# WNSC6D20650-A

## Silicon Carbide Diode

Rev.01 - 30 May 2023 Product data sheet

## 1. General description

Silicon Carbide Schottky diode in a TO220-2L 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

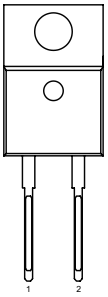
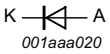
## 4. Quick reference data

**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; $T_{mb}$ ≤ 138 °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 |  |  |
| 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 |
|---|---|---|---|---|---|---|
| WNSC6D20650-A | TO220-2L | WNSC6D20650-A6Q | Tube | 50 | TO220N-2L | 04-May-2023 |

## 7. Marking

**Table 4. Marking codes**

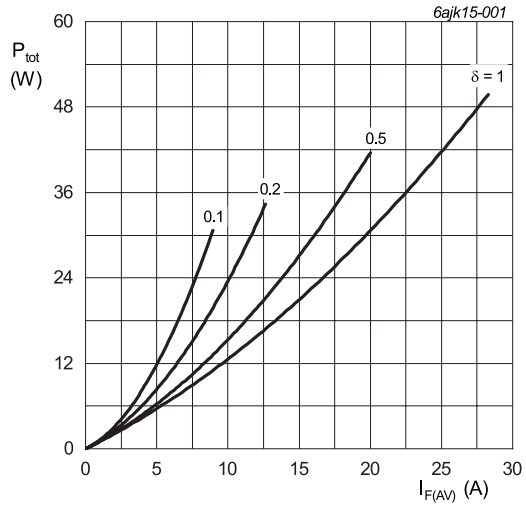
| Type number | Marking codes |
|---|---|
| WNSC6D20650-A | WNSC6D<br>20650-A |

# 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; $T_{mb} \leq 138$ °C; Fig. 1; Fig. 2; Fig. 3 | | 20 | A |
| $I_{FRM}$ | repetitive peak forward current | δ = 0.5; $t_p$ = 25 µs; $T_{mb} \leq 138$ °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**

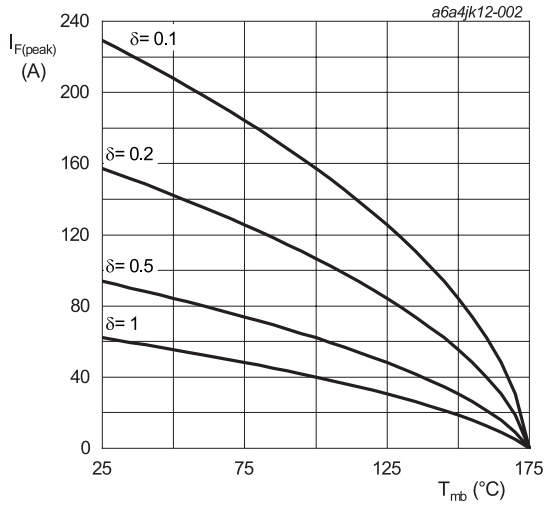



**Fig. 2. Current derating as a function of mounting base temperature**

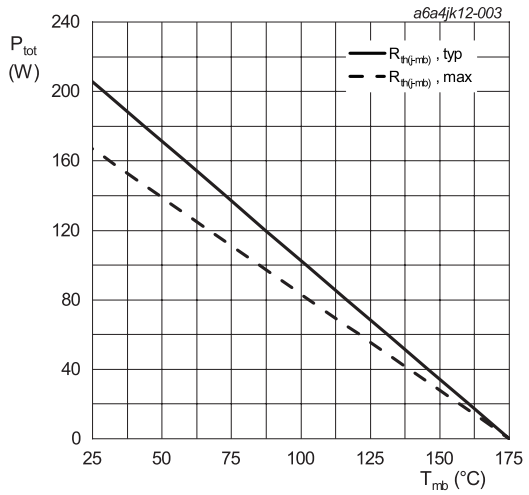



**Fig. 3. Total power dissipation as a function of mounting base temperature**

# 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 | | - | 0.73 | 0.9 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | - | 60 | - | K/W |

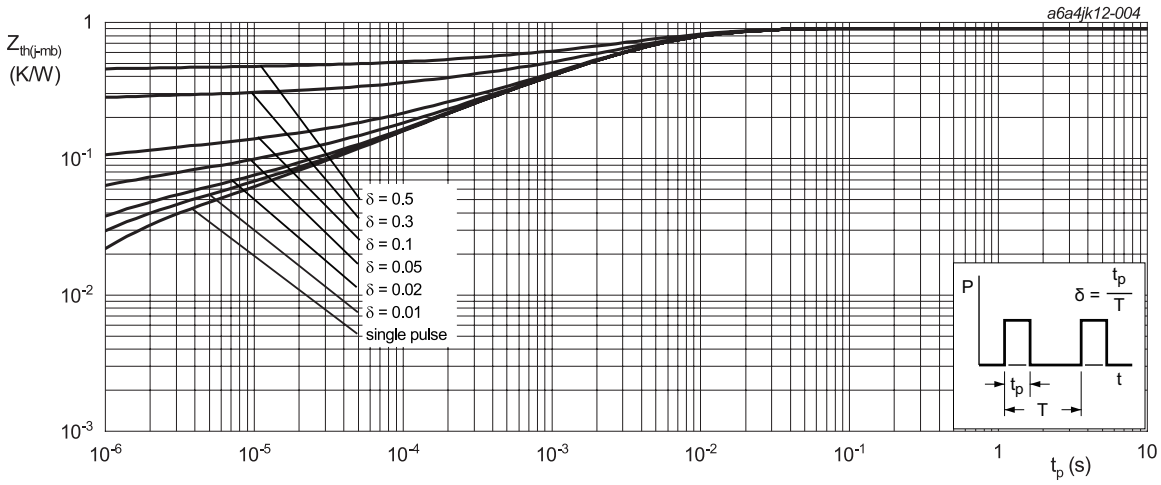
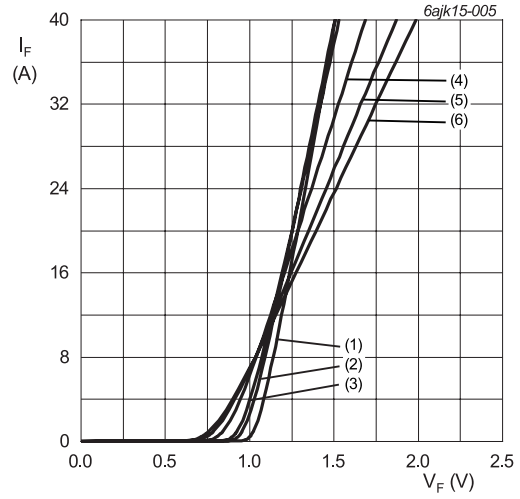



**Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration**

# 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**

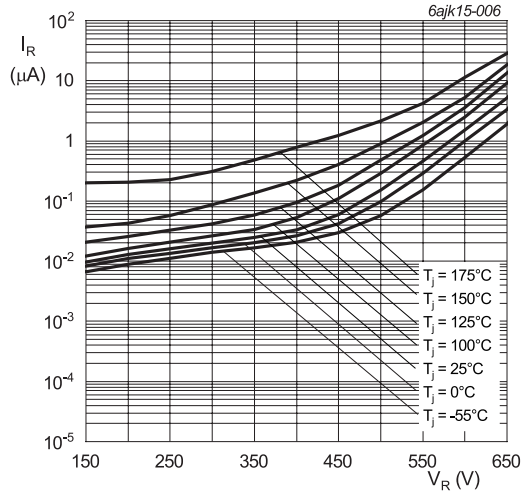



**Fig. 6. Reverse leakage current as a function of reverse voltage; typical value**

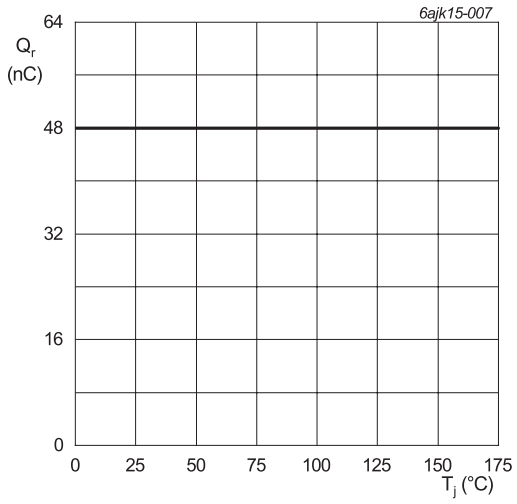
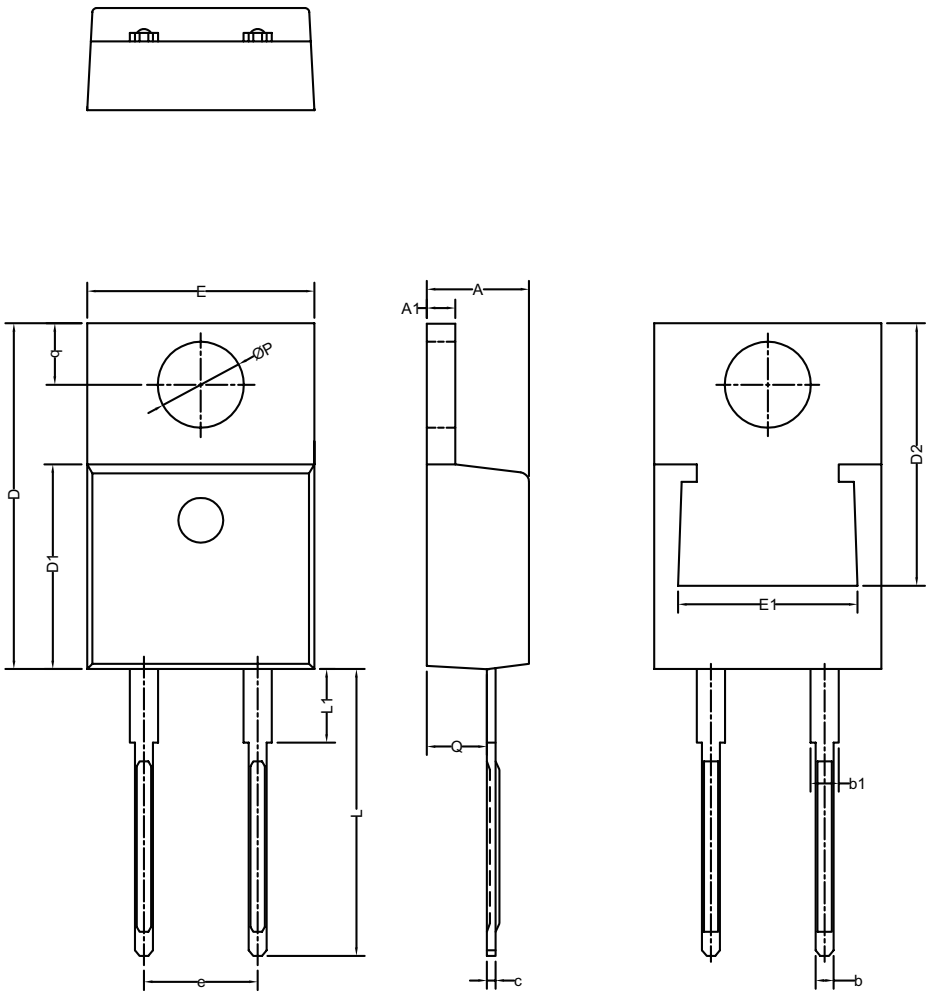



**Fig. 7. Recovered charge as a function of junction temperature**

## 11. Package outline

Plastic single-ended package;heatsink mounted;1 mounting hole; 2 leads TO-220AB TO220-2L




Note:
All dimensions do not include mold flash or protrusion.

| Unit | | A | A1 | b | b1 | c | D | D1 | D2 | E | E1 | e | L | L1 | P | Q | q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MM | min | 4.40 | 1.20 | 0.76 | 1.20 | 0.35 | 15.15 | 9.00 | 12.20 | 9.96 | 7.60 | 5.08 (BSC) | 12.70 | 2.80 | 3.75 | 2.50 | 2.60 |
| | max | 4.72 | 1.40 | 0.92 | 1.36 | 0.46 | 15.80 | 9.32 | 13.00 | 10.40 | 8.20 | | 13.20 | 3.30 | 3.88 | 2.79 | 2.90 |

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| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
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