

1. General description

Planar passivated Silicon Controlled Rectifier (SCR) in a TO220 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.

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

3. Applications

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

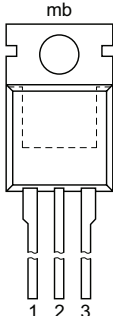
4. Quick reference data

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; $T_{\text{J}(\text{init})} = 25\text{ °C}$; $t_p = 8.3\text{ ms}$	-	-	132	A
		half sine wave; $T_{\text{J}(\text{init})} = 25\text{ °C}$; $t_p = 10\text{ ms}$; Fig. 4 ; Fig. 5	-	-	120	A
T_{J}	junction temperature		-	-	150	°C
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 133\text{ °C}$	-	-	8	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 133\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	12.5	A
Static characteristics						
I_{GT}	gate trigger current	$V_{\text{D}} = 12\text{ V}$; $I_{\text{T}} = 0.1\text{ A}$; $T_{\text{J}} = 25\text{ °C}$; Fig. 7	-	2	15	mA
Dynamic characteristics						
dV_{D}/dt	rate of rise of off-state voltage	$V_{\text{DM}} = 335\text{ V}$; $T_{\text{J}} = 150\text{ °C}$; ($V_{\text{DM}} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 12	-	300	-	V/ μs

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
BT151-500RT	TO220	BT151-500RT,127	Tube	50	SOT78	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: d	Assembly factory: A
BT151-500RT	BT151 500RT PJdxxxx xx	BT151 500RT PJAxxxx xx

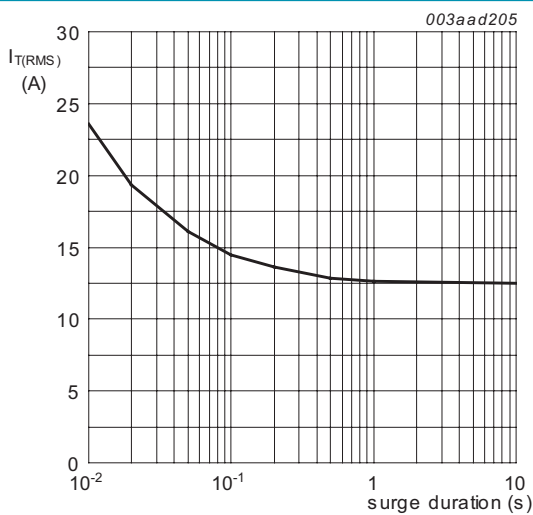
8. Limiting values

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			-	500	V
V_{RRM}	repetitive peak reverse voltage			-	500	V
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 133\text{ }^{\circ}\text{C}$		-	8	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 133\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3		-	12.5	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 8.3\text{ ms}$		-	132	A
		half sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_{\text{p}} = 10\text{ ms}$; Fig. 4 ; Fig. 5		-	120	A
I^2t	I^2t for fusing	$t_{\text{p}} = 10\text{ ms}$; sine-wave pulse		-	72	A^2s
di_{T}/dt	rate of rise of on-state current	$I_{\text{G}} = 30\text{ mA}$		-	50	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current			-	4	A
V_{RGM}	peak reverse gate voltage			-	5	V
P_{GM}	peak gate power			-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		-	1	W
T_{stg}	storage temperature			-40	150	$^{\circ}\text{C}$
T_{j}	junction temperature		[1]	-	150	$^{\circ}\text{C}$

[1] Operation above $110\text{ }^{\circ}\text{C}$ may require the use of a gate to cathode resistor of $1\text{ k}\Omega$ or less.



$f = 50\text{ Hz}$; $T_{\text{mb}} = 133\text{ }^{\circ}\text{C}$

Fig. 1. RMS on-state current as a function of surge duration; maximum values

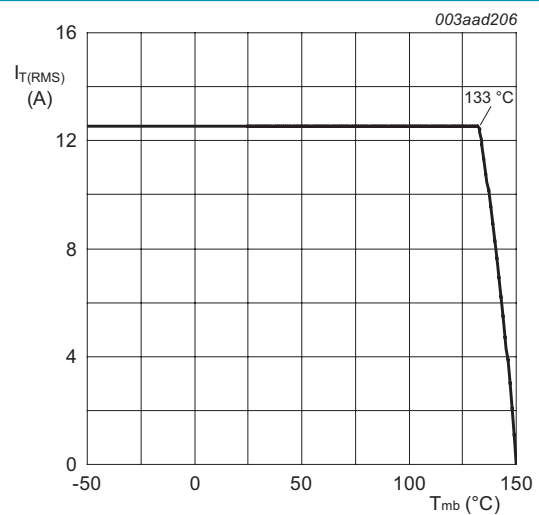
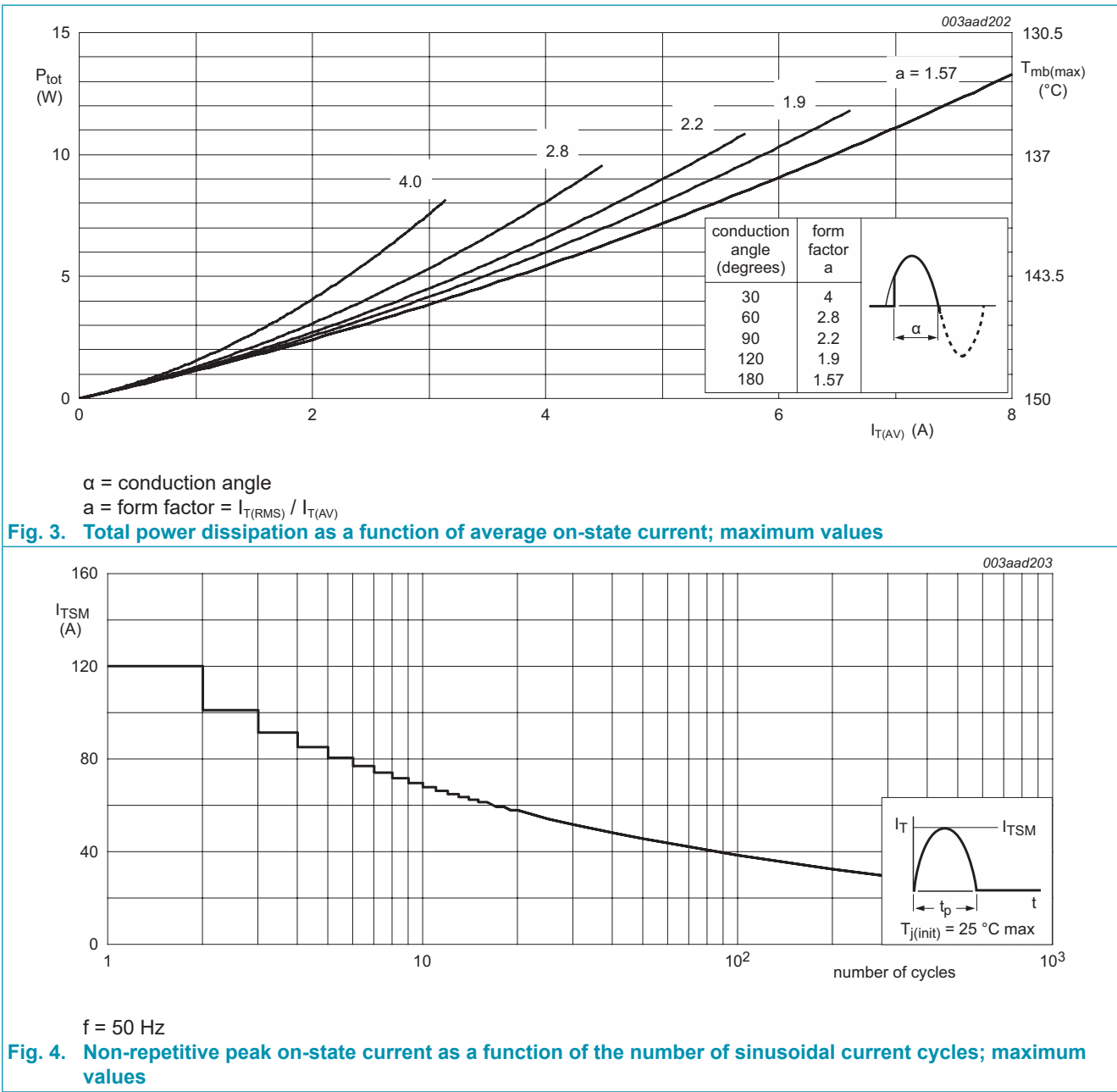
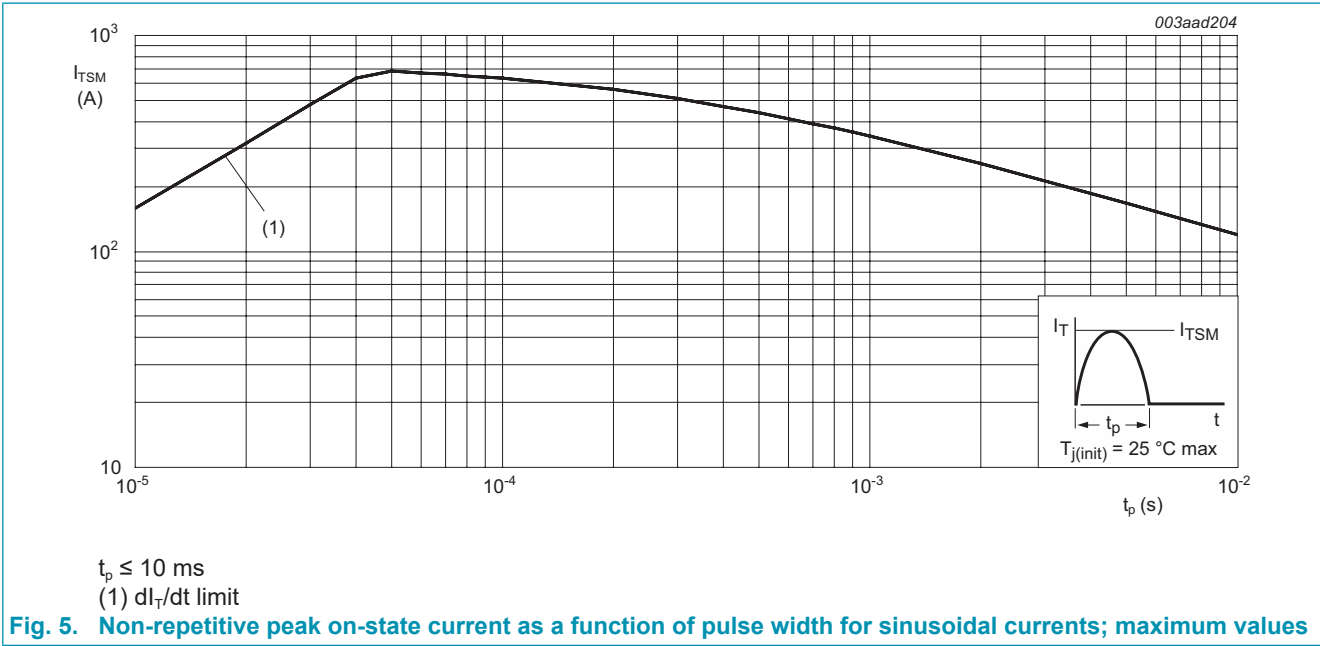


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values





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	Fig. 6		-	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

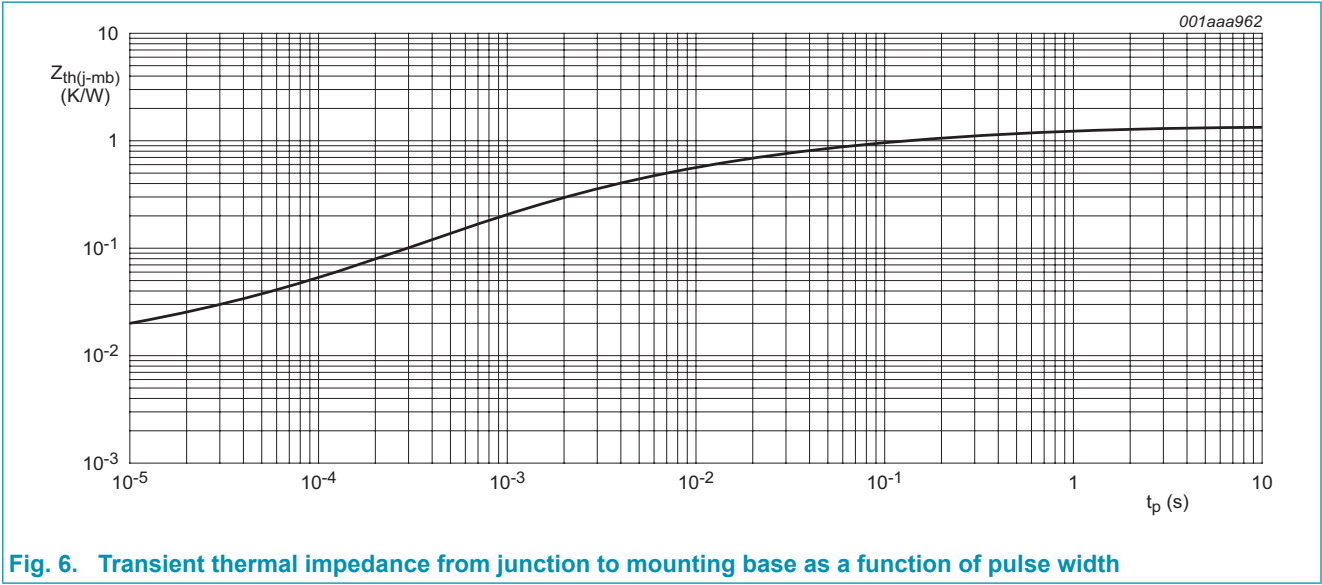


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 7		-	2	15	mA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 8		-	10	40	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 9		-	7	20	mA
V_T	on-state voltage	$I_T = 23\text{ A}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 10		-	1.4	1.75	V
V_{GT}	gate trigger voltage	$V_D = 12\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 11		-	0.6	1	V
		$V_D = 500\text{ V}$; $I_T = 0.1\text{ A}$; $T_J = 150\text{ }^\circ\text{C}$		0.25	0.4	-	V
I_D	off-state current	$V_D = 500\text{ V}$; $T_J = 150\text{ }^\circ\text{C}$		-	0.5	2.5	mA
I_R	reverse current	$V_R = 500\text{ V}$; $T_J = 150\text{ }^\circ\text{C}$		-	0.5	2.5	mA
Dynamic characteristics							
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}); exponential waveform; gate open circuit; Fig. 12		-	300	-	V/ μs
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	-	μs
t_q	commutated turn-off time	$V_{DM} = 335\text{ V}$; $T_J = 150\text{ }^\circ\text{C}$; $I_{TM} = 20\text{ A}$; $V_R = 25\text{ V}$; $(dI_T/dt)_M = 30\text{ A}/\mu\text{s}$; $dV_D/dt = 50\text{ V}/\mu\text{s}$; $R_{GK(ext)} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM})		-	70	-	μs

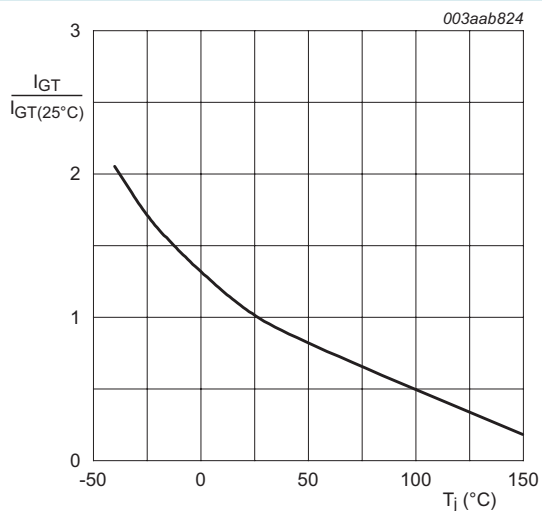


Fig. 7. Normalized gate trigger current as a function of junction temperature

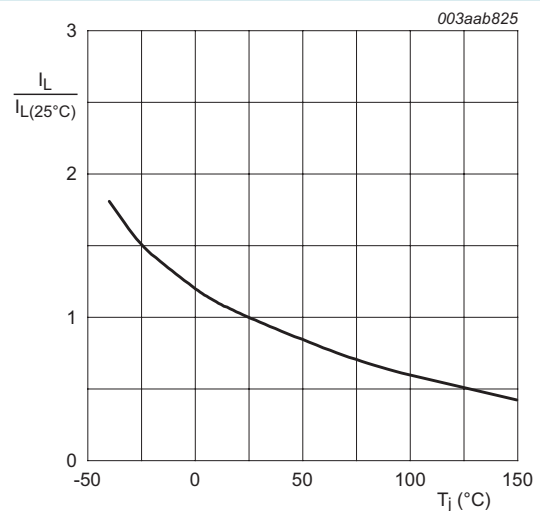


Fig. 8. Normalized latching current as a function of junction temperature

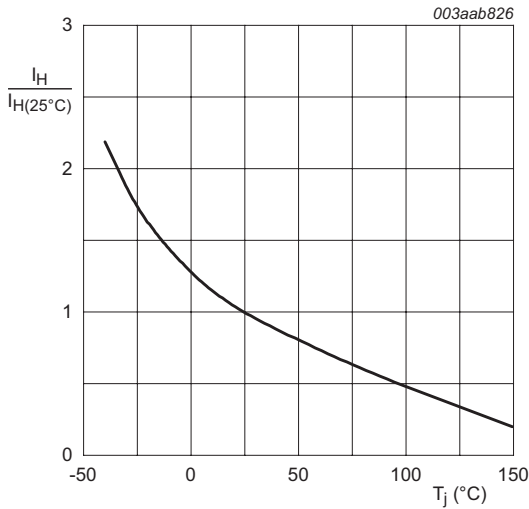
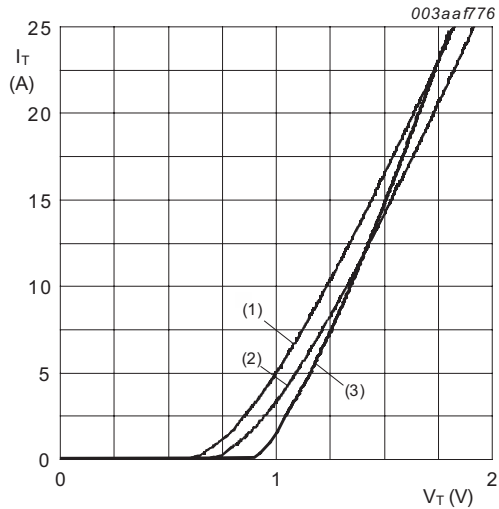


Fig. 9. Normalized holding current as a function of junction temperature



$V_0 = 0.825\text{ V}$; $R_s = 0.41\ \Omega$
(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

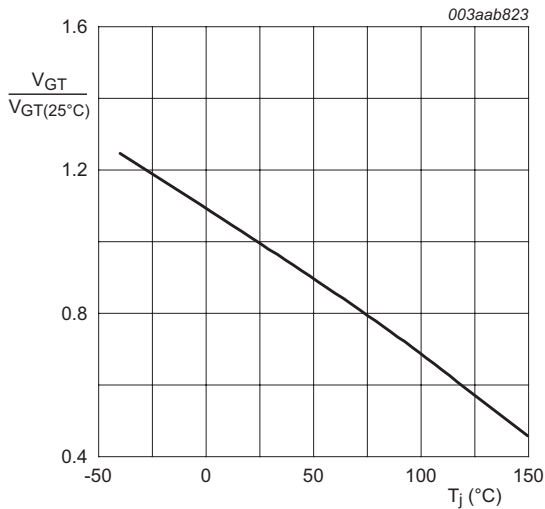
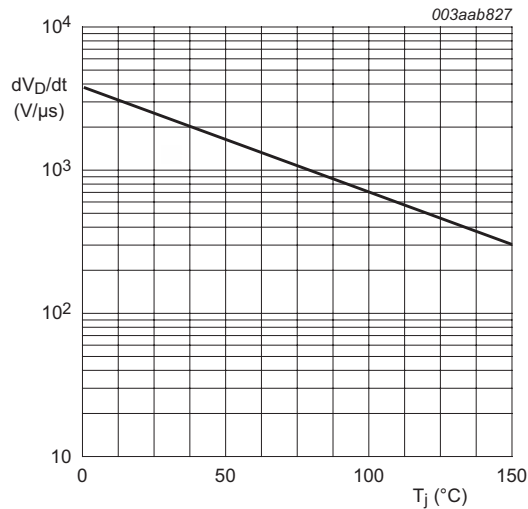


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



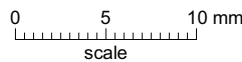
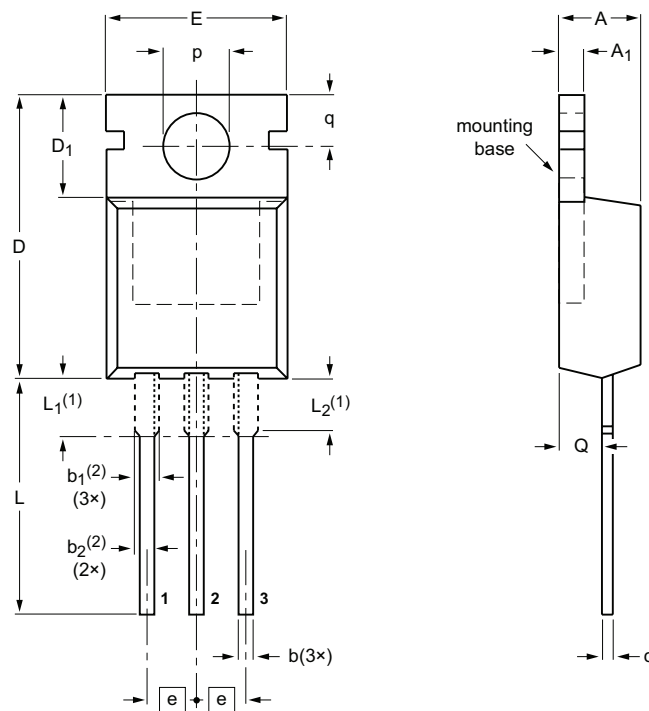
gate open circuit
Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

11. Package outline

Assembly factory: d & A

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

SOT78

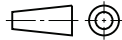


DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁ (2)	b ₂ (2)	c	D	D ₁	E	e	L	L ₁ (1)	L ₂ (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.
Product [short] data sheet	Production	This document contains the product specification.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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13. Contents

1. General description..... 1

2. Features and benefits 1

3. Applications 1

4. Quick reference data..... 1

5. Pinning information..... 2

6. Ordering information..... 2

7. Marking..... 2

8. Limiting values 3

9. Thermal characteristics 6

10. Characteristics..... 7

11. Package outline 9

12. Legal information 10

13. Contents..... 12

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For sales office addresses, please send an email to: salesaddresses@ween-semi.com

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