



**THE DATASHEET OF  
NXPSC10650XQ**



## 1. General description

Silicon Carbide Schottky diode in a TO220F-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
- Insulated package rated at 2500V RMS

## 3. Applications

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

## 4. Quick reference data

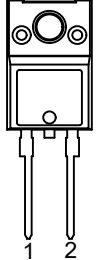
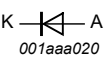
Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions  | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|---|-----|-----|-----|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |   | -   | -   | 650 | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; $T_h \leq 25$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a> | -   | -   | 10  | A    |
| $T_j$                          | junction temperature            |   | -   | -   | 175 | °C   |
| <b>Static characteristics</b>  |                                 |   |     |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 10$ A; $T_j = 25$ °C; <a href="#">Fig. 6</a>   | -   | 1.5 | 1.7 | V    |
|                                |                                 | $I_F = 10$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>  | -   | 1.8 | 2.1 | V    |
| <b>Dynamic characteristics</b> |                                 |   |     |     |     |      |

| Symbol | Parameter        | Conditions   | Min | Typ | Max | Unit |
|--------|------------------|--|-----|-----|-----|------|
| $Q_r$  | recovered charge | $I_F = 10\text{ A}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ;<br>$V_R = 400\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a> | -   | 15  | -   | nC   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description             | Simplified outline   | Graphic symbol  |
|-----|--------|-------------------------|--|---|
| 1   | K      | cathode                 |  <p style="text-align: center;">TO220F-2L</p> |  |
| 2   | A      | anode                   |  |   |
| mb  | n.c.   | mounting base; isolated |  |   |

## 6. Ordering information

Table 3. Ordering information

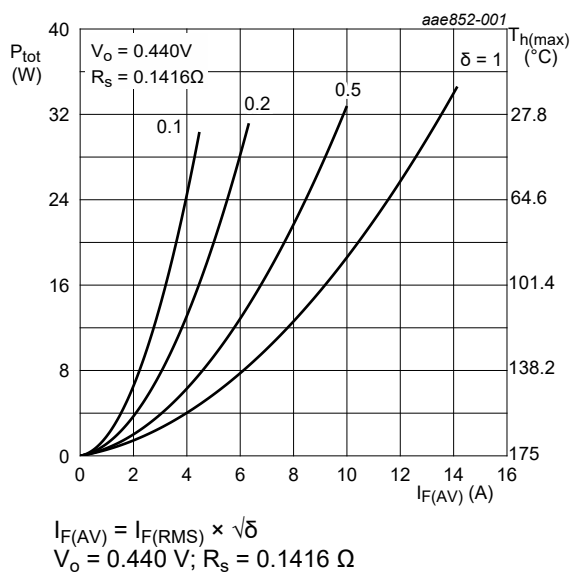
| Type number | Package |   |           |
|-------------|---------|---|-----------|
|             | Name    | Description   | Version   |
| NXPSC10650X | -       | Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F | TO220F-2L |

## 7. Limiting values

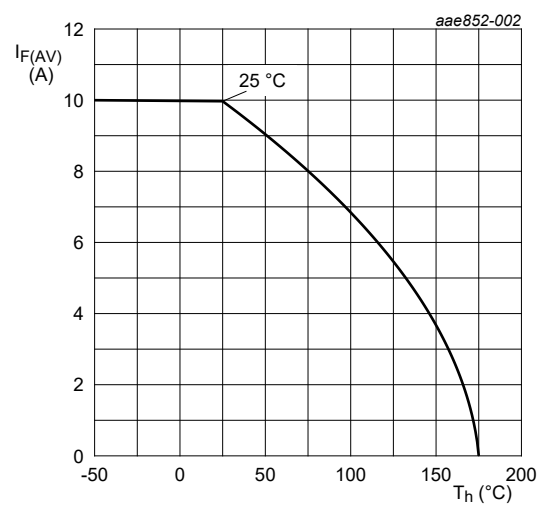
**Table 4. Limiting values**

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

| Symbol      | Parameter                           | Conditions   | Min | Max | 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             | $\delta = 0.5$ ; $T_h \leq 25\text{ }^\circ\text{C}$ ; square-wave pulse;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a> | -   | 10  | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_h \leq 25\text{ }^\circ\text{C}$ ; square-wave pulse   | -   | 20  | 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   | -   | 50  | A                |
|             |                                     | $t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; square-wave pulse  | -   | 450 | A                |
| $T_{stg}$   | storage temperature                 |  | -55 | 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |  | -   | 175 | $^\circ\text{C}$ |



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



**Fig. 2. Forward current as a function of heatsink temperature; maximum values**

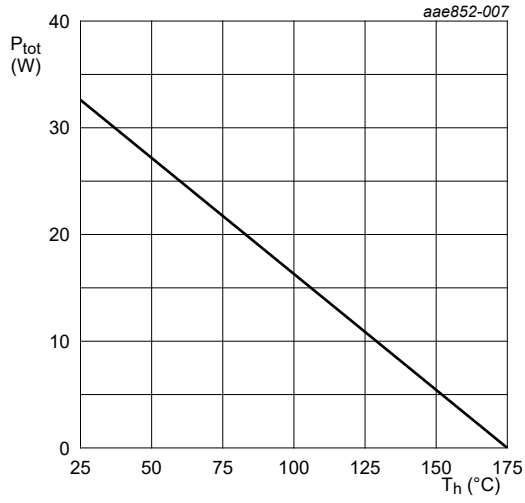


Fig. 3. Total power dissipation as a function of heatsink temperature

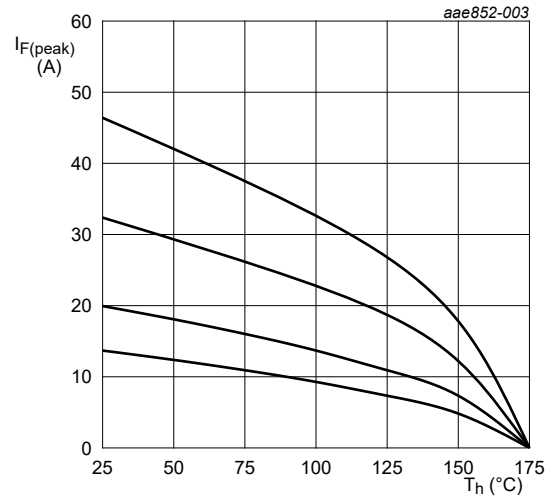


Fig. 4. Current derating as a function of heatsink temperature

## 8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol        | Parameter  | Conditions                                     | Min | Typ | Max | Unit |
|---------------|--|--|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink         | with heatsink compound; <a href="#">Fig. 5</a> | -   | -   | 4.6 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air                                    | -   | 55  | -   | K/W  |

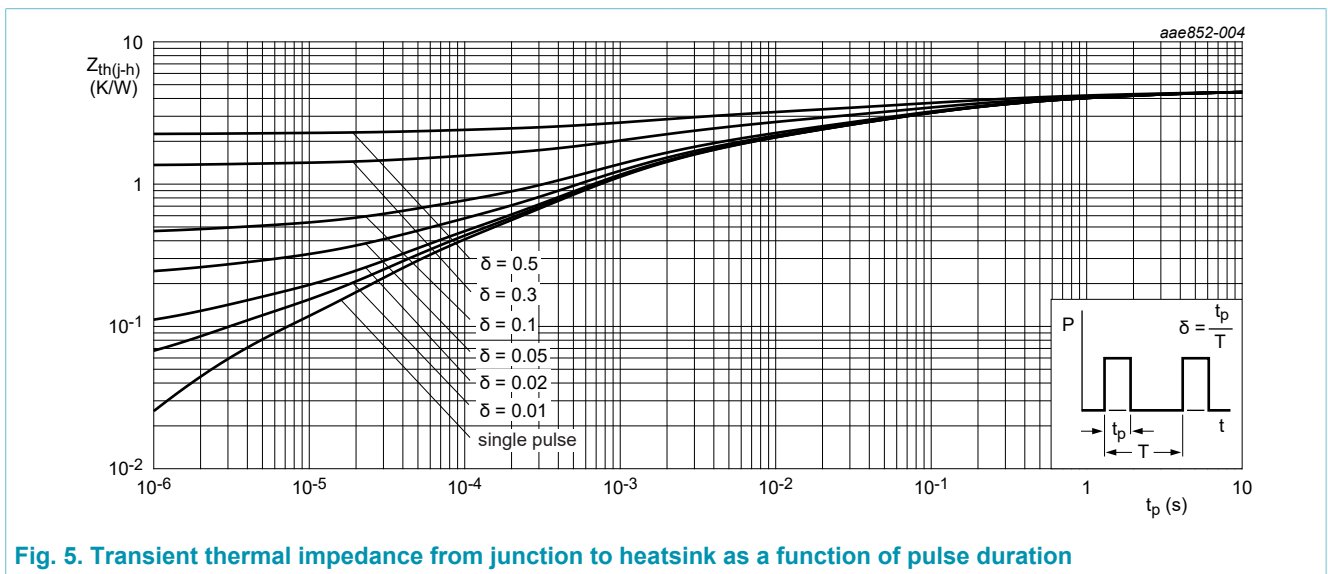


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

## 9. Isolation characteristics

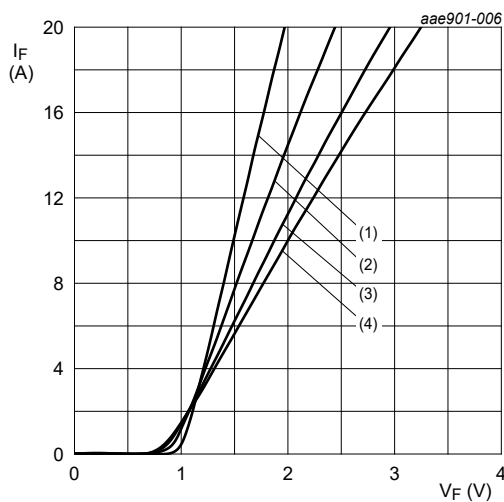
Table 6. Isolation characteristics

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

## 10. Characteristics

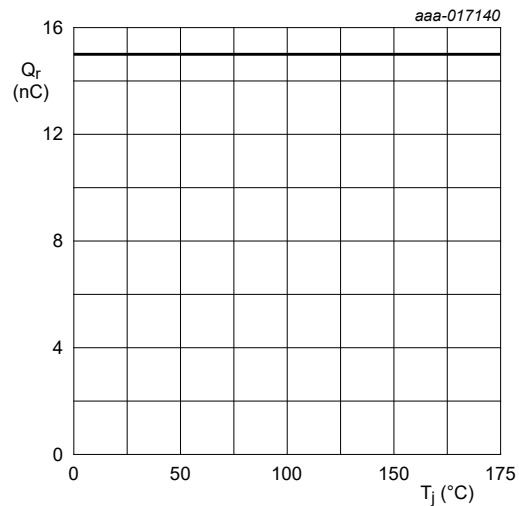
**Table 7. Characteristics**

| Symbol                         | Parameter         | Conditions   | Min | Typ | Max | Unit          |
|--------------------------------|-------------------|--|-----|-----|-----|---------------|
| <b>Static characteristics</b>  |                   |  |     |     |     |               |
| $V_F$                          | forward voltage   | $I_F = 10\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 6</a>  | -   | 1.5 | 1.7 | V             |
|                                |                   | $I_F = 10\text{ A}; T_j = 150\text{ °C};$ <a href="#">Fig. 6</a>   | -   | 1.8 | 2.1 | V             |
| $I_R$                          | reverse current   | $V_R = 650\text{ V}; T_j = 25\text{ °C}$   | -   | -   | 250 | $\mu\text{A}$ |
|                                |                   | $V_R = 650\text{ V}; T_j = 150\text{ °C}$  | -   | -   | 800 | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                   |  |     |     |     |               |
| $Q_r$                          | recovered charge  | $I_F = 10\text{ A}; dI_F/dt = 500\text{ A}/\mu\text{s};$<br>$V_R = 400\text{ V}; T_j = 25\text{ °C};$ <a href="#">Fig. 7</a> | -   | 15  | -   | nC            |
| $C_d$                          | diode capacitance | $f = 1\text{ MHz}; V_R = 1\text{ V}; T_j = 25\text{ °C}$   | -   | 300 | -   | pF            |
|                                |                   | $f = 1\text{ MHz}; V_R = 300\text{ V}; T_j = 25\text{ °C}$   | -   | 34  | -   | pF            |
|                                |                   | $f = 1\text{ MHz}; V_R = 600\text{ V}; T_j = 25\text{ °C}$   | -   | 28  | -   | pF            |



- (1)  $T_j = 25\text{ °C};$  typical values
- (2)  $T_j = 100\text{ °C};$  typical values
- (3)  $T_j = 150\text{ °C};$  typical values
- (4)  $T_j = 175\text{ °C};$  typical values

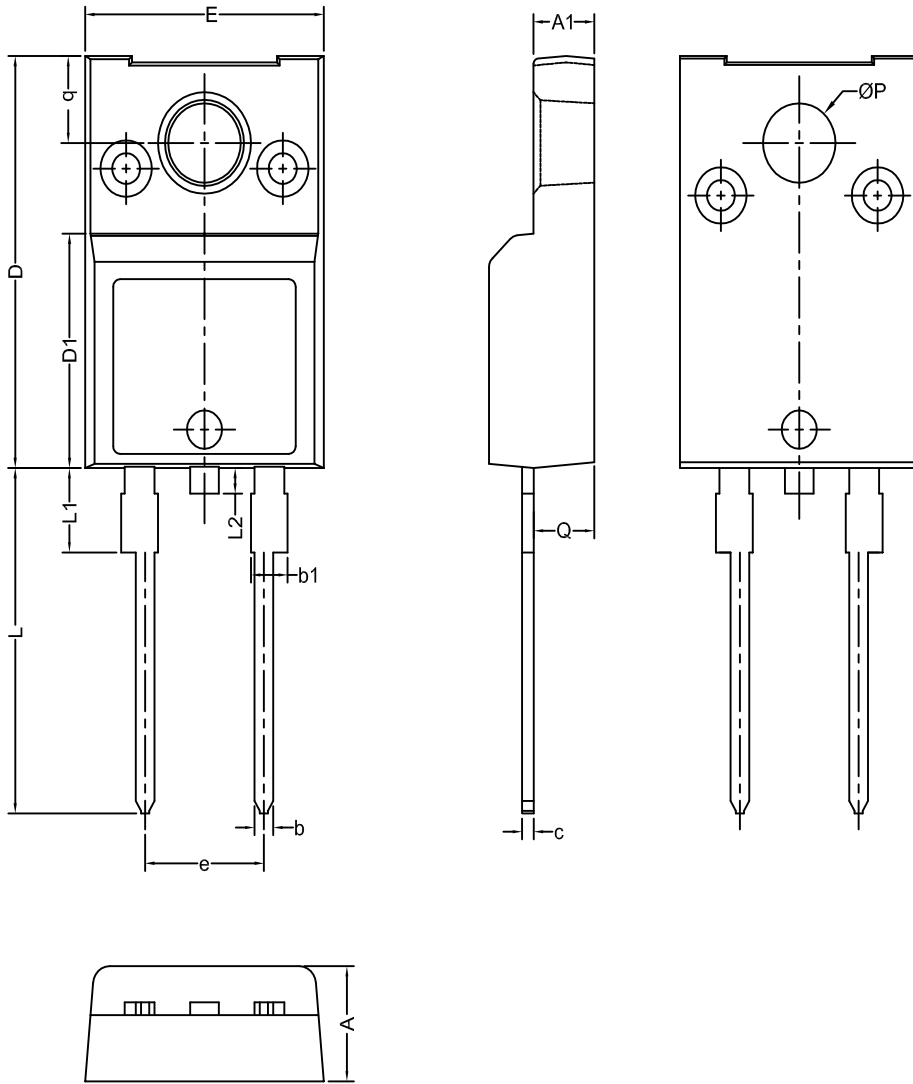
**Fig. 6. Forward current as a function of forward voltage; typical values**



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

**11. Package outline**

Plastic single-ended through-hole package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F TO220F-2L



| Unit | A    | A1   | b    | b1   | c    | D     | D1   | e              | E     | L     | L1   | L2   | P    | q              | Q    |
|------|------|------|------|------|------|-------|------|----------------|-------|-------|------|------|------|----------------|------|
| min  | 4.35 | 2.40 | 0.76 | 1.22 | 0.46 | 15.95 | 9.00 | 5.08<br>(typ.) | 10.05 | 13.15 | 3.15 | 0.50 | 2.95 | 3.40<br>(typ.) | 2.30 |
| max  | 4.65 | 2.80 | 0.89 | 1.60 | 0.59 | 16.25 | 9.30 |                | 10.35 | 13.85 | 3.45 | 1.00 | 3.25 |                | 2.80 |

| OUTLINE VERSION | REFERENCES |       |      |  | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|------------|
|                 | IEC        | JEDEC | EIAJ |  |                     |            |
| TO220F-2L       |            | -     |      |  |                     |            |

**Fig. 8. Package outline TO220F-2L**

## 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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