

## 1. Product profile

### 1.1 General description

Passivated sensitive gate 4-Q triac in a SOT54 plastic package

### 1.2 Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drive circuits
- High blocking voltage of 600V
- Sensitive gate in four quadrants

### 1.3 Applications

- General purpose low power motor control
- Home appliances
- Industrial process control
- Low power AC Fan controllers

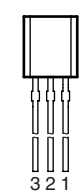
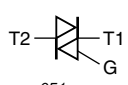
### 1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	-	600	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 38\text{ °C}$ ; see <a href="#">Figure 4</a> and <a href="#">1</a>	-	-	1	A
<b>Static characteristics</b>						
$I_{\text{GT}}$	gate trigger current	$V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ °C}$ ; T2+ G-; see <a href="#">Figure 6</a>	-	-	10	mA
		$V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ °C}$ ; T2- G-	-	-	10	mA
		$V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ °C}$ ; T2+ G+	-	-	10	mA
		$V_{\text{D}} = 12\text{ V}$ ; $T_{\text{j}} = 25\text{ °C}$ ; T2- G+	-	-	10	mA

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2		
2	G	gate		
3	T1	main terminal 1		

**SOT54  
(TO-92)**

## 3. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
Z0109MA	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

## 4. Limiting values

Table 4. 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		-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 38\text{ °C}$ ; see <a href="#">Figure 4</a> and <a href="#">1</a>	-	1	A
$di_T/dt$	rate of rise of on-state current	$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $di_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G+	-	50	A/ $\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $di_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G+	-	20	A/ $\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $di_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G-	-	50	A/ $\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $di_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G-	-	50	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		-	1	A
$P_{GM}$	peak gate power		-	2	W
$T_{stg}$	storage temperature		-40	150	°C
$T_j$	junction temperature		-	125	°C
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $t_p = 16.7\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$	-	8.5	A
		full sine wave; $t_p = 20\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; see <a href="#">Figure 2</a> and <a href="#">3</a>	-	8	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	0.32	A <sup>2</sup> s
$P_{G(AV)}$	average gate power		-	0.1	W

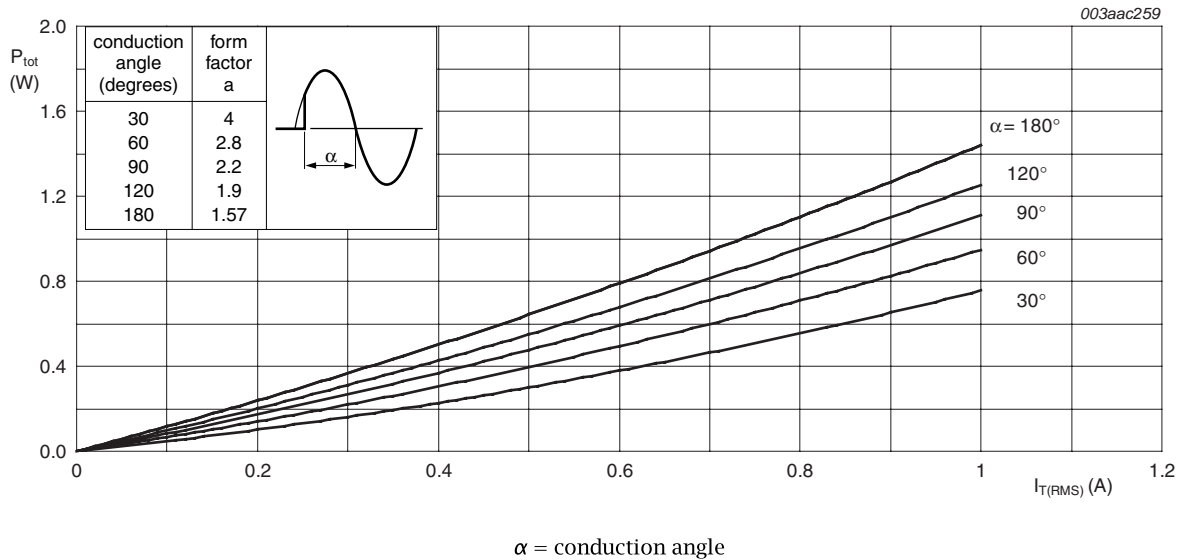


Fig 1. Total power dissipation as a function of RMS on-state current; maximum values

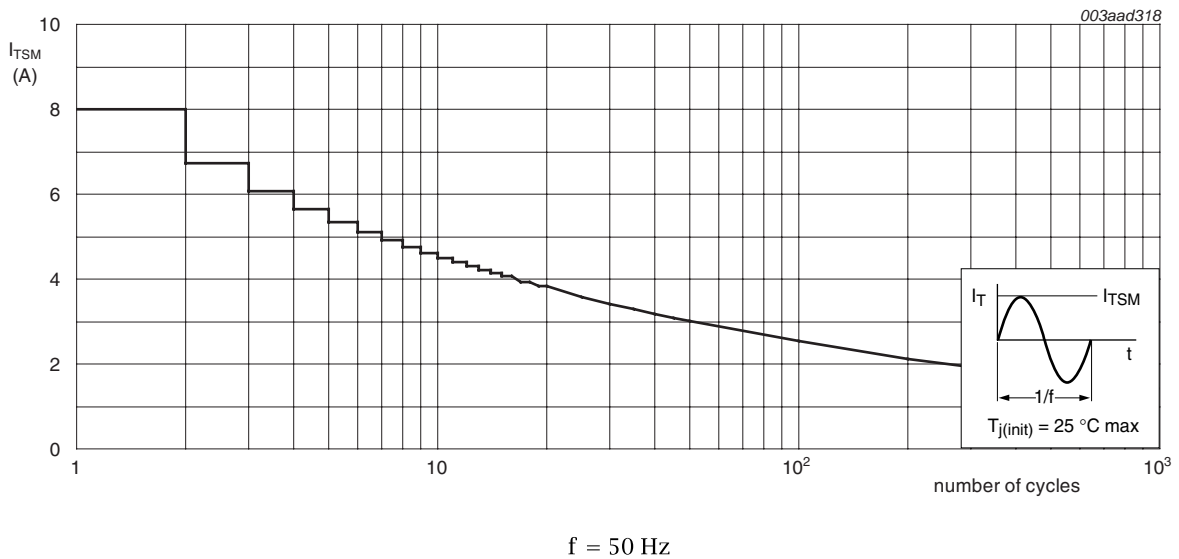
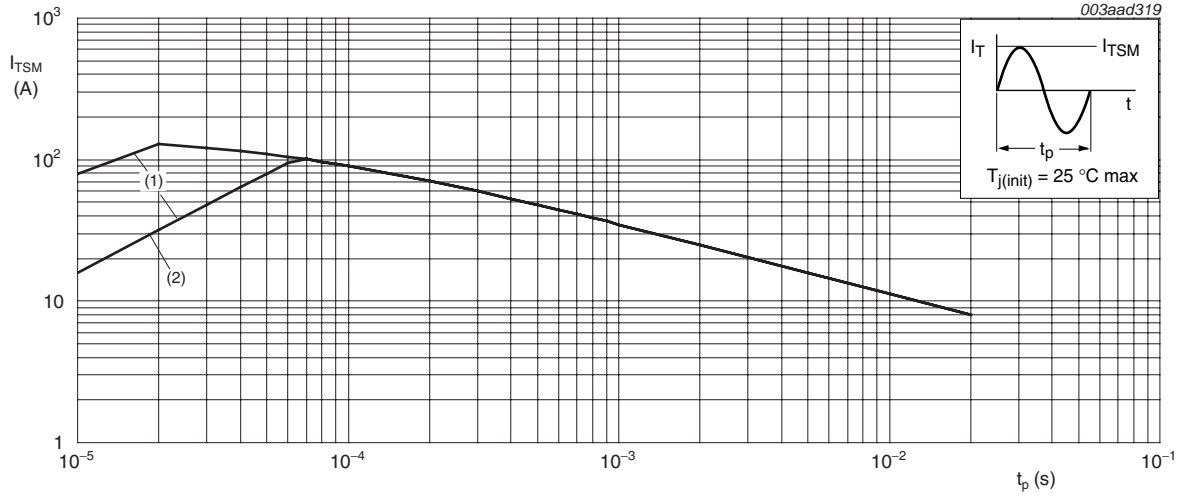
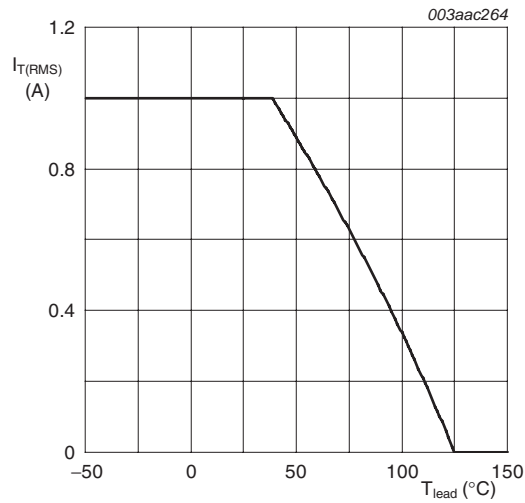


Fig 2. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



$t_p \leq 20\text{ ms}$ ; (1) is  $dI_T/dt$  limit; (2) is T2 – G + quadrant limit

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

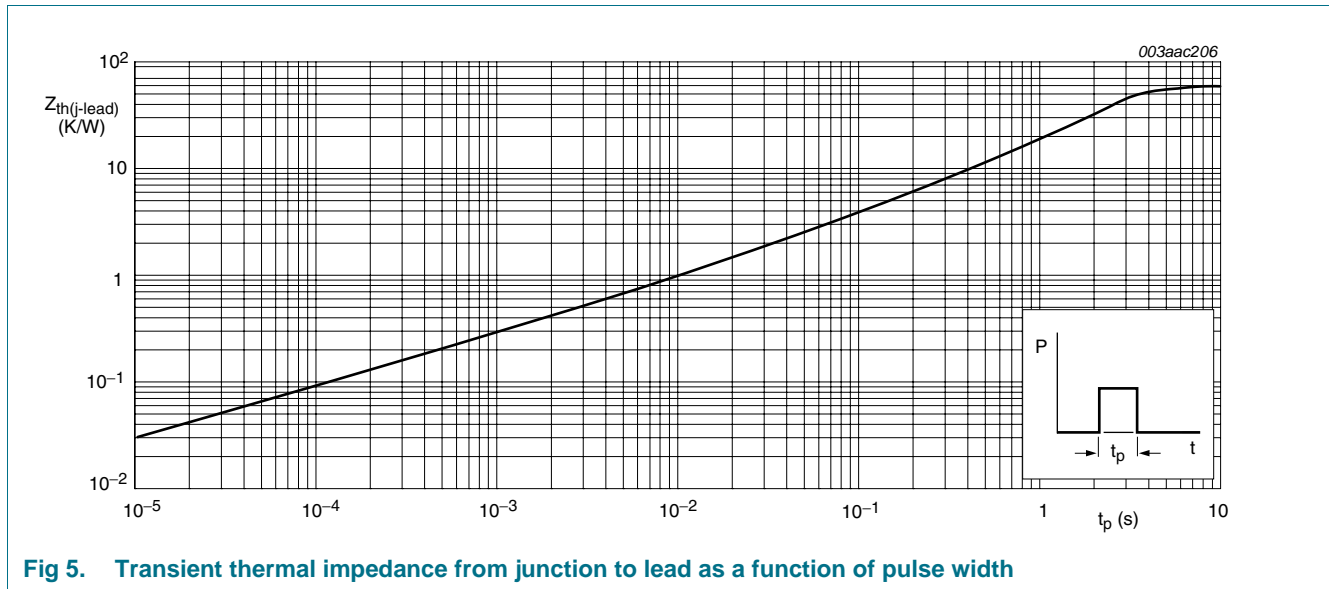


**Fig 4. RMS on-state current as a function of lead temperature; maximum values**

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	150	-	K/W
$R_{th(j-lead)}$	thermal resistance from junction to lead	Full cycle; see <a href="#">Figure 5</a>	-	-	60	K/W

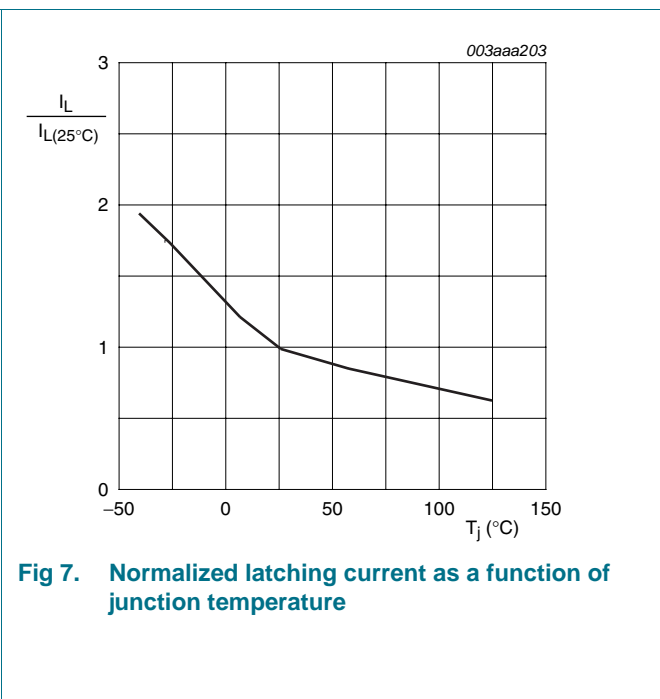
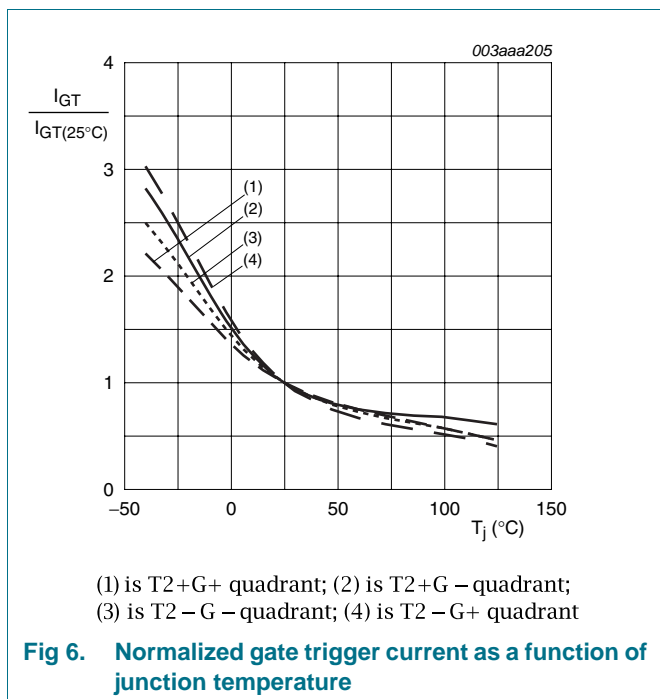


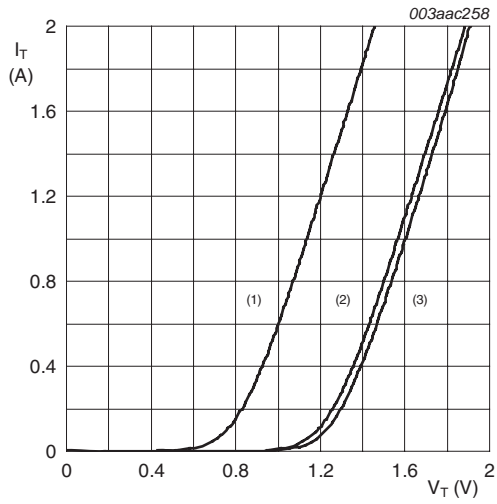
**Fig 5. Transient thermal impedance from junction to lead as a function of pulse width**

## 6. Characteristics

Table 6. Characteristics

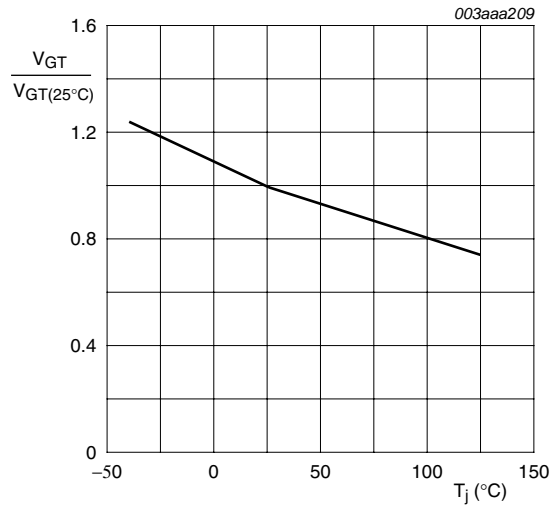
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; T2+ G-;$ see <a href="#">Figure 6</a>	-	-	10	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; T2- G-$	-	-	10	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; T2+ G+$	-	-	10	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; T2- G+$	-	-	10	mA
$I_L$	latching current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_G = 0.1\text{ A}; T2+ G-;$ see <a href="#">Figure 7</a>	-	-	25	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_G = 0.1\text{ A}; T2+ G+$	-	-	15	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_G = 0.1\text{ A}; T2- G+$	-	-	15	mA
		$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C}; I_G = 0.1\text{ A}; T2- G-$	-	-	15	mA
$I_H$	holding current	$V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 10</a>	-	-	10	mA
$V_T$	on-state voltage	$I_T = 1\text{ A};$ see <a href="#">Figure 8</a>	-	1.3	1.6	V
$V_{GT}$	gate trigger voltage	$I_T = 0.1\text{ A}; V_D = 12\text{ V}; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 9</a>	-	-	1.3	V
		$I_T = 0.1\text{ A}; V_D = 600\text{ V}; T_j = 125\text{ }^\circ\text{C}$	0.2	-	-	V
$I_D$	off-state current	$V_D = 600\text{ V}; T_j = 125\text{ }^\circ\text{C}$	-	-	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}; T_j = 110\text{ }^\circ\text{C};$ gate open circuit; see <a href="#">Figure 11</a>	50	-	-	V/ $\mu$ s
$dV_{com}/dt$	rate of rise of commutating voltage	$V_D = 400\text{ V}; T_j = 110\text{ }^\circ\text{C}; dI_{com}/dt = 0.44\text{ A/ms};$ gate open circuit	2	-	-	V/ $\mu$ s



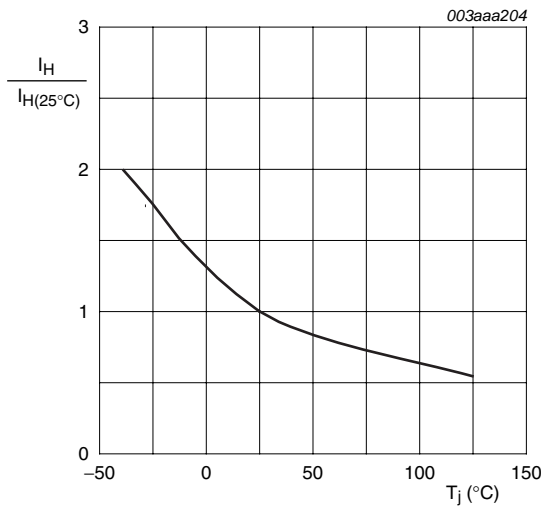


$V_0 = 1.254 \text{ V}; R_s = 0.31 \Omega$   
 (1)  $T_j = 125 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 125 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

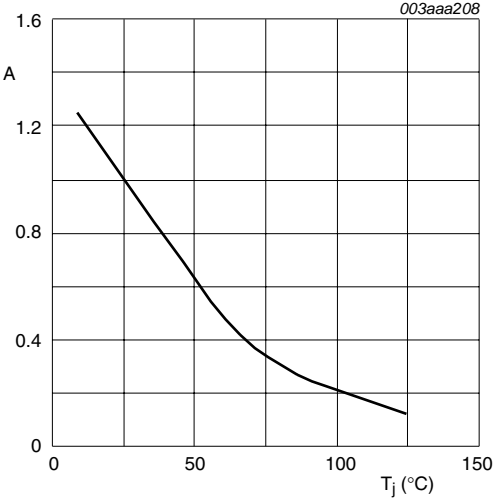
**Fig 8. On-state current as a function of on-state voltage**



**Fig 9. Normalized gate trigger voltage as a function of junction temperature**



**Fig 10. Normalized holding current as a function of junction temperature**



$$A = \frac{dV_D/dt}{dV_{D(25^\circ\text{C})}/dt}$$

Fig 11. Normalized 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

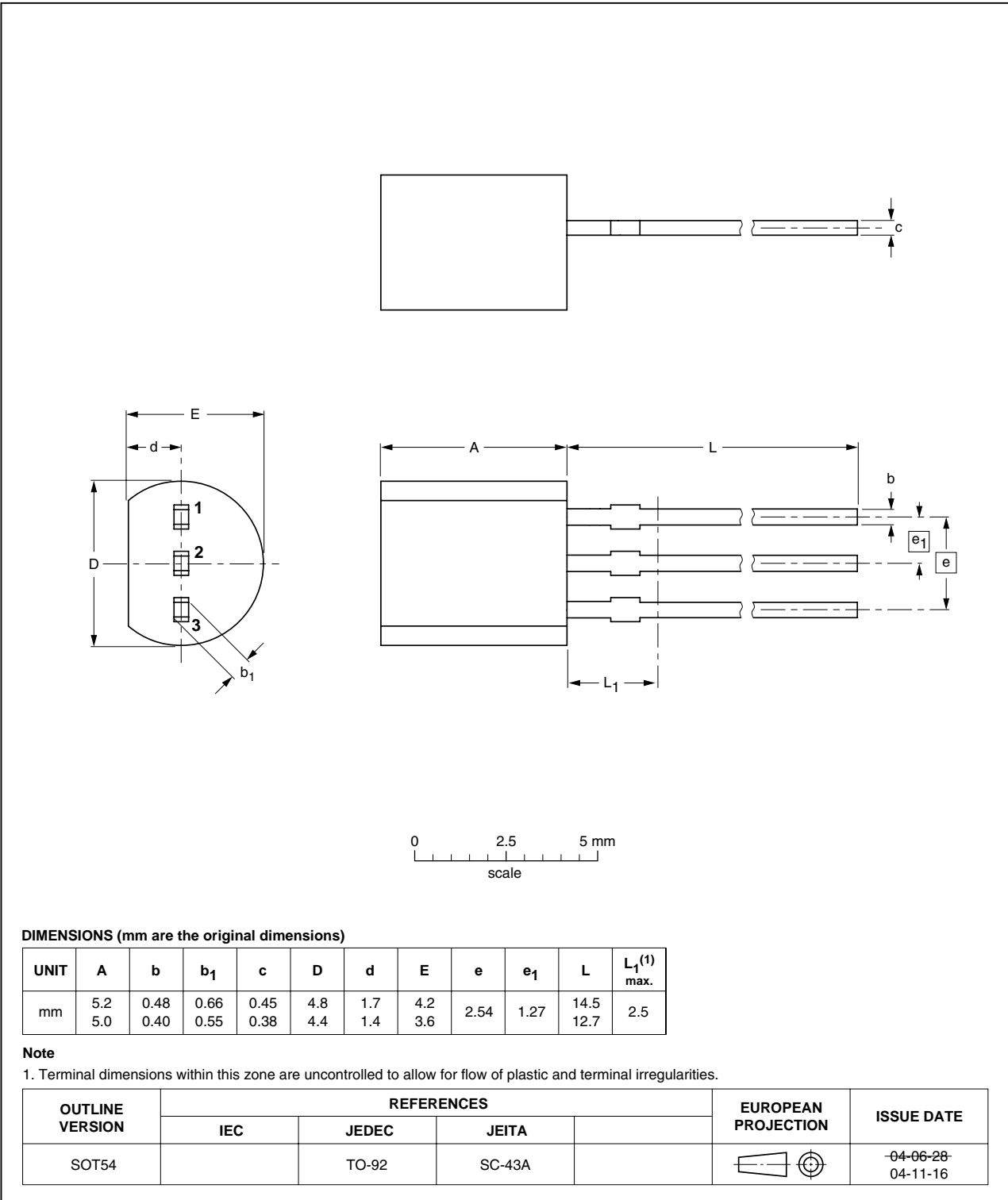


Fig 12. Package outline SOT54 (TO-92)

## 8. Revision history

**Table 7. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0109MA_3	20090804	Product data sheet	-	Z0103_07_09_SERIES-02
Modifications:		<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• Type number Z0109MA separated from data sheet Z0103_07_09_SERIES-02.</li> </ul>		
Z0103_07_09_SERIES-02 (9397 750 10102)	20020912	Product data	-	Z0103_07_09_SERIES-01
Z0103_07_09_SERIES-01 (9397 750 09419)	20020411	Product data	-	-

## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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