INTEGRATED SYMMETRICAL AND ASYMMETRICAL BIDIRECTIONAL OVERVOLTAGE PROTECTORS FOR LUCENT TECHNOLOGIES L7581/2/3 LINE CARD ACCESS SWITCHES

TISPL758LF3D LCAS Protector

Symmetrical and Asymmetrical Characteristics for Optimum Protection of Lucent L7581/2/3 LCAS

Terminal Pair	V_{DRM} V	$V_{(BO)}$ V
T-G (SYMMETRICAL)	±105	±130
R-G (ASYMMETRICAL)	+105, -180	+130, -220

Customized versions available

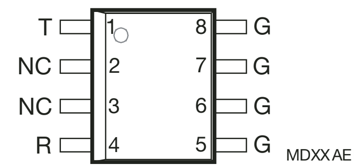
Rated for International Surge Wave Shapes

Wave Shape	Standard	I_{TSP} A
2/10 µs	GR-1089-CORE	175
8/20 µs	ANSI C62.41	120
10/160 µs	FCC Part 68	60
10/700 µs	ITU-T K20/21	50
10/560 µs	FCC Part 68	45
10/1000 µs	GR-1089-CORE	35

Ion-Implanted Breakdown Region
—Precise And Stable Voltage
—Low Voltage Overshoot Under Surge

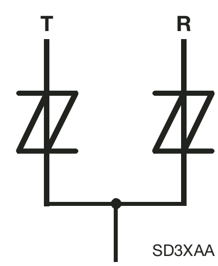
Planar Passivated Junctions
—Low Off-State Current..< ±10 µA

D Package (Top View)



NC - No internal connection

Device Symbol



Terminals T, R and G correspond to the alternative line designators of A, B and C

...UL Recognized Component

How to Order

Device	Carrier	Order As
TISPL758LF3D	Tube	TISPL758LF3D-S
	Taped and reeled	TISPL758LF3DR-S

Description

The TISPL758LF3 is an integrated combination of a symmetrical bidirectional overvoltage protector and an asymmetrical bidirectional overvoltage protector. It is designed to limit the peak voltages on the line terminals of the Lucent Technologies L7581/2/3 LCAS (Line Card Access Switches). An LCAS may also be referred to as a Solid State Relay, SSR, i.e. a replacement of the conventional electro-mechanical relay.

The TISPL758LF3D voltages are chosen to give adequate LCAS protection for all switch conditions. The most potentially stressful condition is low level power cross when the LCAS switches are closed. Under this condition, the TISPL758LF3D limits the voltage and corresponding LCAS dissipation until the LCAS thermal trip operates and opens the switches.

Under open-circuit ringing conditions, the line ring (R) conductor will have high peak voltages. For battery backed ringing, the ring conductor will have a larger peak negative voltage than positive i.e. the peak voltages are asymmetric. An overvoltage protector with a similar voltage asymmetry will give the most effective protection. On a connected line, the tip (T) conductor will have much smaller voltage levels than the open-circuit ring conductor values. Here a symmetrical voltage protector gives adequate protection.

*RoHS Directive 2002/95/EC Jan 27 2003 including Annex
JANUARY 1998 – REVISED JANUARY 2007

Description (Continued)

Overvoltages are normally caused by a.c. power system or lightning flash disturbances which are induced or conducted on to the telephone line. These overvoltages are initially clipped by protector breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar into a low-voltage on state. This low-voltage on state causes the current resulting from the overvoltage to be safely diverted through the device. For negative surges, the high crowbar holding current helps prevent d.c. latchup with the SLIC current, as the surge current subsides. The TISPL758LF3 is guaranteed to voltage limit and withstand the listed international lightning surges in both polarities.

Support from the Microelectronics Group of Lucent Technologies Inc. is gratefully acknowledged in the definition of the TISPL758LF3D voltage levels and for performing TISPL758LF3D evaluations.

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

Rating		Symbol	Value	Unit
Repetitive peak off-state voltage	R-G terminals	V_{DRM}	-180, +105	V
	T-G terminals		-105, +105	
Non-repetitive peak on-state pulse current (see Notes 1, 2 and 3)		I_{TSP}		A
2/10 μs (GR-1089-CORE, 2/10 μs voltage wave shape)			175	
8/20 μs (ANSI C62.41, 1.2/50 μs voltage wave shape)			120	
10/160 μs (FCC Part 68, 10/160 μs voltage wave shape)			60	
5/200 μs (VDE 0433, 2.0 kV, 10/700 μs voltage wave shape)			50	
0.2/310 μs (I3124, 2.0 kV, 0.5/700 μs voltage wave shape)			50	
5/310 μs (ITU-T K20/21, 2.0 kV, 10/700 μs voltage wave shape)			50	
5/310 μs (FTZ R12, 2.0 kV, 10/700 μs voltage wave shape)			50	
10/560 μs (FCC Part 68, 10/560 μs voltage wave shape)			45	
10/1000 μs (GR-1089-CORE, 10/1000 μs voltage wave shape)			35	
Non-repetitive peak on-state current (see Notes 1, 2 and 3)		I_{TSM}		A
full sine wave	50 Hz		16	
	60 Hz		20	
Repetitive peak on-state current, 50/60 Hz, (see Notes 2 and 3)		I_{TSM}	2x1	A
Initial rate of rise of on-state current, Exponential current ramp, Maximum ramp value < 70 A		di_T/dt	150	A/μs
Junction temperature		T_J	-40 to +150	°C
Storage temperature range		T_{stg}	-40 to +150	°C

NOTES: 1. Above the maximum specified temperature, derate linearly to zero at 150 °C lead temperature.
2. Initially the TISPL758LF3 must be in thermal equilibrium with 0 °C < T_J <70 °C.
3. The surge may be repeated after the TISPL758LF3 returns to its initial conditions.

Recommended Operating Conditions

Component			Min	Typ	Max	Unit
R1	Series Resistor for GR-1089-CORE	first-level surge, operational pass (4.5.7)	20			Ω
R1	Series Resistor for FCC Part 68	10/160 non-operational pass	0			Ω
		10/160 operational pass	18			
		10/560 non-operational pass	0			
		10/560 operational pass	10			
R1	Series Resistor for ITU-T K20/21	10/700, < 2 kV, operational pass	0			Ω
		10/700, 4 kV, operational pass	40			

Electrical Characteristics for the T-G and R-G Terminal Pairs, T_J = 25 °C (Unless Otherwise Noted)

Parameter		Test Conditions		Value			Unit
				Min	Typ	Max	
I_{DRM}	Repetitive peak off-state current	$V_D = \pm V_{DRM}$, (See Note 4)				±10	µA
$V_{(BO)}$	Breakover voltage	dv/dt = ±250 V/ms, R_{SOURCE} = 300 Ω	R-G terminals	-220		+130	V
			T-G terminals	-130		+130	
$V_{(BO)}$	Impulse breakover voltage	Rated impulse conditions with operational pass series resistor	R-G terminals	-240		+140	V
			T-G terminals	-140		+140	
I_H	Holding current	di/dt = -30 mA/ms		+100			mA
		di/dt = +30 mA/ms		-150			
I_D	Off-state current	$0 < V_D < \pm 50$ V, T_J = 85 °C				±10	µA
C_{TG}	Off-state capacitance	f = 100 kHz, V_d = 1 V rms V_{TG} = -5 V, (See Note 5)			18	36	pF
C_{RG}	Off-state capacitance	f = 100 kHz, V_d = 1 V rms V_{TG} = -50 V, (See Note 5)			10	20	pF

NOTES: 4. Positive and negative values of V_{DRM} are not equal. See ratings table.
5. These capacitance measurements employ a three terminal capacitance bridge incorporating a guard circuit. The third terminal is connected to the guard terminal of the bridge.

Thermal Characteristics

Parameter		Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$	Junction to free air thermal resistance				160	°C/W

Parameter Measurement Information

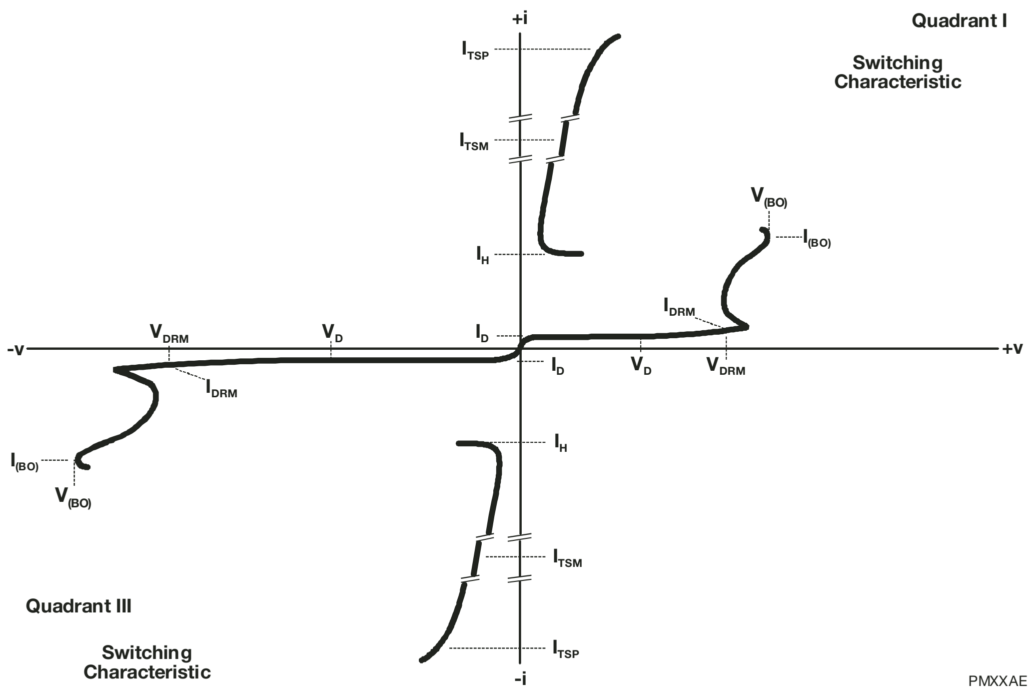


Figure 1. Asymmetrical Voltage-Current Characteristic for R-G Terminal Pair

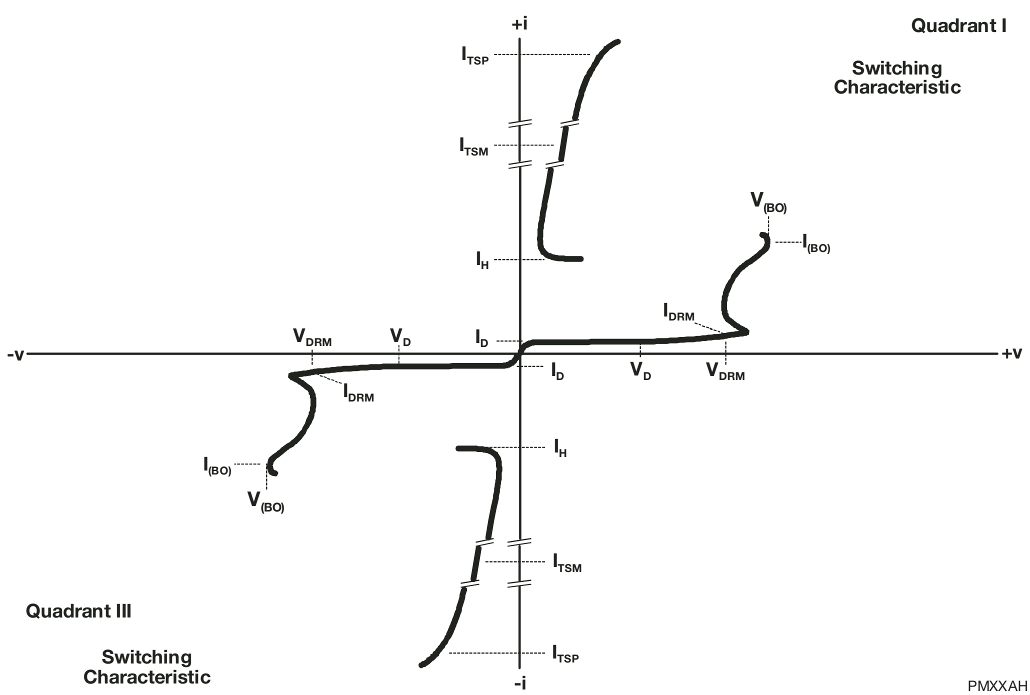


Figure 2. Symmetrical Voltage-current Characteristic for T-G Terminal Pair

Typical Characteristics

OFF-STATE CURRENT vs JUNCTION TEMPERATURE

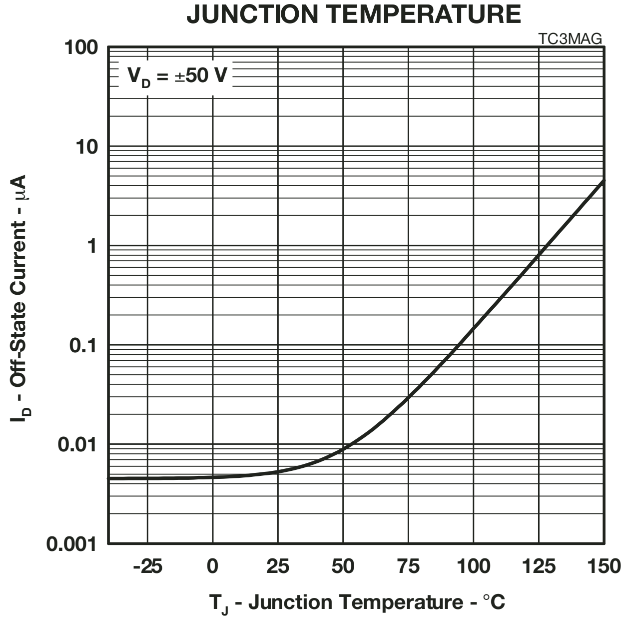


Figure 3.

NORMALIZED BREAKDOWN VOLTAGES vs JUNCTION TEMPERATURE

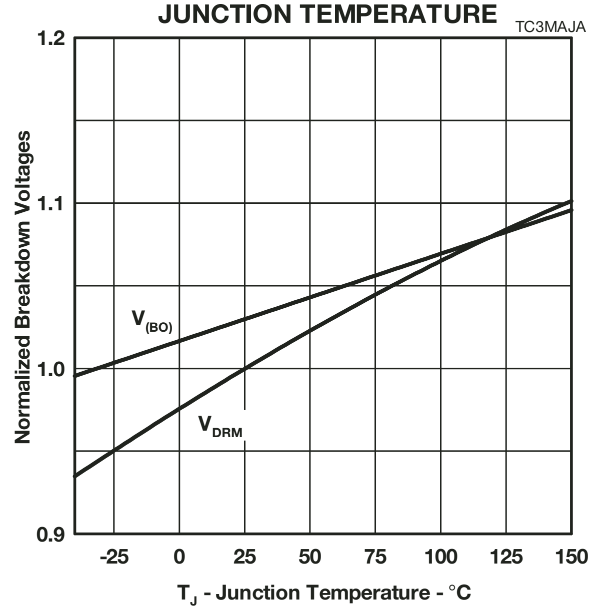


Figure 4.

NORMALIZED BREAKOVER VOLTAGE vs RATE OF RISE OF PRINCIPLE CURRENT

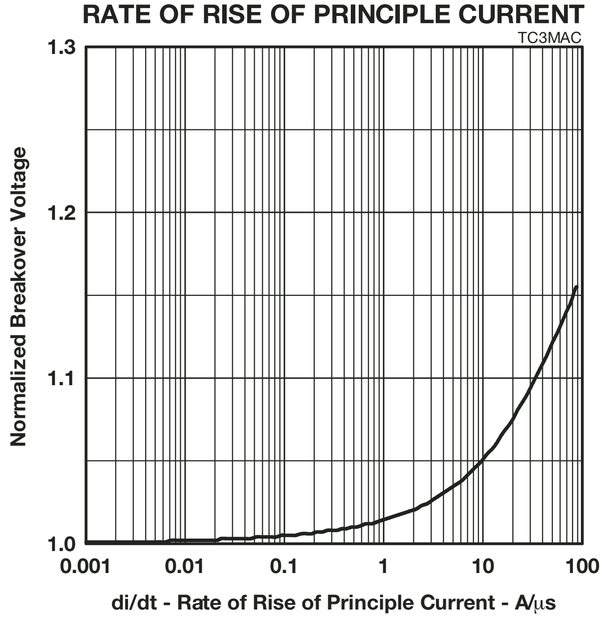


Figure 5.

NORMALIZED HOLDING CURRENT vs JUNCTION TEMPERATURE

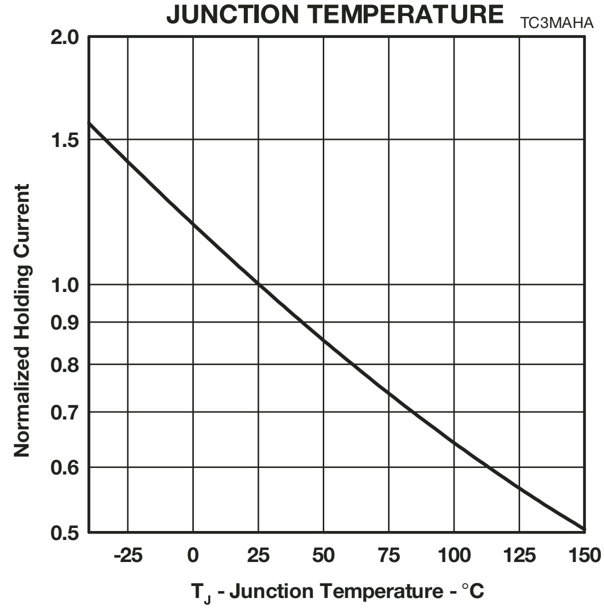


Figure 6.

Applications Information

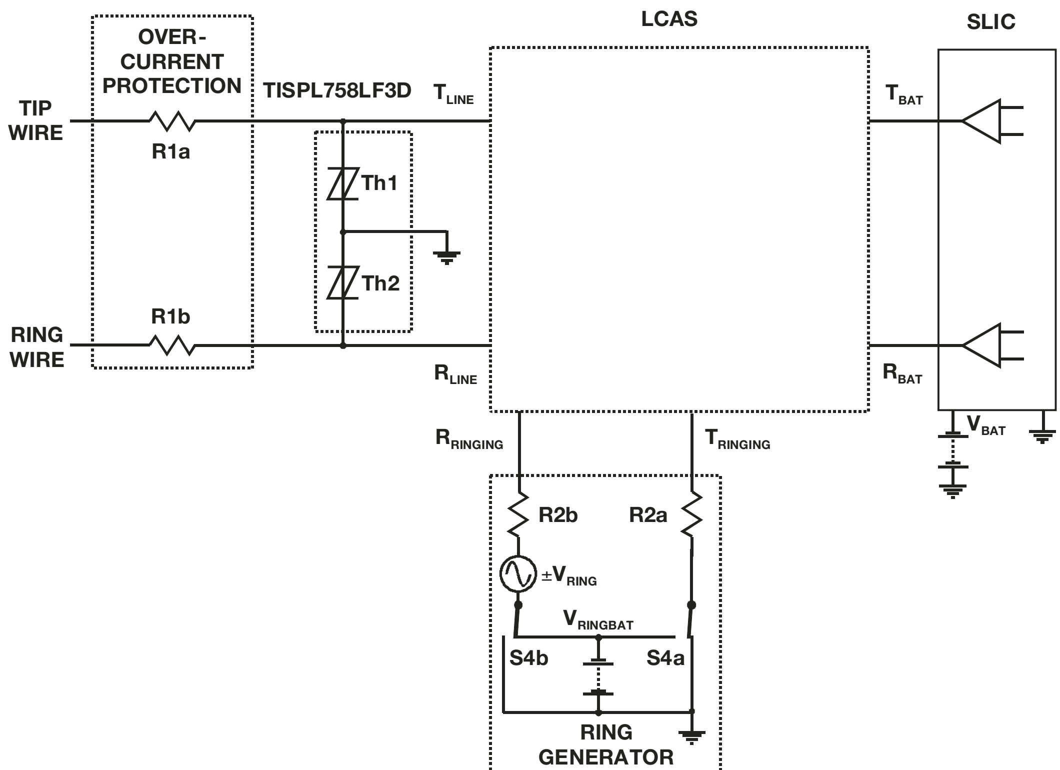


Figure 7. LCAS Protection with a TISPL758LF3D

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