

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



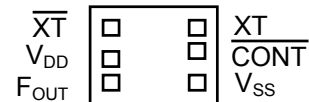
NJU6312XC-L

■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 |
| | B | $f_0/2$ | Connected B Line |
| | C | $f_0/4$ | Connected C Line |
| | D | $f_0/8$ | Connected D Line |
| | E | $f_0/16$ | Connected E Line |
| | F | $f_0/32$ | Connected F Line |

■COORDINATES

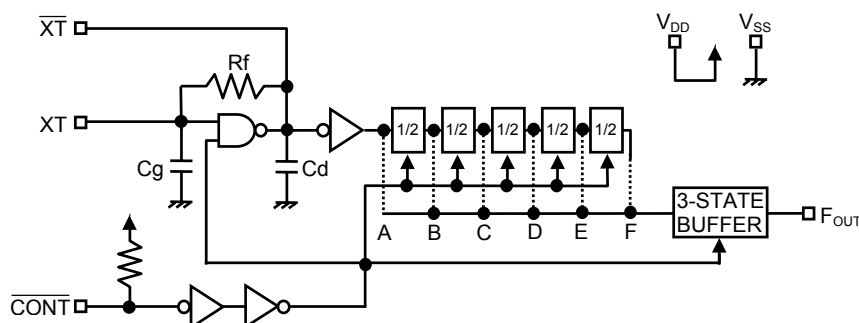
| No | Pad Name | X | Y |
|----|------------------|------|------|
| 1 | XT | -271 | 171 |
| 2 | V _{DD} | -271 | -17 |
| 3 | F _{OUT} | -271 | -171 |
| 4 | V _{SS} | 271 | -171 |
| 5 | CONT | 271 | 17 |
| 6 | XT | 271 | 171 |

■EXAMPLE OF PART NUMBER

- 1) NJU6312AW-L
F_{OUT}= f_0 , Wafer Thickness=140um
- 2) NJU6312CC-L
F_{OUT}= $f_0/4$, Die Thickness=140um

Starting Point: Die Center Unit[um]
 Die Size: 0.8x0.6mm
 Die Thickness (C-L): 140±10um
 Wafer Thickness (W-L): 140±10um
 Pad size: 90x90um
 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 and f ₀ /32 (Note1) |
| | L Oscillation Stop and High impedance Output |
| XT XT | Quartz Crystal Connecting Terminals |
| 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 |

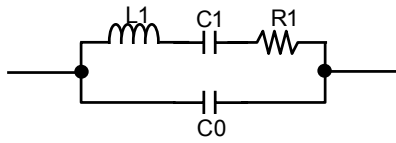
Note4) Excluding input current on CONT Terminal.

($V_{DD}=1.5V$, $T_a=-40$ 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 | Cg/Cd | $f_{osc}=16MHz$ | | 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.

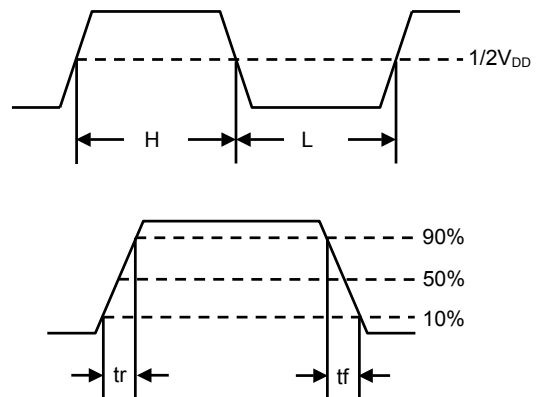
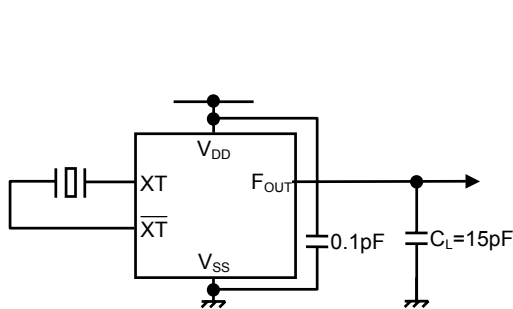
STANDARD CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS



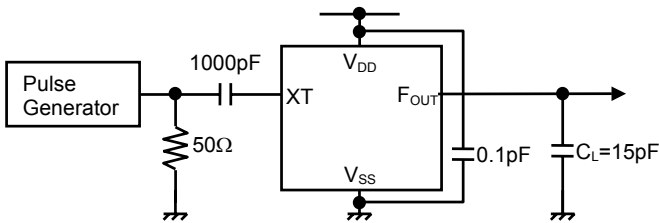
| f[MHz] | R1[Ω] | L1[mH] | C1[fF] | C0[pF] |
|--------|-------|--------|--------|--------|
| 16 | 26.91 | 3.95 | 25.03 | 11.45 |
| 80 | 11.99 | 1.06 | 3.74 | 1.88 |

MEASUREMENT CIRCUITS

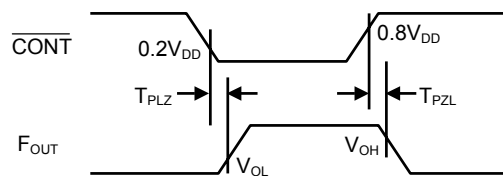
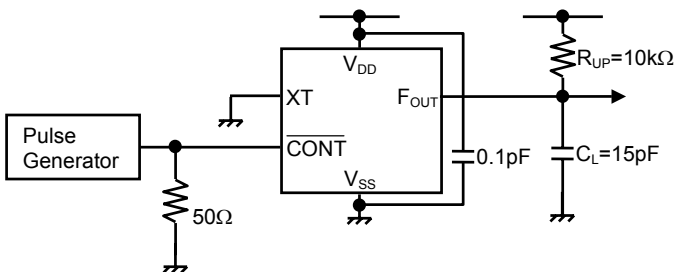
(1) Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time ($C_L=15\text{pF}$)



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



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





[CAUTION]

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