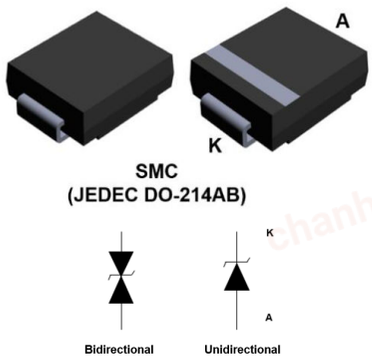
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life.augmented

SMC50JxxA, SMC50JxxCA

Datasheet

5000 W TVS in SMC



Product status link

SMC50J5.0A, SMC50J5.0CA,
SMC50J6.0A, SMC50J6.0CA,
SMC50J6.5A, SMC50J6.5CA,
SMC50J8.5A, SMC50J8.5CA,
SMC50J10A, SMC50J10CA,
SMC50J11A, SMC50J11CA,
SMC50J12A, SMC50J12CA,
SMC50J13A, SMC50J13CA,
SMC50J14A, SMC50J14CA,
SMC50J15A, SMC50J15CA,
SMC50J16A, SMC50J16CA,
SMC50J18A, SMC50J18CA,
SMC50J20A, SMC50J20CA,
SMC50J22A, SMC50J22CA,
SMC50J23A, SMC50J23CA,
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SMC50J30A, SMC50J30CA,
SMC50J31A, SMC50J31CA,
SMC50J33A, SMC50J33CA,
SMC50J36A, SMC50J36CA,
SMC50J40A, SMC50J40CA,
SMC50J48A, SMC50J48CA,
SMC50J58A, SMC50J58CA,
SMC50J64A, SMC50J64CA,
SMC50J70A, SMC50J70CA,
SMC50J85A, SMC50J85CA,
SMC50J100A, SMC50J100CA

Features

- Peak pulse power:
  - 5000 W (10/1000 µs)
  - up to 48 kW (8/20 µs)
- Stand-off voltage range from 5 V to 100 V
- Unidirectional and bidirectional types
- Low leakage current: 0.2 µA at 25 °C
- Operating T_j max: 175 °C
- JEDEC registered package outline
- Lead finishing: matte tin plating

Complies with the following standards

- UL94, V0
- J-STD-020 MSL level 1
- J-STD-002, JESD 22-B102 E3 and MIL-STD-750, method 2026
- JESD-201 class 2 whisker test
- IPC7531 footprint and JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 k V
- IEC 61000-4-2, C = 150 pF, R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMC50J TVS series are designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical overstress such as IEC 61000-4-4 and 5. They are used for surges below 5000 W 10/1000 µs.

This planar technology makes it compatible with high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

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1 Characteristics

Table 1. Absolute maximum ratings (T_{amb} = 25 °C)

Symbol	Parameter		Value	Unit
V_{PP}	Peak pulse voltage	IEC 61000-4-2 (C = 150 pF, R = 330 Ω) Contact discharge Air discharge	 30 30	kV
P_{PP}	Peak pulse power dissipation	T_j initial = T_{amb}	5000	W
T_{stg}	Storage temperature range		-65 to +175	°C
T_j	Operating junction temperature range		-55 to +175	°C
T_L	Maximum lead temperature for soldering during 10 s		260	°C

Figure 1. Electrical characteristics - parameter definitions

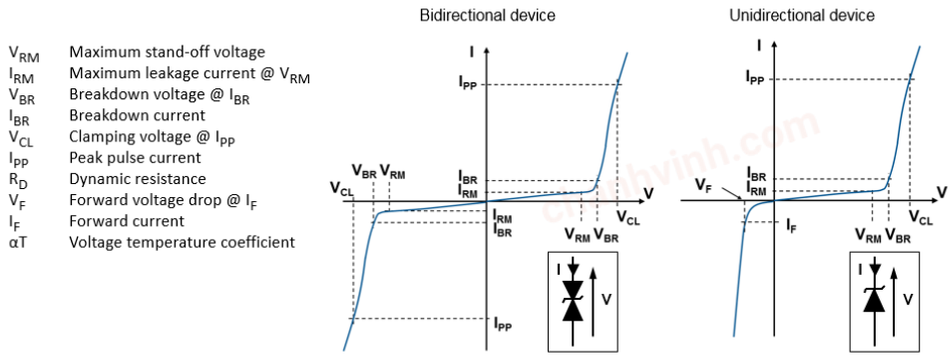
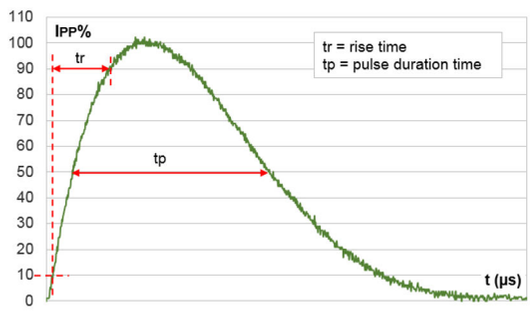


Figure 2. Pulse definition for electrical characteristics



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Table 2. **Electrical characteristics - parameter values (T_{amb} = 25 °C, unless otherwise specified)**

Type	I_{RM} max at V_{RM}			V_{BR} at I_{BR} (1)				10 / 1000 µs			8 / 20µs			αT
								V_{CL}(2)(3)	I_{PP}(4)	R_D	V_{CL}(2)(3)	I_{PP}(4)	R_D	
	25 °C	85°C		Min.	Typ.	Max.		Max.		Max.	Max.		Max.	Max.
	µA	µA	V	V	V	V	mA	V	A	mΩ	V	A	mΩ	10^{-4}/°C
SMC50J5.0A/CA	20	50	5.0	6.4	6.74	7.1	10	9.2	544	3.86	14.4	2136	3.42	5.7
SMC50J6.0A/CA	20	50	6.0	6.7	7.05	7.4	10	10.3	486	5.97	14.7	2042	3.57	5.9
SMC50J6.5A/CA	20	50	6.5	7.2	7.58	8	10	11.2	447	7.16	15.2	1986	3.63	6.1
SMC50J8.5A/CA	20	50	8.5	9.4	9.9	10.4	1	14.4	348	11.5	18.6	1710	4.80	7.3
SMC50J10A/CA	0.2	1	10	11.1	11.7	12.3	1	17	295	15.9	21.7	1505	6.25	7.8
SMC50J11A/CA	0.2	1	11	12.3	13	13.7	1	18	275	15.6	24.2	1387	7.57	8.1
SMC50J12A/CA	0.2	1	12	13.3	14	14.7	1	19.9	252	20.6	25.3	1309	8.10	8.3
SMC50J13A/CA	0.2	1	13	14.4	15.2	16	1	21.5	233	23.6	27.2	1227	9.13	8.4
SMC50J14A/CA	0.2	1	14	15.7	16.5	17.3	1	23.1	216	26.9	29	1151	10.2	8.6
SMC50J15A/CA	0.2	1	15	16.7	17.6	18.5	1	24.4	205	28.8	32.5	1095	12.8	8.8
SMC50J16A/CA	0.2	1	16	17.9	18.8	19.8	1	26	192	32.3	34.2	1040	13.8	9.0
SMC50J18A/CA	0.2	1	18	20	21.1	22.2	1	29.2	171	40.9	39.3	950	18.0	9.2
SMC50J20A/CA	0.2	1	20	22.2	23.4	24.6	1	32.4	155	50.3	42.8	876	20.8	9.4
SMC50J22A/CA	0.2	1	22	24.4	25.7	27	1	35.5	141	60.3	48.3	815	26.1	9.6
SMC50J23A/CA	0.2	1	23	25.7	27	28.4	1	37.8	135	69.6	49.2	784	26.5	9.6
SMC50J24A/CA	0.2	1	24	26.7	28.1	29.5	1	38.9	129	72.9	50	760	27.0	9.6
SMC50J26A/CA	0.2	1	26	28.9	30.4	31.9	1	42.1	119	85.7	53.5	715	30.2	9.7
SMC50J28A/CA	0.2	1	28	31.1	32.7	34.3	1	45.4	110	100.9	59	675	36.6	9.8
SMC50J30A/CA	0.2	1	30	33.2	35	36.8	1	48.4	103	112.6	64.3	640	43.0	9.9
SMC50J31A/CA	0.2	1	31	34.2	36	37.8	1	50.2	100	124	65	626	43.5	9.9
SMC50J33A/CA	0.2	1	33	36.7	38.6	40.5	1	53.3	94	136	69.7	593	49.2	10.0
SMC50J36A/CA	0.2	1	36	40	42.1	44.2	1	58.1	86	162	76	550	57.8	10.0
SMC50J40A/CA	0.2	1	40	44.4	46.7	49	1	64.5	78	199	84	511	68.5	10.1
SMC50J48A/CA	0.2	1	48	53.2	56	58.8	1	77.4	65	286	100	444	92.8	10.3
SMC50J58A/CA	0.2	1	58	64.6	68	71.4	1	93.6	53	419	121	381	130	10.4
SMC50J64A/CA	0.2	1	64	71.1	74.8	78.6	1	103	47	519	133	353	154	10.4
SMC50J70A/CA	0.2	1	70	77.9	82	86.1	1	113	42	640	146	345	174	10.5
SMC50J85A/CA	0.2	1	85	95	100	105	1	137	32	1000	178	265	275	10.6
SMC50J100A/CA	0.2	1	100	111	117	123	1	179	28	2000	212	227	392	10.7

1. *To calculate V_{BR} versus T_j : V_{BR} at T_j = V_{BR} at 25 °C x (1 + αT x (T_j - 25))*
2. *To calculate V_{CL} versus T_j : V_{CL} at T_j = V_{CL} at 25 °C x (1 + αT x (T_j - 25))*
3. *To calculate V_{CL} max versus $I_{PPappli}$: V_{CL}max = V_{BR}max + R_D x $I_{PPappli}$*
4. *Surge capability given for both directions for unidirectional and bidirectional devices*

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1.1 Characteristics (curves)

Figure 3. Maximum peak power dissipation versus initial junction temperature

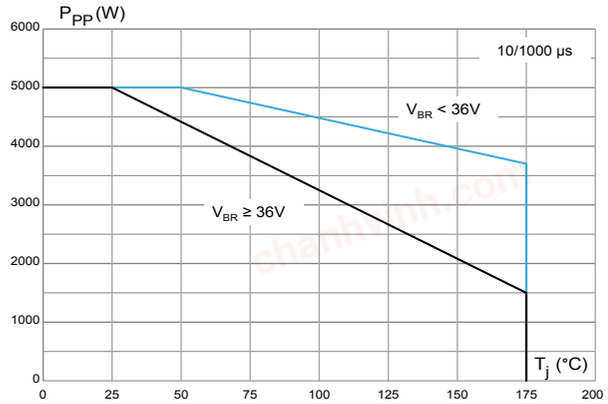


Figure 4. Maximum peak pulse power versus exponential pulse duration

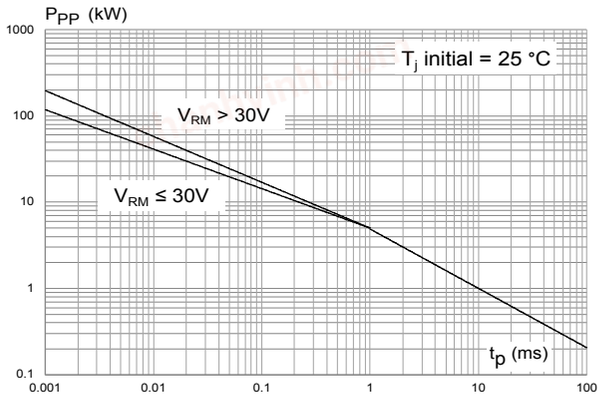


Figure 5. Maximum peak pulse current versus clamping voltage

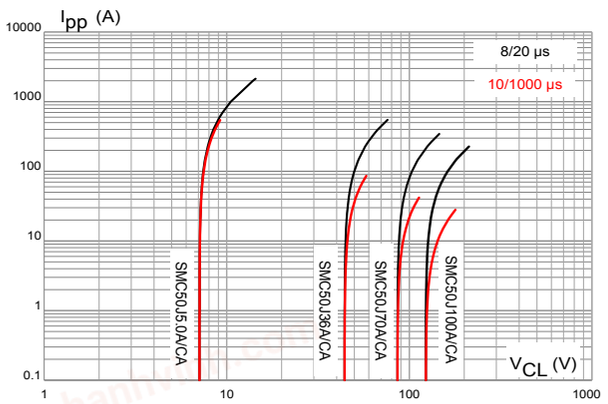


Figure 6. Dynamic resistance versus pulse duration

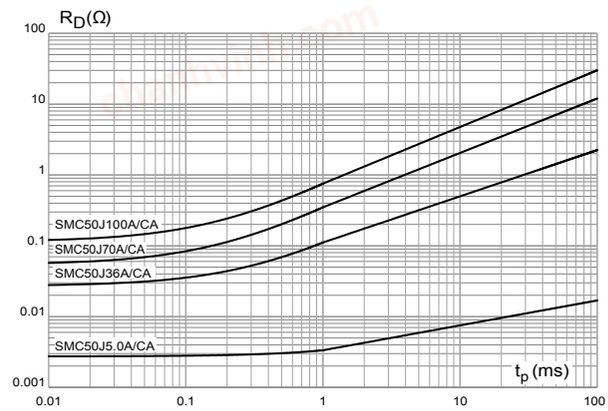


Figure 7. Junction capacitance versus reverse applied voltage (unidirectional type)

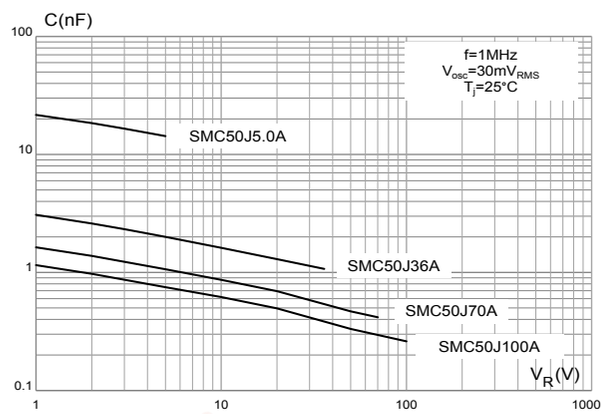
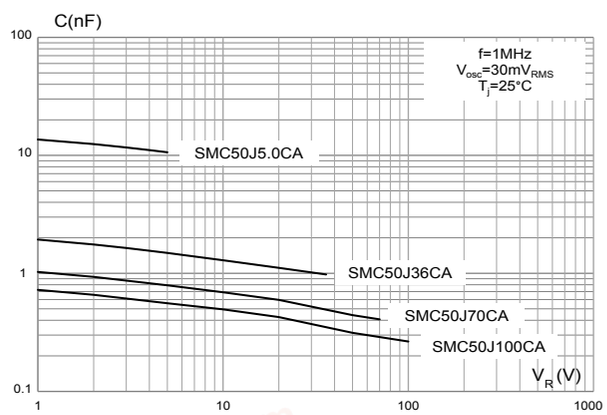


Figure 8. Junction capacitance versus applied voltage (bidirectional type)



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Figure 9. Leakage current versus junction temperature

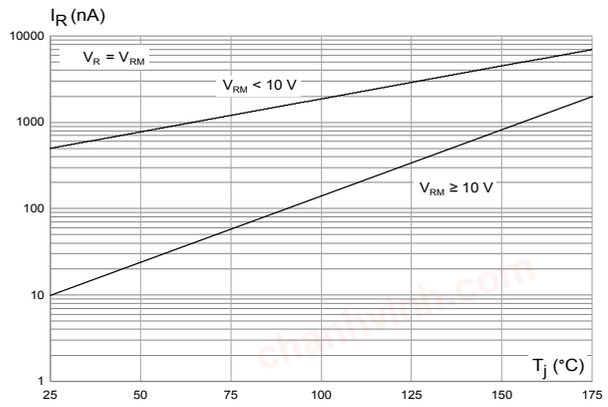


Figure 10. Peak forward voltage drop versus peak forward current

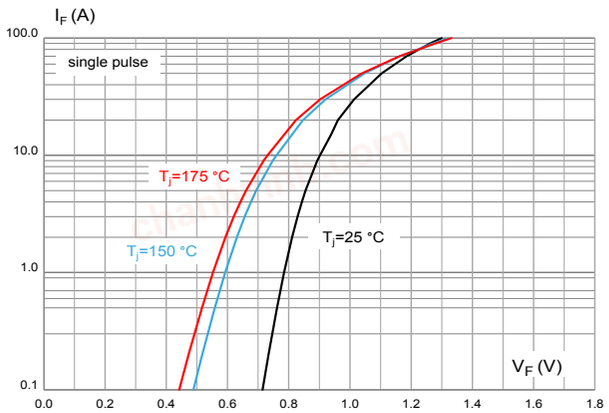


Figure 11. Thermal impedance junction to ambient versus pulse duration

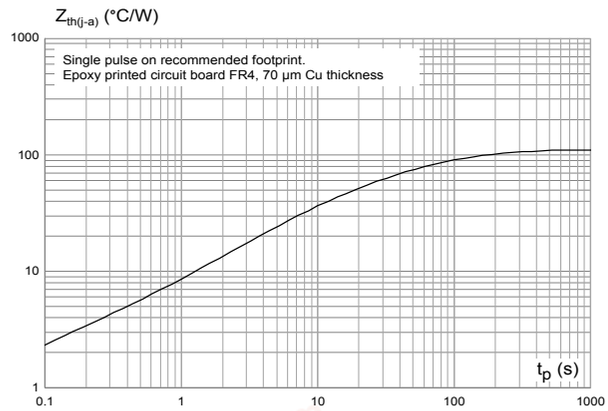
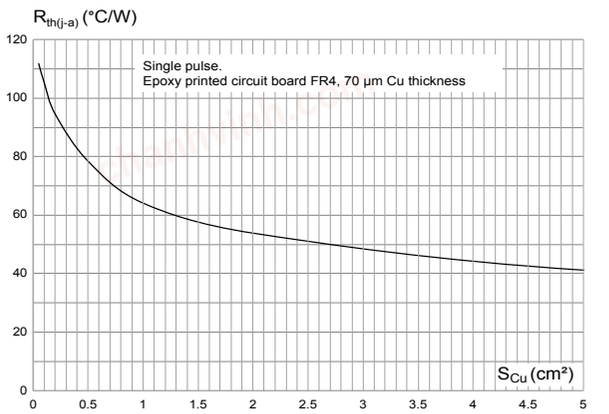


Figure 12. Thermal resistance junction to ambient versus copper area under each lead



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2 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

2.1 SMC package information

Figure 13. SMC package outline

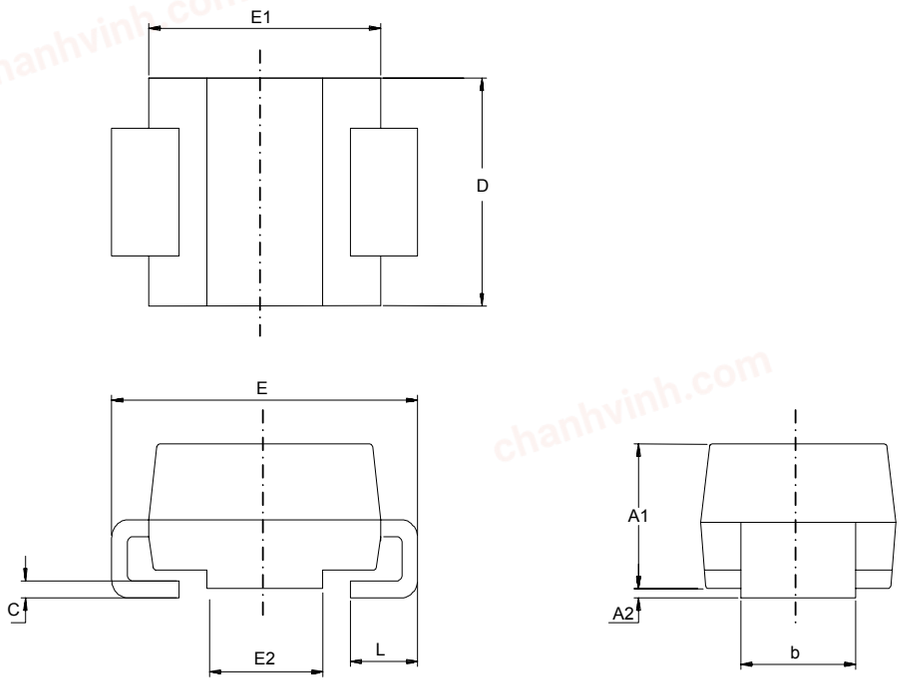


Table 3. SMC package mechanical data

Ref.	Dimensions			
	Millimeters		Inches[1]	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.096
A2	0.05	0.20	0.002	0.008
b	2.90	3.20	0.114	0.126
c	0.15	0.40	0.006	0.016
D	5.55	6.25	0.218	0.246
E	7.75	8.15	0.305	0.321
E1	6.60	7.15	0.260	0.281
E2	4.40	4.70	0.173	0.185
L	0.75	1.50	0.030	0.060

1. *Values in inches are converted from mm.*

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Figure 14. Footprint recommendation

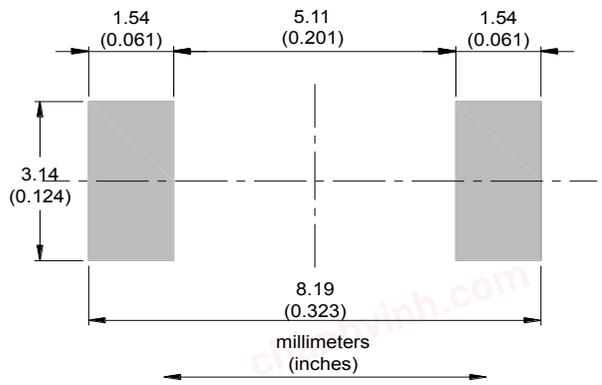
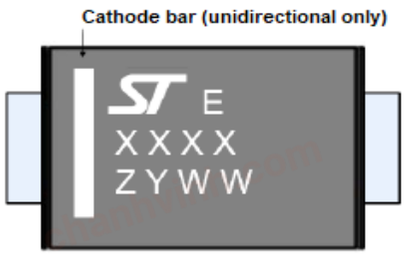
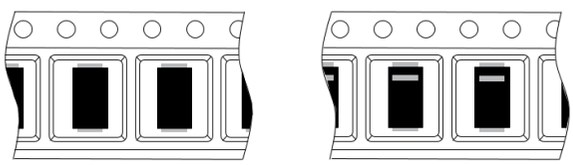


Figure 15. Marking layout



E : ECOPACK grade
XXXX : Marking
Z : Manufacturing location
Y : Year
WW : Week

Figure 16. Package orientation in reel



Taped according to EIA-481
Pocket dimensions are not on scale.
Pocket shape may vary depending on package
On bidirectional devices, marking and logo may not be always in the same direction.

Figure 17. Tape and reel orientation

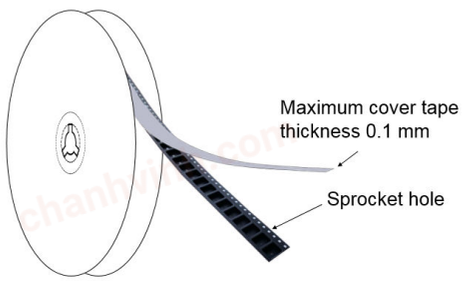


Figure 18. 13" reel dimension values (mm)

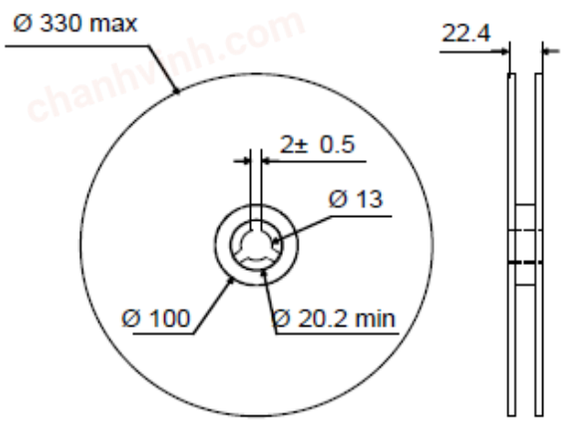
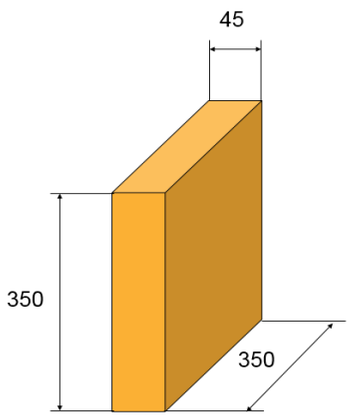
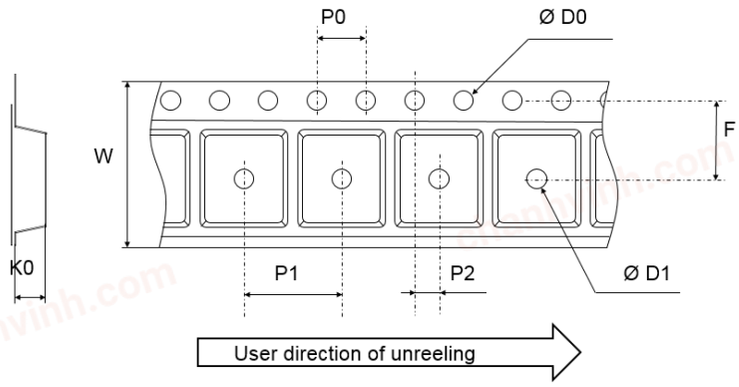


Figure 19. Inner box dimension values (mm)



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Figure 20. **Tape outline**



Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

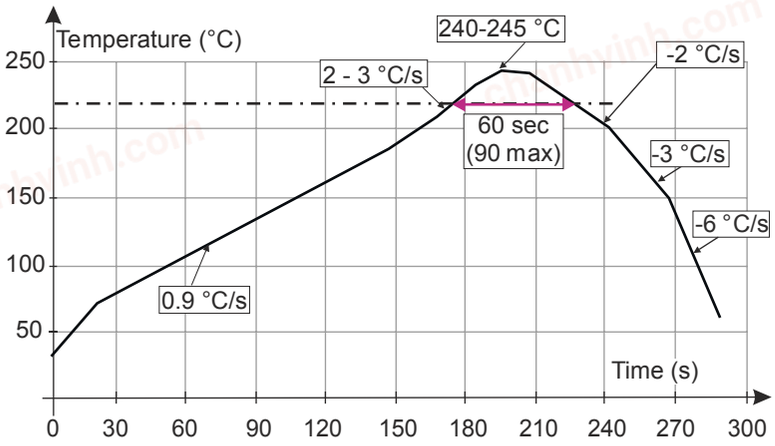
Table 4. **Tape dimension values**

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
D0	1.4	1.5	1.6
D1	1.5		
F	7.4	7.5	7.6
K0	2.39	2.49	2.59
P0	3.9	4.0	4.1
P1	7.9	8.0	8.1
P2	1.9	2.0	2.1
W	15.7	16	16.3

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2.2 Reflow profile

Figure 21. ST ECOPACK recommended soldering reflow profile for PCB mounting



Note: Minimize air convection currents in the reflow oven to avoid component movement. Maximum soldering profile corresponds to the latest IPC/JEDEC J-STD-020.

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3 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SMC50JxxA/CA[1]	See Table 6. Marking.	SMC	264 mg	2500	Tape and reel

1. *Where xx corresponds to V_{RM} and A or CA indicates unidirectional or bidirectional version.*

Table 6. Marking

Order code	Marking	Order code	Marking
SMC50J5.0A	EAI	SMC50J5.0CA	EAI
SMC50J6.0A	EAK	SMC50J6.0CA	EAK
SMC50J6.5A	EAL	SMC50J6.5CA	EAL
SMC50J8.5A	EAP	SMC50J8.5CA	EAP
SMC50J10A	EAS	SMC50J10CA	EAS
SMC50J11A	EAU	SMC50J11CA	EAU
SMC50J12A	EAW	SMC50J12CA	EAW
SMC50J13A	EAY	SMC50J13CA	EAY
SMC50J14A	EBA	SMC50J14CA	EBA
SMC50J15A	EBC	SMC50J15CA	EBC
SMC50J16A	EBE	SMC50J16CA	EBE
SMC50J18A	EBI	SMC50J18CA	EBI
SMC50J20A	EBM	SMC50J20CA	EBM
SMC50J22A	EBO	SMC50J22CA	EBO
SMC50J23A	EBP	SMC50J23CA	EBP
SMC50J24A	EBQ	SMC50J24CA	EBQ
SMC50J26A	EBS	SMC50J26CA	EBS
SMC50J28A	EBU	SMC50J28CA	EBU
SMC50J30A	EBW	SMC50J30CA	EBW
SMC50J31A	EBX	SMC50J31CA	EBX
SMC50J33A	EBZ	SMC50J33CA	EBZ
SMC50J36A	ECC	SMC50J36CA	ECC
SMC50J40A	ECG	SMC50J40CA	ECG
SMC50J48A	ECO	SMC50J48CA	ECO
SMC50J58A	ECY	SMC50J58CA	ECY
SMC50J64A	EDE	SMC50J64CA	EDE
SMC50J70A	EDK	SMC50J70CA	EDK
SMC50J85A	EDZ	SMC50J85CA	EDZ
SMC50J100A	EEO	SMC50J100CA	EEO

Note: Marking differentiation between unidirectional and bidirectional devices is done with cathode bar.

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Revision history

Table 7. **Document revision history**

Date	Revision	Changes
03-Jul-2023	1	Initial release.

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