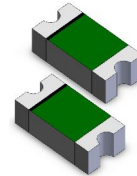


**Positive Temperature Coefficient (PTC)**
**Description**

The 1206 series provides miniature surface mount overcurrent protection with holding current from 0.12A to 2.0A. This series is suitable for wide range of applications in modern electronics where space is limited.

**Features**

- RoHS compliant and lead-free
- Halogen-free
- Compact design saves board space
- Low profile
- Fast response to fault current
- Compatible with high temperature solders


**Applications**

- Mobile Internet Device (MID)
- Battery PCM
- USB hubs, ports and peripherals
- Set-top-box and HDMI
- Game console port protection
- General electronics

**Electrical Characteristics**

| Part Number        | I <sub>hold</sub><br>(A) | I <sub>trip</sub><br>(A) | V <sub>max</sub><br>(Vdc) | I <sub>max</sub><br>(A) | P <sub>d typ</sub><br>(W) | Maximum Time To Trip |                | Resistance              |                          |
|--------------------|--------------------------|--------------------------|---------------------------|-------------------------|---------------------------|----------------------|----------------|-------------------------|--------------------------|
|                    |                          |                          |                           |                         |                           | Current<br>(A)       | Time<br>(Sec.) | R <sub>min</sub><br>(Ω) | R <sub>1max</sub><br>(Ω) |
| SMD1206P012TF      | 0.125                    | 0.29                     | 30                        | 100                     | 0.6                       | 1.00                 | 0.20           | 1.500                   | 6.000                    |
| SMD1206P016TF      | 0.16                     | 0.37                     | 30                        | 100                     | 0.6                       | 1.00                 | 0.30           | 1.200                   | 4.500                    |
| SMD1206P020TF/24   | 0.20                     | 0.42                     | 24                        | 100                     | 0.6                       | 8.00                 | 0.10           | 0.650                   | 2.600                    |
| SMD1206P025TF      | 0.25                     | 0.50                     | 16                        | 100                     | 0.6                       | 8.00                 | 0.08           | 0.550                   | 2.300                    |
| SMD1206P025TF/24   | 0.25                     | 0.55                     | 24                        | 100                     | 0.6                       | 8.00                 | 0.08           | 0.550                   | 2.300                    |
| SMD1206P035TF/16   | 0.35                     | 0.75                     | 16                        | 100                     | 0.6                       | 8.00                 | 0.10           | 0.300                   | 1.200                    |
| SMD1206P050TF      | 0.50                     | 1.00                     | 6                         | 100                     | 0.6                       | 8.00                 | 0.10           | 0.150                   | 0.700                    |
| SMD1206P050TF/15   | 0.50                     | 1.00                     | 15                        | 100                     | 0.6                       | 8.00                 | 0.10           | 0.150                   | 0.750                    |
| SMD1206P075TFT     | 0.75                     | 1.50                     | 8                         | 100                     | 0.6                       | 8.00                 | 0.20           | 0.090                   | 0.290                    |
| SMD1206P075TF/13.2 | 0.75                     | 1.50                     | 13.2                      | 100                     | 0.6                       | 8.00                 | 0.20           | 0.090                   | 0.350                    |
| SMD1206P075TF/16   | 0.75                     | 1.50                     | 16                        | 100                     | 0.6                       | 8.00                 | 0.20           | 0.090                   | 0.290                    |
| SMD1206P110TFT     | 1.10                     | 2.20                     | 8                         | 100                     | 0.8                       | 8.00                 | 0.10           | 0.040                   | 0.210                    |
| SMD1206P150TFT     | 1.50                     | 3.00                     | 8                         | 100                     | 0.8                       | 8.00                 | 0.30           | 0.040                   | 0.120                    |
| SMD1206P175TF      | 1.75                     | 3.50                     | 6                         | 100                     | 0.8                       | 8.00                 | 0.50           | 0.020                   | 0.090                    |
| SMD1206P200TF      | 2.00                     | 3.50                     | 6                         | 100                     | 0.8                       | 8.00                 | 1.50           | 0.018                   | 0.080                    |

## Positive Temperature Coefficient (PTC)

### Note on Electrical Characteristics

#### ■ Vocabulary

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 23°C still air.

$I_{trip}$  = Trip current: minimum current at which the device will trip in 23 °C still air.

$V_{max}$  = Maximum voltage device can withstand without damage at rated current ( $I_{max}$ )

$I_{max}$  = Maximum fault current device can withstand without damage at rated voltage ( $V_{max}$ )

$P_{d\ typ}$  = Typical power dissipated from device when in the tripped state at 23 °C still air.

$R_{min}$  = Minimum resistance of device in initial (un-soldered) state.

$R_{1max}$  = Maximum resistance of device at 23 °C measured one hour after tripping or reflow soldering of 260 °C for 20 sec.

#### ■ Value specified is determined by using the PWB with 0.030”\*1.5oz copper traces.

#### ■ Caution: Operation beyond the specified rating may result in damage and possible arcing and flame.

#### ■ Specifications are subject to change without notice.

### Polymeric PTC Selecting Guide

#### ■ Determine the following operating parameters for the circuits:

- Normal operating current ( $I_{hold}$ )
- Maximum interrupt current ( $I_{max}$ )
- Maximum circuit voltage ( $V_{max}$ )
- Normal operating temperature surrounding device (min°C/max°C)

#### ■ Select the device form factor and dimension suitable for the application:

- Surface Mount Device (SMD)
- Axial Leaded Device (ALD)
- Other Customized Form Factors
- Radial Leaded Device (RLD)
- DISC Device

#### ■ Compare the maximum rating for $V_{max}$ and $I_{max}$ of the PPTC device with the circuit in application and make sure the circuit's requirement does not exceed the device rating.

#### ■ Check that PPTC device's trip time (time-to-trip) will protect the circuit.

#### ■ Verify that the circuit operating temperature is within the PPTC device's normal operating temperature range.

#### ■ Verify the performance and suitability of the chosen PPTC device in the application.

### WARNING

#### ■ Mechanical Stress

- PPTC devices will undergo a thermal expansion during fault condition. If PPTC devices are installed or placed in an application where the space between PPTC devices and the surrounding materials (e.g., covering materials, packaging materials, encapsulate materials and the like) is insufficient, it will cause an inhibiting effect upon the thermal expansion. Pressing, twisting, bending and other kinds of mechanical stress will also adversely affect the performance of the PPTC devices, and shall not be used or applied.

#### ■ Chemical Pollutants

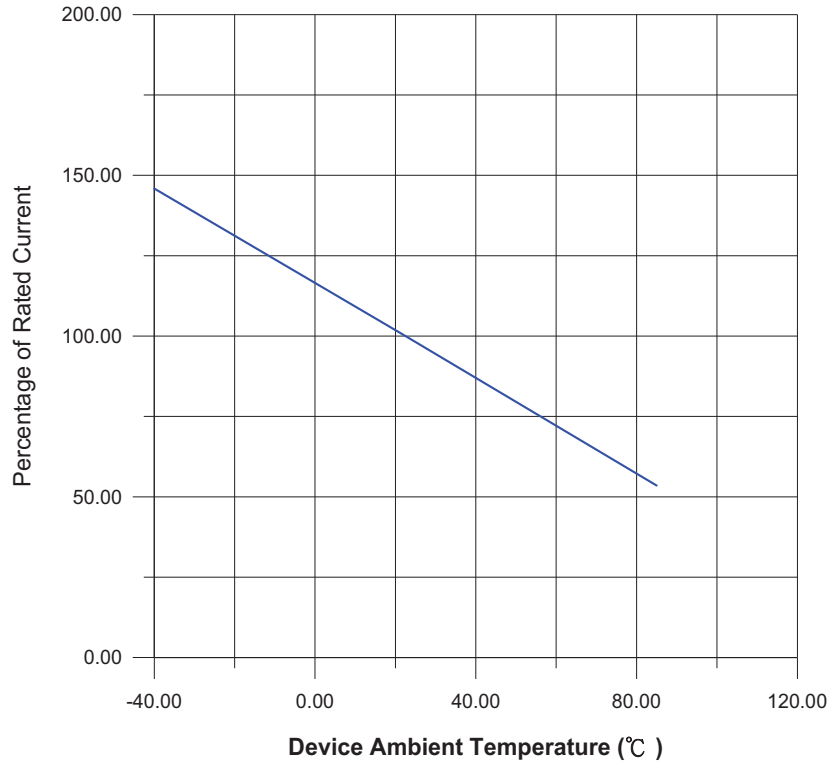
- Silicone-based oils, oils, solvents, gels, electrolytes, fuels, acids, and the like will adversely affect the properties of PPTC devices, and shall not be used or applied.

#### ■ Electronic and Thermal Effect

- PPTC devices are secondary protection devices and are used solely for sporadic, accidental over-current or over-temperature error condition, and shall NOT be used if or when constant or repeated fault conditions (such fault conditions may be caused by, among others, incorrect pin-connection of a connector) or over-extensive trip events may occur.
- PPTC devices are different from fuses and, when a fault condition occurs, will go into high-resistance state and do not open circuit, in which case the voltage at such PPTC devices may reach a hazardous level.
- Operation over the maximum rating or other forms of improper use may cause failure, arcing, flame and/or other damage to the PPTC devices.
- Conductive material contamination, such as metal particle, may induce shortage, flame or arcing.
- Due to the inductance, the operation circuits may generate a circuit voltage ( $Ldi/dt$ ) above the rated voltage of PPTC devices, which shall not be used under such circumstances.

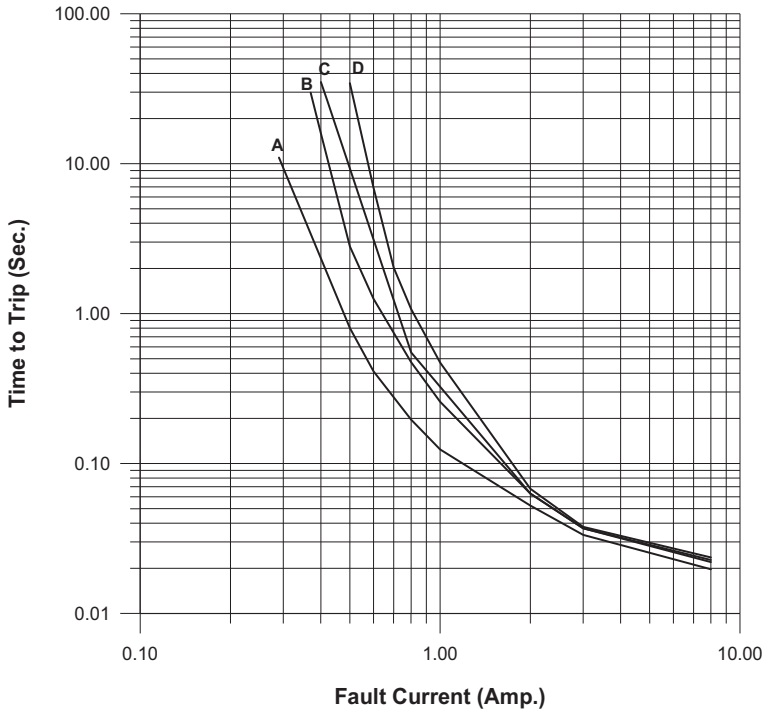
#### ■ General

- Customers shall evaluate and test the properties of PPTC devices independently to verify and ensure that their individual applications will be met.
- The performance of PPTC devices will be adversely affected if they are improperly used under electronic, thermal and/or mechanical procedures and/or conditions non-conformant to those recommended by manufacturer.
- Customers shall be responsible for determining whether it is necessary to have back-up, failsafe and/or fool-proof protection to avoid or minimize damage that may result from extra-ordinary, irregular function or failure of PPTC devices.
- Any and all responsibilities and liabilities are disclaimed if any item under this notice of warning is not complied with.

**Positive Temperature Coefficient (PTC)**
**Thermal Derating Curve**

**Thermal Derating Chart**
**Recommended Hold Current (A) at Ambient Temperature (°C)**

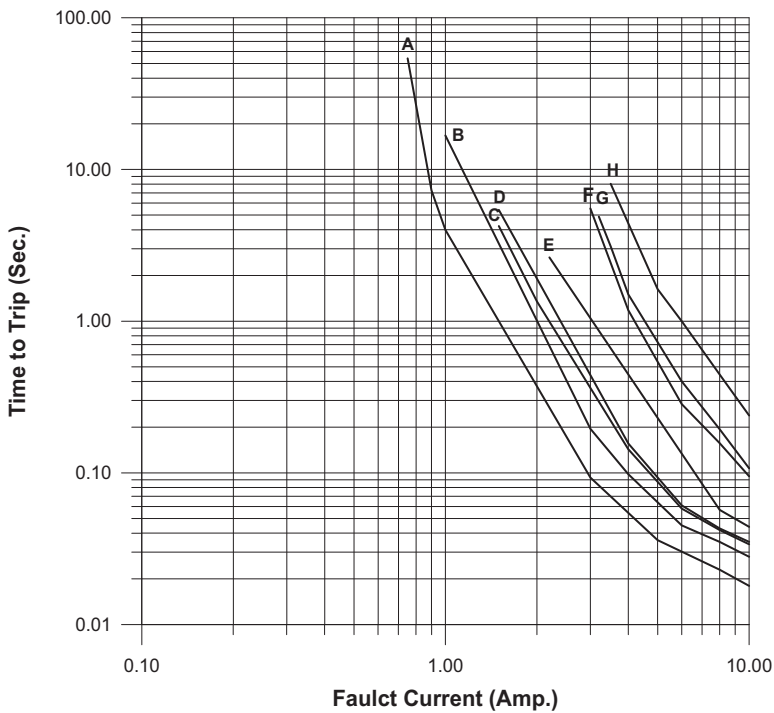
| Part Number        | Ambient Operation Temperature |        |      |       |       |       |       |       |       |
|--------------------|-------------------------------|--------|------|-------|-------|-------|-------|-------|-------|
|                    | -40 °C                        | -20 °C | 0 °C | 23 °C | 40 °C | 50 °C | 60 °C | 70 °C | 85 °C |
| SMD1206P012TF      | 0.18                          | 0.16   | 0.14 | 0.125 | 0.10  | 0.09  | 0.08  | 0.07  | 0.05  |
| SMD1206P016TF      | 0.22                          | 0.20   | 0.18 | 0.16  | 0.14  | 0.12  | 0.10  | 0.09  | 0.08  |
| SMD1206P020TF/24   | 0.28                          | 0.25   | 0.23 | 0.20  | 0.17  | 0.15  | 0.14  | 0.12  | 0.09  |
| SMD1206P025TF      | 0.37                          | 0.33   | 0.29 | 0.25  | 0.22  | 0.20  | 0.17  | 0.15  | 0.12  |
| SMD1206P025TF/24   | 0.37                          | 0.33   | 0.29 | 0.25  | 0.22  | 0.20  | 0.17  | 0.15  | 0.12  |
| SMD1206P035TF/16   | 0.50                          | 0.45   | 0.40 | 0.35  | 0.30  | 0.27  | 0.24  | 0.21  | 0.15  |
| SMD1206P050TF      | 0.71                          | 0.64   | 0.57 | 0.50  | 0.42  | 0.39  | 0.35  | 0.31  | 0.25  |
| SMD1206P050TF/15   | 0.71                          | 0.64   | 0.57 | 0.50  | 0.42  | 0.39  | 0.35  | 0.31  | 0.25  |
| SMD1206P075TFT     | 1.14                          | 1.01   | 0.88 | 0.75  | 0.65  | 0.59  | 0.54  | 0.49  | 0.41  |
| SMD1206P075TF/13.2 | 1.14                          | 1.01   | 0.88 | 0.75  | 0.65  | 0.59  | 0.54  | 0.49  | 0.41  |
| SMD1206P075TF/16   | 1.14                          | 1.01   | 0.88 | 0.75  | 0.65  | 0.59  | 0.54  | 0.49  | 0.41  |
| SMD1206P110TFT     | 1.64                          | 1.46   | 1.30 | 1.10  | 0.92  | 0.83  | 0.80  | 0.65  | 0.52  |
| SMD1206P150TFT     | 2.20                          | 1.99   | 1.77 | 1.50  | 1.34  | 1.23  | 1.10  | 1.01  | 0.84  |
| SMD1206P175TF      | 2.50                          | 2.25   | 2.00 | 1.75  | 1.55  | 1.45  | 1.35  | 1.25  | 1.10  |
| SMD1206P200TF      | 2.60                          | 2.44   | 2.35 | 2.00  | 1.78  | 1.67  | 1.50  | 1.45  | 1.10  |

Average Time-Current Curve



- A – SMD1206P012TF
- B – SMD1206P016TF
- C – SMD1206P020TF/24
- D – SMD1206P025TF
- SMD1206P025TF/24

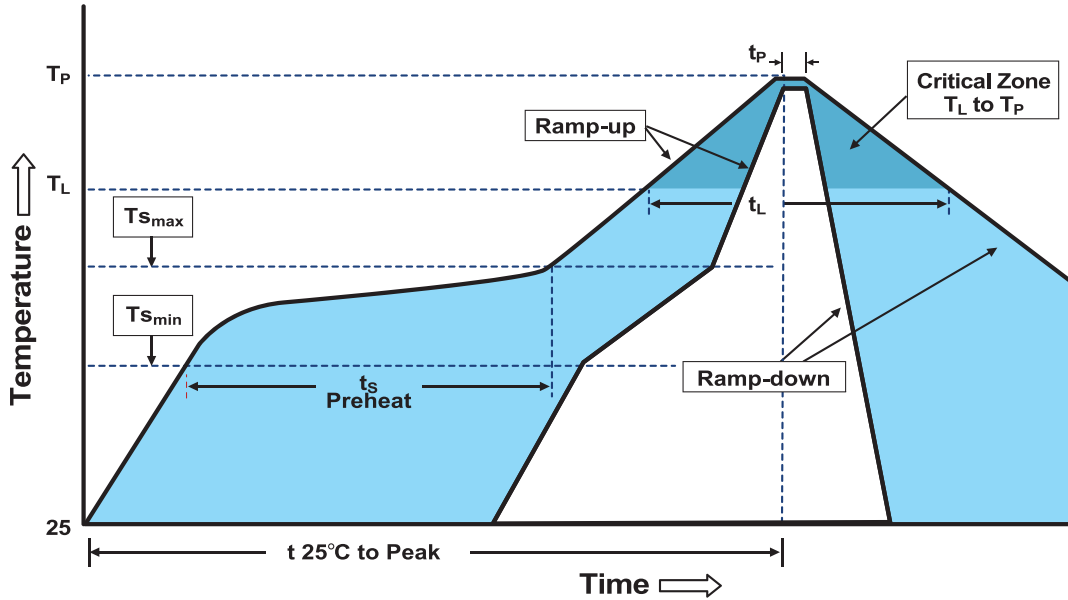
Average Time-Current Curve



- A – SMD1206P035TF/16
- B – SMD1206P050TF/15
- C – SMD1206P075TFT
- D – SMD1206P075TF/13.2
- SMD1206P075TF/16
- E – SMD1206P110TFT
- F – SMD1206P150TFT
- G – SMD1206P175TF
- H – SMD1206P200TF

Positive Temperature Coefficient (PTC)

Soldering Parameters

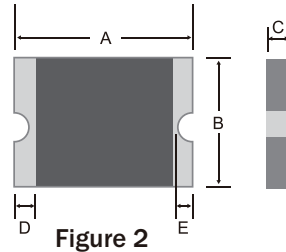


| Profile Feature                                 | Pb-Free Assembly   |
|---|--------------------|
| Average Ramp-Up Rate (Tsmax to TP)              | 3°C/second max.    |
| Preheat   |                    |
| -Temperature Min (Tsmin)                        | 150°C              |
| -Temperature Max (Tsmax)                        | 200°C              |
| -Time (Tsmin to Tsmax)                          | 60-180 seconds     |
| Time maintained above:                          |                    |
| -Temperature (TL)                               | 217°C              |
| -Time (tL)                                      | 60-150 seconds     |
| Peak Temperature (TP)                           | 260°C              |
| Time within 5°C of actual Peak Temperature (tP) | 20-40 seconds      |
| Ramp-Down Rate                                  | 6 °C /second max.  |
| Time 25°C to Peak Temperature                   | 8 minutes max.     |
| Storage Condition                               | 0°C ~35°C, ≤ 70%RH |

- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead-free
- Recommended maximum paste thickness is 0.25mm (0.010 inch)
- Devices can be cleaned using standard industry methods and solvents.

**Note 1:** All temperature refer to topside of the package, measured on the package body surface.

**Note 2:** If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.

**Positive Temperature Coefficient (PTC)**
**Physical Dimensions (mm.)**


| Part Number        | A    |      | B    |      | C    |      | D    |      | E    |      |
|--------------------|------|------|------|------|------|------|------|------|------|------|
|                    | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. | Min. | Max. |
| SMD1206P012TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.65 | 1.45 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P016TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.65 | 1.45 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P020TF/24   | 3.00 | 3.40 | 1.50 | 1.80 | 0.50 | 1.00 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P025TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.50 | 1.00 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P025TF/24   | 3.00 | 3.40 | 1.50 | 1.80 | 0.50 | 1.00 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P035TF/16   | 3.00 | 3.40 | 1.50 | 1.80 | 0.45 | 0.75 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P050TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.45 | 0.75 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P050TF/15   | 3.00 | 3.40 | 1.50 | 1.80 | 0.45 | 0.75 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P075TFT     | 3.00 | 3.40 | 1.50 | 1.80 | 0.40 | 0.60 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P075TF/13.2 | 3.00 | 3.40 | 1.50 | 1.80 | 0.75 | 1.25 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P075TF/16   | 3.00 | 3.40 | 1.50 | 1.80 | 0.75 | 1.25 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P110TFT     | 3.00 | 3.40 | 1.50 | 1.80 | 0.30 | 0.60 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P150TFT     | 3.00 | 3.40 | 1.50 | 1.80 | 0.50 | 1.00 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P175TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.80 | 1.80 | 0.25 | 0.75 | 0.05 | 0.45 |
| SMD1206P200TF      | 3.00 | 3.40 | 1.50 | 1.80 | 0.80 | 1.60 | 0.25 | 0.75 | 0.05 | 0.45 |

**Environmental Specifications**

|   |  |
|---|--|
| Operating Temperature                               | -40°C to +85 °C  |
| Maximum Device Surface Temperature in Tripped State | 125°C  |
| Passive Aging                                       | +85°C , 1000 hours<br>±5% typical resistance change                                |
| Humidity Aging                                      | +85°C , 85%R.H. 1000 hours<br>±5% typical resistance change                        |
| Thermal Shock                                       | MIL-STD-202 Method 107G<br>+85°C /-40°C 20 times<br>-30% typical resistance change |
| Solvent Resistance                                  | MIL-STD-202, Method 215<br>No change   |
| Vibration   | MIL-STD-883C, Method 2007.1, Condition A<br>No change                              |
| Moisture Sensitivity Level                          | Level 1, J-STD-020C  |