



Preliminary Data Sheet

XO2027Cx series Ultra-low Current Fundamental Crystal Oscillator IC

Features

- Wide range of operating supply voltage: 1.5V to 3.63V
- Low crystal drive current oscillation for miniature crystal units
- Ultra-Low power current(128uA/1.8V/26MHz)
- XO2027Cx series: for Wire Bonding Type C
- -45 to 85°C operating temperature range
- Crystal frequency (10~40M)
- Output Freq: Crystal Freq divided by 1/2/4/8
- Very low standby current
- 50±2% output duty cycle
- 15pF output drive capability
- Die form or Wafer form

Description

The XO2027Cx 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

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

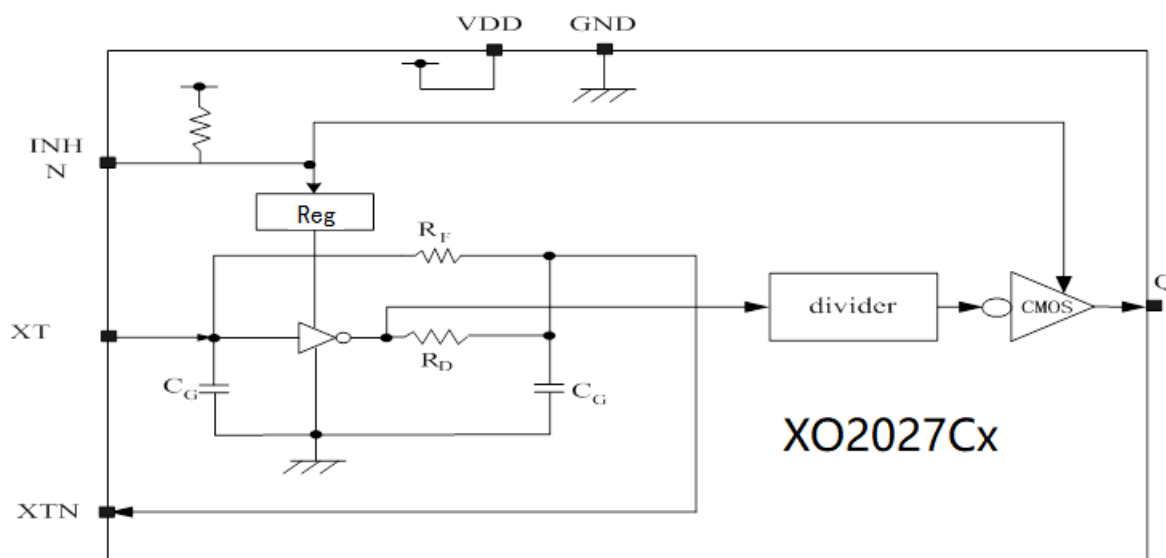
Ordering Information

Part no.	Package type
XO2027Cy-zWF	Wafer form
XO2027Cy-zDE	Die form

Note 1:y: stand for 1/2/4/8

Note 2:Z: -3(130um), -4(100um)

Block Diagram





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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)	F0/1/2/4/8 output frequency	Normal operation
Low	High impedance	Stopped

Power-saving Pull-up Resistor

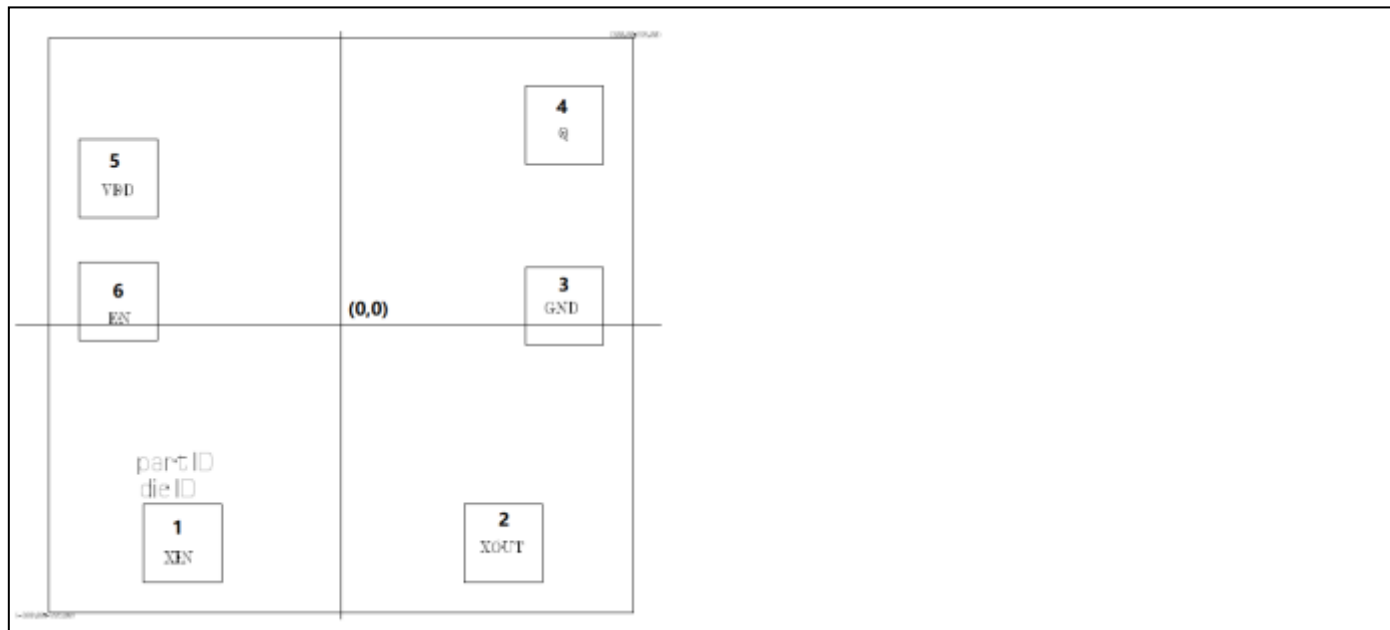
The INHN pin pull-up resistance RUP1 or RUP2 changes in response to the input level(HIGH or LOW). When INHN is tied LOW level, the pull-up resistance is large(RUP1),reducing the current consumed by the resistance. When INHN is left open circuit, the pull-up resistance is small(RUP2),which increases the 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.



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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	-.65	5	-228.6	151
3	229.2	-19.5	6	-228.6	24.8

Note: Substrate is connected to GND or floating.
Die Size: 600μm*590μm (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.	
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)	



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Maximum Ratings

Storage Temperature	-65°C to +150°C
Supply Voltage to Ground Potential (V_{DD} to GND)	-0.5V to +6.5V
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	+85	°C
f_0	Oscillation frequency ^{*1}	-	10		40	MHz



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DC Electrical Characteristics

XO2027C1(V_{DD} = 1.50 to 3.63V, 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(26MHz) no loading	-	128	180	uA	
Operating Current	I _{cc}	V _{DD} =3.3V (26MHz)/no loading	-	150	220	uA	
Operating Current	I _{cc}	V _{DD} =1.8V(26MHz) C _L =5pf	-	316	450	uA	
Operating Current	I _{cc}	V _{DD} =3.3V(26MHz) C _L =5pf	-	575	750	uA	
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

XO2027C1, 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/Output Fall Time	t _{r1} / t _{f1}	C _L =5Pf, 0.1V _{DD} to 0.9V _{DD} V _{DD} =1.8V	-	4	8	ns
Output Rise Time/Fall Time	t _{r1} /t _{f1}	C _L =5Pf, 0.1V _{DD} to 0.9V _{DD} V _{DD} =3.3V	-	2.2	4	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	-	+1	ppm
OSC frequency range	f _R	Fundamental Crystal	10		40	MHz

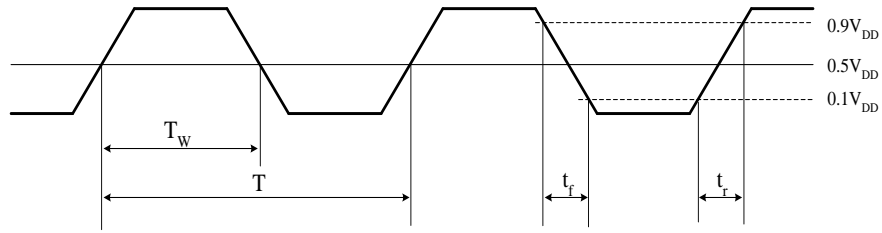
Crystal Specifications

Parameters	Sym	Conditions	Min	Typ	Max	Units
Fundamental Crystal Resonator Frequency(XO2027Cx)	F _{XIN}	-	10		40	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



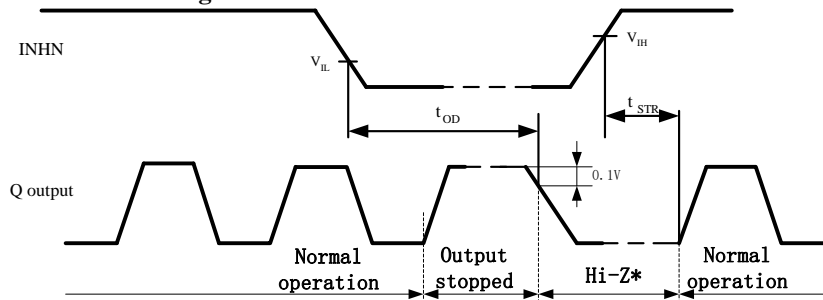
AC Electrical Characteristics

Output switching waveform



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

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)



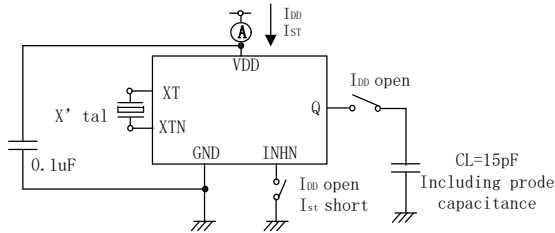
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Measurement Circuit

Measurement cct1

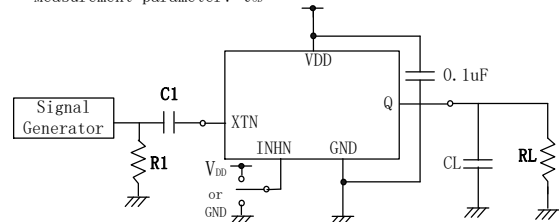
Measurement parameter: I_{DD} , I_{ST} , Duty, t_r , t_f



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

Measurement cct2

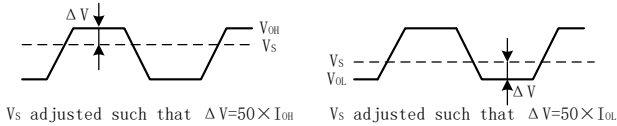
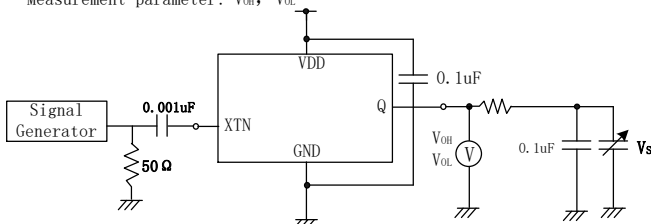
Measurement parameter: t_{OD}



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

Measurement cct3

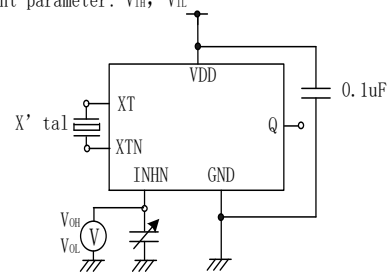
Measurement parameter: V_{OH} , V_{OL}



XTN input signal: 1Vp-p, sina wave

Measurement cct4

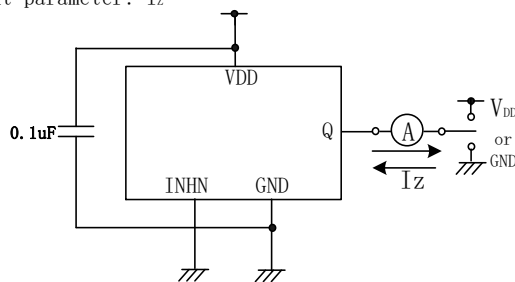
Measurement parameter: V_{IH} , V_{IL}



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: I_z



Measurement cct6

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

