

# C4D20120D

## Silicon Carbide Schottky Diode

### Z-REC<sup>®</sup> RECTIFIER

$V_{RRM}$	=	1200 V
$I_F (T_C=135^\circ\text{C})$	=	33 A**
$Q_c$	=	104 nC**

### Features

- 1.2-KVolt Schottky Rectifier
- Zero Reverse Recovery Current
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Positive Temperature Coefficient on  $V_F$

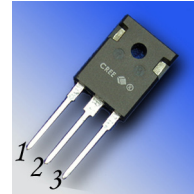
### Benefits

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

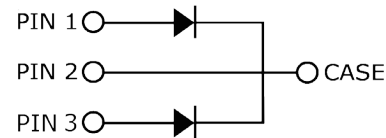
### Applications

- Switch Mode Power Supplies
- Power Factor Correction
- Motor Drives

### Package



TO-247-3



Part Number	Package	Marking
C4D20120D	TO-247-3	C4D20120

### Maximum Ratings ( $T_C=25^\circ\text{C}$ unless otherwise specified)

Symbol	Parameter	Value		Test Conditions	Note
$V_{RRM}$	Repetitive Peak Reverse Voltage	1200	V		
$V_{RSM}$	Surge Peak Reverse Voltage	1300	V		
$V_{DC}$	DC Blocking Voltage	1200	V		
$I_F$	Continuous Forward Current (Per Leg/Device)	34/68 16.5/33 10/20	A	$T_C=25^\circ\text{C}$ $T_C=135^\circ\text{C}$ $T_C=157^\circ\text{C}$	
$I_{FRM}$	Repetitive Peak Forward Surge Current	47* 31.5*	A	$T_C=25^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse $T_C=110^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse	
$I_{FSM}$	Non-Repetitive Peak Forward Surge Current	71* 59.5*	A	$T_C=25^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse $T_C=110^\circ\text{C}$ , $t_p=10$ ms, Half Sine Pulse	
$I_{F,Max}$	Non-Repetitive Peak Forward Current	750* 620*	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	
$P_{tot}$	Power Dissipation(Per Leg/Device)	176/352 76/152	W	$T_C=25^\circ\text{C}$ $T_C=110^\circ\text{C}$	
$T_j$	Operating Junction Range	-55 to +175	$^\circ\text{C}$		
$T_{stg}$	Storage Temperature Range	-55 to +135	$^\circ\text{C}$		
	TO-247 Mounting Torque	1 8.8	Nm lbf-in	M3 Screw 6-32 Screw	

\* Per Leg, \*\* Per Device

### Electrical Characteristics (Per Leg)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.5 2.2	1.8 3	V	$I_F = 10\text{ A}$ $T_J = 25^\circ\text{C}$ $I_F = 10\text{ A}$ $T_J = 175^\circ\text{C}$	
$I_R$	Reverse Current	30 55	250 350	$\mu\text{A}$	$V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$ $V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$	
$Q_C$	Total Capacitive Charge	52		nC	$V_R = 800\text{ V}$ , $I_F = 10\text{ A}$ $di/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$	
C	Total Capacitance	754 45 38		pF	$V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 800\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$	

Note:

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

### Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	0.85* 0.43**		$^\circ\text{C}/\text{W}$		

\* Per Leg, \*\* Per Device

### Typical Performance (Per Leg)

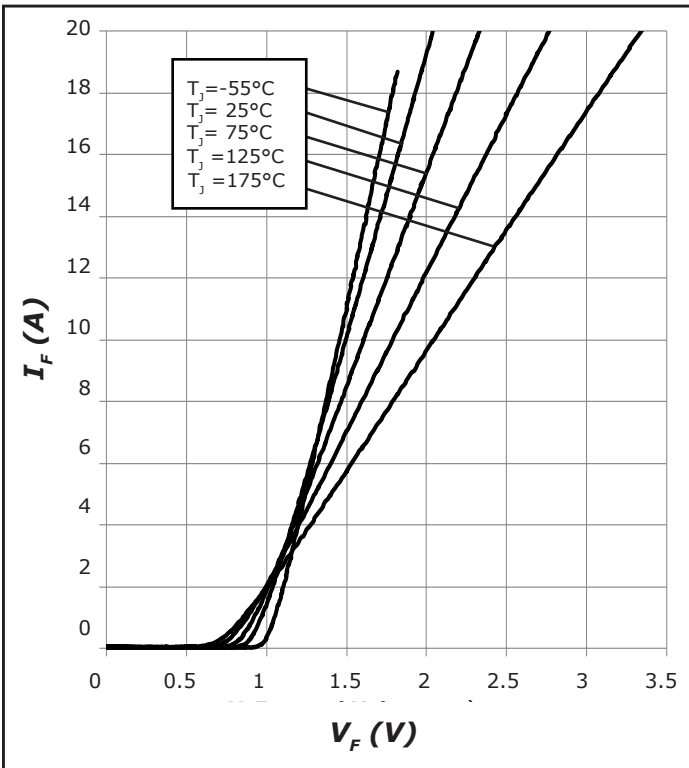


Figure 1. Forward Characteristics

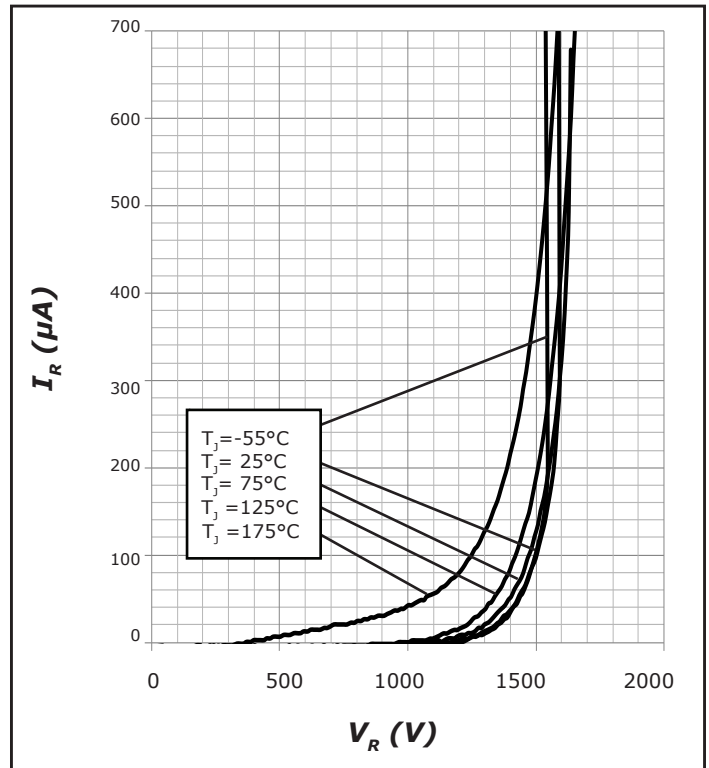


Figure 2. Reverse Characteristics

### Typical Performance (Per Leg)

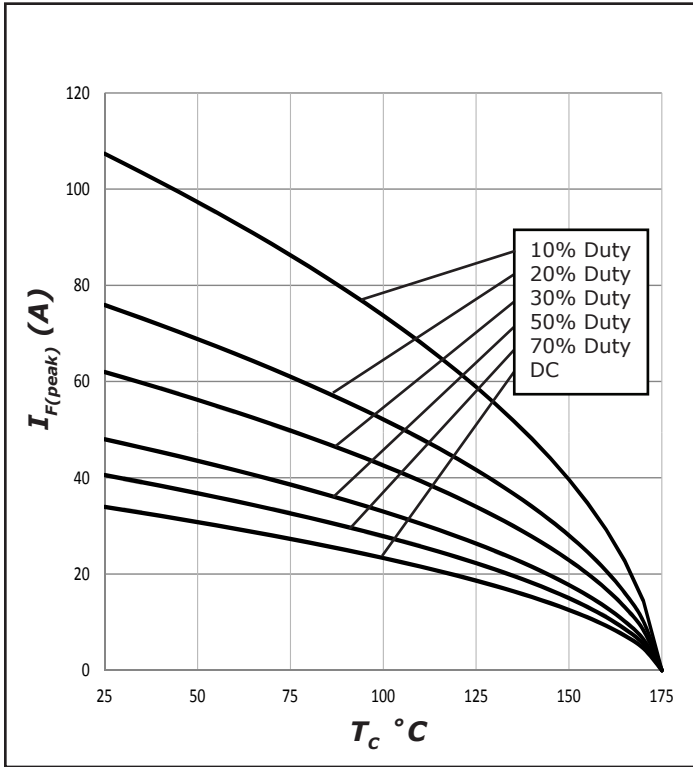


Figure 3. Current Derating

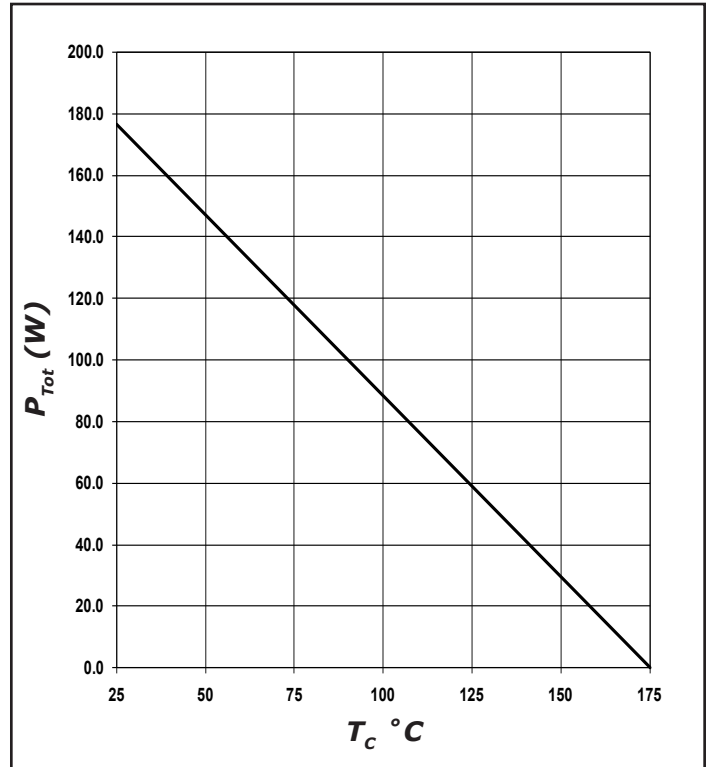


Figure 4. Power Derating

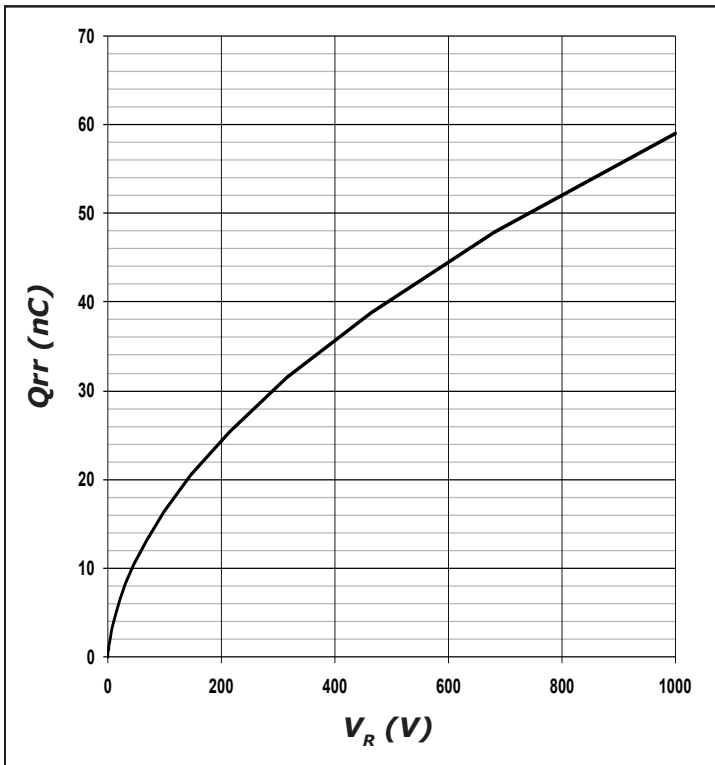


Figure 5. Recovery Charge vs. Reverse Voltage

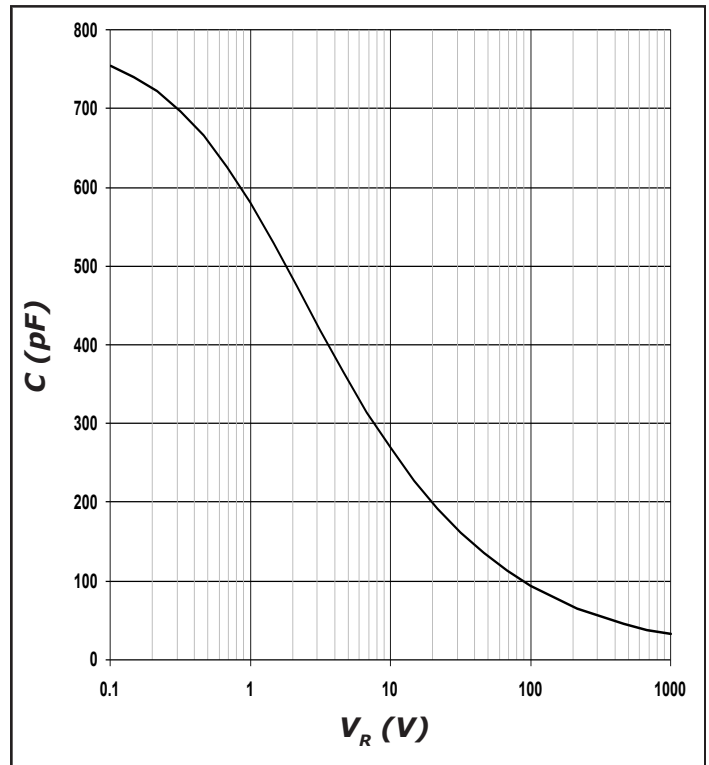


Figure 6. Capacitance vs. Reverse Voltage

Typical Performance

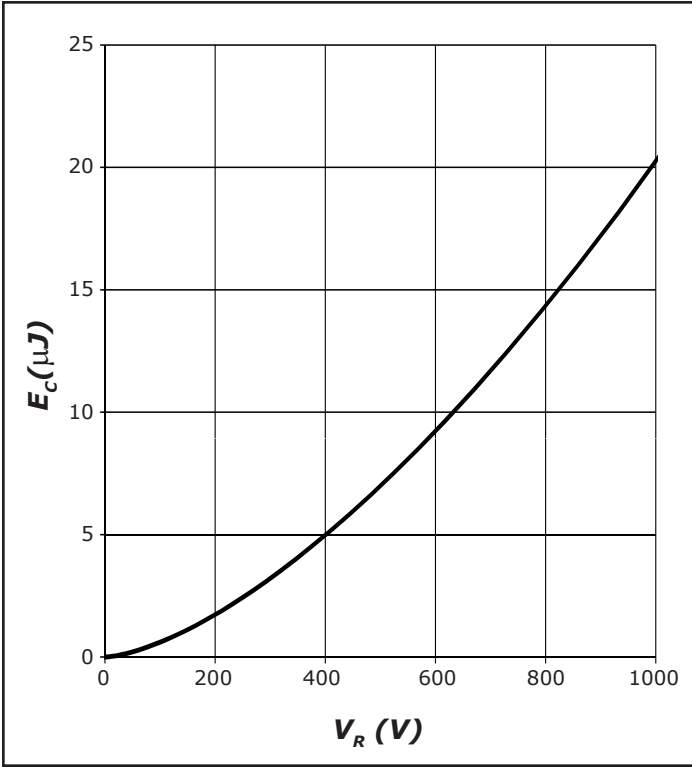


Figure 7. Typical Capacitance Stored Energy

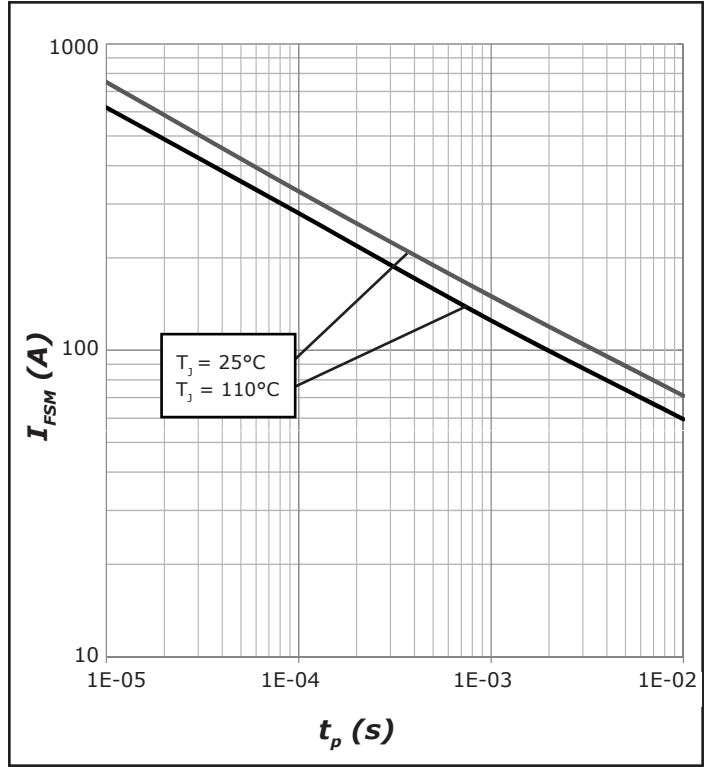


Figure 8. Non-Repetitive Peak Forward Surge Current versus Pulse Duration (sinusoidal waveform)

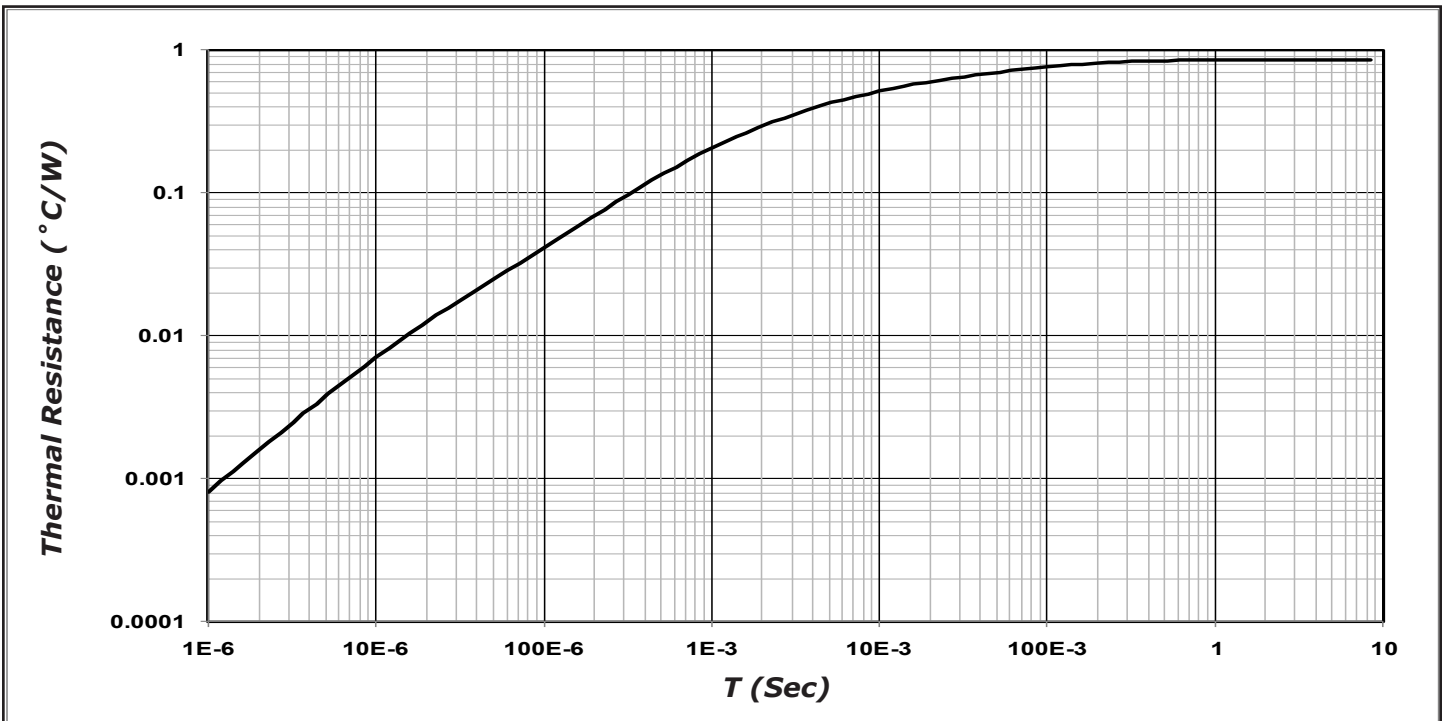
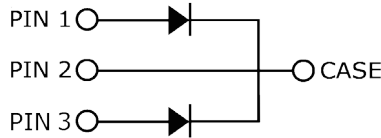
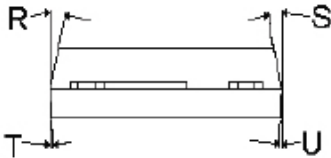
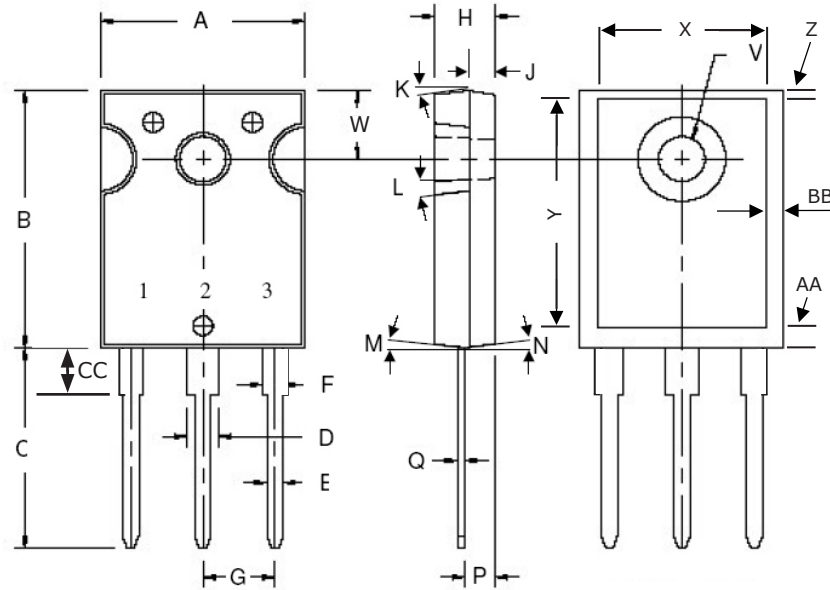


Figure 9. Transient Thermal Impedance

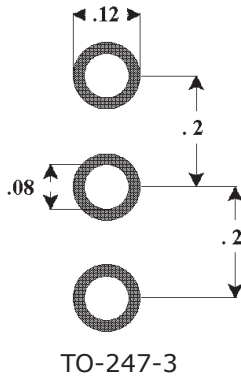
## Package Dimensions

Package TO-247-3



POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.605	.635	15.367	16.130
B	.800	.831	20.320	21.10
C	.780	.800	19.810	20.320
D	.095	.133	2.413	3.380
E	.046	.052	1.168	1.321
F	.060	.095	1.524	2.410
G	.215 TYP		5.460 TYP	
H	.175	.205	4.450	5.210
J	.075	.085	1.910	2.160
K	6°	21°	6°	21°
L	4°	6°	4°	6°
M	2°	4°	2°	4°
N	2°	4°	2°	4°
P	.090	.100	2.286	2.540
Q	.020	.030	.508	.762
R	9°	11°	9°	11°
S	9°	11°	9°	11°
T	2°	8°	2°	8°
U	2°	8°	2°	8°
V	.137	.144	3.487	3.658
W	.210	.248	5.334	6.300
X	.502	.557	12.751	14.150
Y	.637	.695	16.180	17.653
Z	.038	.052	0.964	1.321
AA	.110	.140	2.794	3.556
BB	.030	.046	0.766	1.168
CC	.161	.176	4.100	4.472

## Recommended Solder Pad Layout

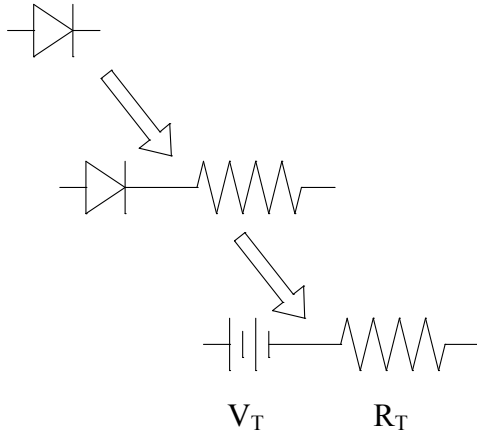


Part Number	Package	Marking
C4D20120D	TO-247-3	C4D20120

Note: Recommended soldering profiles can be found in the applications note here: [http://www.cree.com/power\\_app\\_notes/soldering](http://www.cree.com/power_app_notes/soldering)



## Diode Model



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

$$V_T = 0.98 + (T_j * -1.71 * 10^{-3})$$

$$R_T = 0.040 + (T_j * 5.32 * 10^{-4})$$

**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 Cree representative or from the Product Documentation sections of [www.cree.com](http://www.cree.com).

- 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.