

Z0109NA

4Q Triac

Rev. 05 — 21 March 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 direct interfacing to logic ICs and low power gate drivers.

1.2 Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drive circuits
- High blocking voltage capability
- 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

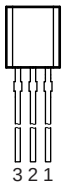
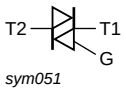
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; see Figure 4; see Figure 5	-	-	8	A
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq$ 45 °C; see Figure 3; see Figure 1; see Figure 2	-	-	1	A

Table 1. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 7	-	-	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
Z0109NA	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

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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		-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 45$ °C; see Figure 3; see Figure 1; see Figure 2	-	1	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; see Figure 4; see Figure 5	-	8	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms	-	8.5	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse	-	0.32	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.1$ A/µs; T2+ G+	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.1$ A/µs; T2+ G-	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.1$ A/µs; T2- G-	-	50	A/µs
		$I_T = 1$ A; $I_G = 20$ mA; $dI_G/dt = 0.1$ A/µs; T2- G+	-	20	A/µs
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	°C
T_j	junction temperature		-	125	°C

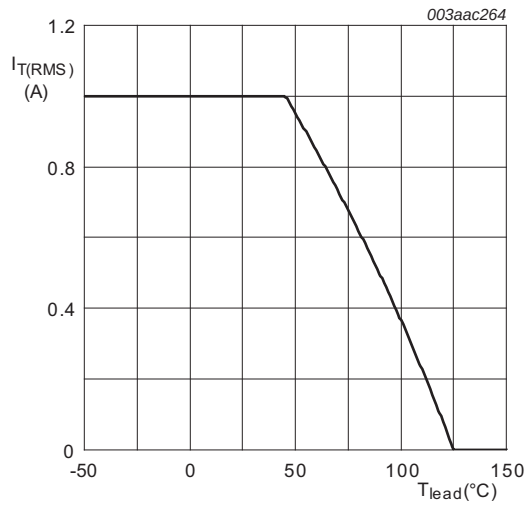
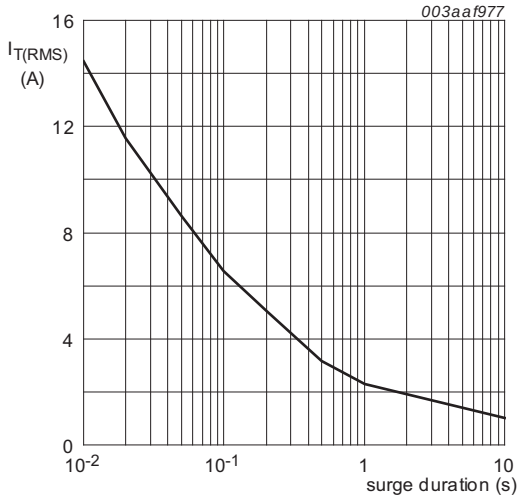


Fig 1. RMS on-state current as a function of lead temperature; maximum values

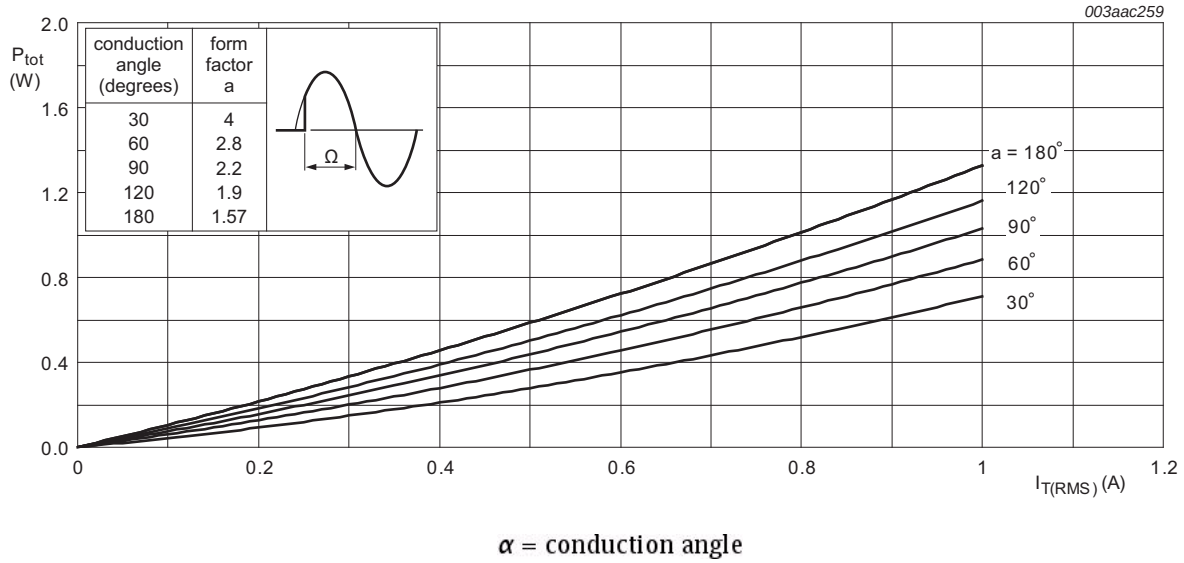


$f = 50Hz$; $T_{lead} = 45°C$

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

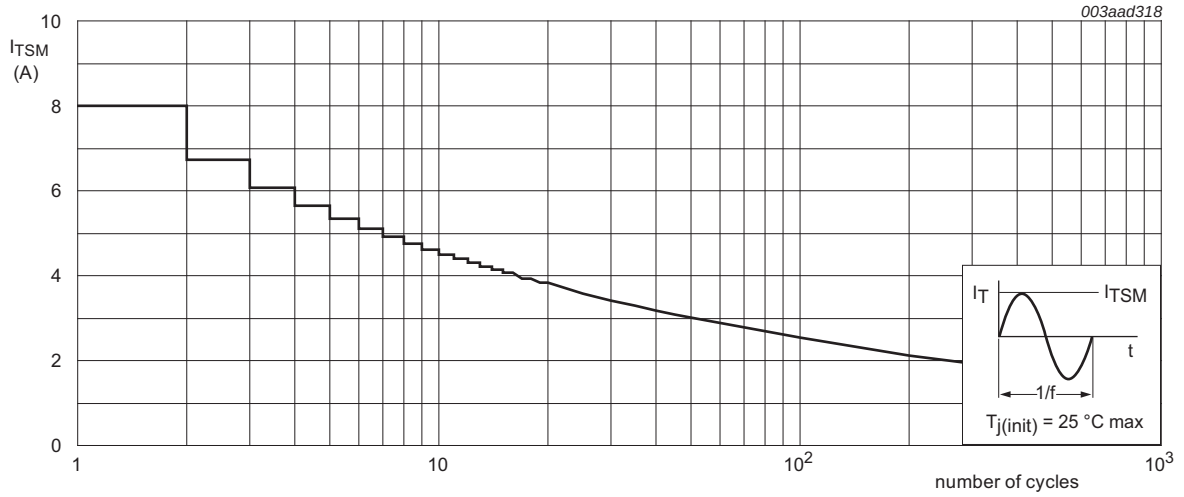
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α = conduction angle

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

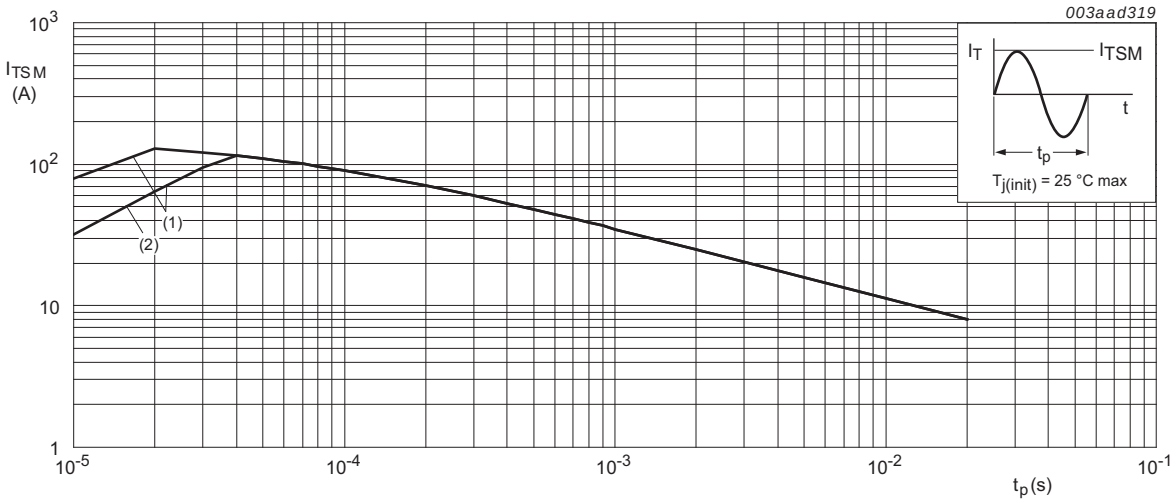


f = 50 Hz

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

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$t_p \leq 20$ ms; (1) dI_T/dt limit; (2) T2 − G + quadrant limit

Fig 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

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5. Thermal characteristics

Table 5. Thermal characteristics

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

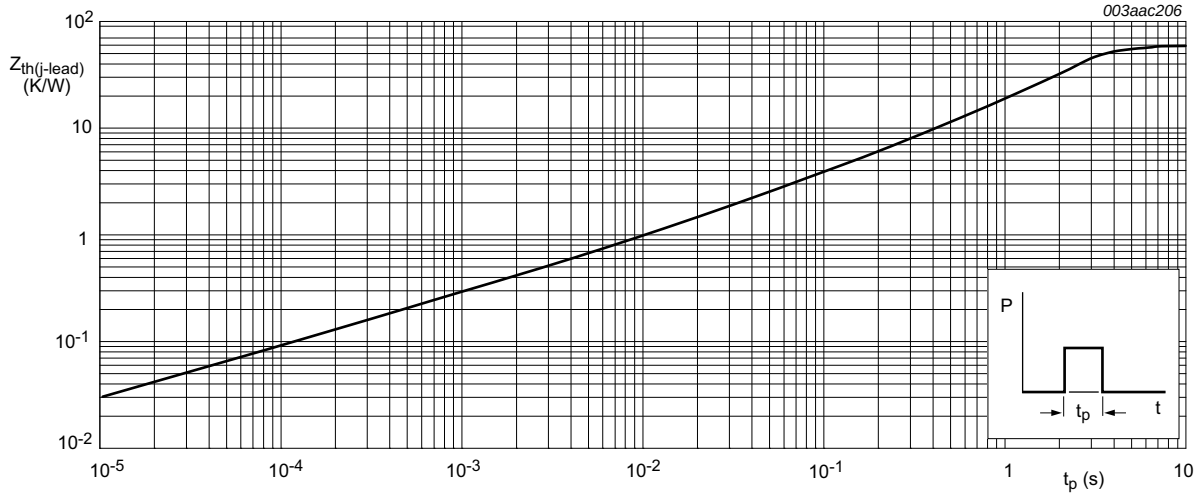


Fig 6. Transient thermal impedance from junction to lead as a function of pulse width

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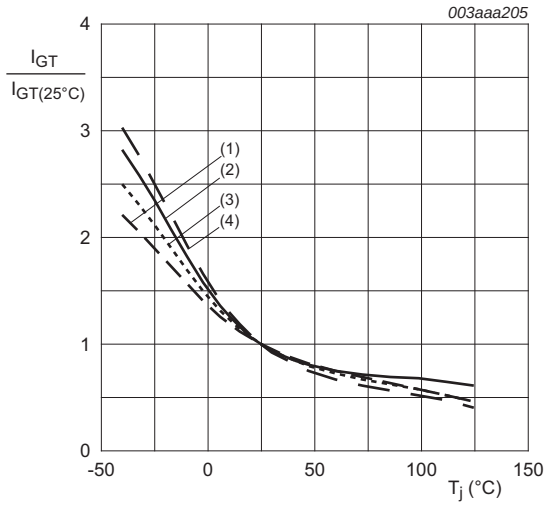
6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; see Figure 7	-	-	10	mA
		V_D = 12 V; I_T = 0.1 A; T2- G+; T_j = 25 °C; see Figure 7	-	-	10	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; see Figure 8	-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; see Figure 8	-	-	25	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; see Figure 8	-	-	15	mA
		V_D = 12 V; I_G = 0.1 A; T2- G+; T_j = 25 °C; see Figure 8	-	-	15	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; see Figure 9	-	-	10	mA
V_T	on-state voltage	I_T = 1 A; T_j = 25 °C; see Figure 10	-	1.3	1.6	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; see Figure 11	-	-	1.3	V
		V_D = 800 V; I_T = 0.1 A; T_j = 125 °C; see Figure 11	0.2	-	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C	-	-	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 536 V; T_j = 110 °C; exponential waveform; gate open circuit; see Figure 12	50	-	-	V/µs
dV_{com}/dt	rate of change of commutating voltage	V_D = 400 V; T_j = 110 °C; dI_{com}/dt = 0.44 A/ms; I_T = 1 A; gate open circuit	2	-	-	V/µs

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(1) T2- G+

(2) T2- G-

(3) T2+ G-

(4) T2+ G+

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

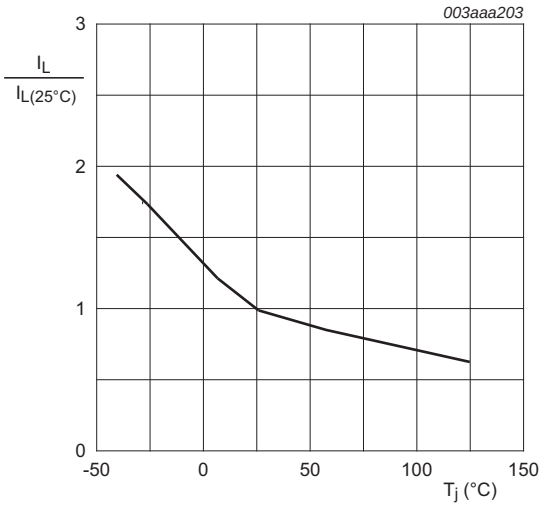


Fig 8. Normalized latching current as a function of junction temperature

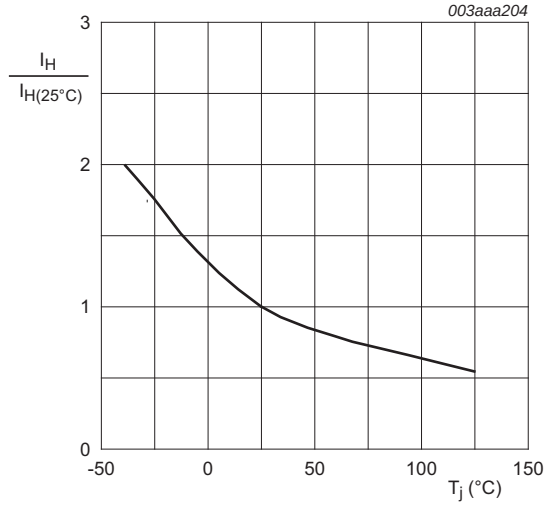
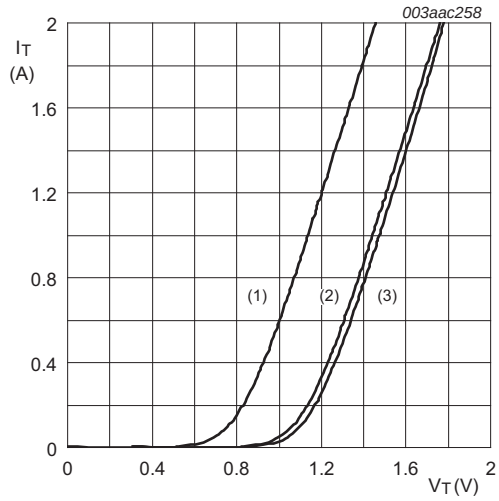


Fig 9. Normalized holding current as a function of junction temperature



V_o = 1.13 V

R_s = 0.31 Ω

(1) T_j = 125 °C; typical values

(2) T_j = 125 °C; maximum values

(3) T_j = 25 °C; maximum values

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

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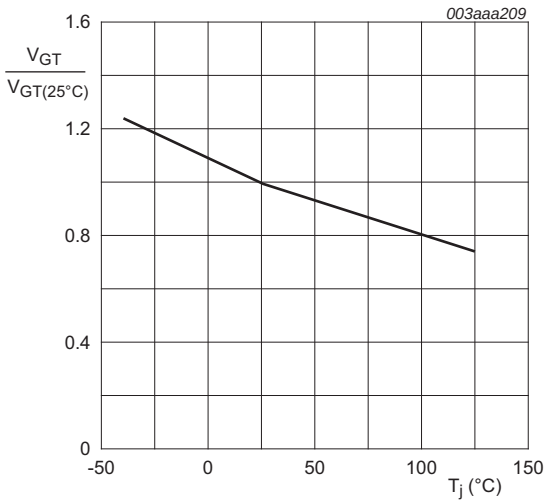
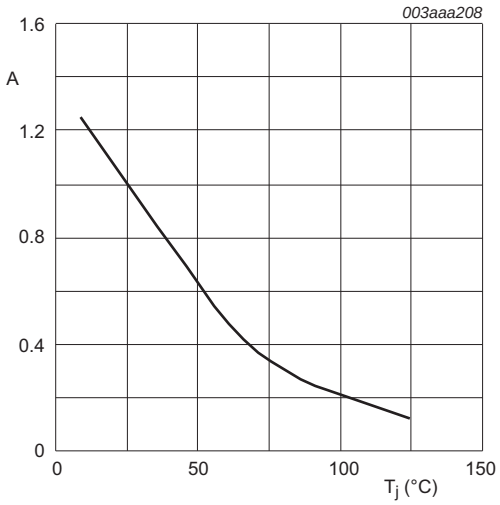


Fig 11. Normalized gate trigger voltage as a function of junction temperature



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

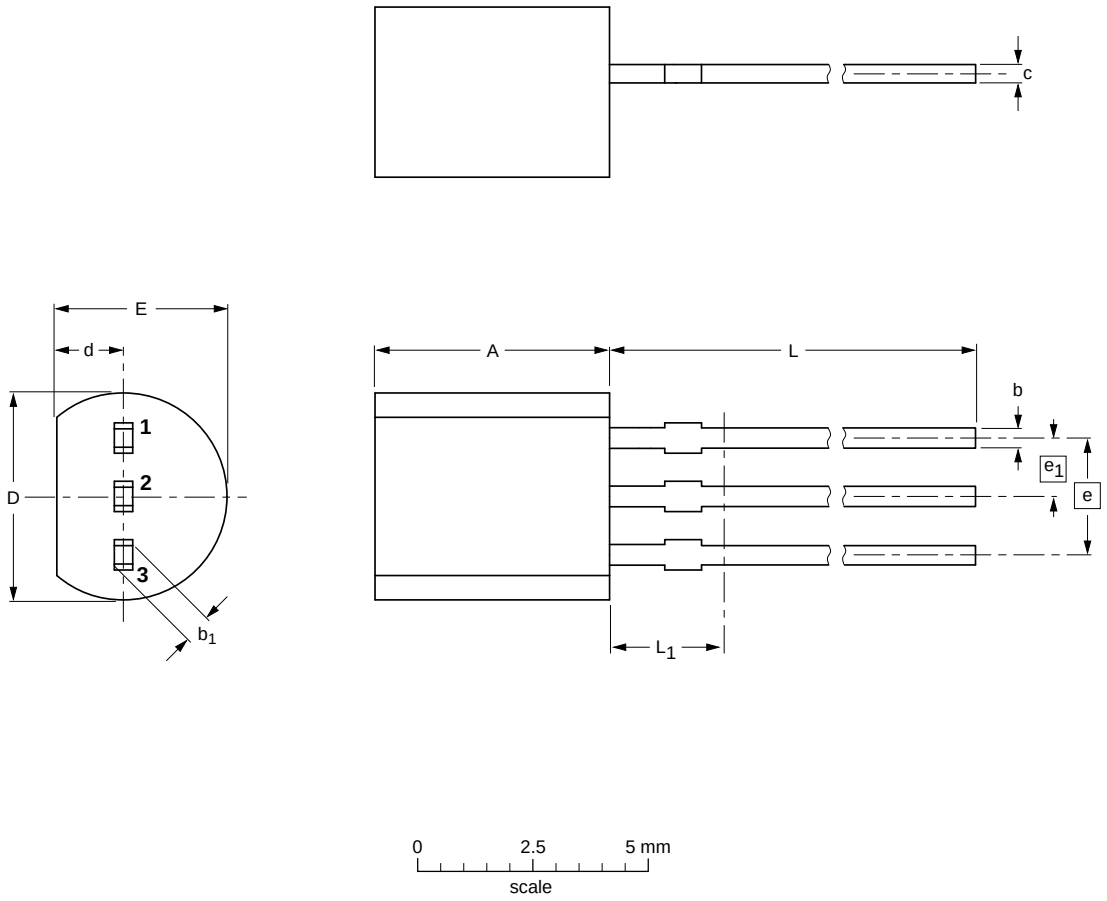
Fig 12. Normalized critical rate of rise of off-state voltage as a function of junction temperature; typical values

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7. 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)

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8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
Z0109NA v.5	20110321	Product data sheet	-	Z0109NA v.4
Modifications:	• Various changes to content.			
Z0109NA v.4	20090804	Product data sheet	-	Z0109NA v.3

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9. Legal information

9.1 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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