BT169D-L

Thyristor logic level

Rev. 02 — 26 February 2008 **Product data sheet**

1. Product profile

1.1 General description

Passivated sensitive gate thyristor in a SOT54 plastic package.

1.2 Features

- Very sensitive gate
- Direct interfacing to low power gate drive circuits
- Direct interfacing to logic level ICs

1.3 Applications

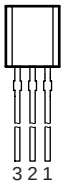
- General purpose switching and phase control

1.4 Quick reference data

- $V_{DRM} \leq 400$ V
- $V_{RRM} \leq 400$ V
- $I_{TSM} \leq 8$ A (t = 10 ms)
- $I_{T(RMS)} \leq 0.8$ A
- $I_{T(AV)} \leq 0.5$ A
- $I_{GT} \leq 50$ µA

2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	anode (A)	 SOT54 (TO-92)	
2	gate (G)		
3	cathode (K)		

3. Ordering information

Table 2. Ordering information

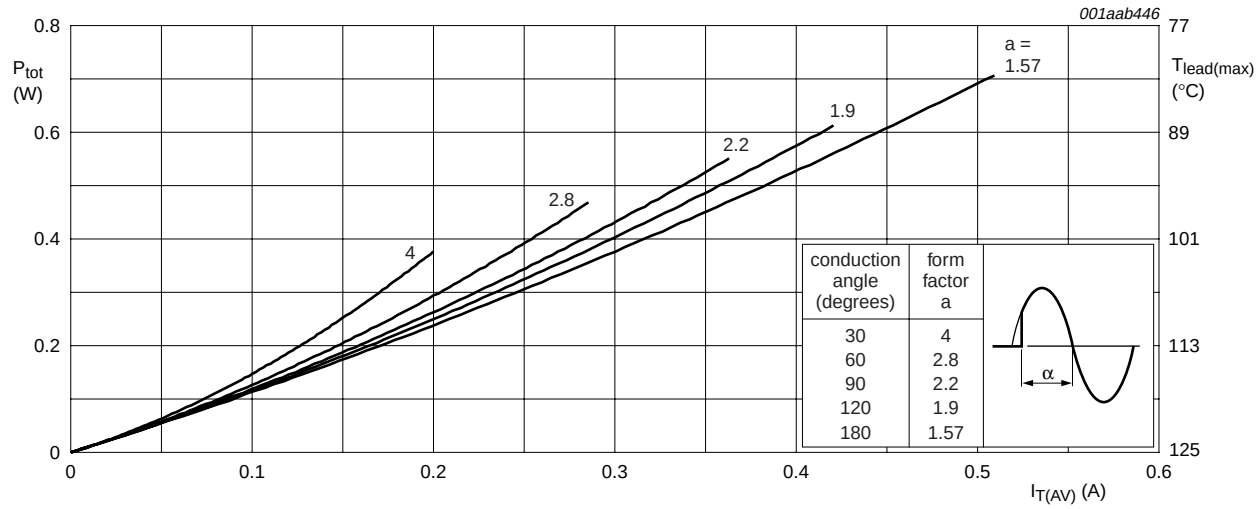
Type number	Package		
	Name	Description	Version
BT169D-L	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

4. Limiting values

Table 3. Limiting values

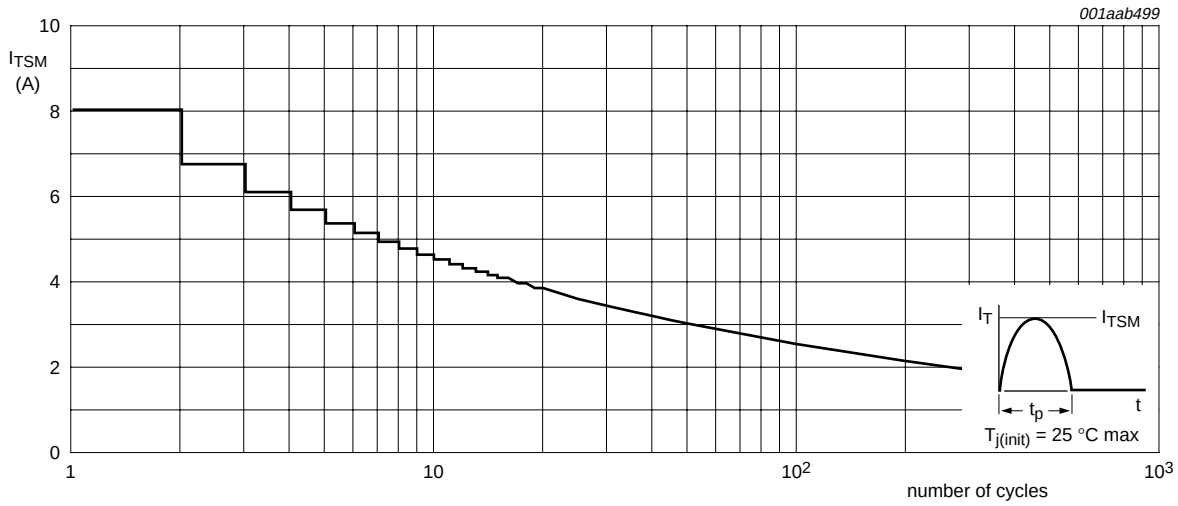
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	400	V
V_{RRM}	repetitive peak reverse voltage		-	400	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83$ °C; see Figure 1	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	all conduction angles; see Figure 4 and 5	-	0.8	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_j = 25$ °C prior to surge; see Figure 2 and 3			
		t = 10 ms	-	8	A
		t = 8.3 ms	-	9	A
I^2t	I^2t for fusing	$t_p = 10$ ms	-	0.32	A^2s
dI_T/dt	rate of rise of on-state current	$I_{TM} = 2$ A; $I_G = 10$ mA; $dI_G/dt = 100$ mA/µs	-	50	A/µs
I_{GM}	peak gate current		-	1	A
V_{RGM}	peak reverse gate voltage		-	5	V
P_{GM}	peak gate power		-	2	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
T_{stg}	storage temperature		–40	+150	°C
T_j	junction temperature		-	125	°C



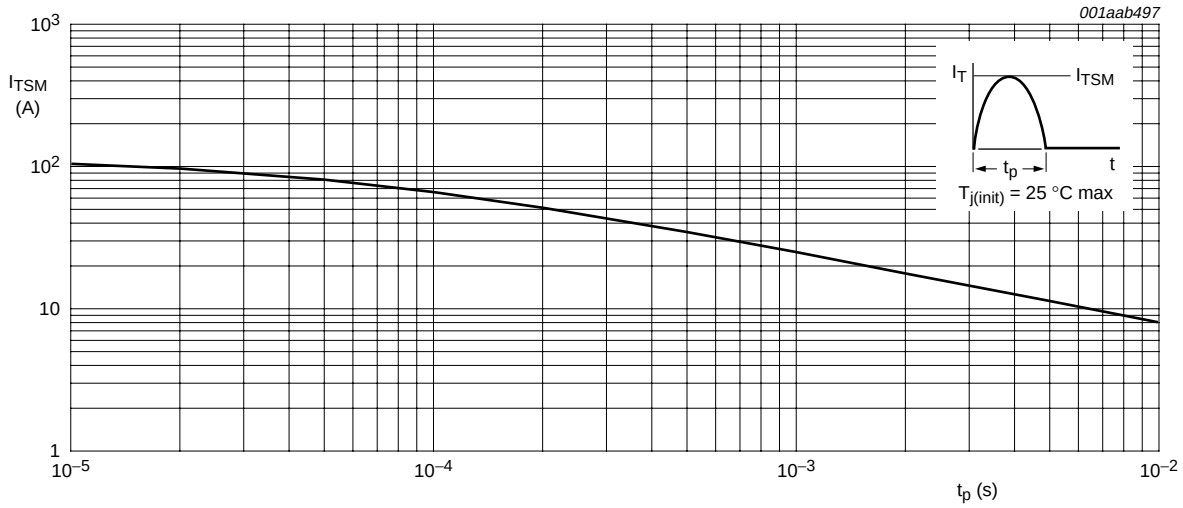
Form factor a = $I_{T(RMS)}$ / $I_{T(AV)}$

Fig 1. Total power dissipation as a function of average on-state current; maximum values



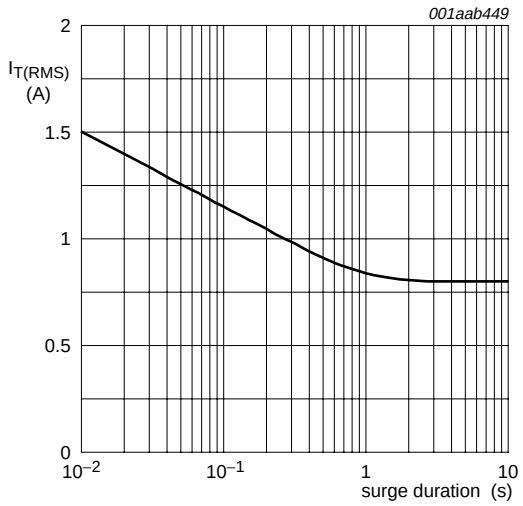
f = 50 Hz

Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



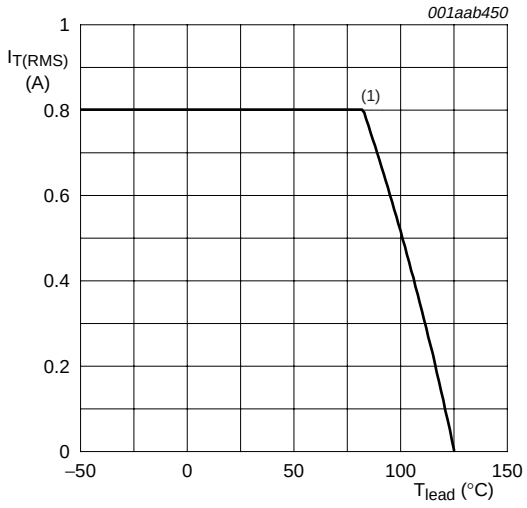
$t_p \leq 10$ ms

Fig 3. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values



f = 50 Hz; $T_{lead} \leq 83$ °C

Fig 4. RMS on-state current as a function of surge duration for sinusoidal currents



(1) $T_{lead} = 83$ °C

Fig 5. RMS on-state current as a function of lead temperature; maximum values

5. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j\text{-}lead)}$	thermal resistance from junction to lead	see Figure 6	-	-	60	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient	printed-circuit board mounted; lead length = 4 mm	-	150	-	K/W

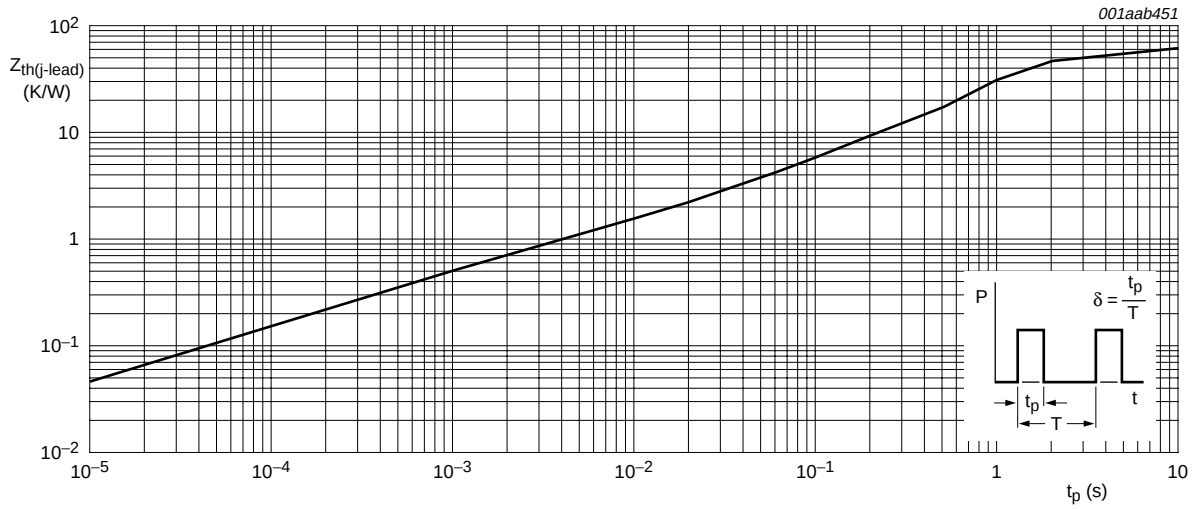


Fig 6. Transient thermal impedance from junction to lead as a function of pulse width

6. Characteristics

Table 5. Characteristics

T_j = 25 °C unless otherwise stated.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 10 mA; see Figure 8	-	-	50	µA
I_L	latching current	V_D = 12 V; I_G = 0.5 mA; R_{GK} = 1 kΩ; see Figure 10	-	2	6	mA
I_H	holding current	V_D = 12 V; I_G = 0.5 mA; R_{GK} = 1 kΩ; see Figure 11	-	2	5	mA
V_T	on-state voltage	I_T = 1.2 A	-	1.25	1.7	V
V_{GT}	gate trigger voltage	I_T = 10 mA; see Figure 7				
		V_D = 12 V	-	0.5	0.8	V
		V_D = $V_{DRM(max)}$; T_j = 125 °C	0.2	0.3	-	V
I_D	off-state current	V_D = $V_{DRM(max)}$; T_j = 125 °C; R_{GK} = 1 kΩ	-	0.05	0.1	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 0.67 × $V_{DRM(max)}$; T_j = 125 °C; exponential waveform; see Figure 12				
		R_{GK} = 1 kΩ	500	800	-	V/µs
		gate open circuit	-	25	-	V/µs
t_{gt}	gate-controlled turn-on time	I_{TM} = 2 A; V_D = $V_{DRM(max)}$; I_G = 10 mA; dI_G/dt = 0.1 A/µs	-	2	-	µs
t_q	commutated turn-off time	V_{DM} = 0.67 × $V_{DRM(max)}$; T_j = 125 °C; I_{TM} = 1.6 A; V_R = 35 V; $(dI_T/dt)_M$ = 30 A/µs; dV_D/dt = 2 V/µs; R_{GK} = 1 kΩ	-	100	-	µs

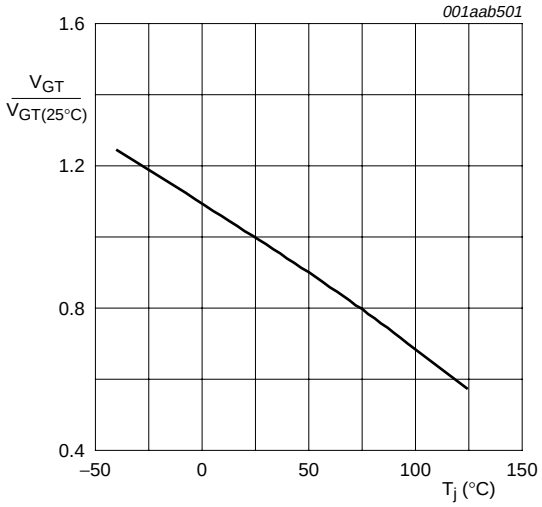


Fig 7. Normalized gate trigger voltage as a function of junction temperature

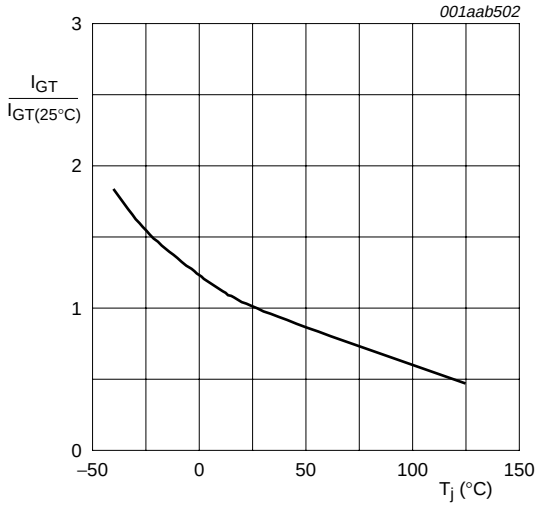
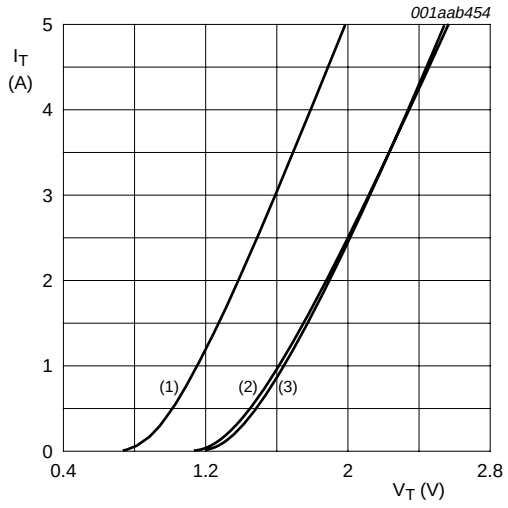


Fig 8. Normalized gate trigger current as a function of junction temperature



V_o = 1.067 V

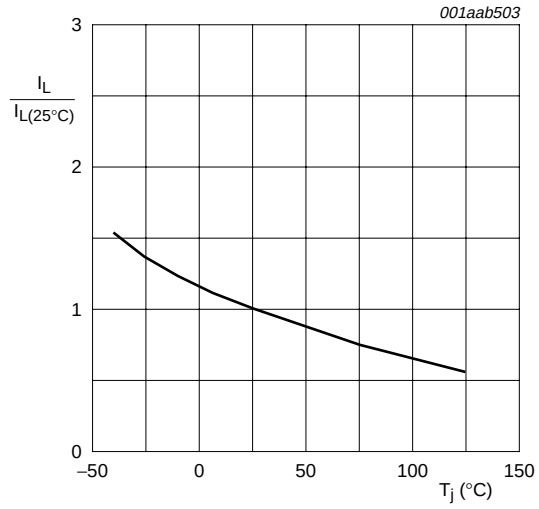
R_s = 0.187 Ω

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

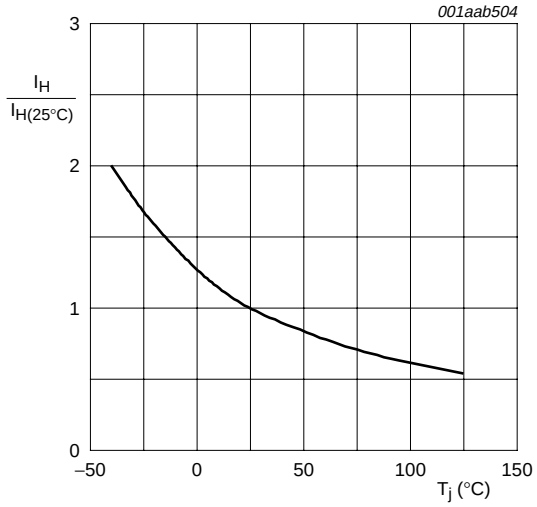
(3) T_j = 25 °C; maximum values

Fig 9. On-state current as a function of on-state voltage



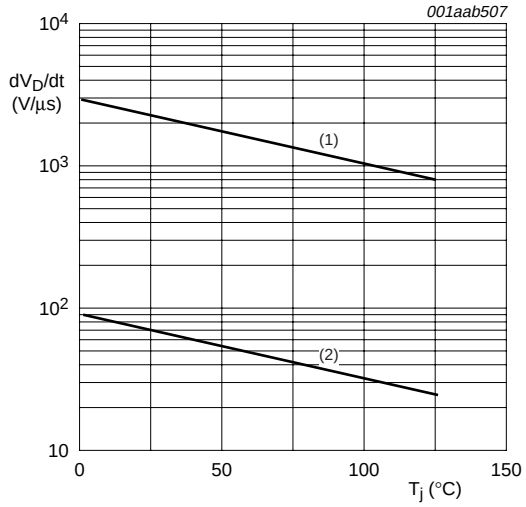
R_{GK} = 1 kΩ

Fig 10. Normalized latching current as a function of junction temperature



R_{GK} = 1 kΩ

Fig 11. Normalized holding current as a function of junction temperature



(1) R_{GK} = 1 kΩ

(2) Gate open circuit

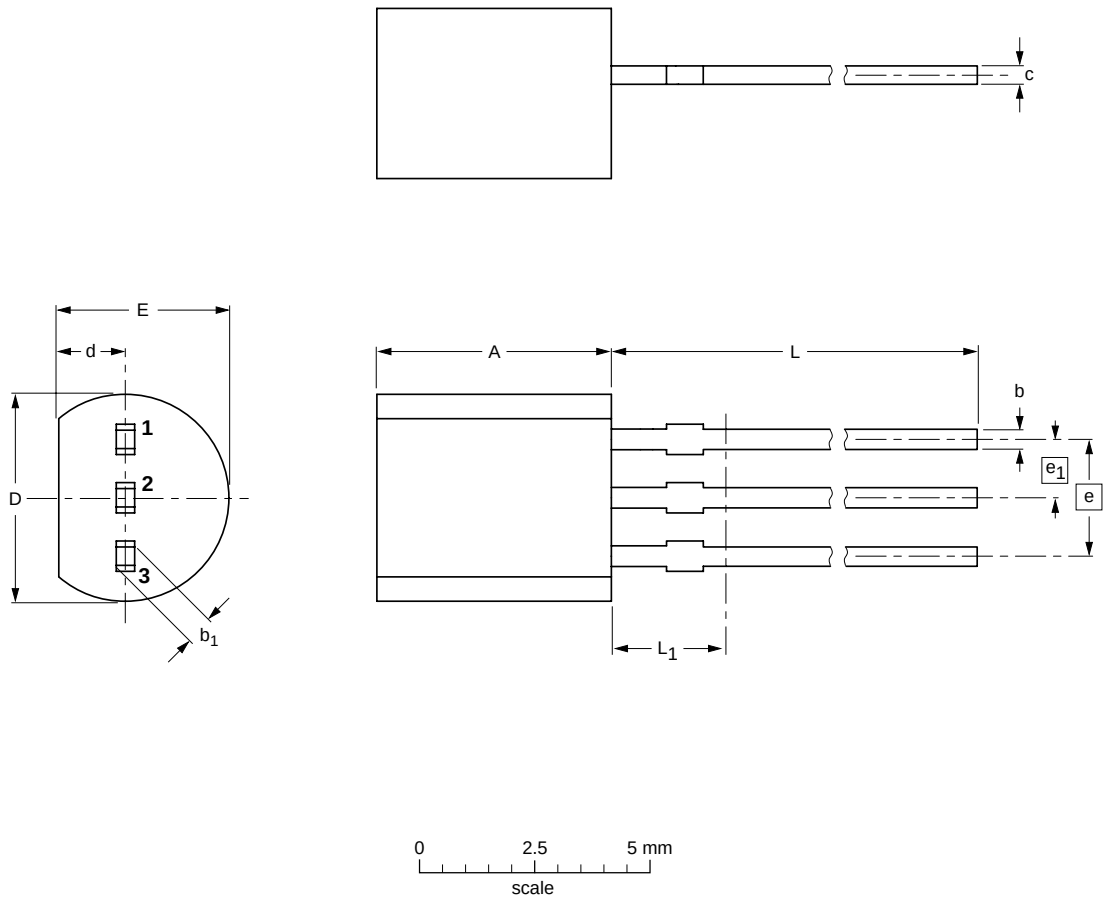
Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

7. Package information

Epoxy meets requirements of UL 94 V-0 at 3.175 mm.

8. Package outline

Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b	b_1	c	D	d	E	e	e_1	L	L_1 (1) max.
mm	5.2 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 12.7	2.5

Note

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT54		TO-92	SC-43A			~~04-06-28~~ 04-11-16

Fig 13. Package outline SOT54 (TO-92)

9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT169D-L_2	20080226	Product data sheet	-	BT169D-L_1
Modifications:	• Section 1.2 “Features” on page 1: updated. • Section 1.4 “Quick reference data” on page 1: condition I_{TSM} updated. • Table 3 “Limiting values” on page 2: table note 1 removed. • Table 5 “Characteristics” on page 6: conditions I_{GT}, I_L, I_H and V_{GT} updated.			
BT169D-L_1	20071112	Product data sheet	-	-

10. Legal information

10.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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12. Contents

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