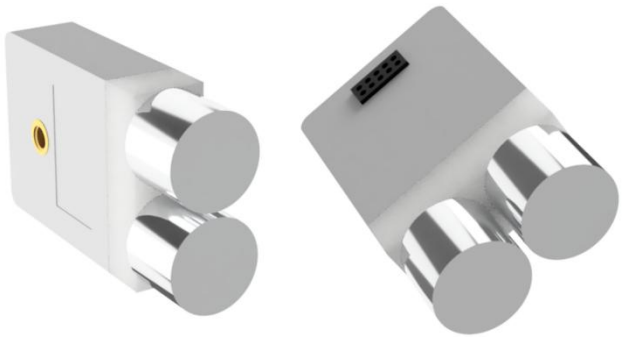
alignG-S Technical Manual S310APU

2.5/25 µm Precision Ultrasonic Proximity/Distance Sensor

FEATURES

- Non-Contact
- Analog/UART/PWM/LED Output
- 2.5 micron precision proximity Sensor
- 25 micron precision distance Sensor
- Only 7 grams



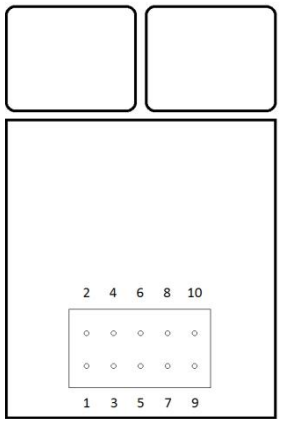
PRODUCT OVERVIEW

alignG-S, is a cost-effective, low power, compact proximity/distance measurement sensor with a Digital & Analog communication port. This 3.3V sensor uses less than 70mW. alignG-S has two measurement modes working simultaneously, Proximity Mode and Distance Measurement Mode. As a proximity sensor, S310APU has a precision of 2.5 µm and as a distance sensor has a precision of 25 µm and accuracy of 50 µm. alignG-S is compatible with several external modules offered by alignG.

PIN DEFINITION

Pin #	Symbol	I/O*	Function
1	VCC	P	+3.3V Power Source
2	LED1	O	Position indicator
3	NC	X	No Connect
4	LED0	O	Zero-point indicator
5	NC	X	No Connect
6	TX	O	UART Output
7	AN	O	Analog Output
8	PWM	O	PWM Output
9	GND	P	Ground
10	EN	I	Chip Enable, Active Hi

* I: Input O: Output P: Power Source X: No Connect



2.5/25 µm Precision Ultrasonic Proximity/Distance Sensor

ABSOLUTE MAXIMUM RATINGS*

VCC Voltage**	3.6 V
Voltage** on Input Pins	0 V to VCC
DC Current Per Output Pins	20 mA
Operating Temperature	-10°C to +70°C

*Exposure to absolute maximum ratings may permanently damage the sensor. Absolute maximum conditions are not the recommended conditions for storage or operating the sensor. Multiple or long term exposure to proximity of absolute maximum conditions may degrade the performance of the sensor.

** Voltages with respect to GND

ELECTRICAL SPECIFICATIONS

Input Voltage*	3.3V
Average Supply Current, Active**	20mA
Peak Supply Current, Active**	40mA
Average Supply Current, Sleep***	700µA

* Voltage with respect to GND ± 1%

** Current while No load on output pins ± 5%

** Average Current ± 5%

PROXIMITY MEASUREMENT PERFORMANCE*

Proximity Measurement Precision**	2.5µm
Measurement Distance***	5mm
Measurement Time	16ms±10%

* The sensor's measurements depend on variety of parameters. These data are verified at 25°C, 50% relative humidity for an object in 4mm-6mm proximity of the sensor.

** Standard Deviation

*** The proximity detection distance may vary depend on the material of the under-test object and environmental conditions

DISTANCE MEASUREMENT PERFORMANCE*

Distance Measurement Precision**	25 µm
Distance Measurement Accuracy	50 µm
Measurement Range***	5mm - 50 mm
Absolute Measurement Range****	λ/2
Measurement Time	1.75s±10%

* The sensor's measurements depend on variety of parameters. These data are verified at 25°C, 50% relative humidity for an object in 20mm-25mm proximity of the sensor.

** Standard Deviation

*** Non-Absolute measurement range

**** The promised precision and accuracy in Absolute Measurement Range is verified in 20mm-25mm proximity of the sensor

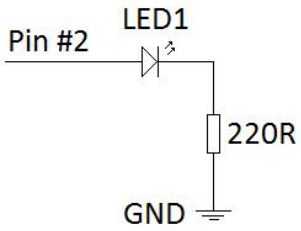
PIN DESCRIPTION

Pin #1: VCC

Power Supply, must be connected to regulated +3.3 V

Pin #2: LED1

LED1 output is one of the simplest position indicator of the sensor that allows the user to precisely compare the distance from two objects using alignG-S, one LED, and one resistor. When the under-test surface is in the mid-point of the measurement range, LED1 has a solid light. Displacing the sensor closer or far from the mid-point, LED starts blinking.



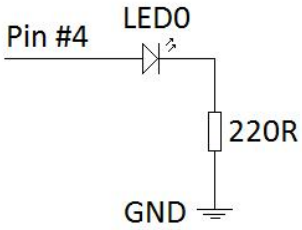
Pin #3: NC

NC should not be connected to any power pin or electrical load. Applying any signal or load to the NC pin may permanently damage the sensor.

Pin #4: LED0

LED0 output is the output of S310APU in proximity sensing mode. This pin is 0 (L) when the sensor is far away from the surface. In 10mm proximity, pin #4 becomes 1 (H).

Another important function of LED0 is for initial alignment of the sensor in distance measurement to achieve the best accuracy. When the sensor is installed for the first time, position it in about 10mm from the under-test surface. Slowly tilt the sensor and displace it back and forth until LED0 starts blinking. This is the best orientation for the sensor to be installed.



Pin #5: NC

NC should not be connected to any power pin or electrical load. Applying any signal or load to the NC pin may permanently damage the sensor.

Pin #6: TX

This Output pin sends the sensor measurements via UART. The table below shows the UART initial setting:

Parameter	Value
Baud Rate (bps)	9600
Data bits	8
Parity	None
Stop bits	1
Flow Control	None

Each UART data packet contains 4 Bytes starting with a header Byte, followed by data high Byte and data low Byte, and ending with tail check Byte.

Byte #	Description
1	Header check, always: AA-Hex = 170-Dec = 10101010-bin
2	data High byte
3	data low byte
4	Tail check = always: 55-Hex = 85-Dec = 01010101-bin

The calibrated distance can be calculated dividing the UART data by 800000.

Examples

Example1: the received data packet in HEX is: AA-0B-0F-55

0B0F-HEX = 2831-DEC; Distance = 2831/800000 = 0.00353875 m = 3.54 mm

Example2: the received data packet in HEX is: AA-02-F1-55

02F1-HEX = 753-DEC; Distance = 753/800000 = 0.00094125 m = 0.94 mm

Pin #7: AN

Analog Output signal varies from 0 to 3.3V. The AN value can be converted to the distance by dividing the voltage value to 644.69

Examples

Example3: the AN voltage is 2.32V; Distance= 2.32/644.69 = 0.0035986 m = 3.60 mm

Pin #8: PWM Output

The distance can be calculated dividing the duty cycle of the PWM signal by 195.36

Examples

Example4: the PWM signal has 50% duty cycle; Distance = 0.5/195.360195 = 0.0025594 m = 2.56 mm

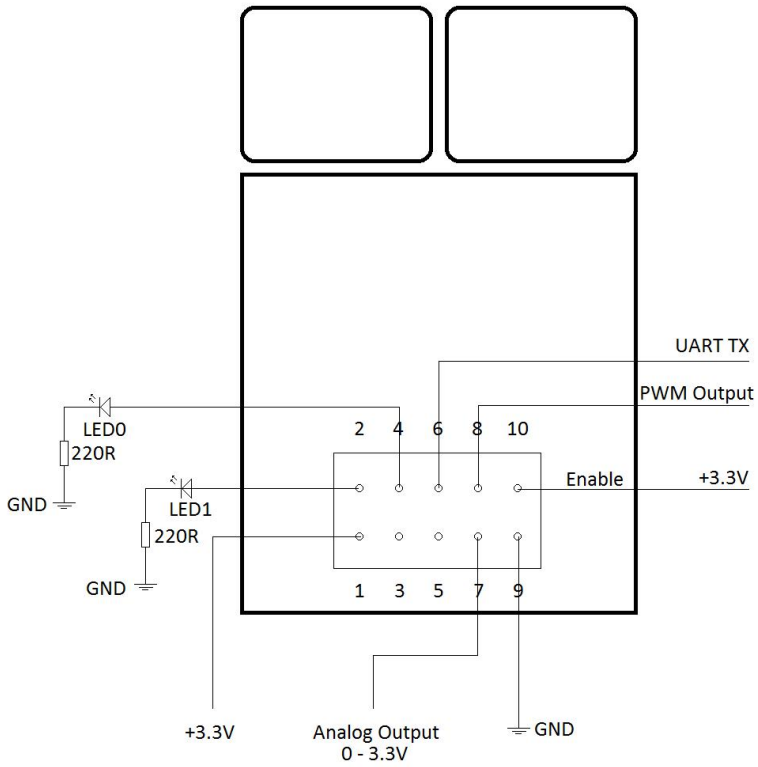
Pin #9: GND

Ground

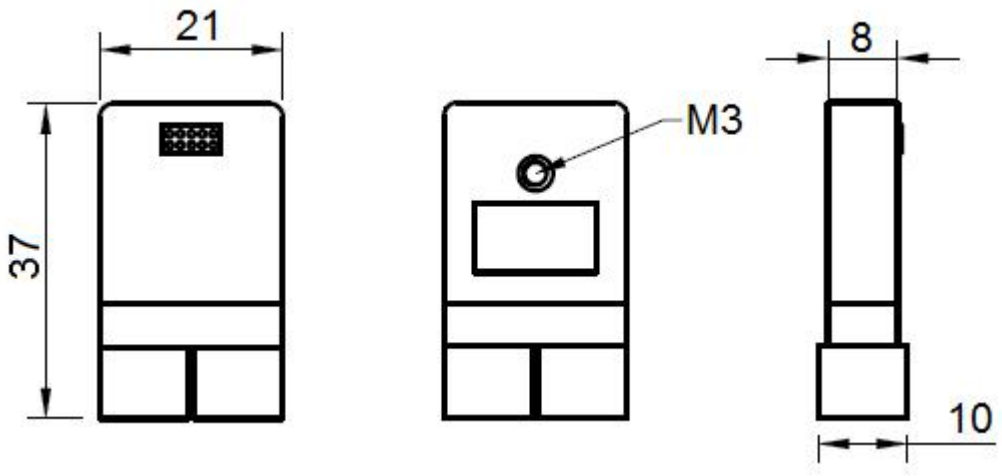
Pin #10: EN

When EN is 0 (L) , the sensor goes to sleep mode, reducing the power consumption of the system. The sensor wakes up setting EN to 1 (H).

QUICK TEST CIRCUIT DIAGRAM



MECHANICAL SPECIFICATIONS



Dimensions : mm