

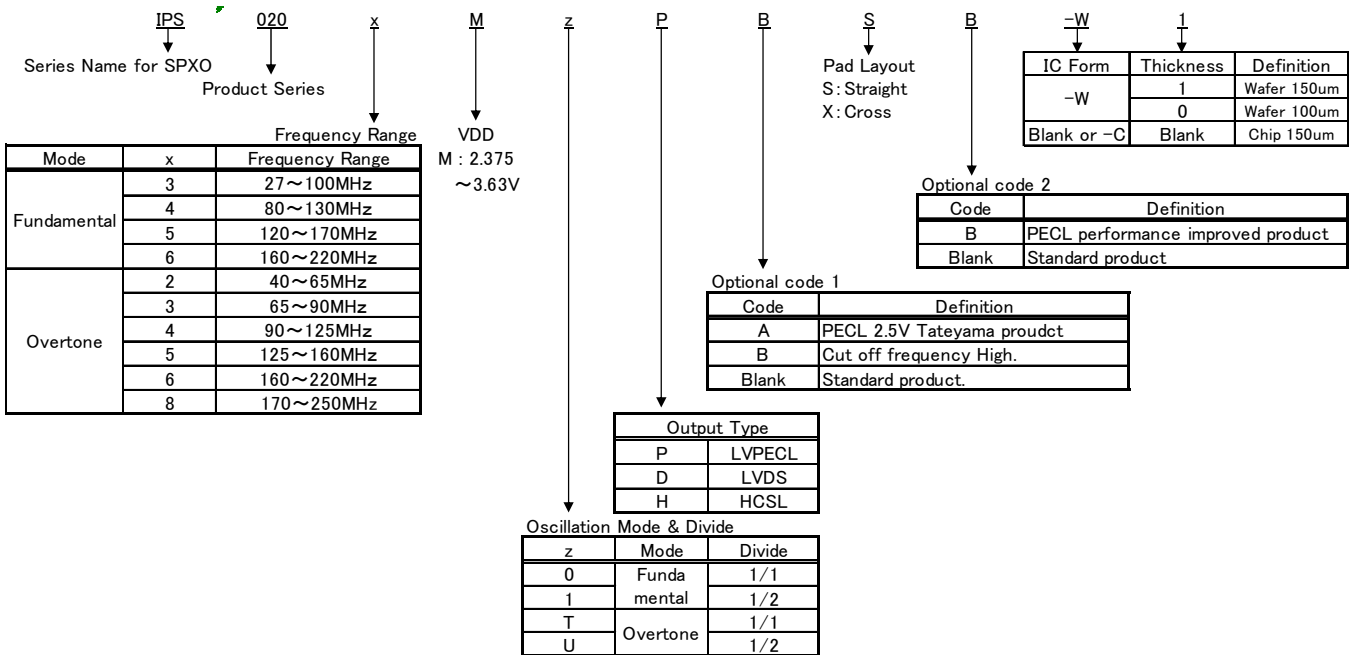
## ■ Description

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

## ■ Features

- Operation temperature : 85°C (125°C with 3<sup>rd</sup> over tone LVDS and PECL output.)
- Power supply voltage : 2.375~3.63V
- Standby function : Oscillation stop
- Crystal frequency : 220MHz maximum
- Output : PECL, LVDS and HCSL
- Divide function : 1/2
- Chip size : 0.65mm × 0.75mm
- Frequency stability to Vdd : Within ±1ppm
- Duty cycle : Within 50±5%

### 1. Part number rule



**2. Series**
**2-1 Pad Layout Straight Type**
**2-1-1 PECL**

Part Number	Output Frequency (MHz)		Divide	Output Type	Mode	Vdd Range	Operating Temp.
	Min.	Max.					
IPS020 3 M 0 P S	27.00	100.00	1/1	LVPECL	Funda.	2.97V ~ 3.63V	-40~85°C
IPS020 3 M 1 P S	13.50	50.00	1/2				
IPS020 4 M 0 P S	80.00	130.00	1/1				
IPS020 5 M 0 P S	120.00	170.00	1/1				
IPS020 6 M 0 P S	160.00	220.00	1/1				
IPS020 2 M T P S	40.00	65.00	1/1		3rd OT	-40~125°C	
IPS020 2 M U P S	20.00	32.50	1/2				
IPS020 3 M T P S	65.00	90.00	1/1				
IPS020 4 M T P S	90.00	125.00	1/1				
IPS020 5 M T P S	125.00	160.00	1/1				
IPS020 6 M T P S	160.00	220.00	1/1				
IPS020 3 M 0 P S B	27.00	100.00	1/1		LVPECL	Funda.	2.375V ~ 3.63V
IPS020 3 M 1 P S B	13.50	50.00	1/2				
IPS020 4 M 0 P S B	80.00	130.00	1/1				
IPS020 5 M 0 P S B	120.00	170.00	1/1				
IPS020 6 M 0 P S B	160.00	220.00	1/1				
IPS020 2 M T P S B	40.00	65.00	1/1	3rd OT		-40~125°C	
IPS020 2 M U P S B	20.00	32.50	1/2				
IPS020 3 M T P S B	65.00	90.00	1/1				
IPS020 4 M T P S B	90.00	125.00	1/1				
IPS020 5 M T P S B	125.00	160.00	1/1				
IPS020 8 M T P B S B	170.00	250.00	1/1				

2-1-2 LVDS and HCSL /  $V_{DD}=2.5V$  and  $3.3V$  (2.375~3.63V)

Part Number	Output Frequency (MHz)		Divide	Output Type	Mode	Vdd Range	Operating Temp.	
	Min.	Max.						
IPS020 3 M 0 D S	27.00	100.00	1/1	LVDS	Funda.	2.375V ~3.63V	-40~85°C	
IPS020 3 M 1 D S	13.50	50.00	1/2					
IPS020 4 M 0 D S	80.00	130.00	1/1					
IPS020 5 M 0 D S	120.00	170.00	1/1					
IPS020 6 M 0 D S	160.00	220.00	1/1					
IPS020 2 M T D S	40.00	65.00	1/1		3rd OT		-40~125°C	
IPS020 2 M U D S	20.00	32.50	1/2					
IPS020 3 M T D S	65.00	90.00	1/1					
IPS020 4 M T D S	90.00	125.00	1/1					
IPS020 5 M T D S	125.00	160.00	1/1					
IPS020 6 M T D S	160.00	220.00	1/1					
IPS020 8 M T D S B	170.00	250.00	1/1					-40~85°C
IPS020 8 M T D B S B	170.00	250.00	1/1					
IPS020 3 M 0 H S	27.00	100.00	1/1		HCSL		Funda.	-40~85°C
IPS020 3 M 1 H S	13.50	50.00	1/2					
IPS020 4 M 0 H S	80.00	130.00	1/1					
IPS020 5 M 0 H S	120.00	170.00	1/1					
IPS020 6 M 0 H S	160.00	220.00	1/1					
IPS020 2 M T H S	40.00	65.00	1/1	3rd OT				
IPS020 3 M T H S	65.00	90.00	1/1					
IPS020 4 M T H S	90.00	125.00	1/1					
IPS020 5 M T H S	125.00	160.00	1/1					

**Remarks**

IPS020 8 M T D S B : Standard product

IPS020 8 M T D B S B : Cut off frequency High version

**2-2 Pad Layout Cross Type**

Part Number	Output Frequency (MHz)		Divide	Output Type	Mode	Vdd Range	Operating Temp.
	Min.	Max.					
IPS020 3 M 0 P X	27.00	100.00	1/1	LVPECL	Funda.	2.97V ~ 3.63V	-40~85°C
IPS020 3 M 1 P X	13.50	50.00	1/2				
IPS020 4 M 0 P X	80.00	130.00	1/1				
IPS020 5 M 0 P X	120.00	170.00	1/1		3rd OT		-40~125°C
IPS020 2 M T P X	40.00	65.00	1/1				
IPS020 2 M U P X	20.00	32.50	1/2				
IPS020 3 M T P X	65.00	90.00	1/1				
IPS020 4 M T P X	90.00	125.00	1/1				
IPS020 5 M T P X	125.00	160.00	1/1				
IPS020 3 M 0 D X	27.00	100.00	1/1	LVDS	Funda.	2.375V ~ 3.63V	-40~85°C
IPS020 3 M 1 D X	13.50	50.00	1/2				
IPS020 4 M 0 D X	80.00	130.00	1/1		3rd OT		-40~125°C
IPS020 2 M T D X	40.00	65.00	1/1				
IPS020 2 M U D X	20.00	32.50	1/2				
IPS020 3 M T D X	65.00	90.00	1/1				
IPS020 4 M T D X	90.00	125.00	1/1				
IPS020 5 M T D X	125.00	160.00	1/1				
IPS020 3 M 0 H X	27.00	100.00	1/1	HCSL	Funda.	-40~85°C	
IPS020 3 M 1 H X	13.50	50.00	1/2				
IPS020 3 M T H X	65.00	90.00	1/1		3rd OT		
IPS020 4 M T H X	90.00	125.00	1/1				
IPS020 5 M T H X	125.00	160.00	1/1				

**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	$V_{IN}$	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
Input Current	$I_{IN}$	CE Pin		50	$\mu A$
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,  $V_{SS}=0V$ ,  $T_a = -40^\circ C \sim +85^\circ C$ 

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	Except below	$V_{DD}$		2.375		3.63	V	$V_{DD}$
	IPS020xMyP			2.97	3.3	3.63		
"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		$R_L$	LVPECL	49.5	50	50.5	$\Omega$	OUT / OUTN
				Supply $V_{DD}-2V$ to end point				
			LVDS	99	100	101		
				R1+R1 between OUT-OUTN				
Ambient Temperature		$T_{opt}$		-40		85	$^\circ C$	
				-40		<b>125</b>		

**5. Electrical Characteristics**
**5-1 IPS020xMzP (LVPECL output)**
**5-1-1 DC Characteristics / IPS020xMzP  $V_{DD}=3.3V$** 

 Unless otherwise stated,  $V_{DD}=2.97\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Overtone.)

Parameter	Symbol	Condition	Specification			Unit	
			Min	Typ	Max		
Out put Leak current	$I_Z$	$CE \leq 0.3V$ , OUT / OUTN			10	$\mu A$	
“L” input current	$I_{IL}$	$CE_{pad}$ , $V_{IL}=0.0V$		-10		$\mu A$	
“H” input voltage	$V_{IH}$	CE Pad	0.7VDD			V	
“L” input voltage	$V_{IL}$	CE Pad			0.3VDD	V	
“H” output voltage	$V_{OH}$	$R_L=50\Omega$ to (VDD-2V), CE=Open, OUT/OUTN	$V_{DD}-1.025$	$V_{DD}-0.95$	$V_{DD}-0.88$	V	
“L” output voltage	$V_{OL}$		$V_{DD}-1.810$	$V_{DD}-1.70$	$V_{DD}-1.62$	V	
Current consumption	$I_{DD}$	Fundamental, $V_{DD}=3.3V$ , CE=Open, -40~85°C					mA
		IPS0203M0, fxtal=63MHz		30	39		
		IMS0204M0, fxtal=100MHz		31	40		
		IMS0205M0, fxtal=135MHz		32	42		
		IMS0206M0, fxtal=173MHz		33	43		
		3rd Overtone, $V_{DD}=3.3V$ , CE=OMen, -40~125°C					
		IMS0202MT, fxtal=48MHz		32	42		
		IMS0203MT, fxtal=66MHz		34	44		
		IMS0204MT, fxtal=100MHz		35	46		
		IMS0205MT, fxtal=125MHz		36	47		
IMS0206MT, fxtal=161MHz		38	50				
Current consumption at oscillation disable	$I_{DDD}$	$CE \leq 0.3V$			10	$\mu A$	

**5-1-2 Switching Characteristics / IPS020xMzP  $V_{DD}=3.3V$** 

 Unless otherwise stated,  $V_{DD}=2.97\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Overtone.)

Parameter	Symbol	Condition	Specification			Unit	
			Min	Typ	Max		
Oscillation start up time	$T_{start}$	Fundamental			2	ms	
		3rd Overtone			10	ms	
Oscillation Disable Time	$T_{plz}$				0.2	$\mu s$	
Oscillation Enable Time	$T_{pzl}$				2	ms	
Rise time / Fall time	$T_r / T_f$	20~80% $V_{DD}$		0.25	0.40	ns	
Output Duty Ratio	Duty	1/2V <sub>Opp</sub> point					%
		Fundamental	45		55		
		3rd Overtone -40~105°C	45		55		
		3rd Overtone 105~125°C	40		60		
Output Swing	$V_{opp}$	Single output wave P to P	0.4			V	
Frequency $V_{DD}$ deviation	$F_{vst}$	$V_{DD}=2.97\sim 3.63V$			$\pm 2$	ppm	

**5-1-3 DC Characteristics / IPS020xMzPSB  $V_{DD}=2.375\sim 3.63$** 

 Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Overtone.)

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Out put Leak current	$I_z$	$CE \leq 0.3V$ , OUT / OUTN			10	$\mu A$
“L” input current	$I_{IL}$	CE pad, $V_{IL}=0.0V$		-10		$\mu A$
“H” input voltage	$V_{IH}$	CE Pad	0.7VDD			V
“L” input voltage	$V_{IL}$	CE Pad			0.3VDD	V
“H” output voltage	$V_{OH}$	$RL=50\Omega$ to (VDD-2V), CE=Open, OUT/OUTN	$V_{DD}-1.025$	$V_{DD}-0.95$	$V_{DD}-0.88$	V
“L” output voltage	$V_{OL}$		$V_{DD}-1.810$	$V_{DD}-1.70$	$V_{DD}-1.62$	V
Current consumption	$I_{DD}$	Fundamental, $V_{DD}=3.63V$ , CE=Open, -40~85°C				mA
		IPS0203M0, fxtal=63MHz			42	
		IPS0204M0, fxtal=100MHz			44	
		IPS0205M0, fxtal=135MHz			45	
		IPS0206M0, fxtal=173MHz			47	
		3rd Overtone, $V_{DD}=3.3V$ , CE=OMen, -40~125°C				
		IPS0202MT, fxtal=48MHz			47	
		IPS0203MT, fxtal=66MHz			48	
		IPS0204MT, fxtal=100MHz			49	
		IPS0205MT, fxtal=125MHz			50	
Current consumption at oscillation disable	$I_{DDD}$	$CE \leq 0.3V$			10	$\mu A$

**5-1-4 Switching Characteristics / IPS020xMzPSB  $V_{DD}=2.375\sim 3.63$** 

 Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Overtone.)

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	$T_{start}$	Fundamental			2	ms
		3rd Overtone			10	ms
Oscillation Disable Time	$T_{plz}$				0.2	$\mu s$
Oscillation Enable Time	$T_{pzl}$				2	ms
Rise time / Fall time	$T_r / T_f$	20~80% $V_{DD}$		0.30	0.60	ns
Output Duty Ratio	Duty	1/2VOpp point				%
		Fundamental	45		55	
		3rd Overtone -40~85°C	45		55	
		3rd Overtone 85~125°C	40		60	
Output Swing	$V_{opp}$	Single output wave P to P	0.4			V
Frequency $V_{DD}$ deviation	$F_{vst}$	$V_{DD}=2.5V \pm 5\%$			$\pm 2$	ppm
		$V_{DD}=3.3V \pm 10\%$			$\pm 2$	ppm

**5-2 IPS020xyzD (LVDS output)**

 5-2-1 DC Characteristics Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Overtone.)

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Out put Leak current	$I_z$	$CE \leq 0.3V$ , OUT / OUTN			10	$\mu A$
“L” input current	$I_{IL}$	CE pad, $V_{IL}=0.0V$		-10		$\mu A$
“H” input voltage	$V_{IH}$	CE Pad	0.7VDD			V
“L” input voltage	$V_{IL}$	CE Pad			0.3VDD	V
“H” output voltage	$V_{OH}$	$RL=100\Omega$ , $CE \geq VDD-0.3V$ , OUT/OUTN		1.43	1.6	V
“L” output voltage	$V_{OL}$		0.9	1.1		V
Differential Voltage	$V_{OD}/V_{OD}$	$RL=100\Omega$ , $CE \geq VDD-0.3V$ , OUT/OUTN differential	247	330	454	mV
Diff. Vol. Deviation	$\Delta V_{OD}$				50	
Offset voltage	$V_{OS}$	$RL=100\Omega$ (Between OUT/OUTN), $CE=Open$	1.125	1.25	1.375	V
Offset deviation	$\Delta V_{OS}$				50	mV
Current consumption	$I_{DD}$	Fundamental, $VDD=3.3V$ , $CE=Open$ , $-40\sim 85^\circ C$				mA
		IPS0203M0 fxtal=63MHz		6.5	13	
		IPS0204M0 fxtal=100MHz		7	14	
		IPS0205M0 fxtal=135MHz		7.5	15	
		IPS0206M0 fxtal=173MHz		8.5	17	
		3rd Over tone, $VDD=3.3V$ , $CE=Open$ , $-40\sim 125^\circ C$				
		IPS0202MT fxtal=48MHz		9	14	
		IPS0203MT fxtal=66MHz		10	15	
		IPS0204MT fxtal=100MHz		11	17	
		IPS0205MT fxtal=125MHz		12	18	
IPS0206MT fxtal=161MHz		13	20			
Current consumption at oscillation disable	$I_{DDD}$	$CE \leq 0.3V$			10	$\mu A$

 5-2-2 Switching Characteristics Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ 

(85°C with Fundamental, 125°C with 3rd Over tone)

Parameter	Symbol	Condition	Specification			Unit	
			Min	Typ	Max		
Oscillation start up time	$T_{start}$	Fundamental			2	ms	
		3rd Overtone			10	ms	
Oscillation Disable Time	$T_{plz}$				0.2	$\mu s$	
Oscillation Enable Time	$T_{pzl}$	Fundamental			2	ms	
		3rd Overtone			10	ms	
Rise time	$T_r$	$20\sim 80\%V_{DD}$			0.40	ns	
Fall time	$T_f$	$20\sim 80\%V_{DD}$			0.40	ns	
Output Duty Ratio	Duty	1/2 Vopp point				%	
		Fundamental	45				55
		3rd Overtone $-40\sim 105^\circ C$	45				55
		3rd Overtone $105\sim 125^\circ C$	40				60
Output Swing	$V_{opp}$		0.25			V	
Frequency $V_{DD}$ deviation	$F_{vst}$	$V_{DD}=2.5V \pm 5\%$			$\pm 2$	ppm	
		$V_{DD}=3.3V \pm 10\%$			$\pm 2$	ppm	



**5-3 IPS020xMzH (HCSL output)**
**5-3-1 DC Characteristics**

 Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ ,  $T_a = -40^{\circ}C \sim +85^{\circ}C$ 

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Out put Leak current	$I_z$	$CE \leq 0.3V$ , OUT / OUTN			10	$\mu A$
“L” input current	$I_{IL}$	CE pad, $V_{IL}=0.0V$		-10		$\mu A$
“H” input voltage	$V_{IH}$	CE Pad	0.7VDD			V
“L” input voltage	$V_{IL}$	CE Pad			0.3VDD	V
“H” output voltage	$V_{OH}$	$RL=50\Omega$ (to GND)、	550		850	mV
“L” output voltage	$V_{OL}$	CE=OPEN、OUT/OUTN	-150	0	150	mV
Current consumption	$I_{DD}$	Fundamental, $V_{DD}=3.3V$ , CE=Open			mA	
		IPS0203M0 fxtal=63MHz		18		28
		IPS0204M0 fxtal=100MHz		19		29
		IPS0205M0 fxtal=135MHz		20		30
		IPS0206M0 fxtal=173MHz		21		32
		3rd Overtone, $V_{DD}=3.3V$ , CE=Open				
		IPS0202MT fxtal=48MHz		20		30
		IPS0203MT fxtal=66MHz		21		32
		IPS0204MT fxtal=100MHz		22		33
IPS0205MT fxtal=125MHz		23	35			
Current consumption at oscillation disable	$I_{DDD}$	$CE \leq 0.3V$			10	$\mu A$

**5-3-2 Switching Characteristics**

 Unless otherwise stated,  $V_{DD}=2.375\sim 3.63V$ ,  $V_{SS}=0V$ ,  $T_a = -40^{\circ}C \sim +85^{\circ}C$ 

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Oscillation start up time	$T_{start}$	Fundamental			2	ms
		3rd Overtone			10	ms
Oscillation Disable Time	$T_{plz}$				0.2	$\mu s$
Oscillation Enable Time	$T_{pzl}$	Fundamental			2	ms
		3rd Overtone			10	ms
Rise time	$T_r$	20~80% $V_{opp}$		0.30	0.5	ns
Fall time	$T_f$	20~80% $V_{opp}$		0.30	0.5	ns
Output Duty Ratio	Duty	OUT/OUTN cross point	45		55	%
Output Swing	$V_{opp}$	$V_{DD}=3.3V$	0.6			V
		$V_{DD}=2.5V$	0.50			
Frequency $V_{DD}$ deviation	$F_{vst}$	$V_{DD}=2.5V \pm 5\%$			$\pm 2$	ppm
		$V_{DD}=3.3V \pm 10\%$			$\pm 2$	ppm

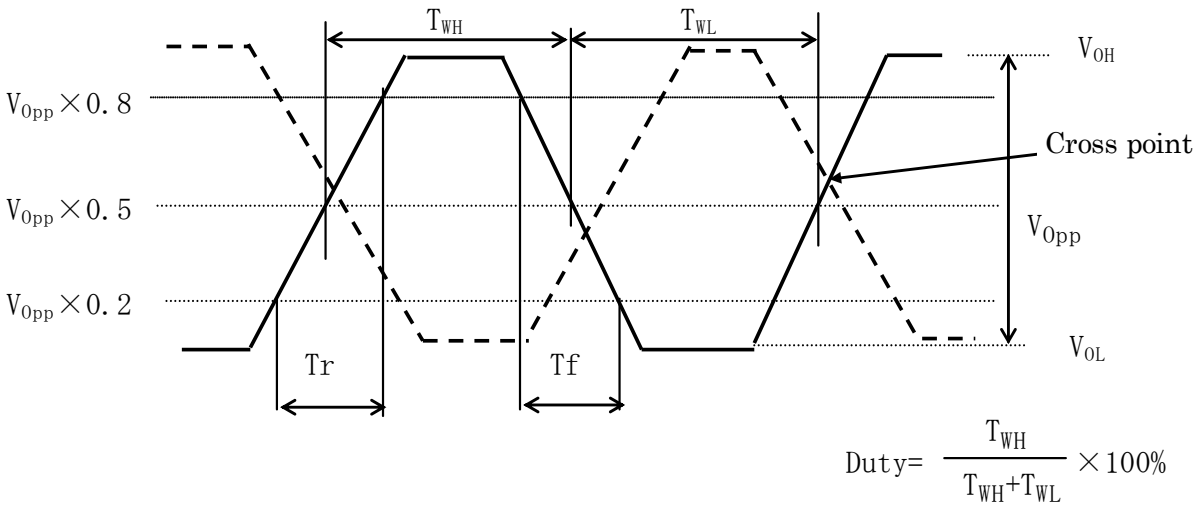


Fig. 5-1 Output Wave Form (Duty,  $T_r$ ,  $T_f$ ,  $V_{OH}$ ,  $V_{OL}$ ,  $V_{OPP}$ ) of PECL

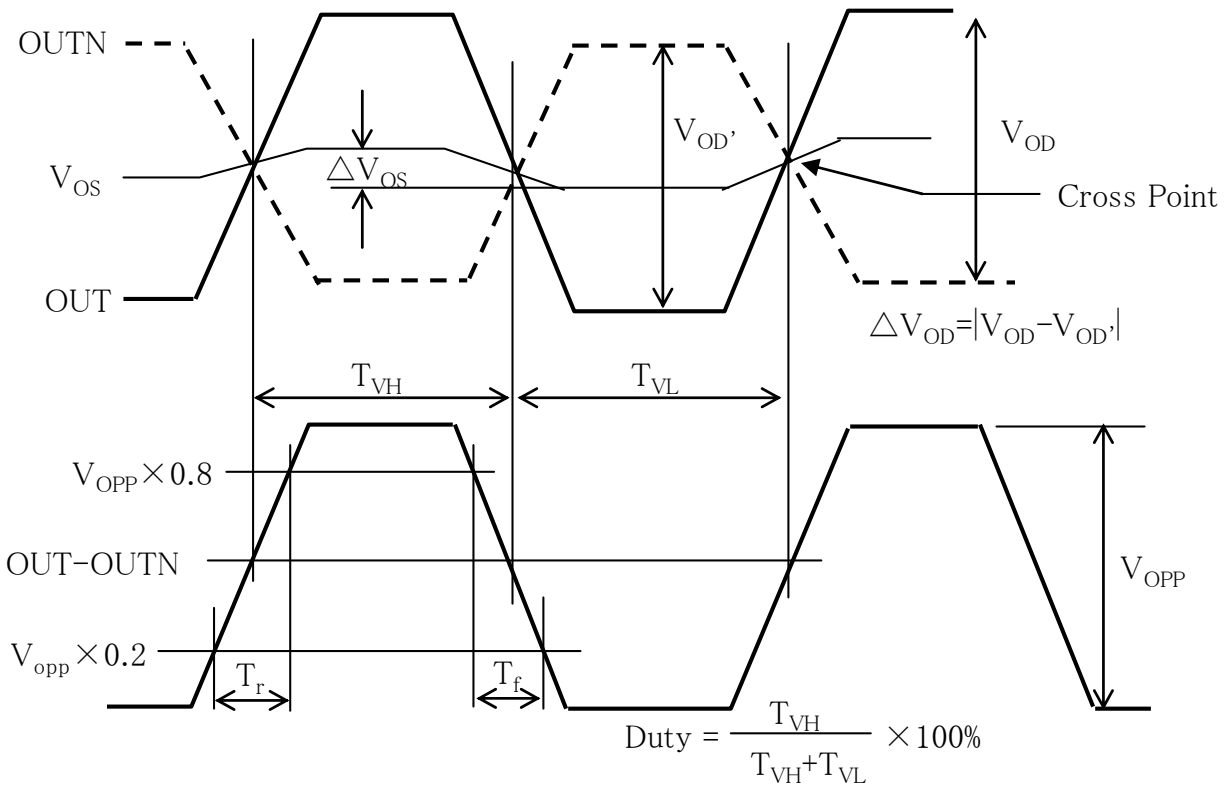


Fig. 5-2 Output Wave Form (Duty,  $T_r$ ,  $T_f$ ,  $V_{OS}$ ,  $V_{OD}$ ) of LVDS

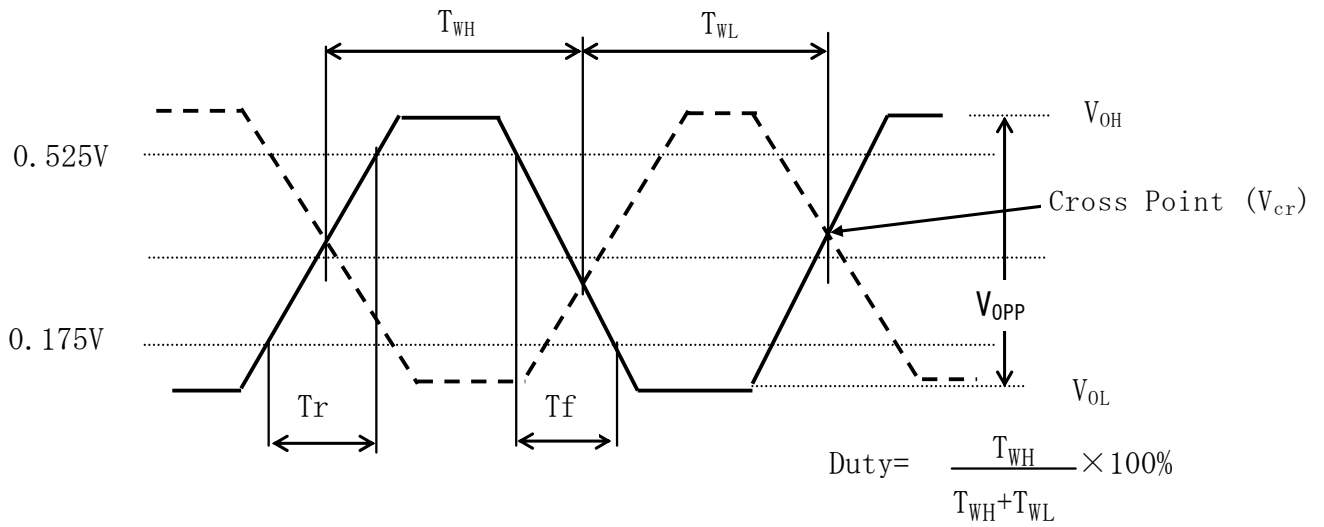
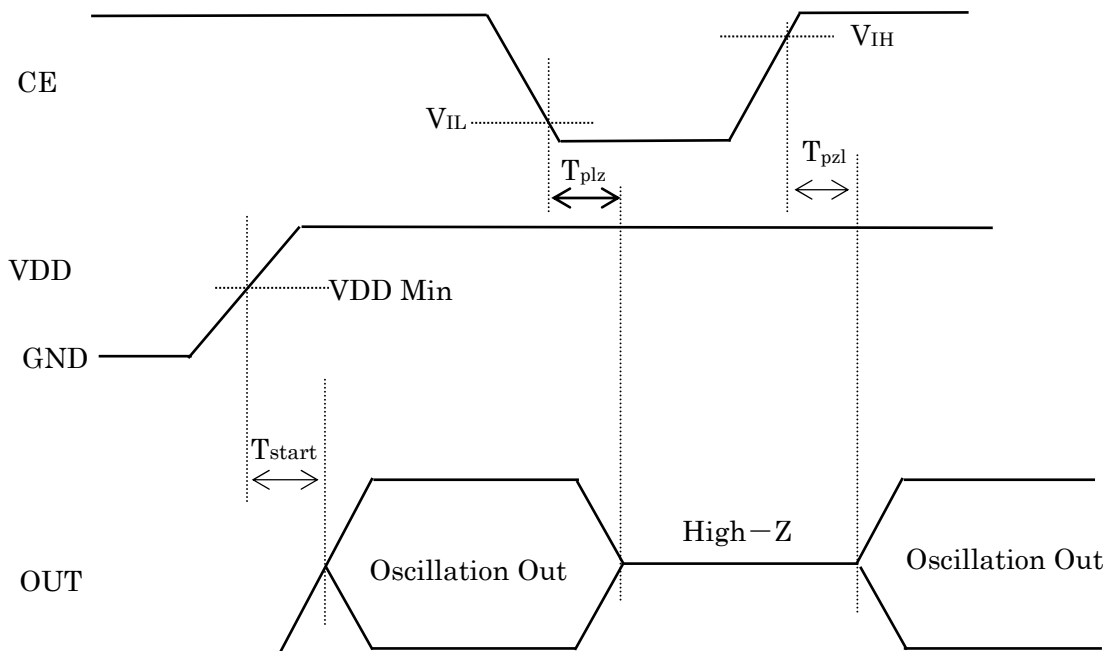


Fig. 5-3 Output Wave Form (Duty,  $T_r$ ,  $T_f$ ,  $V_{OH}$ ,  $V_{OL}$ ,  $V_{OPP}$ ) of HCSL



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

Fig. 5-4 Input output signal timing

**6. Circuit Parameters of Oscillator (Reference Data for Circuit Design)**
 $T_a=25^{\circ}\text{C}$ ,  $V_{DD}=3.3\text{V}$ 

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Drive Level	DL	60MHz	50		150	$\mu\text{W}$
		160MHz	50		380	

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

**6-1-1 IPS020xMyPz / Fundamental**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf			200		K $\Omega$
Driving Resistor	Rd	IPS0203M0		1000		$\Omega$
		IPS0204M0		800		
		IPS0205M0		500		
		IPS0206M0		300		
Oscillation Capacitor	Cg	IPS0203M0		6.0		pF
		IPS0204M0		5.0		
		IPS0205M0		5.0		
		IPS0206M0		4.0		
Oscillation Capacitor	Cd	IPS0203M0		9.0		pF
		IPS0204M0		8.0		
		IPS0205M0		7.0		
		IPS0206M0		6.0		

**6-1-2 IPS020xMyPz / 3<sup>rd</sup> Overtone**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf	IPS0202MT		7.00		K $\Omega$
		IPS0203MT		4.00		
		IPS0204MT		3.00		
		IPS0205MT		1.75		
		IPS0206MT		0.75		
Driving Resistor	Rd	IPS0202MT		800		$\Omega$
		IPS0203MT		500		
		IPS0204MT		400		
		IPS0205MT		200		
		IPS0206MT		200		
Oscillation Capacitor	Cg	IPS0202MT		8.0		pF
		IPS0203MT		7.0		
		IPS0204MT		6.0		
		IPS0205MT		6.0		
		IPS0206MT		6.0		
Oscillation Capacitor	Cd	IPS0202MT		10.0		pF
		IPS0203MT		9.0		
		IPS0204MT		8.0		
		IPS0205MT		8.0		
		IPS0206MT		8.0		

**6-2-1 IPS020xMyPSB / Fundamental**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf			200		K $\Omega$
Driving Resistor	Rd	IPS0203MyPSB		1000		$\Omega$
		IPS0204M0PSB		800		
		IPS0205M0PSB		500		
		IPS0206M0PSB		300		
Oscillation Capacitor	Cg	IPS0203MyPSB		6.0		pF
		IPS0204M0PSB		5.0		
		IPS0205M0PSB		5.0		
		IPS0206M0PSB		4.0		
	Cd	IPS0203MyPSB		9.0		pF
		IPS0204M0PSB		8.0		
		IPS0205M0PSB		7.0		
		IPS0206M0PSB		6.0		

**6-2-2 IPS020xMyPSB / 3<sup>rd</sup> Overtone**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf	IPS0202MyPSB		7.00		K $\Omega$
		IPS0203MTPSB		4.00		
		IPS0204MTPSB		3.00		
		IPS0205MTPSB		1.75		
Driving Resistor	Rd	IPS0202MyPSB		800		$\Omega$
		IPS0203MTPSB		500		
		IPS0204MTPSB		400		
		IPS0205MTPSB		200		
Oscillation Capacitor	Cg	IPS0202MyPSB		8.0		pF
		IPS0203MTPSB		7.0		
		IPS0204MTPSB		3.0		
		IPS0205MTPSB		3.0		
	Cd	IPS0202MyPSB		10.0		pF
		IPS0203MTPSB		9.0		
		IPS0204MTPSB		7.0		
		IPS0205MTPSB		7.0		

**6-3-1 IPS020xMyD / Fundamental**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf			200		KΩ
Driving Resistor	Rd	IPS0203M0		1000		Ω
		IPS0204M0		800		
		IPS0205M0		500		
		IPS0206M0		300		
Oscillation Capacitor	Cg	IPS0203M0		6.0		pF
		IPS0204M0		5.0		
		IPS0205M0		5.0		
		IPS0206M0		4.0		
Oscillation Capacitor	Cd	IPS0203M0		9.0		pF
		IPS0204M0		8.0		
		IPS0205M0		7.0		
		IPS0206M0		6.0		

**6-3-2 IPS020xMyD / 3<sup>rd</sup> Overtone**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf	IPS0202MT		7.00		KΩ
		IPS0203MT		4.00		
		IPS0204MT		3.00		
		IPS0205MT		1.75		
		IPS0206MT		0.75		
Driving Resistor	Rd	IPS0202MT		800		Ω
		IPS0203MT		500		
		IPS0204MT		400		
		IPS0205MT		200		
		IPS0206MT		200		
Oscillation Capacitor	Cg	IPS0202MT		8.0		pF
		IPS0203MT		7.0		
		IPS0204MT		6.0		
		IPS0205MT		6.0		
		IPS0206MT		6.0		
Oscillation Capacitor	Cd	IPS0202MT		10.0		pF
		IPS0203MT		9.0		
		IPS0204MT		8.0		
		IPS0205MT		8.0		
		IPS0206MT		8.0		

**6-4-1 IPS020xMyH / Fundamental**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf			200		KΩ
Driving Resistor	Rd	IPS0203M0		1000		Ω
		IPS0204M0		800		
		IPS0205M0		500		
		IPS0206M0		300		
Oscillation Capacitor	Cg	IPS0203M0		6.0		pF
		IPS0204M0		5.0		
		IPS0205M0		5.0		
		IPS0206M0		4.0		
Oscillation Capacitor	Cd	IPS0203M0		9.0		pF
		IPS0204M0		8.0		
		IPS0205M0		7.0		
		IPS0206M0		6.0		

**6-4-2 IPS020xMyH / 3<sup>rd</sup> Overtone**  
**IPS020xMTHz**

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor	Rf	IPS0202MT		7.00		KΩ
		IPS0203MT		4.00		
		IPS0204MT		3.00		
		IPS0205MT		1.75		
		IPS0206MT		0.75		
Driving Resistor	Rd	IPS0202MT		800		Ω
		IPS0203MT		500		
		IPS0204MT		400		
		IPS0205MT		200		
		IPS0206MT		200		
Oscillation Capacitor	Cg	IPS0202MT		8.0		pF
		IPS0203MT		7.0		
		IPS0204MT		6.0		
		IPS0205MT		6.0		
		IPS0206MT		6.0		
Oscillation Capacitor	Cd	IPS0202MT		10.0		pF
		IPS0203MT		9.0		
		IPS0204MT		8.0		
		IPS0205MT		8.0		
		IPS0206MT		8.0		

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

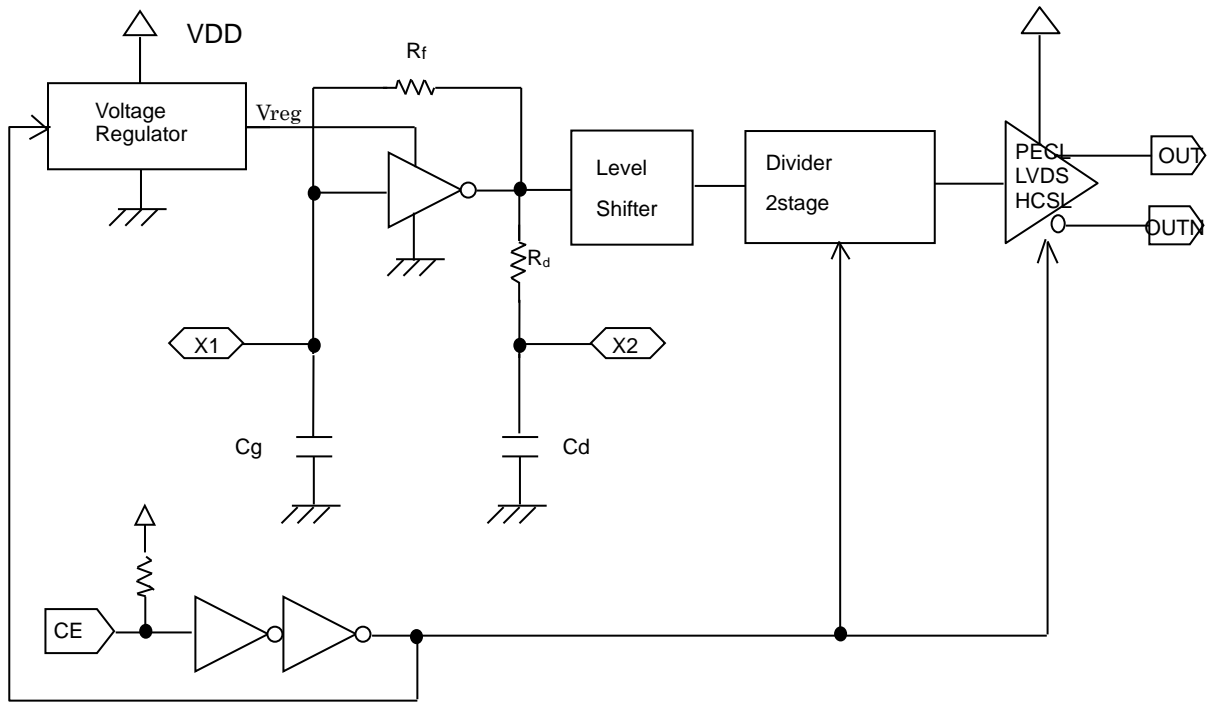
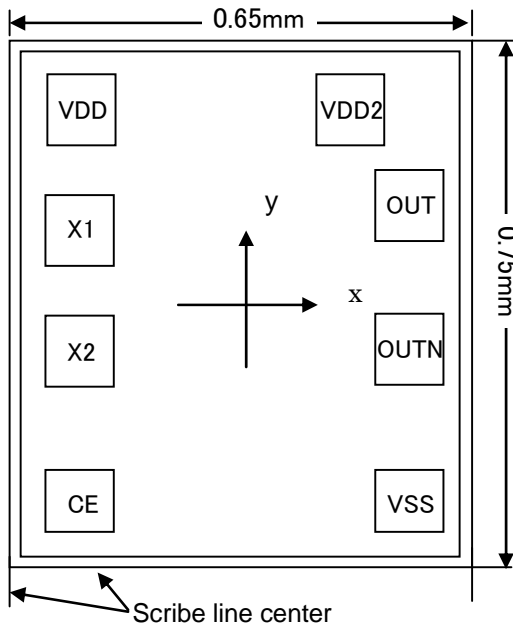


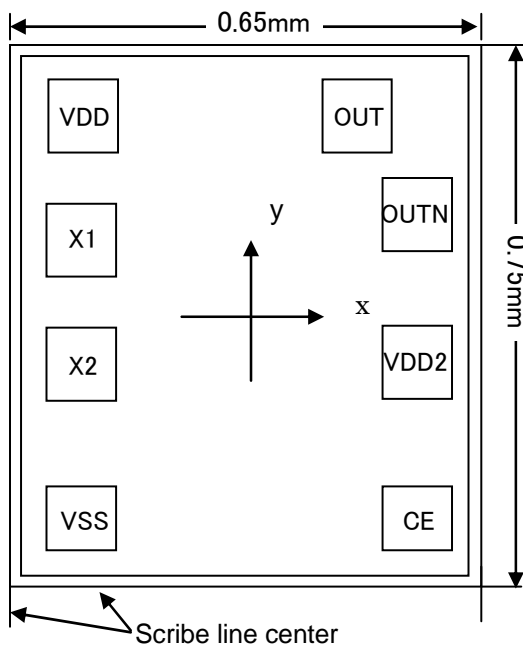
Fig. 6-1 Block Diagram



**7. Pad Layout**


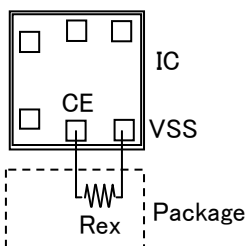
- Die Size : 0.65mm × 0.75mm
- Pad Size : 80um □
- Thickness : 150 ± 20um
- IC Backside : Gnd or Open
- Swapping of OUT/OUTN with wire bond is acceptable

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	Output (Complementary)	206	-65
OUT	Output (True)	206	108
VDD2	NC is acceptable	113	256
Chip Center		0	0

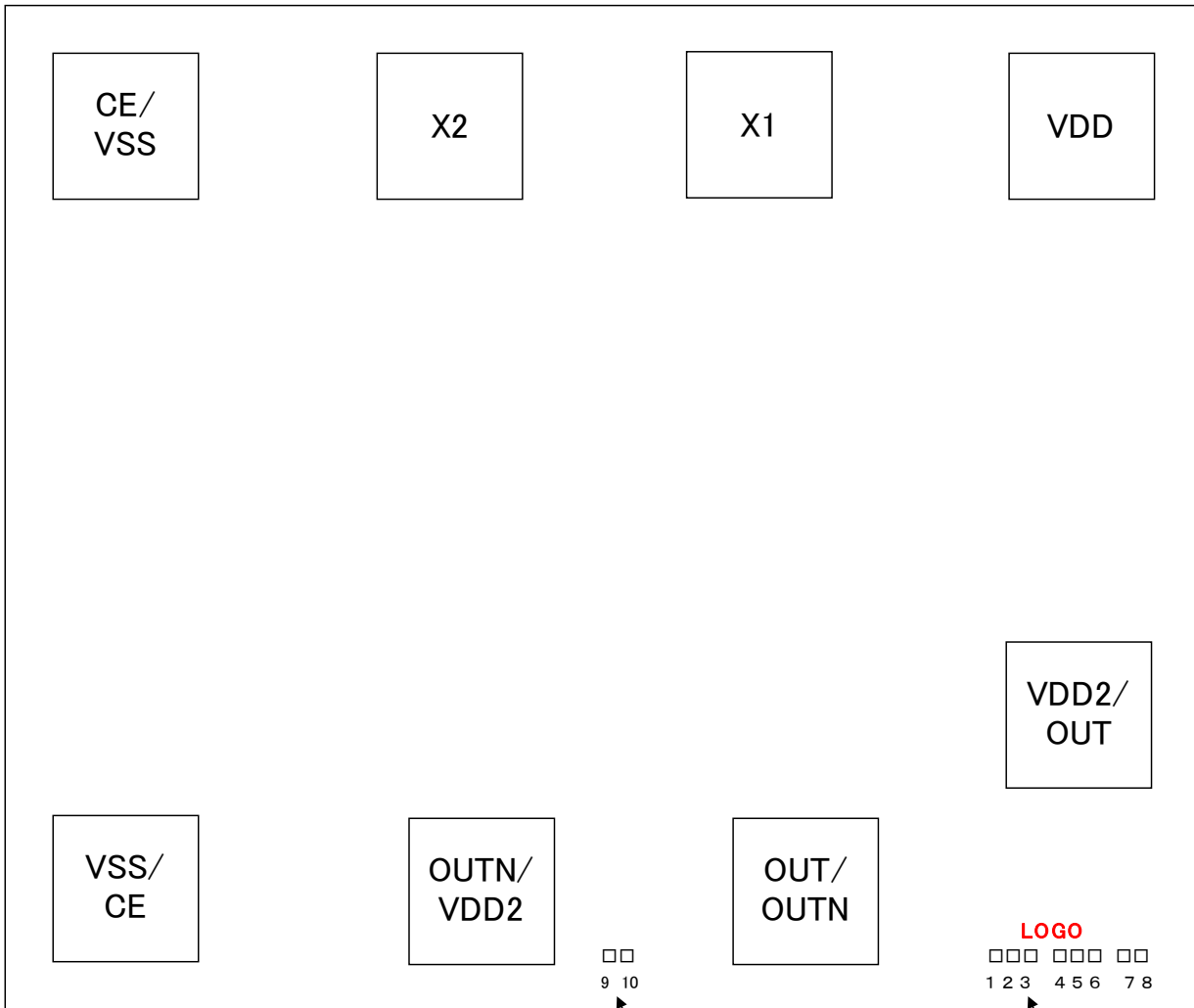
**Fig. 7-1 Straight Type**


- Die Size : 0.65mm × 0.75mm
- Pad Size : 80um □
- Thickness : 150 ± 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
VSS	(-)Ground	-206	-256
CE	Oscillation stop, "L": High-Impedance	206	-256
VDD2	NC is acceptable	206	-65
OUTN	Output (Complementary)	206	108
OUT	Output (True)	113	256
Chip Center		0	0

**Fig. 7-2 Cross Type**

**IMPORTANT Notice for CE function**

- \* Rex should be over 10MΩ in case of CE = Open usage.
  - \* Oscillation will not be activated when CE = Open after CE = Low if Rex is below 10MΩ.
  - \* There is no such issue in case of CE = VDD usage.
- Rex : External resistance value between CE and VSS of package.

**8. IC Part # Identification**

**Optional Code**
**IC Identification Code**
**Definition of the LOGO**

Part #/Pad Layout	LOGO
IPS0202-6/Straight	IPS020_M_S
IPS0202-6/Cross	IPS020_M_X
IPS0208/Straight	IPS0208M_S2
IPS020xMyzSB, x=2~6	IPS020_M_S2

**Code Status**

- Looks Black
- Looks White

**Definition of the Code Status**

Fuse #	Identification	Status	Meaning
1 2 3	Frequency range	□ ■ □	202
		□ ■ ■	203
		■ □ □	204
		■ □ ■	205
		■ ■ □	206
		□ □ □	208
4	Oscillation Mode	□	Fundamental
		■	3rd overtone
5 6	Divide	□ □	1/1
		□ ■	1/2
		■ □	1/4
7 8	Output Type	□ □	PECL
		□ ■	LVDS
		■ □	HCSL
9 10	Optional Code	□ □	2.5V and/or 3.3V
		□ ■	2.5V
		■ □	High cut off

**List of IC Part number and Code status**
**PECL( 3.3V operation ), LVDS and HCSL output**

Part #	Code 9 10	Code 1~8
IPS0203M0P	□□	□■ ■ □□□ □□
IPS0203M1P	□□	□■ ■ □□■ □□
IPS0204M0P	□□	■□□ □□□ □□
IPS0205M0P	□□	■□■ □□□ □□
IPS0206M0P	□□	■ ■ □ □□ □□
IPS0202MTP	□□	□■ □ ■□□ □□
IPS0202MUP	□□	□■ □ ■□■ □□
IPS0202MVP	□□	□■ □ ■■□ □□
IPS0203MTP	□□	□■ ■ ■□□ □□
IPS0204MTP	□□	■□□ ■□□ □□
IPS0204MUP	□□	■□□ ■□■ □□
IPS0205MTP	□□	■□■ ■□□ □□
IPS0206MTP	□□	■ ■ □ ■□□ □□
IPS0203M0PSB	□□	□■ ■ □□□ □□
IPS0203M1PSB	□□	□■ ■ □□■ □□
IPS0204M0PSB	□□	■□□ □□□ □□
IPS0205M0PSB	□□	■□■ □□□ □□
IPS0206M0PSB	□□	■ ■ □ □□ □□
IPS0202MTPSB	□□	□■ □ ■□□ □□
IPS0202MUPSB	□□	□■ □ ■□■ □□
IPS0202MVP	□□	□■ □ ■■□ □□
IPS0203MTPSB	□□	□■ ■ ■□□ □□
IPS0204MTPSB	□□	■□□ ■□□ □□
IPS0204MUPSB	□□	■□□ ■□■ □□
IPS0205MTPSB	□□	■□■ ■□□ □□
IPS0208MTPBSB	■□	□□□ ■□□ □□
IPS0203M0D	□□	□■ ■ □□□ ■□
IPS0203M1D	□□	□■ ■ □□■ ■□
IPS0204M0D	□□	■□□ □□□ ■□
IPS0205M0D	□□	■□■ □□□ ■□
IPS0206M0D	□□	■ ■ □ □□ ■□
IPS0202MTD	□□	□■ □ ■□□ ■□
IPS0202MUD	□□	□■ □ ■□■ ■□
IPS0203MTD	□□	□■ ■ ■□□ ■□
IPS0204MTD	□□	■□□ ■□□ ■□
IPS0205MTD	□□	■□■ ■□□ ■□
IPS0206MTD	□□	■ ■ □ ■□□ ■□
IPS0208MTDSB	□□	□□□ ■□□ ■□
IPS0208MTDBSB	■□	□□□ ■□□ ■□
IPS0203M0H	□□	□■ ■ □□□ ■□
IPS0203M1H	□□	□■ ■ □□■ ■□
IPS0204M0H	□□	■□□ □□□ ■□
IPS0205M0H	□□	■□■ □□□ ■□
IPS0206M0H	□□	■ ■ □ □□ ■□
IPS0202MTH	□□	□■ □ ■□□ ■□
IPS0202MUH	□□	□■ □ ■□■ ■□
IPS0203MTH	□□	□■ ■ ■□□ ■□
IPS0204MTH	□□	■□□ ■□□ ■□
IPS0205MTH	□□	■□■ ■□□ ■□

**PECL( 2.5V operation ) output**

Part #	Code 9 10	Code 1~8
IPS0203M0PA	□■	□■ ■ □□□ □□
IPS0203M1PA	□■	□■ ■ □□■ □□
IPS0204M0PA	□■	■□□ □□□ □□
IPS0205M0PA	□■	■□■ □□□ □□
IPS0206M0PA	□■	■ ■ □ □□ □□
IPS0202MTPA	□■	□■ □ ■□□ □□
IPS0202MUPA	□■	□■ □ ■□■ □□
IPS0202MVPA	□■	□■ □ ■■□ □□
IPS0203MTPA	□■	□■ ■ ■□□ □□
IPS0204MTPA	□■	■□□ ■□□ □□
IPS0204MUPA	□■	■□□ ■□■ □□
IPS0205MTPA	□■	■□■ ■□□ □□
IPS0206MTPA	□■	■ ■ □ ■□□ □□

Code Status  
 ■ Looks Black  
 □ Looks White