

## 1. General description

Silicon Carbide Schottky diode in a TO220F-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
- Insulated package rated at 2500V RMS

## 3. Applications

- Power factor correction
- Telecom / Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED / OLED TV
- Motor Drives

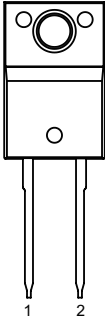

## 4. Quick reference data

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; <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	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WNSC5D20650X	TO220F-2L	WNSC5D20650X6Q	Tube	50	TO220FE-2L	21-Dec-2020

7. Marking

Table 4. Marking codes

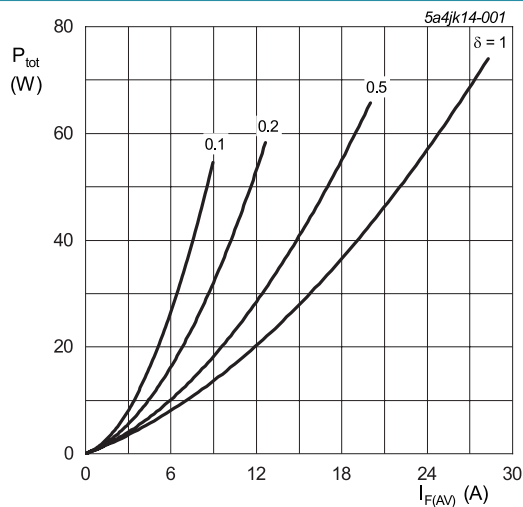
Type number	Marking codes
WNSC5D20650X	WNSC5D 20650X

## 8. Limiting values

**Table 5. Limiting values**

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

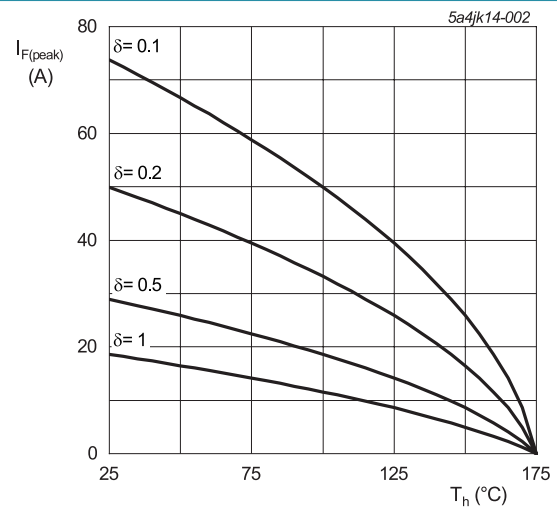
Symbol	Parameter	Conditions	Notes	Values	Unit
$V_{RRM}$	repetitive peak reverse voltage			650	V
$V_{RWM}$	crest working reverse voltage			650	V
$V_R$	reverse voltage	DC		650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		20	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25 \mu s$ ; square-wave pulse		40	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10 ms$ ; $T_{j(init)} = 25^\circ C$ ; sine-wave pulse		80	A
		$t_p = 10 \mu s$ ; $T_{j(init)} = 25^\circ C$ ; square-wave pulse		800	A
$I^2t$	$I^2t$ for fusing	$t_p = 10 ms$ ; $T_{j(init)} = 25^\circ C$ ; sine-wave pulse		32	A <sup>2</sup> s
$T_{stg}$	storage temperature			-55 to 175	°C
$T_j$	junction temperature			-55 to 175	°C



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

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

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



**Fig. 2. Current derating as a function of heatsink temperature**

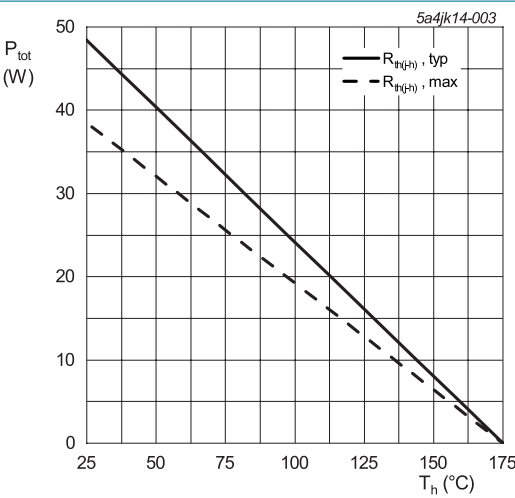


Fig. 3. Total power dissipation as a function of heatsink temperature

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig. 4		-	3.1	3.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

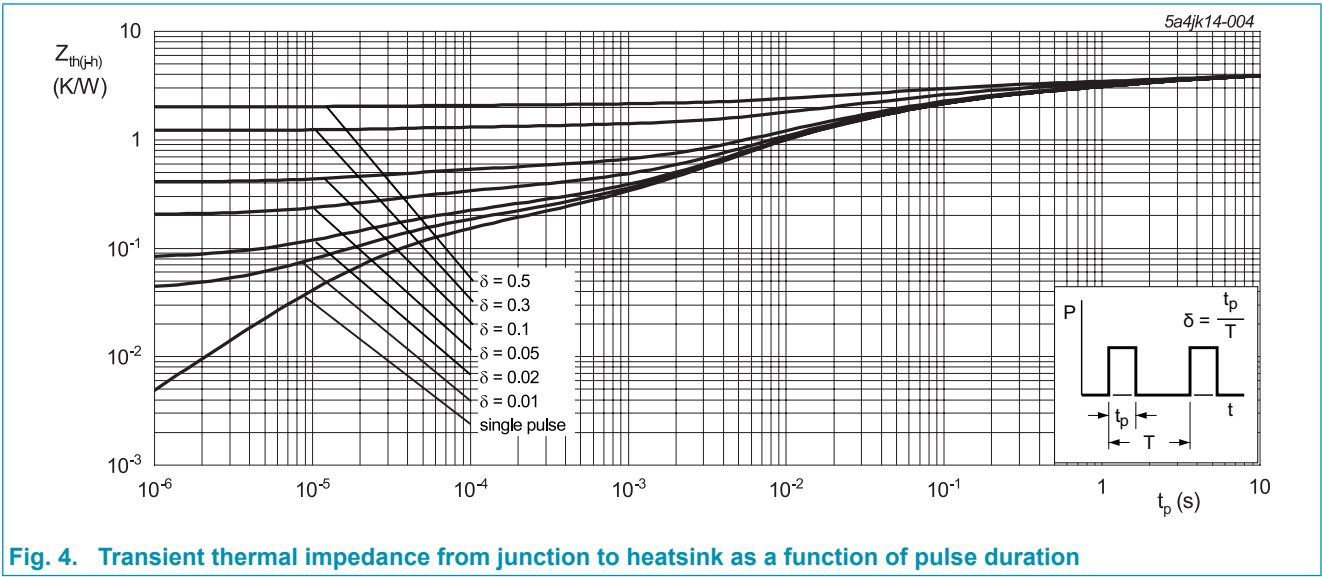


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

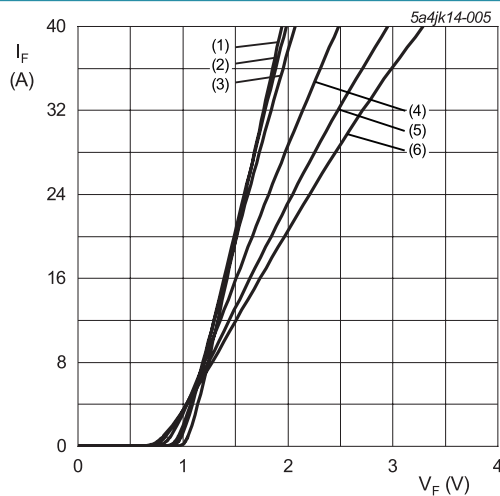
Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; T <sub>h</sub> = 25 °C; RH ≤ 65 %		-	-	2500	V

## 11. Characteristics

Table 8. Characteristics

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
		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		-	640	-	pF
		f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>j</sub> = 25 °C		-	69	-	pF
		f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C		-	65	-	pF
E <sub>as</sub>	non-repetitive avalanche energy	I <sub>R</sub> = 6.3 A; T <sub>j(init)</sub> = 25 °C; L = 5 mH		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

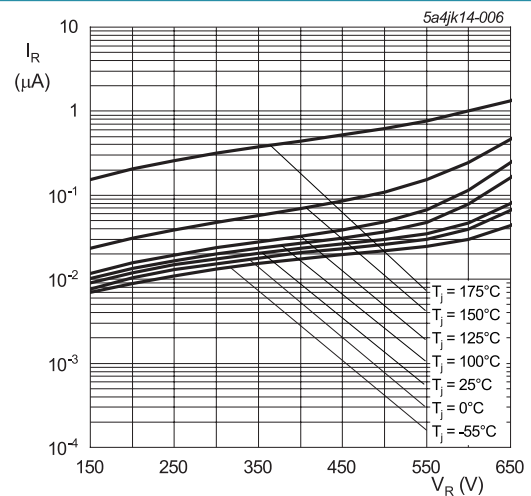


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

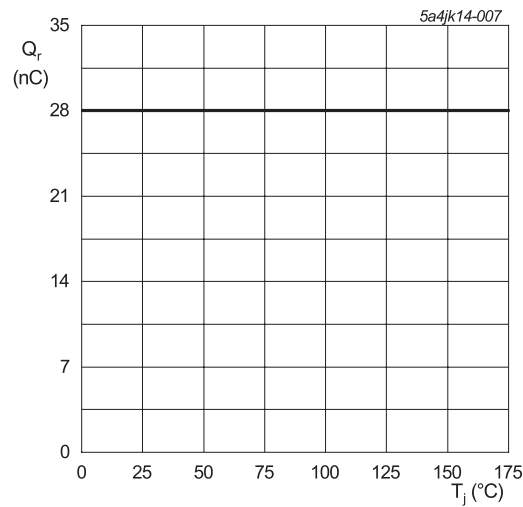
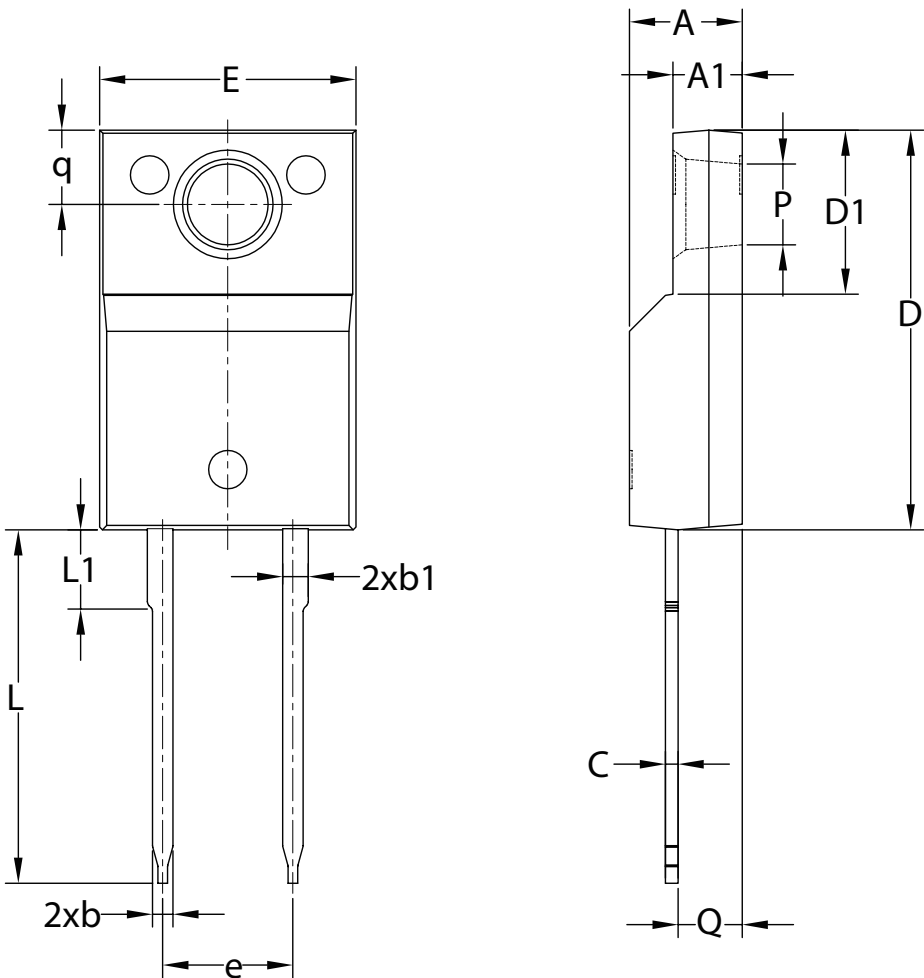


Fig. 7. Recovered charge as a function of junction temperature

12. Package outline

Plastic single-ended package; isolated heatsink mounted;1 mounting hole; 2 leads TO-220 'full pack' TO220F-2L



Unit	A	A1	b	b1	c	D	D1	E	e	L	L1	P	Q	q
MM	min	4.20	2.50	0.70	0.90	0.40	15.40	6.00	9.70	13.50	2.80	3.00	2.30	2.60
	max	4.60	2.90	0.90	1.30	0.60	15.80	6.40	10.30	14.40	3.30	3.30	2.60	3.00



## 13. 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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