



# THBTxxx11D

Application Specific Discretes  
A.S.D.<sup>TM</sup>

TRIPOLAR OVERVOLTAGE  
PROTECTION FOR TELECOM LINE

## FEATURES

- BIDIRECTIONAL CROWBAR PROTECTION BETWEEN TIP AND GND, RING AND GND AND BETWEEN TIP AND RING.
- PEAK PULSE CURRENT :  
I<sub>PP</sub> = 30A for 10/1000µs surge.
- HOLDING CURRENT :  
I<sub>H</sub> = 150mA.
- AVAILABLE IN SO8 PACKAGES.
- LOW DYNAMIC BREAKOVER VOLTAGE.

## DESCRIPTION

Dedicated to telecommunication equipment protection, these devices provide a triple bidirectional protection function.

They ensure the same protection capability with the same breakdown voltage both in longitudinal mode and transversal mode.

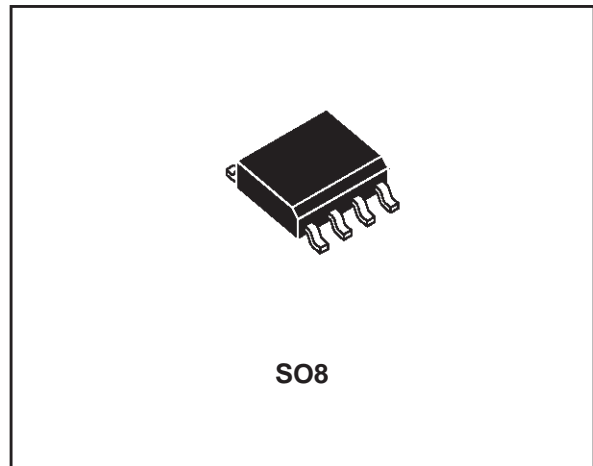
A particular attention has been given to the internal wire bonding. The "4-point" configuration ensures a reliable protection, eliminating overvoltages introduced by the parasitic inductances of the wiring (Ldi/dt), especially for very fast transient overvoltages.

Dynamic characteristics have been defined for several types of surges, in order to meet the SLIC maximum ratings.

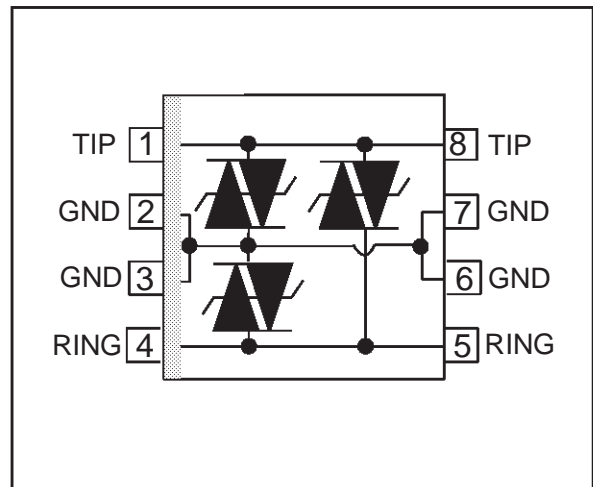
## COMPLIES WITH THE FOLLOWING STANDARDS :

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

(\*) With series resistors or PTC.



## SCHEMATIC DIAGRAM



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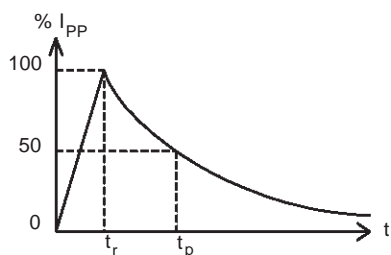
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## ABSOLUTE MAXIMUM RATINGS (T<sub>amb</sub> = 25°C)

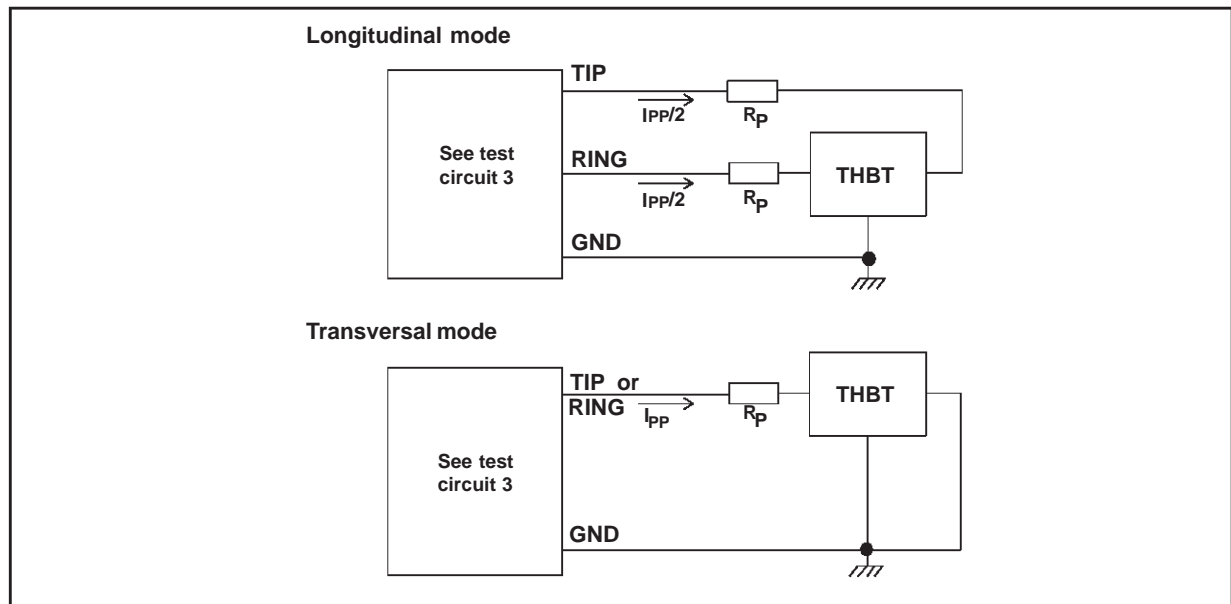
Symbol	Parameter	Value	Unit
I <sub>PP</sub>	Peak pulse current (see note 1)	10/1000 μs	30 A
I <sub>TSM</sub>	Non repetitive surge peak on-state current (F=50Hz)	t <sub>p</sub> = 10 ms t = 1s	8 3.5 A
T <sub>stg</sub> T <sub>j</sub>	Storage temperature range Maximum operating junction temperature	- 40 to + 150 + 150	°C °C
T <sub>L</sub>	Maximum lead temperature for soldering during 10s	260	°C

Note 1 : Pulse waveform :

10/1000μs t<sub>r</sub>=10μs t<sub>p</sub>=1000μs



## TEST CIRCUITS FOR I<sub>PP</sub>

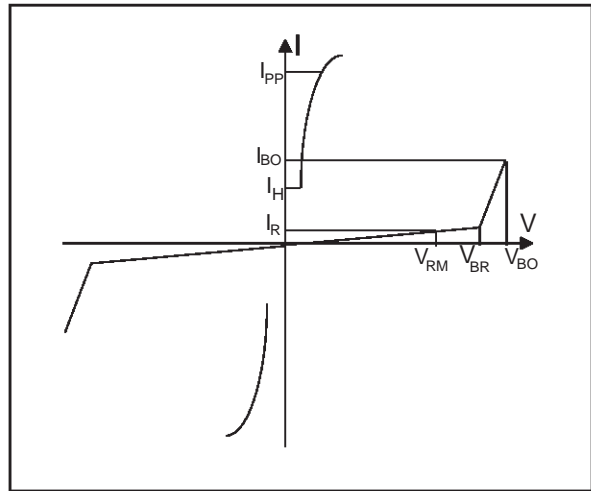


## THERMAL RESISTANCES

Symbol	Parameter	Value	Unit
R <sub>th(j-a)</sub>	Junction to ambient	170	°C/W

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

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
$V_F$	Forward voltage drop
$I_{PP}$	Peak pulse current
C	Capacitance



**STATIC PARAMETERS**

Type	$I_{RM}$ @ $V_{RM}$		$I_R$ @ $V_R$		$V_{BO}$ @ $I_{BO}$			$I_H$	C
	max. $\mu A$	V	max. note 1 $\mu A$	V	max. note 2 V	min. mA	max. mA	min note 3 mA	max note 4 pF
THBT15011D	5	135	50	150	210	50	400	150	80
THBT16011D	5	135	50	160	230	50	400	150	80
THBT20011D	5	180	50	200	290	50	400	150	80
THBT27011D	5	240	50	270	380	50	400	150	80

- Note 1:**  $I_R$  measured at  $V_R$  guarantees  $V_{BR} > V_R$
- Note 2:** Measured at 50 Hz (1 cycle) test circuit 1.
- Note 3:** See the reference test circuit 2.
- Note 4:**  $V_R = 1V$ ,  $F = 1MHz$ .

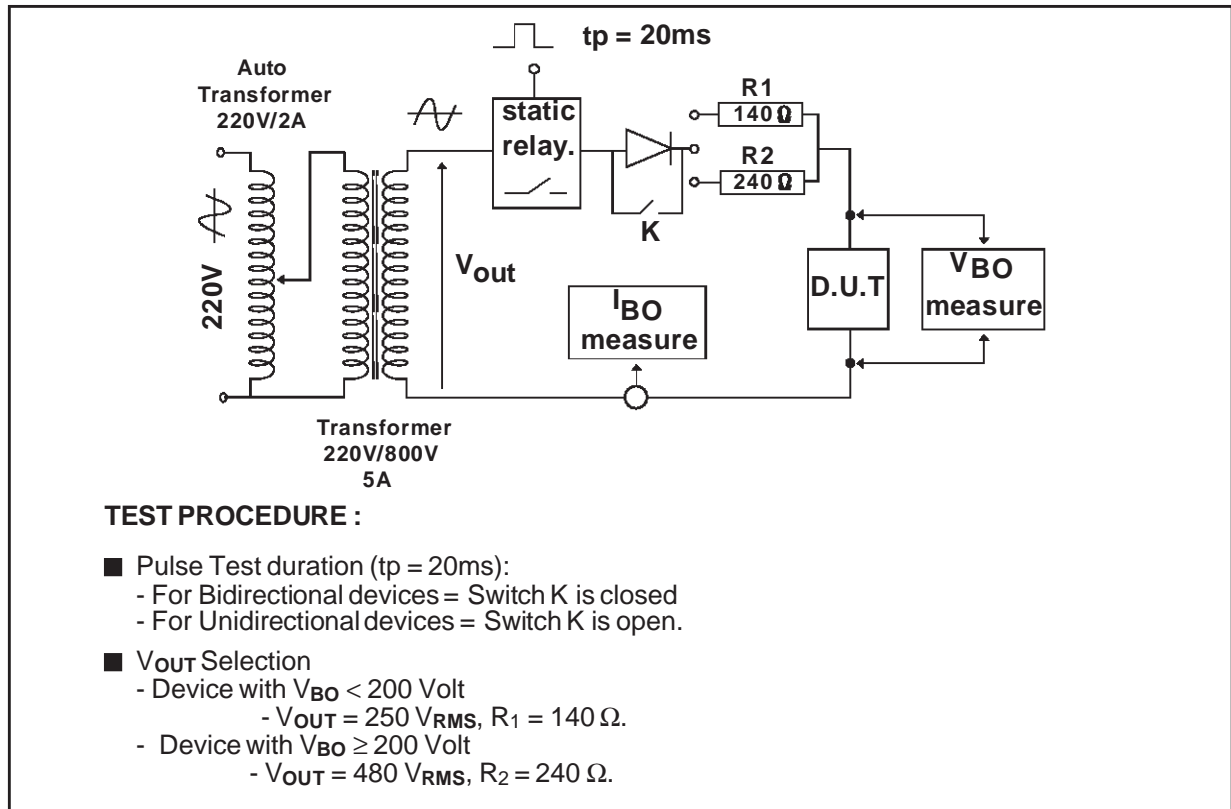
**DYNAMIC BREAKOVER VOLTAGES (Transversal mode)**

Type	Symbol	Test conditions (see note 5)				Maximum	Unit
THBT15011D	$V_{BO}$	10/700 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	240	V
		1.2/50 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	250	
		2/10 $\mu s$	2.5kV	$R_p=62\Omega$	$I_{PP}=38A$	260	
THBT16011D	$V_{BO}$	10/700 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	260	V
		1.2/50 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	270	
		2/10 $\mu s$	2.5kV	$R_p=62\Omega$	$I_{PP}=38A$	290	
THBT20011D	$V_{BO}$	10/700 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	320	V
		1.2/50 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	350	
		2/10 $\mu s$	2.5kV	$R_p=62\Omega$	$I_{PP}=38A$	400	
THBT27011D	$V_{BO}$	10/700 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	390	V
		1.2/50 $\mu s$	1.5kV	$R_p=10\Omega$	$I_{PP}=30A$	440	
		2/10 $\mu s$	2.5kV	$R_p=62\Omega$	$I_{PP}=38A$	480	

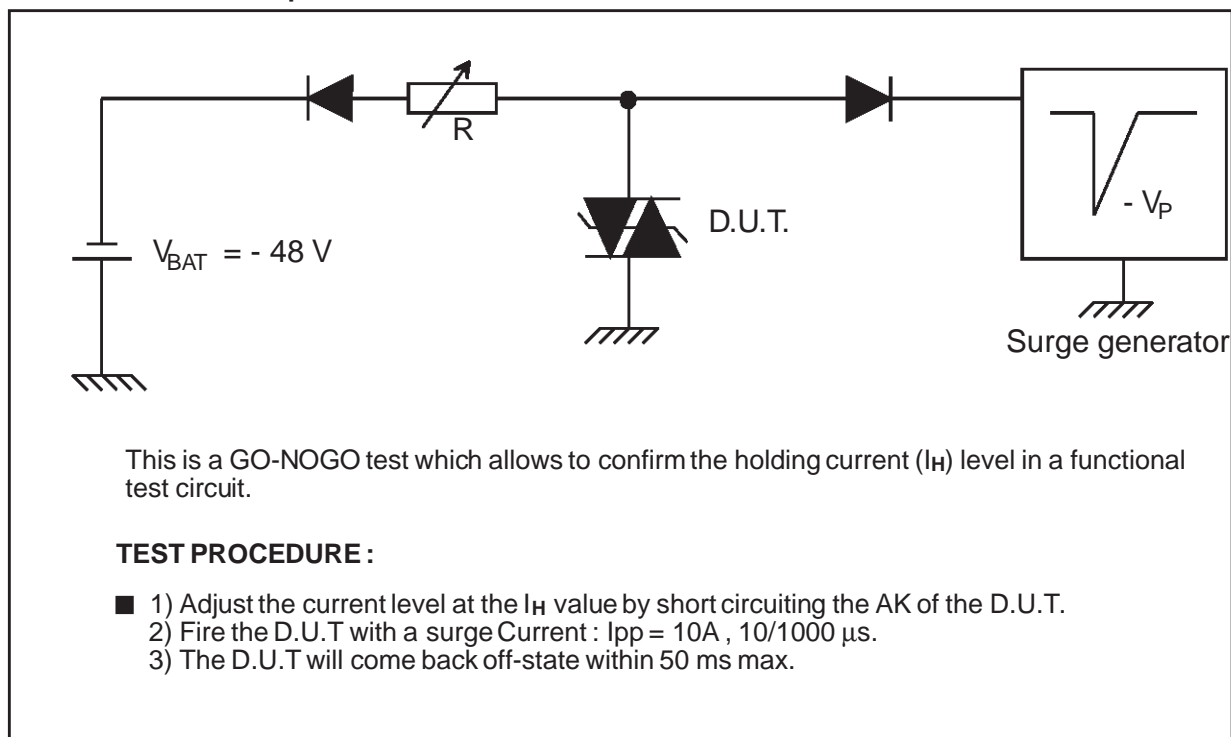
**Note 5:** See test circuit 3 for  $V_{BO}$  dynamic parameters;  $R_p$  is the protection resistor located on the line card.

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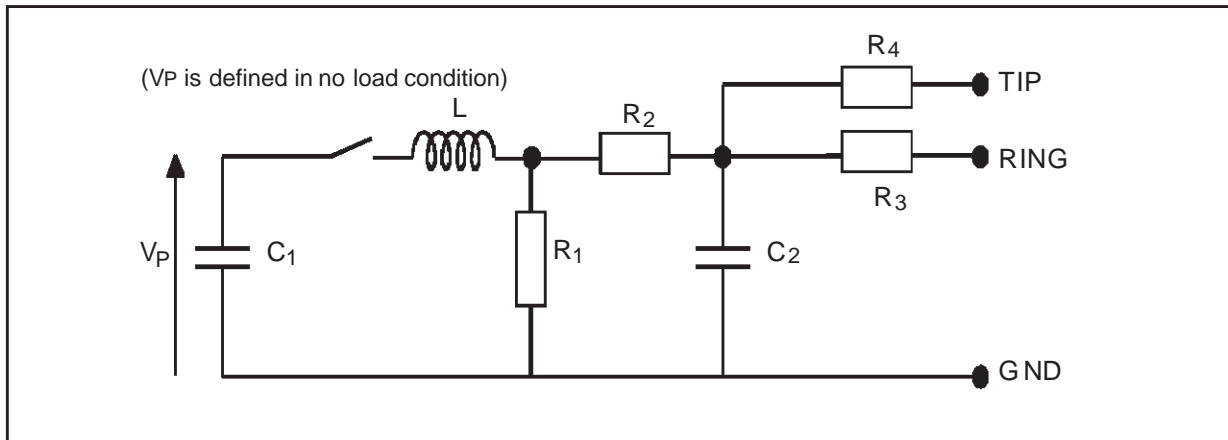
### TEST CIRCUIT 1 for $I_{BO}$ and $V_{BO}$ parameters:



### TEST CIRCUIT 2 for $I_H$ parameter.



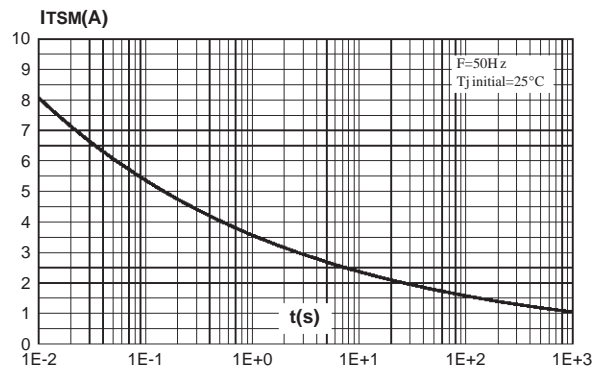
TEST CIRCUIT 3 for  $I_{PP}$  and  $V_{BO}$  parameters :



Pulse ( $\mu s$ )		$V_p$ (V)	$C_1$ ( $\mu F$ )	$C_2$ (nF)	$L$ ( $\mu H$ )	$R_1$ ( $\Omega$ )	$R_2$ ( $\Omega$ )	$R_3$ ( $\Omega$ )	$R_4$ ( $\Omega$ )	$I_{PP}$ (A)	$R_p$ ( $\Omega$ )
$t_r$	$t_p$										
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

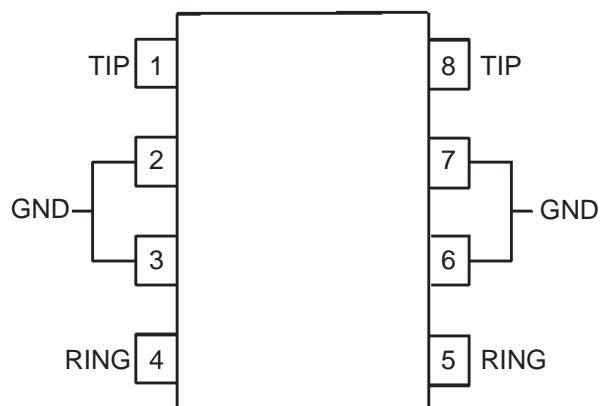
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**Fig. 1:** Surge peak current versus overload duration.



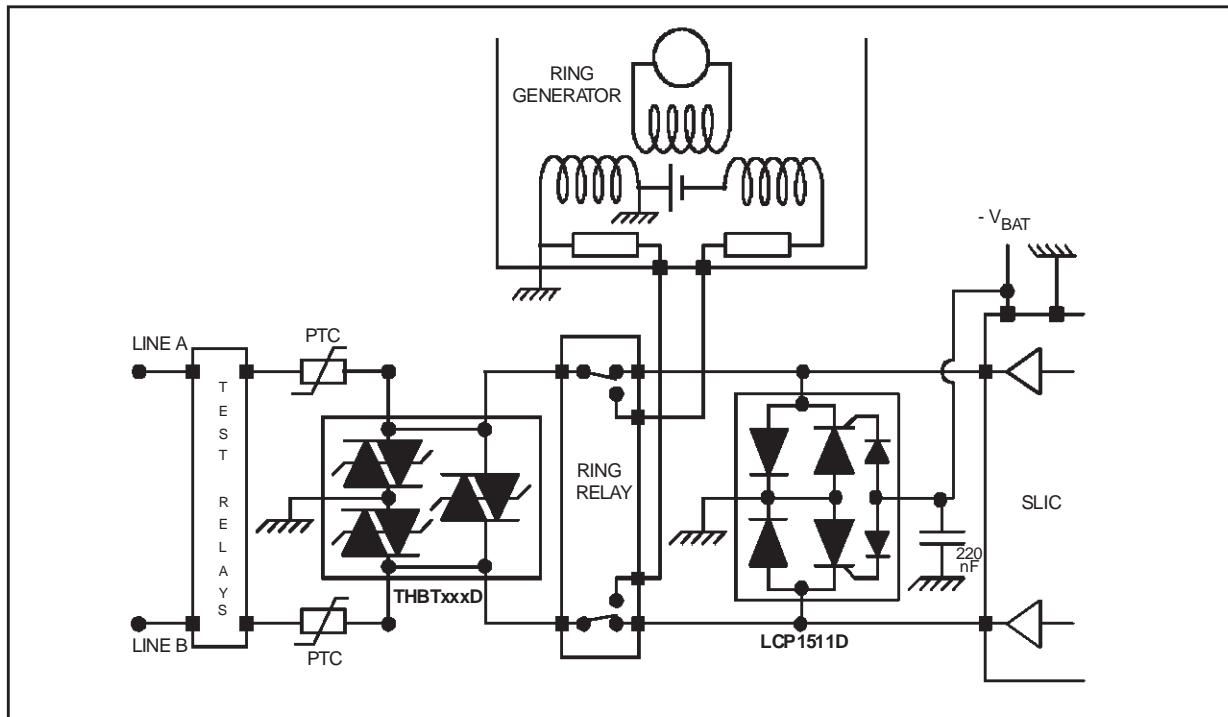
### APPLICATION NOTE

- 1 Connect pins 2, 3, 6 and 7 to Ground in order to guarantee a good surge current capability for long duration disturbances.
- 2 In order to take advantage of the "4-point" structure of the THBT, the TIP and RING lines have to cross the device. In this case, the device will eliminate the overvoltages generated by the parasitic inductances of the wiring ( $L \cdot di/dt$ ), especially for very fast transients.

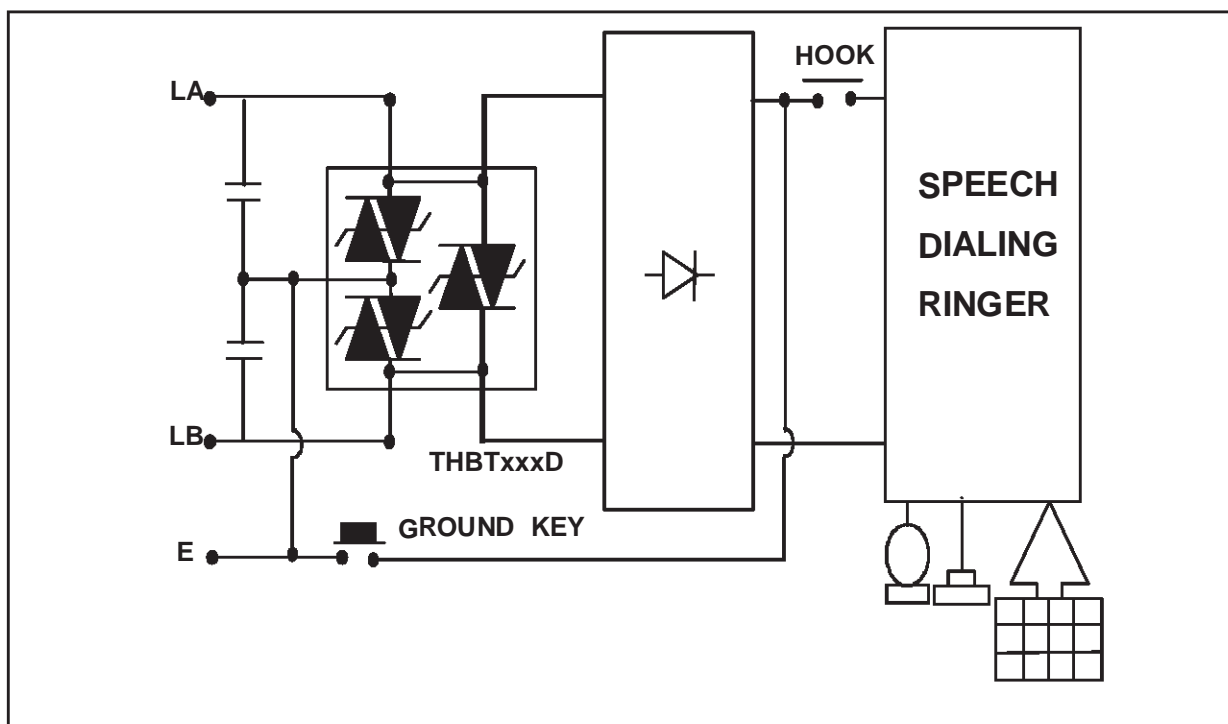


APPLICATION CIRCUIT :

1 - Line card protection

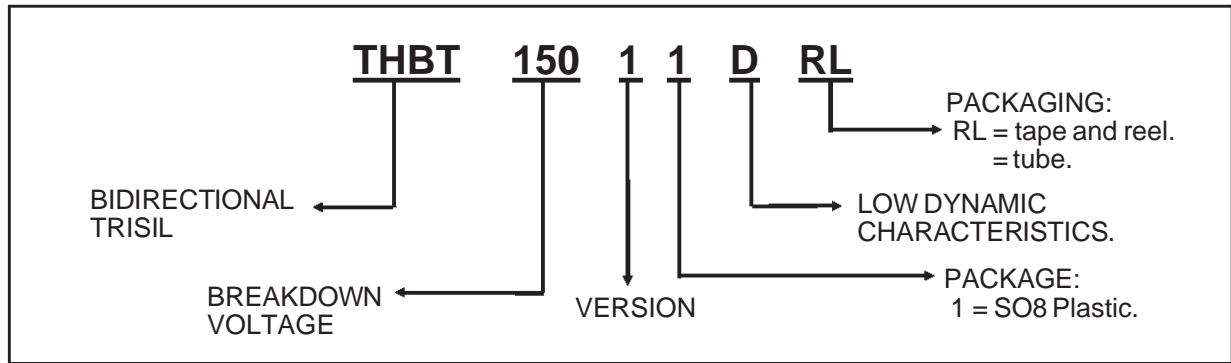


2 - Protection for telephone set with ground key



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## ORDER CODE



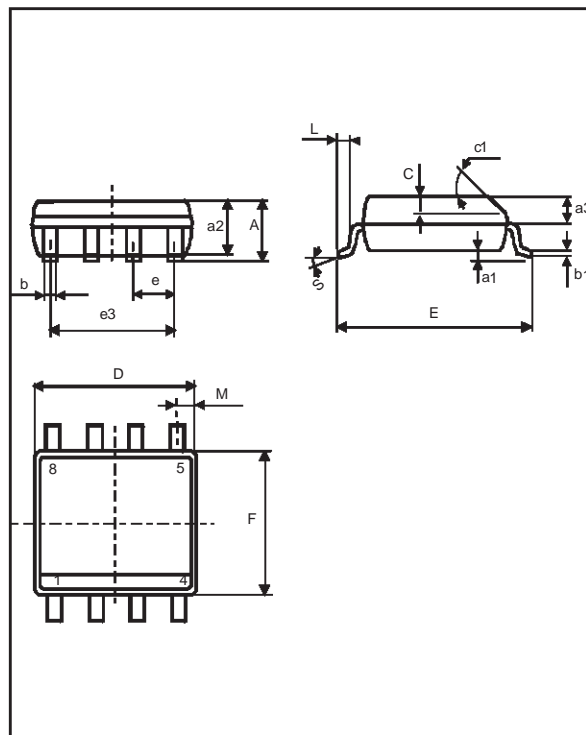
## MARKING

Types	Package	Marking
THBT15011D	SO8	BT151D
THBT16011D	SO8	BT161D
THBT20011D	SO8	BT201D
THBT27011D	SO8	BT271D

## PACKAGE MECHANICAL DATA.

SO8 Plastic

**MARKING** : Logo, Date Code, Part Number.



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)					

**Packaging** : Products supplied in antistatic tubes or tape and reel.

**Weight** : 0.077g



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