XO5072x
2.5/3.3V HCSL Output Crystal Oscillator

Features

- 2.25 to 3.63V operating supply voltage range
- Operating frequency range (varies with version)
  - 20MHz to 50MHz fundamental oscillation
  - 100MHz to 200MHz 3rd overtone oscillation
- -40 to 105℃ 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 Package

Description

The XO5072 series are 2.5V/3.3V operation, differential HCSL output oscillator ICs. They support 20MHz to 50MHz fundamental and 100MHz 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

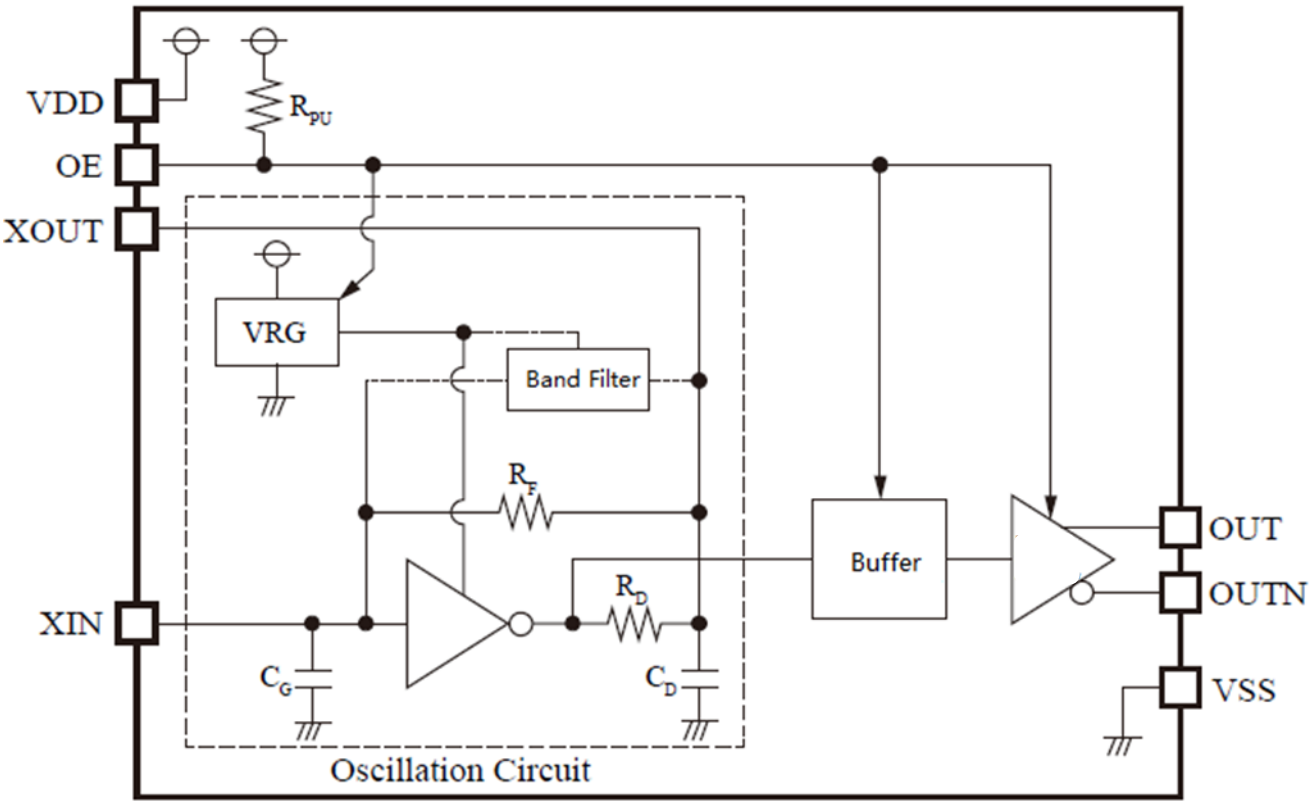
Note:
1."x" shows the different function. See below table.
2. "-y" shows the die thickness,"-3" Stand for thickness 130+/-15um
3. "DE" stands for chip form, "WF" stands for Wafer form

Series Configuration

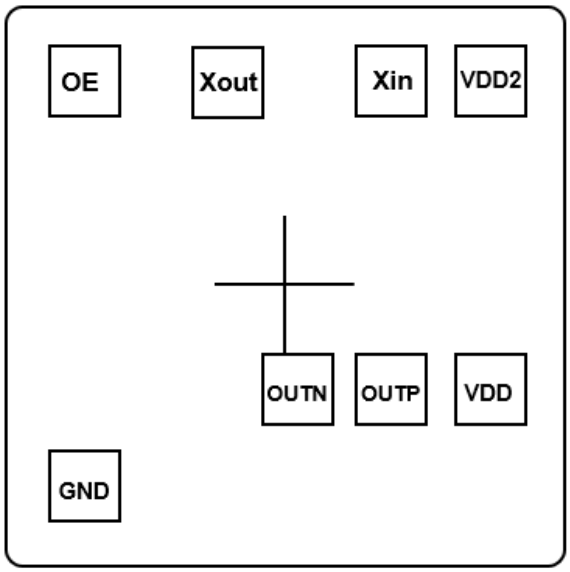
Version	f_{output}	Oscillation	Frequency Range*1
XO5072A	f0	Fundamental	20~50MHz
XO5072L	f0	3rd overtone	100~160MHz
XO5072M	f0		160MHz~200MHz

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.

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: 640μm*580μm (Not Including scribe line size60μm*60μm.) **Die Thickness:** **Pad Size:** 80μm*80μm					

Pad Description

Sym.	Type	Description
VDD VDD2	P	Supply voltage.
XIN	I	Oscillator input pin.
XOUT	O	Oscillator output pin.
GND (VSS)	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)	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.

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	-	2.25	-	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	-	200	MHz

DC Electrical Characteristics

3.3V operation (V_{DD} = 2.97 to 3.63V, T_A = -40 to 105°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, RL=50Ω, OUT,OUTN Pins, F=100MHz	550		850	mV
V_{OL}	Low Level output Voltage		-150	0	150	mV
V_{OD}	Differential output voltage	Measurement cct1,OE=Open, RL=50Ω, OUT,OUTN Pins, F=100MHz	600	800		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	0.7VDD	-	-	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, VIL=0V,OE pin	0	-	-20	µA
I_{IL2}	LOW-level input current2	Measurement cct.1, VIL=0.7VDD,OE pin	-1	-	-150	µA

2.5V operation (V_{DD} = 2.25 to 2.75V, T_A = -40 to 105°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, RL=50Ω, OUT,OUTN Pins, F=100MHz	500		850	mV
V_{OL}	Low Level output Voltage		-150	0	150	mV
V_{OD}	Differential output voltage	Measurement cct1,OE=Open, RL=50Ω, OUT,OUTN Pins, F=100MHz	500	800		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	0.7VDD	-	-	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, VIL=0V,OE pin	0	-	-20	µA
I_{IL2}	LOW-level input current2	Measurement cct.1, VIL=0.7VDD,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.)

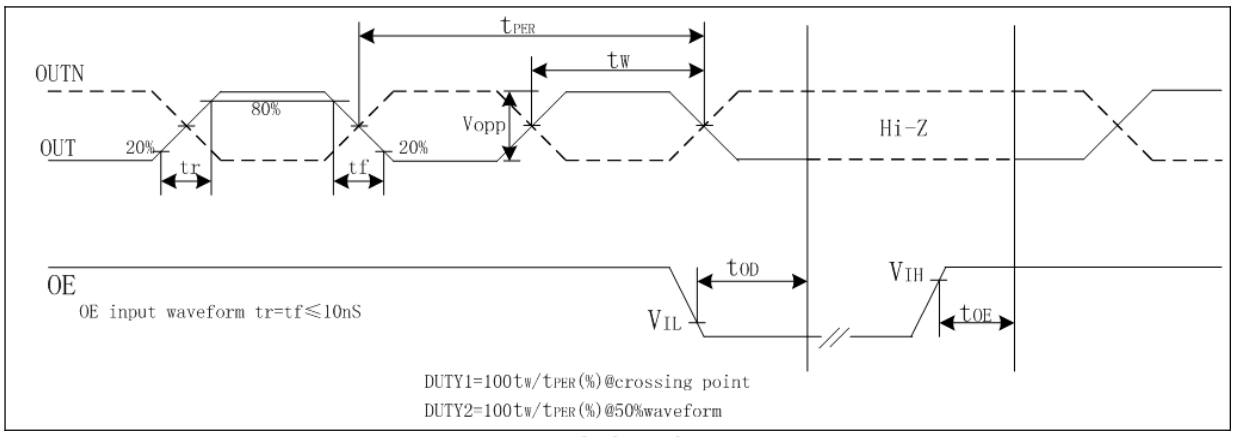
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Duty1	Output duty cycle1	Measurement cct.4,measured at output crossing point,T_A=25℃,V_{DD}=3.3V	45	-	55	%
Duty1	Output duty cycle1	Measurement cct.4,measured at 50% output swing,T_A=25℃,V_{DD}=3.3V	45	-	55	%
Vopp	Output swing	Measurement cct.4, T_A=T_{OPR}, 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
t_{OE}	Output enable time*1	Measurement cct.5,T_A=25℃	-	-	2	ms
t_{OD}	Output disable time	Measurement cct.5,T_A=25℃	-	-	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
Duty1	Output duty cycle1	Measurement cct.4,measured at output crossing point,T_A=25℃,V_{DD}=3.3V	45	-	55	%
Duty1	Output duty cycle1	Measurement cct.4,measured at 50% output swing,T_A=25℃,V_{DD}=3.3V	45	-	55	%
Vopp	Output swing	Measurement cct.4, T_A=T_{OPR}, 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
t_{OE}	Output enable time*1	Measurement cct.5,T_A=25℃	-	-	2	ms
t_{OD}	Output disable time	Measurement cct.5,T_A=25℃	-	-	200	ns

Note:

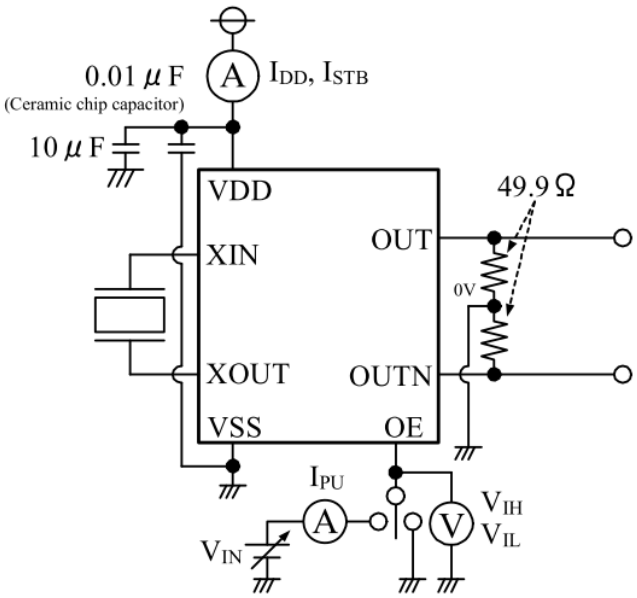
1. The built-in oscillator stop function does not operate with normal output immediately when OE goes HIGH. Instead, normal output occurs after the oscillator startup time has elapsed.



Timing chart

Measurement Circuit

Measurement Circuit 1: IDD, ISTB, VIH,VIH, RPU1,RPU2

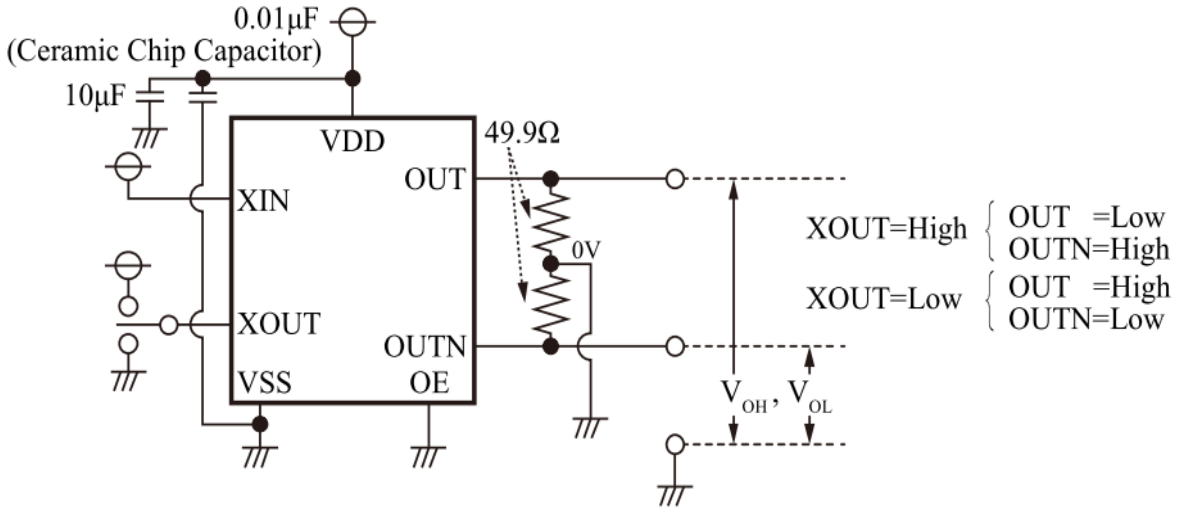


$$R_{PU1} = \frac{V_{DD}}{I_{PU}} \quad (V_{IN} = 0V)$$

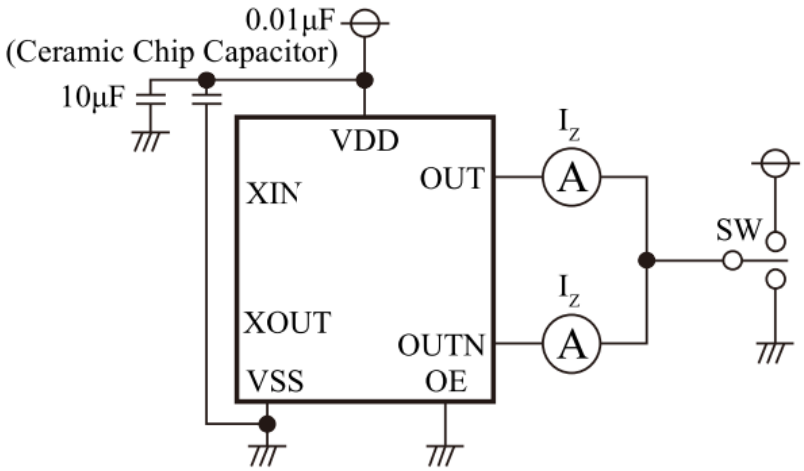
$$R_{PU2} = \frac{V_{DD} - 0.7V_{DD}}{I_{PU}} \quad (V_{IN} = 0.7V_{DD})$$

V_{IH} : $V_{SS} \rightarrow V_{DD}$ voltage that changes output state
V_{IL} : $V_{DD} \rightarrow V_{SS}$ voltage that changes output state

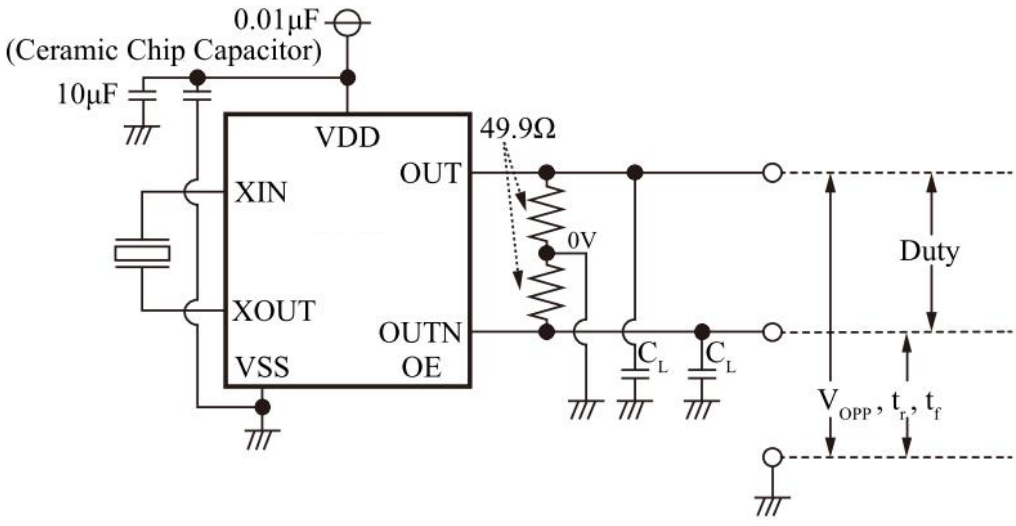
Measurement Circuit 2: VOL, VOH



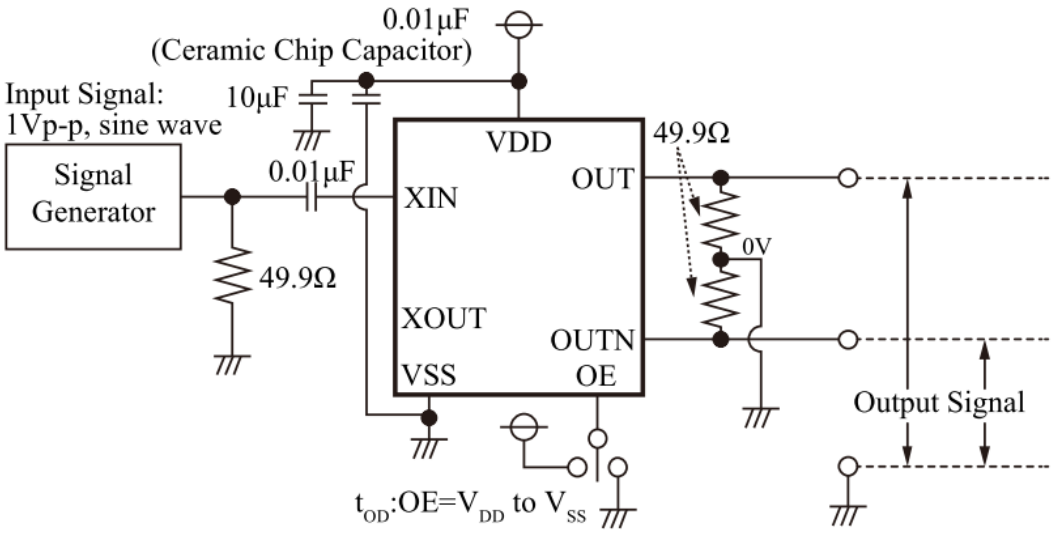
Measurement Circuit 3: IZ



Measurement Circuit 4: Duty1, Duty2,VOPP,tr,tf



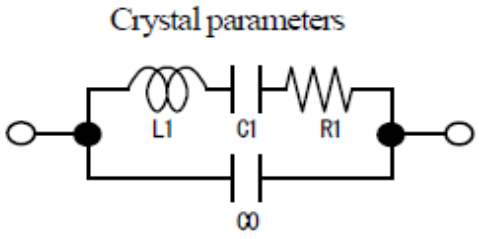
Measurement Circuit 5：tOD



Reference Data

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

Parameter	f0=125.00MHz	f0=156.25MHz
C0(pF)	1.8	1.2
R1(Ω)	35	50



History Log:

Rev #	DCN NO.	REVISION HISTORY	DATE
5.3	230077	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
5.4	230100	Updated: 1. IIL1 from -1uA~-20uA to 0 to -20uA; 2. IIL2 from -10uA~-150uA to -1uA to -150uA;	2023/5/8
5.5	230120	Updated part name from RS1XO5072x to XO5072x	2023/6/1