

Tripolar overvoltage protection for network interfaces

Features

- Triple crowbar protection
- Low capacitance
- Low holding current: $I_H = 30$ mA minimum
- Surge current:
 $I_{PP} = 200$ A, 2/10 μ s
 $I_{PP} = 30$ A, 10/1000 μ s

Benefits

- Trisil™ technology is not subject to ageing and provides a fail safe mode in short circuit for a better protection.
- This device can be used to help equipment to meet main standards such as UL1950, IEC 950 / CSA C22.2 and UL1459.
- Trisils have UL94 V0 approved resin.
- SO8 package is JEDEC registered.
- Trisils comply with the following standards GR-1089 Core, ITU-T-K20/K21, VDE0433, VDE0878, IEC 61000-4-2.

Applications

Dedicated to data line protection, this device provides a tripolar protection function. It ensures the same protection capability with the same breakdown voltage in both common and differential modes.

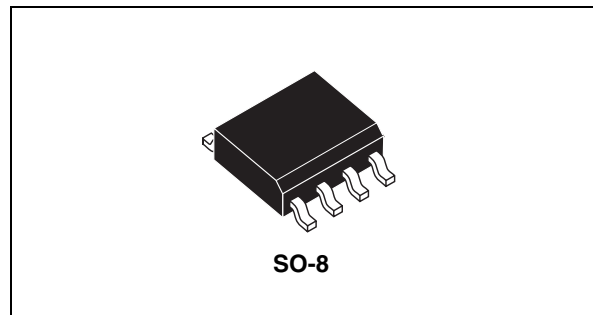
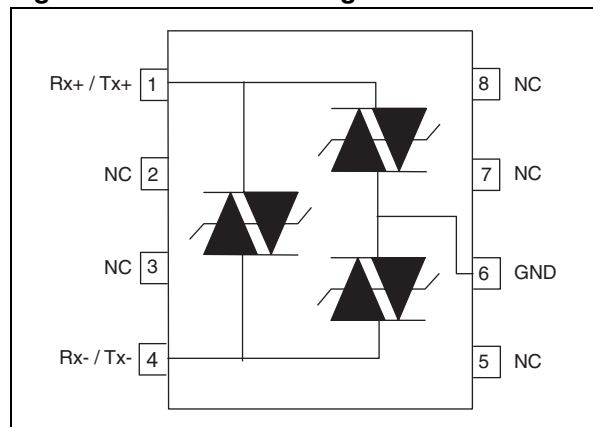


Figure 1. Schematic diagram



Description

The TPN is a low capacitance transient surge arrester designed for protection of high debit rate communication networks. Its low capacitance avoids distortion of the signal as it has been designed for T1/E1 and Ethernet networks.

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1 Characteristics

Table 1. Compliant with the following standards

	Peak surge voltage (V)	Voltage waveform (µs)	Required peak current (A)	Current waveform (µs)	Minimum serial resistor to meet standard (Ω)
GR-1089-CORE First level	2500	2/10	500	2/10	7.5
	1000	10/1000	100	10/1000	25
GR-1089-CORE Intrabuilding	1500	2/10	100	2/10	0
ITU-T-K20/K21	1000	10/700	25	5/310	0
ITU-T-K20 (IEC 61000-4-2)	6000	1/60 ns	ESD contact discharge		-
	8000		ESD air discharge		-
VDE0433	4000	10/700	100	5/310	40
	2000		50		0
VDE0878	4000	1.2/50	100	1/20	0
	2000		50		0
IEC 61000-4-5	2000	10/700	50	5/310	0
	2000	1.2/50	50	8/20	0

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

Symbol	Parameter	Value	Unit	
I _{PP}	Peak pulse current: t _r / t _p	10/1000	30	A
		8/20	100	
		10/560	40	
		5/310	50	
		10/160	75	
		1/20	100	
		2/10	200	
I _{TSM}	Non repetitive surge peak on-state current One cycle	50 Hz 60 Hz	8 9	A
	Non repetitive surge peak on-state current (F = 50Hz)	0.2 s 2 s	3 1.5	A
T _{stg}	Storage temperature range	-55 to +150	°C	
T _j	Operating junction temperature range	-40 to +150	°C	
T _L	Maximum lead temperature for soldering during 10s	260	°C	

Table 3. Thermal resistances

Symbol	Parameter	Value	Unit
R _{th(j-a)}	Junction to ambient	170	°C/W

Table 4. Electrical characteristics - definitions ($T_{amb} = 25^{\circ}C$)

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

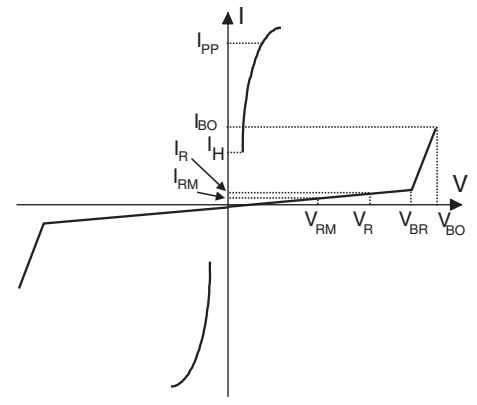


Table 5. Static parameters

Order code	I_{RM} max. @ V_{RM}		$V_{BO}^{(1)}$ max. @ I_{BO}		$I_H^{(2)}$ min.	$C^{(3)}$ typ.
	μA	V	V	mA	mA	pF
TPN3021	4	28	38	300	30	16

1. See [Figure 6: Test circuit 1 for IBO and VBO parameters](#).
2. See [Figure 7: Test circuit 2 for dynamic IH parameter](#)
3. $V_R = 0V$ bias, $V_{RMS} = 1V$, $F = 1MHz$

Figure 2. Pulse waveform

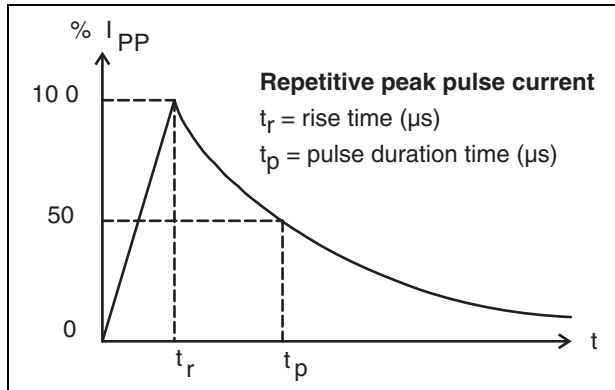


Figure 3. Non repetitive surge peak on-state current versus overload duration (T_j initial = $25^{\circ}C$)

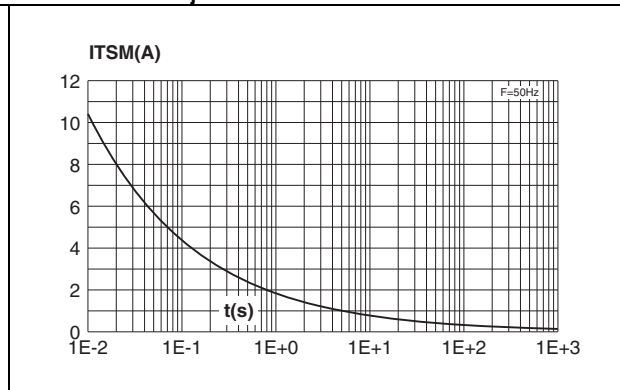


Figure 4. Variation of junction capacitance versus reverse voltage applied (typical values)

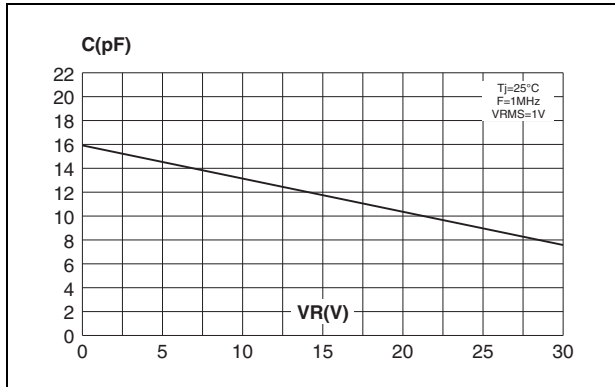
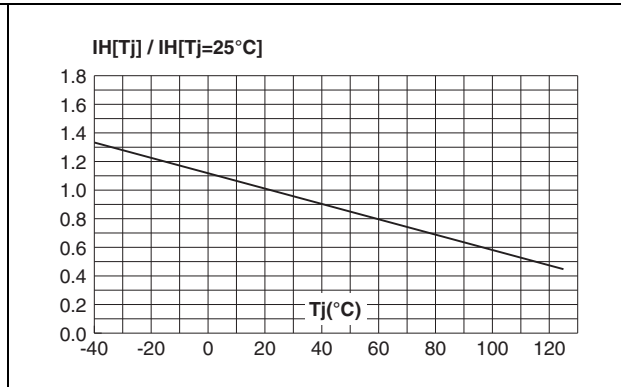


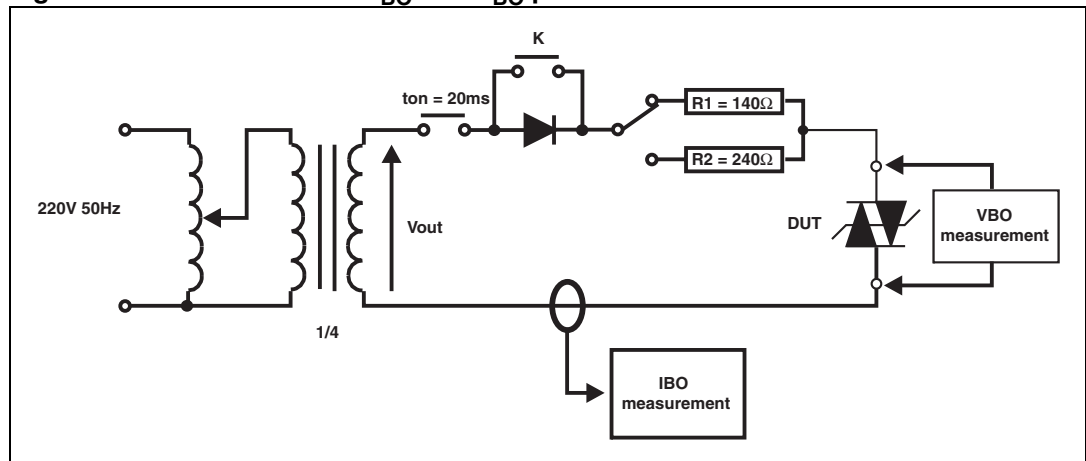
Figure 5. Relative variation of holding current versus junction temperature



2 Test circuits

2.1 Test procedure for test circuit 1

Figure 6. Test circuit 1 for I_{BO} and V_{BO} parameters



Pulse test duration ($t_p = 20 \text{ ms}$):

- For bidirectional devices = switch K is closed
- For unidirectional devices = switch K is open

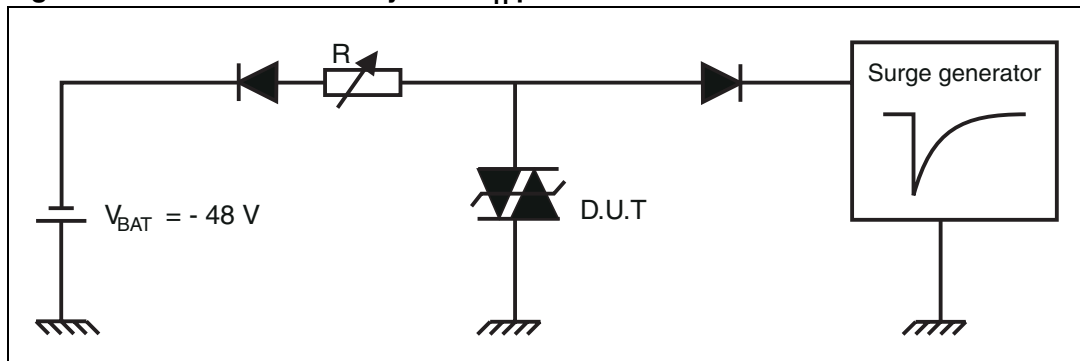
V_{OUT} selection:

Device with $V_{BO} < 200 \text{ V}$, $V_{OUT} = 250 \text{ V}_{RMS}$, $R1 = 140 \text{ } \Omega$

Device with $V_{BO} \geq 200 \text{ V}$, $V_{OUT} = 480 \text{ V}_{RMS}$, $R2 = 240 \text{ } \Omega$

2.2 Test procedure for test circuit 2

Figure 7. Test circuit 2 for dynamic I_H parameter



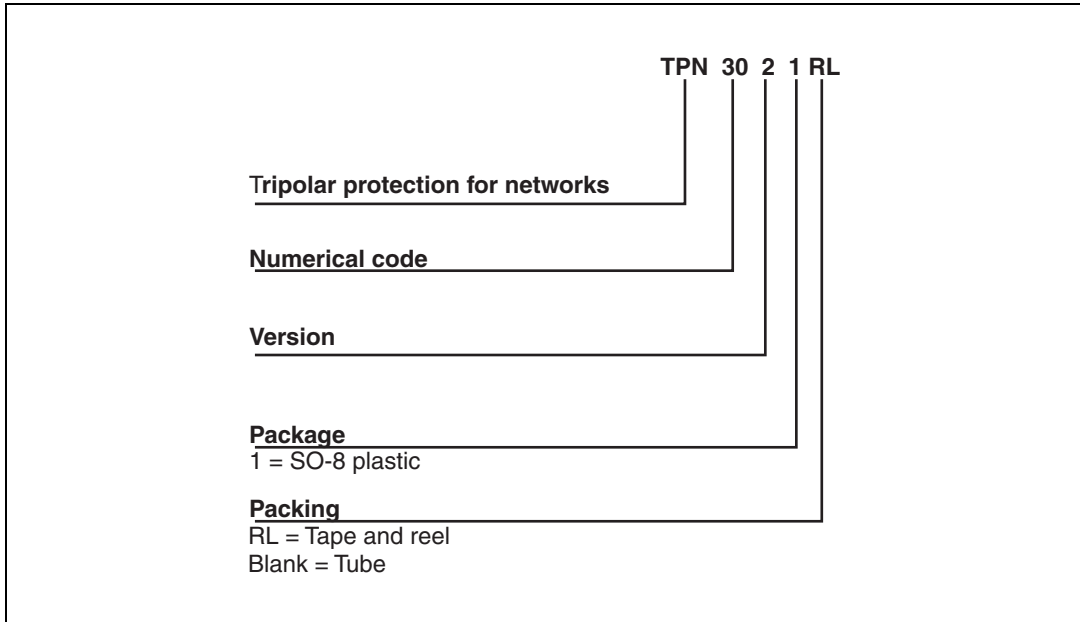
This is a go no-go test, which can confirm the holding current (I_H) level.

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 $I_{PP} = 10\text{A}$, $10/1000\mu\text{s}$.
3. The D.U.T. will come back off-state within 50 ms maximum.

3 Ordering information scheme

Figure 8. Ordering information scheme



4 Package information

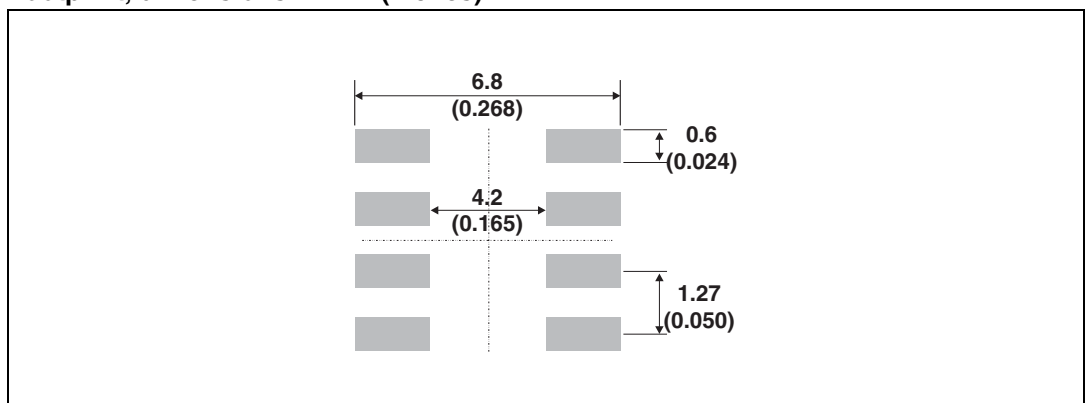
- Epoxy meets UL94, V0
- Lead-free package

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 6. SO-8 dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
A1	0.1		0.25	0.004		0.010
A2	1.25			0.049		
b	0.28		0.48	0.011		0.019
C	0.17		0.23	0.007		0.009
D	4.80	4.90	5.00	0.189	0.193	0.197
E	5.80	6.00	6.20	0.228	0.236	0.244
E1	3.80	3.90	4.00	0.150	0.154	0.157
e		1.27			0.050	
h	0.25		0.50	0.010		0.020
L	0.40		1.27	0.016		0.050
L1		1.04			0.041	
k	0°		8°	0°		8°
ppp			0.10			0.004

Footprint, dimensions in mm (inches)



5 Ordering information

Table 7. Ordering information

Ordering code	Marking	Package	Weight	Base qty	Delivery mode
TPN3021	TPN302	SO-8	0.08g	100	Tube
TPN3021RL ⁽¹⁾	TPN302			2500	Tape and reel

1. Preferred device

6 Revision history

Table 8. Document revision history

Date	Revision	Changes
Sep-2001	3	Previous release
07-Feb-2006	4	Reformatted to current template. Maximum junction temperature parameter replaced by Operating junction temperature range in Table 3. Added footnote 1 to Ordering information table.
25-Jun-2010	5	Updated trademark statement.

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