



## QUARTZ CRYSTAL OSCILLATOR

### ■ GENERAL DESCRIPTION

The NJU6391 series is a 3V operation C-MOS quartz crystal oscillator which consists of an oscillation amplifier and a 3-state output buffer.

This series are classed into three versions A, B and C according to their oscillation frequency range mentioned in the line-up table.

The oscillation amplifier incorporates feed-back resistance and oscillation capacitors( $C_g$ ,  $C_d$ ), therefore, it requires no external component except quartz crystal.

Driverbility of the 3-state output buffer is 8mA (sink/source), thus it can drive C-MOS load.

### ■ PACKAGE OUTLINE



NJU6391XC



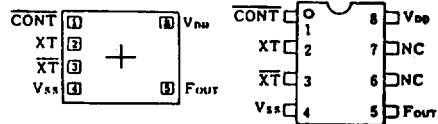
NJU6391XE

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### ■ FEATURES

- Low Operating Voltage. -- 2.4~3.6V
- Maximum Oscillation Frequency (See Line-Up Table)
- Low Operating Current
- High Fan-out --  $I_{OL}/I_{OH}=8mA$
- 3-state Output Buffer
- Oscillation Capacitors  $C_g$  and  $C_d$  on-chip
- NAND Type Oscillation Amplifier ( not Inverter )
- Oscillation Stand-by Function  
( Non Pull-up Resistance )
- Package Outline -- CHIP / EMP 8
- C-MOS Technology

### ■ PAD LOCATION/PIN CONFIGURATION



### ■ LINE-UP TABLE

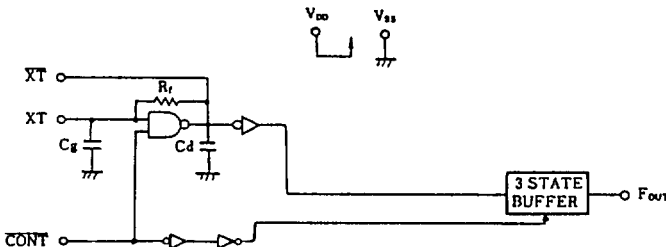
| Type No. | Recommended Osc. Freq. | Output Freq. | $C_g/C_d$ |
|----------|------------------------|--------------|-----------|
| NJU6391A | 20~35MHz               | $f_o$        | 27pF      |
| 6391B    | 35~50MHz               |              | 19pF      |
| 6391C    | 45~75MHz               |              | 12/14pF   |

### ■ COORDINATES

 Unit:  $\mu m$ 

| No. | PAD  | X    | Y    |
|-----|------|------|------|
| 1   | CONT | -408 | 248  |
| 2   | XT   | -408 | 81   |
| 3   | XT   | -408 | -86  |
| 4   | VSS  | -408 | -248 |
| 5   | FOUT | 464  | -248 |
| 8   | VDD  | 464  | 248  |

### ■ BLOCK DIAGRAM



Chip Size : 1.29 X 0.8mm  
 Chip Center :  $X=0\mu m, Y=0\mu m$   
 Chip Thickness :  $400\mu m \pm 30\mu m$   
 (Note) No.6 and 7 terminals are only for package type information. There are no PAD on the chip.


**■ TERMINAL DESCRIPTION**

| NO. | SYMBOL                   | F U N C T I O N                                      |
|-----|--------------------------|--|
| 1   | $\overline{\text{CONT}}$ | 3-State Output Control                               |
|     |                          | $\overline{\text{CONT}}$ Output ( $F_{\text{OUT}}$ ) |
|     |                          | H Output Frequency $f_0$                             |
|     |                          | L Output High Impedance                              |
| 2   | XT                       | Quartz Crystal Connecting Terminals                  |
| 3   | XT                       |  |
| 4   | $V_{\text{SS}}$          | GND  |
| 5   | $F_{\text{OUT}}$         | Output frequency $f_0$                               |
| 8   | $V_{\text{DD}}$          | + 3V   |

(Note) It isn't the pull-up resistance on  $\overline{\text{CONT}}$  terminal.

**■ ABSOLUTE MAXIMUM RATINGS**

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

| P A R A M E T E R           | SYMBOL           | R A T I N G S                              | UNIT             |
|-----------------------------|------------------|--|------------------|
| Supply Voltage              | $V_{\text{DD}}$  | -0.5 ~ +7.0                                | V                |
| Input Voltage               | $V_{\text{IN}}$  | $V_{\text{SS}}-0.5 \sim V_{\text{DD}}+0.5$ | V                |
| Output Voltage              | $V_0$            | -0.5 ~ $V_{\text{DD}}+0.5$                 | V                |
| Input Current               | $I_{\text{IN}}$  | $\pm 10$                                   | mA               |
| Output Current              | $I_0$            | $\pm 25$                                   | mA               |
| Power Dissipation           | $P_D$            | 200 (EMP)                                  | mW               |
| Operating Temperature Range | $T_{\text{opr}}$ | -40 ~ +85                                  | $^\circ\text{C}$ |
| Storage Temperature Range   | $T_{\text{stg}}$ | -55 ~ +125                                 | $^\circ\text{C}$ |

**■ ELECTRICAL CHARACTERISTICS**

 (  $T_a=25^\circ\text{C}$ ,  $V_{\text{DD}}=3\text{V}$  )

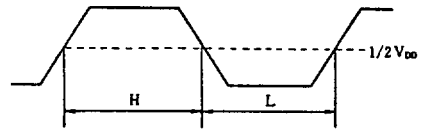
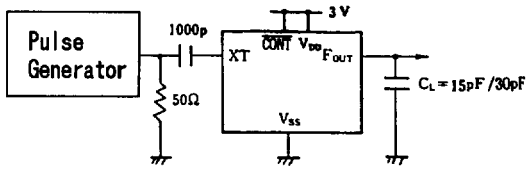
| P A R A M E T E R        | SYMBOL           | C O N D I T I O N S  | MIN | TYP   | MAX       | UNIT          |
|--------------------------|------------------|--|-----|-------|-----------|---------------|
| Operating Voltage        | $V_{\text{DD}}$  |  | 2.4 |       | 3.6       | V             |
| Operating Current        | $I_{\text{DD1}}$ | A Version $f_{\text{osc}}=24\text{MHz}$ , No Load  |     | 6     | 15        | mA            |
|                          | $I_{\text{DD2}}$ | B Version $f_{\text{osc}}=48\text{MHz}$ , No Load  |     | 9     | 20        |               |
|                          | $I_{\text{DD3}}$ | C Version $f_{\text{osc}}=48\text{MHz}$ , No Load  |     | 9     | 25        |               |
| Stand-by Current         | $I_{\text{st}}$  | $\overline{\text{CONT}}, \text{XT}=V_{\text{SS}}$ , No Load (Note)                         |     |       | 1         | $\mu\text{A}$ |
| Input Voltage            | $V_{\text{IH}}$  |  | 2.4 |       | 3.0       | V             |
|                          | $V_{\text{IL}}$  |  | 0   |       | 0.6       |               |
| Output Current           | $I_{\text{OH}}$  | $V_{\text{DD}}=5\text{V}$ , $V_{\text{OH}}=4.5\text{V}$                                    | 8   |       |           | mA            |
|                          | $I_{\text{OL}}$  | $V_{\text{DD}}=5\text{V}$ , $V_{\text{OL}}=0.5\text{V}$                                    | 8   |       |           |               |
| Input Current            | $I_{\text{IN}}$  | $\overline{\text{CONT}}$ Terminal, $\overline{\text{CONT}}=V_{\text{SS}}$                  |     |       | 1         | $\mu\text{A}$ |
| 3-St Off-leakage Current | $I_{\text{oz}}$  | $\overline{\text{CONT}}=V_{\text{SS}}$ , $F_{\text{OUT}}=V_{\text{SS}}$ or $V_{\text{DD}}$ |     |       | $\pm 0.1$ | $\mu\text{A}$ |
| Internal Capacitor       | $C_g/\text{Cd}$  | A Version  |     | 27    |           | pF            |
|                          |                  | B Version  |     | 19    |           |               |
|                          |                  | C Version  |     | 12/14 |           |               |
| Max. Oscillation Freq.   | $f_{\text{MAX}}$ | A Version  | 35  |       |           | MHz           |
|                          |                  | B Version  | 50  |       |           |               |
|                          |                  | C Version  | 75  |       |           |               |
| Output Signal Symmetry   | SYM              | $C_L=15\text{pF}$ at 1.5V  | 45  | 50    | 55        | %             |
|                          |                  | $C_L=30\text{pF}$ at 1.5V  |     |       |           |               |
| Output Signal Rise Time  | $t_{r1}$         | $C_L=15\text{pF}$ , 10~90%   |     | 2     | 4         | ns            |
|                          | $t_{r2}$         | $C_L=30\text{pF}$ , 10~90%   |     |       | 6         |               |
| Output Signal Fall Time  | $t_{f1}$         | $C_L=15\text{pF}$ , 90~10%   |     | 2     | 4         | ns            |
|                          | $t_{f2}$         | $C_L=30\text{pF}$ , 90~10%   |     |       | 6         |               |

(Note) Excluding input current on  $\overline{\text{CONT}}$  terminal.



■ MEASUREMENT CIRCUITS

(1) Output Signal Symmetry



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(2) Output Signal Rise / Fall Time

