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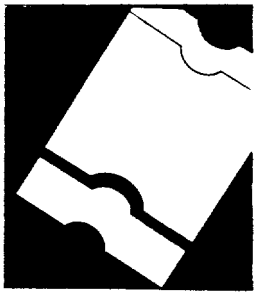
miniSMD Selection Guide and Product Data



This section has two parts:

- **A Selection Guide that walks you through the process of selecting the correct miniSMD device for a circuit.**
- **Product Data that outlines electrical characteristics, termination pad characteristics, agency recognition, environmental specifications, recommended pad layouts, solder reflow/rework information, tape and reel specifications, and ordering information for miniSMD devices..**

miniSMD Selection Guide

Follow these seven steps to select a PolySwitch miniSMD device for a circuit:

1. Define the operating parameters for the circuit. These include:
   - Maximum ambient operating temperature
   - Normal operating current
   - Maximum operating voltage
   - Maximum interrupt current
2. Select the miniSMD device that accommodates the circuit's maximum ambient operating temperature and normal operating current.
3. Compare the miniSMD device's maximum operating voltage and maximum interrupt current with the circuit's to be sure the circuit does not exceed the device ratings.
4. Check the miniSMD device's time-to-trip to be sure it will protect the circuit.
5. Verify that the circuit's ambient operating temperatures are within the miniSMD device's operating temperature range.
6. Verify that the miniSMD device's dimensions fit the application's space considerations.
7. Independently evaluate and test the suitability and performance of the miniSMD device in the application.

1. Define the circuit's operating parameters.

Fill in the following information about the circuit:

Maximum ambient operating temperature _____

Normal operating current _____

Maximum operating voltage _____

Maximum interrupt current _____

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

Look across the top of the table below to find the temperature that most closely matches the circuit's maximum ambient operating temperature. In that column find the value equal to or greater than the circuit's nor mal operating current. Now look to the far left of that row to find the part number for the miniSMD device that will best accommodate the circuit.

The thermal derating curve located on the next page is a normalized representation of the data in the table below.

I_{Hold} versus temperature

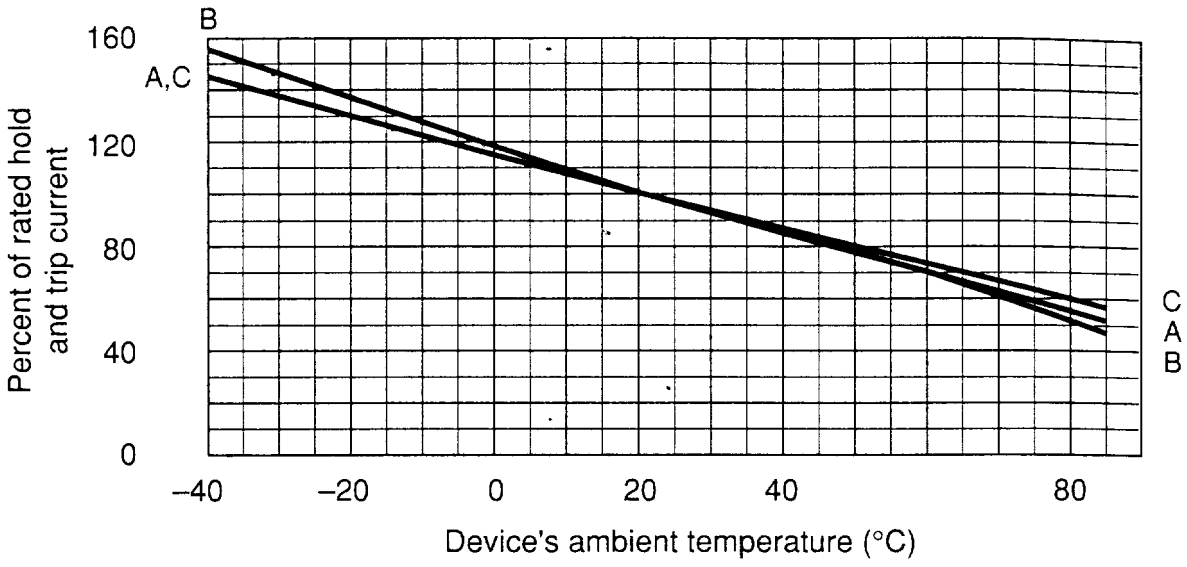
	Part number	Maximum ambient operating temperatures (°C)								
		–40°	–20°	0°	20°	40°	50°	60°	70°	85°
New	miniSMD020	0.29	0.26	0.23	0.20	0.17	0.15	0 14	0.12	0.10
New	miniSMDC035	0.47	0.45	0.40	0.35	0.30	0.28	0.24	0.21	0.18
New	miniSMDC050	0 77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
	miniSMD050	0.77	0.68	0.59	0.50	0.44	0.40	0.37	0.33	0.29
New	miniSMDC075	1.15	1.01	0.88	0.75	0.65	0.60	0.55	0.49	0.43
	miniSMD075	1.15	1.01	0.88	0.75	0.65	0.60	0.55	0.49	0.43
New	miniSMDC110	1.59	1.43	1.26	1.10	0.95	0.87	0.80	0 71	0.60

Thermal derating curve

A= miniSMD020

B= miniSMD050
miniSMDC050
miniSMD075
miniSMDC075

C= miniSMD110
miniSMDC035



3. Compare maximum operating voltages and maximum interrupt currents.

In the first column of the table below, find the part number you selected in Step 1. Look to the right in that row to find the device's maximum operating voltage (V max.) and maximum interrupt current (I max.).

Compare both ratings with the circuit's to be sure the circuit's ratings do not exceed those of the miniSMD device.

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Maximum device voltages and currents

	Part number	V max. (volts)	I max. (amps)
New	miniSMD020	30	10
New	miniSMDC035	6	40
New	miniSMDC050	15	40
	miniSMD050	15	40
New	miniSMDC075	13.2	40
	miniSMD075	13.2	40
New	miniSMDC110	6	40

4. Determine time-to-trip.

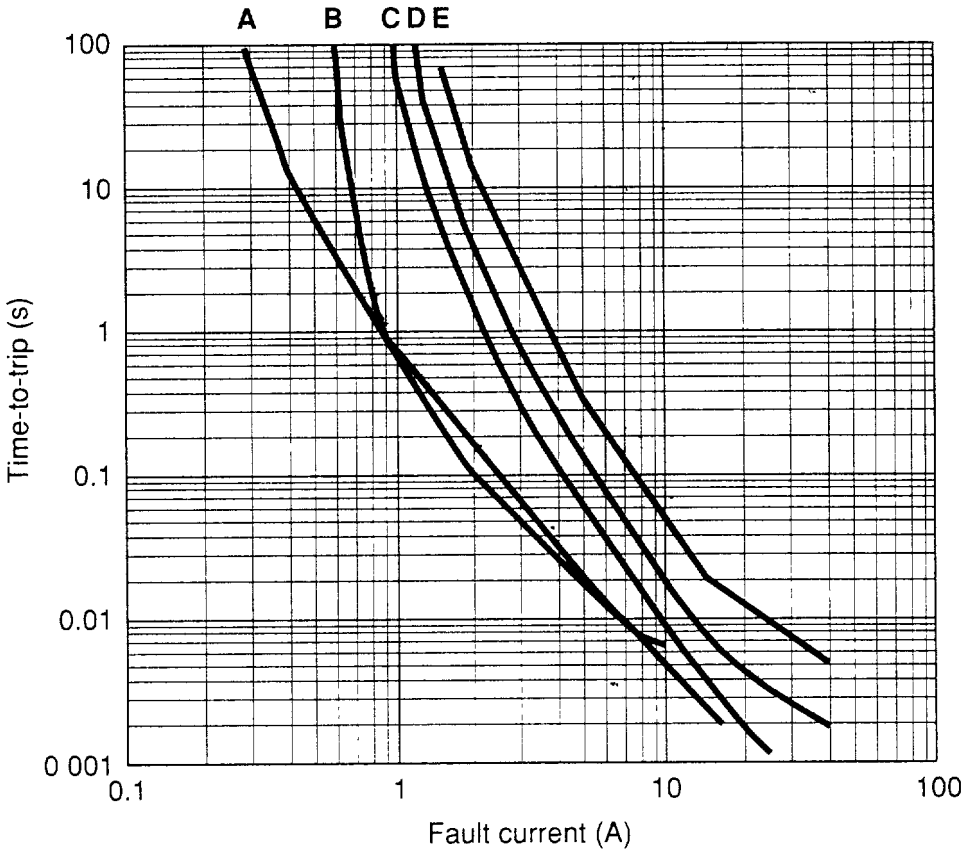
Time-to-trip is the amount of time it takes for a device to switch to a high-resistance state once a fault current has been applied across the device.

Identifying the miniSMD 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.

The chart on the next page shows the typical time-to-trip at 20°C for each PolySwitch miniSMD device. On the chart, find the time-to-trip for the miniSMD device you selected. If the miniSMD device's time-to-trip is too fast or too slow for the circuit, go back to Step 2 and choose an alternate device or refer to the SMD selection guide for an alternate surface-mount device or the RXE and RUE selection guides for radial-leaded products.

Typical time-to-trip at 20°C

A=miniSMD020
B=miniSMDC035
C=miniSMD050
miniSMDC050
D=miniSMD075
miniSMDC075
E=miniSMDC110



5. Verify ambient operating conditions.

Ensure that your application's minimum and maximum ambient temperatures are within the operating temperature range of –40°C and 85°C.

Maximum device surface temperature in the tripped state is 125°C

6. Verify the miniSMD device's dimensions.

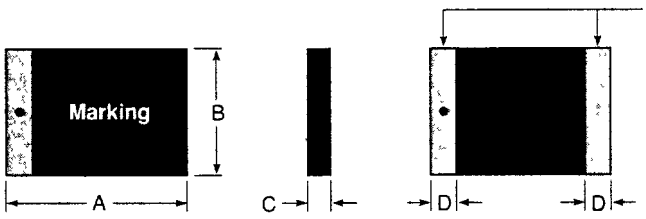
Using dimensions from the table on the next page, compare the dimensions of the miniSMD device you selected with the application's space considerations.

miniSMD product dimensions (millimeters/*inches*)

Part number	Fig.	A min.	A max.	B min.	B max.	C min.	C max.	D min.	E min.	E max.
miniSMD020	1	4.37*(.172)*	4.73*(186)*	3.07*(.121)*	3.41*(.134)*	56*(022)*	81*(.032)*	.65*(025)*		
miniSMDC035*	2	3.00*(118)*	3.43*(135)*	2 35*(.092)*	2.80*(.110)*	38*(.015)*	.62*(.025)*	35*(014)*	.25*(010)*	.50*(.020)*
miniSMDC050*	2	4 37*(172)*	4.73*(.186)*	3.07*(121)*	3.41*(.134)*	.38*(015)*	62*(025)*	.30*(.012)*	25*(010)*	.50*(.020)*
miniSMD050	1	4 37*(.172)*	4.73*(.186)*	3.07*(121)*	3.41*(.134)*	38*(015)*	62*(025)*	65*(.025)*		
miniSMDC075*	2	4.37*(.172)*	4.73*(.186)*	3 07*(.121)*	3 41*(.134)*	38*(015)*	.62*(025)*	.30*(012)*	.25*(010)*	50*(020)*
miniSMD075	1	4 37*(.172)*	4.73*(.186)*	3.07*(.121)*	3.41*(.134)*	.38*(.015)*	.62*(025)*	65*(.025)*		
miniSMDC110*	2	4 37*(.172)*	4.73*(.186)*	3 07*(121)*	3 41*(134)*	38*(.015)*	62*(.025)*	30*(.012)*	25*(010)*	.50*(020)*

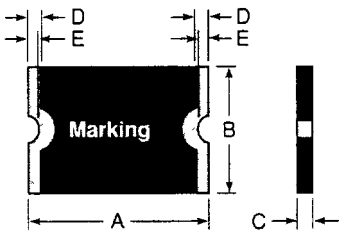
**These devices utilize a castalated termination which enhances the solder joint inspectability when installed on a printed circuit board*

Figure 1



Top View *Side view* *Bottom view*

Figure 2



Top and bottom view *Side view*

miniSMD Product Data

Now that you have selected your miniSMD device, please review the device's characteristics in this section to verify that the device will perform as required.

Electrical characteristics (20°)

	Part number	I_H (A)	I_T (A)	V max. (Vdc)	I max. (A)	P_d Typ. (W)	Maximum time-to-trip (A)	(s)	Resistance R min. (Ω)	R_1 max. (Ω)
New	miniSMD020	0.20	0.40	30	10	0.8	8.0	0.02	0.8	5.0
New	miniSMDC035	0.35	0.70	6.0	40	0.6	8.0	0.10	0.32	1.3
New	miniSMDC050	0.50	1.00	15	40	0.8	8.0	0.15	0.15	1.0
	miniSMD050	0.50	1.00	15	40	0.8	8.0	0.15	0.15	1.0
New	miniSMDC075	0.75	1.50	13.2	40	0.8	8.0	0.2	0.11	0.45
	miniSMD075	0.75	1.50	13.2	40	0.8	8.0	0.2	0.11	0.45
New	miniSMDC110	1.10	2.20	6.0	40	0.8	8.0	0.3	0.04	0.21

I_H = Hold current—maximum current at which the device will not trip at 20°C still air

I_T = Trip current—minimum current at which the device will always trip at 20°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 = Power dissipated from device when in the tripped state in 20°C still air

R_1 max is measured in the nontripped state 1 hour post reflow with reflow conditions of 260°C for 20 sec

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Termination pad characteristics

Termination pad materials	Solder-plated copper
Termination pad solderability	Meets EIA specification RS186-9E, ANSI/J-STD-002 Category 3.

Agency recognition

UL	File # E74889
CSA	File # 78165
TUV	Certificate # R9477354

At the time of this printing miniSMDC035 had not received any agency recognition. Please check with your local sales office to receive agency recognition status.

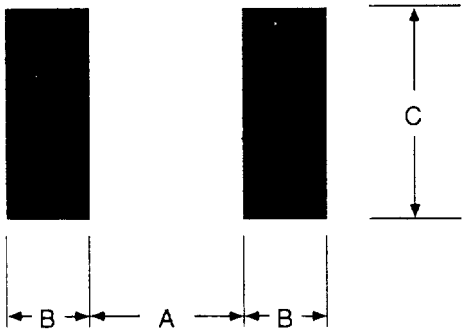
Environmental specifications

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% R.H , 100 days	±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	MIL-STD-883C	No change
Solvent resistance	Raychem PS300, Section 5.2 2, with the following solvents:	Freon	No change
		Trichloroethane	No change

Storage conditions: 40°C max., 70% R H. max ; devices should remain in sealed bags with desiccant prior to use. Devices may not meet specified values if these storage conditions are exceeded.

Recommended pad layouts

The dimensions in the table below provide the recommended pad layout for each miniSMD device.



Pad dimensions (millimeters/*inches*)

Device	A minimum	B nominal	C nominal
New miniSMD020	2.46 (0.097)	1.78 (0.070)	3.09 (0.122)
New miniSMDC035	2.00 (0.079)	1.00 (0.039)	2.5 (0.098)
New miniSMDC050	3.45 (0.136)	1.78 (0.070)	3.15 (0.124)
miniSMD050	2.46 (0.097)	1.78 (0.070)	3.09 (0.122)
New miniSMDC075	3.45 (0.136)	1.78 (0 070)	3.15 (0.124)
miniSMD075	2.46 (0.097)	1.78 (0.070)	3.09 (0.122)
New miniSMDC110	3.45 (0.136)	1.78 (0.070)	3 15 (0.124)

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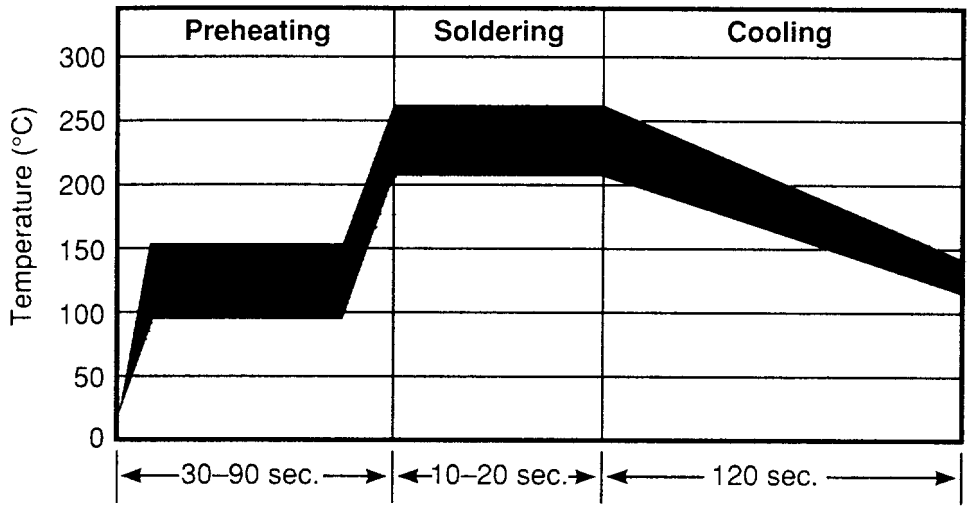
Solder reflow and rework recommendations



Solder reflow

- Recommended reflow methods: IR, vapor phase oven, hot air oven.
- The miniSMD020, miniSMD050, and miniSMD075 devices are not designed to be wave soldered to the bottom side of the board.
- The miniSMDC035, miniSMDC050, miniSMDC075, and miniSMDC110 devices are suitable for use with wave-solder application methods.
- Recommended maximum paste thickness is 0.25 mm (.010 in).
- Devices can be cleaned using standard industry methods and solvents.

Rework

- Use standard industry practices.

CAUTION:

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

miniSMD tape and reel specifications (dimensions in millimeters)

	miniSMD	miniSMDCO35
Governing Specifications	**EIA 481-1**	**EIA 481-1**
W	12 +/- 0.3	8.0 +/- 0.3
P_0	4.0 +/- 0.10	4.0 +/- 0 10
P_1	8.0 +/- 0.10	4.0 +/- 0.10
P_2	2.0 +/- 0.05	2.0 +/- 0.05
A_0	3.5 +/- 0.23	2.8 +/- 0.1
B_0	5.1 +/- 0.15	3.5 +/- 0.1
B_1 max.	5.9	4.35
D_0	1.5 + 0.1, -0	1.5 + 0.1, -0
F	5.5 +/- 0.05	3.5 +/- 0.05
E_1	1.75 +/- 0.10	1.75 +/- 0.10
E_2 min.	10.25	6.25
T max.	0.6	0.6
T_1 max.	0.1	0.1
K_0	0.9 +/- 0.15	1.1 +/- 0.05
Leader min.	390	390
Trailer min.	160	160
Reel Dimensions		
A max.	185	185
N min.	50	50
W_1	12.4 + 2.0, -0	8 4 + 1.50 - 0.0
W_2 max.	18 4	14.4

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Figure 1: EIA Taped Component Dimensions

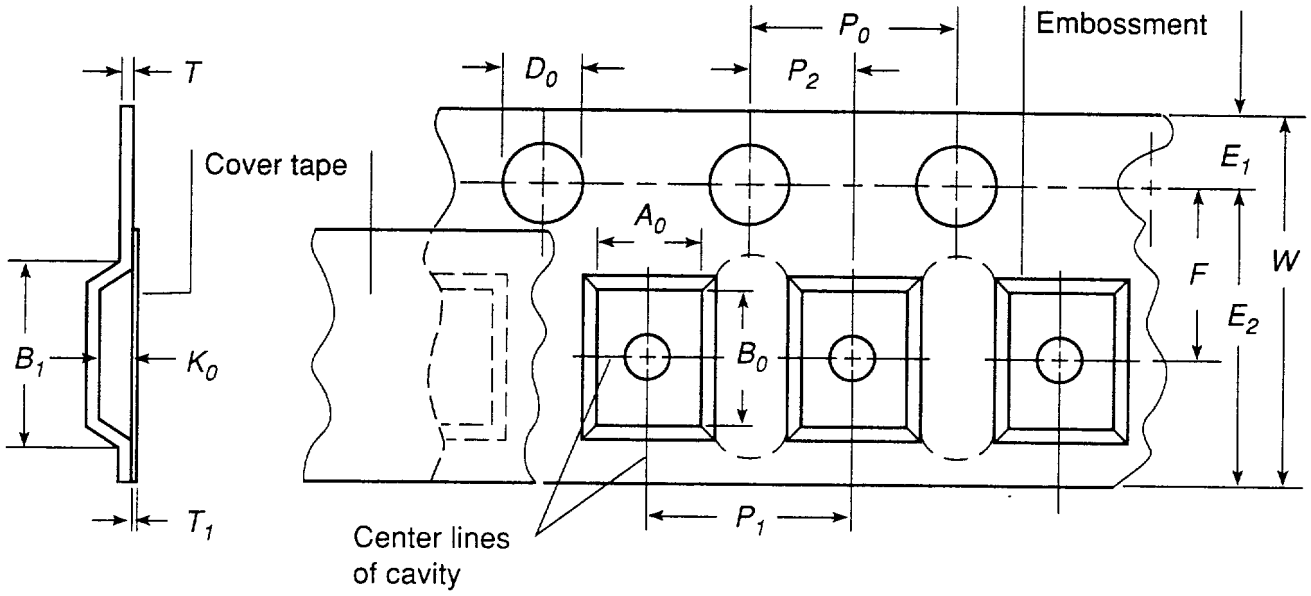

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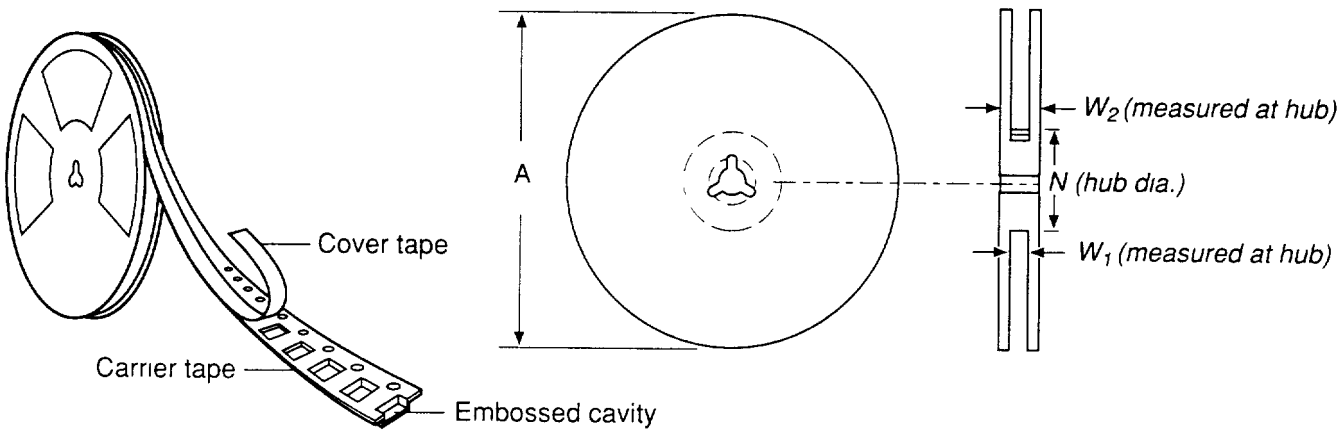
Figure 2: EIA Reel Dimensions



Ordering information

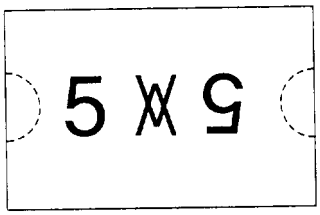
	Product description	Tape and reel quantity	Standard package
New	miniSMD020-2	2000	10000
New	miniSMDC035-2	3000	15000
New	miniSMDC050-2	2000	10000
	miniSMD050-2	1500	7500
New	miniSMDC075-2	2000	10000
	miniSMD075-2	1500	7500
New	miniSMDC110-2	2000	10000

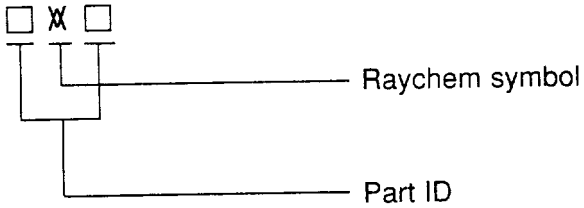
Part numbering system

miniSMDC □□□-2

- Tape and reel packaging
- Current rating
- Improved solder inspectability (optional)

Part marking system





Example

Part description	Part marking
miniSMD020	2 X 2
miniSMDC035	3 X 3
miniSMDC050	5 X 5
miniSMD050	5 X 5
miniSMDC075	7 X 7
miniSMD075	7 X 7
miniSMDC110	1 X 1

⚠ WARNING:

- Operation beyond maximum ratings or improper use may result in device damage and possible electrical arcing and flame.
- These devices are intended for protection against occasional over-current or overtemperature fault conditions, and should not be used when repeated fault conditions are anticipated.