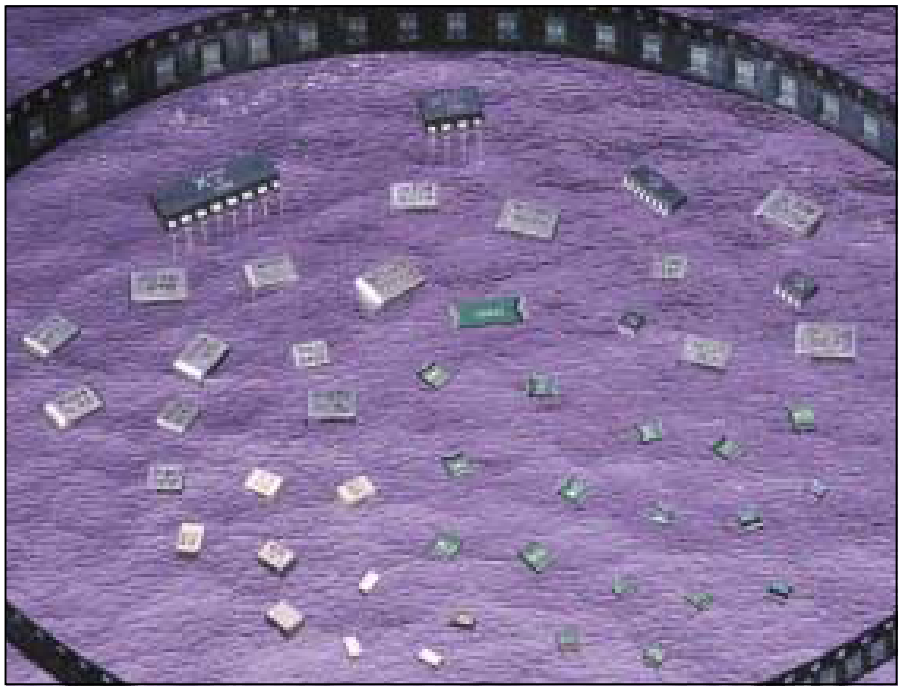
PolySwitch Surface-mount
Resettable Devices

More than ten years ago, Raychem Circuit Protection introduced the SMD product family, and polymeric PTC devices quickly became the computer industry standard for keyboard, mouse, and disk drive protection. In 1995, Raychem Circuit Protection advanced the technology, reducing the size and cost of surface-mount resettable devices with the introduction of its miniSMD product series. The recent additions to the surface-mount family include the nanoSMD series, which reduces the size to a 3216mm (1206mils) foot print, one-third the size of the popular miniSMD series.



Benefits:
- Smaller size saves board space and cost
- Many product choices give engineers more design flexibility
- Compatible with high-volume electronics assembly
- Assists in meeting regulatory requirements
- Higher voltage ratings allow use in new applications

Features:
- Broadest range of resettable devices available in the industry
- Current ratings from 0.05 to 3A
- Voltage ratings from 6V computer and electronic applications to 60V (600V Telecom)
- Agency recognition: UL, CSA, TÜV
- Small footprint
- Fast time-to-trip
- Low resistance

Applications:
- Computer motherboards
- Modems
- USB hub, ports and peripherals
- IEEE1394 ports
- Digital cameras
- Disk drives
- CD-ROMs
- Game machines
- Battery packs
- Phones
- Fax machines
- Analog and digital line cards
- Printers
- PDAs
- Chargers

Products in this section are grouped by:

Product Dimensions, Product Series, Hold Current

Step 1. Determine the circuit's operating parameters.

Fill in the following information about the circuit:

Maximum ambient operating temperature _____

Normal operating current _____

Maximum operating voltage
(i.e. miniSMDC014 is $60V_{DC}$ max.) _____

Maximum interrupt current _____

Step 2. Select the PolySwitch device that will accommodate the circuit's maximum ambient temperature and normal operating current.

Look across the top of Table S2 to find the temperature that most closely matches the circuit's maximum operating temperature. Look down that column to find the value equal to or greater than the circuit's normal operating current. Now look to the far left of that row to find the part number for the PolySwitch surface mount device that will best accommodate the circuit. Devices in this section are grouped by device dimensions, so your operating-current requirement may be found in more then one grouping.

The thermal derating curves located in Figure S1 are the normalized representations of the data in Table S2.

Step 3. Compare the selected device's maximum electrical ratings with the circuit's maximum operating voltage and interrupt current.

Look down the first column of Table S3 to find the part number you selected in Step 2. Look to the right in that row to find the device's maximum operating voltage (V_{MAX}) and maximum interrupt current (I_{MAX}). Ensure that V_{MAX} and I_{MAX} are greater than or equal to the circuit's maximum operating voltage and maximum interrupt current.

Step 4. Determine time-to-trip.

Time-to-trip is the amount of time it takes for a device to switch to a high-resistance state once a fault current has been applied across the device. Identifying the PolySwitch device's time-to-trip is important in order to provide the desired protection capabilities. If the device you choose trips too fast, undesired or nuisance tripping will occur. If the device trips too slowly, the components being protected may be damaged before the device switches to a high-resistance state.

Figures S11-S18 show the typical time-to-trip at 20°C for each of the PolySwitch devices.

If the PolySwitch device's time-to-trip is too fast or too slow for the circuit, go back to Step 2 and choose an alternate device.

Step 5. Verify ambient operating conditions.

Ensure that your application's minimum and maximum ambient temperatures are within the operating temperature of -40˚C to 85˚C (-40˚C to 125˚C for SMDH160).

Step 6. Verify the PolySwitch device dimensions.

Using dimensions in Table S4, compare the dimensions of the PolySwitch device you selected with the application's space considerations.

Protection Application Selection Table for Surface-mount Devices

The table below lists Polyswitch devices typically used in these applications.

Specifications for the suggested device part numbers can be found in this section.

Once a part has been selected, the user should evaluate and test each product for the intended application.

			PolySwitch Resettable Devices—Key Selection Criteria		
Protection Application	**Additional Comments**	**Overcurrent Overvoltage**	**Small Size**	**Low Resistance**	**Fast Time-to-trip (Temperature Protection)**
AC adapter input power	use w/ Zener & triac		SMD250	SMD250	SMD200
Battery pack protection			nanoSMDC150	miniSMDC260	miniSMDE190
Charger protection			nanoSMDM050	miniSMDM110/16	nanoSMDM075
CPU/IC protection			nanoSMDM100	nanoSMDC150	nanoSMDM075
Data acquisition/sensor			microSMD005	—	microSMD005
DC input/output power	≤6V		nanoSMDM075	nanoSMDC150	nanoSMDM050
	≤12V		miniSMDC075	miniSMDM110/16	miniSMDC075
DDC			nanoSMDM075	nanoSMDM100	nanoSMDM050
Device Bay system	DB12, DB20		miniSMDC200	miniSMDC260	miniSMDC200
	DB32		miniSMDC260	SMD300	miniSMDM200
Ethernet/Lan			nanoSMDM050	miniSMDM110/16	nanoSMDM075
Fan			microSMD035	microSMD050	microSMD035
IEEE-1394	power provider		SMD100/33	SMD185	SMD100/33
	alt. power provider		SMD185	SMD185	SMD150/33
	self-powered		SMD185	SMD185	SMD150/33
LCD inverter			nanoSMDM050	miniSMDM110/16	nanoSMDM075
LCD screen power			nanoSMDM050	nanoSMDM050	microSMD035
LNB (Low Noise Block)			SMD075	SMD075	SMD050
Motor	≤6V		nanoSMDM100	nanoSMDC150	microSMDM075
	≤13.2V		miniSMDC075	miniSMDM110/16	miniSMDC075
PS/2 mouse/keyboard			nanoSMDM075	nanoSMDM100	nanoSMDM050
Signal - data communication	≤6V		nanoSMDM075	nanoSMDM075	nanoSMDM075
	≤13.2V		miniSMDC050	miniSMDM075	miniSMDC020
	≤30V		SMD030-2018	SMD075	SMD050
SCSI			nanoSMDM100	nanoSMDC150	nanoSMDM075
Smart card reader			microSMD010	microSMD035	microSMD005
Telecom - modem	UL1950	OC OV	TS600-170 TVB270SA or SC*	TS250-130 TVB270SA or SC*	TS600-170 TVB270SA or SC*
	ITU-T K.21	OC OV	TS250, TSV250 TVB270SA*	TS250, TSV250-130 TVB270SA*	TS250-130-RB TVB270SA*
	Digital line	OC OV	miniSMDC014 TVB270SC*	miniSMDC014 TVB270SC*	miniSMDC014 TVB270SC*
Telecom - PBX	UL1950	OC OV	TS600-170 TVB270SA or SC*	TS600-200-RA TVB270SA or SC*	TS600-170 TVB270SA or SC*
	ITU-T K.21	OC OV	TS250, TSV250 TVB270SA*	TS250-130 TVB270SA*	TS250-130-RB TVB270SA*
	Subscriber	OC	miniSMDC014	miniSMDC014	miniSMDC014
Telecom - line card	Telcordia	OC	TS600-200-RA-B-0.5	TS600-200-RA-B-0.5	TS600-200-RA-B-0.5
	GR-1089	OV	TVB270SC*	TVB270SC*	TVB270SC*
	ITU-T K.20	OC OV	TS250, TSV250 TVB270SA*	TS250-130-RA TVB270SA*	TS250 TVB270SA*
Intrabuilding protection	Telcordia GR1089		TSL250-080	SMD030-2018	TSL250-080
Temperature sensor	CPU		nanoSMDM050	nanoSMDM075	nanoSMDM050
USB	Individual Port		nanoSMDM075	nanoSMDM100	nanoSMDM050
	2 port ganged		nanoSMDC150	miniSMDC150	miniSMDC125
	3 port ganged		miniSMDC200	miniSMDM200	miniSMDM200
	4 port ganged		miniSMDC260	miniSMDM260	miniSMDM260

*Refer to the SiBar thyristor product section for more information.

This list is not exhaustive. Raychem Circuit Protection welcomes our customers' input for additional application ideas for Polyswitch Resettable devices.

Table S1. Product Series: Size, Current Rating, Voltage Rating/Typical Resistance for Surface-mount Devices

	nanoSMDC nanoSMDM	microSMD	miniSMDC miniSMDM	midSMD	SMD	SMD2	miniSMDE	TS250 TSL250 TSV250	TS600
Size mm (mils)	3216 (1206)	3225 (1210)	4532 (1812)	5050 (2018)	7555 (2920)	8763 (3425)	11550 (4420)	*	*
Hold Current (A)	—	—	—	—	—	—	——	—	—
0.05	—	$30V_{DC}/25\Omega$	—	—	—	—	—	—	—
0.08	—	—	—	—	—	—	—	80V/12.5Ω	—
0.13	—	—	—	—	—	—	—	60V/6.0-8.0Ω	—
0.14	—	—	$60V_{DC}/4.0\Omega$	—	—	—	—	—	—
0.17	—	—	—	—	—	—	—	—	60V/11.0Ω
0.18	—	—	—	—	—	—	—	—	—
0.20	—	—	$30V_{DC}/1.4\Omega$	—	—	—	—	—	60V/8.5Ω
0.30	—	—	—	$60V_{DC}/1.4\Omega$	$60V_{DC}/3.0\Omega$	—	—	—	—
0.35	—	$6V_{DC}/0.81\Omega$	—	—	—	—	—	—	—
0.50	$6V_{DC}/0.40\Omega$	$13.2V_{DC}/0.55\Omega$	$15V_{DC}/0.60\Omega$	—	$60V_{DC}/0.87\Omega$	—	—	—	—
0.75	$6V_{DC}/0.20\Omega$	$6V_{DC}/0.29\Omega$	$13.2V_{DC}/0.23\Omega$ $24V_{DC}/0.20\Omega$	—	$30V_{DC}/0.67\Omega$	—	—	—	—
1.00	$6V_{DC}/0.15\Omega$	—	—	$15V_{DC}/0.25\Omega$	$30V_{DC}/0.30\Omega$ $33V_{DC}/0.27\Omega$	—	—	—	—
1.10	—	$6V_{DC}/0.14\Omega$	$6V_{DC}/0.12\Omega$ $8V_{DC}/0.14\Omega$ $16V_{DC}/0.12\Omega$	—	—	—	—	—	—
1.25	—	—	$6V_{DC}/0.09\Omega$	—	$15V_{DC}/0.16\Omega$	—	—	—	—
1.50	$6V_{DC}/0.08\Omega$	$6V_{DC}/0.07\Omega$	$6V_{DC}/0.07\Omega$	$15V_{DC}/0.13\Omega$	—	$15V_{DC}/0.16\Omega$ $33V_{DC}/0.15\Omega$	—	—	—
1.60	—	—	$8V_{DC}/0.066\Omega$	—	—	$16V_{DC}/0.10\Omega$	—	—	—
1.85	—	—	—	—	—	$33V_{DC}/0.12\Omega$	—	—	—
1.90	—	—	—	—	—	—	$16V_{DC}/0.065\Omega$	—	—
2.00	—	—	$6V_{DC}/0.050\Omega$ $8V_{DC}/0.040\Omega$	$6V_{DC}/0.07\Omega$	—	$15V_{DC}/0.09\Omega$	—	—	—
2.50	—	—	—	—	—	$15V_{DC}/0.06\Omega$	—	—	—
2.60	—	—	$6V_{DC}/0.035\Omega$ $6V_{DC}/0.030\Omega$	—	$6V_{DC}/0.05\Omega$	—	—	—	—
3.00	—	—	—	—	$6V_{DC}/0.033\Omega$	—	—	—	—

*Refer to Telecommunications and Networking section for dimensions; voltage for these parts is RMS max.

Table S2. Thermal Derating for Surface-mount Devices [Hold Current (A) at Ambient Temperature (°C)]

Part Number	Maximum Ambient Temperature -40˚C	-20˚C	0˚C	20˚C	25˚C	40˚C	50˚C	60˚C	70˚C	80˚C	85˚C	125˚C
nanoSMD Size 3216 mm/1206 mils												
nanoSMDM012	0.19	0.17	0.15	0.13	0.125	0.11	0.10	0.09	0.08	0.07	0.07	—
nanoSMDM016	0.24	0.22	0.19	0.17	0.16	0.14	0.13	0.10	0.09	0.09	0.08	—
nanoSMDM050	0.76	0.68	0.59	0.52	0.50	0.44	0.40	0.35	0.32	0.28	0.26	—
nanoSMDM050F*	0.76	0.68	0.59	0.52	0.50	0.44	0.40	0.35	0.32	0.28	0.26	—
nanoSMDM075	1.11	1.00	0.85	0.78	0.75	0.67	0.61	0.52	0.50	0.44	0.42	—
nanoSMDM075F*	1.11	1.00	0.85	0.78	0.75	0.67	0.61	0.52	0.50	0.44	0.42	—
nanoSMDM100	1.49	1.34	1.15	1.04	1.00	0.89	0.81	0.70	0.66	0.58	0.55	—
nanoSMDM100F*	1.49	1.34	1.15	1.04	1.00	0.89	0.81	0.70	0.66	0.58	0.55	—
nanoSMDC150	2.20	1.99	1.77	1.55	1.50	1.34	1.23	1.10	1.01	0.90	0.84	
microSMD Size 3225 mm/1210 mils												
microSMD005	0.08	0.07	0.06	0.05	0.048	0.04	0.04	0.03	0.03	0.02	0.02	—
microSMD010	0.15	0.13	0.12	0.10	0.10	0.09	0.08	0.07	0.06	0.05	0.05	—
microSMD035	0.51	0.46	0.40	0.35	0.34	0.30	0.27	0.24	0.22	0.19	0.18	—
microSMD050	0.76	0.66	0.58	0.50	0.475	0.42	0.38	0.35	0.29	0.25	0.23	—
microSMD075	1.10	0.97	0.86	0.75	0.72	0.64	0.58	0.55	0.47	0.42	0.39	—
microSMD110	1.60	1.42	1.26	1.10	1.06	0.94	0.86	0.80	0.70	0.62	0.58	—
microSMD150	2.30	2.02	1.76	1.50	1.43	1.24	1.11	1.00	0.85	0.72	0.65	—
miniSMD Size 4532 mm/1812 mils												
miniSMDC014	0.23	0.20	0.17	0.14	0.13	0.11	0.10	0.09	0.07	0.06	0.05	—
miniSMDC020	0.30	0.27	0.23	0.20	0.19	0.17	0.15	0.13	0.12	0.10	0.09	—
miniSMDC050	0.59	0.57	0.55	0.50	0.48	0.45	0.43	0.35	0.30	0.25	0.23	—
miniSMDC075	1.10	0.99	0.87	0.75	0.72	0.63	0.57	0.49	0.45	0.39	0.35	—
miniSMDM075	1.11	1.00	0.81	0.78	0.75	0.67	0.61	0.49	0.47	0.45	0.42	—
miniSMDM075/24	1.11	1.00	0.85	0.78	0.75	0.67	0.61	0.52	0.50	0.44	0.42	—
miniSMDC110	1.60	1.45	1.28	1.10	1.065	0.92	0.83	0.71	0.66	0.57	0.52	—
miniSMDM110	1.58	1.43	1.20	1.14	1.10	0.98	0.92	0.77	0.73	0.70	0.66	—
miniSMDM110/16	1.61	1.46	1.25	1.14	1.10	0.98	0.90	0.78	0.74	0.66	0.62	—
miniSMDM110F/16*	1.61	1.46	1.25	1.14	1.10	0.98	0.90	0.78	0.74	0.66	0.62	—
miniSMDC125	2.00	1.69	1.47	1.25	1.17	1.03	0.92	0.90	0.69	0.58	0.53	—
miniSMDC150	2.30	2.05	1.77	1.50	1.44	1.23	1.09	0.95	0.82	0.68	0.61	—
miniSMDC160F*	2.50	2.19	1.89	1.60	1.53	1.31	1.16	1.10	0.94	0.79	0.70	—
miniSMDM160	2.32	2.10	1.80	1.66	1.60	1.43	1.32	1.14	1.10	0.99	0.93	—
miniSMDM160F*	2.32	2.10	1.80	1.66	1.60	1.43	1.32	1.14	1.10	0.99	0.93	—
miniSMDC200	2.60	2.44	2.22	2.00	1.96	1.78	1.67	1.50	1.45	1.34	1.29	—
miniSMDM200	2.88	2.61	2.25	2.07	2.0	1.80	1.66	1.45	1.39	1.26	1.19	—
miniSMDM200F*	2.88	2.61	2.25	2.07	2.0	1.80	1.66	1.45	1.39	1.26	1.19	—
miniSMDC260	3.40	3.16	2.88	2.60	2.54	2.32	2.18	2.00	1.90	1.76	1.69	—
miniSMDM260	3.70	3.36	2.90	2.68	2.6	2.35	2.18	1.90	1.84	1.67	1.59	—
miniSMDM260F*	3.70	3.36	2.90	2.68	2.6	2.35	2.18	1.90	1.84	1.67	1.59	—
miniSMDE Size 11550 mm/4420 mils												
miniSMDE190	3.16	2.74	2.20	1.90	1.74	1.48	1.27	1.10	0.80	0.50	0.35	—

*F: lead-free device

Table S2. Thermal Derating for Surface-mount Devices [Hold Current (A) at Ambient Temperature (°C)] *continued*

Part Number	Maximum Ambient Temperature -40˚C	-20˚C	0˚C	20˚C	25˚C	40˚C	50˚C	60˚C	70˚C	80˚C	85˚C	125˚C
midSMD Size 5050 mm/2018 mils												
SMD030-2018	0.48	0.42	0.35	0.30	0.28	0.24	0.21	0.17	0.15	0.12	0.10	—
SMD100-2018	1.59	1.43	1.20	1.10	1.03	0.94	0.85	0.72	0.69	0.61	0.57	—
SMD150-2018	2.21	1.97	1.70	1.50	1.42	1.26	1.15	1.00	0.91	0.79	0.73	—
SMD200-2018	2.81	2.54	2.27	2.00	1.93	1.73	1.59	1.46	1.32	1.19	1.12	—
SMD Size 7555 mm/2920 mils												
SMD030	0.44	0.39	0.32	0.30	0.28	0.26	0.23	0.19	0.18	0.17	0.15	—
SMD050	0.73	0.65	0.55	0.50	0.47	0.43	0.39	0.33	0.31	0.28	0.26	—
SMD075	1.11	0.99	0.84	0.75	0.71	0.63	0.57	0.49	0.45	0.39	0.36	—
SMD100	1.59	1.43	1.20	1.10	1.03	0.94	0.85	0.72	0.69	0.61	0.57	—
SMD100/33	1.48	1.35	1.20	1.10	1.06	0.98	0.91	0.83	0.79	0.73	0.69	—
SMD125	1.89	1.68	1.50	1.25	1.21	1.04	0.93	0.85	0.71	0.61	0.55	—
SMD260 and SMD260-RB	3.82	3.41	2.90	2.60	2.45	2.19	1.99	1.70	1.58	1.38	1.28	—
SMD300	4.13	3.75	3.30	3.00	2.87	2.62	2.43	2.25	2.00	1.87	1.78	—
SMD2 Size 8763 mm/3425 mils												
SMD150	2.30	2.04	1.80	1.50	1.45	1.23	1.10	0.99	0.83	0.70	0.63	—
SMD150/33	2.30	2.04	1.80	1.50	1.45	1.23	1.10	0.99	0.83	0.70	0.63	—
SMDH160	2.15	1.96	1.78	1.60	1.55	1.42	1.33	1.24	1.15	1.05	1.01	0.64
SMD185	2.54	2.29	2.20	1.80	1.80	1.55	1.43	1.31	1.19	1.06	1.00	—
SMD200	3.01	2.67	2.30	2.00	1.90	1.66	1.50	1.30	1.16	0.99	0.91	—
SMD250	3.72	3.31	2.80	2.50	2.35	2.09	1.89	1.60	1.48	1.28	1.18	—
Telecom Surface-mount												
TSL250-080	0.124	0.110	0.095	0.080	0.077	0.066	0.059	0.051	0.044	0.037	0.033	—
TS250-130	0.208	0.182	0.156	0.130	0.124	0.104	0.091	0.078	0.065	0.052	0.045	—
TSV250-130	0.208	0.182	0.156	0.130	0.124	0.104	0.091	0.078	0.065	0.052	0.045	—
TS600-170	0.264	0.230	0.200	0.170	0.163	0.140	0.125	0.109	0.094	0.077	0.070	—
TS600-200-RA	0.310	0.275	0.238	0.200	0.193	0.165	0.147	0.128	0.110	0.091	0.083	—

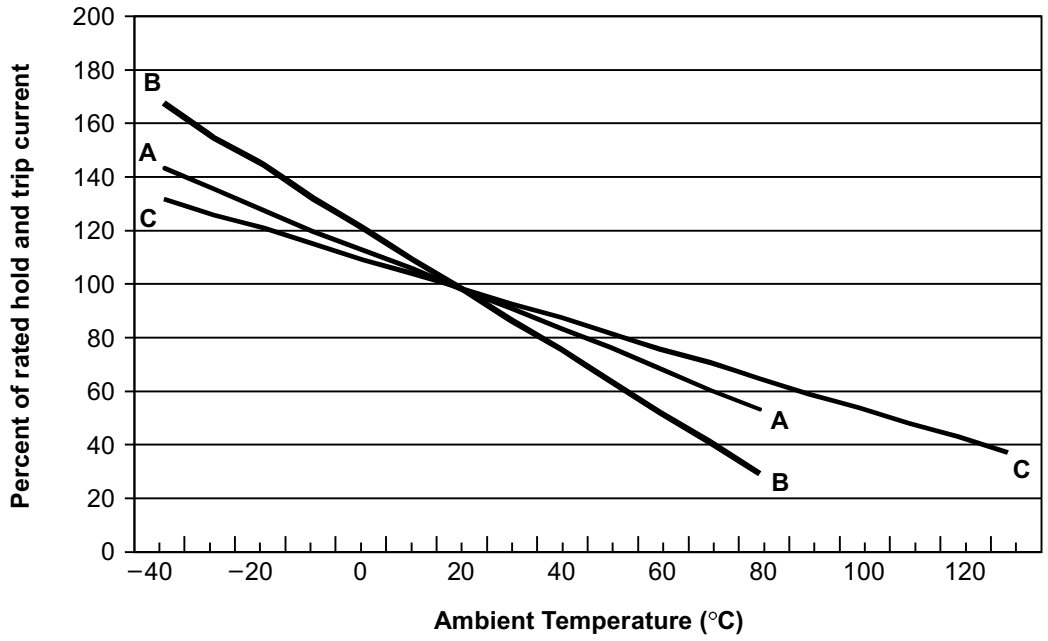
Thermal Derating Curves for Surface-mount Devices*

A = nanoSMD/microSMD/miniSMD & SMD

B = miniSMDE190

C = SMDH160

Figure S1. Thermal Derating Curve



*Refer to Telecom and Networking section for thermal derating of Telecom parts.

Table S3. Electrical Characteristics for Surface-mount Devices at 20°C

	Part Number		I_H (A)	I_T (A)	V_{MAX} (V_{DC})	I_{MAX} (A)	$P_{D\ TYP}$ (W)	Max. Time-to-Trip (A)	Max. Time-to-Trip (s)	R_{MIN} Ω	R_{TYP} Ω	$R_{1\ MAX}$ Ω	Figures for Dimensions
	nanoSMD Size 3216 mm/1206 mils												
New	nanoSMDM012	†	0.125	0.29	30	10	0.4	1.0	0.20	1.50	4.5	6.000	S2
New	nanoSMDM016	†	0.16	0.37	30	10	0.4	1.0	0.30	1.20	3.5	4.500	S2
	nanoSMDM050	†	0.50	1.00	6	40	0.4	8.0	0.10	0.15	0.400	0.700	S2
New	nanoSMDM050F*	†	0.50	1.00	6	40	0.4	8.0	0.10	0.15	0.400	0.700	S2
	nanoSMDM075	†	0.75	1.50	6	40	0.4	8.0	0.20	0.10	0.200	0.290	S2
New	nanoSMDM075F*	†	0.75	1.50	6	40	0.4	8.0	0.20	0.10	0.200	0.290	S2
	nanoSMDM100	†	1.00	1.80	6	40	0.4	8.0	0.30	0.06	0.150	0.210	S2
New	nanoSMDM100F*	†	1.00	1.80	6	40	0.4	8.0	0.30	0.06	0.150	0.210	S2
	nanoSMDC150	†	1.50	3.00	6	40	0.6	8.0	1.00	0.04	0.080	0.110	S3
	microSMD Size 3225 mm/1210 mils												
	microSMD005		0.05	0.15	30	10	0.6	0.25	1.5	3.60	25.00	50.000	S4
New	microSMD010		0.10	0.25	30	10	0.6	0.5	1.0	2.1	9.0	15.000	S3
	microSMD035		0.35	0.75	6	40	0.6	8.0	0.2	0.32	0.81	1.300	S3
	microSMD050		0.50	1.00	13.2	40	0.6	5.0	0.1	0.25	0.55	0.900	S3
	microSMD075		0.75	1.50	6	40	0.6	8.0	0.1	0.11	0.29	0.400	S3
	microSMD110		1.10	2.20	6	40	0.6	5.0	1.0	0.07	0.14	0.210	S3
	microSMD150		1.5	3.0	6	40	0.6	5.0	5.0	0.04	0.07	0.110	S3
	miniSMD Size 4532 mm/1812 mils												
	miniSMDC014		0.14	0.34	60	10	0.6	1.5	0.15	1.500	4.000	6.000	S3
	miniSMDC020		0.20	0.40	30	10	0.6	8.0	0.02	0.600	2.900	3.300	S3
	miniSMDC050		0.50	1.00	15	40	0.6	8.0	0.15	0.150	0.600	1.000	S3
	miniSMDC075		0.75	1.50	13.2	40	0.6	8.0	0.20	0.110	0.260	0.450	S3
	miniSMDM075	†	0.75	1.50	13.2	40	0.5	8.0	0.20	0.100	0.230	0.290	S2
	miniSMDM075/24	†	0.75	1.50	24	40	0.6	8.0	0.30	0.090	0.200	0.290	S5
	miniSMDC110		1.10	2.20	6	40	0.6	8.0	0.30	0.040	0.120	0.210	S3
	miniSMDM110	†	1.10	2.00	8	40	0.5	8.0	0.30	0.060	0.140	0.180	S2
	miniSMDM110/16	†	1.10	1.95	16	40	0.6	8.0	0.50	0.060	0.120	0.180	S5
New	miniSMDM110F/16*	†	1.10	1.95	16	40	0.6	8.0	0.50	0.060	0.120	0.180	S5
	miniSMDC125		1.25	2.50	6	40	0.6	8.0	0.40	0.050	0.090	0.140	S3
	miniSMDC150		1.50	3.00	6	40	0.6	8.0	0.50	0.040	0.070	0.110	S3
New	miniSMDC160F*		1.60	3.65	6	40	0.6	8.0	1.00	0.030	0.078	0.100	S3
	miniSMDM160	†	1.60	2.80	8	40	0.6	8.0	2.00	0.033	0.066	0.099	S5
New	miniSMDM160F*	†	1.60	2.80	8	40	0.6	8.0	2.00	0.033	0.066	0.099	S5
	miniSMDC200		2.00	4.00	6	40	0.6	8.0	5.00	0.020	0.050	0.070	S3
	miniSMDM200	†	2.00	3.50	8	40	0.6	8.0	3.00	0.020	0.040	0.060	S5
New	miniSMDM200F*	†	2.00	3.50	8	40	0.6	8.0	3.00	0.020	0.040	0.060	S5
	miniSMDC260		2.60	5.00	6	40	0.6	8.0	15.00	0.015	0.035	0.047	S3
	miniSMDM260	†	2.60	4.55	6	40	0.6	8.0	6.00	0.010	0.030	0.043	S5
New	miniSMDM260F*	†	2.60	4.55	6	40	0.6	8.0	6.00	0.010	0.030	0.043	S5
	miniSMDE Size 11550 mm/4420 mils												
	miniSMDE190	1.90	3.80	16	100	1.4	10	2.0	0.024	0.065	0.08		S3

*F: lead-free device †Electrical characteristics determined at 25°C.

Table S3. Electrical Characteristics for Surface-mount Devices *continued*

Part Number	I_H (A)	I_T (A)	V_{MAX} (V_{DC})	I_{MAX} (A)	$P_{D\ TYP}$ (W)	Max. Time-to-Trip (A)	Max. Time-to-Trip (s)	R_{MIN} (Ω)	R_{TYP} (Ω)	$R_{1\ MAX}$ (Ω)	Figures for Dimensions
midSMD Size 5050 mm/2018 mils											
SMD030-2018	0.30	0.80	60	20	0.7	1.5	1.5	0.500	1.40	2.300	S6
SMD100-2018	1.10	2.20	15	40	1.2	8.0	0.5	0.100	0.25	0.400	S6
SMD150-2018	1.50	3.00	15	40	1.4	8.0	1.0	0.070	0.13	0.180	S6
SMD200-2018	2.00	4.20	6	40	1.4	8.0	3.0	0.048	0.07	0.100	S6
SMD Size 7555 mm/2920 mils											
SMD030	0.30	0.60	60	10	1.5	1.5	3.0	1.200	3.00	4.800	S7
SMD050	0.50	1.00	60	10	1.5	2.5	4.0	0.350	0.87	1.400	S7
SMD075	0.75	1.50	30	40	1.5	8.0	0.3	0.350	0.67	1.000	S7
SMD100	1.10	2.20	30	40	1.5	8.0	0.5	0.120	0.30	0.480	S7
SMD100/33	1.10	2.20	33	40	1.5	8.0	0.5	0.120	0.27	0.410	S7
SMD125	1.25	2.50	15	40	1.5	8.0	2.0	0.070	0.16	0.250	S7
SMD260	2.60	5.20	6	40	1.5	8.0	20.0	0.025	0.05	0.075	S7
SMD260-RB	2.60	5.00	6	40	1.5	5.0	60.0	0.030	0.055	0.075	S7
SMD300	3.00	6.00	6	40	1.3	8.0	35.0	0.015	0.033	0.048	S7
SMD2 Size 8763 mm/3425 mils											
SMD150	1.50	3.00	15	40	1.7	8.0	5.0	0.060	0.16	0.250	S7
SMD150/33	1.50	3.00	33	40	1.7	8.0	5.0	0.080	0.15	0.230	S7
SMDH160	1.60	3.20	16	70	2.1	8.0	15.0	0.050	0.10	0.150	S7
SMD185	1.80	3.60	33	40	1.2	8.0	5.0	0.065	0.12	0.165***	S7
SMD200	2.00	4.00	15	40	1.7	8.0	12.0	0.050	0.09	0.125	S7
SMD250	2.50	5.00	15	40	1.7	8.0	25.0	0.035	0.06	0.085	S7
Telecom Surface-mount*											
New TSL250-080	0.08	0.16	250**	3.0	1.0	1.0	1.8	5.0	11.0	20.0***	S7
TS250-130	0.13	0.26	250** 650	3.0 1.1	3.0	1.0	2.5	6.5	12.0	20.0	S8
New TSV250-130	0.13	0.26	250**	3.0	3.0	1.0	3.0	4.0	7.0	12.0***	S10
TS600-170	0.17	0.40	600**	3.0	2.5	1.0	21.0	4.0	9.0	18.0	S9
TS600-200-RA	0.20	0.40	600**	3.0	2.5	1.0	21.0	4.0	7.5	13.5	S9

*These products are intended for telecom applications. Time-to-trip is typical, please see Telecom and Networking section for details.

**RMS max. voltage.

***$R_{1\ MAX}$ is measured one hour post-trip or 24 hours post-reflow at 20°C.

I_H = Hold current: maximum current device will pass without interruption in 20°C still air.

I_T = Trip current: minimum current that will switch the device from low resistance to high resistance in 20°C still air.

V_{MAX} = Maximum voltage device can withstand without damage at rated current.

I_{MAX} = Maximum fault current device can withstand without damage at rated voltage.

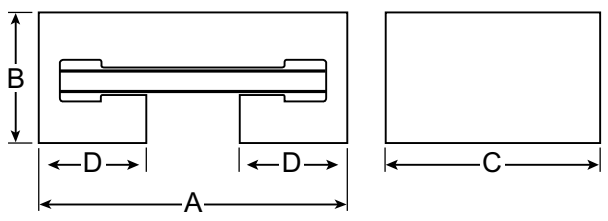
P_D = Power dissipated from device when in the tripped state in 20°C still air.

$R_{1\ MAX}$ is measured one hour post reflow.

R_{TYP} = Typical resistance of device as supplied at 20°C unless otherwise specified.

Figures S2–S10. Physical Description for Dimensions for Surface-mount Devices

Figures S2



Figures S3

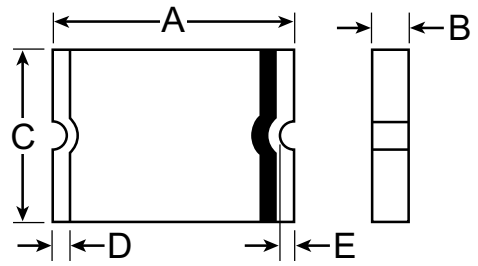


Figure S4

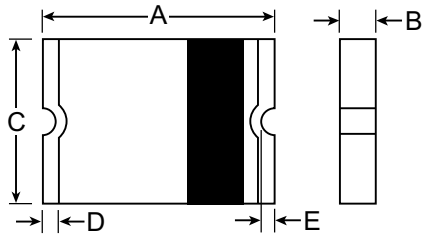
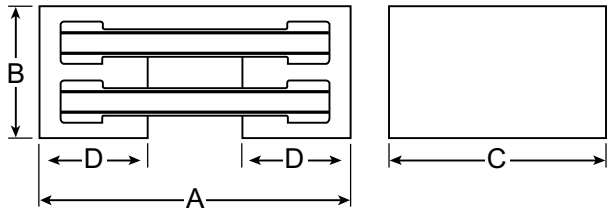
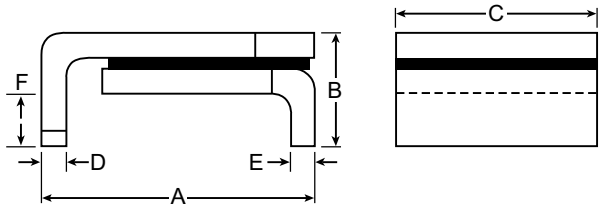


Figure S5



Figures S6



Figures S7

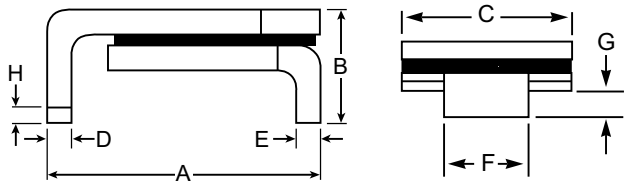


Figure S8

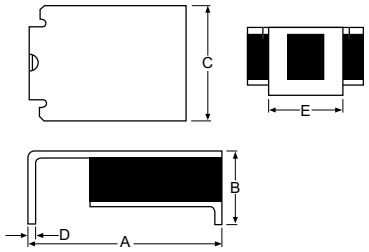


Figure S9

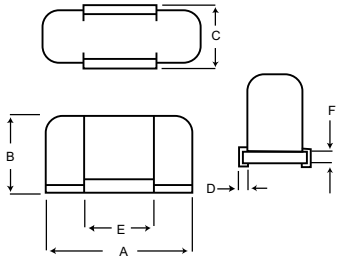


Figure S10

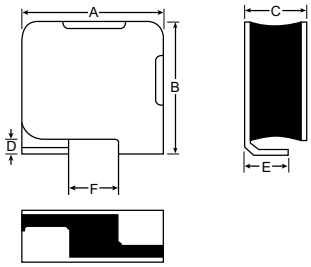


Table S4. Dimensions for Surface-mount Devices in Millimeters (Inches)

Part Number	Dimension A Min.	A Max.	B Min.	B Max.	C Min.	C Max.	D Min.	D Max.	E Min.	E Max.	F Min.	F Max.	G Min	G Max.	H Min.	Figures
nanoSMD																
nanoSMDM012	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM016	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM050	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM050F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM075	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM075F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM100	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDM100F	3.0 (0.118)	3.4 (0.134)	0.8 (0.032)	1.2 (0.047)	1.4 (0.055)	1.8 (0.071)	0.75 (0.030)	1.05 (0.041)								S2
nanoSMDC150	3.0 (0.118)	3.4 (0.134)	0.85 (0.033)	1.4 (0.055)	1.37 (0.054)	1.9 (0.075)	0.25 (0.010)		0.127 (0.005)							S3
microSMD																
microSMD005	3.00 (0.118)	3.43 (0.135)	0.50 (0.019)	0.85 (0.034)	2.35 (0.092)	2.80 (0.110)	0.25 (0.010)		0.20 (0.008)							S4
microSMD010	3.00 (0.118)	3.43 (0.135)	0.50 (0.019)	0.85 (0.034)	2.35 (0.092)	2.80 (0.110)	0.25 (0.010)		0.20 (0.008)							S4
microSMD035	3.00 (0.118)	3.43 (0.135)	0.38 (0.015)	0.62 (0.025)	2.35 (0.092)	2.80 (0.110)	0.30 (0.012)		0.25 (0.010)							S3
microSMD050	3.00 (0.118)	3.43 (0.135)	0.38 (0.015)	0.62 (0.025)	2.35 (0.092)	2.80 (0.110)	0.30 (0.012)		0.25 (0.010)							S3
microSMD075	3.00 (0.118)	3.43 (0.135)	0.38 (0.015)	0.62 (0.025)	2.35 (0.092)	2.80 (0.110)	0.30 (0.012)		0.25 (0.010)							S3
microSMD110	3.00 (0.118)	3.43 (0.135)	0.28 (0.011)	0.48 (0.019)	2.35 (0.092)	2.80 (0.110)	0.30 (0.012)		0.25 (0.010)							S3
microSMD150	3.00 (0.118)	3.43 (0.135)	0.51 (0.020)	1.22 (0.048)	2.35 (0.092)	2.80 (0.110)	0.30 (0.012)		0.25 (0.010)							S3
miniSMD																
miniSMDC014	4.37 (0.172)	4.73 (0.186)	0.635 (0.025)	0.89 (0.035)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)	0.50 (0.020)						S3
miniSMDC020	4.37 (0.172)	4.73 (0.186)	0.635 (0.025)	0.89 (0.035)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)	0.50 (0.020)						S3
miniSMDC050	4.37 (0.172)	4.73 (0.186)	0.38 (0.015)	0.62 (0.025)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)	0.50 (0.020)						S3
miniSMDC075	4.37 (0.172)	4.73 (0.186)	0.38 (0.015)	0.62 (0.025)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)	0.50 (0.020)						S3
miniSMDM075	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S2
miniSMDM075/24	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDC110	4.37 (0.172)	4.73 (0.186)	0.38 (0.015)	0.62 (0.025)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)	0.50 (0.020)						S3
miniSMDM110	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S2
miniSMDM110/16	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDM110F/16	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDC125	4.37 (0.172)	4.73 (0.186)	0.28 (0.011)	0.48 (0.019)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)		0.20 (0.008)	0.50 (0.020)						S3
miniSMDC150	4.37 (0.172)	4.73 (0.186)	0.28 (0.011)	0.48 (0.019)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)		0.20 (0.008)	0.50 (0.020)						S3
miniSMDC160F	4.37 (0.172)	4.73 (0.186)	0.28 (0.011)	0.48 (0.019)	3.07 (0.121)	3.41 (0.134)	0.25 (0.010)		0.20 (0.008)	0.50 (0.020)						S3
miniSMDM160	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDM160F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDC200	4.37 (0.172)	4.73 (0.186)	0.51 (0.020)	1.22 (0.048)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)							S3

Table S4. Dimensions for Surface-mount Devices in Millimeters (Inches) *continued*

Part Number	Dimension A Min.	A Max.	B Min.	B Max.	C Min.	C Max.	D Min.	D Max.	E Min.	E Max.	F Min.	F Max.	G Min	G Max.	H Min.	Figures
miniSMD, *continued*																
miniSMDM200	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDM200F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDC260	4.37 (0.172)	4.73 (0.186)	0.76 (0.030)	1.25 (0.050)	3.07 (0.121)	3.41 (0.134)	0.30 (0.012)		0.25 (0.010)							S3
miniSMDM260	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDM260F	4.35 (0.172)	4.75 (0.187)	1.75 (0.069)	2.00 (0.079)	3.05 (0.120)	3.60 (0.142)	1.4 (0.055)	1.7 (0.067)								S5
miniSMDE																
miniSMDE190	11.15 (0.439)	11.51 (0.453)	0.33 (0.013)	0.53 (0.021)	4.83 (0.190)	5.33 (0.210)	0.51 (0.020)	1.02 (0.040)								S3
midSMD																
SMD030-2018	4.72 (0.186)	5.44 (0.214)		1.78 (0.070)	4.22 (0.166)	4.93 (0.194)	0.25 (0.010)	0.36 (0.014)	0.25 (0.010)	0.36 (0.014)	0.30 (0.012)	0.46 (0.018)				S6
SMD100-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.93 (0.194)	0.25 (0.010)	0.36 (0.014)	0.25 (0.010)	0.36 (0.014)	0.30 (0.012)	0.46 (0.018)				S6
SMD150-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.93 (0.194)	0.25 (0.010)	0.36 (0.014)	0.25 (0.010)	0.36 (0.014)	0.30 (0.012)	0.46 (0.018)				S6
SMD200-2018	4.72 (0.186)	5.44 (0.214)		1.52 (0.060)	4.22 (0.166)	4.93 (0.194)	0.25 (0.010)	0.36 (0.014)	0.25 (0.010)	0.36 (0.014)	0.30 (0.012)	0.46 (0.018)				S6
SMD																
SMD030	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD050	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.20 (0.008)	0.30 (0.012)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD075	6.73 (0.265)	7.98 (0.314)		3.18 (0.125)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD100	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD100/33	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD125	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD260	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD260-RB	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD300	6.73 (0.265)	7.98 (0.314)		3.00 (0.118)	4.8 (0.19)	5.44 (0.214)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	2.16 (0.085)	2.41 (0.095)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD2																
SMD150	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD150/33	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMDH160	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD185	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD200	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
SMD250	8.00 (0.315)	9.40 (0.370)		3.00 (0.118)	6.0 (0.24)	6.71 (0.264)	0.56 (0.022)	0.71 (0.028)	0.56 (0.022)	0.71 (0.028)	3.68 (0.145)	3.94 (0.155)	0.66 (0.026)	1.37 (0.054)	0.43 (0.017)	S7
Telecom Surface-mount																
TSL250-080	6.7 (0.265)	7.9 (0.310)	2.7 (0.11)	3.7 (0.145)	4.8 (0.19)	5.3 (0.21)	0.20 (0.008)	0.38 (0.015)	0.20 (0.008)	0.3 (0.012)	2.5 (0.100)	3.1 (0.120)				
TS250-130	8.5 (0.335)	9.4 (0.370)		3.4 (0.135)		7.4 (0.290)	0.3 (0.011)		3.8 (0.0150)							
TSV250-130		6.1 (0.240)		6.9 (0.270)		3.2 (0.126)	0.56 (0.022)			1.9 (0.075)	1.6 (0.065)	2.31 (0.091)				
TS600-170	18.2 (0.720)	19.4 (0.765)	11.5 (0.455)	12.3 (0.485)	7.21 (0.325)	8.3 (0.325)	1.61 (0.065)	2.4 (0.095)	9.9 (0.390)	10.4 (0.410)	1.5 (0.060)	2.3 (0.090)				
TS600-170	18.2 (0.720)	19.4 (0.765)	11.5 (0.455)	12.3 (0.485)	7.21 (0.325)	8.3 (0.325)	1.61 (0.065)	2.4 (0.095)	9.9 (0.390)	10.4 (0.410)	1.5 (0.060)	2.3 (0.090)				

Figures S11–S18. Typical Time-to-trip Curves at 20°C for Surface-mount Devices

Telecom and Networking Devices

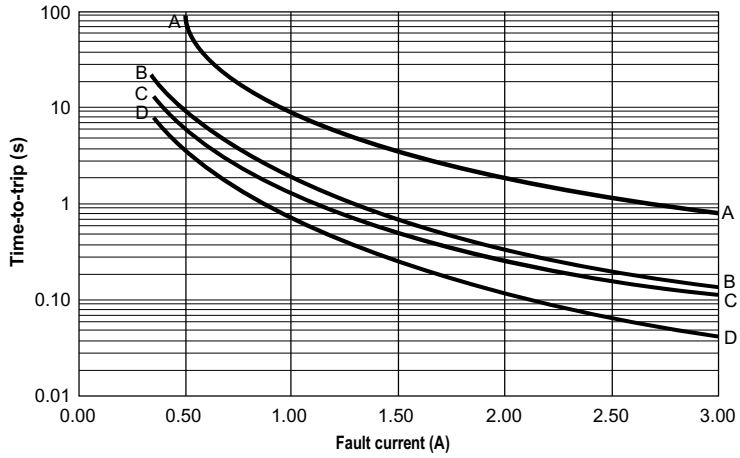
A = TS600-170/TS600-200

B = TS250-130

C = TSV250-130

D = TSL250-080

Figure S11



nanoSMD (data at 25°C)

A = nanoSMDM012

B = nanoSMDM016

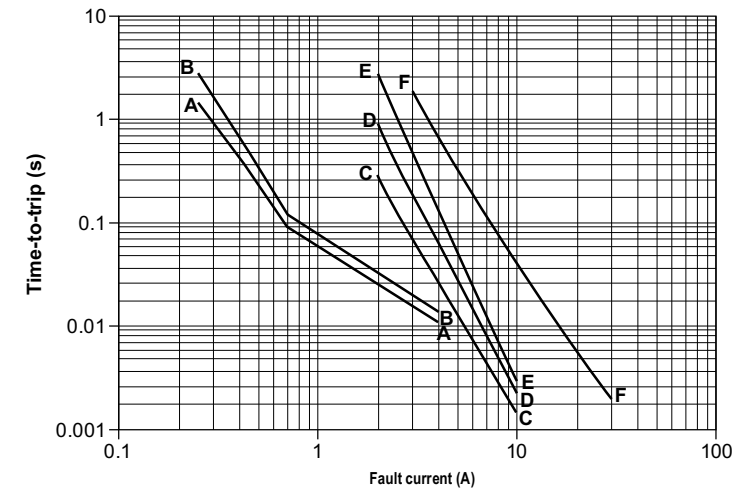
C = nanoSMDM050, nanoSMDM050F

D = nanoSMDM075, nanoSMDM075F

E = nanoSMDM100, nanoSMDM100F

F = nanoSMDC150

Figure S12



microSMD

A = microSMD005

B = microSMD010

C = microSMD035

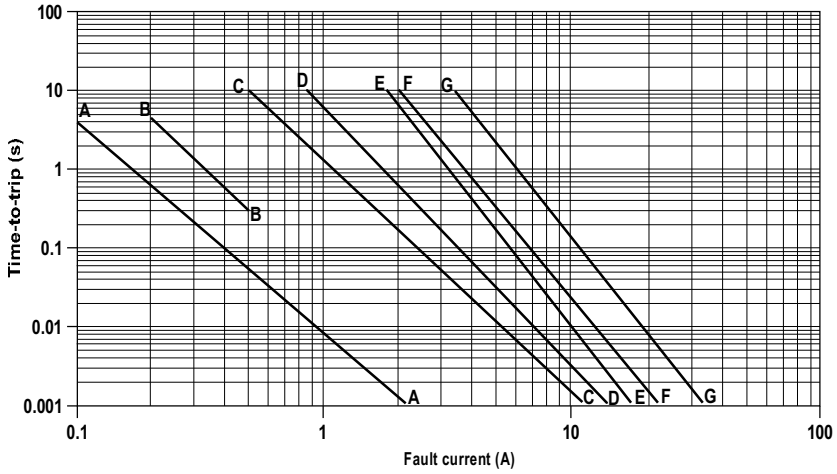
D = microSMD050

E = microSMD075

F = microSMD110

G = microSMD150

Figure S13



Figures S11–S18. Typical Time-to-trip Curves at 20°C for Surface-mount Devices *continued*

miniSMDM (data at 25°C)

A = miniSMDM075

B = miniSMDM075/24

C = miniSMDM110

D = miniSMDM110/16, miniSMDM110F/16

E = miniSMDM160, miniSMDM160F

F = miniSMDM200, miniSMDM200F

G = miniSMDM260, miniSMDM260F

miniSMDC and miniSMDE

A = miniSMDC014

B = miniSMDC020

C = miniSMDC050

D = miniSMDC075

E = miniSMDC110

F = miniSMDC125

G = miniSMDC150

H = miniSMDC160F

I = miniSMDC200

J = miniSMDE190

K = miniSMDC260

midSMD

A = SMD030-2018

B = SMD100-2018

C = SMD150-2018

D = SMD200-2018

Figure S14

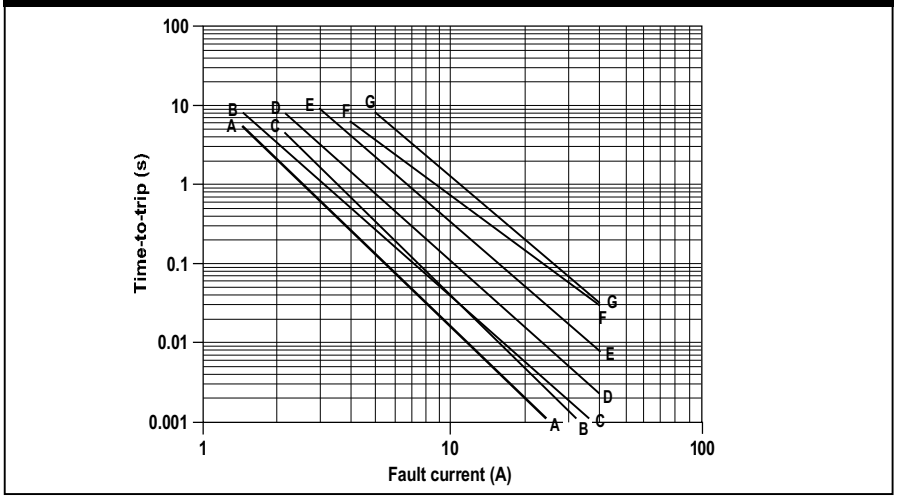


Figure S15

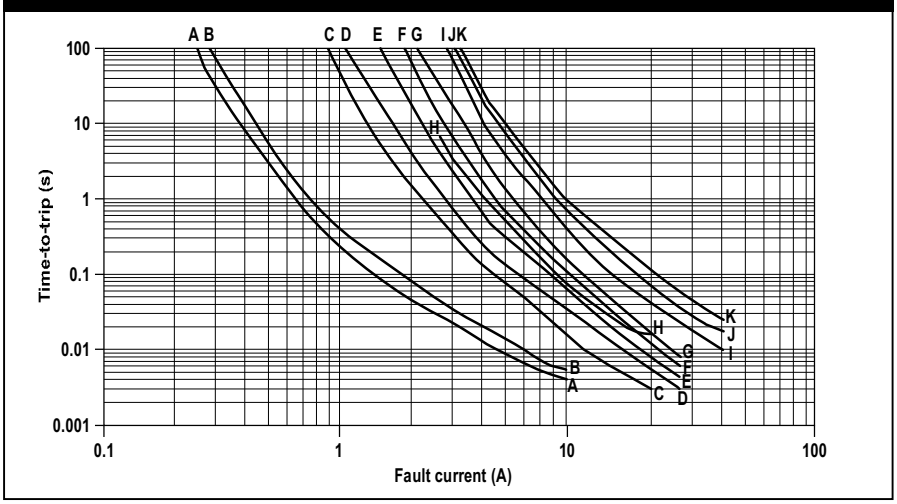
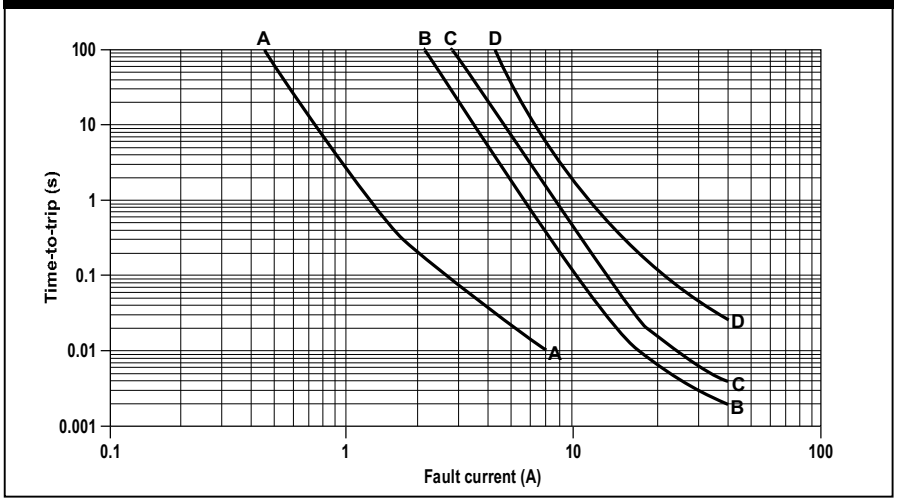


Figure S16



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Figures S11–S18. Typical Time-to-Trip Curves at 20°C for Surface-mount Devices

SMD

A = SMD030

B = SMD050

C = SMD075

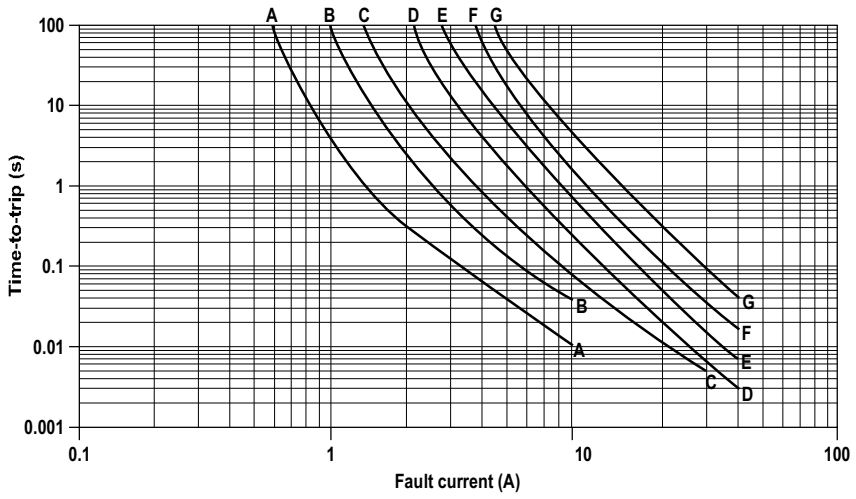
D = SMD100 and 100/33

E = SMD125

F = SMD260 and SMD260RB

G = SMD300

Figure S17



SMD2

A = SMD150 and 150/33

B = SMDH160

C = SMD185

D = SMD200

E = SMD250

Figure S18

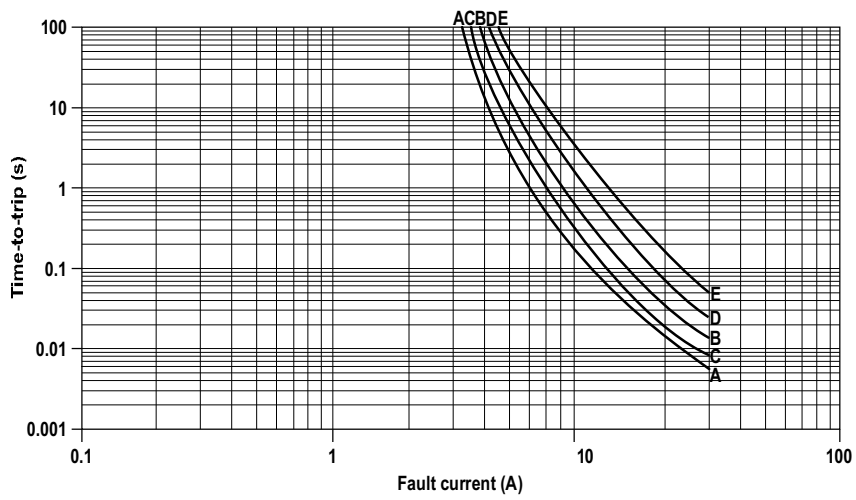


Table S5. Physical Characteristics and Environmental Specifications for Surface-mount Devices Operating temperature range -40°C to 85°C, -40°C to 125°C for SMDH160

Physical Characteristics

Terminal pad material	Solder-plated copper for nanoSMDC, microSMD, and miniSMDC series Gold plating for nanoSMDM, and miniSMDM series 98% tin for SMD series
Soldering characteristics	ANSI/J-STD-002 Category 3 for nanoSMDC, nanoSMDM, microSMD, miniSMDC, and miniSMDM series ANSI/J-STD-002 Category 1 for SMD series
Solder heat withstand	per IEC-STD 68-2-20, Test Tb, Section 5, Method 1A
Flammability resistance	per IEC 695-2-2 Needle Flame Test for 20 sec.
Recommended storage conditions	40°C max, 70% R.H. max; devices may not meet specified ratings if storage conditions are exceeded.

Environmental Specifications

Test	Test Method	Conditions	Resistance Change
Passive aging	Raychem PS300, Section 5.3.2	60°C, 1000 hours	±3% typical
		85°C, 1000 hours	±5% typical
Humidity aging	Raychem PS300, Section 5.3.1	85°C, 85% RH, 100 hours	±1.2% typical
Thermal shock	MIL-STD-202, Method 107G	85°C, -40°C (20 times)	-33% typical
		125°C, -55°C (10 times)	-33% typical
Vibration	MIL-STD-883C	per MIL-STD-883C	No change
Solvent resistance	Raychem PS300, Section 5.2.2	Freon	No change
		Trichloroethane	No change
		Hydrocarbons	No change

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Agency Recognition for Surface-mount Devices*

UL	File # E74889 for all surface-mount devices
CSA	File # CA78165 for SMD/miniSMDC/miniSMDM/microSMD/nanoSMDC/nanoSMDM series
TÜV	Certificate # R9872048 for microSMD/miniSMDC/miniSMDM series Certificate # R2172061 for nanoSMDM/nanoSMDC series Certificate # R9872049 for SMD series

*Refer to Telecom and Networking section for agency recognition on Telecom and Networking Surface Mount Devices

Table S6. Packaging and Marking Information for Surface-mount Devices

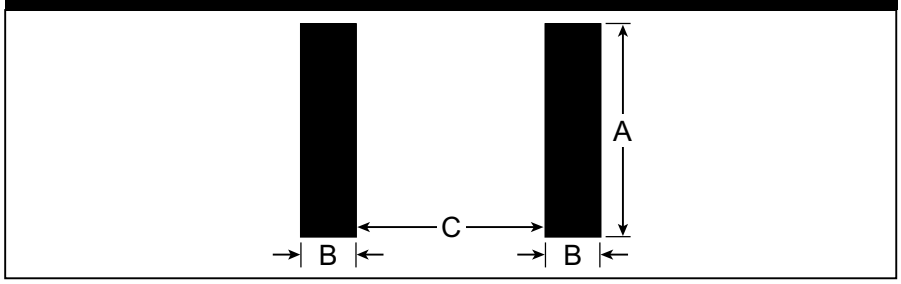
Part Number	Tape & Reel Quantity	Standard Package	Part Marking	Recommended Pad Layout Figures [mm (In.)] Dimension A (Nom.)	Dimension B (Nom.)	Dimension C (Nom.)	Agency Recognition
nanoSMD							
nanoSMDM012	3,000	15,000	**012**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM016	3,000	15,000	**016**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM050	3,000	15,000	**050**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM050F	3,000	15,000	**05F**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM075	3,000	15,000	**075**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM075F	3,000	15,000	**07F**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM100	3,000	15,000	**100**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDM100F	3,000	15,000	**10F**	1.80 (0.071)	1.00 (0.039)	1.5 (0.059)	UL, CSA, TÜV
nanoSMDC150	3,000	15,000	**J**	1.60 (0.063)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD							
microSMD005	4,000	20,000	**05**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD010	4,000	20,000	**10**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD035	4,000	20,000	**3**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD050	4,000	20,000	**50**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD075	4,000	20,000	**75**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD110	4,000	20,000	**11**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
microSMD150	4,000	20,000	**15**	2.50 (0.098)	1.00 (0.039)	2.00 (0.079)	UL, CSA, TÜV
miniSMD							
miniSMDC014	2,000	10,000	**14**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDC020	2,000	10,000	**2**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, TÜV
miniSMDC050	2,000	10,000	**5**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDC075	2,000	10,000	**7**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM075	3,000	15,000	**075**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM075/24	3,000	15,000	**075G**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDC110	2,000	10,000	**1**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM110	3,000	15,000	**110**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM110/16	3,000	15,000	**110G**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM110F/16	3,000	15,000	**11FG**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDC125	2,000	10,000	**12**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDC150	2,000	10,000	**15**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDC160F	2,000	10,000	**16**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM160	3,000	15,000	**160**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM160F	3,000	15,000	**160F**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDC200	2,000	10,000	**20**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM200	3,000	15,000	**200**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM200F	3,000	15,000	**200F**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDC260	1,500	7,500	**26**	3.15 (0.124)	1.78 (0.070)	3.45 (0.136)	UL, CSA, TÜV
miniSMDM260	3,000	15,000	**260**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
miniSMDM260F	3,000	15,000	**260F**	3.20 (0.126)	1.50 (0.059)	2.50 (0.098)	UL, CSA, TÜV
midSMD							
SMD030-2018	4,000	20,000	**A03**	4.6 (0.18)	1.50 (0.059)	3.4 (0.134)	UL
SMD100-2018	4,000	20,000	**A10**	4.6 (0.18)	1.50 (0.059)	3.4 (0.134)	UL, CSA, TÜV
SMD150-2018	4,000	20,000	**A15**	4.6 (0.18)	1.50 (0.059)	3.4 (0.134)	UL, CSA, TÜV
SMD200-2018	4,000	20,000	**A20**	4.6 (0.18)	1.50 (0.059)	3.4 (0.134)	UL, CSA, TÜV
SMD							
SMD030	2,000	10,000	**030**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD050	2,000	10,000	**050**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD075	2,000	10,000	**075**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD100	2,000	10,000	**100**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV

Table S6. Packaging and Marking Information for Surface-mount Devices *continued*

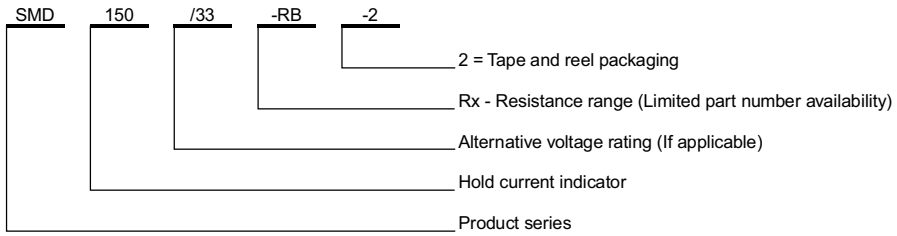
Part Number	Tape & Reel Quantity	Standard Package	Part Marking	Recommended Pad Layout Figures [mm (In.)] Dimension A (Nom.)	Dimension B (Nom.)	Dimension C (Nom.)	Agency Recognition
SMD *continued*							
SMD100/33	2,000	10,000	**103**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD125	2,000	10,000	**125**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD260	2,000	10,000	**260**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD260-RB	2,000	10,000	**260**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD300	2,000	10,000	**300**	3.1 (0.12)	2.3 (0.09)	5.1 (0.201)	UL, CSA, TÜV
SMD2							
SMD150	1,500	7,500	**150**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD150/33	1,500	7,500	**153**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMDH160	1,500	7,500	**160**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	
SMD185	1,500	7,500	**185**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD200	1,500	7,500	**200**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
SMD250	1,500	7,500	**250**	4.6 (0.18)	2.3 (0.09)	6.1 (0.240)	UL, CSA, TÜV
miniSMDE							
miniSMDE190	5,000	20,000	**19**	4.75 (0.187)	1.45 (0.057)	9.57 (0.377)	UL, CSA, TÜV
Telecom Surface-mount							
TSL250-080	1,500	7,500	**T08**	3.6 (0.14)	1.8 (0.07)	5.5 (0.22)	UL, CSA, TÜV
TS250-130	1,500	7,500	**T13**	4.6 (0.18)	1.8 (0.07)	6.1 (0.24)	UL, CSA, TÜV
TSV250-130	1,200	6,000	**T13V**	*	*	*	UL, CSA, TÜV
TS600-170	300	900	**T20**	9.91 (0.390)	3.30 (0.130)	3.35 (0.132)	UL, CSA
TS600-200-RA	300	900	**T20**	9.91 (0.390)	3.30 (0.130)	3.35 (0.132)	UL, CSA

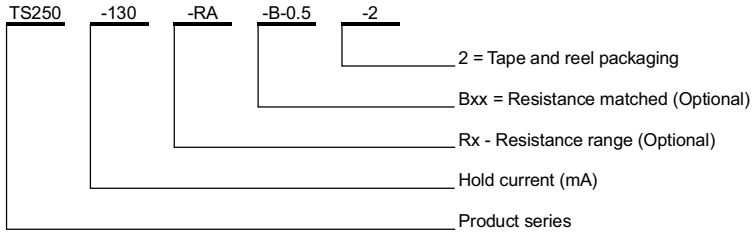
*For TSV250-130 pad layout, see Telecom and Networking Section

Figure S19. Recommended Pad Layout



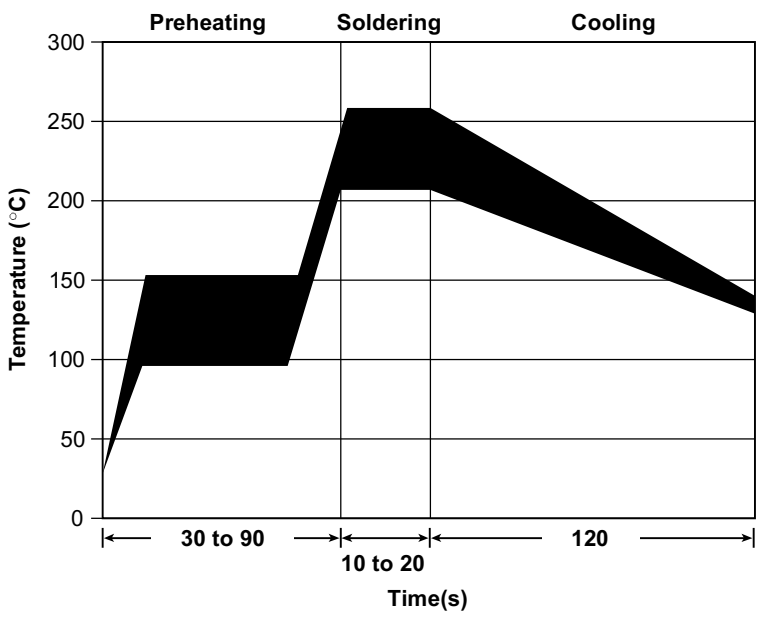
Part Numbering System





Solder Reflow and Rework Recommendations for Surface-mount Devices

Figure S20



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Caution:

- If reflow temperatures exceed the recommended profile, devices may not meet the performance specifications.

Solder Reflow

- Recommended reflow methods: IR, Vapor phase, and hot air oven.
- The following product series are not designed to be wave soldered to circuit boards:
  - nanoSMDM
  - miniSMDM
  - midSMD
  - SMD
  - SMD2
  - TS
- The following product series are designed to be wave soldered to circuit boards:
  - nanoSMDC
  - microSMD
  - miniSMDC, miniSMDE
- Recommended maximum paste thickness for the microSMD, miniSMDC, and miniSMDE devices is 0.25 mm (10mils).
- Devices can be cleaned using standard methods and solvents.

Rework

- Use standard industry practices for the nanoSMDC, nanoSMDM, microSMD, miniSMDC, miniSMDM, and miniSMDE devices.
- For SMD and midSMD series and all TS devices rework should be confined to removal of the installed product and replacement with a fresh device.

Table S7. Tape and Reel Specifications for Surface-mount Devices (in Millimeters)

	nanoSMDC nanoSMDM	microSMD	miniSMDC miniSMDM	miniSMDE190	midSMD	SMD	SMD2
	EIA 481-1	EIA 481-1	EIA 481-1	EIA 481-2	EIA 481-2	EIA 481-2	EIA 481-2
W	8.0 ± 0.30	8.0 ± 0.30	12.0 ± 0.30	24.0 ± 0.30	16.0 ± 0.30	16.0 ± 0.30	16.0 ± 0.30
P_0	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
P_1	4.0 ± 0.10	4.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	8.0 ± 0.10	12.0 ± 0.10
P_2	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.05	2.0 ± 0.10	2.0 ± 0.10	2.0 ± 0.10	2.0 ± 0.10
A_0	Table S7a	2.95 ± 0.10	Table S7b	5.70 ± 0.10	5.11 ± 0.15	5.6 ± 0.23	6.9 ±0.23
B_0	Table S7a	3.58 ± 0.10	Table S7b	11.90 ± 0.10	5.6 ± 0.23	8.1 ± 0.15	9.6 ± 0.15
B_1 max.	4.35	4.35	8.2**	20.1	12.1	12.1	12.1
D_0	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00	1.5 + 0.10/ -.00
F	3.5 ± 0.05	3.5 ± 0.05	5.5 ± 0.05	11.5 ± 0.10	7.5 ± 0.10	7.5 ± 0.10	7.5 ± 0.10
E_1	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
E_2 min.	6.25	6.25	10.25	22.25	14.25	14.25	14.25
T max.	0.6	0.6	0.6	0.6	0.6	0.6	0.6
T_1 max.	0.1	0.1	0.1	0.1	0.1	0.1	0.1
K_0	Table S7a	0.80 ± 0.10*	Table S7b	0.95 ± 0.10	1.8 ± 0.15	3.2 ± 0.15	3.4 ± 0.15
Leader min.	390***	390	390***	400	400	400	400
Trailer min.	160***	160	160***	160	160	160	160

*1.1±0.05 for microSMD150
**5.9 for miniSMDM
***200 for nanoSMDM, miniSMDM

Table S7a

	nanoSMDC150	nanoSMDM
A_0	2.3 ± 0.10	1.88 ± 0.10
B_0	3.5 ± 0.10	3.5 ± 0.10
K_0	1.45 ± 0.10	1.4 ± 0.10

Table S7b

	miniSMDC	miniSMDC260	miniSMDM
A_0	3.5 ± 0.23	3.7 ± 0.10	3.5 ± 0.23
B_0	5.1 ± 0.15	4.9 ± 0.10	5.1 ± 0.15
K_0	0.9 ± 0.15	1.4 ± 0.10	2.3 ± 0.15

Table S7c. Reel Dimensions for Surface-mount Devices

	nanoSMDC nanoSMDM	microSMD	miniSMDC	miniSMDM	miniSMDE190	midSMD	SMD	SMD2
A max.	185	185	185	340	609	609	609	609
N min.	50	50	50	50	60	50	50	50
W_1	8.5 + 1.5/-.00	8.4 + 1.5/-.00	12.4 + 2.0/-.00	12.4 + 2.0/-.00	24.4 + 2.0/-.00	16.4 + 2.0/-.00	16.4 + 2.0/-.00	16.4 + 2.0/-.00
W_2 max.	14.4	14.4	18.4	18.4	30.4	22.4	22.4	22.4

Figure S21. EIA Taped Component Dimensions

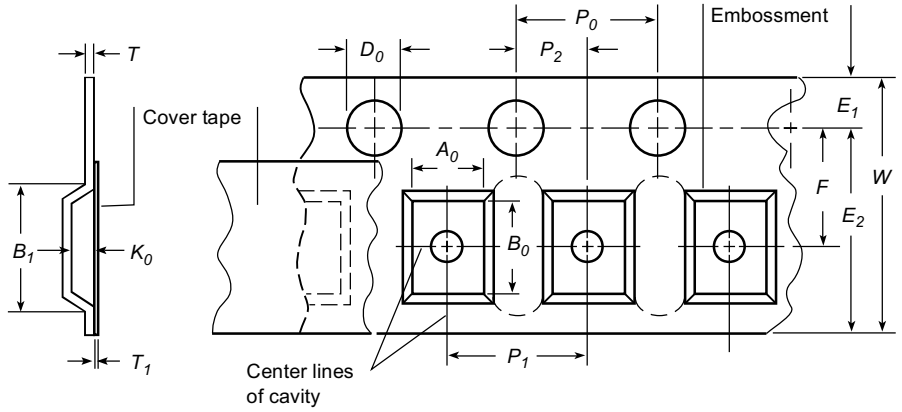
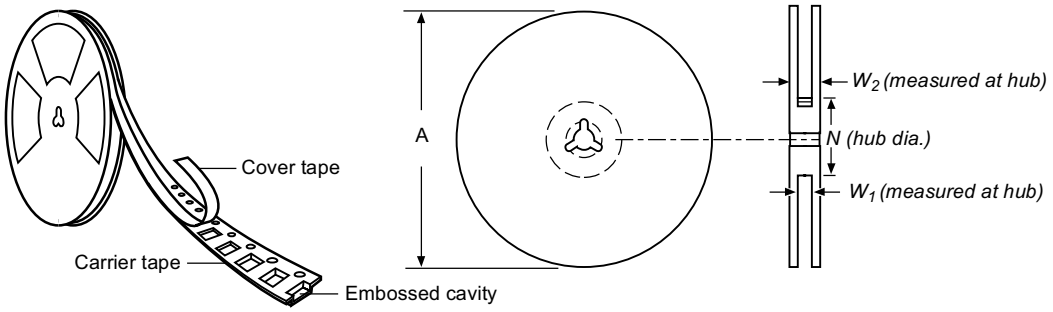


Figure S22. EIA Reel Dimensions



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WARNING:

- Operation beyond the maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- The devices are intended for protection against occasional overcurrent or overtemperature fault conditions and should not be used when repeated fault conditions or prolonged trip events are anticipated.
- Contamination of the PPTC material with certain silicon based oils or some aggressive solvents can adversely impact the perfomance of the devices.
- Device performance can be impacted negatively if devices are handled in a manner inconsistent with recommended electronic, thermal, and mechanical procedures for electronic components.
- Operation in circuits with a large inductance can generate a circuit voltage ($L\,{}^{di}/_{dt}$) above the rated voltage of the PolySwitch resettable device.