HEWLETT PACKARD

## Avantek Products

# YIG-Tuned Oscillators For Extended Temperature Applications

## Technical Data

**AV Series**

### Features

- **1 to 40 GHz Frequency Coverage**
- **Designed to MIL-E-5400 and -16400**
- **Rugged Hermetic Thin-Film Construction**
- **±0.05% to ±0.25% Tuning Linearity**
- **High Rate FM and Phase Lock Capability**
- **Frequency Stable Under Severe Vibration**
- **–54° to +85°C Temperature Range**

### Applications

- **Missiles**
- **Jammers**
- **Military Test Equipment**
- **ESM/ECM**

### Description

The HP high performance fundamental oscillators are extremely compact and lightweight, yet are designed and manufactured to offer excellent performance and high MTBFs over the –54 to +85°C temperature range. They meet the environmental conditions of MIL-E-5400 and MIL-E-16400.

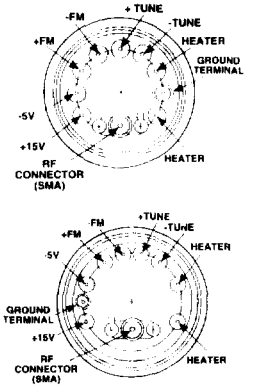
This family of truly ruggedized YTOs offers complete 1 to 40 GHz frequency coverage. They are ideal for systems requiring signal sources with moderate power levels, excellent tuning linearity, low spurious outputs and a flat power out vs. frequency characteristic.

### Greater Than 70,000 hours MTBF Under Missile Launch Conditions

As an indication of the inherent reliability of the HP family of these YTOs, the MTBF of the AV-7246 (2 to 6 GHz) is calculated at 73,900 hours at 71°C under the most severe condition of MIL-HDBK-217 ($M_L$—missile launch). Even at temperatures which exceed the normal guaranteed operating range, the MTBF still remains high. For example under the same $M_L$ conditions, the MTBF of the AV-7246 is 46,600 hours at 100°C.

### Pin Configuration

**See Individual Specification for Case Style**




(See Section 5 for detailed case drawings.)

### Resistant To Shock And Vibration

Under the conditions of MIL-STD-810 with a shock of 50G for 11 ms or 300G for 3 ms, there is no degradation, before and after, of the performance of the AV-7246. The incidental frequency stability of the AV-7246 is equal to or better than 200 kHz with a vibration of 10-2500 Hz at 45G. (Note that the mounting and cabling of the oscillator during the vibration test is critical—consult the HP factory for information on the procedures for duplicating this test.)

## YIG-Tuned Oscillators, Extended Temperature Range Octave Band

Guaranteed Specifications at -54° to +85°C Case Temperature into a 50-ohm Load (Unless Otherwise Noted)

| Model No. | AV-7114 | AV-7214 | AV-7246 | AV-7278 |
|---|---|---|---|---|
| Frequency Range, Min. | 1–4 GHz | 2–4 GHz | 2–6 GHz | 2–8 GHz |
| Power Output into 50-ohm Load, Min./Max. | +13 dBm/+21 dBm | +17 dBm/+23 dBm | +16 dBm/+23 dBm | +14.8 dBm/+23 dBm |
| Frequency Drift Over Operating Temperature, Max. | 20 MHz | 20 MHz | 30 MHz | 40 MHz |
| Pulling Figure (12 dB Return Loss), Typ. | 0.5 MHz | 0.5 MHz | 0.5 MHz | 0.5 MHz |
| Pushing Figure, +15 VDC Supply, Typ. | 0.5 MHz/V | 0.1 MHz/V | 0.1 MHz/V | 0.1 MHz/V |
| -5 VDC Supply, Typ. | 1.5 MHz/V | 1.5 MHz/V | 1.5 MHz/V | 1.5MHz/V |
| etic Susceptibility @ 60 Hz, Typ. | 50 kHz/Gauss | 70 kHz/Gauss | 50 kHz/Gauss | 50 kHz/Gauss |
| rmonic, Min. | -12 dBc | -12 dBc | -8 dBc | -8 dBc |
| rmonic, Min. | -20 dBc | -20 dBc | -12 dBc | -12 dBc |
| ıs Output, Min. | -60 dBc | -60 dBc | -60 dBc | -60 dBc |
| ıning Port Characteristics | | | | |
| nsitivity | +15±0.8 MHz/mA | 15±0.8 MHz/mA | 15±0.8 MHz/mA | 15±0.8 MHz/mA |
| B Bandwidth, Typ. | 5 kHz | 5 kHz | 5 kHz | 5 kHz |
| earity, Typ. | ±0.15% | ±0.05% | ±0.1% | ±0.1% |
| steresis, Typ. | 3 MHz | 3 MHz | 6 MHz | 9 MHz |
| nput Impedance @ 1 kHz and 25°C, Typ. | 10 ohms in series with 42 mH | 7 ohms in series with 51 mH | 7 ohms in series with 51 mH | 7 ohms in series with 60 mH |
| FM Port Characteristics | | | | |
| Sensitivity, Typ. | 310 kHz/mA | 310 kHz/mA | 310 kHz/mA | 310 kHz/mA |
| 3 dB Bandwidth, Typ. | 800 kHz | 400 kHz | 800 kHz | 800 kHz |
| Deviation at 3 dB Bandwidth, Max. | 50 MHz | 60 MHz | 60 MHz | 60 MHz |
| Input Impedance @ 1 MHz and 25°C, Typ. | 1 ohm in series with 1.7 µH | 1 ohm in series with 1.7 µH | 1 ohm in series with 1.7 µH | 1 ohm in series with 1.7 µH |
| DC Circuit Power, Max., | | | | |
| +15±0.5V | 150 mA | 200 mA | 200 mA | 200 mA |
| -5.0±0.1V | 50 mA | 60 mA | 60 mA | 60 mA |
| YIG Heater Power | | | | |
| Input Voltage Range | 20 to 28 VDC | 20 to 28 VDC | 20 to 28 VDC | 20 to 28 VDC |
| Power @ 25°C, Max. | 1.5 watts | 1.5 watts | 1.5 watts | 1.5 watts |
| Power @ -54°C, Max. | 2.5 watts | 2.5 watts | 2.5 watts | 2.5 watts |
| Weight, Max. | 8 oz. | 12 oz. | 12 oz. | 12 oz. |
| Case Style | M1–45 | M4–45 | M4–45 | M4–45 |

## Electrical and Performance Specifications

Guaranteed Specifications at –54° to +85°C Case Temperature into a 50-ohm Load (Unless Otherwise Noted)

| Model No. | AV-7418 | AV-76118 | AV-76418 | AV-7814 |
|---|---|---|---|---|
| Frequency Range, Min. | 4–8 GHz | 6–18 GHz | 6–18 GHz | 8–12.4 GHz |
| Power Output into 50-ohm Load, Min./Max. | +14.8 dBm/+23 dBm | +13 dBm/+23 dBm | +20 dBm/+28 dBm | +13 dBm/+24 dBm |
| Frequency Drift Over Operating Temperature, Max. | 40 MHz | 60 MHz | 60 MHz | 50 MHz |
| Pulling Figure (12 dB Return Loss), Typ. | 0.5 MHz | 1.0 MHz | 0.5 MHz | 0.5 MHz |
| Pushing Figure, +15 VDC Supply, Typ. | 0.1 MHz/V | 0.1 MHz/V | 0.5 MHz/V | 0.1 MHz/V |
| –5 VDC Supply, Typ. | 1.5 MHz/v | N/A | N/A | N/A |
| Magnetic Susceptibility @ 60 Hz, Typ. | 50 kHz/Gauss | 50 kHz/Gauss | 50 kHz/Gauss | 50 kHz/Gauss |
| 2nd Harmonic, Min. | –12 dBc | –8 dBc | –10 dBc | –10 dBc |
| 3rd Harmonic, Min. | –12 dBc | –8 dBc | –10 dBc | –15 dBc |
| Spurious Output, Min. | –60 dBc | –60 dBc | –60 dBc | –60 dBc |
| Main Tuning Port Characteristics | | | | |
| Sensitivity | 15±0.8 MHz/mA | 18±1 MHz/mA | 18±1 MHz/mA | 18±1 MHz/mA |
| 3 dB Bandwidth, Typ. | 5 kHz | 5 kHz | 5 kHz | 5 kHz |
| Linearity, Typ. | ±0.1% | ±0.25% | ±0.25% | ±0.05% |
| Hysteresis, Typ. | 6 MHz | 18 MHz | 18 MHz | 6 MHz |
| Input Impedance @ 1 kHz and 25°C, Typ. | 7 ohms in series with 51 mH | 6 ohms in series with 73 mH | 6 ohms in series with 73 mH | 6 ohms is series with 60 mH |
| FM Port Characteristics | | | | |
| Sensitivity, Typ. | 310 kHz/mA | 450 kHz/mA | 450 kHz/mA | 450 kHz/mA |
| 3 dB Bandwidth, Typ. | 400 kHz | 1 MHz | 1 MHz | 1 MHz |
| Deviation at 3 dB Bandwidth, Max. | 60 MHz | 90 MHz | 90 MHz | 70 kHz |
| Input Impedance @ 1 MHz and 25°C, Typ. | 1 ohm in series with 1.7 µH | .5 ohm in series with 2.3 µH | .5 ohm in series with 2.0 µH | 1 ohm in series with 2.3 µH |
| DC Circuit Power, Max., | | | | |
| +15±0.5V | 200 mA | — | — | — |
| –5.0±0.1V | 60 mA | — | — | — |
| +15+0.5/–3.5V | — | 275 mA | 500 mA | 175 mA |
| YIG Heater Power | | | | |
| Input Voltage Range | 20 to 28 VDC | 20 to 28 VDC | 20 to 28 VDC | 20 to 28 VDC |
| Power @ 25°C, Max. | 1.5 watts | 1.5 watts | 1.5 watts | 1.5 watts |
| Power @ –54°C, Max. | 2.5 watts | 2.5 watts | 2.5 watts | 2.5 watts |
| Weight Max. | 12 oz. | 17 oz. | 17 oz. | 17 oz. |
| Case Style | M1–45 | M3–60 | M3–60 | M3–60 |

## Electrical and Performance Specifications

Guaranteed Specifications at –54° to +85°C Case Temperature into a 50-ohm Load (Unless Otherwise Noted)

| Model No. | AV-78112 | AV-78618 | AV-12118 | AV-18126 |
|---|---|---|---|---|
| Frequency Range, Min. | 8–12.4 GHz | 8–18 GHz | 12–18 GHz | 18–26.5 GHz |
| Power Output into 50-ohm Load, Min./Max. | +19 dBm/+24 dBm | +16 dBm/+24 dBm | +16 dBm/+23 dBm | +16 dBm/+23 dBm |
| Frequency Drift Over Operating Temperature, Max. | 50 MHz | 60 MHz | 60 MHz | 60 MHz |
| Pulling Figure (12 dB Return Loss), Typ. | 1.0 MHz | 1.0 MHz | 1.0 MHz | 1.0 MHz |
| Pushing Figure, +15 VDC Supply, Typ. | 0.1 MHz/V | 0.1 MHz/V | 0.1 MHz/V | 0.1 MHz/V |
| –5 VDC Supply, Typ. | N/A | N/A | N/A | N/A |
| [illegible]netic Susceptibility @ 60 Hz, Typ. | 50 kHz/Gauss | 50 kHz/Gauss | 50 kHz/Gauss | 50 kHz/Gauss |
| [illegible]armonic, Min. | –12 dBc | –10 dBc | –15 dBc | — |
| [illegible]monic, Min. | –15 dBc | –15 dBc | — | — |
| [illegible]utput, Min. | –60 dBc | –60 dBc | –60 dBc | –60 dBc |
| Port Characteristics | | | | |
| [illegible]ty | 18±1 MHz/mA | 18±1 MHz/mA | 18±1 MHz/mA | 30± 1.5MHz/mA |
| [illegible]dwidth, Typ. | 5 kHz | 5 kHz | 5 kHz | 5 kHz |
| [illegible], Typ. | ±0.1% | ±0.1% | ±0.1% | ±0.1% |
| Hyste[illegible] Typ. | 6 MHz | 15 MHz | 9 MHz | 10 MHz |
| Input Impedance @ 1 kHz and 25°C, Typ. | 6 ohms in series with 73 mH | 6 ohms in series with 73 mH | 6 ohms in series with 73 mH | 6.5 ohms is series with 90 mH |
| FM Port Characteristics | | | | |
| Sensitivity, Typ. | 450 kHz/mA | 450 kHz/mA | 450 kHz/mA | 425 kHz/mA |
| 3 dB Bandwidth, Typ. | 1 MHz | 1 MHz | 1 MHz | 400 kHz |
| Deviation at 3 dB Bandwidth, Max. | 90 MHz | 90 MHz | 90 MHz | 90 kHz |
| Input Impedance @ 1 MHz and 25°C, Typ. | 0.5 ohm in series with 2.3 µH | 0.5 ohm in series with 2.3 µH | 0.5 ohm in series with 2.3 µH | 0.35 ohm in series with 2 µH |
| DC Circuit Power, Max., +15+0.5/–0.5V | 275 mA | 275 mA | 275 mA | 200 mA |
| YIG Heater Power | | | | |
| Input Voltage Range | 20 to 28 VDC | 20 to 28 VDC | 20 to 28 VDC | — |
| Power @ 25°C, Max. | 1.5 watts | 1.5 watts | 1.5 watts | — |
| Power @ –54°C, Max. | 2.5 watts | 2.5 watts | 2.5 watts | — |
| Weight Max. | 17 oz. | 17 oz. | 17 oz. | 20 oz. |
| Case Style | M3–60 | M3–60 | M3–60 | M5–60WR28 |

3

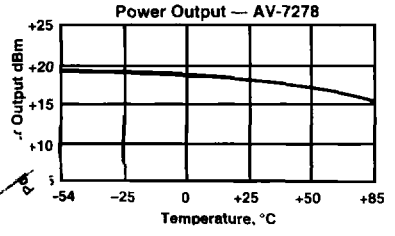
## Electrical and Performance Specifications

Guaranteed Specifications at –54° to +85°C Case Temperature into a 50-ohm Load (Unless Otherwise Noted)

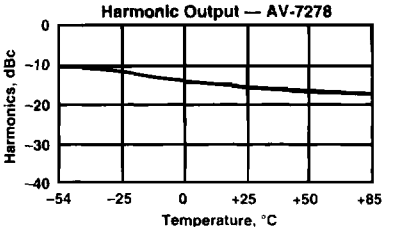
| Model No. | AV-26140M | AV-26140W |
|---|---|---|
| Frequency Range, Min. | 26.5–40 GHz | 26.5–40 GHz |
| Power Output into 50-ohm Load, Min./Max. | +9 dBm/+19 dBm | +9 dBm/+19 dBm |
| Frequency Drift Over Operating Temperature, Max. | 100 MHz | 100 MHz |
| Pulling Figure (12 dB Return Loss), Typ. | 0.5 MHz | 0.5 MHz |
| Pushing Figure, +15 VDC Supply, Typ. | 0.1 MHz/V | 0.1 MHz/V |
| Magnetic Susceptibility @ 60 Hz, Typ. | 50 kHz/Gauss | 50 kHz/Gauss |
| 2nd Harmonic, Min. | — | — |
| 3rd Harmonic, Min. | — | — |
| Spurious Output, Min. | –60 dBc | –60 dBc |
| Main Tuning Port Characteristics | | |
| Sensitivity | 40±2 MHz/mA | 40±2 MHz/mA |
| 3 dB Bandwidth, Typ. | 2 kHz | 2 kHz |
| Linearity, Typ. | ±0.1% | ±0.1% |
| Hysteresis, Typ. | 40 MHz | 40 MHz |
| Input Impedance @ 1 kHz and 25°C, Typ. with 90 mH | 6 ohms in series with 90 mH | 6 ohms in series |
| FM Port Characteristics | | |
| Sensitivity, Typ. | 430 kHz/mA | 430 kHz/mA |
| 3 dB Bandwidth, Typ. | 50 kHz | 50 kHz |
| Deviation at 3 dB Bandwidth, Max. | 100 MHz | 100 MHz |
| Input Impedance @ 1 MHz and 25°C, Typ. with 0.5 µH | 0.3 ohm in series with 0.5 µH | 0.3 ohm in series |
| DC Circuit Power, Max., +8.0 +15.5V Min./Max. | 150 mA | 150 mA |
| YIG Heater Power | | |
| Input Voltage Range | — | — |
| Power @ 25°C, Max. | — | — |
| Power @ –54°C, Max. | — | — |
| Weight Max. | 20 oz. | 20 oz. |
| Case Style | M5–60 | M5–60WR28 |

## Typical Performance @ 25°C Case Temperature (Unless Otherwise Noted)

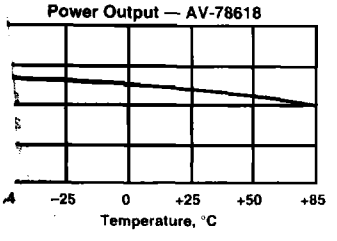
Power Output — AV-7278



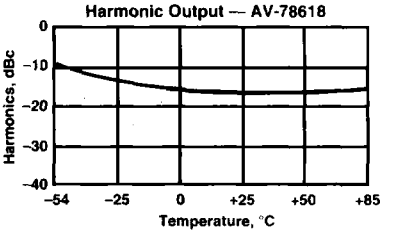

Harmonic Output — AV-7278



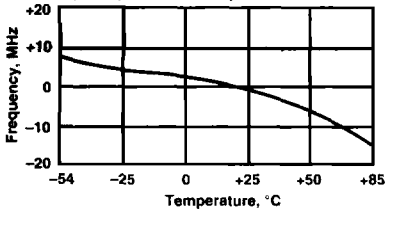

Power Output — AV-78618



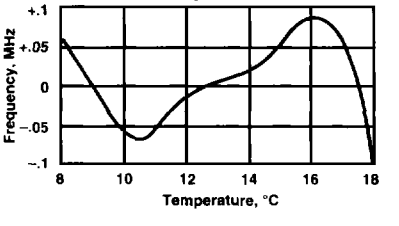

Harmonic Output — AV-78618



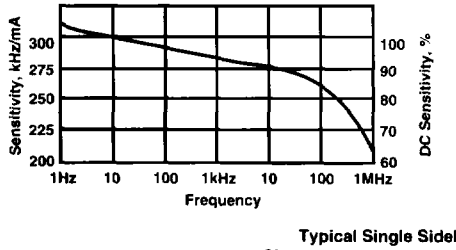

Frequency Drift vs Temperature — AV-78618



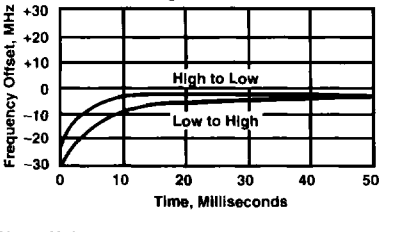

Linearity — AV-78618




FM Port Sensitivity vs. Modulation Frequency (Typical all AV Series Without FM Feedthrough Capacitors)




Setting Time — AV-7246




Typical Single Sideband Phase Noise