

## Three quadrant triacs guaranteed commutation

## BTA204X series D, E and F

### GENERAL DESCRIPTION

Passivated guaranteed commutation triacs in a plastic full pack envelope, intended for use in motor control circuits or with other highly inductive loads. These devices balance the requirements of commutation performance and gate sensitivity. The "sensitive gate" E series and "logic level" D series are intended for interfacing with low power drivers, including micro controllers.

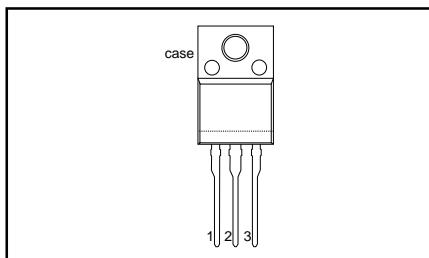
### QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	MAX.	MAX.	UNIT
	BTA204X- BTA204X- BTA204X-	500D 500E 500F	600D 600E 600F	- 800E 800F	V
$V_{DRM}$	Repetitive peak off-state voltages	500	600	800	
$I_{T(RMS)}$	RMS on-state current	4	4	4	A
$I_{TSM}$	Non-repetitive peak on-state current	25	25	25	A

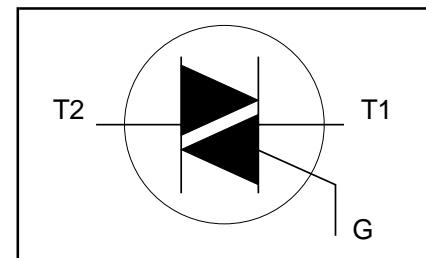
### PINNING - SOT186A

PIN	DESCRIPTION
1	main terminal 1
2	main terminal 2
3	gate
case	isolated

### PIN CONFIGURATION



### SYMBOL



### LIMITING VALUES

Limiting values in accordance with the Absolute Maximum System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.			UNIT
$V_{DRM}$	Repetitive peak off-state voltages		-	-500 500 <sup>1</sup>	-600 600 <sup>1</sup>	-800 800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{hs} \leq 92^\circ\text{C}$	-	4			A
$I_{TSM}$	Non-repetitive peak on-state current	full sine wave; $T_j = 25^\circ\text{C}$ prior to surge $t = 20\text{ ms}$ $t = 16.7\text{ ms}$ $t = 10\text{ ms}$ $I_{TM} = 6\text{ A}$ ; $I_G = 0.2\text{ A}$ ; $dI_G/dt = 0.2\text{ A}/\mu\text{s}$	- - - - - -	25 27 3.1 100			A A A <sup>2</sup> s A/ $\mu\text{s}$
$I^2t$ $dI_t/dt$	$I^2t$ for fusing Repetitive rate of rise of on-state current after triggering			2			
$I_{GM}$ $V_{GM}$ $P_{GM}$ $P_{G(AV)}$	Peak gate current Peak gate voltage Peak gate power Average gate power	over any 20 ms period	- - - -	5 5 0.5			A V W W
$T_{stg}$ $T_j$	Storage temperature Operating junction temperature		-40 -	150 125			°C °C

<sup>1</sup> Although not recommended, off-state voltages up to 800V may be applied without damage, but the triac may switch to the on-state. The rate of rise of current should not exceed 6 A/ $\mu\text{s}$ .

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## ISOLATION LIMITING VALUE &amp; CHARACTERISTIC

 $T_{hs} = 25^\circ\text{C}$  unless otherwise specified

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{isol}$	R.M.S. isolation voltage from all three terminals to external heatsink	$f = 50-60\text{ Hz}$ ; sinusoidal waveform; R.H. $\leq 65\%$ ; clean and dustfree	-		2500	V
$C_{isol}$	Capacitance from T2 to external heatsink	$f = 1\text{ MHz}$	-	10	-	pF

## THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$R_{th j-hs}$	Thermal resistance junction to heatsink	full or half cycle with heatsink compound	-	-	5.5	K/W
$R_{th j-a}$	Thermal resistance junction to ambient	without heatsink compound in free air	-	55	7.2	K/W

## STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.			UNIT
					...D	...E	...F	
$I_{GT}$	Gate trigger current <sup>2</sup>	$V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ T2+ G+ T2+ G- T2- G-	-	-	5	10	25	mA
			-	-	5	10	25	
			-	-	5	10	25	
$I_L$	Latching current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$ T2+ G+ T2+ G- T2- G-	-	-	6	12	20	mA
			-	-	9	18	30	
			-	-	6	12	20	
$I_H$	Holding current	$V_D = 12\text{ V}$ ; $I_{GT} = 0.1\text{ A}$	-	-	6	12	20	mA
			-	-				
			-	-				
$V_T$ $V_{GT}$	On-state voltage Gate trigger voltage	$I_T = 5\text{ A}$ $V_D = 12\text{ V}$ ; $I_T = 0.1\text{ A}$ $V_D = 400\text{ V}$ ; $I_T = 0.1\text{ A}$ ; $T_j = 125^\circ\text{C}$	-	1.4		1.7		V
			-	0.7		1.5		
$I_D$	Off-state leakage current	$V_D = V_{DRM(max)}$ ; $T_j = 125^\circ\text{C}$	0.25	0.4		-		V
			-	0.1		0.5		

<sup>2</sup> Device does not trigger in the T2-, G+ quadrant.

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### DYNAMIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.			TYP.	MAX.	UNIT	
$dV_D/dt$	Critical rate of rise of off-state voltage	<b>BTA204X-</b> $V_{DM} = 67\% V_{DRM(max)}$ ; $T_j = 125^\circ\text{C}$ ; exponential waveform; gate open circuit	...D	20	30	50	-	-	V/ $\mu\text{s}$
$dl_{com}/dt$	Critical rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125^\circ\text{C}$ ; $I_{T(RMS)} = 4\text{ A}$ ; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$ ; gate open circuit	1.0	2.0	2.5	-	-	A/ms	
$dl_{com}/dt$	Critical rate of change of commutating current	$V_{DM} = 400\text{ V}$ ; $T_j = 125^\circ\text{C}$ ; $I_{T(RMS)} = 4\text{ A}$ ; $dV_{com}/dt = 0.1\text{ V}/\mu\text{s}$ ; gate open circuit	5.0	-	-	-	-	A/ms	
$t_{gt}$	Gate controlled turn-on time	$I_{TM} = 12\text{ A}$ ; $V_D = V_{DRM(max)}$ ; $I_G = 0.1\text{ A}$ ; $dl_G/dt = 5\text{ A}/\mu\text{s}$	-	-	-	2	-	$\mu\text{s}$	

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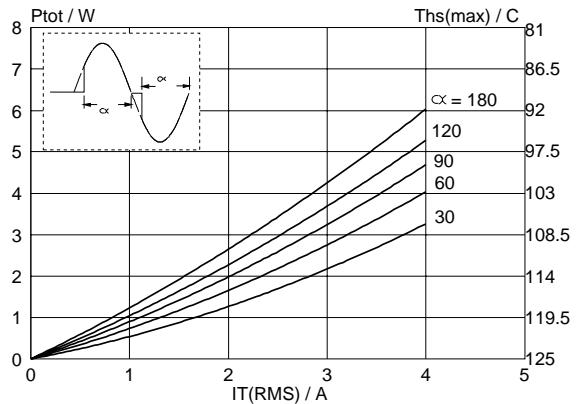


Fig.1. Maximum on-state dissipation,  $P_{tot}$ , versus rms on-state current,  $I_{T(RMS)}$ , where  $\alpha$  = conduction angle.

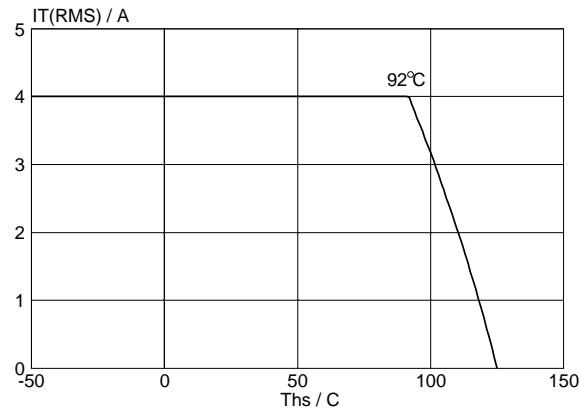


Fig.4. Maximum permissible rms current  $I_{T(RMS)}$ , versus heatsink temperature  $T_{hs}$ .

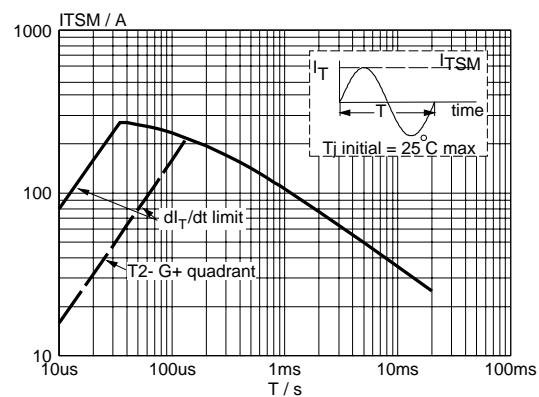


Fig.2. Maximum permissible non-repetitive peak on-state current  $I_{TSM}$ , versus pulse width  $t_p$ , for sinusoidal currents,  $t_p \leq 20ms$ .

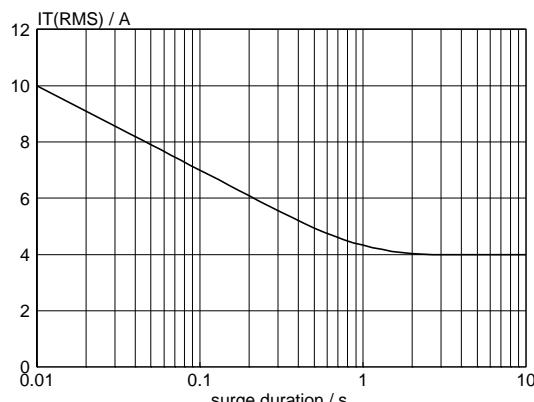


Fig.5. Maximum permissible repetitive rms on-state current  $I_{T(RMS)}$ , versus surge duration, for sinusoidal currents,  $f = 50$  Hz;  $T_{hs} \leq 92$  °C.

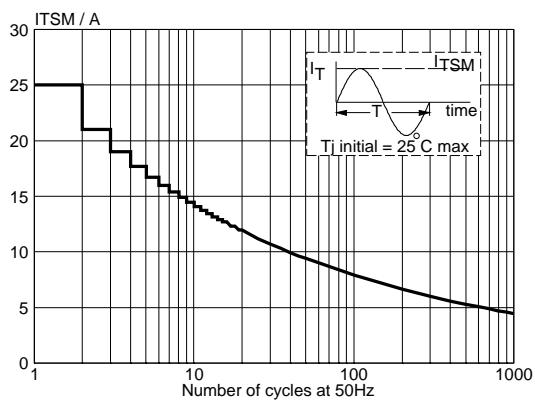


Fig.3. Maximum permissible non-repetitive peak on-state current  $I_{TSM}$ , versus number of cycles, for sinusoidal currents,  $f = 50$  Hz.

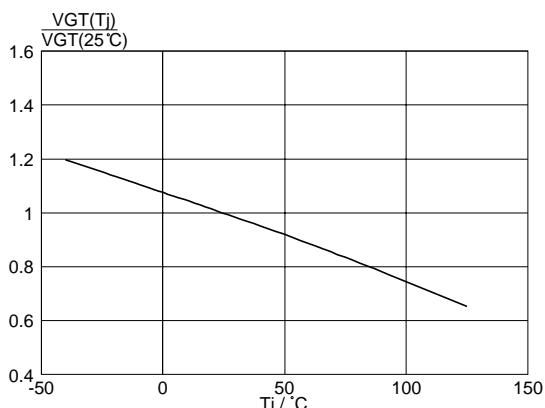


Fig.6. Normalised gate trigger voltage  $V_{GT}(T_j)/V_{GT}(25^\circ C)$ , versus junction temperature  $T_j$ .

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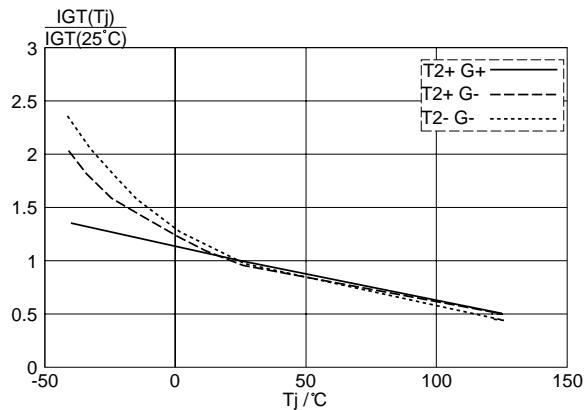


Fig.7. Normalised gate trigger current  $I_{GT}(T_j)/I_{GT}(25^\circ\text{C})$ , versus junction temperature  $T_j$ .

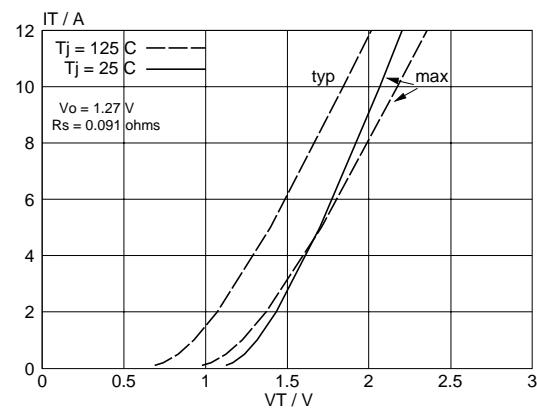


Fig.10. Typical and maximum on-state characteristic.

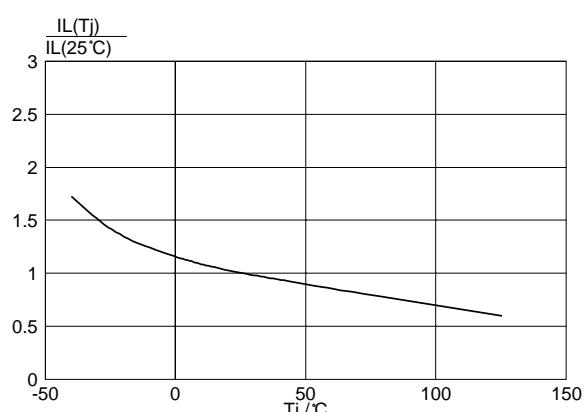


Fig.8. Normalised latching current  $I_L(T_j)/I_L(25^\circ\text{C})$ , versus junction temperature  $T_j$ .

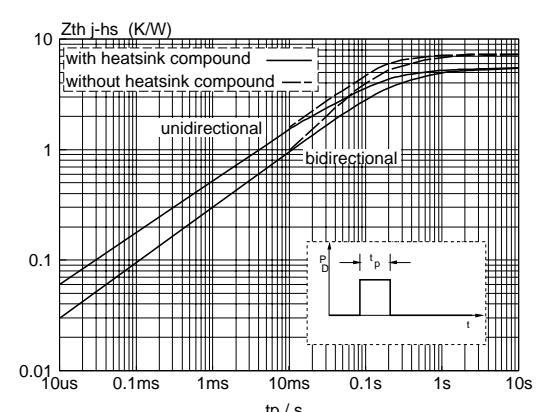


Fig.11. Transient thermal impedance  $Z_{th\ j-hs}$ , versus pulse width  $t_p$ .

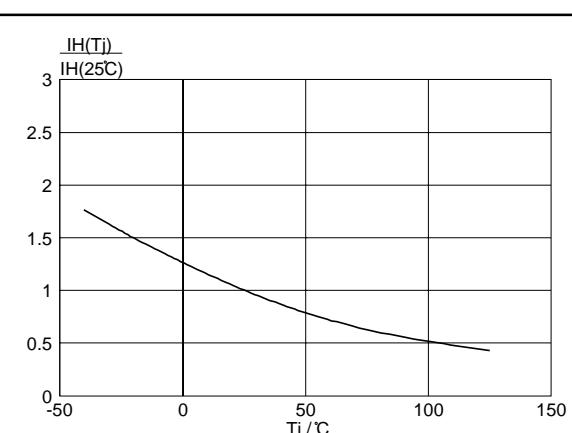


Fig.9. Normalised holding current  $I_H(T_j)/I_H(25^\circ\text{C})$ , versus junction temperature  $T_j$ .

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### MECHANICAL DATA

*Dimensions in mm*

Net Mass: 2 g

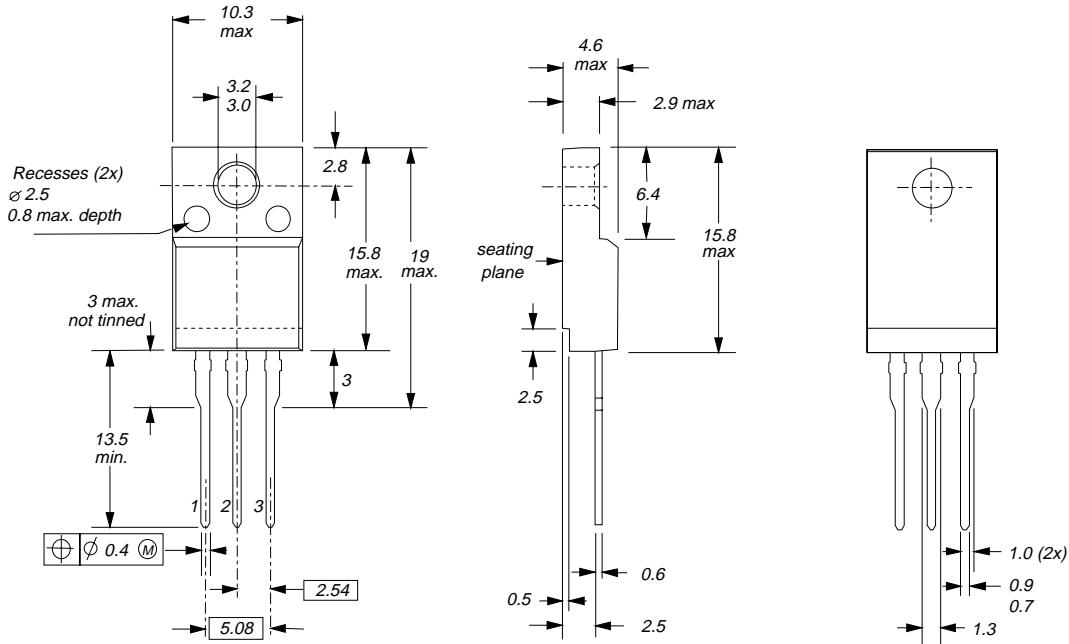


Fig.12. SOT186A; The seating plane is electrically isolated from all terminals.

#### Notes

1. Refer to mounting instructions for F-pack envelopes.
2. Epoxy meets UL94 V0 at 1/8".

**Three quadrant triacs  
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<b>Data sheet status</b>	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
<b>Limiting values</b>	
Limiting values are given in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	
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