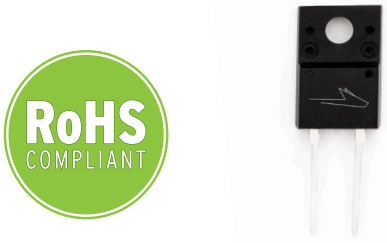
C3D04060F

3rd Generation 600 V, 4 A Silicon Carbide Schottky Diode



Package Type: TO-220-F2
Marking: C3D04060

Description

With the performance advantages of a Silicon Carbide (SiC) Schottky Barrier diode, power electronics systems can expect to meet higher efficiency standards than Si-based solutions, while also reaching higher frequencies and power densities. SiC diodes can be easily paralleled to meet various application demands, without concern of thermal runaway. In combination with the reduced cooling requirements and improved thermal performance of SiC products, SiC diodes are able to provide lower overall system costs in a variety of diverse applications.

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Features

- Optimized for PFC Boost Diode Application
- Zero Reverse Recovery Current / Forward Recovery Voltage
- Temperature-Independent Switching Behavior
- Fully Isolated Case
- Extremely Fast Switching

Applications

- Switch Mode Power Supplies (SMPS)
- Free Wheeling Diodes in Inverter Stages
- Boost for PFC & DC-DC Stages
- Solar Inverters
- AC/DC Converters

Maximum Ratings (T_C = 25°C Unless Otherwise Specified)

Parameter	Symbol	Value	Unit	Test Conditions	Notes
Repetitive Peak Reverse Voltage	V_{RRM}	600	V		
DC Blocking Voltage	V_{DC}	600			
Continuous Forward Current	I_F	9	A	T_C = 25 °C	Fig. 3
		6		T_C = 125 °C	
		4		T_C = 150 °C	
Repetitive Peak Forward Surge Current	I_{FRM}	15		T_C = 25 °C, t_p = 10 ms, Half Sine Wave	
		10.5		T_C = 110 °C, t_p = 10 ms, Half Sine Wave	
Non-Repetitive Forward Surge Current	I_{FSM}	19		T_C = 25 °C, t_p = 10 ms, Half Sine Wave	Fig. 8
		16.5		T_C = 110 °C,t_p = 10 ms, Half Sine Wave	
Non-Repetitive Peak Forward Surge Current	$I_{F,Max}$	220		T_C = 25 °C, t_p = 10 µs, Pulse	Fig 8.
		160		T_C = 110°C, t_p = 10 µs, Pulse	
Power Dissipation	P_{tot}	30.9	W	T_C = 25 °C	Fig. 4
		13.4		T_C = 110 °C	
Diode dV/dt Ruggedness	dV/dt	200	V/ns	V_R = 0-600V	
i^2t value (Per Leg)	$\int i^2dt$	1.8	A^2s	T_C = 25 °C, t_p = 10ms	
		1.3		T_C = 110 °C, t_p = 10ms	

Electrical Characteristics

Parameter	Symbol	Typ.	Max.	Unit	Test Conditions	Notes
Forward Voltage	V_F	1.5	1.7	V	I_F = 4 A, T_j = 25 °C	Fig. 1
		1.7	2.4		I_F = 4 A, T_j = 175 °C	
Reverse Current	I_R	5	25	µA	V_R = 600 V, T_j = 25 °C	Fig. 2
		10	100		V_R = 600 V, T_j = 175 °C	
Total Capacitive Charge	Q_C	10		nC	V_R = 400 V, T_j = 25 °C, I_F = 4 A	Fig. 5
Total Capacitance	C	231		pF	V_R = 0 V, T_j = 25 °C, f = 1 MHz	Fig. 6
		18.5			V_R = 200 V, T_j = 25 °C, f = 1 MHz	
		15			V_R = 400 V, T_j = 25 °C, f = 1 MHz	
Capacitance Stored Energy	E_C	1.4		µJ	V_R = 400 V	Fig. 7

Notes:
SiC Schottky Diodes are majority carrier devices, so there is no reverse recovery charge.

Thermal & Mechanical Characteristics

Parameter	Symbol	Value	Unit	Notes
Thermal Resistance, Junction to Case (Typical)	$R_{\theta, JC (TYP)}$	4.85	°C / W	
Junction Temperature	T_j	-55 to +175	°C	
Case & Storage Temperature	T_c	-55 to +175		
TO-220 Mounting Torque	-	1	Nm	M3 Screw
		8.8	lbf-in	6-32 Screw

Electrostatic Discharge (ESD) Classifications

Parameter	Symbol	Notes
Human Body Model	HBM	Class 3B (≥ 8000 V)
Charge Device Model	CDM	Class C3 (≥ 1000 V)

Typical Performance

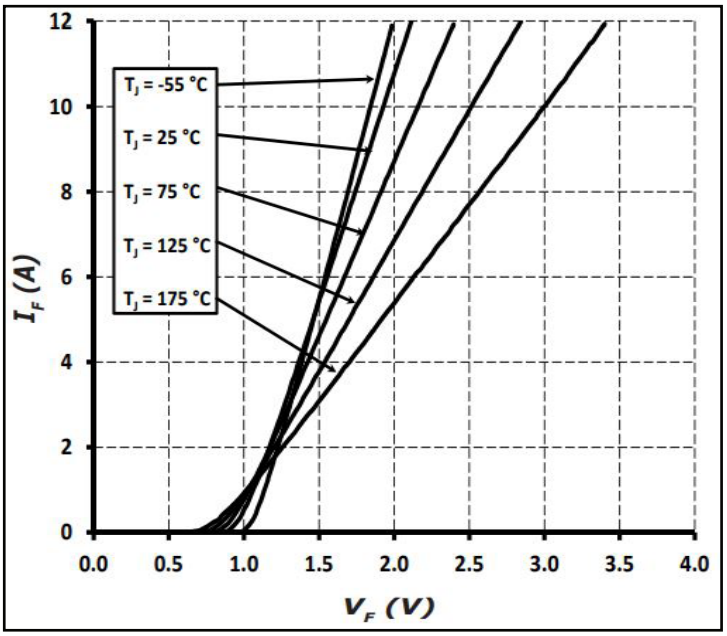


Figure 1
Forward Characteristics

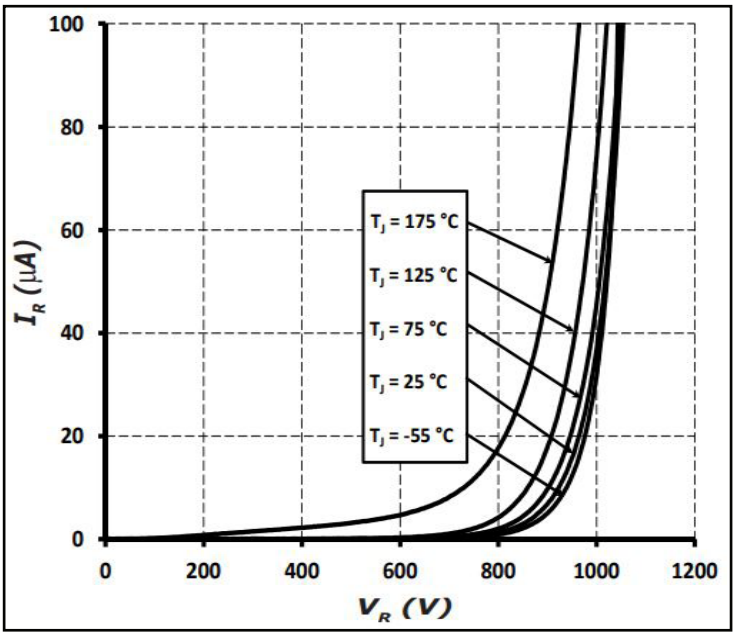


Figure 2
Reverse Characteristics

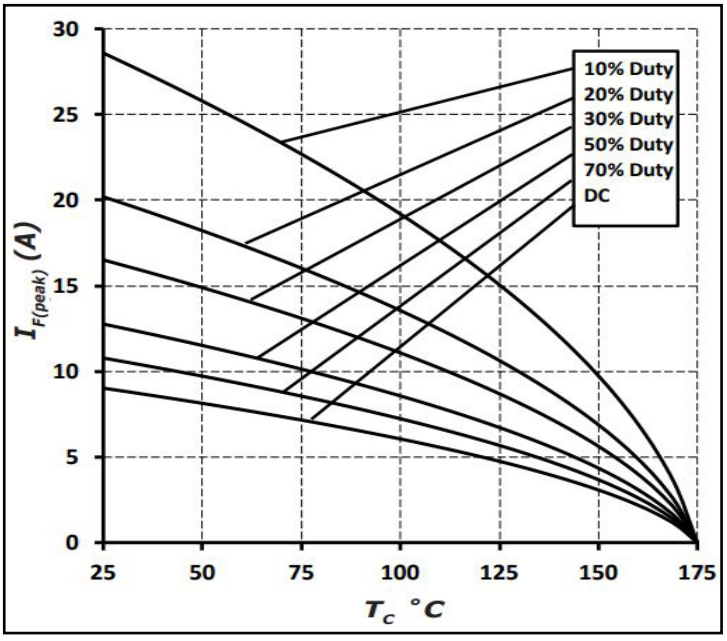


Figure 3
Current Derating

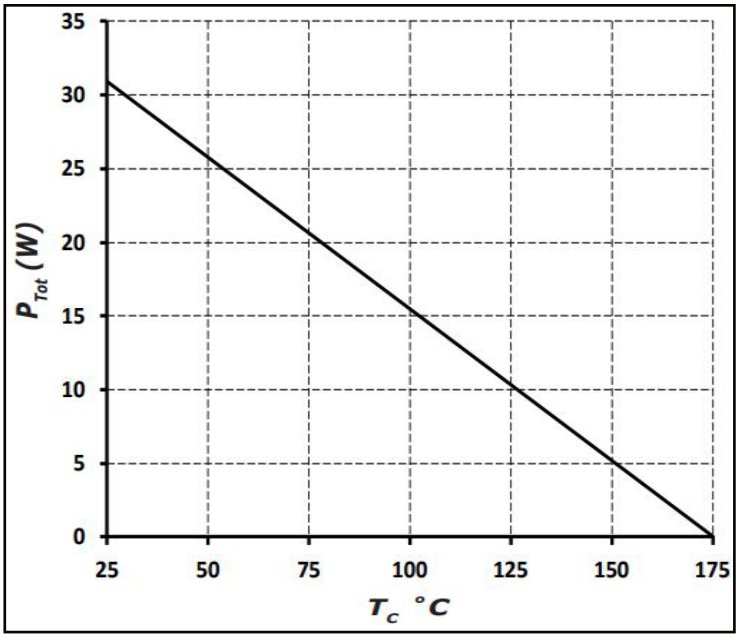


Figure 4
Power Derating

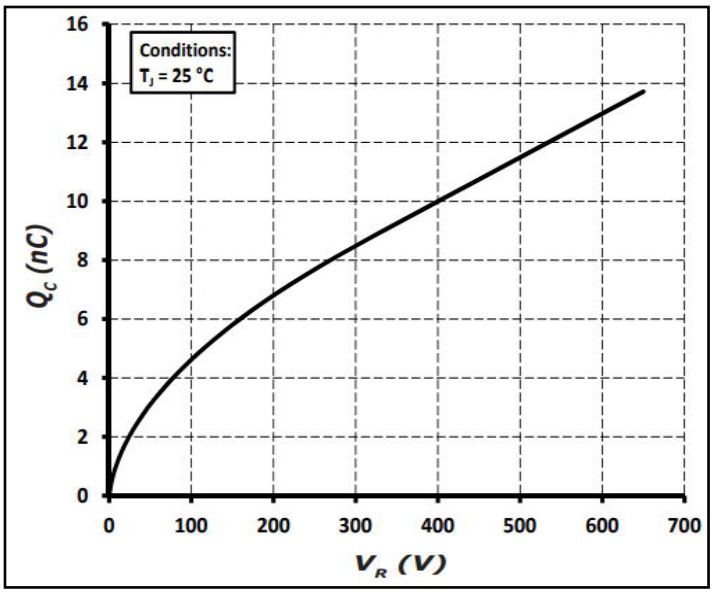


Figure 5
Total Capacitance vs. Reverse Voltage

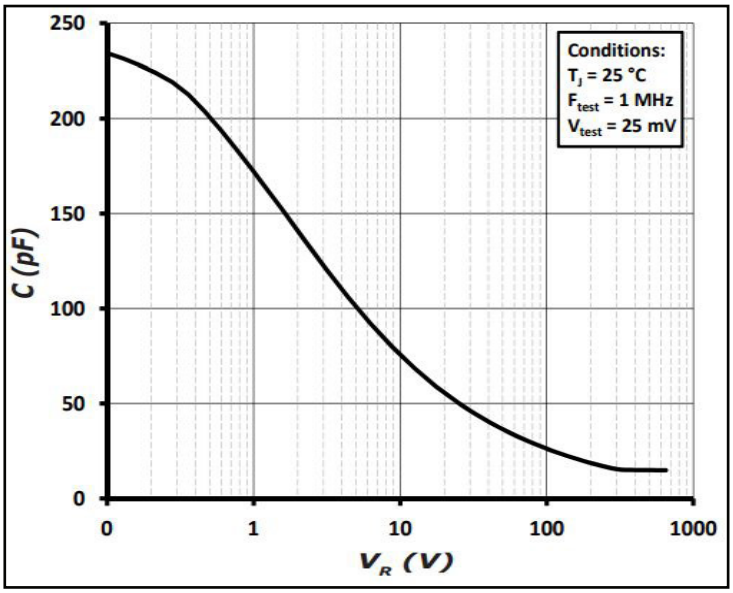


Figure 6
Capacitace vs. Reverse Voltage

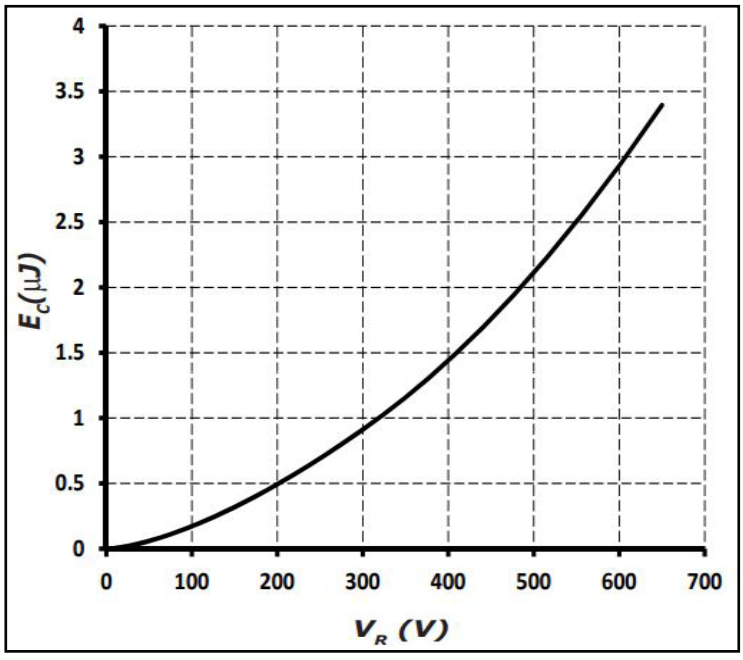


Figure 7
Capacitance Stored Energy

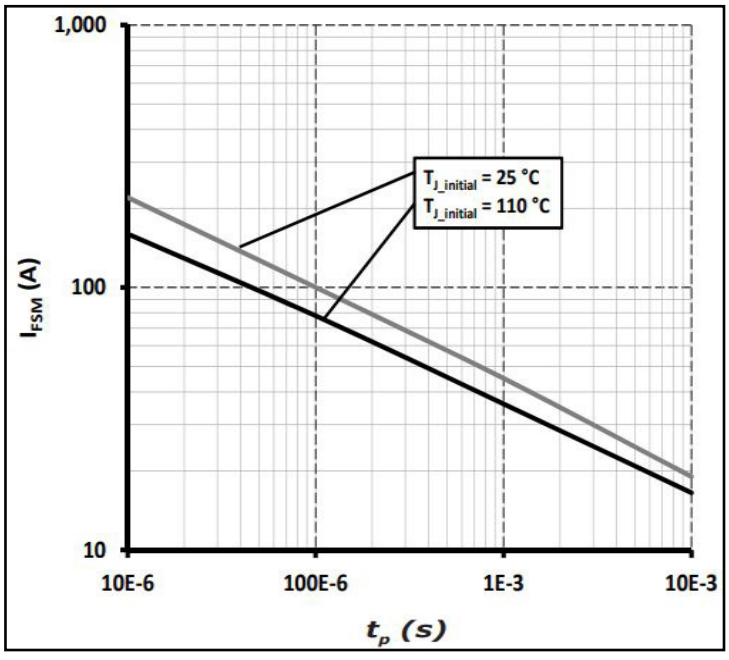


Figure 8
Non-Repetitive Peak Forward Surge Current
versus Pulse Duration (sinusoidal waveform)

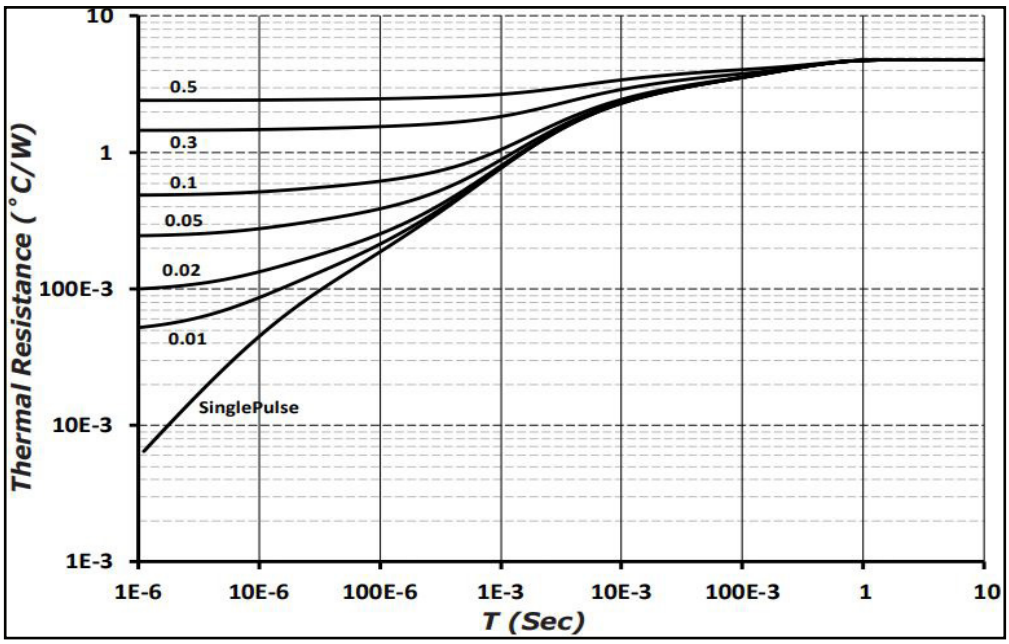
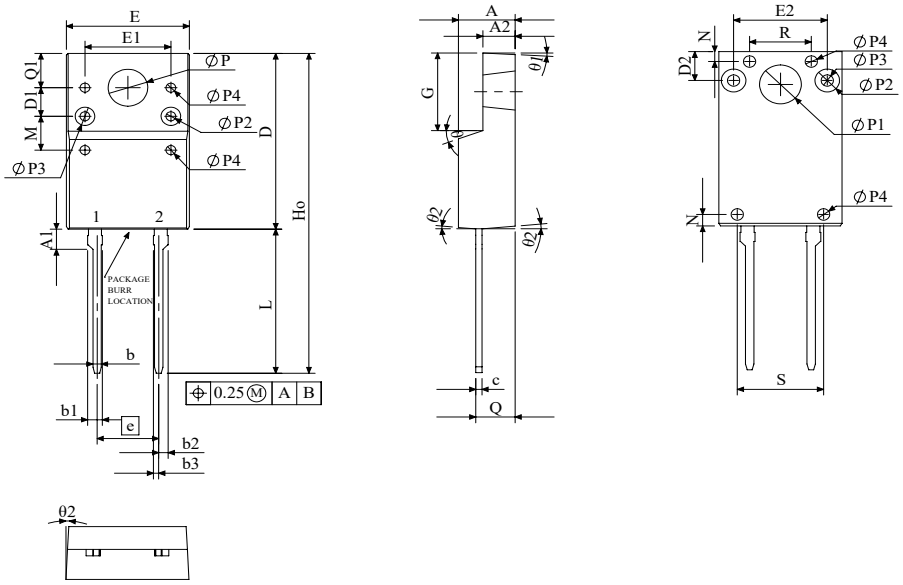


Figure 9

Transient Thermal Impedance

Package Dimensions & Pin-Out

Package: TO-220-F2



SYMBOL	MIN (mm)	MAX (mm)
A	4.30	4.70
A1	1.80	2.10
A2	2.50	2.90
b	0.54	0.84
b1	0.99	1.29
b2	0.565	0.925
b3	0.245	0.545
c	0.49	0.79
D	14.70	15.30
D1	(2.50)	
D2	(2.66)	
E	9.70	10.30
E1	(7.00)	
E2	(7.60)	
Ho	(28.00)	
G	6.70	7.10
e	4.83	5.33
L	12.50	13.50
L1	---	0.50
M	(2.86)	
N	(1.00)	
ØP	3.05	3.40
ØP1	(3.40)	
ØP2	(1.00)	
ØP3	(2.00)	
ØP4	(1.00)	
Q	3.10	3.30
Q1	2.70	3.30
R	(5.00)	
S	(7.00)	
θ	(20°)	
Θ1	(3°)	
Θ2	(5°)	

1	CATHODE
2	ANODE

NOTE
1. ALL METAL SURFACES ARE TIN PLATED (MATTE), EXCEPT AREA OF CUT.
2. DIMENSIONING & TOLERANCING CONFORM TO ASME Y14.5M-1994.
3. ALL DIMENSIONS ARE LISTED IN MILLIMETERS. ANGLES ARE IN DEGREES.
4. PACKAGE BURR FLASH SIZE (0.5 mm) IS NOT INCLUDED IN THE DIMENSIONS

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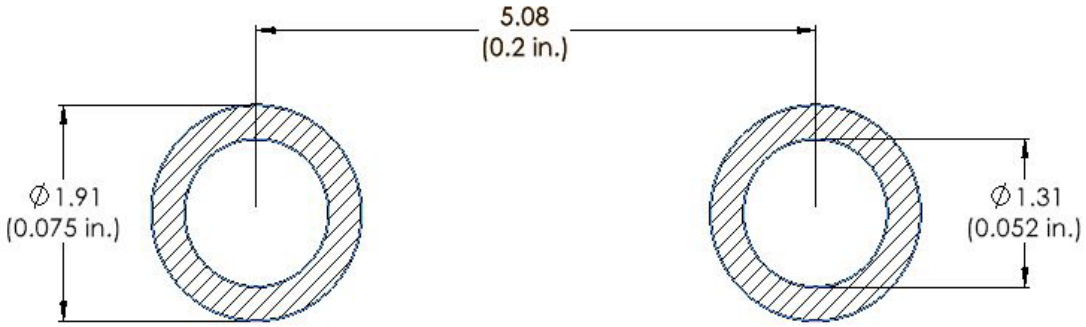
TITLE: PACKAGE OUTLINE DRAWING: TO 220-2L FP

REVISION NO. 3 | A4

Date: 08/02/23 | PRD-05962 | SCALE:1:1 | SHEET 1 OF 1

Recommended Solder Pad Layout

Primary dimensions shown in mm.



Product Ordering Information

Order Number	Packing Type
C3D04060F	Tube

Revision History

Document Version	Date of Release	Description of Changes
H	February- 2019	Initial Release
9	October-2023	Update Package Drawing Update Landing Pad Updated Branding Updated Package Image
10	November-2023	Corrected POD A1, b1, and Q

Notes & Disclaimer

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