BT152-500RT

SCR

Rev.02 - 03 September 2021 — Product data sheet

1. General description

Planar passivated Silicon Controlled Rectifier in a TO220 plastic package intended for use in applications requiring very high inrush current capability, high junction temperature capability and high thermal cycling performance.

2. Features and benefits

- High junction temperature capability
- High thermal cycling performance
- Planar passivated for voltage ruggedness and reliability
- Very high current surge capability

3. Applications

- Ignition circuits
- Protection circuits e.g. SMPS inrush current
- Motor control
- Voltage regulation

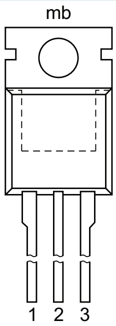
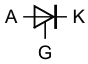
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	500	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_{mb} \leq 122$ °C; Fig. 1		-	-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; Fig. 2; Fig. 3		-	-	20	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)} = 25$ °C; $t_p = 8.3$ ms		-	-	220	A
		half sine wave; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; Fig. 4; Fig. 5		-	-	200	A
T_j	junction temperature			-	-	150	°C
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 100$mA; $T_j = 25$ °C; Fig. 7		-	3	32	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 335$ V; $T_j = 125$ °C; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		200	300	-	V/µs

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		 sym037
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
BT152-500RT	TO220	BT152-500RT,127	Tube	50	SOT78	13-Jun-2008

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: d	Assembly factory: A
BT152-500RT	BT152 500RT PJdxxxx xx	BT152 500RT PJAxxxx xx

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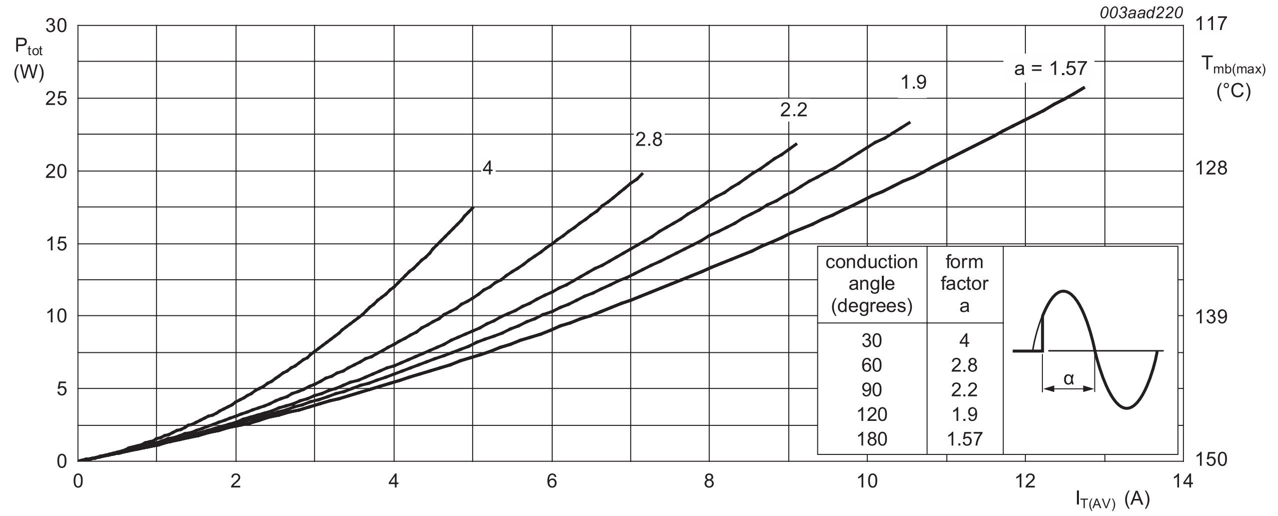
8. Limiting values

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
$I_{T(AV)}$	average on-state current	half sine wave; T_{mb} ≤ 122 °C; Fig. 1		-	13	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; Fig. 2; Fig. 3		-	20	A
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		-	220	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms; Fig. 4; Fig. 5		-	200	A
I^2t	I^2t for fusing	t_P = 10 ms; sine-wave pulse		-	200	A^2s
dI_T/dt	rate of rise of on-state current	I_T = 50 A; I_G = 200 mA; dI_G/dt = 200 mA/µs		-	200	A/µs
I_{GM}	peak gate current			-	5	A
V_{RGM}	peak reverse gate voltage			-	5	V
P_{GM}	peak gate power			-	20	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	1	W
T_{stg}	storage temperature			-40	150	°C
T_j	junction temperature			-	150	°C



a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

Fig. 1. Total power dissipation as a function of average on-state current; maximum values

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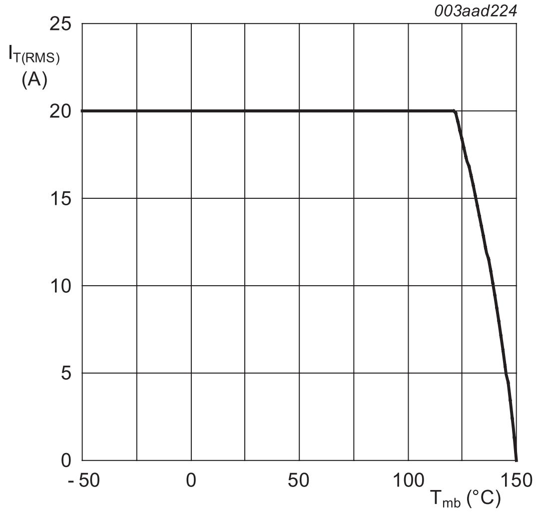
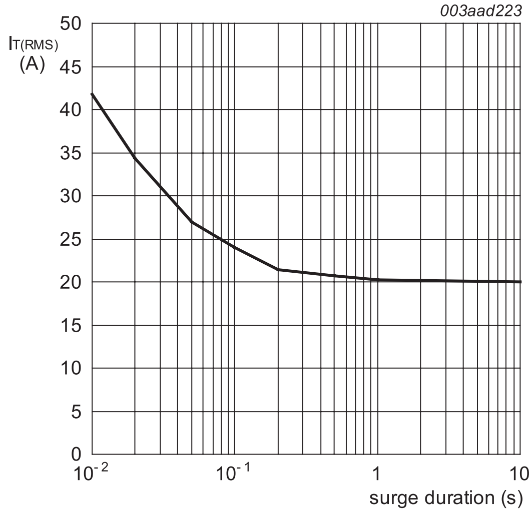
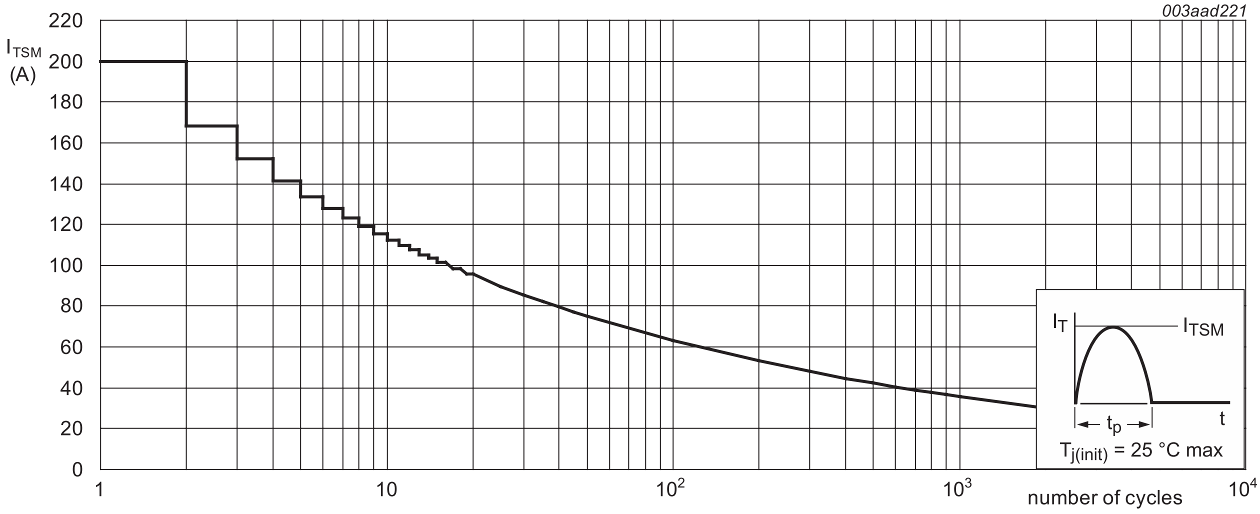


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} =122 °C

Fig. 3. RMS on-state current as a function of surge duration; 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

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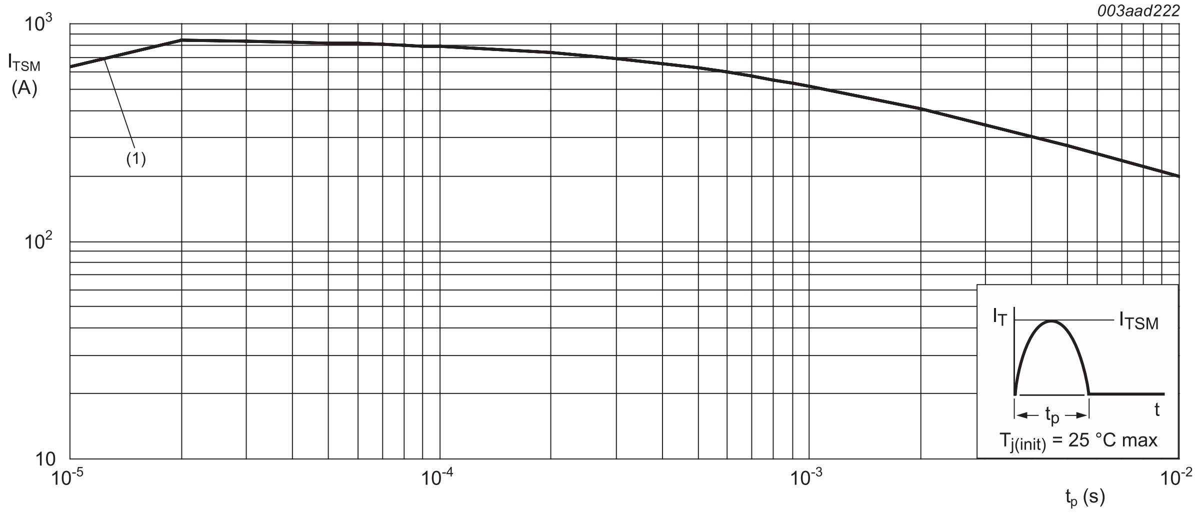

$t_p \leq 10$ ms

(1) dI_T/dt limit

Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

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

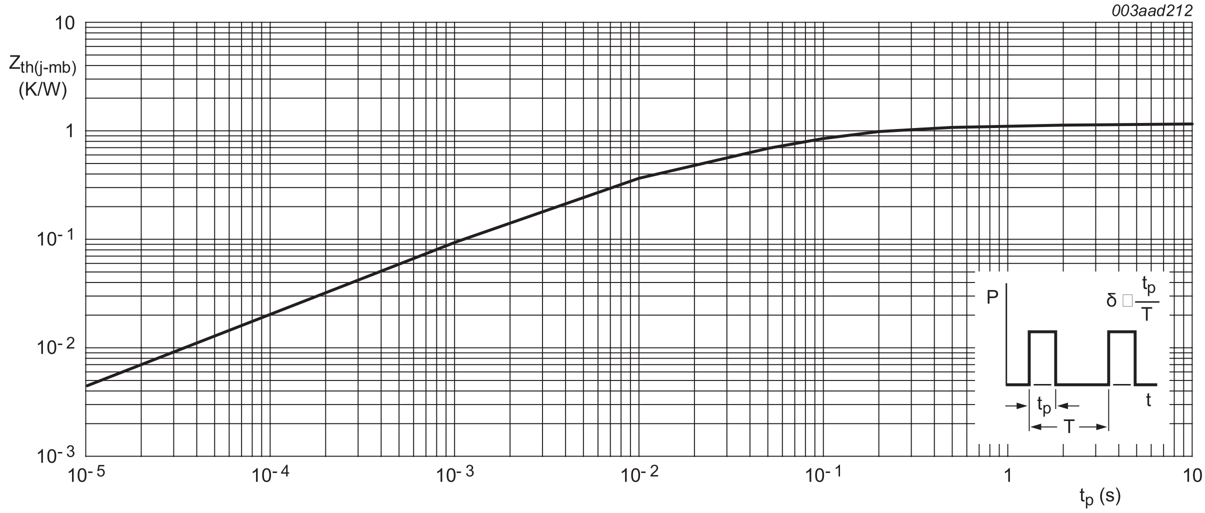

Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse width

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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 7		-	3	32	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T_j = 25 °C; Fig. 8		-	25	80	mA
I_H	holding current	T_j = 25 °C; Fig. 9		-	15	60	mA
V_T	on-state voltage	I_T = 40 A; T_j = 25 °C; Fig. 10		-	1.4	1.75	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A;T_j = 25 °C; Fig. 11		-	0.6	1	V
		V_D = 500V; I_T = 0.1 A;T_j = 125 °C		0.25	0.4	-	V
I_D	off-state current	V_D = 500 V; T_j = 125 °C		-	0.2	1	mA
I_R	reverse current	V_R = 500 V; T_j = 125 °C		-	0.2	1	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 335 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit; Fig. 12		200	300	-	V/μs
t_{gt}	gate-controlled turn-on time	I_{TM} = 40 A; V_D = 500 V; I_G = 0.1 A; dI_G/dt = 5 A/μs		-	2	-	μs
t_q	commutated turn-off time	V_{DM} = 335 V; T_j = 125 °C; I_{TM} = 20 A; V_R = 25 V; $(dI_T/dt)_M$ = 30 A/μs; dV_D/dt = 50 V/μs; R_{GK} = 100 Ω; (V_{DM} = 67% of V_{DRM})		-	70	-	μs

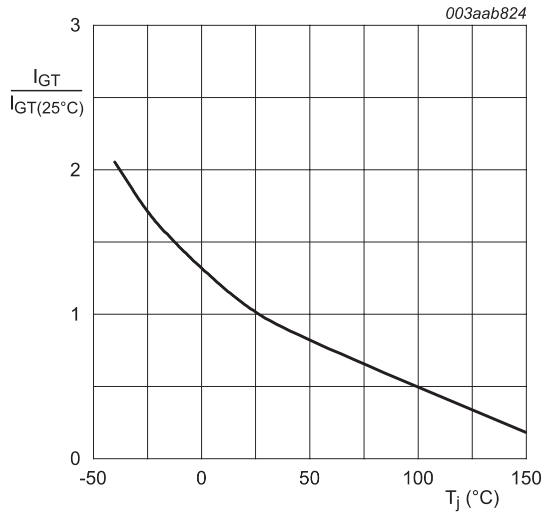

Fig. 7. Normalized gate trigger current as a function of junction temperature

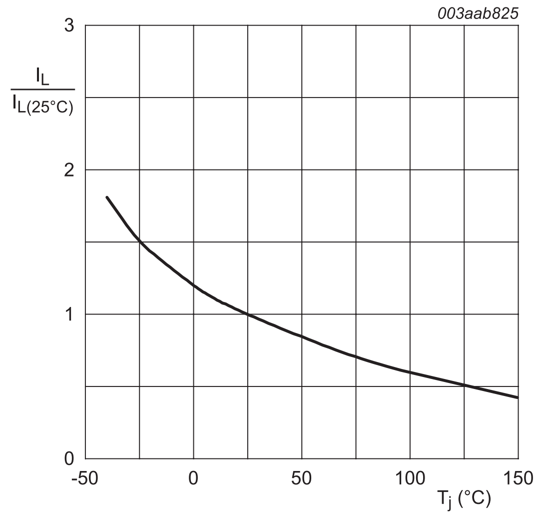

Fig. 8. Normalized latching current as a function of junction temperature

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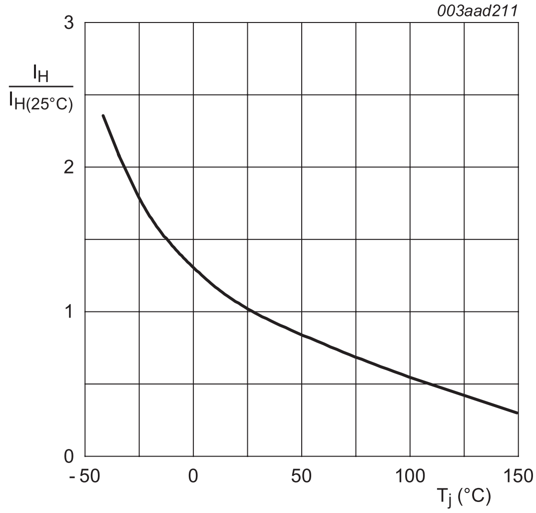
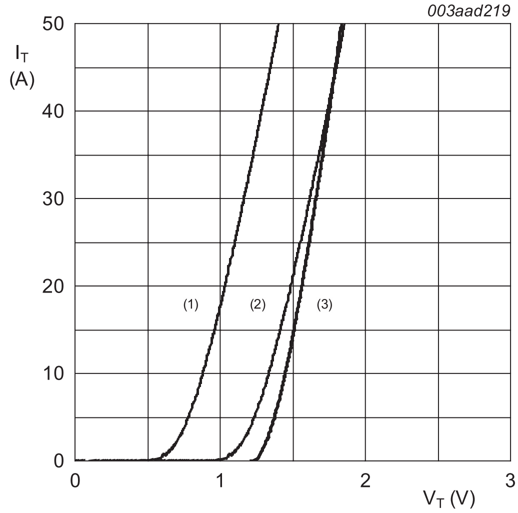


Fig. 9. Normalized holding current as a function of junction temperature



V_0 = 1.06 V; R_s = 0.03 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

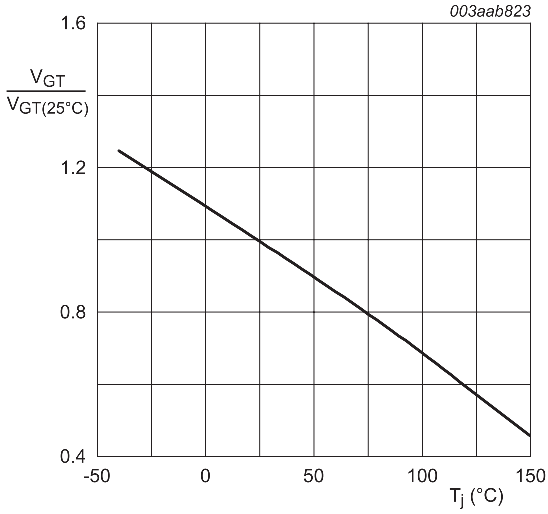
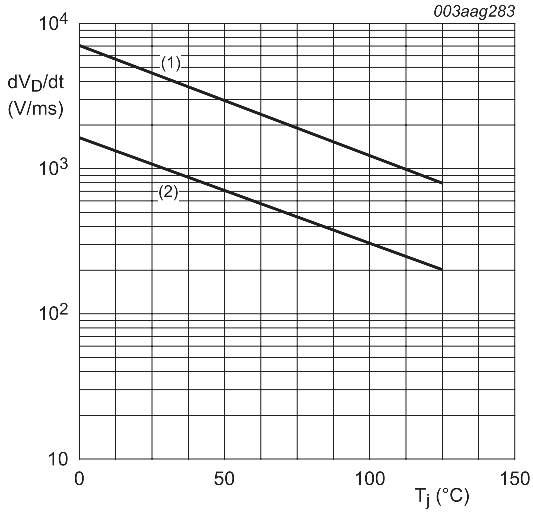


Fig. 11. Normalized gate trigger voltage as a function of junction temperature



(1) R_{GK} = 100 Ω
(2) Gate open circuit

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

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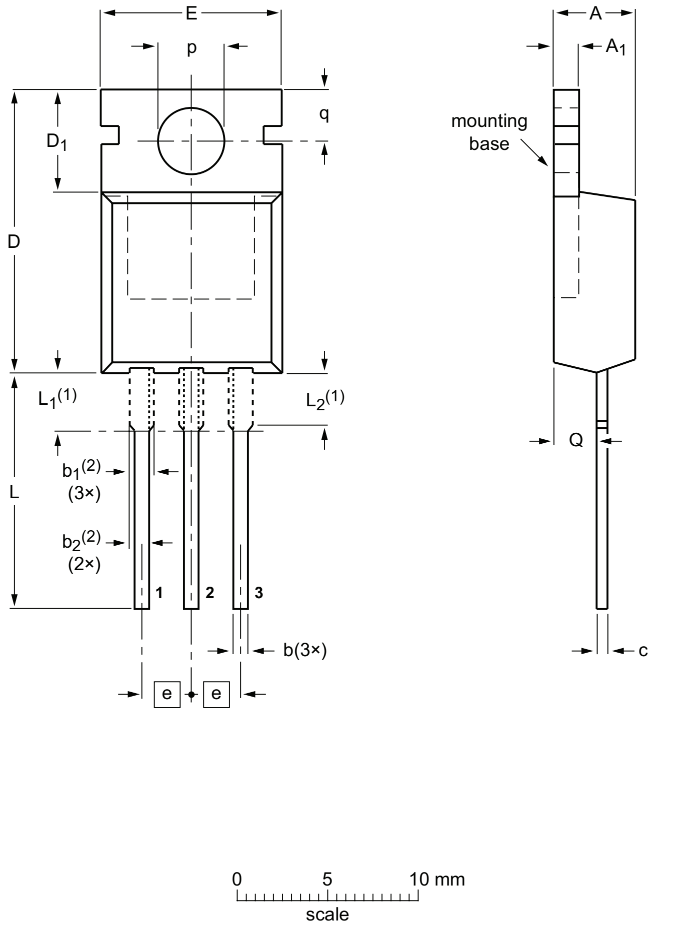
11. Package outline

Assembly factory: d & A

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**

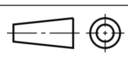


DIMENSIONS (mm are the original dimensions)

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

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

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Document status [1][2]	Product status [3]	Definition
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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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