XO5002AH
High Performance
3rd Overtone Crystal Oscillator IC

Features

- Wide range of operating supply voltage: 2.2 to 5.5V
- Recommended oscillation frequency range -40MHz to 55MHz
- -40 to 85℃ operating temperature range
- High Performance(Low Phase Noise/Low Jitter)
- High Frequency VS Vdd Stability <+/-1ppm
- Ultra-Low Drive Level
- Ultra-low Power Current
- Standby function
- High impedance in standby mode, oscillator stops
- CMOS output duty level(1/2VDD)
- 50±5% output duty
- 50pF output drive capability
- Die form or Wafer form

Description

The XO5002Lx series are miniature crystal oscillator module ICs. The oscillator circuit stage has Voltage regulator , significantly reducing current consumption and crystal current, compared with existing devices, and significantly reducing the oscillator characteristics supply voltage dependency.

Application

- Used for crystal oscillator
- 7050, 5032 Crystal Oscillator(XO5002LB-2/8DE)
- 3225, 2520,Crystal Oscillator(XO5002LB-3/5DE)

Ordering Information

Part no.	Package type
XO5002AH-zWF	Wafer form
XO5002AH-zDE	Die form

Note: 1.Below is the detailed definition of part no.
Note: 2. x: F/A/B/C/D, z: -2(220um) or -3(130um)， -4(100um), -5(150um), -8(180um)

XO 5002 AH - z

Device Type
Clock Series

XO 5002AH

Frequency Range

Oscillation frequency range, frequency divider function

Suffix	f_{output}	Frequency range
AH	40~55	40 to 55MHz

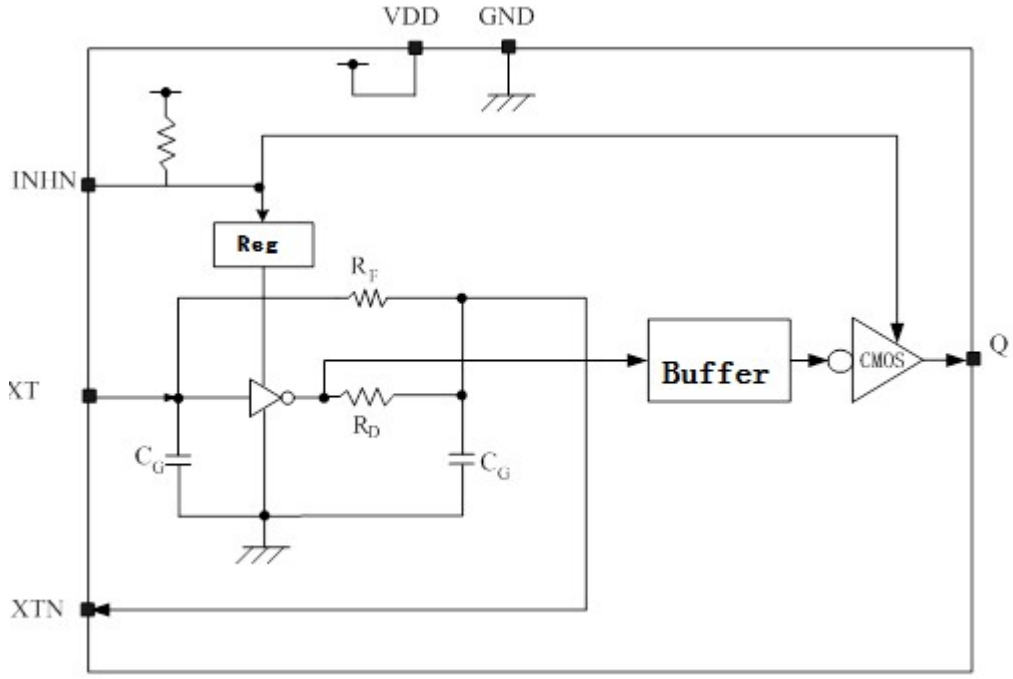
z: 2 Stand for 220um die thickness
3 Stand for 130um die thickness
4 Stand for 100um die thickness
5 Stand for 150um die thickness
8 Stand for 180um die thickness

Series Configuration

Part No.	Output frequency	Operating supply voltage range(V)	Oscillation mode	Recommended oscillation frequency ragne*1(MHz)	Output drive capability(mA)	Standby mode	
						Oscillator stop function	Output state
XO5002AH	40~55MHz	2.3 ~5.5	3rd Overtone	40 to 55	16	Yes	Hi-Z

Note2; "x" means B or C of different Pad layout type.

Block Diagram



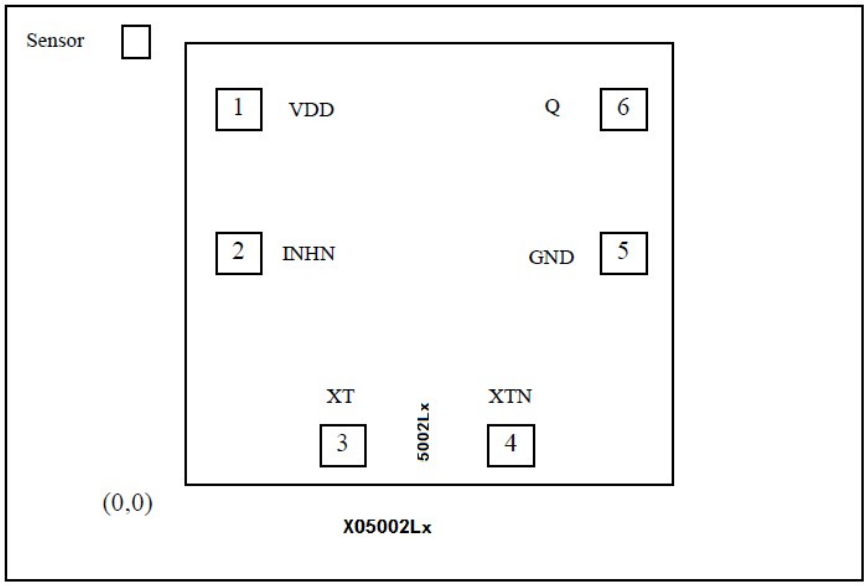
Function Description

Standby Function
When INHN goes LOW, the oscillator stops and the output on Q becomes high impedance.

INHN	Q	Oscillator
HIGH (or open)	fo output frequency	Normal operation
Low	High impedance	Stopped

Power-saving Pull-up Resistor
The INHN pin pull-up resistance RUP1 or RUP2 changes in response to the input level(HIGH or LOW). When INHN is tied LOW level, the pull-up resistance is large(RUP1),reducing the current consumed by the resistance. When INHN is left open circuit, the pull-up resistance is small(RUP2),which increases the input susceptibility to external noise. However, the pull-up resistance ties the INHN pin HIGH level to prevent external noise from unexpectedly stopping the output.
Oscillation Detector Function
The XO5002Lx series also feature an oscillation detector circuit. This circuit functions make the outputs disable until the oscillator circuit starts and oscillation becomes stable. This alleviates the danger of abnormal oscillator output at oscillator start-up when power is applied or when INHN is switched.

Pad Configuration



Pad Coordinate File					
Pad Name	X Coordinate	Y Coordinate	Pad Name	X Coordinate	Y Coordinate
sensor	0	760.00	4	525	119
1	118	584	5	641	303
2	118	301	6	641	584
3	221	119			
Note: .					
Die Size: 760µm*700µm (Including scribe line size 80µm*80µm.) **Die Thickness:** 220um±20um(-2), 130µm±15µm(-3), 100µm±15µm(-4), 150um+/-15um(-5) **Pad Size:** 90µm*90µm **Substrate Level**: GND or Floating					

Pad Description

Sym.	Type	Description	
XTN	O	Amplifier output.	Crystal oscillator connected between XT and XTN
XT	I	Amplifier input.	
INHN	I	Output state control input. High impedance when LOW. Power-saving pull-up resistor built in.	
V_{DD}	P	Supply voltage	
GND	P	Ground	
Q	O	Output. Output frequency determined by external crystal	

Maximum Ratings

Storage Temperature	-65°C to +150°C
Supply Voltage to Ground Potential (V_{DD} to GND)	-0.5V to +7.0V
DC Input (All Other Inputs except V_{DD} & GND)	-0.5V to V_{DD} +0.5V
DC Output	-0.5V to V_{DD} +0.5V
DC Output Current (all outputs)	16mA

Note:
Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

Recommended Operating Conditions

(GND=0V, unless otherwise noted.)

Sym.	Parameter	Series	Conditions	Min	Typ	Max	Unit
V_{DD}	Supply voltage	All series	XO5002Lx,	2.5	-	5.5	V
V_{IN}	Input voltage	All series	-	GND	-	VDD	V
T_A	Operating temperature	All series	-	-40	-	+85	°C
f0	Oscillation frequency*1	5002AH	-	40	-	55	MHz
f_{OUT}	Output frequency	5002AH		40	-	55	MHz

Reliability Data

Sym.	Parameter	Series	Conditions	Min	Typ	Max	Unit
ESD	Human Body Model	All series	MIL-STD-883H Method 3015.8	+/-2000	+/-4500		V
					-		

Note：Industrial Standard ESD：HBM Model +/-2000V

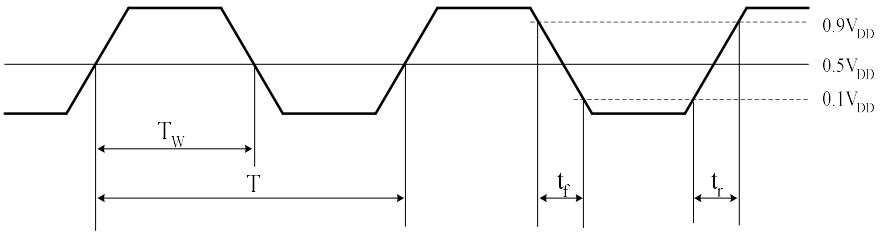
DC Electrical Characteristics

XO5002AH (V_{DD} = 2.7to 5.5V, T_A = -40 to 85°C, unless otherwise noted.)

Sym.	Parameter	Condition		Rating			Unit
				min	typ	max	
V_{OH}	HIGH-level output voltage	Q: Measurement cct3, I_{OH}=8mA		V_{DD}-0.4	-	-	V
V_{OL}	LOW-level output voltage	Q: Measurement cct3, I_{OL}=8mA		-	-	0.4	V
V_{IH}	HIGH-level input voltage	INHN, Measurement cct4		0.7V_{DD}	-	-	V
V_{IL}	LOW-level input voltage	INHN, Measurement cct4		--	-	0.3V_{DD}	V
I_Z	Output leakage current	Q: Measurement cct5, IHNH=LOW	V_{OH} =V_{DD}	-	-	10	uA
			V_{OL}=GND	-	-	10	uA
I_{DD}	Current consumption	Measurement cct 1, 5002LB Fout=50MHz	V_{DD} =3.3V	-	3	8	mA
I_{ST}	Standby current	Measurement cct1, INHN=LOW		-	-	10	uA
R_{UP1}	INHN pull-up resistance	Measurement cct6		0.4	1.5	8	M Ω
R_{UP2}				30	70	150	K Ω
C_G	Oscillator capacitance	XO5002AH			5		pF
C_D					5		pF

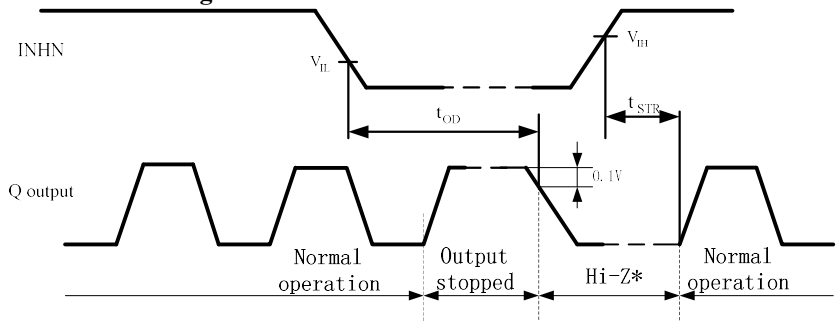
AC Electrical Characteristics

Output switching waveform



DUTY=$T_W/T \times 100$ (%)

Output disable and oscillation start timing chart



When INHN goes HIGH to LOW, the Q output goes HIGH once and then becomes high impedance.
When INHN goes LOW to HIGH, the Q output from high impedance to normal output operation when the oscillation starts (oscillation is detected)
*: the high –impedance interval in the figure is shown as a LOW level due to the 1KΩ pull-down resistor connected to the Q pin(see "Measurement circuit 2" in the "Measurement circuits" section)

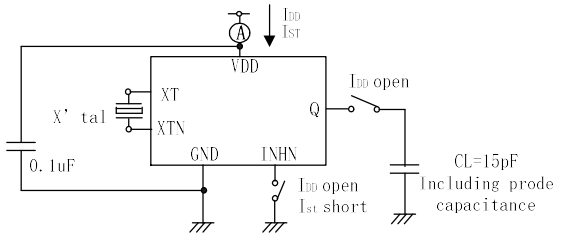
XO5002AH Series(Vdd=2.7 to 5.5V, Ta=-40 to 85℃ unless otherwise noted)

Parameter	Symbol	Condition		Min	Type	Max	Unit
Output rise time Output fall time (XO5002LB/LC/LD/LE)	t_{r1}/t_{r1}	Measurement cct1,CL=15Pf, 0.1V_{DD} to 0.9V_{DD}	V_{DD}=4.5 to 5.5 V	-	1.5	3.0	ns
	t_{r2}/t_{r2}		V_{DD}=2.9 to 3.6 V	-	2.0	4.0	
	t_{r3}/t_{r3}						
Output rise time Output fall time (XO5002LB/LC/LD/LE)	$t_{r1}t_{f1}$	Measurement cct1,CL=15Pf, 0.1V_{DD} to 0.9V_{DD}	V_{DD}=4.5 to 5.5V	-	1.5	3.0	ns
	t_{r2}/t_{f2}		V_{DD}=2.9 to 3.6 V	-	2.0	4.0	
	t_{r3}/t_{f3}						
Output duty cycle	Duty	Measurement cct 1, T_A=25℃,C_L=15pF		40	50	60	%
Output disable delay time	t_{OD}	Measurement cct 1, T_A=25℃,C_L≤15pF		-	-	50	us

Measurement Circuit

Measurement cct1

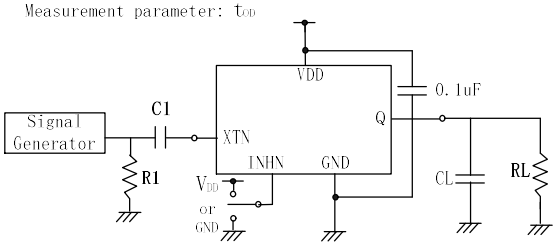
Measurement parameter: I_{DD}, I_{ST}, Duty, t_r, t_f



Note:The AC characteristics are observed using an oscilloscope on pin Q

Measurement cct2

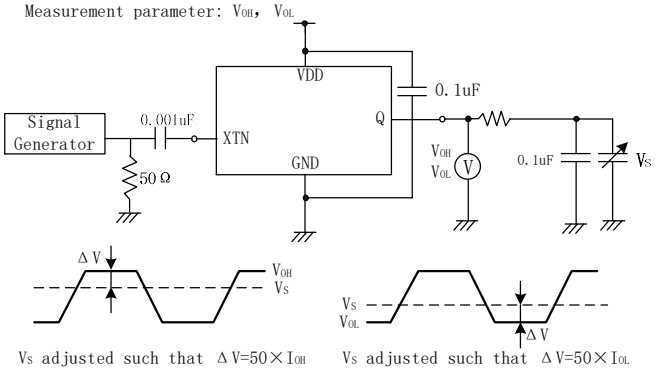
Measurement parameter: t_{OD}



XTN input signal:1Vp-p,sina wave
C1: 0.001uF CL:15pF
R1:50Ω RL: 1KΩ

Measurement cct3

Measurement parameter: V_{OH}, V_{OL}

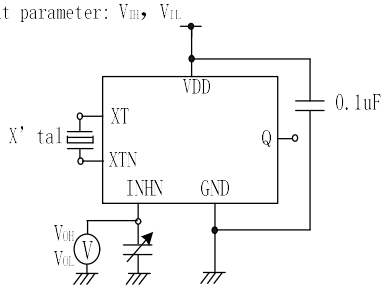


Vs adjusted such that $\Delta V=50\times I_{OH}$ Vs adjusted such that $\Delta V=50\times I_{OL}$

XTN input signal:1Vp-p,sina wave

Measurement cct4

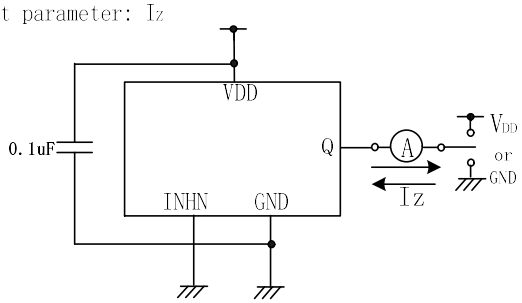
Measurement parameter: V_{IH}, V_{IL}



V_{IH}:Voltage is 0V to V_{DD} transition that changes the output state.
V_{IL}:Voltage is V_{DD} to 0V transition that changes the output state.
INHN has an oscillation stop function

Measurement cct5

Measurement parameter: Iz



Measurement cct6

Measurement parameter: R_{UP1}, R_{UP2}