Features

- Operating supply voltage: 1.60V to 3.63V
- Recommended oscillation frequency (Fundamental):10MHz to 70MHz
- Operation temperature: -40 to +125℃
- Oscillator capacitors C_G, C_D built-in
- Output drive capability: ±4mA
- Output frequency: fosc (oscillator frequency), fosc/2, fosc/4
- Output 3-state function
- Low standby current (oscillator stopped, power saving pull-up resistor)
- Oscillation detection circuit built-in

Application

- Used for crystal oscillator
- 7050, 5032, 3225, 2520, 2016 ,1612 Crystal Oscillator

Description

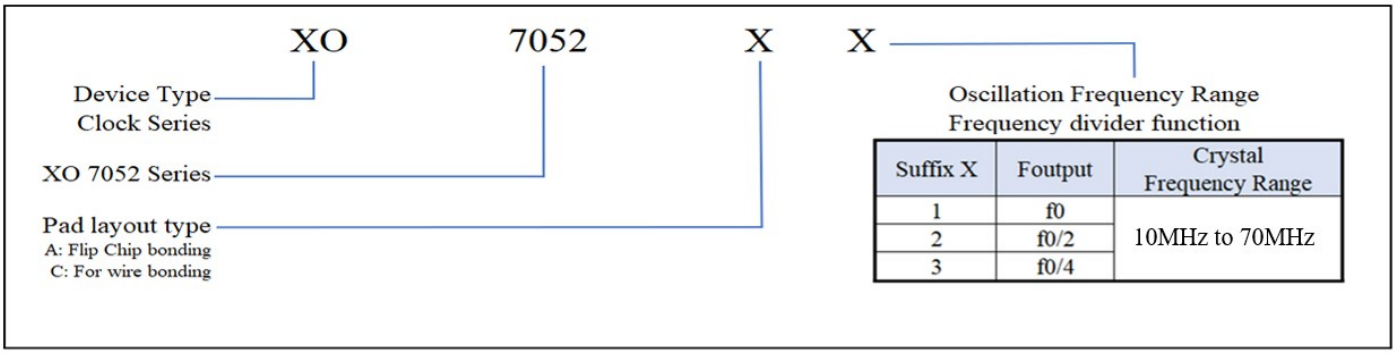
The XO7052xx series are crystal oscillator module CMOS ICs for +125℃ operation. They support 10MHz to 70MHz fundamental-frequency, and have an oscillator amplifier, voltage regulator circuit and output buffer.

The oscillator circuit stage has a voltage regulator drive, reducing current consumption and frequency deviation due to fluctuations in supply voltage.

Ordering Information

Part no.	Package type
XO7052xx-zWF	Wafer form
XO7052xx-zDE	Die form

Note:
"-z" shows the die thickness.
"DE" stands for chip form, "WF" stands for Wafer form.



Suffix X	Foutput	Crystal Frequency Range
1	f0	10MHz to 70MHz
2	f0/2	
3	f0/4	

Series Configuration

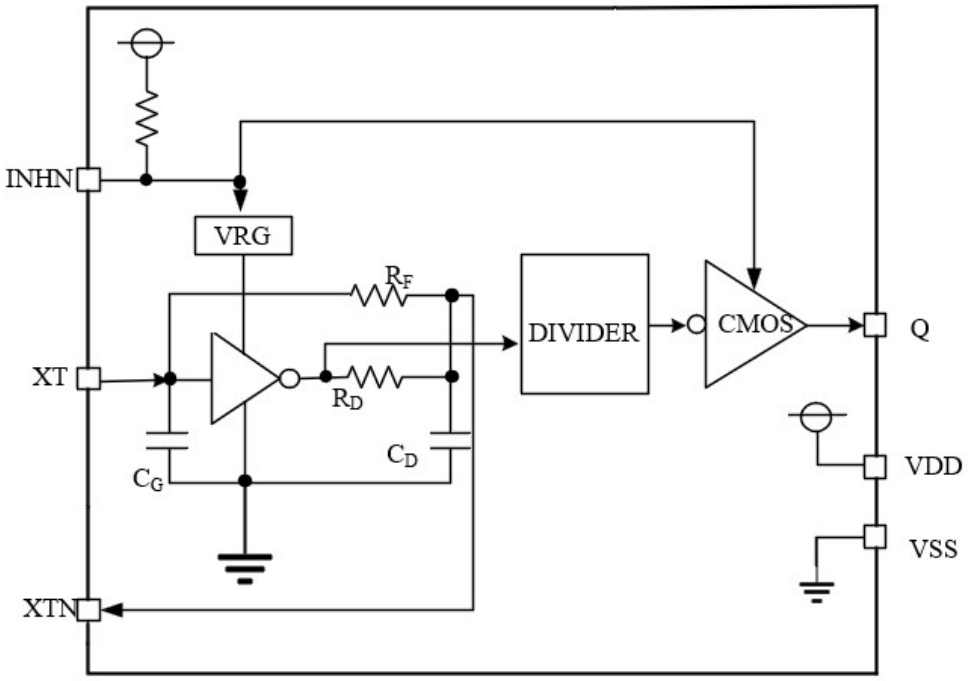
Version name*1	Oscillator frequency (Reference value)*2	Output stage			Standby state	
		Output duty level	Frequency	Output current	Oscillator stopped	Output
XO7052x1	10MHz to 70MHz	$1/2V_{DD}$	f_{OSC}	±4mA	Yes	Hi-Z
XO7052x2			f_{OSC} /2			
XO7052x3			f_{OSC} /4			

Note:

*1: Wafer form devices have designation XO7052xx-zWF and chip form devices have designation XO7052xx-zDE.

*2: The recommended oscillation frequency is a yardstick value derived from the crystal used for characteristics authentication. The oscillation frequency range 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



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)	Output frequency	Normal operation
Low	High impedance	Stopped

Power-saving Pull-up Resistor

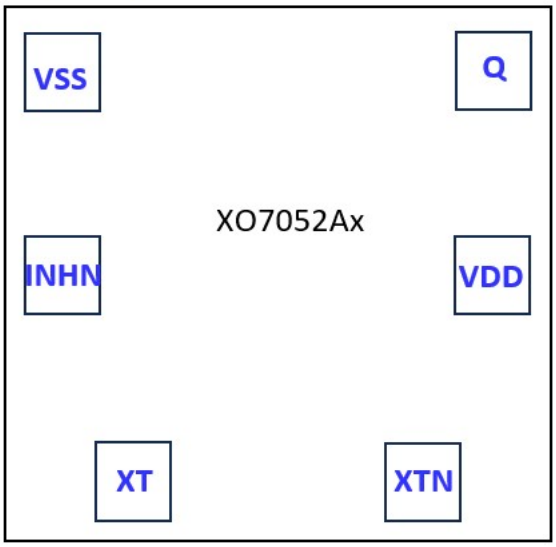
The INHN pin pull-up resistance changes its value to RPU1 or RPU2 in response to the input level (HIGH or LOW). When INHN is tied to LOW level, the pull-up resistance becomes large (RPU1), thus reducing the current consumed by the resistance. When INHN is left open circuit or tied to HIGH level, the pull-up resistance becomes small (RPU2), thus internal circuit of INHN becomes HIGH level. Consequently, the IC is less susceptible to the effects of noise, helping to avoid problems such as the output stopping suddenly.

Oscillation Detector Function

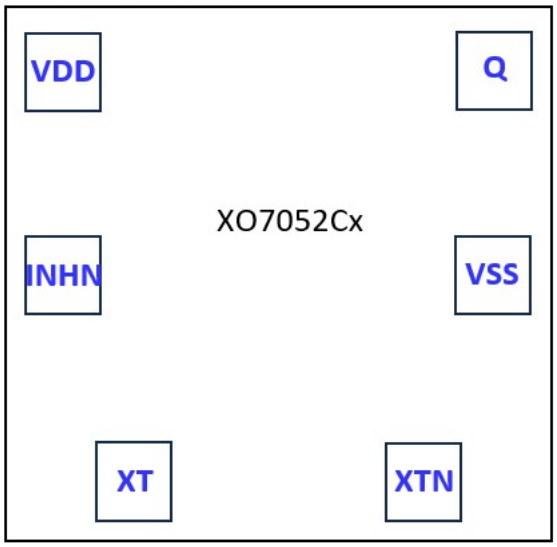
The XO7052xx series have an oscillation detection circuit. The oscillation detection circuit disables the output until crystal oscillation becomes stable when oscillation circuit starts up. This function avoids the abnormal oscillation in the initial power up and in a reactivation by INHN.

Pad Configuration

Flip Chip



Wire Bonding



Pad Coordinate File			
X Coordinate	**Y Coordinate**	**7052Ax(FC)**	**7052Cx(WB)**
-135.2	-186.5	XT	XT
135.2	-186.5	XTN	XTN
201.5	-1.1	V_{DD}	V_{SS}
201.5	183.5	Q	Q
-201.5	183.5	V_{SS}	V_{DD}
-201.5	-1.1	INHN	INHN
Note: Substrate is connected to GND or floating.			
Die Size: 580μm*550μm (Including scribe line, Scribe Line Width 65um) **Die Thickness:** 130μm±15μm (-3) or 100um±15um (-4) **Pad Size:** 70μm*70μm **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 • Oscillator stopped and device in standby mode when LOW • Pull-up resistor built-in	
V_{DD}	-	Supply voltage	
V_{SS}	P	Ground	
Q	O	fosc, fosc/2, fosc/4 frequency output • High-impedance in standby mode	

Maximum Ratings

Parameter	Sym.	Conditions	Rating	Unit	Note
Supply voltage range	V_{DD}	Voltage between V_{DD} and V_{SS}	-0.3 to +3.96	V	*1
Input voltage range	V_{IN}	Input pins	-0.3 to V_{DD}+0.3	V	*1,*2
Output voltage range	V_{OUT}	Output pins	-0.3 to V_{DD}+0.3	V	*1,*2
Output current	I_{OUT}	Q output	±20	mA	*3
Junction temperature	T_j		150	℃	*3
Storage temperature range	T_{STG}	Chip form wafer form	-65 to +150	℃	*4

Note:
*1: Absolute maximum ratings are the values that must never exceed even for a moment. This product may suffer breakdown if any one of these parameter ratings is exceeded. Operation and characteristics are guaranteed only when the product is operated at recommended supply voltage range.
*2: V_{DD} is a V_{DD} value of recommended operating conditions.
*3: Do not exceed the absolute maximum ratings. If they are exceeded, a characteristic and reliability will be degraded.
*4: When stored alone in nitrogen or vacuum atmosphere.

Recommended Operating Conditions

Parameter	Sym.	Conditions		Min	Typ.	Max	Unit
Oscillator frequency *1	f_{OSC}	V_{DD} =1.6 to 3.63V	x1 to x3	10		70	MHz
Output frequency	f_{OUT}	V_{DD} =1.6 to 3.63V, C_{LOUT}<=15pF	x1 to x3	2.5		70	MHz
Operating supply voltage	V_{DD}	Voltage between V_{DD} and V_{SS} *2		1.6		3.63	V
Input voltage	V_{IN}	Input pins		V_{SS}		V_{DD}	V
Operating temperature	T_a			-40		125	℃
Output load capacitance	C_{LOUT}	Q output				15	pF

Note:
*1: The oscillation frequency is a yardstick value and the oscillation frequency range 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.
*2: For stable operation of this product, please mount ceramic chip capacitor that is more than 0.01uF between V_{DD} and V_{SS} in close proximity to IC(within 3mm). Wiring pattern between IC and capacitor should be as thick as possible.
* Since it may influence the reliability if it is used out of the recommended operating conditions range, this product should be used within this range.

DC Electrical Characteristics

(V_{DD}=1.60 to 3.63V, V_{SS}=0V, Ta=-40 to +125°C unless otherwise noted)

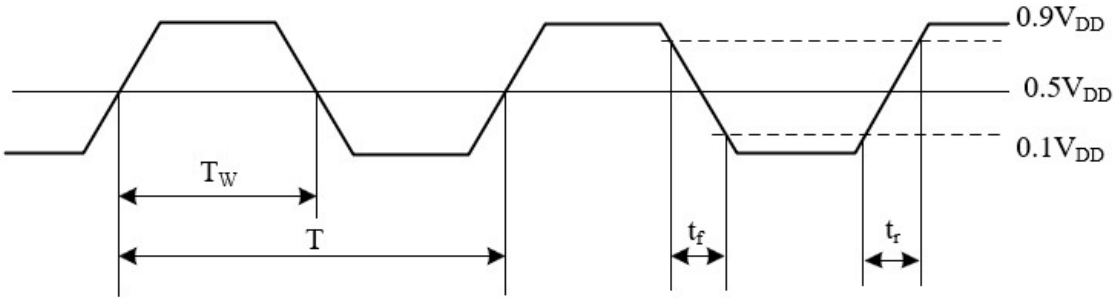
Parameter	Sym.	Conditions		Min.	Typ.	Max.	Unit
HIGH-level output voltage	V_{OH}	Measurement circuit 3, I_{OH}=-4mA, Q pin		V_{DD}-0.4			V
LOW-level output voltage	V_{OL}	Measurement circuit 3, I_{OL}=4mA, Q pin				0.4	V
HIGH-level input voltage	V_{IH}	Measurement circuit 4, INHN pin		0.7V_{DD}			V
LOW-level input voltage	V_{IL}	Measurement circuit 4 INHN pin				0.3V_{DD}	V
Output leakage current	I_Z	Measurement circuit 5, INHN=LOW, Q pin	Q=V_{DD}			10	uA
			Q=V_{SS}	-10			
Current consumption XO7052x1	I_{DD1}	Measurement circuit 1, INHN=OPEN, no load, f_{OSC}=48MHz, f_{OUT}=48MHz	V_{DD} =3.3V		3.0	4.5	mA
			V_{DD} =2.5V		2.2	3.5	mA
			V_{DD} =1.8V		1.6	2.5	mA
Current consumption XO7052x2	I_{DD2}	Measurement circuit 1, INHN=OPEN, no load, f_{OSC}=48MHz, f_{OUT} =24MHz	V_{DD} =3.3V		2.0	3.0	mA
			V_{DD} =2.5V		1.4	2.5	mA
			V_{DD} =1.8V		1.0	2.0	mA
Current consumption XO7052x3	I_{DD3}	Measurement circuit 1, INHN=OPEN, no load, f_{OSC}=48MHz, f_{OUT}=12MHz	V_{DD} =3.3V		1.5	2.5	mA
			V_{DD} =2.5V		1.0	2.0	mA
			V_{DD} =1.8V		0.8	1.5	mA
Standby current	I_{ST}	Measurement circuit 1,INHN=LOW				10	µA
Pull-up resistance	R_{PU1}	Measurement circuit 6,INHN pin, V_{DD} =3.3V		0.8	3	24	Mohm
	R_{PU2}	Measurement circuit 6,INHN pin, V_{DD} =3.3V		30	70	150	kohm
Feedback resistance	R_f	Oscillator		50	100	200	kohm

AC Electrical Characteristics

(V_{DD} =1.60 to 3.63V, V_{SS}=0V, Ta=-40 to +125°C unless otherwise noted)

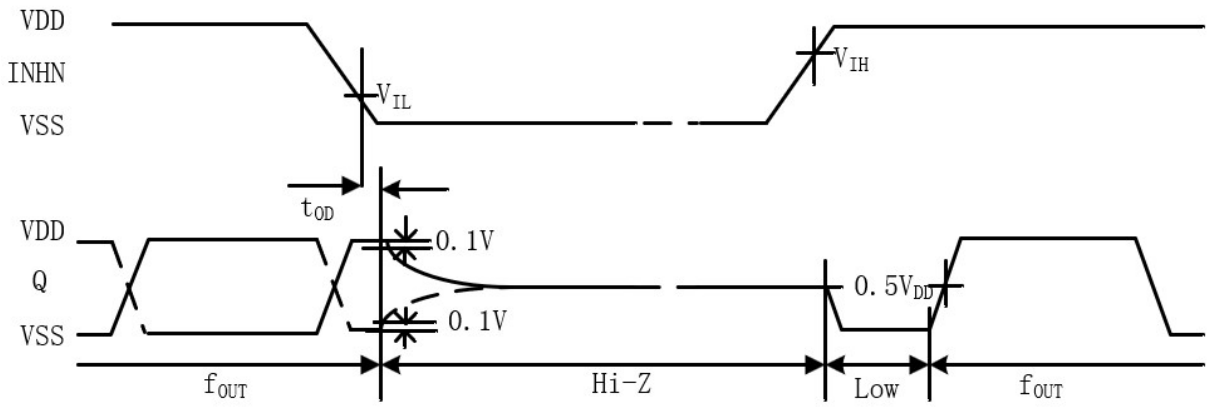
Parameter	Sym.	Conditions	Min.	Typ.	Max.	Unit
Rise time	t_{r1}	Measurement circuit 1, CLOUT=15pF, 0.1 V_{DD} → 0.9 V_{DD}, V_{DD} =2.25 to 3.63V		1.5	5	ns
	t_{r2}	Measurement circuit 1, CLOUT=15pF, 0.1 V_{DD} →0.9 V_{DD}, V_{DD} =1.60 to 2.25V		2	6	
Fall time	t_{f1}	Measurement circuit 1, CLOUT=15pF, 0.9 V_{DD} → 0.1 V_{DD}, V_{DD} =2.25 to 3.63V		1.5	5	
	t_{f2}	Measurement circuit 1, CLOUT=15pF, 0.9 V_{DD} → 0.1 V_{DD}, V_{DD} =1.60 to 2.25V		2	6	
Duty cycle	DUTY	Measurement circuit 1, Ta=25°C, CL_{OUT}=15pF, V_{DD} =1.60 to 3.63V	45	50	55	%
Disable time	t_{OD}	Measurement circuit 2, Ta=25°C, CL_{OUT}<=15pF			200	ns

Output switching waveform



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

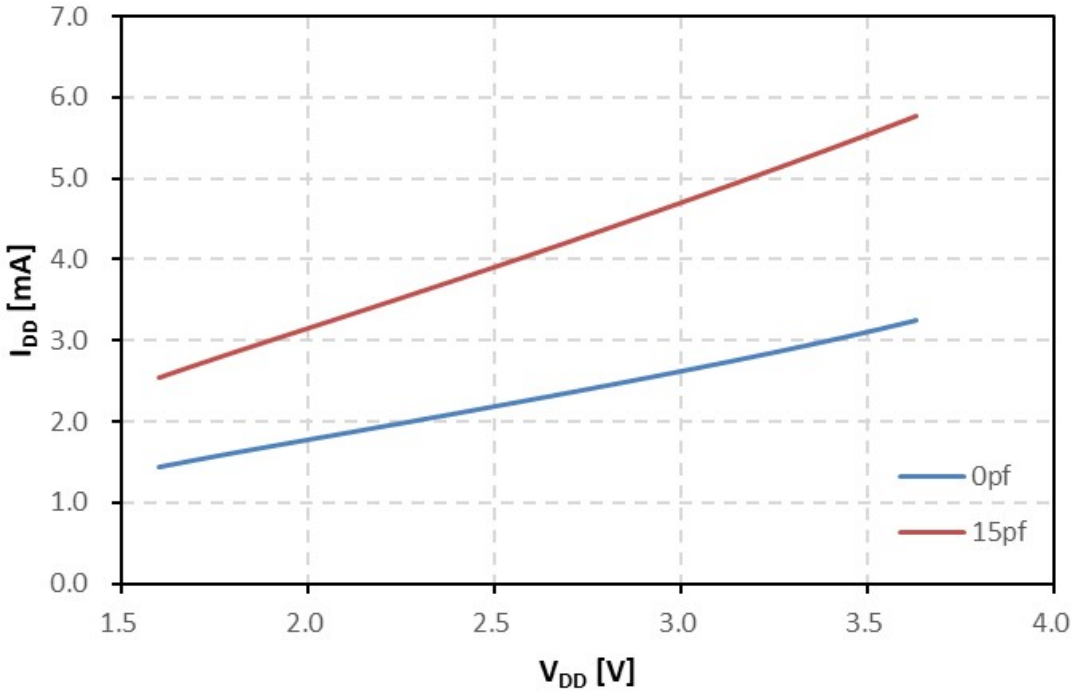
Output disable and oscillation start timing chart



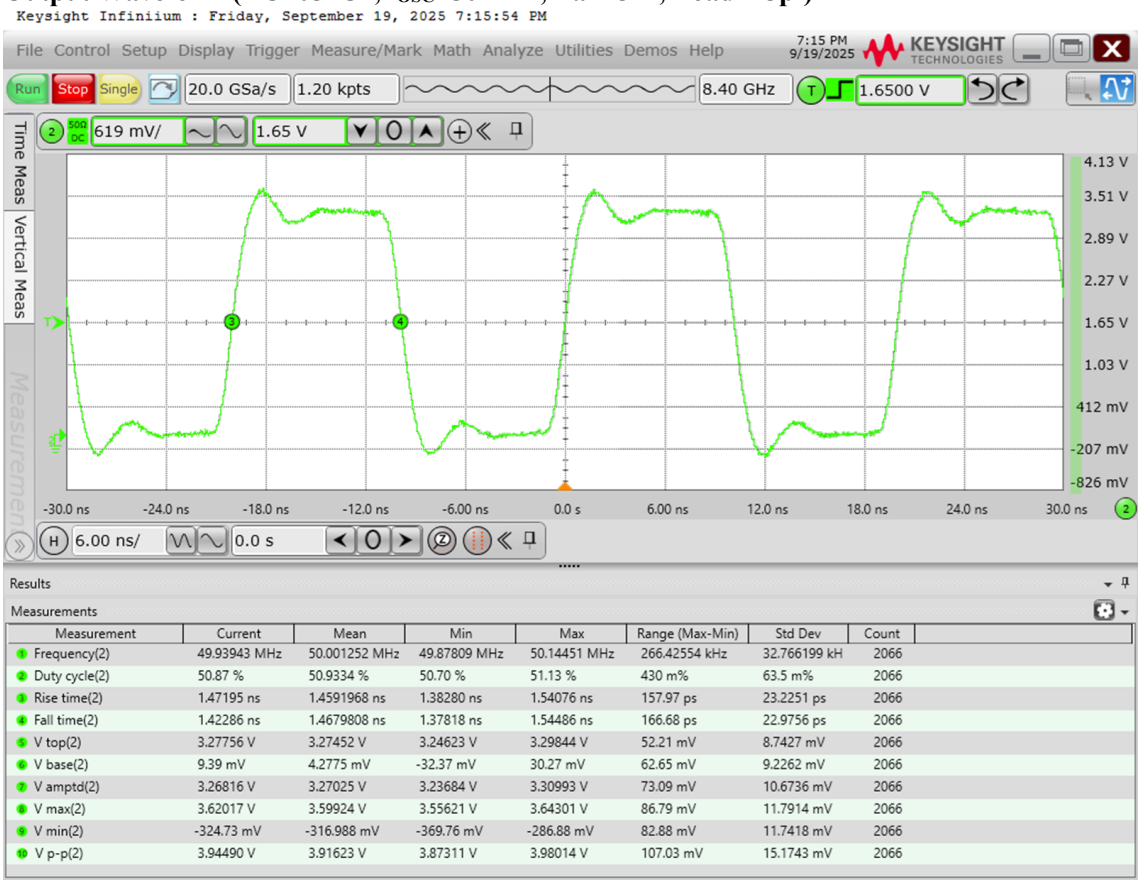
*When INHN goes HIGH to LOW, the Q output becomes high impedance.
*When INHN goes LOW to HIGH, the Q output goes LOW once and then becomes normal output operation after having detected oscillation signals.

Reference DATA (XO7052C1)

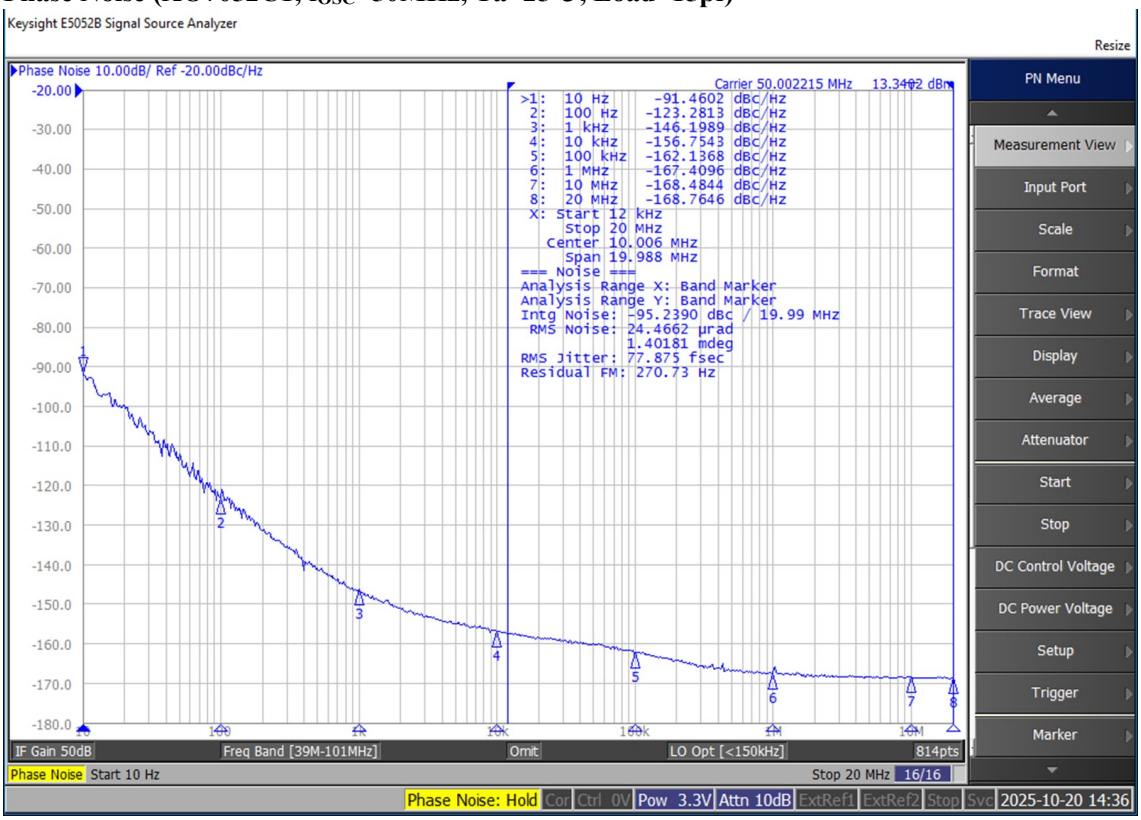
Current Consumption (XO7052C1, f_{OSC}=50MHz, Ta=25℃, no load and 15pf)



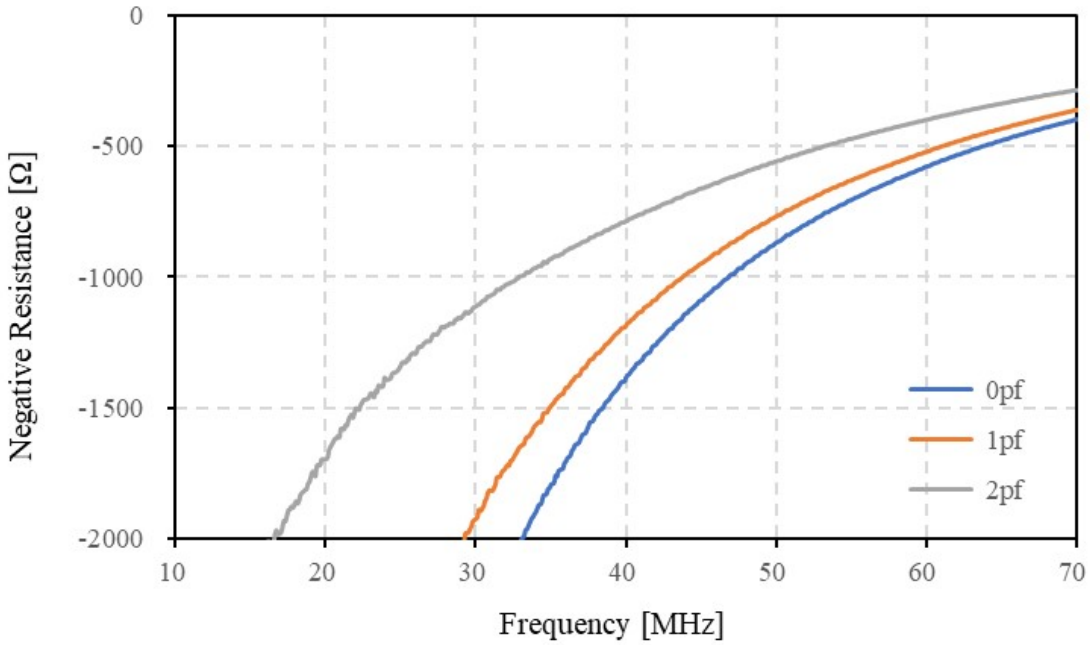
Output Waveform (XO7052C1, f_{OSC}=50MHz, Ta=25℃, Load=15pf)



Phase Noise (XO7052C1, f_{OSC}=50MHz, Ta=25℃, Load=15pf)

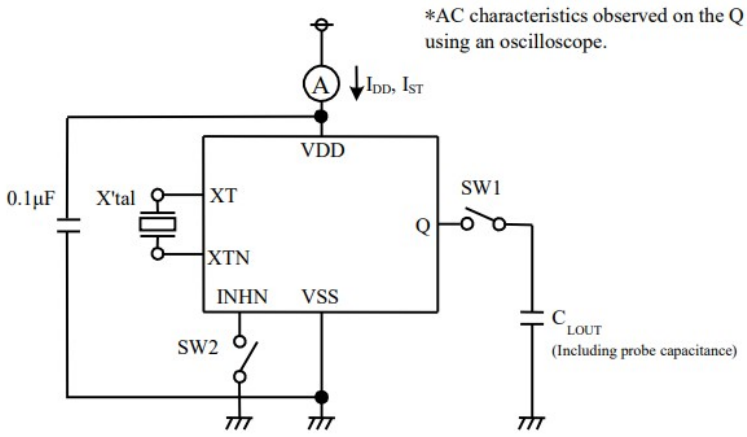


Negative Resistance (XO7052C1, V_{DD}=3.3V, Ta=25℃)



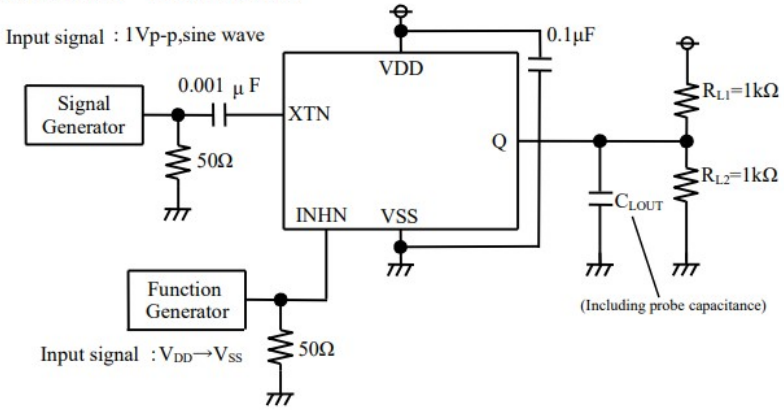
Measurement Circuit

Measurement circuit 1 Parameters: I_{DD}, I_{ST}, DUTY, t_r, t_f

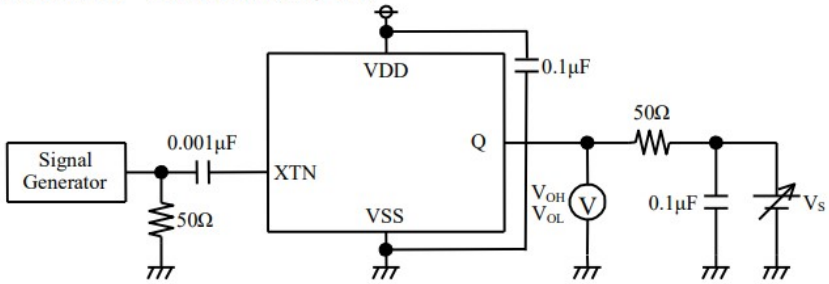


Parameter	SW1	SW2
I_{DD}	OFF	OFF
I_{ST}	ON or OFF	ON
DUTY,t_r,t_f	ON	OFF

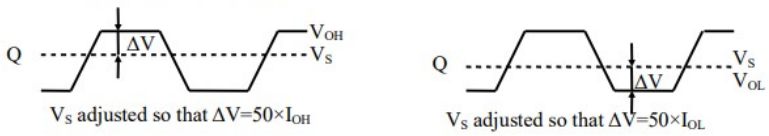
Measurement circuit 2 Parameter: t_{OD}



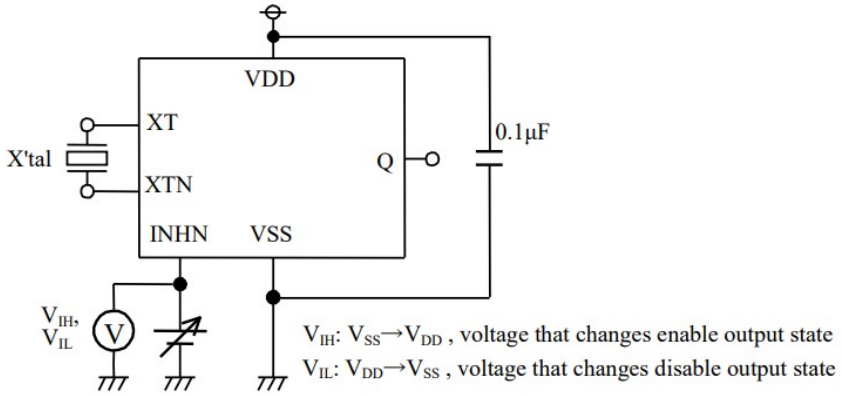
Measurement circuit 3 Parameter: V_{OH}, V_{OL}



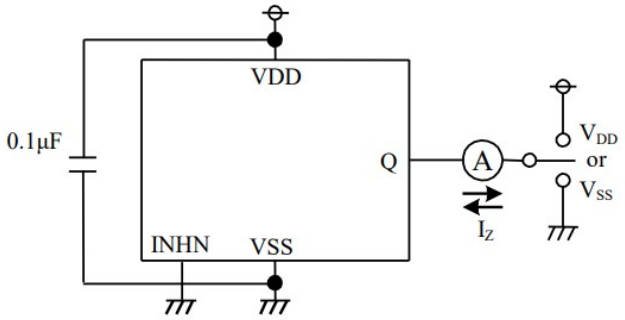
XTN input signal : 1Vp-p,sine wave



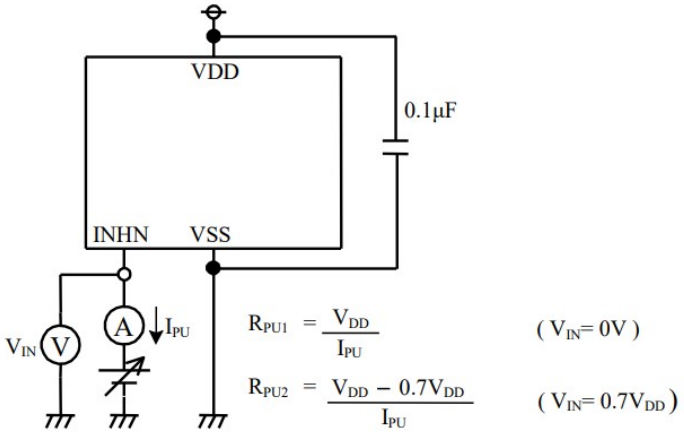
Measurement circuit 4 Parameter: V_{IH}, V_{IL}



Measurement circuit 5 Parameter: I_Z



Measurement circuit 6 Parameter: R_{PU1}, R_{PU2}



Revision History

Revision	Description	Date
V1.0	official release	2026/1/20
V1.1	Change Frequency Range from 20MHz~60MHz to 10MHz~70MHz	2026/3/25
V1.2	Updated Pad Configuration	2026/5/25