

IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors



BT139-800

4Q Triac

27 September 2013

Product data sheet

1. General description

Planar passivated four quadrant triac in a SOT78 (TO-220AB) plastic package intended for use in applications requiring high bidirectional transient and blocking voltage capability and high thermal cycling performance.

2. Features and benefits

- High blocking voltage capability
- Planar passivated for voltage ruggedness and reliability
- Less sensitive gate for high noise immunity
- Triggering in all four quadrants

3. Applications

- General purpose motor controls
- General purpose switching

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25^\circ\text{C}$; $t_p = 20$ ms; Fig. 4 ; Fig. 5	-	-	155	A
$I_{T(\text{RMS})}$	RMS on-state current	full sine wave; $T_{mb} \leq 99^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	16	A
Static characteristics						
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 0.1$ A; T2+ G+; $T_j = 25^\circ\text{C}$; Fig. 7	-	5	35	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2+ G-; $T_j = 25^\circ\text{C}$; Fig. 7	-	8	35	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G-; $T_j = 25^\circ\text{C}$; Fig. 7	-	10	35	mA
		$V_D = 12$ V; $I_T = 0.1$ A; T2- G+; $T_j = 25^\circ\text{C}$; Fig. 7	-	22	70	mA

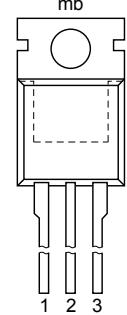
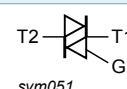


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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		
2	T2	main terminal 2		
3	G	gate		
mb	T2	mounting base; main terminal 2	 TO-220AB (SOT78)	

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BT139-800	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. 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			-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 99$ °C; Fig. 1 ; Fig. 2 ; Fig. 3		-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig. 4 ; Fig. 5		-	155	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	170	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		-	120	A^2s
dI_T/dt	rate of rise of on-state current	$I_T = 20$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/ μ s; T2+ G+		-	50	A/μ s
		$I_T = 20$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/ μ s; T2+ G-		-	50	A/μ s
		$I_T = 20$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/ μ s; T2- G-		-	50	A/μ s
		$I_T = 20$ A; $I_G = 0.2$ A; $dI_G/dt = 0.2$ A/ μ s; T2- G+		-	10	A/μ s
I_{GM}	peak gate current			-	2	A
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	°C
T_j	junction temperature			-	125	°C

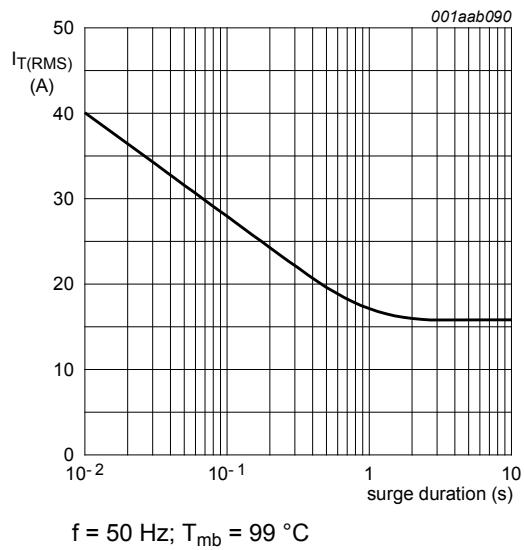


Fig. 1. RMS on-state current as a function of surge duration; maximum values

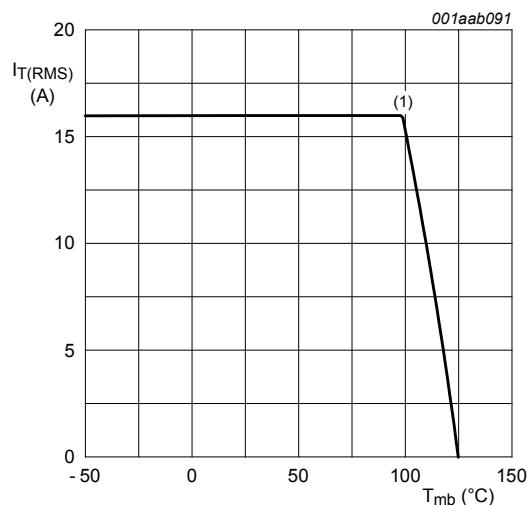
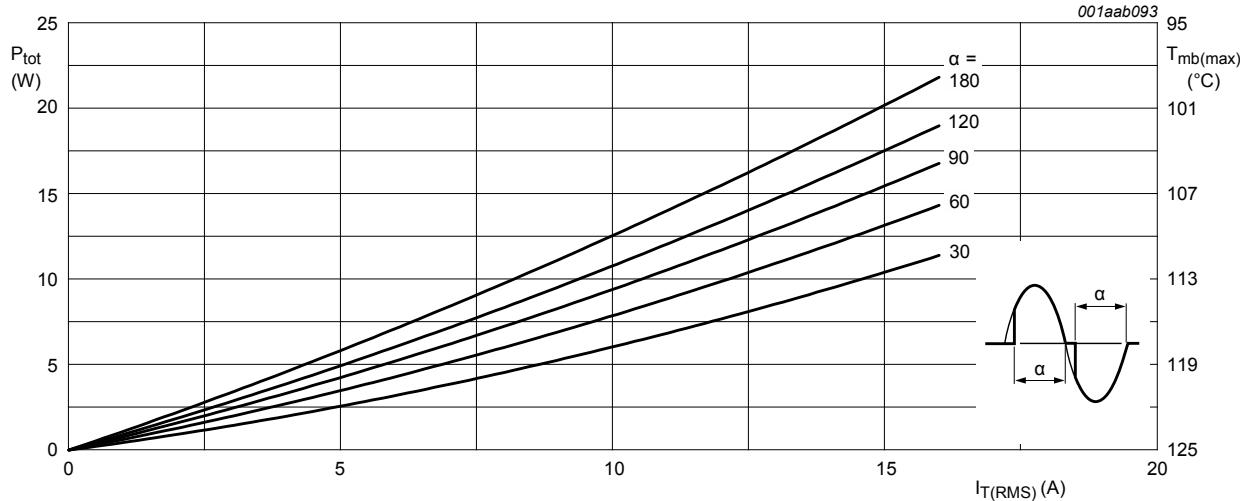
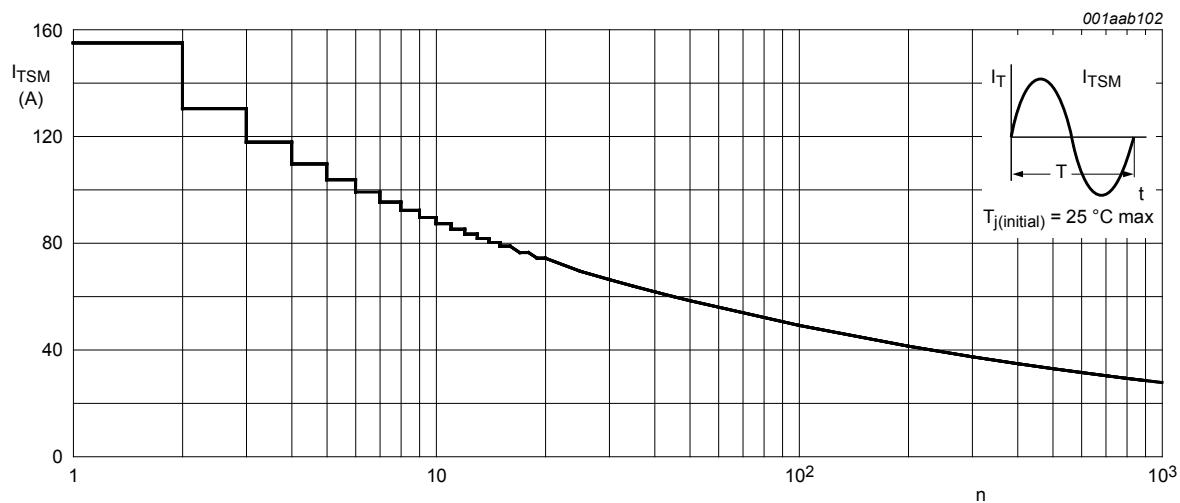


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values



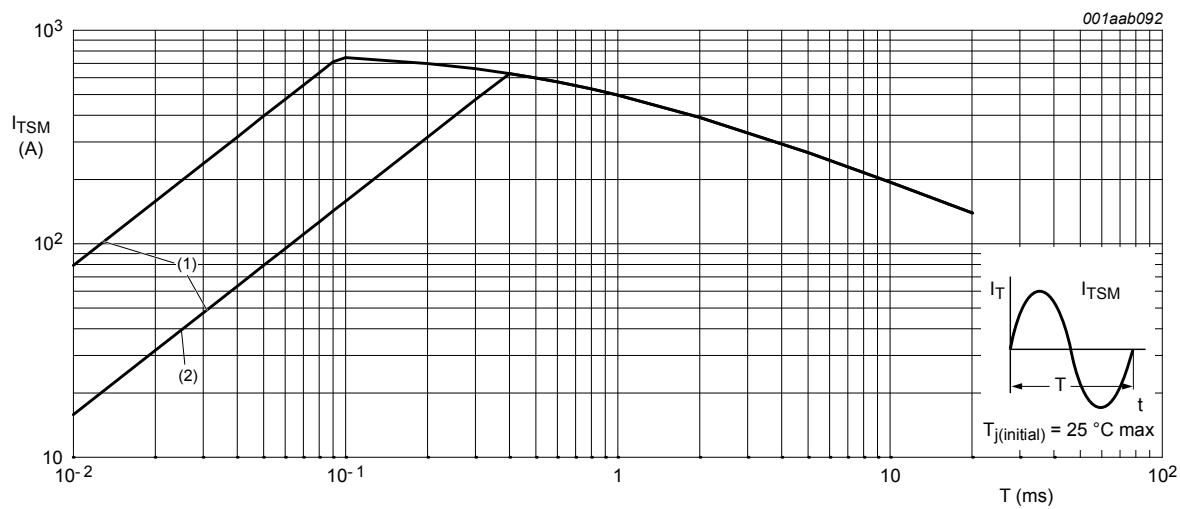
α = conduction angle
 a = form factor = $I_{T(RMS)} / I_{T(AV)}$

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



$f = 50$ Hz; n = number of cycles

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



$t_p \leq 20$ ms

(1) dI_T/dt limit

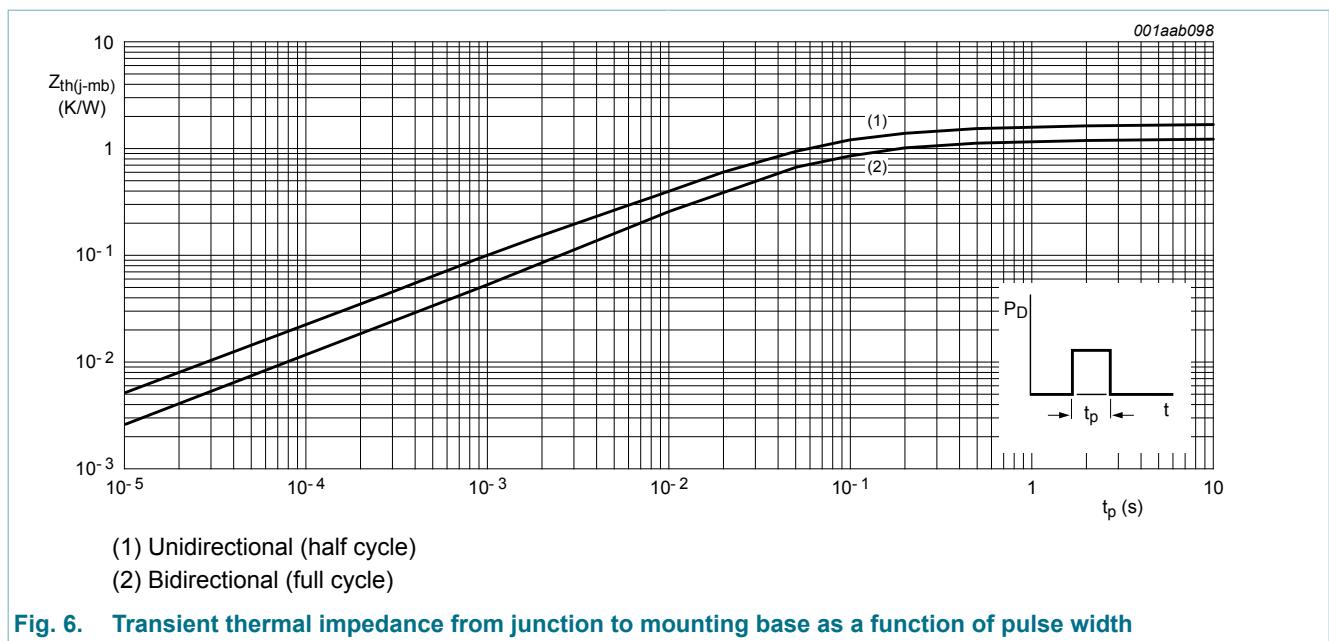
(2) T2- G+ quadrant limit

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

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	half cycle; Fig. 6	-	-	1.7	K/W
		full cycle; Fig. 6	-	-	1.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
I _{GT}	gate trigger current	V _D = 12 V; I _T = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 7		-	5	35	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7		-	8	35	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7		-	10	35	mA
		V _D = 12 V; I _T = 0.1 A; T2- G+; T _j = 25 °C; Fig. 7		-	22	70	mA
I _L	latching current	V _D = 12 V; I _G = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 8		-	7	40	mA
		V _D = 12 V; I _G = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 8		-	22	60	mA
		V _D = 12 V; I _G = 0.1 A; T2- G-; T _j = 25 °C; Fig. 8		-	8	40	mA
		V _D = 12 V; I _G = 0.1 A; T2- G+; T _j = 25 °C; Fig. 8		-	10	60	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9		-	6	45	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; Fig. 10		-	1.2	1.6	V
V _{GT}	gate trigger voltage	V _D = 12 V; I _T = 0.1 A; T _j = 25 °C; Fig. 11		-	0.7	1	V
		V _D = 400 V; I _T = 0.1 A; T _j = 125 °C; Fig. 11		0.25	0.4	-	V
I _D	off-state current	V _D = 800 V; T _j = 125 °C		-	0.1	0.5	mA
Dynamic characteristics							
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 536 V; T _j = 125 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit		200	250	-	V/μs
dV _{com} /dt	rate of change of commutating voltage	V _D = 400 V; T _j = 95 °C; dI _{com} /dt = 7.2 A/ms; I _T = 16 A; gate open circuit		10	20	-	V/μs
t _{gt}	gate-controlled turn-on time	I _{TM} = 20 A; V _D = 800 V; I _G = 0.1 A; dI _G /dt = 5 A/μs		-	2	-	μs

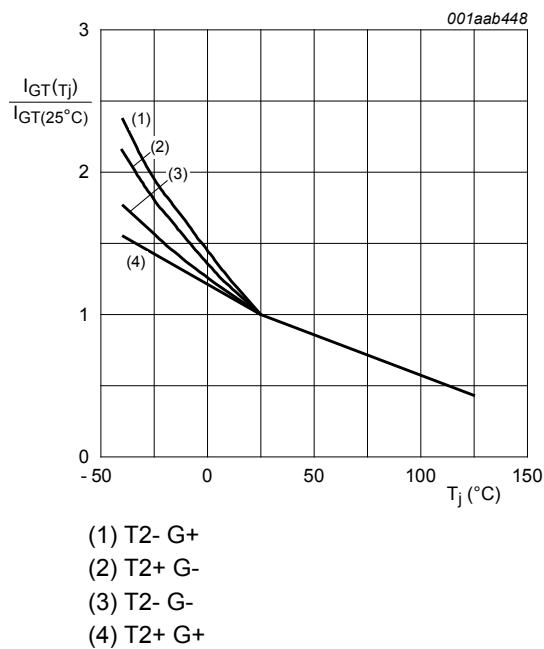


Fig. 7. Normalized gate trigger current as a function of junction temperature

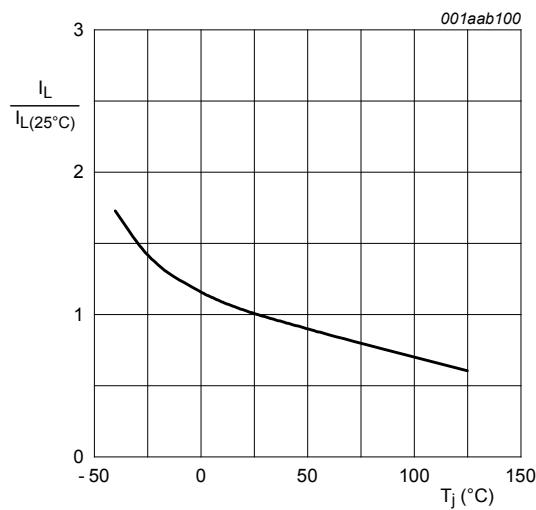


Fig. 8. Normalized latching current as a function of junction temperature

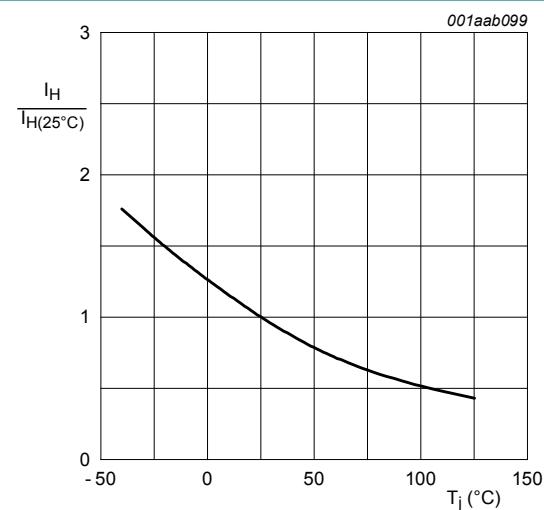


Fig. 9. Normalized holding current as a function of junction temperature

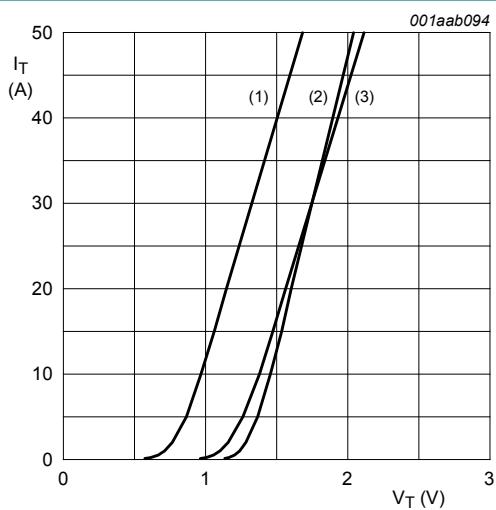


Fig. 10. On-state current as a function of on-state voltage

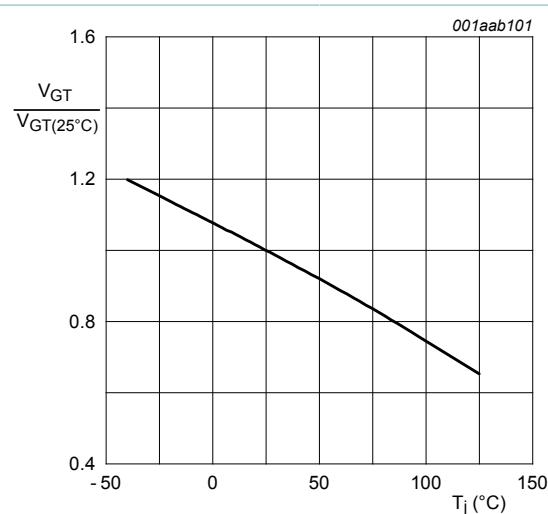
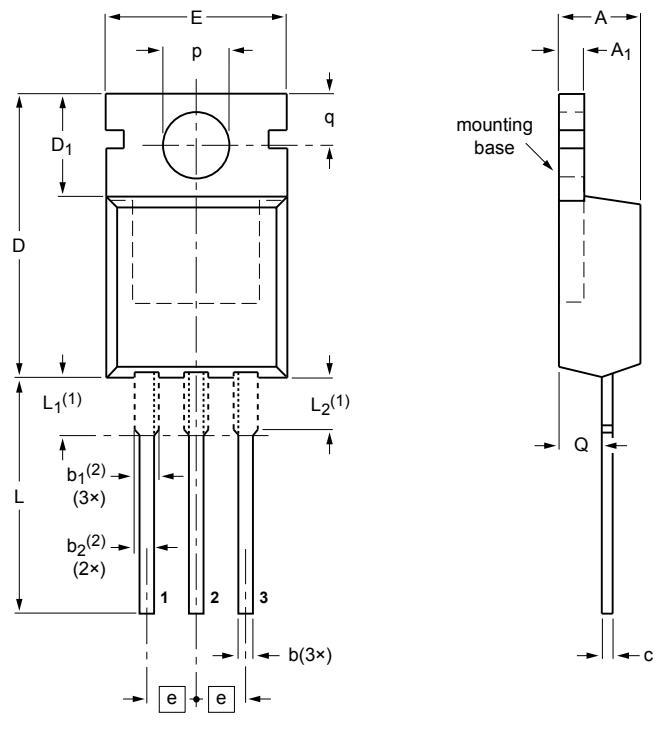


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

10. 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 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	1.40	0.9	1.6	1.3	0.7	16.0	6.6	10.3	2.54	15.0	3.30	3.0	3.8	3.0	2.6
	4.1	1.25	0.6	1.0	1.0	0.4	15.2	5.9	9.7		12.8	2.79	3.0	3.5	2.7	2.2

Notes

1. Lead shoulder designs may vary.
2. Dimension includes excess dambar.

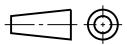
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT78		3-lead TO-220AB	SC-46			08-04-23 08-06-13

Fig. 12. Package outline TO-220AB (SOT78)

11. Legal information

11.1 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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