CF5029A

Divide-by-512 Frequency Output, Crystal Oscillator Module IC

OVERVIEW

The CF5029A is crystal oscillator module IC with divide-by-512 frequency output. It employs a 16.777216MHz fundamental frequency crystal source oscillator to generate a 32.768kHz output crystal oscillator with excellent temperature characteristics.

FEATURES

- 2.25 to 3.6V operating supply voltage range
- 16.777216MHz reference source oscillator frequency
- Output frequency: oscillation frequency divided by 512
- – 40 to 85°C operating temperature range
- Oscillation capacitors C_G, C_D built-in
- Standby function
  - High impedance in standby mode, oscillator stops
- Power-saving pull-up resistor built-in
- 2mA output drive capability (min. V_{DD} = 2.25V)
- CMOS output duty level (1/2VDD)
- Molybdenum-gate CMOS process
- Chip form (CF5029A)

APPLICATIONS

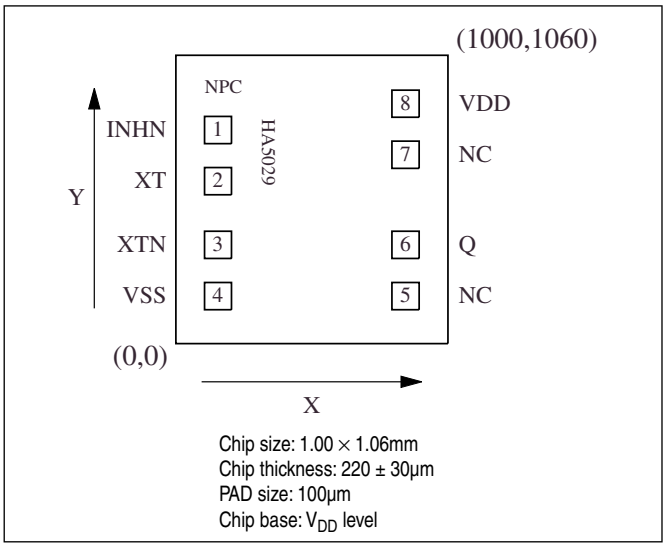
- 32.768kHz output crystal oscillator modules

ORDERING INFORMATION

Device	Package
CF5029A–2	Chip form

PAD LAYOUT

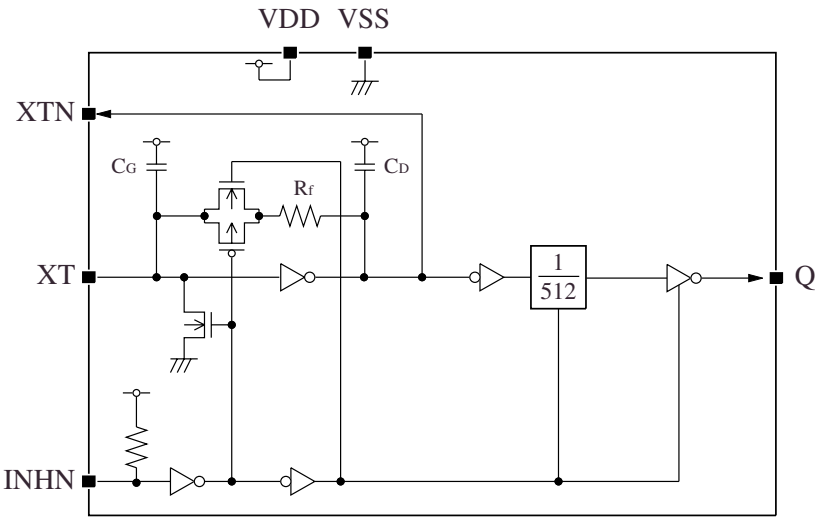
(Unit: µm)



PIN DESCRIPTION and PAD DIMENSIONS

No.	Name	I/O	Description		Pad dimensions [µm]	
					X	Y
1	INHN	I	Output state control input. High impedance when LOW, oscillator stops. Power-saving pull-up resistor built-in.		155	785
2	XT	I	Oscillator input	Crystal connection pins. Crystal is connected between XT and XTN.	155	597
3	XTN	O	Oscillator output		155	363
4	VSS	–	(–) ground		155	175
5	NC	–	No connection (leave open)		844	175
6	Q	O	Output. Source oscillator divided-by-512 frequency output		844	363
7	NC	–	No connection (leave open)		844	694
8	VDD	–	(+) supply voltage		844	882

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS

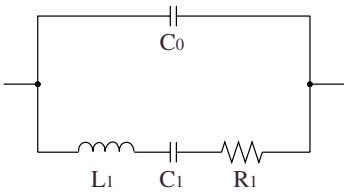
Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V_{DD}		V_{SS} –0.3 to V_{SS} + 5.0	V
Input voltage range	V_{IN}		V_{SS} – 0.3 to V_{DD} + 0.3	V
Output voltage range	V_{OUT}		V_{SS} – 0.3 to V_{DD} + 0.3	V
Storage temperature range	T_{STG}	Chip form	–65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

f_O = 16.777216MHz unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Supply voltage	V_{DD}		2.25	–	3.6	V
Input voltage	V_{IN}		V_{SS}	–	V_{DD}	V
Operating temperature	T_{OPR}		–40	+25	+85	°C

Current consumption and Output waveform with NPC's standard crystal



R_1 [Ω]	L_1 [mH]	C_1 [fF]	C_0 [pF]
5.6	7.45	12.67	3.40

ELECTRICAL CHARACTERISTICS

DC Characteristics

V_{DD} = 2.25 to 3.6V, V_{SS} = 0V, Ta = –40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition		Rating			Unit
				min	typ	max	
Operating current consumption	I_{DD}	Measurement cct 1, INHN = open or HIGH, C_L = 15pF	V_{DD} = 2.25 to 2.75V	–	0.24	0.6	mA
			V_{DD} = 2.75 to 3.6V	–	0.42	1	mA
Standby current	I_{ST}	Measurement cct 1, INHN = LOW		–	–	10	µA
HIGH-level output voltage	V_{OH}	Measurement cct 3, V_{DD} = 2.25 to 3.6V, I_{OH} = 2mA		V_{DD} – 0.4	V_{DD} – 0.15	–	V
LOW-level output voltage	V_{OL}	Measurement cct 3, V_{DD} = 2.25 to 3.6V, I_{OL} = 2mA		–	0.15	0.4	V
Output leakage current	I_Z	Measurement cct 4, INHN = LOW	V_{OH} = V_{DD}	–	–	10	µA
			V_{OL} = V_{SS}	–	–	–10	µA
HIGH-level input voltage	V_{IH}	Measurement cct 5		0.7V_{DD}	–	–	V
LOW-level input voltage	V_{IL}	Measurement cct 5		–	–	0.3V_{DD}	V
INHN pull-up resistance	R_{PU1}	Measurement cct 6	INHN = V_{SS}	0.4	–	4	MΩ
	R_{PU2}		INHN = 0.7V_{DD}	40	–	200	kΩ
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested. Ta = 25°C		5	6	7	pF
	C_D			5	6	7	pF

AC Characteristics

V_{DD} = 2.25 to 3.6V, V_{SS} = 0V, Ta = −40 to +85°C unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output duty cycle	Duty	Measurement cct 1, C_L = 15pF, V_{DD} = 2.5V, 3.3V, Ta = 25°C	45	50	55	%
Rise time	t_r	Measurement cct 1, 0.1V_{DD} to 0.9V_{DD}, C_L = 15pF	–	0.2	1	µs
Fall time	t_f	Measurement cct 1, 0.9V_{DD} to 0.1V_{DD}, C_L = 15pF	–	0.2	1	µs
Output enable delay time[1]	t_{OE}	Measurement cct 2, V_{DD} = 2.5V, 3.3V, Ta = 25°C	–	–	2	µs
Output disable delay time	t_{OD}	Measurement cct 2, V_{DD} = 2.5V, 3.3V, Ta = 25°C	–	–	2	µs

1. Oscillator stop function is built-in. When INHN goes LOW, normal output stops. When INHN goes HIGH, normal output is not resumed until after the oscillator start-up time has elapsed.

Timing chart

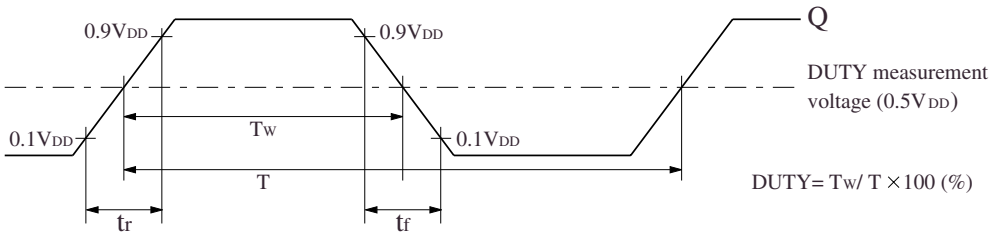


Figure 1. Output switching waveform

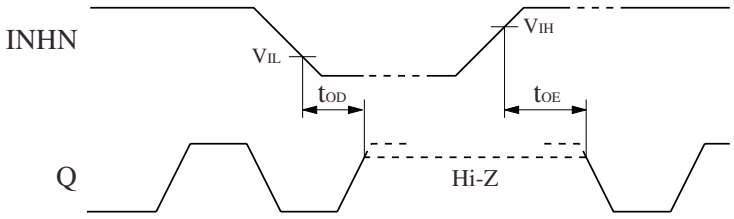


Figure 2. Output disable/enable timing chart

FUNCTIONAL DESCRIPTION

Standby Function

When INHN goes LOW, the device is in standby mode. The Q output becomes high impedance and the oscillator circuit stops.

INHN	Q	Oscillator
HIGH (or open)	$f_O/512$	Normal operation
LOW	High impedance	Stopped

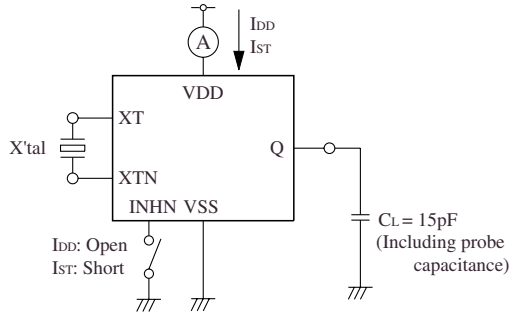
Power-saving Pull-up Resistor

The INHN pin pull-up resistance changes in response to the input level (HIGH or LOW). When INHN is tied LOW, the pull-up resistance becomes large, reducing the current consumed by the resistance. When INHN is open circuit, the pull-up resistance becomes small, decreasing the susceptibility to the effects of external noise.

MEASUREMENT CIRCUITS

Measurement cct 1

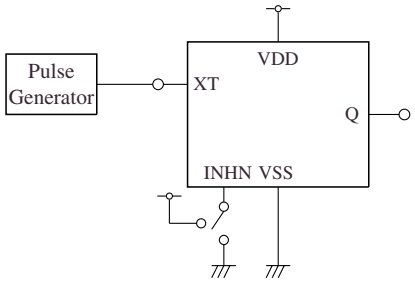
Measurement parameter: I_{DD}, I_{ST}, Duty, t_r , t_f



Note: The AC characteristics are observed with an oscilloscope on pin Q.
X'tal: NPC's standard crystal

Measurement cct 2

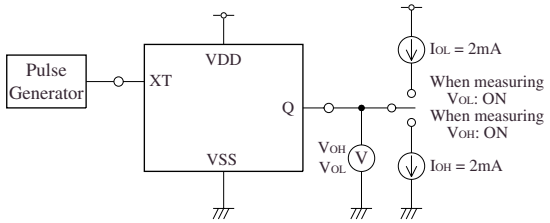
Measurement parameter: t_{OE}, t_{OD}



< 16MHz
HIGH-level: V_{DD} , LOW-level: V_{SS}
Note: Observed with an oscilloscope on pin Q. Does not include the oscillator start time.

Measurement cct 3

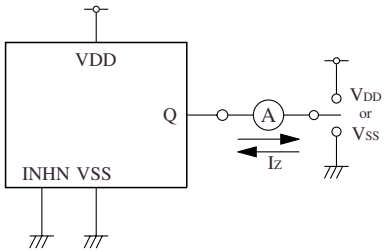
Measurement parameter: V_{OH}, V_{OL}



< 16MHz
HIGH-level: V_{DD} , LOW-level: V_{SS}
Note: Q HIGH-level and LOW-level voltages V_{OH} and V_{OL} are measured with pulse input stopped.

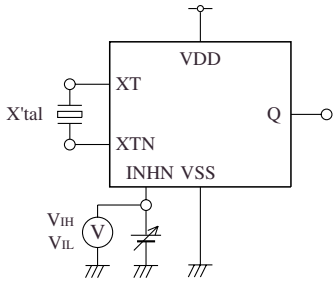
Measurement cct 4

Measurement parameter: I_Z



Measurement cct 5

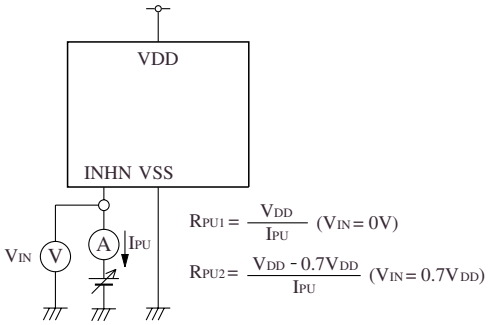
Measurement parameter: V_{IH}, V_{IL}



V_{IH}: Voltage in V_{SS} to V_{DD} transition that changes the output state.
V_{IL}: Voltage in V_{DD} to V_{SS} transition that changes the output state.
INHN is an output state control pin.
Note: X'tal: NPC's standard crystal

Measurement cct 6

Measurement parameter: R_{PU1}, R_{PU2}



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