



**THE DATASHEET OF  
NXPSC046506Q**





# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

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As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors





# NXPSC04650

## Silicon Carbide Diode

4 May 2015

Product data sheet

### 1. General description

Silicon Carbide Schottky diode in a SOD59A (TO-220AC) plastic package, designed for high frequency switched-mode power supplies.

### 2. Features and benefits

- Highly stable switching performance
- High forward surge capability  $I_{FSM}$
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

### 3. Applications

- Power factor correction
- Telecom/Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED/OLED TV
- Motor Drives

### 4. Quick reference data

Table 1. Quick reference data

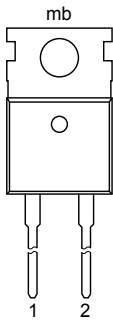
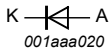
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 136$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	-	-	4	A
$T_j$	junction temperature		-	-	175	°C
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 4$ A; $T_j = 25$ °C; <a href="#">Fig. 4</a>	-	1.5	1.7	V



Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 4\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 5</a>	-	7	-	nC

## 5. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p style="text-align: center;">TO-220AC (SOD59A)</p>	 <p style="text-align: center;">001aaa020</p>
2	A	anode		
mb	mb	mounting base; connected to cathode		

## 6. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
NXPSC04650	TO-220AC	Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC	SOD59A

## 7. Marking

**Table 4. Marking codes**

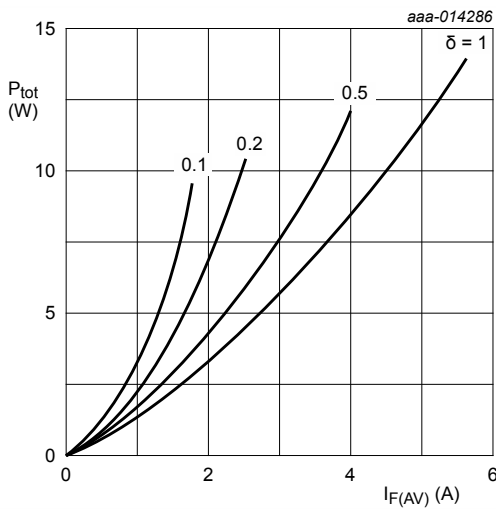
Type number	Marking code
NXPSC04650	NXPSC04650

## 8. Limiting values

**Table 5. Limiting values**

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

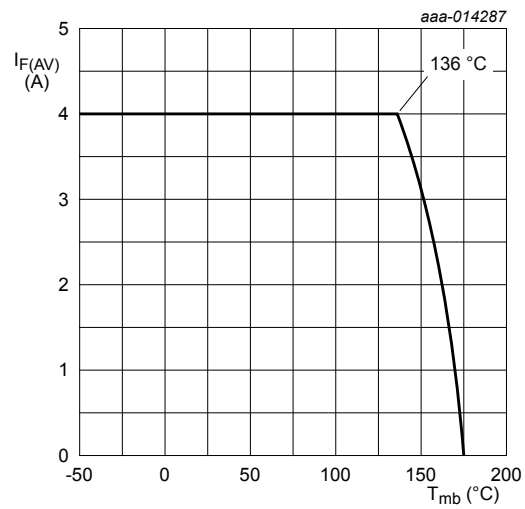
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	650	V
$V_{RWM}$	crest working reverse voltage		-	650	V
$V_R$	reverse voltage	DC	-	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 136\text{ }^\circ\text{C}$ ; square-wave pulse; Fig. 1; Fig. 2	-	4	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 136\text{ }^\circ\text{C}$ ; square-wave pulse	-	8	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse	-	24	A
		$t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; square-wave pulse	-	235	A
$T_{stg}$	storage temperature		-55	175	$^\circ\text{C}$
$T_j$	junction temperature		-	175	$^\circ\text{C}$



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

$$V_o = 1.260\text{ V}; R_s = 0.211\text{ }\Omega$$

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



**Fig. 2. Forward current as a function of mounting base temperature; maximum values**

### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 3</a>	-	-	3.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

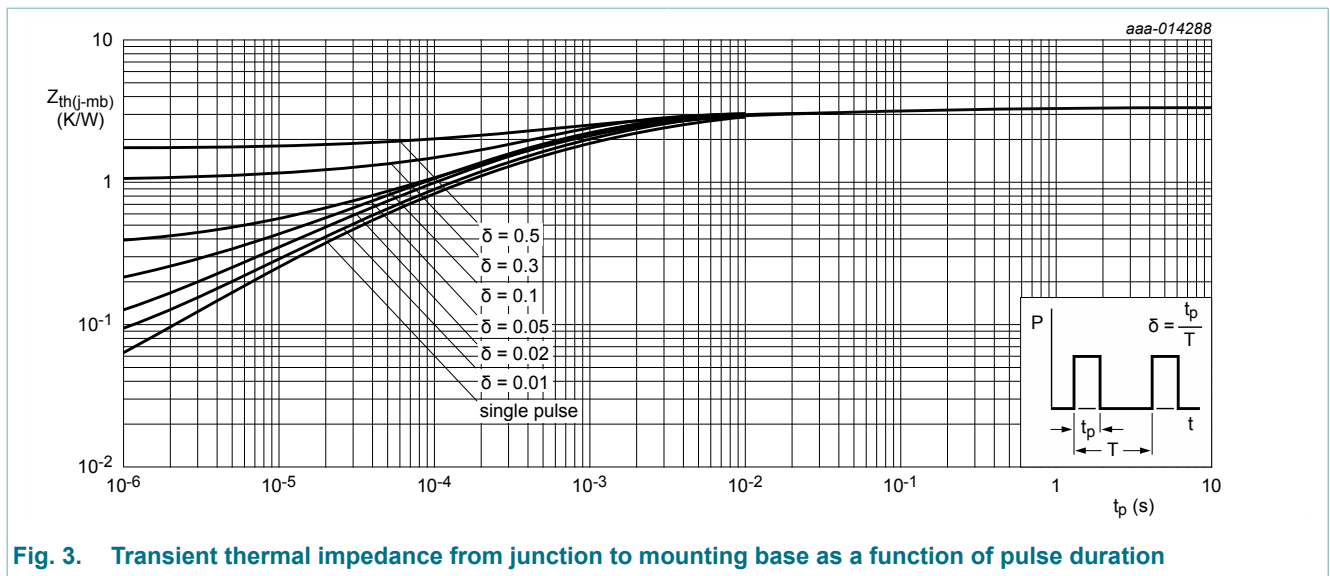
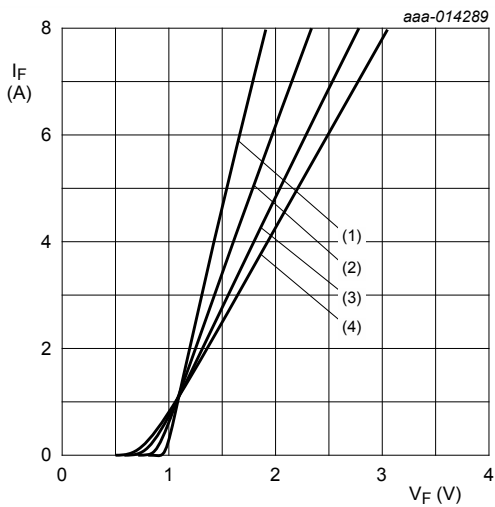


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 4 A; T <sub>j</sub> = 25 °C; Fig. 4	-	1.5	1.7	V
		I <sub>F</sub> = 4 A; T <sub>j</sub> = 150 °C; Fig. 4	-	1.8	2.1	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>j</sub> = 25 °C	-	-	170	μA
		V <sub>R</sub> = 650 V; T <sub>j</sub> = 150 °C	-	-	550	μA
<b>Dynamic characteristics</b>						
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 4 A; dI <sub>F</sub> /dt = 500 A/μs; V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C; Fig. 5	-	7	-	nC
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>j</sub> = 25 °C	-	130	-	pF
		f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>j</sub> = 25 °C	-	16	-	pF
		f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C	-	13	-	pF



V<sub>0</sub> = 1.260 V; R<sub>s</sub> = 0.211 Ω  
 (1) T<sub>j</sub> = 25 °C; typical values  
 (2) T<sub>j</sub> = 100 °C; typical values  
 (3) T<sub>j</sub> = 150 °C; typical values  
 (4) T<sub>j</sub> = 175 °C; typical values

Fig. 4. Forward current as a function of forward voltage; typical values

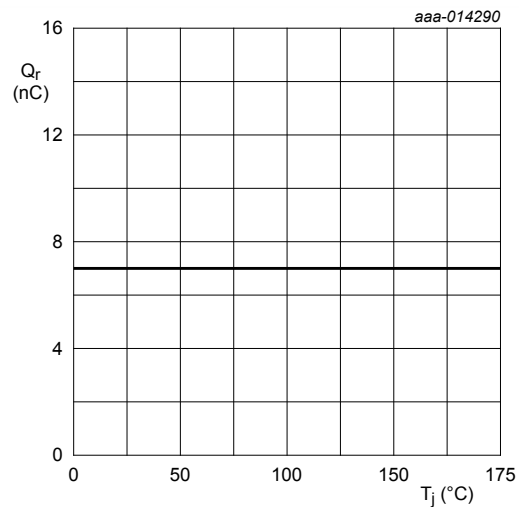
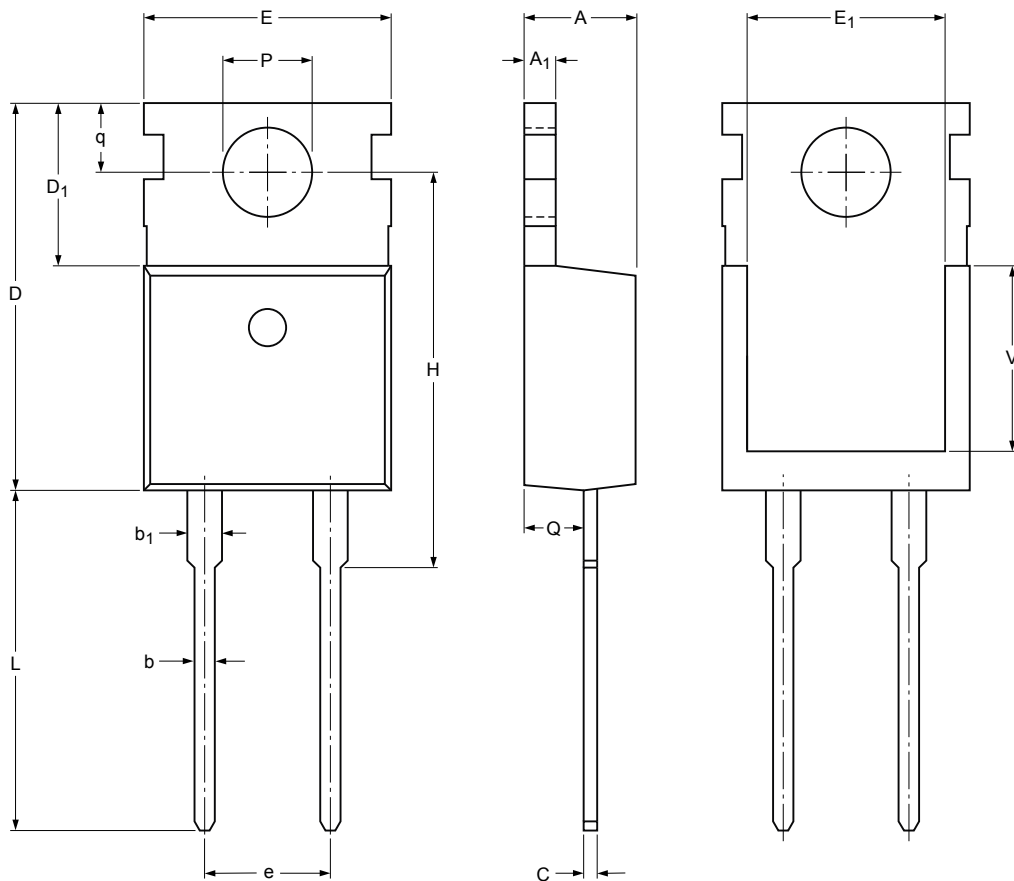


Fig. 5. Recovered charge as a function of junction temperature

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC SOD59A



Dimensions: (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub> ( <sup>1</sup> )	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q	E <sub>1</sub>	V
max	4.7	1.40	0.95	1.70	0.65	15.8	6.8	10.30	5.08	16.25	15.0	3.80	2.6	2.95	8.1	6.9
nom									(REF)							(REF)
min	4.3	1.15	0.70	1.17	0.45	15.6	6.4	9.65		15.70	12.5	3.53	2.2	2.65	7.9	

**Note**

1. Protruded dambar are included in the dimension.

sod059a\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOD59A	TO-220AC (2-lead)					15-03-24 15-03-30

**Fig. 6. Package outline TO-220AC (SOD59A)**

## 12. Legal information

### 12.1 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.
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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