■ Description

IPV035 Series IC is a single chip VCXO IC whose pull ability is adjustable according to the customer's requirement. This product covers both 3.3V and 5V, and Vc Input impedance is 5MΩ. IPV035 series is the best solution for the specific application.

■ Features

- Operation temperature : 85℃ (Please contact us about 105℃ usage.)
- Power supply voltage : 3.3V or 5V
- Vc Input impedance : 5MΩ
- Standby function : Oscillation stop
- Crystal frequency : 15～125MHz
- Output : CMOS
- Divide function : 1/2, 1/4, 1/8 and 1/16
- Small chip size : 0.8mm × 0.9mm
- Frequency stability to Vdd : Within ±1ppm
- Pull ability : Adjustable according to the customer's requirement
- Duty cycle : Within 50±5%

1. Part number rule

IPV 035 x H z – –W 1

- IPV: Series Name for VCXO
- 035: Product Series
- x: Frequency Range
- H: VDD
- z: Divide Function
  - 0 : 1/1
  - 1 : 1/2 Divide
  - 2 : 1/4 Divide
  - 3 : 1/8 Divide
  - 4 : 1/16 Divide
- –: Optional Code

Blank	Standard product
A	Wider Pull range
B	Stable Pull sensitivity
C	Narrow Pull range(±50ppm)

– : IC Form / 1 : Thickness

IC Form	Thickness	Definition
–W	1	Wafer 150um
Blank or –C	Blank	Chip 150um

x	Frequency Range
2	15～50MHz
3	40～70MHz
4	60～90, 100MHz
5	90～125MHz

Recommended VDD	
H	3.3V
C	5.0V

2. Series

Part Number	Output Frequency (MHz) Min.	Output Frequency (MHz) Max.	Divide	Remarks
IPV035 2 H 0	20.00	50.00	1/1	
IPV035 2 H 0 A	15.00	40.00	1/1	Wider pull range
IPV035 2 H 0 C	15.00	40.00	1/1	Pull range=27MHz±50ppm
IPV035 2 C 0 B	15.00	50.00	1/1	Stable Pull sensitivity
IPV035 2 H 1	10.00	25.00	1/2	
IPV035 2 H 2	5.00	12.50	1/4	3.3V Operation
IPV035 2 H 3	2.50	6.25	1/8	
IPV035 2 H 4	1.25	3.13	1/16	
IPV035 3 H 0	40.00	70.00	1/1	
IPV035 4 H 0	60.00	90.00	1/1	
IPV035 5 H 0	90.00	125.00	1/1	
IPV035 5 H 1	45.00	62.50	1/2	
IPV035 2 C 0	15.00	45.00	1/1	
IPV035 2 C 1	7.50	22.50	1/2	
IPV035 2 C 2	3.75	11.25	1/4	
IPV035 2 C 3	1.88	5.63	1/8	5V Operation
IPV035 2 C 4	0.94	2.81	1/16	
IPV035 3 C 0	40.00	70.00	1/1	
IPV035 4 C 0	60.00	100.00	1/1	

3. Absolute Maximum Ratings VSS=0V、 Ta=+ 25℃± 2℃

Parameter	Symbol	Condition	Ratings Min	Ratings Max	Ratings Unit
Supply Voltage	V_{DD}	IPV035xH	V_{SS}-0.5	5	V
		IPV035xC	V_{SS}-0.5	7	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	Tj		-55	150	℃
Storage Temperature	T_{stg}		-55	125	℃

4. Recommended Operating Condition VSS=0V、 Ta=－40℃~+85℃

(Please contact us about 105℃ usage.)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
Supply Voltage	V_{DD}	IPV035xH	2.97	3.3	3.63	V	V_{DD}
		IPV035xC	4.5	5.0	5.5		
“H” Input Voltage	V_{IH}		V_{DD}×0.7			V	CE
“L” Input Voltage	V_{IL}				V_{DD}×0.3	V	CE
Input Voltage	V_{IN}		V_{SS}		V_{DD}	V	CE
Control Voltage	V_C		0		V_{DD}	V	VC
Output Load Capacitance	CL	CMOS			15	pF	OUT
Ambient Temperature	T_{opT}		-40		85	℃	

5. Electrical Specification

5-1 IPV035xH Unless otherwise stated, V_{DD} =2.97~3.63V, Vss=0V, Ta=-40~85℃
(Please contact us about 105℃ usage.)

Parameter		Symbol	Condition	Specification			Unit
				Min	Typ	Max	
"H" input current		I_{IH}	$V_{IN}=V_{DD}$			1	μA
"L" input current		I_{IL}	$V_{IN}=V_{SS}$		1.3	10	μA
"H" output voltage		V_{OH}	I_{OH}=-5mA	V_{DD}-0.4			V
"L" output voltage		V_{OL}	I_{OL}=5mA			0.4	V
Current consumption		I_{DD}	CL=15pF, VDD=3.63V, CE≧VDD-0.3V, F0=27MHz		3	5	mA
Current consumption at oscillation stop		I_{DDD}	CL=15pF, VDD=3.63V, CE≦0.3V, F0=27MHz		1	10	μA
Output off leak at oscillation stop		I_O	CE≦0.3V			10	μA
Output Duty Ratio		Duty	CL=15pF, Vc=1/2V_{DD}	45		55	%
Pull Range	Except below	Fcntr	Vc=+1.65±1.35V 27MHz, Crystal *1		±165		ppm
	IPV0352H0A		Vc=+1.65±1.65V Crystal *2		±100		ppm
	IPV0352H0C		Vc=+1.65±1.65V, 27MHz Crystal *3		±50		ppm
Rise time	IPV0352H	Tr	CL=15pF, 10～90% VDD		2.0	5.0	ns
	IPV0353H				2.0	5.0	
	IPV0354H				1.0	3.0	
	IPV0355H				1.0	3.0	
Fall time	IPV0352H	Tf	CL=15pF, 10～90% VDD		2.0	5.0	ns
	IPV0353H				2.0	5.0	
	IPV0354H				1.0	3.0	
	IPV0355H				1.0	3.0	
Output Enable Time		Tpe				2	ms
Output Disable Time		Tpd				100	ns
Modulation Band Width	No Divide	Fc	Vc=1.35sinωt+1.65V, -3dB	10	15		KHz
	With Divide			6			KHz

Crystal *1; Equivalent Parameter of Crystal is γ=C0/C1<300
Crystal *2; Equivalent Parameter of Crystal is C0=1.5pF, C1=4fF and γ=375
Crystal *3; Equivalent Parameter of Crystal is C0=1.72pF, C1=6.11fF and γ=281

5-2 IPV035xC Unless otherwise stated, V_{DD} =4.5~5.5V, Vss=0V, Ta=-40~85℃
(Please contact us about 105℃ usage.)

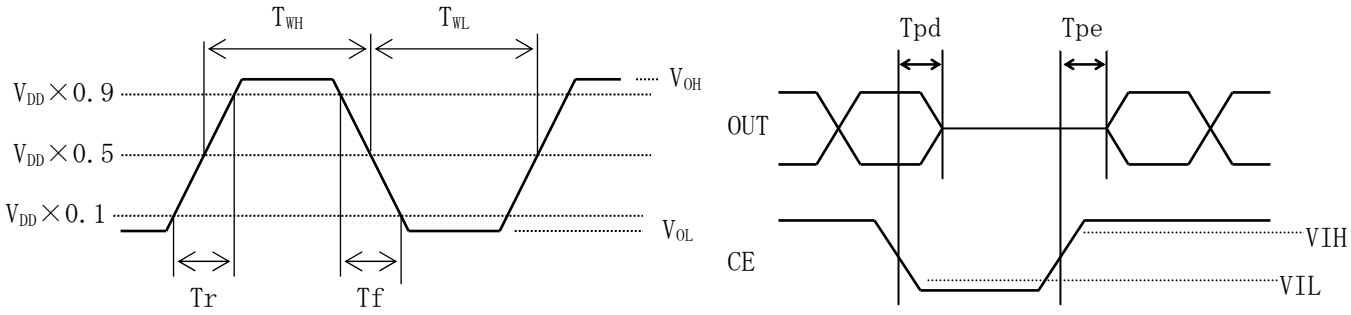
Parameter		Symbol	Condition	Specification			Unit
				Min	Typ	Max	
"H" input current		I_{IH}	$V_{IN}=V_{DD}$			1	μA
"L" input current		I_{IL}	$V_{IN}=V_{SS}$		1.3	10	μA
"H" output voltage		V_{OH}	I_{OH}=-5mA	V_{DD}-0.4			V
"L" output voltage		V_{OL}	I_{OL}=5mA			0.4	V
Current consumption		I_{DD}	CL=15pF, VDD=5.5V, CE≧VDD-0.3V, F0=27MHz		4.0	6.0	mA
Current consumption at oscillation stop		I_{DDD}	CL=15pF, VDD=5.5V, CE≦0.3V, F0=27MHz		1	10	μA
Output off leak at oscillation stop		I_O	CE≦0.3V			10	μA
Output Duty Ratio		Duty	CL=15pF, F0=27MHz, Vc=1/2V_{DD}	45		55	%
Pull Range		Fcntr	Vc=+2.5±2.0V 27MHz, Crystal *1		±150		ppm
Rise time	IPV0352C	Tr	CL=15pF, 10～90% VDD		2.0	5.0	ns
	IPV0353C				2.0	5.0	
	IPV0354C				1.0	3.0	
Fall time	IPV0352C	Tf	CL=15pF, 10～90% VDD		2.0	5.0	ns
	IPV0353C				2.0	5.0	
	IPV0354C				1.0	3.0	
Output Enable Time		Tpe				2	ms
Output Disable Time		Tpd				100	ns
Modulation Band Width	No Divide	Fc	Vc=2.0sinωt+2.5V, -3dB	10	15		KHz
	With Divide			6			KHz

Crystal *1; Equivalent Parameter of Crystal is γ=C0/C1<300

5-3 IPV0352C0B Unless otherwise stated, V_{DD} =2.97~3.63V, Vss=0V, Ta=-40~105℃

Parameter		Symbol	Condition	Specification			Unit
				Min	Typ	Max	
"H" input current		I_{IH}	$V_{IN}=V_{DD}$			1	μA
"L" input current		I_{IL}	$V_{IN}=V_{SS}$		1.3	10	μA
"H" output voltage		V_{OH}	I_{OH}=-5mA	V_{DD}-0.4			V
			CL=15pF	0.9×VDD			
"L" output voltage		V_{OL}	I_{OL}=5mA			0.4	V
			CL=15pF			0.1×VDD	
Current consumption		I_{DD}	CL=15pF, VDD=3.3V, VC=0V, F0=25MHz		2.5	5.0	mA
Current consumption at oscillation stop		I_{DDD}	CL=15pF, VDD=3.3V, CE=VSS, F0=25MHz			5	μA
Output off leak at oscillation stop		I_O	CE≦0.3V			10	μA
Output Duty Ratio		Duty	CL=15pF, F0=25MHz, Vc=1/2V_{DD}	45		55	%
Pull Range	Minus side	Fcntr	Vc=+1.65±1.65V 25MHz, Crystal *1			-110	ppm
	Plus side			+130			
Rise time		Tr	CL=15pF, 10～90% VDD		2.8	5.0	ns
Fall time		Tf	CL=15pF, 10～90% VDD		2.8	5.0	ns
Output Enable Time		Tpe	VDD=3.3V			3	ms
Output Disable Time		Tpd	VDD=3.3V			100	ns
Modulation Band Width		Fc	Vc=1.65sinωt+1.65V, -3dB	10	15		KHz

Crystal *1; Equivalent Parameter of Crystal is C0=2.73pF, C1=10.37fF and γ=264



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

VIH : Threshold voltage for Oscillation Start
VIL : Threshold voltage for Oscillation Stop

Fig. 5-1 Output Wave Form (Duty, Tr, Tf, Tpd, Tpe)

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

6-1 IPV035xH

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor		R_f			120		KΩ
Driving Resistor	IPV0352Hz	Rd			1200		Ω
	IPV0352H0A, C				1550		Ω
	IPV0353H0				600		Ω
	IPV0354H0				100		Ω
	IPV0355H0				50		Ω
Bias Resistor		R_{V1}			240		KΩ
		R_{V2}			120		KΩ
Input Resistor		R_{VC1}			20		KΩ
VC Input impedance		Rvc	VC terminal to GND	5			MΩ
Equivalent series (Loading) Capacitance	IPV0352H	CLxtal	Vc=0V		9.0		pF
			Vc=1.65V		5.9		
			Vc=3.3V		4.0		
	IPV0352H0A		Vc=0V		7.8		pF
			Vc=1.65V		4.7		
			Vc=3.3V		3.0		
	IPV0352H0C		Vc=0V		5.9		pF
			Vc=1.65V		5.0		
			Vc=3.3V		4.3		
DC cut Capacitor	Except Below	Cpg			35.0		pF
	IPV0352H0A				20.0		
	IPV0352H0C				10.0		
	IPV0355H0				15.0		
	Except Below	Cpd			65.0		pF
	IPV0352H0A				20.0		
	IPV0352H0C				10.0		
	IPV0355H0				45.0		
Drive Level	IPV0352H	DL	Vc=1.65V		0		μW
	IPV0355H		Vc=1.65V		390		
Frequency deviation by IC		⊿fc/fc	Crystal fixed			25	ppm

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

6-2 IPV035xC

Parameter		Symbol	Condition	Min	Typ	Max	Unit
Feedback Resistor		Rf			120		KΩ
Driving Resistor	IPV0352Cz, C0B	Rd			1550		Ω
	IPV0353C0				800		Ω
Bias Resistor		R_{V1}			240		KΩ
		R_{V2}			120		KΩ
Input Resistor		R_{VC1}			20		KΩ
VC Input impedance		Rvc	VC terminal to GND	5			MΩ
Equivalent series (Loading) Capacitance	IPV0352Cz	CLxtal	Vc=0.5V		8.5		pF
			Vc=2.5V		5.5		
			Vc=4.5V		3.7		
	IPV0353C0		Vc=0.5V		8.8		pF
			Vc=2.5V		5.7		
			Vc=4.5V		4.0		
	IPV0352C0B		Vc=0V		6.0		pF
			Vc=1.65V		4.4		
			Vc=3.3V		3.2		
DC cut Capacitor		Cpg			35.0		pF
		Cpd			65.0		pF
Drive Level	IPV0352C	DL	Vc=1.65V		30		μW
Frequency deviation by IC		⊿fc/fc	Crystal fixed			25	ppm

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

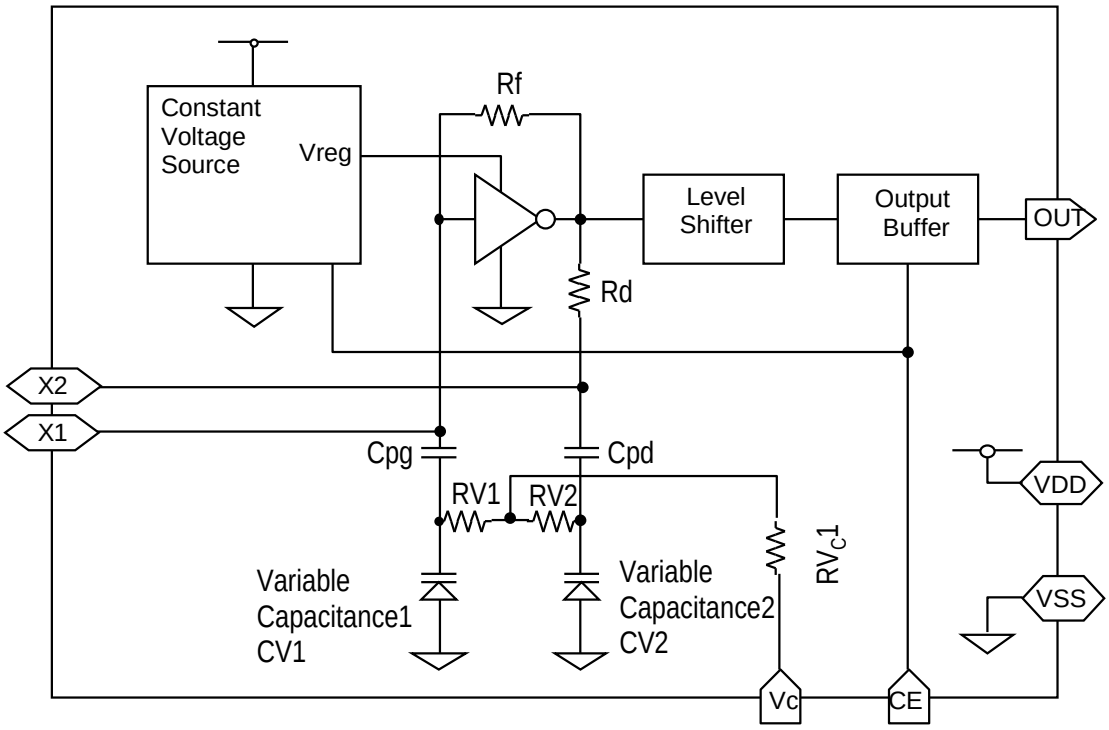
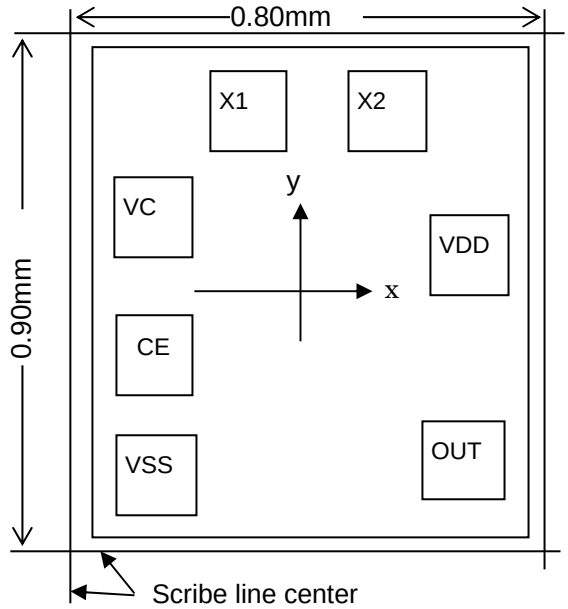


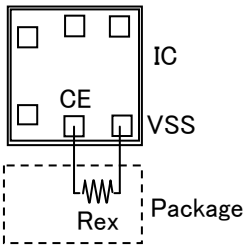
Fig. 6-1 Block Diagram (High frequency, wide pull range type is different)

7. Pad Layout



- Die Size : 0.80mm × 0.90mm
- Pad Size : 80um □
- Thickness : 150±20um
- IC Backside : Gnd or Open

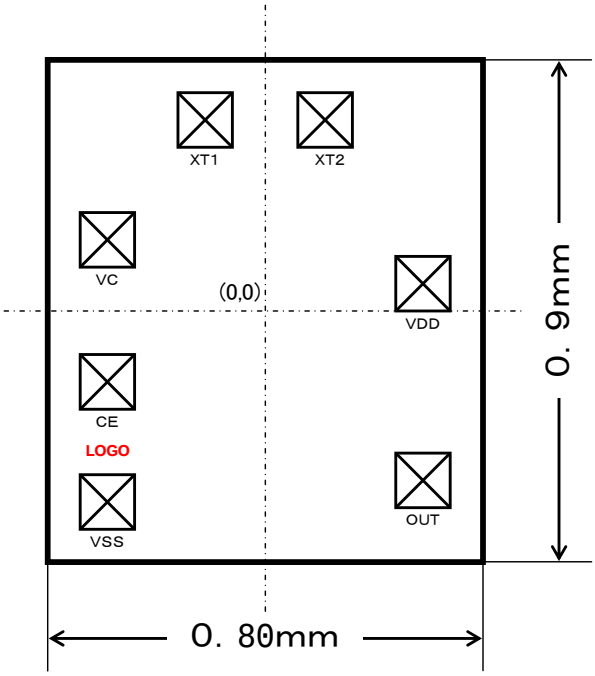
Pad Name	Function	Location (μm)	
		x	y
VSS	(−)Ground	−274	−334
OUT(Q)	Frequency Output	274	−273
VDD	(+)Power Supply	274	40
X2	Crystal Drive	98	334
X1	Crystal Feedback	−98	334
VC	Frequency Control Input	−274	129
CE	Oscillation stop, "L": High-Impedance	−274	−149
Chip Center		0	0



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



There is LOGO in between CE and VSS

Part #	LOGO
IPV0352H0	IPV035_H
IPV0352C0	IPV035_C

Part #	Fuse
IPV0352H0 IPV0352C0	
IPV0352H0A IPV0352C0B	
IPV0352H0C	
IPV0352H1 IPV0352C1	
IPV0352H2 IPV0352C2	
IPV0352H3 IPV0352C3	
IPV0352H4 IPV0352C4	
IPV0353H0 IPV0353C0	
IPV0354H0 IPV0354C0	
IPV0355H0 IPV0355C0	
IPV0355H1	