

C3D10065E

650 V, 10 A Silicon Carbide Schottky Diode



TO-252-2



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



Package Types: TO-252-2

Marking: C3D10065v

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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 ($T_c = 25\text{ }^\circ\text{C}$ 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	32	A	$T_c = 25\text{ }^\circ\text{C}$	Fig. 3
		15		$T_c = 135\text{ }^\circ\text{C}$	
		10		$T_c = 153\text{ }^\circ\text{C}$	
Repetitive Peak Forward Surge Current	I_{FRM}	43.5	A	$T_c = 25\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$, Half Sine Wave	Fig. 8
		28		$T_c = 110\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$, Half Sine Wave	
Non-Repetitive Peak Forward Surge Current	I_{FSM}	90	A	$T_c = 25\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$, Half Sine Wave	Fig. 8
		71		$T_c = 110\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$, Half Sine Wave	
Non-Repetitive Peak Forward Surge Current	$I_{F,Max}$	860	A	$T_c = 25\text{ }^\circ\text{C}$, $t_p = 10\text{ }\mu\text{s}$, Pulse	Fig. 8
		680		$T_c = 110\text{ }^\circ\text{C}$, $t_p = 10\text{ }\mu\text{s}$, Pulse	
Power Dissipation	P_{tot}	150	W	$T_c = 25\text{ }^\circ\text{C}$	Fig. 4
		65		$T_c = 110\text{ }^\circ\text{C}$	
Diode dV/dt Ruggedness	dV/dt	200	V/ns	$V_R = 0\text{--}650\text{ V}$	
i^2t Value	$\int i^2 dt$	40.5	A^2s	$T_c = 25\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$	
		25		$T_c = 110\text{ }^\circ\text{C}$, $t_p = 10\text{ ms}$	
Operating Junction and Storage Temperature	T_J, T_{stg}	-55 to +175	$^\circ\text{C}$		

Electrical Characteristics

Parameter	Symbol	Typ.	Max.	Unit	Test Conditions	Note
Forward Voltage	V_F	1.5	1.8	V	$I_F = 10 \text{ A}$, $T_J = 25 \text{ }^\circ\text{C}$	Fig. 1
		2.0	2.4		$I_F = 10 \text{ A}$, $T_J = 175 \text{ }^\circ\text{C}$	
Reverse Current	I_R	12	60	μA	$V_R = 650 \text{ V}$, $T_J = 25 \text{ }^\circ\text{C}$	Fig. 2
		24	220		$V_R = 650 \text{ V}$, $T_J = 175 \text{ }^\circ\text{C}$	
Total Capacitive Charge	Q_C	24		nC	$V_R = 400 \text{ V}$, $I_F = 10 \text{ A}$ $di/dt = 500 \text{ A}/\mu\text{S}$ $T_J = 25 \text{ }^\circ\text{C}$	Fig. 5
Total Capacitance	C	460.5		pF	$V_R = 0 \text{ V}$, $T_J = 25 \text{ }^\circ\text{C}$, $f = 1 \text{ MHz}$	Fig. 6
		44			$V_R = 200 \text{ V}$, $T_J = 25 \text{ }^\circ\text{C}$, $f = 1 \text{ MHz}$	
		40			$V_R = 400 \text{ V}$, $T_J = 25 \text{ }^\circ\text{C}$, $f = 1 \text{ MHz}$	
Capacitance Stored Energy	E_C	3.6		μJ	$V_R = 400 \text{ V}$	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	$R_{\theta JC}$	1.0	$^\circ\text{C}/\text{W}$	Fig. 9

Typical Performance

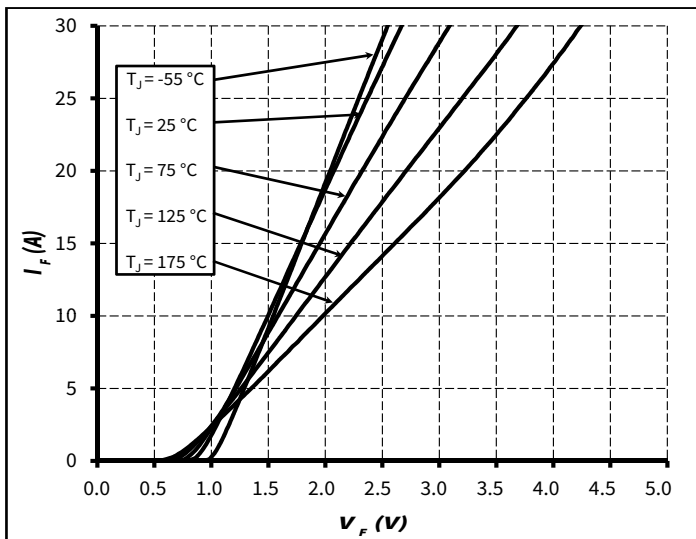


Figure 1. Forward Characteristics

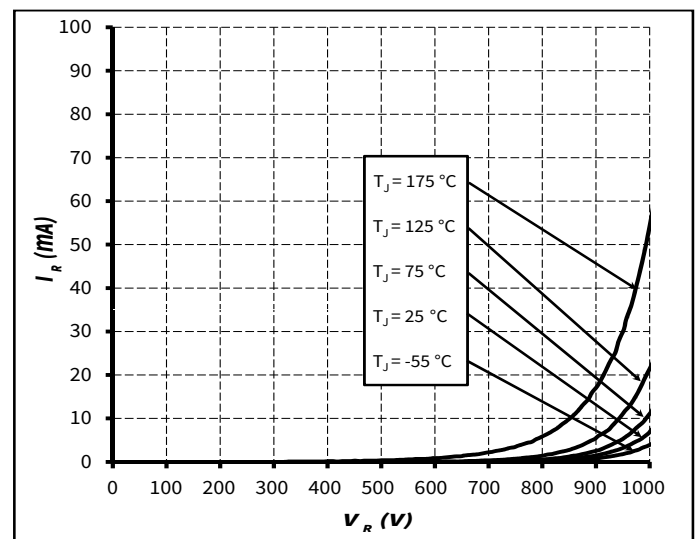


Figure 2. Reverse Characteristics



Typical Performance

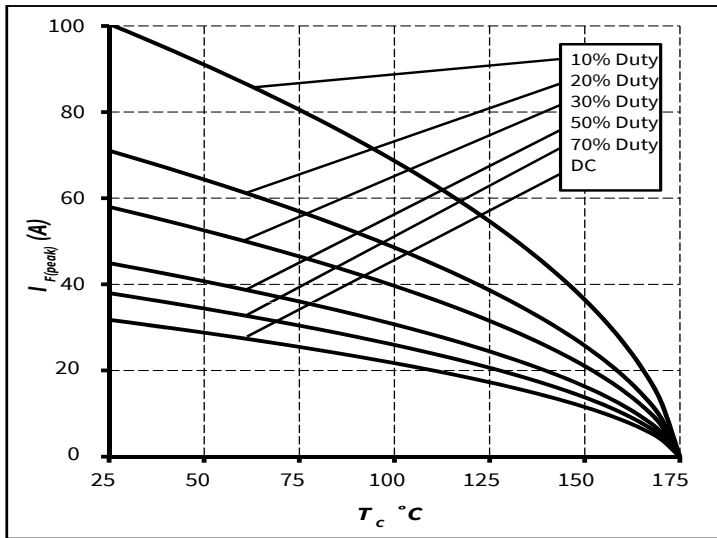


Figure 3. Current Derating

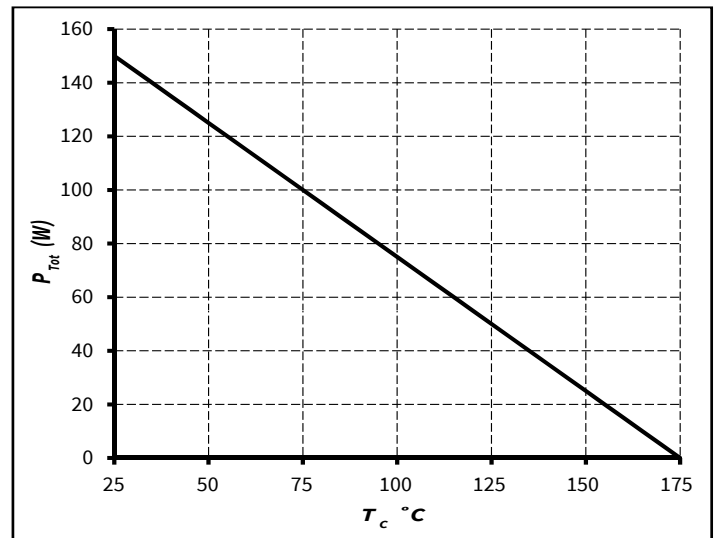


Figure 4. Power Derating

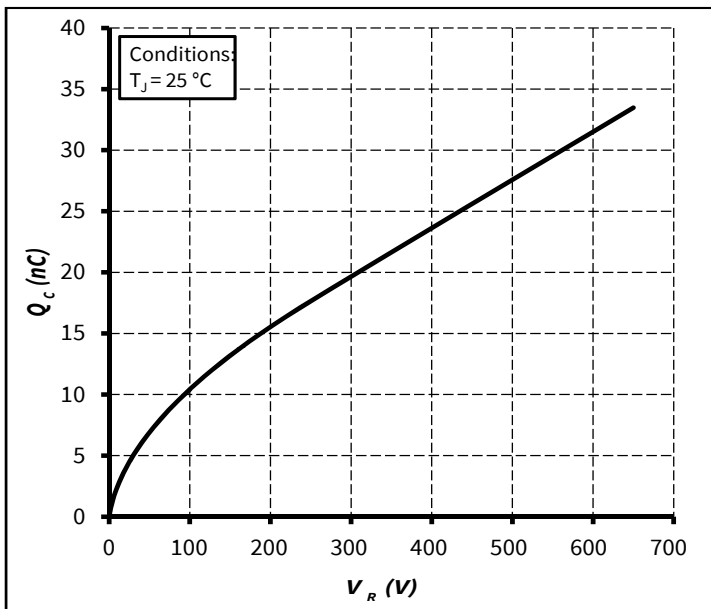


Figure 5. Total Capacitance Charge vs. Reverse Voltage

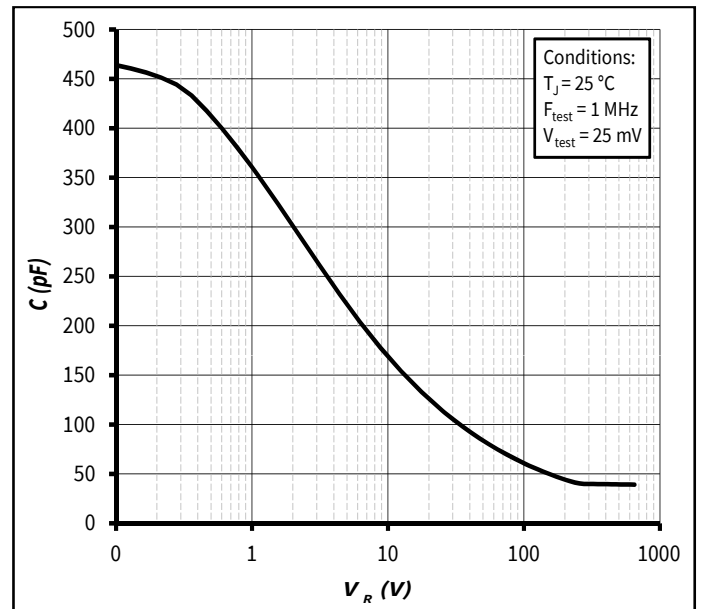


Figure 6. Capacitance vs. Reverse Voltage



Typical Performance

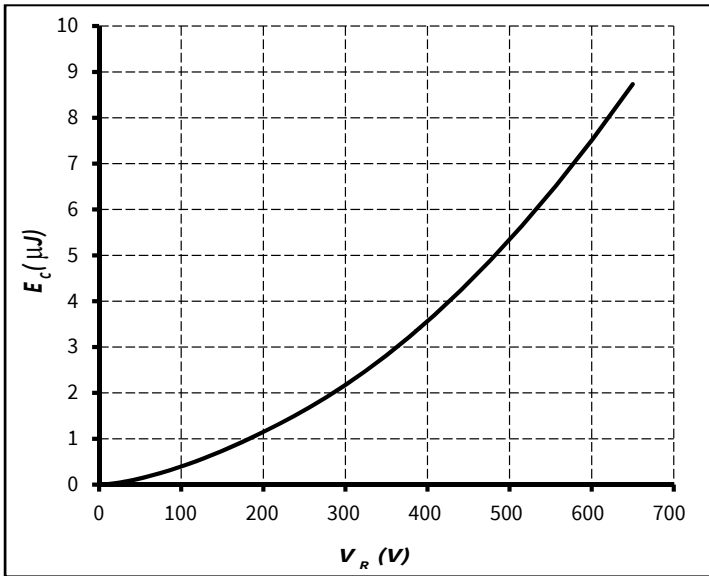


Figure 7. Capacitance Stored Energy

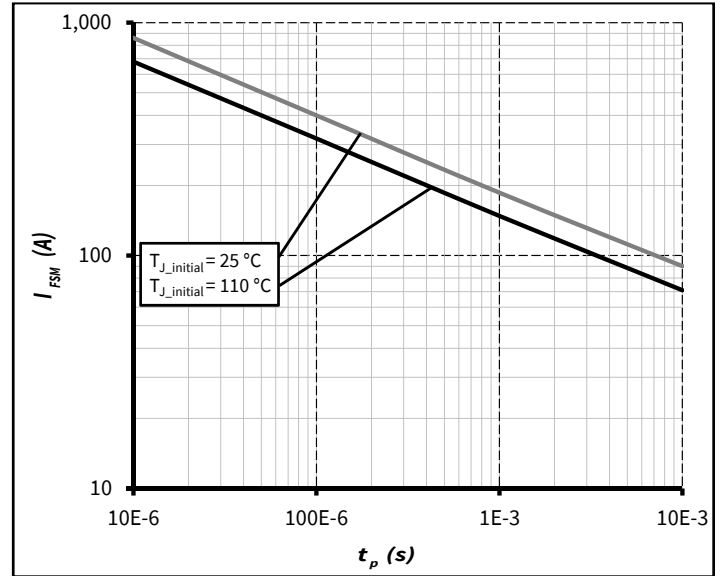


Figure 8. Non-Repetitive Peak Forward Surge Current Versus Pulse Duration (Sinusoidal Waveform)

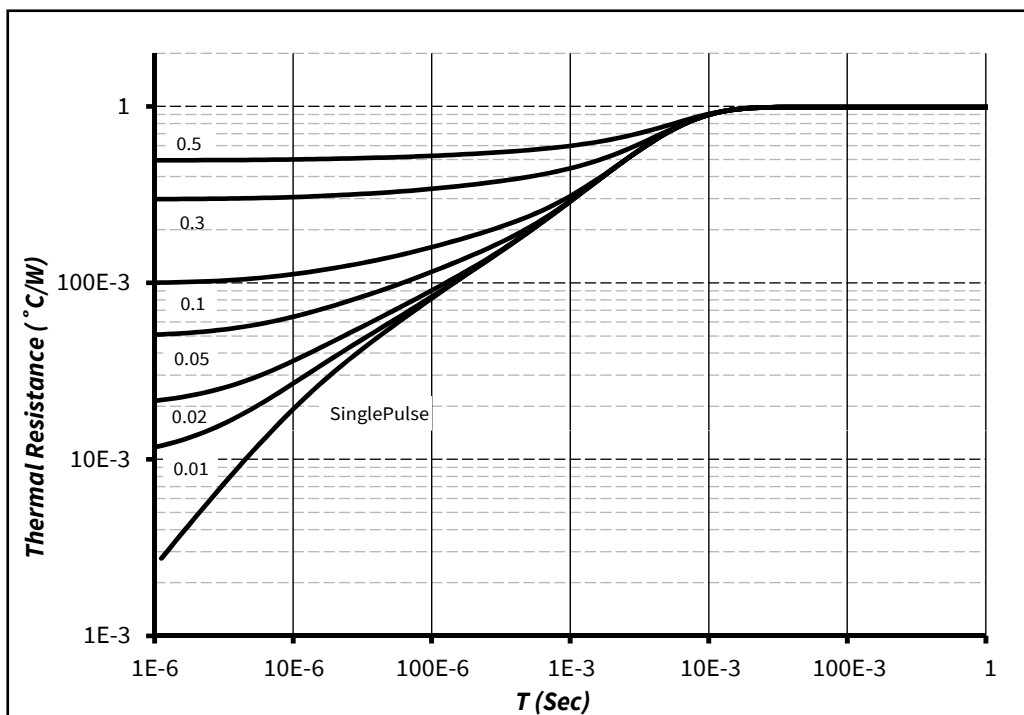
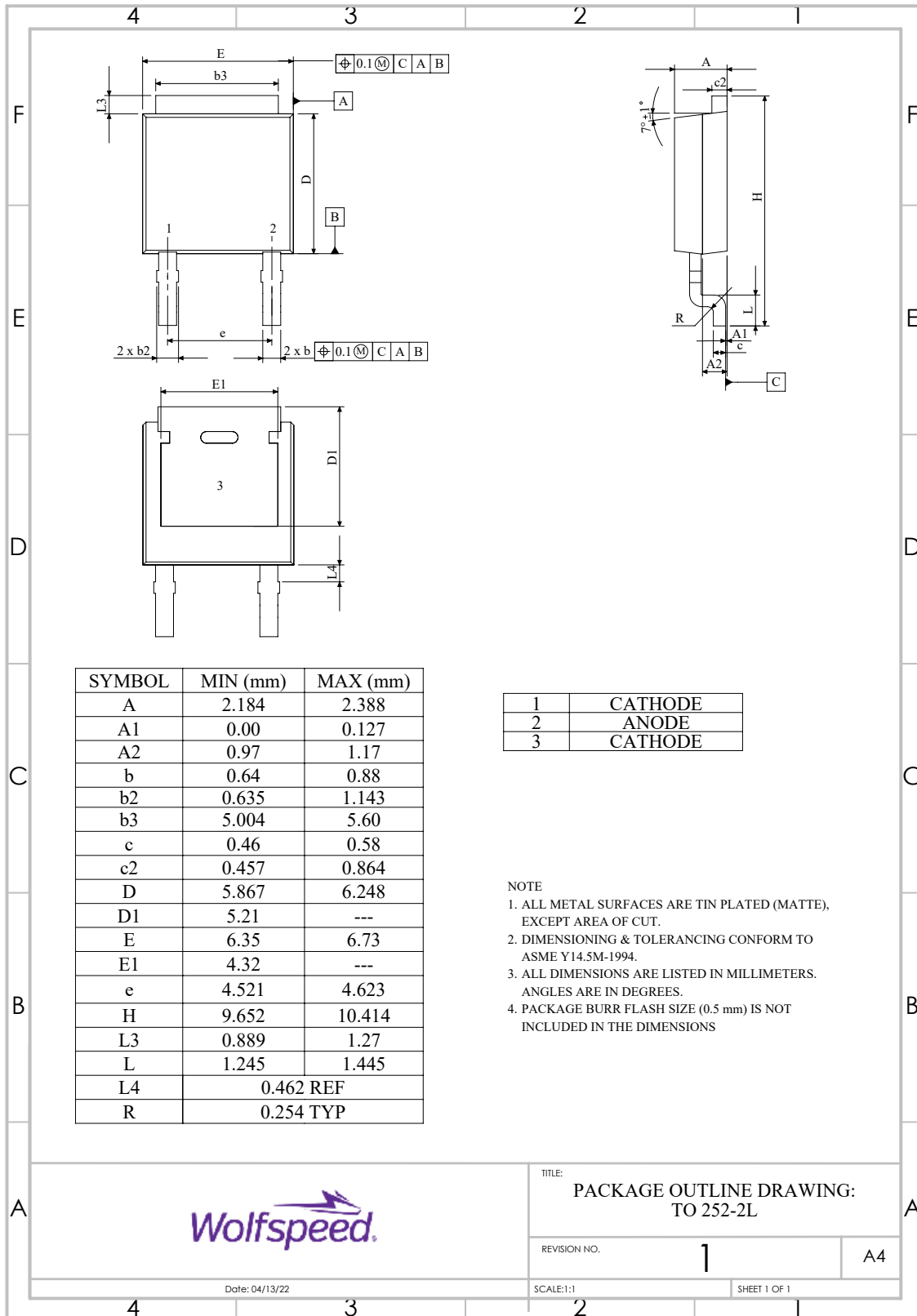


Figure 9. Transient Thermal Impedance



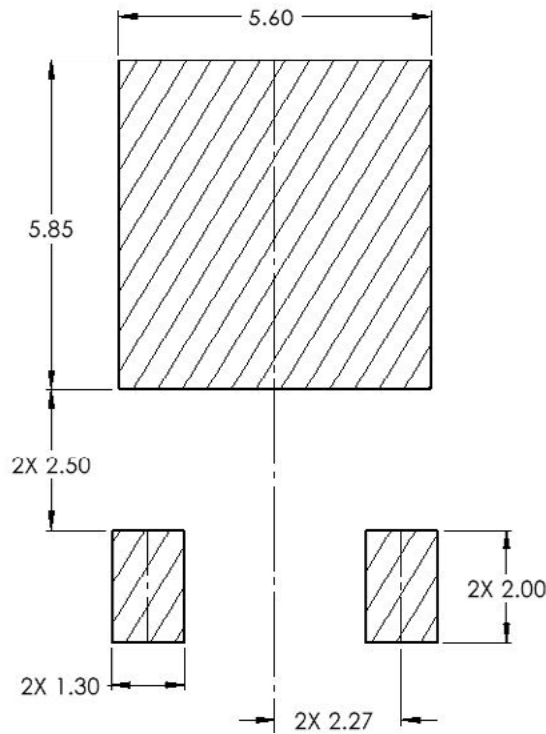
Package Dimensions

Package: TO-252-2



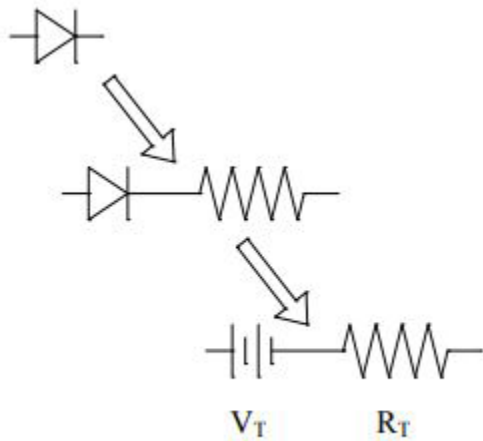


Recommended Solder Pad Layout



Part Number	Package	Marking
C3D10065E	TO-252-2	C3D10065

Diode Model



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

$$V_T = 0.94 + (T_j * -1.3 * 10^{-3})$$

$$R_T = 0.044 + (T_j * 4.4 * 10^{-4})$$

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



Revision History

Document Version	Date of Release	Description of Changes
5	January-2018	N/A
6	August-2023	Update Package Drawing, Update Landing Pad Updated Branding, Removed AEC-Q101 Banner
7	October-2023	Corrected solder pad layout and diode model



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