

1.8V 125MHz 3rd Over Tone Quartz Crystal Oscillator

■GENERAL DESCRIPTION

The NJU6394 series is a C-MOS, 1.8V, 125MHz, 3rd overtone quartz crystal oscillator that consists of an oscillation amplifier (low oscillation-stop current based on NAND circuit) and 3-state output buffer (C-MOS compatible, 15pF load).

The operating voltage is from 1.6V to 3.0V, and frequency range is from 75MHz to 125MHz divided by 3 version, A-type: 75MHz to 90MHz, B-type: 90MHz to 105MHz, C-type: 105MHz to 125MHz.

The oscillation amplifier realizes very low oscillation stop current with NAND circuit.

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

■PACKAGE OUTLINE

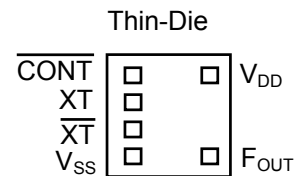


NJU6394XC-X

■FEATURES

- Operating Voltage 1.6 to 3.0V
- Maximum Oscillation Frequency (See Line-up Table)
- Oscillation Stop and Output Stand-by Function
- 3-State Output Buffer
- Oscillation Capacitors C_g and C_d on-Die
- Package Outline Thin-Die/Wafer
- C-MOS Technology

■PAD LOCATION



■LINE-UP TABLE

| Type No. | Recommended Oscillation Frequency | Output Frequency | R _f | C _g /C _d |
|----------|-----------------------------------|------------------|----------------|--------------------------------|
| NJU6394 | A 75 to 90MHz | f ₀ | 2.2 kΩ | 8/12pF |
| | B 90 to 105MHz | | | 7/10pF |
| | C 105 to 125MHz | | | 6/7pF |

■COORDINATES

| No | Pad Name | X | Y |
|----|------------------|------|------|
| 1 | CONT | -178 | 231 |
| 2 | XT | -178 | 77 |
| 3 | XT | -178 | -77 |
| 4 | V _{SS} | -178 | -231 |
| 5 | F _{OUT} | 206 | -231 |
| 6 | V _{DD} | 206 | 231 |

Starting Point: Die Center Unit[μm]

Die Size: 0.7x0.75mm

Thin-Die Thickness(C-D): 200±20μm

Thin-Die Thickness(C-L): 140±10μm

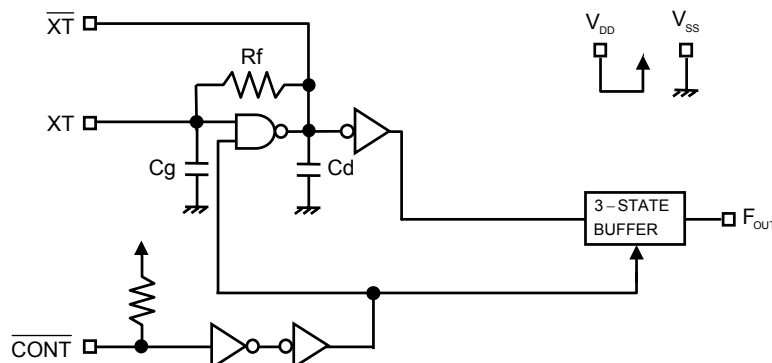
Wafer Thickness(W-H): 200±20μm

Wafer Thickness(W-L): 140±10μm

Pad Size: 90x90μm

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 frequency f_0 |
| | 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} | $V_{\text{DD}}=1.8\text{V}$ | |

■ 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 | $^\circ\text{C}$ |

Note1) 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.

Note2) Decoupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

■ELECTRICAL CHARACTERISTICS

(Ta=25°C)

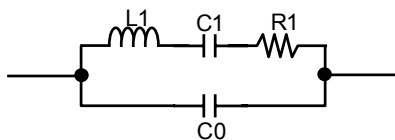
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------|-----------------|------------|-----|-----|-----|------|
| Operating Voltage | V _{DD} | | 1.6 | | 3.0 | V |

(V_{DD}=1.8V, Ta=25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|-------------------------------|--------------------------------|--|------|------|------|------|
| Operating Current | I _{DD1} | A type, fosc=90MHz, C _L =15pF | | 6 | 10 | mA |
| | | B type, fosc=105MHz, C _L =15pF | | 7 | 12 | |
| | | C type, fosc=125MHz, C _L =15pF | | 8 | 12 | |
| Oscillation Stopping Current | I _{DD2} | CONT=V _{SS} , No load | | 2 | 6 | uA |
| Stand-by Current | I _{st} | CONT=XT=V _{SS} , No load Note3) | | | 2 | uA |
| Input Voltage | V _{IH} | | 1.26 | | 1.8 | V |
| | V _{IL} | | 0 | | 0.54 | V |
| Output Current | I _{OH} | V _{OH} =1.62V | 2 | | | mA |
| | I _{OL} | V _{OL} =0.18V | 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} | | | ±0.2 | uA |
| Feedback Resistance | R _f | A type | | 2.2 | | kΩ |
| Internal Capacitor | C _g /C _d | A type, fosc=90MHz | | 8/12 | | pF |
| | | B type, fosc=105MHz | | 7/10 | | |
| | | C type, fosc=125MHz | | 6/7 | | |
| Maximum Oscillation Frequency | F _{MAX} | A type | 90 | | | MHz |
| | | B type | 105 | | | |
| | | C type | 125 | | | |
| 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% | | 2.2 | 3 | ns |
| Output Signal Fall Time | t _f | C _L =15pF, 90% to 10% | | 2.2 | 3 | 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 |

Note3) Excluding input current on CONT Terminal.

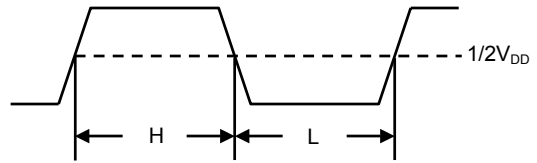
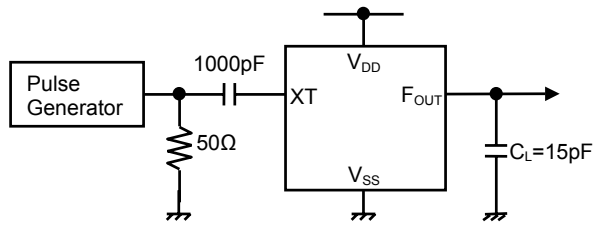
■STANDARD CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS



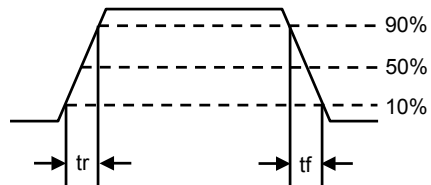
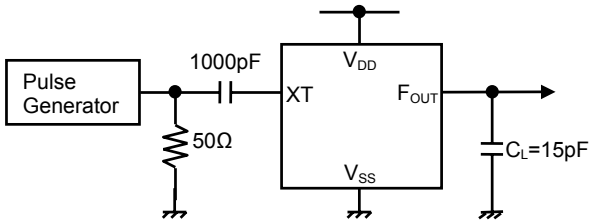
| f[MHz] | R1[Ω] | L1[mH] | C1[fF] | C0[pF] |
|--------|-------|--------|--------|--------|
| 90 | 27.6 | 3.12 | 1.00 | 3.29 |
| 105 | 17.1 | 1.99 | 1.16 | 3.27 |
| 125 | 14.9 | 1.20 | 1.36 | 4.83 |

MEASUREMENT CIRCUITS

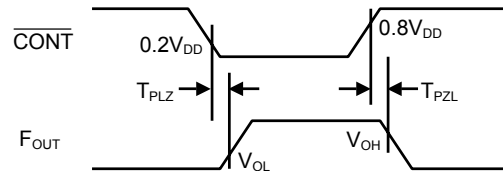
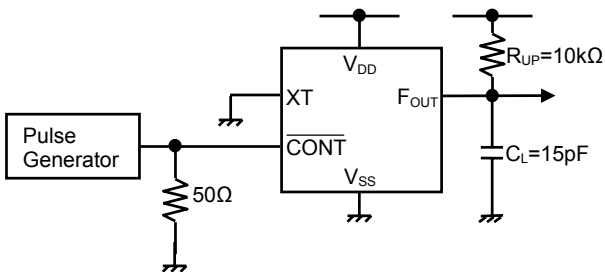
(1) Output Signal Symmetry ($C_L=15\text{pF}$)



(2) Output Signal Rise/Fall Time ($C_L=15\text{pF}$)



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



[CAUTION]
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