SM15T

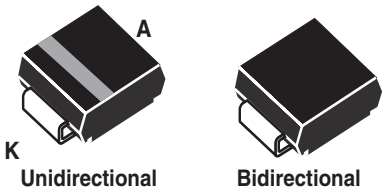
Transil™

Features

- Peak pulse power:
  - 1500 W (10/1000 µs)
  - 10 kW (8/20 µs)
- Breakdown voltage range: from 6.8 V to 220 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_{jmax}:
  - 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
  - See *Table 3* for surge level
- MIL STD 883G, method 3015-7: class 3B
  - 25 kV HBM (human body model)
- UL 497B file number: QVGQ2.E136224
- Resin meets UL 94, V0
- MIL-STD-750, method 2026 solderabilty
- EIA STD RS-481 and IEC 60286-3 packing
- IPC 7531 footprint



SMC
(JEDEC DO-214AB)

Description

The SM15T 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).

Planar technology makes these devices suitable for high-end equipment and SMPS where low leakage current and high junction temperature are required to provide reliability and stability over time.

SM15T are packaged in SMC (SMC footprint in accordance with IPC 7531 standard).

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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 parameter

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

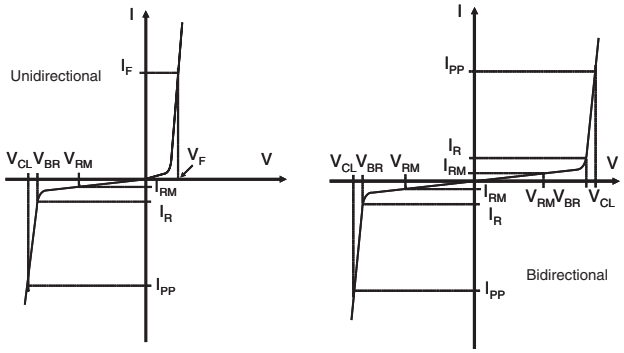


Figure 2. Pulse definition for electrical characteristics

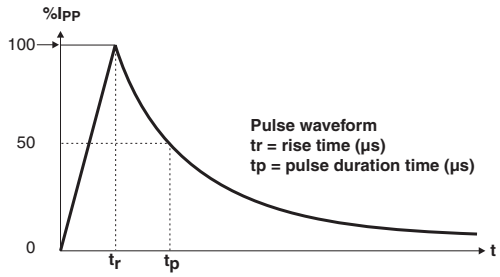


Table 3. Electrical characteristics, parameter values (T_{amb} = 25 °C)

Order code	I_{RM} max@V_{RM}			V_{BR} @I_R (1)				V_{CL} @I_{PP} 10/1000 µs		R_D 10/1000 µs	V_{CL} @I_{PP} 8/20 µs		R_D 8/20 µs	αT (2)
	25 °C	85 °C		min	typ	max		max			max			max
	µA		V	V			mA	V(3)	A(4)	Ω	V(3)	A(4)	Ω	10-4/ °C
SM15T6V8A/CA	500	2000	5.8	6.45	6.8	7.14	10	10.5	143	0.023	13.4	746	0.008	5.7
SM15T7V5A/CA	250	1000	6.4	7.13	7.5	7.88	10	11.3	132	0.026	14.5	690	0.010	6.1
SM15T10A/CA	10	50	8.55	9.5	10	10.5	1	14.5	103	0.039	18.6	538	0.015	7.3
SM15T12A/CA	0.2	1	10.2	11.4	12	12.6	1	16.7	90	0.046	21.7	461	0.020	7.8
SM15T15A/CA	0.2	1	12.8	14.3	15	15.8	1	21.2	71	0.076	27.2	368	0.031	8.4
SM15T18A/CA	0.2	1	15.3	17.1	18	18.9	1	25.2	59.5	0.106	32.5	308	0.044	8.8
SM15T22A/CA	0.2	1	18.8	20.9	22	23.1	1	30.6	49	0.153	39.3	254	0.064	9.2
SM15T24A/CA	0.2	1	20.5	22.8	24	25.2	1	33.2	45	0.178	42.8	234	0.075	9.4
SM15T27A/CA	0.2	1	23.1	25.7	27	28.4	1	37.5	40	0.228	48.3	207	0.096	9.6
SM15T30A/CA	0.2	1	25.6	28.5	30	31.5	1	41.5	36	0.278	53.5	187	0.12	9.7
SM15T33A/CA	0.2	1	28.2	31.4	33	34.7	1	45.7	33	0.333	59.0	169	0.14	9.8
SM15T36A/CA	0.2	1	30.8	34.2	36	37.8	1	49.9	30	0.403	64.3	156	0.17	9.9
SM15T39A/CA	0.2	1	33.3	37.1	39	41.0	1	53.9	28	0.461	69.7	143	0.20	10.0
SM15T68A/CA	0.2	1	58.1	64.6	68	71.4	1	92	16.3	1.26	121	83	0.60	10.4
SM15T75A/CA	0.2	1	64.1	71.3	75	78.8	1	103	14.6	1.66	134	75	0.74	10.5
SM15T100A/CA	0.2	1	85.5	95.0	100	105	1	137	11	2.91	178	56	1.30	10.6
SM15T150A/CA	0.2	1	128	143	150	158	1	207	7.2	6.81	265	38	2.82	10.8
SM15T200A/CA	0.2	1	171	190	200	210	1	274	5.5	11.6	353	28	5.11	10.8
SM15T220A/CA	0.2	1	188	209	220	231	1	328	4.6	21.1	388	26	6.04	10.8

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

Figure 3. Peak pulse power dissipation versus initial junction temperature (printed circuit board)

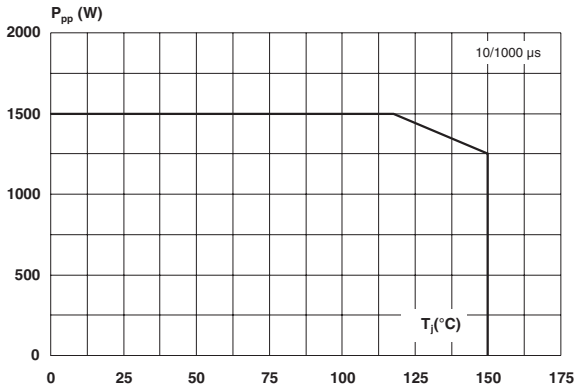


Figure 4. Peak pulse power versus exponential pulse duration

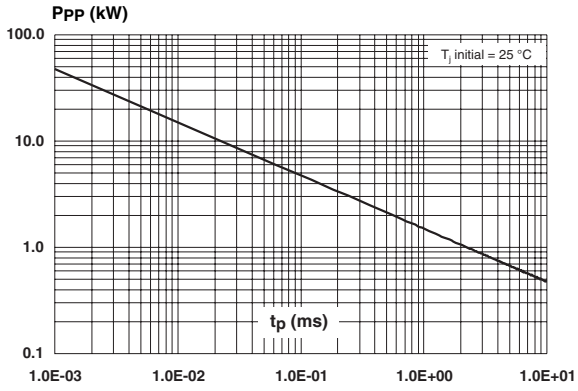


Figure 5. Clamping voltage versus peak pulse current (maximum values)

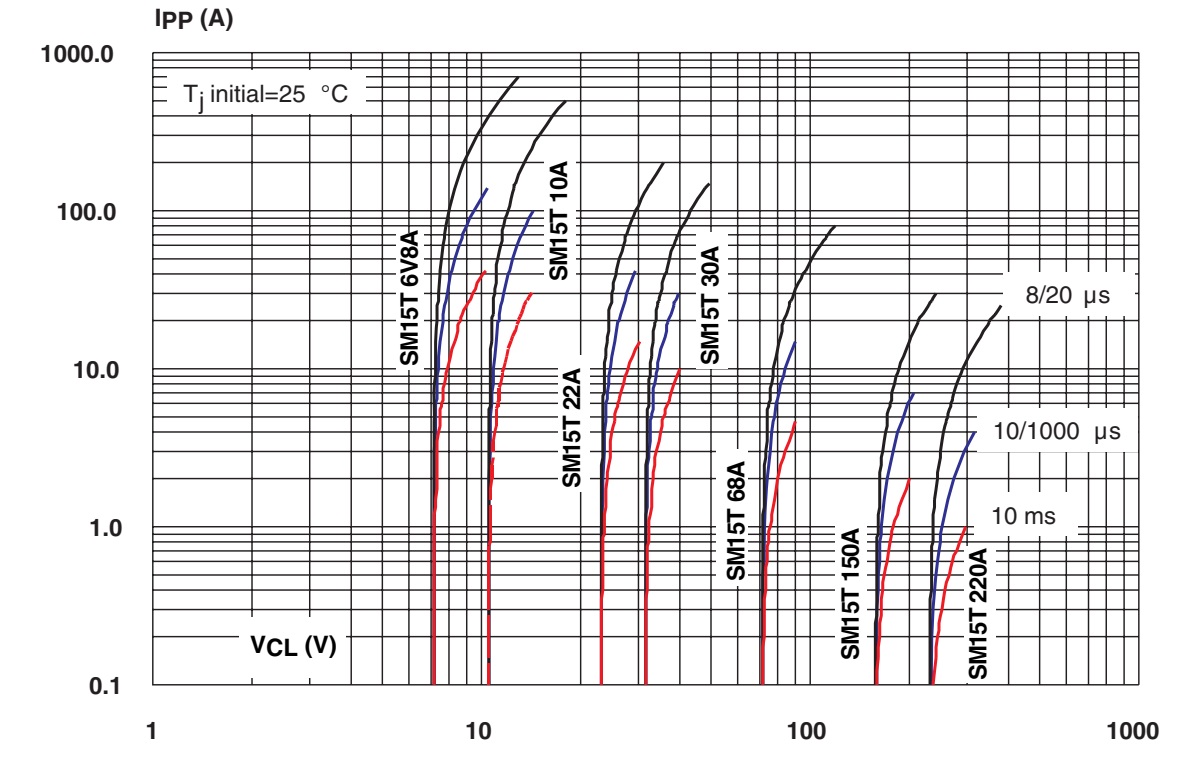


Figure 6. Capacitance versus reverse applied voltage (typical values, SM15TxxA)

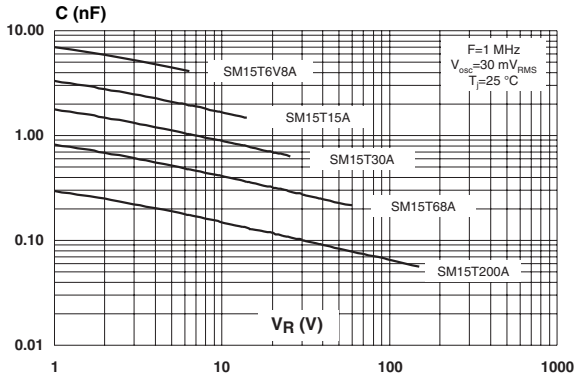


Figure 7. Capacitance versus reverse applied voltage (typical values, SM15TxxCA)

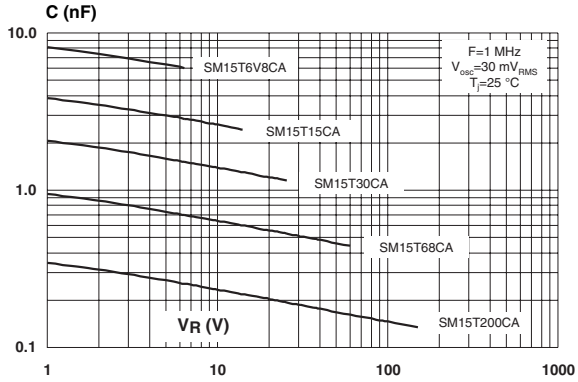


Figure 8. Peak forward voltage drop versus forward current (typical values)

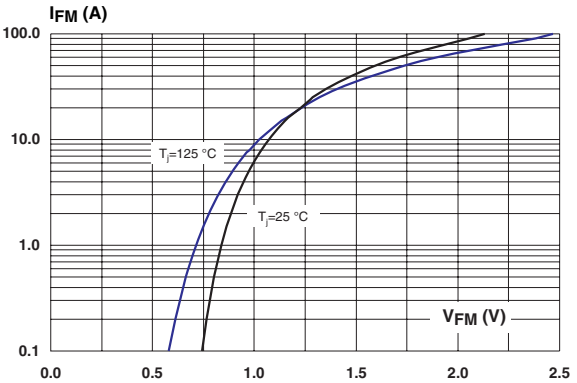


Figure 9. Relative variation of thermal impedance junction to ambient versus pulse duration

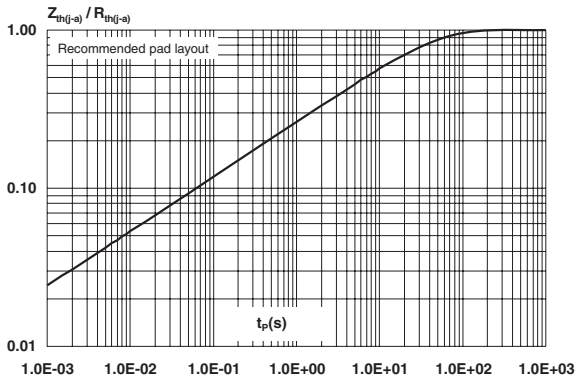


Figure 10. Thermal resistance junction to ambient versus copper surface under each lead

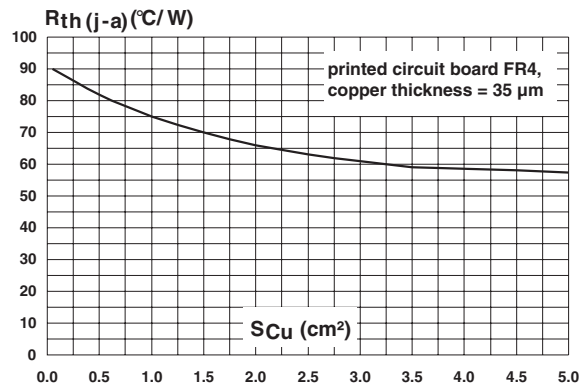
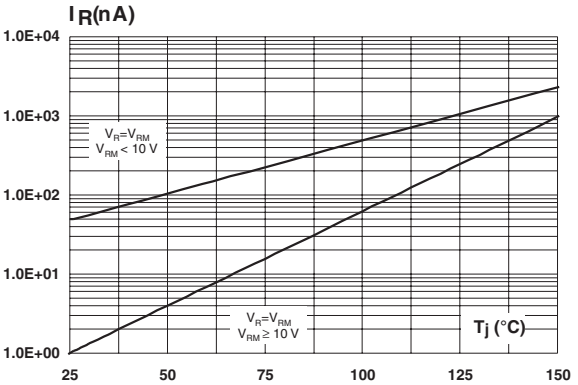
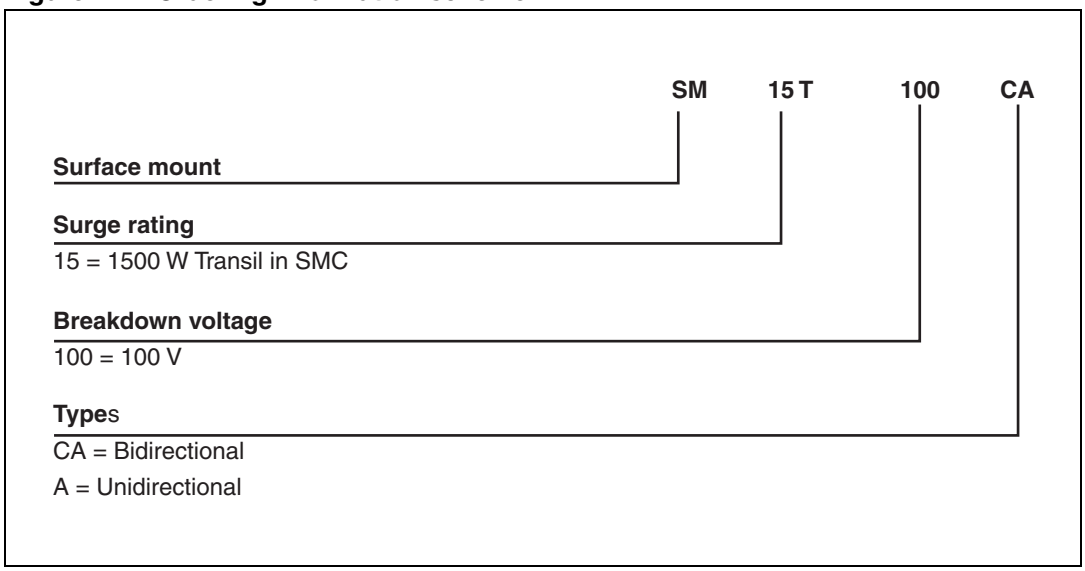


Figure 11. Leakage current versus junction temperature (typical values)



2 Ordering information scheme

Figure 12. Ordering information scheme

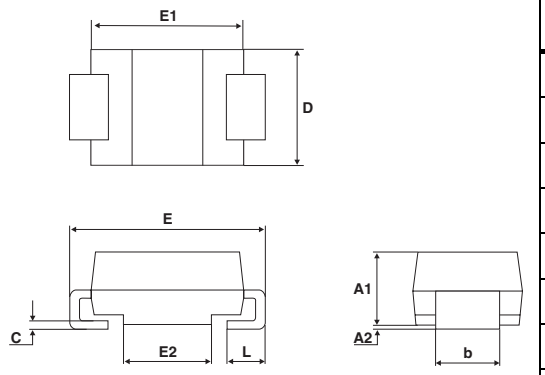


3 Package information

- Case: JEDEC DO-214AB molded plastic over planar junction
- Terminals: solder plated, solderable as per MIL-STD-750, Method 2026
- Polarity: for unidirectional types the band indicates cathode
- Flammability: epoxy is rated UL 94, V0
- 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	3.20	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	0.059

Figure 13. SMC footprint dimensions in mm (inches)

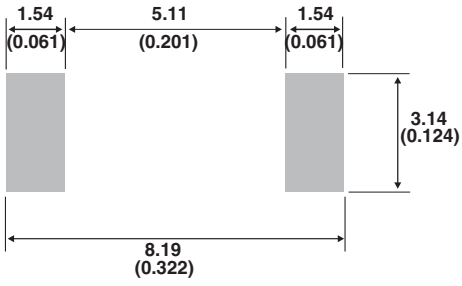
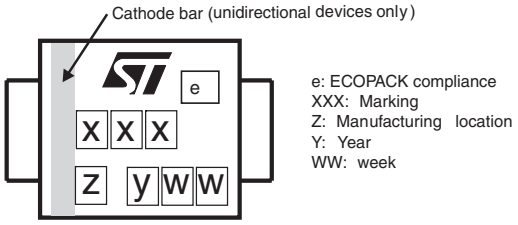


Figure 14. Marking layout(1)



1. Marking layout can vary according to assembly location.

Table 5. Marking

Order code	Marking	Order code	Marking
SM15T6V8A	MDE	SM15T6V8CA	BDE
SM15T7V5A	MDG	SM15T7V5CA	BDG
SM15T10A	MDP	SM15T10CA	BDP
SM15T12A	MDT	SM15T12CA	BDT
SM15T15A	MDX	SM15T15CA	BDX
SM15T18A	MEE	SM15T18CA	BEE
SM15T22A	MEK	SM15T22CA	BEK
SM15T24A	MEM	SM15T24CA	BEM
SM15T27A	MEP	SM15T27CA	BEP
SM15T30A	MER	SM15T30CA	BER
SM15T33A	MET	SM15T33CA	BET
SM15T36A	MEV	SM15T36CA	BEV
SM15T39A	MEX	SM15T39CA	BEX
SM15T68A	MFP	SM15T68CA	BFP
SM15T75A	MFO	SM15T75CA	BFO
SM15T100A	MFX	SM15T100CA	BFX
SM15T150A	MGK	SM15T150CA	BGK
SM15T200A	MGV	SM15T200CA	BGV
SM15T220A	MGX	SM15T220CA	BGX

4 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SM15TxxxA/CA(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	Description of changes
September-2001	3B	Last issue
19-Feb-2007	4	Peak pulse power *Figure 4 on page 4* updated.
04-Feb-2009	5	Updated ECOPACK statement. Added R_D columns in *Table 3*. Updated characteristic curves, *Figure 3* to *Figure 11*.
17-Sep-2009	6	Document updated for low leakage current.

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