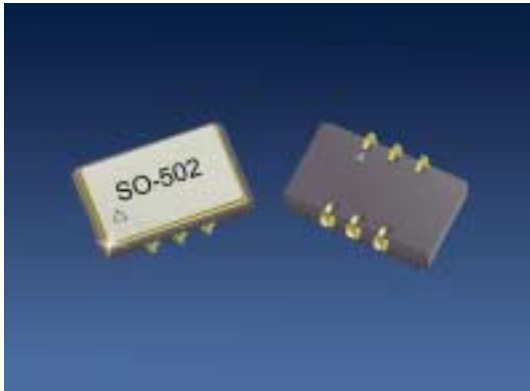


# SO-502 SAW Based Oscillator



Product Data Sheet  
**PRELIMINARY**

## SO-502 SAW Based Clock Oscillator



### Features

- Output frequencies from 300 MHz to 1350 MHz
- Ultra low jitter < 1.0 ps-rms (12 kHz to 20 MHz)  
< 1.0 ps-rms (50 kHz to 80 MHz)
- Small low profile 9.0 \* 14 \* 4.5 mm SMT package
- 3.3 V, 5.0 V and 12V Supply Options
- Low phase noise, -160 dBc/Hz @ 1 MHz offset (1 GHz)
- LV-PECL, PECL, or Sinewave (0 to +10 dBm into 50Ω)
- Output disable feature (For LVPECL - PECL option)

### Applications

- Point to Point / Point to Multi Point Radios
- Instrumentation
- Test & Measurement
- Military & Avionics

### Description

The SO-502 is a SAW based clock oscillator that operates at the fundamental frequency of the internal SAW resonator. This direct approach enables this series to achieve low phase noise and jitter performance at high output frequencies and over wide operating temperature range. The oscillator is housed in a hermetically sealed J-lead surface mount package offered on tape and reel. As an option, it has an output disable to facilitate on-board testing.

# SO-502 SAW Based Oscillator

**Table 1. Electrical Performance**

Parameter	Symbol	Minimum	Typical	Maximum	Units	Notes	
<b>Frequency</b>							
Center Frequency	$F_N$	300		1350	MHz	1,2	
Frequency Stability (Referenced to $F_O$ )	$F_{STAB}$			+50, -250	ppm	1,2,7	
Aging (10 years)				+50, -100	ppm	5	
<b>Supply</b>							
Voltage (B)	$V_{CC}$	11.4	12	12.6	V	2,3	
Voltage (C)	$V_{CC}$	4.75	5	5.25	V	2,3	
Voltage (D)	$V_{CC}$	3.135	3.3	3.450	V	2,3	
Current (No Load)	$I_{CC}$		55	70	mA	2,3	
<b>Output- Sinewave Options</b>							
Sinewave, into 50 $\Omega$ (G)	$P_O$	0			dBm	2,3	
Sinewave, into 50 $\Omega$ (J)	$P_O$	+7			dBm	2,3	
Sinewave, into 50 $\Omega$ (K)	$P_O$	+10			dBm	2,3	
Harmonics				-20	dBc	2,3	
Jitter @ 622.08 MHz (12 kHz to 20 MHz)			0.28		ps,rms	5,6	
Jitter @ 622.08 MHz (50 kHz to 80 MHz)			0.29		ps,rms	5,6	
<b>Output- PECL Logic Option (F)</b>							
Output Level Low	$V_{OL}$	$V_{CC}-1.95$		$V_{CC}-1.63$	V	2,3,4	
Output Level High	$V_{OL}$	$V_{CC}-0.98$		$V_{CC}-0.75$	V	2,3,4	
Rise & Fall Time	$t_R, t_F$		200	350	ps	2,3,4	
Symmetry (Duty Cycle)	SYM	45	49/51	55	%	2,3,4	
<b>Operating Temperature</b>		$T_{OP}$			See Ordering Table	$^{\circ}C$	1
<b>Package Size</b>		9.0 x 14.0 x 4.5			mm		

**Table Notes:**

1. See Standard Frequencies and Ordering Information
2. Parameters are tested with production test circuit
3. Parameters are tested at ambient temperature with test limits guard-banded for specified operating temperature.
4. Output levels are standard 100K PECL compatible and measured from 20% to 80% of a full output swing (Fig 1).
5. Not tested in production, guaranteed by design, verified at qualification.
6. Integrated across 12 kHz to 20 MHz or 50 kHz to 80 MHz per GR-253-CORE Issue3.
7. Maximum Frequency occurs at room temperature

**Table 2. Typical Single Side-Band Phase Noise (dBc/Hz) for Sinewave Output**

Output Frequency	100 Hz Offset	1 kHz Offset	10 kHz Offset	100 kHz Offset	1 MHz Offset
622.08 MHz	-70	-100	-125	-155	-160
1000 MHz	-70	-100	-125	-155	-160

# SO-502 SAW Based Oscillator

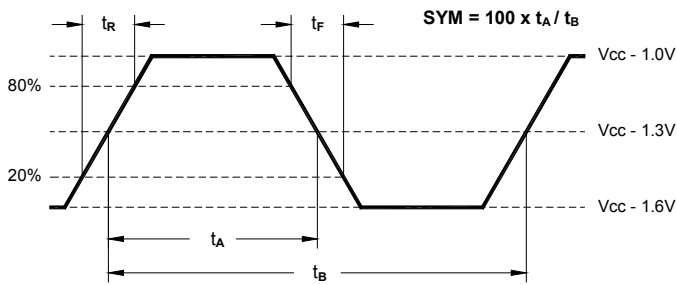
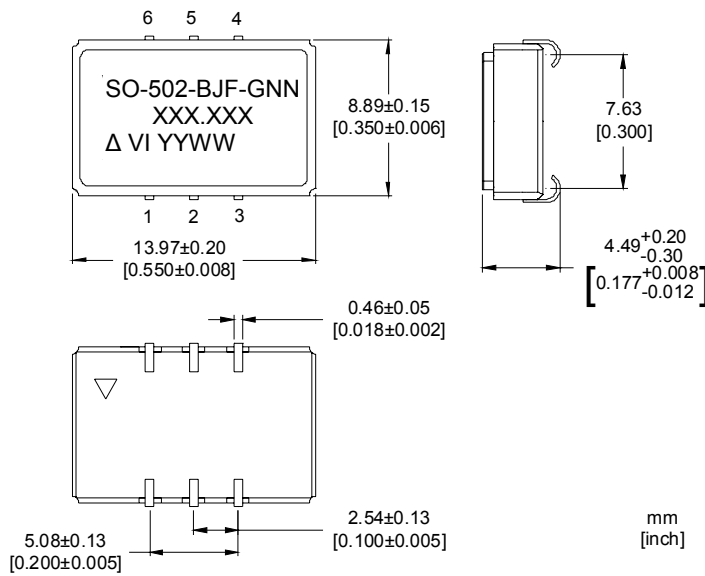
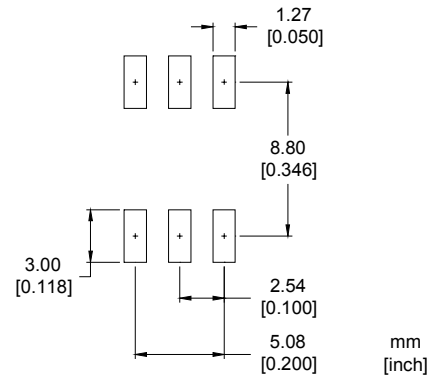


Figure 1. 100K PECL Waveform

## Outline Diagram



## Pad Layout



## Table 3. Pin Out – PECL Option

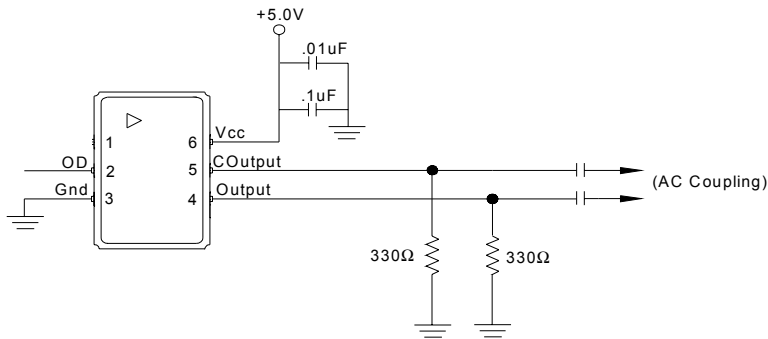
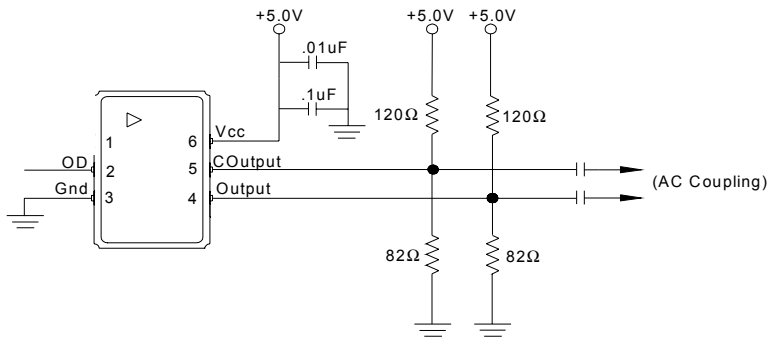
Pin	Symbol	Function
1	-	N/C
2	OD	N/C or Output Disable <sup>1</sup>
3	GND	Case and Electrical Ground
4	Output	Output
5	COutput	Complementary Output
6	V <sub>cc</sub>	Power Supply Voltage

**Table Notes:**

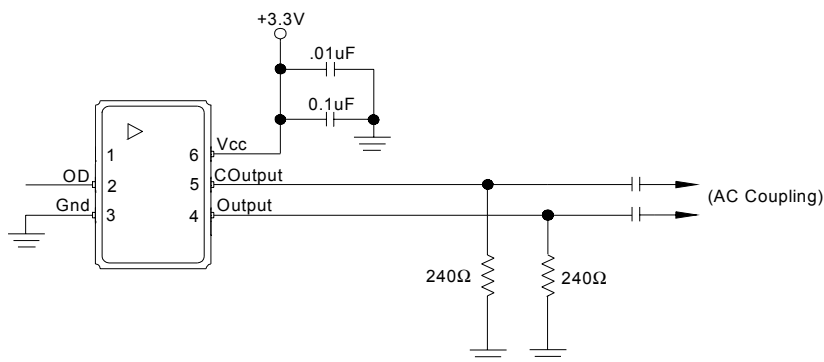
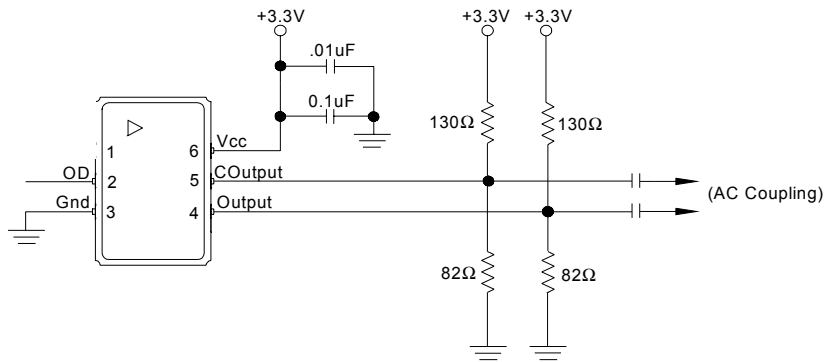
- By setting Output Disable pin low, the RF output is disabled and pin 4 is held high, pin 5 is held low. The threshold for Output Disable is 1.4V above pin 3. Output disable pin can be left floating for normal operation

# SO-502 SAW Based Oscillator

## Suggested Output Load Configurations – PECL Operation



## Suggested Output Load Configurations – LVPECL Operation



# SO-502 SAW Based Oscillator

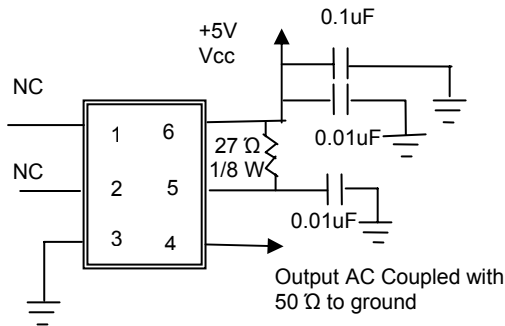
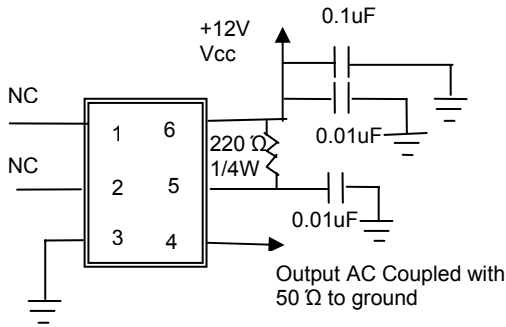
**Table 4. Pin Out – Sinewave Option**

Pin	Symbol	Function
1	V <sub>c</sub>	N/C
2	-	N/C
3	V <sub>EE</sub>	Ground
4	Output	Sinewave Output
5	V <sub>CC</sub>	V <sub>CC2</sub> <sup>1</sup>
6	V <sub>CC</sub>	V <sub>CC1</sub>

**Table Notes:**

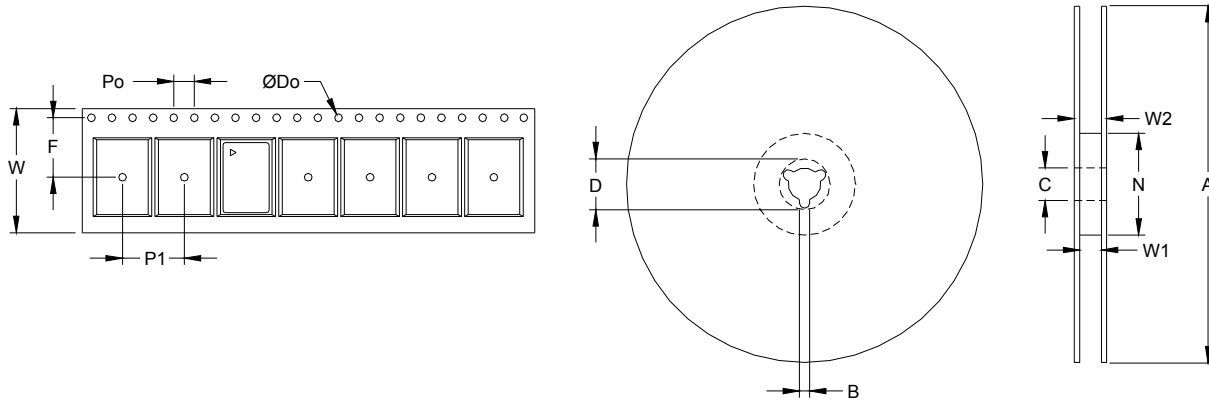
1. If V<sub>CC1</sub> is +12V and a separate 5V is not applied to pin 5 then pin 5 must be connected through a 220Ω 1/4W external resistor.

## Suggested Output Load Configurations – SINEWAVE Operation



# SO-502 SAW Based Oscillator

## 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	
SO-502	24	11.5	1.5	4	12	330	1.5	13	20.2	100	24.4	30.4	200

## Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Power Supply	$V_{CC}$	$V_{CC} + 1.0V$	V
Storage Temperature	$T_s$	-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.

## Reliability

The SO-502 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

# SO-502 SAW Based Oscillator

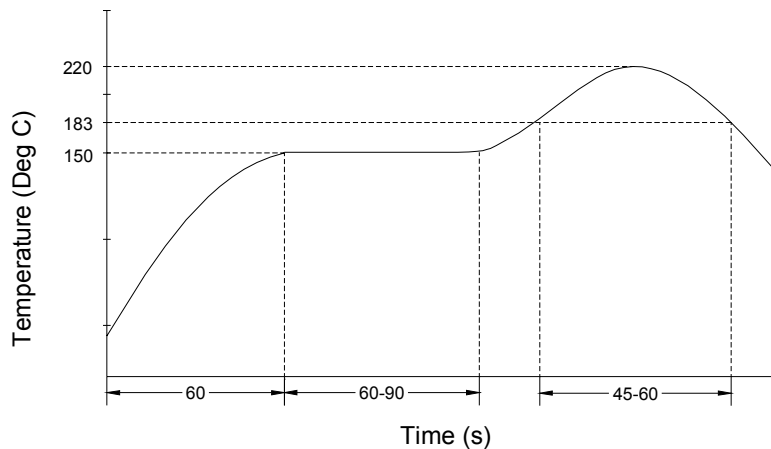
## Handling Precautions

Although ESD protection circuitry has been designed into the SO-502 proper precautions should be taken when handling and mounting. VI employs a human body model 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	JESD 22-C101

## Recommended Solder Reflow Profile



VI qualification includes aging at various extreme temperatures, shock and vibration, temperature cycling, and IR reflow simulation. The conditions a device can withstand are well understood and devices can be subjected to the profile above. This profile shows a ramp up condition to prevent thermal shock, a preheat period in which the flux is activated, a ramp up to 183°C which is the reflow temperature of Sn/Pb eutectic, and a gradual cool down. The time above 183°C should not exceed 60 seconds and the peak temperature should be no more than 220°C for 10 seconds. The SO-502's are hermetically sealed so an aqueous wash is not an issue.

# SO-502 SAW Based Oscillator

## Available Standard Frequencies (MHz)

480	622.08	640	938	970	983.04
990	1000	1090	1200	1330	

Other Frequencies Available Upon Request.

## Ordering Information

### SO – 502 - B J C - G N N – xxxx.xxxx

**Product Family**

SO: SAW XO

**Package**

502: 9 x 14 x 4.5 mm

**Input**

D: 3.3 V

C: 5.0 V

B: 12.0 V

**Output**

F: PECL

G: Sine  $\geq 0$  dBm

H: Sine  $\geq 3$  dBm

J: Sine  $\geq 7$  dBm

K: Sine  $\geq 10$  dBm

**Operating Temperature**

C: 0°C to +70 °C

D: -20°C to +85 °C

F: -40°C to +85 °C

**Frequency (See Above)**

300 – 1350 MHz

**Other (Future Use)**

N: N/A

**Other (Future Use)**

N: N/A

**Frequency Stability**

L:  $\pm 130$  ppm (0°C to +70 °C only)

T:  $\pm 200$  ppm

## For Additional Information, Please Contact:



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