



Features

- Wide range of operating supply voltage: 1.35V to 5.5V
- Low crystal drive current oscillation for miniature crystal units
- XO5127C/B series: for Wire Bonding
- XO5127Cx : C type package
- XO5127Bx: B type package(2016)
- -45 to 125°C operating temperature range
- Crystal frequency (12MHz~60MHz)
- Output Freq: Crystal Freq divided by 1/2/4/8/16/32/64/128/256
- Very low standby current
- 50±5% output duty cycle
- 15pF output drive capability(C1/C2/C3/C4)
- 50pF output drive capability(C5/C6/C7/C8/C9)
- Die form or Wafer form

Description

The XO5127 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.

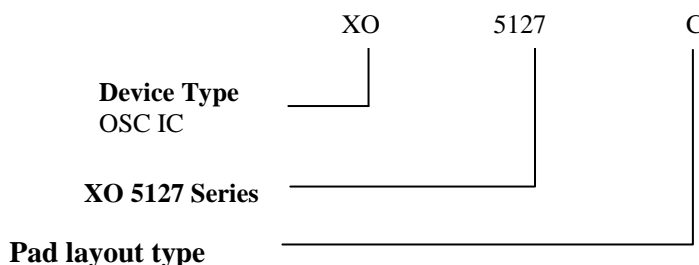
Applications

- Fundamental Crystal Oscillator
- 7050, 5032, 3225, 2520, 2016 (XO5127B1-4) crystal oscillator

Ordering Information

Part No.	Package type
XO5127xy-zWF	6 inches Wafer form
XO5127xy-zDE	Die form

Note 1: x: B suitable for B Base, C suitable for C base
 Note 2: y: 1/2/3/4/5/6/7(1/2/4/8/16/32/64)
 Note 3: z: -2(220um) or -3(130um), -4(100um), -5(150)



Pad layout type

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

X: 2 Stand for 220um die thickness
 3 Stand for 130um die thickness
 4 Stand for 100um die thickness
 5 Stand for 150um die thickness
 8 Stand for 180um die thickness

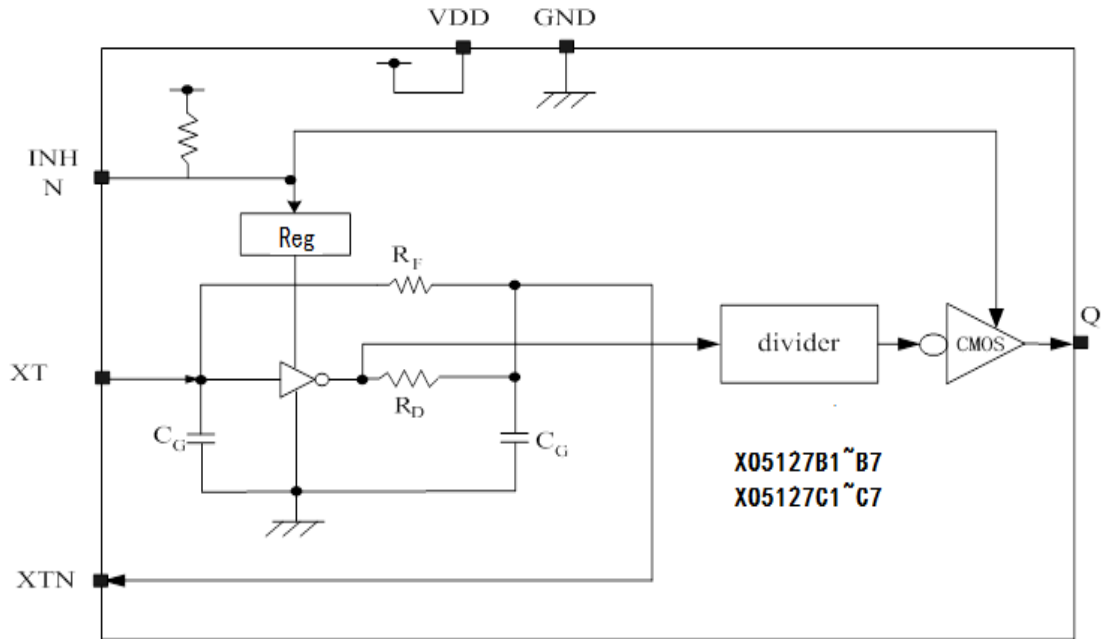
1- X

Oscillation frequency range, frequency divider function

Suffix	f _{output}	Frequency range
1	f ₀	12 to 60MHz
2	f ₀ /2	
3	f ₀ /4	
4	f ₀ /8	
5	f ₀ /16	
6	f ₀ /32	
7	f ₀ /64	
8	f ₀ /128	
9	f ₀ /256	



Block Diagram





Pin Description

Pin Name	Type	Description	
XTN	O	Amplifier output.	Crystal oscillator connected between XT and XTN
XT	I	Amplifier input.	
INH	I	Output state control input. Output High when LOW. Power-saving pull-up resistor built in.	
V _{DD}	P	Supply voltage	
GND	P	Ground	
Q	O	Output. Output frequency determined by fundamental crystal(f_0 divided by 1/2/4/8/16/.../256)	

Absolute 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 (all outputs)	20mA

Note:

Stresses greater than those listed under MAXIMUM RATINGS may be applied for a limited time only. 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.)

Symbol	Parameter	Conditions	MIN	TYP	MAX	Unit
V _{DD}	Supply voltage	-	1.50	-	5.0	V
T _A	Operating temperature	-	-45		+125	°C
f ₀	Oscillation frequency ^{*1}	-	12		60	MHz



DC Electrical Characteristics

XO5127($V_{DD} = 1.50$ to $5.5V$, $T_A = -40$ to $85^\circ C$, unless otherwise noted.)

Parameter	Symbol	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	$0.7V_{DD}$	-	-	V	
LOW-level input voltage	V_{IL}	OE Measurement	-	-	$0.3V_{DD}$		
Operating current	I_{CC}	$V_{DD} = 1.8V(25MHz)$, no loading	-	0.5	0.75	mA	
		$V_{DD} = 3.0V(25MHz)$, no loading	-	0.7	1.0	mA	
		$V_{DD} = 1.8V(40MHz)$, no loading	-	0.7	1.0	mA	
		$V_{DD} = 3.0V(40MHz)$, no loading	-	1.0	1.3	mA	
Standby Current	I_{sb}	OE=off			10	μA	
OE pull-up resistance	R_{PULL}	$V_{DD} = 3.3V$	-	2	-	$M\Omega$	
Output leakage current	I_z	OE=OFF	$V_O = V_{DD}$	-	-	10	μA

AC Electrical Characteristics

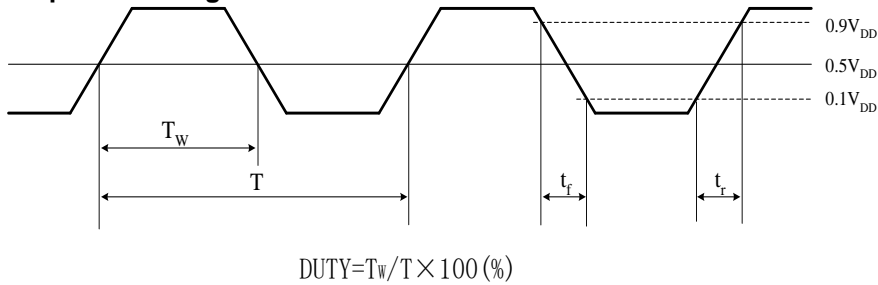
XO5127C/B, $T_A=-40$ to $85^\circ C$ unless otherwise noted

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)	-	-	2	ms
Output rise time	t_r	$C_L=15Pf$, $0.1V_{DD}$ to $0.9V_{DD}$ $V_{DD}=3.3V$	-	1.85	3	ns
Output fall time	t_f	$C_L=15Pf$, $0.1V_{DD}$ to $0.9V_{DD}$ $V_{DD}=3.3V$	-	1.85	3	ns
Output duty cycle	Duty	$T_A=25^\circ C$, $C_L=15pF$	45	50	55	%
V_{DD} Sensitivity Frequency vs. $V_{DD}\pm 10\%$ -2 2 ppm		Frequency vs. $V_{DD}\pm 10\%$	-1	-	+1	ppm
OSC frequency range	f_R	Fundamental Crystal	12		60	MHz

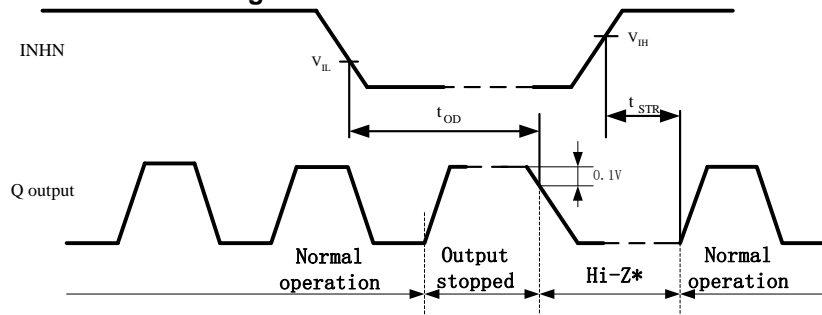


Output Waveform

Output switching waveform



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 1KΩ pull-down resistor connected to the Q pin(see“Measurement circuit 2”in the “Measurement circuits” section)

Crystal Specifications

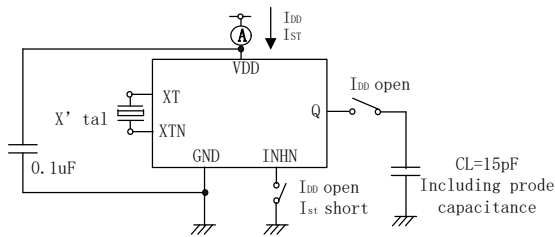
Parameters	Symbol	Conditions	MIN	TYP	MAX	Unit
Fundamental Crystal Resonator Frequency(XO5127)	F_{XIN}	-	12		60	MHz
Maximum Sustainable Drive Level		-	-	-	200	μW
Operating Drive Level		-	-	50	-	μW
Crystal Shunt capacitance	C_o	-	-	-	4	pF
Effective Series Resistance, Fundamental, 10-50MHz	ESR	-	-	-	30	Ω



Measurement Circuit

Measurement cct1

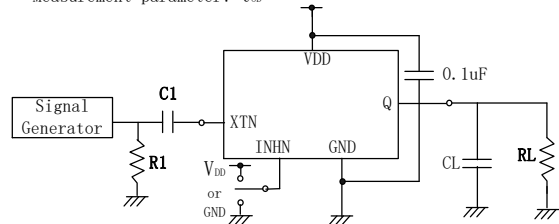
Measurement parameter: I_{DD} , I_{ST} , Duty, t_r , t_f



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

Measurement cct2

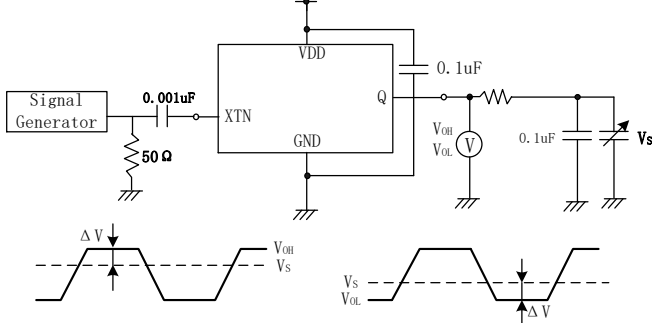
Measurement parameter: t_{DD}



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

Measurement cct3

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



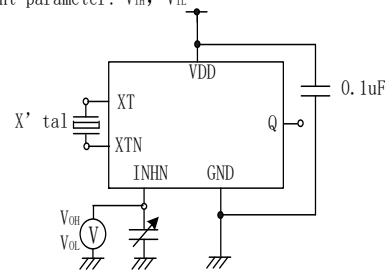
V_S adjusted such that $\Delta V = 50 \times I_{OH}$

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}



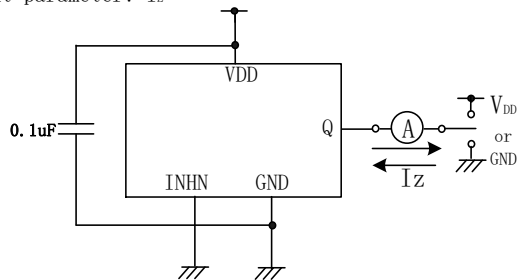
V_{IH} : Voltage is 0V to V_{DD} transition that changes the output state.

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

INHN has an oscillation stop function

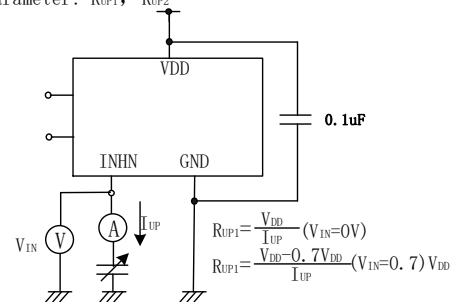
Measurement cct5

Measurement parameter: I_Z



Measurement cct6

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



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

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



Revision History

Revision	Description	Date
V1.9	1. Updated 15pF output drive capability(C1/C2/C3/C4) 2. Updated 50pF output drive capability(C5/C6/C7/C8/C9)	2023/6/21
V2.0	1. Updated T _{STR} max value from 10ms to 2ms;	2023/10/12