Quartz Crystal Oscillator IC with Selectable Divider

■GENERAL DESCRIPTION

The NJU6311 is a fundamental quartz crystal oscillator, up to 50MHz.

The oscillation amplifier incorporates feedback resistor and capacitors (Cg, Cd), therefore, it requires no external component expect quartz crystal, and realizes very low standby current with NAND circuit.

The output frequency select 6-stage to use selectable switch IN1, IN2, and IN3, divided output are f_0, $f_0/2$, $f_0/4$, $f_0/8$, $f_0/16$ and $f_0/32$.

The drivability of the 3-state output buffer is 16mA@5V, thus it can drive C-MOS load.

Furthermore, the package is Thin-VSP10.

■PAKAGE OUTLINE

NJU6311C-D

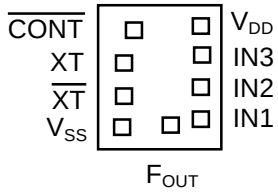
NJU6311RB2

■FEATURES

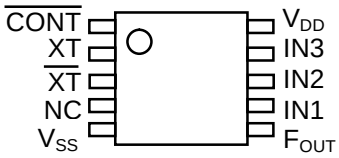
- ●Operating Voltage 2.0 to 5.5V
- ●Maximum Oscillation Frequency 50MHz
- ●Low Operating Current
- ●High Fan-out I_{OH}/I_{OL}=6mA @2.5V
  I_{OH}/I_{OL}=8mA @3.3V
  I_{OH}/I_{OL}=16mA @5.0V
- ●Selectable Divider fo, fo/2, fo/4, fo/8, fo/16 and fo/32
- ●Oscillation Stop and Output Stand-by Function
- ●3-State Output Buffer
- ●Oscillation Capacitors Cg and Cg on-die
- ●Package Outline Thin-Die/TVSP-10
- ●C-MOS Technology

■PAD LOCATION

Thin-Die



TVSP-10



■SELECTABLE DIVIDER LOGIC

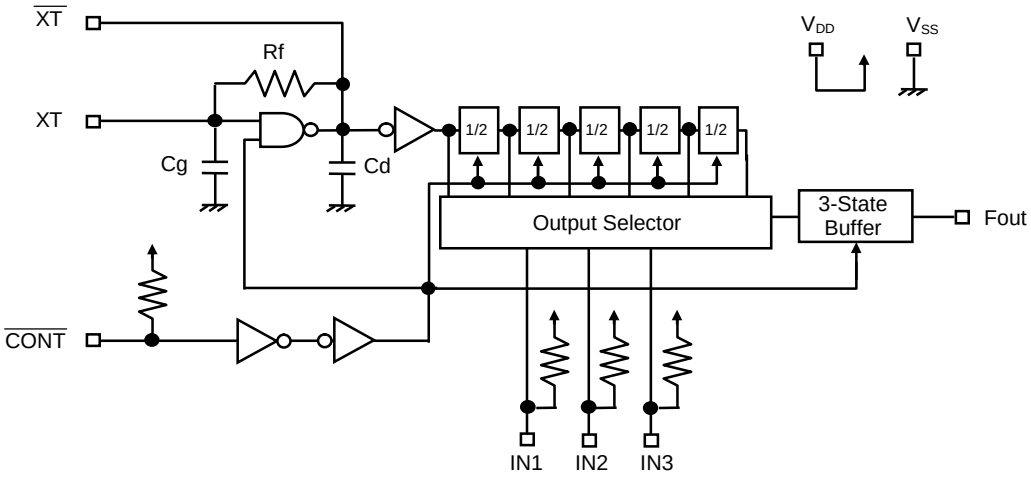
IN1	IN2	IN3	F_{OUT}
H	H	H	fo
L	H	H	$f_0/2$
H	L	H	fo/4
L	L	H	fo/8
H	H	L	fo/16
L	H	L	fo/32
H	L	L	
L	L	L	

■COORDINATES

No	Pad Name	X	Y
1	$\overline{CONT}$	-123	325
2	XT	-200	105
3	$\overline{XT}$	-200	-130
4	V_{SS}	-221	-346
5	F_{OUT}	57	-325
6	IN1	221	-295
7	IN2	221	-60
8	IN3	221	160
9	V_{DD}	221	346

Starting Point:Die Center Unit[um]
Die Size:0.7x0.95mm
Thin-Die Thickness (-D):200±20um
Pad Size:90x90um

■BLOCK DIAGRAM



■TERMINAL DESCRIPTION

SYMBOL	FUNCTION
$\overline{CONT}$	Oscillation and 3-state Output Buffer Control

$\overline{CONT}$	F_{OUT}
H or OPEN	Frequency Output corresponding to Selectable Divider
L	Oscillation Stop and High impedance Output

XT $\overline{XT}$	Quartz Crystal Connecting Terminals
V_{SS}	V_{SS}=0V
F_{OUT}	Frequency Output

Selectable Divider

IN1	IN2	IN3	F_{OUT}
H	H	H	fo
L	H	H	$f_0/2$
H	L	H	fo/4
L	L	H	fo/8
H	H	L	fo/16
L	H	L	fo/32
H	L	L	
L	L	L	

IN1, IN2, IN3: "H" or OPEN

V_{DD}	V_{DD}=2.5/3.3V/5.0V

■ABSOLUTE MAXIMUM RATINGS

(Ta=25°C)

PARAMETER	SYMBOL	RATING	UNIT
Supply Voltage	V_{DD}	-0.5 to +7.0	V
Input Voltage	V_{IN}	V_{SS}-0.5 to 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
Power Dissipation	P_D	320 (TVSP-10)	mW
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-55 to +125	°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) Decupling capacitor should be connected between V_{DD} and V_{SS} due to the stabilized operation for the circuit.

Note3) The power dissipation is the maximum value at only the package.

■ELECTRICAL CHARACTERISTICS

(Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Voltage	V_{DD}		2.0		5.5	V

(V_{DD}=2.5V,Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	fosc=16MHz,C_L=15pF			6	mA
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=IN1=IN2=IN3=V_{SS}, No load		4	10	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	uA
Input Voltage	V_{IH}	$\overline{CONT}$, IN1, IN2, IN3	1.75		2.5	V
	V_{IL}	$\overline{CONT}$, IN1, IN2, IN3	0		0.75	V
Output Current	I_{OH}	V_{OH}=2.25V	6			mA
	I_{OL}	V_{OL}=0.25V	6			mA
Input Current	I_{IN}	$\overline{CONT}$= IN1=IN2=IN3=0.8V_{DD}		7.5	12.0	uA
		$\overline{CONT}$= IN1=IN2=IN3=0.2V_{DD}		1.2	2.0	uA
3-state Off Leakage Current	I_{OZ}	$\overline{CONT}$=V_{SS}, F_{OUT}= V_{DD} or V_{SS}			±0.1	uA
Feedback Resistance	Rf			255		kΩ
Internal Capacitor	Cg/Cd	fosc=16MHz		15/15		pF
Maximum Oscillation Frequency	F_{MAX}	Note5)	50			MHz
Output Signal Symmetry	SYM	C_L=15pF, @V_{DD}/2	45	50	55	%
		C_L=30pF, @V_{DD}/2	40	50	60	
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			200	ns
Output Enable Time	T_{PZL}	C_L=15pF,R_{UP}=10kΩ			200	ns

Note4) Excluding input current on $\overline{CONT}$ Terminal.

Note5) NJR's standard crystal is used for measurement of the oscillation frequency range and it does not guaranteed oscillation.

(V_{DD}=3.3V,Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	fosc=16MHz,C_L=30pF			8	mA
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=IN1=IN2=IN3=V_{SS}, No load		8	20	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	uA
Input Voltage	V_{IH}	$\overline{CONT}$, IN1, IN2, IN3	2.31		3.3	V
	V_{IL}	$\overline{CONT}$, IN1, IN2, IN3	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}	$\overline{CONT}$= IN1=IN2=IN3=0.8V_{DD}		10.0	15.0	uA
		$\overline{CONT}$= IN1=IN2=IN3=0.2V_{DD}		1.8	3.0	uA
3-state Off Leakage Current	I_{OZ}	$\overline{CONT}$=V_{SS}, F_{OUT}= V_{DD} or V_{SS}			±0.1	uA
Feedback Resistance	Rf			255		kΩ
Internal Capacitor	Cg/Cd	fosc=16MHz		15/15		pF
Maximum Oscillation Frequency	F_{MAX}	Note5)	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

(V_{DD}=5.0V,Ta=25°C)

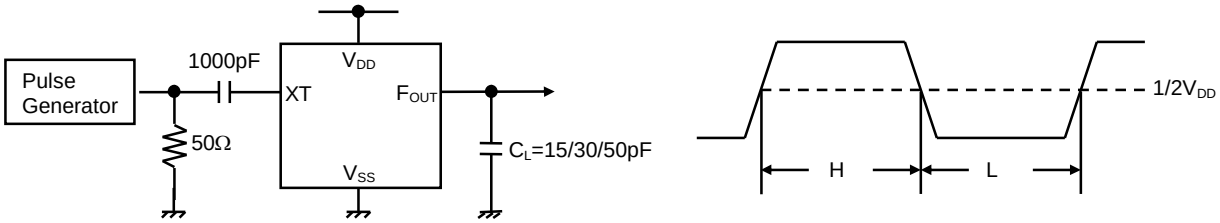
PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	fosc=16MHz,C_L=50pF			15	mA
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=IN1=IN2=IN3=V_{SS}, No load		20	40	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	uA
Input Voltage	V_{IH}	$\overline{CONT}$, IN1, IN2, IN3	3.5		5.0	V
	V_{IL}	$\overline{CONT}$, IN1, IN2, IN3	0		1.5	V
Output Current	I_{OH}	V_{OH}=4.50V	16			mA
	I_{OL}	V_{OL}=0.50V	16			mA
Input Current	I_{IN}	$\overline{CONT}$= IN1=IN2=IN3=0.8V_{DD}		27.0	40.0	uA
		$\overline{CONT}$= IN1=IN2=IN3=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	Rf			255		kΩ
Internal Capacitor	Cg/Cd	fosc=16MHz		15/15		pF
Maximum Oscillation Frequency	F_{MAX}	Note5)	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	tr	C_L=15pF,10% to 90%		2	4	ns
		C_L=50pF,10% to 90%		4	8	
Output Signal Fall Time	tf	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}=10kΩ			100	ns
Output Enable Time	T_{PZL}	C_L=15pF,R_{UP}=10kΩ			100	ns

Note4) Excluding input current on $\overline{CONT}$ Terminal.

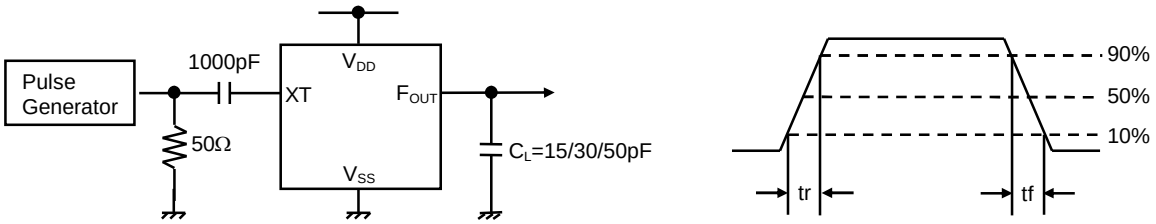
Note5) NJR's standard crystal is used for measurement of the oscillation frequency range and it does not guaranteed oscillation.

■MEASUREMENT CIRCUITS

(1)Output Signal Symmetry



(2)Output Signal Rise/Fall Time



(3)Output Disable/Enable Time