

Features


- ▶ High operating temperature -40°C~125°C
- ▶ Compact design saves board space
- ▶ RoHS compliant, halogen-free and lead-free
- ▶ Resettable solution against overcurrent and short circuit
- ▶ Fast response to fault current
- ▶ Symmetrical design

Applications

- ▶ Automotive and Industrial Transport
- ▶ Frequency Converter
- ▶ Sensor Protection
- ▶ Infotainment/Telematics
- ▶ Outdoor Electronic Equipment
- ▶ Climate Control Systems
- ▶ Security and Communication Systems

HF RoHS REACH Pb Free

1. Electrical Characteristics

Model	I-hold (A)	I-trip (A)	Vmax (Vdc)	Imax (A)	Pd typ (W)	Max. Time to trip		R0 min (Ohm)	R1max (Ohm)	Agency Approval 
						Current (A)	Time (Sec.)			
SMD0603H010TF	0.10	0.50	24.00	40.00	0.50	2.50	1.50	0.90	8.50	x
SMD0603H016TF	0.16	0.48	24.00	40.00	0.50	8.00	0.10	0.60	6.00	x
SMD0603H020TF	0.20	0.60	16.00	40.00	0.60	8.00	0.50	0.35	4.50	x
SMD0603H035TF	0.35	1.05	16.00	40.00	0.60	8.00	0.50	0.30	4.00	x
SMD0805H010TF	0.10	0.50	24.00	40.00	0.90	2.50	1.50	0.80	6.50	x
SMD0805H020TF	0.20	0.60	24.00	40.00	0.90	8.00	0.10	0.45	5.00	x
SMD0805H035TF	0.35	1.05	16.00	40.00	0.90	8.00	0.10	0.30	1.90	x
SMD0805H050TF	0.50	1.50	16.00	40.00	0.90	8.00	0.10	0.25	1.60	x
SMD0805H075TF	0.75	2.25	16.00	40.00	0.90	8.00	1.00	0.13	1.20	x
SMD1206H016TF	0.16	0.80	30.00	20.00	1.00	8.00	0.10	0.40	6.00	x
SMD1206H020TF	0.20	1.00	30.00	20.00	1.00	8.00	0.10	0.35	5.00	x
SMD1206H035TF	0.35	1.05	24.00	40.00	1.00	8.00	0.10	0.20	1.60	x
SMD1206H050TF	0.50	1.50	16.00	40.00	1.00	8.00	0.10	0.14	1.20	x
SMD1206H050/24TF	0.50	1.50	24.00	40.00	1.20	8.00	0.10	0.14	1.20	x
SMD1206H075TF	0.75	2.25	16.00	40.00	1.00	8.00	5.00	0.08	0.70	x
SMD1206H075/TF24	0.75	2.25	24.00	40.00	1.20	8.00	0.50	0.08	0.70	x
SMD1206H110TF	1.10	3.30	16.00	40.00	1.00	8.00	5.00	0.06	0.45	x
SMD1206H125TF	1.25	3.75	16.00	40.00	1.00	8.00	5.0	0.05	0.35	x
SMD1210H110TF	1.10	3.30	16.00	40.00	1.50	8.00	5.00	0.06	0.50	x
SMD1210H125TF	1.25	3.75	16.00	40.00	1.50	8.00	4.00	0.030	0.30	x
SMD1210H150TF	1.50	4.50	16.00	40.00	1.50	8.00	5.00	0.025	0.25	x
SMD1210H175TF	1.75	5.25	16.00	40.00	1.50	8.00	5.00	0.02	0.20	x
SMD1812H050TF	0.50	1.50	30.00	40.00	1.20	8.00	0.10	0.12	1.20	x
SMD1812H075TF	0.75	2.25	30.00	40.00	1.50	8.00	5.00	0.09	0.75	x
SMD1812H110TF	1.10	3.30	24.00	40.00	1.50	8.00	5.00	0.038	0.35	x
SMD1812H125TF	1.25	3.75	24.00	40.00	1.50	8.00	5.00	0.03	0.30	x
SMD1812H150TF	1.50	4.50	24.00	40.00	1.50	8.00	5.00	0.022	0.20	x
SMD1812H150/TF33	1.50	4.50	33.00	40.00	1.50	8.00	5.00	0.022	0.20	x

SMD1812H175TF	1.75	5.25	24.00	40.00	1.50	8.00	5.00	0.018	0.17	x
SMD1812H200TF	2.00	6.00	24.00	40.00	1.50	10.00	5.00	0.015	0.12	x
SMD1812H200/TF30	2.00	6.00	30.00	40.00	1.50	8.00	5.00	0.015	0.12	x
SMD1812H250TF	2.50	7.50	24.00	40.00	1.50	12.50	5.00	0.013	0.09	x
SMD2920H260TF	2.60	7.80	24.00	40.00	3.00	13.00	5.00	0.007	0.065	x
SMD2920H300TF	3.00	9.00	24.00	40.00	3.00	15.00	5.00	0.006	0.055	x
SMD2920H330TF	3.30	9.90	24.00	40.00	3.00	16.50	5.00	0.005	0.045	x
SMD2920H350TF	3.50	10.50	24.00	40.00	3.00	17.00	5.00	0.005	0.040	x
SMD2920H400TF	4.00	12.00	24.00	40.00	3.00	20.00	5.00	0.004	0.035	x

I-hold: Holding Current: maximum current at which the device will not trip in 25°C still air.

I-trip: Tripping Current: minimum current at which the device will trip in 25°C still air.

Vmax: Maximum voltage device can withstand without damage at rated current(I_{max}).

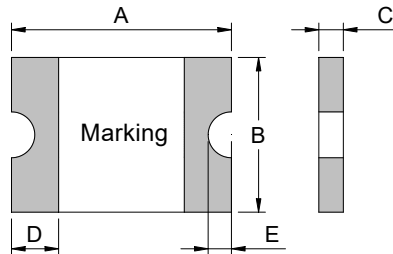
I_{max}: Maximum fault current device can withstand without damage at rated voltage(V_{max}).

P_{d typ}: Typical power dissipated from device when in the tripped state at 25°C still air.

R_{0 min}: Minimum resistance of device in initial (un-soldered) state.

R_{1 max}: Maximum resistance of device at 25°C measured one hour after tripping or reflow soldering of 260°C for 20 sec.

2.Product Dimensions(mm)&Marking



Model	A		B		C		D		E		Marking	pcs/R
	Min	Max	Min	Max	Min	Max	Min	Max	Min			
SMD0603H010TF	1.45	1.85	0.65	1.05	0.40	0.80	0.15	0.50	0.05	b	4000	
SMD0603H016TF	1.45	1.85	0.65	1.05	0.40	0.80	0.15	0.50	0.05	d	4000	
SMD0603H020TF	1.45	1.85	0.65	1.05	0.40	0.80	0.15	0.50	0.05	f	4000	
SMD0603H035TF	1.45	1.85	0.65	1.05	0.40	0.80	0.15	0.50	0.05	h	4000	
SMD0805H010TF	2.00	2.30	1.20	1.50	0.40	0.90	0.20	0.55	0.10	<u>1</u>	5000	
SMD0805H020TF	2.00	2.30	1.20	1.50	0.40	0.90	0.20	0.55	0.10	<u>2</u>	5000	
SMD0805H035TF	2.00	2.30	1.20	1.50	0.40	0.90	0.20	0.55	0.10	<u>3</u>	5000	
SMD0805H050TF	2.00	2.30	1.20	1.50	0.40	0.90	0.20	0.55	0.10	<u>5</u>	5000	
SMD0805H075TF	2.00	2.30	1.20	1.50	0.65	1.15	0.20	0.55	0.10	<u>7</u>	4000	
SMD1206H016TF	3.00	3.40	1.40	1.80	0.35	0.85	0.25	0.75	0.10	HC	5000	
SMD1206H020TF	3.00	3.40	1.40	1.80	0.35	0.85	0.25	0.75	0.10	H2	5000	
SMD1206H035TF	3.00	3.40	1.40	1.80	0.35	0.85	0.25	0.75	0.10	H3	5000	
SMD1206H050TF	3.00	3.40	1.40	1.80	0.35	0.85	0.25	0.75	0.10	H5	5000	
SMD1206H050/24TF	3.00	3.40	1.40	1.80	0.65	1.15	0.25	0.75	0.10	<u>H5</u>	3500	

SMD1206H075TF	3.00	3.40	1.40	1.80	0.35	0.85	0.25	0.75	0.10	H7	5000
SMD1206H075/TF24	3.00	3.40	1.40	1.80	0.65	1.15	0.25	0.75	0.10	H7	3500
SMD1206H110TF	3.00	3.40	1.40	1.80	0.65	1.15	0.25	0.75	0.10	H11	3500
SMD1206H125TF	3.00	3.40	1.40	1.80	0.65	1.15	0.25	0.75	0.10	H12	3500
SMD1210H110TF	3.00	3.43	2.35	2.80	0.35	0.85	0.25	0.75	0.10	H11	4000
SMD1210H125TF	3.00	3.43	2.35	2.80	0.65	1.15	0.25	0.75	0.10	H12	3500
SMD1210H150TF	3.00	3.43	2.35	2.80	0.65	1.15	0.25	0.75	0.10	H15	3500
SMD1210H175TF	3.00	3.43	2.35	2.80	0.65	1.15	0.25	0.75	0.10	H17	3500
SMD1812H050TF	4.37	4.73	3.07	3.41	0.35	0.85	0.30	1.20	0.20	H05	2000
SMD1812H075TF	4.37	4.73	3.07	3.41	0.35	0.85	0.30	1.20	0.20	H07	2000
SMD1812H110TF	4.37	4.73	3.07	3.41	0.65	1.15	0.30	1.20	0.20	H11	1500
SMD1812H125TF	4.37	4.73	3.07	3.41	0.65	1.15	0.30	1.20	0.20	H12	1500
SMD1812H150TF	4.37	4.73	3.07	3.41	0.65	1.15	0.30	1.20	0.20	H15	1500
SMD1812H150/TF33	4.37	4.73	3.07	3.41	1.00	1.50	0.30	1.20	0.20	H15	1000
SMD1812H175TF	4.37	4.73	3.07	3.41	0.65	1.15	0.30	1.20	0.20	H17	1500
SMD1812H200TF	4.37	4.73	3.07	3.41	1.00	1.50	0.30	1.20	0.20	H20	1000
SMD1812H200/TF30	4.37	4.73	3.07	3.41	1.00	1.50	0.30	1.20	0.20	H20	1000
SMD1812H250TF	4.37	4.73	3.07	3.41	1.00	1.50	0.30	1.20	0.20	H25	1000
SMD2920H260TF	6.73	7.98	4.80	5.44	0.60	1.00	0.30	2.50	0.25	H26	1500
SMD2920H300TF	6.73	7.98	4.80	5.44	0.60	1.00	0.30	2.50	0.25	H30	1500
SMD2920H330TF	6.73	7.98	4.80	5.44	1.00	1.50	0.30	2.50	0.25	H33	1500
SMD2920H350TF	6.73	7.98	4.80	5.44	1.00	1.50	0.30	2.50	0.25	H35	1500
SMD2920H400TF	6.73	7.98	4.80	5.44	1.00	1.50	0.30	2.50	0.25	H40	1500

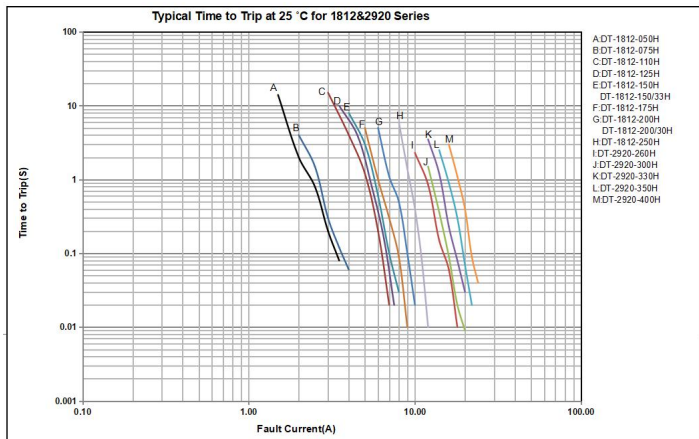
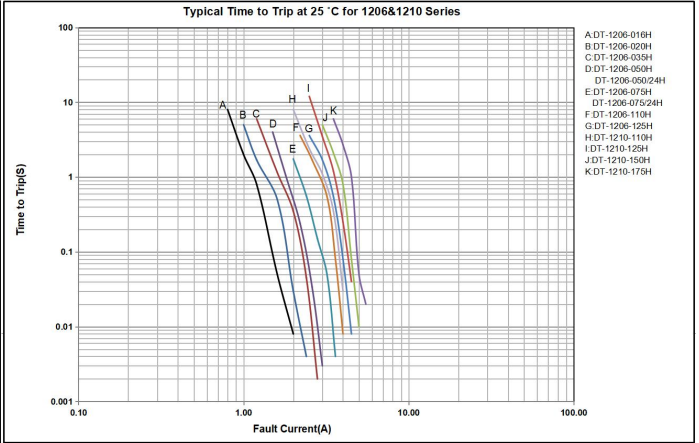
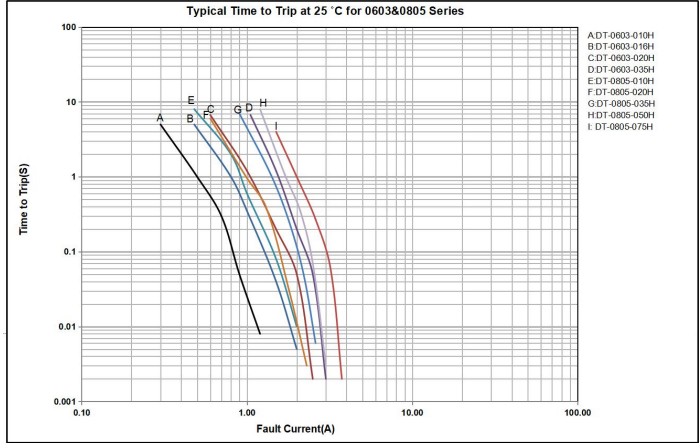
3. Thermal Derating Chart

Recommended hold current(A) at ambient Temperature(°C)

Model	Ambient Operating Temperature									
	-40°C	-20°C	0°C	25°C	40°C	50°C	60°C	70°C	85°C	125°C
SMD0603H010TF	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.03
SMD0603H016TF	0.23	0.21	0.19	0.16	0.14	0.13	0.12	0.11	0.09	0.04
SMD0603H020TF	0.29	0.26	0.23	0.20	0.18	0.16	0.15	0.13	0.11	0.05
SMD0603H035TF	0.51	0.46	0.41	0.35	0.31	0.28	0.26	0.23	0.20	0.09
SMD0805H010TF	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.07	0.06	0.03
SMD0805H020TF	0.29	0.26	0.23	0.20	0.18	0.16	0.15	0.13	0.11	0.05
SMD0805H035TF	0.51	0.46	0.41	0.35	0.31	0.28	0.26	0.23	0.20	0.09
SMD0805H050TF	0.73	0.65	0.58	0.50	0.44	0.41	0.37	0.33	0.28	0.13
SMD0805H075TF	1.09	0.98	0.87	0.75	0.66	0.61	0.56	0.50	0.42	0.20
SMD1206H016TF	0.23	0.21	0.19	0.16	0.14	0.13	0.12	0.11	0.09	0.04
SMD1206H020TF	0.29	0.26	0.23	0.20	0.18	0.16	0.15	0.13	0.11	0.05
SMD1206H035TF	0.51	0.46	0.41	0.35	0.31	0.28	0.26	0.23	0.20	0.09
SMD1206H050TF	0.73	0.65	0.58	0.50	0.44	0.41	0.37	0.34	0.28	0.14
SMD1206H050/24TF	0.73	0.65	0.58	0.50	0.44	0.41	0.37	0.34	0.28	0.14
SMD1206H075TF	1.09	0.98	0.87	0.75	0.66	0.61	0.56	0.50	0.42	0.20
SMD1206H075/TF24	1.09	0.98	0.87	0.75	0.66	0.61	0.56	0.50	0.42	0.20
SMD1206H110TF	1.60	1.44	1.28	1.10	0.97	0.89	0.82	0.74	0.62	0.30

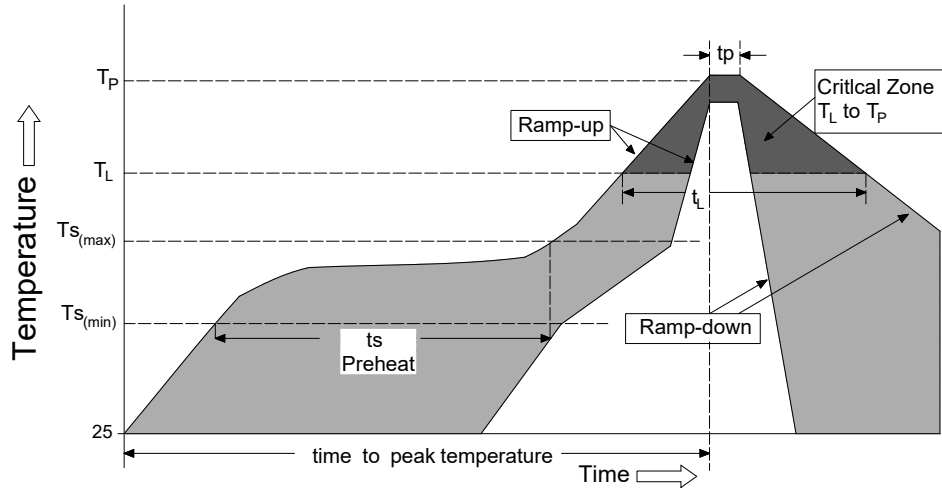
SMD1206H125TF	1.81	1.64	1.45	1.25	1.10	1.01	0.93	0.84	0.70	0.34
SMD1210H110TF	1.60	1.44	1.16	1.10	0.97	0.89	0.82	0.74	0.62	0.30
SMD1210H125TF	1.81	1.64	1.45	1.25	1.10	1.01	0.93	0.84	0.70	0.34
SMD1210H150TF	2.18	1.96	1.74	1.50	1.32	1.22	1.11	1.00	0.84	0.40
SMD1210H175TF	2.54	2.29	2.03	1.75	1.54	1.42	1.30	1.17	0.98	0.47
SMD1812H050TF	0.73	0.65	0.58	0.50	0.44	0.41	0.37	0.33	0.28	0.13
SMD1812H075TF	1.09	0.98	0.87	0.75	0.66	0.61	0.56	0.50	0.42	0.20
SMD1812H110TF	1.60	1.44	1.28	1.10	0.97	0.89	0.82	0.74	0.62	0.30
SMD1812H125TF	1.81	1.64	1.45	1.25	1.10	1.01	0.93	0.84	0.70	0.34
SMD1812H150TF	2.18	1.96	1.74	1.50	1.32	1.22	1.11	1.00	0.84	0.40
SMD1812H150/TF33	2.18	1.96	1.74	1.50	1.32	1.22	1.11	1.00	0.84	0.40
SMD1812H175TF	2.54	2.29	2.03	1.75	1.54	1.42	1.30	1.17	0.98	0.47
SMD1812H200TF	2.90	2.62	2.32	2.00	1.76	1.62	1.49	1.34	1.12	0.54
SMD1812H200/TF30	2.90	2.62	2.32	2.00	1.76	1.62	1.49	1.34	1.12	0.54
SMD1812H250TF	3.63	3.27	2.90	2.50	2.20	2.03	1.86	1.67	1.40	0.67
SMD2920H260TF	3.77	3.40	3.02	2.60	2.29	2.11	1.93	1.74	1.46	0.70
SMD2920H300TF	4.35	3.93	3.48	3.00	2.64	2.43	2.23	2.01	1.68	0.81
SMD2920H330TF	4.79	4.32	3.83	3.30	2.90	2.68	2.45	2.21	1.85	0.89
SMD2920H350TF	5.08	4.58	4.06	3.50	3.08	2.84	2.60	2.34	1.96	0.94
SMD2920H400TF	5.81	5.23	4.64	4.00	3.52	3.25	2.97	2.67	2.24	1.07

4. Typical time to trip at 25°C



The Time to Trip curves represent typical performance of a device in a simulated application environment. Actual performance in specific customer applications may differ from these values due to the influence of other variables.

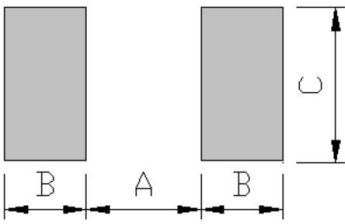
5. Soldering parameters



Profile Feature		Pb-Free Assembly
Average Ramp-Up Rate ($T_{s(max)}$ to T_P)		3°C/second max
Pre Heat:	Temperature Min ($T_{s(min)}$)	150°C
	Temperature Max ($T_{s(max)}$)	200°C
	Time (Min to Max) (t_s)	60 – 180 secs
Time Maintained Above:	Temperature (T_L)	217°C
	Temperature (t_L)	60 – 150 seconds
Peak / Classification Temperature (T_P)		260 ^{+0/-5} °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 (T_P)		8 minutes Max.

- ◆ All temperature refer to topside of the package, measured on the package body surface
- ◆ If reflow temperature exceeds the recommended profile, devices may not meet the performance requirements
- ◆ Recommended reflow methods: IR, vapor phase oven, hot air oven, N2 environment for lead
- ◆ Recommended maximum paste thickness is 0.25mm (0.010inch)
- ◆ Devices can be cleaned using standard industry methods and solvents

6. Recommended Pad Layout(mm) & Physical Specifications



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

Pad Dimensions(mm)			
Series	A	B	C
2920	4.60	2.00	5.30
1812	2.70	1.50	3.20
1210	2.00	1.00	2.80
1206	2.00	1.00	1.80
0805	1.20	1.00	1.50
0603	0.80	1.00	1.00

7. Environmental Specifications

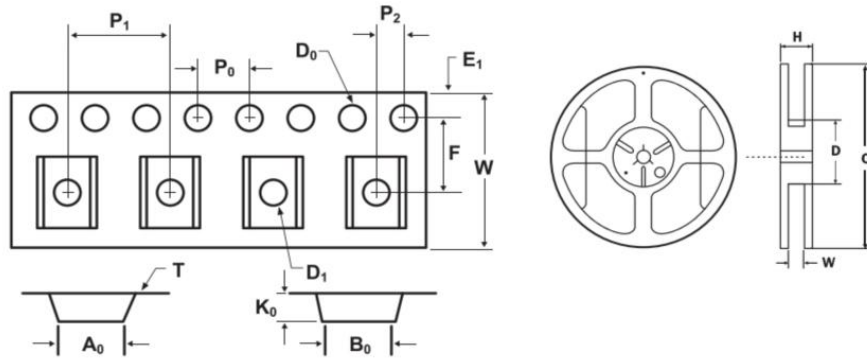
Operating Temperature	-40 °C to +125 °C
Passive Aging	+85 °C, 1000 hours ; R≤ R1max
Humidity Aging	+85 °C, 85 % R.H. 1000 hours; R≤ R1max
Thermal Shock	MIL–STD–202, Method 107; +125 °C to -40 °C, 10 times;R≤ R1max
Solvent Resistance	MIL–STD–202, Method 215 ; No change
Vibration	MIL–STD–883, Method 2007, Condition A; No change
Moisture Sensivity Level	Level 1, J–STD–020
Storage Conditions	+40 °C Max. 70% RH Max. Packed in original packaging.

8. Test Procedures And Requirements

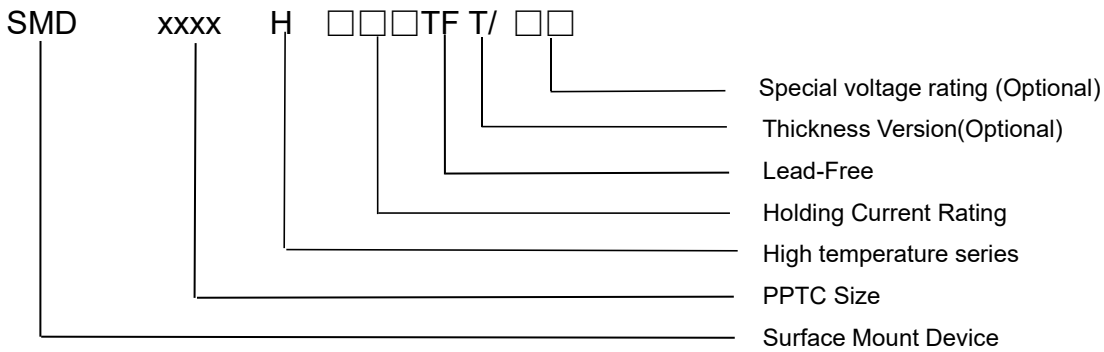
No.	Test	Test Conditions	Accept/Reject Criteria
1	R0 min	Resistance measurement at 25°C	R0min ≤ R ≤ R1max
2	R1 max	Resistance measurement one hour after post trip	R0min ≤ R ≤ R1max
3	I-hold	Hold rated current 1800 second without trip, @ 25°C	No trip
4	I-trip	Device must trip within 900 second under rated current, @25°C	Trip
5	Max. time to trip	At specified current, 25 °C	T ≤ max. time to trip (seconds)
6	Trip Cycle Life	Vmax, Imax, 100 cycles	No arcing or burning
7	Trip Endurance	Vmax,Imax 24 hours	No arcing or burning
8	Solderability	ANSI/J-STD-002	95 % min. coverage

9. Tape and Reel Specifications & Packaging quantity per Reel

TAPE SPECIFICATIONS: EIA-481-1 (mm)											
Item	0603Series	0805Series		1206Series		1210Series		1812Series			2920Series
W	8.00±0.30	8.00±0.10	8.10±0.10	8.10±0.10	8.10±0.10	8.10±0.10	8.10±0.10	12.0±0.10	12.0±0.10	12.0±0.10	16.00±0.30
F	3.50±0.10	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	3.50±0.05	5.50±0.05	5.50±0.05	5.50±0.05	7.50±0.10
E1	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10	1.75±0.10
D0	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05	1.55±0.05
D1	0.50±0.10	1.00 min	1.00 min	1.00 min	1.00 min	1.00 min	1.00 min	1.50 min	1.50 min	1.50 min	1.50±0.10
P0	4.00±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10
P1	4.00±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	4.0±0.10	8.0±0.10	8.0±0.10	8.0±0.10	8.0±0.10
P2	2.00±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.05	2.0±0.10
A0	1.10±0.10	1.70±0.10	1.70±0.10	1.90±0.10	2.00±0.10	3.00±0.10	3.00±0.10	3.58±0.10	3.58±0.10	3.50±0.10	5.74±0.10
B0	1.90±0.10	2.45±0.10	2.45±0.10	3.45±0.10	3.50±0.10	3.50±0.10	3.50±0.10	4.93±0.10	4.93±0.10	4.90±0.10	8.02±0.10
T	0.20±0.10	0.20±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.25±0.05	0.30±0.10
K0	0.85±0.10	0.80±0.10	0.95±0.10	0.85±0.10	1.05±0.10	0.85±0.10	1.22±0.10	0.87±0.10	1.30±0.10	1.70±0.10	1.30±0.10
Leader	390mm	390mm	390mm	390mm	390mm	390mm	390mm	390mm	390mm	390mm	390mm
Trailer	160mm	160mm	160mm	160mm	160mm	160mm	160mm	160mm	160mm	160mm	160mm
Q'ty	4000pcs/Reel	5000pcs/Reel	4000pcs/Reel	4000pcs/Reel	3,500pcs/Reel	4000pcs/Reel	3500pcs/Reel	2000pcs/Reel	1500pcs/Reel	1000pcs/Reel	1500pcs/Reel
REEL DIMENSIONS: EIA-481-1											
C	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±1.0	Ø178±3.0
D	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5	Ø60.2±0.5
W	9.0±1.5	9.0±1.5	9.0±1.5	9.0±1.5	9.0±1.5	9.0±1.5	9.0±1.5	13.2±1.5	13.2±1.5	13.2±1.5	17.0±0.2
H	11.0±0.5	11.0±0.5	11.0±0.5	11.0±0.5	11.0±0.5	11.0±0.5	11.0±0.5	16.0±0.5	16.0±0.5	16.0±0.5	19.5±1.0



10. Part Ordering Number System



Warning:

- ▣ Users shall independently assess the suitability of these devices for each of their applications
- ▣ Operation of these devices beyond the stated maximum ratings could result in damage to the devices and lead to electrical arcing and/or fire
- ▣ These devices are intended to protect against the effects of temporary over-current or over-temperature conditions and are not intended to perform as protective devices where such conditions are expected to be repetitive or prolonged in duration
- ▣ Exposure to silicon-based oils, solvents, electrolytes, acids, and similar materials can adversely affect the performance of these PPTC devices
- ▣ These devices undergo thermal expansion under fault conditions, and thus shall be provided with adequate space and be protected against mechanical stresses
- ▣ Circuits with inductance may generate a voltage ($L di/dt$) above the rated voltage of the PPTC device.