

3rd. Over Tone Quartz Crystal Oscillator

GENERAL DESCRIPTION

The NJU6377 series is a C-MOS 3rd. over tone quartz crystal oscillator that consists of an oscillation amplifier and 3-state output buffer.

The type number is classified in six versions by their oscillation capacitors mentioned in the line-up table.

The oscillation amplifier is realized very low stand-by current using NAND circuit.

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

FEATURES

Operating Voltage	2.2 to 5.5V
Oscillation Frequency Range	(See Line-up Table)
Low Operating Current	
High Fan-out	$I_{OH}/I_{OL}=4mA@2.5V$ $I_{OH}/I_{OL}=5mA@3.0V$ $I_{OH}/I_{OL}=8mA@5.0V$

Oscillation Stop and Output Stand-by Function

3-State Output Buffer

Oscillation Capacitors C_g and C_d on-chip

Package Outline Thin-Die/Wafer

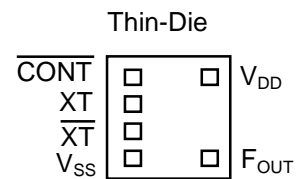
C-MOS Technology

PACKAGE OUTLINE



NJU6377XC-X

PAD LOCATION



LINE-UP TABLE

Type No.	Recommended Oscillation Frequency	Output Frequency	Rf	Cg/Cd
NJU6377	E 30 to 40 MHz	f_0	4.5k Ω	18/18pF
	F 40 to 50 MHz		3.1k Ω	16/16pF
	G 50 to 60 MHz		3.9k Ω	11/11pF
	H 60 to 75 MHz		3.1k Ω	10/10pF
	J 45 to 55 MHz		3.9k Ω	14/14pF
	K 40 to 50 MHz		3.9k Ω	14/16pF

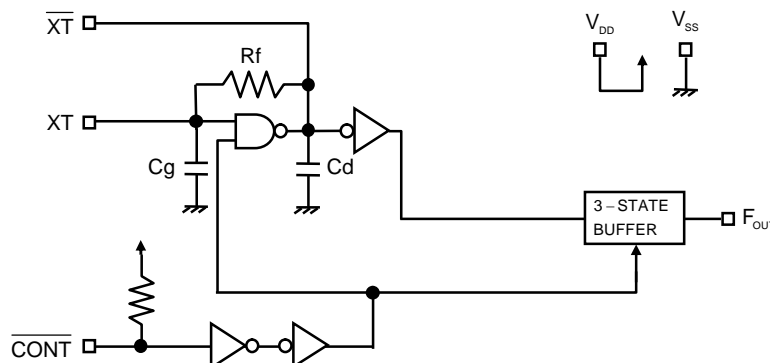
COORDINATES

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

Note1) The oscillation frequency range has used NJRC's characteristics authentication crystal for measurement. However is not guaranteed.

Starting Point: Die Center Unit[μm]
 Die Size: 0.7x0.75mm
 Thin-Die Thickness(C-D): 200 \pm 20 μm
 Thin-Die Thickness(C-L): 140 \pm 10 μm
 Wafer Thickness(W-H): 200 \pm 20 μm
 Wafer Thickness(W-L): 140 \pm 10 μm
 Pad Size: 90x90 μm
 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 frequency f_0 (Note2)
	L	Oscillation Stop and High impedance Output
$\overline{\text{XT}}$	Quartz Crystal Connecting Terminals	
$\overline{\text{XT}}$		
V_{SS}	$V_{\text{SS}}=0\text{V}$	
F_{OUT}	Frequency Output	
V_{DD}	$V_{\text{DD}}=2.5\text{V}/3.0\text{V}/5.0\text{V}$	

Note2) 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	$^\circ\text{C}$

Note3) 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.

Note4) Decoupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

ELECTRICAL CHARACTERISTICS

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V_{DD}		2.2		5.5	V
Recommended Oscillation Frequency	f	E version, Note5)	30		40	MHz
		F version, Note5)	40		50	MHz
		G version, Note5)	50		60	MHz
		H version, Note5)	60		75	MHz
		J version, Note5)	45		55	MHz
		K version, Note5)	40		50	MHz

Note5) The oscillation frequency range has used NJRC's characteristics authentication crystal for measurement. However is not guaranteed.

($V_{DD}=2.5V, T_a=25^{\circ}C$)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	E version, $f_{osc}=40MHz, C_L=15pF$			6	mA
		F version, $f_{osc}=50MHz, C_L=15pF$			9	
		G version, $f_{osc}=60MHz, C_L=15pF$			9	
		H version, $f_{osc}=75MHz, C_L=15pF$			10	
		J version, $f_{osc}=55MHz, C_L=15pF$			9	
		K version, $f_{osc}=50MHz, C_L=15pF$			9	
Oscillation Stopping Current	I_{STB}	$\overline{CONT} = V_{SS}$, No load		2	5	uA
Stand-by Current	I_{st}	$\overline{CONT} = XT = V_{SS}$, No load Note4)			1	uA
Input Voltage	V_{IH}		2.0		2.5	V
	V_{IL}		0		0.5	V
Output Current	I_{OH}	$V_{OH}=2.7V$	4			mA
	I_{OL}	$V_{OL}=0.3V$	4			mA
Input Current	I_{IN}	$\overline{CONT} = 0.8V_{DD}$		7.5	12.0	uA
		$\overline{CONT} = 0.2V_{DD}$		1.2	2.0	uA
3-state Off Leakage Current	I_{OZ}	$\overline{CONT} = V_{SS}$, $F_{OUT} = V_{DD}$ or V_{SS}			± 0.1	uA
Feedback Resistance	R_f	E version		4.5		k Ω
		F version		3.1		
		G version		3.9		
		H version		3.1		
		J version		3.9		
		K version		3.9		
Internal Capacitor	C_g/C_d	E version, $f_{osc}=40MHz$		18/18		pF
		F version, $f_{osc}=50MHz$		16/16		
		G version, $f_{osc}=60MHz$		11/11		
		H version, $f_{osc}=75MHz$		10/10		
		J version, $f_{osc}=55MHz$		14/14		
		K version, $f_{osc}=50MHz$		14/16		
Maximum Oscillation Frequency	F_{MAX}	E version	40			MHz
		F version	50			
		G version	60			
		H version	75			
		J version	55			
		K version	50			
Output Signal Symmetry	SYM	$C_L=15pF, @V_{DD}/2$	45	50	55	%
Output Signal Rise Time	t_r	$C_L=15pF, 10\%$ to 90%		3	6	ns
Output Signal Fall Time	t_f	$C_L=15pF, 90\%$ to 10%		3	6	ns
Output Disable time	t_{PLZ}	$C_L=15pF, R_{UP}=10k\Omega$			200	ns
Output Enable Time	t_{PZL}	$C_L=15pF, R_{UP}=10k\Omega$			200	ns

Note6) Excluding input current on \overline{CONT} Terminal.

($V_{DD}=3.0V, T_a=25^{\circ}C$)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	E version, $f_{osc}=40MHz, C_L=15pF$			8	mA
		F version, $f_{osc}=50MHz, C_L=15pF$			10	
		G version, $f_{osc}=60MHz, C_L=15pF$			11	
		H version, $f_{osc}=75MHz, C_L=15pF$			12	
		J version, $f_{osc}=55MHz, C_L=15pF$			11	
		K version, $f_{osc}=50MHz, C_L=15pF$			11	
Oscillation Stopping Current	I_{STB}	$\overline{CONT} = V_{SS}$, No load		2	5	uA
Stand-by Current	I_{st}	$\overline{CONT} = XT = V_{SS}$, No load Note4)			1	uA
Input Voltage	V_{IH}		2.1		3.0	V
	V_{IL}		0		0.9	V
Output Current	I_{OH}	$V_{OH}=2.7V$	5			mA
	I_{OL}	$V_{OL}=0.3V$	5			mA
Input Current	I_{IN}	$\overline{CONT} = 0.8V_{DD}$		10.0	15.0	uA
		$\overline{CONT} = 0.2V_{DD}$		1.8	3.0	uA
3-state Off Leakage Current	I_{OZ}	$\overline{CONT} = V_{SS}$, $F_{OUT} = V_{DD}$ or V_{SS}			± 0.1	uA
Feedback Resistance	R_f	E version		4.5		k Ω
		F version		3.1		
		G version		3.9		
		H version		3.1		
		J version		3.9		
		K version		3.9		
Internal Capacitor	C_g/C_d	E version, $f_{osc}=40MHz$		18/18		pF
		F version, $f_{osc}=50MHz$		16/16		
		G version, $f_{osc}=60MHz$		11/11		
		H version, $f_{osc}=75MHz$		10/10		
		J version, $f_{osc}=55MHz$		14/14		
		K version, $f_{osc}=50MHz$		14/16		
Maximum Oscillation Frequency	F_{MAX}	E version	40			MHz
		F version	50			
		G version	60			
		H version	75			
		J version	55			
		K version	50			
Output Signal Symmetry	SYM	$C_L=15pF, @V_{DD}/2$	45	50	55	%
Output Signal Rise Time	t_r	$C_L=15pF, 10\%$ to 90%		2.5	5	ns
Output Signal Fall Time	t_f	$C_L=15pF, 90\%$ to 10%		2.5	5	ns
Output Disable time	t_{PLZ}	$C_L=15pF, R_{UP}=10k\Omega$			150	ns
Output Enable Time	t_{PZL}	$C_L=15pF, R_{UP}=10k\Omega$			150	ns

Note6) Excluding input current on \overline{CONT} Terminal.

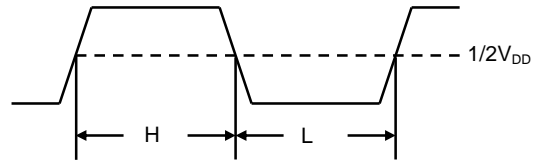
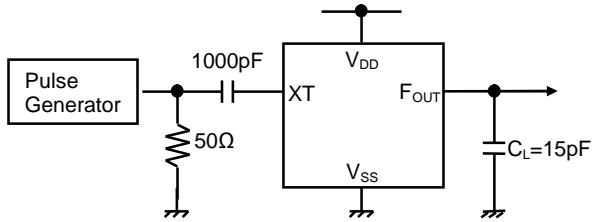
(V_{DD}=5.0V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I _{DD}	E version, fosc=40MHz, C _L =15pF			22	mA
		F version, fosc=50MHz, C _L =15pF			25	
		G version, fosc=60MHz, C _L =15pF			32	
		H version, fosc=75MHz, C _L =15pF			34	
		J version, fosc=55MHz, C _L =15pF			30	
		K version, fosc=50MHz, C _L =15pF			32	
Oscillation Stopping Current	I _{STB}	CONT = V _{SS} , No load		5	10	uA
Stand-by Current	I _{st}	CONT = XT = V _{SS} , No load Note4)			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	8			mA
	I _{OL}	V _{OL} =0.5V	8			mA
Input Current	I _{IN}	CONT = 0.8V _{DD}		27.0	40.0	uA
		CONT = 0.2V _{DD}		5.5	8.0	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	E version		4.5		kΩ
		F version		3.1		
		G version		3.9		
		H version		3.1		
		J version		3.9		
		K version		3.9		
Internal Capacitor	C _g /C _d	E version, fosc=40MHz		18/18		pF
		F version, fosc=50MHz		16/16		
		G version, fosc=60MHz		11/11		
		H version, fosc=75MHz		10/10		
		J version, fosc=55MHz		14/14		
		K version, fosc=50MHz		14/16		
Maximum Oscillation Frequency	F _{MAX}	E version	40			MHz
		F version	50			
		G version	60			
		H version	75			
		J version	55			
		K version	50			
Output Signal Symmetry	SYM	C _L =15pF, @V _{DD} /2	45	50	55	%
Output Signal Rise Time	t _r	C _L =15pF, 10% to 90%		2	4	ns
Output Signal Fall Time	t _f	C _L =15pF, 90% to 10%		2	4	ns
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

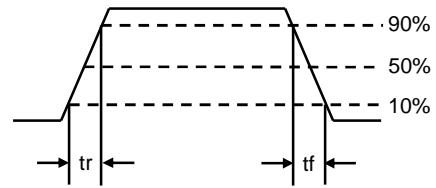
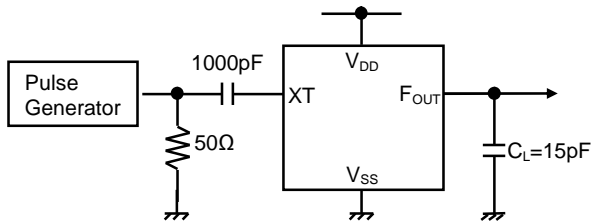
Note6) Excluding input current on CONT Terminal.

MEASUREMENT CIRCUITS

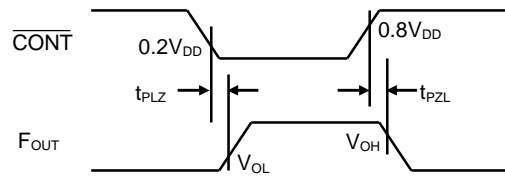
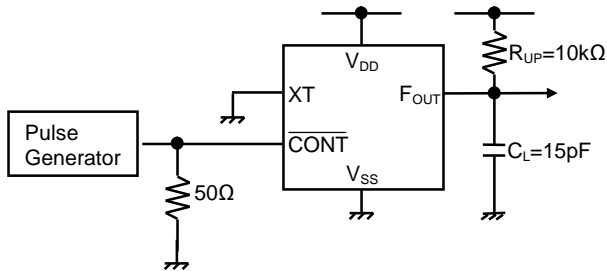
(1) Output Signal Symmetry ($C_L=15\text{pF}$)



(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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