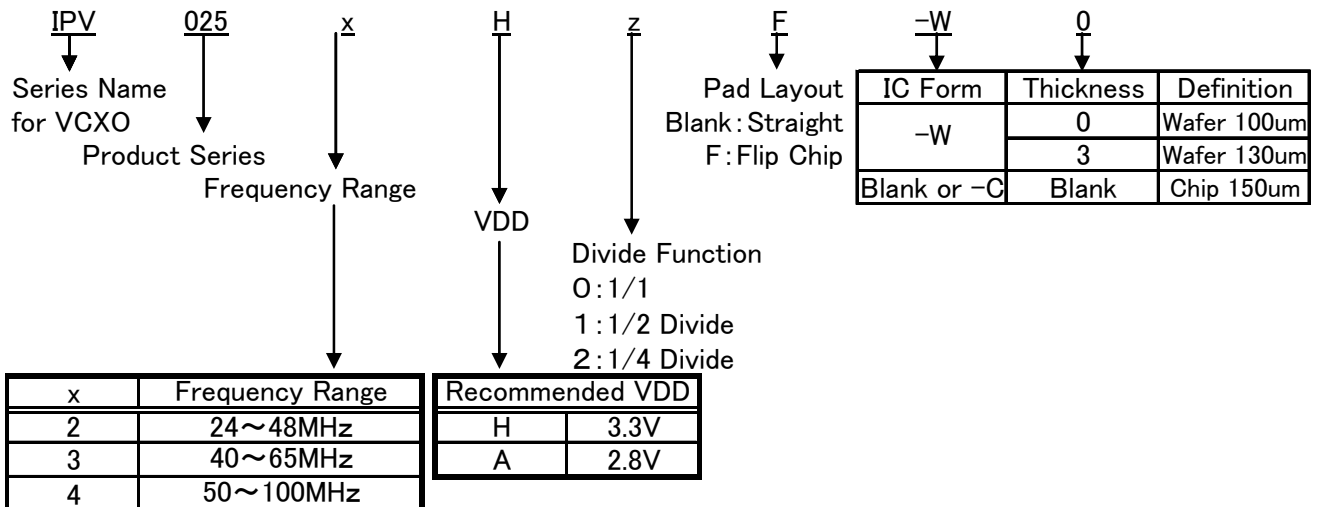


■ Description

IPV025 Series IC is a single chip VCXO IC with built-in Variable Capacitor. Chip size of this product is small enough for 2520 size SMD and 2.8V operation is available, so this IC is suitable for mobile applications.

■ Features

- Small chip size : 0.65mm × 0.67mm
- Operation voltage : 2.8V / IPV025xA and 3.3V / IPV025xH
- Vc Input impedance : 5MΩ
- Standby function : None
- Crystal frequency : 24~100MHz / IPV025xA and IPV025xH
- Low power consumption : 3mA (IPV0252H)
- Operation temperature : 85°C
- Output : CMOS
- Divide function : 1/2 and 1/4
- Frequency stability to Vdd : Within ±2ppm / Vdd±10%
- Wide pulling range : ±90ppm minimum / Vc=1.65±1.65V
- Duty cycle : Within 50±5%

1. Part number rule


**2. Series
2-1 Straight Type**

Part Number	Output Frequency (MHz)		Divide	Remarks
	Min.	Max.		
IPV025 2 H 0	24.00	48.00	1/1	3.3V Operation
IPV025 2 H 1	12.00	24.00	1/2	
IPV025 2 H 2	6.00	12.00	1/4	
IPV025 3 H 0	40.00	65.00	1/1	
IPV025 3 H 1	20.00	32.50	1/2	
IPV025 4 H 0	50.00	100.00	1/1	
IPV025 4 H 1	25.00	50.00	1/2	
IPV025 2 A 0	24.00	48.00	1/1	
IPV025 2 A 1	12.00	24.00	1/2	
IPV025 2 A 2	6.00	12.00	1/4	
IPV025 3 A 0	40.00	65.00	1/1	
IPV025 3 A 1	20.00	32.50	1/2	
IPV025 4 A 0	50.00	100.00	1/1	
IPV025 4 A 1	25.00	50.00	1/2	

2-2 Flip Chip Type

Part Number	Output Frequency (MHz)		Divide	Remarks
	Min.	Max.		
IPV025 2 H 0 F	24.00	48.00	1/1	3.3V Operation
IPV025 2 H 1 F	12.00	24.00	1/2	
IPV025 2 H 2 F	6.00	12.00	1/4	
IPV025 3 H 0 F	40.00	65.00	1/1	
IPV025 3 H 1 F	20.00	32.50	1/2	
IPV025 4 H 0 F	50.00	100.00	1/1	
IPV025 4 H 1 F	25.00	50.00	1/2	
IPV025 2 A 0 F	24.00	48.00	1/1	2.8V Operation
IPV025 2 A 1 F	12.00	24.00	1/2	
IPV025 2 A 2 F	6.00	12.00	1/4	
IPV025 3 A 0 F	40.00	65.00	1/1	
IPV025 3 A 1 F	20.00	32.50	1/2	
IPV025 4 A 0 F	50.00	100.00	1/1	
IPV025 4 A 1 F	25.00	50.00	1/2	

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	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}			30	mA
Junction Temperature	T_j		-55	150	$^{\circ}C$
Storage Temperature	T_{stg}		-55	125	$^{\circ}C$

4. Recommended Operating Condition $V_{SS}=0V$, $T_a=-40^{\circ}C \sim +85^{\circ}C$

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage		V_{DD}	IPV025xH	2.97	3.3	3.63	V	V_{DD}
			IPV025xA	2.52	2.8	3.08		
Control Voltage		V_C		0		$V_{DD} + 1.0$	V	VC
Output Load Capacitance	IPV0252H	CL	CMOS		15	30	pF	OUT
	IPV0253H					15		
	IPV0254H					15		
	IPV0252A				15	30		
	IPV0253A					15		
Ambient Temperature		T_{opT}		-40		85	$^{\circ}C$	

5. Electrical Specification
5-1 IPV025xHz

 Unless otherwise stated, $V_{DD} = 2.97 \sim 3.63V$, $V_{SS} = 0V$, $T_a = -40 \sim 85^\circ C$

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
“H” output voltage	V_{OH}	$I_{OH} = -5mA$	$V_{DD} - 0.4$			V
		$CL = 15pF$	$0.9V_{DD}$			
“L” output voltage	V_{OL}	$I_{OL} = 5mA$			0.4	V
		$CL = 15pF$			$0.1V_{DD}$	
Current consumption	IPV0252	$CL = 15pF, V_{DD} = 3.63V, V_c = 0V$			6.8	mA
	IPV0253				11	
	IPV0254				19	
Output Duty Ratio	Duty	$CL = 15pF, V_c = 1/2V_{DD}$	45		55	%
Pull Range	IPV0252	$V_c = +1.65 \pm 1.35V$ Crystal *1	± 130			ppm
	IPV0253		± 110			
	IPV0254		± 100			
Rise time	IPV0252	$CL = 15pF,$ $10 \sim 90\% V_{DD}$		2.0	4.0	ns
	IPV0253			1.6	3.5	
	IPV0254			1.2	3.0	
Fall time	IPV0252	$CL = 15pF,$ $10 \sim 90\% V_{DD}$		2.0	4.0	ns
	IPV0253			1.6	3.5	
	IPV0254			1.2	3.0	
Output Stabilized Time	T_{OS}	$V_{DD} = 3.3V$			2	ms
Modulation Band Width	F_c	$V_c = 1.35\sin\omega t + 1.65V$	15	20		KHz

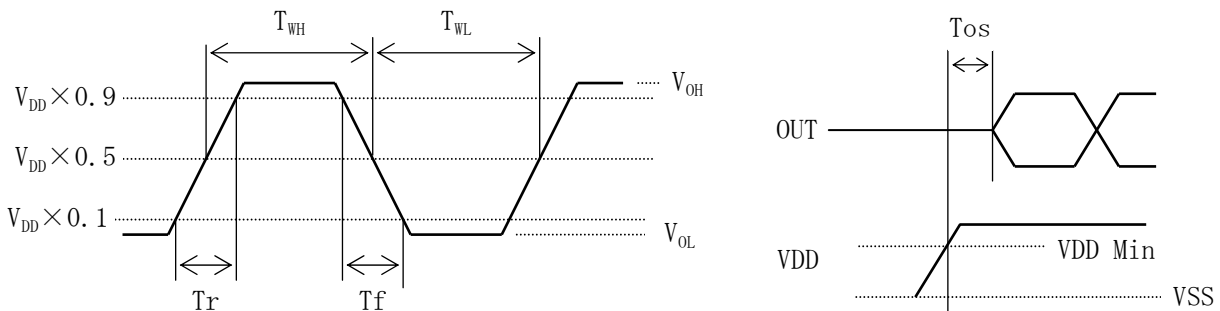
Crystal *1	IC / Frequency	C0 (pF)	C1 (fF)	γ
	IPV0252H / 27MHz	1.22	2.91	420
	IPV0253H / 40MHz	1.24	3.43	362
	IPV0254H / 72MHz	1.81	3.65	497

5-2 IPV025xAz

 Unless otherwise stated, $V_{DD} = 2.52 \sim 3.08V$, $V_{SS} = 0V$, $T_a = -40 \sim 85^\circ C$

Parameter	Symbol	Condition	Specification			Unit	
			Min	Typ	Max		
“H” output voltage	V_{OH}	$I_{OH} = -5mA$	$V_{DD} - 0.4$			V	
		$CL = 15pF$	$0.9V_{DD}$				
“L” output voltage	V_{OL}	$I_{OL} = 5mA$			0.4	V	
		$CL = 15pF$			$0.1V_{DD}$		
Current consumption	IPV0252	I_{DD}	$CL = 15pF$, $V_{DD} = 3.08V$, $V_c = 0V$			5.3	mA
	IPV0253					8.6	
	IPV0254					14.0	
Output Duty Ratio	Duty	$CL = 15pF$, $V_c = 1/2V_{DD}$	45		55	%	
Pull Range	IPV0252	F_{entr}	$V_c = +1.4 \pm 1.4V$ Crystal *1	± 130			ppm
	IPV0253			± 110			
	IPV0254			± 100			
Rise time	IPV0252	T_r	$CL = 15pF$, $10 \sim 90\% V_{DD}$		3.0	4.5	ns
	IPV0253				2.5	4.0	
	IPV0254				2.0	3.5	
Fall time	IPV0252	T_f	$CL = 15pF$, $10 \sim 90\% V_{DD}$		3.0	4.5	ns
	IPV0253				2.5	4.0	
	IPV0254				2.0	3.5	
Output Stabilized Time	T_{os}	$V_{DD} = 2.8V$			2.0	ms	
Modulation Band Width	F_c	$V_c = 1.4\sin\omega t + 1.4V$	15	20		KHz	

Crystal *1	IC / Frequency	C0 (pF)	C1 (fF)	γ
	IPV0252A / 27MHz	1.22	2.91	420
	IPV0253A / 40MHz	1.24	3.43	362
	IPV0254A / 72MHz	1.81	3.65	497



$$\text{Duty} = \frac{T_{WH}}{T_{WH} + T_{WL}} \times 100\%$$

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

6. Circuit Parameters of Oscillator (Reference Data for Circuit Design)
6-1 IPV025xHz

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Input Resistor		R _{VC1}		17	20	23	KΩ
VC Input impedance		R _{vc}	VC terminal to GND	5			MΩ
Equivalent series (Loading) Capacitance		CL _x tal	V _c =0V		8.3		pF
			V _c =1.65V		3.6		
			V _c =3.3V		1.9		
Drive Level	IPV0252H0	DL	27MHz, V _c =0V		75		μW
			27MHz, V _c =1.65V		33		
			27MHz, V _c =3.3V		14		
	IPV0253H0		40MHz, V _c =0V		77		
			40MHz, V _c =1.65V		36		
			40MHz, V _c =3.3V		16		
	IPV0254H0		72MHz, V _c =0V		294		
			72MHz, V _c =1.65V		168		
			72MHz, V _c =3.3V		84		
Frequency deviation by IC		Δf _c /f _c	Crystal fixed			25	ppm

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

*Drive Level is a simulation value just for reference, and actual value depends on crystal.

6-2 IPV025xAz

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Input Resistor		R _{VC1}		17	20	23	KΩ
VC Input impedance		R _{vc}	VC terminal to GND	5			MΩ
Equivalent series (Loading) Capacitance		CL _x tal	V _c =0V		6.8		pF
			V _c =1.4V		3		
			V _c =2.8V		1.5		
Drive Level	IPV0252A0	DL	27MHz, V _c =0V		75		μW
			27MHz, V _c =1.4V		40		
			27MHz, V _c =2.8V		16		
	IPV0253A0		40MHz, V _c =0V		77		
			40MHz, V _c =1.4V		43		
			40MHz, V _c =2.8V		19		
	IPV0254A0		72MHz, V _c =0V		292		
			72MHz, V _c =1.4V		190		
			72MHz, V _c =2.8V		96		
Frequency deviation by IC		Δf _c /f _c	Crystal fixed			25	ppm

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

*Drive Level is a simulation value just for reference, and actual value depends on crystal.

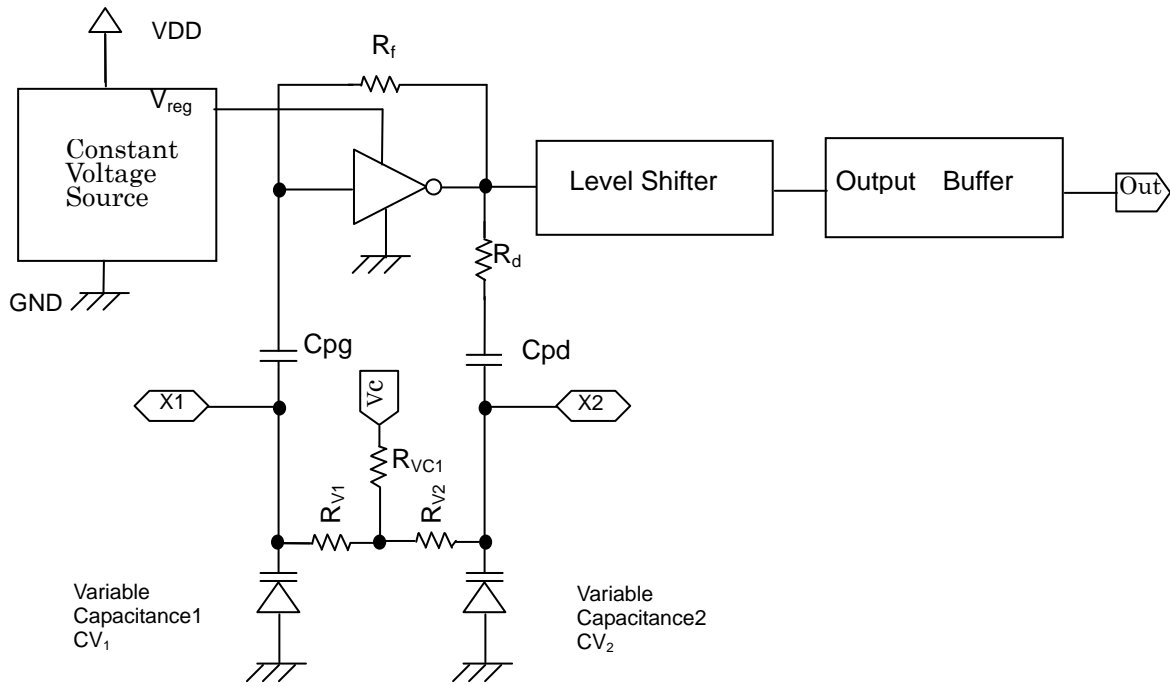
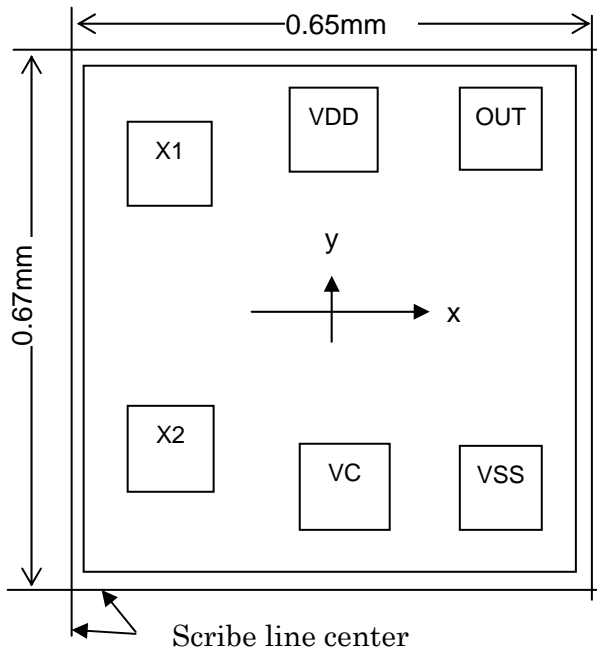
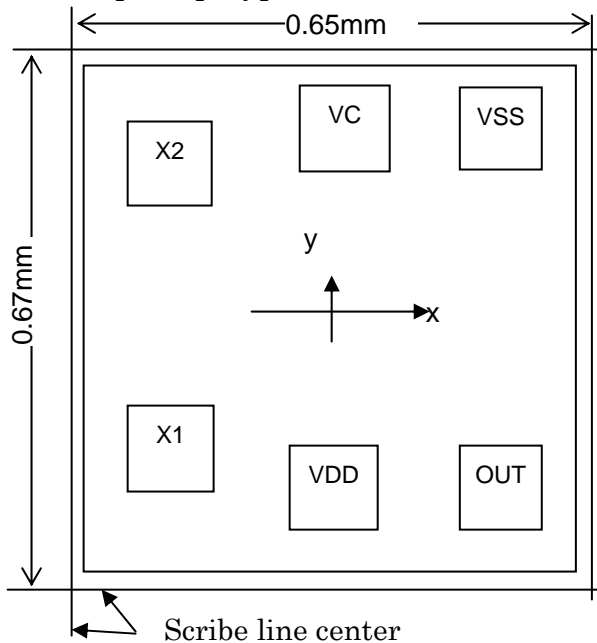


Fig. 6-1 Block Diagram

7. Pad Layout
7-1 Straight Type


- Die Size: 0.65mm × 0.67mm
- Pad Size: 80um □
- Thickness: 150±20um
- IC Backside: Gnd or Open

Pad Name	Function	Location (μm)	
		x	y
X1	Crystal Feedback	-223	166
X2	Crystal Drive	-223	-166
VC	Frequency Control Input	44	-223
VSS	(-)Ground	223	-223
OUT(Q)	Frequency Output	223	223
VDD	(+)Power Supply	19	223
Chip Center		0	0

7-2 Flip Chip Type


- Die Size: 0.65mm × 0.67mm
- Pad Size: 80um □
- Thickness: 100 or 130±10um / Wafer
- IC Backside: Gnd or Open

Pad Name	Function	Location (μm)	
		x	y
X2	Crystal Drive	-223	166
X1	Crystal Feedback	-223	-166
VDD	(+)Power Supply	19	-223
OUT(Q)	Frequency Output	223	-223
VSS	(-)Ground	223	223
VC	Frequency Control Input	44	223
Chip Center		0	0