

C3D04065E

Silicon Carbide Schottky Diode

Z-REC[®] 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

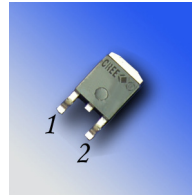
Benefits

- 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 ² 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	μA	$V_R = 650\text{ V}$ $T_J = 25^\circ\text{C}$ $V_R = 650\text{ V}$ $T_J = 175^\circ\text{C}$	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		μJ	$V_R = 400\text{ V}$	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

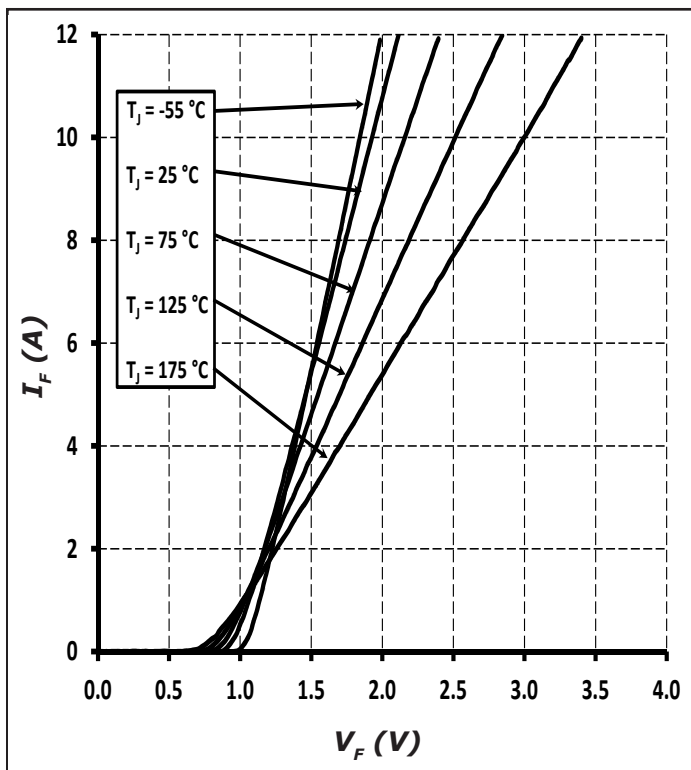


Figure 1. Forward Characteristics

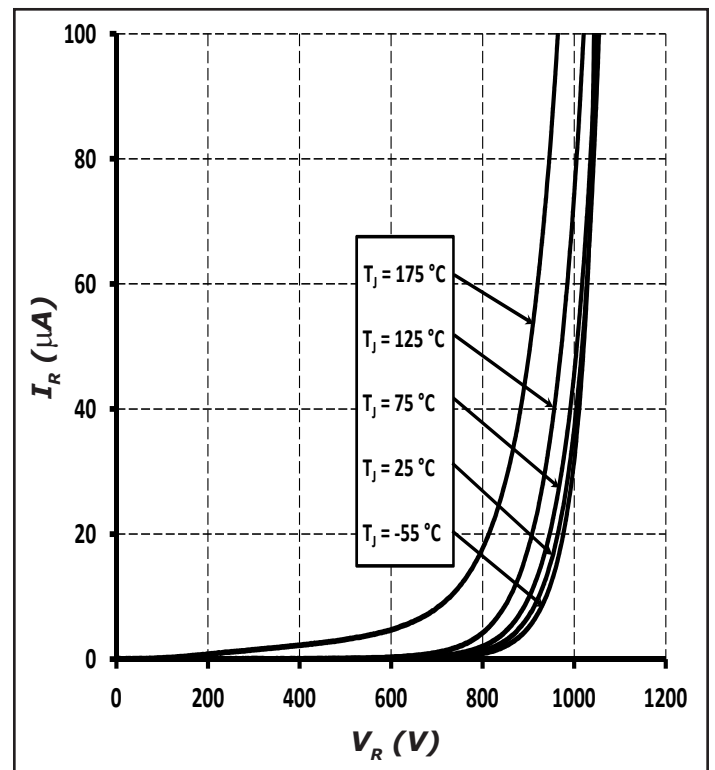


Figure 2. Reverse Characteristics

Typical Performance

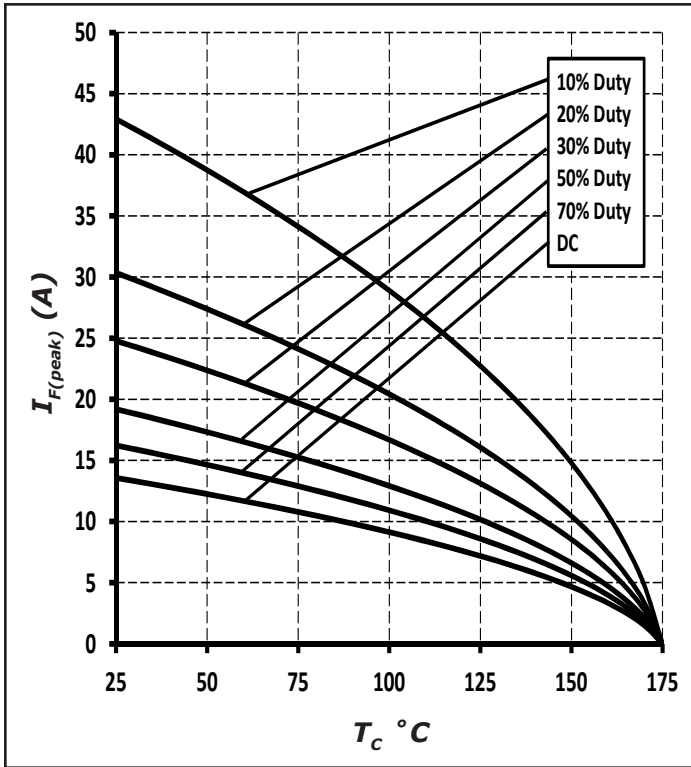


Figure 3. Current Derating

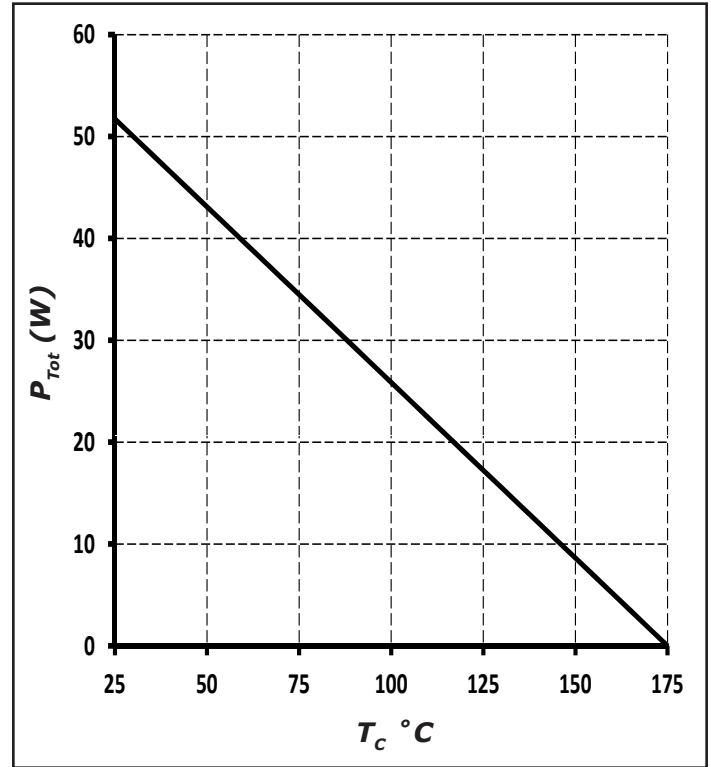


Figure 4. Power Derating

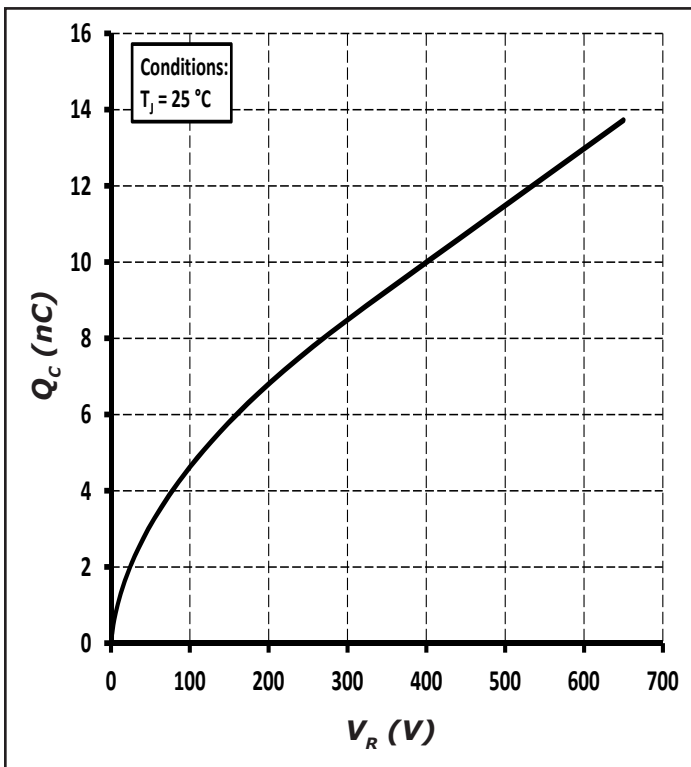


Figure 5. Total Capacitance Charge vs. Reverse Voltage

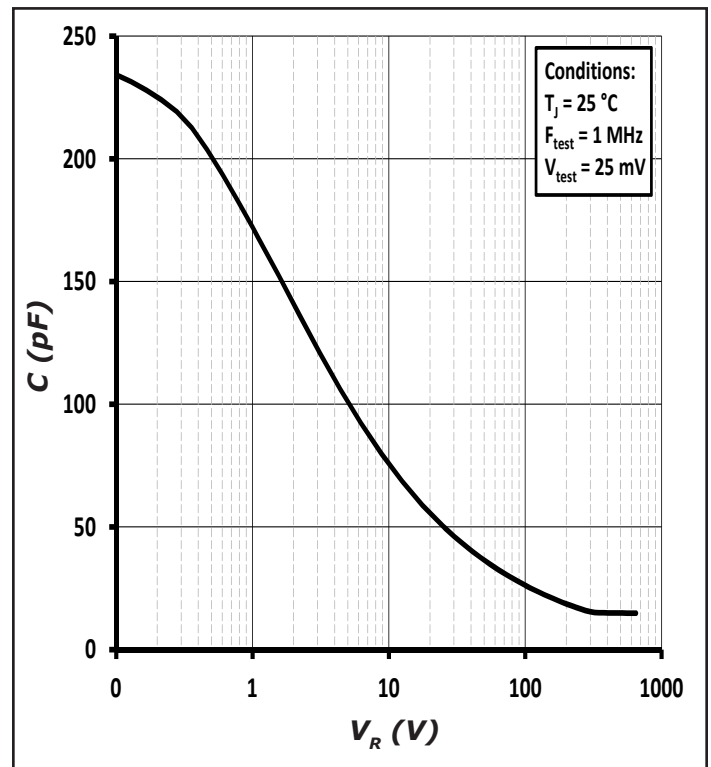


Figure 6. Capacitance vs. Reverse Voltage

Typical Performance

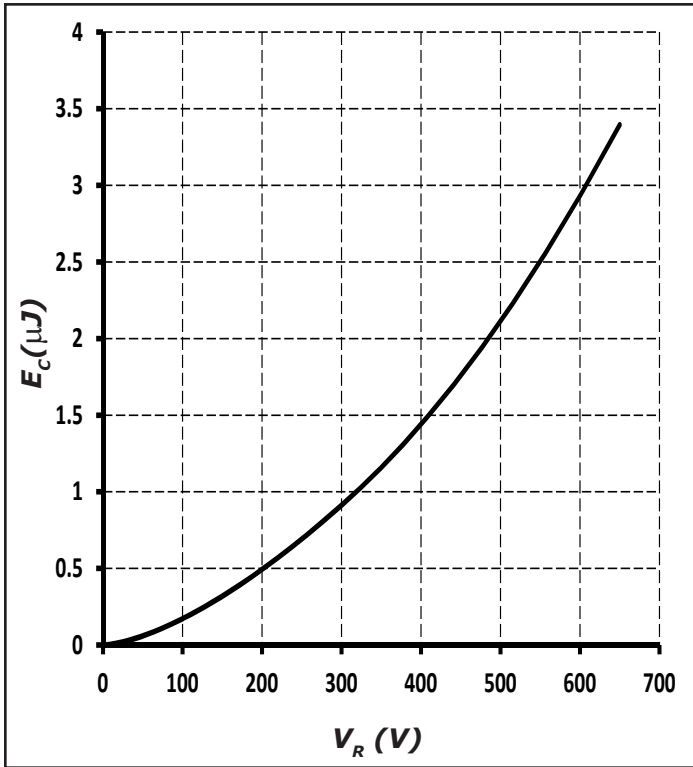


Figure 7. Capacitance Stored Energy

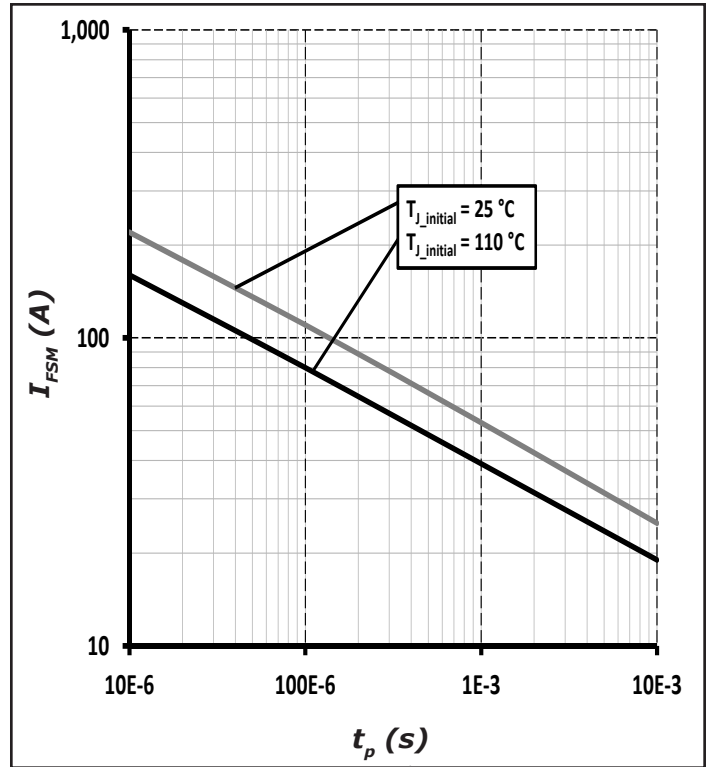


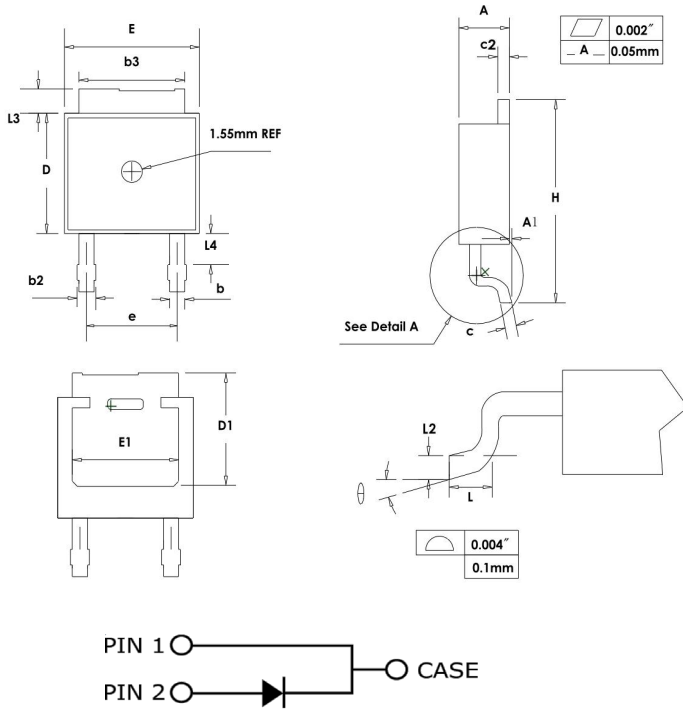
Figure 8. Non-repetitive peak forward surge current versus pulse duration (sinusoidal waveform)



Figure 9. Transient Thermal Impedance

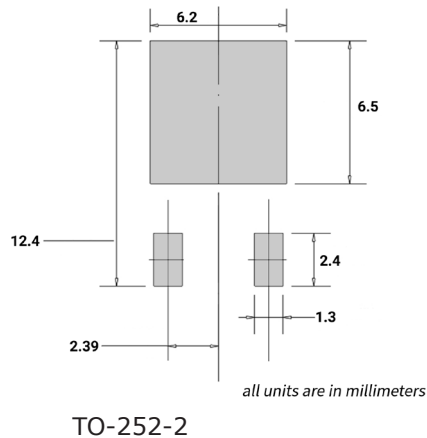
Package Dimensions

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
θ	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

