

Analog IP - Megafunction

Capacitive Sensor Driver / Readout CapSense-1 XB06/XH035

General Description

CapSense-1 Megacell is a scalable capacitive sensor signal conditioning circuit IP.

Typical Applications:

- MEMS pressure sensors with very low capacitance
- MEMS accelerometers and Gyros

It has all necessary sensor driving circuitry as well as readout amplifier, filter and ADC circuitry. The output can be analog and digital. It can be post-processed employing one of PE's digital interface IPs, e.g. the PE_wire IP cell (single wire interface).

A programmable sine wave signal coming from an integrated signal generator drives the sensor. The other port of the MEMS capacitance is connected to the sensor conditioning circuitry. The circuit system is highly flexible and can be easily designed into any ASIC requirement. The cell exists for two technologies (CMOS035, BiCMOS06).

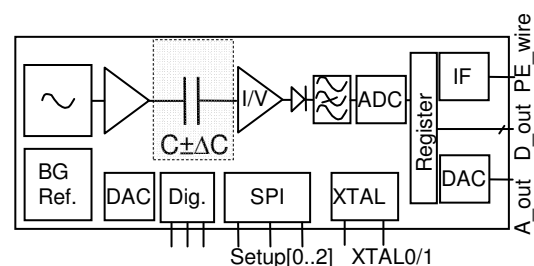
Ratings, Parameters and Conditions (Ratings valid for 0.6um technology cell)

Parameter / Condition	Symbol	Min	Typ.	Max	Unit	Comment
Electrical Parameters						
Sensor						
Sensor capacitance	C_{sensor}	2	5	10	fF	for low - C MEMS
Delta capacitance	ΔC		$3 \times C_{\text{sensor}}$		fF	
Signal Amplifier Unit						
DAC Resolution	N		10		Bit	driving comparator ADC
ADC settling time	t_{START}			8	us	comparator for counter ADC
ADC counter delay	t_{DZ}			2	ns	after clock posedge with 8MHz Clock
reset delay	t_{R}			2	ns	after reset negedge with 8MHz Clock
filter time constant	T_{FILT}		1000		ns	analog filter
bandwidth I/V converter	$BW_{\text{I/U}}$	10			MHz	
Differential linearity error	DAC_{DNL}		$\pm 1/4$	$\pm 3/4$	LSB	
Integral linearity error	DAC_{INL}			± 2	LSB	
Driver Unit						
linear driver range	V_{shift}	1		4	V	
Stimuli clock frequency	F_{stim}	1	10	12	MHz	Sine wave

IO-Description

Interface	I/O	Function	Comment
Vdd	Input	Supply	
Gnd	Input	Supply	
SensOut	Output	driver	driver output
SensIn	Input	readout	Sensing input
clk	Input	Clock	
reset	Input	Reset	Global reset
ena	Input	Enable	
D_out[0..11]	Output	Data	Output data
A_out	Output	Data	Output Analog
Setup[0..2]	In/out	Serial port	Progr./Test register
XTAL[0..1]	In/out	XTAL	crystal

Symbol and external Component Schematic



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