Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a IITO220 internally insulated plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series C" triac will commutate the full RMS current at the maximum rated junction temperature without the aid of a snubber. This device has high T_j operating capability and an internally isolated mounting base.

2. Features and benefits

- · 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- · High surge capability
- High T_{j(max)}
- Isolated mounting base with 2500 V (RMS) isolation
- · Least sensitive gate for highest noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- UL1557 certified (Document number E346397)

3. Applications

- Electronic thermostats (heating and cooling)
- · High power motor controls
- · Rectifier-fed DC inductive loads e.g. DC motors and solenoids

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Тур	Max	Unit		
Absolute	Absolute maximum rating								
V_{DRM}	repetitive peak off-state voltage			-	-	800	V		
I _{T(RMS)}	RMS on-state current	full sine wave; $T_{mb} \le 108 ^{\circ}\text{C}$; Fig. 1; Fig. 2; Fig. 3		-	-	16	А		
I _{TSM}	non-repetitive peak on- state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		-	-	160	А		
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	-	176	Α		
T _j	junction temperature			-	-	150	°C		
Static ch	aracteristics								
I _{GT}	gate trigger current	$V_D = 12 \text{ V}; I_T = 0.1 \text{ A}; T2+ G+;$ $T_j = 25 \text{ °C}; Fig. 7$		2	-	35	mA		

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
		$V_D = 12 \text{ V}; I_T = 0.1 \text{ A}; T2+ G-;$ $T_j = 25 \text{ °C}; Fig. 7$	2	-	35	mA
		$V_D = 12 \text{ V}; I_T = 0.1 \text{ A}; T2- \text{ G-};$ $T_j = 25 \text{ °C}; Fig. 7$	2	-	35	mA
I _H	holding current	$V_D = 12 \text{ V}; T_j = 25 \text{ °C}; Fig. 9$	-	-	35	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; <u>Fig. 10</u>	-	1.2	1.5	V
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	500	-	-	V/µs
		V_{DM} = 536 V; T_{j} = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit	300	-	-	V/µs
dI _{com} /dt	rate of change of commutating current	$V_D = 400 \text{ V}; T_j = 125 ^{\circ}\text{C}; I_{T(RMS)} = 16 \text{ A};$ $dV_{com}/dt = 20 \text{ V}/\mu\text{s}; (snubberless condition); gate open circuit$	10	-	-	A/ms
		$V_D = 400 \text{ V}; T_j = 150 ^{\circ}\text{C}; I_{T(RMS)} = 16 \text{ A};$ $dV_{com}/dt = 20 \text{ V}/\mu\text{s}; (snubberless condition); gate open circuit$	4	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	mb	
2	T2	main terminal 2	1 7 5	T2—T1
3	G	gate		sym051
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA416Y-800C	IITO220	BTA416Y-800C,127	Tube	50	SOT78D	07-July-2010

7. Marking

Table 4. Marking codes

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Type number	Marking codes
BTA416Y-800C	BTA416Y 800C

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		-	800	V
I _{T(RMS)}	RMS on-state current	full sine wave; T _{mb} ≤ 108 °C; Fig 1; Fig 2; Fig 3	-	16	А
I _{TSM}	non-repetitive peak on- state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig 4; Fig 5	-	160	А
		full sine wave; $T_{j(init)} = 25 \text{ °C}$; $t_p = 16.7 \text{ ms}$	-	176	А
l ² t	I ² t for fusing	t _P = 10 ms; SIN	-	128	A ² s
dl _⊤ /dt	rate of rise of on-state current	I _G = 0.2 A	-	100	A/µs
I _{GM}	peak gate current		-	4	А
P_{GM}	peak gate power		-	5	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

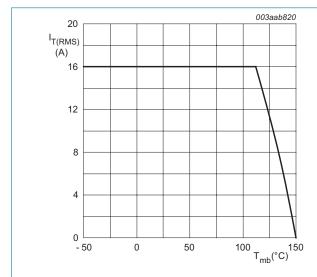
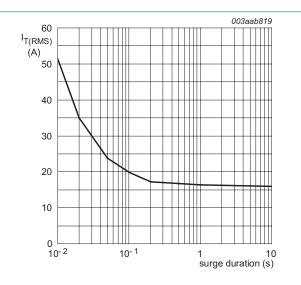


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values

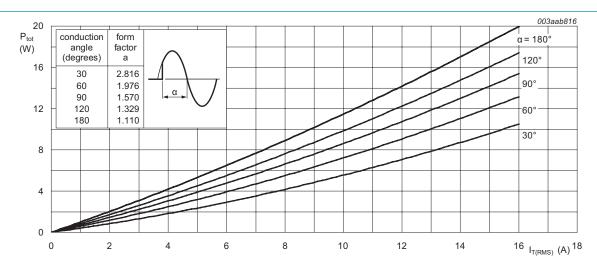


 $f = 50 \text{ Hz}; T_{mb} = 108 \text{ }^{\circ}\text{C}$

Fig. 2. RMS on-state current as a function of surge duration; maximum values

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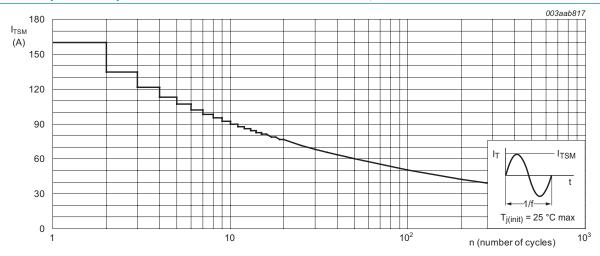
3Q Hi-Com Triac



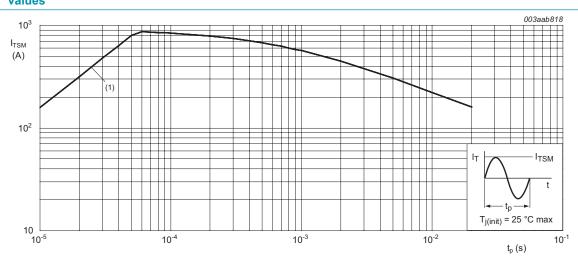
 α = conduction angle

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



 $t_p \le 20 \text{ ms}$ (1) dl_⊤/dt limit

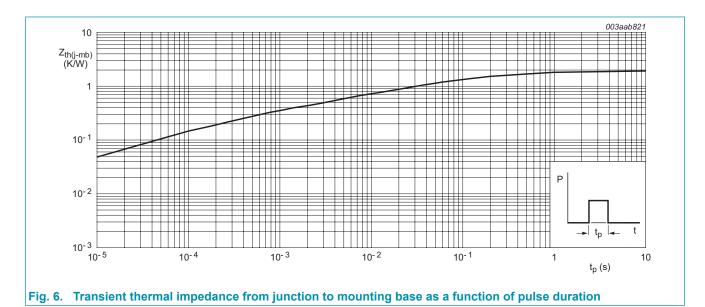
BTA416Y-800C

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
R _{th(j-mb)}	thermal resistance from junction to mounting base	full cycle; Fig. 6	-	-	1.9	K/W
$R_{\text{th(j-a)}}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



10. Isolation characteristics

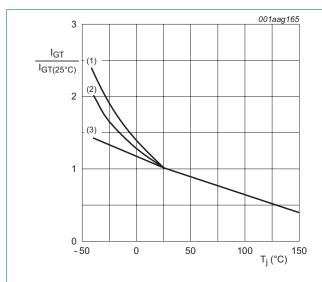
Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V _{isol(RMS)}	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz \leq f \leq 60 Hz; RH \leq 65 %; $T_h = 25$ °C	-	-	2500	V
C _{isol}	isolation capacitance	from main terminal 2 to external heatsink; f = 1 MHz; T _h = 25 °C	-	10	-	pF

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Static ch	aracteristics					
I _{GT}	gate trigger current	$V_D = 12 \text{ V}; I_T = 0.1 \text{ A}; T2+ G+; $ $T_j = 25 \text{ °C}; Fig. 7$	2	-	35	mA
		$V_D = 12 \text{ V; } I_T = 0.1 \text{ A; } T2 + G-;$ $T_j = 25 \text{ °C; } Fig. 7$	2	-	35	mA
		$V_D = 12 \text{ V; } I_T = 0.1 \text{ A; } T2- \text{ G-;} $ $T_j = 25 \text{ °C; } Fig. 7$	2	-	35	mA
I _L	latching current	$V_D = 12 \text{ V}; I_G = 0.1 \text{ A}; T2+ G+;$ $T_j = 25 \text{ °C}; Fig. 8$	-	-	50	mA
		$V_D = 12 \text{ V}; I_G = 0.1 \text{ A}; T2+ G-;$ $T_j = 25 \text{ °C}; Fig. 8$	-	-	60	mA
		$V_D = 12 \text{ V}; I_G = 0.1 \text{ A}; T2- \text{ G-};$ $T_j = 25 \text{ °C}; Fig. 8$	-	-	50	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; <u>Fig. 9</u>	-	-	35	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; <u>Fig. 10</u>	-	1.2	1.5	V
V_{GT}	gate trigger voltage	$V_D = 12 \text{ V}; I_T = 0.1 \text{ A}; T_j = 25 \text{ °C};$ Fig. 11	-	0.7	1	V
		V _D = 400 V; I _T = 0.1 A; T _j = 150 °C	0.25	0.4	-	V
I _D	off-state current	V _D = 800 V; T _j = 125 °C	-	0.1	0.5	mA
		V _D = 800 V; T _j = 150 °C	-	0.4	2	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	500	-	-	V/µs
		V_{DM} = 536 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit	300	-	-	V/µs
dl _{com} /dt	rate of change of commutating current	$V_D = 400 \text{ V; } T_j = 125 \text{ °C; } I_{T(RMS)} = 16 \text{ A;}$ $dV_{com}/dt = 20 \text{ V/}\mu\text{s; (snubberless condition); gate open circuit}$	10	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{con}/dt = 20 V/ μ s; (snubberless condition); gate open circuit	4	-	-	A/ms



- (1) T2- G-
- (2) T2+ G-
- (3) T2+ G+

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

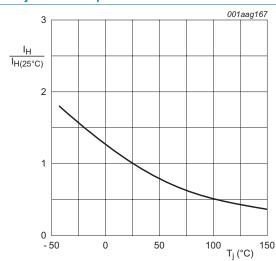


Fig. 9. Normalized holding current as a function of junction temperature

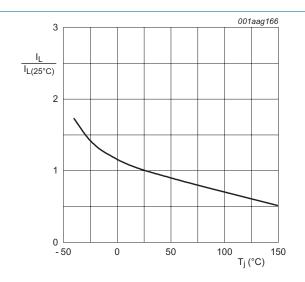
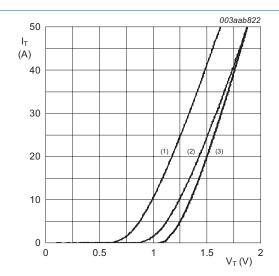
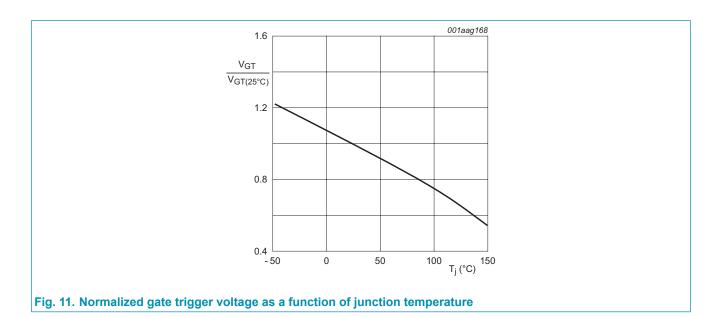


Fig. 8. Normalized latching current as a function of junction temperature

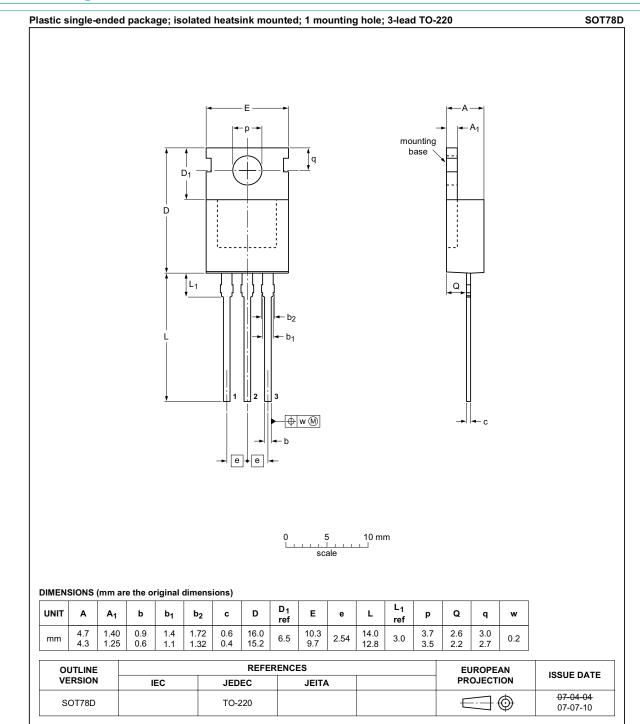


- V_o = 1.086 V; R_s = 0.017 Ω
- (1) $T_j = 150 \,^{\circ}\text{C}$; typical values (2) $T_j = 150 \,^{\circ}\text{C}$; maximum values (3) $T_j = 25 \,^{\circ}\text{C}$; maximum values

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



12. Package outline



13. Legal information

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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Date of release: 18 July 2022

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