

# C3D06065A–Silicon Carbide Schottky Diode

## Z-REC™ RECTIFIER

$$V_{RRM} = 650 \text{ V}$$

$$I_{F(AVG)} = 6 \text{ A}$$

$$Q_c = 16 \text{ nC}$$

### 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
- Power Factor Correction
  - Typical PFC  $P_{out}$  : 600W-1200W
- Motor Drives
  - Typical Power : 2HP-3HP

### Package



TO-220-2



| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D06065A   | TO-220-2 | C3D06065 |

### Maximum Ratings

| 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                |                                                                                                                                                           |      |
| $I_{F(AVG)}$   | Average Forward Current                    | 6              | A                | $T_c = 150^\circ\text{C}$ , DC                                                                                                                            |      |
| $I_{FRM}$      | Repetitive Peak Forward Surge Current      | 41<br>27       | A                | $T_c = 25^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave, $D=0.3$<br>$T_c = 110^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave, $D=0.3$ |      |
| $I_{FSM}$      | Non-Repetitive Peak Forward Surge Current  | 70<br>55       | A                | $T_c = 25^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave, $D=0.3$<br>$T_c = 110^\circ\text{C}$ , $t_p = 10 \text{ ms}$ , Half Sine Wave, $D=0.3$ |      |
| $I_{FSM}$      | Non-Repetitive Peak Forward Surge Current  | 200            | A                | $T_c = 25^\circ\text{C}$ , $t_p = 10 \mu\text{s}$ , Pulse                                                                                                 |      |
| $P_{tot}$      | Power Dissipation                          | 79<br>34       | W                | $T_c = 25^\circ\text{C}$<br>$T_c = 110^\circ\text{C}$                                                                                                     |      |
| $T_j, T_{stg}$ | Operating Junction and Storage Temperature | -55 to<br>+175 | $^\circ\text{C}$ |                                                                                                                                                           |      |
|                | 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         | 1.6<br>1.9      | 1.8<br>2.4 | V             | $I_F = 6\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 6\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                        |      |
| $I_R$  | Reverse Current         | 12<br>24        | 60<br>220  | $\mu\text{A}$ | $V_R = 650\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 650\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                    |      |
| $Q_C$  | Total Capacitive Charge | 16              |            | nC            | $V_R = 650\text{ V}$ , $I_F = 6\text{ A}$<br>$di/dt = 500\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                        |      |
| C      | Total Capacitance       | 294<br>27<br>26 |            | pF            | $V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 200\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$<br>$V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ |      |

Note:

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

## Thermal Characteristics

| Symbol          | Parameter                                | Typ. | Unit                      |
|-----------------|------------------------------------------|------|---------------------------|
| $R_{\theta JC}$ | Thermal Resistance from Junction to Case | 1.6  | $^\circ\text{C}/\text{W}$ |

## Typical Performance

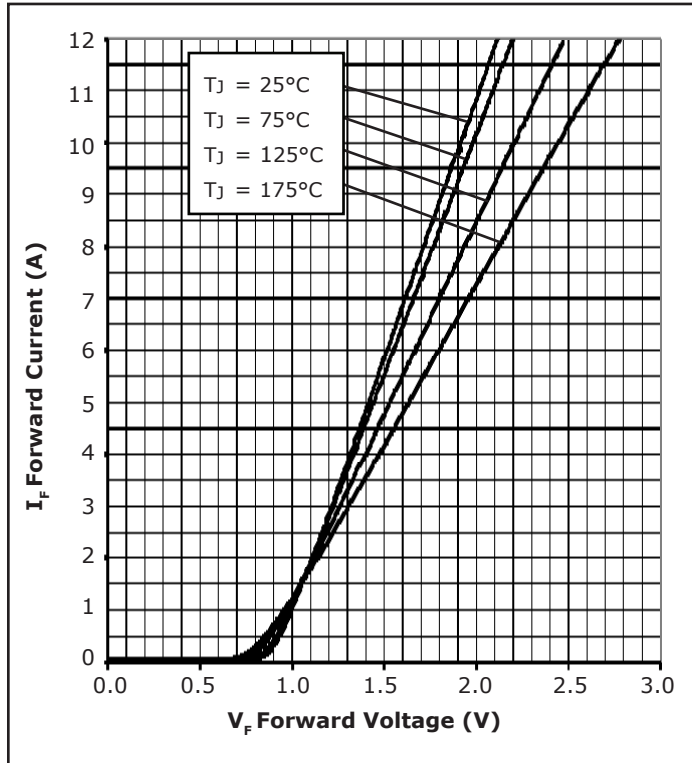


Figure 1. Forward Characteristics

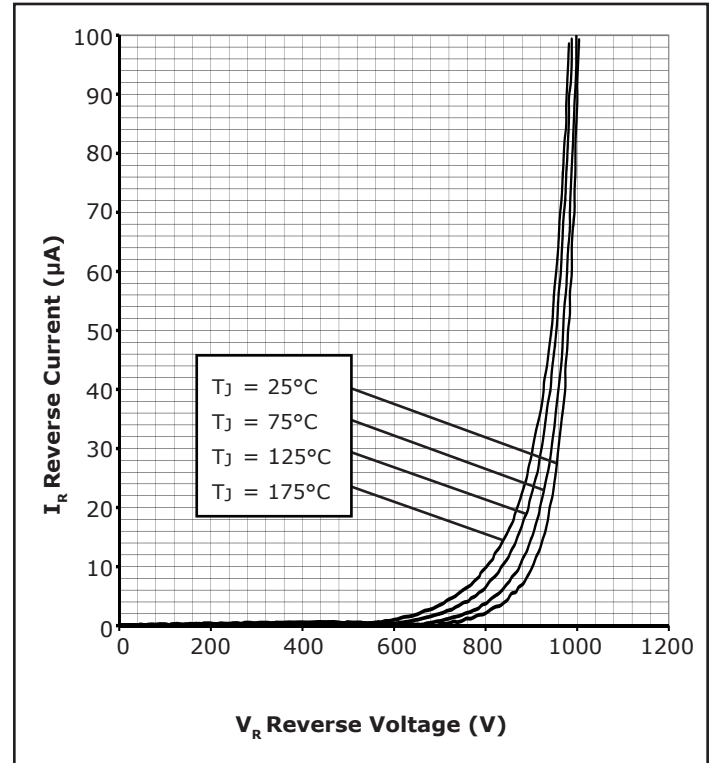


Figure 2. Reverse Characteristics

## Typical Performance

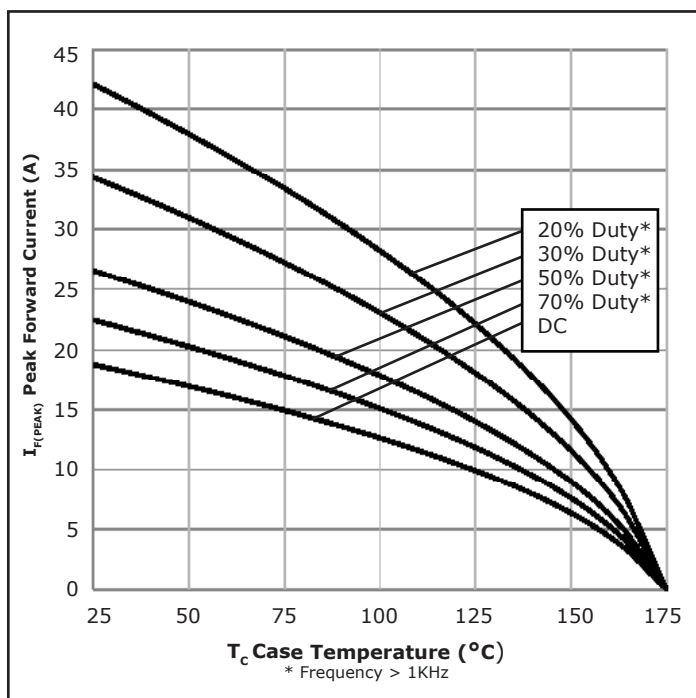


Figure 3. Current Derating

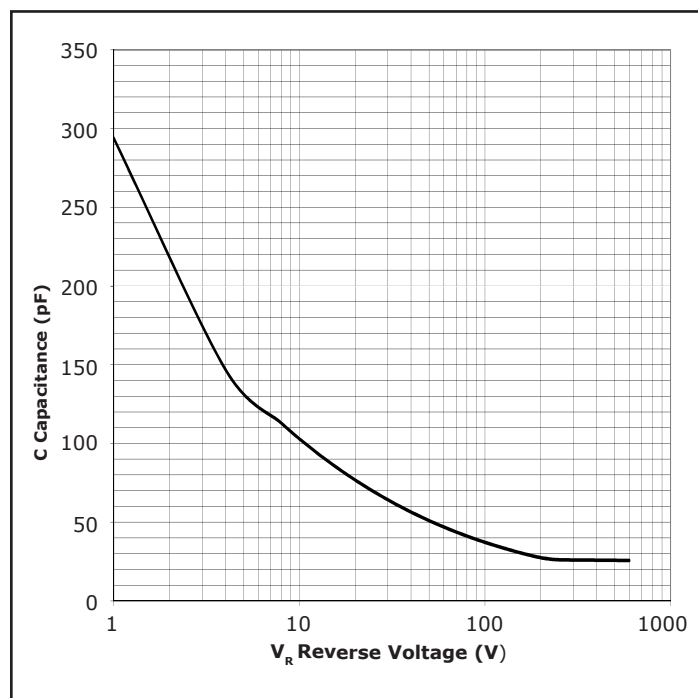


Figure 4. Capacitance vs. Reverse Voltage

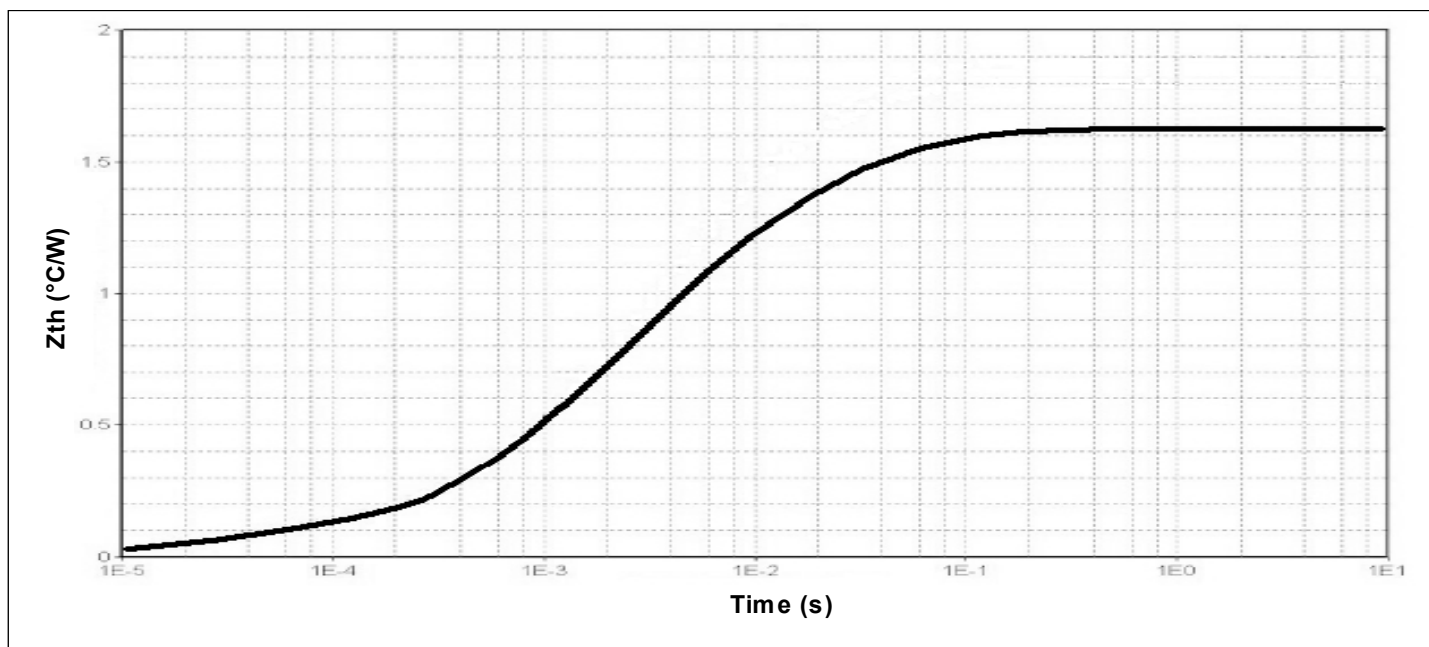


Figure 5. Transient Thermal Impedance

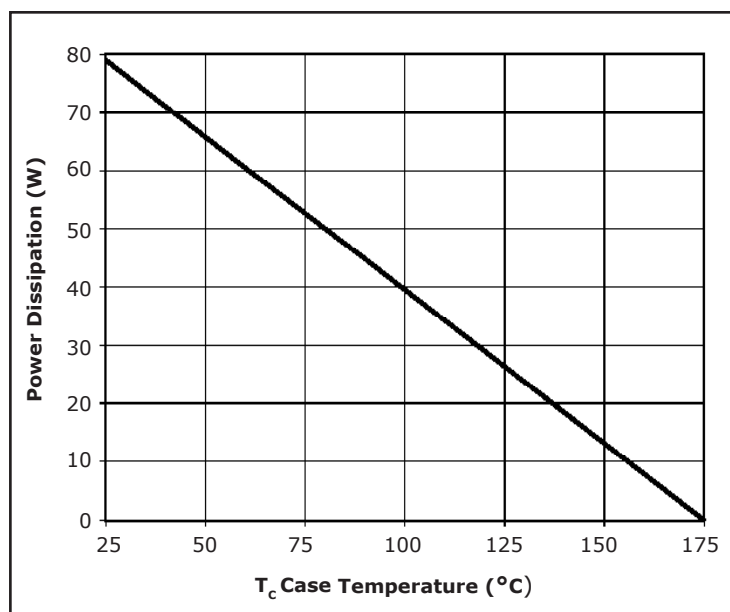
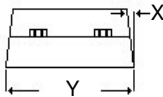
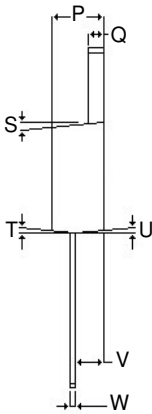
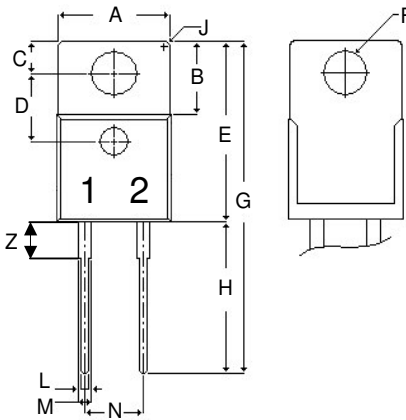
**Typical Performance**

Figure 6. Power Derating



Package Dimensions

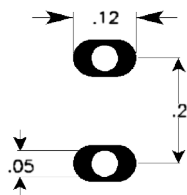
Package TO-220-2



| 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

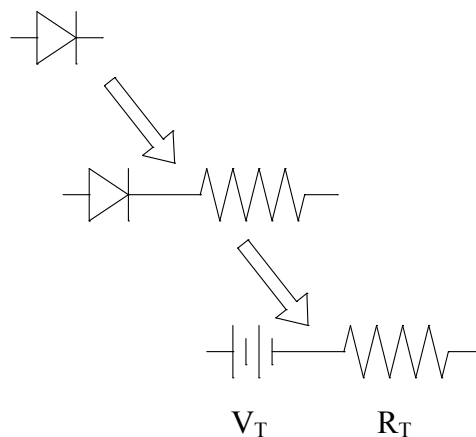
## Recommended Solder Pad Layout



TO-220-2

| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D06065A   | TO-220-2 | C3D06065 |

## Diode Model



$$V_{fT} = V_T + I_f \cdot R_T$$

$$V_T = 0.975 + (T_j \cdot -1.0 \cdot 10^{-3})$$

$$R_T = 0.09 + (T_j \cdot 0.51 \cdot 10^{-3})$$

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

"The levels of environmentally sensitive, persistent biologically toxic (PBT), persistent organic pollutants (POP), or otherwise restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2002/95/EC on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS), as amended through April 21, 2006.

This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, air traffic control systems, or weapons systems.

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Cree, Inc.  
4600 Silicon Drive  
Durham, NC 27703  
USA Tel: +1.919.313.5300  
Fax: +1.919.313.5451  
[www.cree.com/power](http://www.cree.com/power)

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