



**THE DATASHEET OF  
NXPSC20650WQ**



## 1. General description

Dual Silicon Carbide Schottky diode in a 3-lead TO-247 plastic package, designed for high frequency switched-mode power supplies.

## 2. Features and benefits

- Highly stable switching performance
- High forward surge capability IFSM
- 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
- Electrical Vehicle Charger
- Motor Drives

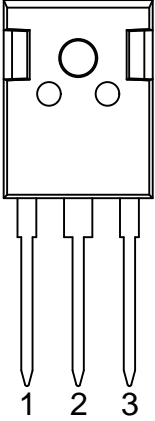
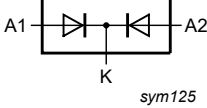
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	650	V
$I_{O(AV)}$	limiting average output current	$T_{mb} \leq 105\text{ °C}$ ; $\delta_{factor} = 0.5$ ; square-wave pulse; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a>	-	-	20	A
$T_j$	junction temperature		-	-	175	°C
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 6</a>	-	1.5	1.7	V
		$I_F = 10\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 6</a>	-	1.8	2.1	V
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 10\text{ A}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $V_R = 400\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	14	-	nC

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode	 <p style="text-align: center;">TO-247 (SOT429N)</p>	
2	K	cathode		
3	A2	anode		
mb	mb	mounting base; connected to cathode		

## 6. Ordering information

Table 3. Ordering information

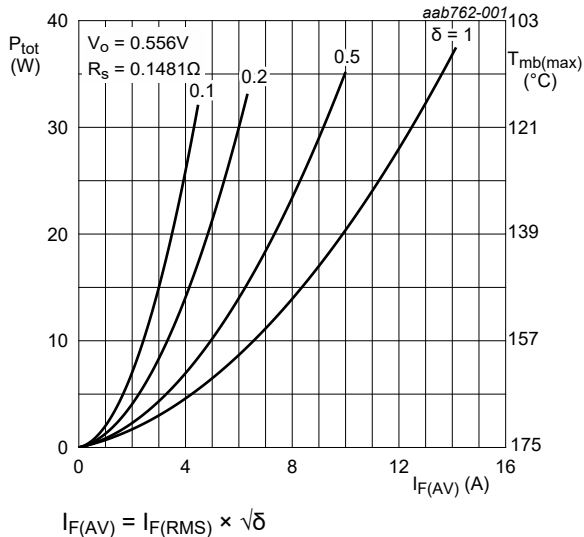
Type number	Package		
	Name	Description	Version
NXPSC20650W	TO-247	Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247	SOT429N

## 7. Limiting values

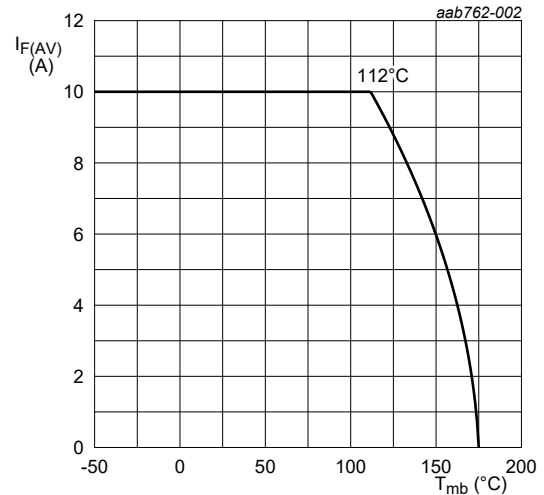
**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	650	V
$V_{RWM}$	crest working reverse voltage		-	650	V
$V_R$	reverse voltage	DC	-	650	V
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25 \mu s$ ; $T_{mb} \leq 112 \text{ }^\circ\text{C}$ ; square-wave pulse; per diode	-	20	A
$I_{O(AV)}$	limiting average output current	$T_{mb} \leq 105 \text{ }^\circ\text{C}$ ; $\delta_{factor} = 0.5$ ; square-wave pulse; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a>	-	20	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10 \text{ ms}$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; square-wave pulse; per diode	-	50	A
		$t_p = 10 \mu s$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; square-wave pulse; per diode	-	450	A
$T_{stg}$	storage temperature		-55	175	$^\circ\text{C}$
$T_j$	junction temperature		-	175	$^\circ\text{C}$



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



**Fig. 2. Forward current as a function of mounting base temperature; per diode**

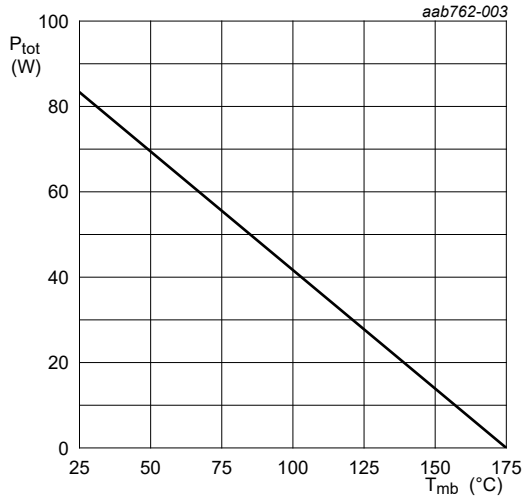


Fig. 3. Total power dissipation as a function of mounting base temperature; per diode

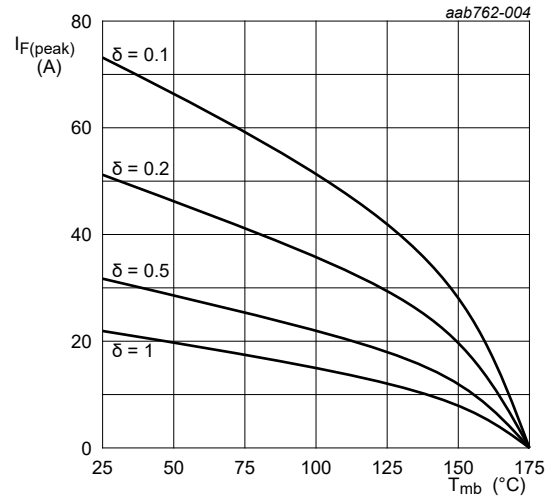


Fig. 4. Current derating as a function of mounting base temperature; per diode

### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R <sub>th(j-mb)</sub>	thermal resistance from junction to mounting base	per diode; Fig. 5	-	-	1.8	K/W
		both diodes conducting	-	-	1	K/W
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient free air	in free air	-	45	-	K/W

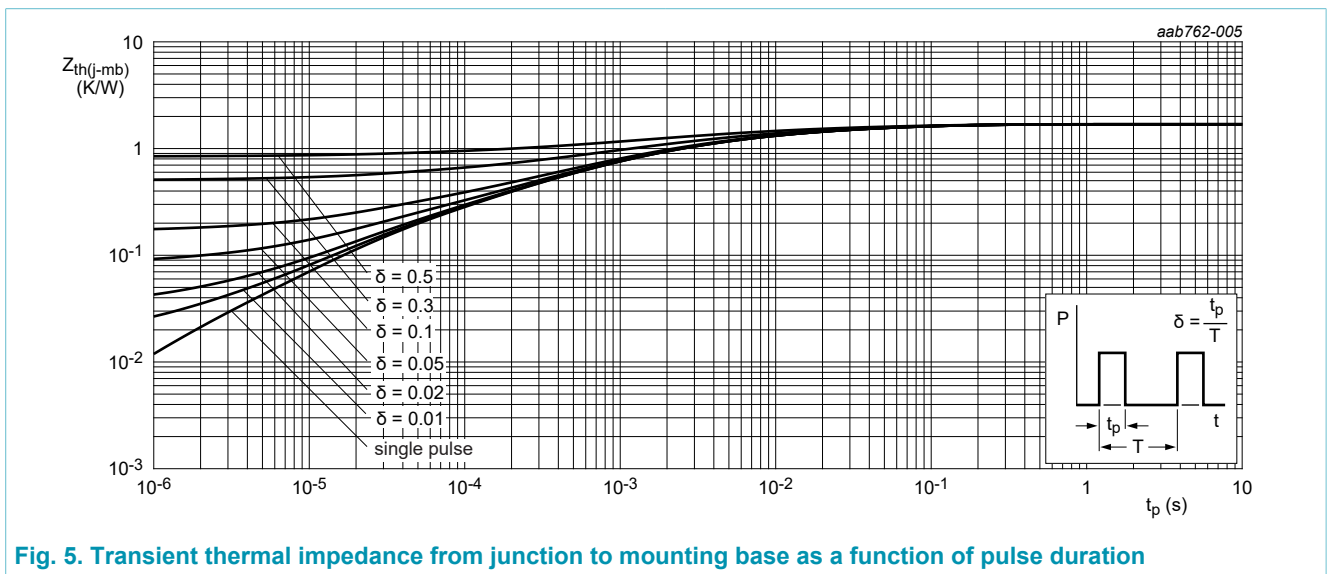


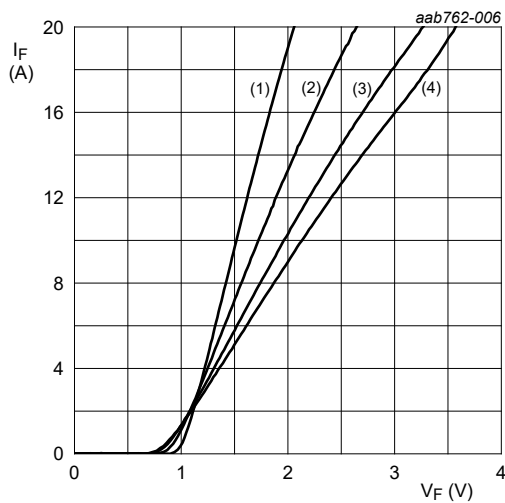
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 9. Characteristics

**Table 6. Characteristics**

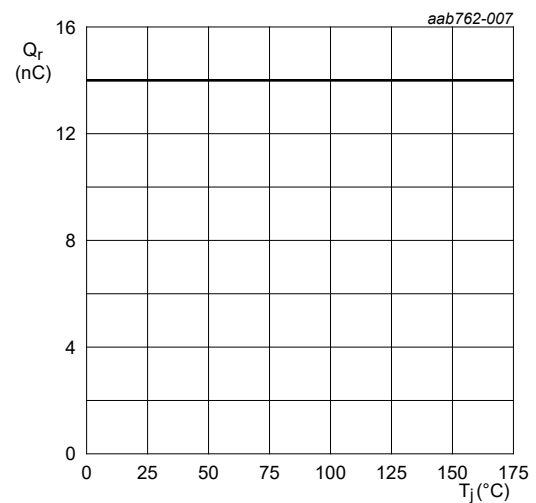
characteristics are per diode unless otherwise stated

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}; T_j = 25\text{ °C}; \text{Fig. 6}$	-	1.5	1.7	V
		$I_F = 10\text{ A}; T_j = 150\text{ °C}; \text{Fig. 6}$	-	1.8	2.1	V
$I_R$	reverse current	$V_R = 650\text{ V}; T_j = 25\text{ °C}$	-	-	250	$\mu\text{A}$
		$V_R = 650\text{ V}; T_j = 150\text{ °C}$	-	-	800	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 10\text{ A}; dI_F/dt = 500\text{ A}/\mu\text{s}; V_R = 400\text{ V}; T_j = 25\text{ °C}; \text{Fig. 7}$	-	14	-	nC
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 1\text{ V}; T_j = 25\text{ °C}$	-	300	-	pF
		$f = 1\text{ MHz}; V_R = 300\text{ V}; T_j = 25\text{ °C}$	-	32	-	pF
		$f = 1\text{ MHz}; V_R = 600\text{ V}; T_j = 25\text{ °C}$	-	25	-	pF



- (1)  $T_j = 25\text{ °C};$  typical values
- (2)  $T_j = 100\text{ °C};$  typical values
- (3)  $T_j = 150\text{ °C};$  typical values
- (4)  $T_j = 175\text{ °C};$  typical values

**Fig. 6. Forward current as a function of forward voltage; typical values; per diode**



**Fig. 7. Recovered charge as a function of junction temperature; per diode**

10. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429N

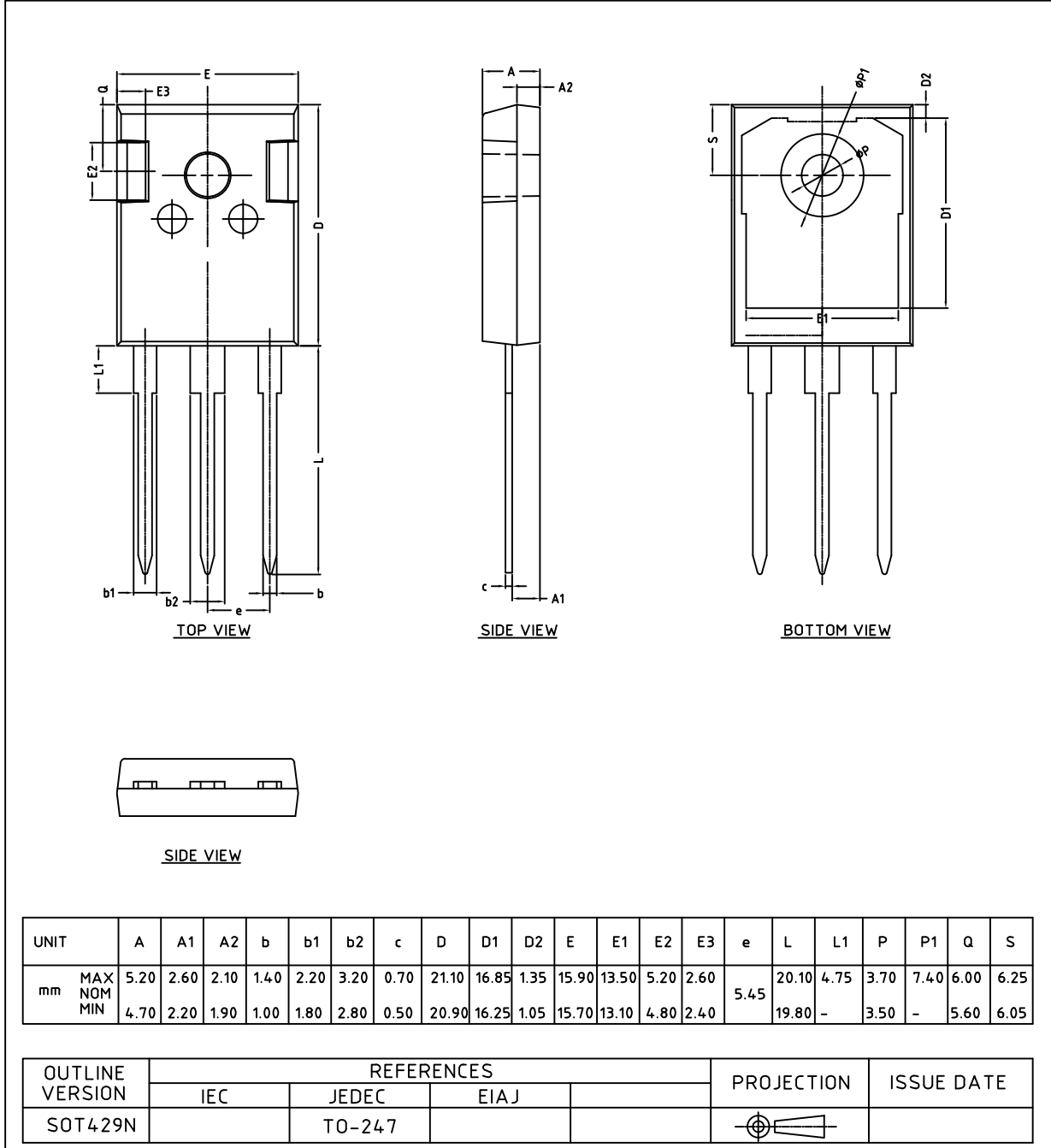


Fig. 8. Package outline TO-247 (SOT429N)

## 11. Legal information

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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