

1. General description

Silicon Carbide Schottky diode in a TSPAK plastic package, featured with top side cooling structure, designed for high frequency, high efficiency systems.



2. Features and benefits

- Top side cooling structure
- 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



3. Applications

- PC/Telecom/Server SMPS
- UPS & energy storage systems
- Battery formation systems
- EV chargers
- PV MPPT circuit
- Motor Drives

4. Quick reference data

Table 1. Quick reference data

Table 17. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		650				V
I_F	continuous forward current	$T_{mb} \leq 144\text{ }^{\circ}\text{C}$, DC; Fig. 2	20				A
T_j	junction temperature		175				$^{\circ}\text{C}$
Symbol	Parameter	Conditions		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	$I_F = 20\text{ A}$; $dI_F/dt = 500\text{ A}/\mu\text{s}$; $V_R = 400\text{ V}$; $T_j = 25\text{ }^{\circ}\text{C}$; Fig. 7		-	48	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1-2	n.c	n.c		
3-7	A	anode		
8-9 mb	K	mounting base; connected to cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
WNSC6D20650TB	TSPAK	WNSC6D20650TB6J	Reel	600	TSPAKH	06-Dec-2024

7. Marking

Table 4. Marking codes

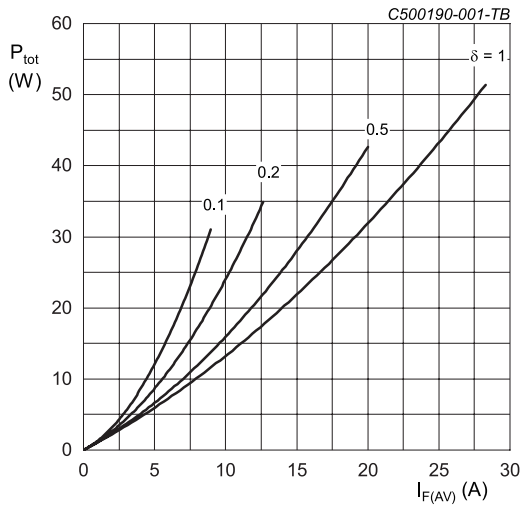
Type number	Marking codes
WNSC6D20650TB	WNSC6D 20650TB

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	$T_{mb} \leq 140\text{ }^{\circ}\text{C}$; DC; Fig. 2		20	A
		$T_{mb} \leq 125\text{ }^{\circ}\text{C}$; DC; Fig. 2		26	A
		$T_{mb} \leq 25\text{ }^{\circ}\text{C}$; DC; Fig. 2		55	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 125\text{ }^{\circ}\text{C}$; square-wave pulse		42	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		120	A
		$t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; square-wave pulse		860	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; SIN		72	A^2s
T_{stg}	storage temperature			-55 to 175	$^{\circ}\text{C}$
T_j	junction temperature			-55 to 175	$^{\circ}\text{C}$



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_o = 1.054\text{ V}; R_s = 0.0270\text{ }\Omega$$

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

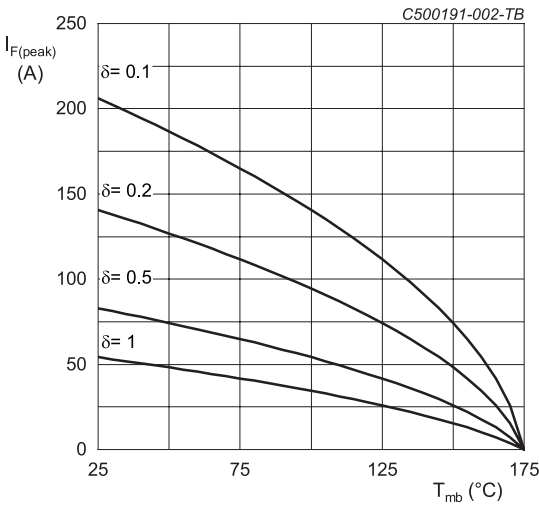


Fig. 2. Current derating as a function of mounting base temperature

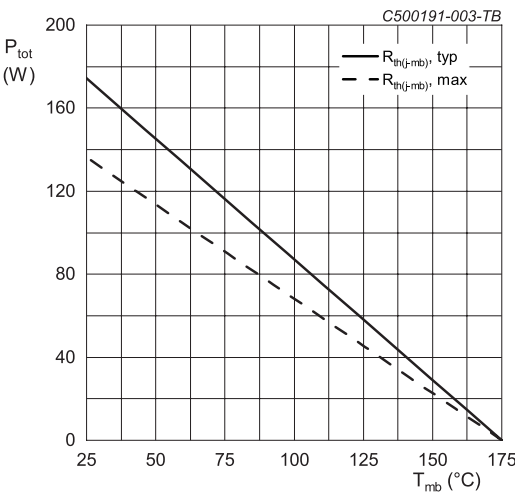


Fig. 3. Total power dissipation as a function of mounting base temperature

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	0.86	1.1	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

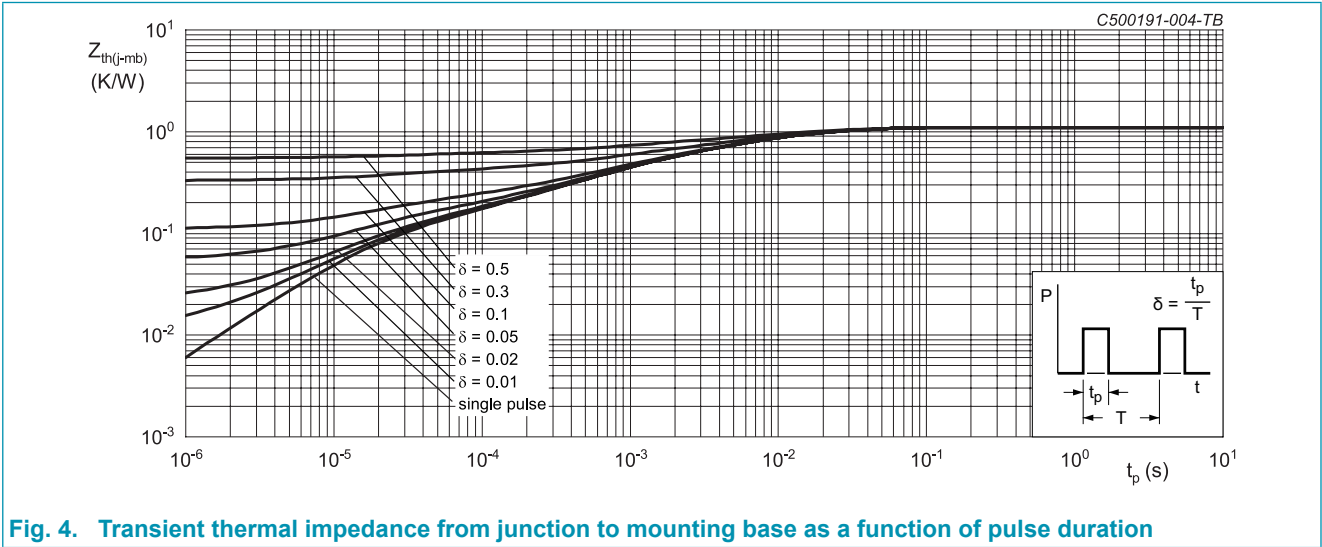
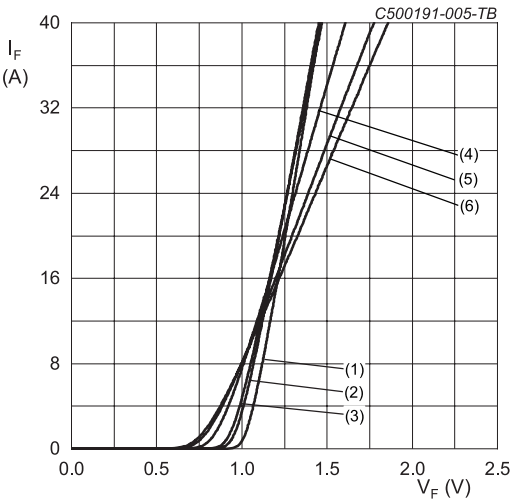


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 20 A; T _J = 25 °C; Fig. 5		-	1.26	1.40	V
		I _F = 20 A; T _J = 150 °C; Fig. 5		-	1.35	1.55	V
		I _F = 20 A; T _J = 175 °C; Fig. 5		-	1.40	1.60	V
I _R	reverse current	V _R = 650 V; T _J = 25 °C; Fig. 6		-	2	100	μA
		V _R = 650 V; T _J = 175 °C; Fig. 6		-	30	400	μA
Dynamic characteristics							
Q _r	recovered charge	I _F = 20 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 7		-	48	-	nC
C _d	diode capacitance	f = 1 MHz; V _R = 1 V; T _J = 25 °C		-	1005	-	pF
		f = 1 MHz; V _R = 300 V; T _J = 25 °C		-	110	-	pF
		f = 1 MHz; V _R = 600 V; T _J = 25 °C		-	102	-	pF
E _{as}	non-repetitive avalanche energy	I _R = 7.8 A; L = 5 mH; T _{j(init)} = 25 °C		150	-	-	mJ



V_o = 1.054 V; R_s = 0.0270 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

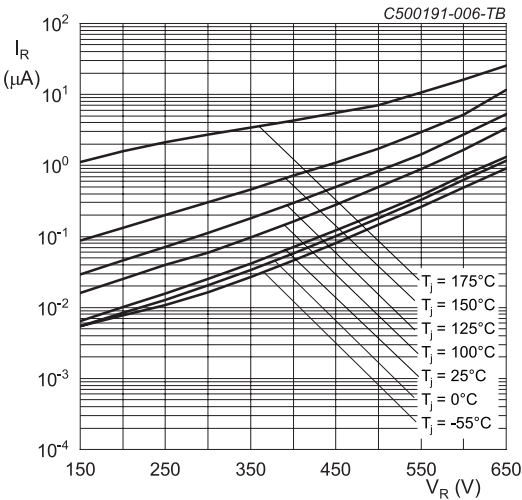


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

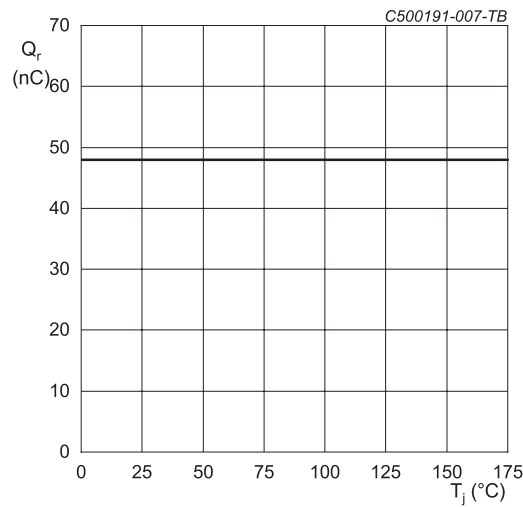
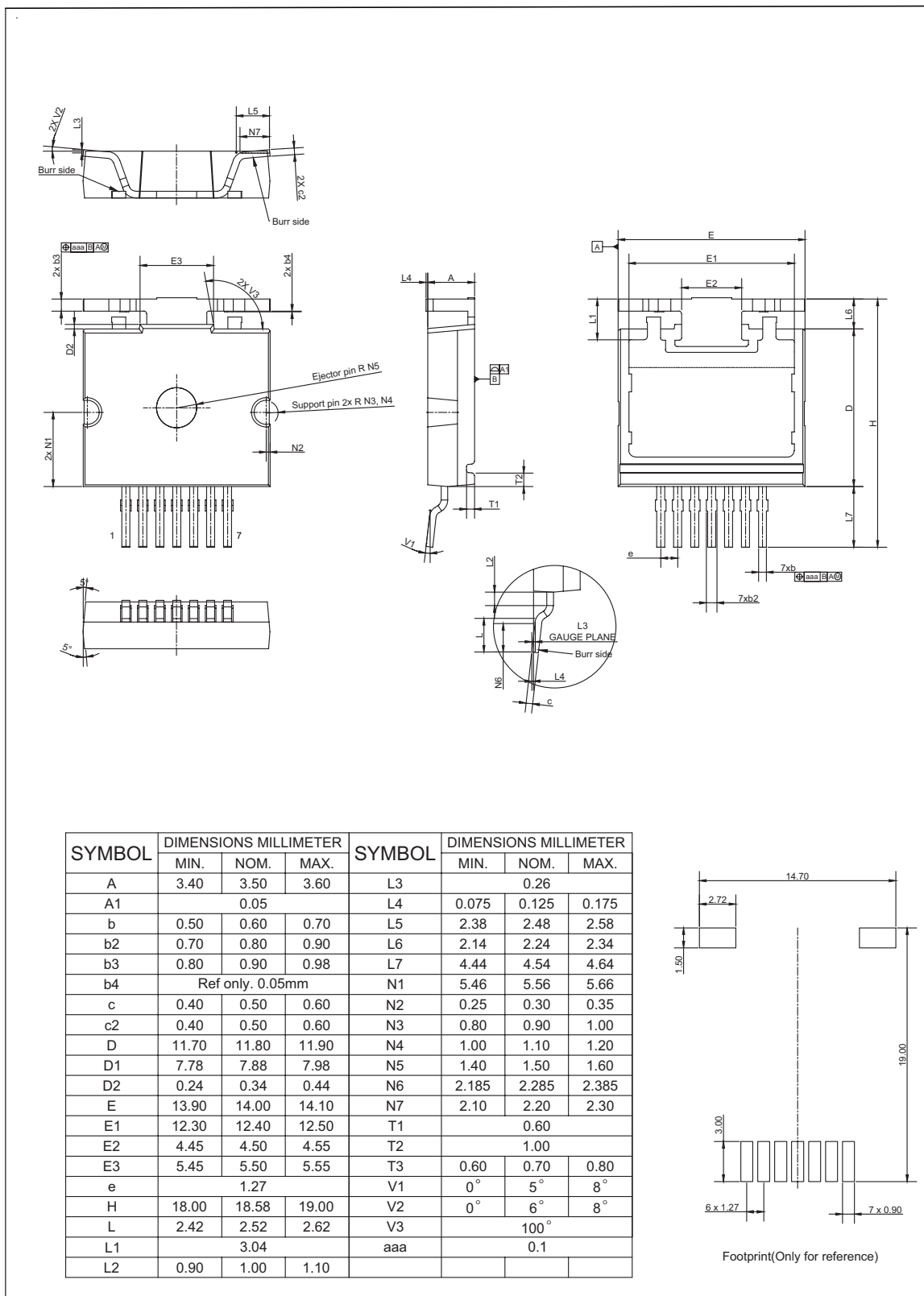


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline



12. 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.
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- [2] The term 'short data sheet' is explained in section "Definitions".
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