

1. Product profile

1.1 General description

Dual ultrafast epitaxial rectifier diodes in a SOT186A (TO-220F) isolated plastic package.

1.2 Features and benefits

- Fast switching
- Guaranteed ESD capability
- High thermal cycling performance
- Low on-state losses
- Soft recovery minimizes power-consuming oscillations

1.3 Applications

- Output rectifiers in high-frequency switched-mode power supplies

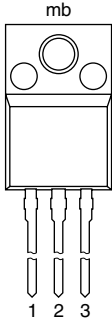
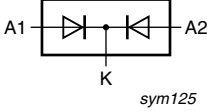
1.4 Quick reference data

Table 1. Quick reference

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage		-	-	200	V
$I_{O(AV)}$	average output current	SQW; $\delta = 0.5$; $T_h \leq 92\text{ °C}$; both diodes conducting; see Figure 1 ; see Figure 2	-	-	10	A
I_{FRM}	repetitive peak forward current	SQW; $\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_h \leq 92\text{ °C}$; per diode	-	-	10	A
Dynamic characteristics						
t_{rr}	reverse recovery time	$I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $dI_F/dt = 100\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; ramp recovery; see Figure 5	-	15	25	ns
Static characteristics						
V_F	forward voltage	$I_F = 5\text{ A}$; $T_j = 150\text{ °C}$; see Figure 4	-	0.8	0.895	V
Electrostatic discharge						
V_{ESD}	electrostatic discharge voltage	HBM; $C = 250\text{ pF}$; $R = 1.5\text{ k}\Omega$; all pins	-	-	8	kV

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode 1	 <p>SOT186A (TO-220F)</p>	
2	K	cathode		
3	A2	anode 2		
mb	n.c.	mounting base; isolated		

3. Ordering information

Table 3. Ordering information

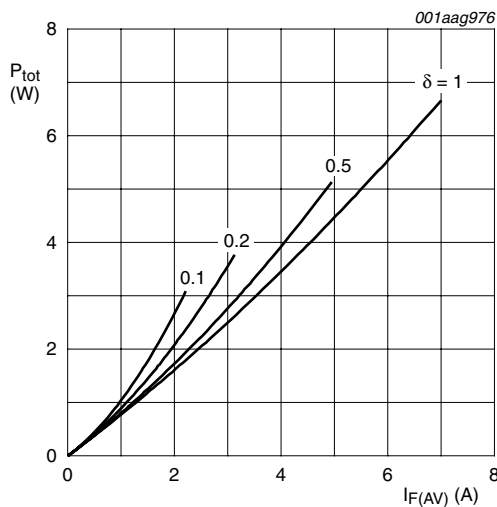
Type number	Package		Version
	Name	Description	
BYQ28X-200	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

4. Limiting values

Table 4. Limiting values

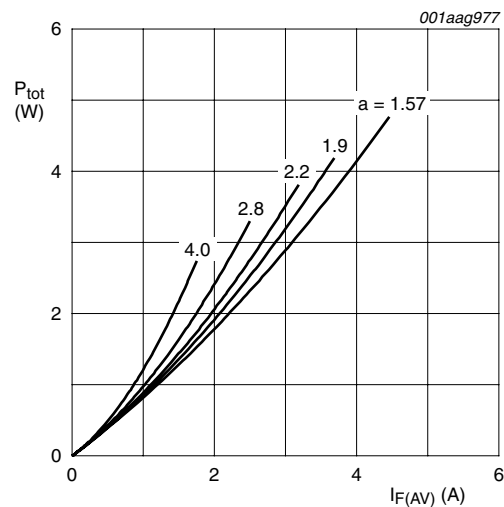
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{RRM}	repetitive peak reverse voltage		-	200	V
V_{RWM}	crest working reverse voltage		-	200	V
V_R	reverse voltage	DC	-	200	V
$I_{O(AV)}$	average output current	SQW; $\delta = 0.5$; $T_h \leq 92\text{ }^\circ\text{C}$; both diodes conducting; see Figure 1 ; see Figure 2	-	10	A
I_{FRM}	repetitive peak forward current	SQW; $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_h \leq 92\text{ }^\circ\text{C}$; per diode	-	10	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; SIN; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; per diode	-	50	A
		$t_p = 8.3\text{ ms}$; SIN; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; per diode	-	55	A
I_{RRM}	repetitive peak reverse current	$t_p = 2\text{ }\mu\text{s}$; $\delta = 0.001$	-	0.2	A
I_{RSM}	non-repetitive peak reverse current	$t_p = 100\text{ }\mu\text{s}$	-	0.2	A
T_{stg}	storage temperature		-40	150	$^\circ\text{C}$
T_j	junction temperature		-	150	$^\circ\text{C}$
Electrostatic discharge					
V_{ESD}	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 k Ω ; all pins	-	8	kV



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

Fig 1. Forward power dissipation as a function of average forward current; square waveform; maximum values



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

Fig 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; see Figure 3	-	-	5.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air		-	55	-	K/W

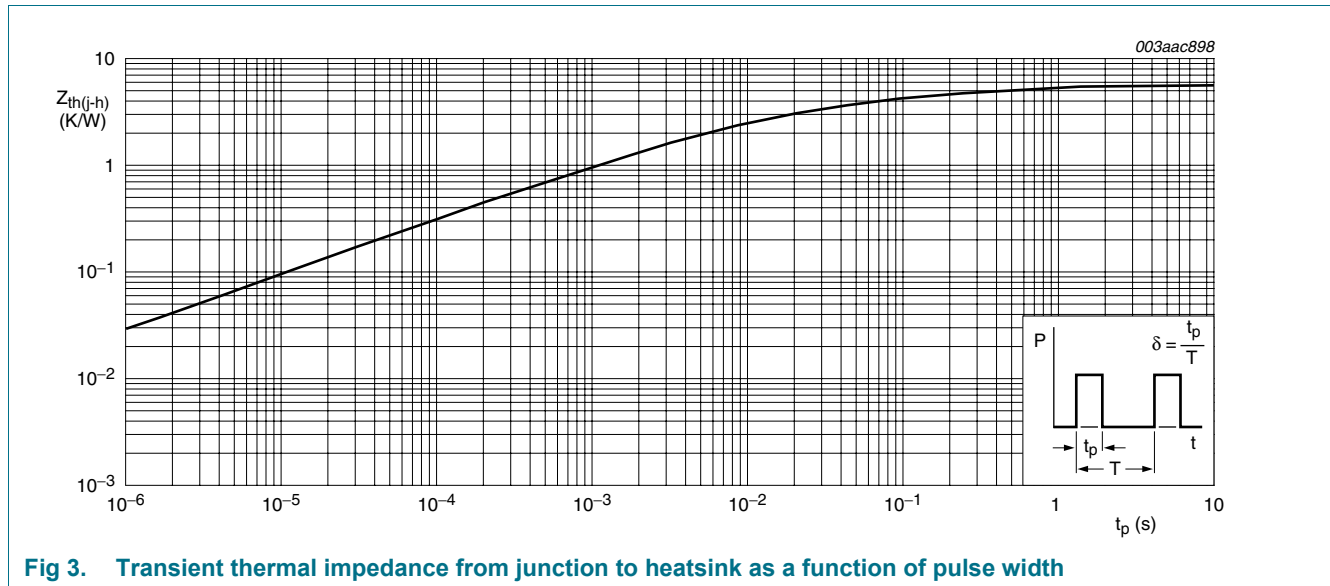


Fig 3. Transient thermal impedance from junction to heatsink as a function of pulse width

6. Isolation characteristics

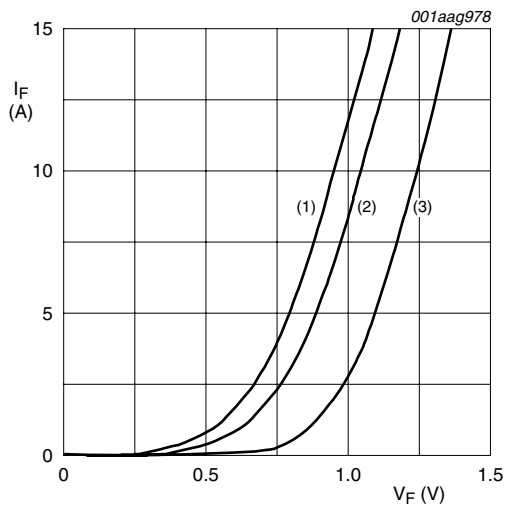
Table 6. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz < f < 60 Hz; sinusoidal waveform; relative humidity < 65 %; clean and dust free; from all terminals to external heatsink	-	-	2500	V
C_{isol}	isolation capacitance	from cathode to external heatsink; f = 1 MHz	-	10	-	pF

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	$I_F = 10\text{ A}; T_j = 25\text{ °C}$	-	1.1	1.25	V
		$I_F = 5\text{ A}; T_j = 150\text{ °C}$; see Figure 4	-	0.8	0.895	V
		$I_F = 5\text{ A}; T_j = 25\text{ °C}$	-	0.95	1.1	V
I_R	reverse current	$V_R = 200\text{ V}; T_j = 25\text{ °C}$	-	2	10	μA
		$V_R = 200\text{ V}; T_j = 100\text{ °C}$	-	0.1	0.2	mA
Dynamic characteristics						
Q_r	recovered charge	$I_F = 2\text{ A}; V_R = 30\text{ V}; dI_F/dt = 20\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$	-	4	9	μC
t_{rr}	reverse recovery time	$I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 100\text{ A}/\mu\text{s};$ ramp recovery; $T_j = 25\text{ °C}$; see Figure 5	-	15	25	ns
		$I_F = 0.5\text{ A}; I_R = 1\text{ A}$; step recovery; measured at $I_R = 0.25\text{ A}; T_j = 25\text{ °C}$; see Figure 6	-	-	20	ns
I_{RM}	peak reverse recovery current	$I_F = 5\text{ A}; V_R \geq 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$; see Figure 5	-	0.5	0.7	A
V_{FRM}	peak forward recovery voltage	$I_F = 1\text{ A}; dI_F/dt = 10\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$; see Figure 7	-	1	-	V



- (1) $T_j = 150\text{ °C}$; typical values
- (2) $T_j = 150\text{ °C}$; maximum values
- (3) $T_j = 25\text{ °C}$; maximum values

Fig 4. Forward current as a function of forward voltage

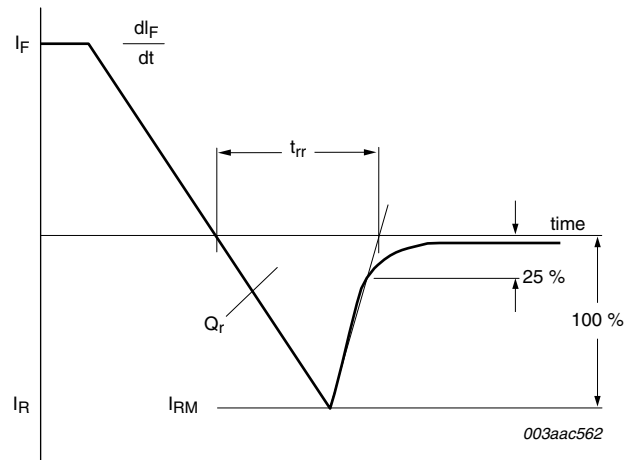
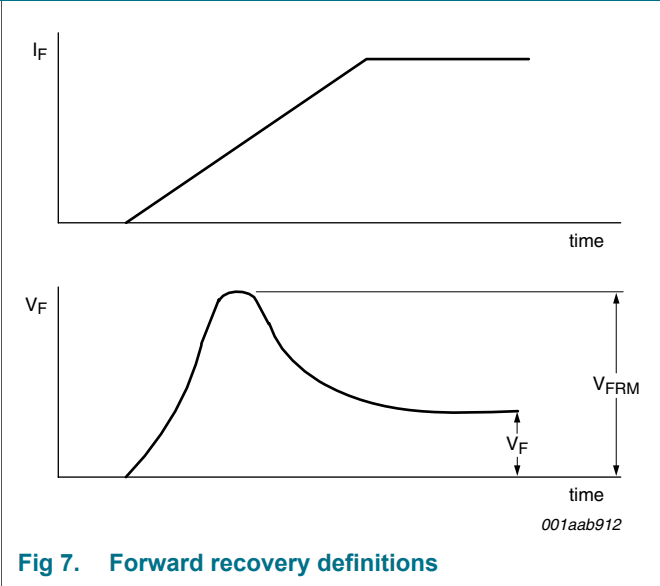
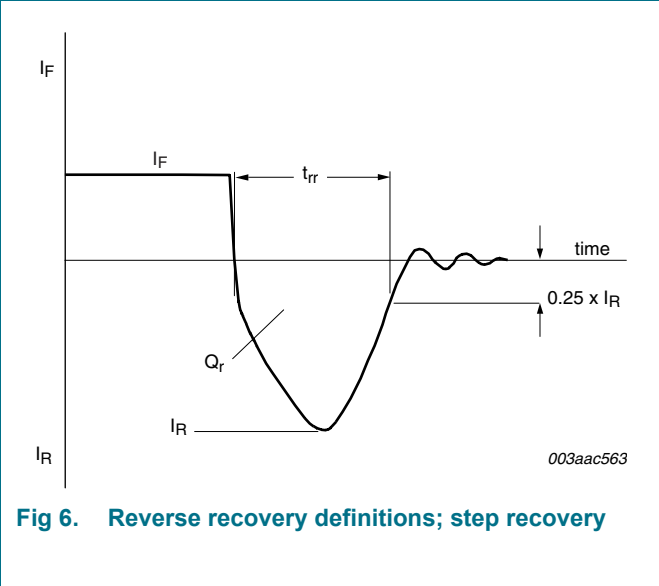


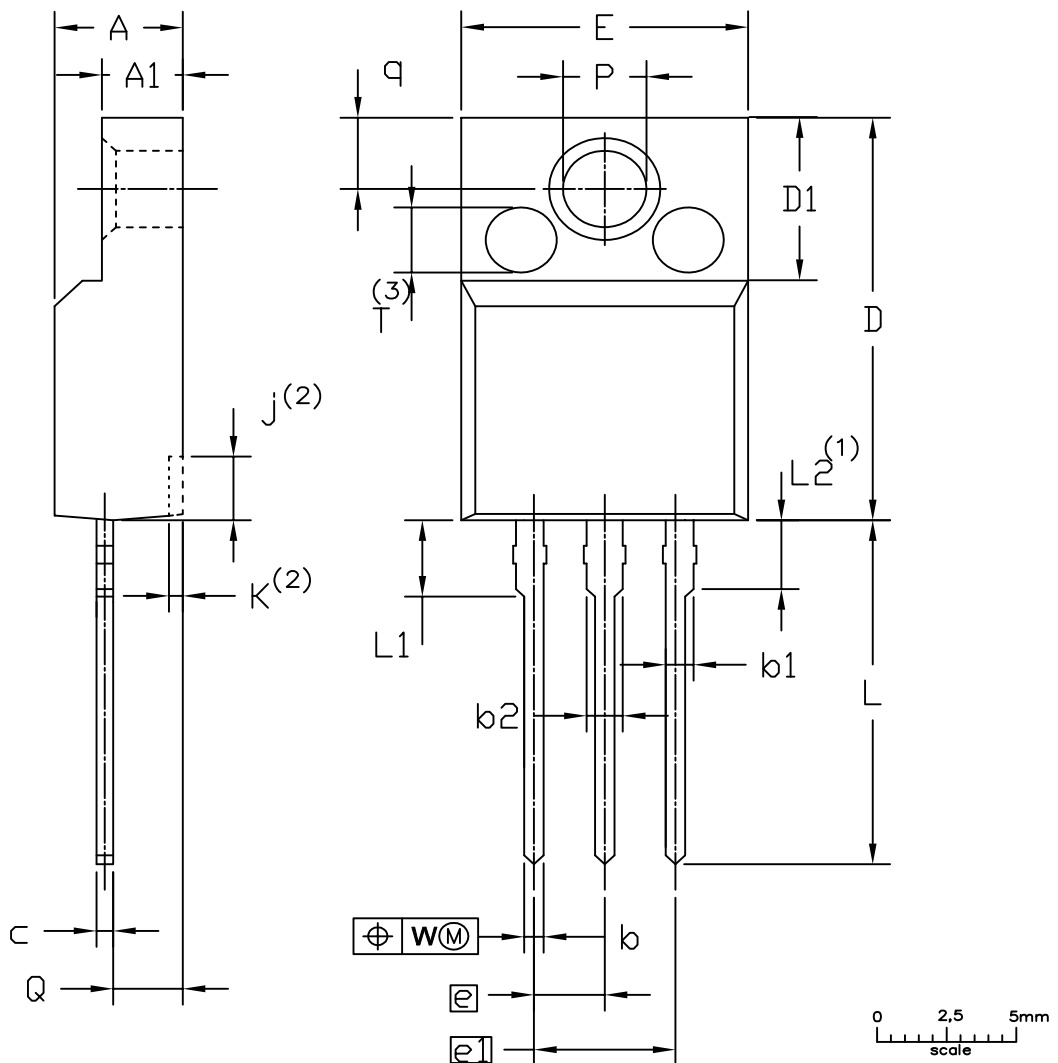
Fig 5. Reverse recovery definitions; ramp recovery



8. Package outline

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

Fig. 8. Package outline TO-220F (SOT186A)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYQ28X-200_H	20180718	Product data sheet	-	BYQ28X_SERIES_1
Modifications:	<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BYQ28X-200 separated from data sheet BYQ28X_SERIES_1. 			
BYQ28X-200_2	20090205	Product data sheet	-	-
Modifications:	<ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BYQ28X-200 separated from data sheet BYQ28X_SERIES_1. 			
BYQ28X_SERIES_1	19960801	Product data sheet	-	-