



Features

- 1.71 to 3.63V operating supply voltage range
1.71V to 1.89V only for XO5072AL
- Operating frequency range (varies with version)
20MHz to 50MHz fundamental oscillation
60MHz to 220MHz 3rd overtone oscillation
- -40 to 105°C operating temperature range
- Differential HCSL output
- 50Ω output load
- Standby function
- Output high impedance when OE is LOW
(oscillator stops)
- Built-in pull-up resistor on pin OE
(For power saving)
- CMOS process
- Die form and wafer form

Applications

- Used for crystal oscillator
- Used for 7050/5032/3225/2520 Package

Series Configuration

Version	Operating Voltage	f _{output}	Oscillation	Frequency Range ^{*1}
XO5072A	2.25V~3.63V	f ₀	Fundamental	20~50MHz
XO5072H	2.25V~3.63V	f ₀	3 rd overtone	60~100MHz
XO5072AL	1.71V~1.89V	f ₀		100~160MHz
XO5072L	2.25V~3.63V	f ₀		100~160MHz
XO5072M	2.25V~3.63V	f ₀		160MHz~220MHz

Note:

1. The recommended operating frequency is a yardstick value derived from the crystal used for RSM characteristics authentication. However, the oscillator frequency band is not guaranteed. Specifically, the characteristics can vary greatly due to crystal characteristics and mounting conditions, so the oscillation characteristics of components must be carefully evaluated.

Description

The XO5072 series are 1.8V/2.5V/3.3V operation, differential HCSL output oscillator ICs. They support 20MHz to 50MHz fundamental and 60MHz to 220MHz 3rd overtone oscillator. The devices are fabricated using a proprietary CMOS process, enabling a high-frequency oscillator circuit and differential HCSL output buffer to be incorporated on a single chip. The XO5072 series can be used to construct high-frequency HCSL output oscillators.

Ordering Information

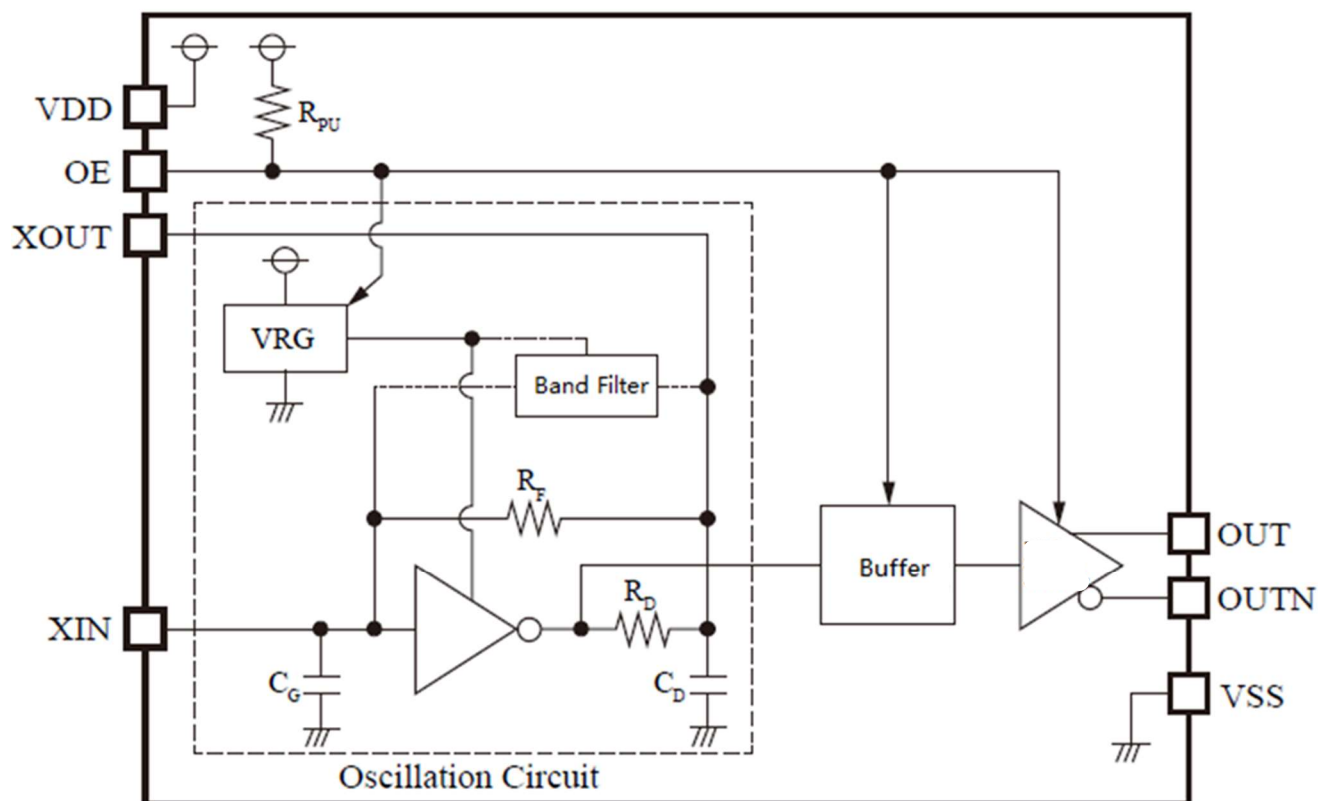
Part no.	Package type
XO5072x-yDE	Die form
XO5072x-yWF	Wafer form

Note:

1. "x" shows the different function. See below table.
2. "-y" shows the die thickness, "-3" Stand for thickness 130+/-15um
3. "DE" stands for chip form, "WF" stands for Wafer form

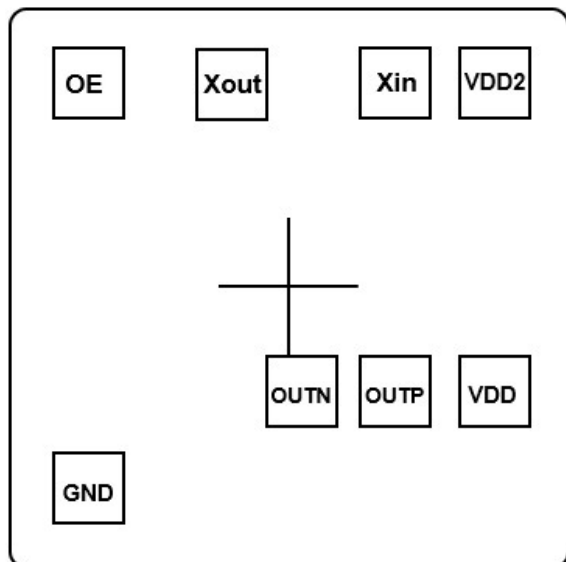


Block Diagram





Pad Configuration



Pad Coordinate					
Pad Name	X Coordinate	Y Coordinate	Pad Name	X Coordinate	Y Coordinate
VDD2	253.995	226.5	OE	-237.27	226.5
XIN	132.125	226.5	OUTN	6.125	-130.165
XOUT	-82.095	226.5	OUTP	132.125	-130.165
GND(VSS)	-225.345	-210.825	VDD	253.995	-130.165
Note: Substrate is connected to GND or floating.					
Die Size: 640um*580um (Not Including scribe line size: 60um*60um.)					
Pad Size: 80um*80um					

Pad Description

Sym.	Type	Description
VDD VDD2	P	Supply voltage.
XIN	I	Oscillator input pin.
XOUT	O	Oscillator output pin.
GND	P	Ground (-).
OE	I	Output enable pin. Output are high impedance when LOW (oscillator stopped). Power-saving pull-up resistor built-in.
OUTN	O	Output pin (complementary).
OUTP	O	Output pin (true).



Function Description

Standby Function

When OE goes LOW, the oscillator stops and the output pins (OUT, OUTN) become high impedance.

OE	OUTP, OUTN	Oscillator
HIGH (or open)	f ₀	Normal operation
LOW	High impedance	Stopped

Power-saving Pull-up Resistor

The OE pin pull-up resistance changes in response to the input level (HIGH or LOW). When OE is tied LOW (standby state), the pull-up resistance becomes large, reducing the current consumed by the resistance. When OE is open circuit, the pull-up resistance becomes small, decreasing the susceptibility to the effects of external noise.

Maximum Ratings

Symbol	Parameter	Min	Typ.	Max	Unit
T _{store}	Storage Temperature	-65	-	+150	°C
V _{DD}	Supply Voltage Range	-0.5	-	5.0	V
V _{IN}	Input Voltage Range	-0.5	-	V _{DD} +0.5	V
V _{OUT}	Output Voltage Range	-0.5	-	V _{DD} +0.5	V

Notes:

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

Sym.	Parameter	Conditions	Min	Typ.	Max	Unit
V _{DD}	Supply voltage	1.8V ± 5% only for XO5072AL	1.71	-	3.63	V
V _{IN}	Input voltage	-	GND	-	V _{DD}	V
T _A	Operating temperature	-	-40	+25	+105	°C
R _L	Output load	Terminated to GND	49.5	50	50.5	Ω
F _{OUT}	Output frequency	-	20	-	220	MHz



DC Electrical Characteristics

3.3V operation ($V_{DD} = 2.97$ to $3.63V$, $T_A = -40$ to $105^\circ C$, $GND = 0V$, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
I_{EE1}	Current consumption1	Measurement cct.1, OE=Open	-	30	60	mA
I_{EE2}	Current consumption2	Measurement cct.1, OE=Low	-	-	30	μA
V_{OH}	High level output voltage	Measurement cct1, OE=Open, $R_L=50\Omega$, OUT, OUTN Pins, $F=100MHz$	550		950	mV
V_{OL}	Low Level output Voltage		-150	0	150	mV
I_Z	Output leakage current	Measurement cct.3, OE=Low, OUT, OUTN pins	-	-	10	μA
V_{IH}	High level input voltage	Measurement cct.1, OE pin	$0.7V_{DD}$	-	-	V
V_{IL}	Low level input voltage	Measurement cct.1, OE pin	-	-	$0.3V_{DD}$	V
I_{IL1}	Low level input current1	Measurement cct.1, $V_{IL}=0V$, OE pin	0	-	-20	μA
I_{IL2}	Low level input current2	Measurement cct.1, $V_{IL}=0.7V_{DD}$, OE pin	-1	-	-150	μA

2.5V operation ($V_{DD} = 2.25$ to $2.75V$, $T_A = -40$ to $105^\circ C$, $GND = 0V$, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ.	Max	Unit
I_{EE1}	Current consumption1	Measurement cct.1, OE=Open	-	30	60	mA
I_{EE2}	Current consumption2	Measurement cct.1, OE=Low	-	-	30	μA
V_{OH}	High level output voltage	Measurement cct1, OE=Open, $R_L=50\Omega$, OUT, OUTN Pins, $F=100MHz$	500		950	mV
V_{OL}	Low Level output Voltage		-150	0	150	mV
I_Z	Output leakage current	Measurement cct.3, OE=LOW, OUT, OUTN pins	-	-	10	μA
V_{IH}	High level input voltage	Measurement cct.1, OE pin	$0.7 V_{DD}$	-	-	V
V_{IL}	Low level input voltage	Measurement cct.1, OE pin	-	-	$0.3V_{DD}$	V
I_{IL1}	Low level input current1	Measurement cct.1, $V_{IL}=0V$, OE pin	0	-	-20	μA
I_{IL2}	Low level input current2	Measurement cct.1, $V_{IL}=0.7V_{DD}$, OE pin	-1	-	-150	μA

1.8V operation ($V_{DD} = 1.71$ to $1.89V$, $T_A = -40$ to $105^\circ C$, $GND = 0V$, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{EE1}	Current consumption1	Measurement cct.1, OE=open	-	30	60	mA
I_{EE2}	Current consumption2	Measurement cct.1, OE=LOW	-	-	30	μA
V_{OH}	High level output voltage	Measurement cct1, OE=Open, $R_L=50\Omega$, OUT, OUTN Pins, $F=100MHz$	500		950	mV
V_{OL}	Low Level output Voltage		-150	0	150	mV
I_Z	Output leakage current	Measurement cct.3, OE=LOW, OUT, OUTN pins	-	-	10	μA
V_{IH}	High level input voltage	Measurement cct.1, OE pin	$0.7V_{DD}$	-	-	V
V_{IL}	Low level input voltage	Measurement cct.1, OE pin	-	-	$0.3V_{DD}$	V
I_{IL1}	Low level input current1	Measurement cct.1, $V_{IL}=0V$, OE pin	0	-	-20	μA
I_{IL2}	Low level input current2	Measurement cct.1, $V_{IL}=0.7V_{DD}$, OE pin	-1	-	-150	μA



AC Electrical Characteristics

3.3V operation (VDD = 2.97 to 3.63V, TA = -40 to 105°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Duty	Output duty cycle	Measurement cct.4, measured at 50% output swing, TA=25°C, VDD=3.3V	45	-	55	%
Vopp	Output swing	Measurement cct.4, TA=TOPR, Peak to Peak of single output wave	0.6	-	-	V
tr	Output rise time	Measurement cct.4, 20 to 80% output swing	-	0.3	0.5	ns
tf	Output fall time	Measurement cct.4, 80 to 20% output swing	-	0.3	0.5	ns
toE	Output enable time*1	Measurement cct.5, TA=25°C	-	-	2	ms
toD	Output disable time	Measurement cct.5, TA=25°C	-	-	200	ns

2.5V operation (VDD = 2.25 to 2.75V, TA = -40 to 105°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Duty	Output duty cycle	Measurement cct.4, measured at 50% output swing, TA=25°C, VDD=2.5V	45	-	55	%
Vopp	Output swing	Measurement cct.4, TA=TOPR, Peak to Peak of single output wave	0.5	-	-	V
tr	Output rise time	Measurement cct.4, 20 to 80% output swing	-	0.3	0.5	ns
tf	Output fall time	Measurement cct.4, 80 to 20% output swing	-	0.3	0.5	ns
toE	Output enable time*1	Measurement cct.5, TA=25°C	-	-	2	ms
toD	Output disable time	Measurement cct.5, TA=25°C	-	-	200	ns

1.8V operation (VDD = 1.71 to 1.89V, TA = -40 to 105°C, GND = 0V, unless otherwise noted.)

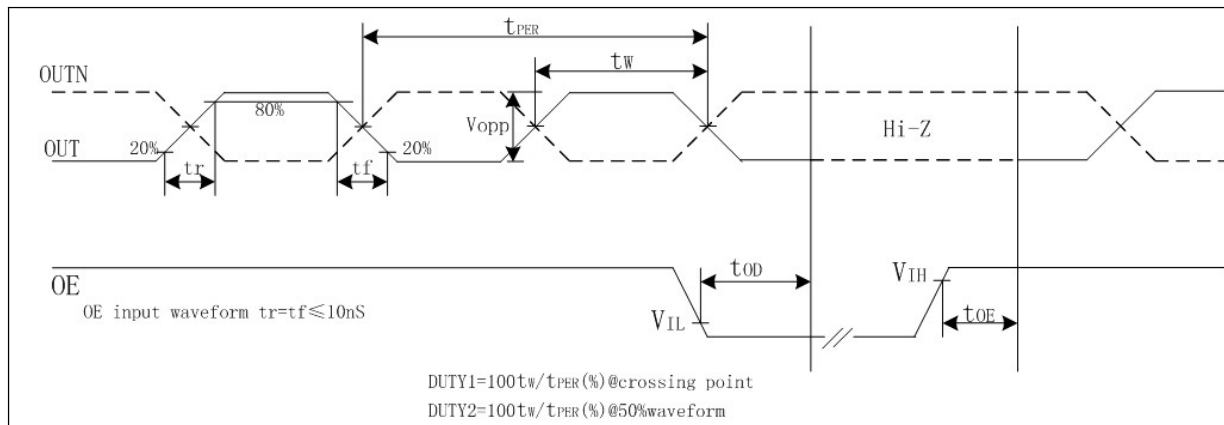
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Duty	Output duty cycle	Measurement cct.4, measured at 50% output swing, TA=25°C, VDD=1.8V	45	-	55	%
Vopp	Output swing	Measurement cct.4, TA=TOPR, Peak to Peak of single output wave	0.5	-	-	V
tr	Output rise time	Measurement cct.4, 20 to 80% output swing	-	0.4	0.6	ns
tf	Output fall time	Measurement cct.4, 80 to 20% output swing	-	0.4	0.6	ns
toE	Output enable time*1	Measurement cct.5, TA=25°C	-	-	2	ms
toD	Output disable time	Measurement cct.5, TA=25°C	-	-	200	ns

Note:

- The built-in oscillator stop function does not operate with normal output immediately when OE goes HIGH. Instead, normal output occurs after the oscillator startup time has elapsed.



Timing chart





RSM

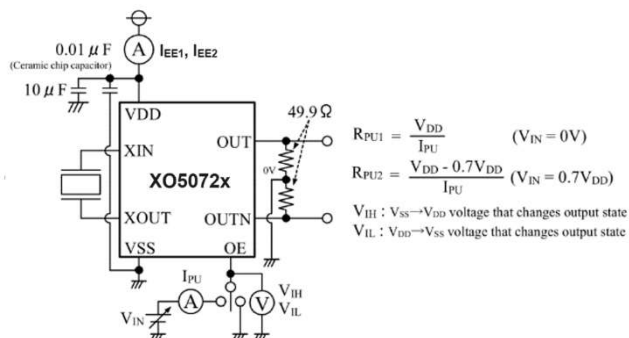
www.raystar-tek.com

XO5072x
1.8V/2.5V/3.3V HCSL Output
Crystal Oscillator

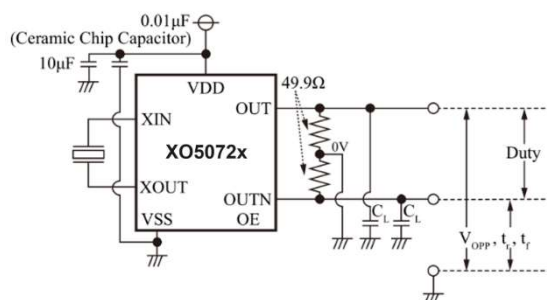
Measurement Circuit

Measurement Circuit 1:

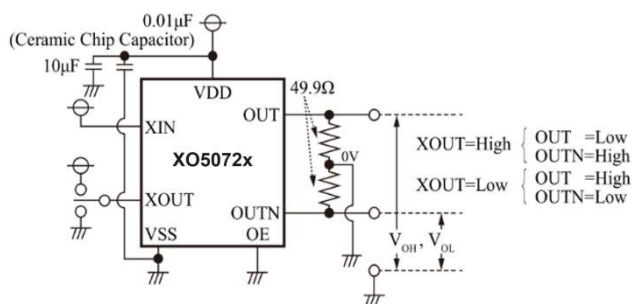
I_{EE1} , I_{EE2} , V_{IH} , V_{IL} , R_{PU1} , R_{PU2}



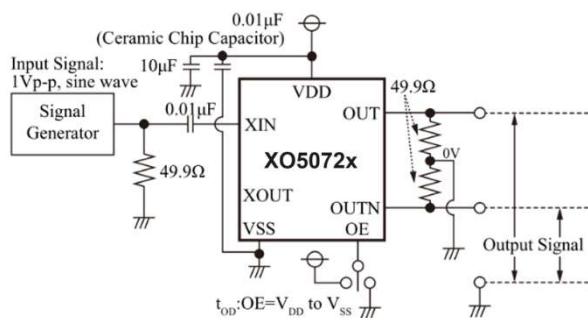
Measurement Circuit 4: Duty, V_{OPP} , t_r , t_f



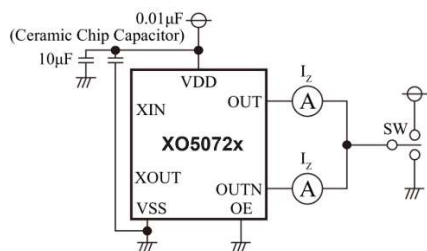
Measurement Circuit 2: V_{OL} , V_{OH}



Measurement Circuit 5: t_{OD}



Measurement Circuit 3: I_Z



Reference Data

The following characteristics are measured using the crystal below. Note that the characteristics will vary with the crystal used.

Parameter	$f_0=125.00\text{MHz}$	$f_0=156.25\text{MHz}$
C0(pF)	1.8	1.2
R1(Ω)	35	50

Crystal parameters



**RSM**

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XO5072x
1.8V/2.5V/3.3V HCSL Output
Crystal Oscillator

Revision History:

Revision	Description	Date
V5.3	Updated: 1. 5072L frequency range from 100M~150MHz to 100MHz~160MHz 2. IEE1 from typ.=48mA, max=80mA to typ.=30mA, Max=60mA	2023/4/17
V5.4	Updated: 1. IIL1 from -1uA~-20uA to 0 to -20uA 2. IIL2 from -10uA~-150uA to -1uA to -150uA	2023/5/8
V5.5	Updated part name from RS1XO5072x to XO5072x	2023/6/1
V5.6	Updated VOH from max=850mV to max=950mV	2024/5/6
V5.7	Add application for SMD2520 package	2024/6/5
V5.8	Add XO5072AL	2024/6/21
V5.9	Updated XO5072M frequency range from 160M~200MHz to 160M~220MHz	2024/10/22