WNSC5D206650CJ

Silicon Carbide Diode

Rev.01 - 16 November 2022 Product data sheet

1. General description

Dual Silicon Carbide Schottky diodes in a TO3PF 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

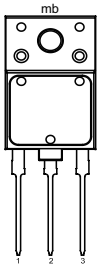
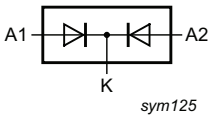
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
$I_{O(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_h \leq 15$ °C; both diodes conducting; Fig. 1; Fig. 2; Fig. 3		20			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 = 10 A; T_j = 25 °C; per diode; Fig. 5		-	1.45	1.70	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 5		-	1.80	2.20	V
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; per diode; Fig. 7		-	14.5	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode		
2	K	cathode		
3	A2	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
WNSC5D20650CJ	TO3PF	WNSC5D20650CJ6Q	Tube	30	SOT1293	16-Mar-2006

7. Marking

Table 4. Marking codes

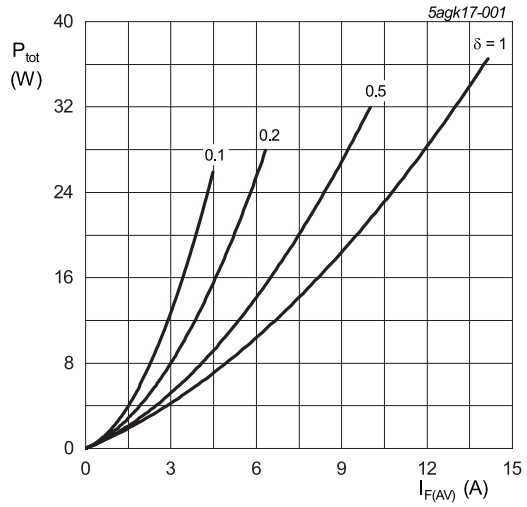
Type number	Marking codes
WNSC5D20650CJ	WNSC5D 20650CJ

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
$I_{O(AV)}$	average forward current	δ = 0.5; square-wave pulse; $T_h \leq 15$ °C; both diodes conducting; Fig. 1; Fig. 2; Fig. 3		20	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_h \leq 60$ °C; square-wave pulse; per diode		20	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode		45	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse; per diode		540	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)}$ = 25 °C; t_p = 10 ms		10.125	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 = 1.103 V; R_s = 0.1048 Ω

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

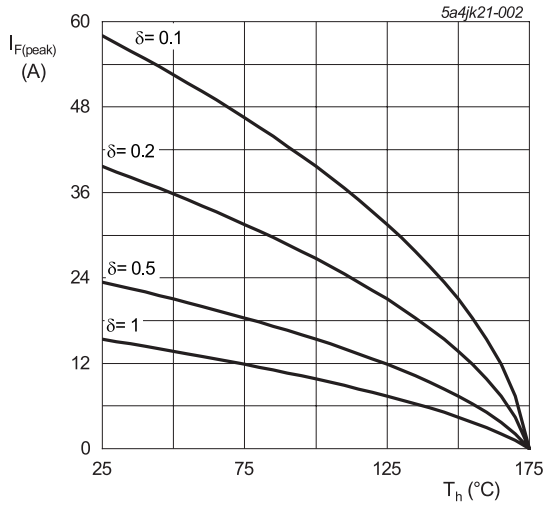


Fig. 2. Current derating as a function of heatsink temperature; per diode

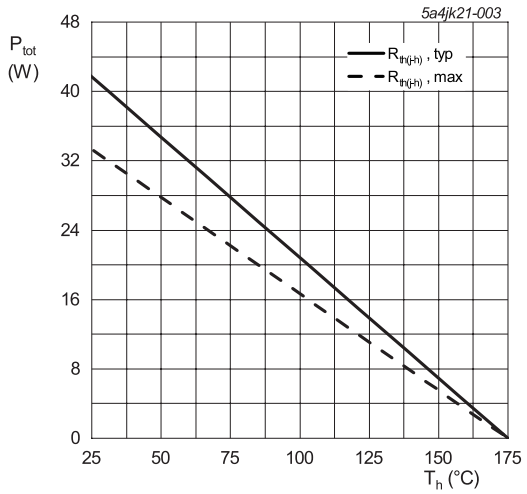


Fig. 3. Total power dissipation as a function of heatsink temperature; per diode

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; per diode; Fig. 4		-	3.6	4.5	K/W
		with heatsink compound; both diodes conducting		-	2.5	3.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

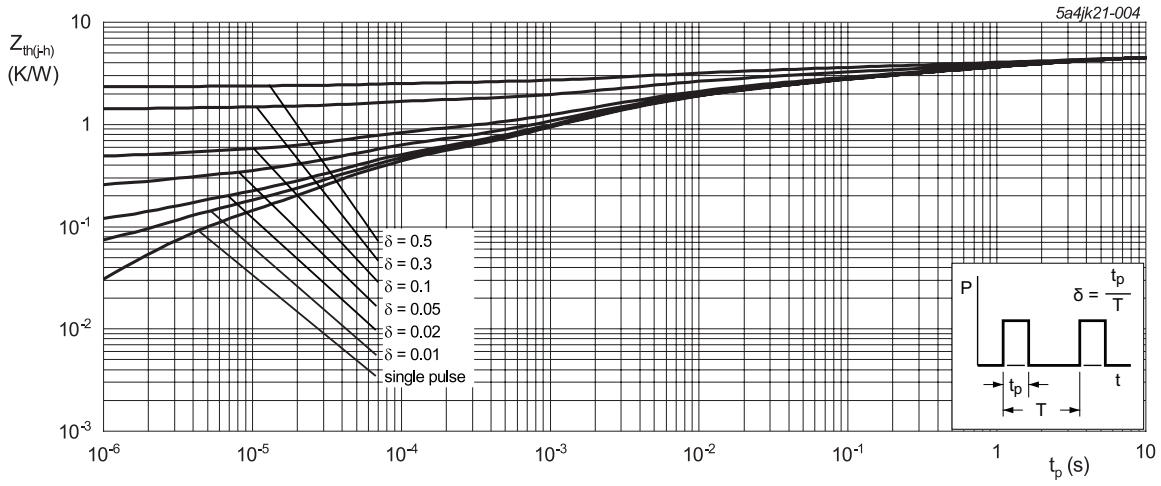


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

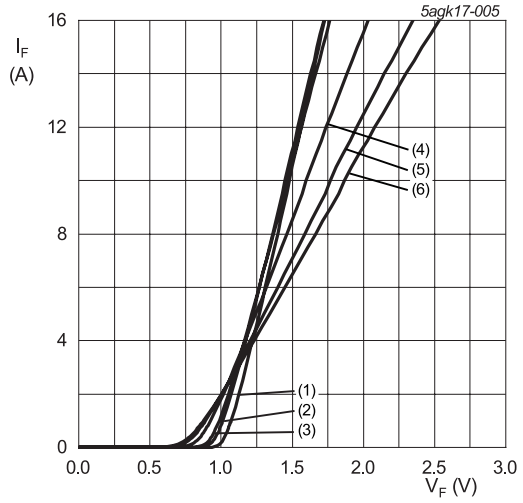
Table 7. Isolation characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free		-	-	2500	V
C_{isol}	isolation capacitance	f = 1 MHz; from cathode to external heatsink		-	10	-	pF

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	I_F = 10 A; T_j = 25 °C; per diode; Fig. 5		-	1.45	1.70	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 5		-	1.80	2.20	V
		I_F = 10 A; T_j = 175 °C; per diode; Fig. 5		-	2.00	2.30	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; per diode; Fig. 6		-	0.5	50	µA
		V_R = 650 V; T_j = 175 °C; per diode; Fig. 6		-	25	250	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; per diode; Fig. 7		-	14.5	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	320	-	pF
		f = 1 MHz; V_R = 300 V; T_j = 25 °C		-	38	-	pF
		f = 1 MHz; V_R = 600 V; T_j = 25 °C		-	36	-	pF
E_{as}	non-repetitive avalanche energy	I_R = 4.9 A; L = 5 mH; $T_{j(init)}$ = 25 °C; per diode		60	-	-	mJ



V_o = 1.103 V; R_s = 0.1048 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; per diode

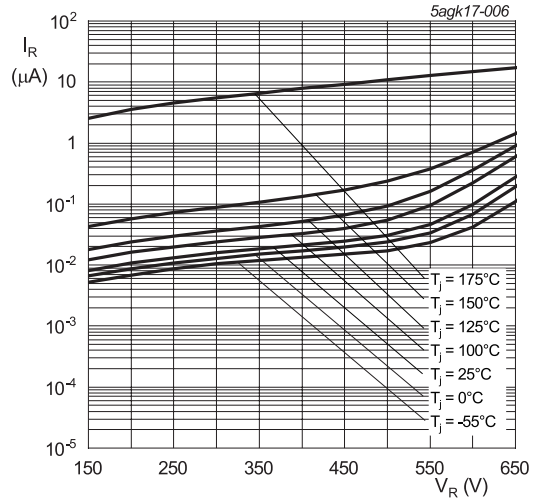


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value; per diode

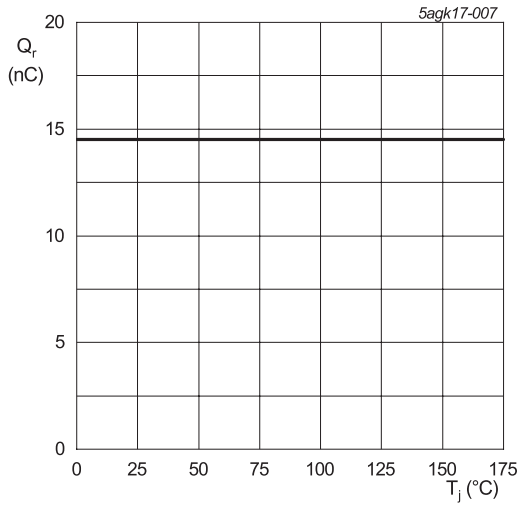
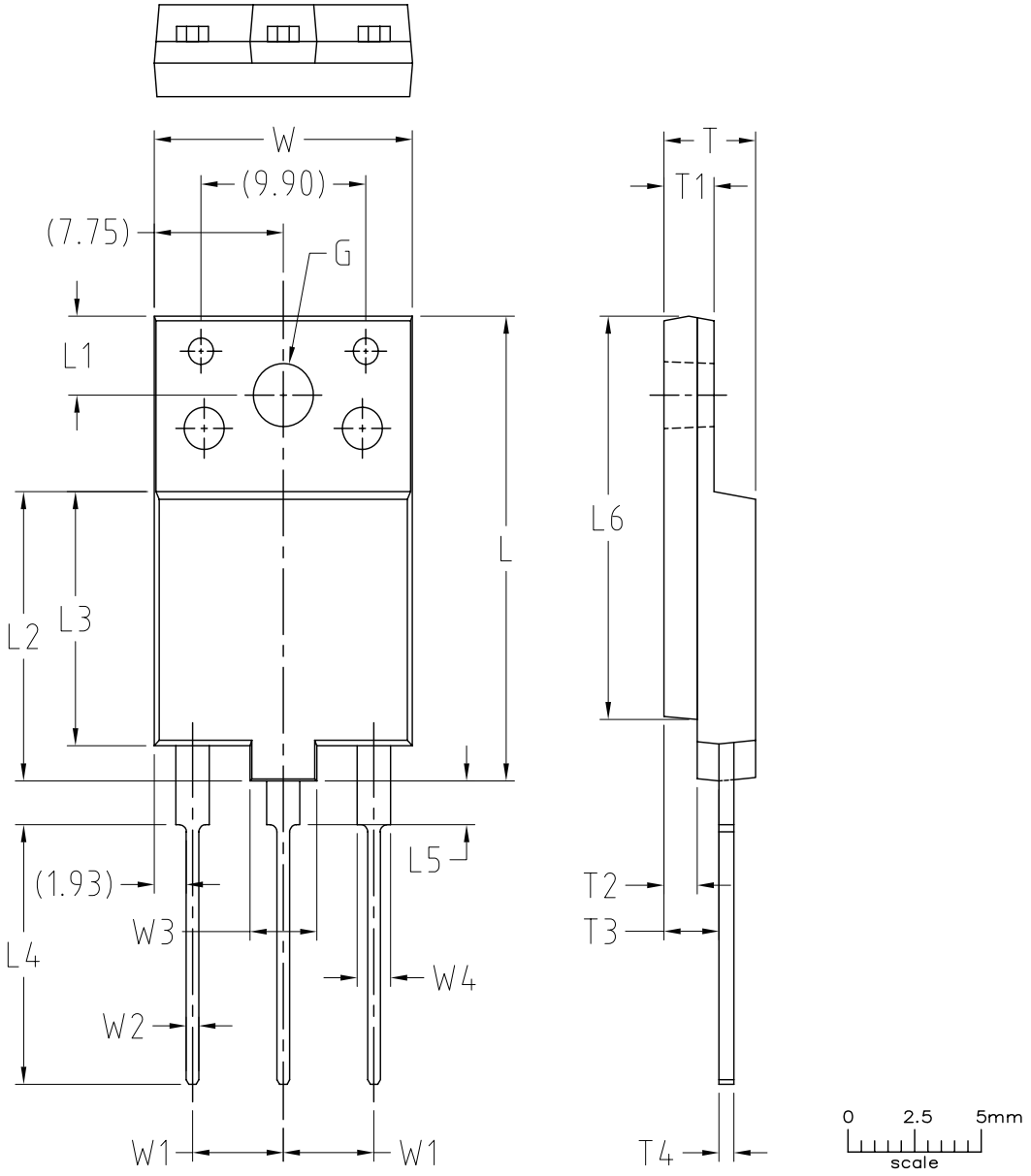


Fig. 7. Recovered charge as a function of junction temperature; per diode

12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack' TO3PF



RemarK : (X) the dimension X in blackets is for reference

UNIT	W	W1	W2	W3	W4	L	L1	L2	L3	L4	L5	L6	T	T1	T2	T3	T4	G(ø)
mm	15.7	5.75	0.95	4.20	2.20	26.7	4.6	16.7	14.7	15.0	2.7	23.2	5.7	3.2	2.2	3.5	1.1	3.8
	15.3	5.15	0.65	3.80	1.80	26.3	4.4	16.3	14.3	14.6	2.3	22.8	5.3	2.8	1.8	3.1	0.8	3.4

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
		TO−3PF				

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.
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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