

High Drive Fundamental Quartz Crystal Oscillator

GENERAL DESCRIPTION

The NJU6368 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 $f_0, f_0/2, f_0/4$ and $f_0/8$ 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 and can drive 50pF(@5V) C-MOS load.

Furthermore, the package is small-sized SOT-23-6-1.

PACKAGE OUTLINE

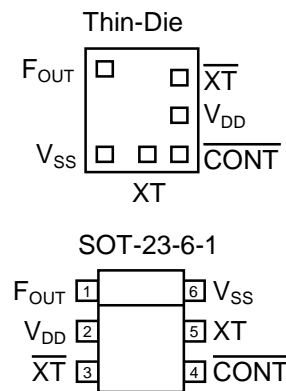


NJU6368XC-C NJU6368XF1

FEATURES

- Operating Voltage 2.7 to 5.5V
- Maximum Oscillation Frequency 50MHz
- Low Operating Current
- High Fan-out $I_{OH}/I_{OL}=8mA@3.3V$
 $I_{OH}/I_{OL}=16mA@5.0V$
- 3-Stage Divider Maximum Divider $f_0/8$
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors C_g and C_d on-Die
- Package Outline Thin-Die/SOT-23-6-1
- C-MOS Technology

PAD LOCATION



LINE-UP TABLE

| Type No. | F _{OUT} | Internal Connect | C _g /C _d | |
|----------|------------------|------------------|--------------------------------|---------|
| NJU6368 | A | f_0 | Connected A Line | 15/15pF |
| | B | $f_0/2$ | Connected B Line | 15/15pF |
| | C | $f_0/4$ | Connected C Line | 15/15pF |
| | D | $f_0/8$ | Connected D Line | 15/15pF |
| | P | f_0 | Connected A Line | Non |

COORDINATES

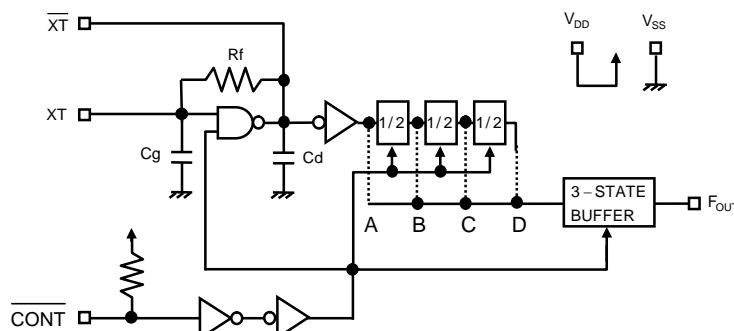
| No | Pad Name | X | Y |
|----|--------------------------|------|------|
| 1 | F _{OUT} | -207 | 247 |
| 2 | V _{SS} | -207 | -247 |
| 3 | XT | 33 | -247 |
| 4 | $\overline{\text{CONT}}$ | 207 | -247 |
| 5 | V _{DD} | 207 | -17 |
| 8 | $\overline{\text{XT}}$ | 207 | 172 |

EXAMPLE OF PART NUMBER

- 1) NJU6368AC-C
F_{OUT}= f_0 , Die Thickness=260um
- 2) NJU6368CF1
F_{OUT}= $f_0/4$, Mold package, SOT-23-6-1

Starting Point: Die Center Unit[um]
 Die Size: 0.67x0.75mm
 Thin-Die Thickness: 260±20um
 Pad Size: 90x90um
 Die Substrate: V_{DD} Level

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 , $f_0/2$, $f_0/4$ and $f_0/8$ (Note1) |
| | L | Oscillation Stop and High impedance Output |
| $\overline{\text{XT}}$ | Quartz Crystal Connecting Terminals | |
| $\overline{\text{XT}}$ | | |
| V_{SS} | $V_{\text{SS}}=0\text{V}$ | |
| F_{OUT} | Frequency Output | |
| V_{DD} | $V_{\text{DD}}=3.3\text{V}/5.0\text{V}$ | |

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 |
| Power Dissipation (Note 4) | P_{D} | 200(SOT-23-6-1) | mW |
| 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.

Note4) Power Dissipation is the maximum value of a package simple substance.

ELECTRICAL CHARACTERISTICS

(Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------|-----------------|------------|-----|-----|-----|------|
| Operating Voltage | V _{DD} | | 2.7 | | 5.5 | V |

(V_{DD}=3.3V, Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|---|------|-------|------|------|
| Operating Current | I _{DD} | A version, fosc=16MHz, C _L =30pF | | | 8 | mA |
| | | B version, fosc=16MHz, C _L =30pF | | | 6 | |
| | | C version, fosc=16MHz, C _L =30pF | | | 4 | |
| | | D version, fosc=16MHz, C _L =30pF | | | 3 | |
| | | P version, fosc=16MHz, C _L =30pF Note5) | | | 8 | |
| 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 Note6) | | | 1 | uA |
| Input Voltage | V _{IH} | | 2.31 | | 3.3 | V |
| | V _{IL} | | 0 | | 0.99 | V |
| Output Current | I _{OH} | V _{OH} =2.97V | 8 | | | mA |
| | I _{OL} | V _{OL} =0.33V | 8 | | | 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, A/B/C/D version | | 15/15 | | pF |
| | | P version | | - | | |
| Maximum Oscillation Frequency | F _{MAX} | | 50 | | | 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 | tr | C _L =15pF, 10% to 90% | | 2 | 4 | ns |
| | | C _L =30pF, 10% to 90% | | 4 | 8 | |
| Output Signal Fall Time | tf | C _L =15pF, 90% to 10% | | 2 | 4 | ns |
| | | C _L =30pF, 90% to 10% | | 4 | 8 | |
| Output Disable time | t _{PLZ} | C _L =15pF, R _{UP} =10kΩ | | | 150 | ns |
| Output Enable Time | t _{PZL} | C _L =15pF, R _{UP} =10kΩ | | | 150 | ns |

Note5) P version is measured with external capacitors contained 13pF for C_g and 13pF for C_d.

Note6) Excluding input current on $\overline{\text{CONT}}$ Terminal.

($V_{DD}=5.0V, T_a=25^{\circ}C$)

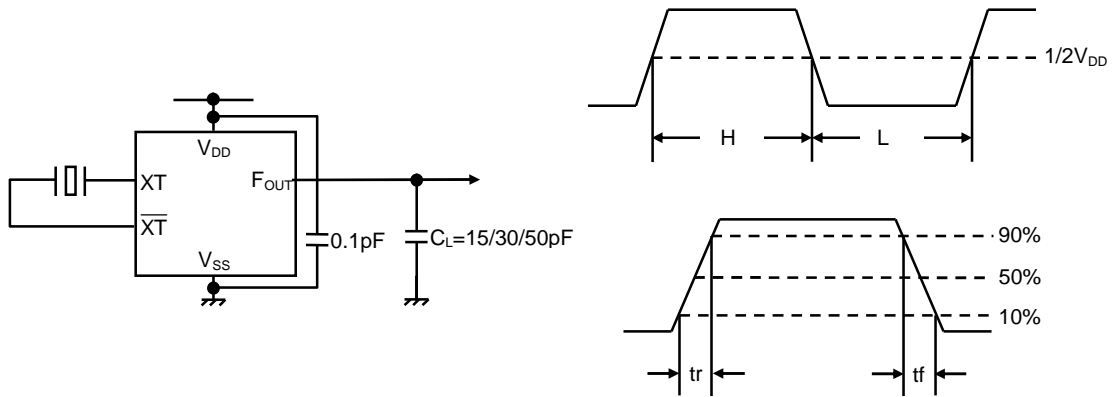
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|-----------|---|-----|-------|-----------|------------|
| Operating Current | I_{DD} | A version, $f_{osc}=16MHz, C_L=50pF$ | | | 15 | mA |
| | | B version, $f_{osc}=16MHz, C_L=50pF$ | | | 11 | |
| | | C version, $f_{osc}=16MHz, C_L=50pF$ | | | 9 | |
| | | D version, $f_{osc}=16MHz, C_L=50pF$ | | | 7 | |
| | | P version, $f_{osc}=16MHz, C_L=50pF$ Note5) | | | 15 | |
| Oscillation Stopping Current | I_{STB} | $\overline{CONT} = V_{SS}$, No load | | 5 | 10 | uA |
| Stand-by Current | I_{st} | $\overline{CONT} = XT = V_{SS}$, No load Note6) | | | 1 | uA |
| Input Voltage | V_{IH} | | 3.5 | | 5.0 | V |
| | V_{IL} | | 0 | | 1.5 | V |
| Output Current | I_{OH} | $V_{OH}=4.5V$ | 16 | | | mA |
| | I_{OL} | $V_{OL}=0.5V$ | 16 | | | mA |
| Input Current | I_{IN} | $\overline{CONT} = 0.8V_{DD}$ | | 27.0 | 40.0 | uA |
| | | $\overline{CONT} = 0.2V_{DD}$ | | 5.5 | 8.0 | uA |
| 3-state Off Leakage Current | I_{OZ} | $\overline{CONT} = V_{SS}$, $F_{OUT} = V_{DD}$ or V_{SS} | | | ± 0.1 | uA |
| Feedback Resistance | R_f | | | 255 | | k Ω |
| Internal Capacitor | C_g/C_d | $f_{osc}=16MHz$, A/B/C/D version | | 15/15 | | pF |
| | | P version | | - | | |
| Maximum Oscillation Frequency | F_{MAX} | | 50 | | | MHz |
| Output Signal Symmetry | SYM | $C_L=15pF$, @ $V_{DD}/2$ | 45 | 50 | 55 | % |
| | | $C_L=50pF$, @ $V_{DD}/2$ | 45 | 50 | 55 | |
| Output Signal Rise Time | t_r | $C_L=15pF$, 10% to 90% | | 2 | 4 | ns |
| | | $C_L=50pF$, 10% to 90% | | 4 | 8 | |
| Output Signal Fall Time | t_f | $C_L=15pF$, 90% to 10% | | 2 | 4 | ns |
| | | $C_L=50pF$, 90% to 10% | | 4 | 8 | |
| Output Disable time | t_{PLZ} | $C_L=15pF, R_{UP}=10k\Omega$ | | | 100 | ns |
| Output Enable Time | t_{PZL} | $C_L=15pF, R_{UP}=10k\Omega$ | | | 100 | ns |

Note5) P version is measured with external capacitors contained 13pF for C_g and 13pF for C_d .

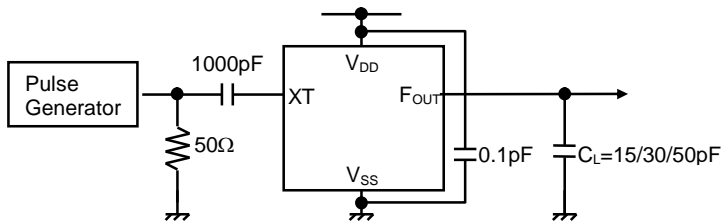
Note6) Excluding input current on \overline{CONT} Terminal.

MEASUREMENT CIRCUITS

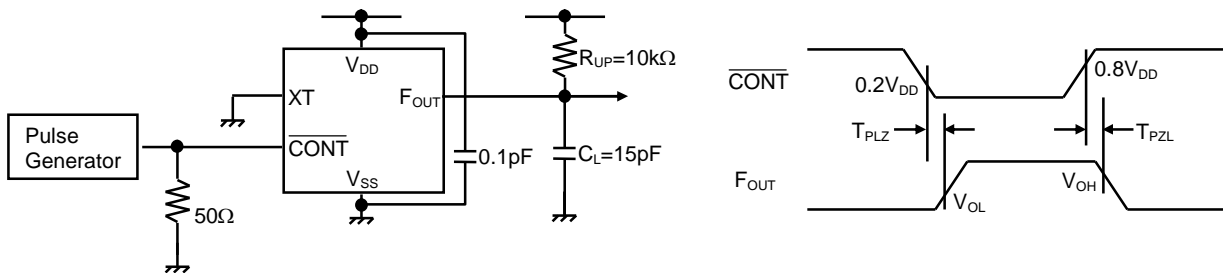
(1) Operating Current, Output Signal Symmetry, Output Signal Rise/Fall Time



(2) Check of Operation



(3) Output Disable/Enable Time



[CAUTION]
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