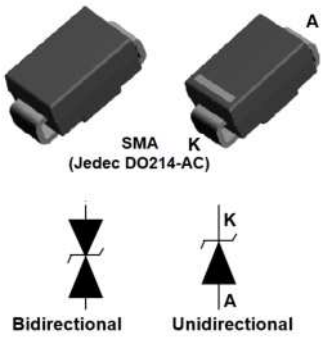
SMAJxxA, SMAJxxCA

Datasheet

400 W TVS in SMA



Product status links
SMAJ5.0A, SMAJ5.0CA,
SMAJ6.0A, SMAJ6.0CA,
SMAJ6.5A, SMAJ6.5CA,
SMAJ8.5A, SMAJ8.5CA,
SMAJ10A, SMAJ10CA,
SMAJ12A, SMAJ12CA,
SMAJ13A, SMAJ13CA,
SMAJ15A, SMAJ15CA,
SMAJ18A, SMAJ18CA,
SMAJ20A, SMAJ20CA,
SMAJ24A, SMAJ24CA,
SMAJ26A, SMAJ26CA,
SMAJ28A, SMAJ28CA
SMAJ30A, SMAJ30CA,
SMAJ33A, SMAJ33CA
SMAJ40A, SMAJ40CA,
SMAJ43A, SMAJ43CA,
SMAJ48A, SMAJ48CA
SMAJ58A, SMAJ58CA,
SMAJ70A, SMAJ70CA,
SMAJ85A, SMAJ85CA,
SMAJ100A, SMAJ100CA,
SMAJ130A, SMAJ130CA,
SMAJ154A, SMAJ154CA,
SMAJ170A, SMAJ170A,
SMAJ188A, SMAJ188CA.

Features

- Peak pulse power:
  - 400 W (10/1000 µs)
  - 2.3 kW (8/20 µs)
- Stand-off voltage range from 5 V to 188 V
- Unidirectional and bidirectional types
- Low leakage current:
  - 0.2 µA at 25 °C
  - 1 µA at 85 °C
- Operating T_j max: 150 °C
- JEDEC registered package outline

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 solderable matte tin plated leads
- JESD-201 class 2 whisker test
- IPC7531 footprint
- JEDEC registered package outline
- IEC 61000-4-4 level 4:
  - 4 kV
- IEC 61000-4-2, C = 150 pF - R = 330 Ω exceeds level 4:
  - 30 kV (air discharge)
  - 30 kV (contact discharge)

Description

The SMAJ series is designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2 and MIL STD 883, method 3015, and electrical overstress according to IEC 61000-4-4 and 5. This device is more generally used against surges below 600 W (10/1000 µs).

The Planar technology makes it compatible with high-end circuits where low leakage current and high junction temperature are required to provide long term reliability and stability. SMAJ devices are packaged in SMA (SMA footprint in accordance with IPC 7531 standard).

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}	400	W
T_{stg}	Storage temperature range		-65 to +150	°C
T_j	Operating junction temperature range		-55 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s		260	°C

Figure 1. Electrical characteristics - parameter definitions

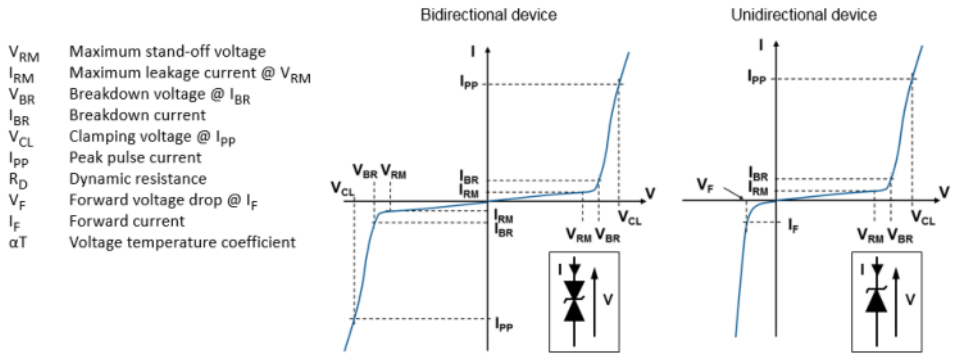


Figure 2. Pulse definition for electrical characteristics

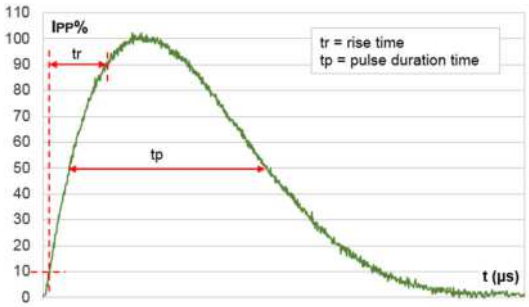


Table 2. Electrical characteristics - parameter values (T_{amb} = 25 °C, unless otherwise specified)

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.
	µA		V	V		mA	V	A	Ω	V	A	Ω	10^{-4}/°C
SMAJ5.0A/CA	20	50	5.0	6.40	6.74	10	9.2	43.5	0.049	13.4	174	0.036	5.7
SMAJ6.0A/CA	20	50	6.0	6.70	7.05	10	10.3	38.8	0.075	13.7	170	0.037	5.9
SMAJ6.5A/CA	20	50	6.5	7.20	7.58	10	11.2	35.7	0.091	14.5	160	0.041	6.1
SMAJ8.5A/CA	20	50	8.5	9.4	9.9	1	14.4	27.7	0.145	19.5	124	0.073	7.3
SMAJ10A/CA	0.2	1	10	11.1	11.7	1	17	23.5	0.201	21.7	106	0.089	7.8
SMAJ12A/CA	0.2	1	12	13.3	14.0	1	19.9	20.1	0.259	25.3	91	0.116	8.3
SMAJ13A/CA	0.2	1	13	14.4	15.2	1	21.5	18.6	0.298	27.2	85	0.132	8.4
SMAJ15A/CA	0.2	1	15	16.7	17.6	1	24.4	16.4	0.361	32.5	71	0.197	8.8
SMAJ18A/CA	0.2	1	18	20.0	21.1	1	29.2	13.7	0.514	39.3	59	0.291	9.2
SMAJ20A/CA	0.2	1	20	22.2	23.4	1	32.4	12.3	0.637	42.8	54	0.338	9.4
SMAJ24A/CA	0.2	1	24	26.7	28.1	1	38.9	10.3	0.912	50	46	0.446	9.6
SMAJ26A/CA	0.2	1	26	28.9	30.4	1	42.1	9.5	1.07	53.5	43	0.502	9.7
SMAJ28A/CA	0.2	1	28	31.1	32.7	1	45.4	8.8	1.26	59	39	0.632	9.8
SMAJ30A/CA	0.2	1	30	33.3	35.1	1	48.4	8.3	1.39	64.3	36	0.762	9.9
SMAJ33A/CA	0.2	1	33	36.7	38.6	1	53.3	7.5	1.70	69.7	33	0.884	10.0
SMAJ40A/CA	0.2	1	40	44.4	46.7	1	64.5	6.2	2.49	84	27	1.30	10.1
SMAJ43A/CA	0.2	1	43	47.8	50.3	1	69.4	5.7	2.91	91	25	1.53	10.2
SMAJ48A/CA	0.2	1	48	53.3	56.1	1	77.4	5.2	3.56	100	23	1.79	10.3
SMAJ58A/CA	0.2	1	58	64.4	67.8	1	93.6	4.3	5.21	121	19	2.62	10.4
SMAJ70A/CA	0.2	1	70	77.8	81.9	1	113	3.5	7.72	146	16	3.75	10.5
SMAJ85A/CA	0.2	1	85	94	99	1	137	2.9	11.4	178	13	5.70	10.6
SMAJ100A/CA	0.2	1	100	111	117	1	162	2.5	15.7	212	11	8.10	10.7
SMAJ130A/CA	0.2	1	130	144	152	1	209	1.9	26.0	265	9	11.7	10.8
SMAJ154A/CA	0.2	1	154	171	180	1	246	1.6	35.6	317	7	18.3	10.8
SMAJ170A/CA	0.2	1	170	189	199	1	275	1.4	47.2	353	6.5	22.2	10.8
SMAJ188A/CA	0.2	1	188	209	220	1	328	1.4	69.3	388	6	26.2	10.8

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_{CLmax} = V_{CL} - R_D x (I_{PP} - $I_{PPappli}$) where $I_{PPappli}$ is the surge current in the application.*
4. *Surge capability given for both directions for unidirectional and bidirectional devices*

1.1 Characteristics (curves)

Figure 3. Maximum peak power dissipation versus initial junction temperature

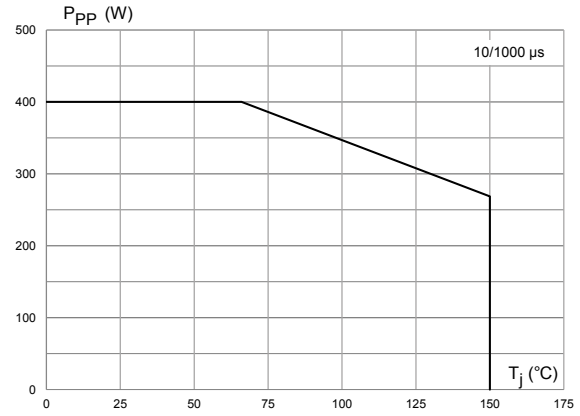


Figure 4. Maximum peak pulse power versus exponential pulse duration

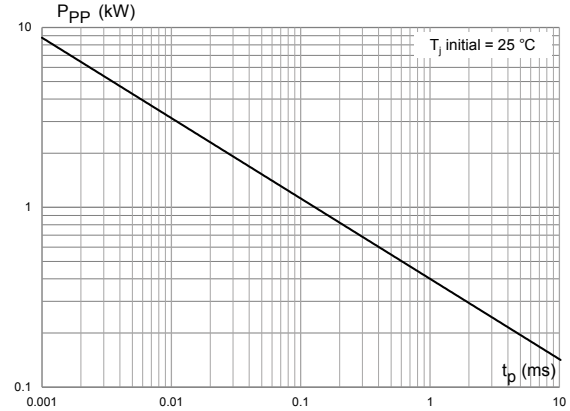


Figure 5. Maximum peak pulse current versus clamping voltage

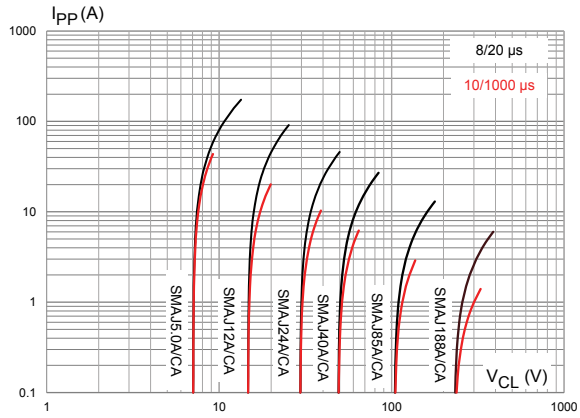


Figure 6. Dynamic resistance versus pulse duration

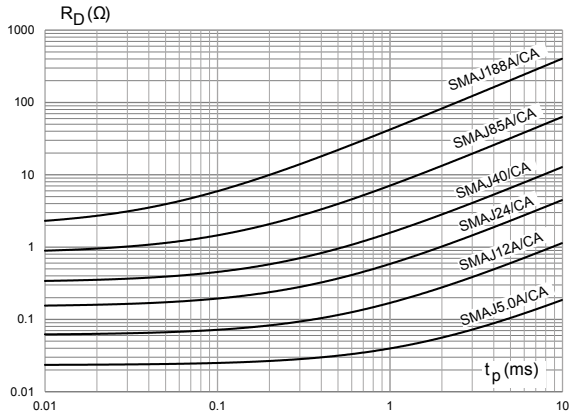


Figure 7. Junction capacitance versus reverse applied voltage (unidirectional type)

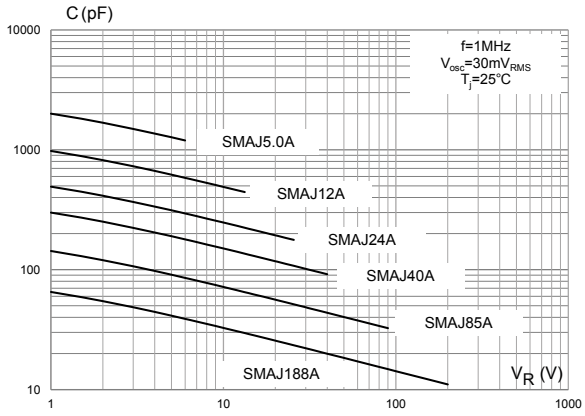


Figure 8. Junction capacitance versus applied voltage (bidirectional type)

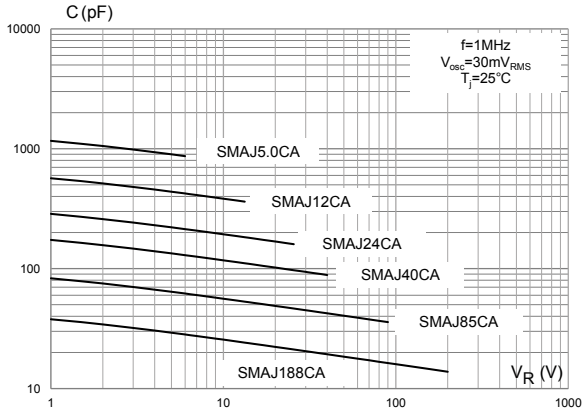


Figure 9. Leakage current versus junction temperature

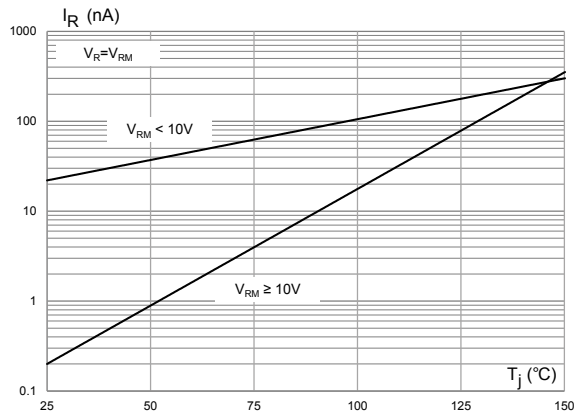


Figure 10. Peak forward voltage drop versus peak forward current

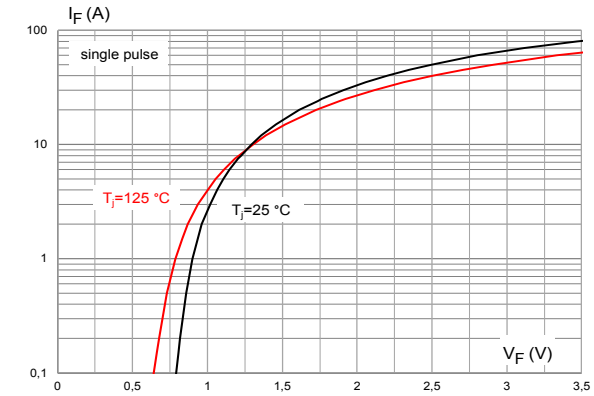


Figure 11. Thermal impedance junction to ambient versus pulse duration

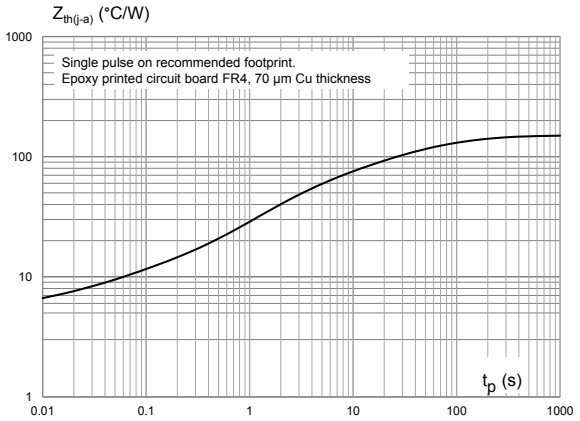
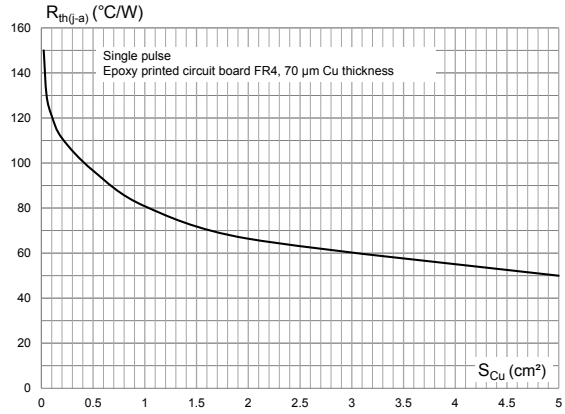


Figure 12. Thermal resistance junction to ambient versus copper area under each lead



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 SMA package information

Figure 13. SMA package outline

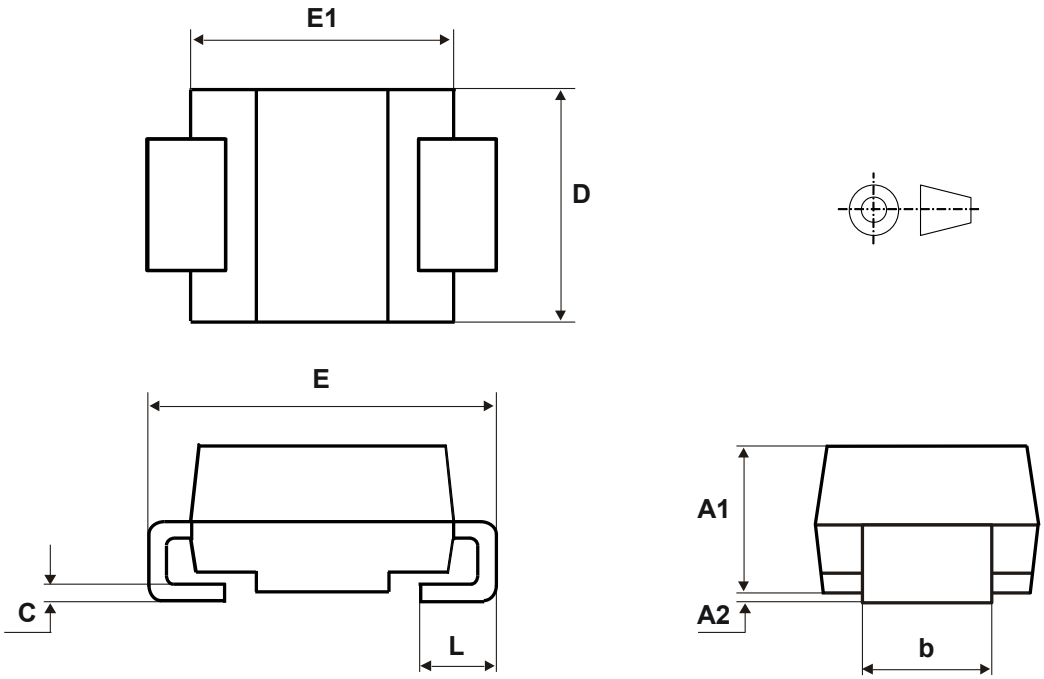


Table 3. SMA package mechanical data

Ref.	Dimensions			
	Millimeters		Inches[1]	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.074	0.097
A2	0.05	0.20	0.001	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.005	0.016
D	2.25	2.90	0.088	0.115
E	4.80	5.35	0.188	0.211
E1	3.95	4.60	0.155	0.182
L	0.75	1.50	0.029	0.060

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

Figure 14. SMA recommended footprint in mm (inches)

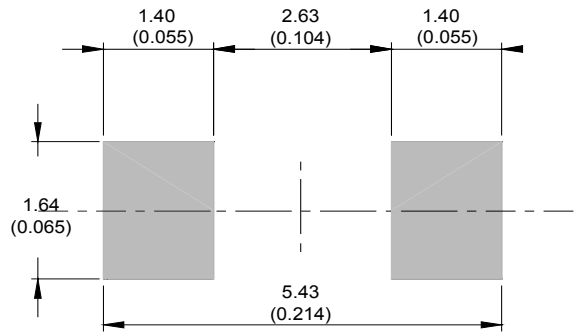
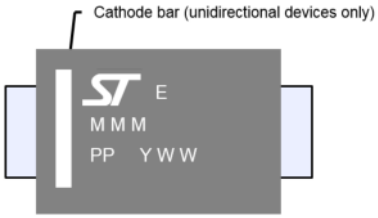
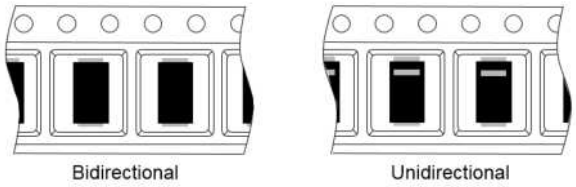


Figure 15. SMA marking



E : ECOPACK grade
MMM : Marking
PP : Assembly 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

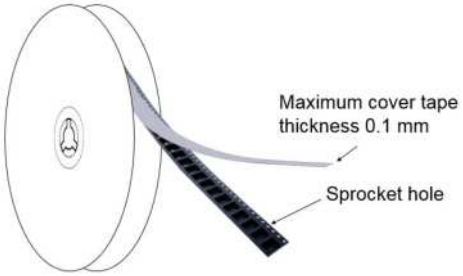


Figure 18. 13" reel dimension values (mm)

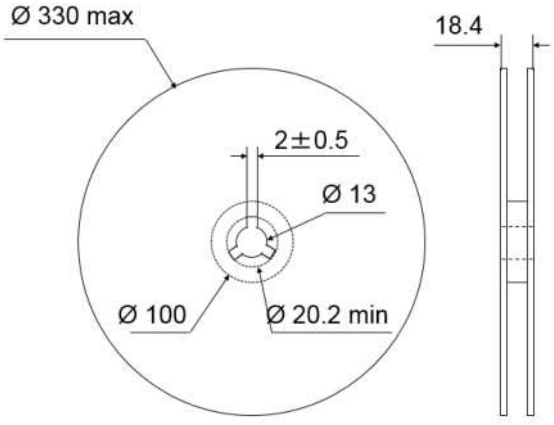


Figure 19. Inner box dimension values (mm)

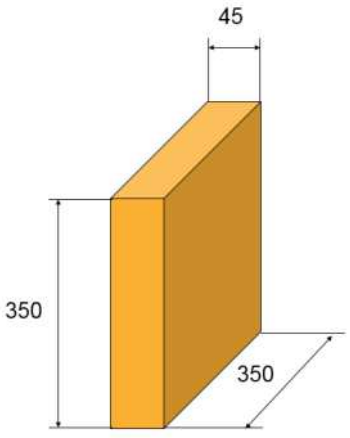
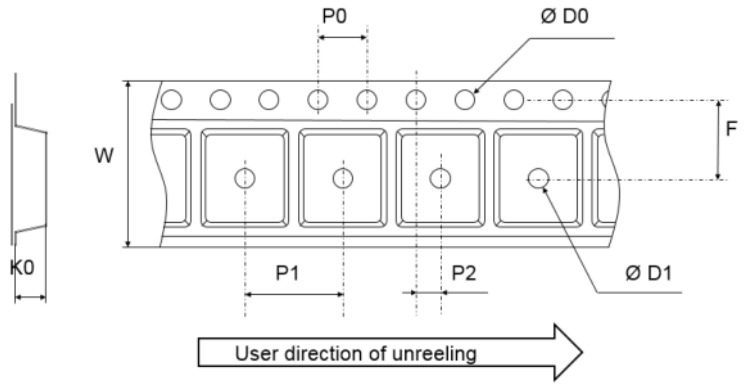


Figure 20. **Tape outline**



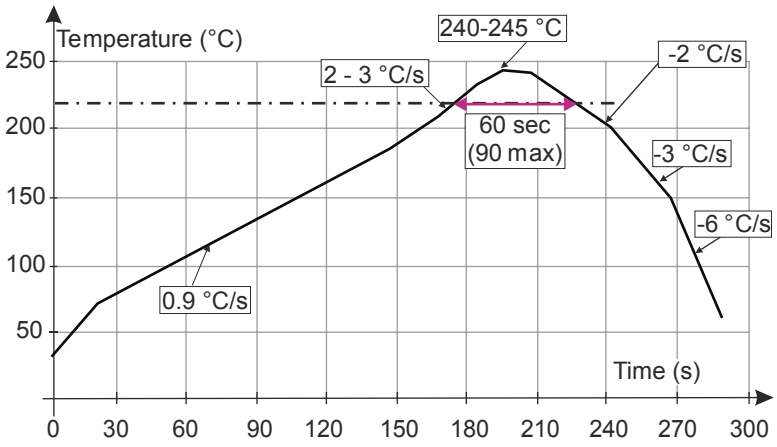
Note: Pocket dimensions are not on scale
Pocket shape may vary depending on package

Table 4. **Tape dimension values**

Ref.	Dimensions		
	Millimeters		
	Min.	Typ.	Max.
D0	1.40	1.50	1.60
D1	1.50		
F	5.40	5.50	5.60
K0	2.26	2.36	2.46
P0	3.90	4.00	4.10
P1	3.90	4.00	4.10
P2	1.95	2.00	2.05
W	11.70	12.00	12.30

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.

3 Ordering information

Table 5. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
SMAJxxA/CA-TR[1]	See Table 6. Marking.	SMA	71 mg	5000	Tape and reel

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

Table 6. Marking

Type	Marking	Type	Marking
SMAJ5.0A-TR	AE	SMAJ5.0CA-TR	AA
SMAJ6.0A-TR	DUB	SMAJ6.0CA-TR	DBB
SMAJ6.5A-TR	DUC	SMAJ6.5CA-TR	DBC
SMAJ8.5A-TR	DUH	SMAJ8.5CA-TR	DBH
SMAJ10A-TR	AX	SMAJ10CA-TR	AC
SMAJ12A-TR	DUK	SMAJ12CA-TR	DBK
SMAJ13A-TR	BG	SMAJ13CA-TR	BH
SMAJ15A-TR	BM	SMAJ15CA-TR	AJ
SMAJ18A-TR	DUQ	SMAJ18CA-TR	DBQ
SMAJ20A-TR	DUR	SMAJ20CA-TR	DBR
SMAJ24A-TR	DUT	SMAJ24CA-TR	DBT
SMAJ26A-TR	DUU	SMAJ26CA-TR	DBU
SMAJ28A-TR	CG	SMAJ28CA-TR	CH
SMAJ30A-TR	CK	SMAJ30CA-TR	CL
SMAJ33A-TR	CM	SMAJ33CA-TR	CN
SMAJ40A-TR	DUZ	SMAJ40CA-TR	DBZ
SMAJ43A-TR	EUA	SMAJ43CA-TR	EBA
SMAJ48A-TR	CX	SMAJ48CA-TR	CY
SMAJ58A-TR	EUF	SMAJ58CA-TR	EBF
SMAJ70A-TR	EUI	SMAJ70CA-TR	EBI
SMAJ85A-TR	EUL	SMAJ85CA-TR	EBL
SMAJ100A-TR	EUN	SMAJ100CA-TR	EBN
SMAJ130A-TR	EUQ	SMAJ130CA-TR	EBQ
SMAJ154A-TR	EUT	SMAJ154CA-TR	EBT
SMAJ170A-TR	SR	SMAJ170CA-TR	SS
SMAJ188A-TR	EUV	SMAJ188CA-TR	EBV

Revision history

Table 7. **Document revision history**

Date	Revision	Changes
September-1998	5B	Previous update.
02-Aug-2004	6	SMA package dimensions update. Reference A1 max. changed from 2.70 mm (0.106) to 2.03 mm (0.080).
10-Dec-2004	7	Template layout update. No content change.
10-Feb-2006	8	Added unidirectional marking on cover page and Figure 14. Changed Figure 13. Foot print.
14-May-2009	9	Updated ECOPACK statement. Reformatted to current standards.
17-Sep-2009	10	Document updated for low leakage current.
05-Nov-2009	11	Corrected typographical error in Package information.
09-Jul-2010	12	Changed timescale in Figure 9.
18-May-2022	13	Updated Description, and Table 2. Added product status links on coverpage.
31-May-2022	14	Updated product links table.
13-Jul-2023	15	Changed "Jedec DO214-AA" to "Jedec DO214-AC".

IMPORTANT NOTICE – READ CAREFULLY

STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, enhancements, modifications, and improvements to ST products and/or to this document at any time without notice. Purchasers should obtain the latest relevant information on ST products before placing orders. ST products are sold pursuant to ST’s terms and conditions of sale in place at the time of order acknowledgment.

Purchasers are solely responsible for the choice, selection, and use of ST products and ST assumes no liability for application assistance or the design of purchasers’ products.

No license, express or implied, to any intellectual property right is granted by ST herein.

Resale of ST products with provisions different from the information set forth herein shall void any warranty granted by ST for such product.

ST and the ST logo are trademarks of ST. For additional information about ST trademarks, refer to www.st.com/trademarks. All other product or service names are the property of their respective owners.

Information in this document supersedes and replaces information previously supplied in any prior versions of this document.

© 2023 STMicroelectronics – All rights reserved