

## 1. General description

Dual Silicon Carbide Schottky diode in a 3-lead TO-247 plastic package, designed for high frequency switched-mode power supplies. This product is qualified to AEC-Q101 standard for use in automotive applications.



AEC - Q101 Qualified



## 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
- AEC-Q101 compliant
- High junction operating temperature capability ( $T_{j(max)} = 175\text{ °C}$ )

## 3. Applications

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

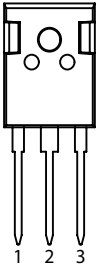
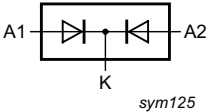
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V <sub>RRM</sub>	repetitive peak reverse voltage		650				V
I <sub>O(AV)</sub>	limiting average output current	δ = 0.5 ; square-wave pulse; T <sub>mb</sub> ≤ 105 °C; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	20				A
T <sub>j</sub>	junction temperature		175				°C
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 10 A; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 4</a>		-	1.5	1.7	V
		I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; per diode; <a href="#">Fig. 4</a>		-	1.8	2.1	V
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 10 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 25 °C; per diode; <a href="#">Fig. 6</a>		-	16	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode		
2	K	cathode		
3	A2	anode		
mb	K	mounting base; connected to cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
NXPSC20650W-A	TO247	NXPSC20650W-AQ	Tube	30	TO247N	20-Jul-2016

7. Marking

Table 4. Marking codes

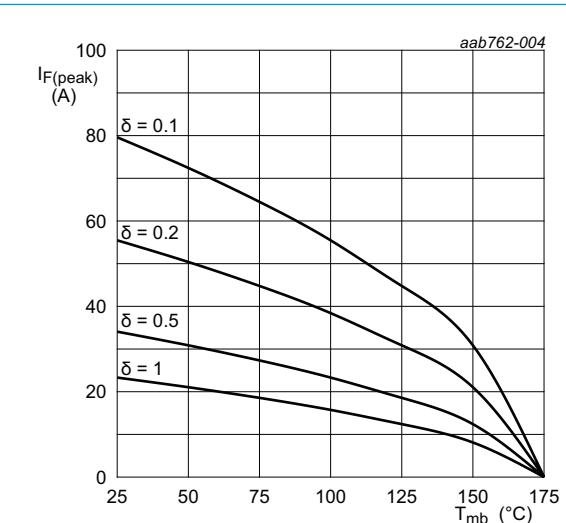
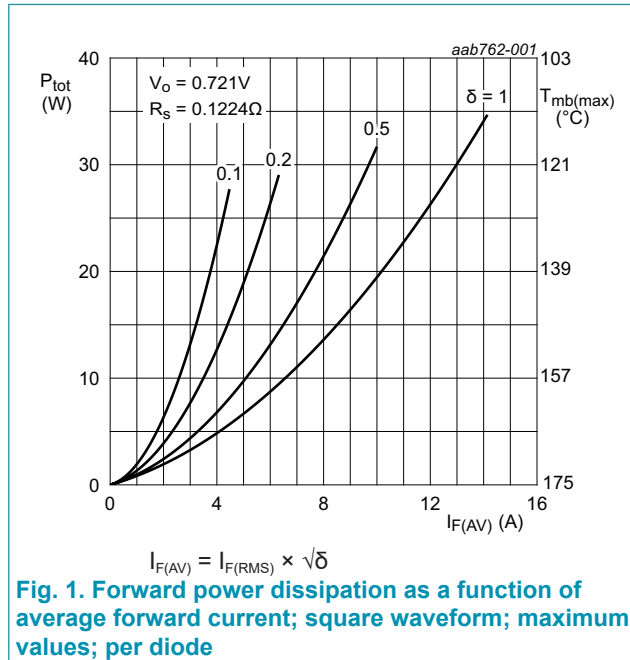
Type number	Marking codes
NXPSC20650W-A	NXPSC20650W-A

## 8. Limiting values

**Table 5. Limiting values**

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

Symbol	Parameter	Conditions	Values	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	$\delta = 0.5$ ; $t_p = 25 \mu s$ ; $T_{mb} \leq 112^\circ C$ ; square-wave pulse; per diode	20	A
$I_{O(AV)}$	limiting average output current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 105^\circ C$ ; both diodes conducting; Fig. 1; Fig. 2	20	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10 ms$ ; $T_{j(init)} = 25^\circ C$ ; sine-wave pulse; per diode	50	A
		$t_p = 10 \mu s$ ; $T_{j(init)} = 25^\circ C$ ; sine-wave pulse; per diode	450	A
$I^2t$	$I^2t$ for fusing	sine-wave pulse; $T_{j(init)} = 25^\circ C$ ; $t_p = 10 ms$ ; per diode	12.5	A <sup>2</sup> s
$T_{stg}$	storage temperature		-55 to 175	$^\circ C$
$T_j$	junction temperature		175	$^\circ C$



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	Per diode; <a href="#">Fig. 3</a>	-	-	1.8	K/W
		both diodes conducting	-	-	1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	45	-	K/W

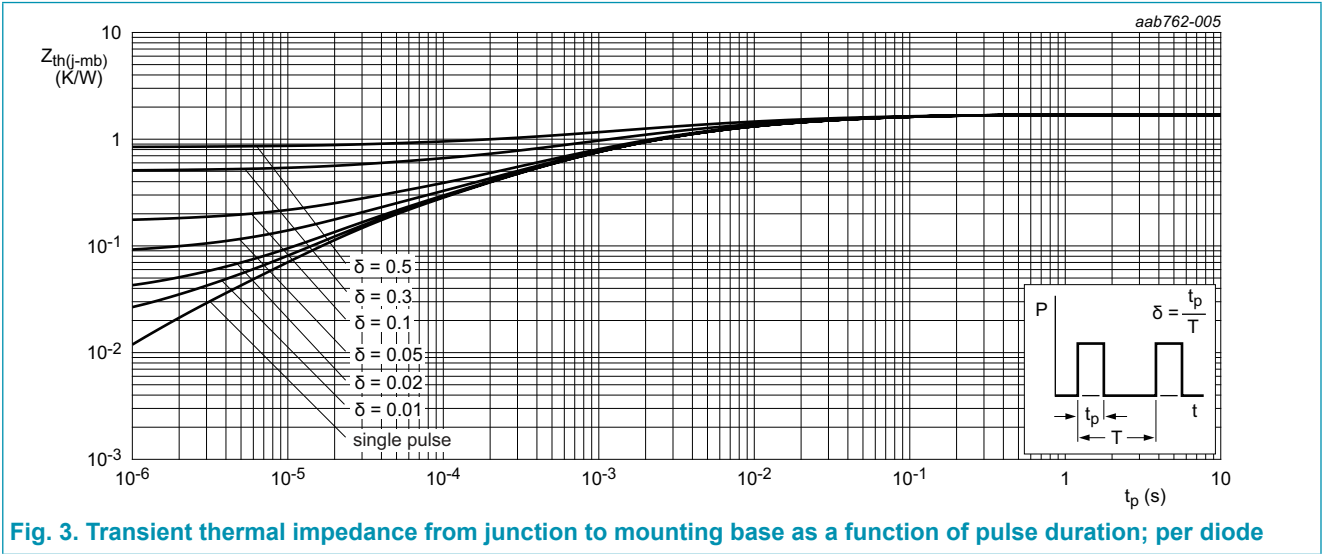
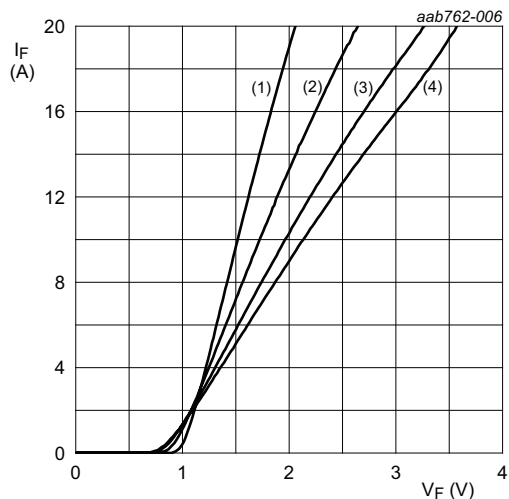


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode

## 10. Characteristics

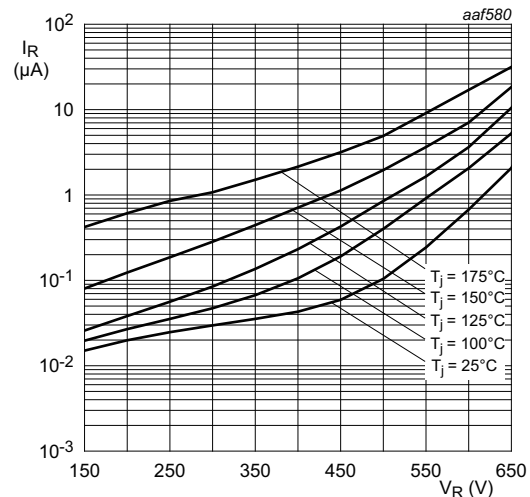
Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward current	I <sub>F</sub> = 10 A; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 4</a>		-	1.5	1.7	V
		I <sub>F</sub> = 10 A; T <sub>J</sub> = 150 °C; per diode; <a href="#">Fig. 4</a>		-	1.8	2.1	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 5</a>		-	-	60	μA
		V <sub>R</sub> = 650 V; T <sub>J</sub> = 150 °C; per diode; <a href="#">Fig. 5</a>		-	-	240	μA
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 10 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 6</a>		-	16	-	nC
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>J</sub> = 25 °C; per diode		-	328	-	pF
		f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>J</sub> = 25 °C; per diode		-	44	-	pF
		f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>J</sub> = 25 °C; per diode		-	42	-	pF
E <sub>as</sub>	non-repetitive avalanche energy	I <sub>R</sub> = 5.5 A; T <sub>J</sub> (init) = 25 °C; L = 5 mH; per diode		75	-	-	mJ



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

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



**Fig. 5. Reverse leakage current as a function of reverse voltage; typical value; per diode**

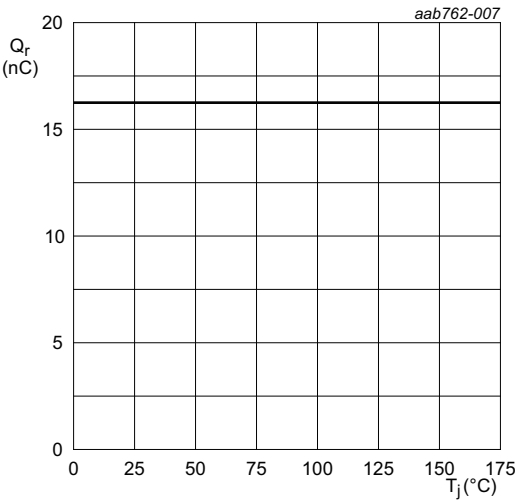
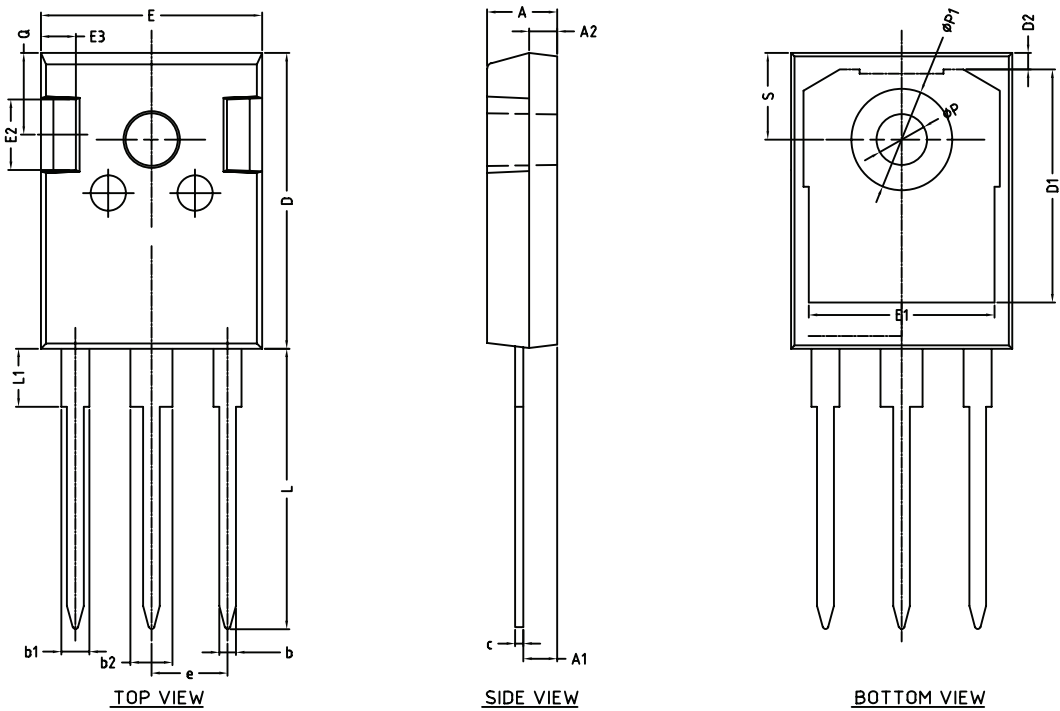


Fig. 6. Recovered charge as a function of junction temperature; per diode

11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247 SOT429N



UNIT	A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	E2	E3	e	L	L1	P	P1	Q	S
mm	5.20	2.60	2.10	1.40	2.20	3.20	0.70	21.10	16.85	1.35	15.90	13.50	5.20	2.60	5.45	20.10	4.75	3.70	7.40	6.00	6.25
	4.70	2.20	1.90	1.00	1.80	2.80	0.50	20.90	16.25	1.05	15.70	13.10	4.80	2.40		19.80	-	3.50	-	5.60	6.05

OUTLINE VERSION	REFERENCES				PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT429N		TO-247				

## 12. 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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