NXPSC20650W-A

Silicon Carbide Diode

Rev.01 25 February 2019 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. This product is qualified to AEC-Q101 standard for use in automotive applications.

RoHS Halogen-Free

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 °C)

3. Applications

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

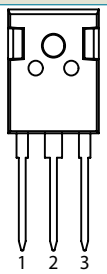
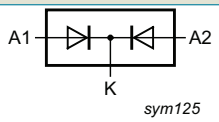
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		650				V
$I_{O(AV)}$	limiting average output current	δ = 0.5 ; square-wave pulse; $T_{mb} \leq 105$ °C; both diodes conducting; Fig. 1; Fig. 2	20				A
T_j	junction temperature		175				°C
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; per diode; Fig. 4		-	1.5	1.7	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 4		-	1.8	2.1	V
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; per diode; Fig. 6		-	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

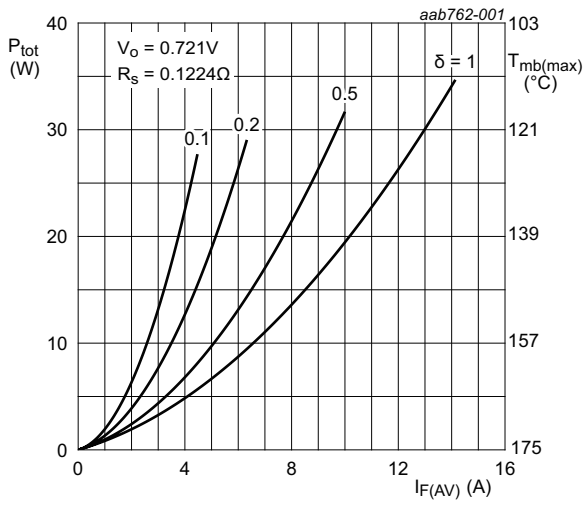
Type number	Marking codes
NXPSC20650W-A	NXPSC20650W-A

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	$\delta = 0.5$; $t_p = 25$ µs; $T_{mb} \leq 112$ °C; square-wave pulse; per diode	20	A
$I_{O(AV)}$	limiting average output current	$\delta = 0.5$; square-wave pulse; $T_{mb} \leq 105$ °C; both diodes conducting; Fig. 1; Fig. 2	20	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; per diode	50	A
		$t_p = 10$ µs; $T_{j(init)} = 25$ °C; sine-wave pulse; per diode	450	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)} = 25$ °C; $t_p = 10$ ms; per diode	12.5	A^2s
T_{stg}	storage temperature		-55 to 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; maximum values; per diode

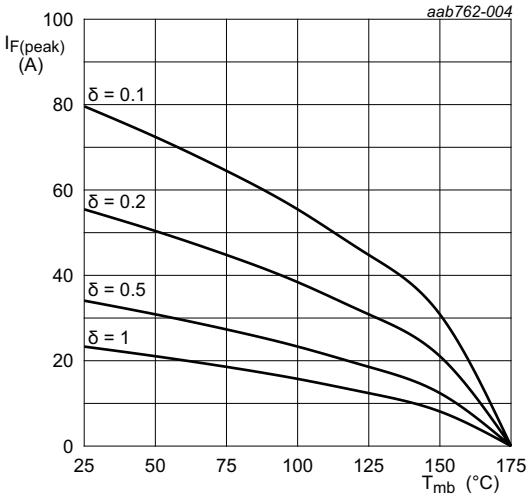


Fig. 2. Current derating as a function of mounting base temperature; per diode

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; Fig. 3		-	-	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

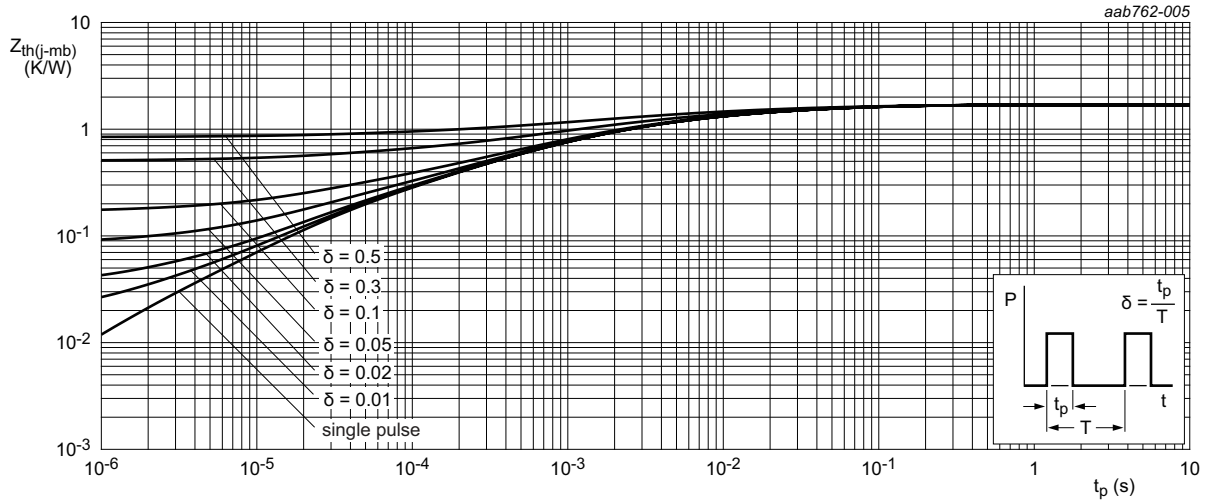
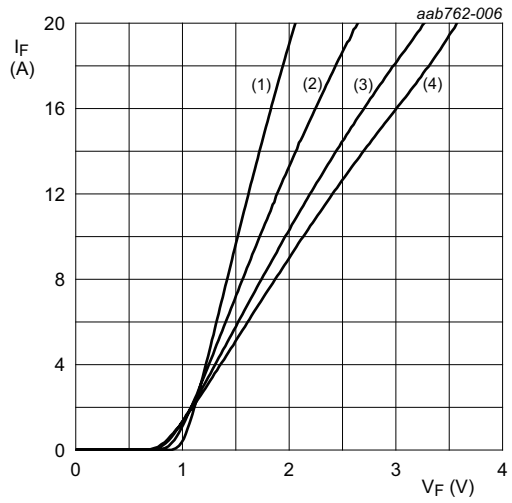


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	I_F = 10 A; T_j = 25 °C; per diode; Fig. 4		-	1.5	1.7	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 4		-	1.8	2.1	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; per diode; Fig. 5		-	-	60	µA
		V_R = 650 V; T_j = 150 °C; per diode; Fig. 5		-	-	240	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; per diode; Fig. 6		-	16	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C; per diode		-	328	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C; per diode		-	44	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C; per diode		-	42	-	pF
E_{as}	non-repetitive avalanche energy	I_R = 5.5 A; $T_{j(init)}$ = 25 °C; L = 5 mH; per diode		75	-	-	mJ



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

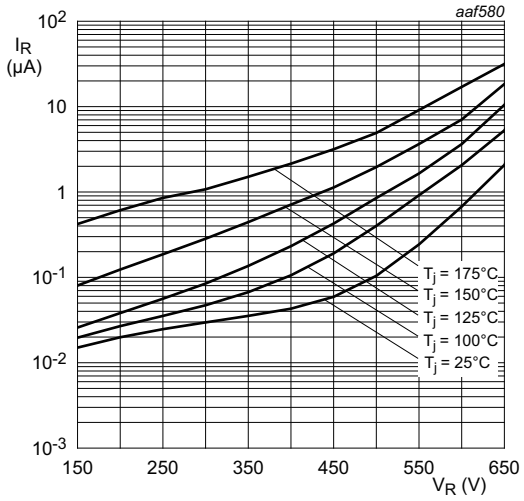


Fig. 5. Reverse leakage current as a function of reverse voltage; typical value; per diode

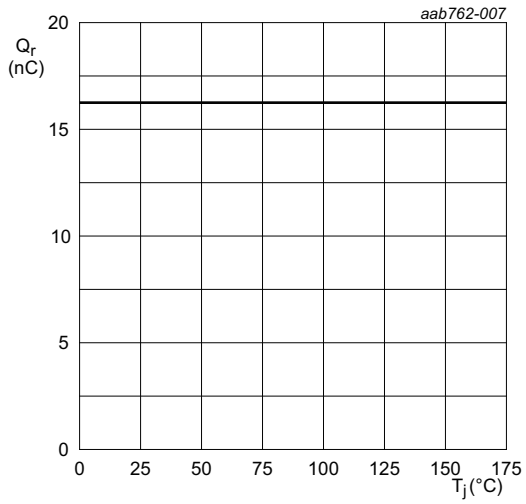
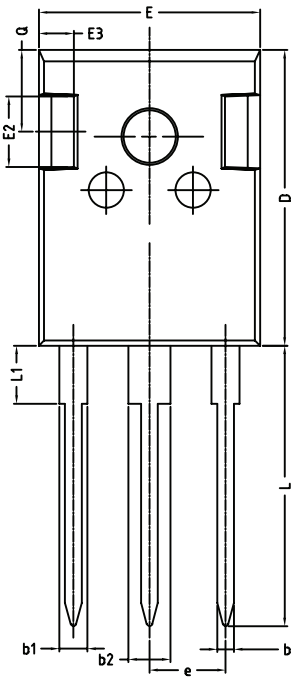


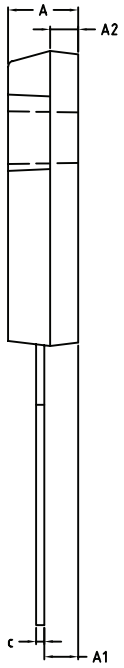
Fig. 6. Recovered charge as a function of junction temperature; per diode

11. Package outline

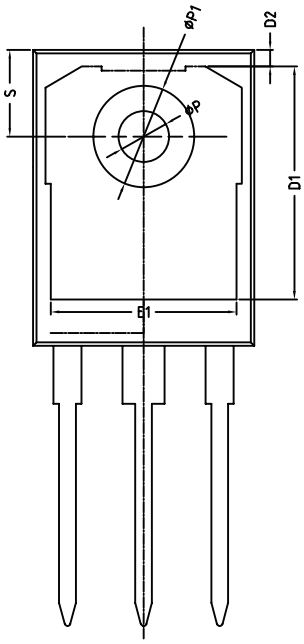
Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247 SOT429N



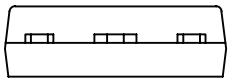
TOP VIEW



SIDE VIEW



BOTTOM VIEW



SIDE VIEW

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				

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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13. Contents

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