



LCP1511D

Application Specific Discretes
A.S.D.TM

PROGRAMMABLE TRANSIENT VOLTAGE SUPPRESSOR FOR SLIC PROTECTION

FEATURES

- DUAL PROGRAMMABLE TRANSIENT SUPPRESSOR.
- WIDE NEGATIVE FIRING VOLTAGE RANGE :
 $V_{MGL} = -80V$ max.
- LOW DYNAMIC SWITCHING VOLTAGES :
 V_{FP} and V_{DGL} .
- LOW GATE TRIGGERING CURRENT :
 $I_{GT} = 5mA$ max.
- PEAK PULSE CURRENT :
 $I_{PP} = 30A$ for 10/1000 μs surge.
- HOLDING CURRENT :
 $I_H = 150mA$.

DESCRIPTION

This device has been especially designed to protect subscriber line card interfaces (SLIC) against transient overvoltages.

Positive overloads are clipped with 2 diodes. Negative surges are suppressed by 2 thyristors, their breakdown voltage being referenced to $-V_{BAT}$ through the gate.

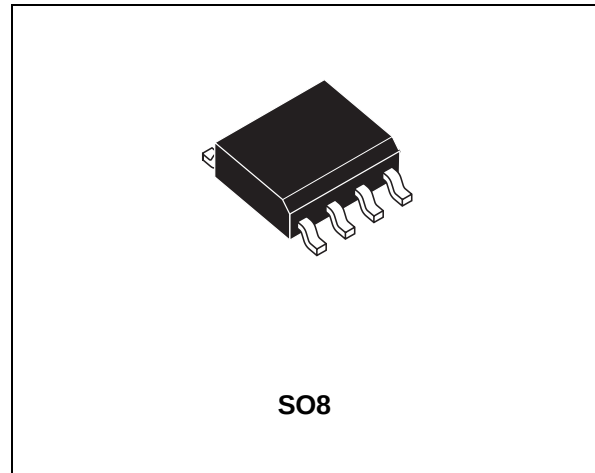
This component presents a very low gate triggering current (I_{GT}) in order to reduce the current consumption on printed circuit board during the firing phase.

A particular attention has been given to the internal wire bonding. The "4-point" configuration ensures reliable protection, eliminating the overvoltage introduced by the parasitic inductances of the wiring (Ldi/dt), especially for very fast transients.

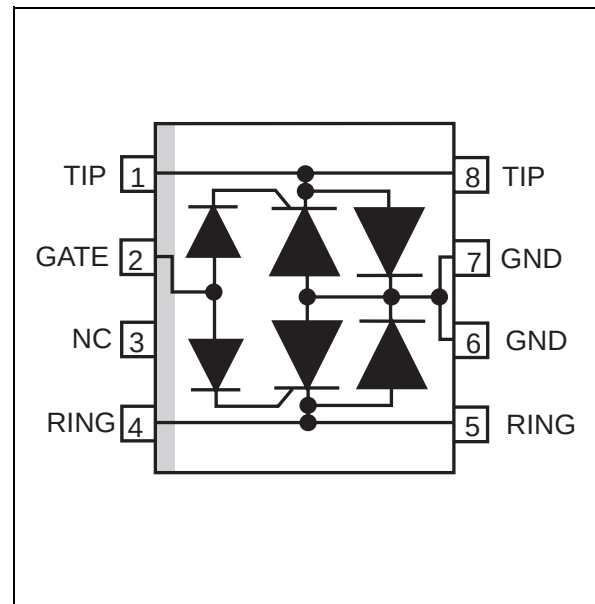
COMPLIES WITH THE FOLLOWING STANDARDS :

CCITT K20 :	10/700 μs	1kV
	5/310 μs	25A
VDE 0433 :	10/700 μs	2kV
	5/310 μs	38A (*)
VDE 0878 :	1.2/50 μs	1.5kV
	1/20 μs	40A
I3124 :	0.5/700 μs	1kV
	0.2/310 μs	25A
FCC part 68 :	2/10 μs	2.5kV
	2/10 μs	170A (*)
BELLCORE		
TR-NWT-001089 :	2/10 μs	2.5kV
	2/10 μs	170A (*)

(*) with series resistors or PTC.



SCHEMATIC DIAGRAM



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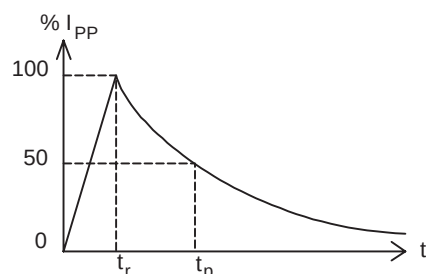
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ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25^{\circ}\text{C}$)

Symbol	Parameter		Value	Unit
I_{PP}	Peak pulse current (see note 1)	10/1000 μs 5/310 μs 2/10 μs	30 38 170	A
I_{TSM}	Non repetitive surge peak on-state current ($F = 50\text{Hz}$)	$t_p = 10\text{ms}$ $t = 1\text{s}$	8 3.5	A
I_{GSM}	Maximum gate current (half sine wave $t_p = 10\text{ms}$)		2	A
V_{MLG} V_{MGL}	Maximum voltage LINE / GROUND Maximum voltage GATE / LINE		-100 -80	V
T_{stg} T_j	Storage temperature range Maximum junction temperature		- 55 to + 150 150	$^{\circ}\text{C}$
T_L	Maximum lead temperature for soldering during 10s		260	$^{\circ}\text{C}$

Note 1 : Pulse waveform :

10/1000 μs	$t_r = 10\mu\text{s}$	$t_p = 1000\mu\text{s}$
5/310 μs	$t_r = 5\mu\text{s}$	$t_p = 310\mu\text{s}$
2/10 μs	$t_r = 2\mu\text{s}$	$t_p = 10\mu\text{s}$

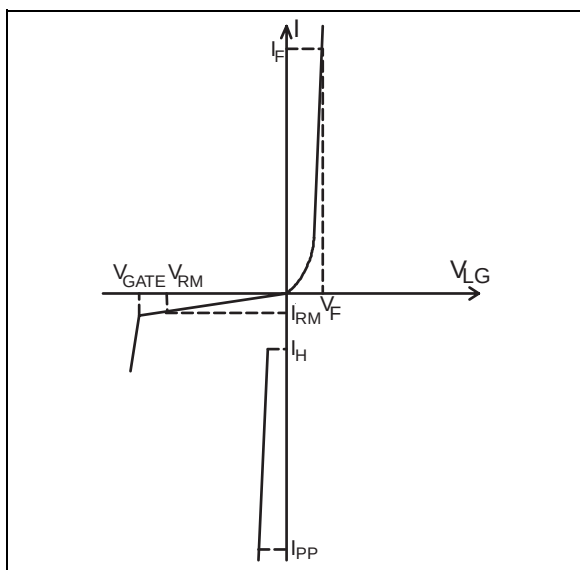


THERMAL RESISTANCE

Symbol	Parameter	Value	Unit
$R_{th(j-a)}$	Junction to ambient	170	$^{\circ}\text{C/W}$

ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$)

Symbol	Parameter
I_{GT}	Gate triggering current
I_H	Holding current
I_{RM}	Reverse leakage current LINE/GND
I_{RG}	Reverse leakage current GATE/LINE
V_{RM}	Reverse voltage LINE/GND
V_F	Forward drop voltage LINE/GND
V_{GT}	Gate triggering voltage
V_{FP}	Peak forward voltage LINE/GND
V_{DGL}	Dynamic switching voltage GATE/LINE
V_{GATE}	GATE/GND voltage
V_{LG}	LINE/GND voltage
C	Off-state capacitance LINE/GND



1 - PARAMETERS RELATED TO THE DIODE LINE/GND ($T_{amb} = 25^{\circ}\text{C}$)

Symbol	Test conditions		Maximum	Unit
V_F	$I_F=5\text{A}$	$t_p=500\mu\text{s}$	3	V
V_{FP}	10/700 μs	1.5kV $R_p=10\Omega$	5	V
	1.2/50 μs	1.5kV $R_p=10\Omega$	7	
	2/10 μs	2.5kV $R_p=62\Omega$	12	

Note 1 : See test circuit 2 for V_{FP} ; R_p is the protection resistor located on the line card.

2 - PARAMETERS RELATED TO THE PROTECTION THYRISTOR ($T_{amb} = 25^{\circ}\text{C}$)

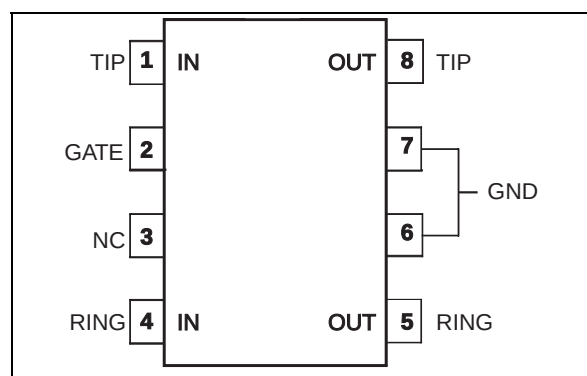
Symbol	Test conditions		Min.	Max.	Unit
I_{GT}	$V_{GND/LINE} = -48\text{V}$		0.2	5	mA
I_H	$V_{GATE} = -48\text{V}$ (see note 2)		150		mA
V_{GT}	at I_{GT}			2.5	V
I_{RG}	$T_c=25^{\circ}\text{C}$	$V_{RG} = -75\text{V}$		5	μA
	$T_c=70^{\circ}\text{C}$	$V_{RG} = -75\text{V}$		50	
V_{DGL}	$V_{GATE} = -48\text{V}$ (see note 3)				V
	10/700 μs	1.5kV $R_p=10\Omega$ $I_{PP}=30\text{A}$		10	
	1.2/50 μs	1.5kV $R_p=10\Omega$ $I_{PP}=30\text{A}$		20	
	2/10 μs	2.5kV $R_p=62\Omega$ $I_{PP}=38\text{A}$		25	

Note 2 : See the functional holding current (I_H) test circuit 2.

Note 3 : See test circuit 1 for V_{DGL} .
The oscillations with a time duration lower than 50ns are not taken into account.

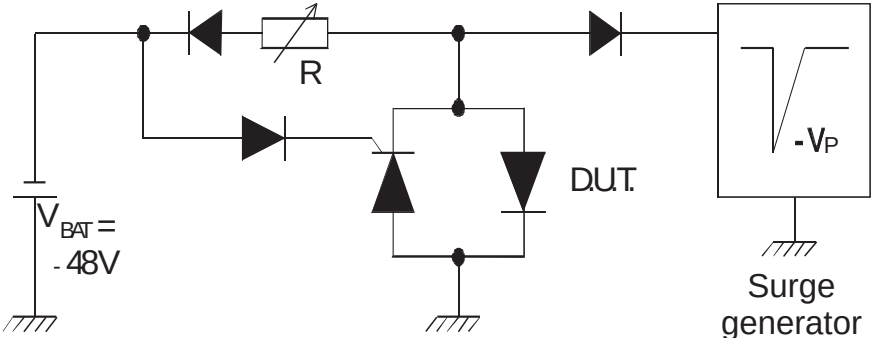
3 - PARAMETERS RELATED TO DIODE AND PROTECTION THYRISTOR ($T_{amb} = 25^{\circ}\text{C}$)

Symbol	Test conditions		Maximum	Unit
I_{RM}	$T_c=25^{\circ}\text{C}$	$V_{GATE/LINE} = -1\text{V}$ $V_{RM} = -75\text{V}$	5	μA
	$T_c=70^{\circ}\text{C}$	$V_{GATE/LINE} = -1\text{V}$ $V_{RM} = -75\text{V}$	50	
C	$V_R = -3\text{V}$	F=1MHz	100	pF
	$V_R = -48\text{V}$	F=1MHz	50	

APPLICATION NOTE

In order to take advantage of the "4 point" structure of the LCP, the TIP and RING lines go across the device. In such case, the device will eliminate the overvoltages generated by the parasitic inductances of the wiring (Ldi/dt), especially for very fast transients.

FUNCTIONAL HOLDING CURRENT (I_H) TEST CIRCUIT 1 : GO-NO GO TEST

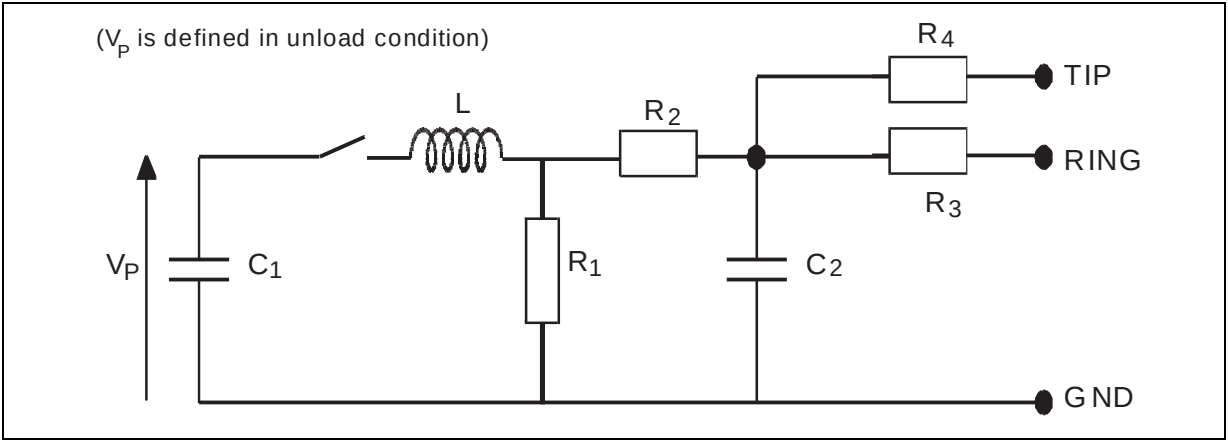


This is a GO-NO GO test which allows to confirm the holding current (I_H) level in a functional test circuit.

TEST PROCEDURE :

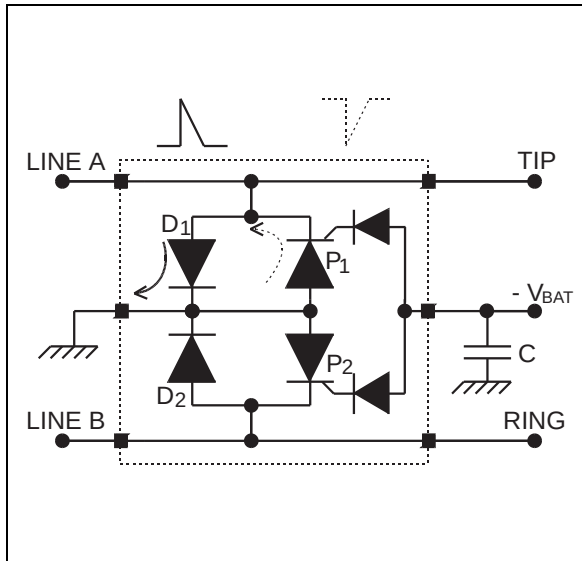
- Adjust the current level at the I_H value by short circuiting the D.U.T.
- Fire the D.U.T. with a surge current : $I_{PP} = 10A, 10/1000\mu s$.
- The D.U.T. will come back to the off-state within a duration of 50ms max.

TEST CIRCUIT 2 FOR V_{FP} AND V_{DGL} PARAMETERS



Pulse (μs)		V_p (V)	C_1 (μF)	C_2 (nF)	L (μH)	R_1 (Ω)	R_2 (Ω)	R_3 (Ω)	R_4 (Ω)	I_{PP} (A)	R_p (Ω)
t_r	t_p										
10	700	1500	20	200	0	50	15	25	25	30	10
1.2	50	1500	1	33	0	76	13	25	25	30	10
2	10	2500	10	0	1.1	1.3	0	3	3	38	62

FUNCTIONAL DESCRIPTION



LINE A PROTECTION :

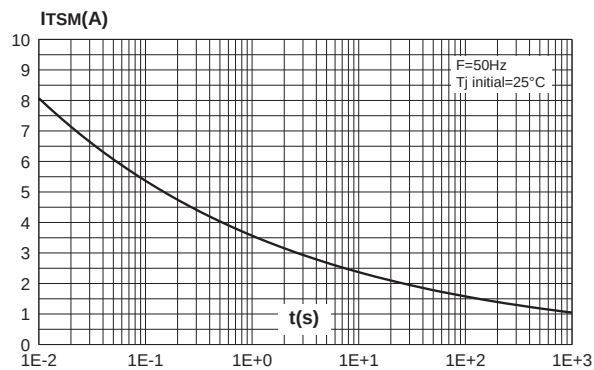
- For positive surges versus GND, the diode D1 will conduct.
- For negative surges versus GND, the protection device P1 will trigger at a voltage fixed by the $-V_{BAT}$ reference.

LINE B PROTECTION :

- For surges on line B, the operating mode is the same, D2 or P2 is activated.

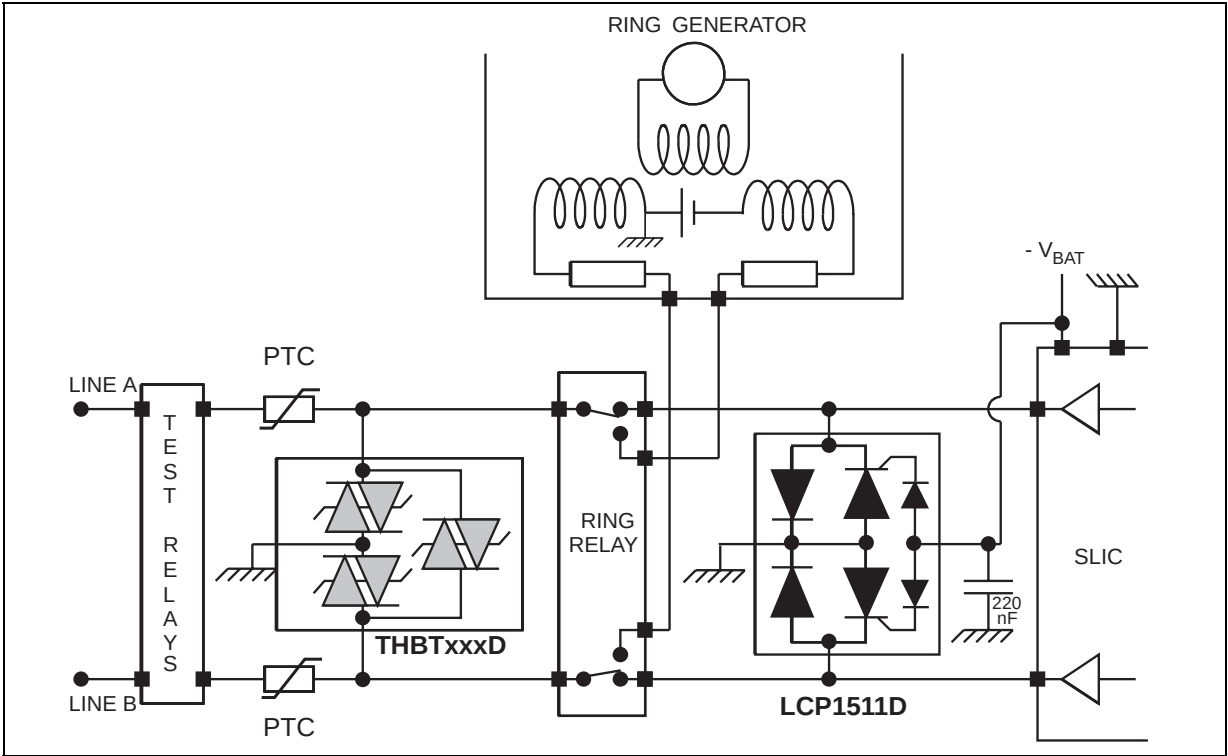
It is recommended to add a capacitor ($C=220\text{nF}$) close to the gate of the LCP, in order to speed up the triggering.

Surge peak current versus overload duration.

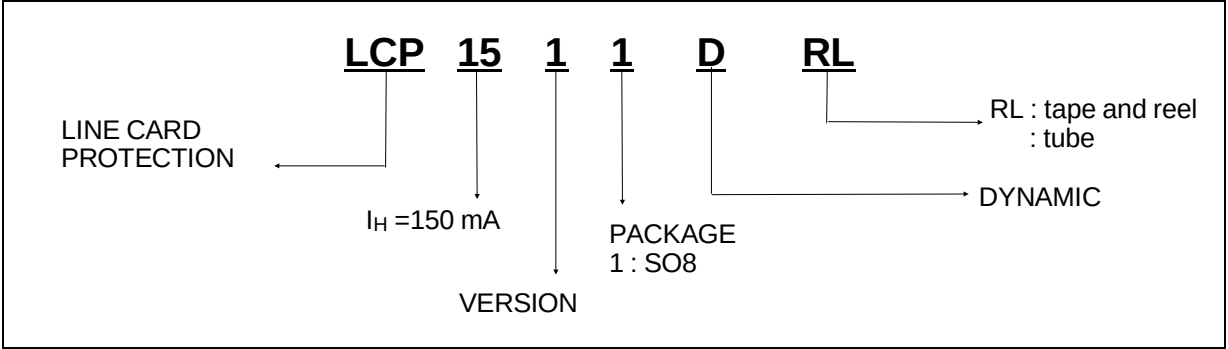


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APPLICATION CIRCUIT : typical SLIC protection concept

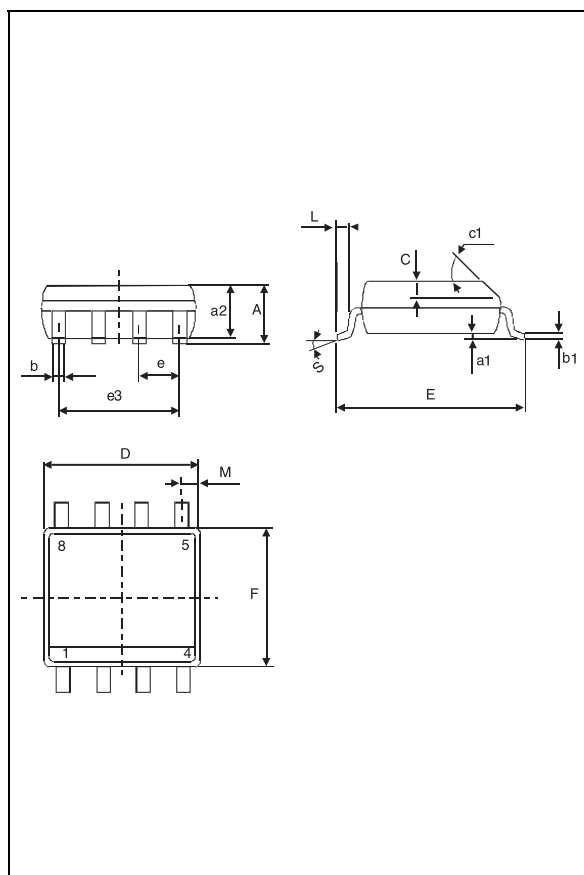


ORDER CODE



MARKING

Package	Type	Marking
SO8	LCP1511D	CP151D

PACKAGE MECHANICAL DATA
 SO8 Plastic


REF.	DIMENSIONS					
	Millimetres			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C		0.50			0.020	
c1	45° (typ)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max)					

Weight = 0.08 g.

Packaging : Product supplied in antistatic tubes or tape and reel .

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