



XE2003

Capacitive Sensor Interface Circuit Gain & Offset Adjustment

General Description

The XE2003 is a CMOS circuit designed to interface with capacitive-type sensors, such as pressure sensors, accelerometers, capacitive microphones and humidity sensors. The interface circuit is compact and easy-to-use since no external components are needed for a default setting of parameters. The low-noise low-drift design enables high precision measurements from DC up to the kHz range.

A high maximum sensitivity of 200 mV/pF can be obtained using a sensor with two nominal capacitances of 25 pF. The circuit is based on a charge compensation feedback loop. This approach guarantees a linear and low-drift transfer between a differential capacitance at the input and the analog output voltage.

For sensors with only one varying capacitance, an additional fixed capacitance with an equal nominal value can be used to form a quasi-differential sensor.

The gain and offset adjustment can be used for adjustment of the sensor's sensitivity and offset.

Key Product Features

- Maximum sensitivity of 200 mV/pF
- Linear response to differential capacitances
- Designed for low drift & low noise
- Gain and offset adjustment possibility
- Dual ± 2.5 Volts or single 5 Volts power supply
- Low power consumption (17 mW max at 5 Volts)
- Frequency bandwidth DC to 17 kHz
- Output load on analog output: 50 pF and/or 10 k Ω
- Available in DIL16 (XE2003D), S016 (XE2003S) or dice

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TYPICAL APPLICATION

A typical application of the XE2003 circuit is interfacing a sensor which is composed of two active capacitances which vary in a differential way.

ELECTRICAL CHARACTERISTICS

(VSS=VSSA=VSSD, VDD-VSS=5V, Temperature = -40..85 °C, C1 = C2 = 50 pF unless otherwise stated)

Characteristic	Min	Typ	Max	Unit
Sensor capacitances total value (C1+C2)	24		110	pF
Maximum capacitances relative difference (C1-C2)/(C1+C2)			±15	%
VOUT output dynamic range, measured with respect to AGND			±1.5	V
Gain (without trimming)	-3.75	-4	-4.25	
Offset voltage in VOUT, measured with respect to AGND.(without trimming)			±50	mV
Offset drift at VOUT output		±100	±150	μV/°C
White noise spectral density at VOUT, (decoupled supplies).		-113	-110	dBV/√Hz
Flicker noise spectral density at VOUT, measured at 1 kHz (decoupled supplies)			-125	dBV/√Hz
Slope of flicker noise			-0.69	
THD measured at VOUT (VOUT=2V _p , f<10kHz)			-57	dB
External C _{ext} capacitance value	0		3	nF
External resistive load on VOUT	10			kΩ
External capacitive load on VOUT			50	pF
Startup time		50	70	ms

Demonstration samples are available upon request.

For further information about the capacitive sensor interface circuit **XE2003** please contact

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