IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors

ACTT16X-800CTN

Enhanced, high temperature ACTT power switch

30 July 2015 **Product data sheet**

1. General description

Planar passivated AC Thyristor Triac power switch in a SOT186A (TO-220F) "full pack" plastic package with self-protective capabilities against low and high energy transients. This "series CTN" 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

- Clamping structure ensuring safe high over-voltage withstand capability
- High junction operating temperature capability ($T_{j(max)}$ = 150 °C)
- High minimum I_{GT} for guaranteed immunity to gate noise
- Full cycle AC conduction
- Over-voltage withstand capability to IEC 61000-4-5
- Pin compatible with standard triacs
- Planar passivated for voltage ruggedness and reliability
- Protective self turn-on capability for high energy transients
- Safe clamping capability for low energy over-voltage transients
- Less sensitive gate for high noise immunity
- Triggering in three quadrants only
- Very high immunity to false turn-on by dV/dt and IEC 61000-4-4 fast transient
- Package meets UL94V0 flammability requirement
- Package is RoHS compliant
- Package meets UL1557 isolation test requirement rated at 2500V RMS

3. Applications

- AC fan, pump and compressor controls
- Highly inductive, resistive and safety loads
- Large and small appliances (White Goods)
- Reversing induction motor controls
- Applications subject to high temperature ($T_{j(max)}$ = 150 °C)

4. Quick reference data

Table 1. Quick reference data

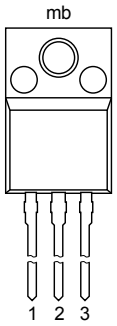
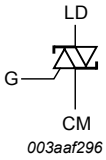
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	800	V

Scan or click this QR code to view the latest information for this product

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{T(RMS)}$	RMS on-state current	full sine wave; $T_h \leq 70$ °C; Fig. 1; Fig. 2; Fig. 3		-	-	16	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		-	-	140	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	-	150	A
T_j	junction temperature			-	-	150	°C
V_{PP}	peak pulse voltage	$T_j = 25$ °C; non-repetitive, off-state; Fig. 6		-	-	2	kV
Static characteristics							
I_{GT}	gate trigger current	$V_D = 12$ V; $I_T = 100$ mA; LD+ G+; $T_j = 25$ °C; Fig. 8		5	-	35	mA
		$V_D = 12$ V; $I_T = 100$ mA; LD+ G-; $T_j = 25$ °C; Fig. 8		5	-	35	mA
		$V_D = 12$ V; $I_T = 100$ mA; LD- G-; $T_j = 25$ °C; Fig. 8		5	-	35	mA
I_H	holding current	$V_D = 12$ V; $T_j = 25$ °C; Fig. 10		-	-	30	mA
V_T	on-state voltage	$I_T = 20$ A; $T_j = 25$ °C; Fig. 11		-	-	1.5	V
V_{CL}	clamping voltage	$I_{CL} = 0.1$ mA; $t_p = 1$ ms; $T_j = 25$ °C		850	-	-	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		1500	-	-	V/µs
		$V_{DM} = 536$ V; $T_j = 150$ °C; exponential waveform; gate open circuit		1000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	$V_D = 400$ V; $T_j = 150$ °C; $I_{T(RMS)} = 16$ A; $dV_{com}/dt = 20$ V/µs; gate open circuit; snubberless condition		12	-	-	A/ms
		$V_D = 400$ V; $T_j = 150$ °C; $I_{T(RMS)} = 16$ A; $dV_{com}/dt = 10$ V/µs; gate open circuit		15	-	-	A/ms
		$V_D = 400$ V; $T_j = 150$ °C; $I_{T(RMS)} = 16$ A; $dV_{com}/dt = 1$ V/µs; gate open circuit		20	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CM	common	 TO-220F (SOT186A)	
2	LD	load		
3	G	gate		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
ACTT16X-800CTN	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

7. Marking

Table 4. Marking codes

Type number	Marking code
ACTT16X-800CTN	ACTT16X-800CTN

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; $T_h \leq 70$ °C; Fig. 1; Fig. 2; Fig. 3		-	16	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		-	140	A
		full sine wave; $T_{j(init)} = 25$ °C; $t_p = 16.7$ ms		-	150	A
I^2t	I^2t for fusing	$t_p = 10$ ms; sine-wave pulse		-	98	A²s
dI_T/dt	rate of rise of on-state current	$I_G = 70$ mA		-	100	A/µs
I_{GM}	peak gate current			-	2	A
P_{GM}	peak gate power			-	5	W
$P_{G(AV)}$	average gate power	over any 20 ms period		-	0.5	W
T_{stg}	storage temperature			-40	150	°C
T_j	junction temperature			-	150	°C
V_{PP}	peak pulse voltage	$T_j = 25$ °C; non-repetitive, off-state; Fig. 6		-	2	kV

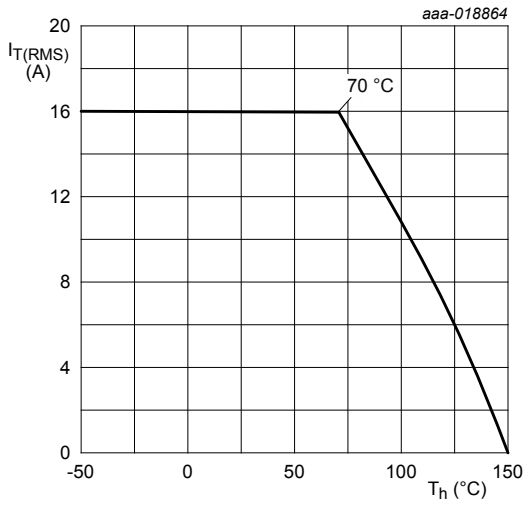
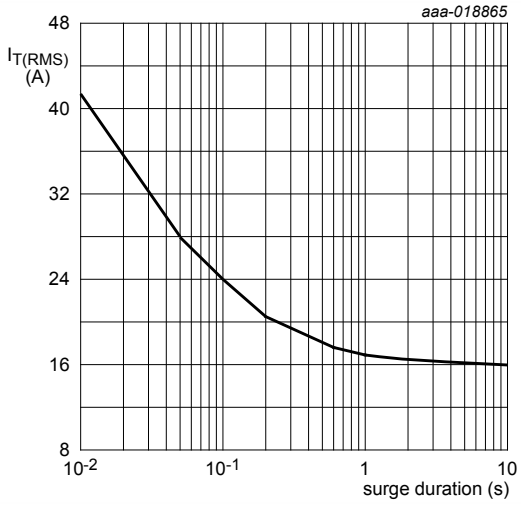
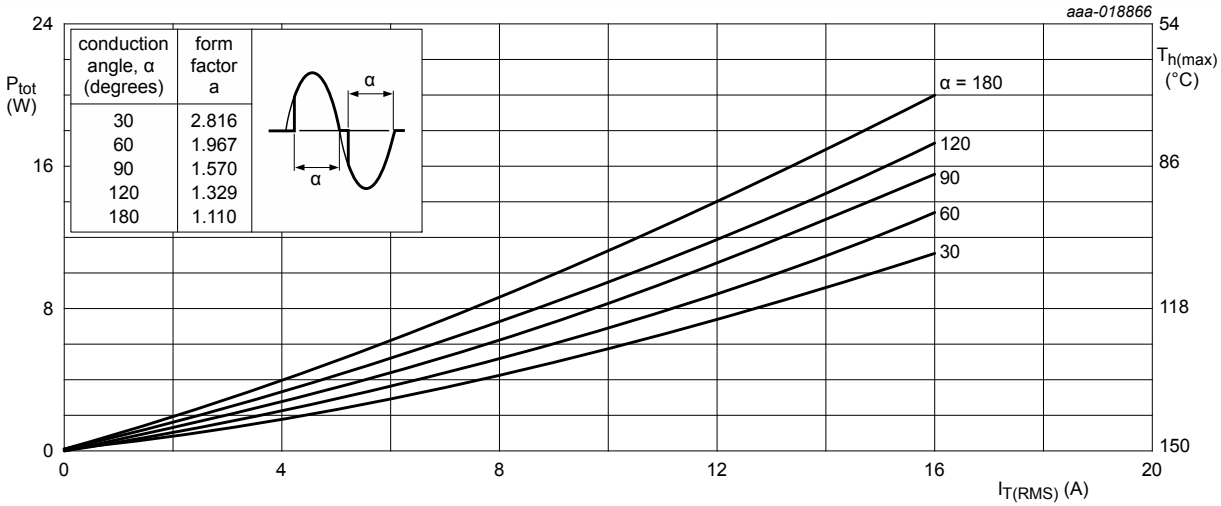


Fig. 1. RMS on-state current as a function of heatsink temperature; maximum values



f = 50 Hz; T_h = 70 °C

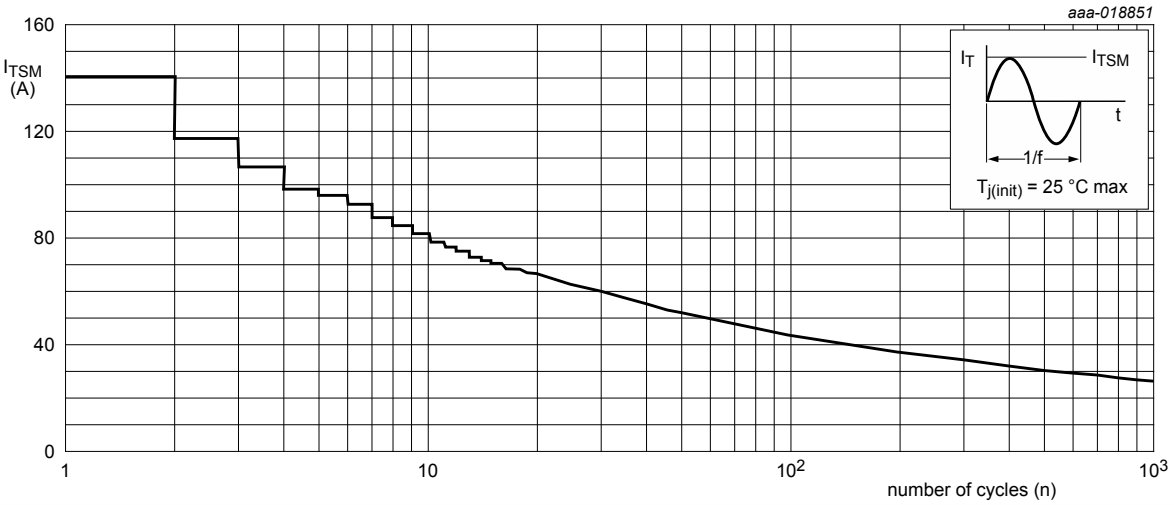
Fig. 2. RMS on-state current as a function of surge duration; maximum values



α = conduction angle

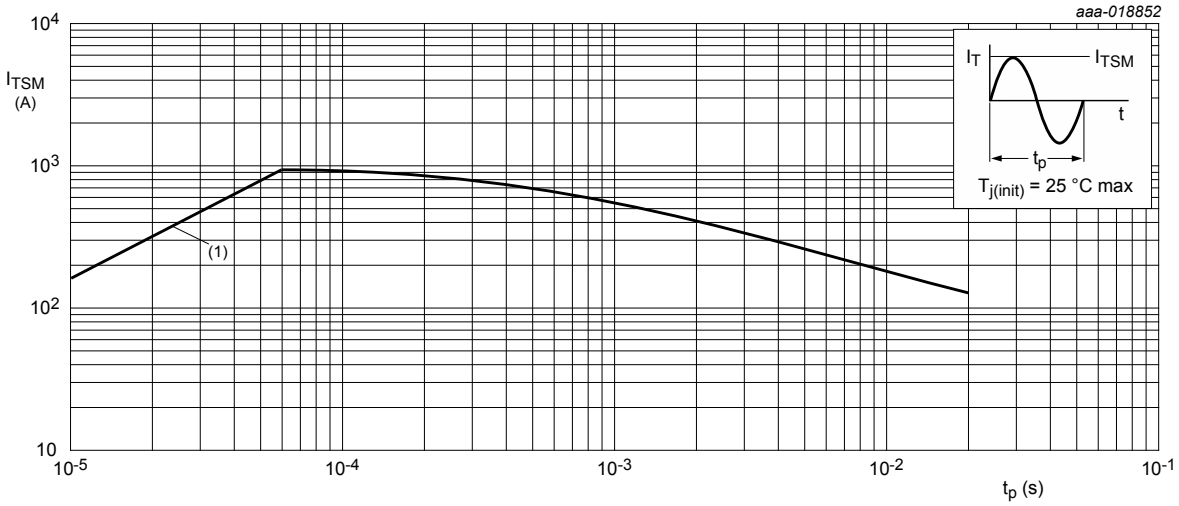
a = form factor = $I_{T(RMS)}$ / $I_{T(AV)}$

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 width; maximum values

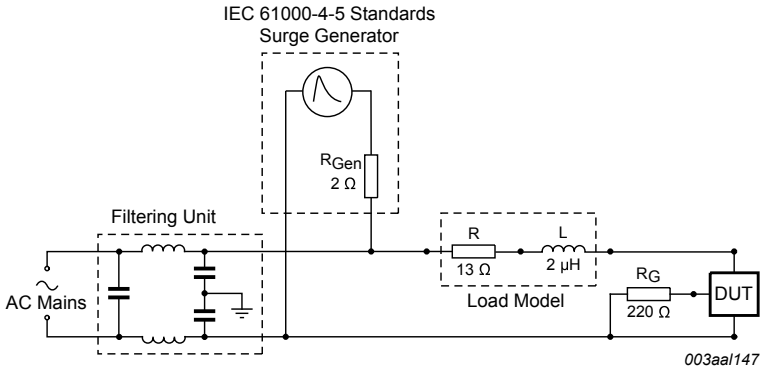


Fig. 6. Test circuit for inductive and resistive loads with conditions equivalent to IEC 61000-4-5

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	full or half cycle; with heatsink compound; Fig. 7		-	-	4	K/W
		full or half cycle; without heatsink compound		-	-	5.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	55	-	K/W

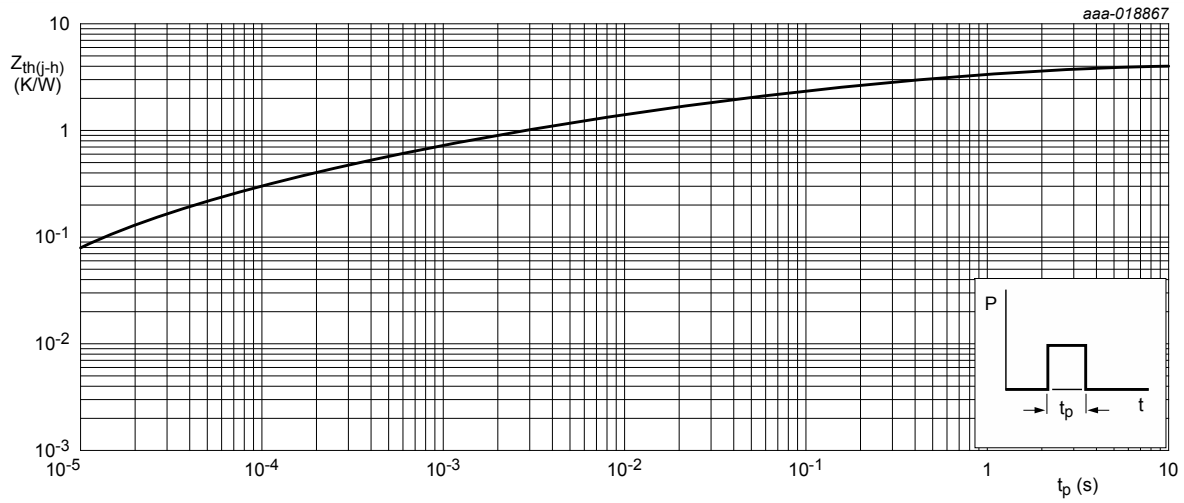


Fig. 7. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

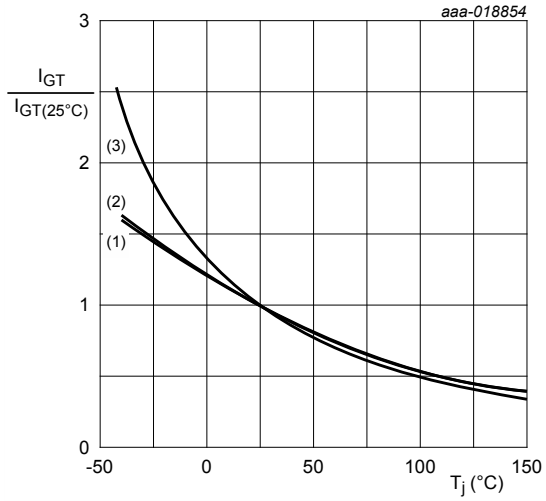
Table 7. Isolation characteristics

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 Hz ≤ f ≤ 60 Hz; 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	Typ	Max	Unit
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 100 mA; LD+ G+; T_j = 25 °C; Fig. 8		5	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD+ G-; T_j = 25 °C; Fig. 8		5	-	35	mA
		V_D = 12 V; I_T = 100 mA; LD- G-; T_j = 25 °C; Fig. 8		5	-	35	mA
I_L	latching current	V_D = 12 V; I_G = 100 mA; LD+ G+; T_j = 25 °C; Fig. 9		-	-	40	mA
		V_D = 12 V; I_G = 100 mA; LD+ G-; T_j = 25 °C; Fig. 9		-	-	50	mA
		V_D = 12 V; I_G = 100 mA; LD- G-; T_j = 25 °C; Fig. 9		-	-	40	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 10		-	-	30	mA
V_T	on-state voltage	I_T = 20 A; T_j = 25 °C; Fig. 11		-	-	1.5	V
V_{GT}	gate trigger voltage	V_D = 12 V; I_T = 100 mA; T_j = 25 °C; Fig. 12		-	0.8	1	V
		V_D = 400 V; I_T = 100 mA; T_j = 150 °C; Fig. 12		0.2	0.45	-	V
I_D	off-state current	V_D = 800 V; T_j = 25 °C		-	-	10	µA
		V_D = 800 V; T_j = 150 °C		-	-	2	mA
V_{CL}	clamping voltage	I_{CL} = 0.1 mA; t_p = 1 ms; T_j = 25 °C		850	-	-	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		1500	-	-	V/µs
		V_{DM} = 536 V; T_j = 150 °C; exponential waveform; gate open circuit		1000	-	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 20 V/µs; gate open circuit; snubberless condition		12	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 10 V/µs; gate open circuit		15	-	-	A/ms
		V_D = 400 V; T_j = 150 °C; $I_{T(RMS)}$ = 16 A; dV_{com}/dt = 1 V/µs; gate open circuit		20	-	-	A/ms



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

Fig. 8. Normalized gate trigger current as a function of junction temperature

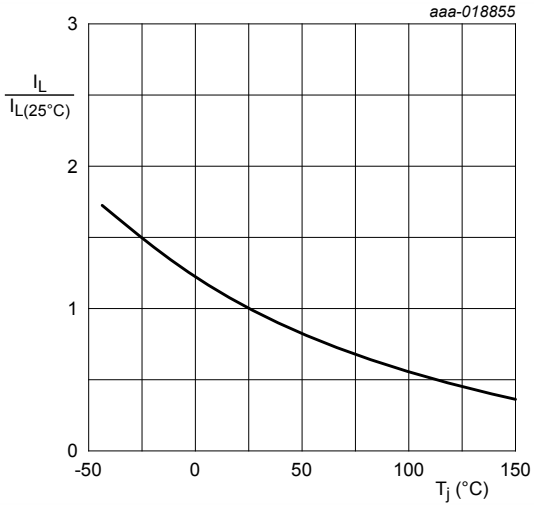


Fig. 9. Normalized latching current as a function of junction temperature

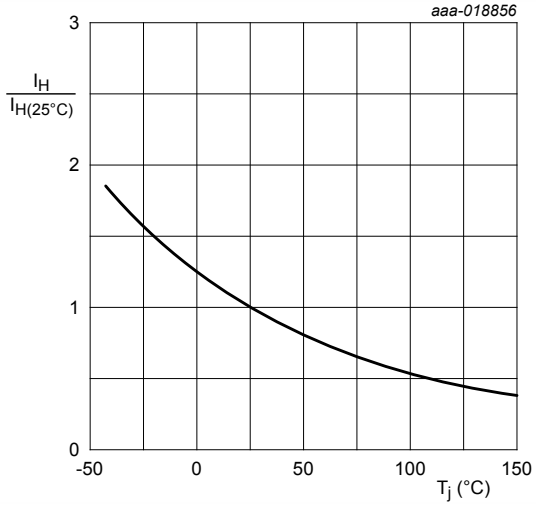
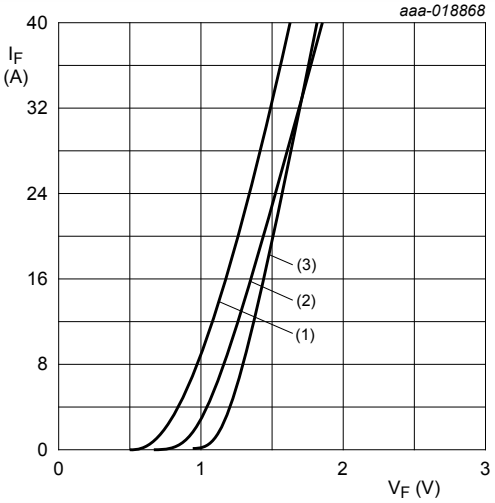


Fig. 10. Normalized holding current as a function of junction temperature



V_o = 1.000 V; R_s = 0.022 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 11. On-state current as a function of on-state voltage

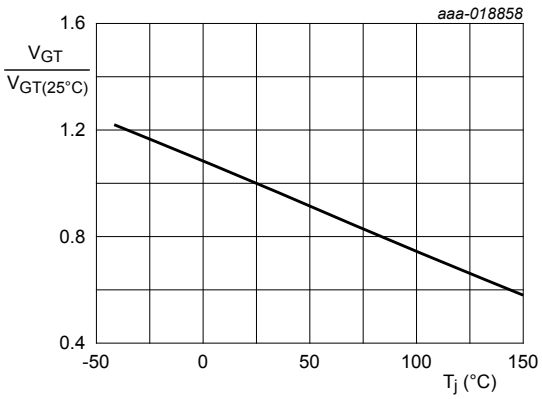
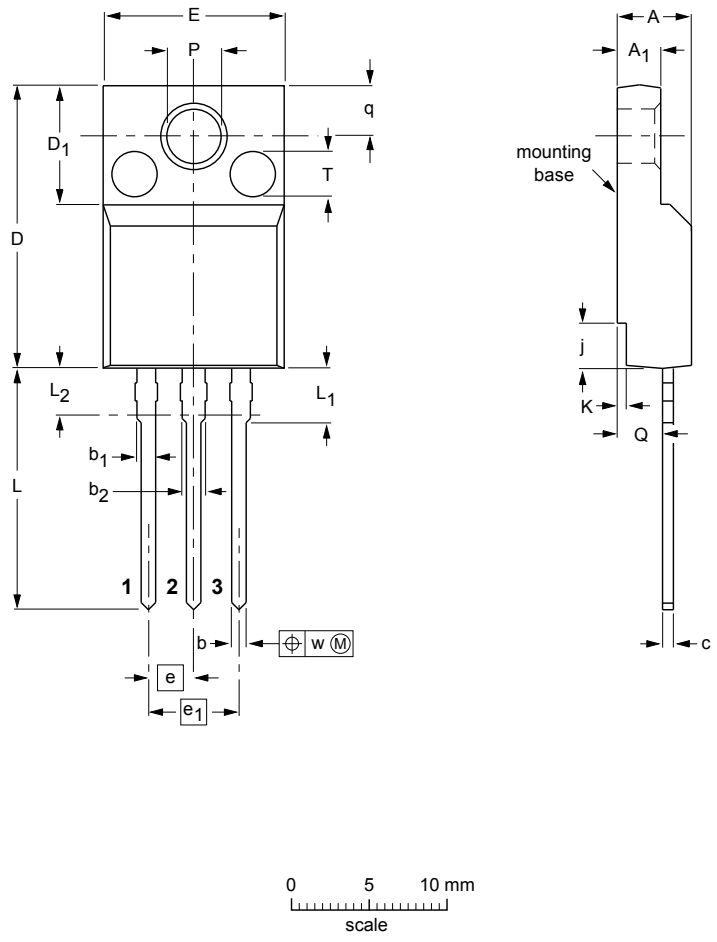


Fig. 12. Normalized gate trigger voltage as a function of junction temperature

12. Package outline

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

SOT186A



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1	E	e	e_1	j	K	L	L_1	L_2 (1) max.	P	Q	q	T (2)	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	1.4 1.0	0.7 0.4	15.8 15.2	6.5 6.3	10.3 9.7	2.54	5.08	2.7 1.7	0.6 0.4	14.4 13.5	3.30 2.79	3	3.2 3.0	2.6 2.3	3.0 2.6	2.5	0.4

Notes

1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are # 2.5 × 0.8 max. depth

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT186A		3-lead TO-220F				~~02-04-09~~ 06-02-14

Fig. 13. Package outline TO-220F (SOT186A)

13. Legal information

13.1 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.

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
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14. Contents

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