



**RLD 60XF Series PTC Devices**

## RLD 60XF Series PTC Devices

### Description

The 60XF 0.1A to 3.75A. This series is suitable for applications with higher holding current and higher working voltage up to 60V.

### Features





- RoHS2.0 compliant and lead-free
- Halogen-free
- High voltage
- Low profile
- Fast response to fault current
- Compatible with high temperature solders





### Applications

- Power over Ethernet (POE)
- Power supplies
- Motor protection
- IEEE 1394 port protection
- Automotive applications
- Industrial control
- Security systems



### Agency Approval and Environmental Compliance

Agency	File Number	Regulation	Standard
	E201431		2011/65/EU
	R50103284		IEC 61249-2-21:2003

### Electrical Characteristics

Part Number	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> (Vdc)	I <sub>max</sub> (A)	P <sub>d typ</sub> (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R <sub>min</sub> (Ω)	R <sub>1max</sub> (Ω)		
RLD60P010XF	0.10	0.20	60	40	0.38	0.50	4.0	2.500	7.500	✓	✓
RLD60P017XF	0.17	0.34	60	40	0.48	0.85	3.0	3.300	8.000	✓	✓
RLD60P020XF	0.20	0.40	60	40	0.41	1.00	2.2	1.830	4.400	✓	✓
RLD60P025XF	0.25	0.50	60	40	0.45	1.25	2.5	1.250	3.000	✓	✓
RLD60P030XF	0.30	0.60	60	40	0.49	1.50	3.0	0.880	2.100	✓	✓
RLD60P040XF	0.40	0.80	60	40	0.56	2.00	3.8	0.550	1.290	✓	✓
RLD60P050XF	0.50	1.00	60	40	0.77	2.50	4.0	0.500	1.170	✓	✓
RLD60P065XF	0.65	1.30	60	40	0.88	3.25	5.3	0.310	0.720	✓	✓
RL60P075XF	0.75	1.50	60	40	0.92	3.75	6.3	0.250	0.600	✓	✓
RLD60P090XF	0.90	1.80	60	40	0.99	4.50	7.2	0.200	0.470	✓	✓
RLD60P110XF	1.10	2.20	60	40	1.50	5.50	8.2	0.150	0.380	✓	✓
RLD60P135XF	1.35	2.70	60	40	1.70	6.75	9.6	0.120	0.300	✓	✓

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Part Number	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> (Vdc)	I <sub>max</sub> (A)	P <sub>d typ</sub> (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R <sub>min</sub> (Ω)	R <sub>1max</sub> (Ω)		
RLD60P160XF	1.60	3.20	60	40	1.9	8.00	11.4	0.090	0.220	✓	✓
RLD60P185XF	1.85	3.70	60	40	2.1	9.25	12.6	0.080	0.190	✓	✓
RLD60P250XF	2.50	5.00	60	40	2.5	12.50	15.6	0.050	0.130	✓	✓
RLD60P300XF	3.00	6.00	60	40	2.8	15.00	19.8	0.040	0.100	✓	✓
RLD60P375XF	3.75	7.50	60	40	3.2	18.75	24.0	0.030	0.080	✓	✓

### Note on Electrical Characteristics

#### ■ Vocabulary

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

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

P<sub>d typ</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>1max</sub> = Maximum resistance of device at 23 °C measured one hour after tripping or reflow soldering of 260 °C for 20 sec.

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

■ Specifications are subject to change without notice.

### Polymeric PTC Selecting Guide

■ Determine the following operating parameters for the circuits:

- Normal operating current (I<sub>hold</sub>)
- Maximum circuit voltage (V<sub>max</sub>)
- Maximum interrupt current (I<sub>max</sub>)
- Normal operating temperature surrounding device (min°C/max°C)

■ Select the device form factor and dimension suitable for the application:

- Surface Mount Device (SMD)
- Radial Leaded Device (RLD)
- Axial Leaded Device (ALD)
- DISC Device
- Other Customized Form Factors

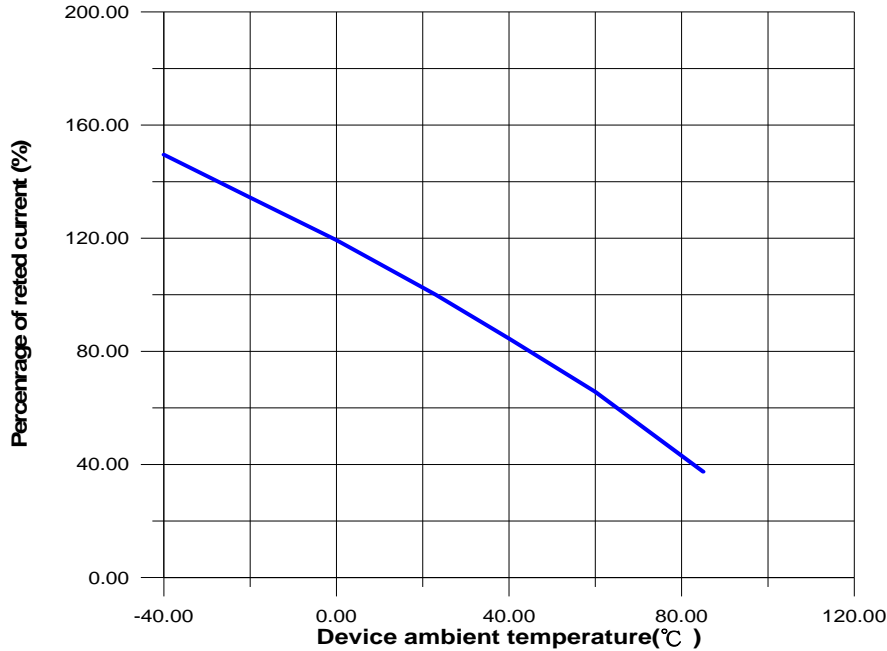
■ Compare the maximum rating for V<sub>max</sub> and I<sub>max</sub> of the PPTC device with the circuit in application and make sure the circuit's requirement does not exceed the device rating.

## RLD 60XF Series PTC Devices

- Check that PPTC device's trip time (time-to-trip) will protect the circuit.
- Verify that the circuit operating temperature is within the PPTC device's normal operating temperature range.
- Verify the performance and suitability of the chosen PPTC device in the application.

## RLD 60XF Series PTC Devices

### Thermal Derating Curve



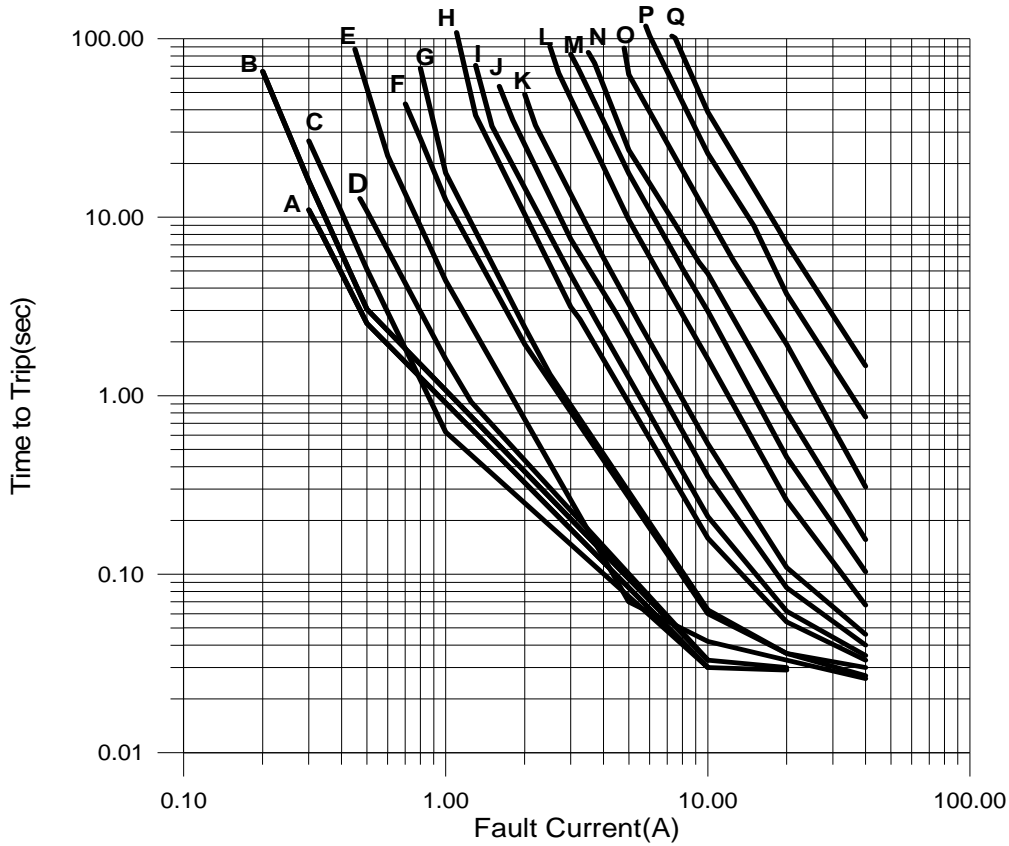
### Thermal Derating Chart

#### Recommended Hold Current (A) at Ambient Temperature (°C)

Part Number	Ambient Operation Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
RLD60P010XF	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05	0.04
RLD60P017XF	0.26	0.23	0.20	0.17	0.14	0.12	0.11	0.09	0.07
RLD60P020XF	0.31	0.27	0.24	0.20	0.16	0.14	0.13	0.11	0.08
RLD60P025XF	0.39	0.34	0.30	0.25	0.20	0.18	0.16	0.14	0.1
RLD60P030XF	0.47	0.41	0.36	0.30	0.24	0.22	0.19	0.16	0.12
RLD60P040XF	0.62	0.54	0.48	0.40	0.32	0.29	0.25	0.22	0.16
RLD60P050XF	0.78	0.68	0.60	0.50	0.41	0.36	0.32	0.27	0.20
RLD60P065XF	1.01	0.88	0.77	0.65	0.53	0.47	0.41	0.35	0.26
RLD60P075XF	1.16	1.02	0.89	0.75	0.61	0.54	0.47	0.41	0.30
RLD60P090XF	1.40	1.22	1.07	0.90	0.73	0.65	0.57	0.49	0.36
RLD60P110XF	1.71	1.50	1.31	1.10	0.89	0.79	0.69	0.59	0.54
RLD60P135XF	2.09	1.84	1.61	1.35	1.09	0.97	0.85	0.73	0.54
RLD60P160XF	2.48	2.18	1.90	1.60	1.30	1.15	1.01	0.86	0.64
RLD60P185XF	2.87	2.52	2.20	1.85	1.50	1.33	1.17	1.00	0.74
RLD60P250XF	3.88	3.40	2.98	2.50	2.03	1.80	1.58	1.35	1.00
RLD60P300XF	4.65	4.08	3.57	3.00	2.43	2.16	1.89	1.62	1.20
RLD60P375XF	5.81	5.10	4.46	3.75	3.04	2.70	2.36	2.03	1.50

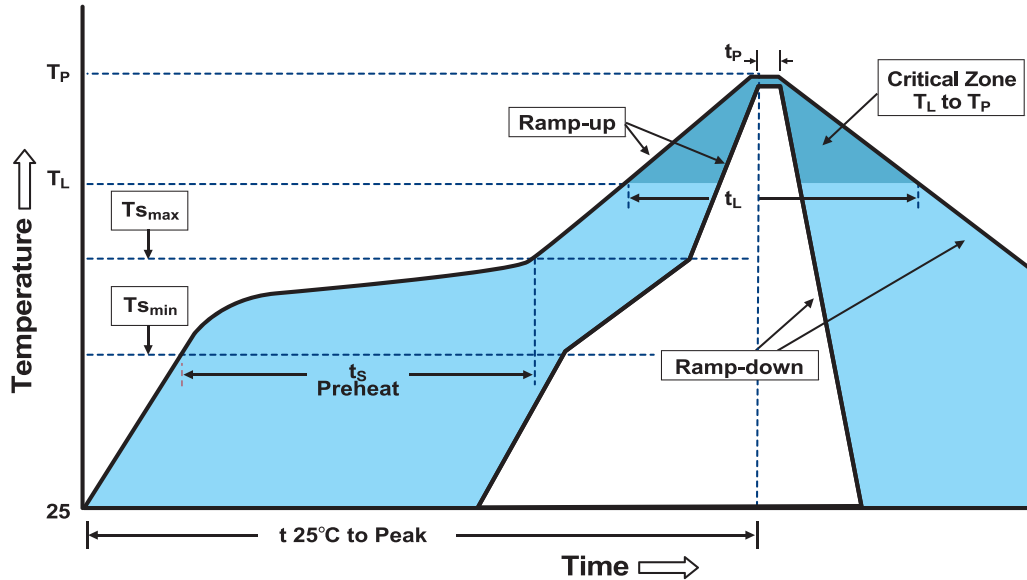
## RLD 60XF Series PTC Devices

### Average Time-Current Curve



## RLD 60XF Series PTC Devices

### Soldering Parameters



Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_P$ )	4°C/second max.
Preheat	
-Temperature Min ( $T_{s_{min}}$ )	120°C
-Temperature Max ( $T_{s_{max}}$ )	150°C
-Time ( $T_{s_{min}}$ to $T_{s_{max}}$ )	60-180 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_P$ )	3 - 5 seconds
Ramp-Down Rate	6 °C /second max.
Time 25°C to Peak Temperature	5 minutes max.
Storage Condition	0°C ~35°C, ≤ 80%RH

- Devices can be cleaned using standard industry methods and solvents.

Note 1: All temperature refer to topside of the package, measured on the package body surface.

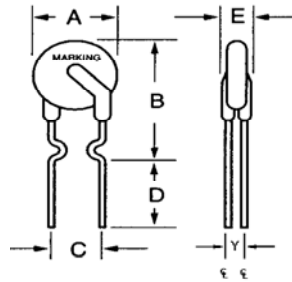
Note 2: If reflow temperatures exceed the recommended profile, devices may not meet the performance requirements

### Physical Dimensions (mm.)

Lead Material	P010XF-P040XF: Tin-plated copper clad steel P050XF-P375XF: Tin-plated copper
Soldering Characteristics	Solderability per MIL-STD-202, Method 208E
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V-0 requirements.
Device Labeling	Marked with the letter "P", voltage, amperage rating, and lot number.

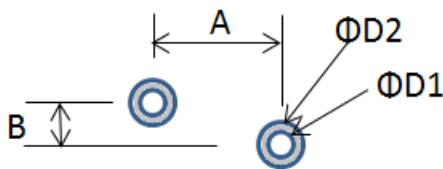
## RLD 60XF Series PTC Devices

### Physical Dimensions (mm.)



Part Number	A	B	C	D	E	Y	Physical Characteristics	
	(max.)	(max.)	(typ.)	(min.)	(max.)	(typ.)	Lead Size	(max.)
RLD60P010XF	7.4	11.6	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P017XF	7.4	12.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P020XF	7.4	12.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P025XF	7.4	12.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P030XF	7.4	13.4	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P040XF	7.6	13.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/CuFe
RLD60P050XF	7.9	13.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/Cu
RLD60P065XF	9.4	15.2	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/Cu
RLD60P075XF	10.2	16.0	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/Cu
RLD60P090XF	11.2	16.7	5.1±0.7	7.6	3.1	1.2	0.51 dia.	Sn/Cu
RLD60P110XF	12.8	18.0	5.1±0.7	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P135XF	14.5	19.6	5.1±0.7	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P160XF	16.3	21.3	5.1±0.7	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P185XF	17.5	22.9	5.1±0.7	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P250XF	20.8	26.4	10.2±1.0	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P300XF	23.9	30.0	10.2±1.0	7.6	3.1	1.4	0.81 dia.	Sn/Cu
RLD60P375XF	27.2	33.5	10.2±1.0	7.6	3.1	1.4	0.81 dia.	Sn/Cu

### Solder Layout Recommend (mm.)



Part Number	A	B	D1	D2
	(typ.)	(typ.)	(typ.)	(typ.)
RLD60P010XF	5.1	1.2	1.0	2.5
RLD60P017XF	5.1	1.2	1.0	2.5
RLD60P020XF	5.1	1.2	1.0	2.5
RLD60P025XF	5.1	1.2	1.0	2.5
RLD60P030XF	5.1	1.2	1.0	2.5
RLD60P040XF	5.1	1.2	1.0	2.5
RLD60P050XF	5.1	1.2	1.0	2.5
RLD60P065XF	5.1	1.2	1.0	2.5
RLD60P075XF	5.1	1.2	1.0	2.5
RLD60P090XF	5.1	1.2	1.0	2.5
RLD60P110XF	5.1	1.4	1.5	3.5
RLD60P135XF	5.1	1.4	1.5	3.5
RLD60P160XF	5.1	1.4	1.5	3.5
RLD60P185XF	5.1	1.4	1.5	3.5
RLD60P250XF	10.2	1.4	1.5	3.5
RLD60P300XF	10.2	1.4	1.5	3.5
RLD60P375XF	10.2	1.4	1.5	3.5



## RLD 60XF Series PTC Devices

### Environmental Specifications

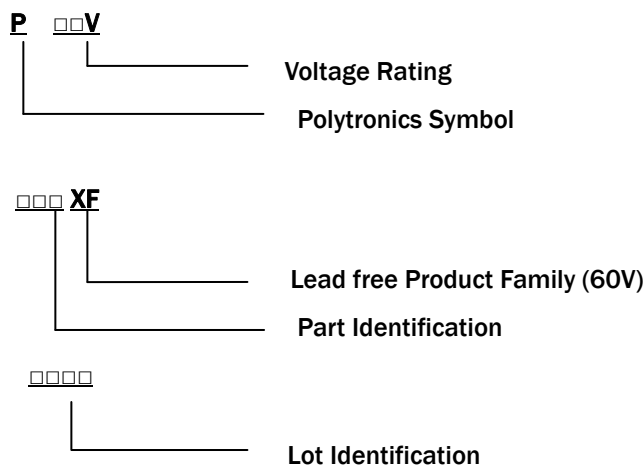
Operating/Storage Temperature	-40°C to +85 °C
Maximum Device Surface Temperature in Tripped State	125°C
Passive Aging	+85°C , 1000 hours ±5% typical resistance change
Humidity Aging	+85°C , 85%R.H. 1000 hours ±5% typical resistance change
Thermal Shock	MIL-STD-202 Method 107G +85°C /-40°C 10 times ±5% typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883C, Method 2007.1,Condition A No change
Moisture Level Sesityity	Level 1, J-STD-020C

## RLD 60XF Series PTC Devices

### Packaging Quantity and Marking

Product Description	Part I.D.	Bag Quantity	Reelpack Quantity	Ammopack Quantity
RLD60P010XF	010	500	2000	2000
RLD60P017XF	017	500	2000	2000
RLD60P020XF	020	500	2000	2000
RLD60P025XF	025	500	2000	2000
RLD60P030XF	030	500	2000	2000
RLD60P040XF	040	500	2000	2000
RLD60P050XF	050	500	2000	2000
RLD60P065XF	065	500	2000	2000
RLD60P075XF	075	500	2000	2000
RLD60P090XF	090	500	2000	2000
RLD60P110XF	110	500	1000	1000
RLD60P135XF	135	200	1000	1000
RLD60P160XF	160	200	1000	1000
RLD60P185XF	185	200	1000	1000
RLD60P250XF	250	200	1000	1000
RLD60P300XF	300	200	1000	1000
RLD60P375XF	375	100	800	800

### Part Marking System



## RLD 60XF Series PTC Devices

### Tape Specifications: EIA468-B/IEC286-2(mm.)

Dimension Description	EIA Mark	IEC Mark	Dimensions	
			Dim.(mm)	Tol.(mm)
Carrier tape width	W	W	18	-0.5/+1.0
Hold down tape width	W <sub>4</sub>	W <sub>0</sub>	11	min.
Top distance between tape edges	W <sub>6</sub>	W <sub>2</sub>	3	max.
Sprocket hole position	W <sub>5</sub>	W <sub>1</sub>	9	-0.5+0.75
Sprocket hole diameter*	D <sub>0</sub>	D <sub>0</sub>	4	-0.32/+0.2
Abscissa to plane(straight lead)	H	H	18.5	+3.0
Abscissa to plane(kinked lead)	H <sub>0</sub>	H <sub>0</sub>	16	+0.5
Abscissa to top P010XF-P090XF	H <sub>1</sub>	H <sub>1</sub>	32.2	max.
Abscissa to top P110XF-P300XF	H <sub>1</sub>		47.5	max.
Overall width without lead protrusion:P010XF-P090XF	C <sub>1</sub>		42.5	max.
Overall width without lead protrusion:P110XF-P300XF			57	
Overall width with lead protrusion:P010XF-P090XF	C <sub>2</sub>		43.2	max.
Overall width with lead protrusion:P110XF-P300XF			58	
Lead protrusion	L <sub>1</sub>	l <sub>1</sub>	1.0	max.
Protrusion of cut out	L	L	11	max.
Protrusion beyond hold-down tape	l <sub>2</sub>	l <sub>2</sub>	Not specified	
Sprocket hole pitch:P010XF-P090XF	P <sub>0</sub>	P <sub>0</sub>	12.7	+0.3
Sprocket hole pitch:P110XF-P300XF	P <sub>0</sub>	P <sub>0</sub>	25.4	+0.5
Pitch tolerance			20 consecutive.	+1
Device pitch:P010XF-P090XF			12.7	
Device pitch:P110XF-P300XF			25.4	
Tape thickness	t	t	0.9	max.
Tape thickness with splice	t <sub>1</sub>		2.0	max.
Splice sprocket hole alignment			0	+0.3
Body lateral deviation	Δh	Δh	0	+1.0
Body tape plane deviation	Δp	Δp	0	+1.3
Ordinate to adjacent component lead*:P010XF-P090XF	P <sub>1</sub>	P <sub>1</sub>	3.81	+0.7
Ordinate to adjacent component lead*:P110XF-P300XF			7.62	+0.7
Lead spacing:P010XF-P185XF	F	F	5.08	+0.8
Lead spacing:P250XF-P300XF	F	F	10.18	+0.8
Reel width P010XF-P065XF	w <sub>2</sub>	w	56	max.
Reel width P075XF-P300XF	w <sub>2</sub>	w	63.5	max.
Reel diameter	a	d	370	max.
Space between flanges less device*	w <sub>1</sub>		4.75	-3.25/+9.25
Arbor hole diameter	c	f	26	+12.0
Core diameter*	n	h	91	max.
Box			56/372/372	max.
Consecutive missing places			None	
Empty places per reel			0.1%max.	

## RLD 60XF Series PTC Devices

### Reel Dimensions: EIA-481-1 (mm.) Tape And Reel Specification

#### Tape AND Reel Specification

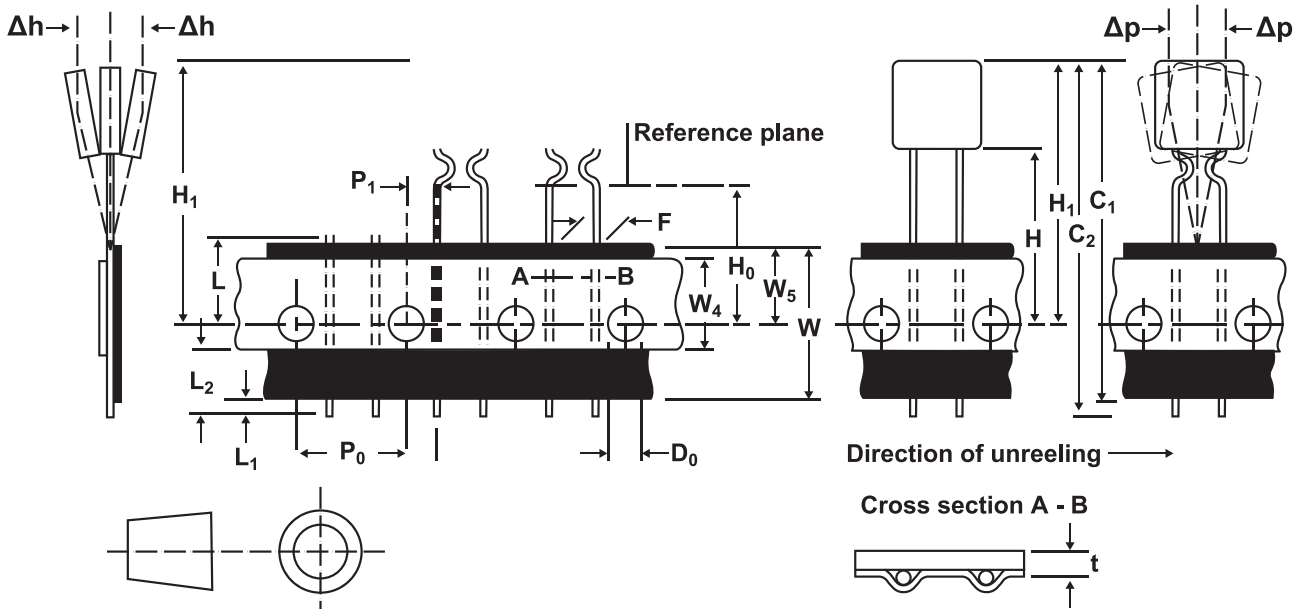


Figure 1

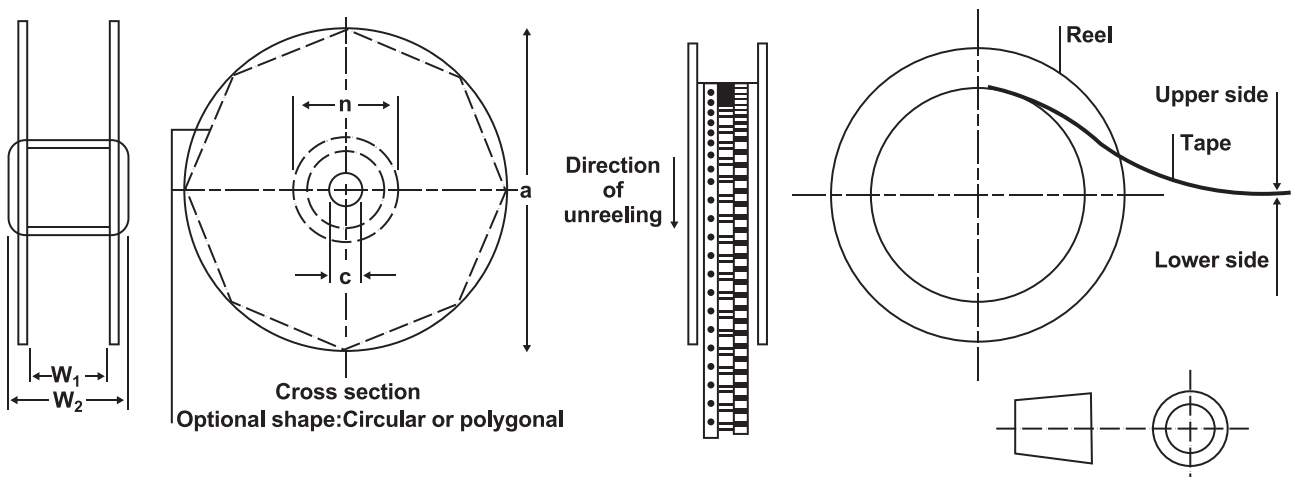
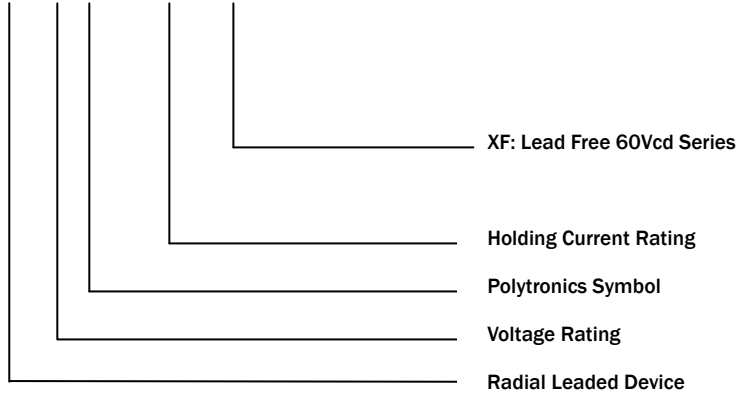


Figure 2

## RLD 60XF Series PTC Devices

### Part Number System

**RLD 60 P** □□□ **XF**



### Cross Reference

Polytronics / EVERFUSE <sup>®</sup>	Cross Reference	
	Tyco / PolySwitch <sup>®</sup>	Bourns / Multifuse <sup>®</sup>
RLD60P010XF	RXEF010	MF-R010
RLD60P017XF	RXEF017	MF-R017
RLD60P020XF	RXEF020	MF-R020
RLD60P025XF	RXEF025	MF-R025
RLD60P030XF	RXEF030	MF-R030
RLD60P040XF	RXEF040	MF-R040
RLD60P050XF	RXEF050	MF-R050
RLD60P065XF	RXEF065	MF-R065
RLD60P075XF	RXEF075	MF-R075
RLD60P090XF	RXEF090	MF-R090
RLD60P110XF	RXEF110	MF-RX110
RLD60P135XF	RXEF135	MF-RX135
RLD60P160XF	RXEF160	MF-RX160
RLD60P185XF	RXEF185	MF-RX185
RLD60P250XF	RXEF250	MF-RX250
RLD60P300XF	RXEF300	MF-RX300
RLD60P375XF	RXEF375	MF-RX375

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“Multifuse” is a registered trademark of Bourns , Inc.

“PolySwitch” is a registered trademark of Tyco Electronics.

