

# C4D20120A–Silicon Carbide Schottky Diode

## Z-REC™ RECTIFIER

$$V_{RRM} = 1200 \text{ V}$$

$$I_F = 20 \text{ A}$$

$$Q_c = 130 \text{ nC}$$

### Features

- 1.2kV Schottky Rectifier
- Zero Reverse Recovery Current
- High-Frequency Operation
- Temperature-Independent Switching
- Extremely Fast Switching

### 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
- Power Factor Correction
- Motor Drives

### Package



TO-220-2



| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C4D20120A   | TO-220-2 | C4D20120 |

### Maximum Ratings ( $T_c=25^\circ\text{C}$ unless otherwise specified)

| Symbol       | Parameter                             | Value          | Unit             | Test Conditions                                                                                                                   | Note |
|--------------|---------------------------------------|----------------|------------------|-----------------------------------------------------------------------------------------------------------------------------------|------|
| $V_{RRM}$    | Repetitive Peak Reverse Voltage       | 1200           | V                |                                                                                                                                   |      |
| $V_{RSM}$    | Surge Peak Reverse Voltage            | 1300           | V                |                                                                                                                                   |      |
| $V_R$        | DC Peak Reverse Voltage               | 1200           | V                |                                                                                                                                   |      |
| $I_{F(AVG)}$ | Maximum DC Current                    | 27             | A                | $T_c=135^\circ\text{C}$ , no AC component                                                                                         |      |
| $I_{FRM}$    | Repetitive Peak Forward Surge Current | 91<br>61       | A                | $T_c=25^\circ\text{C}$ , $t_p=10 \text{ ms}$ , Half Sine Pulse<br>$T_c=110^\circ\text{C}$ , $t_p=10 \text{ ms}$ , Half Sine Pulse |      |
| $I_{FSM}$    | Non-Repetitive Forward Surge Current  | 130<br>110     | A                | $T_c=25^\circ\text{C}$ , $t_p=10 \text{ ms}$ , Half Sine Pulse<br>$T_c=110^\circ\text{C}$ , $t_p=10 \text{ ms}$ , Half Sine Pulse |      |
| $P_{tot}$    | Power Dissipation                     | 242<br>104     | W                | $T_c=25^\circ\text{C}$<br>$T_c=110^\circ\text{C}$                                                                                 |      |
| $T_c$        | Maximum Case Temperature              | 135            | $^\circ\text{C}$ |                                                                                                                                   |      |
| $T_j$        | Operating Junction Range              | -55 to<br>+175 | $^\circ\text{C}$ |                                                                                                                                   |      |
| $T_{stg}$    | Storage Temperature Range             | -55 to<br>+135 | $^\circ\text{C}$ |                                                                                                                                   |      |
|              | TO-220 Mounting Torque                | 1<br>8.8       | Nm<br>lbf-in     | M3 Screw<br>6-32 Screw                                                                                                            |      |

## Electrical Characteristics

| Symbol | Parameter               | Typ.             | Max.       | Unit          | Test Conditions                                                                                                                                                                                                    | Note |
|--------|-------------------------|------------------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| $V_F$  | Forward Voltage         | 1.5<br>2.2       | 1.8<br>3   | V             | $I_F = 20\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 20\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                      |      |
| $I_R$  | Reverse Current         | 35<br>65         | 200<br>400 | $\mu\text{A}$ | $V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                  |      |
| $Q_C$  | Total Capacitive Charge | 130              |            | nC            | $V_R = 1200\text{ V}$ , $I_F = 20\text{ A}$<br>$di/dt = 200\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                      |      |
| C      | Total Capacitance       | 1500<br>93<br>67 |            | pF            | $V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 800\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ |      |

Note:

1. This is a majority carrier diode, so there is no reverse recovery charge.

## Thermal Characteristics

| Symbol          | Parameter                                | Typ. | Max. | Unit                      | Test Conditions | Note |
|-----------------|------------------------------------------|------|------|---------------------------|-----------------|------|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case | 0.62 |      | $^\circ\text{C}/\text{W}$ |                 |      |

## Typical Performance

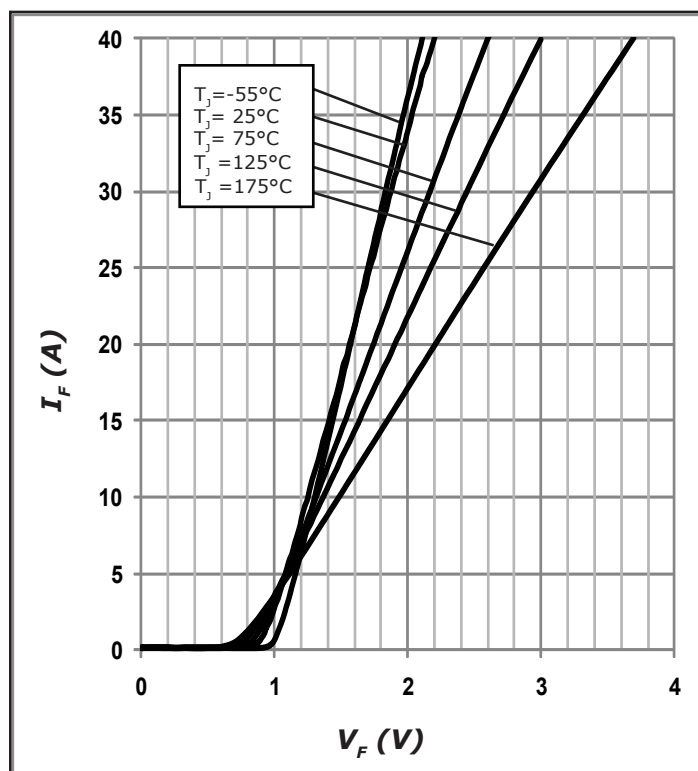


Figure 1. Forward Characteristics

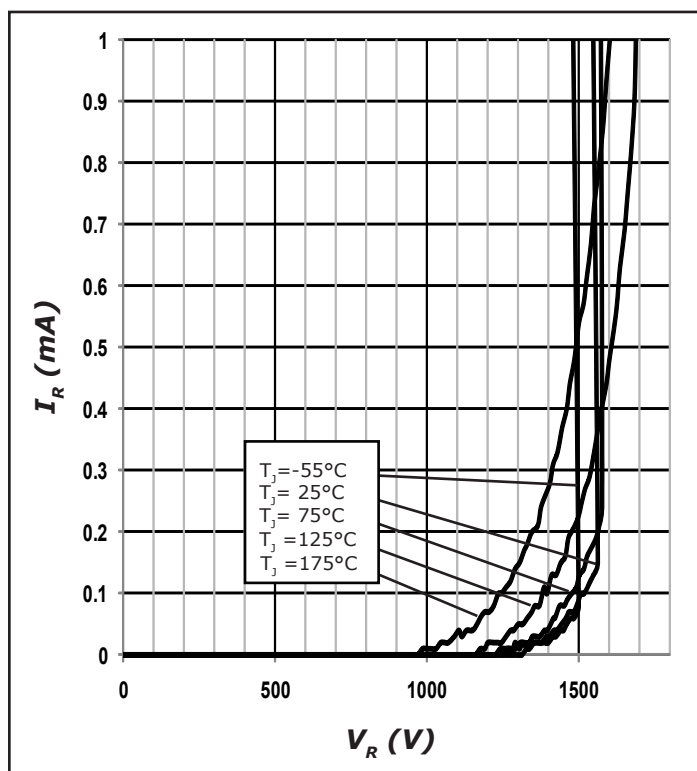


Figure 2. Reverse Characteristics

## Typical Performance

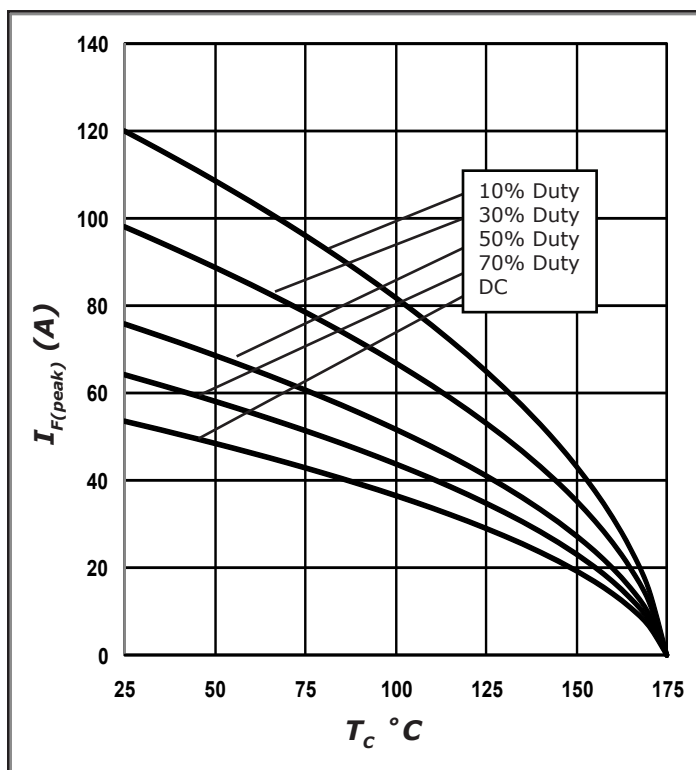


Figure 3. Current Derating

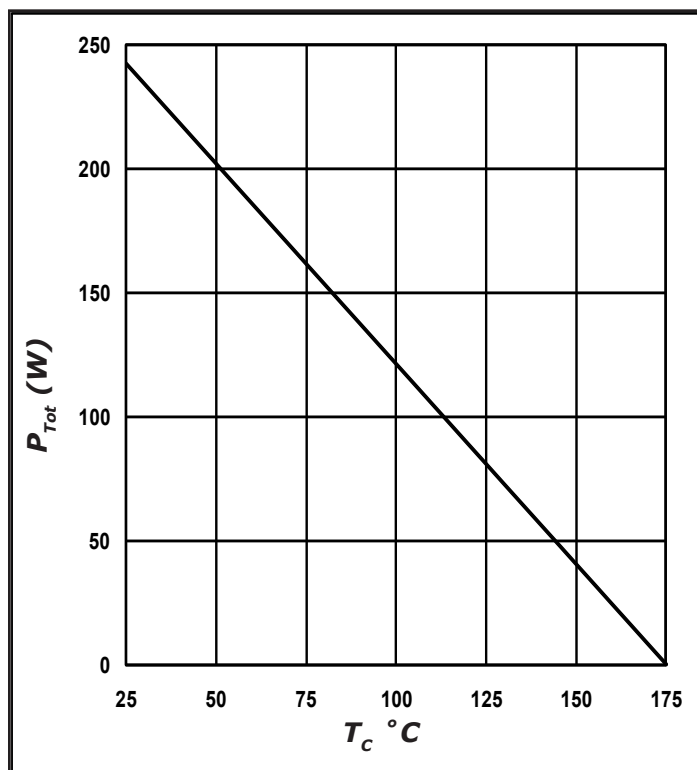


Figure 4. Power Derating

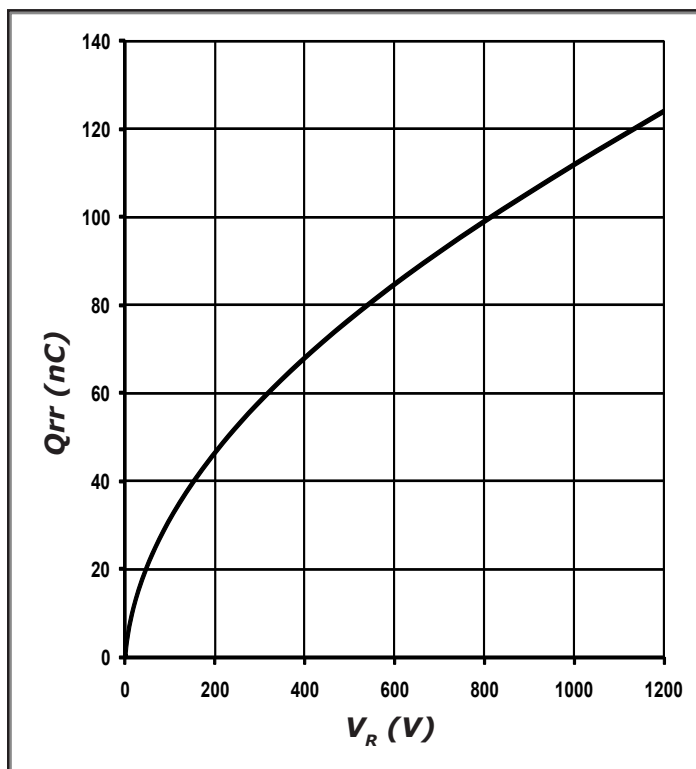


Figure 5. Recovery Charge vs. Reverse Voltage

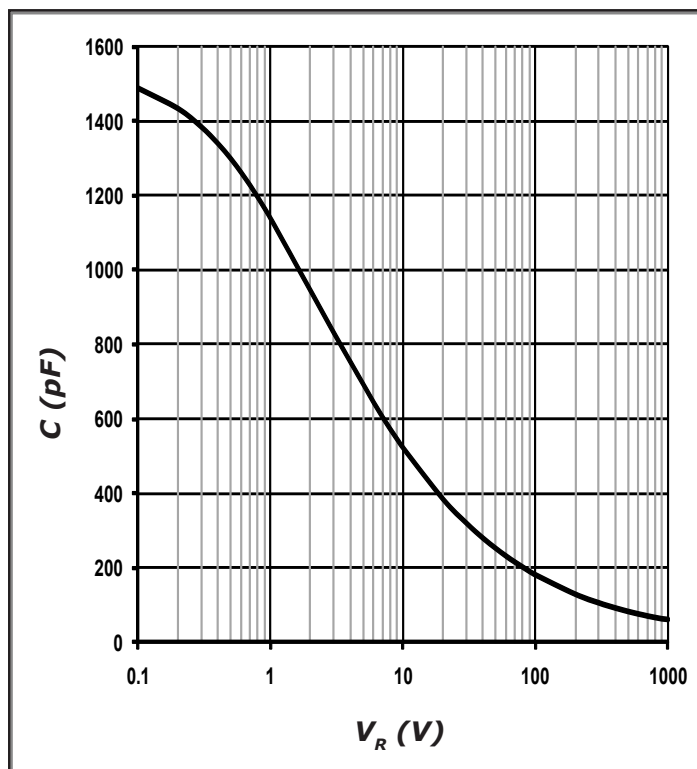


Figure 6. Capacitance vs. Reverse Voltage

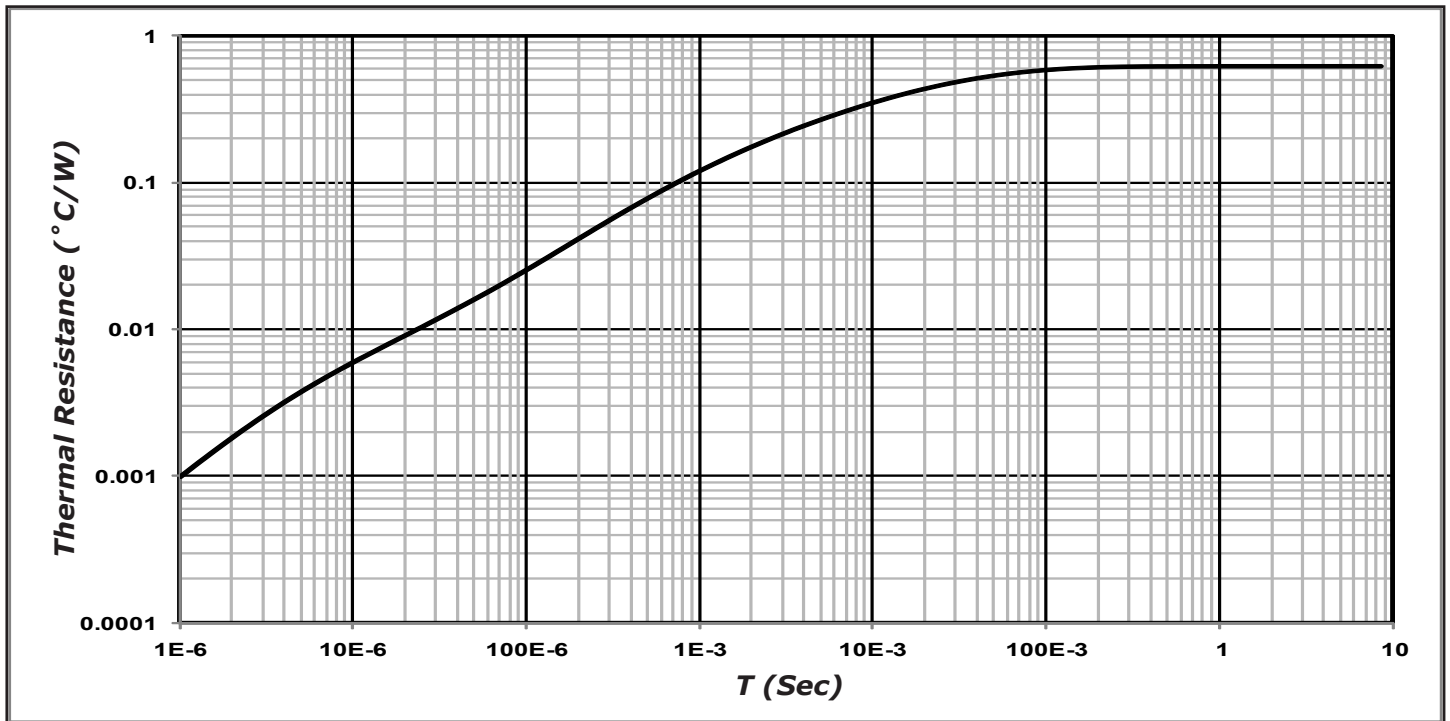
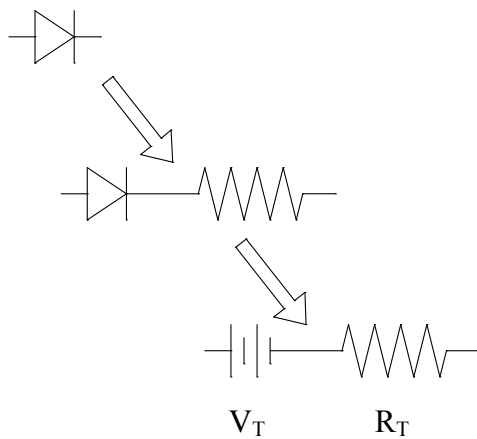


Figure 7. Transient Thermal Impedance

## Diode Model



$$V_{fT} = V_T + I_f * R_T$$

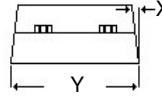
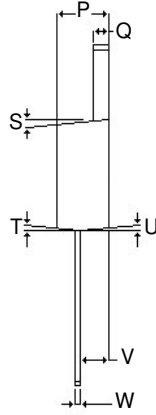
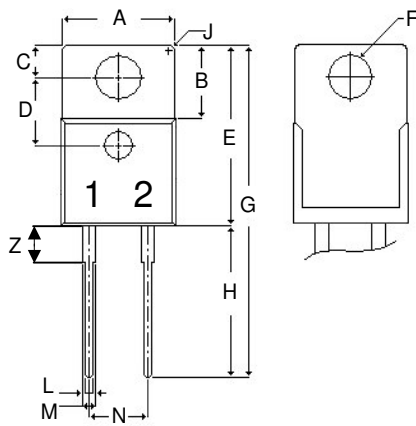
$$V_T = 0.97 + (T_j * -1.40 * 10^{-3})$$

$$R_T = 0.023 + (T_j * 2.71 * 10^{-4})$$

Note:  $T_j$  = Diode Junction Temperature In Degrees Celcius

## Package Dimensions

Package TO-220-2

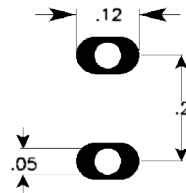


| POS | Inches  |       | Millimeters |        |
|-----|---------|-------|-------------|--------|
|     | Min     | Max   | Min         | Max    |
| A   | .381    | .410  | 9.677       | 10.414 |
| B   | .235    | .255  | 5.969       | 6.477  |
| C   | .100    | .120  | 2.540       | 3.048  |
| D   | .223    | .337  | 5.664       | 8.560  |
| E   | .590    | .615  | 14.986      | 15.621 |
| F   | .143    | .153  | 3.632       | 3.886  |
| G   | 1.105   | 1.147 | 28.067      | 29.134 |
| H   | .500    | .550  | 12.700      | 13.970 |
| J   | R 0.197 |       | R 0.197     |        |
| L   | .025    | .036  | .635        | .914   |
| M   | .045    | .055  | 1.143       | 1.397  |
| N   | .195    | .205  | 4.953       | 5.207  |
| P   | .165    | .185  | 4.191       | 4.699  |
| Q   | .048    | .054  | 1.219       | 1.372  |
| S   | 3°      | 6°    | 3°          | 6°     |
| T   | 3°      | 6°    | 3°          | 6°     |
| U   | 3°      | 6°    | 3°          | 6°     |
| V   | .094    | .110  | 2.388       | 2.794  |
| W   | .014    | .025  | .356        | .635   |
| X   | 3°      | 5.5°  | 3°          | 5.5°   |
| Y   | .385    | .410  | 9.779       | 10.414 |
| Z   | .130    | .150  | 3.302       | 3.810  |

NOTE:

1. Dimension L, M, W apply for Solder Dip Finish

## Recommended Solder Pad Layout



TO-220-2

| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C4D20120A   | TO-220-2 | C4D20120 |

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