# TS Series
## Surface Mount




## Description

Littelfuse PolySwitch® products for telecommunication and networking devices help to meet the growing demand for resettable overcurrent protection. They also provide protection against damage caused by power cross and induced power surges as defined by ITU, Telcordia GR1089, and IEC 62368-1. Littelfuse offers chip, surface-mount, and radial-leaded configurations.

## Applications

Networking Machines and Systems:

- Modem
- Phone set
- Fax machine
- Phone wall outlet
- Alarm system
- PBX system
- MDF module
- T1/E1 equipment
- Analog and digital line card
- xDSL modem and splitter
- Powered Ethernet system
- VoIP (Voice over Internet Protocol) equipment
- LAN, WAN equipment
- Customer premise equipment
- Access network hardware

## Features & Benefits

- Resettable overcurrent protection
- Fast time-to-trip
- Resistance sorted and matched devices available
- Low parasitic capacitance/flat impedance with frequency
- Recognized to UL 1434, approved to CSA TIL No. CA-3A and EN 60730-1.

### Agency Approvals

| Agency | Agency File/Certificate Number |
|---|---|
| | E74889* |
| | 78166* |
| | 72161787* |

* See Electrical Characteristic Table for approved part numbers.

### Electrical Characteristics

| Part Number | Ordering Part Number | $I_H$ | $I_T$ | $V_{MAX}$ | | $I_{MAX}$ | $P_{D\ Typ}$ | Max Time-to-trip | | $R_{MIN}$ | $R_{MAX}$ | $R_{1MAX}$ | Agency Approvals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Operating | Interrupt | Interrupt | | | | | | | | | |
| | | (A) | (A) | ($V_{DC}$) | ($V_{RMS}$) | (A) | (W) | (A) | (s) | (Ω) | (Ω) | (Ω) | | | |
| TS250/TSL250/TSM250/TSV250 – Surface-mount — 250VAC | | | | | | | | | | | | | | | |
| TSL250-080F-2 | E72246-000 | 0.080 | 0.240 | 80 | 250 | 3.0 | 1.2 | 1.0 | 0.8 | 5.0 | 11.0 | 20.0** | x | x | x |
| TSL250-130F-2 | RF3835-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.5 | 1.0 | 2.0 | 4.0 | 8.0 | 12.0** | — | — | — |
| TS250-130F-2 | E44331-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.1 | 1.0 | 0.9 | 6.5 | 12.0 | 20.0** | x | x | x |
| | | — | — | 60 | 600 | 1.0 | — | — | — | — | — | — | | | |
| TS250-130F-RA-2 | E18772-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.1 | 1.0 | 1.4 | 6.5 | 9.0 | 15.0** | x | x | — |
| | | — | — | 60 | 600 | 1.0 | — | — | — | — | — | — | | | |
| TS250-130F-RB-2 | D48481-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.1 | 1.0 | 0.7 | 9.0 | 12.0 | 20.0** | x | x | — |
| | | — | — | 60 | 600 | 1.0 | — | — | — | — | — | — | | | |
| TS250-130F-RC-B-0.5-2 | A05570-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.1 | 1.0 | 1.1 | 7.0 | 10.0 | 17.0** | x | x | — |
| | | — | — | 60 | 600 | 1.0 | — | — | — | — | — | — | | | |



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### Electrical Characteristics

| Part Number | Ordering Part Number | $I_H$ | $I_T$ | $V_{MAX}$ | | $I_{MAX}$ | $P_{D\ Typ}$ | Max Time-to-trip | | $R_{MIN}$ | $R_{MAX}$ | $R_{1MAX}$ | Agency Approvals | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Operating | Interrupt | Interrupt | | | | | | | | | |
| | | (A) | (A) | ($V_{DC}$) | ($V_{RMS}$) | (A) | (W) | (A) | (s) | (Ω) | (Ω) | (Ω) | | | |
| **TS250/TSL250/TSM250/TSV250 – Surface-mount — 250$V_{AC}$** | | | | | | | | | | | | | | | |
| TSM250-130F-2 | RF4825-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.5 | 1.0 | 2.4 | 4.0 | 9.0 | 15.0 | x | — | — |
| TSV250-130F-2 | F59779-000 | 0.130 | 0.260 | 60 | 250 | 3.0 | 1.5 | 1.0 | 2.0 | 4.0 | 7.0 | 12.0** | x | x | x |
| **TS600 – Surface-mount — 600$V_{AC}$ (Single Channel)** | | | | | | | | | | | | | | | |
| TS600-170F-2 | D83387-000 | 0.170 | 0.400 | 60 | 600 | 3.0 | 2.5 | 1.0 | 10.0 | 4.0 | 9.0 | 18.0 | x | x | — |
| TS600-200F-RA-B-0.5-2 | F02483-000 | 0.200 | 0.400 | 60 | 600 | 3.0 | 2.5 | 1.0 | 12.0 | 4.0 | 7.5 | 13.5 | x | x | — |
| TS600-400F-2 | RF0309-000 | 0.400 | 1.000 | 60 | 600 | 3.0 | 2.0 | 3.0 | 5.0 | 0.5 | 1.1 | 2.0 | x | x | — |
| **TSM600 – Surface-mount — 600$V_{AC}$ (Dual Channel)** | | | | | | | | | | | | | | | |
| TSM600-250F-2 | A88766-000 | 0.250 | 0.860 | 250 | 600 | 3.0 | 2.0 | 3.0 | 0.8 | 1.0 | 3.5 | 7.0 | x | x | — |
| TSM600-250F-RA-2 | A88390-000 | 0.250 | 0.860 | 250 | 600 | 3.0 | 2.0 | 3.0 | 1.0 | 1.0 | 3.0 | 5.0 | x | x | — |
| TSM600-400F-2 | E12392-000 | 0.400 | 1.000 | 250 | 600 | 3.0 | 2.0 | 3.0 | 5.0 | 0.5 | 1.1 | 2.0 | x | — | — |

**Notes:**

$I_H$ : Hold current: maximum current device will pass without interruption in 20°C still air.

$I_T$ : Trip current: minimum current that will switch the device from low resistance to high resistance in 20°C still air.

$V_{MAX}$ Operating : Maximum continuous voltage device can withstand without damage at rated current. This voltage is used for component Recognition under UL1434.

$V_{MAX}$ Interrupt : Maximum voltage that can be safely placed across a device in its tripped state.

$I_{MAX}$ Interrupt : Maximum fault current device can withstand without damage at rated operating voltage. This current is used for component Recognition under UL1434. Devices may trip safely under higher level power cross conditions to assist equipment in meeting the appropriate ITU, UL60950 or GR1089 industry requirements.

$P_D$ : Power dissipated from device when in the tripped state in 20°C still air.

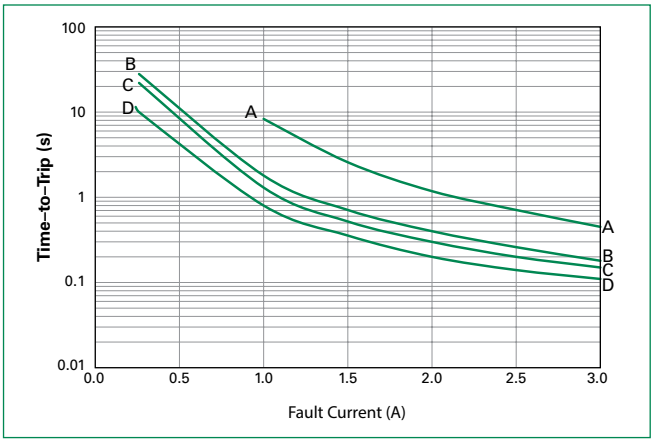
$R_{MIN}$ : Minimum resistance of device as supplied at 20°C unless otherwise specified.

$R_{MAX}$ : Maximum resistance of device as supplied at 20°C unless otherwise specified.

$R_{1MAX}$ : Maximum resistance measured one hour post-trip or post-reflow at 20°C.

** Applies to all products which share the same prefix.

### Typical Time-to-Trip Curves at 25°C



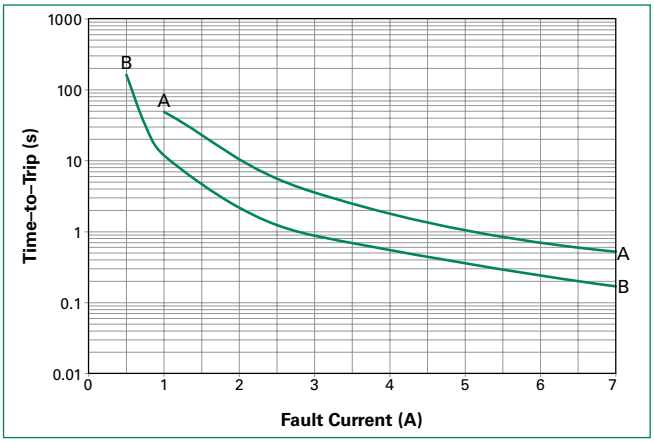

**TS250**

A = TSV250-184F

B = TSV250-130F/TSL250-130F/TSM250-130F

C = TS250-130F

D = TSL250-080F




**TS600/TSM600**

A = TS600-400/TSM600-400F

B = TSM600-250F/TS600-170F/200F



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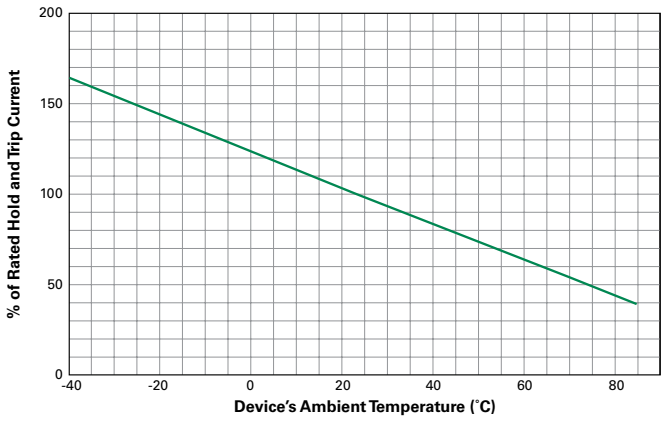
# TS Series
## Surface Mount

### Temperature Rerating

| Maximum Ambient Temperature | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Part Number** | -40°C | -20°C | 0°C | 20°C | 40°C | 50°C | 60°C | 70°C | 85°C |
| **Hold Current (A)** | | | | | | | | | |
| **TS250/TSL250/TSM250/TSV250 – Surface-mount* — 250$V_{AC}$** | | | | | | | | | |
| TSL250-080F | 0.124 | 0.110 | 0.095 | 0.080 | 0.066 | 0.059 | 0.051 | 0.044 | 0.033 |
| TSL250-130F | 0.208 | 0.182 | 0.156 | 0.130 | 0.104 | 0.091 | 0.078 | 0.065 | 0.045 |
| TS250-130F | 0.208 | 0.182 | 0.156 | 0.130 | 0.104 | 0.091 | 0.078 | 0.065 | 0.045 |
| TSM250-130F | 0.208 | 0.182 | 0.156 | 0.130 | 0.104 | 0.091 | 0.078 | 0.065 | 0.045 |
| TSV250-130F | 0.208 | 0.182 | 0.156 | 0.130 | 0.104 | 0.091 | 0.078 | 0.065 | 0.045 |
| TSV250-184F | 0.286 | 0.252 | 0.218 | 0.184 | 0.150 | 0.134 | 0.118 | 0.102 | 0.075 |
| **TS600 – Surface-mount† — 600$V_{AC}$ (Single Channel)** | | | | | | | | | |
| TS600-170F | 0.264 | 0.230 | 0.200 | 0.170 | 0.140 | 0.125 | 0.109 | 0.094 | 0.070 |
| TS600-200F | 0.310 | 0.275 | 0.238 | 0.200 | 0.165 | 0.147 | 0.128 | 0.110 | 0.083 |
| TS600-400F | 0.640 | 0.560 | 0.480 | 0.400 | 0.320 | 0.270 | 0.230 | 0.190 | 0.130 |
| **TSM600 – Surface-mount† — 600$V_{AC}$ (Dual Channel)** | | | | | | | | | |
| TSM600-250F | 0.400 | 0.350 | 0.300 | 0.250 | 0.198 | 0.170 | 0.140 | 0.117 | 0.083 |
| TSM600-400F | 0.640 | 0.560 | 0.480 | 0.400 | 0.320 | 0.270 | 0.230 | 0.190 | 0.130 |

* 250$V_{AC}$ interrupt products may help equipment pass ITU K.20, K.21 and K.45 recommendations and Telcordia GR-1089 Port Type 2 and 4 requirements.
† 600$V_{AC}$ interrupt products may help equipment pass UL60950, TIA-968-A and GR1089 Port Type 1, 3 and 5 requirements.
** Applies to all products which share the same prefix.

### TSx250/TS600/TSM600 – Temperature Rerating Curve





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### TS250/TSV250/TSM250/TSL250 – Physical Specifications

| | |
|---|---|
| **Terminal Material** | Tin-plated Brass, Nickel Under-plating (TS250/TSV250/TSL250)<br>Tin-plated Copper (TSM250) |
| **Soldering Characteristics** | IEC 60068-2-58 |

**Note:** Devices are not intended to be placed through a reflow process.

### TS250/TSV250/TSM250/TSL250 – Environmental Specifications

| Test | Conditions |
|---|---|
| **Passive Aging** | 60°C, 1000 hrs<br>85°C, 1000 hrs |
| **Humidity Aging** | 85°C, 85% R.H., 500 hrs |
| **Thermal Shock** | 125°C, -55°C (10 Times) |
| **Solvent Resistance** | MIL-STD-202, Method 215F |
| **Moisture Resistance Level** | Level 1, J-STD-020 |
| **Storage Conditions** | 40°C max, 70% RH max; devices should remain in original sealed bags prior to use.<br>Devices may not meet specified values if these storage conditions are exceeded. |

### TS600 – Physical Specifications

| | |
|---|---|
| **Terminal Material** | Tin-plated Brass |
| **Insulating Material** | Nylon Resin (UL94V-0), 1000V Dielectric Rating |
| **Soldering Characteristics** | ANSI/J-STD-002, Category 3 |
| **Solder Heat Withstand** | IEC 60068-2-58, Test Tb, Section 8 |

### TS600 – Environmental Specifications

| Test | Conditions |
|---|---|
| **Passive Aging** | 60°C, 1000 hrs<br>85°C, 1000 hrs |
| **Humidity Aging** | 85°C, 85% R.H., 1000 hrs |
| **Thermal Shock** | 125°C, -55°C (10 Times) |
| **Solvent Resistance** | MIL-STD-202, Method 215F |
| **Moisture Resistance Level** | Level 1, J-STD-020 |
| **Storage Conditions** | 40°C max, 70% RH max; devices should remain in original sealed bags prior to use.<br>Devices may not meet specified values if these storage conditions are exceeded. |



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### TSM600 – Physical Specifications

| | |
|---|---|
| **Terminal Material** | Tin-plated Brass |
| **Insulating Material** | Nylon Resin (UL94V-0), 1000V Dielectric Rating |
| **Soldering Characteristics** | IEC 60068-2-58, Method 7 |
| **Solder Heat Withstand** | IEC 60068-2-58, Test Tb, Section 5 Method 1a |

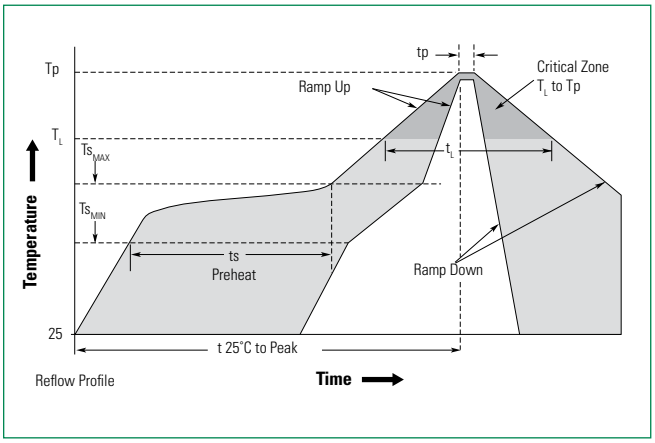
### TSM600 – Environmental Specifications

| **Test** | **Conditions** |
|---|---|
| **Passive Aging** | 60°C, 1000 hrs<br>85°C, 1000 hrs |
| **Humidity Aging** | 85°C, 85% R.H., 1000 hrs |
| **Thermal Shock** | 125°C, -55°C (10 Times) |
| **Solvent Resistance** | MIL-STD-202, Method 215J |
| **Moisture Resistance Level** | Level 2A, J-STD-020 |
| **Storage Conditions** | 40°C max, 70% RH max; devices should remain in original sealed bags prior to use.<br>Devices may not meet specified values if these storage conditions are exceeded. |

### Solder Reflow Recommendations

| **Profile Feature** | Pb-Free Assembly |
|---|---|
| **Average ramp up rate ($Ts_{MAX}$ to Tp)** | 3°C/s max |
| **Preheat** | |
| **Temperature min ($Ts_{MIN}$)** | 150°C |
| **Temperature max ($Ts_{MAX}$)** | 200°C |
| **Time ($ts_{MIN}$ to $ts_{MAX}$)** | 60-180 s |
| **Time maintained above:** | |
| **Temperature ($T_L$)** | 217°C |
| **Time ($t_L$)** | 60-150 s |
| **Peak/Classification temperature (Tp)** | 260°C |
| **Time within 5°C of actual peak temperature** | |
| **Time (tp)** | 20-40 s |
| **Ramp down rate** | 6°C/s max |
| **Time 25°C to peak temperature** | 8min max |

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




### Solder Reflow

- Recommended reflow method: IR, vapor phase oven, hot air oven.
- Surface-mount devices are not intended to be wave soldered to the bottom side of the board.
- Recommended maximum paste thickness of 0.25mm (0.010in).
- Devices can be cleaned using standard industry methods and solvents.

### Rework

- If a device is removed from the board, it should be discarded and replaced with a new device.



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### Dimension Figures

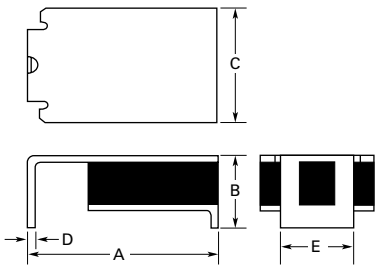



**Figure 1**

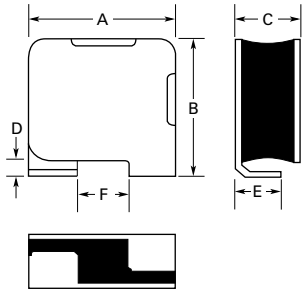



**Figure 2**

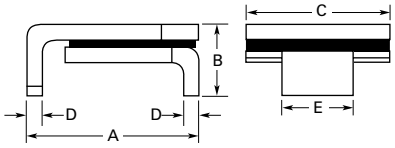



**Figure 3**

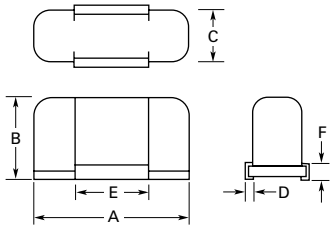



**Figure 4**

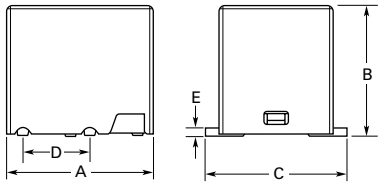



**Figure 5**

### Dimensions and Weights

| Part Number | Dimensions in Millimeters (Inches) | | | | | | | | | | | | Figure | Device Mass (g) (Only for Reference) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | D | | E | | F | | | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | | |
| **TS250/TSL250/TSM250/TSV250 – Surface-mount* — 250$V_{AC}$** | | | | | | | | | | | | | | |
| TSL250-080F | 6.7 (0.27) | 7.9 (0.31) | 2.7 (0.11) | 3.7 (0.15) | 4.8 (0.19) | 5.3 (0.21) | 0.2 (0.01) | 0.4 (0.02) | 2.5 (0.10) | 3.1 (0.12) | — | — | 3 | 2.80 |
| TSL250-130F | 6.7 (0.27) | 7.9 (0.31) | 2.7 (0.11) | 3.7 (0.15) | 4.8 (0.19) | 5.3 (0.21) | 0.2 (0.01) | 0.4 (0.02) | 2.5 (0.10) | 3.1 (0.12) | — | — | 3 | 2.80 |
| TS250-130F | 8.5 (0.34) | 9.4 (0.37) | — | 3.4 (0.14) | — | 7.4 (0.29) | 0.3‡ (0.01) | — | 3.8‡ (0.15) | — | — | — | 1 | 3.60 |
| TSM250-130F | 8.2 (0.323) | 8.9 (0.35) | — | 9.0 (0.354) | 7.8 (0.307) | 8.6 (0.339) | — | 3.9 (0.154) | — | 0.7 (0.026) | — | — | 5 | 0.64 |
| TSV250-130F | — | 6.10 (0.24) | — | 6.90 (0.27) | — | 3.20 (0.13) | 0.56 (0.02) | — | — | 1.90 (0.08) | 1.60 (0.07) | 2.30 (0.09) | 2 | 2.80 |
| TSV250-184F | — | 6.10 (0.24) | — | 6.90 (0.27) | — | 3.20 (0.13) | 0.56 (0.02) | — | — | 1.90 (0.08) | 1.60 (0.07) | 2.30 (0.09) | 2 | 2.80 |
| **TS600 – Surface-mount† — 600$V_{AC}$ (Single Channel)** | | | | | | | | | | | | | | |
| TS600-170F | 18.3 (0.72) | 19.4 (0.77) | 11.6 (0.46) | 12.3 (0.49) | 7.2 (0.29) | 8.3 (0.33) | 1.7 (0.07) | 2.4 (0.10) | 9.9 (0.39) | 10.4 (0.41) | 1.5 (0.06) | 2.3 (0.09) | 4 | 23.6 |
| TS600-200F | 18.3 (0.72) | 19.4 (0.77) | 11.6 (0.46) | 12.3 (0.49) | 7.2 (0.29) | 8.3 (0.33) | 1.7 (0.07) | 2.4 (0.10) | 9.9 (0.39) | 10.4 (0.41) | 1.5 (0.06) | 2.3 (0.09) | 4 | 23.6 |
| TS600-400F | 18.3 (0.72) | 19.4 (0.77) | 11.6 (0.46) | 12.3 (0.49) | 7.2 (0.29) | 8.3 (0.33) | 1.7 (0.07) | 2.4 (0.10) | 9.9 (0.39) | 10.4 (0.41) | 1.5 (0.06) | 2.3 (0.09) | 4 | 19.8 |

† 600$V_{AC}$ interrupt products may help equipment pass UL60950, TIA-968-A and GR1089 Port Type 1, 3 and 5 requirements.



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### Dimension Figures

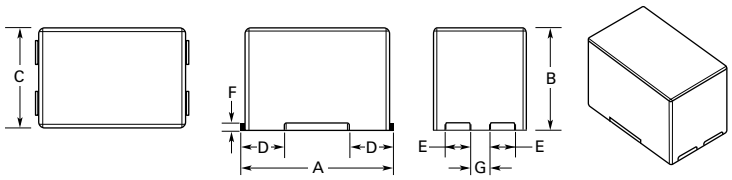



**Figure 6**

### Dimensions and Weights

| Part Number | Dimensions in Millimeters (Inches) | | | | | | | | | | | | | | Figure | Device Mass (g) (Only for Reference) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | D | | E | | F | | G | | | |
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | | |
| **TSM600 – Surface-mount† — 600V$_{AC}$ (Dual Channel)** | | | | | | | | | | | | | | | | |
| TSM600-250F | 17.0 | 17.60 | 11.20 | 11.70 | 10.40 | 11.20 | 4.80 | 5.20 | 2.50 | 2.80 | 0.60 | 1.0 | 2.2 | 3.1 | 6 | 31.2 |
| | (0.67) | (0.69) | (0.44) | (0.46) | (0.41) | (0.44) | (0.19) | (0.20) | (0.10) | (0.11) | (0.02) | (0.04) | (0.09) | (0.12) | | |
| TSM600-400F | 17.0 | 17.60 | 11.20 | 11.70 | 10.40 | 11.20 | 4.80 | 5.20 | 2.50 | 2.80 | 0.60 | 1.0 | 2.2 | 3.1 | 6 | 31.2 |
| | (0.67) | (0.69) | (0.44) | (0.46) | (0.41) | (0.44) | (0.19) | (0.20) | (0.10) | (0.11) | (0.02) | (0.04) | (0.09) | (0.12) | | |

† 600V$_{AC}$ interrupt products may help equipment pass UL60950, TIA-968-A and GR1089 Port Type 1, 3 and 5 requirements.

### Packaging and Marking Information

| Part Number | Bag Quantity | Tape and Reel Quantity | Standard Package Quantity | Part Marking | Agency Approvals |
|---|---|---|---|---|---|
| **TS250/TSL250/TSM250/TSV250 – Surface-mount — 250V$_{AC}$** | | | | | |
| TSL250-080F-2 | — | 1,500 | 7,500 | T08 | UL, CSA,TÜV |
| TSL250-130F-2 | — | 1,500 | 7,500 | T13 | — |
| TS250-130F-2 | — | 1,500 | 7,500 | T13 | UL, CSA, TÜV |
| TSM250-130F-2 | — | 600 | 3,000 | T13M | UL |
| TSV250-130F | 2500 | — | 10,000 | T13V | UL, CSA, TÜV |
| TSV250-130F-2 | — | 1,200 | 6,000 | T13V | UL, CSA, TÜV |
| TSV250-184F | 2500 | — | 10,000 | T18V | UL |
| **TS600 – Surface-mount — 600V$_{AC}$ (Single Channel)** | | | | | |
| TS600-170F-2 | — | 300 | 900 | T20 | UL, CSA |
| TS600-200F-RA-2 | — | 300 | 900 | T20 | UL, CSA |
| TS600-400F-2 | — | 300 | 900 | T40 | UL, CSA |
| **TSM600 – Surface-mount — 600V$_{AC}$ (Dual Channel)** | | | | | |
| TSM600-250F-2 | — | 200 | 600 | TSM600 | UL, CSA |
| TSM600-250F-RA-2 | — | 200 | 600 | TSM600 | UL, CSA |
| TSM600-400F-2 | — | 200 | 600 | TSM600-4 | UL |


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# TS Series
## Surface Mount

### Recommended Pad Layouts in millimeters (inches) Nominal

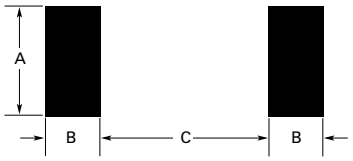



**Figure 1**

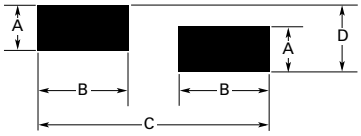



**Figure 2**

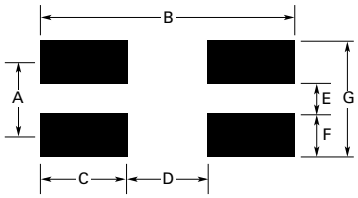



**Figure 3**

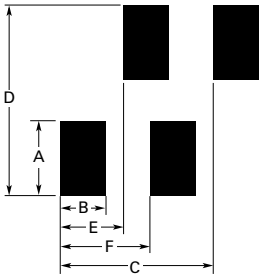
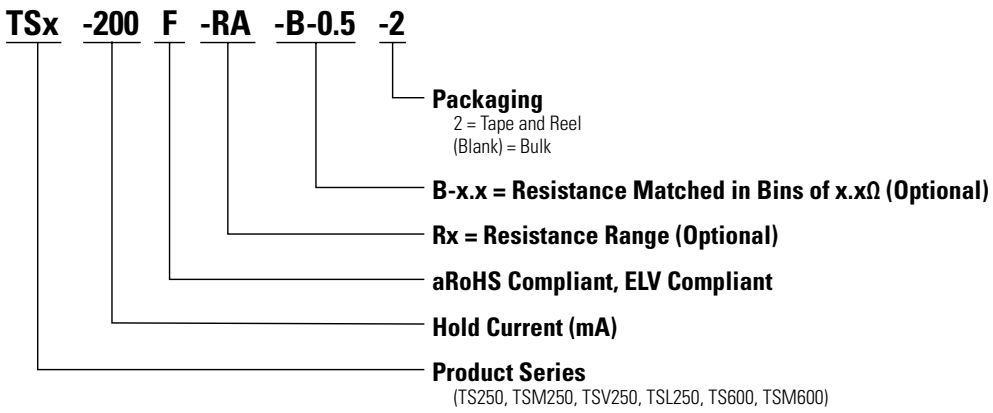



**Figure 4**

| Device | A | B | C | D | E | F | G | Figure |
|---|---|---|---|---|---|---|---|---|
| TS250 (All) | 4.6<br>(0.180) | 1.80<br>(0.070) | 6.10<br>(0.240) | — | — | — | — | 1 |
| TSM250 (All) | 3.20<br>(0.126) | 2.00<br>(0.079) | 6.70<br>(0.264) | 8.20<br>(0.323) | 2.60<br>(0.102) | 3.90<br>(0.154) | — | 4 |
| TSV250 (All) | 2.29<br>(0.090) | 2.41<br>(0.095) | 6.35<br>(0.250) | 3.43<br>(0.135) | — | — | — | 2 |
| TSL250 (All) | 3.6<br>(0.140) | 1.80<br>(0.070) | 5.50<br>(0.220) | — | — | — | — | 1 |
| TS600 (All) | 10.42<br>(0.410) | 3.30<br>(0.130) | 3.35<br>(0.132) | — | — | — | — | 1 |
| TSM600 (All) | 5.2<br>(0.205) | 17.80<br>(0.701) | 5.54<br>(0.218) | 6.75<br>(0.266) | 2.08<br>(0.082) | 3.12<br>(0.123) | 8.39<br>(0.331) | 3 |

### Part Ordering Number System





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# TS Series
## Surface Mount

### TS250/TSV250/TSM250/TSL250 – Tape and Reel Specifications

TS devices are packaged per EIA 481 and EIA 481-2 standards.
See Figures 1 and 2 for details.

| Description | EIA Mark | TS250 | | TSM250 | | TSV250 | | TSL250 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Dimension (mm) | Tolerance (mm) | Dimension (mm) | Tolerance (mm) | Dimension (mm) | Tolerance (mm) | Dimension (mm) | Tolerance (mm) |
| Carrier Tape Width | W | 16 | ±0.30 | 24.0 | ±0.50 | 16.0 | ±0.30 | 16 | ±0.30 |
| Sprocket Hole Pitch | $P_0$ | 4.0 | ±0.10 | 4.0 | ±0.10 | 4.0 | ±0.10 | 4.0 | ±0.10 |
| | $P_1$ | 12.0 | ±0.10 | 16.0 | ±0.10 | 8.0 | ±0.10 | 8.0 | ±0.10 |
| | $P_2$ | 2.0 | ±0.10 | 2.0 | ±0.10 | 2.0 | ±0.10 | 2.0 | ±0.10 |
| | $A_0$ | 6.9 | ±0.23 | 7.05 | ±0.20 | 5.5 | ±0.10 | 5.5 | ±0.10 |
| | $B_0$ | 9.6 | ±0.15 | 8.85 | ±0.20 | 6.2 | ±0.10 | 7.9 | ±0.10 |
| | $B_1$ max | 12.1 | — | 12.45 | — | 8.0 | — | 9.2 | — |
| Sprocket Hole Diameter | $D_0$ | 1.5 | -0/+0.1 | 1.5 | -0/+1.0 | 1.55 | ±0.05 | 1.55 | ±0.05 |
| | F | 7.5 | ±0.10 | 11.5 | ±0.10 | 7.5 | ±0.10 | 7.5 | ±0.10 |
| | $E_1$ | 1.75 | ±0.10 | 1.75 | ±0.10 | 1.75 | ±0.10 | 1.75 | ±0.10 |
| | $E_2$ min | 14.25 | — | 22.25 | — | — | — | — | — |
| Tape Thickness | T max | 0.4 | — | 0.5 | ±0.50 | 0.45 | — | 0.35 | — |
| Tape Thickness with Splice Cover Tape Thickness | $T_1$ max | 0.1 | — | 0.1 | — | 0.1 | — | 0.1 | — |
| | $K_0$ | 3.4 | ±0.15 | 8.55 | ±0.20 | 7.0 | ±0.10 | 3.70 | ±0.10 |
| | Leader min | 300 | — | 300 | — | 390 | — | 390 | — |
| | Trailer min | 300 | — | 160 | — | 160 | — | 160 | — |
| Reel Dimensions | | | | | | | | | |
| Reel Diameter | A max | 340 | — | 390 | — | 340 | — | 340 | — |
| Core Diameter | N min | 50 | — | 75 | — | 50 | — | 50 | — |
| Space between Flanges-less Device | $W_1$ | 16.4 | -0/+2.0 | 25.4 | ±0.5 | 16.4 | -0/+2.0 | 16.4 | -0/+2.0 |
| Reel Width | $W_2$ max | 22.4 | — | 30.4 | — | 22.4 | — | 22.4 | — |



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# TS Series
## Surface Mount

### TS600/TSM600 – Tape and Reel Specifications

TS devices are packaged per EIA 481 and EIA 481-2 standards.
See Figures 1 and 2 for details.

| Description | EIA Mark | TS600 | | TSM600 | |
|---|---|---|---|---|---|
| | | Dimension (mm) | Tolerance (mm) | Dimension (mm) | Tolerance (mm) |
| Carrier Tape Width | W | 32 | ±0.3 | 32 | ±0.3 |
| Sprocket Hole Pitch | $P_0$ | 4.0 | ±0.1 | 4.0 | ±0.1 |
| | $P_1$ | 16 | ±0.1 | 24 | ±0.1 |
| | $P_2$ | 2.0 | ±0.1 | 2.0 | ±0.1 |
| | $A_0$ | 10 | ±0.1 | 11.2 | ±0.1 |
| | $B_0$ | 19.2 | ±0.1 | 17.8 | ±0.1 |
| | $B_1$ max | 21.6 | — | 23.45 | — |
| Sprocket Hole Diameter | $D_0$ | 1.5 | -0/+1.0 | 1.5 | -0/+1.0 |
| | F | 14.2 | ±0.1 | 14.2 | ±0.1 |
| | $E_1$ | 1.75 | ±0.1 | 1.74 | ±0.1 |
| | $E_2$ min | 28.4 | ±0.1 | 28.4 | ±0.1 |
| Tape Thickness | T max | 0.50 | ±0.5 | 0.5 | ±0.5 |
| Tape Thickness with Splice | $T_1$ max | 0.1 | — | 0.1 | — |
| | $K_0$ | 13.2 | ±0.1 | 11.9 | ±0.1 |
| | Leader min | 390 | — | 390 | — |
| | Trailer min | 160 | — | 160 | — |
| Reel Dimensions | | | | | |
| Reel Diameter | A max | 360 | — | 360 | — |
| Core Diameter | N min | 50 | — | 50 | — |
| Space between Flanges-less Device | $W_1$ | 32.4 | -0/+2.0 | 32.4 | -0/+2.0 |
| Reel Width | $W_2$ max | 40 | — | 40 | — |



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# TS Series
## Surface Mount

### Tape and Reel Diagrams

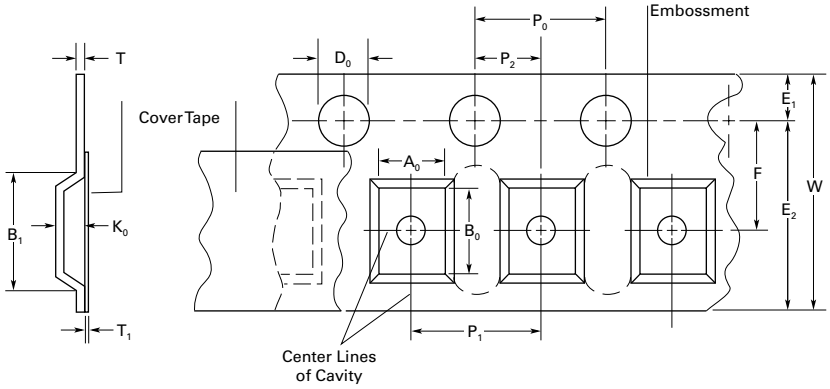



**Figure 1**

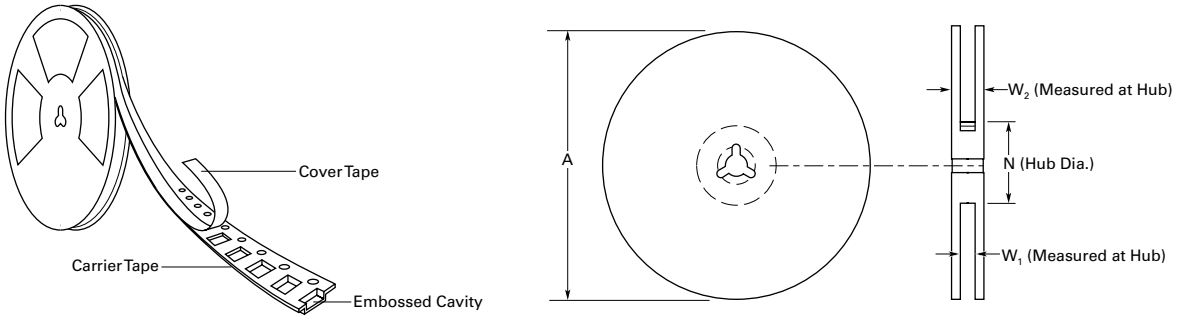



**Figure 2**

**Warning**

- Users should independently evaluate the suitability of and test each product selected for their own application.
- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- These devices are intended for protection against damage caused by occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicone-based oils or some aggressive solvents can adversely impact the performance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- PPTC devices are not recommended for installation in applications where the device is constrained such that its PTC properties are inhibited, for example in rigid potting materials or in rigid housings, which lack adequate clearance to accommodate device expansion.
- Operation in circuits with a large inductance can generate a circuit voltage (Ldi/dt) above the rated voltage of the device.

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