



# Silicon Carbide Schottky Barrier Diode

## 650V, 8A SiC SBD

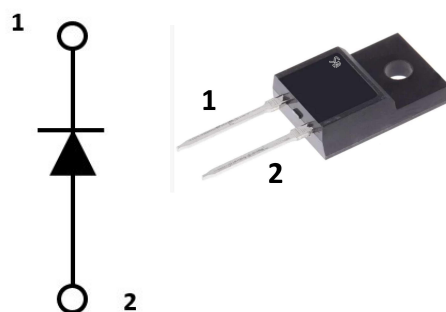
### Features

- Temperature independent switching behavior
- No reverse recovery current / No forward recovery
- Excellent thermal performances
- High surge current capability

|           |               |
|-----------|---------------|
| $V_{RRM}$ | 680V          |
| $I_F$     | 8A (TC=113°C) |
| $Q_C$     | 24.5nC        |

### Applications

- Switch mode power supply
- Power factor correction
- Solar inverter
- Uninterruptible power supply



| Marking      | Package  |
|--------------|----------|
| Q-SSC0865-TF | TO-220-2 |

### Maximum Ratings (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                                                       | Symbol        | Value        | Unit |
|-----------------------------------------------------------------|---------------|--------------|------|
| Repetitive Peak Reverse Voltage                                 | $V_{RRM}$     | 650          | V    |
| Continuous Forward Current, D=1                                 | $I_F$         | 16.1         | A    |
|                                                                 |               | 8            |      |
| Non-Repetitive Peak Forward Surge Current, Half Sine Wave, 10ms | $I_{F,SM}$    | 42           | A    |
|                                                                 |               | 35           |      |
| $i^2t$ Value, 10ms                                              | $\int i^2 dt$ | 8.82         | A    |
| Non-Repetitive Peak Forward Current, 10us                       | $I_{F,max}$   | 252          | A    |
| Power Dissipation                                               | $P_D$         | 48.6         | W    |
| Storage Temperature Range                                       | $T_{STG}$     | -55 to 150°C | °C   |
| Operating Junction Temperature Range                            | $T_J$         | -55 to 175°C | °C   |

**Thermal Characteristics**

| Parameter                                | Symbol            | Conditions | Min. | Typ  | Max  | Unit |
|------------------------------------------|-------------------|------------|------|------|------|------|
| Maximum Junction-to-Ambient <sup>1</sup> | R <sub>thJA</sub> | TO-220F-2L | -    | 1.71 | 3.08 | °C/W |
| Maximum Junction-to-Case <sup>1</sup>    | R <sub>thJC</sub> | TO-220F-2L | -    | -    | 60   | °C/W |

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

| Parameter                 | Symbol         | Conditions                                                                | Min. | Typ. | Max. | Unit |
|---------------------------|----------------|---------------------------------------------------------------------------|------|------|------|------|
| STATIC CHARACTERISTICS    |                |                                                                           |      |      |      |      |
| DC Blocking Voltage       | V <sub>R</sub> | I <sub>R</sub> =100uA, T <sub>J</sub> =25°C                               | 650  | -    | -    | V    |
|                           |                | I <sub>R</sub> =100uA, T <sub>J</sub> =175°C                              | 650  | -    | -    |      |
| Forward Voltage           | V <sub>F</sub> | I <sub>F</sub> =10A, T <sub>J</sub> =25°C                                 | -    | 1.4  | 1.7  | V    |
|                           |                | I <sub>F</sub> =10A, T <sub>J</sub> =150°C                                | -    | 1.8  | 2.2  |      |
|                           |                | I <sub>F</sub> =10A, T <sub>J</sub> =175°C                                | -    | 1.9  | 2.4  |      |
| Reverse Current           | I <sub>R</sub> | V <sub>R</sub> =650V, T <sub>J</sub> =25°C                                | -    | 1    | 45   | μA   |
|                           |                | V <sub>R</sub> =650V, T <sub>J</sub> =150°C                               | -    | 7    | 70   |      |
|                           |                | V <sub>R</sub> =650V, T <sub>J</sub> =175°C                               | -    | 15   | 150  |      |
| DYNAMIC CHARACTERISTICS   |                |                                                                           |      |      |      |      |
| Total Capacitive Charge   | Q <sub>C</sub> | V <sub>R</sub> =400V, T <sub>J</sub> =25°C<br>$Q_C = \int_0^{V_R} C(V)dV$ | -    | 24.5 | -    | nC   |
| Total Capacitance         | C              | V <sub>R</sub> =0.1V, f=1MHz, T <sub>J</sub> =25°C                        | -    | 357  | -    | pF   |
|                           |                | V <sub>R</sub> =200V, f=1MHz, T <sub>J</sub> =25°C                        | -    | 39.4 | -    |      |
|                           |                | V <sub>R</sub> =400V, f=1MHz, T <sub>J</sub> =25°C                        | -    | 34.2 | -    |      |
| Capacitance Stored Energy | E <sub>C</sub> | V <sub>R</sub> =400V, f=1MHz, T <sub>J</sub> =25°C                        | -    | 5.02 | -    | μJ   |

**Notes:**

1. Heat sink size: 25 x 17 x 4 cm<sup>3</sup>
2. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
3. The power dissipation is limited by 175°C junction temperature.
4. The data is theoretically the same as I<sub>F</sub> and I<sub>FSM</sub> in real applications, should be limited by total power dissipation.

Typical Operating Characteristics

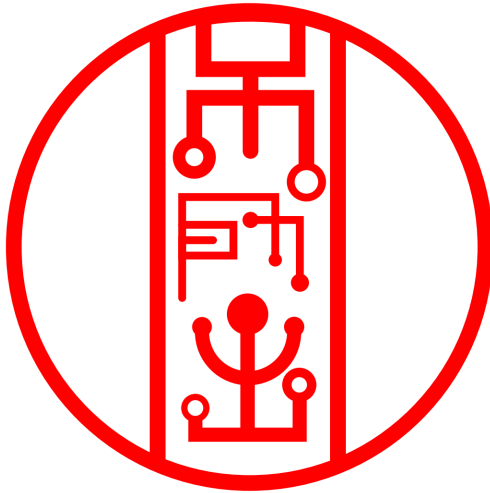
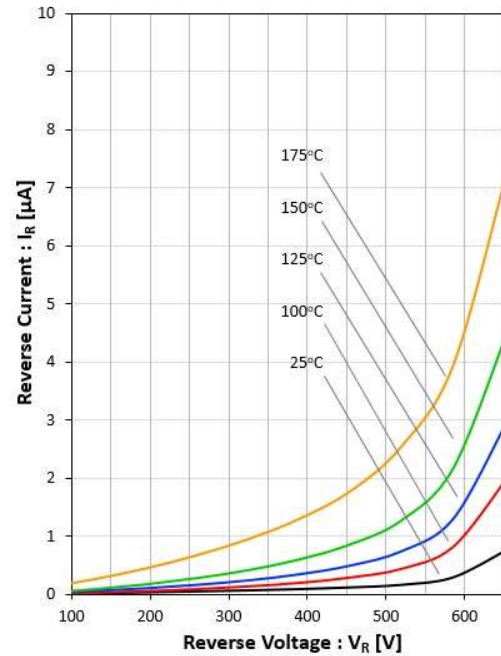
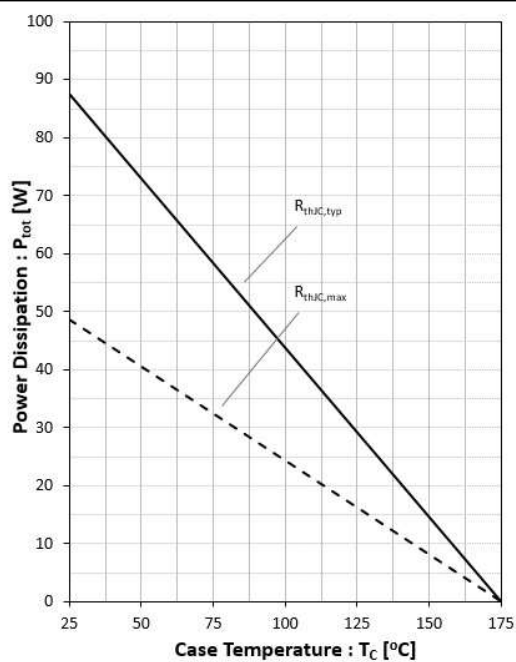


Figure 2: Typical Reverse Characteristics



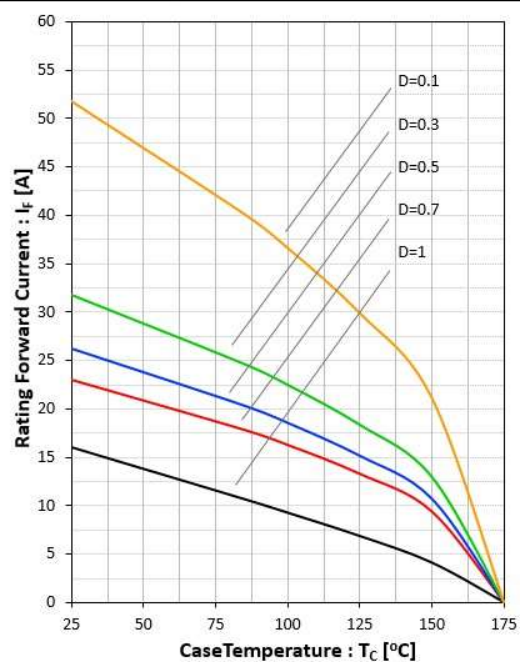
$$I_R = f(V_R, T_j)$$

Figure 3: Power Derating Curves



$$P_{tot} = f(T_C); T_j = 175^\circ C$$

Figure 4: Current Derating Curves



$$I_F = f(T_C); R_{thJC,max}; V_{F,max}; T_j \leq 175^\circ C; D = t_p/T$$

Typical Operating Characteristics (Cont.)

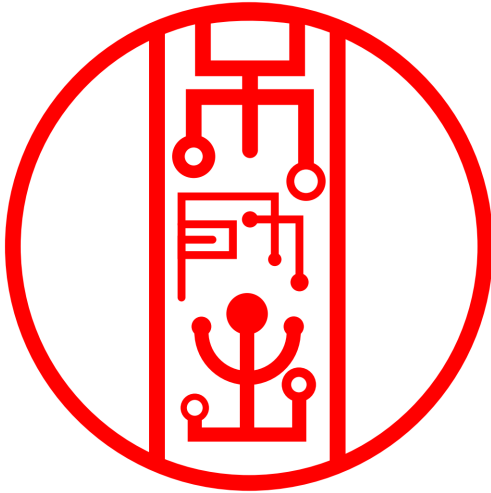
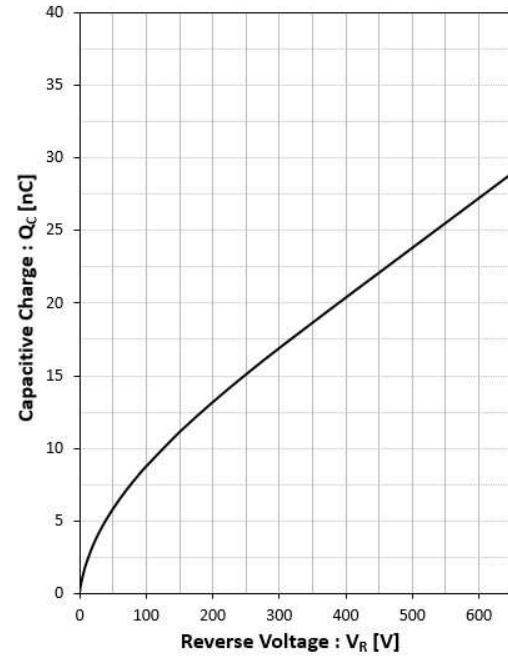
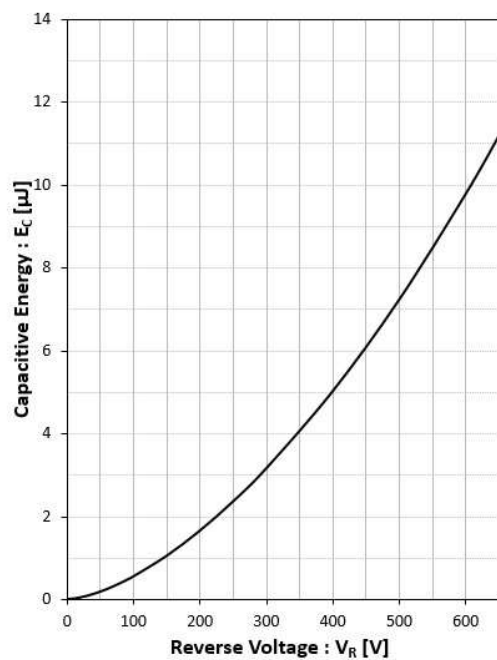


Figure 6: Typical Capacitive Charge



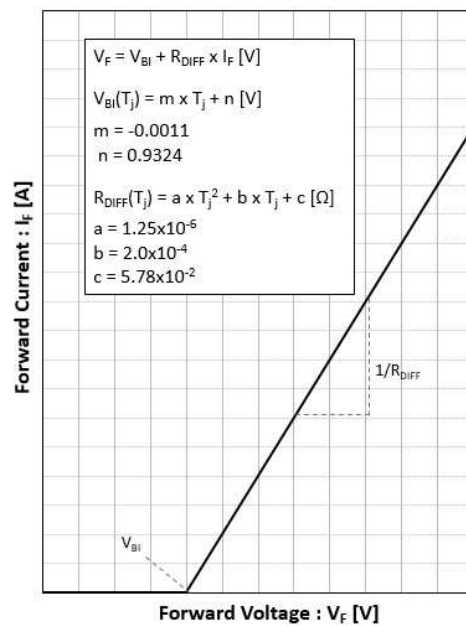
$$Q_C = f(V_R); f=1\text{MHz}$$

Figure 7: Typical Capacitive Energy

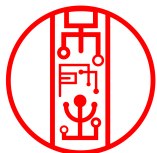


$$E_C = f(V_R); f=1\text{MHz}$$

Figure 8: Forward Curve Model

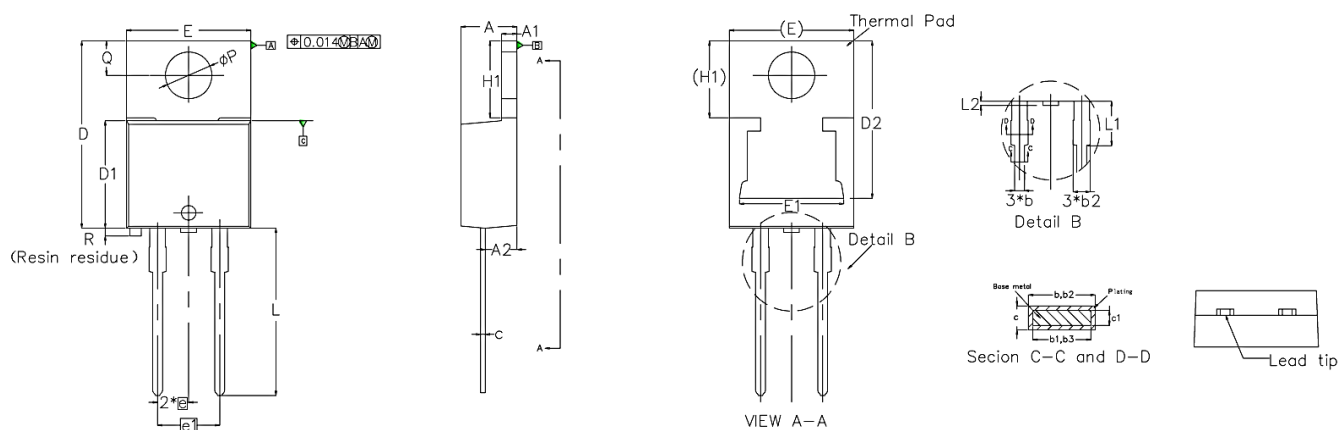


$$I_F = f(V_F, T_j)$$



## Package Dimensions

### To-220-2



| SYMBOL | MILLIMETERS |       |       | NOTES |  | SYMBOL   | MILLIMETERS |       |       | NOTES |
|--------|-------------|-------|-------|-------|--|----------|-------------|-------|-------|-------|
|        | Normal      | MIN.  | MAX.  |       |  |          | Normal      | MIN.  | MAX.  |       |
| A      | 4.55        | 4.44  | 4.65  |       |  | E1       | 8.57        | 8.25  | 8.89  |       |
| A1     | 1.27        | 1.14  | 1.39  |       |  | e        | 2.54        | 2.41  | 2.67  |       |
| A2     | 2.60        | 2.54  | 2.79  |       |  | e1       | 5.08        | 4.95  | 5.20  |       |
| b      | 0.85        | 0.69  | 0.94  |       |  | H1       | 6.20        | 6.09  | 6.40  |       |
| b1     | 0.83        | 0.38  | 0.97  |       |  | L        | 13.60       | 13.52 | 14.00 |       |
| b2     | 1.33        | 1.20  | 1.45  |       |  | L1       | 3.60        | 3.56  | 3.80  |       |
| b3     | 1.33        | 1.20  | 1.45  |       |  | L2       | —           | 0     | 0.35  |       |
| c      | 0.50        | 0.36  | 0.56  |       |  | $\phi P$ | 3.80        | 3.70  | 3.91  |       |
| c1     | 0.48        | 0.36  | 0.56  |       |  | Q        | 2.80        | 2.62  | 2.87  |       |
| D      | 15.25       | 14.95 | 15.32 |       |  | R        |             |       | 0.2   |       |
| D1     | 8.75        | 8.50  | 8.89  |       |  |          |             |       |       |       |
| D2     | 12.85       | 12.20 | 13.30 |       |  |          |             |       |       |       |
| E      | 10.18       | 10.11 | 10.40 |       |  |          |             |       |       |       |