

PolySwitch® Resettable PPTCs

Battery Strap > VLR Series



Description

Littelfuse PolySwitch, a pioneer of polymeric positive temperature coefficient (PPTC) resettable devices, offers several material platforms to help protect battery applications. The lower trip temperature and broad range of hold current ratings combined with a broad range of form-factors and high current interrupt capability are a unique combination for the VLR series

Features & Benefits

- Low trip temperature
- Current ratings from 1.1A to 2.3A
- Voltage ratings from 12V
- Safely interrupt high fault current
- Low-resistance devices increase battery operating time
- RoHS compliant and Halogen free
- Compatible with high-volume electronics assembly
- UL Recognized to UL 1434
CSA Certified to CSA TIL No. CA-3A
TUV Certified to EN 60730-1

Additional Information



Resources



Accessories



Samples

Applications

- Rechargeable batteries for mobile devices
- Video game controller
- Electronic tooth brush
- Battery-powered shaver
- Portable medical devices

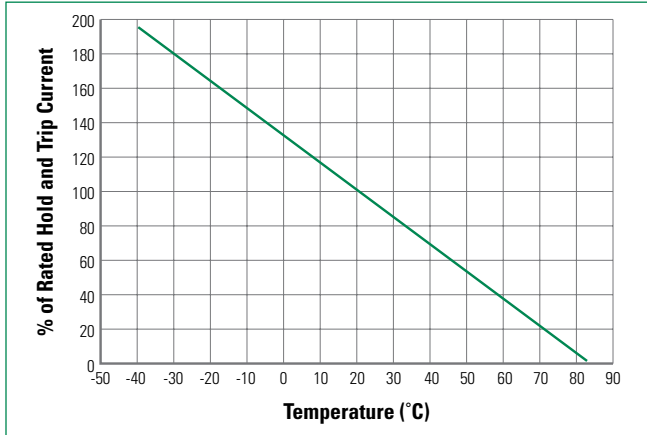
Agency Approvals

| Agency | Agency File/Certificate Number |
|--------|--------------------------------|
| | E74889 |
| | 78165C |
| | 72161788 |

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Thermal Derating Curve



Thermal Derating [Hold Current (A) at Ambient Temperature (°C)]

| Part Description | Ordering Part Number | Maximum Ambient Temperature | | | | | | | | |
|------------------|----------------------|-----------------------------|-------|-----|------|------|------|------|------|------|
| | | -40°C | -20°C | 0°C | 20°C | 25°C | 40°C | 50°C | 60°C | 70°C |
| Hold Current (A) | | | | | | | | | | |
| VLR170F | RF3533-000 | 3.5 | 2.9 | 2.4 | 1.84 | 1.70 | 1.2 | 1.0 | 0.7 | 0.3 |
| VLR175F | RF3505-000 | 3.5 | 2.9 | 2.4 | 1.87 | 1.75 | 1.3 | 1.0 | 0.8 | 0.3 |
| VLR175LF | RF3522-000 | 3.5 | 2.9 | 2.4 | 1.87 | 1.75 | 1.3 | 1.0 | 0.8 | 0.3 |
| VLR230F | RF3516-000 | 5.0 | 4.2 | 3.4 | 2.52 | 2.30 | 1.7 | 1.3 | 0.9 | 0.4 |

* Product electrical characteristics determined at 25°C.

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Electrical Characteristics

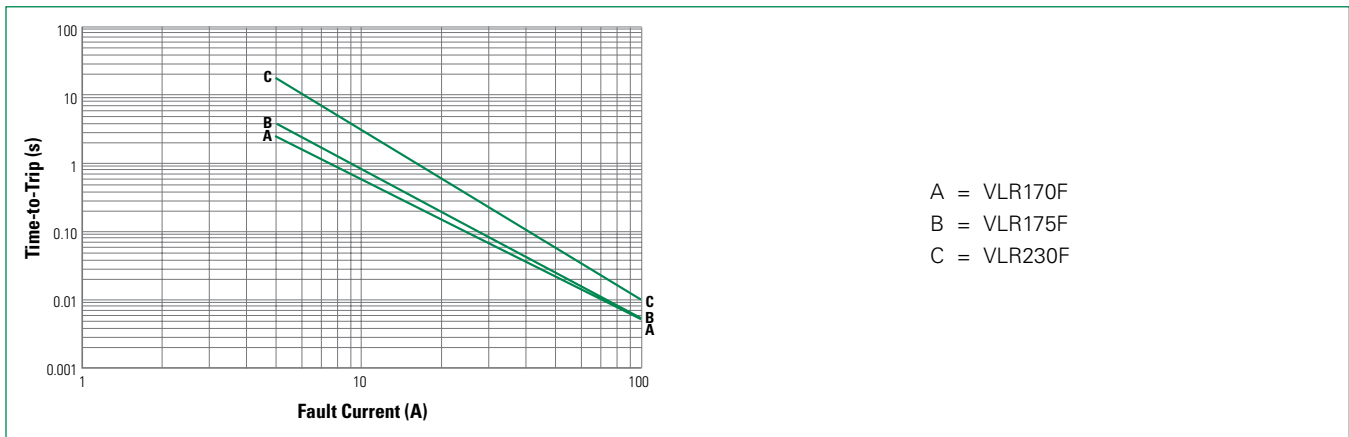
| Part Description | Ordering Part Number | I_H | I_T | V_{MAX} | I_{MAX} | $P_{D MAX}$ | Max Time-to-trip | | R_{MIN} | R_{MAX} | R_{1MAX} | Typical Activation temperature | Typical resistance |
|------------------|----------------------|-------|-------|--------------------|-----------|-------------|------------------|-----|--------------|--------------|--------------|--------------------------------|--------------------|
| | | (A) | (A) | (V _{DC}) | (A) | (W) | (A) | (s) | (Ω) | (Ω) | (Ω) | | |
| VLR170F | RF3533-000 | 1.70 | 4.1 | 12 | 100 | 1.4 | 8.50 | 5.0 | 0.018 | 0.032 | 0.064 | 85 °C | 0.025 |
| VLR175F | RF3505-000 | 1.75 | 4.2 | 12 | 100 | 1.4 | 8.75 | 5.0 | 0.017 | 0.031 | 0.062 | 85 °C | 0.024 |
| VLR175LF | RF3522-000 | 1.75 | 4.2 | 12 | 100 | 1.4 | 8.75 | 5.0 | 0.017 | 0.031 | 0.062 | 85 °C | 0.024 |
| VLR230F | RF3516-000 | 2.30 | 5.0 | 12 | 100 | 2.5 | 10.00 | 5.0 | 0.012 | 0.018 | 0.036 | 85 °C | 0.015 |

* Product electrical characteristics determined at 25°C.

Notes

- I_H : Hold current: maximum current device will pass without interruption in 20°C still air unless otherwise specified.
- I_T : Trip current: minimum current that will switch the device from low-resistance to high-resistance in 20°C still air unless otherwise specified.
- V_{MAX} : Maximum voltage device can withstand without damage at rated current.
- I_{MAX} : Maximum fault current device can withstand without damage at rated voltage.
- P_D : Power dissipated from device when in the tripped state in 20°C still air unless otherwise specified.
- R_{MIN} : Minimum resistance of device as supplied at 20°C unless otherwise specified.
- R_{1MAX} : Maximum resistance of device as supplied at 20°C unless otherwise specified.
- R_{MAX} : Maximum resistance, measured at 20°C unless otherwise specified, of device one hour after being tripped the first time.

Typical Time-to-Trip Curve at 25°C



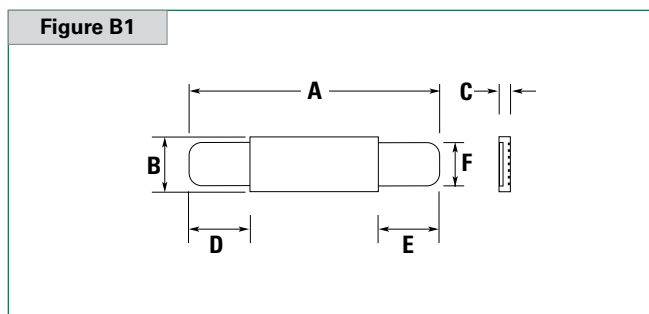
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Dimensions in Millimeters (Inches)

| Part Description | Ordering Part Number | A | | B | | C | | D | | E | | F | | Figure |
|------------------|----------------------|-----------------|-----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----------------|----------------|----------------|--------|
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | |
| VLR170F | RF3533-000 | 20.8 (0.832) | 23.2 (0.928) | 3.5 (0.140) | 3.9 (0.156) | — | 0.8 (0.032) | 4.5 (0.180) | 6.5 (0.260) | 4.5 (0.180) | 6.5 (0.260) | 2.4 (0.096) | 2.6 (0.104) | B1 |
| VLR175F | RF3505-000 | 23.0 (0.920) | 24.5 (0.980) | 2.9 (0.116) | 3.3 (0.132) | 0.5 (0.020) | 0.8 (0.032) | 4.7 (0.188) | 7.2 (0.288) | 3.8 (0.152) | 5.4 (0.216) | 2.4 (0.096) | 2.6 (0.104) | B1 |
| VLR175LF | RF3522-000 | 29.3 (1.172) | 31.7 (1.268) | 2.9 (0.116) | 3.3 (0.132) | — | 0.8 (0.032) | 5.2 (0.208) | 6.8 (0.272) | 10 (0.400) | 12.5 (0.500) | 2.4 (0.096) | 2.6 (0.104) | B1 |
| VLR230F | RF3516-000 | 20.9 (0.836) | 23.1 (0.924) | 4.9 (0.196) | 5.3 (0.212) | — | 0.8 (0.032) | 4.1 (0.164) | 5.8 (0.232) | 4.1 (0.164) | 5.8 (0.232) | 3.9 (0.156) | 4.1 (0.164) | B1 |

Dimension Figure

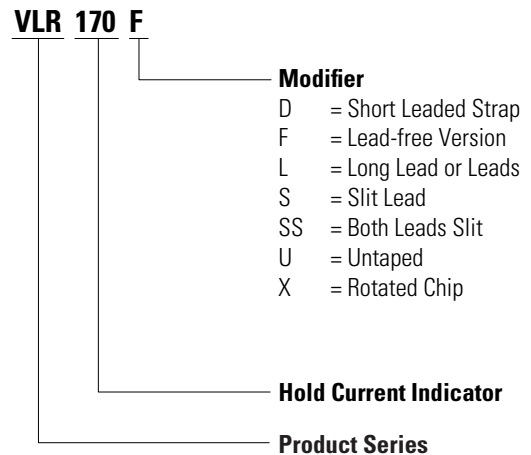


Physical Characteristics and Environmental Specifications

| | | | | |
|-------------------------------------|---------------------------|--|--------------------------|--|
| Physical Characteristics | Lead Material | 0.125mm Nominal Thickness, Quarter-hard Nickel | | |
| | Tape Material | Polyester | | |
| Environmental Specifications | Test | Conditions | Resistance Change | |
| | Passive Aging | -40°C, 1000 hrs | ±5% typ | |
| | | 60°C, 1000 hrs | ±20% typ | |
| | Humidity Aging | 60°C/95% RH, 1000 hrs | ±30% typ | |
| | Thermal Shock | 85°C, -40°C (10 Times) | ±5% typ | |
| Vibration | MIL-STD-883D, Method 2026 | No Change | | |

Notes
Storage conditions: 40°C max., 70% RH max.; devices should remain in original sealed bags prior to use. Devices may not meet specified values if these storage conditions are exceeded.

Part Naming System



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Packaging and Marking Information/Agency Recognition

| Part Description | Ordering Part Number | Bag Quantity | Standard Package Quantity | Part Marking | Agency Recognition |
|------------------|----------------------|--------------|---------------------------|--------------|--------------------|
| VLR170F | RF3533-000 | 1,000 | 10,000 | R17 | UL, CSA,TÜV |
| VLR175F | RF3505-000 | 1,000 | 10,000 | R1X | UL, CSA,TÜV |
| VLR175LF | RF3522-000 | 1,000 | 10,000 | R1X | UL, CSA,TÜV |
| VLR230F | RF3516-000 | 1,000 | 10,000 | R23 | UL, CSA,TÜV |

Installation Guidelines for the Strap Family

- PPTC devices operate by thermal expansion of the conductive polymer. If devices are placed under pressure or installed in spaces that would prevent thermal expansion, they may not properly protect against damage caused by fault conditions. Designs must be selected in such a manner that adequate space is maintained over the life of the product.
- Twisting, bending, or placing the PPTC device in tension will decrease the ability of the device to protect against damage caused by electrical faults. No residual force should remain on device after installation. Mechanical damage to the PPTC device may affect device performance and should be avoided.
- Chemical contamination of PPTC devices should be avoided. Certain greases, solvents, hydraulic fluids, fuels, industrial cleaning agents, volatile components of adhesives, silicones, and electrolytes can have an adverse effect on device performance.
- PPTC strap devices are intended to be resistance welded to battery cells or to pack interconnect straps, yet some precautions must be taken when doing so. In order for the PPTC device to exhibit its specified performance, weld placement should be a minimum of 2mm from the edge of the PPTC device, weld splatter must not touch the PPTC device, and welding conditions must not heat the PPTC device above its maximum operating temperature.
- PPTC strap devices are not intended for applications where reflow onto flex circuits or rigid circuit boards is required.
- The polyester tape on PPTC strap devices is intended for marking and identification purposes only, not for electrical insulation.

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at <https://www.littelfuse.com/legal/disclaimers/polyswitch-products.aspx>.