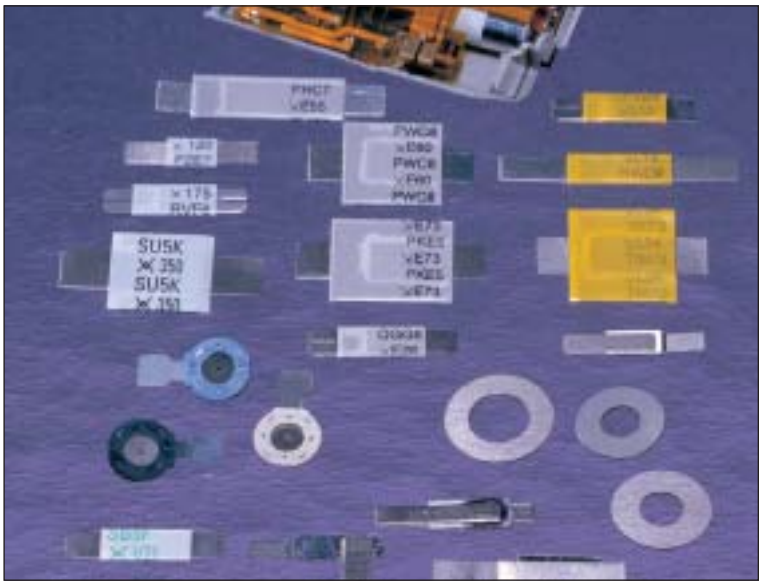
PolySwitch Strap Battery
Resettable Devices

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:
- Broad range of resettable devices available
- Current ratings from 0.7A to 9.0A
- 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

Devices in this section are grouped by:
Activation Temperature, Device Series, Hold Current

Step 1. Determine the circuit's operating parameters.

Fill in the following information about the circuit:

Maximum ambient operating temperature _____

Normal operating current _____

Maximum operating voltage
(i.e., VTP210G is 16V max.) _____

Maximum interrupt current _____

Step 2. Select the PolySwitch device that will accommodate the circuit's maximum ambient temperature and normal operating current.

Look across the top of Table B2 to find the temperature that most closely matches the circuit's maximum operating temperature. Look down the column to find the value equal to or greater than the circuit's normal operating current. Now look to the far left of that row to find the part number for the PolySwitch strap device that will best accommodate the circuit. Devices in this section are grouped by typical activation temperature; therefore, your operating current requirement may be found in more than one grouping.

The thermal derating curves located in Figure B3 are the normalized representations of the data in Table B2.

Step 3. Compare the selected device's electrical ratings with the circuit's maximum operating voltage and maximum interrupt current.

Look down the first column of Table B3 to find the part number you selected in Step 2. Look to the right in that row to find the device's maximum operating voltage (V_{MAX}) and maximum interrupt current (I_{MAX}). Ensure that V_{MAX} and I_{MAX} are greater than or equal to the circuits maximum operating voltage and maximum interrupt current.

Step 4. Determine time-to-trip.

Time-to-trip is the amount of time it takes for a device to switch to a high-resistance state once a fault current has been applied across the device. Identifying the PolySwitch device's time-to-trip is important in order to provide the desired protection capabilities. If the device you choose trips too fast, undesired or nuisance tripping will occur. If the device trips too slowly, the components being protected may be damaged before the device switches to a high resistance state.

Figures B19-25 show the typical time-to-trip at 20°C for each of the PolySwitch devices.

If the PolySwitch device time-to-trip is too fast or too slow for the circuit, go back to Step 2 and choose an alternate device.

Step 5. Match Thermal Cut-Off to Cell Chemistry.

Thermal cut-off is the temperature at which a PolySwitch device will trip when sourced with a specific current. Figure B1 demonstrates how the resistance-versus-temperature characteristics of various PolySwitch strap device series differ by use of different material platforms. Figure B2 shows the thermal cut-off behavior for each strap battery series device. Actual device performance can vary depending on the application environment, and users should independently test and evaluate each product in their application. Thermally sensitive cell chemistries such as Li-ion and NiMH typically use devices with lower thermal cut-off, which can provide enhanced thermal protection (VLR, VLP, and VTP series). Less sensitive chemistries, like NiCd, typically use devices with higher thermal cut-off temperatures (LR4, SRP series).

4

Step 6. Verify ambient operating conditions.

Ensure that your application's minimum and maximum ambient temperatures are within the operating temperature range of -40°C to 85°C (except for VLR series, which is -40°C to 70°C).

Step 7. Verify the PolySwitch device dimensions.

Using dimensions in Table B4, compare the dimensions of the PolySwitch device you selected with the application's space considerations.

Figure B1. Resistance vs. Temperature

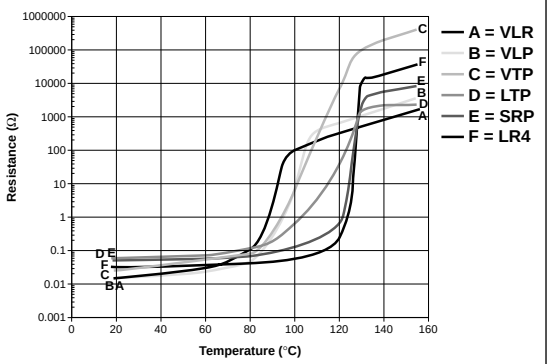
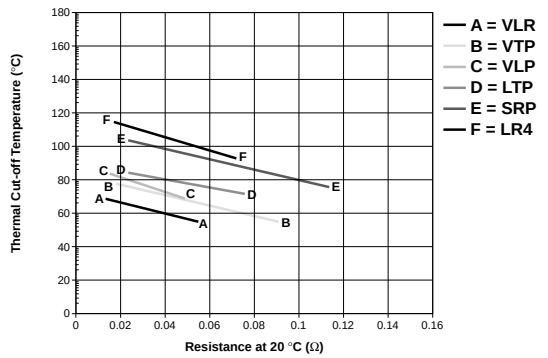


Figure B2. Typical Thermal Cut-Off at 1 A



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	NiCd	Cylindrical (diameter greater than AAA)	LR4-17OU	LTP070
			LR4-190	LTP190
			LR4-260	LTP260
			SRP200	LTP340
			SRP420	—
		Cylindrical (AAA cell)	TAC100-09	VTP170
			TAC170-09	VTP210G
			TAC210	—
			VTP170	—
		Prismatic	LR4-190	—
			LR4-260	—
			SRP120	—
			SRP175	—
	NiMH	Cylindrical (diameter greater than AAA)	VLP270	VLR170
			VTP210G	VLR230
			LR4-190	VLP270
			LR4-260	VTP210G
			—	LTP180
			—	LTP190
			—	LTP260
		Cylindrical (AAA cell)	VLP210	VLP210
			VTP170	VTP170
			TAC100-09	VTP210G
			TAC170-09	LTP180L (4 cells)
			TAC210	—
		Flexprint	miniSMDE190	miniSMDE190
		Prismatic	VLP220	VLR170
			VLP270	VLR230
			VTP210G	VLP220
			LR4-190	VLP270
			LR4-260	VTP210G
			LR4-380	LTP180
	Li-ion	Cylindrical (diameter greater than AAA)	VLP220	VLR170
			VLP270	VLR230
			VTP210G	VLP220
			LR4-190	VLP270
			LR4-260	VTP210G
		Flexprint	miniSMDE190	miniSMDE190
		Prismatic	VLP220	VLR170
			VLP270	VLR230
			VTP210G	VLP270
			PSR-23096 (single cell)	VTP210G
			PSR-22631 (single cell)	VTP175

Protection Application Selection Guide for Strap Battery Devices *continued*

		PolySwitch Resettable Devices—Key Device Selection Criteria		
Protection Application	**Additional Comments**	**Installation Method**	**Lowest Resistance**	**Lowest Thermal Cut-off**
Cordless phone battery packs	NiCd	Cylindrical	SRP120	LTP070
			SRP175	LTP100
			VTP210G	VTP210G
	NiMH	Cylindrical	LTP070	LTP070
			LTP100	LTP100
			VTP210G	VTP210G
Mobile radio packs	NiCd	Cylindrical	LR4-380	LTP260
			LR4-730	LTP300
			SRP350	LTP340
	NiMH	Cylindrical	LR4-380	LTP260
			LR4-730	LTP300
			SRP350	LTP340
Computer battery packs	NiMH	Cylindrical	LR4-380	LTP260
			LR4-450	LTP340
			LR4-550	—
			LR4-600	—
			LR4-730	—
			SRP420	—
			SRP350	—
	Li-ion	Cylindrical	LR4-380	—
			LR4-450	—
			LR4-550	—
			LR4-600	—
			LR4-730	—
			SRP350	—
			SRP420	—
		Prismatic	Consult Local Rep	Consult Local Rep
Camcorder battery packs	NiCd or Li-Ion	Cylindrical	LR4-450	VTP210G
			LR4-550	—
			LR4-600	—
			LR4-730	—
PDA	Li-Ion	Prismatic	VLP220	VLR170
			VLP270	VLR230
			—	VTP110
			—	VTP170
			—	VTP210G
			—	LTP070
			—	LTP100
			—	LTP180

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

	VLR	VLP	VTP	LTP	SRP	LR4	TAC		miniSMDE
Hold	Typical Activation Temperature								
Current (A)	85°C	90°C	90°C	110°C	125°C	125°C	110°	125°C	110°C
0.70	—	—	—	15V/0.15Ω	—	—	—	—	—
1.00	—	—	—	24V/0.100Ω	—	—	15V/0.120Ω	—	—
1.10	—	—	16V/0.054Ω	—	—	—	—	—	—
1.20	—	—	—	—	15V/0.123Ω	—	—	—	—
1.70	12V/0.025Ω	—	16V/0.041Ω	—	—	15V/0.061Ω	—	15V/0.074Ω	—
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	—	—	—	—	15V/0.049Ω	—
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	—	—	—
9.00	—	—	—	—	—	20V/0.008Ω	—	—	—

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

Part Number	Maximum Ambient Temperature -40˚C Amps	-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 †											
VLR170	3.5	2.9	2.4	1.84	1.7	1.2	1.0	0.7	0.3	—	—
VLR170U	3.5	2.9	2.4	1.84	1.7	1.2	1.0	0.7	0.3	—	—
VLR175	3.5	2.9	2.4	1.87	1.75	1.3	1.0	0.8	0.3	—	—
VLR175L	3.5	2.9	2.4	1.87	1.75	1.3	1.0	0.8	0.3	—	—
VLR230	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—
VLR230S	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—
VLR230SU	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—
VLR230U	5.0	4.2	3.4	2.52	2.3	1.7	1.3	0.9	0.4	—	—
90°C Typical Activation VLP †											
VLP210	4.3	3.6	2.9	2.31	2.1	1.6	1.3	1.0	0.6	0.3	0.1
VLP220	4.5	3.8	3.0	2.45	2.2	1.7	1.4	1.1	0.7	0.3	0.1
VLP270	5.6	4.7	4.0	3.05	2.7	2.2	1.7	1.4	0.9	0.4	0.1
90°C Typical Activation VTP †											
VTP110	2.0	1.7	1.4	1.02	1.1	0.8	0.6	0.5	0.3	0.2	0.1
VTP170	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1
VTP170SS	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1
VTP170X	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1
VTP170XS	3.2	2.7	2.2	1.80	1.7	1.3	1.0	0.8	0.5	0.3	0.1
VTP175	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1
VTP175L	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1
VTP175U	3.2	2.7	2.2	1.84	1.75	1.3	1.0	0.8	0.5	0.3	0.1
VTP200G	3.7	3.2	2.6	2.12	2.0	1.5	1.2	0.9	0.5	0.3	0.1
VTP200U	3.7	3.2	2.6	2.12	2.0	1.5	1.2	0.9	0.5	0.3	0.1
VTP210G	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210L	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210S	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210SL	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210SL-19.2/5.8	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210SS	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP210ULD	4.1	3.5	2.9	2.26	2.1	1.6	1.3	1.0	0.7	0.4	0.1
VTP240	4.4	3.7	3.1	2.54	2.4	1.8	1.5	1.2	0.9	0.5	0.1
110°C Typical Activation LTP											
LTP070	1.1	1.0	0.8	0.7	0.65	0.5	0.4	0.35	0.2	0.2	0.1
LTP070S	1.1	1.0	0.8	0.7	0.65	0.5	0.4	0.3	0.2	0.2	0.1
LTP100	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2
LTP100S	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2
LTP100SL	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2
LTP100SS	1.8	1.6	1.4	1.0	0.99	0.8	0.7	0.6	0.4	0.3	0.2
LTP180	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3
LTP180L	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3

† = Product electrical characteristics determined at 25°C

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

Part Number	Maximum Ambient Temperature -40˚C Amps	-20˚C	0˚C	20˚C	25˚C	40˚C	50˚C	60˚C	70˚C	80˚C	85˚C
110°C Typical Activation LTP, *continued*											
LTP180S	3.1	2.6	2.2	1.8	1.67	1.3	1.1	0.9	0.6	0.4	0.3
LTP190	3.3	2.8	2.4	1.9	1.79	1.4	1.2	1.1	0.7	0.5	0.4
LTP260	4.3	3.7	3.1	2.6	2.42	1.9	1.6	1.4	1.1	0.8	0.6
LTP300	5.1	4.4	3.7	3.0	2.82	2.3	1.9	1.6	1.2	0.9	0.7
LTP340	5.5	4.7	4.0	3.4	3.17	2.6	2.2	1.9	1.5	1.1	0.9
miniSMDE											
miniSMDE190	3.0	2.6	2.2	1.9	1.74	1.4	1.2	1.1	0.7	0.5	0.4
TAC											
TAC100-09	1.6	1.4	1.2	1.0	0.92	0.7	0.6	0.5	0.4	0.2	0.2
125°C Typical Activation LR4											
LR4-170U	2.5	2.2	2.0	1.7	1.64	1.4	1.3	1.2	1.0	0.9	0.8
LR4-190	2.8	2.5	2.3	1.9	1.86	1.6	1.5	1.4	1.2	1.1	1.0
LR4-190S	2.8	2.5	2.3	1.9	1.86	1.6	1.5	1.4	1.2	1.1	1.0
LR4-260	3.8	3.4	3.1	2.6	2.54	2.2	2.0	1.9	1.7	1.4	1.3
LR4-260S	3.8	3.4	3.1	2.6	2.54	2.2	2.0	1.9	1.7	1.4	1.3
LR4-380	5.4	4.9	4.4	3.8	3.64	3.3	3.0	2.8	2.5	2.3	2.1
LR4-450	6.5	5.8	5.3	4.5	4.38	3.9	3.6	3.3	2.9	2.6	2.4
LR4-550	7.6	6.9	6.2	5.5	5.32	4.7	4.3	4.0	3.6	3.2	3.0
LR4-600	8.7	7.8	7.1	6.0	5.86	5.2	4.7	4.4	3.9	3.4	3.2
LR4-730	10.5	9.5	8.6	7.3	7.13	6.3	5.7	5.4	4.7	4.2	4.0
LR4-900	12.7	11.4	10	9.0	8.5	7.5	6.8	6.2	5.5	4.9	4.5
SRP											
SRP120	1.9	1.7	1.5	1.2	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120L	1.9	1.7	1.5	1.2	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP120S	1.9	1.7	1.5	1.2	1.17	1.0	0.9	0.8	0.6	0.5	0.4
SRP175	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175L	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175S	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP175SS	2.5	2.2	2.0	1.75	1.68	1.4	1.3	1.2	1.0	0.9	0.8
SRP200	3.1	2.8	2.5	2.0	1.97	1.7	1.5	1.4	1.2	1.0	0.9
SRP350	5.3	4.8	4.3	3.5	3.44	3.0	2.7	2.5	2.1	1.8	1.7
SRP420	6.3	5.7	5.1	4.2	4.11	3.6	3.3	3.0	2.6	2.2	2.1
TAC											
TAC170-09	2.4	2.2	2.0	1.7	1.67	1.5	1.4	1.3	1.1	1.0	1.0
TAC210	2.8	2.6	2.3	2.1	2.03	1.7	1.6	1.5	1.3	1.2	1.1

Figure B3. Thermal Derating

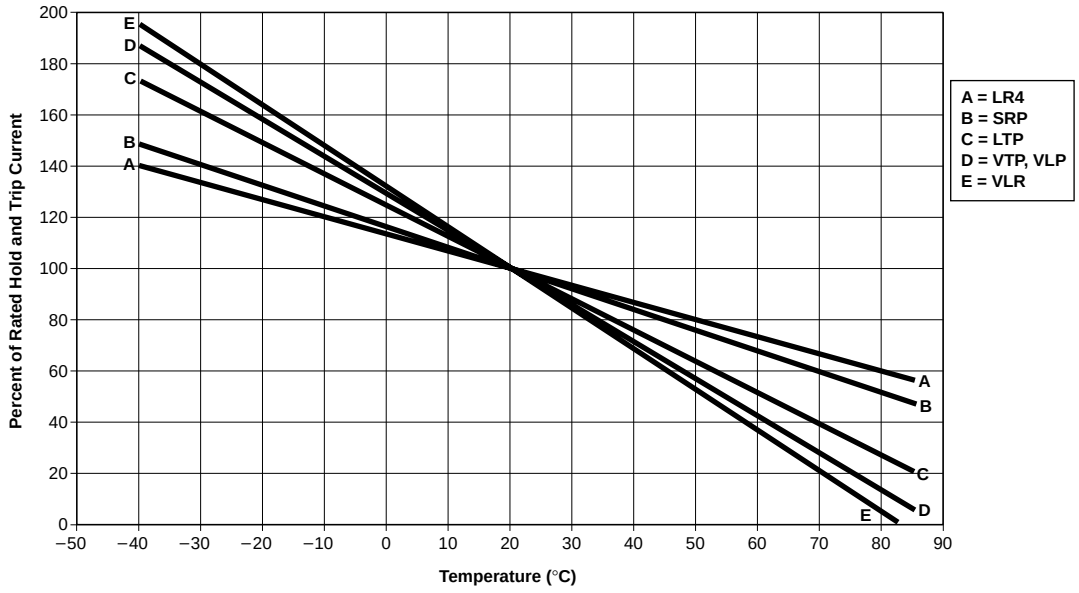


Table B3. Product Electrical Characteristics for Strap Battery Devices

Part Number		I_H (A)	I_T (A)	V_{MAX} (V_{DC})	I_{MAX} (A)	$P_{D\ TYP}$ (W)	Max. Time-to-Trip (A)	Max. Time-to-Trip (s)	R_{MIN} (Ω)	R_{TYP} (Ω)	R_{MAX} (Ω)	$R_{Tripped\ TYP}$ (Ω)	$R_{1\ MAX}$ (Ω)	Figures for Dimensions
85°C Typical Activation														
VLR														
VLR170	†	1.7	4.1	12	100	1.4	8.5	5.0	0.018	0.025	0.032	0.050	0.064	B5
VLR170U	†	1.7	4.1	12	100	1.4	8.5	5.0	0.018	0.025	0.032	0.050	0.064	B8
VLR175	†	1.75	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B5
VLR175L	†	1.75	4.2	12	100	1.4	8.75	5.0	0.017	0.024	0.031	0.048	0.062	B5
VLR230	†	2.3	5.0	12	100	1.4	10.0	5.0	0.012	0.015	0.018	0.030	0.036	B5
VLR230S	†	2.3	5.0	12	100	1.4	8.75	5.0	0.012	0.015	0.018	0.030	0.036	B6
VLR230SU	†	2.3	5.0	12	100	1.4	8.75	5.0	0.012	0.015	0.018	0.030	0.036	B6
VLR230U	†	2.3	5.0	12	100	1.4	8.75	5.0	0.012	0.015	0.018	0.030	0.036	B8
90°C Typical Activation														
VLP														
VLP210	†	2.1	5.0	16	60	0.8	10.5	5.0	0.018	0.024	0.030	0.048	0.060	B4
VLP220	†	2.1	5.3	16	60	0.8	11.0	5.0	0.017	0.023	0.029	0.046	0.058	B5
VLP270	†	2.7	6.5	16	60	1.2	13.5	5.0	0.012	0.015	0.018	0.030	0.036	B5
90°C Typical Activation														
VTP														
VTP110	†	1.1	2.7	16	100	0.7	7.0	5.0	0.038	0.054	0.070	0.108	0.140	B8
VTP170	†	1.7	3.4	16	100	1.0	8.5	3.0	0.030	0.041	0.052	0.082	0.105	B4
VTP170SS	†	1.7	3.4	16	100	1.0	8.5	3.0	0.030	0.041	0.052	0.082	0.105	B11
VTP170X	†	1.7	3.4	16	100	0.7	8.5	5.0	0.030	0.041	0.052	0.082	0.105	B5
VTP170XS	†	1.7	3.4	16	100	0.7	10.0	5.0	0.030	0.041	0.052	0.082	0.105	B6
VTP175	†	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B5
VTP175L	†	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B5
VTP175U	†	1.75	3.6	16	100	0.8	8.75	5.0	0.029	0.040	0.051	0.080	0.102	B8
VTP200G	†	2.0	4.7	16	100	0.9	10.0	5.0	0.022	0.031	0.039	0.062	0.078	B5
VTP200U	†	2.0	4.7	16	100	0.9	10.0	5.0	0.022	0.031	0.039	0.062	0.078	B8
VTP210G	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B5
VTP210L	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B5
VTP210S	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B6
VTP210SL	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B6
VTP210SL-19.2/5.8	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B6
VTP210SS	†	2.1	4.7	16	100	1.2	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B7
VTP210ULD	†	2.1	4.7	16	100	1.5	10.0	5.0	0.018	0.024	0.030	0.048	0.060	B8
VTP240	†	2.4	5.9	16	100	1.0	12.0	5.0	0.014	0.020	0.026	0.040	0.052	B5
110°C Typical Activation														
LTP														
LTP070		0.7	1.45	15	100	0.7	3.5	5.0	0.100	0.150	0.200	0.300	0.340	B9
LTP070S		0.7	1.45	15	100	0.7	3.5	5.0	0.100	0.150	0.200	0.300	0.340	B10
LTP100		1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B9
LTP100S		1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B10
LTP100SL		1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B10
LTP100SS		1.0	2.50	24	100	0.9	5.0	7.0	0.070	0.100	0.130	0.200	0.260	B11
LTP180		1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B9
LTP180L		1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B9
LTP180S		1.8	3.80	24	100	1.0	9.0	2.9	0.040	0.054	0.068	0.108	0.120	B10
LTP190		1.9	4.20	24	100	1.9	10.0	3.0	0.030	0.044	0.057	0.088	0.100	B9
LTP260		2.6	5.20	24	100	1.3	13.0	5.0	0.025	0.034	0.042	0.068	0.076	B9
LTP300		3.0	6.30	24	100	1.7	15.0	4.0	0.015	0.023	0.031	0.046	0.055	B9
LTP340		3.4	6.80	24	100	1.6	17.0	5.0	0.016	0.022	0.027	0.044	0.050	B9

Table B3. Product Electrical Characteristics for Strap Battery Devices *continued*

Part Number	I_H (A)	I_T (A)	V_{MAX} (VDC)	I_{MAX} (A)	$P_{D\ TYP}$ (W)	Max. Time-to-Trip (A)	Max. Time-to-Trip (s)	R_{MIN} (Ω)	R_{TYP} (Ω)	R_{MAX} (Ω)	$R_{Tripped\ TYP}$ (Ω)	$R_{1\ MAX}$ (Ω)	Figures for Dimensions
miniSMDE													
miniSMDE190	1.9	3.8	16	100	1.5	10.0	2.0	0.024	0.032	0.040	0.060	0.080*	B18
TAC													
TAC100-09	1.0	2.4	15	50	1.2	5.0	5.0	0.085	0.120	0.155	0.240	0.300	B12
125°C Typical Activation LR4													
LR4-170U	1.7	3.4	15	100	0.8	8.5	5.0	0.044	0.061	0.078	0.089	0.114	B15
LR4-190	1.9	3.9	15	100	0.8	9.5	5.0	0.039	0.056	0.072	0.079	0.102	B13
LR4-190S	1.9	3.9	15	100	0.8	9.5	5.0	0.039	0.056	0.072	0.079	0.102	B14
LR4-260	2.6	5.8	15	100	1.0	13.0	5.0	0.020	0.031	0.042	0.046	0.063	B13
LR4-260S	2.6	5.8	15	100	1.0	13.0	5.0	0.020	0.031	0.042	0.046	0.063	B14
LR4-380	3.8	8.3	15	100	1.2	19.0	5.0	0.013	0.020	0.026	0.028	0.037	B13
LR4-450	4.5	8.9	20	100	1.4	22.5	5.0	0.011	0.016	0.020	0.022	0.028	B13
LR4-550	5.5	10.5	20	100	2.0	27.5	5.0	0.009	0.013	0.016	0.018	0.022	B13
LR4-600	6.0	11.7	20	100	1.7	30.0	5.0	0.007	0.011	0.014	0.015	0.019	B13
LR4-730	7.3	14.1	20	100	1.9	30.0	5.0	0.006	0.009	0.012	0.011	0.015	B13
LR4-900	9.0	16.7	20	100	3.0	45.0	5.0	0.006	0.008	0.010	0.011	0.014	B13
SRP													
SRP120	1.2	2.7	15	100	0.8	6.0	5.0	0.085	0.123	0.160	0.170	0.220	B9
SRP120L	1.2	2.7	15	100	0.8	6.0	5.0	0.085	0.123	0.160	0.170	0.220	B9
SRP120S	1.2	2.7	15	100	0.8	6.0	5.0	0.085	0.123	0.160	0.170	0.220	B16
SRP175	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B9
SRP175L	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B9
SRP175S	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B16
SRP175SS	1.75	3.8	15	100	0.9	8.75	5.0	0.050	0.070	0.090	0.093	0.120	B17
SRP200	2.0	4.4	30	100	1.6	10.0	4.0	0.030	0.045	0.060	0.075	0.100	B9
SRP350	3.5	6.3	30	100	1.9	20.0	3.0	0.017	0.024	0.031	0.040	0.050	B9
SRP420	4.2	7.6	30	100	2.2	20.0	6.0	0.012	0.018	0.024	0.030	0.040	B9
TAC													
TAC170-09	1.7	3.7	15	50	1.2	8.5	5.0	0.05	0.074	0.098	0.106	0.140	B12
TAC210	2.1	4.7	15	50	1.3	10.5	5.0	0.035	0.049	0.062	0.089	0.113	B12

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 B4–B18. Physical Description for Dimensions

Figure B4

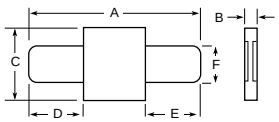


Figure B5

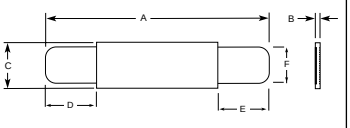


Figure B6

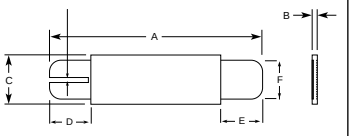


Figure B7

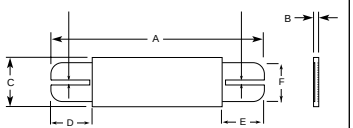


Figure B8

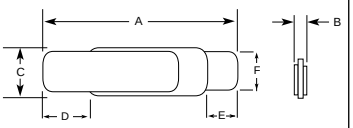


Figure B9

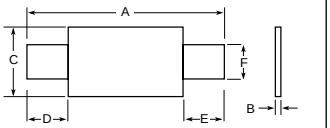


Figure B10

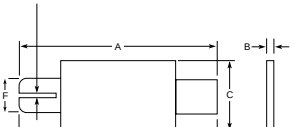


Figure B11

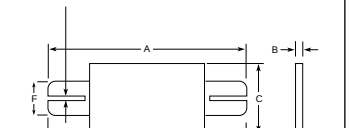


Figure B12

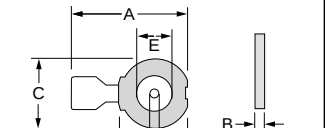


Figure B13

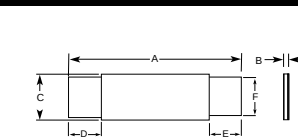


Figure B14

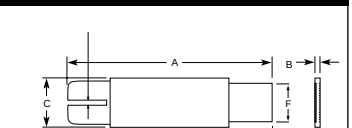


Figure B15

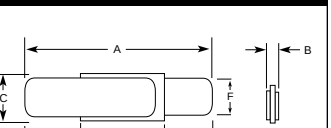


Figure B16

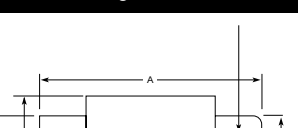


Figure B17

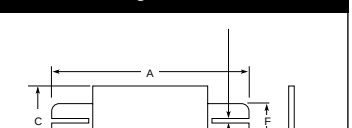
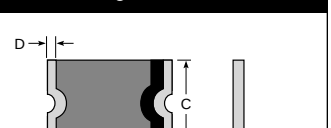


Figure B18



Note: All slit parts are 0.5mm x 4.0mm nom. (0.02 in x 0.16 in)

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

	Dimension												
	A		B		C		D		E		F		
Part Number	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Figures
85°C Typical Activation VLR													
VLR170	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)	B5 —
VLR170U	20.8 (0.82)	23.2 (0.91)	— —	0.7 (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)	B8 —
VLR175	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)	B5 —
VLR175L	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)	B5 —
VLR230	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)	B5 —
VLR230S	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)	B6 —
VLR230SU	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 —
VLR230U	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)	B8 —
90°C Typical Activation VLP													
VLP210	15.4 (0.606)	17.5 (0.689)	0.6 (0.02)	0.8 (0.03)	6.7 (0.265)	7.3 (.287)	4.0 (0.157)	6.2 (0.244)	4.0 (0.157)	6.2 (0.244)	3.9 (0.15)	4.1 (0.16)	B4 —
VLP220	21.1 (0.83)	23.3 (.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)	B5 —
VLP270	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 —
90°C Typical Activation VTP													
VTP110	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)	B8 —
VTP170	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)	B4 —
VTP170SS	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)	B11 —
VTP170X	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)	B5 —
VTP170XS	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)	B6 —
VTP175	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)	B5 —
VTP175L	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)	B5 —
VTP175U	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)	B8 —
VTP200G	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)	B5 —
VTP200U	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)	B8 —
VTP210G	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 —
VTP210L	24.0 (0.94)	26.0 (1.02)	0.6 (0.02)	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	5.0 (0.20)	7.1 (0.28)	5.0 (0.20)	7.1 (0.28)	3.9 (0.15)	4.1 (0.16)	B5 —

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

Part Number	Dimension A Min.	A Max.	B Min.	B Max.	C Min.	C Max.	D Min.	D Max.	E Min.	E Max.	F Min.	F Max.	Figures
90°C Typical Activation VTP, *continued*													
VTP210S	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 (0.28)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B6 —
VTP210SL	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)	B6 —
VTP210SL-19.2/5.8	34.0 (1.33)	37.0 (1.46)	— —	0.8 (0.03)	4.9 (0.19)	5.3 (0.21)	16.8 (0.66)	19.2 (0.76)	4.1 (0.16)	5.8 (0.23)	3.9 (0.15)	4.1 (0.16)	B6 —
VTP210SS	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)	B7 —
VTP210ULD	22.8 (0.89)	25.2 (1.00)	— —	0.8 (0.03)	4.9 (0.19)	5.1 (0.20)	7.8 (0.30)	9.2 (0.37)	2.9 (0.11)	4.1 (0.17)	2.9 (0.11)	3.1 (0.13)	B8 —
VTP240	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)	B5 —
110°C Typical Activation LTP													
LTP070	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)	B9 —
LTP070S	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)	B10 —
LTP100	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 —
LTP100S	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)	B10 —
LTP100SL	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)	B10 —
LTP100SS	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)	B11 —
LTP180	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)	B9 —
LTP180L	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)	B9 —
LTP180S	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)	B10 —
LTP190	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)	B9 —
LTP260	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)	B9 —
LTP300	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)	B9 —
LTP340	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)	B9 —
miniSMDE													
miniSMDE190	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)	— —	— —	— —	— —	B18 —
TAC													
TAC100-09	16.5 (0.65)	17.5 (0.69)	— —	0.9 (0.036)	9.5 (0.37)	10.5 (0.45)	9.4 (0.37)	10.0 (0.040)	5.0 (0.19)	5.2 (0.21)	0.8 (0.03)	1.2 (0.05)	B12 —

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

	Dimension												
	A		B		C		D		E		F		
Part Number	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Figures
125°C Typical Activation LR4													
LR4-170U	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)	B15 —
LR4-190	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)	B13 —
LR4-190S	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)	B14 —
LR4-260	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)	B13 —
LR4-260S	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)	B14 —
LR4-380	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)	B13 —
LR4-450	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)	B13 —
LR4-550	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)	B13 —
LR4-600	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)	B13 —
LR4-730	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)	B13 —
LR4-900	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)	B13 —
SRP													
SRP120	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)	B9 —
SRP120L	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)	B9 —
SRP120S	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)	B16 —
SRP175	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 —
SRP175L	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)	B9 —
SRP175S	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)	B16 —
SRP175SS	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)	B17 —
SRP200	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)	B9 —
SRP350	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)	B9 —
SRP420	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)	B9 —
TAC													
TAC170-09	16.5 (0.65)	17.5 (0.69)	— —	0.9 (0.036)	9.5 (0.37)	10.5 (0.42)	9.4 (0.37)	10.0 (0.40)	5.0 (0.19)	5.2 (0.21)	0.8 (0.03)	1.2 (0.05)	B12 —
TAC210	16.5 (0.65)	17.5 (0.69)	— —	0.9 (0.036)	9.5 (0.37)	10.5 (0.42)	9.4 (0.37)	10.0 (0.40)	5.0 (0.19)	5.2 (0.21)	0.8 (0.03)	1.2 (0.05)	B12 —

Figures B19–B25. Typical Time-to-trip Curves at 20˚C for Strap Battery Devices

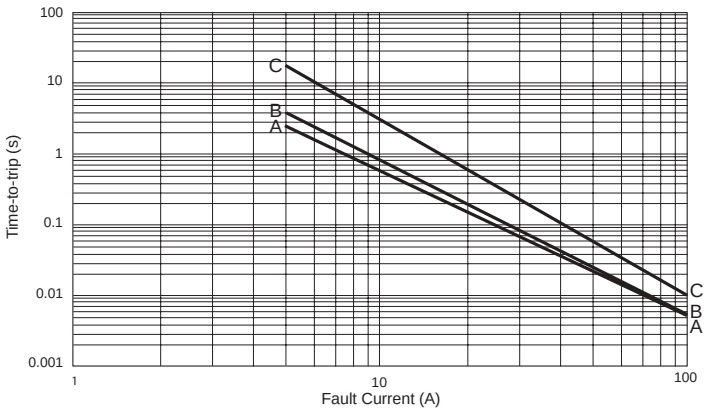
VLR (data at 25°C)

A = VLR170

B = VLR175

C = VLR230

Figure B19



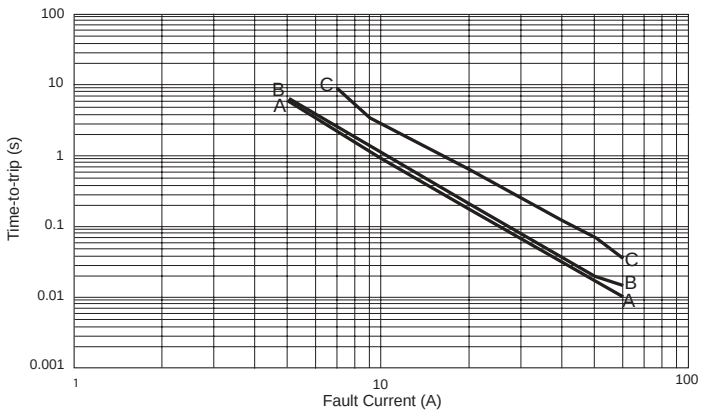
VLP (data at 25°C)

A = VLP210

B = VLP220

C = VLP270

Figure B20



VTP (data at 25°C)

A = VTP170

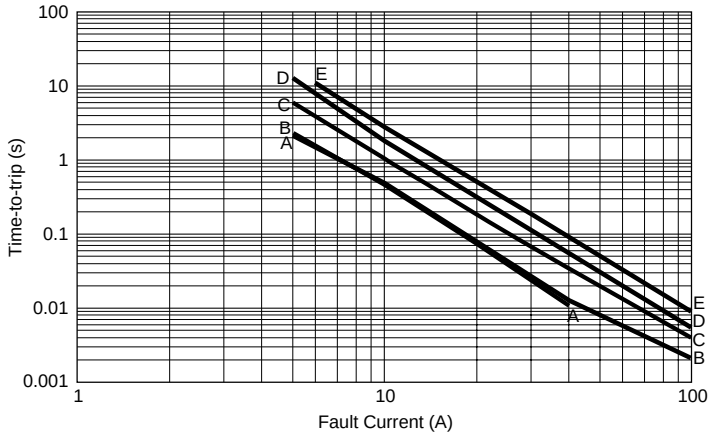
B = VTP175

C = VTP200

D = VTP210G

E = VTP240

Figure B21



Figures B19–B25. Typical Time-to-trip Curves at 20˚C for Strap Battery Devices *continued*

LTP

A = LTP070

B = LTP100

C = LTP180

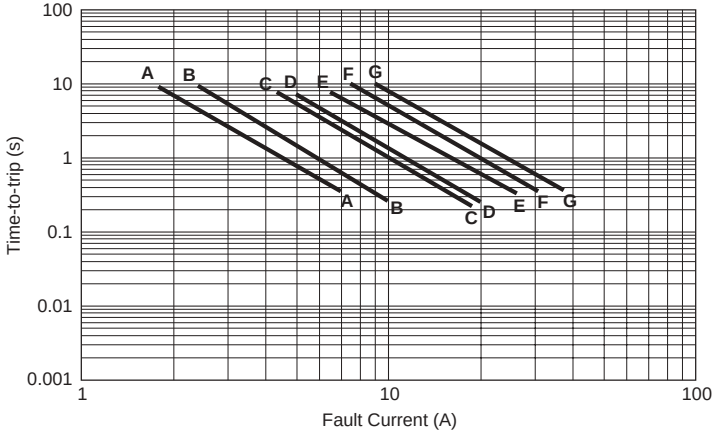
D = LTP190

E = LTP260

F = LTP300

G = LTP340

Figure B22



LR4

A = LR4-170U

B = LR4-190

C = LR4-260

D = LR4-380

E = LR4-450

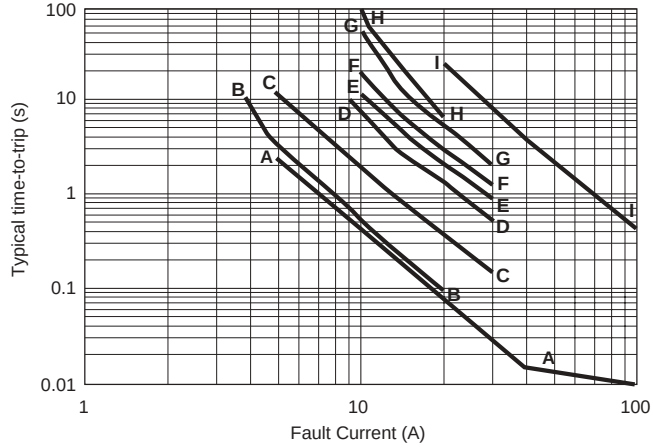
F = LR4-550

G = LR4-600

H = LR4-730

I = LR4-900

Figure B23



SRP

A = SRP120

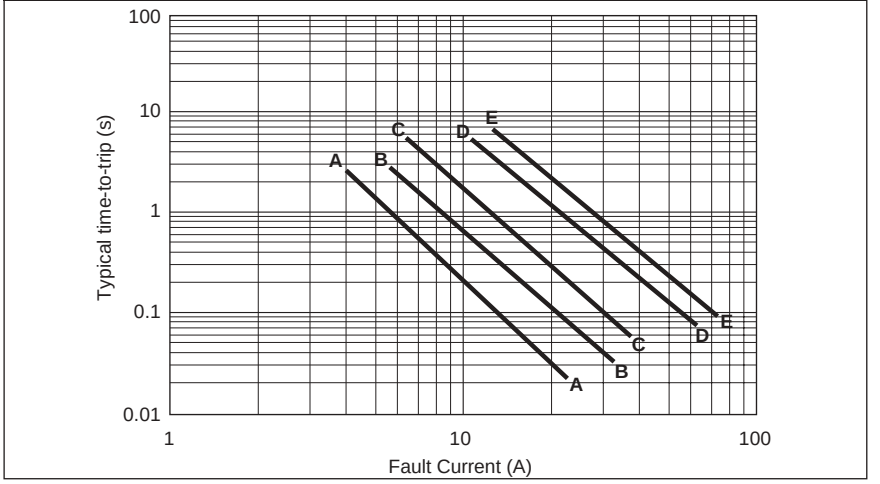
B = SRP175

C = SRP200

D = SRP350

E = SRP420

Figure B24



4

TAC & miniSMDE

A = TAC100-09

B = TAC170-09

C = TAC210

D = miniSMDE190

Figure B25

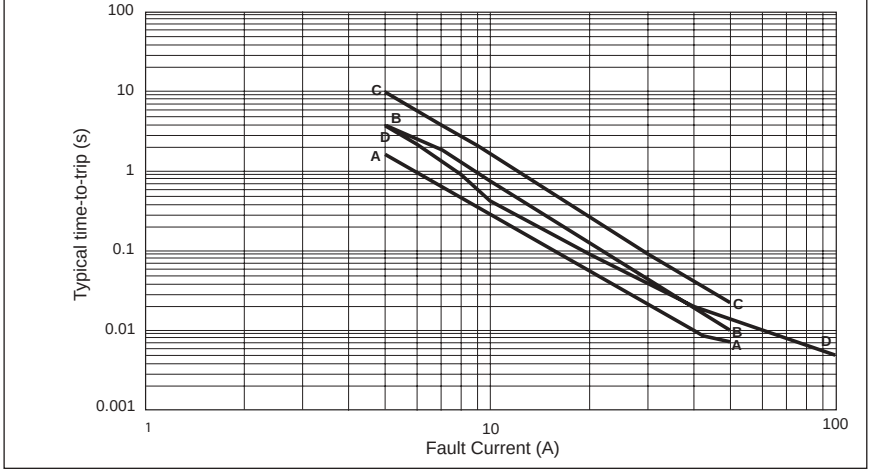


Table B5. Physical Characteristics and Environmental Specifications for Strap Battery Devices

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

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

Table B5. Physical Characteristics and Environmental Specifications for Strap Battery Devices *continued*

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

TAC
Physical Characteristics

Lead material	0.15mm nominal thickness, nickel-plated steel
Molding material	liquid crystal polymer

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-883D, Method 2026	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 $R_{1\ MAX}$
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
85°C Typical Activation—VLR					
VLR170	1,000	—	10,000	R17	UL, CSA,TÜV
VLR170U	1,000	—	10,000	—	UL, CSA,TÜV
VLR175	1,000	—	10,000	R1X	UL
VLR175L	1,000	—	10,000	R1X	UL
VLR230	1,000	—	10,000	R23	UL, CSA,TÜV
VLR230S	1,000	—	10,000	R23	UL, CSA,TÜV
VLR230SU	1,000	—	10,000	—	UL, CSA,TÜV
VLR230U	1,000	—	10,000	—	UL, CSA,TÜV
90°C Typical Activation—VLP					
VLP210	1,000	—	10,000	W21	UL, CSA, TÜV
VLP220	1,000	—	10,000	W22	UL, CSA, TÜV
VLP270	1,000	—	10,000	W27	UL, CSA, TÜV
90°C Typical Activation—VTP					
VTP110	1,000	—	10,000	—	UL, CSA, TÜV
VTP170	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170SS	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170X	1,000	—	10,000	V17	UL, CSA, TÜV
VTP170XS	1,000	—	10,000	V17	UL, CSA, TÜV
VTP175	1,000	—	10,000	V1X	UL, CSA, TÜV
VTP175U	1,000	—	10,000	—	UL, CSA, TÜV
VTP175L	1,000	—	10,000	V1X	UL, CSA, TÜV
VTP200G	1,000	—	10,000	V20	UL, CSA, TÜV
VTP200U	1,000	—	10,000	—	UL, CSA, TÜV
VTP210G	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210G-2	—	5,000	25,000	V21	UL, CSA, TÜV
VTP210L	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210L-2	—	5,000	25,000	V21	UL, CSA, TÜV
VTP210S	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210S-2	—	5,000	25,000	V21	UL, CSA, TÜV
VTP210SL	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210SL-2	—	4,000	20,000	V21	UL, CSA, TÜV
VTP210SL-19.2/5.8	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210SL-19.2/5.8-2	—	4,000	20,000	V21	UL, CSA, TÜV
VTP210SS	1,000	—	10,000	V21	UL, CSA, TÜV
VTP210ULD	1,000	—	10,000	—	UL, CSA, TÜV
VTP240	1,000	—	10,000	V24	UL, CSA, TÜV
110°C Typical Activation—LTP, TAC, miniSMDE					
LTP070	2,000	—	10,000	L07	UL, CSA, TÜV
LTP070S	2,000	—	10,000	L07	UL, CSA, TÜV
LTP100	2,000	—	10,000	L10	UL, CSA, TÜV
LTP100S	2,000	—	10,000	L10	UL, CSA, TÜV
LTP100S-2	—	4,000	20,000	L10	UL, CSA, TÜV
LTP100SL	2,000	—	40,000	L10	UL, CSA, TÜV
LTP100SL-2	—	2,000	10,000	L10	UL, CSA, TÜV
LTP100SS	2,000	—	10,000	L10	UL, CSA, TÜV
LTP180	2,000	—	10,000	L18	UL, CSA, TÜV
LTP180L	500	—	10,000	L18	UL, CSA, TÜV
LTP180L-2	—	2,000	10,000	L18	UL, CSA, TÜV
LTP180S	2,000	—	10,000	L18	UL, CSA, TÜV
LTP180S-2	—	2,000	10,000	L18	UL, CSA, TÜV
LTP190	500	—	10,000	L19	UL, CSA, TÜV

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

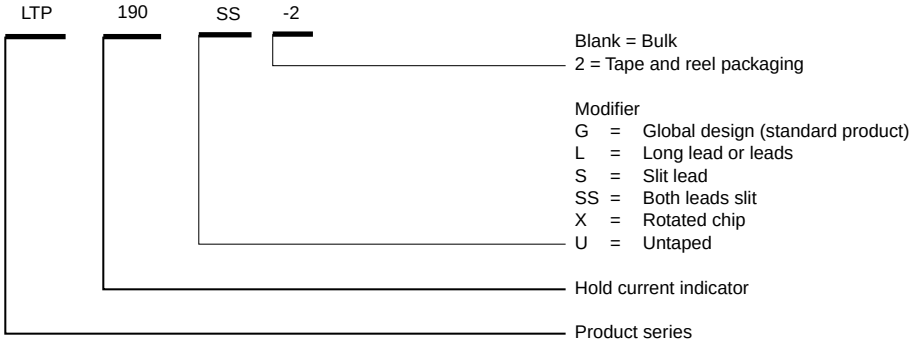
Part Number	Bag Quantity	Tape & Reel Quantity	Standard Package	Part Marking	Agency Recognition
110°C Typical Activation—LTP, TAC, miniSMDE, *continued*					
LTP260	1,000	—	10,000	L26	UL, CSA, TÜV
LTP260-2	—	2,000	10,000	L26	UL, CSA, TÜV
LTP300	500	—	10,000	L30	UL, CSA, TÜV
LTP340	500	—	10,000	L34	UL, CSA, TÜV
miniSMDE190-2	—	5,000	5,000	19	UL, CSA, TÜV
TAC100-09	2,000	—	10,000	Blue*	UL
120°C Typical Activation—LR4, SRP, TAC					
LR4-170U	2,000	—	10,000	NA	UL, CSA, TÜV
LR4-190	2,000	—	10,000	E19	UL, CSA, TÜV
LR4-190S	2,000	—	10,000	E19	UL, CSA, TÜV
LR4-190S-2	—	4,000	20,000	E19	UL, CSA, TÜV
LR4-260	1,000	—	10,000	E26	UL, CSA, TÜV
LR4-260S	1,000	—	10,000	E26	UL, CSA, TÜV
LR4-380	1,000	—	10,000	E38	UL, CSA, TÜV
LR4-450	1,000	—	10,000	E45	UL, CSA, TÜV
LR4-550	1,000	—	10,000	E55	UL, CSA, TÜV
LR4-600	1,000	—	10,000	E60	UL, CSA, TÜV
LR4-730	1,000	—	10,000	E73	UL, CSA, TÜV
LR4-900	500	—	10,000	E90	UL; (CSA and TÜV pending)
SRP120	2,000	—	10,000	120	UL, CSA, TÜV
SRP120L	1,000	—	10,000	120	UL, CSA, TÜV
SRP120S	2,000	—	10,000	120	UL, CSA, TÜV
SRP175	2,000	—	10,000	175	UL, CSA, TÜV
SRP175-2	—	2,000	10,000	175	UL, CSA, TÜV
SRP175L	1,000	—	10,000	175	UL, CSA, TÜV
SRP175S	2,000	—	10,000	175	UL, CSA, TÜV
SRP175SS	2,000	—	10,000	175	UL, CSA, TÜV
SRP200	500	—	10,000	200	UL, CSA, TÜV
SRP200-2	—	4,000	20,000	200	UL, CSA, TÜV
SRP350	500	—	10,000	350	UL, CSA, TÜV
SRP420	500	—	10,000	420	UL, CSA, TÜV
TAC170-09	2,000	—	10,000	Black*	UL, CSA
TAC210	2,000	—	10,000	White*	UL, CSA, TÜV
TAC210-2	—	4,000	20,000	White*	UL, CSA, TÜV

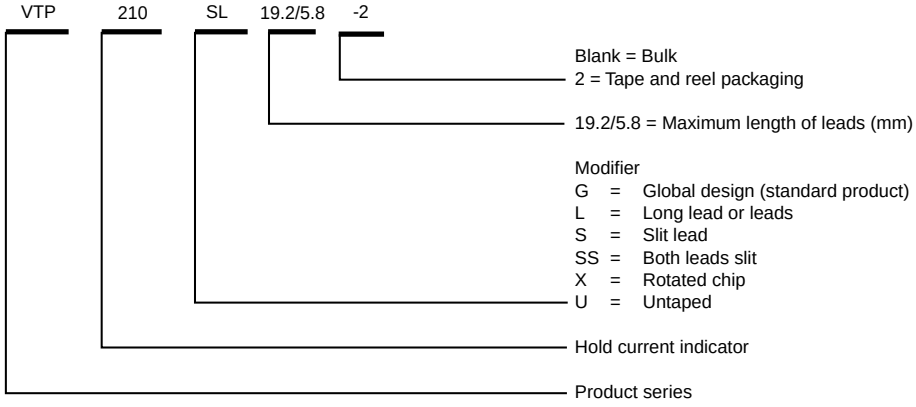
*Color indicated is mold ring material color.

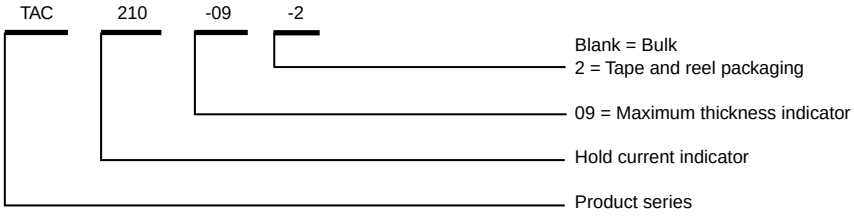
Agency Recognition for Strap Battery Devices

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

Part Numbering System for Strap Battery Devices







Note: Tape and reel packaging not available for all devices. Contact your local Raychem Circuit Protection representative for additional information.

Table B7. Tape and Reel Specifications for TAC Series Devices (in Millimeters)

Description	Mark	Dimensions (mm)	Tolerance (mm)
Carrier tape width	A	24.0	±0.5
Sprocket hole pitch	F	4.0	±0.10
Embossed cavity pitch	D	12.0	±0.10
Ordinate to embossed cavity center	E	2.0	±0.2
Embossed cavity length (inside)	—	17.5	—
Embossed cavity width (inside)	—	10.4	—
Embossed cavity length (outside)	—	17.6	—
Sprocket hole diameter	G	1.55	±0.05
Abscissa to embossed cavity center	—	11.5	±0.15
Sprocket hole location	C	1.75	±0.15
Carrier tape thickness	—	0.3	±0.05
Cover tape thickness	—	0.055	—
Embossed cavity depth (inside)	—	1.35	±0.1
Leader min.	—	800	—
Trailer min.	—	800	—
Reel diameter	a	420	±2
Hub diameter	n	80	±1
Reel width measured at inside hub	W_1	24.4	+2, –0
Reel width measured at outside hub	W_2	30.4	+3, –1

4

Figure B26. Taped Component Dimensions for TAC Series

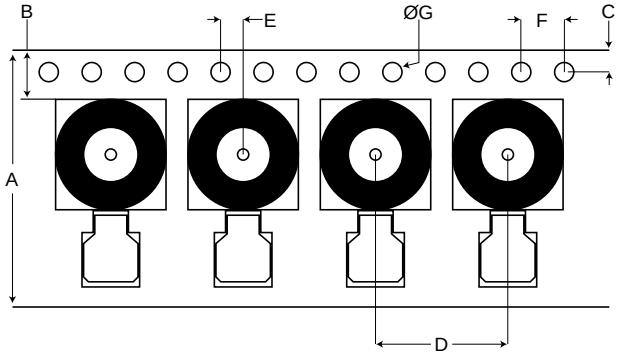


Figure B27. Reel Dimensions for TAC Series

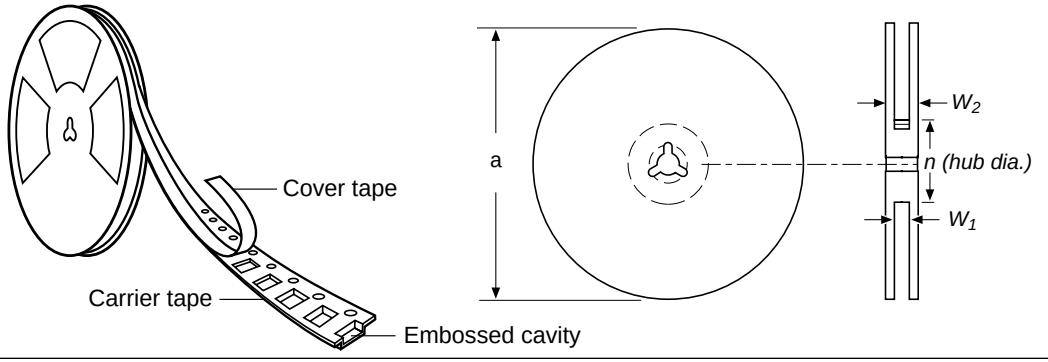
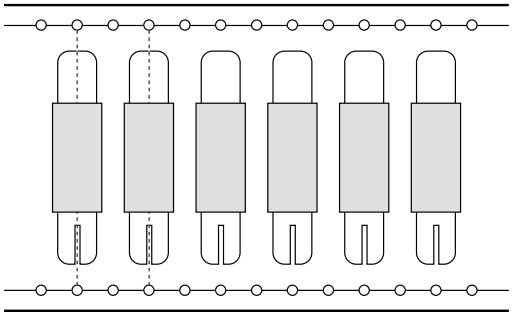


Figure B28. Typical Taped Component Layout for Strap Battery Products



Note: Contact your local Raychem Circuit Protection representative for dimensions and availabilty.

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 PPTC 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 PPTC chip 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 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 PPTC device to exhibit its specified performance, weld placement should be a minimum of 2mm from the edge of the PPTC chip, weld splatter must not touch the PPTC chip, and welding conditions must not heat the PPTC device above its maximum operating temperature.
- PPTC 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 indentification purposes only, not for electrical insulation.

Latest Information

- Please visit us at www.circuitprotection.com or contact your local representative for the latest information.
- The information in this Databook may contain some preliminary information. Raychem Circuit Protection, a divsion of Tyco Electronics, reserves the right to change any of the specifications without notice. In addition, Tyco Electronics reserves the right to make changes—without notification to Buyer—to materials or processing that do not affect compliance with any applicable specification.

⚠ 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 recommendated 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.