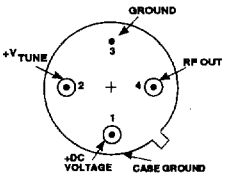
FEATURES

- 300 MHz to 10.5 GHz Coverage
- Fast Tuning
- Fast Settling Time
- +7 to +13 dBm Output Power
- ±1.5 dB Output Flatness
- Hermetic Thin-Film Construction



TO-8V, p. 16–49

DESCRIPTION

Avantek® VTO-8000 Series oscillators use a silicon transistor chip as a negative resistance oscillator. The oscillation frequency is determined by a silicon abrupt varactor diode acting as a voltage-variable capacitor in a thin-film microstripline resonator. This provides extremely fast tuning speed, limited primarily by the internal impedance of the user-supplied voltage driver. With a low-impedance driver, the Avantek VTO-8580 can be swept through 800 MHz in less than 30 ns (see curve) and the other VTO-8000 Series oscillators have comparable tuning speeds. Fast settling is another feature of Avantek's VTO-8000 Series oscillators. Typical settling times for the VTO-8090 are <200 kHz within one microsecond while the VTO-8490 and VTO-8950 settle to <2 MHz within two microseconds referenced to ten milliseconds. The VTO-8850, which provides typical 7.5 to 10.5 GHz tuning range, combines a bipolar transistor oscillator with a GaAs FET buffer stage. This GaAs FET buffer isolates the oscillator from variations in load impedance for low frequency pulling, allows the oscillator to run lightly-loaded for low phase noise content and provides +10 dBm of minimum output power over the full tuning range. The VTO-8000 Series varactor-tuned oscillators are packaged in TO-8 transistor cans for simple installation in a conventional 50-ohm microstripline PC board. They are ideal for the most compact, lightweight commercial and military equipment designs. Test fixturing is also available for lab bench test applications. See page 15–10 for test fixture outlines.

APPLICATIONS

Frequency agile systems, such as digitally controlled receivers and active jamming transmitters often use externally linearized varactor-tuned oscillators. Avantek oscillators are relatively monotonic making external linearization easy using analog (opamp) or digital (EPROM) linearizing techniques. The Avantek VTO Series has been designed with a tuning input bypass capacitance which is sufficient to provide the necessary RF filtering action yet as low as possible to maximize dV/dT characteristics for excellent tuning speeds. Used in a phase locked loop circuit, a VTO provides a receiver LO with stability equivalent to the reference oscillator (usually crystal controlled), yet variable in discrete steps or continuously depending on the PLL configuration.

Another important aspect of VTOs used in LO application is their power vs. frequency flatness (±1.5 dB). This assures that once a receiver mixer is biased for best dynamic range the local oscillator drive will remain constant throughout the tuning range without complex leveling circuitry.

ELECTRICAL AND PERFORMANCE SPECIFICATIONS

Guaranteed Specifications @ 25°C Case Temperature (0° to +65°C Operating Temperature)

Model No.	VTO-8030	VTO-8040	VTO-8060	VTO-8080	VTO-8090
Frequency Range, Min.	300–450 MHz	400–600 MHz	600-1000 MHz	800–1400 MHz	900–1600 MHz
Power Output into 50-ohm Load, Min.	10 mW/+10 dBm	20 mW/+13 dBm	20 mW/+13 dBm	20 mW/+13 dBm	20 mW/+13 dBm
Power Output Variation @ 25°C, Max.	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB
Operating Case Temperature Range	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C
Frequency Drift Over Operating Temperature, Typ.	8 MHz	8 MHz	8 MHz	10 MHz	10 MHz
Pulling Figure (12 dB Return Loss), Typ.	20 MHz	20 MHz	25 MHz	25 MHz	25 MHz
Pushing Figure, +15 VDC Supply, Typ.	0.6 MHz/V	0.6 MHz/V	5 MHz/V	6 MHz/V	6 MHz/V
Harmonics, Below Carrier, Typ.	–15 dB	–15 dB	–15 dB	–15 dB	–15 dB
Spurious Output Below Carrier, Min.	–60 dB	–60 dB	–60 dB	–60 dB	–60 dB
Tuning Voltage, Typ.					
Low Frequency	5±4 VDC	3±1 VDC	3±1 VDC	2±1.5 VDC	2±1 VDC
High Frequency	50±10 VDC	40±8 VDC	40±8 VDC	35±10 VDC	48+8/–10 VDC
Maximum Tuning Voltage	+60 VDC	+60 VDC	+60 VDC	+60 VDC	+60 VDC
Tuning Port Capacitance, Nom.	180 pF	180 pF	180 pF	180 pF	180 pF
Phase Noise, Single Sideband, 1 Hz Bandwidth, Typ.					
50 kHz From Carrier	–114 dBc	–114 dBc	–110 dBc	–100 dBc	–100 dBc
100 kHz From Carrier	–120 dBc	–120 dBc	–117 dBc	–107 dBc	–107 dBc
Input Power ±1% Regulation					
Voltage, Nom.	+15 VDC	+15 VDC	+15 VDC	+15 VDC	+15 VDC
Current, Max.	50 mA	50 mA	50 mA	50 mA	50 mA
Case Style	TO–8V	TO–8V	TO–8V	TO–8V	TO–8V

Model No.	VTO-8100	VTO-8150	VTO-8200	VTO-8240	VTO-8300
Frequency Range, Min.	1000–1400 MHz	1500–2500 MHz	2000–3000 MHz	2400–3700 MHz	3000–3500 MHz
Power Output into 50-ohm Load, Min.	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm
Power Output Variation @ 25°C., Max.	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB
Operating Case Temperature Range	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C
Frequency Drift Over Operating Temperature, Typ.	10 MHz	18 MHz	30 MHz	30 MHz	30 MHz
Pulling Figure (12 dB Return Loss), Typ.	25 MHz	35 MHz	35 MHz	35 MHz	35 MHz
Pushing Figure, +15 VDC Supply, Typ.	6 MHz/V	6 MHz/V	6 MHz/V	6 MHz/V	6 MHz/V
Harmonics, Below Carrier, Typ.	–15 dB	–15 dB	–18 dB	–18 dB	–18 dB
Spurious Output Below Carrier, Min.	–60 dB	–60 dB	–60 dB	–60 dB	–60 dB
Tuning Voltage, Typ.					
Low Frequency	3±1 VDC	2.5±1 VDC	2+2/–1 VDC	2+2/–1 VDC	3.5 VDC Min.
High Frequency	20±4 VDC	47±8 VDC	20±4 VDC	30±8 VDC	11 VDC Max.
Maximum Tuning Voltage	+60 VDC	+60 VDC	+45 VDC	+45 VDC	+30 VDC
Tuning Port Capacitance, Nom.	180 pF	90 pF	45 pF	45 pF	45 pF
Phase Noise, Single Sideband, 1 Hz Bandwidth, Typ.					
50 kHz From Carrier	–100 dBc	–95 dBc	–95 dBc	–95 dBc	–95 dBc
100 kHz From Carrier	–107 dBc	–102 dBc	–102 dBc	–102 dBc	–102 dBc
Input Power +1% Regulation					
Voltage, Nom.	+15 VDC	+15 VDC	+15 VDC	+15 VDC	+15 VDC
Current, Max.	50 mA	50 mA	50 mA	50 mA	50 mA
Case Style	T0-8V	TO-8V	TO–8V	TO–8V	TO–8V

ELECTRICAL AND PERFORMANCE SPECIFICATIONS

Guaranteed Specifications @ 25°C Case Temperature (0° to +65°C Operating Temperature)

Model No.	VTO–8350	VTO-8360	VTO-8400	VTO-8420	VTO-8430
Frequency Range, Min.	3500–4500 MHz	3600–4300 MHz	4000–4500 MHz	4200–5000 MHz	4300–5800 MHz
Power Output into 50-ohm Load, Min.	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm
Power Output Variation @ 25°C., Max.	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB
Operating Case Temperature Range	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C
Frequency Drift Over Operating Temperature, Typ.	36 MHz	35 MHz	45 MHz	45 MHz	60 MHz
Pulling Figure (12 dB Return Loss), Typ.	40 MHz	40 MHz	45 MHz	45 MHz	50 MHz
Pushing Figure, +15 VDC Supply, Typ.	6 MHz/V	6 MHz/V	6 MHz/V	6 MHz/V	6 MHz/V
Harmonics, Below Carrier, Typ.	–20 dB	–25 dB	–25 dB	–25 dB	–25 dB
Spurious Output Below Carrier, Min.	–60 dB	–60 dB	–60 dB	–60 dB	–60 dB
Tuning Voltage, Typ.					
Low Frequency	5.0 VDC Min.	8±2 VDC	2 VDC Min.	7.5±2.5 VDC	1.0 VDC Min.
High Frequency	35 VDC Max.	24±4 VDC	14 VDC Max.	25+2.5/–4 VDC	20.0 VDC Max.
Maximum Tuning Voltage	+35 VDC	+30 VDC	+30 VDC	+30 VDC	+30 VDC
Tuning Port Capacitance, Nom.	45 pF	45 pF	45 pF	45 pF	45 pF
Phase Noise, Single Sideband, 1 Hz Bandwidth, Typ.					
50 kHz From Carrier	–100 dBc	–100 dBc	–90 dBc	–90 dBc	–90 dBc
100 kHz From Carrier	–108 dBc	–108 dBc	–97 dBc	–97 dBc	–97 dBc
Input Power +1% Regulation					
Voltage, Nom.	+15 VDC	+15 VDC	+15 VDC	+15 VDC	+15 VDC
Current, Max.	50 mA	50 mA	50 mA	50 mA	50 mA
Case Style	TO–8V	TO–8V	TO–8V	TO–8V	TO–8V

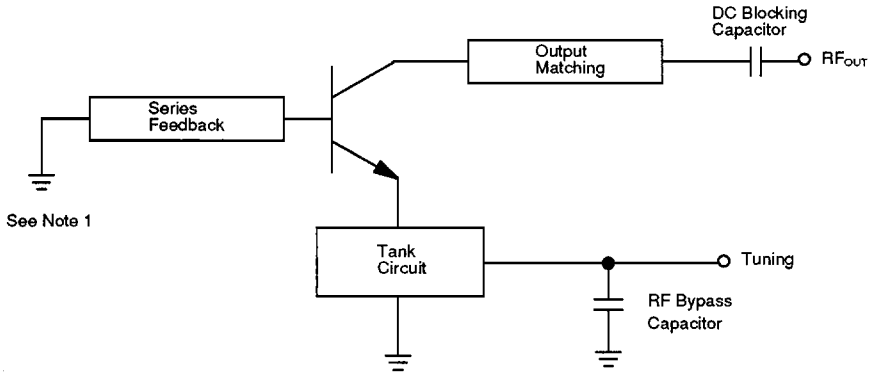
Model No.	VTO-8490	VTO–8520	VTO–8540	VTO-8580	VTO-8650
Frequency Range, Min.	4900–5900 MHz	5200–6100 MHz	5400–5900 MHz	5800–6600 MHz	6500–8600 MHz
Power Output into 50-ohm Load, Min.	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	5 mW/+7 dBm	10 mW/+10 dBm
Power Output Variation @ 25°C., Max.	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB
Operating Case Temperature Range	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C
Frequency Drift Over Operating Temperature, Typ.	60 MHz	70 MHz	60 MHz	70 MHz	100 MHz
Pulling Figure (12 dB Return Loss), Typ.	50 MHz	70 MHz	50 MHz	70 MHz	15 MHz
Pushing Figure, +15 VDC Supply, Typ.	6 MHz/V	8 MHz/V	8 MHz/V	8 MHz/V	10 MHz/V
Harmonics, Below Carrier, Typ.	–25 dB	–25 dB	–15 dB	–25 dB	–20 dB
Spurious Output Below Carrier, Min.	–60 dB	–60 dB	–60 dB	–60 dB	–60 dB
Tuning Voltage, Typ.					
Low Frequency	5.5±2 VDC	5.5±2 VDC	8 VDC Min.	5±2.5 VDC	2±1 VDC
High Frequency	24 +3/–4 VDC	24±3 VDC	28 VDC Max.	24+3/–5 VDC	20±5 VDC
Maximum Tuning Voltage	+30 VDC	+30 VDC	+30 VDC	+30 VDC	+30 VDC
Tuning Port Capacitance, Nom.	45 pF	45 pF	45 pF	45 pF	26 pF
Phase Noise, Single Sideband, 1 Hz Bandwidth, Typ.					
50 kHz From Carrier	–90 dBc	–85 dBc	–85 dBc	–85 dBc	–80 dBc
100 kHz From Carrier	–97 dBc	–92 dBc	–92 dBc	–92 dBc	–88 dbc
Input Power +1% Regulation					
Voltage, Nom.	+15 VDC	+15 VDC	+15 VDC	+15 VDC	+15 VDC
Current, Max.	50 mA	50 mA	50 mA	50 mA	100 mA
Case Style	TO–8V	TO–8V	TO–8V	TO–8V	TO–8V

ELECTRICAL AND PERFORMANCE SPECIFICATIONS

Guaranteed Specifications @ 25°C Case Temperature (0° to +65°C Operating Temperature)

Model No.	VTO–8790	VTO-8810	VTO-8850	VTO–8950	VTO–81000
Frequency Range, Min.	7900–10100 MHz	8100–9100 MHz	8500–9600 MHz	9500–10500 MHz	10000–10250 MHz
Power Output into 50-ohm load, Min.	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm	10 mW/+10 dBm
Power Output Variation @ 25°C., Max.	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB	±1.5 dB
Operating Case Temperature Range	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C	0° to +65°C
Frequency Drift Over Operating Temperature, Typ.	130 MHz	110 MHz	110 MHz	160 MHz	160 MHz
Pulling Figure (12 dB Return Loss), Typ.	8 MHz	8 MHz	6 MHz	20 MHz	40 MHz
Pushing Figure, +15 VDC Supply, Typ.	30 MHz/V	12 MHz/V	12 MHz/V	10 MHz/V	30 MHz/V
Harmonics, Below Carrier, Typ.	–10 dB	–15 dB	–25 dB	–20 dB	–15 dB
Spurious Output Below Carrier, Min.	–60 dB	–60 dB	–60 dB	–60 dB	–60 dB
Tuning Voltage, Typ.					
Low Frequency	0 VDC	2 VDC Min.	5±2 VDC	4±1 VDC	0 VDC Min.
High Frequency	3±2 VDC	16 VDC Max.	13±5 VDC	10 VDC Max.	15 VDC Max.
Maximum Tuning Voltage	26±4 VDC	+30 VDC	+30 VDC	+15 VDC	+15 VDC
Tuning Port Capacitance, Nom.	26 pF	26 pF	26 pF	26 pF	26 pF
Phase Noise, Single Sideband, 1 Hz Bandwidth, Typ.					
50 kHz From Carrier	–80 dBc	–80 dBc	–82 dBc	–78 dBc	–78 dBc
100 kHz From Carrier	–88 dBc	–88 dBc	–90 dBc	–85 dBc	–85 dBc
Input Power +1% Regulation					
Voltage, Nom.	+15 VDC	+15 VDC	+15 VDC	+15 VDC	+15 VDC
Current, Max.	100 mA	100 mA	100 mA	100 mA	100 mA
Case Style	TO–8V	TO–8V	TO–8V	TO–8V	TO–8V

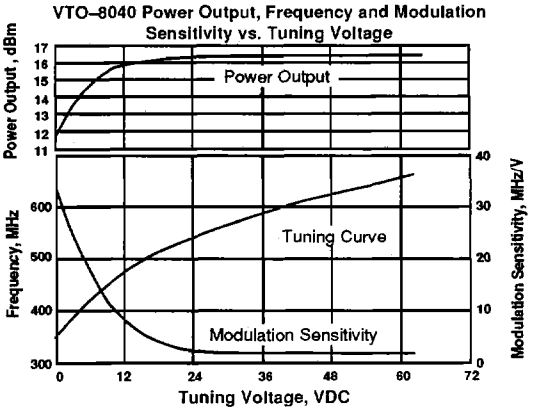
SCHEMATIC



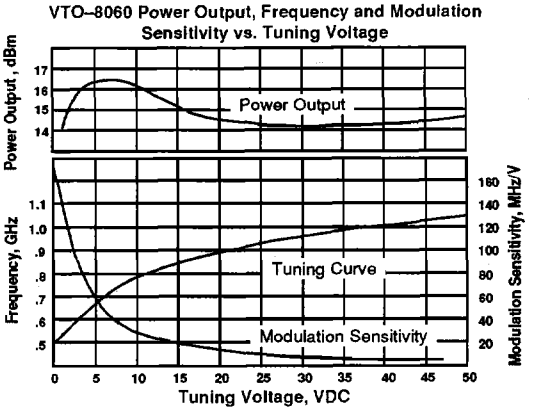
NOTE 1: DC bias lines (not shown) have internal decoupling capacitors.

TYPICAL PERFORMANCE @ 25°C Case Temperature

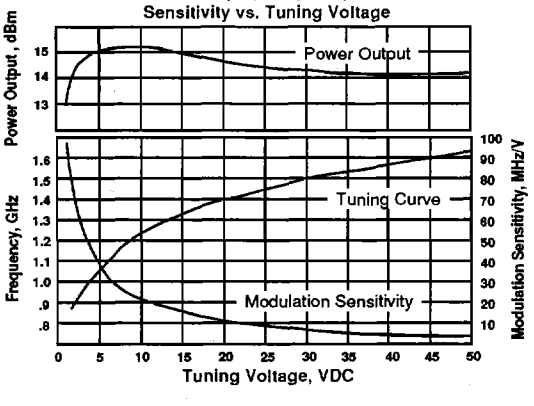
VTO–8040 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



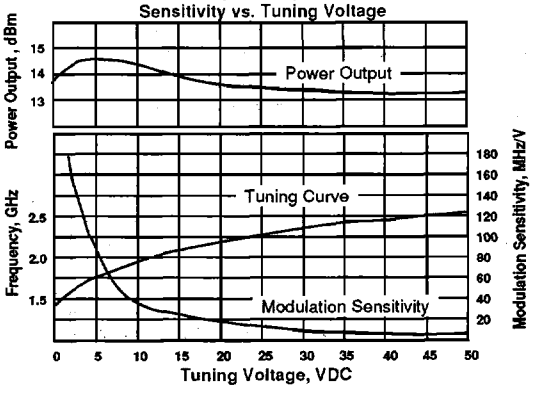
VTO–8060 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



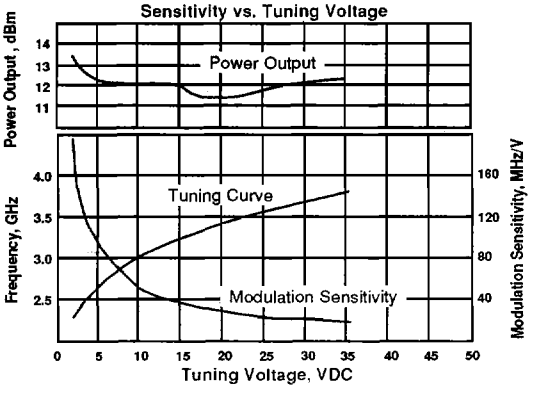
VTO–8090 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



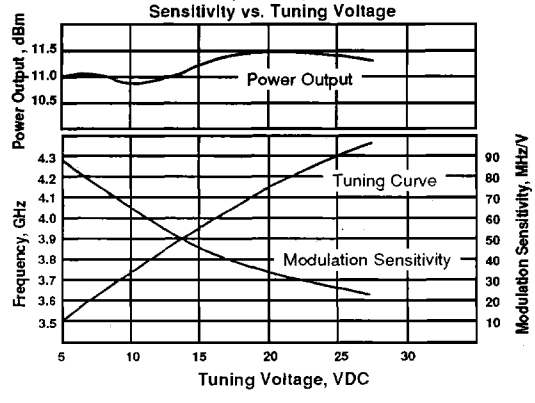
VTO–8150 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



VTO–8240 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage

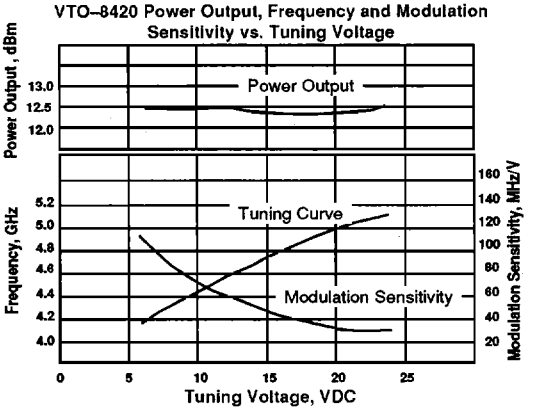


VTO–8360 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage

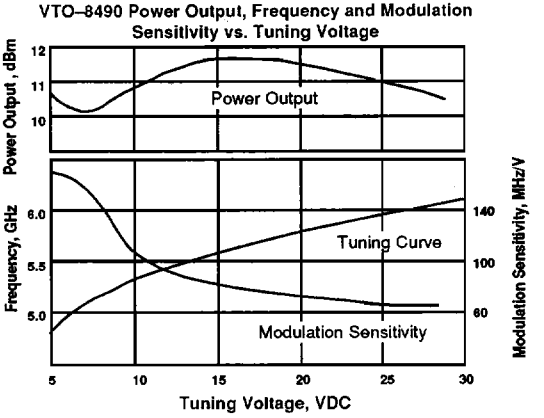


TYPICAL PERFORMANCE (continued)

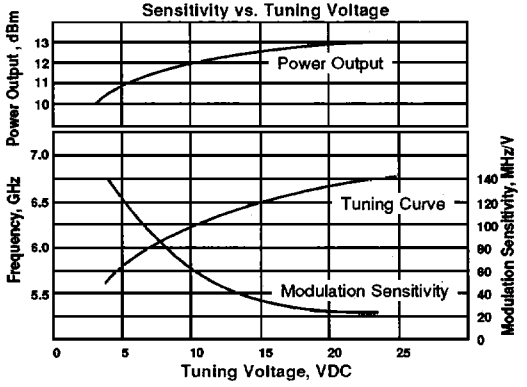
VTO–8420 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



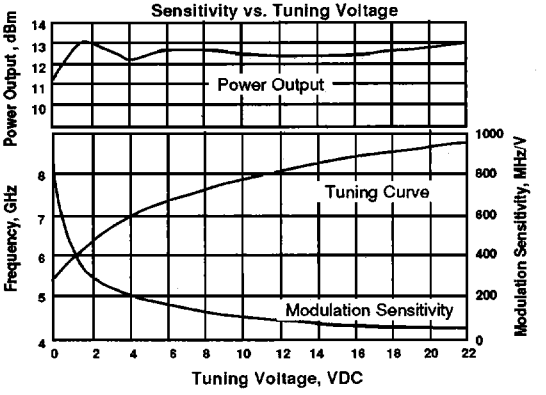
VTO–8490 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



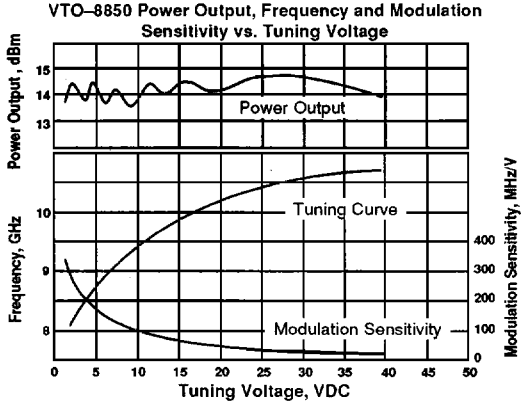
VTO–8580 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



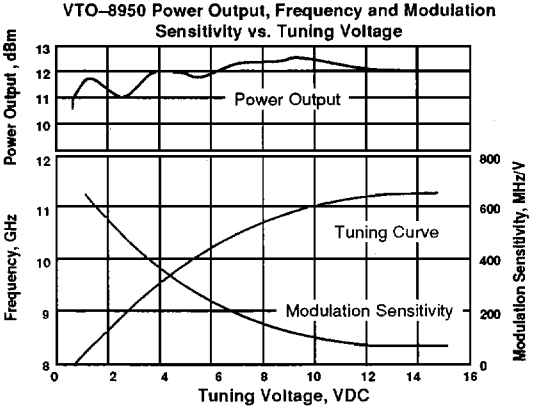
VTO–8650 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage



VTO–8850 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage

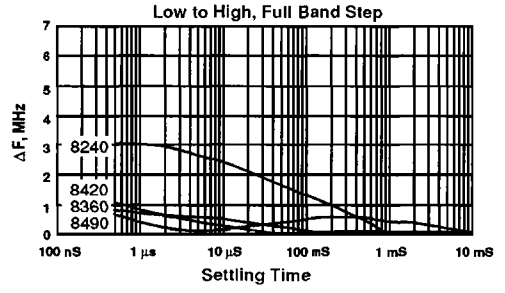


VTO–8950 Power Output, Frequency and Modulation Sensitivity vs. Tuning Voltage

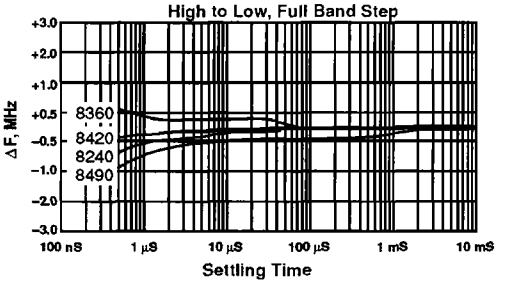


TYPICAL PERFORMANCE (continued)

Frequency Changes vs. Settling Time
Low to High, Full Band Step



Frequency Changes vs. Settling Time
High to Low, Full Band Step



Noise Comparison
Single Sideband Phase Noise