THE DATASHEET OF

SMCJ28A-TR

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SMCJ

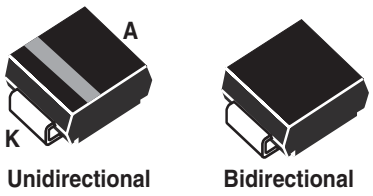
Transil™

Features

- Peak pulse power:
  - 1500 W (10/1000 µs)
  - 10 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
- High power capability at $T_{j\,max}$:
  - 1250 W (10/1000 µs)
- JEDEC registered package outline

Complies with the following standards

- IEC 61000-4-2 level 4
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- IEC 61000-4-5
- MIL STD 883G, method 3015-7 Class 3B
  - 25 kV HBM (human body model)
- Resin meets UL 94, V0
- MIL-STD-750, method 2026 solderability
- EIA STD RS-481 and IEC 60286-3 packing
- IPC 7531 footprint



Unidirectional Bidirectional

SMC
(JEDEC DO-214AB)

Description

The SMCJ Transil series has been designed to protect sensitive equipment against electrostatic discharges according to IEC 61000-4-2, and MIL STD 883, method 3015, and electrical over stress according to IEC 61000-4-4 and 5. These devices are more generally used against surges below 1500 W (10/1000 µs).

The 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.

SMCJ are packaged in SMC (SMC footprint in accordance with IPC 7531 standard).

TM: Transil is a trademark of STMicroelectroniocs

1 Characteristics

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

Symbol	Parameter		Value	Unit
P_{PP}	Peak pulse power dissipation (1)	T_j initial = T_{amb}	1500	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

1. For a surge greater than the maximum values, the diode will fail in short-circuit.

Table 2. Thermal resistances

Symbol	Parameter	Value	Unit
$R_{th(j-l)}$	Junction to leads	15	° C/W
$R_{th(j-a)}$	Junction to ambient on printed circuit on recommended pad layout	90	° C/W

Figure 1. Electrical characteristics - definitions

Symbol	Parameter
V_{RM}	Stand-off voltage
V_{BR}	Breakdown voltage
V_{CL}	Clamping voltage
I_{RM}	Leakage current @ V_{RM}
I_{PP}	Peak pulse current
αT	Voltage temperature coefficient
V_F	Forward voltage drop
R_D	Dynamic resistance

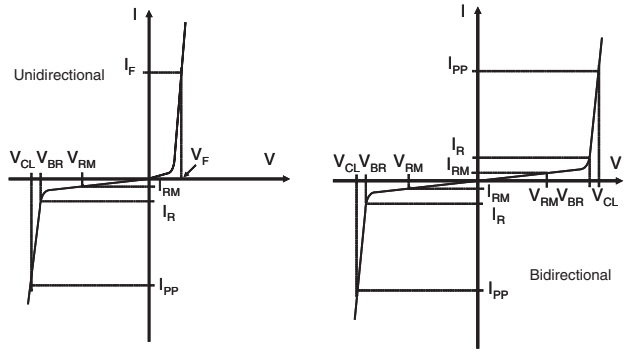


Figure 2. Pulse definition for electrical characteristics

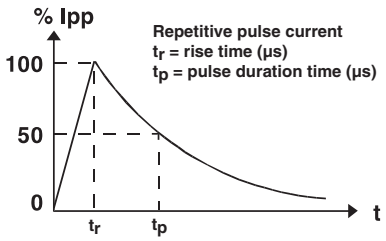


Table 3. Electrical characteristics - parameter values (T_{amb} = 25 °C)

Order code	I_{RM} max@V_{RM}			V_{BR} @I_R(1)			V_{CL} @I_{PP} 10/1000 µs		R_D (2) 10/1000 µs	V_{CL} @I_{PP} 8/20 µs		R_D (2) 8/20 µs	αT (3)
	25 °C	85 °C		min	typ		max			max			max
	µA		V	V		mA	V	A(4)	Ω	V	A(4)	mΩ	10-4/ °C
SMCJ5.0A/CA	500	2000	5.0	6.4	6.74	10	9.2	171	0.012	13.4	746	8.5	5.7
SMCJ6.0A/CA	500	2000	6.0	6.7	7.05	10	10.3	152	0.019	13.7	730	8.6	5.9
SMCJ6.5A/CA	250	1000	6.5	7.2	7.58	10	11.2	140	0.023	14.5	690	9.5	6.1
SMCJ8.5A/CA	10	50	8.5	9.4	9.9	1	14.4	105	0.038	19.5	512	18	7.3
SMCJ10A/CA	0.2	1	10	11.1	11.7	1	17	92	0.051	21.7	461	20	7.8
SMCJ12A/CA	0.2	1	12	13.3	14	1	19.9	79	0.066	25.3	394	27	8.3
SMCJ13A/CA	0.2	1	13	14.4	15.2	1	21.5	73	0.076	27.2	368	31	8.4
SMCJ15A/CA	0.2	1	15	16.7	17.6	1	24.4	64	0.092	32.5	308	46	8.8
SMCJ18A/CA	0.2	1	18	20.0	21.1	1	29.2	53	0.133	39.3	254	68	9.2
SMCJ20A/CA	0.2	1	20	22.2	23.4	1	32.4	48	0.163	42.8	234	78	9.4
SMCJ22A/CA	0.2	1	22	24.4	25.7	1	35.5	44	0.194	48.3	207	103	9.6
SMCJ24A/CA	0.2	1	24	26.7	28.1	1	38.9	40	0.235	50	200	102	9.6
SMCJ26A/CA	0.2	1	26	28.9	30.4	1	42.1	37	0.275	53.5	187	115	9.7
SMCJ28A/CA	0.2	1	28	31.1	32.7	1	45.4	34	0.325	59	169	146	9.8
SMCJ30A/CA	0.2	1	30	33.3	35.1	1	48.4	32	0.361	64.3	156	176	9.9
SMCJ33A/CA	0.2	1	33	36.7	38.6	1	53.3	29	0.440	69.7	143	204	10.0
SMCJ40A/CA	0.2	1	40	44.4	46.7	1	64.5	24	0.644	84	119	294	10.1
SMCJ48A/CA	0.2	1	48	53.3	56.1	1	77.4	20	0.925	100	100	411	10.3
SMCJ58A/CA	0.2	1	58	64.4	67.8	1	93.6	16	1.40	121	83	600	10.4
SMCJ70A/CA	0.2	1	70	77.8	81.9	1	113	13.9	1.94	146	69	870	10.5
SMCJ85A/CA	0.2	1	85	94	99	1	137	11.5	2.87	178	56	1322	10.6
SMCJ100A/CA	0.2	1	100	111	117	1	162	9.7	4.04	212	47	1897	10.7
SMCJ130A/CA	0.2	1	130	144	152	1	209	7.5	6.59	265	38	2774	10.8
SMCJ154A/CA	0.2	1	154	171	180	1	246	6.1	9.34	317	31.5	4063	10.8
SMCJ170A/CA	0.2	1	170	189	199	1	275	5.7	11.6	353	28	5145	10.8
SMCJ188A/CA	0.2	1	188	209	220	1	328	4.6	21.1	388	26	6038	10.8

1. Pulse test : t_p < 50 ms
2. To calculate maximum clamping voltage at other surge level,use the following formula: $V_{CLmax} = V_{CL} - R_D \times (I_{PP} - I_{PPappli})$ where $I_{PPappli}$ is the surge current in the application
3. To calculate V_{BR} or V_{CL} versus junction temperature, use the following formulas:
   V_{BR} @ T_J = V_{BR} @ 25°C x (1 + αT x (T_J – 25))
   V_{CL} @ T_J = V_{CL} @ 25°C x (1 + αT x (T_J – 25))
4. Surge capability given for both directions for unidirectional and bidirectional types.

Figure 3. Peak pulse power dissipation versus initial junction temperature

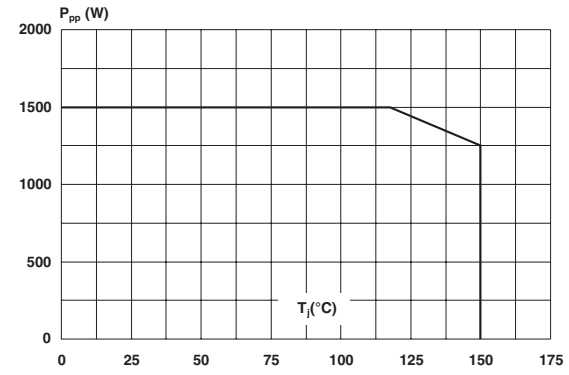


Figure 4. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

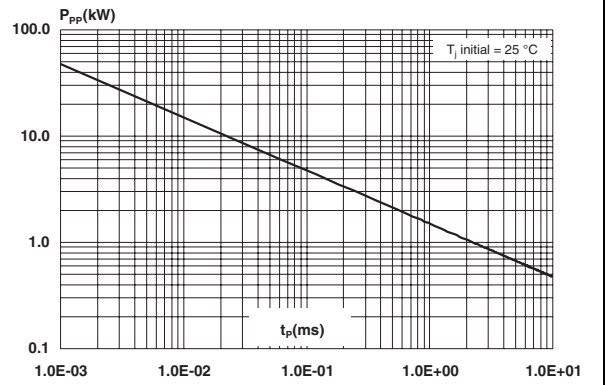


Figure 5. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

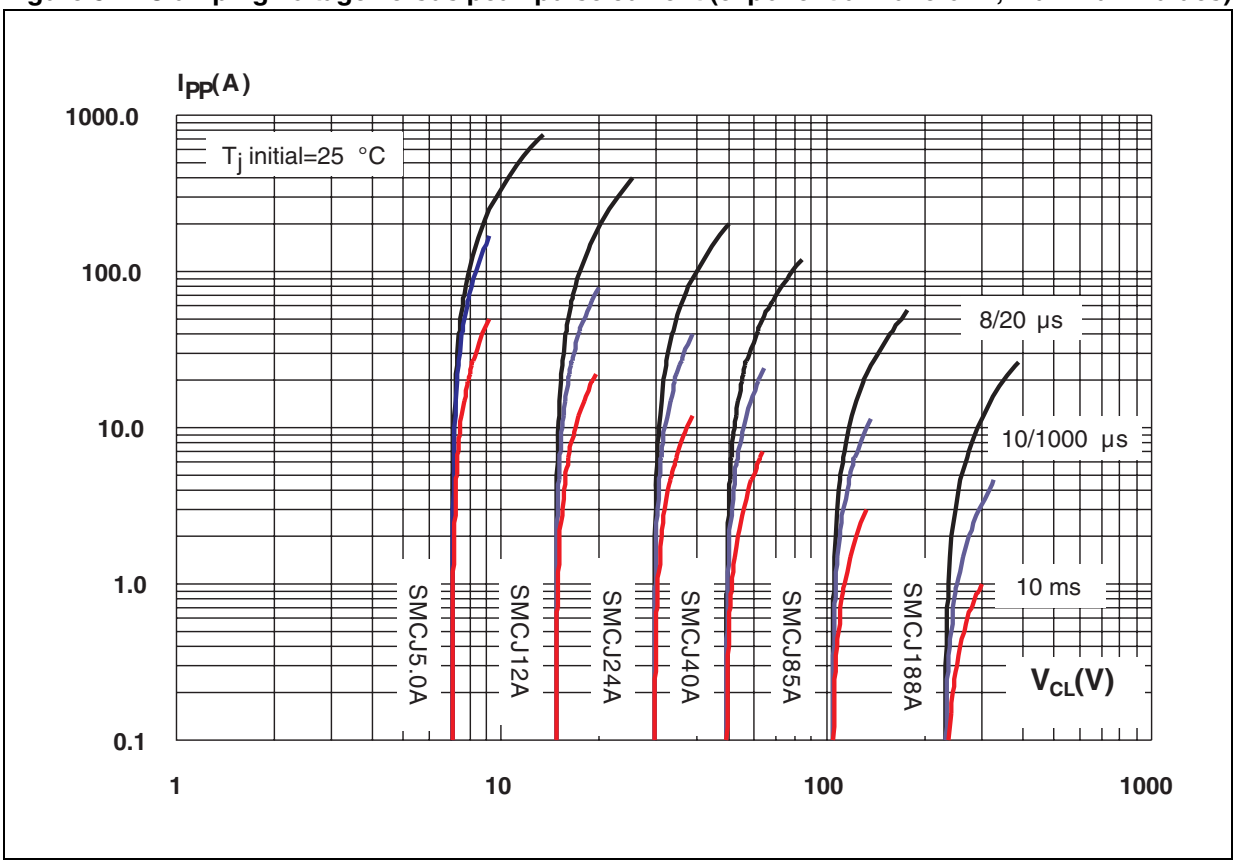


Figure 6. Junction capacitance versus reverse applied voltage for unidirectional types (typical values)

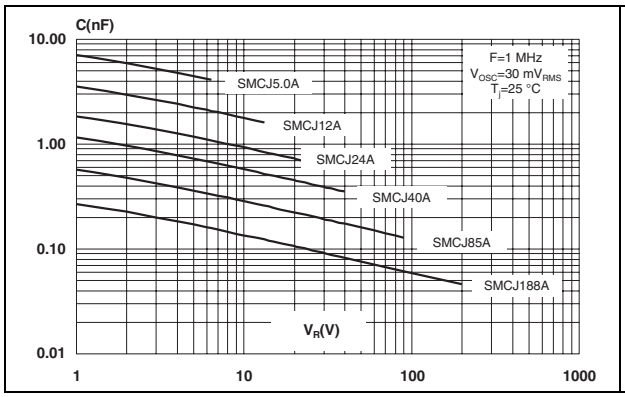


Figure 7. Junction capacitance versus reverse applied voltage for bidirectional types (typical values)

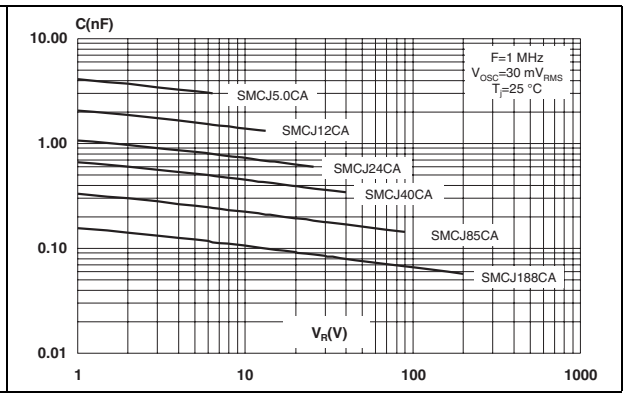


Figure 8. Peak forward voltage drop versus peak forward current (typical values)

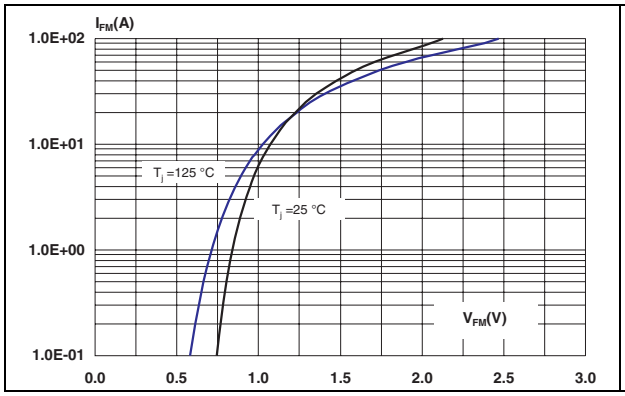


Figure 9. Relative variation of thermal impedance, junction to ambient, versus pulse duration

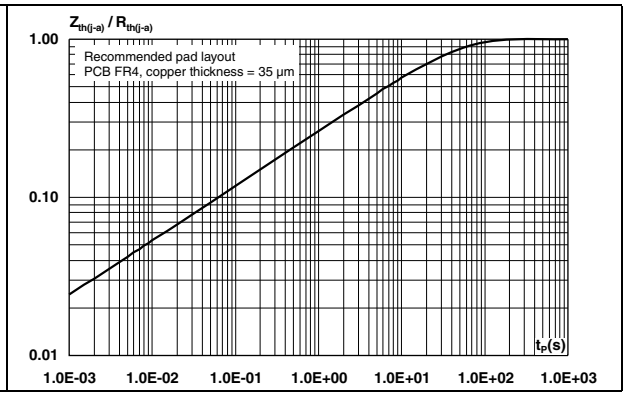


Figure 10. Thermal resistance junction to ambient versus copper surface under each lead

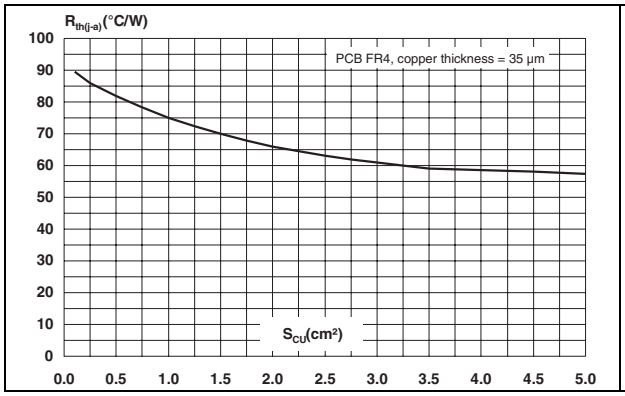
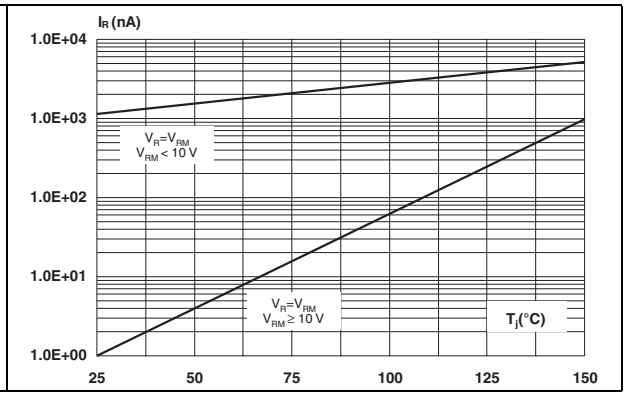
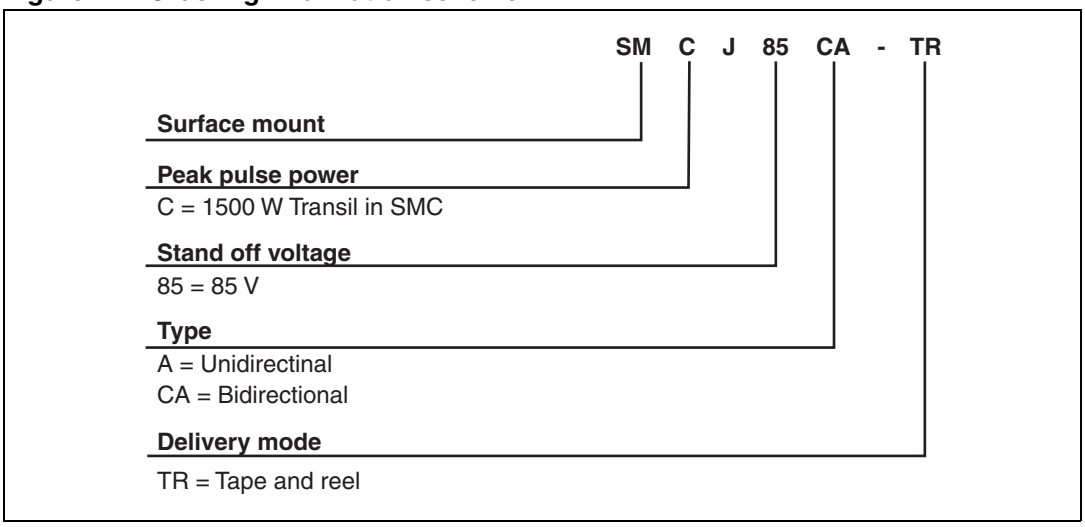


Figure 11. Leakage current versus junction temperature (typical values)



2 Ordering information scheme

Figure 12. Ordering information scheme

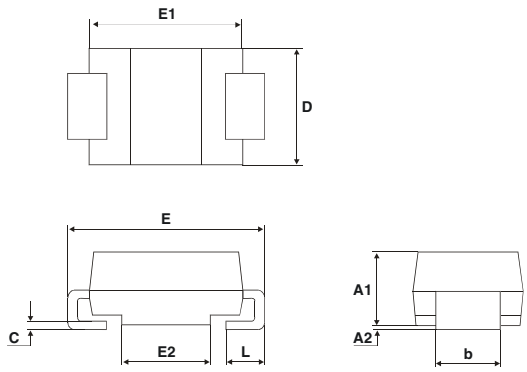


3 Package information

- Case: JEDEC DO-214AB molded plastic over planar junction
- Terminals: solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Flammability: epoxy is rated UL94V-0
- RoHS package

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.

Table 4. SMC dimensions



Ref.	dimensions			
	Millimeters		Inches	
	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	3.2	0.114	0.126
c	0.15	0.41	0.006	0.016
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
D	5.55	6.25	0.218	0.246
L	0.75	1.60	0.030	0.063

Figure 13. Footprint dimensions mm (inches)

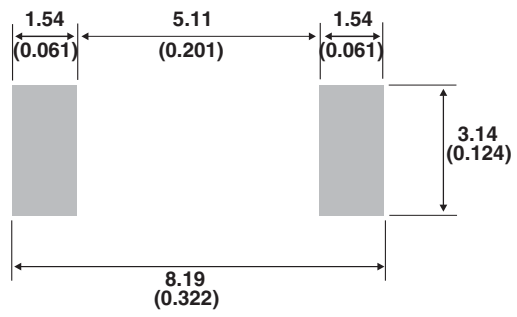
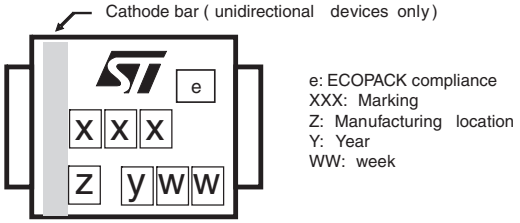


Figure 14. Marking layout(1)



1. Marking layout can vary according to assembly location.

Table 5. Marking

Order code	Marking	Order code	Marking
SMCJ5.0A-TR	FUA	SMCJ5.0CA-TR	FBA
SMCJ6.0A-TR	FUB	SMCJ6.0CA-TR	FBB
SMCJ6.5A-TR	FUC	SMCJ6.5CA-TR	FBC
SMCJ8.5A-TR	FUD	SMCJ8.5CA-TR	FBD
SMCJ10A-TR	FUF	SMCJ10CA-TR	FBF
SMCJ12A-TR	FUH	SMCJ12CA-TR	FBH
SMCJ13A-TR	FUI	SMCJ13CA-TR	FBI
SMCJ15A-TR	FUJ	SMCJ15CA-TR	FBJ
SMCJ18A-TR	FUL	SMCJ18CA-TR	FBL
SMCJ20A-TR	FUM	SMCJ20CA-TR	FBM
SMCJ22A-TR	FUN	SMCJ22CA-TR	FBN
SMCJ24A-TR	FUO	SMCJ24CA-TR	FBO
SMCJ26A-TR	FUP	SMCJ26CA-TR	FBP
SMCJ28A-TR	FUQ	SMCJ28CA-TR	FBQ
SMCJ30A-TR	FUR	SMCJ30CA-TR	FBR
SMCJ33A-TR	FUS	SMCJ33CA-TR	FBS
SMCJ40A-TR	FUU	SMCJ40CA-TR	FBU
SMCJ48A-TR	FUW	SMCJ48CA-TR	FBW
SMCJ58A-TR	FUZ	SMCJ58CA-TR	FBZ
SMCJ70A-TR	GUB	SMCJ70CA-TR	GBB
SMCJ85A-TR	GUE	SMCJ85CA-TR	GBE
SMCJ100A-TR	GUG	SMCJ100CA-TR	GBG
SMCJ130A-TR	GUI	SMCJ130CA-TR	GBI
SMCJ154A-TR	GUL	SMCJ154CA-TR	GBL
SMCJ170A-TR	GUM	SMCJ170CA-TR	GBM
SMCJ188A-TR	GUN	SMCJ188CA-TR	GBN

4 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SMCJxxxA/CA-TR(1)	See *Table 5 on page 8*	SMC	0.25 g	2500	Tape and reel

1. Where xxx is nominal value of V_{BR} and A or CA indicates unidirectional or bidirectional version. See *Table 3* for list of available devices and their order codes

5 Revision history

Table 7. Document revision history

Date	Revision	Changes
August-1999	5A	Previous update.
14-May-2009	6	Reformatted to current standards. Updated ECOPACK statement.
17-Sep-2009	7	Document updated for low leakage current.
12-Jul-2010	8	Changed timescale in *Figure 9.*

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