

# SC3D20065D

Silicon Carbide Schottky Barrier Diode

 $V_{RRM}=650V$   
 $I_F(T_C=130^\circ C)=$   
 $10A$   $Q_C=28nC$ 

## Features

- 650-Volt Schottky Rectifier
- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Extremely Fast Switching
- Positive Temperature Coefficient on  $V_F$

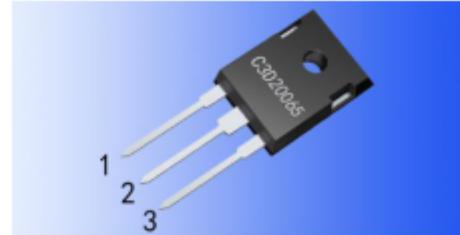
## Benefits

- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

## Applications

- Switch Mode Power Supplies(SMPS)
- Boost diodes in PFC or DC/DC stages
- Free wheeling diodes in inverter stages

## Package



| Part Number | Package   | Marking |
|-------------|-----------|---------|
| SC3D20065D  | TO-247-3L | 3D20065 |

## Maximum Ratings ( $T_C=25^\circ C$ unless otherwise specified)

| Symbol         | Parameter                                      | Value          | Unit       | Test Conditions   | Note |
|----------------|--|----------------|------------|---|------|
| $V_{RRM}$      | Repetitive Peak Reverse Voltage                | 650            | V          |   |      |
| $V_{RSM}$      | Surge Peak Reverse Voltage                     | 650            | V          |   |      |
| $V_{DC}$       | DC Blocking Voltage                            | 650            | V          |   |      |
| $I_F$          | Continuous Forward Current<br>(Per Leg/Device) | 10<br>20       | A          | $T_C=25^\circ C$<br>$T_C=130^\circ C$                     |      |
| $I_{FRM}$      | Repetitive Peak Forward Surge Current          | 70<br>140      | A          | $T_C=25^\circ C, t_p=10ms$<br>$T_C=110^\circ C, t_p=10ms$ |      |
| $I_{FSM}$      | Non-repetitive peak forward surge current      | 90<br>180      | A          | $t_p=10ms, T_C=25^\circ C$                                |      |
| $P_{tot}$      | Power Dissipation<br>(Per Leg/Device)          | 93.7<br>40.6   | W          | $T_C=25^\circ C$<br>$T_C=110^\circ C$                     |      |
| $dV/dt$        | Diode $dV/dt$ ruggedness                       | 200            | V/ns       | $V_R=0-650V$  |      |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature     | -55 to<br>+175 | $^\circ C$ |   |      |

## Electrical Characteristics\*

| Symbol | Parameter                 | Typ.            | Max.       | Unit    | Test Condition   | Note |
|--------|---------------------------|-----------------|------------|---------|--|------|
| $V_F$  | Forward Voltage           | 1.4<br>1.7      | 1.7<br>2.0 | V       | $I_F=10A, T_J=25^\circ C$<br>$I_F=10A, T_J=175^\circ C$  |      |
| $I_R$  | Reverse Current           | 2<br>40         | 20<br>200  | $\mu A$ | $V_R=650V, T_J=25^\circ C$<br>$V_R=650V, T_J=175^\circ C$  |      |
| $Q_C$  | Total Capacitive Charge   | 28              |            | nC      | $V_R=400V, I_F=10A,$<br>$di/dt=500A/\mu s, T_J=25^\circ C$   |      |
| $E_C$  | Capacitance stored energy | 7.0             |            | $\mu J$ | $V_R=400V, T_J=25^\circ C$   |      |
| C      | Total Capacitance         | 550<br>53<br>48 |            | pF      | $V_R=0V, T_J=25^\circ C, f=1MHz$<br>$V_R=200V, T_J=25^\circ C, f=1MHz$<br>$V_R=400V, T_J=25^\circ C, f=1MHz$ |      |

**Thermal Characteristics**

| Symbol          | Parameter        | Typ. | Unit                        | Note  |
|-----------------|------------------|------|-----------------------------|-------|
| $R_{\theta JC}$ | Junction to Case | 1.15 | $^{\circ}\text{C}/\text{W}$ | Fig.7 |

**Typical Performance\***

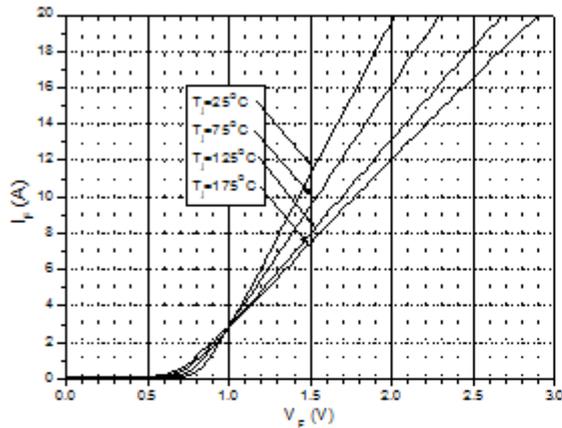


FIG.1: Forward characteristics

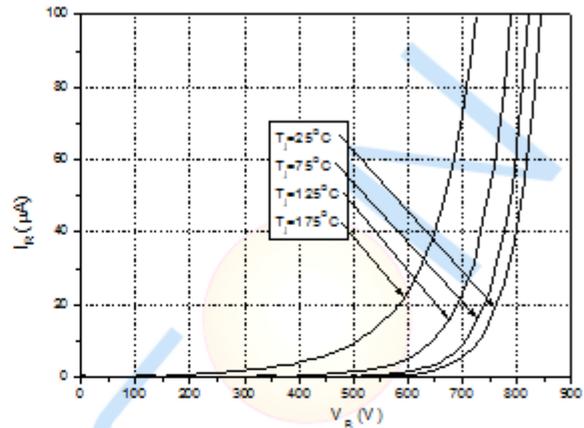


FIG.2: Reverse characteristics

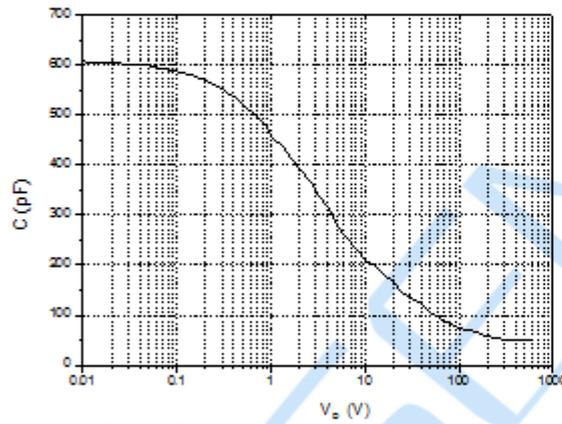


FIG.3: Capacitance vs. reverse voltage

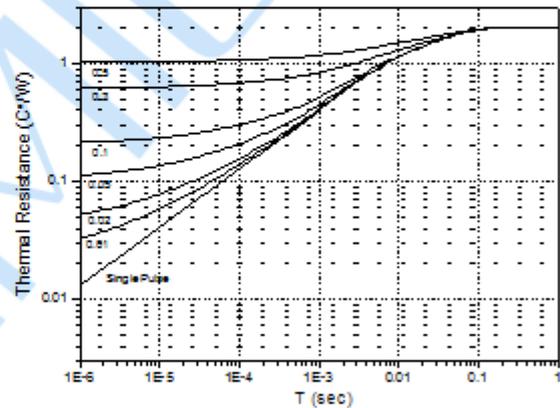


FIG.4: Transient thermal impedance

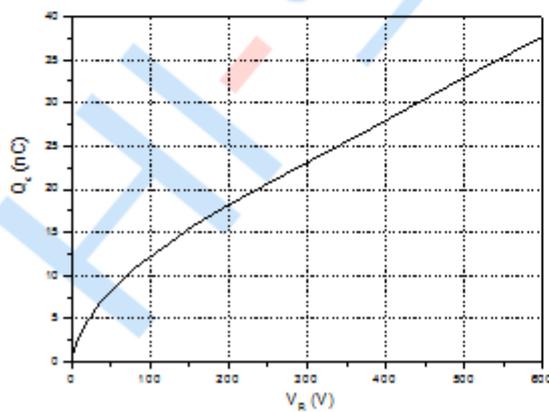


FIG.5: Capacitance charge vs. reverse voltage

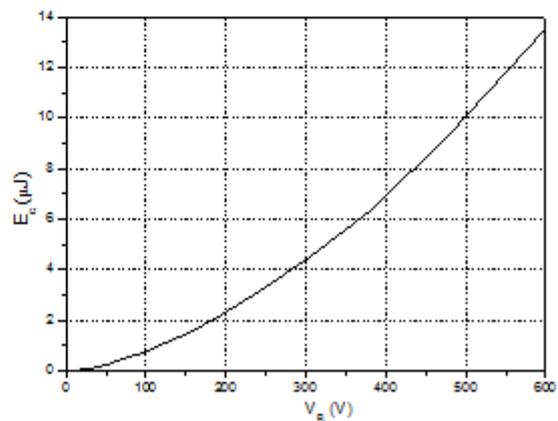


FIG.6: Capacitance stored energy

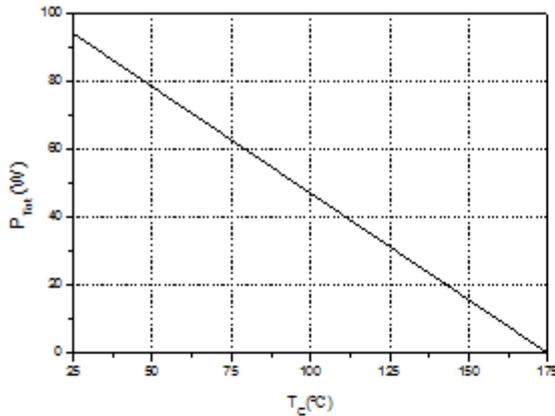


FIG.7: Power derating

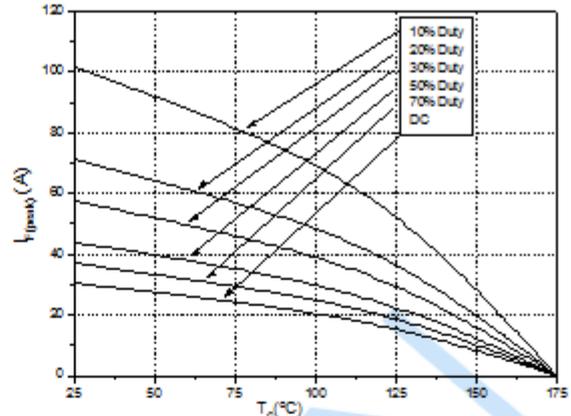
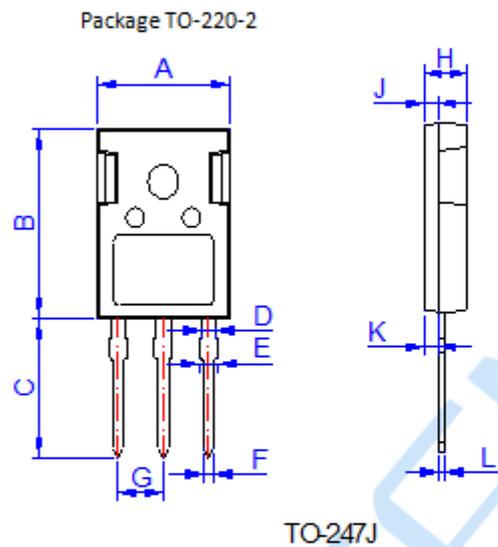


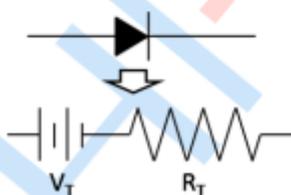
FIG.8: Current derating

### Package Dimensions



| Ref. | Dimensions  |       |       |        |       |       |
|------|-------------|-------|-------|--------|-------|-------|
|      | Millimeters |       |       | Inches |       |       |
|      | Min.        | Typ.  | Max.  | Min.   | Typ.  | Max.  |
| A    | 15.50       | 15.80 | 16.10 | 0.610  | 0.622 | 0.634 |
| B    | 20.80       | 21.00 | 22.20 | 0.819  | 0.828 | 0.874 |
| C    | 19.70       | 20.00 | 20.30 | 0.776  | 0.787 | 0.799 |
| D    | 1.80        | 2.00  | 2.20  | 0.071  | 0.079 | 0.087 |
| E    | 1.90        | 2.10  | 2.30  | 0.075  | 0.083 | 0.091 |
| F    | 1.00        | 1.20  | 1.40  | 0.039  | 0.047 | 0.055 |
| G    |             | 5.44  |       |        | 0.214 |       |
| H    | 4.80        | 5.00  | 5.20  | 0.189  | 0.197 | 0.205 |
| J    | 1.90        | 2.00  | 2.10  | 0.075  | 0.079 | 0.083 |
| K    | 2.20        | 2.35  | 2.50  | 0.087  | 0.093 | 0.098 |
| L    | 0.41        | 0.60  | 0.79  | 0.016  | 0.024 | 0.031 |

### Diode Model\*



$$V_T = V_T + I_T \times R_T$$

$$V_T = 1.132 - 1.05 \times 10^{-3} \times T_J$$

$$R_T = 0.037 + 3.10 \times 10^{-4} \times T_J + 1.66 \times 10^{-5} \times T_J^2$$

Note: T<sub>J</sub>=Diode Junction Temperature In Degree Celsius, valid from -55°C to 175°C.

### Notes

Due to technical requirements, components may contain dangerous substances. For information on the types in question, please contact hi-semiconics electronics co.,ltd.