NXPSC20650

Silicon Carbide Diode

Rev.03 - 06 May 2020 Product data sheet

1. General description

Silicon Carbide Schottky diode in a TO220-2L 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

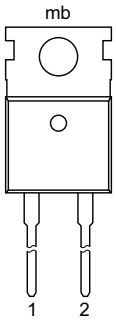
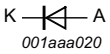
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		650				V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_{mb} \leq 76$ °C; Fig. 1; Fig. 2; Fig. 3	20				A
T_j	junction temperature		175				°C
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 20 A; T_j = 25 °C; Fig. 5		-	1.5	1.7	V
		I_F = 20 A; T_j = 150 °C; Fig. 5		-	1.8	2.1	V
Dynamic characteristics							
Q_r	recovered charge	I_F = 20 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 7		-	33	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	mb	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
NXPSC20650	TO220-2L	NXPSC206506Q	Tube	50	SOD59A	30-Mar-2015

7. Marking

Table 4. Marking codes

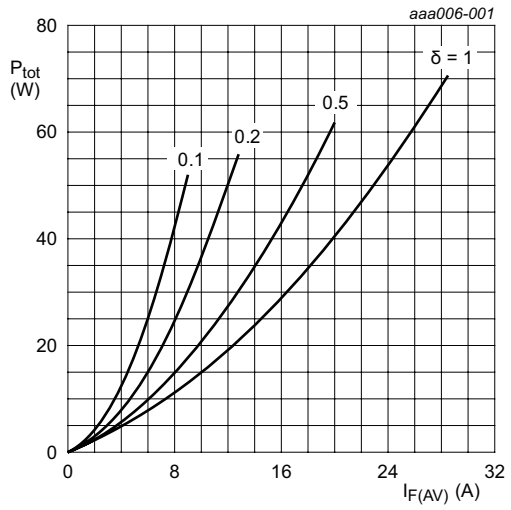
Type number	Marking codes
NXPSC20650	NXPSC 20650

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
$I_{F(AV)}$	average forward current	δ = 0.5; square-wave pulse; $T_{mb} \leq 76$ °C; Fig. 1; Fig. 2; Fig. 3	20	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 76$ °C; square-wave pulse	40	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	100	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse	900	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)}$ = 25 °C; t_p = 10 ms	50	A^2s
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		175	°C



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

V_o = 0.970 V; R_s = 0.054 Ω

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

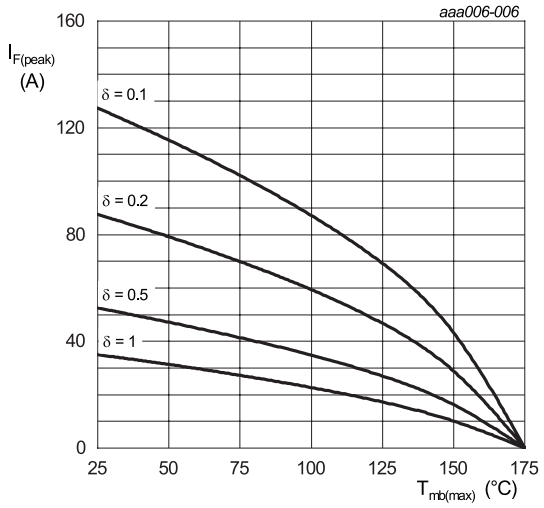


Fig. 2. Current derating as a function of mounting base temperature

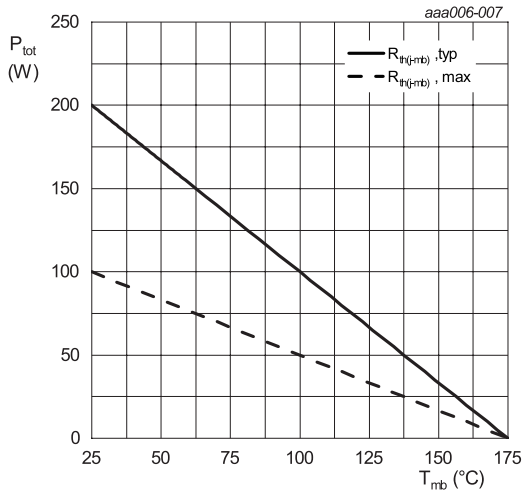


Fig. 3. Total power dissipation as a function of mounting base temperature

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	with heatsink compound; Fig. 4		-	0.75	1.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

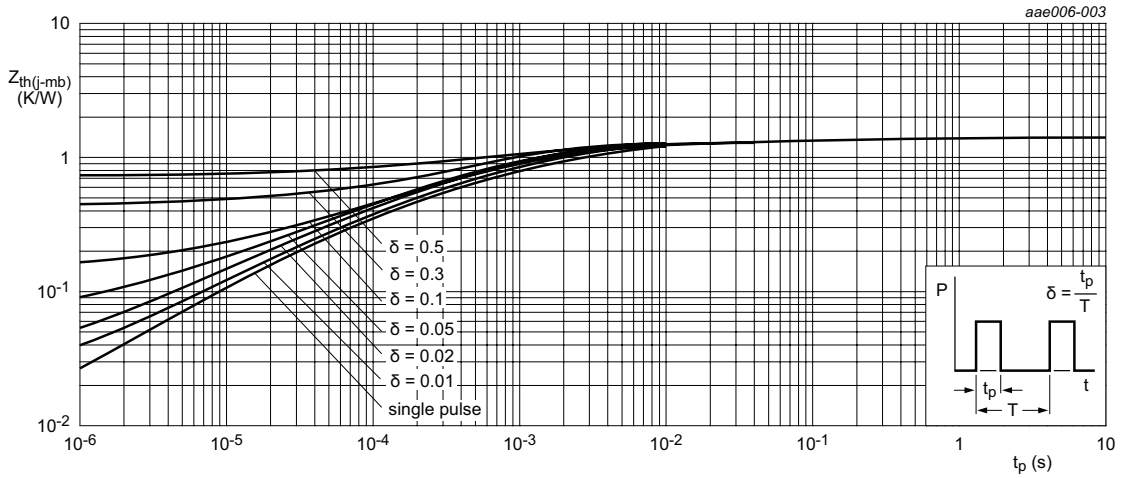
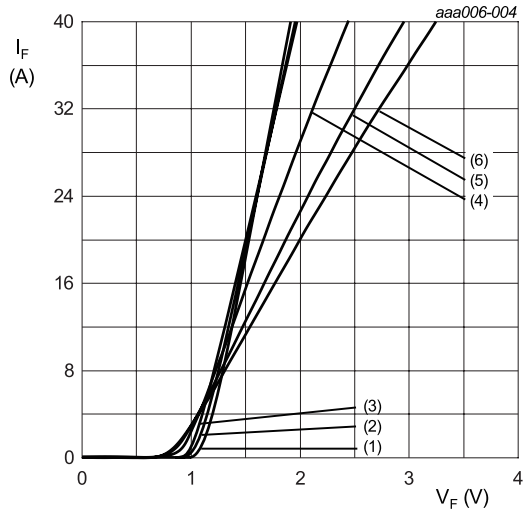


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	I_F = 20 A; T_j = 25 °C; Fig. 5		-	1.5	1.7	V
		I_F = 20 A; T_j = 150 °C; Fig. 5		-	1.8	2.1	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; Fig. 6		-	-	120	µA
		V_R = 650 V; T_j = 150 °C; Fig. 6		-	-	480	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 20 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	33	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	655	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	88	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	85	-	pF
E_{as}	non-repetitive avalanche energy	I_R = 7.5 A; L = 5 mH; $T_{j(init)}$ = 25 °C		150	-	-	mJ



V_o = 0.970 V; R_s = 0.054 Ω
(1) T_j = -55 °C; typical values
(2) T_j = 0 °C; typical values
(3) T_j = 25 °C; typical values
(4) T_j = 100 °C; typical values
(5) T_j = 150 °C; typical values
(6) T_j = 175 °C; typical values

Fig. 5. Forward current as a function of forward voltage; typical values

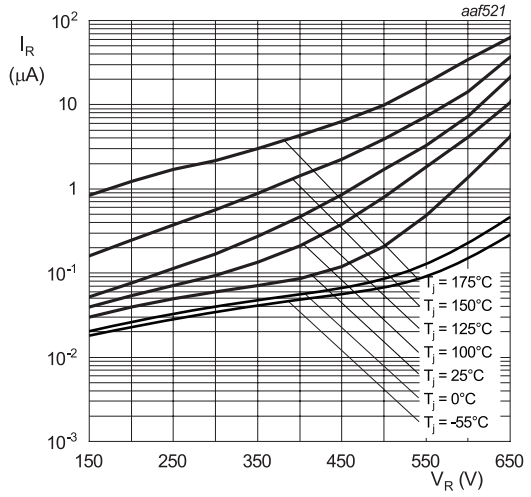


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

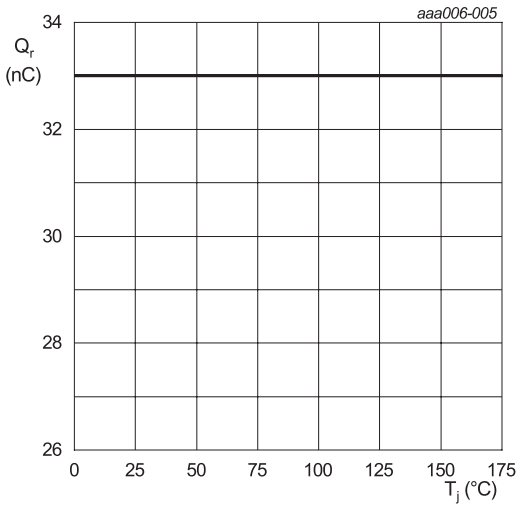
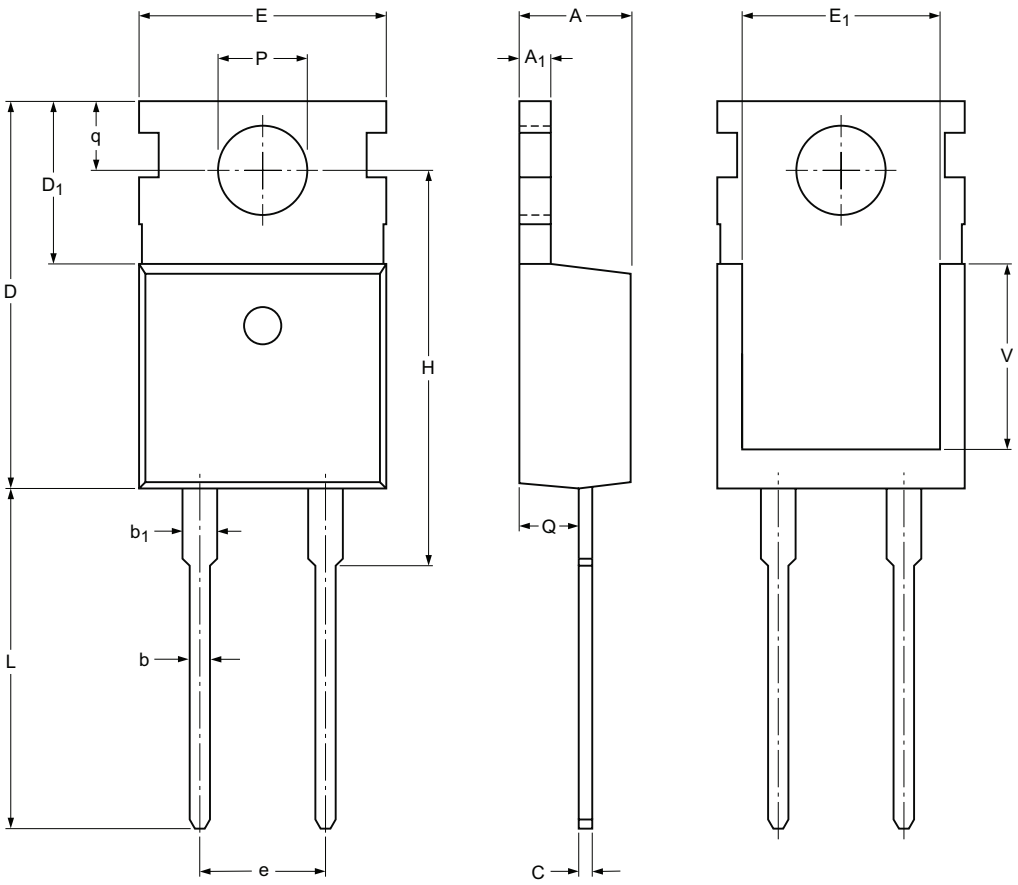


Fig. 7. Recovered charge as a function of junction temperature

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_1	b	b_1[1]	c	D	D_1	E	e	H	L	P	Q	q	E_1	V
mm	max	4.7	1.40	0.95	1.70	0.65	15.8	6.8	10.30	5.08 (REF)	16.25	15.0	3.80	2.6	2.95	8.1	6.9 (REF)
	nom																
	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

12. 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.
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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