

# PolySwitch Resettable Devices

## Strap Battery Devices

Raychem Circuit Protection, 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. Raychem Circuit Protection's battery protection family includes SRP, LTP, LR4, VTP, VLP, and VLR 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 upon request
- Broad range of resettable devices available
- Current ratings from 0.7A to 14.1A
- Voltage ratings from 12V to 30V
- Agency recognition, UL, CSA, TÜV
- Fast time-to-trip
- Low resistance

### Applications

- Mobile phone battery packs
- Cordless phone battery packs
- Mobile radio packs
- Computer battery packs
- Camcorder battery packs
- PDA battery packs

## 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.

Protection Application	Additional Comments	PolySwitch Resettable Devices—Key Device Selection Criteria		
		Installation Method	Lowest Resistance	Lowest Thermal Cut-off
Mobile phone battery packs	NiMH	Cylindrical (AAA cell)	VLP210F	VTP170F
		Flexprint	miniSMDE190F	—
		Prismatic	VLP270F VTP210GF LR4-260F	VLR230F
	Li-ion	Flexprint	miniSMDE190F	—
		Surface Mount	refer to Surface Mount section of this Databook	
		Prismatic	VLP270F VTP210GF	VLR175F
Cordless phone battery packs	NiMH	Cylindrical	VLP210F SRP175F	VTP170F
Mobile radio packs	NiMH	Cylindrical	LR4-380F SRP350F	LTP340F
Computer battery packs	NiMH	Cylindrical	LR4-900F	—
	Li-ion	Cylindrical	LR4-1410F	—
		Prismatic	Consult local Rep	Consult local Rep
Camcorder battery packs	NiMH or Li-ion	Prismatic	VLP270F LR4-380F	VTP210GF —
PDA	Li-ion	Prismatic	VLP220F VTP175F	VLR175F —
Power tools (charge line)	NiCd or NiMH	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	SRP	LR4	miniSMDE
	Typical Activation Temperature						
	85°C	90°C	90°C	110°C	125°C	125°C	110°C
0.70	—	—	—	15V/0.15Ω	—	—	—
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	—	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	—
14.10	—	—	—	—	—	20V/0.004Ω	—

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

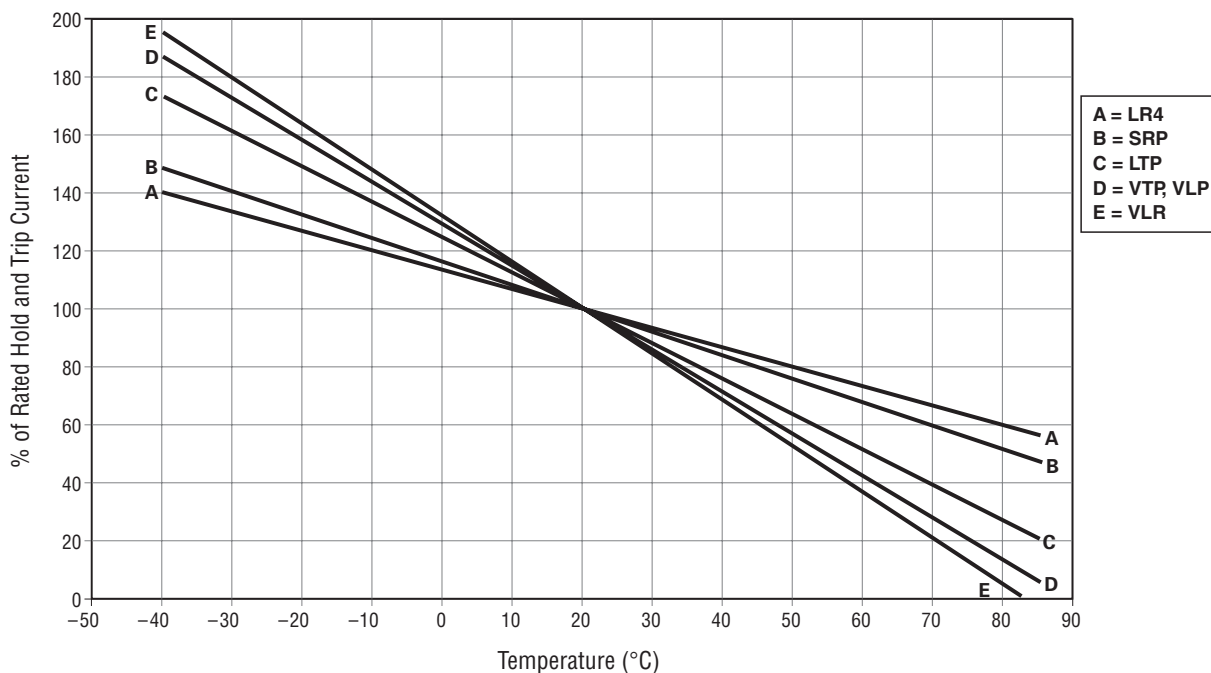
Part Number	Maximum Ambient Temperature											
	-40°C	-20°C	0°C	20°C	25°C	40°C	50°C	60°C	70°C	80°C	85°C	
<b>85°C Typical Activation</b>												
<b>VLR*</b>												
VLR170F	3.5	2.9	2.4	1.84	1.7	1.2	1.0	0.7	0.3	—	—	
VLR170LF	3.5	2.9	2.4	1.84	1.7	1.2	1.0	0.7	0.3	—	—	
VLR170UF	3.5	2.9	2.4	1.84	1.7	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	2.3	1.7	1.3	0.9	0.4	—	—	
VLR230F-C36	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—	
VLR230UF	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—	
<b>90°C Typical Activation</b>												
<b>VLP*</b>												
VLP220F	4.5	3.8	3.0	2.45	2.2	1.7	1.4	1.1	0.7	0.3	0.1	
VLP270F	5.6	4.7	4.0	3.05	2.7	2.2	1.7	1.4	0.9	0.4	0.1	
<b>90°C Typical Activation</b>												
<b>VTP*</b>												
VTP110F	2.0	1.7	1.4	1.02	1.1	0.8	0.6	0.5	0.3	0.2	0.1	
VTP170F	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170SSF	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170XF	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1	
VTP170XSF	3.2	2.7	2.2	1.80	1.7	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	2.0	1.5	1.2	0.9	0.5	0.3	0.1	
VTP200UF	3.7	3.2	2.6	2.12	2.0	1.5	1.2	0.9	0.5	0.3	0.1	
VTP210GF	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SF	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SLF	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1	
VTP210SSF	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1	
VTP240F	4.4	3.7	3.1	2.54	2.4	1.8	1.5	1.2	0.9	0.5	0.1	
<b>110°C Typical Activation</b>												
<b>LTP</b>												
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	
<b>miniSMDE</b>												
miniSMDE190F	3.0	2.6	2.2	1.9	1.74	1.4	1.2	1.1	0.7	0.5	0.4	

\* 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
<b>125°C Typical Activation</b>											
<b>LR4</b>											
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	8.3	7.4	6.8	6.2	5.5	4.8	4.5
LR4-900F	12.7	11.4	10	9.0	8.5	7.5	6.8	6.2	5.5	4.9	4.5
LR4-1300SSF	17.9	16.2	14.5	13.0	12.4	11.1	10.3	9.5	8.6	7.7	7.2
<b>SRP</b>											
SRP120F	1.9	1.7	1.5	1.2	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120LF	1.9	1.7	1.5	1.2	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120SF	1.9	1.7	1.5	1.2	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	2.0	1.97	1.7	1.5	1.4	1.2	1.0	0.9
SRP350F	5.3	4.8	4.3	3.5	3.44	3.0	2.7	2.5	2.1	1.8	1.7
SRP420F	6.3	5.7	5.1	4.2	4.11	3.6	3.3	3.0	2.6	2.2	2.1

**Figure B1 - Thermal Derating Curve**



### Table B3 - Electrical Characteristics for Strap Battery Devices

Part Number	$I_H$	$I_T$	$V_{Max}$	$I_{Max}$	$P_{D\ TYP}$	Max. Time-to-trip		$R_{Min}$	$R_{TYP}$	$R_{Max}$	$R_{Tripped\ TYP}$	$R_{1\ Max}$	Figure for Dimension
	(A)	(A)	(V <sub>DC</sub> )	(A)	(W)	(A)	(s)	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	
<b>85°C Typical Activation*</b>													
<b>VLR</b>													
VLR170F	1.7	4.1	12	100	1.4	8.5	5.0	0.018	0.025	0.032	0.050	0.064	B3
VLR170LF	1.7	4.1	12	100	1.4	8.5	5.0	0.018	0.025	0.032	0.050	0.064	B3
VLR170UF	1.7	4.1	12	100	1.4	8.5	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	1.8	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B6
VLR230F	2.3	5.0	12	100	1.4	10.0	5.0	0.012	0.015	0.018	0.030	0.036	B3
VLR230F-C36	2.3	5.0	12	100	1.4	10.0	5.0	0.012	0.015	0.018	0.030	0.036	B10
VLR230UF	2.3	5.0	12	100	1.4	10.0	5.0	0.012	0.015	0.018	0.030	0.036	B6
<b>90°C Typical Activation*</b>													
<b>VLP</b>													
VLP220F	2.1	5.3	16	60	0.8	11.0	5.0	0.017	0.023	0.029	0.046	0.058	B3
VLP270F	2.7	6.5	16	60	1.2	13.5	5.0	0.012	0.015	0.018	0.030	0.036	B3
<b>90°C Typical Activation*</b>													
<b>VTP</b>													
VTP110F	1.1	2.7	16	100	0.7	7.0	5.0	0.038	0.054	0.070	0.108	0.140	B6
VTP170F	1.7	3.4	16	100	1.0	8.5	5.0	0.030	0.041	0.052	0.082	0.105	B2
VTP170XF	1.7	3.4	16	100	0.7	8.5	5.0	0.030	0.041	0.052	0.082	0.105	B3
VTP170XSF	1.7	3.4	16	100	0.7	8.5	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	2.0	4.7	16	100	0.9	10.0	5.0	0.022	0.031	0.039	0.062	0.078	B3
VTP200UF	2.0	4.7	16	100	0.9	10.0	5.0	0.022	0.031	0.039	0.062	0.078	B6
VTP210GF	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B3
VTP210SF	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B4
VTP210SLF	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B4
VTP210SSF	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B5
VTP240F	2.4	5.9	16	100	1.2	12.0	5.0	0.014	0.020	0.026	0.040	0.052	B3
<b>110°C Typical Activation</b>													
<b>LTP</b>													
LTP070F	0.7	1.45	15	100	0.7	3.5	5.0	0.100	0.150	0.200	0.300	0.340	B7
LTP070SF	0.7	1.45	15	100	0.7	3.5	5.0	0.100	0.150	0.200	0.300	0.340	B8
LTP100F	1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B7
LTP100SF	1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B8
LTP100SLF	1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B8
LTP100SSF	1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B9
LTP180F	1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B7
LTP180LF	1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B7
LTP180SF	1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B8
LTP190F	1.9	4.20	24	100	1.9	10.0	3.0	0.030	0.044	0.057	0.088	0.100	B7
LTP260F	2.6	5.20	24	100	1.3	13.0	5.0	0.025	0.034	0.042	0.068	0.076	B7
LTP300F	3.0	6.30	24	100	1.7	15.0	4.0	0.015	0.023	0.031	0.046	0.055	B7
LTP340F	3.4	6.80	24	100	1.6	17.0	5.0	0.016	0.022	0.027	0.044	0.050	B7

\* Product electrical characteristics determined at 25°C

**Table B3 - Electrical Characteristics for Strap Battery Devices**

... **Cont'd**

Part Number	$I_H$	$I_T$	$V_{Max}$	$I_{Max}$	$P_{D\ TYP}$	Max. Time-to-trip		$R_{Min}$	$R_{TYP}$	$R_{Max}$	$R_{Tripped\ TYP}$	$R_{1\ Max}$	Figure for Dimension
	(A)	(A)	(V <sub>DC</sub> )	(A)	(W)	(A)	(s)	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	( $\Omega$ )	
<b>miniSMDE</b>													
miniSMDE190F	1.9	3.8	16	100	1.5	10.0	2.0	0.024	0.032	0.040	0.060	0.080 <sup>†</sup>	B17
<b>125°C Typical Activation</b>													
<b>LR4</b>													
LR4-170UF	1.7	3.4	15	100	0.8	8.5	5.0	0.044	0.061	0.078	0.089	0.114	B12
LR4-190F	1.9	3.9	15	100	0.8	9.5	5.0	0.039	0.056	0.072	0.079	0.102	B10
LR4-190SF	1.9	3.9	15	100	0.8	9.5	5.0	0.039	0.056	0.072	0.079	0.102	B11
LR4-260F	2.6	5.8	15	100	1.0	13.0	5.0	0.020	0.031	0.042	0.046	0.063	B10
LR4-260SF	2.6	5.8	15	100	1.0	13.0	5.0	0.020	0.031	0.042	0.046	0.063	B11
LR4-380F	3.8	8.3	15	100	1.2	19.0	5.0	0.013	0.020	0.026	0.028	0.037	B10
LR4-380XF	3.8	8.3	15	100	1.2	19.0	5.0	0.013	0.020	0.026	0.028	0.037	B10
LR4-450F	4.5	8.9	20	100	1.4	22.5	5.0	0.011	0.016	0.020	0.022	0.028	B10
LR4-550F	5.5	10.5	20	100	2.0	27.5	5.0	0.009	0.013	0.016	0.018	0.022	B10
LR4-600F	6.0	11.7	20	100	1.7	30.0	5.0	0.007	0.011	0.014	0.015	0.019	B10
LR4-600XF	6.0	11.7	20	100	1.7	30.0	5.0	0.0075	0.012	0.014	0.015	0.019	B10
LR4-730F	7.3	14.1	20	100	1.9	30.0	5.0	0.006	0.009	0.012	0.011	0.015	B10
LR4-880SSF	8.8	16.0	20	100	2.0	44.0	5.0	0.0065	0.0085	0.0105	0.012	0.0145	B14
LR4-900F	9.0	16.7	20	100	3.0	45.0	5.0	0.006	0.008	0.010	0.011	0.014	B10
LR4-1300SSF	13.0	21.2	20	100	2.2	50.0	10.0	0.004	0.006	0.007	0.008	0.009	B14
<b>SRP</b>													
SRP120F	1.2	2.7	15	100	0.8	6.0	5.0	0.085	0.123	0.160	0.170	0.220	B7
SRP120LF	1.2	2.7	15	100	0.8	6.0	5.0	0.085	0.123	0.160	0.170	0.220	B7
SRP120SF	1.2	2.7	15	100	0.8	6.0	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	2.0	4.4	30	100	1.6	10.0	4.0	0.030	0.045	0.060	0.075	0.100	B7
SRP350F	3.5	6.3	30	100	1.9	20.0	3.0	0.017	0.024	0.031	0.040	0.050	B7
SRP420F	4.2	7.6	30	100	2.2	20.0	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.
- $R_{Tripped\ TYP}$  = 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.
- \* = Product electrical characteristics determined at 25°C.
- † =  $R_{1max}$  value for this device is the maximum resistance of the device at 20°C one hour after reflow.

# Figures B2-B15 - Dimension Figures for Strap Battery Devices

Figure B2

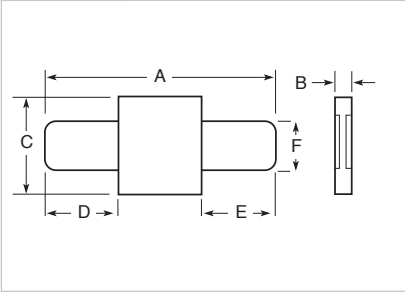


Figure B3

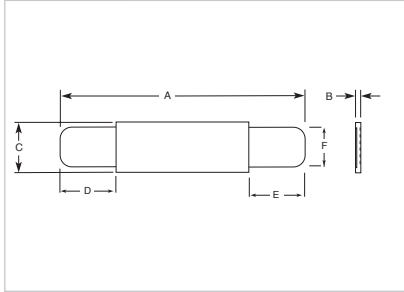


Figure B4

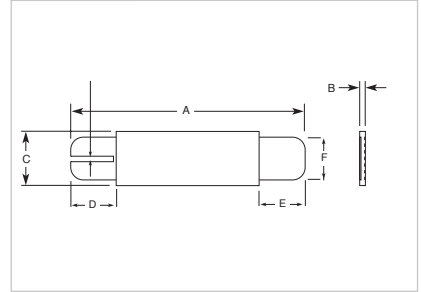


Figure B5

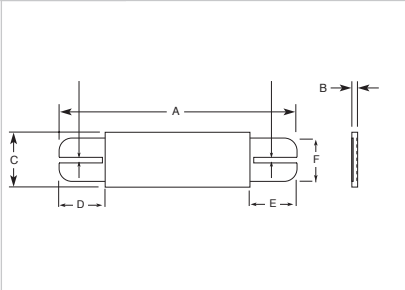


Figure B6

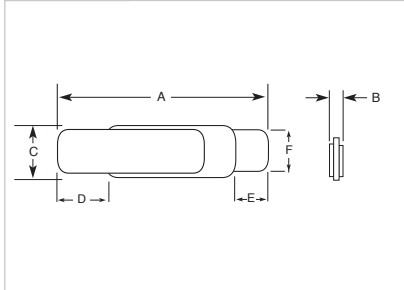


Figure B7

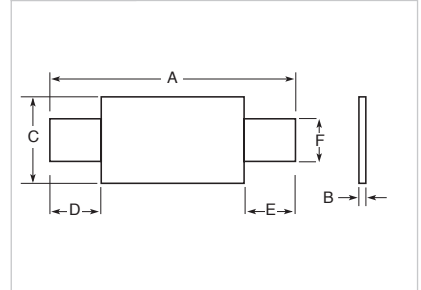


Figure B8

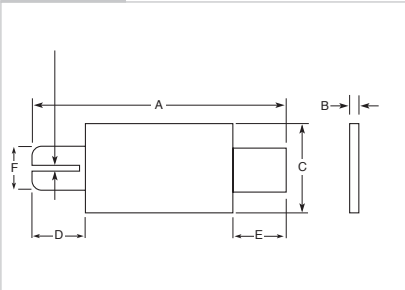


Figure B9

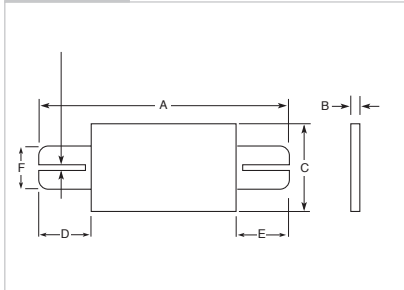


Figure B10

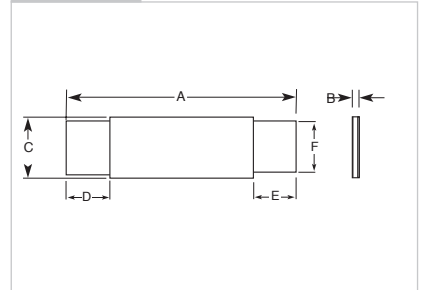


Figure B11

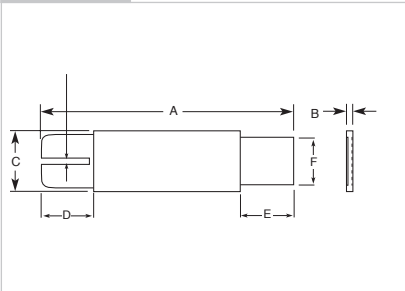


Figure B12

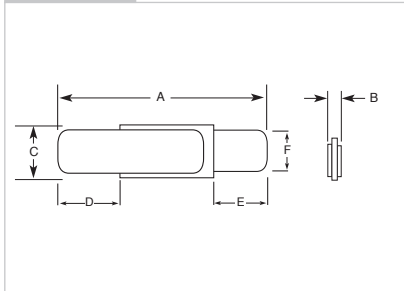


Figure B13

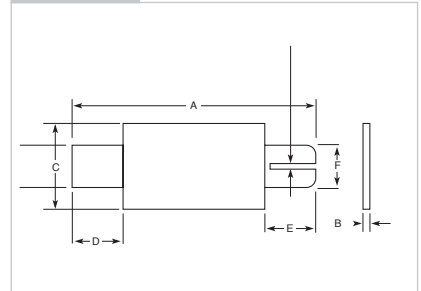


Figure B14

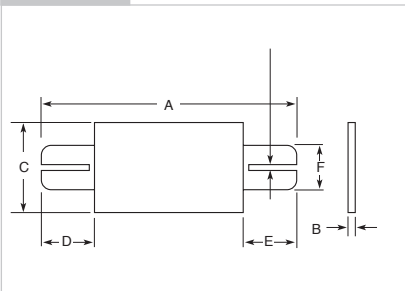
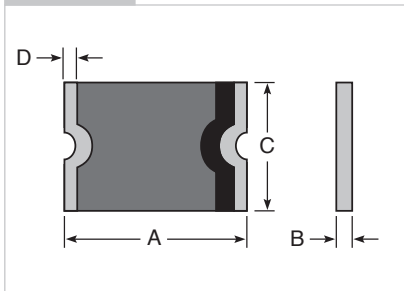


Figure B15



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

Part Number	Dimension												Figure
	A		B		C		D		E		F		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
<b>85°C Typical Activation</b>													
<b>VLR</b>													
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)	—	0.8 (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 (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 (1.01)	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 —
<b>90°C Typical Activation</b>													
<b>VLP</b>													
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 —
<b>90°C Typical Activation</b>													
<b>VTP</b>													
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)	3.5 (0.13)	5.8 (0.23)	12.5 (0.49)	14.5 (0.57)	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 —
<b>110°C Typical Activation</b>													
<b>LTP</b>													
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 —



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

... **Cont'd**

Part Number	Dimension A		Dimension B		Dimension C		Dimension D		Dimension E		Dimension F		Figure
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
<b>110°C Typical Activation</b>													
<b>LTP</b>													
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 (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 —
<b>miniSMDE</b>													
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)	—	—	—	—	B17 —
<b>125°C Typical Activation</b>													
<b>LR4</b>													
LR4-170UF	19.0 (0.75)	21.0 (0.83)	0.5 (0.02)	0.7 (0.03)	3.8 (0.15)	4.0 (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)	26.0 (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 —
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 (2.42)	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 —
<b>SRP</b>													
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 —

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

... Cont'd

Part Number	Dimension												Figure
	A		B		C		D		E		F		
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
<b>SRP</b>													
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)	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 —
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 —

**Figures B16-B22 - Typical Time-to-trip Curves at 20°C for Strap Battery Devices**

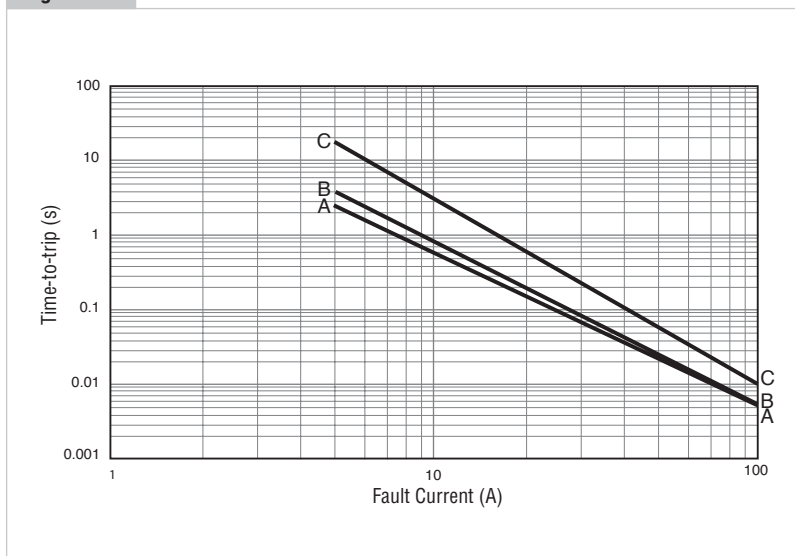
**VLR (data at 25°C)**

A = VLR170F

B = VLR175F

C = VLR230F

**Figure B16**



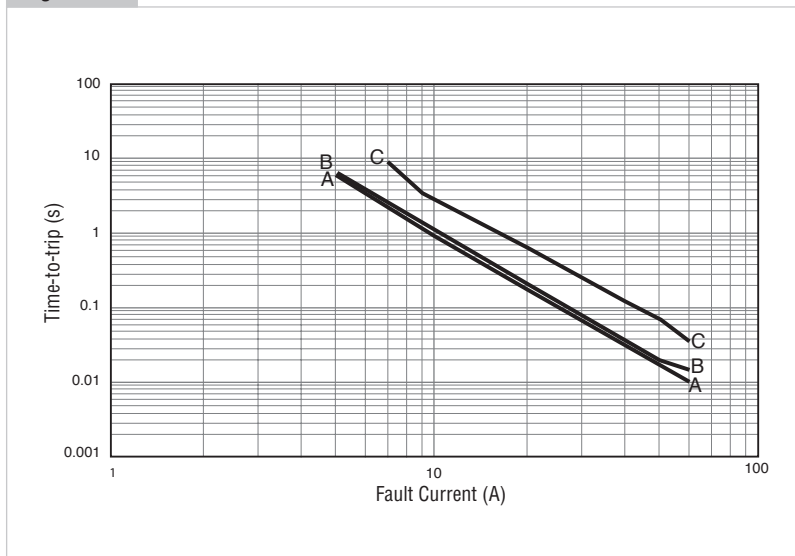
**VLP (data at 25°C)**

A = VLP210F

B = VLP220F

C = VLP270F

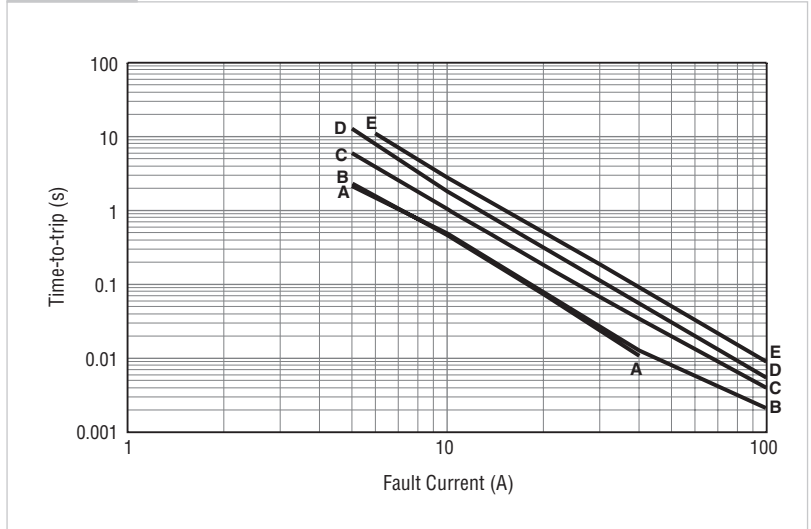
**Figure B17**



**VTP** (data at 25°C)

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

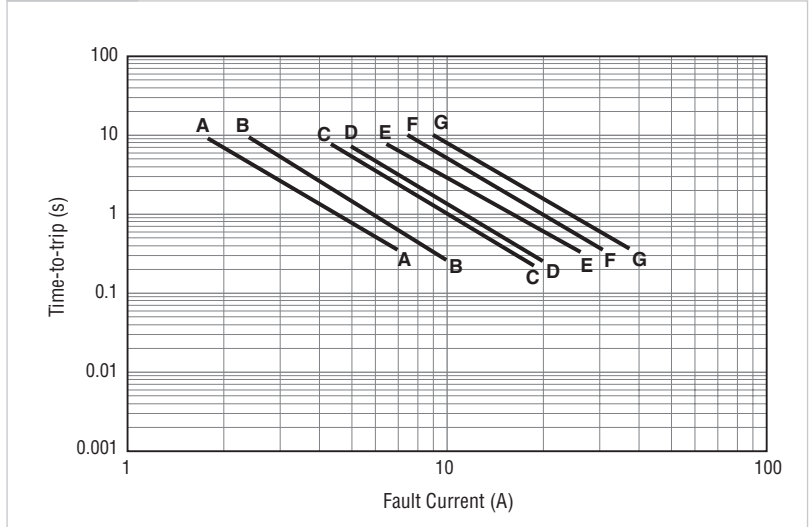
**Figure B18**



**LTP**

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

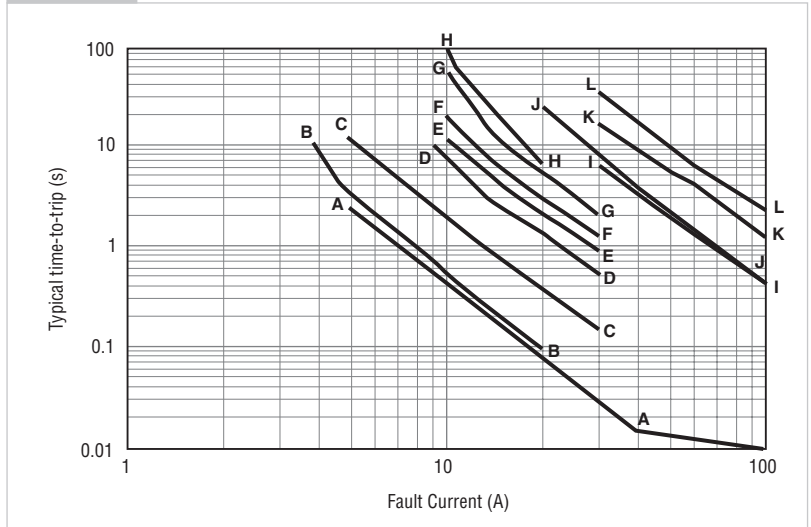
**Figure B19**



**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
- L = LR4-1410F

**Figure B20**



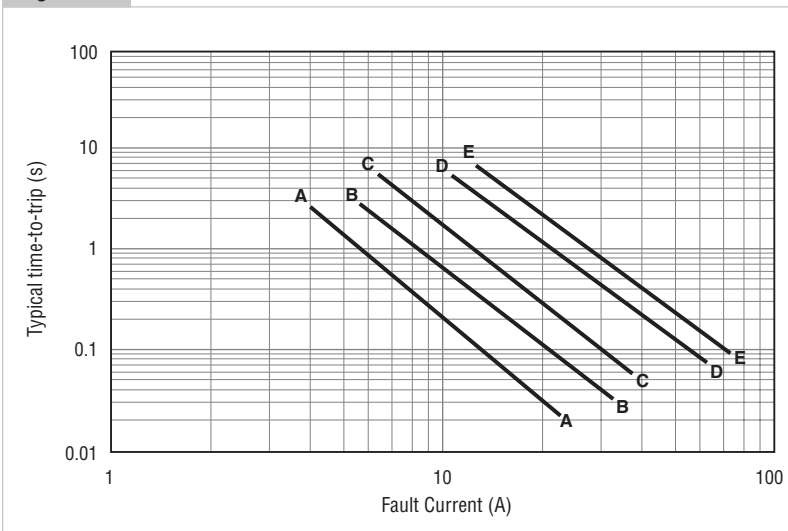
**Figures B16-B22 - Typical Time-to-trip Curves at 20°C for Strap Battery Devices**

... Cont'd

**SRP**

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

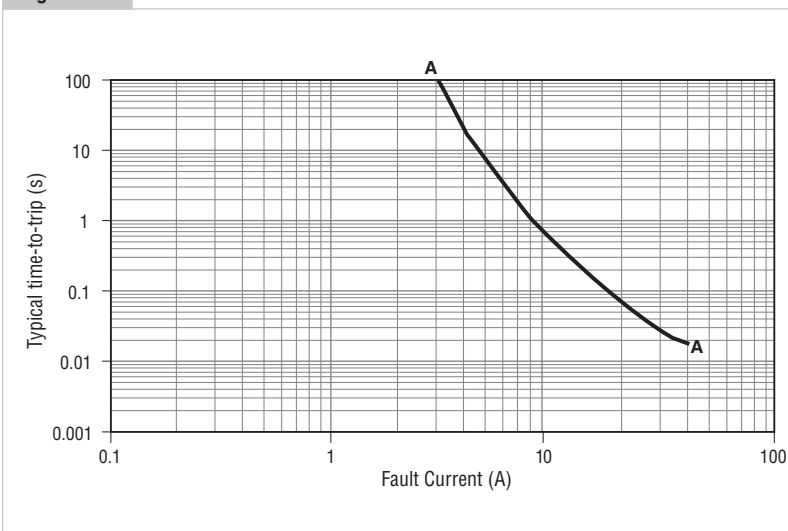
**Figure B21**



**miniSMDE**

- A = miniSMDE190F

**Figure B22**



**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

**VLR 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

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

**VLP and VTP  
Physical Characteristics**

Lead material	0.125mm nominal thickness, quarter-hard nickel
Tape material	Polyester

**VLP and VTP  
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

**LTP  
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

**LR4  
Physical Characteristics**

Lead material	0.125mm nominal thickness, quarter-hard nickel
Tape material	Polyester

**LR4  
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

**SRP  
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

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

**miniSMDE  
Physical Characteristics**

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

**miniSMDE  
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	Part Marking	Agency Recognition
<b>85°C Typical Activation-VLR</b>					
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
<b>90°C Typical Activation-VLP</b>					
VLP220F	1,000	—	10,000	W22	UL, CSA, TÜV
VLP270F	1,000	—	10,000	W27	UL, CSA, TÜV
<b>90°C Typical Activation-VTP</b>					
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
VTP175UF	1,000	—	10,000	—	UL, CSA, TÜV
VTP175LF	1,000	—	10,000	V1X	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

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

... Cont'd

Part Number	Bag Quantity	Tape & Reel Quantity	Standard Package	Part Marking	Agency Recognition
<b>110°C Typical Activation—LTP, miniSMDE</b>					
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
miniSMDE190-2F	—	5,000	5,000	19	UL, CSA, TÜV
<b>125°C Typical Activation—LR4, SRP</b>					
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
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

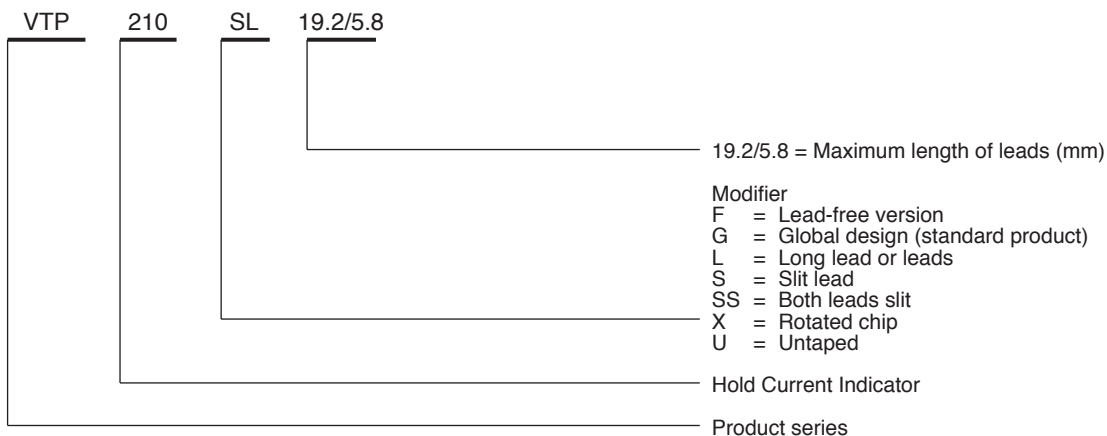
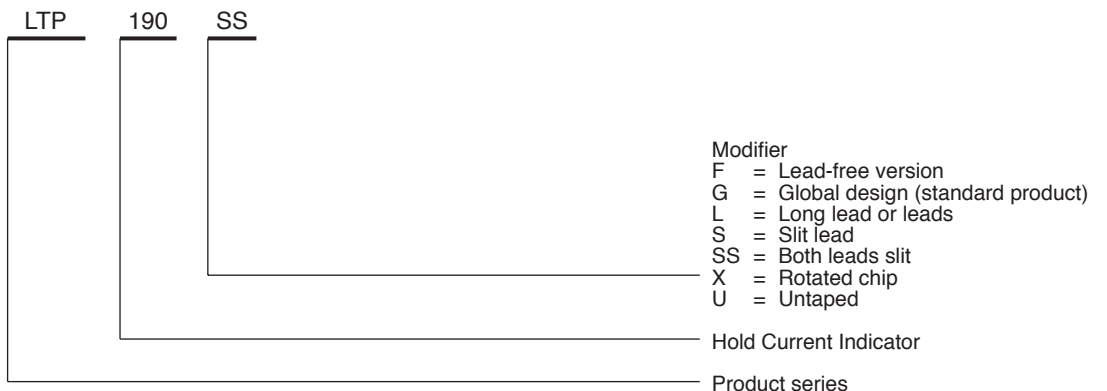
## Installation Guidelines for the Strap Family

- 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.

## Agency Recognition for Strap Battery Devices

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

## 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 ( $L \frac{di}{dt}$ ) above the rated voltage of the PolySwitch resettable device.