

**Description**

The 250R Series is designed to protect against short duration high voltage fault currents (power cross or power induction surge) typically found in telecom applications (250Vrms). The series can be used to help telecom networking equipment meet the protection requirements specified in ITU K.20 and K.21.

**Features**

- 0.08 – 0.18 hold current range, 60VDC operating voltage
- 250VAC interrupt rating
- Fast time-to-trip
- Binned and sorted narrow resistance ranges available
- RoHS compliant, Lead-Free and Halogen-Free\*

**Agency Approvals**

AGENCY      AGENCY FILE NUMBER



E183209



R50120008

**Applications**

- Customer Premises Equipment (CPE)
- Central Office (CO)/telecom centers
- LAN/WAN equipment
- Access equipment

**Electrical Characteristics**

Part Number	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> V <sub>int</sub> / V <sub>op</sub>	I <sub>max</sub> (A)	P <sub>d</sub> typ. (W)	Maximum Time To Trip		Resistance			Agency Approvals	
						Current (A)	Time (Sec.)	R <sub>min</sub> (Ω)	R <sub>typ</sub> (Ω)	R <sub>1max</sub> (Ω)	cRU <sup>us</sup>	TÜV
250R080	0.08	0.16	250/60	3	1	0.35	3	14	22	33	X	X
250R080T	0.08	0.16	250/60	3	1	0.35	3	15	22	33	X	X
250R120	0.12	0.24	250/60	3	1	1	1.5	4	8	16	X	X
250R120-RA	0.12	0.24	250/60	3	1	1	1.0	7	9	16	X	X
250R120-RC	0.12	0.24	250/60	3	1	1	0.85	5.4	7.5	14	X	X
250R120-RF	0.12	0.24	250/60	3	1	1	0.7	6	10.5	16	X	X
250R120-R1	0.12	0.24	250/60	3	1	1	0.8	6	9	16	X	X
250R120-R2	0.12	0.24	250/60	3	1	1	0.7	8	10.5	16	X	X
250R120-R3	0.12	0.24	250/60	3	1	1	1	8	10	16	X	X
250R120T	0.12	0.24	250/60	3	1	1	1.2	7	12	16	X	X
250R145	0.145	0.29	250/60	3	1	1	2.5	3	6	14	X	X
250R145-RA	0.145	0.29	250/60	3	1	1	5	3	5.5	12	X	X
250R145-RB	0.145	0.29	250/60	3	1	1	2.5	4.5	6	14	X	X
250R145T	0.145	0.29	250/60	3	1	1	2.0	5.4	7.5	14	X	X
250R180	0.18	0.65	250/60	10	1.8	1	21	0.8	2.2	4	X	X
250R180T	0.18	0.65	250/60	10	1.8	1	20	1.4	3.9	4.5	X	X

Items with T at end of part number = pre-tripped device. See Part Ordering Number System section of this data sheet for additional information.

I<sub>hold</sub> = Hold current: maximum current device will pass without tripping in 23°C still air.

I<sub>trip</sub> = Trip current: minimum current at which the device will trip in 23°C still air.

V<sub>int</sub> = Maximum voltage the device can withstand without damage at rated current (I<sub>max</sub>)

V<sub>op</sub> = The device regular operation voltage

I<sub>max</sub> = Maximum fault current device can withstand without damage at rated voltage (V<sub>max</sub>)

P<sub>d</sub> = Power dissipated from device when in the tripped state at 23°C still air.

R<sub>min</sub> = Minimum resistance of device in initial (un-soldered) state.

R<sub>typ</sub> = Typical resistance of device in initial (un-soldered) state.

R<sub>1max</sub> = Maximum resistance of device at 20°C measured one hour after tripping.

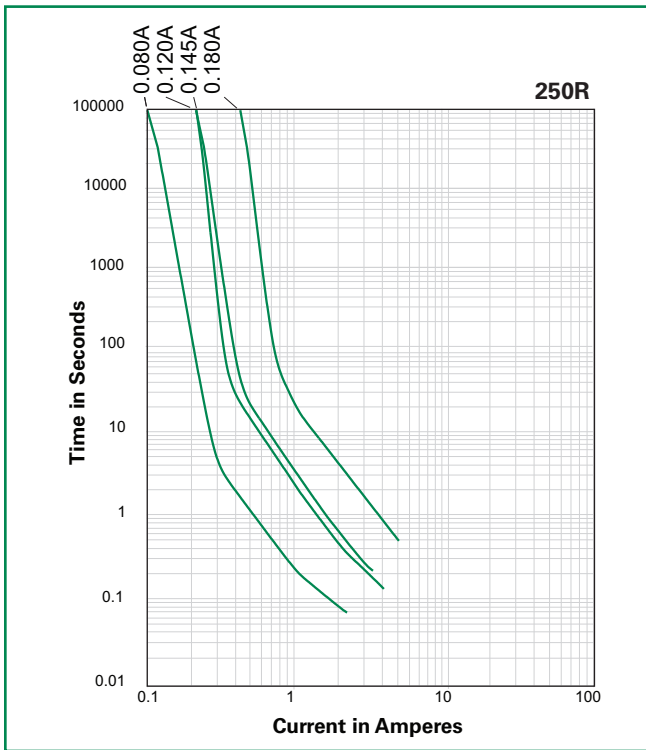
**Caution:** Operation beyond the specified rating may result in damage and possible arcing and flame.

\* Effective January 1, 2010, all 250R PTC products will be manufactured Halogen Free (HF). Existing Non-Halogen Free 250R PTC products may continue to be sold, until supplies are depleted.

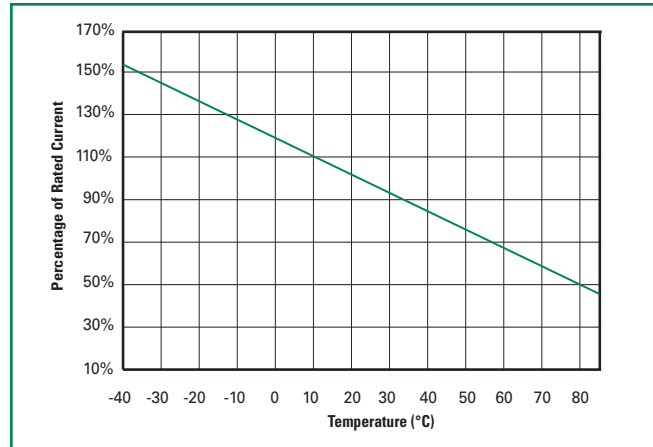
**Temperature Rerating**

Part Number	Ambient Operation Temperature								
	-40°C	-20°C	0°C	23°C	40°C	50°C	60°C	70°C	85°C
250R080	0.12	0.11	0.09	0.08	0.06	0.05	0.05	0.04	0.03
250R080T	0.12	0.11	0.09	0.08	0.06	0.05	0.05	0.04	0.03
250R120	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.06	0.05
250R120T	0.18	0.16	0.14	0.12	0.10	0.09	0.08	0.06	0.05
250R145	0.26	0.20	0.17	0.145	0.12	0.11	0.09	0.08	0.06
250R145T	0.26	0.20	0.17	0.145	0.12	0.11	0.09	0.08	0.06
250R180	0.28	0.23	0.21	0.18	0.16	0.13	0.10	0.11	0.083
250R180T	0.28	0.23	0.21	0.18	0.16	0.13	0.10	0.11	0.083

**Average Time Current Curves**



**Temperature Rerating Curve**



The average time current curves and Temperature Rerating curve performance is affected by a number of variables, and these curves provided as guidance only. Customer must verify the performance in their application.

**Agency Specification Selection Guide For Telecom and Networking Applications**

Product	Lightning	Power Cross
250R120	ITU K.20/21/45 – 1.5kV 10/700µs	ITU K.20/21/45 – 230Vac, 10Ω
250R145	ITU K.20/21/45 – 4kV 10/700µs*	ITU K.20/21/45 – 600Vac, 600Ω
250R180	ITU K.20/21/45 – 1.5kV 10/700µs ITU K.20/21/45 – 4kV 10/700µs* Telcordia GR – 974 – 1.0kV 10/1000µs	ITU K.20/21/45 – 230Vac, 10Ω ITU K.20/21/45 – 600Vac, 600Ω Telcordia GR – 974- 283Vac, 10A

\*Devices should be independently evaluated and tested for use in any specific application

**Protection Application Guide**

Region/Specification	Application	Device Selection
South America/Asia/Europe ITU K.45	*Access network equipment Remote terminal Repeaters WAN equipment Cross –connect	250R180
		250R180T
		250R145
		250R145T
		250R120
		250R120T
South America/Asia/Europe ITU K.21	Customer and IT equipment Analog modems ADSL, xDSL Phone sets, PBX systems Internet appliances POS terminals	250R180
		250R180T
		250R145
		250R145T
		250R120
		250R120T
South America/Asia/Europe ITU K.20	Central Office POTS/ISDN linecards T1/E1/J1 linecards ADSL/VDSL splitters CSU/DSU	250R180
		250R180T
		250R145
		250R145T
		250R120
		250R120T
North America Telcordia GR-974	*Primary protection modules MDF modules Network interface	250R180
South America/Asia/Europe ITU K.20		250R180T
		250R145
		250R145T
		250R120
		250R120T
North America Telcordia GR-1089	*Intrabuilding communication systems LAN, VOIP cards Local loop handsets	250R180
South America/Asia/Europe ITU K.20 and K.21		250R180T
		250R145
		250R145T
		250R120
		250R120T
	LAN Intrabuilding power cross Protection LAN equipment, IP phone	250R080

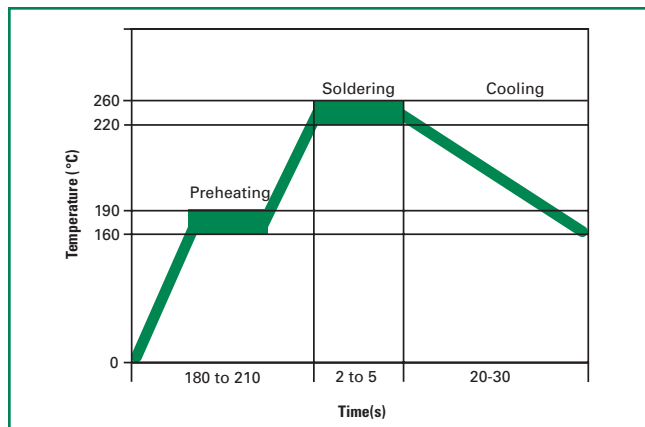
\*Resistance binned parts are recommended

### Soldering Parameters - Wave Soldering

Condition	Wave Soldering
Peak Temp/ DurationTime	260°C ≤ 5 Sec
≥ 220°C	2 Sec ~ 20 Sec
Preheat 140°C ~ 180°C	180 Sec ~ 210 Sec
Storage Condition	0°C~35°C ≤ 70%RH

- Recommended soldering methods: heat element oven or N<sub>2</sub> environment for lead-free.
- Devices are designed to be wave soldered to the bottom side of the board.
- Devices can be cleaned using standard industry methods and solvents.
- This profile can be used for lead-free device

**Note:** If soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

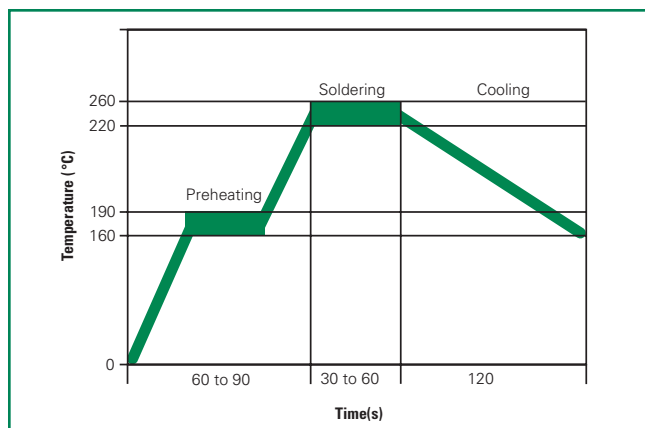


### Soldering Parameters - Solder Reflow

Condition	Reflow
Peak Temp/ DurationTime	260°C ≥ 5 Sec
≥ 220°C	30 Sec ~ 60 Sec
Preheat 160°C ~ 190°C	60 Sec ~ 90 Sec
Storage Condition	0°C~35°C, ≤ 70%RH

- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead-free.
- Devices are not designed to be wave soldered to the bottom side of the board.
- Devices can be cleaned using standard industry methods and solvents.

**Note:** If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements.



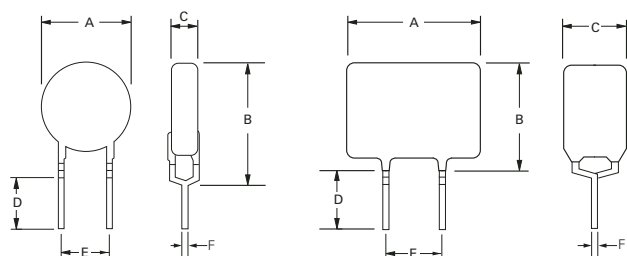
### Physical Specifications

<b>Lead Material</b>	Tin-plated Copper
<b>Soldering Characteristics</b>	Solderability per MIL-STD-202, Method 208E
<b>Insulating Material</b>	Cured, flame retardant epoxy polymer meets UL94V-0 requirements.
<b>Device Labeling</b>	Marked with 'LF', voltage, current rating, and date code.

### Environmental Specifications

<b>Operating/Storage Temperature</b>	-40°C to +85°C
<b>Maximum Device Surface Temperature in Tripped State</b>	125°C
<b>Passive Aging</b>	65°C/85°C, 1000 hours
<b>Humidity Aging</b>	+85°C, 85% R.H., 1000 hours
<b>Thermal Shock</b>	MIL-STD-202F, Method 107G +125°C to -55°C 10 times
<b>Solvent Resistance</b>	MIL-STD-202, Method 215F
<b>Moisture Sensitivity Level</b>	Level 1, J-STD-020C

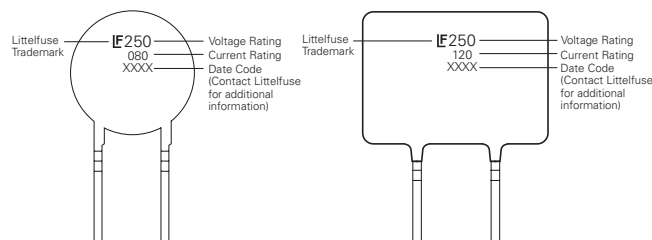
**Dimensions**



**Figure 1**

**Figure 2**

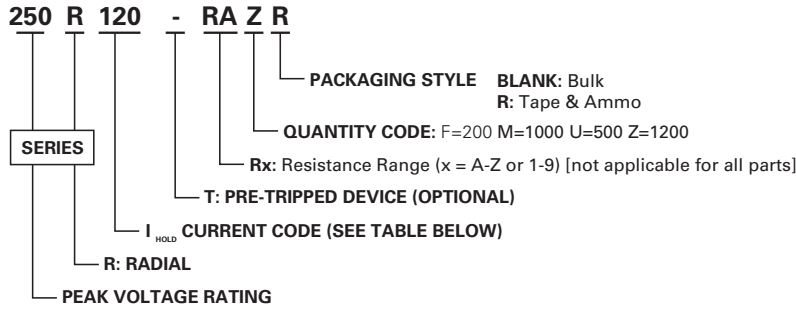
**Part Marking System**



Part Number	Figure	A		B		C		D		E		Physical Characteristics		
		Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Lead (dia)		Material
		Max.	Max.	Max.	Max.	Max.	Max.	Min.	Min.	Typ.	Typ.	Inches	mm	
250R080	1	0.23	5.8	0.39	9.9	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R080T	1	0.23	5.8	0.39	9.9	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120	2	0.26	6.5	0.43	11	0.15	3.8	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-RA	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-RC	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-RF	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-R1	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-R2	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120-R3	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R120T	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R145	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R145-RA	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R145-RB	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R145T	2	0.26	6.5	0.43	11	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R180	1	0.37	9.5	0.47	12	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
250R180T	1	0.37	9.5	0.47	12	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu

**250R Series**

**Part Ordering Number System**



**Packaging**

Part Number	Ordering Number	I <sub>hold</sub> (A)	I <sub>hold</sub> Code	Packaging Option	Quantity	Quantity & Packaging Codes
250R080	250R080U	0.080	080	Bulk	500	U
	250R080ZR			Tape and Ammo	1200	ZR
250R080T	250R080TU	0.080	080	Bulk	500	U
	250R080TZR			Tape and Ammo	1200	ZR
250R120	250R120U	0.120	120	Bulk	500	U
	250R120ZR			Tape and Ammo	1200	ZR
250R120-RA	250R120-RAU	0.120	120	Bulk	500	U
	250R120-RAZR			Tape and Ammo	1200	ZR
250R120-RC	250R120-RCU	0.120	120	Bulk	500	U
	250R120-RCZR			Tape and Ammo	1200	ZR
250R120-RF	250R120-RFU	0.120	120	Bulk	500	U
	250R120-RFZR			Tape and Ammo	1200	ZR
250R120-R1	250R120-R1U	0.120	120	Bulk	500	U
	250R120-R1ZR			Tape and Ammo	1200	ZR
250R120-R2	250R120-R2U	0.120	120	Bulk	500	U
	250R120-R2ZR			Tape and Ammo	1200	ZR
250R120-R3	250R120-R3U	0.120	120	Bulk	500	U
	250R120-R3ZR			Tape and Ammo	1200	ZR
250R120T	250R120TU	0.120	120	Bulk	500	U
	250R120TZR			Tape and Ammo	1200	ZR
250R145	250R145U	0.145	145	Bulk	500	U
	250R145ZR			Tape and Ammo	1200	ZR
250R145-RA	250R145-RAU	0.145	145	Bulk	500	U
	250R145-RAZR			Tape and Ammo	1200	ZR
250R145-RB	250R145-RBU	0.145	145	Bulk	500	U
	250R145-RBZR			Tape and Ammo	1200	ZR
250R145T	250R145TU	0.145	145	Bulk	500	U
	250R145TZR			Tape and Ammo	1200	ZR
250R180	250R180F	0.180	180	Bulk	200	F
	250R180MR			Tape and Ammo	1000	MR
250R180T	250R180TF	0.180	180	Bulk	200	F
	250R180TMR			Tape and Ammo	1000	MR

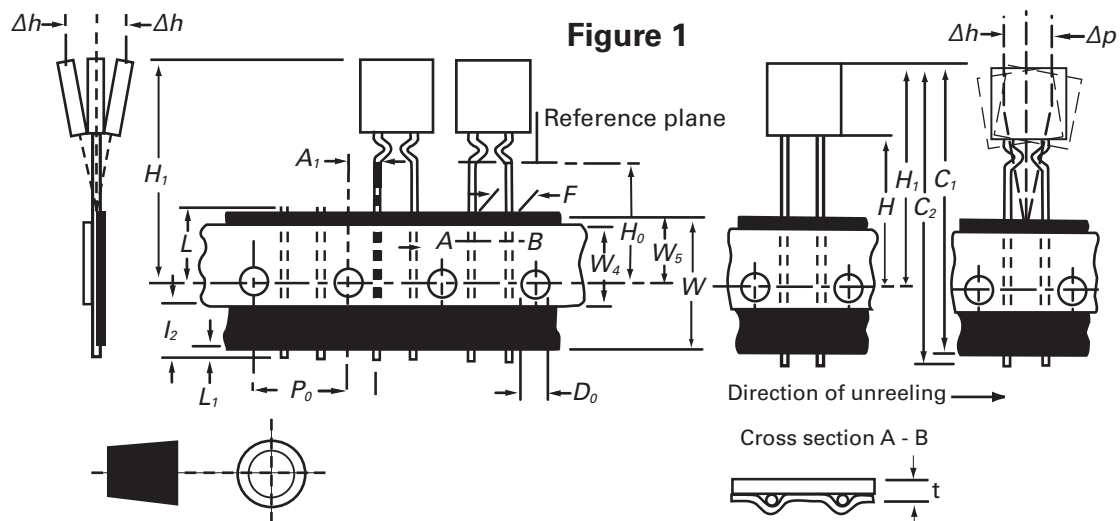
**Tape and Ammo Specifications**

Devices taped using EIA468-B/IE286-2 standards. See table below and Figure 1 for details.

Dimension	EIA Mark	IEC Mark	Dimensions	
			Dim. (mm)	Tol. (mm)
Carrier tape width	<b>W</b>	<b>W</b>	18	-0.5 / +1.0
Hold down tape width	<b>W<sub>4</sub></b>	<b>W<sub>0</sub></b>	11	min.
Top distance between tape edges	<b>W<sub>6</sub></b>	<b>W<sub>2</sub></b>	3	max.
Sprocket hole position	<b>W<sub>5</sub></b>	<b>W<sub>1</sub></b>	9	-0.5 / +0.75
Sprocket hole diameter*	<b>D<sub>0</sub></b>	<b>D<sub>0</sub></b>	4	-0.32 / +0.2
Abscissa to plane (straight lead)	<b>H</b>	<b>H</b>	18.5	-/+ 3.0
Abscissa to plane (kinked lead)	<b>H<sub>0</sub></b>	<b>H<sub>0</sub></b>	16	-/+ 0.5
Abscissa to top	<b>H<sub>1</sub></b>	<b>H<sub>1</sub></b>	32.2	max.
Overall width without lead protrusion	<b>C<sub>1</sub></b>		42.5	max.
Overall width with lead protrusion	<b>C<sub>2</sub></b>		43.2	max.
Lead protrusion	<b>L<sub>1</sub></b>	<b>I<sub>1</sub></b>	1.0	max.
Protrusion of cut out	<b>L</b>	<b>L</b>	11	max.
Protrusion beyond hold-down tape	<b>I<sub>2</sub></b>	<b>I<sub>2</sub></b>	Not specified	
Sprocket hole pitch: 250R080-250R145	<b>P<sub>0</sub></b>	<b>P<sub>0</sub></b>	12.7	-/+ 0.3
Sprocket hole pitch: 250R180	<b>P<sub>0</sub></b>	<b>P<sub>0</sub></b>	25.4	-/+ 0.5
Pitch tolerance			20 consecutive.	-/+ 1
Device pitch: 250R080-250R145			12.7	
Device pitch: 250R180			25.4	
Tape thickness	<b>t</b>	<b>t</b>	0.9	max.
Tape thickness with splice	<b>t<sub>1</sub></b>		2.0	max.
Splice sprocket hole alignment			0	-/+ 0.3
Body lateral deviation	<b>Δh</b>	<b>Δh</b>	0	-/+ 1.0
Body tape plane deviation	<b>Δp</b>	<b>Δp</b>	0	-/+ 1.3
Ordinate to adjacent component lead*	<b>P<sub>1</sub></b>	<b>P<sub>1</sub></b>	3.81	-/+ 0.7
Lead spacing	<b>F</b>	<b>F</b>	5.1	-/+ 0.7

\*Differs from EIA Specification

**Tape and Ammo Diagram**



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