

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

- 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

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

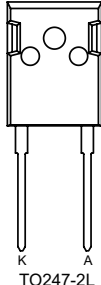

4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Notes | Values | | | Unit |
|--------------------------------|---------------------------------|---|-------|------------|------|------|------|
| Absolute maximum rating | | | | | | | |
| V_{RRM} | repetitive peak reverse voltage | | | 650 | | | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 133$ °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/ μ s; $V_R = 400$ 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 |  <p style="text-align: center;">TO247-2L</p> |  |
| 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 | TO247-2L | WNSC6D20650W6Q | Tube | 30 | TO247L-2L | 10-Nov-2020 |

7. Marking

Table 4. Marking codes

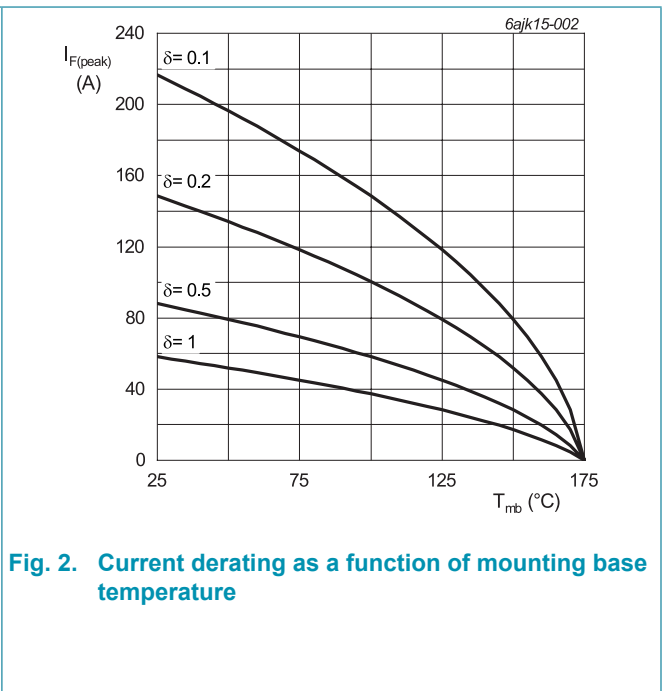
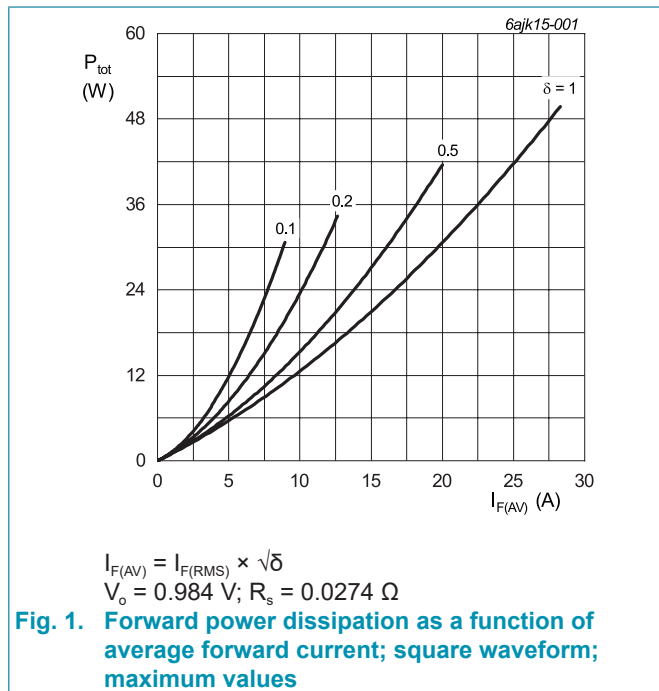
| Type number | Marking codes |
|--------------|------------------|
| WNSC6D20650W | WNSC6D 20650W |

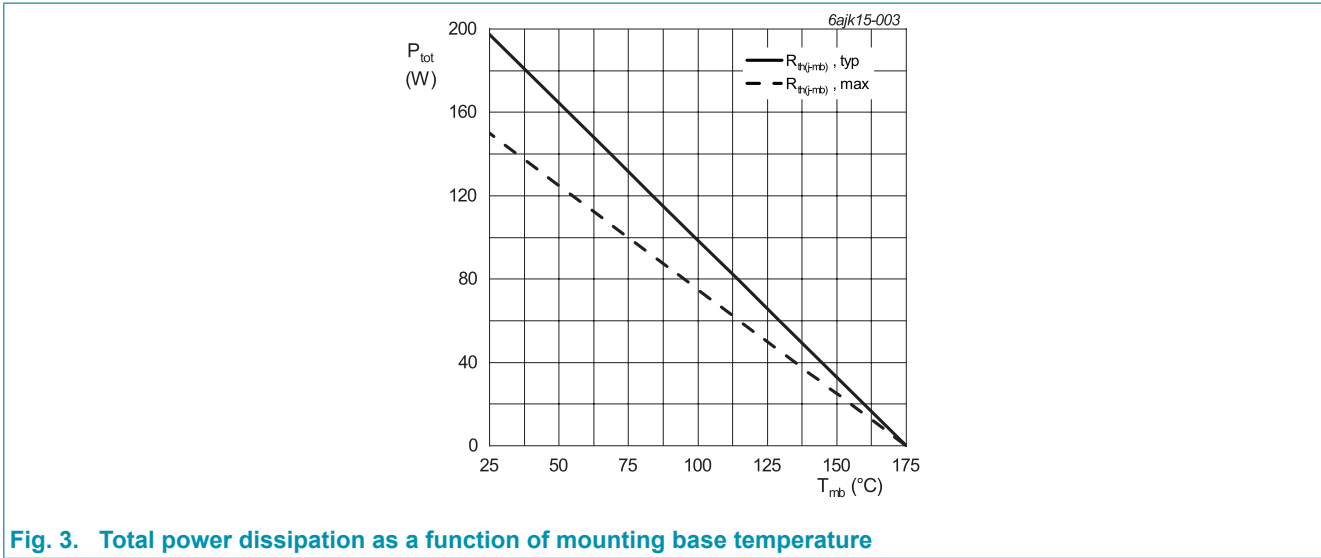
8. Limiting values

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 | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 133\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | | 20 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 133\text{ }^\circ\text{C}$; square-wave pulse | | 40 | 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 | | 170 | A |
| | | $t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; square-wave pulse | | 1000 | A |
| I^2t | I^2t for fusing | sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; $t_p = 10\text{ ms}$ | | 144.5 | A^2s |
| T_{stg} | storage temperature | | | -55 to 175 | $^\circ\text{C}$ |
| T_j | junction temperature | | | -55 to 175 | $^\circ\text{C}$ |





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 | | - | 0.75 | 1 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | - | 60 | - | K/W |

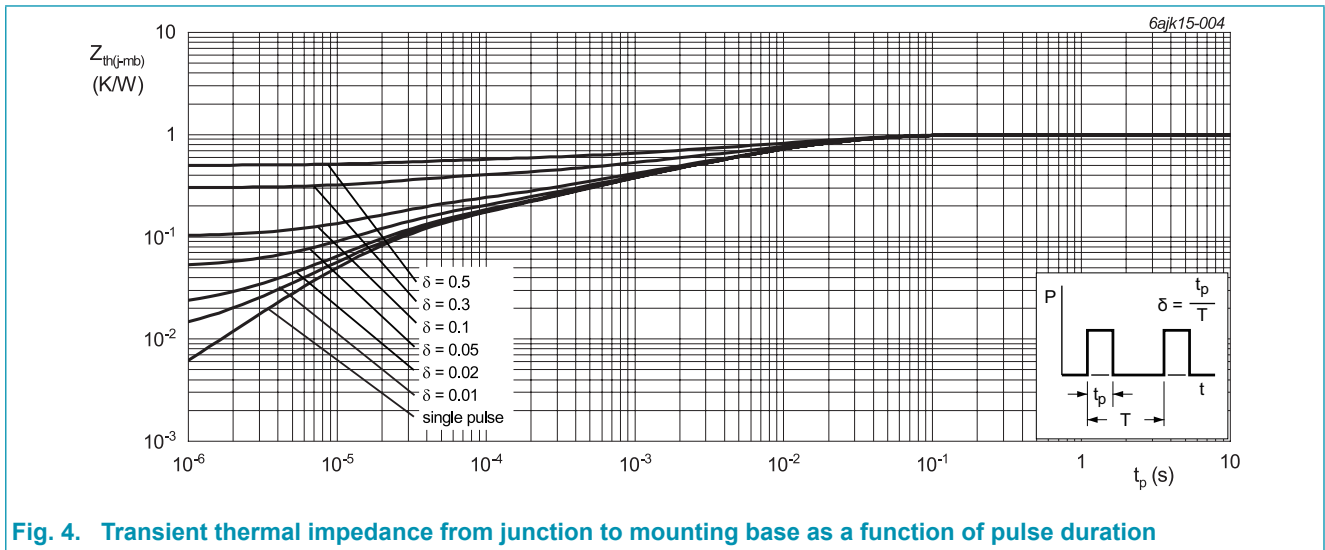
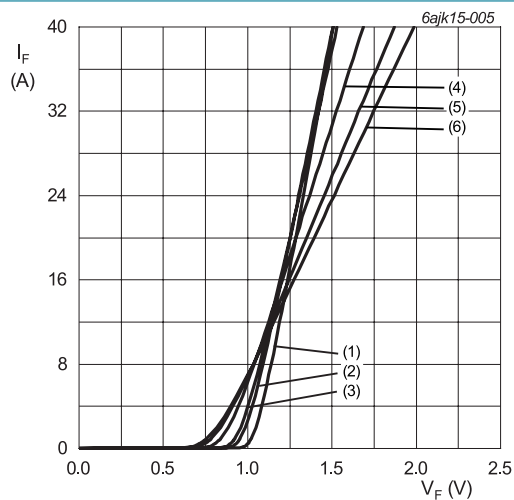


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Notes | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|---|-------|-----|------|------|---------------|
| Static characteristics | | | | | | | |
| V_F | forward current | $I_F = 20\text{ A}; T_J = 25\text{ °C};$ Fig. 5 | | - | 1.26 | 1.40 | V |
| | | $I_F = 20\text{ A}; T_J = 150\text{ °C};$ Fig. 5 | | - | 1.35 | 1.55 | V |
| | | $I_F = 20\text{ A}; T_J = 175\text{ °C};$ Fig. 5 | | - | 1.40 | 1.60 | V |
| I_R | reverse current | $V_R = 650\text{ V}; T_J = 25\text{ °C};$ Fig. 6 | | - | 2 | 100 | μA |
| | | $V_R = 650\text{ V}; T_J = 175\text{ °C};$ Fig. 6 | | - | 30 | 400 | μA |
| Dynamic characteristics | | | | | | | |
| Q_r | recovered charge | $I_F = 20\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_J = 25\text{ °C};$ Fig. 7 | | - | 48 | - | nC |
| C_d | diode capacitance | $f = 1\text{ MHz}; V_R = 1\text{ V}; T_J = 25\text{ °C}$ | | - | 1005 | - | pF |
| | | $f = 1\text{ MHz}; V_R = 300\text{ V}; T_J = 25\text{ °C}$ | | - | 110 | - | pF |
| | | $f = 1\text{ MHz}; V_R = 600\text{ V}; T_J = 25\text{ °C}$ | | - | 102 | - | pF |
| E_{as} | non-repetitive avalanche energy | $I_R = 7.8\text{ A}; L = 5\text{ mH}; T_{j(\text{init})} = 25\text{ °C}$ | | 150 | - | - | mJ |



$V_o = 0.984\text{ V}; R_s = 0.0274\ \Omega$
 (1) $T_J = -55\text{ °C};$ typical values
 (2) $T_J = 0\text{ °C};$ typical values
 (3) $T_J = 25\text{ °C};$ typical values
 (4) $T_J = 100\text{ °C};$ typical values
 (5) $T_J = 150\text{ °C};$ typical values
 (6) $T_J = 175\text{ °C};$ typical values

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

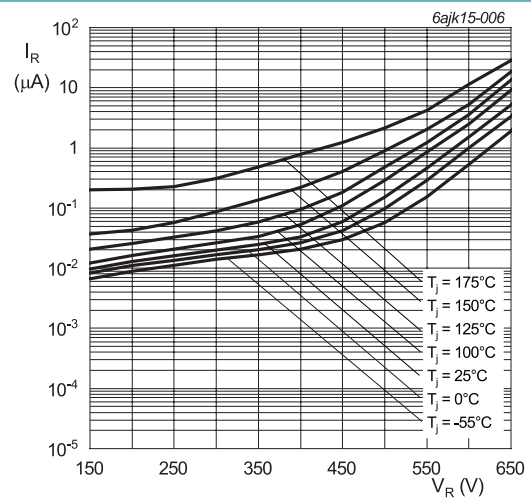


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

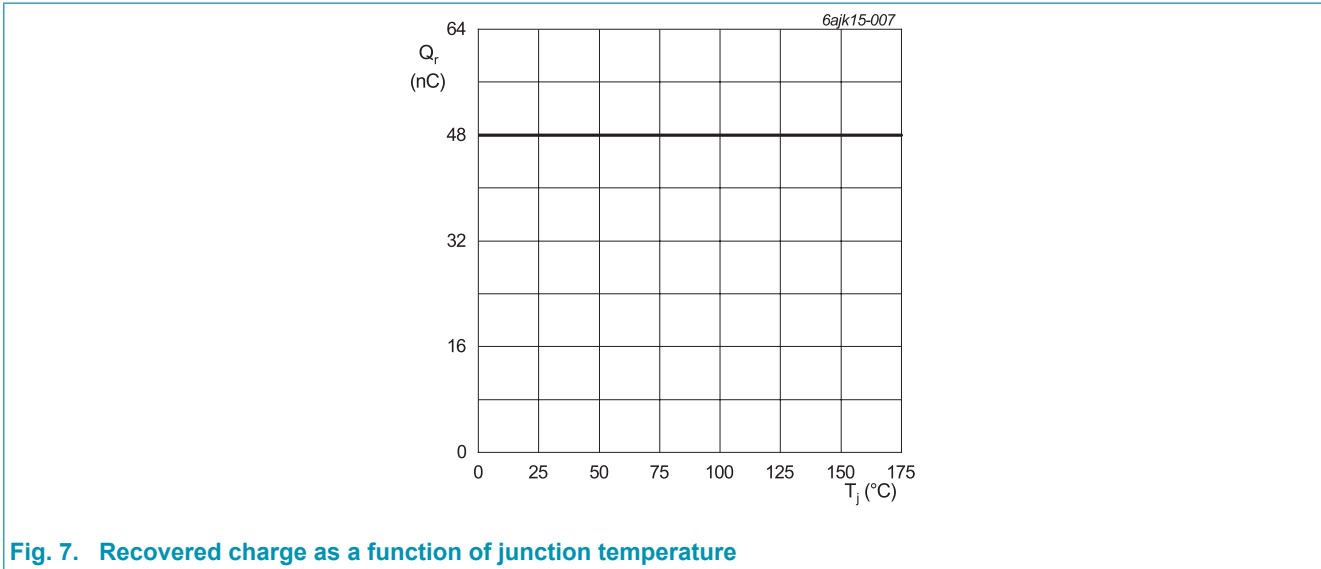
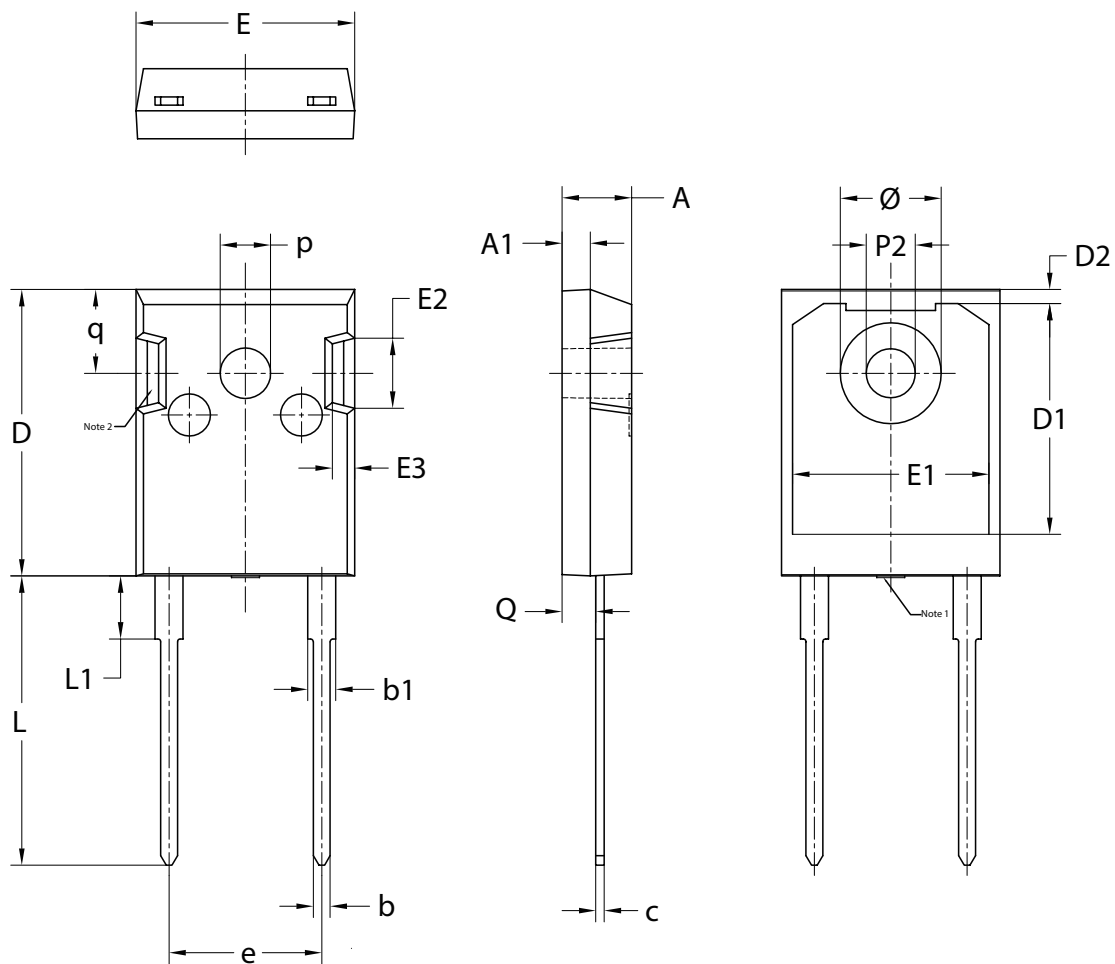


Fig. 7. Recovered charge as a function of junction temperature

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 Ⓜ | D ₂ | E | E ₁ | E ₂ | E ₃ | e | L | L ₁ | P ₂ | p | Q | q | Ø |
|------|------|----------------|------|----------------|------|-------|---------------------|----------------|-------|----------------|----------------|----------------|-------|-------|----------------|----------------|------|------|------|------|
| mm | 5.20 | 2.10 | 1.40 | 2.20 | 0.70 | 20.60 | 16.20 | 1.20 | 15.75 | 14.22 | 5.20 | 1.80 | 10.90 | 20.72 | 4.75 | 3.60 | 3.70 | 2.60 | 6.18 | 7.30 |
| | 4.70 | 1.90 | 1.00 | 1.80 | 0.50 | 20.30 | 16.87 | 0.80 | 15.45 | 13.82 | 4.80 | 1.40 | BSC | 20.22 | 4.25 | 3.40 | 3.50 | 2.20 | 5.78 | 7.10 |

Note:

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

12. Legal information

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|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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