

0.9V Operation Fundamental Quartz Crystal Oscillator IC for Flip

■GENERAL DESCRIPTION

The NJU6312 series is C-MOS quartz crystal oscillator IC for fundamental (up to 80MHz) oscillation.

The pad arrangement suitable for flip die mount simplifies development of small-sized oscillator.

The operating voltage is from 0.9V to 3.0V, and the pad layout is for flip die based on smaller ceramic package.

The 5-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.

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

■PACKAGE OUTLINE



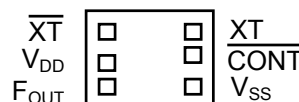
NJU6312XC-L

■FEATURES

- Operating Voltage 0.9 to 3.0V
- Maximum Oscillation Frequency 80MHz
- Low Operating Current
- 5-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
- Pad Layout for Flip Die
- Package Outline Thin-Die
- C-MOS Technology

■PAD LOCATION

Thin-Die



■LINE-UP TABLE

Type No.	F_{OUT}	Internal Connect	C_g/C_d
NJU6312	A f_0	Connected A Line	8/9pF
	B $f_0/2$	Connected B Line	8/9pF
	C $f_0/4$	Connected C Line	8/9pF
	D $f_0/8$	Connected D Line	8/9pF
	E $f_0/16$	Connected E Line	8/9pF
	F $f_0/32$	Connected F Line	8/9pF

■COORDINATES

No	Pad Name	X	Y
1	XT	-271	171
2	V_{DD}	-271	-17
3	F_{OUT}	-271	-171
4	V_{SS}	271	-171
5	CONT	271	17
6	XT	271	171

Starting Point: Die Center Unit[um]

Die Size: 0.8x0.6mm

Die Thickness (C-L): $140 \pm 10 \mu m$

Wafer Thickness (W-L): $140 \pm 10 \mu m$

Pad size: 90x90um

Die Substrate: V_{DD} level

■EXAMPLE OF PART NUMBER

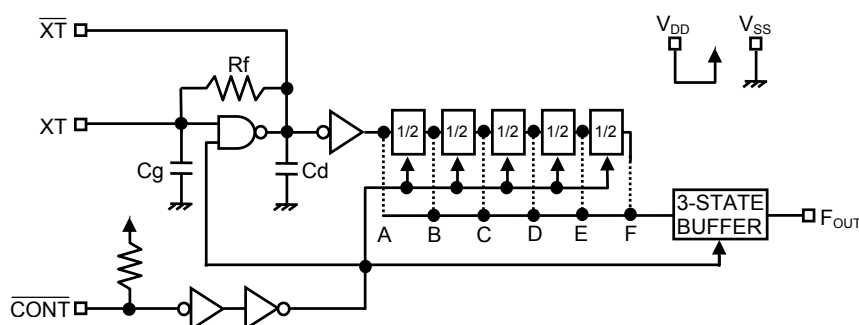
1)NJU6312AW-L

 $F_{OUT}=f_0$, Wafer Thickness= $140 \mu m$

2)NJU6312CC-L

 $F_{OUT}=f_0/4$, Die Thickness= $140 \mu m$

■BLOCK DIAGRAM



■ TERMINAL DESCRIPTION

SYMBOL	FUNCTION
CONT	Oscillation and 3-state Output Buffer Control
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
XT	Quartz Crystal Connecting Terminals
$\overline{\text{XT}}$	
V _{SS}	V _{SS} =0V
F _{OUT}	Frequency Output
V _{DD}	V _{DD} =1.2V/1.5V

Note1) Refer to the line-up table.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V _{DD}	-0.5 to +3.3	V
Input Voltage	V _{IN}	V _{SS} -0.5 to V _{DD} +0.5	V
Output Voltage	V _O	-0.5 to V _{DD} +0.5	V
Input Current	I _{IN}	±10	mA
Output Current	I _O	±25	mA
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-55 to +125	°C

Note2) If the supply voltage(V_{DD}) is less than 3.3V, the input voltage must not over the V_{DD} level though 3.3V 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=-40 to +85°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V_{DD}	8MHz≤fosc≤40MHz	0.9		3.0	V
		fosc≤80MHz	1.1		3.0	

(V_{DD}=1.2V, Ta=-40 to +85°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version, fosc=16MHz, C _L =15pF			1.3	mA
		B version, fosc=16MHz, C _L =15pF			0.9	
		C version, fosc=16MHz, C _L =15pF			0.7	
		D version, fosc=16MHz, C _L =15pF			0.6	
		E version, fosc=16MHz, C _L =15pF			0.6	
		F version, fosc=16MHz, C _L =15pF			0.6	
Oscillation Stopping Current	I_{STB}	CONT=V _{SS} , No load		1	3	uA
Stand-by Current	I_{st}	CONT=XT=V _{SS} , No load Note4)			1	uA
Input Voltage	V_{IH}		0.84		1.2	V
	V_{IL}		0		0.36	V
Output Current	I_{OH}	V _{OH} =1.08V	2			mA
	I_{OL}	V _{OL} =0.12V	2			mA
Input Current	I_{IN}	CONT=0.8V _{DD}		3.0	4.5	uA
		CONT=0.2V _{DD}		0.5	0.7	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			255		kΩ
Internal Capacitor	C _g /C _d	fosc=16MHz		8/9		pF
Maximum Oscillation Frequency	F _{MAX}		80			MHz
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} =10kΩ			250	ns
Output Enable Time	t _{PZL}	C _L =15pF, R _{UP} =10kΩ			250	ns
Start Up Time	t _{START}	C _L =15pF, V _{TRIGGER} =0.9V _{DD}		2	10	ns

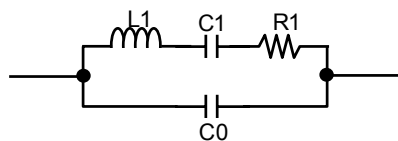
Note4) Excluding input current on CONT Terminal.

($V_{DD}=1.5V$, $T_a=-40$ to $+85^{\circ}C$)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version, $f_{osc}=16MHz$, $C_L=15pF$			2.0	mA
		B version, $f_{osc}=16MHz$, $C_L=15pF$			1.5	
		C version, $f_{osc}=16MHz$, $C_L=15pF$			1.2	
		D version, $f_{osc}=16MHz$, $C_L=15pF$			1.0	
		E version, $f_{osc}=16MHz$, $C_L=15pF$			1.0	
		F version, $f_{osc}=16MHz$, $C_L=15pF$			1.0	
Oscillation Stopping Current	I_{STB}	CONT= V_{SS} , No load		2	5	μA
Stand-by Current	I_{st}	CONT=XT= V_{SS} , No load Note4)			1	μA
Input Voltage	V_{IH}		1.05		1.5	V
	V_{IL}		0		0.45	V
Output Current	I_{OH}	$V_{OH}=1.35V$	2			mA
	I_{OL}	$V_{OL}=0.15V$	2			mA
Input Current	I_{IN}	CONT= $0.8V_{DD}$		3.0	4.5	μA
		CONT= $0.2V_{DD}$		0.6	0.9	μA
3-state Off Leakage Current	I_{OZ}	CONT= V_{SS} , $F_{OUT}=V_{DD}$ or V_{SS}			± 0.1	μA
Feedback Resistance	R_f			255		k Ω
Internal Capacitor	C_g/C_d	$f_{osc}=16MHz$		8/9		pF
Maximum Oscillation Frequency	F_{MAX}		80			MHz
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}	$C_L=15pF$, $R_{UP}=10k\Omega$			250	ns
Output Enable Time	t_{PZL}	$C_L=15pF$, $R_{UP}=10k\Omega$			250	ns
Start Up Time	t_{START}	$C_L=15pF$, $V_{TRIGGER}=0.9V_{DD}$		2	10	ns

Note4) Excluding input current on CONT Terminal.

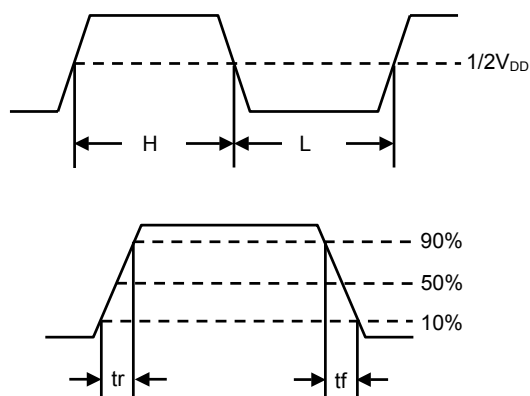
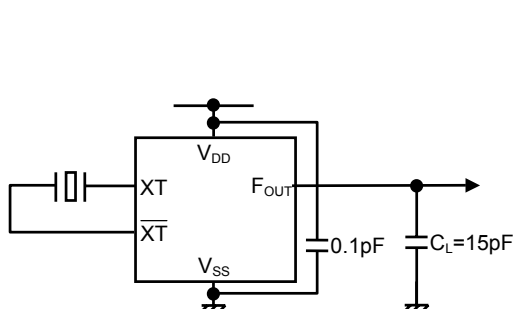
STANDARD CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS



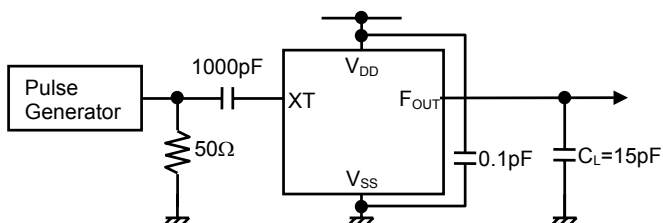
f[MHz]	R1[Ω]	L1[mH]	C1[fF]	C0[pF]
16	26.91	3.95	25.03	11.45
80	11.99	1.06	3.74	1.88

MEASUREMENT CIRCUITS

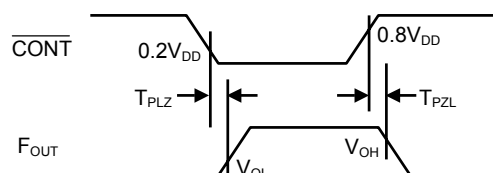
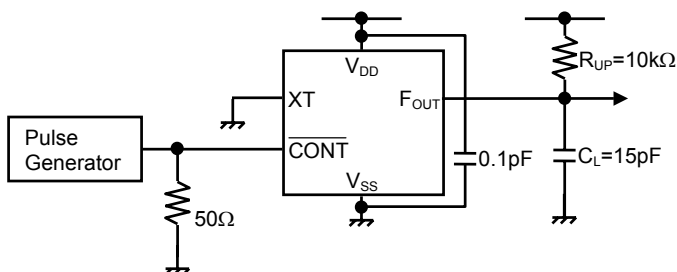
(1) Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time ($C_L=15\text{pF}$)



(2) Check of Operation ($C_L=15\text{pF}$)



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





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