TISP61089M

PROGRAMMABLE OVERVOLTAGE PROTECTOR
DUAL FORWARD-CONDUCTING P-GATE THYRISTOR

TISP61089M SLIC Overvoltage Protector

High 70 A 5/310 Capability
Dual Voltage-Programmable Protector
- Supports Voltages Down to -155 V
- Low 5 mA max. Gate Triggering Current
- High 150 mA min. Holding Current

Description

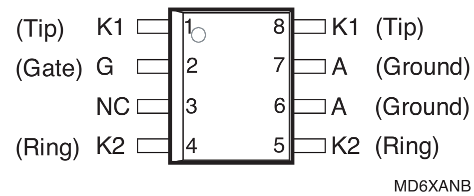
The TISP61089M is a dual forward-conducting buffered p-gate overvoltage protector. It is designed to protect monolithic SLICs (Subscriber Line Interface Circuits) against overvoltages on the telephone line caused by lightning, a.c. power contact and induction. The TISP61089M limits voltages that exceed the SLIC supply rail voltage. The TISP61089M parameters are specified to allow equipment compliance with Bellcore GR-1089-CORE, ITU-T K.21 and K.45 and YD/T-950.

The SLIC line driver section is typically powered from 0 V (ground) and a negative voltage in the region of -20 V to -155 V. The protector gate is connected to this negative supply. This references the protection (clipping) voltage to the negative supply voltage. As the protection voltage will then track the negative supply voltage, the overvoltage stress on the SLIC is minimized.

Positive overvoltages are clipped to ground by diode forward conduction. Negative overvoltages are initially clipped close to the SLIC negative supply rail value. If sufficient current is available from the overvoltage, then the protector will crowbar into a low voltage on-state condition. As the overvoltage subsides, the high holding current of the crowbar helps prevent d.c. latchup.

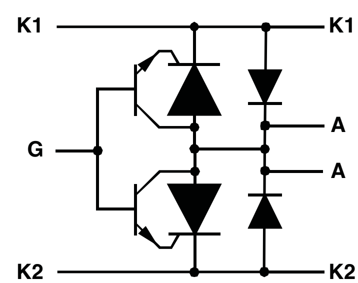
These monolithic protection devices are fabricated in ion-implanted planar vertical power structures for high reliability and in normal system operation they are virtually transparent. The TISP61089M buffered gate design reduces the loading on the SLIC supply during overvoltages caused by power cross and induction. The TISP61089M is available in an 8-pin plastic small-outline surface mount package.

8 Pin Small-Outline (D008) Package (Top View)



NC - No internal connection
Terminal typical application names shown in parenthesis

Device Symbol



Terminals K1, K2 and A correspond to the alternative line designators of T, R and G or A, B and C. The negative protection voltage is controlled by the voltage, V_{GG}, applied to the G terminal.

SD6XAEBa

How to Order

Device	Package	Carrier	Order As	Marking Code	Standard Quantity
TISP61089M	8 Pin Small Outline (D008)	Embossed Tape Reeled	TISP61089MDR-S	1089M	2500

*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

SEPTEMBER 2013

Absolute Maximum Ratings, T_J = 25 °C (Unless Otherwise Noted)

Rating		Symbol	Value	Unit
Repetitive peak off-state voltage, I_G = 0	T_J = 25 °C	V_{DRM}	-170	V
Repetitive peak gate-cathode voltage, V_{KA} = 0	T_J = 25 °C	V_{GKRM}	-167	V
Non-repetitive peak on-state pulse current (see Notes 1 and 2)				
10/1000 µs (Bellcore GR-1089-CORE, Issue 1, November 1994, Section 4)		I_{TSP}	30	A
5/310 µs (ITU-T K.20/21/45, YD/T-950, open-circuit voltage wave shape 10/700 µs)		I_{TSP}	70	A
2/10 µs (Bellcore GR-1089-CORE)		I_{TSP}	120	A
Non-repetitive peak on-state current, 60 Hz (see Notes 1 and 2 and Figure 2 on Page 4)				
0.1 s		I_{TSM}	11	A
1 s		I_{TSM}	4.5	A
5 s		I_{TSM}	2.4	A
300 s		I_{TSM}	0.95	A
900 s		I_{TSM}	0.93	A
Junction temperature		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-40 to +150	°C

NOTES: 1. Initially the protector must be in thermal equilibrium with T_J = 25 °C. The surge may be repeated after the device returns to its initial conditions.

2. The rated current values may be applied either to the Ring to Ground or to the Tip to Ground terminal pairs. Additionally, both terminal pairs may have their rated current values applied simultaneously (in this case the Ground terminal current will be twice the rated current value of an individual terminal pair).

Recommended Operating Conditions

		Min	Typ	Max	Unit
C_G	Gate decoupling capacitor		100		nF

Electrical Characteristics, T_J = 25 °C (Unless Otherwise Noted)

Parameter		Test Conditions		Min	Typ	Max	Unit
I_D	Off-state current	$V_D = V_{DRM}$, V_{GK} = 0	T_J = 25 °C			-5	µA
			T_J = 85 °C			-50	µA
$V_{(BO)}$	Breakover voltage	2/10 µs, I_{TM} = -100 A, di/dt = -80 A/µs, R_S = 50 Ω, V_{GG} = -100 V, (see Note 4)				-112	V
V_F	Forward voltage	I_F = 5 A, t_w = 200 µs				3	V
V_{FRM}	Peak forward recovery voltage	2/10 µs, I_F = 100 A, di/dt = 80 A/µs, R_S = 50 Ω, (see Note 4)				10	V
I_H	Holding current	I_T = -1 A, di/dt = 1A/ms, V_{GG} = -100 V		-150			mA
I_{GAS}	Gate reverse current	$V_{GG} = V_{GK} = V_{GKRM}$, V_{KA} = 0	T_J = 25 °C			-5	µA
			T_J = 85 °C			-50	µA
I_{GT}	Gate trigger current	I_T = -3 A, $t_{p(g)} \geq$ 20 µs, V_{GG} = -48 V				5	mA
V_{GT}	Gate trigger voltage	I_T = -3 A, $t_{p(g)} \geq$ 20 µs, V_{GG} = -48 V				2.5	V
C_{AK}	Anode-cathode off-state capacitance	f = 1 MHz, V_d = 1 V, I_G = 0, (see Note 3)	V_D = -3 V			100	pF
			V_D = -48 V			50	pF

NOTE: 3. These capacitance measurements employ a three terminal capacitance bridge incorporating a guard circuit. The unmeasured device terminals are a.c. connected to the guard terminal of the bridge.

NOTE: 4. Voltage measurements should be made with an oscilloscope with limited bandwidth (20 MHz) to avoid high frequency noise.

Thermal Characteristics

Parameter		Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$	Junction to free air thermal resistance	P_{tot} = 0.8 W, T_A = 25 °C 5 cm^2, FR4 PCB			160	°C/W

Parameter Measurement Information

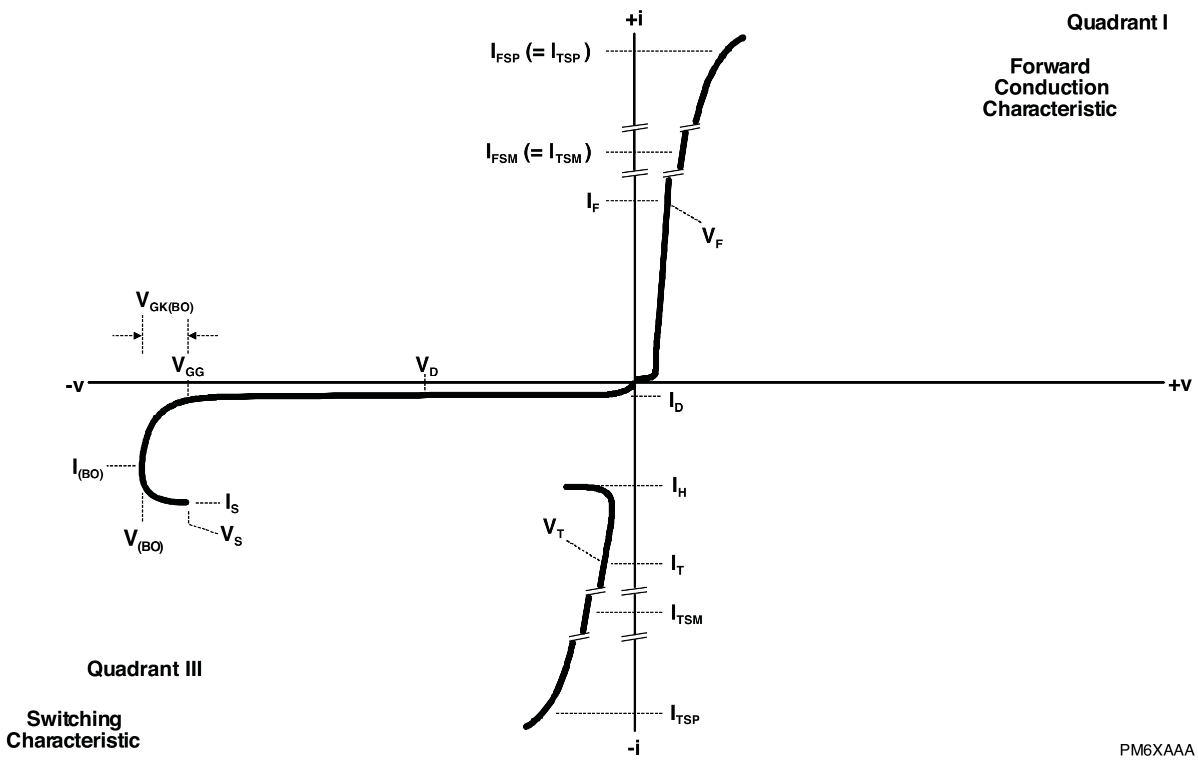


Figure 1. Voltage-Current Characteristic
Unless Otherwise Noted, All Voltages are Referenced to the Anode

Thermal Information

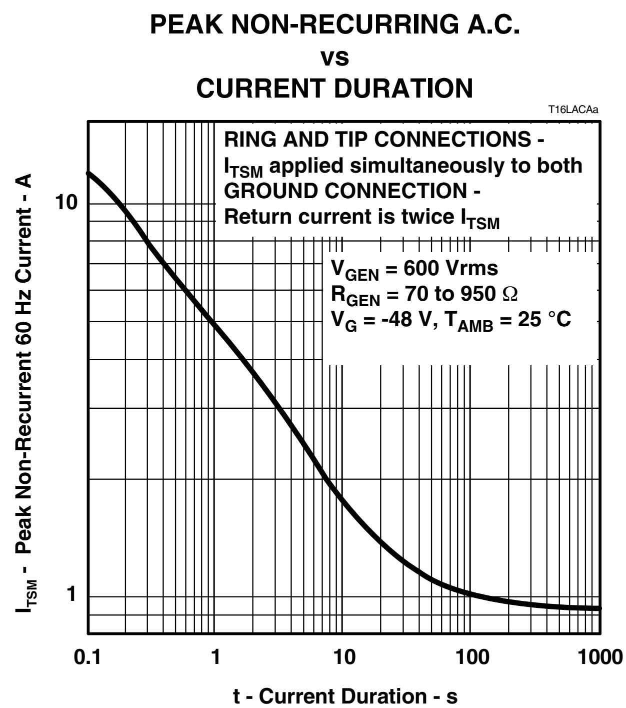


Figure 2. Non-Repetitive Peak On-State Current against Duration

Applications Information

Typical Applications Circuit

Figure 3 shows a typical TISP61089M SLIC card protection circuit. The incoming line conductors, Ring (R) and Tip (T), connect to the relay matrix via the series overcurrent protection. Positive temperature coefficient (PTC) resistors can be used for overcurrent protection. Resistors will reduce the prospective current from the surge generator for both the TISP61089M and the ring/test protector.

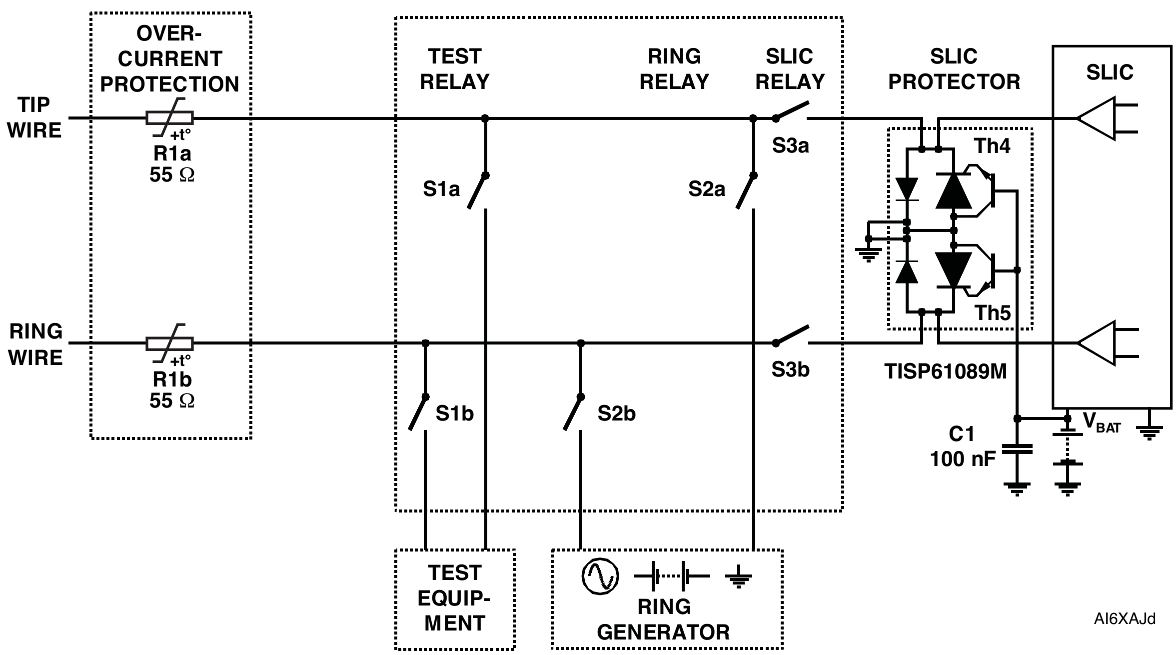


Figure 3. Typical Application Circuit

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