1.8V Operating Voltage Fundamental Quartz Crystal Oscillator IC

■GENERAL DESCRIPTION

The NJU6212 series is a C-MOS quartz crystal oscillator IC realized excellent frequency stability for fundamental (up to 60MHz) oscillation, and consists of an oscillation amplifier, 4-stage divider, 3-state output buffer and a built-in LDO.

The operating voltage is from 1.62V to 3.63V, and the LDO holds down the characteristic change of the oscillation amplifier for operating voltage variation, and has been stabilized oscillation frequency.

The 4-stage divider generates only one frequency selected of f_0,$f_0/2$,$f_0/4$ and $f_0/8$ internal circuits is output.

The 3-state output buffer is C-MOS compatible of high fan-out.

The oscillation stopping current is very low stand-by mode below 10uA, therefore, it is suitable for the portable items of the communication equipment and the like.

■PACKAGE OUTLINE

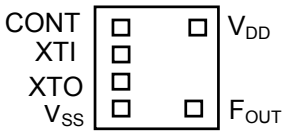
NJU6212XC-X

■FEATURES

- ●Frequency Stability ±1ppm@V_{DD}±10%
- ●Operating Voltage 1.62 to 3.63V
- ●Maximum Oscillation Frequency Up to 60MHz
- ●Low Operating Current 5mA typ.@60MHz/3.3V/15pF
- ●4-Stage Divider Maximum Divider $f_0/8$
- ●Built-in LDO
- ●Oscillation Stop and Output Stand-by Function
- ●3-State Output Buffer
- ●Variable Pull-up Resistance on-Die
- ●Oscillation Capacitors Cg and Cg on-Die
- ●Package Outline Die/Wafer
- ●C-MOS Technology

■PAD LOCATION

Die



■LINE-UP TABLE

Type No.		F_{OUT}	Internal Connect			Cg/Cd
			Short	Open	N	
NJU6212	A	f_0	A	B	-	9.3/10.7pF
	B	$f_0/2$	B	A	2	9.3/10.7pF
	C	$f_0/4$	B	A	4	9.3/10.7pF
	D	$f_0/8$	B	A	8	9.3/10.7pF

■COORDINATES

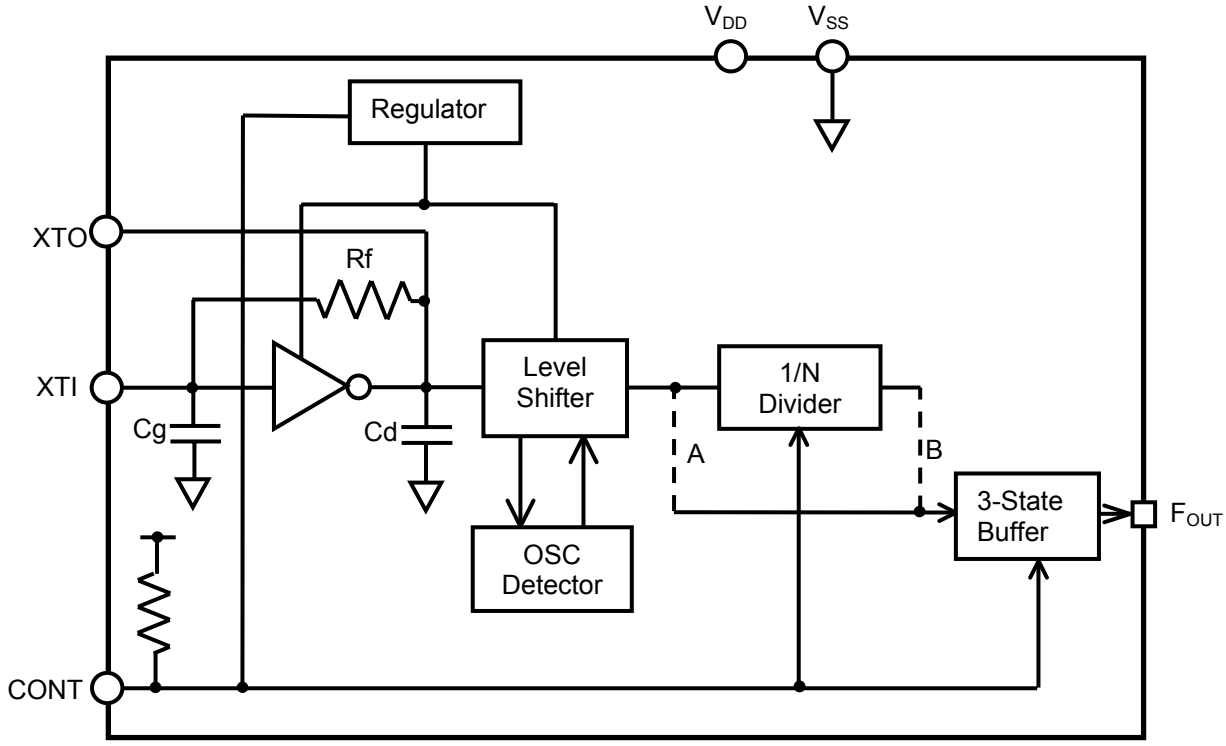
No	Pad Name	X	Y
1	CONT	-189	231
2	XTI	-189	77
3	XTO	-189	-77
4	V_{SS}	-189	-231
5	F_{OUT}	215	-231
6	V_{DD}	222	231

Starting Point: Die Center Unit[um]
Die Size: 0.70x0.75mm
Die Thickness (C-L): 140±10um
Die Thickness (C-D): 200±20um
Wafer Thickness (W-L): 140±10um
Wafer Thickness (W-H): 200±20um
Pad size: 90x90um
Die Substrate: V_{SS} level

■EXAMPLE OF PART NUMBER

1)NJU6212AW-L
$F_{OUT}=f_0$, Wafer Thickness=140um
2)NJU6212CC-D
$F_{OUT}= f_0/4$, Die Thickness=200um

■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, $f_0/2$,$f_0/4$ and $f_0/8$ Note1)
L	Oscillation Stop and High impedance Output

XTI	Quartz Crystal Connecting Terminals
XTO	
V_{SS}	V_{SS}=0V : GND
F_{OUT}	Frequency Output
V_{DD}	V_{DD}=1.62 to 3.63V

Note1) Refer to the line-up table.

■ABSOLUTE MAXIMUM RATINGS

(V_{SS}=0V, Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	-0.5 to +7.0	V
Input Voltage	V_{IN}	-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 7.0V, the input voltage must not over the V_{DD} level though 7.0V is limit specified.

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

■ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V_{DD}	fosc=60MHz	1.62		3.63	V
Output Frequency Stability	df/f	V_{DD}±10%		±1		ppm

(V_{DD}=1.8V,Ta=+25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version, f_0=60MHz, C_L=15pF		3.0	4.0	mA
		B version, f_0/2=30MHz, C_L=15pF		1.8	2.6	
		C version, f_0/4=15MHz, C_L=15pF		1.3	2.0	
		D version, f_0/8=7.5MHz, C_L=15pF		1.0	2.0	
Oscillation Stopping Current	I_{STB}	CONT=V_{SS}, No load			1	uA
Input Voltage	V_{IH}		1.26		1.8	V
	V_{IL}		0		0.54	V
Output Voltage	V_{OH}	I_{OH}=2mA	1.62			V
	V_{OL}	I_{OL}=2mA			0.18	V
Input Current	I_{IN}	CONT=0.8V_{DD}		1.9	2.7	uA
		CONT=0.2V_{DD}		0.1	0.25	uA
3-state Off Leakage Current	I_{OZ}	CONT=V_{SS}, F_{OUT}= V_{DD} or V_{SS}			±0.1	uA
Feedback Resistance	Rf			270		kΩ
Internal Capacitor	Cg	fosc=60MHz		9.3		pF
Internal Capacitor	Cd	fosc=60MHz		10.7		pF
Oscillation Frequency	fosc	Recommendation Note4)			60	MHz
Output Signal Symmetry	SYM	C_L=15pF, @V_{DD}/2	45	50	55	%
Output Signal Rise Time	tr	C_L=15pF, 0.1V_{DD} to 0.9V_{DD}		3.2	5.0	ns
Output Signal Fall Time	tf	C_L=15pF, 0.9V_{DD} to 0.1V_{DD}		3.2	5.0	ns
Output Disable time	t_{POZ}	C_L=15pF, R_L=1kΩ			100	ns
Output Enable Time	t_{PZO}	C_L=15pF			1	ms

Note4) The oscillation frequency range has used NJRC's standard crystal for measurement. However it is not guaranteed. (Refer to EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS)

(V_{DD}=2.5V,Ta=+25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version, f_0=60MHz, C_L=15pF		3.7	5.0	mA
		B version, f_0/2=30MHz, C_L=15pF		2.4	3.3	
		C version, f_0/4=15MHz, C_L=15pF		1.6	2.4	
		D version, f_0/8=7.5MHz, C_L=15pF		1.2	2.0	
Oscillation Stopping Current	I_{STB}	CONT=V_{SS}, No load			1	uA
Input Voltage	V_{IH}		1.75		2.5	V
	V_{IL}		0		0.75	V
Output Voltage	V_{OH}	I_{OH}=4mA	2.25			V
	V_{OL}	I_{OL}=4mA			0.25	V
Input Current	I_{IN}	CONT=0.8V_{DD}		4.2	9.0	uA
		CONT=0.2V_{DD}		0.3	0.6	uA
3-state Off Leakage Current	I_{OZ}	CONT=V_{SS}, F_{OUT}= V_{DD} or V_{SS}			±0.1	uA
Feedback Resistance	Rf			270		kΩ
Internal Capacitor	Cg	fosc=60MHz		9.3		pF
Internal Capacitor	Cd	fosc=60MHz		10.7		pF
Oscillation Frequency	fosc	Recommendation Note4)			60	MHz
Output Signal Symmetry	SYM	C_L=15pF, @V_{DD}/2	45	50	55	%
Output Signal Rise Time	tr	C_L=15pF, 0.1V_{DD} to 0.9V_{DD}		2.2	3.7	ns
Output Signal Fall Time	tf	C_L=15pF, 0.9V_{DD} to 0.1V_{DD}		2.2	3.7	ns
Output Disable time	t_{POZ}	C_L=15pF, R_L=1kΩ			100	ns
Output Enable Time	t_{PZO}	C_L=15pF			1	ms

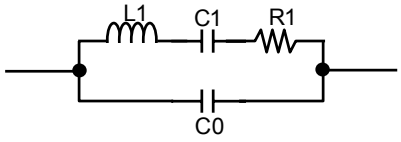
Note4) The oscillation frequency range has used NJRC's standard crystal for measurement. However it is not guaranteed. (Refer to EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS)

(V_{DD}=3.3V,Ta=+25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version, f_0=60MHz, C_L=15pF		5.0	7.0	mA
		B version, f_0/2=30MHz, C_L=15pF		3.2	4.4	
		C version, f_0/4=15MHz, C_L=15pF		2.2	3.0	
		D version, f_0/8=7.5MHz, C_L=15pF		1.7	2.5	
Oscillation Stopping Current	I_{STB}	CONT=V_{SS}, No load			1	uA
Input Voltage	V_{IH}		2.31		3.3	V
	V_{IL}		0		0.99	V
Output Voltage	V_{OH}	I_{OH}=6mA	2.97			V
	V_{OL}	I_{OL}=6mA			0.33	V
Input Current	I_{IN}	CONT=0.8V_{DD}		7.8	16.0	uA
		CONT=0.2V_{DD}		0.6	1.2	uA
3-state Off Leakage Current	I_{OZ}	CONT=V_{SS}, F_{OUT}= V_{DD} or V_{SS}			±0.1	uA
Feedback Resistance	Rf			270		kΩ
Internal Capacitor	Cg	fosc=60MHz		9.3		pF
Internal Capacitor	Cd	fosc=60MHz		10.7		pF
Oscillation Frequency	fosc	Recommendation Note4)			60	MHz
Output Signal Symmetry	SYM	C_L=15pF, @V_{DD}/2	45	50	55	%
Output Signal Rise Time	tr	C_L=15pF, 0.1V_{DD} to 0.9V_{DD}		1.8	3.0	ns
Output Signal Fall Time	tf	C_L=15pF, 0.9V_{DD} to 0.1V_{DD}		1.8	3.0	ns
Output Disable time	t_{POZ}	C_L=15pF, R_L=1kΩ			100	ns
Output Enable Time	t_{PZO}	C_L=15pF			1	ms

Note4) The oscillation frequency range has used NJRC's standard crystal for measurement. However it is not guaranteed. (Refer to EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS)

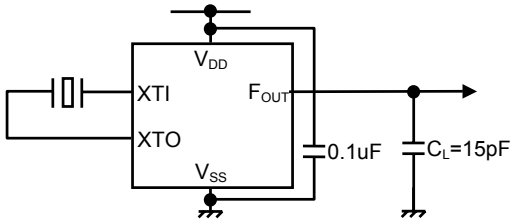
■EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS

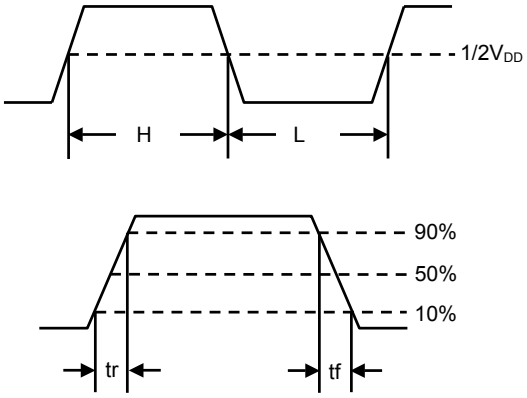


f[MHz]	R1[Ω]	L1[mH]	C1[fF]	C0[pF]
60	31.2	3.75	1.87	0.92

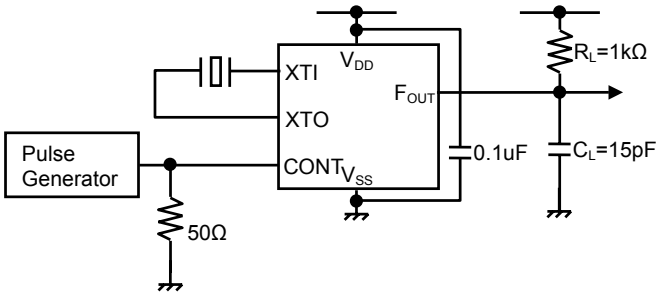
■MEASUREMENT CIRCUITS

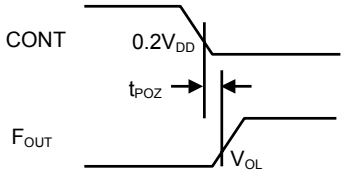
(1)Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time (C_L=15pF)



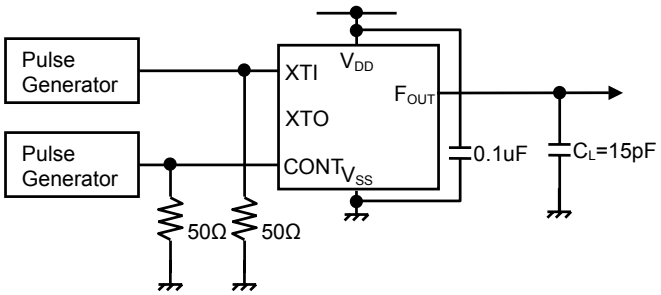


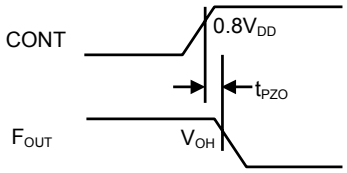
(2)Output Disable Time (C_L=15pF,R_L=1kΩ)





(3)Output Enable Time (C_L=15pF)





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