Silicon Tuning Diodes

1N5446ARL
1N5448ARL
1N5456A

These are epitaxial passivated abrupt junction tuning diodes designed for electronic tuning, FM, AFC and harmonic–generation applications in AM through UHF ranges, providing solid–state reliability to replace mechanical tuning methods.

- Excellent Q Factor at High Frequencies
- Guaranteed Capacitance Change — 2.0 to 30 V
- Capacitance Tolerance — 10% and 5.0%
- Complete Typical Design Curves

6.8 – 100 pF
30 VOLTS
VOLTAGE–VARIABLE
CAPACITANCE DIODES

CASE 51–02
(DO–204AA)

MAXIMUM RATINGS[(1)]

Rating	Symbol	Value	Unit
Reverse Voltage	V_R	30	Volts
Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	400 2.67	mW mW/°C
Operating Junction Temperature Range	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)	$V_{(BR)R}$	30	—	—	Vdc
Reverse Voltage Leakage Current (V_R = 25 Vdc, T_A = 25°C) (V_R = 25 Vdc, T_A = 150°C)	I_R	— —	— —	0.02 20	μAdc
Series Inductance (f = 250 MHz, lead length ≈ 1/16″)	L_S	—	4.0	—	nH
Case Capacitance (f = 1.0 MHz, lead length ≈ 1/16″)	C_C	—	0.17	—	pF
Diode Capacitance Temperature Coefficient (Note 6) (V_R = 4.0 Vdc, f = 1.0 MHz)	TC_C	—	300	—	ppm/°C

Device	C_T, Diode Capacitance V_R = 4.0 Vdc, f = 1.0 MHz pF			TR, Tuning Ratio C_2/C_{30} f = 1.0 MHz		Q, Figure of Merit V_R = 4.0 Vdc, f = 50 MHz
	Min (Nom –10%)	Nom	Max (Nom +10%)	Min	Max	Min
1N5446ARL	16.2	18	19.8	2.6	3.2	350
1N5448ARL	19.8	22	24.2	2.6	3.2	350
1N5456A	90	100	110	2.7	3.3	175

1. Indicates JEDEC Registered Data.

(Replaces 1N5441A/D)

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 or equivalent).

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 2.0 Vdc divided by C_T measured at 30 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:

$$Q = \frac{2\pi fC}{G}$$

(Boonton Electronics Model 33AS8 or equivalent).

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:

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

Accuracy limited by C_T measurement to ±0.1 pF.

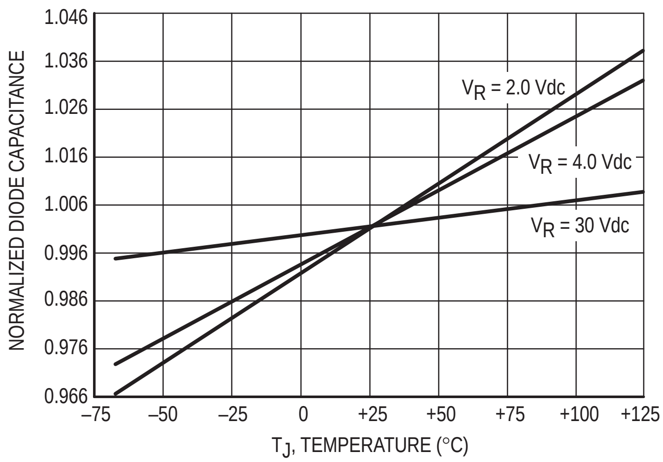

Figure 1. Normalized Diode Capacitance versus Junction Temperature

TYPICAL DEVICE PERFORMANCE

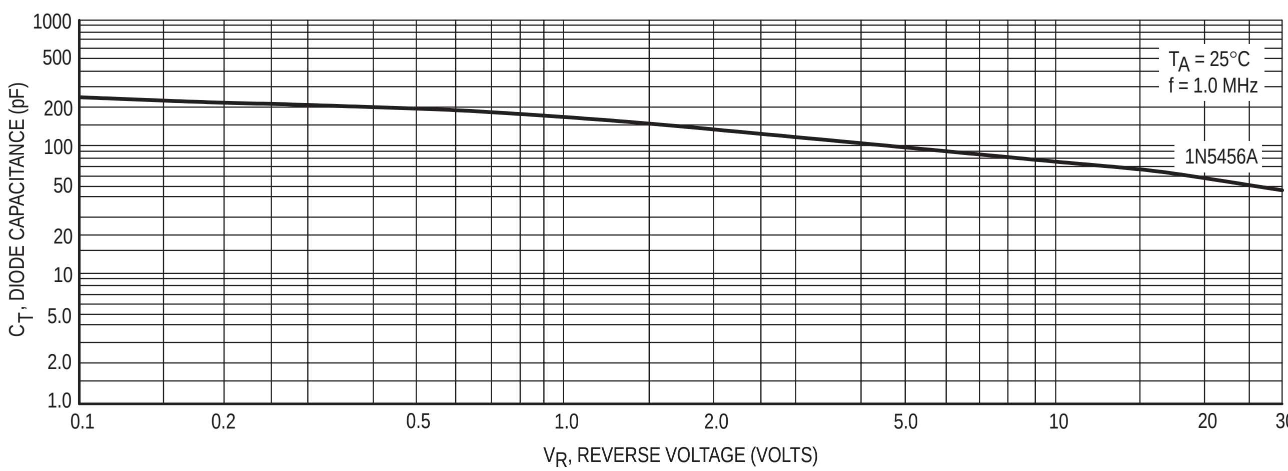

Figure 2. Diode Capacitance versus Reverse Voltage

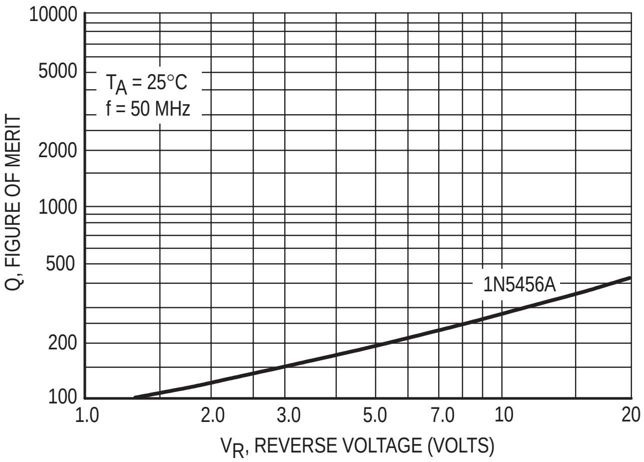

Figure 3. Figure of Merit versus Reverse Voltage

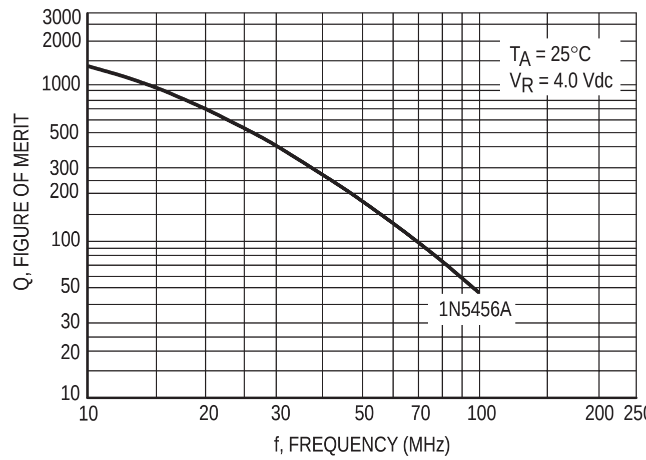

Figure 4. Figure of Merit versus Frequency

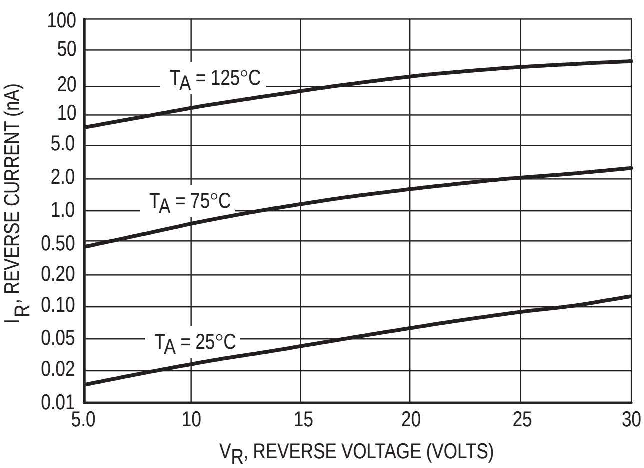

Figure 5. Reverse Current versus Reverse Bias Voltage

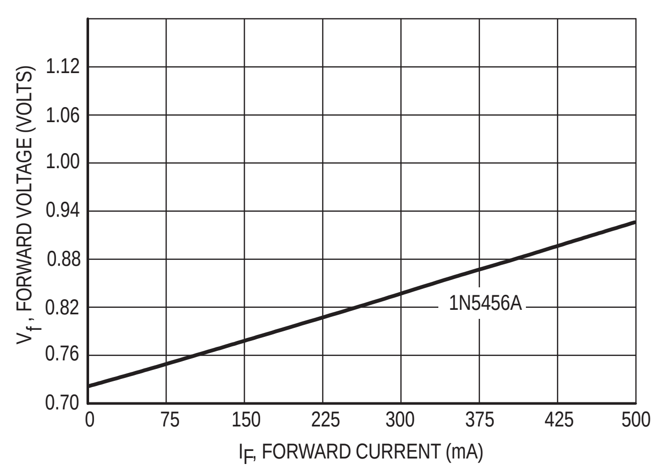

Figure 6. Forward Voltage versus Forward Current