WNSC6D20650W-A

Silicon Carbide Diode

Rev.01 - 30 May 2023 Product data sheet

1. General description

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

RoHS Halogen-Free

AEC - Q101 Qualified

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
- AEC-Q101 qualified

3. Applications

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

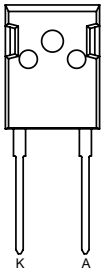
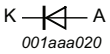
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; T_{mb} ≤ 127 °C; 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 = 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
Dynamic characteristics							
Q_r	recovered charge	I_F = 20 A; dI_F/dt = 500 A/µs; V_R = 400 V; T_j = 25 °C; Fig. 7		-	48	-	nC

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 TO247-2L	 *001aaa020*
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
WNSC6D20650W-A	TO247-2L	WNSC6D20650W-A6Q	Tube	30	TO247L-2L	10-Nov-2020

7. Marking

Table 4. Marking codes

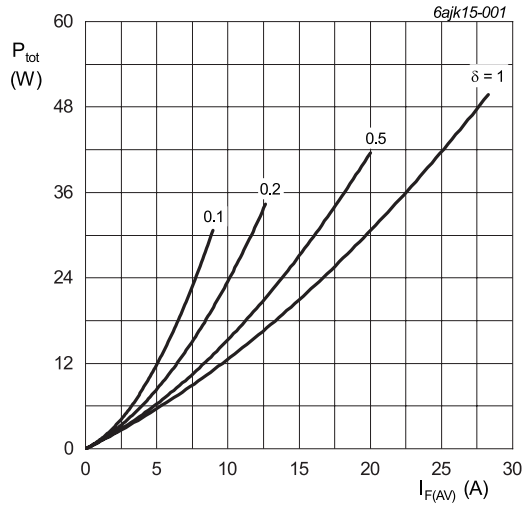
Type number	Marking codes
WNSC6D20650W-A	WNSC6D 20650W-A

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
$I_{F(AV)}$	average forward current	δ = 0.5; square-wave pulse; $T_{mb} \leq 127$ °C; Fig. 1; Fig. 2; Fig. 3		20	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 127$ °C; square-wave pulse		40	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		140	A
		t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse		1000	A
I^2t	I^2t for fusing	sine-wave pulse; $T_{j(init)}$ = 25 °C; t_p = 10 ms		98	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 = 0.984 V; R_s = 0.0274 Ω

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

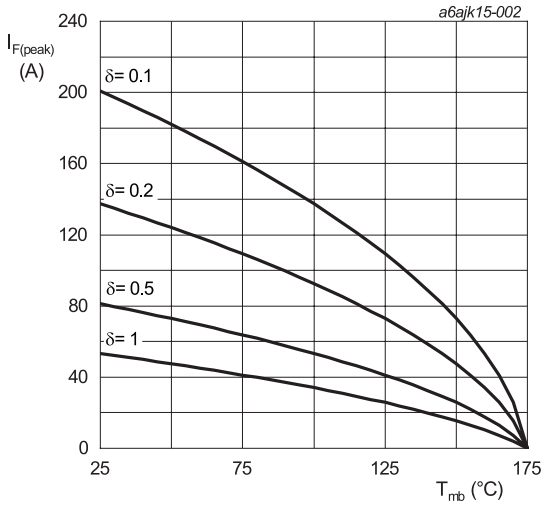


Fig. 2. Current derating as a function of mounting base temperature

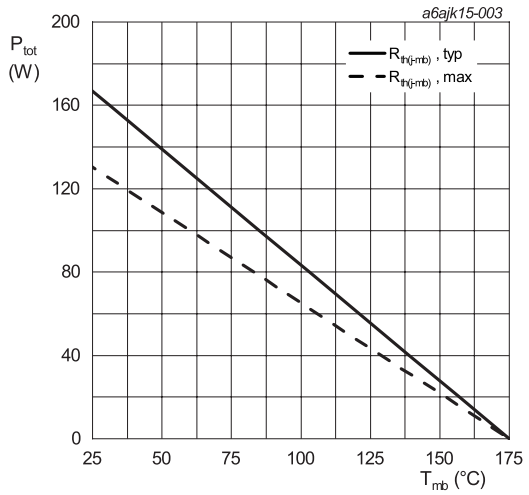


Fig. 3. Total power dissipation as a function of mounting base temperature

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	0.9	1.15	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

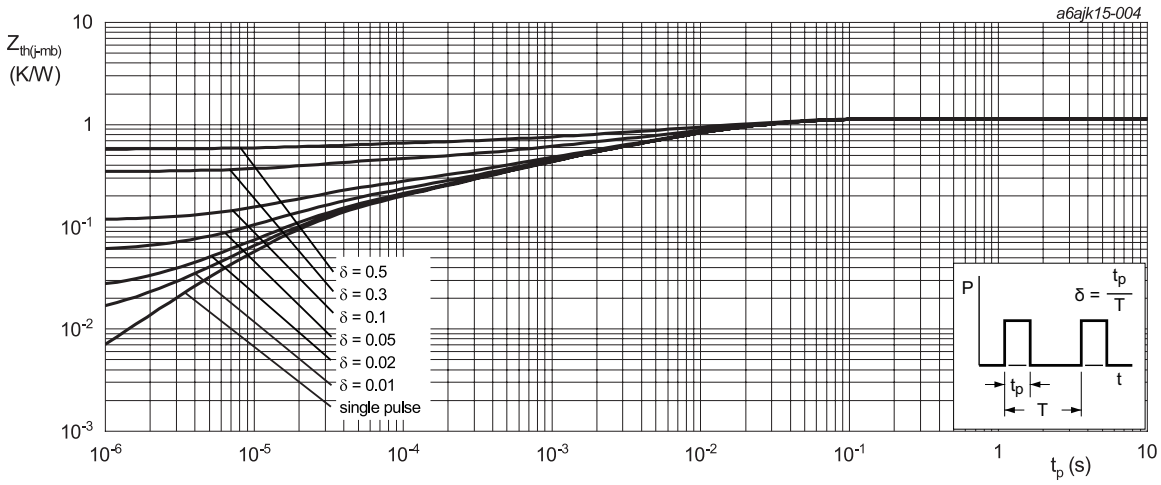
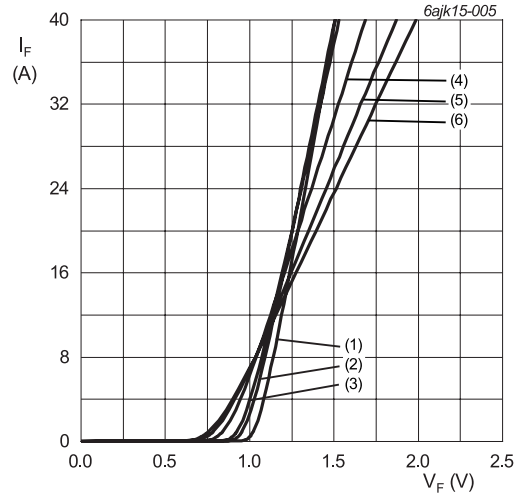


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	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 = 0.984 V; R_s = 0.0274 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

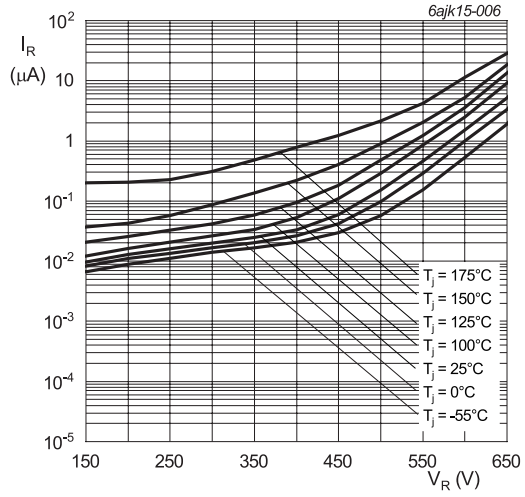


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

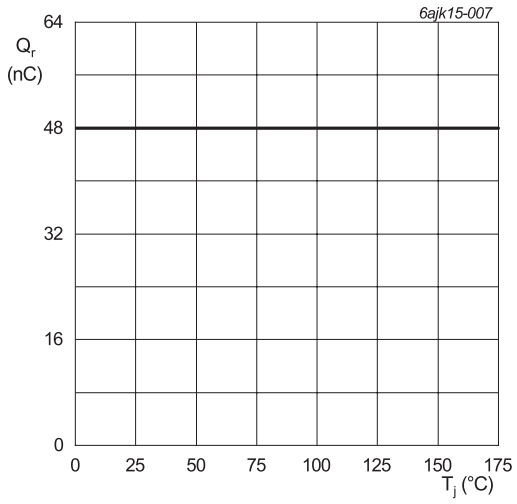
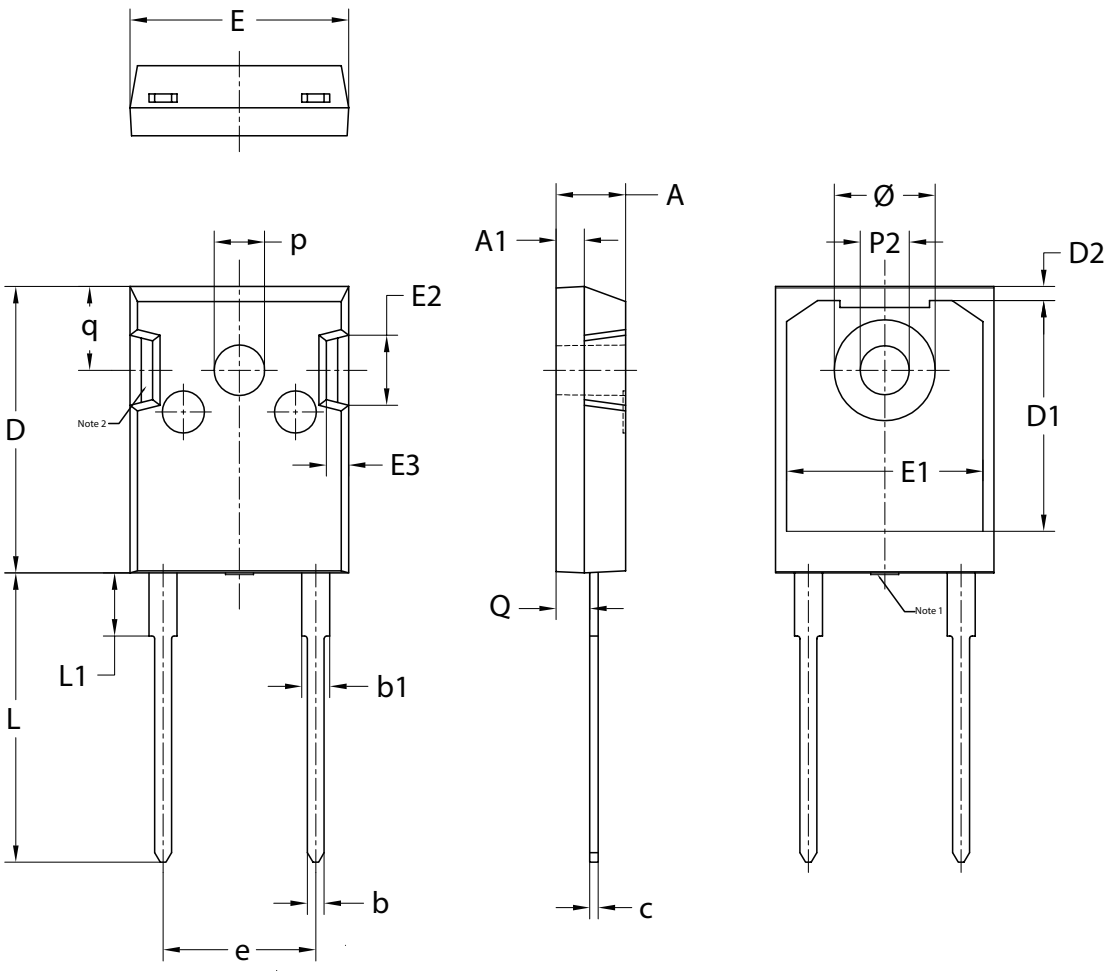


Fig. 7. Recovered charge as a function of junction temperature

11. Package outline

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.

12. 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.
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Date of release: 30 May 2023