

# C5D50065D

## Silicon Carbide Schottky Diode

### Z-REC<sup>®</sup> RECTIFIER

$V_{RRM}$	=	650 V
$I_F (T_C=130^\circ\text{C})$	=	50 A
$Q_c$	=	110 nC

#### 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  $V_F$

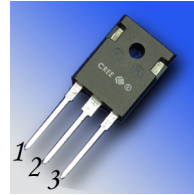
#### Benefits

- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

#### Applications

- Solar Inverters
- Motor Drives
- EV Chargers
- UPS
- Automotive

#### Package



TO-247-3



Part Number	Package	Marking
C5D50065D	TO-247-3	C5D50065

#### 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 Peak Blocking Voltage	650	V		
$I_F$	Continuous Forward Current	100 50 46	A	$T_C=25^\circ\text{C}$ $T_C=130^\circ\text{C}$ $T_C=135^\circ\text{C}$	Fig. 3
$I_{FRM}$	Repetitive Peak Forward Surge Current	153 106	A	$T_C=25^\circ\text{C}, t_p=10\text{ ms}, \text{Half Sine Pulse}$ $T_C=110^\circ\text{C}, t_p=10\text{ ms}, \text{Half Sine Pulse}$	
$I_{FSM}$	Non-Repetitive Forward Surge Current	400 330	A	$T_C=25^\circ\text{C}, t_p=10\text{ ms}, \text{Half Sine Pulse}$ $T_C=110^\circ\text{C}, t_p=10\text{ ms}, \text{Half Sine Pulse}$	Fig. 8
$I_{F,Max}$	Non-Repetitive Peak Forward Current	2000 1600	A	$T_C=25^\circ\text{C}, t_p=10\text{ }\mu\text{s}, \text{Pulse}$ $T_C=110^\circ\text{C}, t_p=10\text{ }\mu\text{s}, \text{Pulse}$	Fig. 8
$P_{tot}$	Power Dissipation	300 130	W	$T_C=25^\circ\text{C}$ $T_C=110^\circ\text{C}$	Fig. 4
$\int i^2 dt$	$i^2t$ value (Per Leg)	800 545	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	$^\circ\text{C}$		
	TO-247 Mounting Torque	1 8.8	Nm lbf-in	M3 Screw 6-32 Screw	

## Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.5	1.8	V	$I_F = 50 \text{ A}$ , $T_J = 25^\circ\text{C}$	Fig. 1
		1.25			$I_F = 25 \text{ A}$ , $T_J = 25^\circ\text{C}$	
$I_R$	Reverse Current	1.8	2.2	$\mu\text{A}$	$V_R = 650 \text{ V}$ , $T_J = 175^\circ\text{C}$	Fig. 2
		1.3			$V_R = 400 \text{ V}$ , $T_J = 175^\circ\text{C}$	
$I_R$	Reverse Current	50	500	$\mu\text{A}$	$V_R = 650 \text{ V}$ , $T_J = 25^\circ\text{C}$	Fig. 2
		4			$V_R = 400 \text{ V}$ , $T_J = 25^\circ\text{C}$	
$I_R$	Reverse Current	200	1000	$\mu\text{A}$	$V_R = 650 \text{ V}$ , $T_J = 175^\circ\text{C}$	Fig. 2
		6			$V_R = 400 \text{ V}$ , $T_J = 175^\circ\text{C}$	
$Q_C$	Total Capacitive Charge	110		nC	$V_R = 400 \text{ V}$ , $I_F = 50 \text{ A}$ $di/dt = 500 \text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$	Fig. 5
C	Total Capacitance	1970		pF	$V_R = 0 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$	Fig. 6
		200			$V_R = 200 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$	
		180			$V_R = 400 \text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1 \text{ MHz}$	
$E_C$	Capacitance Stored Energy	16.5		$\mu\text{J}$	$V_R = 400 \text{ V}$	Fig. 7

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

## Thermal Characteristics

Symbol	Parameter	Typ.	Unit
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.5	$^\circ\text{C}/\text{W}$

## Typical Performance

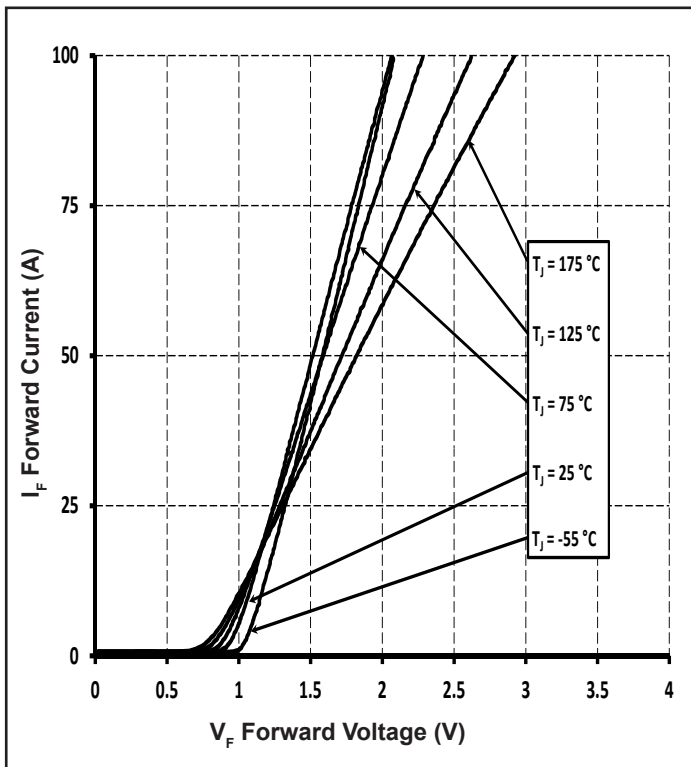


Figure 1. Forward Characteristics

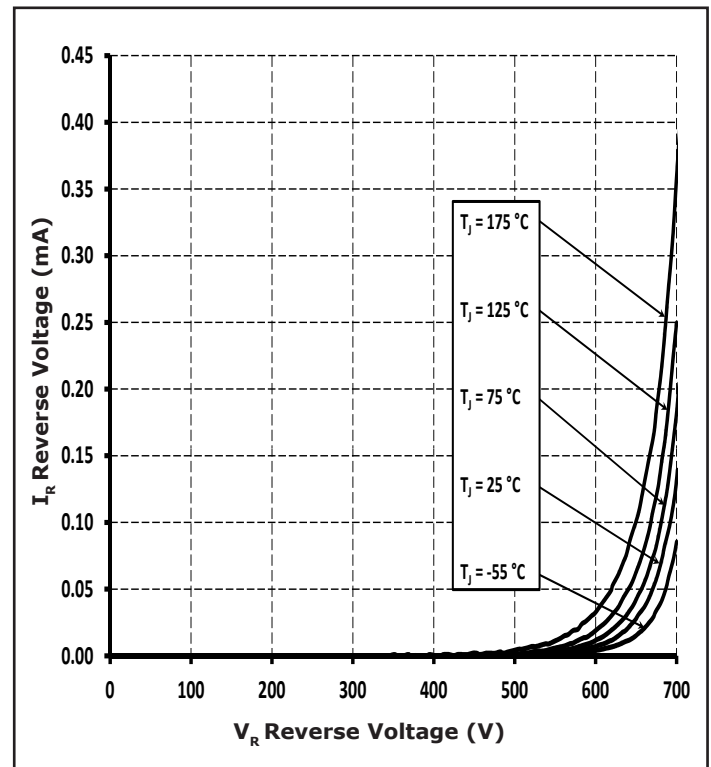


Figure 2. Reverse Characteristics

## Typical Performance

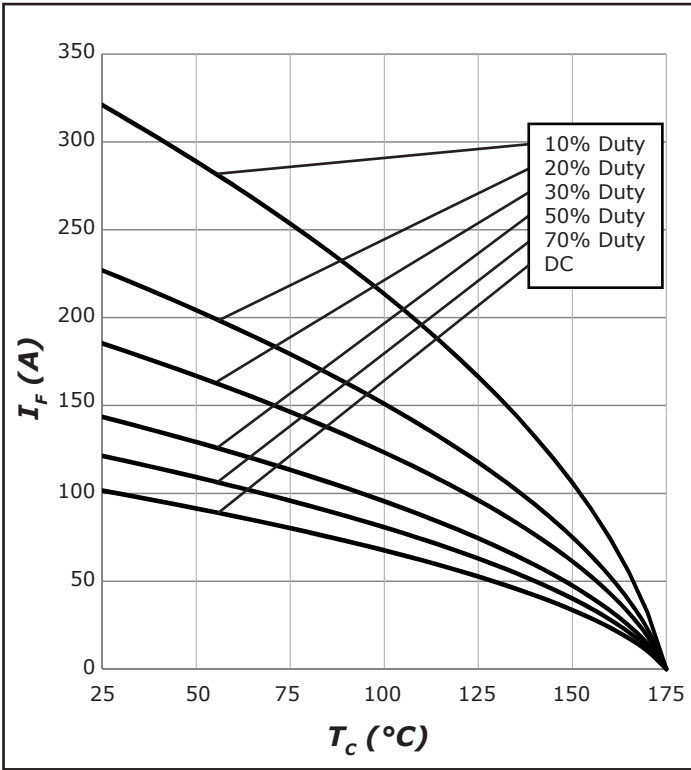


Figure 3. Current Derating

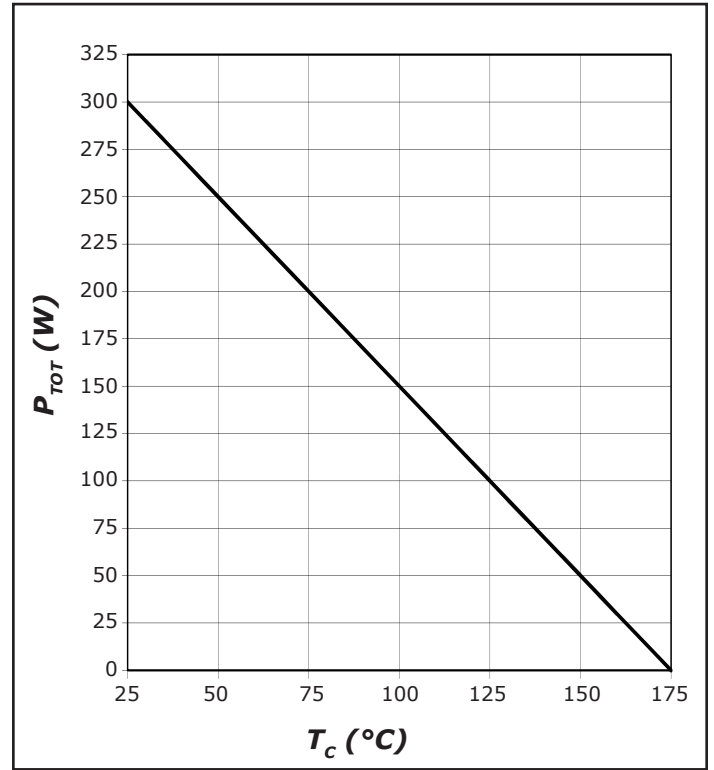


Figure 4. Power Derating

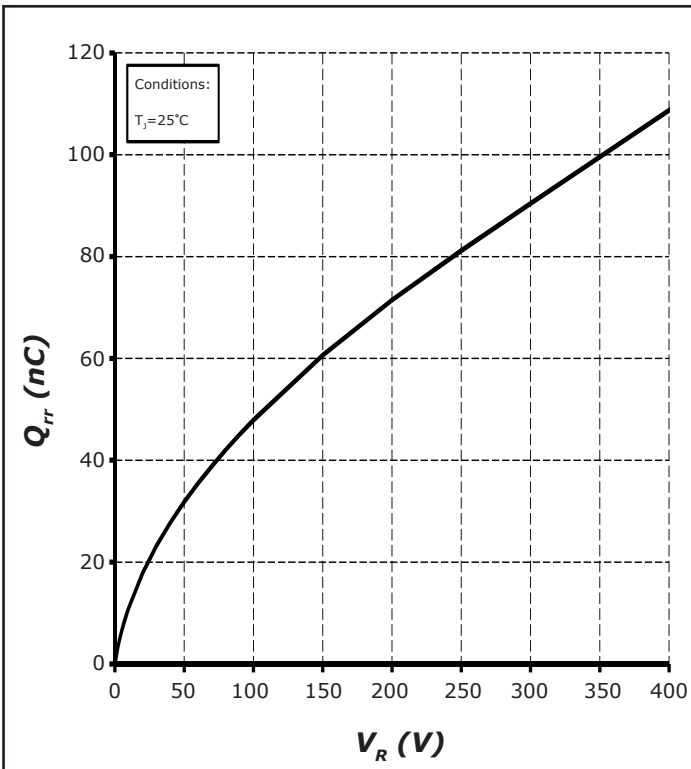


Figure 5. Recovery Charge vs. Reverse Voltage

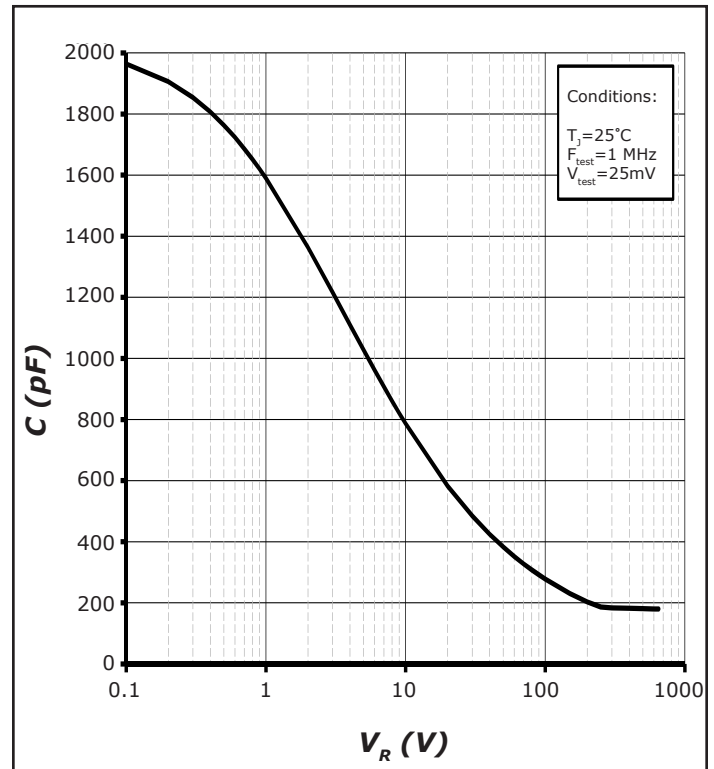


Figure 6. Typical Capacitance vs. Reverse Voltage

## Typical Performance

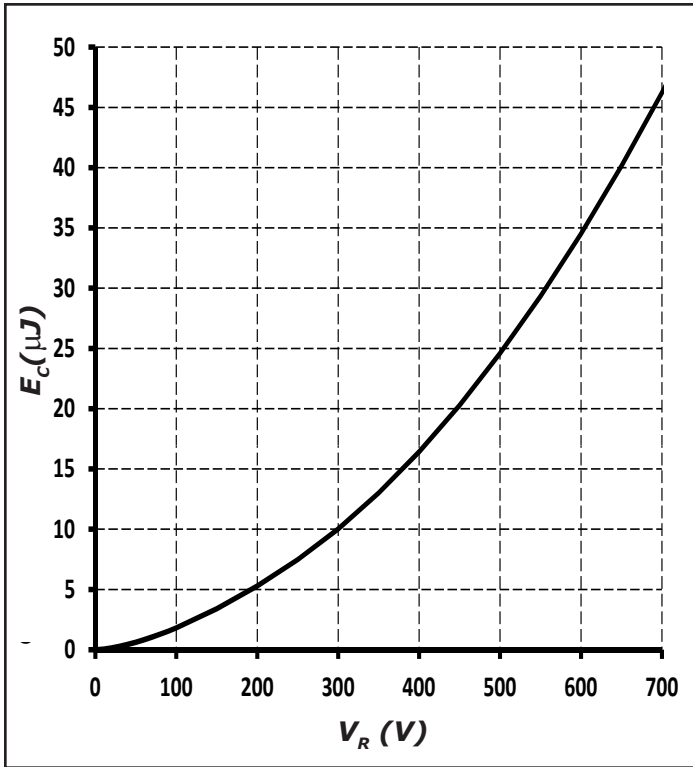


Figure 7. Typical Capacitance Stored Energy

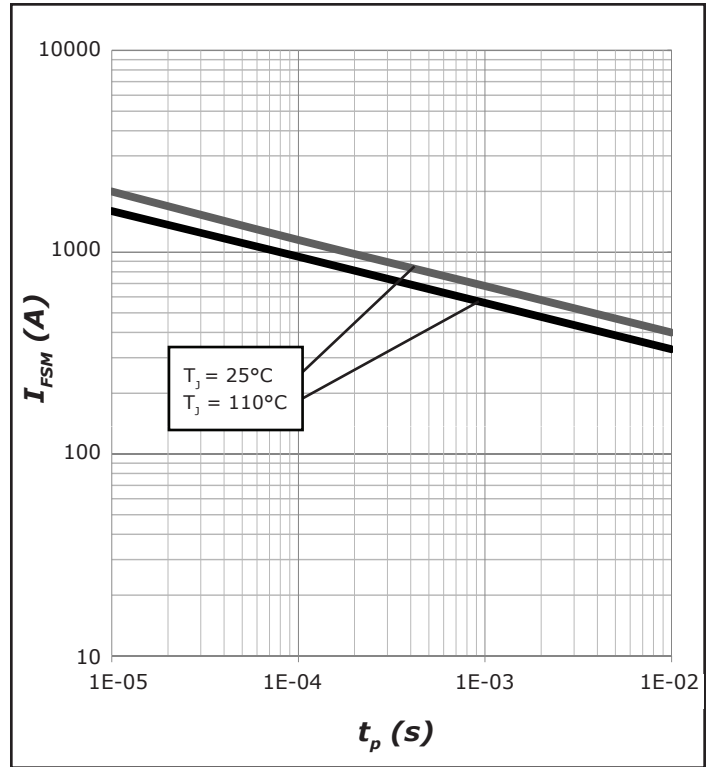


Figure 8. Non-Repetitive Peak Forward Surge Current versus Pulse Duration (sinusoidal waveform)

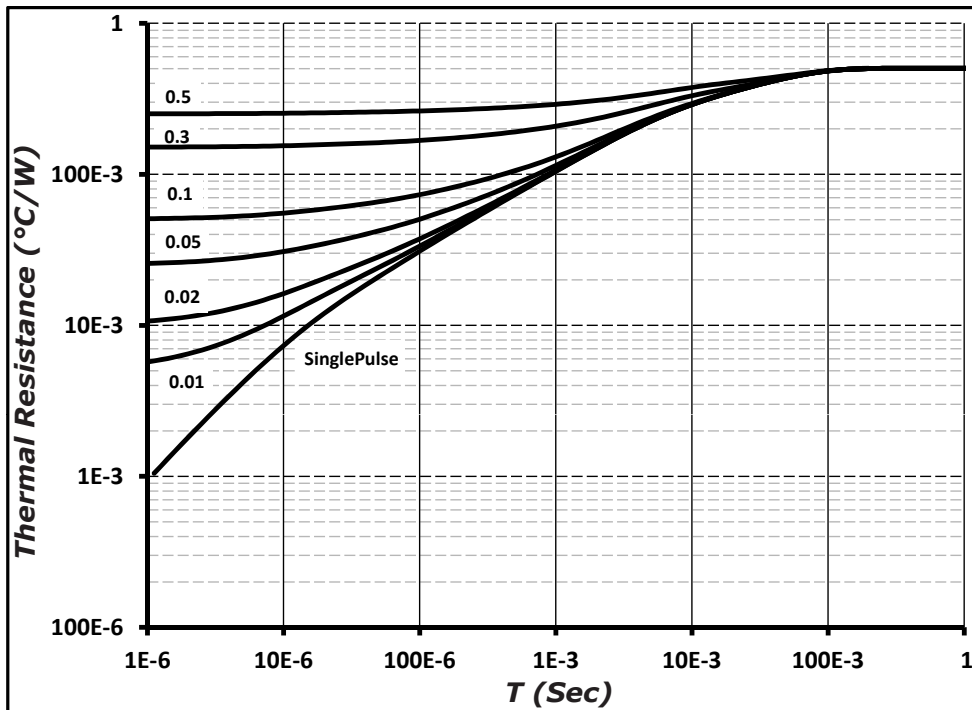
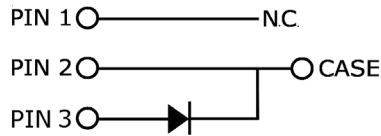
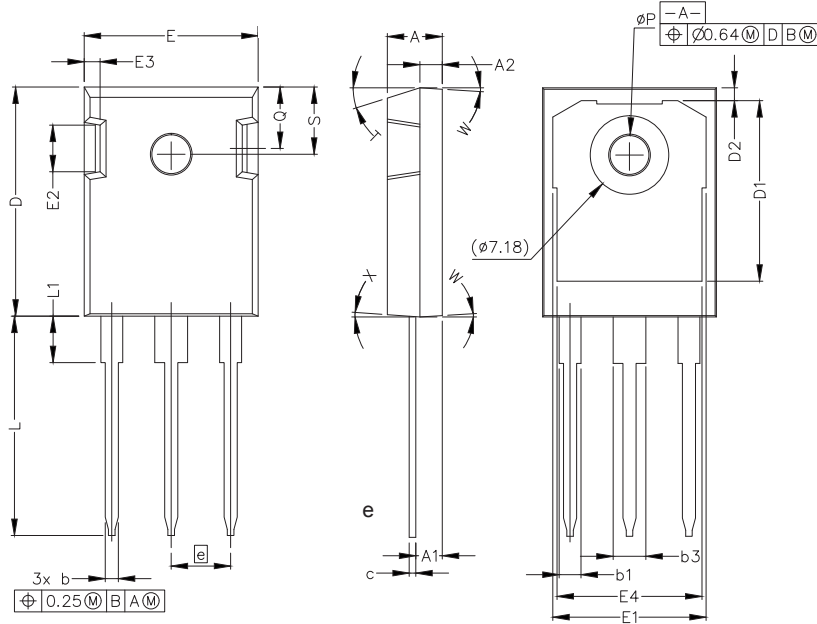


Figure 9. Transient Thermal Impedance

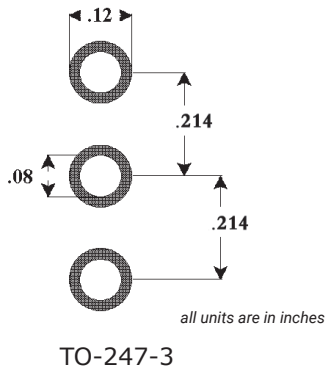
## Package Dimensions

Package TO-247-3



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b3	.113	.133	2.87	3.38
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.557	13.10	14.15
E2	.145	.201	3.68	5.10
E3	.039	.075	1.00	1.90
E4	.487	.529	12.38	13.43
e	.214 BSC		5.44 BSC	
L	.780	.800	19.81	20.32
L1	.161	.173	4.10	4.40
N	3			
ØP	.138	.144	3.51	3.65
Q	.216	.236	5.49	6.00
S	.238	.248	6.04	6.30
T	17.5° REF			
W	3.5° REF			
X	4° REF			

## Recommended Solder Pad Layout

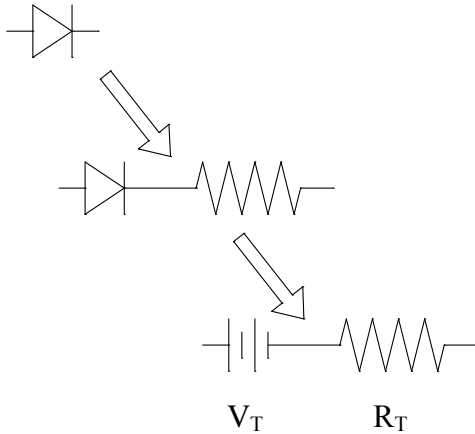


Part Number	Package	Marking
C5D50065D	TO-247-3	C5D50065

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)



## Diode Model



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

$$V_T = 0.9947 + (T_j * -0.0013)$$

$$R_T = 0.0093 + (T_j * 7.00 * 10^{-5})$$

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

## Notes

- **RoHS Compliance**

The levels of RoHS restricted materials in this product are below the maximum concentration values (also referred to as the threshold limits) permitted for such substances, or are used in an exempted application, in accordance with EU Directive 2011/65/EC (RoHS2), as implemented January 2, 2013. RoHS Declarations for this product can be obtained from your Wolfspeed representative or from the Product Ecology section of our website at <http://www.wolfspeed.com/Power/Tools-and-Support/Product-Ecology>.

- **REACH Compliance**

REACH substances of high concern (SVHCs) information is available for this product. Since the European Chemical Agency (ECHA) has published notice of their intent to frequently revise the SVHC listing for the foreseeable future, please contact a Cree representative to insure you get the most up-to-date REACH SVHC Declaration. REACH banned substance information (REACH Article 67) is also available upon request.

- This product has not been designed or tested for use in, and is not intended for use in, applications implanted into the human body nor in applications in which failure of the product could lead to death, personal injury or property damage, including but not limited to equipment used in the operation of nuclear facilities, life-support machines, cardiac defibrillators or similar emergency medical equipment, aircraft navigation or communication or control systems, or air traffic control systems.

## Related Links

- Cree SiC Schottky diode portfolio: <http://www.wolfspeed.com/Power/Products#SiCSchottkyDiodes>
- Schottky diode Spice models: <http://www.wolfspeed.com/power/tools-and-support/DIODE-model-request2>
- SiC MOSFET and diode reference designs: <http://go.pardot.com/l/101562/2015-07-31/349i>

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