WNSC12650W

Silicon Carbide Diode

Rev.01 - 12 November 2020 Product data sheet

1. General description

Silicon Carbide Schottky diode in a TO247-2L plastic package, designed for high frequency switched-mode power supplies.

2. Features and benefits

- Highly stable switching performance
- High forward surge capability I_{FSM}
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

3. Applications

- Power factor correction
- Telecom / Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED / OLED TV
- Motor Drives

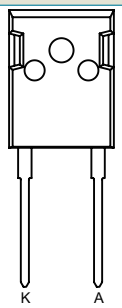
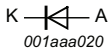
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	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; $T_{mb} \leq 127$ °C; Fig. 1; Fig. 2; Fig. 3	12				A
T_j	junction temperature		175				°C
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 12 A; T_j = 25 °C; Fig. 5		-	1.5	1.7	V
		I_F = 12 A; T_j = 150 °C; Fig. 5		-	1.68	2	V
Dynamic characteristics							
Q_r	recovered charge	I_F = 12 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 7		-	16	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 TO247-2L	
2	A	anode		
mb	mb	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
WNSC12650W	TO247-2L	WNSC12650WQ	Tube	30	TO247L-2L	10-Nov-2020

7. Marking

Table 4. Marking codes

Type number	Marking codes
WNSC12650W	WNSC 12650W

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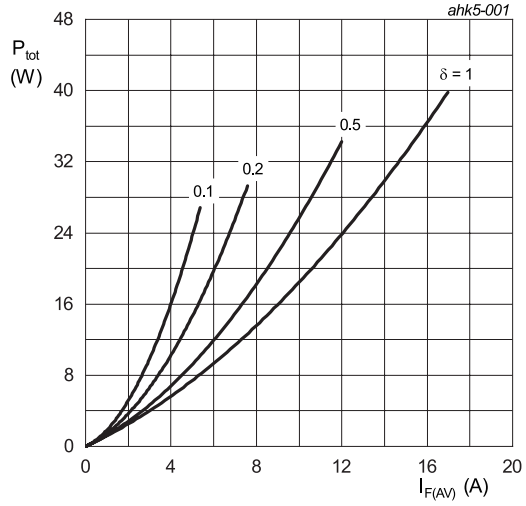
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8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	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; $T_{mb} \leq 127$ °C; Fig. 1; Fig. 2; Fig. 3	12	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_c \leq 127$ °C; square-wave pulse	24	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	72	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse	620	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)}$ = 25 °C; t_p = 10 ms	25.9	A^2s
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		175	°C



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
V_o = 1.120 V; R_s = 0.0723 Ω

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

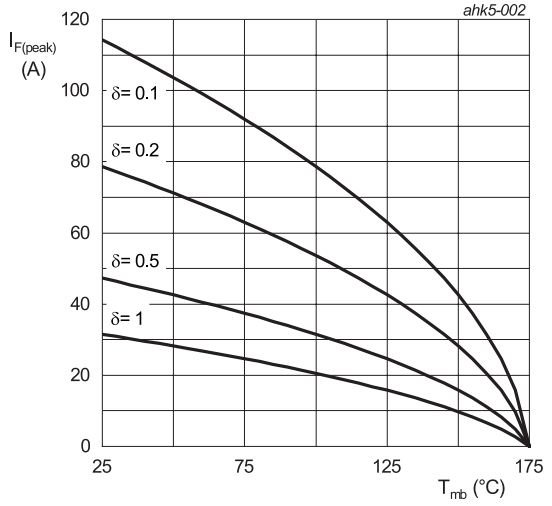


Fig. 2. Current derating as a function of mounting base temperature

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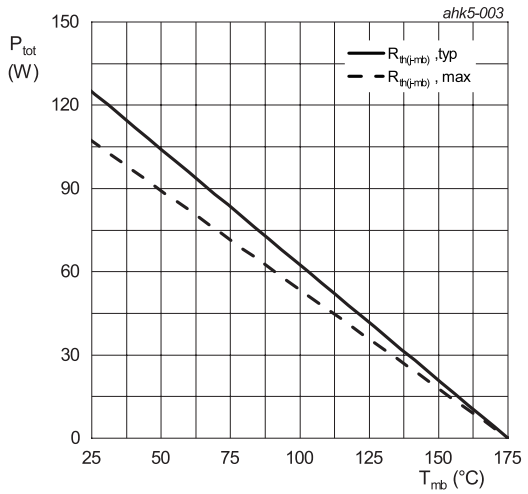


Fig. 3. Total power dissipation as a function of mounting base temperature

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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		-	1.2	1.4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	40	-	K/W

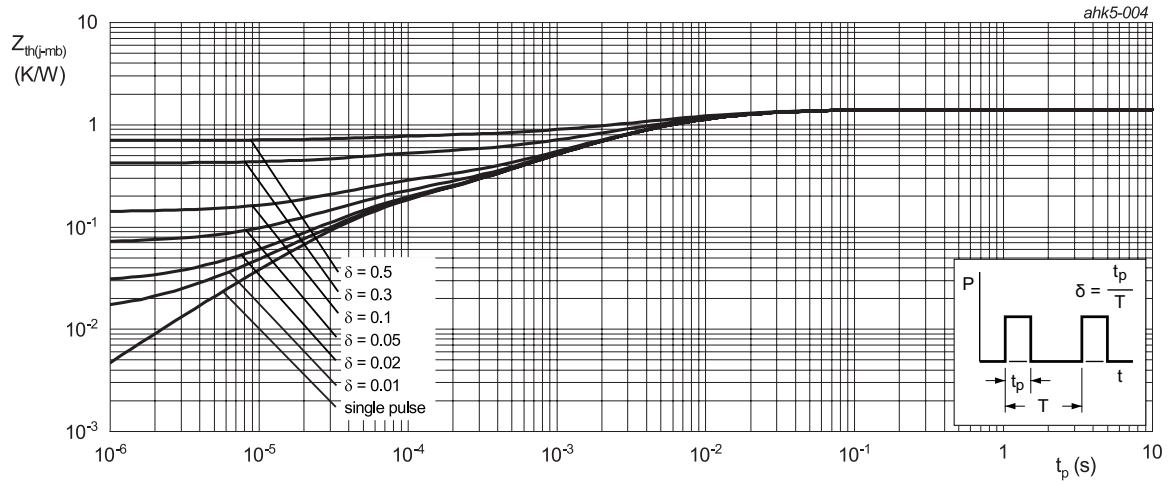


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

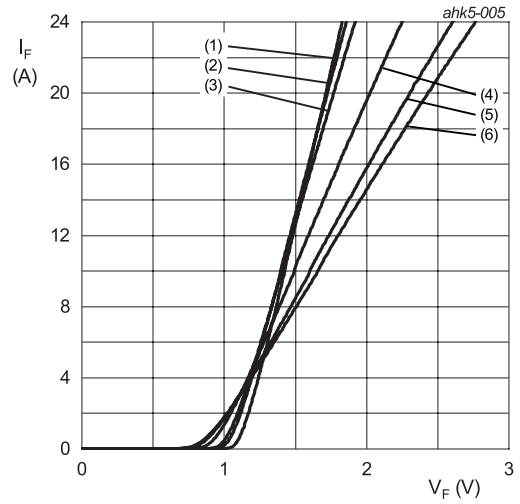
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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	I_F = 12 A; T_j = 25 °C; Fig. 5		-	1.5	1.7	V
		I_F = 12 A; T_j = 150 °C; Fig. 5			1.68	2	V
		I_F = 12 A; T_j = 175 °C; Fig. 5		-	1.75	2.1	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C; Fig. 6		-	-	60	µA
		V_R = 650 V; T_j = 175 °C; Fig. 6		-	-	240	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 12 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	16	-	nC
C_d	diode capacitance	f = 1 MHz; V_R = 1 V; T_j = 25 °C		-	328	-	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		-	34	-	pF
E_{as}	non-repetitive avalanche energy	I_R = 6 A; L = 5 mH; $T_{j(init)}$ = 25 °C		90	-	-	mJ



V_o = 1.120 V; R_s = 0.0723 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

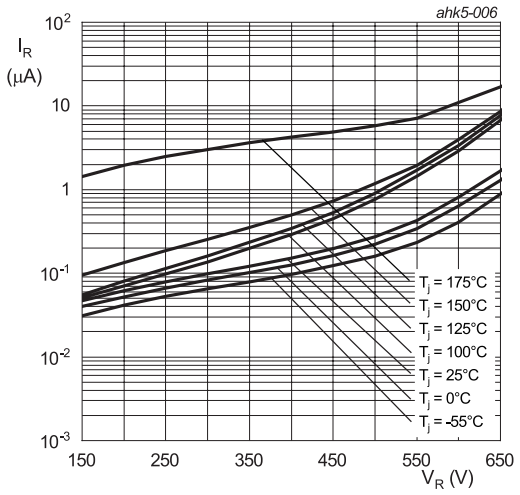


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

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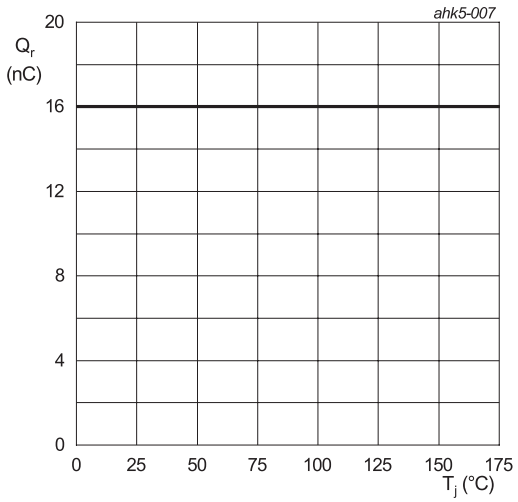


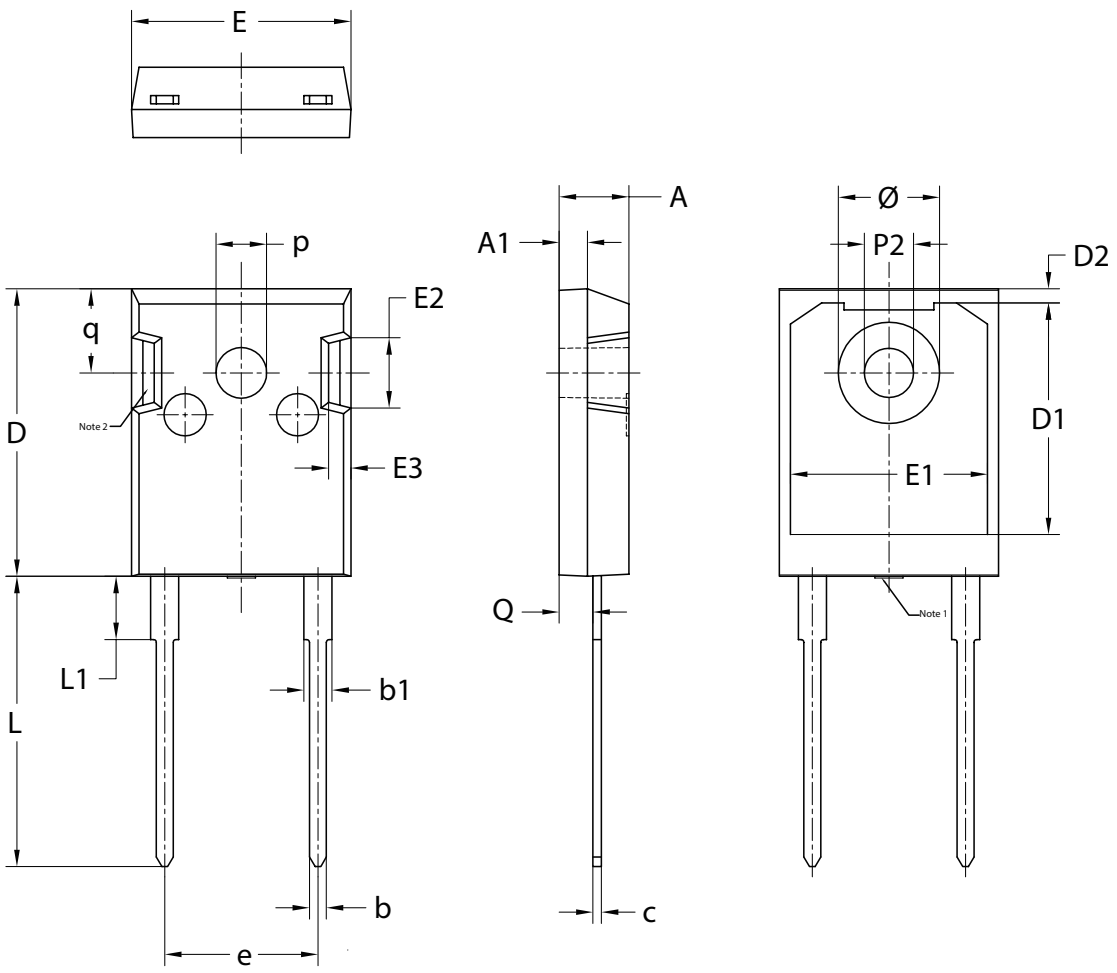
Fig. 7. Recovered charge as a function of junction temperature

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11. Package outline

Plastic single-ended through-hole package; heatsink mounted;1 mounting hole; 2 leads TO-247 TO247-2L



UNIT	A	A_1	b	b_1	c	D	D_1 (2)	D_2	E	E_1	E_2	E_3	e	L	L_1	P_2	p	Q	q	Ø
mm	5.20 4.70	2.10 1.90	1.40 1.00	2.20 1.80	0.70 0.50	20.60 20.30	16.20 16.87	1.20 0.80	15.75 15.45	14.22 13.82	5.20 4.80	1.80 1.40	10.90 BSC	20.72 20.22	4.75 4.25	3.60 3.40	3.70 3.50	2.60 2.20	6.18 5.78	7.30 7.10

Note:
1. Mold resin protrusion max 0.127mm.
2. Metal exposed with Sn plating.

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