

Helping Customers Innovate, Improve & Grow



Description

The VS-402 dual frequency VCSO (Voltage Controlled Saw Oscillator) from Vectron is a high frequency, ultra low phase noise oscillator designed to support high speed data converters and 100G coherent optical receivers. The VS-402 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 1.0 to 2.5 GHz
- Dual Frequency
- Ultra low jitter performance
- Typical Jitter: 12fsec rms, 12kHz to 20MHz
- 3.3 supply voltage
- Output sinewave + balanced sinewave
- 13x20 mm SMD package
- See table on Page 5 for standard frequencies

Applications

- High Speed ADCs
- 40G / 100G / 200G Coherent Receivers
- Test & Measurement

Performance Specifications

| Pulling Characteristics | | | | | |
|-----------------------------------|----------|------|-------|-------|---|
| Parameter | Min | Typ | Max | Units | Notes |
| Absolute Pull Range (APR) | ±20 | | | ppm | Includes df vs: •Operating temperature range +10 .. 85°C •Aging 10 years •Supply Voltage Change 5% •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 (V_s) | | | | | |
| Supply voltage | 3.135 | 3.3 | 3.465 | VDC | |
| Current consumption | | | 100 | mA | @ Sinewave / Balanced Sinewave |

Performance Specifications (Continued)

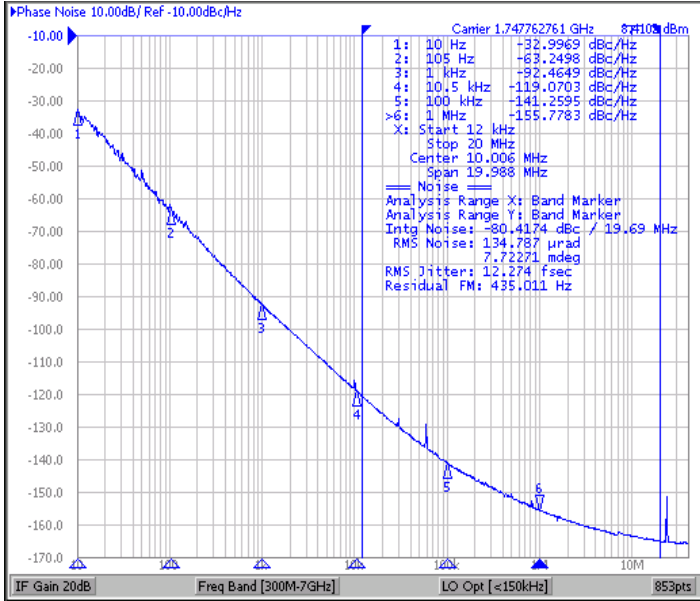
| RF Output | | | | | |
|--|-------------------|------|----------|------------|--------------------------------|
| Parameter | Min | Typ | Max | Units | Notes |
| Signal | Sinewave | | | | |
| Load | 45 | 50 | 55 | Ω | |
| Output Power | 7 | 8.5 | 12 | dBm | |
| Signal | Balanced Sinewave | | | | |
| Load | 45 | 50 | 55 | Ω | |
| Output Power | 0 | 3 | 6 | dBm | |
| Phase difference between output signal pairs | | | ± 10 | $^{\circ}$ | |
| Subharmonics | | | -30 | dBc | |
| Phase Noise: 100Hz offset | | -63 | | dBc/Hz | @ 1.75GHz Sinewave |
| Phase Noise: 1kHz offset | | -92 | | dBc/Hz | |
| Phase Noise: 10kHz offset | | -119 | | dBc/Hz | |
| Phase Noise: 100kHz offset | | -141 | | dBc/Hz | |
| Phase Noise: 1MHz offset | | -155 | | dBc/Hz | |
| Phase Noise: 10MHz offset | | -163 | | dBc/Hz | |
| Jitter: 12kHz to 20MHz offset | | 12 | | fs rms | |
| Phase Noise: 100Hz offset | | -62 | | dBc/Hz | @ 1.98GHz Balanced Sinewave |
| Phase Noise: 1kHz offset | | -92 | | dBc/Hz | |
| Phase Noise: 10kHz offset | | -118 | | dBc/Hz | |
| Phase Noise: 100kHz offset | | -140 | | dBc/Hz | |
| Phase Noise: 1MHz offset | | -155 | | dBc/Hz | |
| Phase Noise: 10MHz offset | | -161 | | dBc/Hz | |
| Jitter: 12kHz to 20MHz offset | | 13 | | fs rms | |
| Phase Noise: 100Hz offset | | -64 | | dBc/Hz | @ 2.46GHz Balanced Sinewave |
| Phase Noise: 1kHz offset | | -94 | | dBc/Hz | |
| Phase Noise: 10kHz offset | | -118 | | dBc/Hz | |
| Phase Noise: 100kHz offset | | -138 | | dBc/Hz | |
| Phase Noise: 1MHz offset | | -151 | | dBc/Hz | |
| Phase Noise: 10MHz offset | | -160 | | dBc/Hz | |
| Jitter: 12kHz to 20MHz offset | | 11 | | fs rms | |

| 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 | $^{\circ}\text{C}$ | | |
| Storage Temperature Range | -55 | +125 | $^{\circ}\text{C}$ | | |

Typical Performance

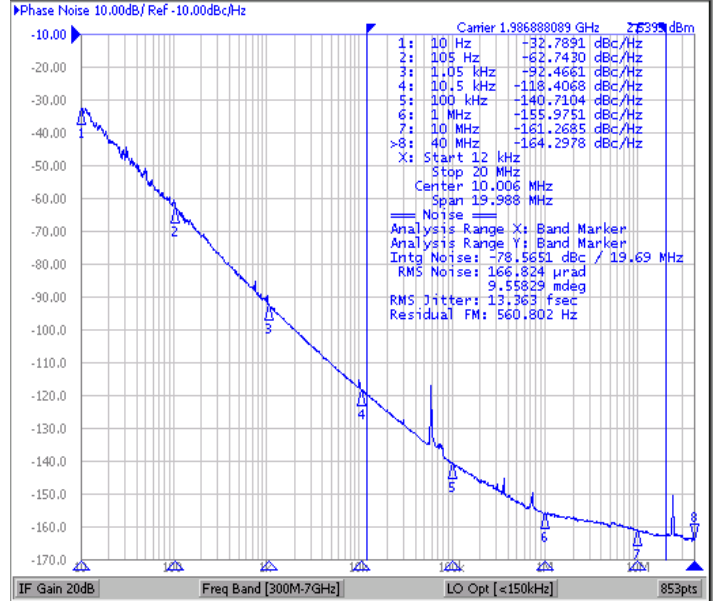
Phase Noise

VS-402 @ 1.75GHz Sinewave



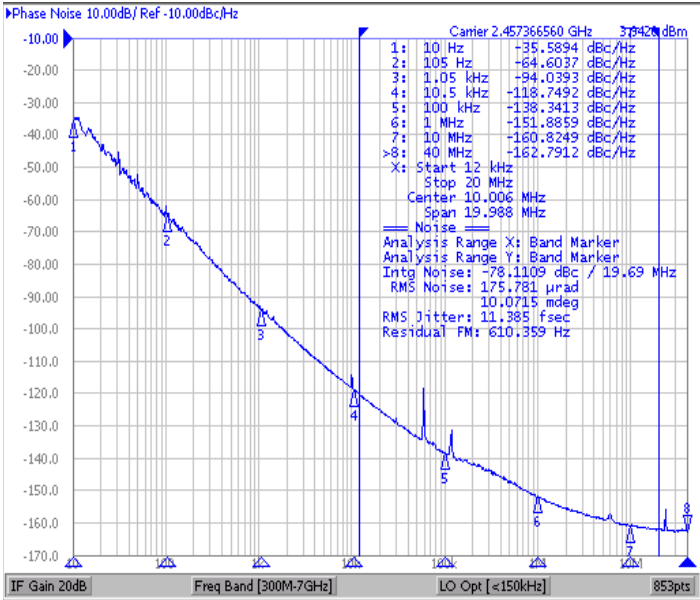
Phase Noise

VS-402 @ 1.97GHz Balanced Sinewave



Phase Noise

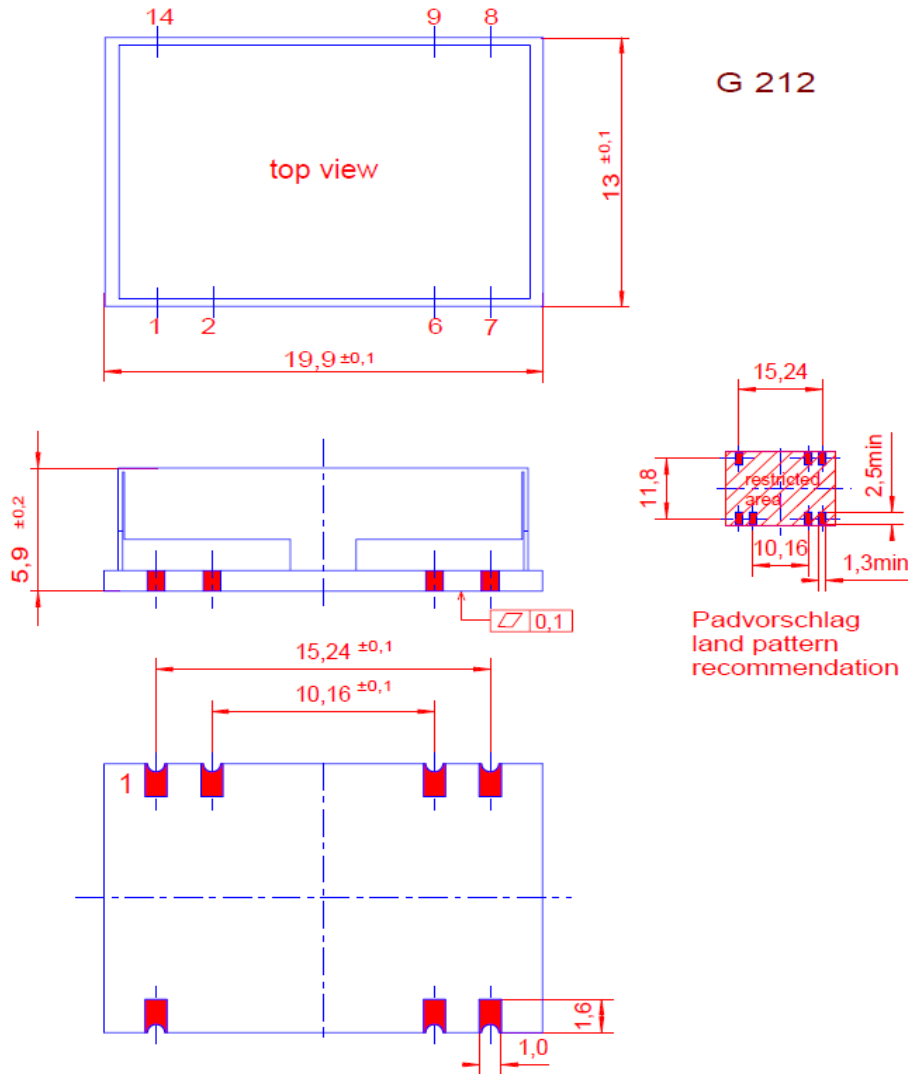
VS-402 @ 2.46GHz Balanced Sinewave



Outline Drawing / Enclosure

| Package Codes | | |
|---------------|------------|----------------|
| Code | Height "H" | Pin Length "L" |
| G212 | 5.9 | NA |

Dimensions in mm

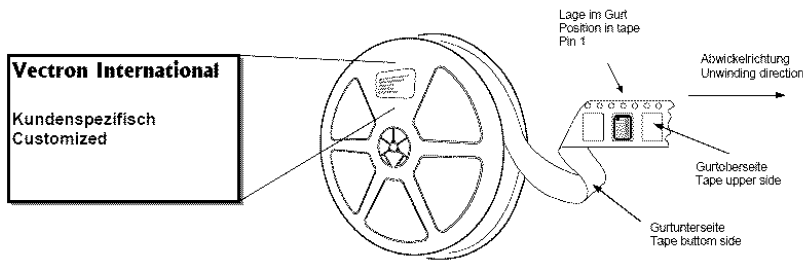
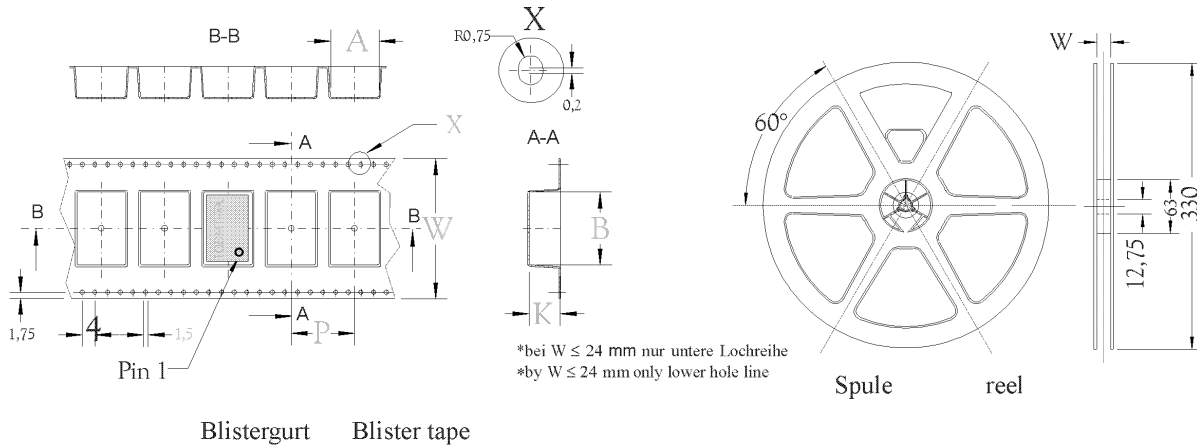


| Pin Assignment (Sinewave) | |
|---------------------------|--------------------------------|
| 1 | Control Voltage (V_c) |
| 2 | Frequency Select |
| 6 | GND |
| 7 | GND |
| 8 | RF Out |
| 9 | GND |
| 14 | Supply Voltage Input (V_s) |

| Pin Assignment (Balanced Sinewave) | |
|------------------------------------|------------------------------------|
| 1 | Control Voltage (V_c) |
| 2 | Frequency Select |
| 6 | GND |
| 7 | GND |
| 8 | RF Out |
| 9 | RF Out compl. (180° phase shifted) |
| 14 | Supply Voltage Input (V_s) |

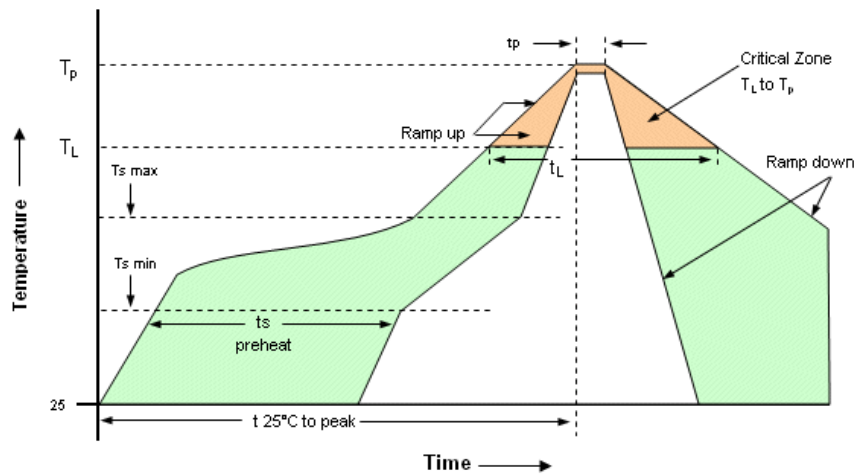
| Marking |
|-------------------------|
| VS-402-xxxx |
| Frequency_1/Frequency_2 |
| •AYYWW |

Standard Shipping Method



| Enclosure Type | Tape Width W (mm) | Quantity per meter | Quantity per reel | Dimension P |
|----------------|-------------------|--------------------|-------------------|-------------|
| G212 | 24 | | 500 | 12 |

Recommended Reflow Profile

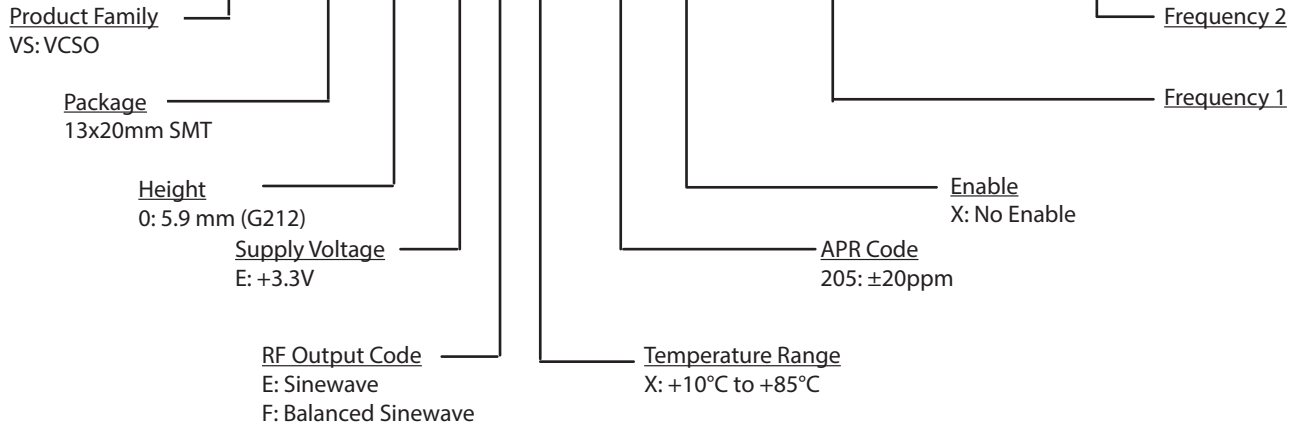


| Profile Feature | Pb-Free Assembly/Sn-Pb Assembly | Profile Feature | Pb-Free Assembly/Sn-Pb Assembly |
|--|----------------------------------|---|---------------------------------|
| Average ramp-up rate (T_L to T_p) | 3°C/second max. | Time 25°C to Peak Temperature | 8 minutes max. |
| Preheat - Temperature Min T_{Smin} -Temperature Min T_{Sma} -Time (min to max) t_s | 150°C 200°C 60-180 seconds | Time maintained above -Temperature (T_L) -Time (t_L) | 217°C 60-150 seconds |
| T_{Smax} to T_L -Ramp-up Rate | 3°C/second max | | |
| Time maintained above -Temperature (T_L) -Time (t_L) | 217°C 60-150 seconds | Time within 5°C of actual Peak-Temperature (t_p) | 20-40 seconds |
| Peak Temperature (T_p) | max 260°C | Ramp-down Rate | 6°C/ second max |

Note: All temperatures refer to topside of the package, measured on the package body surface. SMD oscillators must be on the top side of the PCB during the reflow process.

Ordering Information

VS - 402 0 - E E X - 205 X - 1747M030837 - 1986M819383



| Standard Frequencies (MHz) | | | | | | |
|----------------------------|-------------|-------------|-------------|-------------|---------|-------------|
| 832 | 1000 | 1040 | 1687.5 | 1701.32 | 1707.08 | 1747.030837 |
| 1747.62305 | 1748.366885 | 1769.145 | 1879.437686 | 1884.052863 | 1959.55 | 1968.75 |
| 1980.022 | 1986.819 | 1986.819383 | 2000 | 2104.658326 | 2187.5 | 2457.6 |

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.

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