

Surface Mount Type

TPE series B size

POSCAP



Features

- Small size (L 3.5 × W 2.8 × H 1.9 mm)
- Low ESR (15 mΩ max.)
- RoHS compliance, Halogen free

Specifications

| | | |
|---------------------------|--|--|
| Size code | B2 | |
| Category temp. range | -55 °C to +105 °C | |
| Rated volt. range | 2.0 V.DC to 10 V.DC | |
| Category volt. range | 1.8 V.DC to 8 V.DC | |
| Rated cap. range | 47 μF to 470 μF | |
| Capacitance tolerance | ±20 % (120 Hz / +20 °C) | |
| Leakage current | Please see the attached characteristics list | |
| Dissipation factor(tan δ) | Please see the attached characteristics list | |
| Surge voltage (V.DC) | Rated voltage × 1.15 | |
| Endurance | +105 °C 1000 h rated voltage applied | |
| | Rated temp, +85 °C Products : +85 °C 1000 h, rated voltage applied | |
| | Capacitance change | Within ±20 % of the initial value |
| | Dissipation factor(tan δ) | ≤ 1.5 times of the initial limit |
| Damp heat (Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage | |
| | Capacitance change | Within +50 %, -20 % of the initial value (2R5TPE220MAZB (MAPB, MAFB), 2R5TPE330MAZB, 2TPE330MAFB (MADGB), 2TPE470MAJGB (MAFB), 2TPE330MFB, ETPE330MAFB (MA9GB)) |
| | | Within +40 %, -20 % of the initial value (Except for above model) |
| | Dissipation factor(tan δ) | ≤ 1.5 times of the initial limit |
| | Leakage current | ≤ 3 times of the initial limit |

Marking

Rated capacitance code

Polarity marking(+)

Rated voltage code

Lot No.

| R. voltage code | | Unit : V.DC | |
|-----------------|-----|-------------|-----|
| d | 2.0 | g | 4.0 |
| e | 2.5 | j | 6.3 |
| | | k | 8.0 |
| | | A | 10 |

| R. capacitance code | | Unit : μF | |
|---------------------|-----|-----------|-----|
| S7 | 47 | E8 | 150 |
| A8 | 100 | J8 | 220 |
| C8 | 120 | N8 | 330 |
| | | S8 | 470 |

Dimensions (not to scale)

| Unit : mm | | | | | |
|-----------|-------|-------|-------|-------|--------|
| Size code | L±0.2 | W±0.2 | H±0.1 | S±0.2 | W1±0.1 |
| B2 | 3.5 | 2.8 | 1.9 | 0.8 | 2.2 |

* Externals of figure are the reference.

Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) | | | Size code | Specifications | | | | Standard | | Floor life level | |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|-----|-----------|--|-----------------------------|---------------------|-----------------------|---------------|--------------------------|--------------------|--------------------|
| | | | | | L | W | H | | Ripple current* ¹ (mA r.m.s.) | ESR* ² (mΩ max.) | tan δ* ³ | LC* ⁴ (μA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C |
| 2.0 | 105 | 2.0 | 105 | 330 | 3.5 | 2.8 | 1.9 | B2 | 2000 | 15 | 0.08 | 132.0 | 2TPE330MFB | 2000 | 3 | 3 |
| | 85 | 1.8 | 105 | | 3.5 | 2.8 | 1.9 | | 2000 | 15 | 0.08 | 132.0 | 2TPE330MAFB | 2000 | | |
| | 85 | 1.8 | 105 | | 3.5 | 2.8 | 1.9 | | 2000 | 13/300kHz | 0.10 | 132.0 | 2TPE330MADGB | 2000 | | |
| | 85 | 1.8 | 105 | 470 | 3.5 | 2.8 | 1.9 | | 2300 | 15 | 0.10 | 188.0 | 2TPE470MAFB | 2000 | | |
| | 85 | 1.8 | 105 | | 3.5 | 2.8 | 1.9 | | 2300 | 11/300kHz | 0.08 | 188.0 | 2TPE470MAJGB | 2000 | | |
| 2.5 | 85 | 2.0 | 105 | 220 | 3.5 | 2.8 | 1.9 | | 2000 | 15 | 0.08 | 110.0 | 2R5TPE220MAFB | 2000 | | |
| | 105 | 2.5 | 105 | | 3.5 | 2.8 | 1.9 | | 1800 | 15/300kHz | 0.08 | 110.0 | 2R5TPE220MFGB | 2000 | | |
| | 105 | 2.5 | 105 | | 3.5 | 2.8 | 1.9 | | 1700 | 21 | 0.08 | 55.0 | 2R5TPE220MLB | 2000 | | |
| | 85 | 2.0 | 105 | | 3.5 | 2.8 | 1.9 | | 1600 | 25 | 0.08 | 55.0 | 2R5TPE220MAPB | 2000 | | |
| | 105 | 2.5 | 105 | | 3.5 | 2.8 | 1.9 | | 1400 | 35 | 0.08 | 55.0 | 2R5TPE220MZB | 2000 | | |
| | 85 | 2.0 | 105 | | 3.5 | 2.8 | 1.9 | | 1400 | 35 | 0.08 | 55.0 | 2R5TPE220MAZB | 2000 | | |
| | 85 | 2.0 | 105 | 330 | 3.5 | 2.8 | 1.9 | | 1400 | 35 | 0.08 | 82.5 | 2R5TPE330MAZB | 2000 | | |
| | 85 | 2.0 | 105 | | 3.5 | 2.8 | 1.9 | | 3200 | 9/300kHz | 0.08 | 165.0 | ETPE330MA9GB | 2000 | | |
| | 105 | 2.5 | 105 | | 3.5 | 2.8 | 1.9 | | 3200 | 9/300kHz | 0.08 | 165.0 | ETPE330M9GB | 2000 | | |
| | 85 | 2.0 | 105 | | 3.5 | 2.8 | 1.9 | | 2700 | 15 | 0.08 | 165.0 | ETPE330MAFB | 2000 | | |
| 4.0 | 105 | 4.0 | 105 | 100 | 3.5 | 2.8 | 1.9 | 2700 | 15 | 0.08 | 165.0 | ETPE330MFB | 2000 | | | |
| | 85 | 3.2 | 105 | | 150 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 40.0 | 4TPE100MZB | 2000 | | |
| | 85 | 3.2 | 105 | | 220 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 60.0 | 4TPE150MAZB | 2000 | | |
| | 85 | 3.2 | 105 | | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 88.0 | 4TPE220MAZB | 2000 | | | |
| 6.3 | 105 | 6.3 | 105 | 100 | 3.5 | 2.8 | 1.9 | 1600 | 25 | 0.08 | 63.0 | 6TPE100MPB | 2000 | | | |
| | 85 | 5.0 | 105 | | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 63.0 | 6TPE100MAZB | 2000 | | | |
| | 105 | 6.3 | 105 | | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 63.0 | 6TPE100MZB | 2000 | | | |
| | 85 | 5.0 | 105 | 120 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 75.6 | 6TPE120MAZB | 2000 | | | |
| | 85 | 5.0 | 105 | | 3.5 | 2.8 | 1.9 | 1600 | 25 | 0.08 | 94.5 | 6TPE150MAPB | 2000 | | | |
| | 85 | 5.0 | 105 | 150 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 94.5 | 6TPE150MAZB | 2000 | | | |
| | 85 | 5.0 | 105 | | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.10 | 138.6 | 6TPE220MAZB | 2000 | | | |
| | 85 | 5.0 | 105 | | 3.5 | 2.8 | 1.9 | 1600 | 25 | 0.10 | 138.6 | 6TPE220MAPB | 2000 | | | |
| 8.0 | 85 | 6.3 | 105 | 100 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 80.0 | 8TPE100MAZB | 2000 | | | |
| 10 | 85 | 8.0 | 105 | 47 | 3.5 | 2.8 | 1.9 | 1400 | 35 | 0.08 | 47.0 | 10TPE47MAZB | 2000 | | | |

*1: Ripple current (100 kHz / +45 °C)

*2: ESR (100 kHz / +20 °C)

*3: tan δ (120 Hz / +20 °C)

*4: After 5 minutes

◆ Please refer to each page in this catalog for "Reflow conditions", "Taping specifications" and "Floor life level".

◆ Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

Surface Mount Type

TPE series D size



POSCAP

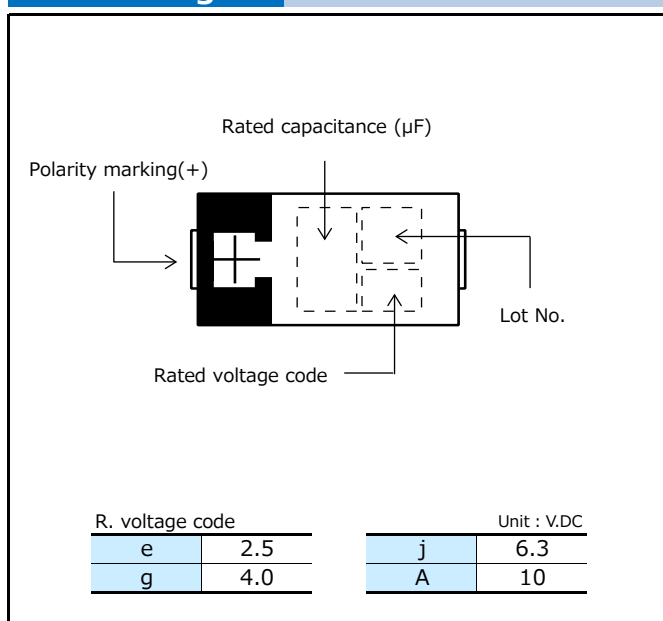
Features

- Low profile (Height 1.5 mm max.)
- Low ESR (7 mΩ max.)
- Large capacitance (1500 μF max.)
- RoHS compliance, Halogen free

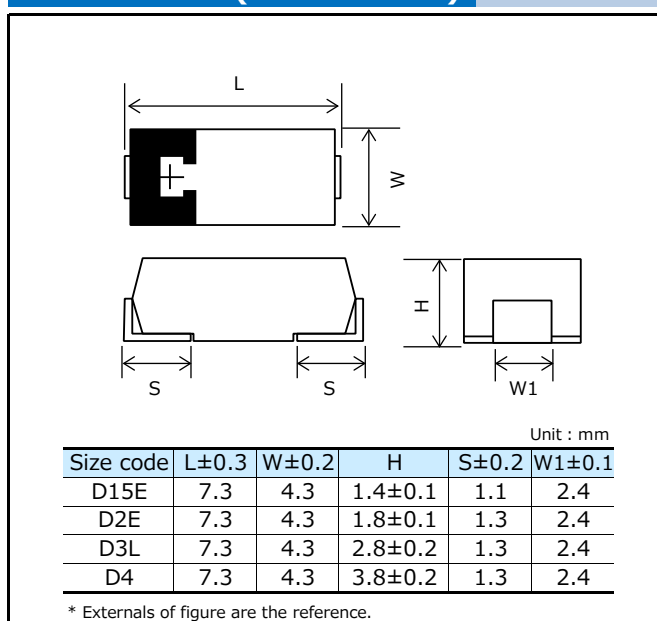
Specifications

| Size code | D15E | D2E | D3L | D4 |
|---------------------------|--|--|------------------|-------------------|
| Category temp. range | -55 °C to +105 °C | | | |
| Rated volt. range | 6.3 V.DC | 2.5 V.DC to 10 V.DC | | |
| Category volt. range | 5.0 V.DC | 2.5 V.DC to 10 V.DC | | |
| Rated cap. range | 470 μF | 68 μF to 470 μF | 220 μF to 680 μF | 330 μF to 1500 μF |
| Capacitance tolerance | ±20 % (120 Hz / +20 °C) | | | |
| Leakage current | Please see the attached characteristics list | | | |
| Dissipation factor(tan δ) | Please see the attached characteristics list | | | |
| Surge voltage (V.DC) | Rated voltage × 1.15 | | | |
| Endurance | +105 °C 2000 h rated voltage applied Rated temp, +85 °C Products : +85 °C 1000 h, rated voltage applied 6TPE330MAP, 6TPE470MAZU : +85 °C 2000 h, rated voltage applied | | | |
| | Capacitance change | Within ±20 % of the initial value | | |
| | Dissipation factor(tan δ) | ≤ 1.5 times of the initial limit | | |
| | Leakage current | Within the initial limit | | |
| Damp heat (Steady State) | +60 °C, 90 % to 95 %, 500 h, No-applied voltage | | | |
| | Capacitance change | Within +50 %, -20 % of the initial value (2R5TPE220M (I, F, 9), 2R5TPE330M (I, F, C, 9, 7), 2R5TPE470M (I, F, C, 9, 7), 2R5TPE1000MF, 2R5TPE1500M (F, C)) Within +40 %, -20 % of the initial value (Except for above model) | | |
| | Dissipation factor(tan δ) | ≤ 1.5 times of the initial limit | | |
| | Leakage current | ≤ 3 times of the initial limit | | |

Marking



Dimensions (not to scale)



Characteristics list

| Rated volt. (V.DC) | Rated temp. (°C) | Category volt. (V.DC) | Category temp. (°C) | Rated cap. (μF) | Case size (mm) | | | Size code | Specifications | | | | Standard | | Floor life level | | | |
|--------------------|------------------|-----------------------|---------------------|-----------------|----------------|-----|------|-----------|--|-----------------------------|---------------------|-----------------------|-------------|--------------------------|--------------------|--------------------|-------------|------|
| | | | | | L | W | H | | Ripple ^{*1} current (mA r.m.s.) | ESR ^{*2} (mΩ max.) | tan δ ^{*3} | LC ^{*4} (μA) | Part number | Min. packaging qty (pcs) | Reflow temp ≤260°C | Reflow temp ≤250°C | | |
| 2.5 | 105 | 2.5 | 105 | 220 | 7.3 | 4.3 | 1.8 | D2E | 3900 | 9 | 0.10 | 55.0 | 2R5TPE220M9 | 3000 | 3 | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3100 | 15 | 0.10 | 55.0 | 2R5TPE220MF | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 55.0 | 2R5TPE220MI | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 55.0 | 2R5TPE220M | 3000 | | | | |
| | 105 | 2.5 | 105 | 330 | 7.3 | 4.3 | 1.8 | | 4400 | 7 | 0.10 | 82.5 | 2R5TPE330M7 | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3900 | 9 | 0.10 | 82.5 | 2R5TPE330M9 | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3500 | 12 | 0.10 | 82.5 | 2R5TPE330MC | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3100 | 15 | 0.10 | 82.5 | 2R5TPE330MF | 3000 | | | | |
| | 105 | 2.5 | 105 | 470 | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 82.5 | 2R5TPE330MI | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 82.5 | 2R5TPE330M | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 4400 | 7 | 0.10 | 117.5 | 2R5TPE470M7 | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3900 | 9 | 0.10 | 117.5 | 2R5TPE470M9 | 3000 | | | | |
| | 105 | 2.5 | 105 | 680 | 7.3 | 4.3 | 1.8 | | 3500 | 12 | 0.10 | 117.5 | 2R5TPE470MC | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 3100 | 15 | 0.10 | 117.5 | 2R5TPE470MF | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 117.5 | 2R5TPE470MI | 3000 | | | | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 2.8 | | D3L | 3500 | 12 | 0.10 | 170.0 | 2R5TPE680MCL | | | 2500 | |
| | 105 | 2.5 | 105 | 1000 | 7.3 | 4.3 | 3.8 | | D4 | 3100 | 15 | 0.10 | 170.0 | 2R5TPE680MFL | | | 2500 | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 3.8 | | | 3900 | 15 | 0.15 | 250.0 | 2R5TPE1000MF | | | 2000 | |
| | 105 | 2.5 | 105 | 1500 | 7.3 | 4.3 | 3.8 | | D4 | 4400 | 12 | 0.15 | 375.0 | 2R5TPE1500MC | | | 2000 | |
| | 105 | 2.5 | 105 | | 7.3 | 4.3 | 3.8 | | | 3900 | 15 | 0.15 | 375.0 | 2R5TPE1500MF | | | 2000 | |
| 4.0 | 105 | 4.0 | 105 | 150 | 7.3 | 4.3 | 1.8 | D2E | 2800 | 18 | 0.10 | 60.0 | 4TPE150MI | 3000 | 2a | | | |
| | 105 | 4.0 | 105 | 220 | 7.3 | 4.3 | 1.8 | | 3100 | 15 | 0.10 | 88.0 | 4TPE220MF | 3000 | | | | |
| | 105 | 4.0 | 105 | | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 88.0 | 4TPE220MI | 3000 | | | | |
| | 105 | 4.0 | 105 | 7.3 | 4.3 | 1.8 | 2400 | | 25 | 0.10 | 88.0 | 4TPE220M | 3000 | | | | | |
| | 105 | 4.0 | 105 | 330 | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 132.0 | 4TPE330MI | 3000 | | | | |
| | 105 | 4.0 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 132.0 | 4TPE330M | 3000 | | | | |
| | 105 | 4.0 | 105 | 470 | 7.3 | 4.3 | 2.8 | | D3L | 3500 | 12 | 0.10 | 188.0 | 4TPE470MCL | | | 2500 | |
| | 105 | 4.0 | 105 | | 7.3 | 4.3 | 2.8 | | | 3100 | 15 | 0.10 | 188.0 | 4TPE470MFL | | | 2500 | |
| | 105 | 4.0 | 105 | | 7.3 | 4.3 | 2.8 | | | 2800 | 18 | 0.10 | 188.0 | 4TPE470MIL | | | 2500 | |
| | 105 | 4.0 | 105 | | 7.3 | 4.3 | 2.8 | | | 2400 | 25 | 0.10 | 188.0 | 4TPE470ML | | | 2500 | |
| 6.3 | 105 | 6.3 | 105 | 100 | 7.3 | 4.3 | 1.8 | D2E | 2800 | 18 | 0.10 | 63.0 | 6TPE100MI | 3000 | 3 | | | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 63.0 | 6TPE100M | 3000 | | | | |
| | 105 | 6.3 | 105 | 150 | 7.3 | 4.3 | 1.8 | | 3100 | 15 | 0.10 | 94.5 | 6TPE150MF | 3000 | | | | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 94.5 | 6TPE150MI | 3000 | | | | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 94.5 | 6TPE150M | 3000 | | | | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 1.8 | | 2800 | 18 | 0.10 | 138.6 | 6TPE220MI | 3000 | | | | |
| | 105 | 6.3 | 105 | 220 | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 138.6 | 6TPE220M | 3000 | | | | |
| | 85 | 5.0 | 105 | | 7.3 | 4.3 | 1.8 | | 2400 | 25 | 0.10 | 138.6 | 6TPE220MAP | 3000 | | | | |
| | 85 | 5.0 | 105 | 330 | 7.3 | 4.3 | 1.8 | | D3L | 2400 | 25 | 0.10 | 207.9 | 6TPE330MAP | | | 3000 | |
| | 85 | 5.0 | 105 | | 7.3 | 4.3 | 2.8 | | | 2400 | 25 | 0.10 | 207.9 | 6TPE330MAL | | | 2500 | |
| | 85 | 5.0 | 105 | | 7.3 | 4.3 | 2.8 | | | 3900 | 9/500kHz | 0.10 | 207.9 | 6TPE330MA9EL | | | 2500 | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 2.8 | | | 3100 | 15 | 0.10 | 207.9 | 6TPE330MFL | | | 2500 | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 2.8 | | | 2800 | 18 | 0.10 | 207.9 | 6TPE330MIL | | | 2500 | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 2.8 | | | 2400 | 25 | 0.10 | 207.9 | 6TPE330ML | | | 2500 | |
| | 85 | 5.0 | 105 | 470 | 7.3 | 4.3 | 3.8 | | D4 | 4400 | 10 | 0.10 | 207.9 | 6TPE330MAA | | | 2000 | |
| | 85 | 5.0 | 105 | | 7.3 | 4.3 | 1.4 | | | D15E | 1700 | 35 | 0.10 | 296.1 | | | 6TPE470MAZU | 4000 |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 3.8 | | | 3500 | 18 | 0.15 | 296.1 | 6TPE470MI | | | 2000 | |
| | 105 | 6.3 | 105 | | 7.3 | 4.3 | 3.8 | | | 3000 | 25 | 0.15 | 296.1 | 6TPE470M | | | 2000 | |
| 105 | 6.3 | 105 | 7.3 | | 4.3 | 3.8 | 3500 | 18 | | 0.15 | 428.4 | 6TPE680MI | 2000 | | | | | |
| 105 | 6.3 | 105 | 7.3 | | 4.3 | 3.8 | 3000 | 25 | | 0.15 | 428.4 | 6TPE680M | 2000 | | | | | |
| 10 | 105 | 10 | 105 | 68 | 7.3 | 4.3 | 1.8 | D2E | 2400 | 25 | 0.10 | 68.0 | 10TPE68M | 3000 | - | | | |
| | 105 | 10 | 105 | 220 | 7.3 | 4.3 | 2.8 | D3L | 2800 | 18 | 0.10 | 220.0 | 10TPE220MIL | 2500 | | | | |
| | 105 | 10 | 105 | | 7.3 | 4.3 | 2.8 | | 2400 | 25 | 0.10 | 220.0 | 10TPE220ML | 2500 | | | | |
| | 105 | 10 | 105 | 330 | 7.3 | 4.3 | 3.8 | D4 | 3000 | 25 | 0.10 | 330.0 | 10TPE330M | 2000 | | | | |

*1: Ripple current (100 kHz / +45 °C)

*2: ESR (100 kHz / +20 °C)

*3: tan δ (120 Hz / +20 °C)

*4: After 5 minutes

◆ Please refer to each page in this catalog for "Reflow conditions", "Taping specifications" and "Floor life level".

◆ Small order quantity (500 pcs/reel) is available with TPE series. Please contact our sales representative if you prefer it.

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- When you use the inventory of our products for which it is unclear whether those products are compliant with the RoHS Directive/REACH Regulation, please select "Sales Inquiry" in the website inquiry form and contact us.

We do not take any responsibility for the use of our products outside the scope of the specifications, descriptions, guidelines and precautions described in this online catalog.

Notices

■ Applicable laws and regulations

- This product complies with the RoHS Directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU and (EU)2015/863)).
- No Ozone Depleting Chemicals(ODC's), controlled under the Montreal Protocol Agreement, are used in producing this product.
We do not use PBBs or PBDEs as brominated flame retardants.
- Export procedure which followed export related regulations, such as foreign exchange and a foreign trade method, on the occasion of export of this product.
- These products are not dangerous goods on the transportation as identified by UN(United Nations) numbers or UN classification.

■ Limited applications

- This capacitor is designed to be used for electronics circuits such as audio/visual equipment, home appliances, computers and other office equipment, optical equipment, measuring equipment.
- High reliability and safety are required [be / a possibility that incorrect operation of this product may do harm to a human life or property] more. When use is considered by the use, the delivery specifications which suited the use separately need to be exchanged.

■ Intellectual property rights and licenses

- The technical information in this specification provides examples of our products' typical operations and application circuits. We do not guarantee the non-infringement of third party's intellectual property rights and we do not grant any license, right, or interest in our intellectual property.

Items to be observed

■ For specification

- This specification guarantees the quality and performance of the product as individual components. The durability differs depending on the environment and the conditions of usage. Before use, check and evaluate their compatibility with actual conditions when installed in the products. When safety requirements cannot be satisfied in your technical examination, inform us immediately.
- Do not use the products beyond the specifications described in this document.

■ Upon application to products where safety is regarded as important

Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other signification damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/ gas equipment, rotating rotating equipment, and disaster/crime prevention equipment.

- (1) The system is equipped with a protection circuit and protection device.
- (2) The system is equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault.

■ Conditions of use

- Before using the products, carefully check the effects on their quality and performance, and determined whether or not they can be used. These products are designed and manufactured for general-purpose and standard use in general electronic equipment. These products are not intended for use in the following special conditions.
 - (1) In liquid, such as Water, Oil, Chemicals, or Organic solvent.
 - (2) In direct sunlight, outdoors, or in dust.
 - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl₂, H₂S, NH₃, SO₂, or NO_x.
 - (4) In an environment where strong static electricity or electromagnetic waves exist.
 - (5) Mounting or placing heat-generating components or inflammables, such as vinyl-coated wires, near these products.
 - (6) Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin and other material.
 - (7) Using solvent, water or water-soluble cleaner for flux cleaning agent after soldering. (In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues)
 - (8) Using in the atmosphere where strays acid or alkaline.
 - (9) Using in the atmosphere where there are excessive vibration and shock.
- Please arrange circuit design for preventing impulse or transitional voltage. Do not apply voltage, which exceeds the full rated voltage when the capacitors receive impulse voltage, instantaneous high voltage, high pulse voltage etc.
- Our products there is a product are using an electrolyte solution. Therefore, misuse can result in rapid deterioration of characteristics and functions of each product. Electrolyte leakage damages printed circuit and affects performance, characteristics, and functions of customer system.

Notices

■ Applicable laws and regulations

- This product complies with the RoHS Directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment (DIRECTIVE 2011/65/EU).
- No Ozone Depleting Chemicals(ODC's), controlled under the Montreal Protocol Agreement, are used in producing this product.
We do not use PBBs or PBDEs as brominated flame retardants.
- Export procedure which followed export related regulations, such as foreign exchange and a foreign trade method, on the occasion of export of this product.
- These products are not dangerous goods on the transportation as identified by UN(United Nations) numbers or UN classification.

■ Limited applications

- This capacitor is designed to be used for electronics circuits such as audio/visual equipment, home appliances, computers and other office equipment, optical equipment, measuring equipment.
- High reliability and safety are required [be / a possibility that incorrect operation of this product may do harm to a human life or property] more. When use is considered by the use, the delivery specifications which suited the use separately need to be exchanged.

Items to be observed

■ For specification

- This specification guarantees the quality and performance of the product as individual components.
Before use, check and evaluate their compatibility with installed in your products.
- Do not use the products beyond the specifications described in this document.

■ Upon application to products where safety is regarded as important

Install the following systems for a failsafe design to ensure safety if these products are to be used in equipment where a defect in these products may cause the loss of human life or other signification damage, such as damage to vehicles (automobile, train, vessel), traffic lights, medical equipment, aerospace equipment, electric heating appliances, combustion/ gas equipment, rotating rotating equipment, and disaster/crime prevention equipment.

- (1) The system is equipped with a protection circuit and protection device.
- (2) The system is equipped with a redundant circuit or other system to prevent an unsafe status in the event of a single fault.

■ Conditions of use

- Before using the products, carefully check the effects on their quality and performance, and determined whether or not they can be used. These products are designed and manufactured for general-purpose and standard use in general electronic equipment. These products are not intended for use in the following special conditions.
 - (1) In liquid, such as Water, Oil, Chemicals, or Organic solvent.
 - (2) In direct sunlight, outdoors, or in dust.
 - (3) In vapor, such as dew condensation water of resistive element, or water leakage, salty air, or air with a high concentration corrosive gas, such as Cl₂, H₂S, NH₃, SO₂, or NO_x.
 - (4) In an environment where strong static electricity or electromagnetic waves exist.
 - (5) Mounting or placing heat-generating components or inflammables, such as vinyl-coated wires, near these products.
 - (6) Sealing or coating of these products or a printed circuit board on which these products are mounted, with resin and other material.
 - (7) Using res solvent, water or water-soluble cleaner for flux cleaning agent after soldering. (In particular, when using water or a water-soluble cleaning agent, be careful not to leave water residues)
 - (8) Using in the atmosphere which strays acid or alkaline.
 - (9) Using in the atmosphere which there are excessive vibration and shock.
- Please arrange circuit design for preventing impulse or transitional voltage.
Do not apply voltage, which exceeds the full rated voltage when the capacitors receive impulse voltage, instantaneous high voltage, high pulse voltage etc.
- Our products there is a product are using an electrolyte solution. Therefore, misuse can result in rapid deterioration of characteristics and functions of each product. Electrolyte leakage damages printed circuit and affects performance, characteristics, and functions of customer system.

⚠ Guidelines and precautions (POSCAP)

1. Circuit design

1.1 Prohibited circuits

Since problems can be expected, POSCAP cannot be used on the following circuits.

- (1) High impedance voltage retention circuits
- (2) Coupling circuit
- (3) Time constant circuits
- (4) Circuits greatly affected by leakage current
- (5) The circuit in which two or more POSCAP are connected in a series so as to raise the endurance voltage.

1.2 Failure and life-span

The failure rate is 0.5 %* / 1000 h (Confidence level : 60 %) based on JIS C 5003.

The mainly failure modes are as follows.

* B2 size or less : 1.0 %

1.2-1 Contingency failure

The main causes of failure are thermal stresses cause by the soldering or thermal use environment, along with heat stresses, electrical stresses or mechanical stresses. The most common failure mode is a short circuit. In case a short circuit occurs, ensure safety by fully considering the followings.

- (a) If POSCAP emit smoke, turn off the main power of the equipment. In this case, keep your face and hands away from the area.
- (b) It may take a few seconds to a few minutes before POSCAP emits smoke by the situation. Increase safety by using a protective circuit.
- (c) If the smoke comes into eyes, rinse immediately. If the smoke is inhaled, gargle immediately.
- (d) In case a large current continues to flow after a short circuit, in the worst case, the shorted-out section may ignite. For safety, install a redundant circuit or a protective circuit, etc.

1.2-2 Wear-out failure (lifetime)

When lifetime exceeded the specified guarantee time of Endurance and Damp heat, electrolyte might insulate and cause electric characteristic changed. This is called an open circuit. The electric characteristics of capacitance and ESR may possibly change within the specified range in specifications when it is used under the condition of the rated voltage, electric and mechanical performance.

Please note it when design.

1.3 Reduction of failure stress

When POSCAP is used within the rated voltage, it shows a stable characteristic, but it may be damaged in a short circuit when an overvoltage, for instance, is applied. The time to reach the failure mode can be extended by using POSCAP with reduced environment temperature, ripple current and applied voltage.

Failure rate

- In the case of the endurance which is 105 °C 2000 h.
0.5 %/1000 h (Environment temp. : 105 °C, Rated voltage or Category voltage applied)
- In the case of the endurance which is 105 °C 1000 h or 125 °C 1000 h.
1.0 %/1000 h (Environment temp. : 105 °C, Rated voltage or Category voltage applied)
- In the case of the endurance which is 85 °C 1000 h.
1.0 %/1000 h (Environment temp. : 85 °C, Rated voltage applied)

1.4 Check the rated performance

After checking the operation and installation environments, design the circuit so that it falls within the rated performance range stipulated in this delivery specification.

1.5 Operating temperature and ripple current

- (1) Set the operating temperature so that it falls within the range stipulated in this delivery specification.
- (2) Do not apply current that exceeds the allowable ripple current. Ripple current should be controlled so that surface temperature of a capacitor do not exceed the rated temperature.
(For questions regarding TQC series, please contact us.)
- (3) Specified ESR is a value at the time of shipping from factory. ESR may change upon use conditions.

1.6 Leakage current

Even when the soldering conditions fall within the range of this delivery specifications, leakage current increases a little on occasion. It also increases a little during high temperature storage, high humidity storage and temperature cycling with no voltage applied. In cases such as these, leakage current will decrease by applying voltage under the condition of below the POSCAP's maximum operating temperature.

The speed at which the leakage current is restored is increased by applying voltage when the POSCAP's temperature is close to the maximum operating temperature.

1.7 Rapid charge and discharge limitation

Rapid charge and discharge are restricted (for maintainance of high-proof reliability).

A protective circuit is recommended for when a rapid charge or discharge causes excessive rush current since this is main cause of short circuit and large leakage current. Use a protective circuits in case the rush current value exceeds 20 A*.

Be sure to insert a protection resistor of about 1 kΩ for charge and discharge when measuring the leakage current.

* When TH series use under the ambient temperature more than 105 °C : 10 A, TPU series : 10 A

2. Mounting

2.1 Protect circuit

The failure mode of POSCAP is the short mode. When it breaks down, short electric current flows to it. POSCAP gives off heat by this short current.

Do the following consideration in design fully for the safety because it has a bad influence on the part around POSCAP due to this heat.

- A protective circuit and a protective device are set up, so as to make the system safer.
- A diffuse circuit and so on is set up, so as to make the system safer such as that a machine may not break down as to the single trouble.

2.2 Considerations when soldering

The soldering conditions are to be within the range prescribed in this delivery specification.

If the specifications are not followed, there is the possibility of degradation of electric characteristic and lifetime when soldering is conducted under conditions that are harsher than those stipulated.

2.3 Others

POSCAP's Electrical characteristics are affected by temperature and frequency fluctuations.

Design circuits after checking the amount of fluctuation.

3. Storage

It is necessary to set an environment to prevent a trouble at the time of soldering by the degradation of solder ability or moisture's getting into the molding resin when POSCAP are stored.

- Please make storage of POSCAP sealing up in the reel and storage bag at the time of delivery in the following environment. Also, set storage period of unopened as 18 months or shorter after shipment from factory.
 - Room temperature and room humidity (generally : 15 to 35 °C, 45 to 75% RH) are desirable.
 - Place where POSCAP is not exposed by direct sunshine.
- Please unseal storage bag just before mounting and use up POSCAP in the storage bag.

| Floor life | | |
|------------|-----------|------------------|
| Level | Time | Conditions |
| 2a | 4 weeks | ≤ 30 °C / 60 %Rh |
| 3 | 168 hours | ≤ 30 °C / 60 %Rh |
| 5 | 48 hours | ≤ 30 °C / 60 %Rh |

POSCAP is not compatible with JEDEC J-STD-020, J-STD-033

* Intellectual property right

We, Panasonic Group are providing the product and service that customers can use without anxiety, and are working positively on the protection of our products under intellectual property rights.

Representative patents relating to POSCAP are as follows:

US Patent No.6508800, No.6891717, No.7158368, No.7326260号, No.8081421, No.8149569, No.8456804, No.8559166