

BT168 series

Thyristors logic level for RCD/GFI/LCCB applications

Rev. 5 — 1 November 2011

Product data sheet

1. Product profile

1.1 General description

Passivated, sensitive gate thyristors in a SOT54 plastic package.

1.2 Features and benefits

- Designed to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

1.3 Applications

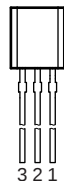
- For use in Residual Current Devices (RCD), Ground Fault Interrupters (GFI) and Leakage Current Circuit Breakers (LCCB) applications, where a minimum I_{GT} limit is needed.

1.4 Quick reference data

- $V_{DRM}, V_{RRM} \leq 500 \text{ V}$ (BT168E)
- $V_{DRM}, V_{RRM} \leq 600 \text{ V}$ (BT168G)
- $I_{T(RMS)} \leq 0.8 \text{ A}$
- $I_{T(AV)} \leq 0.5 \text{ A}$
- $I_{TSM} \leq 8 \text{ A}$.

2. Pinning information

Table 1. Discrete pinning

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

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
BT168E	-	plastic single-ended leaded (through hole) package; 3 leads	SOT54
BT168G			

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} , V_{RRM}	repetitive peak off-state voltage				
	BT168E		[1] -	500	V
	BT168G		[1] -	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83\text{ }^{\circ}\text{C}$; 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; $T_j = 25\text{ }^{\circ}\text{C}$ prior to surge; see Figure 2 and 3			
		$t = 10\text{ ms}$	-	8	A
		$t = 8.3\text{ ms}$	-	9	A
I^2t	I^2t for fusing	$t = 10\text{ ms}$	-	0.32	A^2s
dI_T/dt	repetitive rate of rise of on-state current after triggering	$I_{TM} = 2\text{ A}$; $I_G = 10\text{ mA}$; $dI_G/dt = 100\text{ mA}/\mu\text{s}$	-	50	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current		-	1	A
V_{GM}	peak gate voltage		-	5	V
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	$^{\circ}\text{C}$
T_j	junction temperature		-	125	$^{\circ}\text{C}$

- [1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ μs .

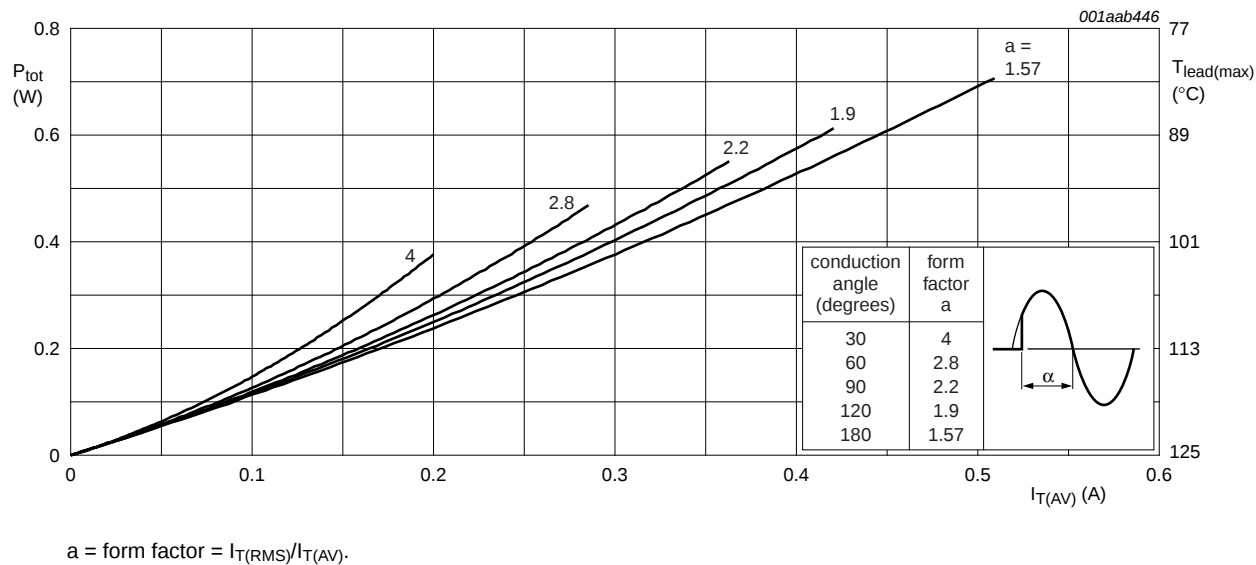


Fig 1. Total power dissipation as a function of average on-state current; maximum values

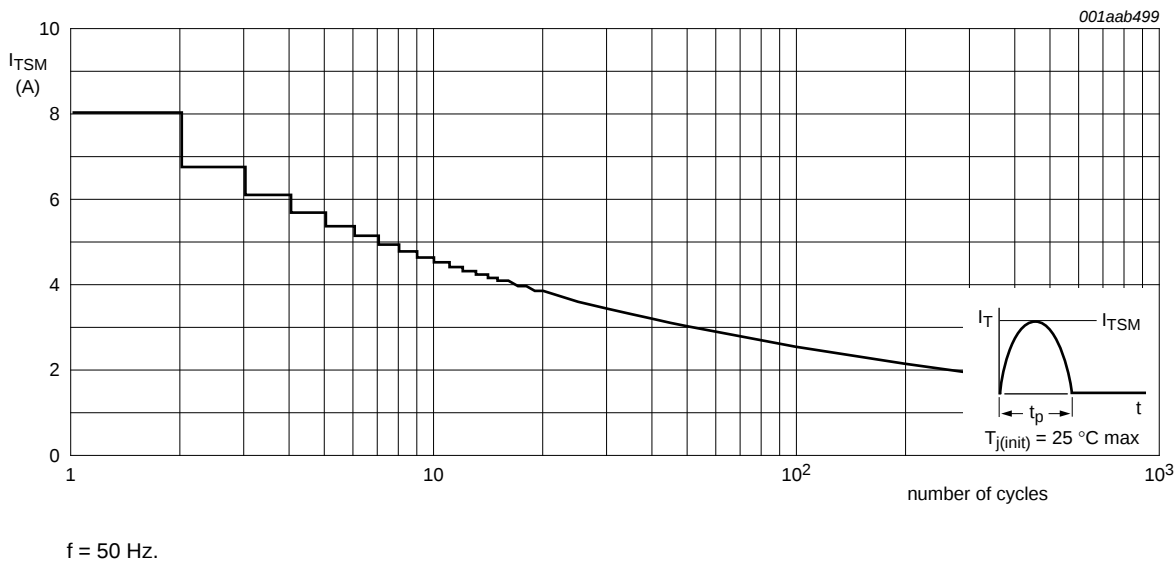
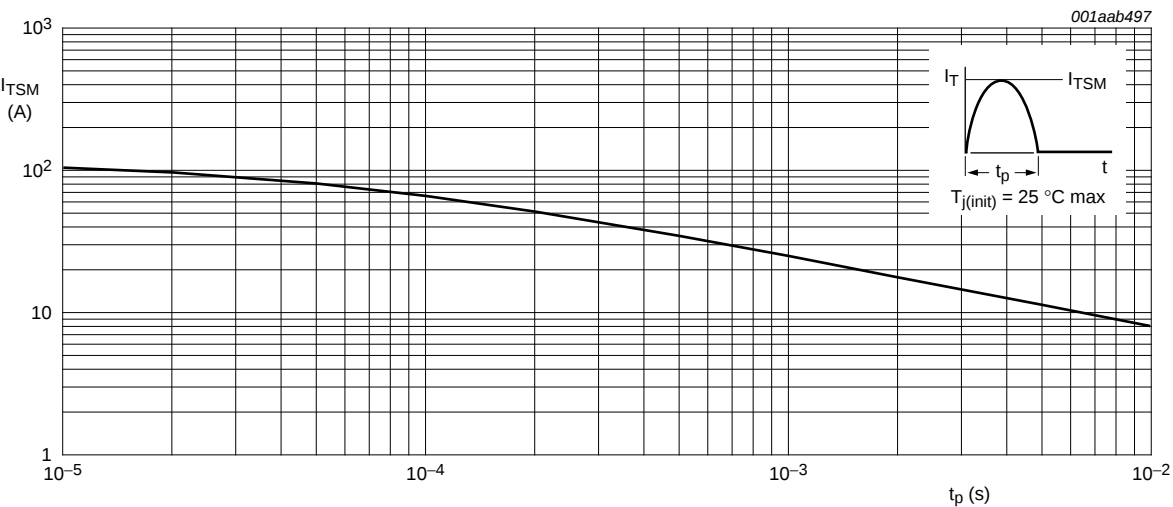
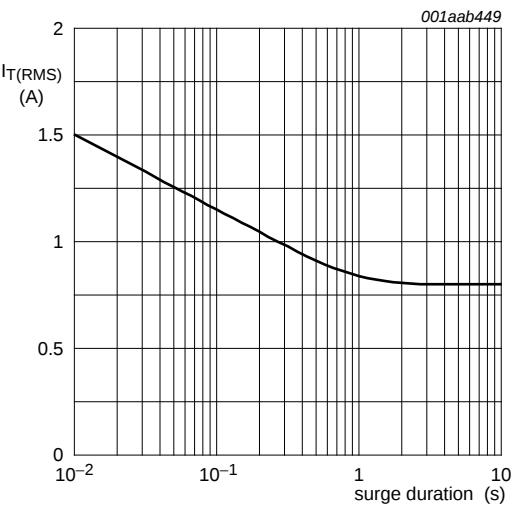


Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



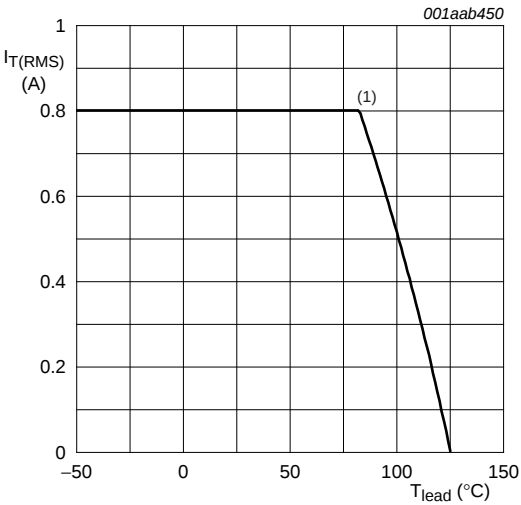
$t_p \leq 10\text{ ms.}$

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



$f = 50\text{ Hz; } T_{lead} \leq 83\text{ }^{\circ}\text{C.}$

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



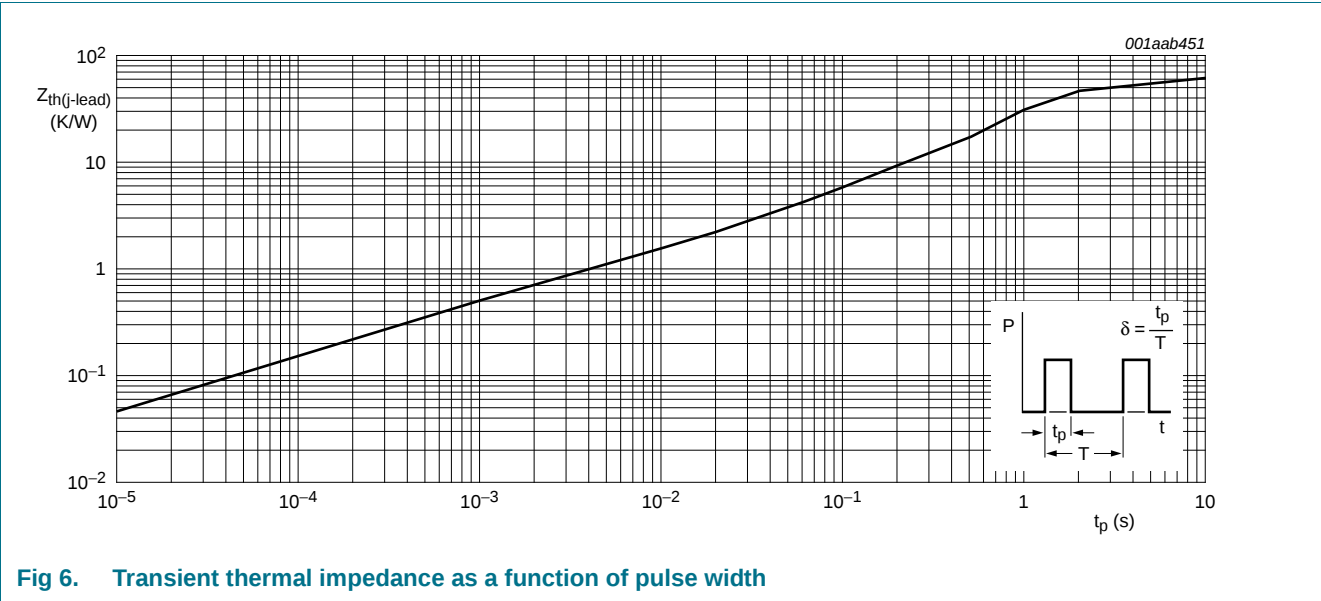
(1) $T_{lead} = 83\text{ }^{\circ}\text{C.}$

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
$R_{th(j-lead)}$	thermal resistance from junction to lead		-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	printed-circuit board mounted; lead length = 4 mm	-	150	-	K/W

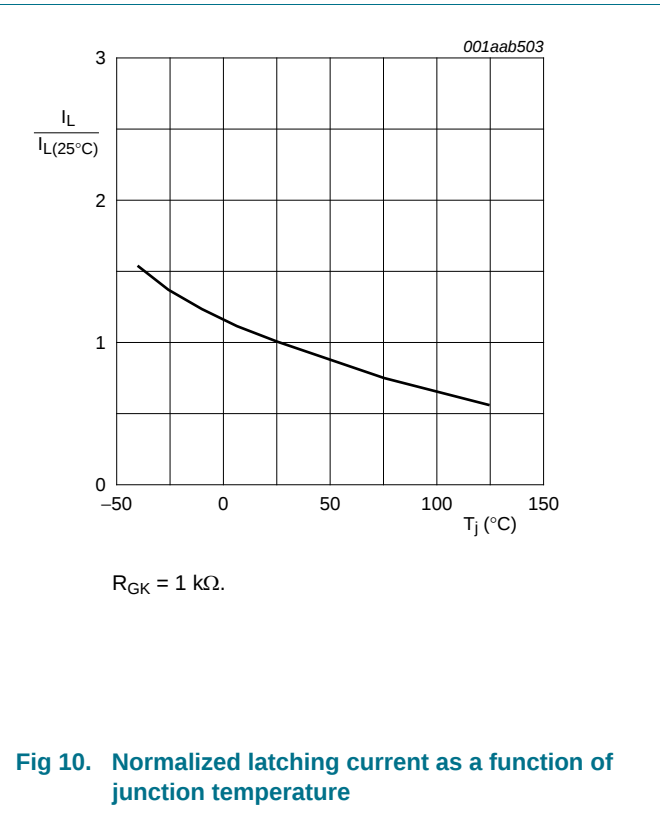
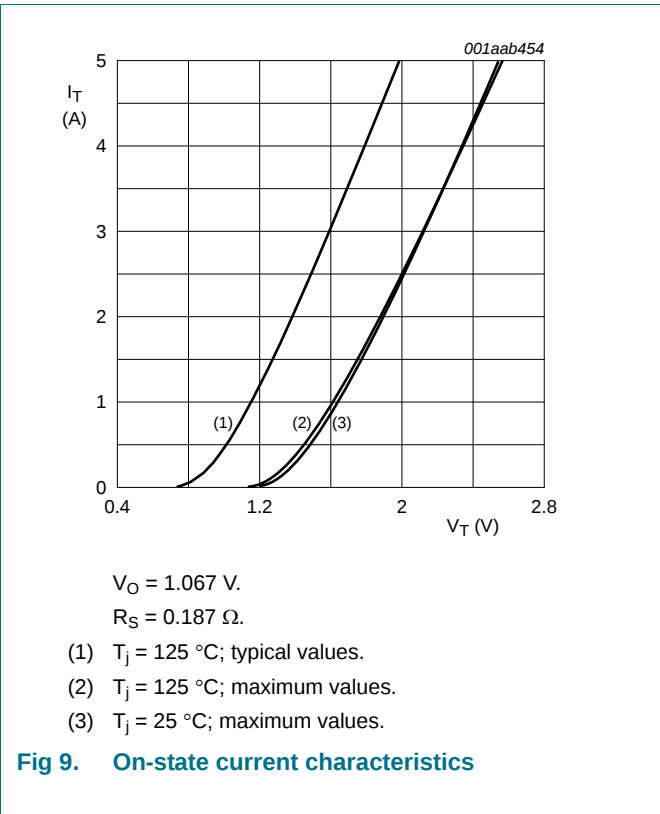
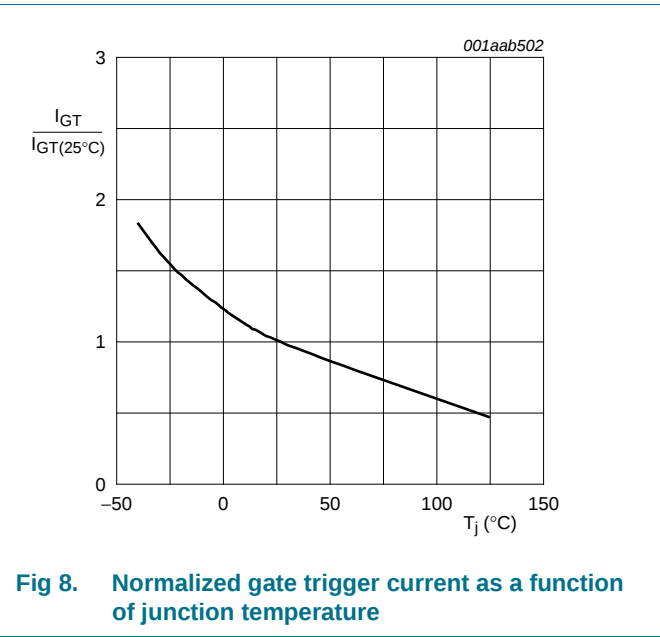
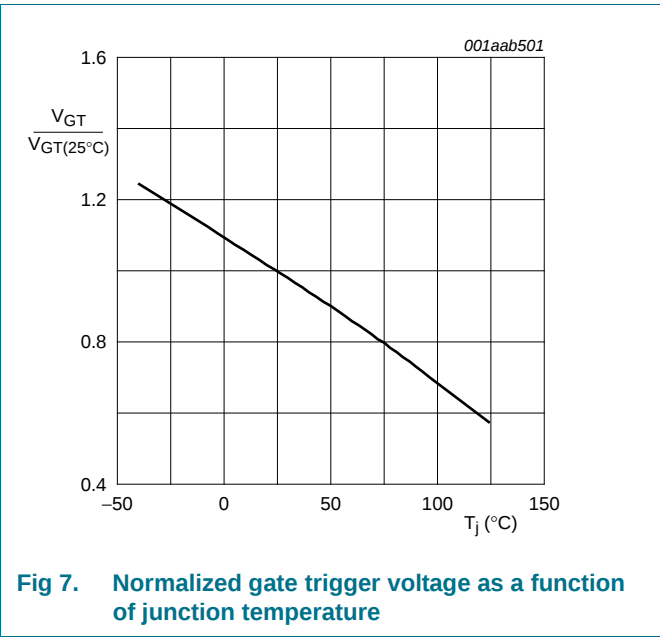


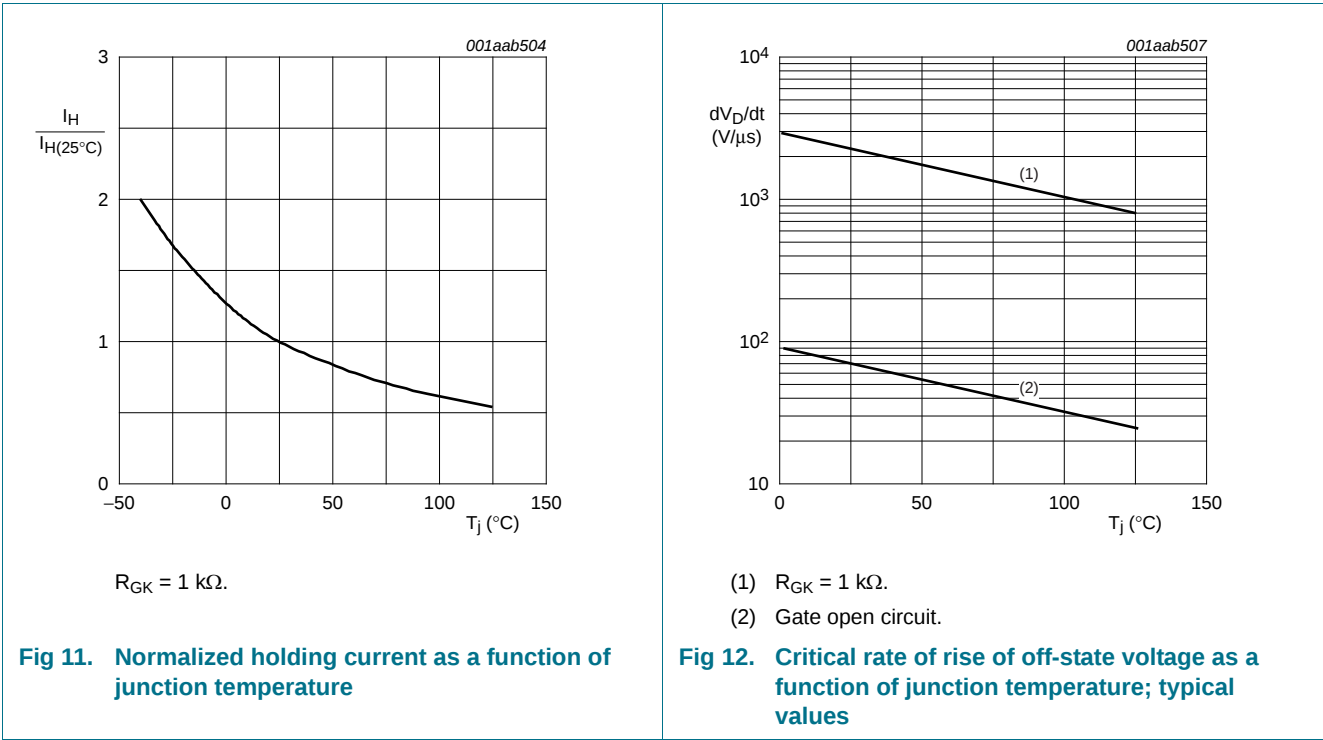
6. Characteristics

Table 5. Characteristics

$T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise stated.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 10\text{ mA}$; gate open circuit; see Figure 8	20	50	200	μA
I_L	latching current	$V_D = 12\text{ V}$; $I_{GT} = 0.5\text{ mA}$; $R_{GK} = 1\text{ k}\Omega$; see Figure 10	-	2	6	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 0.5\text{ mA}$; $R_{GK} = 1\text{ k}\Omega$; see Figure 11	-	2	5	mA
V_T	on-state voltage	$I_T = 1.2\text{ A}$	-	1.25	1.7	V
V_{GT}	gate trigger voltage	$I_T = 10\text{ mA}$; gate open circuit; see Figure 7				
		$V_D = 12\text{ V}$	-	0.5	0.8	V
		$V_D = V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$	0.2	0.3	-	V
I_D, I_R	off-state leakage current	$V_D = V_{DRM(max)}$; $V_R = V_{RRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$; $R_{GK} = 1\text{ k}\Omega$	-	0.05	0.1	mA
Dynamic characteristics						
dV_D/dt	critical rate of rise of off-state voltage	$V_{DM} = 67\text{ \% } V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$; exponential waveform; see Figure 12				
		$R_{GK} = 1\text{ k}\Omega$	500	800	-	$\text{V}/\mu\text{s}$
		gate open circuit	-	25	-	$\text{V}/\mu\text{s}$
t_{gt}	gate controlled turn-on time	$I_{TM} = 2\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 10\text{ mA}$; $dI_G/dt = 0.1\text{ A}/\mu\text{s}$	-	2	-	μs
t_q	circuit commuted turn-off time	$V_D = 67\text{ \% } V_{DRM(max)}$; $T_j = 125\text{ }^{\circ}\text{C}$; $I_{TM} = 1.6\text{ A}$; $V_R = 35\text{ V}$; $dI_{TM}/dt = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 2\text{ V}/\mu\text{s}$; $R_{GK} = 1\text{ k}\Omega$	-	100	-	μs





7. Package information

Epoxy meets requirements of UL94 V-0 at 1/8 inch.

8. Package outline

Plastic single-ended leaded (through hole) package; 3 leadsSOT54

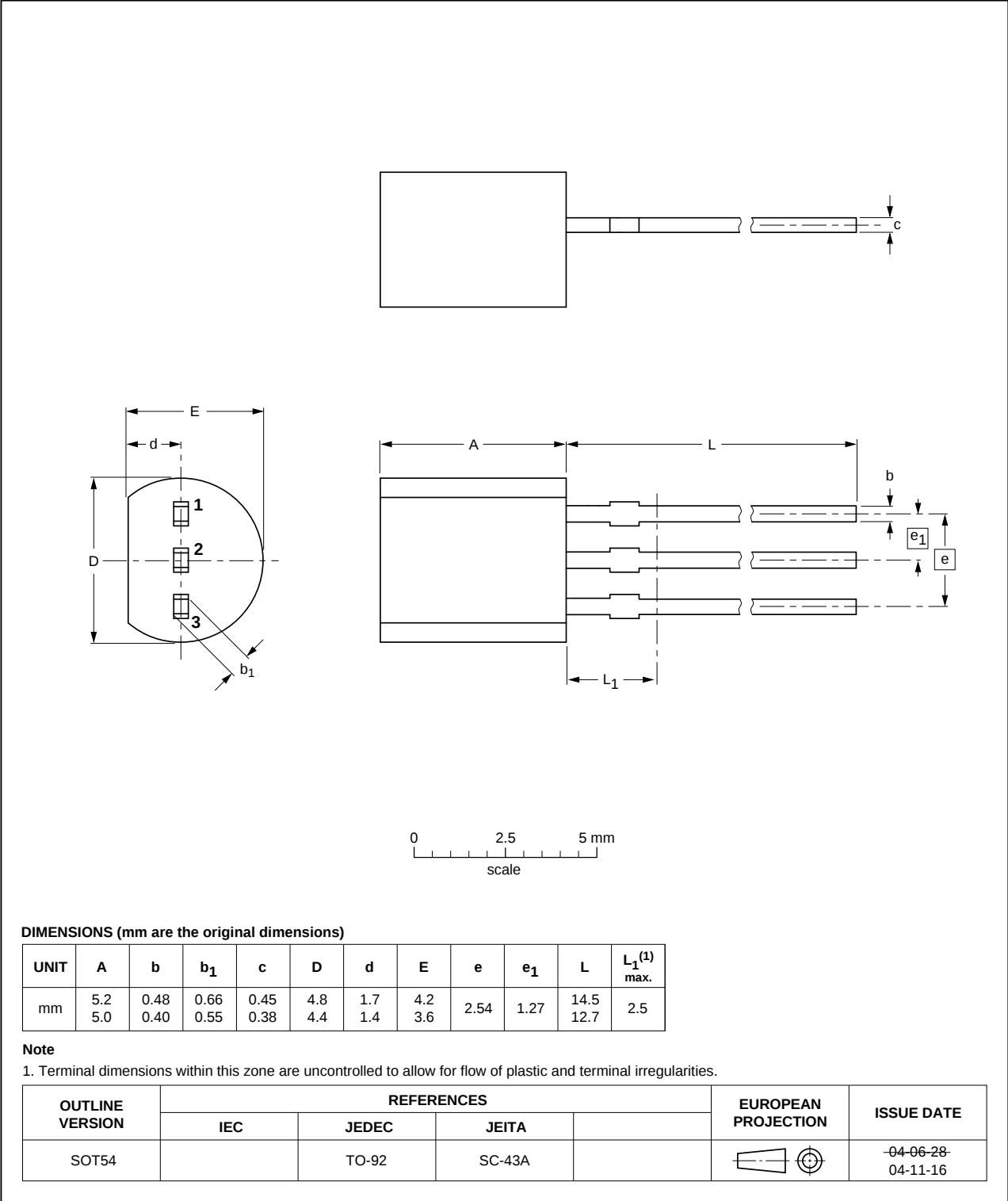


Fig 13. Package outline SOT54 (TO-92)

9. Revision history

Table 6. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BT168_SER v.5	20111101	Product data sheet		BT168_SERIES v.4
Modifications:	- The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. - Legal texts have been adapted to the new company name where appropriate.			
BT168_SERIES v.4	20040820	Product data sheet		BT168_SERIES v.3
BT168_SERIES v.3	20010902	Product specification		BT168_SERIES v.2
BT168_SERIES v.2	20010901	Product specification		BT168_SERIES v.1
BT168_SERIES v.1	19970901	Product specification		-

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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