

BT1308-400D/600D

Logic level triac

Rev. 01 — 19 February 2004

Product data

1. Product profile

1.1 Description

Logic level sensitive gate triac intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

1.2 Features

- Sensitive gate in all four quadrants
- Low cost package.

1.3 Applications

- General purpose bidirectional switching
- Solid state relays
- Phase control applications
- Low power AC fan speed controllers.

1.4 Quick reference data

- $V_{DRM} \leq 600$ V (BT1308-600D)
- $V_{DRM} \leq 400$ V (BT1308-400D)
- $I_{TSM} \leq 9$ A
- $I_{T(RMS)} \leq 0.8$ A.

2. Pinning information

Table 1: Pinning - SOT54 (TO-92), simplified outline and symbol

Pin	Description	Simplified outline	Symbol
1	main terminal 2		
2	gate		
3	main terminal 1		

MSB033
SOT54 (TO-92)
MBL305



PHILIPS

3. Ordering information

Table 2: Ordering information

Type number	Package		Version
	Name	Description	
BT1308-600D	TO-92	Plastic single-ended leaded (through hole) package; 3 leads	SOT54
BT1308-400D	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					
		BT1308-600D	$25\text{ °C} \leq T_j \leq 125\text{ °C}$	-	600	V
		BT1308-400D		-	400	V
$I_{\text{T(RMS)}}$	on-state current (RMS value)	full sine wave; $T_{\text{lead}} \leq 55\text{ °C}$; Figure 1 and 2	-	0.8	A	
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_j = 25\text{ °C}$ prior to surge; Figure 3 and 4				
		$t = 20\text{ ms}$	-	9	A	
		$t = 16.7\text{ ms}$	-	10	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	$I_{\text{TM}} = 1\text{ A}$; $I_{\text{G}} = 0.2\text{ A}$; $di_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$				
		T2+ G+	-	50	$\text{A}/\mu\text{s}$	
		T2+ G-	-	50	$\text{A}/\mu\text{s}$	
		T2- G-	-	50	$\text{A}/\mu\text{s}$	
		T2- G+	-	10	$\text{A}/\mu\text{s}$	
I_{GM}	gate current (peak value)	$t = 2\text{ }\mu\text{s max}$	-	1	A	
V_{GM}	gate voltage (peak value)		-	5	V	
P_{GM}	gate power (peak value)		-	5	W	
$P_{\text{G(AV)}}$	average gate power	$t = 2\text{ }\mu\text{s max}$; $T_{\text{case}} \leq 80\text{ °C}$	-	0.1	W	
T_{stg}	storage temperature		-40	+150	$^{\circ}\text{C}$	
T_j	junction temperature		-40	+125	$^{\circ}\text{C}$	

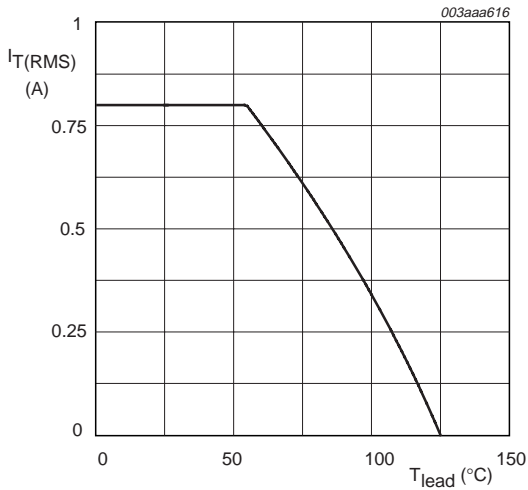
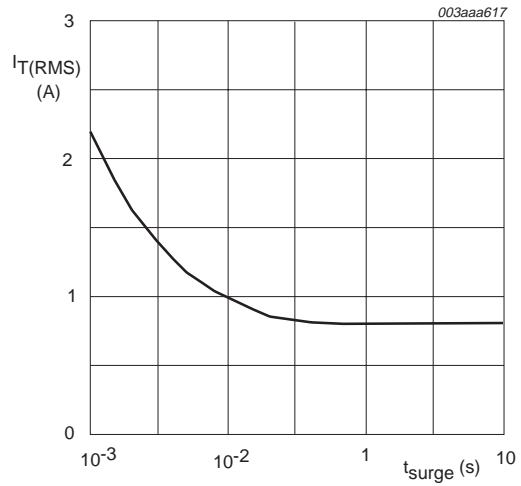
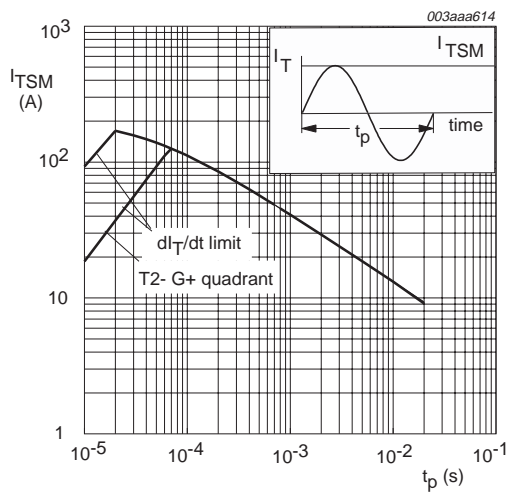


Fig 1. Maximum permissible on-state current (RMS value) as a function of lead temperature.



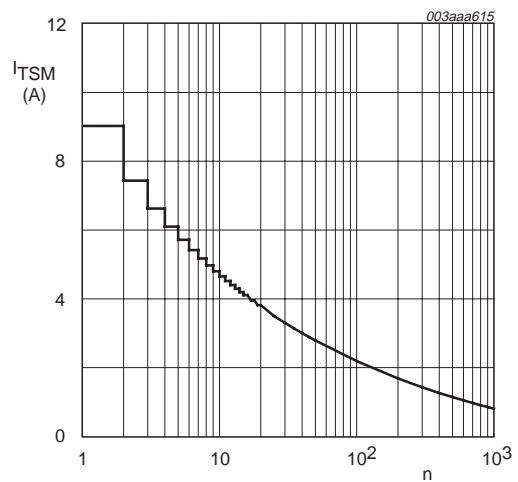
$f = 50 \text{ Hz}$
 $T_{\text{lead}} \leq 65 \text{ }^{\circ}\text{C}$

Fig 2. Maximum permissible repetitive on-state current (RMS value) as a function of surge duration for sinusoidal currents.



$t_p \leq 20 \text{ ms}$
 initial $T_j \leq 25 \text{ }^{\circ}\text{C}$

Fig 3. Maximum permissible non-repetitive peak on-state current as a function of pulse width for sinusoidal currents.



$n = \text{number of cycles}$
 $f = 50 \text{ Hz}$
 initial $T_j \leq 25 \text{ }^{\circ}\text{C}$

Fig 4. Maximum permissible non-repetitive peak on-state current as a function of number of cycles for sinusoidal currents.

5. Thermal characteristics

Table 4: Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle	-	-	60	K/W
		half cycle			80	
$R_{th(j-a)}$	thermal resistance from junction to ambient	mounted on a printed-circuit board; lead length = 4 mm; Figure 5	-	150	-	K/W

5.1 Transient thermal impedance

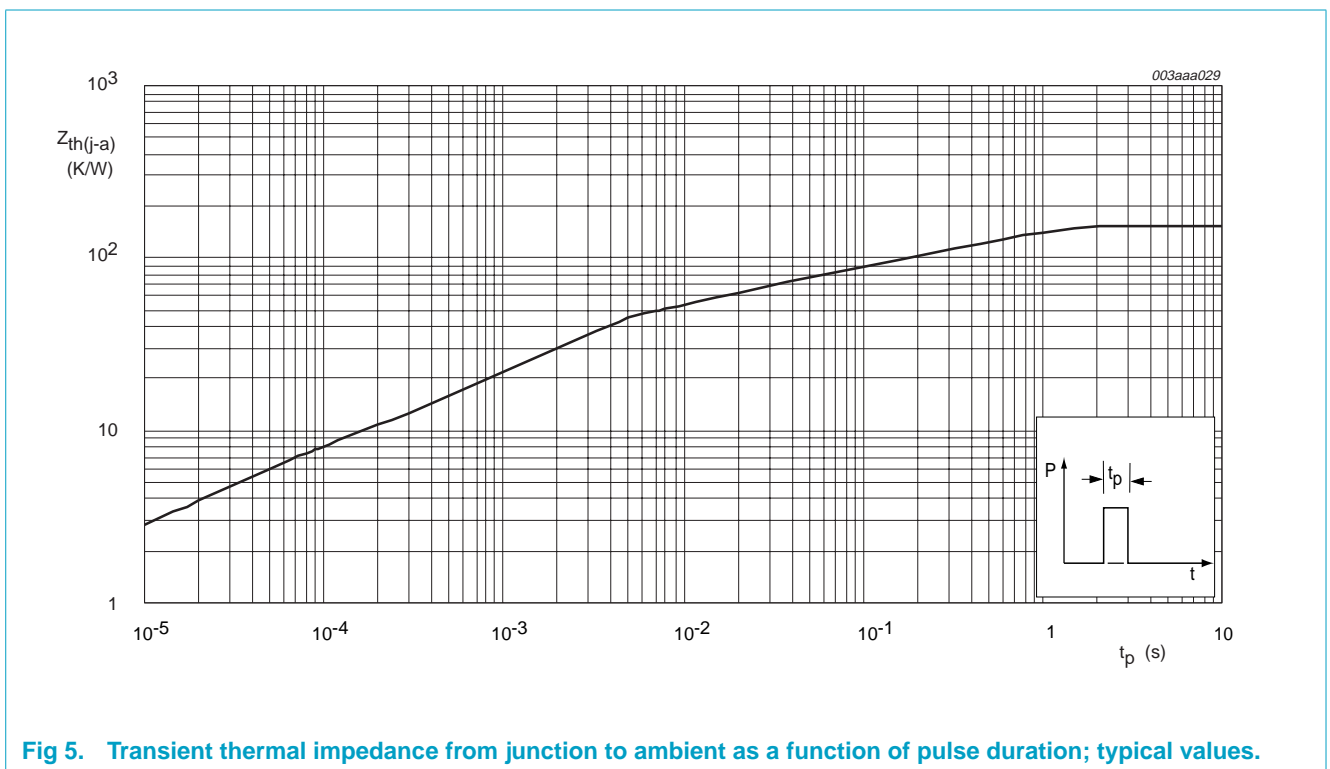


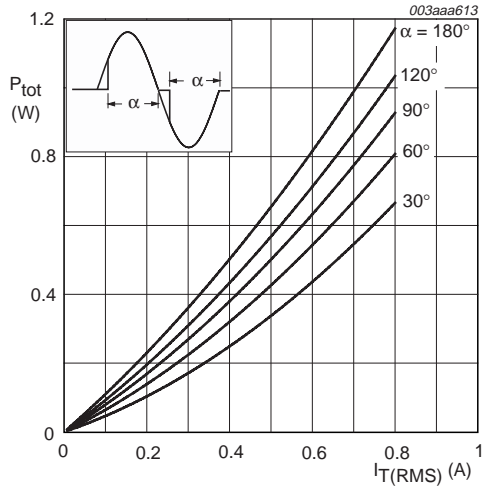
Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values.

6. Characteristics

Table 5: Characteristics

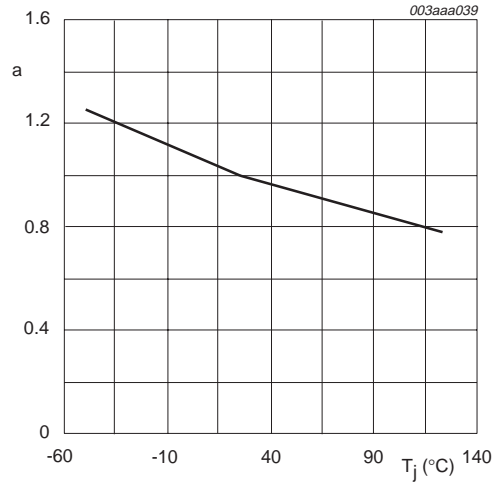
$T_j = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; Figure 8				
		T2+ G+	-	1	5	mA
		T2+ G-	-	2	5	mA
		T2- G-	-	2	5	mA
		T2- G+	-	4	7	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; Figure 9				
		T2+ G+	-	1	10	mA
		T2+ G-	-	5	10	mA
		T2- G-	-	1	10	mA
		T2- G+	-	2	10	mA
I_H	holding current	$V_D = 12\text{ V}$; $I_{GT} = 0.1\text{ A}$; Figure 10	-	1	10	mA
V_T	on-state voltage	$I_T = 0.85\text{ A}$; Figure 11	-	1.35	1.6	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; Figure 7	-	0.9	2	V
		$V_D = V_{DRM}$; $I_T = 0.1\text{ A}$; $T_j = 110\text{ °C}$	0.1	0.7	-	V
I_D	off-state leakage current	$V_D = V_{DRM(max)}$; $T_j = 110\text{ °C}$	-	3	100	μA
Dynamic characteristics						
dV_D/dt	critical rate of rise of off-state voltage	$V_D = 67\%$ of $V_{DM(max)}$; $T_{case} = 110\text{ °C}$; exponential waveform; gate open circuit; Figure 12	30	45	-	$\text{V}/\mu\text{s}$
dV_{com}/dt	critical rate of rise of commutation voltage	$V_D = \text{rated } V_{DM}$; $T_{case} = 50\text{ °C}$; $I_{TM} = 0.84\text{ A}$; commutating $di/dt = 0.3\text{ A/ms}$	-	5	-	$\text{V}/\mu\text{s}$
t_{gt}	gate controlled turn-on time	$I_{TM} = 1.0\text{ A}$; $V_D = V_{DRM(max)}$; $I_G = 25\text{ mA}$; $di_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	μs



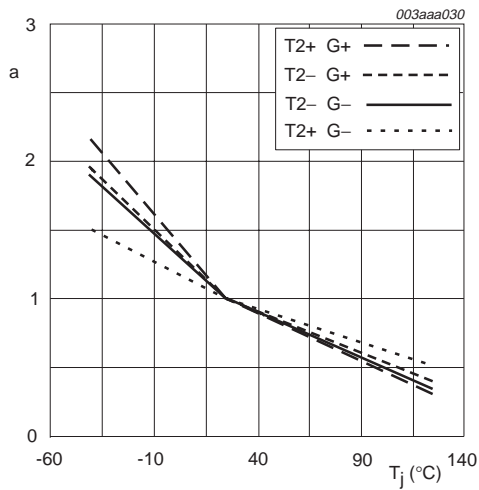
α = conduction angle

Fig 6. On-state dissipation as a function of on-state current (RMS value); maximum values.



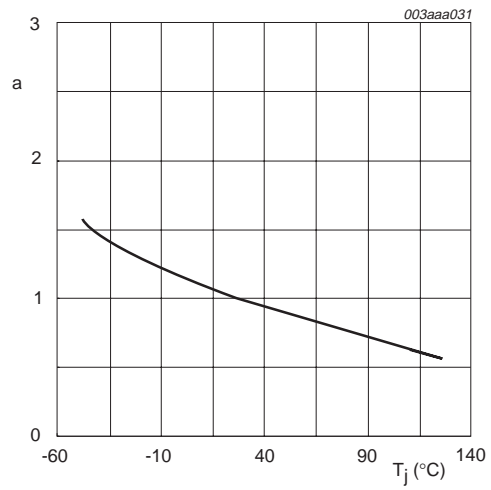
$$a = \frac{V_{GT}(T_j)}{V_{GT}(25^\circ C)}$$

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



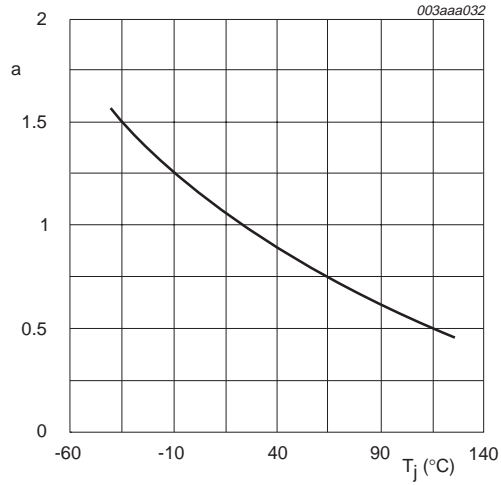
$$a = \frac{I_{GT}(T_j)}{I_{GT}(25^\circ C)}$$

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



$$a = \frac{I_L(T_j)}{I_L(25^\circ C)}$$

Fig 9. Normalized latching current as a function of junction temperature; typical values.



$$a = \frac{I_{H(T_j)}}{I_{H(25^\circ C)}}$$

Fig 10. Normalized holding current as a function of junction temperature; typical values

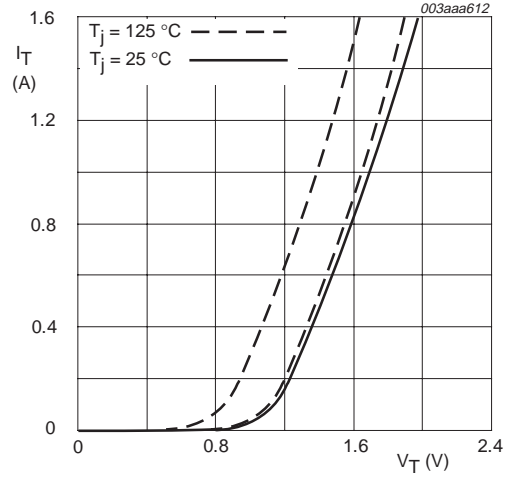


Fig 11. On-state current as a function of on-state voltage; typical and maximum values.

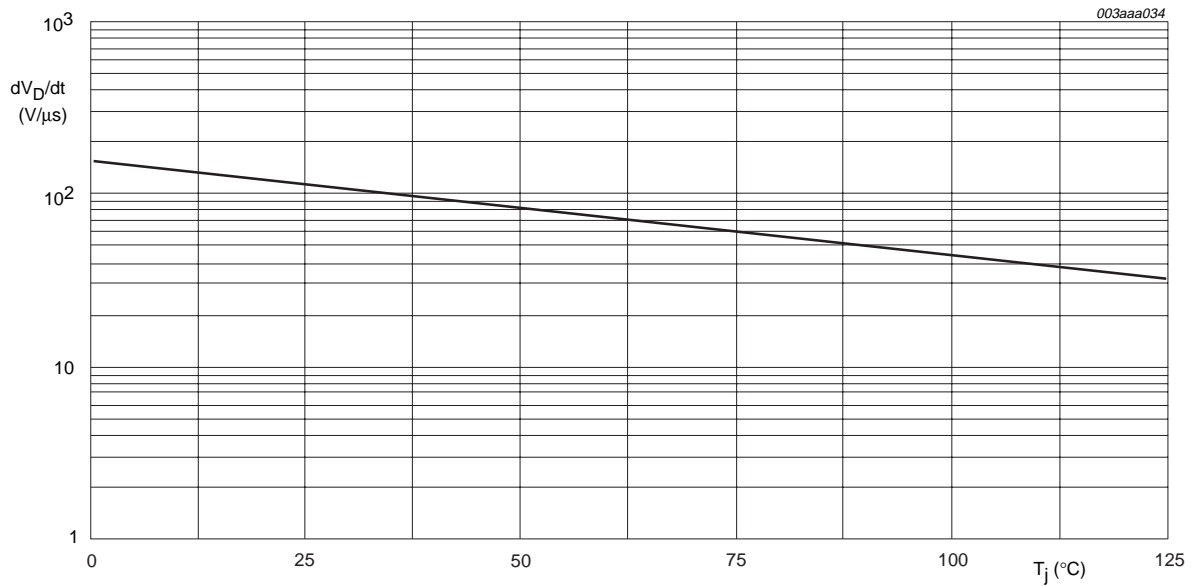


Fig 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values.

7. Package outline

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

SOT54

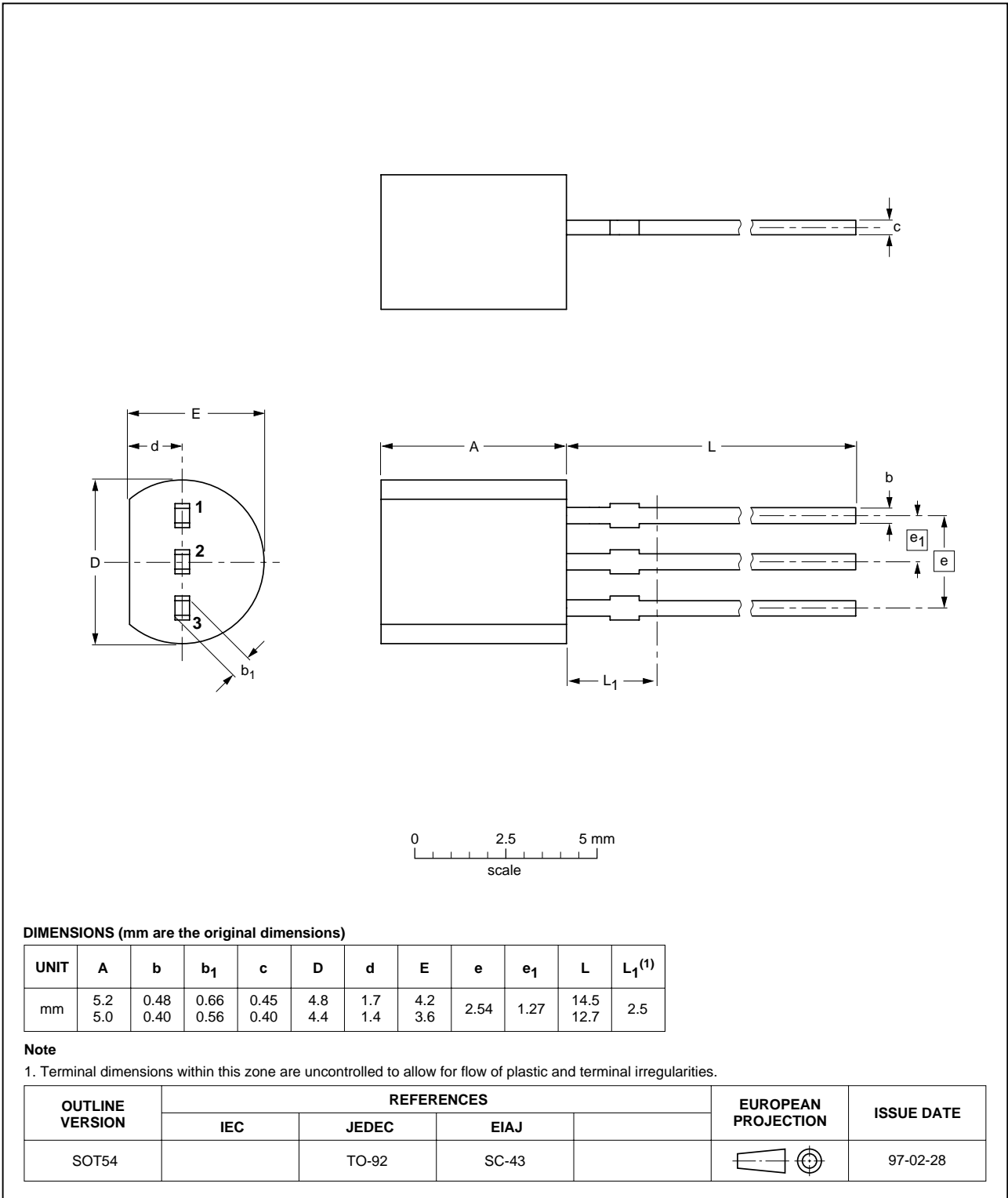


Fig 13. SOT54 (TO-92).

8. Revision history

Table 6: Revision history

Rev	Date	CPCN	Description
01	20040219	-	Product data (9397 750 12594)

9. Data sheet status

Level	Data sheet status ^[1]	Product status ^{[2][3]}	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

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

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

10. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

11. Disclaimers

Life support — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no licence or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Contact information

For additional information, please visit <http://www.semiconductors.philips.com>.

For sales office addresses, send e-mail to: sales.addresses@www.semiconductors.philips.com.

Fax: +31 40 27 24825

Contents

1	Product profile	1
1.1	Description	1
1.2	Features	1
1.3	Applications	1
1.4	Quick reference data	1
2	Pinning information	1
3	Ordering information	2
4	Limiting values	2
5	Thermal characteristics	4
5.1	Transient thermal impedance	4
6	Characteristics	5
7	Package outline	8
8	Revision history	9
9	Data sheet status	10
10	Definitions	10
11	Disclaimers	10

© Koninklijke Philips Electronics N.V. 2004.
Printed in The Netherlands

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner.

The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 19 February 2004

Document order number: 9397 750 12594



PHILIPS

Let's make things better.