Features

- 2.97 to 3.63V operating supply voltage range
- Operating frequency range(varies with version)
  Input: 20~40MHz fundamental oscillation
  21.25M/25M/27M/37.125MHz
  Output:
  212.5MHz @21.25MHz XTAL
  100M/125M/156.25M/150M/200M/250M/
  312.5M/625MHz @25MHz XTAL
  162MHz@27MHz XTAL
  74.25M/148.5MHz@37.125MHz XTAL
- Operating Temperature Range: -40 to +125℃
- Differential LVDS/LVPECL output
- Standby function
- Power-saving pull-up resistor built-in (Pin OE)
- Die form and wafer form

Applications

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

Description

The XO5090 series are multiple frequency differential LVDS/LVPECL output oscillator ICs. They support 20MHz to 40MHz fundamental oscillator. The devices use the Dividers to generate multiple division frequencies from the fundamental frequency, and then multiples the division signal to the desired frequency Clock based on different multiples.

The XO5090 series can be used to construct high-frequency LVDS/LVPECL output oscillators.

Ordering Information

Part no.	Package type
XO5090-xDE	Die form
XO5090-xWF	Wafer form

Note:
1. “-x” shows the die thickness.” “-3” Stand for thickness 130+/-15um
2. “DE” stands for chip form, “WF” stands for Wafer form

Block Diagram

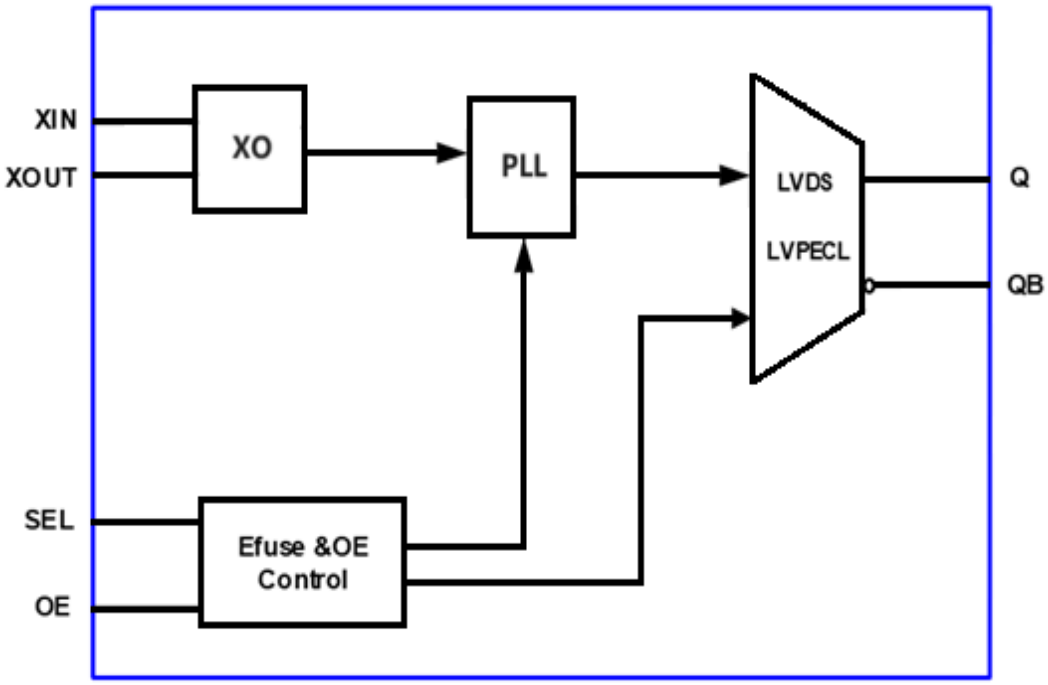


Figure 1 XO5090 Block Diagram

Oscillator circuit constant

The XO5090 series oscillator setting varies with device version to optimize characteristics over the recommended operating frequency range.

Part Name	Operating Voltage	f_{in} *1	f_{output} Range
XO5090	3.3V	21.25MHz	212.5MHz
		25MHz	100/125/150/156.25/200/250/312.5/625MHz
		27MHz	162MHz
		37.125MHz	74.25/148.5MHz

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.

Pad Configuration

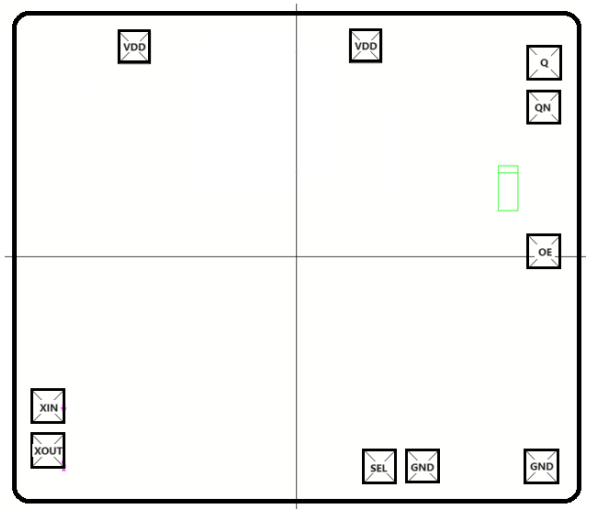


Figure 2 XO5090 Pad Location

Pad Coordinate File					
Pad Name	**X Coordinate**	**Y Coordinate**	**Pad Name**	**X Coordinate**	**Y Coordinate**
X_{IN}	-458.320	-269.995	OE	458.320	8.910
X_{OUT}	-458.320	-349.995	QN	458.320	270.000
SEL	154.835	-378.320	Q	458.320	350.000
GND	234.835	-378.320	V_{DD}	128.180	378.320
GND	452.155	-378.320	V_{DD}	-298.925	378.320
Note: Substrate is connected to GND or floating.					
Die Size: 1040um*880um (Not-Including scribe line ize:60um*60um.) **Pad Size:** 60um*60um					

Pad Description

Pin Name	Type	Description
V_{DD}	P	Supply voltage.
X_{IN}	I	Oscillator input pin.
X_{OUT}	O	Oscillator output pin.
OE	I	Output enable pin. Outputs are high impedance when LOW (oscillator stopped). Power-saving pull-up resistor built-in. Tri-state pin
SEL	I	Efuse control pin. Normal work status when LOW and Efuse trimming mode when HIGH Pull-down resistor built-in. Tri-state pin
GND	P	Ground (-).
QN	O	Output pin (complementary).
Q	O	Output pin (true).

Mode selection

SEL	OE	MODE
0	0/1	Normal
M	1	Calibration
M	M	Bypass xo to output
1	Data in	Efuse trimming

Function Description

Standby Function

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

OE	Q/QN	Oscillator
HIGH (or open)	f0	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.

Absolute Maximum Ratings

Storage Temperature .....-55°C to +150°C
Supply Voltage range.....-0.5V to +4.0V
Input voltage range.....GND-0.5V to V_{DD} +0.5V
Output voltage range .....GND-0.5V to V_{DD} +0.5V

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

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V_{DD}	Supply voltage	-	2.97	-	3.63	V
V_{IN}	Input voltage	-	GND	-	V_{DD}	V
T_A	Operating temperature		-40	+25	+125	°C
R_L	Output load	LVPECL	49.5	50	50.5	Ω
		LVDS	99	100	101	Ω
F_{IN}	Input frequency		20	-	40	MHz
F_{OUT}	Output frequency	-	74.25	-	625	MHz

DC Electrical Characteristics

LVPECL Output 3.3V operation (V_{DD} = 2.97 to 3.63V, T_A = -40 to +125°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
I_{EE1}	Current consumption1	Measurement cct.A1, OE=Open or High	-	70	90	mA
I_{EE2}	Current consumption2	Measurement cct.A1, OE=LOW	-	50	70	mA
V_{OH}	HIGH-level output voltage	Measurement cct.A2, V_{DD}=3.3V, OE=open, Q, QN pins	V_{DD}-1.4	-	V_{DD}-0.8	V
V_{OL}	LOW-level output voltage		V_{DD}-2	-	V_{DD}-1.6	V
I_Z	Output leakage current	Measurement cct.A3, OE=LOW, Q/QN pin	-	-	10	µA
V_{IH}	HIGH-level input voltage	Measurement cct.A1, OE pin	2	-	V_{DD}	V
		Measurement cct.A1, SEL pin	V_{DD}-0.7	-	V_{DD}	V
V_{IL}	LOW-level input voltage	Measurement cct.A1, OE/SEL pin	0	-	0.8	V
		Measurement cct.A1, OE/SEL pin	0	-	0.7	V
V_{IM}	Middle-level input voltage	Measurement cct.A1, OE/SEL pin	-	1/2V_{DD}	-	V
I_{IH}	HIGH-level input current	Measurement cct.A1, V_{IH}=V_{DD},OE/SEL pin	-	30	-	µA
I_{IL}	LOW-level input current1	Measurement cct.A1, V_{IL}=0V, OE/SEL pin	-	30	-	µA
R_f	Feedback resistance		80		120	KΩ

LVDS Output 3.3V operation (V_{DD} = 2.97 to 3.63V, T_A = -40 to +125°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
I_{EE1}	Current consumption1	Measurement cct.B1, OE=Open or High	-	70	90	mA
I_{EE2}	Current consumption2	Measurement cct.B1, OE=LOW	-	50	70	mA
V_{OH}	HIGH-level output voltage	Measurement cct.B2, V_{DD}=3.3V, OE=open, Q, QN pins		1.4		V
V_{OL}	LOW-level output voltage			1.0		V
I_Z	Output leakage current	Measurement cct.B3, OE=LOW, Q/QN pin	-	-	10	µA
V_{IH}	HIGH-level input voltage	Measurement cct.B1, OE pin	2	-	V_{DD}	V
		Measurement cct.B1, SEL pin	V_{DD}-0.7	-	V_{DD}	V
V_{IL}	LOW-level input voltage	Measurement cct.B1, OE pin	0	-	0.8	V
		Measurement cct.B1, SEL pin	0	-	0.7	V
V_{IM}	Middle-level input voltage	Measurement cct.B1, OE/SEL pin	-	1/2V_{DD}	-	V
I_{IH}	HIGH-level input current	Measurement cct.B1, V_{IH}=V_{DD},OE/SEL pin	-	30	-	µA
I_{IL}	LOW-level input current1	Measurement cct.A1, V_{IL}=0V, OE/SEL pin	-	30	-	µA
R_f	Feedback resistance		80		120	KΩ

AC Electrical Characteristics

LVPECL Output 3.3V operation (V_{DD} = 2.97 to 3.63V, T_A = -40 to +125°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
Duty	Output duty cycle	Measurement cct.A4, measured at 50% output swing, T_A=25℃, V_{DD}=3.3V	45	-	55	%
Vopp	Output swing	Measurement cct.A4,Peak to Peak of single output wave	0.6	-	1	V
T_R	Output rise time	Measurement cct.A4,20 to 80% output swing	-	0.2	0.4	ns
T_F	Output fall time	Measurement cct.A4,80 to 20% output swing	-	0.2	0.4	ns
T_{OE}	Output enable time*1	Measurement cct.A5, T_A=25℃	-	-	5	us
T_{OD}	Output disable time	Measurement cct.A5, T_A=25℃	-	-	200	ns
Jitter	RMS Phase Jitter	100MHz@12K~20M, T_A=25℃	-	0.3	0.5	ps

LVDS Output 3.3V operation (V_{DD} = 2.97 to 3.63V, T_A = -40 to +125°C, GND = 0V, unless otherwise noted.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
Duty	Output duty cycle	Measurement cct.B4, measured at 50% output swing, T_A=25℃, V_{DD}=3.3V	45	-	55	%
Vopp	Output swing	Measurement cct.B4, Peak to Peak of single output wave	-	0.4	-	V
T_R	Output rise time	Measurement cct.B4,20 to 80% output swing	-	0.2	0.4	ns
T_F	Output fall time	Measurement cct.B4,80 to 20% output swing	-	0.2	0.4	ns
T_{OE}	Output enable time*1	Measurement cct.B5, T_A=25℃	-	-	5	us
T_{OD}	Output disable time	Measurement cct.B5, T_A=25℃	-	-	200	ns
Jitter	RMS Phase Jitter	100MHz@12K~20M, T_A=25℃	-	0.3	0.5	ps

Timing chart

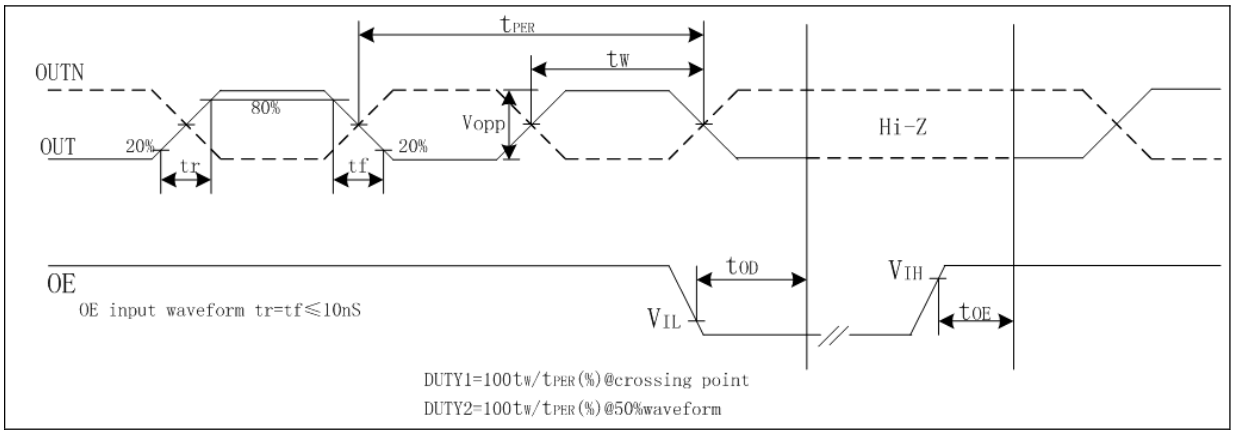


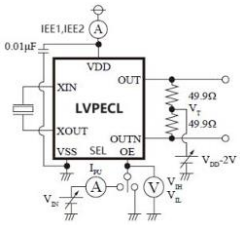
Figure 3 Timing chart

Measurement Information

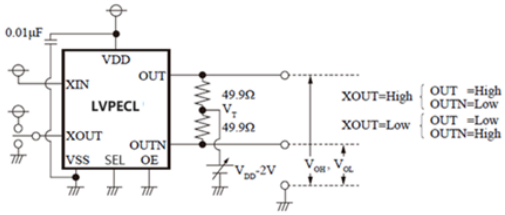
Measurement Circuit: LVPECL

Measurement Circuit A1:

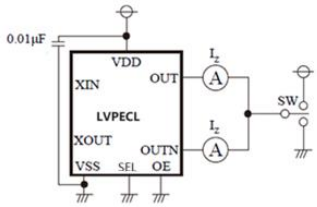
IEE1, IEE2, VIH, VIL, VIM, IIH, IIL



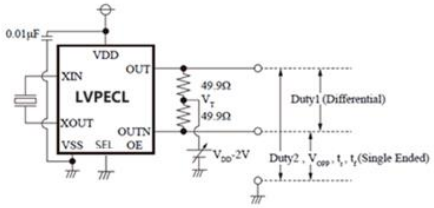
Measurement Circuit A2: VOL, VOH



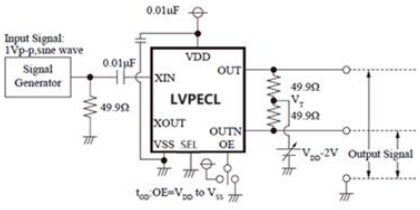
Measurement Circuit A3: IZ



Measurement Circuit A4: Duty, VOPP, TR, TF



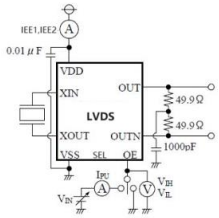
Measurement Circuit A5：TOE，TOD



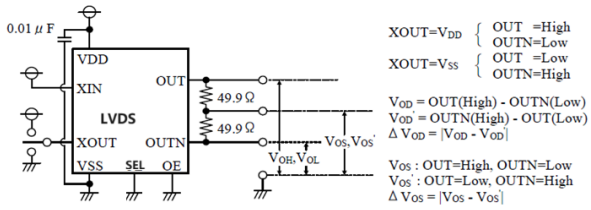
Measurement Circuit: LVDS

Measurement Circuit B1:

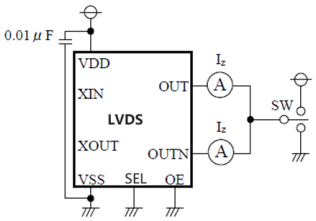
IEE1, IEE2, VIH, VIL, VIM, IIH, IIL



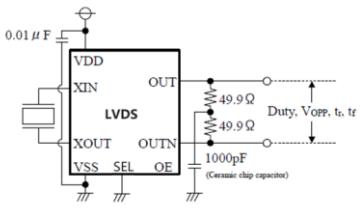
Measurement Circuit B2: VOL, VOH



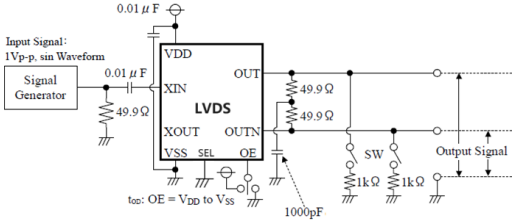
Measurement Circuit B3: IZ



Measurement Circuit B4: Duty, VOPP, TR, TF



Measurement Circuit B5：TOE，TOD



Revision History

Revision	Description	Date
0.9	1. Preliminary version	2024/2/28
1.0	1. Official release 2. Modify several parameters	2024/3/14
1.1	1. updated some typo wrong	2024/6/24