

1. General description

Planar passivated high commutation three quadrant triac in a TO220F "full pack" plastic package. This triac is intended for use in motor control circuits where high blocking voltage, high static and dynamic dV/dt as well as high dI_{com}/dt can occur. This triac will commute the full rated RMS current at the maximum rated junction temperature without the aid of a snubber.

2. Features and benefits

- 3Q technology for improved noise immunity
- High commutation capability with maximum false trigger immunity
- High immunity to false turn-on by dV/dt
- Isolated mounting base package
- Optimized for highest noise immunity
- Planar passivated for voltage ruggedness and reliability
- Triggering in three quadrants only
- High voltage capability

3. Applications

- Compressor starting controls circuits
- General purpose motor controls
- Reversing induction motor control e.g. vertical axis washing machines

4. Quick reference data

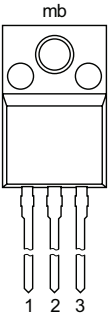
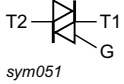
Table 1. Quick reference data

Table 1. Quick reference data							
Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V _{DRM}	repetitive peak off-state voltage			800			V
I _{T(RMS)}	RMS on-state current	full sine wave; T _h ≤ 100 °C; Fig. 1 ; Fig. 2 ; Fig. 3		8			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		60			A
		full sine wave; T _{j(init)} = 25 °C; t _p = 16.7 ms		65			A
T _j	junction temperature			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		5	-	30	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _j = 25 °C; Fig. 7		5	-	30	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _i = 25 °C; Fig. 7		5	-	30	mA

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
I_H	holding current	$V_D = 12\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 9		-	-	50	mA
V_T	on-state voltage	$I_T = 10\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 10		-	1.3	1.65	V
Dynamic characteristics							
dV_D/dt	rate of rise of off-state voltage	$V_{DM} = 536\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$; ($V_{DM} = 67\%$ of V_{DRM}); exponential waveform; gate open circuit		1500	-	-	V/ μs
dI_{com}/dt	rate of change of commutating current	$V_D = 400\text{ V}$; $T_j = 125\text{ }^\circ\text{C}$; $I_{T(RMS)} = 8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 12		12	-	-	A/ms
		$V_D = 400\text{ V}$; $T_j = 150\text{ }^\circ\text{C}$; $I_{T(RMS)} = 8\text{ A}$; $dV_{com}/dt = 20\text{ V}/\mu\text{s}$; (snubberless condition); gate open circuit; Fig. 12		7	-	-	A/ms

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	T1	main terminal 1		
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
T830X-800C	TO220F	T830X-800CQ	Tube	50	SOT186A	14-Nov-2013 09-Apr-2025

7. Marking

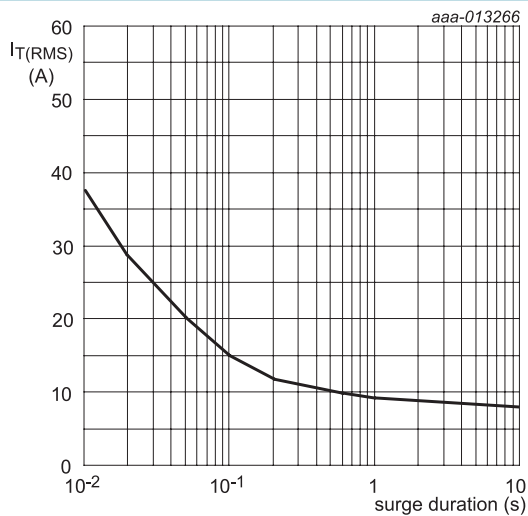
Table 4. Marking codes

Type number	Marking codes	
	Assembly factory: d	Assembly factory: R
T830X-800C	T830X 800C PJdxxxx xx	T830X 800C PJRxxxx xx

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			800	V
$I_{\text{T(RMS)}}$	RMS on-state current	full sine wave; $T_h \leq 100\text{ }^{\circ}\text{C}$; Fig 1 ; Fig 2 ; Fig 3		8	A
I_{TSM}	non-repetitive peak on-state current	full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_p = 20\text{ ms}$; Fig 4 ; Fig 5		60	A
		full sine wave; $T_{\text{j(init)}} = 25\text{ }^{\circ}\text{C}$; $t_p = 16.7\text{ ms}$		65	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN		18	A^2s
di_T/dt	rate of rise of on-state current	$I_G = 0.2\text{ A}$		100	$\text{A}/\mu\text{s}$
I_{GM}	peak gate current			2	A
P_{GM}	peak gate power			5	W
$P_{\text{G(AV)}}$	average gate power	over any 20 ms period		0.5	W
T_{stg}	storage temperature			-40 to 150	$^{\circ}\text{C}$
T_j	junction temperature			150	$^{\circ}\text{C}$



$f = 50\text{ Hz}$; $T_h = 75\text{ }^{\circ}\text{C}$

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

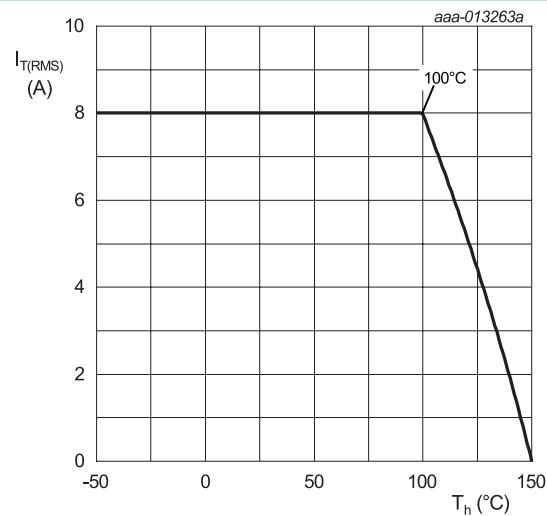


Fig. 2. RMS on-state current as a function of heatsink temperature; maximum values

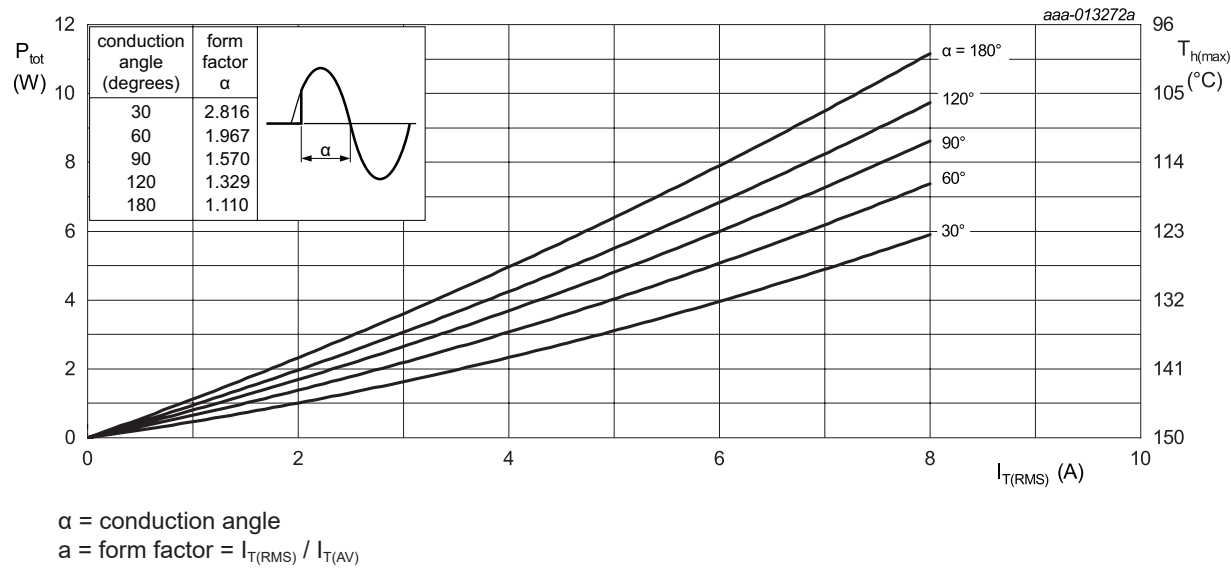


Fig. 3. Total power dissipation as a function of RMS on-state current; maximum values

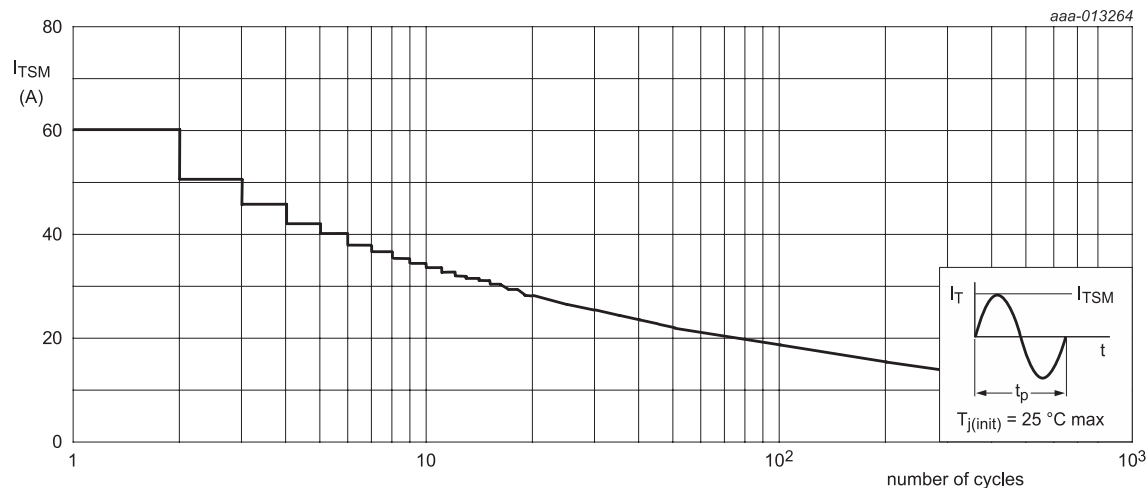


Fig. 4. Non-repetitive peak on-state current as a function of the number of sinusoidal current cycles; maximum values

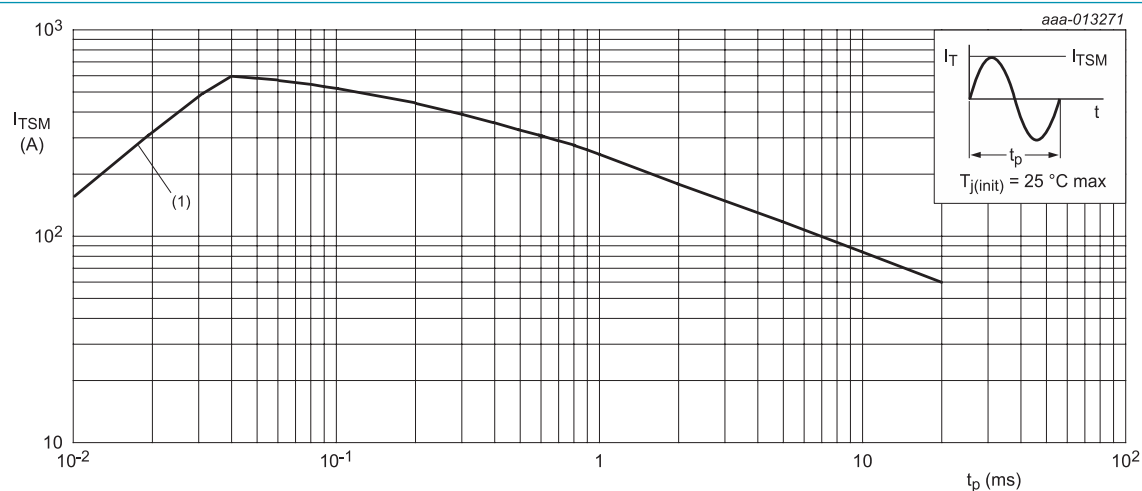
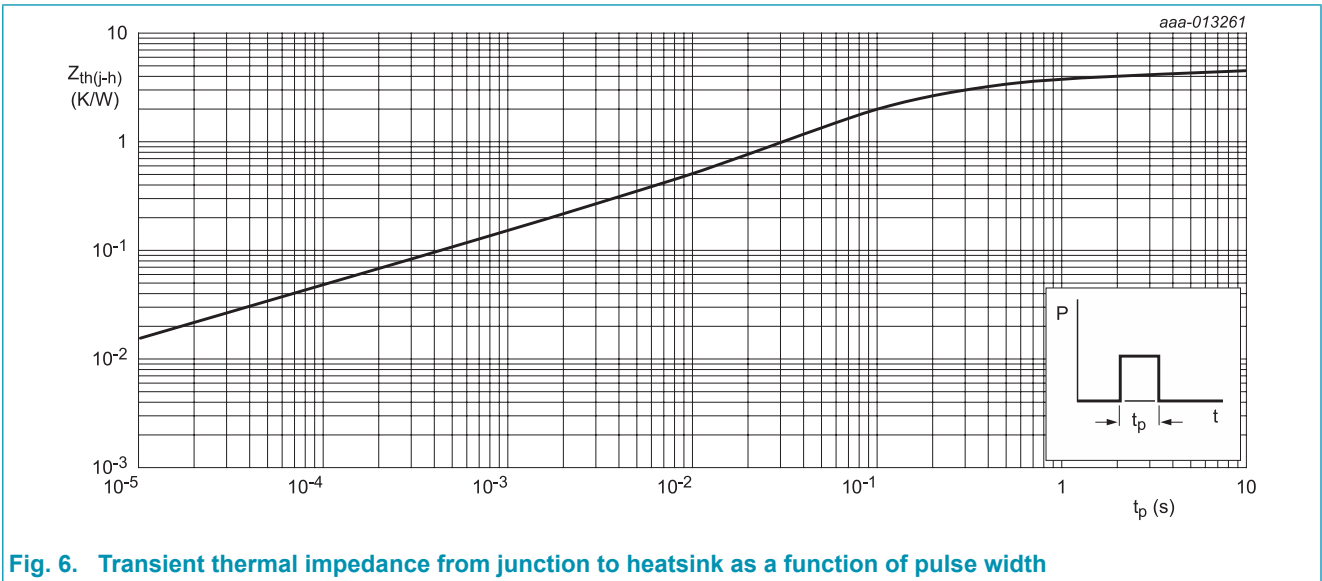


Fig. 5. Non-repetitive peak on-state current as a function of pulse duration; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	full cycle or half cycle; with heatsink compound; Fig 6		-	-	4.5	K/W
		full cycle or half cycle; without heatsink compound		-	-	6.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	55	-	K/W



10. Isolation characteristics

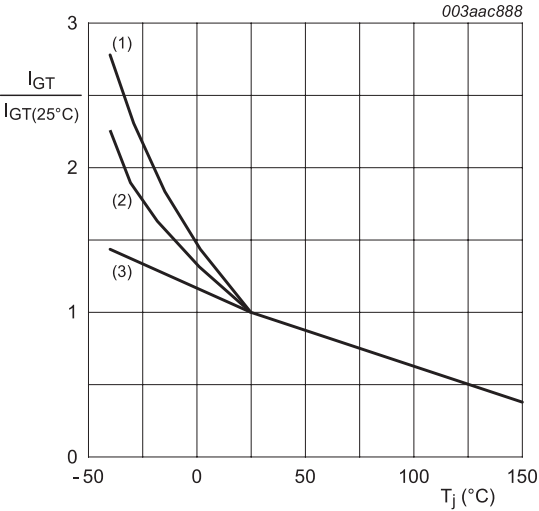
Table 7. Isolation characteristics

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; RH ≤ 65 %; 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	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		5	-	30	mA
		V _D = 12 V; I _T = 0.1 A; T2+ G-; T _J = 25 °C; Fig. 7		5	-	30	mA
		V _D = 12 V; I _T = 0.1 A; T2- G-; T _J = 25 °C; Fig. 7		5	-	30	mA
I _L	latching current	V _D = 12 V; I _G = 0.1 A; T2+ G+; T _J = 25 °C; Fig. 8		-	-	50	mA
		V _D = 12 V; I _G = 0.1 A; T2+ G-; T _J = 25 °C; Fig. 8		-	-	75	mA
		V _D = 12 V; I _G = 0.1 A; T2- G-; T _J = 25 °C; Fig. 8		-	-	50	mA
I _H	holding current	V _D = 12 V; T _J = 25 °C; Fig. 9		-	-	50	mA
V _T	on-state voltage	I _T = 10 A; T _J = 25 °C; Fig. 10		-	1.3	1.65	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		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 = 125 °C		-	-	0.5	mA
Dynamic characteristics							
dV _D /dt	rate of rise of off-state voltage	V _{DM} = 536 V; T _J = 150 °C; (V _{DM} = 67% of V _{DRM}); exponential waveform; gate open circuit		1500	-	-	V/μs
dI _{com} /dt	rate of change of commutating current	V _D = 400 V; T _J = 125 °C; I _{T(RMS)} = 8 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit; Fig. 12		12	-	-	A/ms
		V _D = 400 V; T _J = 150 °C; I _{T(RMS)} = 8 A; dV _{com} /dt = 20 V/μs; (snubberless condition); gate open circuit; Fig. 12		7	-	-	A/ms



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

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

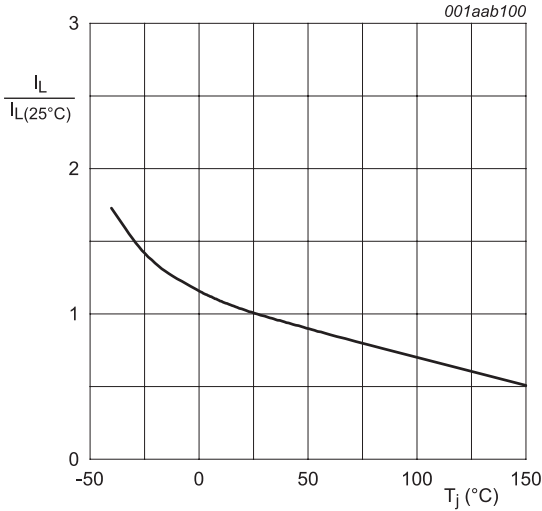


Fig. 8. Normalized latching current as a function of junction temperature

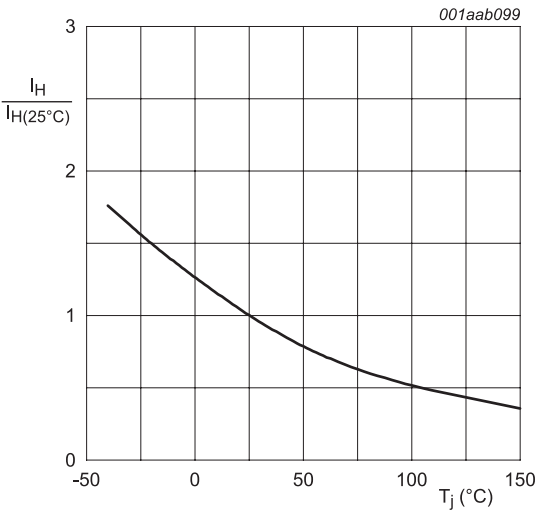
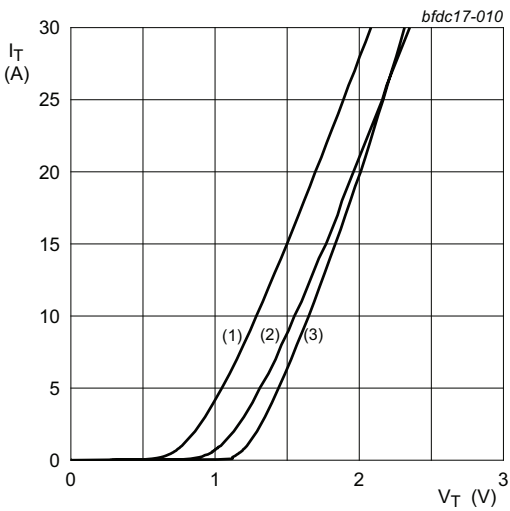


Fig. 9. Normalized holding current as a function of junction temperature



- $V_o = 1.210 V$; $R_s = 0.0288 \Omega$
- (1) $T_j = 150^{\circ}C$; typical values
 - (2) $T_j = 150^{\circ}C$; maximum values
 - (3) $T_j = 25^{\circ}C$; maximum values

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

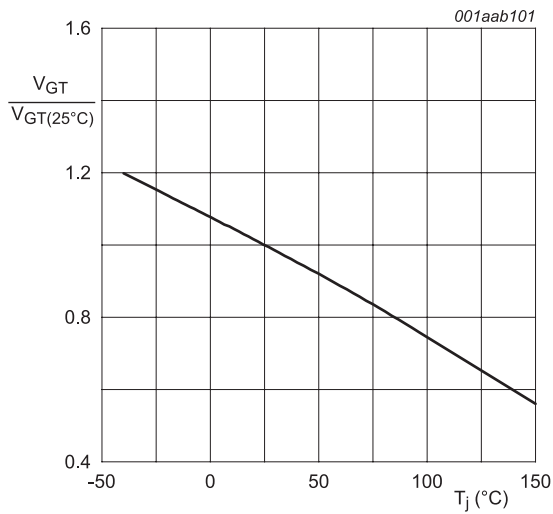


Fig. 11. Normalized gate trigger voltage as a function of junction temperature

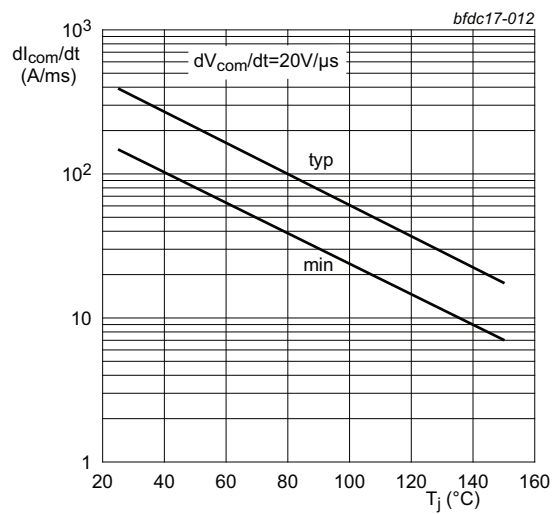
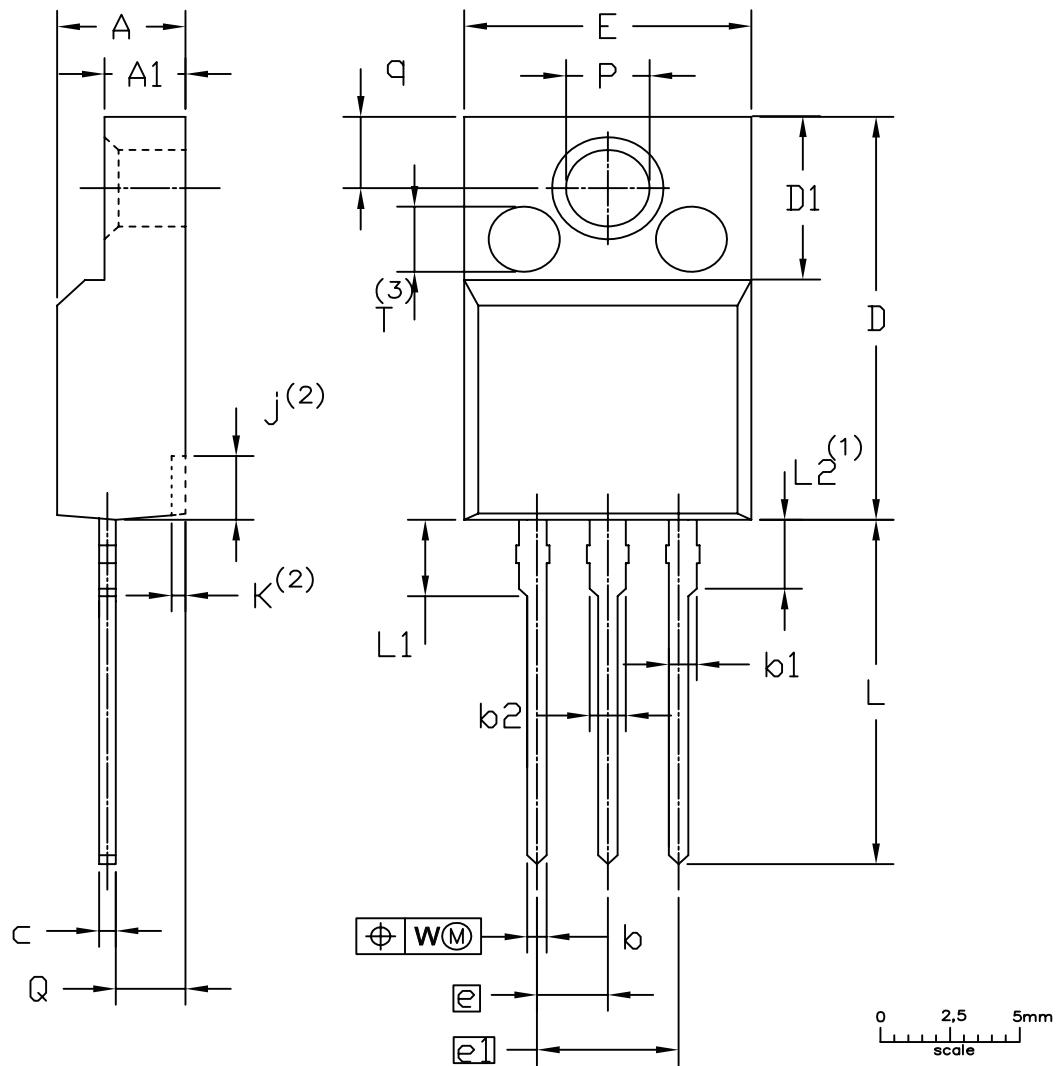


Fig. 12. Rate of change of commutating current as a function of junction temperature; typical and minimum values

12. Package outline

Assembly factory: d

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



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

- Notes
1. Terminal dimensions within this zone are uncontrolled
 2. Dot lines area designs may vary
 3. Eject pin mark is for reference only

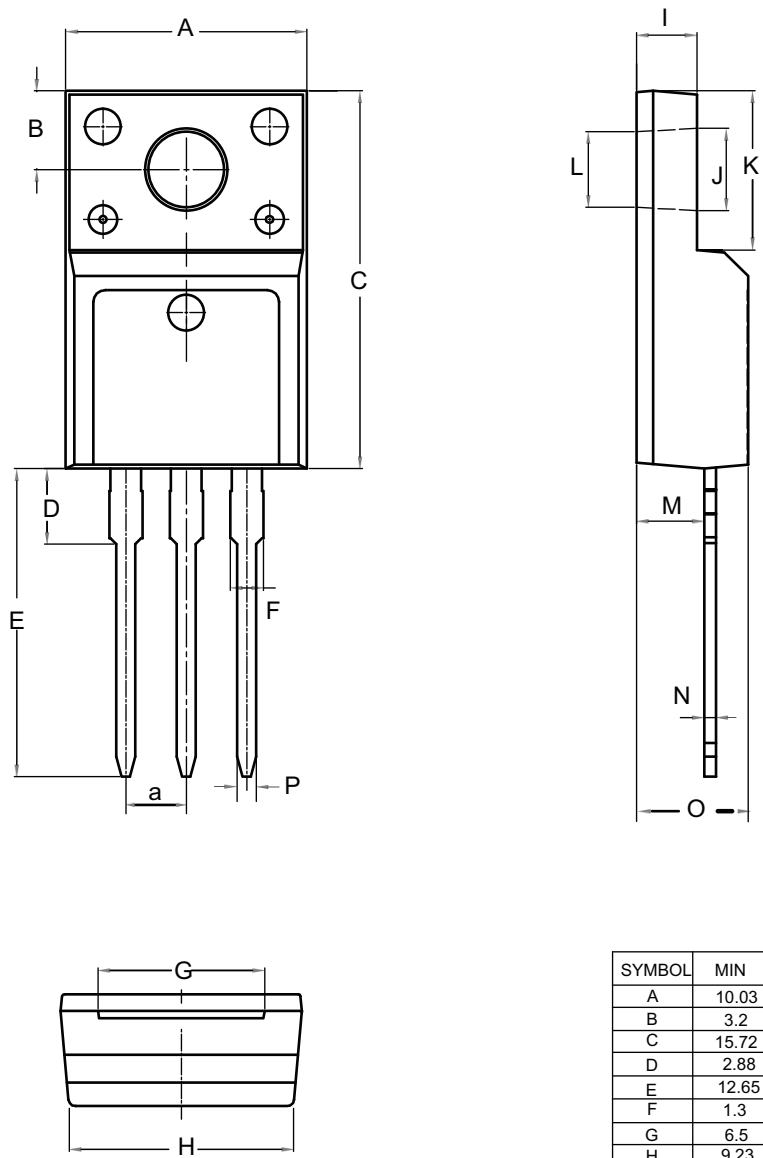
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT186A		3 LEADS TO220F				2013-11-14

· PACKAGE BODY SIZES EXCLUDE MOLD FLASH AND GATE BURRS.

Assembly factory: R

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

TO220F



SYMBOL	MIN	MAX
A	10.03	10.23
B	3.2	3.4
C	15.72	16.02
D	2.88	3.3
E	12.65	13.25
F	1.3	1.5
G	6.5	7.5
H	9.23	9.63
I	2.44	2.64
J	3.35	3.55
K	6.58	6.78
L	3.08	3.28
M	2.75	2.95
N	0.4	0.6
O	4.5	4.9
P	0.71	0.91
a	2.5	2.58

13. 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.

- [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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