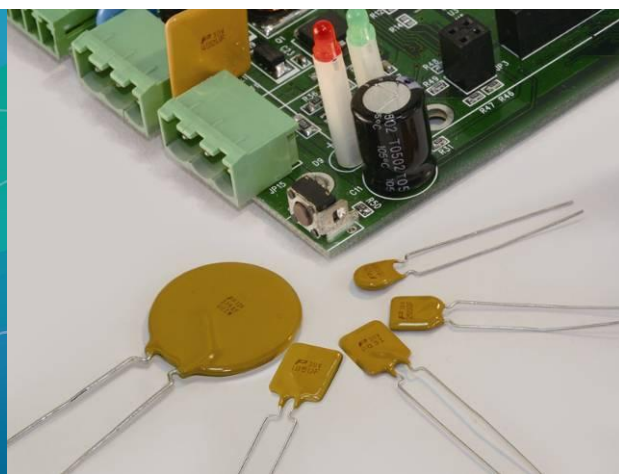


PRODUCT
DATASHEET



RLD 32V HF Series PTC Devices

RLD 32V HF Series PTC Devices

Description

The HF series provides radial leaded resettable over-current protection with holding current from 0.3A to 12.0A. This series is suitable for wide range of applications in modern electronics and automotive industry.

Features

- RoHS compliant and lead-free
- Halogen-free
- Compact design saves board space
- Low profile
- Fast response to fault current
- Compatible with high temperature solders



Applications

- Motors
- Fans and blowers
- Set-top-box and HDMI
- Game console port protection
- Optical disk drives
- General electronics

Agency Approval and Environmental Compliance

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

Electrical Characteristics

Part Number	I _{hold} (A)	I _{trip} (A)	V _{max} (Vdc)	I _{max} (A)	P _{d typ} (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R _{min} (Ω)	R _{1max} (Ω)		
RLD32P030HF	0.3	0.6	32	100	0.8	1.5	2.5	0.900	2.100	Pending	Pending
RLD32P050HF	0.5	0.9	32	100	0.9	2.5	2.5	0.350	1.100	Pending	Pending
RLD32P070HF	0.7	1.4	32	100	0.9	3.5	3.2	0.230	0.800	Pending	Pending
RLD32P100HF	1.0	2.0	32	100	1.4	5.0	5.2	0.130	0.430	Pending	Pending
RLD32P200HF	2.0	4.0	32	100	2.5	10.0	5.0	0.057	0.170	Pending	Pending
RLD32P300HF	3.0	6.0	32	100	3.2	15.0	5.0	0.035	0.110	Pending	Pending
RLD32P400HF	4.0	8.0	32	100	4.0	20.0	8.0	0.022	0.065	Pending	Pending
RLD32P500HF	5.0	10.0	32	100	5.3	25.0	9.0	0.015	0.040	Pending	Pending
RLD32P600HF	6.0	12.0	32	100	5.5	30.0	10.0	0.012	0.038	Pending	Pending
RLD32P700HF	7.0	14.0	32	100	6.0	35.0	12.0	0.009	0.030	Pending	Pending
RLD32P750HF	7.5	15.0	32	100	6.5	37.5	13.0	0.007	0.024	Pending	Pending
RLD32P800HF	8.0	16.0	32	100	6.5	40.0	14.0	0.007	0.023	Pending	Pending
RLD32P900HF	9.0	18.0	32	100	7.0	45.0	14.0	0.006	0.021	Pending	Pending

RLD 32V HF Series PTC Devices

Part Number	I _{hold} (A)	I _{trip} (A)	V _{max} (Vdc)	I _{max} (A)	P _{d typ} (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R _{min} (Ω)	R _{1max} (Ω)	 US	
RLD32P1000HF	10.0	20.0	32	100	7.0	50.0	15.0	0.005	0.016	Pending	Pending
RLD32P1200HF	12.0	24.0	32	100	7.5	60.0	20.0	0.004	0.015	Pending	Pending

Note on Electrical Characteristics

■ Vocabulary

I_{hold} = Hold current: maximum current device will pass without tripping in 25°C still air.

I_{trip} = Trip current: minimum current at which the device will trip in 25 °C still air.

V_{max} = Maximum voltage device can withstand without damage at rated current (I_{max})

I_{max} = Maximum fault current device can withstand without damage at rated voltage (V_{max})

P_{d typ} = Typical power dissipated from device when in the tripped state at 25 °C still air.

R_{min} = Minimum resistance of device in initial (un-soldered) state.

R_{1max} = Maximum resistance of device at 25 °C measured one hour after tripping or wave soldering of 260 °C for 5 sec.

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

■ Specifications are subject to change without notice.

RLD 32V HF Series PTC Devices

Polymeric PTC Selecting Guide

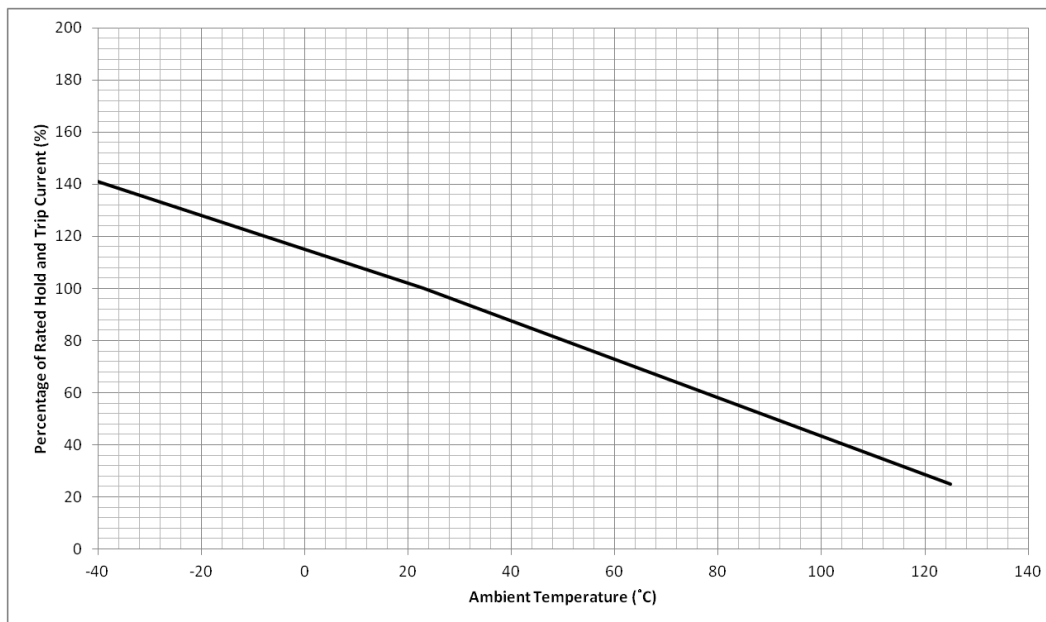
- Determine the following operating parameters for the circuits:
 - Normal operating current (I_{hold})
 - Maximum circuit voltage (V_{max})
 - Maximum interrupt current (I_{max})
 - Normal operating temperature surrounding device ($min^{\circ}C/max^{\circ}C$)
- Select the device form factor and dimension 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_{max} and I_{max} of the PPTC device with the circuit in application and make sure the circuit's requirement does not exceed the device rating.
- 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.

WARNING

- **Mechanical Stress**
 - PPTC devices will undergo a thermal expansion during fault condition. If PPTC devices are installed or placed in an application where the space between PPTC devices and the surrounding materials (e.g., covering materials, packaging materials, encapsulate materials and the like) is insufficient, it will cause an inhibiting effect upon the thermal expansion. Pressing, twisting, bending and other kinds of mechanical stress will also adversely affect the performance of the PPTC devices, and shall not be used or applied.
- **Chemical Pollutants**
 - Silicone-based oils, oils, solvents, gels, electrolytes, fuels, acids, and the like will adversely affect the properties of PPTC devices, and shall not be used or applied.
- **Electronic and Thermal Effect**
 - PPTC devices are secondary protection devices and are used solely for sporadic, accidental over-current or over-temperature error condition, and shall NOT be used if or when constant or repeated fault conditions (such fault conditions may be caused by, among others, incorrect pin-connection of a connector) or over-extensive trip events may occur.
 - PPTC devices are different from fuses and, when a fault condition occurs, will go into high-resistance state and do not open circuit, in which case the voltage at such PPTC devices may reach a hazardous level.
 - Operation over the maximum rating or other forms of improper use may cause failure, arcing, flame and/or other damage to the PPTC devices.
 - Conductive material contamination, such as metal particle, may induce shortage, flame or arcing.
 - Due to the inductance, the operation circuits may generate a circuit voltage (Ldi/dt) above the rated voltage of PPTC devices, which shall not be used under such circumstances.
- **General**
 - Customers shall evaluate and test the properties of PPTC devices independently to verify and ensure that their individual applications will be met.
 - The performance of PPTC devices will be adversely affected if they are improperly used under electronic, thermal and/or mechanical procedures and/or conditions non-conformant to those recommended by manufacturer.
 - Customers shall be responsible for determining whether it is necessary to have back-up, failsafe and/or fool-proof protection to avoid or minimize damage that may result from extra-ordinary, irregular function or failure of PPTC devices.
 - Any and all responsibilities and liabilities are disclaimed if any item under this notice of warning is not complied with.

RLD 32V HF Series PTC Devices

Thermal Derating Curve



Thermal Derating Table

Recommended Hold Current (A) vs. Ambient Temperature (°C)

Part Number	Ambient Operation Temperature								
	-40 °C	-20 °C	0 °C	25 °C	40 °C	60 °C	85 °C	100 °C	125 °C
RLD32P030HF	0.42	0.39	0.35	0.30	0.27	0.22	0.17	0.14	0.08
RLD32P050HF	0.71	0.64	0.58	0.50	0.45	0.37	0.28	0.23	0.14
RLD32P070HF	0.99	0.90	0.81	0.70	0.62	0.52	0.39	0.32	0.19
RLD32P100HF	1.41	1.28	1.16	1.00	0.89	0.74	0.56	0.45	0.27
RLD32P200HF	2.82	2.56	2.32	2.00	1.78	1.48	1.12	0.90	0.54
RLD32P300HF	4.23	3.85	3.47	3.00	2.67	2.23	1.69	1.36	0.81
RLD32P400HF	5.64	5.12	4.64	4.00	3.56	2.96	2.24	1.80	1.08
RLD32P500HF	7.05	6.42	5.79	5.00	4.45	3.72	2.81	2.26	1.35
RLD32P600HF	8.46	7.68	6.96	6.00	5.34	4.44	3.36	2.70	1.62
RLD32P700HF	9.87	8.96	8.12	7.00	6.23	5.18	3.92	3.15	1.89
RLD32P750HF	10.6	9.63	8.68	7.50	6.68	5.58	4.22	3.39	2.03
RLD32P800HF	11.3	10.2	9.28	8.00	7.12	5.92	4.48	3.60	2.16
RLD32P900HF	12.7	11.5	10.44	9.00	8.00	6.66	5.04	4.05	2.43
RLD32P1000HF	14.1	12.8	11.6	10.0	8.91	7.45	5.62	4.53	2.70
RLD32P1200HF	16.9	15.4	13.9	12.0	10.7	8.88	6.72	5.40	3.24

RLD 32V HF Series PTC Devices

Physical Dimensions (mm.)

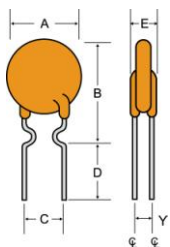


Fig. 1

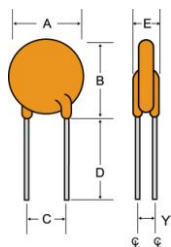


Fig. 2

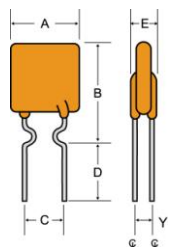


Fig. 3

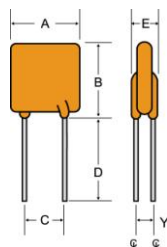


Fig. 4

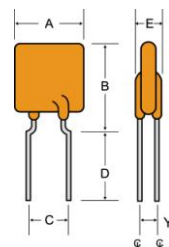
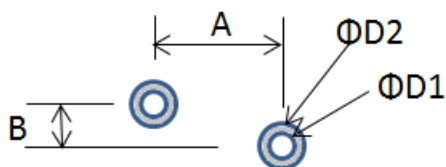


Fig. 5

Part Number	A Max.	B Max.	C Typ.	D Min.	E Max.	Y	Fig.	Lead Dia.
						Typ.		
RLD32P030HF	5.8	10.3	5.1±0.7	7.6	3.1	1.0	1	0.51
RLD32P050HF	6.5	11.0	5.1±0.7	7.6	3.1	1.0	1	0.51
RLD32P070HF	6.8	10.8	5.1±0.7	7.6	3.1	1.0	3	0.51
RLD32P100HF	6.5	11.0	5.1±0.7	7.6	3.1	1.0	1	0.51
RLD32P200HF	8.9	13.4	5.1±0.7	7.6	3.1	1.0	1	0.51
RLD32P300HF	9.1	11.6	5.1±0.7	7.6	3.8	1.3	4	0.81
RLD32P400HF	10.0	14.2	5.1±0.7	7.6	3.8	1.3	4	0.81
RLD32P500HF	10.3	16.0	5.1±0.7	7.6	3.8	1.3	4	0.81
RLD32P600HF	11.7	20.5	5.1±0.7	7.6	3.8	1.3	4	0.81
RLD32P700HF	13.1	22.1	5.1±0.7	7.6	3.8	1.3	4	0.81
RLD32P750HF	14.2	23.1	10.2±1.0	7.6	3.8	1.3	4	0.81
RLD32P800HF	14.2	23.1	10.2±1.0	7.6	3.8	1.3	4	0.81
RLD32P900HF	15.5	23.0	10.2±1.0	7.6	3.8	1.3	4	0.81
RLD32P1000HF	17.5	25.0	10.2±1.0	7.6	3.8	1.3	4	0.81
RLD32P1200HF	18.5	28.0	10.2±1.0	7.6	4.0	1.5	4	1.00

RLD 32V HF Series PTC Devices

Recommend Pad Layout



Part Number	A	B	D1	D2
RLD32P030HF	5.1	1.0	1.0	2.5
RLD32P050HF	5.1	1.0	1.0	2.5
RLD32P070HF	5.1	1.0	1.0	2.5
RLD32P100HF	5.1	1.0	1.0	2.5
RLD32P200HF	5.1	1.0	1.0	2.5
RLD32P300HF	5.1	1.1	1.5	3.5
RLD32P400HF	5.1	1.1	1.5	3.5
RLD32P500HF	5.1	1.1	1.5	3.5
RLD32P600HF	5.1	1.1	1.5	3.5
RLD32P700HF	5.1	1.1	1.5	3.5
RLD32P750HF	10.2	1.2	1.5	3.5
RLD32P800HF	10.2	1.2	1.5	3.5
RLD32P900HF	10.2	1.2	1.5	3.5
RLD32P1000HF	10.2	1.2	1.5	3.5
RLD32P1200HF	10.2	1.4	1.8	4.0

RLD 32V HF Series PTC Devices

Environmental Specifications

Operating Temperature	-40°C to +125 °C
Maximum Device Surface Temperature in Tripped State	165°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 -30% typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883C, Method 2007.1, Condition A No change
Moisture Sensitivity Level	Level 1, J-STD-020C

Physical Specifications

Lead Material	32P030HF-32P100HF: Tin-plated copper clad steel 32P300HF-32P1000HF: Tin-plated copper
Soldering Characteristics	Solderability per MIL-STD-202, Method 208E
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V-0 requirements.

RLD 32V HF Series PTC Devices

Tape and Reel Specifications: EIA-481/IEC286-2

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 ₄	W ₀	11	min.
Top distance between tape edges	W ₆	W ₂	3	max.
Sprocket hole position	W ₅	W ₁	9	-0.5+0.75
Sprocket hole diameter*	D ₀	D ₀	4	-0.32/+0.2
Abscissa to plane(straight lead)	H	H	18.5	±3.0
Abscissa to plane(kinked lead)	H ₀	H ₀	16	±0.5
Abscissa to top P030HF-P400HF	H ₁	H ₁	32.2	max.
Abscissa to top P500HF-P1200HF	H ₁		47.5	max.
Overall width without lead protrusion: P030HF-P400HF	C ₁		42.5	max.
Overall width without lead protrusion: P500HF-P1200HF			57	
Overall width with lead protrusion: P030HF-P400HF	C ₂		43.2	max.
Overall width with lead protrusion: P500HF-P1200HF			58	
Lead protrusion	L ₁	l ₁	1.0	max.
Protrusion of cut out	L	L	11	max.
Protrusion beyond hold-down tape	l ₂	l ₂	Not specified	
Sprocket hole pitch: P030HF-P700HF	P ₀	P ₀	12.7	±0.3
Sprocket hole pitch: P750HF-P1200HF	P ₀	P ₀	25.4	±0.5
Pitch tolerance			20 consecutive.	±1
Device pitch: P030HF-P700HF			12.7	
Device pitch: P750HF-P1200HF			25.4	
Tape thickness	t	t	0.9	max.
Tape thickness with splice	t ₁		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*:P030HF-P700HF	P ₁	P ₁	3.81	±0.7
Ordinate to adjacent component lead*:P750HF-P1200HF			7.62	±0.7
Lead spacing: P030HF-P700HF	F	F	5.08	±0.8
Lead spacing: P750HF-P1200HF	F	F	10.18	±0.8
Reel width P030HF-P400HF	w ₂	w	56	max.
Reel width P500HF-P1200HF	w ₂	w	63.5	max.
Reel diameter	a	d	370	max.
Space between flanges less device*	w ₁		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 32V HF Series PTC Devices

Tape and Reel Specifications: EIA-481/IEC286-2

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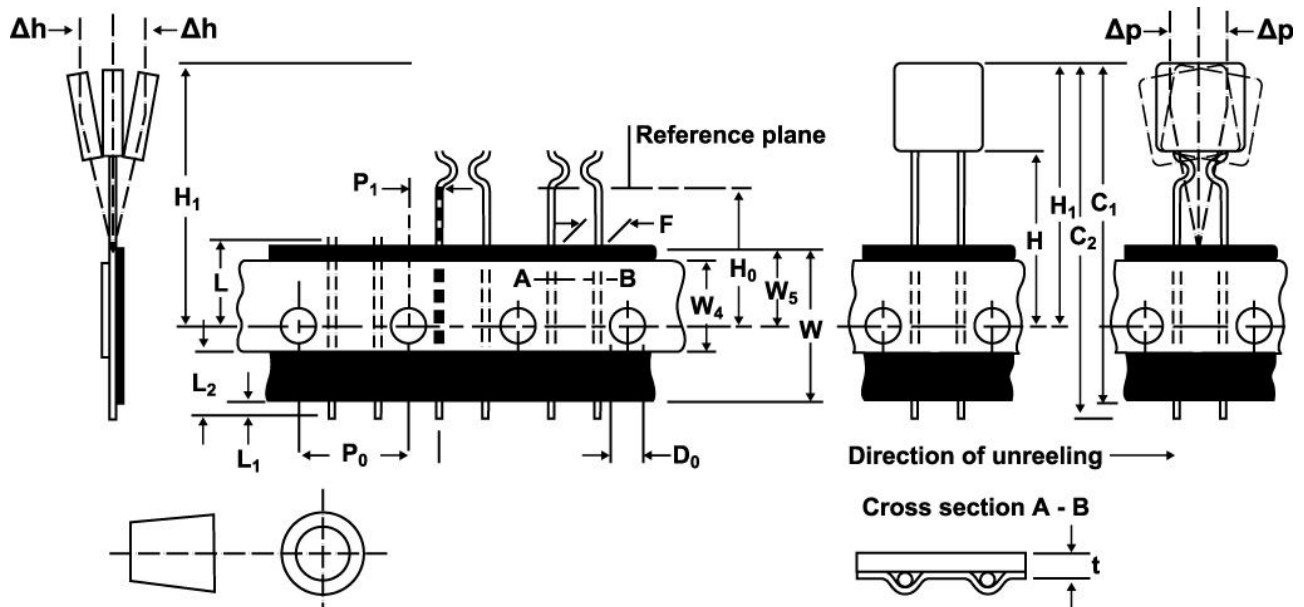


Fig. 1

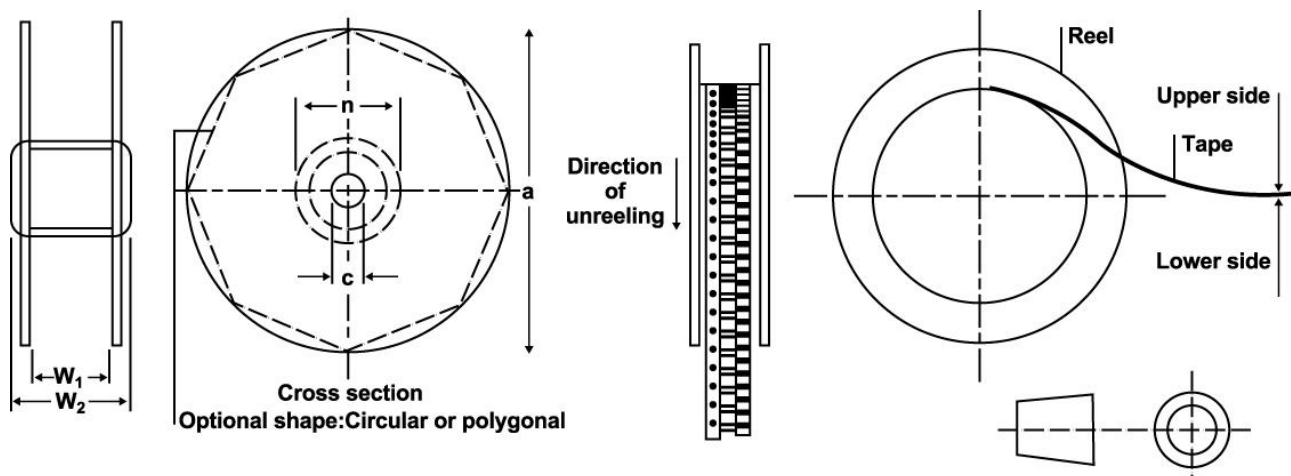
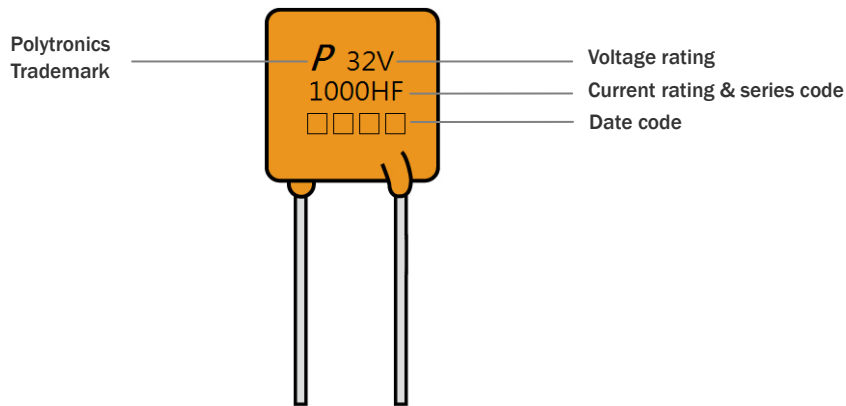


Fig. 2

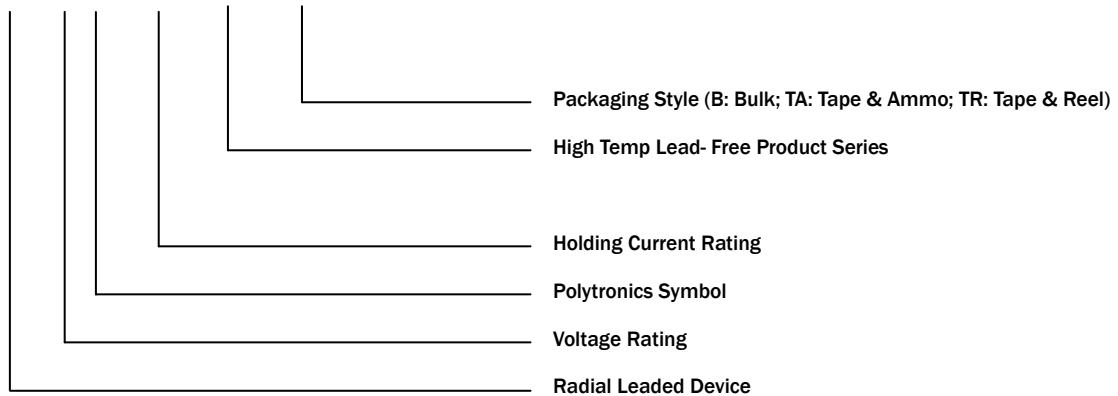
RLD 32V HF Series PTC Devices

Marking on Device



Part Ordering Number System

RLD 32 P □ □ □ **HF -** □ □



RLD 32V HF Series PTC Devices

Packaging Quantity

Part Number	Ordering Code	Bag Quantity	Reelpack Quantity	Ammopack Quantity
RLD32P030HF	RLD32P030HF-B	500		
	RLD32P030HF-TR		2000	
	RLD32P030HF-TA			2000
RLD32P050HF	RLD32P050HF-B	500		
	RLD32P050HF-TR		2000	
	RLD32P050HF-TA			2000
RLD32P070HF	RLD32P070HF-B	500		
	RLD32P070HF-TR		2000	
	RLD32P070HF-TA			2000
RLD32P100HF	RLD32P100HF-B	500		
	RLD32P100HF-TR		2000	
	RLD32P100HF-TA			2000
RLD32P200HF	RLD32P200HF-B	500		
	RLD32P200HF-TR		2000	
	RLD32P200HF-TA			2000
RLD32P300HF	RLD32P300HF-B	500		
	RLD32P300HF-TR		2000	
	RLD32P300HF-TA			2000
RLD32P400HF	RLD32P400HF-B	500		
	RLD32P400HF-TR		2000	
	RLD32P400HF-TA			2000
RLD32P500HF	RLD32P550HF-B	500		
	RLD32P550HF-TR		2000	
	RLD32P550HF-TA			2000
RLD32P600HF	RLD32P600HF-B	500		
	RLD32P600HF-TR		2000	
	RLD32P600HF-TA			2000
RLD32P700HF	RLD32P700HF-B	500		
	RLD32P700HF-TR		2000	
	RLD32P700HF-TA			2000
RLD32P750HF	RLD32P750HF-B	200		
	RLD32P750HF-TR		1000	
	RLD32P750HF-TA			1000
RLD32P800HF	RLD32P800HF-B	200		
	RLD32P800HF-TR		1000	
	RLD32P800HF-TA			1000
RLD32P900HF	RLD32P900HF-B	200		
	RLD32P900HF-TR		1000	
	RLD32P900HF-TA			1000
RLD32P1000HF	RLD32P1000HF-B	200		
	RLD32P1000HF-TR		1000	
	RLD32P1000HF-TA			1000
RLD32P1200HF	RLD32P1200HF-B	200		
	RLD32P1200HF-TR		1000	
	RLD32P1200HF-TA			1000