Analog IP - Megafunction
2 x Differential Capacitive Voltage Converter
XH035

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General Description

This universal Megafunction block converts single ended and differential capacitances into digital values. It integrates all necessary sample&hold and mux functions, references, ADC, registers and SPI and is functional as a separate IC with reference voltage pins connected to VDD and VSS. Parameters and measured data are stored in registers and can be read and written via SPI. It has been evaluated for complete functionality and accuracy in silicon.

Ratings, Parameters and Conditions

Parameter / Condition	Symbol	Min	Typ.	Max	Unit	Comment
Sensor capacitance	C_{sensor}	1		10	pF	Delta C = 4pF = ±2pF
Resolution	N		12		Bit	LSB 1fF
Conversion time	T_{conv}			4	ms	
Supply Voltage	Vdd	3.0	3.3	3.6	V	
Current Consumption	Idd			850	µA	
Operating temperature	$T_{junction}$	-20		80		Calibration required
Stimuli clock frequency	F_{stim}		1		MHz	within the IP cell

Register structure

Name	Address	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
CTOV Active	01h	n.u.															EN
StartX	02h	n.u.				Measure Data from last Measurement of X Sensor											
StartY	03h	n.u.				Measure Data from last Measurement of Y Sensor											
CalibStartX	04h	n.u.				Old calibration register Data back, replacing data											
CalibStartY	05h	n.u.				Old calibration register Data back, replacing data											
CalibConstX	10h	n.u.				Calibration data back and replacing data											
CalibConstY	11h	n.u.				Calibration data back and replacing data											
CPNX	12h	DEX	CP-DataX							n.u.	CN-DataX						
CPNY	13h	DEY	CP-DataY							n.u.	CN-DataY						
Clk1MTrim	14h	ENPADCLK												CLK1MTRIM-Data			
ReadX	80h	n.u.				Send back measurement register											
ReadY	81h	n.u.				Send back measurement register											

CTOV Active
Enables the cell with EN='1' and disables with EN='0'.

StartX/ StartY
Start measurement for X/Y Sensor, send back last Data and writes new measurement data.

CalibStartX/ CalibStartY
Start calibration of X/Y Sensor, send back last Data (CalibConstX, CalibConstY) and writes new calibration data.

CalibConstX/ CalibConstY
Send back last Data and writes new data from SPI interface. (12 Bit)

CPNX/ CPNY
Send back last Data and writes new data from SPI interface. Bit15 set DiffEnX/ DiffEnY. The highest bit of CP-DataX/CN-DataX / DataY/CN-DataY is the enable signal to activate the CPX/CNX / CPY/CNY capacity.

Clk1MTrim
Send back last registered Data and replace register with new data from SPI interface. (4Bit) Bit15 enables the external Clock "PADCLK1M".

ReadX/ ReadY

Send back measured registered X/Y Data. (12 Bit)

Symbol