

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

- New 6th Generation Technology
- Low Forward Voltage Drop
- Low Reverse Leakage Current
- High Forward Surge Capability I_{FSM}
- 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

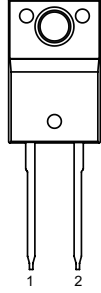
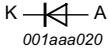
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
I_F	continuous forward current	$T_h \leq 63\text{ }^\circ\text{C}$, DC; Fig. 2		20			A
T_j	junction temperature			-55 to 175			$^\circ\text{C}$
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 20\text{ A}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 5	-	1.26	1.40	V	
		$I_F = 20\text{ A}$; $T_j = 150\text{ }^\circ\text{C}$; Fig. 5	-	1.35	1.55	V	
Dynamic characteristics							
Q_r	recovered charge	$I_F = 20\text{ A}$; $di_F/dt = 500\text{ A}/\mu\text{s}$; $V_R = 400\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; per diode; Fig. 7	-	48	-	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
WNSC6D20650X	TO220F-2L	WNSC6D20650X6Q	Tube	50	TO220FE-2L	21-Dec-2020

7. Marking

Table 4. Marking codes

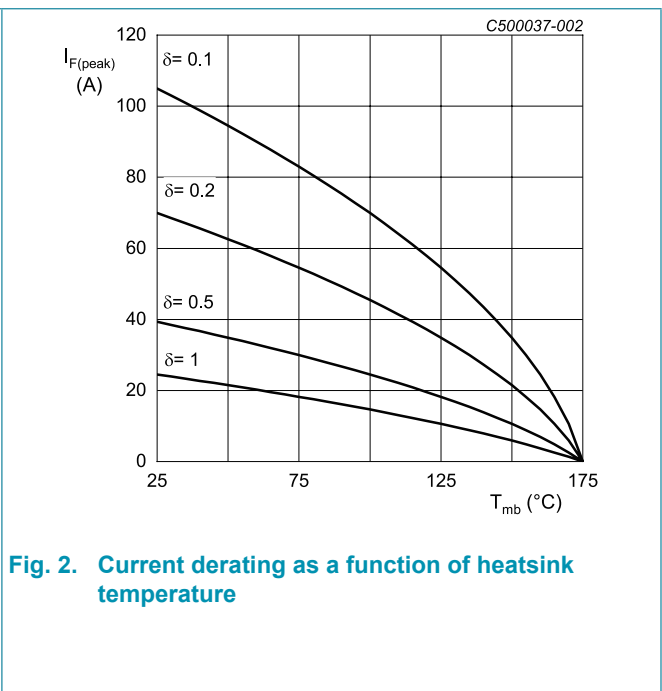
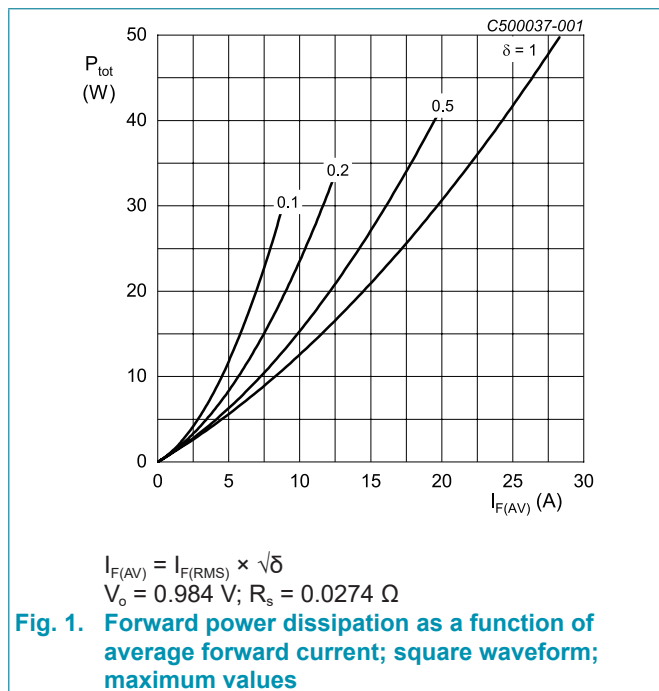
Type number	Marking codes
WNSC6D20650X	WNSC6D 20650X

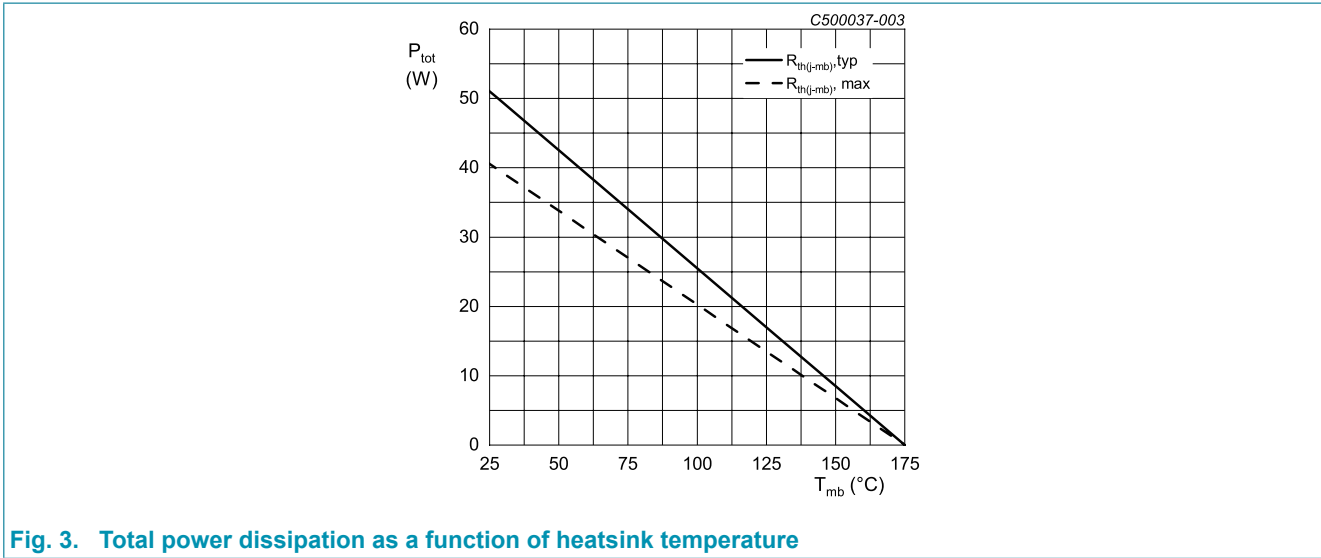
8. Limiting values

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	continuous forward current	$T_h \leq 63\text{ }^\circ\text{C}$, DC; Fig. 2		20	A
		$T_h \leq 125\text{ }^\circ\text{C}$, DC; Fig. 2		10	A
		$T_h \leq 25\text{ }^\circ\text{C}$, DC; Fig. 2		24	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_h \leq 125\text{ }^\circ\text{C}$; square-wave pulse		18	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		125	A
		$t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; square-wave pulse		1000	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse		78.125	A^2s
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; Fig. 4		-	2.94	3.7	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

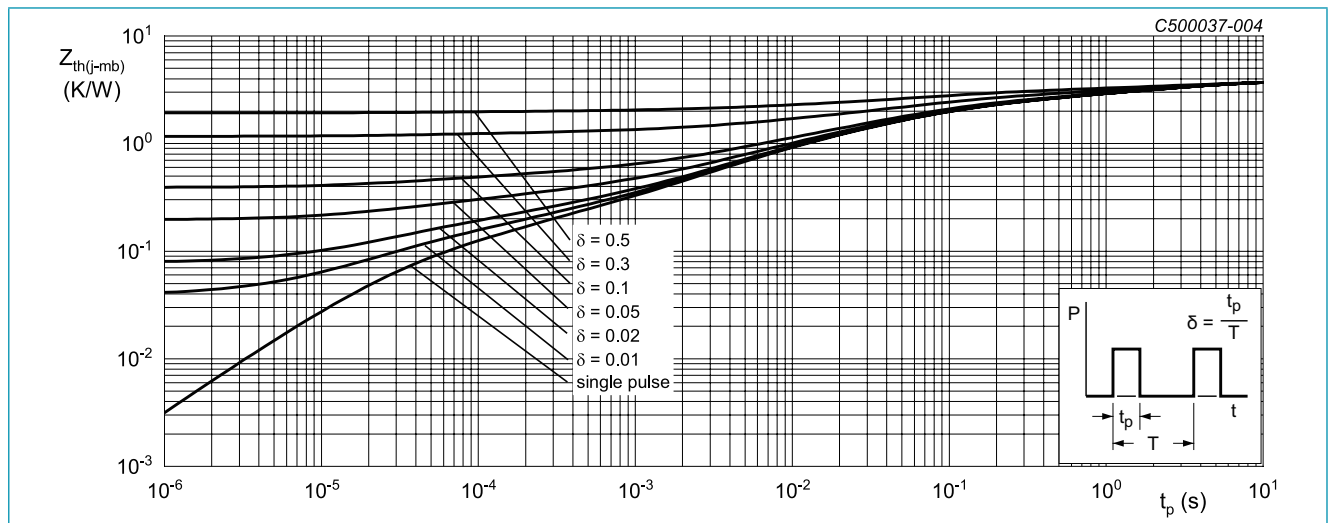


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

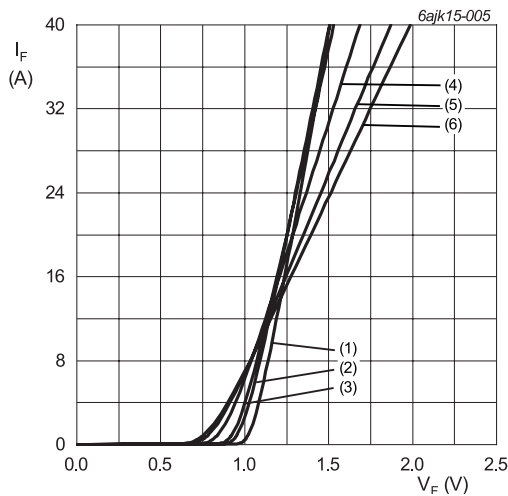
Table 7. Isolation characteristics

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
Static characteristics							
V_F	forward voltage	$I_F = 20\text{ A}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 5}$		-	1.26	1.40	V
		$I_F = 20\text{ A}; T_J = 150\text{ }^\circ\text{C}; \text{Fig. 5}$		-	1.35	1.55	V
		$I_F = 20\text{ A}; T_J = 175\text{ }^\circ\text{C}; \text{Fig. 5}$		-	1.40	1.60	V
I_R	reverse current	$V_R = 650\text{ V}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 6}$		-	2	100	μA
		$V_R = 650\text{ V}; T_J = 175\text{ }^\circ\text{C}; \text{Fig. 6}$		-	30	400	μA
Dynamic characteristics							
Q_r	recovered charge	$I_F = 20\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_J = 25\text{ }^\circ\text{C}; \text{Fig. 7}$		-	48	-	nC
C_d	diode capacitance	$f = 1\text{ MHz}; V_R = 1\text{ V}; T_J = 25\text{ }^\circ\text{C}$		-	1005	-	pF
		$f = 1\text{ MHz}; V_R = 300\text{ V}; T_J = 25\text{ }^\circ\text{C}$		-	110	-	pF
		$f = 1\text{ MHz}; V_R = 600\text{ V}; T_J = 25\text{ }^\circ\text{C}$		-	102	-	pF
E_{as}	non-repetitive avalanche energy	$I_R = 7.8\text{ A}; T_{j(\text{init})} = 25\text{ }^\circ\text{C}; L = 5\text{ mH}$		150	-	-	mJ



$V_o = 0.984\text{ V}; R_s = 0.0274\ \Omega$
 (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

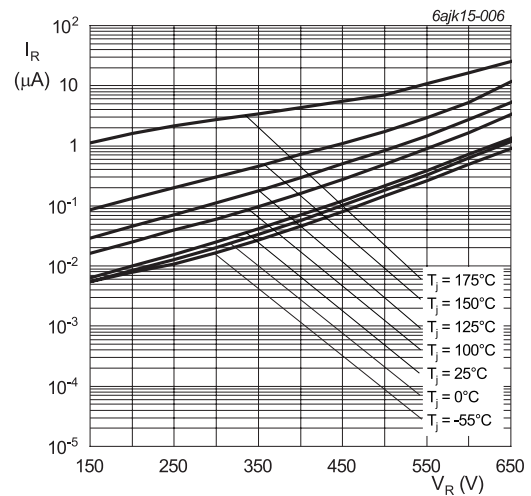


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

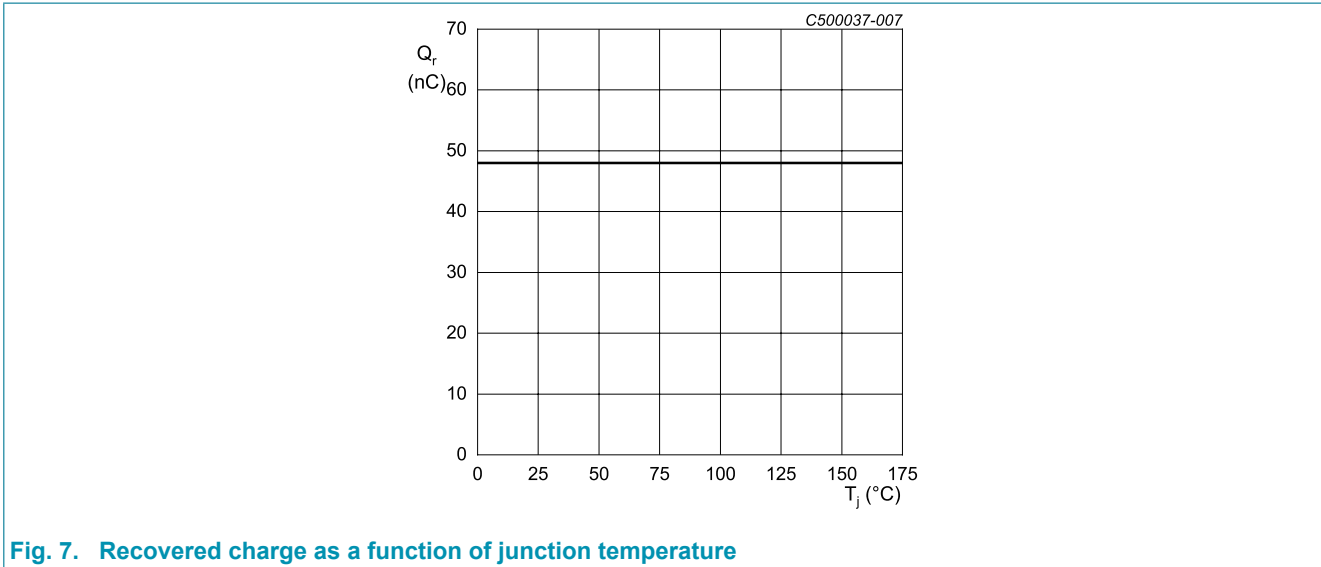
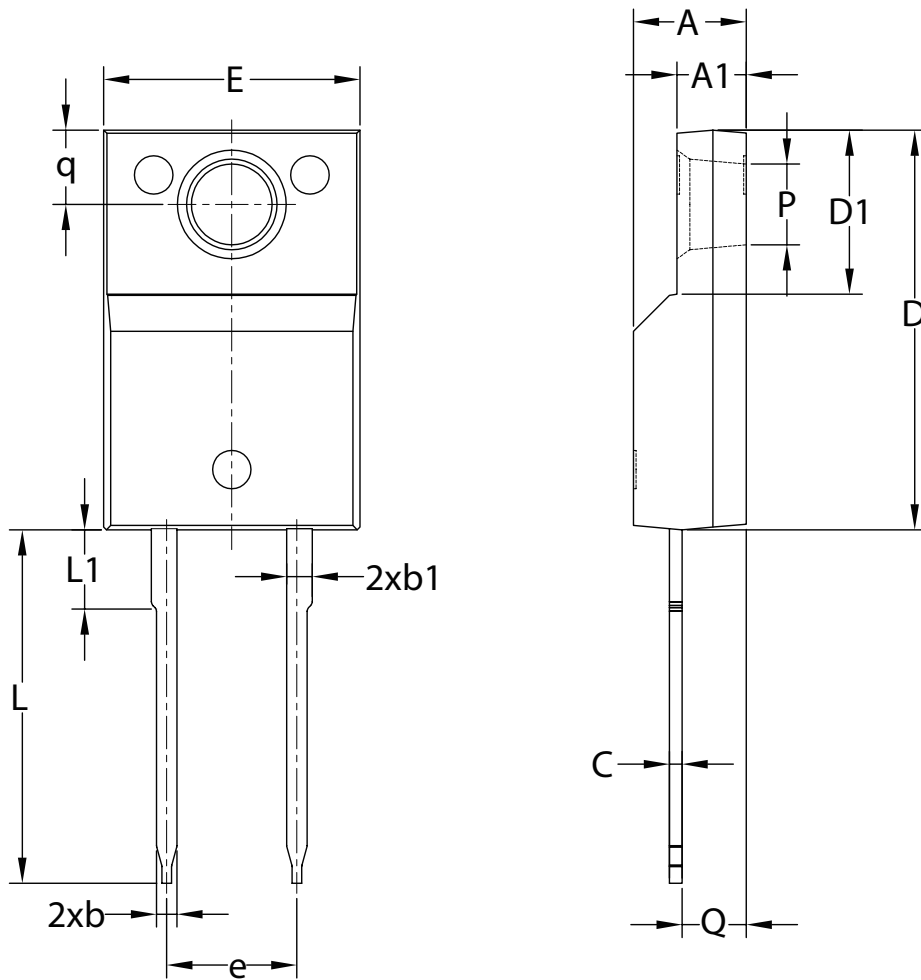


Fig. 7. Recovered charge as a function of junction temperature

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

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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.
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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- [2] The term 'short data sheet' is explained in section "Definitions".
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For sales office addresses, please send an email to: salesaddresses@ween-semi.com

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