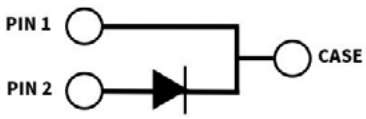
C3D03065E

650 V, 3 A Silicon Carbide Schottky Diode

TO-252-2



Package Types: TO-252-2
Marking: C3D03065

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

Wolfspeed, Inc. is in the process of rebranding its products and related materials pursuant to the entity name change from Cree, Inc. to Wolfspeed, Inc. During this transition period, products received may be marked with either the Cree name and/or logo or the Wolfspeed name and/or logo.

Typical Applications

- Switch mode power supplies (SMPS)
- Boost diodes in PFC or DC/DC stages
- Free wheeling diodes in inverter stages
- AC/DC converters

Benefits

- Replace bipolar with unipolar rectifiers
- Essentially no switching losses
- Higher efficiency
- Reduction of heat sink requirements
- Parallel devices without thermal runaway

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

Parameter	Symbol	Value	Unit	Test Conditions	Note
Repetitive Peak Reverse Voltage	V_{RRM}	650	V		
Surge Peak Reverse Voltage	V_{RSM}	650			
DC Blocking Voltage	V_{DC}	650			
Continuous Forward Current	I_F	11	A	T_C = 25 °C	Fig. 3
		5		T_C = 135 °C	
		3		T_C = 158 °C	
Repetitive Peak Forward Surge Current	I_{FRM}	18		T_C = 25 °C, t_P = 10 ms, Half Sine Wave D=0.3	
		13.5		T_C = 110 °C, t_P = 10 ms, Half Sine Wave D=0.3	
Non-Repetitive Peak Forward Surge Current	I_{FSM}	26		T_C = 25 °C, t_P = 10 ms, Half Sine Wave D=0.3	
		23		T_C = 110 °C, t_P = 10 ms, Half Sine Wave D=0.3	
Non-Repetitive Peak Forward Surge Current	I_{FSM}	100		T_C = 25 °C, t_P = 10 µs, Pulse	
Power Dissipation	P_{tot}	47	W	T_C = 25 °C	Fig. 4
		20		T_C = 110 °C	
Diode dV/dt Ruggedness	dV/dt	200	V/ns	V_R = 0-650 V	
Operating Junction and Storage Temperature	T_J, T_{stg}	-55 to +175	°C		

Electrical Characteristics

Parameter	Symbol	Typ.	Max.	Unit	Test Conditions	Note
Forward Voltage	V_F	1.5	1.7	V	I_F = 3 A, T_J = 25 °C	Fig. 1
		1.8	2.4		I_F = 3 A, T_J = 175 °C	
Reverse Current	I_R	5	24	µA	V_R = 650 V, T_J = 25 °C	Fig. 2
		9.5	96		V_R = 650 V, T_J = 175 °C	
Total Capacitive Charge	Q_C	7.6		nC	V_R = 400 V, I_F = 3 A di/dt = 500 A/µS T_J = 25 °C	Fig. 5
Total Capacitance	C	166		pF	V_R = 0 V, T_J = 25 °C, f = 1 MHz	Fig. 6
		14			V_R = 200 V, T_J = 25 °C, f = 1 MHz	
		11			V_R = 400 V, T_J = 25 °C, f = 1 MHz	
Capacitance Stored Energy	E_C	1.1		µJ	V_R = 400 V	Fig. 7

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

Thermal Characteristics

Parameter	Symbol	Typ.	Unit	Note
Thermal Resistance from Junction to Case	$R_{\theta JC}$	3.2	°C/W	Fig. 8

Typical Performance

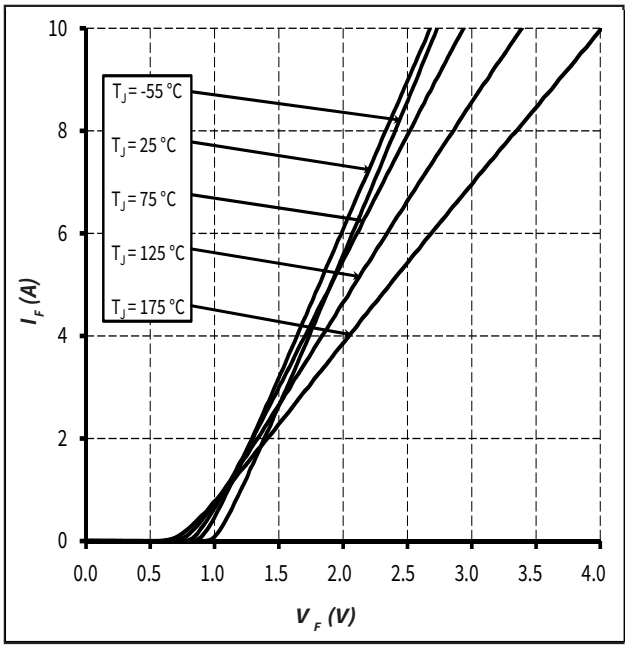


Figure 1. Forward Characteristics

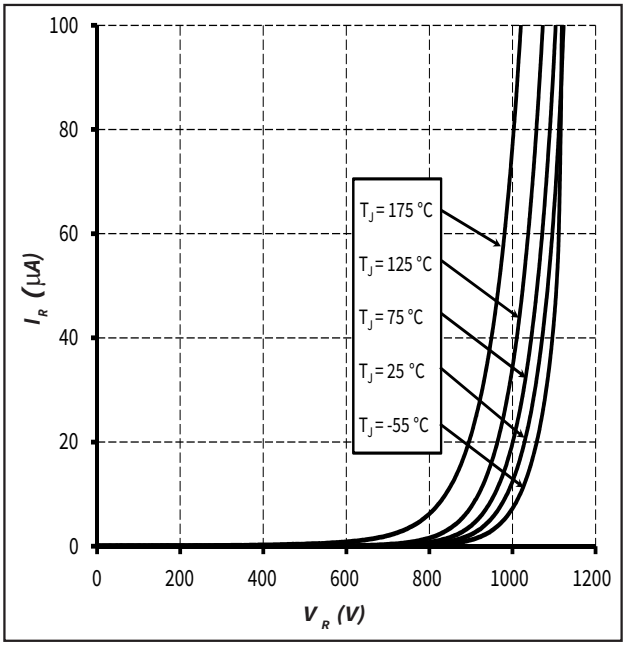


Figure 2. Reverse Characteristics

Typical Performance

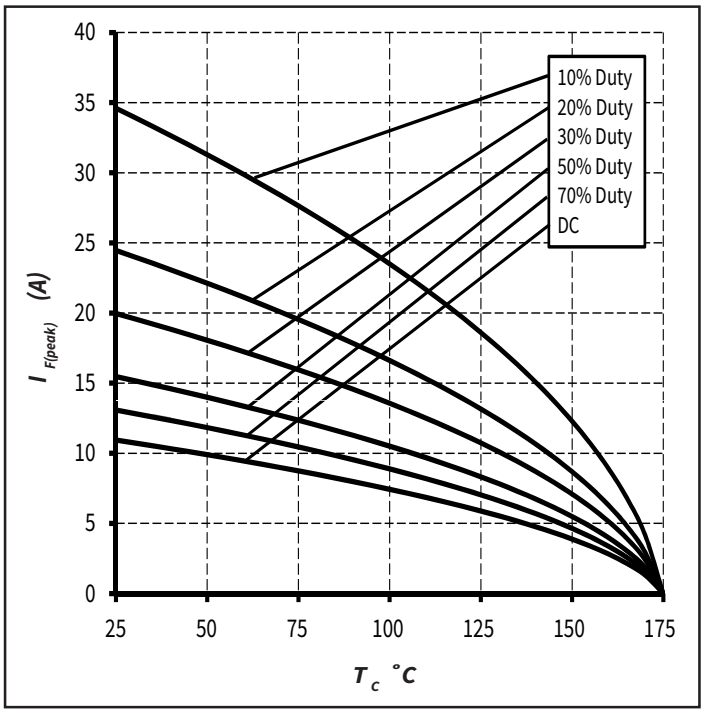


Figure 3. Current Derating

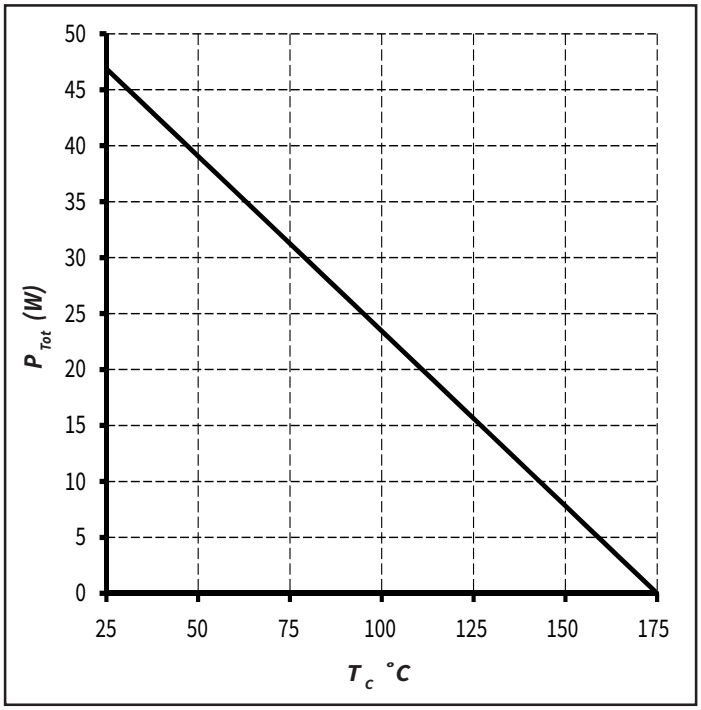


Figure 4. Power Derating

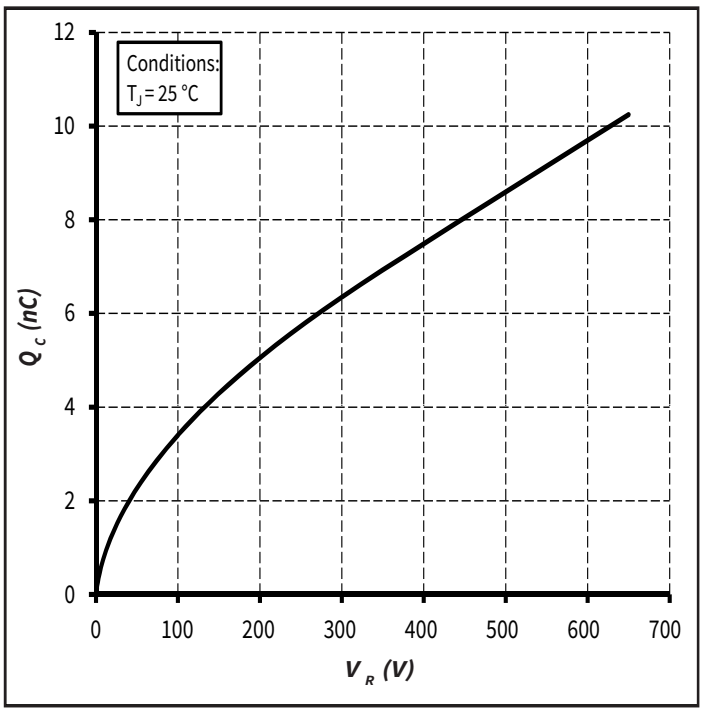


Figure 5. Total Capacitance Charge vs. Reverse Voltage

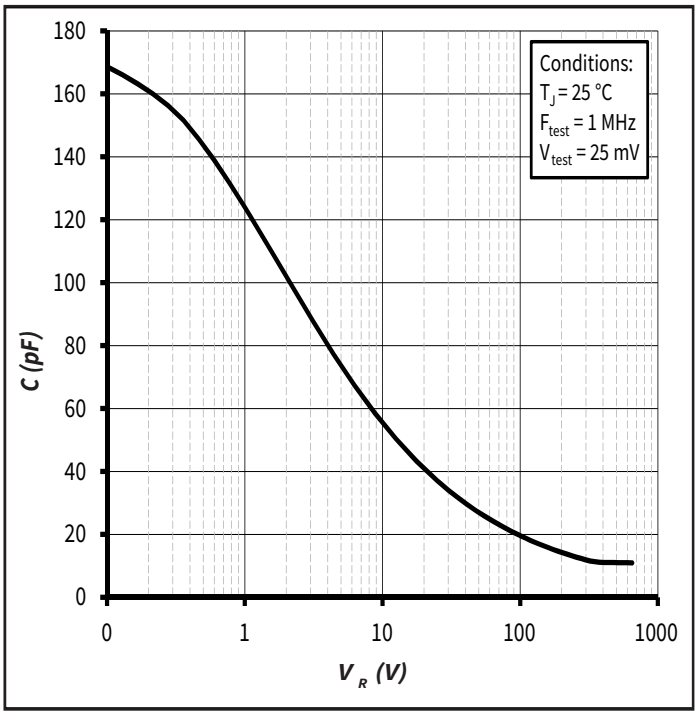


Figure 6. Capacitance vs. Reverse Voltage

Typical Performance

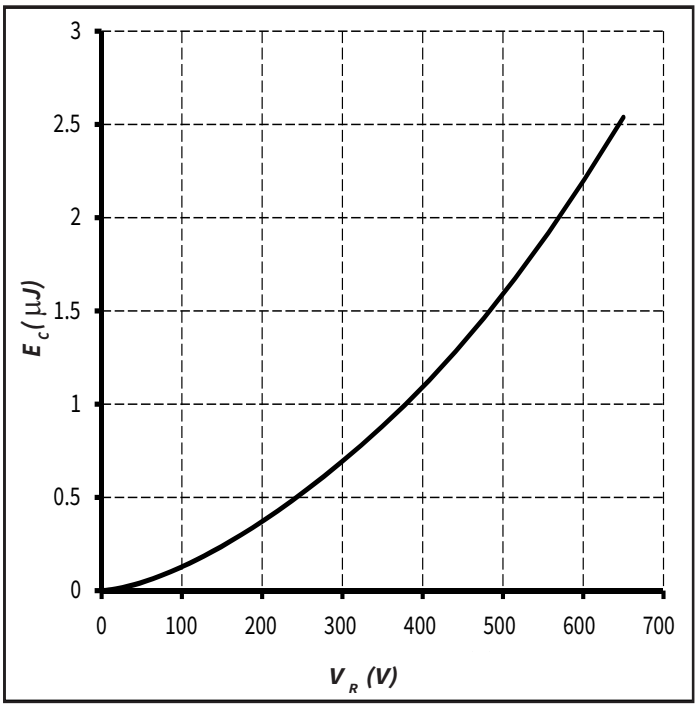


Figure 7. Capacitance Stored Energy

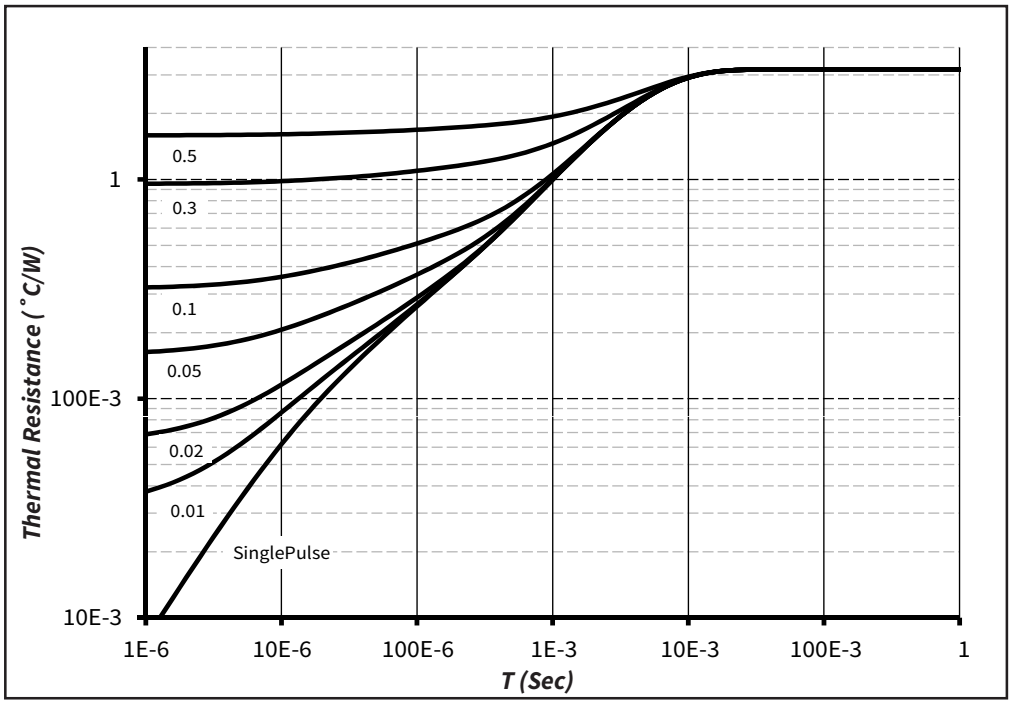
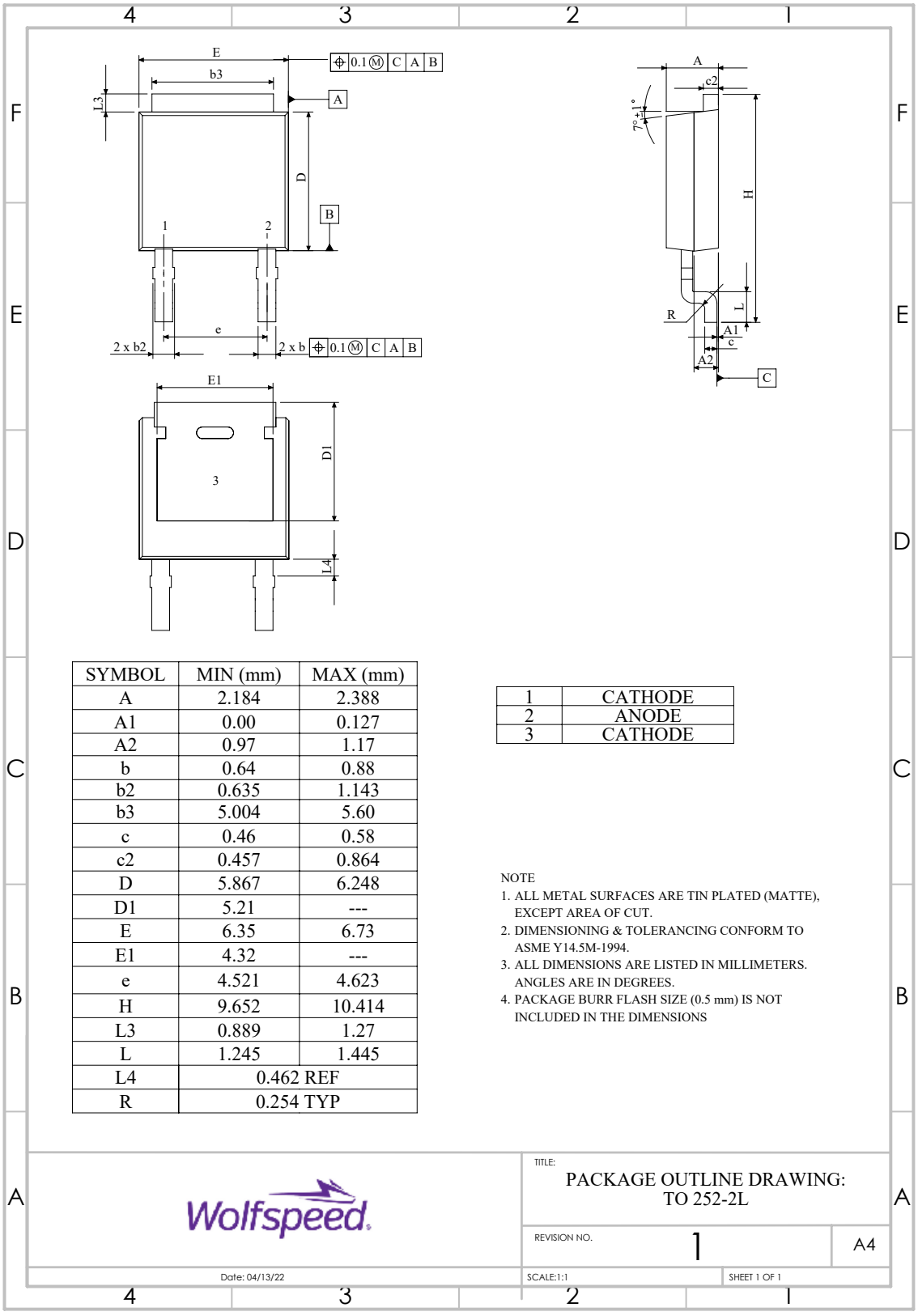


Figure 8. Transient Thermal Impedance

Package Dimensions

Package: TO-252-2



SYMBOL	MIN (mm)	MAX (mm)
A	2.184	2.388
A1	0.00	0.127
A2	0.97	1.17
b	0.64	0.88
b2	0.635	1.143
b3	5.004	5.60
c	0.46	0.58
c2	0.457	0.864
D	5.867	6.248
D1	5.21	---
E	6.35	6.73
E1	4.32	---
e	4.521	4.623
H	9.652	10.414
L3	0.889	1.27
L	1.245	1.445
L4	0.462 REF	
R	0.254 TYP	

1	CATHODE
2	ANODE
3	CATHODE

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

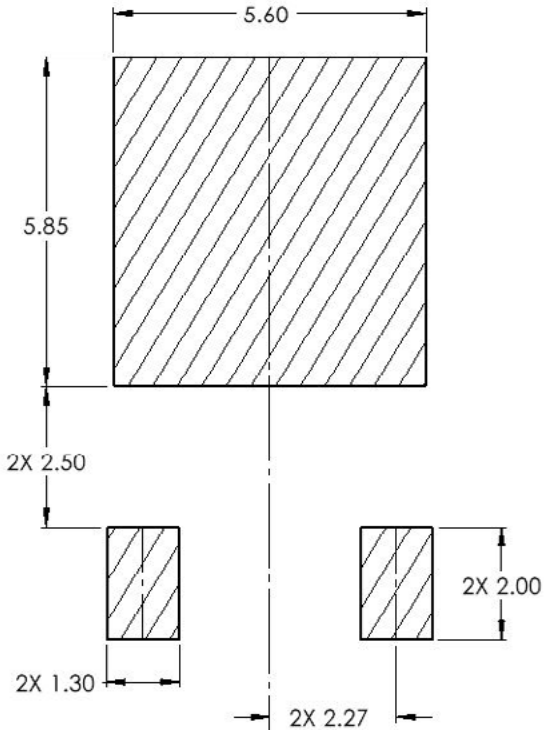
Wolfspeed

TITLE: PACKAGE OUTLINE DRAWING: TO 252-2L

REVISION NO. 1 | A4

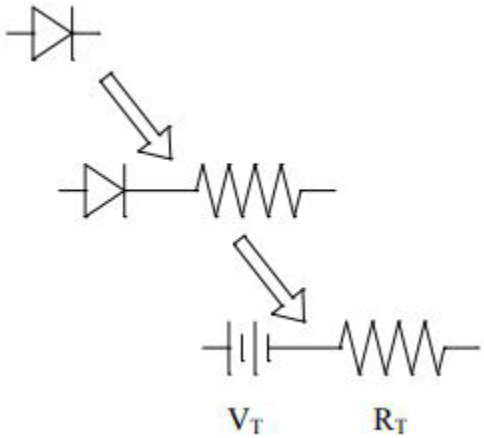
Date: 04/13/22 | SCALE:1:1 | SHEET 1 OF 1

Recommended Solder Pad Layout



Part Number	Package	Marking
C3D03065E	TO-252-2	C3D03065

Diode Model



$$Vf_T = V_T + If * R_T$$

$$V_T = 0.96 + (T_J * -1.1 * 10^{-3})$$
$$R_T = 0.145 + (T_J * 9.5 * 10^{-4})$$

Note: T_J = Diode Junction Temperature In Degrees Celsius, valid from 25°C to 175°C

Revision History

Current Revision	Date of Release	Description of Changes
5	September-2023	Updated Wolfspeed branding, package drawing, and solder pad lay-out, Removed AEC-Q101 banner
6	October-2023	Corrected solder pad layout and diode model
7	November - 2024	Legal Disclaimer

Notes & Disclaimer

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