2□-30C | 7 | 30 | N750±500 |

Type CTZ2-P (max. height 1.3mm)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ2□-03A | 2 | 3 | NP0±500 |
| CTZ2□-05A | 3 | 5 | NP0±500 |
| CTZ2□-05C | 2.5 | 5 | N750±500 |
| CTZ2□-10A | 3 | 10 | NP0±500 |
| CTZ2□-10C | 5 | 10 | N750±500 |
| CTZ2□-20C | 5.5 | 20 | N750±500 |
| CTZ2□-30C | 7 | 30 | N750±500 |

Type CTZ2-P1 (max. height 1.0mm)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ2□-03A | 2 | 3 | NP0±500 |
| CTZ2□-05A | 3 | 5 | NP0±500 |
| CTZ2□-05C | 2.5 | 5 | N750±500 |
| CTZ2□-10A | 3 | 10 | NP0±500 |
| CTZ2□-10C | 5 | 10 | N750±500 |
| CTZ2□-20C | 5 | 20 | N750±500 |
| CTZ2□-30C | 7 | 30 | N750±500 |

Type CTZ2-PR

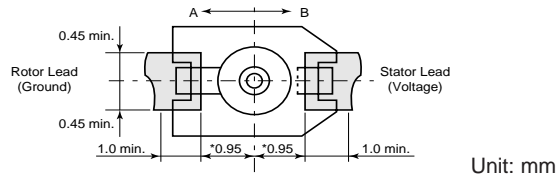
| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ2□-03A | 2 | 3 | NP0±500 |
| CTZ2□-05A | 3 | 5 | NP0±500 |
| CTZ2□-05C | 2.5 | 5 | N750±500 |
| CTZ2□-10A | 3 | 10 | NP0±500 |
| CTZ2□-10C | 5 | 10 | N750±500 |
| CTZ2□-20C | 5 | 20 | N750±500 |
| CTZ2□-30C | 7 | 30 | N750±500 |

CTZ2-P/A/P1 Series

Conditions and Precautions

Mounting Pattern:

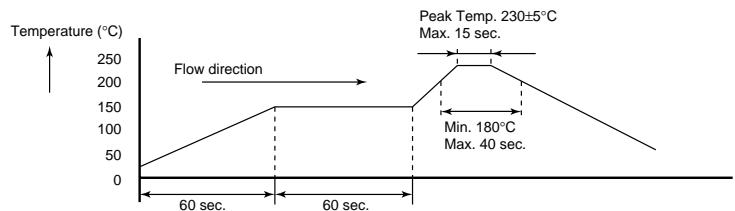
1) Recommended pattern:



- 2) Determine if there is adequate room for mounting according to pattern dimensions and set pattern dimensions.
- 3) Connect stator terminal to voltage, rotor terminal to ground.
- 4) Make sure that the solder cream for coating is sufficient. (We recommend 150 μ m.)
- 5) Take caution that the solder flux and adhesive paste does not flow in between rotor and stator.

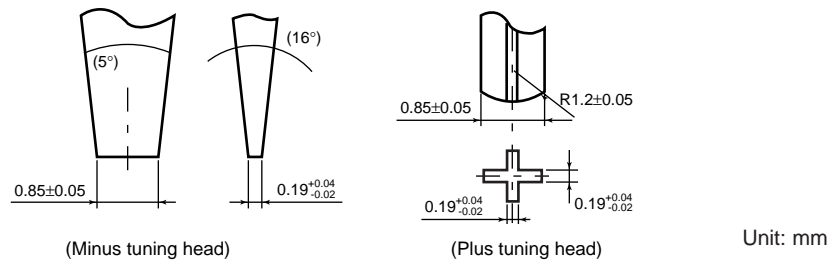
Soldering:

- 1) Recommended reflow temperature curve.
- 2) Recommended hand soldering conditions: tip temperature $270 \pm 5^\circ$, soldering time less than 5 seconds.



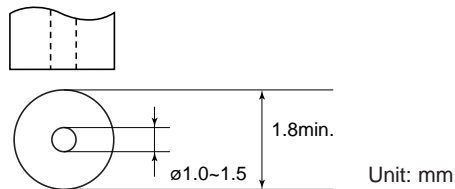
Adjustment:

- 1) After removing from reflow, let cool to room temperature (at least 4 hrs.) before adjustment.
- 2) Maximum pressure of screwdriver should be less than 100g.
- 3) Recommended screwdriver head dimensions:



Mounting:

1) Recommended adhesive nozzle procedure:



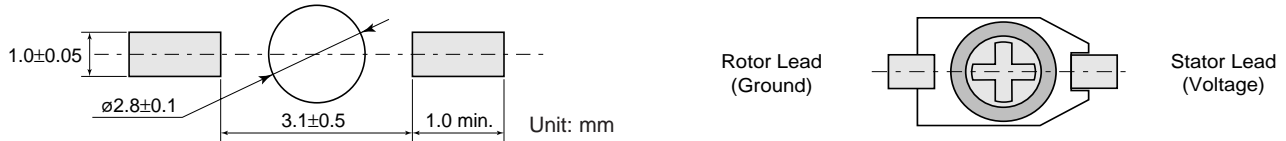
2) Mechanical centering method: when mounting automatically with mechanical centering method, adjust so that the centering hook touches the stator (take caution that centering hook does not touch lead).

CTZ2-PR Series

Conditions and Precautions

Mounting Pattern:

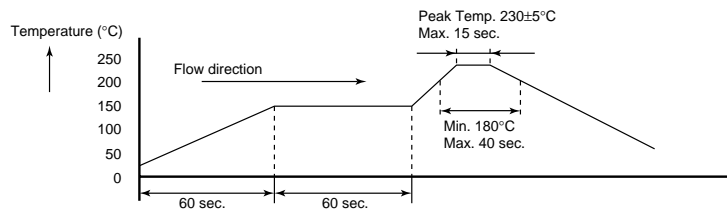
1) Recommended pattern:



- 2) Determine if there is adequate room for mounting according to pattern dimensions and set pattern dimensions.
- 3) Connect stator terminal to voltage, rotor terminal to ground.
- 4) Make sure that the solder cream for coating is sufficient. (We recommend $150\mu\text{m}$.)
- 5) Take caution that the solder flux and adhesive paste does not flow in between rotor and stator.

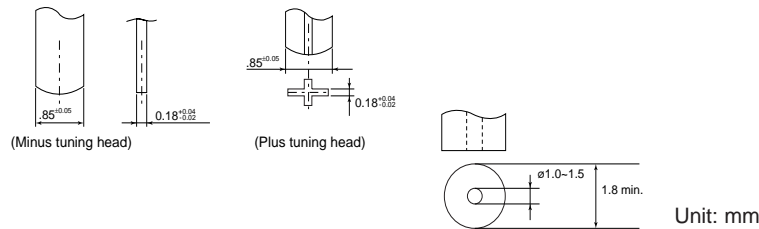
Soldering:

- 1) Recommended reflow temperature curve.
- 2) Recommended hand soldering conditions: tip temperature $270 \pm 5^\circ$, soldering time less than 5 seconds.



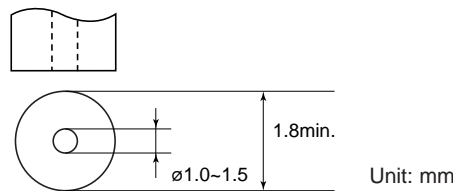
Adjustment:

- 1) After removing from reflow, let cool to room temperature (at least 4 hrs.) before adjustment.
- 2) Maximum pressure of screwdriver should be less than 100g.
- 3) Recommended screwdriver head dimensions:

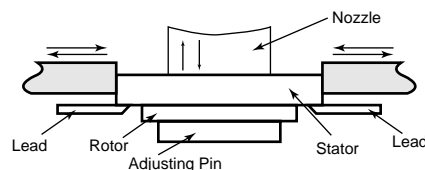


Mounting:

1) Recommended adhesive nozzle procedure:



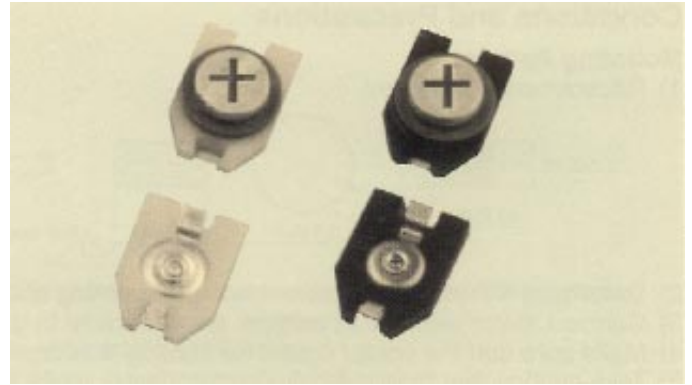
2) Mechanical centering method: when mounting automatically with mechanical centering method, adjust so that the centering hook touches the stator (take caution that centering hook does not touch lead).



CTZ3 Series

Four Basic Types:

| | | |
|----------|--------------------------------|--|
| CTZ3-P | — [CTZ3S-P CTZ3E-P] | Philips Adjust. |
| CTZ3-A | — [CTZ3S-A CTZ3E-A] | Setting drift 1% w/ Philips Adjust. |
| CTZ3-1.5 | — [CTZ3S-P1.5 CTZ3E-P1.5] | Low profile w/ Philips Adjust. |
| CTZ3-PR | — [CTZ3S-PR CTZ3E-PR] | Reverse ultra thin w/ Philips Adjust. |



How To Order:

CTZ3 E - 03 A - W 1 - P F

Optional:

Blank = Straight Lead
F = Lead Form

Optional:

A = Setting drift ±1% (Philips adjust)
P = Philips adjust
P1.5 = Product height 1.5mm max. (Philips adjust)
PR = Reverse type (Bottom adjust)

Quantity Per Reel

1 = 1000 pcs
5 = 5000 pcs

Packaging Method

B = Bulk
W = Taping (W direction)
X = Taping (X direction option)

Temperature Characteristic

A = NPO ± 500 ppm/°C
B = N400 ± 500 ppm/°C
C = N750 ± 500 ppm/°C

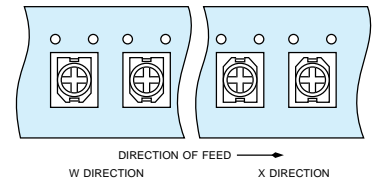
Maximum Capacitance

03 = 3pF, +100, -0%
05 = 5pF, +100, -0%
10 = 10pF, +100, -0%
20 = 20pF, +100, -0%
30 = 30pF, +100, -0%
40 = 40pF, +100, -0%
50 = 50pF, +100, -0%

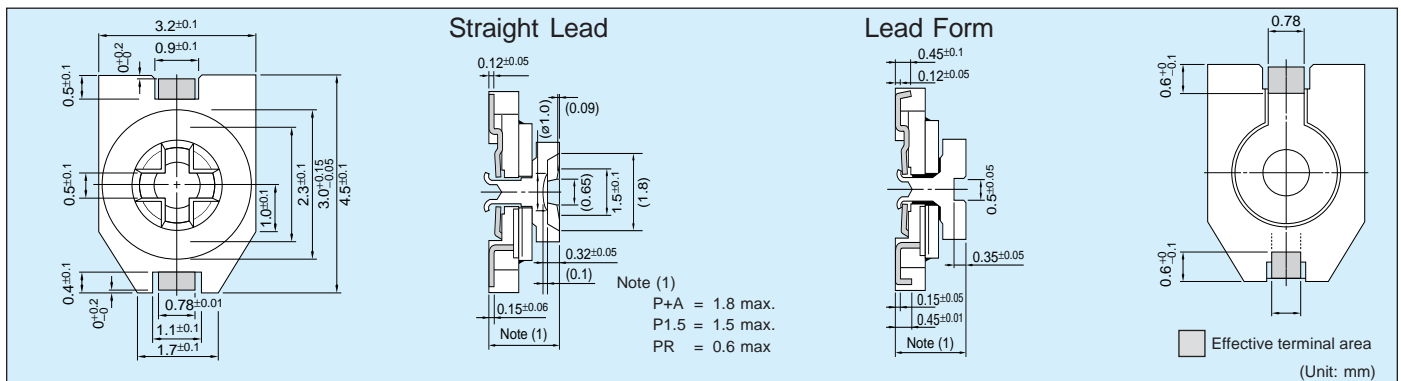
Type

S = Reflow non-washable type
E = Reflow washable type

CTZ3 Series



Philips Adjustment Dimensions



CTZ3 Series

Specifications

Type CTZ3-A (max. height=1.8mm, 1% setting drift)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ3□-03A | 1.5 | 3 | NP0±500 |
| CTZ3□-05A | 2 | 5 | NP0±500 |
| CTZ3□-05C | 3 | 5 | N750±500 |
| CTZ3□-10A | 4 | 10 | NP0±500 |
| CTZ3□-10B | 2 | 10 | N400±500 |
| CTZ3□-10C | 3 | 10 | N750±500 |
| CTZ3□-20C | 7.5 | 20 | N750±500 |
| CTZ3□-30C | 7.5 | 30 | N750±500 |
| CTZ3□-40C | 7.5 | 40 | N750±500 |
| CTZ3□-50C | 12.5 | 50 | N750±500 |

Type CTZ3-P (max. height=1.8mm)

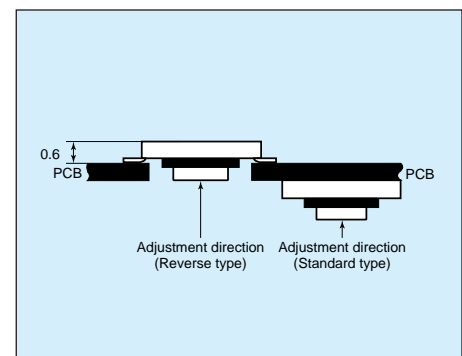
| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ3□-03A | 1 | 3 | NP0±500 |
| CTZ3□-05A | 1.5 | 5 | NP0±500 |
| CTZ3□-05C | 2 | 5 | N750±500 |
| CTZ3□-10A | 2.5 | 10 | NP0±500 |
| CTZ3□-10B | 1.5 | 10 | N400±500 |
| CTZ3□-10C | 3 | 10 | N750±500 |
| CTZ3□-20C | 5 | 20 | N750±500 |
| CTZ3□-30C | 5 | 30 | N750±500 |
| CTZ3□-40C | 5 | 40 | N750±500 |
| CTZ3□-50C | 7 | 50 | N750±500 |

Type CTZ3-P1.5 (max. height=1.5mm)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ3□-03A | 1 | 3 | NP0±500 |
| CTZ3□-05A | 1.5 | 5 | NP0±500 |
| CTZ3□-05C | 2 | 5 | N750±500 |
| CTZ3□-10A | 2.5 | 10 | NP0±500 |
| CTZ3□-10B | 1.5 | 10 | N400±500 |
| CTZ3□-10C | 3 | 10 | N750±500 |
| CTZ3□-20C | 5 | 20 | N750±500 |
| CTZ3□-30C | 5 | 30 | N750±500 |
| CTZ3□-40C | 5 | 40 | N750±500 |
| CTZ3□-50C | 7 | 50 | N750±500 |

Type CTZ3-PR (max. height=0.6mm, reverse type)

| Part number | Min. cap. value (pF) | Max. cap. value (pF) | TC (ppm/°C) |
|-------------|----------------------|----------------------|-------------|
| CTZ3□-03A | 1 | 3 | NP0±500 |
| CTZ3□-05A | 1.5 | 5 | NP0±500 |
| CTZ3□-05C | 2 | 5 | N750±500 |
| CTZ3□-10A | 2.5 | 10 | NP0±500 |
| CTZ3□-10B | 1.5 | 10 | N400±500 |
| CTZ3□-10C | 3 | 10 | N750±500 |
| CTZ3□-20C | 5 | 20 | N750±500 |
| CTZ3□-30C | 5 | 30 | N750±500 |
| CTZ3□-40C | 5 | 40 | N750±500 |
| CTZ3□-50C | 7 | 50 | N750±500 |

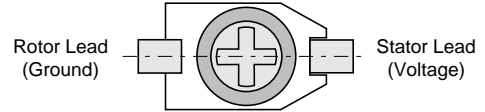
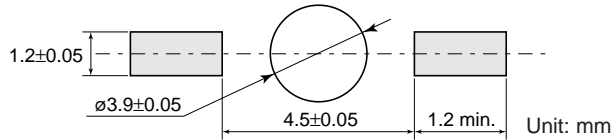


CTZ3-PR Series

Conditions and Precautions

Mounting Pattern:

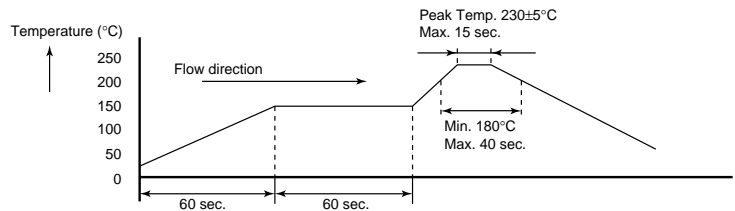
1) Recommended pattern:



- Determine if there is adequate room for mounting according to pattern dimensions and set pattern dimensions.
- Connect stator terminal to voltage, rotor terminal to ground.
- Make sure that the solder cream for coating is sufficient. (We recommend $150\mu\text{m}$.)
- Take caution that the solder flux and adhesive paste does not flow in between rotor and stator.

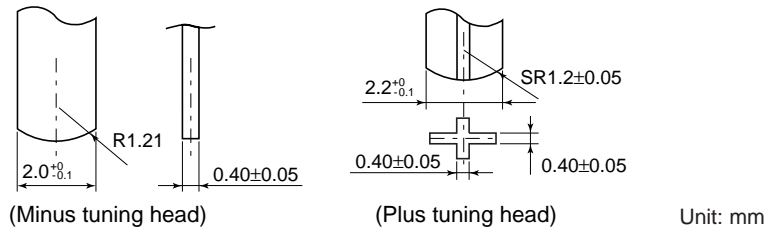
Soldering:

- Recommended reflow temperature curve.
- Recommended hand soldering conditions: tip temperature $270 \pm 5^\circ$, soldering time less than 5 seconds.



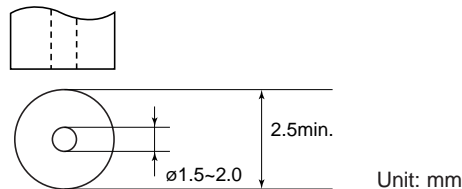
Adjustment:

- After removing from reflow, let cool to room temperature (at least 4 hrs.) before adjustment.
- Maximum pressure of screwdriver should be less than 100g.
- Recommended screwdriver head dimensions:

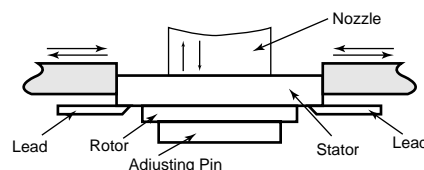


Mounting:

1) Recommended adhesive nozzle procedure:



2) Mechanical centering method: when mounting automatically with mechanical centering method, adjust so that the centering hook touches the stator (take caution that centering hook does not touch lead).

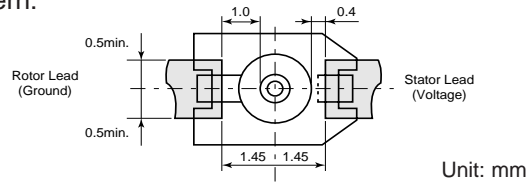


CTZ3-P/A/P1.5 Series

Conditions and Precautions

Mounting Pattern:

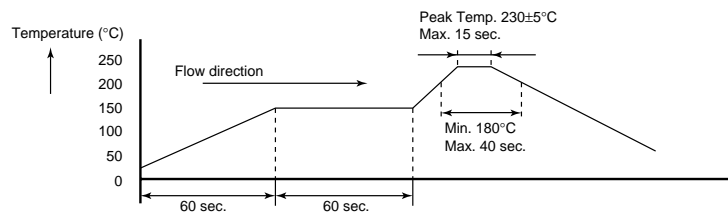
1) Recommended pattern:



- 2) Determine if there is adequate room for mounting according to pattern dimensions and set pattern dimensions.
- 3) Connect stator terminal to voltage, rotor terminal to ground.
- 4) Make sure that the solder cream for coating is sufficient. (We recommend 150 μ m.)
- 5) Take caution that the solder flux and adhesive paste does not flow in between rotor and stator.

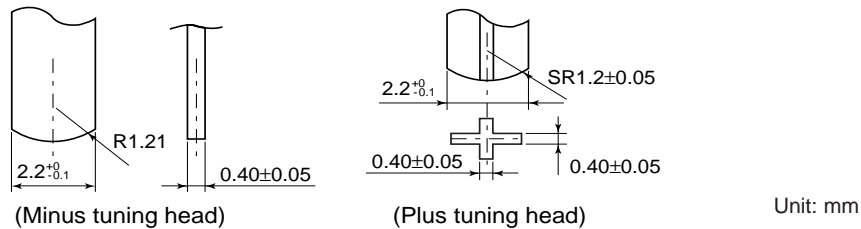
Soldering:

- 1) Recommended reflow temperature curve:
- 2) Recommended hand soldering conditions: tip temperature 270 \pm 5 $^{\circ}$, soldering time less than 5 seconds.



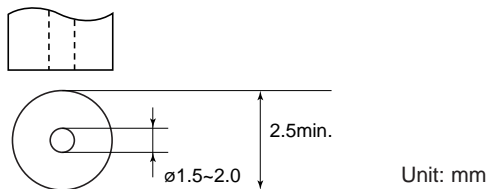
Adjustment:

- 1) After removing from reflow, let cool to room temperature (at least 4 hrs.) before adjustment.
- 2) Maximum pressure of screwdriver should be less than 100g.
- 3) Recommended screwdriver head dimensions:



Mounting:

1) Recommended adhesive nozzle procedure:



2) Mechanical centering method: when mounting automatically with mechanical centering method, adjust so that the centering hook touches the stator (take caution that centering hook does not touch lead).

CTZ2/CTZ3 Series

Test Methods

| Item | Specification | Measuring Condition |
|--------------------------------|--|--|
| Humidity Test | Δ C : ±10% Max Q : 150 Min IR : 103MΩ Min | Expose at 40±2°C, 90~95% RH for 96±4 hours and keep at normal conditions for 1 hour |
| High Temperature Load Test | Δ C : ±5% Max. Q : 200 Min. IR : 103MΩ Min. | Apply 2 × rated voltage at 85±3°C in high temperature chamber for 96±4 hours and keep at normal conditions for 24 hours |
| Temperature Cycling Test | Δ C : ±7% Max. Q : 200 Min. IR : 103 MΩ Min | Perform 5 cycles as follows: -25°C (30 min.) → room temperature (5 min.) → +85°C (30 min.) and keep at normal conditions for 24±1 hour |
| Vibration Test | Δ C : ±5% Max. Q : 250 Min. IR : 103MΩ Min. | Vibration frequency range: 10~55Hz Time: 2 hours each in three different vertical directions (X, Y and Z axes, total 6 hours) Amplitude: 1.5 mm |
| Shock Resistance Test | no problem observed | Fix on 50 gram metal case and drop onto the concrete floor from a height of 1 meter |
| Solderability | coverage ≥ 75% ea. termination end | Immerse in Pb-Sn solder at 230±5°C for 5 +1/-0 seconds |
| Resistance to Solder Heat Test | Δ C : ±10% Max. Q : 250 Min. IR : 103MΩ Min. | Put on a hot plate at 270±5°C for 5±1 seconds and keep at normal conditions for 24 hours |
| Low Temperature Exposure | Δ C : ±5% Max. Q : 250 Min. IR : 103MΩ Min. | Expose in low temperature chamber at -25°C for 96±4 hours and keep at normal conditions for 1 hour |
| Mechanical Load | Δ C : ±5% Max. | Apply a 100 gram load in the axis of the rotor |
| Setting Drift | Δ C : ±5% Max. | Rotate rotor 3 times until rotor slot is perpendicular to mounting pads, at 10 rpm. After that, take an initial reading of capacitance after 5 seconds. Measure again after 1 hour |

Recommended Washing Conditions

| Solvent | Maker | Measuring Condition | Results |
|-------------------------|-----------------------------------|---|---------|
| AK225 | Asahi Glass Company | Immerse 50 ~ 55°C 5 min. | O.K. |
| AK14lb | Asahi Glass Company | Immerse 32±1°C 5 min. | O.K. |
| Pine Alph (ST100S) | Arakawa Chemical Industries, Ltd. | Immerse 70±1°C Immerse into water 60±1°C 3 min. | O.K. |
| Clean slough (750H) | KAO Corporation | Immerse 60°C. 5 min. Rinse with pure water. Dry 85°C | O.K. |
| San Elec (FS813D) | Sanyo Chemical Industries, Ltd. | Immerse 60°C 5 min. Dry 85°C 10min. | O.K. |
| Techno Care | Toshiba | Immerse into FRW17 (ultrasonic 10 min) Rinse out of FRW1 (ultrasonic 3 min) | O.K. |
| Terpene Cleaner (EC-7R) | Alpha Metals | Immerse room temperature 10 min. and ultrasonic 2 min. Rinse with water 40~50°C | O.K. |
| IPA | | Immerse room temperature 1 min. | O.K. |
| Methylene Chloride | | Immerse room temperature 10 min. | O.K. |
| Hot Water | | Immerse 65°C 10 min. | O.K. |

Recommended Cleaning Precautions for CTZ-E types only

- When washing with solution (IPA), follow conditions below:
 - Ultrasound wave washing under 1 minute.
 - Soak washing under 5 minutes. However, if using both ultrasound and soak washing, the total washing time should be under 3 minutes.
- When revolving, the silicon coating will break and the torque will increase. This is not irregular. Once the silicon coating breaks, the torque will return to normal value.

CTZ2 / CTZ3 Series

Carrier Tape Dimensions

(Unit: mm)

| Items | A | B | W | F |
|-------|----------------|----------------|----------------|----------------|
| CTZ3 | 3.35 ± 0.1 | 4.60 ± 0.1 | 12.00 ± 0.3 | 5.50 ± 0.05 |
| CTZ2 | 2.70 ± 0.1 | 3.20 ± 0.1 | 12.00 ± 0.3 | 5.50 ± 0.05 |
| Items | E | P ₀ | P ₁ | P ₂ |
| CTZ3 | 1.75 ± 0.1 | 4.00 ± 0.1 | 8.00 ± 0.1 | 2.00 ± 0.05 |
| CTZ2 | 1.75 ± 0.1 | 4.00 ± 0.1 | 4.00 ± 0.1 | 2.00 ± 0.05 |
| Items | ∅Do | M | R | t ₁ |
| CTZ3 | 1.50 ± 0.1 | 3° + 0 | 0.30 + 0 | 0.30 ± 0.1 |
| CTZ2 | 1.50 ± 0.1 | 3° + 0 | 0.30 + 0 | 0.30 ± 0.1 |
| Items | t ₂ | t ₃ | t ₄ | C |
| CTZ3 | 2.50 ± 0.1 | 2.00 ± 0.1 | 0.30 ± 0.05 | 1.50 ± 0.1 |
| CTZ2 | 2.00 ± 0.1 | 1.30 ± 0.1 | 0.30 ± 0.1 | 1.03 ± 0.1 |

Reel Dimensions

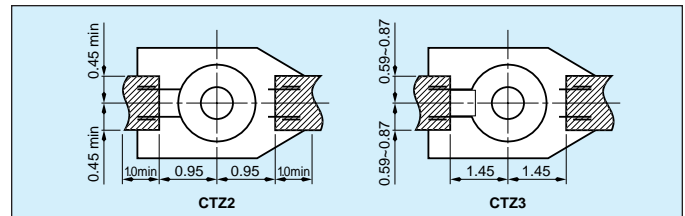
(Unit: mm)

| CTZ3 | | | | | | | | | |
|----------|-----------|------------|------------|------------|-----------|------------|-----------|-----|--|
| Items | A | B | C | D∅ | E | W | t | R | |
| 1000 pcs | 178 ± 2.0 | >50 | 13.0 ± 0.5 | 21.0 ± 0.8 | 2.0 ± 0.5 | 14.0 ± 2.0 | 2.5 ± 0.5 | 1.0 | |
| 5000 pcs | 420 ± 2.0 | 80.0 ± 2.0 | 13.0 ± 0.5 | 21.0 ± 1.0 | 2.0 ± 0.5 | 14.0 ± 2.0 | 2.0 ± 0.5 | 5.0 | |
| CTZ2 | | | | | | | | | |
| Items | A | B | C | D∅ | E | W | t | R | |
| 2000 pcs | 178 ± 2.0 | >50 | 13.0 ± 0.5 | 21.0 ± 0.8 | 2.0 ± 0.5 | 14.0 ± 2.0 | 2.5 ± 0.5 | 1.0 | |

Application Cautions

Mounting:

- 1) Solder reflow temperature should not exceed 240°C.
- 2) Prevent flux or wax from flowing between rotor and stator.
- 3) Do not run conductor patterns underneath the mounted trimmer capacitor.



Adjustment:

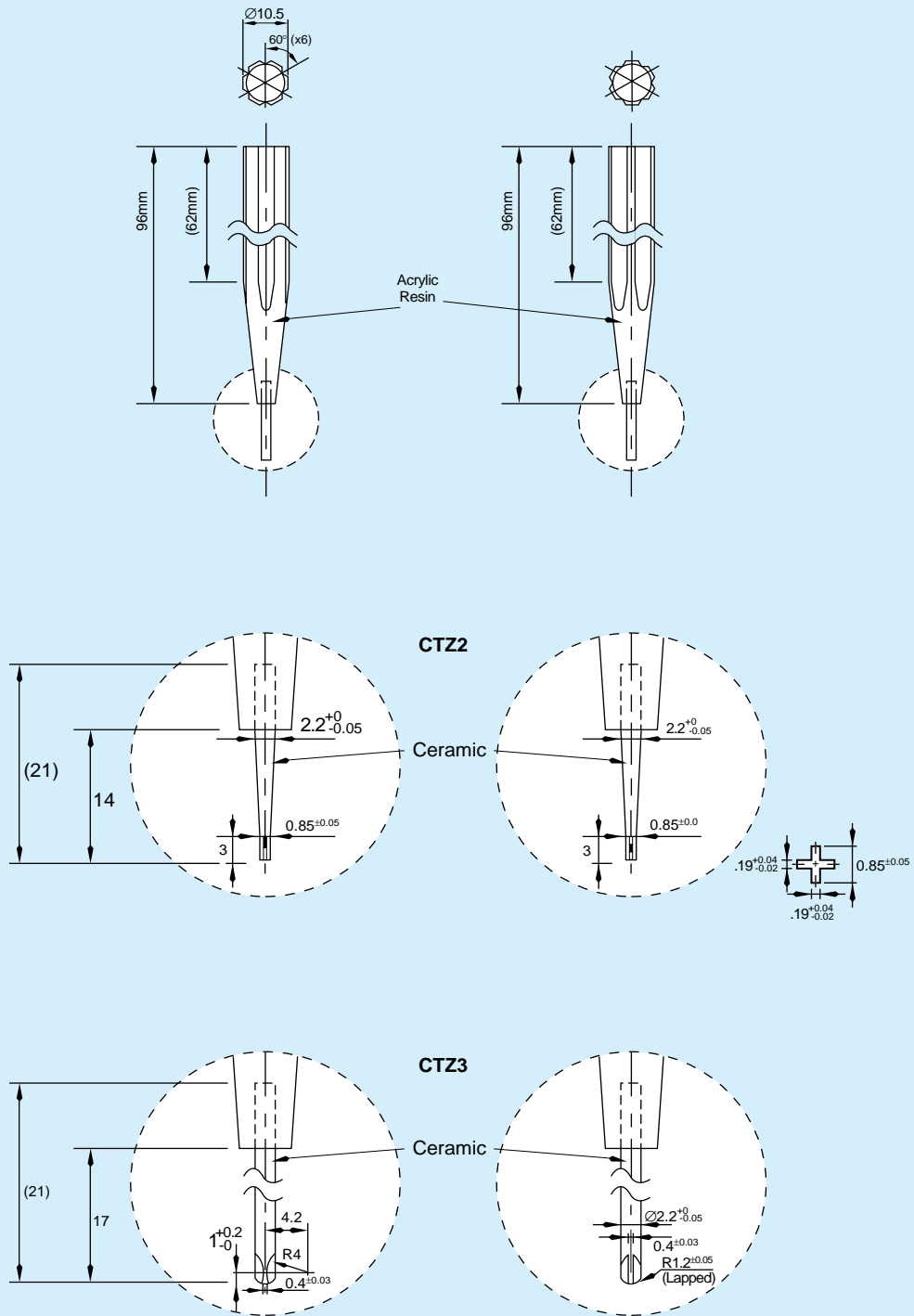
- 1) Any capacitance adjustments should be executed 12 hours after reflow soldering has been completed.
- 2) Maximum load on rotor by adjusting screw driver should not exceed 100 grams (3.53 ounces).
- 3) For critical and/or accurate capacitance adjustments rotate 360° before finding setting. When tight tolerance of a CTZ's setting is needed in a circuit add a fixed capacitor as a "stray capacitor" in series or parallel with the CTZ to tighten the tolerance of the CTZ's setting drift.

Application cautions, inclusive for CTZ3 E and CTZ2 E series:

- 1) Maintain the following conditions when washing with solvents such as freon etc.
 - (1) Ultrasonic wave wash within 1 minute
 - (2) Immersion wash within 5 minutes
 When using ultrasonic wave wash with immersion wash total time should remain under 3 minutes.
- 2) Do not wash after rotating the rotor.
- 3) When rotation is started, torque is temporarily high (maximum 200 g•cm) due to the silicon coating. Torque should be normal after first rotation.

Store in normal ambient conditions.
Avoid high temperatures, humid air, and dust.

NOTE: For CTZ2 S and CTZ3 S series avoid the use of solvent washes.

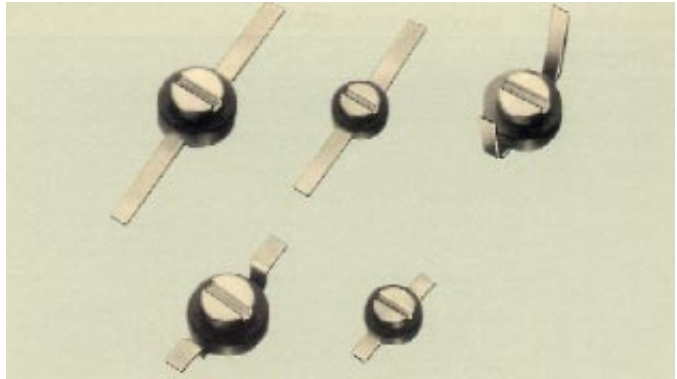


(Unit: mm)

TCX, TCF, TSR, TSX, TSF, TSW Series

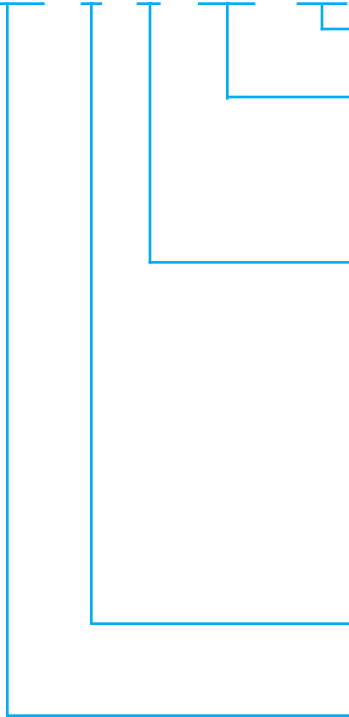
Features:

- 1) Small size and wide capacitance range.
- 2) Small ΔC in alcohol washing.
- 3) Wide slot type which can be trimmed using a non-conductive trimming tool.



How To Order:

TCX - 3 - S - 150 - AU



Lead Type HB available in 2 \emptyset & 3 \emptyset

AB & AU available in 3 \emptyset only

Thickness Indication

(see specifications table)

100 = 1.0 mm

120 = 1.2 mm

150 = 1.5 mm

180 = 1.8 mm

Capacitance Value

(see specifications table)

Codes marked with an asterisk denote standard values. Values in parentheses are only available in 1mm thickness. All values are in picofarads.

3 \emptyset Type

Z = 1 to 3

P = 1.5 to 5

SP = 1.5 to 10

H = 2.5 to 10

S3* = 5 to 20

S2* = 5 to 25

S* = 5 to 30

\square^* = 5 to 35

2 \emptyset Type

\square^* = 5 to 15 (6 to 15)

L = 5 to 20 (6 to 20)

Diameter Indication

3 = 3 \emptyset mm

2 = 2 \emptyset mm

Type

(see Table 2 at right)

TCX, TCF, TSR, TSX, TSF, TSW

Table 1

(Unit: mm)

| Dimension | HB type | AB type | AU type |
|-----------|---------------|---------------|-----------|
| Lead Type | HB | AB | AU |
| H | 1.2 +0/-0.3 | 2.6 \pm 0.3 | 2.35 Max. |
| B | 4.6 +0/-0.4 | 5.0 \pm 0.5 | 4.20 Max. |
| L | 6.7 +0.1/-0.3 | — | — |

Table 2

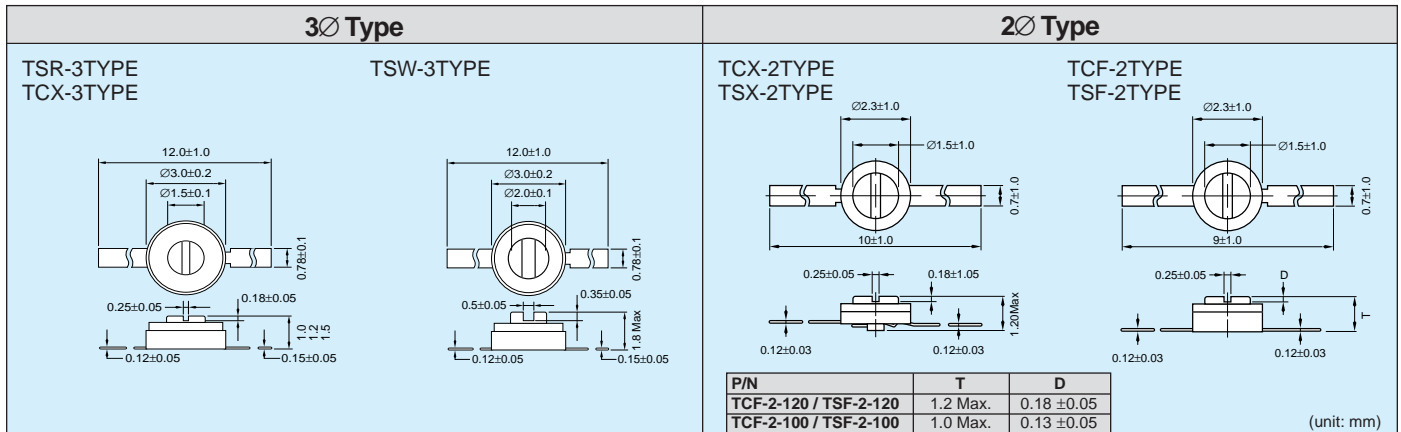
| Type | Lead Plating | Slot Specification | Diameter |
|------|--------------|--------------------|-------------------------------|
| TCX | Au | Normal | 3 \emptyset , 2 \emptyset |
| TCF | | | 2 \emptyset |
| TSR | Ag | | 3 \emptyset |
| TSX | | | 2 \emptyset |
| TSF | | | 2 \emptyset |
| TSW | | | Wide |

Normal slot (width) 0.25 \pm 0.05
(depth) 0.18 \pm 0.05

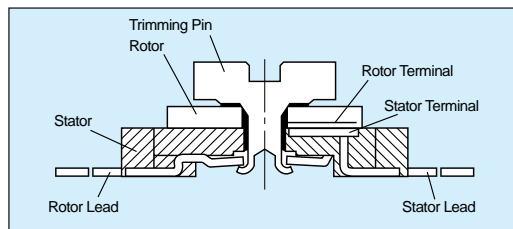
Wide slot (width) 0.5 \pm 0.05
(depth) 0.35 \pm 0.05

TCX, TCF, TSR, TSX, TSF, TSW Series

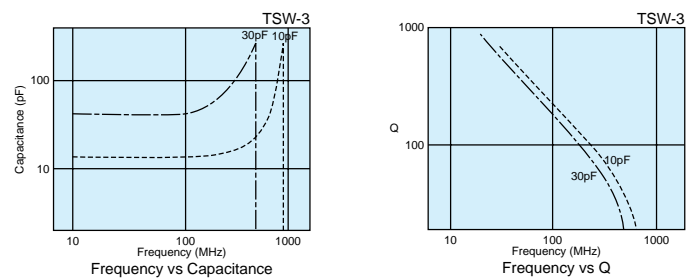
Dimensions



Construction



Performance Characteristic Graphs



Performance Characteristics

| Item | | Characteristic | Measuring Condition |
|--------------------------|-----|--|---|
| Capacitance | - | within specification | TSW-3: 20±1MHz (1±0.5Vrms)(25°C) |
| Q factor | Q | TSW-3: > 200 TSR-3: } > 150 TCX-3: } TSX/TCX-2: } > 100 TSF/TCF-2: } | TSR-3: } TCX-3: } 1±0.1MHz TSX/TCX-2: } (1±0.5Vrms)(25°C) TSF/TCF-2: } |
| Rated Voltage | - | DC 25V | _____ |
| Withstanding Voltage | DWV | No problem observed | Apply 3 × rated voltage for 1 min. |
| Insulating Resistance | IR | > 10,000 MΩ | Apply rated voltage for 1 min. |
| Operating Temperature | - | -25°C to +85°C | _____ |
| Temperature Coefficiency | TC | -1,200±800ppm/°C | -25°C to +85°C |
| Torque | - | 10~75 g•cm | _____ |

TCX, TCF, TSR, TSX, TSF, TSW Series

Specifications

X=Standard, O=Option, Blank=Not Available

| Type | P/N | Capacitance Range Mark | Capacitance Range (pF) | Thickness (mm) | | | | Temp. Coef. (ppm/°C) | Q Factor | | |
|---------|-------------------------|------------------------|------------------------|-------------------|-----|-----|-------------------------------|----------------------|-------------------------------|--|----------|
| | | | | Thickness Marking | | 1.0 | 1.2 | | | 1.5 | 1.8 |
| | | | | P/N | 100 | 120 | 150 | 180 | | | |
| Ø3 Type | TCX-3 TSR-3 TSW-3 | Z | 1 to 3 | TCX-3 | | | O | | NPO±300 | TSW-3: 200 min (1 ±0.1 MHz) TSR-3 TCX-3 150 min (1 ±0.1 MHz) | |
| | | | | TSR-3 | | | O | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | P | 1.5 to 5 | TCX-3 | | | O | | | | N400±300 |
| | | | | TSR-3 | | | O | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | SP | 1.5 to 10 | TCX-3 | | | O | | NPO±500 | | |
| | | | | TSR-3 | | | O | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | H | 2.5 to 10 | TCX-3 | | | O | | N750±500 | | |
| | | | | TSR-3 | | | O | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | S3 | 5 to 20 Standard | TCX-3 | X | X | X | | TCX-3, TSR-3: N1200±800 | | |
| | | | | TSR-3 | X | X | X | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | S2 | 5 to 25 Standard | TCX-3 | X | X | X | | TSW-3: N750±500 | | |
| | | | | TSR-3 | X | X | X | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | S | 5 to 30 Standard | TCX-3 | X | X | X | | TCX-3, TSR-3: N1200±800 | | |
| | | | | TSR-3 | X | X | X | | | | |
| | | | | TSW-3 | | | | X | | | |
| | | □ | 5 to 35 Standard | TCX-3 | X | X | X | | TSW-3: N750±500 | | |
| | | | | TSR-3 | X | X | X | | | | |
| | | | | TSW-3 | | | | X | | | |
| L | 6 to 40 | TCX-3 | | X | X | | TCX-3, TSR-3: N1200±800 | | | | |
| | | TSR-3 | | X | X | | | | | | |
| | | TSW-3 | | | | X | | | | | |
| Ø2 Type | TCX-2 | □ | 5 to 15 | TCX/TSX-2 | | X | | N1200±800 | 100 min (1 ±0.1 MHz) | | |
| | TCF-2 | | ★(6 to 15) | TCF/TSF-2 | X | X | | | | | |
| | TSX-2 | | 5 to 20 | TCX/TSX-2 | | X | | | | | |
| | TSF-2 | | ★(6 to 20) | TCF/TSF-2 | X | X | | | | | |

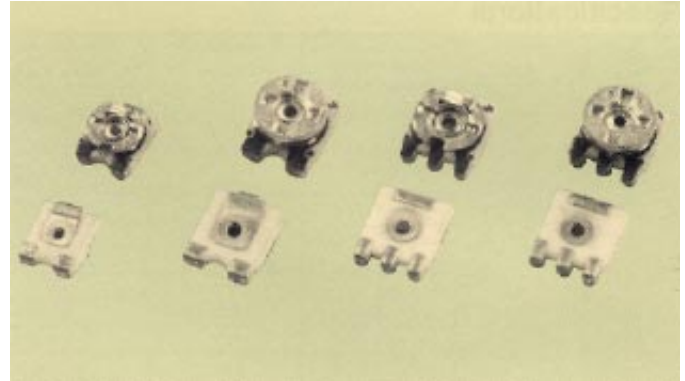
Tolerance of variable capacitance range: Min +0/-100%, Max +100%/-0

★ Thickness only 1.0mm

CVR-32 / CVR-42 / CVR-43 Series

Features:

- 1) Two small sizes and profiles: CVR-3 & CVR-4.
- 2) Solderable only in the terminal electrode areas.
- 3) Individual part marking provides easy identification.
- 4) The CVR-4 series is available in a 2 or 3 terminal style.
- 5) Packaged in bulk, or on 12mm embossed plastic tape and reel.
- 6) Easily adjustable with a screwdriver.



How To Order:

CVR - 4 3 C - 223 S W 1 □

Others

Standard Quantity Per Package

| CVR-4 | | CVR-3 | |
|-------|------------|-------|-------------|
| 1 | = 1,000pcs | 2 | = 2,000pcs |
| 5 | = 5,000pcs | 5 | = 5,000pcs |
| | | 0 | = 10,000pcs |

Packaging

B = Bulk
 W = Taping (W direction)
 X = Taping (X direction) option

Adjustment Method

S = Standard
 G = Low Profile
 A = For Automatic
 R = Bottom (CVR-43 only)

Nominal Resistance Value

(3 digits, 2 significant digits and 1 number of zeros)
 example: 223 = 22kΩ

Circuit Type

A = Voltage adjustment
 C = Current adjustment (except for CVR-3)

Terminal Numbers

2 = 2 terminals
 3 = 3 terminals (except for CVR-3)

Size

4 = 4mm
 3 = 3mm

Chip Trimmer Potentiometer

CVR-32 / CVR-42 / CVR-43 Series

Dimensions

| Item | Circuit Type | Equivalent Circuit | Dimension (Unit: mm) |
|----------------------------------|--------------|--------------------|--|
| (Face) (Back) CVR-43 Auto | A type | | <p>*G type height = 1.8 ± 0.2</p> |
| | C type | | |
| CVR-42 Auto | A type | | <p>*G type height = 1.8 ± 0.2</p> |
| | C type | | |
| CVR-43 Reverse | A type | | |
| | C type | | |
| CVR-43 Standard | A type | | |
| | C type | | |
| CVR-42 Standard | A type | | |
| | C type | | |
| CVR-32 Standard | A type | | |

CVR-32 / CVR-42 / CVR-43 Series

Rating

| Specifications | Rating | |
|-----------------------------|---------------------|---------------------|
| | CVR-4 series | CVR-3 series |
| Rated power | 0.2W (70°C) | 0.1W (70°C) |
| Rated voltage | 100V | 50V |
| Resistance Value | 100Ω~2.2MΩ | 100Ω~2.2MΩ |
| Resistance Tolerance | ±30% | ±30% |
| Resistance Change Linearity | Straight line "B" | Straight line "B" |
| Rotation life | (20 rotations) ±15% | (20 rotations) ±15% |
| Torque | 20~200g•cm | 20~200g•cm |
| Rotation angle | 270°±20° | 270°±20° |
| Operating temp | -40°C~+100°C | -40°C~+100°C |
| T.C.R. | ±250 ppm/°C | ±250 ppm/°C |

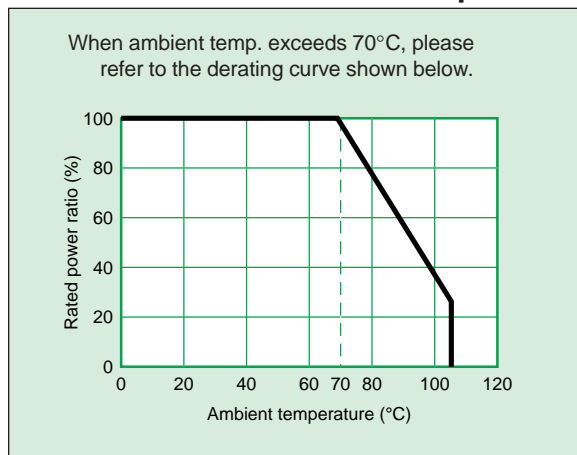
Code

| Code (a) (The first two significant figures) | | Code (b) (10 logarithmic multiplier) | |
|---|-------|---|-----------------|
| Sign | Value | Sign | Value |
| 1 | 10 | 1 | 10 ¹ |
| A | 15 | 2 | 10 ² |
| 2 | 20 | 3 | 10 ³ |
| 3 | 30 | 4 | 10 ⁴ |
| 4 | 47 | 5 | 10 ⁵ |
| 5 | 50 | | |
| 6 | 68 | | |

(Left side (1) only . . . circuit type C)
(Both side (1)&(3) . . . circuit type A)

• Example (a) 4 (b) 3 ⇒ 47 × 10³ = 47 kΩ

Rated Power vs. Ambient Temp.



Rated Power

Rated voltage is calculated from the following definition.

$$E = \sqrt{PR}$$

E: Rated voltage (V)
P: Rated power (W)
R: Nominal resistance value (Ω)

Maximum operating voltage

CVR-4 series – 100VDC
CVR-3 series – 50VDC

Standard Values

| Style | Full resistance value (Ω, kΩ, MΩ) | Code | |
|-------------|--------------------------------------|------|-----|
| | | (a) | (b) |
| CVR-□□□-101 | 100 Ω | 1 | 1 |
| CVR-□□□-151 | 150 Ω | A | 1 |
| CVR-□□□-201 | 200 Ω | | 1 |
| CVR-□□□-221 | 220 Ω | 2 | 1 |
| CVR-□□□-301 | 300 Ω | | 1 |
| CVR-□□□-331 | 330 Ω | 3 | 1 |
| CVR-□□□-471 | 470 Ω | 4 | 1 |
| CVR-□□□-501 | 500 Ω | 5 | 1 |
| CVR-□□□-681 | 680 Ω | 6 | 1 |
| CVR-□□□-102 | 1.0 kΩ | 1 | 2 |
| CVR-□□□-152 | 1.5 kΩ | A | 2 |
| CVR-□□□-202 | 2.0 kΩ | | 2 |
| CVR-□□□-222 | 2.2 kΩ | 2 | 2 |
| CVR-□□□-302 | 3.0 kΩ | | 2 |
| CVR-□□□-332 | 3.3 kΩ | 3 | 2 |
| CVR-□□□-472 | 4.7 kΩ | 4 | 2 |
| CVR-□□□-502 | 5.0 kΩ | 5 | 2 |
| CVR-□□□-682 | 6.8 kΩ | 6 | 2 |
| CVR-□□□-103 | 10 kΩ | 1 | 3 |
| CVR-□□□-153 | 15 kΩ | A | 3 |
| CVR-□□□-203 | 20 kΩ | | 3 |
| CVR-□□□-223 | 22 kΩ | 2 | 3 |
| CVR-□□□-303 | 30 kΩ | | 3 |
| CVR-□□□-333 | 33 kΩ | 3 | 3 |
| CVR-□□□-473 | 47 kΩ | 4 | 3 |
| CVR-□□□-503 | 50 kΩ | 5 | 3 |
| CVR-□□□-683 | 68 kΩ | 6 | 3 |
| CVR-□□□-104 | 100 kΩ | 1 | 4 |
| CVR-□□□-154 | 150 kΩ | A | 4 |
| CVR-□□□-204 | 200 kΩ | | 4 |
| CVR-□□□-224 | 220 kΩ | 2 | 4 |
| CVR-□□□-304 | 300 kΩ | | 4 |
| CVR-□□□-334 | 330 kΩ | 3 | 4 |
| CVR-□□□-474 | 470 kΩ | 4 | 4 |
| CVR-□□□-504 | 500 kΩ | 5 | 4 |
| CVR-□□□-684 | 680 kΩ | 6 | 4 |
| CVR-□□□-105 | 1.0 MΩ | 1 | 5 |
| CVR-□□□-155 | 1.5 MΩ | A | 5 |
| CVR-□□□-205 | 2.0 MΩ | | 5 |
| CVR-□□□-225 | 2.2 MΩ | 2 | 5 |

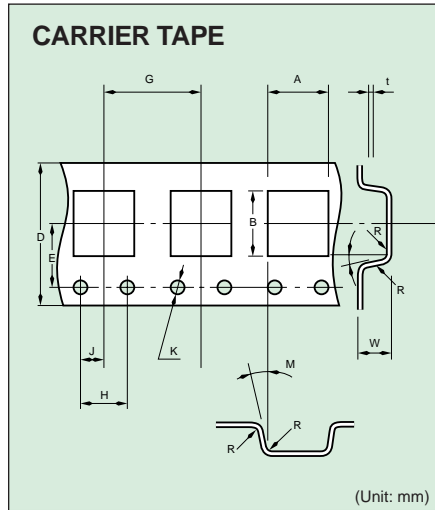
CVR-32 / CVR-42 / CVR-43 Series

Specifications and Methods of Reliability Test

| Item | Specification | Measuring Condition |
|-----------------------|--|--|
| Load life | $\Delta R < \pm 5\%$ of Initial value | 1: Stabilize at $70 \pm 2^\circ\text{C}$ for 8 hours. 2: Measure initial value. 3: Perform voltage cycle for 1000 ± 12 hours. on: 1.5 hours off: 0.5 hours 4: Stabilize at 25°C for 5 hours. 5: Measure value. |
| Load life in moisture | $\Delta R < \pm 5\%$ of Initial value | 1: Perform voltage cycle for 500 ± 12 hours in chamber ($40 \pm 2^\circ\text{C}$, 90–95% RH). on: 1.5 hours off: 0.5 hours 2: Stabilize at 25°C for 5 hours. 3: Measure value. |
| Heat resistance | $\Delta R < \pm 5\%$ of Initial value | Dwell in temperature $100 \pm 3^\circ\text{C}$ for 250 ± 6 hours stabilize at 25°C for 5 hours. Measure resistance value. |
| Temperature cycle | $\Delta R < \pm 2\%$ of Initial value | Cycle 1: $-40^{+3}_{-3}^\circ\text{C}$ for 30 min. 1 cycle is composed of 4 conditions. 2: $25^{+10}_{-5}^\circ\text{C}$ for 15 min. After 5 cycles, stabilize at 25°C 3: $100^{+10}_{-5}^\circ\text{C}$ for 30 min. for 5 hours. 4: $25^{+10}_{-5}^\circ\text{C}$ for 15 min. Measure resistance value. |
| Antivibration test | $\Delta R < \pm 1\%$ of Initial value | Sweep at frequency 10 to 55Hz, amplitude 15mm, during 2 hours each in X, Y, and Z axes. (total 6 hours) Measure resistance value. |
| Resistance to solder | $\Delta R < \pm 1\%$ of Initial value (no evidence of leaching) | Immerse in solder bath at 250°C for 5 ± 1 sec. Stabilize at 25°C for 5 hours. Measure resistance value. |
| Solvent resistance | $\Delta R < \pm 1\%$ of Initial value | Immerse in trichloroethylene or equivalent for 15 min. Stabilize at 25°C for 5 hours. Measure resistance value. |
| Solderability | Coverage $> 75\%$ each termination end | Immerse in solder at $230 \pm 5^\circ\text{C}$ for 3 ± 0.5 sec. |

CVR-32 / CVR-42 / CVR-43 Series

Tape & Reel Packaging Dimensions



| Code | A | B | D | E |
|-------|---------|---------|----------|---------|
| CVR-4 | 4.2±0.2 | 4.8±0.2 | 12.0±0.3 | 5.5±0.1 |
| CVR-3 | 3.3±0.2 | 4.0±0.2 | 8.1±0.3 | 3.5±0.1 |

| Code | F | G | H | J |
|-------|----------|---------|---------|---------|
| CVR-4 | 1.5±0.2 | 8.0±0.1 | 4.0±0.1 | 2.0±0.1 |
| CVR-3 | 1.75±0.2 | 4.0±0.1 | 4.0±0.1 | 2.0±0.1 |

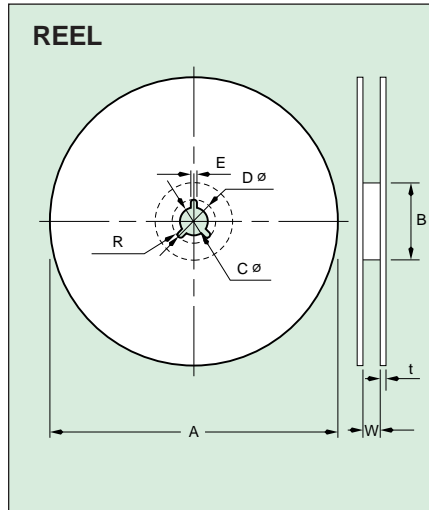
| Code | K | M | R | W* |
|-------|-----------------------------------|-------|-------|----------|
| CVR-4 | 1.5 ^{+0.1} ₋₀ | 15°±0 | 0.3±0 | 2.7±0.1 |
| CVR-3 | 1.55±0.1 | 3°±0 | 0.3±0 | 2.15±0.2 |

| Code | t |
|-------|---------|
| CVR-4 | 0.3±0.1 |
| CVR-3 | 0.2±0.1 |

*G type W = 1.85±0.1

Remarks

- 1) Embossed style plastic (CVR-4 series), or vinyl chloride (CVR-3 series).
- 2) The dimensional tolerance on pitch is ± 0.2 mm cumulative over 40 pitches (CVR-4), or ± 0.2 mm cumulative over 10 pitches (CVR-3).
- 3) The top cover tape width is 9.5 ± 0.2 mm (CVR-4), or 5.7 ± 0.2 mm (CVR-3), and shall not cover the feeder sprocket holes.

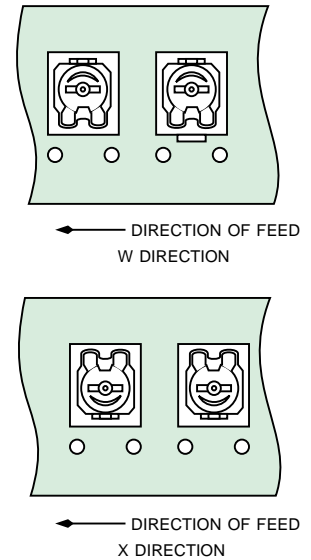


| Code | 1,000 per reel | 5,000 per reel |
|------|----------------|----------------|
| A | 178±2.0 | 420±2.0 |
| B | >50 | 80.0±2.0 |
| C | 13.0±0.5 | 13.0±0.5 |
| D | 21.0±0.8 | 21.0±1.0 |
| E | 2.0±0.5 | 2.0±0.5 |
| W | 14.0±1.5 | 14.0±1.5 |
| t | 1.0±0.5 | 2.0±0.5 |
| R | 1.0 | 5.0 |

| Code | 2,000 per reel | 5,000 per reel | 10,000 per reel |
|------|----------------|----------------|-----------------|
| A | 178±2.0 | 250±2.0 | 330±2.0 |
| B | 80.0±2.0 | 80.0±2.0 | 80.0±2.0 |
| C | 13.0±0.5 | 13.0±0.5 | 13.0±0.5 |
| D | 21.0±0.5 | 21.0±0.5 | 21.0±0.5 |
| E | 2.0±0.5 | 2.0±0.5 | 2.0±0.5 |
| W | 9.5±1.0 | 9.5±1.0 | 9.5±1.0 |
| t | 2.5MAX | 3.0MAX | 3.0MAX |
| R | 1.0±0.5 | 1.5±0.5 | 1.5±0.5 |

Taping

- 1) Quantity per reel:
A maximum of 5000 pcs at 1 reel (CVR-4) or maximum of 1,000 pcs at 1 reel (CVR-3) is packaged. There should be no missing parts.
- 2) Direction of taping:
W direction is our standard; X direction taping is available upon special order



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