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

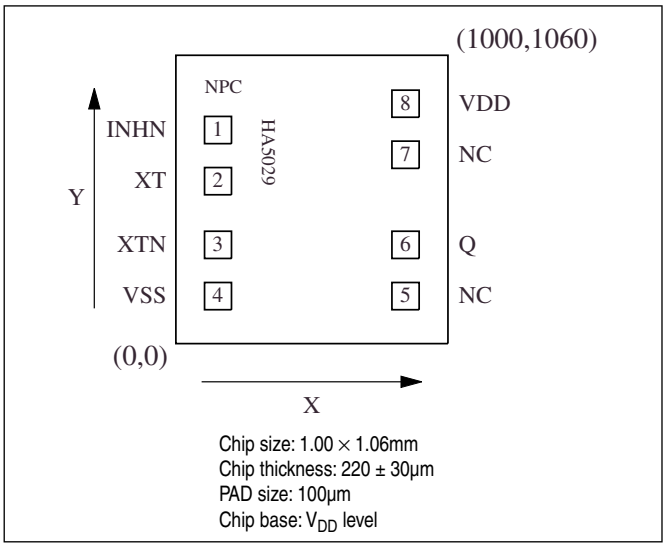
- 32.768kHz output crystal oscillator modules

ORDERING INFORMATION

Device	Package
CF5029A–2	Chip form

PAD LAYOUT

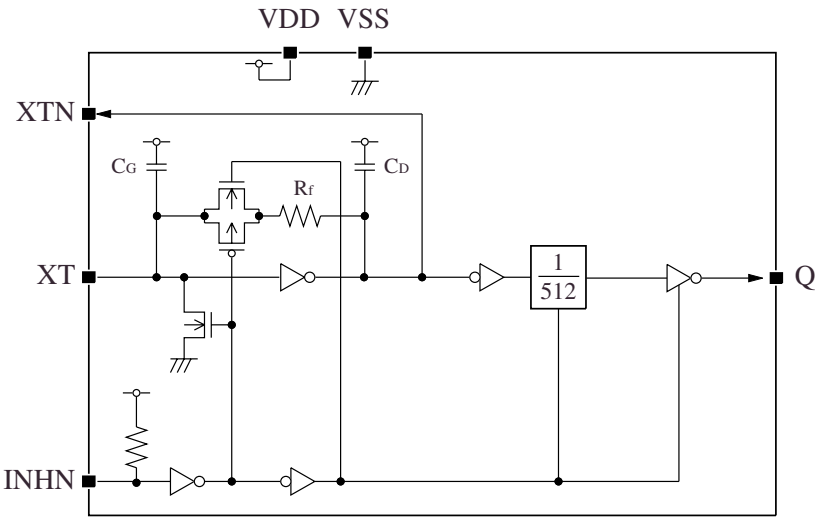
(Unit: µm)



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

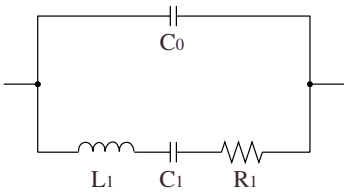
Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V_{DD}		V_{SS} –0.3 to V_{SS} + 5.0	V
Input voltage range	V_{IN}		V_{SS} – 0.3 to V_{DD} + 0.3	V
Output voltage range	V_{OUT}		V_{SS} – 0.3 to V_{DD} + 0.3	V
Storage temperature range	T_{STG}	Chip form	–65 to +150	°C

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

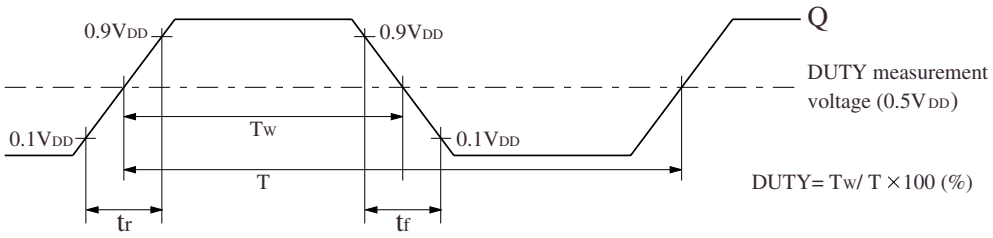


Figure 1. Output switching waveform

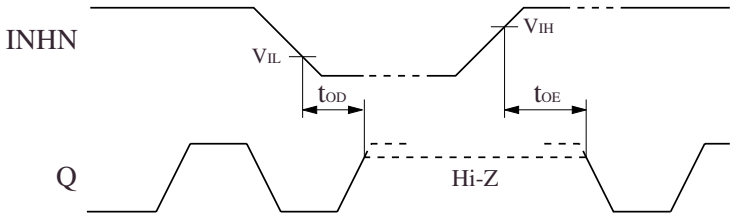


Figure 2. Output disable/enable timing chart

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

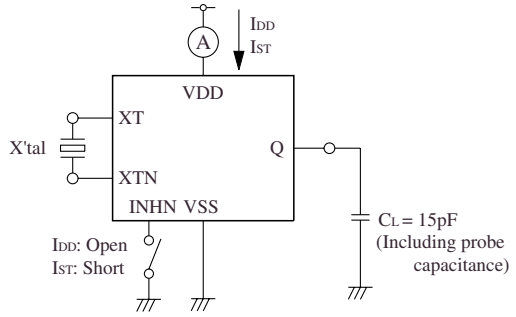
Power-saving Pull-up Resistor

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

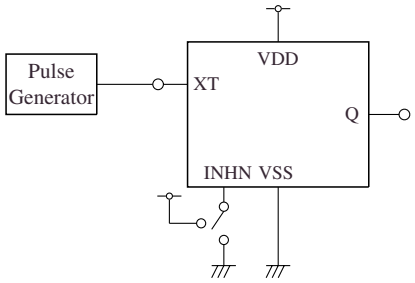
Measurement parameter: I_{DD}, I_{ST}, Duty, t_r , t_f



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

Measurement cct 2

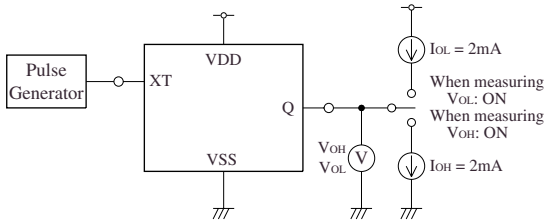
Measurement parameter: t_{OE}, t_{OD}



< 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

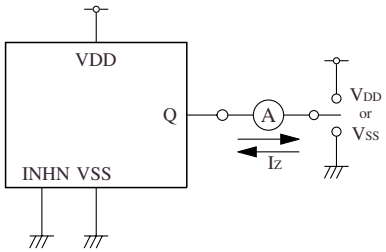
Measurement parameter: V_{OH}, V_{OL}



< 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.

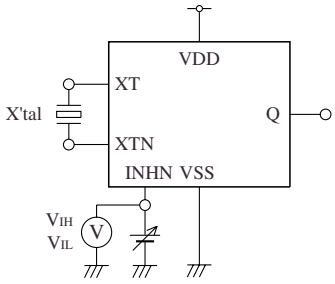
Measurement cct 4

Measurement parameter: I_Z



Measurement cct 5

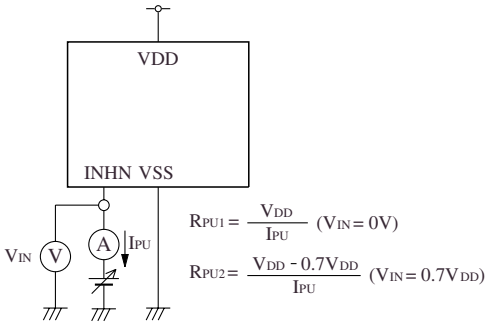
Measurement parameter: V_{IH}, V_{IL}



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}



Please pay your attention to the following points at time of using the products shown in this document.

The products shown in this document (hereinafter “Products”) are not intended to be used for the apparatus that exerts harmful influence on human lives due to the defects, failure or malfunction of the Products. Customers are requested to obtain prior written agreement for such use from SEIKO NPC CORPORATION (hereinafter “NPC”). Customers shall be solely responsible for, and indemnify and hold NPC free and harmless from, any and all claims, damages, losses, expenses or lawsuits, due to such use without such agreement. NPC reserves the right to change the specifications of the Products in order to improve the characteristic or reliability thereof. NPC makes no claim or warranty that the contents described in this document dose not infringe any intellectual property right or other similar right owned by third parties. Therefore, NPC shall not be responsible for such problems, even if the use is in accordance with the descriptions provided in this document. Any descriptions including applications, circuits, and the parameters of the Products in this document are for reference to use the Products, and shall not be guaranteed free from defect, inapplicability to the design for the mass-production products without further testing or modification. Customers are requested not to export or re-export, directly or indirectly, the Products to any country or any entity not in compliance with or in violation of the national export administration laws, treaties, orders and regulations. Customers are requested appropriately take steps to obtain required permissions or approvals from appropriate government agencies.

SEIKO NPC CORPORATION

15-6, Nihombashi-kabutocho, Chuo-ku,
Tokyo 103-0026, Japan
Telephone: +81-3-6667-6601
Facsimile: +81-3-6667-6611
http://www.npc.co.jp/
Email: sales@npc.co.jp

NC0313BE 2006.04