

# 0603L Series

## Surface Mount



### 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

### Additional Information



Resources



Accessories



Samples

### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| cUL US | E183209            |
| TÜV    | 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>( $\Omega$ ) | cUL US           | TÜV |
| 0603L001/60 | ●       | 0.01              | 0.05              | 60                 | 40               | 0.5                  | 0.20                 | 1.00           | 15.00                     | 100.00                     | X                | X   |
| 0603L002/60 | 2       | 0.02              | 0.06              | 60                 | 40               | 0.5                  | 0.20                 | 1.00           | 12.00                     | 70.00                      | X                | X   |
| 0603L003/36 | ▲       | 0.03              | 0.09              | 36                 | 40               | 0.5                  | 0.20                 | 1.00           | 6.00                      | 50.00                      | X                | X   |
| 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.

#### Warning

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration
- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage ( $L di/dt$ ) above the rated voltage of the PPTC device.

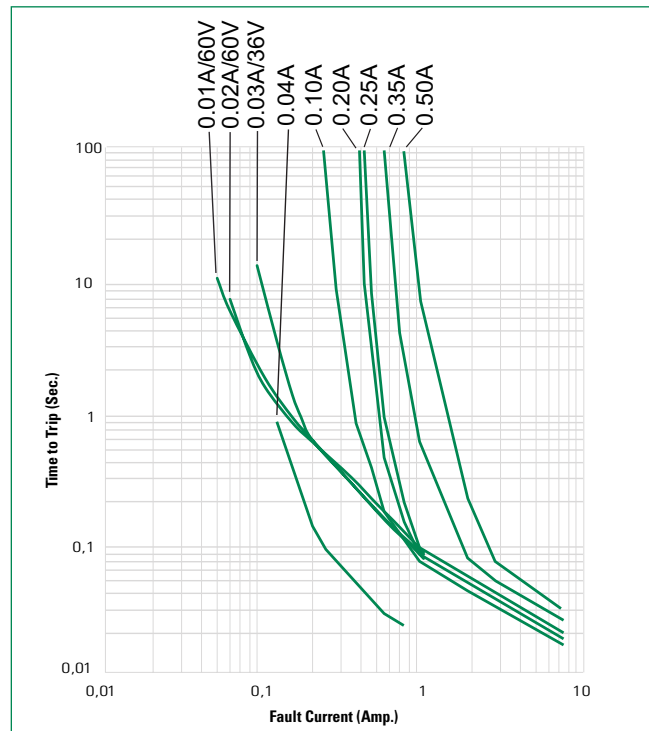
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## Surface Mount

### Temperature Derating

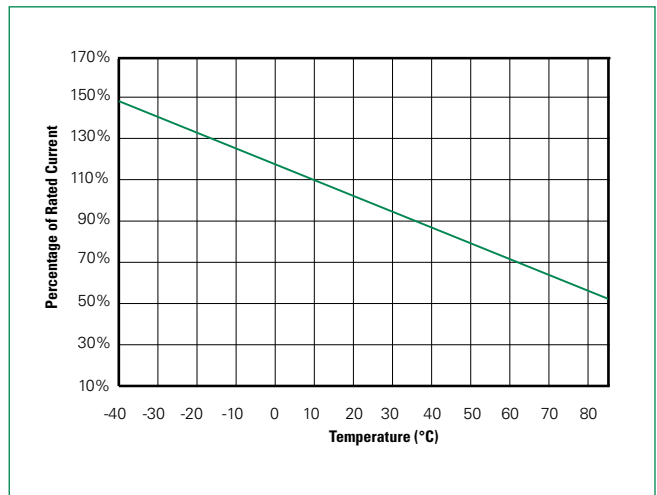
| Part Number      | Ambient Operation Temperature |        |        |       |        |        |        |        |        |
|------------------|-------------------------------|--------|--------|-------|--------|--------|--------|--------|--------|
|                  | -40°C                         | -20°C  | 0°C    | 20°C  | 40°C   | 50°C   | 60°C   | 70°C   | 85°C   |
| Hold Current (A) |                               |        |        |       |        |        |        |        |        |
| 0603L001/60      | 0.0156                        | 0.0138 | 0.0121 | 0.010 | 0.0085 | 0.0076 | 0.0067 | 0.0058 | 0.0045 |
| 0603L002/60      | 0.0299                        | 0.0268 | 0.0236 | 0.020 | 0.0173 | 0.0157 | 0.0142 | 0.0126 | 0.0102 |
| 0603L003/36      | 0.0454                        | 0.0405 | 0.0356 | 0.030 | 0.0258 | 0.0234 | 0.0209 | 0.0185 | 0.0148 |
| 0603L004         | 0.052                         | 0.048  | 0.044  | 0.040 | 0.032  | 0.028  | 0.024  | 0.020  | 0.012  |
| 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         | 0.67                          | 0.59   | 0.54   | 0.50  | 0.41   | 0.37   | 0.34   | 0.29   | 0.20   |

### Average Time Current Curves



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.

### Temperature Derating Curve



**Note:**

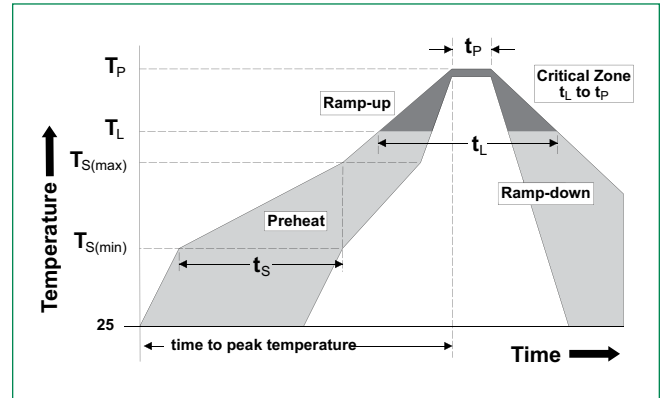
Typical Temperature derating curve, refer to table for derating data

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### Soldering Parameters

|                                                                           |                                                  |                         |
|---------------------------------------------------------------------------|--------------------------------------------------|-------------------------|
| <b>Profile Feature</b>                                                    |                                                  | Pb-Free Assembly        |
| <b>Average Ramp-Up Rate (<math>T_{S(max)}</math> to <math>T_P</math>)</b> |                                                  | 3°C/second max          |
| <b>Pre Heat:</b>                                                          | <b>Temperature Min (<math>T_{S(min)}</math>)</b> | 150°C                   |
|                                                                           | <b>Temperature Max (<math>T_{S(max)}</math>)</b> | 200°C                   |
|                                                                           | <b>Time (Min to Max) (<math>t_s</math>)</b>      | 60 – 180 secs           |
| <b>Time Maintained Above:</b>                                             | <b>Temperature (<math>T_L</math>)</b>            | 217°C                   |
|                                                                           | <b>Temperature (<math>t_L</math>)</b>            | 60 – 150 seconds        |
| <b>Peak / Classification Temperature (<math>T_P</math>)</b>               |                                                  | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_P</math>)</b>      |                                                  | 20 – 40 seconds         |
| <b>Ramp-down Rate</b>                                                     |                                                  | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_P</math>)</b>                   |                                                  | 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,  $N_2$  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. |

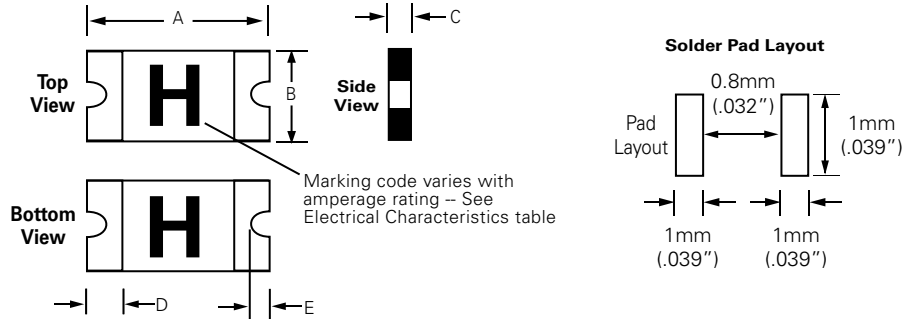
### Environmental Specifications

|                                                            |                                                                                   |
|------------------------------------------------------------|-----------------------------------------------------------------------------------|
| <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 107<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-883, Method 2007,<br>Condition A<br>No change                             |
| <b>Moisture Sensitivity Level</b>                          | Level 1, J-STD-020                                                                |

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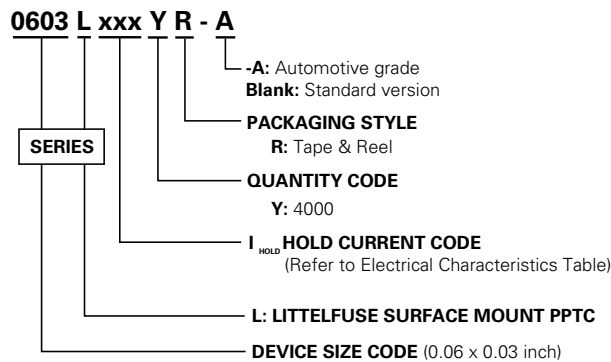
## Surface Mount

### 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  |
| 0603L001/60 | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .039 | 0.40 | 1.00 | .006 | .020 | 0.15 | 0.50 | -    | .016 | -    | 0.40 |
| 0603L002/60 | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .039 | 0.40 | 1.00 | .006 | .020 | 0.15 | 0.50 | -    | .016 | -    | 0.40 |
| 0603L003/36 | .055 | .071 | 1.40 | 1.80 | .024 | .039 | 0.60 | 1.00 | .016 | .039 | 0.40 | 1.00 | .006 | .020 | 0.15 | 0.50 | -    | .016 | -    | 0.40 |
| 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 |
|-------------|-----------------|--------------|-----------------------|------------------------|------------------|----------|----------------------------|
| 0603L001/60 | 0603L001/60YR   | Yes          | 0.01                  | 001                    | Tape and Reel    | 4000     | YR                         |
| 0603L002/60 | 0603L002/60YR   | Yes          | 0.02                  | 002                    | Tape and Reel    | 4000     | YR                         |
| 0603L003/36 | 0603L003/36YR   | Yes          | 0.03                  | 003                    | Tape and Reel    | 4000     | YR                         |
| 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                         |

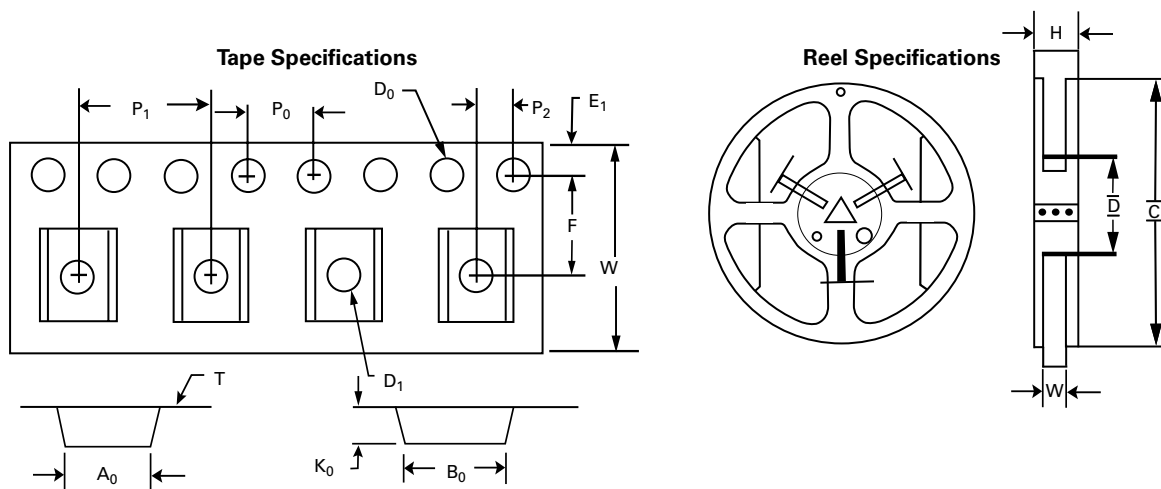
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## Surface Mount

### Tape and Reel Specifications

| TAPE SPECIFICATIONS: EIA-481-1 (mm) |                                              |                                                                   | REEL DIMENSIONS:<br>EIA-481-1 (mm) |              |
|-------------------------------------|----------------------------------------------|-------------------------------------------------------------------|------------------------------------|--------------|
|                                     | 0603L004<br>0603L010<br>0603L020<br>0603L025 | 0603L001/60<br>0603L002/60<br>0603L003/36<br>0603L035<br>0603L050 |                                    |              |
| <b>W</b>                            | 8.0+/- 0.30                                  | 8.0+/- 0.30                                                       | <b>C</b>                           | Ø178+/-1.0   |
| <b>F</b>                            | 3.5+/- 0.05                                  | 3.5+/- 0.05                                                       | <b>D</b>                           | Ø60.2+/- 0.5 |
| <b>E<sub>1</sub></b>                | 1.75+/- 0.10                                 | 1.75+/- 0.10                                                      | <b>H</b>                           | 11.0+0.5     |
| <b>D<sub>0</sub></b>                | 1.55+/- 0.05                                 | 1.55+/- 0.05                                                      | <b>W</b>                           | 9.0+/- 1.5   |
| <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                                                               |                                    |              |

### Tape and Reel Diagram



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