Preliminary

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 1.00μA(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.

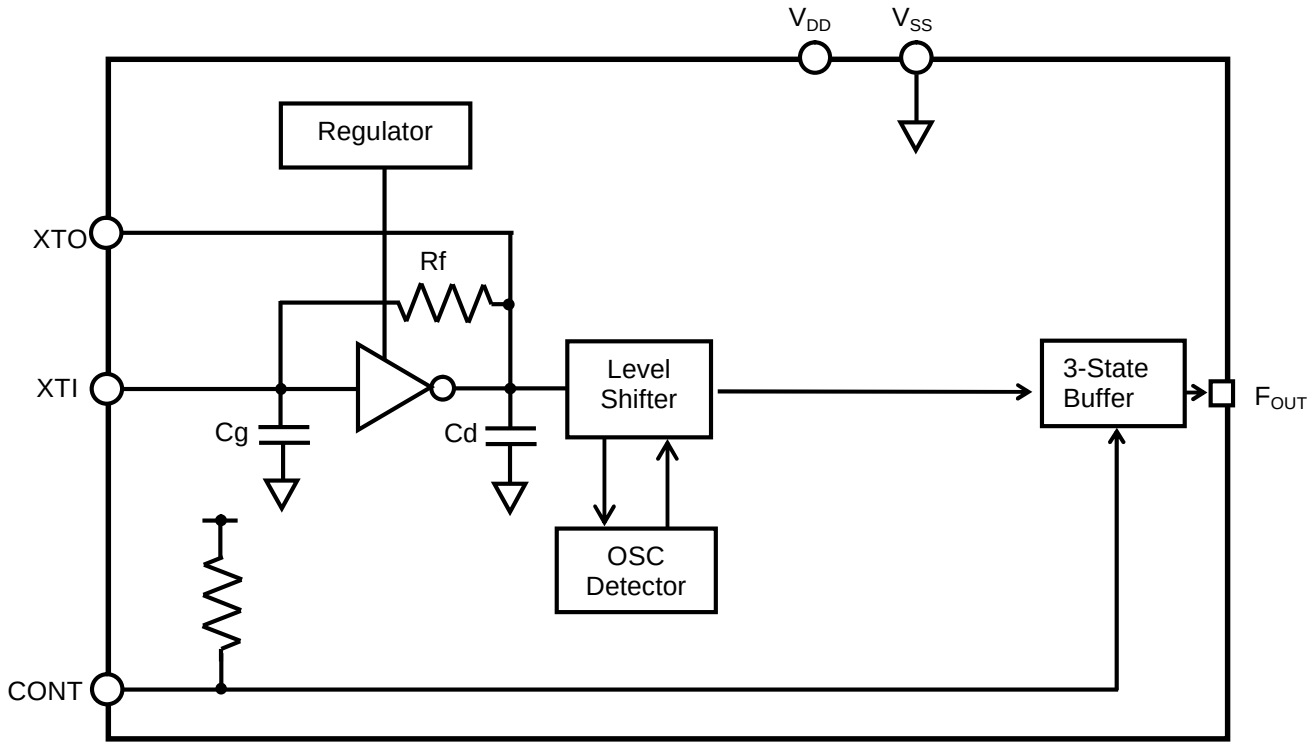
■PACKAGE OUTLINE

NJU6229XC-V

■FEATURES

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

■BLOCK DIAGRAM

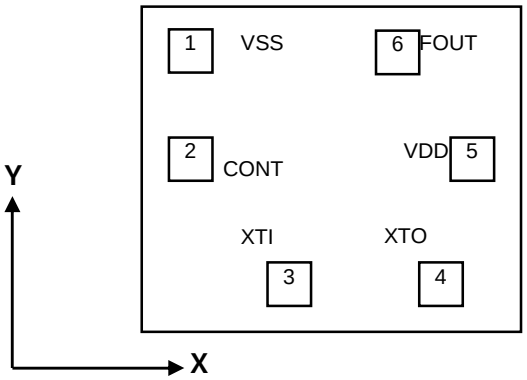


■LINE-UP TABLE

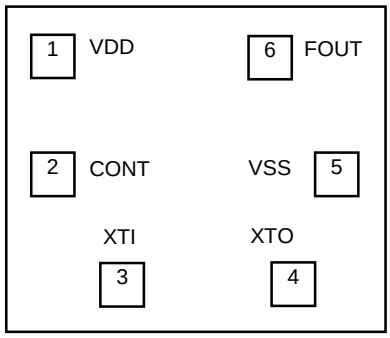
Type No.	Version	
	Type A	Type C
NJU6229	A	C

■PAD LOCATION

Type A
(For Flip Chip Bonding)



Type C
(For Wire Bonding)



■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

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

■PART NUMBER

NJU6229 □□ □-□

W-H: Wafer (200μm)
C-V: Chip (130μm)

Version

Device name

■TERMINAL DESCRIPTION

SYMBOL	FUNCTION
CONT	3-state Output Buffer Control Terminal CONT: H or OPEN → Output of f_0; L → High-Z (F_{OUT})
XTI	Quartz Crystal Connecting Terminals
XTO	
V_{SS}	GND Terminal (Vss=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, Ta=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	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-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) Decupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

Preliminary

■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}=-400µA, V_{DD}=1.62V~5.50V	V_{DD}-0.4		V_{DD}	V
" Low level" Output Voltage	V_{OL}	I_{OL}=400µA, V_{DD}=1.62V~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

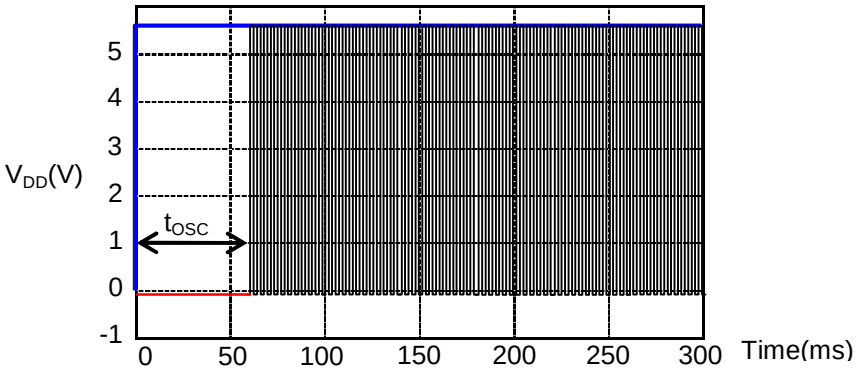
* Under development and tentative value.

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

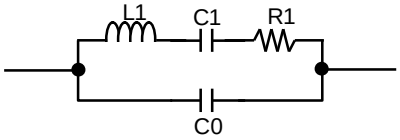
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Feedback Resistance	Rf			24		MΩ
Internal Capacitor	Cg	fosc=32.768kHz		7		pF
	Cd	fosc=32.768kHz		8.5		pF
Output Signal Symmetry	SYM	C_L=15pF, @V_{DD}/2	45	50	55	%
Output Signal Rise Time	tr	C_L=15pF 0.1V_{DD} to 0.9V_{DD}			500	ns
Output Signal Fall Time	tf	C_L=15pF 0.9V_{DD} to 0.1V_{DD}			500	ns
Output Disable time	t_{POZ}	C_L=15pF, R_L=1kΩ			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



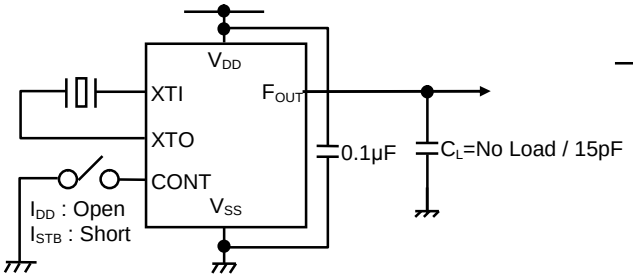
■EXAMPLE OF CRYSTAL PARAMETERS FOR MEASUREMENT CIRCUITS

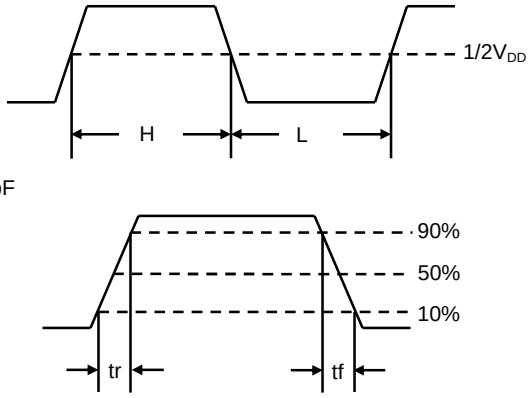


f0[kHz]	R1[Ω]	L1[H]	C1[fF]	C0[pF]
32.768	58.93k	3684.41	6.41	1.41

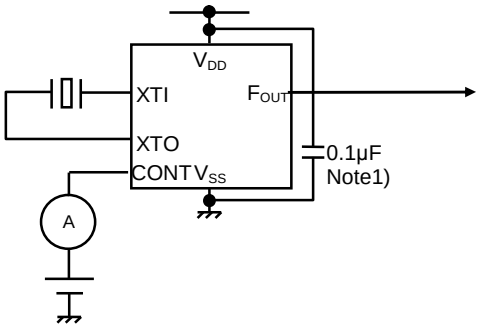
■MEASUREMENT CIRCUITS

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

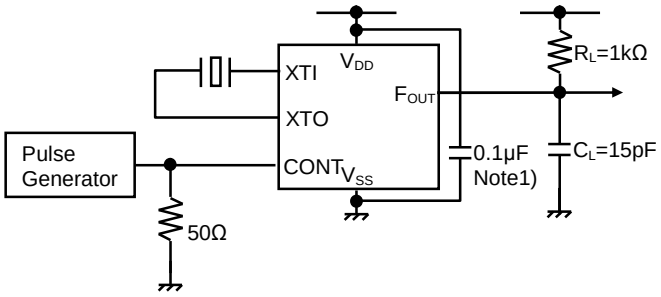


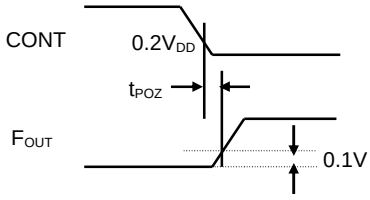


(2) Input Current

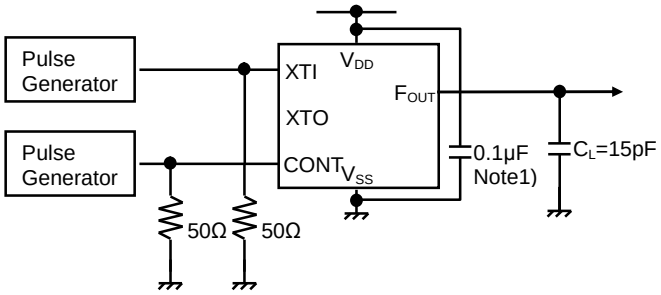


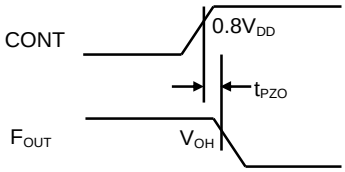
(3) Output Disable Time (C_L=15pF,R_L=1kΩ)



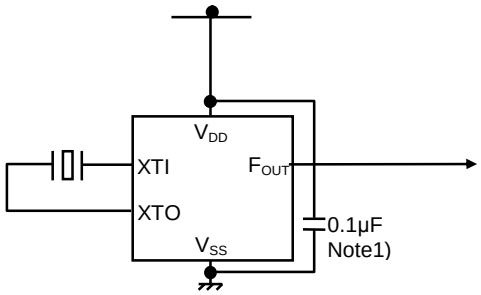


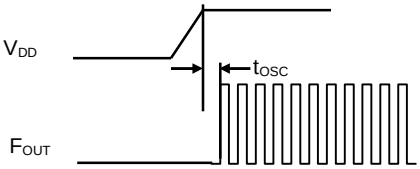
(4) Output Enable Time (C_L=15pF)





(5) Start up time





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

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