VS-708

Single Frequency VCSO

Helping Customers Innovate, Improve & Grow

Description

The VS-708 is a Voltage Controlled SAW Oscillator that operates at the fundamental or a fraction of the internal SAW filter frequency. The SAW component is a high-Q Quartz device that enables the circuit to achieve low phase jitter performance over a wide operating temperature range. The oscillator is housed in a hermetically sealed leadless surface mount package and offered on tape and reel. It has a tri-state Output Enable function that provides one of three conditions: Outputs Enabled, Outputs Set, or Outputs Disabled.

Features

- Industry Standard Package: 5.0 x 7.0 x 1.8 mm^3
- Output Frequencies: 600 MHz to 2.3 GHz
- 5th Generation ASIC Technology for Low Jitter 55 fs-rms (f_N = 1.8 GHz, 12 kHz to 20 MHz)
- Absolute Pull Range: ±50 ppm
- Supply Voltage: 3.3 V
- LVDS Compatible Outputs (f_N < 1.2 GHz)
- Differential or SE Sinewave Outputs (f_N ≥ 1.2 GHz)
- Tri-State Output Enable (OE / OS / OD)
- Compliant to EU RoHS 6 Directive

Applications

- High Speed Data Converters (ADC / DAC)
- Optical Transport Networks (40G / 100G / 200G / 400G)
- Wireless Communication
- Cable Modem Termination Systems (DOCSIS)

Block Diagram

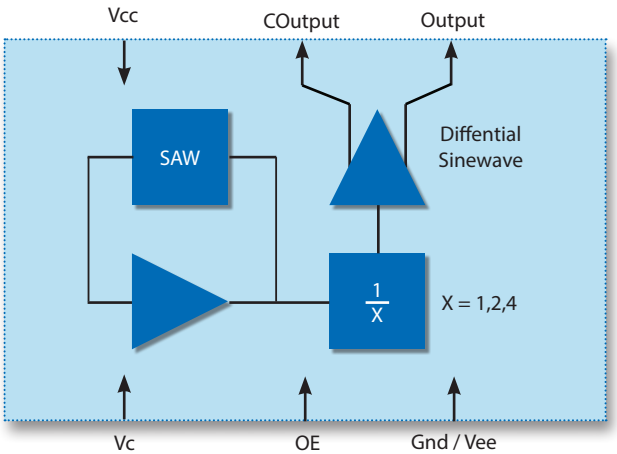

Figure 1. Functional block diagram

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Performance Specifications

Electrical Performance						
Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes
Frequency						
Nominal Frequency	f_N	600		2300	MHz	1,3
Absolute Pull Range	APR	±50			ppm	1,3,4
Gain Transfer	K_V		+200		ppm/V	4
Temperature Stability	f_{STAB}		±50		ppm	1
Supply						
Voltage (± 10%)	V_{CC}	2.97	3.3	3.63	V	3
Current (Typical 50 Ω Load)	I_{EE}		80		mA	2,3
Outputs (f_N <1.2 GHz)						
LVDS Output Power (0.7 GHz to 0.9 GHz) Output Power (0.9 GHz to 1.2 GHz)		 -1.5 -2			 dBm dBm	 2,3 2,3
Outputs (f_N ≥ 1.2 GHz)						
Single Ended Sinewave Output Power (> 1.20 GHz to < 1.90 GHz) Output Power (≥ 1.91 GHz to < 2.30 GHz)			 -4 -6		 dBm dBm	
Differential Sinewave Differential Swing (f_N = 1.2GHz) Differential Swing (f_N = 1.8GHz) Differential Swing (f_N = 2.1GHz) Differential Swing (f_N = 2.3GHz)			 1100 900 800 650		 mV mV mV mV	
Subharmonics			< -85		dBc	
Harmonics (f_N > 2.1GHz)			< -25		dBc	
Outputs (600 MHz < f_N < 2.3 GHz)						
Spurious Suppression (Non-Harmonic)		85	90		dBc	
Symmetry	SYM	45	50	55	%	3
Jitter (10 kHz to 40 MHz) (12 kHz to 20 MHz)	 ΦJ ΦJ		 70 55		 fs-rms fs-rms	
Control Voltage						
Control Voltage	V_C	0.3		3.0	V	3
Modulation Bandwidth	BW		50		kHz	
Operating Temperature	T_{OP}	-40		+85	°C	1,3
Package Size			5.0 x 7.0 x 1.8		mm^3	

Notes:

1. *See Standard Frequencies and Ordering Information (Pg 6).*
2. *Output power levels degrade linearly over the whole frequency range. Given values are worst case values for each frequency range.*
3. *Parameters are tested at ambient temperature with test limits guard-banded for specified operating temperature.*
4. *Tested with Vc = 0.3V to 3.0V.*
5. *The Vc Model is described below (Fig 1).*

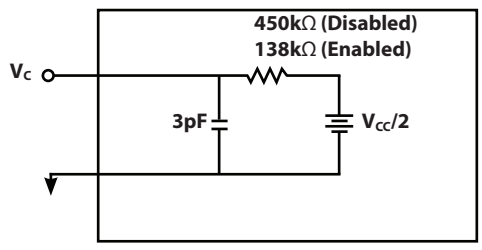


Figure 1. Vc Model - Outputs Enabled / Disabled

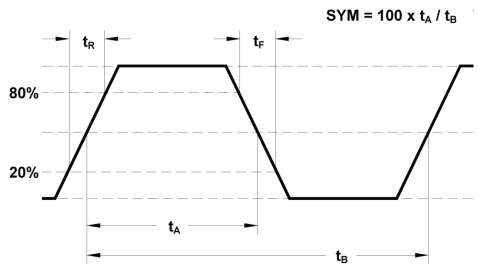


Figure 2. Waveform

Absolute Maximum Ratings

Absolute Maximum Ratings			
Parameter	Symbol	Ratings	Unit
Power Supply	V_{CC}	0 to 6	V
Voltage Control Range	V_C	0 to V_{CC}	V
Output Enable	OE	0 to V_{CC}	V
Storage Temperature	T_{STR}	-55 to 125	ºC
Soldering Temperature/Duration	T_{PEAK}/t_P	260 / 40	ºC/s

Stresses in excess of the absolute maximum ratings can permanently damage the device. Also, exposure to these absolute maximum ratings for extended periods may adversely affect device reliability. Functional operation is not implied at these or any other conditions in excess of those represented in the operational sections of this datasheet. Permanent damage is also possible if any device input (Vc or OE) draws >100 mA.

Performance Characteristics

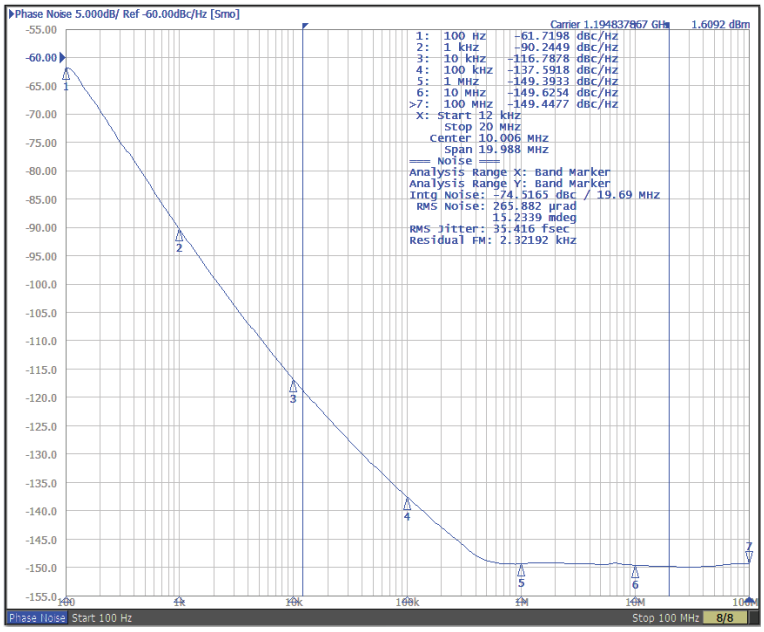


Figure 3. Performance Characteristics @ 1.2 GHz

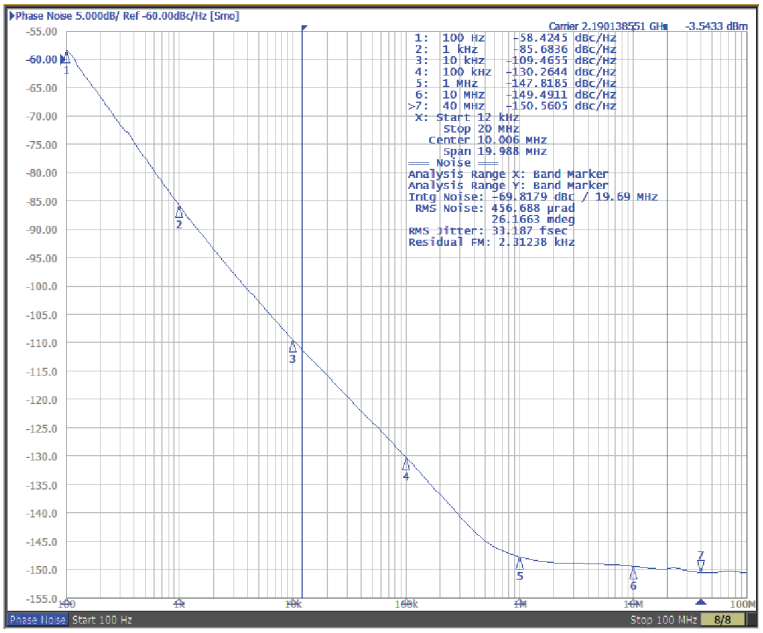
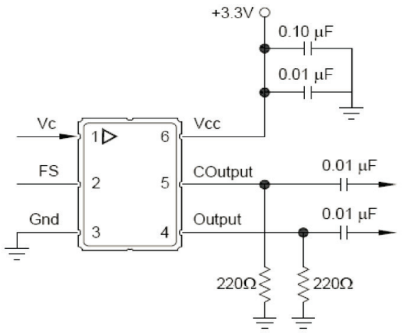


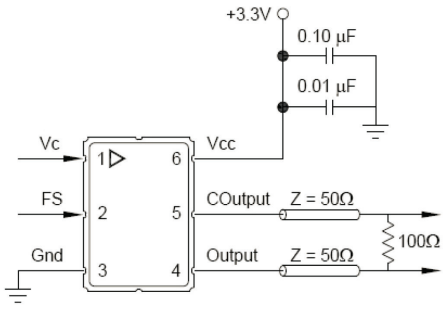
Figure 4. Performance Characteristics @ 2.2 GHz

Output Load Configuration

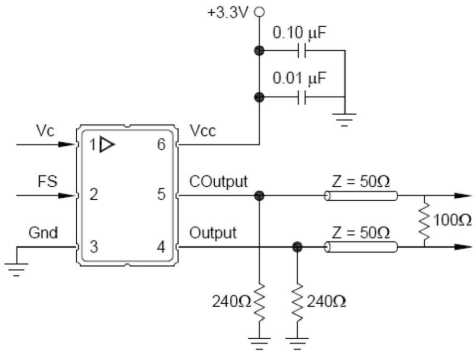
Differential Sinewave Output



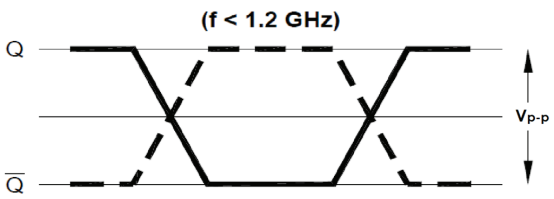
LVDS Output

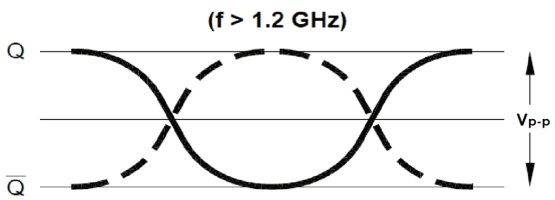


LVPECL Output



Output Waveform Definition





Reliability

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VS-708 family is capable of meeting the following qualification tests:

Environmental Compliance	
Parameter	**Conditions**
Mechanical Shock	MIL-STD-883, Method 2002
Mechanical Vibration	MIL-STD-883, Method 2007
Solderability	MIL-STD-883, Method 2003
Gross and Fine Leak	MIL-STD-883, Method 1014
Resistance to Solvents	MIL-STD-883, Method 2016
Moisture Sensitivity Level	IPC/JEDEC J-STD-020, MSL1

Handling Precautions

Although ESD protection circuitry has been designed into the VS-708 proper precautions should be taken when handling and mounting. VI employs a Human Body Model (HBM), a Charged Device Model (CDM), and a Machine Model (MM) for ESD susceptibility testing and design protection evaluation.

ESD Ratings		
Model	**Minimum**	**Conditions**
Human Body Model	2000 V	MIL-STD 883, Method 3015
Charged Device Model	1000 V	JEDEC, JESD22-C101
Machine Model	200 V	JEDEC, JESD22-A115-A

Reflow Profile (IPC/JEDEC J-STD-020)		
Parameter	**Symbol**	**Value**
PreHeat Time	t_S	60 s min., 180 s max.
Ramp Up	R_{UP}	3°C / s max.
Time Above 217°C	t_L	60 s min., 150 s max.
Time To Peak Temperature	t_{AMB-P}	480 s max.
Time At 260°C	t_P	20 s min., 40 s max.
Ramp Down	R_{DN}	6°C / s max.

The device has been qualified to meet the JEDEC standard for Pb-free assembly. The temperatures and time intervals listed are based on the Pb-free small body requirements. The temperatures refer to the topside of the package, measured on the package body surface. The VS-708 device is hermetically sealed so an aqueous wash is not an issue.

Terminal Plating: Electroless Au > 1.50 µm over
Electroless Ni > 1.90 µm

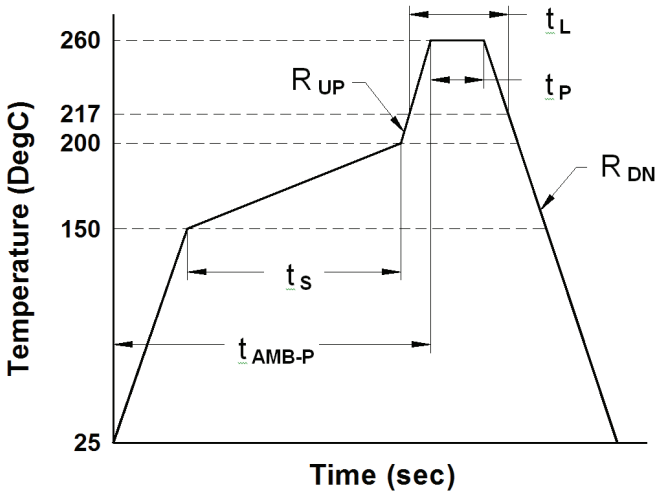
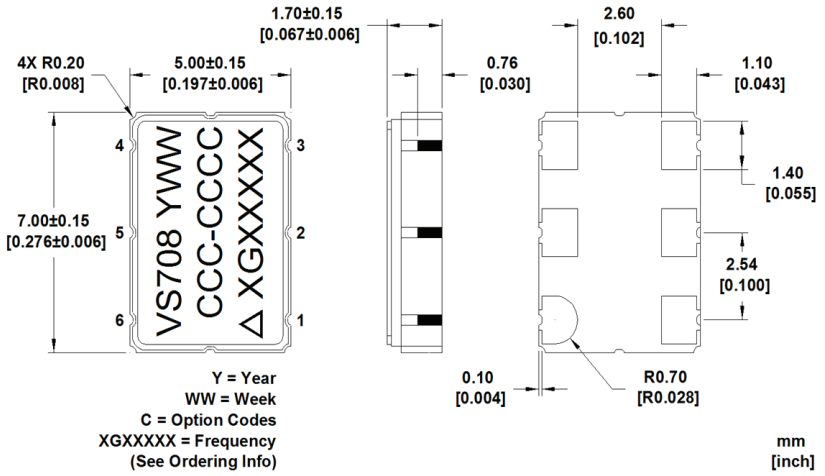
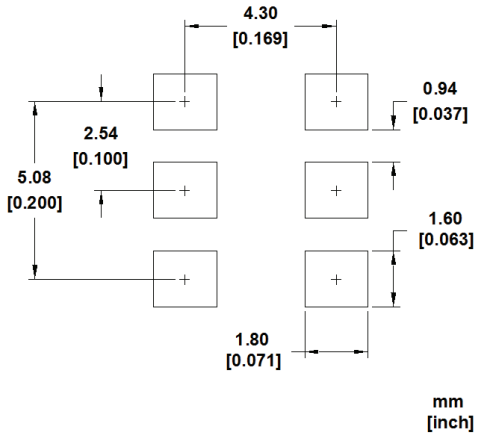


Figure 5. Recommended Reflow Profile

Outline Drawing & Pad Layout





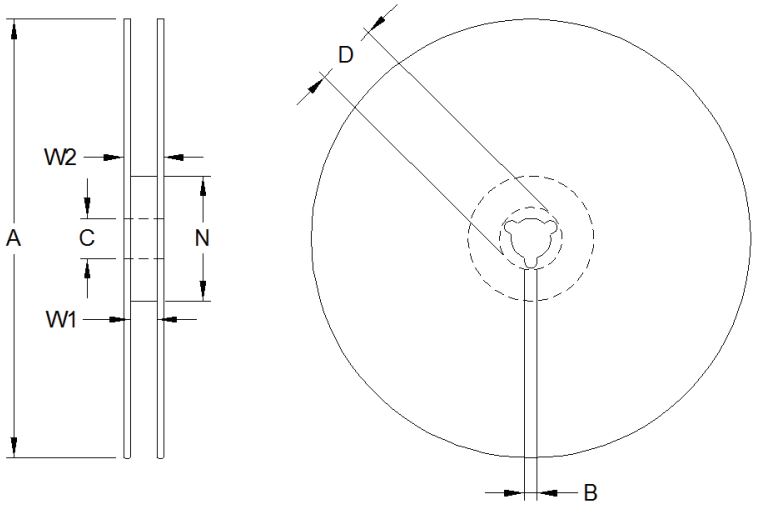
Pin Out		
Pin	**Symbol**	**Function**
1	V_C	Control Voltage
2	OE	Output Enable
3	GND	Case and Electrical Ground
4	Output	Output
5	COutput	Complementary Output
6	V_{CC}	Power Supply Voltage

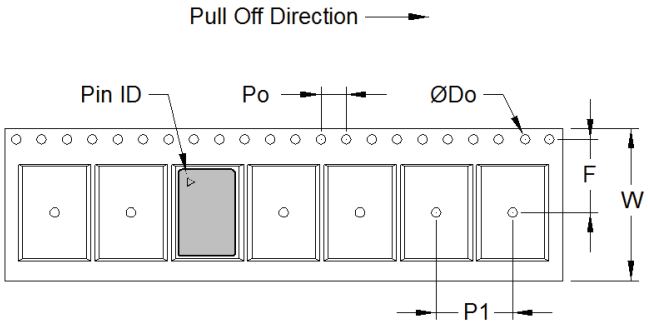
Floating OE Always Results In Outputs Enabled

Pin Out			
Option	**OE**	**Voltage Range**	**Result**
A	H	$(5V_{CC} / 6)$ to V_{CC}	OE
	M	$(V_{CC} / 2) \pm 15\%$ $(V_{CC} / 2)$	OS
	L	Gnd to $(V_{CC} / 6)$	OD
B	H	$(5V_{CC} / 6)$ to V_{CC}	OD
	M	$(V_{CC} / 2) \pm 15\%$ $(V_{CC} / 2)$	OS
	L	Gnd to $(V_{CC} / 6)$	OE

OE = Outputs Enabled
OS = Outputs Set (Output = H, COutput = L)
OD = Outputs Disabled

Tape and Reel (EIA-481-2-A)





Tape Dimensions (mm)						Reel Dimensions (mm)							
Dimension	**W**	**F**	**Do**	**Po**	**P1**	**A**	**B**	**C**	**D**	**N**	**W1**	**W2**	**#Per Reel**
Tolerance	**Typ.**	**Typ.**	**Typ.**	**Typ.**	**Typ.**	**Typ.**	**Min.**	**Typ.**	**Min.**	**Min.**	**Typ.**	**Max.**	
VS-708	16	7.5	1.5	4	8	178	1.5	13	20.2	50	16.4	22.4	200

Ordering Information

Standard Frequencies (MHz)						
873.515420	983.040000	993.409690				

Standard Frequencies (GHz)						
1.1950000	1.22880000	1.47456000	1.74703084	1.8750000	1.96608000	1.98681938

Other Frequencies Available Upon Request

Ordering Information

VS- 708 - E G U - K A A N - xGxxxxxxxx

Product Family
VS: VCSO

Package
708: 5.0 x 7.0 x 1.8 mm^3

Supply Voltage
E: 3.3 V

Output
C: LVPECL*
G: Differential Sinewave *

Operating Temperature
U: 0°C to 85°C
E: -40°C to 85°C

Absolute Pull Range
K: ± 50 ppm

Frequency (See Above)
600M000000 - 2G30000000

Factory Use
N: N/A

Oscillator Gain
A: Standard

Enable Logic (Float Condition)
A: H=OE, M=OS, L=OD (OE)
B: H=OD, M=OS, L=OE (OE)

Example: **VS-708-EGE-KAAN-2G30000000**

*LVPECL and LVDS available for f_N <1.2GHz,
Differential Sinewave available for $f_N \geq$ 1.2GHz

Revision History		
Date	**Approved**	**Description**
19Jun2015	TM	Generation of development specification
18Nov2015	MK	Product image changed
16Feb2016	MK	Output type LVPECL added
13May2016	MK	Datasheet layout changed

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