

## Positive Temperature Coefficient (PTC) Data Sheet

### Description

The 1812 series provides miniature surface mount resettable overcurrent protection withholding current from 0.1A to 3.0A. This series offers complete portfolio in terms of holding current and working voltage, and is suitable for wide range of application.

### Features

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

### Applications

- USB peripherals and Type-C
- Disk drives and CD-ROMs
- Plug and play protection for motherboards and peripherals
- Mobile phones-battery and port protection
- PDAs/digital cameras
- Game console port protection
- HDMI and Set-top-box

### Electrical Characteristics

Part Number	Marking	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> (V)	I <sub>max</sub> (A)	Pd typ. (W)	Maximum time to trip		Resistace	
							Time(s)	Current(A)	R <sub>min</sub> (Ω )	R <sub>1max</sub> (Ω )
FTR1812-010	010	0.10	0.30	30.0	100	0.8	1.50	0.50	1.60	15.00
FTR1812-014	014	0.14	0.34	60.0	10	0.8	0.15	1.50	1.50	6.00
FTR1812-020	020	0.20	0.40	30.0	100	0.8	0.02	8.00	0.80	5.00
FTR1812-020/60	0260	0.20	0.40	60.0	40	0.8	2.00	1.00	0.70	5.00
FTR1812-035	035	0.35	0.75	30.0	40	0.8	0.15	8.00	0.40	1.70
FTR1812-050	050	0.50	1.00	15.0	100	0.8	0.15	8.00	0.15	1.00
FTR1812-050/30	0530	0.50	1.00	30.0	100	0.8	0.15	8.00	0.15	1.00
FTR1812-075	075	0.75	1.50	13.2	100	0.8	0.20	8.00	0.10	0.45
FTR1812-075/24	0724	0.75	1.50	24.0	100	0.8	0.20	8.00	0.10	0.29
FTR1812-075/33	0733	0.75	1.50	33.0	20	0.8	0.20	8.00	0.10	0.40
FTR1812-110	110	1.10	2.20	8.0	100	0.8	0.30	8.00	0.04	0.21
FTR1812-110/16	1116	1.10	1.95	16.0	100	0.8	0.30	8.00	0.06	0.18
FTR1812-110/24	1124	1.10	1.95	24.0	20	0.8	0.50	8.00	0.06	0.20
FTR1812-110/33	1133	1.10	1.95	33.0	20	0.8	0.50	8.00	0.06	0.20
FTR1812-125	125	1.25	2.50	6.0	100	0.8	0.40	8.00	0.05	0.14
FTR1812-125/16	1216	1.25	2.50	16.0	100	0.8	0.40	8.00	0.05	0.14
FTR1812-150/8	150	1.50	3.00	8.0	100	0.8	0.30	8.00	0.04	0.12
FTR1812-150/12	1512	1.50	3.00	12.0	100	0.8	0.50	8.00	0.040	0.120
FTR1812-150/16	1516	1.50	2.80	16.0	100	0.8	0.50	8.00	0.040	0.120
FTR1812-150/24	1524	1.50	3.00	24.0	20	0.8	1.50	8.00	0.040	0.120
FTR1812-160	160	1.60	2.80	8.0	100	0.8	0.30	8.00	0.030	0.100
FTR1812-160/16	1616	1.60	2.80	16.0	100	0.8	0.80	8.00	0.030	0.100

Part Number	Marking	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> (V)	I <sub>max</sub> (A)	Pd typ. (W)	Maximum time to trip		Resistance	
							Time(s)	Current(A)	R <sub>min</sub> (Ω)	R <sub>1max</sub> (Ω)
FTR1812-200	200	2.00	3.50	8.0	100	0.8	2.00	8.00	0.020	0.070
FTR1812-200/12	2012	2.00	3.50	12.0	100	1.0	2.00	8.00	0.020	0.075
FTR1812-200/16	2016	2.00	3.50	16.0	100	1.0	2.00	8.00	0.020	0.075
FTR1812-260	260	2.60	5.00	8.0	100	0.8	2.50	8.00	0.015	0.047
FTR1812-260/12	2612	2.60	5.00	12.0	100	0.8	5.00	8.00	0.015	0.055
FTR1812-260/16	2616	2.60	5.00	16.0	100	1.2	5.00	8.00	0.015	0.050
FTR1812-300	300	3.00	5.00	6.0	100	0.8	4.00	8.00	0.012	0.040

·I<sub>hold</sub>= Hold current: maximum current device will pass without tripping in 23°C still air.

·I<sub>trip</sub>= Trip current: minimum current at which the device will trip in 23°C still air.

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

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

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

·R<sub>min</sub>= Minimum resistance of device in initial (un-soldered) state.

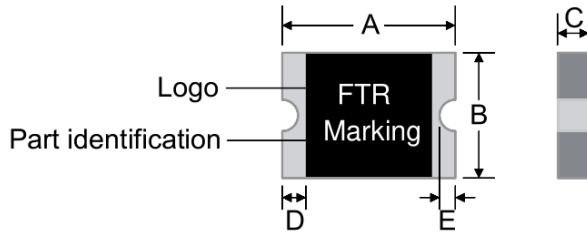
·R<sub>1max</sub>= Maximum resistance of device at 23°C measured one hour after tripping or reflow soldering of 260°C for 20 sec.

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

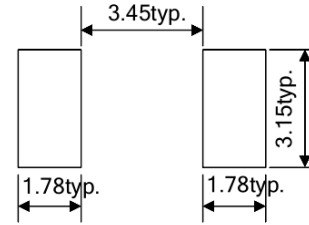
## Thermal Derating Chart

Part Number	Ambient Operation Temperature								
	-40°C	-20°C	0°C	23°C	40°C	50°C	60°C	70°C	85°C
FTR1812-010	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05	0.03
FTR1812-014	0.23	0.19	0.17	0.14	0.12	0.10	0.09	0.08	0.06
FTR1812-020	0.29	0.26	0.23	0.20	0.17	0.15	0.14	0.12	0.10
FTR1812-020/60	0.29	0.26	0.23	0.20	0.17	0.15	0.14	0.12	0.10
FTR1812-035	0.50	0.45	0.40	0.35	0.30	0.26	0.24	0.20	0.16
FTR1812-050	0.77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
FTR1812-050/30	0.77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
FTR1812-075	1.15	1.01	0.88	0.75	0.65	0.60	0.55	0.49	0.43
FTR1812-075/24	1.06	0.95	0.84	0.75	0.60	0.55	0.50	0.45	0.37
FTR1812-075/33	1.10	1.00	0.88	0.75	0.66	0.60	0.56	0.47	0.36
FTR1812-110	1.59	1.43	1.26	1.10	0.95	0.87	0.80	0.71	0.60
FTR1812-110/16	1.58	1.43	1.27	1.10	0.95	0.85	0.77	0.71	0.58
FTR1812-110/24	1.55	1.40	1.25	1.10	0.93	0.83	0.73	0.63	0.50
FTR1812-110/33	1.55	1.40	1.25	1.10	0.93	0.83	0.73	0.63	0.50
FTR1812-125	2.00	1.75	1.52	1.25	1.00	0.95	0.90	0.75	0.53
FTR1812-125/16	2.00	1.75	1.52	1.25	1.00	0.95	0.90	0.75	0.53
FTR1812-150/8	2.06	1.93	1.79	1.50	1.28	1.10	1.02	0.80	0.68
FTR1812-150/12	2.04	1.88	1.68	1.50	1.25	1.10	1.00	0.80	0.60
FTR1812-150/16	2.04	1.88	1.68	1.50	1.25	1.10	1.00	0.80	0.60
FTR1812-150/24	2.05	1.87	1.67	1.50	1.25	1.08	0.95	0.77	0.60
FTR1812-160	2.20	2.06	1.91	1.60	1.36	1.17	1.09	0.85	0.72
FTR1812-160/16	2.20	2.06	1.91	1.60	1.36	1.17	1.09	0.85	0.72
FTR1812-200	2.60	2.44	2.22	2.00	1.78	1.67	1.50	1.45	1.29
FTR1812-200/12	2.60	2.44	2.22	2.00	1.78	1.67	1.50	1.45	1.29
FTR1812-200/16	2.60	2.44	2.22	2.00	1.78	1.67	1.50	1.45	1.29
FTR1812-260	3.40	3.16	3.00	2.60	2.30	2.15	2.00	1.85	1.63
FTR1812-260/12	3.40	3.16	3.00	2.60	2.30	2.15	2.00	1.85	1.63
FTR1812-260/16	3.40	3.16	3.00	2.60	2.30	2.15	2.00	1.85	1.63
FTR1812-300	4.13	3.75	3.30	3.00	2.62	2.43	2.25	2.00	1.78

## Dimensions and PAD Size



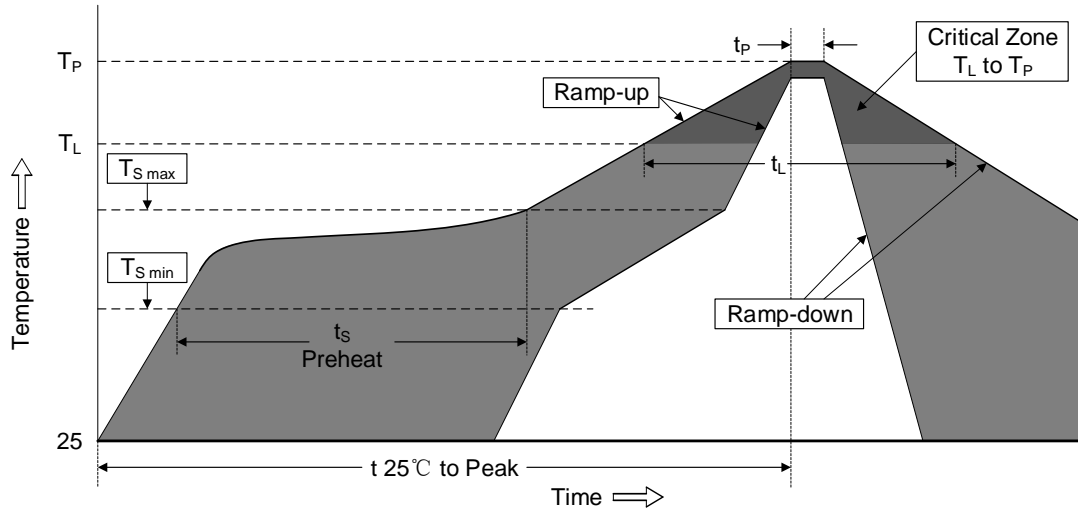
## Recommended Pad Layout (mm)



Part Number	Dimensins(mm)									
	A		B		C		D		E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
FTR1812-010	4.37	4.73	3.07	3.41	0.75	1.25	0.30	1.20	0.15	0.65
FTR1812-014	4.37	4.73	3.07	3.41	0.75	1.95	0.30	1.20	0.15	0.65
FTR1812-020	4.37	4.73	3.07	3.41	0.55	1.25	0.30	1.20	0.15	0.65
FTR1812-020/60	4.37	4.73	3.07	3.41	0.55	1.25	0.30	1.20	0.15	0.65
FTR1812-035	4.37	4.73	3.07	3.41	0.55	1.25	0.30	1.20	0.15	0.65
FTR1812-050	4.37	4.73	3.07	3.41	0.50	1.25	0.30	1.20	0.15	0.50
FTR1812-050/30	4.37	4.73	3.07	3.41	0.50	2.10	0.30	1.20	0.15	0.65
FTR1812-075	4.37	4.73	3.07	3.41	0.50	1.55	0.30	1.20	0.15	0.50
FTR1812-075/24	4.37	4.73	3.07	3.41	0.50	1.55	0.30	1.20	0.15	0.65
FTR1812-075/33	4.37	4.73	3.07	3.41	0.75	1.55	0.30	1.20	0.15	0.65
FTR1812-110	4.37	4.73	3.07	3.41	0.30	2.00	0.30	1.20	0.15	0.65
FTR1812-110/16	4.37	4.73	3.07	3.41	0.30	2.00	0.30	1.20	0.15	0.65
FTR1812-110/24	4.37	4.73	3.07	3.41	0.30	2.00	0.30	1.20	0.15	0.65
FTR1812-110/33	4.37	4.73	3.07	3.41	0.75	2.00	0.30	1.20	0.15	0.65
FTR1812-125	4.37	4.73	3.07	3.41	0.45	1.50	0.30	1.20	0.15	0.65
FTR1812-125/16	4.37	4.73	3.07	3.41	0.45	1.50	0.30	1.20	0.15	0.65
FTR1812-150/8	4.37	4.73	3.07	3.41	0.40	0.90	0.30	1.20	0.15	0.65
FTR1812-150/12	4.37	4.73	3.07	3.41	0.40	1.80	0.30	1.20	0.15	0.65
FTR1812-150/16	4.37	4.73	3.07	3.41	0.40	1.80	0.30	1.20	0.15	0.65
FTR1812-150/24	4.37	4.73	3.07	3.41	0.80	2.10	0.30	1.20	0.15	0.65
FTR1812-160	4.37	4.73	3.07	3.41	0.40	1.80	0.30	1.20	0.15	0.65
FTR1812-160/16	4.37	4.73	3.07	3.41	0.75	1.80	0.30	1.20	0.15	0.65
FTR1812-200	4.37	4.73	3.07	3.41	0.20	1.25	0.30	1.20	0.15	0.65
FTR1812-200/12	4.37	4.73	3.07	3.41	0.80	1.80	0.30	1.20	0.15	0.65
FTR1812-200/16	4.37	4.73	3.07	3.41	0.80	2.00	0.30	1.20	0.15	0.65
FTR1812-260	4.37	4.73	3.07	3.41	0.20	1.80	0.30	1.20	0.15	0.65
FTR1812-260/12	4.37	4.73	3.07	3.41	0.80	1.80	0.30	1.20	0.15	0.65
FTR1812-260/16	4.37	4.73	3.07	3.41	0.80	2.10	0.30	1.20	0.15	0.65
FTR1812-300	4.37	4.73	3.07	3.41	0.50	1.60	0.30	1.20	0.15	0.65

## Recommended Soldering Conditions

### Reflow Soldering



### Recommended Conditions

Profile Feature	Pb-Free Assembly
Average ramp-up rate ( $T_L$ to $T_P$ )	3°C/second max.
Preheat	
-Temperature Min ( $T_{S\ min}$ )	150°C
-Temperature Max ( $T_{S\ max}$ )	200°C
-Time (min to max) ( $t_s$ )	60-180 seconds
$T_{S\ max}$ to $T_L$	
-Ramp-up Rate	3°C/second max.
Time maintained above:	
-Temperature ( $T_L$ )	217°C
-Time ( $t_L$ )	60-150 seconds
Peak Temperature ( $T_P$ )	260°C
Time within 5°C of actual Peak Temperature ( $t_p$ )	20-40 seconds
Ramp-down Rate	6°C/second max.
Time 25°C to Peak Temperature	8 minutes max.
Storage Condition	0°C ~ 35°C, ≤70%RH

· Recommended reflow methods: IR, vapor phase oven, hot air oven, N 2 environment for lead-free

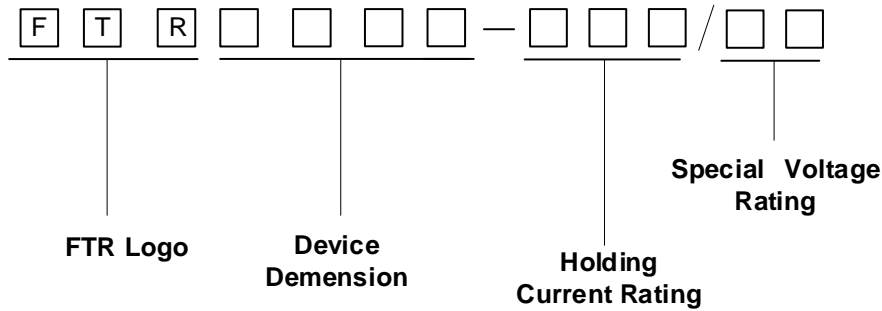
· Recommended maximum paste thickness is 0.25mm (0.010 inch)

· Device can be cleaned using standard industry methods and solvents.

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

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

## Partnumber code



## Environmental Specifications

Operating / Storage temperature	-40°C to +85°C
Maximum Device Surface Temperature in Tripped State	125°C
Passive Aging	+85°C, 1000 hours ±50% typical resistance change
Humidity Aging	+85°C, 85%RH, 1000 hours ±50% typical resistance change
Thermal Shock	MIL-STD-202, Method 107G +85°C/-40°C 20 times -50% typical resistance change
Solvent Resistance	MIL-STD-202, Method 215 No change
Vibration	MIL-STD-883C, Method 2007.1, Condition A No change
Moisture Level Sensitivity	Level 1, J-STD-020C

## Physical Specifications

Terminal Material	Solder-Plated Copper (Solder Material: Matte Tin (Sn))
Terminal Solderability	Meets EIA Specification RS186-9E, ANSI/J-STD-002 Category 3.

Part Number	Quantity	Part Number	Quantity	Part Number	Quantity
FTR1812-010	1500	FTR1812-110	2000	FTR1812-160	2000
FTR1812-014	1500	FTR1812-110/16	1500	FTR1812-160/16	1000
FTR1812-020	1500	FTR1812-110/24	1000	FTR1812-200	2000
FTR1812-020/60	1500	FTR1812-110/33	1000	FTR1812-200/12	1000
FTR1812-035	2000	FTR1812-125	1500	FTR1812-200/16	1000
FTR1812-050	2000	FTR1812-125/16	2000	FTR1812-260	2000
FTR1812-050/30	1000	FTR1812-150/8	2000	FTR1812-260/12	1000
FTR1812-075	2000	FTR1812-150/12	1500	FTR1812-260/16	1000
FTR1812-075/24	1500	FTR1812-150/16	1000	FTR1812-300	1000
FTR1812-075/33	1000	FTR1812-150/24	1000		

Tape	Symbol	Dimension (mm)		
		035,050,075, 110,125,150, 160,200,260	010,014,020 020/60,075/24, 110/16,125/16 150/12	050/30,075/33 110/24,110/33 150/16,150/24 160/16,200/12 200/16,260/12 260/16,300
	W	12.00±0.30	12.00±0.30	12.00±0.10
	P0	4.00±0.10	4.00±0.10	4.00±0.10
	P1	8.00±0.10	8.00±0.10	8.00±0.10
	P2	2.00±0.10	2.00±0.10	2.00±0.10
	D0	Φ1.55±0.10	Φ1.55±0.10	Φ1.55±0.10
	D1	1.55min	1.50±0.10	1.55min
	E	1.75±0.10	1.75±0.10	1.75±0.10
	F	5.50±0.05	5.50±0.05	5.50±0.05
	A0	3.58±0.1	3.50±0.1	3.58±0.1
	B0	4.93±0.1	4.85±0.1	4.93±0.1
	K0	0.87±0.1	1.25±0.1	2.10±0.1
	T	0.25±0.1	0.25±0.1	0.25±0.1
	Reel 	C	Φ178.0±1.0	
D		Φ60.2±0.5		
H		16.0±0.5		
W		13.2±1.5		