



THBTxxx11D

Application Specific Discretes
A.S.D.™

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 :
 $I_{PP} = 30A$ for 10/1000 μs surge.
- HOLDING CURRENT :
 $I_H = 150mA$.
- 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 ($L di/dt$), especially for very fast transient overvoltages.

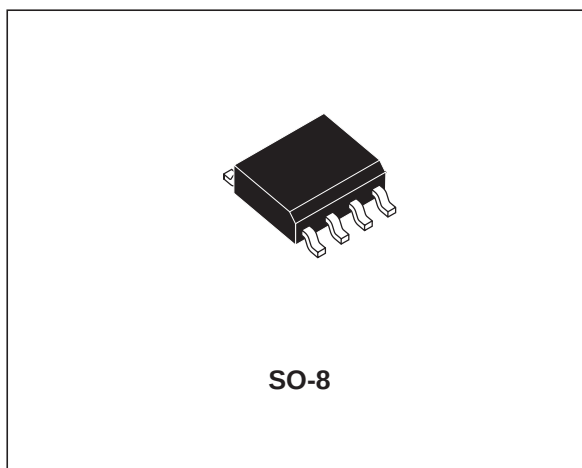
Dynamic characteristics have been defined for several types of surges, in order to meet the SLIC maximum ratings.

COMPLIES WITH BELLCORE STANDARDS :

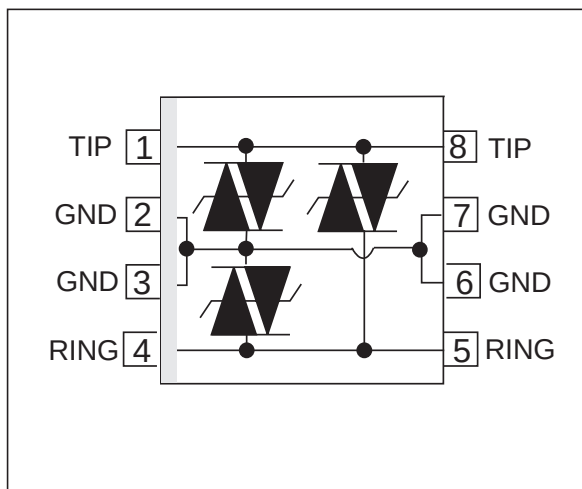
TR-NWT-001089:	10/1000 μs	1000V
	2/10 μs	2500V (first level)
	2/10 μs	5000V

(second level)

with line series resistors of 56 Ω



SCHEMATIC DIAGRAM



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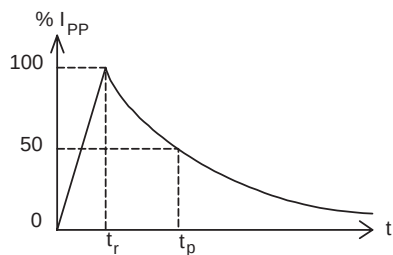
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ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25^{\circ}\text{C}$)

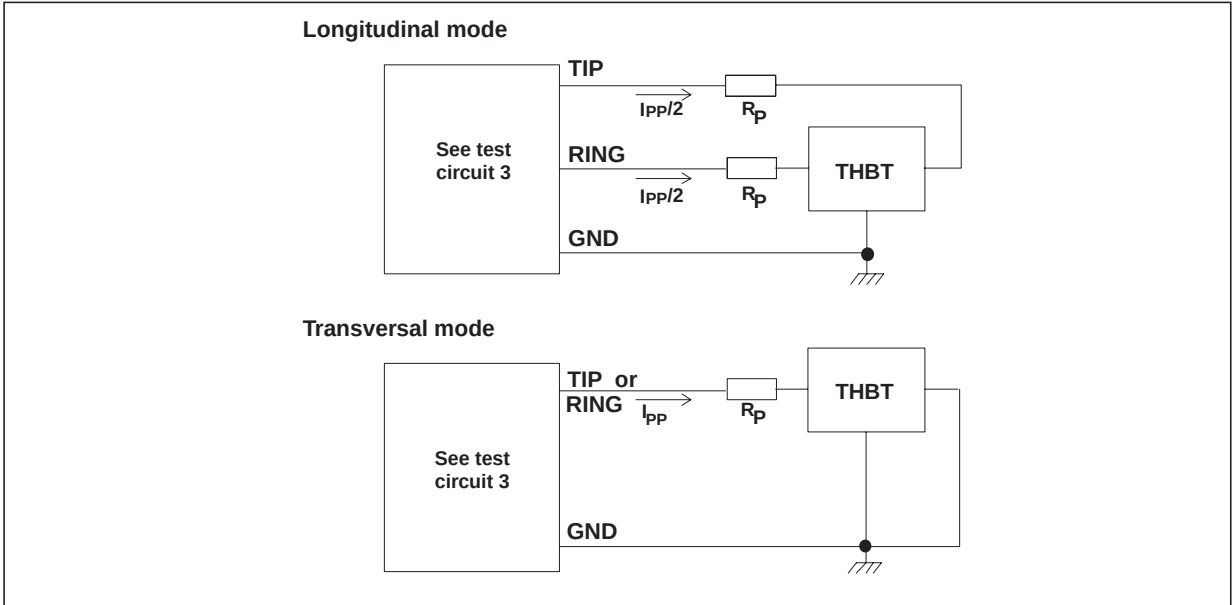
Symbol	Parameter		Value	Unit
I_{PP}	Peak pulse current (see note 1)	10/1000 μs	30	A
I_{TSM}	Non repetitive surge peak on-state current ($F=50\text{Hz}$)	$t_p = 10\text{ ms}$ $t = 1\text{ s}$	8 3.5	A
T_{stg} T_j	Storage temperature range Maximum operating junction temperature		- 40 to + 150 + 150	$^{\circ}\text{C}$ $^{\circ}\text{C}$
T_L	Maximum lead temperature for soldering during 10s		260	$^{\circ}\text{C}$

Note 1 : Pulse waveform :

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



TEST CIRCUITS FOR I_{PP}

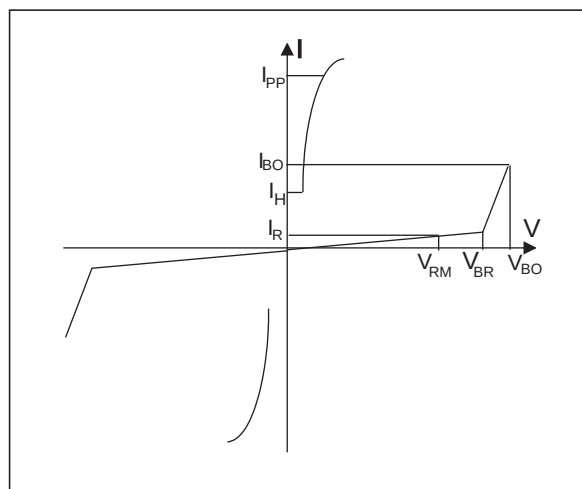


THERMAL RESISTANCES

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
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.		max.		max.	min.	max.	min	max
	μA	V	μA	V	V	mA	mA	mA	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: $V_R = 1\text{V}$, $F = 1\text{MHz}$.

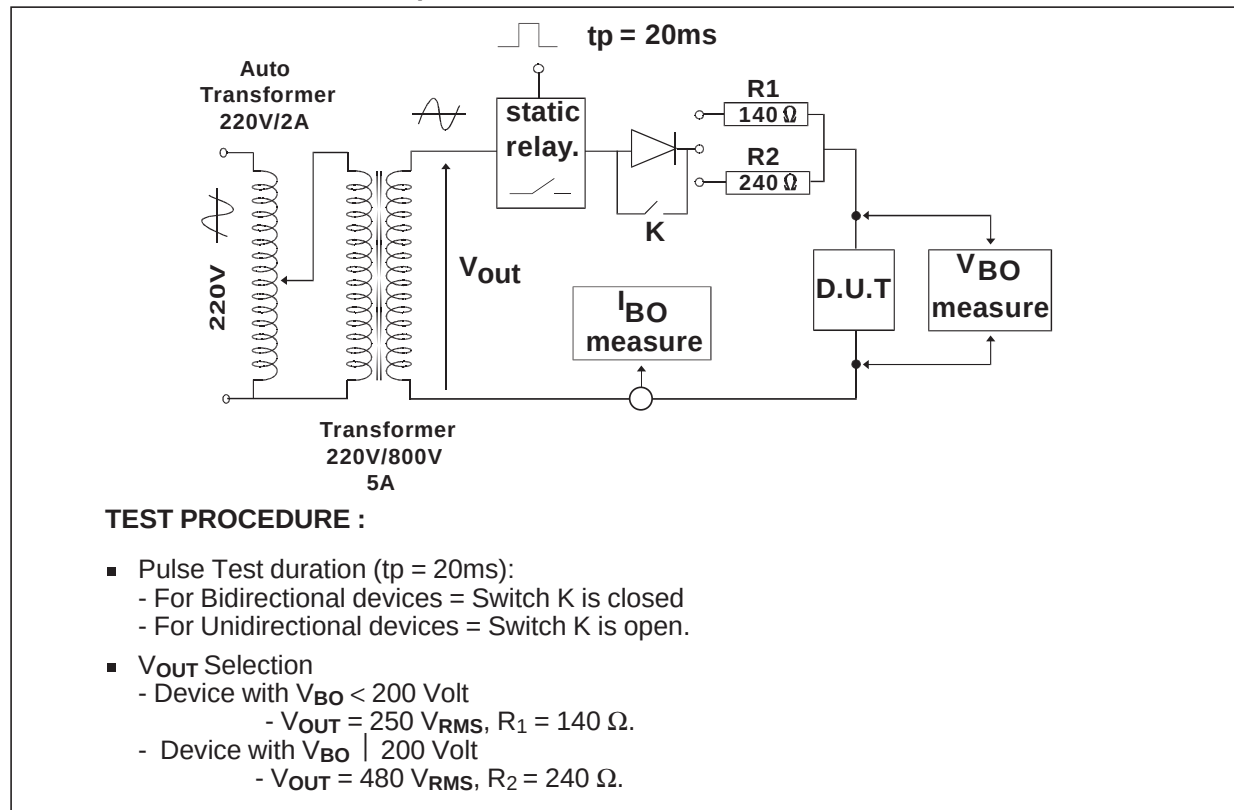
DYNAMIC BREAKOVER VOLTAGES (Transversal mode)

Type	Symbol	Test conditions (see note 5)					Maximum	Unit
THBT15011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		190	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		190	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$		200	
THBT16011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		200	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		200	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$		210	
THBT20011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		270	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		270	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$		280	
THBT27011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		360	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$		360	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$		400	

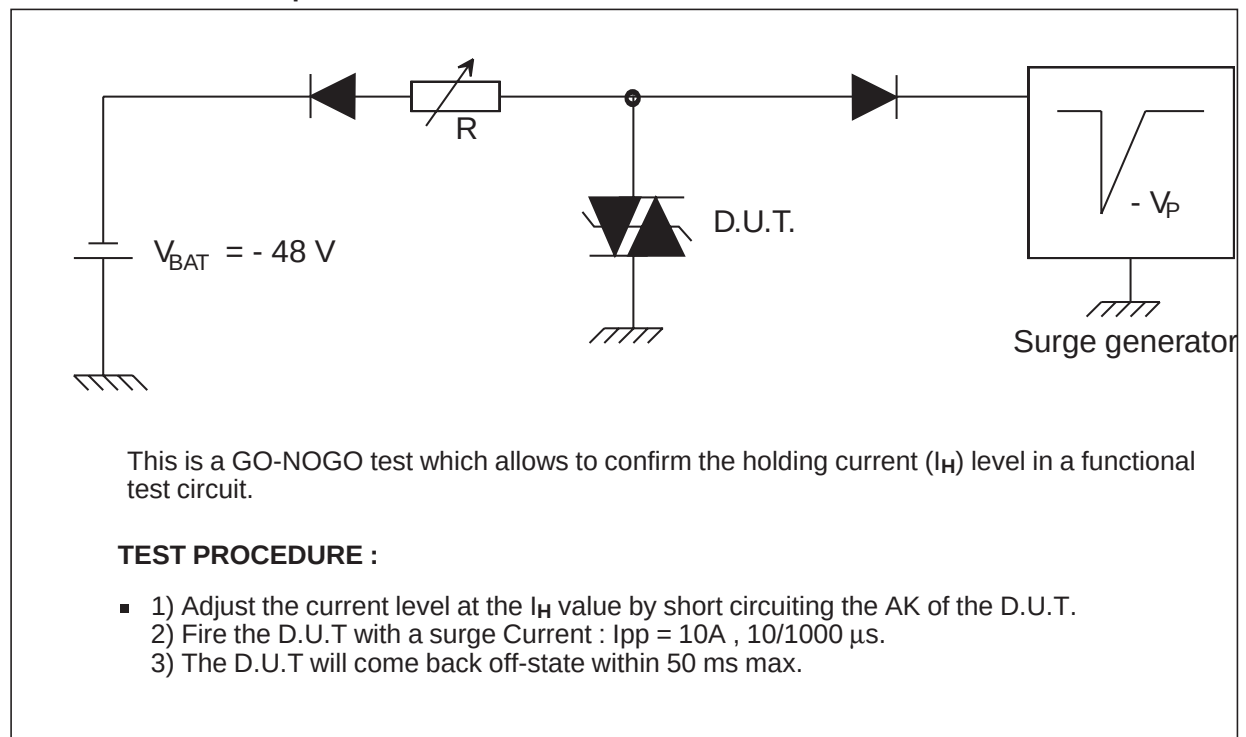
Note 5: See test circuit 3 for V_{BO} dynamic parameters; R_p is the protection resistor located on the line card.

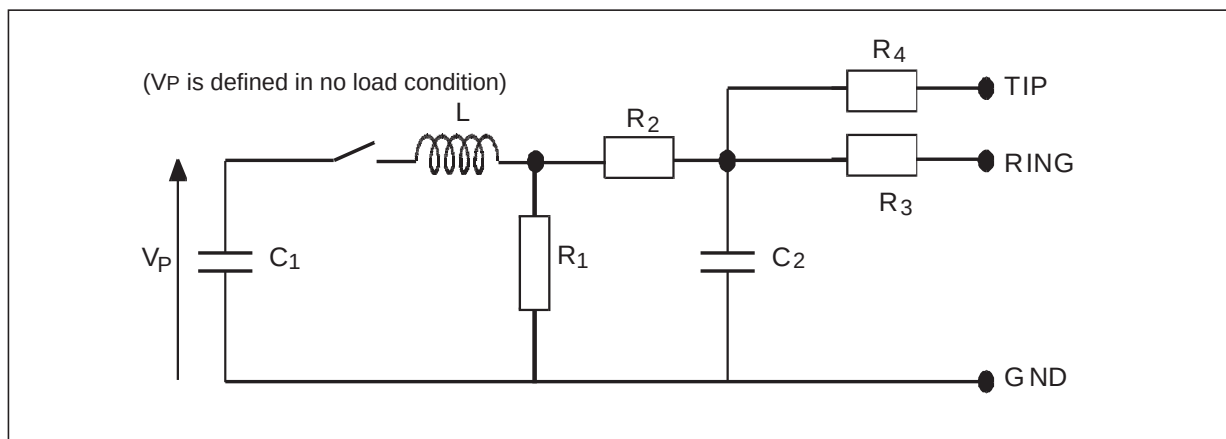
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TEST CIRCUIT 1 for I_{BO} and V_{BO} parameters :



TEST CIRCUIT 2 for I_H parameter.

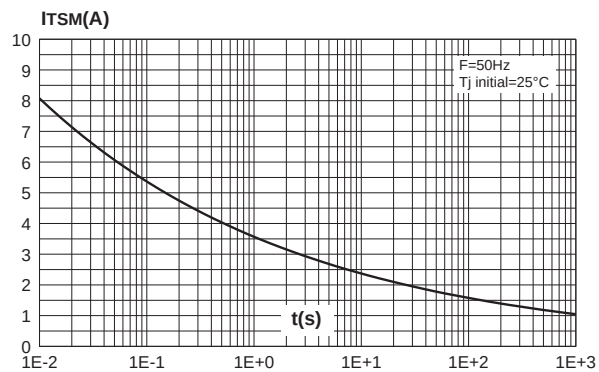


TEST CIRCUIT 3 for I_{PP} and V_{BO} parameters :

Pulse (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

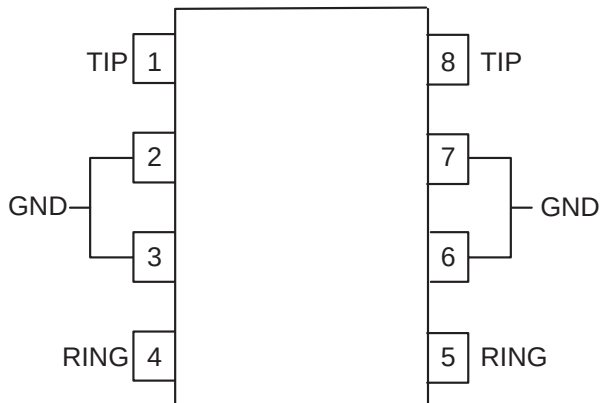
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Fig. 1: Surge peak current versus overload duration.



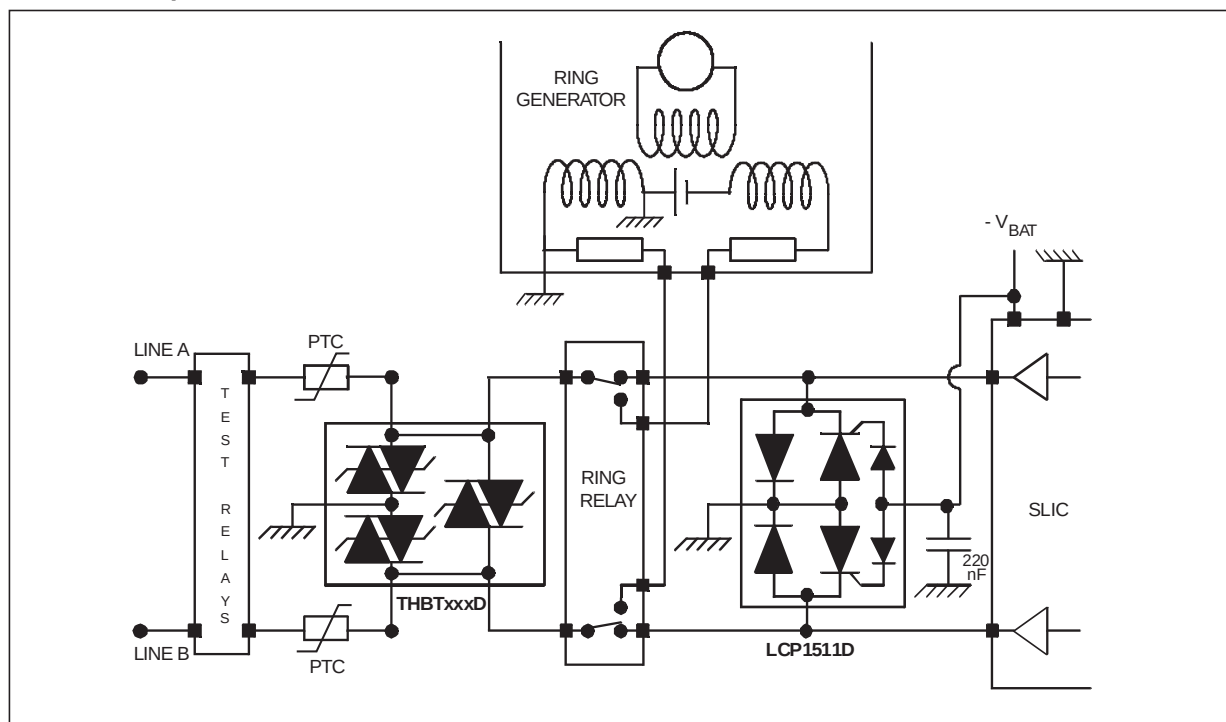
APPLICATION NOTE

- 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 (Ldi/dt), especially for very fast transients.

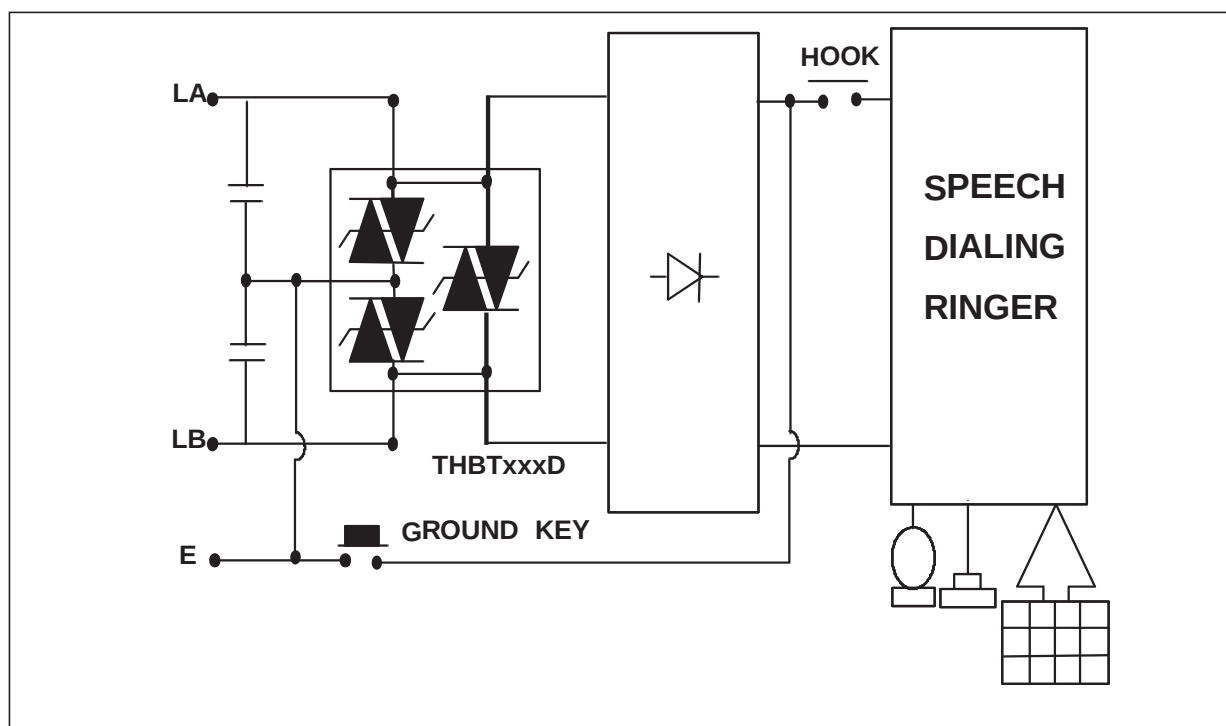


APPLICATION CIRCUIT :

1 - Line card protection

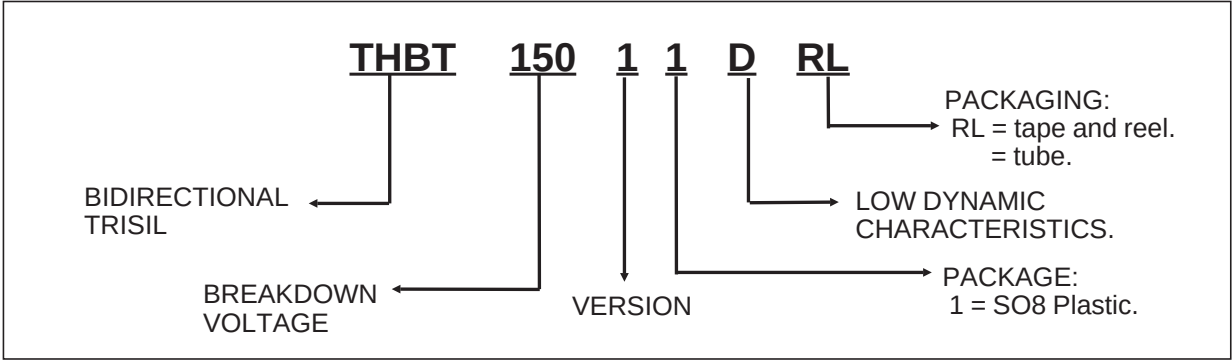


2 - Protection for telephone set with ground key



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ORDER CODE



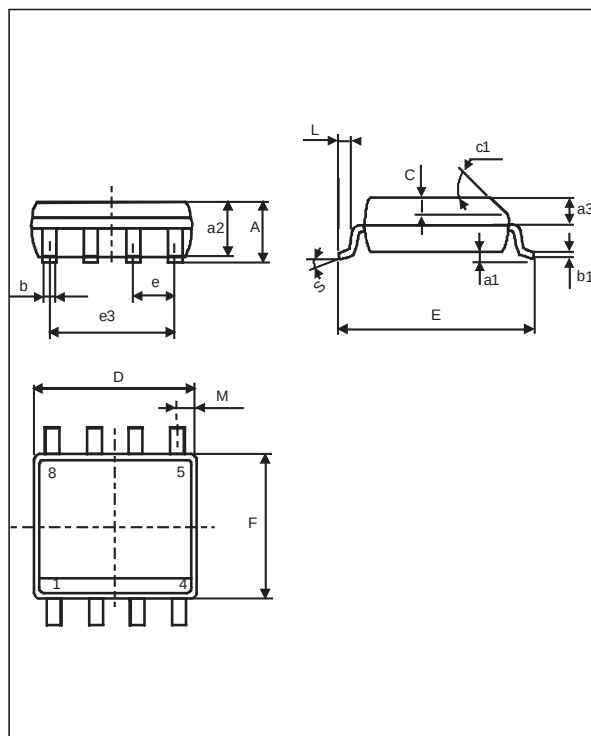
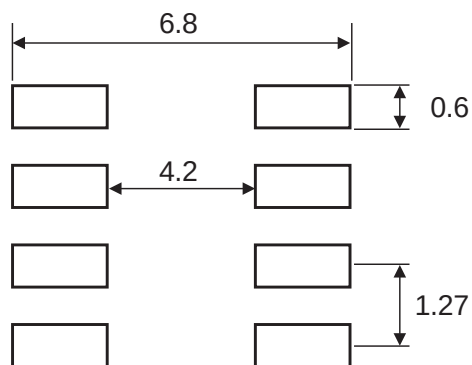
MARKING

Types	Package	Marking
THBT15011D	SO-8	BT151D
THBT16011D	SO-8	BT161D
THBT20011D	SO-8	BT201D
THBT27011D	SO-8	BT271D

MARKING : Logo, Date Code, Part Number.

PACKAGE MECHANICAL DATA.

SO-8 Plastic

**FOOT PRINT DIMENSIONS (in millimeters)**

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 : 0.077 g.

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