


**VS-701**

## Description

The VS-701 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 / 400G coherent optical receivers. The VS-701 provides 13fs rms jitter in a 12kHz to 20MHz integration bandwidth and is available from 0.6 to 3.0GHz.

## Features

- Frequency Range 0.6 to 3.0 GHz
- Ultra low jitter performance
- Typical Jitter: 13fsec rms, 12kHz to 20MHz
- 3.3 + 5V supply voltage
- Output: Sinewave & LVPECL
- 5x7 mm SMD package
- 20.000G shock survival
- See table on Page 5 for standard frequencies

## Applications

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

## 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             | 0.5   | 2.5  | 4.5      | V DC     | with $V_s = 5V$                                                                                                                 |
|                                   | 0     | 1.65 | 3.3      | VDC      | with $V_s = 3.3V$                                                                                                               |
| Frequency control input impedance | 100   |      |          | kΩ       |                                                                                                                                 |
| Modulation bandwidth              | 20    |      |          | kHz      | @ -3dB                                                                                                                          |
| Supply Voltage ( $V_s$ )          |       |      |          |          |                                                                                                                                 |
| Supply voltage (standard)         | 4.75  | 5.00 | 5.25     | V DC     |                                                                                                                                 |
| Current consumption               |       |      | 50       | mA       | @ sinewave                                                                                                                      |
| Supply voltage (standard)         | 3.135 | 3.3  | 3.465    | V DC     |                                                                                                                                 |
| Current consumption               |       |      | 75<br>95 | mA<br>mA | @ sinewave<br>@ LVPECL                                                                                                          |

## Performance Specifications (Continued)

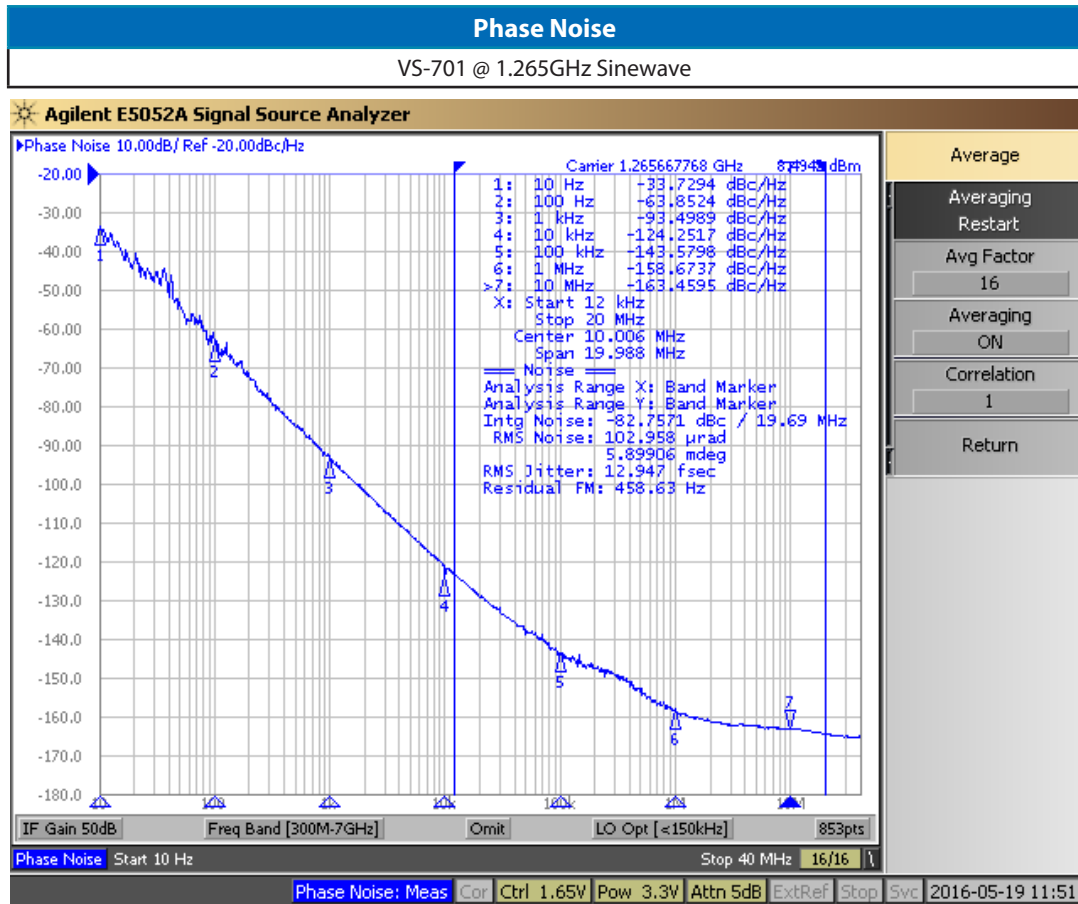
| RF Output                     |          |      |     |          |                                |
|-------------------------------|----------|------|-----|----------|--------------------------------|
| Parameter                     | Min      | Typ  | Max | Units    | Notes                          |
| Signal                        | Sinewave |      |     |          | Package G352                   |
| Load                          | 45       | 50   | 55  | $\Omega$ |                                |
| Output Power                  | 4        | 7    | 10  | dBm      |                                |
| Signal                        | LVPECL   |      |     |          | Package G356                   |
| Load                          | 45       | 50   | 55  | $\Omega$ |                                |
| Duty Cycle                    | 45       |      | 55  | %        |                                |
| Phase Noise: 100Hz offset     |          | -63  |     | dBc/Hz   | @ 1.265GHz<br>Sinewave<br>3.3V |
| Phase Noise: 1kHz offset      |          | -93  |     | dBc/Hz   |                                |
| Phase Noise: 10kHz offset     |          | -124 |     | dBc/Hz   |                                |
| Phase Noise: 100kHz offset    |          | -143 |     | dBc/Hz   |                                |
| Phase Noise: 1MHz offset      |          | -158 |     | dBc/Hz   |                                |
| Phase Noise: 10MHz offset     |          | -163 |     | dBc/Hz   |                                |
| Jitter: 12kHz to 20MHz offset |          | 13   |     | fs rms   |                                |

| Additional Parameters  |                              |  |     |       |           |
|------------------------|------------------------------|--|-----|-------|-----------|
| Parameter              | Min                          |  | Max | Units | Notes     |
| Weight                 | 1.0g                         |  |     |       |           |
| Subharmonics           |                              |  | -20 | dBc   | > 1.2 GHz |
| 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  | -40 |  | +95 | $^{\circ}\text{C}$ |       |

| Environmental Conditions  |                                                                                                                                    |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Rapid Temperature Changes | MIL-883-1010 Cond B 500 cycles -55/125C                                                                                            |
| Vibration                 | MIL-STD-883 Meth 2007 Cond A: 20g 20-2000Hz 4x in each 3axis 4 min sweep time                                                      |
| Shock                     | MIL-STD-883G Meth 2002.4 Cond. D: 5000g 0,3ms 6 shocks in each direction<br>MIL-STD-883G Meth 2002.4 Cond. E: 20000g 0,2ms 1 shock |
| Solderability             | J-STD-002C Cond A, leaded Cond. B SMD (MIL-STD-883 M 2003); 245 $^{\circ}\text{C}$<br>Dip&Look with 8h damp pre-treatment          |
| Solvent Resistance        | MIL-STD-883 Meth 2015 Solv. 1,3,4                                                                                                  |
| ESD                       | JESD22-A114F Class 1; 10* 800V                                                                                                     |
| Moisture Sensitivity      | Level 1 JESD22-A113-B                                                                                                              |

# Typical Performance

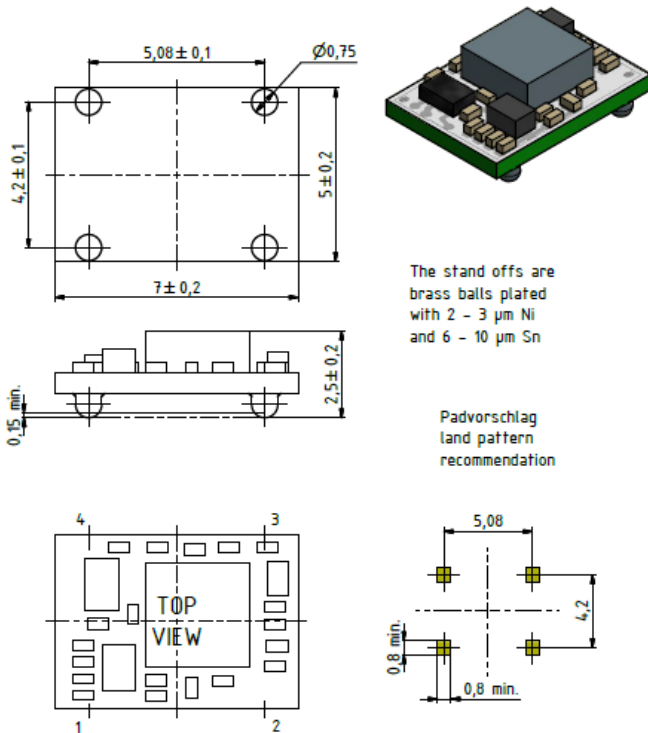


## Outline Drawing / Enclosure

| Package Codes |            |                |
|---------------|------------|----------------|
| Code          | Height "H" | Pin Length "L" |
| G352          | 2.5        | N/A            |
| G356          | 2.5        | N/A            |

Dimensions in mm

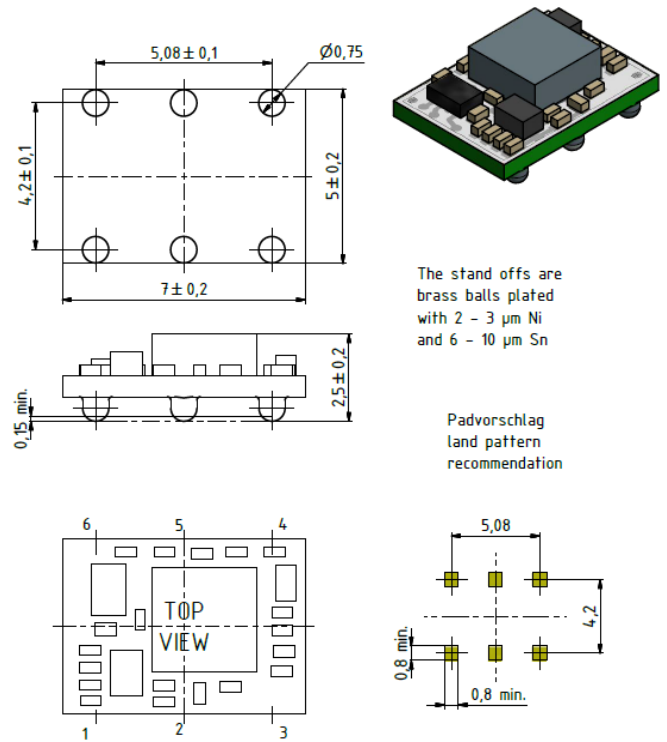
### G352



The stand offs are brass balls plated with 2 - 3  $\mu$ m Ni and 6 - 10  $\mu$ m Sn

Padvorschlag  
land pattern  
recommendation

### G356



The stand offs are brass balls plated with 2 - 3  $\mu$ m Ni and 6 - 10  $\mu$ m Sn

Padvorschlag  
land pattern  
recommendation

#### Pin Assignment Sinewave (G352)

|   |                                |
|---|--------------------------------|
| 1 | Control Voltage ( $V_c$ )      |
| 2 | GND                            |
| 3 | RF-Out                         |
| 4 | Supply Voltage Input ( $V_s$ ) |

#### Pin Assignment LVPECL (G356)

|   |                                |
|---|--------------------------------|
| 1 | Control Voltage ( $V_c$ )      |
| 2 | Enable                         |
| 3 | GND                            |
| 4 | RF-Out                         |
| 5 | RF-Out_complementary           |
| 6 | Supply Voltage Input ( $V_s$ ) |

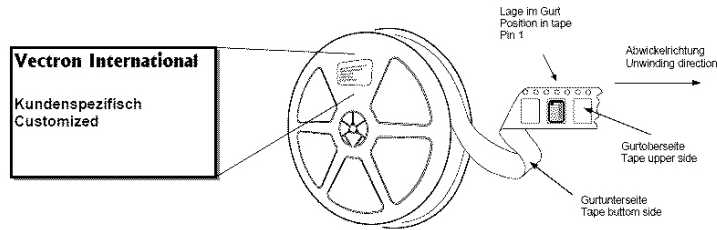
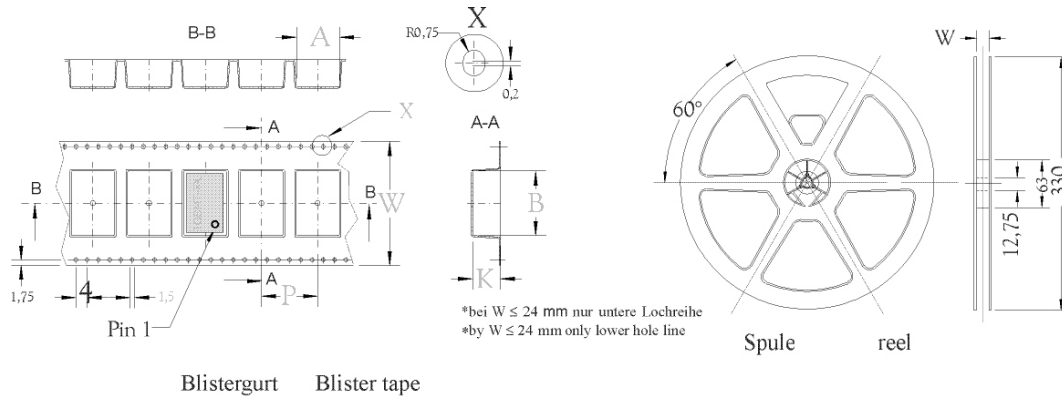
#### Marking

|             |
|-------------|
| VS-701-xxxx |
| Frequency   |
| •AYYWW      |

#### Enable true table (optional)

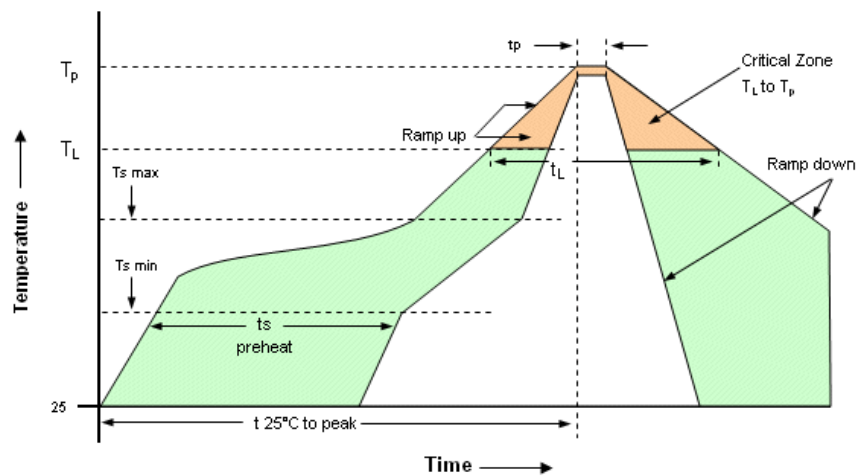
| LVPECL |         |             |
|--------|---------|-------------|
| Pin 2  | Pin 4   | Pin 5       |
| High   | Data    | Compl. Data |
| Open   | Data    | Compl. Data |
| Low    | No Data | No Data     |

## Standard Shipping Method



| Enclosure Type | Tape Width W (mm) | Quantity per meter | Quantity per reel | Dimension P (mm) |
|----------------|-------------------|--------------------|-------------------|------------------|
| G352 / G356    | 24                |                    | 750               | 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 $T_{smin}$<br>-Temperature Min $T_{sma}$<br>-Time (min to max) $t_s$ | 150°C<br>200°C<br>60-180 seconds | Time maintained above -Temperature ( $T_L$ )<br>-Time ( $t_L$ ) | 217°C<br>60-150 seconds         |
| $T_{smax}$ to $T_L$ -Ramp-up Rate                                                              | 3°C/second max                   |                                                                 |                                 |
| Time maintained above -Temperature ( $T_L$ )<br>-Time ( $t_L$ )                                | 217°C<br>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 - 701 0 - D E X - 205 X - 1000M0

**Product Family**  
VS: VCSO

**Package**  
5x7 mm SMT

**Height**  
0: 2.5mm (G352: Sinewave)  
1: 2.5mm (G356: LVPECL)

**Supply Voltage**  
D: +5.0V  
E: +3.3V

**RF Output Code**  
C: LVPECL  
E: Sinewave

**Temperature Range**  
X: +10°C to +85°C  
E: -40°C to +85°C

**APR Code**  
205: ±20ppm

**Frequency**  
**Enable**  
X: No Enable (Sinewave)  
1: Enable (LVPECL)

#### Standard Frequencies (MHz)

|             |             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 632.8125    | 784.489605  | 832         | 867.1875    | 873.5154185 | 949.976022  | 980.604559  |
| 993.4096915 | 1000        | 1024.23965  | 1034.337568 | 1040        | 1067.686799 | 1200        |
| 1265.625    | 1280        | 1568.97921  | 1687.5      | 1701.32     | 1707.08     | 1734.375    |
| 1747.030837 | 1747.62305  | 1748.366885 | 1769.145    | 1875        | 1879.437686 | 1884.052863 |
| 1899.952044 | 1961.209118 | 1968.75     | 1986.819383 | 2000        | 2048.4793   | 2068.675135 |
| 2104.658326 | 2135.373597 | 2187.5      | 2400        | 2457.6      | 2560        | 2812.5      |
| 2949.12     |             |             |             |             |             |             |

Other frequencies and temperature ranges 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.

## For Additional Information, Please Contact

### USA:

Microsemi  
267 Lowell Road, Unit 102  
Hudson, NH 03051  
Tel: 1.888.328.7661  
Fax: 1.888.329.8328

### Europe:

Vectron International GmbH  
Landstrasse, D-74924  
Neckarbischofsheim, Germany  
Tel: +49 (0) 7268-801-0  
Fax: +49 (0) 7268-801-281

### Asia:

Microsemi  
68 Yin Cheng Road(C), 22nd Floor  
One LuJiaZui  
Pudong, Shanghai 200120, China  
Tel: +86 21 6194 6886  
Fax: +86 21 6194 6699

#### Disclaimer

Microsemi reserves the right to make changes to the product(s) and or information contained herein without notice. No liability is assumed as a result of their use or application. No rights under any patent accompany the sale of any such product(s) or information.

Rev: 01/2018