

## High Drive Fundamental Quartz Crystal Oscillator

### GENERAL DESCRIPTION

The NJU6368 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  $f_0, f_0/2, f_0/4$  and  $f_0/8$  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 and can drive 50pF(@5V) C-MOS load.

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

### PACKAGE OUTLINE

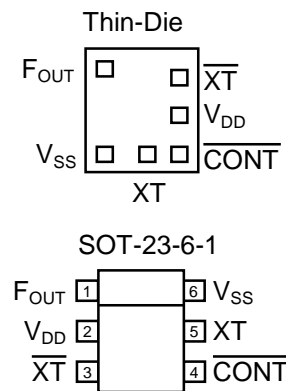


NJU6368XC-C NJU6368XF1

### FEATURES

- Operating Voltage 2.7 to 5.5V
- Maximum Oscillation Frequency 50MHz
- Low Operating Current
- High Fan-out  $I_{OH}/I_{OL}=8mA@3.3V$   
 $I_{OH}/I_{OL}=16mA@5.0V$
- 3-Stage Divider Maximum Divider  $f_0/8$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors  $C_g$  and  $C_d$  on-Die
- Package Outline Thin-Die/SOT-23-6-1
- C-MOS Technology

### PAD LOCATION



### LINE-UP TABLE

Type No.	F <sub>OUT</sub>	Internal Connect	C <sub>g</sub> /C <sub>d</sub>	
NJU6368	A	$f_0$	Connected A Line	15/15pF
	B	$f_0/2$	Connected B Line	15/15pF
	C	$f_0/4$	Connected C Line	15/15pF
	D	$f_0/8$	Connected D Line	15/15pF
	P	$f_0$	Connected A Line	Non

### COORDINATES

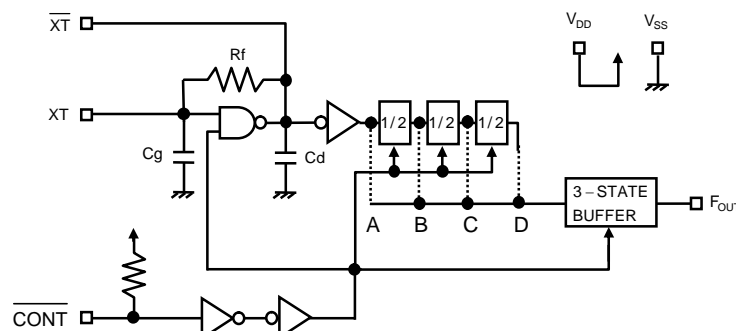
No	Pad Name	X	Y
1	F <sub>OUT</sub>	-207	247
2	V <sub>SS</sub>	-207	-247
3	XT	33	-247
4	$\overline{\text{CONT}}$	207	-247
5	V <sub>DD</sub>	207	-17
8	$\overline{\text{XT}}$	207	172

### EXAMPLE OF PART NUMBER

- 1) NJU6368AC-C  
F<sub>OUT</sub>=  $f_0$ , Die Thickness=260um
- 2) NJU6368CF1  
F<sub>OUT</sub>=  $f_0/4$ , Mold package, SOT-23-6-1

Starting Point: Die Center Unit[um]  
 Die Size: 0.67x0.75mm  
 Thin-Die Thickness: 260±20um  
 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 $f_0$ , $f_0/2$ , $f_0/4$ and $f_0/8$ (Note1)
	L	Oscillation Stop and High impedance Output
$\overline{\text{XT}}$	Quartz Crystal Connecting Terminals	
$\overline{\text{XT}}$		
$V_{\text{SS}}$	$V_{\text{SS}}=0\text{V}$	
$F_{\text{OUT}}$	Frequency Output	
$V_{\text{DD}}$	$V_{\text{DD}}=3.3\text{V}/5.0\text{V}$	

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 (Note 4)	$P_{\text{D}}$	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) Power Dissipation is the maximum value of a package simple substance.

## ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V <sub>DD</sub>		2.7		5.5	V

(V<sub>DD</sub>=3.3V, Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I <sub>DD</sub>	A version, fosc=16MHz, C <sub>L</sub> =30pF			8	mA
		B version, fosc=16MHz, C <sub>L</sub> =30pF			6	
		C version, fosc=16MHz, C <sub>L</sub> =30pF			4	
		D version, fosc=16MHz, C <sub>L</sub> =30pF			3	
		P version, fosc=16MHz, C <sub>L</sub> =30pF Note5)			8	
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 Note6)			1	uA
Input Voltage	V <sub>IH</sub>		2.31		3.3	V
	V <sub>IL</sub>		0		0.99	V
Output Current	I <sub>OH</sub>	V <sub>OH</sub> =2.97V	8			mA
	I <sub>OL</sub>	V <sub>OL</sub> =0.33V	8			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 version		15/15		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%		4	8	
Output Signal Fall Time	tf	C <sub>L</sub> =15pF, 90% to 10%		2	4	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

Note5) P version is measured with external capacitors contained 13pF for C<sub>g</sub> and 13pF for C<sub>d</sub>.

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

( $V_{DD}=5.0V, T_a=25^{\circ}C$ )

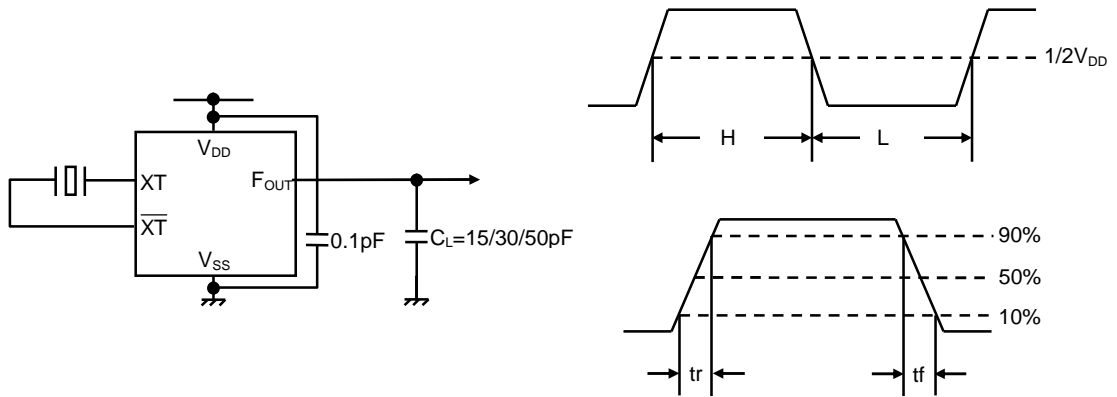
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	$I_{DD}$	A version, $f_{osc}=16MHz, C_L=50pF$			15	mA
		B version, $f_{osc}=16MHz, C_L=50pF$			11	
		C version, $f_{osc}=16MHz, C_L=50pF$			9	
		D version, $f_{osc}=16MHz, C_L=50pF$			7	
		P version, $f_{osc}=16MHz, C_L=50pF$ Note5)			15	
Oscillation Stopping Current	$I_{STB}$	$\overline{CONT} = V_{SS}$ , No load		5	10	uA
Stand-by Current	$I_{st}$	$\overline{CONT} = XT = V_{SS}$ , No load Note6)			1	uA
Input Voltage	$V_{IH}$		3.5		5.0	V
	$V_{IL}$		0		1.5	V
Output Current	$I_{OH}$	$V_{OH}=4.5V$	16			mA
	$I_{OL}$	$V_{OL}=0.5V$	16			mA
Input Current	$I_{IN}$	$\overline{CONT} = 0.8V_{DD}$		27.0	40.0	uA
		$\overline{CONT} = 0.2V_{DD}$		5.5	8.0	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	$R_f$			255		k $\Omega$
Internal Capacitor	$C_g/C_d$	$f_{osc}=16MHz$ , A/B/C/D version		15/15		pF
		P version		-		
Maximum Oscillation Frequency	$F_{MAX}$		50			MHz
Output Signal Symmetry	SYM	$C_L=15pF$ , @ $V_{DD}/2$	45	50	55	%
		$C_L=50pF$ , @ $V_{DD}/2$	45	50	55	
Output Signal Rise Time	$t_r$	$C_L=15pF$ , 10% to 90%		2	4	ns
		$C_L=50pF$ , 10% to 90%		4	8	
Output Signal Fall Time	$t_f$	$C_L=15pF$ , 90% to 10%		2	4	ns
		$C_L=50pF$ , 90% to 10%		4	8	
Output Disable time	$t_{PLZ}$	$C_L=15pF, R_{UP}=10k\Omega$			100	ns
Output Enable Time	$t_{PZL}$	$C_L=15pF, R_{UP}=10k\Omega$			100	ns

Note5) P version is measured with external capacitors contained 13pF for  $C_g$  and 13pF for  $C_d$ .

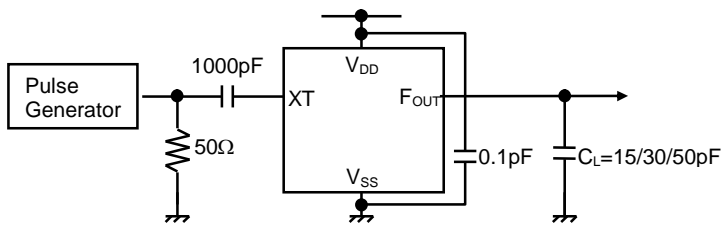
Note6) Excluding input current on  $\overline{CONT}$  Terminal.

MEASUREMENT CIRCUITS

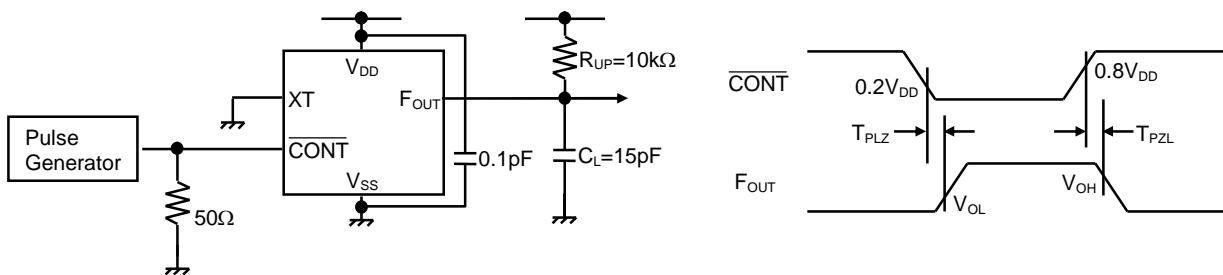
(1) Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time



(2) Check of Operation



(3) Output Disable/Enable Time



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