

High Frequency-Stability Fundamental Quartz Crystal Oscillator IC

■GENERAL DESCRIPTION

The NJU6314 series is a C-MOS IC for fundamental quartz crystal oscillator that consists of an oscillation amplifier, 6-stage divider and 3-state output buffer.

The operating voltage is from 2.0V to 3.6V and high frequency-stability based on most suitable oscillation circuit including Cg, Cd and Rf.

The 6-stage divider generates only one frequency selected of $f_0, f_0/2, f_0/4, f_0/8, f_0/16, f_0/32$ and $f_0/64$ 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.

■FEATURES

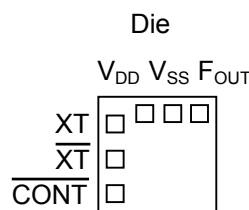
- High Frequency-Stability for Operating Voltage
- Operating Voltage 2.0 to 3.6V
- Maximum Oscillation Frequency 60MHz
- Low Operating Current
- 6-Stage Divider Maximum Divider $f_0/64$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors Cg and Cd on-Die
- Package Outline Die/Wafer
- C-MOS Technology

■PACKAGE OUTLINE



NJU6314XC-X

■PAD LOCATION



■LINE-UP TABLE

| Type No. | F _{OUT} | Internal Connect | Cg/Cd |
|----------|------------------|------------------|-------|
| NJU6314 | A | Connected A Line | 8/9pF |
| | B | Connected B Line | 8/9pF |
| | C | Connected C Line | 8/9pF |
| | D | Connected D Line | 8/9pF |
| | E | Connected E Line | 8/9pF |
| | F | Connected F Line | 8/9pF |
| | G | Connected G Line | 8/9pF |

■COORDINATES

| No | Pad Name | X | Y |
|----|-------------------|------|------|
| 1 | XT | -173 | 164 |
| 2 | \overline{XT} | -173 | 0 |
| 3 | \overline{CONT} | -173 | -164 |
| 4 | V _{DD} | -53 | 182 |
| 5 | V _{SS} | 67 | 182 |
| 6 | F _{OUT} | 187 | 182 |

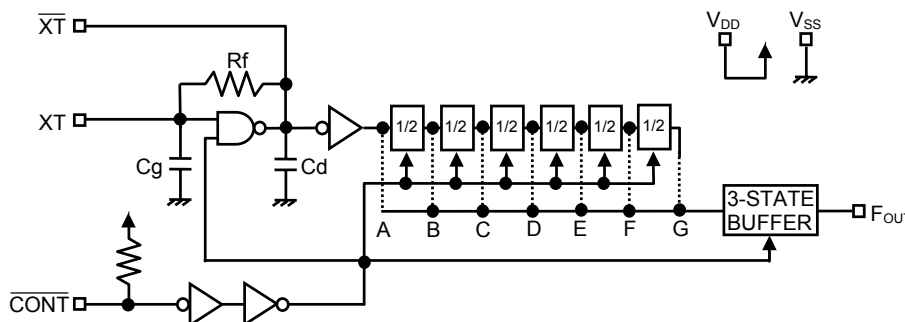
Note) Please contact us about the divider type (B to G) of 130um die and wafer.

■EXAMPLE OF PART NUMBER

- 1) NJU6314CW-L
F_{OUT}= $f_0/4$, Wafer Thickness=140um
- 2) NJU6314AC-V
F_{OUT}= f_0 , Die Thickness=130um

Starting Point: Die Center Unit[um]
 Chip Size: 0.6x0.6mm
 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_{DD} Level

■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 f ₀ /32 and f ₀ /64 Note1) |
| | L | Oscillation Stop and High impedance Output |
| XT $\overline{\text{XT}}$ | Quartz Crystal Connecting Terminals | |
| V _{SS} | V _{SS} =0V | |
| F _{OUT} | Frequency Output | |
| V _{DD} | V _{DD} =2.5V/3.3V | |

Note1) Refer to the line-up table.

■ ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|-----------------|--|------|
| Supply Voltage | V _{DD} | -0.5 to +7.0 | 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 7.0V, the input voltage must not over the V_{DD} level though 7.0V 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=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------|-----------------|------------|-----|-----|-----|------|
| Operating Voltage | V _{DD} | | 2.0 | | 3.6 | V |

(V_{DD}=2.5V, Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|--|------|-----|------|------|
| Operating Current | I _{DD} | A version, fosc=16MHz, C _L =15pF | | | 2.5 | mA |
| | | B version, fosc=16MHz, C _L =15pF | | | 2.0 | |
| | | C version, fosc=16MHz, C _L =15pF | | | 1.5 | |
| | | D version, fosc=16MHz, C _L =15pF | | | 1.5 | |
| | | E version, fosc=16MHz, C _L =15pF | | | 1.5 | |
| | | F version, fosc=16MHz, C _L =15pF | | | 1.5 | |
| | | G version, fosc=16MHz, C _L =15pF | | | 1.5 | |
| Oscillation Stopping Current | I _{STB} | CONT=V _{SS} , No load | | | 1 | uA |
| Stand-by Current | I _{st} | CONT=XT=V _{SS} , No load Note4) | | | 1 | uA |
| Input Voltage | V _{IH} | | 1.75 | | 2.5 | V |
| | V _{IL} | | 0 | | 0.75 | V |
| Output Current | I _{OH} | V _{OH} =2.25V | 5 | | | mA |
| | I _{OL} | V _{OL} =0.25V | 5 | | | mA |
| Input Current | I _{IN} | CONT=0.8V _{DD} | | 3.6 | 5.5 | uA |
| | | CONT=0.2V _{DD} | | 0.3 | 0.5 | 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} | | 60 | | | MHz |
| Output Signal Symmetry | SYM | C _L =15pF, @V _{DD} /2 | 45 | 50 | 55 | % |
| | | C _L =30pF, @V _{DD} /2 | 40 | 50 | 60 | |
| Output Signal Rise Time | tr | C _L =15pF, 10% to 90% | | 2.8 | 5.5 | ns |
| | | C _L =30pF, 10% to 90% | | 4.5 | 9 | |
| Output Signal Fall Time | tf | C _L =15pF, 90% to 10% | | 2.8 | 5.5 | ns |
| | | C _L =30pF, 90% to 10% | | 4.5 | 9 | |
| Output Disable time | t _{PLZ} | C _L =15pF, R _{UP} =10kΩ | | | 200 | ns |
| Output Enable Time | t _{PZL} | C _L =15pF, R _{UP} =10kΩ | | | 200 | ns |

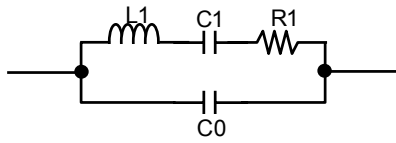
Note4) Excluding input current on CONT Terminal.

($V_{DD}=3.3V, T_a=25^{\circ}C$)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------|---|------|-----|-----------|------------|
| Operating Current | I_{DD} | A version, $f_{osc}=16MHz, C_L=15pF$ | | | 3.5 | mA |
| | | B version, $f_{osc}=16MHz, C_L=15pF$ | | | 3.0 | |
| | | C version, $f_{osc}=16MHz, C_L=15pF$ | | | 2.5 | |
| | | D version, $f_{osc}=16MHz, C_L=15pF$ | | | 2.5 | |
| | | E version, $f_{osc}=16MHz, C_L=15pF$ | | | 2.5 | |
| | | F version, $f_{osc}=16MHz, C_L=15pF$ | | | 2.5 | |
| | | G version, $f_{osc}=16MHz, C_L=15pF$ | | | 2.5 | |
| Oscillation Stopping Current | I_{STB} | CONT= V_{SS} , No load | | | 1 | μA |
| Stand-by Current | I_{st} | CONT=XT= V_{SS} , No load Note4) | | | 1 | μA |
| Input Voltage | V_{IH} | | 2.31 | | 3.3 | V |
| | V_{IL} | | 0 | | 0.99 | V |
| Output Current | I_{OH} | $V_{OH}=2.97V$ | 6 | | | mA |
| | I_{OL} | $V_{OL}=0.33V$ | 6 | | | mA |
| Input Current | I_{IN} | CONT= $0.8V_{DD}$ | | 6.5 | 10 | μA |
| | | CONT= $0.2V_{DD}$ | | 0.5 | 1 | 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 | Cg/Cd | $f_{osc}=16MHz$ | | 8/9 | | pF |
| Maximum Oscillation Frequency | F_{MAX} | | 60 | | | MHz |
| Output Signal Symmetry | SYM | $C_L=15pF, @V_{DD}/2$ | 45 | 50 | 55 | % |
| | | $C_L=30pF, @V_{DD}/2$ | 45 | 50 | 55 | |
| Output Signal Rise Time | t_r | $C_L=15pF, 10\%$ to 90% | | 2.5 | 5 | ns |
| | | $C_L=30pF, 10\%$ to 90% | | 4 | 8 | |
| Output Signal Fall Time | t_f | $C_L=15pF, 90\%$ to 10% | | 2.5 | 5 | ns |
| | | $C_L=30pF, 90\%$ to 10% | | 4 | 8 | |
| 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 |

Note4) Excluding input current on CONT Terminal.

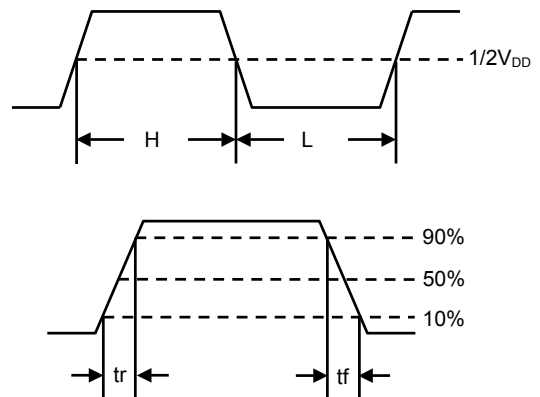
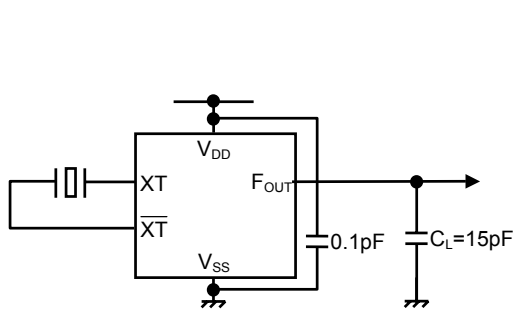
STANDARD CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS



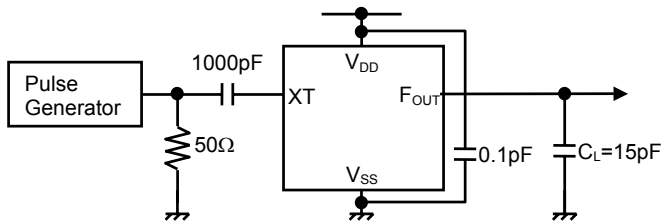
| f[MHz] | R1[Ω] | L1[mH] | C1[fF] | C0[pF] |
|--------|-------|--------|--------|--------|
| 16 | 26.9 | 4.0 | 25.0 | 11.5 |
| 59 | 15.0 | 1.6 | 4.4 | 1.7 |

MEASUREMENT CIRCUITS

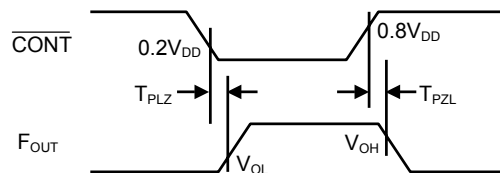
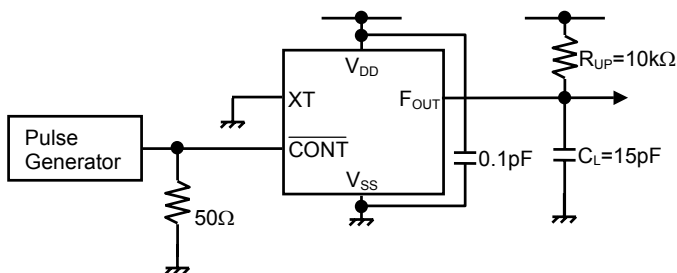
(1) Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time ($C_L=15\text{pF}$)



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



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



[CAUTION]

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