1.5V Operation Fundamental Quartz Crystal Oscillator

■GENERAL DESCRIPTION

The NJU6369 series is a C-MOS IC for fundamental quartz crystal oscillator that consists of an oscillation amplifier, 5-stage divider and 3-state output buffer, and can oscillate at 1.5V very low voltage.

The 5-stage divider generates only one frequency selected of f_0,$f_0/2$,$f_0/4$ $f_0/8$, $f_0/16$ and $f_0/32$ by internal circuits is output.

The oscillation amplifier is realized very low stand-by current using NAND circuit.

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

■PAKAGE OUTLINE

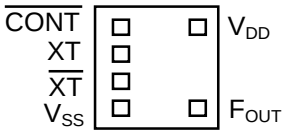
NJU6369XC-D

■FEATURES

●Operating Voltage	1.5 to 3.6V
●Maximum Oscillation Frequency	40MHz@1.5V 40MHz@1.8V 60MHz@≥2.5V
●Low Operating Current	
●High Fan-out	I_{OH}/I_{OL}=2mA@1.8V I_{OH}/I_{OL}=5mA@2.5V I_{OH}/I_{OL}=6mA@3.3V
●5-Stage Divider	Maximum Divider $f_0/32$
●Oscillation Stop and Output Stand-by Function	
●3-State Output Buffer	
●Oscillation Capacitors Cg and Cg on-chip	
●Package Outline	Thin-Chip
●C-MOS Technology	

■PAD LOCATION

Thin-Chip



■LINE-UP TABLE

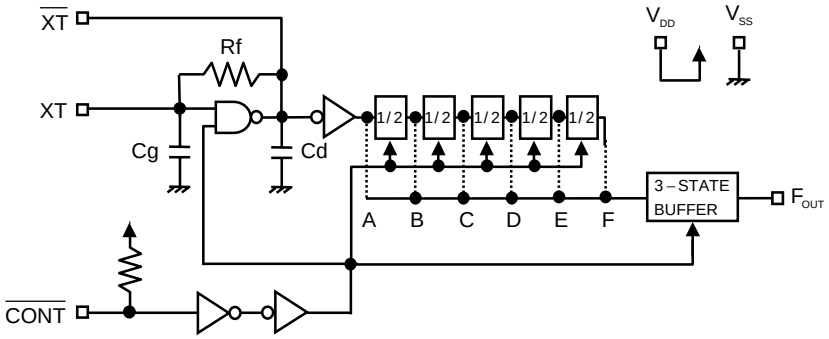
Type No.		F_{OUT}	Internal Connect	Cg/Cd
NJU6369	A	f_0	Connected A Line	8/9pF
	B	$f_0/2$	Connected B Line	8/9pF
	C	$f_0/4$	Connected C Line	8/9pF
	D	$f_0/8$	Connected D Line	8/9pF
	E	$f_0/16$	Connected E Line	8/9pF
	F	$f_0/32$	Connected F Line	8/9pF

■COORDINATES

No	Pad Name	X	Y
1	$\overline{CONT}$	-178	231
2	XT	-178	77
3	$\overline{XT}$	-178	-77
4	V_{SS}	-178	-231
5	F_{OUT}	206	-231
8	V_{DD}	206	231

Starting Point:Chip Center Unit[um]
Chip Size:0.7x0.75mm
Thin-Chip Thickness:200±20um
Pad Size:90x90um

■BLOCK DIAGRAM



■TREMINAL DESCRIPTION

SYMBOL	FUNCTION	
$\overline{CONT}$	Oscillation and 3-state Output Buffer Control	
	$\overline{CONT}$	F_{OUT}
	H or OPEN	Output either one frequency selected of f_0, $f_0/2$,$f_0/4$,$f_0/8$, $f_0/16$ and $f_0/32$ Note1)
	L	Oscillation Stop and High impedance Output
XT $\overline{XT}$	Quartz Crystal Connecting Terminals	
V_{SS}	V_{SS}=0V	
F_{OUT}	Frequency Output	
V_{DD}	V_{DD}=1.8V/2.5V/3.3V	

Note1) Refer to the line-up table.

■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
Operating Temperature Range	Topr	-40 to +85	°C
Storage Temperature Range	Tstg	-55 to +125	°C

Note2) 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.

Note3) Decupling 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}		1.5		3.6	V

(V_{DD}=1.8V,Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version,fosc=16MHz,C_L=15pF			2	mA
		B version,fosc=16MHz,C_L=15pF			1.5	
		C version,fosc=16MHz,C_L=15pF			1	
		D version,fosc=16MHz,C_L=15pF			1	
		E version,fosc=16MHz,C_L=15pF			1	
		F version,fosc=16MHz,C_L=15pF			1	
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=V_{SS}, No load		1	3	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	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}	$\overline{CONT}$=0.8V_{DD}		3.0	4.5	uA
		$\overline{CONT}$=0.2V_{DD}		0.5	0.7	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		8/9		pF
Maximum Oscillation Frequency	F_{MAX}		40			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%		3	6	ns
		C_L=30pF,10% to 90%		6	10	
Output Signal Fall Time	tf	C_L=15pF,90% to 10%		3	6	ns
		C_L=30pF,90% to 10%		6	10	
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

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

(V_{DD}=2.5V,Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version,fosc=16MHz,C_L=15pF			3	mA
		B version,fosc=16MHz,C_L=15pF			2.5	
		C version,fosc=16MHz,C_L=15pF			2	
		D version,fosc=16MHz,C_L=15pF			2	
		E version,fosc=16MHz,C_L=15pF			2	
		F version,fosc=16MHz,C_L=15pF			2	
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=V_{SS}, No load		2	5	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	uA
Input Voltage	V_{IH}		1.75		2.5	V
	V_{IL}		0		0.75	V
Output Current	I_{OH}	V_{OH}=2.25V	5			mA
	I_{OL}	V_{OL}=0.25V	5			mA
Input Current	I_{IN}	$\overline{CONT}$=0.8V_{DD}		7.5	12.0	uA
		$\overline{CONT}$=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		8/9		pF
Maximum Oscillation Frequency	F_{MAX}		60			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%		2.8	5.5	ns
		C_L=30pF,10% to 90%		4.5	9	
Output Signal Fall Time	tf	C_L=15pF,90% to 10%		2.8	5.5	ns
		C_L=30pF,90% to 10%		4.5	9	
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.

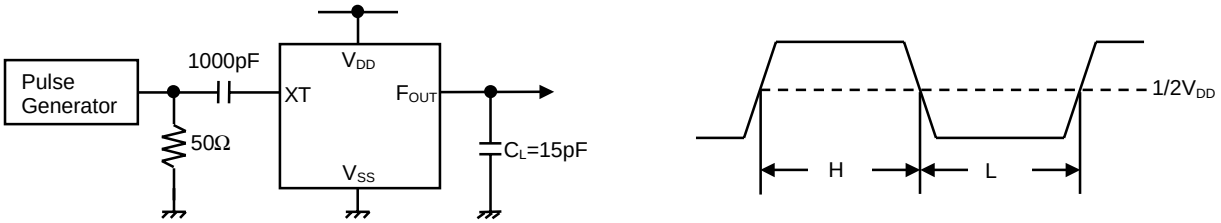
(V_{DD}=3.3V,Ta=25°C)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Operating Current	I_{DD}	A version,fosc=16MHz,C_L=15pF			5	mA
		B version,fosc=16MHz,C_L=15pF			4	
		C version,fosc=16MHz,C_L=15pF			3	
		D version,fosc=16MHz,C_L=15pF			3	
		E version,fosc=16MHz,C_L=15pF			3	
		F version,fosc=16MHz,C_L=15pF			3	
Oscillation Stopping Current	I_{STB}	$\overline{CONT}$=V_{SS}, No load		2	5	uA
Stand-by Current	Ist	$\overline{CONT}$=XT=V_{SS}, No load Note4)			1	uA
Input Voltage	V_{IH}		2.31		3.3	V
	V_{IL}		0		0.99	V
Output Current	I_{OH}	V_{OH}=2.97V	6			mA
	I_{OL}	V_{OL}=0.33V	6			mA
Input Current	I_{IN}	$\overline{CONT}$=0.8V_{DD}		10.0	15.0	uA
		$\overline{CONT}$=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		8/9		pF
Maximum Oscillation Frequency	F_{MAX}		60			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%		2.5	5	ns
		C_L=30pF,10% to 90%		4	8	
Output Signal Fall Time	tf	C_L=15pF,90% to 10%		2.5	5	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

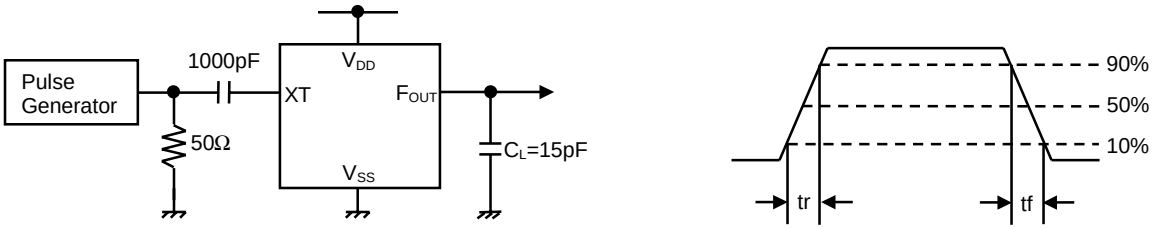
Note4) Excluding input current on $\overline{CONT}$ Terminal.

■MEASURMENT CIRCUITS

(1)Output Signal Symmetry(C_L=15pF)



(2)Output Signal Rise/Fall Time(C_L=15pF)



(3)Output Disable/Enable Time(C_L=15pF,R_{UP}=10kΩ)