RECTRON SEMICONDUCTOR
TECHNICAL SPECIFICATION

# SC3S12020D

## Silicon Carbide Schottky Diode

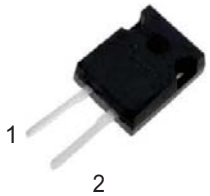
| | | | |
|---|---|---|---|
| $V_{RRM}$ | = | 1200 | V |
| $I_F$ ( $T_C$≤135˚C) | = | 24 | A |
| $Q_C$ | = | 51 | nC |

## Features

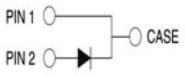
- Zero Reverse Recovery Current
- Zero Forward Recovery Voltage
- Positive Temperature Coefficient on $V_F$
- Temperature-independent Switching
- 175°C Operating Junction Temperature

## Benefits

- Replace Bipolar with Unipolar Device
- Reduction of Heat Sink Size
- Parallel Devices Without Thermal Runaway
- Essentially No Switching Losses



TO-247-2




## Applications

- Switch Mode Power Supplies
- Power Factor Correction
- Motor drive, PV Inverter, Wind Power Station

| Part Number | Package | Marking |
|---|---|---|
| SC3S12020D | TO-247-2 | SC12020 |

## Maximum Ratings

| Symbol | Parameter | Value | Unit | Test Conditions | Note |
|---|---|---|---|---|---|
| $V_{RRM}$ | Repetitive Peak Reverse Voltage | 1200 | V | $T_C$ = 25˚C | |
| $V_{RSM}$ | Surge Peak Reverse Voltage | 1200 | V | $T_C$ = 25˚C | |
| $V_R$ | DC Blocking Voltage | 1200 | V | $T_C$ = 25˚C | |
| $I_F$ | Forward Current | 51<br>24<br>20 | A | $T_C$ ≤ 25˚C<br>$T_C$ ≤ 135˚C<br>$T_C$ ≤ 146˚C | |
| $I_{FSM}$ | Non-Repetitive Forward Surge Current | 180 | A | $T_C$ = 25˚C, $t_p$ = 8.3ms, Half Sine Wave | |
| $P_{tot}$ | Power Dissipation | 230 | W | $T_C$ = 25˚C | Fig.3 |
| $T_C$ | Maximum Case Temperature | 146 | ˚C | | |
| $T_J$, $T_{STG}$ | Operating Junction and Storage Temperature | -55 to 175 | ˚C | | |
| | TO-247 Mounting Torque | 1 | Nm | M3 Screw | |

2023-07/110
REV:A

## Electrical Characteristics

| Symbol | Parameter | Typ. | Max. | Unit | Test Conditions | Note |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | 1.55<br>2.2 | 1.8<br>2.5 | V | $I_F$ = 20A, $T_J$ = 25˚C<br>$I_F$ = 20A, $T_J$ = 175˚C | Fig.1 |
| $I_R$ | Reverse Current | 5<br>30 | 20<br>200 | μA | $V_R$ = 1200V, $T_J$ = 25˚C<br>$V_R$ = 1200V, $T_J$ = 175˚C | Fig.2 |
| C | Total Capacitance | 1280<br>95<br>77 | / | pF | $V_R$ = 0V, $T_J$ = 25˚C, f = 1MHz<br>$V_R$ = 400V, $T_J$ = 25˚C, f = 1MHz<br>$V_R$ = 800V, $T_J$ = 25˚C, f = 1MHz | Fig.5 |
| $Q_C$ | Total Capacitive Charge | 51 | / | nC | $V_R$ = 800V, $I_F$ = 20A<br>di/dt = 200A/μs, $T_J$ = 25˚C | Fig.4 |

## Thermal Characteristics

| Symbol | Parameter | Typ. | Unit | Note |
|---|---|---|---|---|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case | 0.65 | ˚C/W | Fig.6 |
| $R_{\theta JA}$ | Thermal Resistance from Junction to Ambient | 80 | ˚C/W | |
| $T_{sold}$ | Soldering Temperature | 260 | ˚C | |

## RATING AND CHARACTERISTICS CURVES (SC3S12020D)

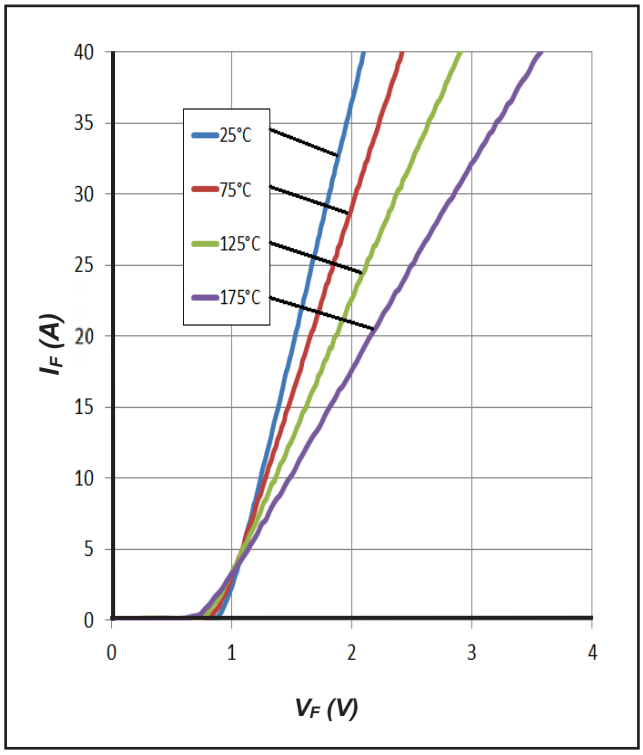



Figure 1. Forward Characteristics

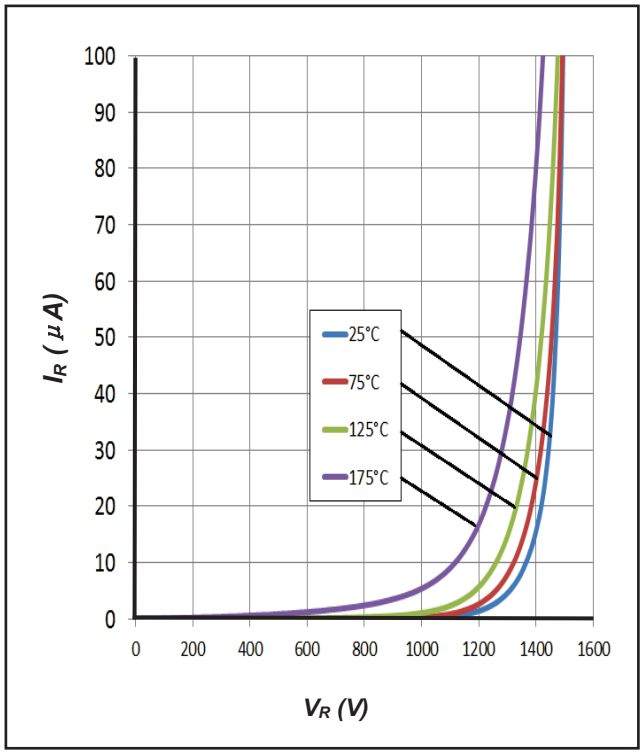



Figure 2. Reverse Characteristics

## RATING AND CHARACTERISTICS CURVES (SC3S12020D)

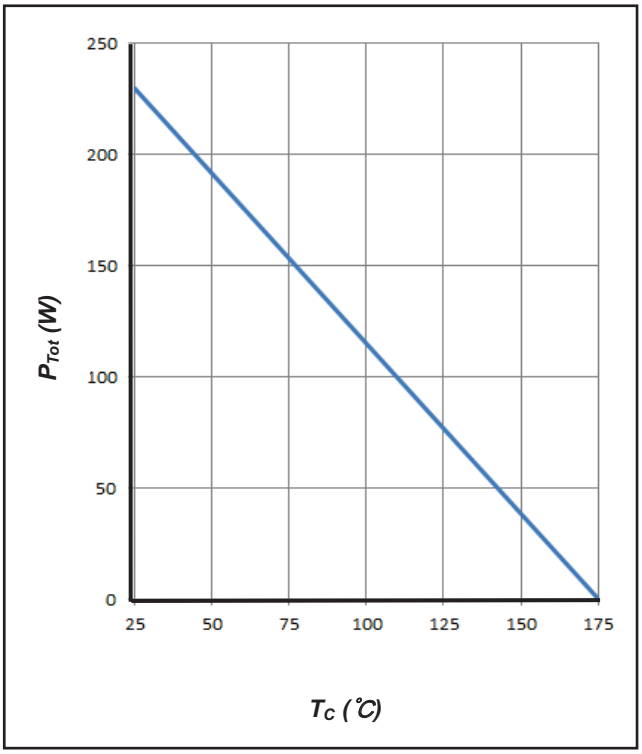



Figure 3. Power Derating

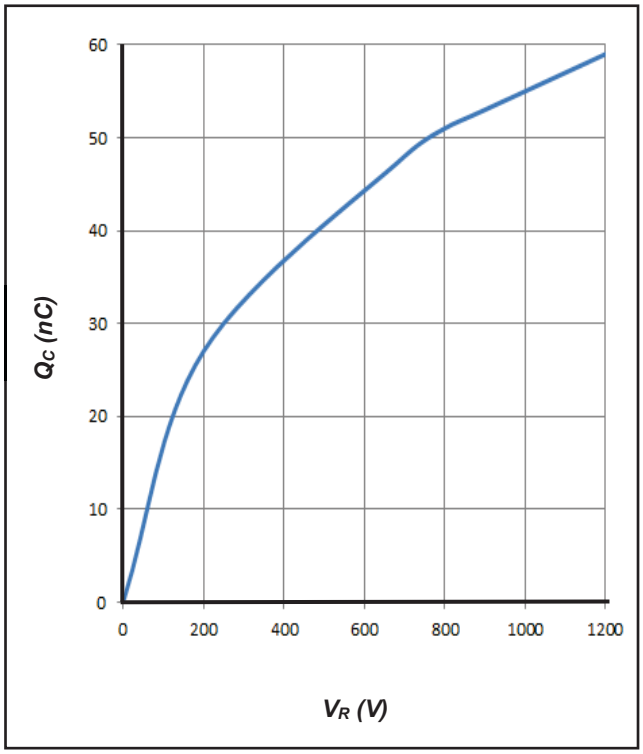



Figure 4. Total Capacitive Charge vs. Reverse Voltage

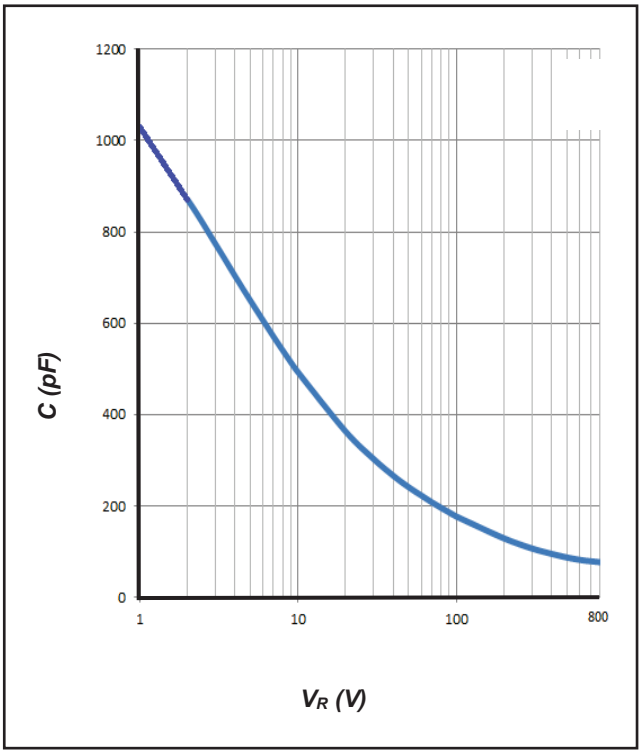



Figure 5. Total Capacitance vs. Reverse Voltage

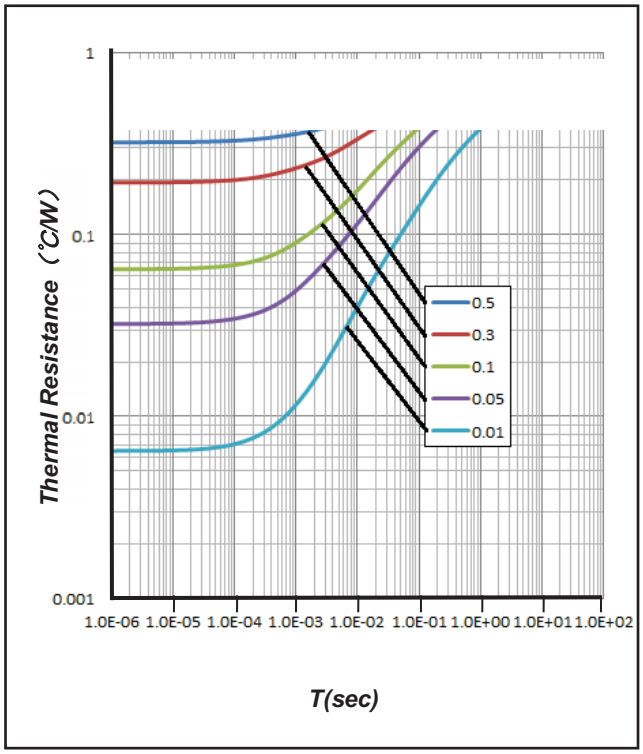
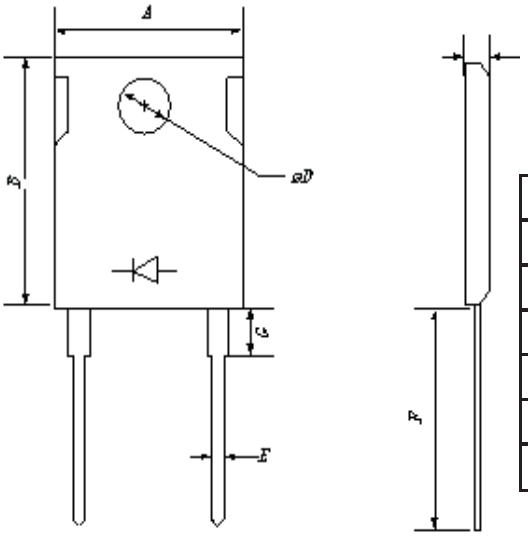
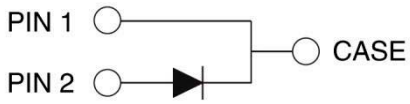



Figure 6. Transient Thermal Impedance

## Package Dimensions

Package TO-247-2

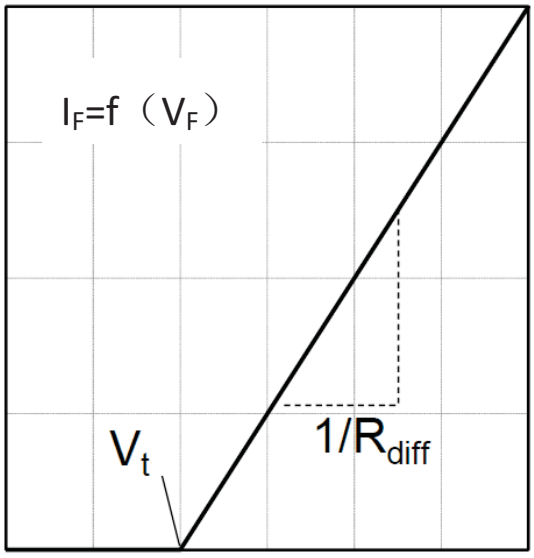





| Symbol | Min. (mm) | Typ. (mm) | Max. (mm) |
|---|---|---|---|
| A | 14.18 | 15.75 | 17.33 |
| B | 18.45 | 20.5 | 22.55 |
| C | 4.50 | 5.00 | 5.50 |
| D | 3.15 | 3.50 | 3.85 |
| E | 1.08 | 1.20 | 1.32 |
| F | 18.27 | 20.30 | 22.33 |

## Simplified Diode Model

**Equivalent IV Curve for Model**




**Mathematical Equation**

$$V_F=V_t + I_F \times R_{diff}$$

$V_t = -0.0012 \times T_j + 0.987$ [V]

$R_{diff} = 9 \times 10^{-7} \times T_j^2 + 9 \times 10^{-5} \times T_j + 0.0257$ [Ω]

Note:

Tj = Diode Junction Temperature In Degrees Celsius, valid from 25°C to 175°C

$I_F$= Forward Current

Less than 40A

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