

## 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
- 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

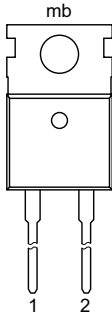
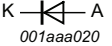
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<b>Absolute maximum rating</b>							
$V_{RRM}$	repetitive peak reverse voltage			650			V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 116$ °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		20			A
$T_j$	junction temperature			-55 to 175			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_F$	forward voltage	$I_F = 20$ A; $T_j = 25$ °C; <a href="#">Fig. 5</a>		-	1.45	1.70	V
		$I_F = 20$ A; $T_j = 150$ °C; <a href="#">Fig. 5</a>		-	1.80	2.20	V
<b>Dynamic characteristics</b>							
$Q_r$	recovered charge	$I_F = 20$ A; $di_F/dt = 500$ A/ $\mu$ s; $V_R = 400$ V; $T_j = 25$ °C; <a href="#">Fig. 7</a>		-	28	-	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
WNSC5D20650	TO220-2L	WNSC5D206506Q	Tube	50	SOD59A	30-Mar-2015

## 7. Marking

Table 4. Marking codes

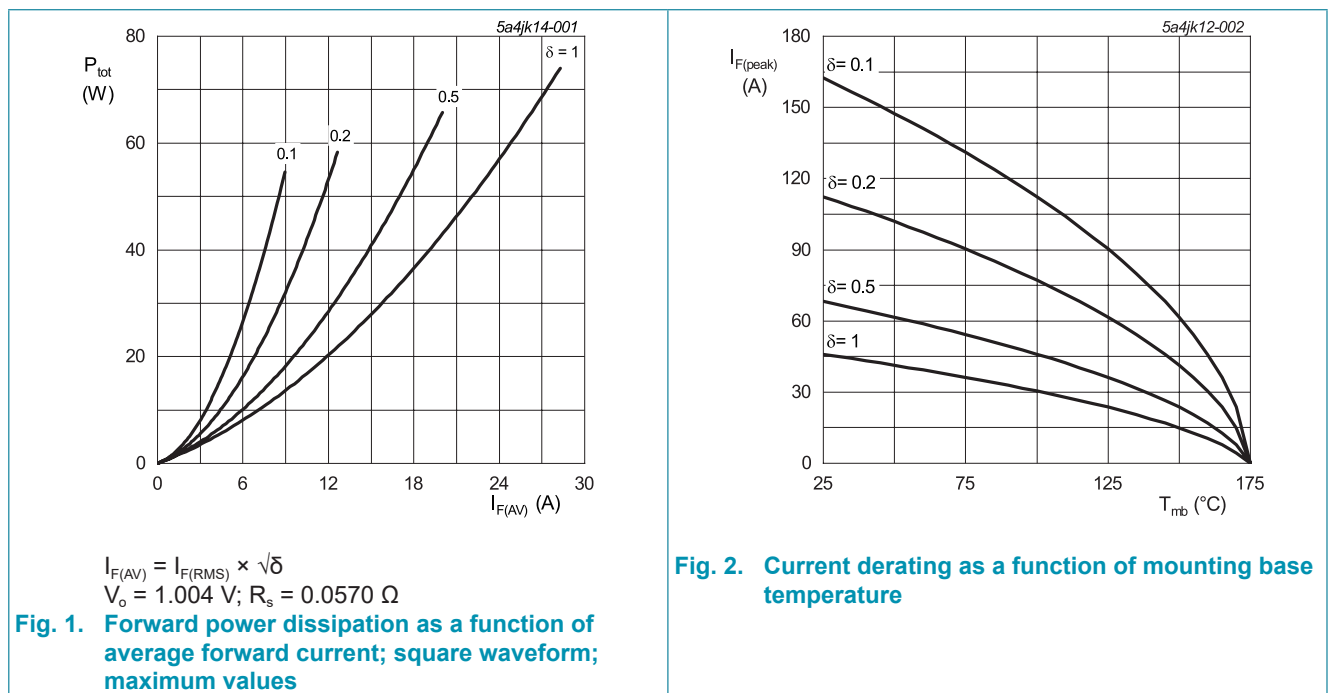
Type number	Marking codes
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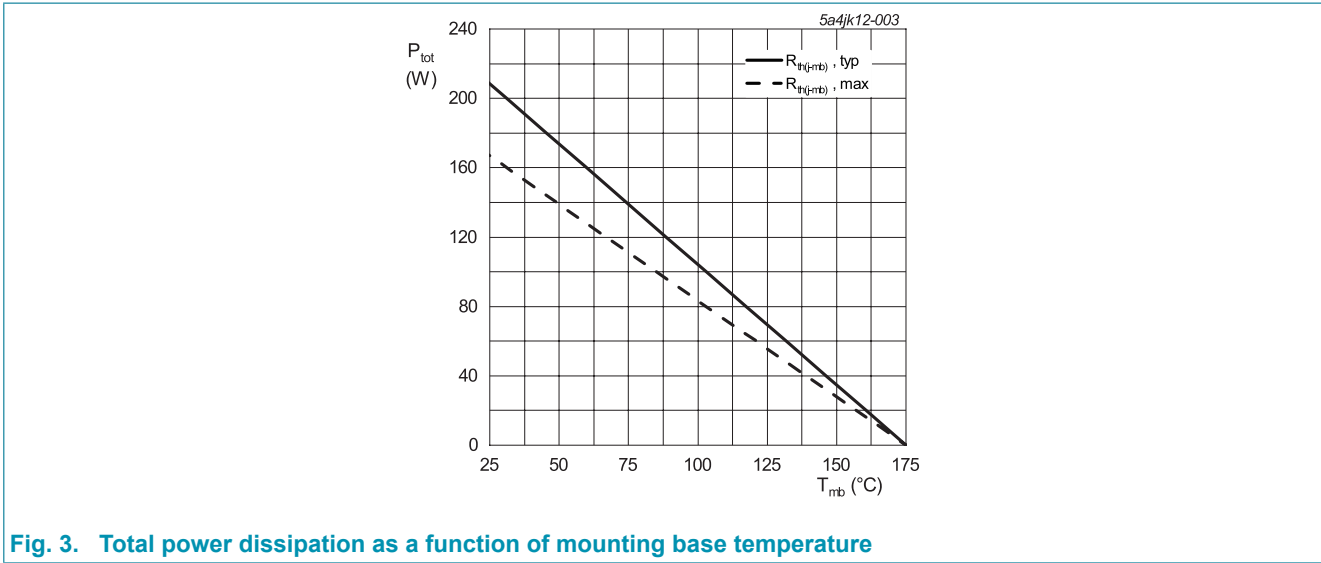
## 8. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	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; $T_{mb} \leq 116\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		20	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 116\text{ }^\circ\text{C}$ ; square-wave pulse		40	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		95	A
		$t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; square-wave pulse		800	A
$I^2t$	$I^2t$ for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 10\text{ ms}$		45.125	$\text{A}^2\text{s}$
$T_{stg}$	storage temperature			-55 to 175	$^\circ\text{C}$
$T_j$	junction temperature			-55 to 175	$^\circ\text{C}$





### 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 4</a>		-	0.72	0.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

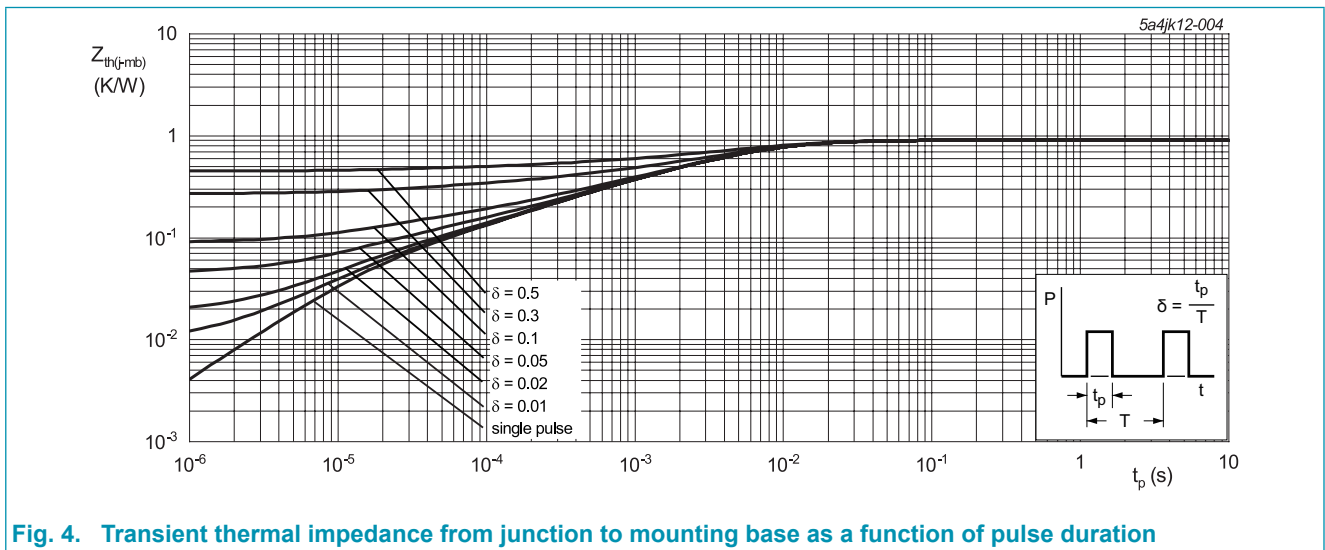
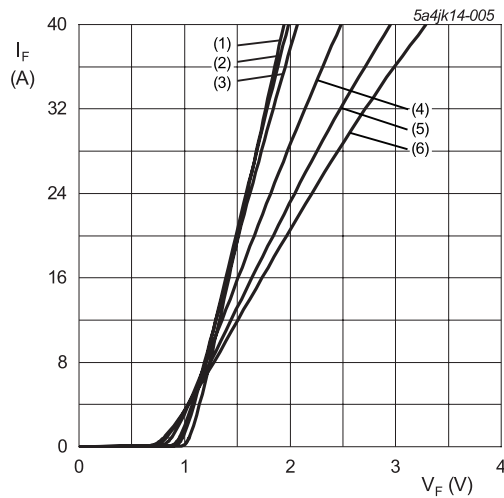


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

### 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_F$	forward current	$I_F = 20\text{ A}; T_J = 25\text{ °C}; \text{Fig. 5}$		-	1.45	1.70	V
		$I_F = 20\text{ A}; T_J = 150\text{ °C}; \text{Fig. 5}$		-	1.80	2.20	V
		$I_F = 20\text{ A}; T_J = 175\text{ °C}; \text{Fig. 5}$		-	2.00	2.30	V
$I_R$	reverse current	$V_R = 650\text{ V}; T_J = 25\text{ °C}; \text{Fig. 6}$		-	1	100	$\mu\text{A}$
		$V_R = 650\text{ V}; T_J = 175\text{ °C}; \text{Fig. 6}$		-	30	500	$\mu\text{A}$
<b>Dynamic characteristics</b>							
$Q_r$	recovered charge	$I_F = 20\text{ A}; V_R = 400\text{ V}; di_F/dt = 500\text{ A}/\mu\text{s}; T_J = 25\text{ °C}; \text{Fig. 7}$		-	28	-	nC
$C_d$	diode capacitance	$f = 1\text{ MHz}; V_R = 1\text{ V}; T_J = 25\text{ °C}$		-	640	-	pF
		$f = 1\text{ MHz}; V_R = 300\text{ V}; T_J = 25\text{ °C}$		-	70	-	pF
		$f = 1\text{ MHz}; V_R = 600\text{ V}; T_J = 25\text{ °C}$		-	65	-	pF
$E_{as}$	non-repetitive avalanche energy	$I_R = 6.3\text{ A}; L = 5\text{ mH}; T_{j(\text{init})} = 25\text{ °C}$		100	-	-	mJ



$V_o = 1.004\text{ V}; R_s = 0.0570\ \Omega$   
 (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

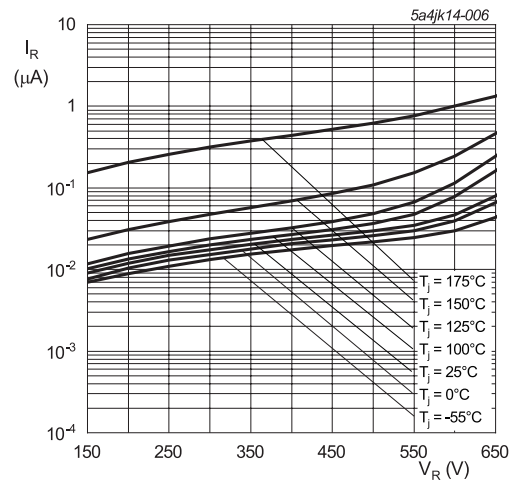


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

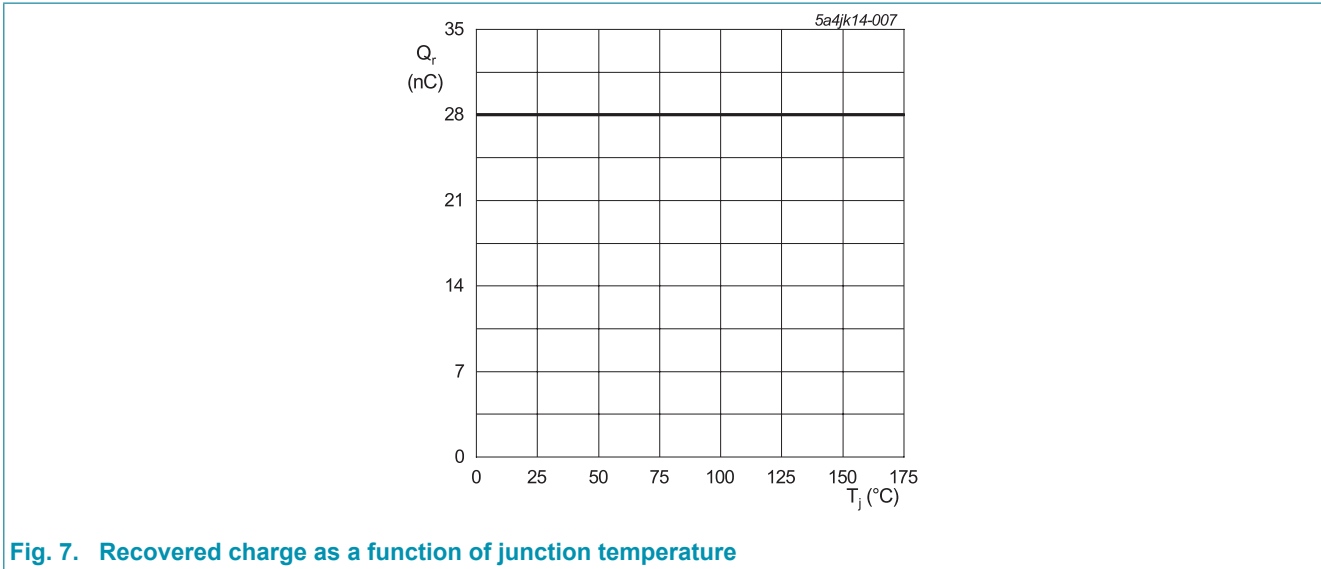
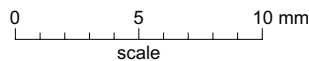
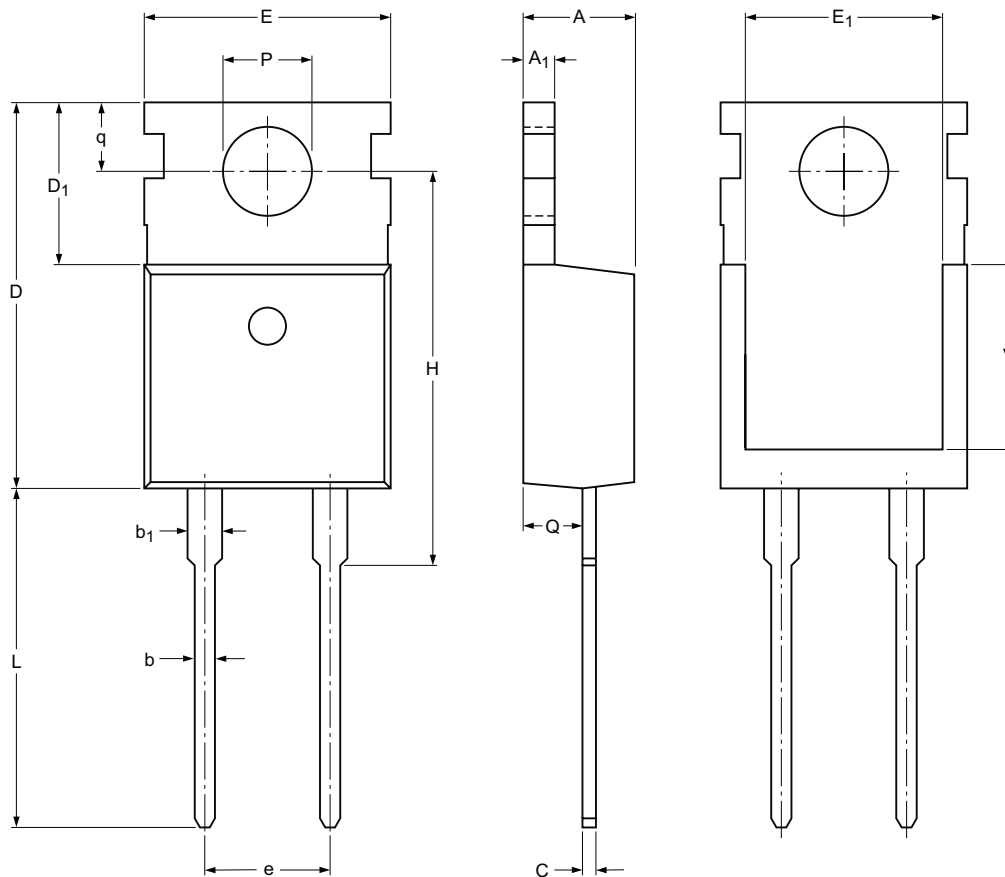


Fig. 7. Recovered charge as a function of junction temperature

### 11. Package outline

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

SOD59A



Dimensions: (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub> ( <sup>1</sup> )	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q	E <sub>1</sub>	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
mm 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.

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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.
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