

## 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

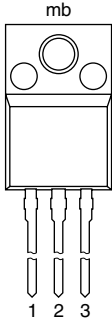
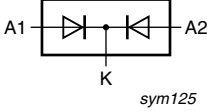
### 1.4 Quick reference data

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; $\delta = 0.5$ ; $T_h \leq 92$ °C; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	10	A
$I_{FRM}$	repetitive peak forward current	SQW; $\delta = 0.5$ ; $t_p = 25$ $\mu$ s; $T_h \leq 92$ °C; per diode	-	-	10	A
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 100$ A/ $\mu$ s; $T_j = 25$ °C; ramp recovery; see <a href="#">Figure 5</a>	-	15	25	ns
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5$ A; $T_j = 150$ °C; see <a href="#">Figure 4</a>	-	0.8	0.895	V
<b>Electrostatic discharge</b>						
$V_{ESD}$	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 k $\Omega$ ; all pins	-	-	8	kV

## 2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode 1		
2	K	cathode		
3	A2	anode 2		
mb	n.c.	mounting base; isolated		

**SOT186A  
(TO-220F)**

## 3. Ordering information

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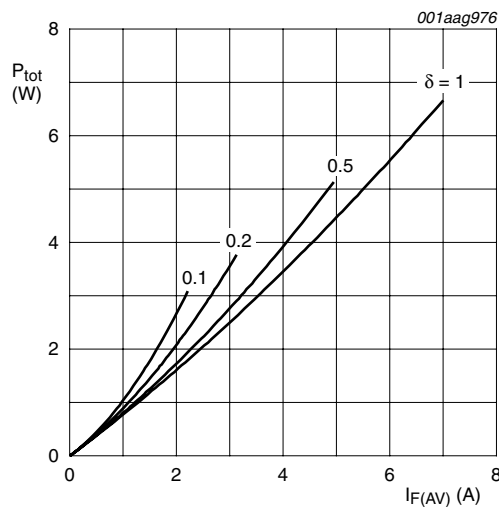
Type number	Package		Version
	Name	Description	
BYQ28X-200	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

### 4. Limiting values

**Table 4. Limiting values**

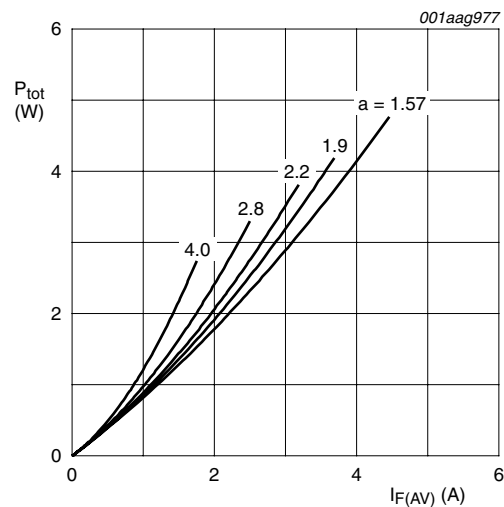
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>RRM</sub>	repetitive peak reverse voltage		-	200	V
V <sub>RWM</sub>	crest working reverse voltage		-	200	V
V <sub>R</sub>	reverse voltage	DC	-	200	V
I <sub>O(AV)</sub>	average output current	SQW; δ = 0.5; T <sub>h</sub> ≤ 92 °C; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	10	A
I <sub>FRM</sub>	repetitive peak forward current	SQW; δ = 0.5; t <sub>p</sub> = 25 μs; T <sub>h</sub> ≤ 92 °C; per diode	-	10	A
I <sub>FSM</sub>	non-repetitive peak forward current	t <sub>p</sub> = 10 ms; SIN; T <sub>j(init)</sub> = 25 °C; per diode	-	50	A
		t <sub>p</sub> = 8.3 ms; SIN; T <sub>j(init)</sub> = 25 °C; per diode	-	55	A
I <sub>RRM</sub>	repetitive peak reverse current	t <sub>p</sub> = 2 μs; δ = 0.001	-	0.2	A
I <sub>RSM</sub>	non-repetitive peak reverse current	t <sub>p</sub> = 100 μs	-	0.2	A
T <sub>stg</sub>	storage temperature		-40	150	°C
T <sub>j</sub>	junction temperature		-	150	°C
<b>Electrostatic discharge</b>					
V <sub>ESD</sub>	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 kΩ; 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**



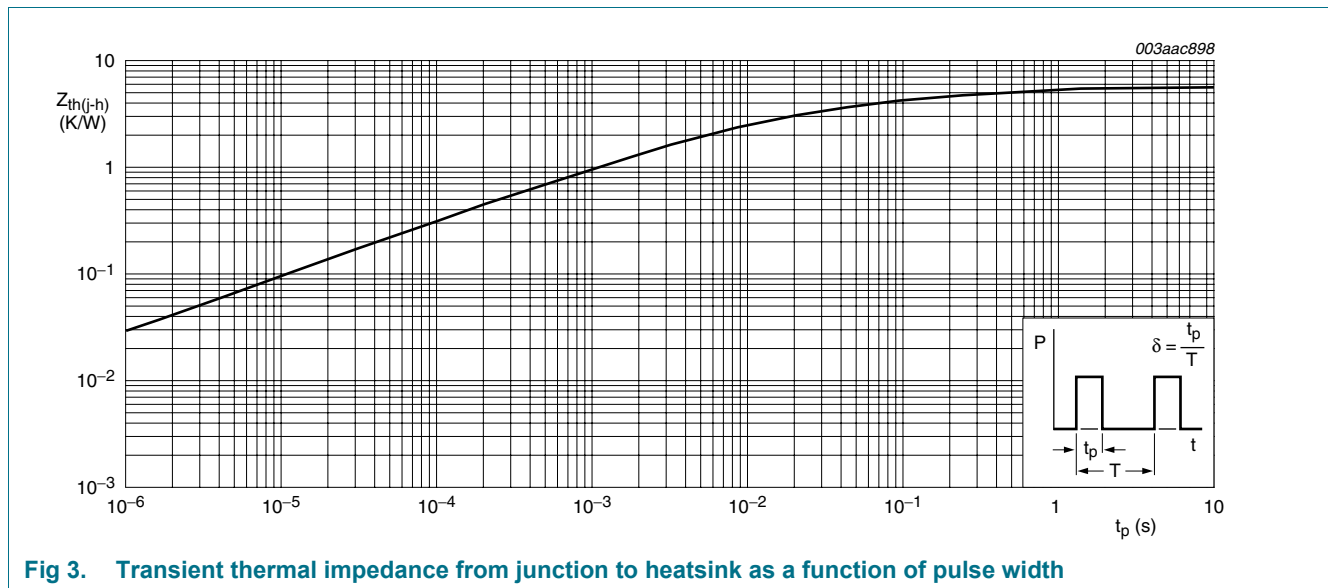
$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

**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 <a href="#">Figure 3</a>	-	-	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

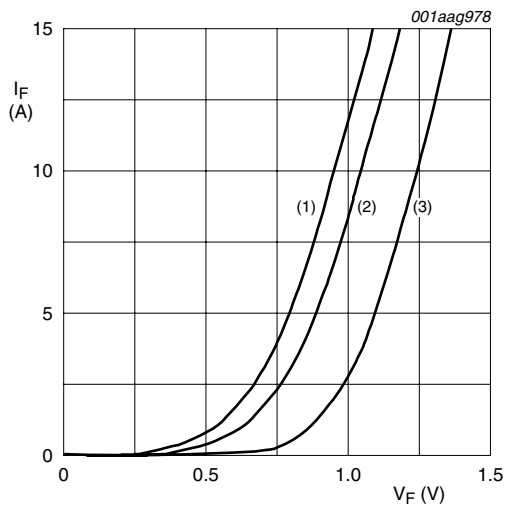
**Table 6. Isolation characteristics**

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

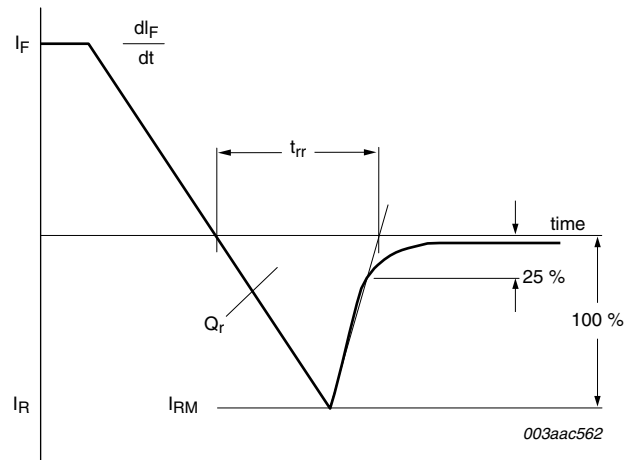
**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	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 <a href="#">Figure 4</a>	-	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	$\mu\text{A}$
		$V_R = 200\text{ V}; T_j = 100\text{ °C}$	-	0.1	0.2	$\text{mA}$
<b>Dynamic characteristics</b>						
$Q_r$	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	$\mu\text{C}$
$t_{rr}$	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 <a href="#">Figure 5</a>	-	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 <a href="#">Figure 6</a>	-	-	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 <a href="#">Figure 5</a>	-	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 <a href="#">Figure 7</a>	-	1	-	V

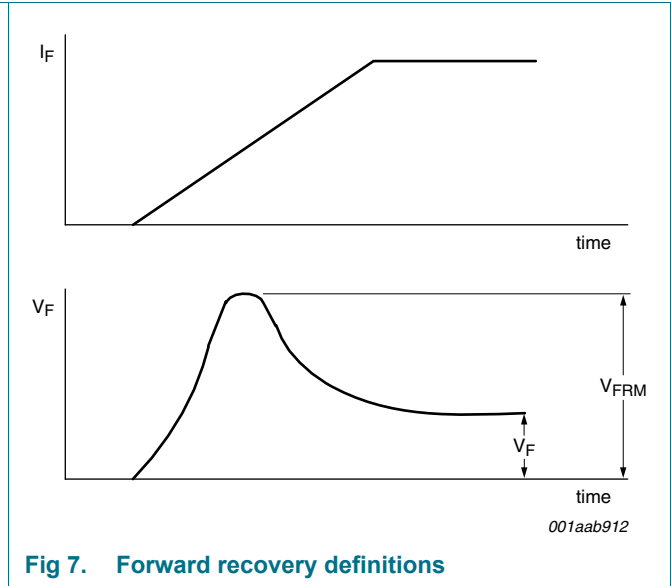
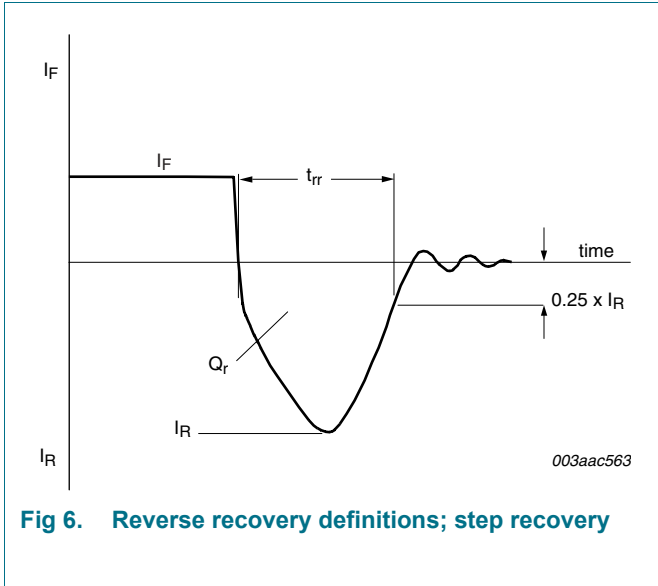


- (1)  $T_j = 150\text{ °C}$ ; typical values
- (2)  $T_j = 150\text{ °C}$ ; maximum values
- (3)  $T_j = 25\text{ °C}$ ; maximum values

**Fig 4. Forward current as a function of forward voltage**



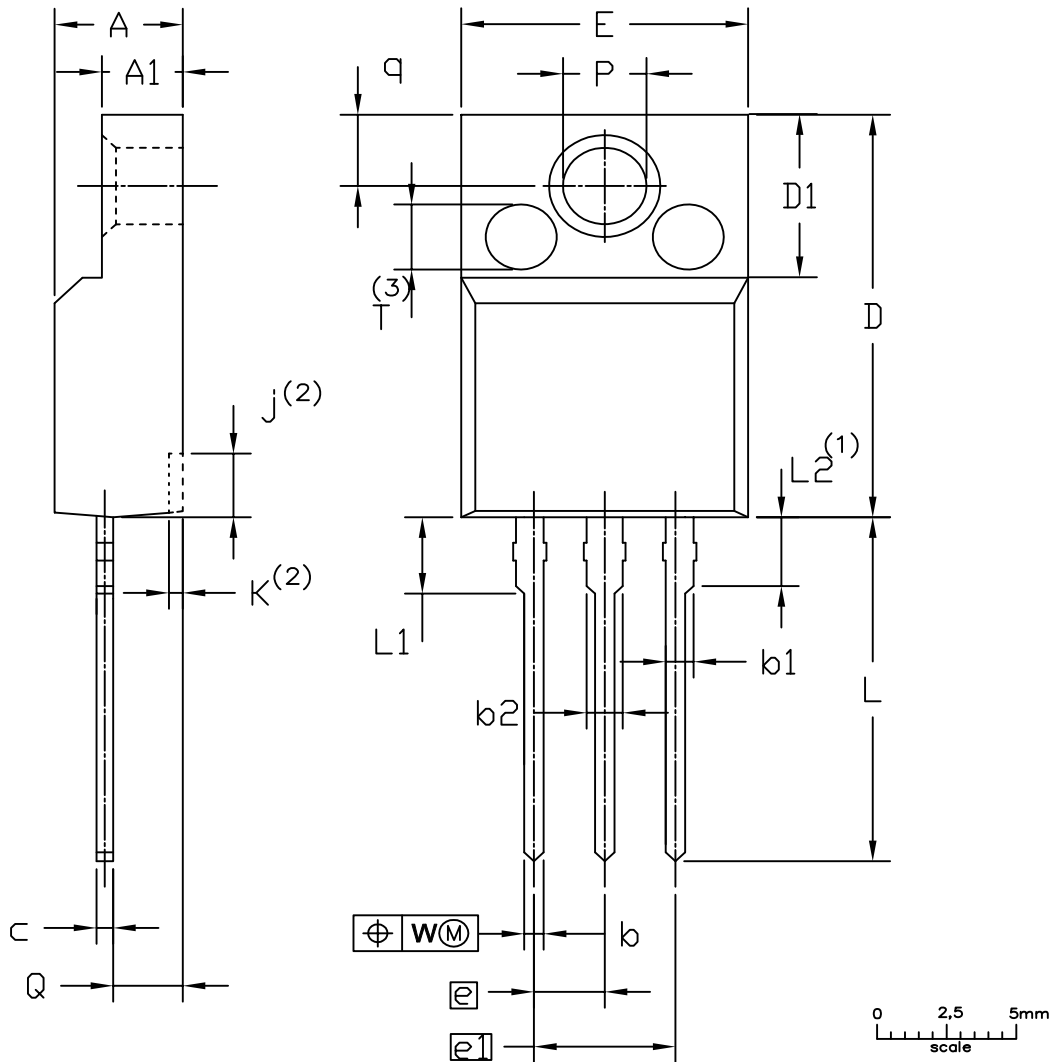
**Fig 5. Reverse recovery definitions; ramp recovery**



**8. Package outline**

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

SOT186A



UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	b <sub>2</sub>	c	D	D <sub>1</sub>	E	e	e <sub>1</sub>	j <sup>(2)</sup>	k <sup>(2)</sup>	L	L <sub>1</sub>	L <sub>2</sub> <sup>(1)</sup> max.	P	Q	q	W	T <sup>(3)</sup>
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_3	20180718	Product data sheet	-	BYQ28X-200_2
Modifications:	<ul style="list-style-type: none"> <li>• Change NXP logo to WeEn logo.</li> <li>• Update POD to combine different assembly plant.</li> </ul>			
BYQ28X-200_2	20090205	Product data sheet	-	BYQ28X_SERIES_1
Modifications:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• Type number BYQ28X-200 separated from data sheet BYQ28X_SERIES_1.</li> </ul>			
BYQ28X_SERIES_1	19960801	Product data sheet	-	-



## 10. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.ween-semi.com>.

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