

# Z0109MA0

## 4Q Triac

Rev. 5 — 22 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated sensitive gate four quadrant triac in a SOT54 (TO-92) plastic package intended for use in applications requiring enhanced noise immunity and direct interfacing to logic ICs and low power gate drivers.

### 1.2 Features and benefits

- Direct interfacing to logic level ICs
- Enhanced current surge capability
- Enhanced noise immunity
- High blocking voltage of 600V
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate in four quadrants
- Triggering in all 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 data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage		-	-	600	V
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ °C}$ ; $t_{\text{p}} = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	-	12.5	A
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{lead}} \leq 45\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a> ; see <a href="#">Figure 2</a>	-	-	1	A

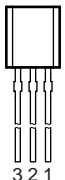
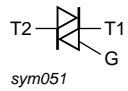


Table 1. Quick reference data ...continued

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+G+; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2+G-; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2-G-; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}; I_T = 0.1\text{ A}; T2-G+; T_j = 25\text{ }^\circ\text{C};$ see <a href="#">Figure 7</a>	0.4	-	10	mA

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2		 sym051
2	G	gate		
3	T1	main terminal 1		

**SOT54 (TO-92)**

## 3. Ordering information

Table 3. Ordering information

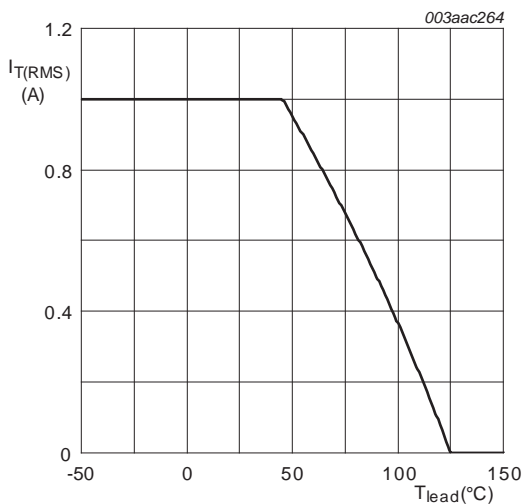
Type number	Package		
	Name	Description	Version
Z0109MA0	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

### 4. Limiting values

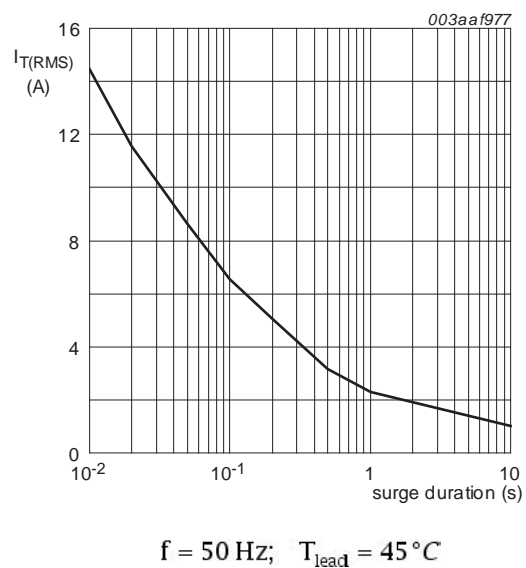
**Table 4. Limiting values**

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; $T_{lead} \leq 45\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 3</a> ; see <a href="#">Figure 2</a>	-	1	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; see <a href="#">Figure 4</a> ; see <a href="#">Figure 5</a>	-	12.5	A
		full sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$	-	13.8	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse	-	0.78	$\text{A}^2\text{s}$
$dl_T/dt$	rate of rise of on-state current	$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G+	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2+ G-	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G-	-	50	$\text{A}/\mu\text{s}$
		$I_T = 1\text{ A}$ ; $I_G = 20\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu\text{s}$ ; T2- G+	-	20	$\text{A}/\mu\text{s}$
$I_{GM}$	peak gate current		-	1	A
$P_{GM}$	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	$^{\circ}\text{C}$



**Fig 1. RMS on-state current as a function of lead temperature; maximum values**



**Fig 2. RMS on-state current as a function of surge duration; maximum values**

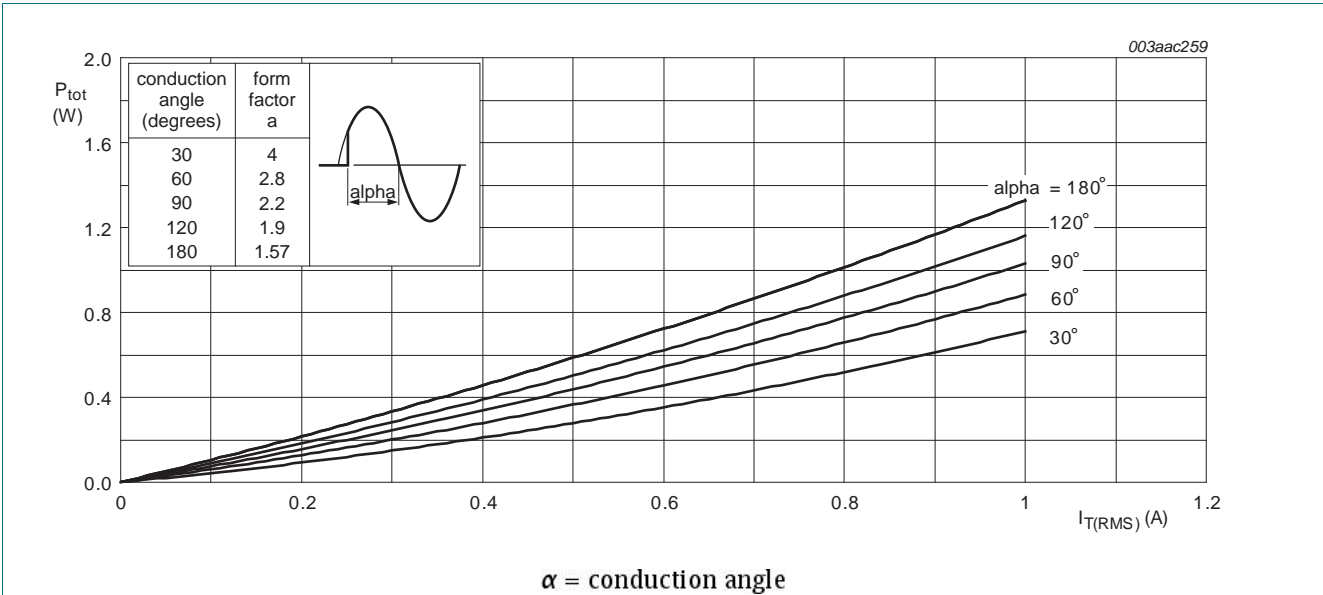


Fig 3. Total power dissipation as a function of RMS on-state current; maximum values

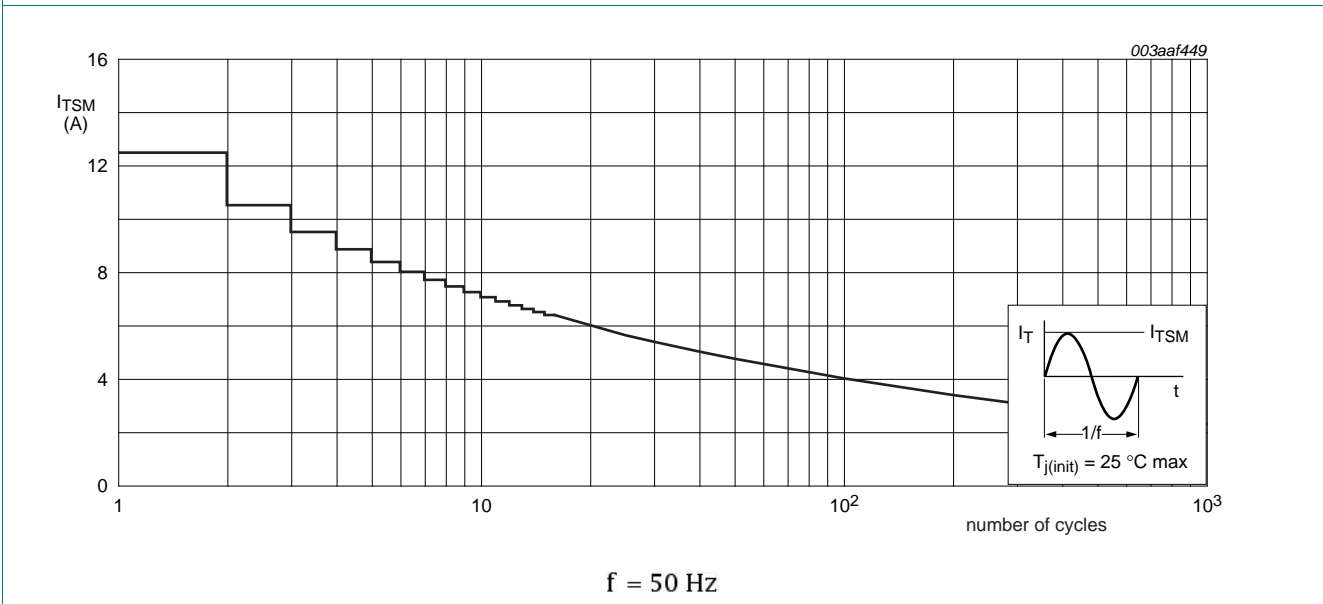
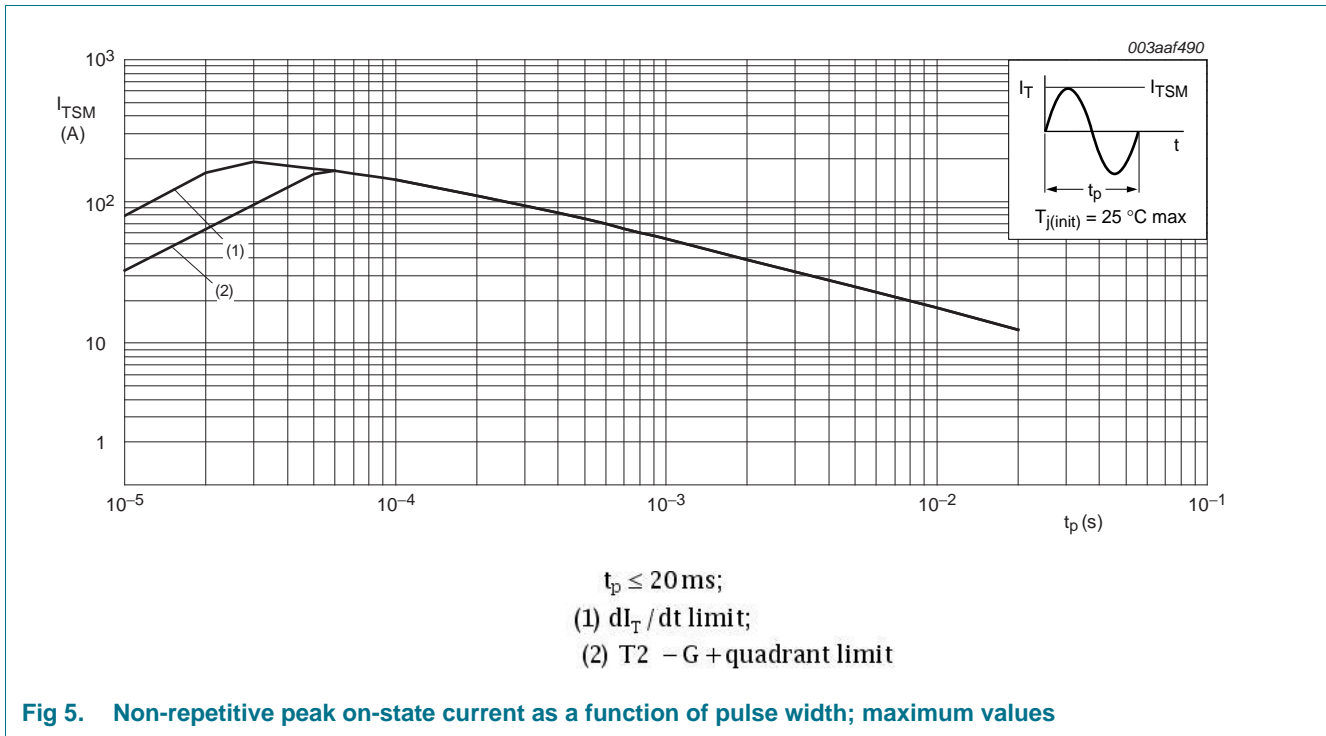


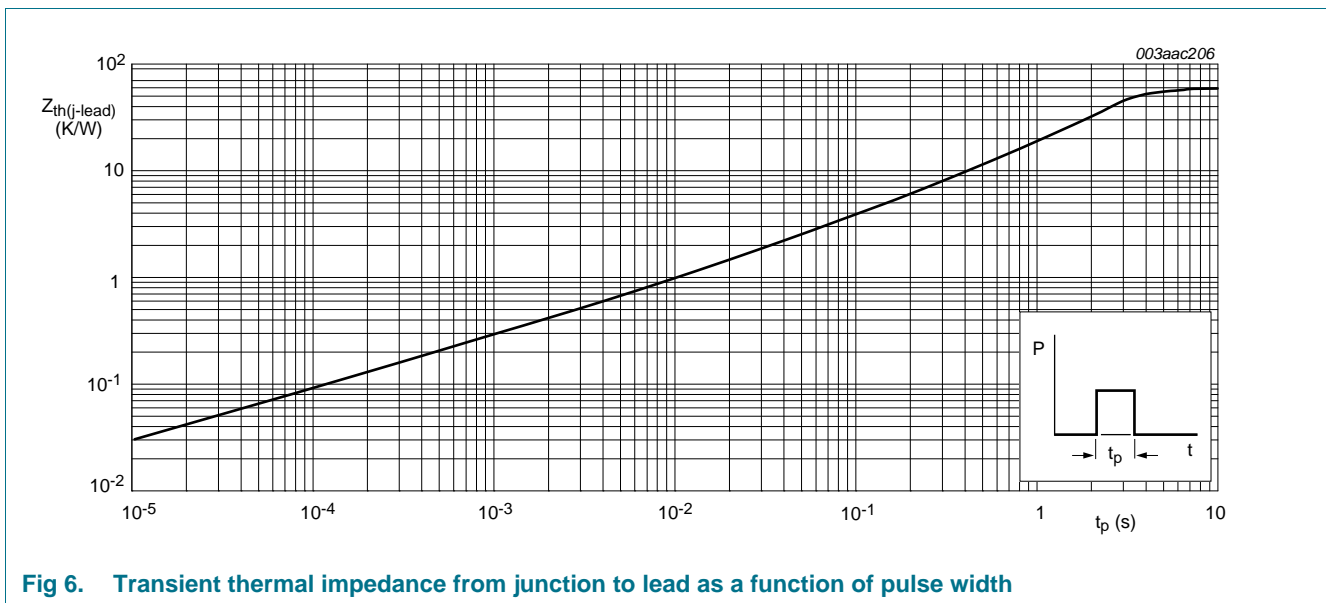
Fig 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 5. Thermal characteristics

**Table 5. Thermal characteristics**

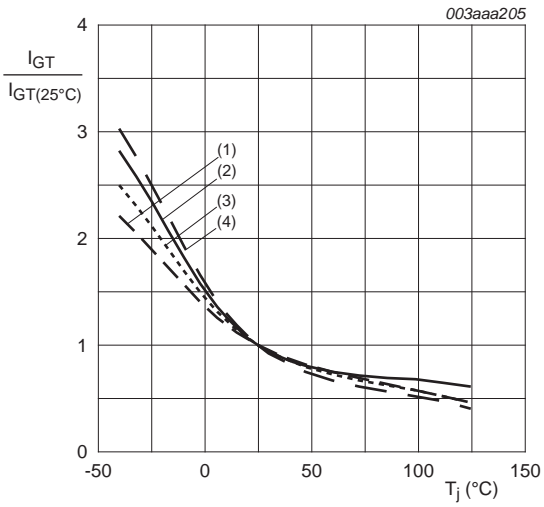
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle; see <a href="#">Figure 6</a>	-	-	60	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	full cycle; printed circuit board mounted; lead length 4 mm	-	150	-	K/W



## 6. Characteristics

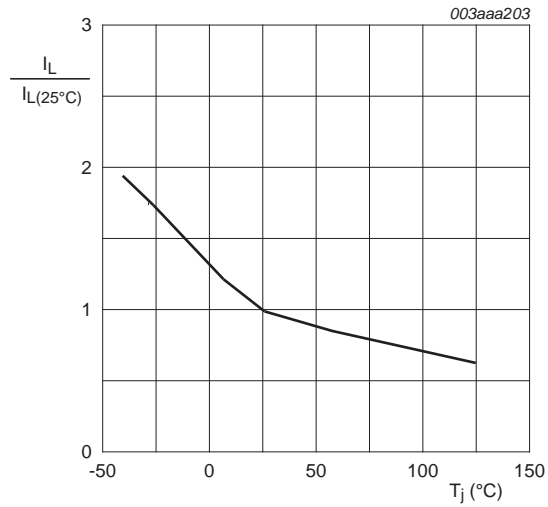
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	0.4	-	10	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 7</a>	0.4	-	10	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	-	30	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	-	15	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 8</a>	-	-	15	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 9</a>	-	-	10	mA
$V_T$	on-state voltage	$I_T = 1\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 10</a>	-	1.3	1.6	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; see <a href="#">Figure 11</a>	-	-	1.3	V
		$V_D = 600\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125\text{ °C}$ ; see <a href="#">Figure 11</a>	0.2	-	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 125\text{ °C}$	-	-	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 110\text{ °C}$ ; gate open circuit; exponential waveform; see <a href="#">Figure 12</a>	120	-	-	V/ $\mu$ s
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_j = 110\text{ °C}$ ; $dI_{com}/dt = 0.44\text{ A/ms}$ ; gate open circuit	2	-	-	V/ $\mu$ s

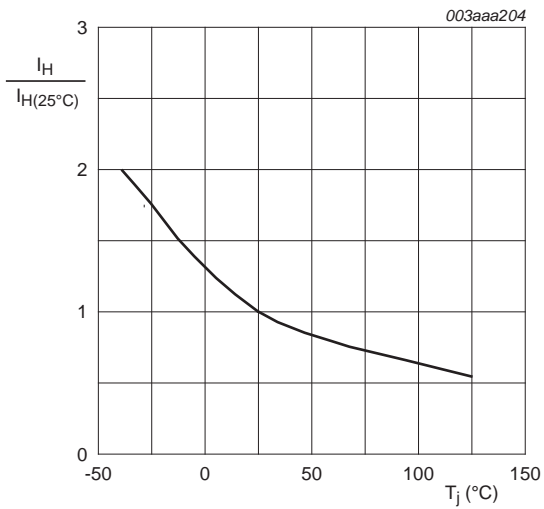


- (1) T2- G+
- (2) T2- G-
- (3) T2+ G-
- (4) T2+ G+

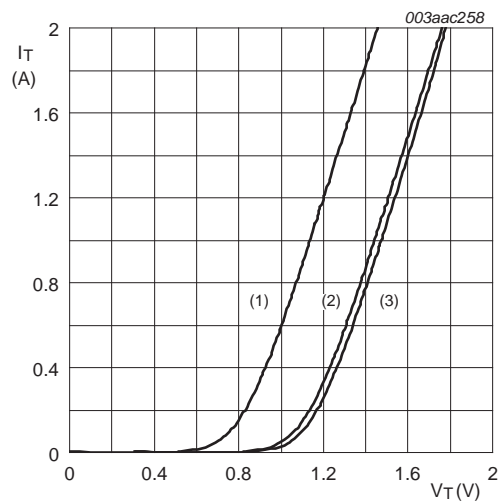
**Fig 7. Normalized gate trigger current as a function of junction temperature**



**Fig 8. Normalized latching current as a function of junction temperature**



**Fig 9. Normalized holding current as a function of junction temperature**



$V_o = 1.13 \text{ V}$   
 $R_s = 0.31 \text{ } \Omega$

- (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 10. On-state current as a function of on-state voltage**

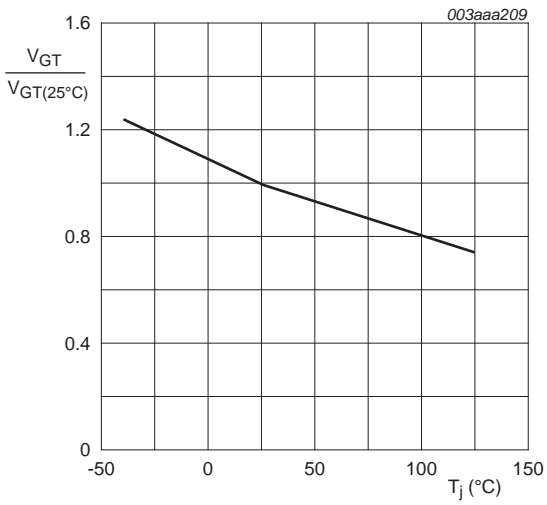
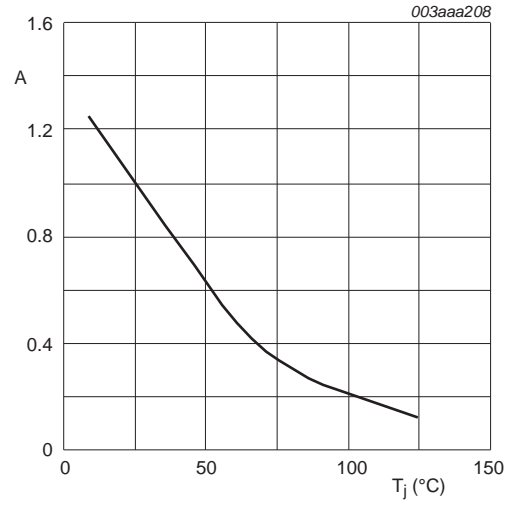


Fig 11. Normalized gate trigger voltage as a function of junction temperature



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

Fig 12. 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

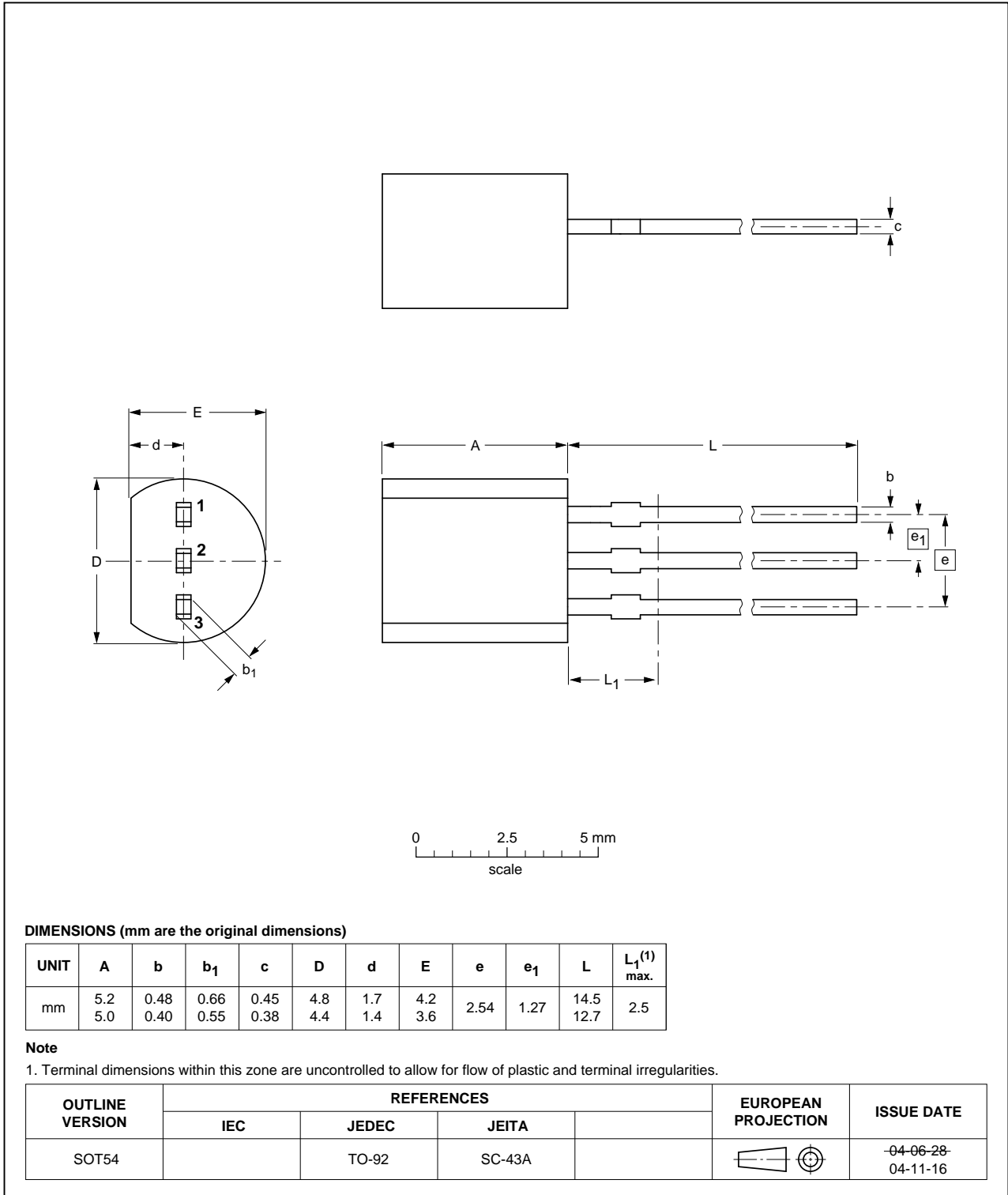


Fig 13. Package outline SOT54 (TO-92)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0109MA0 v.5	20110722	Product data sheet	-	Z0109MA0 v.4
Modifications:	• Various changes to content.			
Z0109MA0 v.4	20110512	Product data sheet	-	Z0109MA0 v.3

## 9. Legal information

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Document status <sup>[1]</sup> <sup>[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.

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## 11. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Limiting values</b> . . . . .	<b>3</b>
<b>5</b>	<b>Thermal characteristics</b> . . . . .	<b>5</b>
<b>6</b>	<b>Characteristics</b> . . . . .	<b>6</b>
<b>7</b>	<b>Package outline</b> . . . . .	<b>9</b>
<b>8</b>	<b>Revision history</b> . . . . .	<b>10</b>
<b>9</b>	<b>Legal information</b> . . . . .	<b>11</b>
9.1	Data sheet status . . . . .	11
9.2	Definitions . . . . .	11
9.3	Disclaimers . . . . .	11
9.4	Trademarks . . . . .	12
<b>10</b>	<b>Contact information</b> . . . . .	<b>12</b>

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