MICROCHIP

Vectron™ Oscillators

# VS-504

## High Frequency Discrete Dual Frequency VCSO


## Description

The VS-504 dual frequency VCSO (Voltage Controlled Saw Oscillator) is a high frequency, ultra low phase noise oscillator designed to support high speed data converters and 100G coherent optical receivers. The VS-504 provides 12fs rms jitter in the 12kHz to 20MHz integration bandwidth and is available from 1GHz to 2.5GHz. Two frequencies are switchable.

## Features

- Frequency Range 0.6 to 3.0 GHz
- Dual Frequency
- Ultra low jitter performance
- Typical Jitter: 12fsec rms, 12kHz to 20MHz
- 3.3 supply voltage
- Output sinewave + balanced sinewave + LVPECL
- 9x14 mm SMD package
- See table on Page 5 for standard frequencies

## Applications

- High Speed ADCs
- 100G / 200G / 400G Coherent Receivers
- Test & Measurement

## Performance Specifications

| Pulling Characteristics | | | | | |
|---|---|---|---|---|---|
| Parameter | Min | Typ | Max | Units | Notes |
| Absolute Pull Range (APR) | ±20 | | | ppm | Includes df vs:<br>•Operating temperature range +10 .. 85°C<br>•Aging 10 years<br>•Supply Voltage Change 5%<br>•Load change 10% |
| Tuning Slope | Positive | | | | |
| Control Voltage Range | 0 | 1.65 | 3.3 | VDC | with $V_S$ = 3.3V |
| Frequency control input impedance | 10 | | | kΩ | |
| **Supply Voltage (Vs)** | | | | | |
| Supply voltage | 3.135 | 3.3 | 3.465 | VDC | |
| Current consumption | | | 95 | mA | @ Sinewave / Balanced Sinewave |
| | | | 100 | mA | @ LVPECL |

# Performance Specifications (Continued)

| RF Output | | | | | |
|---|---|---|---|---|---|
| Parameter | Min | Typ | Max | Units | Notes |
| Signal | | Sinewave | | | |
| Load | 45 | 50 | 55 | Ω | |
| Output Power | 7 | 8.5 | 12 | dBm | |
| Signal | | Balanced Sinewave | | | |
| Load | 45 | 50 | 55 | Ω | |
| Output Power | 0 | 3 | 6 | dBm | |
| Phase difference between output signal pairs | | | ±10 | ° | |
| Signal | | LVPECL | | | |
| Load | 45 | 50 | 55 | Ω | |
| Duty Cycle | 45 | | 55 | % | |
| Subharmonics | | | -25 | dBc | |
| Phase Noise: 100Hz offset | | -70 | | dBc/Hz | @ 1.75GHz Balanced Sinewave |
| Phase Noise: 1kHz offset | | -98 | | dBc/Hz | |
| Phase Noise: 10kHz offset | | -122 | | dBc/Hz | |
| Phase Noise: 100kHz offset | | -145 | | dBc/Hz | |
| Phase Noise: 1MHz offset | | -159 | | dBc/Hz | |
| Phase Noise: 10MHz offset | | -163 | | dBc/Hz | |
| Jitter: 12kHz to 20MHz offset | | 10 | | fs rms | |
| Phase Noise: 100Hz offset | | -69 | | dBc/Hz | @ 1.98GHz Balanced Sinewave |
| Phase Noise: 1kHz offset | | -97 | | dBc/Hz | |
| Phase Noise: 10kHz offset | | -120 | | dBc/Hz | |
| Phase Noise: 100kHz offset | | -142 | | dBc/Hz | |
| Phase Noise: 1MHz offset | | -158 | | dBc/Hz | |
| Phase Noise 10MHz offset | | -159 | | dBc/Hz | |

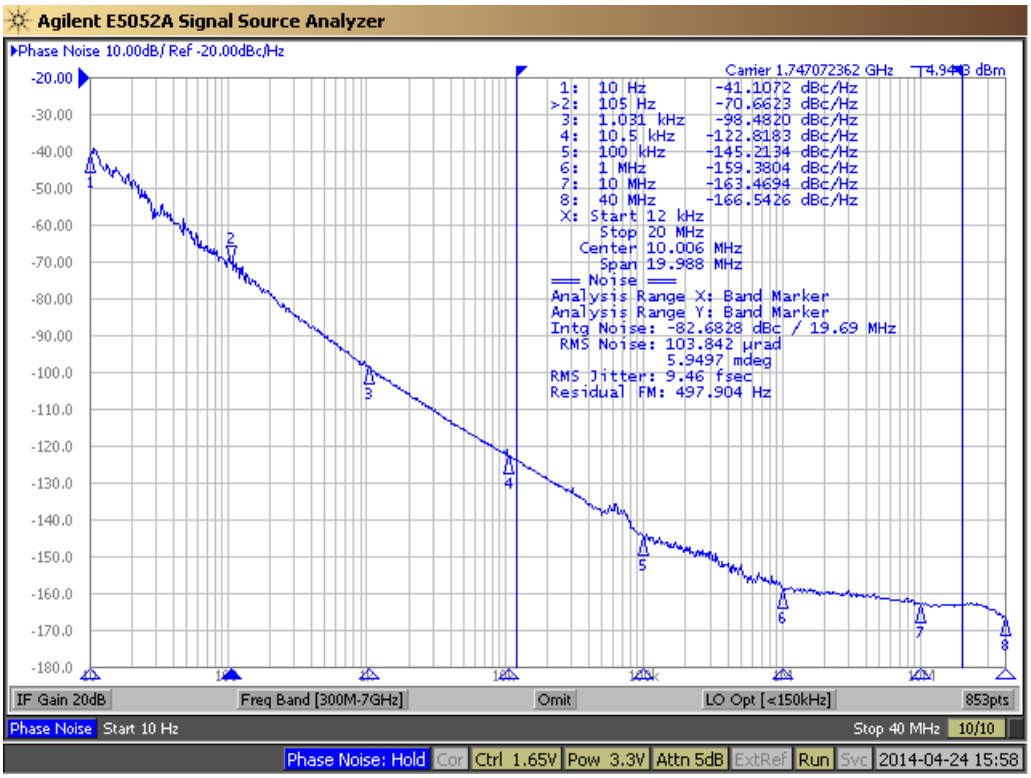
| Additional Parameters | | |
|---|---|---|
| Weight | 2.0g | |
| Processing and Packing | Handling and Processing Note | |

| Absolute Maximum Ratings | | | | | |
|---|---|---|---|---|---|
| Parameter | Min | | Max | Units | Notes |
| Supply Voltage ($V_S$) | | | 6.0 | V | |
| Operable Temperature Range | -40 | | +85 | ºC | |
| Storage Temperature Range | -40 | | +95 | ºC | |

# Typical Performance

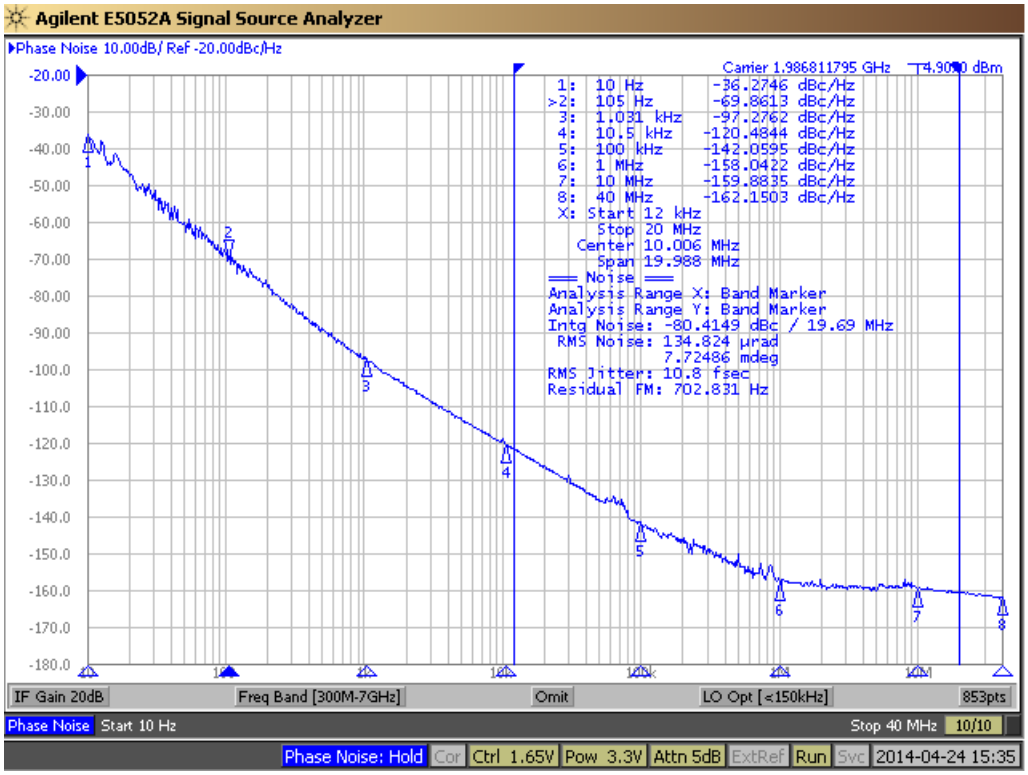
## Phase Noise

VS-504 @ 1.75GHz Balanced Sinewave




## Phase Noise

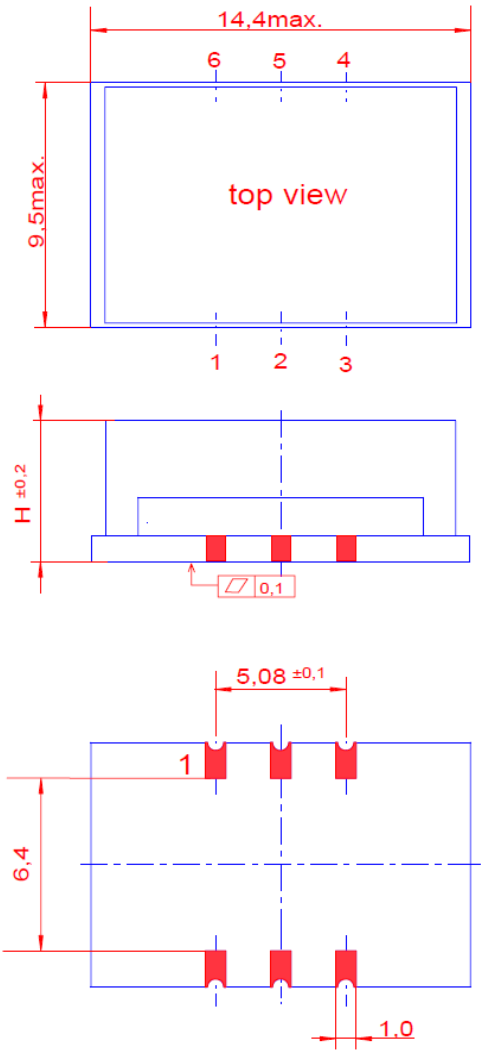
VS-504 @ 1.98GHz Balanced Sinewave



# Outline Drawing / Enclosure

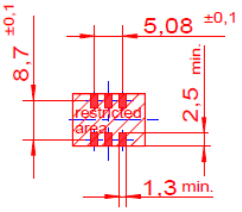
| Package Codes | | |
|---|---|---|
| Code | Height "H" | Pin Length "L" |
| G218K | 4.8 | NA |

Dimensions in mm




G 218

H = 5,9 ; G218 B
H = 2,8 ; G218 C
H = 2,6 ; G218 D
H = 4,7 ; G218 E
H = 5,7 ; G218 F
H = 5,4 ; G218 G
H = 4,9 ; G218 H
H = 4,5 ; G218 I
H = 4,8 ; G218 K

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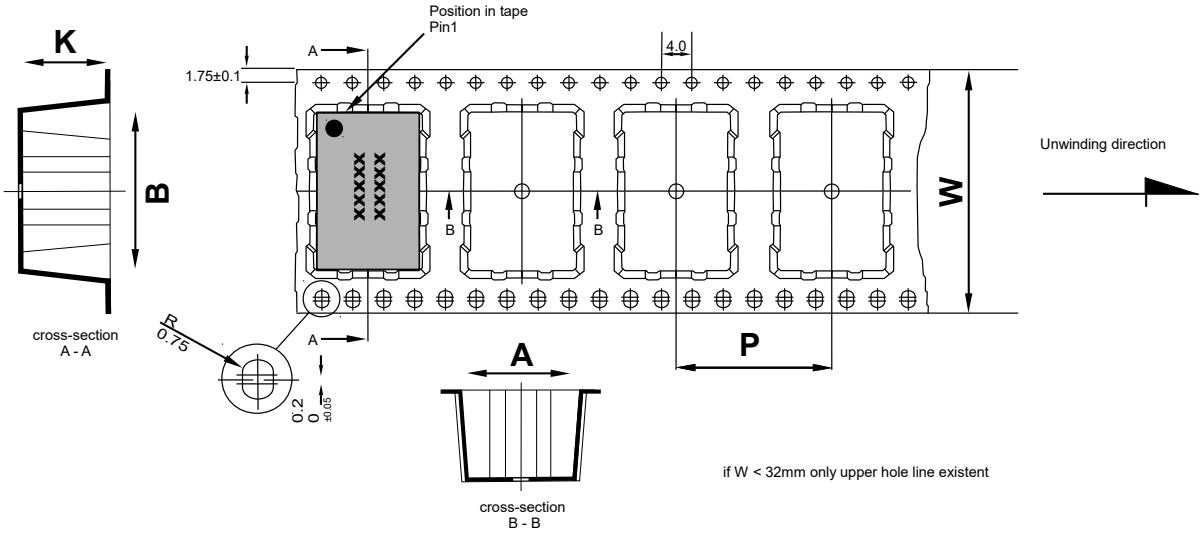
land pattern
recommendation

| Pin Assignment (Sinewave) | |
|---|---|
| 1 | Control Voltage ($V_C$) |
| 2 | Frequency Select |
| 3 | GND |
| 4 | RF Out |
| 5 | GND |
| 6 | Supply Voltage Input ($V_S$) |

| Pin Assignment (Balanced Sinewave) | |
|---|---|
| 1 | Control Voltage ($V_C$) |
| 2 | Frequency Select |
| 3 | GND |
| 4 | RF Out |
| 5 | RF Out compl. (180° phase shifted) |
| 6 | Supply Voltage Input ($V_S$) |

| Marking |
|---|
| VS-504-xxxx |
| Frequency_1/Frequency_2 |
| •AYYWW |

# Standard Shipping Method




Dimension in mm:

A, B and K are dependent uppon component dimensions

production tolerance complying DIN IEC 286-3

All dimensions in millimeters unless otherwise stated

| Enclosure Type | Tape Width W (mm) | Quantity per meter | Quantity per reel | Dimension P |
|---|---|---|---|---|
| G218K | 24 | | 850 | 12 |

# Recommended Reflow Profile

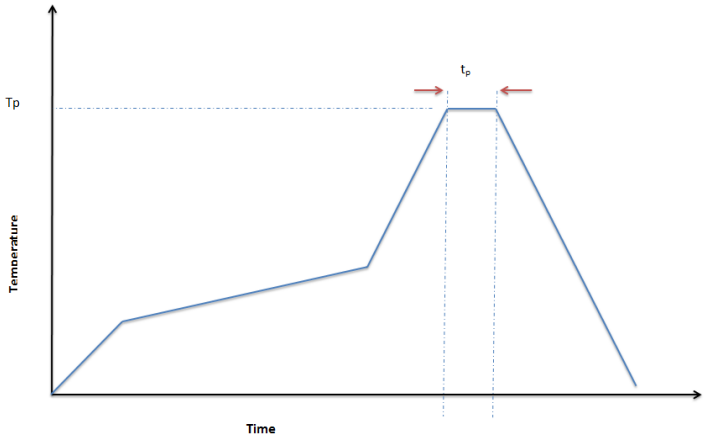
TP: max 250°C (@ solder joint, customer board level)

$T_p$: max: 10…30 sec

Additional Information:

This SMD oscillator has been designed for pick and place reflow soldering

SMD oscillators must be on the top side of the PCB during the reflow process.



# Ordering Information

**VS - 504 0 - E E X - 205 X - 1747M030837 - 1986M819383**

- Product Family: VS: VCSO
- Package: 9x14mm SMT
- Height: 0: 4.8 mm (G218K)
- Supply Voltage: E: +3.3V
- RF Output Code: C: LVPECL; E: Sinewave; F: Balanced Sinewave
- Temperature Range: X: +10°C to +85°C
- APR Code: 205: ±20ppm
- Enable: X: No Enable
- Frequency 1: 1747M030837
- Frequency 2: 1986M819383

| Standard Frequencies (MHz) | | | | | | |
|---|---|---|---|---|---|---|
| 632.8125 | 784.489605 | 832 | 867.1875 | 873.5154185 | 949.976022 | 980.604559 |
| 993.4096915 | 1000 | 1024.23965 | 1034.337568 | 1067.686799 | 1200 | 1265.625 |
| 1280 | 1568.97921 | 1687.5 | 1701.32 | 1734.375 | 1747.030837 | 1747.62305 |
| 1748.366885 | 1879.437686 | 1884.052863 | 1899.952044 | 1961.209118 | 1986.819383 | 2000 |
| 2000 | 2048.4793 | 2068.675135 | 2104.658326 | 2135.373597 | 2400 | 2457.6 |
| 2949.12 | | | | | | |

Other Frequencies Available Upon Request

**Notes:**

1. Contact factory for improved stabilities or additional product options. Not all options and codes are available at all frequencies.
2. Unless other stated all values are valid after warm-up time and refer to typical conditions for supply voltage, frequency control voltage, load, temperature (25°C).
3. Phase noise degrades with increasing output frequency.
4. Subject to technical modification.
5. Contact factory for availability.

# Contact Information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