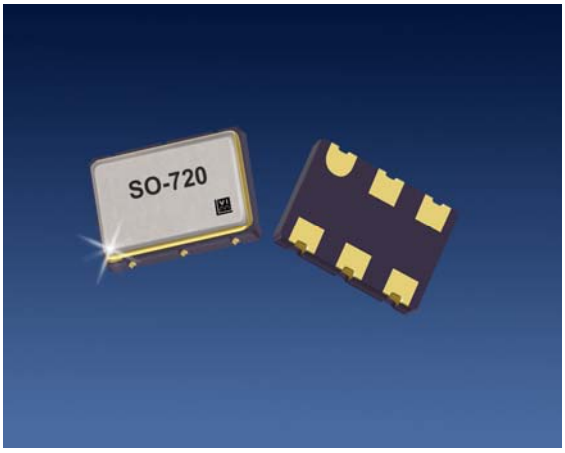
SO-720
SAW Based Clock Oscillator



Features

- Industry Standard Package, 5.0 x 7.5 x 2.0 mm
- ASIC Technology For Ultra Low Jitter
  - 0.100 ps-rms typical across 12 kHz to 20 MHz BW
  - 0.120 ps-rms typical across 50 kHz to 80 MHz BW
- Output Frequencies from 150 MHz to 1 GHz
- 3.3 V Operation
- LV-PECL or LVDS Configuration with Fast Transition Times
- Complementary Outputs
- Output Disable Feature
- Improved Temperature Stability over Standard SAW XO

Product is free of lead and compliant to EC RoHS Directive

Applications

Reference Clock for Wired and Wireless Products

Description	Standard
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

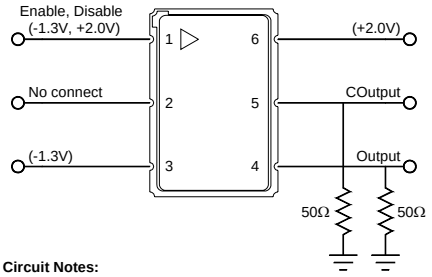
Description

The SO-720 is a SAW Based Clock Oscillator that achieves low phase noise and very low jitter performance.
The SO-720 is housed in an industry standard 6-Pad leadless ceramic package that is hermetically sealed. Packaging options include bulk or tape and reel.

Electrical Performance

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes
Frequency						
Nominal Frequency	f_N	150		1000	MHz	1,2
Frequency Stability (Ordering Option)	f_{STAB}		±50, ±100		ppm	1,2
Aging				10	ppm	6,8
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 - LVPECL		Vcc-1.4	Vcc-1.25	Vcc-1.0	V	2,3
Swing – LVPECL		450	600	750	mV-pp	2,3
Mid Level - LVDS		V_{CC}-2.4	Vcc-2.3	V_{CC}-2.5	V	2,3
Swing – LVDS		250	350	450	mV-pp	2,3
Current	I_{OUT}			20	mA	6
Rise Time	t_R			500	ps	5,6
Fall Time	t_F			500	ps	5,6
Symmetry	SYM	45	50	55	%	2,3
Jitter (12 kHz – 20 MHz BW) 622.08 MHz	ϕJ		0.100	0.250	ps-rms	6,7
Jitter (50 kHz – 80 MHz BW) 622.08 MHz	ϕJ		0.120	0.300	ps-rms	6,7
Period Jitter, RMS (622.08 MHz)	ϕJ		2.5	3.0	ps-rms	9
Period Jitter, Peak - Peak (622.08 MHz)	ϕJ		16	24	ps pk-pk	9
Operating Temp. (Ordering Option)	T_{OP}	0/70,-20/70 or -40/85			°C	1
Package Size		5.0 x 7.5 x 2.0			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 guard-banded 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 stated bandwidth per GR-253-CORE Issue3.
8. Aging Rate for 10 years (Aging is not part of overall frequency stability budget unless specified at time of order)
9. Broadband Period Jitter measured using Lecroy Wavemaster 8600A 6 GHz Oscilloscope, 250K samples taken.



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

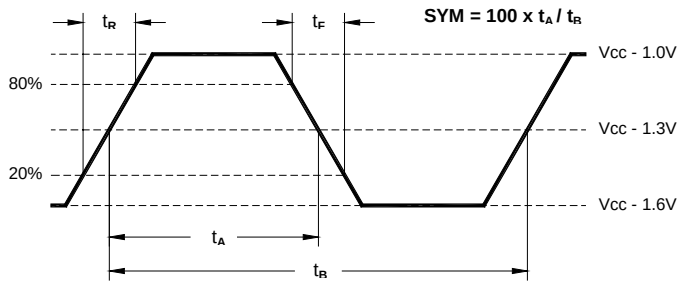
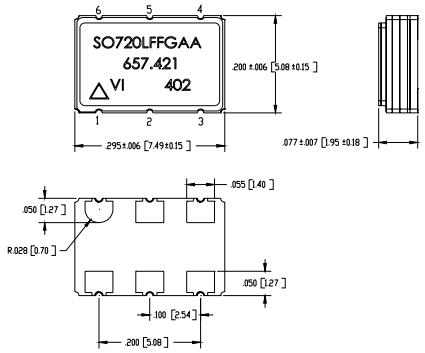


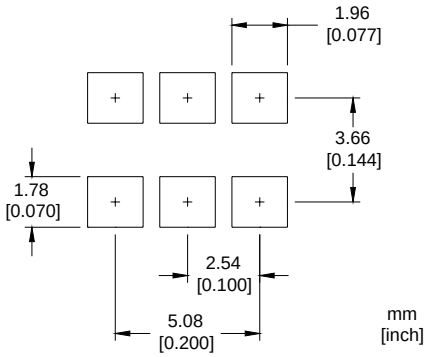
Figure 2. 10K LV-PECL Waveform

SO-720 SAW Clock Oscillator

Outline Diagram



Suggested Pad Layout



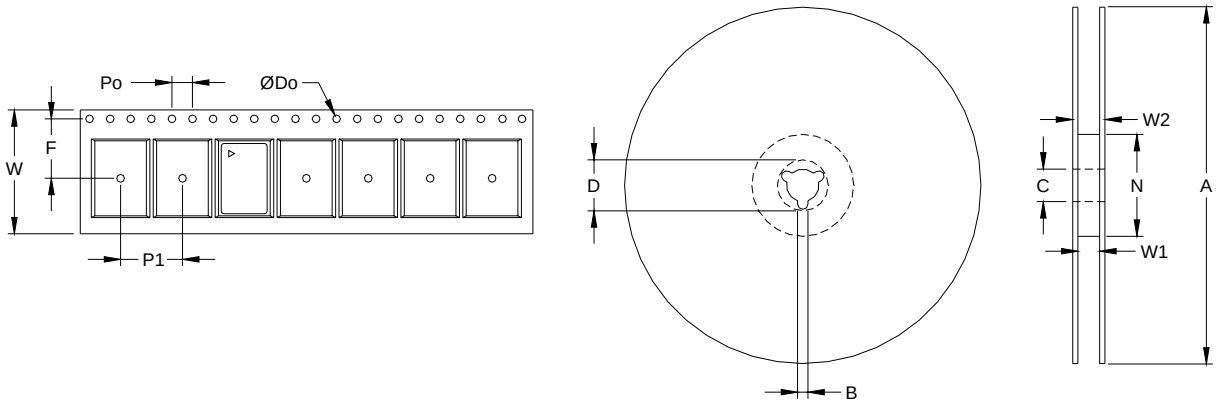
Pin Out

Pin	Symbol	Function
1	NC or OE[1]	NC or Enable = LV-CMOS Logic 0 or Ground Disabled = LV-CMOS Logic 1
2	OE[1] or NC	NC or Enable = LV-CMOS Logic 0 or Ground Disabled = LV-CMOS Logic 1
3	GND	Case and Electrical Ground
4	Output	Output
5	COutput	Complementary Output
6	V_{cc}	Power Supply Voltage (+3.3V ± 10%)

Note 1: For proper operation, chosen disable pin can not be left floating and a pin 1 or pin 2 enable option must be ordered

See page 7 for alternative input logic option

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



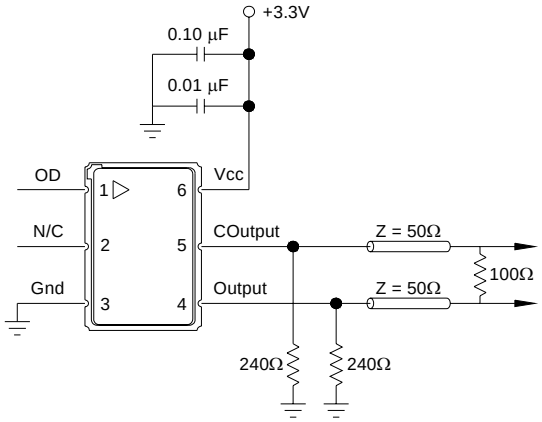
Tape Dimensions (mm)						Reel Dimensions (mm)							
Dimension	W	F	Do	Po	P1	A	B	C	D	N	W1	W2	# Per
Tolerance	Typ	Typ	Typ	Typ	Typ	Typ	Min	Typ	Min	Min	Typ	Max	Reel
SO-720	16	7.5	1.5	4	8	178	1.5	13	20.2	50	16.4	22.4	200

Absolute Maximum Ratings

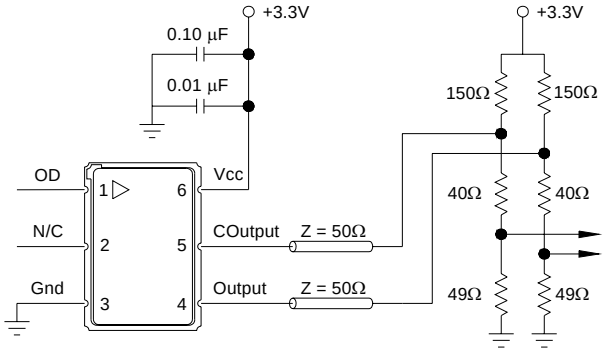
Parameter	Symbol	Ratings	Unit
Power Supply	V_{CC}	0 to 4	V
Output Current	Iout	25	mA
Storage Temperature	TS	-55 to 125	°C
Soldering Temp/Time	T_{LS}	260 / 40	°C/sec

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 is applied before Vcc.

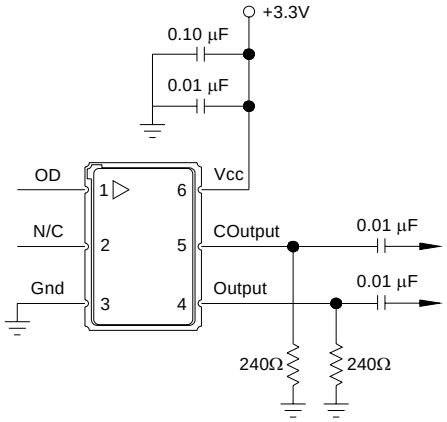
Suggested Output Load Configurations



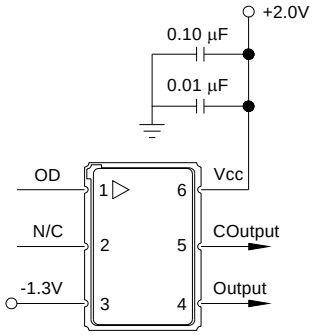
LV-PECL to LV-PECL: For short transmission lengths, the power consumption could be reduced by removing the 100Ω resistor and doubling the value of the pull down resistors.



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

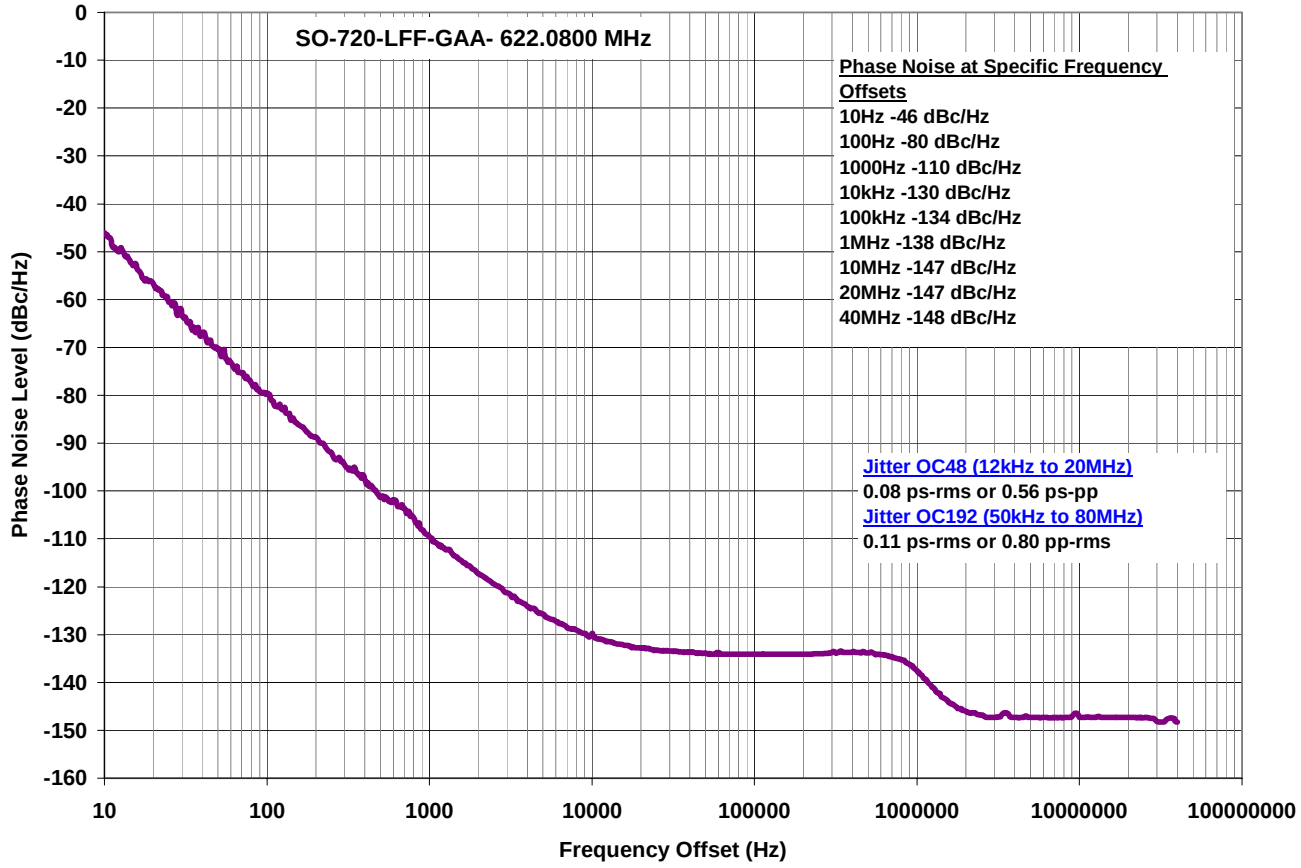


Functional Test: Allows standard power supply configuration. Since AC coupled, the LV-PECL levels cannot be measured.



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

Typical Phase Noise



Reliability

VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The SO-720 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 SO-720 proper precautions should be taken when handling and mounting. VI employs a Human Body model (HBM) and a Man-Man model (MM) for ESD susceptibility testing and design protection evaluation.

ESD Ratings

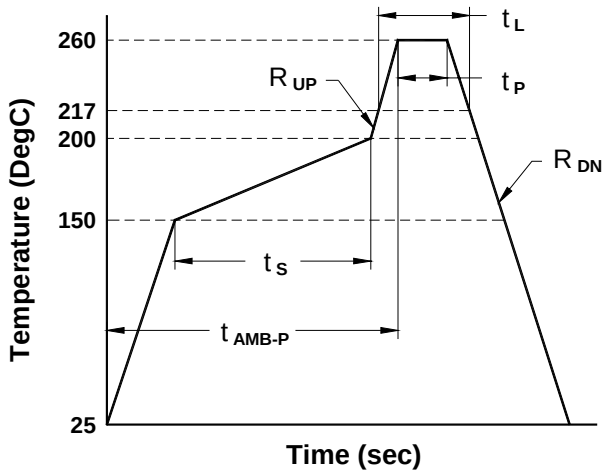
Model	Minimum	Conditions
Human Body Model	1500 V	MIL-STD 883, Method 3015
Man Man Model	200 V	V/JESD22-A115-A,

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

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 is designed 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 SO-720 device is hermetically sealed so an aqueous wash is not an issue.

Termination Plating: Electroless Gold Plate over Nickel Plate



SO-720 SAW Clock Oscillator

Standard Output Frequencies (MHz)

*155.5200	*156.2500	*160.0000	*175.0000	*187.5000	*194.8000	*200.0000	*240.0000
*250.0000	*268.8000	300.0000	311.0400	312.5000	320.0000	350.0000	375.0000
389.6000	400.0000	480.0000	500.0000	531.2500	532.0000	533.0000	537.6000
600.0000	622.0800	625.0000	640.0000	644.5313	657.4219	666.5143	669.3266
672.1627	690.5692	693.4830	704.3806	707.3527	720.0000	768.0000	796.8750
901.1200	1000.000						

Frequencies not shown are available upon request. *VCC6 is preferred XO for frequencies < 300 MHz

Revision Control

A	**6/21/06**	**Vectron Prod. Mgt.**	**Release of SO-720 Datasheet**
B	**11/28/07**	**Tim Glass**	**Increased Frequency Range to 1 GHz**

Ordering Information

SO - 720 - L F F - G A A - xxx.xxx

Product Family
SO = SO Based XO

Package
720 = 5.0 x 7.5 x 2.0 mm
6 Pad Ceramic SMD

Input
L = 3.3 Vdc ± 10%

Output
F = LVPECL (45/55% Symmetry)
P = LVDS (45/55% Symmetry)

Operating Temperature
C = 0°C to 70°C
D = -20ºC to 70ºC
F = -40°C to 85°C

Stability
G = ± 50 ppm maximum
H = ± 100 ppm maximum

Enable/Disable Pin & Input Logic
A = Pin 2: Enable Low (or Gnd) / Disable High
B = Pin 2: Enable High (or Vcc) / Disable Low
C = Pin 1: Enable Low (or Gnd) / Disable High
D = Pin 1: Enable High (or Vcc) / Disable Low

Overall Stability Condition
A = Includes 10 years of aging at 40ºC
N = Excludes aging

Frequency
150 - 1000 MHz

Not All Combinations Possible

For Additional Information, Please Contact:

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