

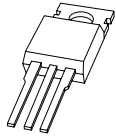


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# BT139 series

## Triacs

Rev. 04.00 — 6 July 2004

Product data sheet

## 1. Product profile

### 1.1 General description

Passivated triacs in a SOT78 plastic package, intended for use in applications requiring high bidirectional transient and blocking voltage capability.

### 1.2 Features

- High thermal cycling performance.

### 1.3 Applications

- Motor control
- Industrial and domestic lighting, heating and static switching.

### 1.4 Quick reference data

- $V_{\text{DRM}} \leq 600 \text{ V}$  (BT139-600)
- $V_{\text{DRM}} \leq 600 \text{ V}$  (BT139-600F)
- $V_{\text{DRM}} \leq 800 \text{ V}$  (BT139-800)
- $V_{\text{DRM}} \leq 800 \text{ V}$  (BT139-800F)
- $V_{\text{DRM}} \leq 800 \text{ V}$  (BT139-800G)
- $I_{\text{T(RMS)}} \leq 16 \text{ A}$
- $I_{\text{TSM}} \leq 155 \text{ A}$ .

## 2. Pinning information

Table 1: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	main terminal 1	<p>SOT78 (TO-220AB)</p>	<p>sym051</p>
2	main terminal 2		
3	gate		
mb	main terminal 2		

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### 3. Ordering information

**Table 2: Ordering information**

Type number	Package		
	Name	Description	Version
BT139-600	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78
BT139-600F			
BT139-800			
BT139-800F			
BT139-800G			

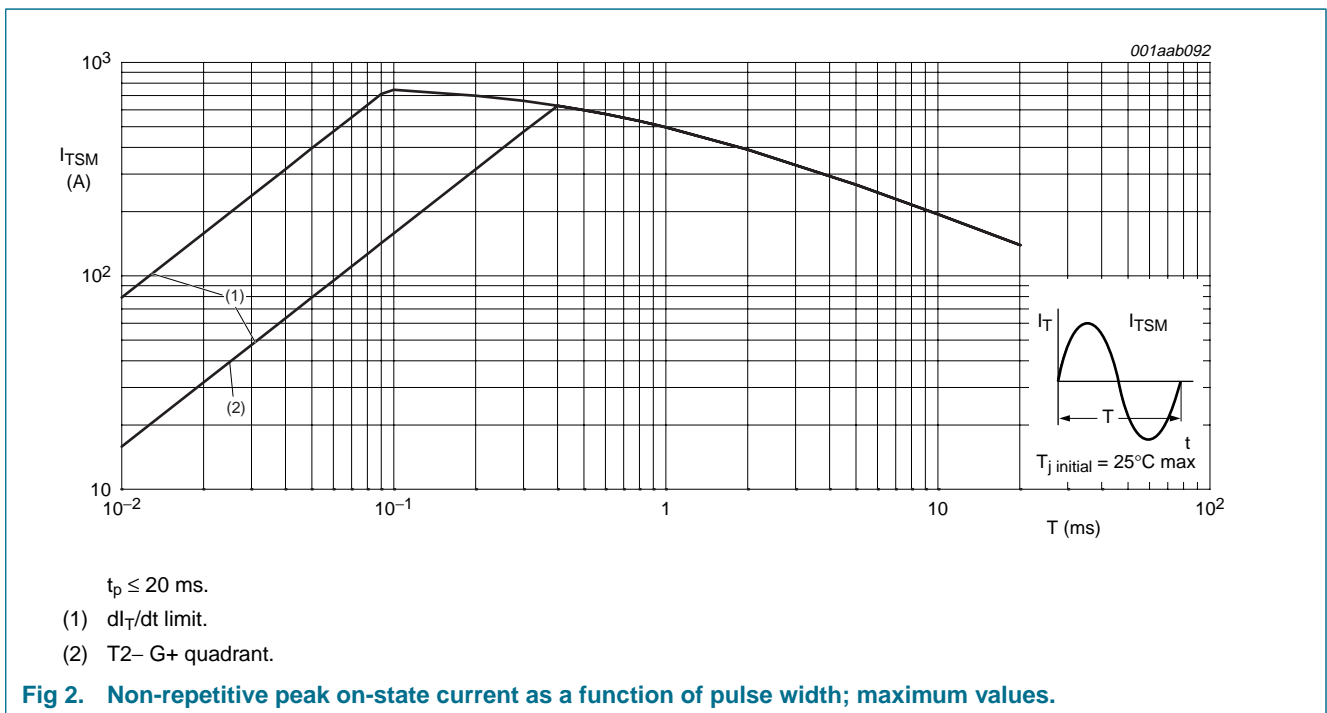
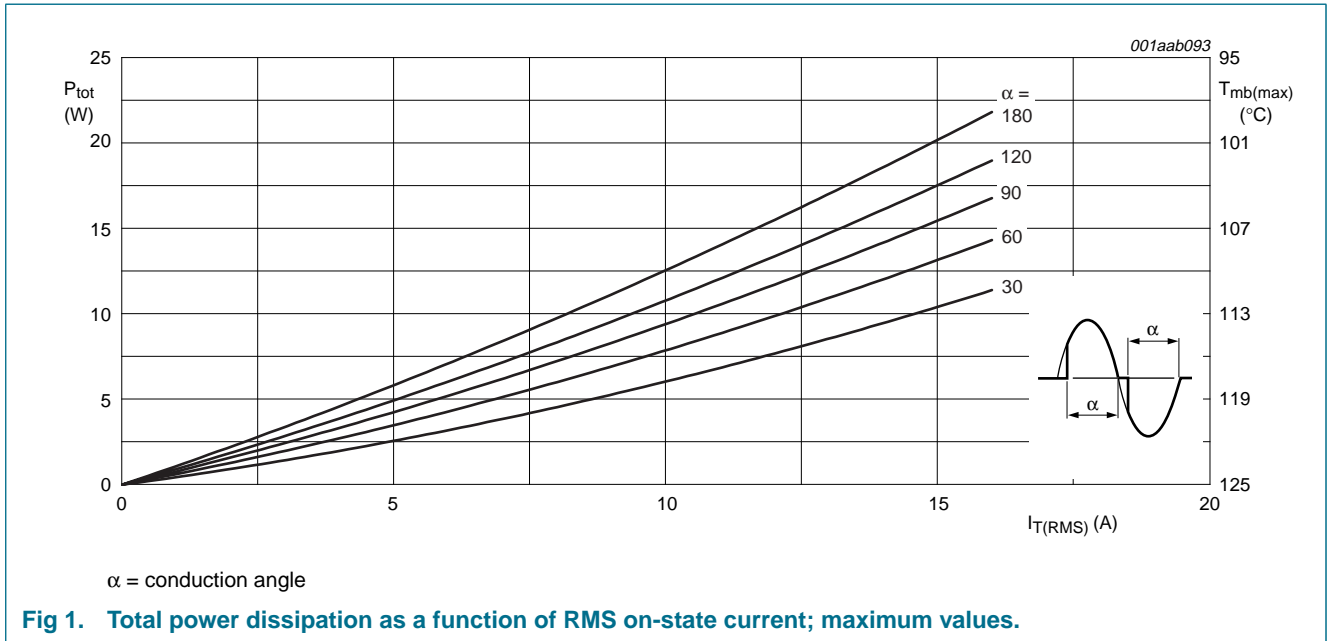
### 4. Limiting values

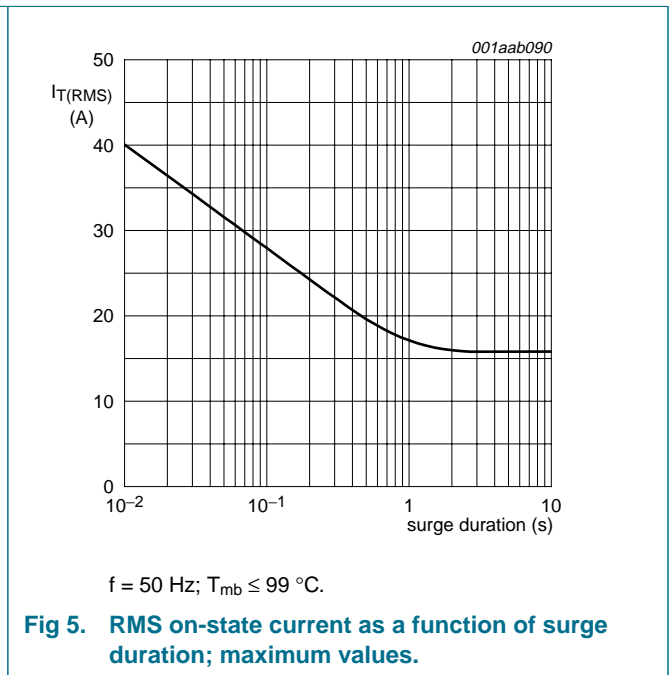
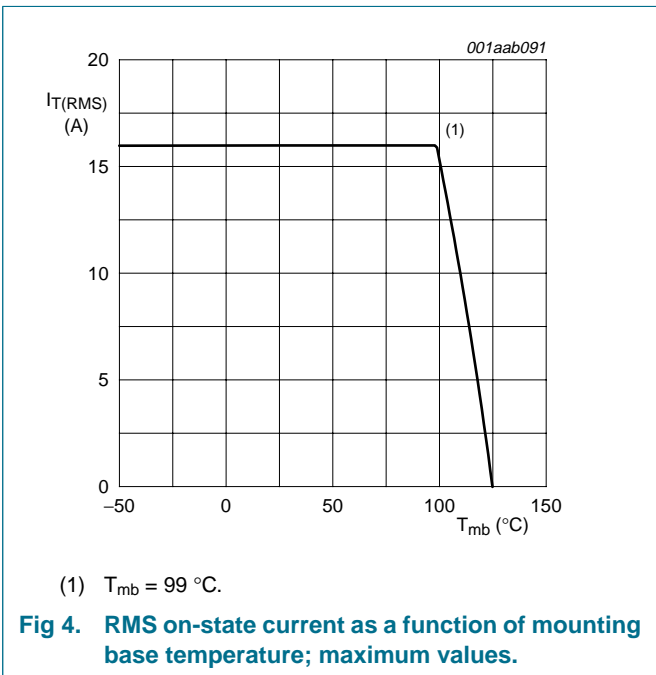
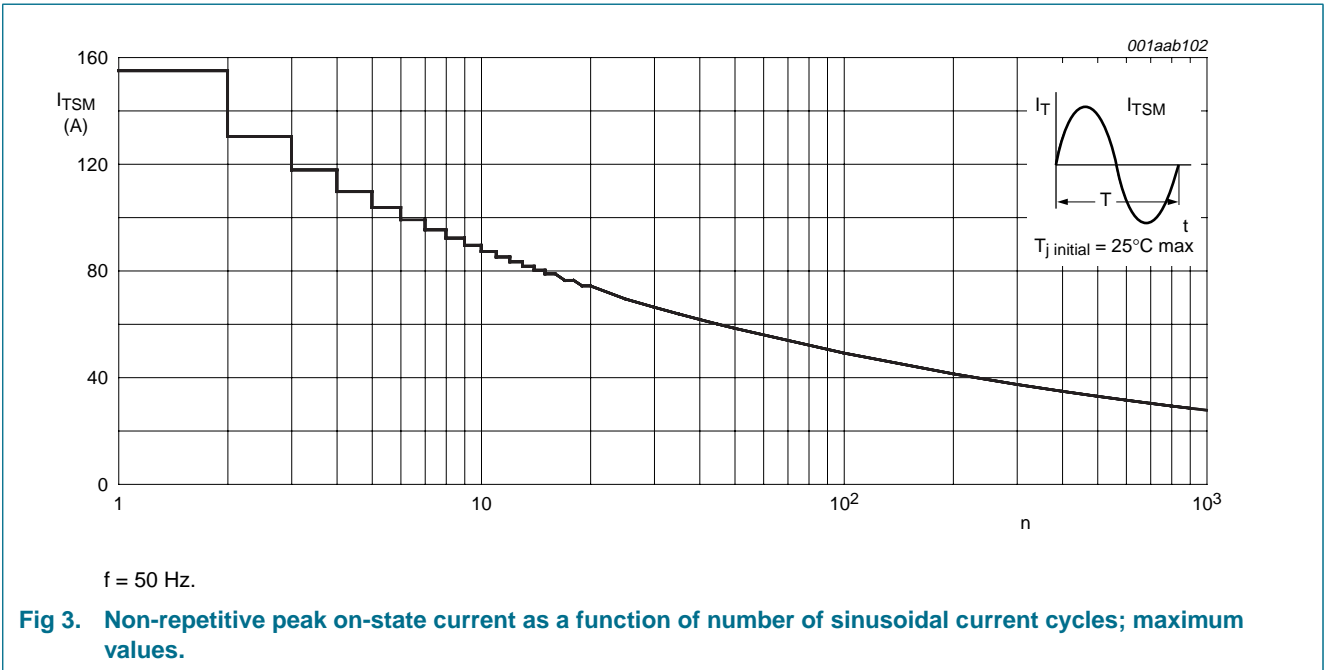
**Table 3: Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{\text{DRM}}$	repetitive peak off-state voltage				
			-	600 [1]	V
			-	800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_{\text{mb}} \leq 99\text{ °C}$ ; Figure 4 and Figure 5	-	16	A
$I_{\text{TSM}}$	non-repetitive peak on-state current	full sine wave; $T_{\text{j}} = 25\text{ °C}$ prior to surge; Figure 2 and Figure 3			
		$t = 20\text{ ms}$	-	155	A
		$t = 16.7\text{ ms}$	-	170	A
$I^2t$	$I^2t$ for fusing	$t = 10\text{ ms}$	-	120	A <sup>2</sup> s
$di_{\text{T}}/dt_{\text{T}}$	repetitive rate of rise of on-state current after triggering	$I_{\text{TM}} = 20\text{ A}$ ; $I_{\text{G}} = 0.2\text{ A}$ ; $dI_{\text{G}}/dt = 0.2\text{ A}/\mu\text{s}$			
		T2+ G+	-	50	A/ $\mu\text{s}$
		T2+ G-	-	50	A/ $\mu\text{s}$
		T2- G-	-	50	A/ $\mu\text{s}$
		T2- G+	-	10	A/ $\mu\text{s}$
$I_{\text{GM}}$	peak gate current		-	2	A
$V_{\text{GM}}$	peak gate voltage		-	5	V
$P_{\text{GM}}$	peak gate power		-	5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period	-	0.5	W
$T_{\text{stg}}$	storage temperature		-40	+150	°C
$T_{\text{j}}$	junction temperature		-	125	°C

[1] Although not recommended, off-state voltages up to 800 V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 15 A/ $\mu\text{s}$ .

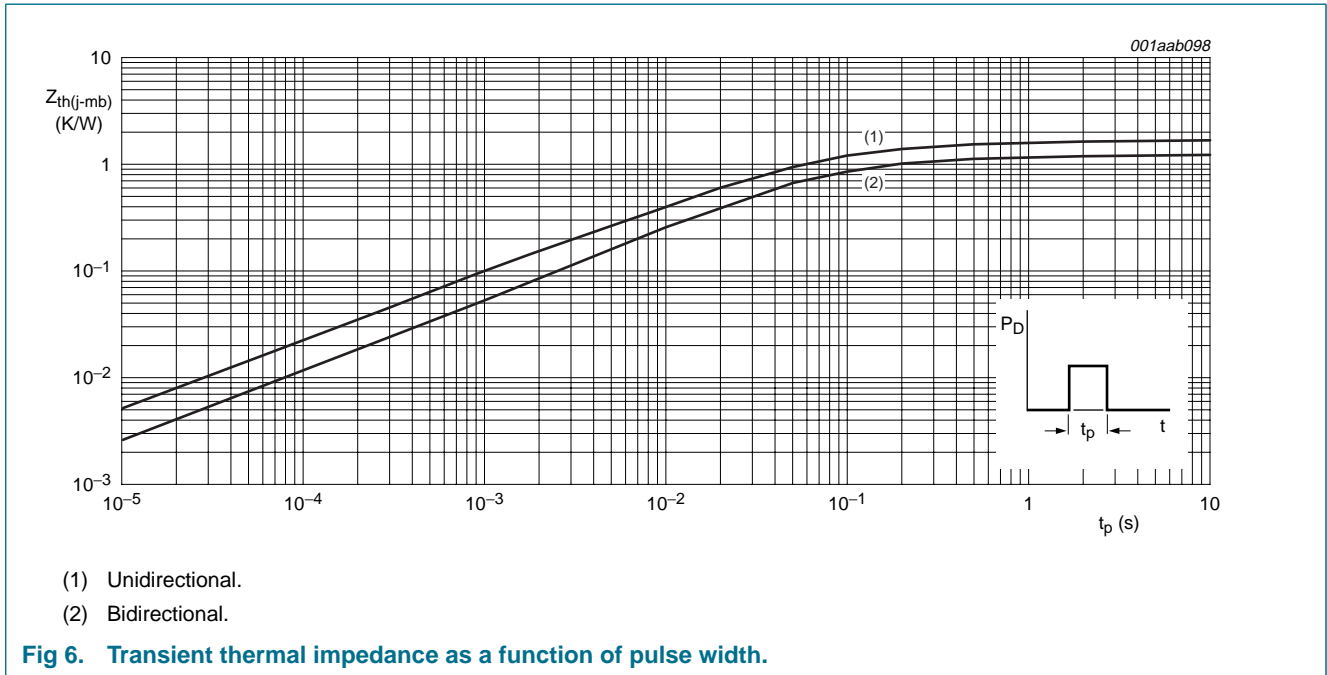




## 5. Thermal characteristics

**Table 4: Thermal characteristics**

Symbol	Parameter	Conditions	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance junction to mounting base	full cycle <a href="#">Figure 6</a>	-	1.2	K/W
		half cycle <a href="#">Figure 6</a>	-	1.7	K/W
$R_{th(j-a)}$	thermal resistance junction to ambient	in free air	60	-	K/W



## 6. Static characteristics

**Table 5: Static characteristics**

$T_j = 25^\circ\text{C}$  unless otherwise stated.

Symbol	Parameter	Conditions	BT139			BT139-F			BT139-G			Unit	
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max		
$I_{GT}$	gate trigger current	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ <a href="#">Figure 8</a>	T2+ G+	-	5	35	-	5	25	-	5	50	mA
			T2+ G-	-	8	35	-	8	25	-	8	50	mA
			T2- G-	-	10	35	-	10	25	-	10	50	mA
			T2- G+	-	22	70	-	22	70	-	22	100	mA
			$I_L$	latching current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ <a href="#">Figure 9</a>	T2+ G+	-	7	40	-	7	40	-
			T2+ G-	-	20	60	-	20	60	-	20	90	mA
			T2- G-	-	8	40	-	8	40	-	8	60	mA
			T2- G+	-	10	60	-	10	60	-	10	90	mA
$I_H$	holding current	$V_D = 12\text{ V};$ $I_{GT} = 0.1\text{ A};$ <a href="#">Figure 10</a>	-	6	45	-	6	45	-	6	60	mA	
$V_T$	on-state voltage	$I_T = 20\text{ A};$ <a href="#">Figure 11</a>	-	1.2	1.6	-	1.2	1.6	-	1.2	1.6	V	

Table 5: Static characteristics ...continued

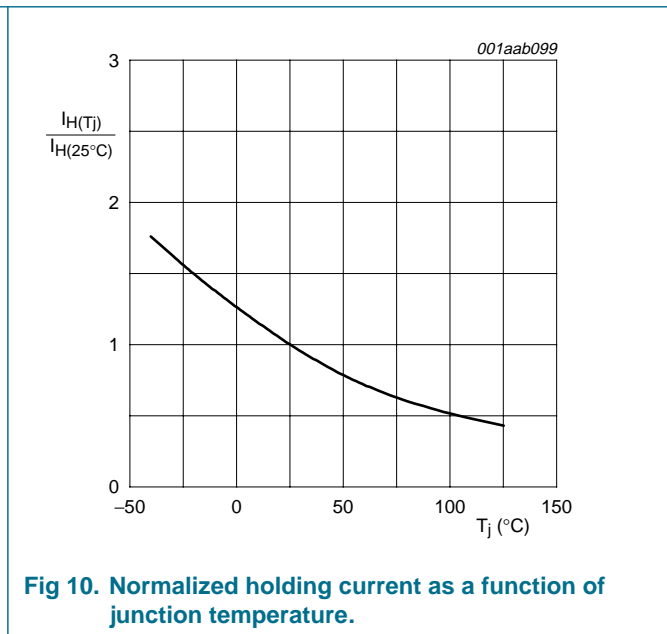
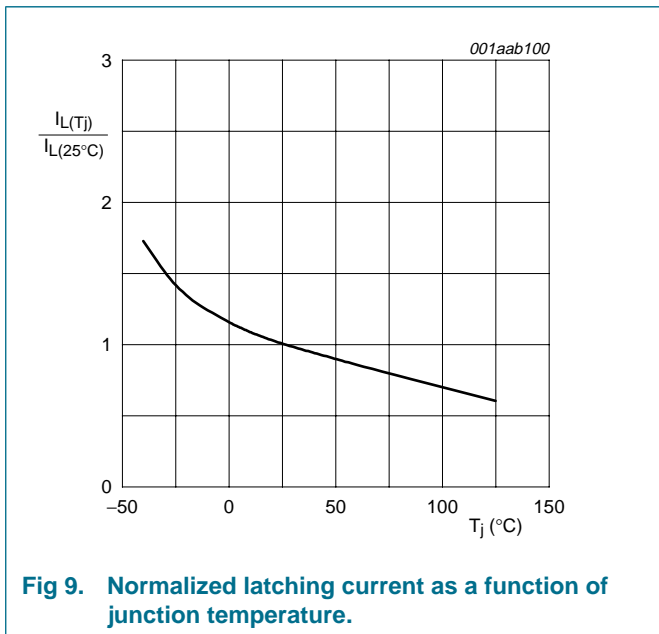
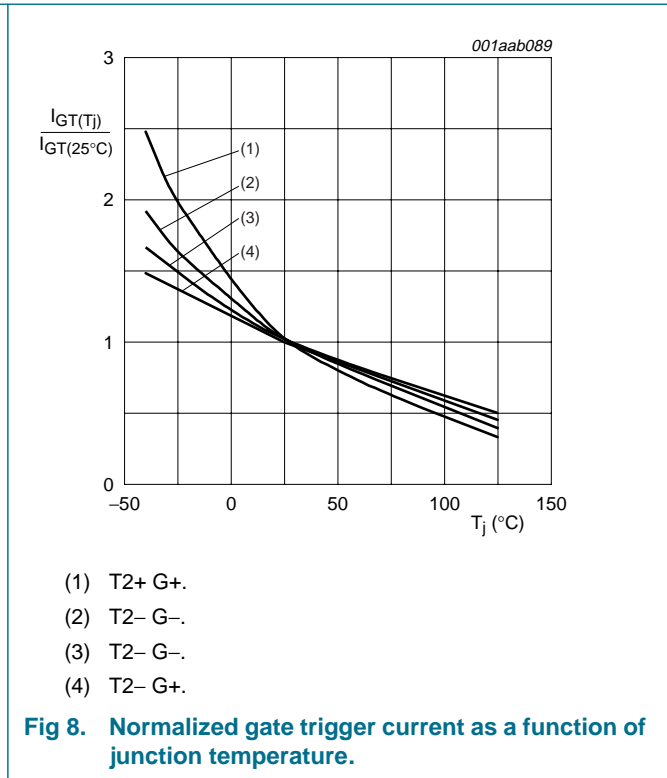
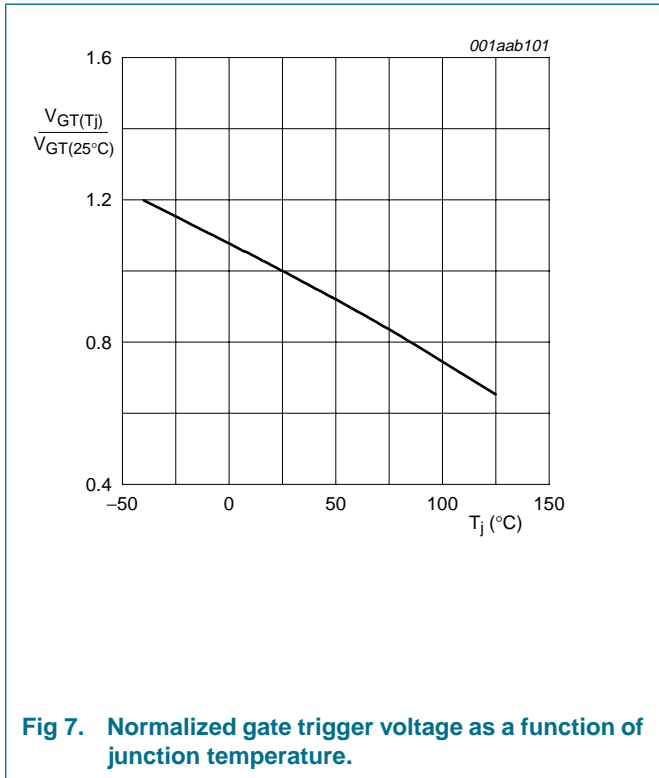
 $T_j = 25\text{ }^\circ\text{C}$  unless otherwise stated.

Symbol	Parameter	Conditions	BT139			BT139-F			BT139-G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$V_{GT}$	gate trigger voltage	$V_D = 12\text{ V};$ $I_T = 0.1\text{ A};$ <a href="#">Figure 7</a>	-	0.7	1.5	-	0.7	1.5	-	0.7	1.5	V
		$V_D = 400\text{ V};$ $I_T = 0.1\text{ A};$ $T_j = 125\text{ }^\circ\text{C}$	0.25	0.4	-	0.25	0.4	-	0.25	0.4	-	V
$I_D$	off-state leakage current	$V_D = V_{DRM(max)};$ $T_j = 125\text{ }^\circ\text{C}$	-	0.1	0.5	-	0.1	0.5	-	0.1	0.5	mA

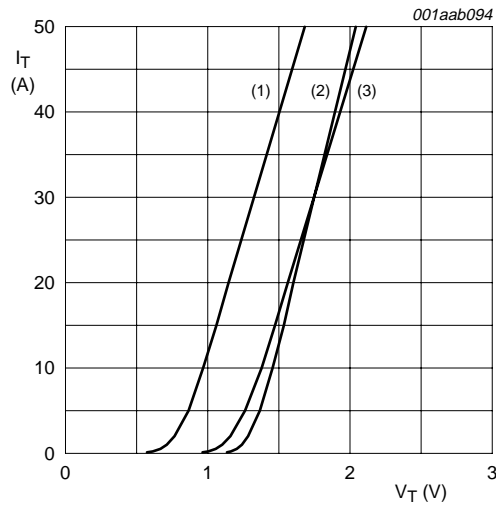
## 7. Dynamic characteristics

Table 6: Dynamic characteristics

Symbol	Parameter	Conditions	BT139			BT139-F			BT139-G			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
$dV_D/dt$	critical rate of rise of off-state voltage	$V_{DM} = 67\text{ }%$ $V_{DRM(max)};$ $T_j = 125\text{ }^\circ\text{C};$ exponential waveform; gate open circuit	200	250	-	50	250	-	200	250	-	V/ $\mu\text{s}$
$dV_{com}/dt$	critical rate of change of commutating voltage	$V_{DM} = 400\text{ V};$ $T_j = 95\text{ }^\circ\text{C};$ $I_{T(RMS)} = 16\text{ A};$ $dI_{com}/dt = 7.2\text{ A/ms};$ gate open circuit	10	20	-	-	20	-	10	20	-	V/ $\mu\text{s}$
$t_{gt}$	gate controlled turn-on time	$I_{TM} = 20\text{ A};$ $V_D = V_{DRM(max)};$ $I_G = 0.1\text{ A};$ $dI_G/dt = 5\text{ A}/\mu\text{s}$		2	-	-	2	-		2	-	$\mu\text{s}$



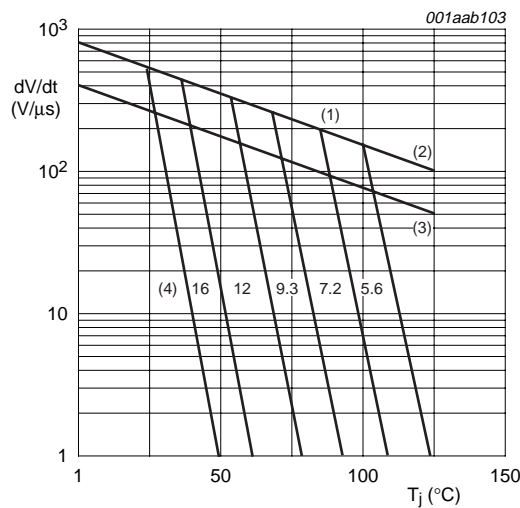




$V_O = 1.06\text{ V}$ .  
 $R_S = 0.0304\ \Omega$ .

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

Fig 11. On-state current characteristics.



The triac should commute when the  $dI_T/dt$  is below the value on the appropriate curve for pre-commutation  $dI_T/dt$ .

- (1) BT139 SERIES.
- (2) BT139...G SERIES.
- (3) BT139...F SERIES.
- (4)  $dI_{com}/dt = 20\text{ A/ms}$ .

Fig 12. Critical rate of change of commutating voltage as a function of junction temperature; minimum values.

8. Package outline

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

SOT78

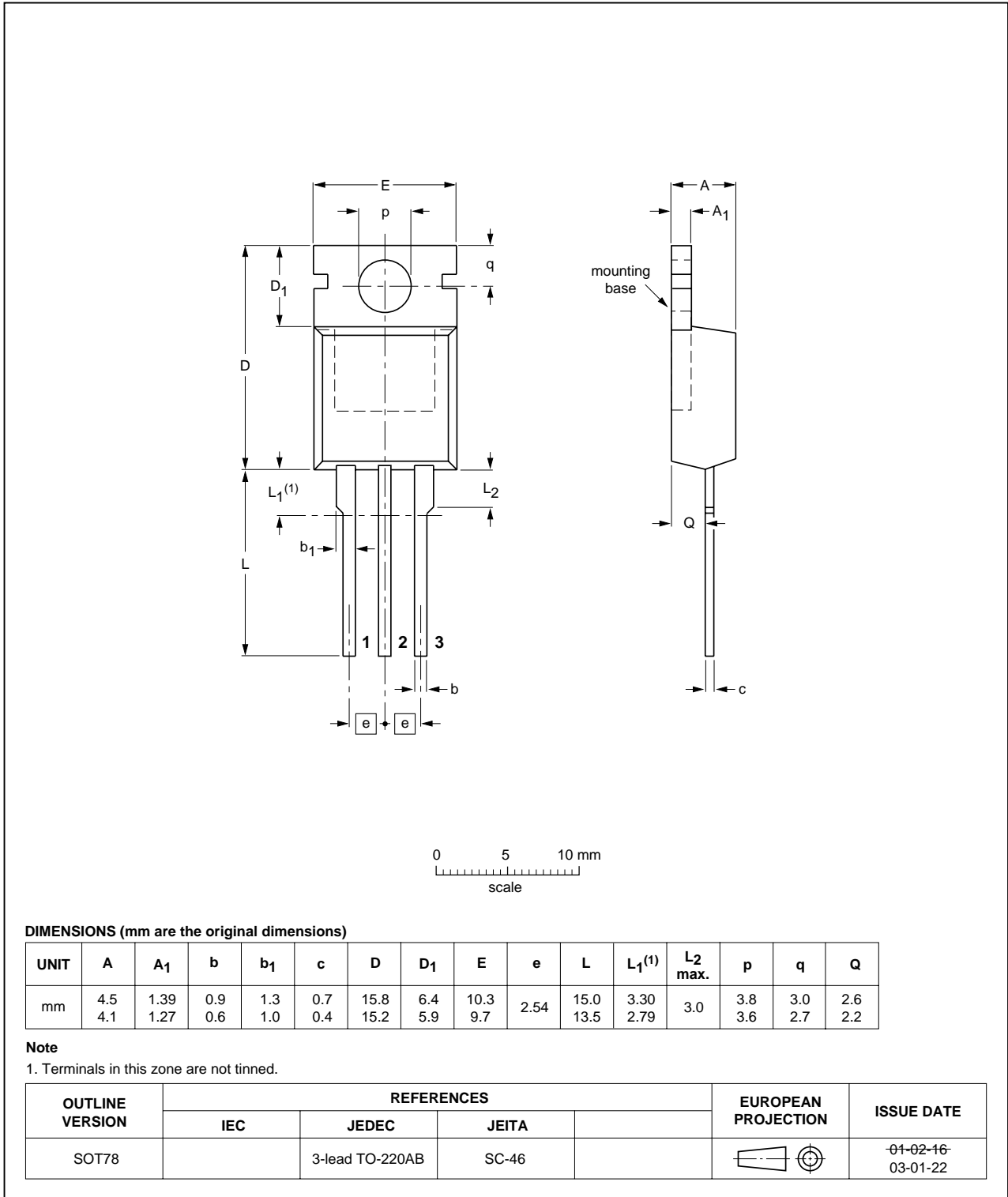


Fig 13. Package outline.

## 9. Revision history

**Table 7: Revision history**

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
BT139_SERIES_4	20040706	Product data sheet	-	9397 750 13358	BT139_SERIES_3
Modifications:	Data sheet updated to latest standards.				
BT139_SERIES_3	20030401	Product specification	-	-	BT139_SERIES_2
BT139_SERIES_2	20010701	Product specification	-	-	BT139_SERIES_1
BT139_SERIES_1	19970901	Product specification	-	-	-

## 10. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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