

Silicon Tuning Diodes

Designed for electronic tuning and harmonic-generation applications, and provide solid-state reliability to replace mechanical tuning methods.

- Guaranteed High-Frequency Q
- Guaranteed Wide Tuning Range
- Standard 10% Capacitance Tolerance
- Complete Typical Design Curves

1N5148
1N5148A

**6.8–47 pF EPICAP
VOLTAGE-VARIABLE
CAPACITANCE DIODES**



MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

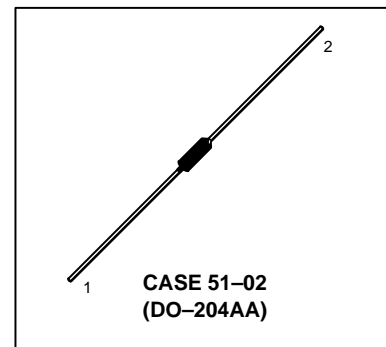
Rating	Symbol	Value	Unit
Reverse Voltage	V _R	60	Volts
Forward Current	I _F	250	mAdc
RF Power Input(1)	P _{in}	5.0	Watts
Device Dissipation @ T _A = 25°C Derate above 25°C	P _D	400 2.67	mW mW/°C
Device Dissipation @ T _C = 25°C Derate above 25°C	P _C	2.0 13.3	Watts mW/°C
Junction Temperature	T _J	+175	°C
Storage Temperature Range	T _{stg}	–65 to +200	°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Reverse Breakdown Voltage (I _R = 10 μAdc)	V _{(BR)R}	60	70	—	Vdc
Reverse Voltage Leakage Current (V _R = 55 Vdc, T _A = 25°C) (V _R = 55 Vdc, T _A = 150°C)	I _R	— —	— —	0.02 20	μAdc
Series Inductance (f = 250 MHz, L ≈ 1/16")	L _S	—	4.0	—	nH
Case Capacitance (f = 1.0 MHz, L ≈ 1/16")	C _C	—	0.17	—	pF
Diode Capacitance Temperature Coefficient (V _R = 4.0 Vdc, f = 1.0 MHz)	TC _C	—	200	—	ppm/°C

1. The RF power input rating assumes that an adequate heatsink is provided.

Device	C _T , Diode Capacitance V _R = 4.0 Vdc, f = 1.0 MHz pF			Q, Figure of Merit V _R = 4.0 Vdc, f = 50 MHz	α V _R = 4.0 Vdc, f = 1.0 MHz		TR, Tuning Ratio C ₄ /C ₆₀ f = 1.0 MHz	
	Min	Typ	Max		Min	Typ	Min	Typ
1N5148	42.3	47	51.7	200	0.43	0.45	3.2	3.4
1N5148A	44.7	47	49.3	200	0.43	0.45	3.2	3.4



PARAMETER TEST METHODS

1. **L_S, SERIES INDUCTANCE**

L_S is measured on a shorted package at 250 MHz using an impedance bridge (Boonton Radio Model 250A RX Meter). L = lead length.

2. **C_C, CASE CAPACITANCE**

C_C is measured on an open package at 1.0 MHz using a capacitance bridge (Boonton Electronics Model 75A or equivalent).

3. **C_T, DIODE CAPACITANCE**

(C_T = C_C + C_J). C_T is measured at 1.0 MHz using a capacitance bridge (Boonton Electronics Model 75A or equivalent).

4. **TR, TUNING RATIO**

TR is the ratio of C_T measured at 4.0 Vdc divided by C_T measured at 60 Vdc.

5. **Q, FIGURE OF MERIT**

Q is calculated by taking the G and C readings of an admittance bridge at the specified frequency and substituting in the following equations:

$$Q = \frac{2\pi f C}{G}$$

(Boonton Electronics Model 33AS8).

6. **α, DIODE CAPACITANCE REVERSE VOLTAGE SLOPE**

The diode capacitance, C_T (as measured at V_R = 4.0 Vdc, f = 1.0 MHz) is compared to C_T (as measured at V_R = 60 Vdc, f = 1.0 MHz) by the following equation which defines α.

$$\alpha = \frac{\log C_T(4) - \log C_T(60)}{\log 60 - \log 4}$$

Note that a C_T versus V_R law is assumed as shown in the following equation where C_C is included.

$$C_T = \frac{K}{V_R^\alpha}$$

7. **TC_C, DIODE CAPACITANCE TEMPERATURE COEFFICIENT**

TC_C is guaranteed by comparing C_T at V_R = 4.0 Vdc, f = 1.0 MHz, T_A = -65°C with C_T at V_R = 4.0 Vdc, f = 1.0 MHz, T_A = +85°C in the following equation which defines TC_C:

$$TC_C = \left| \frac{C_T(+85^\circ\text{C}) - C_T(-65^\circ\text{C})}{85 + 65} \right| \cdot \frac{10^6}{C_T(25^\circ\text{C})}$$

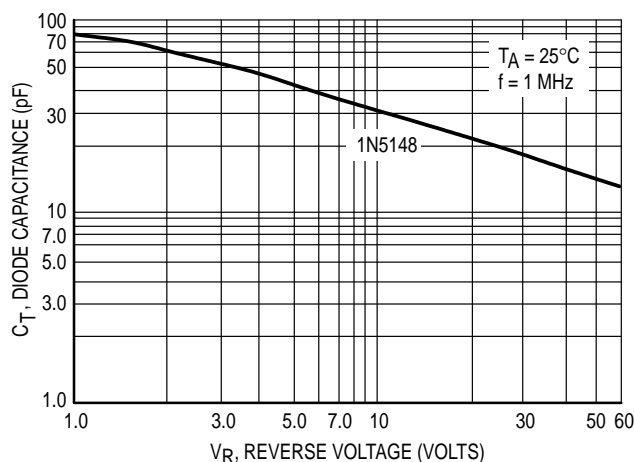


Figure 1. Diode Capacitance versus Reverse Voltage

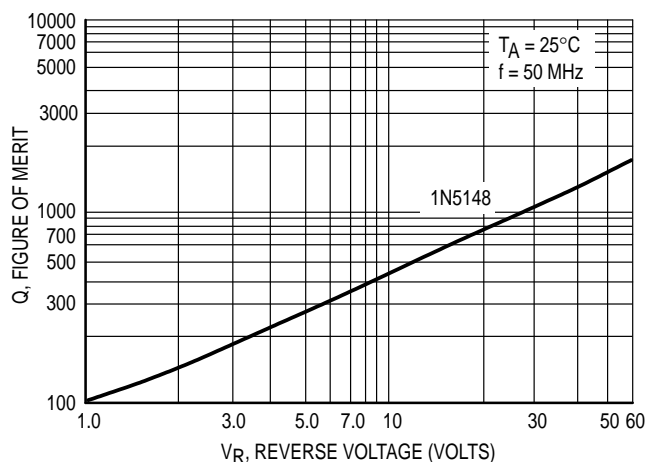


Figure 2. Figure of Merit versus Reverse Voltage

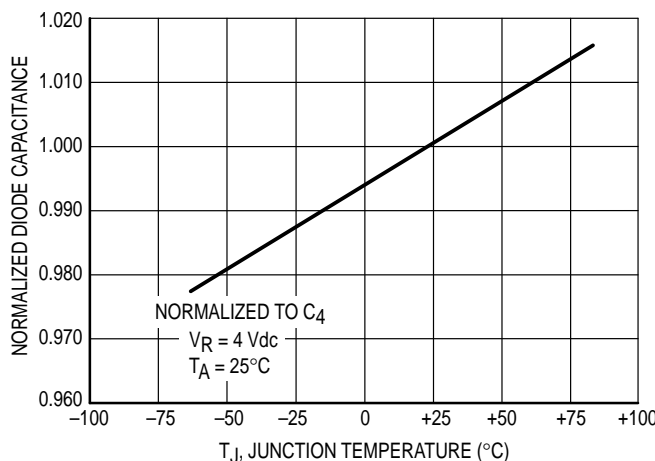


Figure 3. Normalized Diode Capacitance versus Junction Temperature

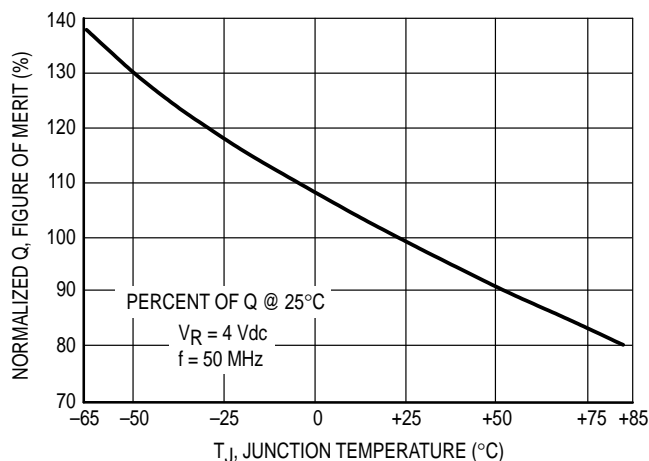


Figure 4. Normalized Figure of Merit versus Junction Temperature

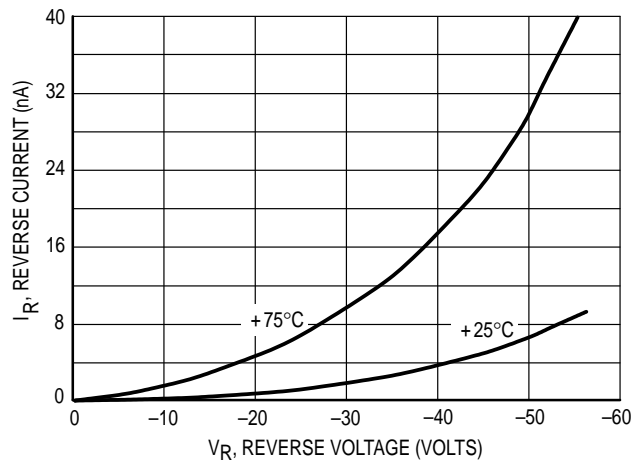


Figure 5. Reverse Current versus Reverse Bias Voltage

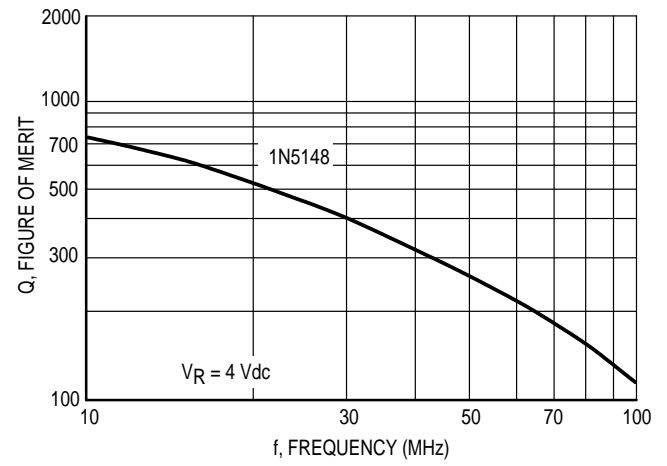
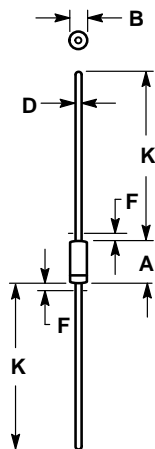


Figure 6. Figure of Merit versus Frequency

PACKAGE DIMENSIONS




NOTES:

1. PACKAGE CONTOUR OPTIONAL WITHIN DIA B AND LENGTH A. HEAT SLUGS, IF ANY, SHALL BE INCLUDED WITHIN THIS CYLINDER, BUT SHALL NOT BE SUBJECT TO THE MIN LIMIT OF DIA B.
2. LEAD DIA NOT CONTROLLED IN ZONES F, TO ALLOW FOR FLASH, LEAD FINISH BUILDUP, AND MINOR IRREGULARITIES OTHER THAN HEAT SLUGS.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.84	7.62	0.230	0.300
B	2.16	2.72	0.085	0.107
D	0.46	0.56	0.018	0.022
F	—	1.27	—	0.050
K	25.40	38.10	1.000	1.500

All JEDEC dimensions and notes apply.

**CASE 51-02
(DO-204AA)
ISSUE E**

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