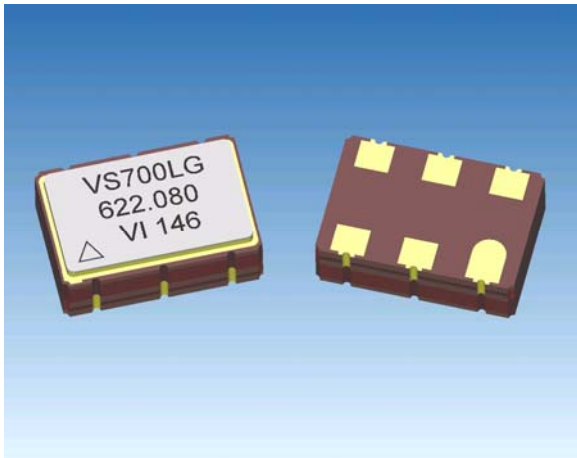



VS-700

Voltage Controlled SAW Oscillator



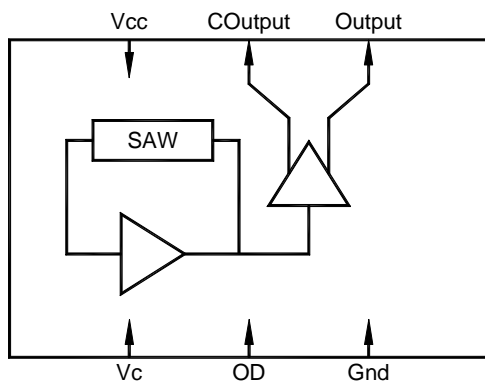
Features

- Industry Standard Package, 5.0 x 7.5 x 2.5 mm
- Output Frequencies from 500 MHz to 850 MHz
- 3.3 V Operation
- Low Jitter < 0.25 ps-rms across 50 kHz to 80 MHz
- LV-PECL Configuration with Fast Transition Times
- Complementary Outputs
- Output Disable Feature
-  Product is free of lead and compliant to EC RoHS Directive

Applications

PLL circuits for Clock Smoothing and Frequency Translation

<u>Description</u>	<u>Standard</u>
• 1-2-4 Gigabit Fibre Channel	INCITS 352-2002
• 10 Gigabit Fibre Channel	INCITS 364-2003
• 10GbE LAN / WAN	IEEE 802.3ae
• OC-192	ITU-T G.709
• SONET / SDH	GR-253-CORE Issue3
• WiMax	IEEE 802.16



Description

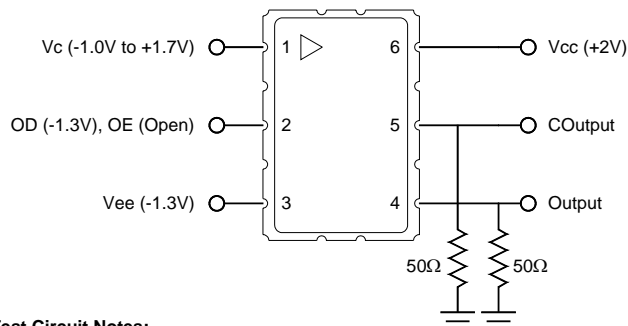
The VS-700 is a SAW based voltage controlled oscillator that operates at the fundamental frequency of the internal SAW filter. The SAW filter is a high-Q quartz device that enables the circuit to achieve low phase jitter performance over a wide operating temperature range. The oscillator is housed in a hermetically sealed leadless surface mount package offered on tape and reel. It has an output disable to facilitate on-board testing.

VS-700 Voltage Controlled SAW Oscillator

Electrical Performance

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes
Frequency						
Nominal Frequency	f_N		500 - 850		MHz	1,2,3
Absolute Pull Range	APR	±50			ppm	1,2,3,8
Linearity	Lin		±5		%	2,4,8
Gain Transfer (See Pg 5)	K_V		+390		ppm/V	2,8
Temperature Stability	f_{STAB}		±100		ppm	1,6
Supply						
Voltage	V_{CC}	2.97	3.3	3.63	V	2,3
Current (No Load)	I_{CC}		55	70	mA	3
Outputs						
Mid Level		$V_{CC}-1.5$	$V_{CC}-1.3$	$V_{CC}-1.1$	V	2,3
Swing		500	650	800	mV-pp	2,3
Current	I_{OUT}			20	mA	6
Rise Time	t_R		250	400	ps	5,6
Fall Time	t_F		250	400	ps	5,6
Symmetry	SYM	45	50	55	%	2,3
Spurious Suppression		50	60		dBc	6
Jitter (See Pg 5)	ϕ_J		0.120	0.250	ps-rms	6,7
Control Voltage						
Input Impedance	Z_c		100		$k\Omega$	6
Modulation Bandwidth	BW		500		kHz	6
Operating Temperature						
	T_{OP}	-40		85	°C	1,3
Package Size						
		5.0 x 7.5 x 2.5			mm	

1. See Standard Frequencies and Ordering Information (Pg 7).
2. Parameters are tested with production test circuit below (Fig 1).
3. Parameters are tested at ambient temperature with test limits guardbanded for specified operating temperature.
4. Measured as the maximum deviation from the best straight-line fit, per MIL-0-55310.
5. Measured from 20% to 80% of a full output swing (Fig 2).
6. Not tested in production, guaranteed by design, verified at qualification.
7. Integrated across 50 kHz to 80 MHz, per GR-253-CORE Issue3.
8. Tested with $V_c = 0.3V$ to $3.0V$.



Test Circuit Notes:

- 1) To Permit 50Ω Measurement of Outputs, all DC Inputs are Biased Down 1.3V.
- 2) All Voltage Sources Contain Bypass Capacitors to Minimize Supply Noise.
- 3) 50Ω Terminations are Within Test Equipment.

Figure 1. Test Circuit

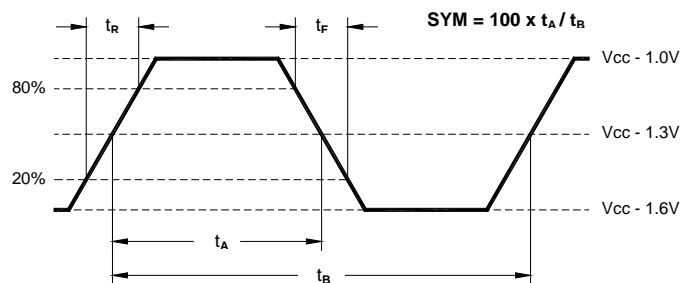
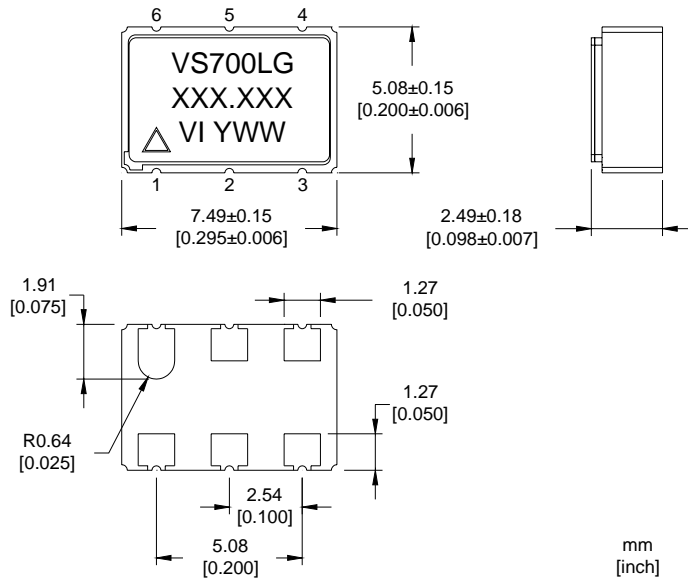


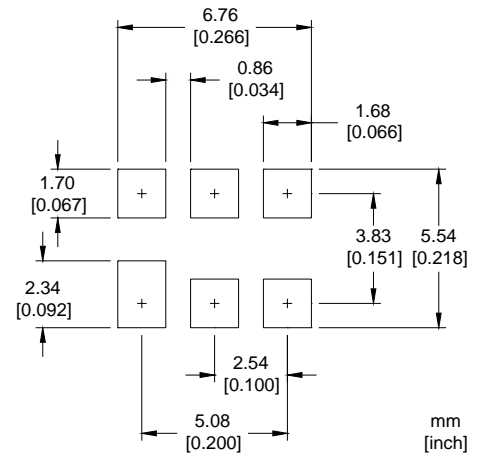
Figure 2. 10K LV-PECL Waveform

VS-700 Voltage Controlled SAW Oscillator

Outline Diagram



Suggested Pad Layout



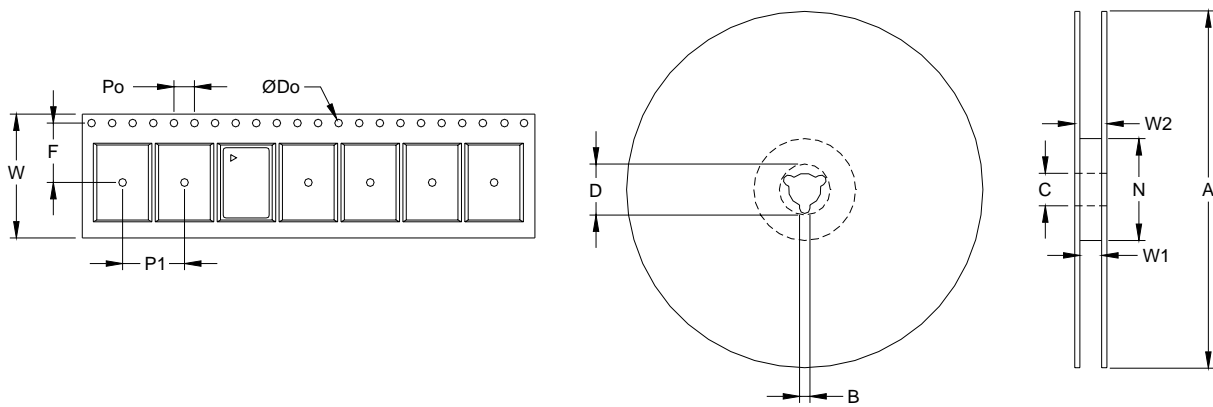
Pin Out

Pin	Symbol	Function
1	V _c	VCSO Control Voltage
2	OD	Output Disable Disabled = LV-CMOS Logic 0 (or Gnd) Enabled = LV-CMOS Logic 1 (or Open)
3	GND	Case and Electrical Ground
4	Output	VCSO Output
5	COutput	VCSO Complementary Output
6	V _{cc}	Power Supply Voltage (3.3 V ±10%)

Marking Key

Position 6	Position 7
L = LFF	G = GNN
	H = HNN

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-700	16	7.5	1.5	4	8	178	1.5	13	20.2	50	16.4	22.4	200

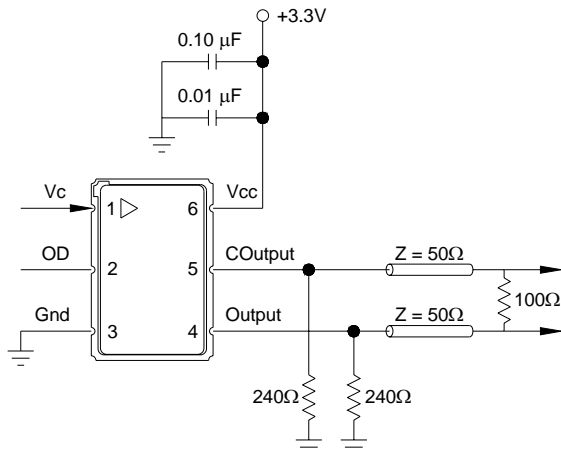
VS-700 Voltage Controlled SAW Oscillator

Absolute Maximum Ratings

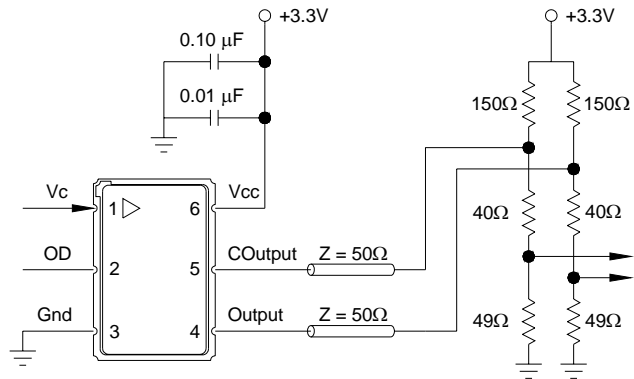
Parameter	Symbol	Ratings	Unit
Power Supply	V_{CC}	0 to 6	V
Input Current	I_{IN}	100	mA
Output Current	I_{OUT}	25	mA
Voltage Control Range	V_C	0 to V_{CC}	V
Storage Temperature	T_{STR}	-55 to 125	°C
Soldering Temperature / Duration	T_{PEAK} / t_P	260 / 40	°C / sec

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 (V_C or OD) draws >100 mA.

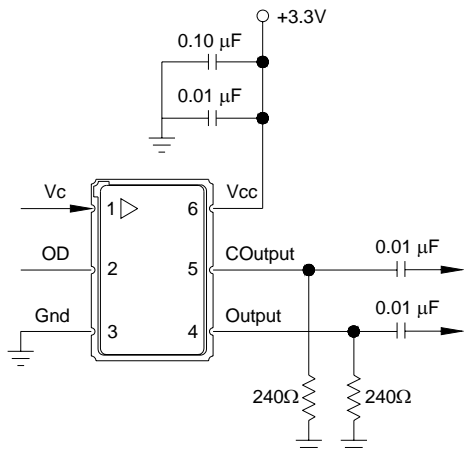
Suggested Output Load Configurations



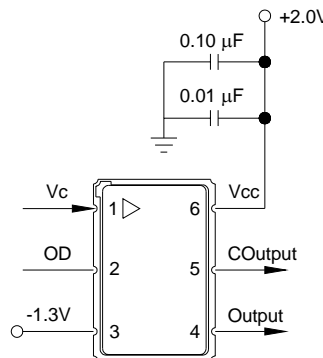
LV-PECL to LV-PECL: For short transmission lengths, the power consumption could be reduced by removing the 100Ω resistor and doubling the value of the pull down resistors.



LV-PECL to LVDS: Restricted for short transmission lengths. Configuration may require modification depending on LVDS receiver.



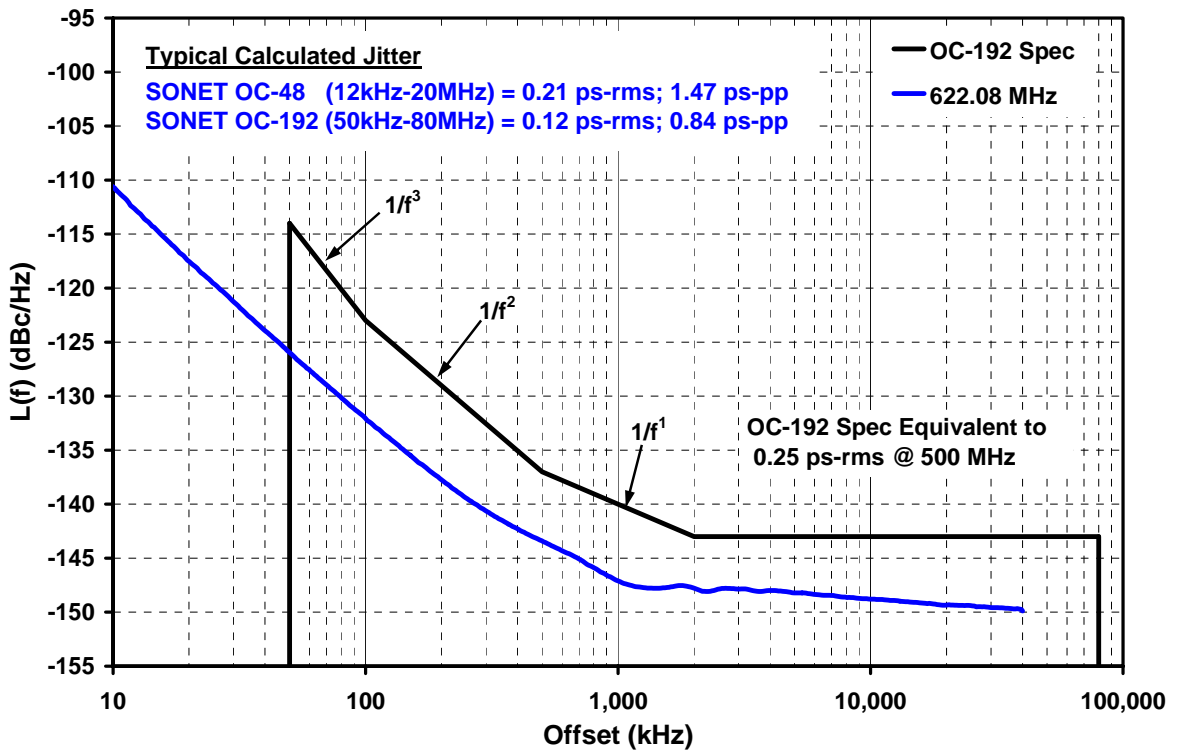
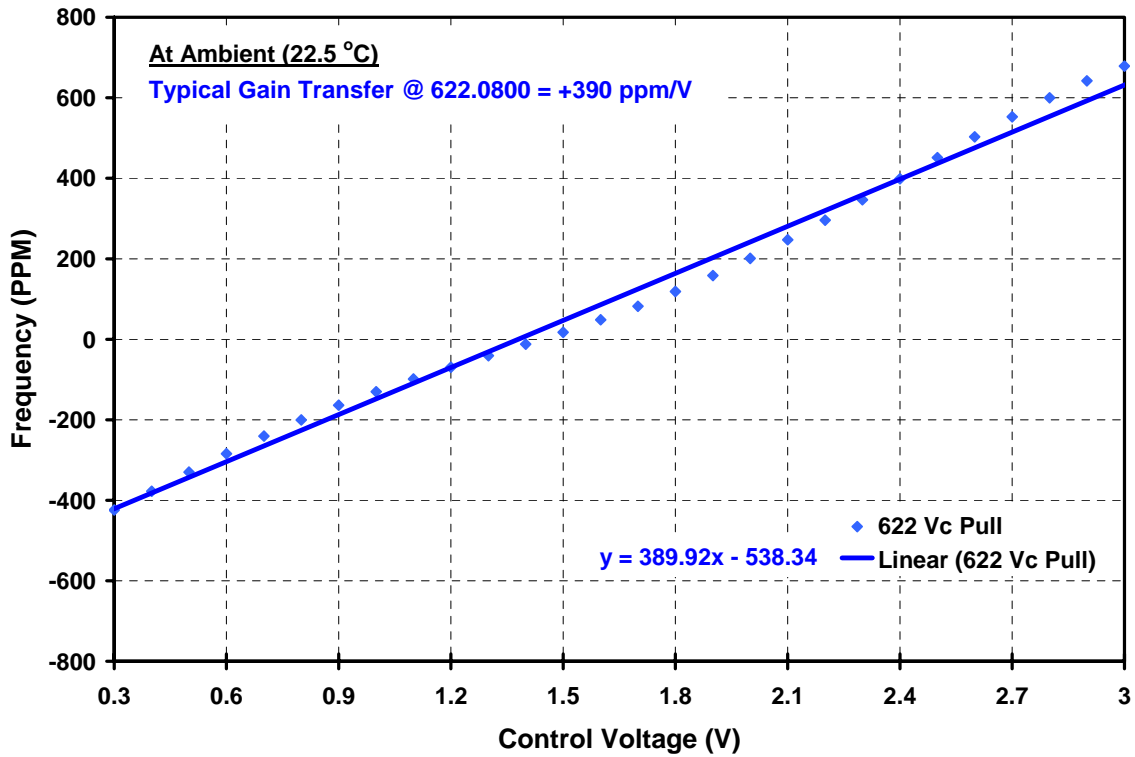
Functional Test: Allows standard power supply configuration. Since AC coupled, the LV-PECL levels cannot be measured.



Production Test: Allows direct DC coupling into 50Ω measurement equipment. Must bias the power supplies as shown. Similar to Figure 1.

VS-700 Voltage Controlled SAW Oscillator

Typical Characteristics



VS-700 Voltage Controlled SAW Oscillator

Reliability

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The VS-700 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

Handling Precautions

Although ESD protection circuitry has been designed into the VS-700 proper precautions should be taken when handling and mounting. VI employs a human body model (HBM) and a charged-device model (CDM) for ESD susceptibility testing and design protection evaluation.

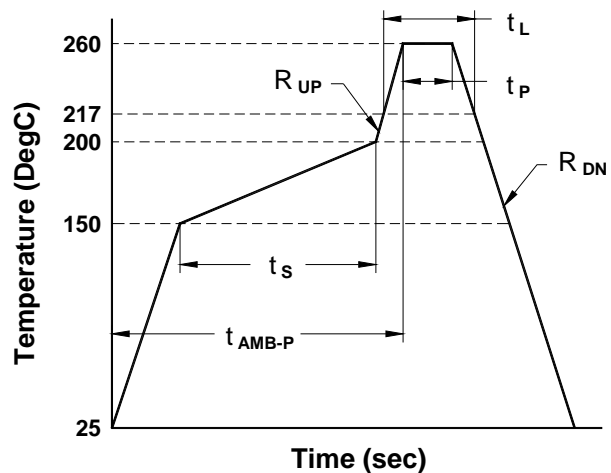
ESD Ratings

Model	Minimum	Conditions
Human Body Model	1500 V	MIL-STD 883, Method 3015
Charged Device Model	1000 V	JEDEC, JESD22-C101

Reflow Profile (IPC/JEDEC J-STD-020C)

Parameter	Symbol	Value
PreHeat Time	t_s	60 sec Min, 180 sec Max
Ramp Up	R_{UP}	3 °C/sec Max
Time Above 217 °C	t_L	60 sec Min, 150 sec Max
Time To Peak Temperature	t_{AMB-P}	480 sec Max
Time At 260 °C	t_P	20 sec Min, 40 sec Max
Ramp Down	R_{DN}	6 °C/sec 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-700 device is hermetically sealed so an aqueous wash is not an issue.



VS-700 Voltage Controlled SAW Oscillator

Standard Frequencies (MHz)							
500.0000	531.2500	552.9600	569.1964	595.0560	622.0800	624.6938	625.0000
627.3296	629.9878	637.5000	639.1200	640.0000	644.5313	647.2394	648.8064
657.4219	660.1842	666.5143	669.3266	669.6429	670.8386	672.1627	673.4566
674.2788	690.5692	693.4830	693.7500	704.3806	707.3527	709.3750	716.5732
718.7500	719.7344	737.2800	748.0709	750.0000	777.6000	779.5686	780.8810
781.2500	796.8750	800.0000	805.6641	809.0635	838.8608		

Other frequencies available upon request

Ordering Information

VS - 700 - L F F - G N N - xxx.xxx

Product Family

VS: VCSO

Package

700: 5.0 x 7.5 x 2.5 mm

Input

L: 3.3 V

Output

F: LV-PECL

Frequency (See Above)

500 - 850 MHz

Other (Future Use)

N: N/A

Other (Future Use)

N: N/A

Absolute Pull Range

G: +/- 50 ppm

H: +/- 100 ppm

Operating Temperature

F: -40 to 85 °C

For Additional Information, Please Contact:



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