

## 3rd. Over Tone Small Sized Quartz Crystal Oscillator

### GENERAL DESCRIPTION

The NJU6376 series is a C-MOS 3rd. over tone quartz crystal oscillator that consists of an oscillation amplifier and 3-state output buffer.

The type numbers are classed into four versions G, H, J and K according to their oscillation frequency range shown 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.

Furthermore, the package is small-sized SOT-23-6-1.

### PACKAGE OUTLINE



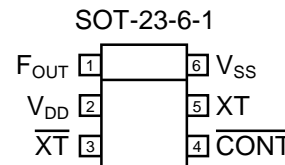
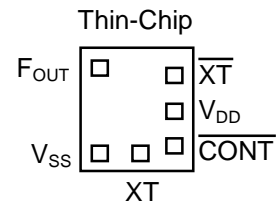
NJU6376XC-C    NJU6376XF1

### FEATURES

- Operating Voltage                    2.2 to 5.5V
- Oscillation Frequency Range        (See Line-up Table)
- Low Operating Current
- High Fan-out                             $I_{OH}/I_{OL}=4mA @2.5V$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors  $C_g$  and  $C_d$  on-chip
- Package Outline                        Chip/SOT-23-6-1
- C-MOS Technology

New Japan Radio Co.,Ltd.

### PAD LOCATION/PIN CONFIGURATION



### LINE-UP TABLE

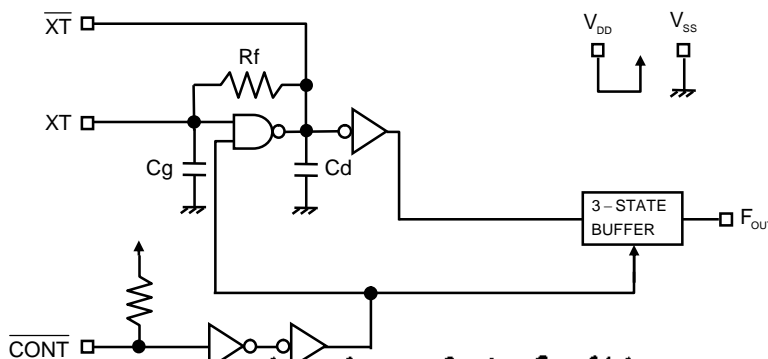
Type No.	Recommended Oscillation Frequency Range	Output Frequency	$C_g/C_d$
NJU6376	G	30 to 40MHz	18/18pF
	H	40 to 50MHz	16/16pF
	J	50 to 60MHz	11/11pF
	K	60 to 75MHz	10/10pF

### COORDINATION

Pad Name	X	Y
$F_{OUT}$	-220	245
$V_{SS}$	-205	-230
XT	13	-230
$\overline{CONT}$	205	-191
$V_{DD}$	205	0
$\overline{XT}$	205	191

Starting Point:Chip Center Unit[um]  
 Chip Size: 0.70x0.75mm  
 Thin-Chip Thickness(-C): $260\pm 20\mu m$   
 Pad Size:90x90um

### BLOCK DIAGRAM



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## TERMINAL DESCRIPTION

SYMBOL	FUNCTION	
$\overline{\text{CONT}}$	Oscillation and 3-state Output Buffer Control	
	$\overline{\text{CONT}}$	$F_{\text{OUT}}$
	H or OPEN	Output frequency $f_0$ (Note1)
	L	Oscillation Stop and High impedance Output
$\overline{\text{XT}}$	Quartz Crystal Connecting Terminals	
$\text{XT}$		
$V_{\text{SS}}$	$V_{\text{SS}}=0\text{V}$	
$F_{\text{OUT}}$	Frequency Output	
$V_{\text{DD}}$	$V_{\text{DD}}=2.5\text{V}/3.0\text{V}/5.0\text{V}$	

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
Power Dissipation Note4)	$P_{\text{D}}$	200(SOT-23-6-1)	mW
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.

Note4) The power dissipation is the maximum value at only the package.

## ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V <sub>DD</sub>		2.2		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>	G version, fosc=40MHz, C <sub>L</sub> =15pF			6	mA
		H version, fosc=50MHz, C <sub>L</sub> =15pF			9	
		J version, fosc=60MHz, C <sub>L</sub> =15pF			9	
		K version, fosc=75MHz, C <sub>L</sub> =15pF			10	
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	4			mA
	I <sub>OL</sub>	V <sub>OL</sub> =0.3V	4			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>	G version		4.5		kΩ
		H version		3.1		
		J version		3.9		
		K version		3.1		
Internal Capacitor	C <sub>g</sub> /C <sub>d</sub>	G version, fosc=40MHz		18/18		pF
		H version, fosc=50MHz		16/16		
		J version, fosc=60MHz		11/11		
		K version, fosc=75MHz		10/10		
Maximum Oscillation Frequency	F <sub>MAX</sub>	G version	40			MHz
		H version	50			
		J version	60			
		K version	75			
Output Signal Symmetry	SYM	C <sub>L</sub> =15pF, @V <sub>DD</sub> /2	45	50	55	%
Output Signal Rise Time	t <sub>r</sub>	C <sub>L</sub> =15pF, 10% to 90%		3	6	ns
Output Signal Fall Time	t <sub>f</sub>	C <sub>L</sub> =15pF, 90% to 10%		3	6	ns
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

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

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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	$I_{DD}$	G version, $f_{osc}=40MHz, C_L=15pF$			8	mA
		H version, $f_{osc}=50MHz, C_L=15pF$			10	
		J version, $f_{osc}=60MHz, C_L=15pF$			11	
		K version, $f_{osc}=75MHz, C_L=15pF$			12	
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 Note5)			1	uA
Input Voltage	$V_{IH}$		2.1		3.0	V
	$V_{IL}$		0		0.9	V
Output Current	$I_{OH}$	$V_{OH}=2.7V$	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 $V_{SS}$			$\pm 0.1$	uA
Feedback Resistance	$R_f$	G version		4.5		k $\Omega$
		H version		3.1		
		J version		3.9		
		K version		3.1		
Internal Capacitor	$C_g/C_d$	G version, $f_{osc}=40MHz$		18/18		pF
		H version, $f_{osc}=50MHz$		16/16		
		J version, $f_{osc}=60MHz$		11/11		
		K version, $f_{osc}=75MHz$		10/10		
Maximum Oscillation Frequency	$F_{MAX}$	G version	40			MHz
		H version	50			
		J version	60			
		K version	75			
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

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

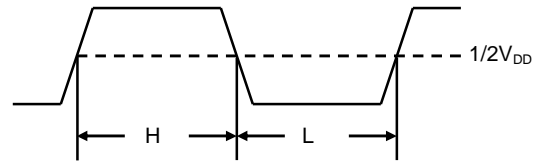
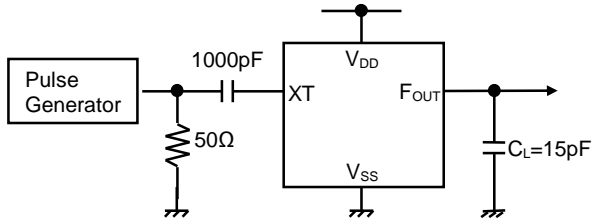
(V<sub>DD</sub>=5.0V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I <sub>DD</sub>	G version, fosc=40MHz, C <sub>L</sub> =15pF			22	mA
		H version, fosc=50MHz, C <sub>L</sub> =15pF			25	
		J version, fosc=60MHz, C <sub>L</sub> =15pF			32	
		K version, fosc=75MHz, C <sub>L</sub> =15pF			34	
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	8			mA
	I <sub>OL</sub>	V <sub>OL</sub> =0.5V	8			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>	G version		4.5		kΩ
		H version		3.1		
		J version		3.9		
		K version		3.1		
Internal Capacitor	C <sub>g</sub> /C <sub>d</sub>	G version, fosc=40MHz		18/18		pF
		H version, fosc=50MHz		16/16		
		J version, fosc=60MHz		11/11		
		K version, fosc=75MHz		10/10		
Maximum Oscillation Frequency	F <sub>MAX</sub>	G version	40			MHz
		H version	50			
		J version	60			
		K version	75			
Output Signal Symmetry	SYM	C <sub>L</sub> =15pF, @V <sub>DD</sub> /2	45	50	55	%
Output Signal Rise Time	t <sub>r</sub>	C <sub>L</sub> =15pF, 10% to 90%		2	4	ns
Output Signal Fall Time	t <sub>f</sub>	C <sub>L</sub> =15pF, 90% to 10%		2	4	ns
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

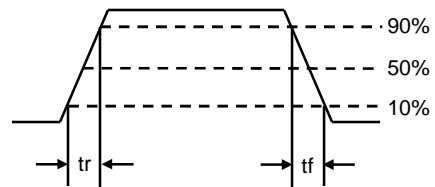
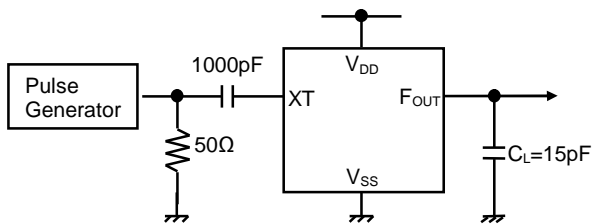
Note5) Excluding input current on  $\overline{\text{CONT}}$  Terminal.

MEASUREMENT CIRCUITS

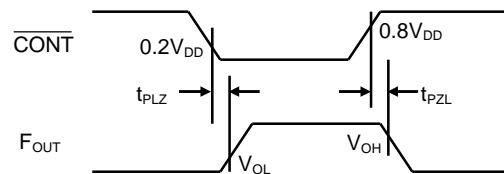
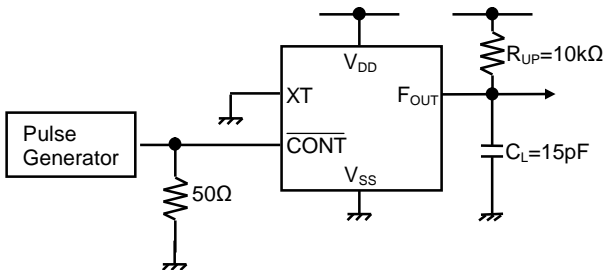
(1) Output Signal Symmetry ( $C_L=15\text{pF}$ )



(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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