

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 plastic package intended for use in applications requiring high bidirectional blocking voltage capability, high current inrush capability and high thermal cycling performance

## 2. Features and benefits

- High junction operating temperature capability ( $T_{j(max)} = 150\text{ °C}$ )
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- High voltage capacity
- Very high current surge capability

## 3. Applications

- DC Motor control
- Power converter
- Lighting and temperature control
- Softstart AC motor control
- AC power control
- Solid State Relay (SSR)

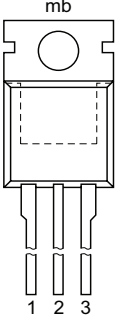

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
$V_{DRM}$	repetitive peak off-state voltage			1200			V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 132\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		47			A
$I_{TSM}$	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>		350			A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$		385			A
$T_j$	junction temperature			150			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>		-	-	50	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 9</a>		-	-	80	mA
$V_T$	on-state voltage	$I_T = 30\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 10</a>		-	-	1.30	V
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 804\text{ V}$ ; $T_j = 150\text{ °C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit		1000	-	-	V/ $\mu$ s

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BT153-1200T	TO220	BT153-1200TQ	Tube	50	SOT78	13-Jun-2008

## 7. Marking

Table 4. Marking codes

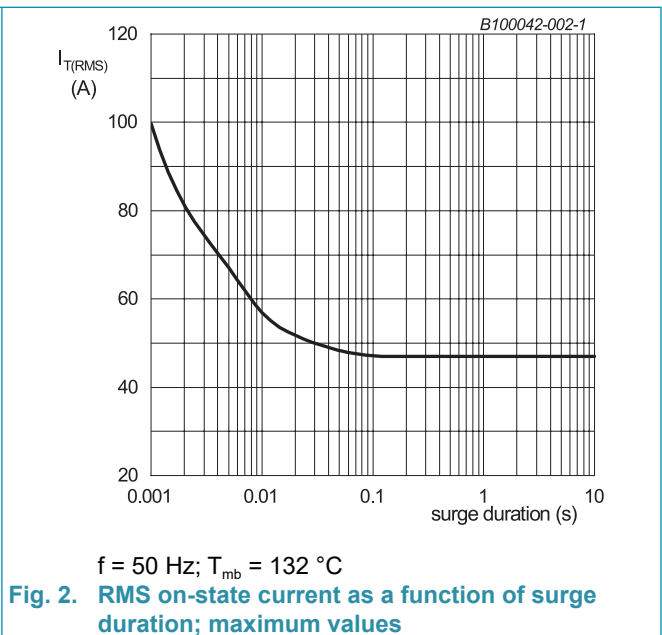
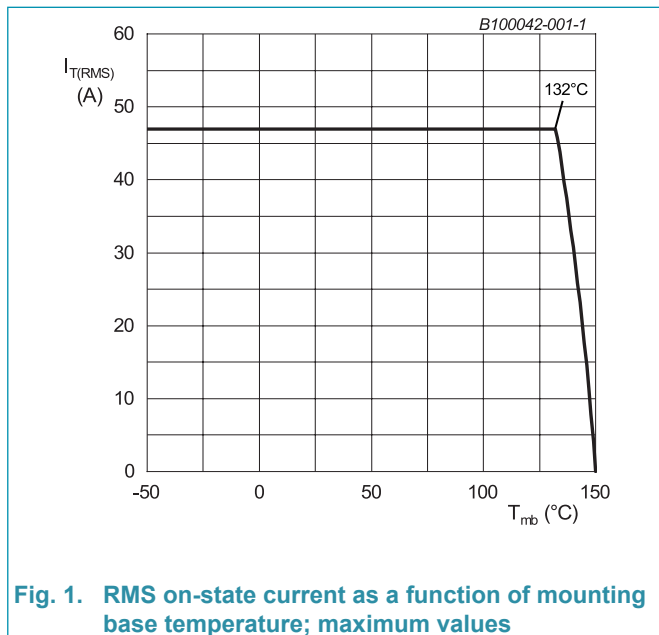
Type number	Marking codes
BT153-1200T	BT153 1200T

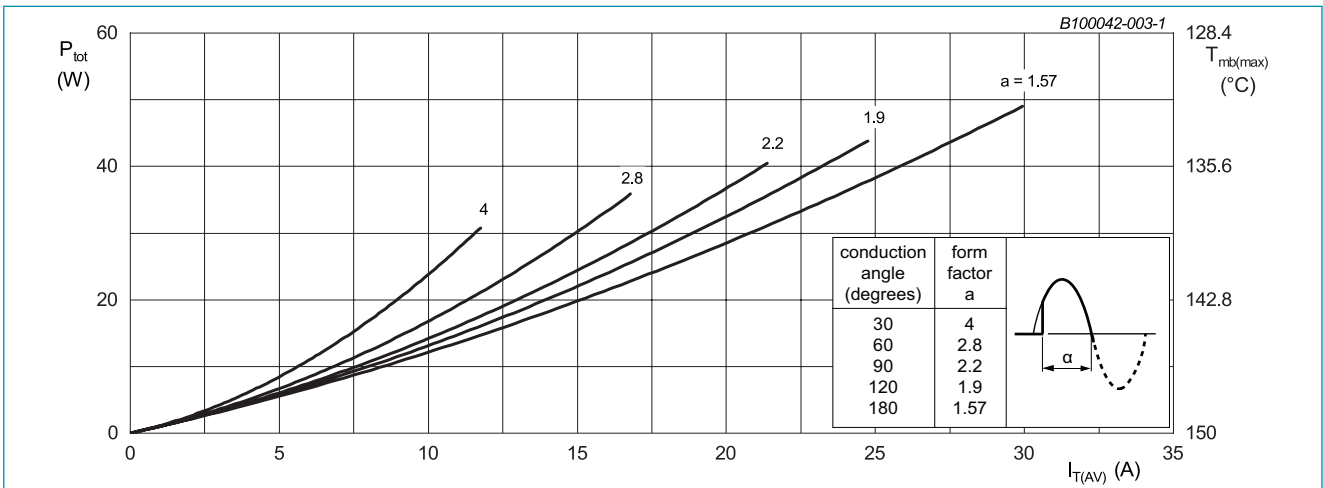
## 8. Limiting values

**Table 5. Limiting values**

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

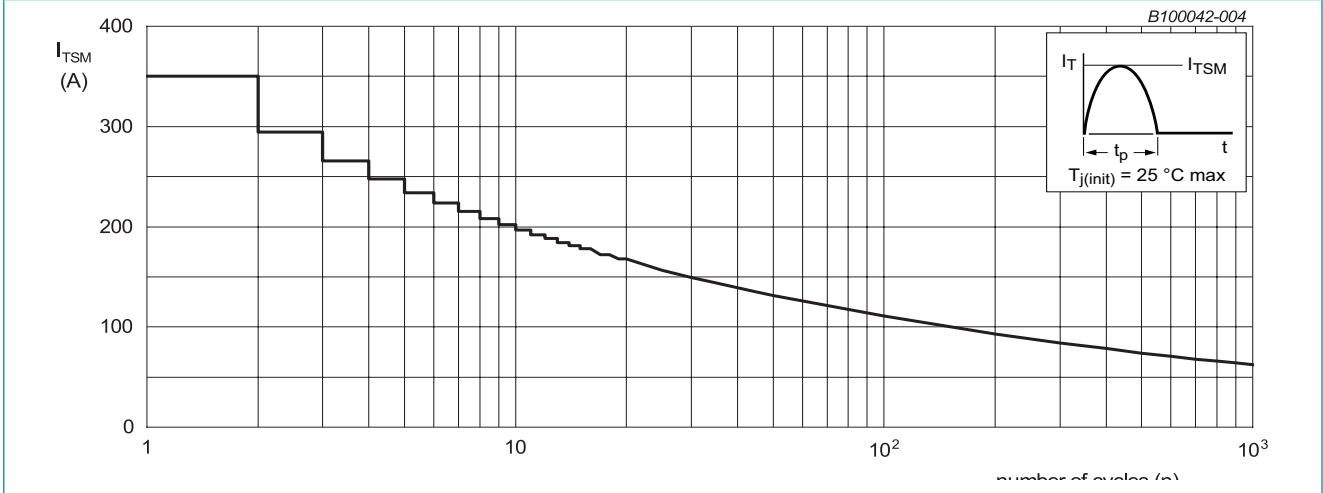
Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{DRM}$	repetitive peak off-state voltage			1200	V
$V_{RRM}$	repetitive peak reverse voltage			1200	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 132\text{ °C}$ ;		30	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 132\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		47	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>		350	A
		half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$		385	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; sine-wave pulse		612.5	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_G = 100\text{ mA}$		150	$A/\mu s$
$I_{GM}$	peak gate current			5	A
$V_{GM}$	peak gate voltage			5	V
$P_{GM}$	peak gate power	$T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 20\text{ }\mu s$		20	W
$P_{G(AV)}$	average gate power	over any 20 ms period		0.5	W
$T_{stg}$	storage temperature			-40 to 150	$^{\circ}C$
$T_j$	junction temperature			150	$^{\circ}C$





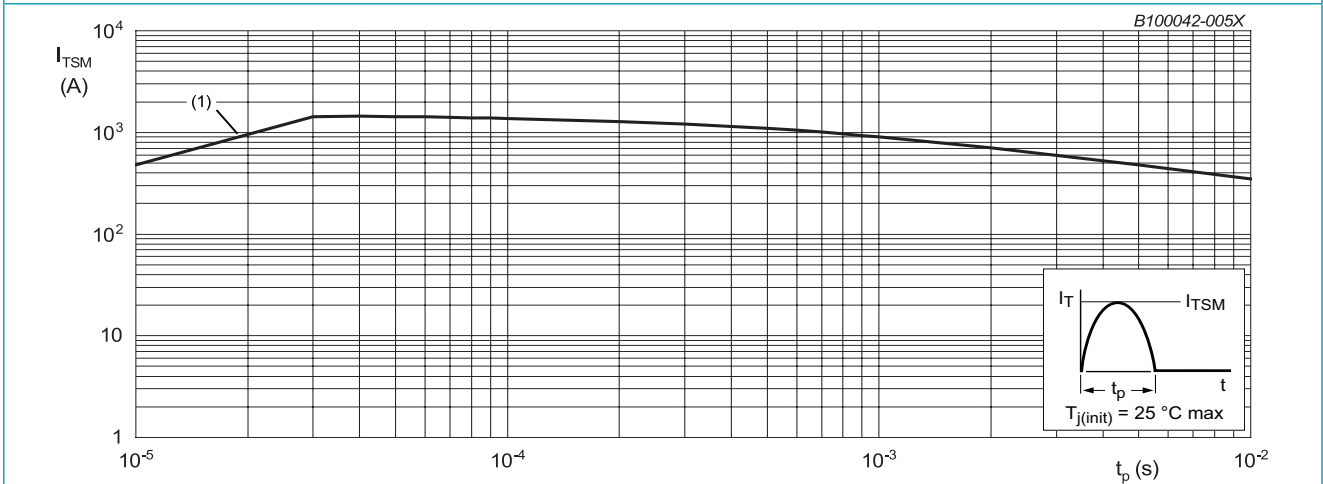
$\alpha$  = conduction angle  
 $a$  = form factor =  $I_{T(RMS)} / I_{T(AV)}$

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



$t_p \leq 10$  ms  
 (1)  $di_T/dt$  limit

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

### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 6</a>		-	-	0.36	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

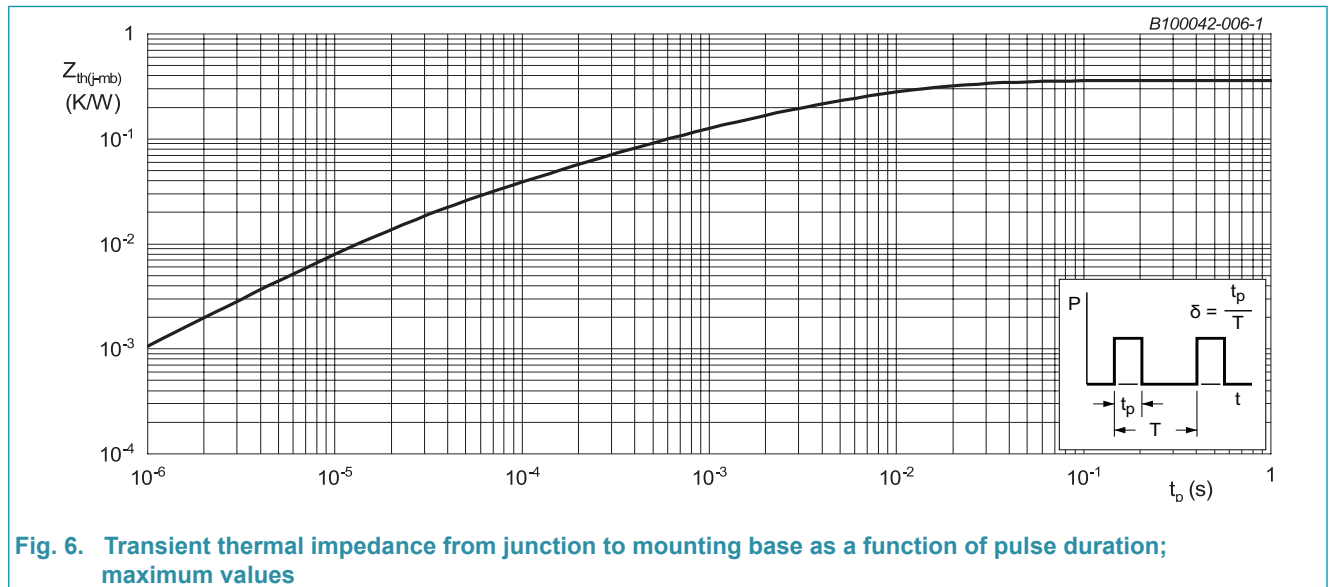


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	-	50	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>		-	-	100	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	80	mA
$V_T$	on-state voltage	$I_T = 30\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	-	1.30	V
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>		-	0.75	1.0	V
		$V_D = 1200\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$		0.20	0.45	-	V
$I_D$	off-state current	$V_D = 1200\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	-	30	$\mu\text{A}$
		$V_D = 1200\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$		-	-	2	mA
$I_R$	reverse current	$V_D = 1200\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	-	30	$\mu\text{A}$
		$V_D = 1200\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$		-	-	2	mA
<b>Dynamic characteristics</b>							
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 804\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); exponential waveform; gate open circuit		1000	-	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 30\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 804\text{ V}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; $I_{TM} = 30\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )		-	70	-	$\mu\text{s}$

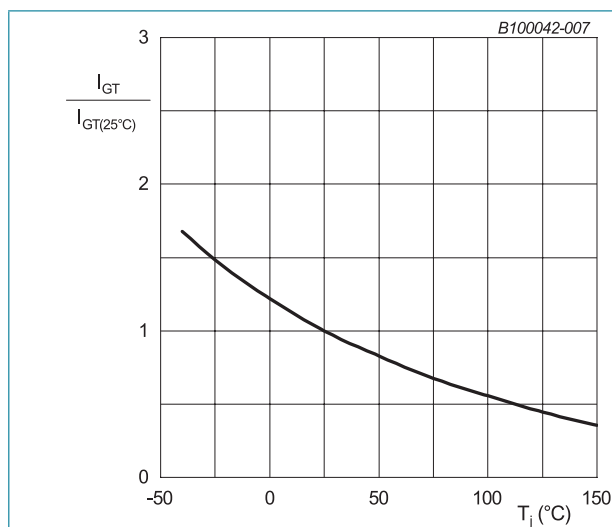


Fig. 7. Normalized gate trigger current as a function of junction temperature

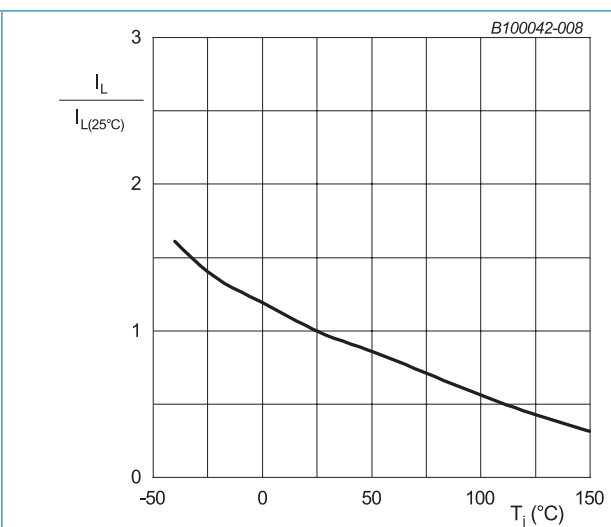


Fig. 8. Normalized latching current as a function of junction temperature

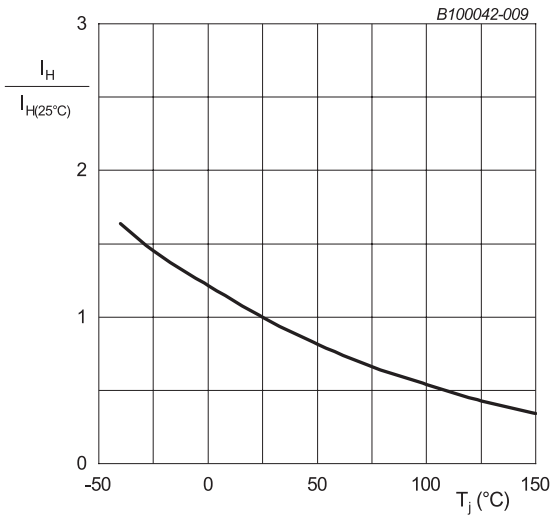
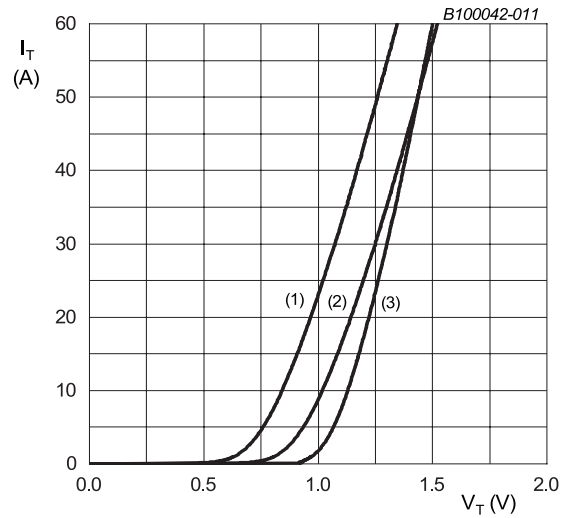


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.002 \text{ V}; R_s = 0.0086 \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values

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

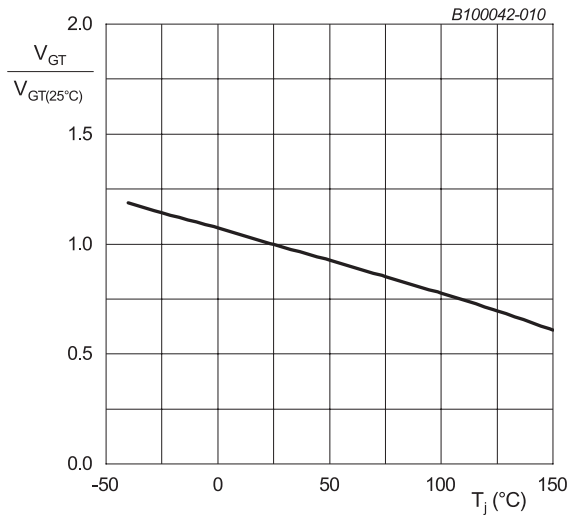
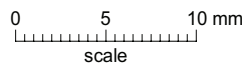
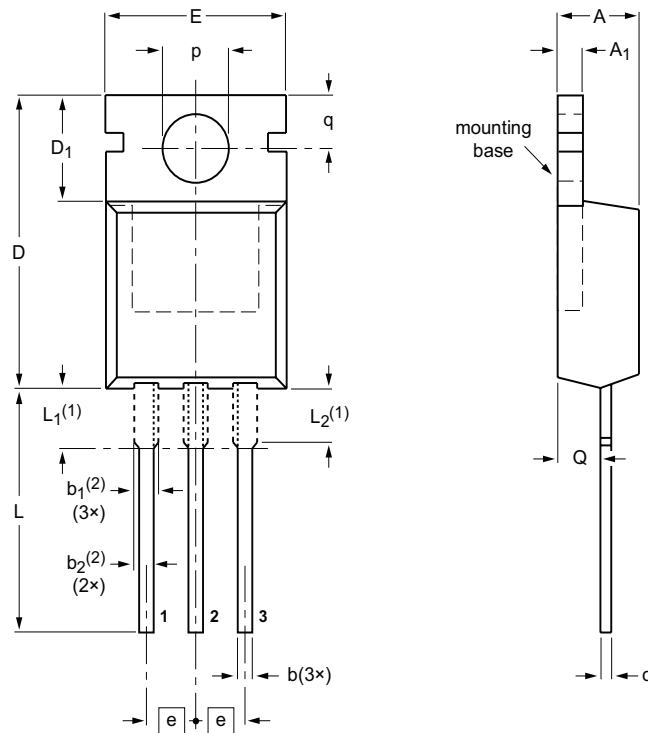


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB

SOT78



**DIMENSIONS** (mm are the original dimensions)

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub> (2)	b <sub>2</sub> (2)	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> (1)	L <sub>2</sub> (1) max.	p	q	Q
mm	4.7 4.1	1.40 1.25	0.9 0.6	1.6 1.0	1.3 1.0	0.7 0.4	16.0 15.2	6.6 5.9	10.3 9.7	2.54	15.0 12.8	3.30 2.79	3.0	3.8 3.5	3.0 2.7	2.6 2.2

**Notes**

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT78		3-lead TO-220AB	SC-46		08-04-23 08-06-13



## 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.
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