

# BT151-500RT

SCR

27 July 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT78 (TO-220AB) plastic package intended for use in applications requiring good bidirectional blocking voltage capability, high surge current capability, high junction temperature capability and high thermal cycling performance.

### 1.2 Features and benefits

- Good bidirectional blocking voltage capability
- High junction operating temperature capability
- High surge current capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability

### 1.3 Applications

- Capacitive Discharge Ignition (CDI)
- Crowbar protection
- Inrush protection
- Motor control
- Voltage regulation

### 1.4 Quick reference data

Table 1. Quick reference data

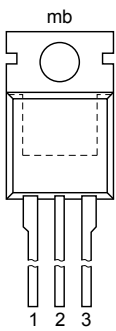

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DRM}$	repetitive peak off-state voltage		-	-	500	V
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	-	132	A
		half sine wave; $T_{j(init)} = 25\text{ °C}$ ; $t_p = 10\text{ ms}$ ; <a href="#">Fig. 4</a> ; <a href="#">Fig. 5</a>	-	-	120	A
$T_j$	junction temperature		-	-	150	°C
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 133\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	12.5	A



Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 6</a>	-	2	15	mA

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p style="text-align: center;">TO-220AB (SOT78)</p>	
2	A	anode		
3	G	gate		
mb	A	mounting base; connected to anode		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT151-500RT	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

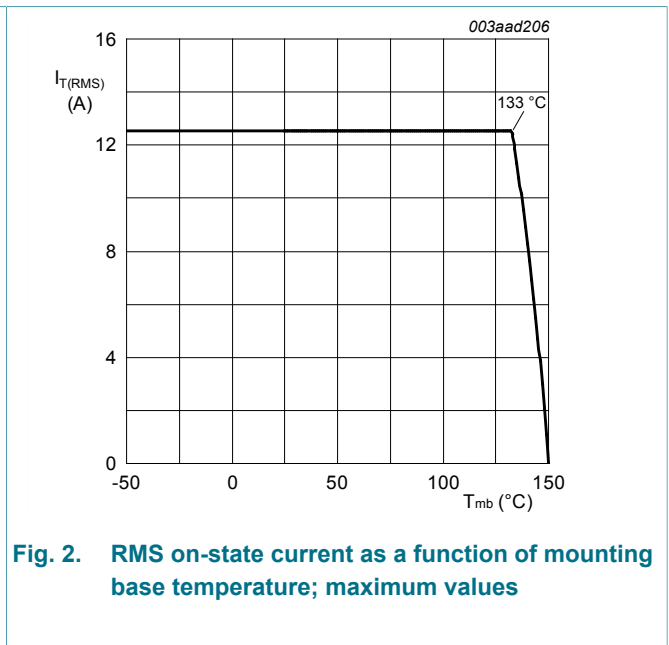
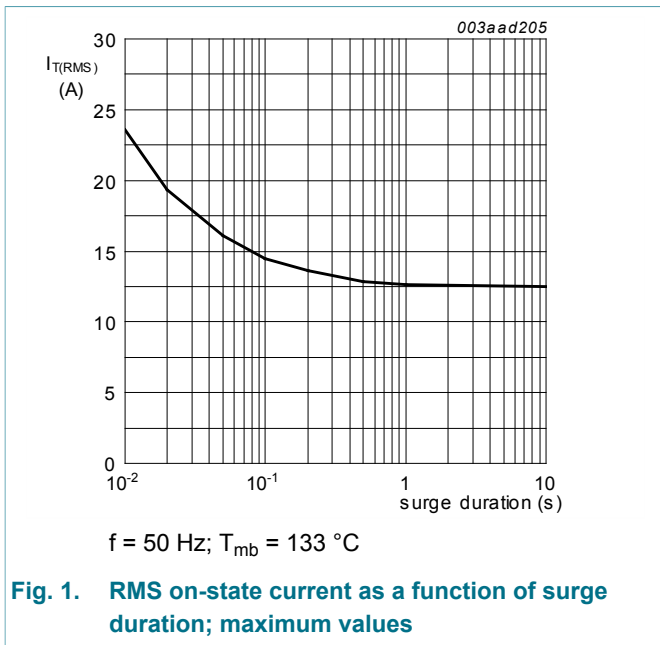
## 4. Limiting values

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		-	500	V
$V_{RRM}$	repetitive peak reverse voltage		-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 133\text{ °C}$	-	8	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 133\text{ °C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	12.5	A
$I_{TSM}$	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ °C}$ ; $t_p = 8.3\text{ ms}$	-	132	A
		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>	-	120	A

Symbol	Parameter	Conditions	Min	Max	Unit
$I^2t$	$I^2t$ for fusing	$t_p = 10$ ms; SIN	-	72	$A^2s$
$di_T/dt$	rate of rise of on-state current	$I_T = 20$ A; $I_G = 50$ mA; $di_G/dt = 50$ mA/ $\mu$ s	-	50	A/ $\mu$ s
$I_{GM}$	peak gate current		-	4	A
$V_{RGM}$	peak reverse gate voltage		-	5	V
$P_{GM}$	peak gate power		-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period	-	1	W
$T_{stg}$	storage temperature		-40	150	$^{\circ}C$
$T_j$	junction temperature		-	150	$^{\circ}C$



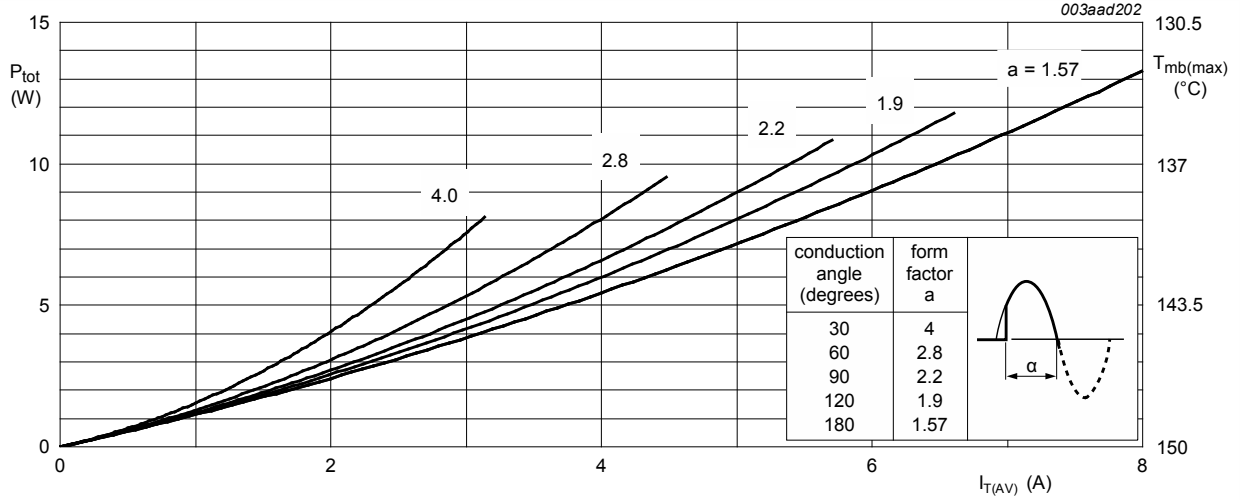
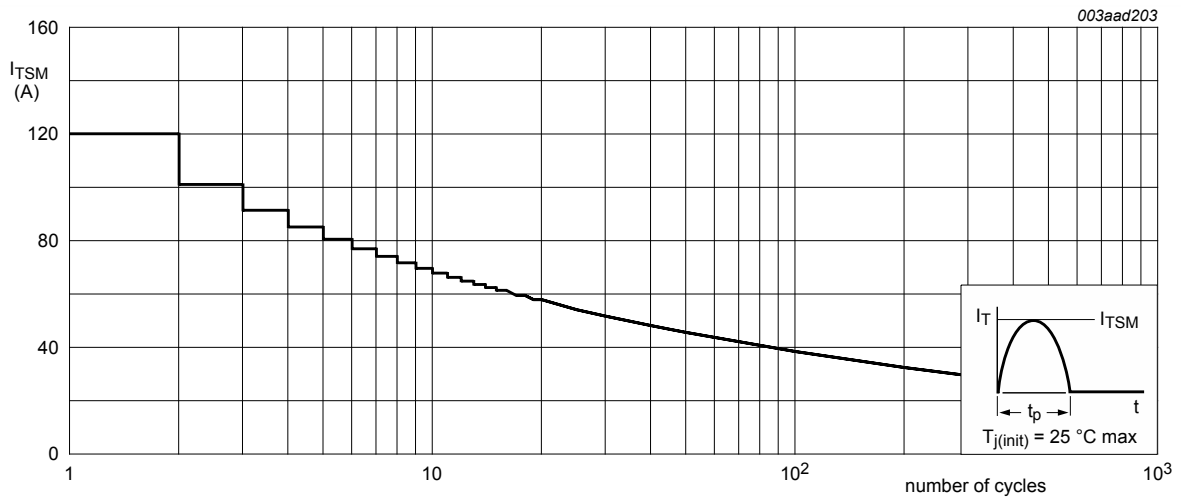
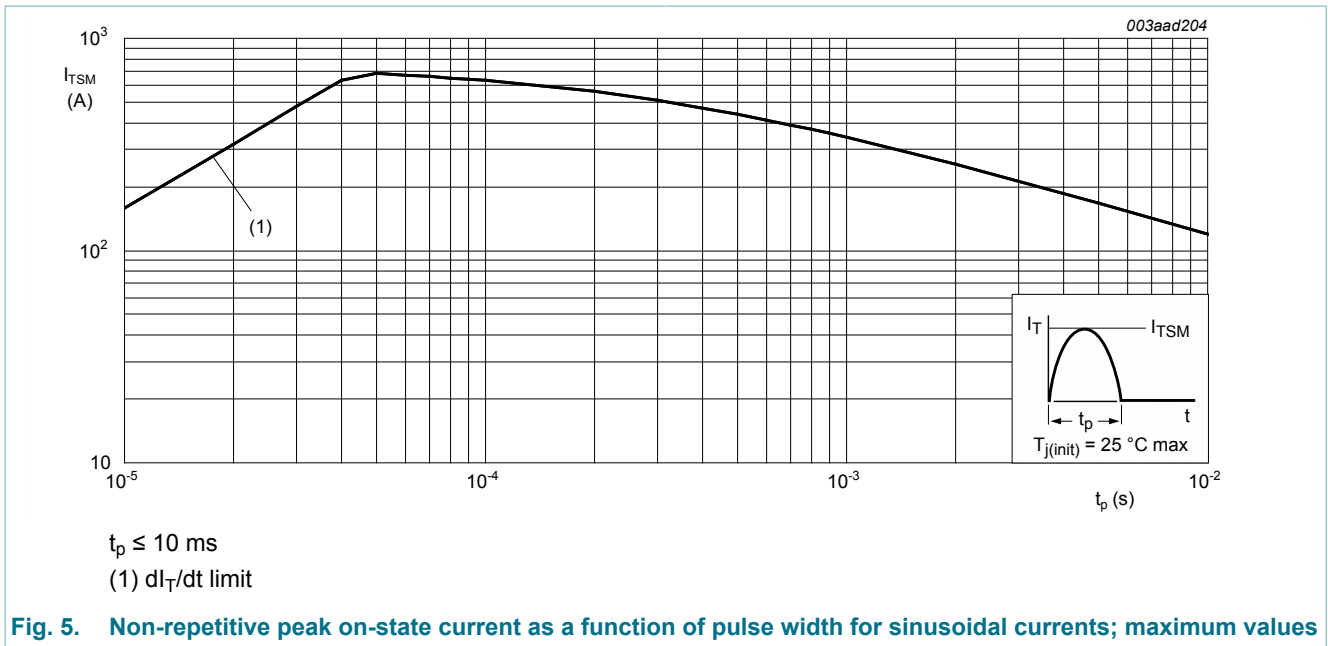


Fig. 3. Total power dissipation as a function of average on-state current; maximum values



f = 50 Hz

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



## 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$I_{GT}$	gate trigger current	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 6</a>	-	2	15	mA
$I_L$	latching current	$V_D = 12\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	10	40	mA
$I_H$	holding current	$V_D = 12\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 8</a>	-	7	20	mA
$V_T$	on-state voltage	$I_T = 23\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 11</a>	-	1.4	1.75	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. 9</a>	-	0.6	1.5	V
		$V_D = 500\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 9</a>	0.25	0.4	-	V
$I_D$	off-state current	$V_D = 500\text{ V}$ ; $T_j = 150\text{ °C}$	-	0.5	2.5	mA
$I_R$	reverse current	$T_j = 125\text{ °C}$ ; $V_R = 500\text{ V}$	-	0.1	0.5	mA
		$T_j = 150\text{ °C}$ ; $V_R = 500\text{ V}$	-	0.1	0.5	mA

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$dV_D/dt$	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ ); gate open circuit; exponential waveform; Fig. 10	-	300	-	V/ $\mu\text{s}$
$t_{gt}$	gate-controlled turn-on time	$I_{TM} = 40\text{ A}$ ; $V_D = 500\text{ V}$ ; $I_G = 0.1\text{ A}$ ; $dI_G/dt = 5\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$	-	2	-	$\mu\text{s}$
$t_q$	commutated turn-off time	$V_{DM} = 335\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; $I_{TM} = 20\text{ A}$ ; $V_R = 25\text{ V}$ ; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$ ; $dV_D/dt = 50\text{ V}/\mu\text{s}$ ; $R_{GK} = 100\text{ }\Omega$ ; ( $V_{DM} = 67\%$ of $V_{DRM}$ )	-	70	-	$\mu\text{s}$

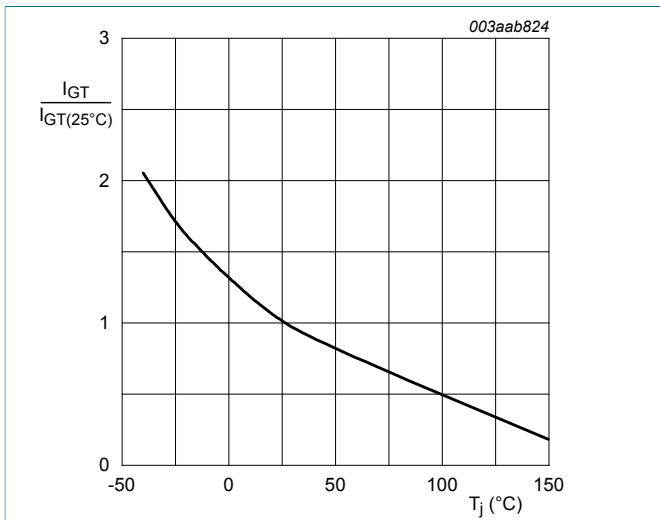


Fig. 6. Normalized gate trigger current as a function of junction temperature

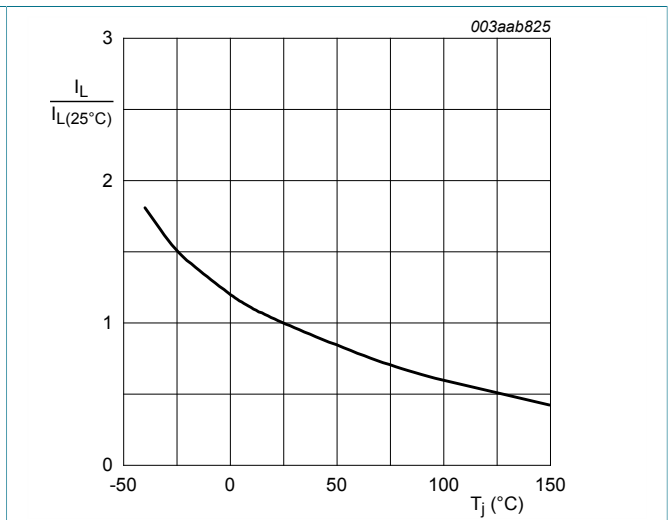


Fig. 7. Normalized latching current as a function of junction temperature

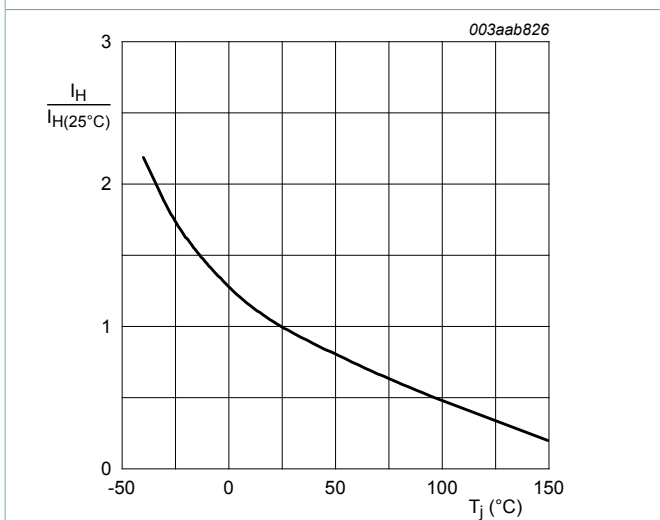


Fig. 8. Normalized holding current as a function of junction temperature

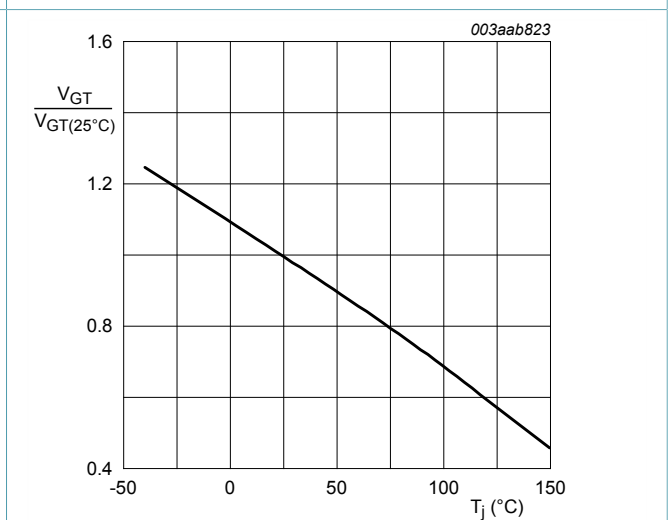
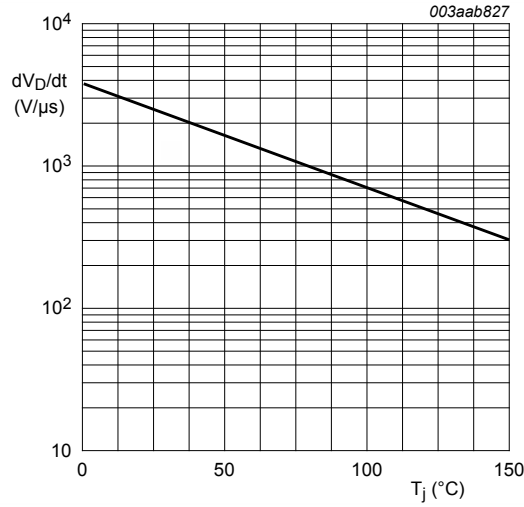
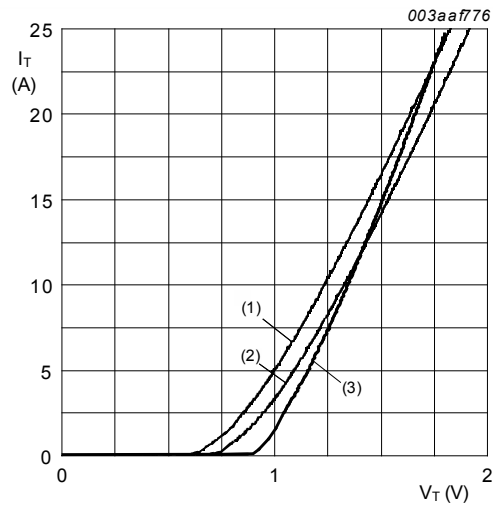


Fig. 9. Normalized gate trigger voltage as a function of junction temperature



gate open circuit

Fig. 10. Critical rate of rise of off-state voltage as a function of junction temperature; typical values



$V_o = 0.825\text{ V}$ ;  $R_s = 0.41\ \Omega$

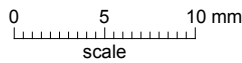
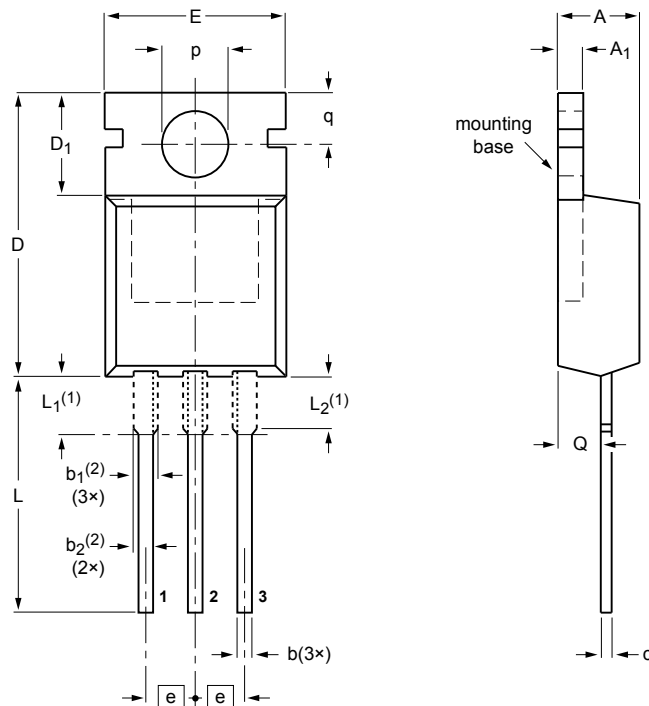
- (1)  $T_j = 150^{\circ}C$ ; typical values
- (2)  $T_j = 150^{\circ}C$ ; maximum values
- (3)  $T_j = 25^{\circ}C$ ; maximum values

Fig. 11. On-state current as a function of on-state voltage

7. 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

Fig. 12. TO-220AB (SOT78)

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