

32.768kHz output Tuning fork Quartz Crystal Oscillator IC

GENERAL DESCRIPTION

The NJU6229 is a CMOS oscillator IC which is designed for 32.768kHz tuning fork quartz unit.

The NJU6229 is ultra-small IC realizing to micro size oscillator unit. The oscillation current is ultra-low power consumption 1.00 μ A(TYP). This is applicable for the portable devices requiring small sized and low power XO module. The operating voltage is from 1.62 to 5.50V. The 3-state output buffer is C-MOS compatible of fan-out.

PACKAGE OUTLINE

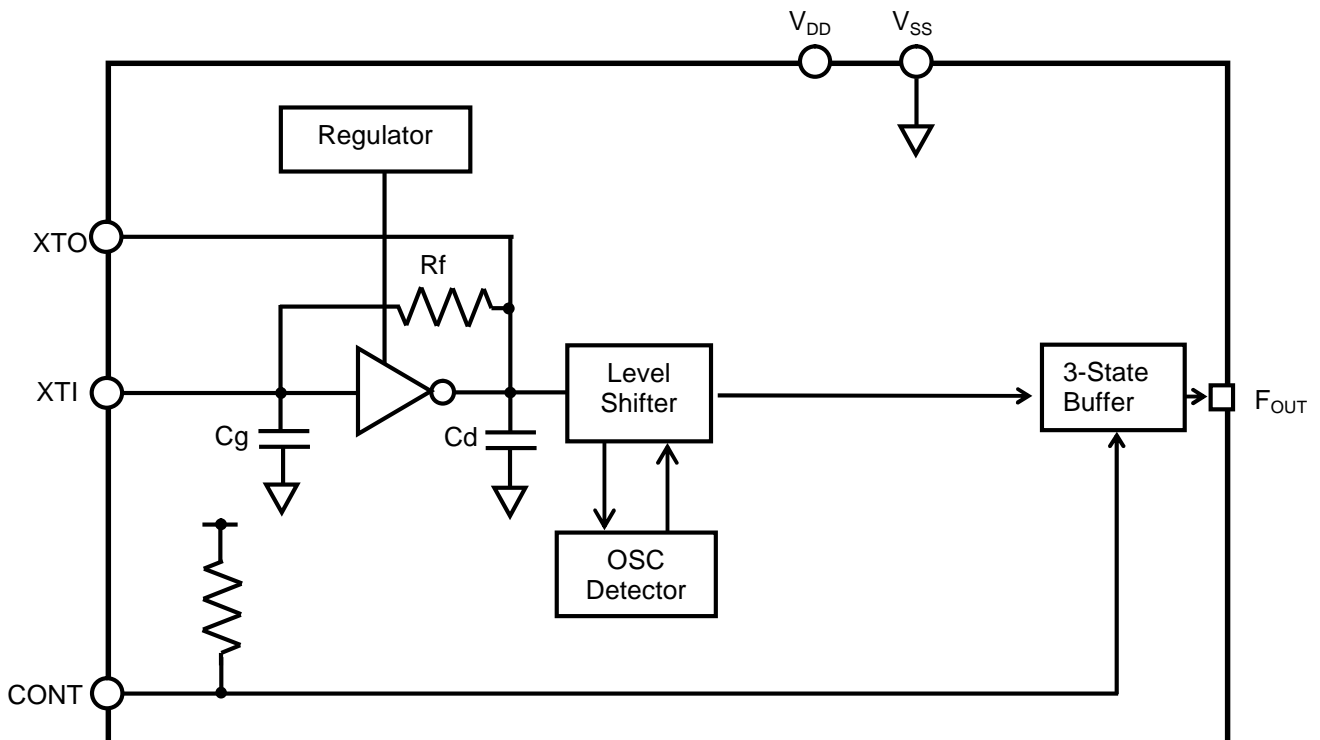


NJU6229XC-V

FEATURES

| | |
|---|--|
| Oscillation Frequency | 32.768kHz |
| Wide Operating Voltage | 1.62 to 5.50V |
| Low power consumption | 1.00 μ A ($V_{DD}=1.80V$, No load) |
| Output Disable Function | |
| 3-State Output Buffer | |
| Variable Pull-up Resistance on-Die | |
| Oscillation Capacitors C_g and C_d on-Die | |
| Package Outline | Die/Wafer |
| C-MOS Technology | |

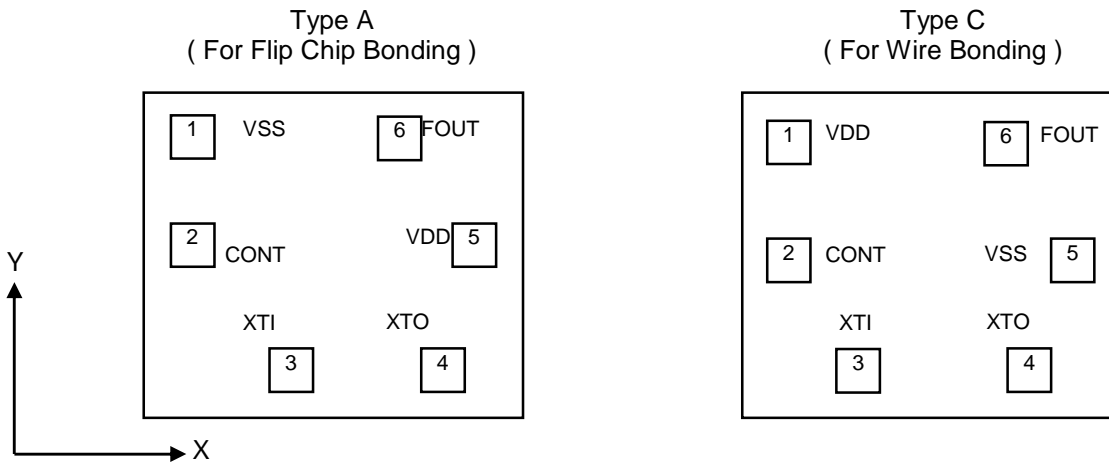
BLOCK DIAGRAM



LINE-UP TABLE

| Type No. | Version | |
|----------|---------|--------|
| | Type A | Type C |
| NJU6229 | A | C |

PAD LOCATION

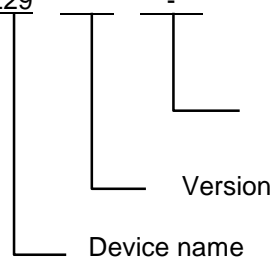


COORDINATES

| Pad No. | X | Y |
|---------|--------|--------|
| 1 | -151.5 | 160.0 |
| 2 | -161.5 | -46.0 |
| 3 | -10.5 | -160.0 |
| 4 | 151.5 | -160.0 |
| 5 | 161.5 | 0 |
| 6 | 121.5 | 160.0 |

PART NUMBER

NJU6229



W-H: Wafer (200μm)
C-V: Chip (130μm)

Starting Point: Die Center Unit[μm]
 Die Size: 0.534 x 0.534mm
 Die Thickness (C-V): 130±15μm
 Wafer Thickness (W-H): 200±20μm
 Die Substrate: V_{SS} leve
 Pad size: Type-A: 80 x 80μm
 Type-C: 80 x 80μm

TERMINAL DESCRIPTION

| SYMBOL | FUNCTION | |
|------------------|--|--------------------------|
| CONT | 3-state Output Buffer Control Terminal | |
| | CONT | F _{OUT} |
| | H or OPEN | Output of f ₀ |
| | L | High-Z |
| XTI XTO | Quartz Crystal Connecting Terminals | |
| V _{SS} | GND Terminal (V _{SS} =0V) | |
| F _{OUT} | Frequency Output | |
| V _{DD} | V _{DD} =1.62 to 5.50V | |

FUNCTIONAL DESCRIPTION

Output Disable Function

When CONT Terminal goes "Low", the F_{OUT} Terminal output becomes High impedance.

| CONT | F _{OUT} | Oscillator |
|------------|------------------|------------------|
| High(Open) | Frequency output | Normal operation |
| Low | Hi-Z | Normal operation |

Variable Pull-up Resistance

The CONT Terminal pull-up resistance changes in response to the input level. When CONT is tied "LOW" level, the pull-up resistance is large, reducing the current consumed by the resistance. When CONT is left open circuit, the pull-up resistance is small, which increases the input susceptibility to external noise. However, the pull-up resistance ties the CONT Terminal "High" level to prevent external noise from unexpectedly stopping the output.

ABSOLUTE MAXIMUM RATINGS

(V_{SS}=0V, T_a=25°C)

| PARAMETER | SYMBOL | RATING | UNIT |
|-----------------------------|------------------|---|------|
| Supply Voltage | V _{DD} | -0.5 to +6.0 | V |
| Input Voltage | V _{IN} | V _{SS} -0.5 ~ 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 | T _{opr} | -40 to +85 | °C |
| Storage Temperature Range | T _{stg} | -55 to +150 | °C |

Note1) If the supply voltage(V_{DD}) is less than 6.0V, the input voltage must not over the V_{DD} level though 6.0V 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} | fosc=32.768kHz | 1.62 | | 5.50 | V |
| Input Voltage | V_{IN} | CONT | 0 | | 5.50 | V |
| Output Voltage | V_{OUT} | F _{OUT} | 0 | | V_{DD} | V |

($V_{DD}=1.62$ to $5.50V$, $V_{SS}=0V$, Ta=+25°C)

| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|------------------------------|-----------|--|--------------|------|-------------|---------|
| Operating Current | I_{DD} | $V_{DD}=1.80V$, No Load | | 1.00 | 2.00 | μA |
| | | $V_{DD}=2.50V$, No Load | | 1.30 | 2.60 | |
| | | $V_{DD}=3.30V$, No load | | 1.60 | 3.20 | |
| | | $V_{DD}=5.00V$, No load | | 2.70 | 5.40 | |
| | | $V_{DD}=1.80V$, CL=15pF | | 2.30 | 4.60 | |
| | | $V_{DD}=2.50V$, CL=15pF | | 3.00 | 6.00 | |
| | | $V_{DD}=3.30V$, CL=15pF | | 3.80 | 7.60 | |
| | | $V_{DD}=5.00V$, CL=15pF | | 5.80 | 11.60 | |
| Oscillation Stopping Current | I_{STB} | $V_{DD}=1.80V$, CONT= V_{SS} , No load | | 0.65 | 1.30 | μA |
| | | $V_{DD}=2.50V$, CONT= V_{SS} , No load | | 0.70 | 1.40 | |
| | | $V_{DD}=3.30V$, CONT= V_{SS} , No load | | 0.75 | 1.50 | |
| | | $V_{DD}=5.00V$, CONT= V_{SS} , No load | | 0.90 | 1.80 | |
| “ High level” Output Voltage | V_{OH} | $I_{OH}=-400\mu A$, $V_{DD}=1.62V\sim 5.50V$ | $V_{DD}-0.4$ | | V_{DD} | V |
| “ Low level” Output Voltage | V_{OL} | $I_{OL}=400\mu A$, $V_{DD}=1.62V\sim 5.50V$ | | | 0.4 | V |
| Input Voltage | V_{IH} | CONT | $0.7V_{DD}$ | | | V |
| | V_{IL} | CONT | | | $0.3V_{DD}$ | V |
| 3-state Off Leakage Current | I_{OZ} | CONT= V_{SS} , F _{OUT} = V_{DD} or V_{SS} | | | ± 0.1 | μA |

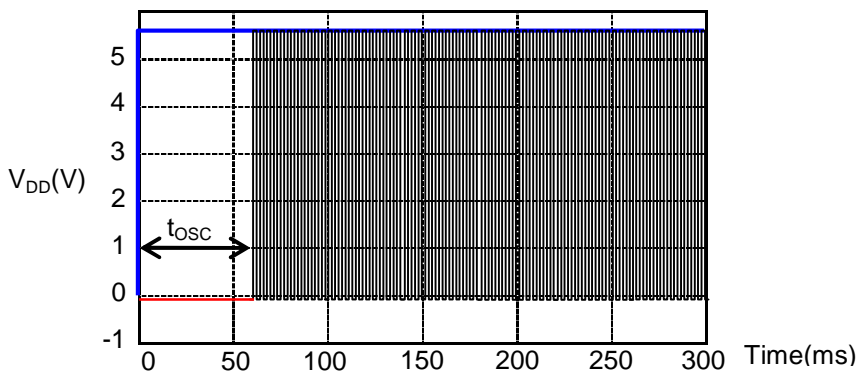
* Under development and tentative value.

($V_{DD}=1.62$ to $5.50V$, $V_{SS}=0V$, $T_a=+25^{\circ}C$)

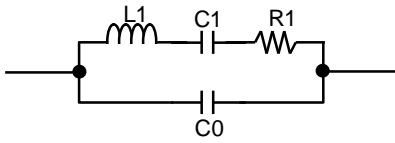
| PARAMETER | SYMBOL | CONDITIONS | MIN | TYP | MAX | UNIT |
|---------------------------|------------------|---|-----|-----|-----|---------|
| Feedback Resistance | Rf | | | 24 | | M |
| Internal Capacitor | Cg | fosc=32.768kHz | | 7 | | pF |
| | Cd | fosc=32.768kHz | | 8.5 | | pF |
| Output Signal Symmetry | SYM | $C_L=15pF$, @ $V_{DD}/2$ | 45 | 50 | 55 | % |
| Output Signal Rise Time | tr | $C_L=15pF$ 0.1 V_{DD} to 0.9 V_{DD} | | | 500 | ns |
| Output Signal Fall Time | tf | $C_L=15pF$ 0.9 V_{DD} to 0.1 V_{DD} | | | 500 | ns |
| Output Disable time | t _{POZ} | $C_L=15pF$, $R_L=1k\Omega$ | | | 500 | ns |
| Output Enable Time | t _{PZO} | $C_L=15pF$ | | | 50 | μs |
| Oscillation Start up Time | T _{OSC} | | | 150 | 500 | ms |

Note3) The oscillation frequency range has used NJRC's standard crystal for measurement. However it is not guaranteed. (Refer to EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS)

(1)Output Signal



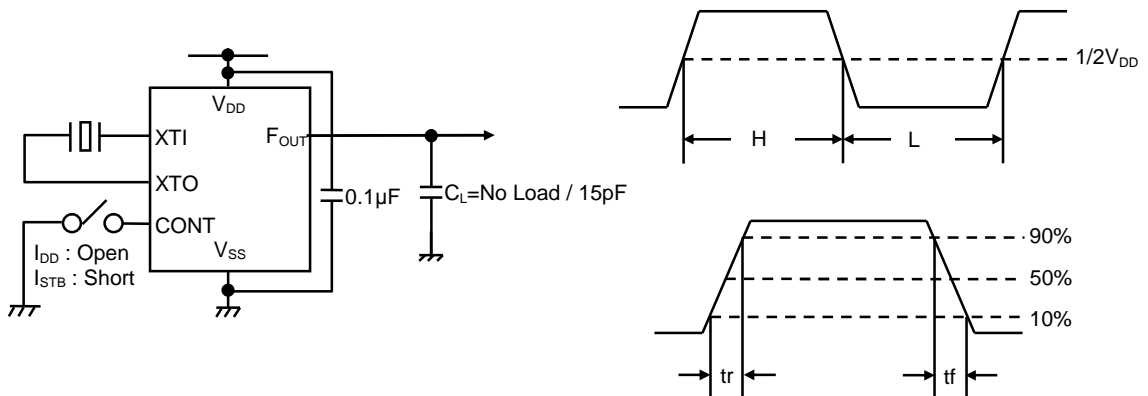
EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS



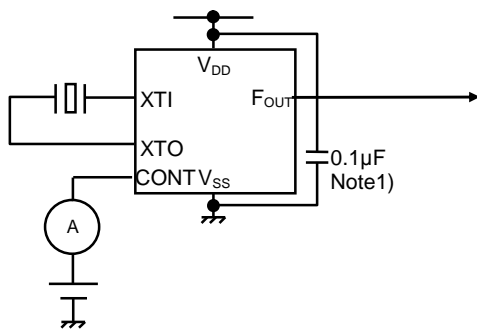
| f0[kHz] | R1[Ω] | L1[H] | C1[fF] | C0[pF] |
|---------|--------|---------|--------|--------|
| 32.768 | 58.93k | 3684.41 | 6.41 | 1.41 |

MEASUREMENT CIRCUITS

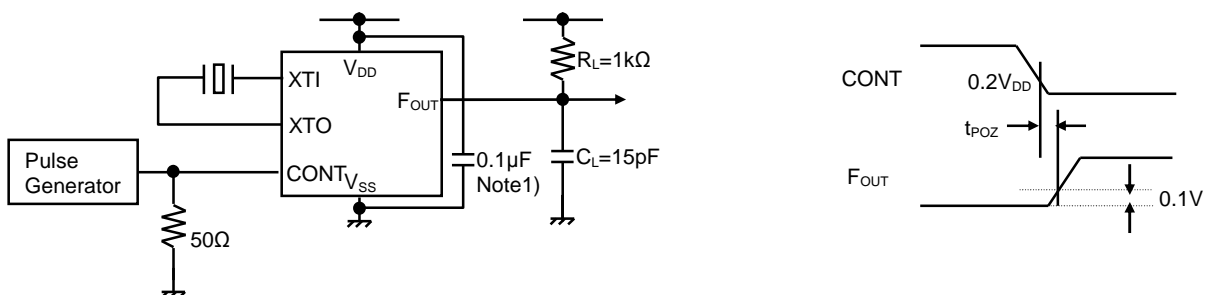
(1) Operating Current, Standby Current, Output Signal Symmetry, Output Signal Rise/Fall Time (C_L=15pF)



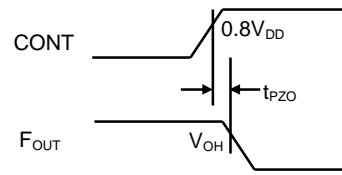
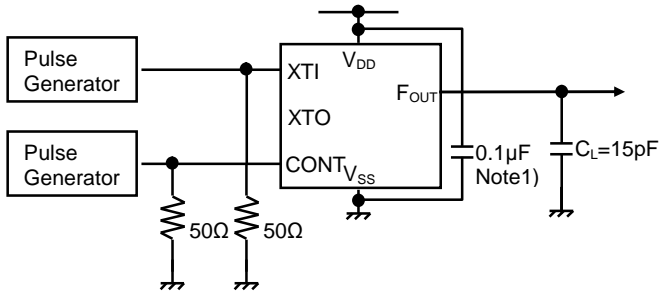
(2) Input Current



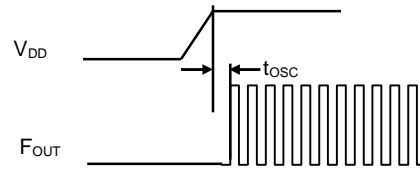
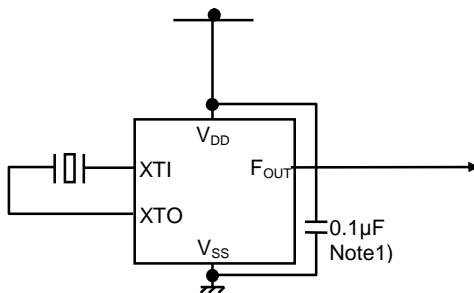
(3) Output Disable Time (C_L=15pF, R_L=1kΩ)



(4) Output Enable Time ($C_L=15\text{pF}$)



(5) Start up time



Note1) Decoupling capacitor between V_{DD} and V_{SS} is, should shorten the wiring as much as possible

[CAUTION]
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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9