



# 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.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



## 1. General description

Planar passivated Silicon Controlled Rectifier with sensitive gate in a SOT54 (TO-92) plastic package. This SCR is designed to be interfaced directly to microcontrollers, logic ICs and other low power gate trigger circuits.

## 2. Features and benefits

- Guaranteed minimum gate trigger current limit
- Planar passivated for voltage ruggedness and reliability
- Sensitive gate
- Direct triggering from low power gate circuits and logic ICs

## 3. Applications

- Ground Fault Interrupters (GFI)
- Leakage Current Circuit Breakers (LCCB)
- Residual Current Devices (RCD)

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	500	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	8	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	9	A
$T_j$	junction temperature		-	-	125	°C
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83\text{ °C}$ ; <a href="#">Fig. 1</a>	-	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 83\text{ °C}$ ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	0.8	A
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	20	50	200	$\mu\text{A}$
<b>Dynamic characteristics</b>						

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 1\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; <a href="#">Fig. 12</a>	500	800	-	V/ $\mu$ s

## 5. Ordering information

Table 2. Ordering information

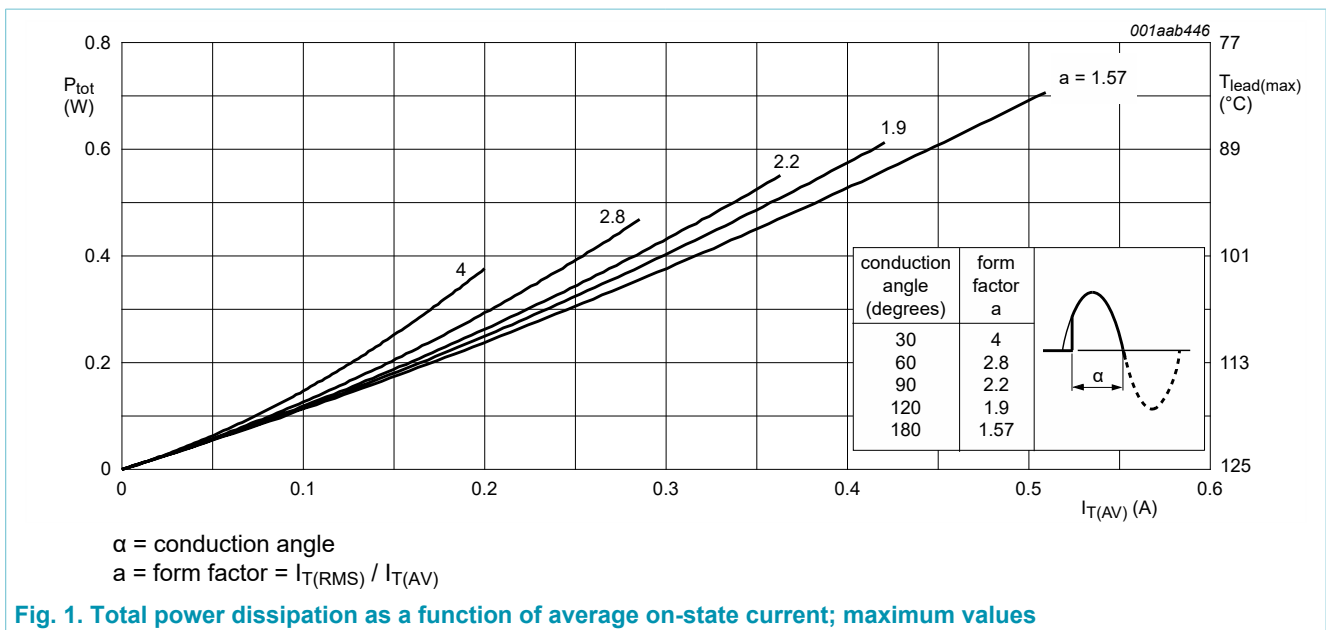
Type number	Package		
	Name	Description	Version
BT168E	TO-92	plastic single-ended leaded (through hole) package; 3 leads	SOT54

## 6. 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		-	500	V
$V_{RRM}$	repetitive peak reverse voltage		-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{lead} \leq 83\text{ }^{\circ}\text{C}$ ; Fig. 1	-	0.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{lead} \leq 83\text{ }^{\circ}\text{C}$ ; Fig. 2; Fig. 3	-	0.8	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$ ; Fig. 4; Fig. 5	-	8	A
		half sine wave; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 8.3\text{ ms}$	-	9	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	0.32	$\text{A}^2\text{s}$
$dl_T/dt$	rate of rise of on-state current	$I_T = 2\text{ A}$ ; $I_G = 10\text{ mA}$ ; $dl_G/dt = 100\text{ mA}/\mu\text{s}$	-	50	$\text{A}/\mu\text{s}$
$I_{GM}$	peak gate current		-	1	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	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	$^{\circ}\text{C}$



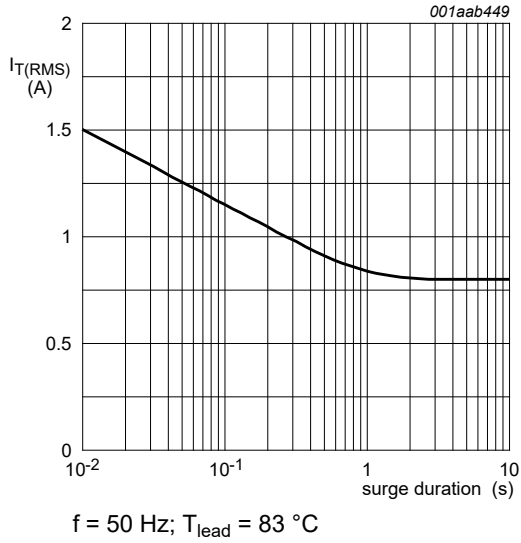


Fig. 2. RMS on-state current as a function of surge duration for sinusoidal currents

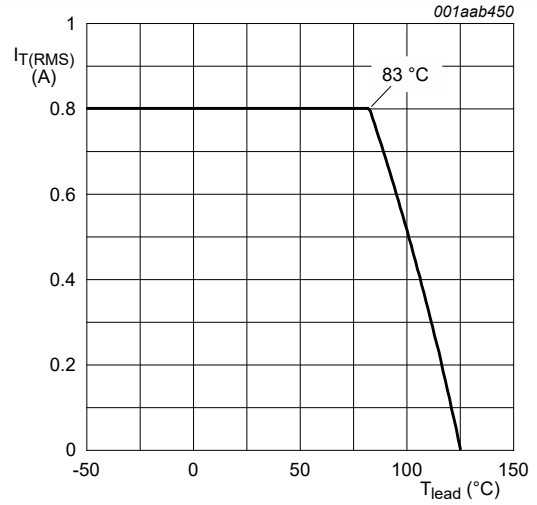


Fig. 3. RMS on-state current as a function of lead temperature; maximum values

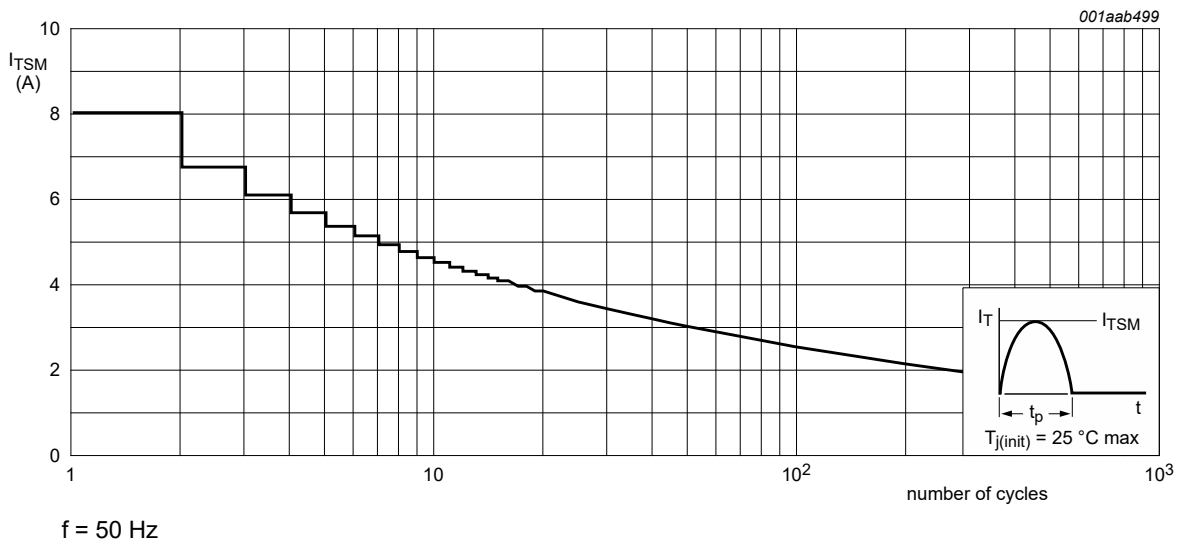
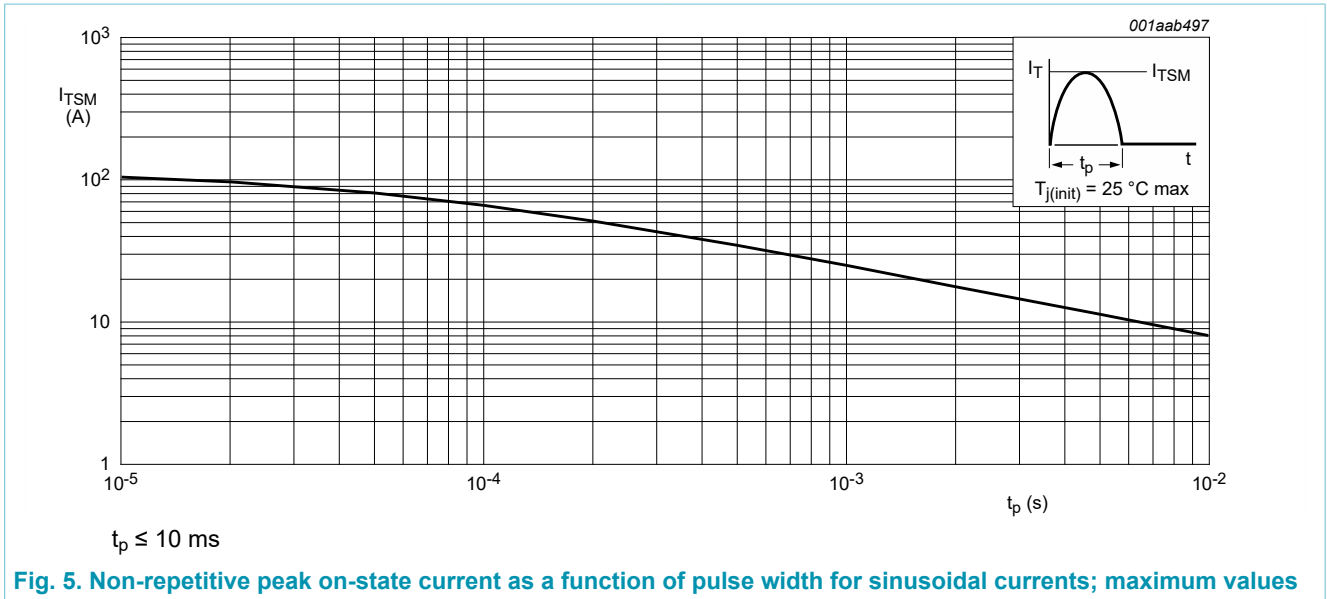


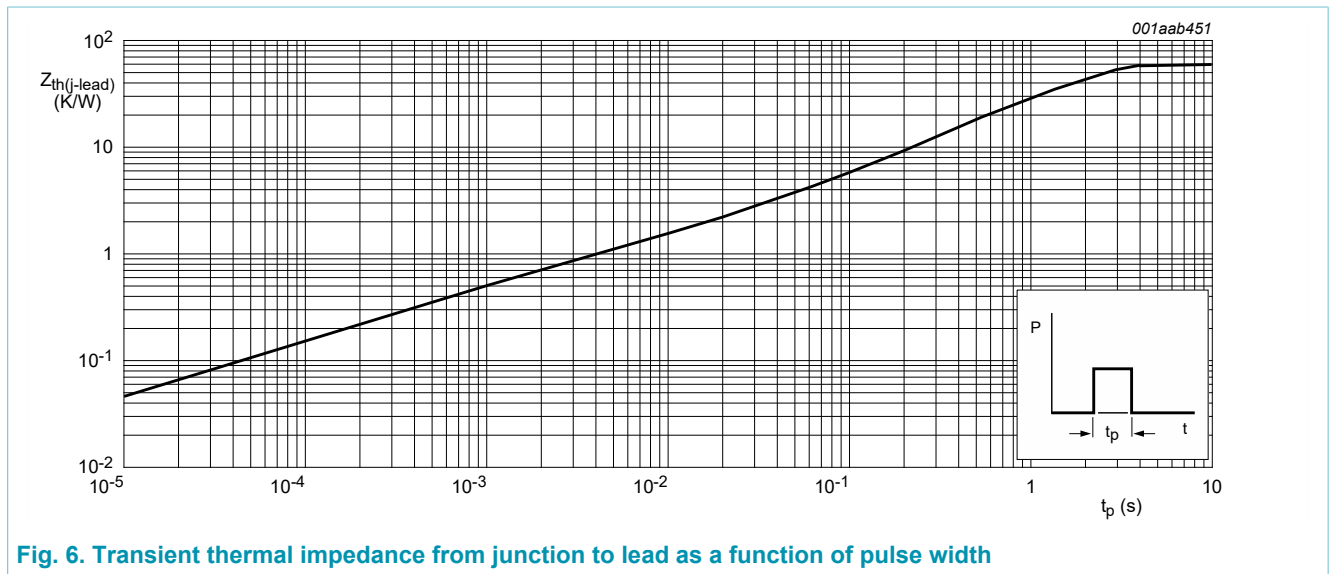
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 7. Thermal characteristics

Table 4. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	<a href="#">Fig. 6</a>	-	-	60	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



## 8. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	20	50	200	$\mu\text{A}$
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 10\text{ mA}$ ; $T_j = 25\text{ °C}$ ; $R_{GK(ext)} = 1\text{ k}\Omega$ ; <a href="#">Fig. 8</a>	-	2	6	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; $R_{GK(ext)} = 1\text{ k}\Omega$ ; <a href="#">Fig. 9</a>	-	2	5	mA
$V_T$	on-state voltage	$I_T = 1.2\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	1.25	1.7	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	0.5	0.8	V
		$V_D = 500\text{ V}$ ; $I_T = 10\text{ mA}$ ; $T_j = 125\text{ °C}$ ; <a href="#">Fig. 11</a>	0.2	0.3	-	V
$I_D$	off-state current	$V_D = 500\text{ V}$ ; $R_{GK(ext)} = 1\text{ k}\Omega$ ; $T_j = 125\text{ °C}$	-	0.05	0.1	mA
$I_R$	reverse current	$V_R = 500\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK(ext)} = 1\text{ k}\Omega$	-	0.05	0.1	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $R_{GK} = 1\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; <a href="#">Fig. 12</a>	500	800	-	V/ $\mu\text{s}$
		$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit; <a href="#">Fig. 12</a>	-	25	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 2\text{ A}$ ; $V_D = 500\text{ V}$ ; $I_G = 10\text{ mA}$ ; $dI_G/dt = 0.1\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$	-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 335\text{ V}$ ; $T_j = 125\text{ °C}$ ; $I_{TM} = 1.6\text{ A}$ ; $V_R = 35\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 2\text{ V}/\mu\text{s}$ ; $R_{GK(ext)} = 1\text{ k}\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )	-	100	-	$\mu\text{s}$



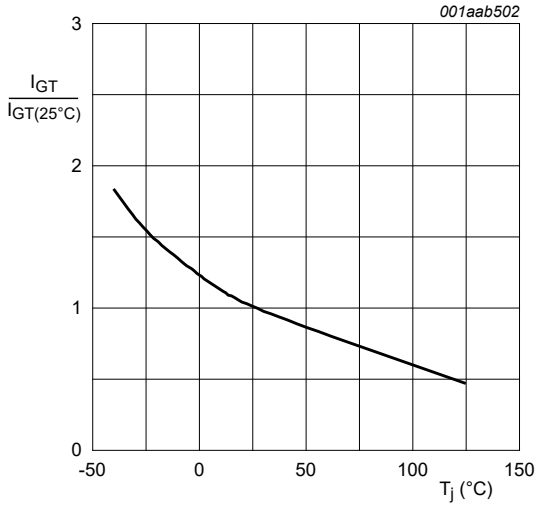


Fig. 7. Normalized gate trigger current as a function of junction temperature

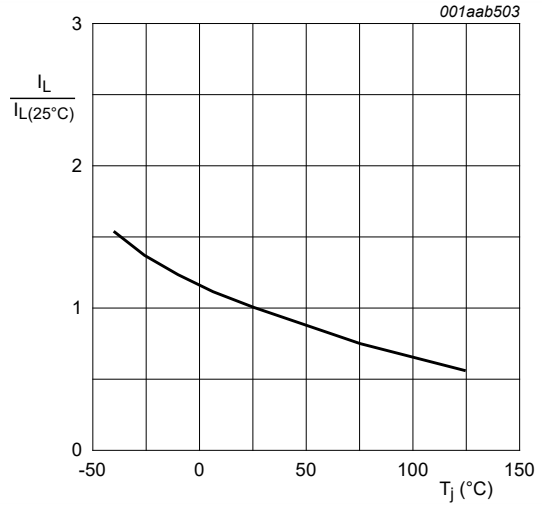


Fig. 8. Normalized latching current as a function of junction temperature  
 $R_{GK} = 1 \text{ k}\Omega$

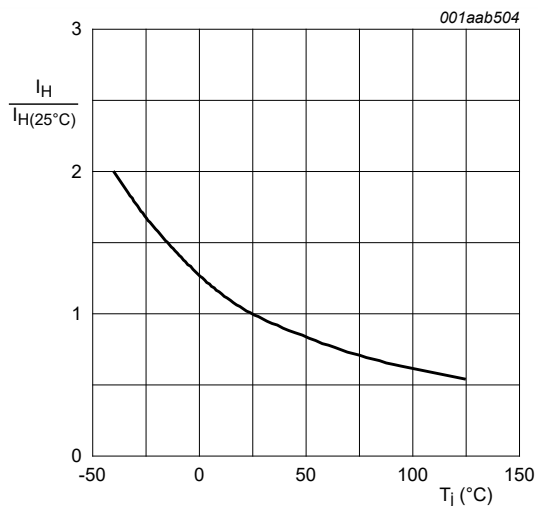


Fig. 9. Normalized holding current as a function of junction temperature  
 $R_{GK} = 1 \text{ k}\Omega$

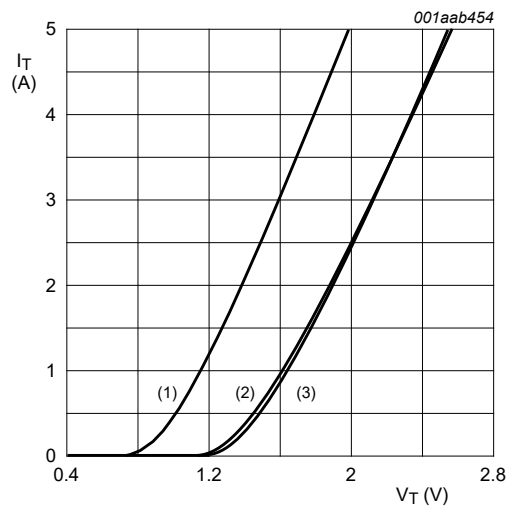


Fig. 10. On-state current as a function of on-state voltage  
 $V_o = 1.067 \text{ V}; R_s = 0.187 \Omega$   
 (1)  $T_j = 125 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 125 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

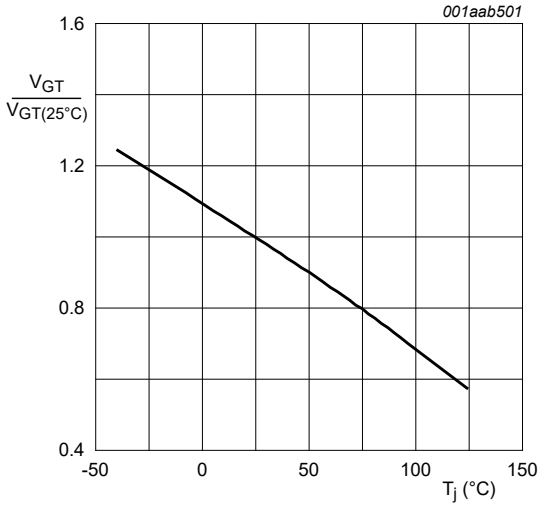
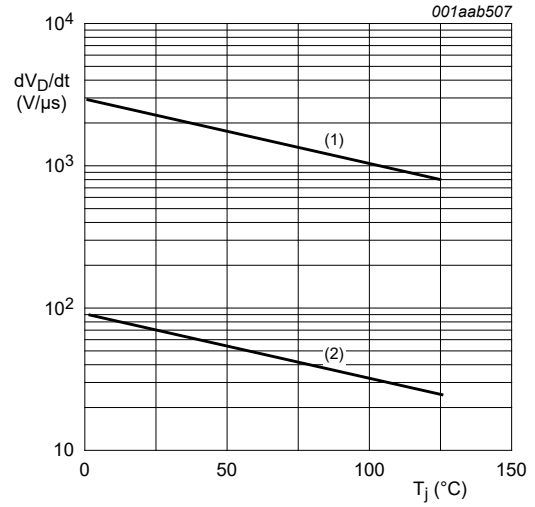


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



- (1)  $R_{GK} = 1 \text{ k}\Omega$
- (2) gate open circuit

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

9. Package outline

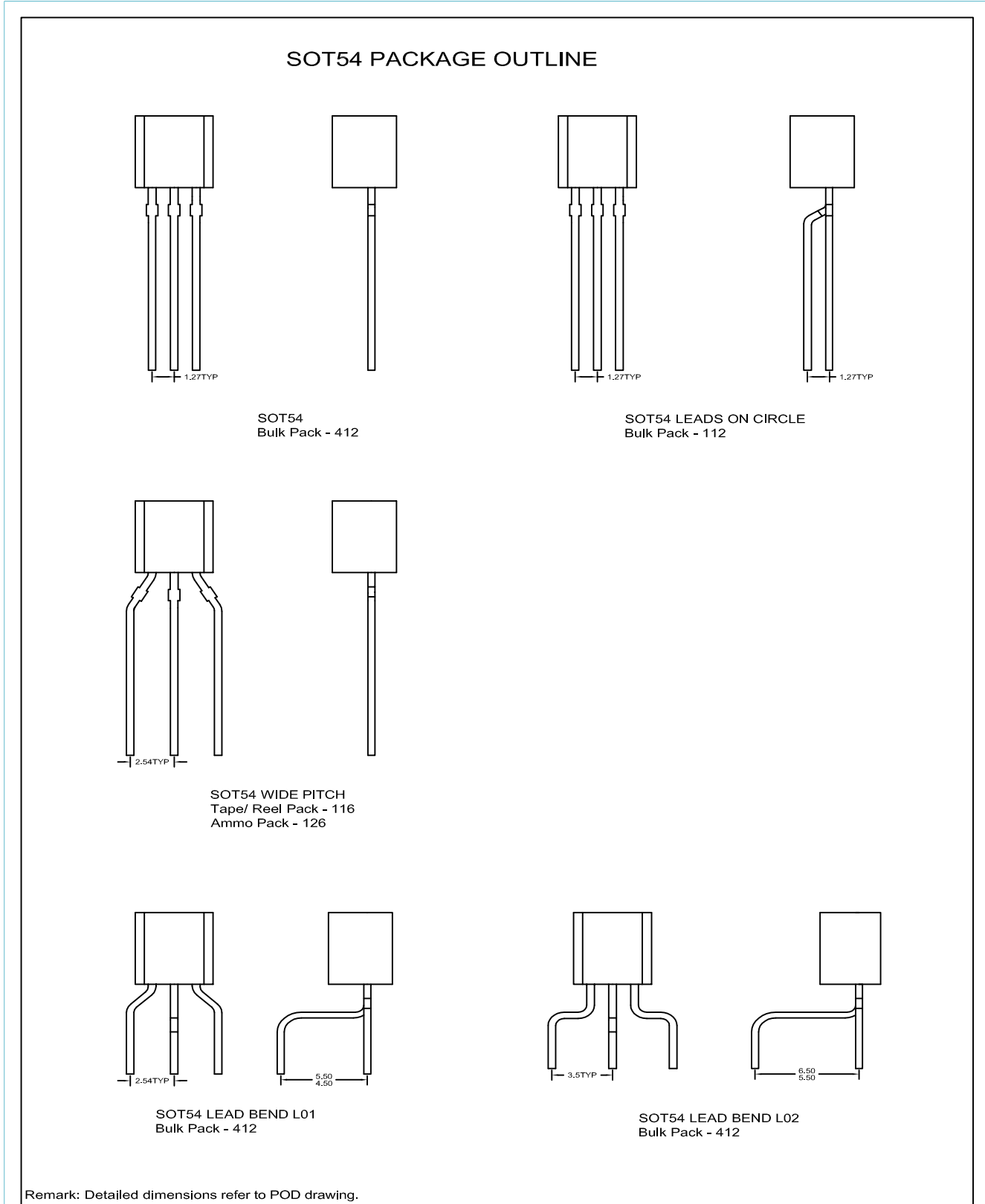


Fig. 13. Package outline TO-92 (SOT54)

## 10. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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