

1. General description

Planar passivated SCR with sensitive gate in a TO220 plastic package. This device is intended to be interfaced directly to microcontrollers, logic integrated circuits and other low power gate trigger circuits.

2. Features and benefits

- Sensitive gate
- Planar passivated for voltage ruggedness and reliability
- Direct triggering from low power drivers and logic ICs

3. Applications

- General purpose switching
- Protection Circuits

4. Quick reference data

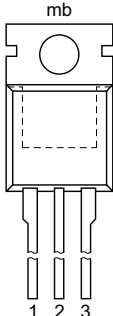
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	500	V
$I_{\text{T(AV)}}$	average on-state current	half sine wave; $T_{\text{mb}} \leq 113\text{ °C}$; Fig. 1		-	-	2.5	A
$I_{\text{T(RMS)}}$	RMS on-state current	half sine wave; $T_{\text{mb}} \leq 113\text{ °C}$; Fig. 2 ; Fig. 3		-	-	4	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{\text{J(init)}} = 25\text{ °C}$; $t_{\text{p}} = 10\text{ ms}$; Fig. 4 ; Fig. 5		-	-	35	A
		half sine wave; $T_{\text{J(init)}} = 25\text{ °C}$; $t_{\text{p}} = 8.3\text{ ms}$		-	-	38	A
T_{J}	junction temperature		[1]	-	-	125	°C
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		-	15	200	μA
Dynamic characteristics							
dV_{D}/dt	rate of rise of off-state voltage	$V_{\text{DM}} = 335\text{ V}$; $T_{\text{J}} = 125\text{ °C}$; $R_{\text{GK}} = 100\text{ } \Omega$; ($V_{\text{DM}} = 67\%$ of V_{DRM}); exponential waveform; Fig. 12		-	50	-	V/μs

[1] Operation above 110°C may require the use of a gate to cathode resistor of 1kΩ or less.

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
BT150-500R	TO220	BT150-500R,127	Tube	50	SOT78	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: d	Assembly factory: A
BT150-500R	BT150 500R PJdxxxx xx	BT150 500R PJAxxxx xx

8. Limiting values

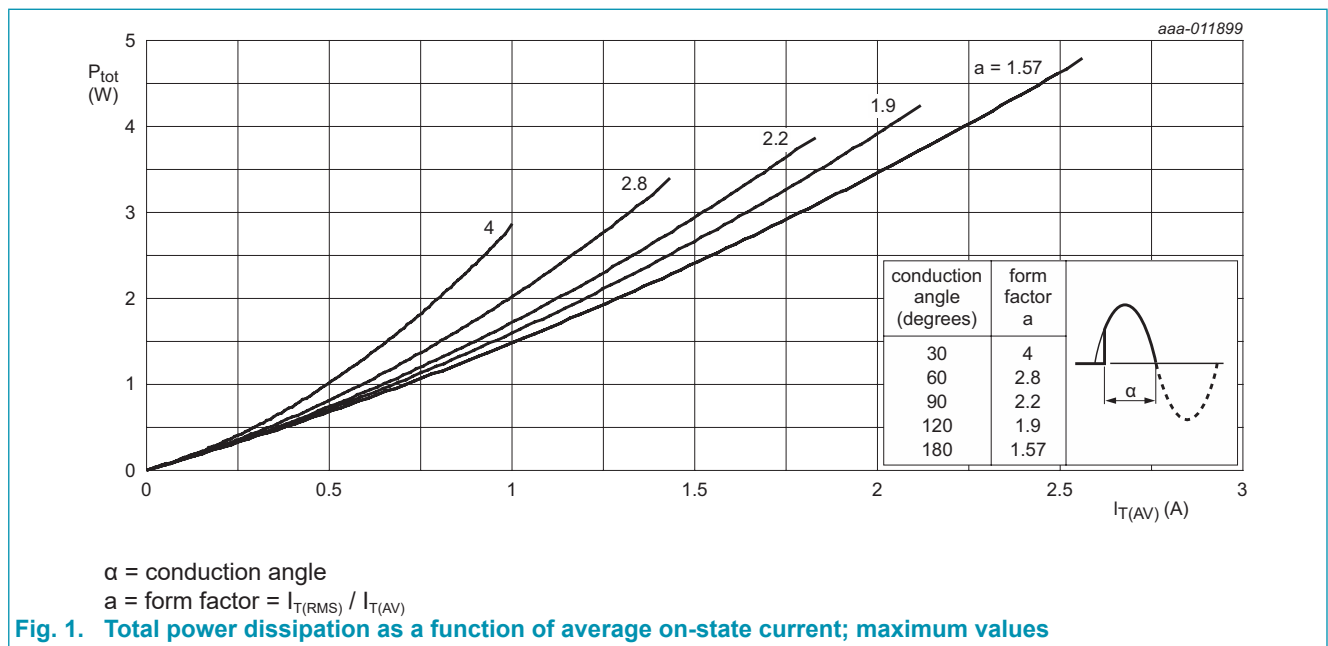
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{DRM}	repetitive peak off-state voltage		[1]	-	500	V
V_{RRM}	repetitive peak reverse voltage			-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 113\text{ }^{\circ}\text{C}$; Fig. 1		-	2.5	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_{mb} \leq 113\text{ }^{\circ}\text{C}$; Fig. 2; Fig. 3		-	4	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 10\text{ ms}$; Fig. 4; Fig. 5		-	35	A
		half sine wave; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 8.3\text{ ms}$		-	38	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN		-	6.1	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 50\text{ mA}$		-	50	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current			-	2	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		-	0.5	W
T_{stg}	storage temperature			-40	150	$^{\circ}\text{C}$
T_j	junction temperature		[2]	-	125	$^{\circ}\text{C}$

[1] Although not recommended, off-state voltages up to 800V may be applied without damage, but the thyristor may switch to the on-state. The rate of rise of current should not exceed 15 A/ μs .

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



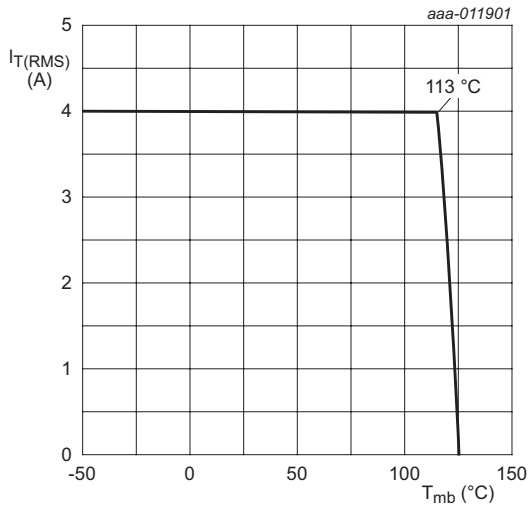


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values

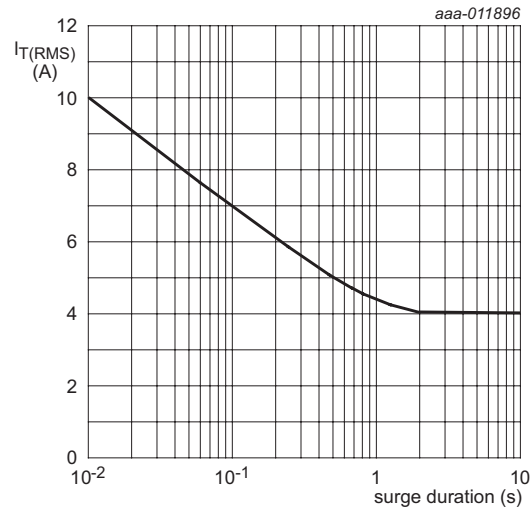


Fig. 3. RMS on-state current as a function of surge duration; maximum values
 $f = 50 \text{ Hz}$; $T_{mb} = 113 \text{ °C}$

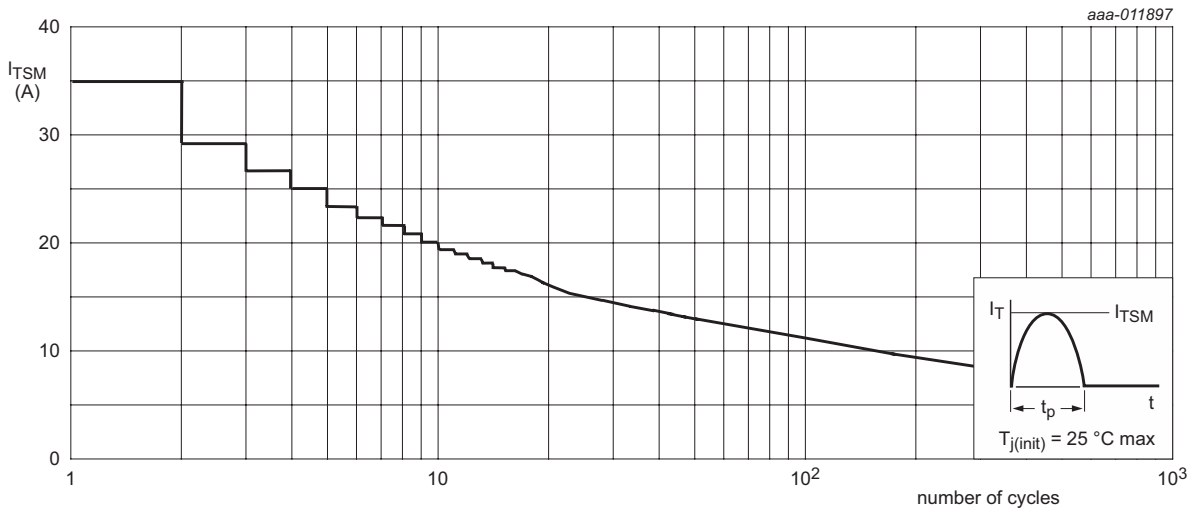
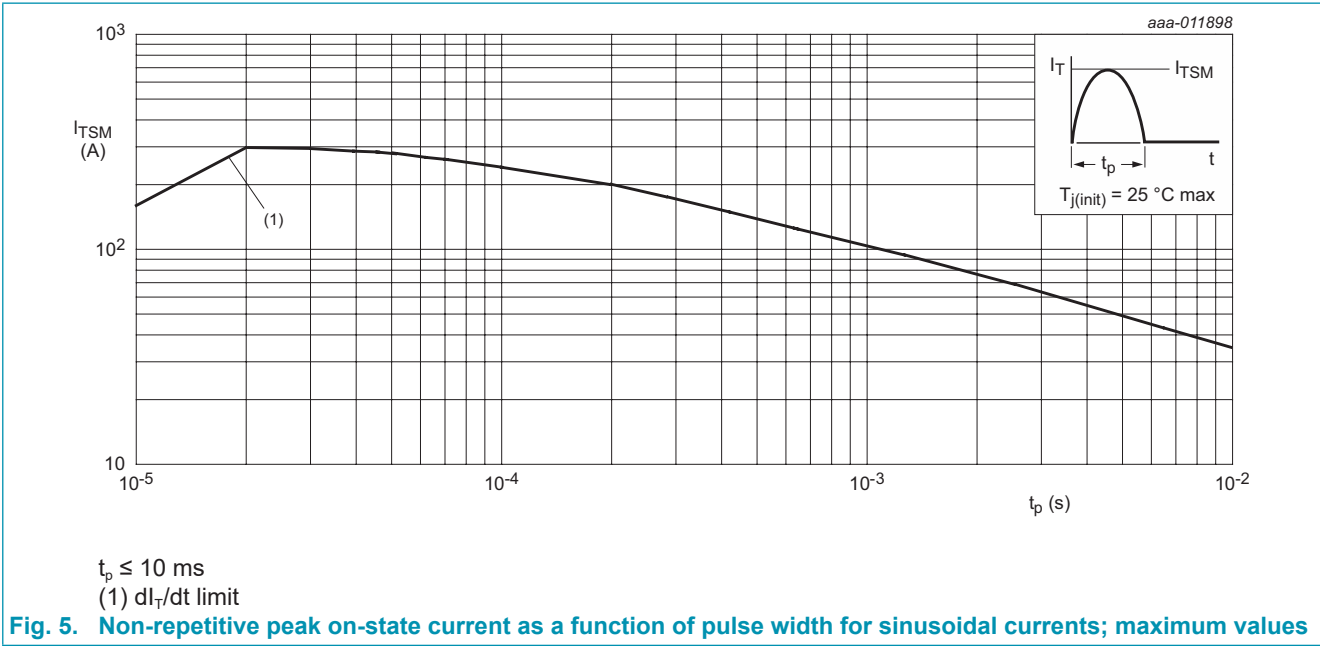


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values
 $f = 50 \text{ Hz}$



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

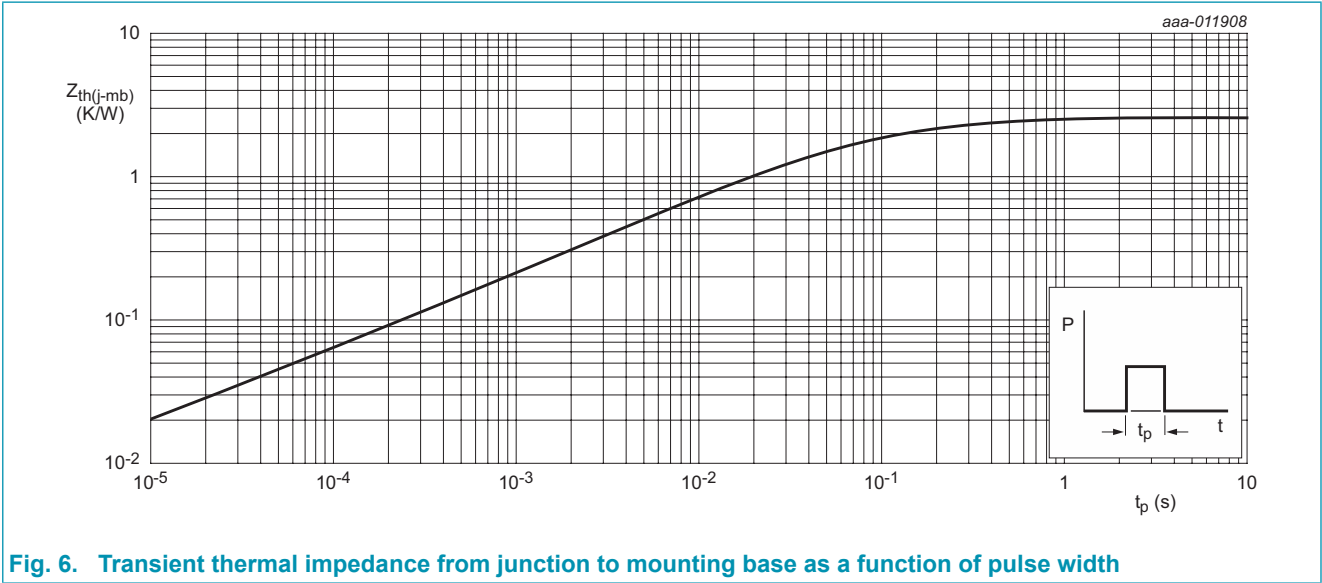


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

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	-	15	200	μA
I_L	latching current	$V_D = 12\text{ V}$; $I_G = 0.1\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 8	-	0.17	10	mA
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9	-	0.1	6	mA
V_T	on-state voltage	$I_T = 5\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10	-	1.23	1.8	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	-	0.4	1	V
		$V_D = 500\text{ V}$; $I_T = 0.1\text{ A}$; $T_j = 110\text{ }^\circ\text{C}$	0.1	0.2	-	V
I_D	off-state current	$V_D = 500\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
I_R	reverse current	$V_R = 500\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	mA
Dynamic characteristics						
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $R_{GK} = 100\text{ }\Omega$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; Fig. 12	-	50	-	V/ μs
t_{gt}	gate-controlled turn-on time	$I_{TM} = 10\text{ A}$; $V_D = 500\text{ V}$; $I_G = 5\text{ mA}$; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$	-	2	-	μs
t_q	commutated turn-off time	$V_{DM} = 335\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{TM} = 8\text{ A}$; $V_R = 10\text{ V}$; $(dI_T/dt)_M = 10\text{ A}/\mu\text{s}$; $dV_D/dt = 2\text{ V}/\mu\text{s}$; $R_{GK(ext)} = 1\text{ k}\Omega$; ($V_{DM} = 67\%$ of V_{DRM})	-	100	-	μs

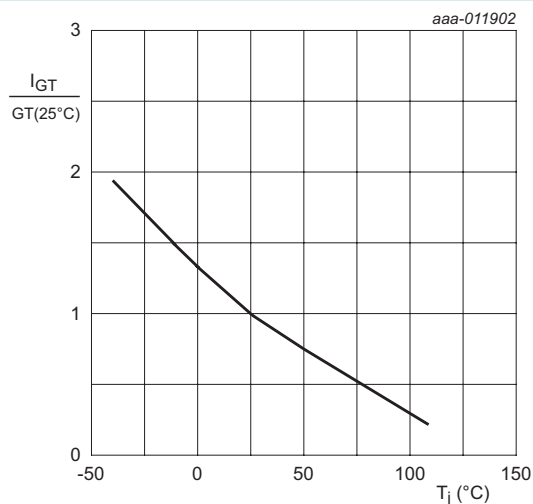


Fig. 7. Normalized gate trigger current as a function of junction temperature

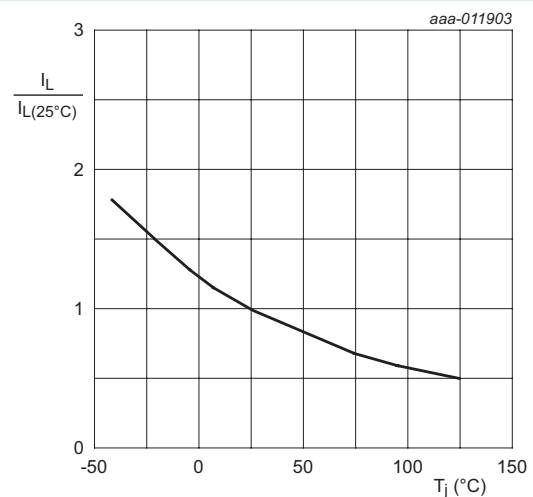
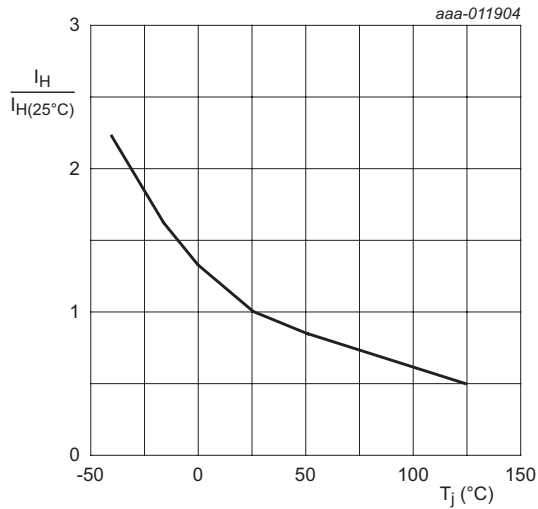
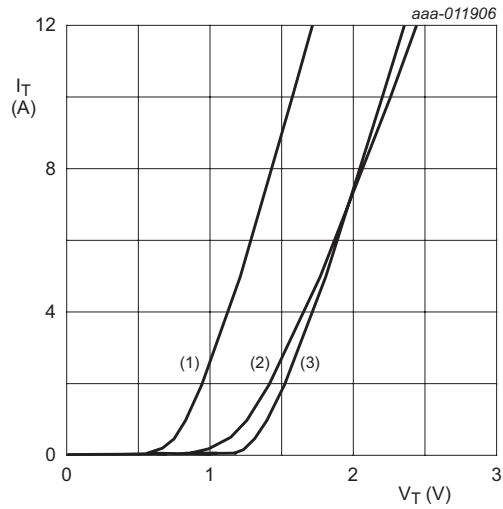


Fig. 8. Normalized latching current as a function of junction temperature
 $R_{GK} = 1\text{ k}\Omega$



$R_{GK} = 1 \text{ k}\Omega$

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



$V_0 = 1.26 \text{ V}$; $R_s = 0.099 \Omega$

- (1) $T_j = 125^\circ\text{C}$; typical values
- (2) $T_j = 125^\circ\text{C}$; maximum values
- (3) $T_j = 25^\circ\text{C}$; maximum values

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

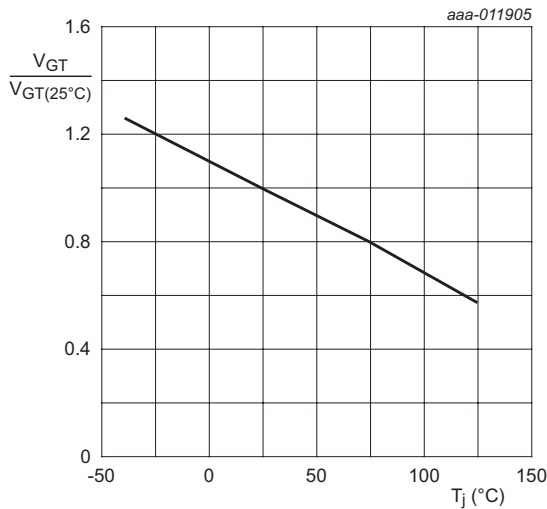
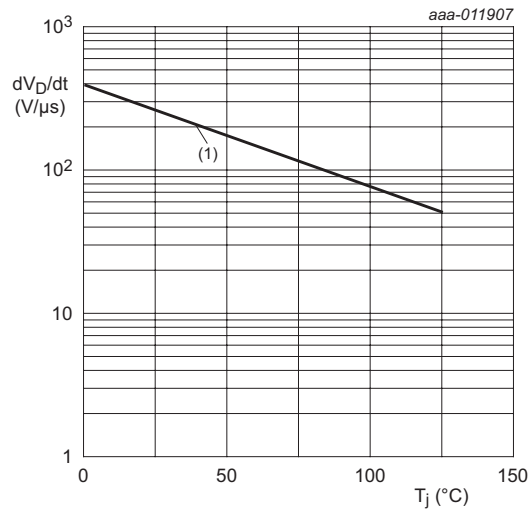


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



(1) $R_{GK} = 100 \Omega$

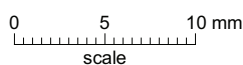
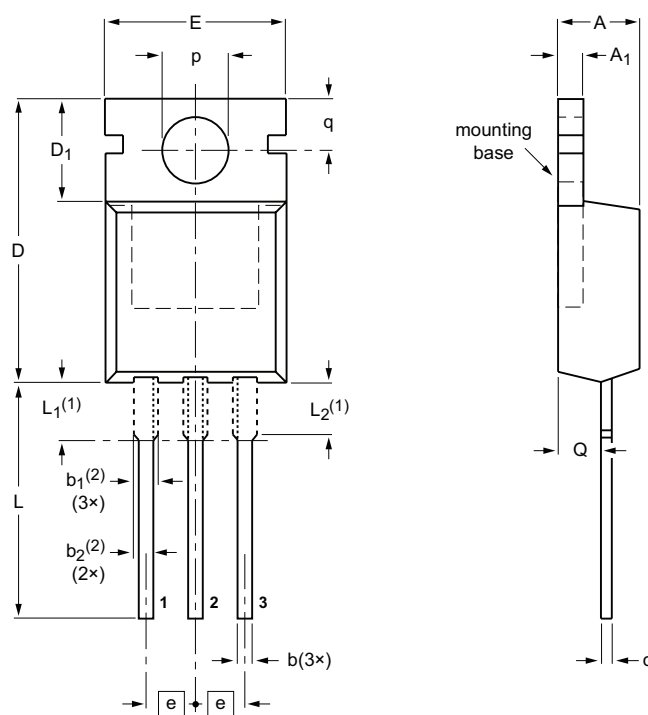
Fig. 12. Critical rate of rise of off-state voltage as a function of junction temperature; typical values

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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