



THBTxxx11D

Application Specific Discretes
A.S.D.TM

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.

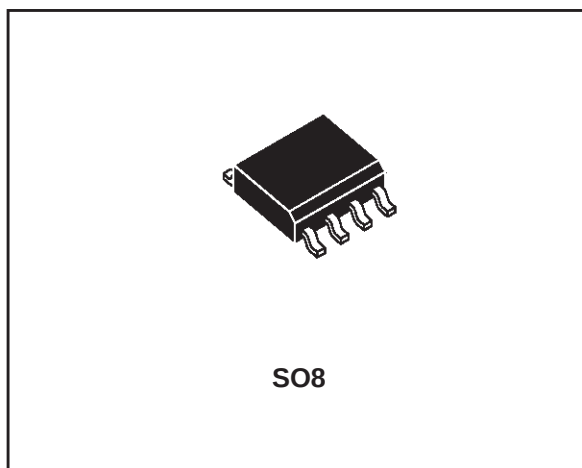
A particular attention has been given to the internal wire bonding. The "4-point" configuration ensures a reliable protection, eliminating overvoltages introduced by the parasitic inductances of the wiring ($L di/dt$), especially for very fast transient overvoltages.

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

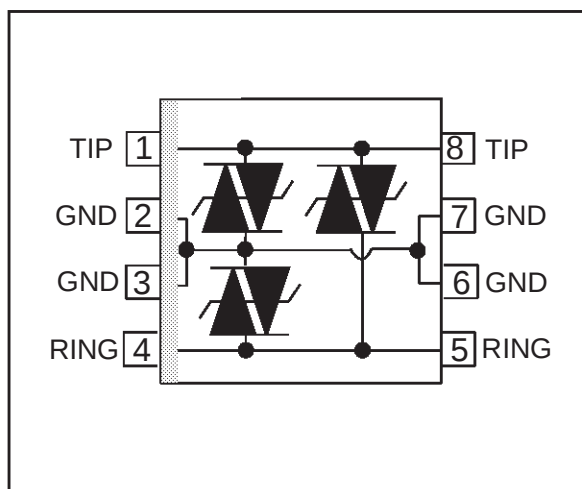
COMPLIES WITH THE FOLLOWING STANDARDS :

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

(*) With series resistors or PTC.



SCHEMATIC DIAGRAM



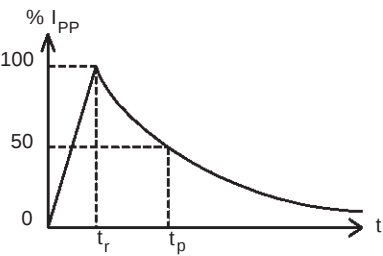
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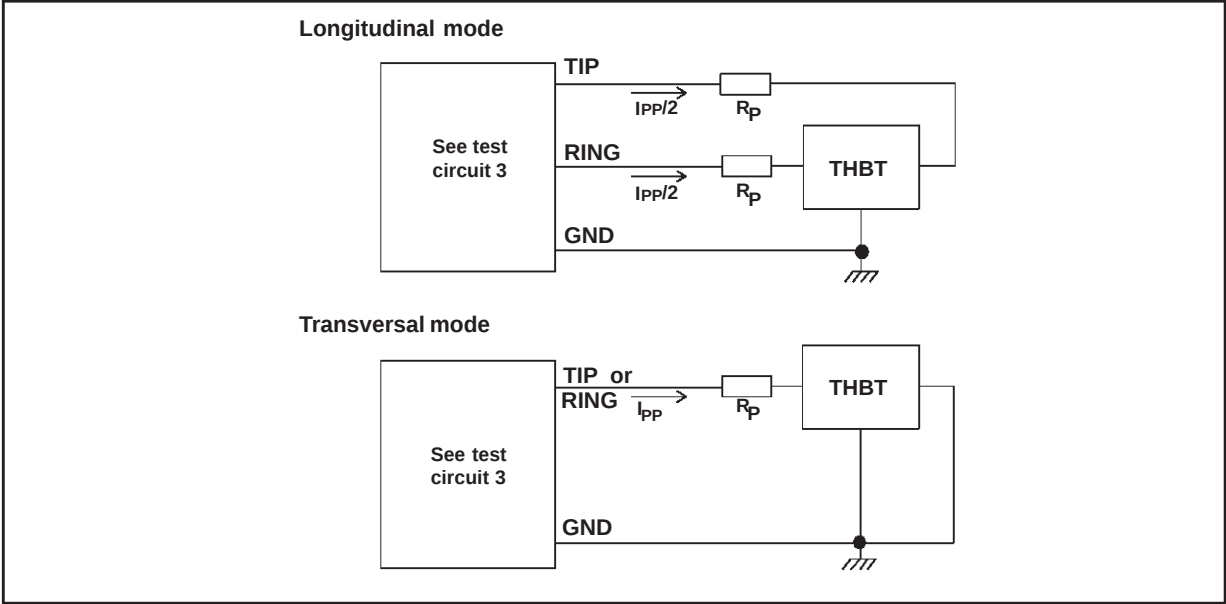
ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25°C)

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=50Hz)	t _p = 10 ms t = 1s	8 3.5	A
T _{stg} T _j	Storage temperature range Maximum operating junction temperature		- 40 to + 150 + 150	°C °C
T _L	Maximum lead temperature for soldering during 10s		260	°C

Note 1 : Pulse waveform :
10/1000μs t_r=10μs t_p=1000μs



TEST CIRCUITS FOR I_{PP}

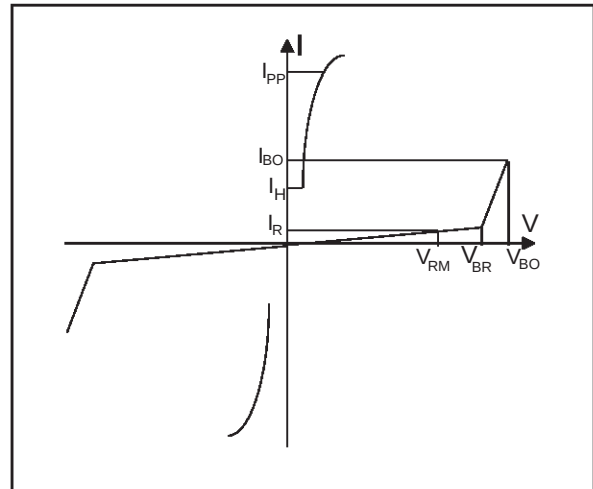


THERMAL RESISTANCES

Symbol	Parameter	Value	Unit
R _{th (j-a)}	Junction to ambient	170	°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	$R_p=10\Omega$	$I_{PP}=30\text{A}$	240	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	250	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$	260	
THBT16011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	260	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	270	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$	290	
THBT20011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	320	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	350	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$	400	
THBT27011D	V_{BO}	10/700 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	390	V
		1.2/50 μs	1.5kV	$R_p=10\Omega$	$I_{PP}=30\text{A}$	440	
		2/10 μs	2.5kV	$R_p=62\Omega$	$I_{PP}=38\text{A}$	480	

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

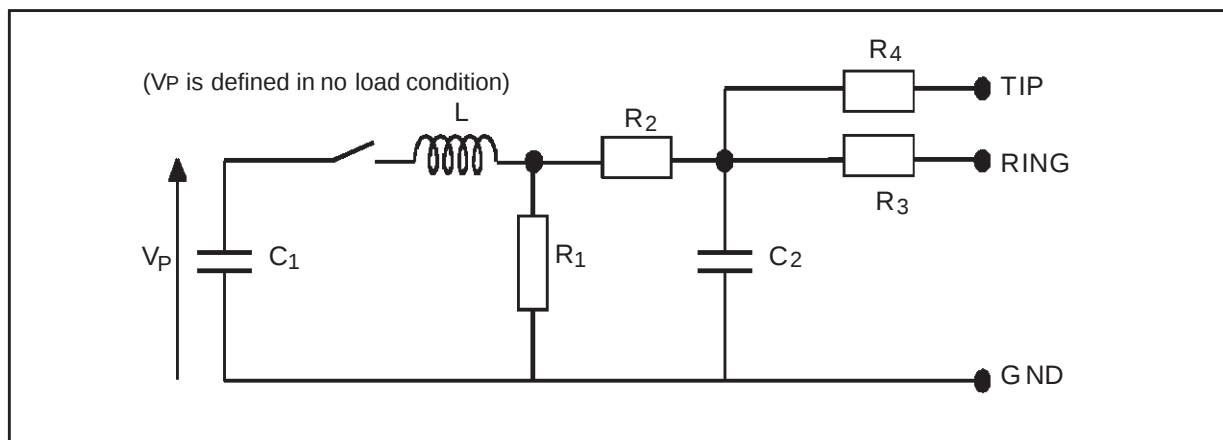


- Pulse Test duration ($t_p = 20\text{ms}$):
 - For Bidirectional devices = Switch K is closed
 - For Unidirectional devices = Switch K is open.
- V_{OUT} Selection
 - Device with $V_{BO} < 200\text{ Volt}$
 - $V_{OUT} = 250\text{ V}_{RMS}$, $R_1 = 140\ \Omega$.
 - Device with $V_{BO} \geq 200\text{ Volt}$
 - $V_{OUT} = 480\text{ V}_{RMS}$, $R_2 = 240\ \Omega$.

This is a GO-NOGO test which allows to confirm the holding current (I_H) level in a functional test circuit.

TEST PROCEDURE:

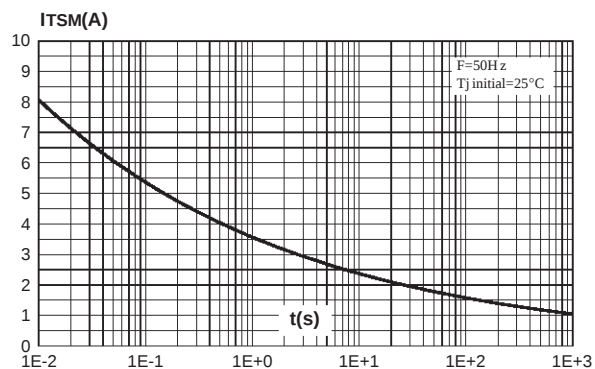
- 1) Adjust the current level at the I_H value by short circuiting the AK of the D.U.T.
- 2) Fire the D.U.T with a surge Current : $I_{pp} = 10A$, $10/1000 \mu s$.
- 3) The D.U.T will come back off-state within 50 ms max.

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

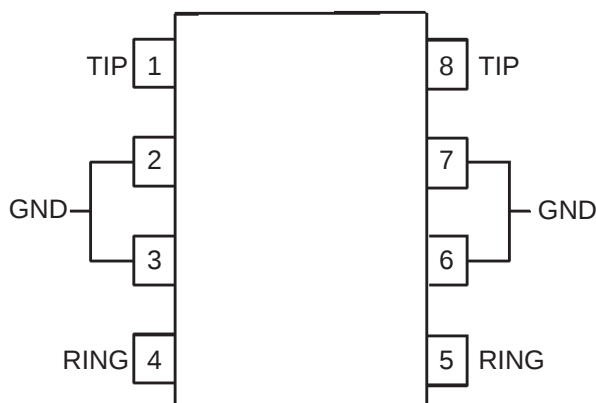
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Fig. 1: Surge peak current versus overload duration.



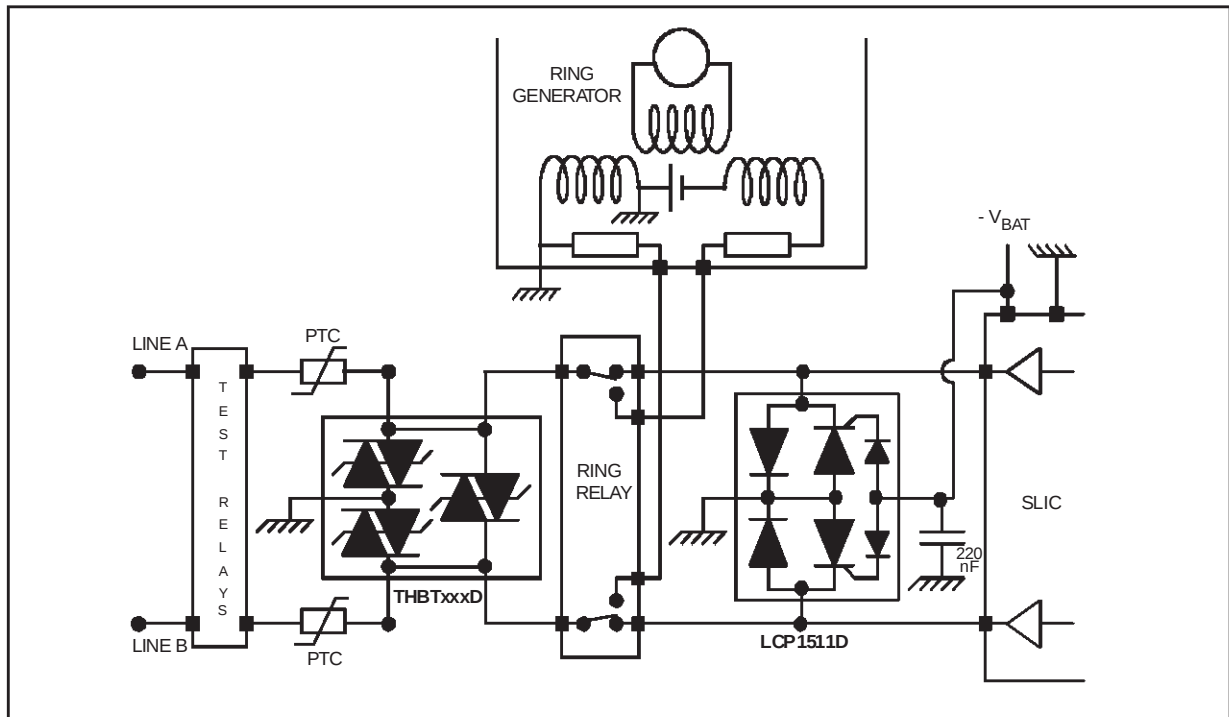
APPLICATION NOTE

- 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 ($L di/dt$), especially for very fast transients.

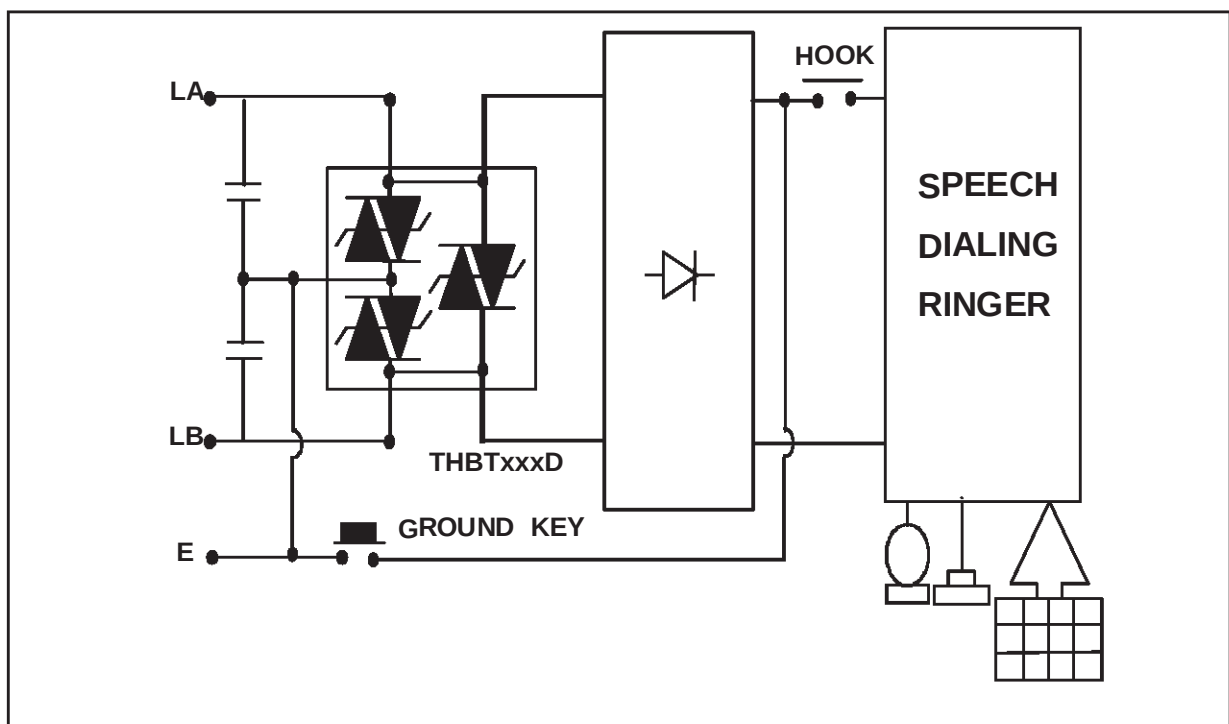


APPLICATION CIRCUIT :

1 - Line card protection

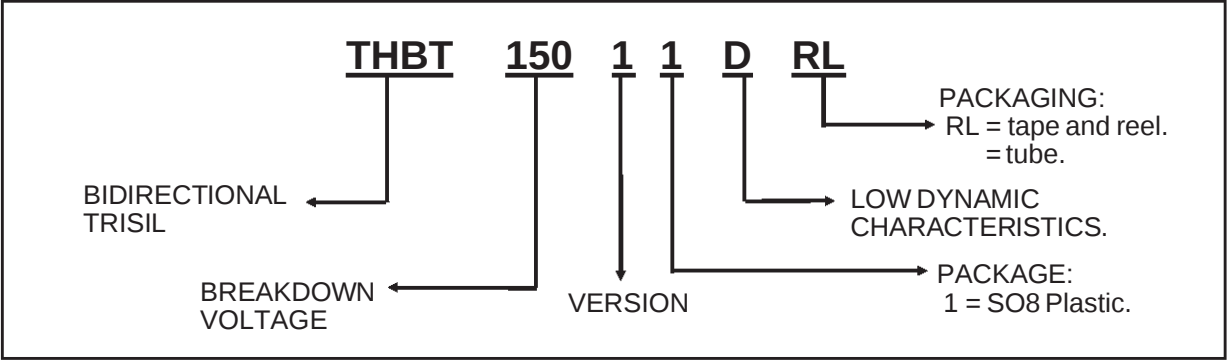


2 - Protection for telephone set with ground key



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ORDER CODE

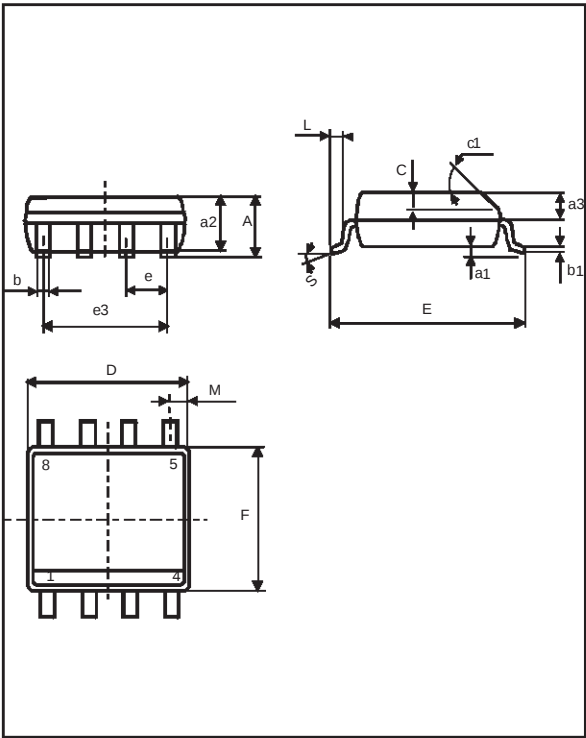


MARKING

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.



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

Weight : 0.077g

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)					



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