

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

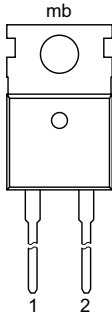
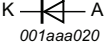
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
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} ≤ 131 °C; Fig. 1 ; Fig. 2 ; Fig. 3		12			A
T _j	junction temperature			-55 to 175			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 12 A; T _j = 25 °C; Fig. 5		-	1.45	1.70	V
		I _F = 12 A; T _j = 150 °C; Fig. 5		-	1.80	2.20	V
Dynamic characteristics							
Q _r	recovered charge	I _F = 12 A; dI _F /dt = 500 A/μs; V _R = 400 V; T _j = 25 °C; Fig. 7		-	18	-	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
WNSC5D12650	TO220-2L	WNSC5D126506Q	Tube	50	SOD59A	30-Mar-2015

7. Marking

Table 4. Marking codes

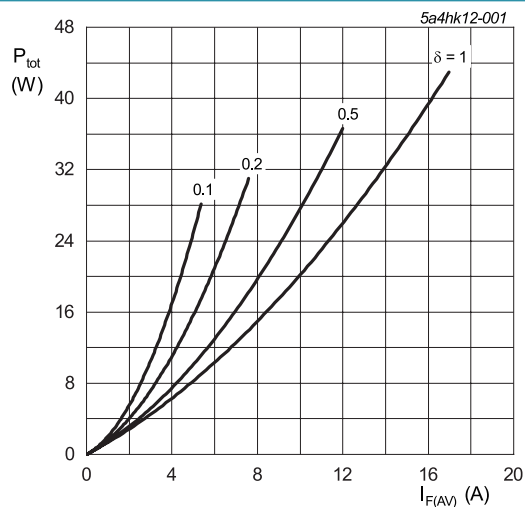
Type number	Marking codes
WNSC5D12650	WNSC5D 12650

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; $T_{mb} \leq 131\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3		12	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 131\text{ }^{\circ}\text{C}$; square-wave pulse		24	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		72	A
		$t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; square-wave pulse		640	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; $t_p = 10\text{ ms}$		25.92	A^2s
T_{stg}	storage temperature			-55 to 175	$^{\circ}\text{C}$
T_j	junction temperature			-55 to 175	$^{\circ}\text{C}$



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

$$V_o = 1.277\text{ V}; R_s = 0.0740\text{ }\Omega$$

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

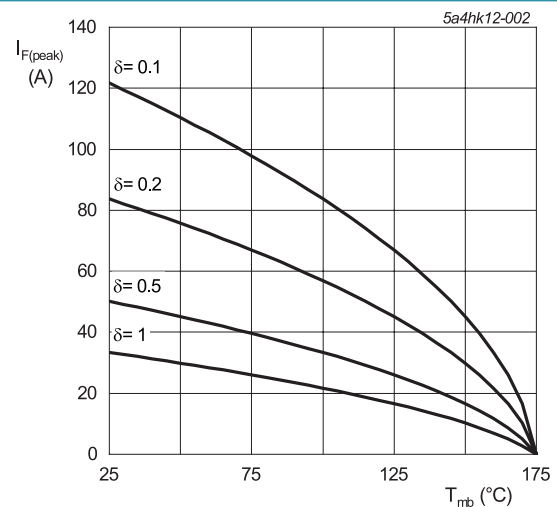


Fig. 2. Current derating as a function of mounting base temperature

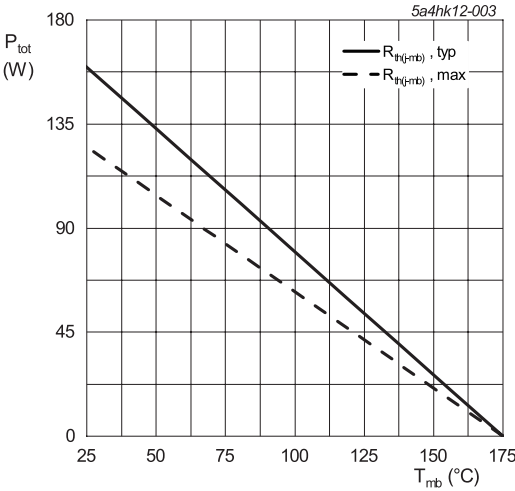
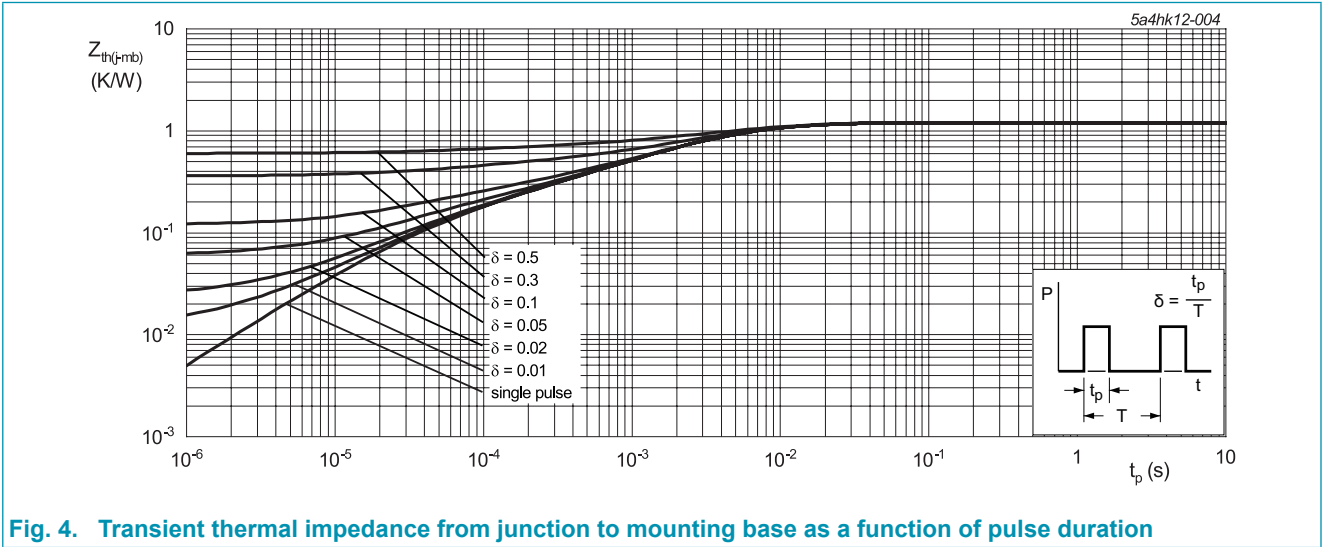


Fig. 3. Total power dissipation as a function of mounting base temperature

9. Thermal characteristics

Table 6. Thermal characteristics

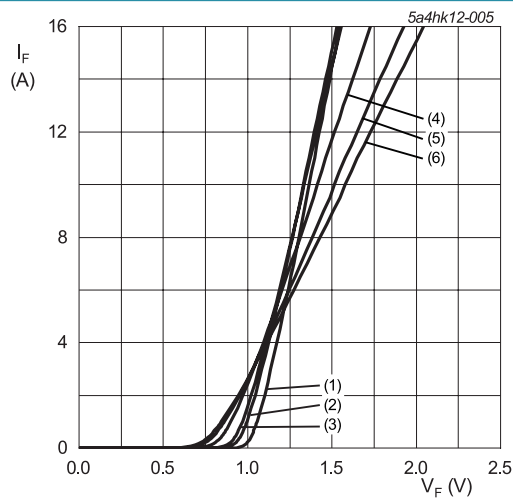
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	0.94	1.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward current	I _F = 12 A; T _J = 25 °C; Fig. 5		-	1.45	1.70	V
		I _F = 12 A; T _J = 150 °C; Fig. 5		-	1.80	2.20	V
		I _F = 12 A; T _J = 175 °C; Fig. 5		-	2.00	2.30	V
I _R	reverse current	V _R = 650 V; T _J = 25 °C; Fig. 6		-	0.6	60	μA
		V _R = 650 V; T _J = 175 °C; Fig. 6		-	30	300	μA
Dynamic characteristics							
Q _r	recovered charge	I _F = 12 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 7		-	18	-	nC
C _d	diode capacitance	f = 1 MHz; V _R = 1 V; T _J = 25 °C		-	420	-	pF
		f = 1 MHz; V _R = 300 V; T _J = 25 °C		-	45	-	pF
		f = 1 MHz; V _R = 600 V; T _J = 25 °C		-	42	-	pF
E _{as}	non-repetitive avalanche energy	I _R = 4.5 A; L = 5 mH; T _J (init) = 25 °C		50	-	-	mJ



$V_o = 1.277\text{ V}$; $R_s = 0.0740\text{ }\Omega$

- (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

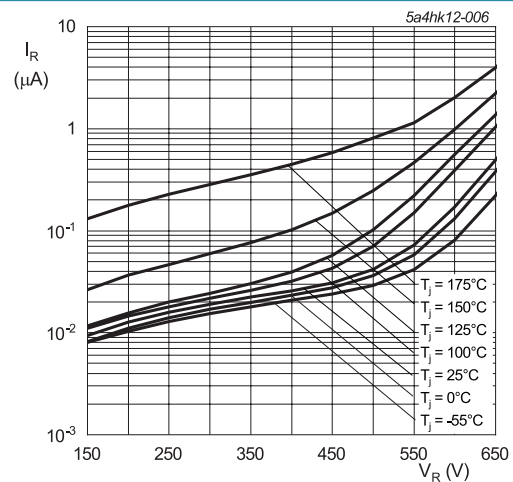


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

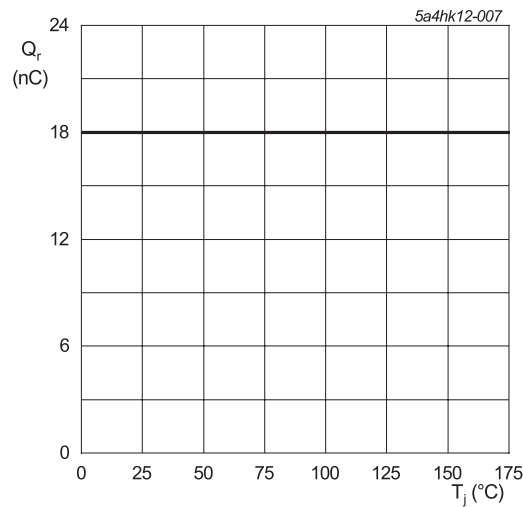
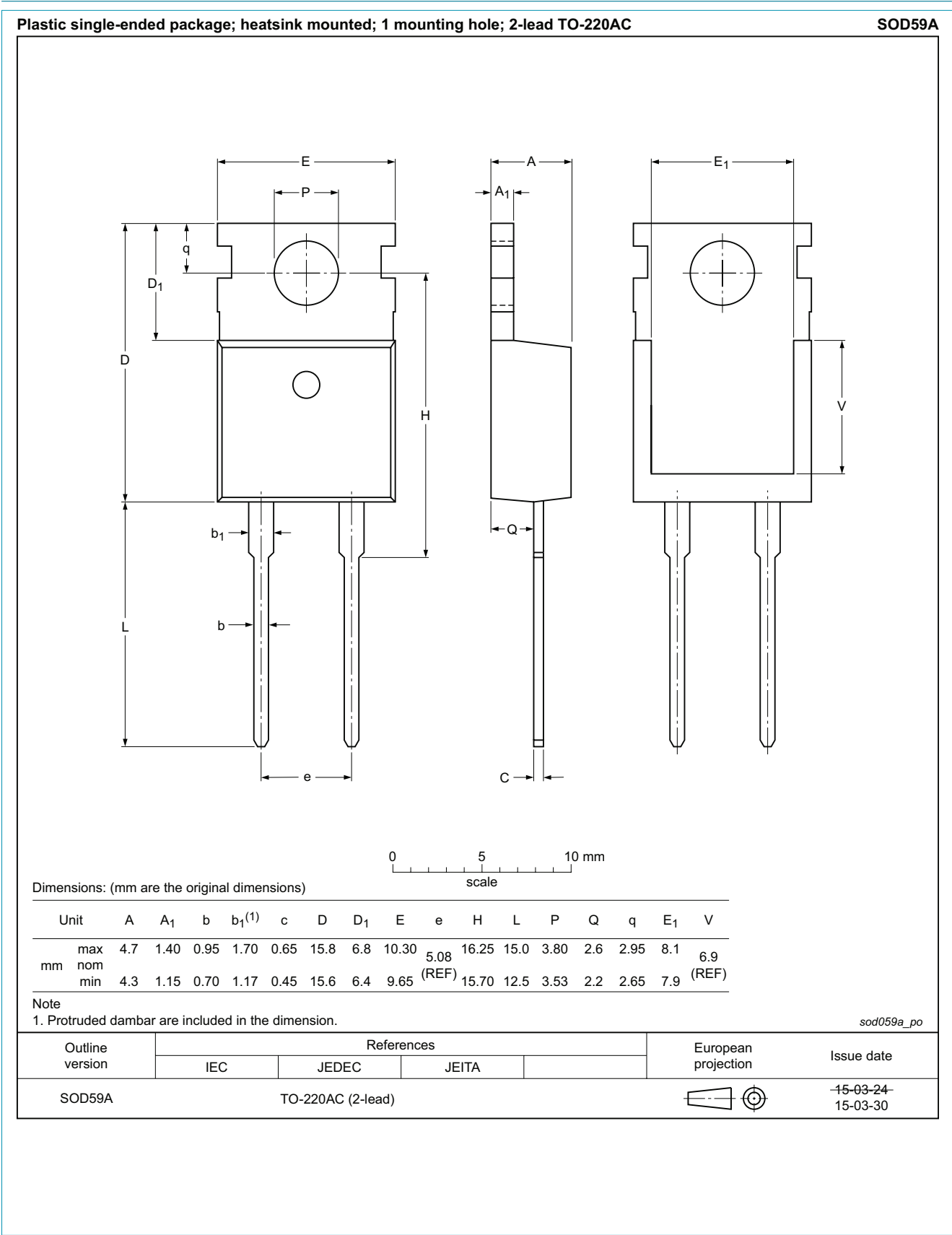


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline



WNSC5D12650

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Product data sheet08 November 20228 / 11

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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