

## 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

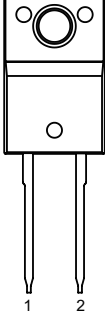
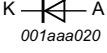
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
<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; <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	$I_F = 20\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 5</a>	-	1.45	1.70	V	
		$I_F = 20\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 5</a>	-	1.80	2.20	V	
<b>Dynamic characteristics</b>							
$Q_r$	recovered charge	$I_F = 20\text{ A}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $V_R = 400\text{ V}$ ; $T_j = 25\text{ °C}$ ; <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

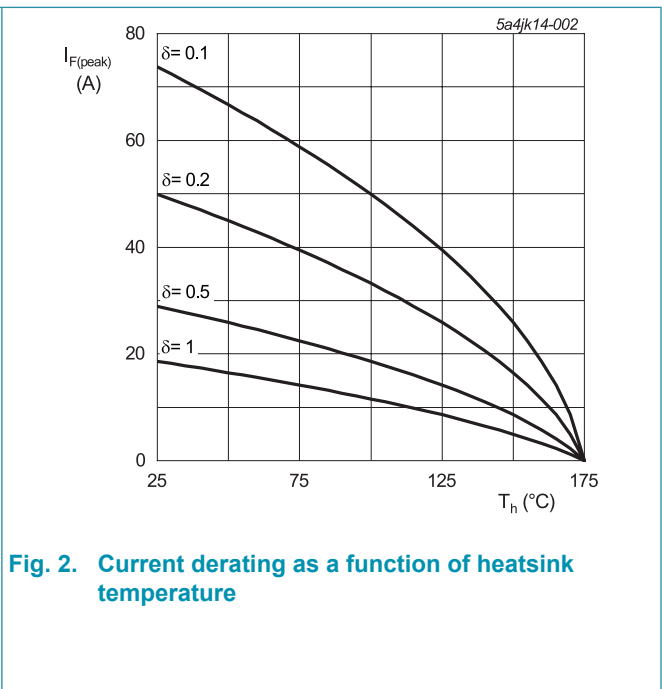
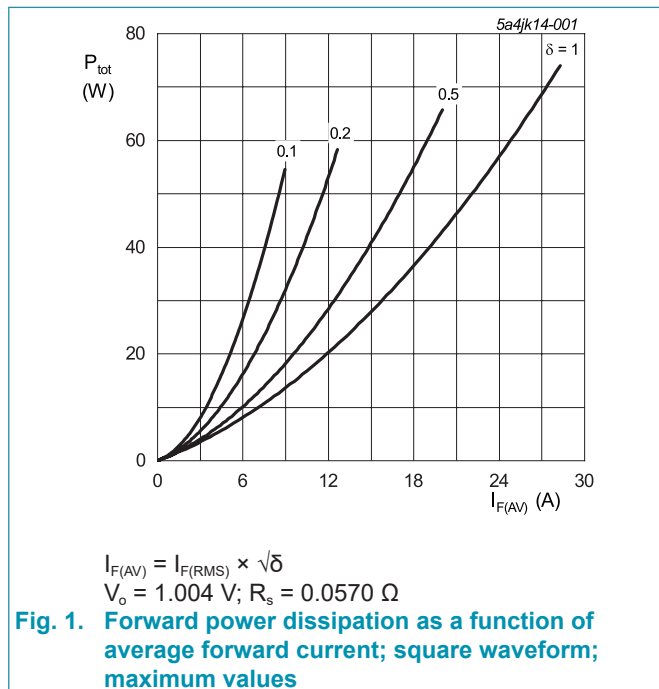
Type number	Marking codes
WNSC5D20650X	WNSC5D 20650X

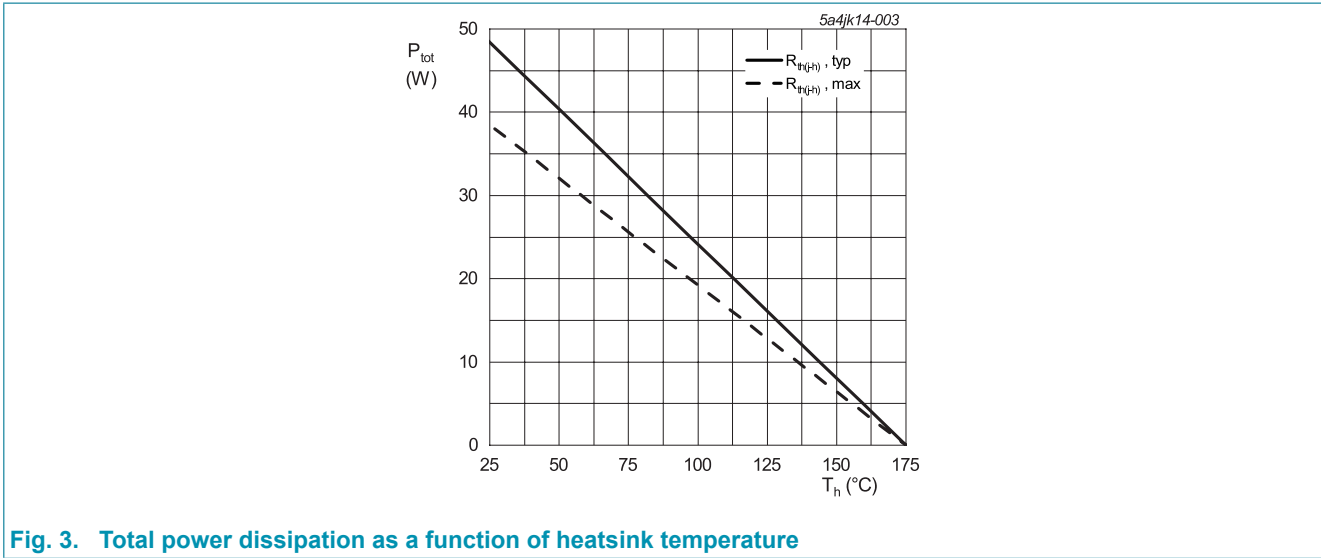
## 8. Limiting values

**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	$t_p = 10 ms$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; sine-wave pulse		80	A
		$t_p = 10 \mu s$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; square-wave pulse		800	A
$I^2t$	$I^2t$ for fusing	$t_p = 10 ms$ ; $T_{j(init)} = 25 \text{ }^\circ\text{C}$ ; sine-wave pulse		32	A <sup>2</sup> 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
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; <a href="#">Fig. 4</a>		-	3.1	3.9	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

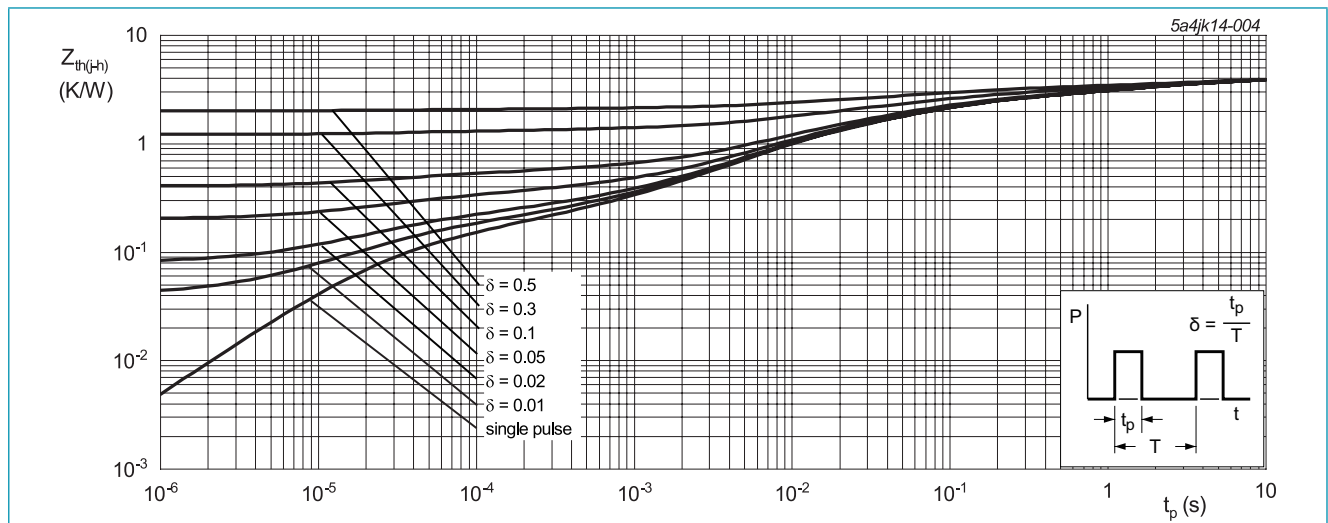


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

## 10. Isolation characteristics

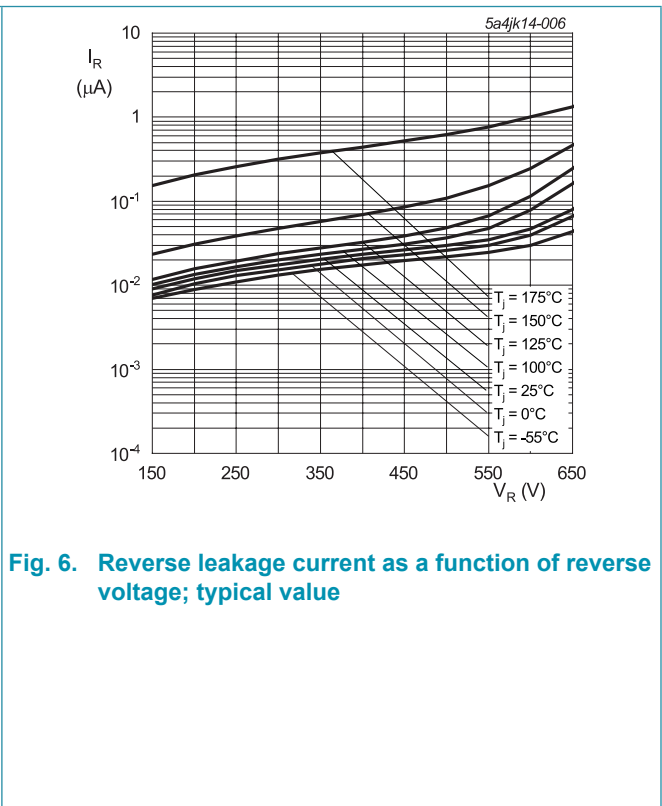
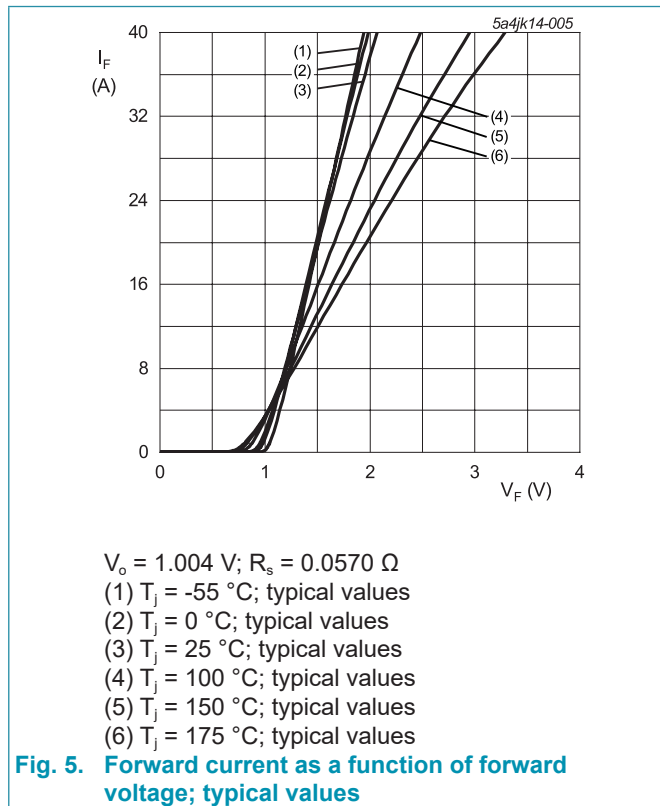
Table 7. Isolation characteristics

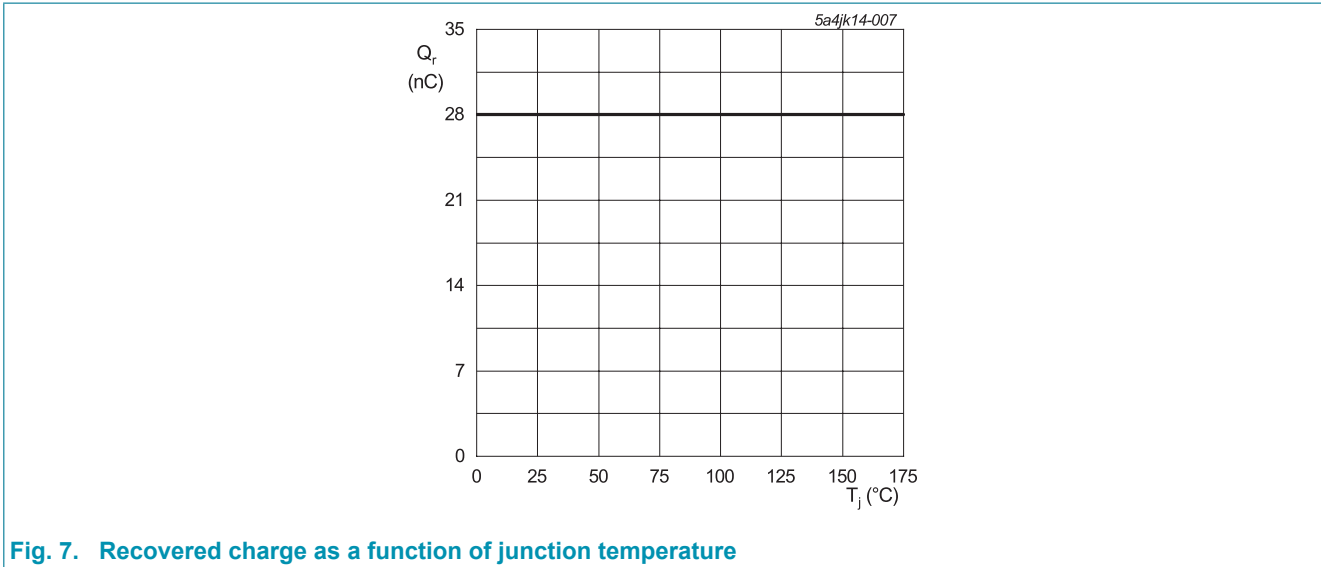
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50\text{ Hz} \leq f \leq 60\text{ Hz}$ ; $T_h = 25\text{ }^\circ\text{C}$ ; $RH \leq 65\%$		-	-	2500	V

### 11. Characteristics

Table 8. Characteristics

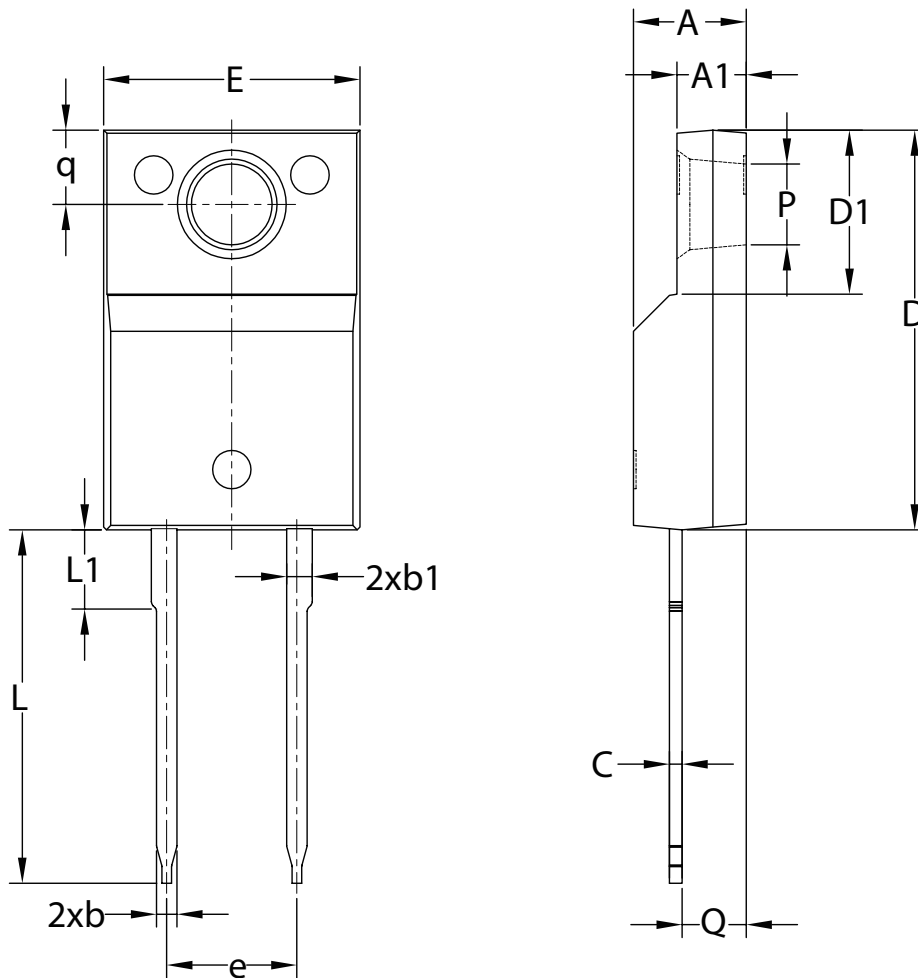
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
<b>Static characteristics</b>							
$V_F$	forward voltage	$I_F = 20\text{ A}; T_j = 25\text{ °C}; \text{Fig. 5}$		-	1.45	1.70	V
		$I_F = 20\text{ A}; T_j = 150\text{ °C}; \text{Fig. 5}$		-	1.80	2.20	V
		$I_F = 20\text{ A}; T_j = 175\text{ °C}; \text{Fig. 5}$		-	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
		$f = 1\text{ MHz}; V_R = 300\text{ V}; T_j = 25\text{ °C}$		-	69	-	pF
		$f = 1\text{ MHz}; V_R = 600\text{ V}; T_j = 25\text{ °C}$		-	65	-	pF
$E_{as}$	non-repetitive avalanche energy	$I_R = 6.3\text{ A}; T_{j(\text{init})} = 25\text{ °C}; L = 5\text{ mH}$		100	-	-	mJ





### 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	15.40	6.00	9.70	5.08 (BSC)	13.50	2.80	3.00	2.30	2.60
	max	4.60	2.90	0.90	1.30	15.80	6.40	10.30		14.40	3.30	3.30	2.60	3.00



## 13. 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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