NXPSC20650

Silicon Carbide Diode

6 May 2016 Product data sheet

1. General description

Silicon Carbide Schottky diode in a SOD59A (TO-220AC) 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
- PC Silverbox
- LED / OLED TV
- Motor Drives

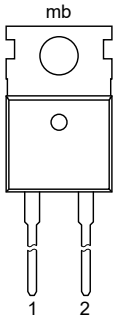
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage			-	-	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq 76$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3		-	-	20	A
T_j	junction temperature			-	-	175	°C
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. 6		-	28	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 TO-220AC (SOD59A)	
2	A	anode		
mb	mb	mounting base; connected to cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
NXPSC20650	TO-220AC	Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC	SOD59A

7. Marking

Table 4. Marking codes

Type number	Marking code
NXPSC20650	NXPSC20650

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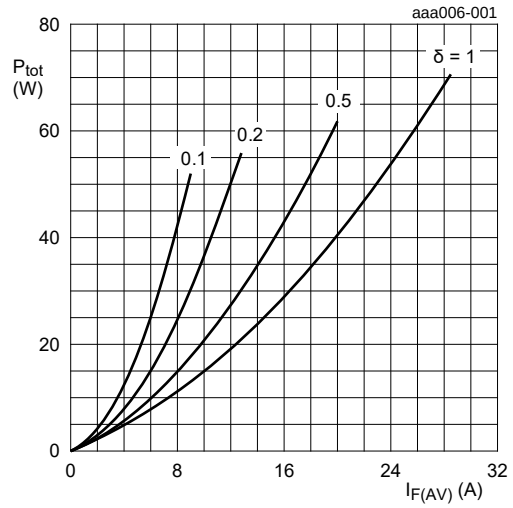
8. Limiting values

Table 5. 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
$I_{F(AV)}$	average forward current	δ = 0.5 ; T_{mb} ≤ 76 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3		-	20	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; T_{mb} ≤ 76 °C; square-wave pulse		-	40	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; SIN		-	100	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; SIN		-	900	A
T_{stg}	storage temperature			-55	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

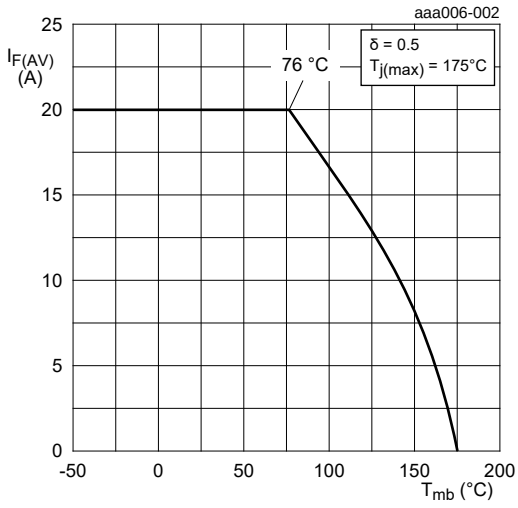


Fig. 2. Forward current as a function of mounting base temperature; maximum values

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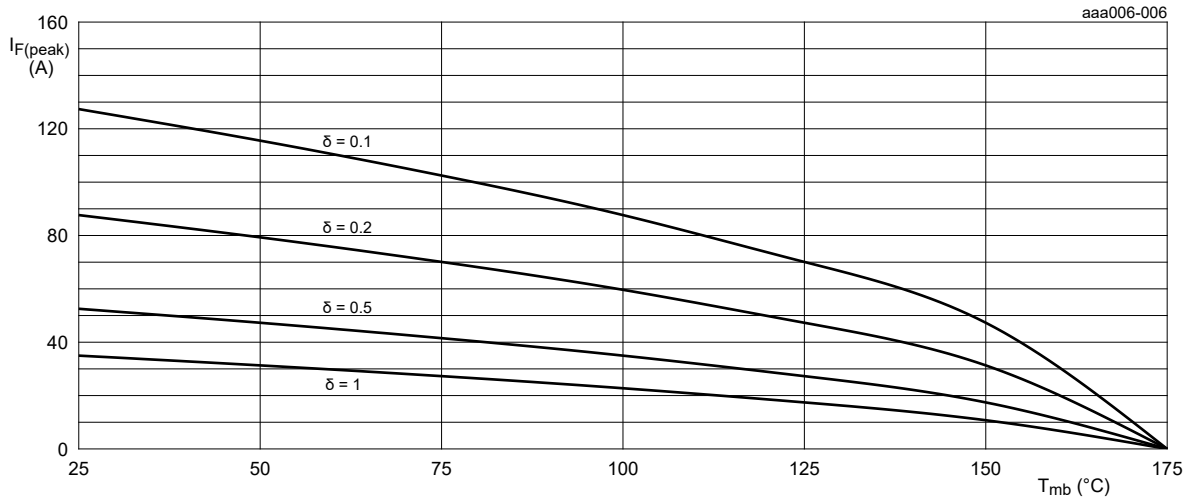

Fig. 3. Current derating as a function of mounting base temperature

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9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j\text{-}mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	-	1.5	K/W
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

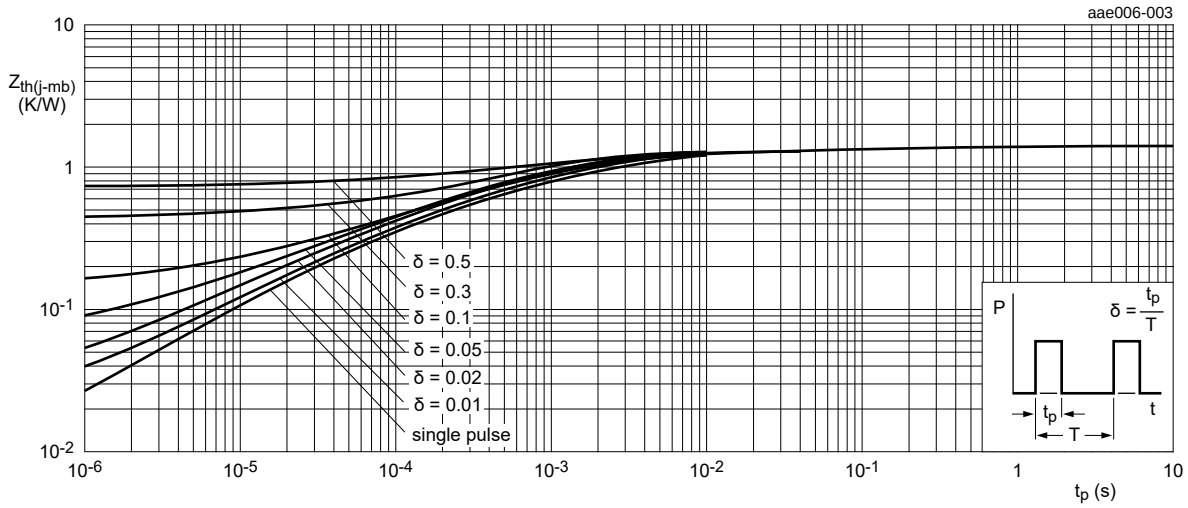

Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

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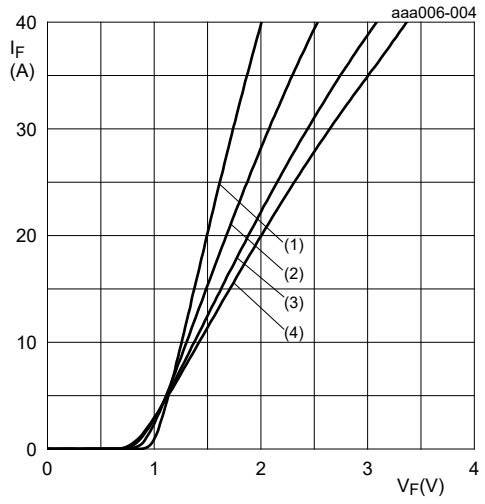
10. Characteristics

Table 7. Characteristics

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
I_R	reverse current	V_R = 650 V; T_j = 25 °C		-	-	500	µA
		V_R = 650 V; T_j = 150 °C		-	-	1600	µA
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. 6		-	28	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	600	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	64	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	50	-	pF



V_o = 0.970 V; R_s = 0.054 Ω
(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. 5. Forward current as a function of forward voltage; typical values

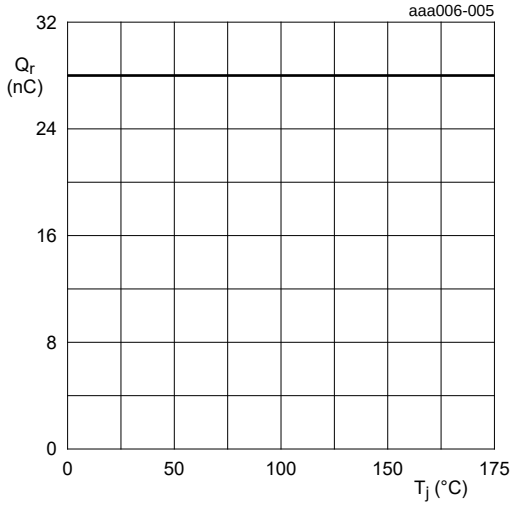


Fig. 6. Recovered charge as a function of junction temperature

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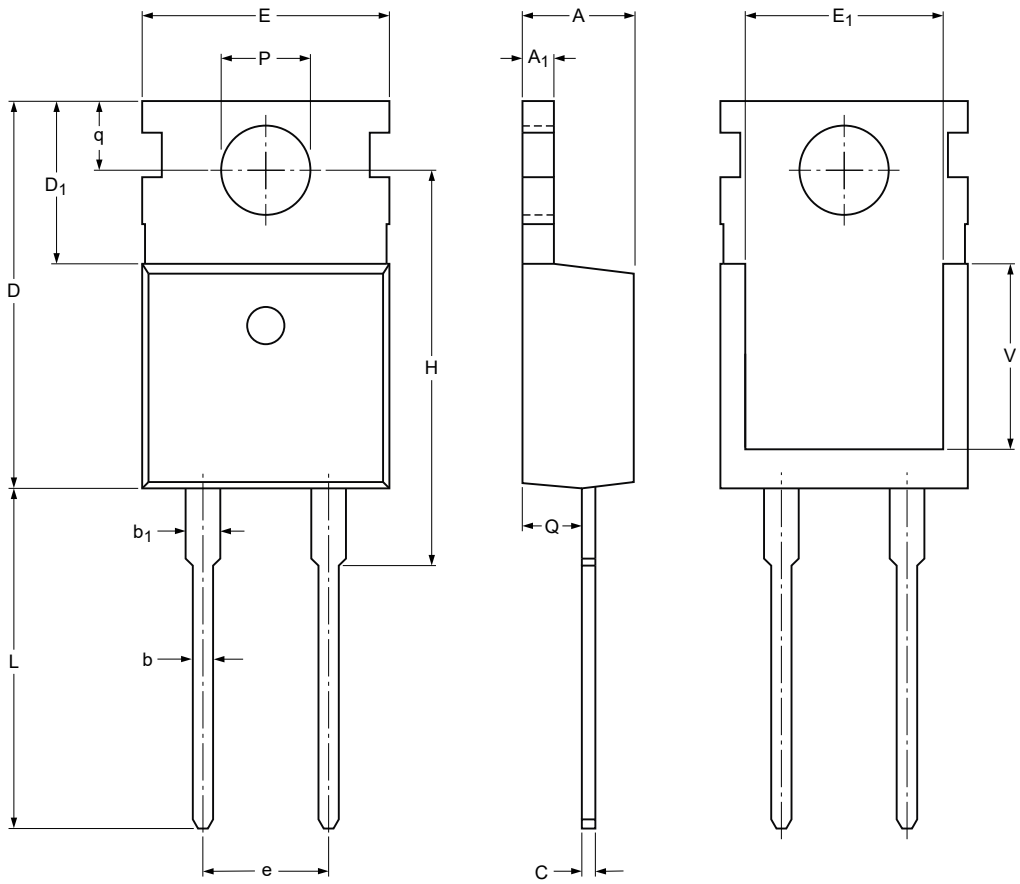
11. Package outline

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	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	
	min																

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

Fig. 7. Package outline TO-220AC (SOD59A)

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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.
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