



### Description

The 0603L Series PTC provides surface mount overcurrent protection for applications where space is at a premium and resettable protection is desired.

### Features

- RoHS compliant, lead-free and halogen free
- Fast response to fault currents
- Compact design saves board space
- Low resistance
- Low-profile
- Compatible with high temperature solders

### Applications

- USB peripherals
- Disk drives
- CD-ROMs
- Plug and play protection for motherboards and peripherals
- PDAs / digital cameras
- Game console port protection

### Agency Approvals

| AGENCY                                                                            | AGENCY FILE NUMBER |
|-----------------------------------------------------------------------------------|--------------------|
|  | E183209            |
|  | R50119118          |

### Electrical Characteristics

| Part Number | Marking | $I_{hold}$<br>(A) | $I_{trip}$<br>(A) | $V_{max}$<br>(Vdc) | $I_{max}$<br>(A) | $P_d$<br>typ.<br>(W) | Maximum Time To Trip |                | Resistance                |                            | Agency Approvals                                                                      |                                                                                       |
|-------------|---------|-------------------|-------------------|--------------------|------------------|----------------------|----------------------|----------------|---------------------------|----------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|             |         |                   |                   |                    |                  |                      | Current<br>(A)       | Time<br>(Sec.) | $R_{min}$<br>( $\Omega$ ) | $R_{1max}$<br>( $\Omega$ ) |  |  |
| 0603L004    | -       | 0.04              | 0.12              | 24                 | 20               | 0.5                  | 0.20                 | 1.00           | 4.00                      | 40.00                      | X                                                                                     | X                                                                                     |
| 0603L010    | C       | 0.10              | 0.30              | 15                 | 40               | 0.5                  | 0.50                 | 1.00           | 0.900                     | 6.000                      | X                                                                                     | X                                                                                     |
| 0603L020    | H       | 0.20              | 0.50              | 9                  | 40               | 0.5                  | 1.00                 | 0.60           | 0.550                     | 3.500                      | X                                                                                     | X                                                                                     |
| 0603L025    | I       | 0.25              | 0.55              | 9                  | 40               | 0.5                  | 8.00                 | 0.08           | 0.500                     | 3.000                      | X                                                                                     | X                                                                                     |
| 0603L035    | F       | 0.35              | 0.75              | 6                  | 40               | 0.5                  | 8.00                 | 0.10           | 0.200                     | 1.000                      | X                                                                                     | X                                                                                     |
| 0603L050    | J       | 0.50              | 1.00              | 6                  | 40               | 0.5                  | 8.00                 | 0.10           | 0.100                     | 0.680                      | X                                                                                     | X                                                                                     |

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 20°C still air.

$I_{trip}$  = Trip current: minimum current at which the device will trip in 20°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 ( $V_{max}$ )

$P_d$  = Power dissipated from device when in the tripped state at 20°C still air.

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

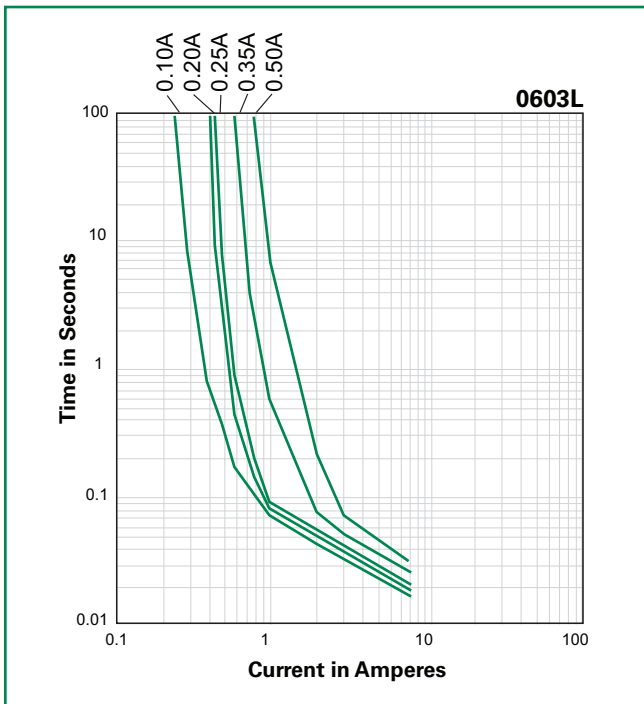
$R_{1max}$  = Maximum resistance of device at 20°C measured one hour after tripping or reflow soldering of 260°C for 20 sec.

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

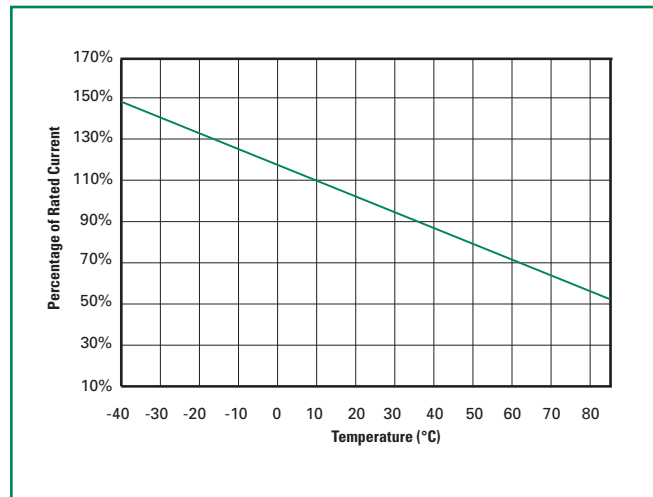
## Temperature Derating

| Part Number      | Ambient Operation Temperature |       |      |      |      |      |      |      |      |
|------------------|-------------------------------|-------|------|------|------|------|------|------|------|
|                  | -40°C                         | -20°C | 0°C  | 20°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| Hold Current (A) |                               |       |      |      |      |      |      |      |      |
| 0603L004         | 0.05                          | 0.05  | 0.04 | 0.04 | 0.03 | 0.03 | 0.02 | 0.02 | 0.01 |
| 0603L010         | 0.13                          | 0.12  | 0.11 | 0.10 | 0.08 | 0.07 | 0.06 | 0.05 | 0.03 |
| 0603L020         | 0.27                          | 0.25  | 0.23 | 0.20 | 0.17 | 0.14 | 0.12 | 0.10 | 0.07 |
| 0603L025         | 0.32                          | 0.29  | 0.27 | 0.25 | 0.21 | 0.18 | 0.16 | 0.14 | 0.10 |
| 0603L035         | 0.47                          | 0.41  | 0.38 | 0.35 | 0.29 | 0.26 | 0.24 | 0.20 | 0.14 |
| 0603L050         | 0.73                          | 0.66  | 0.60 | 0.50 | 0.44 | 0.40 | 0.37 | 0.31 | 0.22 |

## Average Time Current Curves



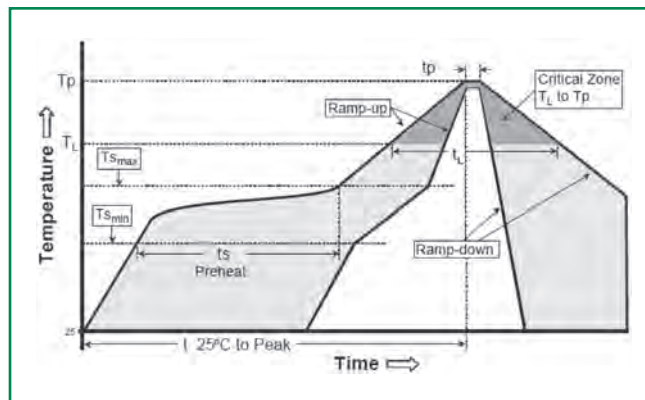
## Temperature Derating Curve



The average time current curves and Temperature Derating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

## Soldering Parameters

|                                                      |                                  |                         |
|------------------------------------------------------|----------------------------------|-------------------------|
| Profile Feature                                      |                                  | Pb-Free Assembly        |
| Average Ramp-Up Rate ( $T_{s(max)}$ to $T_p$ )       |                                  | 3°C/second max          |
| Pre Heat:                                            | Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                      | Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                      | Time (Min to Max) ( $t_s$ )      | 60 – 180 secs           |
| Time Maintained Above:                               | Temperature ( $T_L$ )            | 217°C                   |
|                                                      | Temperature ( $t_L$ )            | 60 – 150 seconds        |
| Peak / Classification Temperature ( $T_p$ )          |                                  | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ ) |                                  | 20 – 40 seconds         |
| Ramp-down Rate                                       |                                  | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )              |                                  | 8 minutes Max.          |



- All temperature refer to topside of the package, measured on the package body surface
- If reflow temperature exceeds the recommended profile, devices may not meet the performance requirements
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead
- Recommended maximum paste thickness is 0.25mm (0.010inch)
- Devices can be cleaned using standard industry methods and solvents
- Devices can be reworked using the standard industry practices

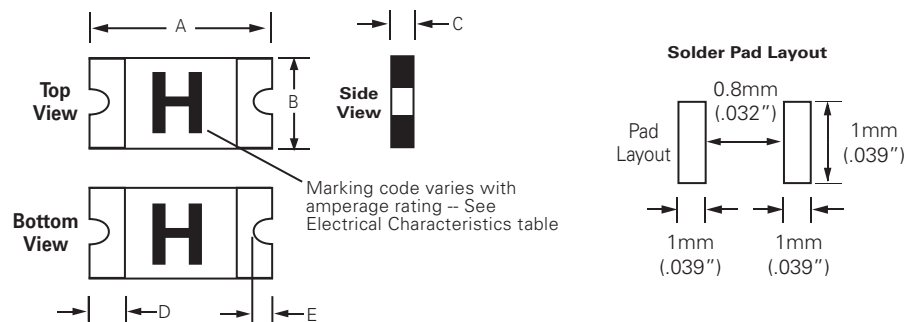
## Physical Specifications

|                           |                                                                  |
|---------------------------|------------------------------------------------------------------|
| <b>Terminal Material</b>  | Solder-Plated Copper<br>(Solder Material: Matte Tin (Sn))        |
| <b>Lead Solderability</b> | Meets EIA Specification RS186-9E,<br>ANSI/J-STD-002, Category 3. |

## Environmental Specifications

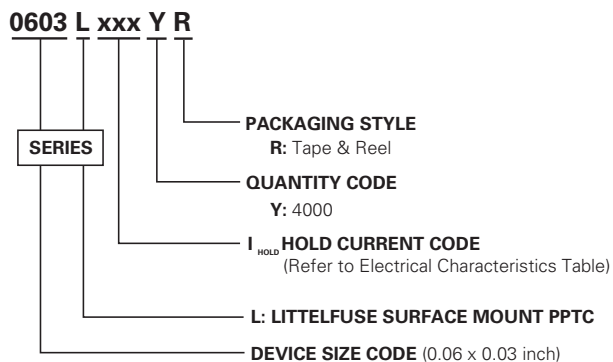
|                                                            |                                                                                    |
|------------------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Operating/Storage Temperature</b>                       | -40°C to +85°C                                                                     |
| <b>Maximum Device Surface Temperature in Tripped State</b> | 125°C                                                                              |
| <b>Passive Aging</b>                                       | +85°C, 1000 hours<br>-/+10% typical resistance change                              |
| <b>Humidity Aging</b>                                      | +85°C, 85% R.H., 100 hours<br>-/+15% typical resistance change                     |
| <b>Thermal Shock</b>                                       | MIL-STD-202, Method 107G<br>+85°C/-40°C 20 times<br>-30% typical resistance change |
| <b>Solvent Resistance</b>                                  | MIL-STD-202, Method 215<br>No change                                               |
| <b>Vibration</b>                                           | MIL-STD-883C, Method 2007.1,<br>Condition A<br>No change                           |
| <b>Moisture Sensitivity Level</b>                          | Level 1, J-STD-020C                                                                |

## Dimensions



| Part Number | A    |      |      |      | B    |      |      |      | C    |      |      |      | D    |      |      |      | E    |      |      |      |
|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
|             | Inch |      | mm   |      | Inch |      | mm   |      | Inch |      | mm   |      | Inch |      | mm   |      | Inch |      | mm   |      |
|             | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  | Min  | Max  |
| 0603L004    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .030 | 0.40 | 0.75 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |
| 0603L010    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .030 | 0.40 | 0.75 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |
| 0603L020    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .030 | 0.40 | 0.75 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |
| 0603L025    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .030 | 0.40 | 0.75 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |
| 0603L035    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .030 | .061 | 0.75 | 1.55 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |
| 0603L050    | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .030 | .061 | 0.75 | 1.55 | .006 | .020 | 0.15 | 0.50 | .004 | .016 | 0.10 | 0.40 |

## Part Ordering Number System



## Packaging

| Part Number | Ordering Number | Halogen Free | I <sub>hold</sub> (A) | I <sub>hold</sub> Code | Packaging Option | Quantity | Quantity & Packaging Codes |
|-------------|-----------------|--------------|-----------------------|------------------------|------------------|----------|----------------------------|
| 0603L004    | 0603L004YR      | Yes          | 0.04                  | 004                    | Tape and Reel    | 4000     | YR                         |
| 0603L010    | 0603L010YR      | Yes          | 0.10                  | 010                    | Tape and Reel    | 4000     | YR                         |
| 0603L020    | 0603L020YR      | Yes          | 0.20                  | 020                    | Tape and Reel    | 4000     | YR                         |
| 0603L025    | 0603L025YR      | Yes          | 0.25                  | 025                    | Tape and Reel    | 4000     | YR                         |
| 0603L035    | 0603L035YR      | Yes          | 0.35                  | 035                    | Tape and Reel    | 4000     | YR                         |
| 0603L050    | 0603L050YR      | Yes          | 0.50                  | 050                    | Tape and Reel    | 4000     | YR                         |

## Tape and Reel Specifications

| TAPE SPECIFICATIONS: EIA-481-1 (mm) |                                              |                      |
|-------------------------------------|----------------------------------------------|----------------------|
|                                     | 0603L004<br>0603L010<br>0603L020<br>0603L025 | 0603L035<br>0603L050 |
| <b>W</b>                            | 8.0+/- 0.30                                  | 8.0+/- 0.30          |
| <b>F</b>                            | 3.5+/- 0.05                                  | 3.5+/- 0.05          |
| <b>E<sub>1</sub></b>                | 1.75+/- 0.10                                 | 1.75+/- 0.10         |
| <b>D<sub>0</sub></b>                | 1.55+/- 0.05                                 | 1.55+/- 0.05         |
| <b>D<sub>1</sub></b>                | 0.5(min)                                     | 0.5 (min)            |
| <b>P<sub>0</sub></b>                | 4.0+/- 0.10                                  | 4.0+/- 0.10          |
| <b>P<sub>1</sub></b>                | 4.0+/- 0.10                                  | 4.0+/- 0.10          |
| <b>P<sub>2</sub></b>                | 2.0+/- 0.05                                  | 2.0+/- 0.05          |
| <b>A<sub>0</sub></b>                | 1.10+/- 0.10                                 | 1.10+/- 0.10         |
| <b>B<sub>0</sub></b>                | 1.92+/- 0.10                                 | 1.92+/- 0.10         |
| <b>T</b>                            | 0.20+/- 0.10                                 | 0.20+/- 0.10         |
| <b>K<sub>0</sub></b>                | 0.72+/- 0.10                                 | 0.96+/- 0.10         |
| <b>Leader min.</b>                  | 390                                          | 390                  |
| <b>Trailer min.</b>                 | 160                                          | 160                  |

## REEL DIMENSIONS: EIA-481-1 (mm)

|                      |               |
|----------------------|---------------|
| <b>H</b>             | 12.0+/- 0.05  |
| <b>W</b>             | 9.0+/- 0.5    |
| <b>D</b>             | Ø60+0.5       |
| <b>F</b>             | Ø13.0 +/- 0.2 |
| <b>C</b>             | Ø178 +/- 1.0  |
| <b>H<sub>1</sub></b> | 11+/- 0.5     |
| <b>W<sub>1</sub></b> | 2.2+/- 0.5    |
| <b>W<sub>2</sub></b> | 3.0+0.5       |
| <b>W<sub>3</sub></b> | 4.0+0.5       |
| <b>W<sub>4</sub></b> | 5.5+0.5       |

## Tape and Reel Diagram

