BTA440J-1200AT

3Q Hi-Com Triac

Rev.01 - 20 December 2024 Product data sheet

1. General description

Planar passivated high commutation three quadrant triac in a TO3PF package intended for use in circuits where high static and dynamic dV/dt and high dI/dt can occur. This "series AT" triac will commutate the full RMS current at the maximum rated junction temperature ($T_{j(max)}$ = 150 °C) without the aid of a snubber. It is used in applications where "high junction operating temperature capability" is required.

2. Features and benefits

- High current TRIAC
- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- High voltage capability
- Least sensitive gate for highest noise immunity
- Low thermal resistance
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- Insulated tab rated at 2500Vrms

3. Applications

- Applications subject to high temperature ($T_{j(max)}$ = 150 °C)
- High current / high surge applications
- High power / industrial controls - e.g. heating, motors, lighting

4. Quick reference data

Table 1. Quick reference data

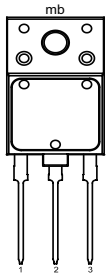
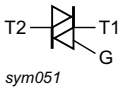
Symbol	Parameter	Conditions	Notes	Values			Unit
V_{DRM}	repetitive peak off-state voltage			1200			V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 77$ °C; Fig. 1; Fig. 2; Fig. 3		40			A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)}$ = 25 °C; t_p = 20 ms; Fig. 4; Fig. 5		400			A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		440			A
T_j	operating junction temperature			-40 to 150			°C
Symbol	**Parameter**	**Conditions**	**Notes**	**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		-	-	75	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	-	75	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	-	75	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	80	mA
V_T	on-state voltage	I_T = 40 A; T_j = 25 °C; Fig. 10		-	-	1.4	V

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Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 804 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1500	-	-	V/µs
		V_{DM} = 804 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 20 A; dV_{com}/dt = 200 V/µs; (snubberless condition); gate open circuit; Fig. 12		35	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 20 A; dV_{com}/dt = 10 V/µs; (snubberless condition); gate open circuit; Fig. 12		180		-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		 sym051
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	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA440J-1200AT	TO3PF	BTA440J-1200ATQ	Tube	30	SOT1293	01-Mar-2017

7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: A	Assembly factory: d
BTA440J-1200AT	BTA440J 1200AT PJAxxxx xx	BTA440J 1200AT PJdxxxx xx

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8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{DRM}	repetitive peak off-state voltage			1200	V
V_{RRM}	repetitive peak reverse voltage			1200	V
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 77$ °C; Fig 1; Fig 2; Fig 3		40	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{j(init)} = 25$ °C; $t_p = 20$ ms; Fig 4; Fig 5		400	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		440	A
I^2t	I^2t for fusing	$t_p = 10$ ms; SIN		800	A^2s
dI_T/dt	rate of rise of on-state current	$I_G = 100$ mA		150	A/µs
I_{GM}	peak gate current			8	A
P_{GM}	peak gate power	$t_p = 25$ us; $T_{j(init)} = 25$ °C		40	W
$P_{G(AV)}$	average gate power	over any 20 ms period		1	W
T_{stg}	storage temperature			-40 to 150	°C
T_j	operating junction temperature			-40 to 150	°C

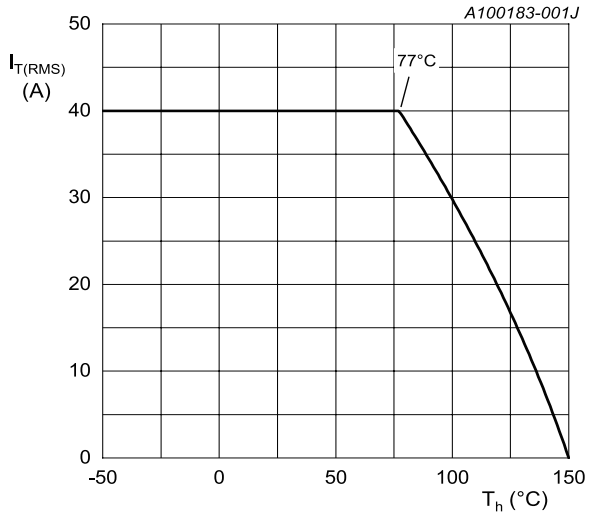
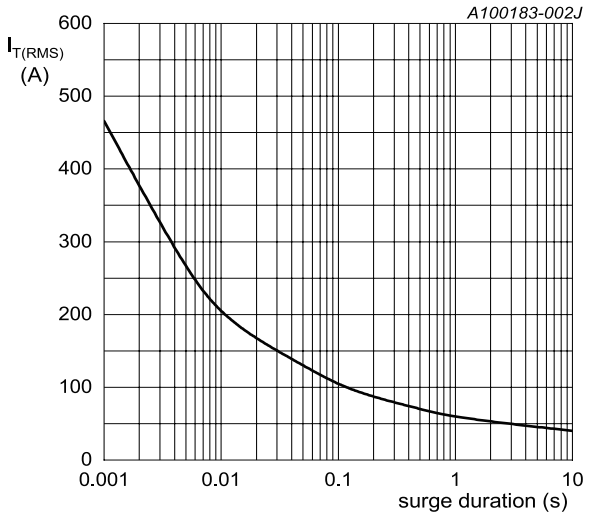


Fig. 1. RMS on-state current as a function of heatsink temperature; maximum values



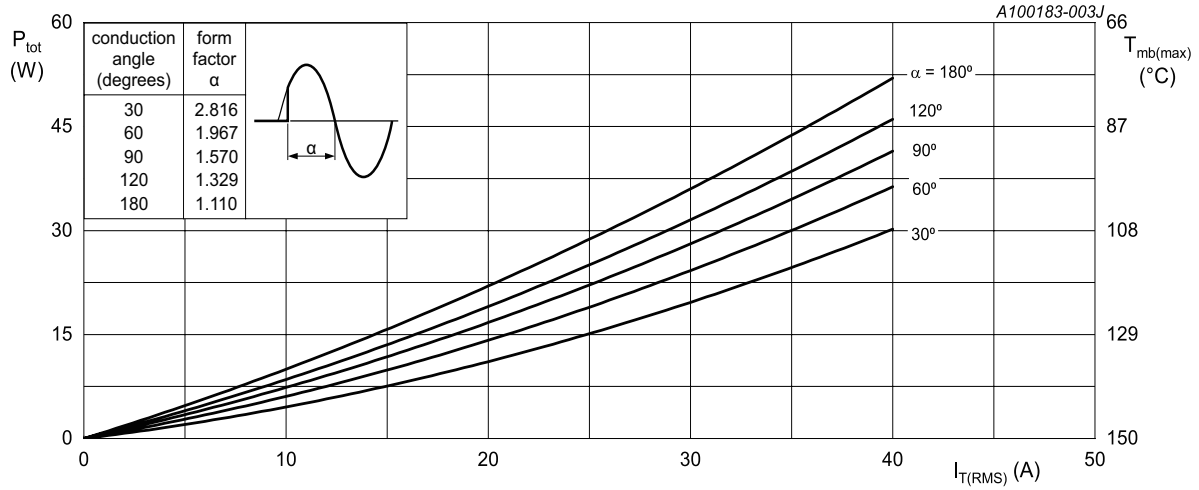
f = 50 Hz; $T_{mb} = 77$ °C

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

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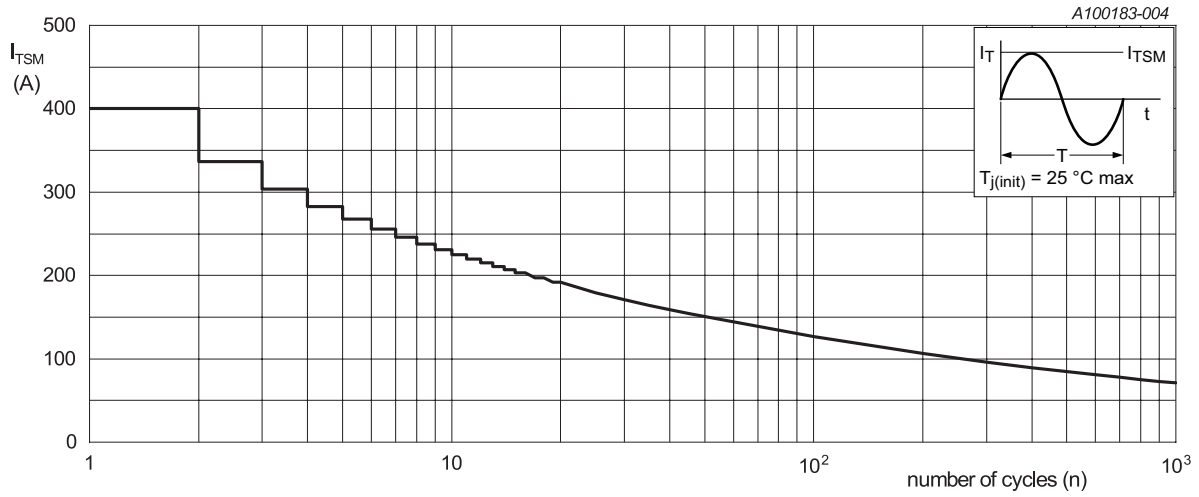
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α = conduction angle

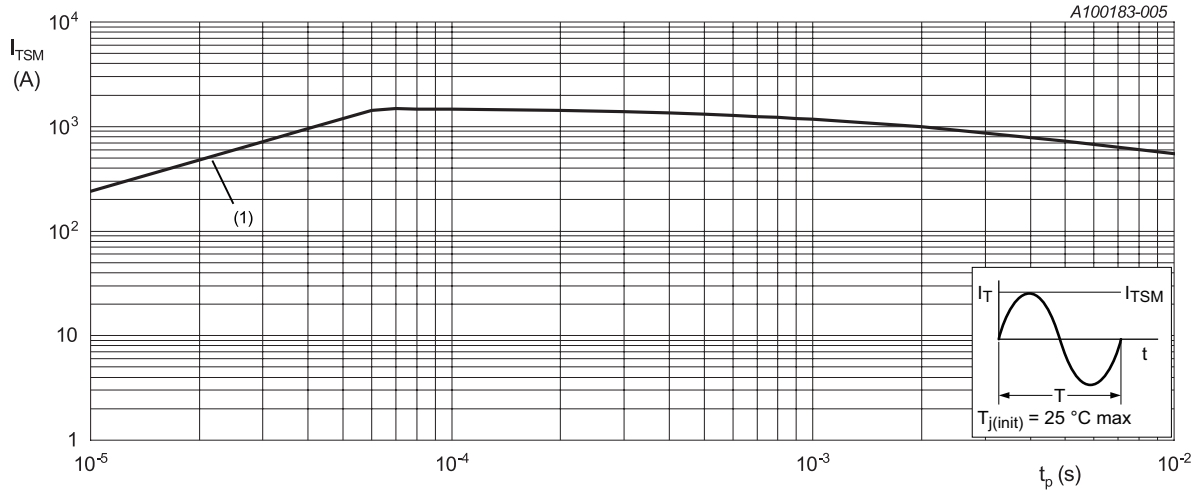
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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



f = 50 Hz

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



$t_p \leq 20$ ms

(1) dI_T/dt limit

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

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9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	full cycle; Fig. 6		-	-	1.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	35	-	K/W

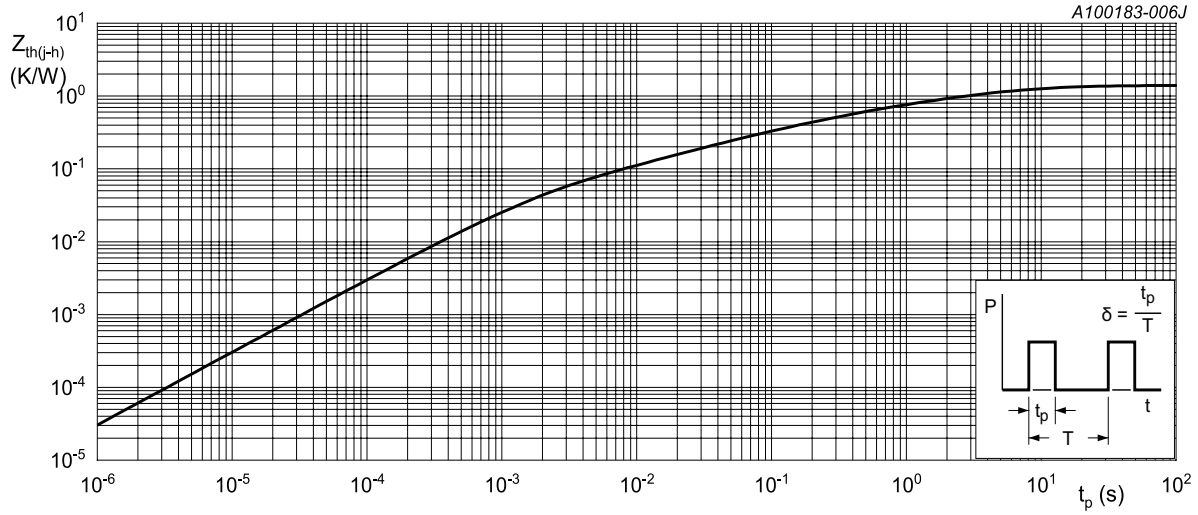


Fig. 6. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all pins to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T_{mb} = 25 °C		-	-	2500	V

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11. Characteristics

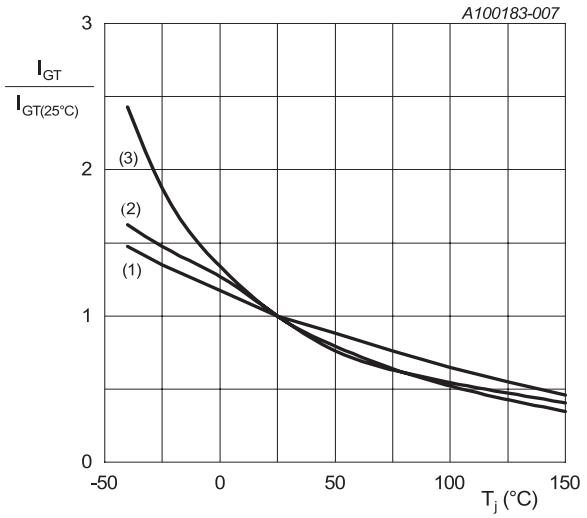
Table 8. Characteristics

Symbol	Parameter	Conditions	Notes	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		-	-	75	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		-	-	75	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		-	-	75	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	100	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	200	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	100	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	80	mA
V_T	on-state voltage	I_T = 40 A; T_j = 25 °C; Fig. 10		-	-	1.4	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 11		-	-	1.2	V
		V_D = 400 V; I_T = 0.1 A; T_j = 150 °C		0.3	-	-	V
I_D	off-state current	V_D = 1200 V; T_j = 25 °C		-	-	10	µA
		V_D = 1200 V; T_j = 125 °C		-	-	2	mA
		V_D = 1200 V; T_j = 150 °C		-	-	5	mA
I_R	reverse current	V_R = 1200 V; T_j = 25 °C		-	-	10	µA
		V_R = 1200 V; T_j = 125 °C		-	-	2	mA
		V_R = 1200 V; T_j = 150 °C		-	-	5	mA
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 804 V; T_j = 125 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1500	-	-	V/µs
		V_{DM} = 804 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		1000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 20 A; dV_{com}/dt = 200 V/µs; (snubberless condition); gate open circuit; Fig. 12		35	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 20 A; dV_{com}/dt = 10 V/µs; (snubberless condition); gate open circuit; Fig. 12		180		-	A/ms

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

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

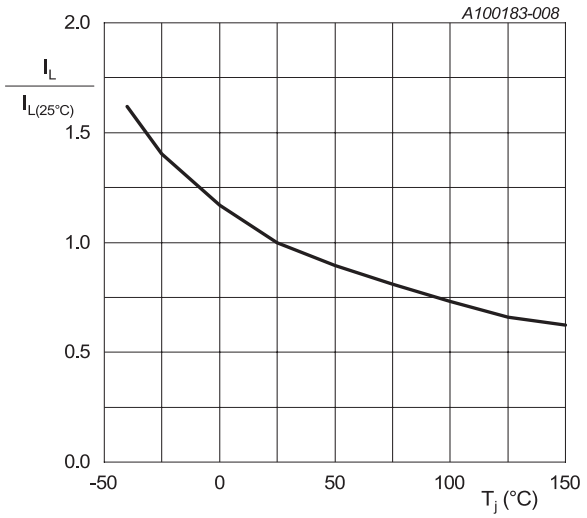


Fig. 8. Normalized latching current as a function of junction temperature

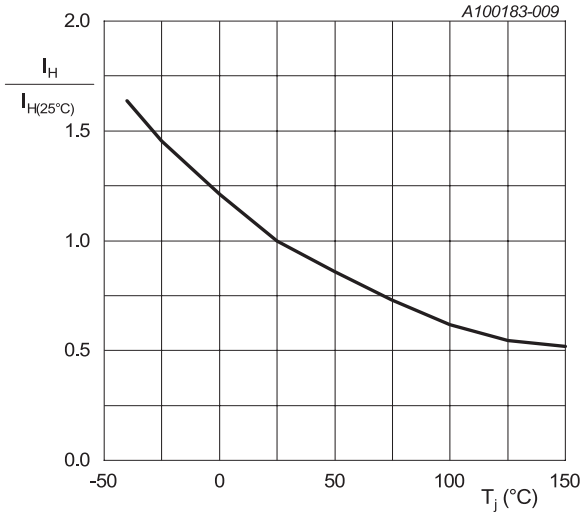
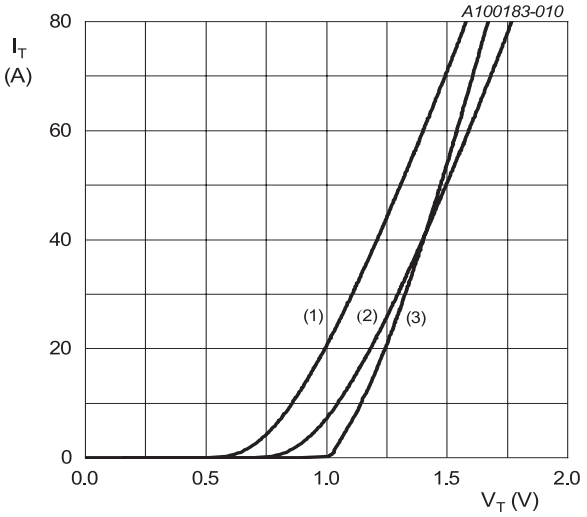


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 0.999 V; R_s = 0.0100 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

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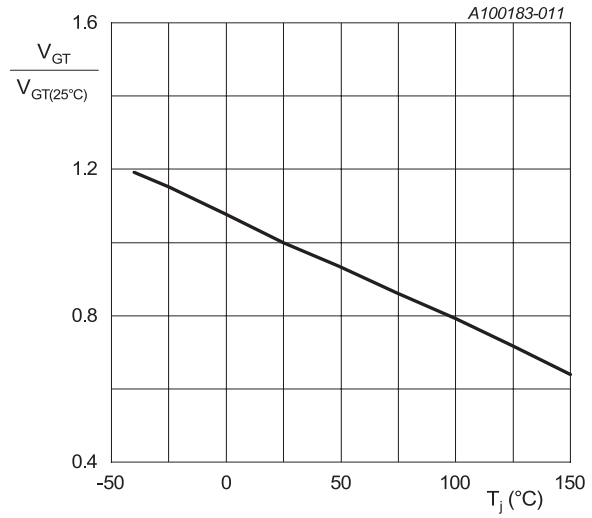


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

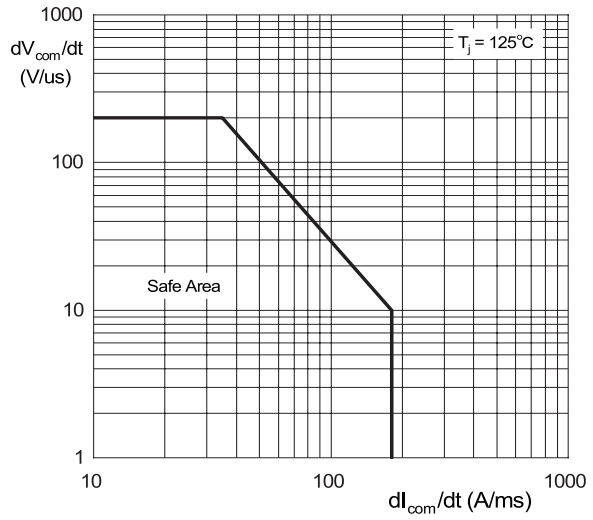


Fig. 12. Safe operating area

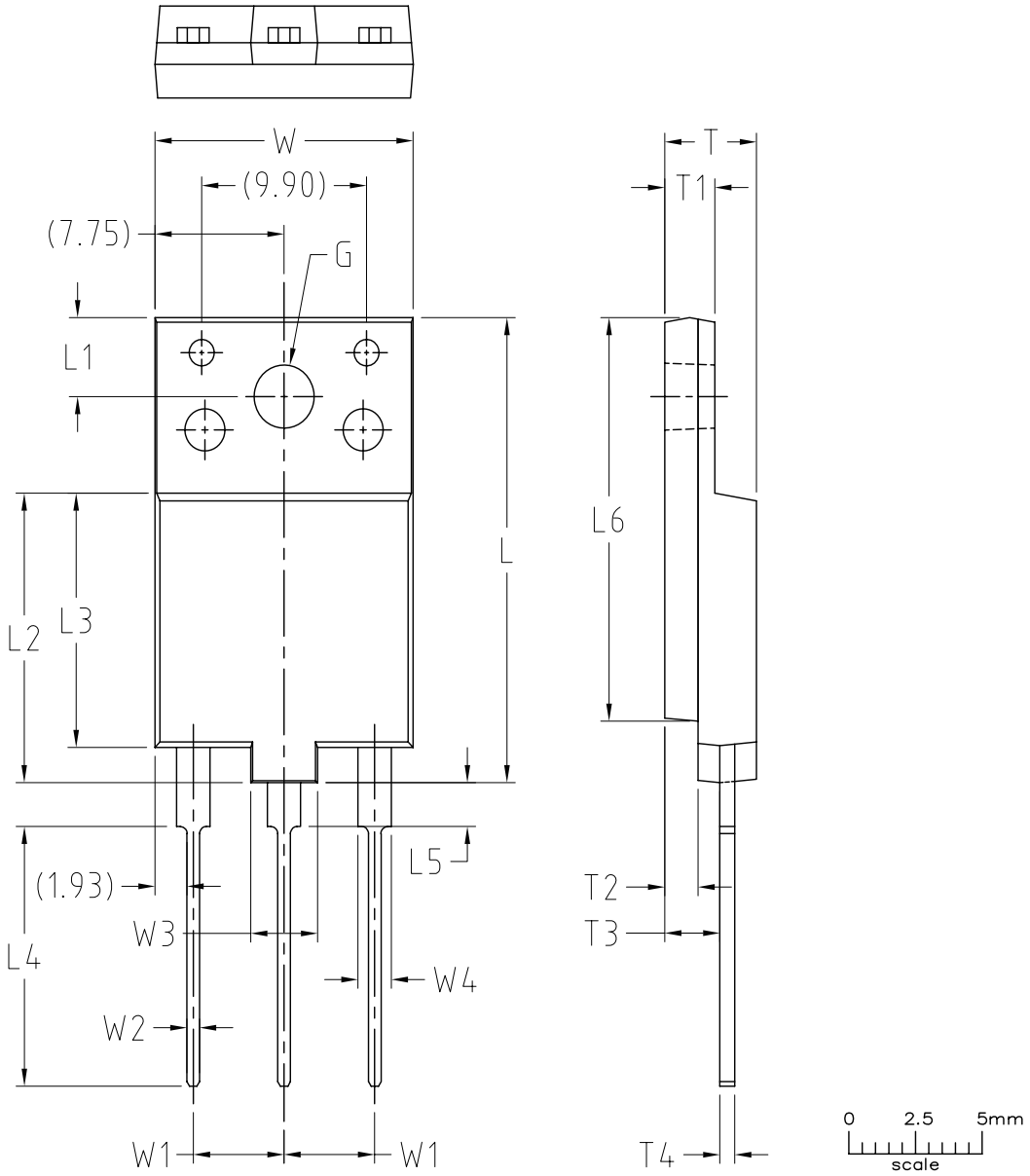
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12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack' TO3PF



RemarK : (X) the dimension X in blackets is for reference

UNIT	W	W1	W2	W3	W4	L	L1	L2	L3	L4	L5	L6	T	T1	T2	T3	T4	G(ø)
mm	15.7	5.75	0.95	4.20	2.20	26.7	4.6	16.7	14.7	15.0	2.7	23.2	5.7	3.2	2.2	3.5	1.1	3.8
	15.3	5.15	0.65	3.80	1.80	26.3	4.4	16.3	14.3	14.6	2.3	22.8	5.3	2.8	1.8	3.1	0.8	3.4

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
		TO−3PF				

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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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[2] The term 'short data sheet' is explained in section "Definitions".
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