

# 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

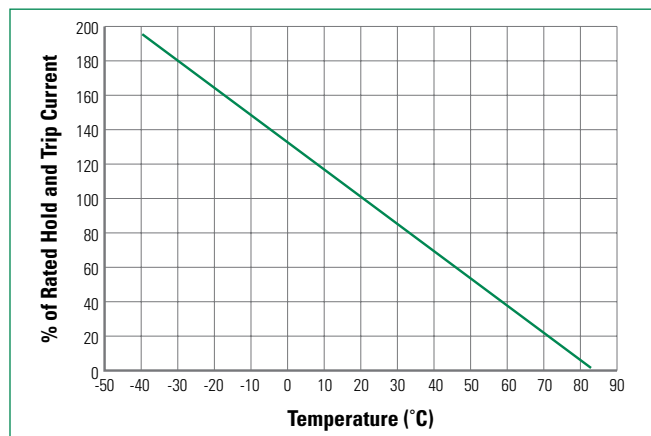
### Agency Approvals

Agency	Agency File/Certification 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

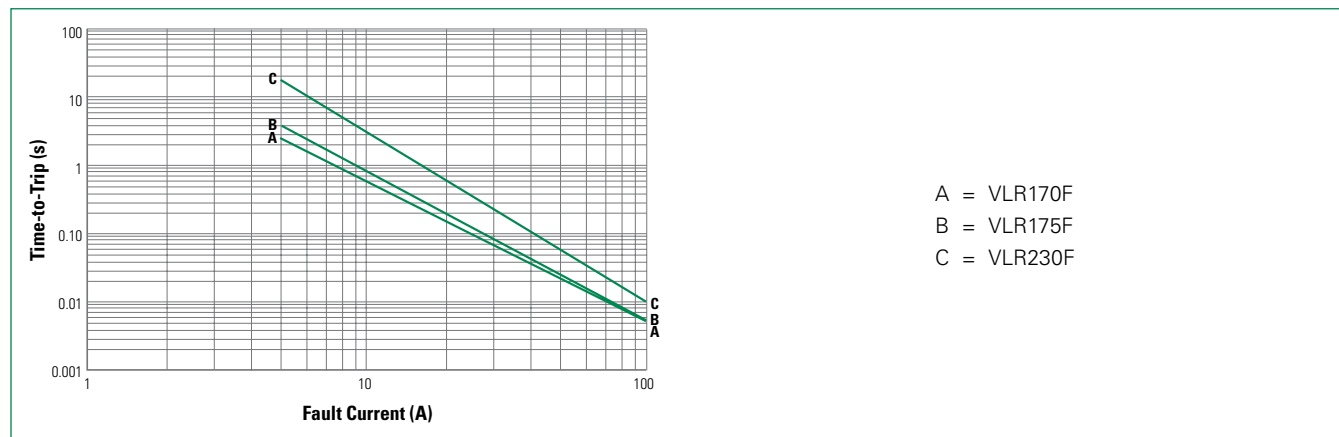
Part Description	Ordering Part Number	$I_H$	$I_T$	$V_{MAX}$	$I_{MAX}$	$P_{D MAX}$	Max Time-to-trip		$R_{MIN}$	$R_{MAX}$	$R_{1MAX}$	Typical Activation temperature	Typical resistance
		(A)	(A)	(V <sub>DC</sub> )	(A)	(W)	(A)	(s)	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )		
VLR170F	RF3533-000	1.70	4.1	12	100	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.  
 $R_{IMAX}$  : 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



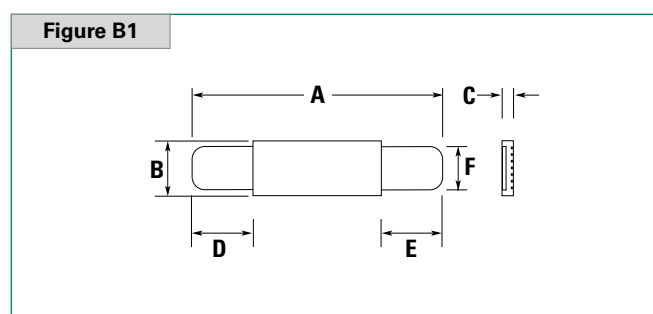
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### Dimensions in Millimeters (Inches)

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



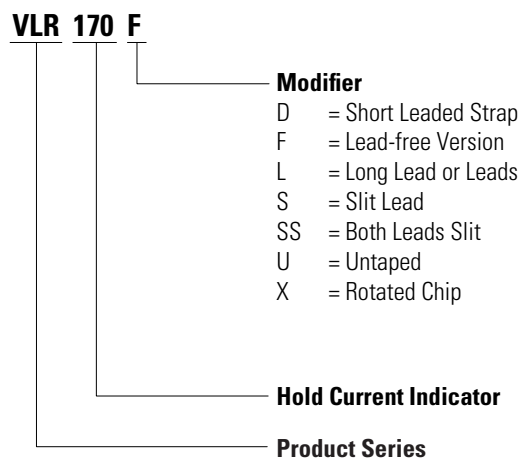
### Physical Characteristics and Environmental Specifications

<b>Physical Characteristics</b>	Lead Material	0.125mm Nominal Thickness, Quarter-hard Nickel		
	Tape Material	Polyester		
<b>Environmental Specifications</b>	<b>Test</b>	<b>Conditions</b>	<b>Resistance Change</b>	
	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>.