

■ Description

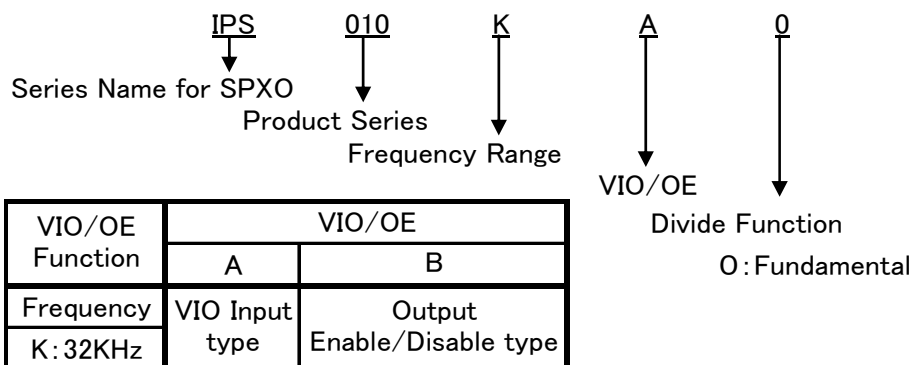
IPS010KA0/KB0 is a CMOS oscillator IC which is specially designed to combine with the 32,768Hz crystal unit.

This product enables ultra low power consumption crystal oscillator by sophisticated design and specially tuned CMOS process. Since the power supply of the output stage can be set up independently, the interface to a receptacle is easy. This IC is small enough to form a micro size oscillator.

■ Features

- Power supply voltage : 1.2~5.5V
- VIO function : Individual output voltage(VIO) supply is available
- Crystal frequency : 32.768KHz
- Low power consumption : 0.5 μ A ($V_{DD}=3.3V$, No Load)
- Output : CMOS
- Small chip size : 0.74mm \times 0.70mm
- Frequency stability to Vdd : Within $\pm 0.5Hz$
- Duty cycle : Within $50 \pm 5\%$

1. Part number rule



2. Series

Part Number	VIO / Standby Function	Freq. (KHz)	Vdd (V)	Remarks
IPS010 K A 0	VIO Input type	32.768	1.2~5.5	
IPS010 K B 0	Output Enable / Disable type			

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}	$V_{SS}=0V$	$V_{SS}-0.5$	7.0	V
Input Voltage	V_{IO}	$V_{SS}=0V$	$V_{SS}-0.5$	7.0	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 $V_{SS}=0V$

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage		V_{DD}		1.2	3.3	5.5	V	V_{DD}
Interface Voltage	IPS010KA	V_{IO}		V_{SS}		V_{DD}	V	VIO
Input Voltage	IPS010KB	V_{IN}		V_{SS}		V_{DD}	V	OE
Crystal Frequency		f_0			32.768		KHz	OUT
Output Load Capacitance		CL	CMOS			15	pF	OUT
Ambient Temperature	IPS010KA	T_{opt}		-40		85	$^{\circ}C$	
	IPS010KB			-40		125		

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

5. Electrical Specification

5-1 IPS010KA

Unless otherwise stated, $V_{DD}=1.2V\sim 5.5V$, $V_{IO}=1.2V\sim 5.5V$, $V_{SS}=0V$, $T_a=-40^{\circ}C\sim +85^{\circ}C$

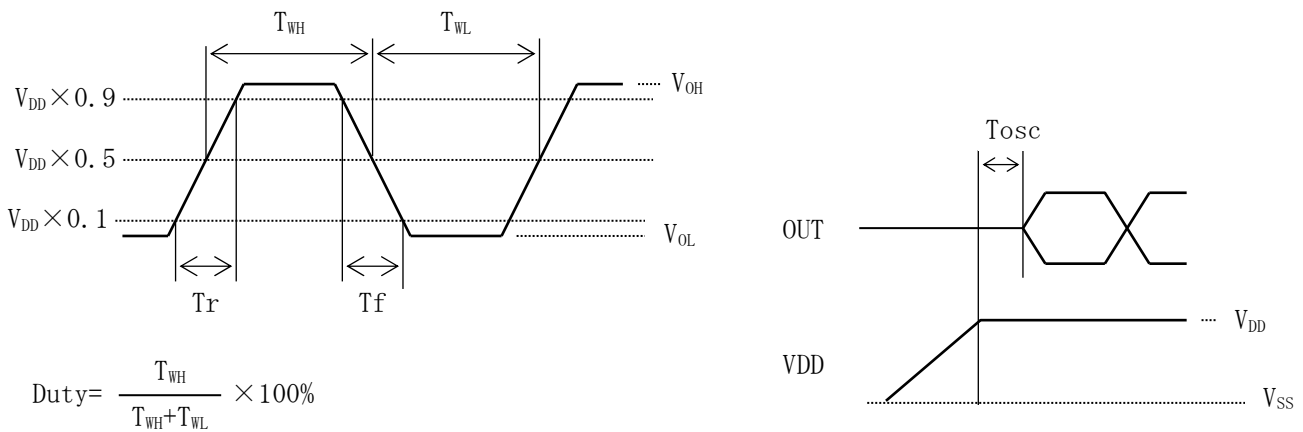
Parameter		Symbol	Condition	Min	Typ	Max	Unit
Operation Voltage		V_{DD}		1.2		5.5	V
Output Voltage		V_{IO}		1.2		5.5	V
Output leak		I_z	$V_{IO}=5.5V$			10	μA
Output Voltage	High Level	V_{OH}	$I_{OH}=400\mu A$, $V_{DD}=V_{IO}=1.5V\sim 5.5V$	$V_{DD}-0.4$			V
	Low Level	V_{OL}	$I_{OL}=400\mu A$, $V_{DD}=V_{IO}=1.5V\sim 5.5V$			$V_{SS}+0.4$	
VDD Current Consumption		I_{DD}			0.25	0.35	μA
VIO Current Consumption		I_{IO}	No Load, $V_{IO}=5.5V$		1.2	1.4	mA
			No Load, $V_{IO}=3.63V$		0.8	1.0	
			$CL=15pF$, $V_{IO}=5.5V$		5.0	5.3	
			$CL=15pF$, $V_{IO}=3.63V$		2.6	3.3	
Rise Time / Fall Time		T_r/T_f	$CL=15pF$, $V_{DD}\&V_{IO}=1.2V\sim 1.5V$			100	ns
			$CL=15pF$, $V_{DD}\&V_{IO}=1.5V\sim 5.5V$			80	
Output Duty Cycle		Duty	$CL=15pF$, at $0.5V_{IO}$	45		55	%
VDD Sensitivity		$(\Delta f_0/f_0)/V$	$T_a=25^{\circ}C$, $V_{DD}=1.3V\sim 1.5V$	-0.2		+0.2	$\times 10^{-6}/V$
Oscillation Start up Time		T_{osc}			120	300	ms

Crystal ; Equivalent Parameter of Crystal is $L1=6536H$, $C1=3.62fF$, $R1=60K\Omega$, $C0=1.5pF$.

5-2 IPS010KB

 Unless otherwise stated, $V_{DD}=1.2V\sim 5.5V$, $V_{SS}=0V$, $T_a = -40^{\circ}C\sim +125^{\circ}C$

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operation Voltage	V_{DD}		1.2		5.5	V
Output leak	I_Z	$V_{IO}=5.5V$			10	μA
Output Voltage	High Level	V_{OH} $I_{OH}=-400\mu A$, $V_{DD}=1.5V-5.5V$	$V_{DD}-0.4$			V
	Low Level	V_{OL} $I_{OL}=400\mu A$, $V_{DD}=1.5V-5.5V$			$V_{SS}+0.4$	
Input Voltage	High Level	V_{IH}	$V_{DD}*0.8$			V
	Low Level	V_{IL}			$V_{DD}*0.2$	
Current Consumption	I_{DD}	No Load, $V_{DD}=5.5V$		1.2	2.5	μA
		No Load, $V_{DD}=3.63V$		0.8	1.5	
		$CL=15pF$, $V_{DD}=5.5V$		4	5	
		$CL=15pF$, $V_{DD}=3.63V$		2.6	3.5	
Standby Current	I_{DDD}	$OE \leq 0.3V$			0.5	μA
Rise Time / Fall Time	T_r/T_f	$CL=15pF$, $V_{DD}=1.2V-1.5V$			150	ns
		$CL=15pF$, $V_{DD}=1.5V-5.5V$			100	
Output Duty Cycle	Duty	$CL=15pF$, at $0.5V_{IO}$	45		55	%
VDD Sensitivity	$(\Delta f_0/f_0)/V$	$T_a=25^{\circ}C$			4	$\times 10^{-6}/V$
Oscillation Start up Time	T_{osc}			150	500	ms

 Crystal ; Equivalent Parameter of Crystal is $L1=6536H$, $C1=3.62fF$, $R1=60K\Omega$, $C0=1.5pF$.

Fig. 5-1 Output Wave Form (Duty, T_r , T_f , T_{osc})

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

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Equivalent series (Loading) Capacitance	CLxtal			4		pF

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

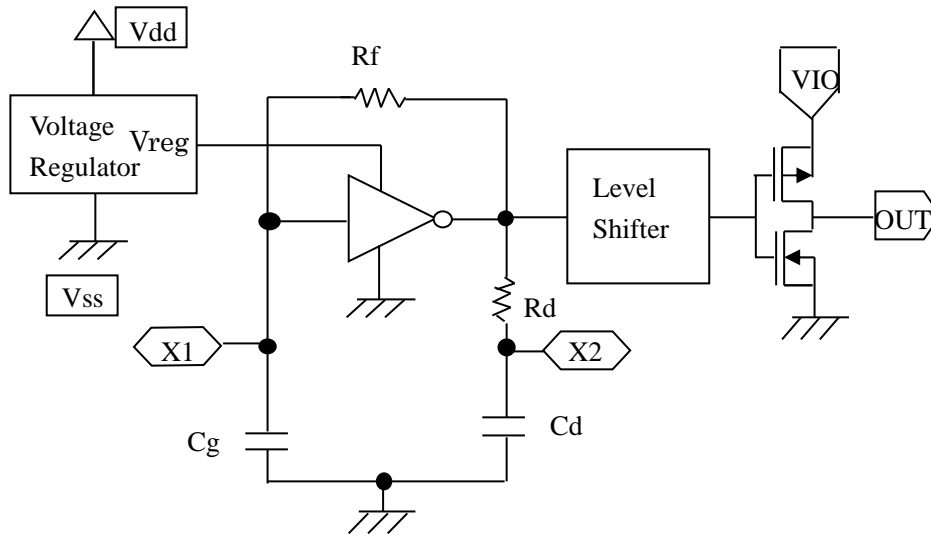


Fig. 6-1 Block Diagram of IPS010KA

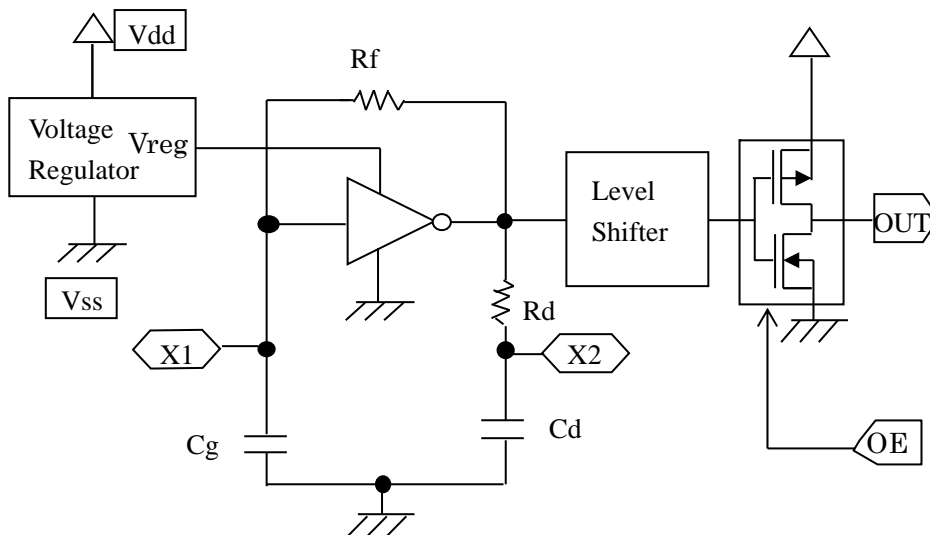
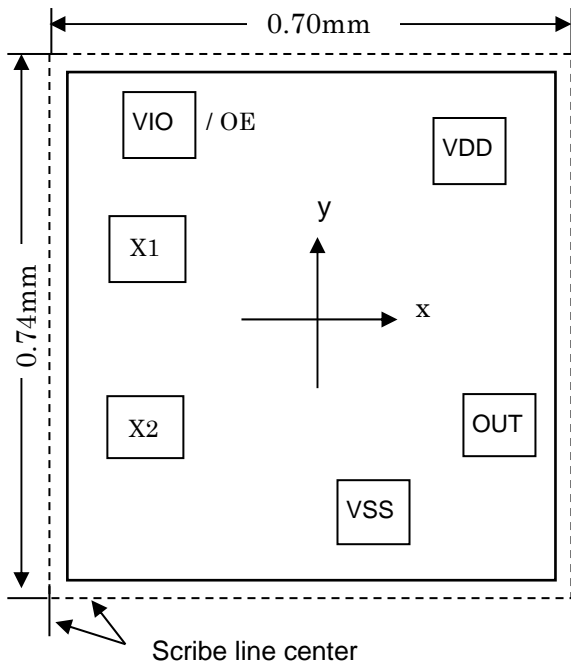


Fig. 6-2 Block Diagram of IPS010KB

7. Pad Layout



- Die Size: 0.70mm × 0.74mm
- Pad Size: 80μm □
- Thickness: 150 ± 20μm
- IC Backside: Gnd or Open

Pad Name	Function	Location (μm)	
		x	y
VDD	(+)Power Supply	119	239
OUT	Frequency Output	210	-158
VSS	(-)Ground	50	-242
X2	Crystal Drive	-211	-139
X1	Crystal Feedback	-211	84
VIO / OE	IPS009KA : VIO IPS009KB : OE	-152	242
Chip Center		0	0

VIO : Input pad for output voltage.

Required output voltage should be applied to this pad. $VIO \geq VDD(5.5V_{max})$

OE : When OE is “Low”, OUT pad becomes Hi-Z and output disable.

When “High” or “Floating”, OUT pad becomes output enable.

Connect to “High” to ensure output when VDD is lower than 1.6V.

“Floating” is not recommended below 1.6V VDD.