CXTA SOLID STATE, ANALOG SERIES

- Small, Low-Cost, Rugged
- Rapid Response
- ± 75° Range
- Fully Conditioned Analog Outputs

Applications

- Scissor Lifts
- Static Platforms
- Survey Leveling Equipment
- Laser Leveling





MERSE

CXTA01, CXTA02

The CXTA single- and dual-axis analog tilt sensors offer resolution, accuracy, and fast response in an inexpensive, easy-to-use package. The CXTA series design centers on a highly stable silicon micro-machined capacitive inclination sensor element. The CXTA series is fully signal conditioned with high level analog output(s), and optional analog temperature signal.

Micro-machined devices, perfected in automotive safety applications, offer several distinct advantages over fluid, electrolytic, and pendulum-based sensors. Like other solid-state devices, they are more reliable than their mechanical counterparts. In a package smaller than many pendulum or fluid raw sensing elements, completely integrated electronics eliminate the need for external components. Unlike other micro-machined devices, the CXTA Series maintains its accuracy and stability over temperature: < 2° of arc over the range 0° to 70° C. The output can be user corrected for temperature with the T option, yielding accuracy to within \pm 0.5° over the angular range.

A typical configuration using CXTA sensors is shown below. Each module is factory calibrated, tested and includes a calibration sheet. The module can be securely attached using screws or adhesive. The CXTA is available in a standard nylon or high temperature aluminum package.



Typical CXTA02 Configuration

Micromachined Tilt Sensor Element

inear Angular Range (°) ± 20 ± 20 full Angular Range (°) ± 20 ± 75 Angular Resolution (° ms)0.050.05iensitivity - small angles (mV/°) 35 ± 2 35 ± 2 Actual value provided with Sensoriensitivity Drift (%/°C)0.010.01fero Angle Voltage (Volts) 2.5 ± 0.15 2.5 ± 0.15 Actual value provided with Sensorfero Angle Drift (mV/°C)1.01.0Typicalfero Angle Drift (mV/°C)0.030.03Typicalfero Angle Drift (mV/°C)0.030.03Over $\pm 20^\circ$ not including Arcsine Errorandwidth (Hz)5050ferting Time (sec)0.20.2lignment (°) ± 1 ± 1 Typicaltorage Temperature (°C) -55 to $+85$ Nylon Packageopperating Temperature (°C) -55 to ± 105 -55 to ± 105 opperating Temperature (°C) -55 to ± 105 $-AL$ High Temperature Packageopperating Temperature (°C) -55 to ± 105 $-AL$ High Temperature Packageopperating Vibration (g mms)101020-2 kHz randomopply Voltage (VDC) $6 - 30$ $6 - 30$ Unregulatedurrent (mA) 4 8 Implicationitizer (Nylon Package) $78 \times 1.75 \times 1.07$ " ($1.98 \times 4.45 \times 2.72$ cm)(Aluminum Package) $95 \times 2.00 \times 1.20$ " ($2.41 \times 5.08 \times 3.05$ cm)	Specifications	CXTA01	CXTA02	Remarks	
Hull Angular Range (°) \pm 75 \pm 75Angular Resolution (° rms)0.050.05Angular Resolution (° rms)35 \pm 235 \pm 2Actual value provided with SensorGensitivity Small angles (mV/°)35 \pm 235 \pm 2Actual value provided with SensorGensitivity Drift (%/°C)0.010.01CGensitivity Drift (%/°C)1.01.0TypicalGensitivity Orift (%/°C)0.030.03TypicalGensitivity (°)< 0.4	Performance				
Nngular Resolution (* mrs)0.050.05Gensitivity - small angles (mV/°) 35 ± 2 35 ± 2 Actual value provided with SensorGensitivity Drift (%/°C)0.010.01Cero Angle Voltage (Volts) 2.5 ± 0.15 2.5 ± 0.15 Actual value provided with SensorCero Angle Drift (mV/°C)1.01.0TypicalCero Angle Drift (%/°C)0.030.03TypicalNon-Linearity (°)< 0.4	Linear Angular Range (°)	± 20	± 20		
instituty - small angles (mV/P) 35 ± 2 35 ± 2 35 ± 2 Actual value provided with Sensoriensitivity Drift (%/PC)0.010.010.01tero Angle Voltage (Volts) 2.5 ± 0.15 2.5 ± 0.15 Actual value provided with Sensortero Angle Drift (mV/PC)1.01.0Typicaltero Angle Drift (%/PC)0.030.03Typicaltero Angle Drift (%/PC)0.030.03Typicaltero Angle Drift (%/PC)0.030.03Typicaltero Angle Drift (%/PC)0.04< 0.4	Full Angular Range (°)	± 75	± 75		
Sensitivity Drift (%/°C) 0.01 0.01 Gero Angle Voltage (Volts) 2.5 ± 0.15 2.5 ± 0.15 Actual value provided with Sensor Gero Angle Drift (mV/°C) 1.0 1.0 Typical Gero Angle Drift (mV/°C) 0.03 0.03 Typical Non-Linearity (°) < 0.4	Angular Resolution (° rms)	0.05	0.05		
Lero Angle Voltage (Volts) 2.5 ± 0.15 2.5 ± 0.15 Actual value provided with SensorLero Angle Drift (mV/°C) 1.0 1.0 TypicalNon-Linearity (°) < 0.4 < 0.4 Over $\pm 20^{\circ}$ not including Arcsine ErrorSandwidth (Hz) 50 50 50 Sandwidth (Hz) 0.2 0.2 100 Nigment (°) ± 1 ± 1 TypicalStorage Temperature (°C) -55 to $+85$ So to +85Operating Temperature (°C) -55 to $+85$ Nylon PackageOperating Temperature (°C) -55 to $+105$ $-AL$ High Temperature PackageOperating Temperature (°C) -40 to $+85$ -40 to $+105$ $-AL$ High Temperature PackageOperating Temperature (°C) -40 to $+105$ $-4L$ High Temperature PackageOperating Vibration (g rms) 10 10 $20-2$ kHz randomShock (g) 2000 2000 1 ms, half sineElectrical -10 -30 $6 - 30$ Sinply Voltage (VDC) $6 - 30$ $6 - 30$ UnregulatedSupply Voltage (VDC) $6 - 30$ $6 - 30$ UnregulatedSinger (Mylon Package) $.78 \times 1.75 \times 1.07$ " ($1.98 \times 4.45 \times 2.72$ cm) -100 (Aluminum Package) $.95 \times 2.00 \times 1.20$ " ($2.41 \times 5.08 \times 3.05$ cm) -100	Sensitivity - small angles (mV/°)	35 ± 2	35 ± 2	Actual value provided with Sensor	
Lero Angle Drift (mV/°C)1.01.0TypicalLero Angle Drift '9/°C)0.030.03TypicalJon-Linearity (°)< 0.4	Sensitivity Drift (%/ºC)	0.01	0.01		
Ereo Angle Drift %0.030.03TypicalAon-Linearity (°)<0.4	Zero Angle Voltage (Volts)	2.5 ± 0.15	2.5 ± 0.15	Actual value provided with Sensor	
Non-Linearity (°)< 0.4< 0.4Over \pm 20° not including Arcsine ErrorBandwidth (Hz)5050Bandwidth (Hz)0.20.2Wignment (°) \pm 1 \pm 1TypicalCross-axis Sensitivity (%))< 5	Zero Angle Drift (mV/°C)	1.0	1.0	Typical	
Andwidth (Hz)5050iettling Time (sec)0.20.2Nignment (°) ± 1 ± 1 TypicalCross-axis Sensitivity (%))< 5	Zero Angle Drift ⁽⁰ / ⁰ C)	0.03	0.03	Typical	
Interface tertling Time (sec)0.20.20.2Alignment (°) ± 1 ± 1 TypicalCross-axis Sensitivity (%))< 5	Non-Linearity (°)	< 0.4	< 0.4	Over ± 20° not including Arcsine Error	
Alignment (°) ± 1 ± 1 TypicalCross-axis Sensitivity (%))< 5	Bandwidth (Hz)	50	50		
Tross-axis Sensitivity (%))< 5< 5Inclusive of alignment errorinvironmentitorage Temperature (°C)-55 to +85-55 to +85Nylon PackageOperating Temperature (°C)-40 to +85-40 to +85Nylon Packageobservating Temperature (°C)-55 to +105-55 to +105-AL High Temperature Packageobservating Temperature (°C)-40 to +105-40 to +105-AL High Temperature Packageobservating Temperature (°C)-40 to +105-40 to +105-AL High Temperature Packageobservating Temperature (°C)-40 to +105-40 to +105-AL High Temperature Packageobservating Vibration (g rms)101020-2 kHz randomshock (g)200020001 ms, half sineElectrical	Settling Time (sec)	0.2	0.2		
Invironment Image: Constraint of the second se	Alignment (°)	± 1	± 1	ТурісаІ	
Additional and the second se	Cross-axis Sensitivity (%))	< 5	< 5	Inclusive of alignment error	
Operating Temperature (°C) -40 to +85 -40 to +85 Nylon Package Storage Temperature (°C) -55 to +105 -AL High Temperature Package Operating Temperature (°C) -40 to +105 -AL High Temperature Package Non-Operating Vibration (g ms) 10 20-2 kHz random Nohck (g) 2000 2000 1 ms, half sine Electrical -6 - 30 6 - 30 Unregulated Current (mA) 4 8 - Physical .78 x 1.75 x 1.7* (1.98 x 4.45 x 2.72 cm) - (Aluminum Package) .95 x 2.00 x 1.2* (2.41 x 5.08 x 3.05 cm) -	Environment				
AL High Temperature (°C) -55 to +105 -55 to +105 -AL High Temperature Package Operating Temperature (°C) -40 to +105 -AL High Temperature Package Jon-Operating Vibration (g rms) 10 10 20-2 kHz random Jon-Operating Vibration (g rms) 10 2000 1 ms, half sine Electrical	Storage Temperature (°C)	-55 to +85	-55 to +85	Nylon Package	
Operating Temperature (°C) -40 to +105 -40 to +105 -AL High Temperature Package Jon-Operating Vibration (g rms) 10 10 20-2 kHz random Johock (g) 2000 2000 1 ms, half sine Electrical	Operating Temperature (°C)	-40 to +85	-40 to +85	Nylon Package	
Non-Operating Vibration (g rms) 10 10 20-2 kHz random Johock (g) 2000 2000 1 ms, half sine Electrical	Storage Temperature (°C)	-55 to +105	-55 to +105	-AL High Temperature Package	
Action Action Action shock (g) 2000 1 ms, half sine silectrical 2000 1 ms, half sine siupply Voltage (VDC) 6 - 30 6 - 30 Unregulated current (mA) 4 8	Operating Temperature (°C)	-40 to +105	-40 to +105	-AL High Temperature Package	
Ilectrical Image: second sec	Non-Operating Vibration (g rms)	10	10	20-2 kHz random	
Status 6 - 30 6 - 30 Unregulated Supply Voltage (VDC) 6 - 30 Unregulated Current (mA) 4 8 Physical 78 × 1.75 × 1.0* 1.98 × 4.45 × 2.72 cm (Aluminum Package) .95 × 2.00 × 1.2 ⁻¹ (2.41 × 5.08 × 3.05 cm)	Shock (g)	2000	2000	1 ms, half sine	
Current (mA) 4 8 Physical	Electrical				
Physical Image: Constraint of the state of	Supply Voltage (VDC)	6 - 30	6 - 30	Unregulated	
ize (Nylon Package) .78 x 1.75 x 1.07" (1.98 x 4.45 x 2.72 cm) (Aluminum Package) .95 x 2.00 x 1.20" (2.41 x 5.08 x 3.05 cm)	Current (mA)	4	8		
(Aluminum Package) .95 x 2.00 x 1.20" (2.41 x 5.08 x 3.05 cm)	Physical				
	Size (Nylon Package)	.78 x 1.75 x 1.07" (1.98 x 4.45 x 2.72 cm)			
Veight (Nylon Package) 1.38 oz (43 gm)	(Aluminum Package)	.95 x 2.00 x 1.20" (2.41 x 5.08 x 3.05 cm)			
	Weight (Nylon Package)	1.38 oz (43 gm)			
(Aluminum Package) 2.09 oz (65 gm)	(Aluminum Package)	2.09 oz (65 gm)			



Sensitivity (V/rad)

Specifications subject to change without notice

Principle of Operation

The CXTA Series Tilt Sensors use a micro-machined acceleration sensing element with a DC response to measure inclination relative to gravity. The response of the tilt sensor depends on the magnitude of gravity parallel to the sensor element. The output of the tilt sensor will be an offset voltage plus the voltage response proportional to the amount of gravity measured by the sensor.

Using the CXTA Sensor

The voltage response of the CXTA is proportional to the sine of the tilt angle.

Accurately measuring tilt angle involves solving the equation shown in Figure 1. To solve this equation the Zero Angle Voltage and Sensitivity must be determined prior to use, and the sensitivity must be converted to V/rad. MEMSIC provides this information on a calibration sheet with its CXTA products.



For angles less than 20°, the sine function can be approximated by a linear relationship between the Vout and the tilt angle in degrees. Thus the simplified equation for small angle in degrees is:

When the tilt angle is less than 20°, the error from linear approximation will be less than 2%. This is convenient when you don't have or want the computing power to calculate an inverse sine function.

Pin	Color	Function	
1	Red	Power	
2	Black	Ground	
3	White	Roll	
4	Yellow	Pitch	
5	Green	Temp	

Pin Diagram



Optional Aluminum Package

Ordering Information								
Model	Axes	Linear Range	Full Range	Resolution				
CXTA01	Х	± 20°	± 75°	0.05°				
CXTA02	X,Y	± 20°	± 75°	0.05°				
OPTIONS								
-T	Temperature Sensor Internal							
-AL	High Temperature Aluminum Package							

CALL FACTORY FOR OTHER CONFIGURATIONS