

### Precautions for the Fusing Components

Refer to the precautions of common matters for all products in the beginning of this catalog.

#### Safety Standards

- KOA's fuse components comply with the following safety standards:
  - U.S.A. UL (Underwriters Laboratories Inc.) UL248
  - CANADA CSA (Canadian Standards Association) C22.2 No.248 c-UL (Underwriters Laboratories Inc.) UL248
  - INTERNATIONAL IEC (International Electrotechnical Commission) 60127-1, -4

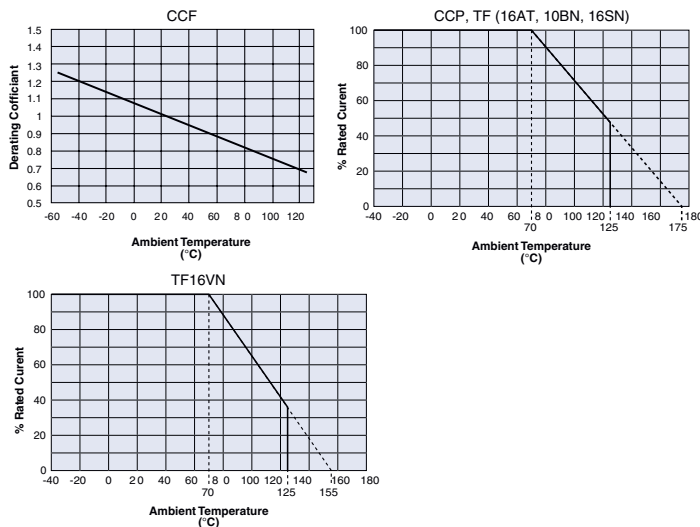
#### Rated Current

- Specified amperage that conforms to safety standards, such as fusing time. This is not to be confused with the steady-state (stationary) current, which is calculated using the following equation:
 
$$\text{Stationary Current} \leq \text{Rated Current} \times \text{Stationary Derating Coefficient} \times \text{Ambient Temperature Derating}$$
 The table below indicates deratings for each type of products.

| Type                   | Stationary Derating Coefficient |
|------------------------|---------------------------------|
| CCF1N, CCF1F           | 0.7                             |
| TF16AT                 | 0.75                            |
| TF10BN, TF16SN, TF16VN | 1.0                             |
| CCP2B, CCP2E           | 1.0                             |

#### Deratings for Ambient Temperatures

The following Deratings for Ambient Temperatures are required:



- Ambient Temperature Derating values are found on product datasheets.
- If the current waveform is a repeated pulse or AC waveform, the peak current shall be both the rated current and stationary current. Do not use the effective value of the current waveform.

#### Rated Voltage

- A rated voltage indicates the voltage that does not run through electrodes after the fuse blows. In case of exceeding the rated voltage, the circuit voltage should be applied at voltage not higher than the rated voltage because the current may run again or may break the elements.

#### Interrupting Capacity

- Maximum current and voltage that can be interrupted when an abnormal situation arises. Make sure beforehand that voltage and current at the time of abnormality occurring in the circuit are within the interrupting capacity.

| Type           | Fusing Current              | Fusing Time |
|----------------|-----------------------------|-------------|
| CCF1N (0.4~10) | Rated Current x 2 or Over   | 1 second    |
| CCP2B          | Rated Current x 2 or Over   | 1 second    |
| CCP2E          | Rated Current x 2.5 or Over | 1 second    |
| CCP2E H        | Rated Current x 2 or Over   | 1 second    |
| TF16SN         | Rated Current x 2 or Over   | 1 second    |
| TF10BN         | Rated Current x 2 or Over   | 5 seconds   |
| TF16AT         | Rated Current x 2 or Over   | 5 seconds   |
| TF16VN         | Rated Current x 2.5 or Over | 5 seconds   |
| CCF1N (12, 15) | Rated Current x 2 or Over   | 60s second  |
| CCF1F          | Rated Current x 2 or Over   | 120 seconds |

#### Fusing Current

- Minimum current needed to break fusing element. Refer to the following list to quickly interrupt if an abnormal current occurred in the circuit:
  - If fusing time is within 1 second or greater, the variance in the fusing time is largely affected by the surroundings (temperature, mounting pad dimensions, substrate material, etc.). Verification should be made with an actual circuit.

#### Anti-Surge Characteristics

There are limits to applications of transient overcurrents (inrush current, reversible current at motor-lock, etc.) that occur in circuits. It is necessary to select proper products that withstand such overcurrents without fusing. Select proper fusing components considering the following conditions:

- The transient phenomenon varies with the ambient temperature, charging/discharging conditions of capacitors, etc. Check the current waveform under such conditions that the stationary current also becomes the peak current. If the circuit has components highly dependent on temperature, such as thermistors, etc., please do a check under these conditions.
- For a peak current observation, shorten the sampling time of an oscilloscope to verify the maximum value of the wave-form of the surge current.
- We recommend the current measurement using current probe. If current measuring is performed by measuring voltages of shunt resistors, etc., use the lowest possible resistances.

#### Operation Check

- Before you decide which fuse product you use, please mount the selected fuse on actual device and confirm that rush current and surge current have enough margin and that the product has performance that enables it to interrupt the abnormal current quickly.

#### Soldering

- This product is suitable both for reflow-soldering and for flowsoldering, but excessive heat may cause an open-circuit and change its characteristics.
- The part shall be soldered at the maximum temperature of 260°C or less.
- If a soldering iron is used, it shall be at 350°C or less and should be soldered in a short time. Further, pay attention that the products are not touched directly by the top of the iron. It may cause disconnection or characteristic change.

#### Placement

- If resin coating, potting or encapsulation molding is used, please confirm reliability. Small contractile stress at resin stiffening time can cause cracks, fuse shear line, or resistance change. Also, the generated heat may not be able to dissipate properly, causing a change in fusing characteristics.
- The fusing characteristics may change when there are components that generate heat around the fuses. Keep fuses away from those parts.

#### Storage

- Avoid storing components under the condition of high temperature/high humidity (40°C/70%RH or more) which may deteriorate solderability.
- Also avoid direct sun light which may deteriorate solderability and induce changes in taping strength.se parts.

#### Parts Selection

- If you have any questions about fuse selection, please do not hesitate contacting us.

#### Reference

- For basic precautions, refer to JEITA technical report "JEITA RCR-4800 Safety application guide on fuse for use in electronic and electrical equipment".