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## FUZETEC TECHNOLOGY

Founded in 1997, as a world leading device manufacturer and designer, Fuzetec Technology Co., Ltd. (FUZETEC) is committed to provide continuous circuit protection solutions to today's and tomorrow's electronic and electrical industries.

With the most advanced Positive Temperature Coefficient (PTC) conductive polymer technologies, FUZETEC offers a wide variety of Polymeric PTC resettable fuses to fulfill the needs of modern demanding high-tech applications. They include, but not limited to: Telecommunications, Networks, Computers & Peripherals, Notebook PC's, Primary & Secondary Batteries, Automotives, Instrumentations & Industrial Controls, Power Supplies, and Consumer Electronics etc.

## FUZETEC $\hat{\circ}$ PRODUCT FAMILY

FUZETEC™ product families are designed for today's demanding electronic and electrical industries. Its resettable feature, compact size, flexible construction, low thermal output and competitive cost out performed the traditional fuse, Ceramic PTC, Bimetal fuse and Current control IC. They are ideal for all low voltage DC and AC application. FUZETEC™ resettable fuse are offered in a variety constructions, which include: Radial Leaded (16V, 30V, 60V, 90V, 120Vac, 240 VAC/DC, 250V & 600V), Surface Mount (1206, 1210, 1812 & 2920 sizes) & Axial Leaded for all battery packs applications. In addition to our standard products we offer a flexible range of custom design devices (i.e. Disc Type).



## SAFETY, QUALITY AND CUSTOMER SATISFACTORY

With third party approvals (UL, C-UL and TÜV), FUZETEC™ products are ensured to provide long lasting safety and performance. From product design and development, through manufacturing and quality control to delivery and shipment. Fuzetec Technology strictly implements ISO 9001-2000 quality standards to assure its products quality and consistency. With continuous improvement, we are committed to provide top products and services to better satisfy our customer's needs. We strongly believe that excellent partnership between customers and us are the best and the only route to achieve success in tomorrow's competing business world.

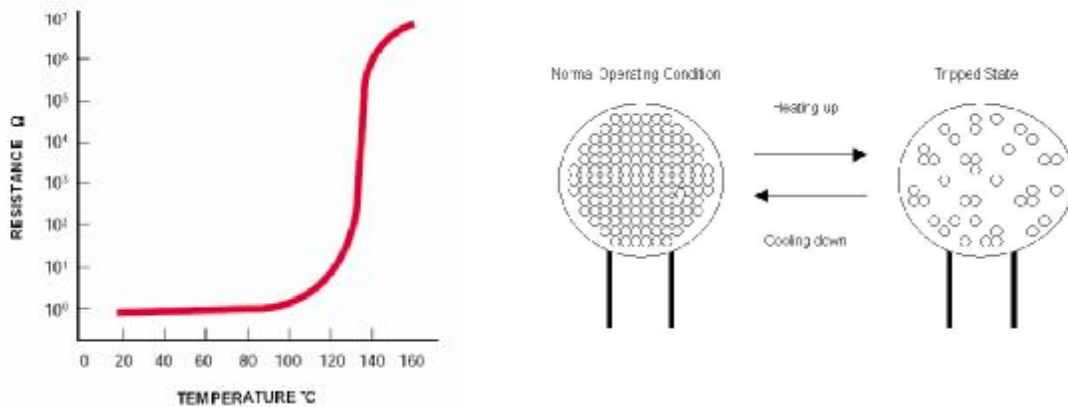
## TECHNOLOGY NICHE

Polymeric PTC material and devices technology synergistically integrate the advance polymer material technologies, conductive material science, novel processing engineering, and fundamental electronic and electrical theory. Electrical resistance of such material and devices increases with temperature increases and vice versa. When experiencing "overcurrent and/or over voltage", the device generates thermal energy ( $\text{Energy} = I \cdot V$ ) and heats up itself. This makes polymer matrix's morphology change from crystalline to amorphous phase, and results in a resistance increase of thousand orders of magnitude such that "trip" the electricity. The device will remain hot and stay "tripped" until the fault is cleared and power is removed.

# OVERVIEW

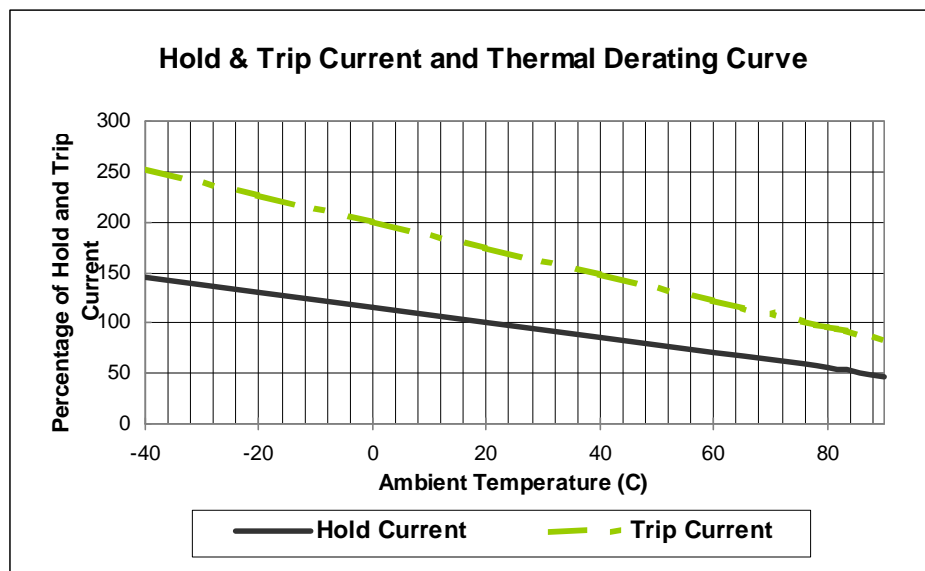
## HOW DOES THE RESETTABLE FUSE WORK

FUZETEC™ resettable fuses are designed and made of patented novel polymeric PTC material in thin chip form, developed solely by FUZETEC. With electrodes and leads attached on both sides, it is placed in series to protect a circuit. At “normal operating condition” the device remains at an extremely low resistance (mini-ohms) and allows the electrical current to flow through it without any restriction. When overcurrent conditions occur, the polymeric PTC material heats up and its resistance increases sharply. Such a sharp resistance increase (to an insulated status) cuts off the current in the circuit, and consequently protects the element and device in the circuit. Upon fault current being removed, the resettable fuse cools and its resistance drops to the original extremely low value. The resettable fuse is “resetted” and allows the current through the circuit again.



## TRIP CURRENT, HOLD CURRENT AND THERMAL DERATING

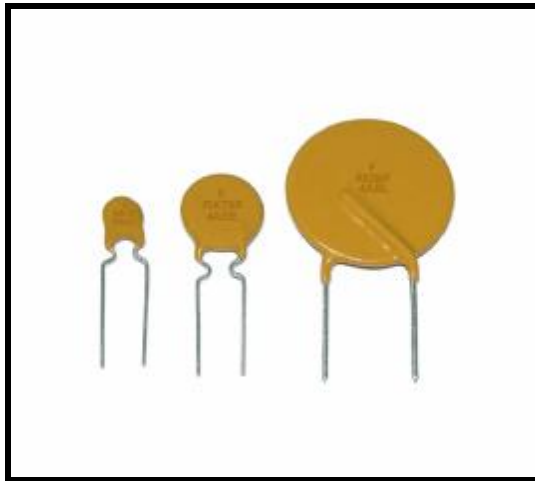
Trip Current (IT) and Hold Current (IH) of FUZETEC™ resettable fuse are rated at 23°C. Typically its Trip Current is twice as much as its Hold Current. FUZETEC™ device does not trip at or below its rated Hold Current, and will trip at or above its Trip Current value. However, due to PTC effect both IT and IH reduce with ambient temperature increase and vice versa. As shown below, the currents are reduced nearly 50% at 85°C and increased to 150% at -40°C.



# Radial Leaded PTC FRX Series



**RoHS Compliant &  
Lead Free**



**Application:**

Wide variety of electronic equipment

**Product Features:**

Low hold current, Solid state

Radial-leaded product ideal for up to 60V

**Operation Current:** 50mA ~ 3.75A

**Maximum Voltage:** 60V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

TÜV (R3-50004084)

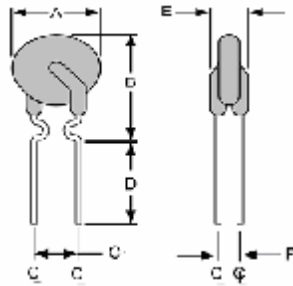
## Electrical Characteristics(23°C)

Part Number	Hold Current I <sub>H</sub> , A	Trip Current I <sub>T</sub> , A	Max.Time to Trip at 5xI <sub>H</sub> , S	Maximum Current I <sub>MAX</sub> , A	Rated Voltage V <sub>MAX</sub> , Vdc	Typical Power Pd, W	Resistance Tolerance	
							R <sub>MIN</sub> Ohms	R <sub>1MAX</sub> Ohms
FRX005-60F	0.05	0.10	5.0	40	60	0.26	7.30	20.0
FRX010-60F	0.10	0.20	4.0	40	60	0.38	2.50	7.50
FRX017-60F	0.17	0.34	3.0	40	60	0.48	2.00	7.00
FRX020-60F	0.20	0.40	2.2	40	60	0.41	1.83	4.40
FRX025-60F	0.25	0.50	2.5	40	60	0.45	1.25	3.00
FRX030-60F	0.30	0.60	3.0	40	60	0.49	0.88	2.10
FRX040-60F	0.40	0.80	3.8	40	60	0.56	0.55	1.29
FRX050-60F	0.50	1.00	4.0	40	60	0.77	0.50	1.17
FRX065-60F	0.65	1.30	5.3	40	60	0.88	0.31	0.72
FRX075-60F	0.75	1.50	6.3	40	60	0.92	0.25	0.60
FRX090-60F	0.90	1.80	7.2	40	60	0.99	0.20	0.47
FRX110-60F	1.10	2.20	8.2	40	60	1.50	0.15	0.38
FRX135-60F	1.35	2.70	9.6	40	60	1.70	0.12	0.30
FRX160-60F	1.60	3.20	11.4	40	60	1.90	0.09	0.22
FRX185-60F	1.85	3.70	12.6	40	60	2.10	0.08	0.19
FRX250-60F	2.50	5.00	15.6	40	60	2.50	0.05	0.13
FRX300-60F	3.00	6.00	19.8	40	60	2.80	0.04	0.10
FRX375-60F	3.75	7.50	24.0	40	60	3.20	0.03	0.08

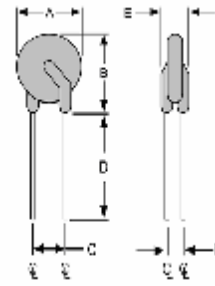
I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
 I<sub>MAX</sub>= Maximum fault current device can withstand and without damage at rated voltage (V max).  
 Pd=Typical power dissipated from device when in the tripped state in 23°C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23°C.  
 R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping .  
 Physical specifications:  
 Lead material: FRX005F~FRX090F Tin plated copper, 24 AWG.  
 FRX110F~FRX375F Tin plated copper, 20 AWG.  
 Soldering characteristics: MIL-STD-202, Method 208E.  
 Insulating coating:Flame retardant epoxy, meet UL-94V-0 requirement.

NOTE : All Specification subject to change without notice. 3

## FRX Product Dimensions (Millimeters)



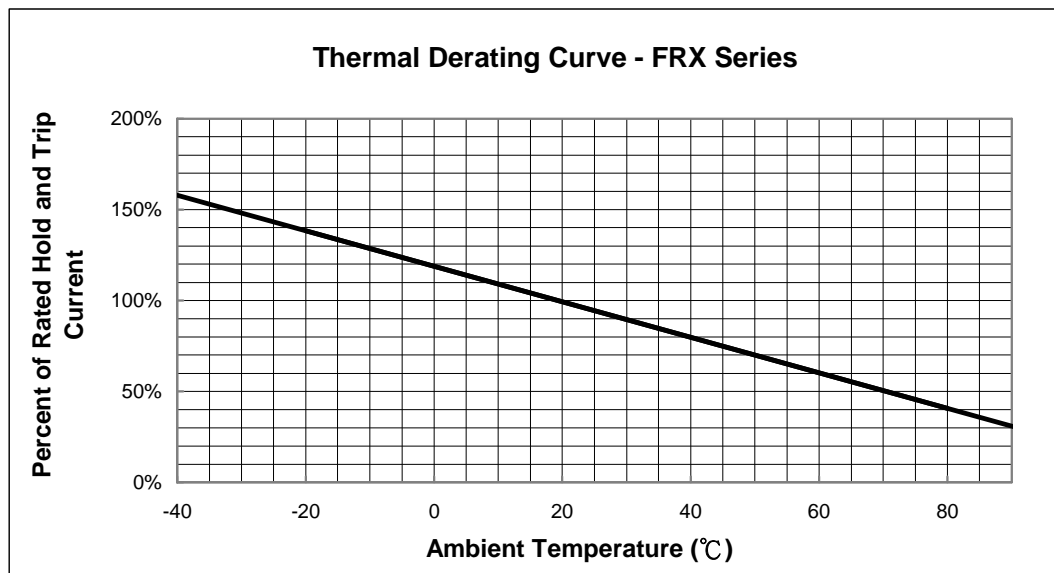
FRX 005-60F ~ FRX 090-60F  
Lead Size: 24AWG,  
Φ 0.51 mm Diameter



FRX 110-60F ~ FRX 375-60F  
Lead Size: 20AWG,  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRX005-60F	7.4	12.7	5.1	7.6	3.1	1.1
FRX010-60F	7.4	12.7	5.1	7.6	3.1	1.1
FRX017-60F	7.4	12.7	5.1	7.6	3.1	1.1
FRX020-60F	7.4	12.7	5.1	7.6	3.1	1.1
FRX025-60F	7.4	12.7	5.1	7.6	3.1	1.1
FRX030-60F	7.4	13.0	5.1	7.6	3.1	1.1
FRX040-60F	7.6	13.5	5.1	7.6	3.1	1.1
FRX050-60F	7.9	13.7	5.1	7.6	3.1	1.1
FRX065-60F	9.7	14.5	5.1	7.6	3.1	1.1
FRX075-60F	10.4	15.2	5.1	7.6	3.1	1.1
FRX090-60F	11.7	15.8	5.1	7.6	3.1	1.1
FRX110-60F	13.0	18.0	5.1	7.6	3.1	1.4
FRX135-60F	14.5	19.6	5.1	7.6	3.1	1.4
FRX160-60F	16.3	21.3	5.1	7.6	3.1	1.4
FRX185-60F	17.8	22.9	5.1	7.6	3.1	1.4
FRX250-60F	21.3	26.4	10.2	7.6	3.1	1.4
FRX300-60F	24.9	30.0	10.2	7.6	3.1	1.4
FRX375-60F	28.5	33.5	10.2	7.6	3.1	1.4

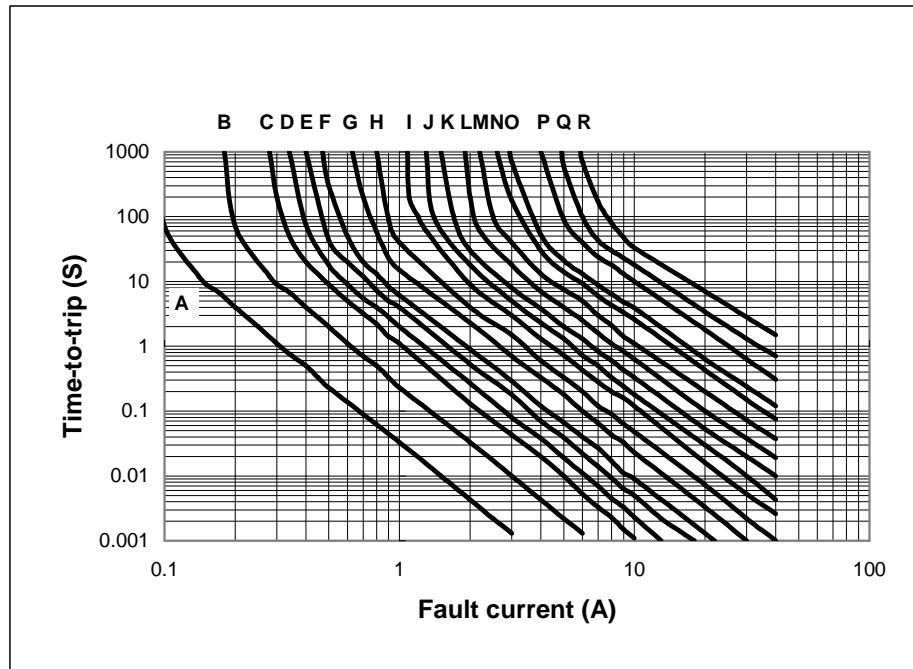
## Thermal Derating Curve



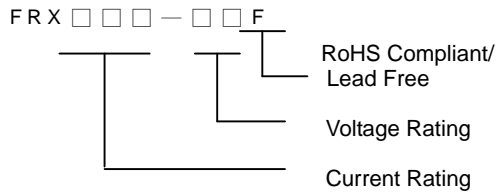
NOTE : All Specification subject to change without notice . 4

## Typical Time-To-Trip at 23°C

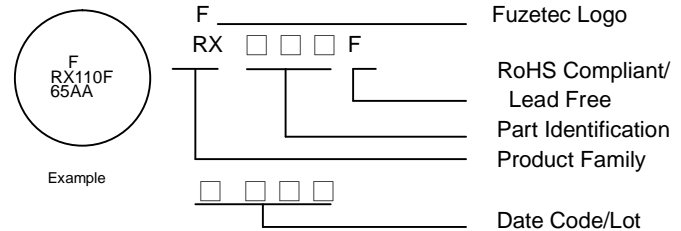
- A= FRX005-60F
- B = FRX010-60F
- C = FRX017-60F
- D = FRX020-60F
- E = FRX025-60F
- F = FRX030-60F
- G = FRX040-60F
- H = FRX050-60F
- I = FRX065-60F
- J = FRX075-60F
- K= FRX090-60F
- L = FRX110-60F
- M = FRX135-60F
- N = FRX160-60F
- O = FRX185-60F
- P = FRX250-60F
- Q = FRX300-60F
- R = FRX375-60F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag	Reel/Tape
FRX005-60F	500	3K
FRX010-60F	500	3K
FRX017-60F	500	3K
FRX020-60F	500	3K
FRX025-60F	500	3K
FRX030-60F	500	3K
FRX040-60F	500	3K
FRX050-60F	500	3K
FRX065-60F	300	3K

P/N	Pcs /Bag	Reel/Tape
FRX075-60F	300	3K
FRX090-60F	300	3K
FRX110-60F	300	1.5K
FRX135-60F	200	1.5K
FRX160-60F	200	1.5K
FRX185-60F	200	1.5K
FRX250-60F	100	-----
FRX300-60F	100	-----
FRX375-60F	100	-----

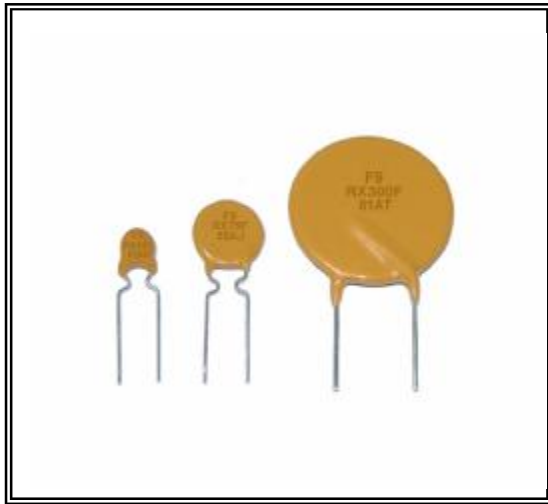
**Warning:**

- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.



NOTE : All Specification subject to change without notice . 5

# Radial Leaded PTC FRX 90V Series



**RoHS Compliant & Lead Free)**



**Application:**

Telecom & wide variety of electronic equipment

**Product Features:**

Low hold current, Solid state, Radial leaded product ideal for up to 90V

**Operation Current:** 100mA~3.75A

**Maximum Voltage:** Up to 90V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

TÜV (R50004084)

**Electrical Characteristics (23°C)**

Part Number	Hold Current	Trip Current	Max.Time to Trip	Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
							RMIN	R1MAX
							Ohms	Ohms
FRX010-90F	0.10	0.20	4.0	40	72/90	0.38	2.50	7.50
FRX015-90F	0.15	0.35	10.0	40	72/90	0.70	2.40	7.00
FRX017-90F	0.17	0.34	3.0	40	72/90	0.48	2.00	5.00
FRX020-90F	0.20	0.40	2.2	40	72/90	0.41	1.83	4.40
FRX025-90F	0.25	0.50	2.5	40	72/90	0.45	1.25	3.00
FRX030-90F	0.30	0.60	3.0	40	72/90	0.49	0.88	2.10
FRX035-90F	0.35	0.75	10.0	40	72/90	1.30	0.70	2.50
FRX040-90F	0.40	0.80	3.8	40	72/90	0.56	0.55	1.29
FRX050-90F	0.50	1.00	4.0	40	72/90	0.77	0.50	1.17
FRX055-90F	0.55	1.20	10.0	40	72/90	1.50	0.40	1.50
FRX065-90F	0.65	1.30	5.3	40	72/90	0.88	0.31	0.72
FRX075-90F	0.75	1.50	6.3	40	72/90	0.92	0.25	0.60
FRX090-90F	0.90	1.80	7.2	40	72/90	0.99	0.20	0.47
FRX110-90F	1.10	2.20	8.2	40	72/90	1.50	0.15	0.38
FRX135-90F	1.35	2.70	9.6	40	72/90	1.70	0.12	0.30
FRX160-90F	1.60	3.20	11.4	40	72/90	1.90	0.09	0.22
FRX185-90F	1.85	3.70	12.6	40	72/90	2.10	0.08	0.19
FRX250-90F	2.50	5.00	15.6	40	72/90	2.50	0.05	0.13
FRX300-90F	3.00	6.00	19.8	40	72/90	2.80	0.04	0.10
FRX375-90F	3.75	7.50	24.0	40	72/90	3.20	0.03	0.08

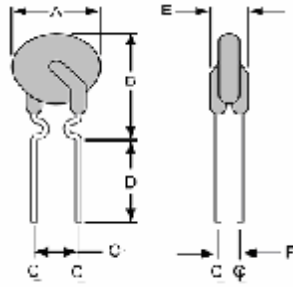
I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
 I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V<sub>MAX</sub>).  
 Pd=Typical power dissipated from device when in tripped state in 23°C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23°C.  
 R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping .  
 Physical specifications:  
 Lead material: FRX010F~FRX090F Tin plated copper, 24 AWG.  
 FRX110F~FRX375F Tin plated copper, 20 AWG.  
 Soldering characteristics: MIL-STD-202, Method 208E.  
 Insulating coating:Flame retardant epoxy, meets UL-94V-0 requirement.

NOTE : All Specification subject to change without notice . 6

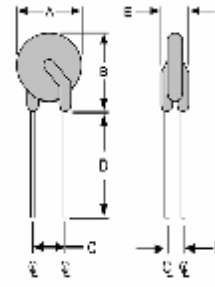
# Radial Leaded PTC FRX 90V Series



## FRX90V Production Dimensions (millimeter)



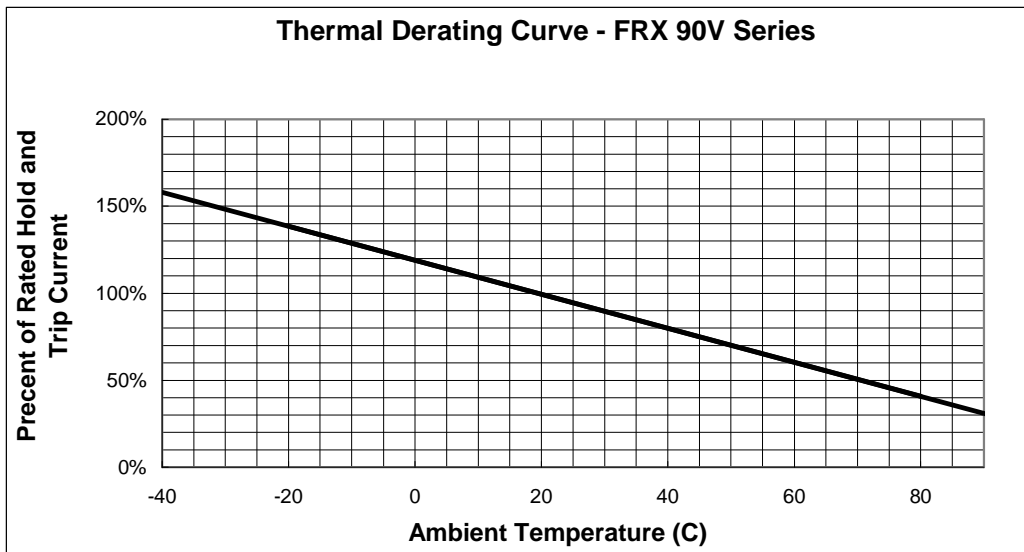
FRX 010-90F ~ FRX 090-90F  
Lead Size : 24AWG  
Φ 0.51 mm Diameter



FRX 110-90F ~ FRX 375-90F  
Lead Size : 20AWG  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRX010-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX015-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX017-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX020-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX025-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX030-90F	7.4	13.0	5.1	7.6	3.1	1.1
FRX035-90F	7.4	12.7	5.1	7.6	3.1	1.1
FRX040-90F	7.6	13.5	5.1	7.6	3.1	1.1
FRX050-90F	7.9	13.7	5.1	7.6	3.1	1.1
FRX055-90F	9.7	14.0	5.1	7.6	3.1	1.1
FRX065-90F	9.7	14.5	5.1	7.6	3.1	1.1
FRX075-90F	10.4	15.2	5.1	7.6	3.1	1.1
FRX090-90F	11.7	15.8	5.1	7.6	3.1	1.1
FRX110-90F	13.0	18.0	5.1	7.6	3.1	1.4
FRX135-90F	14.5	19.6	5.1	7.6	3.1	1.4
FRX160-90F	16.3	21.3	5.1	7.6	3.1	1.4
FRX185-90F	17.8	22.9	5.1	7.6	3.1	1.4
FRX250-90F	21.3	26.4	10.2	7.6	3.1	1.4
FRX300-90F	24.9	30.0	10.2	7.6	3.1	1.4
FRX375-90F	28.5	33.5	10.2	7.6	3.1	1.4

## Thermal Derating Curve



NOTE : All Specification subject to change without notice . 7

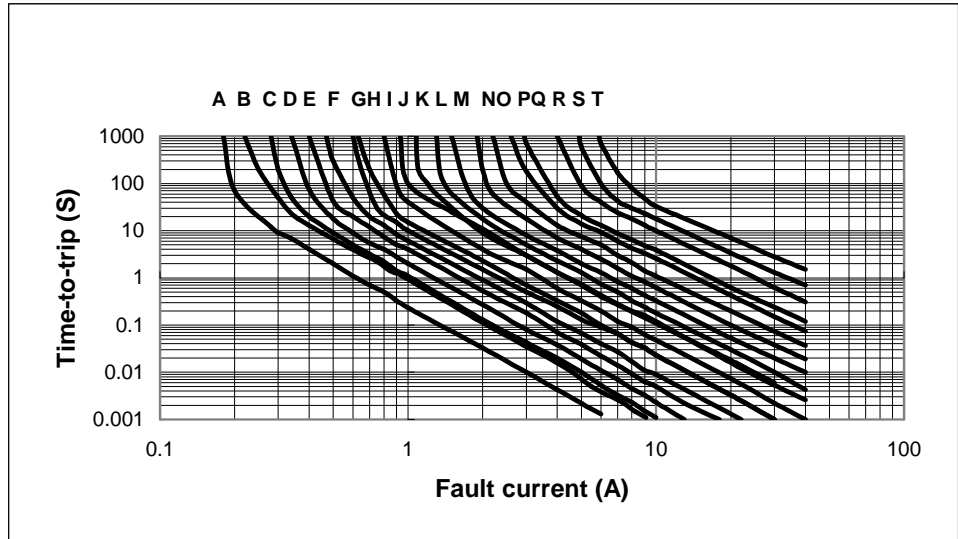


# Radial Leaded PTC FRX 90V Series

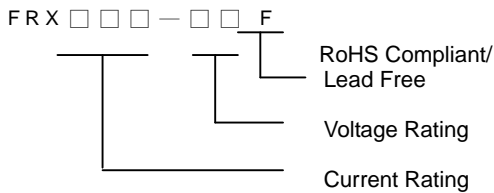


## Typical Time-To-Trip at 23°C

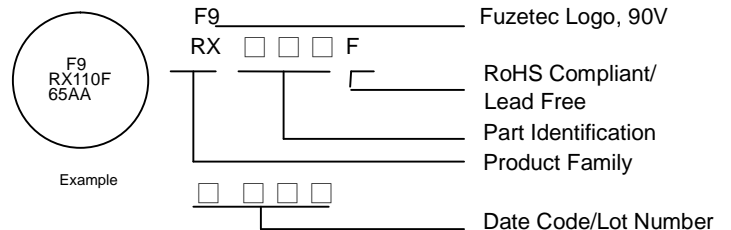
- A = FRX010-90F
- B = FRX015-90F
- C = FRX017-90F
- D = FRX020-90F
- E = FRX025-90F
- F = FRX030-90F
- G = FRX035-90F
- H = FRX040-90F
- I = FRX050-90F
- J = FRX055-90F
- K = FRX065-90F
- L = FRX070-90F
- M = FRX090-90F
- N = FRX110-90F
- O = FRX135-90F
- P = FRX160-90F
- Q = FRX185-90F
- R = FRX250-90F
- S = FRX300-90F
- T = FRX375-90F



## Part Numbering System



## Part Marking System



## Standard Package

P/N	Pcs /Bag	Reel/Tape
FRX010-90F	500	3K
FRX015-90F	500	3K
FRX017-90F	500	3K
FRX020-90F	500	3K
FRX025-90F	500	3K
FRX030-90F	500	3K
FRX035-90F	500	3K
FRX040-90F	500	3K
FRX050-90F	500	3K
FRX055-90F	500	3K

P/N	Pcs /Bag	Reel/Tape
FRX065-90F	300	3K
FRX075-90F	300	3K
FRX090-90F	300	3K
FRX110-90F	200	1.5K
FRX135-90F	200	1.5K
FRX160-90F	200	1.5K
FRX185-90F	200	1.5K
FRX250-90F	100	-----
FRX300-90F	100	-----
FRX375-90F	100	-----

**Warning:**

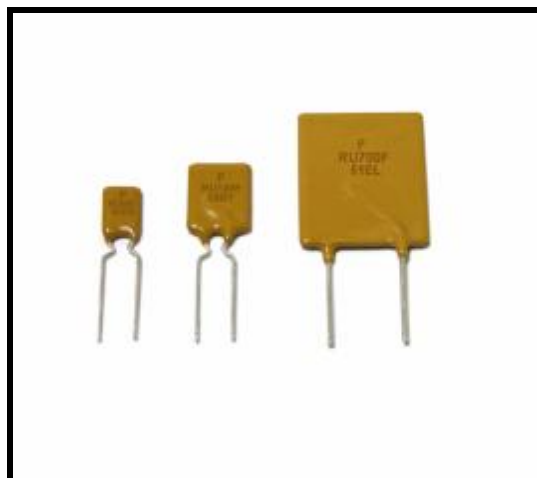
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance .



# Radial Leaded PTC FRU Series



**RoHS Compliant &  
Lead Free**



**Application:**

Wide variety of electronic equipment

**Product Features:**

Low resistance, High hold current, Solid state

Radial-leaded product ideal for up to 30V

**Operation Current:** 900mA~9A

**Maximum Voltage:** 30V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

TÜV (R3-50004084)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Trip Current	Max.Time To Trip	Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
							RMIN	R1MAX
							Ohms	Ohms
FRU090-30F	0.90	1.80	5.9	40	30	0.6	0.070	0.22
FRU110-30F	1.10	2.20	6.6	40	30	0.7	0.050	0.17
FRU135-30F	1.35	2.70	7.3	40	30	0.8	0.040	0.13
FRU160-30F	1.60	3.20	8.0	40	30	0.9	0.030	0.11
FRU185-30F	1.85	3.70	8.7	40	30	1.0	0.030	0.09
FRU250-30F	2.50	5.00	10.3	40	30	1.2	0.020	0.07
FRU300-30F	3.00	6.00	10.8	40	30	2.0	0.020	0.08
FRU400-30F	4.00	8.00	12.7	40	30	2.5	0.010	0.05
FRU500-30F	5.00	10.00	14.5	40	30	3.0	0.010	0.05
FRU600-30F	6.00	12.00	16.0	40	30	3.5	0.005	0.04
FRU700-30F	7.00	14.00	17.5	40	30	3.8	0.005	0.03
FRU800-30F	8.00	16.00	18.8	40	30	4.0	0.005	0.02
FRU900-30F	9.00	18.00	20.0	40	30	4.2	0.005	0.02

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.

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

V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.

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

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

R<sub>MIN</sub>=Minimum device resistance at 23°C.

R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping.

Physical specifications:

Lead material: FRU090F~FRU250F Tin plated copper, 24 AWG.

FRU300F~FRU900F Tin plated copper, 20 AWG.

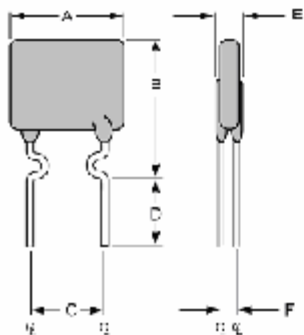
Soldering characteristics: MIL-STD-202, Method 208E.

Insulating coating:Flame retardant epoxy, meet UL-94V-0 requirement.

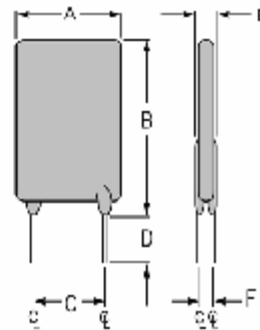
# Radial Leaded PTC FRU Series



## FRU Product Dimensions (millimeters)



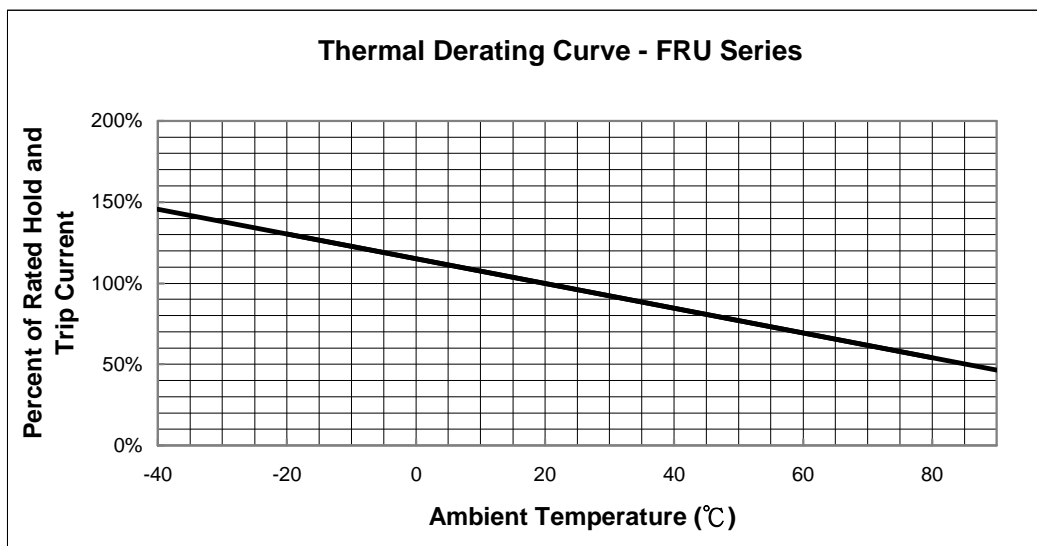
FRU 090-30F ~ FRU 250-30F  
Lead Size: 24AWG,  
Φ 0.51 mm Diameter



FRU 300-30F ~ FRU 900-30F  
Lead Size: 20AWG  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRU090-30F	7.4	12.2	5.1	7.6	3.0	0.9
FRU110-30F	7.4	14.2	5.1	7.6	3.0	0.9
FRU135-30F	8.9	13.5	5.1	7.6	3.0	0.9
FRU160-30F	8.9	15.2	5.1	7.6	3.0	0.9
FRU185-30F	10.2	15.7	5.1	7.6	3.0	0.9
FRU250-30F	11.4	18.3	5.1	7.6	3.0	0.9
FRU300-30F	11.4	17.3	5.1	7.6	3.0	1.2
FRU400-30F	14.0	20.1	5.1	7.6	3.0	1.2
FRU500-30F	14.0	24.9	10.2	7.6	3.0	1.2
FRU600-30F	16.5	24.9	10.2	7.6	3.0	1.2
FRU700-30F	19.1	26.7	10.2	7.6	3.0	1.2
FRU800-30F	21.6	29.2	10.2	7.6	3.0	1.2
FRU900-30F	24.1	29.7	10.2	7.6	3.0	1.2

## Thermal Derating Curve



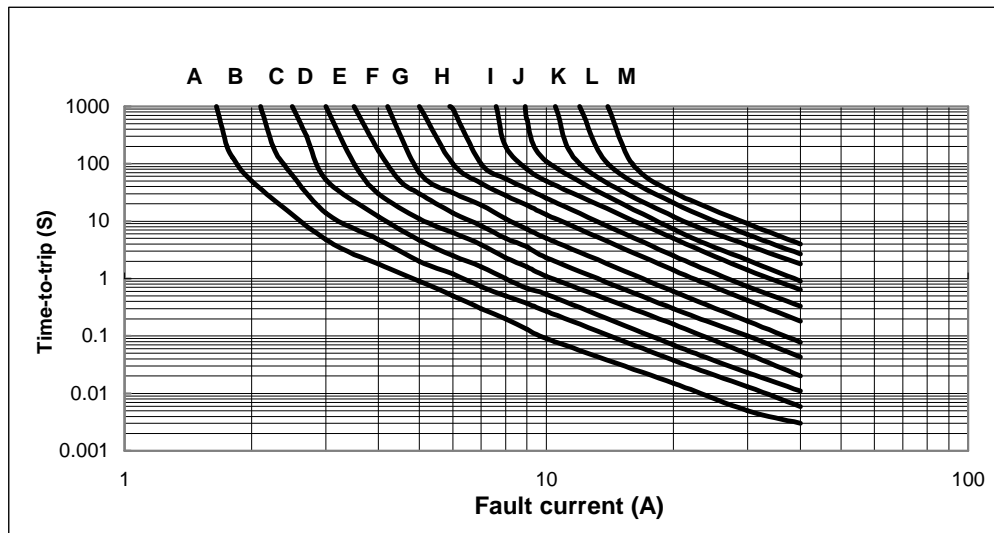
NOTE : All Specification subject to change without notice . 10

# Radial Leaded PTC FRU Series

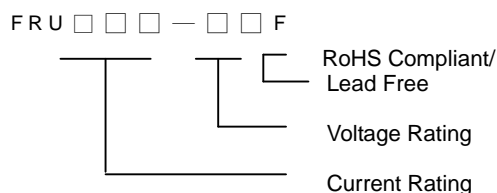


## Typical Time-To-Trip at 23°C

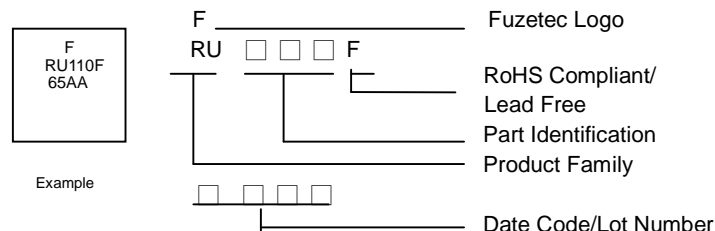
- A = FRU090-30F
- B = FRU110-30F
- C = FRU135-30F
- D = FRU160-30F
- E = FRU185-30F
- F = FRU250-30F
- G = FRU300-30F
- H = FRU400-30F
- I = FRU500-30F
- J = FRU600-30F
- K = FRU700-30F
- L = FRU800-30F
- M = FRU900-30F



## Part Numbering System



## Part Marking System



## Standard Package

P/N	Pcs /Bag	Reel/Tape
FRU090-30F	500	3k
FRU110-30F	500	3k
FRU135-30F	300	3k
FRU160-30F	300	3k
FRU185-30F	300	3k
FRU250-30F	300	3k
FRU300-30F	200	1.5k

P/N	Pcs /Bag	Reel/Tape
FRU400-30F	200	1.5k
FRU500-30F	200	-----
FRU600-30F	100	-----
FRU700-30F	100	-----
FRU800-30F	100	-----
FRU900-30F	100	-----

### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

NOTE : All Specification subject to change without notice . 11

# Radial Leaded PTC FRT Series



**RoHS Compliant &  
Lead Free**



**Application:**

IEEE 1394 FireWire, Computers & Consumer electronics

**Product Features:**

Fast trip time, Lower Trip-to-hold Ratio,  
Radial-leaded product ideal for up to 36V

**Operation Current:** 500mA~2.50A

**Maximum Voltage:** 36V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

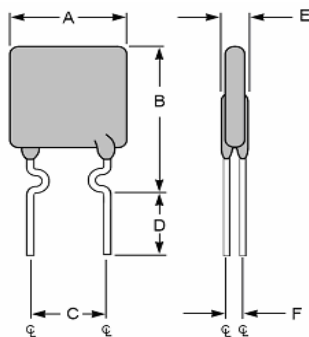
C-UL(E211981)

## Electrical Characteristics (23°C)

Part Number	Hold Current	Trip Current	Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
	$I_H$ , A	$I_T$ , A	$I_{MAX}$ , A	$V_{MAX}$ , Vdc	$P_d$ , W	$R_{MIN}$	$R_{1MAX}$
						Ohms	Ohms
<b>FRT050-33F</b>	0.50	<b>1.00</b>	40	36	0.67	0.140	0.448
<b>FRT075-33F</b>	0.75	1.50	40	36	0.71	0.115	0.368
<b>FRT090-33F</b>	0.90	1.80	40	36	0.74	0.090	0.288
<b>FRT120-33F</b>	1.20	2.30	40	36	0.78	0.074	0.180
<b>FRT135-33F</b>	1.35	2.50	40	36	0.84	0.059	0.143
<b>FRT160-33F</b>	1.60	2.75	40	36	0.86	0.041	0.131
<b>FRT190-33F</b>	1.90	3.00	40	36	0.90	0.045	0.092
<b>FRT220-33F</b>	2.20	3.50	40	36	0.95	0.025	0.080
<b>FRT250-33F</b>	2.50	4.00	40	36	0.99	0.020	0.064

$I_H$ =Hold current-maximum current at which the device will not trip at 23°C still air.  
 $I_T$ =Trip current-minimum current at which the device will always trip at 23°C still air.  
 $V_{MAX}$ =Maximum voltage device can withstand without damage at its rated current.  
 $I_{MAX}$ = Maximum fault current device can withstand without damage at rated voltage ( $V_{MAX}$ ).  
 $P_d$ =Typical power dissipated from device when in tripped state in 23°C still air environment.  
 $R_{MIN}$ =Minimum device resistance at 23°C.  
 $R_{1MAX}$ =Maximum device resistance at 23°C, 1 hour after tripping .  
Physical specifications:  
Lead material: Tin plated copper, 24 AWG.  
Soldering characteristics:MIL-STD-202, Method 208E.  
Insulating coating:Flame retardant epoxy, meets UL-94V-0 requirement.

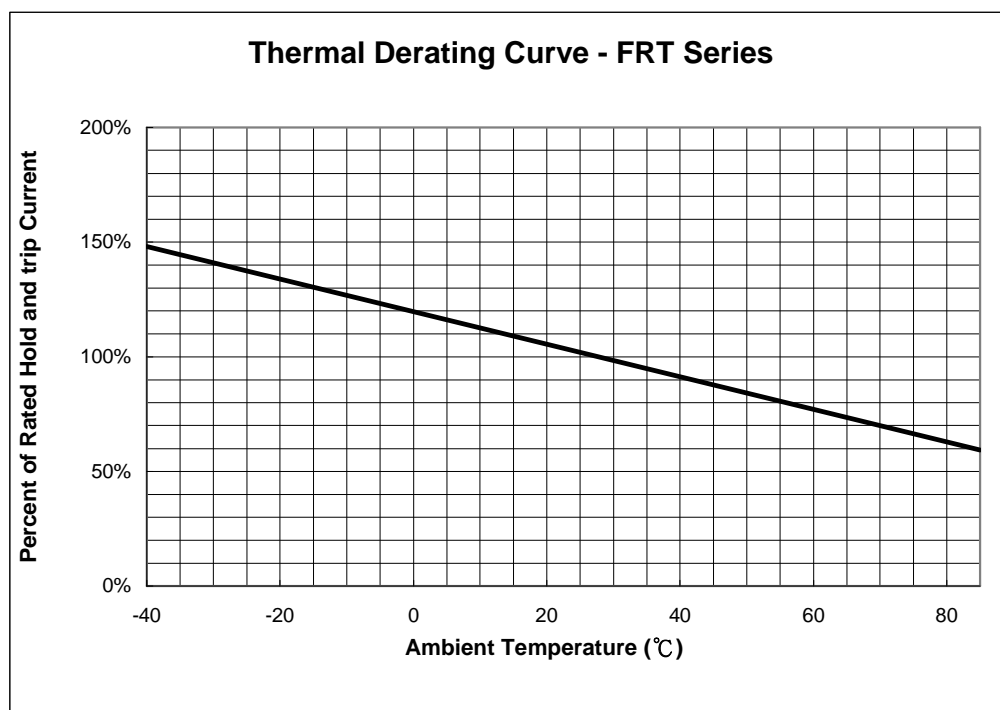
## Production Dimensions (millimeter)



Lead Size: 24AWG,  
Φ 0.51 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRT050-33F	7.4	12.2	5.1	7.6	3.0	1.1
FRT075-33F	7.4	12.2	5.1	7.6	3.0	1.1
FRT090-33F	7.4	12.2	5.1	7.6	3.0	1.1
FRT120-33F	7.4	12.2	5.1	7.6	3.0	1.1
FRT135-33F	7.4	14.2	5.1	7.6	3.0	1.1
FRT160-33F	7.4	14.0	5.1	7.6	3.0	1.1
FRT190-33F	9.0	13.5	5.1	7.6	3.0	1.1
FRT220-33F	10.0	17.0	5.1	7.6	3.0	1.1
FRT250-33F	10.0	19.5	5.1	7.6	3.0	1.1

## Thermal Derating Curve

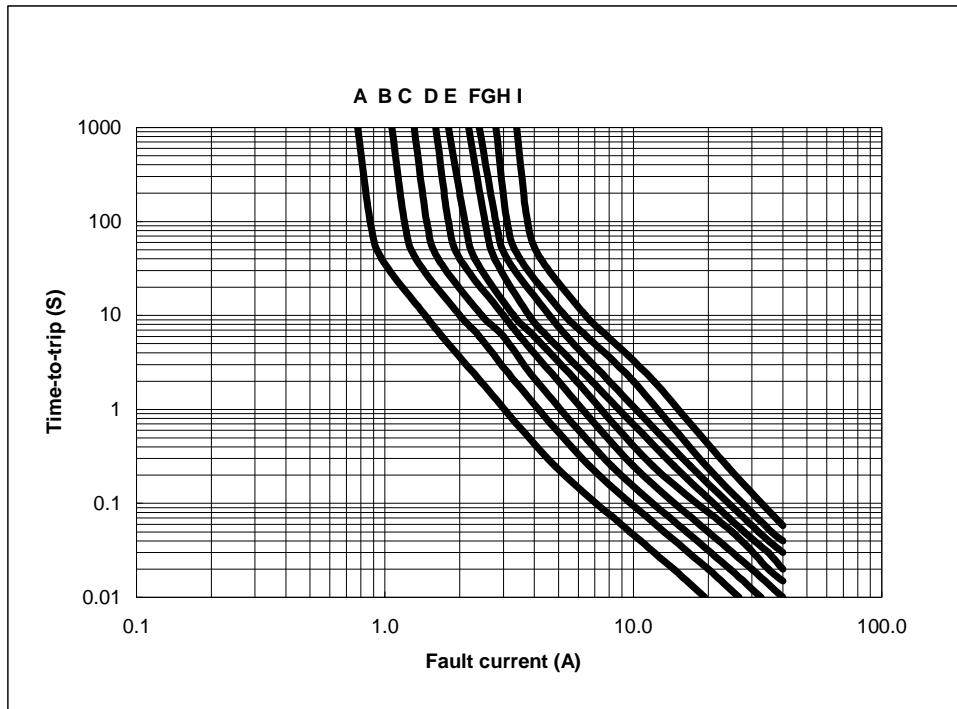


# Radial Leaded PTC FRT Series

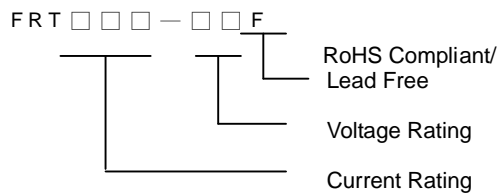


## Typical Time-To-Trip at 23°C

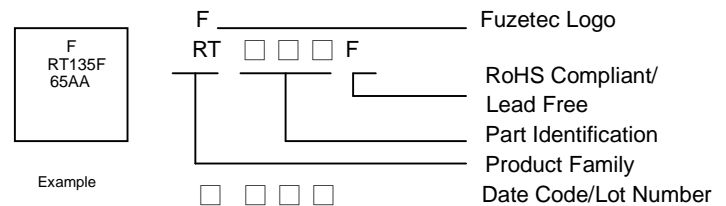
- A= FRT 050-33F
- B= FRT 075-33F
- C= FRT 090-33F
- D= FRT 120-33F
- E= FRT 135-33F
- F= FRT 160-33F
- G= FRT 190-33F
- H= FRT 220-33F
- I= FRT 250-33F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag	Reel/Tape
FRT050-33F	500	3K
FRT075-33F	500	3K
FRT090-33F	500	3K
FRT120-33F	500	3K
FRT135-33F	500	3K

P/N	Pcs /Bag	Reel/Tape
FRT160-33F	500	3K
FRT190-33F	500	3K
FRT220-33F	500	3K
FRT250-33F	500	3K

# Radial Leaded PTC FUSB Series



**RoHS Compliant &  
Lead Free**



**Application:**

Low voltage USB equipment

**Product Features:**

Low resistance, Fast trip time , Lower Trip-to-hold Ratio

**Operation Current:** 750mA ~2.5A

**Maximum Voltage:** 16V/30V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

TÜV (R3-50004084)

## Electrical characteristics(23°C)

Part Number	Hold Current	Trip Current	Max.Time to Trip		Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
			at 8A, S	at 5xI <sub>H</sub> , S				R <sub>MIN</sub>	R <sub>1MAX</sub>
	I <sub>H</sub> , A	I <sub>T</sub> , A			I <sub>MAX</sub> , A	V <sub>MAX</sub> ,Vdc	P <sub>d</sub> , W	Ohms	Ohms
FUSB075F	0.75	1.30	0.4	--	40	16	0.3	0.08	0.23
FUSB090F	0.90	1.80	1.2	5.9	40	16/30	0.6	0.07	0.18
FUSB110F	1.10	2.20	2.3	6.6	40	16/30	0.7	0.05	0.14
FUSB120F	1.20	2.00	0.5	--	40	16	0.6	0.04	0.14
FUSB135F	1.35	2.70	4.5	7.3	40	16/30	0.8	0.04	0.12
FUSB155F	1.55	2.70	0.6	--	40	16	0.7	0.03	0.12
FUSB160F	1.60	3.20	9.0	8.0	40	16/30	0.9	0.03	0.11
FUSB185F	1.85	3.70	10.0	8.7	40	16/30	1.0	0.03	0.09
FUSB250F	2.50	5.00	40.0	10.3	40	16/30	1.2	0.02	0.07

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.

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

V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.

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

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

R<sub>MIN</sub>=Minimum device resistance at 23°C.

R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping .

Physical specifications:

Lead material: Tin plated copper, 24 AWG.

Soldering characteristics: Soldering ability per ANSI/J-STD 002  
Solder heat withstand per IEC 68-2-20

Insulating coating:Flame retardant epoxy polymer,meets UL 94V-0 requirement.



# Radial Leaded PTC FUSB Series



## FUSB Product Dimensions (millimeters)

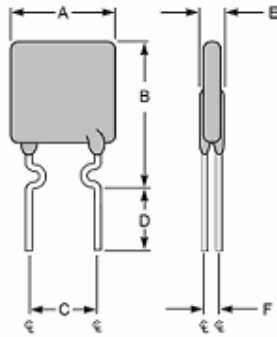


Figure 1  
Lead Size: 24AWG,  
Φ 0.51 mm Diameter

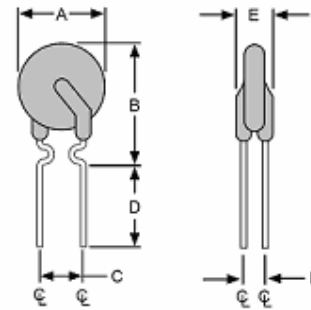
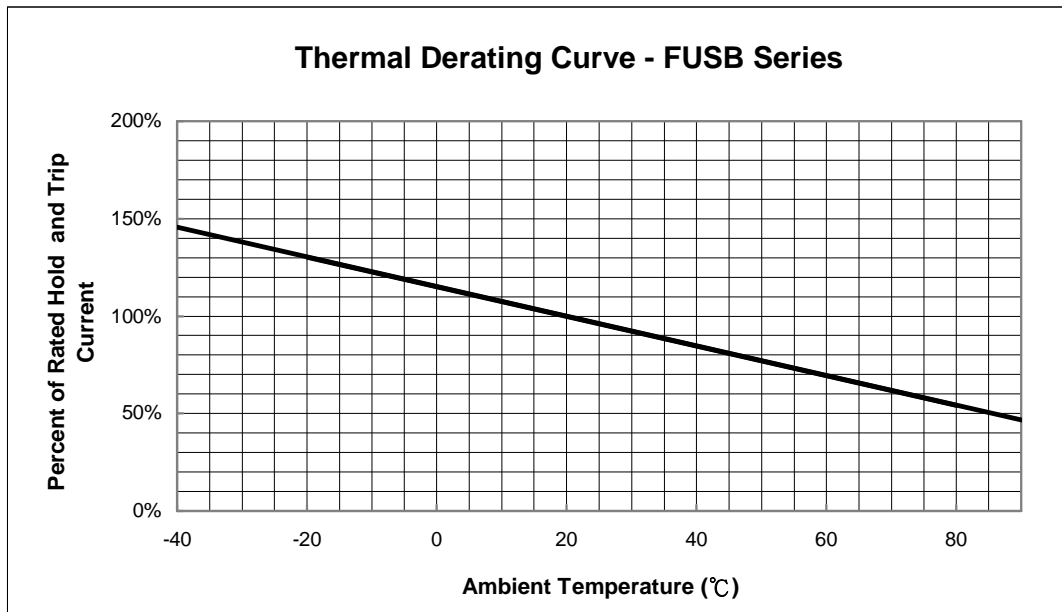


Figure 2  
Lead Size : 24AWG  
Φ 0.51 mm Diameter

Part Number	Fig	A	B	C	D	E	F
		Maximum	Maximum	Typical	Minimum	Maximum	Typical
FUSB075F	2	6.9	11.4	5.1	7.6	3.0	0.8
FUSB090F	1	7.4	12.2	5.1	7.6	3.0	0.8
FUSB110F	1	7.4	14.2	5.1	7.6	3.0	0.8
FUSB120F	2	6.9	11.7	5.1	7.6	3.0	0.8
FUSB135F	1	8.9	13.5	5.1	7.6	3.0	0.8
FUSB155F	2	6.9	11.7	5.1	7.6	3.0	0.8
FUSB160F	1	8.9	15.2	5.1	7.6	3.0	0.8
FUSB185F	1	10.2	15.7	5.1	7.6	3.0	0.8
FUSB250F	1	11.4	18.3	5.1	7.6	3.0	0.8

## Thermal Derating Curve

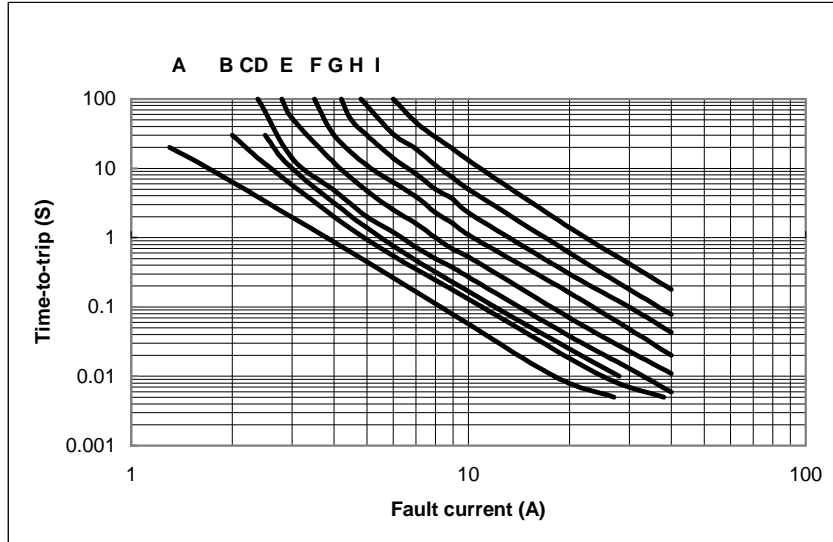


# Radial Leaded PTC FUSB Series

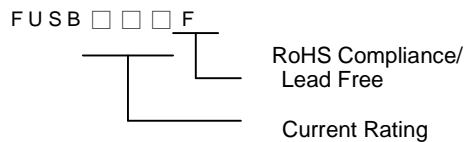


## Typical Time-To-Trip at 23°C

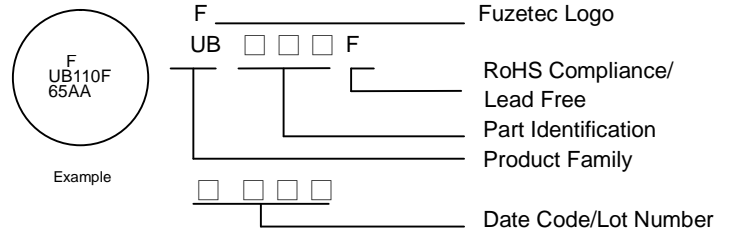
- A = FUSB075F
- B = FUSB120F
- C = FUSB155F
- D = FUSB090F
- E = FUSB110F
- F = FUSB135F
- G = FUSB160F
- H = FUSB185F
- I = FUSB250F



## Part Numbering System



## Part Marking System



## Standard Package

P/N	Pcs /Bag	Reel/Tape
FUSB075F	500	3K
FUSB090F	500	3K
FUSB110F	500	3K
FUSB120F	500	3K
FUSB135F	500	3K

P/N	Pcs /Bag	Reel/Tape
FUSB155F	500	3K
FUSB160F	500	3K
FUSB185F	500	3K
FUSB250F	500	3K

- Warning:**
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
  - PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
  - Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.



# Radial Leaded PTC FRG Series



**RoHS Compliant &  
Lead Free**



**Application:**

Wide variety of electronic equipment

**Product Features:**

Very high hold current, Solid state

Radial-leaded product ideal for up to 16Vdc

**Operation Current:** 3 A~14A

**Maximum Voltage:** 16V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

TÜV (R50004084)

## Electrical Characteristics(23°C)

Part Number	Hold Current I <sub>H</sub> , A	Trip Current I <sub>T</sub> , A	Max.time to trip at 5xI <sub>H</sub> , S	Maximum Current I <sub>MAX</sub> , A	Rated Voltage V <sub>MAX</sub> , Vdc	Typical Power Pd, W	Resistance Tolerance	
							R <sub>MIN</sub> Ohms	R <sub>1MAX</sub> Ohms
FRG300-16F	3.0	5.1	2.0	100	16	2.3	0.034	0.105
FRG400-16F	4.0	6.8	3.5	100	16	2.4	0.020	0.063
FRG500-16F	5.0	8.5	3.6	100	16	2.6	0.014	0.044
FRG600-16F	6.0	10.2	5.8	100	16	2.8	0.009	0.033
FRG700-16F	7.0	11.9	8.0	100	16	3.0	0.006	0.021
FRG800-16F	8.0	13.6	9.0	100	16	3.0	0.005	0.018
FRG900-16F	9.0	15.3	12.0	100	16	3.3	0.004	0.015
FRG1000-16F	10.0	17.0	12.5	100	16	3.3	0.003	0.012
FRG1100-16F	11.0	18.7	13.5	100	16	3.7	0.003	0.010
FRG1200-16F	12.0	20.4	16.0	100	16	4.2	0.002	0.009
FRG1400-16F	14.0	23.8	20.0	100	16	4.6	0.002	0.008

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.

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

V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.

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

Pd=Typical power dissipated from device when in the tripped state in 23°C still air environment.

R<sub>MIN</sub>=Minimum device resistance at 23°C.

R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping.

Physical specifications:

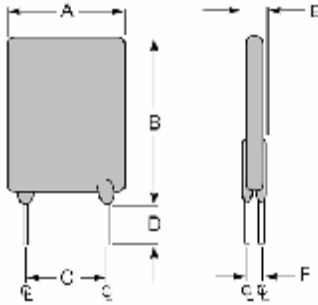
Lead material: FRG300F~FRG1100F Tin plated copper, 20 AWG.

FRG1200F~FRG1400F Tin plated copper, 18 AWG.

Soldering characteristics: MIL-STD-202, Method 208E.

Insulating coating:Flame retardant epoxy, meet UL-94V-0 requirement.

**FRG Product Dimensions (millimeters)**

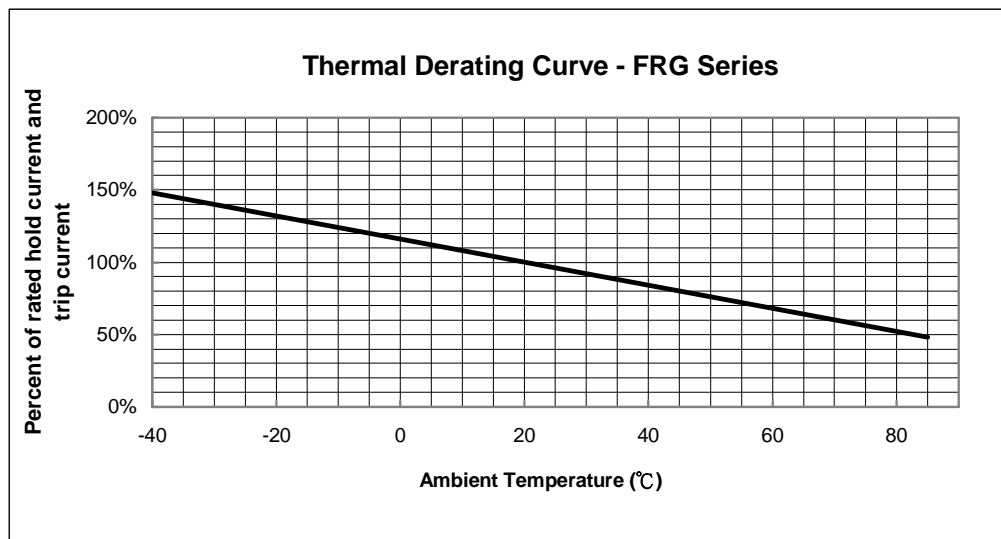


Lead Size  
FRG300-16F~FRG1100-16F  
20AWG  
Φ 0.81 mm Diameter

Lead Size  
FRG1200-16F~FRG1400-16F  
18AWG  
Φ 1.0 mm Diameter

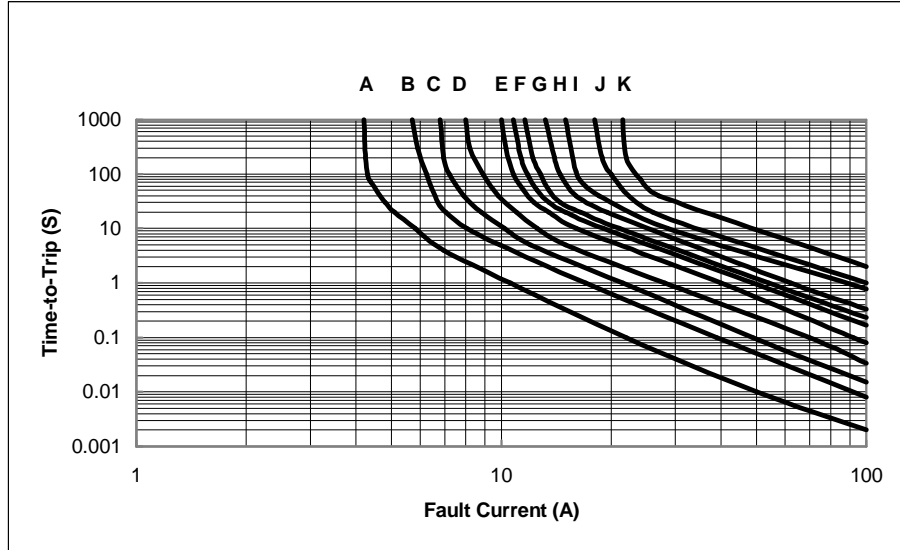
Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRG300-16F	7.1	11.0	5.1	7.6	3.0	1.2
FRG400-16F	8.9	12.8	5.1	7.6	3.0	1.2
FRG500-16F	10.4	14.3	5.1	7.6	3.0	1.2
FRG600-16F	10.7	17.1	5.1	7.6	3.0	1.2
FRG700-16F	11.2	19.7	5.1	7.6	3.0	1.2
FRG800-16F	12.7	20.9	5.1	7.6	3.0	1.2
FRG900-16F	14.0	21.7	5.1	7.6	3.0	1.2
FRG1000-16F	16.5	24.1	5.1	7.6	3.0	1.2
FRG1100-16F	17.5	26.0	5.1	7.6	3.0	1.2
FRG1200-16F	17.5	28.0	10.2	7.6	3.6	1.4
FRG1400-16F	27.9	27.9	10.2	7.6	3.6	1.4

**Thermal Derating Curve**

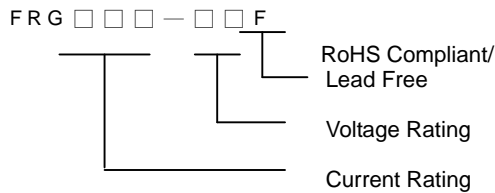


## Typical Time-To-Trip at 23°C

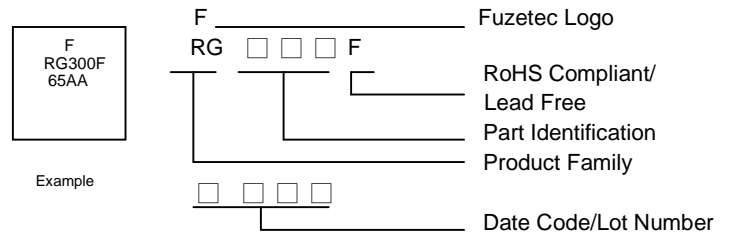
- A=FRG300-16F
- B=FRG400-16F
- C=FRG500-16F
- D=FRG600-16F
- E=FRG700-16F
- F=FRG800-16F
- G=FRG900-16F
- H=FRG1000-16F
- I =FRG1100-16F
- J=FRG1200-16F
- K=FRG1400-16F



## Part Numbering System



## Part Marking System



## Standard Package

P/N	Pcs /Bag	Reel/Tape
FRG300-16F	500	2.5k
FRG400-16F	300	2.5k
FRG500-16F	300	2.5k
FRG600-16F	300	2.5k
FRG700-16F	200	1.2k
FRG800-16F	200	-----

P/N	Pcs /Bag	Reel/Tape
FRG900-16F	200	-----
FRG1000-16F	100	-----
FRG1100-16F	100	-----
FRG1200-16F	100	-----
FRG1400-16F	100	-----

### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

# Radial Leaded PTC FBR Series



**RoHS Compliant &  
Lead Free**



**Application:**

Cable /Telephone Electronics: Cable Power  
Passing Tap.

**Product Features:**

Low hold current, Solid state, Radial-leaded product  
ideal for up to 90V

**Operation Current:** 100mA~900mA

**Maximum Voltage:** 90V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL(E211981)

TÜV (R50004084)

## Electrical Characteristics (23°C)

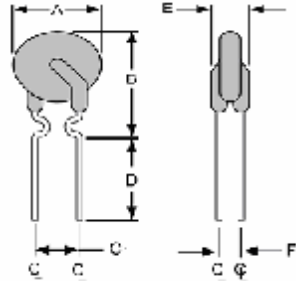
Part Number	Hold Current	Trip Current	Max.Time to Trip	Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
							R <sub>MIN</sub>	R <sub>1MAX</sub>
	I <sub>H</sub> , A	I <sub>T</sub> , A	at 5xI <sub>H</sub> , S	I <sub>MAX</sub> , A	V <sub>MAX</sub> ,Vdc	P <sub>d</sub> , W	Ohms	Ohms
FBR100(U)F	0.10	0.20	10	40	90	0.38	2.50	7.50
FBR150(U)F	0.15	0.35	10	40	90	0.70	2.40	7.00
FBR200(U)F	0.20	0.45	10	40	90	0.80	1.50	4.50
FBR250(U)F	0.25	0.55	10	40	90	0.90	1.25	3.70
FBR350(U)F	0.35	0.75	10	40	90	1.30	0.90	2.50
FBR550(U)F	0.55	1.20	12	40	90	1.50	0.45	1.50
FBR750(U)F	0.75	1.60	13	40	90	1.70	0.30	1.20
FBR900(U)F	0.90	2.00	20	40	90	2.30	0.15	0.70

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23 °C still air.  
I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23 °C still air.  
V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V<sub>MAX</sub>).  
P<sub>d</sub>=Typical power dissipated from device when in tripped state in 23 °C still air environment.  
R<sub>MIN</sub>=Minimum device resistance at 23°C.  
R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping .  
Physical specifications:  
Lead material: FBR100F~FBR900F Tin plated copper, 20 AWG.  
Soldering characteristics: MIL-STD-202, Method 208E.  
Insulating coating:Flame retardant epoxy, meets UL-94V-0 requirement.

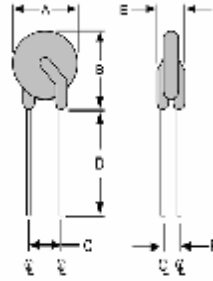
# Radial Leaded PTC FBR Series



## Production Dimensions (millimeter)



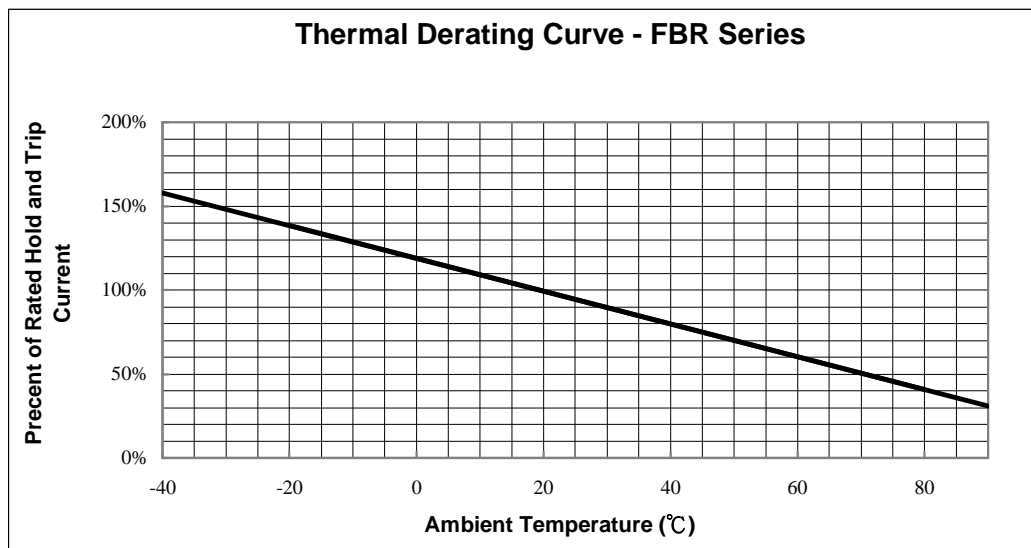
FBR100-90F ~ FBR350-90F  
Lead Size: 24AWG  
Φ 0.51 mm Diameter



FBR550-90F ~ FBR900-90F  
Lead Size: 20AWG  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FBR100(U)F	7.4	12.7	5.1	7.6	3.6	1.4
FBR150(U)F	9.0	12.7	5.1	7.6	3.6	1.4
FBR200(U)F	9.0	12.7	5.1	7.6	3.6	1.4
FBR250(U)F	9.0	12.7	5.1	7.6	3.6	1.4
FBR350(U)F	9.0	12.7	5.1	7.6	3.6	1.4
FBR550(U)F	10.9	14.0	5.1	7.6	3.6	1.4
FBR750(U)F	11.9	15.5	5.1	7.6	3.6	1.4
FBR900(U)F	13.0	16.0	5.1	7.6	3.6	1.4

## Thermal Derating Curve



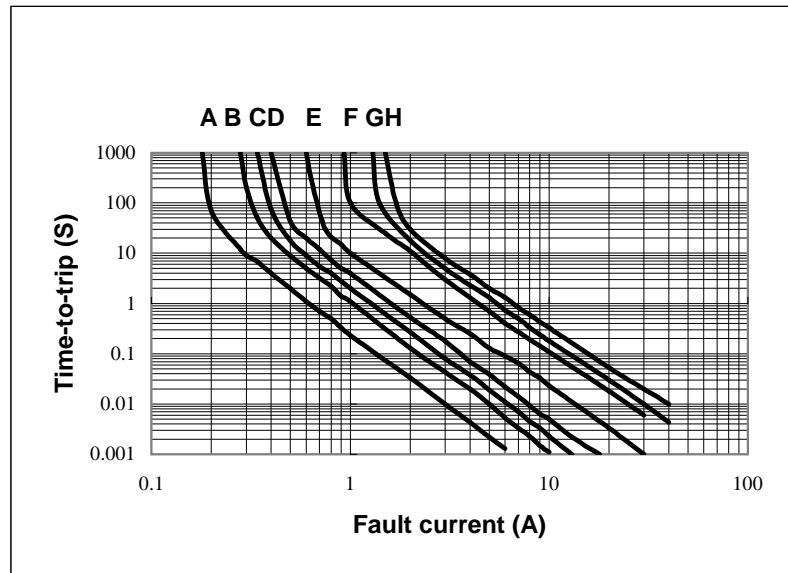
NOTE : All Specification subject to change without notice . 22

# Radial Leaded PTC FBR Series

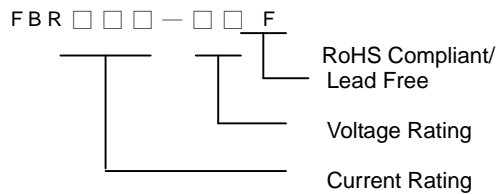


## Typical Time-To-Trip at 23°C

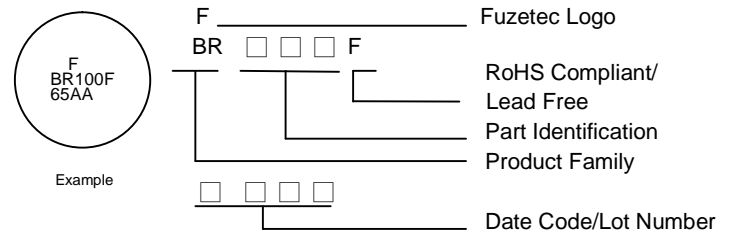
- A = FBR100 (U)F
- B = FBR150 (U)F
- C = FBR200 (U)F
- D = FBR250 (U)F
- E = FBR350 (U)F
- F = FBR550 (U)F
- G = FBR750 (U)F
- H = FBR900 (U)F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag	Reel/Tape
FBR100 (U)F	500	2.5K
FBR150 (U)F	500	2.5K
FBR200 (U)F	500	2.5K
FBR250 (U)F	500	2.5K

P/N	Pcs /Bag	Reel/Tape
FBR350 (U)F	500	2.5K
FBR550 (U)F	500	2K
FBR750 (U)F	500	2K
FBR900 (U)F	500	2K

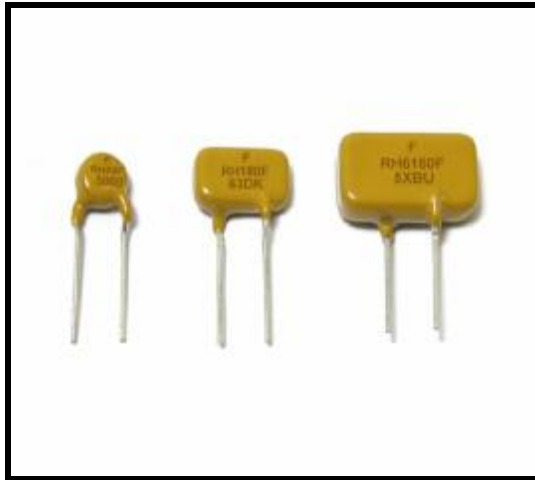
#### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.



# Radial Leaded PTC FRH Series



**RoHS Compliant &  
Lead Free**



**Application:**

Telecommunication and Data transmitting

**Product Features:**

Low hold current, Solid state  
Radial-leaded product ideal for up to 60V/250V/600V

**Operation Current:** 0.08 A~0.18A

**Maximum Voltage:** 60V/250V/600V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

TÜV(R50021651)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Maximum Current	Max Oper. Voltage	Max Int. Voltage	Resistance Tolerance	
					R MIN	R1MAX
	I <sub>H</sub> , A	I <sub>MAX</sub> , A	V <sub>MAX</sub> ,V	V <sub>IMAX</sub> ,V	Ohms	Ohms
FRH080-250UF	0.08	3.0	60	250	14.0	33.0
FRH080-250F	0.08	3.0	60	250	14.0	33.0
FRH110-250UF	0.11	3.0	60	250	5.0	16.0
FRH110-250F	0.11	3.0	60	250	5.0	16.0
FRH120-250UF	0.12	3.0	60	250	6.0	16.0
FRH120-250F	0.12	3.0	60	250	4.0	16.0
FRH145-250UF	0.15	3.0	60	250	3.5	12.0
FRH145-250F	0.15	3.0	60	250	3.0	12.0
FRH180-250UF	0.18	10.0	60	250	0.8	4.0
FRH180-250F	0.18	10.0	60	250	0.8	4.0
FRH150-600F	0.15	3.0	60	600	6.0	22.0
FRH160-600F	0.16	3.0	60	600	4.0	18.0

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
V<sub>I-MAX</sub> = Maximum interrupt voltage device can withstand for short period of time. (Not for long term.)  
I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V max).  
P<sub>d</sub>=Typical power dissipated from device when in the tripped state in 23°C still air environment.  
R<sub>MIN</sub>=Minimum device resistance at 23°C.  
R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping .  
Physical specifications:  
Lead material: FRH080-250F ~ FRH180-250F Tin plated copper, 22 AWG.  
FRH150-600F ~ FRH160-600F Tin plated copper, 22 AWG.  
Soldering characteristics:MIL-STD-202, Method 208E.  
Insulating coating:Flame retardant epoxy, meet UL-94V-0 requirement.

**NOTE : All FRH products are designed to assist equipment to pass ITU, UL1950 or GR1089 specification.**

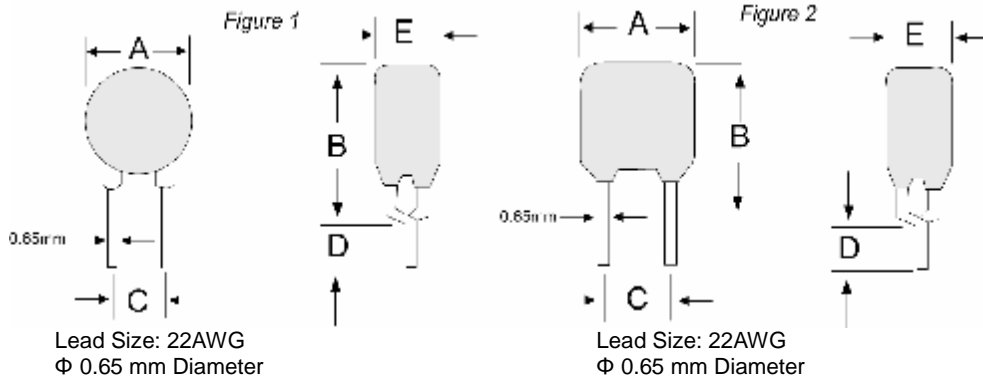
**CAUTION : FRH devices are not intended for continuous use of Line Voltage such as 120 VAC~ 600VAC and above.**

NOTE : All Specification subject to change without notice. 24

# Radial Leaded PTC FRH Series

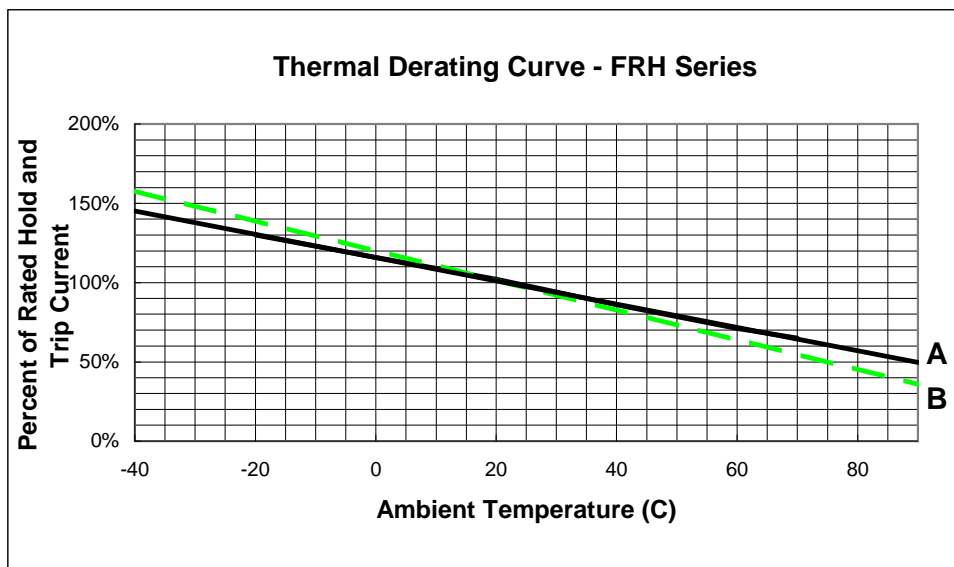


## FRH Product Dimensions (millimeters)



Part Number	Fig	A	B	C	D	E
		Maximum	Maximum	Typical	Minimum	Maximum
FRH080-250UF	1	5.1	9.1	5.0	4.7	3.8
FRH080-250F	1	5.8	9.6	5.0	4.7	4.6
FRH110-250UF	1	5.9	9.4	5.0	4.7	3.8
FRH110-250F	1	6.8	9.9	5.0	4.7	4.6
FRH120-250UF	2	6.0	10.0	5.0	4.7	3.8
FRH120-250F	2	6.5	11.0	5.0	4.7	4.6
FRH145-250UF	2	6.0	10.0	5.0	4.7	3.8
FRH145-250F	2	6.5	11.0	5.0	4.7	4.6
FRH180-250UF	2	10.4	12.6	5.0	4.7	3.8
FRH180-250F	2	10.9	12.6	5.0	4.7	4.6
FRH150-600F	2	13.5	12.6	5.0	4.7	6.0
FRH160-600F	2	16.0	12.6	5.0	4.7	6.0

## Thermal Derating Curve



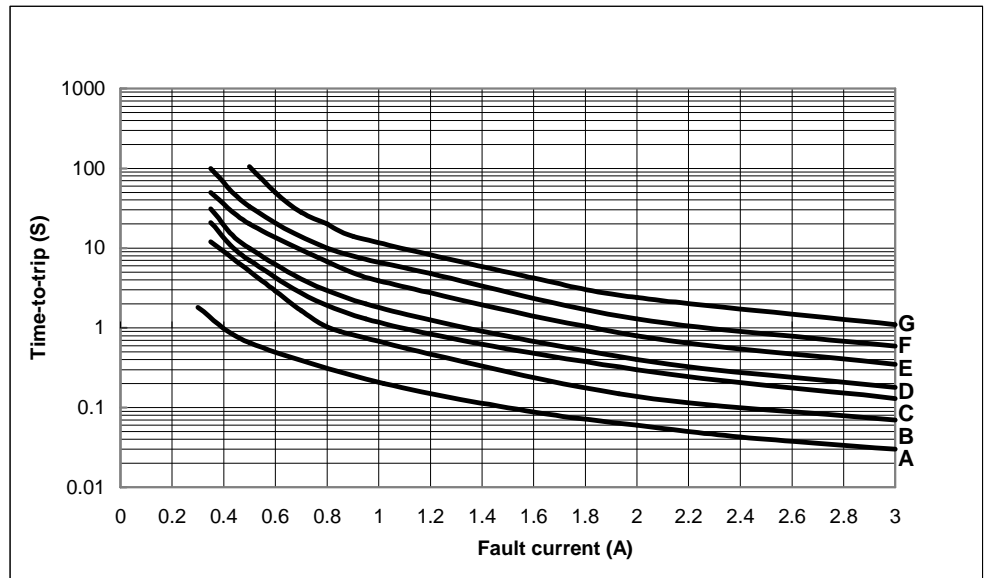
A= FRH180-250UF; FRH180-250F  
B= All other FRH devices

# Radial Leaded PTC FRH Series

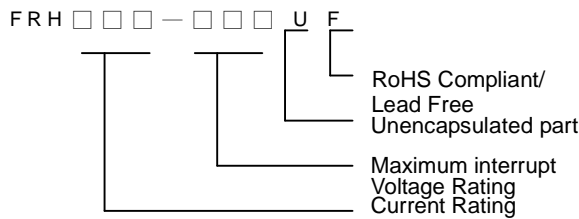


## Typical Time-To-Trip at 23°C

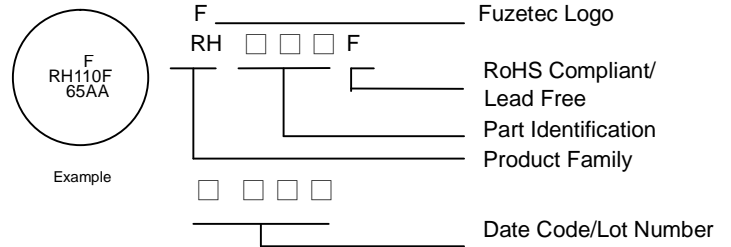
- A= FRH080-250(U)F
- B= FRH110-250(U)F
- C= FRH120-250(U)F
- D= FRH145-250(U)F
- E= FRH180-250(U)F
- F= FRH150-600F
- G= FRH160-600F



## Part Numbering System



## Part Marking System



\* FRH150-600 Marking: RH6150

\* FRH160-600 Marking: RH6160

## Standard Package

P/N	Pcs /Bag	Reel/Tape
FRH080-250UF	300	1.5K
FRH080-250F	300	1.5K
FRH110-250UF	300	1.5K
FRH110-250F	300	1.5K
FRH120-250UF	300	1.5K
FRH120-250F	300	1.5K

P/N	Pcs /Bag	Reel/Tape
FRH145-250UF	300	1.5K
FRH145-250F	300	1.5K
FRH180-250UF	200	1.2K
FRH180-250F	200	1.2K
FRH150-600F	100	600
FRH160-600F	100	600

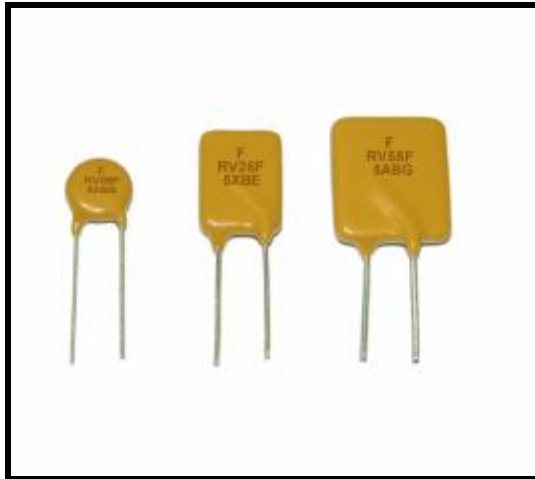
### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

NOTE : All Specification subject to change without notice . 26

# Radial Leaded PTC FRV Series



**RoHS Compliant &  
Lead Free**



**Application:**

Line Voltage Power Supply, Transformer and Appliances

**Product Features:**

Low hold current, Solid state, Radial leaded product ideal for up to 265V<sub>AC/DC</sub>

**Operation Current:** 50mA~550mA

**Maximum Operating Voltage:** 240V<sub>AC/DC</sub>

**Maximum Interrupt Voltage:** 265V<sub>AC/DC</sub>

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL(E211981)

C-UL(E211981)

## Electrical Characteristics (23°C)

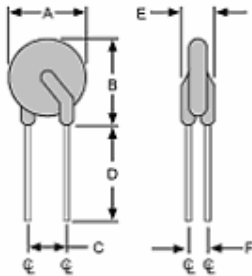
Part Number	Hold Current	Trip Current	Max.Time to Trip	Maximum Current	Rated Voltage	Typical Power	Resistance Tolerance	
							R <sub>MIN</sub>	R <sub>1MAX</sub>
	I <sub>H</sub> , A	I <sub>T</sub> , A	at 5xI <sub>H</sub> , S	I <sub>MAX</sub> , A	V <sub>MAX</sub> , V <sub>AC/DC</sub>	P <sub>d</sub> , W	Ohms	Ohms
FRV005-240F	0.05	0.12	15.0	1.0	240	0.70	18.50	65.00
FRV008-240F	0.08	0.19	15.0	1.2	240	0.80	7.40	26.00
FRV012-240F	0.12	0.30	15.0	1.2	240	1.00	3.00	12.00
FRV016-240F	0.16	0.37	15.0	2.0	240	1.40	2.50	7.80
FRV025-240F	0.25	0.56	18.5	3.5	240	1.50	1.30	3.80
FRV033-240F	0.33	0.74	18.5	4.5	240	1.70	0.83	2.60
FRV040-240F	0.40	0.90	24.0	5.5	240	2.00	0.60	1.90
FRV055-240F	0.55	1.25	26.0	7.0	240	3.40	0.45	1.45

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23 °C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23 °C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
 I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V<sub>MAX</sub>).  
 P<sub>d</sub>=Typical power dissipated from device when in tripped state in 23 °C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23 °C.  
 R<sub>1MAX</sub>=Maximum device resistance at 23 °C, 1 hour after tripping.  
 Physical specifications:  
 Lead material: FRV005-240F~FRV016-240F Tin plated copper, 24AWG.  
 FRV025-240F~FRV040-240F Tin plated copper, 22AWG.  
 FRV055-240F Tin plated copper, 20AWG.  
 Soldering characteristics: MIL-STD-202, Method 208E.  
 Insulating coating:Flame retardant epoxy, meets UL-94V-0 requirement.

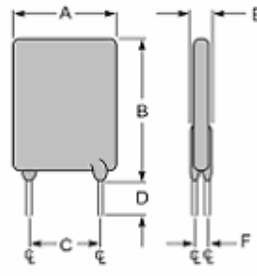
# Radial Leaded PTC FRV Series



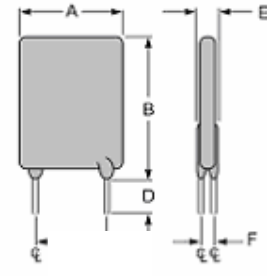
## Production Dimensions (millimeter)



FRV 005-240F~FRV016-240F  
Lead Size: 24AWG  
Φ 0.51 mm Diameter



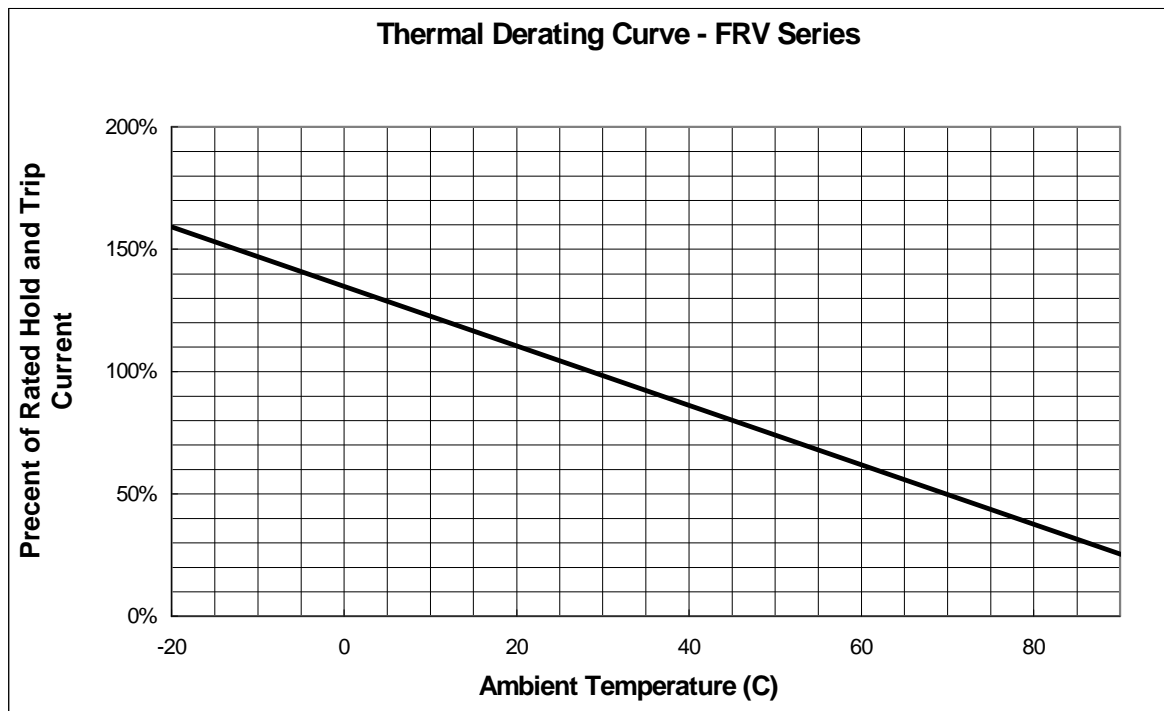
FRV025-240F~FRV040-240F  
Lead Size: 22AWG  
Φ 0.65 mm Diameter



FRV055-240F  
Lead Size: 20AWG  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E
	Maximum	Maximum	Typical	Minimum	Maximum
FRV005-240F	8.3	10.7	5.1	7.6	3.8
FRV008-240F	8.3	10.7	5.1	7.6	3.8
FRV012-240F	8.3	10.7	5.1	7.6	3.8
FRV016-240F	9.9	12.5	5.1	7.6	3.8
FRV025-240F	9.6	17.4	5.1	7.6	3.8
FRV033-240F	11.4	16.5	5.1	7.6	3.8
FRV040-240F	11.5	19.5	5.1	7.6	3.8
FRV055-240F	14.0	21.7	5.1	7.6	4.1

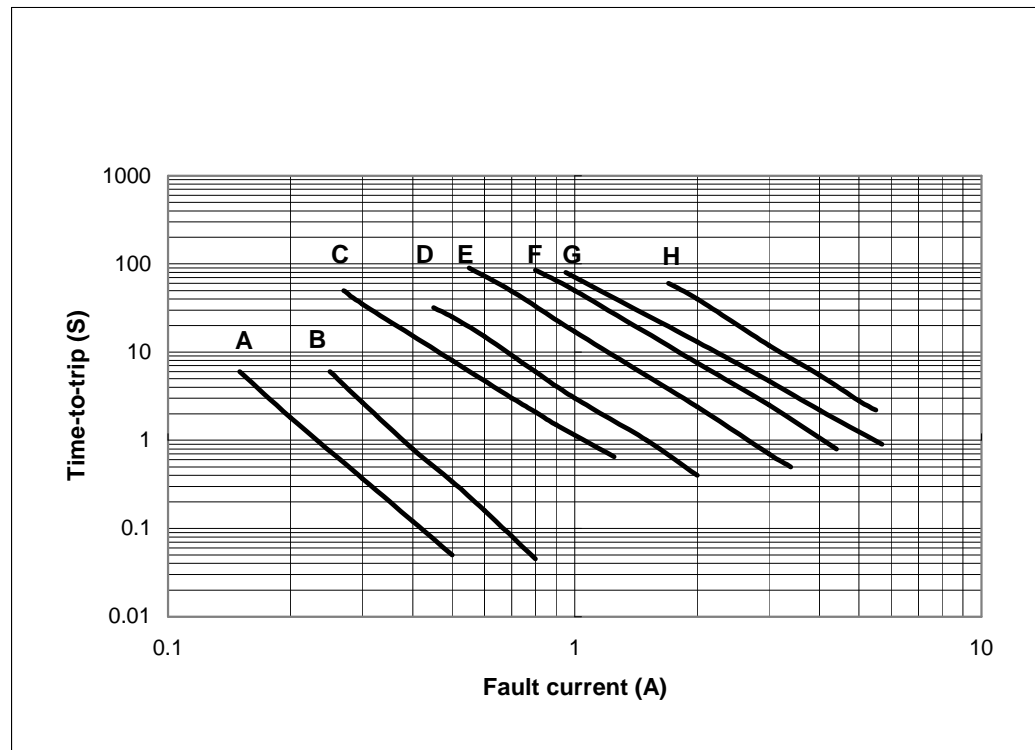
## Thermal Derating Curve



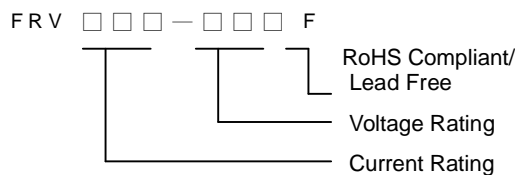
NOTE : All Specification subject to change without notice . 28

## Typical Time-To-Trip at 23°C

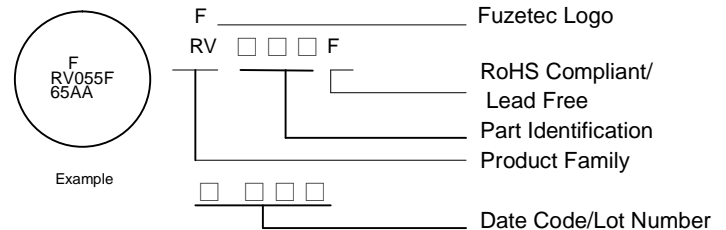
- A= FRV005-240F
- B= FRV008-240F
- C= FRV012-240F
- D= FRV016-240F
- E= FRV025-240F
- F= FRV033-240F
- G= FRV040-240F
- H= FRV055-240F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag	Reel/Tape
FRV005-240F	500	2.5K
FRV008-240F	500	2.5K
FRV012-240F	500	2.5K
FRV016-240F	500	2.5K

P/N	Pcs /Bag	Reel/Tape
FRV025-240F	500	2K
FRV033-240F	500	2K
FRV040-240F	500	2K
FRV055-240F	500	1K

**Warning:** - Each product should be carefully evaluated and tested for their suitability of application.

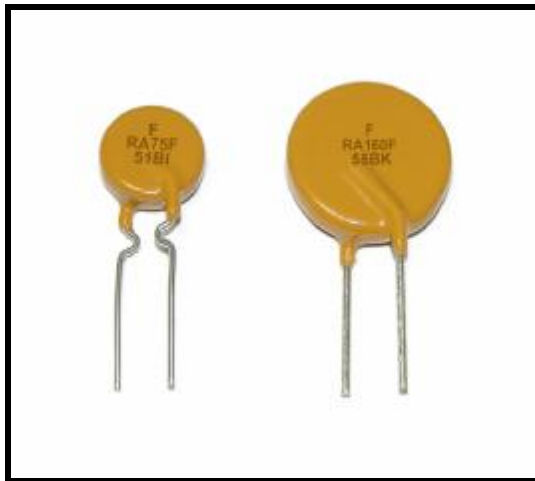
- Operation beyond the specified maximum rating or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.- Avoid contact of PPTC device with chemical solvent, including some inert material such as silicone based oil, lubricant and etc. Prolonged contact will damage the device performance.- Additional protection mechanism are strongly recommended to be used in conjunction with the PPTC device for protection against abnormal or failure conditions.- Avoid use of PPTC device in a constrained space such as potting material, housing and containers where have limited space to accommodate device thermal expansion and/or contraction.



# Radial Leaded PTC FRA Series



**RoHS Compliant &  
Lead Free**



**Application:**

Wide variety of electronic equipment

**Product Features:**

Low hold current, Solid state

Radial-leaded product ideal for up to  
120VDC/120VAC

**Operation Current:** 100mA~3.75A

**Maximum Voltage:** 120VDC/120VAC

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL, C-UL & TÜV pending

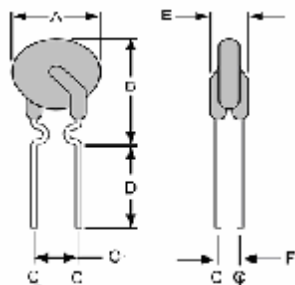
## Electrical Characteristics(23°C)

Part Number	Hold Current I <sub>H</sub> , A	Trip Current I <sub>T</sub> , A	Max. Time to Trip at 5xI <sub>H</sub> , S	Maximum Current I <sub>MAX</sub> , A	Rated Voltage V <sub>MAX</sub> , V <sub>AC/DC</sub>	Typical Power P <sub>d</sub> , W	Resistance Tolerance	
							R <sub>MIN</sub> Ohms	R <sub>1MAX</sub> Ohms
FRA010-120F	0.10	0.20	4.0	2.0	120	0.57	2.50	7.50
FRA017-120F	0.17	0.34	3.0	2.0	120	0.59	2.00	7.00
FRA020-120F	0.20	0.40	2.2	2.0	120	0.62	1.83	4.40
FRA025-120F	0.25	0.50	2.5	3.0	120	0.68	1.25	3.00
FRA030-120F	0.30	0.60	3.0	3.0	120	0.74	0.88	2.10
FRA040-120F	0.40	0.80	3.8	3.0	120	0.84	0.55	1.29
FRA050-120F	0.50	1.00	4.0	3.0	120	1.16	0.50	1.17
FRA065-120F	0.65	1.30	5.3	3.0	120	1.32	0.31	0.72
FRA075-120F	0.75	1.50	6.3	5.0	120	1.38	0.25	0.60
FRA090-120F	0.90	1.80	7.2	5.0	120	1.49	0.20	0.47
FRA110-120F	1.10	2.20	8.2	5.0	120	2.25	0.15	0.38
FRA135-120F	1.35	2.70	9.6	8.0	120	2.55	0.12	0.30
FRA160-120F	1.60	3.20	11.4	8.0	120	2.85	0.09	0.22
FRA185-120F	1.85	3.70	12.6	8.0	120	3.15	0.08	0.19
FRA250-120F	2.50	5.00	15.6	12.0	120	3.75	0.05	0.13
FRA300-120F	3.00	6.00	19.8	15.0	120	4.20	0.04	0.10
FRA375-120F	3.75	7.50	24.0	15.0	120	4.80	0.03	0.08

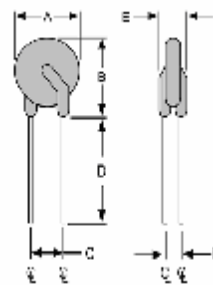
I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23 °C still air.  
I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23 °C still air.  
V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V max).  
P<sub>d</sub>=Typical power dissipated from device when in the tripped state in 23 °C still air environment.  
R<sub>MIN</sub>=Minimum device resistance at 23 °C.  
R<sub>1MAX</sub>=Maximum device resistance at 23 °C, 1 hour after tripping .  
Physical specifications:  
Lead material: FRA010F~FRA090F Tin plated copper, 22 AWG.  
FRA110F~FRA375F Tin plated copper, 20 AWG.  
Soldering characteristics:MIL-STD-202, Method 208E.  
Insulating coating:Flame retardant epoxy, meet UL-94V-0 requirement.

NOTE : All Specification subject to change without notice . 30

## FRA Product Dimensions (millimeters)



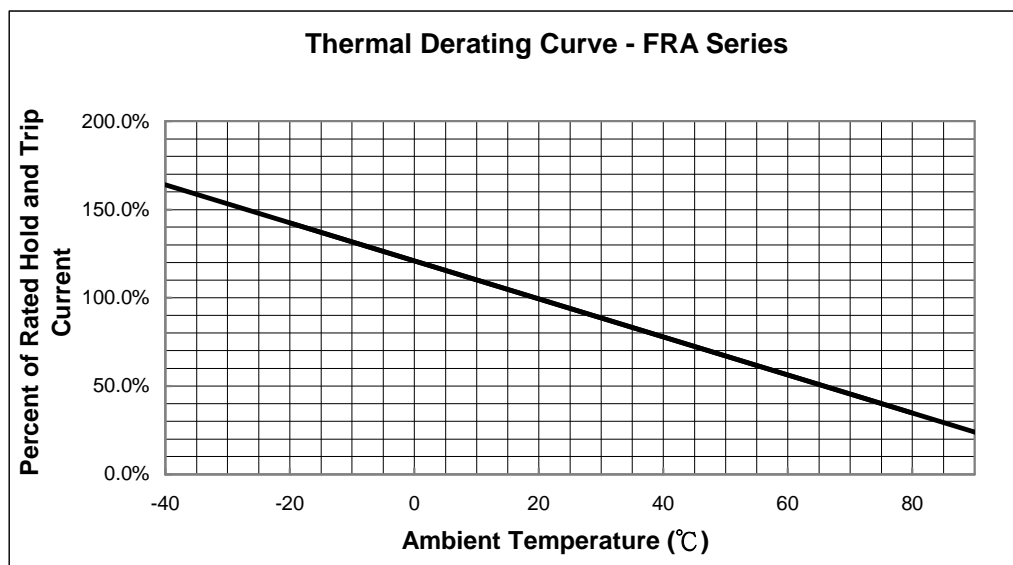
FRA010-120F ~ FRA090-120F  
Lead Size: 22AWG,  
Φ 0.65 mm Diameter



FRA110-120F ~ FRA375-120F  
Lead Size : 20AWG,  
Φ 0.81 mm Diameter

Part Number	A	B	C	D	E	F
	Maximum	Maximum	Typical	Minimum	Maximum	Typical
FRA010-120F	7.9	12.7	5.1	7.6	5.0	3.0
FRA017-120F	7.9	12.7	5.1	7.6	5.0	3.0
FRA020-120F	7.9	12.2	5.1	7.6	5.0	3.0
FRA025-120F	7.9	12.7	5.1	7.6	5.0	3.0
FRA030-120F	7.9	13.0	5.1	7.6	5.0	3.0
FRA040-120F	8.2	14.2	5.1	7.6	5.0	3.0
FRA050-120F	9.2	14.9	5.1	7.6	5.0	3.0
FRA065-120F	9.7	14.9	5.1	7.6	5.0	3.0
FRA075-120F	10.6	15.5	5.1	7.6	5.0	3.0
FRA090-120F	11.9	15.9	5.1	7.6	5.0	3.0
FRA110-120F	13.3	18.3	5.1	7.6	5.0	3.0
FRA135-120F	15.5	20.6	5.1	7.6	5.0	3.0
FRA160-120F	17.5	22.5	5.1	7.6	5.0	3.0
FRA185-120F	19.9	24.9	5.1	7.6	5.0	3.0
FRA250-120F	22.5	27.5	10.2	7.6	5.0	3.0
FRA300-120F	25.5	30.0	10.2	7.6	5.0	3.0
FRA375-120F	29.5	34.0	10.2	7.6	5.0	3.0

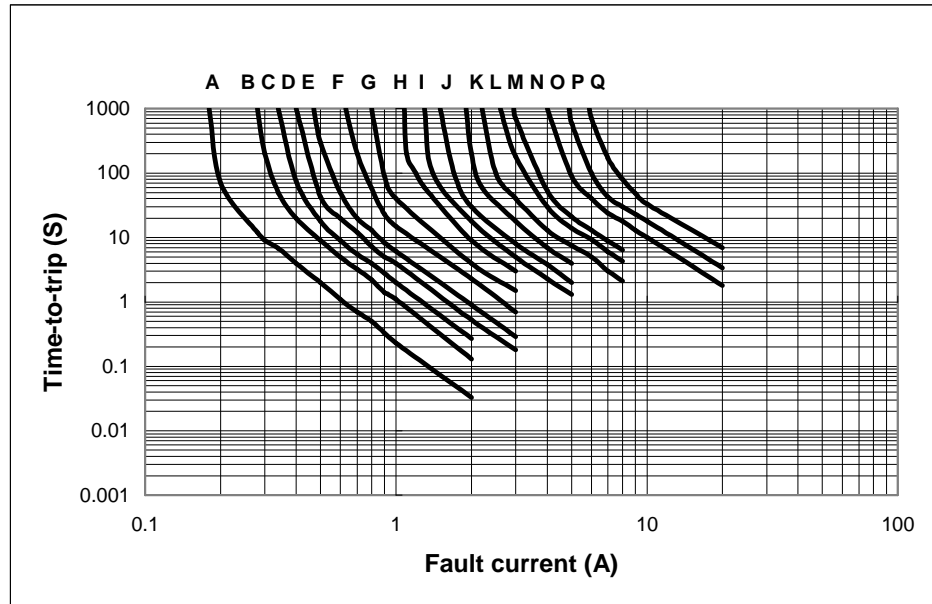
## Thermal Derating Curve



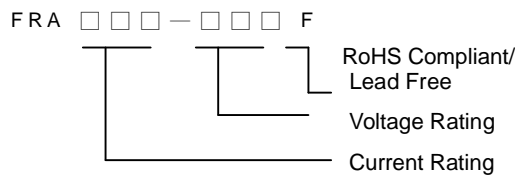


## Typical Time-To-Trip at 23°C

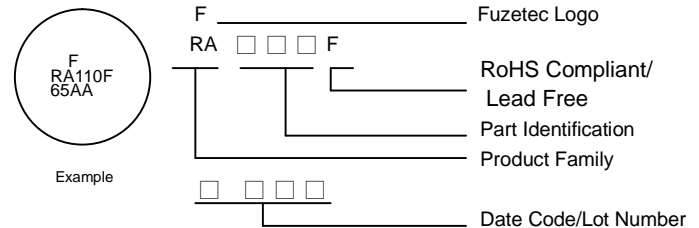
- A = FRA010-120F
- B = FRA017-120F
- C = FRA020-120F
- D = FRA025-120F
- E = FRA030-120F
- F = FRA040-120F
- G = FRA050-120F
- H = FRA065-120F
- I = FRA075-120F
- J = FRA090-120F
- K = FRA110-120F
- L = FRA135-120F
- M = FRA160-120F
- N = FRA185-120F
- O = FRA250-120F
- P = FRA300-120F
- Q = FRA375-120F



## Part Numbering System



## Part Marking System



## Standard Package

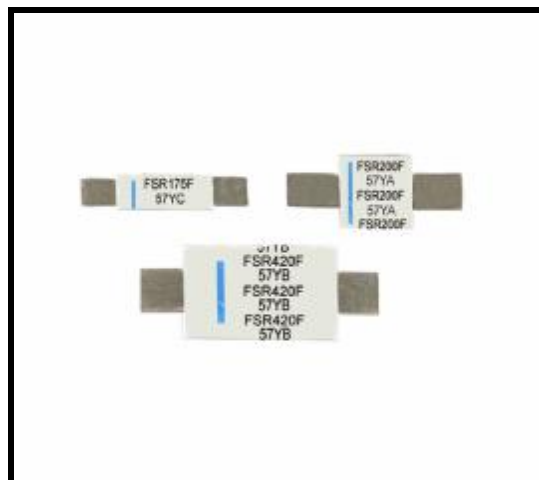
P/N	Pcs /Bag	Reel/Tape
FRA010-120F	300	1.5K
FRA017-120F	300	1.5K
FRA020-120F	300	1.5K
FRA025-120F	300	1.5K
FRA030-120F	300	1.5K
FRA040-120F	300	1.5K
FRA050-120F	300	1.5K
FRA065-120F	300	1.5K
FRA075-120F	300	1.5K

P/N	Pcs /Bag	Reel/Tape
FRA090-120F	300	1.5K
FRA110-120F	300	600
FRA135-120F	200	600
FRA160-120F	200	-----
FRA185-120F	200	-----
FRA250-120F	100	-----
FRA300-120F	100	-----
FRA375-120F	100	-----

- Warning:**
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
  - PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
  - Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.



# Axial Leaded PTC FSR Series



**RoHS Compliant & Lead Free**



**Application:**

- Rechargeable battery packs
- Lithium cell and battery packs

**Product Features:**

- Low profile, Solid state
- Operation Current:** 1.2A~4.2 A
- Maximum Voltage:** 15V& 30V
- Temperature Range:** -40°C to 85°C
- Agency Recognition:** UL (E211981)

TÜV (R3-50004084)

## Electrical Characteristics(23°C)

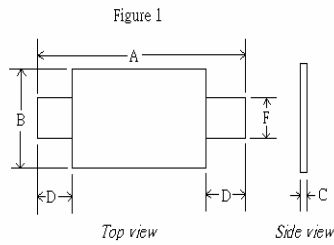
Part Number	Hold Current I <sub>H</sub> , A	Trip Current I <sub>T</sub> , A	Rated Voltage V <sub>MAX</sub> , Vdc	Maximum Current I <sub>MAX</sub> , A	Typical Power Pd, W	Resistance Tolerance		
						R <sub>MIN</sub> Ohms	R <sub>MAX</sub> Ohms	R <sub>1MAX</sub> Ohms
<b>FSR120F</b>	1.20	2.70	15	100	1.2	0.085	0.160	0.220
<b>FSR175F</b>	1.75	3.80	15	100	1.5	0.050	0.090	0.120
<b>FSR200F</b>	2.00	4.40	30	100	1.9	0.030	0.060	0.100
<b>FSR350F</b>	3.50	6.30	30	100	2.5	0.017	0.031	0.050
<b>FSR420F</b>	4.20	7.60	30	100	2.9	0.012	0.024	0.040

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
 I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V max).  
 Pd=Maximum power dissipated from device when in the tripped state in 23°C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23°C.  
 R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping.  
 Physical specifications:  
 Lead material:0.13mm nominal thickness, quarter-hard nickel.  
 Insulating material: Polyester tape.

# Axial Leaded PTC FSR Series

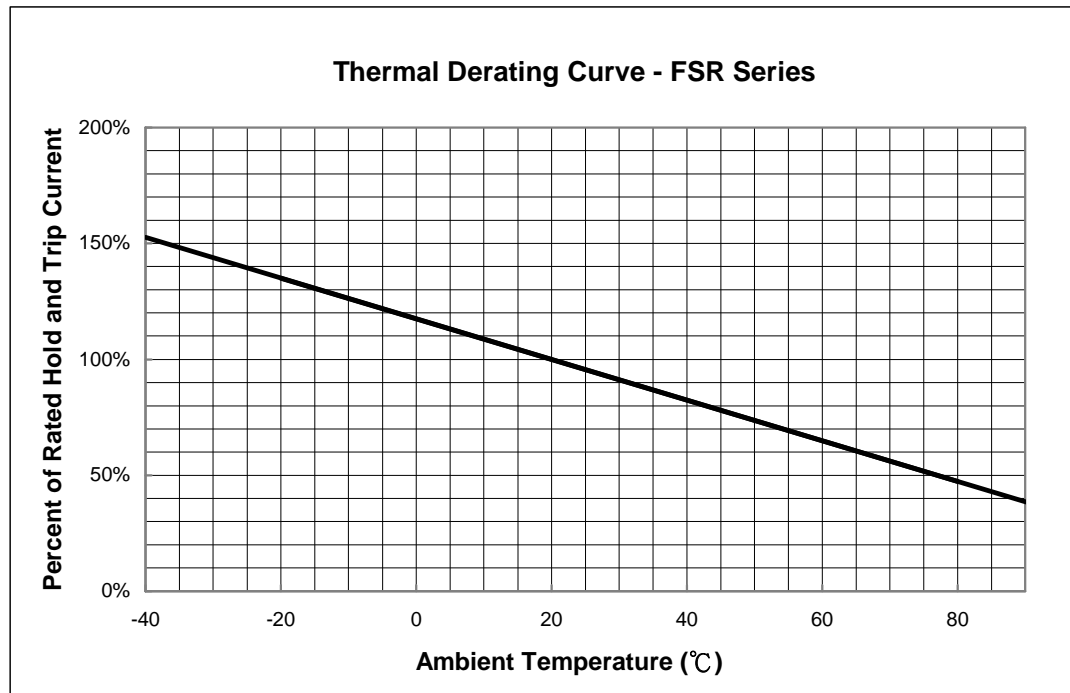


## FSR Product Dimensions (Millimeters)



Part Number	A		B		C		D		F	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
FSR120F	19.9	22.1	4.9	5.2	0.6	1.0	5.5	7.5	3.9	4.1
FSR175F	20.9	23.1	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1
FSR200F	21.3	23.4	10.2	11.0	0.5	1.1	5.0	7.6	4.8	5.4
FSR350F	28.4	31.8	13.0	13.5	0.5	1.1	6.3	8.9	6.0	6.6
FSR420F	30.6	32.4	12.9	13.6	0.5	1.1	5.0	7.5	6.0	6.7

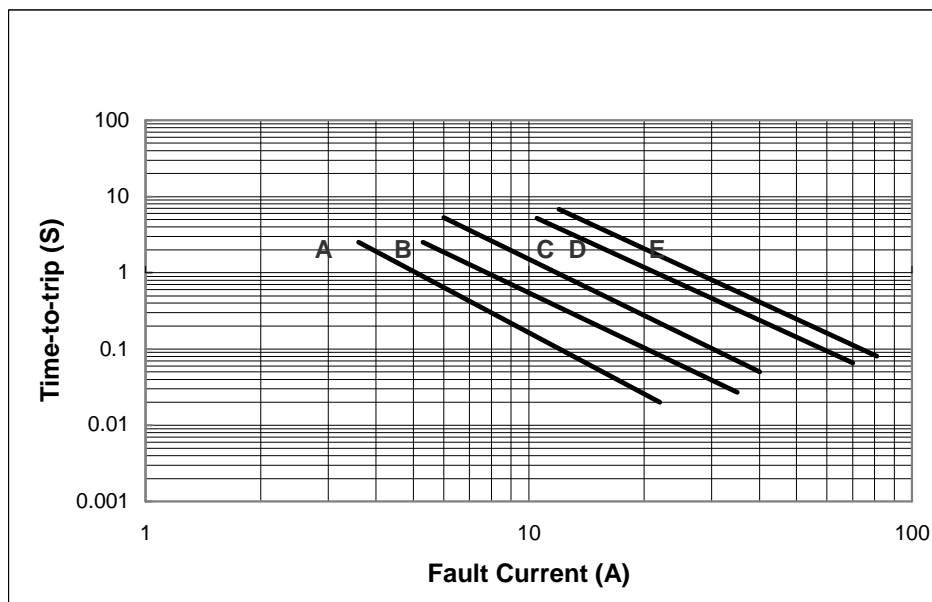
## Thermal Derating Curve



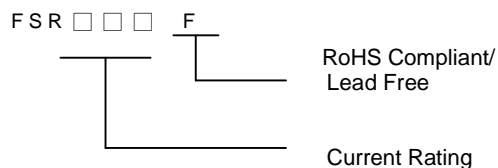
NOTE : All Specification subject to change without notice . 34

## Typical Time-To-Trip at 23°C

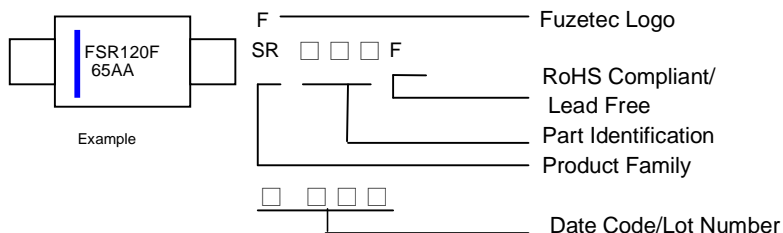
- A = FSR120F
- B = FSR175F
- C = FSR200F
- D = FSR350F
- E = FSR420F



## Part Numbering System



## Part Marking System



## Standard Package

P/N	Pcs /Bag
FSR120F	1K
FSR175F	1K
FSR200F	500

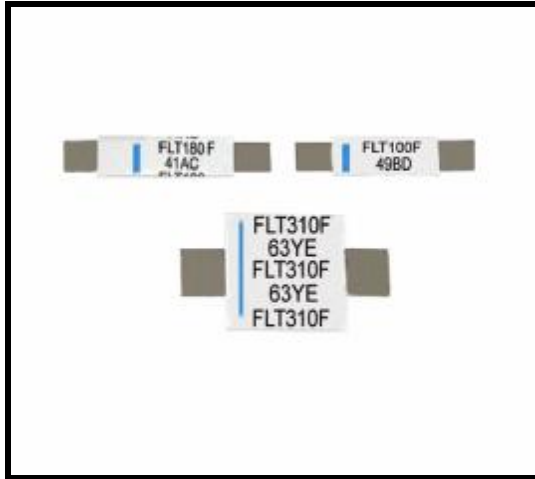
P/N	Pcs /Bag
FSR350F	500
FSR420F	500

### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

# Axial Leaded PTC FLT Series



**RoHS Compliant &  
Lead Free**



**Application:**

Rechargeable battery packs  
Lithium cell and battery packs

**Product Features:**

Low profile, Solid state

**Operation Current:** 0.7A~3.4 A

**Maximum Voltage:** 24V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:**UL(E211981)

C-UL(E211981)

TÜV (R3-50004084)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Trip Current	Rated Voltage	Maximum Current	Typical Power	Resistance Tolerance		
						R <sub>MIN</sub>	R <sub>MAX</sub>	R <sub>1MAX</sub>
	I <sub>H</sub> , A	I <sub>T</sub> , A	V <sub>MAX</sub> , Vdc	I <sub>MAX</sub> , A	P <sub>d</sub> , W	Ohms	Ohms	Ohms
<b>FLT070F</b>	0.7	1.5	24	100	1.1	0.100	0.200	0.340
<b>FLT100F</b>	1.0	2.5	24	100	1.5	0.070	0.130	0.260
<b>FLT180F</b>	1.8	3.8	24	100	2.0	0.040	0.068	0.120
<b>FLT190F</b>	1.9	4.2	24	100	1.9	0.030	0.057	0.100
<b>FLT260F</b>	2.6	5.2	24	100	2.3	0.025	0.042	0.076
<b>FLT300F</b>	3.0	6.3	24	100	2.0	0.015	0.031	0.055
<b>FLT310F</b>	3.1	6.0	24	100	2.5	0.018	0.030	0.055
<b>FLT340F</b>	3.4	6.8	24	100	2.7	0.016	0.027	0.050

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23 °C still air.

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

V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.

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

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

R<sub>MIN</sub>=Minimum device resistance at 23 °C.

R<sub>1MAX</sub>=Maximum device resistance at 23 °C, 1 hour after tripping.

Physical specifications:

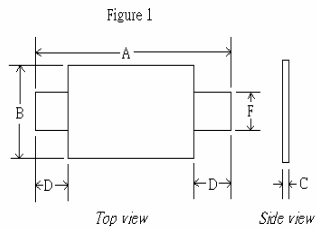
Lead material:0.13mm.nominal thickness ,quarter-hard nickel.

Insulating material: Polyester tape.

# Axial Leaded PTC FLT Series

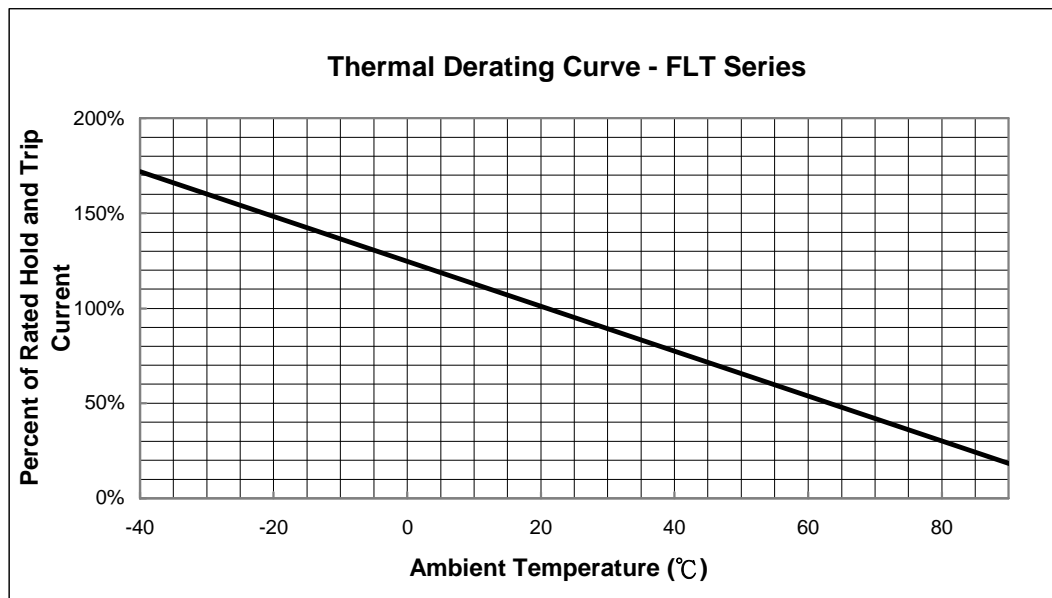


## FLT Product Dimensions (Millimeters)



Part Number	A		B		C		D		F	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
FLT070F	19.9	22.1	4.9	5.2	0.7	1.2	5.5	7.5	3.9	4.1
FLT100F	20.9	23.1	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1
FLT180F	24.0	26.0	4.9	5.2	0.6	1.0	4.1	5.5	3.9	4.1
FLT190F	21.3	23.4	10.2	11.0	0.5	1.1	5.0	7.6	4.8	5.4
FLT260F	24.0	26.0	10.8	11.9	0.6	1.0	5.0	7.0	5.9	6.1
FLT300F	28.4	31.8	13.0	13.5	0.5	1.1	6.3	8.9	6.0	6.6
FLT310F	24.0	26.0	14.8	15.9	0.6	1.0	5.0	7.0	5.9	6.1
FLT340F	24.0	26.0	14.8	15.9	0.6	1.0	4.0	5.0	5.9	6.1

## Thermal Derating Curve



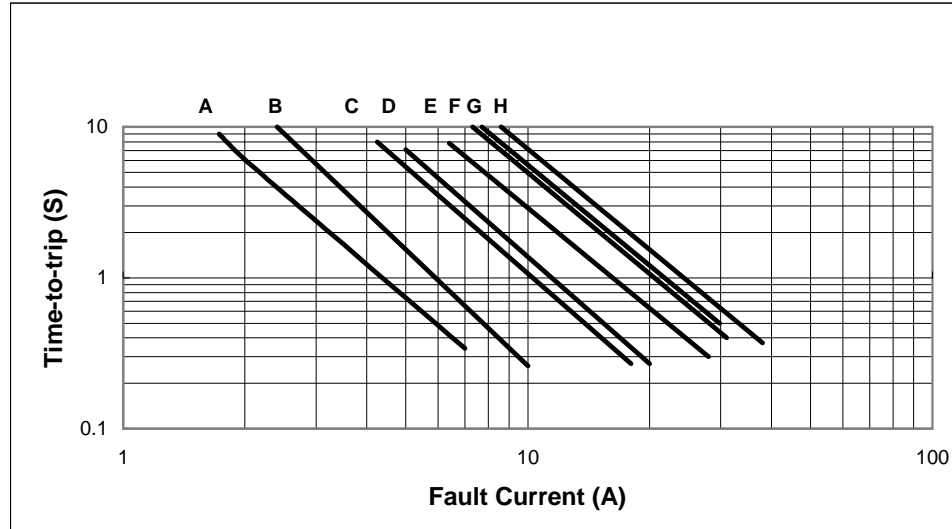
NOTE : All Specification subject to change without notice . 37

# Axial Leaded PTC FLT Series

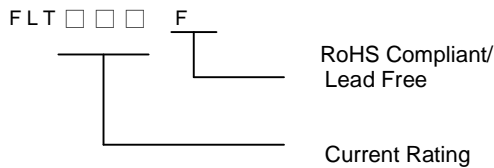


## Typical Time-To-Trip at 23°C

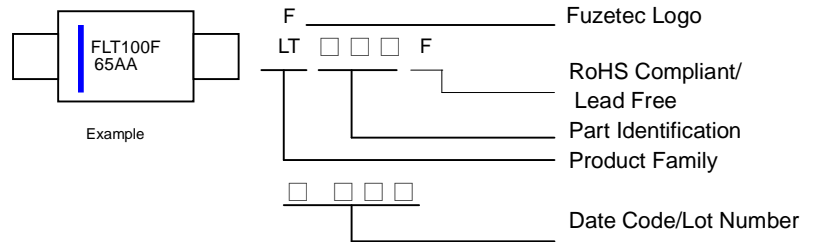
- A=FLT070F
- B=FLT100F
- C=FLT180F
- D=FLT190F
- E=FLT260F
- F=FLT300F
- G=FLT310F
- H=FLT340F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag
FLT070F	1K
FLT100F	1K
FLT180F	1K
FLT190F	500

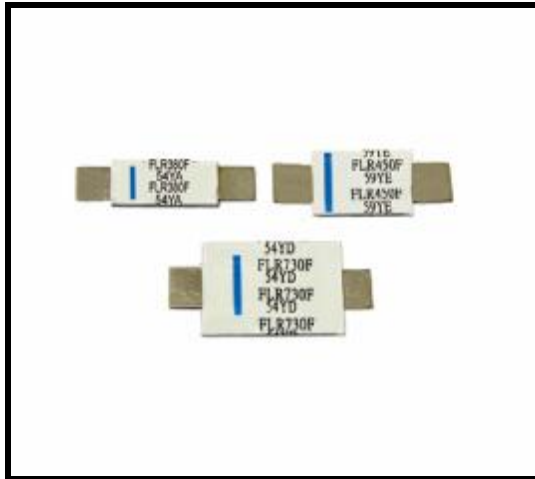
P/N	Pcs /Bag
FLT260F	500
FLT300F	500
FLT310F	500
FLT340F	500

#### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

# Axial Leaded PTC FLR Series



**RoHS Compliant & Lead Free Product**



**Application:**

- Rechargeable battery packs
- Lithium cell and battery packs

**Product Features:**

Low profile, Solid state

**Operation Current:** 1.9A~7.3 A

**Maximum Voltage:** 15V & 20V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

TÜV (R50004084)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Trip Current	Rated Voltage	Maximum Current	Typical Power	Resistance Tolerance		
						R <sub>MIN</sub>	R <sub>MAX</sub>	R <sub>1MAX</sub>
	I <sub>H</sub> , A	I <sub>T</sub> , A	V <sub>MAX</sub> , Vdc	I <sub>MAX</sub> , A	P <sub>d</sub> , W	Ohms	Ohms	Ohms
FLR190F	1.9	3.9	15	100	1.2	0.039	0.072	0.102
FLR260F	2.6	5.8	15	100	2.5	0.020	0.042	0.063
FLR380F	3.8	8.3	15	100	2.5	0.013	0.026	0.037
FLR450F	4.5	8.9	20	100	2.5	0.011	0.020	0.028
FLR550F	5.5	10.5	20	100	2.8	0.009	0.016	0.022
FLR600F	6.0	11.7	20	100	2.8	0.007	0.014	0.019
FLR730F	7.3	14.1	20	100	3.3	0.006	0.012	0.015

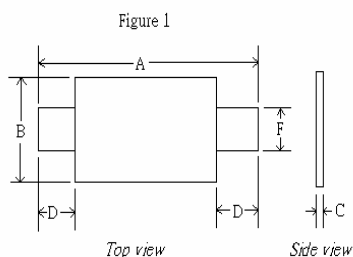
I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at its rated current.  
 I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V max).  
 P<sub>d</sub>=Maximum power dissipated from device when in the tripped state in 23°C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23°C.  
 R<sub>1MAX</sub>=Maximum device resistance at 23°C, 1 hour after tripping.  
 Physical specifications:  
 Lead material:0.13mm nominal thickness, quarter-hard nickel.  
 Insulating material: Polyester tape.



# Axial Leaded PTC FLR Series

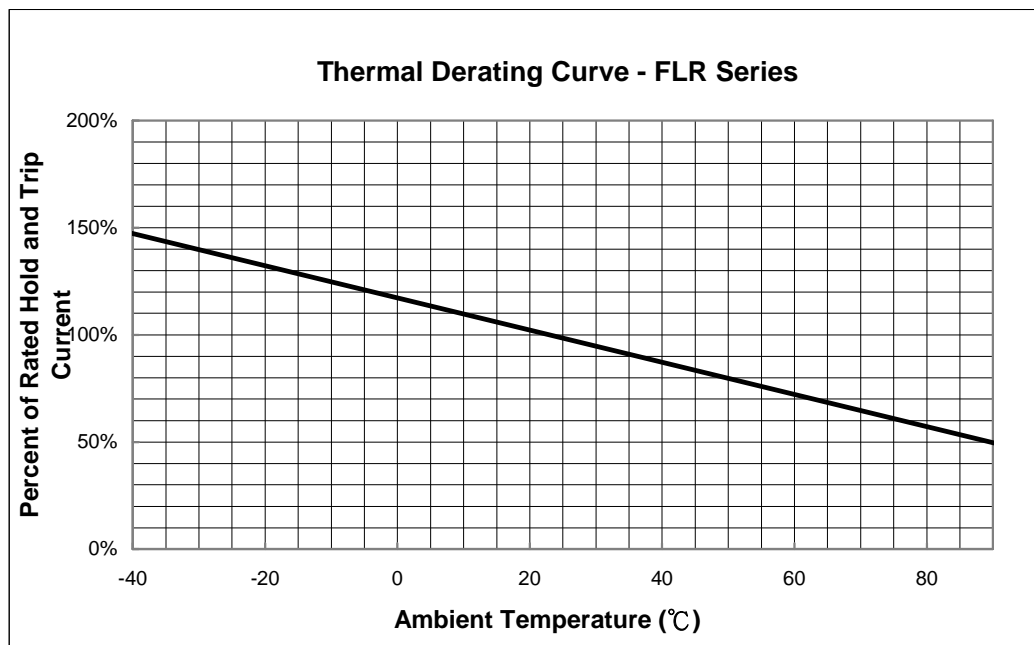


## FLR Product Dimensions (Millimeters)



Part Number	A		B		C		D		F	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
FLR190F	19.9	22.1	4.9	5.5	0.6	1.0	5.5	7.5	3.9	4.1
FLR260F	20.9	23.1	4.9	5.5	0.6	1.0	4.1	5.5	3.9	4.1
FLR380F	24.0	26.0	6.9	7.5	0.6	1.0	4.1	5.5	4.9	5.1
FLR450F	24.0	26.0	9.9	10.5	0.6	1.0	5.3	6.7	5.9	6.1
FLR550F	35.0	37.0	6.9	7.5	0.6	1.0	5.3	6.7	4.9	5.1
FLR600F	24.0	26.0	13.9	14.5	0.6	1.0	4.1	5.5	5.9	6.1
FLR730F	27.1	29.1	13.9	14.5	0.6	1.0	4.1	5.5	5.9	6.1

## Thermal Derating Curve



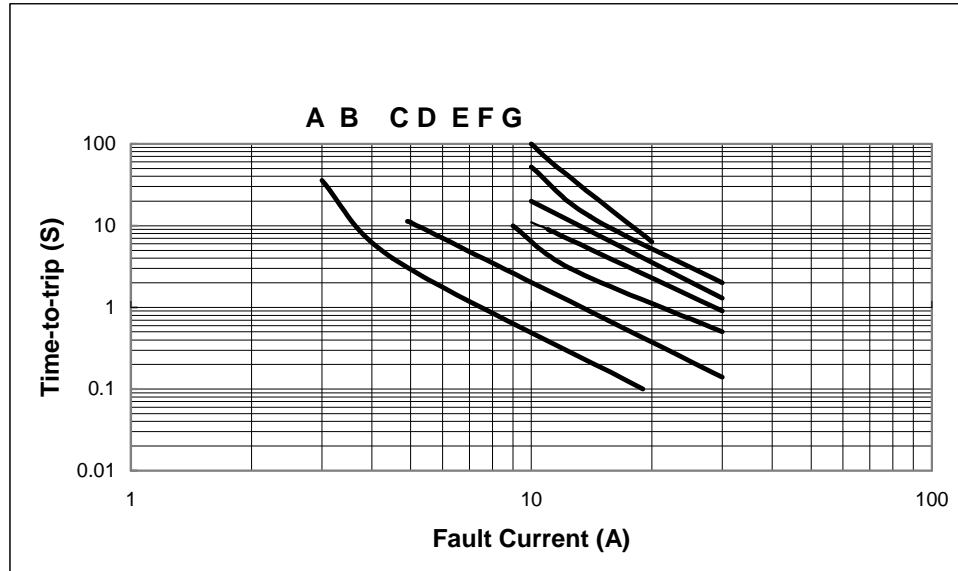
NOTE : All Specification subject to change without notice . 40

# Axial Leaded PTC FLR Series

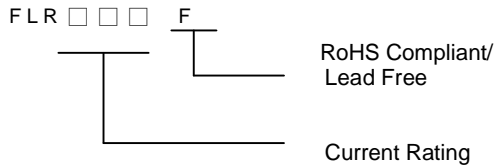


## Typical Time-To-Trip at 23°C

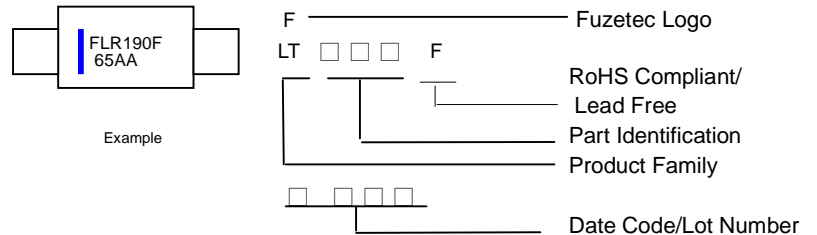
- A=FLR190F
- B=FLR260F
- C=FLR380F
- D=FLR450F
- E=FLR550F
- F=FLR600F
- G=FLR730F



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag
FLR190F	1K
FLR260F	1K
FLR380F	1K
FLR450F	500

P/N	Pcs /Bag
FLR550F	500
FLR600F	500
FLR730F	500

#### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

NOTE : All Specification subject to change without notice . 41

# Surface Mount PTC FSMD1812 Series



**RoHS Compliant &  
Lead Free**



**Application:**

All high-density boards

**Product Features:**

Small surface mount, Solid state  
Faster time to trip than standard SMD devices  
Lower resistance than standard SMD devices

**Operation Current:** 140mA~2.0A

**Maximum Voltage:** 6V~60V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

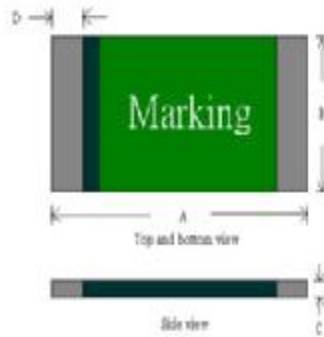
TÜV (R50004084)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Trip Current	Rated Voltage	Max Current	Typical Power	Max Time to Trip		Resistance Tolerance	
						Current	Time	R <sub>MIN</sub>	R <sub>1MAX</sub>
						I <sub>H</sub> , A	I <sub>T</sub> , A	V <sub>MAX</sub> , V <sub>AC</sub>	I <sub>MAX</sub> , A
FSMD014	0.14	0.30	60	10	0.8	8.0	< 0.02	1.20	6.50
FSMD020	0.20	0.40	30	10	0.8	8.0	0.02	0.80	5.00
FSMD035	0.35	0.70	16	40	0.8	8.0	0.10	0.32	1.50
FSMD050	0.50	1.00	16	40	0.8	8.0	0.15	0.15	1.00
FSMD075	0.75	1.50	16	40	0.8	8.0	0.2	0.11	0.45
FSMD110	1.10	2.20	6	40	0.8	8.0	0.30	0.04	0.21
FSMD110-16	1.10	1.95	16	40	0.8	8.0	0.50	0.04	0.18
FSMD125	1.25	2.50	6	40	0.8	8.0	0.40	0.05	0.14
FSMD150	1.50	3.00	6	40	0.8	8.0	0.50	0.04	0.11
FSMD160	1.60	3.20	6	40	0.8	8.0	< 0.5	0.03	0.10
FSMD200	2.00	3.50	8	40	0.8	8.0	2	0.02	0.07

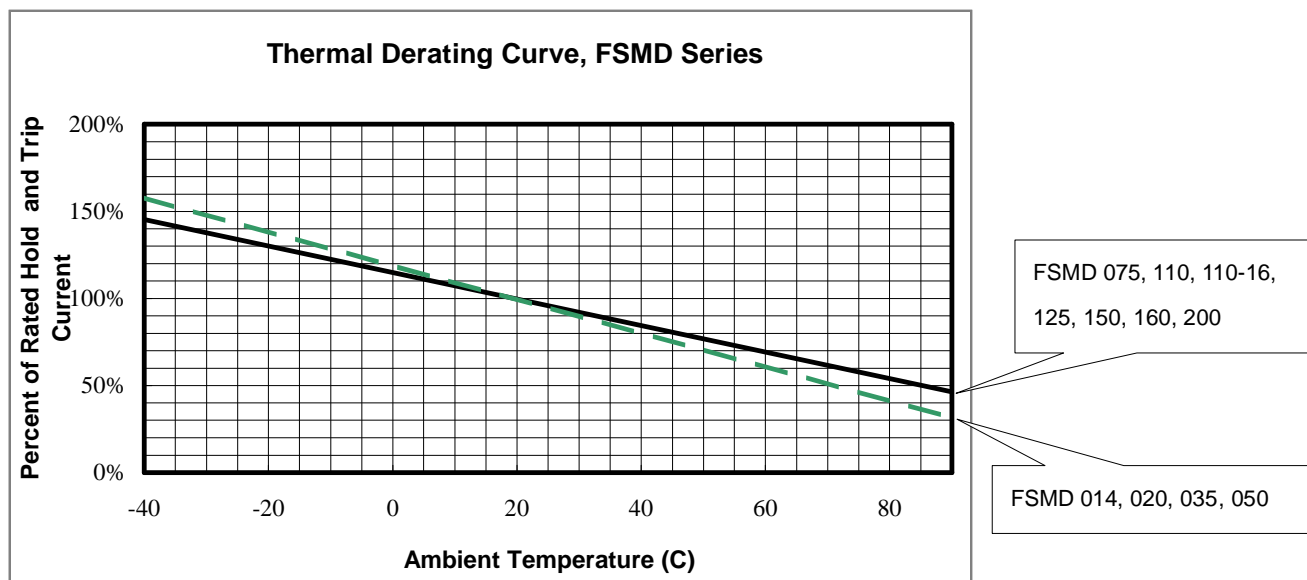
I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23 °C still air.  
I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23 °C still air.  
V<sub>MAX</sub>=Maximum voltage device can withstand without damage at it rated current.(I<sub>max</sub>)  
I<sub>MAX</sub>= Maximum fault current device can withstand without damage at rated voltage (V<sub>max</sub>).  
P<sub>d</sub>=Typical power dissipated-type amount of power dissipated by the device when in the tripped state in 23°C still air environment.  
R<sub>MIN</sub>=Minimum device resistance at 23°C prior to tripping.  
R<sub>1MAX</sub>=Maximum device resistance at 23°C measured 1 hour post trip.  
Termination pad characteristics  
Termination pad materials: 100% Tin

## FSMD Product Dimensions (Millimeters)



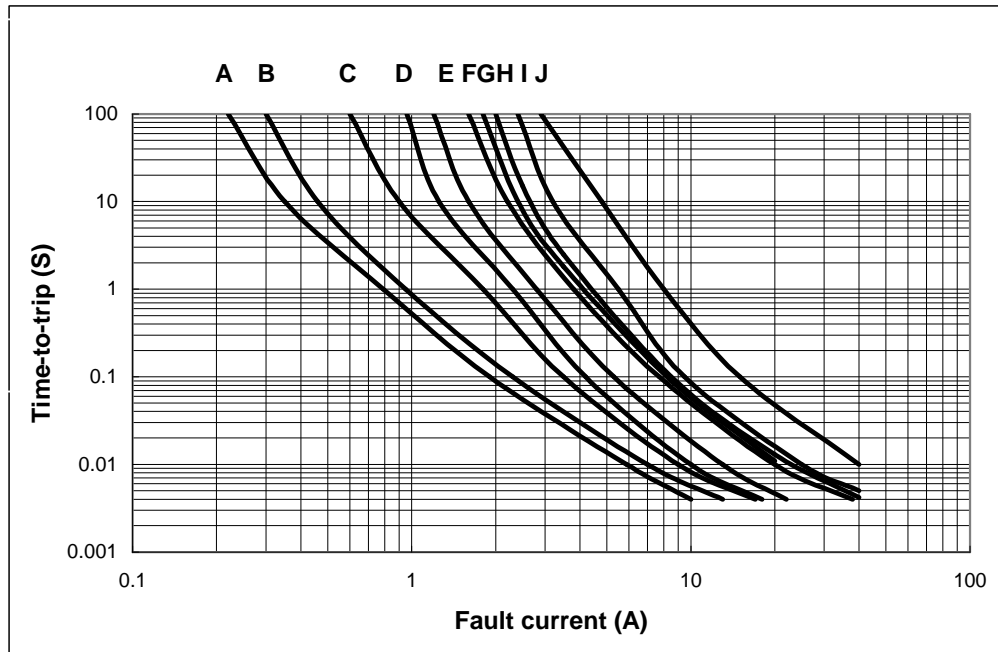
PART NUMBER	A		B		C		D
	Min	Max	Min	Max	Min	Max	Min
FSMD014	4.37	4.73	3.07	3.41	0.60	0.90	0.3
FSMD020	4.37	4.73	3.07	3.41	0.60	0.90	0.3
FSMD035	4.37	4.73	3.07	3.41	0.40	0.70	0.3
FSMD050	4.37	4.73	3.07	3.41	0.35	0.65	0.3
FSMD075	4.37	4.73	3.07	3.41	0.35	0.65	0.3
FSMD110	4.37	4.73	3.07	3.41	0.25	0.55	0.3
FSMD110-16	4.37	4.73	3.07	3.41	0.25	0.55	0.3
FSMD125	4.37	4.73	3.07	3.41	0.25	0.55	0.3
FSMD150	4.37	4.73	3.07	3.41	0.25	0.55	0.3
FSMD160	4.37	4.73	3.07	3.41	0.25	0.90	0.3
FSMD200	4.37	4.73	3.07	3.41	0.50	0.90	0.3

## Thermal Derating Curve

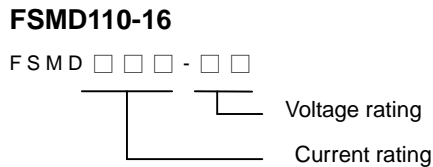


## Typical Time-To-Trip at 23°C

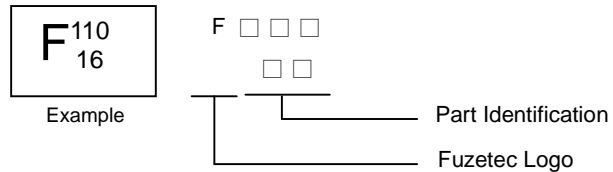
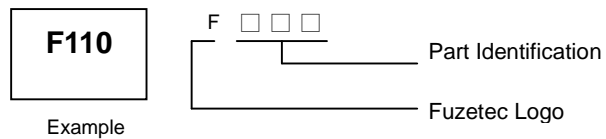
- A = FSMD014
- B = FSMD020
- C = FSMD035
- D = FSMD050
- E = FSMD075
- F = FSMD110/  
FSMD110-16
- G = FSMD125
- H = FSMD150
- I = FSMD160
- J = FSMD200



### Part Numbering System



### Part Marking System



### Standard Package

P/N	Pcs /Bag	Reel/Tape
FSMD014	-----	2K
FSMD020	-----	2K
FSMD035	-----	2K
FSMD050	-----	2K
FSMD075	-----	2K
FSMD110	-----	2K

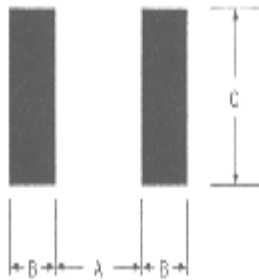
P/N	Pcs /Bag	Reel/Tape
FSMD110-16	-----	2K
FSMD125	-----	2K
FSMD150	-----	2K
FSMD160	-----	2K
FSMD200	-----	2K

- Warning:**
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
  - PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
  - Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance. .



## Pad Layouts 、 Solder Reflow and Rework Recommendations

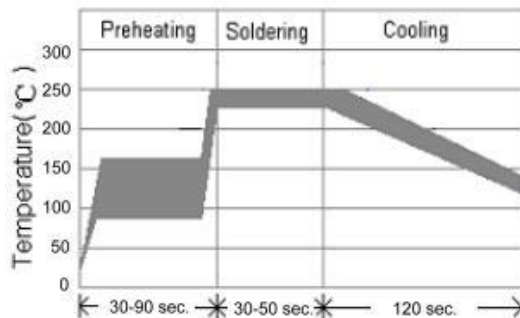
The dimension in the table below provide the recommended pad layout for each FSMD1812 device



Pad dimensions (millimeters)			
Device	A Nominal	B Nominal	C Nominal
FSMD014	3.45	1.78	3.50
FSMD020	3.45	1.78	3.50
FSMD035	3.45	1.78	3.50
FSMD050	3.45	1.78	3.50
FSMD075	3.45	1.78	3.50
FSMD110	3.45	1.78	3.50
FSMD110-16	3.45	1.78	3.50
FSMD125	3.45	1.78	3.50
FSMD150	3.45	1.78	3.50
FSMD160	3.45	1.78	3.50
FSMD200	3.45	1.78	3.50

### Solder reflow

※ Due to “Lead Free” nature, Temperature and Dwelling time for the soldering zone is higher than those for Regular. This may cause damage to other components.



1. Recommended reflow methods; IR , vapor phase oven, hot air oven.
2. The FSMD1812 Series are suitable for use with wave-solder application methods.
3. Recommended maximum paste thickness is 0.25mm.
4. Devices can be cleaned using standard industry methods and solvents.

### **CAUTION:**

**If reflow temperatures exceed the recommended Profile, devices may not meet the performance requirements.**

### **Rework:**

Use standard industry practices.



**RoHS Compliant &  
Lead Free**



**Application:**

All high-density boards

**Product Features:** 2920 Dimension, Surface mountable, Solid state, Faster time to trip than standard SMD devices.

**Operation Current:** 300mA~2.6A

**Maximum Voltage:** 6V~60V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

## Electrical Characteristics (23°C)

Part Number	Hold Current	Trip Current	Rated Voltage	Max Current	Typical Power	Max Time to Trip		Resistance Tolerance	
						Current	Time	RMIN	R1MAX
	I <sub>H</sub> , A	I <sub>T</sub> , A	V <sub>MAX</sub> , V <sub>DC</sub>	I <sub>MAX</sub> , A	P <sub>d</sub> , W	A	Sec	Ω	Ω
<b>FSMD030-2920</b>	0.30	0.60	60	10	1.5	1.5	3.0	1.000	4.800
<b>FSMD050-2920</b>	0.50	1.00	60	10	1.5	2.5	4.0	0.300	1.400
<b>FSMD075-2920</b>	0.75	1.50	33	40	1.5	8.0	0.3	0.180	1.000
<b>FSMD100-2920</b>	1.10	2.20	33	40	1.5	8.0	0.5	0.090	0.410
<b>FSMD125-2920</b>	1.25	2.50	33	40	1.5	8.0	2.0	0.050	0.250
<b>FSMD150-2920</b>	1.50	3.00	33	40	1.5	8.0	2.0	0.050	0.230
<b>FSMD185-2920</b>	1.85	3.70	33	40	1.5	8.0	2.5	0.040	0.150
<b>FSMD200-2920</b>	2.00	4.00	16	40	1.5	8.0	4.5	0.035	0.120
<b>FSMD250-2920</b>	2.50	5.00	16	40	1.5	8.0	16.0	0.025	0.085
<b>FSMD260-2920</b>	2.60	5.20	6	40	1.5	8.0	20.0	0.020	0.075

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.

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

V<sub>MAX</sub>=Maximum voltage device can withstand without damage at it 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</sub>=Typical power dissipated-type amount of power dissipated by the device when in the tripped state in 23°C still air environment

R<sub>MIN</sub>=Minimum device resistance at 23°C prior to tripping.

R<sub>1MAX</sub>=Maximum device resistance at 23°C measured 1 hour post trip.

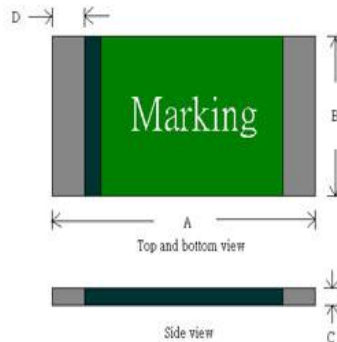
Termination pad characteristics

Termination pad materials: 100% Tin

# Surface Mount PTC FSMD2920 Series

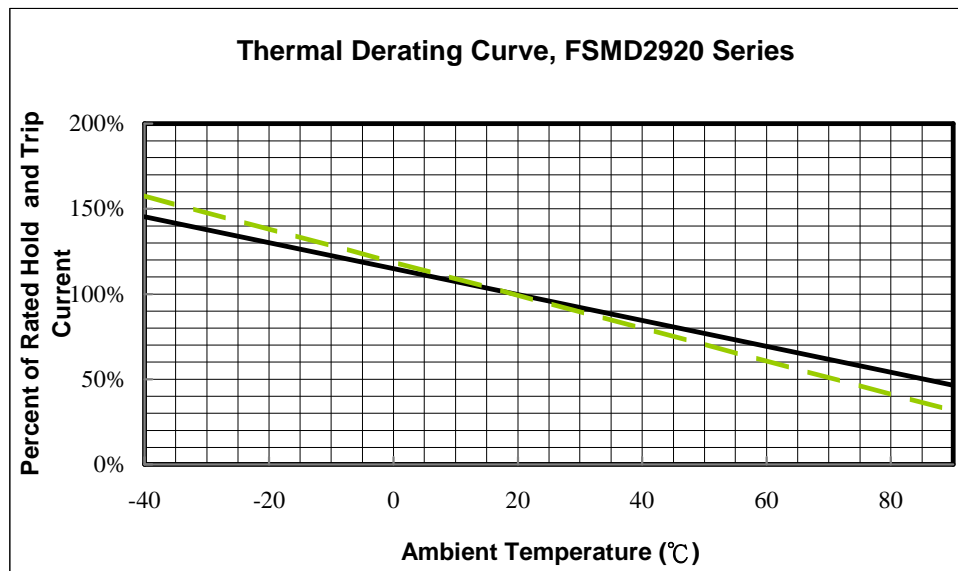


## FSMD2920 Product Dimensions (Millimeters)



PART NUMBER	A		B		C		D
	Min	Max	Min	Max	Min	Max	Min
FSMD030-2920	6.73	7.98	4.80	5.44	0.60	1.15	0.35
FSMD050-2920	6.73	7.98	4.80	5.44	0.60	1.15	0.35
FSMD075-2920	6.73	7.98	4.80	5.44	0.60	1.15	0.35
FSMD100-2920	6.73	7.98	4.80	5.44	0.40	1.00	0.35
FSMD125-2920	6.73	7.98	4.80	5.44	0.40	0.90	0.35
FSMD150-2920	6.73	7.98	4.80	5.44	0.40	0.90	0.35
FSMD185-2920	6.73	7.98	4.80	5.44	0.30	0.90	0.35
FSMD200-2920	6.73	7.98	4.80	5.44	0.30	0.90	0.35
FSMD250-2920	6.73	7.98	4.80	5.44	0.30	0.90	0.35
FSMD260-2920	6.73	7.98	4.80	5.44	0.30	0.90	0.35

## Thermal Derating Curve



A=FSMD125~FSMD260

B=FSMD030~FSMD100

NOTE : All Specification subject to change without notice . 47



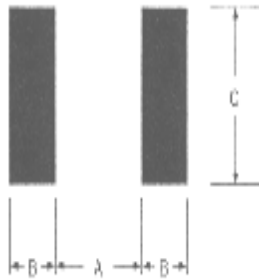


# Surface Mount PTC FSMD2920 Series

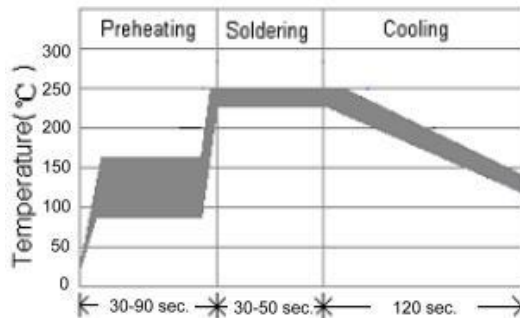


## Pad Layouts 、 Solder Reflow and Rework Recommendations

The dimension in the table below provide the recommended pad layout for each FSMD2920 device



Pad dimensions (millimeters)			
Device	A Nominal	B Nominal	C Nominal
FSMD030-2920	5.1	2.3	5.6
FSMD050-2920	5.1	2.3	5.6
FSMD075-2920	5.1	2.3	5.6
FSMD100-2920	5.1	2.3	5.6
FSMD125-2920	5.1	2.3	5.6
FSMD150-2920	5.1	2.3	5.6
FSMD185-2920	5.1	2.3	5.6
FSMD200-2920	5.1	2.3	5.6
FSMD250-2920	5.1	2.3	5.6
FSMD260-2920	5.1	2.3	5.6



### Solder reflow

※ Due to “Lead Free” nature, Temperature and Dwelling time for the soldering zone is higher than those for Regular. This may cause damage to other components.

1. Recommended reflow methods; IR , vapor phase oven, hot air oven.
2. The FSMD2920 Series are suitable for use with wave-solder application methods.
3. Recommended maximum paste thickness is 0.25mm.
4. Devices can be cleaned using standard industry methods and solvents.

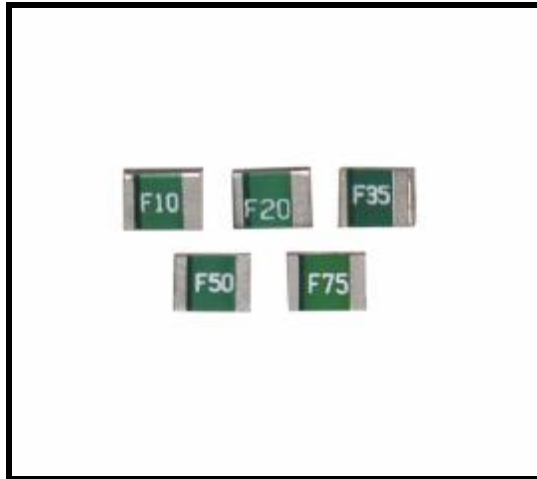
### CAUTION:

If reflow temperatures exceed the recommended Profile, devices may not meet the performance requirements.

### Rework:

Use standard industry practices.

# Surface Mount PTC FSMD1210 Series



**RoHS Compliant & Lead Free**



**Application:**

All high-density boards

**Product Features:**

- Small surface mount, Solid state
- Faster time to trip than standard SMD devices
- Lower resistance than standard SMD devices

**Operation Current:** 50mA~0.75A

**Maximum Voltage:** 6V~60V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

## Electrical Characteristics(23°C)

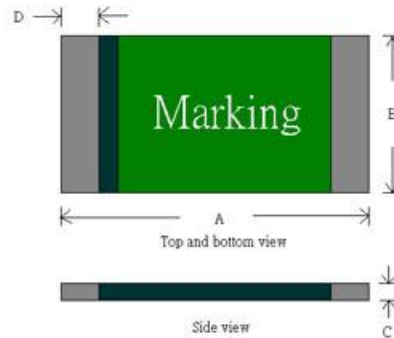
Part Number	Hold Current	Trip Current	Rated Voltage	Max Current	Typical Power	Max Time to Trip		Resistance Tolerance	
						Current	Time	R MIN	R1 MAX
						I <sub>H</sub> , A	I <sub>T</sub> , A	V <sub>MAX</sub> , V <sub>DC</sub>	I <sub>MAX</sub> , A
FSMD005-1210	0.05	0.15	60	10	0.60	0.25	1.50	3.60	50.00
FSMD010-1210	0.10	0.25	60	10	0.60	0.50	1.50	1.60	15.00
FSMD020-1210	0.20	0.40	30	10	0.60	8.00	0.02	0.80	5.00
FSMD035-1210	0.35	0.70	20	40	0.60	8.00	0.20	0.32	1.30
FSMD050-1210	0.50	1.00	16	40	0.60	8.00	0.10	0.25	0.90
FSMD075-1210	0.75	1.50	8	40	0.60	8.00	0.10	0.13	0.40

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.  
 I<sub>T</sub>=Trip current-minimum current at which the device will always trip at 23°C still air.  
 V<sub>MAX</sub>=Maximum voltage device can withstand without damage at it 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</sub>=Typical power dissipated-type amount of power dissipated by the device when in the tripped state in 23°C still air environment.  
 R<sub>MIN</sub>=Minimum device resistance at 23°C prior to tripping.  
 R<sub>1MAX</sub>=Maximum device resistance at 23°C measured 1 hour post trip.  
 Termination pad characteristics  
 Termination pad materials : 100% Tin

# Surface Mount PTC FSMD1210 Series

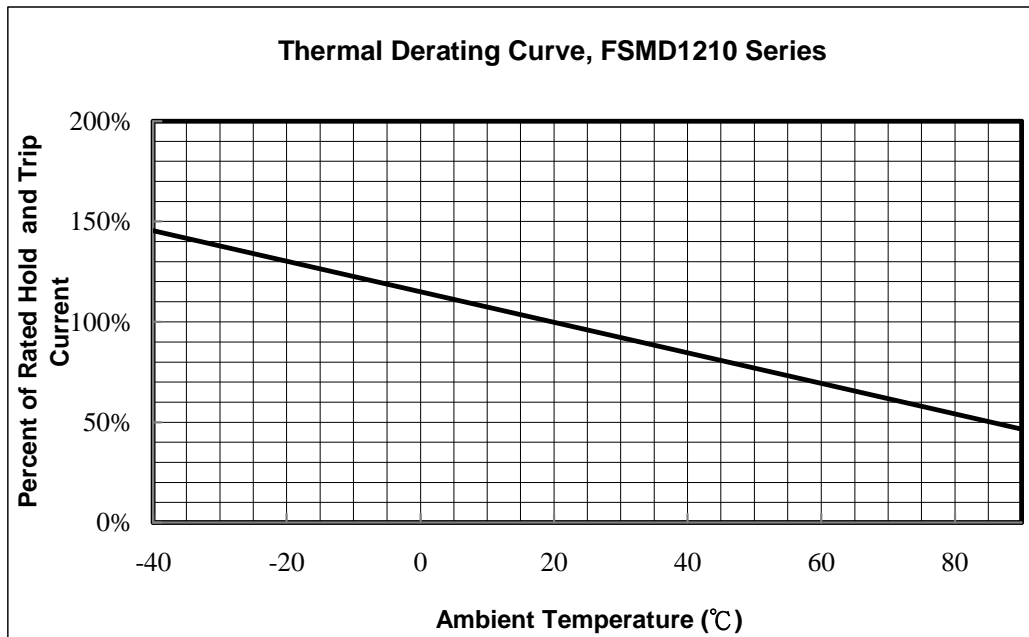


## FSMD Product Dimensions (Millimeters)



Part Number	A		B		C		D
	Min	Max	Min	Max	Min	Max	Min
FSMD005-1210	3.00	3.43	2.35	2.80	0.60	1.15	0.25
FSMD010-1210	3.00	3.43	2.35	2.80	0.60	1.15	0.25
FSMD020-1210	3.00	3.43	2.35	2.80	0.40	0.85	0.25
FSMD035-1210	3.00	3.43	2.35	2.80	0.40	0.80	0.25
FSMD050-1210	3.00	3.43	2.35	2.80	0.30	0.75	0.25
FSMD075-1210	3.00	3.43	2.35	2.80	0.30	0.70	0.25

## Thermal Derating Curve

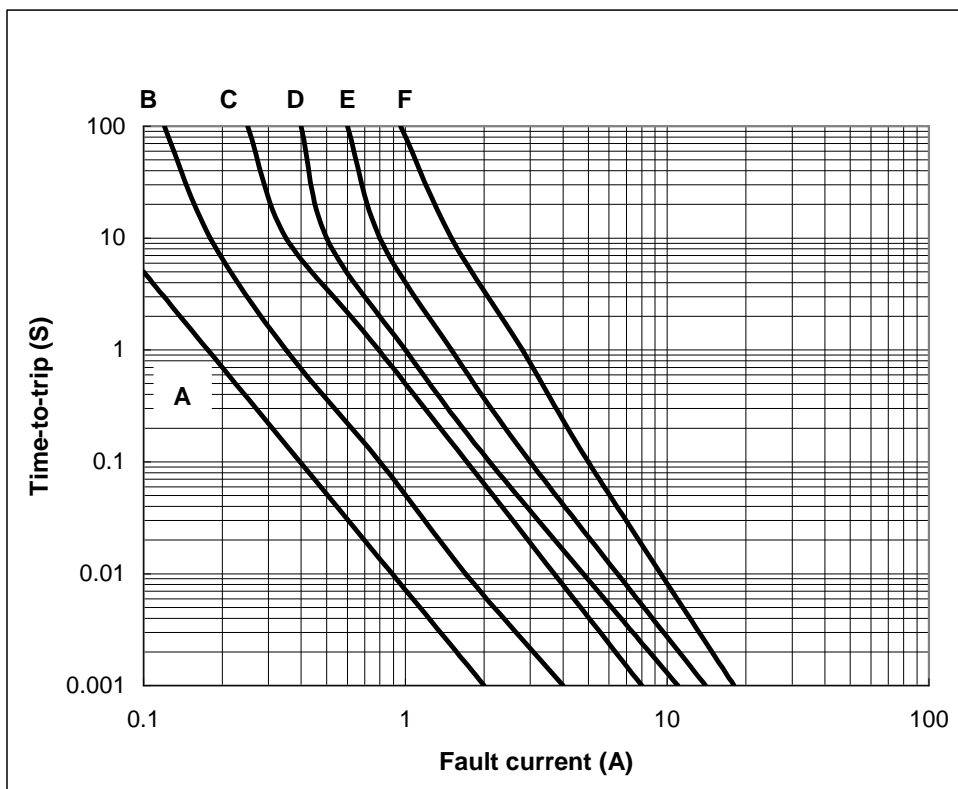


# Surface Mount PTC FSMD1210 Series

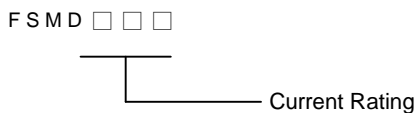


## Typical Time-To-Trip at 23°C

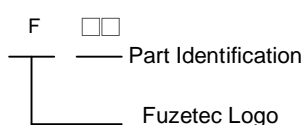
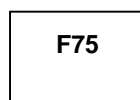
- A =FSMD005-1210
- B =FSMD010-1210
- C =FSMD020-1210
- D =FSMD035-1210
- E =FSMD050-1210
- F =FSMD075-1210



### Part Numbering System



### Part Marking System



- F05 =FSMD005-1210
- F10 =FSMD010-1210
- F20 =FSMD020-1210
- F35 =FSMD035-1210
- F50 =FSMD050-1210
- F75 =FSMD075-1210

### Standard Package

P/N	Pcs /Bag	Reel/Tape
FSMD005-1210	-----	3K
FSMD010-1210	-----	3K
FSMD020-1210	-----	3K

P/N	Pcs /Bag	Reel/Tape
FSMD035-1210	-----	4K
FSMD050-1210	-----	4K
FSMD075-1210	-----	4K

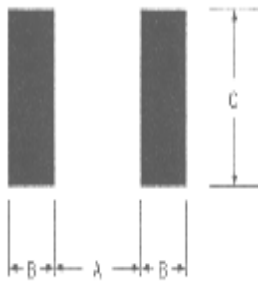
#### Warning:



- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

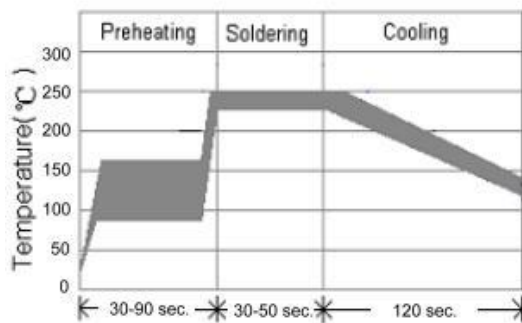
## Pad Layouts 、 Solder Reflow and Rework Recommendations

The dimension in the table below provide the recommended pad layout for each FSMD1210 device



**Pad dimensions(millimeters)**

Device	A Nominal	B Nominal	C Nominal
FSMD005-1210	2.00	1.00	2.80
FSMD010-1210	2.00	1.00	2.80
FSMD020-1210	2.00	1.00	2.80
FSMD035-1210	2.00	1.00	2.80
FSMD050-1210	2.00	1.00	2.80
FSMD075-1210	2.00	1.00	2.80



### Solder reflow

※ Due to “Lead Free” nature, Temperature and Dwelling time for the soldering zone is higher than those for Regular. This may cause damage to other components.

1. Recommended reflow methods; IR , vapor phase oven, hot air oven.
2. The FSMD1210 Series are suitable for use with wave-solder application methods.
3. Recommended maximum paste thickness is 0.25mm.
4. Devices can be cleaned using standard industry methods and solvents.

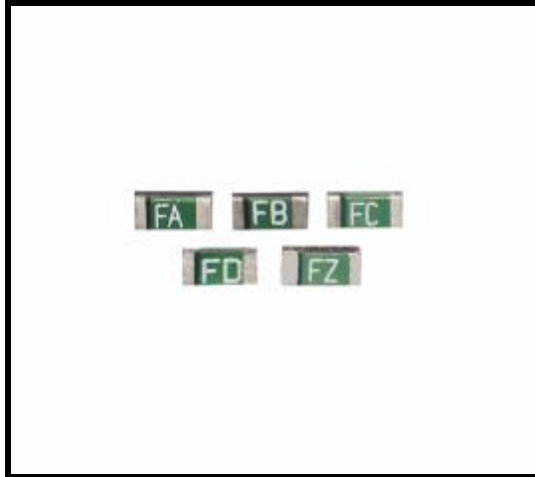
### **CAUTION:**

**If reflow temperatures exceed the recommended Profile, devices may not meet the performance requirements.**

### **Rework:**

Use standard industry practices.

# Surface Mount PTC FSMD1206 Series



**RoHS Compliant &  
Lead Free**



**Application:**

All high-density boards

**Product Features:**

- Small surface mount, Solid state
- Faster time to trip than standard SMD devices
- Lower resistance than standard SMD devices

**Operation Current:** 50mA~500mA

**Maximum Voltage:** 6V~60V

**Temperature Range:** -40°C to 85°C

**Agency Recognition:** UL (E211981)

C-UL (E211981)

## Electrical Characteristics(23°C)

Part Number	Hold Current	Trip Current	Rated Voltage	Max Current	Typical Power	Max Time to Trip		Resistance Tolerance	
						Current	Time	R MIN	R1 MAX
	I <sub>H</sub> ,A	I <sub>T</sub> ,A	V <sub>MAX</sub> ,V <sub>DC</sub>	I <sub>MAX</sub> , A	P <sub>d</sub> , W	A	Sec	Ohms	Ohms
<b>FSMD005-1206</b>	0.05	0.15	60	10	0.4	0.25	1.50	3.60	50.00
<b>FSMD010-1206</b>	0.10	0.25	60	10	0.4	0.50	1.00	1.60	15.00
<b>FSMD020-1206</b>	0.20	0.40	30	10	0.4	8.00	0.05	0.60	2.50
<b>FSMD035-1206</b>	0.35	0.75	16	40	0.4	8.00	0.10	0.30	1.20
<b>FSMD050-1206</b>	0.50	1.00	8	40	0.4	8.00	0.10	0.15	0.70

I<sub>H</sub>=Hold current-maximum current at which the device will not trip at 23°C still air.

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

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

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

P<sub>d</sub>=Typical power dissipated-type amount of power dissipated by the device when in the tripped state in 23°C still air environment.

R<sub>MIN</sub>=Minimum device resistance at 23°C prior to tripping.

R<sub>1MAX</sub>=Maximum device resistance at 23°C measured 1 hour post trip.

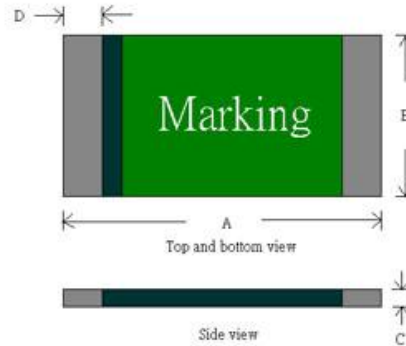
Termination pad characteristics

Termination pad materials : 100% Tin

# Surface Mount PTC FSMD1206 Series

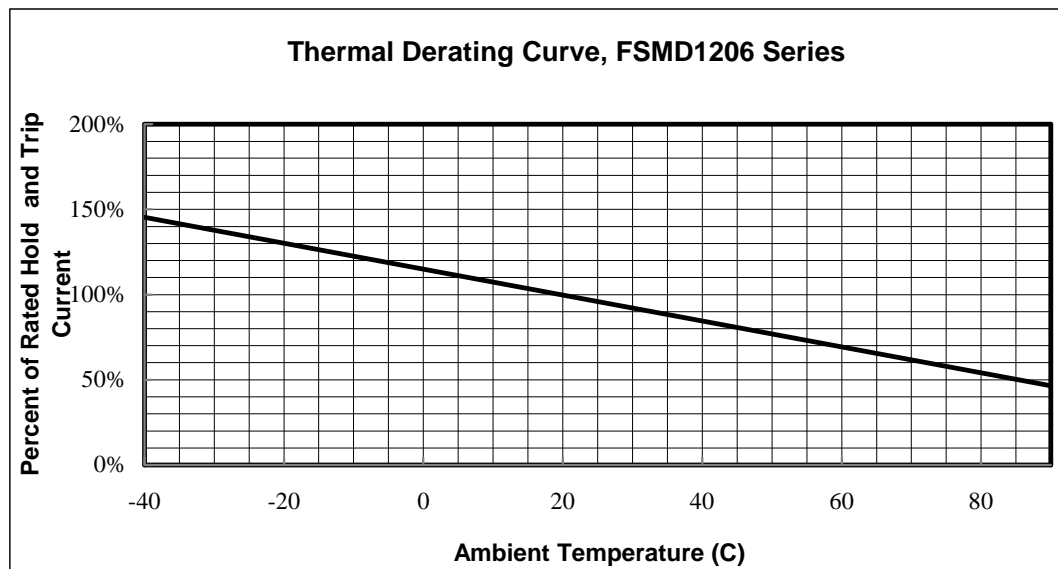


## FSMD Product Dimensions (Millimeters)



Part Number	A		B		C		D
	Min	Max	Min	Max	Min	Max	Min
FSMD005-1206	3.0	3.5	1.50	1.80	0.45	0.75	0.10
FSMD010-1206	3.0	3.5	1.50	1.80	0.45	0.75	0.10
FSMD020-1206	3.0	3.5	1.50	1.80	0.45	0.75	0.10
FSMD035-1206	3.0	3.5	1.50	1.80	0.45	0.75	0.10
FSMD050-1206	3.0	3.5	1.50	1.80	0.25	0.55	0.10

## Thermal Derating Curve



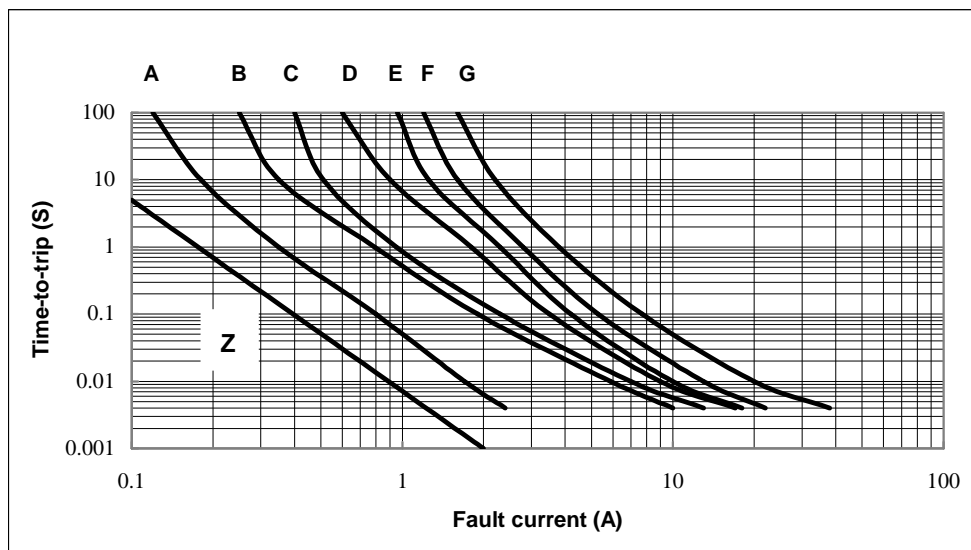


# Surface Mount PTC FSMD1206 Series

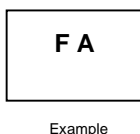
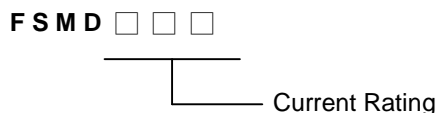


## Typical Time-To-Trip at 23°C

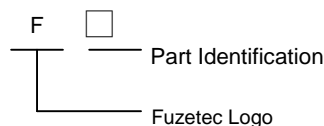
Z =FSMD005-1206  
 A =FSMD010-1206  
 B =FSMD020-1206  
 C =FSMD035-1206  
 D =FSMD050-1206



### Part Numbering System



### Part Marking System



FZ =FSMD005-1206  
 FA =FSMD010-1206  
 FB =FSMD020-1206  
 FC =FSMD035-1206  
 FD =FSMD050-1206

### Standard Package

P/N	Pcs /Bag	Reel/Tape
FSMD005-1206	-----	3K
FSMD010-1206	-----	3K
FSMD020-1206	-----	3K

P/N	Pcs /Bag	Reel/Tape
FSMD035-1206	-----	4K
FSMD050-1206	-----	4K

#### Warning:



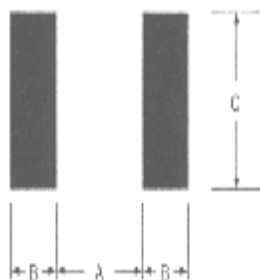
- Operation beyond the specified maximum ratings or improper use may result in damage and possible electrical arcing and/or flame.
- PPTC device are intended for occasional overcurrent protection. Application for repeated overcurrent condition and/or prolonged trip are not anticipated.
- Avoid contact of PPTC device with chemical solvent. Prolonged contact will damage the device performance.

# Surface Mount PTC FSMD1206 Series



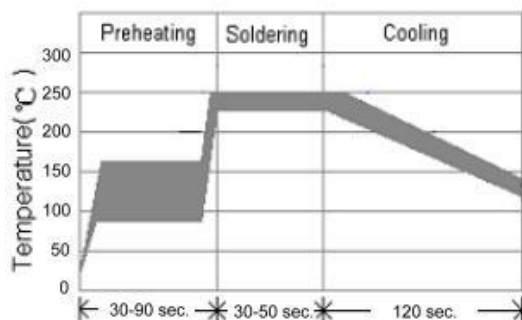
## Pad Layouts 、 Solder Reflow and Rework Recommendations

The dimension in the table below provide the recommended pad layout for each FSMD1206 device



**Pad dimensions(millimeters)**

Device	A Nominal	B Nominal	C Nominal
FSMD005-1206	2.00	1.00	1.90
FSMD010-1206	2.00	1.00	1.90
FSMD020-1206	2.00	1.00	1.90
FSMD035-1206	2.00	1.00	1.90
FSMD050-1206	2.00	1.00	1.90



### Solder reflow

※ Due to “Lead Free” nature, Temperature and Dwelling time for the soldering zone is higher than those for Regular. This may cause damage to other components.

1. Recommended reflow methods; IR , vapor phase oven, hot air oven.
2. The FSMD1206 Series are suitable for use with wave-solder application methods.
3. Recommended maximum paste thickness is 0.25mm.
4. Devices can be cleaned using standard industry methods and solvents.

### **CAUTION:**

**If reflow temperatures exceed the recommended Profile, devices may not meet the performance requirements.**

### **Rework:**

Use standard industry practices.

# Quick Selection Guide

Fill in the following BLANKS to help us out in suggesting the “Right” product for your applications.

**1. Determine the followings to define your circuit operation parameter,**

Normal operating current : \_\_\_\_\_ Typical fault current: \_\_\_\_\_

Normal operating voltage : \_\_\_\_\_ Required opening time at fault: \_\_\_\_\_

Maximum interrupt current: \_\_\_\_\_ Form factor: \_\_\_\_\_

Maximum operating voltage: \_\_\_\_\_

Maximum Ambient Temperature/ Derating : Between \_\_\_\_\_°C and \_\_\_\_\_°C

Typical resistance (in circuit): \_\_\_\_\_ Agency approvals: \_\_\_\_\_

**2. Select the appropriate Fuzetec series from the table listed below:** \_\_\_\_\_

Fuzetec Family	Voltage	Hold Current	Form factor	Application
<b>FRX</b>	60V	50mA~3.75A	Radial Leaded	Computer & Electronic Equipment
<b>FRX90V</b>	90V	100mA~3.75A	Radial Leaded	Telecom and electronic Equipment
<b>FRU</b>	30 V	900mA~9A	Radial Leaded	Computer & Electronic Equipment
<b>FRT</b>	36V	500mA~2.50A	Radial Leaded	IEEE 1394 FireWire, Computers & Consumer electronics
<b>FUSB</b>	16V/30V	750mA~2.5A	Radial Leaded	Computer & Electronic Equipment
<b>FRG</b>	16V	3A~14A	Radial Leaded	Electronics, Automotive & Appliance
<b>FBR</b>	90V	100mA~900mA	Radial Leaded	Cable Telephone Electronics/Cable Power Passing Tap
<b>FRH</b>	60V/250V/600V	0.08A~0.18A	Radial Leaded	Telecom Equipment
<b>FRV</b>	240V <sub>AC/DC</sub>	50mA~550mA	Radial Leaded	Line Voltage Power Supply, Transformer and Appliances
<b>FRA</b>	120V <sub>AC/DC</sub>	100mA~3.75A	Radial Leaded	Electrical & Electronic Appliance
<b>FSR</b>	15V&30V	1.2A~4.2A	Axial Leaded	Rechargeable Battery & Packs
<b>FLT</b>	24V	0.7A ~3.4A	Axial Leaded	Rechargeable Battery & Packs
<b>FLR</b>	15V&20V	1.9A~7.3A	Axial Leaded	Rechargeable Battery & Packs
<b>FSMD 1812</b>	6V~60V	140mA~2.0A	Surface Mount	High-density PCB
<b>FSMD 1206</b>	6V~60V	0.05A ~0.50A	Surface Mount	High-density PCB
<b>FSMD 1210</b>	6V~60V	0.05A ~0.75A	Surface Mount	High-density PCB
<b>FSMD 2920</b>	6V~60V	300mA~2.6A	Surface Mount	High-density PCB

**3. Fill in the followings:**

a) Quantity of samples requested: \_\_\_\_\_

b) Application Type: \_\_\_\_\_

c) Company name: \_\_\_\_\_

d) Address: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Position : \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

E-mail: \_\_\_\_\_ Website: \_\_\_\_\_

e) Type of Business: \_\_\_\_\_

NOTE : All Specification subject to change without notice . 58

# Cross Reference



<u>Fuzetec</u>		<u>Raychem</u>		<u>Bourns</u>		<u>Littelfuse</u>	
FRX	005-60F	RXE	005	MF-R	005	--	--
FRX	010-60F	RXE	010	MF-R	010	60R	010
FRX	017-60F	RXE	017	MF-R	017	60R	017
FRX	020-60F	RXE	020	MF-R	020	60R	020
FRX	025-60F	RXE	025	MF-R	025	60R	025
FRX	030-60F	RXE	030	MF-R	030	60R	030
FRX	040-60F	RXE	040	MF-R	040	60R	040
FRX	050-60F	RXE	050	MF-R	050	60R	050
FRX	065-60F	RXE	065	MF-R	065	60R	065
FRX	075-60F	RXE	075	MF-R	075	60R	075
FRX	090-60F	RXE	090	MF-R	090	60R	090
FRX	110-60F	RXE	110	MF-RX	110	60R	110
FRX	135-60F	RXE	135	MF-RX	135	60R	135
FRX	160-60F	RXE	160	MF-RX	160	60R	160
FRX	185-60F	RXE	185	MF-RX	185	60R	185
FRX	250-60F	RXE	250	MF-RX	250	60R	250
FRX	300-60F	RXE	300	MF-RX	300	60R	300
FRX	375-60F	RXE	375	MF-RX	375	60R	375

FRX	010-90F	--	--	--	--	--	--
FRX	015-90F	--	--	--	--	--	--
FRX	017-90F	--	--	--	--	--	--
FRX	020-90F	RXE	020 (72V)	--	--	--	--
FRX	025-90F	RXE	025 (72V)	--	--	--	--
FRX	030-90F	RXE	030 (72V)	--	--	--	--
FRX	035-90F	--	--	--	--	--	--
FRX	040-90F	RXE	040 (72V)	--	--	--	--
FRX	050-90F	RXE	050 (72V)	--	--	--	--
FRX	055-90F	--	--	--	--	--	--
FRX	065-90F	RXE	065 (72V)	--	--	--	--
FRX	075-90F	RXE	075 (72V)	--	--	--	--
FRX	090-90F	RXE	090 (72V)	--	--	--	--
FRX	110-90F	RXE	110 (72V)	--	--	--	--
FRX	135-90F	RXE	135 (72V)	--	--	--	--
FRX	160-90F	RXE	160 (72V)	--	--	--	--
FRX	185-90F	RXE	185 (72V)	--	--	--	--
FRX	250-90F	RXE	250 (72V)	--	--	--	--
FRX	300-90F	RXE	300 (72V)	--	--	--	--
FRX	375-90F	RXE	375 (72V)	--	--	--	--

FBR	100(U)F	--	--	--	--	--	--
FBR	150(U)F	--	--	--	--	--	--
FBR	200(U)F	--	--	--	--	--	--
FBR	250(U)F	--	--	--	--	--	--
FBR	350(U)F	--	--	--	--	--	--
FBR	550(U)F	BBR	550	MF-R	055/90(U)	--	--
FBR	750(U)F	BBR	750	MF-R	075/90	--	--
FBR	900(U)F	--	--	--	--	--	--

FRU	090-30F	RUE	090	MF-R	090-09	30R	090
FRU	110-30F	RUE	110	MF-R	110	30R	110
FRU	135-30F	RUE	135	MF-R	135	30R	135
FRU	160-30F	RUE	160	MF-R	160	30R	160
FRU	185-30F	RUE	185	MF-R	185	30R	185
FRU	250-30F	RUE	250	MF-R	250(10)	30R	250
FRU	300-30F	RUE	300	MF-R	300	30R	300
FRU	400-30F	RUE	400	MF-R	400	30R	400
FRU	500-30F	RUE	500	MF-R	500	30R	500
FRU	600-30F	RUE	600	MF-R	600	30R	600
FRU	700-30F	RUE	700	MF-R	700	30R	700
FRU	800-30F	RUE	800	MF-R	800	30R	800
FRU	900-30F	RUE	900	MF-R	900	30R	900

NOTE : All Specification subject to change without notice. 59

# Cross Reference



<u>Fuzetec</u>		<u>Raychem</u>		<u>Bourns</u>		<u>Littelfuse</u>	
FRT	050-33F	-	-	-	-	-	-
FRT	075-33F	-	-	-	-	-	-
FRT	090-33F	-	-	-	-	-	-
FRT	120-33F	RTE	120	-	-	-	-
FRT	135-33F	RTE	135	-	-	-	-
FRT	160-33F	-	-	-	-	-	-
FRT	190-33F	RTE	190	-	-	-	-
FRT	220-33F	-	-	-	-	-	-
FRT	250-33F	-	-	-	-	-	-

FUSB	075F	RUSB	075	--	--	--	--
FUSB	090F	RUSB	090	--	--	--	--
FUSB	110F	RUSB	110	--	--	--	--
FUSB	120F	RUSB	120	--	--	--	--
FUSB	135F	RUSB	135	--	--	--	--
FUSB	155F	RUSB	155	--	--	--	--
FUSB	160F	RUSB	160	--	--	--	--
FUSB	185F	RUSB	185	--	--	--	--
FUSB	250F	RUSB	250	--	--	--	--

FRG	300-16F	RGE	300	MF-RG	300	--	--
FRG	400-16F	RGE	400	--	--	--	--
FRG	500-16F	RGE	500	MF-RG	500	--	--
FRG	600-16F	RGE	600	--	--	--	--
FRG	700-16F	RGE	700	MF-RG	700	--	--
FRG	800-16F	RGE	800	--	--	--	--
FRG	900-16F	RGE	900	MF-RG	900	--	--
FRG	1000-16F	RGE	1000	--	--	--	--
FRG	1100-16F	RGE	1100	MF-RG	1100	--	--
FRG	1200-16F	RGE	1200	--	--	--	--
FRG	1400-16F	RGE	1400	--	--	--	--

FRH	080-250UF	TR250	080U	MF-R008	250U	--	--
FRH	080-250F	TR250	080	MF-R008	250-B10	--	--
FRH	110-250UF	TR250	110U	MF-R011	250U	--	--
FRH	110-250F	TR250	---	---	---	--	--
FRH	120-250UF	TR250	120U	MF-R012	250U	--	--
FRH	120-250F	TR250	120	MF-R012	250	--	--
FRH	145-250UF	TR250	145U	MF-R014	250U	--	--
FRH	145-250F	TR250	145	MF-R014	250	--	--
FRH	180-250UF	TR250	180U	MF-R018	250U	--	--
FRH	180-250F	TR250	---	--	--	--	--
FRH	150-600F	TR600	150	--	--	--	--
FRH	160-600F	TR600	160	--	--	--	--

FRV	005-240F	LVR	005	--	--	--	--
FRV	008-240F	LVR	008	--	--	--	--
FRV	012-240F	LVR	012	--	--	--	--
FRV	016-240F	LVR	016	--	--	--	--
FRV	025-240F	LVR	025	--	--	--	--
FRV	033-240F	LVR	033	--	--	--	--
FRV	040-240F	LVR	040	--	--	--	--
FRV	055-240F	LVR	055K	--	--	--	--

# Cross Reference



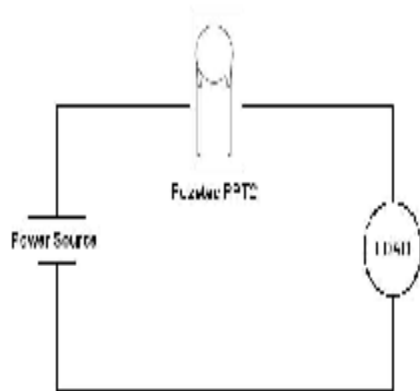
<u>Fuzetec</u>		<u>Raychem</u>		<u>Bourns</u>		<u>Littelfuse</u>	
FSR	120F	SRP	120	MF-S	120	--	--
FSR	175F	SRP	175	MF-S	175	--	--
FSR	200F	SRP	200	MF-S	200	--	--
FSR	350F	SRP	350	MF-S	350	--	--
FSR	420F	SRP	420	MF-S	420	--	--
FLT	070F	LTP	070	MF-LS	070	--	--
FLT	100F	LTP	100	--	--	--	--
FLT	180F	LTP	180	MF-LS	180	--	--
FLT	190F	LTP	190	MF-LS	190	--	--
FLT	260F	LTP	260	MF-LS	260	--	--
FLT	300F	LTP	300	MF-LS	300	--	--
FLT	310F	LTP	310	--	--	--	--
FLT	340F	LTP	340	MF-LS	340	--	--
FLR	190F	LR4	190	MF-LR	190	--	--
FLR	260F	LR4	260	MF-LR	260	--	--
FLR	380F	LR4	380	MF-LR	380	--	--
FLR	450F	LR4	450	MF-LR	450	--	--
FLR	550F	LR4	550	MF-LR	550	--	--
FLR	600F	LR4	600	MF-LR	600	--	--
FLR	730F	LR4	730	MF-LR	730	--	--
FSMD	014	mSMD	C014	MF-MSMD	014	--	--
FSMD	020	mSMD	020	MF-MSMD	020	--	--
FSMD	035	mSMD	C035	MF-MSMD	030	--	--
FSMD	050	mSMD	C050	MF-MSMD	050	1812L	050
FSMD	075	mSMD	C075	MF-MSMD	075	1812L	075
FSMD	110	mSMD	C110	MF-MSMD	110	1812L	110
FSMD	110-16	mSMD	M110/16	MF-MSMD	M110/16	--	--
FSMD	125	mSMD	C125	--	--	1812L	125
FSMD	150	mSMD	150	MF-MSMD	150	1812L	150
FSMD	160	mSMD	160	MF-MSMD	160	1812L	160
FSMD	200	mSMD	200	MF-MSMD	200	1812L	200
FSMD*	030-2920	SMD	030-2	MF-SM	030	2920L	030
FSMD*	050-2920	SMD	050-2	MF-SM	050	2920L	050
FSMD*	075-2920	SMD	075-2	MF-SM	075	2920L	075
FSMD*	100-2920	SMD	100-2	MF-SM	100	2920L	100
FSMD*	125-2920	SMD	125-2	MF-SM	125	2920L	125
FSMD**	150-2920	SMD	150	MF-SM	150		
FSMD**	185-2920	SMD	185	MF-SM	185		
FSMD**	200-2920	SMD	200	MF-SM	200		
FSMD**	250-2920	SMD	250	MF-SM	250		
FSMD**	260-2920	SMD	260	MF-SM	260		
FSMD	005-1210	microSMD	005	MF-USMD	005	--	--
FSMD	010-1210	--	--	MF-USMD	010	--	--
FSMD	020-1210	--	--	MF-USMD	020	--	--
FSMD	035-1210	microSMD	035	MFUSMD	035	--	--
FSMD	050-1210	microSMD	050	MFUSMD	050	--	--
FSMD	075-1210	microSMD	075	MFUSMD	075	--	--
FSMD	005-1206	--	--	--	--		
FSMD	010-1206	--	--	MF-NSMF	012		
FSMD	020-1206	--	--	--	--	1206L	020
FSMD	035-1206	--	--	--	--	1206L	035
FSMD	050-1206	nanoSMD	M050	MF-NSMF	050	1206L	050

\* : Dimensional equivalent. Functional identical.  
 \*\* : Dimensional smaller. Functional identical.

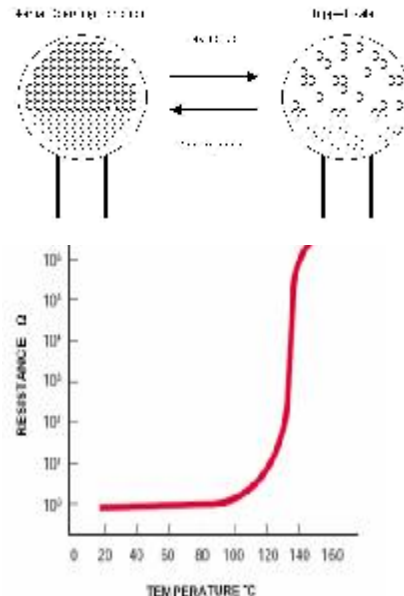
# Fuzetec PPTC Resettable Fuses Technology



The conductive carbon black particles in Fuzetec's PPTC resettable fuses are dispersed in a polymer that has a crystalline structure. At normal operating conditions there are numerous carbon chains forming conductive paths through the material. Under fault conditions (Tripped State), excessive current flows through the PPTC device and the PTC material heats up making the conductive particles move apart from each other, most of them no longer conduct current and the resistance of the device increases sharply. Upon fault current being removed, the resettable fuse is reset and allows the current through the circuit again.



When connected in series to a circuit, Fuzetec's PPTC resettable fuses remain at extremely low resistance and allow the electrical current to flow through it without any restriction. When overcurrent situations occur, Fuzetec PPTC resettable fuses limit the current to a very small value and therefore protect the circuit from being damaged by the high current.



## PPTC Applications by Industry

<b>Telecom &amp; Communications</b>	ADSL, VDSL Cable modems, Set top Box	Customer Premise Equipment/UL-1495
	MDF Module	Telecom Network Equipment
<b>Computer Industry</b>	Mother board	Printer, Scanner, Modem
	Universal Serial Bus (USB) & IEEE1394	I/O Card
<b>Industrial, Power Supply &amp; Other Electronics</b>	Power Supply Devices	Test & Measurement Equipment
	Ballast	Industrial Process Controls
	Motors, Fans & Blowers	Speakers
	Security & Fire Alarm Systems	Consumer Electronics
<b>Automotive Industry</b>	Automobile cigar-lighter adapters (CLAs)	
	Wire Harness	
	Automotive Security Alarm & other Automotive Electronics	
	Automotive actuators & motors (i.e. Power Windows)	
<b>Battery &amp; Portable Electronics</b>	Battery Cell & Battery Packs	
	Battery Chargers	
	Notebook, PDA & Cellphone Batteries	

# PPTC Resettable Fuse(PPTC 可復式保險絲)



## Radial Leaded (For Telecom & Electronic Equipment)

	<p><b>FRX</b> Operation Current:0.05A ~3.75A VMAX:60V, IMAX: 40A. Wide Variety of Electronic Equipment</p>		<p><b>FRX90V</b> Operation Current:0.1A ~3.75A VMAX:72V/90V, IMAX: 40A. Wide Variety of Electronic Equipment</p>
	<p><b>FRU</b> Operation Current:0.9A ~9A VMAX:30V, IMAX: 40A. Wide Variety of Electronic Equipment</p>		<p><b>FRT</b> Operation Current:0.5A ~2.5A VMAX:36V, IMAX: 40A. Wide Variety of Electronic Equipment</p>
	<p><b>FRG</b> Operation Current:3A~14A VMAX:16V, IMAX: 100A. Wide Variety of Electronic Equipment</p>		<p><b>FUSB</b> Operation Current:0.75A~2.5A VMAX:16/30V, IMAX: 40A. Low Voltage USB Equipment</p>
	<p><b>FBR</b> Operation Current:0.10A ~0.9A VMAX:90V, IMAX: 40A. Cable/Telephone Electronic</p>		<p><b>FRH</b> Operation Current:0.08A~0.18A Max Operation Voltage:60V Interrupt Voltage: 250V or 600V Telecommunication and Net Work</p>
	<p><b>FRV</b> Operation Current: 50mA~550mA Max Operation Voltage: 240V<sub>AC/DC</sub> Interrupt Voltage: 265V Line Voltage application</p>		<p><b>FRA</b> Operation Current:0.1A ~3.75A VMAX:120V<sub>AC/DC</sub>, IMAX: 2A~15A. Wide Variety of Electronic Equipment</p>

## Axial Leaded (For Rechargeable Battery Packs)

	<p><b>FSR</b> Operation Current: 1.2A~4.2 A VMAX:15V/30V, IMAX: 100A. Rechargeable Battery Packs</p>		<p><b>FLT</b> Operation Current: 0.7A~3.4A VMAX:24V, IMAX: 100A. Rechargeable Battery Packs</p>
	<p><b>FLR</b> Operation Current: 1.9A~7.3 A VMAX:15V/20V, IMAX: 100A. Rechargeable Battery Packs</p>		<p><b>Disc (Donut type)</b> <b>Custom Design</b> Battery Cell and Charger</p>

## Surface Mount (For High Density Board)

	<p><b>FSMD1812</b> Operation Current:0.14A ~2.0A VMAX:6V~60V, IMAX: 10A~40A. All High-Density Board</p>		<p><b>FSMD2920</b> Operation Current:0.3A ~2.6A VMAX:6V~60V, IMAX: 10A~40A. All High-Density Board</p>
	<p><b>FSMD1210</b> Operation Current:0.05A ~0.75A</p>		<p><b>FSMD1206</b> Operation Current:0.05A ~0.5A</p>

NOTE : All Specification subject to change without notice . 63



	VMAX:6V~60V, IMAX: 10A~40A. All High-Density Board	VMAX:6V~60V, IMAX: 10A~40A. All High-Density Board
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