

# C3D04065E

## Silicon Carbide Schottky Diode

### Z-REC<sup>®</sup> RECTIFIER

$V_{RRM}$	=	650 V
$I_F (T_C=135^\circ\text{C})$	=	6 A
$Q_c$	=	10 nC

#### Features

- 650-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  $V_F$

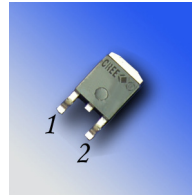
#### Benefits

- 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 (SMPS)
- Boost diodes in PFC or DC/DC stages
- Free Wheeling Diodes in Inverter stages
- AC/DC converters

#### Package



TO-252-2



AEC-Q101 Qualified



Part Number	Package	Marking
C3D04065E	TO-252-2	C3D04065

#### Maximum Ratings ( $T_C = 25^\circ\text{C}$ 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	13.5 6 4	A	$T_C=25^\circ\text{C}$ $T_C=135^\circ\text{C}$ $T_C=155^\circ\text{C}$	Fig. 3
$I_{FRM}$	Repetitive Peak Forward Surge Current	17 12	A	$T_C=25^\circ\text{C}, t_p = 10 \text{ ms}$ , Half Sine Wave $T_C=110^\circ\text{C}, t_p = 10 \text{ ms}$ , Half Sine Wave	
$I_{FSM}$	Non-Repetitive Peak Forward Surge Current	25 19	A	$T_C=25^\circ\text{C}, t_p = 10 \text{ ms}$ , Half Sine Wave $T_C=110^\circ\text{C}, t_p = 10 \text{ ms}$ , Half Sine Wave	Fig. 8
$I_{F,Max}$	Non-Repetitive Peak Forward Surge Current	220 160	A	$T_C=25^\circ\text{C}, t_p = 10 \mu\text{s}$ , Pulse $T_C=110^\circ\text{C}, t_p = 10 \mu\text{s}$ , Pulse	Fig. 8
$P_{tot}$	Power Dissipation	52 22.5	W	$T_C=25^\circ\text{C}$ $T_C=110^\circ\text{C}$	Fig. 4
dV/dt	Diode dV/dt ruggedness	200	V/ns	$V_R=0-650\text{V}$	
$\int i^2 dt$	$i^2t$ value	3.1 1.8	A <sup>2</sup> s	$T_C=25^\circ\text{C}, t_p=10 \text{ ms}$ $T_C=110^\circ\text{C}, t_p=10 \text{ ms}$	
$T_J, T_{stg}$	Operating Junction and Storage Temperature	-55 to +175	$^\circ\text{C}$		

## Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.4 1.7	1.7 2.4	V	$I_F = 4\text{ A}$ $T_J = 25^\circ\text{C}$ $I_F = 4\text{ A}$ $T_J = 175^\circ\text{C}$	Fig. 1
$I_R$	Reverse Current	6 12	30 120	$\mu\text{A}$	$V_R = 650\text{ V}$ $T_J = 25^\circ\text{C}$ $V_R = 650\text{ V}$ $T_J = 175^\circ\text{C}$	Fig. 2
$Q_C$	Total Capacitive Charge	10		nC	$V_R = 400\text{ V}$ , $I_F = 4\text{ A}$ $di/dt = 500\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$	Fig. 5
C	Total Capacitance	231 18.5 15		pF	$V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 200\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$	Fig. 6
$E_C$	Capacitance Stored Energy	1.4		$\mu\text{J}$	$V_R = 400\text{ V}$	Fig. 7

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

## Thermal Characteristics

Symbol	Parameter	Typ.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	2.9	$^\circ\text{C}/\text{W}$	Fig. 9

## Typical Performance

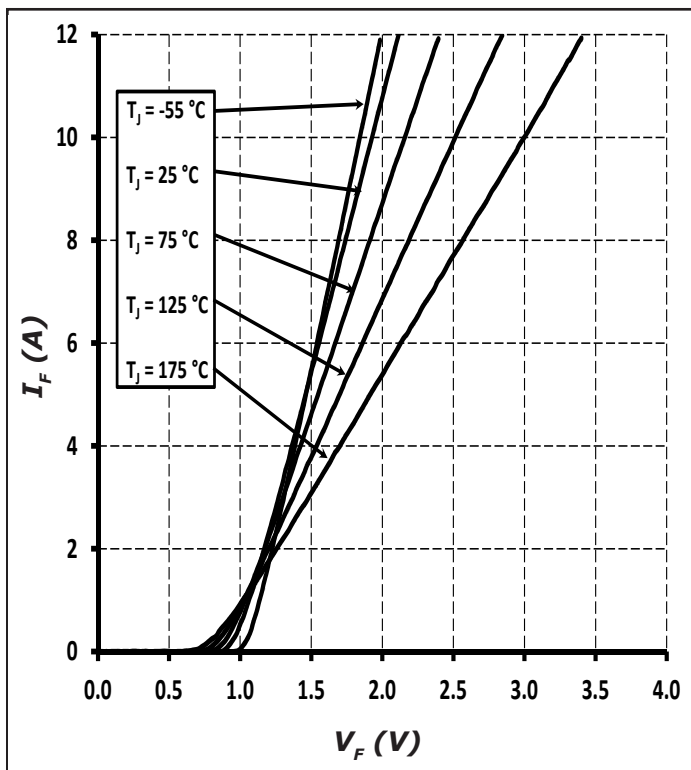


Figure 1. Forward Characteristics

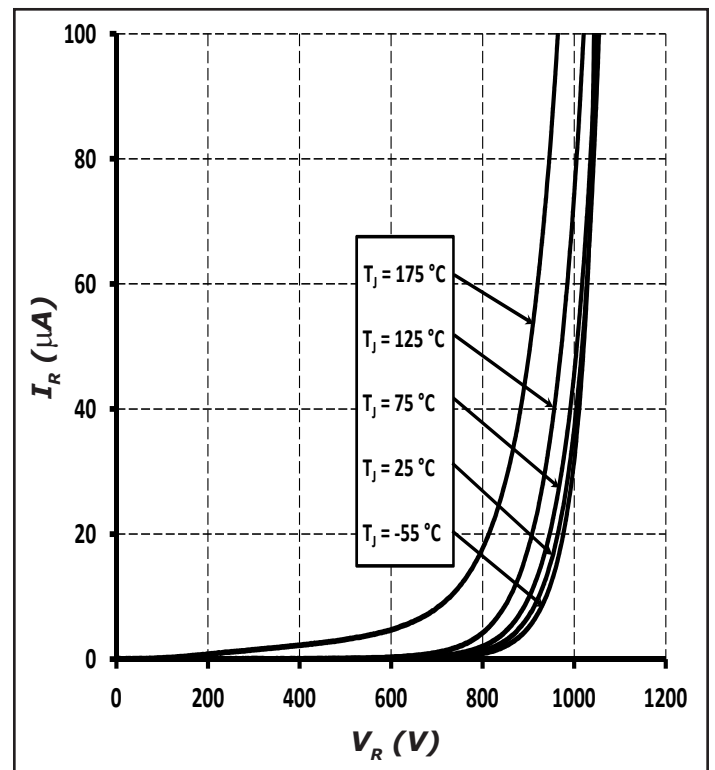


Figure 2. Reverse Characteristics

## Typical Performance

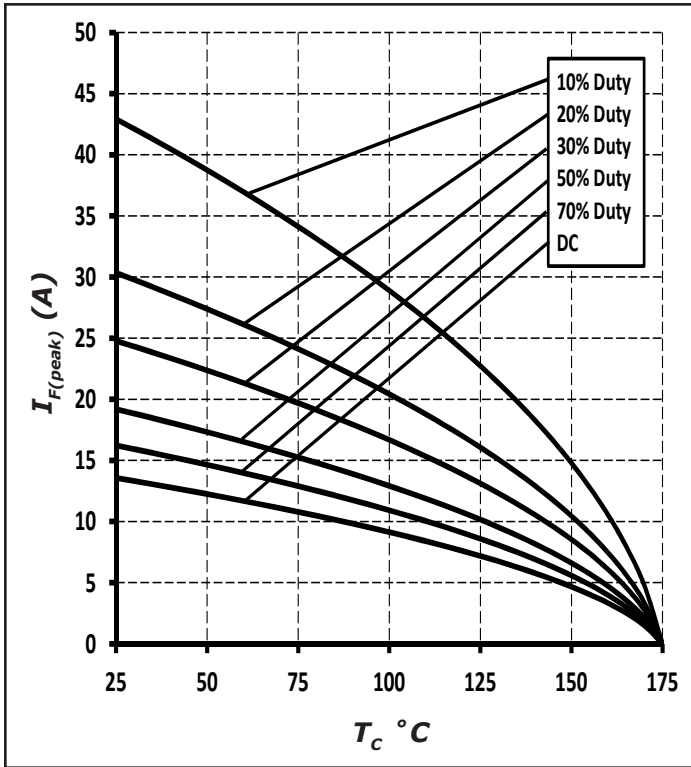


Figure 3. Current Derating

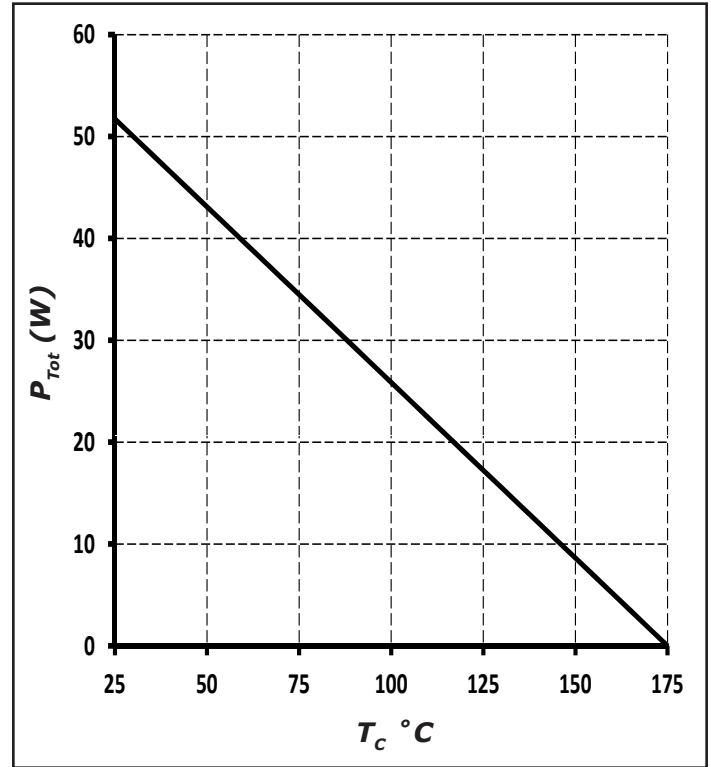


Figure 4. Power Derating

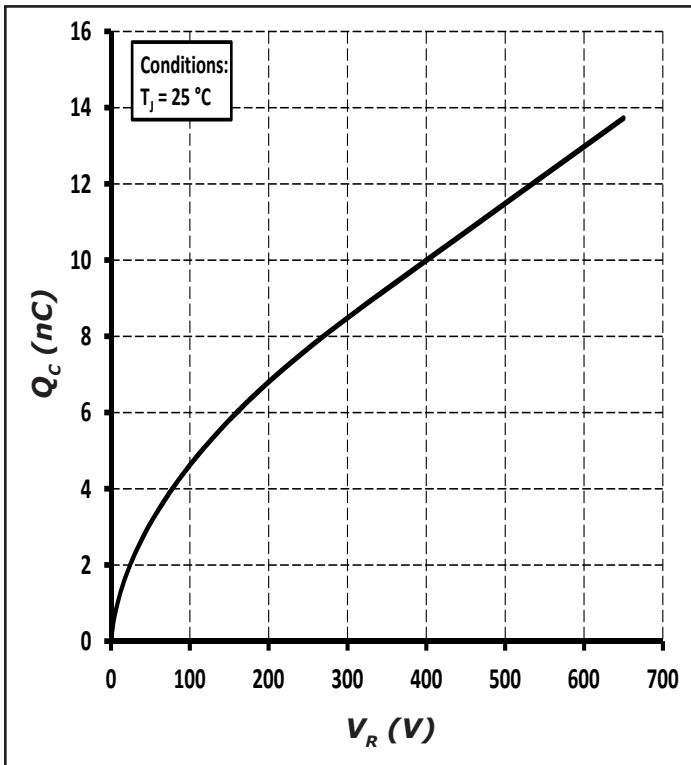


Figure 5. Total Capacitance Charge vs. Reverse Voltage

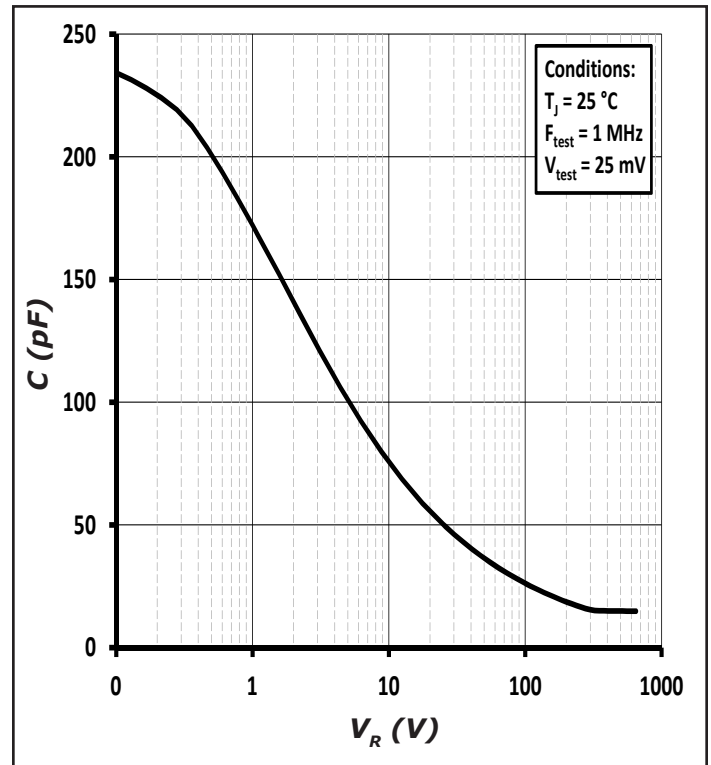


Figure 6. Capacitance vs. Reverse Voltage

## Typical Performance

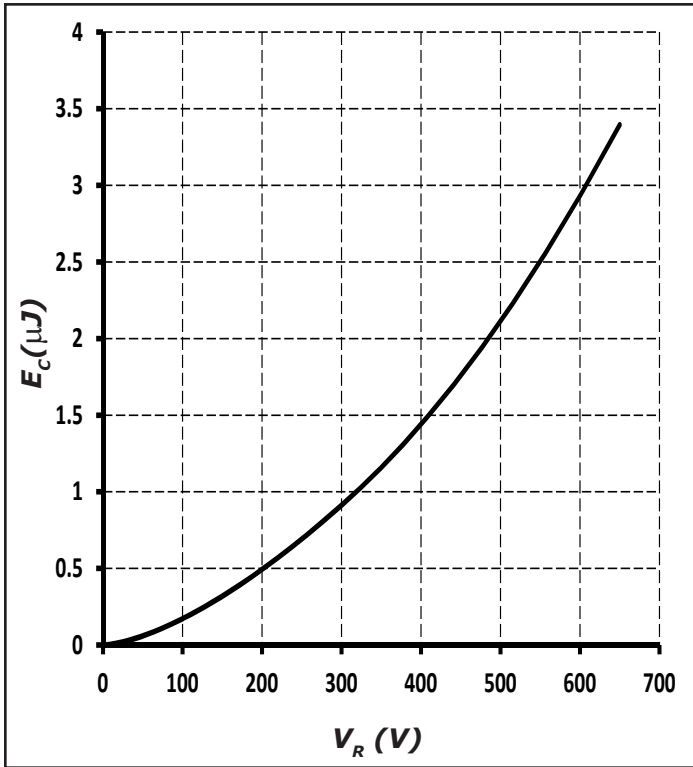


Figure 7. Capacitance Stored Energy

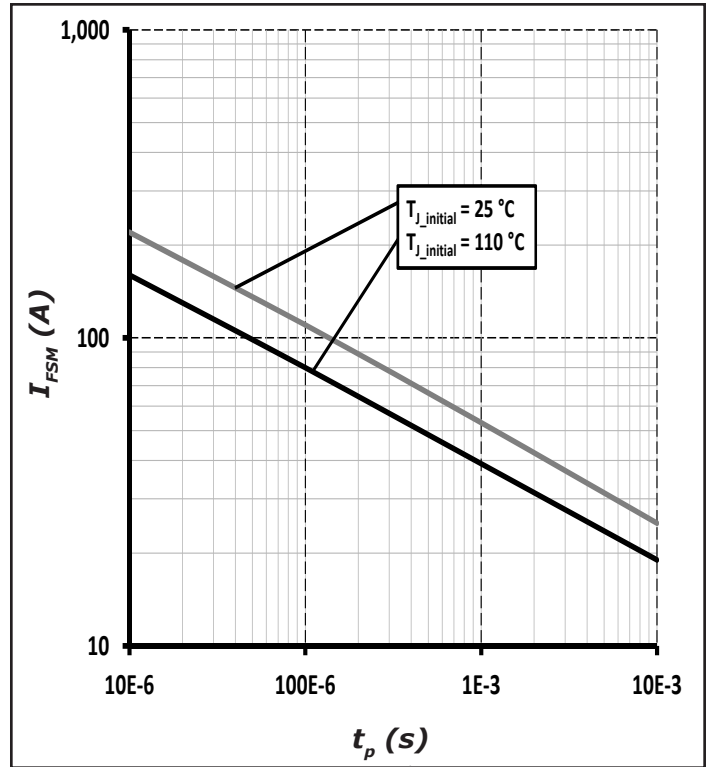


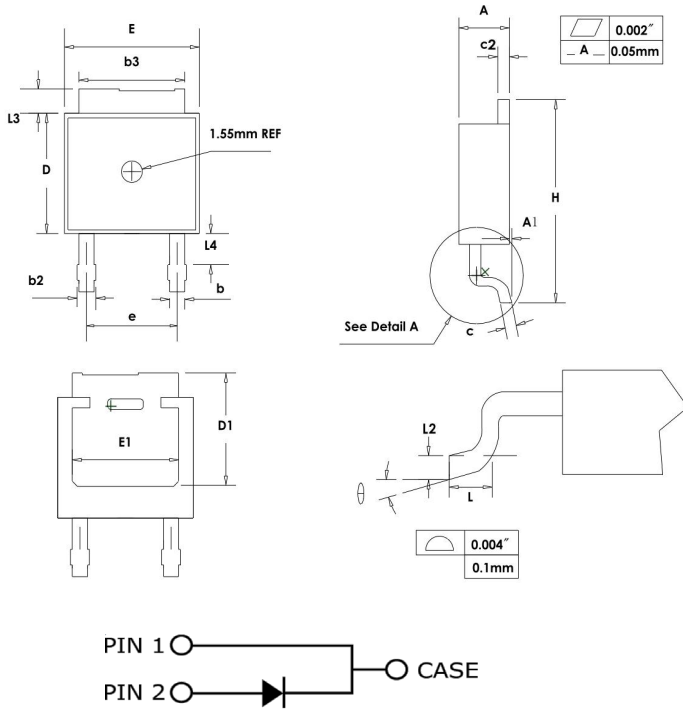
Figure 8. Non-repetitive peak forward surge current versus pulse duration (sinusoidal waveform)



Figure 9. Transient Thermal Impedance

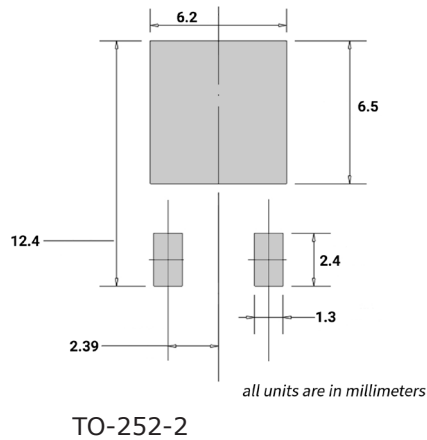
## Package Dimensions

Package TO-252-2



SYMBOL	MILLIMETERS	
	MIN	MAX
A	2.159	2.413
A1	0	0.13
b	0.64	0.89
b2	0.653	1.143
b3	5.004	5.6
c	0.457	0.61
c2	0.457	0.864
D	5.867	6.248
D1	5.21	-
E	6.35	7.341
E1	4.32	-
e	4.58 BSC	
H	9.65	10.414
L	1.106	1.78
L2	0.51 BSC	
L3	0.889	1.27
L4	0.64	1.01
$\theta$	0°	8°

## Recommended Solder Pad Layout



Part Number	Package	Marking
C3D04065E	TO-252-2	C3D04065

Note: Recommended soldering profiles can be found in the applications note here:  
[http://www.wolfspeed.com/power\\_app\\_notes/soldering](http://www.wolfspeed.com/power_app_notes/soldering)

