Positive Temperature Coefficient(PTC)Data Sheet

Description

The2016series provides miniature surface mount resettable overcurrent protection withholding current from 0.3A to 2.0A. This series is suitable for applications with applications where space is at a premium and the device current is low.

Features

- RoHS compliant and lead-free
- Halogen-free
- High voltage
- Low profile
- Fast response to fault current
- Compatible with high temperature solders

Applications

- Power over Ethernet (POE)
- Powered USB for POS and IPC
- Automotive electronics control module protection
- IEEE 1394 port protection
- Low voltage telecom equipment
- Industrial control
- Security systems

Agency Approval and Environmental Compliance

Agency	File Number
UL/CUL	E482628
TUV	B160696048001

Regulation	Standard
RoHS	2011/65/EU
Halogen Free	EN 14582:2007

Electrical Characteristics

Part Number	I_{hold} (A)	I_{trip} (A)	V_{max} (Vdc)	I_{max} (A)	$P_{d\ typ.}$ (W)	Maximum Time To Trip		Resistance	
						Time (Sec.)	Current (A)	R_{min} (Ω)	R_{1max} (Ω)
SMD2016B030TF	0.30	0.60	60	20	1.40	3.00	1.50	0.500	2.300
SMD2016B050TF	0.55	1.10	60	20	1.40	5.00	2.50	0.200	1.000
SMD2016B100TF	1.10	2.20	15	40	1.40	0.50	8.00	0.060	0.400
SMD2016B100TF/33	1.10	2.20	33	40	1.40	0.50	8.00	0.060	0.400
SMD2016B150TF	1.50	3.00	15	40	1.40	1.00	8.00	0.050	0.180
SMD2016B200TF	2.00	4.20	6	40	1.40	3.00	8.00	0.030	0.100

Note on Electrical Characteristics

■Vocabulary

- I_{hold} = Hold current: maximum current device will pass without tripping in 23℃ still air.
- I_{trip} = Trip current: minimum current at which the device will trip in 23℃ 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℃ still air.
- R_{min}= Minimum resistance of device in initial (un-soldered) state.
- R_{1max}= Maximum resistance of device at 23℃ measured one hour after tripping or reflow soldering of 260℃ for 20 sec.

■Value specified is determined by using the PWB with 0.090”*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 interrupt current (I_{max})
- Maximum circuit voltage (V_{max})
- Normal operating temperature surrounding device (min℃/max℃)

■Select the device from factor and dimension suitable for the application
■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 that performance and suitability of the chosen PPTC device in the application.

⚠ WARNING

■Mechanical Stress

- PPTC devices will undergo a thermal expansion during fault condition. If PPTC devices are installed or placed in an application where the space between PPTC devices and the surrounding materials (e.g., covering materials, packaging materials, encapsulate materials and the like) is insufficient, it will cause an inhibiting effect upon the thermal expansion. Pressing, twisting, bending and other kinds of mechanical stress will also adversely affect the performance of the PPTC devices, and shall not be used or applied.

■Chemical Pollutants

- Silicone-based oils, oils, solvents, gels, electrolytes, fuels, acids, and the like will adversely affect the properties of PPTC devices, and shall not be used or applied.

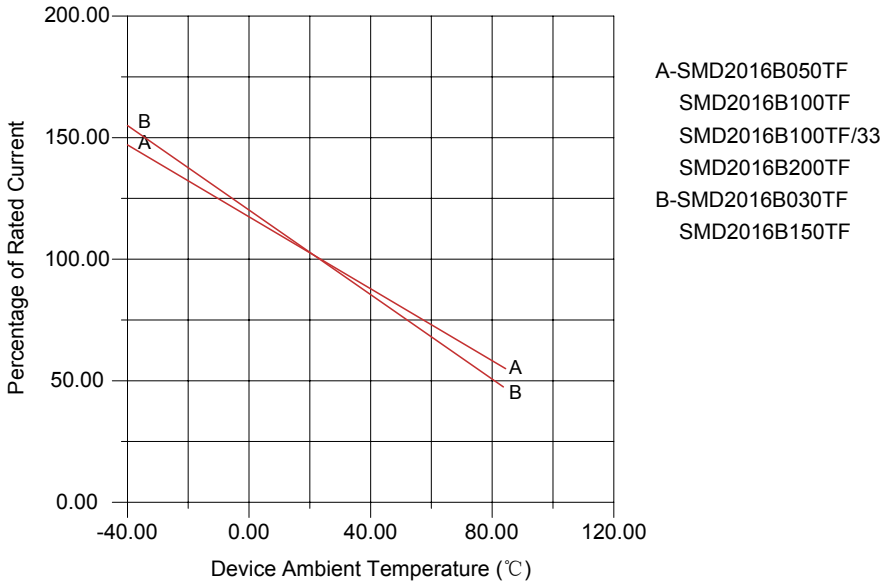
■Electronic and Thermal Effect

- PPTC devices are secondary protection devices and are used solely for sporadic, accidental over-current or over-temperature error condition, and shall NOT be used if or when constant or repeated fault conditions (such fault conditions may be caused by, among others, incorrect pin-connection of a connector) or over-extensive trip events may occur.
- PPTC devices are different from fuses and, when a fault condition occurs, will go into high-resistance state and do not open circuit,in which case the voltage at such PPTC devices may reach a hazardous level.
- Operation over the maximum rating or other forms of improper use may cause failure, arcing, flame and/or other damage to the PPTC devices.
- Conductive material contamination, such as metal particle, may induce shortage, flame or arcing.
- Due to the inductance, the operation circuits may generate a circuit voltage (Ldi/dt) above the rated voltage of PPTC devices, which shall not be used under such circumstances.

■General

- Customers shall evaluate and test the properties of PPTC devices independently to verify and ensure that their individual applications will be met.
- The performance of PPTC devices will be adversely affected if they are improperly used under electronic, thermal and/or mechanical procedures and/or conditions non-conformant to those recommended by manufacturer.
- Customers shall be responsible for determining whether it is necessary to have back-up, failsafe and/or fool-proof protection To avoid or minimize damage that may result from extra-ordinary, irregular function or failure of PPTC devices.
- Any and all responsibilities and liabilities are disclaimed if any item under this notice of warning is not complied with.

Thermal Derating Curve

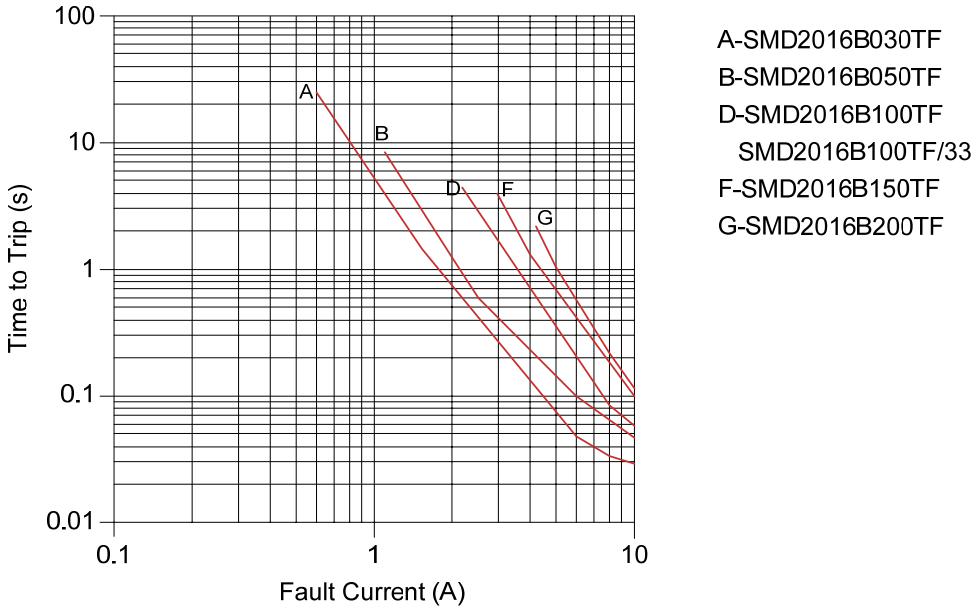


Thermal Derating Chart

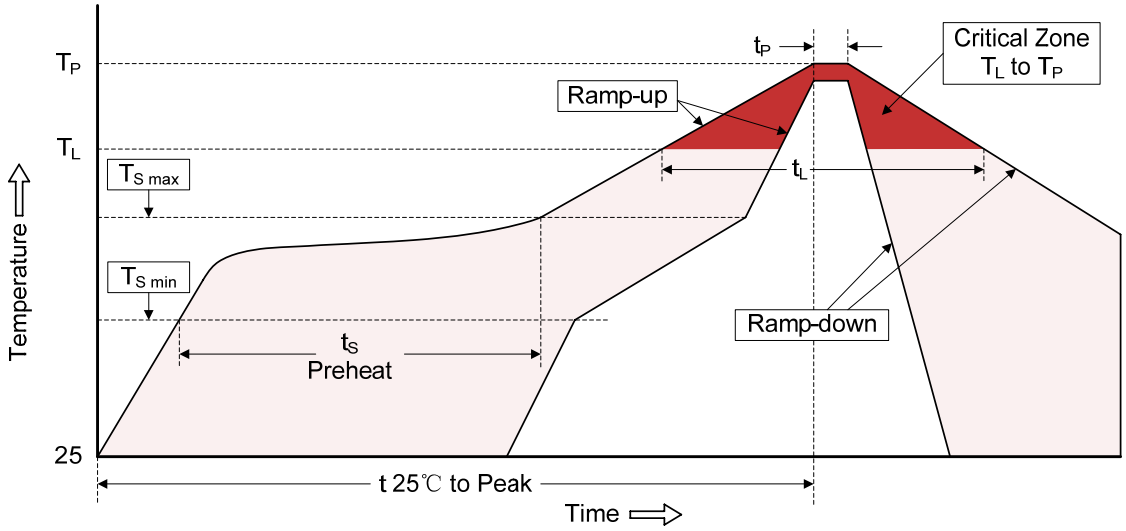
Recommended Hold Current (A) at Ambient Temperature (℃)

Part Number	Ambient Operation Temperature								
	-40℃	-20℃	0℃	23℃	40℃	50℃	60℃	70℃	85℃
SMD2016B030TF	0.45	0.40	0.35	0.30	0.25	0.23	0.20	0.18	0.14
SMD2016B050TF	0.93	0.80	0.65	0.50	0.42	0.38	0.33	0.30	0.23
SMD2016B100TF	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
SMD2016B100TF/33	1.66	1.47	1.29	1.10	0.91	0.83	0.73	0.64	0.50
SMD2016B150TF	2.26	2.00	1.76	1.50	1.24	1.13	1.00	0.87	0.68
SMD2016B200TF	2.80	2.50	2.19	2.00	1.84	1.74	1.50	1.34	1.14

Average Time-Current Curve



Soldering Parameters



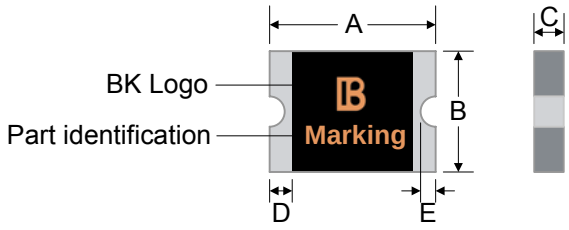
Profile Feature	Pb-Free Assembly
Average ramp-up rate ($T_{S\ max}$ to T_P)	3℃/second max.
Preheat -Temperature Min ($T_{S\ min}$) -Temperature Max ($T_{S\ max}$) -Time (min to max) ($T_{S\ min}$ to $T_{S\ max}$)	 150℃ 200℃ 60-180 seconds
Time maintained above: -Temperature (T_L) -Time (t_L)	 217℃ 60-150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

Physical Dimensions (mm)



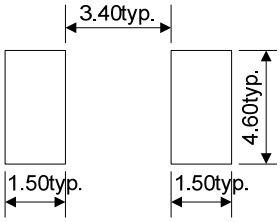
Part Number	A		B		C		D		E	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
SMD2016B030TF	4.72	5.44	3.70	4.43	0.55	1.05	0.30	1.50	0.25	0.65
SMD2016B050TF	4.72	5.44	3.70	4.43	0.75	2.00	0.30	1.50	0.25	0.65
SMD2016B100TF	4.72	5.44	3.70	4.43	0.50	1.20	0.30	1.50	0.25	0.65
SMD2016B100TF/33	4.72	5.44	3.70	4.43	0.75	1.25	0.30	1.50	0.25	0.65
SMD2016B150TF	4.72	5.44	3.70	4.43	0.50	1.55	0.30	1.50	0.25	0.65
SMD2016B200TF	4.72	5.44	3.70	4.43	0.50	1.20	0.30	1.50	0.25	0.65

Environmental Specifications

Operating / Storage temperature	-40℃ to +85℃
Maximum Device Surface Temperature in Tripped State	125℃
Passive Aging	+85℃, 1000 hours ±50% typical resistance change
Humidity Aging	+85℃, 85%R.H. 1000 hours ±50% typical resistance change
Thermal Shock	MIL-STD-202, Method 107G +85℃/-40℃ 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

Packaging Quantity and Marking

Recommended Pad Layout (mm)



Part Number	Marking	Quantity
SMD2016B030TF	030	1500
SMD2016B050TF	050	1000
SMD2016B100TF	100	2000
SMD2016B100TF/33	1033	1500
SMD2016B150TF	150	1500
SMD2016B200TF	200	2000

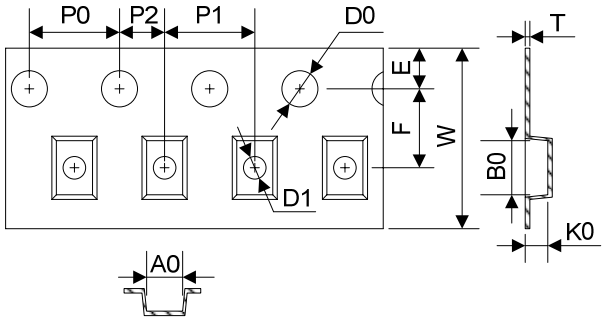
◎ 8mm tape on 7 inch reel per EIA-481 (equivalent to IEC286, part 3)

Physical Specifications

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

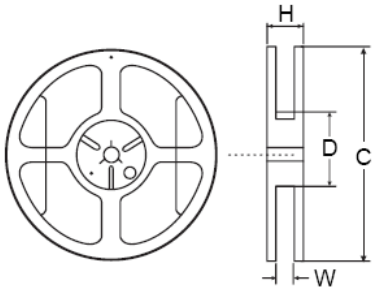
Packaging

Tape



Symbol	Dimensions (mm)		
	B100TF B200TF	B030TF B100TF/33 B150TF	B050TF
W	12.0±0.30	12.0±0.30	12.0±0.30
F	5.50±0.05	5.50±0.05	5.50±0.05
E_1	1.75±0.10	1.75±0.10	1.75±0.10
D_0	1.55±0.05	1.55±0.05	1.55±0.05
D_1	1.50(MIN)	1.50±0.10	1.50±0.10
P_0	4.00±0.10	4.00±0.10	4.00±0.10
P_1	8.00±0.10	8.00±0.10	8.00±0.10
P_2	2.00±0.05	2.00±0.05	2.00±0.05
A_0	4.40±0.10	4.48±0.10	4.45±0.10
B_0	5.50±0.10	5.40±0.10	5.48±0.10
T	0.25±0.10	0.25±0.10	0.25±0.10
K_0	0.75±0.10	1.36±0.10	1.86±0.10
Leader min.	390	390	390
Trailer min.	160	160	160

Reel



C	Φ178.0±1.0
D	Φ60.2±0.5
H	16.0±0.5
W	13.2±1.5

Part Number System

SMD 2016 B □ □ □ TF T / □ □

- Special Voltage Rating (Optional)
- Thickness Version (Optional)
- Lead-Free
- Holding Current Rating
- Delimiter
- Device Dimensions: Length/Width (Unit: 1/100 inch)
- Surface Mount Device