■ Description

IPS021A and B types are Phase Noise improved versions of the IPS020PE Differential output SPXO-IC series, with narrowed VOH and VOL specifications. The output type is LVPECL.

■ Features

- Operation temperature : -40℃~125℃
- Power supply voltage : 2.375V~2.625V (A version)
  2.97V~3.63V (B version)
- Standby function : Oscillation stop
- Output : LVPECL
- Crystal mode : Fundamental & 3rd overtone
- Small chip size : 0.65mm × 0.75mm
- Pad layout : Straight type & Flip type
- Duty cycle : Within 50%±5%
- Low Phase Jitter : ~40fs@F0=156MHz,Vdd=3.3V

1. Part number rule

IPS 021 x M z P v q −W 1

Series Name For SPXO

Product Series

y	V_{DD}
M	2.375V~3.63V

Output Type
P : LVPECL

V_{DD} Version
A : 2.5V±5%
B : 3.3V±10%

IC Form	Thickness	Definition
−W	1	Wafer 150um
Blank or −C	Blank	Chip 150um

※Please contact us for wafer thickness.

X'tal Mode
0 : Fund.
T : 3rd

x	Frequency Range	
	Fund.	3rd
4	50~125MHz	100~125MHz
5	100~160MHz	125~160MHz

Pad Layout
S : Straight
F : Flip

2. Series

Part Number	Output	Crystal Frequency (MHz)			Divide	Output Frequency (MHz)		Remarks
		Mode	Min.	Max.		Min.	Max.	
IPS021 4 M 0 P A S	LVPECL	Fund.	50	125	1/1	50	125	A version V_{DD}=2.5V±5% B version V_{DD}=3.3V±10%
IPS021 4 M 0 P A F								
IPS021 4 M 0 P B S								
IPS021 4 M 0 P B F								
IPS021 5 M 0 P A S			100	160		100	160	
IPS021 5 M 0 P A F								
IPS021 5 M 0 P B S								
IPS021 5 M 0 P B F								
IPS021 4 M T P A S		3rd	100	125		100	125	
IPS021 4 M T P A F								
IPS021 4 M T P B S								
IPS021 4 M T P B F								
IPS021 5 M T P A S			125	160		125	160	
IPS021 5 M T P A F								
IPS021 5 M T P B S								
IPS021 5 M T P B F								

Please contact us for gray color models.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25℃± 2℃

Parameter	Symbol	Condition	Ratings		
			Min	Max	Unit
Supply Voltage	V_{DD}		V_{SS}-0.5	5.0	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

V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	V_{DD}	A version	2.375		2.625	V	V_{DD}
		B version	2.97		3.63		
"H" Input Voltage	V_{IH}		V_{DD}×0.7			V	CE
"L" Input Voltage	V_{IL}				V_{DD}×0.3	V	CE
Input Voltage	V_{IN}		V_{SS}		V_{DD}	V	CE
Output Load Resistance	RL	LVPECL *	49.5	50.0	50.5	Ω	OUT
Ambient Temperature	Topt		-40		125	℃	

This IC has enough immunity against ESD and Latch-up, but handle with care.

* Terminate to V_{DD}-2.0V

5. Electrical Specification

5-1 LVPECL Output

5-1-1 DC Characteristics

Unless otherwise stated, V_{DD}=2.5V±5%(A version) or 3.3V±10%(B version), V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition		Specification Min	Typ	Max	Unit
Output leak current	I_Z	CE=0.3V				10	μA
"L" input current	I_{IL}	V_{IN}=V_{SS}			-10		μA
"H" output voltage*	V_{OH}	CE=Open OUT/OUTN	A version	V_{DD} -1.085	V_{DD} -0.950	V_{DD} -0.860	V
			B version	V_{DD} -1.085	V_{DD} -0.950	V_{DD} -0.880	
"L" output voltage*	V_{OL}	CE=Open OUT/OUTN	A version	V_{DD} -1.810	V_{DD} -1.700	V_{DD} -1.620	V
			B version	V_{DD} -1.810	V_{DD} -1.700	V_{DD} -1.620	
Current consumption*	I_{DD}	IPS0214M0P, F0=122MHz				55.0	mA
		IPS0215M0P, F0=160MHz				60.0	
		IPS0214MTP, F0=125MHz				55.0	
		IPS0215MTP, F0=160MHz				60.0	
Current consumption at oscillation stop	I_{DDD}	CE=GND				10	uA

*Condition : CE=Open, RL=50Ω (Terminated to V_{DD}-2.0V)

5-1-2 Switching Characteristics

Unless otherwise stated, V_{DD}=2.5V±5%(A version) or 3.3V±10%(B version), V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	Tstart	Fund			2.0	ms
		3rd			10.0	
Output Disable Time	Tplz				200	ns
Output Enable Time	Tpzl	Fund			2.0	ms
		3rd			10.0	
Rise time / Fall time	Tr / Tf	20%~80% Vopp			0.50	ns
Output Duty Ratio	Duty	1/2Vopp point	45		55	%
Output Swing	Vopp		0.4			V
Freq. V_{DD} deviation	Fvst	V_{DD}=2.5V±5% (A version)			±2.0	ppm
		V_{DD}=3.3V±10% (B version)			±2.0	

Condition : CE=Open, RL=50Ω (Terminated to VDD-2.0V)

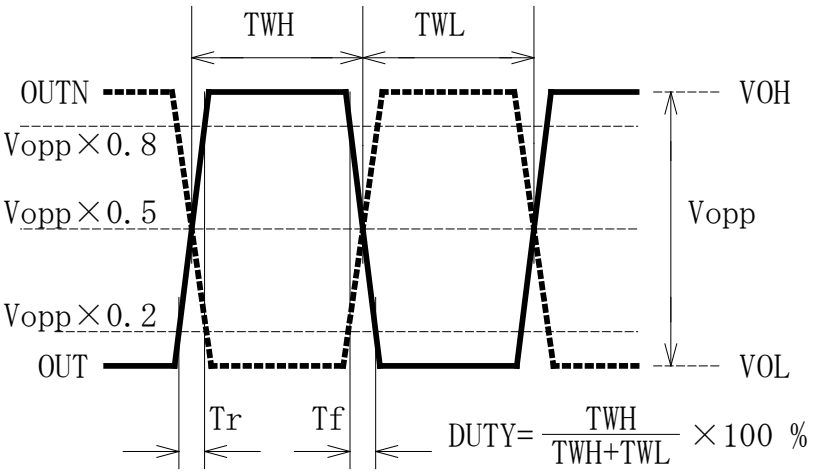
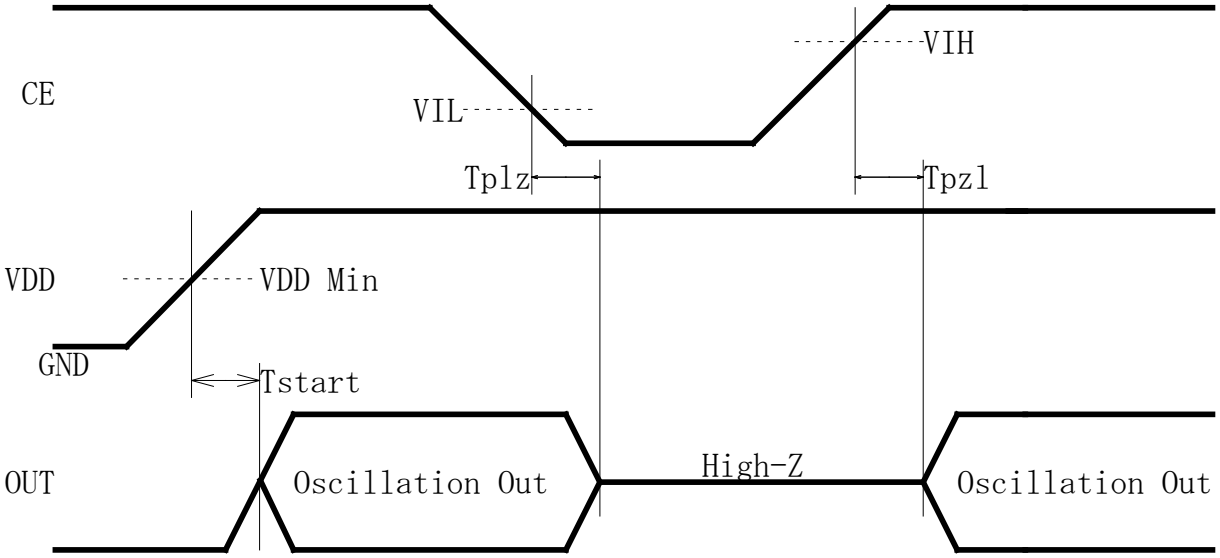


Fig. 5-1　Output Wave Form (Duty, Tr, Tf, V_{OH}, V_{OL}, Vopp) of LVPEL



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	Min	Typ	Max	Unit
Feedback Resistor	IPS0214M0P IPS0215M0P	Rf	Refer to Fig. 6-1		200		kΩ
	IPS0214MT				2.25		
	IPS0215MTP				1.5		
Driving Resistor	IPS0214M0P	Rd			750		Ω
	IPS0215M0P				500		
	IPS0214MTP				50		
	IPS0215MTP				50		
Oscillation Capacitor	IPS0214M0P	Cg			5.0		pF
		Cd			8.0		
	IPS0215M0P	Cg			5.0		
		Cd			7.0		
	IPS0214MTP	Cg			7.0		
		Cd			14.0		
	IPS0215MTP	Cg			7.0		
		Cd			12.0		

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

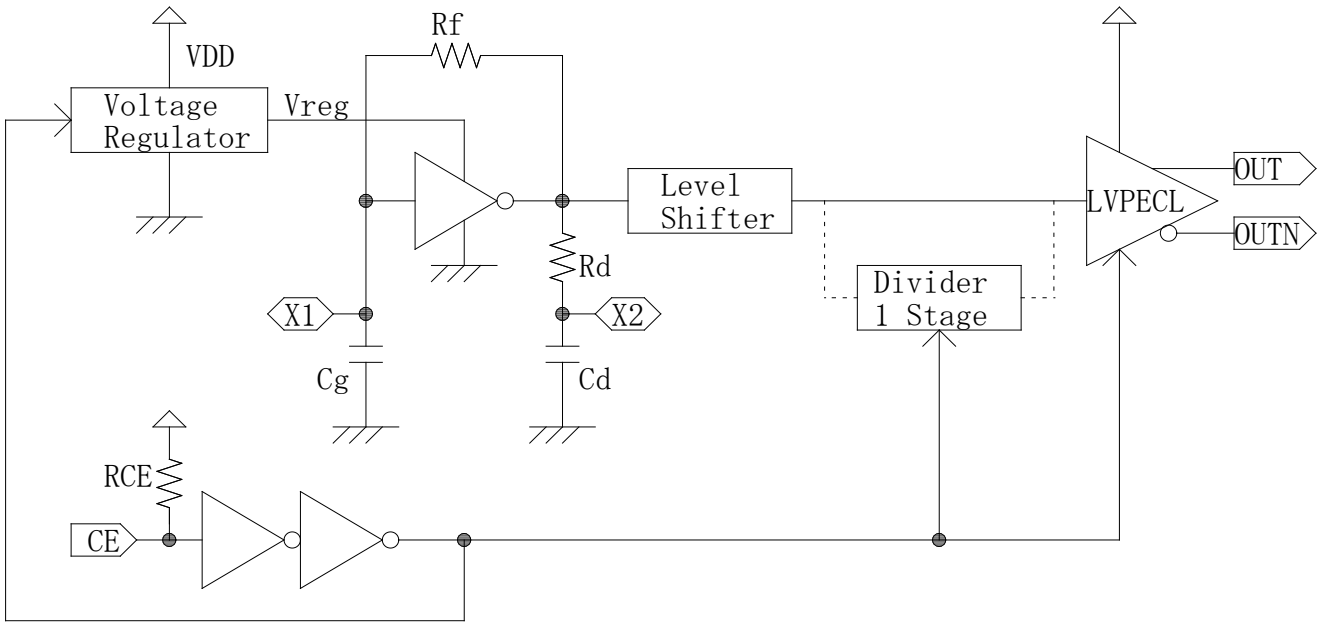
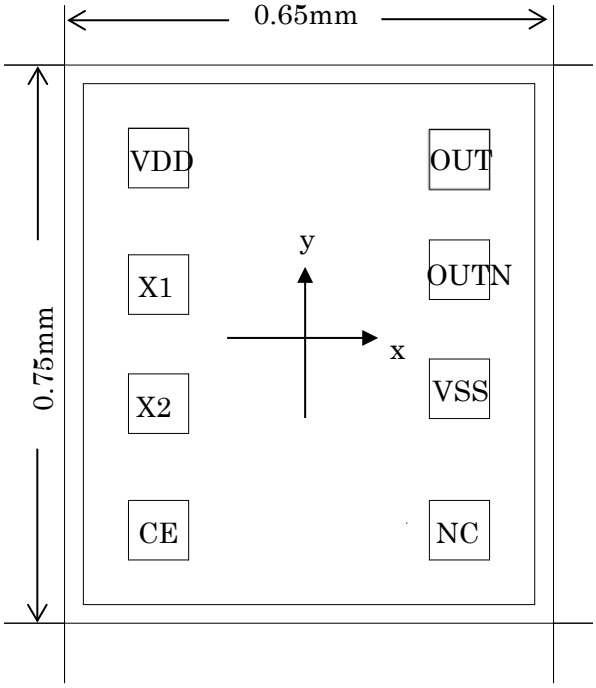


Fig. 6-1 Block Diagram

7. Pad Layout

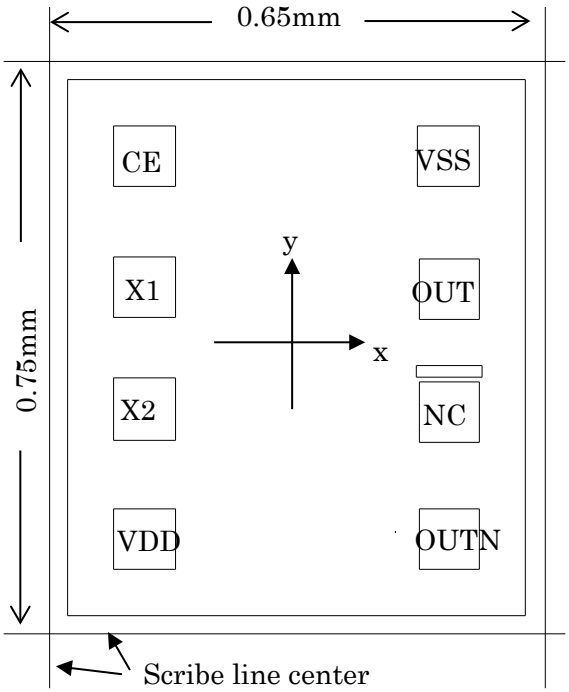
7-1 Straight Type



- Die Size: 0.65mm × 0.75mm
- Pad Size: 80um □
- Thickness: 150um ±20um
- IC Backside: Gnd or Open
- Swapping of OUT/OUTN with wire bond is acceptable

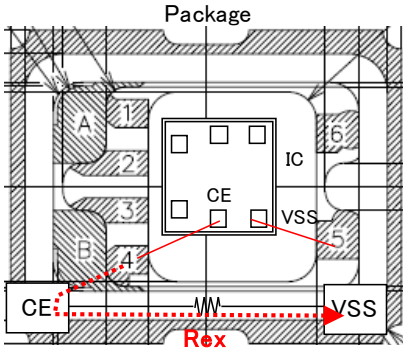
Pad Name	Function	Location (μm)	
		x	y
VDD	(+) Power Supply	-216	266
X1	Crystal Feedback	-216	83
X2	Crystal Drive	-216	-83
CE	Oscillation stop "L": High-Impedance	-216	-266
NC	NC	216	-266
VSS	(−) Ground	216	-83
OUTN	OUT(Complementary)	216	90
OUT	OUT(True)	216	266
Chip Center		0	0

7-2 Flip Type



- Die Size: 0.65mm × 0.75mm
- Pad Size: 80um □
- Thickness: 100um or 150um ±20um
- IC Backside: Gnd or Open
- Swapping of OUT/OUTN with wire bond is acceptable

Pad Name	Function	Location (μm)	
		x	y
CE	Oscillation stop "L": High-Impedance	-216	266
X1	Crystal Feedback	-216	83
X2	Crystal Drive	-216	-83
VDD	(+) Power Supply	-216	-266
OUTN	OUT(Complementary)	216	-266
NC	NC	216	-83
OUT	OUT(True)	216	90
VSS	(−) Ground	216	266
Chip Center		0	0



IMPORTANT Notice for CE function

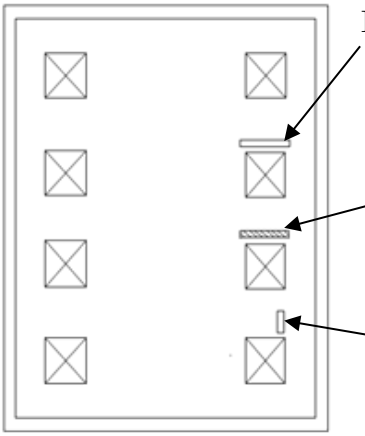
※ Oscillation will not be activated when CE=Open after CE=Low if Rex is not large.

※ 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. IC Part # Identification



IC Identification Code
Fuse □□□ □□□ □□
Code 1 2 3 4 5 6 7 8

LOGO : IPS021_M_q
q = Pad LayOut (S/F)

IC Identification Code
Fuse □□
Code 9 10

Part #	Code 1~8	Code 9, 10
IPS0214M0PAq	■□□ □□□ □□	□■
IPS0214M0PBq	■□□ □□□ □□	■□
IPS0215M0PAq	■□■ □□□ □□	□■
IPS0215M0PBq	■□■ □□□ □□	■□
IPS0214MTPAq	■□□ ■□□ □□	□■
IPS0214MTPBq	■□□ ■□□ □□	■□
IPS0215MTPAq	■□■ ■□□ □□	□■
IPS0215MTPBq	■□■ ■□□ □□	■□

□ : Fuse no cut ■ : Fuse cut

9. Revision History

Revision No.	Revision Date	Revised items	Before Revision	After Revision
SD-8.1	2025/11/07	1st edition	-	-