

## 1. General description

Silicon Carbide Schottky diode in a TO247-2L 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

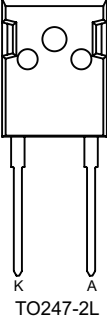
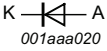
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V <sub>RRM</sub>	repetitive peak reverse voltage			650			V
I <sub>F(AV)</sub>	average forward current	δ = 0.5 ; square-wave pulse; T <sub>mb</sub> ≤ 103 °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		20			A
T <sub>j</sub>	junction temperature			-55 to 175			°C
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 20 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>		-	1.45	1.70	V
		I <sub>F</sub> = 20 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>		-	1.80	2.20	V
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 20 A; dI <sub>F</sub> /dt = 500 A/μs; V <sub>R</sub> = 400 V; T <sub>j</sub> = 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
WNSC5D20650W	TO247-2L	WNSC5D20650W6Q	Tube	30	TO247L-2L	10-Nov-2020

7. Marking

Table 4. Marking codes

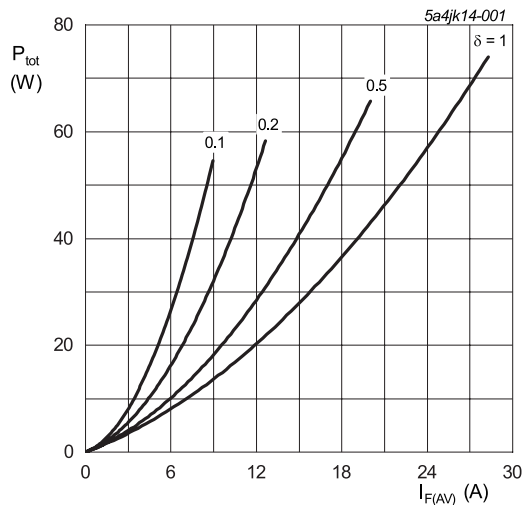
Type number	Marking codes
WNSC5D20650W	WNSC5D 20650W

## 8. Limiting values

**Table 5. Limiting values**

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

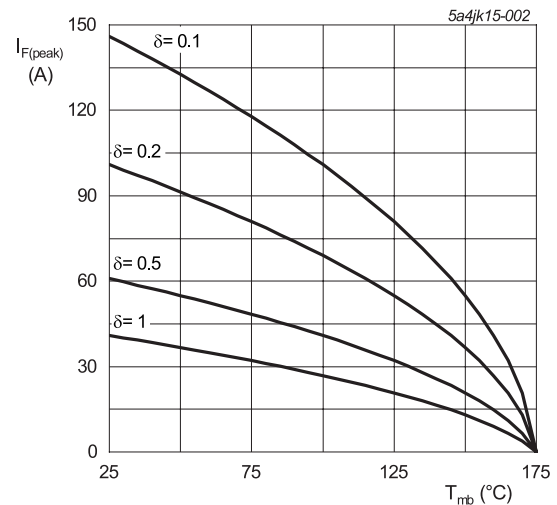
Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{RRM}$	repetitive peak reverse voltage			650	V
$V_{RWM}$	crest working reverse voltage			650	V
$V_R$	reverse voltage	DC		650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		20	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 103\text{ }^{\circ}\text{C}$ ; 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		100	A
		$t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; square-wave pulse		825	A
$I^2t$	$I^2t$ for fusing	sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; $t_p = 10\text{ ms}$		50	$\text{A}^2\text{s}$
$T_{stg}$	storage temperature			-55 to 175	$^{\circ}\text{C}$
$T_j$	junction temperature			-55 to 175	$^{\circ}\text{C}$



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

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

**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**

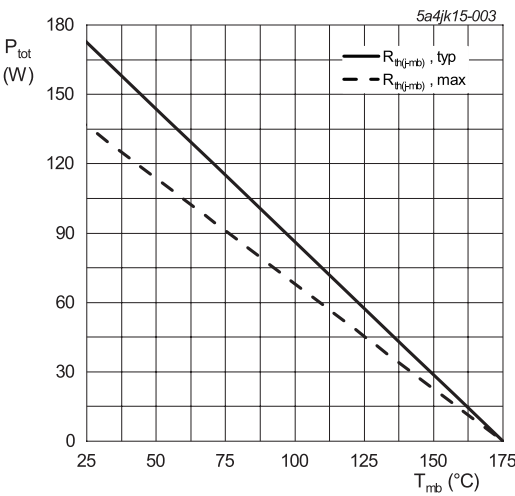


Fig. 3. Total power dissipation as a function of mounting base temperature

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	<a href="#">Fig. 4</a>		-	0.87	1.1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

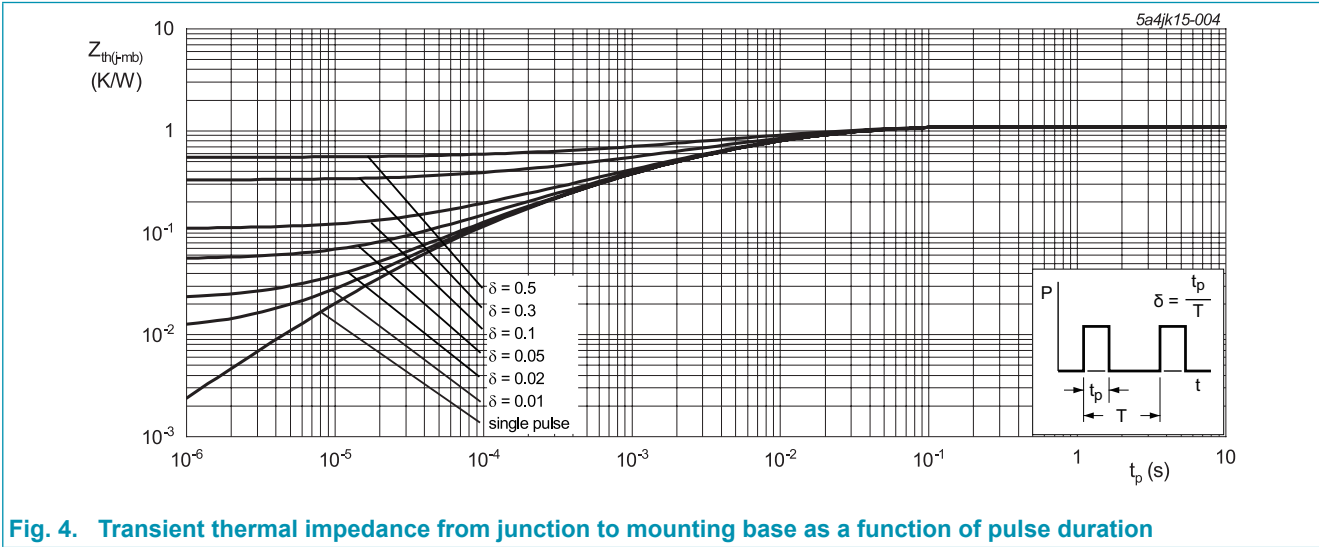
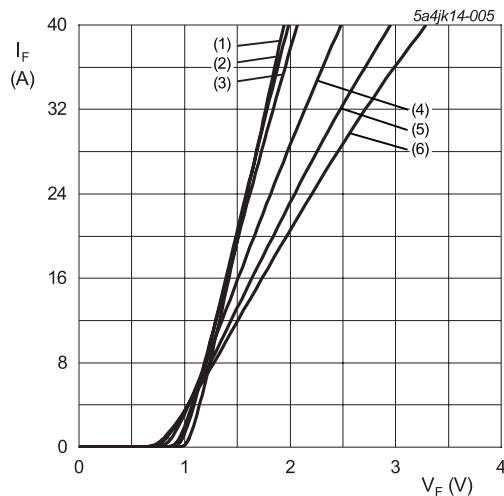


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward current	I <sub>F</sub> = 20 A; T <sub>J</sub> = 25 °C; <a href="#">Fig. 5</a>		-	1.45	1.70	V
		I <sub>F</sub> = 20 A; T <sub>J</sub> = 150 °C; <a href="#">Fig. 5</a>		-	1.80	2.20	V
		I <sub>F</sub> = 20 A; T <sub>J</sub> = 175 °C; <a href="#">Fig. 5</a>		-	2.00	2.30	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>J</sub> = 25 °C; <a href="#">Fig. 6</a>		-	1	100	μA
		V <sub>R</sub> = 650 V; T <sub>J</sub> = 175 °C; <a href="#">Fig. 6</a>		-	30	500	μA
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 20 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>J</sub> = 25 °C; <a href="#">Fig. 7</a>		-	28	-	nC
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>J</sub> = 25 °C		-	620	-	pF
		f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>J</sub> = 25 °C		-	70	-	pF
		f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>J</sub> = 25 °C		-	68	-	pF
E <sub>as</sub>	non-repetitive avalanche energy	I <sub>R</sub> = 6.3 A; L = 5 mH; T <sub>J</sub> (init) = 25 °C		100	-	-	mJ



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

- (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

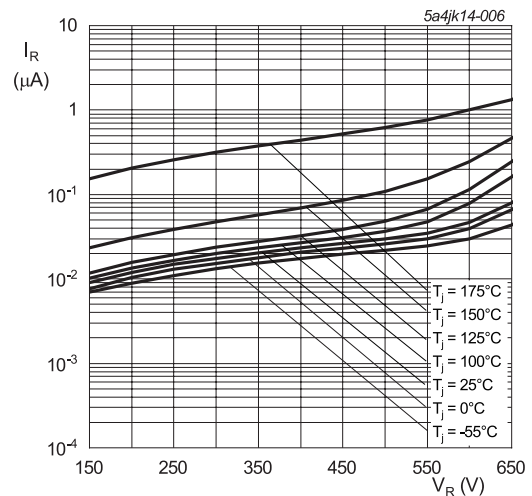


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

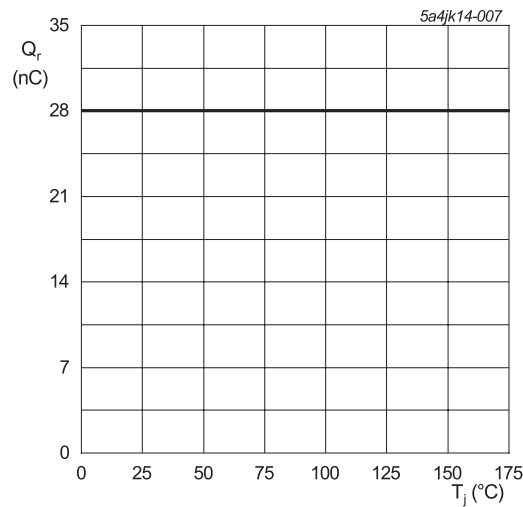
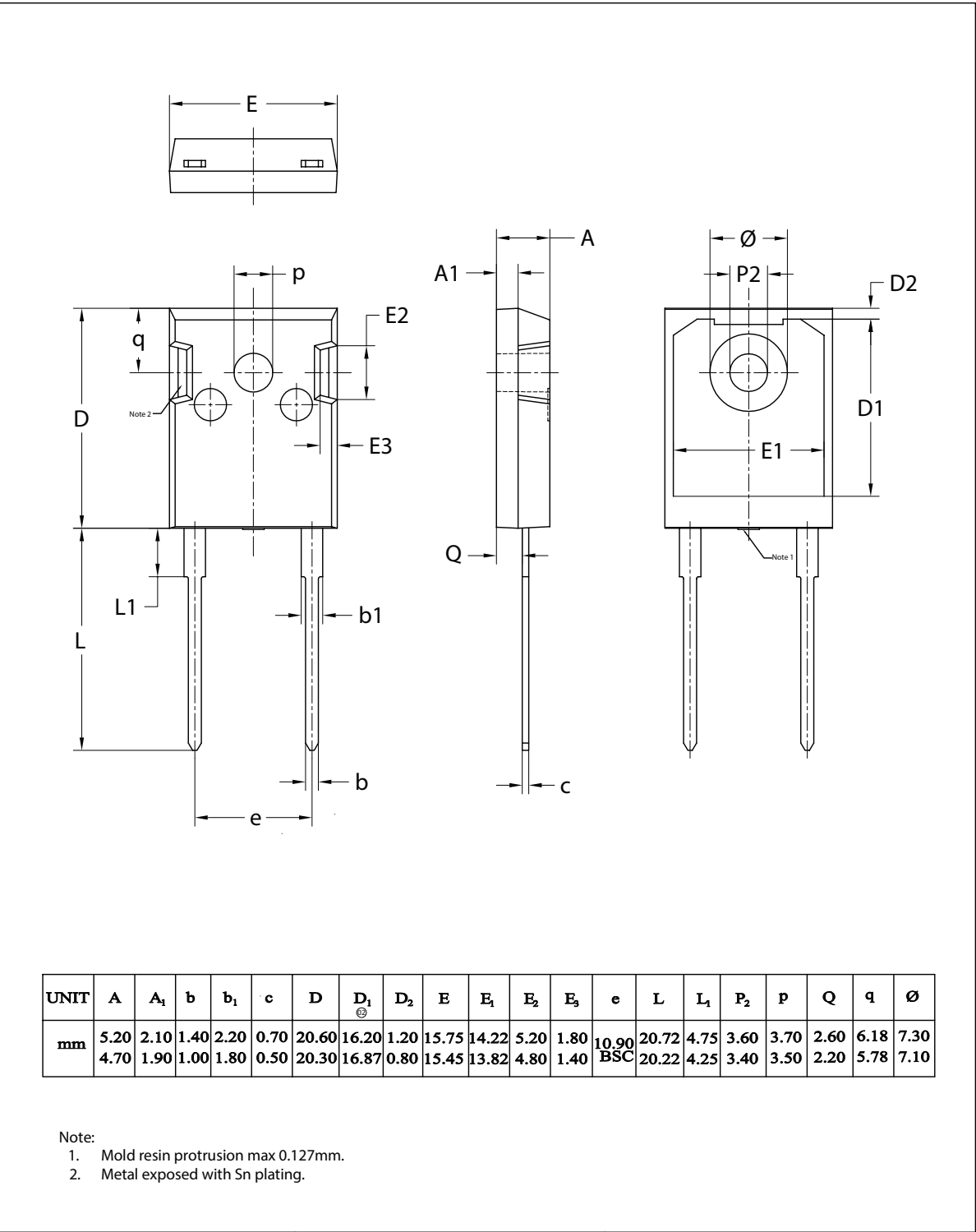


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline

Plastic single-ended through-hole package; heatsink mounted;1 mounting hole; 2 leads TO-247

TO247-2L



UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub> ②	D <sub>2</sub>	E	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	e	L	L <sub>1</sub>	P <sub>2</sub>	p	Q	q	Ø
mm	5.20 4.70	2.10 1.90	1.40 1.00	2.20 1.80	0.70 0.50	20.60 20.30	16.20 16.87	1.20 0.80	15.75 15.45	14.22 13.82	5.20 4.80	1.80 1.40	10.90 BSC	20.72 20.22	4.75 4.25	3.60 3.40	3.70 3.50	2.60 2.20	6.18 5.78	7.30 7.10



## 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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