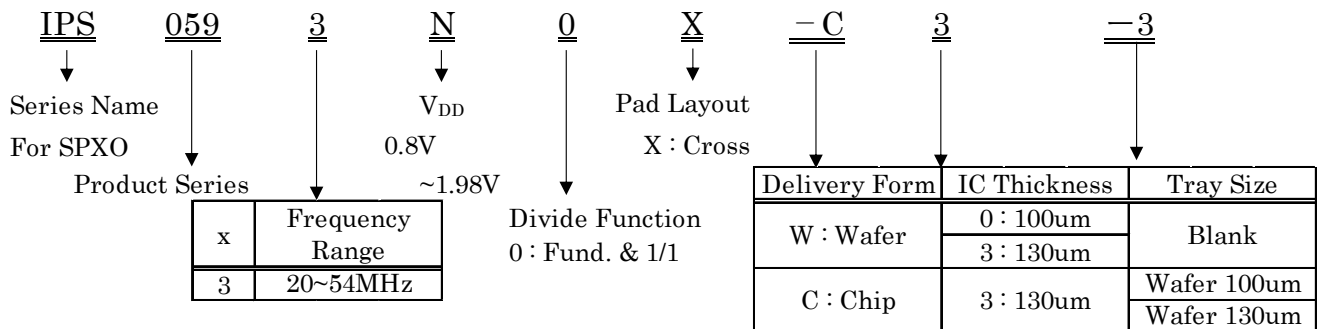■ Description

IPS0593N0X is the Low operation voltage (0.8V~1.98V) CMOS output SPXO IC. It is corresponding to the fundamental crystal from 20MHz to 54MHz.

■ Features

- Operating Voltage : 0.8V~1.98V
- Output frequency : 20MHz~54MHz
- Current consumption : 1.8mA max at CL=15pF, fxtal=54MHz, V_{DD}=0.9V
- Chip size : 0.60mm × 0.60mm
- Operation temperature : -40℃~125℃
- Standby function : Oscillation stop
- Output : CMOS

1. Part number rule

IPS 059 3 N 0 X －C 3 －3

Series Name
For SPXO

V_{DD}
0.8V
~1.98V

Pad Layout
X : Cross

Product Series

x	Frequency Range
3	20~54MHz

Divide Function
0 : Fund. & 1/1

Delivery Form	IC Thickness	Tray Size
W : Wafer	0 : 100um	Blank
	3 : 130um	
C : Chip	3 : 130um	Wafer 100um
		Wafer 130um

2. Series

Part Number	Crystal Frequency f（MHz）		Divide	Output Frequency F0 (MHz)		Pad Layout	Remarks
	Min.	Max.		Min.	Max.		
IPS0593N0X	20.00	54.00	1/1	20.00	54.00	Cross	

3. Absolute Maximum Ratings

Unless otherwise stated, V_{SS}=0V, Ta=25℃±2℃

Parameter	Symbol	Condition	Ratings		
			Min	Max	Unit
Supply Voltage	V_{DD}		V_{SS}-0.5	3.6	V
Input Voltage	V_{IN}	All Input Pin	V_{SS}-0.5	V_{DD}+0.5	V
Output Voltage	V_{OUT}		V_{SS}-0.5	V_{DD}+0.5	V
Output Current	I_{OUT}			25	mA
Junction Temperature	Tj		-55	150	℃
Storage Temperature	Tstg		-55	125	℃

4. Recommended Operating Condition

Unless otherwise stated, V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	V_{DD}		0.80		1.98	V	V_{DD}
Input Voltage	V_{IN}		V_{SS}		V_{DD}	V	CE
Output Load Capacitance	CL	CMOS			15	pF	OUT
Ambient Temperature	Topt		-40		125	℃	

5. Electrical Specification

Unless otherwise stated, V_{DD}=0.8V~1.98V, V_{SS}=0V, CL=15pF, Ta=-40℃~125℃

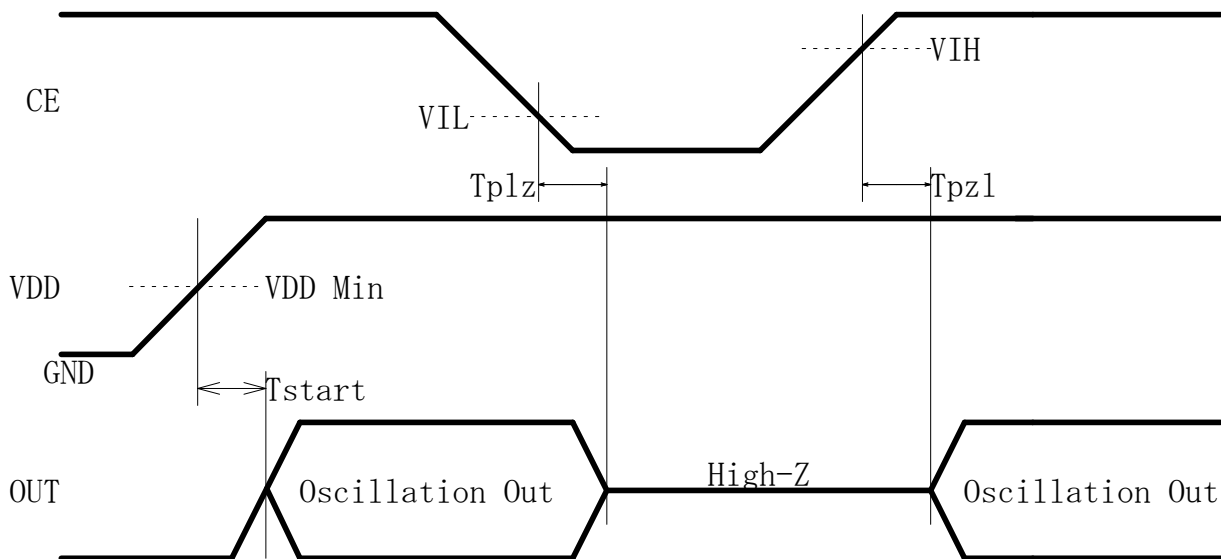| Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Output leak current	Iz	CE=Low, V_{DD}=1.05V			20	μA
"H" input voltage	V_{IH}	CE Pad	$0.8V_{DD}$			V
"L" input voltage	V_{IL}	CE Pad			$0.2V_{DD}$	V
"L" input current	I_{IL}	CE Pad, V_{IL}=0V		-10		μA
Oscillation Disable Time	Tplz	OUT Pad			0.1	μs
Oscillation Enable Time	Tpzl	OUT Pad			5.0	ms
Oscillation Start up Time	Tstart				5.0	ms
"H" output voltage	V_{OH}	OUT Pad, I_{OH}=-1.0mA, V_{DD}=0.9V	$0.9V_{DD}$			V
"L" output voltage	V_{OL}	OUT Pad, I_{OL}=1.0mA, V_{DD}=0.9V			$0.1V_{DD}$	V
Current consumption	I_{DD}	CL=15pF, V_{DD}=0.9V, F0=54MHz		0.7	1.8	mA
Current consumption at oscillation disable	I_{DDD}	V_{DD}=0.9V, CE=0V		0.8	5.0	μA
Freq. V_{DD} deviation	F_{VST}	V_{DD}±10%			±2.0	ppm
Output Duty Ratio	Duty		45		55	%
Rise time/Fall time	Tr/Tf				5.2	ns
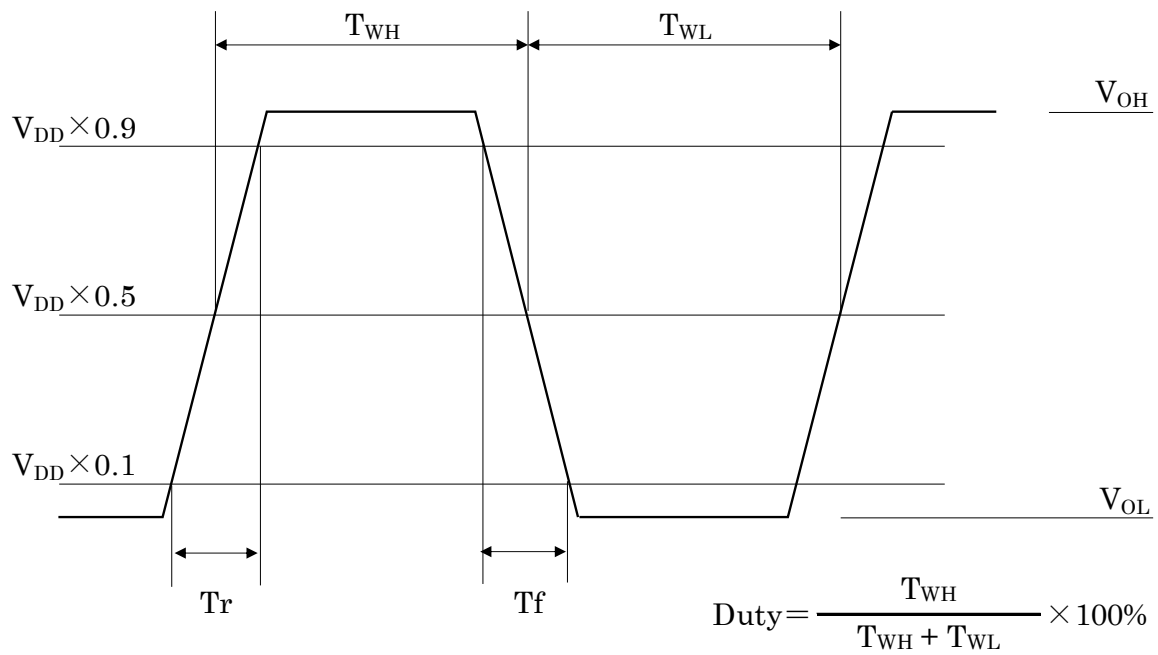
Fig. 5-1 Output wave form (Duty, Tr, Tf, V_{OH}, V_{OL})

V_{IH} : Threshold voltage for Oscillation Start
V_{IL} : Threshold voltage for Oscillation Stop

Fig. 5-2 Input output signal timing

6. Circuit Parameters of Oscillator (Reference Data for Circuit Design)

Ta=25℃

Parameter	Symbol	Condition	Typical value	Unit
Regulated Voltage	Vreg		0.6	V
Feedback Resistor	Rf		300	kΩ
Driving Resistor	Rd		500	Ω
Oscillation Capacitor	Cg	Gate side	4.5	pF
	Cd	Drain side	4.5	pF

* The above values are the design values and are not guaranteed by test.
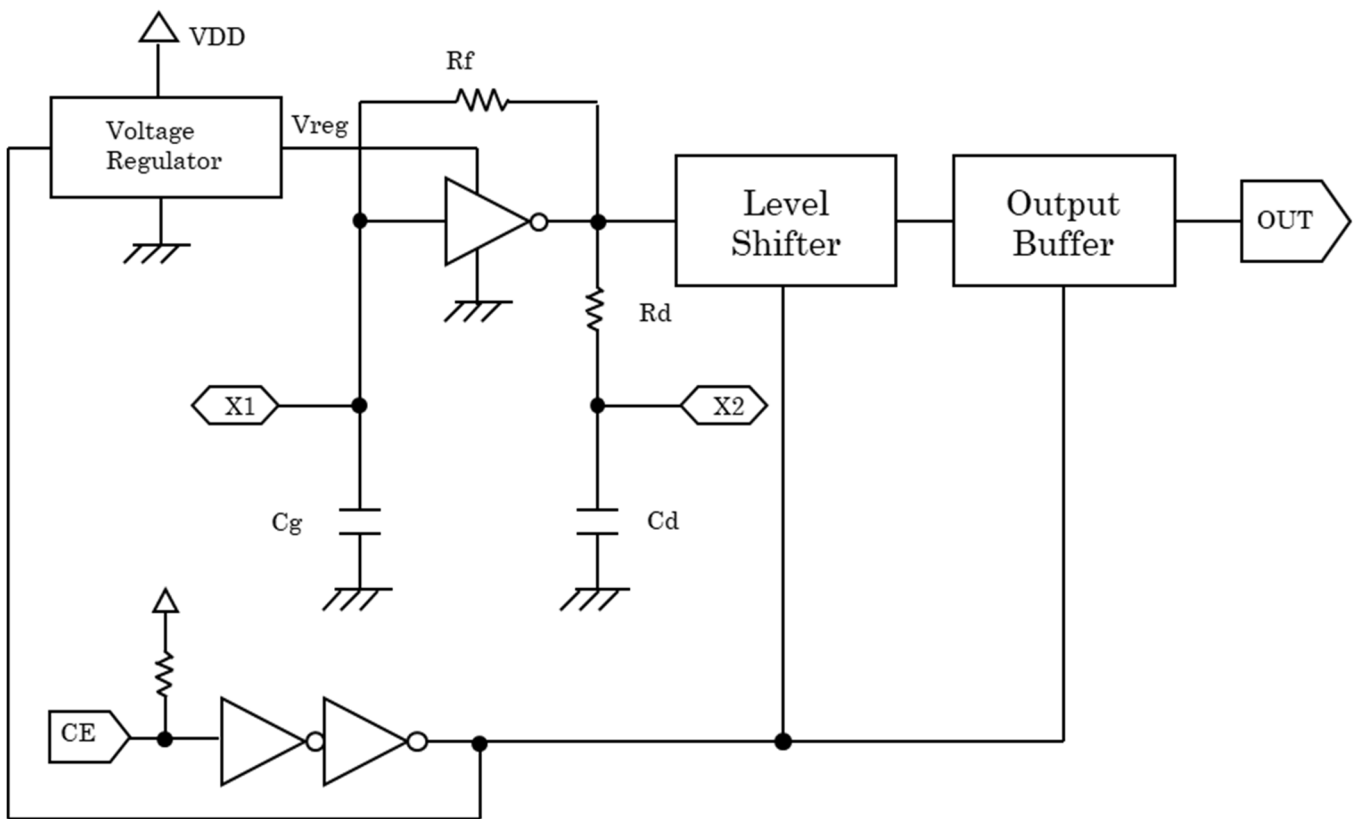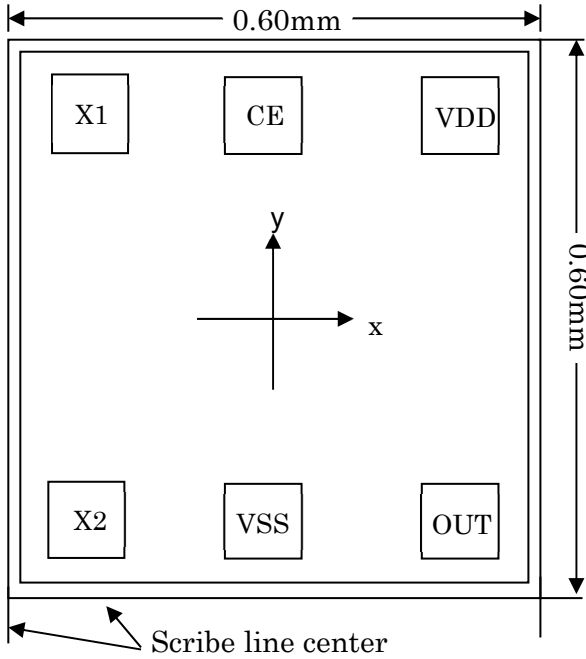

Fig. 6-1 Block Diagram

7. Pad Layout
7-1 Cross Type

- Die Size：0.60mm × 0.60mm
- Pad Size：80um □
- Thickness：100μm or 130μm ± 10um
- IC Backside：Gnd or Open
- Scribe Line：80um

Pad Name	Function	Location (μm) x	Location (μm) y
VDD	(+)Power Supply	195	187
OUT(Q)	Frequency Output	195	-187
VSS	(-)Ground	-20	-187
X2	Crystal Drive	-187	-187
X1	Crystal Feedback	-187	187
CE	Oscillation stop, "L": High-Impedance	-20	187
Chip Center		0	0

Fig. 7-1 Pad Layout of IPS0593N0X
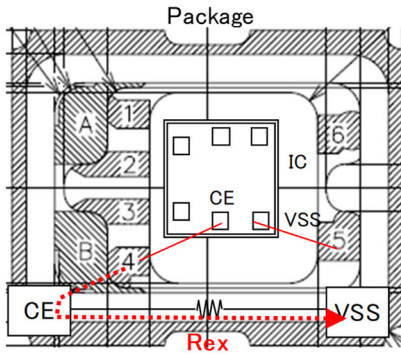
IMPORTANT Notice for CE function

※ Oscillation will not be activated when CE=Open after CE=Low if Rex is not large.

※ Reference value of Rex is over 10MΩ with CE=Open usage.

※ There is no such issue with CE=VDD usage.

Rex ： Resistance value between CE and VSS of package