



NXPSC10650

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	$\delta = 0.5$; square-wave pulse; $T_{mb} \leq 112$ °C; Fig. 1 ; Fig. 2 ; Fig. 3	10			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; Fig. 5	-	1.5	1.7	V
		$I_F = 10$ A; $T_j = 150$ °C; Fig. 5	-	1.8	2.1	V
Dynamic characteristics						
Q_r	recovered charge	$I_F = 10$ A; $di_F/dt = 500$ A/ μ s; $V_R = 400$ V; $T_j = 25$ °C; Fig. 7	-	16	-	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
NXPSC10650	TO220-2L	NXPSC106506Q	Tube	50	SOD59A	30-Mar-2015

7. Marking

Table 4. Marking codes

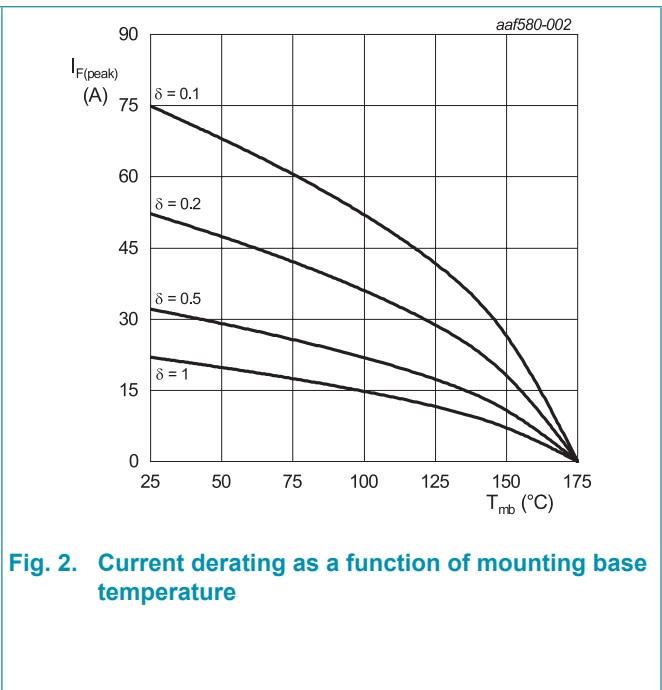
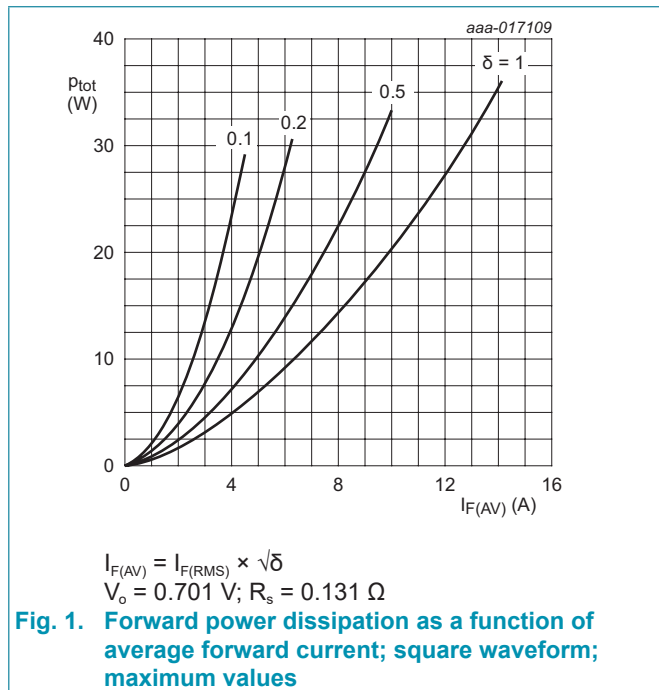
Type number	Marking codes
NXPSC10650	NXPSC 10650

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	$\delta = 0.5$; square-wave pulse; $T_{mb} \leq 112\text{ °C}$; Fig. 1 ; Fig. 2 ; Fig. 3	10	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_{mb} \leq 112\text{ °C}$; square-wave pulse	20	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ °C}$; sine-wave pulse	50	A
		$t_p = 10\ \mu\text{s}$; $T_{j(\text{init})} = 25\text{ °C}$; square-wave pulse	450	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$; $t_p = 10\text{ ms}$	12.5	A^2s
T_{stg}	storage temperature		-55 to 175	$^{\circ}\text{C}$
T_j	junction temperature		175	$^{\circ}\text{C}$



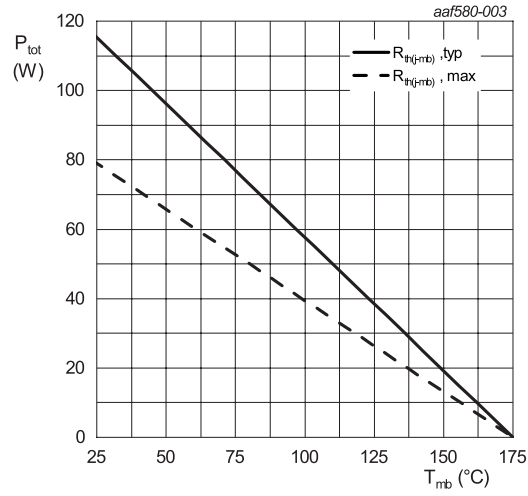


Fig. 3. Total power dissipation as a function of mounting base temperature

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	-	1.3	1.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

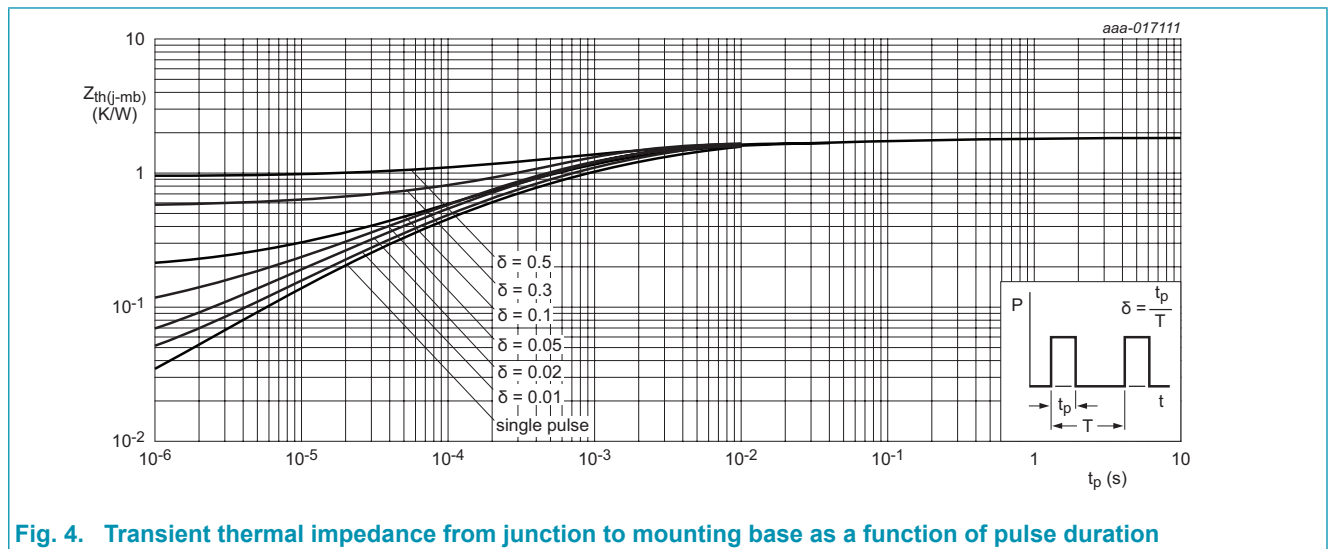
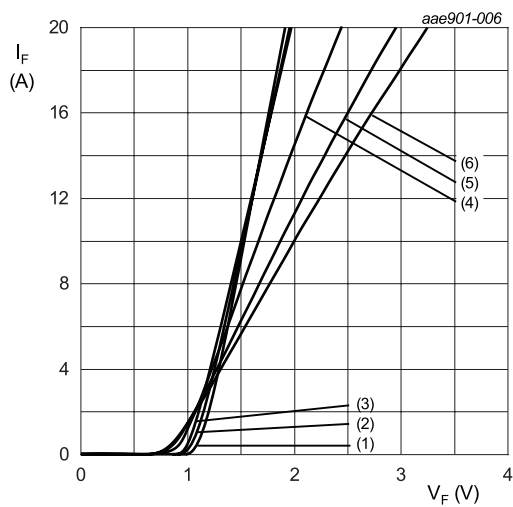


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward current	$I_F = 10 \text{ A}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.5	1.7	V
		$I_F = 10 \text{ A}; T_J = 150 \text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.8	2.1	V
I_R	reverse current	$V_R = 650 \text{ V}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	-	60	μA
		$V_R = 650 \text{ V}; T_J = 150 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	-	240	μA
Dynamic characteristics						
Q_r	recovered charge	$I_F = 10 \text{ A}; V_R = 400 \text{ V}; dI_F/dt = 500 \text{ A}/\mu\text{s}; T_J = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	16	-	nC
C_d	diode capacitance	$f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$	-	328	-	pF
		$f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$	-	44	-	pF
		$f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_J = 25 \text{ }^\circ\text{C}$	-	42	-	pF
E_{as}	non-repetitive avalanche energy	$I_R = 5.5 \text{ A}; L = 5 \text{ mH}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$	75	-	-	mJ



$V_0 = 0.701 \text{ V}; R_s = 0.131 \text{ } \Omega$
 (1) $T_J = -55 \text{ }^\circ\text{C}$; typical values
 (2) $T_J = 0 \text{ }^\circ\text{C}$; typical values
 (3) $T_J = 25 \text{ }^\circ\text{C}$; typical values
 (4) $T_J = 100 \text{ }^\circ\text{C}$; typical values
 (5) $T_J = 150 \text{ }^\circ\text{C}$; typical values
 (6) $T_J = 175 \text{ }^\circ\text{C}$; typical values

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

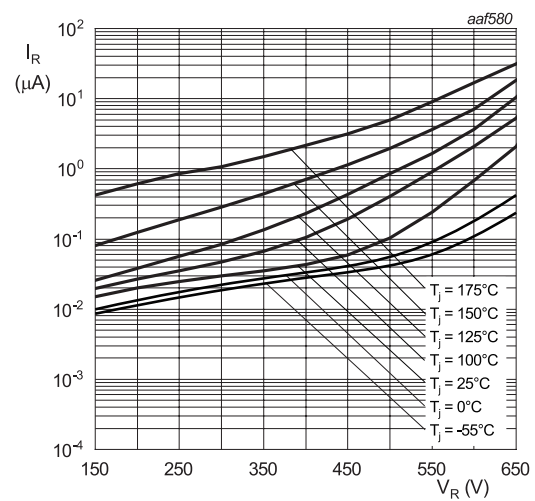


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

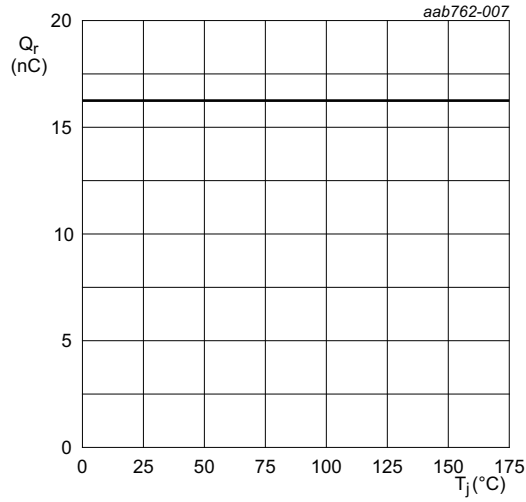
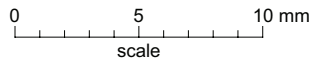
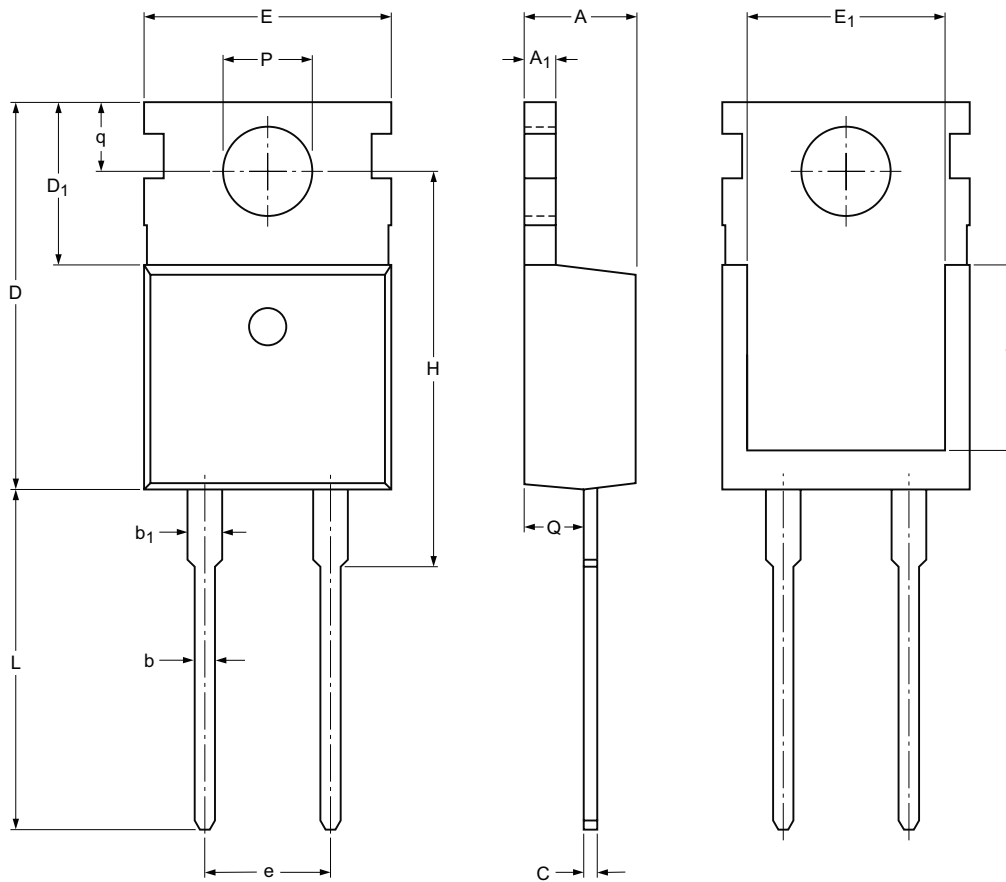


Fig. 7. Recovered charge as a function of junction temperature

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
max	4.7	1.40	0.95	1.70	0.65	15.8	6.8	10.30	5.08	16.25	15.0	3.80	2.6	2.95	8.1	6.9
nom									(REF)							(REF)
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

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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 Date of release: 06 May 2020