SGS-THOMSON MICROELECTRONICS

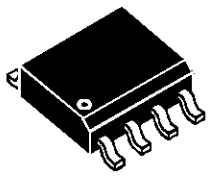
LCP1511D
LCP1512D

Application Specific Discretes
A.S.D.™

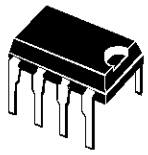
PROGRAMMABLE TRANSIENT VOLTAGE SUPPRESSOR FOR SLIC PROTECTION

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 10/1000µs surge.
- HOLDING CURRENT : I_H = 150mA.



SO8
(Plastic)



DIL8
(Plastic)

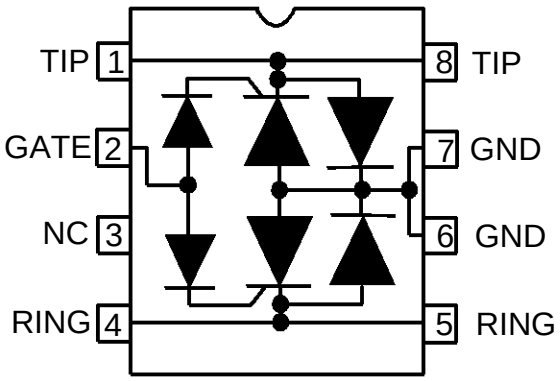
DESCRIPTION

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, the breakdown voltage of which is 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. A "4-point" configuration ensures a reliable protection, eliminating the overvoltage introduced by the parasitic inductances of the wiring (Ldi/dt), especially for very fast transients.

COMPLIES WITH FOLLOWING STANDARDS :

CCITT K20 :	10/700µs	1.5kV
	5/310µs	
VDE 0433 :	10/700µs	2kV
	5/310µs	
VDE 0878 :	1.2/50µs	1.5kV
	1/20µs	
I3124 :	0.5/700µs	1.5kV
	0.2/310µs	
FCC part 68 :	2/10µs	2.5kV
BELLCORE TR-NWT-001089 :	2/10µs	

FUNCTIONAL DIAGRAM

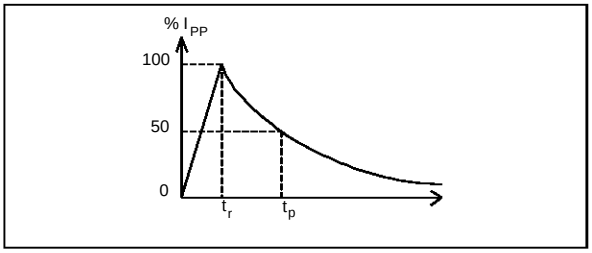


ABSOLUTE MAXIMUM RATINGS ($-40°C \leq T_{amb} \leq 85°C$)

Symbol	Parameter		Value	Unit
I_{PP}	Peak pulse current (see note 1)	10/1000µs 5/310µs 2/10µs	30 38 170	A
I_{TSM}	Non repetitive surge peak on-state current (F = 50Hz)	t_p = 10ms t_p = 1s	5 3.5	A
I_{GSM}	Maximum gate current (half sine wave -10ms)		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	°C

Note 1 : Pulse waveform :

10/1000µs	t_r=10µs	t_p=1000µs
5/310µs	t_r=5µs	t_p=310µs
2/10µs	t_r=2µs	t_p=10µs

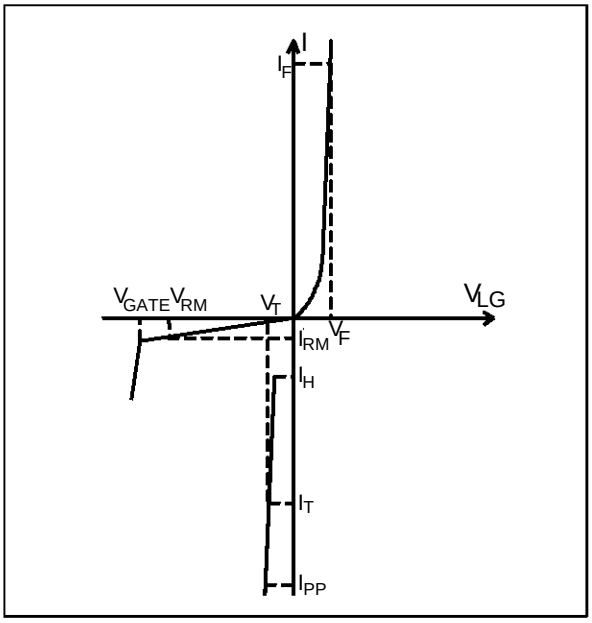


THERMAL RESISTANCE

Symbol	Parameter	Package	Value	Unit
$R_{th\ (j-a)}$	Junction to ambient	SO8 DIL8	170 125	°C/W °C/W

ELECTRICAL CHARACTERISTICS
(T_{amb} = 25°C, unless otherwise specified)

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 voltage LINE/GND
V_{GT}	Gate triggering voltage
V_{FP}	Peak forward voltage LINE/GND
V_{DGL}	Dynamic switching voltage GATE/LINE
V_T	On-state voltage
V_{GATE}	GATE/GND voltage
V_{LG}	LINE/GND voltage
C_{off}	Off-state capacitance LINE/GND



PARAMETERS RELATED TO THE DIODE LINE/GND

Symbol	Test conditions	Maximum	Unit
V_F	Square pulse; t_p=500µs; I_F=5A	3	V
V_{FP} see note 1	10/700µs 1.5kV R_p=10Ω 1.2/50µs 1.5kV R_p=10Ω 2/10µs 2.5kV R_p=62Ω	5 7 12	V

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

PARAMETERS RELATED TO THE PROTECTION THYRISTOR

Symbol	Test conditions	Min.	Max.	Unit
I_{GT}	$V_{GND/LINE}$ = -48V	0.2	5	mA
I_H	V_{GATE} =-48V (see note 2)	150		mA
V_{GT}	at I_{GT}		2.5	V
I_{RG}	T_c=25°C V_{RG} =-75V T_c=70°C V_{RG} =-75V		5 50	µA
V_{DGL}	VGATE= -48V (see note 3) 10/700µs 1.5kV Rp=10Ω I_{PP}=30A 1.2/50µs 1.5kV Rp=10Ω I_{PP}=30A 2/10µs 2.5kV Rp=62Ω I_{PP}=38A		 10 20 25	V
V_T	Square pulse; t_p=500µs; I_T=3A		4	V

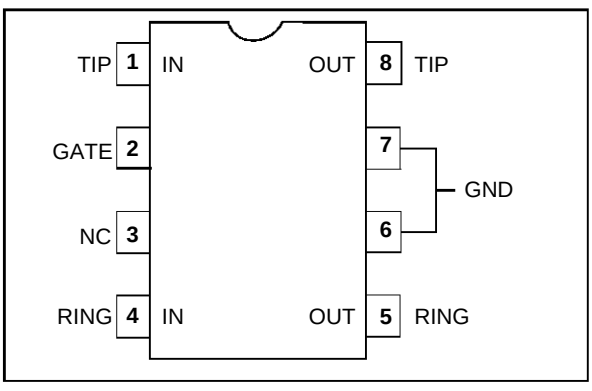
Note 2 : See the functional holding current (I_H) test circuit.

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

PARAMETERS RELATED TO DIODE AND PROTECTION THYRISTOR

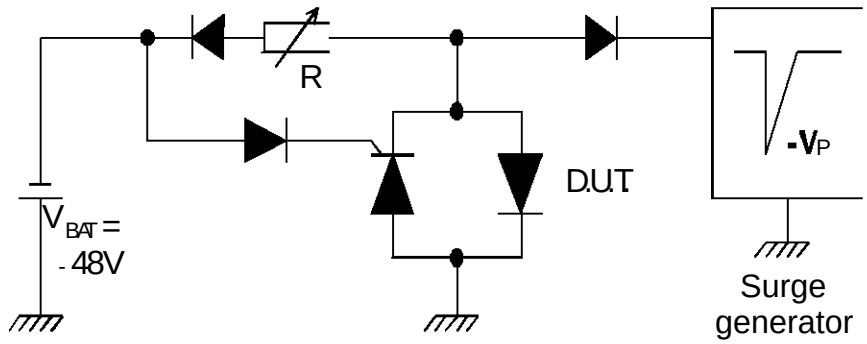
Symbol	Test conditions	Maximum	Unit
I_{RM}	T_c=25°C $V_{GATE/LINE}$ = -1V V_{RM} =-75V T_c=70°C $V_{GATE/LINE}$ = -1V V_{RM} =-75V	5 50	µA
C_{off}	V_R =-3V F=1MHz V_R =-48V F=1MHz	100 50	pF

APPLICATION NOTE



In order to take advantage of the ”4 point” structure of the LCP, the TIP and RING lines have to cross through 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 : GO-NO GO TEST

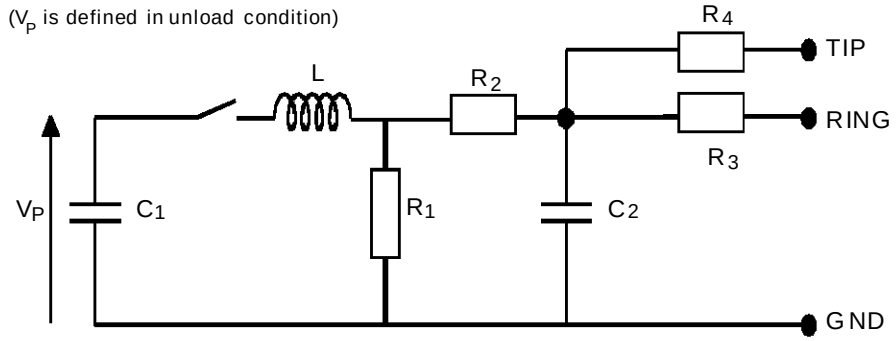


This is a GO-NO GO test which allows to confirm the holding current (I_H) level in a functional test circuit.

TEST PROCEDURE :

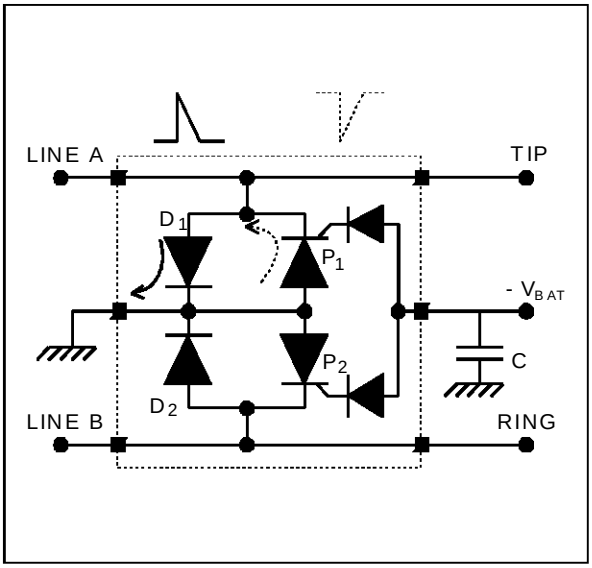
- Adjust the current level at the I_H value by short circuiting the D.U.T.
- Fire the D.U.T. with a surge current : I_{PP} = 10A, 10/1000µs.
- The D.U.T. will come back to the OFF-state within a duration of 50ms max.

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



Pulse (µs)		V_p	C_1	C_2	L	R_1	R_2	R_3	R_4	I_{PP}	R_p
t_r	t_p	(V)	(µF)	(nF)	(µH)	(Ω)	(Ω)	(Ω)	(Ω)	(A)	(Ω)
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.

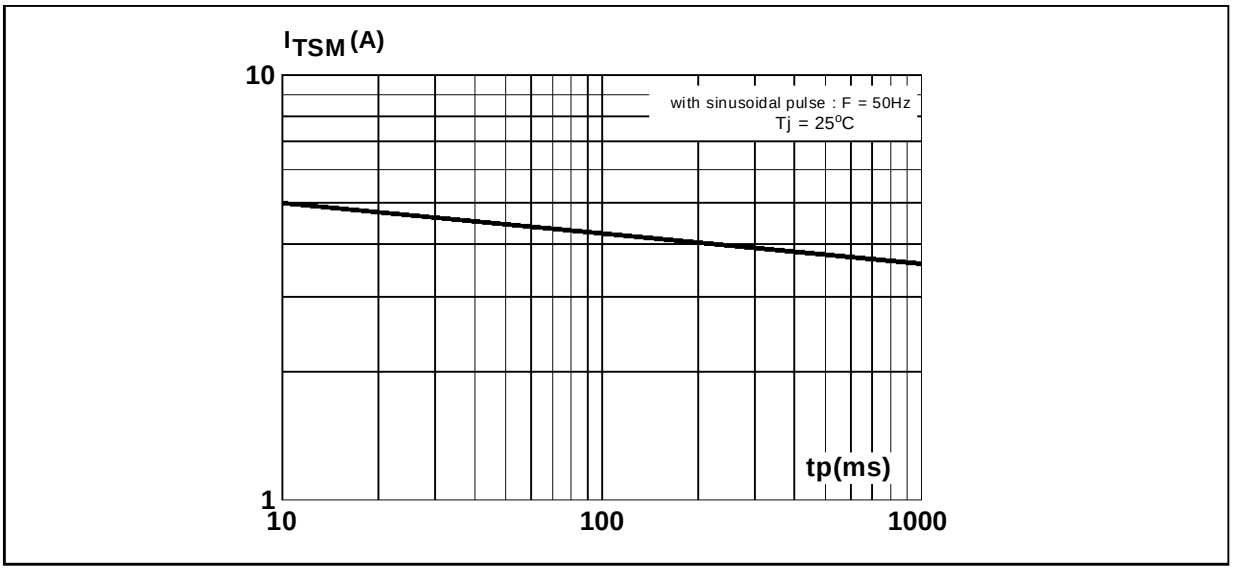
– For negative surges versus GND, the protection device P1 will trigger at a voltage fixed by the $-V_{BAT}$ reference.

LINE B PROTECTION :

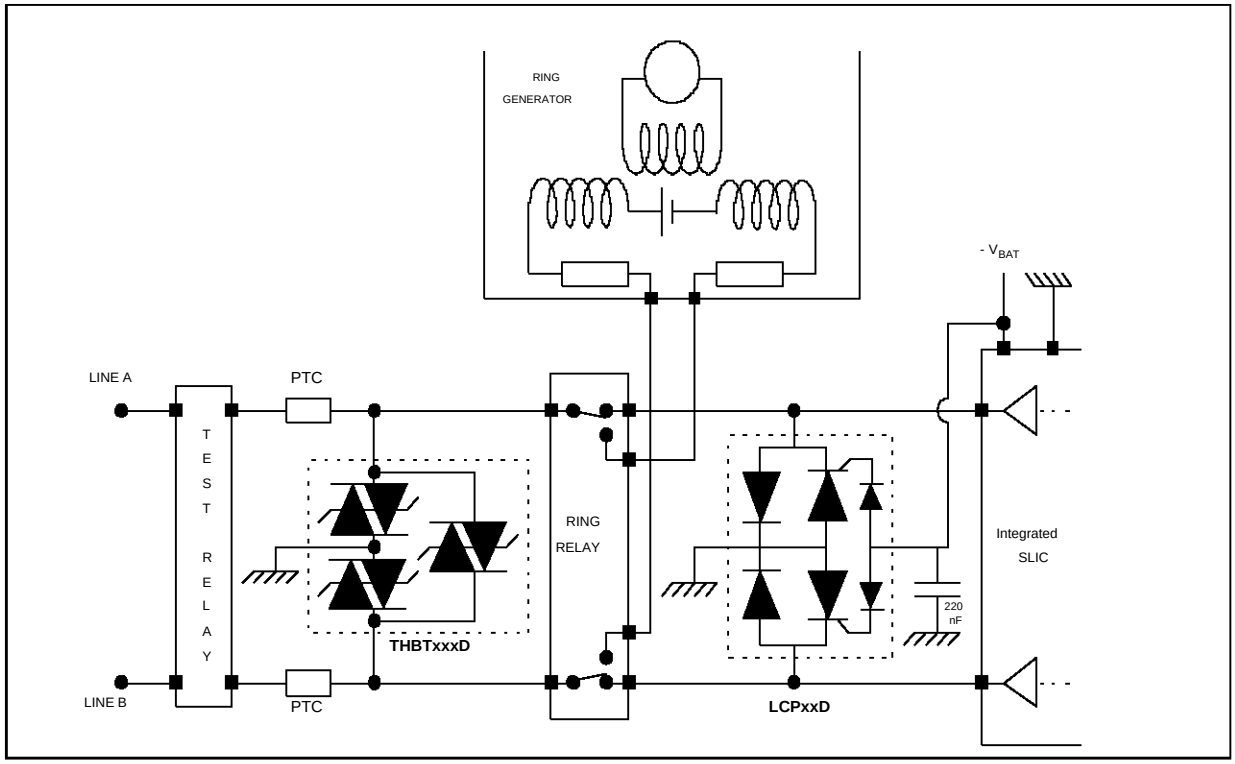
– For surges on line B, the operating mode is the same, D2 or P2 is activated.

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

MAXIMUM NON REPETITIVE SURGE PEAK ON-STATE CURRENT



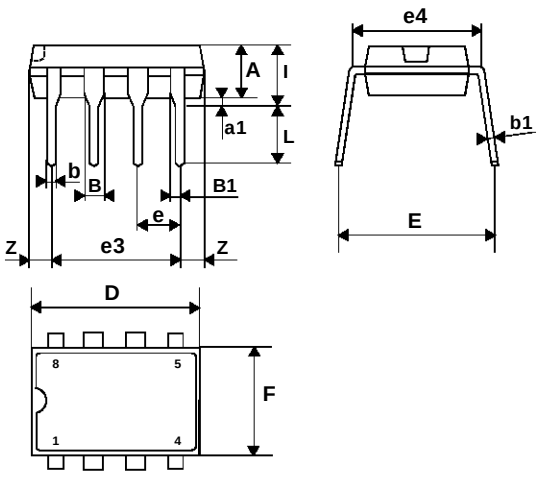
APPLICATION CIRCUIT : typical SLIC protection concept



MARKING

Package	Type	Marking
SO8	LCP1511D	CP151D
DIL8	LCP1512D	CP152D

PACKAGE MECHANICAL DATA
DIL8 Plastic

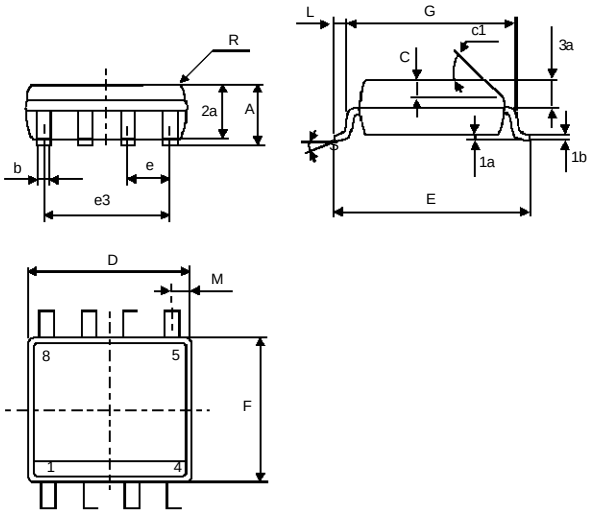


REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063

Weight = 0.58 g.

PACKAGE MECHANICAL DATA

SO8 Plastic



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			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		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)					