

## 1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 (TO-220AB) 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

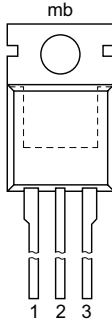

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values	Unit
<b>Absolute maximum rating</b>				
$V_{RRM}$	repetitive peak reverse voltage		1200	V
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 128\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	31	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>	250	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	275	A
$T_j$	junction temperature		150	°C

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	-	35	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	60	mA
$V_T$	on-state voltage	$I_T = 20\text{ A}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	1.15	1.5	V
<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;		1000	-	-	V/ $\mu\text{s}$

## 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	Description	Version
BT152-1200T	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Marking

Table 4. Marking codes

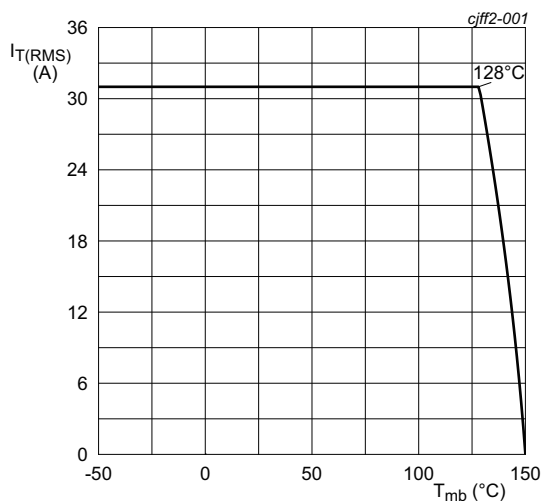
Type number	Marking codes
BT152-1200T	BT152-1200T

## 8. Limiting values

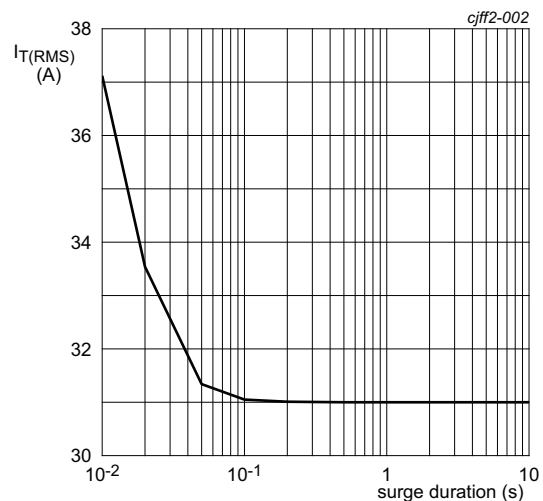
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	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; $T_{mb} \leq 128\text{ °C}$ ;	20	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 128\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	31	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>	250	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	275	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ms}$ ; sine wave	312.5	A <sup>2</sup> s
$dI_T/dt$	rate of rise of on-state current	$I_G = 60\text{mA}$	150	A/ $\mu\text{s}$
$I_{GM}$	peak gate current		5	A
$V_{GM}$	peak gate voltage		5	V
$P_{GM}$	peak gate power		20	W
$P_{G(AV)}$	average gate power	over any 20 ms period	0.5	W
$T_{stg}$	storage temperature		-40 to 150	°C
$T_j$	junction temperature		150	°C

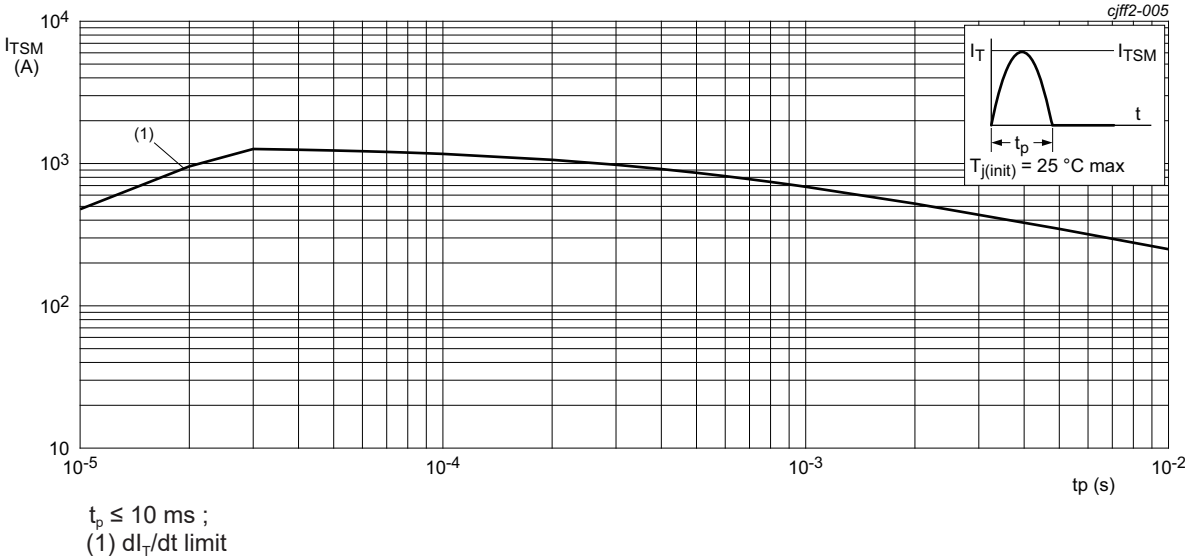
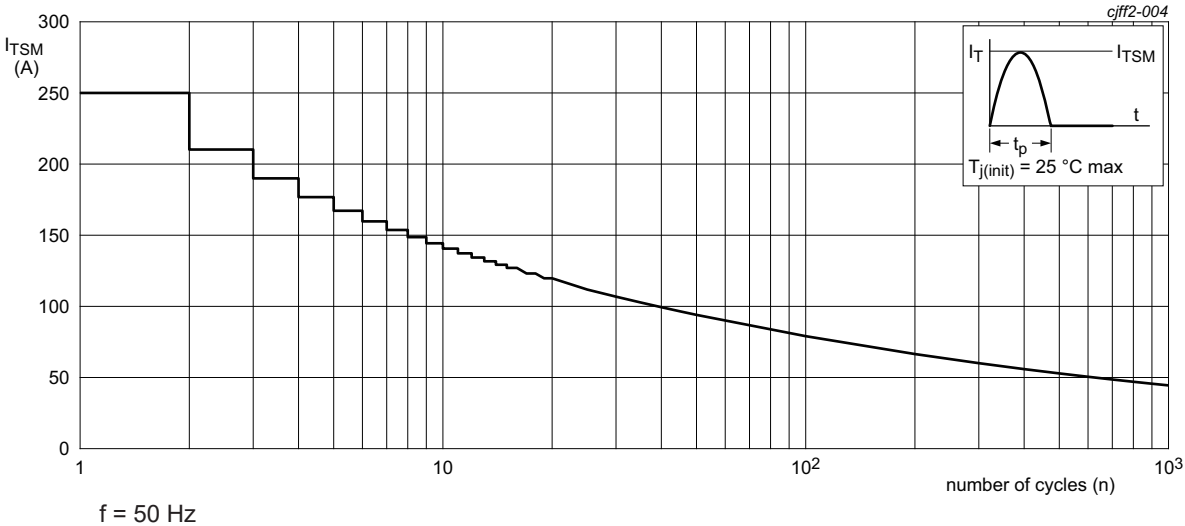
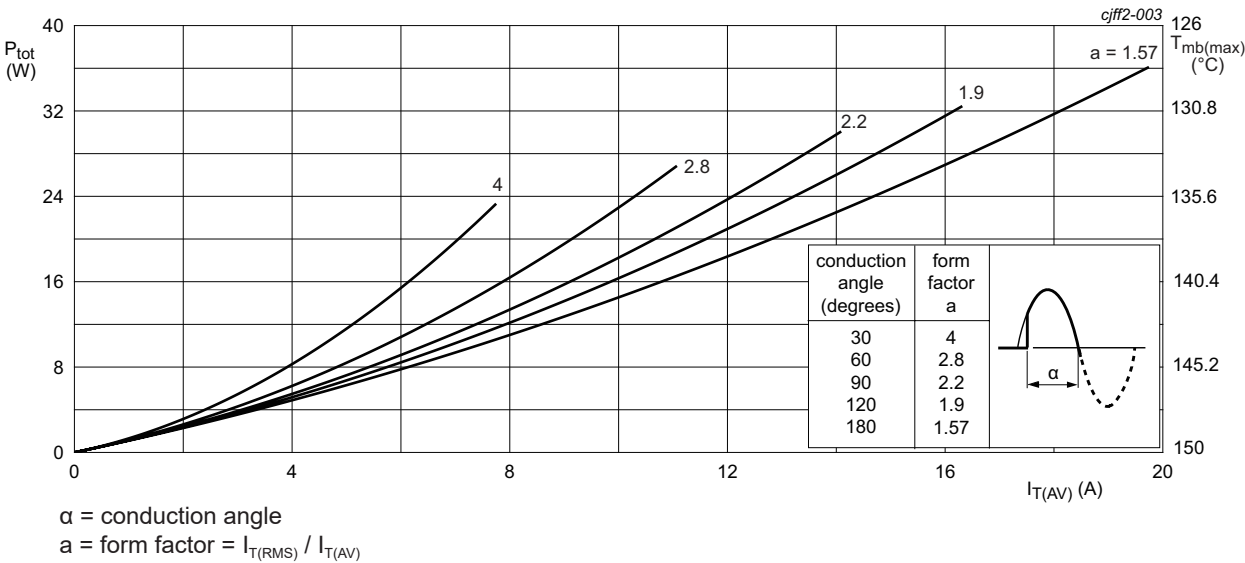


**Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values**



$f = 50\text{ Hz}$ ;  $T_{mb} = 128\text{ °C}$

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



9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 6</a>		-	-	0.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

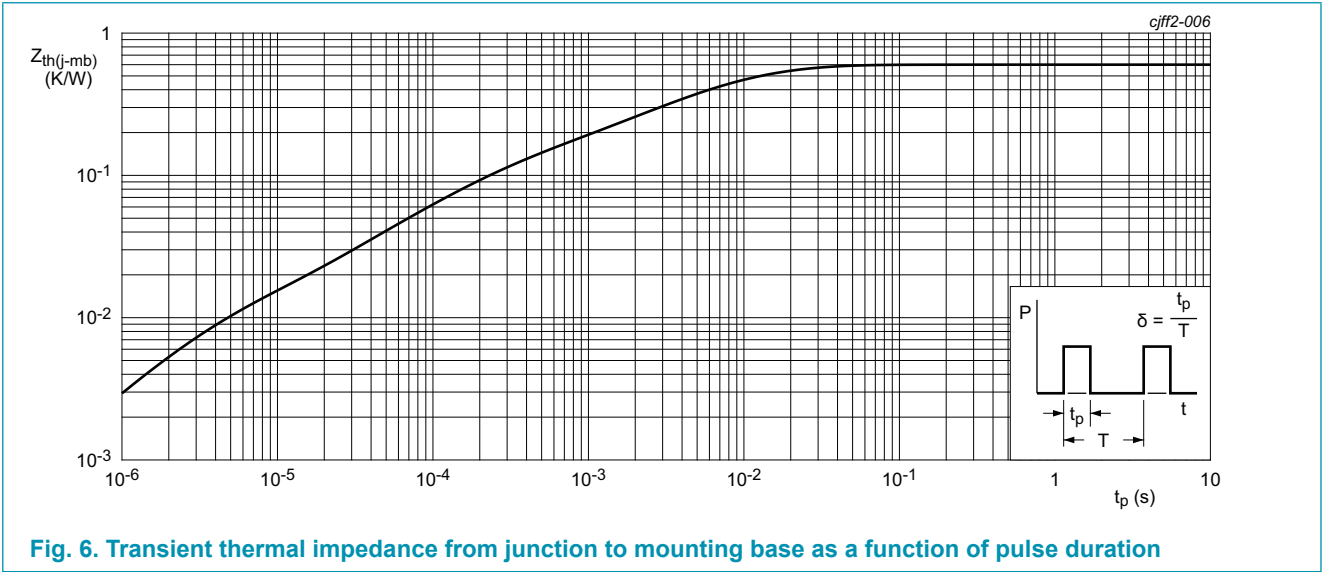


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
<b>Static characteristics</b>							
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	-	35	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 8</a>		-	-	80	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 9</a>		-	-	60	mA
$V_T$	on-state voltage	$I_T = 20\text{ A}$ ; $T_J = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 10</a>		-	1.15	1.5	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>		-	0.7	1	V
		$V_D = 1200\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_J = 150\text{ }^\circ\text{C}$ ; <a href="#">Fig. 11</a>		0.25	0.4	-	V
$I_D$	off-state current	$V_D = 1200\text{ V}$ ; $T_J = 150\text{ }^\circ\text{C}$		-	-	2	mA
$I_R$	reverse current	$V_D = 1200\text{ V}$ ; $T_J = 150\text{ }^\circ\text{C}$		-	-	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		1000	-	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 20\text{ A}$ ; $V_D = 800\text{ V}$ ; $I_G = 100\text{ mA}$ ; $(dI_G/dt)_M = 5\text{ A}/\mu\text{s}$ ; $T_J = 25\text{ }^\circ\text{C}$			2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 804\text{ V}$ ; $T_J = 125\text{ }^\circ\text{C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )			70	-	$\mu\text{s}$

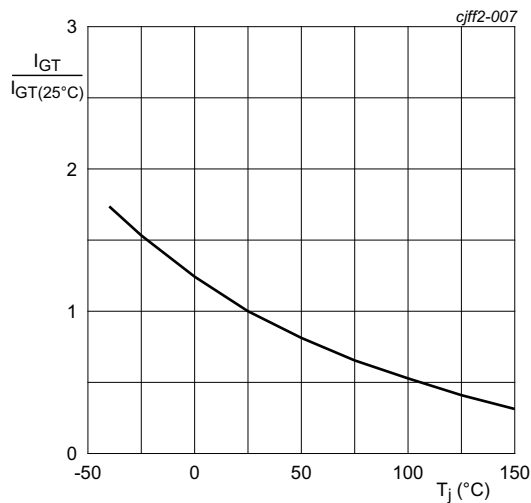


Fig. 7. Normalized gate trigger current as a function of junction temperature

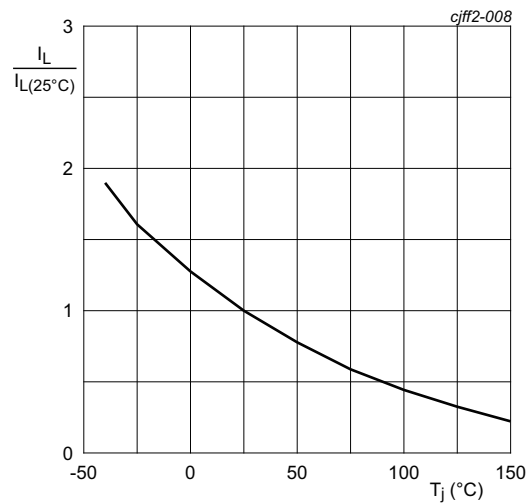


Fig. 8. Normalized latching current as a function of junction temperature

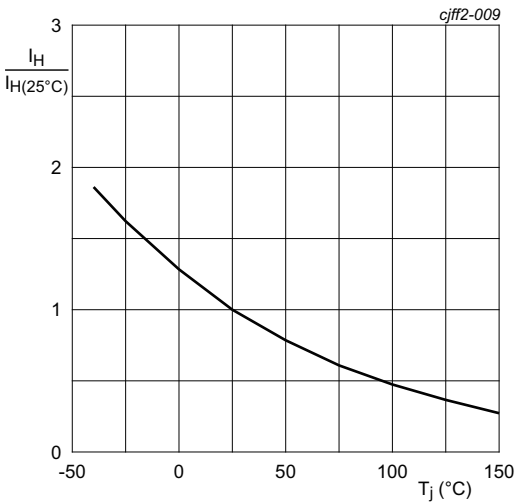
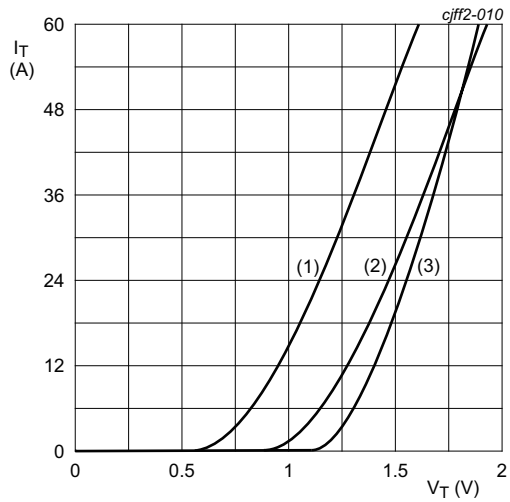


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.067 \text{ V}; R_s = 0.0156 \Omega$   
(1)  $T_j = 150^\circ\text{C}$ ; typical values  
(2)  $T_j = 150^\circ\text{C}$ ; maximum values  
(3)  $T_j = 25^\circ\text{C}$ ; maximum values

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

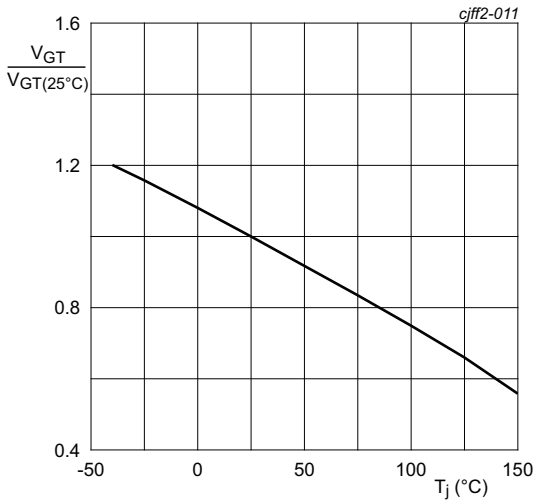
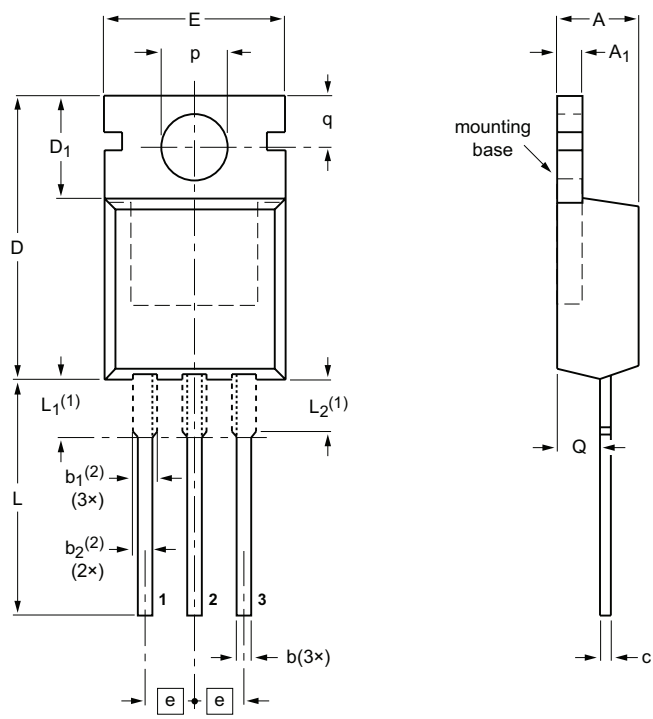


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

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
- Lead shoulder designs may vary.
  - 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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