

Helping Customers Innovate, Improve & Grow



### Description

The VS-504 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-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: •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			95	mA	@ Sinewave / Balanced Sinewave
			100	mA	@ LVPECL

## Performance Specifications (Continued)

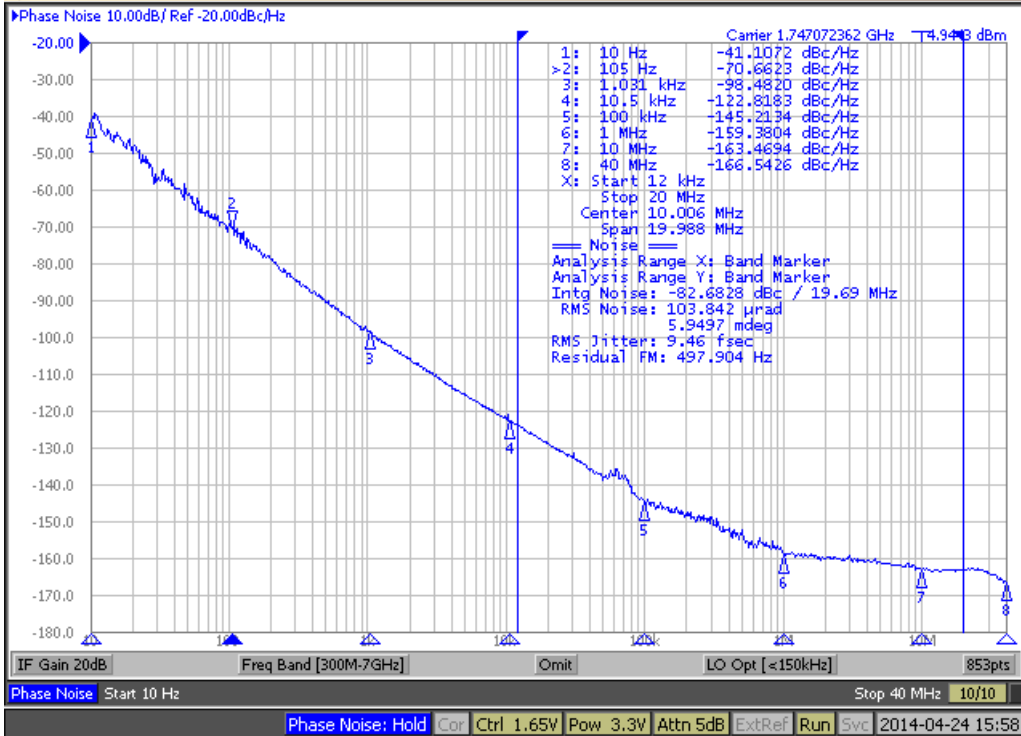
RF Output					
Parameter	Min	Typ	Max	Units	Notes
Signal	Sinewave				
Load	45	50	55	$\Omega$	
Output Power	7	8.5	12	dBm	
Signal	Balanced Sinewave				
Load	45	50	55	$\Omega$	
Output Power	0	3	6	dBm	
Phase difference between output signal pairs			$\pm 10$	$^{\circ}$	
Signal	LVPECL				
Load	45	50	55	$\Omega$	
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	$^{\circ}\text{C}$	
Storage Temperature Range	-40		+95	$^{\circ}\text{C}$	

# Typical Performance

## Phase Noise

VS-504 @ 1.75GHz Balanced Sinewave

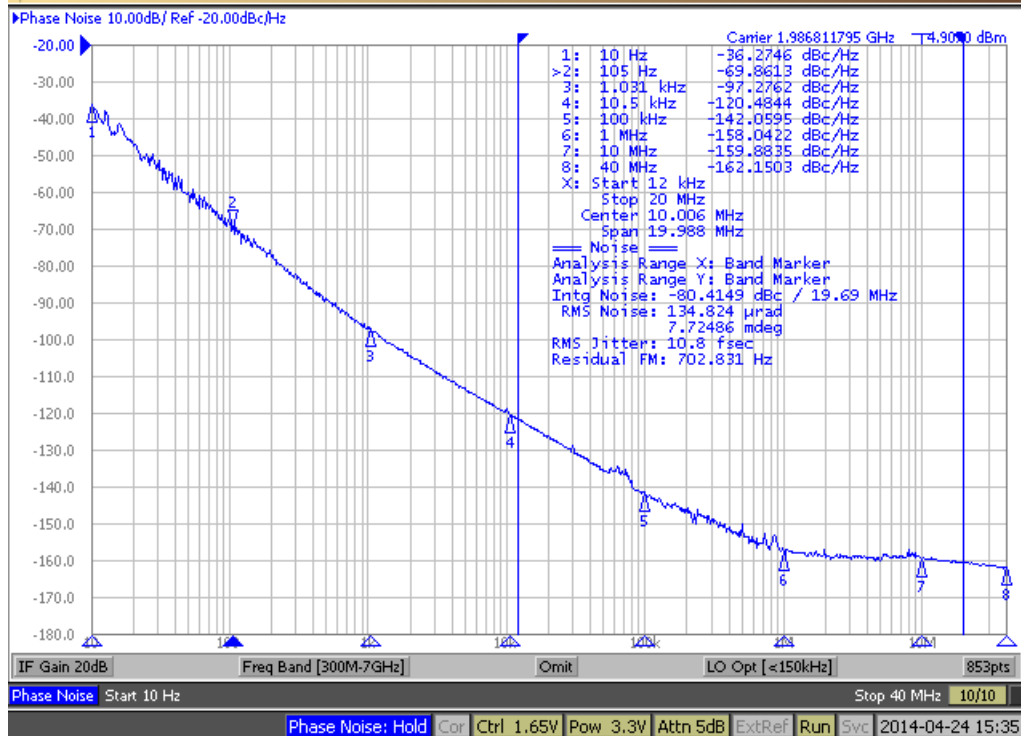
### Agilent E5052A Signal Source Analyzer



## Phase Noise

VS-504 @ 1.98GHz Balanced Sinewave

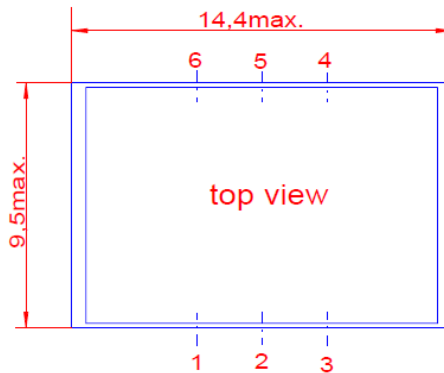
### Agilent E5052A Signal Source Analyzer



# Outline Drawing / Enclosure

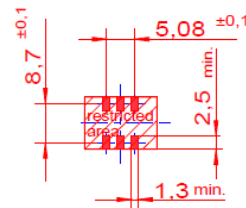
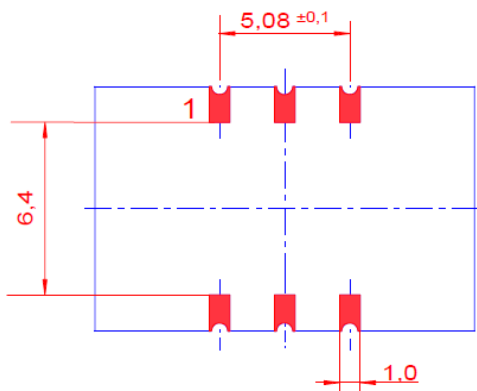
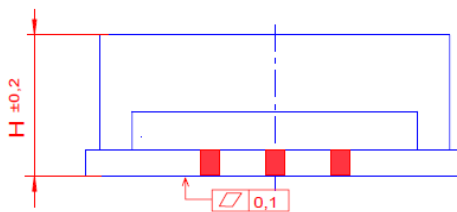
Package Codes		
Code	Height "H"	Pin Length "L"
G218K	4.8	NA

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



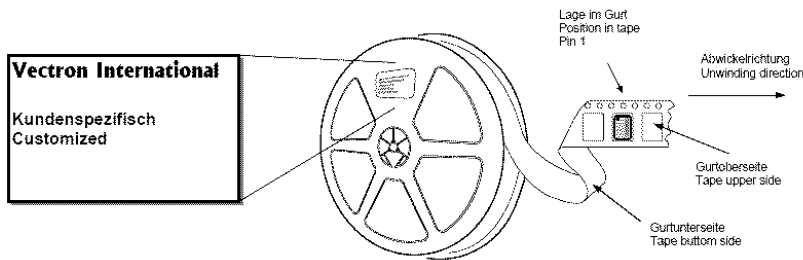
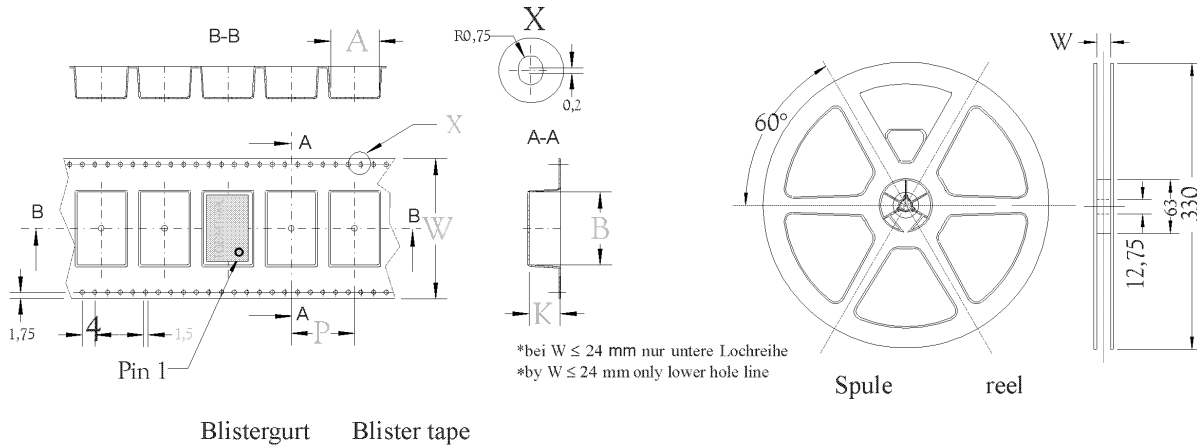
Padvorschlag  
land pattern  
recommendation

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 ( $V_S$ )

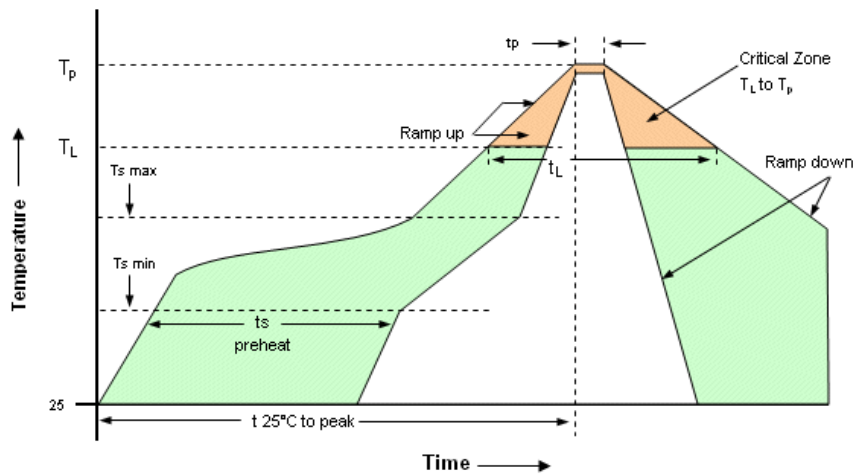
Marking
VS-504-xxxx
Frequency_1/Frequency_2
•AYYWW

## Standard Shipping Method



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

## Recommended Reflow Profile

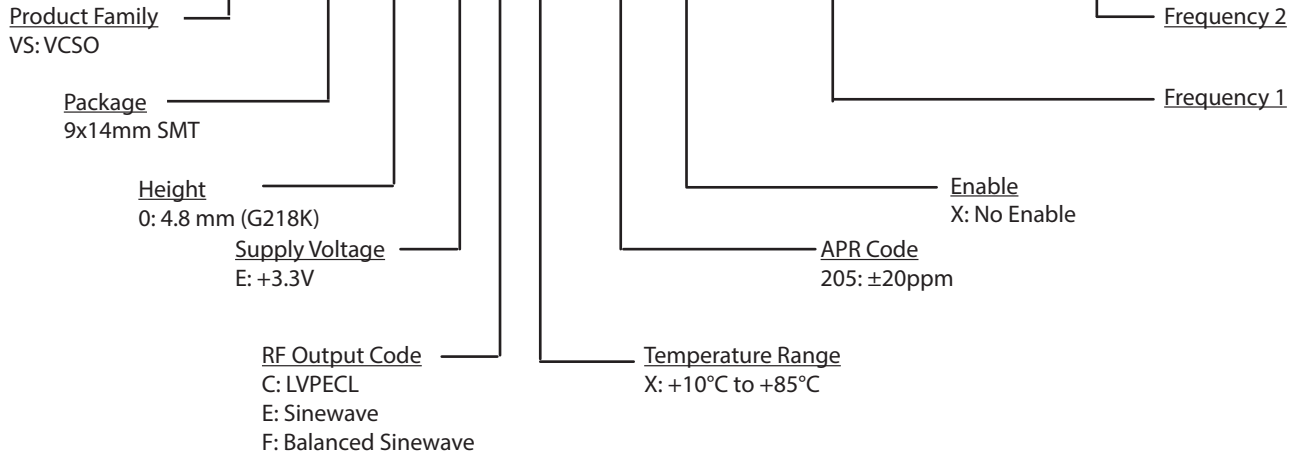


Profile Feature	Pb-Free Assembly/Sn-Pb Assembly	Profile Feature	Pb-Free Assembly/Sn-Pb Assembly
Average ramp-up rate ( $T_L$ to $T_p$ )	3°C/second max.	Time 25°C to Peak Temperature	8 minutes max.
Preheat - Temperature Min $T_{smin}$ -Temperature Min $T_{sma}$ -Time (min to max) $t_s$	150°C 200°C 60-180 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 - 504 0 - E E X - 205 X - 1747M030837 - 1986M819383**



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 Available Upon Request

**Notes:**

- Contact factory for improved stabilities or additional product options. Not all options and codes are available at all frequencies.
- 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).
- Phase noise degrades with increasing output frequency.
- Subject to technical modification.
- Contact factory for availability.

## For Additional Information, Please Contact

**USA:**

Vectron International  
267 Lowell Road, Suite 102  
Hudson, NH 03051  
Tel: 1.888.328.7661  
Fax: 1.888.329.8328

**Europe:**

Vectron International  
Landstrasse, D-74924  
Neckarbischofsheim, Germany  
Tel: +49 (0) 3328.4784.17  
Fax: +49 (0) 3328.4784.30

**Asia:**

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

**Disclaimer**

Vectron International 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: 05/2016