PolySwitch® Resettable PPTCs

Battery Strap > LR4 Series

Additional Information

Resources | Accessories | Samples

Agency Approvals

Agency	Agency File Number
	E74889
	78165C
	72161788

Description

Littelfuse PolySwitch, a pioneer of polymeric positive temperature coefficient (PPTC) resettable devices, offers several material platforms to help protect battery applications. The high trip temperature, broad range of hold current ratings, and high voltage ratings available, combined with automotive qualifications are a unique combination for the LR4 series

Features & Benifits

- Qualified to AEC-Q200 for automotive applications
- Current ratings from 1.9A to 13A
- Voltage ratings from 15V to 20V
- Broad range of resettable devices available
- 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

Applications

- Rechargeable batteries for mobile devices
- E-call systems
- Vacuum cleaner
- Power tools
- Portable medical devices

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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	80°C	85°C
		Hold Current (A)										
LR4-190F	RF1538-000	2.8	2.5	2.3	1.9	1.86	1.6	1.5	1.4	1.2	1.1	1.0
LR4-260F	RF1543-000	3.8	3.4	3.1	2.6	2.54	2.2	2.0	1.9	1.7	1.4	1.3
LR4-380F	RF1536-000	5.4	4.9	4.4	3.8	3.64	3.3	3.0	2.8	2.5	2.3	2.1
LR4-380XF	E89591-000	5.4	4.9	4.4	3.8	3.64	3.3	3.0	2.8	2.5	2.3	2.1
LR4-450F	RF1542-000	6.5	5.8	5.3	4.5	4.38	3.9	3.6	3.3	2.9	2.6	2.4
LR4-550F	RF1545-000	7.6	6.9	6.2	5.5	5.32	4.7	4.3	4.0	3.6	3.2	3.0
LR4-550A	RF5306-000	7.6	6.9	6.2	5.5	5.32	4.7	4.3	4	3.6	3.2	3
LR4-550ALL	RF5307-000	7.6	6.9	6.2	5.5	5.32	4.7	4.3	4	3.6	3.2	3
LR4-600F	RF1549-000	8.7	7.8	7.1	6.0	5.86	5.2	4.7	4.4	3.9	3.4	3.2
LR4-600XF	A77736-000	8.7	7.8	7.1	6.0	5.86	5.2	4.7	4.4	3.9	3.4	3.2
LR4-730F	RF1547-000	10.5	9.5	8.6	7.3	7.13	6.3	5.7	5.4	4.7	4.2	4.0
LR4-900F	RF2165-000	12.7	11.4	10.0	9.0	8.50	7.5	6.8	6.2	5.5	4.9	4.5
LR4-970F	RF2233-000	14	12.5	11.3	9.7	9.5	9	8.6	8.2	7	6.1	5.5
LR4-1300SSF	RF1550-000	17.9	16.2	14.5	13.0	12.40	11.1	10.3	9.5	8.6	7.7	7.2

* Product electrical characteristics determined at 25°C.

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)		
LR4-190F	RF1538-000	1.90	3.9	15	100	1.2	9.5	5.0	0.0390	0.0720	0.102	125 °C	0.056
LR4-260F	RF1543-000	2.60	5.8	15	100	2.5	13.0	5.0	0.0200	0.0420	0.063	125 °C	0.031
LR4-380F	RF1536-000	3.80	8.3	15	100	2.5	19.0	5.0	0.0130	0.0260	0.037	125 °C	0.020
LR4-380XF	E89591-000	3.80	8.3	15	100	2.5	19.0	5.0	0.0130	0.0260	0.037	125 °C	0.020
LR4-450F	RF1542-000	4.50	8.9	20	100	2.3	22.5	5.0	0.0110	0.0200	0.028	125 °C	0.016
LR4-550F	RF1545-000	5.50	10.5	20	100	2.8	27.5	5.0	0.0090	0.0160	0.022	125 °C	0.013
LR4-550A	RF5306-000	5.5	11.0	16	100	3.0	27.5	5.0	0.007	0.026	0.026	125˚C	0.017
LR4-550ALL	RF5307-000	5.5	11.0	16	100	3.0	27.5	5.0	0.007	0.018	0.026	125˚C	0.013
LR4-600F	RF1549-000	6.00	11.7	20	100	2.8	30.0	5.0	0.0070	0.0140	0.019	125 °C	0.011
LR4-600XF	A77736-000	6.00	11.7	20	100	2.8	30.0	5.0	0.0075	0.0140	0.019	125 °C	0.011
LR4-730F	RF1547-000	7.30	14.1	20	100	3.3	30.0	5.0	0.0060	0.0120	0.015	125 °C	0.009
LR4-900F	RF2165-000	9.00	16.7	20	100	3.8	45.0	5.0	0.0060	0.0100	0.014	125 °C	0.008
LR4-970F	RF2233-000	9.7	17.7	20	100	3.8	48.5	5.0	0.0065	0.0105	0.0145	125˚C	0.009
LR4-1300SSF	RF1550-000	13.00	21.2	20	100	4.5	50.0	10.0	0.0035	0.0065	0.009	125 °C	0.006

* 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_{MAX} - Maximum resistance of device as supplied at 20°C unless otherwise specified.

R_{1MAX} - Maximum resistance, measured at 20°C unless otherwise specified, of device one hour after being gripped the first time.

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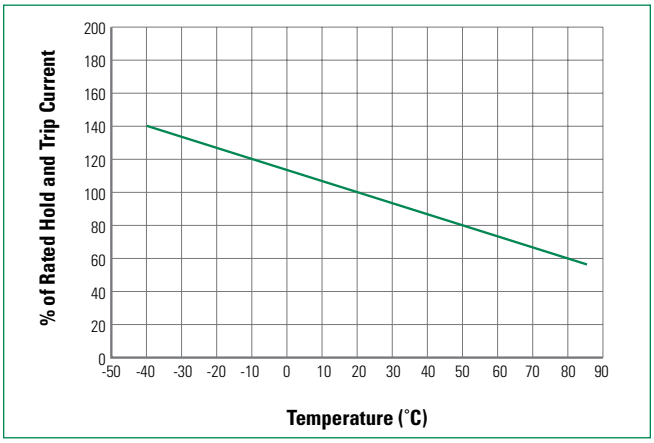
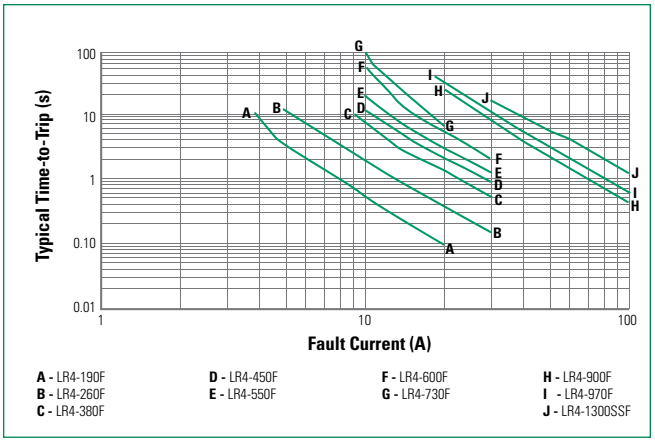
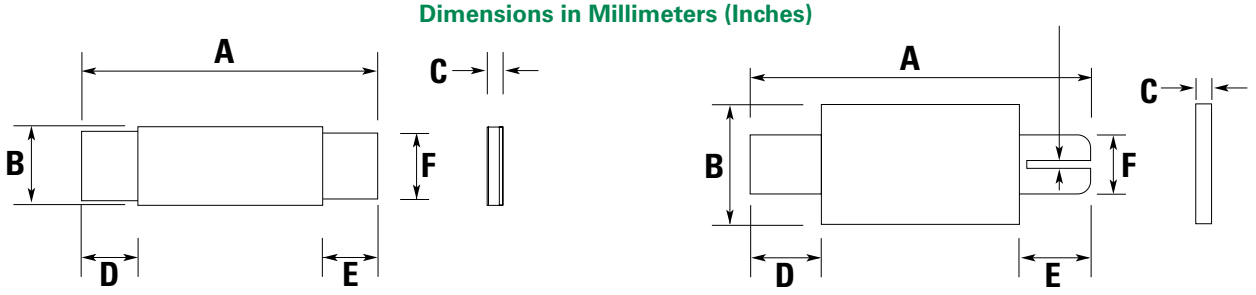
Thermal Derating Curve



Typical Time-to-Trip Curve at 20°C



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	
LR4-190F	RF1538-000	19.9 (0.796)	22.1 (0.884)	4.9 (0.196)	5.5 (0.220)	0.6 (0.024)	1.0 (0.040)	5.5 (0.220)	7.5 (0.300)	5.5 (0.220)	7.5 (0.300)	3.9 (0.156)	4.1 (0.164)	B1
LR4-260F	RF1543-000	20.9 (0.836)	23.1 (0.924)	4.9 (0.196)	5.5 (0.220)	0.6 (0.024)	1.0 (0.040)	4.1 (0.164)	5.5 (0.220)	4.1 (0.164)	5.5 (0.220)	3.9 (0.156)	4.1 (0.164)	B1
LR4-380F	RF1536-000	24.0 (0.960)	26.0 (1.040)	6.9 (0.276)	7.5 (0.300)	0.6 (0.024)	1.0 (0.040)	4.1 (0.164)	5.5 (0.220)	4.1 (0.164)	5.5 (0.220)	4.9 (0.196)	5.1 (0.204)	B1
LR4-380XF	E89591-000	32.2 (1.288)	35.8 (1.432)	4.9 (0.196)	5.5 (0.220)	0.6 (0.024)	1.0 (0.040)	5.5 (0.220)	7.5 (0.300)	5.5 (0.220)	7.5 (0.300)	3.9 (0.156)	4.1 (0.164)	B1
LR4-450F	RF1542-000	24.0 (0.960)	26 (1.040)	9.9 (0.396)	10.5 (0.420)	0.6 (0.024)	1.0 (0.040)	5.3 (0.212)	6.7 (0.268)	5.3 (0.212)	6.7 (0.268)	5.9 (0.236)	6.1 (0.244)	B1
LR4-550F	RF1545-000	35.0 (1.400)	37.0 (1.480)	6.9 (0.276)	7.5 (0.300)	0.6 (0.024)	1.0 (0.040)	5.3 (0.212)	6.7 (0.268)	5.3 (0.212)	6.7 (0.268)	4.9 (0.196)	5.1 (0.204)	B1
LR4-550A	RF5306-000	15.0 (0.591)	17.5 (0.689)	9.0 (0.354)	9.6 (0.378)	0.4 (0.016)	1.0 (0.039)	2.0 (0.079)	4.4 (0.173)	2.0 (0.079)	4.4 (0.173)	3.9 (0.154)	4.1 (0.161)	B1
LR4-550ALL	RF5307-000	35.0	37.0 (1.378)	4.9 (0.193)	5.5 (0.217)	0.4 (0.016)	1.0 (0.039)	5.0 (0.197)	7.0 (0.276)	5.0 (0.197)	7.0 (0.276)	3.9 (0.154)	4.1 (0.161)	B1
LR4-600F	RF1549-000	24.0 (0.960)	26.0 (1.040)	13.9 (0.556)	14.5 (0.580)	0.6 (0.024)	1.0 (0.040)	4.1 (0.164)	5.5 (0.220)	4.1 (0.164)	5.5 (0.220)	5.9 (0.236)	6.1 (0.244)	B1
LR4-600XF	A77736-000	40.5 (1.620)	42.7 (1.708)	6.9 (0.276)	7.5 (0.300)	0.6 (0.024)	1.0 (0.040)	5.2 (0.208)	6.8 (0.272)	5.2 (0.208)	6.8 (0.272)	4.9 (0.196)	5.1 (0.204)	B1
LR4-730F	RF1547-000	27.1 (1.084)	29.1 (1.164)	13.9 (0.556)	14.5 (0.580)	0.6 (0.024)	1.0 (0.040)	4.1 (0.164)	5.5 (0.220)	4.1 (0.164)	5.5 (0.220)	5.9 (0.236)	6.1 (0.244)	B1
LR4-900F	RF2165-000	45.4 (1.816)	47.6 (1.904)	7.9 (0.316)	8.5 (0.340)	0.9 (0.036)	1.3 (0.052)	4.6 (0.184)	6.2 (0.248)	4.6 (0.184)	6.2 (0.248)	5.9 (0.236)	6.1 (0.244)	B1
LR4-970F	RF2233-000	53.0 (2.087)	55.4 (2.181)	7.9 (0.311)	8.5 (0.335)	0.65 (0.026)	1.05 (0.041)	5.1 (0.201)	7.1 (0.280)	5.1 (0.201)	7.1 (0.280)	5.9 (0.232)	6.1 (0.240)	B1
LR4-1300SSF	RF1550-000	61.5 (2.460)	66.5 (2.660)	9.4 (0.376)	10.0 (0.400)	0.9 (0.036)	1.3 (0.052)	5.0 (0.200)	7.5 (0.300)	5.0 (0.200)	7.5 (0.300)	5.9 (0.236)	6.1 (0.244)	B2

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Physical Characteristics & Environmental Specifications

Physical Characteristics		
Lead Material	0.125mm Nominal Thickness, Quarter-hard Nickel	
Tape Material	Polyester	
Environmental Specifications		
Test	**Conditions**	**Resistance Change**
Passive Aging	70°C, 1000 hrs	±10% typ
Humidity Aging	85°C/85% RH, 7 Days	±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

LR4 190 F

Modifier
- T/N = Tin plating lead
- H = Hole Punched in Lead
- D = Short Leaded Strap
- F = Lead-free Version
- L = Long Lead or Leads
- S = Slit Lead
- SS = Both Leads Slit
- U = Untaped
- X = Rotated Chip

Hold Current Indicator

Product Series

Packaging and Marking Information/Agency Recognition

Part Description	Ordering Part Number	Bag Quantity	Standard Package Quantity	Part Marking	Agency Recognition
LR4-190F	RF1538-000	2,000	10,000	E19	UL, CSA, TÜV
LR4-260F	RF1543-000	1,000	10,000	E26	UL, CSA, TÜV
LR4-380F	RF1536-000	1,000	10,000	E38	UL, CSA, TÜV
LR4-380XF	E89591-000	1,000	10,000	E38	UL, CSA, TÜV
LR4-450F	RF1542-000	1,000	10,000	E45	UL, CSA, TÜV
LR4-550F	RF1545-000	1,000	10,000	E55	UL, CSA, TÜV
LR4-550A	RF5306-000	1,000	10,000	L55	UL, TÜV
LR4-550ALL	RF5307-000	1,000	10,000	L55	UL, TÜV
LR4-600F	RF1549-000	1,000	10,000	E60	UL, CSA, TÜV
LR4-600XF	A77736-000	1,000	10,000	E60	UL, CSA, TÜV
LR4-730F	RF1547-000	1,000	10,000	E73	UL, CSA, TÜV
LR4-900F	RF2165-000	500	10,000	E90	UL, CSA, TÜV
LR4-970F	RF2233-000	500	10,000	E97	UL, CSA, TÜV
LR4-1300SSF	RF1550-000	250	10,000	EX3	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.

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