

# C4D02120E

## Silicon Carbide Schottky Diode

### Z-REC<sup>®</sup> RECTIFIER

$V_{RRM}$	=	1200 V
$I_F (T_C=135^\circ\text{C})$	=	4.5 A
$Q_c$	=	11 nC

### Features

- 1.2kV Schottky Rectifier
- Optimized for PFC Boost Diode Application
- 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

- Solar Inverters
- Power Factor Correction
- LED Lighting Power Supplies
- X-Ray Tube Power Drivers
- EV Charging and Power Conversion

### Package



TO-252-2



Part Number	Package	Marking
C4D02120E	TO-252-2	C4D02120

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

Symbol	Parameter	Value	Unit	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		
$I_F$	Maximum DC Current	9 4.5 2	A	$T_C=25^\circ\text{C}$ $T_C=135^\circ\text{C}$ $T_C=162^\circ\text{C}$	
$I_{FRM}$	Repetitive Peak Forward Surge Current	14.4 10	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	19 16.5	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	
$I_{FMax}$	Non-Repetitive Peak Forward Current	200 160	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	51.7 22.4	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	$^\circ\text{C}$		

## Electrical Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
$V_F$	Forward Voltage	1.4 1.9	1.8 3	V	$I_F = 2\text{ A}$ $T_J = 25^\circ\text{C}$ $I_F = 2\text{ A}$ $T_J = 175^\circ\text{C}$	
$I_R$	Reverse Current	10 40	50 150	$\mu\text{A}$	$V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$ $V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$	
$Q_C$	Total Capacitive Charge	11		nC	$V_R = 800\text{ V}$ , $I_F = 2\text{ A}$ $di/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$	
C	Total Capacitance	167 11 8		pF	$V_R = 0\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 400\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ $V_R = 800\text{ V}$ , $T_J = 25^\circ\text{C}$ , $f = 1\text{ MHz}$	
$E_C$	Capacitance Stored Energy	3.2		$\mu\text{J}$	$V_R = 800\text{ V}$	Fig. 7

Note:

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

## Thermal Characteristics

Symbol	Parameter	Typ.	Unit
$R_{\theta JC}$	TO-252 Package Thermal Resistance from Junction to Case	2.9	$^\circ\text{C}/\text{W}$

## Typical Performance

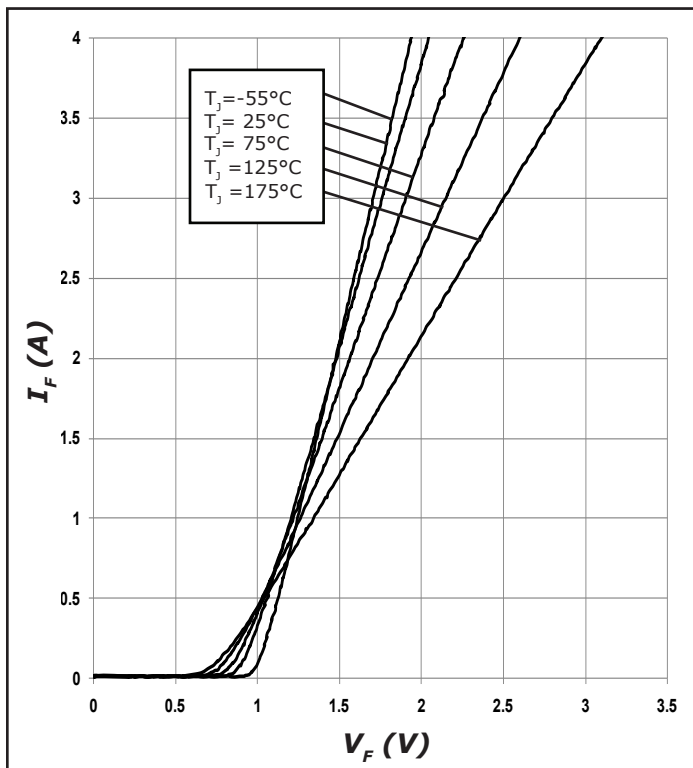


Figure 1. Forward Characteristics

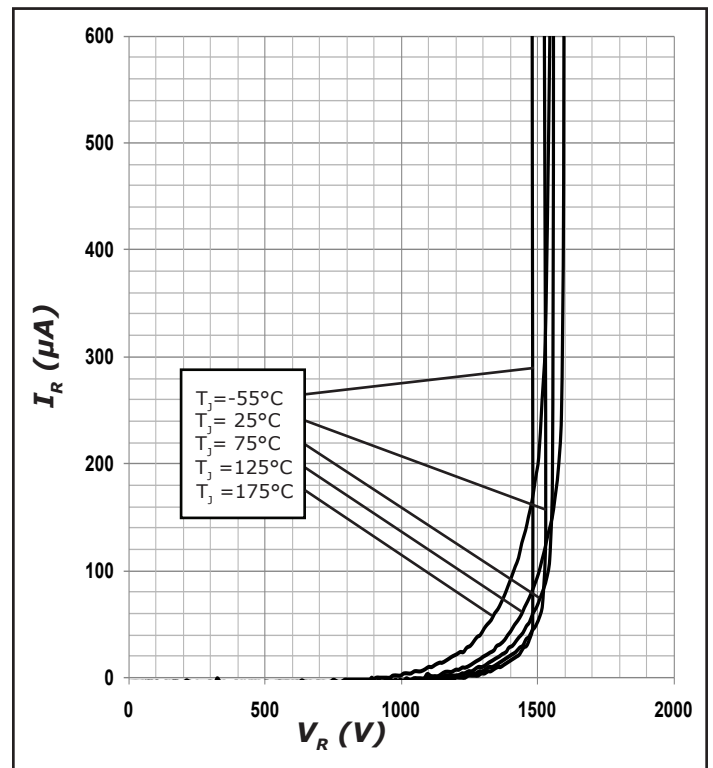


Figure 2. Reverse Characteristics

## Typical Performance

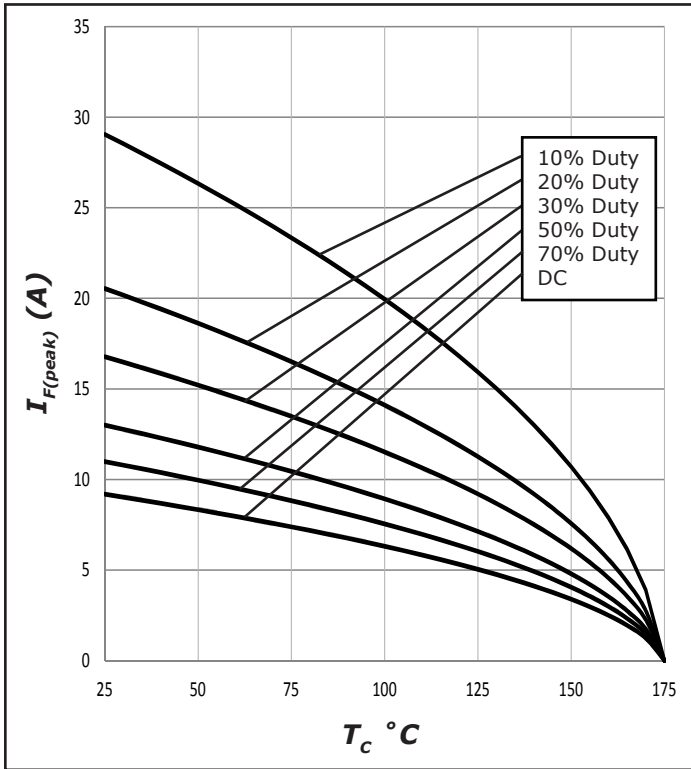


Figure 3. Current Derating

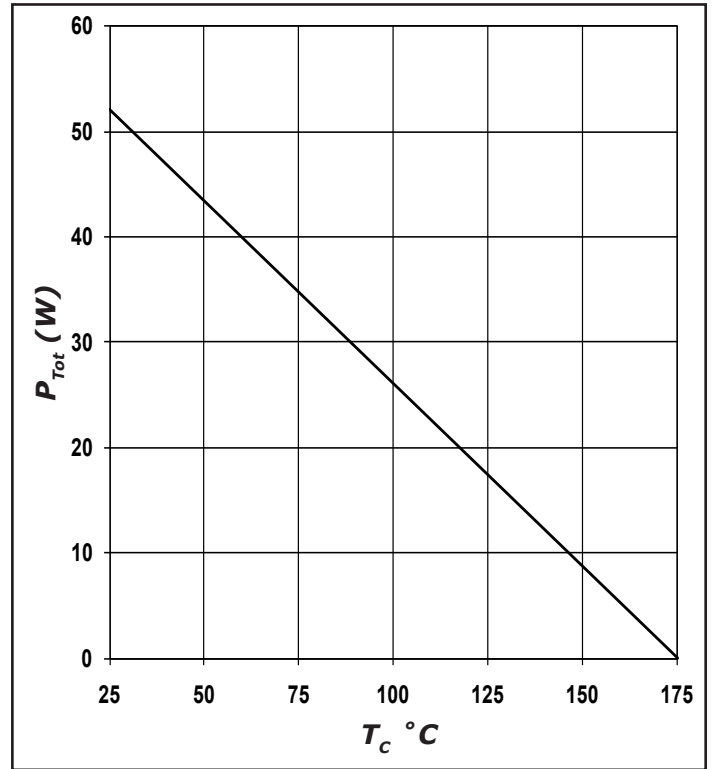


Figure 4. Power Derating

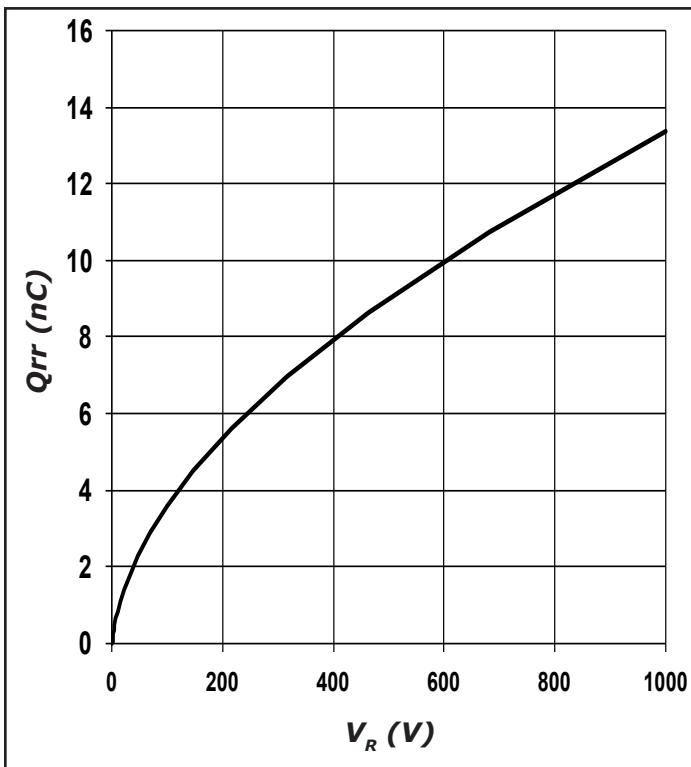


Figure 5. Recovery Charge vs. Reverse Voltage

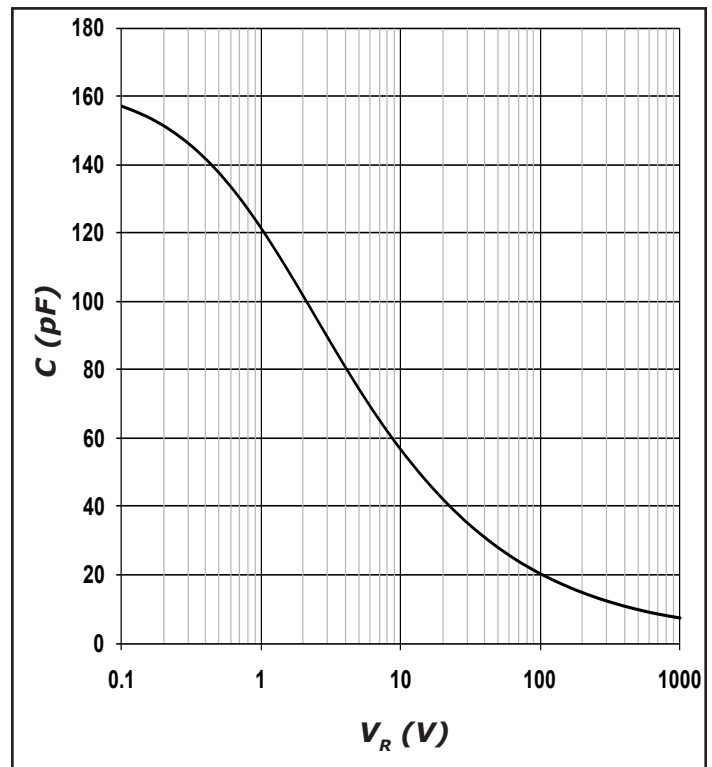


Figure 6. Capacitance vs. Reverse Voltage

## Typical Performance

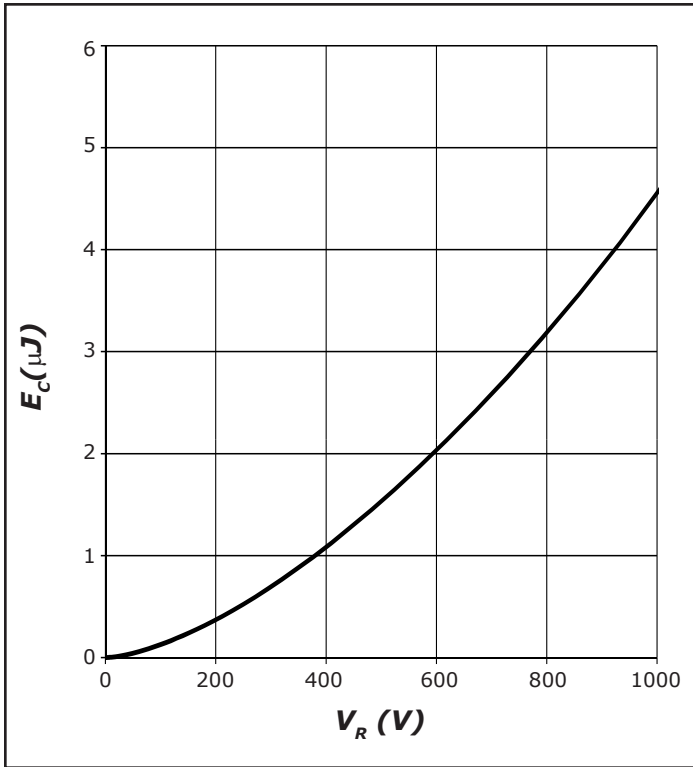


Figure 7. Typical Capacitance Stored Energy

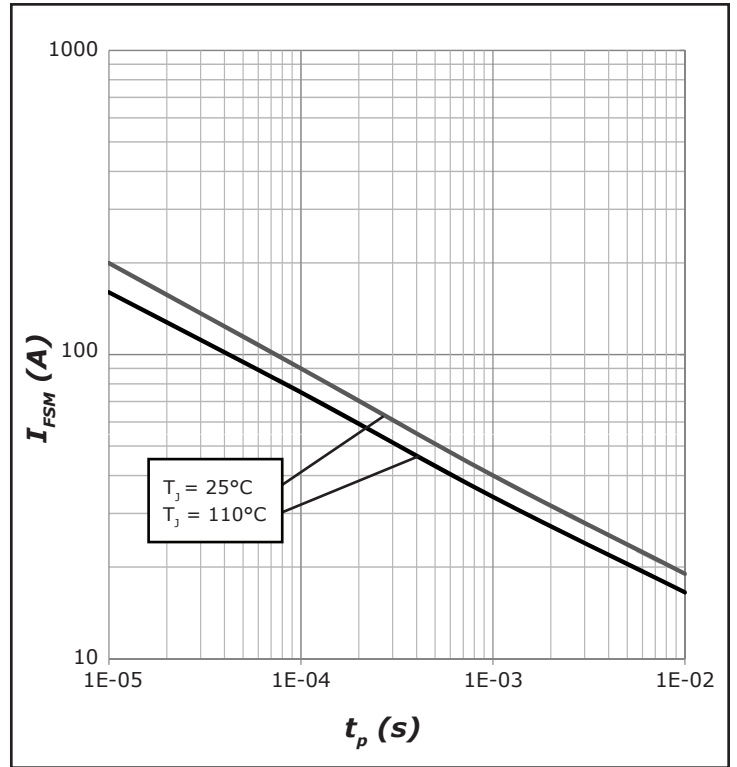


Figure 8. Non-repetitive peak forward surge current versus pulse duration (sinusoidal waveform)

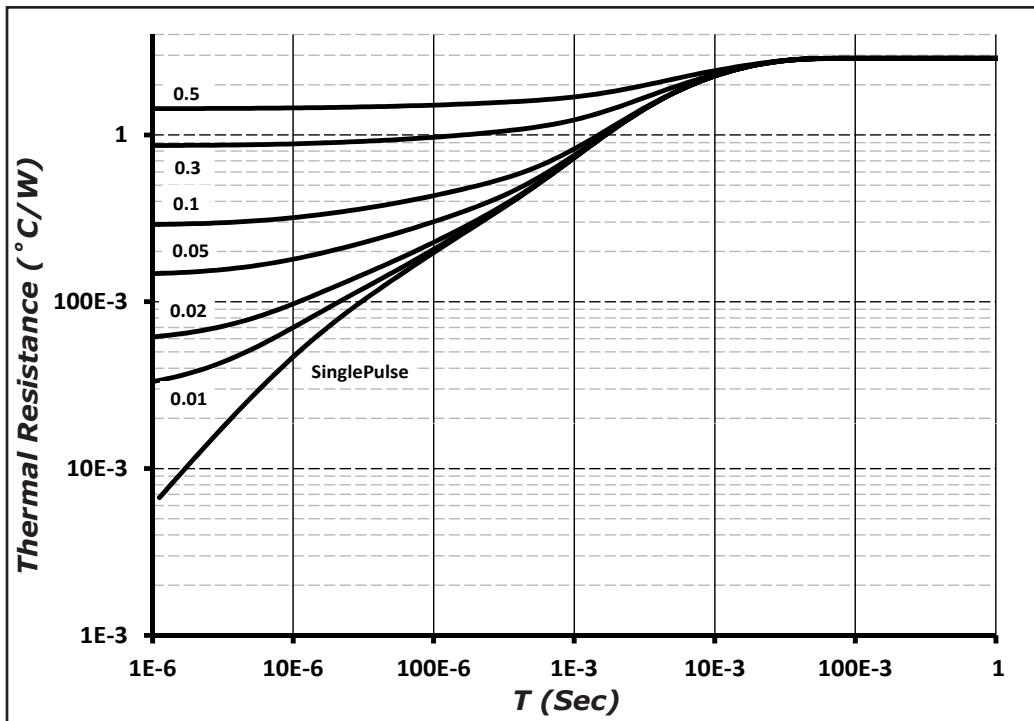
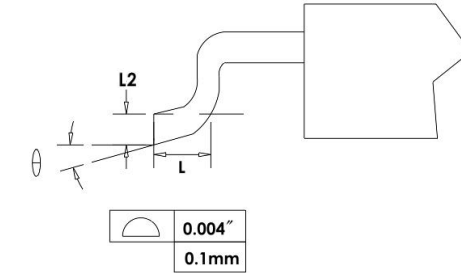
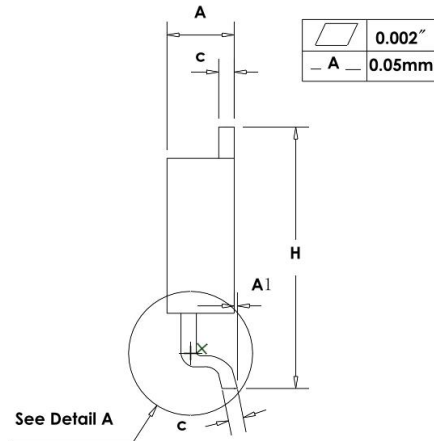
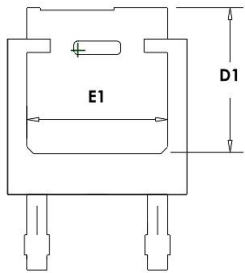
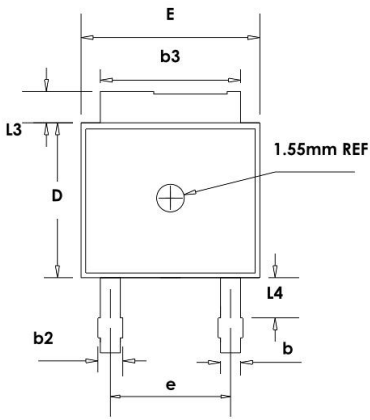


Figure 9. Transient Thermal Impedance

## Package Dimensions

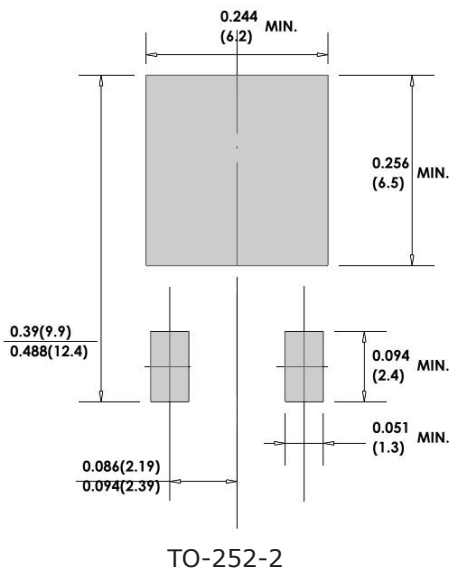
Package TO-252-2



SYMBOL	MILLIMETERS	
	MIN	MAX
A	2.19	2.38
A1	—	0.13
b	0.64	0.89
b2	0.84	1.14
b3	5.21	5.46
c	0.46	0.61
D	5.97	6.22
D1	5.21	—
E	6.35	6.73
E1	4.83	—
e	4.58BSC	
H	9.65	10.41
L	1.40	1.78
L2	0.51BSC	
L3	0.89	1.27
L4	0.64	1.01
θ	0	8



## Recommended Solder Pad Layout

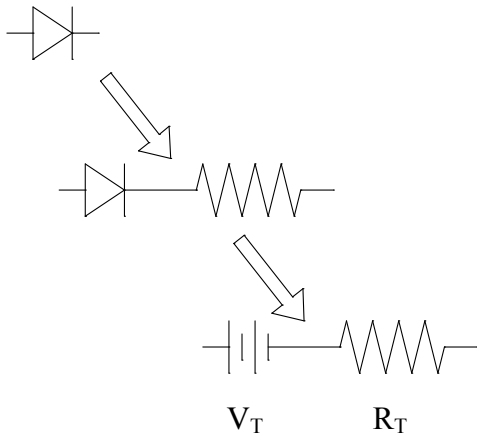


Part Number	Package	Marking
C4D02120E	TO-252-2	C4D02120

**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



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

$$V_T = 0.9592 + (T_J * -1.20 * 10^{-3})$$

$$R_T = 0.1673 + (T_J * 2.10 * 10^{-3})$$

**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).
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- 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.cree.com/diodes>
- C3D Spice models: [http://response.cree.com/Request\\_Diode\\_model](http://response.cree.com/Request_Diode_model)
- SiC MOSFET and diode reference designs: [http://response.cree.com/SiC\\_RefDesigns](http://response.cree.com/SiC_RefDesigns)



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