SMA6F

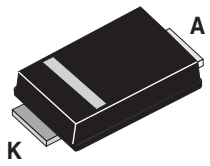
High junction temperature Transil™

Features

- Halogen-free package
- Peak pulse power:
  - 600 W (10/1000 µs)
  - 4 kW (8/20 µs)
- Stand off voltage: 5, 12 or 13 V
- Unidirectional type
- Low clamping voltage versus standard series
- Low leakage current, 0.2 µA at 25 °C
- Operating T_j max: 175 °C
- JEDEC registered package outline

Complies with the following standards

- IEC 61000-4-2 level 4:
  - 15 kV (air discharge)
  - 8 kV (contact discharge)
- MIL STD 883G-Method 3015-7: class3B
  - 25 kV (human body model)



Unidirectional

SMAflat

Description

The SMA6F Transil series has been designed to protect sensitive equipment against electro-static discharges according to IEC 61000-4-2, MIL STD 883 Method 3015, and electrical over stress such as IEC 61000-4-4 and 5. They are generally for surges below 600 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. Their low clamping voltages provides a better safety margin to protect sensitive circuits with extended life time expectancy.

Packaged in SMAflat non exposed pad, this minimizes PCB space consumption (footprint in accordance with IPC 7531 standard).

TM: Transil is a trademark of STMicroelectronics

1 Characteristics

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

Symbol	Parameter		Value	Unit
P_{PP}	Peak pulse power dissipation (1)	T_j initial = T_{amb}	600	W
P	Power dissipation on infinite heatsink	T_{lead} = 55 °C	6	W
I_{FSM}	Non repetitive surge peak forward current for unidirectional types	t_p = 10 ms T_j initial = T_{amb}	60	A
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

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

Table 2. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{th\ (j-l)}$	Junction to leads	20	°C/W

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

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

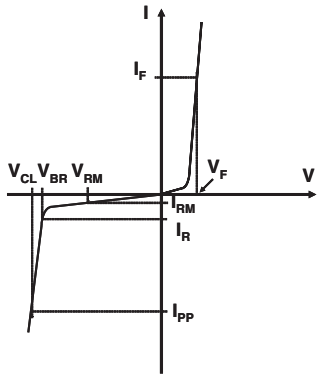


Table 4. Electrical characteristics - values (T_{amb} = 25 °C)

Type	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			max
	µA (Max)		V	V			mA	V	A	Ω	V	A	Ω	10-4/°C
SMA6F5.0A	10	50	5.0	6.40	6.74	7.07	10	9.2	68	0.029	13.4	298	0.021	5.7
SMA6F12AVCL	0.2	1	12	13.2	13.7	14.3	1	18.5	31	0.135	22.9	157	0.055	7.8
SMA6F13A	0.2	1	13	14.4	15.2	15.9	1	20.4	29	0.154	23.9	147	0.054	8.3

1. Pulse test: t_p <50ms.
2. To calculate maximum clamping voltage at other surge currents, use the following formula
   $V_{CLmax} = R_D \times I_{PP} + V_{BRmax}$
3. 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))

Figure 1. Definition of Ipp pulse

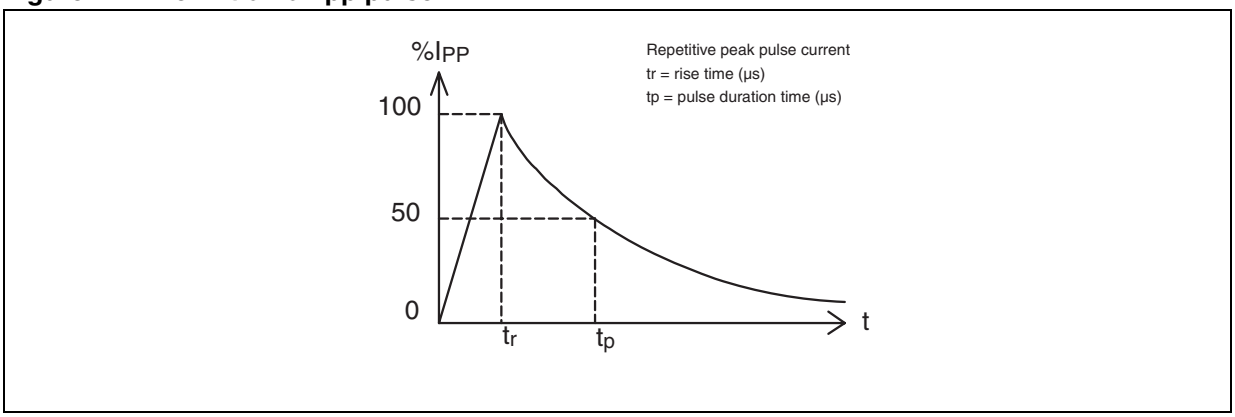


Figure 2. Relative peak power dissipation versus initial junction temperature

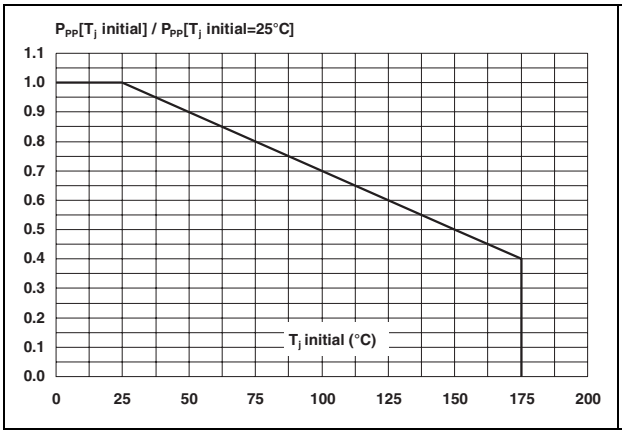


Figure 3. Peak pulse power versus exponential pulse duration (T_j initial = 25 °C)

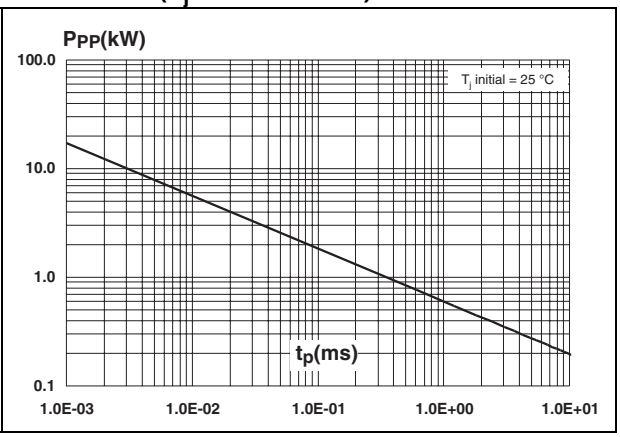


Figure 4. Clamping voltage versus peak pulse current (exponential waveform, maximum values)

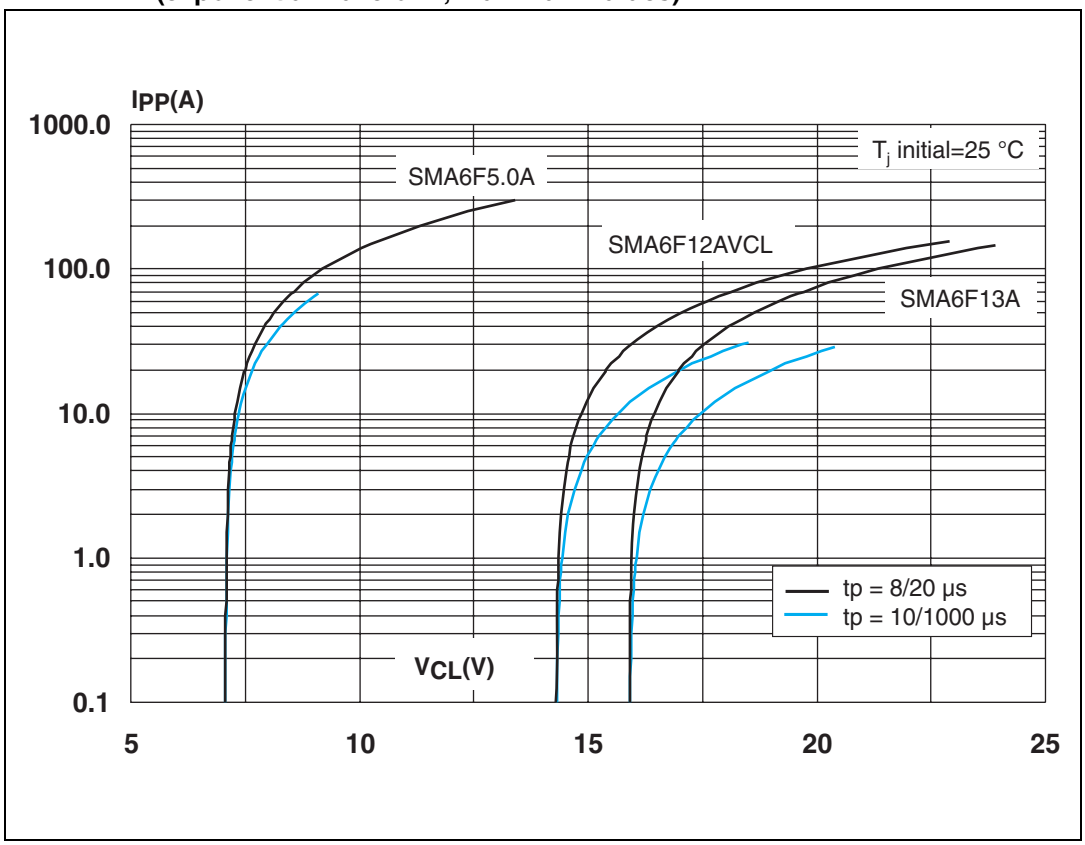


Figure 5. Junction capacitance versus reverse applied voltage (typical values)

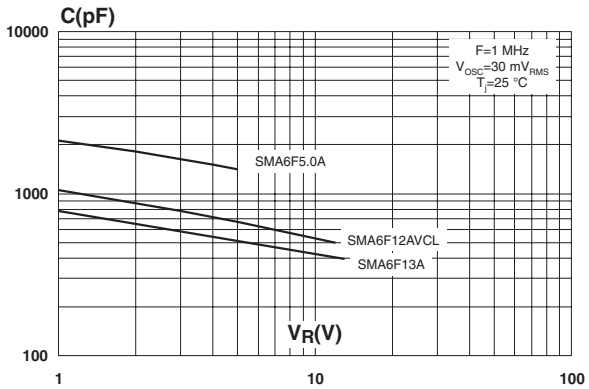


Figure 6. Peak forward voltage drop versus peak forward current (typical values)

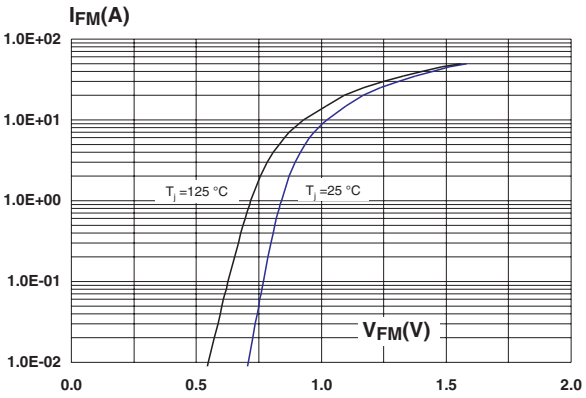


Figure 7. Relative variation of thermal impedance junction to ambient versus pulse duration (printed ciruit board FR4, S_{Cu} = 1 cm^2)

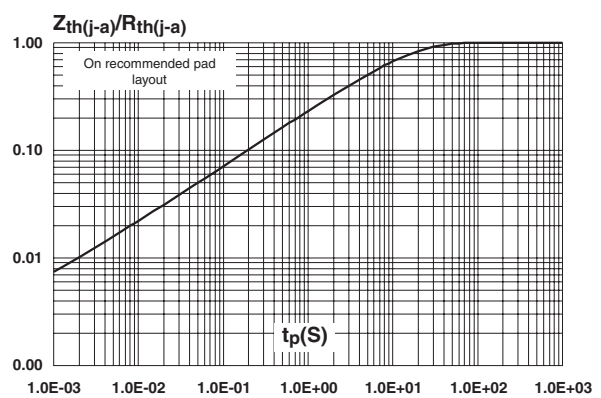


Figure 8. Thermal resistance junction to ambient versus copper surface under each lead (printed circuit board FR4, copper thickness = 35 µm)

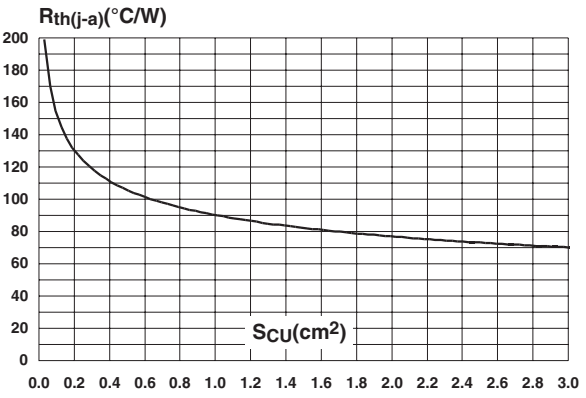
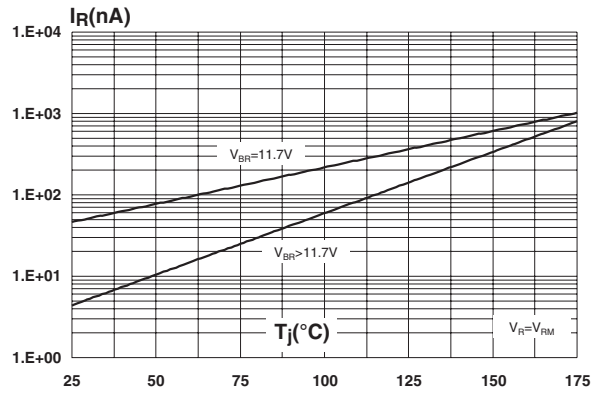
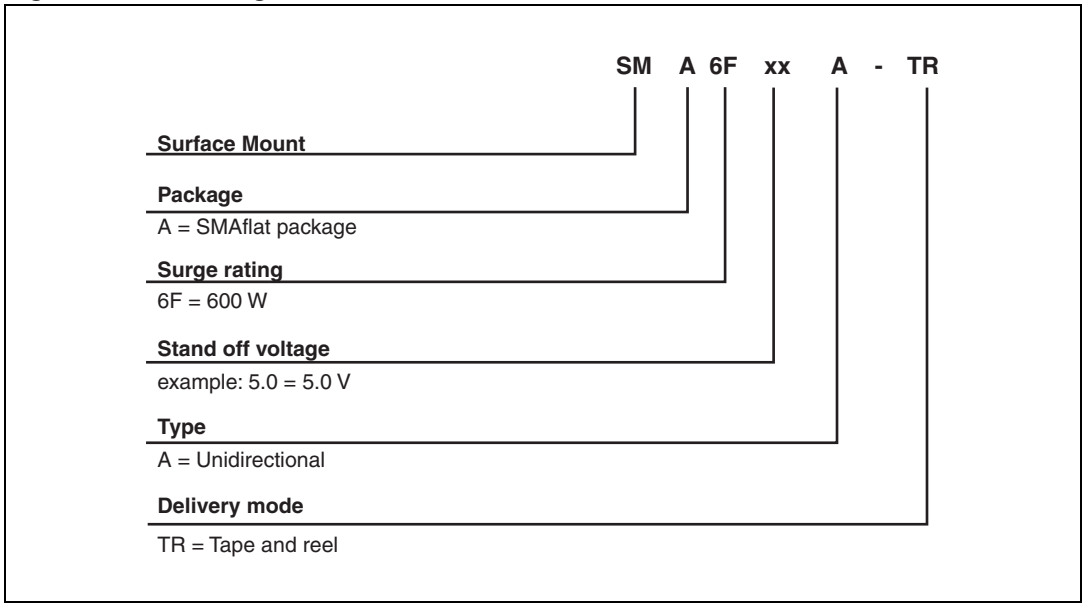


Figure 9. Leakage current versus junction temperature (typical values)



2 Ordering information scheme

Figure 10. Ordering information scheme

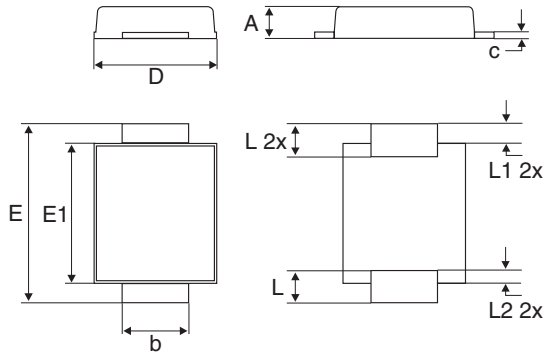


3 Package information

- Case: JEDEC DO-221AC molded plastic over Planar junction
- Terminals: Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: Band indicates cathode
- Flammability: Epoxy rated UL94V-0
- RoHS package

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at *www.st.com*.

Table 5. SMAflat (non exposed pad) dimensions



Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	0.90		1.10	0.035		0.043
b	1.25		1.65	0.049		0.065
c	0.15		0.40	0.006		0.016
D	2.25		2.95	0.088		0.116
E	4.80		5.60	0.189		0.220
E1	3.95		4.60	0.156		0.181
L	0.75		1.50	0.030		0.059
L1		0.50			0.019	
L2		0.50			0.019	

Figure 11. SMAflat footprint dimensions

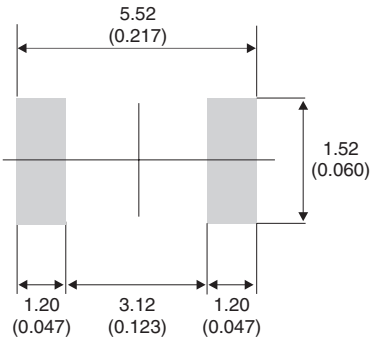
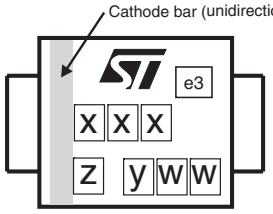


Figure 12. Marking information



e3: ECOPACK (Leadfree)
XXX: Marking
Z: Manufacturing location
Y: Year
WW: week

4 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
SMA6F5.0A-TR	SUA	SMAflat	0.035 g	10000	Tape and reel
SMA6F12AVCL-TR	SUJ				
SMA6F13A-TR	SUG				

5 Revision history

Table 7. Document revision history

Date	Revision	Changes
04-Sep-2008	1	First issue.

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