

## Surface Mount Type

Series: TK Type : V

Country of Origin

Japan



- Features
  - Life Time: 3000 hours at 125°C
  - Low ESR at -40°C(50%lower than TG series)
  - Added ESR specification after the test
  - RoHS directive compliant

### ■ Specification

|                                    |                                                                                                                                                                     |                                                  |                                          |    |    |                            |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|------------------------------------------|----|----|----------------------------|
| Category Temp.Range                | -40 ~ +125°C                                                                                                                                                        |                                                  |                                          |    |    |                            |
| Rated W.V.Range                    | 10 ~ 35 V .DC                                                                                                                                                       |                                                  |                                          |    |    |                            |
| Nominal Cap.Range                  | 47 ~ 470 μ F                                                                                                                                                        |                                                  |                                          |    |    |                            |
| Capacitance Tolerance              | ±20 % (120Hz/+20°C)                                                                                                                                                 |                                                  |                                          |    |    |                            |
| Leakage Current                    | I ≤ 0.01 CV or 3(μ A) After 2 minutes application of rated working voltage at +20°C<br>(Whichever is greater)                                                       |                                                  |                                          |    |    |                            |
| tan δ                              | Please see the attached standard products list                                                                                                                      |                                                  |                                          |    |    |                            |
| Characteristics at Low Temperature | W.V. (V)                                                                                                                                                            | 10                                               | 16                                       | 25 | 35 | (Impedance ratio at 120Hz) |
|                                    | Z(-25°C) / Z(+20°C)                                                                                                                                                 | 3                                                | 2                                        | 2  | 2  |                            |
|                                    | Z(-40 °C)/ Z(+20°C)                                                                                                                                                 | 4                                                | 3                                        | 3  | 3  |                            |
| Endurance                          | After the life test with DC rated woking voltage at +125 ±2°Cfor 3000 hours, the capacitors shall meet the limits specified below. Post-test requirements at +20°C. |                                                  |                                          |    |    |                            |
|                                    | Capacitance change                                                                                                                                                  | ±30% of initially measured values(code U:±35%)   |                                          |    |    |                            |
|                                    | tan δ                                                                                                                                                               | ≤300% of initially specified values(code U:350%) |                                          |    |    |                            |
|                                    | DC leakage current                                                                                                                                                  | ≤initially specified values                      |                                          |    |    |                            |
| Shelf Life                         | After storage for 1000 hours at +125±2°C with no voltage applied and then being stabilized at +20°C,capacitors shall meet the limits specified in Endurance.        |                                                  |                                          |    |    |                            |
| ESR after the Life test            | After the life test with DC rated working voltage at +125±2°C for 3000 hours, ESR value shall meet the specified below.                                             |                                                  |                                          |    |    |                            |
|                                    | After 1000 hours                                                                                                                                                    | 20°C                                             | ≤150% of the initially specified value.  |    |    |                            |
|                                    |                                                                                                                                                                     | -40°C                                            | ≤200% of the initially specified value.  |    |    |                            |
|                                    | After 2000 hours                                                                                                                                                    | 20°C                                             | ≤300% of the initially specified value.  |    |    |                            |
|                                    |                                                                                                                                                                     | -40°C                                            | ≤400% of the initially specified value.  |    |    |                            |
|                                    | After 3000 hours                                                                                                                                                    | 20°C                                             | ≤1000% of the initially specified value. |    |    |                            |
|                                    |                                                                                                                                                                     | -40°C                                            | ≤1500% of the initially specified value. |    |    |                            |

### ■ Marking

Example: 10V470μF(Polarized)

Marking color: BLACK

W.V.code

|      |    |    |    |    |
|------|----|----|----|----|
| V    | 10 | 16 | 25 | 35 |
| Code | A  | C  | E  | V  |

### ■ Dimensions in mm(not to scale)

( ):reference size

(mm)

| Size code | D    | L    | A,B  | H max. | I   | W         | P   | K          |
|-----------|------|------|------|--------|-----|-----------|-----|------------|
| F         | 8.0  | 10.2 | 8.3  | 10.0   | 3.4 | 0.90 ±0.2 | 3.1 | 0.70 ±0.20 |
| G         | 10.0 | 10.2 | 10.3 | 12.0   | 3.5 | 0.90 ±0.2 | 4.6 | 0.70 ±0.20 |

■ Case size VS Capacitance, ESR and Ripple current

ESR;(Ω/100kHz),  
Ripple current (mA r.m.s./100kHz+125°C)

| Capacitance<br>(μF) | W.V<br>(V) | 10   |       |       | 16    |       |       |
|---------------------|------------|------|-------|-------|-------|-------|-------|
|                     |            | size | ESR   |       | size  | ESR   |       |
|                     |            |      | 20°C  | -40°C |       | 20°C  | -40°C |
| 100                 |            |      |       |       | F     | 0.3   | 5.0   |
| 220                 |            | F    | 0.3   | 5.0   | 197   | G     | 0.2   |
|                     |            |      |       |       | (F)   | (0.3) | 3.0   |
| 330                 |            | G    | 0.2   | 3.0   | 270   | (G)   | (0.2) |
|                     |            | (F)  | (0.3) | (5.0) | (197) | (3.0) | (270) |
| 470                 |            | (G)  | (0.2) | (3.0) | (270) |       |       |

| Capacitance<br>(μF) | W.V<br>(V) | 25   |       |       | 35    |       |       |
|---------------------|------------|------|-------|-------|-------|-------|-------|
|                     |            | size | ESR   |       | size  | ESR   |       |
|                     |            |      | 20°C  | -40°C |       | 20°C  | -40°C |
| 47                  |            |      |       |       | F     | 0.3   | 5.0   |
| 100                 |            | F    | 0.3   | 5.0   | 197   | G     | 0.2   |
|                     |            |      |       |       | (F)   | (0.3) | 3.0   |
| 220                 |            | G    | 0.2   | 3.0   | 270   | (G)   | (0.2) |
|                     |            | (F)  | (0.3) | (5.0) | (197) | (3.0) | (270) |
| 330                 |            | (G)  | (0.2) | (3.0) | (270) |       |       |

( ):Miniaturization type (suffix:U)

■ Standard Products

Endurance : 125°C 3000h

| W.V.<br>(V) | Cap.<br>(±20%)<br>(μF) | Case size    |                |              | Specification                                     |                                   |                             | Part No.<br>(RoHS:compliant) | Min.<br>Packaging<br>Q'ty |
|-------------|------------------------|--------------|----------------|--------------|---------------------------------------------------|-----------------------------------|-----------------------------|------------------------------|---------------------------|
|             |                        | Dia.<br>(mm) | Length<br>(mm) | Size<br>Code | Ripple<br>current<br>(100kHz)<br>(+125°C)<br>(mA) | ESR<br>(100kHz)<br>(+20°C)<br>(Ω) | tan δ<br>(120Hz)<br>(+20°C) |                              |                           |
| 10          | 220                    | 8            | 10.2           | F            | 197                                               | 0.3                               | 0.30                        | EEETK1A221P                  | (6) 500                   |
|             | 330                    | (8)          | (10.2)         | (F)          | (197)                                             | (0.3)                             | 0.30                        | EEETK1A331UP                 | (6) 500                   |
|             |                        | 10           | 10.2           | G            | 270                                               | 0.2                               | 0.30                        | EEETK1A331P                  | (6) 500                   |
|             | 470                    | (10)         | (10.2)         | (G)          | (270)                                             | (0.2)                             | 0.30                        | EEETK1A471UP                 | (6) 500                   |
| 16          | 100                    | 8            | 10.2           | F            | 197                                               | 0.3                               | 0.23                        | EEETK1C101P                  | (6) 500                   |
|             | 220                    | (8)          | (10.2)         | (F)          | (197)                                             | (0.3)                             | 0.23                        | EEETK1C221UP                 | (6) 500                   |
|             |                        | 10           | 10.2           | G            | 270                                               | 0.2                               | 0.23                        | EEETK1C221P                  | (6) 500                   |
|             | 330                    | (10)         | (10.2)         | (G)          | (270)                                             | (0.2)                             | 0.23                        | EEETK1C331UP                 | (6) 500                   |
| 25          | 100                    | 8            | 10.2           | F            | 197                                               | 0.3                               | 0.18                        | EEETK1E101P                  | (6) 500                   |
|             | 220                    | (8)          | (10.2)         | (F)          | (197)                                             | (0.3)                             | 0.18                        | EEETK1E221UP                 | (6) 500                   |
|             |                        | 10           | 10.2           | G            | 270                                               | 0.2                               | 0.18                        | EEETK1E221P                  | (6) 500                   |
|             | 330                    | (10)         | (10.2)         | (G)          | (270)                                             | (0.2)                             | 0.18                        | EEETK1E331UP                 | (6) 500                   |
| 35          | 47                     | 8            | 10.2           | F            | 197                                               | 0.3                               | 0.16                        | EEETK1V470P                  | (6) 500                   |
|             | 100                    | (8)          | (10.2)         | (F)          | (197)                                             | (0.3)                             | 0.16                        | EEETK1V101UP                 | (6) 500                   |
|             |                        | 10           | 10.2           | G            | 270                                               | 0.2                               | 0.16                        | EEETK1V101P                  | (6) 500                   |
|             | 220                    | (10)         | (10.2)         | (G)          | (270)                                             | (0.2)                             | 0.16                        | EEETK1V221UP                 | (6) 500                   |

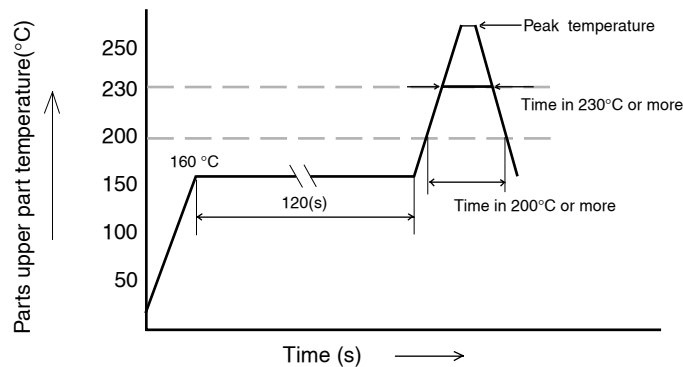
The taping dimensions are explained on P.195 of our Catalog.

Please use it as a reference guide.

Reflow Profile(Fig-1 to Fig-6) listed on last page of our Catalog.

■ Reflow guaranteed condition

● RoHS compliant



### Lead-Free reflow

| Reflow No                | Fig.(1)      | Fig.(2)     | Fig.(3)        | Fig.(4)                          |
|--------------------------|--------------|-------------|----------------|----------------------------------|
| Category                 | φ 3 to φ 6.3 | φ 8 to φ 10 | φ 12.5 to φ 18 | EB series only<br>(φ 10 to φ 18) |
| Peak temperature         | 250°C        | 235°C       | 230°C (220°C)  | 230°C                            |
| Time in peak temperature | 5s           | 5s          | 5s (s)         | 5s                               |
| Time in 200°C or more    | 60s          | 60s         | 20s (30s)      | 20s                              |
| Time of reflow           | 1 time       | 1 time      | 1 time         | 1 time                           |

### High temperature Lead-Free reflow

| Reflow No                    | Fig.(5)                      | Fig.(6)              |
|------------------------------|------------------------------|----------------------|
| Category                     | φ 4 to φ 6.3                 | φ 8 to φ 10          |
| Peak temperature             | 260°C (255°C)                | 245°C                |
| Time around peak temperature | 5s in (10s) in 250°C or more | 10s in 240°C or more |
| Time in 230°C or more        | 30s                          | 30s                  |
| Time in 200°C or more        | 70s                          | 70s                  |
| Time of reflow               | 2 times                      | 2 times              |

● RoHS not compliant

| Category         | Dia. φ3 to φ 6.3 EEV-, ECEV- Part No.                                                         | Dia. φ8 to φ 10 EEV-, ECEV- Part No.                                                          |
|------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Reflow condition | <p>Peak temperature/ Time in 200°C or more</p> <p>Peak temperature/ Time in 200°C or more</p> | <p>Peak temperature/ Time in 200°C or more</p> <p>Peak temperature/ Time in 200°C or more</p> |

\* For reflow, use athermal condition system such as infrared radiation(IR) or hot blast.

\* Vapor heat transfer systems(VPS) are not recommended.

Design, and specifications are each subject to change without notice. Ask factory for the current technical specifications before purchase and / or use. Should a safety concern arise regarding this product, please be sure to contact us immediately.