

1. General description

Planar passivated high commutation three quadrant triac in a SOT78D (TO-220AB) internally insulated plastic package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series B" 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
- Very high immunity to false turn-on by dV/dt

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

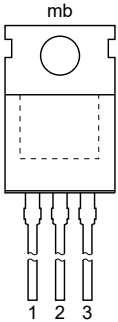

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage		-	-	800	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_{mb} \leq 108\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	-	160	A
		full sine wave; $T_{j(init)} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	-	176	A
T_j	junction temperature		-	-	150	°C
Static characteristics						

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{GT}	gate trigger current	V _D = 12 V; I _T = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 7	2	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7	2	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7	2	-	50	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9	-	-	60	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; Fig. 10	-	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	1000	-	-	V/μs
		V _{DM} = 536 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveeform; gate open circuit	600	-	-	V/μs
dI _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; (without snubber condition); gate open circuit	15	-	-	A/ms
		V _D = 400 V; T _j = 150 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; (without snubber condition); gate open circuit	6	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	 <p>TO-220AB (SOT78D)</p>	 <p>sym051</p>
2	T2	main terminal 2		
3	G	gate		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
T416Y-800B	TO-220AB	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220	SOT78D

7. Limiting values

Table 4. Limiting values

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; $T_{mb} \leq 108\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	-	16	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 20\text{ ms}$; Fig. 4 ; Fig. 5	-	160	A
		full sine wave; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 16.7\text{ ms}$	-	176	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN	-	128	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 0.2\text{ A}$	-	100	$A/\mu s$
I_{GM}	peak gate current		-	4	A
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	$^{\circ}C$
T_j	junction temperature		-	150	$^{\circ}C$

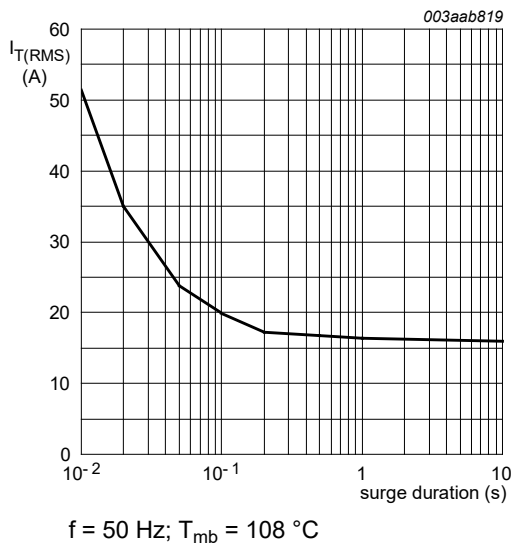


Fig. 1. RMS on-state current as a function of surge duration; maximum values

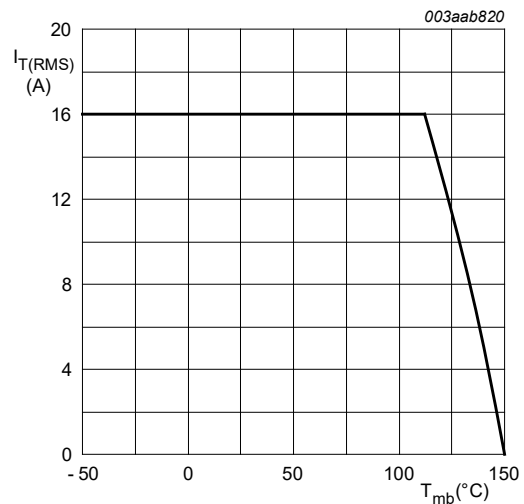


Fig. 2. RMS on-state current as a function of mounting base temperature; maximum values

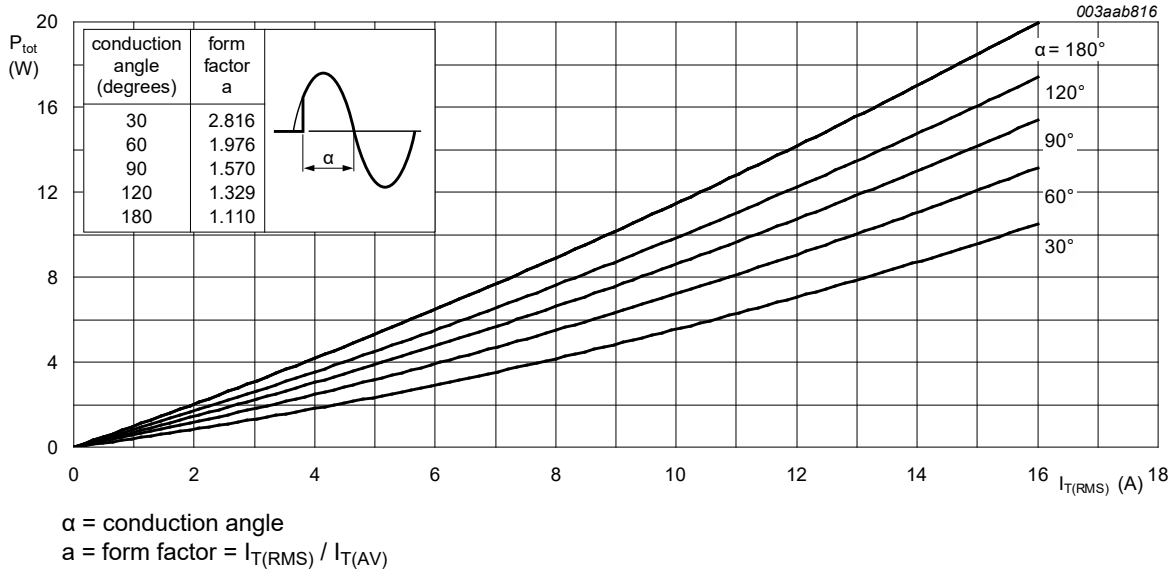


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

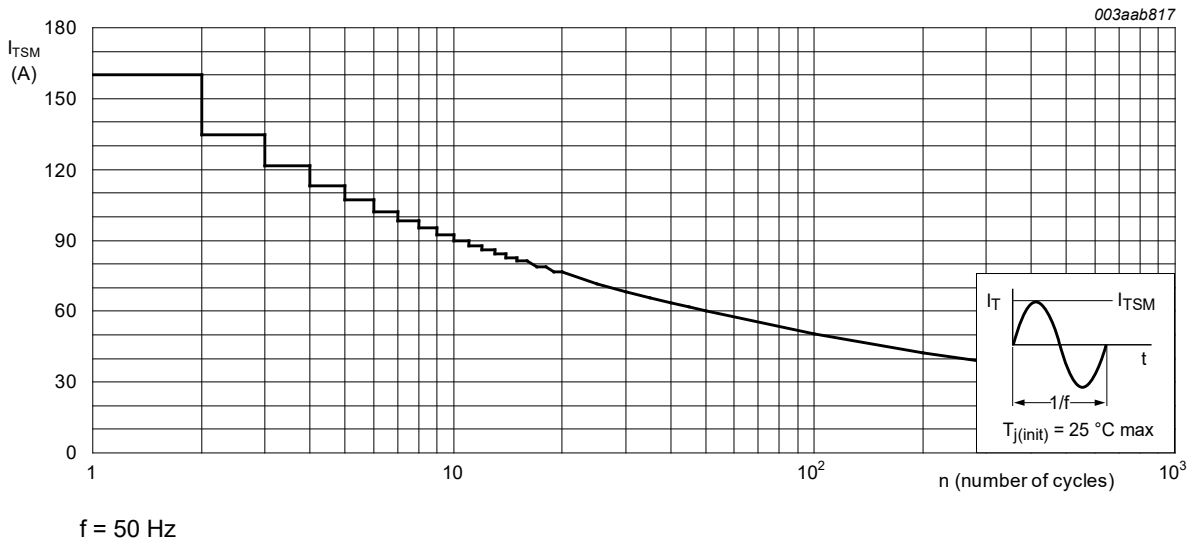


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

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	full cycle; Fig. 6	-	-	1.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

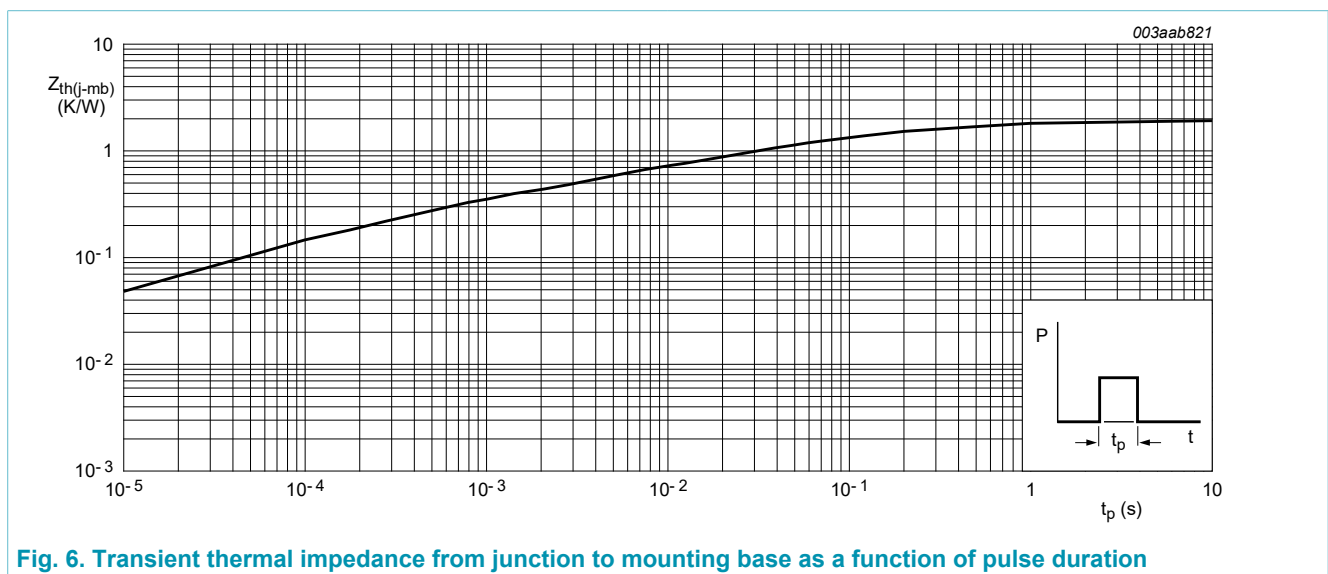


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Isolation characteristics

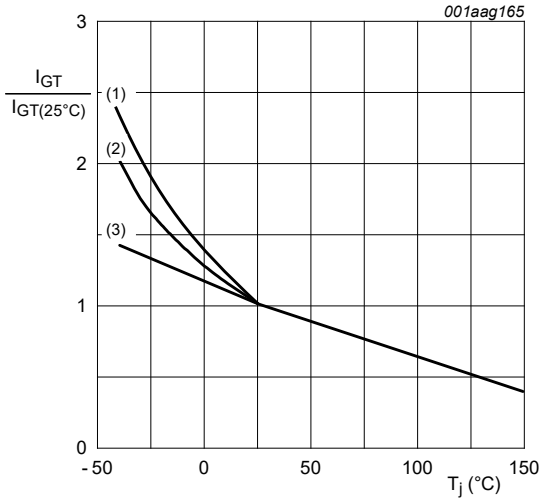
Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50 \text{ Hz} \leq f \leq 60 \text{ Hz}$; $RH \leq 65 \%$; $T_{mb} = 25 \text{ }^\circ\text{C}$	-	-	2500	V
C_{isol}	isolation capacitance	from main terminal 2 to external heatsink; $f = 1 \text{ MHz}$; $T_{mb} = 25 \text{ }^\circ\text{C}$	-	10	-	pF

10. Characteristics

Table 7. 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	2	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7	2	-	50	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _j = 25 °C; Fig. 7	2	-	50	mA
I _L	latching current	V _D = 12 V; I _G = 0.1 A; T2+ G+; T _j = 25 °C; Fig. 8	-	-	60	mA
		V _D = 12 V; I _G = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 8	-	-	90	mA
		V _D = 12 V; I _G = 0.1 A; T2- G-; T _j = 25 °C; Fig. 8	-	-	60	mA
I _H	holding current	V _D = 12 V; T _j = 25 °C; Fig. 9	-	-	60	mA
V _T	on-state voltage	I _T = 20 A; T _j = 25 °C; Fig. 10	-	1.2	1.5	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 = 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	1000	-	-	V/μs
		V _{DM} = 536 V; T _j = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveeform; gate open circuit	600	-	-	V/μs
di _{com} /dt	rate of change of commutating current	V _D = 400 V; T _j = 125 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; (without snubber condition); gate open circuit	15	-	-	A/ms
		V _D = 400 V; T _j = 150 °C; I _{T(RMS)} = 16 A; dV _{com} /dt = 20 V/μs; (without snubber condition); gate open circuit	6	-	-	A/ms



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

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

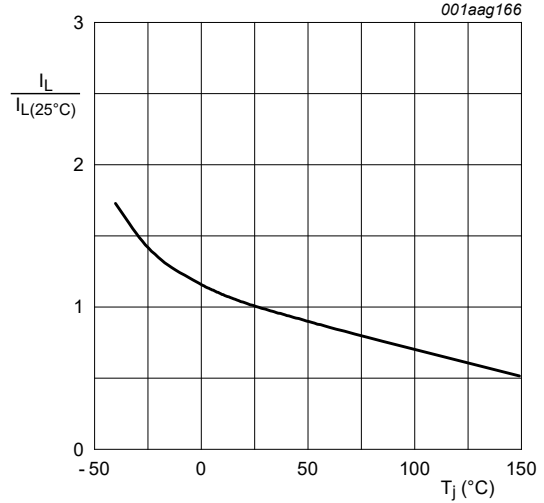


Fig. 8. Normalized latching current as a function of junction temperature

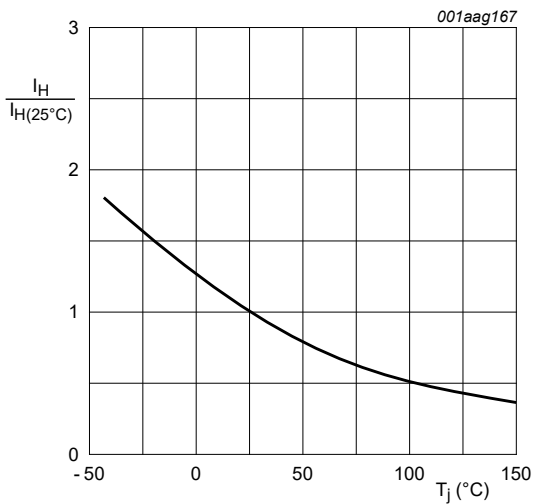
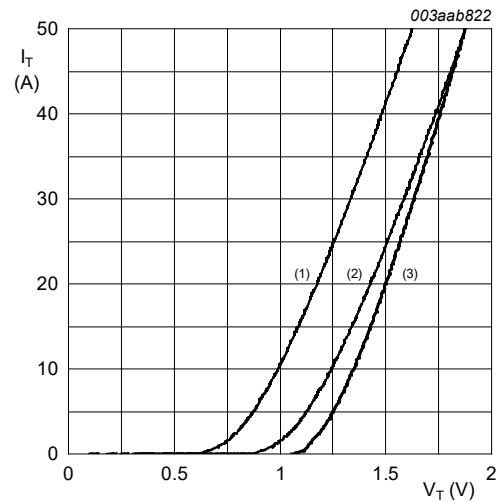


Fig. 9. Normalized holding current as a function of junction temperature



$V_o = 1.086 \text{ V}; R_s = 0.017 \Omega$

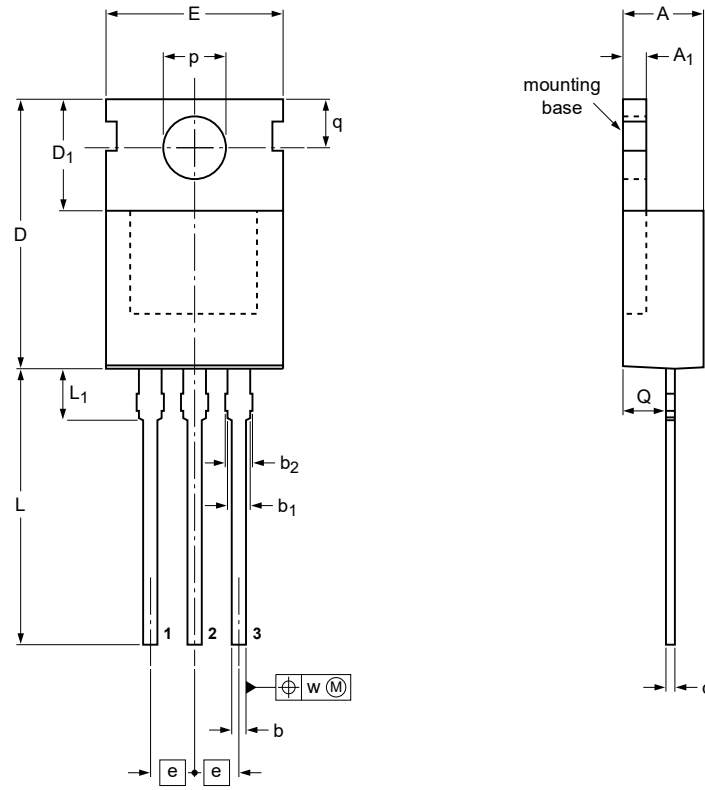
- (1) $T_j = 150^\circ\text{C}$; typical values
- (2) $T_j = 150^\circ\text{C}$; maximum values
- (3) $T_j = 25^\circ\text{C}$; maximum values

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

11. Package outline

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

SOT78D



0 5 10 mm
scale

DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁	b	b ₁	b ₂	c	D	D ₁ ref	E	e	L	L ₁ ref	p	Q	q	w
mm	4.7 4.3	1.40 1.25	0.9 0.6	1.4 1.1	1.72 1.32	0.6 0.4	16.0 15.2	6.5	10.3 9.7	2.54	14.0 12.8	3.0	3.7 3.5	2.6 2.2	3.0 2.7	0.2

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