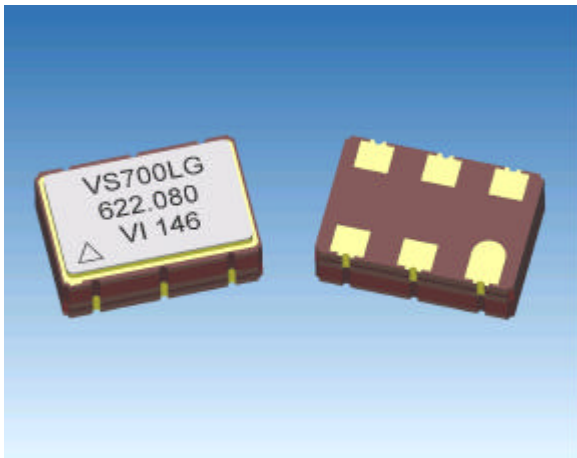


## VS-700

### Voltage Controlled SAW Oscillator



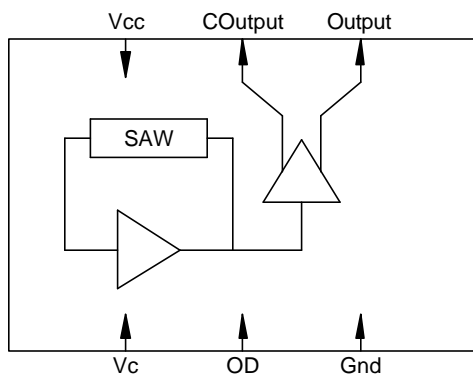
#### Features

- 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 < 0.20 ps-rms across 50 kHz to 80 MHz
- LV-PECL Configuration with Fast Transition Times
- Complementary Outputs
- Output Disable Feature
- Fully Compatible for Lead Free Assembly

#### 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



#### Description

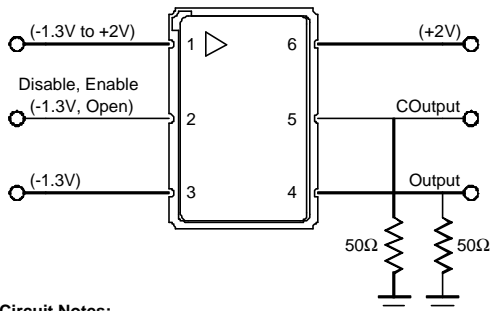
The VS-700 is a SAW based voltage controlled oscillator that operates at the fundamental frequency of the internal SAW filter. The SAW filter is a high-Q quartz device that enables the circuit to achieve low phase jitter performance over a wide operating temperature range. The oscillator is housed in 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
<b>Frequency</b>						
Nominal Frequency	$f_N$		500 - 850		MHz	1,2,3
Absolute Pull Range	APR	$\pm 50$			ppm	1,2,3,8
Linearity	Lin		$\pm 5$		%	2,4,8
Gain Transfer (See Pg 5)	$K_V$		+390		ppm/V	2,8
Temperature Stability	$f_{STAB}$		$\pm 100$		ppm	1,6
<b>Supply</b>						
Voltage	$V_{CC}$	2.97	3.3	3.63	V	2,3
Current (No Load)	$I_{CC}$		55	70	mA	3
<b>Outputs</b>						
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)	$\phi_J$		0.120		ps-rms	6,7
<b>Control Voltage</b>						
Input Impedance	$Z_c$		100		$k\Omega$	6
Modulation Bandwidth	BW		500		kHz	6
<b>Operating Temperature</b>						
	$T_{OP}$	-40		85	$^{\circ}C$	1,3
<b>Package Size</b>						
		5.0 x 7.5 x 2.5			mm	

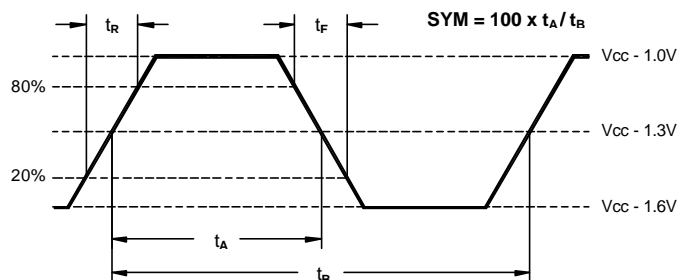
1. See Standard Frequencies and Ordering Information (Pg 7).
2. Parameters are tested with production test circuit below (Fig 1).
3. Parameters are tested at ambient temperature with test limits guardbanded for specified operating temperature.
4. Measured as the maximum deviation from the best straight-line 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.

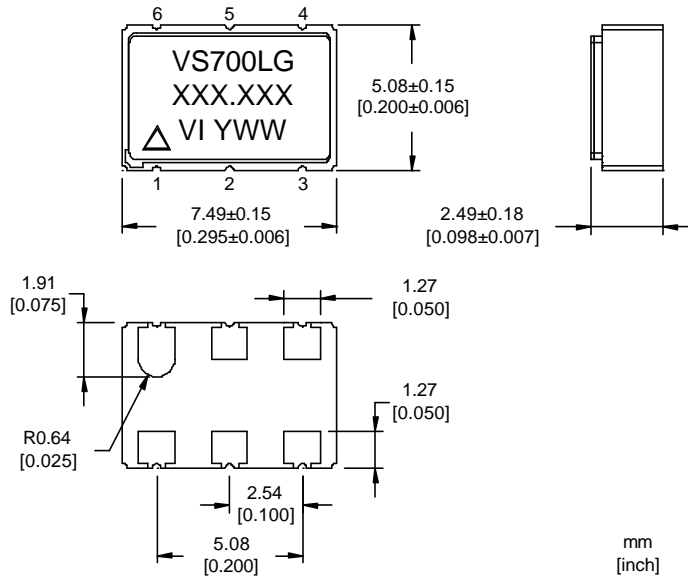
**Figure 1. Test Circuit**



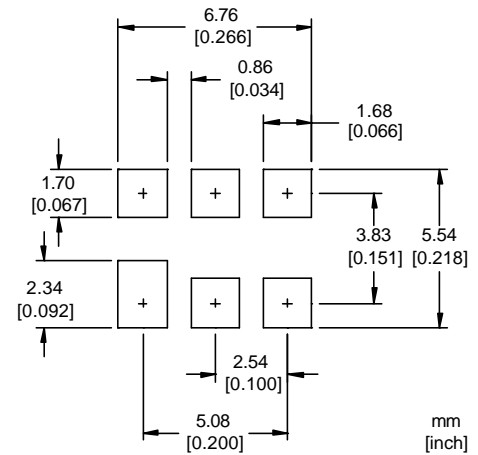
**Figure 2. 10K LV-PECL Waveform**

# VS-700 Voltage Controlled SAW Oscillator

## Outline Diagram



## Suggested Pad Layout



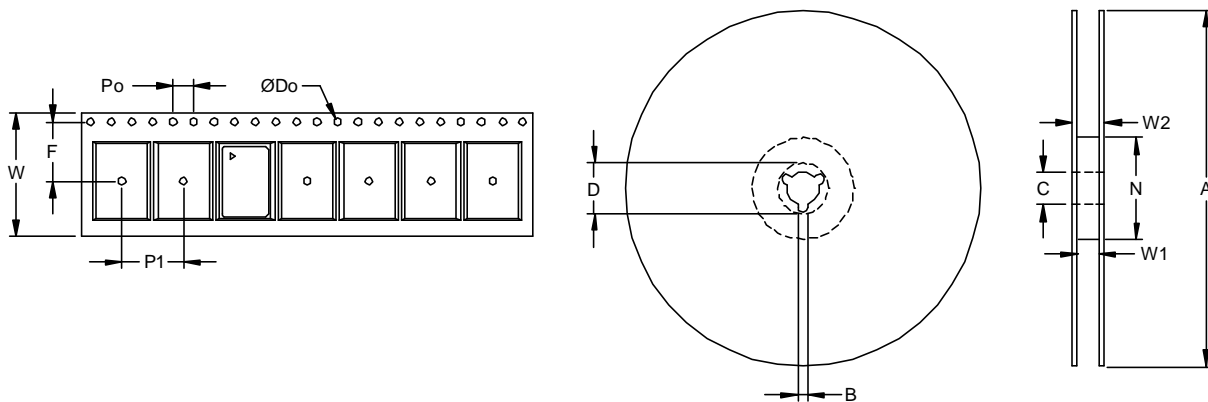
## Pin Out

Pin	Symbol	Function
1	V <sub>c</sub>	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 <sub>cc</sub>	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

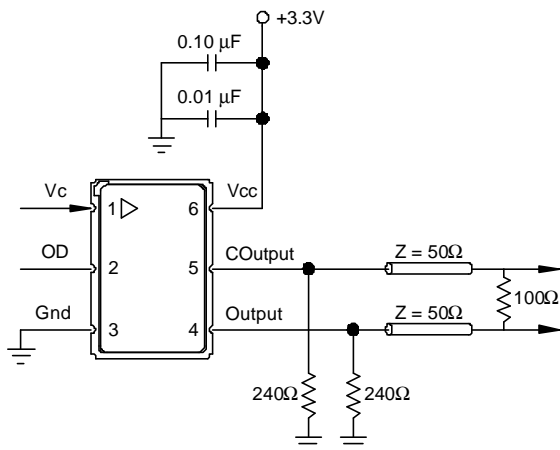
# VS-700 Voltage Controlled SAW Oscillator

## Absolute Maximum Ratings

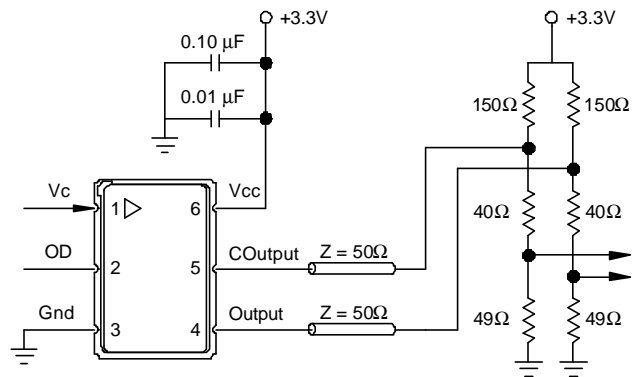
Parameter	Symbol	Ratings	Unit
Power Supply	$V_{CC}$	0 to 6	V
Output Current	$I_{out}$	25	mA
Voltage Control Range	$V_C$	0 to $V_{CC}$	V
Storage Temperature	TS	-55 to 125	°C
Soldering Temp/Time	$T_{Ls}$	220/10	°C/sec

Stresses in excess of the absolute maximum ratings can permanently damage the device. Functional operation is not implied at these or any other conditions in excess of conditions represented in the operational sections of this datasheet. Exposure to absolute maximum ratings for extended periods may adversely affect device reliability. Permanent damage is also possible if OD or  $V_C$  is applied before  $V_{CC}$ .

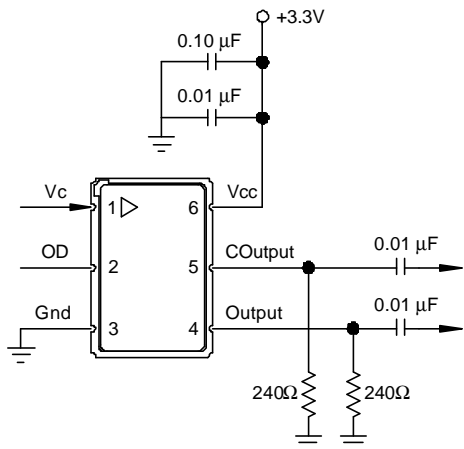
## Suggested Output Load Configurations



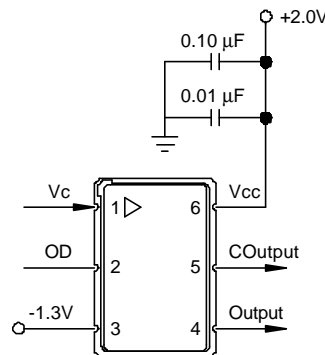
**LV-PECL to LV-PECL:** For short transmission lengths, the power consumption could be reduced by removing the 100Ω resistor and doubling the value of the pull down resistors.



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



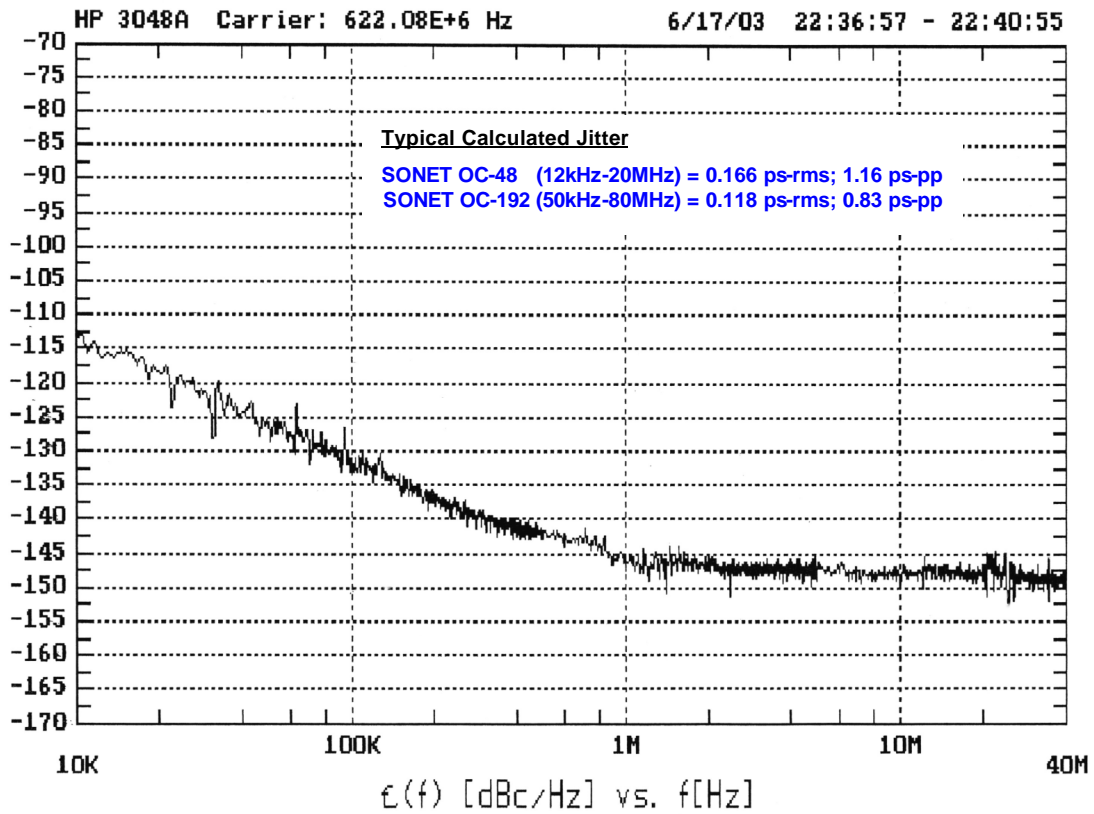
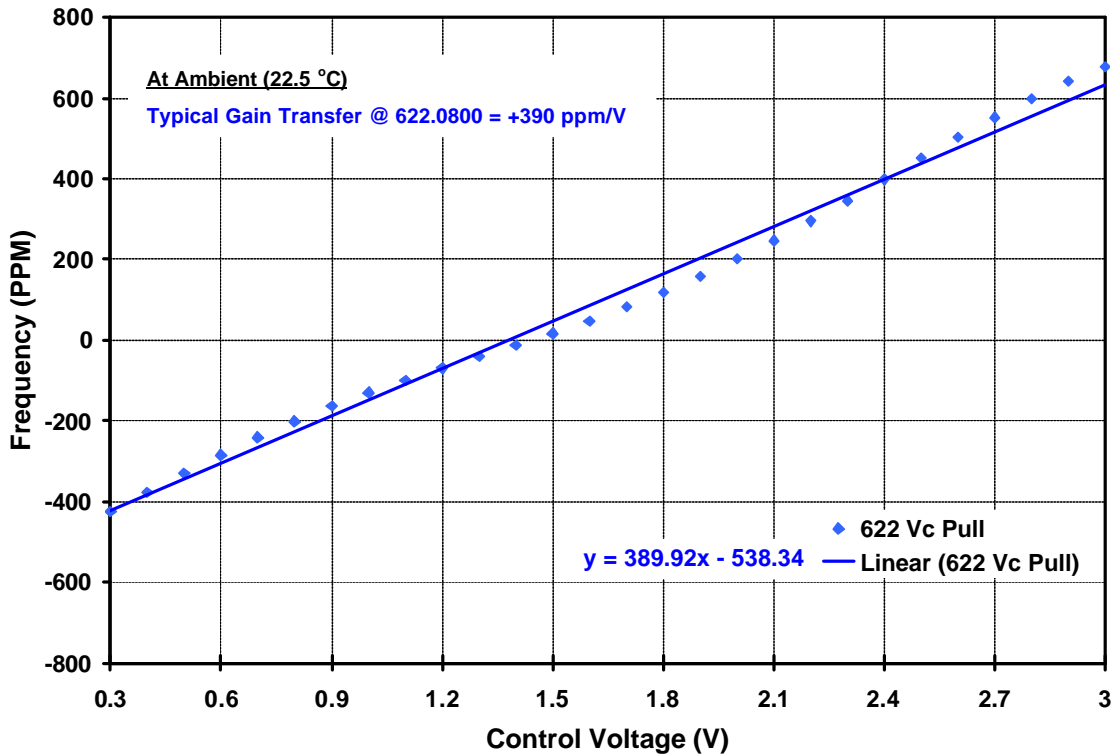
**Functional Test:** Allows standard power supply configuration. Since AC coupled, the LV-PECL levels cannot be measured.



**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.

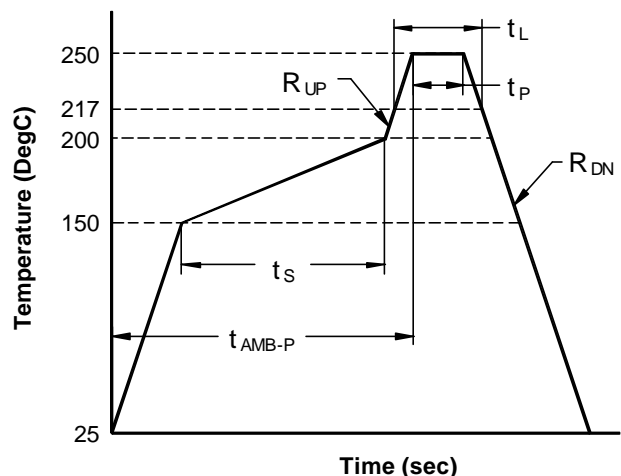
## ESD Ratings

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-020B)

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 250 °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 VS-700 device is hermetically sealed so an aqueous wash is not an issue.



# VS-700 Voltage Controlled SAW Oscillator



## Standard Frequencies (MHz)

531.2500	569.1964	622.0800	624.7048	625.0000	627.3296	629.9878	637.5000
644.5313	657.4219	666.5143	669.3266	669.6429	670.8386	672.1627	673.4566
690.5692	693.4830	693.7500	707.3527	716.5732	718.7500	719.7344	748.0709
750.0000	777.6000	779.5686	780.8810	781.2500	796.8750	805.6641	809.0635

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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 EUROPE: . . . . . Tel: +49 (0) 3328-4784-17 Fax: +49 (0) 3328-4784-30  
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