

Fundamental Quartz Crystal Oscillator

■GENERAL DESCRIPTION

The NJU6367 series is a C-MOS fundamental quartz crystal oscillator that consists of an oscillation amplifier, 3-stage divider and 3-state output buffer.

The 3-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.

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

■PACKAGE OUTLINE

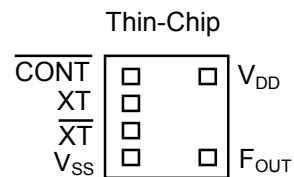


NJU6367XC-D

■FEATURES

- Operating Voltage 2.0 to 5.5V
- Maximum Oscillation Frequency 50MHz
- Low Operating Current
- High Fan-out
 - $I_{OH}/I_{OL}=5mA@2.5V$
 - $I_{OH}/I_{OL}=6mA@3.0V$
 - $I_{OH}/I_{OL}=12mA@5.0V$
- 3-Stage Divider Maximum Divider $f_0/32$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors C_g and C_d on-chip
- Package Outline Thin-Chip
- C-MOS Technology

■PAD LOCATION



■LINE-UP TABLE

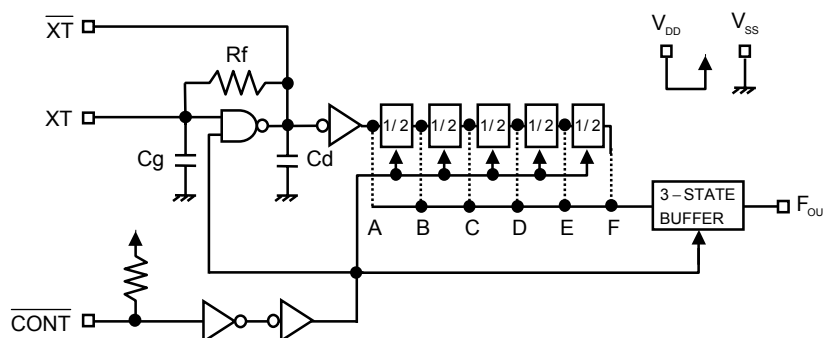
Type No.	F _{OUT}	Internal Connect	C _g /C _d
A	f_0	Connected A Line	23/23pF
B	$f_0/2$	Connected B Line	23/23pF
C	$f_0/4$	Connected C Line	23/23pF
D	$f_0/8$	Connected D Line	23/23pF
E	$f_0/16$	Connected E Line	23/23pF
F	$f_0/32$	Connected F Line	23/23pF
P	f_0	Connected A Line	Non

■COORDINATES

No	Pad Name	X	Y
1	$\overline{\text{CONT}}$	-178	231
2	XT	-178	77
3	$\overline{\text{XT}}$	-178	-77
4	V _{SS}	-178	-231
5	F _{OUT}	206	-231
6	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	
$\overline{\text{CONT}}$	Oscillation and 3-state Output Buffer Control	
	$\overline{\text{CONT}}$	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
$\overline{\text{XT}}$	Quartz Crystal Connecting Terminals	
V_{SS}	$V_{\text{SS}}=0\text{V}$	
F_{OUT}	Frequency Output	
V_{DD}	$V_{\text{DD}}=2.5/3.0\text{V}/5.0\text{V}$	

Note1) Refer to the line-up table.

■ ABSOLUTE MAXIMUM RATINGS

($T_a=25^\circ\text{C}$)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	-0.5 to +7.0	V
Input Voltage	V_{IN}	$V_{\text{SS}}-0.5$ to $V_{\text{DD}}+0.5$	V
Output Voltage	V_{O}	-0.5 to $V_{\text{DD}}+0.5$	V
Input Current	I_{IN}	± 10	mA
Output Current	I_{O}	± 25	mA
Operating Temperature Range	T_{opr}	-40 to +85	$^\circ\text{C}$
Storage Temperature Range	T_{stg}	-55 to +125	$^\circ\text{C}$

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}		2.0		5.5	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 =15pF			5	mA
		B version, fosc=16MHz, C _L =15pF			4	
		C version, fosc=16MHz, C _L =15pF			3	
		D version, fosc=16MHz, C _L =15pF			3	
		E version, fosc=16MHz, C _L =15pF			3	
		F version, fosc=16MHz, C _L =15pF			3	
		P version, fosc=16MHz, C _L =15pF Note4)			5	
Oscillation Stopping Current	I _{STB}	$\overline{\text{CONT}} = V_{SS}$, No load		2	5	uA
Stand-by Current	I _{st}	$\overline{\text{CONT}} = \text{XT} = V_{SS}$, No load Note5)			1	uA
Input Voltage	V _{IH}		2.0		2.5	V
	V _{IL}		0		0.5	V
Output Current	I _{OH}	V _{OH} =2.2V	5			mA
	I _{OL}	V _{OL} =0.3V	5			mA
Input Current	I _{IN}	$\overline{\text{CONT}} = 0.8V_{DD}$		7.5	12.0	uA
		$\overline{\text{CONT}} = 0.2V_{DD}$		1.2	2.0	uA
3-state Off Leakage Current	I _{OZ}	$\overline{\text{CONT}} = V_{SS}$, F _{OUT} = V _{DD} or V _{SS}			±0.1	uA
Feedback Resistance	R _f			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz, A/B/C/D/E/F version		23/23		pF
		P version		-		
Maximum Oscillation Frequency	F _{MAX}		50			MHz
Output Signal Symmetry	SYM	C _L =15pF, @V _{DD} /2	45	50	55	%
		C _L =30pF, @V _{DD} /2	45	50	55	
Output Signal Rise Time	tr	C _L =15pF, 10% to 90%		3	6	ns
		C _L =30pF, 10% to 90%		4	8	
Output Signal Fall Time	tf	C _L =15pF, 90% to 10%		3	6	ns
		C _L =30pF, 90% to 10%		4	8	
Output Disable time	t _{PLZ}	C _L =15pF, R _{UP} =10kΩ			200	ns
Output Enable Time	t _{PZL}	C _L =15pF, R _{UP} =10kΩ			200	ns

Note4) P version is measured with external capacitors contained 23pF for C_g and 23pF for C_d.

Note5) Excluding input current on $\overline{\text{CONT}}$ Terminal.

(V_{DD}=3.0V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I _{DD}	A version, fosc=16MHz, C _L =15pF			6	mA
		B version, fosc=16MHz, C _L =15pF			5	
		C version, fosc=16MHz, C _L =15pF			4	
		D version, fosc=16MHz, C _L =15pF			4	
		E version, fosc=16MHz, C _L =15pF			4	
		F version, fosc=16MHz, C _L =15pF			4	
		P version, fosc=16MHz, C _L =15pF Note4)			6	
Oscillation Stopping Current	I _{STB}	$\overline{\text{CONT}} = V_{SS}$, No load		2	5	uA
Stand-by Current	I _{st}	$\overline{\text{CONT}} = \text{XT} = V_{SS}$, No load Note5)			1	uA
Input Voltage	V _{IH}		2.1		3.0	V
	V _{IL}		0		0.9	V
Output Current	I _{OH}	V _{OH} =2.7V	6			mA
	I _{OL}	V _{OL} =0.3V	6			mA
Input Current	I _{IN}	$\overline{\text{CONT}} = 0.8V_{DD}$		10.0	15.0	uA
		$\overline{\text{CONT}} = 0.2V_{DD}$		1.8	3.0	uA
3-state Off Leakage Current	I _{OZ}	$\overline{\text{CONT}} = V_{SS}$, F _{OUT} = V _{DD} or V _{SS}			±0.1	uA
Feedback Resistance	R _f			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz, A/B/C/D/E/F version		23/23		pF
		P version		-		
Maximum Oscillation Frequency	F _{MAX}		50			MHz
Output Signal Symmetry	SYM	C _L =15pF, @V _{DD} /2	45	50	55	%
		C _L =30pF, @V _{DD} /2	45	50	55	
Output Signal Rise Time	tr	C _L =15pF, 10% to 90%		3	6	ns
		C _L =30pF, 10% to 90%		4	8	
Output Signal Fall Time	tf	C _L =15pF, 90% to 10%		3	6	ns
		C _L =30pF, 90% to 10%		4	8	
Output Disable time	t _{PLZ}	C _L =15pF, R _{UP} =10kΩ			150	ns
Output Enable Time	t _{PZL}	C _L =15pF, R _{UP} =10kΩ			150	ns

Note4) P version is measured with external capacitors contained 23pF for C_g and 23pF for C_d.

Note5) Excluding input current on $\overline{\text{CONT}}$ Terminal.

(V_{DD}=5.0V, Ta=25°C)

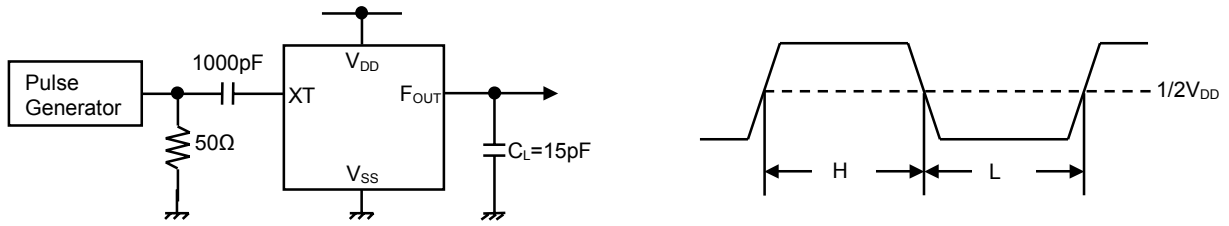
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I _{DD}	A version, fosc=16MHz, C _L =15pF			10	mA
		B version, fosc=16MHz, C _L =15pF			9	
		C version, fosc=16MHz, C _L =15pF			9	
		D version, fosc=16MHz, C _L =15pF			8	
		E version, fosc=16MHz, C _L =15pF			8	
		F version, fosc=16MHz, C _L =15pF			8	
		P version, fosc=16MHz, C _L =15pF Note4)			10	
Oscillation Stopping Current	I _{STB}	$\overline{\text{CONT}} = V_{SS}$, No load		5	10	uA
Stand-by Current	I _{st}	$\overline{\text{CONT}} = \text{XT} = V_{SS}$, No load Note5)			1	uA
Input Voltage	V _{IH}		3.5		5.0	V
	V _{IL}		0		1.5	V
Output Current	I _{OH}	V _{OH} =4.5V	12			mA
	I _{OL}	V _{OL} =0.5V	12			mA
Input Current	I _{IN}	$\overline{\text{CONT}} = 0.8V_{DD}$		27.0	40.0	uA
		$\overline{\text{CONT}} = 0.2V_{DD}$		5.5	8.0	uA
3-state Off Leakage Current	I _{OZ}	$\overline{\text{CONT}} = V_{SS}$, F _{OUT} = V _{DD} or V _{SS}			±0.1	uA
Feedback Resistance	R _f			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz, A/B/C/D/E/F version		23/23		pF
		P version		-		
Maximum Oscillation Frequency	F _{MAX}		50			MHz
Output Signal Symmetry	SYM	C _L =15pF, @V _{DD} /2	45	50	55	%
		C _L =30pF, @V _{DD} /2	45	50	55	
Output Signal Rise Time	tr	C _L =15pF, 10% to 90%		2	4	ns
		C _L =30pF, 10% to 90%		3	6	
Output Signal Fall Time	tf	C _L =15pF, 90% to 10%		2	4	ns
		C _L =30pF, 90% to 10%		3	6	
Output Disable time	t _{PLZ}	C _L =15pF, R _{UP} =10kΩ			100	ns
Output Enable Time	t _{PZL}	C _L =15pF, R _{UP} =10kΩ			100	ns

Note4) P version is measured with external capacitors contained 23pF for C_g and 23pF for C_d.

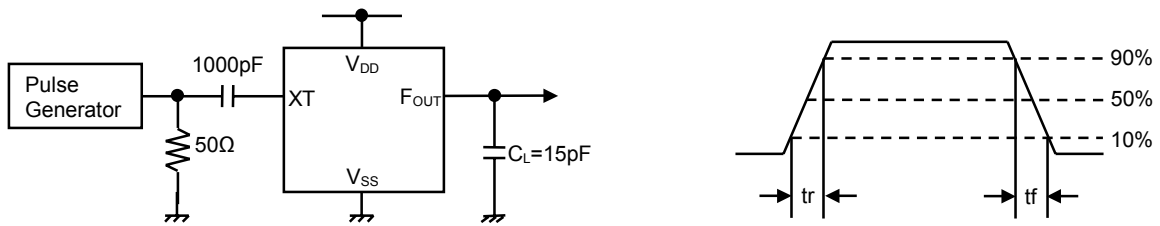
Note5) Excluding input current on $\overline{\text{CONT}}$ Terminal.

MEASUREMENT CIRCUITS

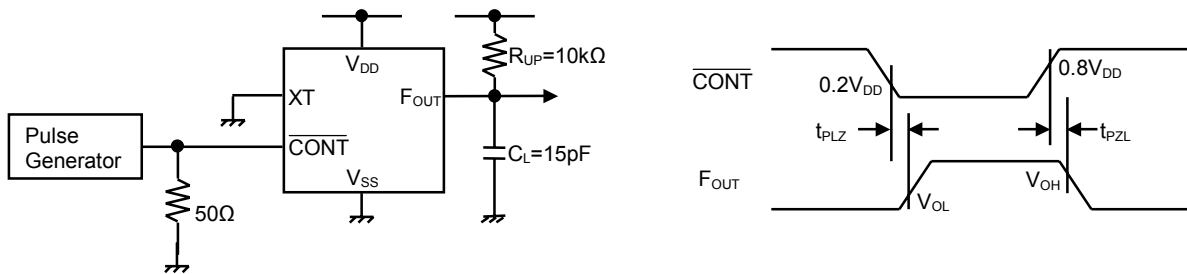
(1) Output Signal Symmetry ($C_L=15\text{pF}$)



(2) Output Signal Rise/Fall Time ($C_L=15\text{pF}$)



(3) Output Disable/Enable Time ($C_L=15\text{pF}, R_{UP}=10\text{k}\Omega$)



[CAUTION]
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