WNSC5D04650X

Silicon Carbide Diode

Rev.01 - 10 October 2022 Product data sheet

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

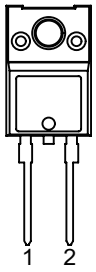
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_h \leq 93$ °C; Fig. 1; Fig. 2; Fig. 3		4			A
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 4 A; T_j = 25 °C; Fig. 5		-	1.45	1.70	V
		I_F = 4 A; T_j = 150 °C; Fig. 5		-	1.80	2.20	V

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
WNSC5D04650X	TO220F-2L	WNSC5D04650X6Q	Tube	50	TO220FN-2L	20-July-2016

7. Marking

Table 4. Marking codes

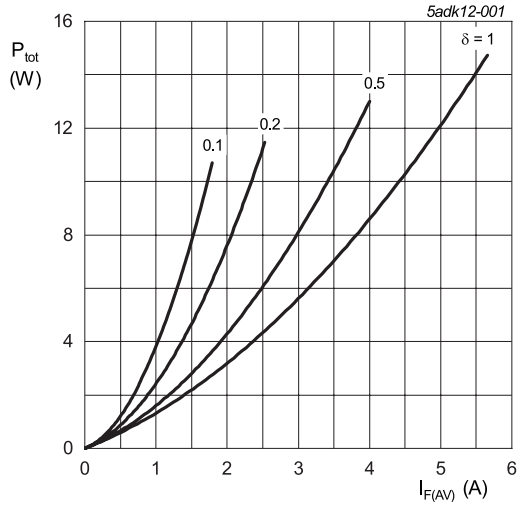
Type number	Marking codes
WNSC5D04650X	WNSC5D 04650X

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	δ = 0.5; square-wave pulse; $T_h \leq 93$ °C; Fig. 1; Fig. 2; Fig. 3		4	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_h \leq 93$ °C; square-wave pulse		8	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		24	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse		260	A
I^2t	I^2t for fusing	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		2.88	A^2s
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 = 1.044 V; R_s = 0.2758 Ω

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

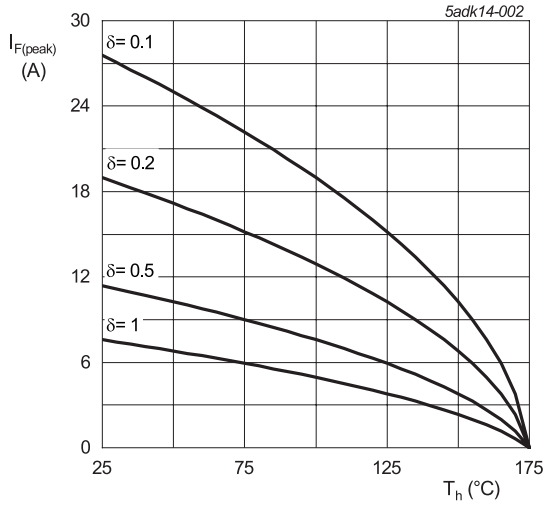


Fig. 2. Current derating as a function of heatsink temperature

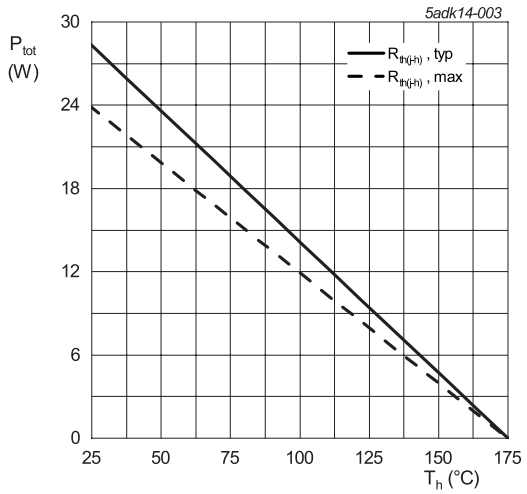


Fig. 3. Total power dissipation as a function of heatsink temperature

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		-	5.3	6.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	50	-	K/W

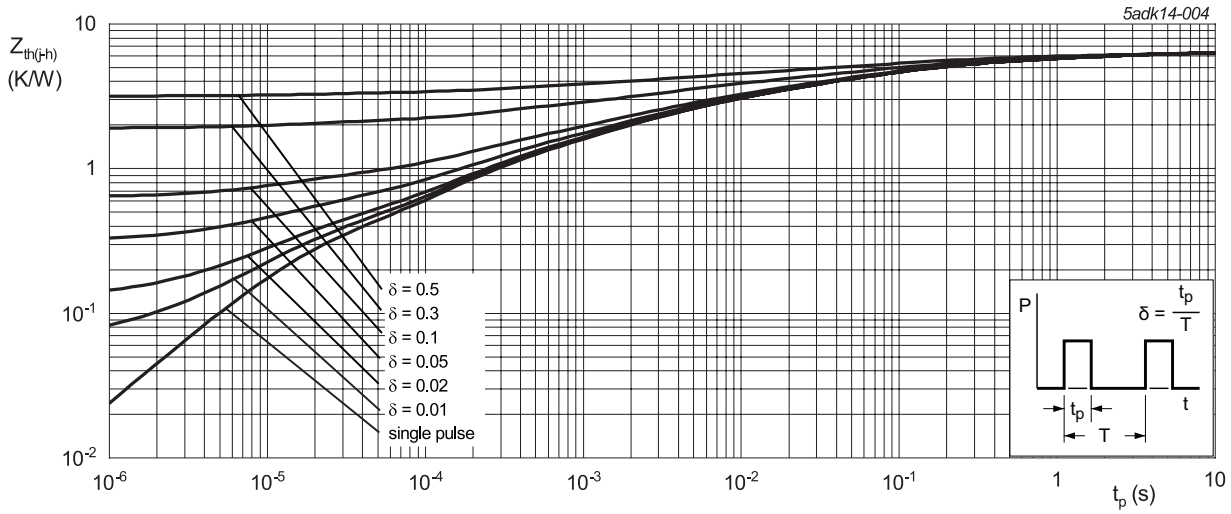


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

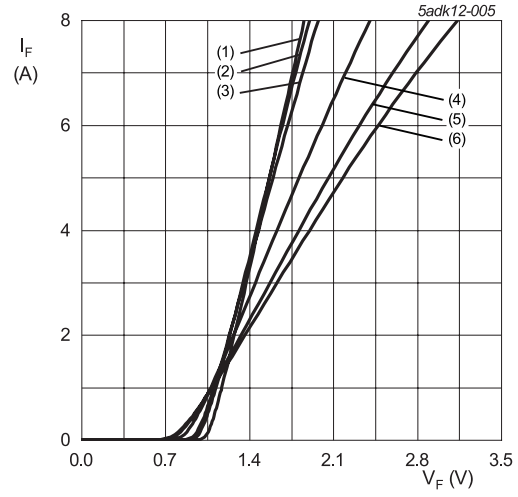
Table 7. Isolation characteristics

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_h = 25 °C; RH ≤ 65 %		-	-	2500	V

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 4 A; T_j = 25 °C; Fig. 5		-	1.45	1.70	V
		I_F = 4 A; T_j = 150 °C; Fig. 5		-	1.80	2.20	V
		I_F = 4 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		-	0.2	20	µA
		V_R = 650 V; T_j = 175 °C; Fig. 6		-	10	100	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 4 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	6	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	138	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	17	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	15	-	pF
E_{as}	non-repetitive avalanche energy	I_R = 2.8 A; $T_{j(init)}$ = 25 °C; L = 5 mH		20	-	-	mJ



V_o = 1.044 V; R_s = 0.2758 Ω
(1) T_j = -55 °C; typical values
(2) T_j = 0 °C; typical values
(3) T_j = 25 °C; typical values
(4) T_j = 100 °C; typical values
(5) T_j = 150 °C; typical values
(6) T_j = 175 °C; typical values

Fig. 5. Forward current as a function of forward voltage; typical values

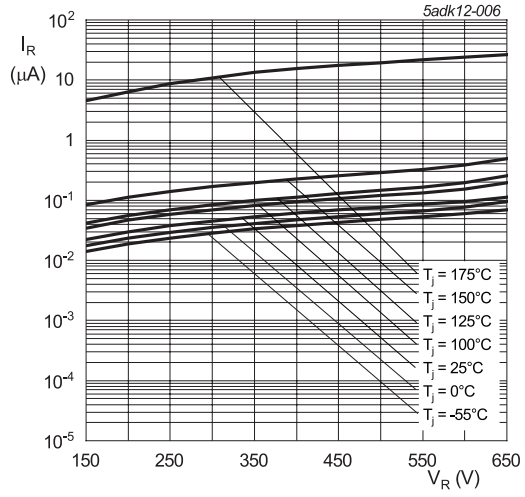


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

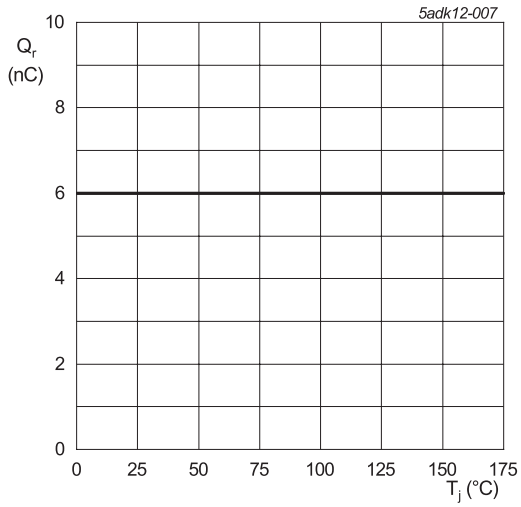
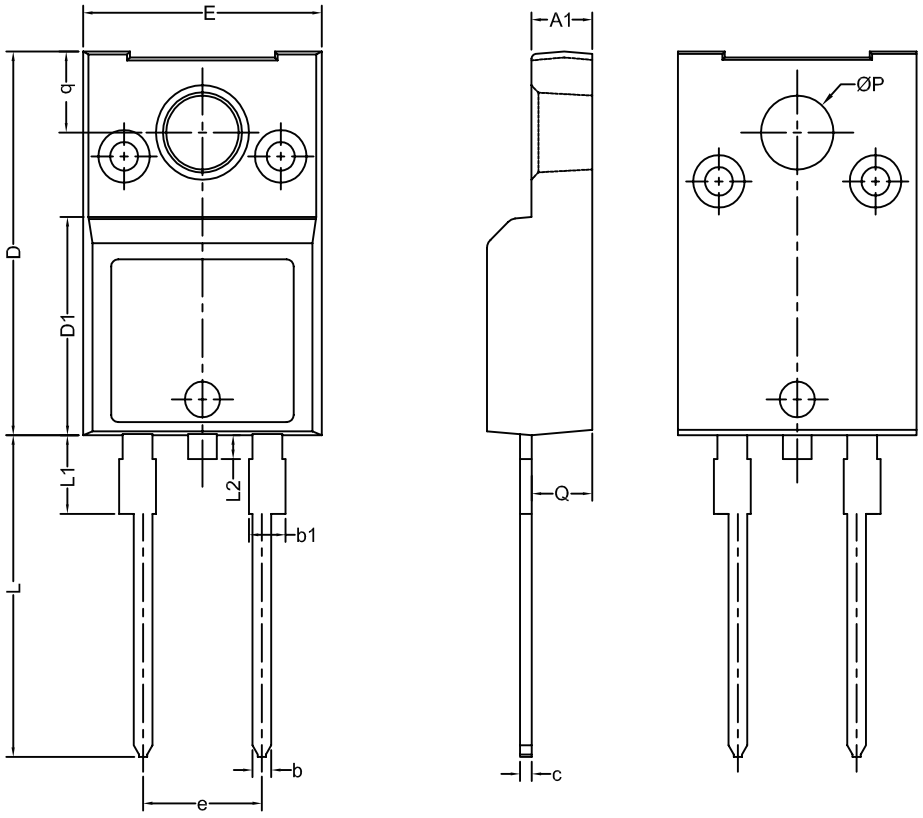


Fig. 7. Recovered charge as a function of junction temperature

12. Package outline

Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F TO220F-2L



Unit	A	A1	b	b1	c	D	D1	e	E	L	L1	L2	P	q	Q
min	4.35	2.40	0.76	1.22	0.46	15.95	9.00	5.08 (typ.)	10.05	13.15	3.15	0.50	2.95	3.40 (typ.)	2.30
max	4.65	2.80	0.89	1.60	0.59	16.25	9.30		10.35	13.85	3.45	1.00	3.25		2.80

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
TO220F-2L		-				

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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Product [short] data sheet	Production	This document contains the product specification.

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