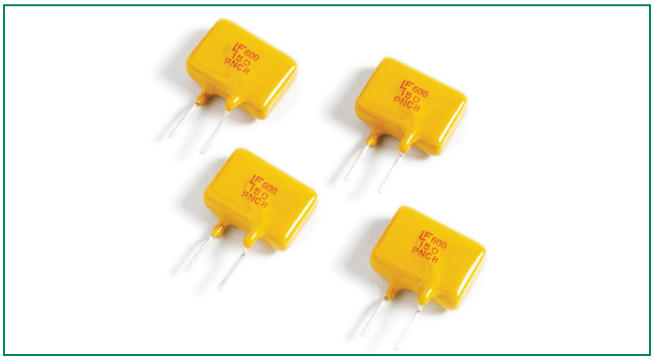
RoHS HF* 600R Series



Description

- The 600R Series is designed to protect against power fault events typically found in telecom applications. This series is designed to be used in applications that need to meet the requirements of GR–1089-CORE and UL60950/EN60950/IEC60950. These resettable devices also help to meet the requirements of ITU K.20, K.21 and K.44.

Features

- 0.15 – 0.16A hold current range, 60VDC operating voltage
- 600VAC interrupt rating
- Fast time–to-trip
- Binned and sorted narrow resistance ranges available
- RoHS compliant, Lead–Free and Halogen-Free*

Applications

Secondary overcurrent protection for:

- Central Office Equipment (CO)
- Customer Premises Equipment (CE)
- Alarm systems
- Set Top Boxes (STB)
- Voice over IP (VOIP)
- Subscriber Line Interface Circuit (SLIC)

Agency Approvals

AGENCY	AGENCY FILE NUMBER
c UL us	E183209
TÜV	R50120008

Electrical Characteristics

Part Number	I_{hold} (A)	I_{trip} (A)	V_{max} V_{int} / V_{op}	I_{max} (A)	P_d typ. (W)	Maximum Time To Trip		Resistance			Agency Approvals	
						Current (A)	Time (Sec.)	R_{min} (Ω)	R_{typ} (Ω)	R_{1max} (Ω)	c UL us	TÜV
600R150	0.15	0.30	600/60	3	1.00	1	4.0	6	10	17	X	X
600R150-RA	0.15	0.30	600/60	3	1.00	1	4.0	7	10	20	X	X
600R150-RB	0.15	0.30	600/60	3	1.00	1	3.0	9	12	22	X	X
600R160	0.16	0.32	600/60	3	1.00	1	10	4	10	18	X	X
600R160-RA	0.16	0.32	600/60	3	1.00	1	9.5	4	7	16	X	X
600R160-R1	0.16	0.32	600/60	3	1.00	1	9.0	4	8	17	X	X

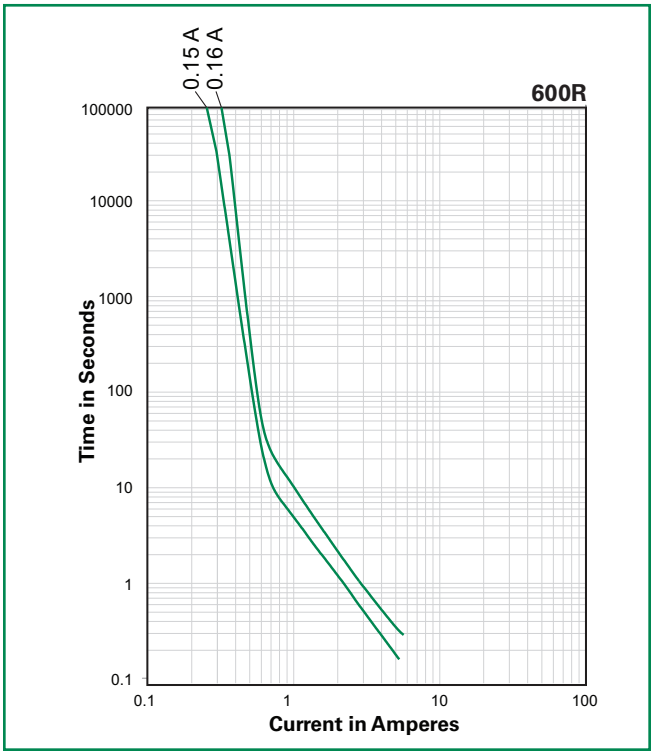
I_{hold} = Hold current: maximum current device will pass without tripping in 23°C still air.
I_{trip} = Trip current: minimum current at which the device will trip in 23°C still air.
V_{int} = Maximum voltage the device can withstand without damage at rated current (I max)
V_{op} = The device regular operation voltage
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 23°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.
Caution: Operation beyond the specified rating may result in damage and possible arcing and flame.

* Effective February 11, 2010 onward, all 600R PTC products will be manufactured Halogen Free (HF). Existing Non-Halogen Free 600R PTC products may continue to be sold, until supplies are depleted. This change will have no effect on 600R product specifications or performance.

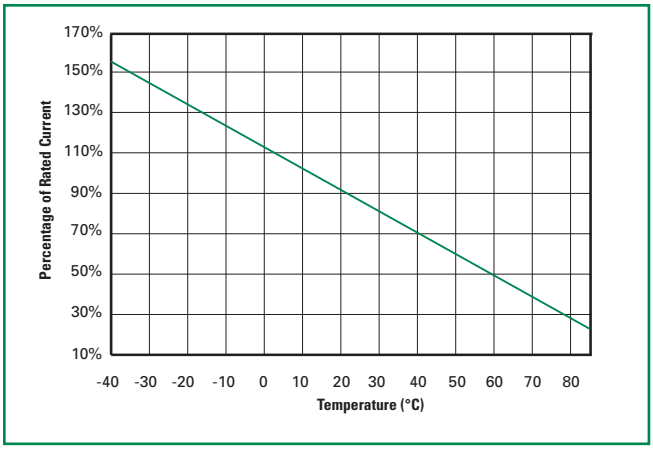
Temperature Rerating

	Ambient Operation Temperature						
	-40°C	-20°C	0°C	23°C	40°C	60°C	85°C
Part Number	Hold Current (A)						
600R150	0.26	0.23	0.19	0.15	0.124	0.062	0.03
600R160	0.27	0.24	0.20	0.16	0.13	0.07	0.05

Average Time Current Curves



Temperature Rerating Curve



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.

Agency Specification Selection Guide For Telecom and Networking Applications

Part Number	Lightning	Power Cross
600R150 600R160	TIA-968-A – 1.5kV 10/160µs 800V 10/560µs Telcordia GR 1089 – 1.0kV 10/1000µs 2.5kV 2/10µs	UL60950, 3rd Ed – 600Vac, 40A Telcordia GR – 1089 – 600Vac, 60A

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

Protection Application Guide

Region/Specification	Application	Device Selection
North America Telcordia GR-1089	*Access network equipment Remote terminal Repeaters WAN equipment Cross -connect	600R150 600R160
North America TIA-968-A, UL60950	Customer and IT equipment Analog modems ADSL, XDSL modems Phone sets, PBX systems Internet appliances POS terminals	600R150 600R160
North America Telcordia GR-1089	Central Office POTS/ISDN linecards T1/E1/J1 linecards ADSL/VDSL splitters CSU/DSU	600R150 600R160
North America Telcordia GR-1089 South America/Asia/Europe ITU K.20 and K.21	*Intrabuilding communication systems LAN, VOIP cards Local loop handsets	600R150 600R160

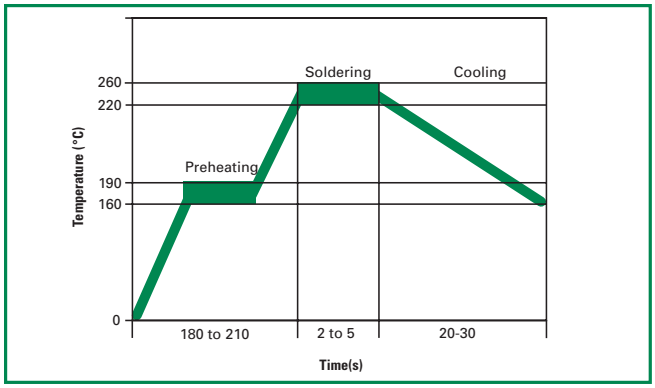
*Resistance binned parts are recommended

Soldering Parameters - Wave Soldering

Condition	Wave Soldering
Peak Temp/ Duration Time	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_2 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.



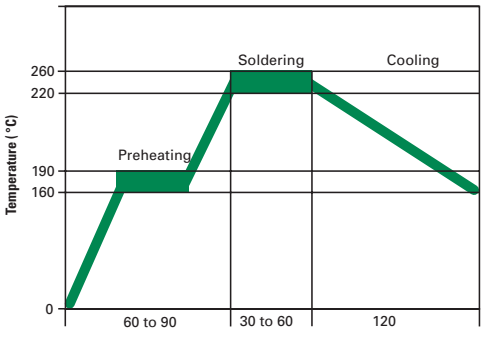
600R Series

Soldering Parameters - Solder Reflow

Condition	Reflow
Peak Temp/ Duration Time	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_2 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

Lead Material	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 'LF', voltage, current rating, and date code.

Environmental Specifications

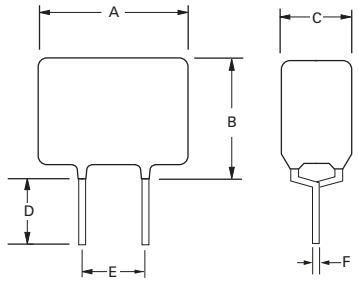
Operating/Storage Temperature	-40°C to +85°C
Maximum Device Surface Temperature in Tripped State	125°C
Passive Aging	85°C/85°C, 1000 hours
Humidity Aging	+85°C, 85% R.H.,1000 hours
Thermal Shock	MIL–STD–202F, Method 107G +125°C to -55°C 10 times
Solvent Resistance	MIL–STD–202, Method 215F

Part Ordering Number System

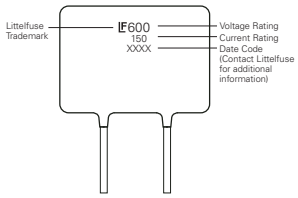
600 R 160 - RA F

- **PACKAGING STYLE** **BLANK:** Bulk, **R:** Tape & Ammo
- **QUANTITY CODE:** F=200 U=500 Z = 600
- **Rx:** Resistance Range (x = A-Z or 1-9) [not applicable for all
- **I HOLD CURRENT CODE (SEE TABLE BELOW)**
- **R: RADIAL**
- **PEAK VOLTAGE RATING**
- **SERIES**

Dimensions



Part Marking System



Part Number	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	
Device dimensions through February 10, 2010*													
600R150	0.53	13.5	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R150-RA	0.53	13.5	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R150-RB	0.53	13.5	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160-RA	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160-R1	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
Device dimensions after February 11, 2010*													
600R150	0.35	9	0.49	12.5	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R150-RA	0.35	9	0.49	12.5	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R150-RB	0.35	9	0.49	12.5	0.18	4.6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160-RA	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu
600R160-R1	0.63	16	0.50	12.6	0.24	6	0.19	4.7	0.20	5.1	0.026	0.65	Sn/Cu

* Littelfuse will be changing the form dimensions of 600R series devices. Effective Febraury 11, 2010, all 600R series devices will be manufactured using the smaller dimensions listed. This change affects dimensions only, and will have no effect on electrical specification, quality or performance.

Packaging

Part Number	Ordering Number	I_{hold} (A)	I_{hold} Code	Packaging Option	Quantity	Quantity & Packaging Codes
600R150	600R150F	0.15	150	Bulk	200	F
	600R150ZR			Tape and Ammo	600	ZR
600R150-RA	600R150-RAF	0.15	150	Bulk	200	F
	600R150-RAZR			Tape and Ammo	600	ZR
600R150-RB	600R150-RBF	0.15	150	Bulk	200	F
	600R150-RBZR			Tape and Ammo	600	ZR
600R160	600R160F	0.16	160	Bulk	200	F
	600R160UR			Tape and Ammo	500	UR
600R160-RA	600R160-RAF	0.16	160	Bulk	200	F
	600R160-RAUR			Tape and Ammo	500	UR
600R160-R1	600R160-R1F	0.16	160	Bulk	200	F
	600R160-R1UR			Tape and Ammo	500	UR

Tape and Ammo Specifications

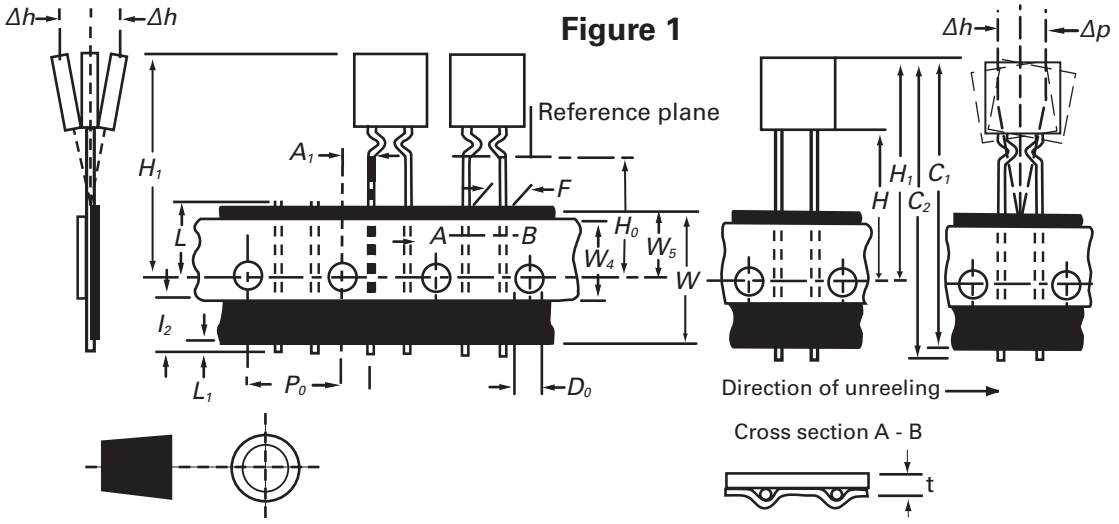
Devices taped using EIA468-B/IE286-2 standards. See table below and Figure 1 for details.

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	H_1	H_1	32.2	max.
Overall width w/o lead protrusion	C_1		42.5	max.
Overall width w/ lead protrusion	C_2		43.2	max.
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: 600R150 & 600R160	P_0	P_0	25.4	-/+ 0.5
Device pitch: 600R150 & 600R160			25.4	
Pitch tolerance			20 consecutive.	-/+ 1
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*	P_1	P_1	3.81	-/+ 0.7
Lead spacing	**F**	**F**	5.08	-/+ 0.8

*Differs from EIA Specification

Tape and Ammo Diagram

Figure 1



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