

CF5005B series

High-frequency Crystal Oscillator Module ICs

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-harmonic 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

Vandan	Recommended		Built-in capa	5 # 63	
Version	operating frequency ¹ [MHz]	gm ratio	C _G	C _D	R _f [kΩ]
CF5005BLA	125 to 150	1.0	1	6	2.2
CF5005BLB	140 to 165	1.0	1	3	2.2

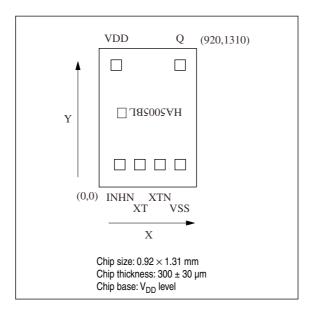
^{1.} The recommended operating frequency is a yardstick value derived from the crystal used for NPC characteristics authentication. However, the oscillator frequency band is not guaranteed. Specifically, when used at high frequencies, the characteristics can vary greatly due to crystal characteristics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

ORDERING INFORMATION

Device	Package		
CF5005B××-1	Chip form		

PAD LAYOUT

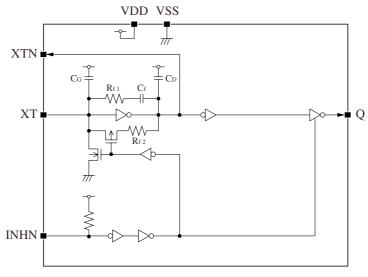
 $(Unit: \mu m)$



PIN DESCRIPTION and PAD DIMENSIONS

Name I/O		Description			Pad dimensions [µm]		
Ivallie	1/0		Description –		Y		
INHN	- [Output state control	input. Oscillator stops when LOW. Pull-up resistor built in	195	212		
XT	- [Amplifier input.	Crystal oscillator connection pins.	385	212		
XTN	0	Amplifier output.	Crystal oscillator connected between XT and XTN		212		
VSS	-	Ground		766	212		
Q	0	Output. Output frequency (f _O). High impedance in standby mode		765	1152		
VDD	-	Supply voltage		162	1152		

BLOCK DIAGRAM



Substrate potential: V_{DD}

SPECIFICATIONS

Absolute Maximum Ratings

 $V_{SS} = 0V$

Parameter	Symbol	Condition	Rating	Unit
Supply voltage range	V _{DD}		-0.5 to 7.0	٧
Input voltage range	V _{IN}		-0.5 to V _{DD} + 0.5	٧
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
raidiliciei			min	typ	max	Oille
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, Ta = -20 to 80°C unless otherwise noted.

Parameter	Combal	Condition					
Parameter	Symbol			min	typ	max	Unit
HIGH-level output voltage	V _{OH}	Q: Measurement cct 1, V _{DD} = 3.0V, I _{OH}	_I = 8mA	2.5	2.7	-	٧
LOW-level output voltage	V _{OL}	Q: Measurement cct 2, V _{DD} = 3.0V, I _{OL}	= 8mA	-	0.3	0.4	٧
Outrot leeleese surrent		Q: Measurement cct 2, INHN = LOW,	$V_{OH} = V_{DD}$	-	-	10	μΑ
Output leakage current	l _Z	V _{DD} = 3.6V	V _{OL} = V _{SS}	-	-	10	
HIGH-level input voltage	V _{IH}	INHN		0.7V _{DD}	-	-	٧
LOW-level input voltage	V _{IL}	INHN	INHN		-	0.3V _{DD}	٧
Current consumption	I _{DD}	Measurement cct 3, load cct 1,	f = 133MHz	-	30	65	- mA
		INHN = open, C _L = 15pF	f = 156MHz	-	35	80	
Standby current	I _{ST}	Measurement cct 3, INHN = LOW		-	-	10	μA
	R _{UP1}	M	INHN = V _{SS}	0.4	-	4	MΩ
INHN pull-up resistance	R _{UP2}	Measurement cct 4	INHN = 0.7V _{DD}	50	-	150	kΩ
AC feedback resistance	R _{f1}	Design value, determined by the intern	al wafer pattern	1.76	2.2	2.64	kΩ
DC feedback resistance	R _{f2}	Measurement cct 5		50	-	150	kΩ
AC feedback capacitance	C _f	Design value, determined by the intern	Design value, determined by the internal wafer pattern		10	10.7	pF
Built-in capacitance	1 (:	Design value, determined by the internal wafer pattern	CF5005BLA	0.93	1	1.07	_
			CF5005BLB	0.93	1	1.07	pF
	C _D Design value, determined by the internal wafer pattern	CF5005BLA	5.58	6	6.42	pF	
		CF5005BLB	2.79	3	3.21		

Switching Characteristics

 V_{DD} = 3.0 to 3.6V, V_{SS} = 0V, Ta = -20 to 80 °C unless otherwise noted.

Parameter	Cumbal	Symbol Condition		Rating		
Farameter	Syllibol			typ	max	Unit
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, Ta = 25°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, Ta = 25°C, V_{DD} = 3.0V, $C_L \le$ 15pF		-	100	ns
Output enable delay time ²	t _{PZL}	Measurement cct 6, load cct 1, Ta = 25°C, V_{DD} = 3.0V, $C_L \le$ 15pF	-	-	100	ns

^{1.} Monitored in sample lots.

FUNCTIONAL DESCRIPTION

Standby Function

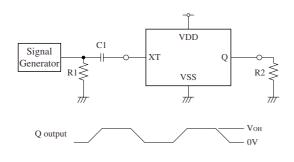
The oscillator stops when INHN goes LOW. When the oscillator stops, the oscillator output on Q goes high impedance.

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

^{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.

MEASUREMENT CIRCUITS

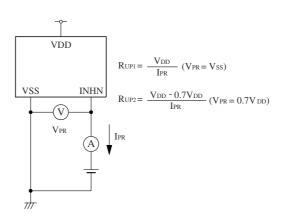
Measurement cct 1



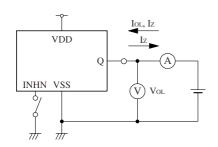
 $2.5 V_{P-P}$, 10MHz sine wave input signal C1 : $0.001 \mu F$

C1 : $0.001\mu F$ R1 : 50Ω R2 : 312.5Ω

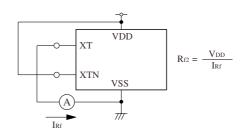
Measurement cct 4



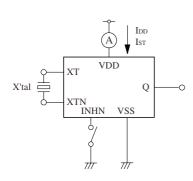
Measurement cct 2



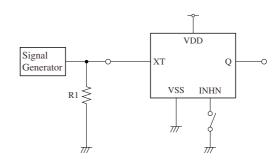
Measurement cct 5



Measurement cct 3

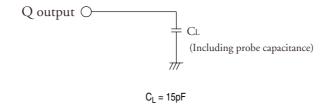


Measurement cct 6



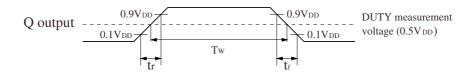
R1:50 Ω

Load cct 1

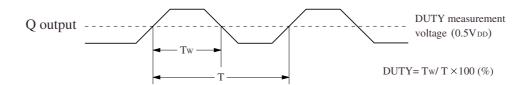


Switching Time Measurement Waveform

Tr, Tf, DUTY

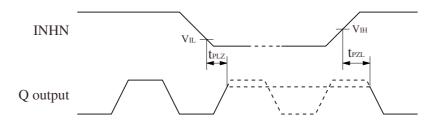


Output duty cycle



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.



INHN input waveform $tr = tf \le 10ns$

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