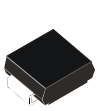
SMP50 / SMTPA / TPA

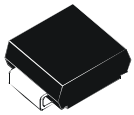
Trisil™ for telecom equipment protection

Features

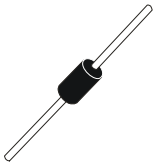
- Bidirectional crowbar protection
- Voltage range from 62 V to 320 V
- Low capacitance from 12 pF to 20 pF @ 50 V
- Low leakage current : I_R = 2 µA max
- Holding current: I_H = 150 mA min
- Repetitive peak pulse current : I_{PP} = 50 A (10/1000 µs)



SMA
(JEDEC DO-214AC)
SMP50



SMB
(JEDEC DO-214AA)
SMTPA



DO-15
TPA

Main applications

Telecommunication equipment such as:

- Analog and digital line cards (xDSL, T1/E1, ISDN, ...)
- Terminals (phone, fax, modem, ...) and central office equipment

Description

These Trisil series have been designed to protect telecommunication equipment against lightning and transient induced by AC power lines.

They are available in SMA, SMB and DO-15 packages.

Benefits

Trisils are not subject to ageing and provide a fail safe mode in short circuit for a better protection. They are used to help equipment to meet various standards such as UL1950, IEC950 / CSA C22.2, UL1459 and FCC part 68.

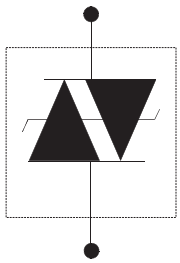
Trisils have UL94 V0 approved resin.
SMA and SMB packages are JEDEC registered (DO-214AC and DO-214AA).

Trisils are UL497B approved (file: E136224).

Order codes

Part Number	Marking
SMP50-xxx	See *Ordering Information on page 9*
TPAxxx	
SMTPAxxx	

Schematic Diagram



TM: TRISIL is a trademark of STMicroelectronics

1 Characteristics

Table 1. Compliant with the following standards

Standard	Peak Surge Voltage (V)	Waveform Voltage	Required peak current (A)	Current waveform	Minimum serial resistor to meet standard (Ω)
GR-1089 Core First level	2500 1000	2/10 µs 10/1000 µs	500 100	2/10 µs 10/1000 µs	20 10
GR-1089 Core Second level	5000	2/10 µs	500	2/10 µs	40
GR-1089 Core Intra-building	1500	2/10 µs	100	2/10 µs	0
ITU-T-K20/K21	6000 1500	10/700 µs	150 37.5	5/310 µs	53 0
ITU-T-K20 (IEC61000-4-2)	8000 15000	1/60 ns	ESD contact discharge ESD air discharge		0 0
VDE0433	4000 2000	10/700 µs	100 50	5/310 µs	21.5 0
VDE0878	4000 2000	1.2/50 µs	100 50	1/20 µs	0 0
IEC61000-4-5	4000 4000	10/700 µs 1.2/50 µs	100 100	5/310 µs 8/20 µs	21.5 0
FCC Part 68, lightning surge type A	1500 800	10/160 µs 10/560 µs	200 100	10/160 µs 10/560 µs	12.5 6.5
FCC Part 68, lightning surge type B	1000	9/720 µs	25	5/320 µs	0

Table 2. Absolute ratings (T_{amb} = 25° C)

Symbol	Parameter		Value	Unit
I_{PP}	Repetitive peak pulse current (see *Figure 1*)	10/1000 µs 8/20 µs 10/560 µs 5/310 µs 10/160 µs 1/20 µs 2/10 µs	50 150 55 65 75 100 100	A
I_{FS}	Fail-safe mode : maximum current(1)	8/20 µs	2.5	kA
I_{TSM}	Non repetitive surge peak on-state current (sinusoidal)	t = 0.2 s t = 1 s t = 2 s t = 15 mn	16 11.5 10 3.5	A
I^2t	I^2t value for fusing	t = 16.6 ms t = 20 ms	6.2 6.5	A^2s
T_{stg} T_j	Storage temperature range Maximum junction temperature		-55 to 150 150	°C
T_L	Maximum lead temperature for soldering during 10 s.		260	°C

1. in fail safe mode, the device acts as a short circuit

Table 3. Thermal resistances

Symbol	Parameter	Value			Unit
		DO-15	SMA	SMB	
$R_{th(j-a)}$	Junction to ambient (with recommended footprint or with L_{lead} = 10 mm for DO-15)	100	120	100	°C/W
$R_{th(j-l)}$	Junction to leads (L_{lead} = 10 mm for DO-15)	60	30	20	°C/W

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

Symbol	Parameter
V_{RM}	Stand-off voltage
V_{BR}	Breakdown voltage
V_{BO}	Breakover voltage
I_{RM}	Leakage current
I_{PP}	Peak pulse current
I_{BO}	Breakover current
I_H	Holding current
V_R	Continuous reverse voltage
I_R	Leakage current at V_R
C	Capacitance

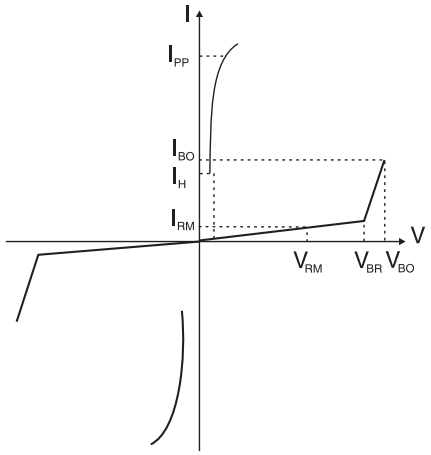


Table 5. Electrical characteristics - values (T_{amb} = 25°C)

Types	I_{RM} @ V_{RM}		I_R @ V_R(1)		Dynamic V_{BO}(2)	Static V_{BO} @ I_{BO}(3)		I_H(4)	C(5)	C(6)
	max.		max.		max.	max.	max.	min.	typ.	typ.
	µA	V	µA	V	V	V	mA	mA	pF	pF
SMP50-62 / TPA62 SMTPA62	2	56	5	62	85	82	800	150	20	40
SMP50-68 / TPA68 SMTPA68		61		68	93	90			20	40
SMP50-100 / TPA100 SMTPA100		90		100	135	133			16	35
SMP50-120 / TPA120 SMTPA120		108		120	160	160			16	30
SMP50-130 / TPA130 SMTPA130		117		130	173	173			14	30
SMP50-180 / TPA180 SMTPA180		162		180	235	240			14	25
SMP50-200 / TPA200 SMTPA200		180		200	262	267			12	25
SMP50-220 / TPA220 SMTPA220		198		220	285	293			12	25
SMP50-240 / TPA240 SMTPA240		216		240	300	320			12	25
SMP50-270 / TPA270 SMTPA270		243		270	350	360			12	25
SMP50-320 / SMTPA320		290		320	400	400			12	25

1. I_R measured at V_R guarantee V_{BR} min ≥ V_R
2. See functional test circuit 1(*Figure 9.*)
3. See test circuit 2(*Figure 10.*)
4. See functional holding current test circuit 3(*Figure 11.*)
5. V_R = 50 V bias, V_{RMS} = 1 V, F = 1 MHz
6. V_R = 2 V bias, V_{RMS} = 1 V, F = 1 MHz

Figure 1. Pulse waveform (10/1000 µs)

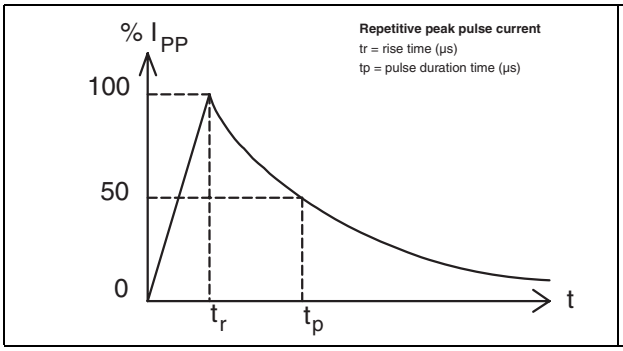


Figure 2. Non repetitive surge peak on-state current versus overload duration

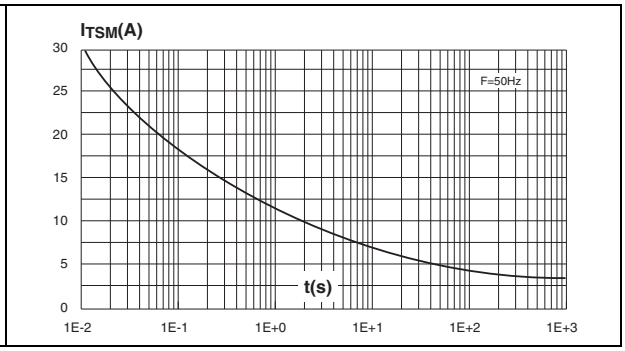


Figure 3. On-state voltage versus on-state current (typical values)

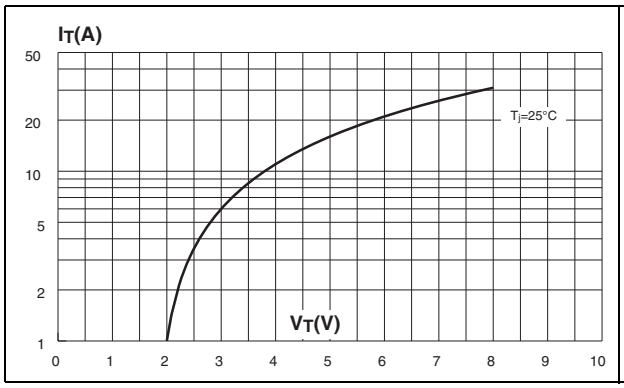


Figure 4. Relative variation of holding current versus junction temperature

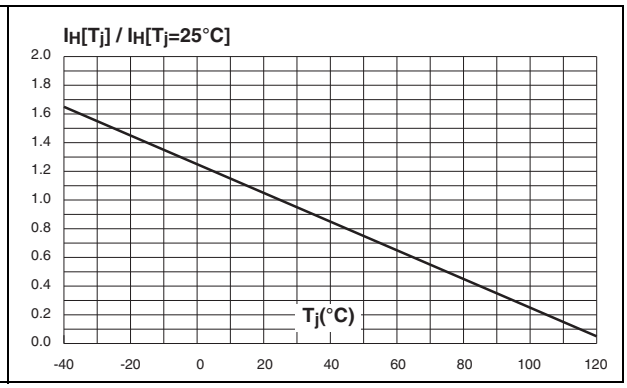


Figure 5. Relative variation of breakover voltage versus junction temperature

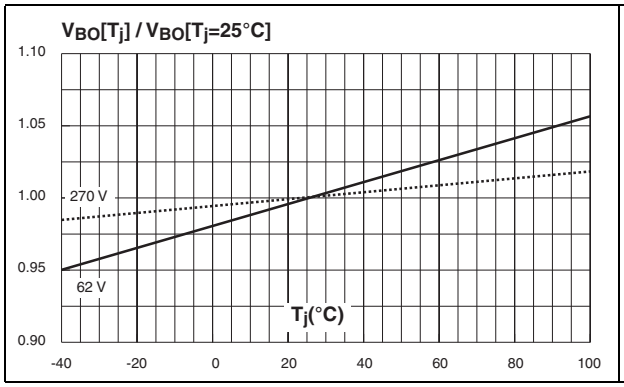


Figure 6. Relative variation of leakage current versus reverse voltage applied (typical values)

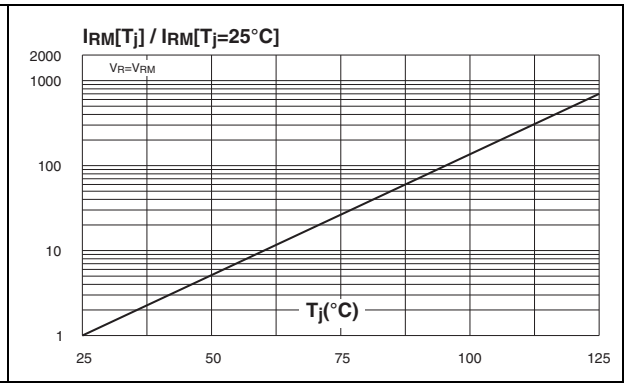


Figure 7. Variation of thermal impedance junction to ambient versus pulse duration (Printed circuit board FR4, S_{Cu} = 35 µm, recommended pad layout)

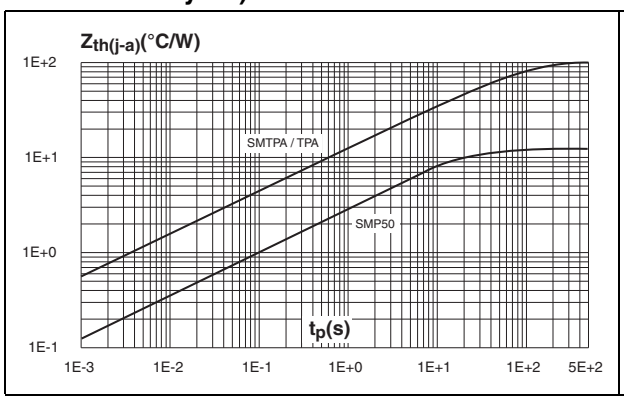


Figure 8. Relative variation of junction capacitance versus reverse voltage applied (typical values)

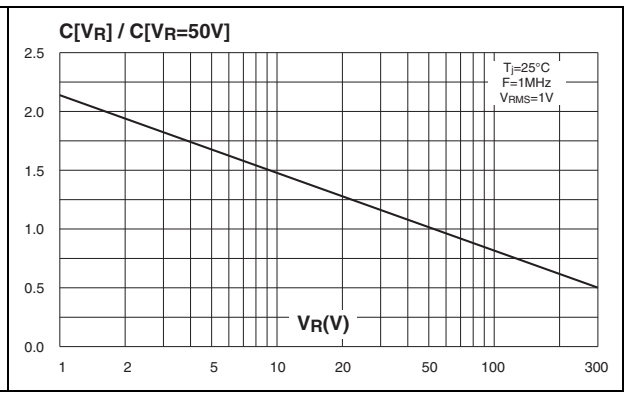


Figure 9. Test circuit 1 for Dynamic I_{BO} and V_{BO} parameters

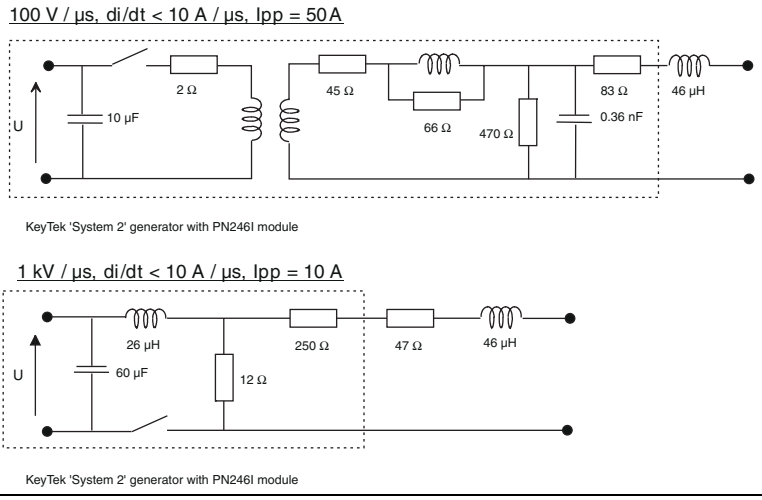
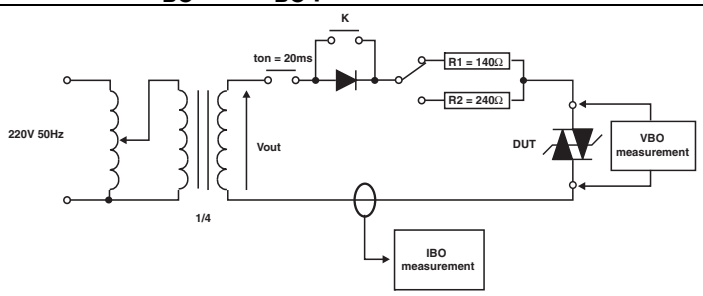


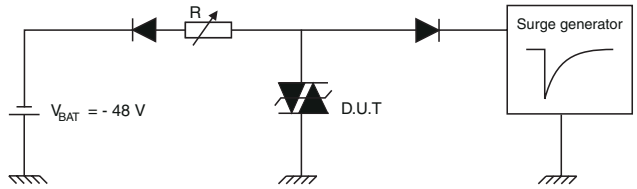
Figure 10. Test circuit 2 for I_{BO} and V_{BO} parameters



TEST PROCEDURE
Pulse test duration (tp = 20ms):
- for Bidirectional devices = Switch K is closed
- for Unidirectional devices = Switch K is open

V_{OUT} selection:
- Device with V_{BO} > 200V → V_{OUT} = 250 V_{RMS}, R1 = 140Ω
- Device with V_{BO} ≥ 200V → V_{OUT} = 480 V_{RMS}, R2 = 240Ω

Figure 11. Test circuit 3 for dynamic I_H parameters



This is a GO-NOGO test which allows to confirm the holding current (I_H) level in a functional test circuit.

TEST PROCEDURE
1/ Adjust the current level at the I_H value by short circuiting the AK of the D.U.T.
2/ Fire the D.U.T. with a surge current → I_{PP} = 10A, 10/1000µs.
3/ The D.U.T. will come back off-state within 50ms maximum.

2 Ordering information scheme

SMP 50 - xxx

Series

SMP = Trisil surface mount in SMA
SMTP = Trisil surface mount in SMB
TP = Trisil in DO-15

Repetitive Peak Pulse Current

A or 50 = 50 A

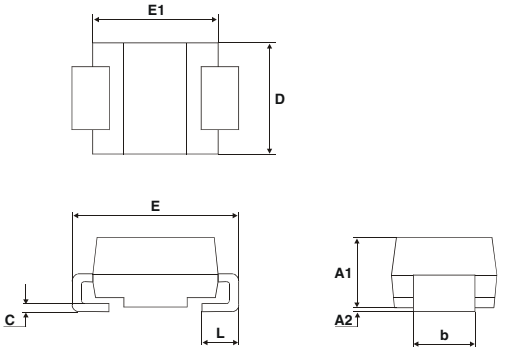
Voltage

62 = 62 V

3 Package information

- Epoxy meets UL94, V0

Table 6. SMA dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A1	1.90	2.45	0.075	0.094
A2	0.05	0.20	0.002	0.008
b	1.25	1.65	0.049	0.065
c	0.15	0.40	0.006	0.016
D	2.25	2.90	0.089	0.114
E	4.80	5.35	0.189	0.211
E1	3.95	4.60	0.156	0.181
L	0.75	1.50	0.030	0.059

Figure 12. Footprint, dimensions in mm (inches)

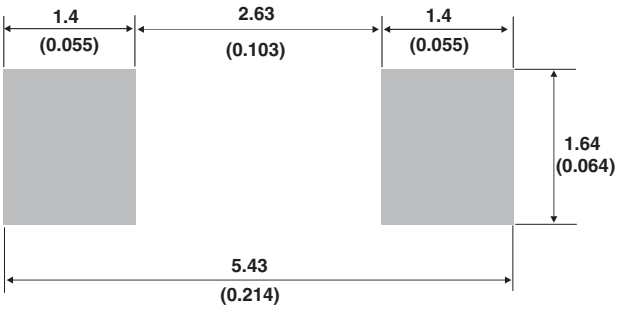
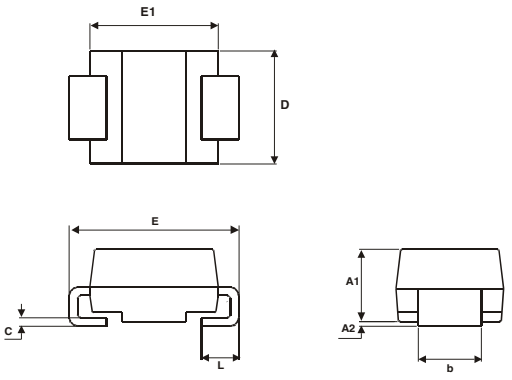


Table 7. SMB dimensions



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	1.95	2.20	0.077	0.087
c	0.15	0.40	0.006	0.016
E	5.10	5.60	0.201	0.220
E1	4.05	4.60	0.159	0.181
D	3.30	3.95	0.130	0.156
L	0.75	1.50	0.030	0.059

Figure 13. Footprint, dimensions in mm (inches)

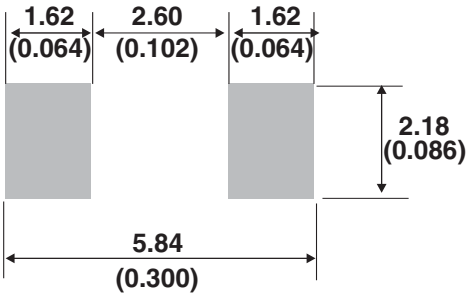
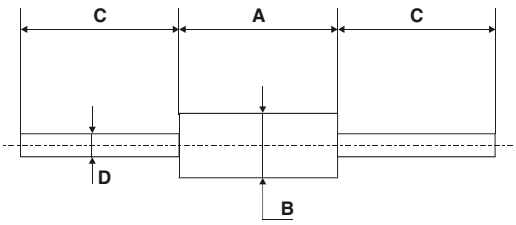


Table 8. DO-15 dimensions



Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	6.05	6.75	0.238	0.266
B	2.95	3.53	0.116	0.139
C	26	31	1.024	1.220
D	0.71	0.88	0.028	0.035

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.

4 Ordering Information

Part Number	Marking	Package	Weight	Base qty	Delivery mode
SMP50-62	V06	SMA	0.068 g	5000	Tape & reel
SMP50-68	V07				
SMP50-100	V10				
SMP50-120	V12				
SMP50-130	V13				
SMP50-180	V18				
SMP50-200	V20				
SMP50-220	V22				
SMP50-240	V24				
SMP50-270	V27				
SMP50-320	V32				
SMTPA62	U01	SMB	0.11 g	2500	Tape & reel
SMTPA68	U05				
SMTPA100	U13				
SMTPA120	U17				
SMTPA130	U19				
SMTPA180	U25				
SMTPA200	U27				
SMTPA220	U31				
SMTPA240	U35				
SMTPA270	U39				
SMTPA320	U47				
TPA62	TPA62	DO-15	0.40 g	1000	Ammopack
TPA62RL				6000	Tape & reel
TPA68	TPA68			1000	Ammopack
TPA68RL				6000	Tape & reel
TPA100	TPA100			1000	Ammopack
TPA100RL				6000	Tape & reel
TPA120	TPA120			1000	Ammopack
TPA130	TPA130			1000	Ammopack
TPA130RL				6000	Tape & reel
TPA180	TPA180			1000	Ammopack
TPA180RL				6000	Tape & reel
TPA200	TPA200			1000	Ammopack
TPA200RL				6000	Tape & reel
TPA220	TPA220			1000	Ammopack
TPA220RL				6000	Tape & reel
TPA240	TPA240			1000	Ammopack
TPA240RL				6000	Tape & reel
TPA270	TPA270			1000	Ammopack
TPA270RL				6000	Tape & reel

5 Revision History

Date	Revision	Description of Changes
16-Nov-2004	1	SMP50, SMTPA and TPA datasheets merge.
30-Mar-2007	2	Reformatted to current standards. Updated I_{PP} value in Table 2 . Added part numbers SMP50-320 and SMTPA320. Updated dimensions and footprint for SMA and footprint for SMB.
12-Jun-2007	3	Corrected typographical error in part number. Added dimensions in inches to footprint illustrations.

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