



Features

- Wide range of operating supply voltage: 1.6V to 5.5V
- Low crystal drive current oscillation for miniature crystal units
- XO5052C/B series: for Wire Bonding
 - XO5052Cx : C type package
 - XO5052Bx: B type package(2016)
- -45 to 125°C operating temperature range
- Crystal frequency (10MHz~60MHz)
- Output Freq: Crystal Freq divided by 1/2/4/8/16
- Very low standby current
- 50±5% output duty cycle
- 50pF output drive capability (2.25~5.5V)
- 15pF output drive Capability(1.6~5.5V)
- Die form or Wafer form

Applications

- Fundamental Crystal Oscillator
- 7050, 5032, 3225, 2520, 2016 crystal oscillator

Description

The XO5052 series are miniature crystal oscillator module ICs. The oscillator circuit stage has constant current drive, significantly reducing current consumption and crystal current, compared with existing devices, and significantly reducing the oscillator characteristics supply voltage dependency.

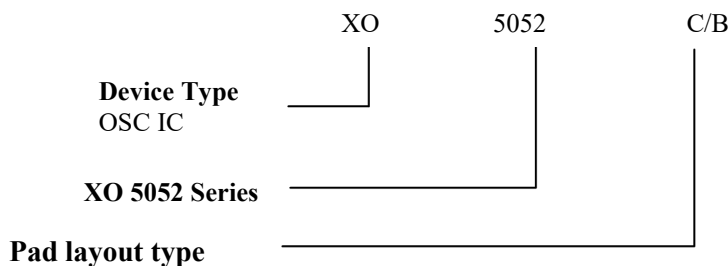
Ordering Information

Part no.	Package type
XO5052xy-zWF-C	Wafer form
XO5052xy-zDE-C	Die form

Note 1: x: B suitable for B Base, C suitable for C base

Note 2.:y: 1/2/3/4(1/2/4/8/16)

Note 3: z: -8(180um) or -3(130um), -4(100um),



B: for Wire Bonding (type I)
C: for Wire Bonding (type II)

Oscillation frequency range, frequency divider function

Suffix	f _{output}	Frequency range
1	f _o	10 to 60MHz
2	f _o /2	
3	f _o /4	
4	f _o /8	
5	f _o /16	
6	f _o /32	
7	f _o /64	
8	f _o /128	
9	f _o /256	



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 (Q output).....	20mA

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	Conditions	Min	Typ	Max	Unit
V_{DD}	Supply voltage	-	1.6	-	5.5	V
T_A	Operating temperature	-	-45		+125	°C
f_0	Oscillation frequency*1	-	10		60	MHz



DC Electrical Characteristics

XO5052(V_{DD} = 1.6 to 5.5V, T_A = -40 to 85°C, unless otherwise noted.)

Parameter	Sym	Conditions	Min	Typ	Max	Unit	
HIGH-level output voltage	V _{OH}	I _{OH} =1mA	V _{DD} -0.4	-	-	V	
LOW-level output voltage	V _{OL}	I _{OL} =1mA	-	-	0.4		
HIGH-level input voltage	V _{IH}	OE Measurement	0.7V _{cc}	-	-	V	
LOW-level input voltage	V _{IL}	OE Measurement	-	-	0.4		
Operating current	I _{CC}	V _{dd} =1.8V(25MHz), no loading	-	0.65	1.3	mA	
Operating Current	I _{cc}	V _{dd} =3.0V(25MHz), no loading	-	1.4	2.8	mA	
Operating Current	I _{cc}	V _{dd} =1.8V(25MHz),15pf loading	-	1.3	2.0	mA	
Operating Current	I _{cc}	V _{dd} =3.0V(25MHz),15pf loading	-	2.5	3.5	mA	
Standby Current	I _{sb}	OE=off			10	uA	
OE pull-up resistance			-		-		
	R _{PULL}	V _{DD} = 3.3V	-	2	-	MΩ	
Output leakage current	I _Z	OE=OFF	V _O =V _{DD}	-	-	10	μA

AC Characteristics

XO5052C/B, T_A=-40 to 85°C unless otherwise noted

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output Disable Delay	t _{OD}	Output Disable Function (OE)	-	-	100	ns
Output Enable Delay	t _{STR}	Output Enable Function (OE)	-	-	10	ms
Output rise time	t _{rl}	C _L =15Pf, 0.1V _{DD} to 0.9V _{DD} V _{DD} =3.3V	-	1.6	2.5	ns
Output fall time	t _{fl}	C _L =15Pf, 0.1V _{DD} to 0.9V _{DD} V _{DD} =3.3V	-	1.6	2.5	ns
Output duty cycle	Duty	T _A =25°C, C _L =15pF	45	50	55	%
V _{DD} Sensitivity Frequency vs. V _{DD} +/-10% -2 2 ppm		Frequency vs. V _{DD} +/-10%	-1.5	-	+1.5	ppm
OSC frequency range	f _R	Fundamental Crystal	10		60	MHz

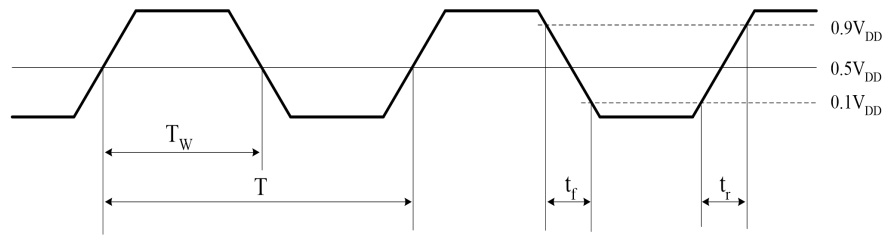
Crystal Specifications

Parameters	Sym	Conditions	Min	Typ	Max	Units
Fundamental Crystal Resonator Frequency(XO5052)	F _{XIN}	-	10		60	MHz
Maximum Sustainable Drive Level		-	-	-	200	μW
Operating Drive Level		-	-	30	-	μW
Crystal Shunt capacitance	C _O	-	-	-	4	pF
Effective Series Resistance, Fundamental, 20-60MHz	ESR	-	-	-	40	Ω



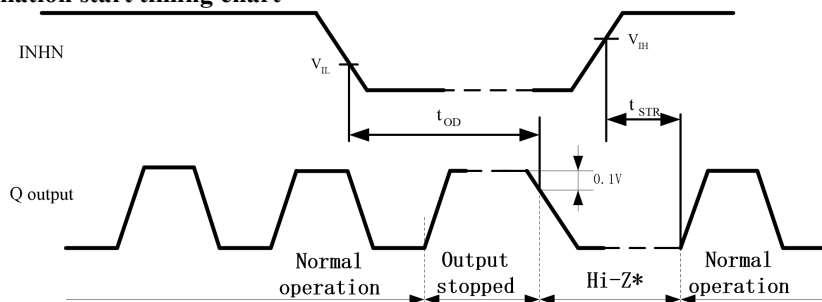
AC Electrical Characteristics

Output switching waveform



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

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)

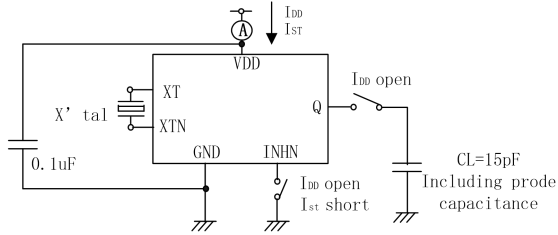
*: the high-impedance interval in the figure is shown as a LOW level due to the 1K Ω pull-down resistor connected to the Q pin (see "Measurement circuit 2" in the "Measurement circuits" section)



Measurement Circuit

Measurement cct1

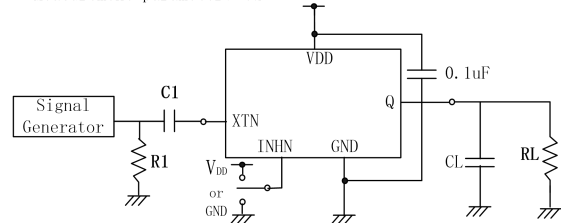
Measurement parameter: I_{DD} , I_{ST} , Duty, t_r , t_f



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

Measurement cct2

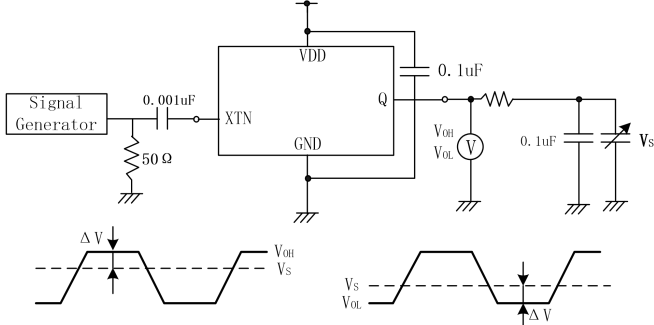
Measurement parameter: t_{OD}



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

Measurement cct3

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



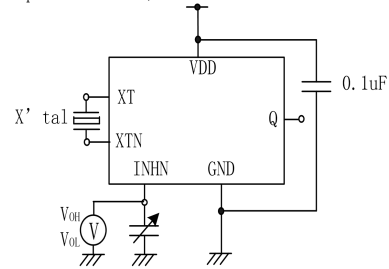
V_S adjusted such that $\Delta V = 50 \times I_{OH}$

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

XTN input signal: 1Vp-p, sine wave

Measurement cct4

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



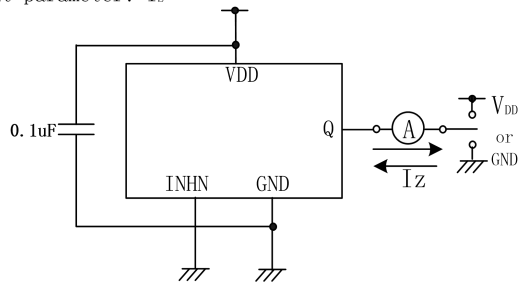
V_{IH} : Voltage is 0V to V_{DD} transition that changes the output state.

V_{IL} : Voltage is V_{DD} to 0V transition that changes the output state.

INHN has an oscillation stop function

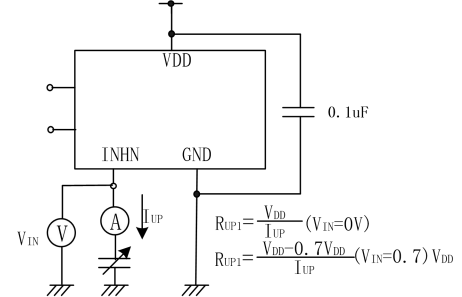
Measurement cct5

Measurement parameter: I_Z



Measurement cct6

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



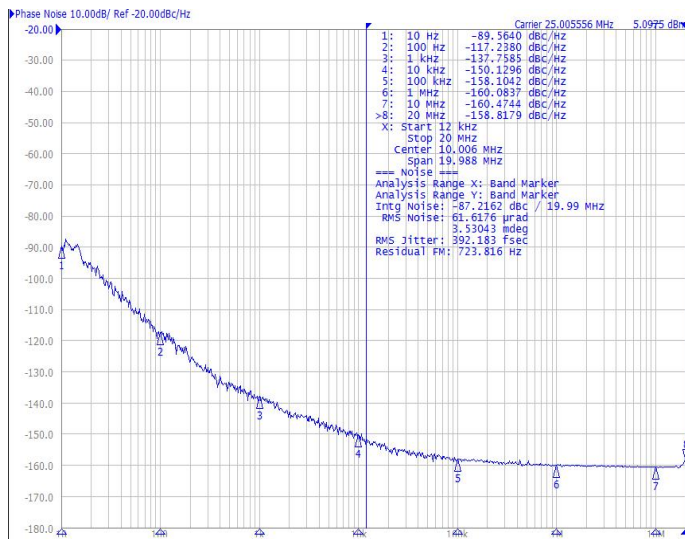
$$R_{UP1} = \frac{V_{DD}}{I_{UP}} \quad (V_{IN} = 0V)$$

$$R_{UP1} = \frac{V_{DD} - 0.7V_{DD}}{I_{UP}} \quad (V_{IN} = 0.7V_{DD})$$

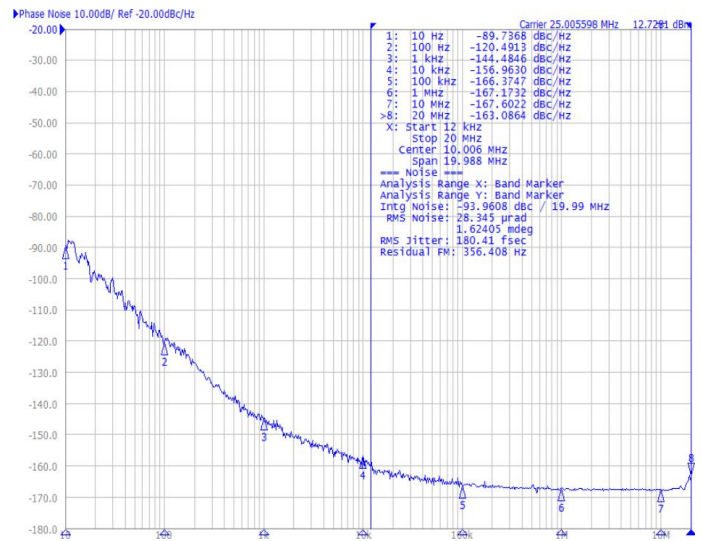


Phase noise test figures:

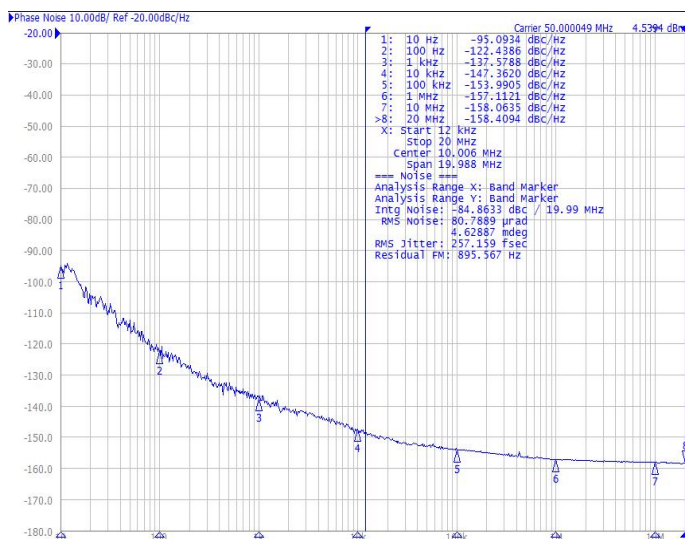
25MHz/15pf/1.8V



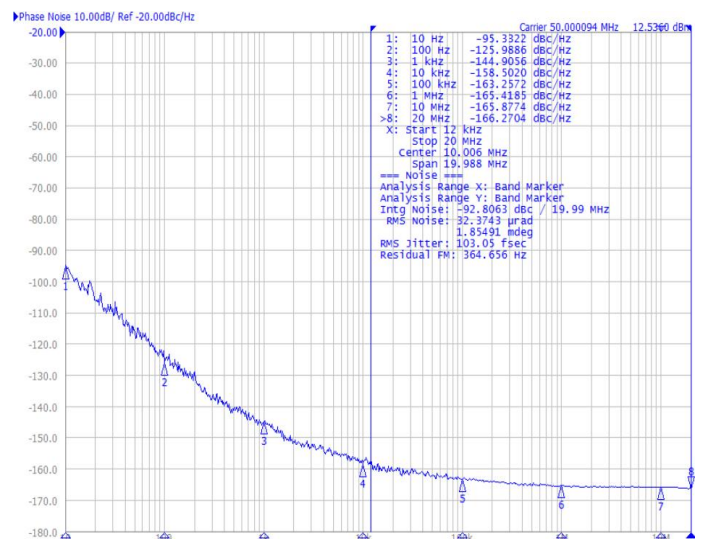
25MHz/15pf/3.3V



50MHz/15pf/1.8V



50MHz/15pf/3.3V





Rev #	DCN NO.	REVISION HISTORY	DATE
A.0	220126	Initial release	2022/11/28