

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

- New 6th Generation Technology
- Low Forward Voltage Drop
- Low Reverse Leakage Current
- High Forward Surge Capability IFSM
- 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

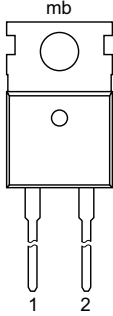
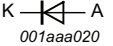
4. Quick reference data

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} ≤ 151 °C; Fig. 1 ; Fig. 2 ; Fig. 3	6				A
T _j	junction temperature		175				°C
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 6 A; T _j = 25 °C; Fig. 5		-	1.27	1.4	V
		I _F = 6 A; T _j = 150 °C; Fig. 5		-	1.34	1.55	V
Dynamic characteristics							
Q _r	recovered charge	I _F = 6 A; dI _F /dt = 500 A/μs; 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
WNSC6D06650	TO220-2L	WNSC6D06650Q	Tube	50	SOD59A	30-Mar-2015

7. Marking

Table 4. Marking codes

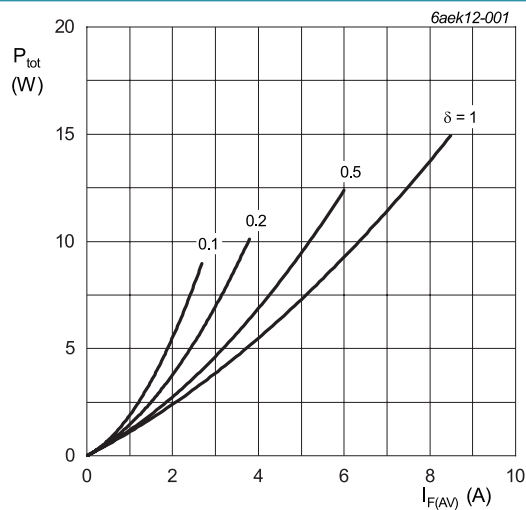
Type number	Marking codes
WNSC6D06650	WNSC6D 06650

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; $T_{mb} \leq 151\text{ }^{\circ}\text{C}$; Fig. 1; Fig. 2; Fig. 3	6	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 151\text{ }^{\circ}\text{C}$; square-wave pulse	12	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; sine-wave pulse	46	A
		$t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; square-wave pulse	550	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 10\text{ ms}$	11	A^2s
T_{stg}	storage temperature		-55 to 175	$^{\circ}\text{C}$
T_j	junction temperature		175	$^{\circ}\text{C}$



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

$$V_o = 1.025\text{ V}; R_s = 0.0864\text{ }\Omega$$

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

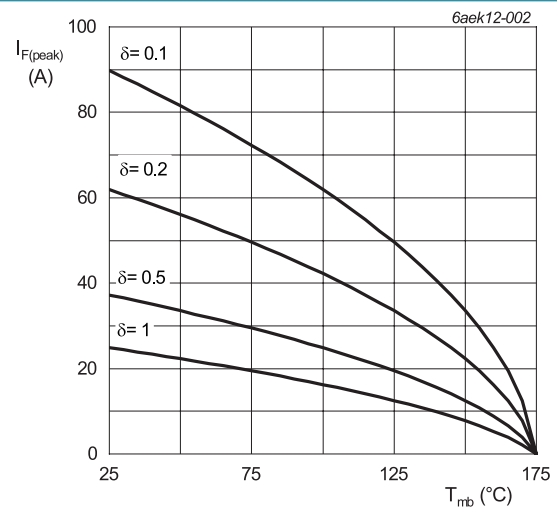


Fig. 2. Current derating as a function of mounting base temperature

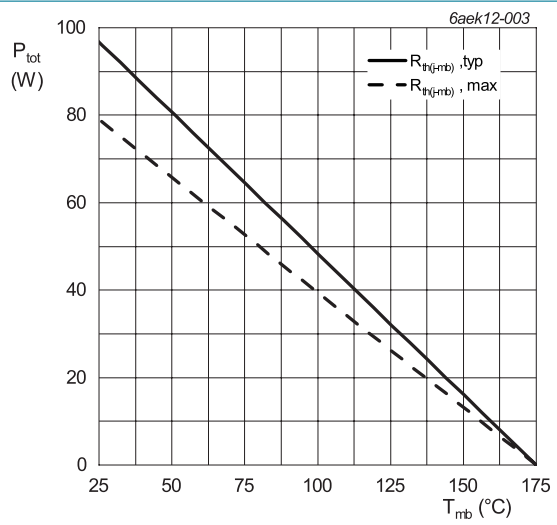


Fig. 3. Total power dissipation as a function of mounting base temperature

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	-	1.55	1.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

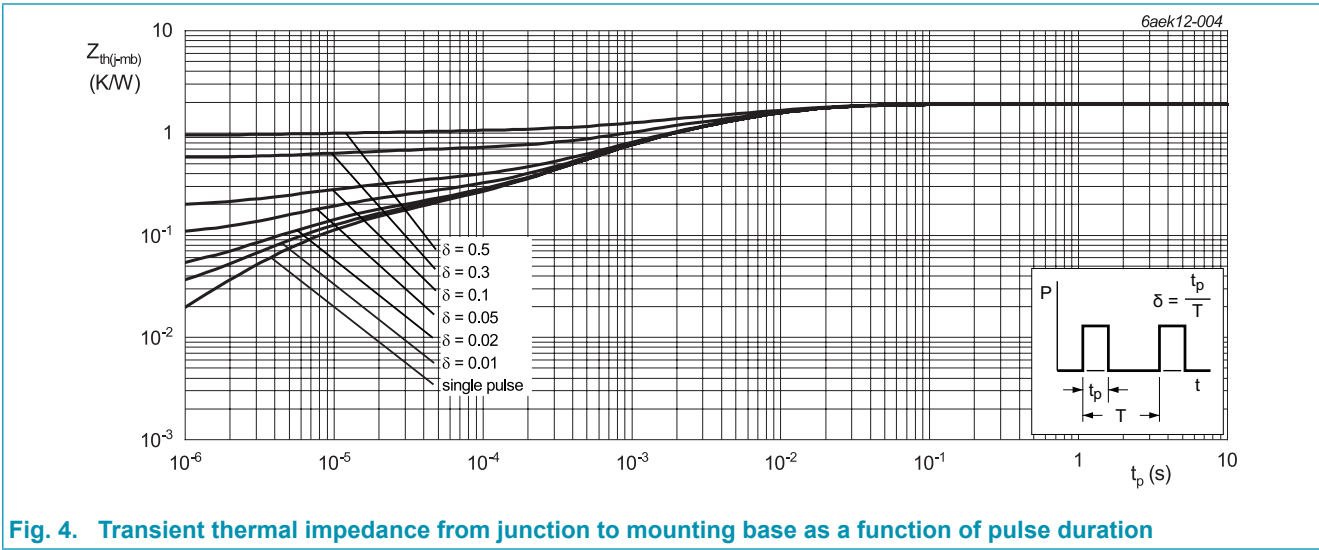
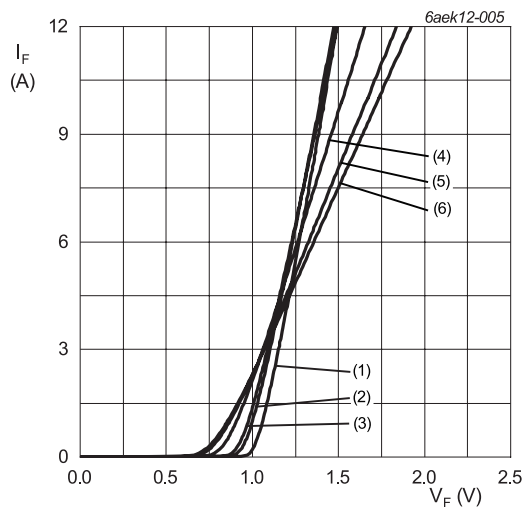


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _F	forward current	I _F = 6 A; T _j = 25 °C; Fig. 5		-	1.27	1.4	V
		I _F = 6 A; T _j = 150 °C; Fig. 5		-	1.34	1.55	V
		I _F = 6 A; T _j = 175 °C; Fig. 5		-	1.37	1.6	V
I _R	reverse current	V _R = 650 V; T _j = 25 °C; Fig. 6		-	1	50	μA
		V _R = 650 V; T _j = 175 °C; Fig. 6		-	14	100	μA
Dynamic characteristics							
Q _r	recovered charge	I _F = 6 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _j = 25 °C; Fig. 7		-	16	-	nC
C _d	diode capacitance	f = 1 MHz; V _R = 1 V; T _j = 25 °C		-	327	-	pF
		f = 1 MHz; V _R = 300 V; T _j = 25 °C		-	39	-	pF
		f = 1 MHz; V _R = 600 V; T _j = 25 °C		-	30	-	pF
E _{as}	non-repetitive avalanche energy	I _R = 4.7 A; L = 5 mH; T _j (init) = 25 °C		55	-	-	mJ



$V_o = 1.025\text{ V}$; $R_s = 0.0864\text{ }\Omega$

- (1) $T_J = -55\text{ °C}$; typical values
- (2) $T_J = 0\text{ °C}$; typical values
- (3) $T_J = 25\text{ °C}$; typical values
- (4) $T_J = 100\text{ °C}$; typical values
- (5) $T_J = 150\text{ °C}$; typical values
- (6) $T_J = 175\text{ °C}$; typical values

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

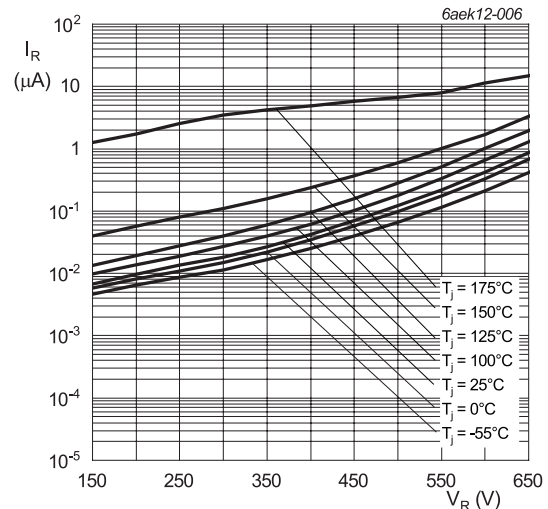


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

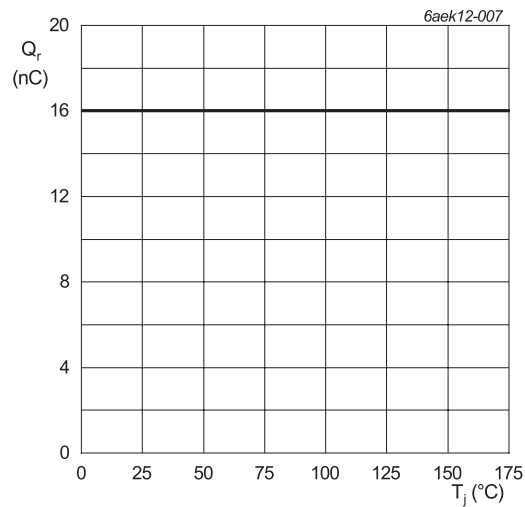


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59A

Technical drawing of the SOD59A package showing three views: front, side, and top. Dimensions are labeled with letters A through V. A scale bar at the bottom indicates 0, 5, and 10 mm.

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	16.25	15.0	3.80	2.6	2.95	8.1
	nom								(REF)							6.9
	min	4.3	1.15	0.70	1.17	0.45	15.6	6.4	9.65	(REF)	15.70	12.5	3.53	2.2	2.65	7.9

Note
1. Protruded dambar are included in the dimension.

Outline version

SOD59A

References

IEC

JEDEC

JEITA

TO-220AC (2-lead)

European projection

Issue date

15-03-24

15-03-30

WNSC6D06650

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Product data sheet

22 April 2021

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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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