

OVERVIEW

The CF5005B series are high-frequency crystal oscillator module ICs. They are comprised of an oscillator circuit and output buffer optimized for operation at 125 to 165MHz. The crystal oscillator circuit has a built-in thin-film feedback resistor with good temperature characteristics and built-in capacitors with excellent frequency response, making possible a stable 3rd overtone oscillator with only the addition of a crystal element.

FEATURES

- 3.0 to 3.6V operating supply voltage range
- 125 to 165MHz recommended operating frequency range
- Inverter amplifier feedback resistor built-in
- Oscillator capacitors C_G , C_D built-in
- Output three-state function (high impedance in standby mode, oscillator stops)
- f_O output frequency (oscillator frequency)
- 8mA output drive capability ($V_{DD} = 3.0V$)
- CMOS output duty level
- Chip form (CF5005B××)

SERIES CONFIGURATION

Version	Recommended operating frequency range ¹ [MHz]	gm ratio	Built-in capacitance [pF]		R_f [kΩ]
			C_G	C_D	
CF5005BLA	125 to 150	1.0	1	6	2.2
CF5005BLB	140 to 165	1.0	1	3	2.2

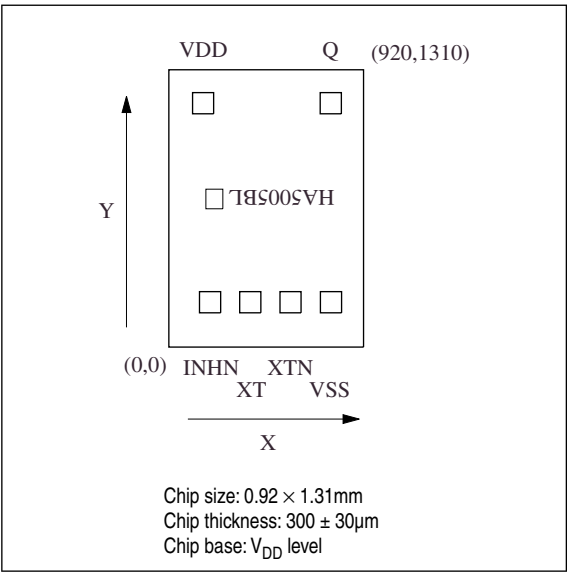
1. The recommended operating frequency is a yardstick value derived from the crystal used for NPC characteristics authentication. However, the oscillator frequency band is not guaranteed. Specifically, when used at high frequencies, the characteristics can vary greatly due to crystal characteristics and mounting conditions, so the oscillation characteristics of components must be carefully evaluated.

ORDERING INFORMATION

Device	Package
CF5005B××-1	Chip form

PAD LAYOUT

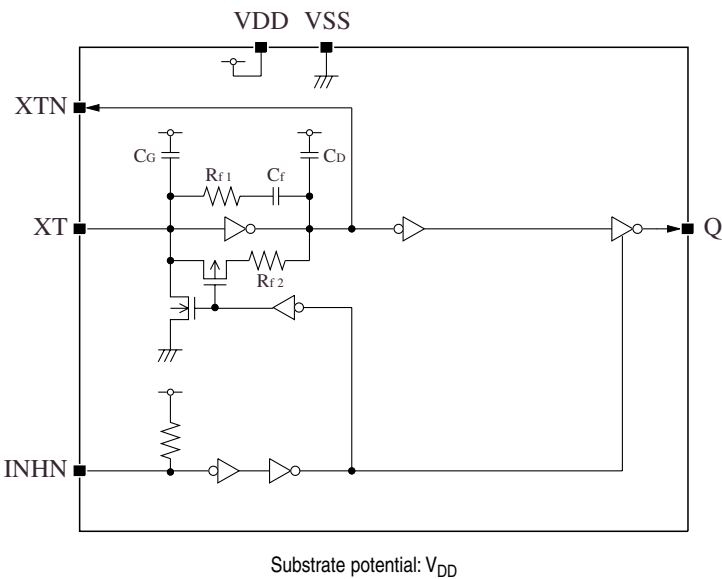
(Unit: μm)



PIN DESCRIPTION and PAD DIMENSIONS

Name	I/O	Description		Pad dimensions [μm]	
				X	Y
INHN	I	Output state control input. Oscillator stops when LOW. Pull-up resistor built in		195	212
XT	I	Amplifier input.	Crystal oscillator connection pins. Crystal oscillator connected between XT and XTN	385	212
XTN	O	Amplifier output.		575	212
VSS	–	Ground		766	212
Q	O	Output. Output frequency (f _O). High impedance in standby mode		765	1152
VDD	–	Supply voltage		162	1152

BLOCK DIAGRAM



SPECIFICATIONS

Absolute Maximum Ratings

$V_{SS} = 0V$

Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V_{DD}		-0.5 to 7.0	V
Input voltage range	V_{IN}		-0.5 to $V_{DD} + 0.5$	V
Output voltage range	V_{OUT}		-0.5 to $V_{DD} + 0.5$	V
Operating temperature range	T_{opr}		-40 to 85	°C
Storage temperature range	T_{stg}		-65 to 150	°C
Output current	I_{OUT}		25	mA

Recommended Operating Conditions

$V_{SS} = 0V$, $f \leq 165MHz$, $C_L \leq 15pF$ unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Operating supply voltage	V_{DD}		3.0	—	3.6	V
Input voltage	V_{IN}		V_{SS}	—	V_{DD}	V
Operating temperature	T_{OPR}		-20	—	80	°C

Electrical Characteristics

$V_{DD} = 3.0$ to $3.6V$, $V_{SS} = 0V$, $T_a = -20$ to $80^\circ C$ unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
HIGH-level output voltage	V_{OH}	Q: Measurement cct 1, $V_{DD} = 3.0V$, $I_{OH} = 8mA$	2.5	2.7	—	V
LOW-level output voltage	V_{OL}	Q: Measurement cct 2, $V_{DD} = 3.0V$, $I_{OL} = 8mA$	—	0.3	0.4	V
Output leakage current	I_Z	Q: Measurement cct 2, INHN = LOW, $V_{DD} = 3.6V$	—	—	10	μA
		$V_{OH} = V_{DD}$ $V_{OL} = V_{SS}$	—	—	10	
HIGH-level input voltage	V_{IH}	INHN	$0.7V_{DD}$	—	—	V
LOW-level input voltage	V_{IL}	INHN	—	—	$0.3V_{DD}$	V
Current consumption	I_{DD}	Measurement cct 3, load cct 1, INHN = open, $C_L = 15pF$	$f = 133MHz$	—	30	mA
			$f = 156MHz$	—	35	
Standby current	I_{ST}	Measurement cct 3, INHN = LOW	—	—	10	μA
INHN pull-up resistance	R_{UP1}	Measurement cct 4	INHN = V_{SS}	0.4	—	M Ω
	R_{UP2}		INHN = $0.7V_{DD}$	50	—	k Ω
AC feedback resistance	R_{f1}	Design value. A monitor pattern on a wafer is tested.	1.76	2.2	2.64	k Ω
DC feedback resistance	R_{f2}	Measurement cct 5	50	—	150	k Ω
AC feedback capacitance	C_f	Design value. A monitor pattern on a wafer is tested.	9.3	10	10.7	pF
Built-in capacitance	C_G	Design value. A monitor pattern on a wafer is tested.	CF5005BLA	0.93	1	pF
			CF5005BLB	0.93	1	
	C_D	Design value. A monitor pattern on a wafer is tested.	CF5005BLA	5.58	6	pF
			CF5005BLB	2.79	3	

Switching Characteristics

$V_{DD} = 3.0$ to $3.6V$, $V_{SS} = 0V$, $T_a = -20$ to $80\text{ }^{\circ}C$ unless otherwise noted.

Parameter	Symbol	Condition	Rating			Unit
			min	typ	max	
Output rise time	t_r	Measurement cct 3, load cct 1, $0.1V_{DD}$ to $0.9V_{DD}$, $C_L = 15pF$	–	1.5	2.5	ns
Output fall time	t_f	Measurement cct 3, load cct 1, $0.9V_{DD}$ to $0.1V_{DD}$, $C_L = 15pF$	–	1.5	2.5	ns
Output duty cycle ¹	Duty	Measurement cct 3, load cct 1, $T_a = 25^{\circ}C$, $V_{DD} = 3.3V$, $C_L = 15pF$, $f \leq 165MHz$	40	–	60	%
Output disable delay time ²	t_{PLZ}	Measurement cct 6, load cct 1, $T_a = 25^{\circ}C$, $V_{DD} = 3.0V$, $C_L \leq 15pF$	–	–	100	ns
Output enable delay time ²	t_{PZL}	Measurement cct 6, load cct 1, $T_a = 25^{\circ}C$, $V_{DD} = 3.0V$, $C_L \leq 15pF$	–	–	100	ns

1. The duty cycle characteristic is checked the sample chips of each production lot.

2. 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.

FUNCTIONAL DESCRIPTION

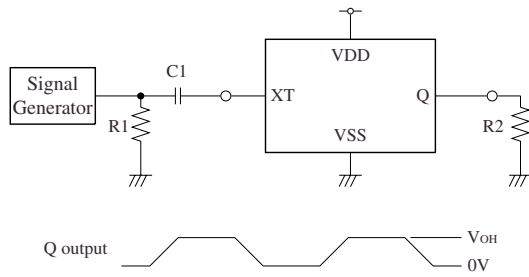
Standby Function

The oscillator stops when INHN goes LOW. When the oscillator stops, the oscillator output on Q goes high impedance.

INHN	Q	Oscillator
HIGH (or open)	f_O output frequency	Normal operation
LOW	High impedance	Stopped

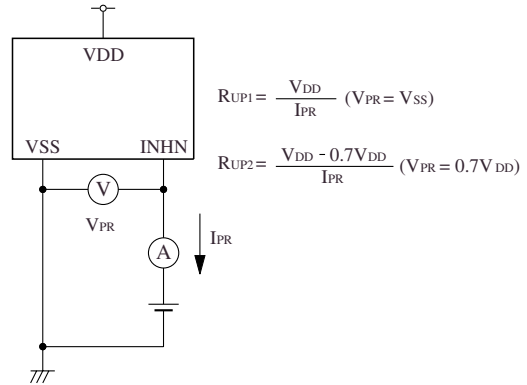
MEASUREMENT CIRCUITS

Measurement cct 1

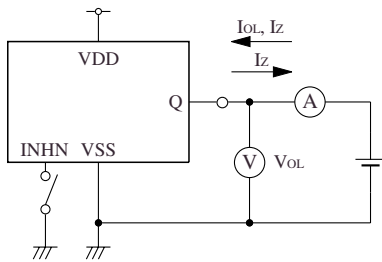


2.5V_{P-P}, 10MHz sine wave input signal
 C1 : 0.001μF
 R1 : 50Ω
 R2 : 312.5Ω

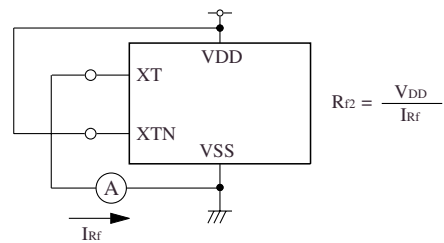
Measurement cct 4



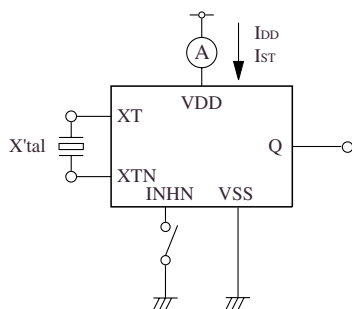
Measurement cct 2



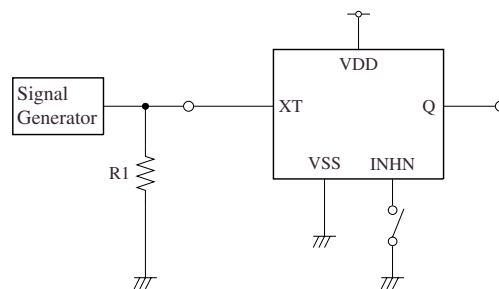
Measurement cct 5



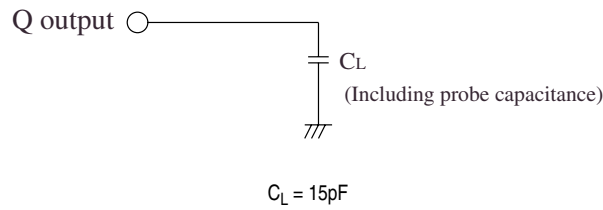
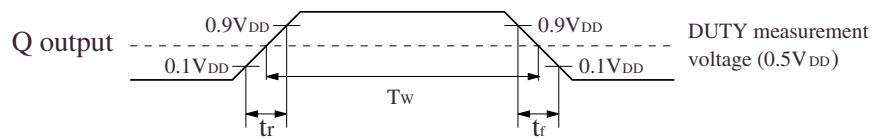
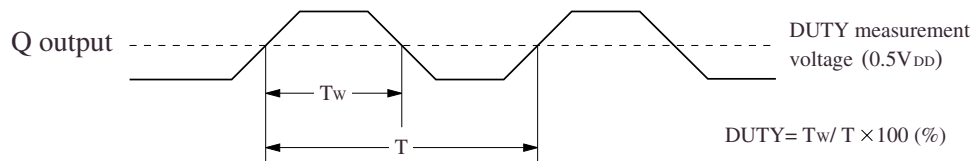
Measurement cct 3



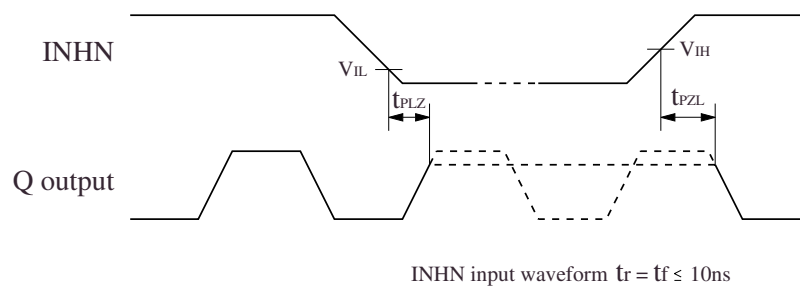
Measurement cct 6



R1 : 50Ω

Load cct 1**Switching Time Measurement Waveform** t_r , t_f , DUTY**Output duty cycle****Output Enable/Disable Delay**

The following figure shows the oscillator timing during normal operation. Note that when the device is in standby, the oscillator stops. When standby is released, the oscillator starts and stable oscillator output occurs after a short delay.



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.

The logo for NPC (Seiko NPC Corporation) consists of the letters 'NPC' in a bold, stylized, sans-serif font. The 'N' and 'P' are connected, and the 'C' is a simple curve.

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

NC0109BE 2006.04