1. General description

Planar passivated high commutation three quadrant triac in a SOT186A (TO-220F) "full pack" plastic package. The "series D" triac balances the requirements of commutation performance and gate sensitivity. This "very sensitive gate" "series D" is intended for interfacing with low power drivers including microcontrollers.

2. Features and benefits

- 3Q technology for improved noise immunity
- Direct interfacing with low power drivers and microcontrollers
- Good immunity to false turn-on by dV/dt
- High commutation capability with very sensitive gate
- High voltage capability
- Isolated mounting base package
- Planar technology for voltage ruggedness and reliability
- Triggering in three quadrants only
- Very sensitive gate for easy logic level triggering

3. Applications

- General purpose motor controls
- Large and small appliances (White Goods)
- Loads such as contactors, circuit breakers, valves, dispensers and door locks
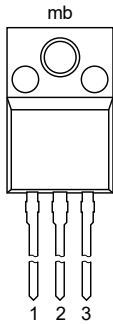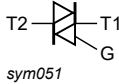- Lower-power highly inductive, resistive and safety loads

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; $T_h \leq$ 110 °C; Fig. 1; Fig. 2; Fig. 3		-	-	2	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		-	-	14	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	-	15.4	A
T_j	junction temperature			-	-	125	°C
Static characteristics							
I_{GT}	gate trigger current	V_D = 12 V; I_T = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 7		0.25	-	5	mA

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	5	mA
V_T	on-state voltage	I_T = 3 A; T_j = 25 °C; Fig. 10		-	1.63	2	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; $R_{GT1(ext)}$ = 220 Ω		-	350	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		1	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 10 V/µs; gate open circuit		1.2	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1	mb	T2 — T1 / G
2	T2	main terminal 2		sym051
3	G	gate		
mb	n.c.	mounting base; isolated	1 2 3 **TO-220F (SOT186A)**	

6. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
T202X-800D	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

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; $T_h \leq$ 110 °C; Fig. 1; Fig. 2; Fig. 3		-	2	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		-	14	A
		full sine wave; $T_{j(init)}$ = 25 °C; t_p = 16.7 ms		-	15.4	A
I^2t	I^2t for fusing	t_p = 10 ms; SIN		-	0.98	A²s
dI_T/dt	rate of rise of on-state current	I_G = 0.2 A		-	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			-	125	°C

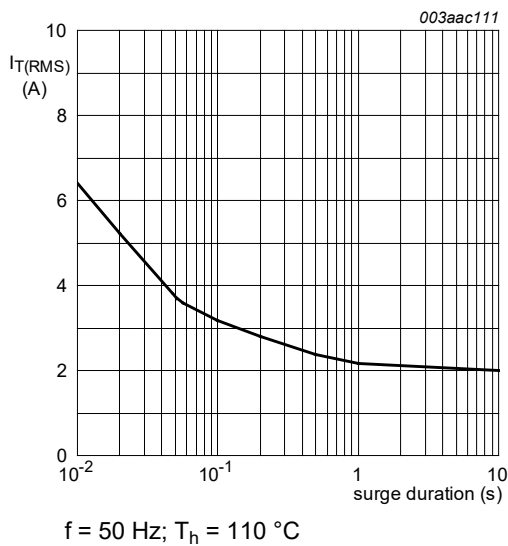*003aac111*

f = 50 Hz; T_h = 110 °C

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

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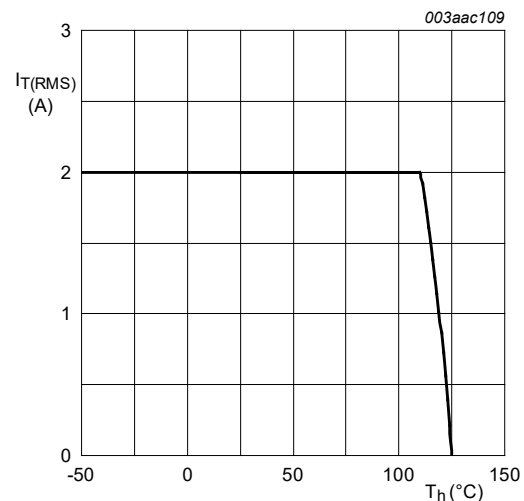
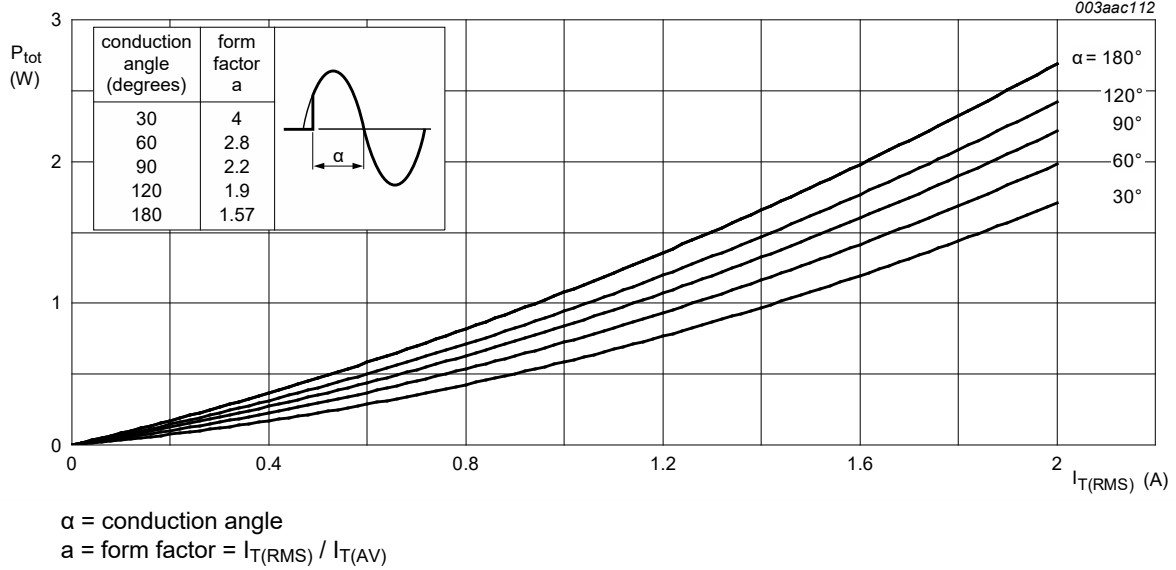**Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values**

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conduction angle (degrees)	form factor a
30	4
60	2.8
90	2.2
120	1.9
180	1.57

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

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$T_{j(init)}$ = 25 °C max
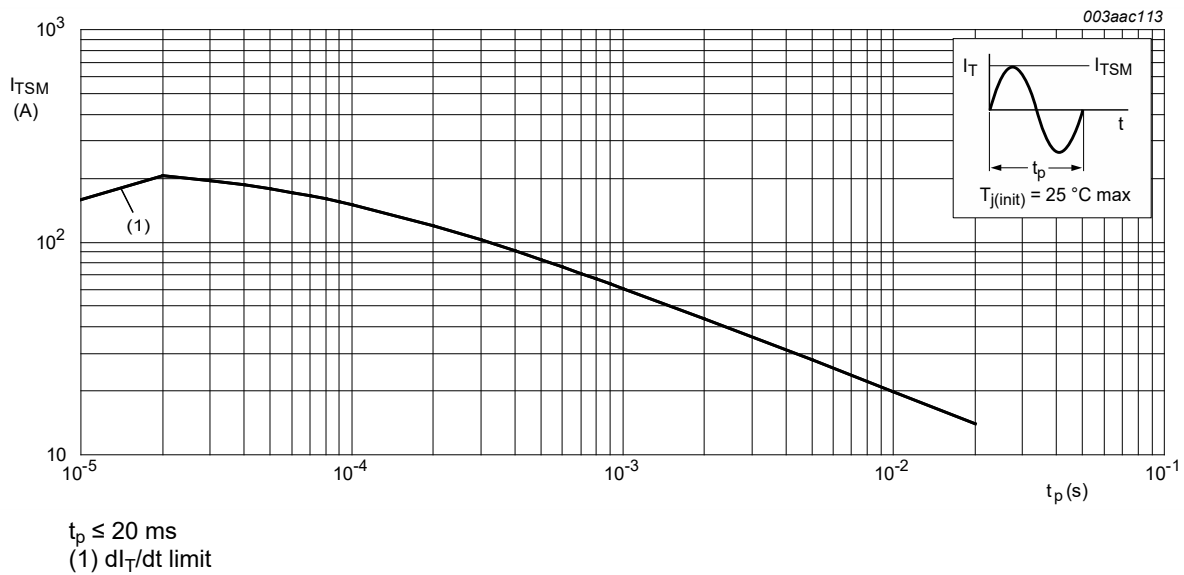
t_p ≤ 20 ms
(1) dI_T/dt limit

Fig. 4. Non-repetitive peak on-state current as a function of pulse width; maximum values

8. 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		0.25	-	5	mA
		V_D = 12 V; I_T = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
		V_D = 12 V; I_T = 0.1 A; T2- G-; T_j = 25 °C; Fig. 7		0.25	-	5	mA
I_L	latching current	V_D = 12 V; I_G = 0.1 A; T2+ G+; T_j = 25 °C; Fig. 8		-	-	5	mA
		V_D = 12 V; I_G = 0.1 A; T2+ G-; T_j = 25 °C; Fig. 8		-	-	10	mA
		V_D = 12 V; I_G = 0.1 A; T2- G-; T_j = 25 °C; Fig. 8		-	-	5	mA
I_H	holding current	V_D = 12 V; T_j = 25 °C; Fig. 9		-	-	5	mA
V_T	on-state voltage	I_T = 3 A; T_j = 25 °C; Fig. 10		-	1.63	2	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 = 125 °C; Fig. 11		0.2	0.3	-	V
I_D	off-state current	V_D = 800 V; T_j = 125 °C		-	0.1	0.5	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; $R_{GT1(ext)}$ = 220 Ω		-	350	-	V/µs
dI_{com}/dt	rate of change of commutating current	V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 20 V/µs; (snubberless condition); gate open circuit		1	-	-	A/ms
		V_D = 400 V; T_j = 125 °C; $I_{T(RMS)}$ = 2 A; dV_{com}/dt = 10 V/µs; gate open circuit		1.2	-	-	A/ms

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$$\frac{I_{GT}}{I_{GT(25°C)}}$$

(1)
(2)
(3)

(3)
(2)
(1)

T_j (°C)

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

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

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$$\frac{I_L}{I_{L(25°C)}}$$

T_j (°C)
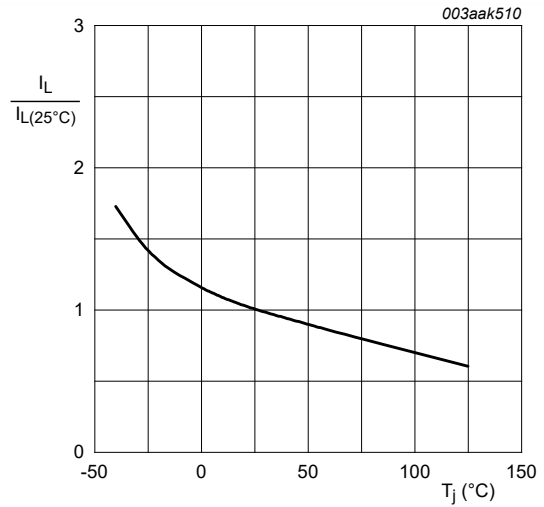
Fig. 8. Normalized latching current as a function of junction temperature

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$$\frac{I_H}{I_{H(25°C)}}$$

T_j (°C)
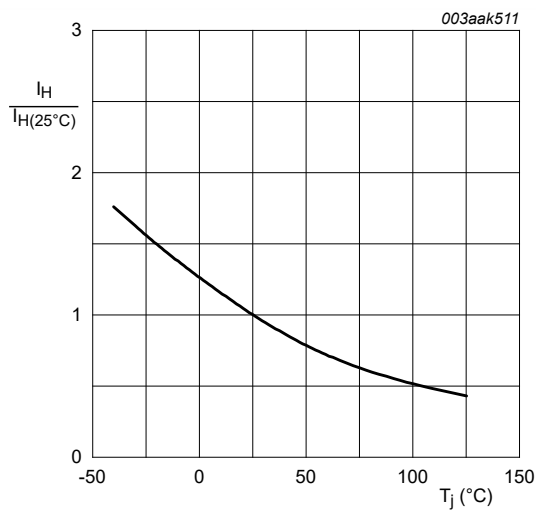
Fig. 9. Normalized holding current as a function of junction temperature

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I_T (A)

(1) (2) (3)

V_T (V)
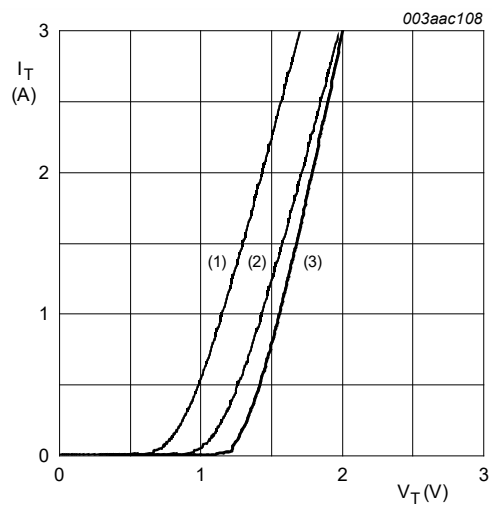
V_o = 0.9 V; R_s = 0.267 Ω
(1) T_j = 125 °C; typical values
(2) T_j = 125 °C; maximum values
(3) T_j = 25 °C; maximum values

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

9. Package outline

Plastic single—ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO—220 "full pack"
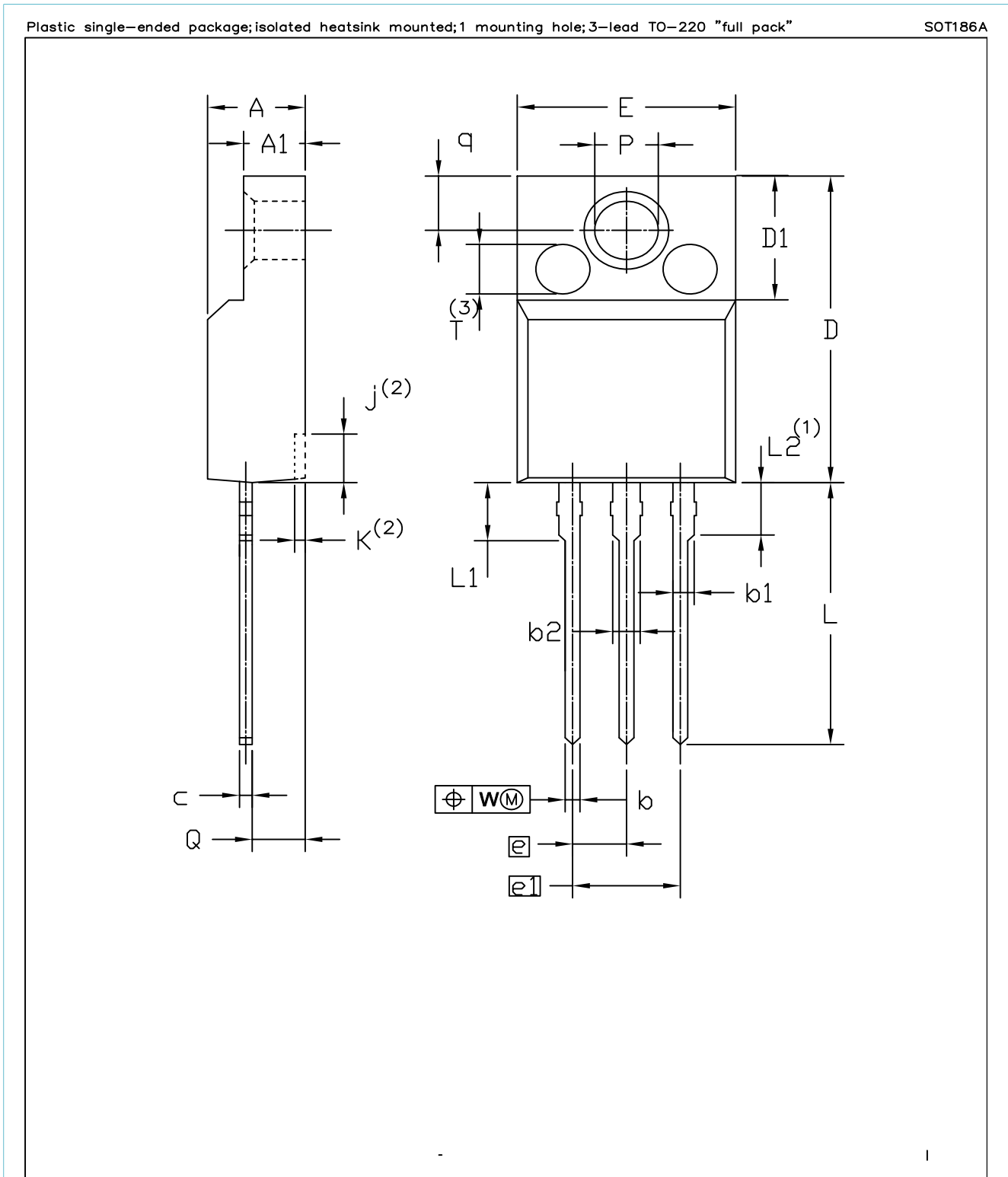
SOT186A

Fig. 12. Package outline TO-220F (SOT186A)

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