

# C3D04060E–Silicon Carbide Schottky Diode

## Z-REC™ RECTIFIER

$$V_{RRM} = 600 \text{ V}$$

$$I_F = 4 \text{ A}$$

$$(T_c < 160^\circ \text{C})$$

$$Q_c = 8.5 \text{ nC}$$

### Features

- 600-Volt Schottky Rectifier
- Optimized for PFC Boost Diode Application
- 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  $P_{out}$  : 400W-600W

### Package



TO-252-2



| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D04060E   | TO-252-2 | C3D04060 |

### Maximum Ratings

| Symbol         | Parameter                                  | Value          | Unit              | Test Conditions                                                                                                                                               | Note |
|----------------|--------------------------------------------|----------------|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| $V_{RRM}$      | Repetitive Peak Reverse Voltage            | 600            | V                 |                                                                                                                                                               |      |
| $V_{RSM}$      | Surge Peak Reverse Voltage                 | 600            | V                 |                                                                                                                                                               |      |
| $V_{DC}$       | DC Blocking Voltage                        | 600            | V                 |                                                                                                                                                               |      |
| $I_F$          | Forward Continuous Current                 | 4<br>6         | A                 | $T_c < 160^\circ \text{C}$<br>$T_c < 145^\circ \text{C}$                                                                                                      |      |
| $I_{FRM}$      | Repetitive Peak Forward Surge Current      | 22<br>17       | 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  | 31.9<br>28.5   | 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  | 110            | A                 | $T_c = 25^\circ \text{C}$ , $t_p = 10 \mu\text{S}$ , Pulse                                                                                                    |      |
| $P_{tot}$      | Power Dissipation                          | 75<br>32.5     | 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         | 1.5<br>1.8      | 1.7<br>2.4 | V             | $I_F = 4\text{ A}$ $T_J = 25^\circ\text{C}$<br>$I_F = 4\text{ A}$ $T_J = 175^\circ\text{C}$                                                                                                                        |      |
| $I_R$  | Reverse Current         | 10<br>20        | 50<br>100  | $\mu\text{A}$ | $V_R = 600\text{ V}$ $T_J = 25^\circ\text{C}$<br>$V_R = 600\text{ V}$ $T_J = 175^\circ\text{C}$                                                                                                                    |      |
| $Q_C$  | Total Capacitive Charge | 8.5             |            | nC            | $V_R = 600\text{ V}$ , $I_F = 4\text{ A}$<br>$di/dt = 500\text{ A}/\mu\text{s}$<br>$T_J = 25^\circ\text{C}$                                                                                                        |      |
| C      | Total Capacitance       | 251<br>22<br>21 |            | 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                      |
|-----------------|---------------------------------------------------------|------|---------------------------|
| $R_{\theta JC}$ | TO-252 Package Thermal Resistance from Junction to Case | 2.02 | $^\circ\text{C}/\text{W}$ |

## Typical Performance

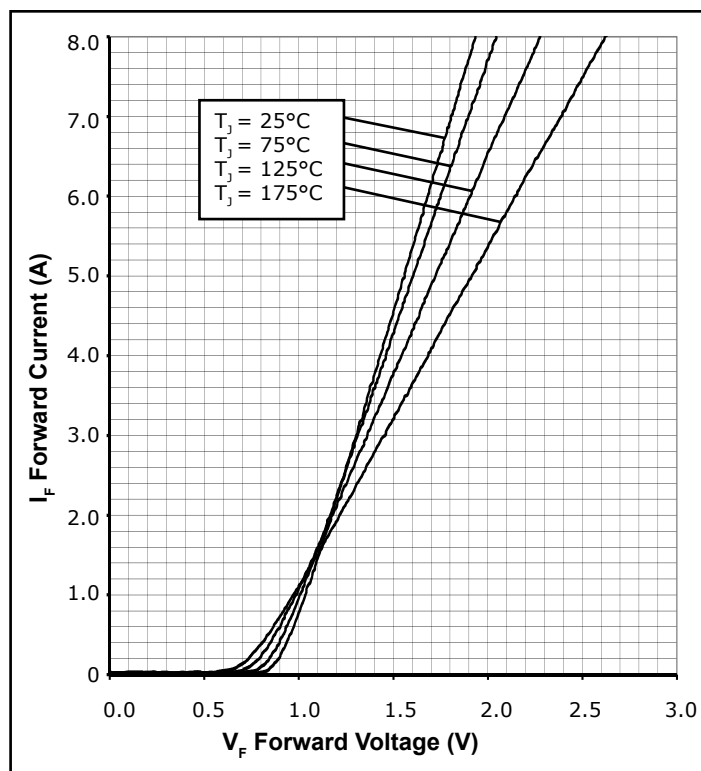


Figure 1. Forward Characteristics

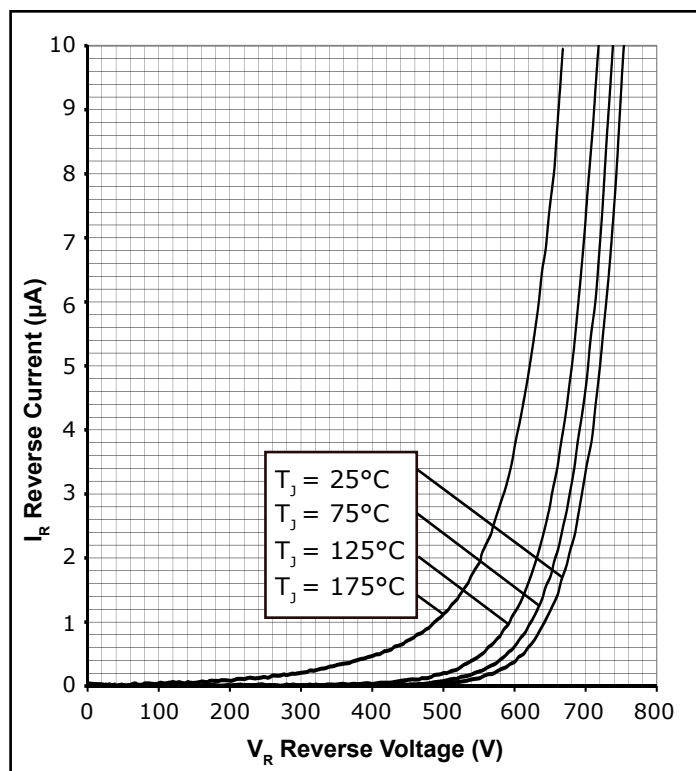


Figure 2. Reverse Characteristics

## Typical Performance

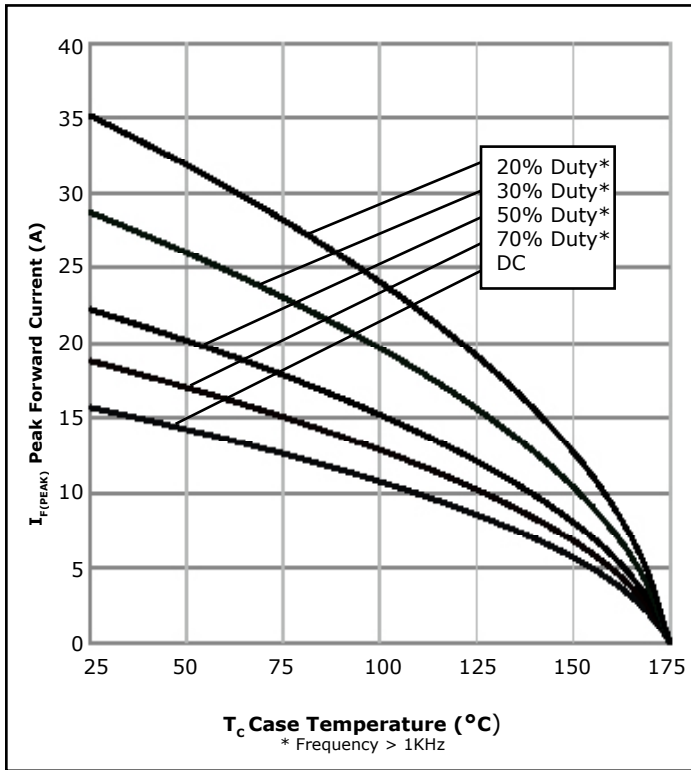


Figure 3. Current Derating

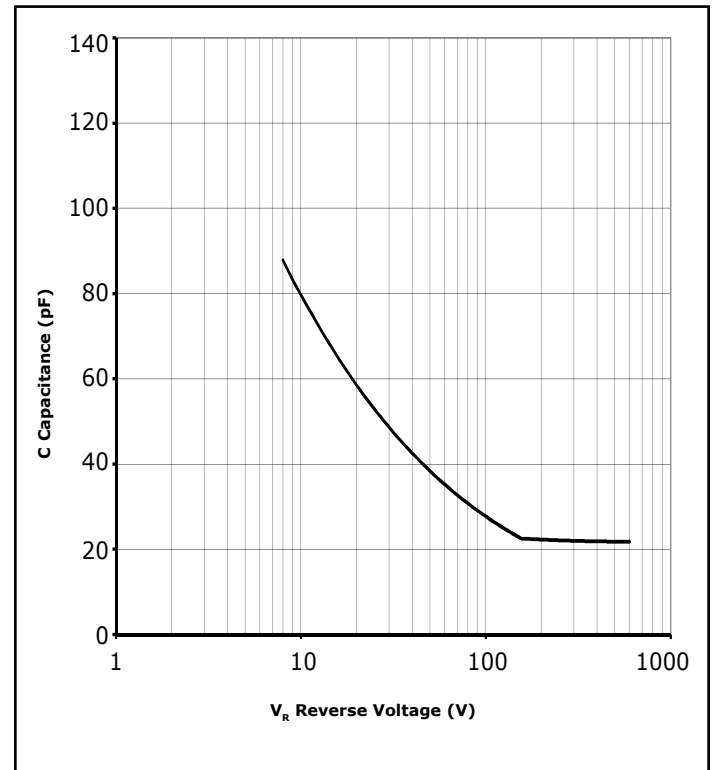


Figure 4. Capacitance vs. Reverse Voltage

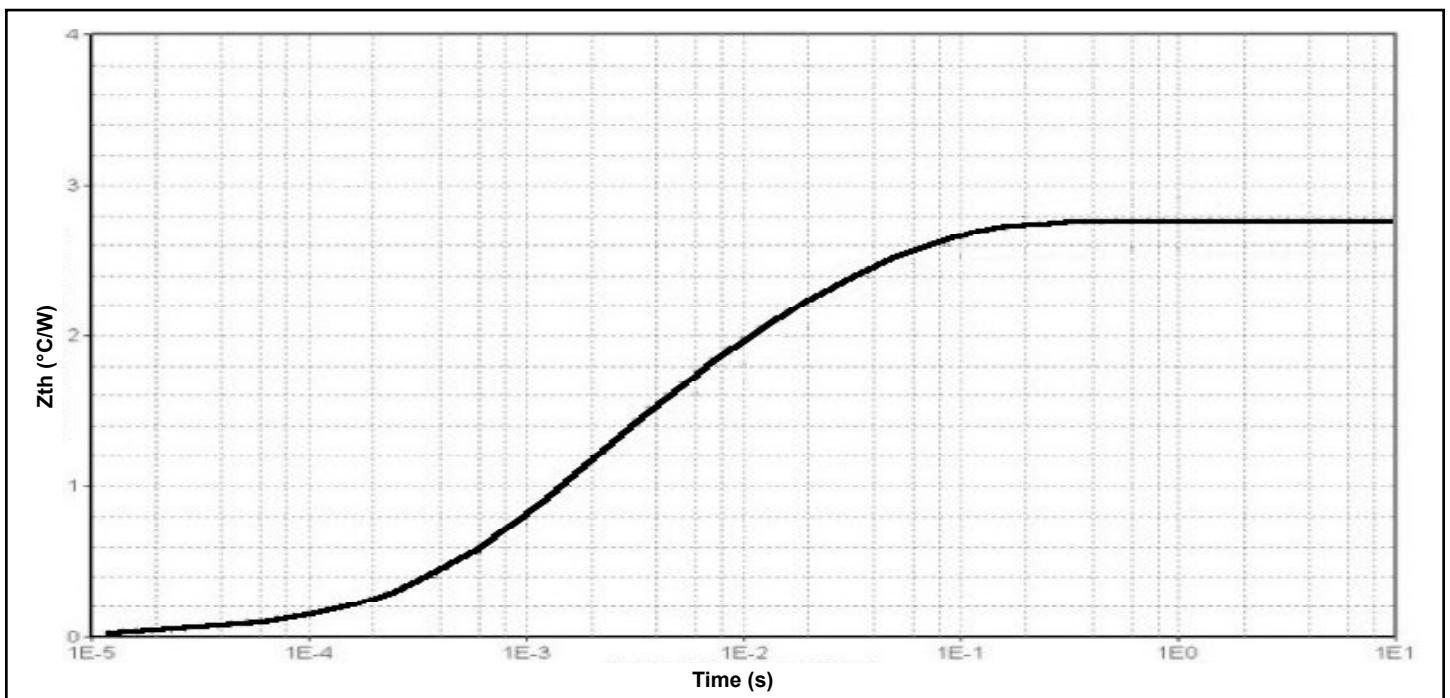


Figure 5. Transient Thermal Impedance

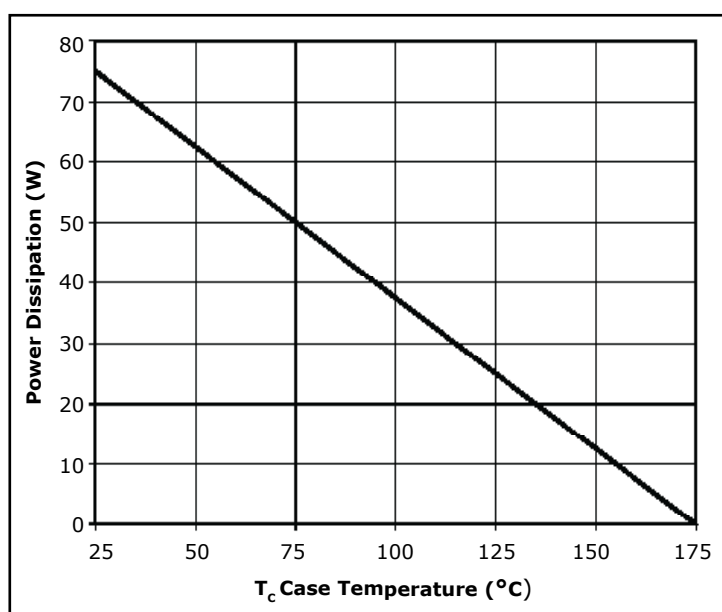
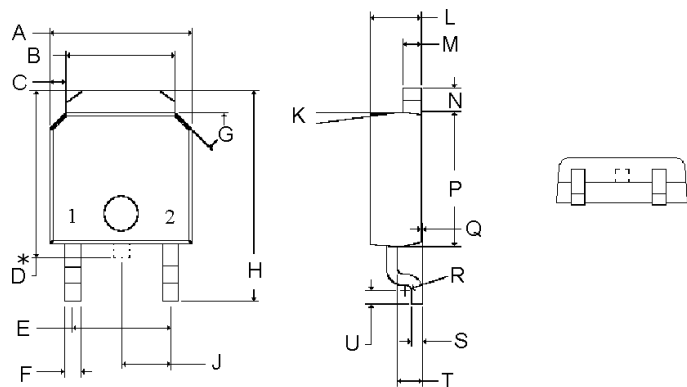
**Typical Performance**

Figure 6. Power Derating

## Package Dimensions

Package TO-252-2

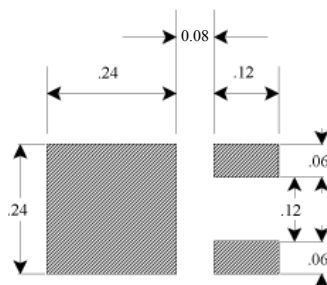


| POS | Inches     |      | Millimeters |        |
|-----|------------|------|-------------|--------|
|     | Min        | Max  | Min         | Max    |
| A   | .250       | .289 | 6.350       | 7.341  |
| B   | .197       | .215 | 5.004       | 5.461  |
| C   | .027       | .050 | .686        | 1.270  |
| D*  | .270       | .322 | 6.858       | 8.179  |
| E   | .178       | .182 | 4.521       | 4.623  |
| F   | .025       | .045 | .635        | 1.143  |
| G   | 44°        | 46°  | 44°         | 46°    |
| H   | .380       | .410 | 9.652       | 10.414 |
| J   | .090 TYP   |      | 2.286 TYP   |        |
| K   | 6°         | 8°   | 6°          | 8°     |
| L   | .086       | .094 | 2.184       | 2.388  |
| M   | .018       | .034 | .457        | .864   |
| N   | .035       | .050 | .889        | 1.270  |
| P   | .231       | .246 | 5.867       | 6.248  |
| Q   | 0.00       | .005 | 0.00        | .127   |
| R   | R0.010 TYP |      | R0.254 TYP  |        |
| S   | .017       | .023 | .432        | .584   |
| T   | .038       | .045 | .965        | 1.143  |
| U   | .021       | .029 | .533        | .737   |

Note:

\* Tab "D" may not be present

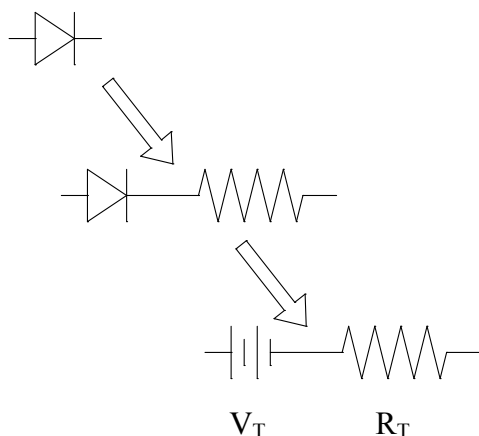
## Recommended Solder Pad Layout



TO-252-2

| Part Number | Package  | Marking  |
|-------------|----------|----------|
| C3D04060E   | TO-252-2 | C3D04060 |

## Diode Model



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

$$V_T = 0.98 + (T_J * -1.8 * 10^{-3})$$

$$R_T = 0.10 + (T_J * 9.16 * 10^{-4})$$

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

## Данный компонент на территории Российской Федерации

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