



# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



## 1. General description

Planar passivated very sensitive gate four quadrant triac in a SOT54 plastic package intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

## 2. Features and benefits

- Direct interfacing to logic level ICs
- Direct interfacing to low power gate drivers and microcontrollers
- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Triggering in all four quadrants
- Very sensitive gate

## 3. Applications

- General purpose low power phase control
- General purpose low power switching
- Solid-state relay

## 4. Quick reference data

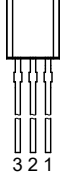

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 50\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	0.6	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(initial)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	8	A
		full sine wave; $T_{j(initial)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	-	8.8	A
$T_j$	junction temperature		-	-	125	°C
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	1	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	2	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	2	5	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	4	7	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>	-	1	10	mA
$V_T$	on-state voltage	$I_T = 0.85\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>	-	1.4	1.9	V
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 110\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 12</a>	30	45	-	V/ $\mu\text{s}$
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 600\text{ V}$ ; $T_j = 50\text{ }^\circ\text{C}$ ; $dI_{com}/dt = 0.3\text{ A/ms}$ ; $I_T = 0.84\text{ A}$ ; gate open circuit	-	5	-	V/ $\mu\text{s}$

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T2	main terminal 2	 <p>TO-92 (SOT54)</p>	 <p>sym051</p>
2	G	gate		
3	T1	main terminal 1		

## 6. Ordering information

Table 3. Ordering information

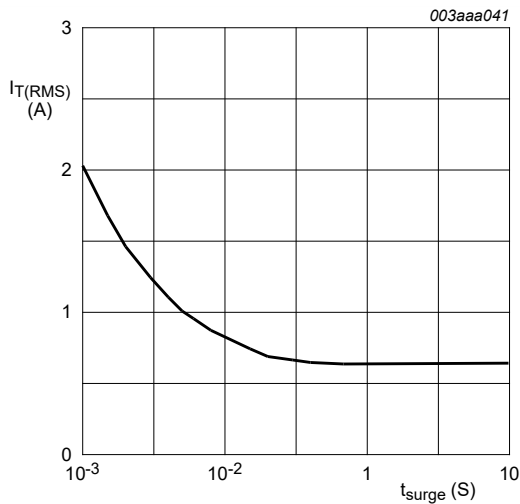
Type number	Package		
	Name	Description	Version
MAC97A8	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

## 7. Limiting values

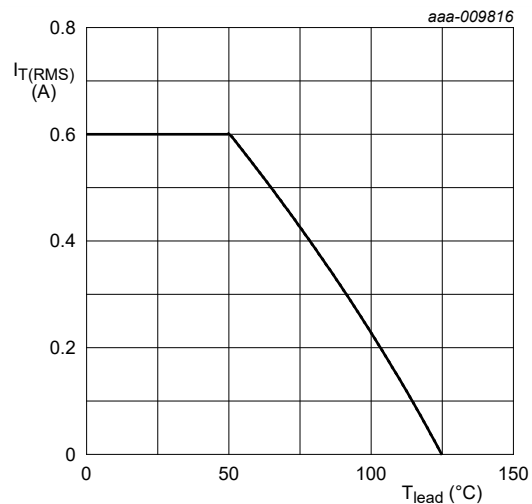
**Table 4. Limiting values**

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; $T_{lead} \leq 50\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	0.6	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	8	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	8.8	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	0.32	A <sup>2</sup> s
$di_T/dt$	rate of rise of on-state current	$I_G = 10\text{ mA}$	-	50	A/ $\mu$ s
		$I_G = 14\text{ mA}$	-	10	A/ $\mu$ s
		$I_G = 10\text{ mA}$	-	50	A/ $\mu$ s
		$I_G = 10\text{ mA}$	-	50	A/ $\mu$ s
$I_{GM}$	peak gate current	$t = 2\text{ microseconds (max)}$	-	1	A
$P_{GM}$	peak gate power		-	5	W
$P_{G(AV)}$	average gate power	$T(lead) \leq 80\text{ °C}$ ; $t = 2\text{ microseconds (max)}$	-	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 surge duration; maximum values**



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

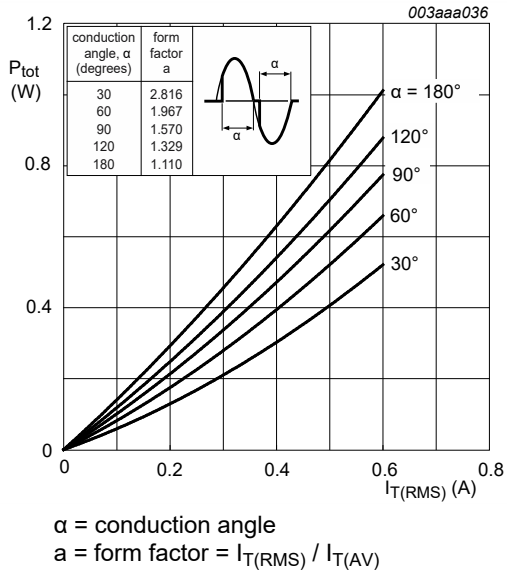


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

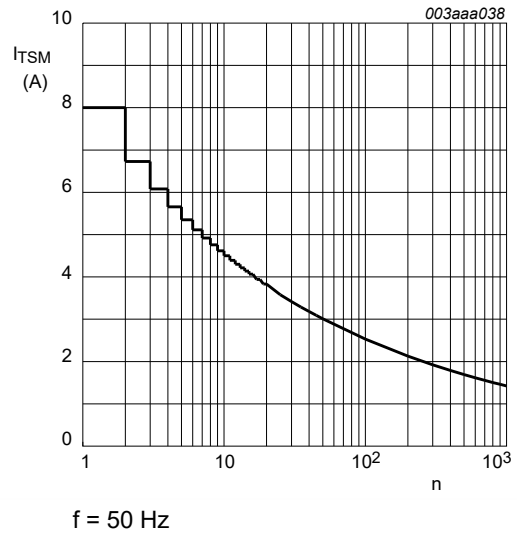


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

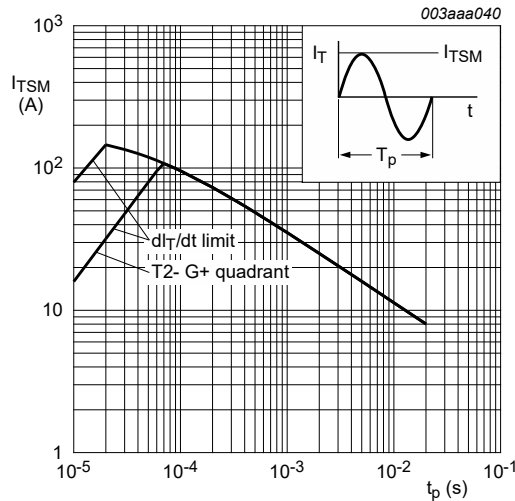


Fig. 5. Non-repetitive peak on-state current as a function of pulse width; maximum values

## 8. 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; <a href="#">Fig. 6</a>	-	-	60	K/W
		half cycle	-	-	80	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted: lead length = 4 mm	-	150	-	K/W

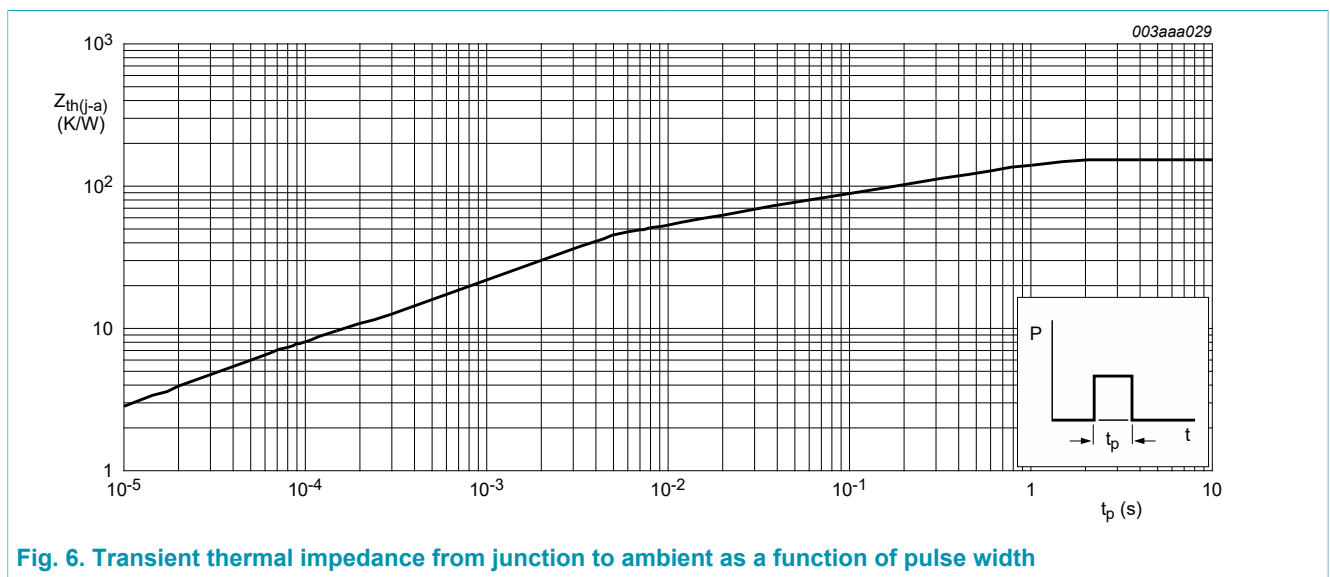


Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse width

## 9. 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+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	1	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	2	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	2	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	4	7	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	1	10	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	5	10	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	1	10	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G+; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	2	10	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>	-	1	10	mA
$V_T$	on-state voltage	$I_T = 0.85\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	1.4	1.9	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	0.9	1.5	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 110\text{ °C}$ ; <a href="#">Fig. 11</a>	0.1	0.7	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_j = 110\text{ °C}$	-	3	100	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 110\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 12</a>	30	45	-	$\text{V}/\mu\text{s}$
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 600\text{ V}$ ; $T_j = 50\text{ °C}$ ; $dI_{com}/dt = 0.3\text{ A/ms}$ ; $I_T = 0.84\text{ A}$ ; gate open circuit	-	5	-	$\text{V}/\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 1\text{ A}$ ; $V_D = 600\text{ V}$ ; $I_G = 25\text{ mA}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu\text{s}$

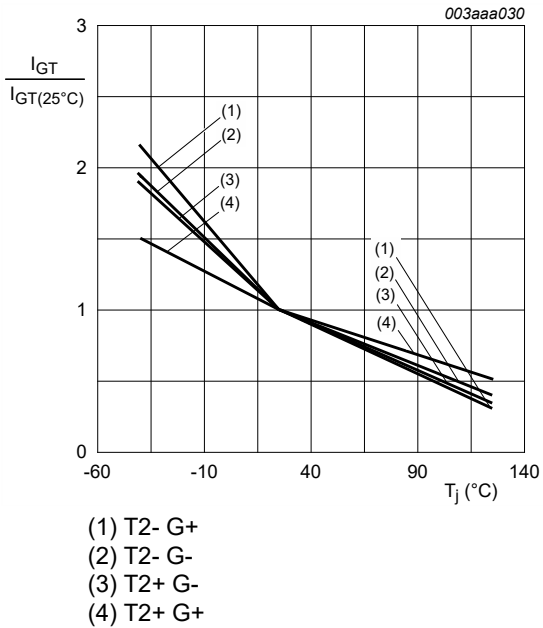


Fig. 7. Normalized gate trigger current as a function of junction temperature

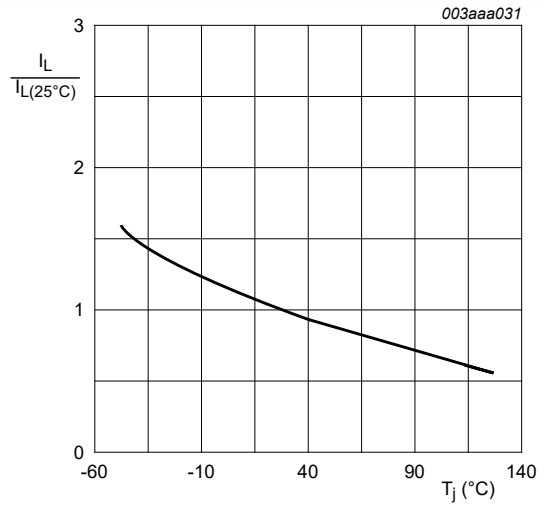


Fig. 8. Normalized latching current as a function of junction temperature

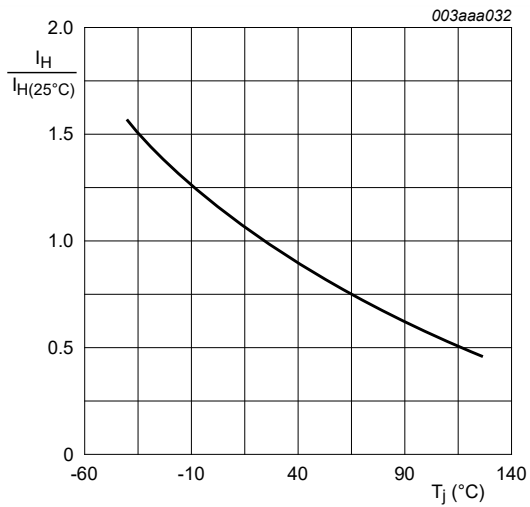
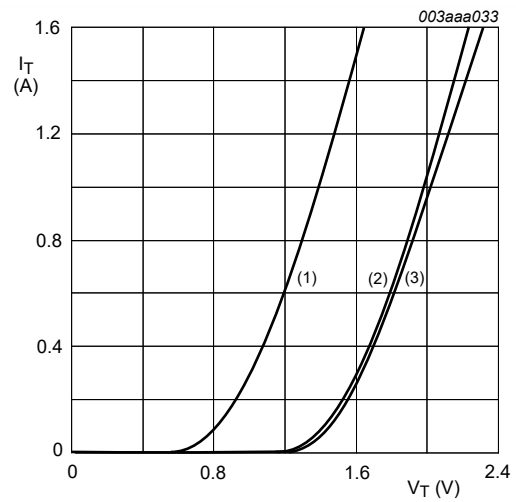


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.45\text{ V}; R_s = 0.1875\ \Omega$

- (1)  $T_j = 125^\circ\text{C}$ ; typical values
- (2)  $T_j = 125^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25^\circ\text{C}$ ; maximum values

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



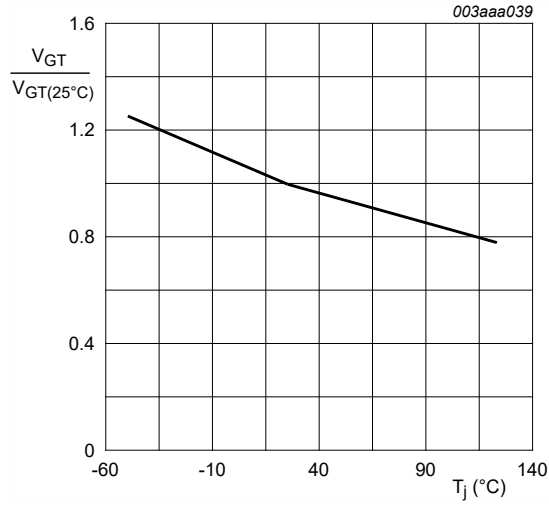


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

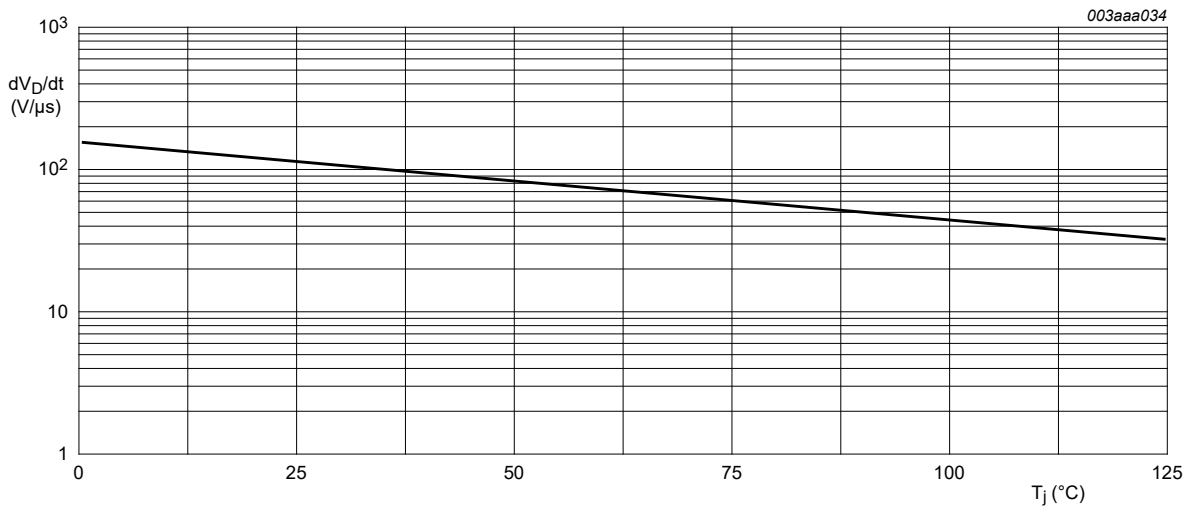


Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

### 10. Package outline



Fig. 13. Package outline TO-92 (SOT54)

# 11. Legal information

## 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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## 12. Contents

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1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Limiting values.....	3
8. Thermal characteristics.....	5
9. Characteristics.....	6
10. Package outline.....	9
11. Legal information.....	10

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