Features

- Wide range of operating supply voltage: 1.5V to 3.63V
- Low crystal drive current oscillation for miniature crystal units
- Ulta-Low power consumption(12uA/1.8V)
- XO5129CA/B series: for Wire Bonding Type C
- -45 to 125℃ operating temperature range
- Crystal frequency 16.777216M(XO5129CA /512)
- Crystal frequency 33.554432M(XO5129CB /1024)
- Output Freq: Crystal Freq divided by /512 or 1024
- Very low standby current
- 50±2% output duty cycle
- 15pF output drive capability
- Die form or Wafer form

Description

The XO5129 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.

Application

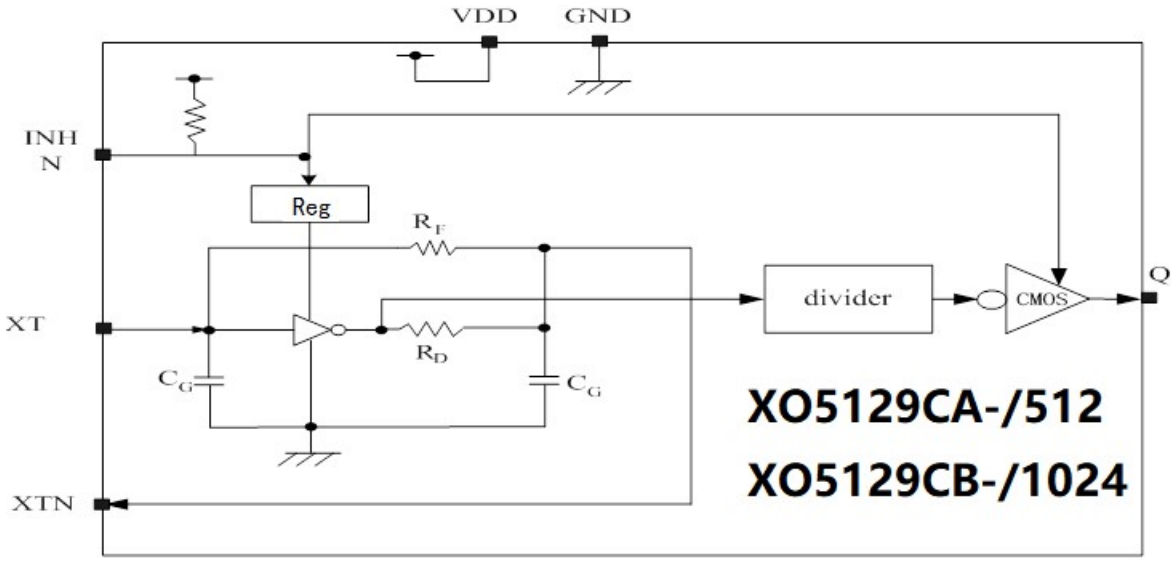
- 32.768KHz Crystal Oscillator
- 7050, 5032, 3225, 2520, 2016 crystal oscillator

Ordering Information

Part no.	Package type
XO5129Cy-zWF	Wafer form
XO5129Cy-zDE	Die form

Note 1:y: A stand for /512, B stand for /1024
Note 2:.Z: -3(130um), -4(100um)

Block Diagram



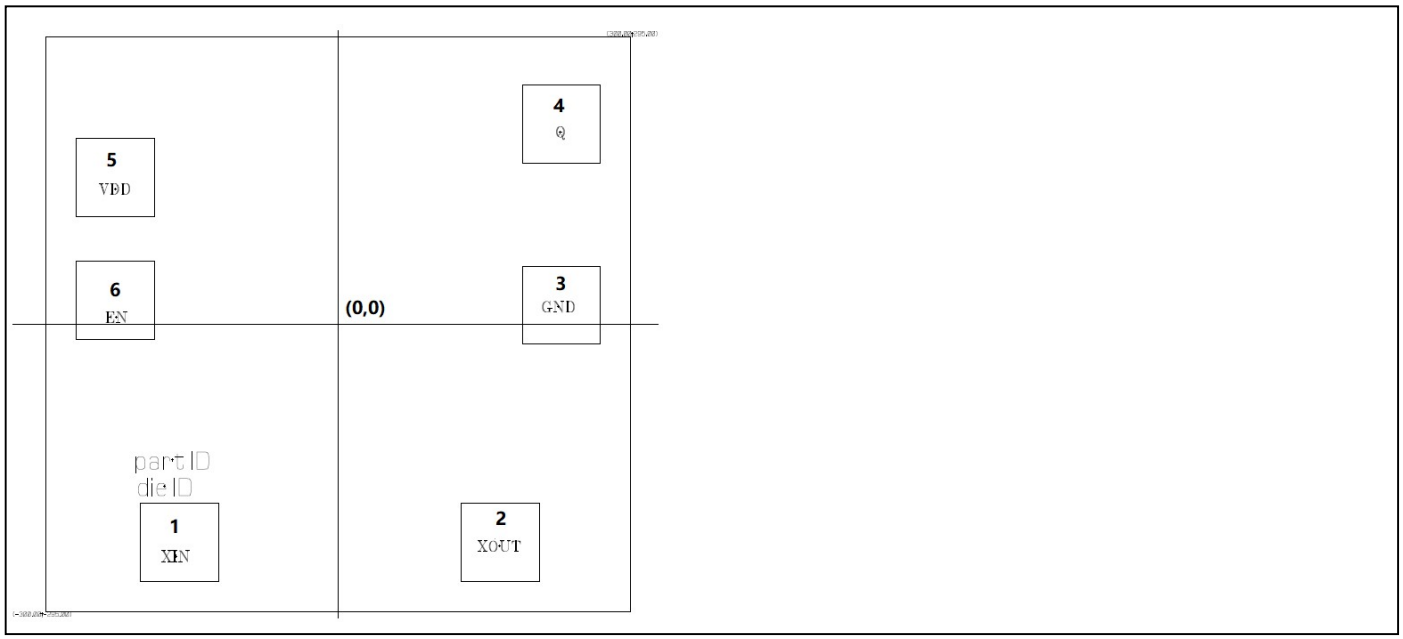
Function Description

Standby Function
When INHN goes LOW, the oscillator stops and the output on Q becomes high impedance.

INHN	Q	Oscillator
HIGH (or open)	F0/512 or F0/1024 output frequency	Normal operation
Low	High impedance	Stopped

Power-saving Pull-up Resistor
The INHN pin pull-up resistance RUP1 or RUP2 changes in response to the input level(HIGH or LOW). When INHN is tied LOW level, the pull-up resistance is large(RUP1),reducing the current consumed by the resistance. When INHN is left open circuit, the pull-up resistance is small(RUP2),which increases the input susceptibility to external noise. However, the pull-up resistance ties the INHN pin HIGH level to prevent external noise from unexpectedly stopping the output.

Pad Configuration



Pad Coordinate File					
Pad Name	X Coordinate	Y Coordinate	Pad Name	X Coordinate	Y Coordinate
1	-162.5	-224	4	228.9	205.4
2	166.5	-224	5	-228.6	151
3	229.2	19.5	6	-228.6	24.8
Note: Substrate is connected to GND or floating.					
Die Size: 660μm*650μm (Including scribe line: 60um) **Die Thickness:** 130μm±15μm(-3) , 100um±15um(-4) **Pad Size:** 80μm*80μm **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. 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(f0 divided by 512/1024)	

Maximum Ratings

Storage Temperature.....- 65°C to +150°C
Supply Voltage to Ground Potential (V_{DD} to GND).....- 0.5V to +5.5V
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

Recommended Operating Conditions

(GND=0V, unless otherwise noted.)

Sym.	Parameter	Conditions	Min	Typ	Max	Unit
V_{DD}	Supply voltage	-	1.5	-	3.63	V
T_A	Operating temperature	-	-45	+25	+125	°C
f_0	Oscillation frequency*1	-	-	16.777216(XO5129CA) 33.554432(XO5129CB)	-	MHz

DC Electrical Characteristics

XO5129(V_{DD} = 1.50 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		0.7Vcc	-	-	V
LOW-level input voltage	V_{IL}	OE Measurement		-	-	0.4	
Operating current	I_{CC}	Vdd=1.8V(XO5129CA)/512		-	12	18	uA
Operating Current	I_{cc}	Vdd=3.0V(XO5129CA)/512		-	14	20	uA
Operating Current	Icc	Vdd=1.8V(XO5129CB)/1024		-	18	26	uA
Operating Current	Icc	Vdd=3.0V(XO5129CB)/1024		-	20	28	uA
Standby Current	Isb	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

XO5129C/B, T_A=-40 to 85℃ unless otherwise noted

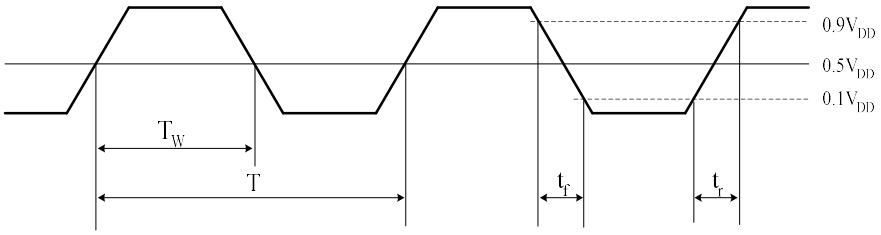
Parameter	Symbol	Condition		Min	Typ	Max	Unit
Output Disable Delay	t_{OD}	Output Disable Function (OE)		-	-	100	ns
Output Enable Delay	t_{STR}	Output Enable Function (OE)		-	-	10	ms
Output rise time	t_{r1}	C_L=15Pf, 0.1V_{DD} to 0.9V_{DD}	V_{DD}=3.3V	-	50	100	ns
Output fall time	t_{f1}	C_L=15Pf, 0.1V_{DD} to 0.9V_{DD}	V_{DD}=3.3V	-	50	100	ns
Output duty cycle	Duty	T_A=25°C, C_L=15pF		48	50	52	%
V_{DD} Sensitivity Frequency vs. VDD+/-10% -2 2 ppm		Frequency vs. V_{DD}+/-10%		-1	-	+1	ppm
OSC frequency range	f_R	Fundamental Crystal		-	16.777216 33.554432	-	MHz

Crystal Specifications

Parameters	Sym	Conditions	Min	Typ	Max	Units
Fundamental Crystal Resonator Frequency(XO5129CA)	F_{XIN}	-	-	16.777216	-	MHz
Fundamental Crystal Resonator Frequency(XO5129BB)	F_{XIN}	-	-	33.554432	-	MHz
Maximum Sustainable Drive Level		-	-	-	100	μW
Operating Drive Level		-	-	20	-	μW
Crystal Shunt capacitance	C_O	-	-	-	4	pF
Effective Series Resistance, Fundamental, 10-50MHz	ESR	-	-	-	30	Ω

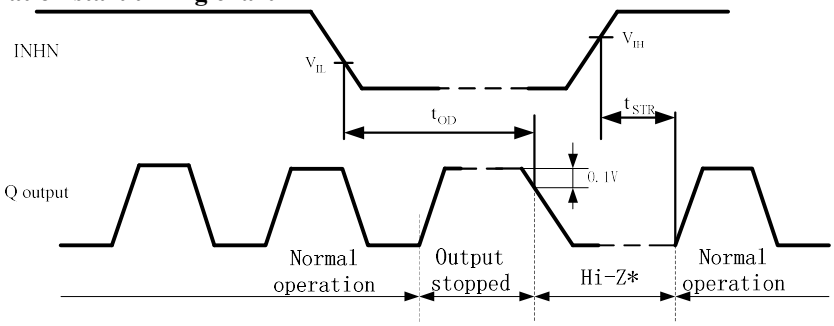
AC Electrical Characteristics

Output switching waveform



$DUTY=T_W/T\times100(\%)$

Output disable and oscillation start timing chart

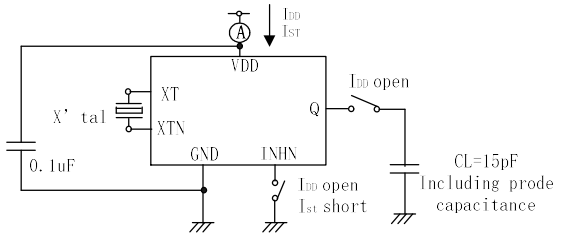


When INHN goes HIGH to LOW, the Q output goes HIGH once and then becomes high impedance.
When INHN goes LOW to HIGH, the Q output from high impedance to normal output operation when the oscillation starts (oscillation is detected)
*: the high –impedance interval in the figure is shown as a LOW level due to the 1KΩ pull-down resistor connected to the Q pin(see "Measurement circuit 2" in the "Measurement circuits" section)

Measurement Circuit

Measurement cct1

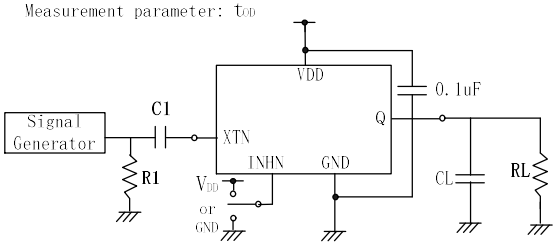
Measurement parameter: I_{DD}, I_{ST}, Duty, t_R, t_F



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

Measurement cct2

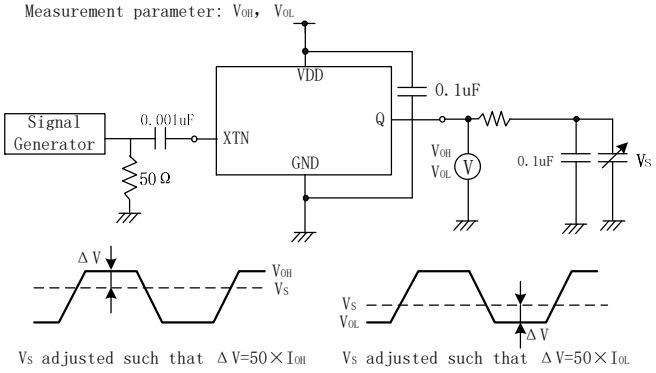
Measurement parameter: t_{OD}



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

Measurement cct3

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

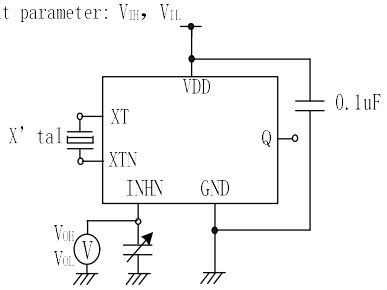


Vs adjusted such that ΔV=50×I_{OH} Vs adjusted such that ΔV=50×I_{OL}

XTN input signal:1Vp-p,sina wave

Measurement cct4

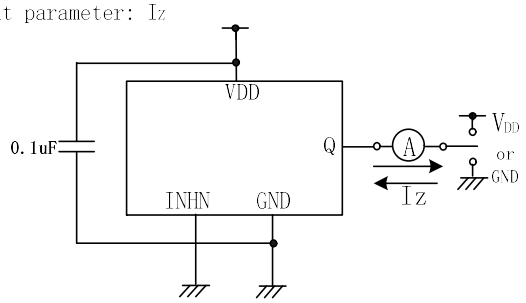
Measurement parameter: V_{IH}, V_{IL}



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: Iz



Measurement cct6

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