



## SMD1812 HF Series Surface Mount PTC Devices

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### Description

The 1812 series provides surface mount resettable overcurrent protection with holding 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 applications.

### Features





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

### Applications



- USB hubs, ports and peripherals
- Set-top-box and HDMI
- Game console port protection
- Motherboard USB & IEEE 1394 protection
- Optical disk drives
- General electronics



### Agency Approval and Environmental Compliance

Agency	File Number	Regulation	Standard
	E201431		2002/95/EC
	R50099121		IEC 61249-2-21:2003

### Electrical Characteristics

Part Number	I <sub>hold</sub> (A)	I <sub>trip</sub> (A)	V <sub>max</sub> (Vdc)	I <sub>max</sub> (A)	P <sub>d typ</sub> (W)	Maximum Time To Trip		Resistance		Agency Approval	
						Current (A)	Time (Sec.)	R <sub>min</sub> (Ω)	R <sub>1max</sub> (Ω)		
SMD1812P010TF	0.10	0.30	30	100	0.8	0.50	1.50	1.600	15.000	✓	✓
SMD1812P014TF	0.14	0.34	60	10	0.8	1.50	0.15	1.500	6.000	✓	✓
SMD1812P020TF	0.20	0.40	30	100	0.8	8.00	0.02	0.800	5.000	✓	✓
SMD1812P035TF/30	0.35	0.75	30	40	0.8	8.00	0.15	0.400	1.700	✓	✓
SMD1812P050TF	0.50	1.00	15	100	0.8	8.00	0.15	0.150	1.000	✓	✓
SMD1812P050TF/30	0.50	1.00	30	100	0.8	8.00	0.15	0.150	1.000	✓	✓
SMD1812P075TF	0.75	1.50	13.2	100	0.8	8.00	0.20	0.100	0.450	✓	✓
SMD1812P075TF/24	0.75	1.50	24	100	0.8	8.00	0.20	0.110	0.290	✓	✓
SMD1812P075TF/33	0.75	1.50	33	20	0.8	8.00	0.20	0.110	0.400	✓	✓
SMD1812P110TF	1.10	2.20	8	100	0.8	8.00	0.30	0.040	0.210	✓	✓
SMD1812P110TF/16	1.10	1.95	16	100	0.8	8.00	0.30	0.060	0.180	✓	✓
SMD1812P110TF/24	1.10	1.95	24	20	0.8	8.00	0.50	0.060	0.200	✓	✓
SMD1812P110TF/33	1.10	1.95	33	20	0.8	8.00	0.50	0.060	0.200	✓	✓
SMD1812P125TF/16	1.25	2.50	16	100	0.8	8.00	0.40	0.050	0.140	✓	✓
SMD1812P125TF/6,4L	1.25	2.50	6	100	0.8	8.00	0.40	0.050	0.140	✓	✓
SMD1812P150TF/8	1.50	3.00	8	100	0.8	8.00	0.30	0.040	0.110	✓	✓
SMD1812P150TF/12	1.50	3.00	12	100	0.8	8.00	0.50	0.040	0.110	✓	✓
SMD1812P150TF/24	1.50	3.00	24	20	0.8	8.00	1.50	0.040	0.120	✓	✓
SMD1812P160TF/8(4L)	1.60	2.80	8	100	0.8	8.00	1.00	0.030	0.100	✓	✓
SMD1812P200TFT	2.00	3.50	8	100	0.8	8.00	2.00	0.020	0.070	✓	✓
SMD1812P260TFT	2.60	5.00	8	100	0.8	8.00	2.50	0.015	0.047	✓	✓
SMD1812P260TF/12	2.60	5.00	12	100	0.8	8.00	5.00	0.015	0.055	✓	✓
SMD1812P300TFT	3.00	5.00	6	100	0.8	8.00	4.00	0.012	0.040	✓	✓

## SMD1812 HF Series Surface Mount PTC Devices

### Note on Electrical Characteristics

#### ■ Vocabulary

$I_{hold}$  = Hold current: maximum current device will pass without tripping in 23°C still air.

$I_{trip}$  = Trip current: minimum current at which the device will trip in 23 °C still air.

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

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

$P_{d\ typ}$  = Typical power dissipated from device when in the tripped state at 23 °C still air.

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

$R_{1max}$  = Maximum resistance of device at 23 °C measured one hour after tripping or reflow soldering of 260 °C for 20 sec.

- Value specified is determined by using the PWB with 0.030"\*1.5oz copper traces.
- Caution: Operation beyond the specified rating may result in damage and possible arcing and flame.
- Specifications are subject to change without notice.

### Polymeric PTC Selecting Guide

#### ■ Determine the following operating parameters for the circuits:

- Normal operating current ( $I_{hold}$ )
- Maximum circuit voltage ( $V_{max}$ )
- Maximum interrupt current ( $I_{max}$ )
- Normal operating temperature surrounding device (min°C/max°C)

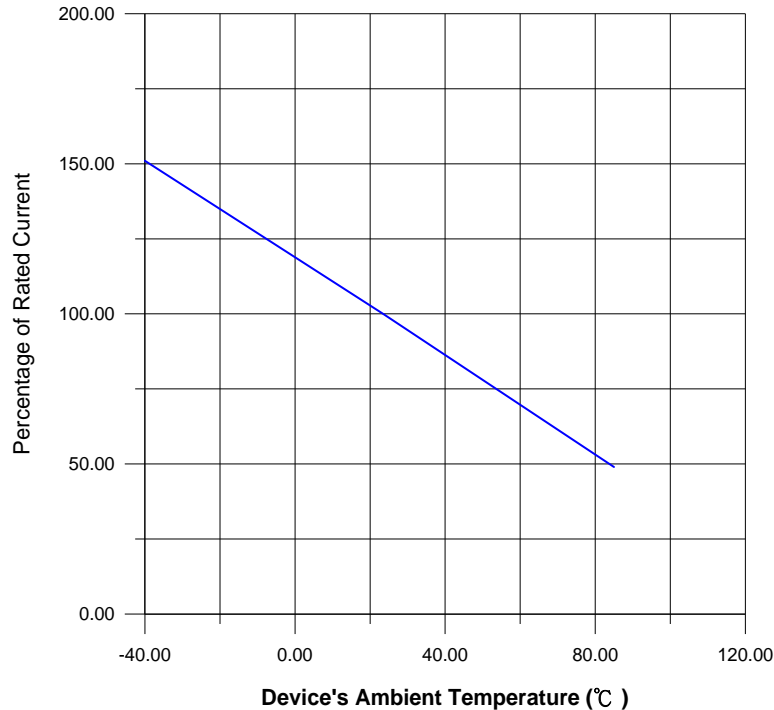
#### ■ Select the device form factor and dimension suitable for the application:

- Surface Mount Device (SMD)
- Radial Leaded Device (RLD)
- Axial Leaded Device (ALD)
- DISC Device
- Other Customized Form Factors

- Compare the maximum rating for  $V_{max}$  and  $I_{max}$  of the PPTC device with the circuit in application and make sure the circuit's requirement does not exceed the device rating.
- Check that PPTC device's trip time (time-to-trip) will protect the circuit.
- Verify that the circuit operating temperature is within the PPTC device's normal operating temperature range.
- Verify the performance and suitability of the chosen PPTC device in the application.

## SMD1812 HF Series Surface Mount PTC Devices

### Thermal Derating Curve



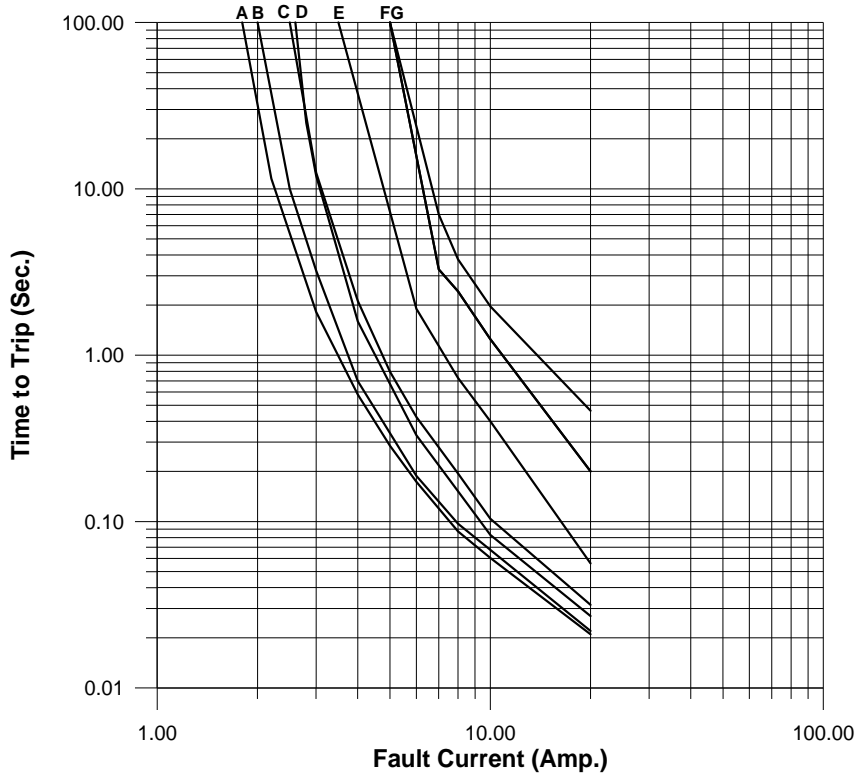
### Thermal Derating Chart

#### Recommended Hold Current (A) at Ambient Temperature (°C)

Part Number	Ambient Operation Temperature								
	-40 °C	-20 °C	0 °C	23 °C	40 °C	50 °C	60 °C	70 °C	85 °C
SMD1812P010TF	0.16	0.14	0.12	0.10	0.08	0.07	0.06	0.05	0.03
SMD1812P014TF	0.23	0.19	0.17	0.14	0.12	0.10	0.09	0.08	0.06
SMD1812P020TF	0.29	0.26	0.23	0.20	0.17	0.15	0.14	0.12	0.10
SMD1812P035TF/30	0.50	0.45	0.40	0.35	0.30	0.26	0.24	0.20	0.16
SMD1812P050TF	0.77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
SMD1812P050TF/30	0.77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
SMD1812P075TF	1.15	1.01	0.88	0.75	0.65	0.60	0.55	0.49	0.43
SMD1812P075TF/24	1.06	0.95	0.84	0.75	0.60	0.55	0.50	0.45	0.37
SMD1812P075TF/33	1.10	1.00	0.88	0.75	0.66	0.60	0.56	0.47	0.36
SMD1812P110TF	1.59	1.43	1.26	1.10	0.95	0.87	0.80	0.71	0.60
SMD1812P110TF/16	1.58	1.43	1.27	1.10	0.95	0.85	0.77	0.71	0.58
SMD1812P110TF/24	1.55	1.40	1.25	1.10	0.93	0.83	0.73	0.63	0.50
SMD1812P110TF/33	1.55	1.40	1.25	1.10	0.93	0.83	0.73	0.63	0.50
SMD1812P125TF/16	2.00	1.75	1.52	1.25	1.00	0.95	0.90	0.75	0.53
SMD1812P125TF/6,4L	2.00	1.75	1.52	1.25	1.00	0.95	0.90	0.75	0.53
SMD1812P150TF/8	2.06	1.93	1.79	1.50	1.28	1.10	1.02	0.80	0.68
SMD1812P150TF/12	2.04	1.88	1.68	1.50	1.25	1.10	1.00	0.80	0.60
SMD1812P150TF/24	2.05	1.87	1.67	1.50	1.25	1.08	0.95	0.77	0.60
SMD1812P160TF/8(4L)	2.20	2.06	1.91	1.60	1.36	1.17	1.09	0.85	0.72
SMD1812P200TFT	2.60	2.44	2.22	2.00	1.78	1.67	1.50	1.45	1.29
SMD1812P260TFT	3.40	3.16	3.00	2.60	2.30	2.15	2.00	1.85	1.63
SMD1812P260TF/12	3.40	3.16	3.00	2.60	2.30	2.15	2.00	1.85	1.63
SMD1812P300TFT	4.13	3.75	3.30	3.00	2.62	2.43	2.25	2.00	1.78

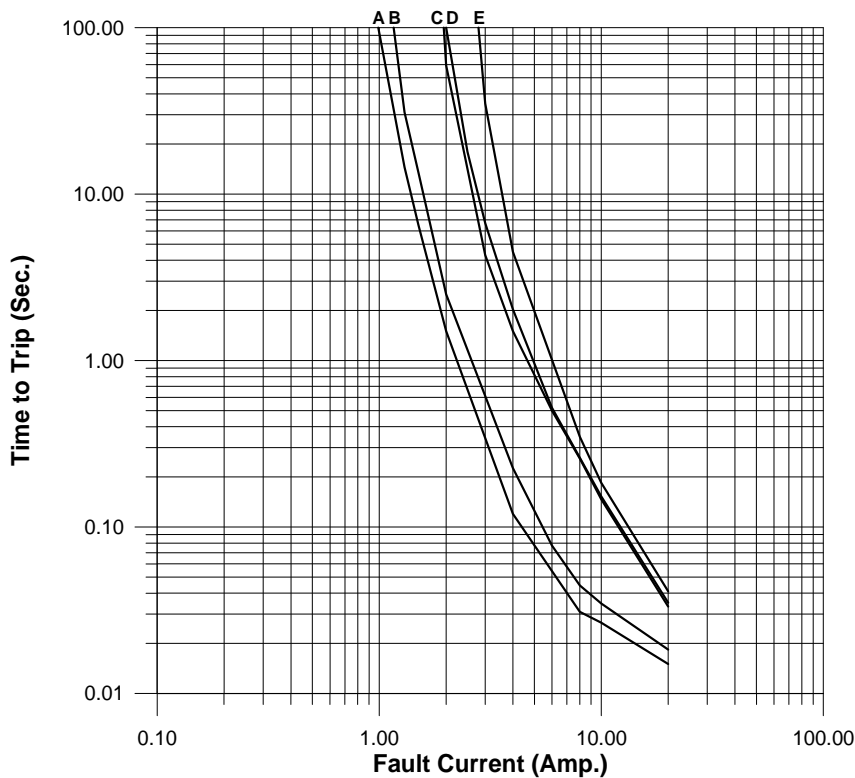
## SMD1812 HF Series Surface Mount PTC Devices

Average Time-Current Curve



- A – SMD1812P110TF
- B – SMD1812P125TF/6,4L
- C – SMD1812P150TF/8
- D – SMD1812P160TF/8(4L)
- E – SMD1812P200TFT
- F – SMD1812P260TFT
- SMD1812P260TF/12
- G – SMD1812P300TFT

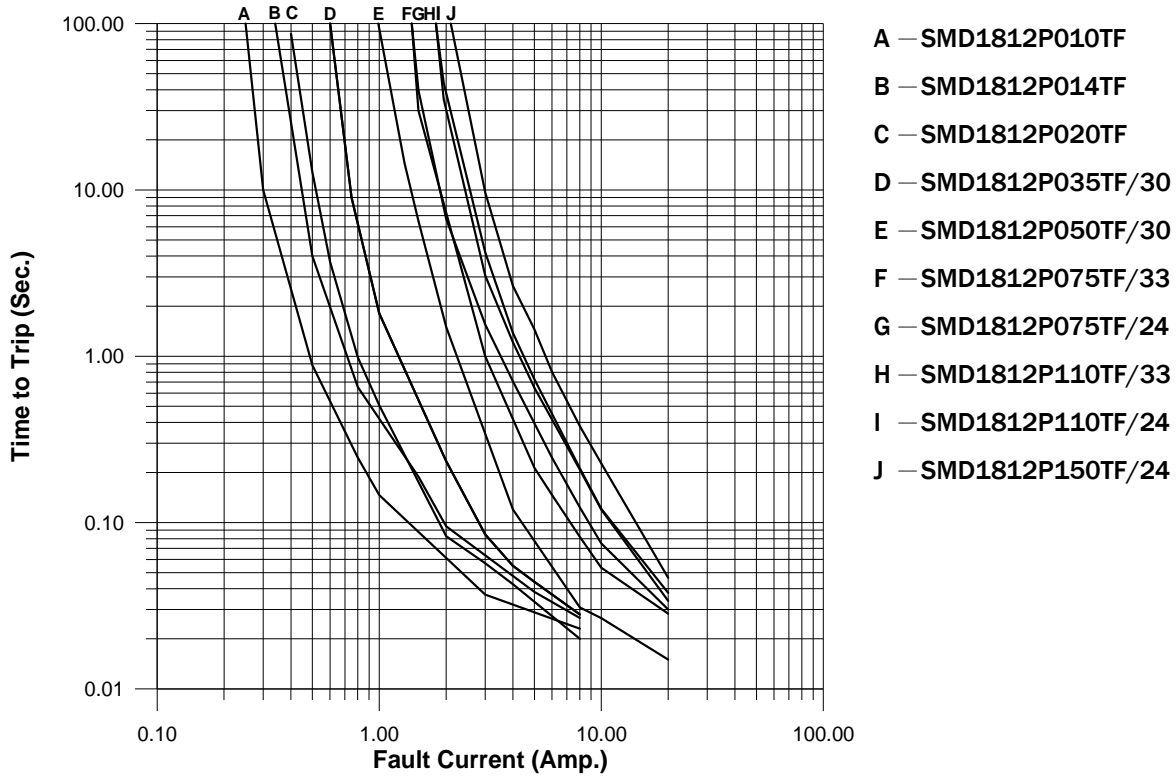
Average Time-Current Curve



- A – SMD1812P050TF
- B – SMD1812P075TF
- C – SMD1812P110TF/16
- D – SMD1812P125TF/16
- E – SMD1812P150TF/12

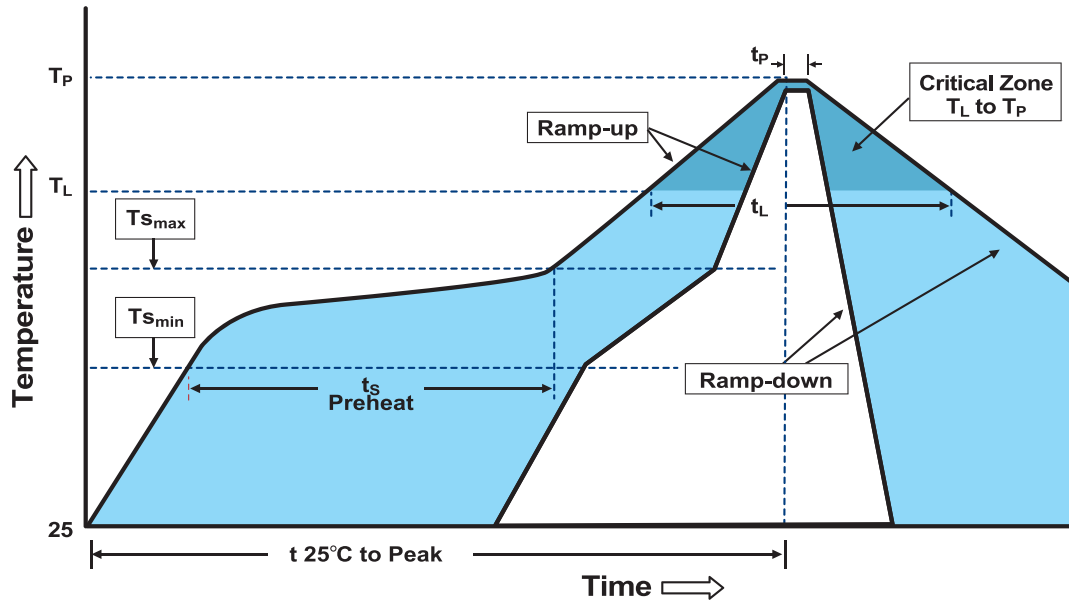
## SMD1812 HF Series Surface Mount PTC Devices

### Average Time-Current Curve



## SMD1812 HF Series Surface Mount PTC Devices

### Soldering Parameters



Profile Feature	Pb-Free Assembly
Average Ramp-Up Rate ( $T_{s_{max}}$ to $T_P$ )	3°C/second max.
Preheat	
-Temperature Min ( $T_{s_{min}}$ )	150°C
-Temperature Max ( $T_{s_{max}}$ )	200°C
-Time ( $T_{s_{min}}$ to $T_{s_{max}}$ )	60-180 seconds
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

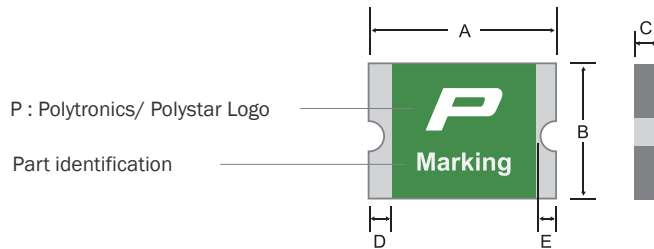
- Recommended reflow methods: IR, vapor phase oven, hot air oven, N<sub>2</sub> environment for lead-free
- Recommended maximum paste thickness is 0.25mm (0.010 inch)
- Devices can be cleaned using standard industry methods and solvents.

**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.

## SMD1812 HF Series Surface Mount PTC Devices

### Physical Dimensions (mm.)



Part Number	A		B		C		D		E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
SMD1812P010TF	4.37	4.73	3.07	3.41	0.75	1.25	0.30	1.20	0.15	0.65
SMD1812P014TF	4.37	4.73	3.07	3.41	0.75	1.95	0.30	1.20	0.15	0.65
SMD1812P020TF	4.37	4.73	3.07	3.41	0.55	1.00	0.30	1.20	0.15	0.65
SMD1812P035TF/30	4.37	4.73	3.07	3.41	0.65	1.25	0.30	1.20	0.15	0.65
SMD1812P050TF	4.37	4.73	3.07	3.41	0.50	0.75	0.30	1.20	0.15	0.50
SMD1812P050TF/30	4.37	4.73	3.07	3.41	0.50	1.00	0.30	1.20	0.15	0.65
SMD1812P075TF	4.37	4.73	3.07	3.41	0.50	0.75	0.30	1.20	0.15	0.50
SMD1812P075TF/24	4.37	4.73	3.07	3.41	0.75	1.55	0.30	1.20	0.15	0.65
SMD1812P075TF/33	4.37	4.73	3.07	3.41	0.75	1.55	0.30	1.20	0.15	0.65
SMD1812P110TF	4.37	4.73	3.07	3.41	0.30	0.71	0.30	1.20	0.15	0.65
SMD1812P110TF/16	4.37	4.73	3.07	3.41	0.75	1.25	0.30	1.20	0.15	0.65
SMD1812P110TF/24	4.37	4.73	3.07	3.41	0.50	1.07	0.30	1.20	0.15	0.65
SMD1812P110TF/33	4.37	4.73	3.07	3.41	1.20	2.00	0.30	1.20	0.15	0.65
SMD1812P125TF/16	4.37	4.73	3.07	3.41	0.75	1.25	0.30	1.20	0.15	0.65
SMD1812P125TF/6,4L	4.37	4.73	3.07	3.41	0.45	0.75	0.30	1.20	0.15	0.65
SMD1812P150TF/8	4.37	4.73	3.07	3.41	0.40	0.71	0.30	1.20	0.15	0.65
SMD1812P150TF/12	4.37	4.73	3.07	3.41	0.75	1.25	0.30	1.20	0.15	0.65
SMD1812P150TF/24	4.37	4.73	3.07	3.41	0.80	1.80	0.30	1.20	0.15	0.65
SMD1812P160TF/8(4L)	4.37	4.73	3.07	3.41	0.40	0.75	0.30	1.20	0.15	0.65
SMD1812P200TFT	4.37	4.73	3.07	3.41	0.20	0.60	0.30	1.20	0.15	0.65
SMD1812P260TFT	4.37	4.73	3.07	3.41	0.50	1.00	0.30	1.20	0.15	0.65
SMD1812P260TF/12	4.37	4.73	3.07	3.41	0.80	1.34	0.30	1.20	0.15	0.65
SMD1812P300TFT	4.37	4.73	3.07	3.41	0.50	1.00	0.30	1.20	0.15	0.65

### Environmental Specifications

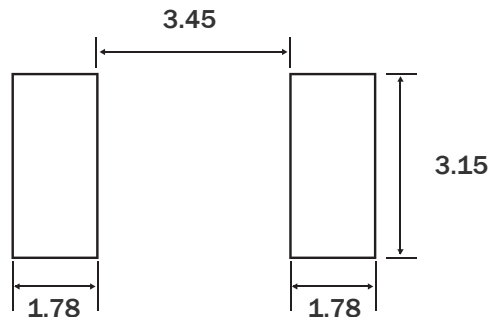
Operating/Storage Temperature	-40°C to +85 °C
Maximum Device Surface Temperature in Tripped State	125°C
Passive Aging	+85°C , 1000 hours ±5% typical resistance change
Humidity Aging	+85°C , 85%R.H. 1000 hours ±5% typical resistance change
Thermal Shock	MIL-STD-202 Method 107G +85°C /-40°C 20 times
Solvent 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



## SMD1812 HF Series Surface Mount PTC Devices

### Packaging Quantity and Marking

Recommended Pad Layout (mm.)



Part Number	Marking	Quantity
SMD1812P010TF	010	1500
SMD1812P014TF	014	1500
SMD1812P020TF	020	2000
SMD1812P035TF/30	0330	1500
SMD1812P050TF	050	2000
SMD1812P050TF/30	0530	2000
SMD1812P075TF	075	2000
SMD1812P075TF/24	0724	1500
SMD1812P075TF/33	0733	1500
SMD1812P110TF	110	2000
SMD1812P110TF/16	1116	1500
SMD1812P110TF/24	1124	1500
SMD1812P110TF/33	1133	1000
SMD1812P125TF/16	125	1500
SMD1812P125TF/6,4L	125	2000
SMD1812P150TF/8	150	2000
SMD1812P150TF/12	1512	1500
SMD1812P150TF/24	1524	1000
SMD1812P160TF/8(4L)	160	2000
SMD1812P200TFT	20	2000
SMD1812P260TFT	260	1500
SMD1812P260TF/12	2612	1000
SMD1812P300TFT	30	1500

© 8 mm tape on 7 inch reel per EIA-481-1 (equivalent to IEC286, part 3)

### Physical Specifications

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

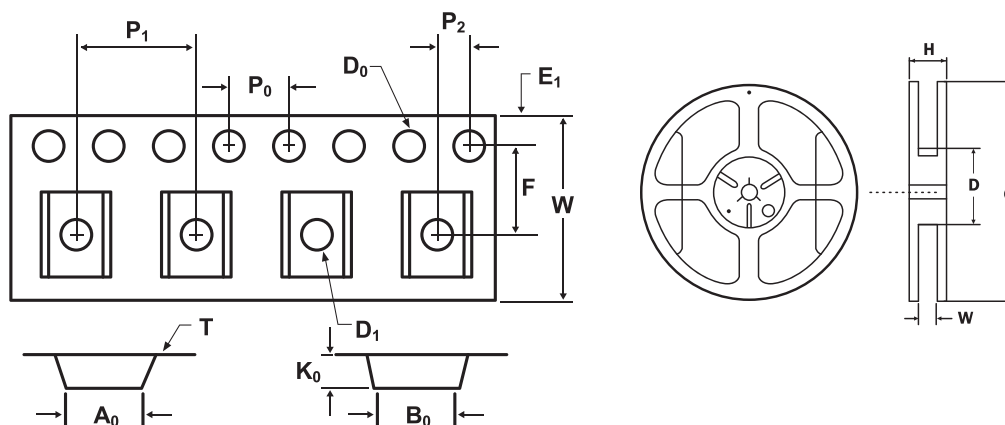
## SMD1812 HF Series Surface Mount PTC Devices

### Tape Specifications: EIA-481-1 (mm.)

	P020TF, P035TF/30 P050TF, P075TF P110TF P125TF/6,4L P160TF/8(4L) P150TF/8 P200TFT	P010TF, P014TF P050TF/30 P075TF/24, P075TF/33 P110TF/16, P110TF/24 P125TF/16, P150TF/12 P260TFT, P300TFT	P110TF/33 P150TF/24 P260TF/12
<b>W</b>	12.00 ± 0.30	12.00 ± 0.30	12.00 ± 0.10
<b>F</b>	5.50 ± 0.05	5.50 ± 0.05	5.50 ± 0.05
<b>E<sub>1</sub></b>	1.75 ± 0.10	1.75 ± 0.10	1.75 ± 0.10
<b>D<sub>0</sub></b>	1.55 ± 0.05	1.55 ± 0.05	1.55 ± 0.05
<b>D<sub>1</sub></b>	1.55 (MIN)	1.50 ± 0.10	1.50 (MIN)
<b>P<sub>0</sub></b>	4.00 ± 0.10	4.00 ± 0.10	4.00 ± 0.08
<b>P<sub>1</sub></b>	8.00 ± 0.10	8.00 ± 0.10	8.00 ± 0.10
<b>P<sub>2</sub></b>	2.00 ± 0.05	2.00 ± 0.05	2.00 ± 0.05
<b>A<sub>0</sub></b>	3.58 ± 0.10	3.50 ± 0.10	3.58 ± 0.10
<b>B<sub>0</sub></b>	4.93 ± 0.10	4.85 ± 0.10	4.93 ± 0.10
<b>T</b>	0.25 ± 0.10	0.25 ± 0.10	0.25 ± 0.10
<b>K<sub>0</sub></b>	0.87 ± 0.06	1.25 ± 0.10	2.10 ± 0.10
<b>Leader min.</b>	390	390	390
<b>Trailer min.</b>	160	160	160

### Reel Dimensions: EIA-481-1 (mm.)

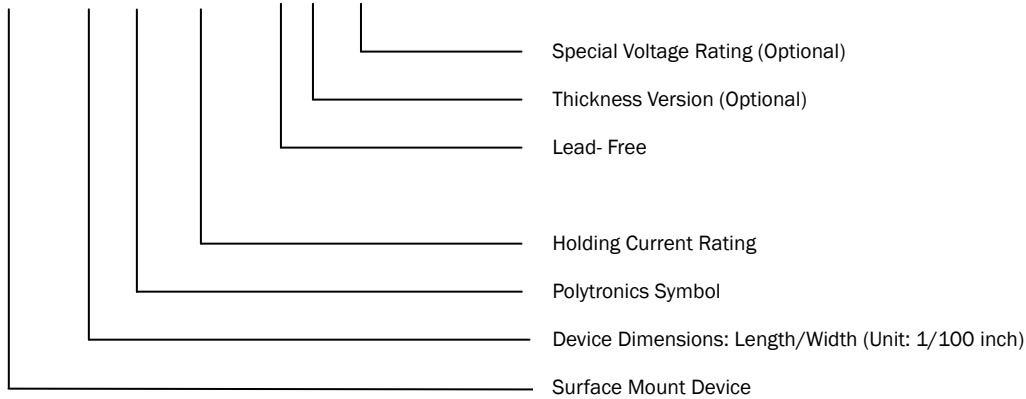
<b>C</b>	Ø178 ± 1.0
<b>D</b>	Ø60.2 ± 0.5
<b>H</b>	11.0 ± 0.5
<b>W</b>	9.0 ± 1.5



## SMD1812 HF Series Surface Mount PTC Devices

### Part Number System

SMD 1812 P □□□ TF T / □□



### Cross Reference

Polytronics / EVERFUSE <sup>®</sup>	Cross Reference	
	Tyco / PolySwitch <sup>®</sup>	Bourns / Multifuse <sup>®</sup>
SMD1812P010TF	miniSMDC010F	MF-MSMF010
SMD1812P014TF	miniSMDC014F	MF-MSMF014
SMD1812P020TF	miniSMDC020F	MF-MSMF020
SMD1812P035TF/30	-	MF-MSMF035
SMD1812P050TF	miniSMDC050F	MF-MSMF050
SMD1812P050TF/30	miniSMDC050F	-
SMD1812P075TF	miniSMDC075F	MF-MSMF075
SMD1812P075TF/24	miniSMDM075F/24	MF-MSMF075/24
SMD1812P075TF/33	-	-
SMD1812P110TF	miniSMDC110F	MF-MSMF110
SMD1812P110TF/16	miniSMDC110F/16	MF-MSMF110/16
SMD1812P110TF/24	miniSMDC110F/24	-
SMD1812P110TF/33	-	-
SMD1812P125TF/16	miniSMDC125F/16	MF-MSMF125
SMD1812P125TF/6,4L	miniSMDC125F	MF-MSMF125
SMD1812P150TF/8	miniSMDC150F	MF-MSMF150
SMD1812P150TF/12	miniSMDC150F/12	-
SMD1812P150TF/24	miniSMDM150F/24	-
SMD1812P160TF/8(4L)	miniSMDM160F	MF-MSMF160
SMD1812P200TFT	miniSMDC200F	MF-MSMF200
SMD1812P260TFT	miniSMDC260F	MF-MSMF260
SMD1812P260TF/12	miniSMDC260F/12	-
SMD1812P300TFT	miniSMDC300F	-

“EVERFUSE” is a registered trademark of Polytronics Technology Corp.

“Multifuse” is a registered trademark of Bourns, Inc.

“PolySwitch” is a registered trademark of Tyco Electronics.

