



# ABRUPT TUNING VARACTORS

ASI, AT series of Abrupt PN-Junction Tuning Varactors utilize the lowest resistance & highest Q characteristics of optimized tuning circuit performance. Applications include both narrow and wideband frequency tuning through 12GHz. These devices are designed so the capacitance-voltage relationship closely approximates Square Law ( $n = 0.5$ ).

**ABSOLUTE MAXIMUM RATINGS:**

Storage Temperature:  
-65°C to +175°C

$$C_T = C_P + C_J = C_P + \frac{C_{J0}}{(1-V_{BIAS})^n}$$

$C_T$  = TOTAL CAPACITANCE

$C_P$  = PACKAGE CAPACITANCE

$C_{JU}$  = JUNCTION CAPACITANCE AT ZERO BIAS

$V_{BIAS}$  = APPLIED REVERSE VOLTAGE

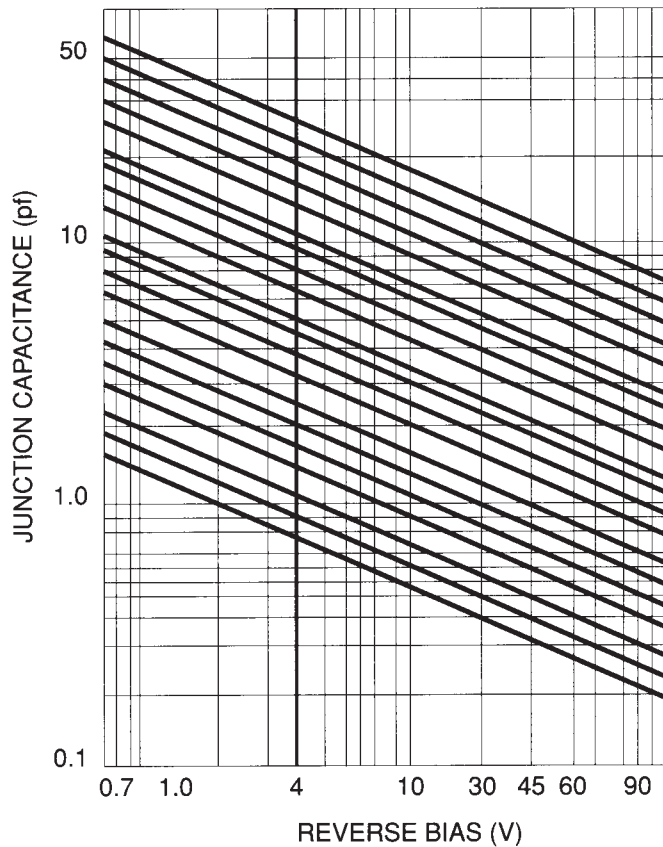
$\theta$  = CONTACT POTENTIAL OF THE DIODE (0.6 - 0.8 VOLTS)

$n$  = SLOPE OF DIODE C-V CURVE (0.5 FOR ABRUPT JUNCTION)

These diodes are suitable for Transistor, Gunn and Impatt Voltage Controlled Oscillators; AFC Loops and Amplifiers; Tunable Filters; and Linear Frequency and Phase Modulators

All of the abrupt tuning varactors meet or exceed the military environmental specifications of MIL-S-19500, MIL-STD-202 and methods from MIL-STD-750 that specify mechanical, electrical, thermal and environmental tests.

**TYPICAL JUNCTION CAPACITANCE VS REVERSE BIAS**



## ADVANCED SEMICONDUCTOR, INC.

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**TUNING VARACTORS**

BREAKDOWN VOLTAGE VB@10 $\mu$ AIR				C <sub>T</sub> (-4V <sup>1</sup> ) PF	C <sub>T0</sub> /C <sub>TVB</sub> <sup>5</sup> MIN.	Q (-4V <sup>2</sup> ) MIN.	SUGGESTED TUNING FREQ. (GHz)
30V	45V	60V	90V				
AT3000A	AT4500A	AT6000A	AT9000A	<b>0.4</b>	3.0:1	4000	10.0-12.0
					4.0:1	2600	8.0-10.0
					4.7:1	1700	6.0-8.0
					5.4:1	1100	4.0-6.0
AT3000	AT4500	AT6000	AT9000	<b>0.8</b>	3.2:1	3800	8.0-10.0
					4.2:1	2500	6.0-8.0
					4.8:1	1600	4.0-6.0
					5.6:1	1000	2.0-4.0
AT3001	AT4501	AT6001	AT9001	<b>1.0</b>	3.2:1	3800	7.0-9.0
					4.4:1	2500	5.0-7.0
					4.9:1	1600	4.0-6.0
					6.0:1	1000	2.0-4.0
AT3002	AT4502	AT6002	AT9002	<b>1.2</b>	3.5:1	3600	6.0-8.0
					4.5:1	2300	4.0-6.0
					5.0:1	1500	2.0-4.0
					6.2:1	950	2.0-4.0
AT3003	AT4503	AT6003	AT9003	<b>1.5</b>	3.6:1	3600	6.0-8.0
					4.7:1	2300	4.0-6.0
					5.2:1	1500	2.0-4.0
					6.8:1	950	2.0-4.0
AT3004	AT4504	AT6004	AT9004	<b>1.8</b>	3.6:1	3600	5.0-7.0
					4.8:1	2300	3.0-5.0
					5.4:1	1400	2.0-4.0
					7.2:1	900	2.0-4.0
AT3005	AT4505	AT6005	AT9005	<b>2.2</b>	3.7:1	3400	5.0-7.0
					5.0:1	2100	3.0-5.0
					5.6:1	1400	1.5-3.0
					7.8:1	900	1.5-3.0
AT3006	AT4506	AT6006	AT9006	<b>2.7</b>	3.8:1	3200	4.0-6.0
					5.1:1	2100	2.0-4.0
					5.8:1	1300	1.5-3.0
					8.2:1	850	1.5-3.0
AT3007	AT4507	AT6007	AT9007	<b>3.3</b>	3.9:1	3000	4.0-6.0
					5.3:1	2000	2.0-4.0
					6.0:1	1300	1.5-3.0
					8.4:1	850	1.5-3.0
AT3008	AT4508	AT6008	AT9008	<b>3.9</b>	4.0:1	2800	3.0-5.0
					5.3:1	2000	1.5-3.0
					6.2:1	1200	1.0-2.0
					8.6:1	800	1.0-2.0
AT3009	AT4509	AT6009	AT9009	<b>4.7</b>	4.1:1	2600	3.0-5.0
					5.4:1	1800	1.0-2.0
					6.4:1	1200	1.0-2.0
					8.6:1	800	1.0-2.0
AT3010	AT4510	AT6010	AT9010	<b>5.6</b>	4.1:1	2600	2.0-4.0
					5.6:1	1800	1.0-2.0
					6.6:1	1200	1.0-2.0
					8.8:1	750	1.0-2.0
AT3011	AT4511	AT6011	AT9011	<b>6.8</b>	4.2:1	2400	2.0-4.0
					5.6:1	1800	1.0-2.0
					6.8:1	1100	0.5-1.0
					8.8:1	750	0.5-1.0

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BREAKDOWN VOLTAGE VB@10μAIR				C <sub>T</sub> (-4V <sup>1</sup> ) PF	C <sub>T0</sub> /C <sub>TVB</sub> <sup>5</sup> MIN.	Q (-4V <sup>2</sup> ) MIN.	SUGGESTED TUNING FREQ. (GHz)
30V	45V	60V	90V				
AT3012	AT4512	AT6012	AT9012	8.2	4.2:1	2400	1.0-2.0
					5.8:1	1600	1.0-2.0
					6.8:1	1100	0.5-1.0
					9.0:1	700	0.5-1.0
AT3013	AT4513	AT6013	AT9013	10	4.4:1	2200	1.0-2.0
					5.8:1	1600	1.0-2.0
					7.0:1	1000	0.5-1.0
					9.2:1	700	0.5-1.0
AT3014	AT4514	AT6014	AT9014	12	4.4:1	2200	0.8-1.0
					6.0:1	1400	0.8-1.0
					7.0:1	1000	0.4-0.8
					9.2:1	650	0.4-0.8
AT3015	AT4515	AT6015	AT9015	15	4.6:1	2000	0.6-0.8
					6.0:1	1400	0.6-0.8
					7.0:1	1000	0.4-0.8
					9.4:1	650	0.4-0.8
AT3016	AT4516	AT6016	AT9016	18	4.6:1	2000	0.4-0.6
					6.2:1	1200	0.4-0.6
					7.2:1	900	0.3-0.5
					9.4:1	600	0.3-0.5
AT3017	AT4517	AT6017	AT9017	22	4.6:1	1800	0.4-0.6
					6.2:1	1000	0.3-0.5
					7.2:1	900	0.2-0.4
					9.4:1	600	0.2-0.4
AT3018	AT4518	AT6018	AT9018	27	4.7:1	1700	0.3-0.5
					6.4:1	900	0.2-0.4
					7.2:1	800	0.1-0.3
					9.5:1	500	0.1-0.3
AT3019	AT4519	AT6019	AT9019	33	4.7:1	1400	0.2-0.4
					6.4:1	800	0.2-0.4
					7.4:1	700	0.1-0.25
					9.5:1	500	0.1-0.25
AT3020	AT4520	AT6020	AT9020	39	4.7:1	1000	0.15-0.30
					6.4:1	800	0.15-0.30
					7.4:1	700	0.05-0.15
					9.5:1	500	0.05-0.15
AT3021	AT4521	AT6021	AT9021	47	4.7:1	800	0.10-0.20
					6.4:1	700	0.10-0.20
					7.4:1	600	0.05-0.10
					9.5:1	450	0.05-0.10

**NOTES:**

1. Total capacitance is measured at 1 MHz and -4 volts on a Boonton capacitance meter. Standard tolerance  $\pm 10\%$ .

2. Quality factor is calculated at -4 volts and 50 MHz, using values of  $R_S$  obtained at 1.0GHz and  $C_{J-4}$  measured at 1MHz and the following equation:  
 $Q_{-4V} = 1/2\pi f R_S C_{J-4}$

3. Package style 51 is the standard package for this series of tuning varactors. These diodes are also available in the following package styles: 01, 10, 11, 15 (DO-7), 20, 21, 31, 83, 84. When ordering, specify package designation as a suffix to type number.

4. Capacitance temperature coefficient: 300ppm/°C max. at -4 Volts. Calculated from the following equation:  $TC = [C_T(+85^\circ C) - C_T(-65^\circ C)] / 10^6 / (85+65)C_T(25^\circ C)$  average between -65°C and +85°C and is expressed in parts per million per degree centigrade (ppm/°C).

5. Tuning ratio includes all capacitances, junction, package and all internal fringing capacitance ( $C_T = C_J + C_P$ ), from 0 volts to the rated breakdown voltage.

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