

## 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

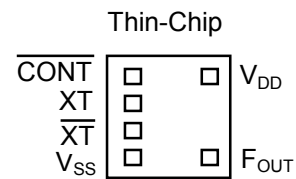


NJU6367XC-D

### ■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

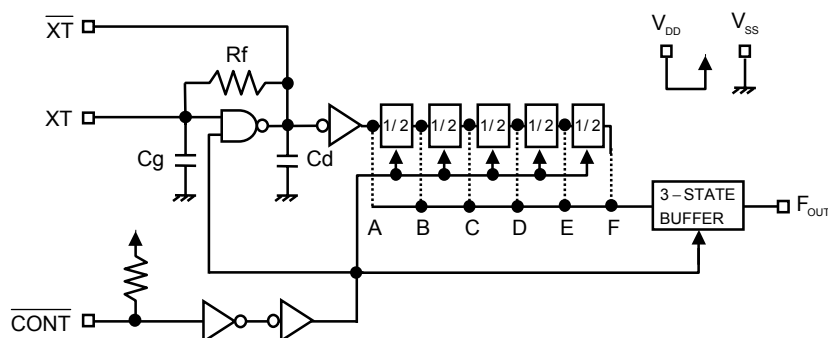
Type No.	F <sub>OUT</sub>	Internal Connect	C <sub>g</sub> /C <sub>d</sub>
A	$f_0$	Connected A Line	23/23pF
B	$f_0/2$	Connected B Line	23/23pF
C	$f_0/4$	Connected C Line	23/23pF
D	$f_0/8$	Connected D Line	23/23pF
E	$f_0/16$	Connected E Line	23/23pF
F	$f_0/32$	Connected F Line	23/23pF
P	$f_0$	Connected 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 <sub>SS</sub>	-178	-231
5	F <sub>OUT</sub>	206	-231
6	V <sub>DD</sub>	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<sub>DD</sub> Level

### ■BLOCK DIAGRAM



## ■ TERMINAL DESCRIPTION

SYMBOL	FUNCTION	
$\overline{\text{CONT}}$	Oscillation and 3-state Output Buffer Control	
	$\overline{\text{CONT}}$	$F_{\text{OUT}}$
	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	
$V_{\text{SS}}$	$V_{\text{SS}}=0\text{V}$	
$F_{\text{OUT}}$	Frequency Output	
$V_{\text{DD}}$	$V_{\text{DD}}=2.5/3.0\text{V}/5.0\text{V}$	

Note1) Refer to the line-up table.

## ■ ABSOLUTE MAXIMUM RATINGS

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

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

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

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

## ■ ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V <sub>DD</sub>		2.0		5.5	V

(V<sub>DD</sub>=2.5V, Ta=25°C)

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

Note4) P version is measured with external capacitors contained 23pF for C<sub>g</sub> and 23pF for C<sub>d</sub>.

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

(V<sub>DD</sub>=3.0V, Ta=25°C)

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

Note4) P version is measured with external capacitors contained 23pF for C<sub>g</sub> and 23pF for C<sub>d</sub>.

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

(V<sub>DD</sub>=5.0V, Ta=25°C)

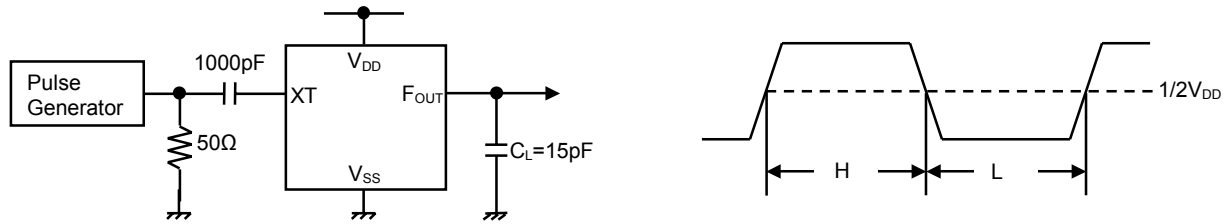
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I <sub>DD</sub>	A version, fosc=16MHz, C <sub>L</sub> =15pF			10	mA
		B version, fosc=16MHz, C <sub>L</sub> =15pF			9	
		C version, fosc=16MHz, C <sub>L</sub> =15pF			9	
		D version, fosc=16MHz, C <sub>L</sub> =15pF			8	
		E version, fosc=16MHz,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

Note4) P version is measured with external capacitors contained 23pF for C<sub>g</sub> and 23pF for C<sub>d</sub>.

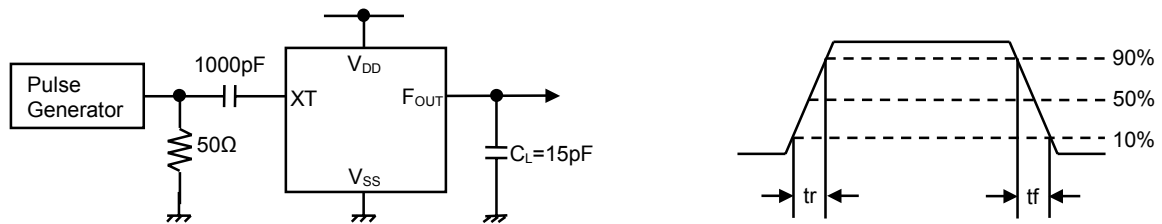
Note5) Excluding input current on  $\overline{\text{CONT}}$  Terminal.

MEASUREMENT CIRCUITS

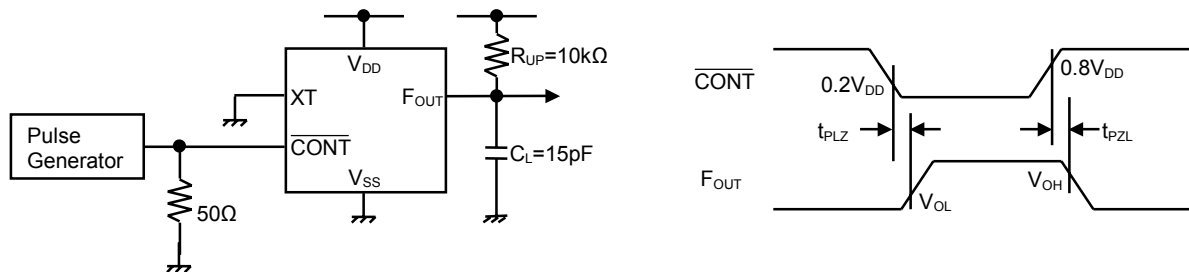
(1) Output Signal Symmetry ( $C_L=15\text{pF}$ )



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



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



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