

Low Operating Current Fundamental Quartz Crystal Oscillator

■GENERAL DESCRIPTION

The NJU6363 series is a C-MOS fundamental quartz crystal oscillator that consists of an oscillation amplifier, 3-stage divider and 3-state output buffer.

The 3-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.

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

■PACKAGE OUTLINE

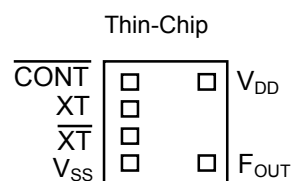


NJU6363XC-D

■FEATURES

- Low Operating Current 1mA @1.8V
- Operating Voltage 1.5 to 3.6V
- Maximum Oscillation Frequency 40MHz @1.5V
- High Fan-out $I_{OH}/I_{OL}=1mA @1.8V$
- 3-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
- Package Outline Thin-Chip
- C-MOS Technology

■PAD LOCATION



■LINE-UP TABLE

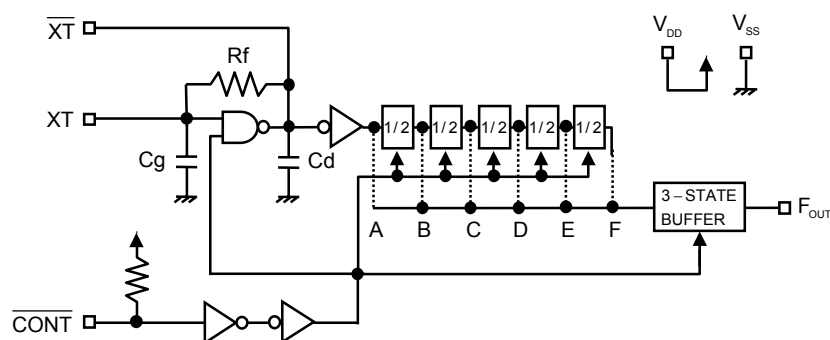
| Type No. | F_{OUT} | Internal Connect | C_g/C_d |
|----------|------------|------------------|-----------|
| NJU6363 | A f_0 | Connected A Line | 8/9 |
| | B $f_0/2$ | Connected B Line | 8/9 |
| | C $f_0/4$ | Connected C Line | 8/9 |
| | D $f_0/8$ | Connected D Line | 8/9 |
| | E $f_0/16$ | Connected E Line | 8/9 |
| | F $f_0/32$ | Connected F Line | 8/9 |

■COORDINATES

| No | Pad Name | X | Y |
|----|-------------------|------|------|
| 1 | \overline{CONT} | -178 | 231 |
| 2 | XT | -178 | 77 |
| 3 | \overline{XT} | -178 | -77 |
| 4 | V_{SS} | -178 | -231 |
| 5 | F_{OUT} | 206 | -231 |
| 6 | V_{DD} | 206 | 231 |

Starting Point: Chip Center Unit[um]
 Chip Size: 0.7x0.75mm
 Thin-Chip Thickness(-D): 200±20um
 Pad Size: 90x90um

■BLOCK DIAGRAM



■TERMINAL DESCRIPTION

| SYMBOL | FUNCTION | |
|--------------------------|---|--|
| $\overline{\text{CONT}}$ | Oscillation and 3-state Output Buffer Control | |
| | $\overline{\text{CONT}}$ | 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} | $V_{\text{SS}}=0\text{V}$ | |
| F_{OUT} | Frequency Output | |
| V_{DD} | $V_{\text{DD}}=1.8/2.5\text{V}/3.3\text{V}$ | |

Note1) Refer to the line-up table.

■ABSOLUTE MAXIMUM RATINGS

($T_a=25^\circ\text{C}$)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|------------------|--|------------------|
| Supply Voltage | V_{DD} | -0.5 to +7.0 | V |
| Input Voltage | V_{IN} | $V_{\text{SS}}-0.5$ to $V_{\text{DD}}+0.5$ | V |
| Output Voltage | V_{O} | -0.5 to $V_{\text{DD}}+0.5$ | V |
| Input Current | I_{IN} | ± 10 | mA |
| Output Current | I_{O} | ± 25 | mA |
| Operating Temperature Range | T_{opr} | -40 to +85 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +125 | $^\circ\text{C}$ |

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} | | 1.5 | | 3.6 | V |

(V_{DD}=1.8V, Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|---|------|-----|------|------|
| Operating Current | I _{DD} | A version, fosc=16MHz, C _L =5pF | | | 1 | mA |
| | | B version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | C version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | D version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | E version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | F version, fosc=16MHz, C _L =5pF | | | 1 | |
| Oscillation Stopping Current | I _{STB} | $\overline{\text{CONT}} = V_{SS}$, No load | | 1 | 3 | uA |
| Stand-by Current | I _{st} | $\overline{\text{CONT}} = \text{XT} = V_{SS}$, No load Note4) | | | 1 | uA |
| Input Voltage | V _{IH} | | 1.26 | | 1.8 | V |
| | V _{IL} | | 0 | | 0.54 | V |
| Output Current | I _{OH} | VOH=1.62V | 1.2 | | | mA |
| | I _{OL} | VOL=0.18V | 1.2 | | | mA |
| Input Current | I _{IN} | $\overline{\text{CONT}} = 0.8V_{DD}$ | | 3.0 | 4.5 | uA |
| | | $\overline{\text{CONT}} = 0.2V_{DD}$ | | 0.5 | 0.7 | uA |
| 3-state Off Leakage Current | I _{OZ} | $\overline{\text{CONT}} = V_{SS}$, 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} | | 40 | | | MHz |
| Output Signal Symmetry | SYM | C _L =5pF, @V _{DD} /2 | 45 | 50 | 55 | % |
| Output Signal Rise Time | t _r | C _L =5pF, 10% to 90% | | 5 | 10 | ns |
| Output Signal Fall Time | t _f | C _L =5pF, 90% to 10% | | 5 | 10 | ns |
| Output Disable time | T _{PLZ} | C _L =5pF, R _{Up} =10kΩ | | | 250 | ns |
| Output Enable Time | T _{PZL} | C _L =5pF, R _{Up} =10kΩ | | | 250 | ns |

Note4) Excluding input current on $\overline{\text{CONT}}$ Terminal.

(V_{DD}=2.5V, Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|--|------|-----|------|------|
| Operating Current | I _{DD} | A version, fosc=16MHz, C _L =5pF | | | 2 | mA |
| | | B version, fosc=16MHz, C _L =5pF | | | 1.5 | |
| | | C version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | D version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | E version, fosc=16MHz, C _L =5pF | | | 1 | |
| | | F version, fosc=16MHz, C _L =5pF | | | 1 | |
| Oscillation Stopping Current | I _{STB} | CONT = V _{SS} , No load | | 2 | 5 | 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} | VOH=2.25V | 3 | | | mA |
| | I _{OL} | VOL=0.25V | 3 | | | mA |
| Input Current | I _{IN} | CONT = 0.8V _{DD} | | 7.5 | 12.0 | uA |
| | | CONT = 0.2V _{DD} | | 1.2 | 2.0 | 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} | | 40 | | | MHz |
| Output Signal Symmetry | SYM | C _L =5pF, @V _{DD} /2 | 45 | 50 | 55 | % |
| Output Signal Rise Time | t _r | C _L =5pF, 10% to 90% | | 4 | 8 | ns |
| Output Signal Fall Time | t _f | C _L =5pF, 90% to 10% | | 4 | 8 | ns |
| Output Disable time | T _{PLZ} | C _L =5pF, R _{UP} =10kΩ | | | 200 | ns |
| Output Enable Time | T _{PZL} | C _L =5pF, R _{UP} =10kΩ | | | 200 | ns |

Note4) Excluding input current on CONT Terminal.

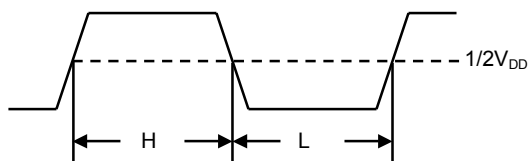
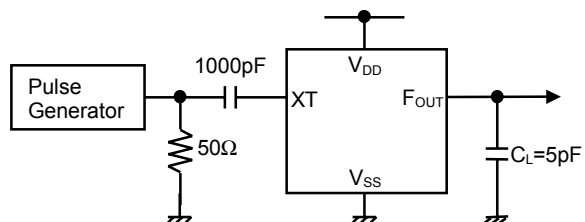
(V_{DD}=3.3V, T_a=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|---|------|------|------|------|
| Operating Current | I _{DD} | A version, fosc=16MHz, C _L =5pF | | | 2.5 | mA |
| | | B version, fosc=16MHz, C _L =5pF | | | 2 | |
| | | C version, fosc=16MHz, C _L =5pF | | | 1.5 | |
| | | D version, fosc=16MHz, C _L =5pF | | | 1.5 | |
| | | E version, fosc=16MHz, C _L =5pF | | | 1.5 | |
| | | F version, fosc=16MHz, C _L =5pF | | | 1.5 | |
| Oscillation Stopping Current | I _{STB} | $\overline{\text{CONT}} = V_{SS}$, No load | | 2 | 5 | uA |
| Stand-by Current | I _{st} | $\overline{\text{CONT}} = \text{XT} = V_{SS}$, No load Note4) | | | 1 | uA |
| Input Voltage | V _{IH} | | 2.31 | | 3.3 | V |
| | V _{IL} | | 0 | | 0.99 | V |
| Output Current | I _{OH} | VOH=2.97V | 5 | | | mA |
| | I _{OL} | VOL=0.33V | 5 | | | mA |
| Input Current | I _{IN} | $\overline{\text{CONT}} = 0.8V_{DD}$ | | 10.0 | 15.0 | uA |
| | | $\overline{\text{CONT}} = 0.2V_{DD}$ | | 1.8 | 3.0 | uA |
| 3-state Off Leakage Current | I _{OZ} | $\overline{\text{CONT}} = V_{SS}$, 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 =5pF, @V _{DD} /2 | 45 | 50 | 55 | % |
| Output Signal Rise Time | t _r | C _L =5pF, 10% to 90% | | 3 | 6 | ns |
| Output Signal Fall Time | t _f | C _L =5pF, 90% to 10% | | 3 | 6 | ns |
| Output Disable time | T _{PLZ} | C _L =5pF, R _{UP} =10kΩ | | | 150 | ns |
| Output Enable Time | T _{PZL} | C _L =5pF, R _{UP} =10kΩ | | | 150 | ns |

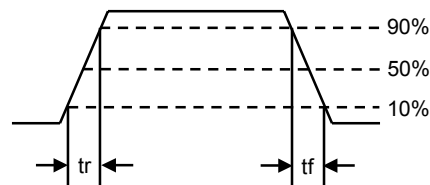
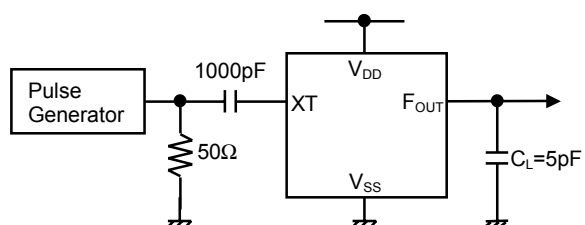
Note4) Excluding input current on $\overline{\text{CONT}}$ Terminal.

MEASUREMENT CIRCUITS

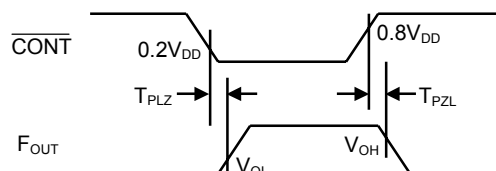
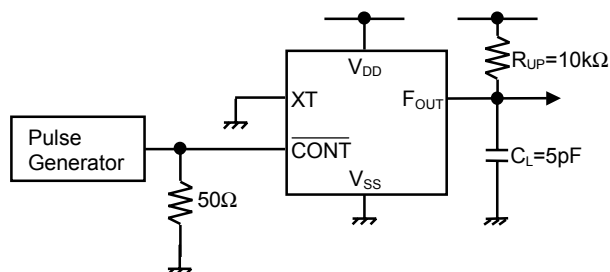
(1) Output Signal Symmetry ($C_L=5\text{pF}$)



(2) Output Signal Rise/Fall Time ($C_L=5\text{pF}$)



(3) Output Disable/Enable Time ($C_L=5\text{pF}$, $R_{UP}=10\text{k}\Omega$)



[CAUTION]

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