BTA440W-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 TO247 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

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

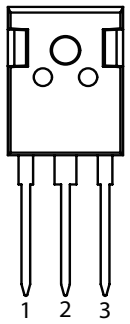
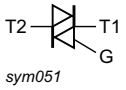
Table 1. Quick reference data

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; $T_{mb} \leq 136$ °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

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; 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; 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	T2	mounting base; main terminal 2		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BTA440W-1200AT	TO247	BTA440W-1200ATQ	Tube	30	TO247N	20-Jun-2016

7. Marking

Table 4. Marking codes

Type number	Marking codes
BTA440W-1200AT	BTA440W 1200AT

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; $T_{mb} \leq 136$ °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	$I_G = 150$ 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

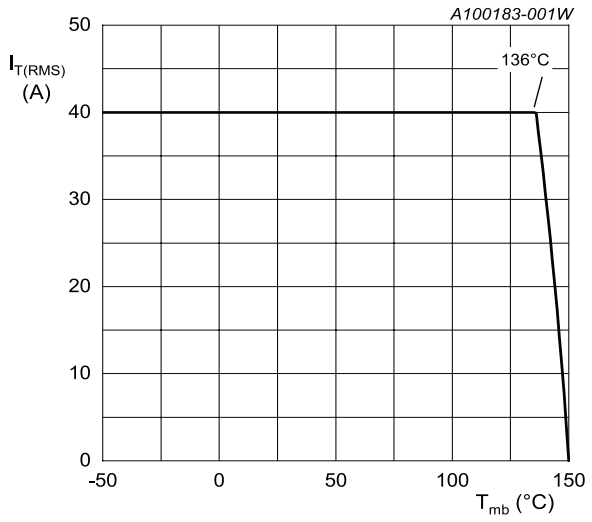
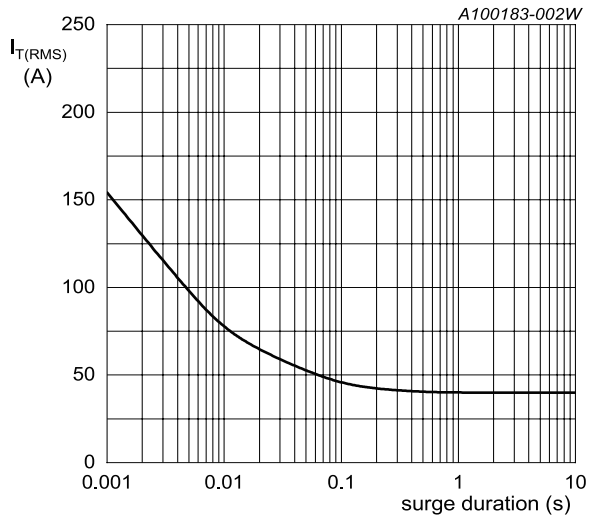
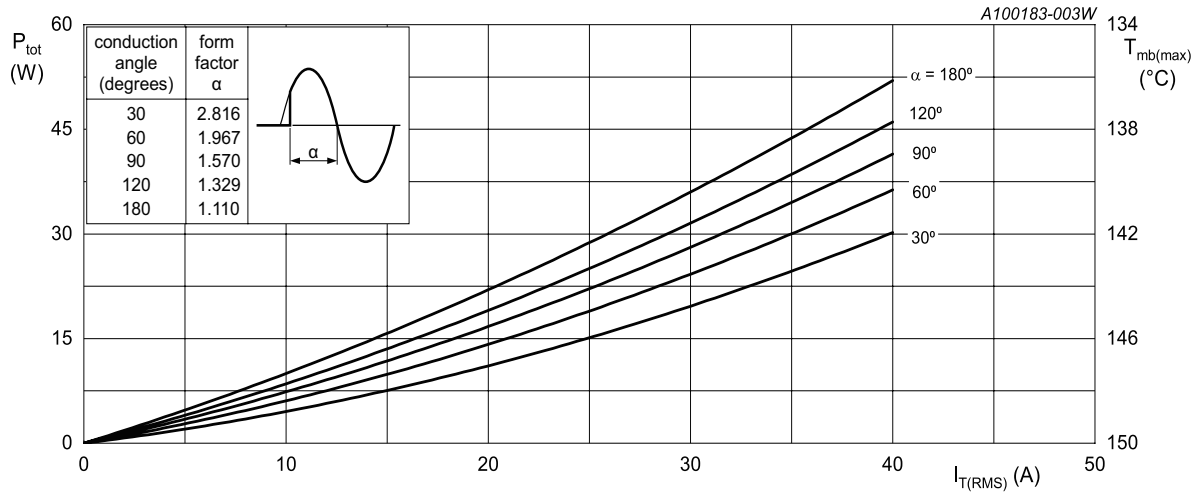


Fig. 1. RMS on-state current as a function of mounting base temperature; maximum values



f = 50 Hz; T_{mb} = 136 °C

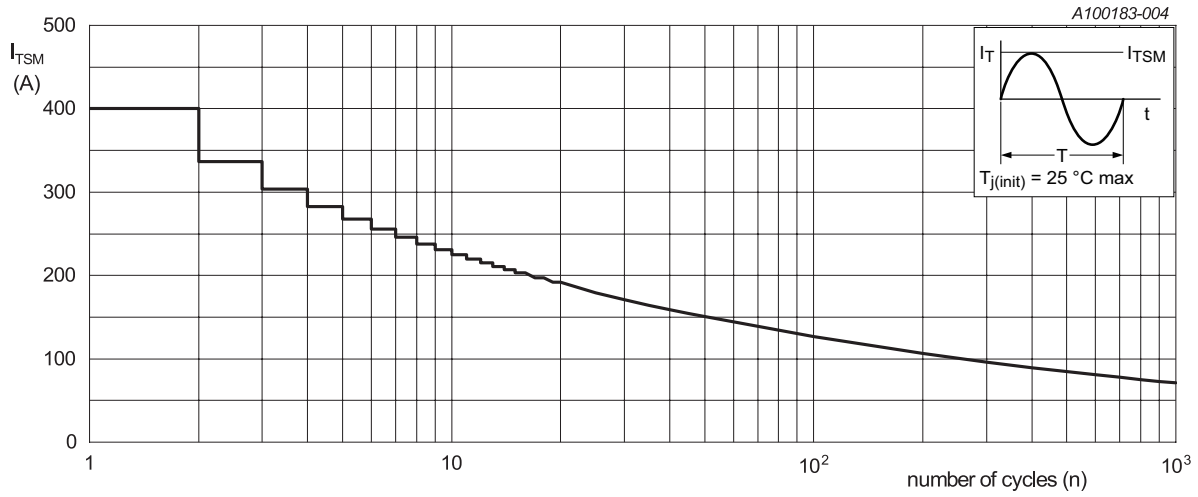
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

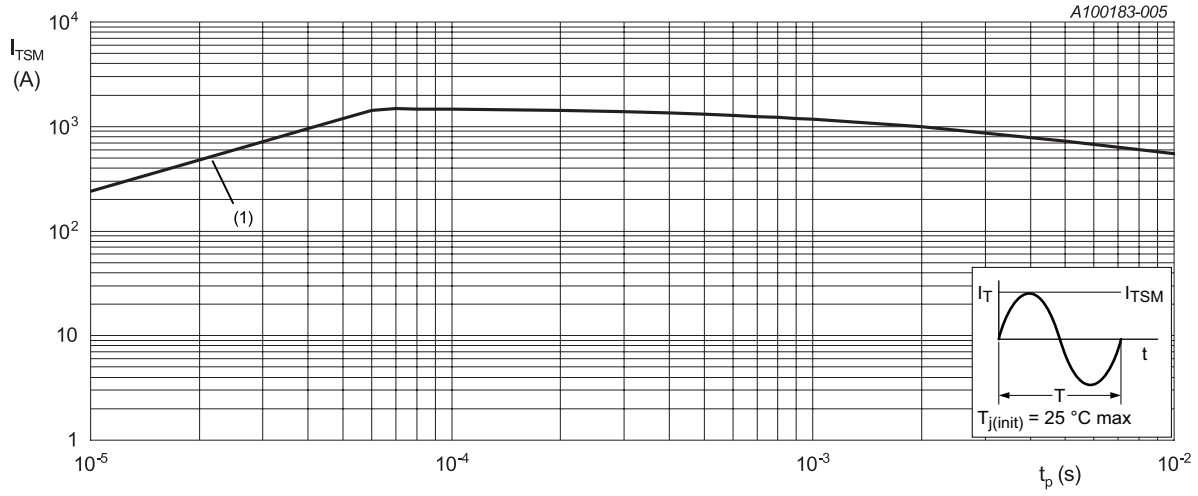
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	full cycle; Fig. 6		-	-	0.27	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	45	-	K/W

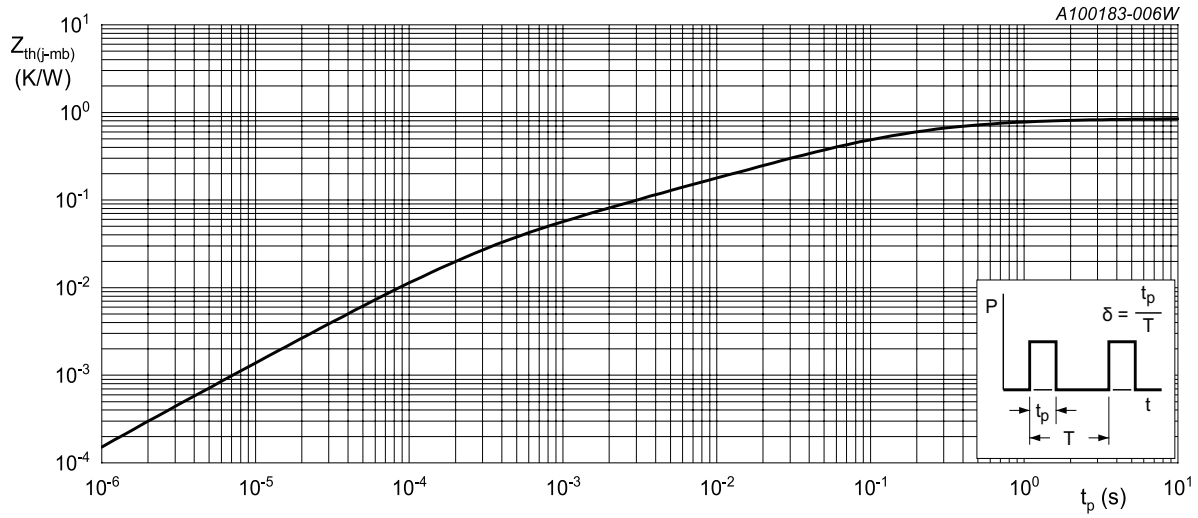
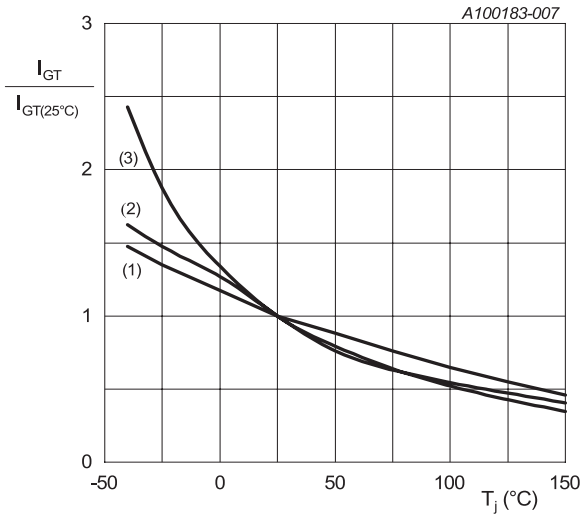


Fig. 6. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. 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; 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; gate open circuit; Fig. 12		180		-	A/ms



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

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

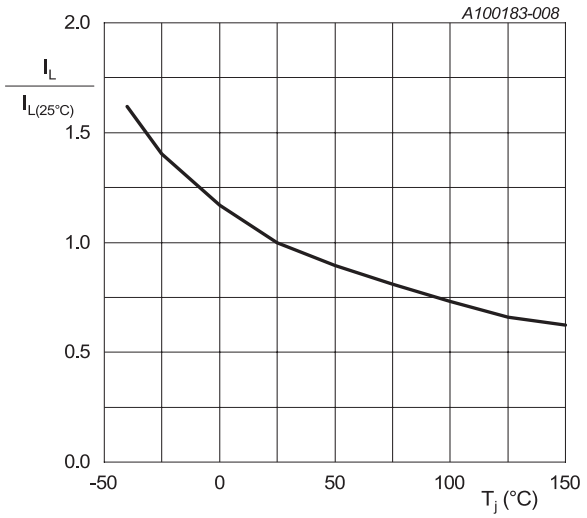


Fig. 8. Normalized latching current as a function of junction temperature

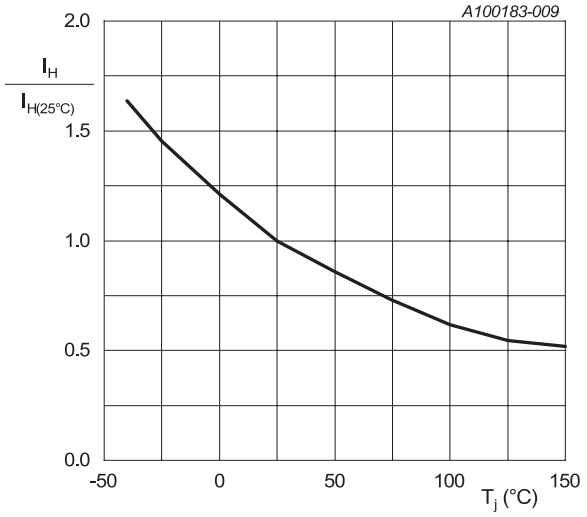
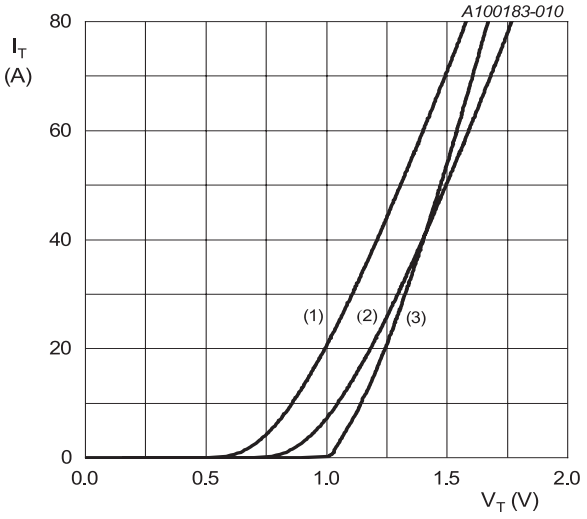


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 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

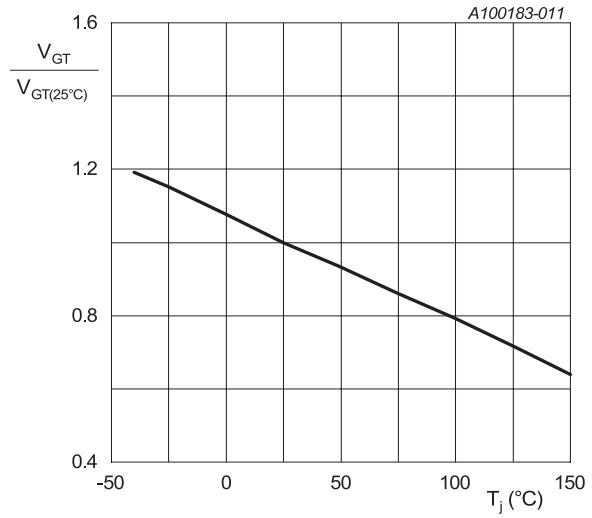


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

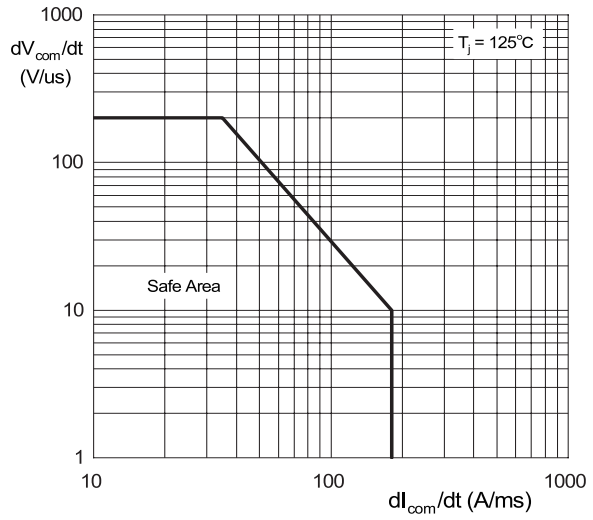
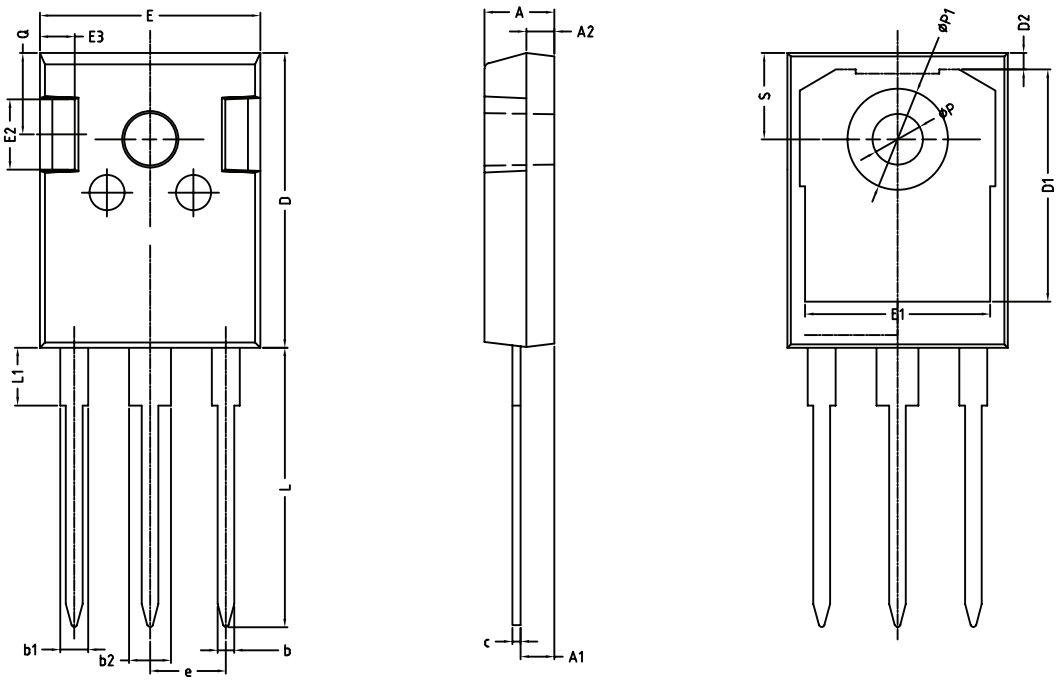
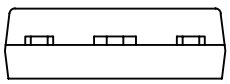


Fig. 12. Safe operating area

11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247 SOT429N





SIDE VIEW

UNIT		A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	E2	E3	e	L	L1	P	P1	Q	S
mm	MAX	5.20	2.60	2.10	1.40	2.20	3.20	0.70	21.10	16.85	1.35	15.90	13.50	5.20	2.60	5.45	20.10	4.75	3.70	7.40	6.00	6.25
	NOM																					
	MIN	4.70	2.20	1.90	1.00	1.80	2.80	0.50	20.90	16.25	1.05	15.70	13.10	4.80	2.40		19.80	-	3.50	-	5.60	6.05

OUTLINE VERSION	REFERENCES				PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429N		TO-247				

12. 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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13. Contents

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