

## Surface Mount Type

## SP-Cap

Series : **CS, CT, CX**



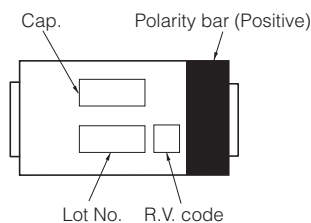
### Features

- High voltage (35 V.DC max.)
- Low profile (Height 1.0 mm max.)
- High ripple current (5600 mAr.m.s. max.)
- RoHS compliance, Halogen free

### Specifications

| Series                     | CS  | CT   | CX                         |              |
|----------------------------|---|--|----------------------------|--------------|
| Category temp. range       | -55 °C to +105 °C   |  |                            |              |
| Rated voltage range        | 4 V.DC to 35 V.DC   |  | 2 V.DC to 35 V.DC          |              |
| Nominal cap.range          | 10 µF to 120 µF   | 15 µF to 180 µF  | 15 µF to 560 µF            |              |
| Capacitance tolerance      | ±20 % (120 Hz / + 20 °C)  |  |                            |              |
| DC leakage current         | I ≤ 0.1 CV (µA) [2 V.DC to 6.3 V.DC, 2 minutes], I ≤ 0.3 CV (µA) [10 V.DC to 35 V.DC, 2 minutes]    |  |                            |              |
| Dissipation factor (tan δ) | ≤ 0.06 (120 Hz / + 20 °C)   |  |                            |              |
| Surge voltage (V.DC)       | Rated voltage × 1.25 [2 V.DC to 16 V.DC], × 1.15 [20 V.DC to 35 V.DC] (15 °C to 35 °C)              |  |                            |              |
| Endurance                  | +105 °C, 2000 h, rated voltage applied  |  |                            |              |
|                            | Capacitance change  | Within ±20 % of the initial value  |                            |              |
|                            | tan δ   | ≤ 2 times of the initial limit   |                            |              |
|                            | DC leakage current  | 2 V.DC to 6.3 V DC : ≤ 3 times of the initial limit<br>10 V.DC to 35 V.DC : Within the initial limit |                            |              |
| Damp heat (Steady state)   | +60 °C, 90 %, 500 h, No-applied voltage   |  |                            |              |
|                            | Capacitance change of initial measurd value   | 2 V.DC to 2.5 V.DC   | 4 V.DC, 10 V.DC to 35 V.DC | 6.3 V.DC     |
|                            |   | +70 %, -20 %   | +60 %, -20 %               | +50 %, -20 % |
|                            | tan δ   | ≤ 2 times of the initial limit   |                            |              |
| DC leakage current         | 2 V.DC to 6.3 V.DC : Within the initial limit<br>10 V.DC to 35V DC : ≤ 3 times of the initial limit |  |                            |              |

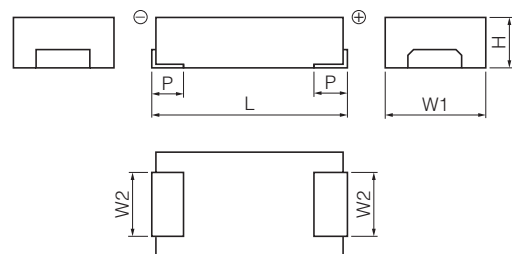
### Marking



Rated voltage mark

|   |          |   |          |   |         |
|---|----------|---|----------|---|---------|
| d | 2 V.DC   | j | 6.3 V.DC | D | 20 V.DC |
| e | 2.5 V.DC | A | 10 V.DC  | E | 25 V.DC |
| g | 4 V.DC   | C | 16 V.DC  | V | 35 V.DC |

### Dimensions (not to scale)



Unit : mm

| Series | L±0.2 | W1±0.2 | W2±0.1 | H±0.1 | P±0.3 |
|--------|-------|--------|--------|-------|-------|
| CS     | 7.3   | 4.3    | 2.4    | 1.1   | 1.3   |
| CT     | 7.3   | 4.3    | 2.4    | 1.4   | 1.3   |
| CX     | 7.3   | 4.3    | 2.4    | 1.9   | 1.3   |

\* Externals of figure are the reference.

## Characteristics list

|        |                      | Reflow *3               |                | <Standard> |      |                                 |                     |             |                             |
|--------|----------------------|-------------------------|----------------|------------|------|---------------------------------|---------------------|-------------|-----------------------------|
| Series | Rated voltage (V.DC) | Capacitance (±20%) (μF) | Case size (mm) |            |      | Specification                   |                     | Part number | Min.*4 Packaging Q'ty (pcs) |
|        |                      |                         | L              | W          | H    | *1<br>Ripple current (mAr.m.s.) | *2<br>ESR (mΩ max.) |             |                             |
| CS     | 4                    | 120                     | 7.3            | 4.3        | 1.1  | 5100                            | 15                  | EEFCS0G121R | 3500                        |
|        | 6.3                  | 68                      | 7.3            | 4.3        | 1.1  | 5100                            | 15                  | EEFCS0J680R | 3500                        |
|        | 10                   | 47                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1A470R | 3500                        |
|        | 16                   | 15                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1C150R | 3500                        |
|        |                      | 22                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1C220R | 3500                        |
|        |                      | 33                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1C330R | 3500                        |
|        | 20                   | 10                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1D100R | 3500                        |
|        |                      | 15                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1D150R | 3500                        |
|        |                      | 22                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1D220R | 3500                        |
|        | 25                   | 10                      | 7.3            | 4.3        | 1.1  | 3200                            | 40                  | EEFCS1E100R | 3500                        |
| 15     |                      | 7.3                     | 4.3            | 1.1        | 3200 | 40                              | EEFCS1E150R         | 3500        |                             |
| 35     | 10                   | 7.3                     | 4.3            | 1.1        | 3200 | 40                              | EEFCS1V100R         | 3500        |                             |
| CT     | 4                    | 180                     | 7.3            | 4.3        | 1.4  | 5100                            | 15                  | EEFCT0G181R | 3500                        |
|        | 6.3                  | 100                     | 7.3            | 4.3        | 1.4  | 5100                            | 15                  | EEFCT0J101R | 3500                        |
|        | 10                   | 68                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1A680R | 3500                        |
|        | 16                   | 47                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1C470R | 3500                        |
|        | 20                   | 33                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1D330R | 3500                        |
|        |                      | 47                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1D470R | 3500                        |
|        | 25                   | 22                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1E220R | 3500                        |
|        | 35                   | 15                      | 7.3            | 4.3        | 1.4  | 3200                            | 40                  | EEFCT1V150R | 3500                        |

\*1: Ripple current (100 kHz/ +45°C), \*2: ESR (100 kHz/+20 °C)

\*3: Please refer to the page of "Mounting Specifications".

\*4: Please contact us when 500 pcs packing is necessary.

## Characteristics list

Reflow \*3 <Standard>

| Series | Rated voltage (V.DC) | Capacitance (±20%) (μF) | Case size (mm) |     |      | Specification                 |                  | Part number  | Min.*4 Packaging Q'ty (pcs) |
|--------|----------------------|-------------------------|----------------|-----|------|-------------------------------|------------------|--------------|-----------------------------|
|        |                      |                         | L              | W   | H    | Ripple current *1 (mA r.m.s.) | ESR *2 (mΩ max.) |              |                             |
| CX     | 2                    | 220                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0D221R  | 3500                        |
|        |                      | 270                     | 7.3            | 4.3 | 1.9  | 5600                          | 12               | EEFCX0D271XR | 3500                        |
|        |                      | 330                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0D331R  | 3500                        |
|        |                      |                         | 7.3            | 4.3 | 1.9  | 5600                          | 12               | EEFCX0D331XR | 3500                        |
|        |                      | 390                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0D391R  | 3500                        |
|        |                      | 470                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0D471R  | 3500                        |
|        | 560                  | 7.3                     | 4.3            | 1.9 | 5100 | 15                            | EEFCX0D561R      | 3500         |                             |
|        | 2.5                  | 220                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0E221R  | 3500                        |
|        |                      | 330                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0E331R  | 3500                        |
|        |                      | 390                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0E391R  | 3500                        |
|        |                      | 470                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0E471R  | 3500                        |
|        | 4                    | 150                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0G151R  | 3500                        |
|        |                      |                         | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0G181R  | 3500                        |
|        |                      | 220                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0G221R  | 3500                        |
|        |                      |                         | 7.3            | 4.3 | 1.9  | 5600                          | 12               | EEFCX0G221XR | 3500                        |
|        |                      | 270                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0G271R  | 3500                        |
|        |                      | 330                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0G331R  | 3500                        |
|        | 6.3                  | 100                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0J101R  | 3500                        |
|        |                      | 120                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0J121R  | 3500                        |
|        |                      | 150                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0J151R  | 3500                        |
|        |                      |                         | 7.3            | 4.3 | 1.9  | 5600                          | 12               | EEFCX0J151XR | 3500                        |
|        |                      | 180                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0J181R  | 3500                        |
|        |                      | 220                     | 7.3            | 4.3 | 1.9  | 5100                          | 15               | EEFCX0J221R  | 3500                        |
|        | 10                   | 47                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1A470R  | 3500                        |
|        |                      | 68                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1A680R  | 3500                        |
|        |                      | 100                     | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1A101R  | 3500                        |
|        | 16                   | 15                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1C150R  | 3500                        |
|        |                      | 22                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1C220R  | 3500                        |
|        |                      | 33                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1C330R  | 3500                        |
|        |                      | 47                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1C470R  | 3500                        |
|        |                      | 68                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1C680R  | 3500                        |
|        | 20                   | 22                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1D220R  | 3500                        |
|        |                      | 33                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1D330R  | 3500                        |
|        |                      | 47                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1D470R  | 3500                        |
|        |                      | 56                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1D560R  | 3500                        |
|        | 25                   | 15                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1E150R  | 3500                        |
|        |                      | 22                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1E220R  | 3500                        |
|        |                      | 33                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1E330R  | 3500                        |
|        | 35                   | 15                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1V150R  | 3500                        |
|        |                      | 22                      | 7.3            | 4.3 | 1.9  | 3200                          | 40               | EEFCX1V220R  | 3500                        |

\*1: Ripple current (100 kHz/ +45°C), \*2: ESR (100 kHz/+20°C)

\*3: Please refer to the page of "Mounting Specifications".

\*4: Please contact us when 500 pcs packing is necessary.

## Temperature compensation multipliers for ripple current

|                    | Temp.       | T ≤ 45 °C | 45 °C < T ≤ 85 °C | 85 °C < T ≤ 105 °C |
|--------------------|-------------|-----------|-------------------|--------------------|
| 2 V.DC to 6.3 V.DC | Coefficient | 1.0       | 0.7               | 0.25               |
| 10 V.DC to 35 V.DC |             | 1.0       | 0.8               | 0.5                |

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