MAX.

800E

800

4

25

UNIT

V

А

A

### Three quadrant triacs guaranteed commutation

### BTA204 series D, E and F

MAX.

600D

600E

600F

600

4

25

### GENERAL DESCRIPTION

Passivated guaranteed commutation triacs in a plastic 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.

### **PINNING - TO220AB**

# 

current

QUICK REFERENCE DATA

PARAMETER

Repetitive peak

off-state voltages RMS on-state current

Non-repetitive peak on-state

SYMBOL

 $V_{DRM}$ 

I<sub>T(RMS)</sub>

**PIN CONFIGURATION** 

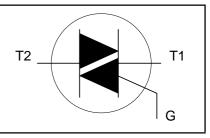
 $I_{TSM}$ 



**BTA204-**

**BTA204-**

BTA204-



PIN	DESCRIPTION			
1	main terminal 1			
2	main terminal 2			
3	gate			
tab	main terminal 2			

### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	M	UNIT	
V <sub>DRM</sub>	Repetitive peak off-state voltages		-	<b>-600</b> 600 <sup>1</sup>	<b>-800</b> 800	V
I <sub>T(RMS)</sub> I <sub>TSM</sub>	RMS on-state current Non-repetitive peak on-state current	full sine wave; $T_{mb} \le 107 \degree C$ full sine wave; $T_{mb} = 25 \degree C$ prior to	-		A	
l²t dI <sub>⊤</sub> /dt	l <sup>2</sup> t for fusing Repetitive rate of rise of on-state current after			2 3 1	Α Α Α²s Α/μs	
I <sub>GM</sub> P <sub>GM</sub> P <sub>G(AV)</sub>	triggering Peak gate current Peak gate power Average gate power	over any 20 ms	- - -	С	A W W	
T <sub>stg</sub> T <sub>j</sub>	Storage temperature Operating junction temperature		-40 -		50 25	°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  $A/\mu s$ .

## Three quadrant triacs guaranteed commutation

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### THERMAL RESISTANCES

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
R <sub>th j-mb</sub> R <sub>th j-a</sub>	Thermal resistance junction to mounting base Thermal resistance junction to ambient	full cycle half cycle in free air		- - 60	3.0 3.7 -	K/W K/W K/W

### STATIC CHARACTERISTICS

 $T_j = 25$  °C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.		MAX.		UNIT
		BTA204-			D	E	F	
I <sub>GT</sub>	Gate trigger current <sup>2</sup>	$V_{\rm D} = 12 \text{ V}; \text{ I}_{\rm T} = 0.1 \text{ A}$ T2+G+	_	_	5	10	25	mA
		T2+ G- T2- G-	-	-	5 5	10 10 10	25 25	mA mA
IL.	Latching current	$V_{\rm D} = 12 \text{ V}; \text{ I}_{\rm GT} = 0.1 \text{ A}$	-	-				
		T2+G+ T2+G-	-	-	6 9	12 18	20 30	mA mA
I <sub>H</sub>	Holding current	T2- G- V <sub>D</sub> = 12 V; I <sub>GT</sub> = 0.1 A	-	-	6 6	12 12	20 20	mA mA
$V_{T} V_{GT}$	On-state voltage Gate trigger voltage	$I_{T} = 5 A$ $V_{D} = 12 V; I_{T} = 0.1 A$ $V_{D} = 400 V; I_{T} = 0.1 A;$	- - 0.25	1.4 0.7 0.4		1.7 1.5 -		V V V
I <sub>D</sub>	Off-state leakage current	$T_{j} = 125 °C$ $V_{D} = V_{DRM(max)};$ $T_{j} = 125 °C$	-	0.1		0.5		mA

### **DYNAMIC CHARACTERISTICS**

 $T_i = 25$  °C unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS		MIN.		TYP.	MAX.	UNIT
		BTA204-	D	E	F			
dV <sub>D</sub> /dt	Critical rate of rise of off-state voltage	$V_{DM} = 67\% V_{DRM(max)};$ $T_j = 125 °C; exponential waveform; gate open circuit$	20	30	50	-	-	V/µs
dl <sub>com</sub> /dt	Critical rate of change of commutating current	$V_{DM} = 400 \text{ V}; \text{ T}_{j} = 125 \text{ °C};$ $I_{T(RMS)} = 4 \text{ A};$ $dV_{com}/dt = 10V/\mu \text{s}; \text{ gate}$ open circuit	1.1	2.1	3.0	-	-	A/ms
dl <sub>com</sub> /dt	Critical rate of change of commutating current	$V_{DM} = 400 \text{ V}; \text{ T}_{j} = 125 \text{ °C};$ $I_{T(RMS)} = 4 \text{ A};$ $dV_{com}/dt = 0.1 \text{ V}/\mu\text{s}; \text{ gate}$ open circuit	4.5	8.0	15	-	-	A/ms
t <sub>gt</sub>	Gate controlled turn-on time	$I_{TM} = 12 \text{ A}; V_D = V_{DRM(max)};$ $I_G = 0.1 \text{ A}; dI_G/dt = 5 \text{ A}/\mu \text{s}$	-	-	-	2	-	μs

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

8

7

6

5

4

3

2

1 0

0

1000

100

25

20

15

10

5

01

BTA204 series D, E and F

### Three quadrant triacs guaranteed commutation

#### Tmb(max) / C Ptot / W IT(RMS) / A 5 104 107℃ ⊂ = 180 107 120 110 90 3 60 113 30 2 116 119 122 125 0<u></u>\_50 50 Tmb / C 2 3 IT(RMS) / A 3 4 5 0 100 150 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 mounting base temperature $T_{mb}$ . 12 |T(RMS) / A 10 tim 8 6 dl<sub>T</sub>/dt limit G+ quadrant 2 10 **∟** 10us 100us 10ms 1ms T/s 100ms 8.01 0.1 10 surge duration / s Fig.5. Maximum permissible repetitive rms on-state current $I_{T(RMS)}$ , versus surge duration, for sinusoidal currents, f = 50 Hz; $T_{mb} \le 107^{\circ}$ C. Fig.2. Maximum permissible non-repetitive peak on-state current $I_{TSM}$ , versus pulse width $t_p$ , for sinusoidal currents, $t_p \le 20ms$ . 30 | ITSM / A VGT(Tj VGT(25 1.6 тем 1.4 Ti initial = 25 C max 1.2 1 0.8 0.6 0.4 └─ -50 10 100 Number of cycles at 50Hz 1000 тј / °С 100 150 0

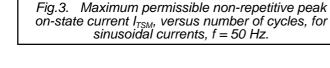
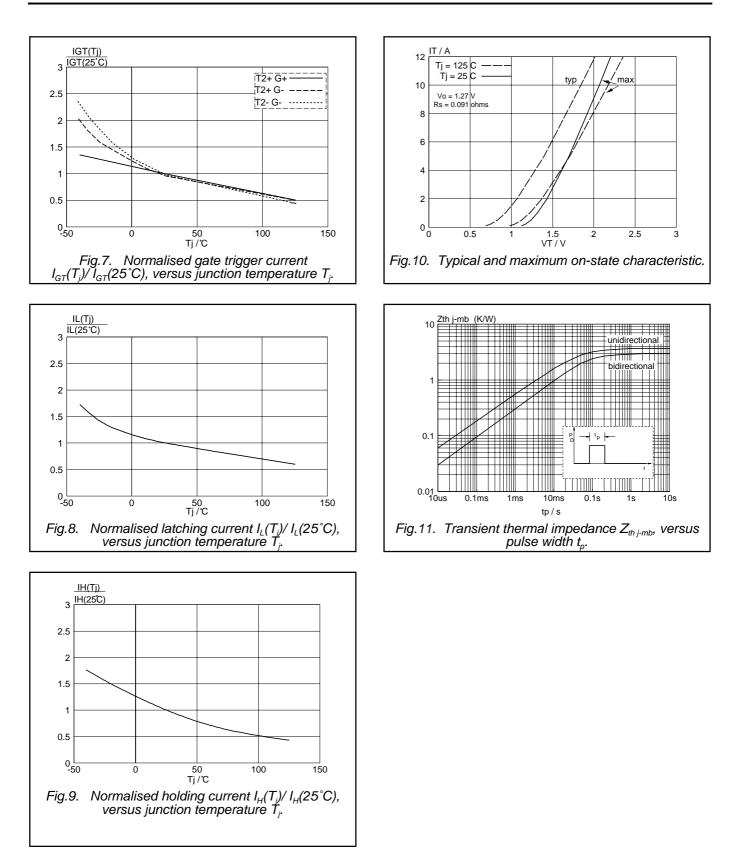


Fig.6. Normalised gate trigger voltage

 $V_{GT}(T_j)/V_{GT}(25^{\circ}C)$ , versus junction temperature  $T_j$ .

BTA204 series D, E and F

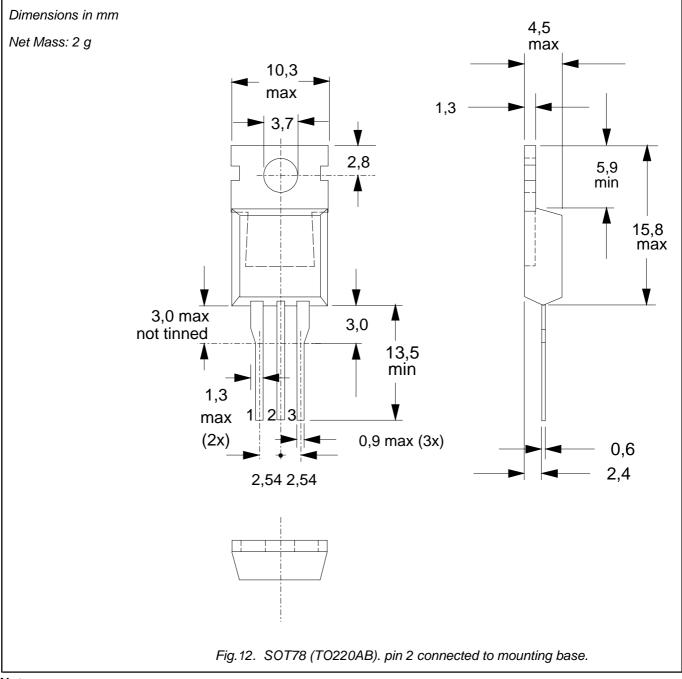
### Three quadrant triacs guaranteed commutation



## Three quadrant triacs guaranteed commutation

### BTA204 series D, E and F

### **MECHANICAL DATA**



Notes 1. Refer to mounting instructions for SOT78 (TO220) envelopes. 2. Epoxy meets UL94 V0 at 1/8".

### Three quadrant triacs guaranteed commutation

### BTA204 series D, E and F

#### DEFINITIONS

DATA SHEET STATUS						
DATA SHEET STATUS <sup>3</sup>	PRODUCT STATUS⁴	DEFINITIONS				
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				
Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product				
Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Changes will be communicated according to the Customer Product/Process Change Notification (CPCN) procedure SNW-SQ-650A				

#### Limiting values

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.

#### Application information

Where application information is given, it is advisory and does not form part of the specification.

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<sup>3</sup> Please consult the most recently issued datasheet before initiating or completing a design.

**<sup>4</sup>** The product status of the device(s) described in this datasheet may have changed since this datasheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.