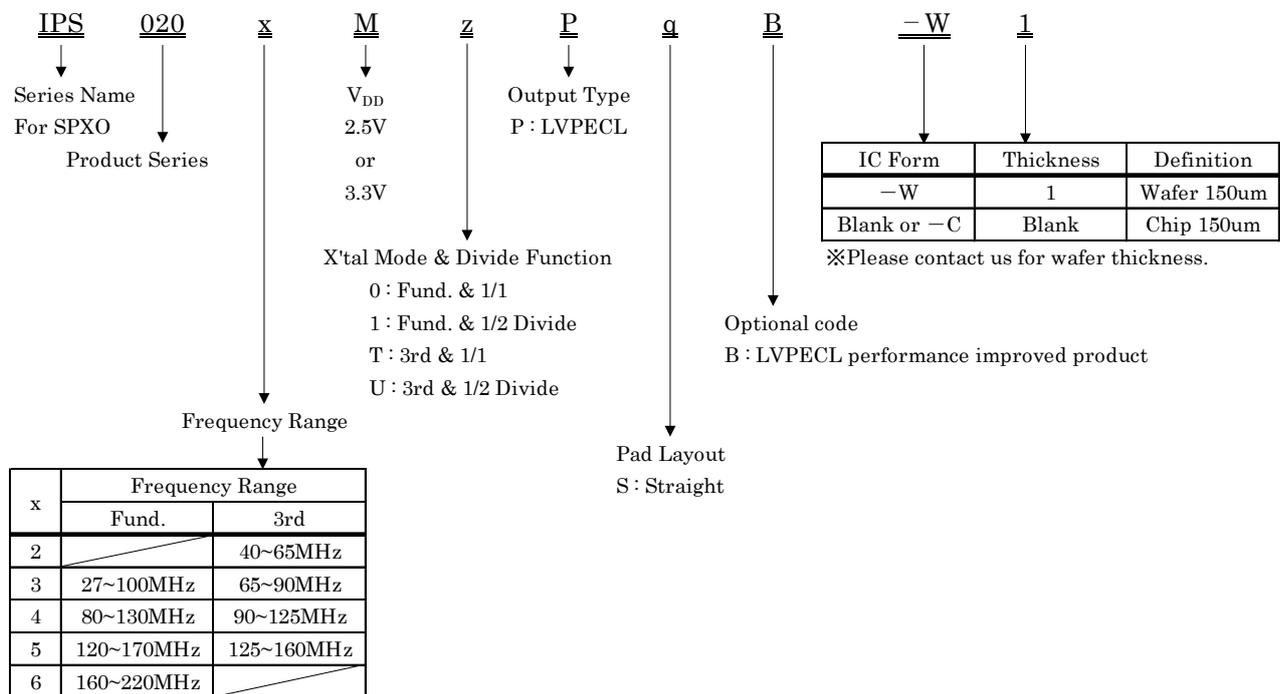## ■ Description

IPS020*B is the IC for differential output SPXO corresponding to the fundamental crystal from 27MHz to 220MHz, and operation voltage is 2.375V minimum. 3rd overtone oscillation is also available.

■ Features

- Operation temperature ：-40℃~125℃
- Power supply voltage ：2.375V~3.63V
- Standby function ：Oscillation stop
- Crystal frequency ：27MHz~220MHz
- Output ：LVPECL
- Divide function ：1/2
- Small chip size ：0.65mm × 0.75mm
- Frequency stability to V_{DD} ：Within ±2ppm
- Duty cycle ：Within 50%±5%
- Pad layout ：Straight type

1. Part number rule

IPS 020 x M z P q B −W 1

Series Name
For SPXO

Product Series

V_{DD}
2.5V
or
3.3V

Output Type
P：LVPECL

X'tal Mode & Divide Function
0：Fund. & 1/1
1：Fund. & 1/2 Divide
T：3rd & 1/1
U：3rd & 1/2 Divide

Frequency Range

x	Frequency Range	
	Fund.	3rd
2		40~65MHz
3	27~100MHz	65~90MHz
4	80~130MHz	90~125MHz
5	120~170MHz	125~160MHz
6	160~220MHz	

Pad Layout
S：Straight

Optional code
B：LVPECL performance improved product

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

※Please contact us for wafer thickness.

2. Series

Part Number	Output	Output Frequency F0 (MHz)		Crystal Mode	Divide	Remarks
		Min.	Max.			
IPS020 3 M 0 P S B	LVPECL	27.0	100.0	Fund.	1/1	
IPS020 3 M 1 P S B		13.5	50.0		1/2	
IPS020 4 M 0 P S B		80.0	130.0		1/1	
IPS020 5 M 0 P S B		120.0	170.0		1/1	
IPS020 6 M 0 P S B		160.0	220.0		1/1	
IPS020 2 M T P S B	LVPECL	40.0	65.0	3rd	1/1	
IPS020 2 M U P S B		20.0	32.5		1/2	X'tal f=40MHz~65MHz
IPS020 3 M T P S B		65.0	90.0		1/1	
IPS020 4 M T P S B		90.0	125.0		1/1	
IPS020 5 M T P S B		125.0	160.0		1/1	

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}		2.375	3.30	3.63	V	V_{DD}
"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	Terminated to V_{DD}-2.0V	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.

5. Electrical Specification

5-1 IPS020xMzPSB (z=0, 1)

5-1-1 DC Characteristics

Unless otherwise stated, V_{DD}=2.375V~3.63V, V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition		Specification			Unit
				Min	Typ	Max	
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}	RL=50Ω(Terminated to V_{DD}-2.0V) CE=Open, OUT/OUTN		V_{DD} -1.025	V_{DD} -0.950	V_{DD} -0.880	V
"L" output voltage	V_{OL}			V_{DD} -1.810	V_{DD} -1.700	V_{DD} -1.620	V
Current consumption	I_{DD}	V_{DD}=3.63V CE=Open RL=50Ω (Terminated to V_{DD}-2.0V)	IPS0203M0PSB			42.0	mA
			IPS0203M1PSB			40.0	
			IPS0204M0PSB			44.0	
			IPS0205M0PSB			45.0	
			IPS0206M0PSB			47.0	
Current consumption at oscillation stop	I_{DDD}	CE=GND				10	uA

5-1-2 Switching Characteristics

Unless otherwise stated, V_{DD}=2.375V~3.63V, V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	Tstart				2.0	ms
Output Disable Time	Tplz				200	ns
Output Enable Time	Tpzl				2.0	ms
Rise time / Fall time	Tr / Tf	20%~80% Vopp		0.3	0.6	ns
Output Duty Ratio	Duty	1/2Vopp point	45		55	%
Output Swing	Vopp		0.4			V
Freq. V_{DD} deviation	Fvst	V_{DD}=3.3V±10%			±2.0	ppm
		V_{DD}=2.5V±5%			±2.0	

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5-2 IPS020xMzPSB (z=T, U)
  5-2-1 DC Characteristics

Unless otherwise stated, V_{DD}=2.375V~3.63V, V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition		Specification			Unit
				Min	Typ	Max	
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}	RL=50Ω(Terminated to V_{DD}-2.0V) CE=Open, OUT/OUTN		V_{DD} -1.025	V_{DD} -0.950	V_{DD} -0.880	V
"L" output voltage	V_{OL}			V_{DD} -1.810	V_{DD} -1.700	V_{DD} -1.620	V
Current consumption	I_{DD}	V_{DD}=3.63V CE=Open RL=50Ω (Terminated to V_{DD}-2.0V)	IPS0202MTPSB			47.0	mA
			IPS0202MUPSB			46.0	
			IPS0203MTPSB			48.0	
			IPS0204MTPSB			49.0	
			IPS0205MTPSB			50.0	
Current consumption at oscillation stop	I_{DDD}	CE=GND				10	uA

  5-2-2 Switching Characteristics

Unless otherwise stated, V_{DD}=2.375V~3.63V, V_{SS}=0V, Ta=-40℃~125℃

Parameter	Symbol	Condition		Specification			Unit
				Min	Typ	Max	
Oscillation start up time	Tstart					10	ms
Output Disable Time	Tplz					200	ns
Output Enable Time	Tpzl					10	ms
Rise time / Fall time	Tr / Tf	20%~80% Vopp			0.3	0.6	ns
Output Duty Ratio	Duty	1/2Vopp point	Ta=-40℃~85℃	45		55	%
			Ta=85℃~125℃	40		60	
Output Swing	Vopp			0.4			V
Freq. V_{DD} deviation	Fvst	V_{DD}=3.3V±10%				±2.0	ppm
		V_{DD}=2.5V±5%				±2.0	

$$DUTY = \frac{TWH}{TWH+TWL} \times 100 \ \%$$

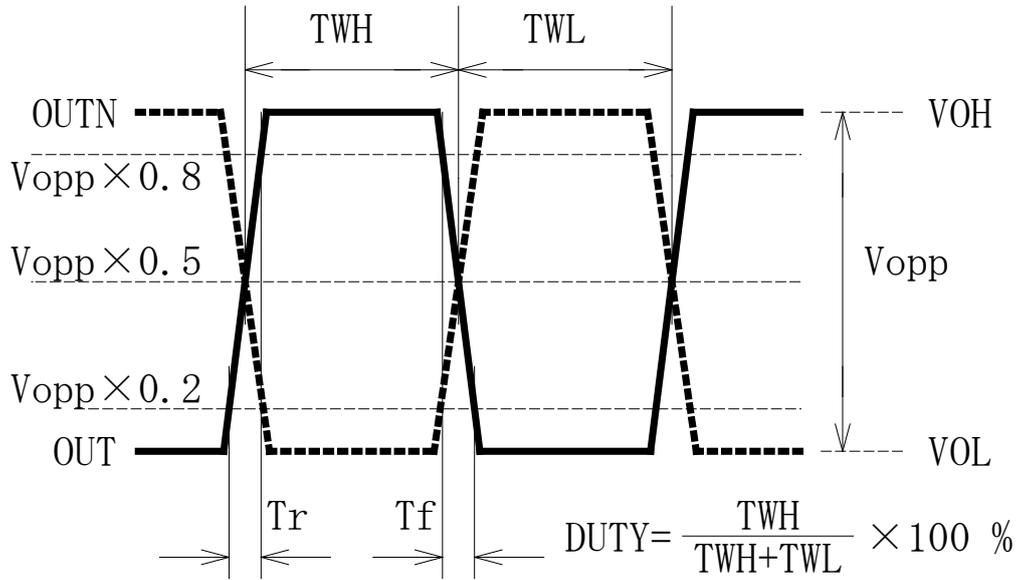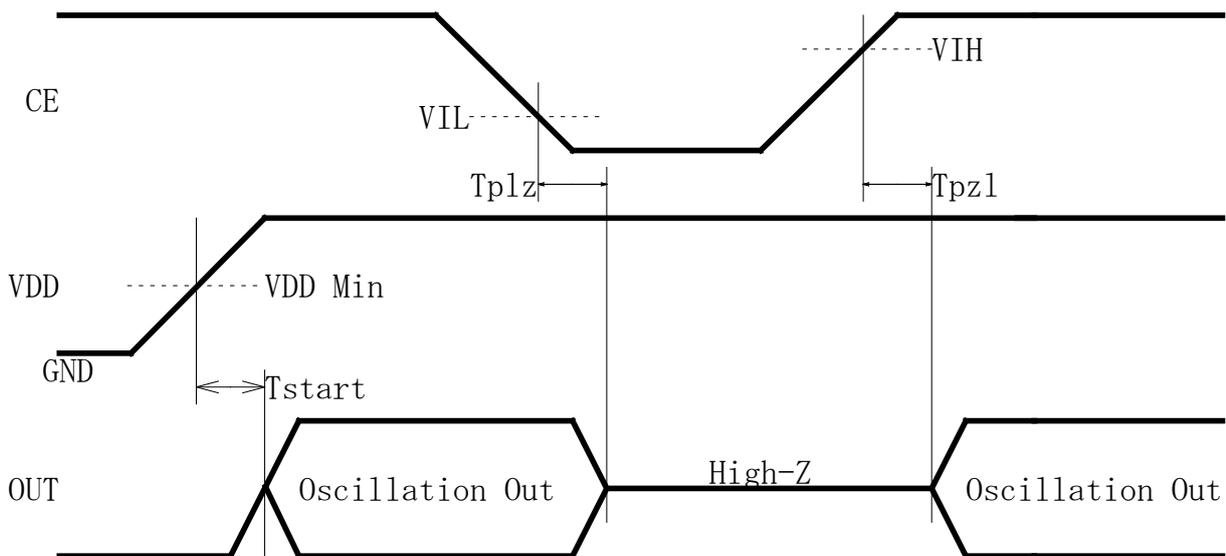Fig. 5-1   Output Wave Form (Duty, Tr, Tf, V_{OH}, V_{OL}, Vopp)

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

Fig. 5-2   Input output signal timing

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

Ta=25℃

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	IPS020xM0PSB IPS0203M1PSB	Rf	Refer to Fig. 6-1		200		kΩ
	IPS0202MTPSB IPS0202MUPSB				7.00		
	IPS0203MTPSB				4.00		
	IPS0204MTPSB				3.00		
	IPS0205MTPSB				1.75		
Driving Resistor	IPS020xM0PSB IPS0203M1PSB	Rd	Refer to Fig. 6-1		1000		Ω
	IPS0204M0PSB				800		
	IPS0205M0PSB				500		
	IPS0206M0PSB				300		
	IPS0202MTPSB IPS0202MUPSB				800		
	IPS0203MTPSB				500		
	IPS0204MTPSB				400		
	IPS0205MTPSB				200		
Oscillation Capacitor	IPS020xM0PSB IPS0203M1PSB	Cg	Refer to Fig. 6-1		6.0		pF
		Cd			9.0		
	IPS0204M0PSB	Cg			5.0		
		Cd			8.0		
	IPS0205M0PSB	Cg			5.0		
		Cd			7.0		
	IPS0206M0PSB	Cg			4.0		
		Cd			6.0		
	IPS0202MTPSB IPS0202MUPSB	Cg			8.0		
		Cd			10.0		
	IPS0203MTPSB	Cg			7.0		
		Cd			9.0		
	IPS0204MTPSB	Cg			3.0		
		Cd			7.0		
	IPS0205MTPSB	Cg			3.0		
		Cd			7.0		

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

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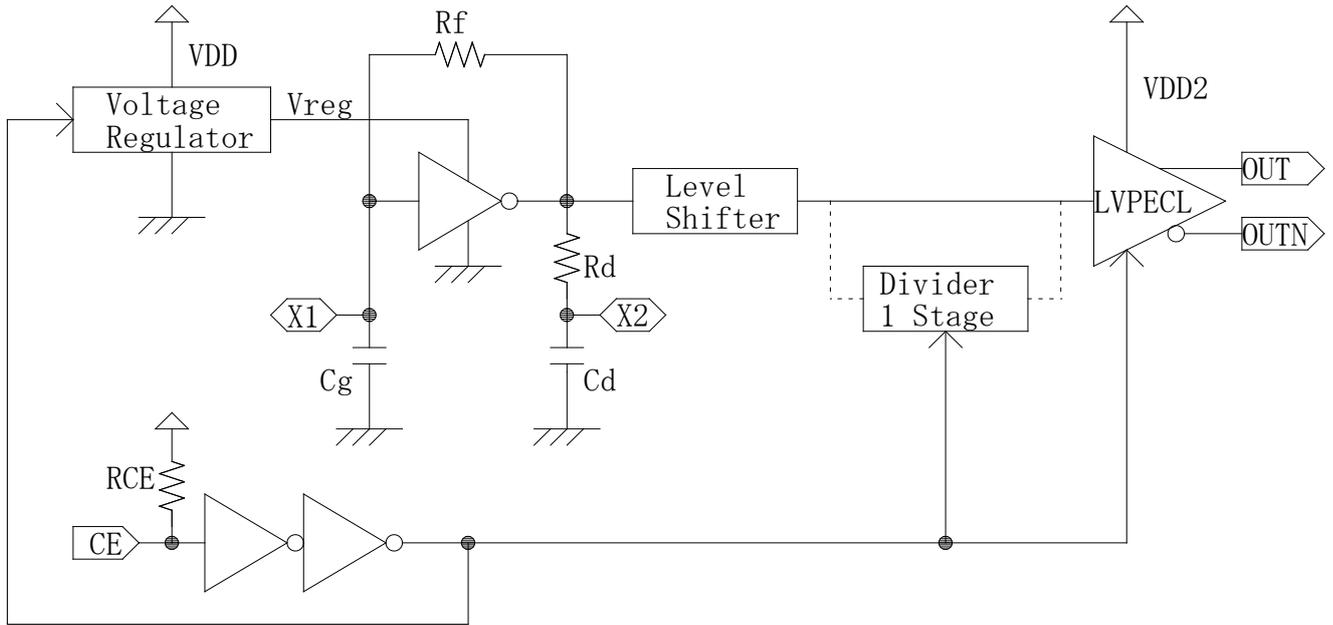
Fig. 6-1　Block Diagram

7.　Pad Layout
7-1 Straight Type

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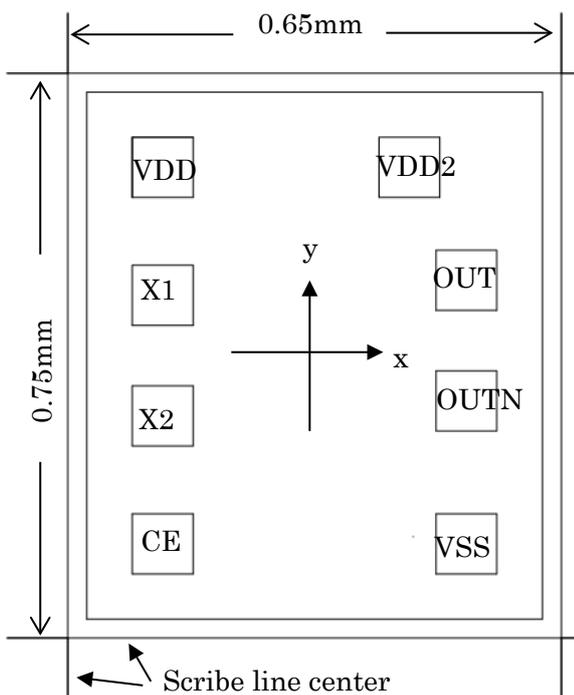
- Die Size：0.65mm × 0.75mm
- Pad Size：80um □
- Thickness：150um±20um
- IC Backside：Gnd or Open
- Swapping of OUT/OUTN with wire bond is acceptable

| Pad Name	Function	Location (μm)	
		x	y
VDD	(＋) Power Supply	-206	256
X1	Crystal Feedback	-206	83
X2	Crystal Drive	-206	-83
CE	Oscillation stop "L": High-Impedance	-206	-256
VSS	(－) Ground	206	-256
OUTN	OUT(Complementary)	206	-65
OUT	OUT(True)	206	108
VDD2	NC is acceptable	113	256
Chip Center		0	0
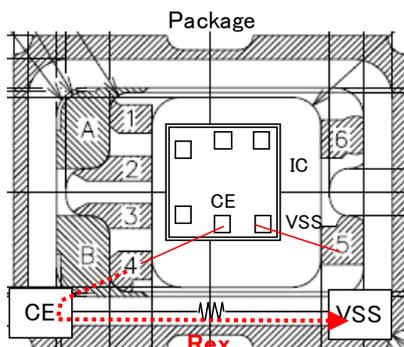
IMPORTANT Notice for CE function

※ 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

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8. IC Part # Identification

LOGO：IPS020_M_S2

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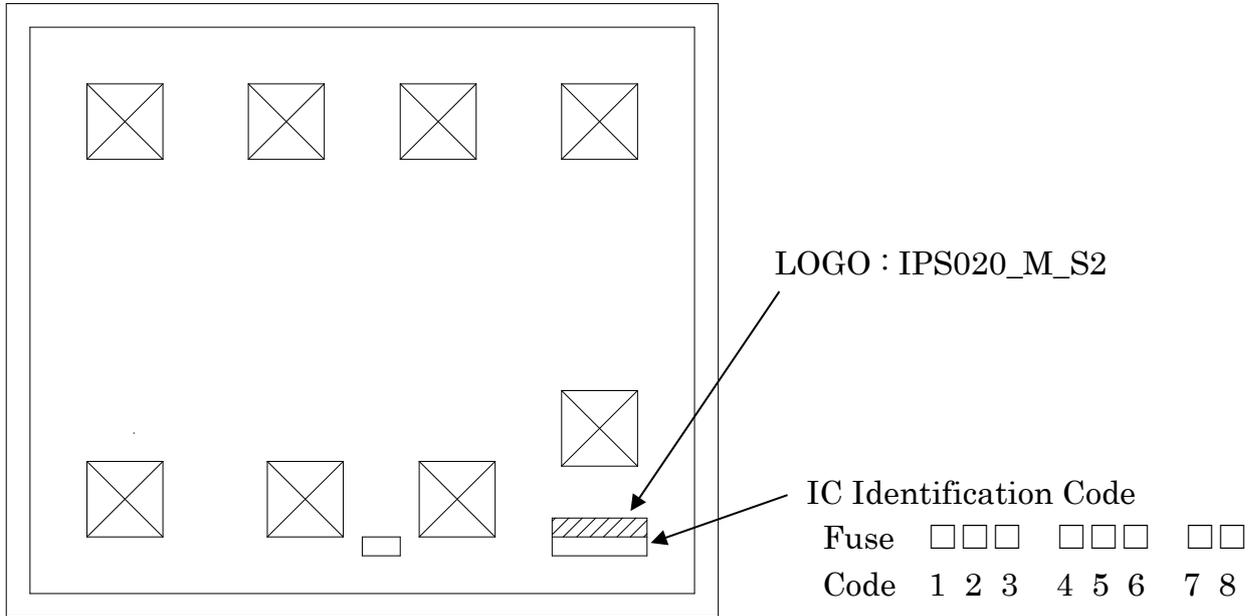
Fuse	□	□	□	□ □ □		□ □	
Code	1	2	3	4 5 6		7 8	

Part #	Code 1~8
IPS0203M0PqB	□■■　□□□　□□
IPS0204M0PqB	■□□　□□□　□□
IPS0205M0PqB	■□■　□□□　□□
IPS0206M0PqB	■■□　□□□　□□
IPS0203M1PqB	□■■　□□■　□□
IPS0202MTPqB	□■□　■□□　□□
IPS0203MTPqB	□■■　■□□　□□
IPS0204MTPqB	■□□　■□□　□□
IPS0205MTPqB	■□■　■□□　□□
IPS0202MUPqB	□■□　■□■　□□

□ ：Fuse no cut

■ ：Fuse cut

9. Revision History

Revision No.	Revision Date	Revised items	Before Revision	After Revision
SD-1.2	2025/11/04	Wafer thickness 100um	Listed	As requested
		IPS0204M0PSB	Under Development	Listed
		IPS0205M0PSB	Under Development	Listed
		IPS0202MUPSB	Under Development	Listed
		I_{DDD} Condition	CE≦0.3V	CE=GND