



Features

- Wide range of operating supply voltage: 1.62V to 3.63V
- Low crystal drive current oscillation for miniature crystal units
- XO5052HCx-Q series: for Wire Bonding
XO5052HCx-Q : C type package
- -40 to 125°C operating temperature range
- Crystal frequency (50MHz~100MHz)
- Output Freq: Crystal Freq divided by 1/2/4
- Very low standby current
- 50±5% output duty cycle
- 15pF output drive capability
- Die form or Wafer form
- AEC-Q 100 qualified, Automotive Grade 1 support; PPAP capable, and manufactured in IATF 16949 certified facilities

Description

The XO5052HCx-Q 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

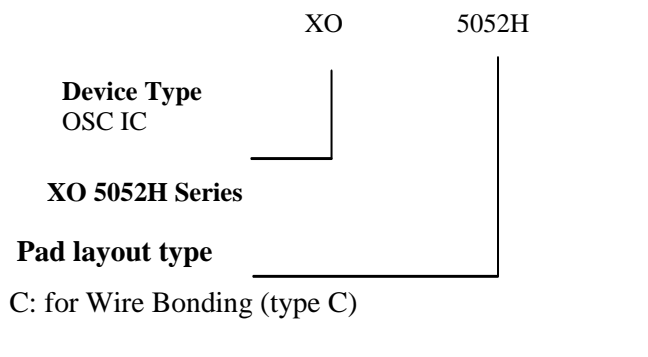
- Fundamental Crystal Oscillator
- 3225, 2520, 2016 crystal oscillator

Ordering Information

Part no.	Package type
XO5052HCx-zWF-Q	Wafer form
XO5052HCx-zDE-Q	Die form

Note 1: x: y: 1/2/3/4(1/2/4)

Note 2: -8(180um) or -3(130um), -4(100um),-5(150)



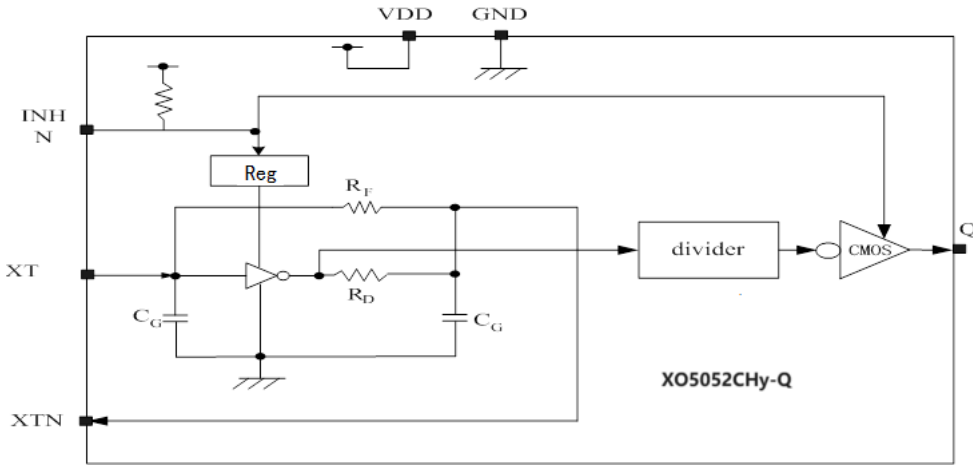
Oscillation frequency range, frequency divider function

Suffix	f _{output}	Frequency range
1	f ₀	50 to 100MHz
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	

z: 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



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)	F0/1/2/4/8 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.



Absolute Maximum Ratings

Parameter	MIN	TYP.	MAX	Unit
Storage Temperature	-65	-	+150	°C
Supply Voltage Range	-0.5	-	5.0	V
Input Voltage Range	-0.5	-	V _{DD} +0.5	V
Output Voltage Range	-0.5	-	V _{DD} +0.5	V
DC Output Current (Q output)			20	mA

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	-	1.62	-	3.63	V
T _A	Operating temperature	-	-40		+125	°C
f ₀	Oscillation frequency*1	-	50		100	MHz



DC Electrical Characteristics

XO5052HCx-Q ($V_{DD} = 1.6$ to $3.63V$, $T_A = -40$ to $125^\circ C$, 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_{DD}	$V_{DD}=1.8V(50MHz)$, no loading	-		3	mA
Operating Current	I_{DD}	$V_{DD}=3.0V(50MHz)$, no loading	-		6	mA
Operating Current	I_{DD}	$V_{DD}=1.8V(50MHz)$,15pf loading	-		6	mA
Operating Current	I_{DD}	$V_{DD}=3.0V(50MHz)$,15pf loading	-		8	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			10	μA

AC Characteristics

XO5052HCx-Q, $T_A=-40$ to $125^\circ C$ unless otherwise noted

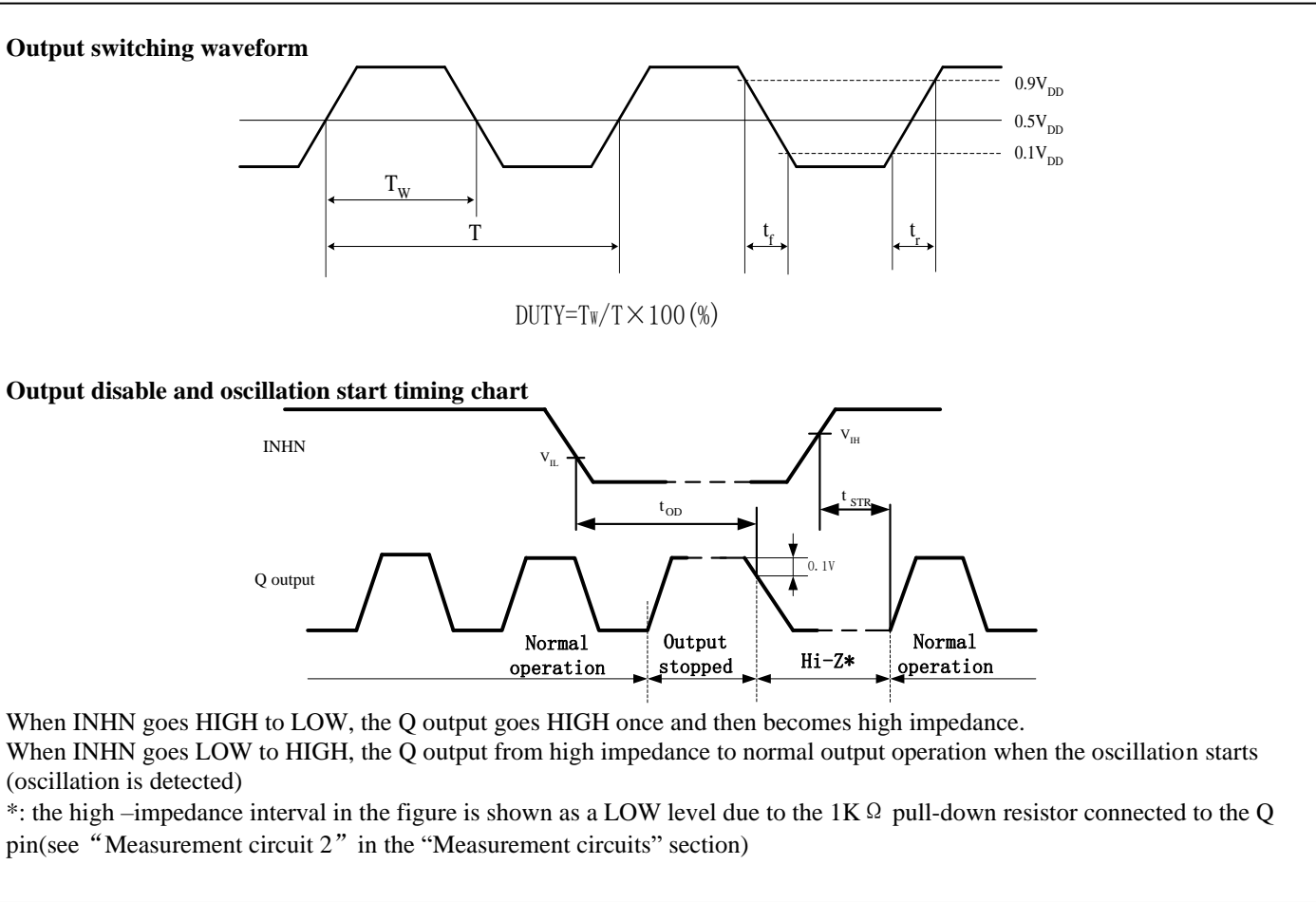
Parameter	Symbol	Condition	Min	Typ.	Max	Unit		
Output Disable Delay	t_{OD}	Output Disable Function (OE)	-	-	100	ns		
Output Enable Delay	t_{STR}	Output Enable Function (OE)	-	-	10	ms		
Output rise time	t_{r1}	$C_L=15Pf$, $0.1V_{DD}$ to $0.9V_{DD}$		$V_{DD}=3.3V$	-	1.2	2.0	ns
Output fall time	t_{f1}	$C_L=15Pf$, $0.1V_{DD}$ to $0.9V_{DD}$		$V_{DD}=3.3V$	-	1.2	2.0	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. $V_{DD}\pm 10\%$	-1.5	-	+1.5	ppm		
OSC frequency range	f_R	Fundamental Crystal	50		100	MHz		



Crystal Specifications

Parameters	Sym	Conditions	Min	Typ	Max	Units
Fundamental Crystal Resonator Frequency(XO5052)	F _{XIN}	-	50		100	MHz
Maximum Sustainable Drive Level		-	-	-	200	μW
Operating Drive Level		-	-	40	-	μW
Crystal Shunt capacitance	C _O	-	-	-	2	pF
Effective Series Resistance, Fundamental, 50-100MHz	ESR	-	-	-	40	Ω

AC Electrical Characteristics

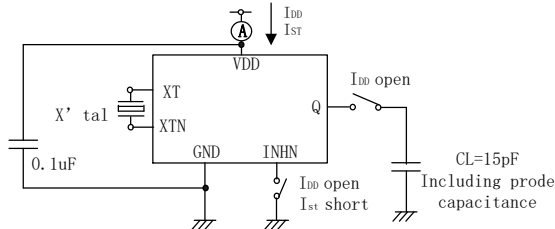




Measurement Circuit

Measurement cct1

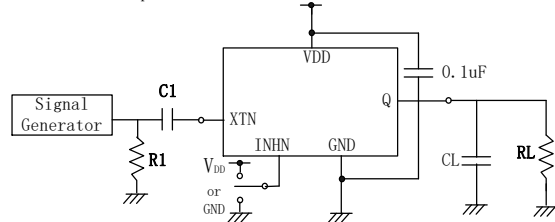
Measurement parameter: I_{DD} , I_{ST} , Duty, t_r , t_f



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

Measurement cct2

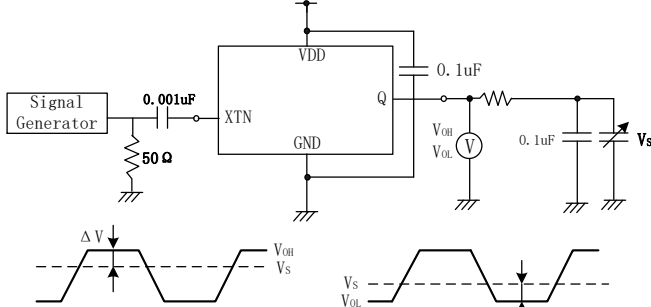
Measurement parameter: t_{CO}



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

Measurement cct3

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



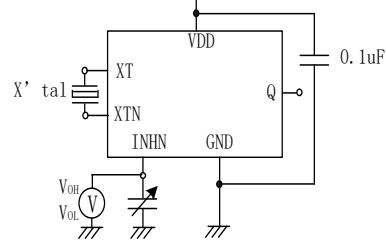
V_S adjusted such that $\Delta V = 50 \times I_{OH}$

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

XTN input signal: 1V_{p-p}, sine wave

Measurement cct4

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



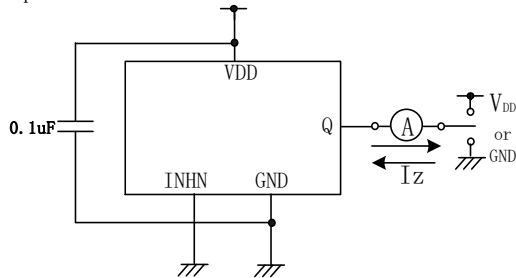
V_{IH} : Voltage is 0V to V_{DD} transition that changes the output state.

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

INHN has an oscillation stop function

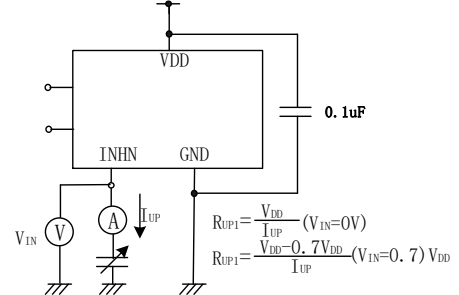
Measurement cct5

Measurement parameter: I_Z



Measurement cct6

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



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

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



RSM
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Preliminary Datasheet
Low Supply Voltage
XO5052HCx-Q series
Fundamental Crystal Oscillator IC

History Log:

Revision	Description	Date
V0.9	Initiated	2023/9/22