



■ Description

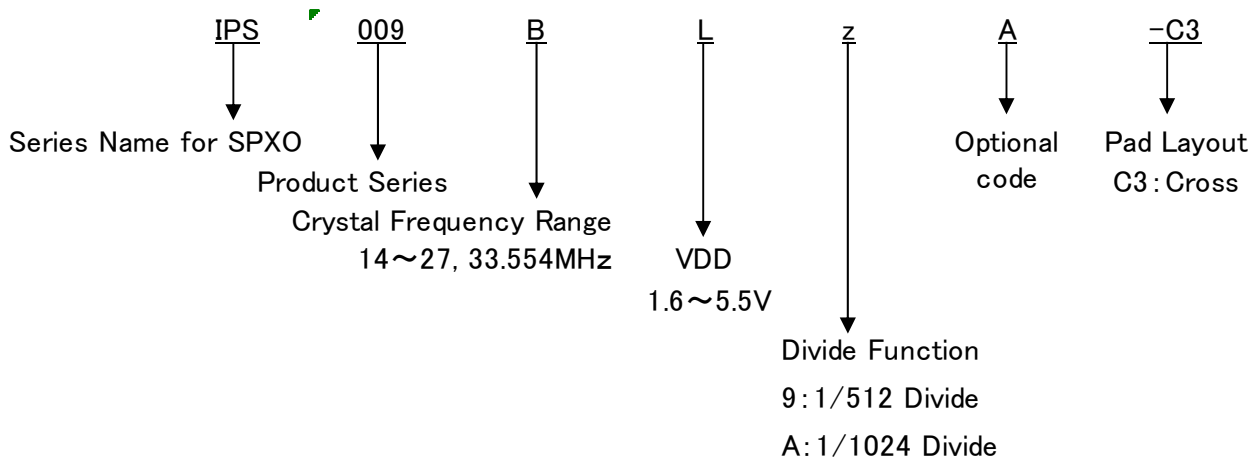
IPS009BL9, IPS009BL9A and IPS009BLAA is the specific SPXO IC for achieving 32KHz output by divide, corresponding to the fundamental crystal from 14MHz to 27MHz and 33.554MHz corresponding to each IC.

The power consumption of these IC is quite low, so IPS009BL9, IPS009BL9A and IPS009BLAA suit for mobile application.

■ Features

- Divide function : 1/512 or 1/1024
- Crystal frequency : 14MHz to 27MHz or 33.554MHz
- Operation temperature : -40°C~125°C
- Power supply voltage : 1.6~5.5V
- Standby function : Oscillation stop
- Output : CMOS
- Small chip size : 0.70mm × 0.75mm
- Frequency stability to Vdd : Within ±1ppm
- Duty cycle : Within 50±5%

1. Part number rule





2. Series

- Applicable crystal : AT Cut 14MHz~27MHz, 33.554MHz

Part Number	Output Frequency (KHz)		Divide	Pad Layout	Vdd (V)	Remarks
	Min.	Max.				
IPS009 B L 9 -C3	32.768		1/512	Cross	1.62 ~ 5.5	Low Power Consumption
IPS009 B L 9 A -C3	27.3	52.7				
IPS009 B L A A -C3	32.768		1/1024			

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}		$V_{SS}-0.5$	7.0	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	μA
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		-40~125 $^{\circ}C$	1.6	3.3	5.5	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 Capacitance	IPS009BL9	CL	CMOS		30	pF	OUT
	IPS009BL9A				15		
	IPS009BLAA						
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

Unless otherwise stated, V_{DD}=1.6V~5.5V, V_{SS}=0V, T_a = -40~125°C

Parameter	Symbol	Condition	Specification				Unit
			Min	Typ	Max	125°C	
Out put Leak current	I _z	CE=0V, X1=V _{DD} , V _{SS} , V _{out} =V _{SS} ~V _{DD}			10	20	μA
“H” input voltage	V _{IH}	CE pad	0.7V _{DD}			←	V
“L” input voltage	V _{IL}	CE pad			0.3V _{DD}	←	V
“H” input current	I _{IH}	CE pad, V _{IH} =V _{DD}		0.01	0.15	←	μA
“L” input current	I _{IL}	CE pad, V _{IL} =0V	-1.45	-1.25		←	
Oscillation Disable Time	T _{plz}	OUT pad			0.1	←	μs
Oscillation Enable Time	T _{pzl}	OUT pad			2	←	ms
Oscillation start up time	T _{start}	V _{DD} >1.6V			2	←	ms
“H” output voltage	IPS009BL9	V _{OH}	OUT pad, I _{OH} =-1.0mA	0.9V _{DD}		←	V
	IPS009BL9A IPS009BLAA						
“L” output voltage	IPS009BL9	V _{OL}	OUT pad, I _{OL} =1.0mA			0.1V _{DD}	←
	IPS009BL9A IPS009BLAA						
Current consumption IPS009BL9	I _{DD}	CE ≥ V _{DD} -0.3V, f _{xtal} =16.777MHz				μA	
		CL=30pF, V _{DD} =1.8V		52	80		110
		CL=15pF, V _{DD} =3.63V		56	88		115
		CL=30pF, V _{DD} =3.63V		58	90		120
		CL=15pF, V _{DD} =5.5V		64	100		130
		CL=30pF, V _{DD} =5.5V		67	105	140	
Current consumption IPS009BL9A	I _{DD}	No Load, CE ≥ V _{DD} -0.3V, f _{xtal} =16.777MHz				μA	
		V _{DD} =3.63V		38	50		58
		V _{DD} =5.5V		45	60		80
		No Load, CE ≥ V _{DD} -0.3V, f _{xtal} =27MHz					
		V _{DD} =3.63V		64	82		97
		V _{DD} =5.5V		75	100	120	
Current consumption IPS009BLAA	I _{DD}	No Load, CE ≥ V _{DD} -0.3V, f _{xtal} =33.554MHz				μA	
		V _{DD} =3.63V		75	108		125
		V _{DD} =5.5V		80	120		140
Current consumption at oscillation disable	I _{DD}	CL=15pF, V _{DD} =3.3V, CE ≤ 0.3V		1	1.5	3	μA
Frequency V _{DD} deviation	F _{vst}	V _{DD} =3.3 ± 10%			±1	←	ppm
Output Duty Ratio	Duty	CL=0pF, 15pF, 25pF	45		55	←	%
Rise/Fall time	Tr/Tf	10~90%V _{DD}				ns	
IPS009BL9		CL=15pF, V _{DD} =2.5V~5.5V		3	8		10
		CL=30pF, V _{DD} =2.5V~5.5V		5	10		13
		CL=15pF, V _{DD} =1.62V~2.5V		5.5	12		14
		CL=30pF, V _{DD} =1.62V~2.5V		8	15		18
IPS009BL9A		CL=15pF, V _{DD} =2.5V~5.5V		8	10		12
IPS009BLAA	CL=15pF, V _{DD} =1.62V~2.5V		14	18	21		

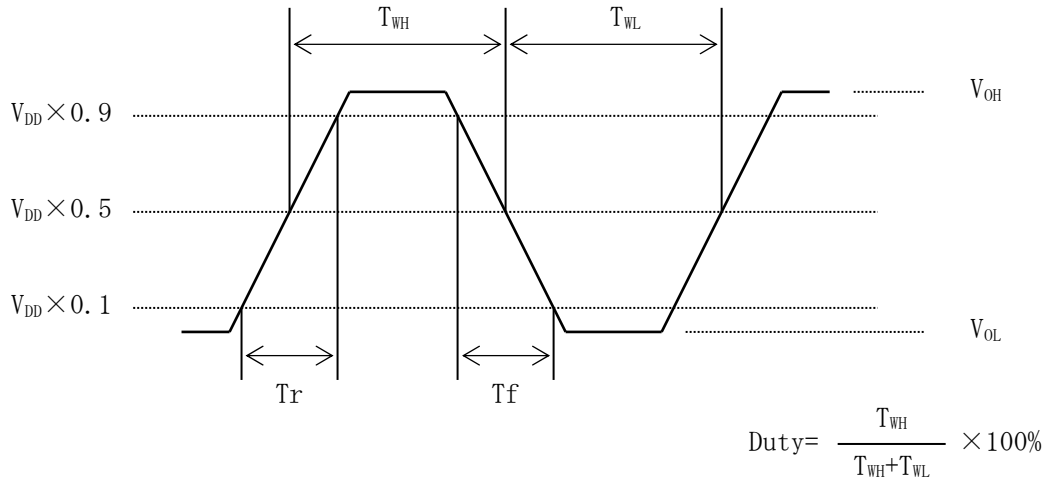
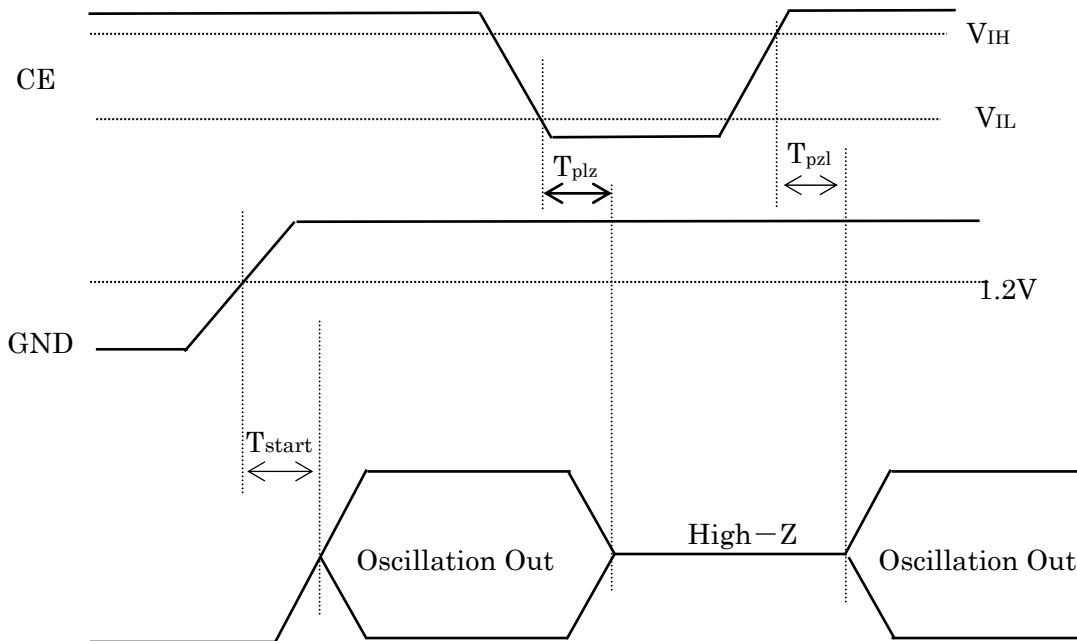


Fig. 5-1 Output wave form (Duty, Tr, Tf, VOH, VOL)



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	Min	Typ	Max	Unit
Equivalent series (Loading) Capacitance	CL_{xtal}	$V_{DD}=3.3\text{V}$, $f_{xtal}=16\text{MHz}$		3.3		pF
Drive Level	IPS009BL9	$V_{DD}=3.3\text{V}$, $T_a=25^\circ\text{C}$ $f_{xtal}=16\text{MHz}$		15		μW
	IPS009BL9A			1.7		
	IPS009BLAA					
Feedback Resistor	R_f			300		$\text{K}\Omega$
Driving Resistor	IPS009BL9			600		Ω
	IPS009BL9A			1000		
	IPS009BLAA					
Oscillation Capacitor		C_g		6.0		pF
	IPS009BL9	C_d		8.0		pF
	IPS009BL9A			2.0		
	IPS009BLAA			2.0		

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

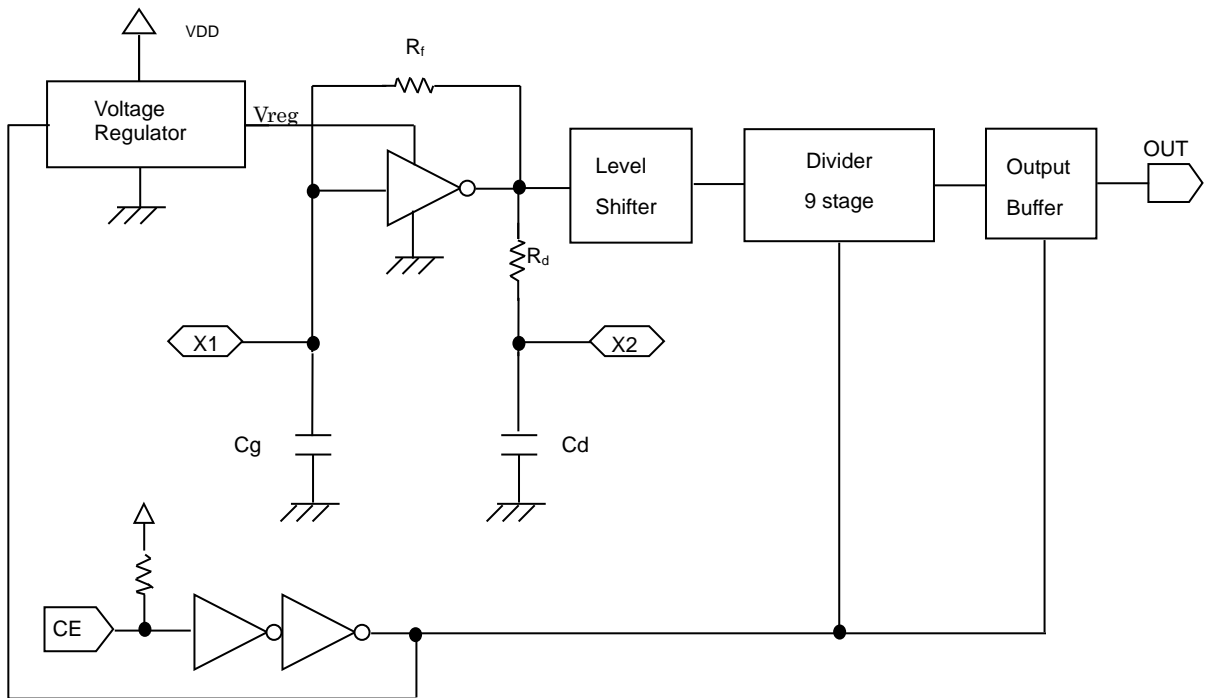


Fig. 6 Block Diagram



7. Pad Layout

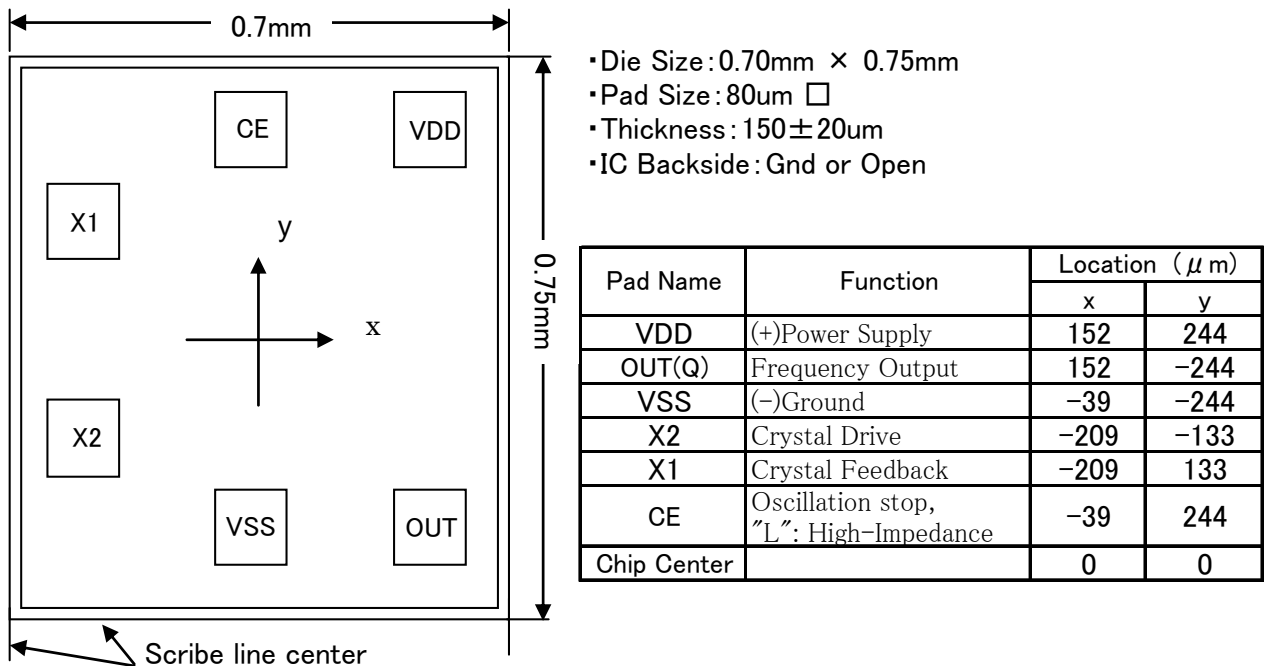
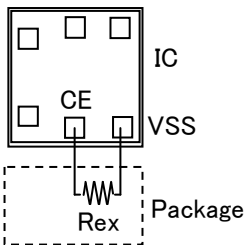


Fig. 7 Pad Layout of IPS009L9, BL9A and BLAA (Cross Type)



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.