

PolySwitch Resettable Devices Strap Battery Devices

Tyco Electronics, pioneer of polymeric PTC resettable devices, has developed several material platforms specifically tailored to help protect battery applications. Each of these material platforms offers different performance characteristics, allowing the engineer greater design flexibility. PolySwitch, Raychem Circuit Protection Products, for battery protection includes SRP, LTP, LR4, VTP, VLP, VLR and MXP series, disc, and special application strap devices.



Benefits

- Many material platforms and device form factors give engineers more design flexibility
- Compatible with high-volume electronics assembly
- Assists in meeting regulatory requirements
- Low resistance devices increase battery operating time

Features

- RoHS compliant
- Lead free versions of all devices are available
- Broad range of resettable devices available
- Current ratings from 0.7A to 13A
- Voltage ratings from 6V to 30V
- Agency recognition, UL, CSA, TÜV
- Fast time-to-trip
- Low resistance

Applications

- Mobile phone battery packs
- Cordless phone battery packs
- Mobile radio battery packs
- Computer battery packs
- Camcorder battery packs
- Portable music player battery packs
- Power tools (charge line)

Protection Application Selection Guide for Strap Battery Devices

The guide below lists PolySwitch devices which are typically used in these applications. The following pages contain the specifications for the part numbers recommended below. Once a device is selected, the user should evaluate and test each product for its intended application.

		PolySwitch Resettable Devices — Key Device Selection Criteria		
Protection Application	Additional Comments	Installation Method	Lowest Resistance	Lowest Thermal Cut-off
Mobile phone battery packs	Li-ion	Flexprint	miniSMDE190F	—
		Surface Mount	refer to Surface-mount section of this catalog	
		Prismatic	MXP190BB	VLR175F
Cordless phone battery packs	NiMH	Cylindrical	VLP210F SRP175F	VTP170F
Mobile radio battery packs	NiMH	Cylindrical	LR4-380F SRP350F	LTP340F
Computer battery packs	NiMH	Cylindrical	LR4-900F	—
	Li-ion	Cylindrical	LR4-1300SSF	—
		Prismatic	Consult local Rep	Consult local Rep
Camcorder battery packs	NiMH or Li-ion	Prismatic	VLP270F LR4-380F	VTP210GF —
PDA battery packs	Li-ion	Prismatic	VLP220F VTP175F	VLR175F —
Power tools (charge line)	NiCd, NiMH or Li-ion	Cylindrical	custom LR4	custom VTP

Table B1 Product Series - Current Rating, Voltage Rating / Typical Resistance for Strap Battery Devices

Hold Current (A)	VLR	VLP	VTP	LTP	MXP	SRP	LR4	miniSMDE
	Typical Activation Temperature							
	85°C	90°C	90°C	110°C	120°C	125°C	125°C	110°C
0.70	—	—	—	15V/0.150Ω	—	—	—	—
1.00	—	—	—	24V/0.100Ω	—	—	—	—
1.10	—	—	16V/0.054Ω	—	—	—	—	—
1.20	—	—	—	—	—	15V/0.123Ω	—	—
1.70	12V/0.025Ω	—	16V/0.041Ω	—	—	—	15V/0.061Ω	—
1.75	12V/0.024Ω	—	16V/0.040Ω	—	—	15V/0.070Ω	—	—
1.80	—	—	—	24V/0.054Ω	—	—	—	—
1.90	—	—	—	24V/0.044Ω	6V/0.010Ω	—	15V/0.056Ω	16V/0.032Ω
2.00	—	—	16V/0.031Ω	—	—	30V/0.045Ω	—	—
2.10	—	16V/0.024Ω	16V/0.024Ω	—	—	—	—	—
2.20	—	16V/0.023Ω	—	—	—	—	—	—
2.30	12V/0.015Ω	—	—	—	—	—	—	—
2.40	—	—	16V/0.020Ω	—	—	—	—	—
2.60	—	—	—	24V/0.034Ω	—	—	15V/0.031Ω	—
2.70	—	16V/0.015Ω	—	—	—	—	—	—
3.00	—	—	—	24V/0.023Ω	—	—	—	—
3.40	—	—	—	24V/0.022Ω	—	—	—	—
3.50	—	—	—	—	—	30V/0.024Ω	—	—
3.80	—	—	—	—	—	—	15V/0.020Ω	—
4.20	—	—	—	—	—	30V/0.018Ω	—	—
4.50	—	—	—	—	—	—	20V/0.016Ω	—
5.50	—	—	—	—	—	—	20V/0.013Ω	—
6.00	—	—	—	—	—	—	20V/0.011Ω	—
7.30	—	—	—	—	—	—	20V/0.009Ω	—
8.80	—	—	—	—	—	—	20V/0.085Ω	—
9.00	—	—	—	—	—	—	20V/0.008Ω	—
13.00	—	—	—	—	—	—	20V/0.006Ω	—

**Table B2 Thermal Derating for Strap Battery Devices
[Hold Current (A) at Ambient Temperature (°C)]**

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	
85°C Typical Activation												
VLR*												
VLR170F	3.5	2.9	2.4	1.84	1.70	1.2	1.0	0.7	0.3	—	—	
VLR170LF	3.5	2.9	2.4	1.84	1.70	1.2	1.0	0.7	0.3	—	—	
VLR170UF	3.5	2.9	2.4	1.84	1.70	1.2	1.0	0.7	0.3	—	—	
VLR175F	3.5	2.9	2.4	1.87	1.75	1.3	1.0	0.8	0.3	—	—	
VLR175LF	3.5	2.9	2.4	1.87	1.75	1.3	1.0	0.8	0.3	—	—	
VLR175UF	3.5	2.9	2.4	1.87	1.75	1.3	1.0	0.8	0.3	—	—	
VLR230F	5.0	4.2	3.4	2.52	2.30	1.7	1.3	0.9	0.4	—	—	
VLR230F-C36	5.0	4.2	3.4	2.52	2.30	1.7	1.3	0.9	0.4	—	—	
VLR230UF	5.0	4.2	3.4	2.52	2.30	1.7	1.3	0.9	0.4	—	—	
90°C Typical Activation												
VLP*												
VLP210F	4.3	3.6	2.9	2.31	2.10	1.6	1.3	1.0	0.6	0.3	0.1	
VLP220F	4.5	3.8	3.0	2.45	2.20	1.7	1.4	1.1	0.7	0.3	0.1	
VLP270F	5.6	4.7	4.0	3.05	2.70	2.2	1.7	1.4	0.9	0.4	0.1	
VTP*												
VTP110F	2.0	1.7	1.4	1.02	1.10	0.8	0.6	0.5	0.3	0.2	0.1	
VTP170F	3.2	2.7	2.2	1.80	1.70	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170SSF	3.2	2.7	2.2	1.80	1.70	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170XF	3.2	2.7	2.2	1.80	1.70	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170XSF	3.2	2.7	2.2	1.80	1.70	1.3	1.0	0.8	0.5	0.3	0.1	
VTP175F	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1	
VTP175LF	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1	
VTP175UF	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1	
VTP200GF	3.7	3.2	2.6	2.12	2.00	1.5	1.2	0.9	0.5	0.3	0.1	
VTP200UF	3.7	3.2	2.6	2.12	2.00	1.5	1.2	0.9	0.5	0.3	0.1	
VTP210GF	4.1	3.5	2.9	2.26	2.10	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SF	4.1	3.5	2.9	2.26	2.10	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SLF	4.1	3.5	2.9	2.26	2.10	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SSF	4.1	3.5	2.9	2.26	2.10	1.6	1.3	1.0	0.7	0.4	0.1	
VTP240F	4.4	3.7	3.1	2.54	2.40	1.8	1.5	1.2	0.9	0.5	0.1	
110°C Typical Activation												
LTP												
LTP070F	1.1	1.0	0.8	0.7	0.65	0.5	0.4	0.3	0.2	0.2	0.1	
LTP070SF	1.1	1.0	0.8	0.7	0.65	0.5	0.4	0.3	0.2	0.2	0.1	
LTP100F	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2	
LTP100SF	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2	
LTP100SLF	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2	
LTP100SSF	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2	
LTP180F	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3	
LTP180LF	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3	
LTP180SF	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3	
LTP190F	3.3	2.8	2.4	1.9	1.79	1.4	1.2	1.1	0.7	0.5	0.4	
LTP260F	4.3	3.7	3.1	2.6	2.42	1.9	1.6	1.4	1.1	0.8	0.6	
LTP300F	5.1	4.4	3.7	3.0	2.82	2.3	1.9	1.6	1.2	0.9	0.7	
LTP340F	5.5	4.7	4.0	3.4	3.17	2.6	2.2	1.9	1.5	1.1	0.9	
miniSMDE												
miniSMDE190F	3.16	2.74	2.2	1.9	1.74	1.48	1.27	1.10	0.80	0.50	0.35	
120°C Typical Activation												
MXP*												
MXP190BB	—	—	2.6	—	1.90	—	—	0.85	—	—	—	

* Product electrical characteristics determined at 25°C

Table B2 Thermal Derating for Strap Battery Devices
 [Hold Current (A) at Ambient Temperature (°C)] ... Cont'd

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
125°C Typical Activation											
LR4											
LR4-170UF	2.5	2.2	2.0	1.7	1.64	1.4	1.3	1.2	1.0	0.9	0.8
LR4-190F	2.8	2.5	2.3	1.9	1.86	1.6	1.5	1.4	1.2	1.1	1.0
LR4-190SF	2.8	2.5	2.3	1.9	1.86	1.6	1.5	1.4	1.2	1.1	1.0
LR4-260F	3.8	3.4	3.1	2.6	2.54	2.2	2.0	1.9	1.7	1.4	1.3
LR4-260SF	3.8	3.4	3.1	2.6	2.54	2.2	2.0	1.9	1.7	1.4	1.3
LR4-380F	5.4	4.9	4.4	3.8	3.64	3.3	3.0	2.8	2.5	2.3	2.1
LR4-380XF	5.4	4.9	4.4	3.8	3.64	3.3	3.0	2.8	2.5	2.3	2.1
LR4-450F	6.5	5.8	5.3	4.5	4.38	3.9	3.6	3.3	2.9	2.6	2.4
LR4-550F	7.6	6.9	6.2	5.5	5.32	4.7	4.3	4.0	3.6	3.2	3.0
LR4-600F	8.7	7.8	7.1	6.0	5.86	5.2	4.7	4.4	3.9	3.4	3.2
LR4-600XF	8.7	7.8	7.1	6.0	5.86	5.2	4.7	4.4	3.9	3.4	3.2
LR4-730F	10.5	9.5	8.6	7.3	7.13	6.3	5.7	5.4	4.7	4.2	4.0
LR4-880SSF	12.3	11.0	9.8	8.8	8.30	7.4	6.8	6.2	5.5	4.8	4.5
LR4-900F	12.7	11.4	10.0	9.0	8.50	7.5	6.8	6.2	5.5	4.9	4.5
LR4-1300SSF	17.9	16.2	14.5	13.0	12.40	11.1	10.3	9.5	8.6	7.7	7.2
SRP											
SRP120F	1.9	1.7	1.5	1.20	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120LF	1.9	1.7	1.5	1.20	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120SF	1.9	1.7	1.5	1.20	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP175F	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175LF	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175SF	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175SSF	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP200F	3.1	2.8	2.5	2.00	1.97	1.7	1.5	1.4	1.2	1.0	0.9
SRP350F	5.3	4.8	4.3	3.50	3.44	3.0	2.7	2.5	2.1	1.8	1.7
SRP420F	6.3	5.7	5.1	4.20	4.11	3.6	3.3	3.0	2.6	2.2	2.1

Figure B1 Thermal Derating Curve for Strap Battery Devices

- A = LR4
- B = SRP
- C = LTP
- D = VTP, VLP, MXP
- E = VLR

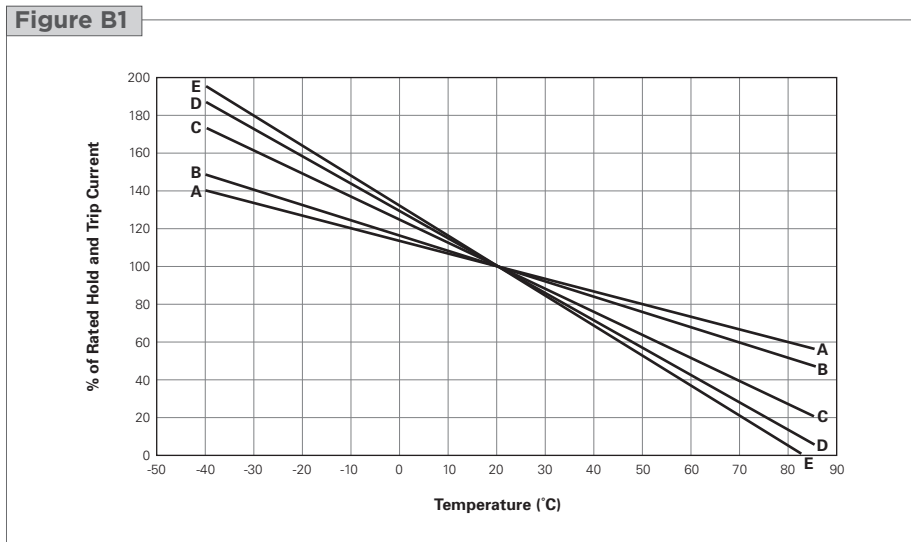


Table B3 Electrical Characteristics for Strap Battery Devices

Part Number	I_H (A)	I_T (A)	V_{Max} (V_{DC})	I_{Max} (A)	$P_{D\ TYP}$ (W)	Max. Time-to-trip (s)		R_{Min} (Ω)	R_{TYP} (Ω)	R_{Max} (Ω)	$R_{TrippedTYP}$ (Ω)	$R_{1\ Max}$ (Ω)	Figure for Dimensions
85°C Typical Activation													
VLR*													
VLR170F	1.70	4.1	12	100	1.4	8.50	5.0	0.018	0.025	0.032	0.050	0.064	B3
VLR170LF	1.70	4.1	12	100	1.4	8.50	5.0	0.018	0.025	0.032	0.050	0.064	B3
VLR170UF	1.70	4.1	12	100	1.4	8.50	5.0	0.018	0.025	0.032	0.050	0.064	B6
VLR175F	1.75	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B3
VLR175LF	1.75	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B3
VLR175UF	1.75	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B6
VLR230F	2.30	5.0	12	100	1.4	10.00	5.0	0.012	0.015	0.018	0.030	0.036	B3
VLR230F-C36	2.30	5.0	12	100	2.5	10.00	5.0	0.012	0.015	0.018	0.030	0.036	B10
VLR230UF	2.30	5.0	12	100	1.4	10.00	5.0	0.012	0.015	0.018	0.030	0.036	B6
90°C Typical Activation													
VLP*													
VLP210F	2.10	5.0	16	60	0.8	10.50	5.0	0.018	0.024	0.030	0.048	0.060	B2
VLP220F	2.20	5.3	16	60	0.8	11.00	5.0	0.017	0.023	0.029	0.046	0.058	B3
VLP270F	2.70	6.5	16	60	1.2	13.50	5.0	0.012	0.015	0.018	0.030	0.036	B3
VTP*													
VTP110F	1.10	2.7	16	100	0.7	5.50	5.0	0.038	0.054	0.070	0.108	0.140	B6
VTP170F	1.70	3.4	16	100	1.0	8.50	5.0	0.030	0.041	0.052	0.082	0.105	B2
VTP170SSF	1.70	3.4	16	100	1.0	8.50	5.0	0.030	0.041	0.052	0.082	0.105	B9
VTP170XF	1.70	3.4	16	100	0.7	8.50	5.0	0.030	0.041	0.052	0.082	0.105	B3
VTP170XSF	1.70	3.4	16	100	0.7	8.50	5.0	0.030	0.041	0.052	0.082	0.105	B4
VTP175F	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B3
VTP175LF	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B3
VTP175UF	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B6
VTP200GF	2.00	4.7	16	100	0.9	10.00	5.0	0.022	0.031	0.039	0.062	0.078	B3
VTP200UF	2.00	4.7	16	100	0.9	10.00	5.0	0.022	0.031	0.039	0.062	0.078	B6
VTP210GF	2.10	4.7	16	100	1.2	10.00	5.0	0.018	0.024	0.030	0.048	0.060	B3
VTP210SF	2.10	4.7	16	100	1.2	10.00	5.0	0.018	0.024	0.030	0.048	0.060	B4
VTP210SLF	2.10	4.7	16	100	1.2	10.00	5.0	0.018	0.024	0.030	0.048	0.060	B4
VTP210SSF	2.10	4.7	16	100	1.2	10.00	5.0	0.018	0.024	0.030	0.048	0.060	B5
VTP240F	2.40	5.9	16	100	1.2	12.00	5.0	0.014	0.020	0.026	0.040	0.052	B3
110°C Typical Activation													
LTP													
LTP070F	0.70	1.45	15	100	0.7	3.50	5.0	0.100	0.150	0.200	0.300	0.340	B7
LTP070SF	0.70	1.45	15	100	0.7	3.50	5.0	0.100	0.150	0.200	0.300	0.340	B8
LTP100F	1.00	2.50	24	100	0.9	5.00	7.0	0.070	0.100	0.130	0.200	0.260	B7
LTP100SF	1.00	2.50	24	100	0.9	5.00	7.0	0.070	0.100	0.130	0.200	0.260	B8
LTP100SLF	1.00	2.50	24	100	0.9	5.00	7.0	0.070	0.100	0.130	0.200	0.260	B8
LTP100SSF	1.00	2.50	24	100	0.9	5.00	7.0	0.070	0.100	0.130	0.200	0.260	B9
LTP180F	1.80	3.80	24	100	1.0	9.00	2.9	0.040	0.054	0.068	0.108	0.120	B7
LTP180LF	1.80	3.80	24	100	1.0	9.00	2.9	0.040	0.054	0.068	0.108	0.120	B7
LTP180SF	1.80	3.80	24	100	1.0	9.00	2.9	0.040	0.054	0.068	0.108	0.120	B8
LTP190F	1.90	4.20	24	100	1.5	10.00	3.0	0.030	0.044	0.057	0.088	0.100	B7
LTP260F	2.60	5.20	24	100	1.3	13.00	5.0	0.025	0.034	0.042	0.068	0.076	B7
LTP300F	3.00	6.30	24	100	1.7	15.00	4.0	0.015	0.023	0.031	0.046	0.055	B7
LTP340F	3.40	6.80	24	100	1.6	17.00	5.0	0.016	0.022	0.027	0.044	0.050	B7
miniSMDE													
miniSMDE190F	1.90	3.8	16	100	1.5	10.00	2.0	0.024	0.032	0.040	0.060	0.080†	B15
120°C Typical Activation													
MXP*													
MXP190BB	1.90	4.9	6	50	0.4	9.50	2.0	0.009	0.010	0.014	0.015	0.024	B16

* Product electrical characteristics determined at 25°C

 † $R_{1\ max}$ value for this device is the maximum resistance of the device at 20°C one hour after reflow.

Table B3 Electrical Characteristics for Strap Battery Devices

... Cont'd

Part Number	I_H (A)	I_T (A)	V_{Max} (V _{DC})	I_{Max} (A)	P_{DTYP} (W)	Max. Time-to-trip		R_{Min} (Ω)	R_{TYP} (Ω)	R_{Max} (Ω)	$R_{TrippedTYP}$ (Ω)	R_{1Max} (Ω)	Figure for Dimensions
						(A)	(s)						
125°C Typical Activation													
LR4													
LR4-170UF	1.70	3.4	15	100	0.8	8.50	5.0	0.0440	0.0610	0.0780	0.089	0.1140	B12
LR4-190F	1.90	3.9	15	100	0.8	9.50	5.0	0.0390	0.0560	0.0720	0.079	0.1020	B10
LR4-190SF	1.90	3.9	15	100	0.8	9.50	5.0	0.0390	0.0560	0.0720	0.079	0.1020	B11
LR4-260F	2.60	5.8	15	100	1.0	13.00	5.0	0.0200	0.0310	0.0420	0.046	0.0630	B10
LR4-260SF	2.60	5.8	15	100	1.0	13.00	5.0	0.0200	0.0310	0.0420	0.046	0.0630	B11
LR4-380F	3.80	8.3	15	100	1.2	19.00	5.0	0.0130	0.0200	0.0260	0.028	0.0370	B10
LR4-380XF	3.80	8.3	15	100	1.2	19.00	5.0	0.0130	0.0200	0.0260	0.028	0.0370	B10
LR4-450F	4.50	8.9	20	100	1.4	22.50	5.0	0.0110	0.0160	0.0200	0.022	0.0280	B10
LR4-550F	5.50	10.5	20	100	2.0	27.50	5.0	0.0090	0.0130	0.0160	0.018	0.0220	B10
LR4-600F	6.00	11.7	20	100	1.7	30.00	5.0	0.0070	0.0110	0.0140	0.015	0.0190	B10
LR4-600XF	6.00	11.7	20	100	1.7	30.00	5.0	0.0075	0.0120	0.0140	0.015	0.0190	B10
LR4-730F	7.30	14.1	20	100	1.9	30.00	5.0	0.0060	0.0090	0.0120	0.011	0.0150	B10
LR4-880SSF	8.80	16.0	20	100	2.0	44.00	5.0	0.0065	0.0085	0.0105	0.012	0.0145	B14
LR4-900F	9.00	16.7	20	100	3.0	45.00	5.0	0.0060	0.0080	0.0100	0.011	0.0140	B10
LR4-1300SSF	13.00	21.2	20	100	2.2	65.00	5.0	0.0035	0.0060	0.0065	0.008	0.0090	B14

SRP													
SRP120F	1.20	2.7	15	100	0.8	6.00	5.0	0.085	0.123	0.160	0.170	0.220	B7
SRP120LF	1.20	2.7	15	100	0.8	6.00	5.0	0.085	0.123	0.160	0.170	0.220	B7
SRP120SF	1.20	2.7	15	100	0.8	6.00	5.0	0.085	0.123	0.160	0.170	0.220	B13
SRP175F	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B7
SRP175LF	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B7
SRP175SF	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B13
SRP175SSF	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B14
SRP200F	2.00	4.4	30	100	1.6	10.00	4.0	0.030	0.045	0.060	0.075	0.100	B7
SRP350F	3.50	6.3	30	100	1.9	20.00	3.0	0.017	0.024	0.031	0.040	0.050	B7
SRP420F	4.20	7.6	30	100	2.2	20.00	6.0	0.012	0.018	0.024	0.030	0.040	B7

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_{TYP} : Typical resistance of device as supplied at 20°C unless otherwise specified.
- $R_{TrippedTYP}$: Typical resistance, measured at 20°C unless otherwise specified, of device one hour after being tripped the first time.
- R_{Max} : Maximum resistance of device as supplied at 20°C unless otherwise specified.

Figure B2-B16 Dimension Figures for Strap Battery Devices

Figure B2

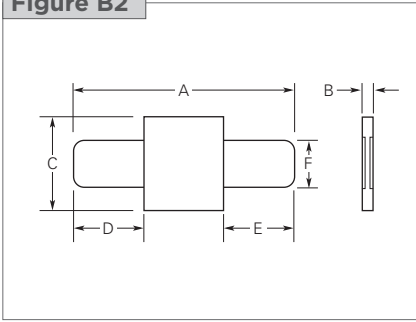


Figure B3

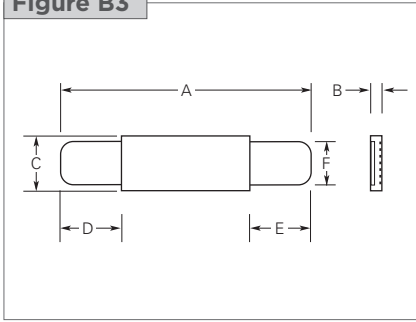


Figure B4

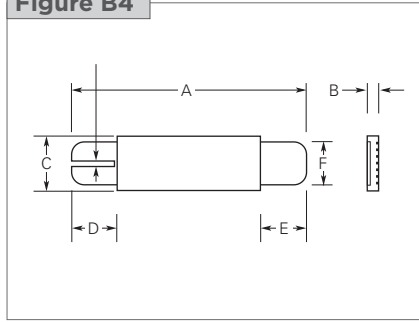


Figure B5

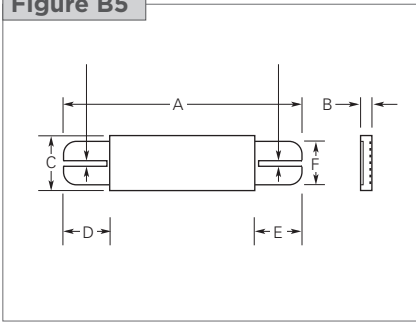


Figure B6

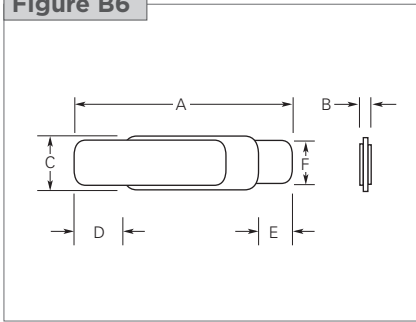


Figure B7

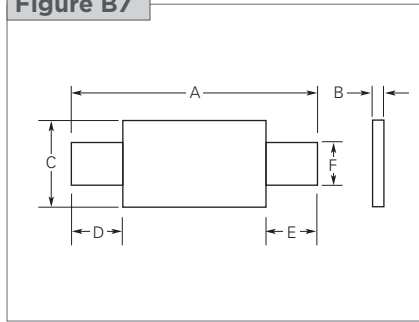


Figure B8

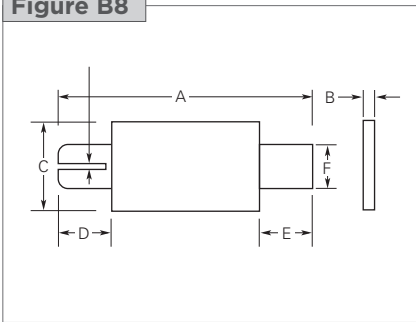


Figure B9

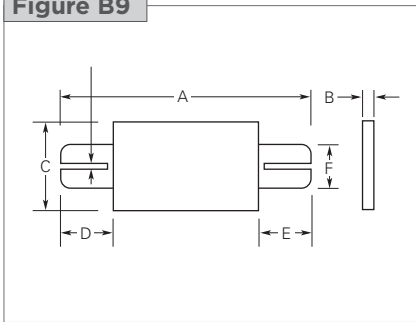


Figure B10

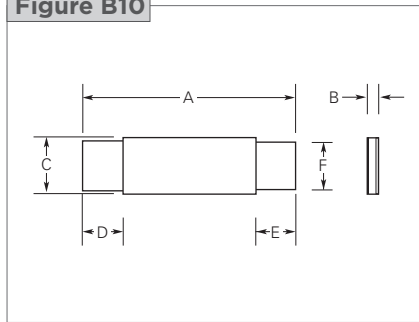


Figure B11

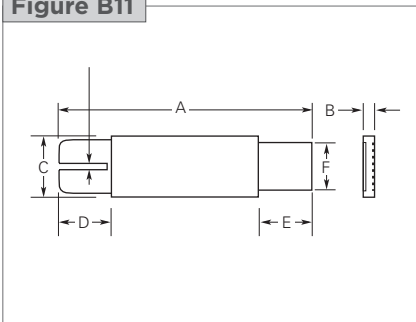


Figure B12

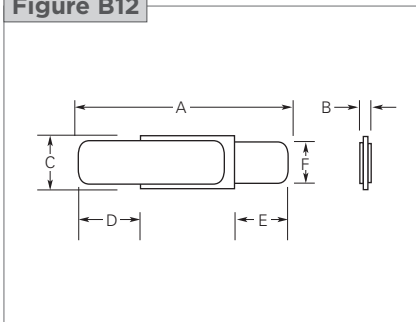


Figure B13

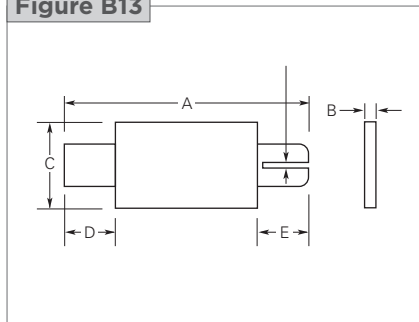


Figure B14

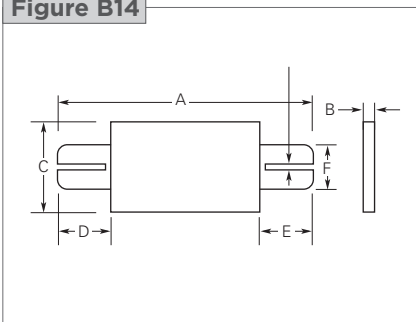


Figure B15

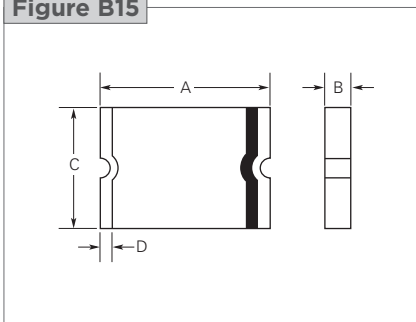


Figure B16

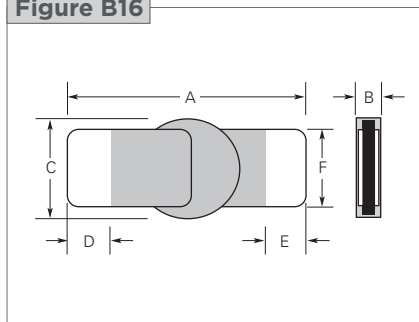


Table B4 Dimensions for Strap Battery Devices in Millimeters (Inches)

Part Number	A		B		C		D		E		F		Figure
	min	max	min	max	min	max	min	max	min	max	min	max	
85°C Typical Activation													
VLR													
VLR170F	20.8 (0.82)	23.2 (0.91)	—	0.8 (0.03)	3.5 (0.14)	3.9 (0.15)	4.5 (0.18)	6.5 (0.26)	4.5 (0.18)	6.5 (0.26)	2.4 (0.09)	2.6 (0.10)	B3 —
VLR170LF	38.8 (1.53)	41.2 (1.62)	—	0.8 (0.03)	3.5 (0.14)	3.9 (0.15)	8.7 (0.34)	10.3 (0.41)	18.7 (0.74)	20.3 (0.80)	2.4 (0.09)	2.6 (0.10)	B3 —
VLR170UF	20.8 (0.81)	23.2 (0.91)	—	0.07 (0.03)	3.5 (0.14)	3.7 (0.15)	5.3 (0.21)	6.7 (0.26)	5.3 (0.21)	6.7 (0.26)	2.4 (0.09)	2.6 (0.10)	B6 —
VLR175F	23.0 (0.91)	24.5 (0.96)	0.5 (0.02)	0.8 (0.03)	2.9 (0.11)	3.3 (0.13)	4.7 (0.19)	7.2 (0.28)	3.8 (0.15)	5.4 (0.21)	2.4 (0.09)	2.6 (0.10)	B3 —
VLR175LF	29.3 (1.15)	31.7 (1.25)	—	0.8 (0.03)	2.9 (0.11)	3.3 (0.13)	5.2 (0.21)	6.8 (0.27)	10 (0.39)	12.5 (0.49)	2.4 (0.09)	2.6 (0.10)	B3 —
VLR175UF	23.0 (0.91)	24.5 (0.96)	—	0.7 (0.03)	2.9 (0.11)	3.1 (0.12)	5.2 (0.20)	7.5 (0.30)	4.3 (0.17)	5.7 (0.22)	2.4 (0.09)	2.6 (0.10)	B6 —
VLR230F	20.9 (0.82)	23.1 (0.91)	—	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	4.1 (0.16)	5.8 (0.23)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B3 —
VLR230F-C36	25.3 (0.10)	27.7 (1.09)	—	0.8 (0.03)	3.5 (0.14)	3.9 (0.15)	3.5 (0.14)	5.7 (0.22)	3.5 (0.14)	5.7 (0.22)	2.9 (0.11)	3.1 (0.12)	B10 —
VLR230UF	20.9 (0.82)	23.1 (0.91)	—	0.7 (0.03)	4.9 (0.19)	5.1 (0.20)	4.1 (0.16)	6.0 (0.24)	4.1 (0.16)	6.0 (0.24)	3.9 (0.15)	4.1 (0.16)	B6 —
90°C Typical Activation													
VLP													
VLP210F	15.4 (0.61)	17.5 (0.69)	0.6 (0.02)	0.8 (0.03)	6.9 (0.27)	7.3 (0.29)	4.0 (0.16)	6.2 (0.24)	4.0 (0.16)	6.2 (0.24)	3.9 (0.15)	4.1 (0.16)	B2 —
VLP220F	21.1 (0.83)	23.3 (0.92)	0.6 (0.02)	0.8 (0.03)	3.5 (0.13)	3.9 (0.15)	5.1 (0.20)	6.8 (0.27)	5.1 (0.20)	6.8 (0.27)	2.9 (0.11)	3.1 (0.12)	B3 —
VLP270F	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	4.1 (0.16)	5.8 (0.23)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B3 —
VTP													
VTP110F	23.6 (0.93)	25.6 (1.01)	—	0.7 (0.03)	2.7 (0.11)	2.9 (0.11)	7.0 (0.28)	8.0 (0.32)	7.0 (0.28)	8.0 (0.32)	2.3 (0.09)	2.5 (0.10)	B6 —
VTP170F	15.4 (0.606)	17.5 (0.689)	0.5 (0.02)	0.8 (0.03)	7.0 (0.275)	7.4 (0.292)	4.0 (0.157)	6.2 (0.244)	4.0 (0.157)	6.2 (0.244)	3.9 (0.15)	4.1 (0.16)	B2 —
VTP170SSF	15.4 (0.606)	17.5 (0.689)	0.5 (0.02)	0.8 (0.03)	7.0 (0.275)	7.4 (0.292)	4.0 (0.157)	6.2 (0.244)	4.0 (0.157)	6.2 (0.244)	3.9 (0.154)	4.1 (0.161)	B9 —
VTP170XF	20.9 (0.82)	22.9 (0.90)	0.5 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	6.0 (0.23)	8.6 (0.34)	6.0 (0.23)	8.6 (0.34)	3.9 (0.15)	4.1 (0.16)	B3 —
VTP170XSF	20.9 (0.82)	22.9 (0.90)	0.5 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	6.0 (0.23)	8.6 (0.34)	6.0 (0.23)	8.6 (0.34)	3.9 (0.15)	4.1 (0.16)	B4 —
VTP175F	21.2 (0.83)	23.2 (0.91)	—	0.8 (0.03)	3.5 (0.14)	3.9 (0.15)	4.6 (0.18)	6.6 (0.26)	4.6 (0.18)	6.6 (0.26)	2.9 (0.11)	3.1 (0.12)	B3 —
VTP175LF	25.8 (1.02)	28.2 (1.11)	—	0.8 (0.03)	3.5 (0.13)	3.9 (0.15)	5.7 (0.22)	7.3 (0.29)	8.7 (0.34)	10.3 (0.41)	2.4 (0.09)	2.6 (0.10)	B3 —
VTP175UF	21.2 (0.83)	23.2 (0.91)	—	0.7 (0.03)	3.5 (0.13)	3.7 (0.15)	5.6 (0.22)	6.8 (0.27)	5.6 (0.22)	6.8 (0.27)	2.9 (0.11)	3.1 (0.12)	B6 —
VTP200GF	20.9 (0.82)	23.1 (0.91)	—	0.8 (0.03)	4.1 (0.16)	4.5 (0.18)	3.0 (0.11)	4.8 (0.19)	3.0 (0.11)	4.8 (0.19)	2.9 (0.11)	3.1 (0.12)	B3 —
VTP200UF	20.9 (0.82)	23.1 (0.91)	—	0.7 (0.03)	4.1 (0.16)	4.3 (0.17)	4.0 (0.16)	5.4 (0.21)	4.0 (0.16)	5.4 (0.21)	2.9 (0.11)	3.1 (0.12)	B6 —
VTP210GF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	4.1 (0.16)	5.8 (0.23)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B3 —
VTP210SF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	4.1 (0.16)	5.8 (0.23)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B4 —
VTP210SLF	29.0 (1.14)	32.0 (1.26)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	12.5 (0.49)	14.5 (0.57)	3.5 (0.13)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B4 —
VTP210SSF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	4.1 (0.16)	5.8 (0.23)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B5 —
VTP240F	23.8 (0.93)	26.2 (1.03)	—	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	3.5 (0.13)	5.7 (0.23)	3.5 (0.13)	5.7 (0.23)	3.9 (0.15)	4.1 (0.16)	B3 —

Table B4 Dimensions for Strap Battery Devices in Millimeters (Inches)

... Cont'd

Part Number	A		B		C		D		E		F		Figure
	min	max	min	max	min	max	min	max	min	max	min	max	
110°C Typical Activation													
LTP													
LTP070F	19.9 (0.783)	22.1 (0.870)	0.7 (0.027)	1.2 (0.048)	4.9 (0.192)	5.2 (0.205)	5.5 (0.216)	7.5 (0.296)	5.5 (0.216)	7.5 (0.296)	3.9 (0.153)	4.1 (0.162)	B7 —
LTP070SF	19.9 (0.783)	22.1 (0.870)	0.7 (0.027)	1.2 (0.048)	4.9 (0.192)	5.2 (0.205)	5.5 (0.216)	7.5 (0.296)	5.5 (0.216)	7.5 (0.296)	3.9 (0.153)	4.1 (0.162)	B8 —
LTP100F	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B7 —
LTP100SF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B8 —
LTP100SLF	29.0 (1.14)	32.0 (1.26)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	3.5 (0.13)	5.5 (0.22)	12.5 (0.49)	14.5 (0.57)	3.9 (0.15)	4.1 (0.16)	B8 —
LTP100SSF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B9 —
LTP180F	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B7 —
LTP180LF	35.5 (1.40)	37.5 (1.48)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	9.7 (0.38)	11.0 (0.44)	9.7 (0.38)	11.0 (0.44)	3.9 (0.15)	4.1 (0.16)	B7 —
LTP180SF	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B8 —
LTP190F	21.3 (0.84)	23.4 (0.92)	0.5 (0.02)	1.1 (0.04)	10.2 (0.40)	11.0 (0.43)	5.0 (0.20)	7.6 (0.30)	5.0 (0.20)	7.6 (0.30)	4.8 (0.19)	5.4 (0.21)	B7 —
LTP260F	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	10.8 (0.43)	11.9 (0.47)	5.0 (0.20)	7.0 (0.28)	5.0 (0.20)	7.0 (0.28)	5.9 (0.23)	6.1 (0.24)	B7 —
LTP300F	28.4 (1.12)	31.8 (1.25)	0.5 (0.02)	1.1 (0.04)	13 (0.51)	13.5 (0.53)	6.3 (0.25)	8.9 (0.35)	6.3 (0.25)	8.9 (0.35)	6.0 (0.24)	6.6 (0.26)	B7 —
LTP340F	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	14.8 (0.58)	15.9 (0.63)	4.0 (0.16)	5.0 (0.20)	4.0 (0.16)	5.0 (0.20)	5.9 (0.23)	6.1 (0.24)	B7 —
miniSMDE													
miniSMDE190F	11.15 (0.439)	11.51 (0.453)	0.33 (0.013)	0.53 (0.021)	4.83 (0.19)	5.33 (0.21)	0.51 (0.02)	1.02 (0.04)	—	—	—	—	B15 —
120°C Typical Activation													
MPX													
MPX190BB	9.2 (0.36)	10.8 (0.43)	0.7 (0.03)	1.1 (0.04)	2.96 (0.01)	3.26 (0.13)	1.6 (0.06)	3.1 (0.12)	1.6 (0.06)	3.1 (0.12)	2.2 (0.09)	2.4 (0.09)	B16
125°C Typical Activation													
LR4													
LR4-170UF	19.0 (0.75)	21.0 (0.83)	0.5 (0.02)	0.7 (0.03)	3.8 (0.15)	4.1 (0.16)	5.3 (0.21)	6.5 (0.26)	5.3 (0.21)	6.5 (0.26)	2.9 (0.11)	3.1 (0.12)	B12 —
LR4-190F	19.9 (0.78)	22.1 (0.87)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.5 (0.22)	5.5 (0.22)	7.5 (0.30)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B10 —
LR4-190SF	19.9 (0.78)	22.1 (0.87)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.5 (0.22)	5.5 (0.22)	7.5 (0.30)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B11 —
LR4-260F	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B10 —
LR4-260SF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B11 —
LR4-380F	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	6.9 (0.27)	7.5 (0.30)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	4.9 (0.19)	5.1 (0.20)	B10 —
LR4-380XF	32.2 (1.27)	35.8 (1.41)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.5 (0.22)	5.5 (0.22)	7.5 (0.30)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B10 —
LR4-450F	24.0 (0.94)	26 (1.02)	0.6 (0.02)	1.0 (0.04)	9.9 (0.41)	10.5 (0.39)	5.3 (0.21)	6.7 (0.26)	5.3 (0.21)	6.7 (0.26)	5.9 (0.23)	6.1 (0.24)	B10 —
LR4-550F	35.0 (1.38)	37.0 (1.46)	0.6 (0.02)	1.0 (0.04)	6.9 (0.27)	7.5 (0.30)	5.3 (0.21)	6.7 (0.26)	5.3 (0.21)	6.7 (0.26)	4.9 (0.19)	5.1 (0.20)	B10 —
LR4-600F	24.0 (0.95)	26.0 (1.02)	0.6 (0.02)	1.0 (0.04)	13.9 (0.55)	14.5 (0.57)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	5.9 (0.23)	6.1 (0.24)	B10 —
LR4-600XF	40.5 (1.59)	42.7 (1.68)	0.6 (0.02)	1.0 (0.04)	6.9 (0.27)	7.5 (0.30)	5.2 (0.20)	6.8 (0.27)	5.2 (0.20)	6.8 (0.27)	4.9 (0.19)	5.1 (0.20)	B10 —

Table B4 Dimensions for Strap Battery Devices in Millimeters (Inches)

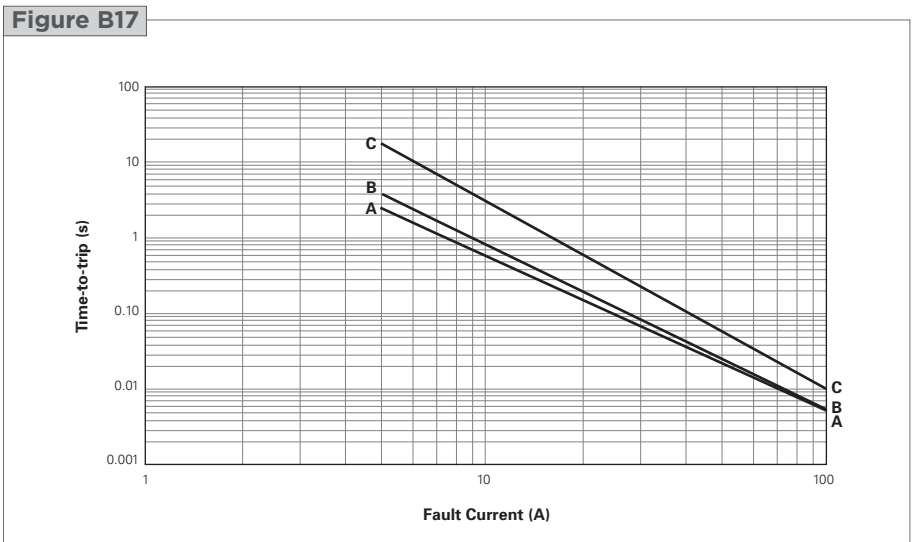
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Part Number	A		B		C		D		E		F		Figure
	min	max	min	max	min	max	min	max	min	max	min	max	
125°C Typical Activation													
LR4													
LR4-730F	27.1 (1.06)	29.1 (1.15)	0.6 (0.02)	1.0 (0.04)	13.9 (0.54)	14.5 (0.57)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	5.9 (0.23)	6.1 (0.24)	B10 —
LR4-880SF	62.8 (2.47)	65.2 (2.57)	0.6 (0.02)	1.0 (0.04)	7.9 (0.31)	8.5 (0.33)	10.0 (0.39)	12.0 (0.47)	10.0 (0.39)	12.0 (0.47)	5.9 (0.23)	6.1 (0.24)	B14 —
LR4-900F	45.4 (1.79)	47.6 (1.87)	0.9 (0.04)	1.3 (0.05)	7.9 (0.31)	8.5 (0.33)	4.6 (0.18)	6.2 (0.24)	4.6 (0.18)	6.2 (0.24)	5.9 (0.23)	6.1 (0.24)	B10 —
LR4-1300SSF	61.5 (0.42)	66.5 (2.62)	0.9 (0.04)	1.3 (0.05)	9.4 (0.37)	10.0 (0.39)	5.0 (0.20)	7.5 (0.30)	5.0 (0.20)	7.5 (0.30)	5.9 (0.23)	6.1 (0.24)	B14 —
SRP													
SRP120F	19.9 (0.78)	22.1 (0.87)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	5.5 (0.22)	7.5 (0.30)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B7 —
SRP120LF	24.9 (0.98)	27.1 (1.07)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	5.5 (0.22)	7.5 (0.30)	10.5 (0.41)	12.5 (0.49)	3.9 (0.15)	4.1 (0.16)	B7 —
SRP120SF	19.9 (0.78)	22.1 (0.87)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	5.5 (0.22)	7.5 (0.30)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B13 —
SRP175F	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B7 —
SRP175LF	29.9 (1.18)	32.1 (1.26)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	10.5 (0.41)	12.5 (0.49)	5.5 (0.22)	7.5 (0.30)	3.9 (0.15)	4.1 (0.16)	B7 —
SRP175SF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B13 —
SRP175SSF	20.9 (0.82)	23.1 (0.91)	0.6 (0.02)	1.0 (0.04)	4.9 (0.19)	5.2 (0.20)	4.1 (0.16)	5.5 (0.22)	4.1 (0.16)	5.5 (0.22)	3.9 (0.15)	4.1 (0.16)	B14 —
SRP200F	21.3 (0.84)	23.4 (0.92)	0.5 (0.02)	1.1 (0.04)	10.2 (0.40)	11.0 (0.43)	5.0 (0.20)	7.6 (0.30)	5.0 (0.20)	7.6 (0.30)	4.8 (0.19)	5.4 (0.21)	B7 —
SRP350F	28.4 (1.12)	31.8 (1.25)	0.5 (0.02)	1.1 (0.04)	13.0 (0.53)	13.5 (0.51)	6.3 (0.25)	8.9 (0.35)	6.3 (0.25)	8.9 (0.35)	6.0 (0.24)	6.6 (0.26)	B7 —
SRP420F	30.6 (1.20)	32.4 (1.28)	0.5 (0.02)	1.1 (0.04)	12.9 (0.51)	13.6 (0.54)	5.0 (0.20)	7.5 (0.30)	5.0 (0.20)	7.5 (0.30)	6.0 (0.24)	6.7 (0.26)	B7 —

Figure B17-B24 Typical Time-to-trip Curves at 20°C for Strap Battery Devices

VLR (data at 25°C)

- A = VLR170F
- B = VLR175F
- C = VLR230F



14

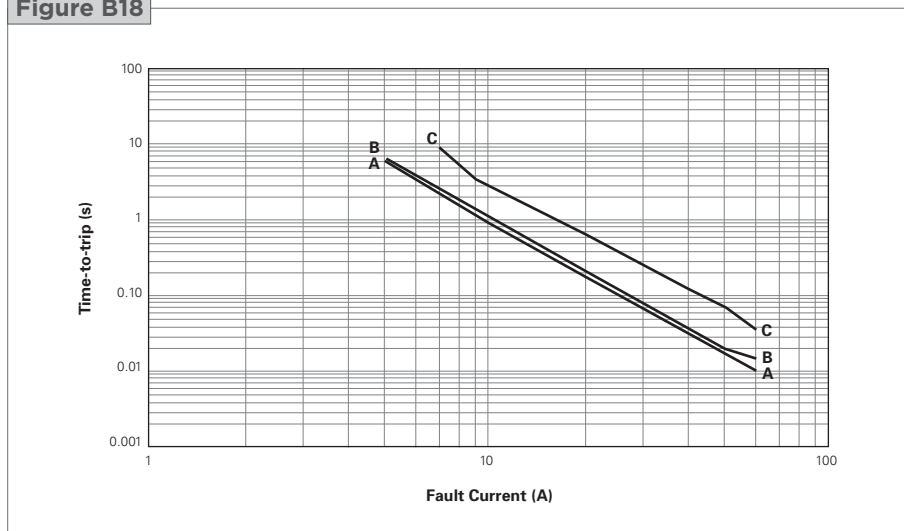
Figure B17-B24 Typical Time-to-trip Curves at 20°C for Strap Battery Devices

... Cont'd

VLP (data at 25°C)

- A = VLP210F
- B = VLP220F
- C = VLP270F

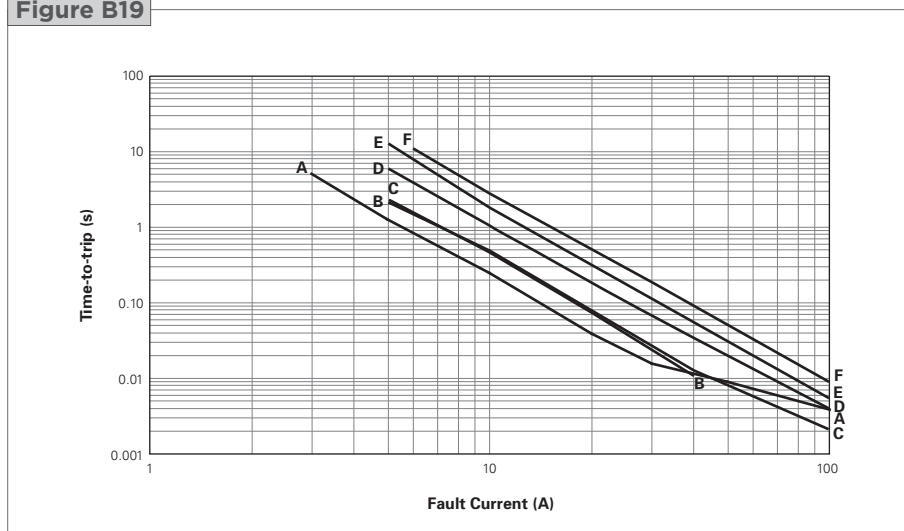
Figure B18



VTP (data at 25°C)

- A = VTP110F
- B = VTP170F
- C = VTP175F
- D = VTP200F
- E = VTP210GF
- F = VTP240F

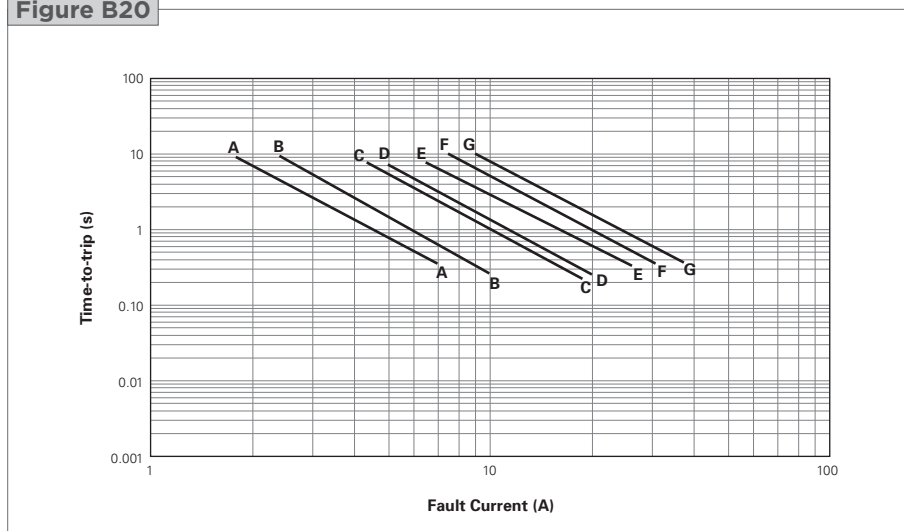
Figure B19



LTP

- A = LTP070F
- B = LTP100F
- C = LTP180F
- D = LTP190F
- E = LTP260F
- F = LTP300F
- G = LTP340F

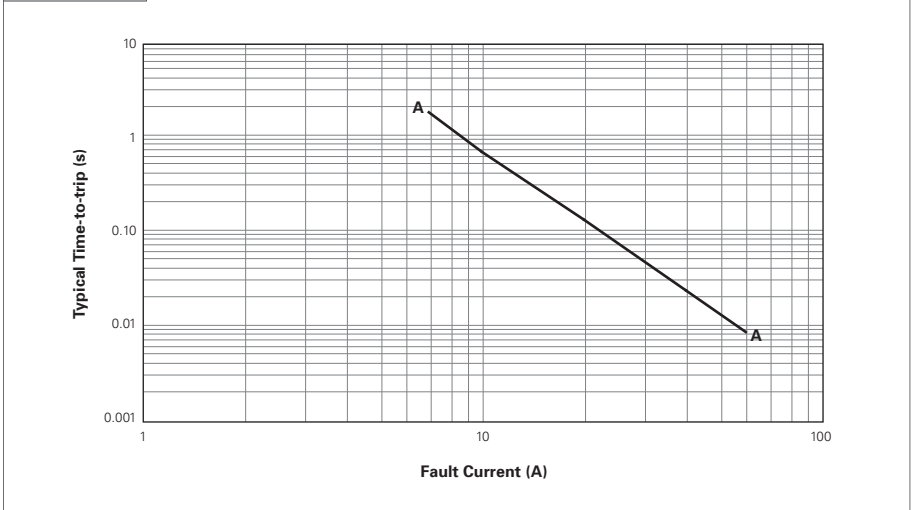
Figure B20



MXP (data at 25°C)

A = MXP190BB

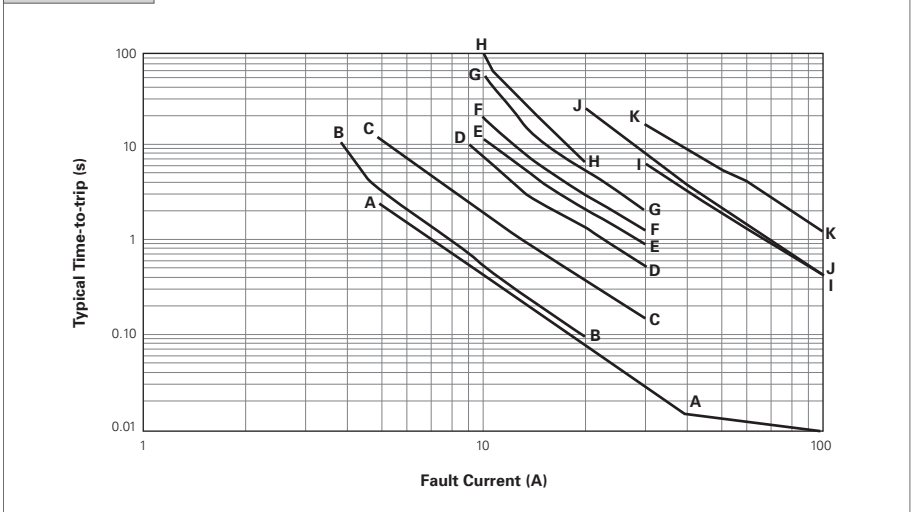
Figure B21



LR4

- A = LR4-170UF
- B = LR4-190F
- C = LR4-260F
- D = LR4-380F
- E = LR4-450F
- F = LR4-550F
- G = LR4-600F
- H = LR4-730F
- I = LR4-880F
- J = LR4-900F
- K = LR4-1300F

Figure B22



SRP

- A = SRP120F
- B = SRP175F
- C = SRP200F
- D = SRP350F
- E = SRP420F

Figure B23

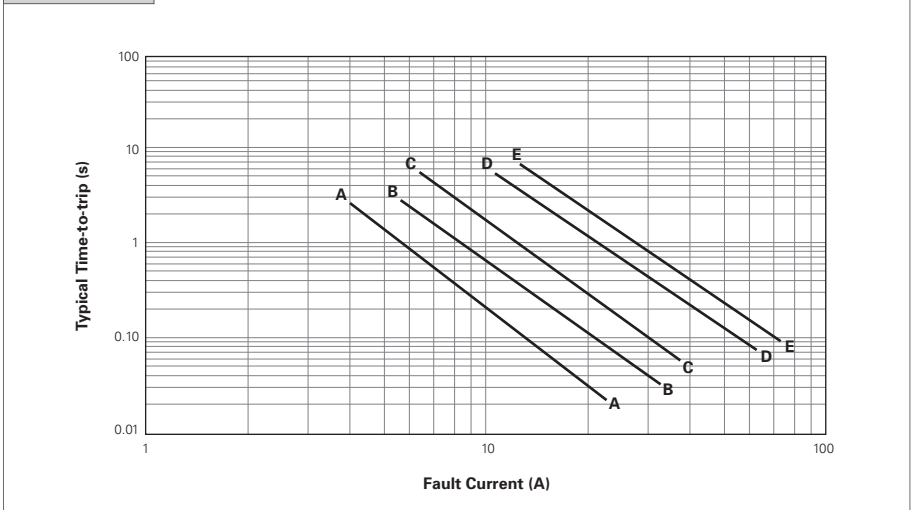


Figure B17-B24 Typical Time-to-trip Curves at 20°C for Strap Battery Devices

... Cont'd

miniSMDE

A = miniSMDE190F

Figure B24

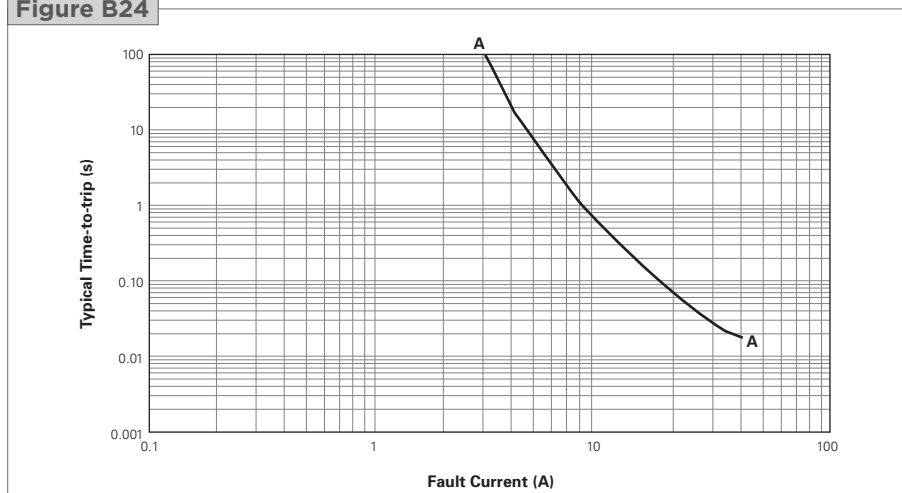


Table B5 Physical Characteristics and Environmental Specifications for Strap Battery Devices

VLR

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 hours	±5%
	60°C, 1000 hours	±20%
Humidity aging	60°C/95% RH, 1000 hours	±30%
Thermal shock	85°C, -40°C (10 times)	±5%
Vibration	MIL-STD-883D, Method 2026	No change

VLP and VTP

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 hours	±5%
	60°C, 1000 hours	±10%
Humidity aging	60°C/95% RH, 1000 hours	±10%
Thermal shock	85°C, -40°C (10 times)	±5%
Vibration	MIL-STD-883D, Method 2026	No change

LTP

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 hours	±10%
Humidity aging	85°C/85% RH, 7 days	±15%
Vibration	MIL-STD-883C, Test Condition A	No change

Table B5 Physical Characteristics and Environmental Specifications for Strap Battery Devices ... Cont'd

MXP

Physical Characteristics

Lead material	0.1mm nominal thickness, half-hard nickel
Coating material	Epoxy

Environmental Specifications

Test	Conditions	Resistance Change
Passive aging	-40°C, 1000 hours	±5%
	60°C, 1000 hours	±20%
Humidity aging	60°C/95% RH, 1000 hours	±30%
Thermal shock	85°C, -40°C (10 times)	±5%
Vibration	MIL-STD-883D, Method 2026	No change

LR4

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 hours	±10%
Humidity aging	85°C/85% RH, 7 days	±5%
Vibration	MIL-STD-883D, Method 2026	No change

SRP

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 hours	±10%
Humidity aging	85°C/85% RH, 7 days	±5%
Vibration	MIL-STD-883C, Test Condition A	No change

miniSMDE

Physical Characteristics

Termination pad materials	Solder-plated copper
Termination pad solderability	Meets EIA specification RS186-9E, ANSI/J-STD-002 Category 3

Environmental Specifications

Test	Conditions	Resistance Change
Passive aging	60°C, 1000 hours	±5% typical
	85°C, 1000 hours	±5% typical
Humidity aging	85°C/85% RH, 100 days	±15% typical
Thermal shock	85°C, -40°C (20 times)	-33% typical
	125°C, -55°C (10 times)	-33% typical
Vibration	MIL-STD-883D, Method 2026	No change
Reflow conditions	260°C for 10-20 seconds	Less than R
Tape and reel specifications	Per EIA 481-1	N/A

Note: 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.

Table B6 Packaging and Marking Information/Agency Recognition for Strap Battery Devices

Part Number	Bag Quantity	Tape & Reel Quantity	Standard Package Quantity	Part Marking	Agency Recognition
85°C Typical Activation					
VLR					
VLR170F	1,000	—	10,000	R17	UL, CSA, TÜV
VLR170LF	1,000	—	10,000	R17	UL, CSA, TÜV
VLR170UF	1,000	—	10,000	—	UL, CSA, TÜV
VLR175F	1,000	—	10,000	R1X	UL, CSA, TÜV
VLR175LF	1,000	—	10,000	R1X	UL, CSA, TÜV
VLR175UF	1,000	—	10,000	—	UL, CSA, TÜV
VLR230F	1,000	—	10,000	R23	UL, CSA, TÜV
VLR230F-C36	1,000	—	10,000	R23	UL, CSA, TÜV
VLR230UF	1,000	—	10,000	—	UL, CSA, TÜV
90°C Typical Activation					
VLP					
VLP210F	1,000	—	10,000	W21	UL, CSA, TÜV
VLP220F	1,000	—	10,000	W22	UL, CSA, TÜV
VLP270F	1,000	—	10,000	W27	UL, CSA, TÜV
VTP					
VTP110F	1,000	—	10,000	—	UL, CSA, TÜV
VTP170F	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170SSF	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170XF	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170XSF	1,000	—	10,000	V17	UL, CSA, TÜV
VTP175F	1,000	—	10,000	V1X	UL, CSA, TÜV
VTP175LF	1,000	—	10,000	V1X	UL, CSA, TÜV
VTP175UF	1,000	—	10,000	—	UL, CSA, TÜV
VTP200GF	1,000	—	10,000	V20	UL, CSA, TÜV
VTP200UF	1,000	—	10,000	—	UL, CSA, TÜV
VTP210GF	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210GUF	1,000	—	10,000	—	UL, CSA, TÜV
VTP210SF	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210SLF	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210SSF	1,000	—	10,000	V21	UL, CSA, TÜV
VTP240F	1,000	—	10,000	V24	UL, CSA, TÜV
110°C Typical Activation					
LTP					
LTP070F	2,000	—	10,000	L07	UL, CSA, TÜV
LTP070SF	2,000	—	10,000	L07	UL, CSA, TÜV
LTP100F	2,000	—	10,000	L10	UL, CSA, TÜV
LTP100SF	2,000	—	10,000	L10	UL, CSA, TÜV
LTP100SLF	2,000	—	40,000	L10	UL, CSA, TÜV
LTP100SSF	2,000	—	10,000	L10	UL, CSA, TÜV
LTP180F	2,000	—	10,000	L18	UL, CSA, TÜV
LTP180LF	500	—	10,000	L18	UL, CSA, TÜV
LTP180SF	2,000	—	10,000	L18	UL, CSA, TÜV
LTP190F	500	—	10,000	L19	UL, CSA, TÜV
LTP260F	1,000	—	10,000	L26	UL, CSA, TÜV
LTP300F	500	—	10,000	L30	UL, CSA, TÜV
LTP340F	500	—	10,000	L34	UL, CSA, TÜV
miniSMDE					
miniSMDE190F-2	—	5,000	5,000	19	UL, CSA, TÜV
120°C Typical Activation					
MXP					
MXP190BB	4,000	—	8,000	—	UL, CSA, TÜV

Part Number	Bag Quantity	Tape & Reel Quantity	Standard Package Quantity	Part Marking	Agency Recognition
125°C Typical Activation					
LR4					
LR4-170UF	2,000	—	10,000	NA	UL, CSA, TÜV
LR4-190F	2,000	—	10,000	E19	UL, CSA, TÜV
LR4-190SF	2,000	—	10,000	E19	UL, CSA, TÜV
LR4-260F	1,000	—	10,000	E26	UL, CSA, TÜV
LR4-260SF	1,000	—	10,000	E26	UL, CSA, TÜV
LR4-380F	1,000	—	10,000	E38	UL, CSA, TÜV
LR4-380XF	1,000	—	10,000	E3X	UL, CSA, TÜV
LR4-450F	1,000	—	10,000	E45	UL, CSA, TÜV
LR4-550F	1,000	—	10,000	E55	UL, CSA, TÜV
LR4-600F	1,000	—	10,000	E60	UL, CSA, TÜV
LR4-600XF	1,000	—	10,000	E60	UL, CSA, TÜV
LR4-730F	1,000	—	10,000	E73	UL, CSA, TÜV
LR4-73XF	500	—	10,000	E7X	UL, CSA, TÜV
LR4-880SSF	250	—	8,000	E88	(UL, CSA, TÜV pending)
LR4-900F	500	—	10,000	E90	UL, CSA, TÜV
LR4-1300SSF	250	—	10,000	EX3	UL, CSA, TÜV
SRP					
SRP120F	2,000	—	10,000	120	UL, CSA, TÜV
SRP120LF	1,000	—	10,000	120	UL, CSA, TÜV
SRP120SF	2,000	—	10,000	120	UL, CSA, TÜV
SRP175F	2,000	—	10,000	175	UL, CSA, TÜV
SRP175LF	1,000	—	10,000	175	UL, CSA, TÜV
SRP175SF	2,000	—	10,000	175	UL, CSA, TÜV
SRP175SSF	2,000	—	10,000	175	UL, CSA, TÜV
SRP200F	500	—	10,000	200	UL, CSA, TÜV
SRP350F	500	—	10,000	350	UL, CSA, TÜV
SRP420F	500	—	10,000	420	UL, CSA, TÜV

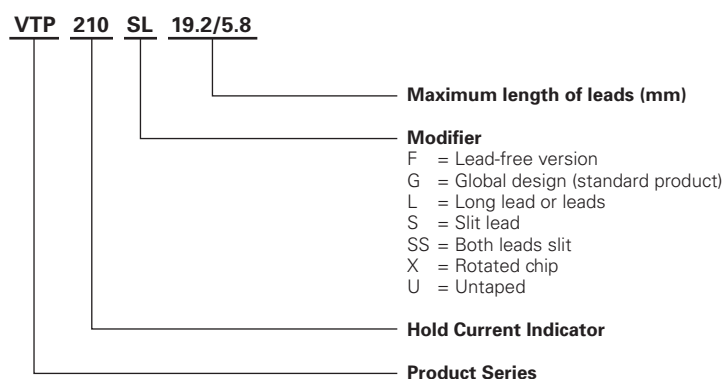
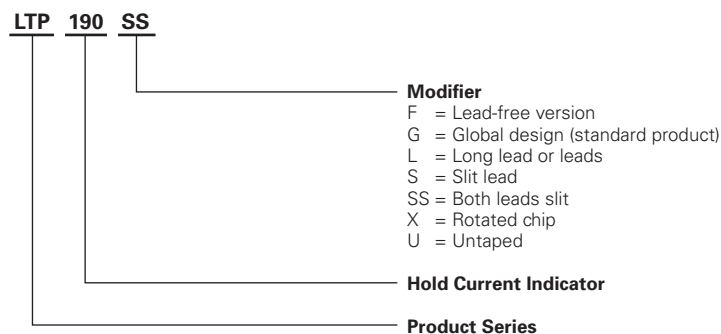
Agency Recognition for Strap Battery Devices

UL	File # E74889
CSA	File # 78165C
TÜV	Certificate number available on request

Installation Guidelines for the Strap Family

- Polymeric PTC 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 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 Polymeric PTC device in tension will decrease the ability of the device to protect against electrical faults. No residual force should remain on device after installation. Mechanical damage to Polymeric PTC chip may affect device performance and should be avoided.
- Chemical contamination of Polymeric PTC 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.
- Polymeric PTC strap devices are designed 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 Polymeric PTC device to exhibit its specified performance, weld placement should be a minimum of 2mm from the edge of the Polymeric PTC chip, weld splatter must not touch the Polymeric PTC chip, and welding conditions must not heat the Polymeric PTC device above its maximum operating temperature.
- Polymeric PTC strap devices are not designed for applications where reflow onto flex circuits or rigid circuit boards is required.
- The polyester tape on PolySwitch strap devices is intended for marking and identification purposes only, not for electrical insulation.
- The coating on MXP devices is intended to prevent oxidization/aging of the devices. Damaging the coating or causing the coating to delaminate can have negative effects on device performance and should be avoided.
- MXP devices have small Polymeric PTC chip size and therefore have weaker peel strength between polymer and Ni-foil of the chip. Excessive mechanical force to the device may cause delamination of Ni-foil from polymer.

Part Numbering System for Strap Battery Devices



Warning :

- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- The devices are intended for protection against 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 silicon 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.
- Operation in circuit with a large inductance can generate a circuit voltage (L di/dt) above the rated voltage of the PolySwitch resettable device.