TYN16X-600RT

SCR

19 July 2012 Product data sheet

1. Product profile

1.1 General description

Planar passivated Silicon Controlled Rectifier (SCR) in a SOT186A (TO-220F) "full pack" plastic package intended for use in applications requiring very high inrush current capability, high thermal cycling performance and high junction temperature capability ($T_{j(max)}$ = 150 °C).

1.2 Features and benefits

- High junction operating temperature capability
- High thermal cycling performance
- High voltage capability
- Isolated package
- Planar passivated for voltage ruggedness and reliability
- Very high current surge capability

1.3 Applications

- Ignition circuits
- Motor control
- Protection circuits e.g. SMPS inrush current
- Voltage regulation

1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{DRM}	repetitive peak off-state voltage			-	-	600	V
V_{RRM}	repetitive peak reverse voltage			-	-	600	V
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms; Fig. 4; Fig. 5		-	-	210	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		-	-	231	A
T_j	junction temperature			-	-	150	°C
$I_{T(AV)}$	average on-state current	half sine wave; $T_h \leq 86$ °C; Fig. 3		-	-	10.2	A

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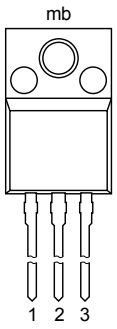
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 86$ °C; Fig. 1; Fig. 2		-	-	16	A
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T_j = 25 °C; Fig. 7		-	4.5	25	mA
Dynamic charateristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		300	-	-	V/µs

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 **TO-220F (SOT186A)**	
2	A	anode		
3	G	gate		
mb	n.c.	mounting base; isolated		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
TYN16X-600RT	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

4. Limiting values

Table 4. 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			-	600	V
V_{RRM}	repetitive peak reverse voltage			-	600	V
$I_{T(AV)}$	average on-state current	half sine wave; $T_h \leq 86$ °C; Fig. 3		-	10.2	A
$I_{T(RMS)}$	RMS on-state current	half sine wave; $T_h \leq 86$ °C; Fig. 1; Fig. 2		-	16	A

Symbol	Parameter	Conditions		Min	Max	Unit
I_{TSM}	non-repetitive peak on-state current	half sine wave; $T_{j(init)}$ = 25 °C; t_p = 10 ms; Fig. 4; Fig. 5		-	210	A
		half sine wave; $T_{j(init)}$ = 25 °C; t_p = 8.3 ms		-	231	A
I^2t	I^2t for fusing	t_p = 10 ms; SIN		-	220.5	A^2s
dI_T/dt	rate of rise of on-state current	I_T = 40 A; I_G = 200 mA; dI_G/dt = 200 mA/µs		-	50	A/µs
I_{GM}	peak gate current			-	5	A
V_{RGM}	peak reverse gate voltage			-	5	V
P_{GM}	peak gate power			-	20	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

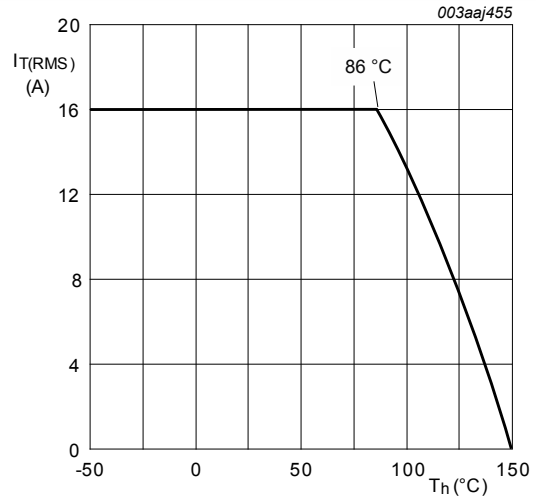


Fig. 1. RMS on-state current as a function of heatsink temperature; maximum values

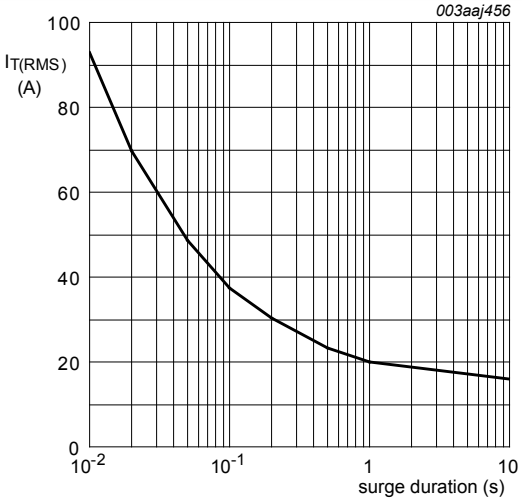


Fig. 2. RMS on-state current as a function of surge duration; maximum values

f = 50 Hz; T_h = 86 °C

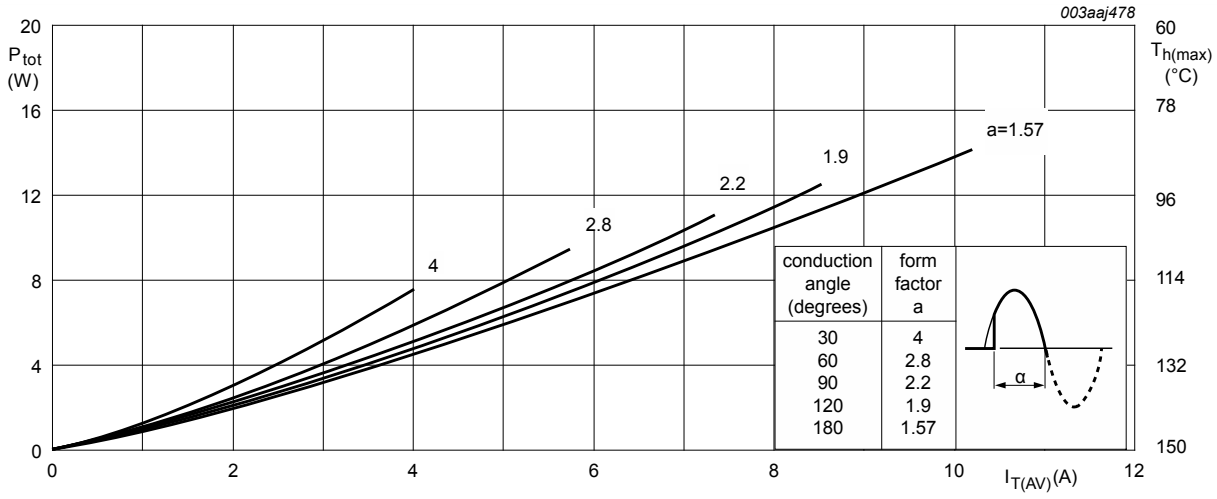


Fig. 3. Total power dissipation as a function of average on-state current; maximum values

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

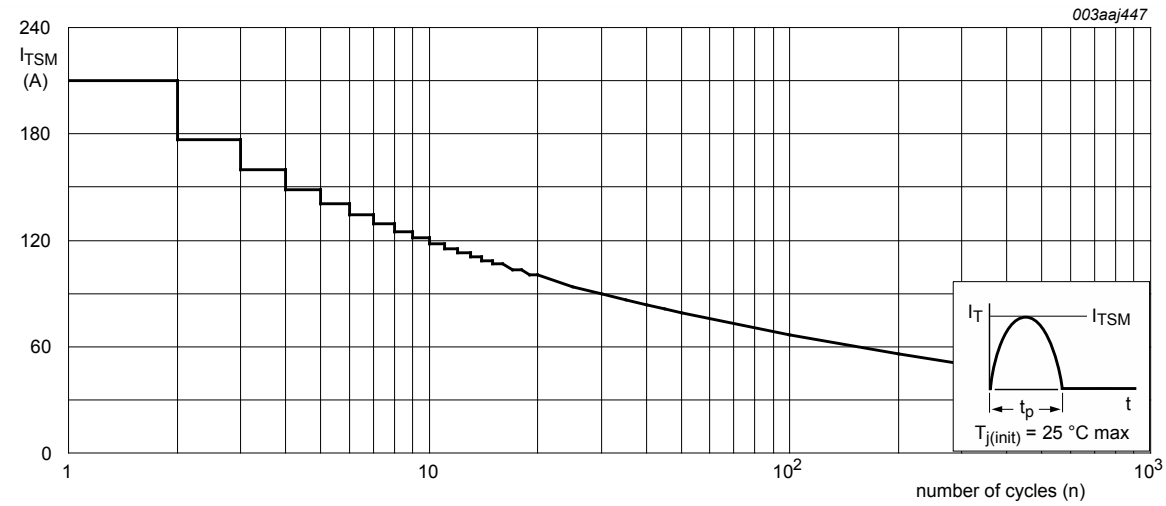


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

$$f = 50\ Hz$$

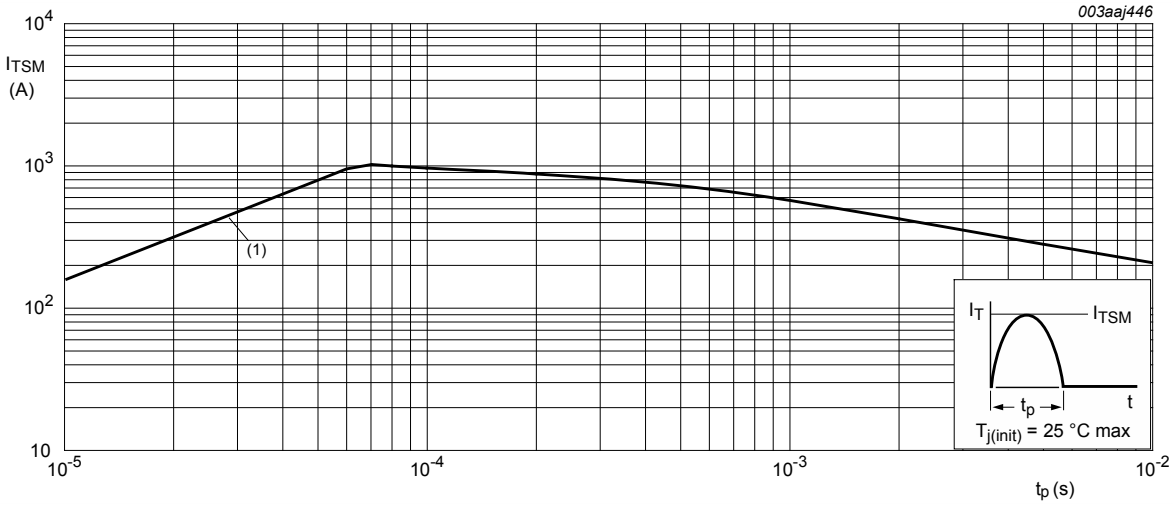


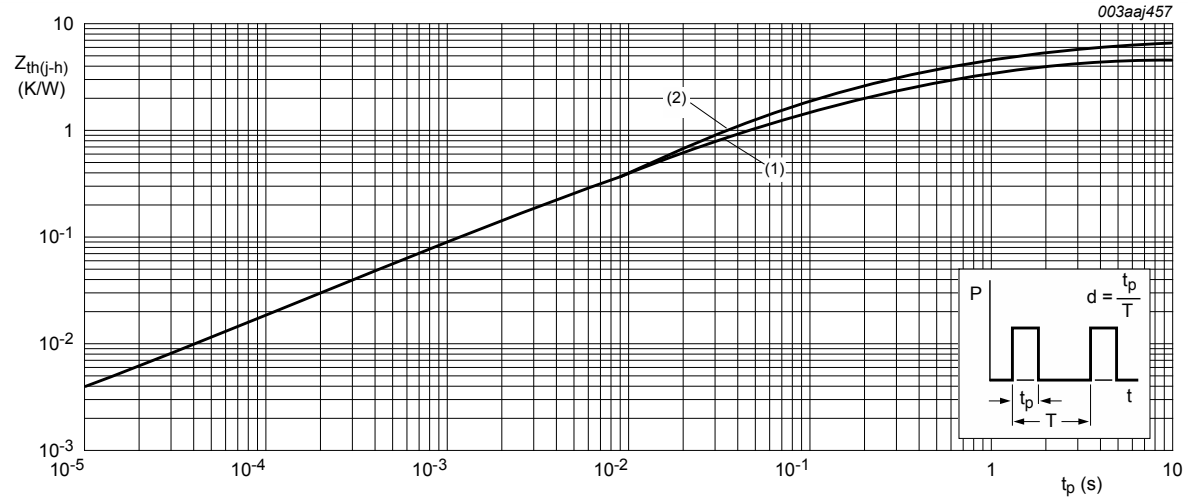
Fig. 5. Non-repetitive peak on-state current as a function of pulse width for sinusoidal currents; maximum values

$t_p \leq 10$ ms; (1) dI_T / dt limit

5. Thermal characteristics

Table 5. 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. 6		-	-	4.5	K/W
		full or half cycle; without heatsink compound; Fig. 6		-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	55	-	K/W



(1) with heatsink compound
(2) without heatsink compound

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

6. 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 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; T_h = 25 °C		-	-	2500	V
C_{isol}	isolation capacitance	from anode to external heatsink ; f = 1 MHz; T_h = 25 °C		-	10	-	pF

7. 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; T_j = 25 °C; Fig. 7		-	4.5	25	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T_j = 25 °C; Fig. 8		-	21	60	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	16	40	mA
V_T	on-state voltage	I_T = 32 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	1.3	V
		V_D = 400 V; I_T = 0.1 A; T_j = 150 °C; Fig. 11		0.2	0.4	-	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_D	off-state current	V_D = 600 V; T_j = 150 °C		-	0.2	1	mA
I_R	reverse current	T_j = 150 °C; V_R = 600 V		-	0.2	1	mA
Dynamic charateristics							
dV_D/dt	rate of rise of off-state voltage	V_{DM} = 402 V; T_j = 150 °C; (V_{DM} = 67% of V_{DRM}); exponential waveform; gate open circuit		300	-	-	V/µs

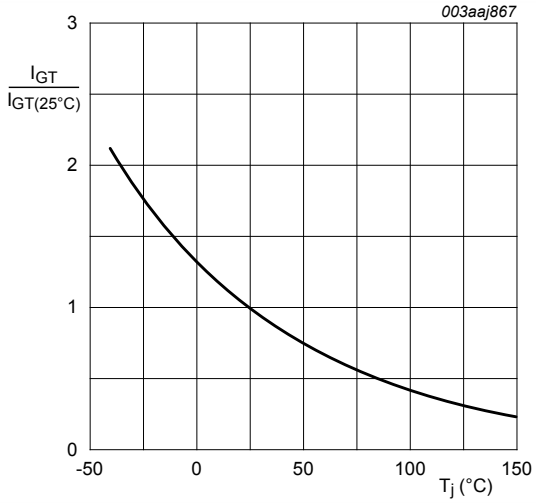


Fig. 7. Normalized gate trigger current as a function of junction temperature

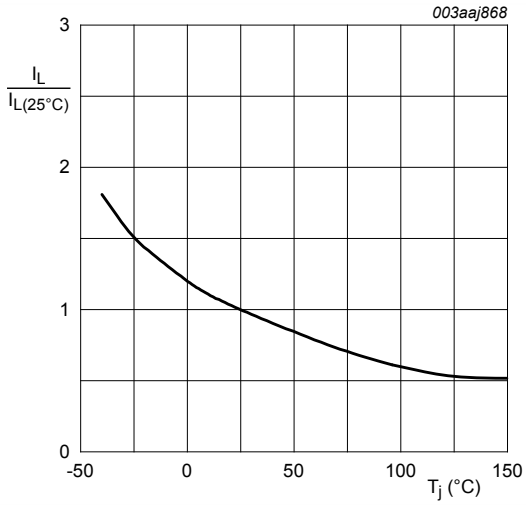


Fig. 8. Normalized latching current as a function of junction temperature

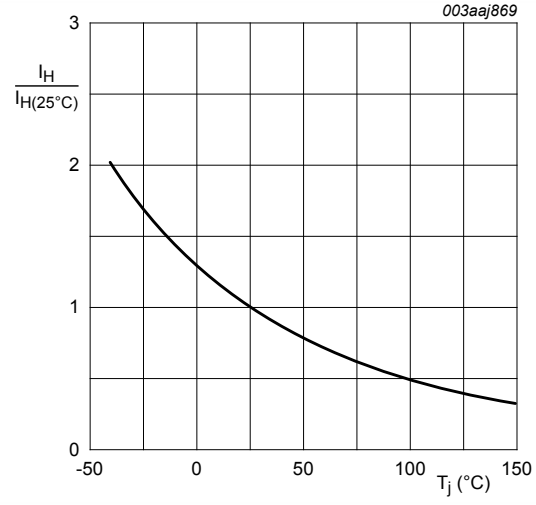
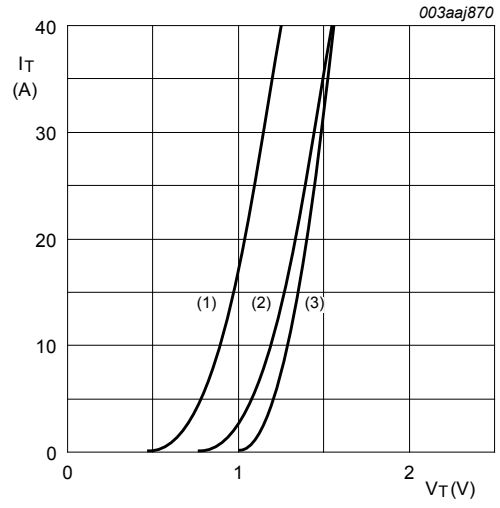


Fig. 9. Normalized holding current as a function of junction temperature



V_o = 1.0336 V; R_s = 0.0141 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

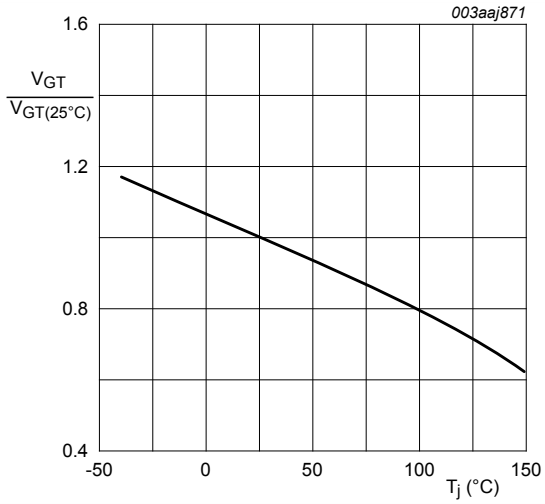
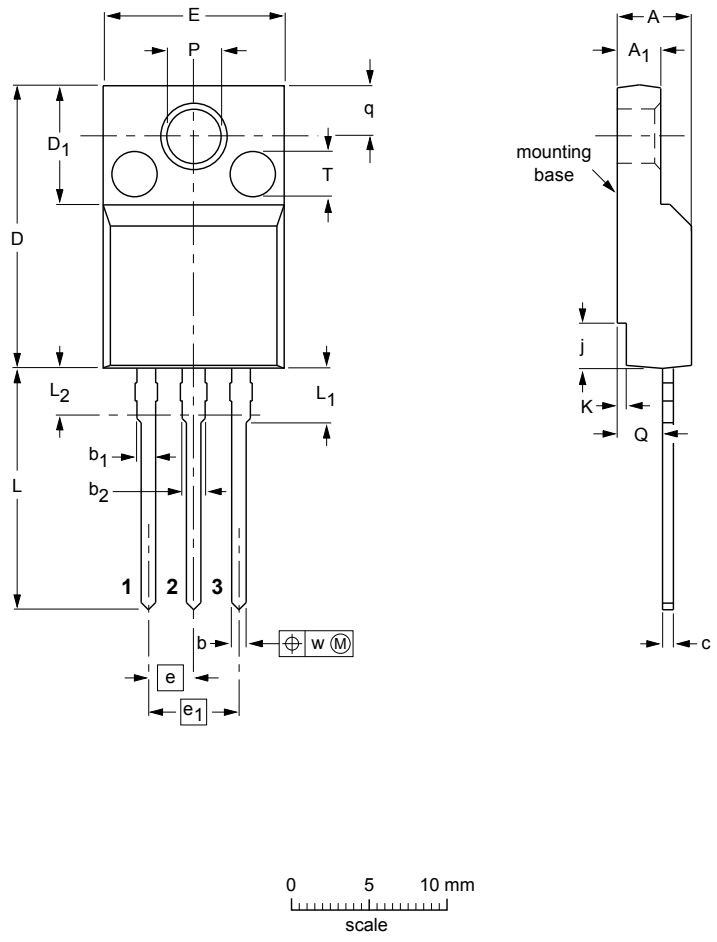


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

8. 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. 12. TO-220F (SOT186A)

9. Legal information

9.1 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.
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