

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

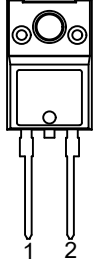
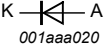
Table 1. Quick reference data

| 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; Fig. 1 ; Fig. 2 ; Fig. 3 ; Fig. 4 | - | - | 10 | A |
| T_j | junction temperature | | - | - | 175 | °C |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 10$ A; $T_j = 25$ °C; Fig. 6 | - | 1.5 | 1.7 | V |
| | | $I_F = 10$ A; $T_j = 150$ °C; Fig. 6 | - | 1.8 | 2.1 | V |
| Dynamic characteristics | | | | | | |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|------------------|--|-----|-----|-----|------|
| Q_r | recovered charge | $I_F = 10\text{ A}$; $di_F/dt = 500\text{ A}/\mu\text{s}$; $V_R = 400\text{ V}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | 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; Fig. 1 ; Fig. 2 ; Fig. 3 ; Fig. 4 | - | 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 | $^\circ\text{C}$ |

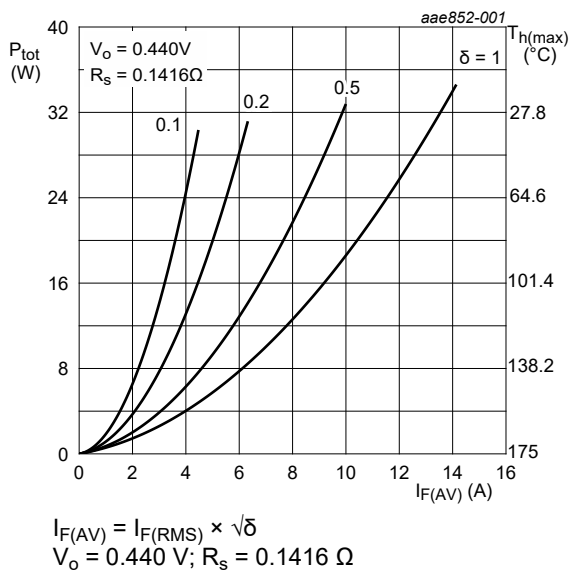


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

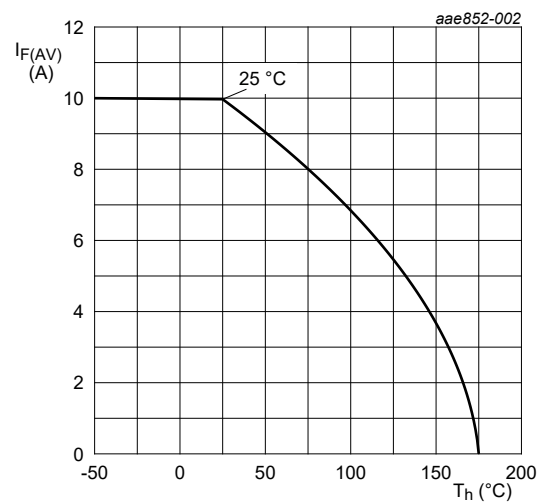


Fig. 2. Forward current as a function of heatsink temperature; maximum values

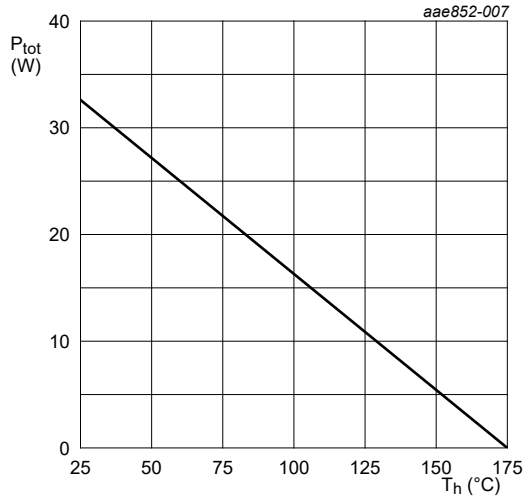


Fig. 3. Total power dissipation as a function of heatsink temperature

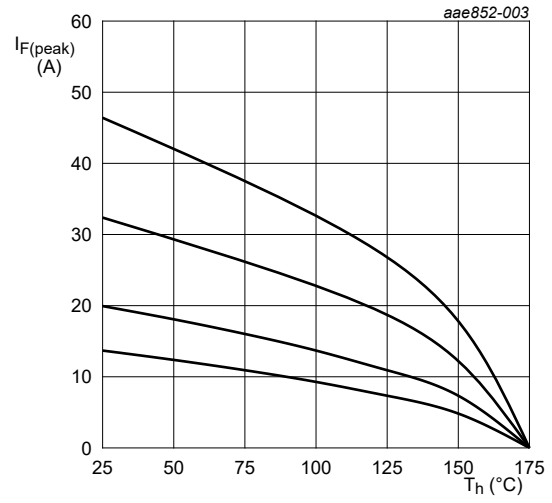


Fig. 4. Current derating as a function of heatsink temperature

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; Fig. 5 | - | - | 4.6 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 55 | - | K/W |

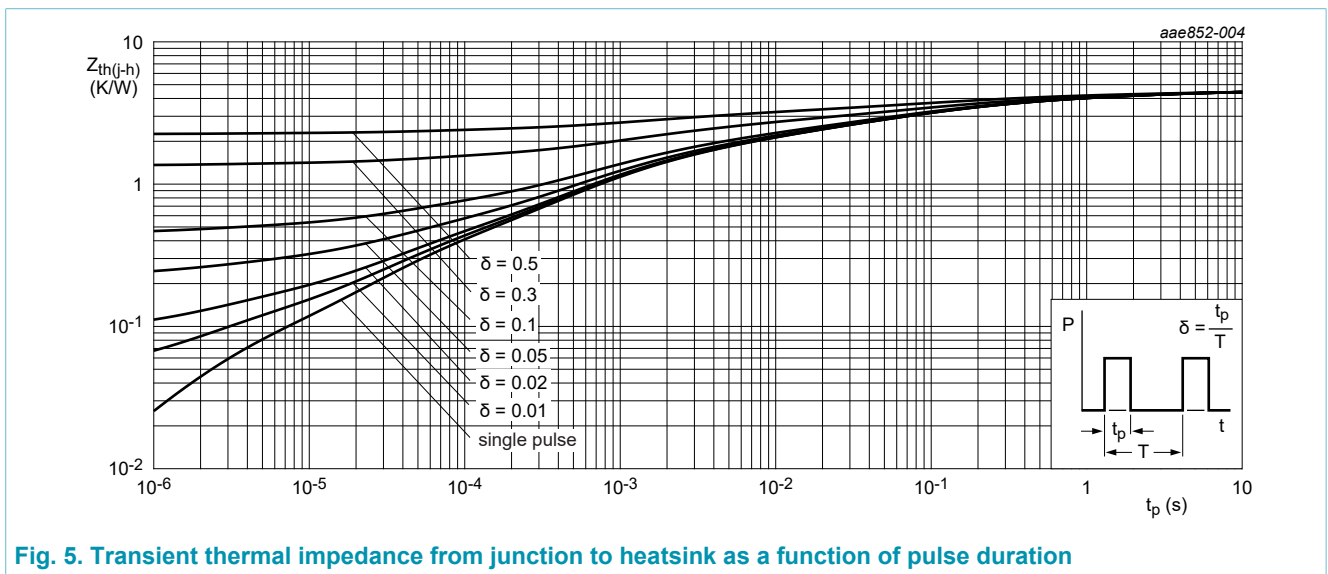


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

9. Isolation characteristics

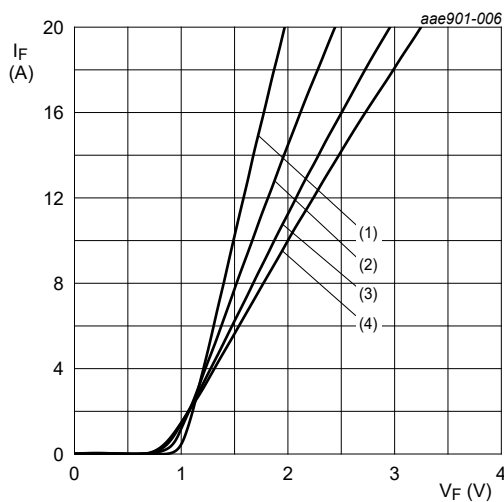
Table 6. Isolation characteristics

| 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 |
|--------------------------------|-------------------|--|-----|-----|-----|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 10\text{ A}; T_j = 25\text{ °C};$ Fig. 6 | - | 1.5 | 1.7 | V |
| | | $I_F = 10\text{ A}; T_j = 150\text{ °C};$ Fig. 6 | - | 1.8 | 2.1 | V |
| I_R | reverse current | $V_R = 650\text{ V}; T_j = 25\text{ °C}$ | - | - | 250 | μA |
| | | $V_R = 650\text{ V}; T_j = 150\text{ °C}$ | - | - | 800 | μA |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 10\text{ A}; dI_F/dt = 500\text{ A}/\mu\text{s};$ $V_R = 400\text{ V}; T_j = 25\text{ °C};$ Fig. 7 | - | 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

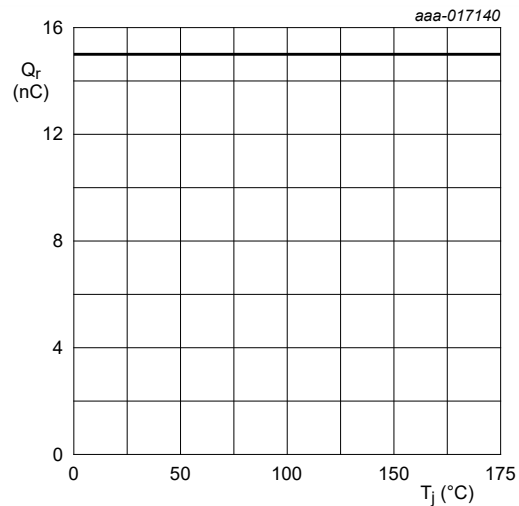
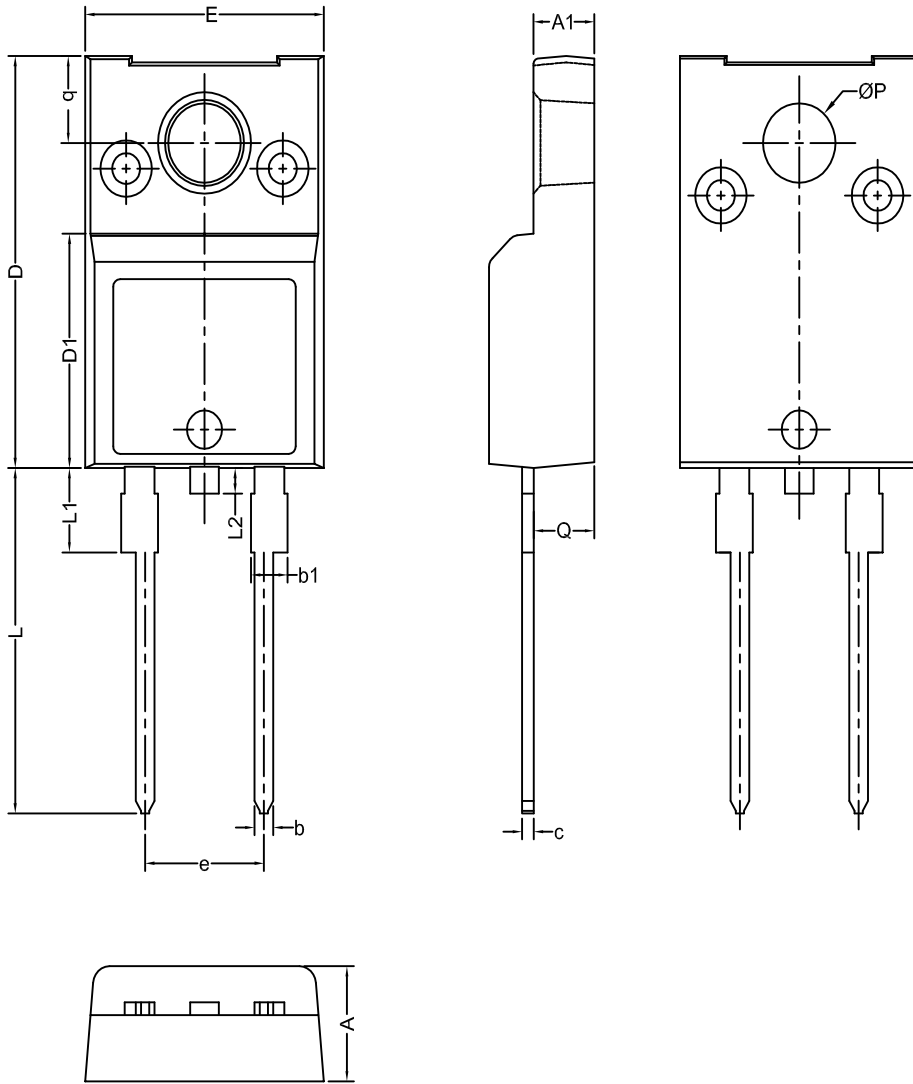


Fig. 7. Recovered charge as a function of junction temperature

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 (typ.) | 10.05 | 13.15 | 3.15 | 0.50 | 2.95 | 3.40 (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. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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