

Low Operating Current Fundamental Quartz Crystal Oscillator IC

■GENERAL DESCRIPTION

The NJU6365 series is a C-MOS IC for fundamental quartz crystal oscillator that consists of an oscillation amplifier, 5-stage divider and 3-state output buffer.

The operating voltage is from 1.8V to 3.6V and high frequency-stability based on most suitable oscillation circuit including Cg, Cd and Rf.

The 5-stage divider generates only one frequency selected of $f_0, f_0/2, f_0/4, f_0/8, f_0/16$ and $f_0/32$ by internal circuits is output.

The oscillation amplifier is realized very low stand-by current using NAND circuit, and the operating current is lower than 1.5mA at 3.3V and 16MHz.

The 3-state output buffer is C-MOS compatible.

■FEATURES

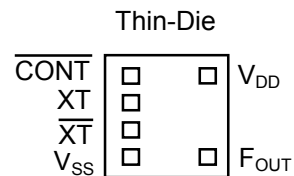
- High Frequency-Stability for Operating Voltage
- Low Operating Current 1.5mA max@3.3V
- Operating Voltage 1.8 to 3.6V
- Maximum Oscillation Frequency 32MHz
- Fan-out 1.2mA min@2.5V
- 5-Stage Divider Maximum Divider $f_0/32$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors Cg and Cd on-Die
- Package Outline Thin-Die/Wafer
- C-MOS Technology

■PACKAGE OUTLINE



NJU6365XC-X

■PAD LOCATION



■LINE-UP TABLE

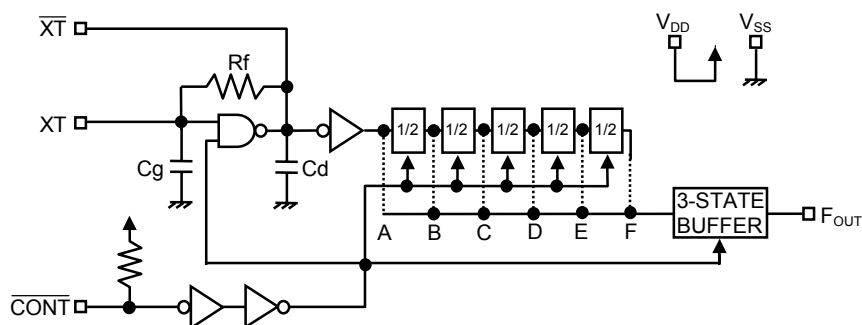
Type No.	F _{OUT}	Internal Connect	Cg/Cd	
NJU6364	A	f_0	Connected A Line	8/9pF
	B	$f_0/2$	Connected B Line	8/9pF
	C	$f_0/4$	Connected C Line	8/9pF
	D	$f_0/8$	Connected D Line	8/9pF
	E	$f_0/16$	Connected E Line	8/9pF
	F	$f_0/32$	Connected F Line	8/9pF

■COORDINATES

No	Pad Name	X	Y
1	CONT	-178	231
2	XT	-178	77
3	XT	-178	-77
4	V _{SS}	-178	-231
5	F _{OUT}	206	-231
8	V _{DD}	206	231

Starting Point: Chip Center Unit[um]
 Chip Size: 0.7x0.75mm
 Thin-Die Thickness(C-D): 200±20um
 Thin-Die Thickness(C-L): 140±10um
 Wafer Thickness(W-H): 200±20um
 Wafer Thickness(W-L): 140±10um
 Pad Size: 90x90um
 Die Substrate: V_{DD} Level

■BLOCK DIAGRAM



■ TERMINAL DESCRIPTION

SYMBOL	FUNCTION
CONT	Oscillation and 3-state Output Buffer Control
	CONT F _{OUT}
	H or OPEN Output either one frequency selected of f ₀ , f ₀ /2, f ₀ /4, f ₀ /8, f ₀ /16 and f ₀ /32 Note1)
	L Oscillation Stop and High impedance Output
XT XT	Quartz Crystal Connecting Terminals
V _{SS}	V _{SS} =0V
F _{OUT}	Frequency Output
V _{DD}	V _{DD} =2.5V/3.3V

Note1) Refer to the line-up table.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V _{DD}	-0.5 to +7.0	V
Input Voltage	V _{IN}	V _{SS} -0.5 to V _{DD} +0.5	V
Output Voltage	V _O	-0.5 to V _{DD} +0.5	V
Input Current	I _{IN}	±10	mA
Output Current	I _O	±25	mA
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-55 to +125	°C

Note2) If the supply voltage(V_{DD}) is less than 7.0V, the input voltage must not over the V_{DD} level though 7.0V is limit specified.

Note3) Decoupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

■ ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V _{DD}		1.8		3.6	V

(V_{DD}=2.5V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I _{DD}	A version, fosc=16MHz, C _L =5pF			1.0	mA
		B version, fosc=16MHz, C _L =5pF			0.8	
		C version, fosc=16MHz, C _L =5pF			0.5	
		D version, fosc=16MHz, C _L =5pF			0.5	
		E version, fosc=16MHz, C _L =5pF			0.5	
		F version, fosc=16MHz, C _L =5pF			0.5	
Oscillation Stopping Current	I _{STB}	CONT=V _{SS} , No load			1	uA
Stand-by Current	I _{st}	CONT=XT=V _{SS} , No load Note4)			1	uA
Input Voltage	V _{IH}		1.75		2.5	V
	V _{IL}		0		0.75	V
Output Current	I _{OH}	V _{OH} =2.25V	1.2			mA
	I _{OL}	V _{OL} =0.25V	1.2			mA
Input Current	I _{IN}	CONT=0.8V _{DD}		3.6	5.5	uA
		CONT=0.2V _{DD}		0.3	0.5	uA
3-state Off Leakage Current	I _{OZ}	CONT=V _{SS} , F _{OUT} = V _{DD} or V _{SS}			±0.1	uA
Feedback Resistance	R _f			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz		8/9		pF
Maximum Oscillation Frequency	F _{MAX}		32			MHz
Output Signal Symmetry	SYM	C _L =5pF, @V _{DD} /2	45	50	55	%
Output Signal Rise Time	t _r	C _L =5pF, 10% to 90%		4	8	ns
Output Signal Fall Time	t _f	C _L =5pF, 90% to 10%		4	8	ns
Output Disable time	t _{PLZ}	C _L =5pF, R _{UP} =10kΩ			200	ns
Output Enable Time	t _{PZL}	C _L =5pF, R _{UP} =10kΩ			200	ns

Note4) Excluding input current on CONT Terminal.

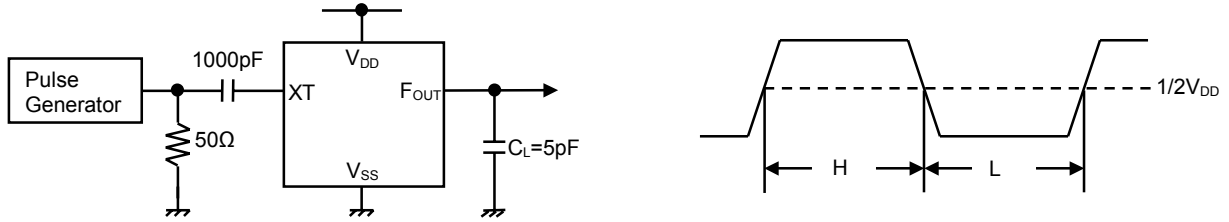
(V_{DD}=3.3V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I _{DD}	A version, fosc=16MHz, C _L =5pF			1.5	mA
		B version, fosc=16MHz, C _L =5pF			1.2	
		C version, fosc=16MHz, C _L =5pF			1.0	
		D version, fosc=16MHz, C _L =5pF			1.0	
		E version, fosc=16MHz, C _L =5pF			1.0	
		F version, fosc=16MHz, C _L =5pF			1.0	
Oscillation Stopping Current	I _{STB}	CONT=V _{SS} , No load			1	uA
Stand-by Current	I _{st}	CONT=XT=V _{SS} , No load Note4)			1	uA
Input Voltage	V _{IH}		2.31		3.3	V
	V _{IL}		0		0.99	V
Output Current	I _{OH}	V _{OH} =2.97V	1.5			mA
	I _{OL}	V _{OL} =0.33V	1.5			mA
Input Current	I _{IN}	CONT=0.8V _{DD}		6.5	10	uA
		CONT=0.2V _{DD}		0.5	1	uA
3-state Off Leakage Current	I _{OZ}	CONT=V _{SS} , F _{OUT} = V _{DD} or V _{SS}			±0.1	uA
Feedback Resistance	R _f			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz		8/9		pF
Maximum Oscillation Frequency	F _{MAX}		32			MHz
Output Signal Symmetry	SYM	C _L =5pF, @V _{DD} /2	45	50	55	%
Output Signal Rise Time	t _r	C _L =5pF, 10% to 90%		3	6	ns
Output Signal Fall Time	t _f	C _L =5pF, 90% to 10%		3	6	ns
Output Disable time	t _{PLZ}	C _L =5pF, R _{UP} =10kΩ			150	ns
Output Enable Time	t _{PZL}	C _L =5pF, R _{UP} =10kΩ			150	ns

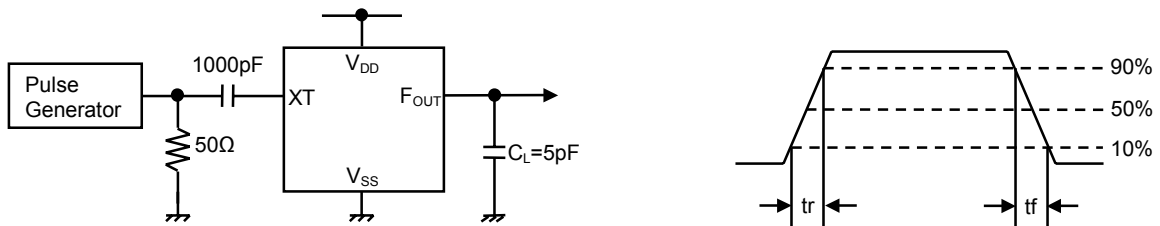
Note4) Excluding input current on CONT Terminal.

MEASUREMENT CIRCUITS

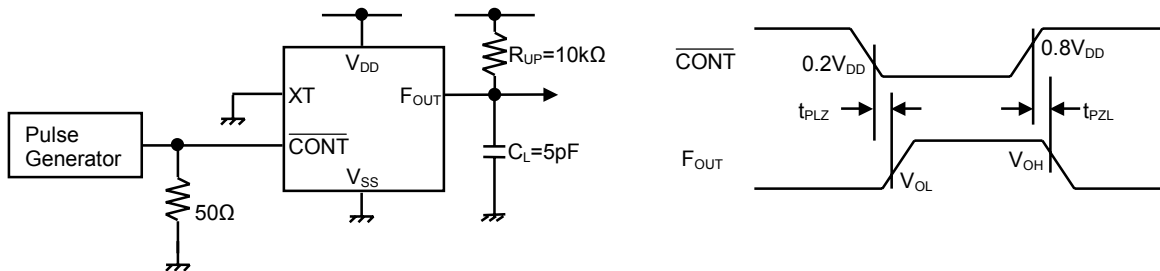
(1) Output Signal Symmetry ($C_L=5\text{pF}$)



(2) Output Signal Rise/Fall Time ($C_L=5\text{pF}$)

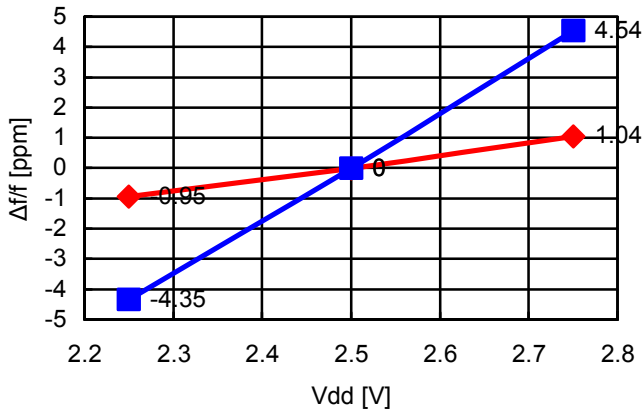


(3) Output Disable/Enable Time ($C_L=5\text{pF}, R_{UP}=10\text{k}\Omega$)



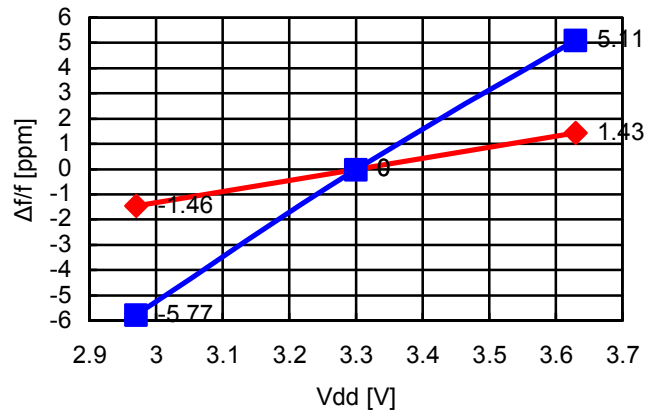
■ FREQUENCY STABILITY CHARACTERISTICS EXAMPLE

fcenter=16MHz, Vdd=2.5V±10%



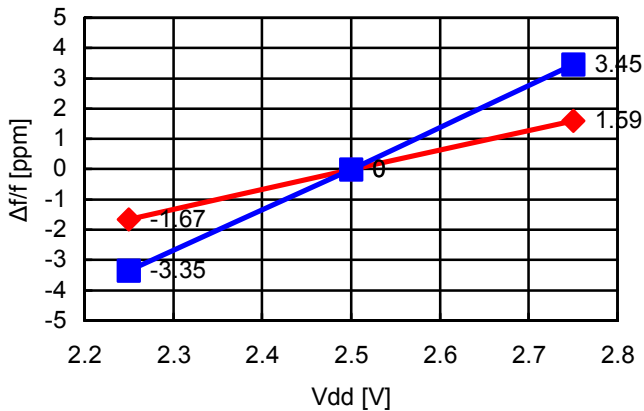
◆ NJU6365 ■ Previous

fcenter=16MHz, Vdd=3.3V±10%



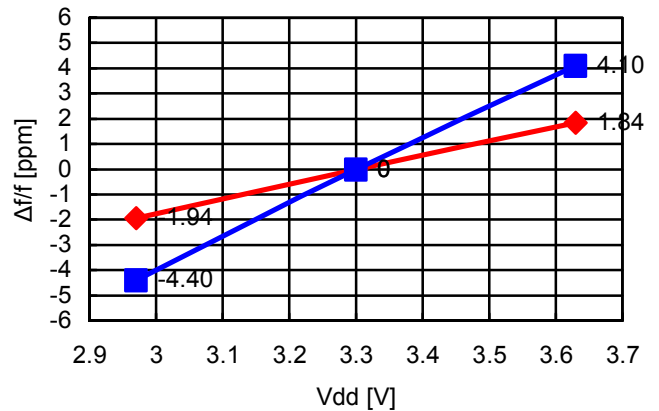
◆ NJU6365 ■ Previous

fcenter=32MHz, Vdd=2.5V±10%



◆ NJU6365 ■ Previous

fcenter=32MHz, Vdd=3.3V±10%



◆ NJU6365 ■ Previous

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