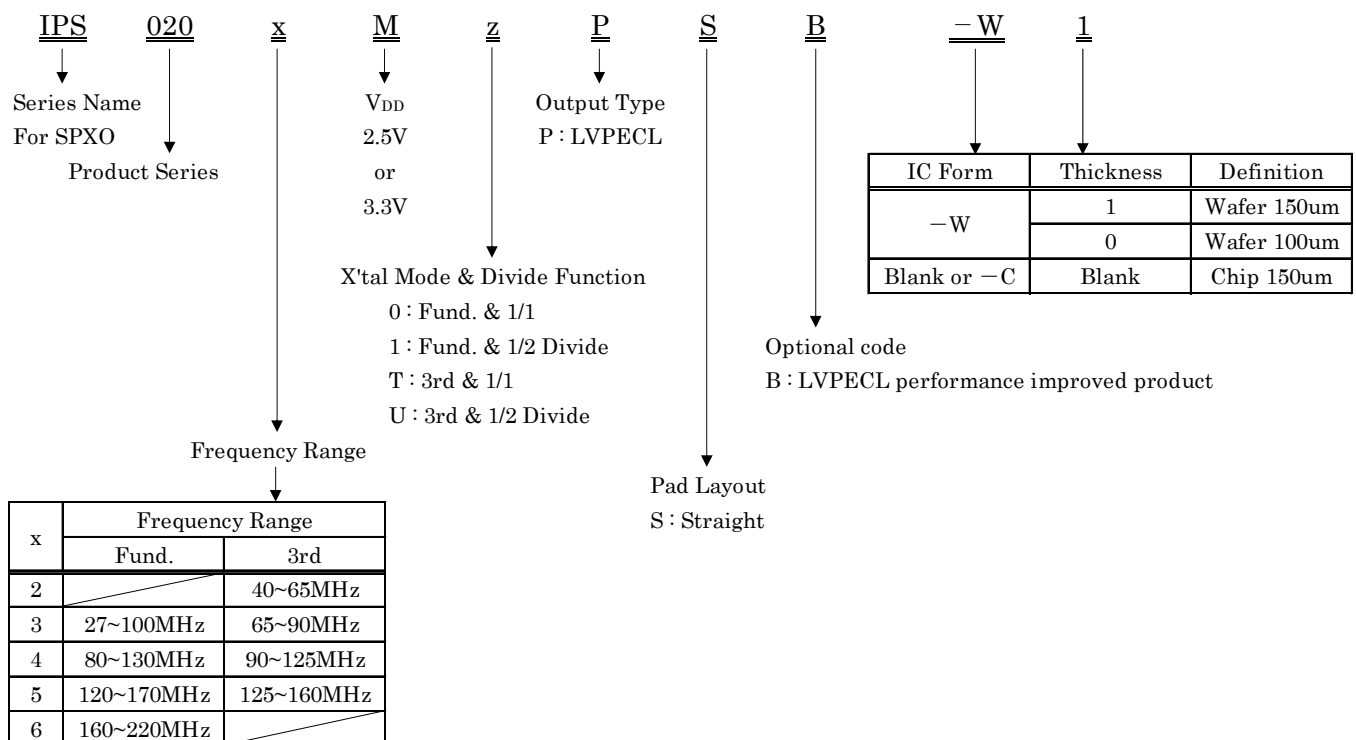


■ Description

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°C~125°C
- 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


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	

Please contact us for gray color models.

3. Absolute Maximum Ratings

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

Parameter	Symbol	Condition	Ratings		
			Min	Max	Unit
Supply Voltage	V_{DD}		$V_{SS}-0.5$	5.0	V
Input Voltage	V_{IN}	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	T_j		-55	150	$^{\circ}C$
Storage Temperature	T_{stg}		-55	125	$^{\circ}C$

4. Recommended Operating Condition

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

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}		$V_{DD} \times 0.7$			V	CE
"L" Input Voltage	V_{IL}				$V_{DD} \times 0.3$	V	CE
Input Voltage	V_{IN}		V_{SS}		V_{DD}	V	CE
Output Load Resistance	R_L	Terminated to $V_{DD}-2.0V$	49.5	50.0	50.5	Ω	OUT
Ambient Temperature	T_{opt}		-40		125	$^{\circ}C$	

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, $V_{DD}=2.375V\sim 3.63V$, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

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}	$RL=50\Omega$ (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}	$V_{DD}=3.63V$ $CE=Open$ $RL=50\Omega$ (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}	$CE\leq 0.3V$			10	μA

5-1-2 Switching Characteristics

 Unless otherwise stated, $V_{DD}=2.375V\sim 3.63V$, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	T_{start}				2.0	ms
Output Disable Time	T_{plz}				200	ns
Output Enable Time	T_{pzl}				2.0	ms
Rise time / Fall time	T_r / T_f	20%~80% V_{opp}		0.3	0.6	ns
Output Duty Ratio	Duty	1/2 V_{opp} point	45		55	%
Output Swing	V_{opp}		0.4			V
Freq. V_{DD} deviation	F_{vst}	$V_{DD}=3.3V\pm 10\%$			± 2.0	ppm
		$V_{DD}=2.5V\pm 5\%$			± 2.0	

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

 Unless otherwise stated, $V_{DD}=2.375V\sim 3.63V$, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

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}	$RL=50\Omega$ (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}	$V_{DD}=3.63V$ $CE=Open$ $RL=50\Omega$ (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}	$CE\leq 0.3V$			10	μA

5-2-2 Switching Characteristics

 Unless otherwise stated, $V_{DD}=2.375V\sim 3.63V$, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim 125^{\circ}C$

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	T_{start}				10	ms
Output Disable Time	T_{plz}				200	ns
Output Enable Time	T_{pzl}				10	ms
Rise time / Fall time	T_r / T_f	20%~80% V_{opp}		0.3	0.6	ns
Output Duty Ratio	Duty	1/2 V_{opp} point	$T_a=-40^{\circ}C\sim 85^{\circ}C$	45	55	%
			$T_a=85^{\circ}C\sim 125^{\circ}C$	40	60	
Output Swing	V_{opp}		0.4			V
Freq. V_{DD} deviation	F_{vst}	$V_{DD}=3.3V\pm 10\%$			± 2.0	ppm
		$V_{DD}=2.5V\pm 5\%$			± 2.0	

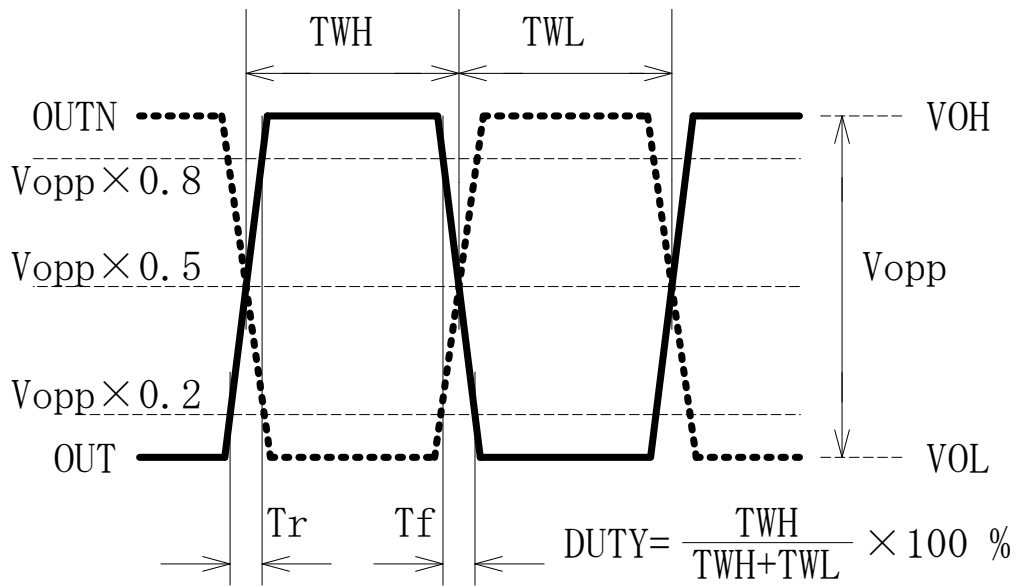
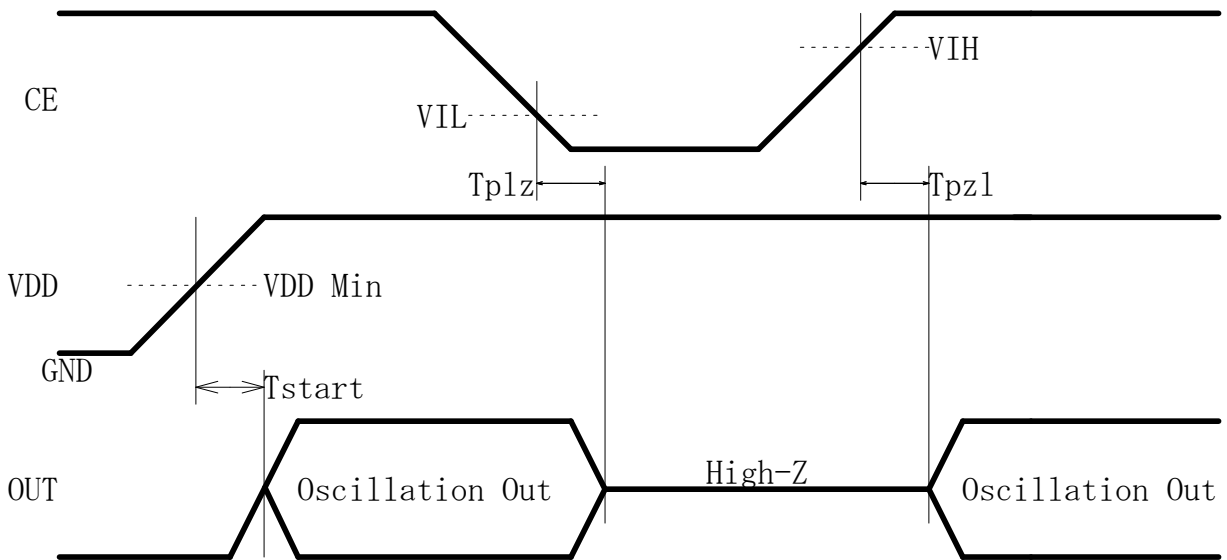


Fig. 5-1 Output Wave Form (Duty, Tr, Tf, V_{OH}, V_{OL}, V_{opp})



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°C

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.

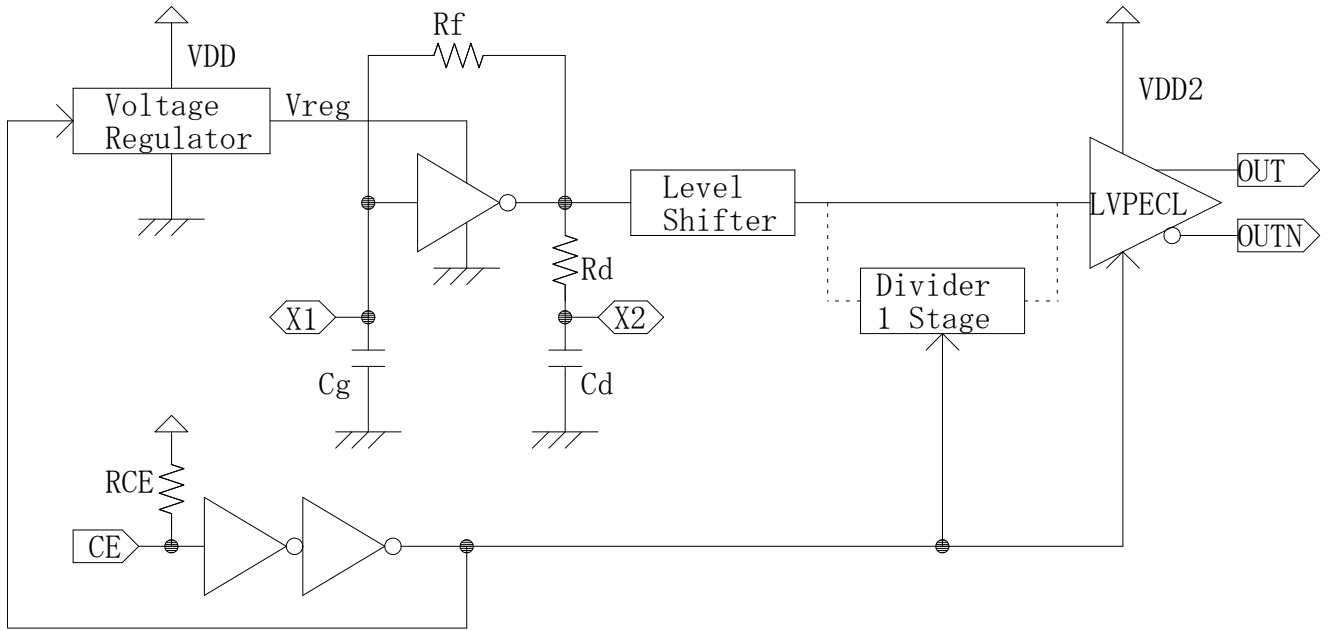
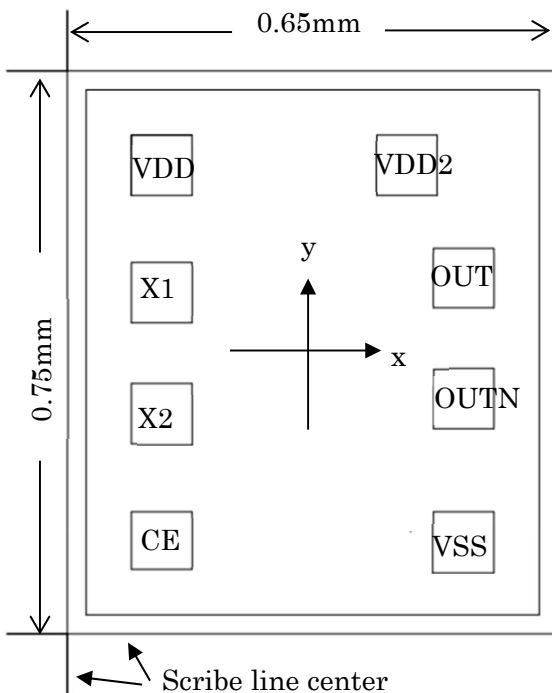


Fig. 6-1 Block Diagram

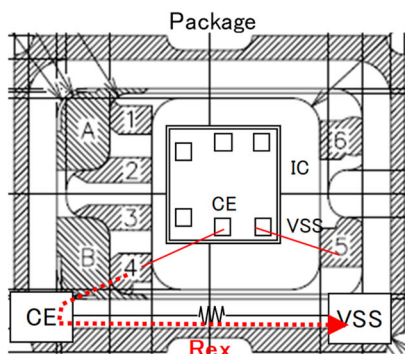
7. Pad Layout

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

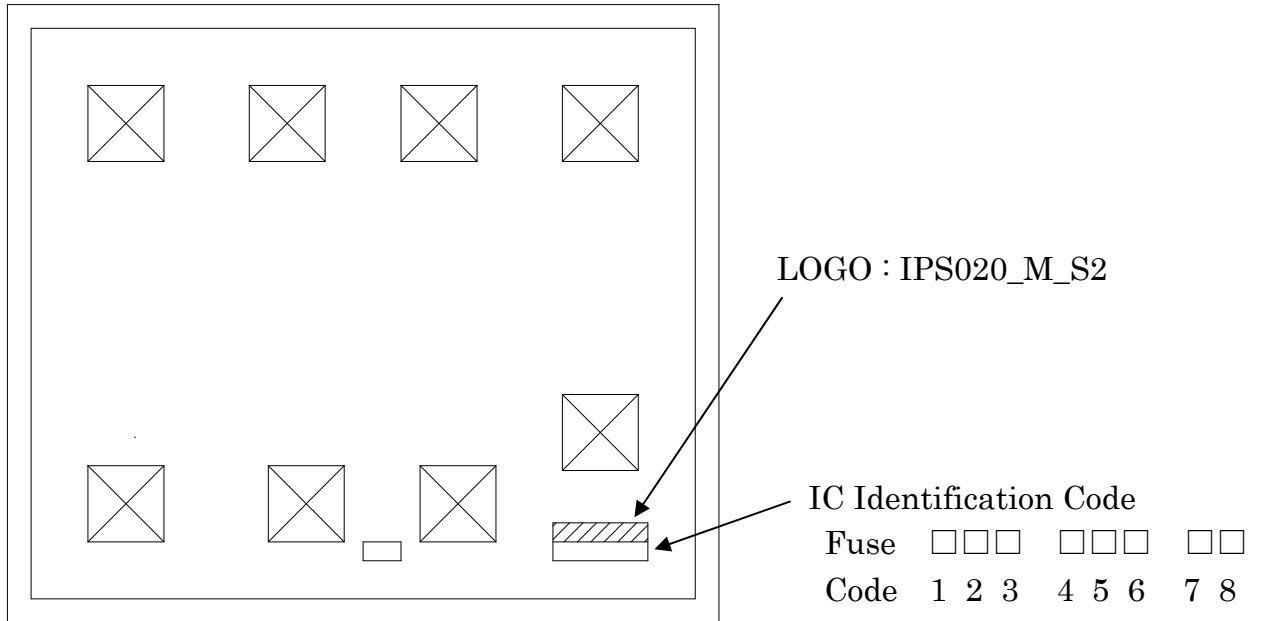
Pad Name	Function	Location (μm)	
		x	y
VDD	(+) Power Supply	-206	256
X1	Crystal Feedback	-206	83
X2	Crystal Drive	-206	-83
CE	Oscillation stop "L": High-Impedance	-206	-256
VSS	(-) Ground	206	-256
OUTN	OUT(Complementary)	206	-65
OUT	OUT(True)	206	108
VDD2	NC is acceptable	113	256
Chip Center		0	0



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

8. IC Part # Identification


Part #	Code 1~8
IPS0203M0PSB	□ ■ ■ □ □ □ □ □
IPS0204M0PSB	■ □ □ □ □ □ □ □
IPS0205M0PSB	■ □ ■ □ □ □ □ □
IPS0206M0PSB	■ ■ □ □ □ □ □ □
IPS0203M1PSB	□ ■ ■ □ □ ■ □ □
IPS0202MTPSB	□ ■ □ ■ □ □ □ □
IPS0203MTPSB	□ ■ ■ ■ □ □ □ □
IPS0204MTPSB	■ □ □ ■ □ □ □ □
IPS0205MTPSB	■ □ ■ ■ □ □ □ □
IPS0202MUPSB	□ ■ □ ■ □ ■ □ □

□ : Fuse no cut

■ : Fuse cut