

## 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 6<sup>th</sup> 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 inverter and MPPT circuit
- Motor Drives

## 4. Quick reference data

Table 1. Quick reference data

Table 7. Quick reference data							
Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V <sub>RRM</sub>	repetitive peak reverse voltage		650				V
I <sub>F</sub>	continuous forward current	T <sub>mb</sub> ≤ 149 °C, DC; <a href="#">Fig. 2</a>	10				A
T <sub>j</sub>	junction temperature		175				°C
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 10 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>		-	1.29	1.45	V
		I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>		-	1.45	1.65	V
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 10 A; dI <sub>F</sub> /dt = 500 A/μs; V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	24	-	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
WNSC6D10650TB	TSPAK	WNSC6D10650TB6J	Reel	600	TSPAK	06-Dec-2024

7. Marking

Table 4. Marking codes

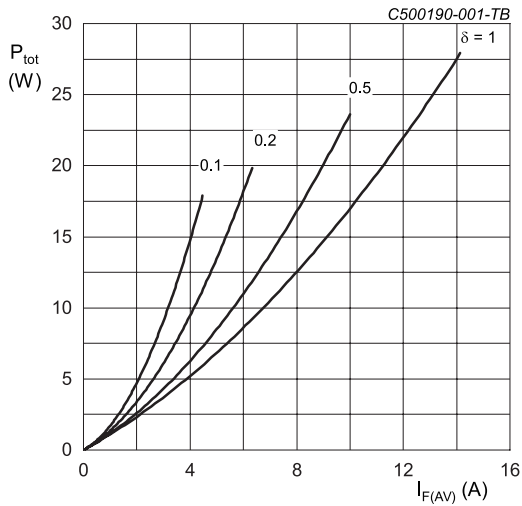
Type number	Marking codes
WNSC6D10650TB	WNSC6D 10650TB

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	$T_{mb} \leq 149\text{ }^{\circ}\text{C}$ ; DC; Fig. 2		10	A
		$T_{mb} \leq 125\text{ }^{\circ}\text{C}$ ; DC; Fig. 2		16	A
		$T_{mb} \leq 25\text{ }^{\circ}\text{C}$ ; DC; Fig. 2		31	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		25	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		70	A
		$t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; square-wave pulse		665	A
$I^2t$	$I^2t$ for fusing	$t_p = 10\text{ ms}$ ; SIN		24.5	$\text{A}^2\text{s}$
$T_{stg}$	storage temperature			-55 to 175	$^{\circ}\text{C}$
$T_j$	junction temperature			-55 to 175	$^{\circ}\text{C}$



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_o = 1.036\text{ V}; R_s = 0.0664\text{ }\Omega$$

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

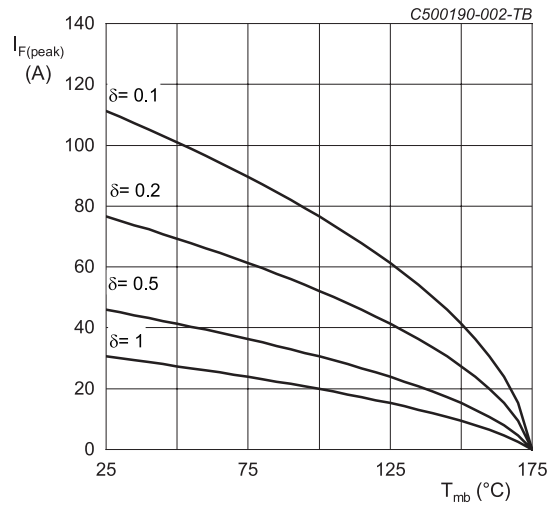


Fig. 2. Current derating as a function of mounting base temperature

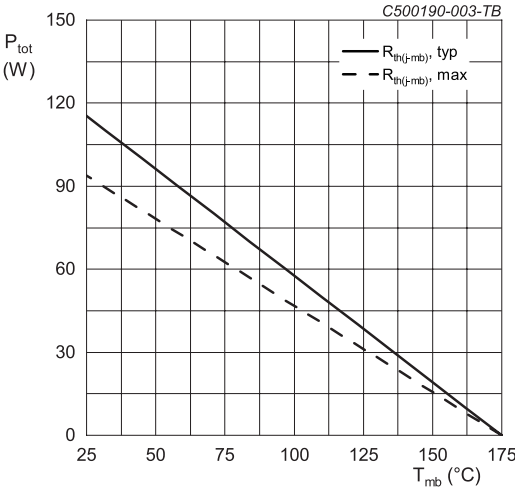


Fig. 3. Total power dissipation as a function of mounting base temperature

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	<a href="#">Fig. 4</a>		-	1.3	1.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

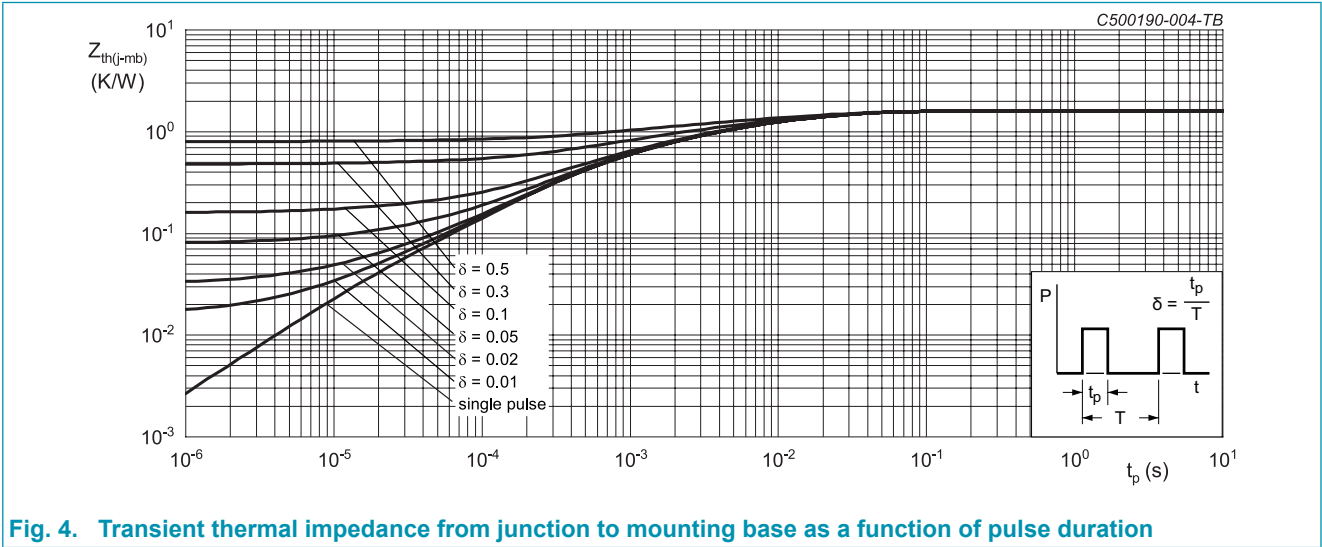
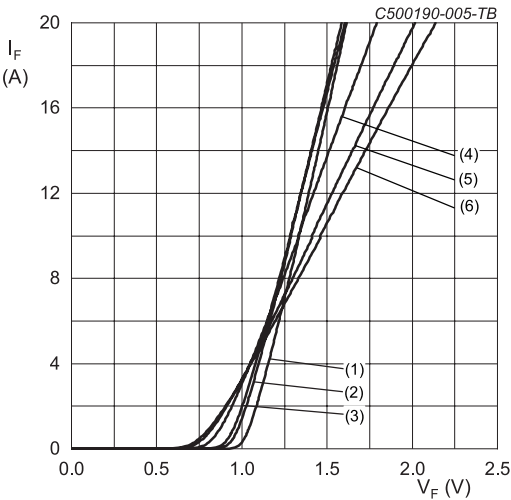


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 10 A; T <sub>J</sub> = 25 °C; <a href="#">Fig. 5</a>		-	1.29	1.45	V
		I <sub>F</sub> = 10 A; T <sub>J</sub> = 150 °C; <a href="#">Fig. 5</a>		-	1.45	1.65	V
		I <sub>F</sub> = 10 A; T <sub>J</sub> = 175 °C; <a href="#">Fig. 5</a>		-	1.50	1.70	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>J</sub> = 25 °C; <a href="#">Fig. 6</a>		-	1	50	μA
		V <sub>R</sub> = 650 V; T <sub>J</sub> = 175 °C; <a href="#">Fig. 6</a>		-	15	200	μA
Dynamic characteristics							
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 10 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>J</sub> = 25 °C; <a href="#">Fig. 7</a>		-	24	-	nC
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>J</sub> = 25 °C		-	500	-	pF
		f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>J</sub> = 25 °C		-	58	-	pF
		f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>J</sub> = 25 °C		-	52	-	pF
E <sub>as</sub>	non-repetitive avalanche energy	I <sub>R</sub> = 5 A; L = 5 mH; T <sub>J</sub> (init) = 25 °C		60	-	-	mJ



V<sub>o</sub> = 1.036 V; R<sub>s</sub> = 0.0664 Ω  
(1) T<sub>J</sub> = -55 °C; typical values  
(2) T<sub>J</sub> = 0 °C; typical values  
(3) T<sub>J</sub> = 25 °C; typical values  
(4) T<sub>J</sub> = 100 °C; typical values  
(5) T<sub>J</sub> = 150 °C; typical values  
(6) T<sub>J</sub> = 175 °C; typical values

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

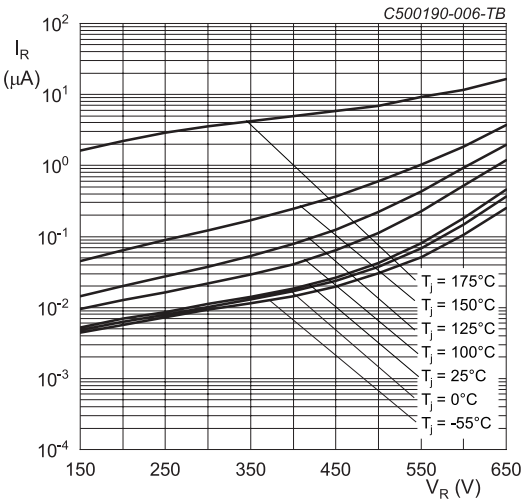
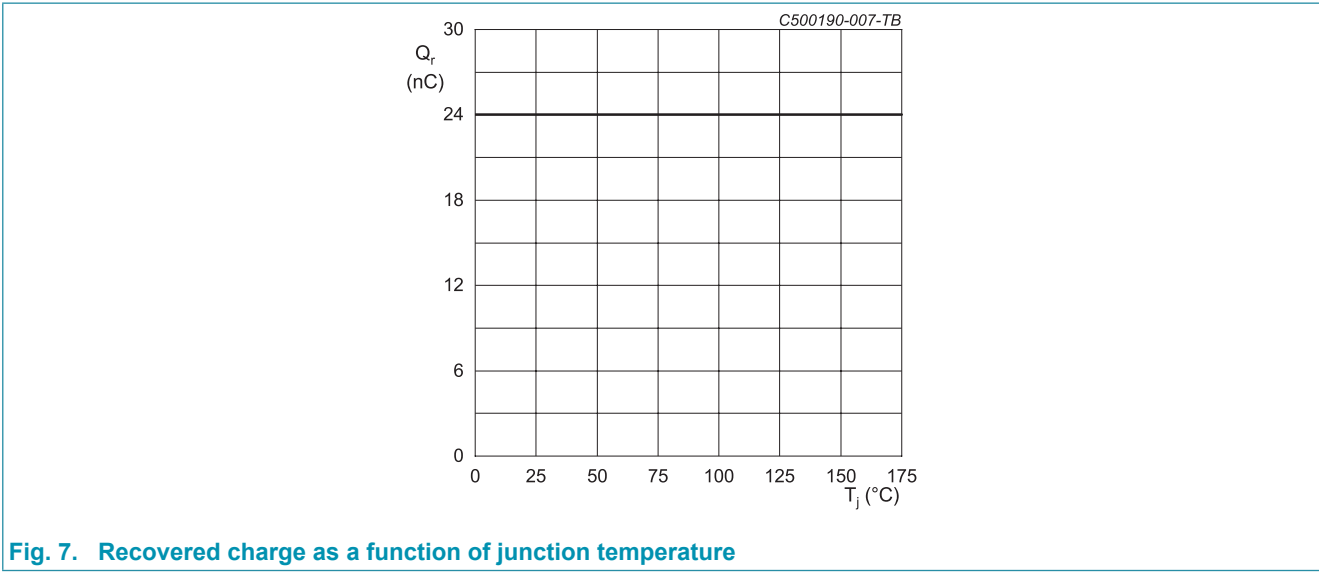
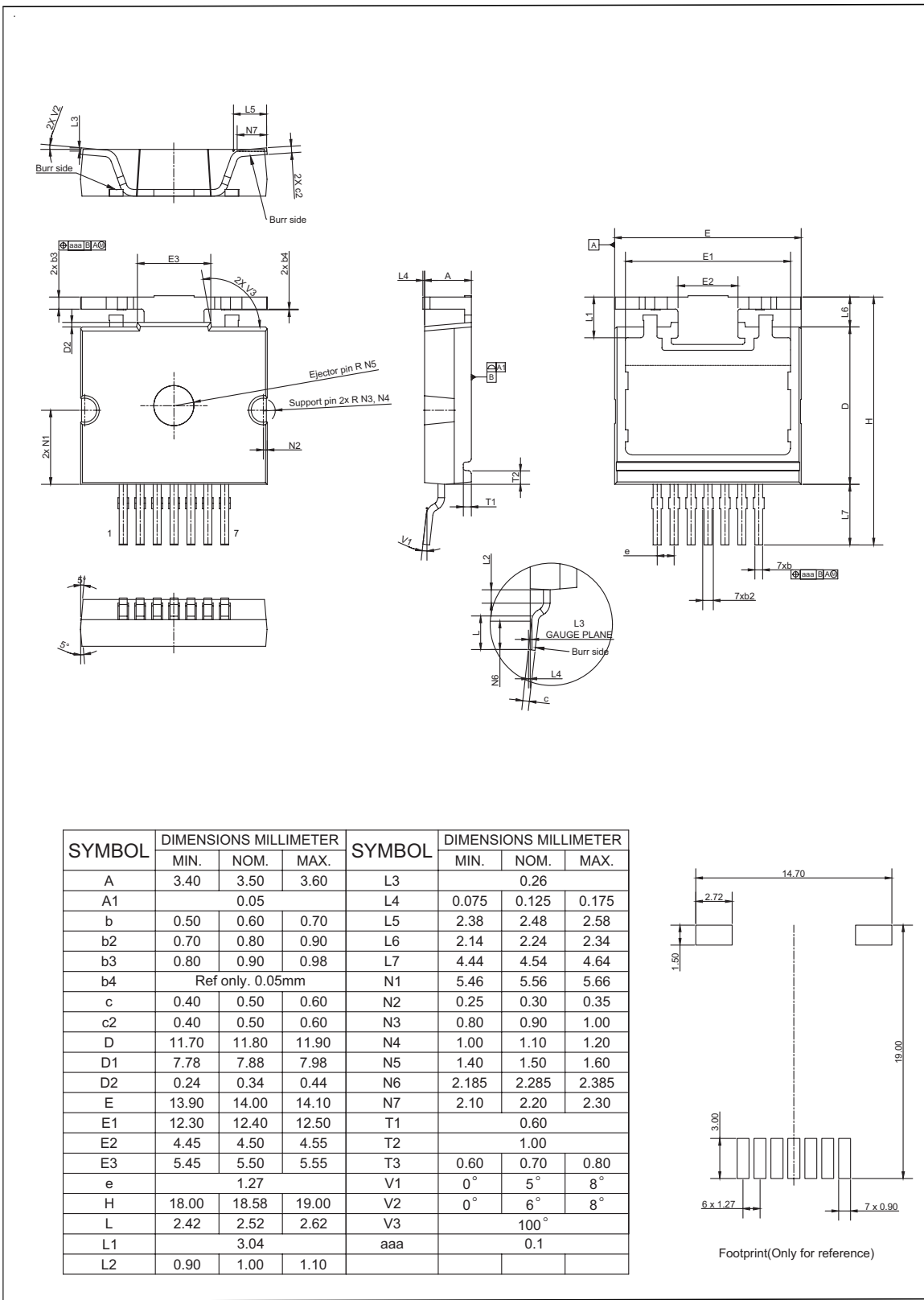


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value



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.
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