NXPSC20650W

Silicon Carbide Diode

22 November 2016 Product data sheet

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

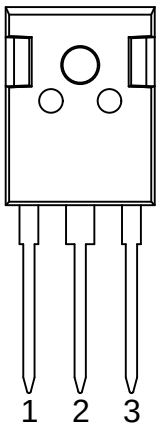
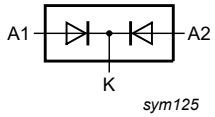
4. Quick reference data

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	$T_{mb} \leq 105$ °C; $\delta_{factor} = 0.5$; square-wave pulse; both diodes conducting; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	-	20	A
T_j	junction temperature			-	-	175	°C
Static characteristics							
V_F	forward voltage	$I_F = 10$ A; $T_j = 25$ °C; Fig. 6		-	1.5	1.7	V
		$I_F = 10$ A; $T_j = 150$ °C; Fig. 6		-	1.8	2.1	V
Dynamic characteristics							
Q_r	recovered charge	$I_F = 10$ A; $dI_F/dt = 500$ A/µs; $V_R = 400$ V; $T_j = 25$ °C; Fig. 7		-	14	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode	 TO-247 (SOT429N)	
2	K	cathode		
3	A2	anode		
mb	mb	mounting base; connected to cathode		

6. Ordering information

Table 3. Ordering information

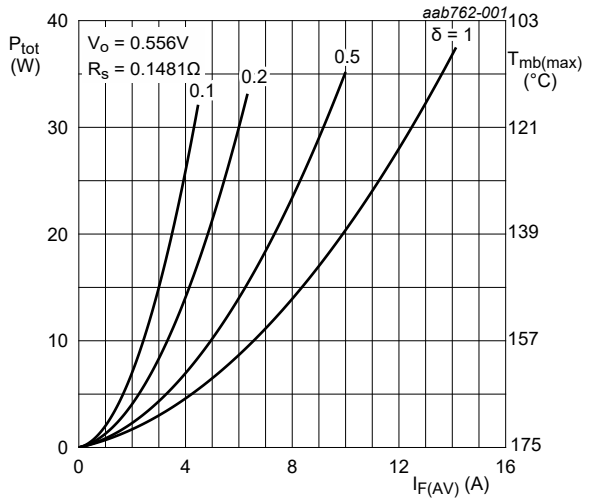
Type number	Package		
	Name	Description	Version
NXPSC20650W	TO-247	Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247	SOT429N

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	$\delta = 0.5$; $t_p = 25$ µs; $T_{mb} \leq 112$ °C; square-wave pulse; per diode		-	20	A
$I_{O(AV)}$	limiting average output current	$T_{mb} \leq 105$ °C; $\delta_{factor} = 0.5$; square-wave pulse; both diodes conducting; Fig. 1; Fig. 2; Fig. 3; Fig. 4		-	20	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; square-wave pulse; per diode		-	50	A
		$t_p = 10$ µs; $T_{j(init)} = 25$ °C; square-wave pulse; per diode		-	450	A
T_{stg}	storage temperature			-55	175	°C
T_j	junction temperature			-	175	°C



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

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

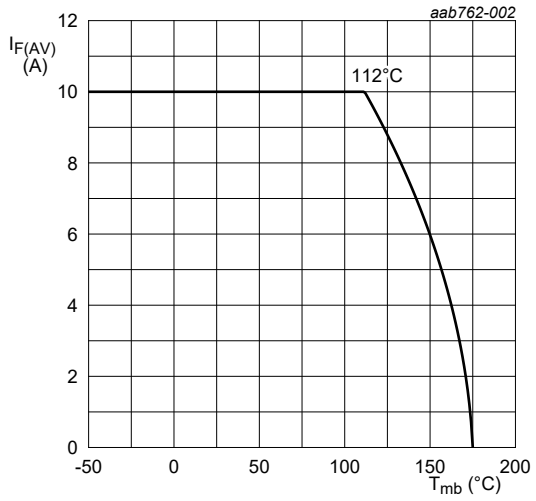


Fig. 2. Forward current as a function of mounting base temperature; per diode

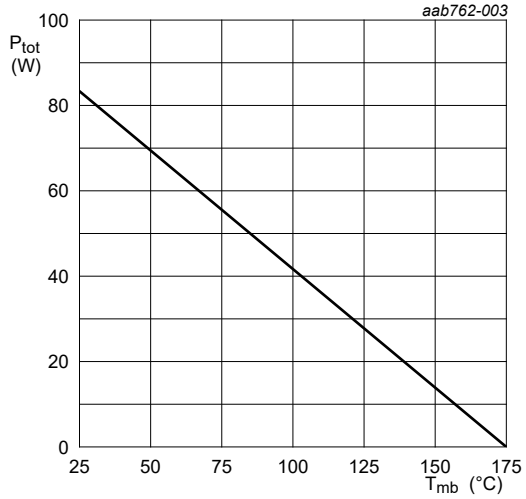


Fig. 3. Total power dissipation as a function of mounting base temperature; per diode

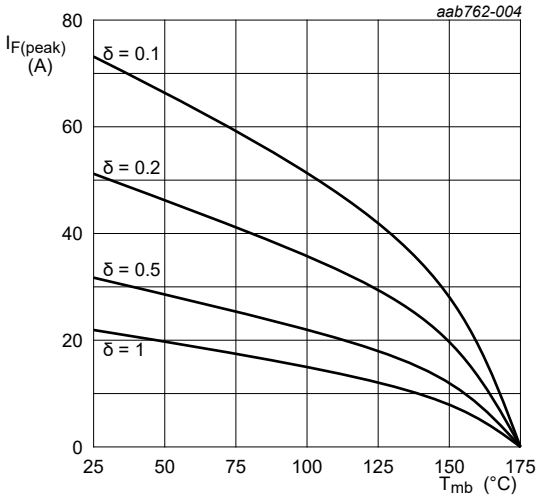


Fig. 4. Current derating as a function of mounting base temperature; per diode

8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	per diode; Fig. 5		-	-	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

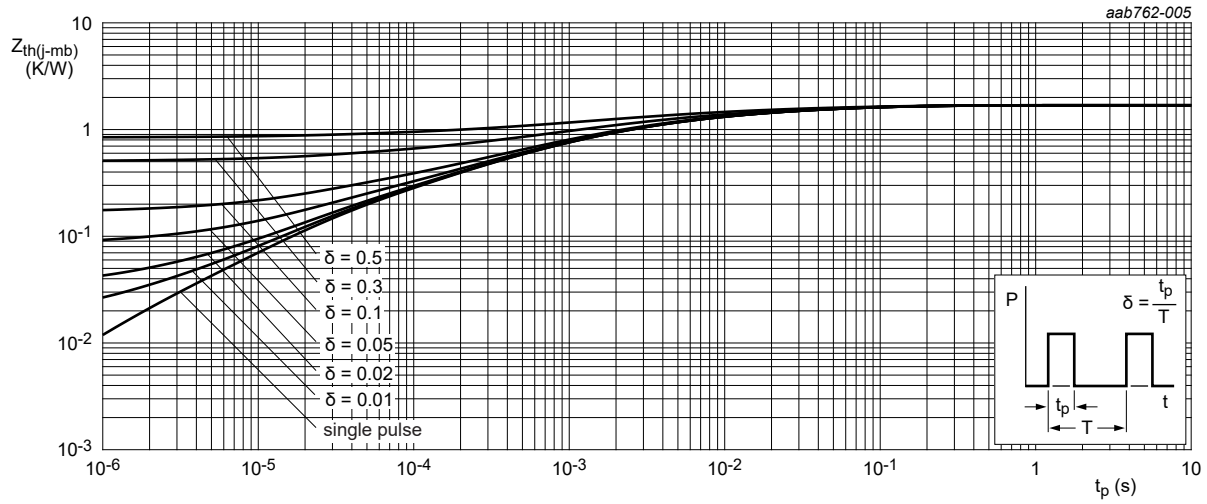


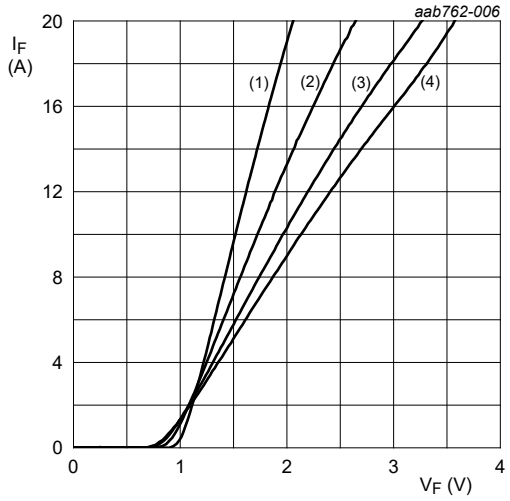
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

characteristics are per diode unless otherwise stated

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



(1) T_j = 25 °C; typical values
(2) T_j = 100 °C; typical values
(3) T_j = 150 °C; typical values
(4) T_j = 175 °C; typical values

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

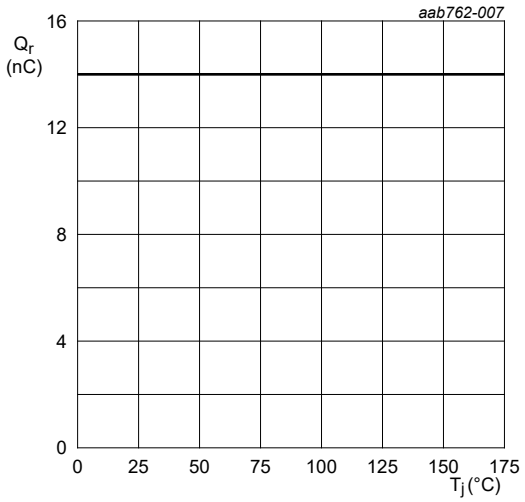
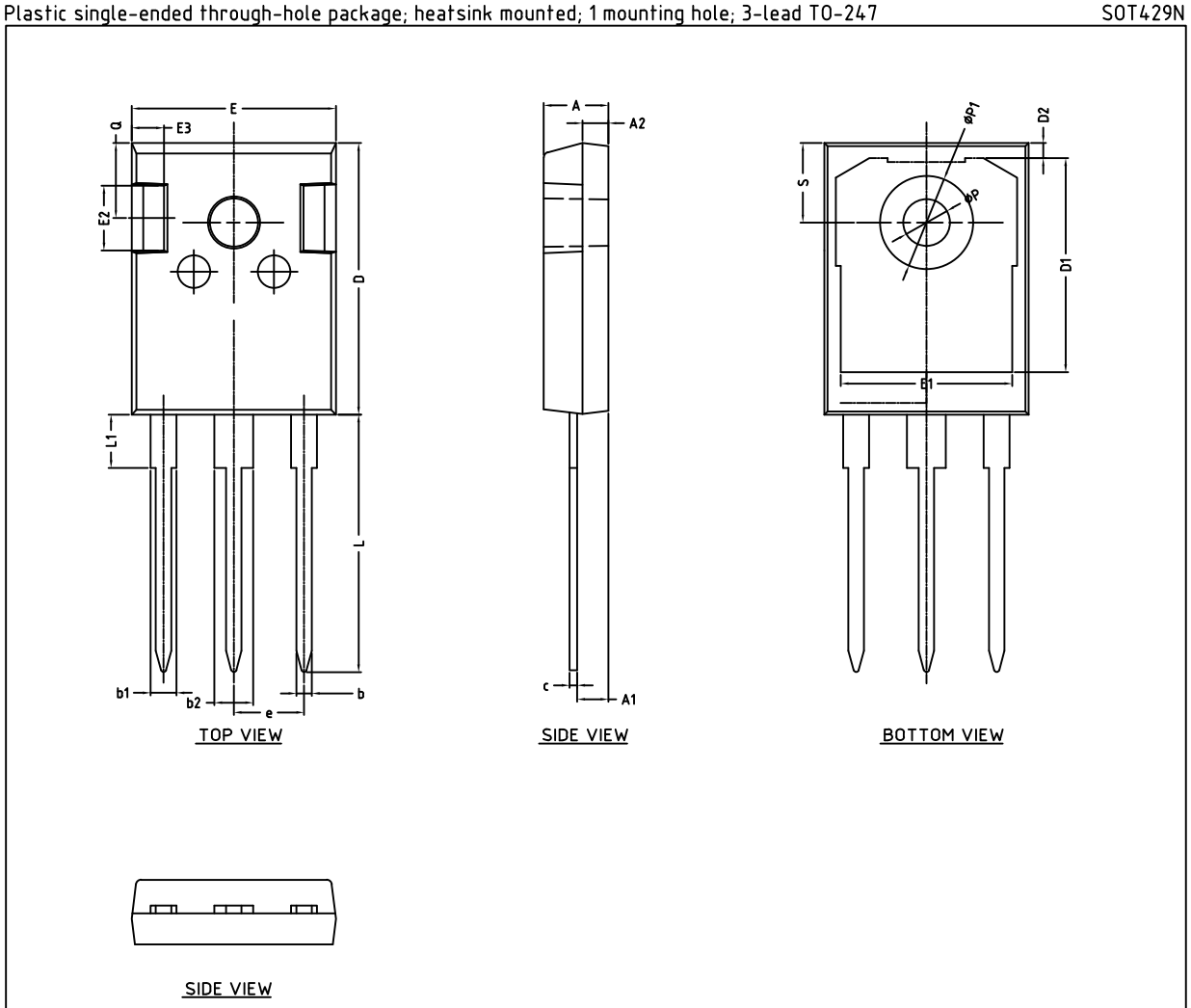


Fig. 7. Recovered charge as a function of junction temperature; per diode

10. Package outline

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



UNIT		A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	E2	E3	e	L	L1	P	P1	Q	S
mm	MAX	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
	NOM																					
	MIN	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				

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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12. Contents

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