



APSEMI

AC4D15120D

Silicon Carbide Schottky Diode



Features

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

Benefits

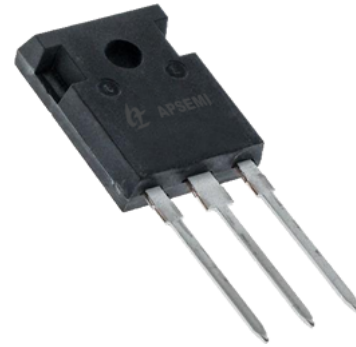
- Replace Bipolar with Unipolar Rectifiers
- Essentially No Switching Losses
- Higher Efficiency
- Reduction of Heat Sink Requirements
- Parallel Devices Without Thermal Runaway

Applications

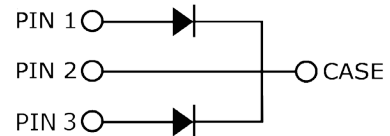
- Switch Mode Power Supplies (SMPS)
- Boost diodes in PFC or DC/DC stages
- Free Wheeling Diodes in Inverter stages
- AC/DC converters

Part Number	Package
AC4D15120D	TO-247-3

Parameter	Rating	Units
V_{RRM}	1200	V
$I_F (T_C=135^\circ\text{C})$	24	A**
Q_c	74	nC**



TO-247-3
Package



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)	24.5/49 12/24 7.5/15	A	$T_C=25^\circ\text{C}$ $T_C=135^\circ\text{C}$ $T_C=157^\circ\text{C}$	Fig. 3
I_{FRM}	Repetitive Peak Forward Surge Current	38* 25*	A	$T_C=25^\circ\text{C}, t_p=10\text{ ms}$, Half Sine Pulse $T_C=110^\circ\text{C}, t_p=10\text{ ms}$, Half Sine Pulse	
I_{FSM}	Non-Repetitive Peak Forward Surge Current	66* 49.5*	A	$T_C=25^\circ\text{C}, t_p=10\text{ ms}$, Half Sine Pulse $T_C=110^\circ\text{C}, t_p=10\text{ ms}$, Half Sine Pulse	Fig. 8
I_{FMax}	Non-Repetitive Peak Forward Current	600* 480*	A	$T_C=25^\circ\text{C}, t_p=10\text{ }\mu\text{s}$, Pulse $T_C=110^\circ\text{C}, t_p=10\text{ }\mu\text{s}$, Pulse	Fig. 8
P_{tot}	Power Dissipation(Per Leg/Device)	135/270 58.5/117	W	$T_C=25^\circ\text{C}$ $T_C=110^\circ\text{C}$	Fig. 4
dV/dt	Diode dV/dt ruggedness	200	V/ns	$V_R=0\text{-}960\text{V}$	
$\int i^2 dt$	i^2t value	20.5* 12.25*	A ² 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 (Per Leg)

Symbol	Parameter	Typ.	Max.	Unit	Test Conditions	Note
V_F	Forward Voltage	1.5 2.2	1.8 3	V	$I_F = 8\text{ A}$ $T_J = 25^\circ\text{C}$ $I_F = 8\text{ A}$ $T_J = 175^\circ\text{C}$	Fig. 1
I_R	Reverse Current	35 100	250 350	μA	$V_R = 1200\text{ V}$ $T_J = 25^\circ\text{C}$ $V_R = 1200\text{ V}$ $T_J = 175^\circ\text{C}$	Fig. 2
Q_C	Total Capacitive Charge	37		nC	$V_R = 800\text{ V}$, $I_F = 8\text{ A}$ $di/dt = 200\text{ A}/\mu\text{s}$ $T_J = 25^\circ\text{C}$	Fig. 5
C	Total Capacitance	560 37 27		pF	$V_R = 0\text{ V}$, $T_J = 25^\circ\text{C}$, $f = 1\text{ MHz}$ $V_R = 400\text{ V}$, $T_J = 25^\circ\text{C}$, $f = 1\text{ MHz}$ $V_R = 800\text{ V}$, $T_J = 25^\circ\text{C}$, $f = 1\text{ MHz}$	Fig. 6
E_C	Capacitance Stored Energy	10.5		μJ	$V_R = 800\text{ V}$	Fig. 7

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

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit	Note
$R_{\theta JC}$	Thermal Resistance from Junction to Case	1.11* 0.56**		$^\circ\text{C}/\text{W}$	Fig. 9

* Per Leg, ** Per Device

Typical Performance

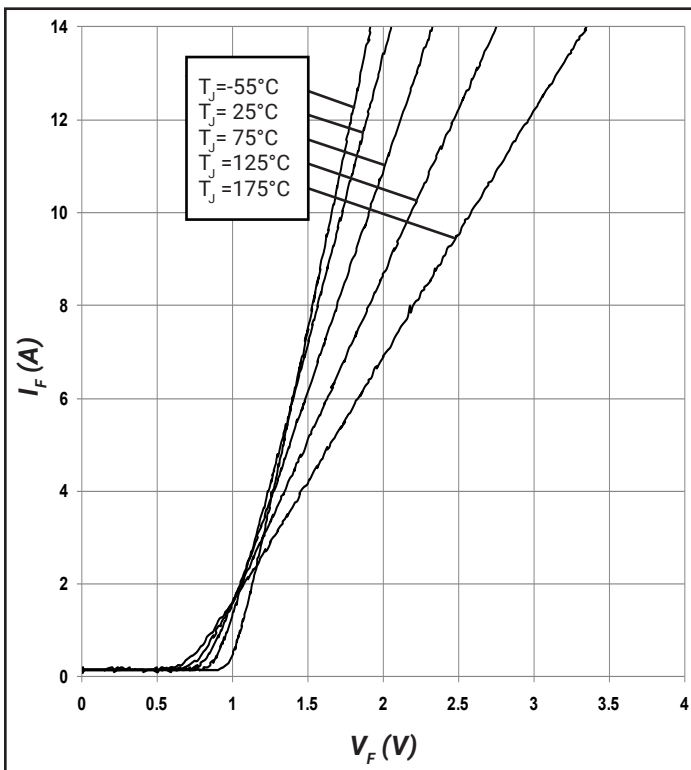


Figure 1. Forward Characteristics

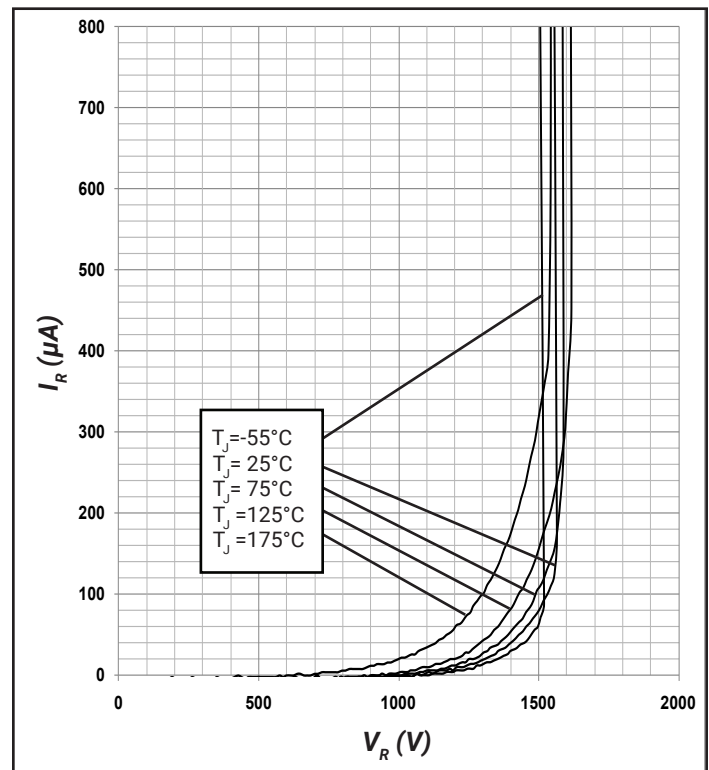


Figure 2. Reverse Characteristics



Typical Performance (Per Leg)

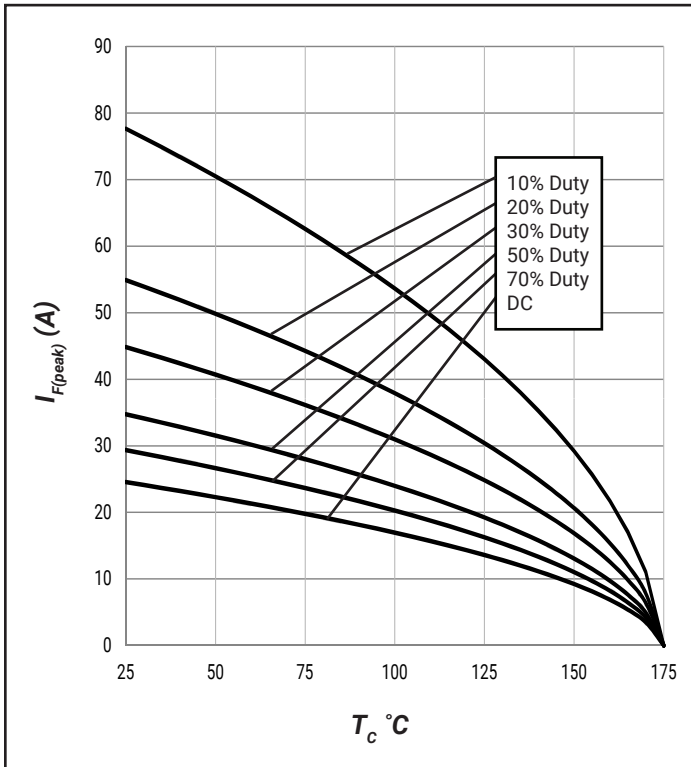


Figure 3. Current Derating

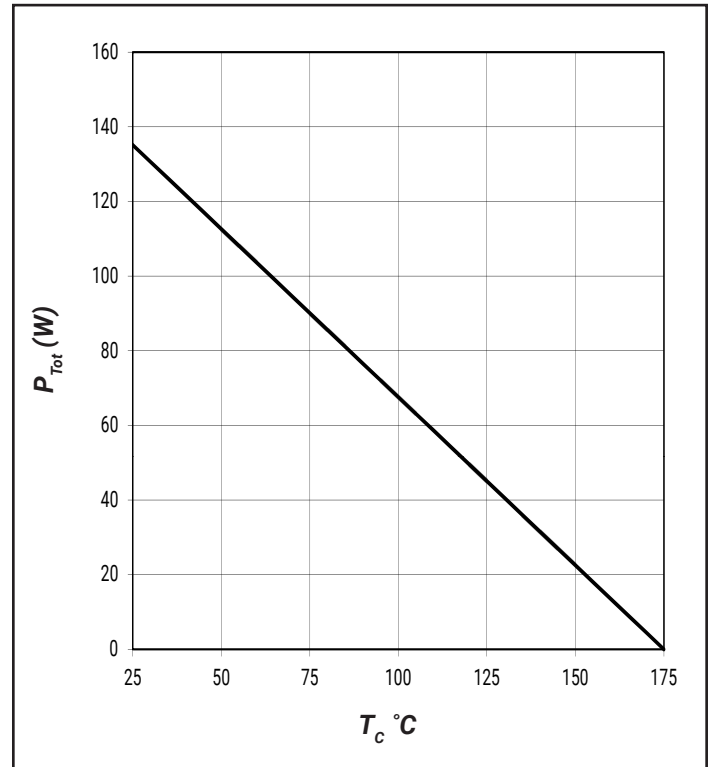


Figure 4. Power Derating

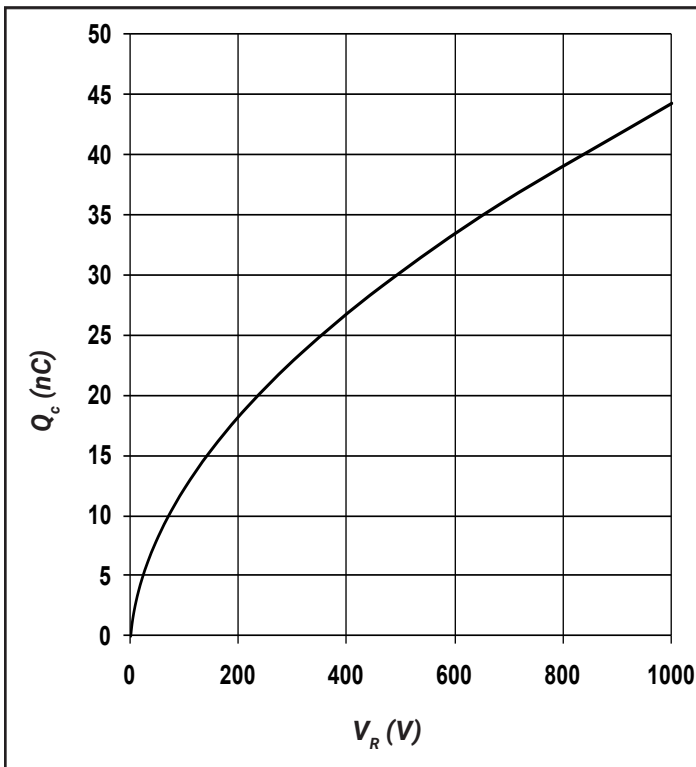


Figure 5. Recovery Charge vs. Reverse Voltage

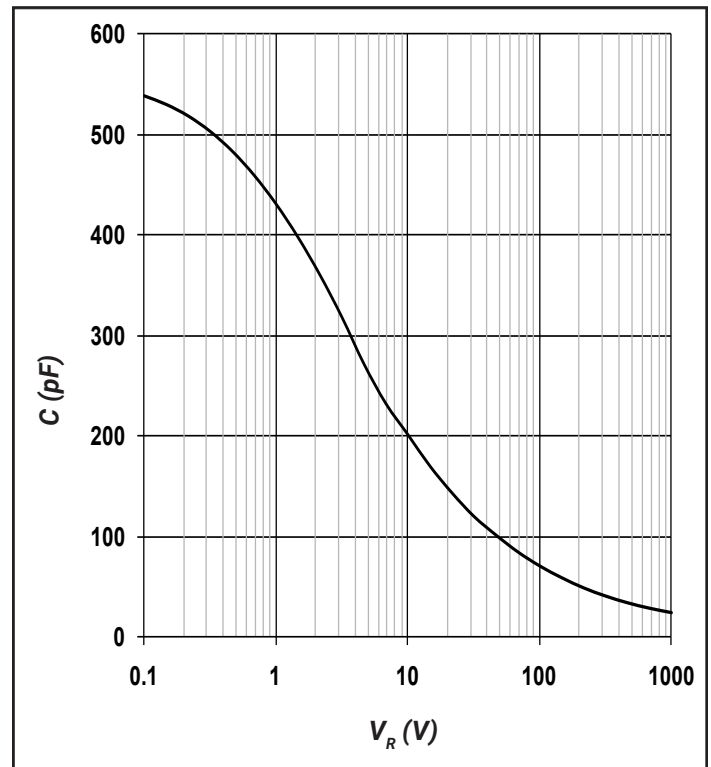


Figure 6. Capacitance vs. Reverse Voltage



Typical Performance

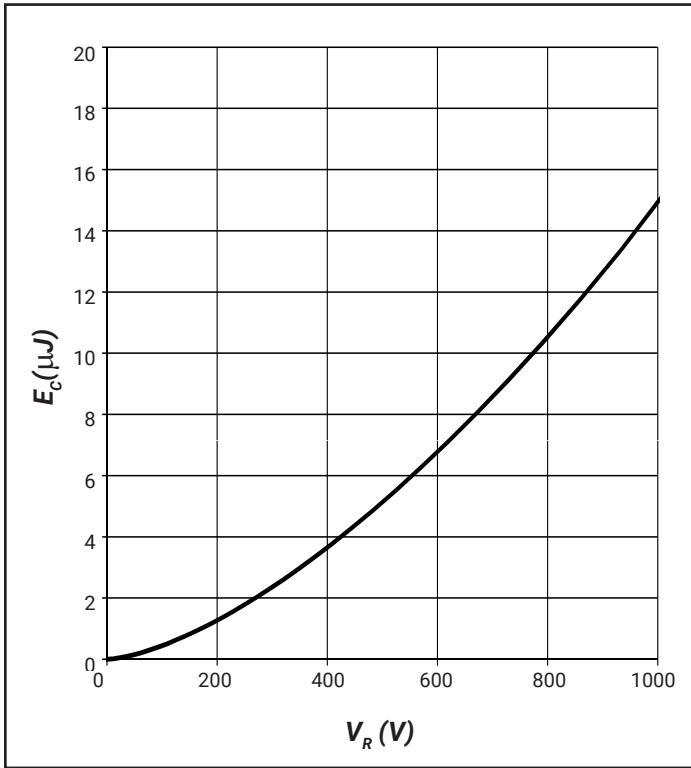


Figure 7. Typical Capacitance Stored Energy, per leg

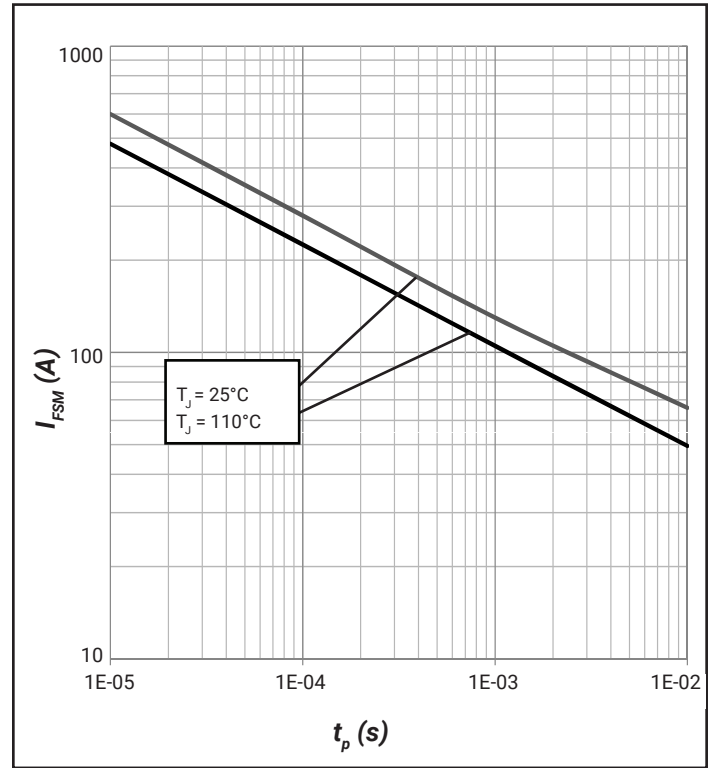


Figure 8. Non-repetitive Peak Forward Surge Current vs. Pulse Duration (sinusoidal waveform), per leg

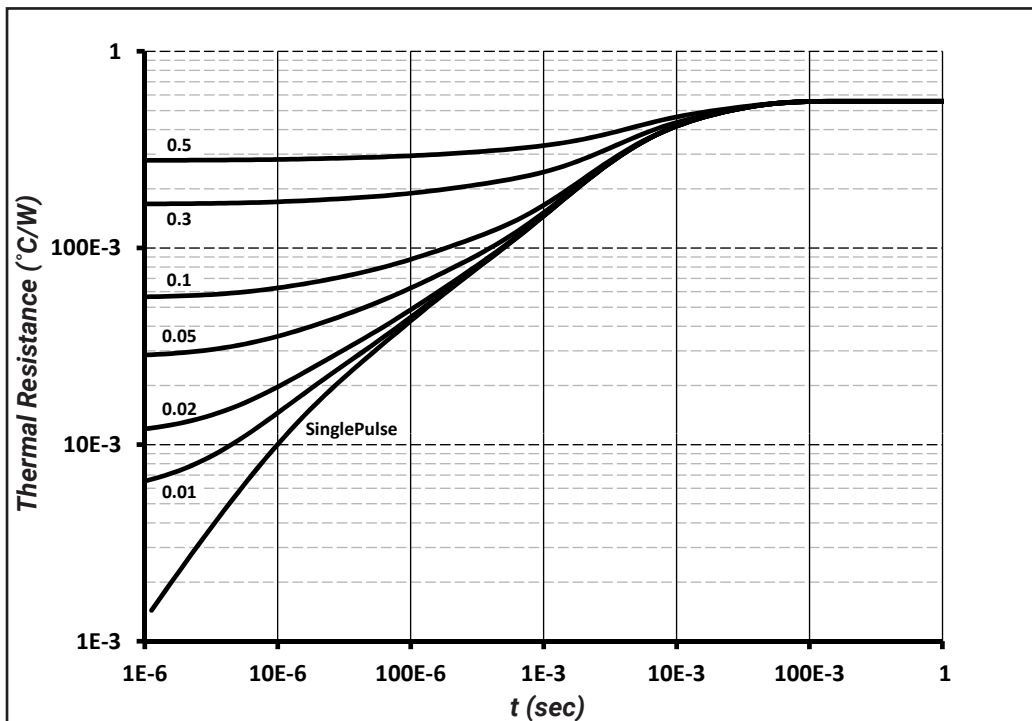
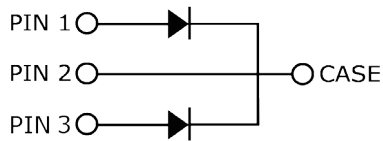
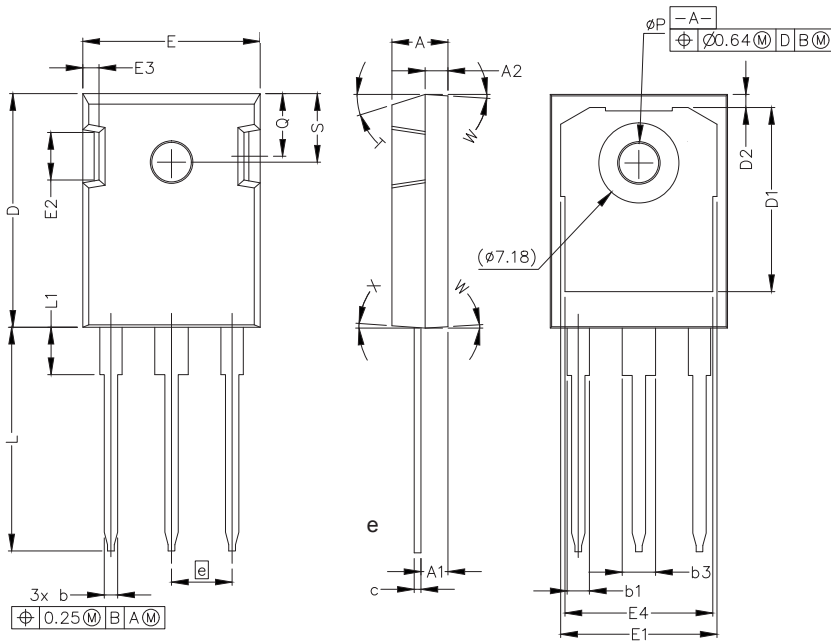


Figure 9. Device Transient Thermal Impedance

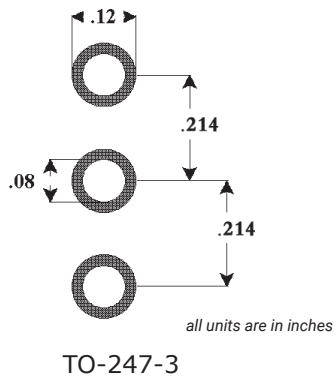
Package Dimensions

Package TO-247-3



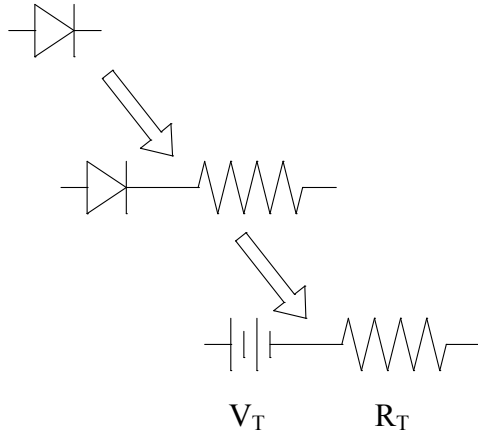
POS	Inches		Millimeters	
	Min	Max	Min	Max
A	.190	.205	4.83	5.21
A1	.090	.100	2.29	2.54
A2	.075	.085	1.91	2.16
b	.042	.052	1.07	1.33
b1	.075	.095	1.91	2.41
b3	.113	.133	2.87	3.38
c	.022	.027	0.55	0.68
D	.819	.831	20.80	21.10
D1	.640	.695	16.25	17.65
D2	.037	.049	0.95	1.25
E	.620	.635	15.75	16.13
E1	.516	.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
AC4D15120D	TO-247-3

Diode Model



$$V_{fT} = V_T + I_f \cdot R_T$$

$$V_T = 0.96 + (T_J \cdot -2.1 \cdot 10^{-3})$$

$$R_T = 0.06 + (T_J \cdot 8.0 \cdot 10^{-4})$$

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