

## 1. General description

Planar passivated very sensitive gate four quadrant triac in a TO92 plastic package. This very sensitive gate "series D" triac is intended for interfacing with low power drivers including microcontrollers.

## 2. Features and benefits

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

## 3. Applications

- Air conditioner indoor fan control
- General purpose low power motor control
- General purpose switching and phase control

## 4. Quick reference data

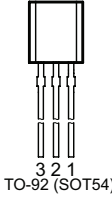

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Absolute maximum rating</b>						
$V_{DRM}$	repetitive peak off-state voltage		-	-	600	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{lead} \leq 51\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	1	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(initial)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 20\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	12.5	A
		full sine wave; $T_{j(initial)} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 16.7\text{ ms}$	-	-	13.7	A
$T_j$	junction temperature		-	-	125	$^{\circ}\text{C}$
<b>Symbol</b>	<b>Parameter</b>	<b>Conditions</b>	<b>Min</b>	<b>Typ</b>	<b>Max</b>	<b>Unit</b>
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G+; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	-	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2+ G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	-	5	mA
		$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; T2- G-; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>	-	-	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>	-	-	7	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>	-	1.3	10	mA
$V_T$	on-state voltage	$I_T = 1.4\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	1.2	1.5	V
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_j = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; $R_{GT1(ext)} = 1\text{ k}\Omega$	20	-	-	V/ $\mu$ s
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; $dI_{com}/dt = 0.5\text{ A/ms}$ ; $I_T = 1\text{ A}$ ; gate open circuit	3	-	-	V/ $\mu$ 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	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT131-600D	TO92	BT131-600D,412	Bulk	1000	SOT54	14-Nov-2013
BT131-600D	TO92	BT131-600DQP	Reel	2000	SOT54	14-Nov-2013
BT131-600D/L01	TO92	BT131-600D/L01EP	Bulk	500	SOT54/L01	14-Nov-2013

## 7. Marking

Table 4. Marking codes

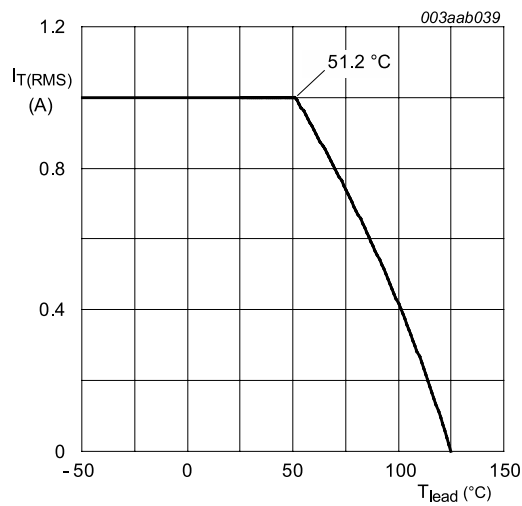
Type number	Marking codes
BT131-600D	131-6D

## 8. Limiting values

**Table 5. Limiting values**

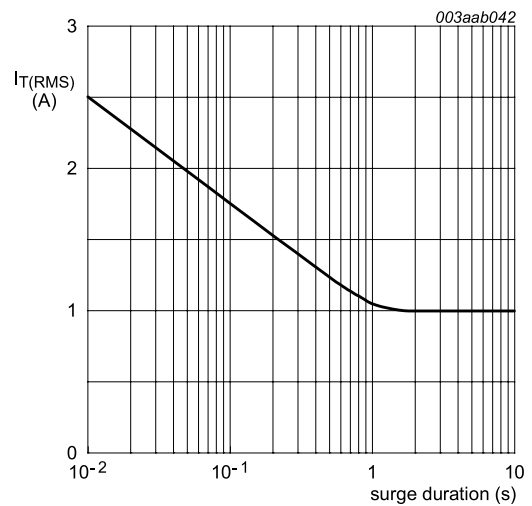
In accordance with the Absolute Maximum Rating System (IEC 60134).

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; $T_{lead} \leq 51\text{ °C}$ ; Fig 1; Fig 2; Fig 3	-	1	A
$I_{TSM}$	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 20\text{ ms}$ ; Fig 4; Fig 5	-	12.5	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 16.7\text{ ms}$	-	13.7	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN	-	0.78	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_G = 10\text{ mA}$	-	50	$A/\mu s$
		$I_G = 10\text{ mA}$	-	50	$A/\mu s$
		$I_G = 14\text{ mA}$	-	10	$A/\mu s$
		$I_G = 10\text{ mA}$	-	50	$A/\mu s$
$I_{GM}$	peak gate current		-	2	A
$P_{GM}$	peak gate power		-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	0.1	W
$T_{stg}$	storage temperature		-40	150	$^{\circ}C$
$T_j$	junction temperature		-	125	$^{\circ}C$



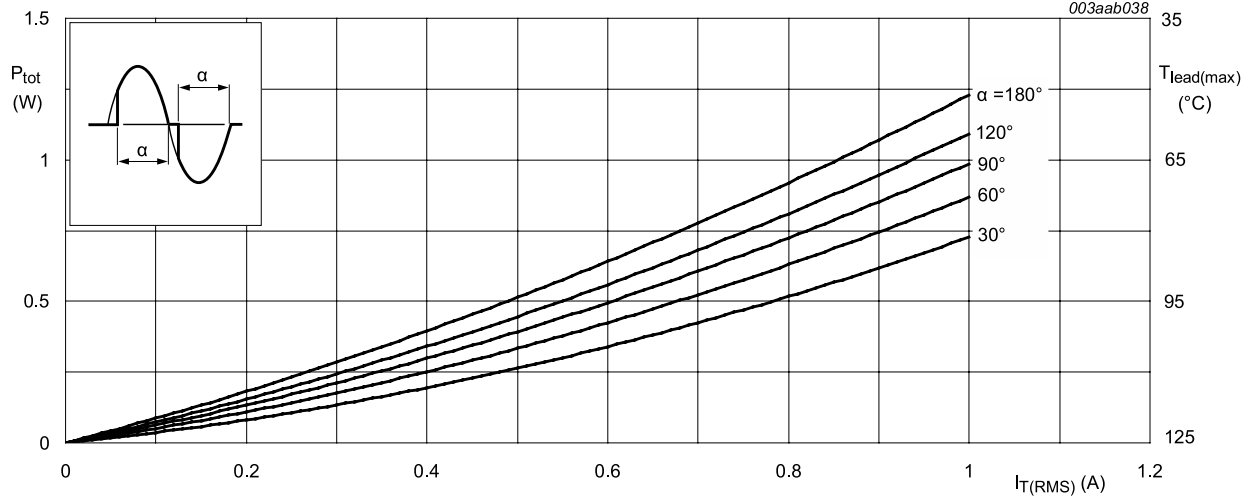
$T_{lead} = 51.2\text{ °C}$

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



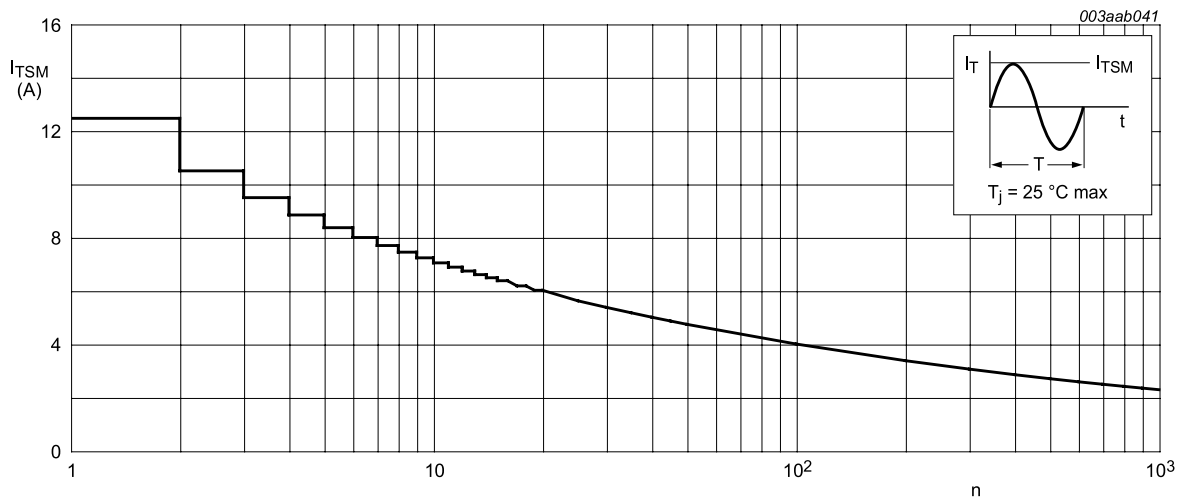
$f = 50\text{ Hz}$ ;  $T_{lead} = 51.2\text{ °C}$

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



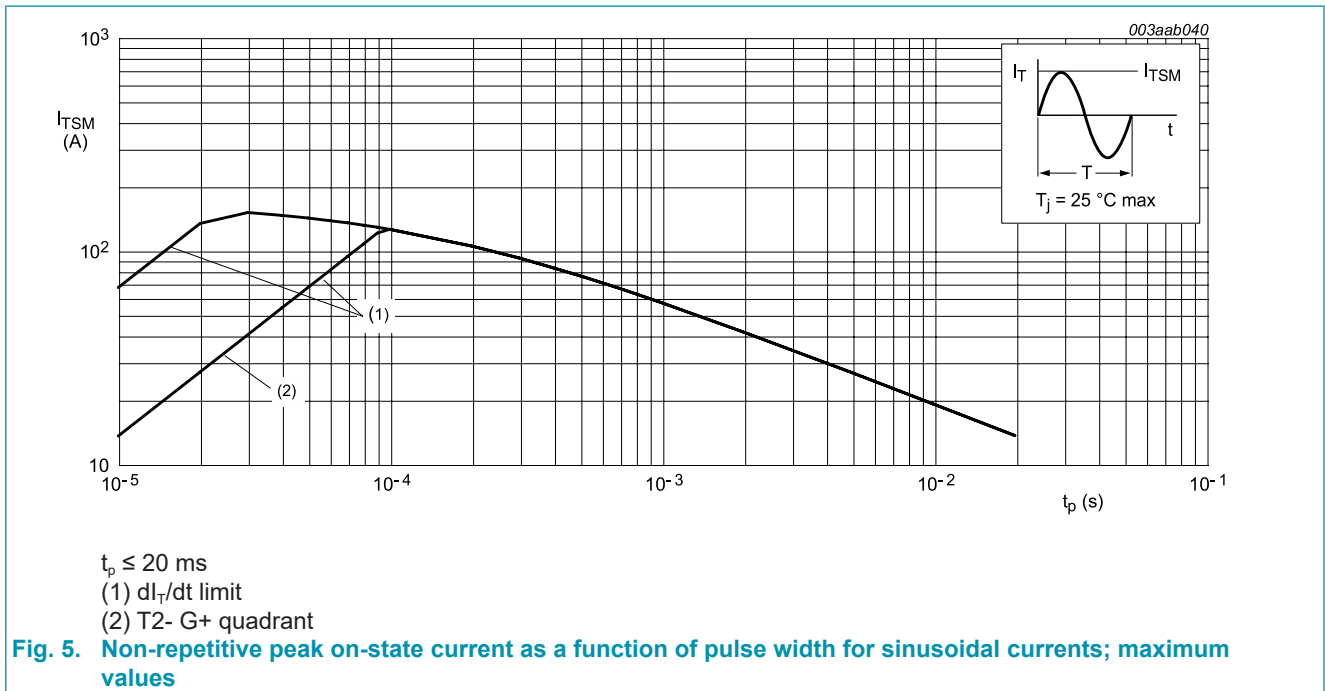
$\alpha$  = conduction angle

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



$f = 50\text{ Hz}$

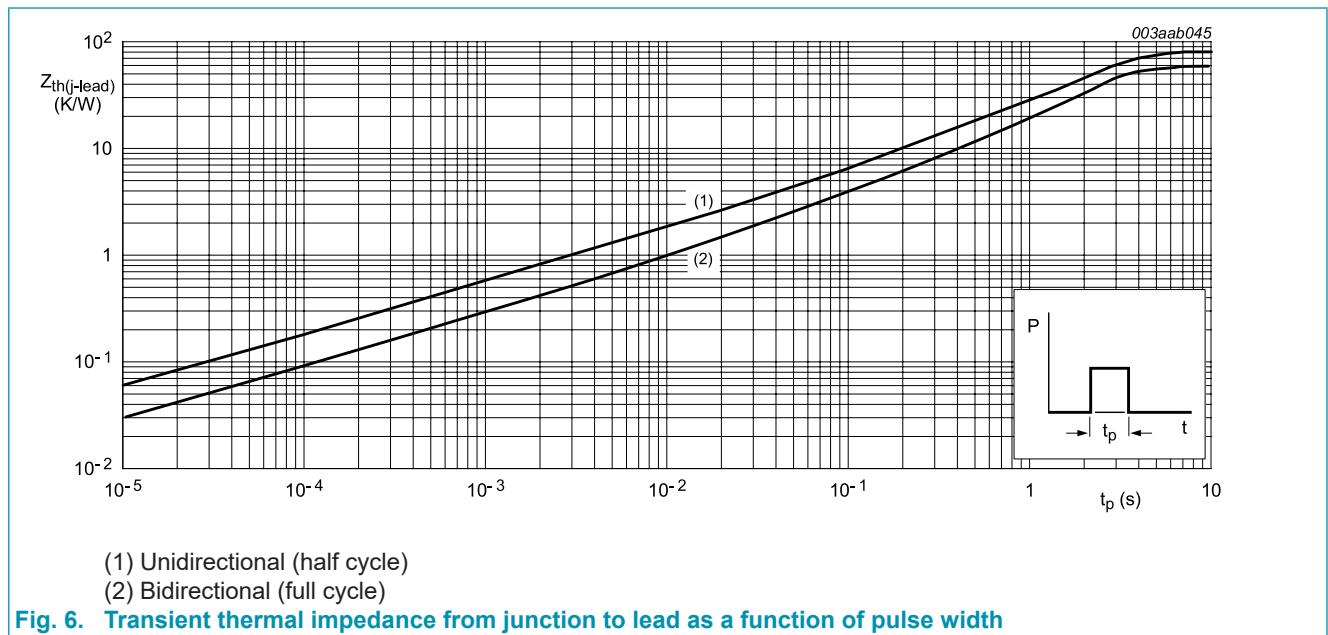
Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values



## 9. Thermal characteristics

Table 6. Thermal characteristics

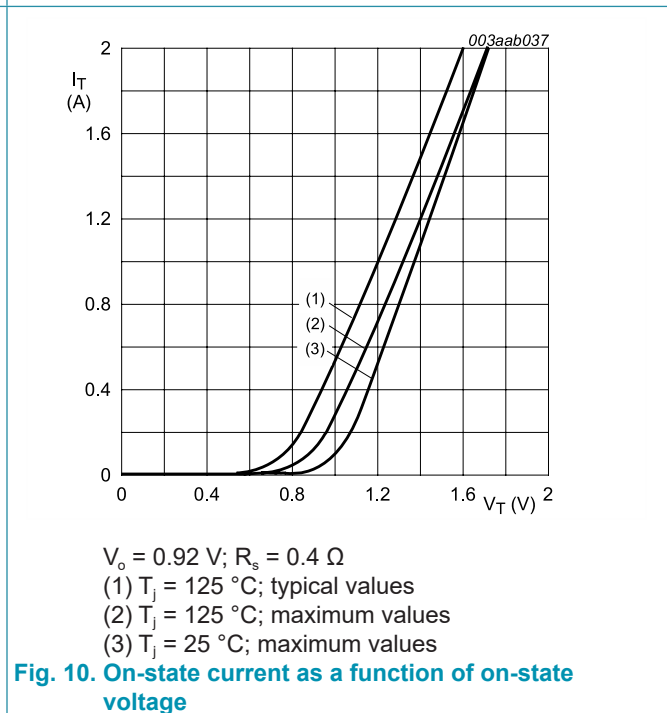
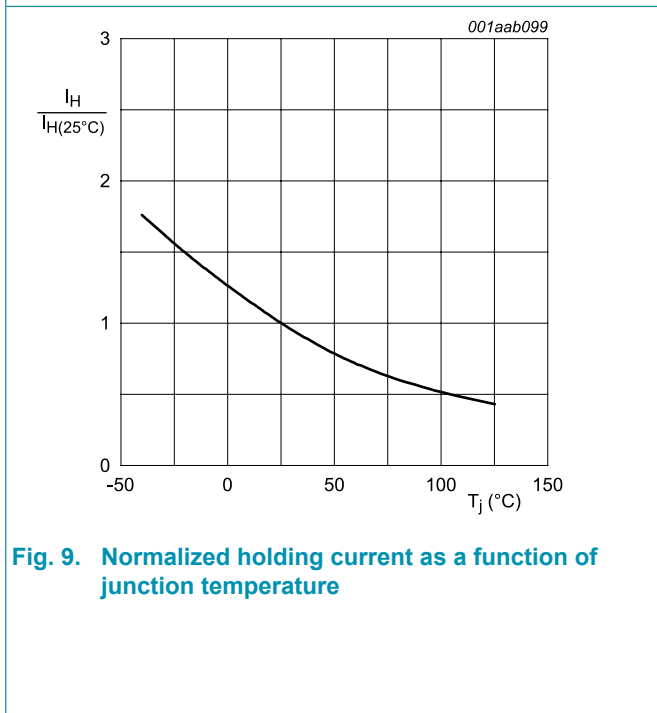
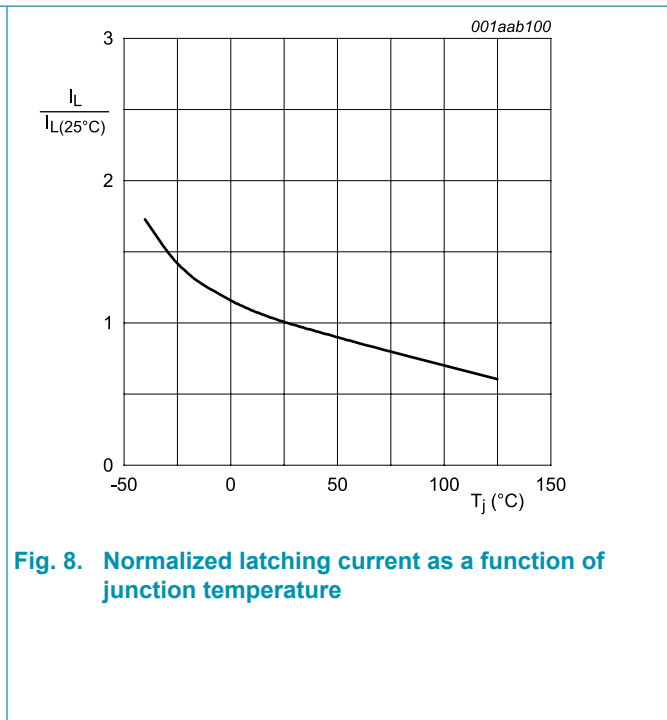
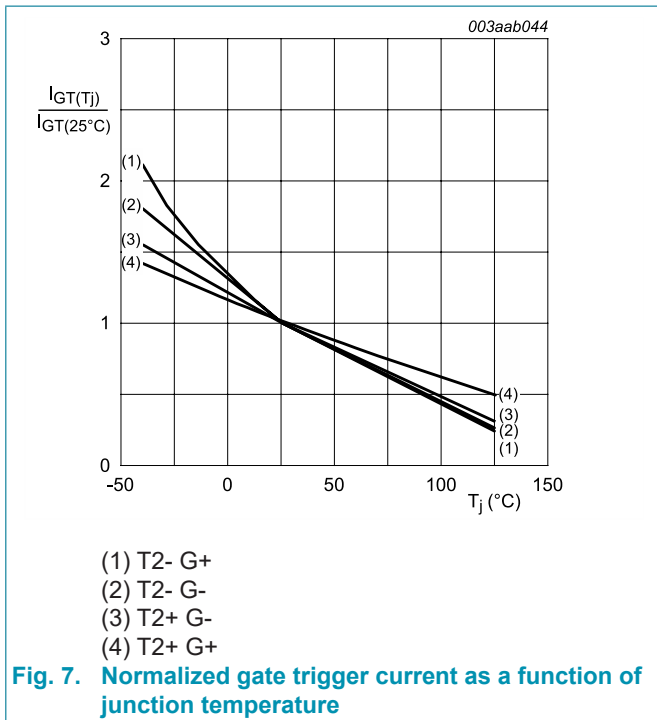
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-lead)}$	thermal resistance from junction to lead	full cycle; Fig 6	-	-	60	K/W
		half cycle; Fig 6	-	-	80	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	printed circuit board mounted: lead length = 4 mm	-	150	-	K/W



## 10. Characteristics

Table 7. 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>	-	-	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>	-	-	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>	-	-	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>	-	-	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>	-	-	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>	-	-	20	mA
		$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; T2- G-; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	-	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>	-	-	10	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 9</a>	-	1.3	10	mA
$V_T$	on-state voltage	$I_T = 1.4\text{ A}$ ; $T_J = 25\text{ °C}$ ; <a href="#">Fig. 10</a>	-	1.2	1.5	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>	-	0.7	1	V
		$V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 125\text{ °C}$	0.2	0.3	-	V
$I_D$	off-state current	$V_D = 600\text{ V}$ ; $T_J = 125\text{ °C}$	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 402\text{ V}$ ; $T_J = 125\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; $R_{GT1(ext)} = 1\text{ k}\Omega$	20	-	-	V/ $\mu$ s
$dV_{com}/dt$	rate of change of commutating voltage	$V_D = 400\text{ V}$ ; $T_J = 125\text{ °C}$ ; $dI_{com}/dt = 0.5\text{ A/ms}$ ; $I_T = 1\text{ A}$ ; gate open circuit	3	-	-	V/ $\mu$ s
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 1.5\text{ A}$ ; $V_D = 600\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$	-	2	-	$\mu$ s





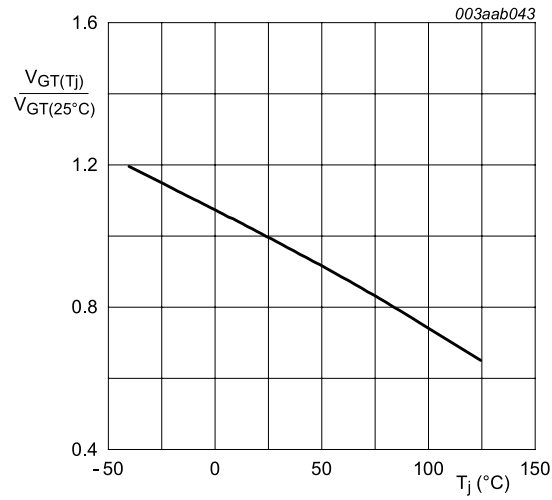
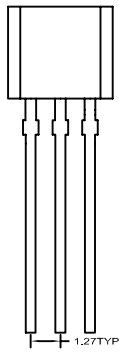


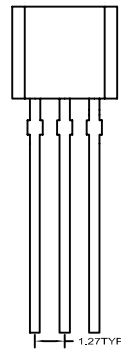
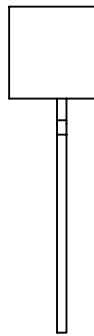
Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

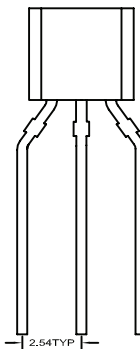
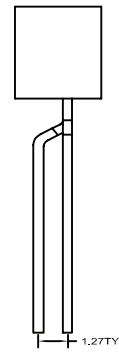
#### SOT54 PACKAGE OUTLINE



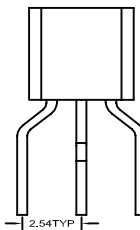
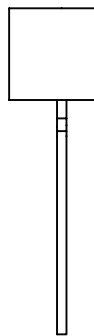
SOT54  
Bulk Pack - 412



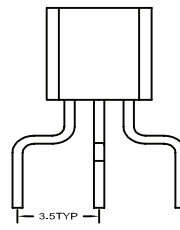
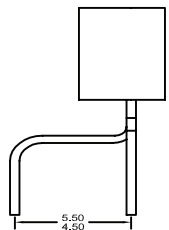
SOT54 LEADS ON CIRCLE  
Bulk Pack - 112



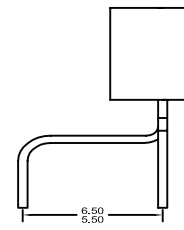
SOT54 WIDE PITCH  
Tape/ Reel Pack - 116  
Ammo Pack - 126



SOT54 LEAD BEND L01  
Bulk Pack - 412



SOT54 LEAD BEND L02  
Bulk Pack - 412



Remark: Detailed dimensions refer to POD drawing.

## 12. 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.
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For sales office addresses, please send an email to: [salesaddresses@ween-semi.com](mailto:salesaddresses@ween-semi.com)

Date of release: 23 December 2019

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