

## 1. General description

Silicon Carbide Schottky diode in a TO220F-2L plastic package, designed for high frequency, high efficiency systems.



## 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
- High junction operating temperature capability ( $T_{j(max)} = 175\text{ °C}$ )
- Insulated package rated at 2500V RMS

## 3. Applications

- Switching mode power supplies
- UPS & energy storage systems
- PV inverter and MPPT circuit
- Battery formation systems
- EV chargers
- Motor Drives

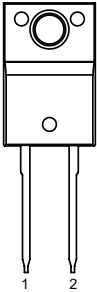
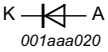
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                  | Parameter                       | Conditions                                                                                                                   | Notes | Values     |      |      | Unit |
|-------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------|------------|------|------|------|
| Absolute maximum rating |                                 |                                                                                                                              |       |            |      |      |      |
| V <sub>RRM</sub>        | repetitive peak reverse voltage |                                                                                                                              |       | 1400       |      |      | V    |
| I <sub>F</sub>          | continuous forward current      | T <sub>h</sub> ≤ 100 °C; DC; <a href="#">Fig. 2</a>                                                                          |       | 5          |      |      | A    |
| T <sub>j</sub>          | junction temperature            |                                                                                                                              |       | -55 to 175 |      |      | °C   |
| Symbol                  | Parameter                       | Conditions                                                                                                                   | Notes | Min        | Typ  | Max  | Unit |
| Static characteristics  |                                 |                                                                                                                              |       |            |      |      |      |
| V <sub>F</sub>          | forward voltage                 | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>                                                         |       | -          | 1.49 | 1.70 | V    |
|                         |                                 | I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                        |       | -          | 2.15 | 2.60 | V    |
| Dynamic characteristics |                                 |                                                                                                                              |       |            |      |      |      |
| Q <sub>r</sub>          | recovered charge                | I <sub>F</sub> = 5 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> |       | -          | 10   | -    | nC   |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description             | Simplified outline                                                                | Graphic symbol                                                                      |
|-----|--------|-------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | K      | cathode                 |  |  |
| 2   | A      | anode                   |                                                                                   |                                                                                     |
| mb  | n.c.   | mounting base; isolated |                                                                                   |                                                                                     |

6. Ordering information

Table 3. Ordering information

| Type number   | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|---------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WNSC2D051400X | TO220F-2L    | WNSC2D051400X6Q       | Tube           | 50                     | TO220FE-2L      | 21-Dec-2020        |

7. Marking

Table 4. Marking codes

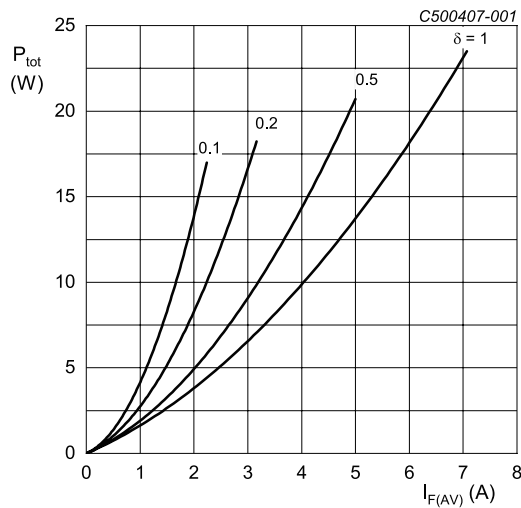
| Type number   | Marking codes     |
|---------------|-------------------|
| WNSC2D051400X | WNSC2D<br>051400X |

## 8. Limiting values

**Table 5. Limiting values**

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

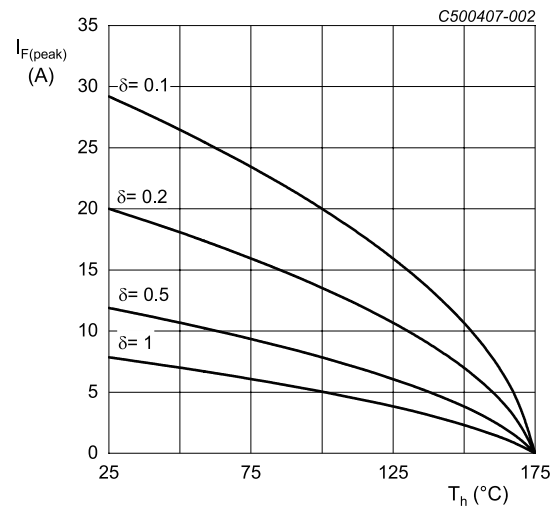
| Symbol           | Parameter                           | Conditions                                                                                                  | Notes | Values     | Unit                 |
|------------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------|-------|------------|----------------------|
| $V_{RRM}$        | repetitive peak reverse voltage     |                                                                                                             |       | 1400       | V                    |
| $V_{RWM}$        | crest working reverse voltage       |                                                                                                             |       | 1400       | V                    |
| $V_R$            | reverse voltage                     | DC                                                                                                          |       | 1400       | V                    |
| $I_F$            | continuous forward current          | $T_h \leq 100\text{ }^{\circ}\text{C}$ ; DC; Fig. 2                                                         |       | 5          | A                    |
|                  |                                     | $T_h \leq 125\text{ }^{\circ}\text{C}$ ; DC; Fig. 2                                                         |       | 3.8        | A                    |
|                  |                                     | $T_h \leq 25\text{ }^{\circ}\text{C}$ ; DC; Fig. 2                                                          |       | 7.8        | A                    |
| $I_{FRM}$        | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_h \leq 125\text{ }^{\circ}\text{C}$ ; square-wave pulse |       | 6.1        | 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                  |       | 45         | A                    |
|                  |                                     | $t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; square-wave pulse       |       | 450        | A                    |
| $I^2t$           | $I^2t$ for fusing                   | $t_p = 10\text{ ms}$ ; SIN                                                                                  |       | 10.125     | $\text{A}^2\text{s}$ |
| $T_{\text{stg}}$ | storage temperature                 |                                                                                                             |       | -55 to 175 | $^{\circ}\text{C}$   |
| $T_j$            | junction temperature                |                                                                                                             |       | -55 to 175 | $^{\circ}\text{C}$   |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 1.347\text{ V}; R_s = 0.2796\text{ }\Omega$$

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



**Fig. 2. Current derating as a function of heatsink temperature**

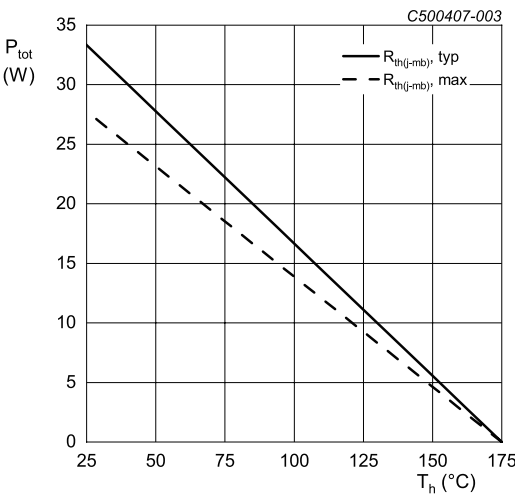


Fig. 3. Total power dissipation as a function of heatsink temperature

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                            | Conditions             | Notes | Min | Typ | Max | Unit |
|---------------|------------------------------------------------------|------------------------|-------|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink         | <a href="#">Fig. 4</a> |       | -   | 4.5 | 5.4 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air            |       | -   | 60  | -   | K/W  |

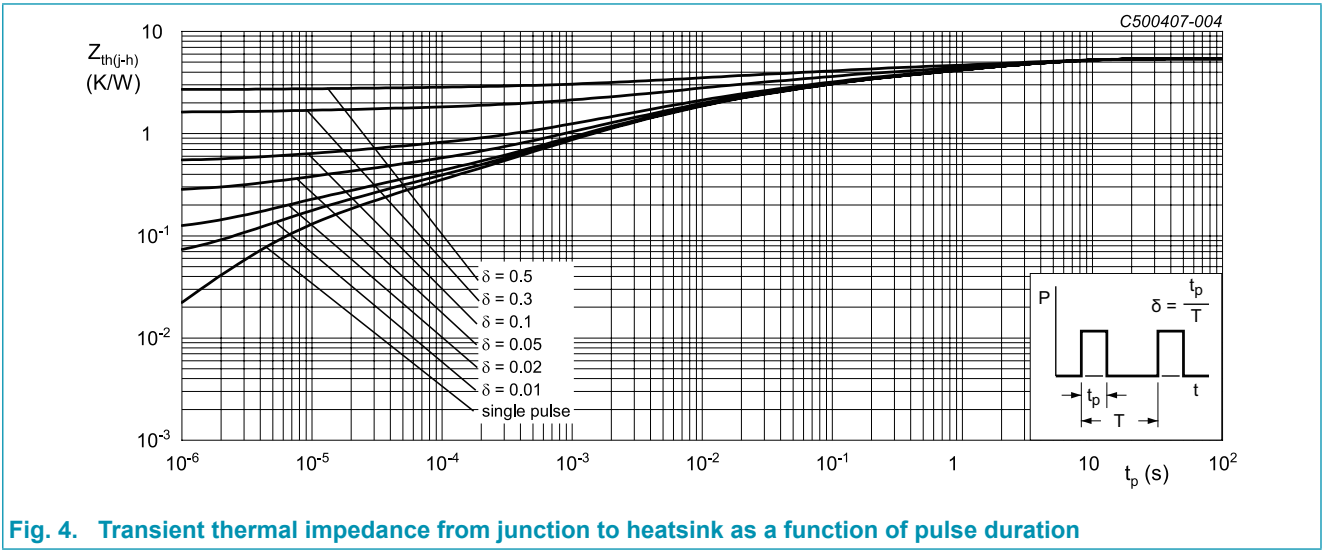


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

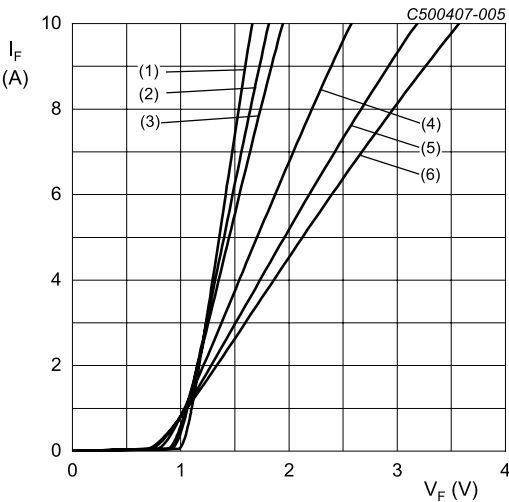
Table 7. Isolation characteristics

| Symbol          | Parameter             | Conditions                                                                                                                                                                     | Notes | Min | Typ | Max  | Unit |
|-----------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink; sinusoidal waveform; clean and dust free; $50\text{ Hz} \leq f \leq 60\text{ Hz}$ ; $T_h = 25\text{ }^\circ\text{C}$ ; $RH \leq 65\%$ |       | -   | -   | 2500 | V    |

11. Characteristics

Table 7. Characteristics

| Symbol                  | Parameter                       | Conditions                                                                                                                   | Notes | Min | Typ  | Max  | Unit |
|-------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------|-------|-----|------|------|------|
| Static characteristics  |                                 |                                                                                                                              |       |     |      |      |      |
| V <sub>F</sub>          | forward voltage                 | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a>                                                         |       | -   | 1.49 | 1.70 | V    |
|                         |                                 | I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 5</a>                                                        |       | -   | 2.15 | 2.60 | V    |
|                         |                                 | I <sub>F</sub> = 5 A; T <sub>j</sub> = 175 °C; <a href="#">Fig. 5</a>                                                        |       | -   | 2.40 | 2.80 | V    |
| I <sub>R</sub>          | reverse current                 | V <sub>R</sub> = 1400 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>                                                      |       | -   | 0.5  | 25   | μA   |
|                         |                                 | V <sub>R</sub> = 1400 V; T <sub>j</sub> = 175 °C; <a href="#">Fig. 6</a>                                                     |       | -   | 25   | -    | μA   |
| Dynamic characteristics |                                 |                                                                                                                              |       |     |      |      |      |
| Q <sub>r</sub>          | recovered charge                | I <sub>F</sub> = 5 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> |       | -   | 10   | -    | nC   |
| C <sub>d</sub>          | diode capacitance               | f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>j</sub> = 25 °C                                                                      |       | -   | 220  | -    | pF   |
|                         |                                 | f = 1 MHz; V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C                                                                    |       | -   | 20   | -    | pF   |
|                         |                                 | f = 1 MHz; V <sub>R</sub> = 800 V; T <sub>j</sub> = 25 °C                                                                    |       | -   | 17   | -    | pF   |
| E <sub>as</sub>         | non-repetitive avalanche energy | I <sub>R</sub> = 4.3 A; L = 10 mH; T <sub>j(init)</sub> = 25 °C                                                              |       | 90  | -    | -    | mJ   |



V<sub>0</sub> = 1.347 V; R<sub>s</sub> = 0.2796 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

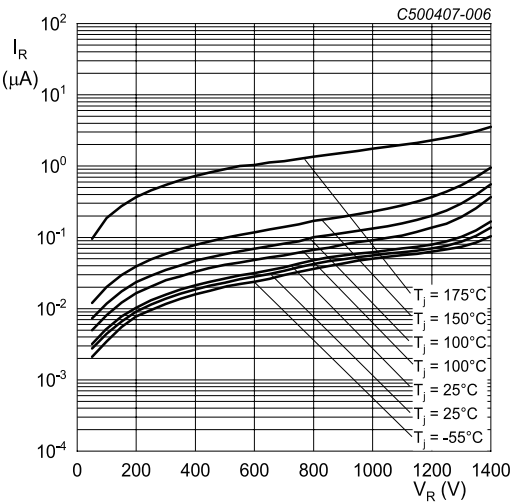


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value

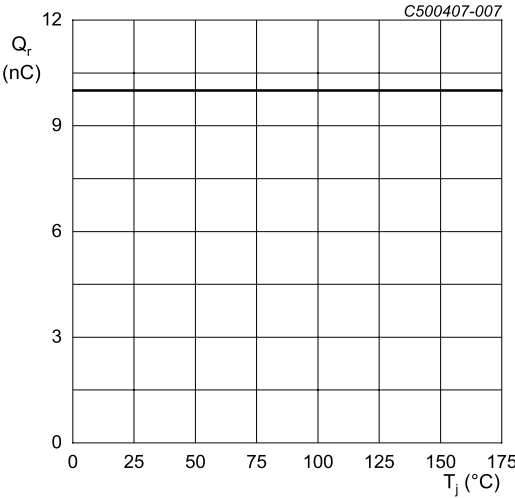


Fig. 7. Recovered charge as a function of junction temperature



## 13. 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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