## ■ Description
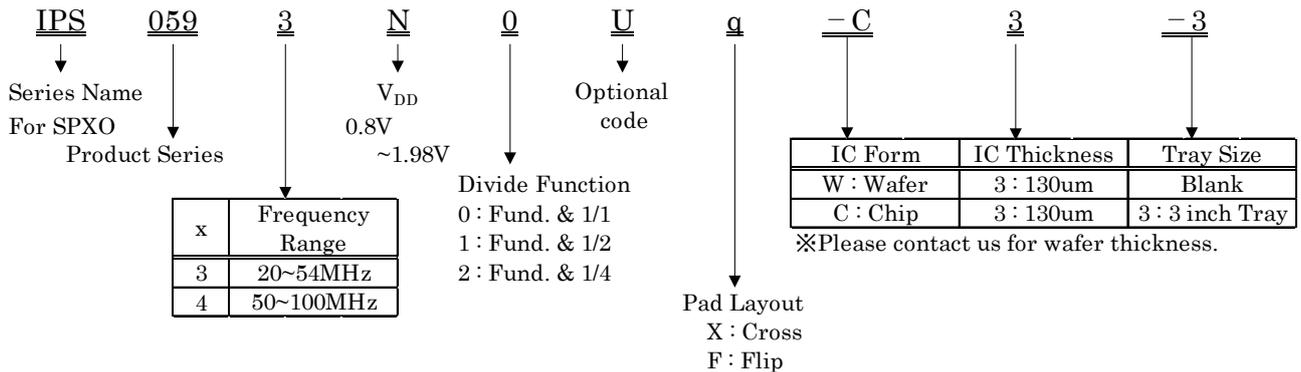
IPS059xNzUq is successor of IPS0593N0X and IPS029xN series. IPS059xNzUq is the Low operation voltage (0.8V~1.98V) CMOS output SPXO IC.

## ■ Features

- Operating Voltage : 0.8V~1.98V
- Output frequency : 20MHz~100MHz
- Crystal mode : Fundamental
- Chip size : 0.55mm × 0.56mm
- Operation temperature : -40℃~125℃
- Standby function : Oscillation stop
- Output : CMOS
- Divider function : 1/2, 1/4

## 1. Part number rule

IPS 059 3 N 0 U q −C 3 −3

Series Name
For SPXO

Product Series

$V_{DD}$
0.8V
~1.98V

| x | Frequency Range |
|---|---|
| 3 | 20~54MHz |
| 4 | 50~100MHz |

Divide Function
0 : Fund. & 1/1
1 : Fund. & 1/2
2 : Fund. & 1/4

Optional code

Pad Layout
X : Cross
F : Flip

| IC Form | IC Thickness | Tray Size |
|---|---|---|
| W : Wafer | 3 : 130um | Blank |
| C : Chip | 3 : 130um | 3 : 3 inch Tray |

※Please contact us for wafer thickness.

**INTERCHIP CORPORATION**

## 2. Series

| Part Number | Crystal Frequency f（MHz） | | | Divide | Output Frequency F0 (MHz) | | Remarks |
|---|---|---|---|---|---|---|---|
| | Mode | Min. | Max. | | Min. | Max. | |
| IPS059 3 N 0 U X | Fund. | 20.00 | 54.00 | 1/1 | 20.00 | 54.00 | |
| IPS059 3 N 0 U F | | | | | | | |
| IPS059 3 N 1 U X | | | | 1/2 | 10.00 | 27.00 | |
| IPS059 3 N 1 U F | | | | | | | |
| IPS059 3 N 2 U X | | | | 1/4 | 5.00 | 13.50 | |
| IPS059 3 N 2 U F | | | | | | | |
| IPS059 4 N 0 U X | | 50.00 | 100.00 | 1/1 | 50.00 | 100.00 | |
| IPS059 4 N 0 U F | | | | | | | |
| IPS059 4 N 1 U X | | | | 1/2 | 25.00 | 50.00 | |
| IPS059 4 N 1 U F | | | | | | | |
| IPS059 4 N 2 U X | | | | 1/4 | 12.50 | 25.00 | |
| IPS059 4 N 2 U F | | | | | | | |

Please contact us for gray color models.

## 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 | 3.5 | 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

### 5-1. IPS0593N0U

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 *f=54MHz | $I_{DD}$ | IPS0593N0, $V_{DD}$=0.9V | | | 3.5 | mA |
| | | IPS0593N0, $V_{DD}$=1.8V | | | 5.5 | |
| | | IPS0593N1, $V_{DD}$=0.9V | | | 3.0 | |
| | | IPS0593N1, $V_{DD}$=1.8V | | | 5.0 | |
| | | IPS0593N2, $V_{DD}$=0.9V | | | 2.5 | |
| | | IPS0593N2, $V_{DD}$=1.8V | | | 4.0 | |
| Current consumption at oscillation disable | $I_{DDD}$ | CE=GND | | | 50.0 | μA |
| Freq. $V_{DD}$ deviation | $F_{VST}$ | $V_{DD}$=0.9V±10% | | | ±1.0 | ppm |
| | | $V_{DD}$=1.8V±10% | | | ±1.0 | |
| Output Duty Ratio | Duty | | 45 | | 55 | % |
| Rise time/Fall time | Tr/Tf | | | | 5.0 | ns |

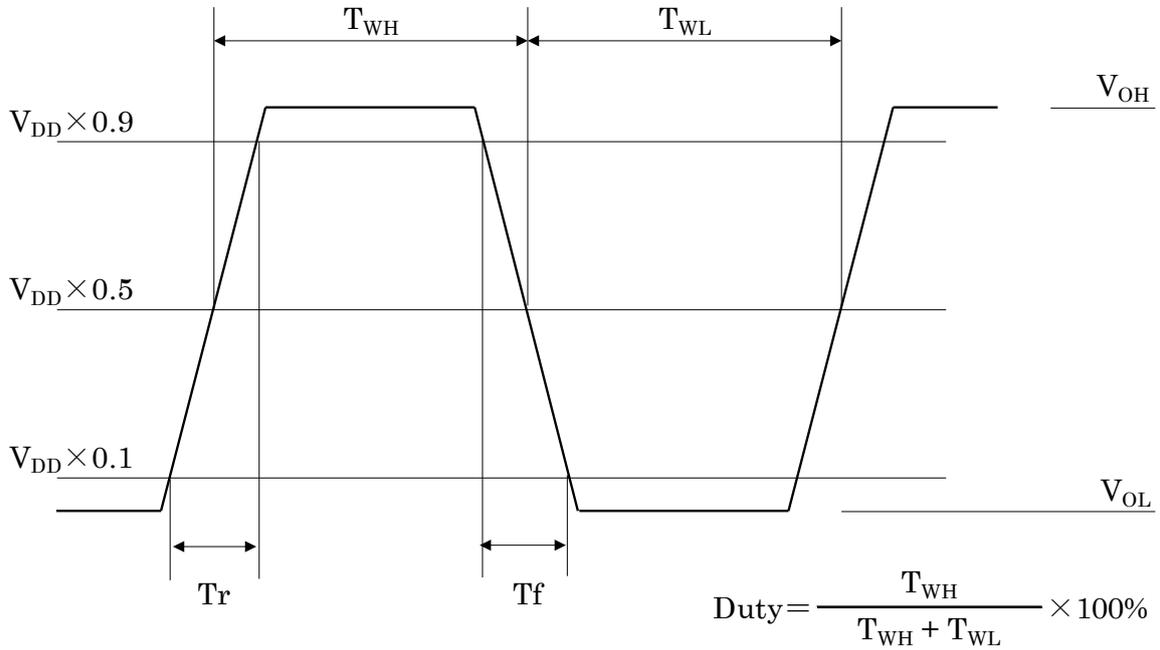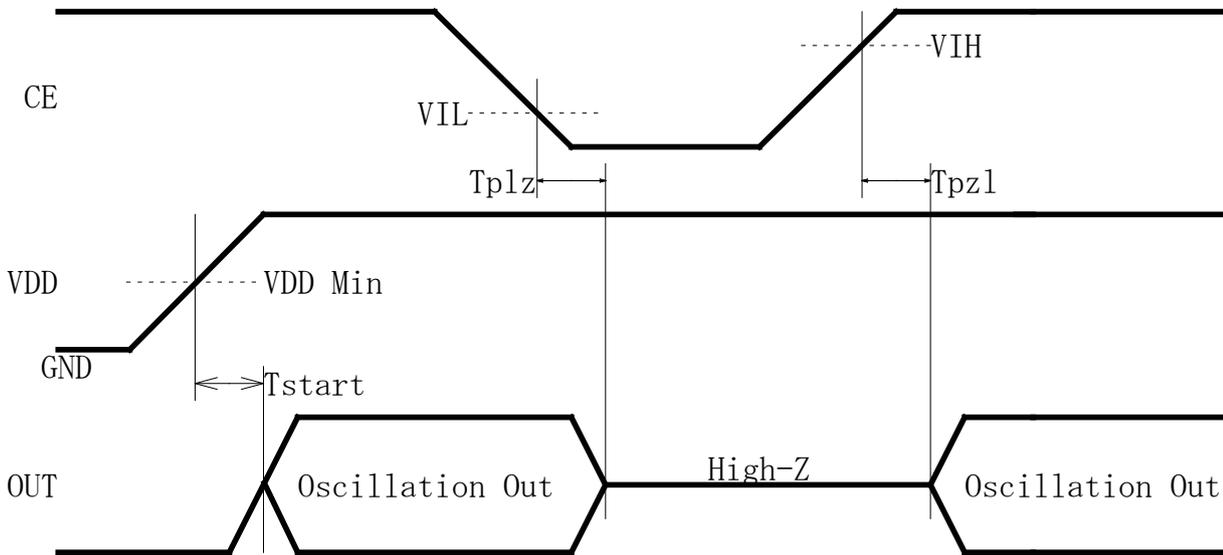$$Duty = \frac{T_{WH}}{T_{WH} + T_{WL}} \times 100\%$$

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)

### 6-1 IPS0593

Ta=25℃

| Parameter | Symbol | Condition | Typical value | Unit |
|---|---|---|---|---|
| Feedback Resistor | Rf | | 350 | kΩ |
| Driving Resistor | Rd | | 500 | Ω |
| Oscillation Capacitor | Cg | Gate side | 7.2 | pF |
| | Cd | Drain side | 7.2 | pF |

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

### 6-2 IPS0594

Ta=25℃

| Parameter | Symbol | Condition | Typical value | Unit |
|---|---|---|---|---|
| Feedback Resistor | Rf | | 350 | kΩ |
| Driving Resistor | Rd | | 500 | Ω |
| Oscillation Capacitor | Cg | Gate side | 2.4 | pF |
| | Cd | Drain side | 2.4 | pF |

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



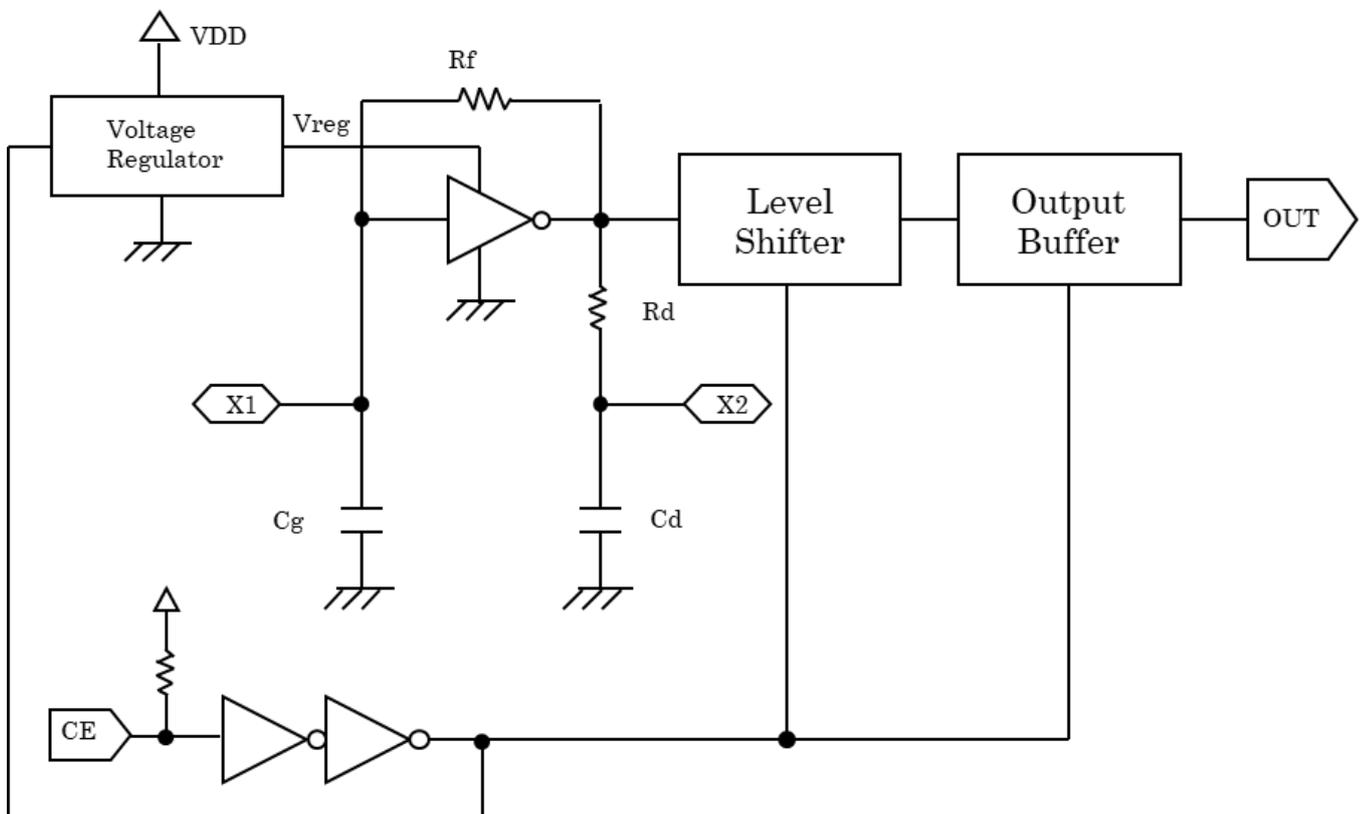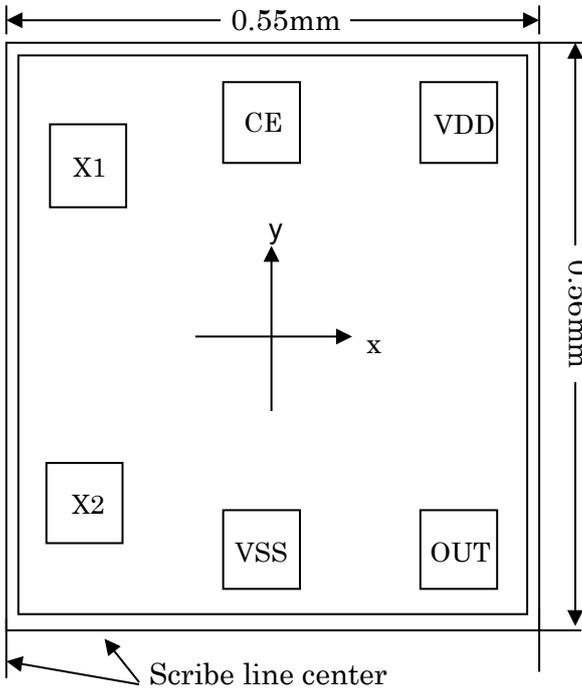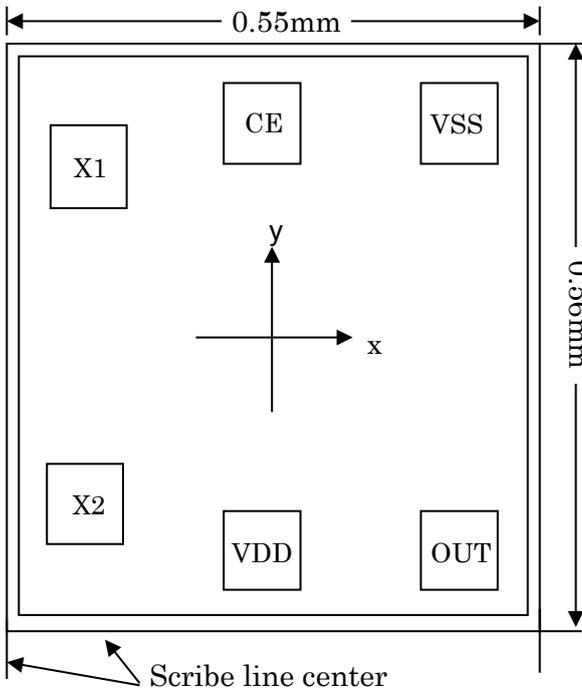Fig. 6-1 Block Diagram

## 7. Pad Layout

### 7-1 Cross Type



・Die Size：0.55mm × 0.56mm

・Pad Size：80um □

・Thickness：130um ±10um

・IC Backside：Gnd or Open

・Scribe Line：80um

| Pad Name | Function | Location (μm) | |
|---|---|---|---|
| | | x | y |
| X2 | Crystal Drive | -175.55 | -143.15 |
| VSS | (−) Ground | 0.00 | -180.55 |
| OUT(Q) | Frequency Output | 175.55 | -180.55 |
| VDD | (+) Power Supply | 175.55 | 180.55 |
| CE | Oscillation stop "L": High-Impedance | 0.00 | 180.55 |
| X1 | Crystal Feedback | 175.55 | -143.15 |
| Chip Center | | 0 | 0 |

Fig. 7-1 Pad Layout of Cross Type

### 7-2 Flip Type



・Die Size：0.55mm × 0.56mm

・Pad Size：80um □

・Thickness：130um ±10um

・IC Backside：Gnd or Open

・Scribe Line：80um

| Pad Name | Function | Location (μm) | |
|---|---|---|---|
| | | x | y |
| X2 | Crystal Drive | -175.55 | -143.15 |
| VDD | (+) Power Supply | 0.00 | -180.55 |
| OUT(Q) | Frequency Output | 175.55 | -180.55 |
| VSS | (−) Ground | 175.55 | 180.55 |
| CE | Oscillation stop "L": High-Impedance | 0.00 | 180.55 |
| X1 | Crystal Feedback | 175.55 | -143.15 |
| Chip Center | | 0 | 0 |

Fig. 7-2 Pad Layout of Flip Type

Package
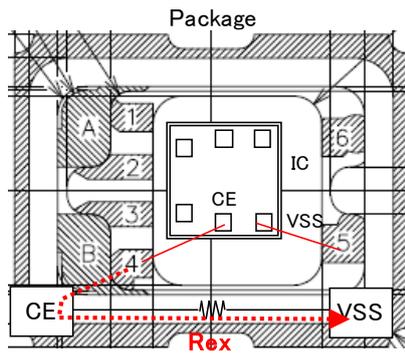
## IMPORTANT Notice for CE function

※ 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

**INTERCHIP CORPORATION**

8. Revision History

| Revision No. | Revision Date | Revised items | Before Revision | After Revision |
|---|---|---|---|---|
| SC-9.3 | 2025/11/04 | Wafer thickness 100um (Flip) | Listed | As requested |
| | | 1.Part number rule | Tray size：2 | Tray size：3 |
| | | Data sheet Number | SS-4 | SC-9 |
| | | $I_{DDD}$ Condition (CE) | CE=0V | CE=GND |
| | | 6-1 IPS0593 / Feedback Resistor | Rf=300kΩ | Rf=350kΩ |
| SC-9.4 | 2026/02/24 | $I_{DD}$ Parameter | *CL=15pF, F0=54MHz | *f=54MHz |
| | | | | |
| | | | | |