Small-Sized 1.8V Operating Voltage
Fundamental Quartz Crystal Oscillator IC

■GENERAL DESCRIPTION

The NJU6214 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 $f_0, f_0/2, f_0/4$ $f_0/8$ and $f_0/16$ 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 1uA, therefore, it is suitable for the portable items of the communication equipment and the like.

The pad arranges "L" location to be easy to put on 2016 size oscillator by wire bonding.

■FEATURES
- Frequency Stability $\pm1\text{ppm}@V_{DD}\pm10\%$
- 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 $f_0/16$
- 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

■PACKAGE OUTLINE

NJU6214XC-X

■PAD LOCATION

■LINE-UP TABLE

Type No.		F_{OUT}	Internal Connect			Cg/Cd
			Short	Open	N	
NJU6214	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
	*E	$f_0/16$	B	A	16	9.3/10.7pF

* Under Development

■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: 0.64x0.60mm
Die Thickness (C-V): 130±10um
Die Thickness (C-L): 140±10um
Wafer Thickness (W-V): 130±10um
Wafer Thickness (W-L): 140±10um
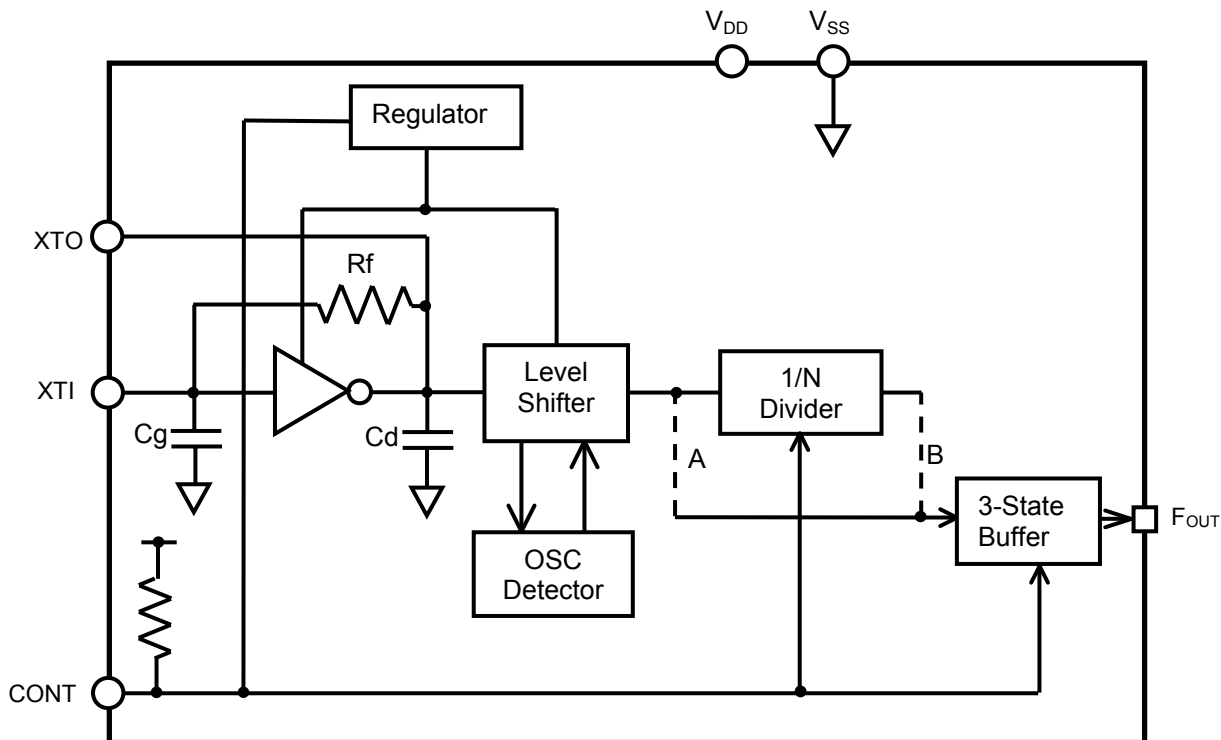Pad size: 70x70um
Die Substrate: V_{SS} level

■EXAMPLE OF PART NUMBER
1) NJU6214AW-L
     $F_{OUT}=f_0$, Wafer Thickness=140um
2) NJU6214CC-V
     $F_{OUT}= f_0/4$, Die Thickness=130um

■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, $f_0/2, f_0/4, f_0/8$ and $f_0/16$ 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	
		*E version, f_0/16=3.75MHz, C_L=15pF		0.9	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)
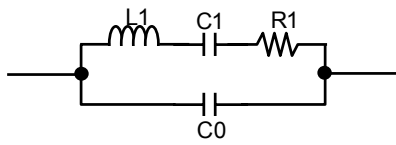* Under Development.

(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	
		*E version, f_0/16=3.75MHz, C_L=15pF		1.0	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)
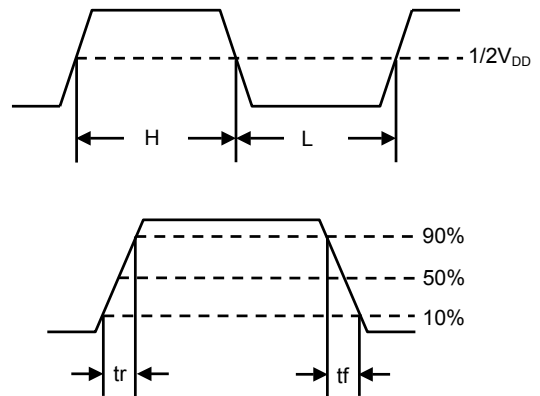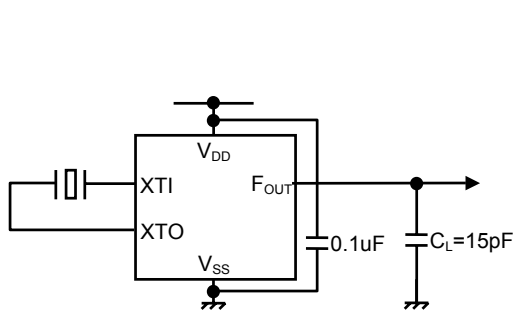* Under Development.

(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	
		*E version, f$_0$/16=3.75MHz, C$_L$=15pF		1.5	2.3	
Oscillation Stopping Current	I$_{STB}$	CONT=V$_{SS}$, No load			10	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)

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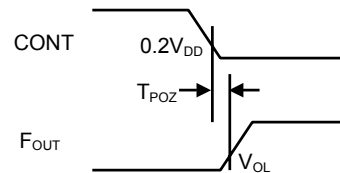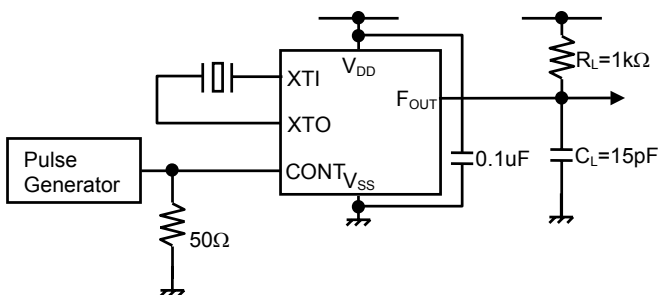■EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS

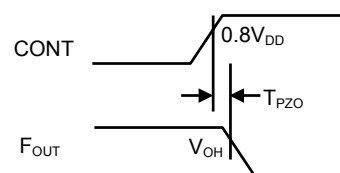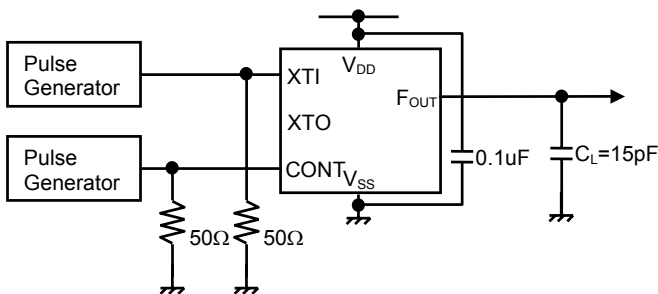| f[MHz]	R1[Ω]	L1[mH]	C1[fF]	C0[pF]
60	31.2	3.75	1.87	0.92

■MEASUREMENT CIRCUITS

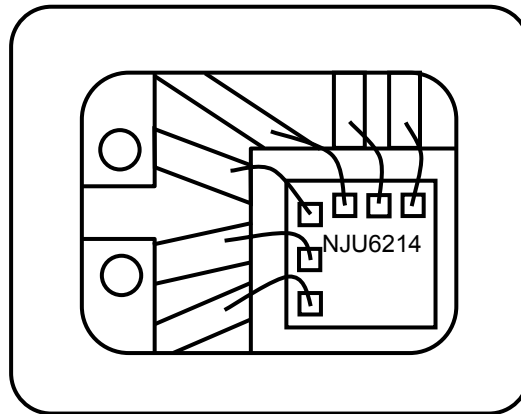(1)Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time (C_L=15pF)

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

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

■2016 SIZE OSCILLATOR IMAGE DIAGRAM