60R Series



Description

The 60R Series radial leaded device is designed to provide overcurrent protection for (≤60V) applications where space is not a concern and resettable protection is preferred.

Features

- Cured, flame retardant epoxy polymer insulating material meets UL 94V-0 requirements
- Fast time–to-trip
- RoHS compliant, Lead-Free and Halogen-Free*

Applications

- USB hubs, ports and peripherals
- IEEE1394 ports
- Computers & peripherals
- Motor protection
- General electronics
- Automotive applications
- Industrial controls
- Transformers

Agency Approvals

AGENCY	AGENCY FILE NUMBER	60R010X & 60R017X
c UL us	E183209	E183209
TÜV	R50119318	N/A

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 Approvals	
						Current (A)	Time (Sec.)	R_{min} (Ω)	R_{1max} (Ω)	c UL us	TÜV
60R010X	0.10	0.20	60	40	0.38	0.50	4.00	2.500	7.500	X	
60R017X	0.17	0.34	60	40	0.48	0.85	3.00	3.300	8.000	X	
60R020X	0.20	0.40	60	40	0.41	1.00	2.20	1.830	4.400	X	X
60R025X	0.25	0.50	60	40	0.45	1.25	2.50	1.250	3.000	X	X
60R030X	0.30	0.60	60	40	0.49	1.50	3.00	0.880	2.100	X	X
60R040X	0.40	0.80	60	40	0.56	2.00	3.80	0.550	1.290	X	X
60R050X	0.50	1.00	60	40	0.77	2.50	4.00	0.500	1.170	X	X
60R065X	0.65	1.30	60	40	0.88	3.25	5.30	0.310	0.720	X	X
60R075X	0.75	1.50	60	40	0.92	3.75	6.30	0.250	0.600	X	X
60R090X	0.90	1.80	60	40	0.99	4.50	7.20	0.200	0.470	X	X
60R110X	1.10	2.20	60	40	1.50	5.50	8.20	0.150	0.380	X	X
60R135X	1.35	2.70	60	40	1.70	6.75	9.60	0.120	0.300	X	X
60R160X	1.60	3.20	60	40	1.90	8.00	11.40	0.090	0.220	X	X
60R185X	1.85	3.70	60	40	2.10	9.25	12.60	0.080	0.190	X	X
60R250X	2.50	5.00	60	40	2.50	12.50	15.60	0.050	0.130	X	X
60R300X	3.00	6.00	60	40	2.80	15.00	19.80	0.040	0.100	X	X
60R375X	3.75	7.50	60	40	3.20	18.75	24.00	0.030	0.080	X	X

I_{hold} = Hold current: maximum current device will pass without tripping in 20°C still air.

I_{trip} = Trip current: minimum current at which the device will trip in 20°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 = Power dissipated from device when in the tripped state at 20°C still air.

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

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

R_{1max} = Maximum resistance of device at 20°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.

* Effective January 1, 2010, all 60R PTC products will be manufactured Halogen Free (HF). Existing Non-Halogen Free 60R PTC products may continue to be sold, until supplies are depleted.

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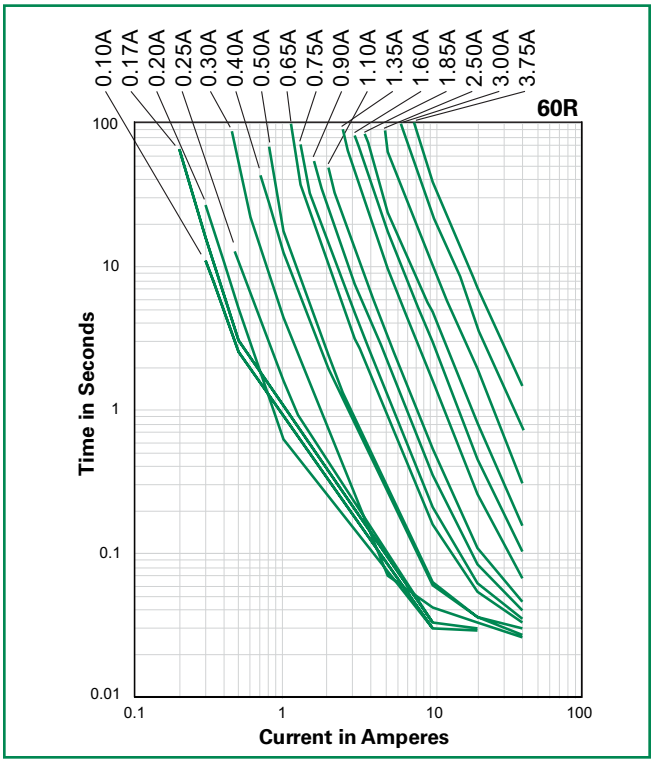
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Radial Leaded > 60R Series

Temperature Rerating

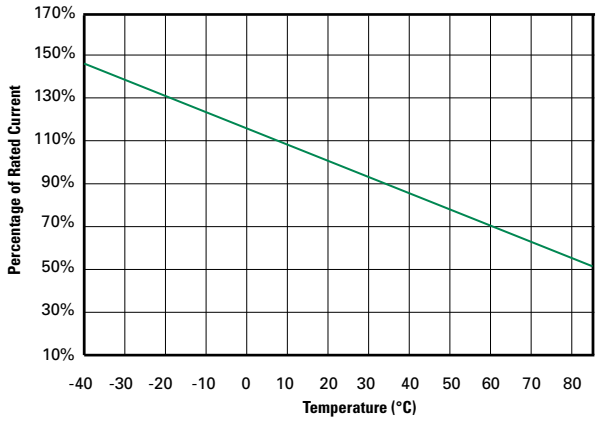
	Ambient Operation Temperature								
	-40°C	-20°C	0°C	20°C	40°C	50°C	60°C	70°C	85°C
Part Number	Hold Current (A)								
60R010X	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05	0.04
60R017X	0.26	0.23	0.20	0.17	0.14	0.12	0.11	0.09	0.07
60R020X	0.31	0.27	0.24	0.20	0.16	0.14	0.13	0.11	0.08
60R025X	0.39	0.34	0.30	0.25	0.20	0.18	0.16	0.14	0.10
60R030X	0.47	0.41	0.36	0.30	0.24	0.22	0.19	0.16	0.12
60R040X	0.62	0.54	0.48	0.40	0.32	0.29	0.25	0.22	0.16
60R050X	0.78	0.68	0.60	0.50	0.41	0.36	0.32	0.27	0.20
60R065X	1.01	0.88	0.77	0.65	0.53	0.47	0.41	0.35	0.26
60R075X	1.16	1.02	0.89	0.75	0.61	0.54	0.47	0.41	0.30
60R090X	1.40	1.22	1.07	0.90	0.73	0.65	0.57	0.49	0.36
60R110X	1.71	1.50	1.31	1.10	0.89	0.79	0.69	0.59	0.44
60R135X	2.09	1.84	1.61	1.35	1.09	0.97	0.85	0.73	0.54
60R160X	2.48	2.18	1.90	1.60	1.30	1.15	1.01	0.86	0.64
60R185X	2.87	2.52	2.20	1.85	1.50	1.33	1.17	1.00	0.74
60R250X	3.88	3.40	2.98	2.50	2.03	1.80	1.58	1.35	1.00
60R300X	4.65	4.08	3.57	3.00	2.43	2.16	1.89	1.62	1.20
60R375X	5.81	5.10	4.46	3.75	3.04	2.70	2.36	2.03	1.50

Average Time Current Curves



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

Temperature Rerating Curve

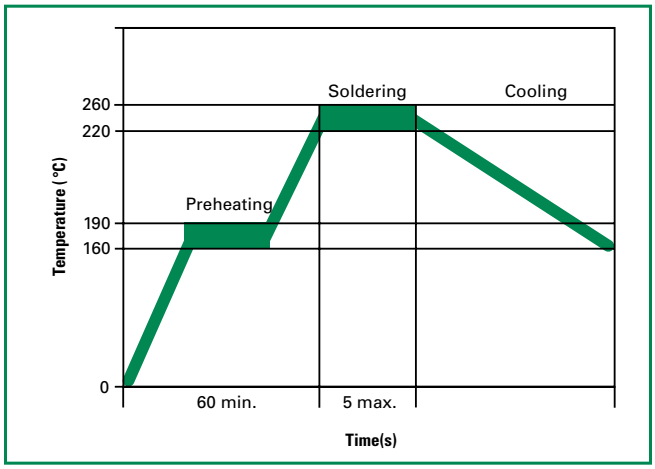


Note:
Typical Temperature rerating curve, refer to table for derating dat

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Soldering Parameters - Wave Soldering

Pre-Heating Zone	Refer to the condition recommended by the flux manufacturer. Max. ramping rate should not exceed 4°C/Sec.
Soldering Zone	Max. solder temperature should not exceed 260°C Time within 5°C of actual Max. solder temperature within 3 - 5 seconds Total time from 25°C room to Max. solder temperature within 5 minutes including Pre-Heating time
Cooling Zone	Cooling by natural convection in air. Max. ramping down rate should not exceed 6°C/Sec.



Physical Specifications

Lead Material	.20-.40A: Tin-plated Copper clad steel .50-3.75A: Tin-plated Copper
Soldering Characteristics	Solderability per MIL–STD–202, Method 208
Insulating Material	Cured, flame retardant epoxy polymer meets UL94V-0 requirements.
Device Labeling	Marked with 'LF', voltage, current rating, and date code.

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	+85°C to -40°C 10 times -/+ 5% typical resistance change
Solvent Resistance	MIL–STD–202, Method 215
Moisture Resistance Level	Level 1, J–STD–020

Additional Information

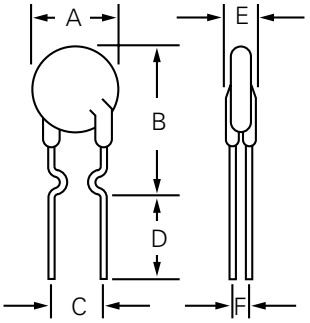
Datasheet | **Resources** | **Samples**

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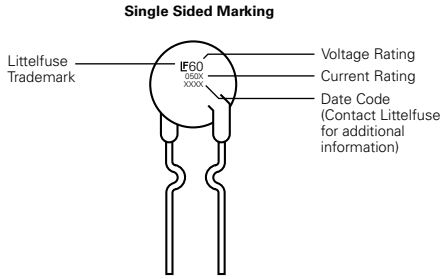
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Dimensions



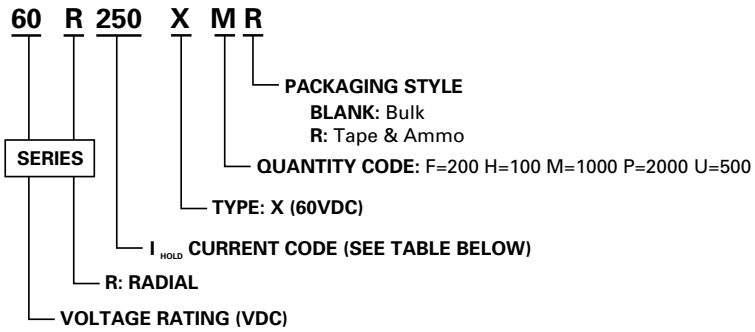
Part Marking System



Part Number	A		B		C		D		E		F		Physical Characteristics		
	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Inches	mm	Lead (dia)		Material
	Max.	Max.	Max.	Max.	Typ.	Typ.	Min.	Min.	Max.	Max.	Typ.	Typ.	Inches	mm	
60R010X	0.29	7.4	0.50	12.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R017X	0.29	7.4	0.50	12.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R020X	0.29	7.4	0.46	11.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R025X	0.29	7.4	0.50	12.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R030X	0.29	7.4	0.50	12.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R040X	0.30	7.6	0.53	13.5	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/CuFe
60R050X	0.31	7.9	0.54	13.7	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/Cu
60R065X	0.37	9.4	0.57	14.5	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/Cu
60R075X	0.40	10.2	0.59	15	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/Cu
60R090X	0.44	11.2	0.62	15.8	0.20	5.1	0.30	7.6	0.12	3.1	0.047	1.2	0.02	0.51	Sn/Cu
60R110X	0.51	13	0.72	18.2	0.20	5.1	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R135X	0.53	13.58	0.78	19.8	0.20	5.1	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R160X	0.60	15.36	0.85	21.6	0.20	5.1	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R185X	0.66	16.76	0.91	23	0.20	5.1	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R250X	0.78	19.93	1.03	26.2	0.40	10.2	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R300X	0.91	23.11	1.15	29.3	0.40	10.2	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu
60R375X	1.04	26.3	1.22	31.1	0.40	10.2	0.30	7.6	0.12	3.1	0.055	1.4	0.03	0.81	Sn/Cu

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Part Ordering Number System



Packaging

Part Number	Ordering Number	I_{hold} (A)	I_{hold} Code	Packaging Option	Quantity	Quantity & Packaging Codes
60R010X	60R010XU	0.10	010	Bulk	500	U
	60R010XPR			Tape and Ammo	2000	PR
60R017X	60R017XU	0.20	020	Bulk	500	U
	60R017XPR			Tape and Ammo	2000	PR
60R020X	60R020XU	0.20	020	Bulk	500	U
	60R020XPR			Tape and Ammo	2000	PR
60R025X	60R025XU	0.25	025	Bulk	500	U
	60R025XPR			Tape and Ammo	2000	PR
60R030X	60R030XU	0.30	030	Bulk	500	U
	60R030XPR			Tape and Ammo	2000	PR
60R040X	60R040XU	0.40	040	Bulk	500	U
	60R040XPR			Tape and Ammo	2000	PR
60R050X	60R050XU	0.50	050	Bulk	500	U
	60R050XPR			Tape and Ammo	2000	PR
60R065X	60R065XU	0.65	065	Bulk	500	U
	60R065XPR			Tape and Ammo	2000	PR
60R075X	60R075XU	0.75	075	Bulk	500	U
	60R075XPR			Tape and Ammo	2000	PR
60R090X	60R090XU	0.90	090	Bulk	500	U
	60R090XPR			Tape and Ammo	2000	PR
60R110X	60R110XU	1.10	110	Bulk	500	U
	60R110XMR			Tape and Ammo	1000	MR
60R135X	60R135XF	1.35	135	Bulk	200	F
	60R135XMR			Tape and Ammo	1000	MR
60R160X	60R160XF	1.60	160	Bulk	200	F
	60R160XMR			Tape and Ammo	1000	MR
60R185X	60R185XF	1.85	185	Bulk	200	F
	60R185XMR			Tape and Ammo	1000	MR
60R250X	60R250XF	2.50	250	Bulk	200	F
	60R250XMR			Tape and Ammo	1000	MR
60R300X	60R300XF	3.00	300	Bulk	200	F
60R375X	60R375XH	3.75	375	Bulk	100	H

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Tape and Ammo Specifications

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

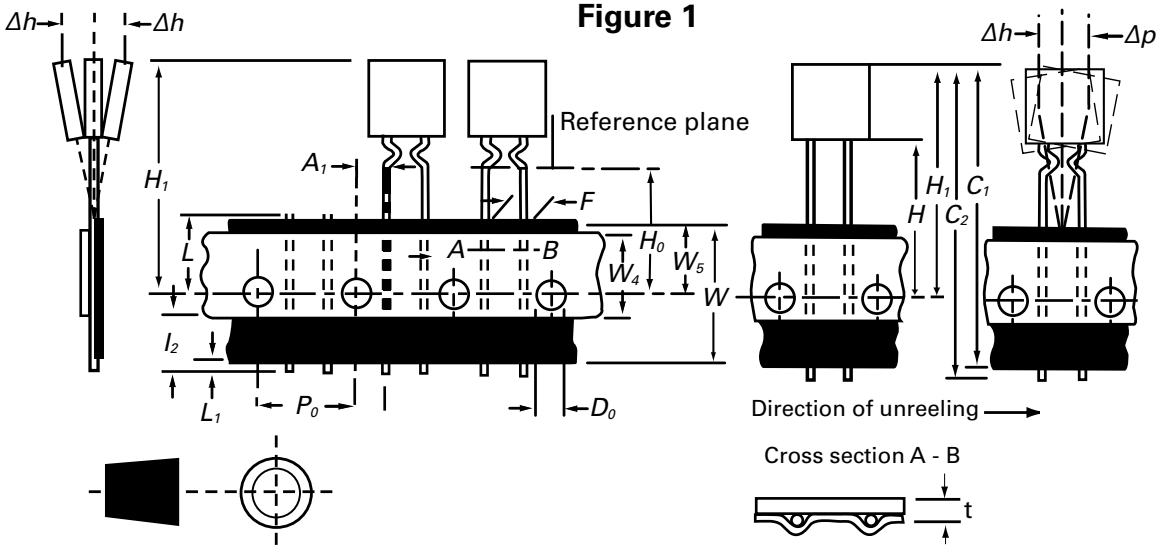
Dimension	EIA Mark	IEC Mark	Dimensions	
			Dim. (mm)	Tol. (mm)
Carrier tape width	**W**	**W**	18	-0.5 / +1.0
Hold down tape width	**W_4**	**W_0**	11	min.
Top distance between tape edges	**W_6**	**W_2**	3	max.
Sprocket hole position	**W_5**	**W_1**	9	-0.5 / +0.75
Sprocket hole diameter*	**D_0**	**D_0**	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 60R010-60R090	**H_1**	**H_1**	32.2	max.
Abscissa to top 60R110-60R300	**H_1**		47.5	max.
Overall width without lead protrusion:60R010-60R090	**C_1**		42.5	max.
Overall width without lead protrusion:60R110-60R300			57	
Overall width with lead protrusion:60R010-60R090	**C2**		43.2	max.
Overall width with lead protrusion:60R110-60R300			58	
Lead protrusion	**L_1**	**I_1**	1.0	max.
Protrusion of cut out	**L**	**L**	11	max.
Protrusion beyond hold-down tape	**I_2**	**I_2**	Not specified	
Sprocket hole pitch:60R010-60R090	**P_0**	**P_0**	12.7	-/+ 0.3
Sprocket hole pitch:60R110-60R300	**P_0**	**P_0**	25.4	-/+ 0.5
Pitch tolerance			20 consecutive.	-/+ 1
Device pitch:60R010-60R090			12.7	
Device pitch:60R110-60R300			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*:60R010-60R090	**P_1**	**P_1**	3.81	-/+ 0.7
Ordinate to adjacent component lead*:60R110-60R300			7.62	-/+ 0.7
Lead spacing:60R010-60R185	**F**	**F**	5.08	-/+ 0.8
Lead spacing:60R250-60R300	**F**	**F**	10.18	-/+ 0.8

*Differs from EIA Specification

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Tape and Ammo Diagram

Figure 1



WARNING

- Users shall independently assess the suitability of these devices for each of their applications
- Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration
- Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- Circuits with inductance may generate a voltage (L di/dt) above the rated voltage of the PPTC device.

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