

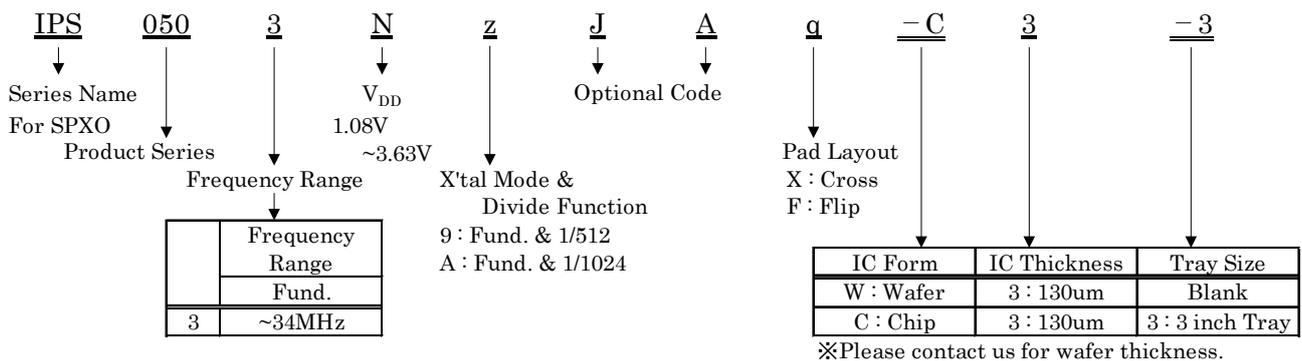
■ Description

IPS050*JA [kHz] series is the specific SPXO IC for achieving 32.768kHz output by divide. The power consumption of IPS050*JA [kHz] series is quite Low, and comparable with tuning fork solution.

■ Features

- Power consumption : 12μA typical (IPS0503NAJAq, V_{DD}=3.3V, No Load, Ta=25°C)
- Divide function : 1/512 and 1/1024
- Output frequency : 32.768kHz
- Operation temperature : -40°C~125°C
- Power supply voltage : 1.08V~3.63V
- Standby function : Oscillation stop
- Output : CMOS
- Small chip size : 0.55mm × 0.54mm
- Frequency stability to V_{DD} : Within ±1.0ppm

1. Part number rule



Under Development

2. Series

| Part Number | Crystal Frequency f (MHz) | Divide | Output Frequency F0 (kHz) | Pad Layout | Remarks |
|--------------------|------------------------------|--------|------------------------------|---------------|---------|
| IPS050 3 N 9 J A X | 16.777 | 1/512 | 32.768 | Cross | |
| IPS050 3 N A J A X | 33.554 | 1/1024 | | | |
| IPS050 3 N 9 J A F | 16.777 | 1/512 | 32.768 | Flip | |
| IPS050 3 N A J A F | 33.554 | 1/1024 | | | |

Please contact us for gray color models.

3. Absolute Maximum Ratings

Unless otherwise stated, $V_{SS}=0V$, $T_a=25^{\circ}C\pm 2^{\circ}C$

| Parameter | Symbol | Condition | Ratings | | |
|----------------------|-----------|--------------|--------------|--------------|-------------|
| | | | Min | Max | Unit |
| Supply Voltage | V_{DD} | | $V_{SS}-0.5$ | 5.0 | V |
| Input Voltage | V_{IN} | Except below | $V_{SS}-0.5$ | $V_{DD}+0.5$ | V |
| | | X1, X2 | $V_{SS}-0.5$ | 2.0 | |
| Output Voltage | V_{OUT} | | $V_{SS}-0.5$ | $V_{DD}+0.5$ | V |
| Output Current | I_{OUT} | | | 25 | mA |
| Junction Temperature | T_j | | -55 | 150 | $^{\circ}C$ |
| Storage Temperature | T_{stg} | | -55 | 125 | $^{\circ}C$ |

4. Recommended Operating Condition

Unless otherwise stated, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Note |
|-------------------------|-----------|-----------|----------|-----|----------|-------------|----------|
| Supply Voltage | V_{DD} | | 1.08 | | 3.63 | V | V_{DD} |
| Input Voltage | V_{IN} | | V_{SS} | | V_{DD} | V | CE |
| Output Load Capacitance | CL | CMOS | | | 15 | pF | OUT |
| Ambient Temperature | T_{opt} | | -40 | | 125 | $^{\circ}C$ | |

5. Electrical Specification

 Unless otherwise stated, $V_{DD}=1.08V\sim 3.63V$, $V_{SS}=0V$, $CL=15pF$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

| Parameter | Symbol | Condition | Specification | | | Unit | |
|--|-------------|---|---------------|-----|-------------|---------|---------|
| | | | Min | Typ | Max | | |
| Output leak current | I_z | CE=0V, X1=2.0V or V_{SS} $V_{out}=V_{SS}\sim V_{DD}$ | | | 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 | T_{plz} | OUT Pad | | | 0.2 | μs | |
| Oscillation Enable Time | T_{pzl} | OUT Pad | | | 2.0 | ms | |
| Oscillation Start up Time | T_{start} | $V_{DD}=1.2V$ | | | 5.0 | ms | |
| | | $V_{DD}=1.8V, V_{DD}=3.3V$ | | | 2.0 | | |
| “H” output voltage | V_{OH} | OUT Pad, $I_{OH}=-1.0mA$, $V_{DD}=3.3V$ | $0.9V_{DD}$ | | | V | |
| “L” output voltage | V_{OL} | OUT Pad, $I_{OL}=1.0mA$, $V_{DD}=3.3V$ | | | $0.1V_{DD}$ | V | |
| Current consumption | I_{DD} | $V_{DD}=1.2V$ No Load | IPS0503N9JA | | | TBD | μA |
| | | | IPS0503NAJA | | | 26.0 | |
| | | $V_{DD}=1.8V$ No Load | IPS0503N9JA | | | 14.5 | |
| | | | IPS0503NAJA | | | 26.0 | |
| | | $V_{DD}=3.3V$ No Load | IPS0503N9JA | | | 15.0 | |
| | | | IPS0503NAJA | | | 27.0 | |
| Current consumption at oscillation disable | I_{DDD} | $V_{DD}=3.3V$, CE=GND | | 0.6 | 3.0 | μA | |
| Freq. V_{DD} deviation | F_{VST} | $V_{DD}\pm 10\%$ ($V_{DD}=1.2V, 1.8V, 3.3V$) | | | ± 1.0 | ppm | |
| Output Duty Ratio | Duty | $CL=15pF$, $1/2V_{DD}$ point | 45 | | 55 | % | |
| Rise time/Fall time | T_r/T_f | $CL=15pF$ $10\%\leftrightarrow 90\%V_{DD}$ | $V_{DD}=1.2V$ | | | 30.0 | ns |
| | | | $V_{DD}=1.8V$ | | | 15.0 | |
| | | | $V_{DD}=3.3V$ | | | 7.5 | |

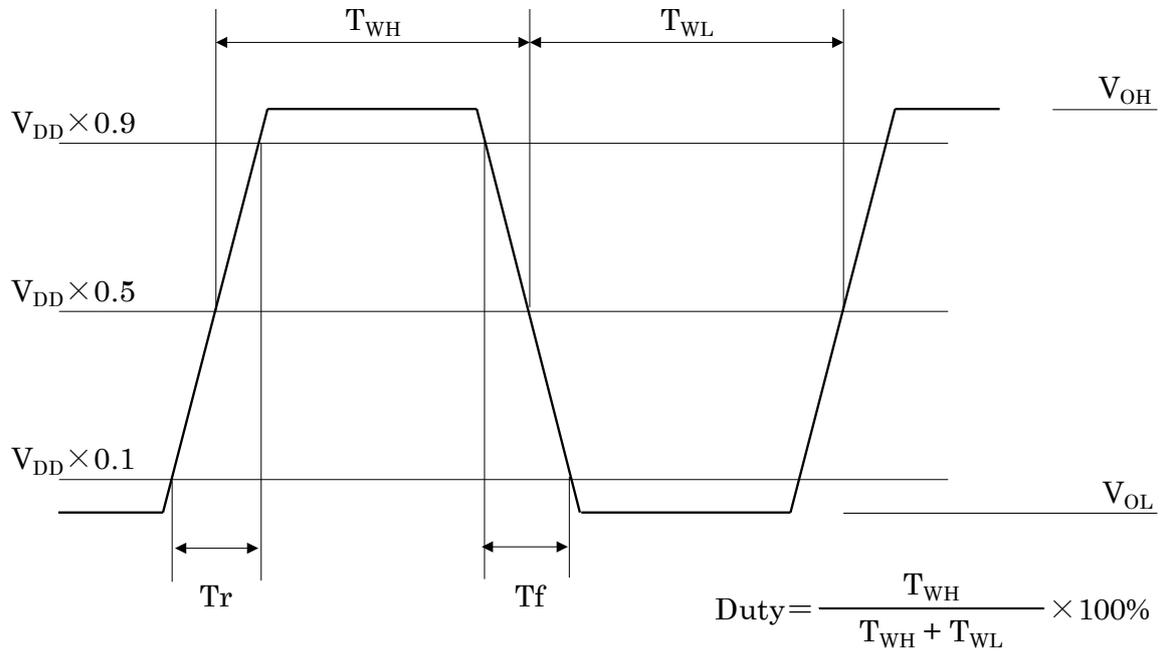
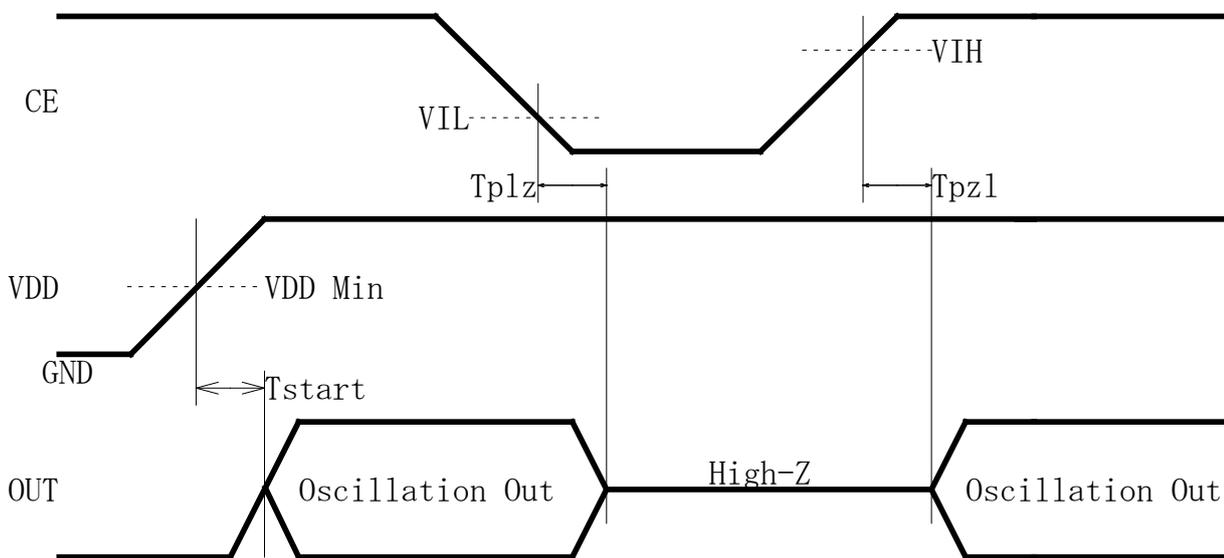


Fig. 5-1 Output wave form (Duty, Tr, Tf, VOH, VOL)



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)
 $T_a=25^{\circ}\text{C}$

| Parameter | Symbol | Condition | Typical value | Unit |
|-----------------------|--------|------------|---------------|------------|
| Regulated Voltage | Vreg | | 0.8 | V |
| Feedback Resistor | Rf | | 570 | k Ω |
| Driving Resistor | Rd | | 1000 | Ω |
| Oscillation Capacitor | Cg | Gate side | 3.0 | pF |
| | Cd | Drain side | 1.0 | pF |

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

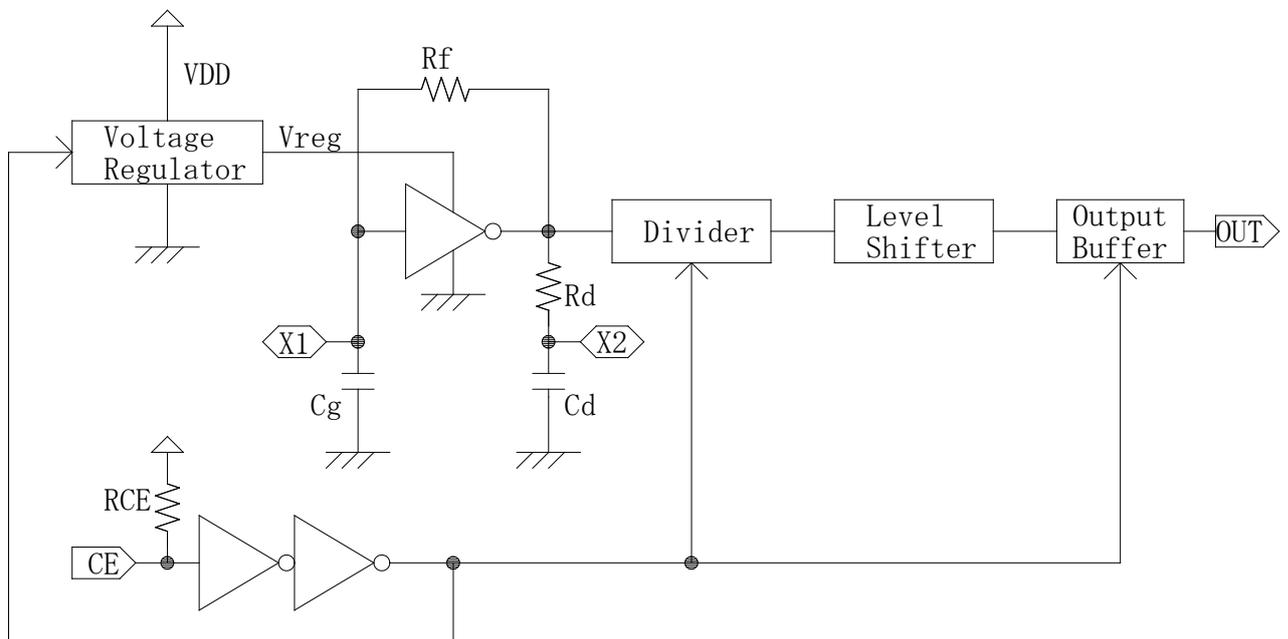
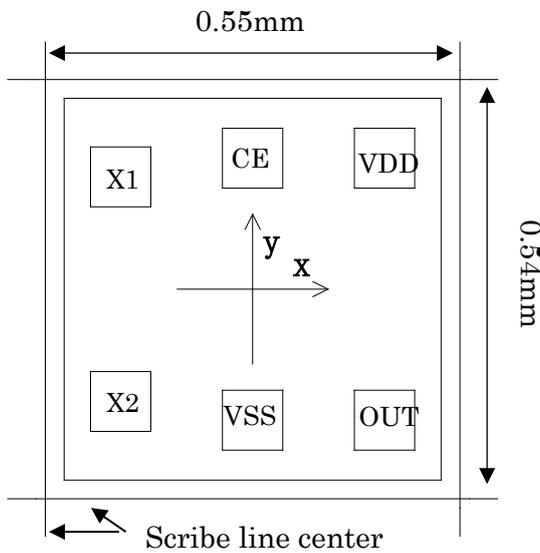


Fig. 6-1 Block Diagram

7. Pad Layout

7-1 Cross Type

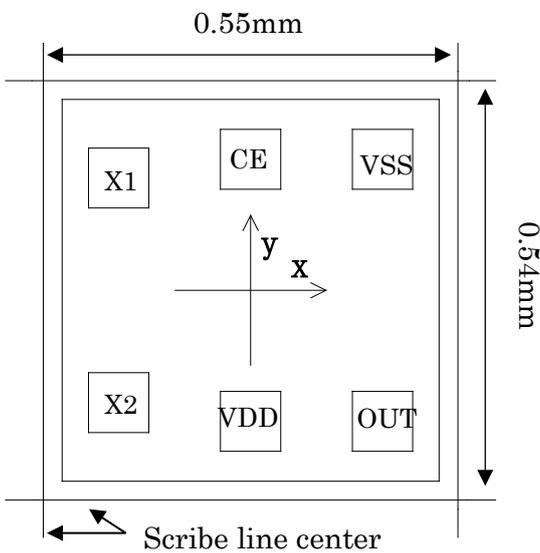


- Die Size: 0.55mm × 0.54mm
- Pad Size: 80um □
- Thickness: 130um±10um
- Scribe Line: 60um
- IC Backside: Gnd or Open

| Pad Name | Function | Location (μm) | |
|-------------|---|---------------|------|
| | | x | y |
| VDD | (+) Power Supply | 180 | 175 |
| OUT(Q) | Frequency Output | 180 | -175 |
| VSS | (-) Ground | 0 | -175 |
| X2 | Crystal Drive | -180 | -150 |
| X1 | Crystal Feedback | -180 | 150 |
| CE | Oscillation stop "L": High-Impedance | 0 | 175 |
| Chip Center | | 0 | 0 |

Fig. 7-1 Pad Layout of IPS0503NzJAX

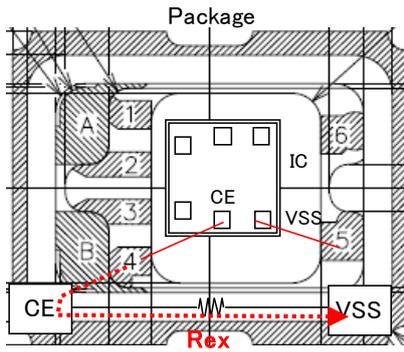
7-2 Flip Type



- Die Size: 0.55mm × 0.54mm
- Pad Size: 80um □
- Thickness: 130um±10um
- Scribe Line: 60um
- IC Backside: Gnd or Open

| Pad Name | Function | Location (μm) | |
|-------------|---|---------------|------|
| | | x | y |
| VSS | (-) Ground | 180 | 175 |
| OUT(Q) | Frequency Output | 180 | -175 |
| VDD | (+) Power Supply | 0 | -175 |
| X2 | Crystal Drive | -180 | -150 |
| X1 | Crystal Feedback | -180 | 150 |
| CE | Oscillation stop "L": High-Impedance | 0 | 175 |
| Chip Center | | 0 | 0 |

Fig. 7-2 Pad Layout of IPS0503NzJAF



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

8. Revision History

| Revision No. | Revision Date | Revised items | Before Revision | After Revision |
|--------------|---------------|---------------|-----------------|----------------|
| SC-7.1 | 2025/11/04 | 1st edition | - | - |
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