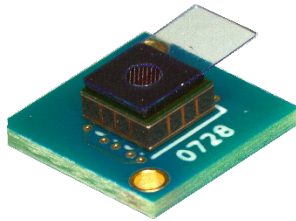


Ultra-low Power Integrated Ultrasonic Time-of-Flight Range Sensor with Particle Ingress Filter

MOD_CH101-0X-03 HIGHLIGHTS

The MOD_CH101-0x-03 is a miniature, ultra-low-power ultrasonic Time-of-Flight (ToF) range sensor with a particle ingress filter ready for an acoustic housing placement to achieve the desired field-of-view. Based on Chirp’s patented MEMS technology, the CH101 is a system-in-package that integrates a PMUT (Piezoelectric Micromachined Ultrasonic Transducer) together with an ultra-low-power SoC (System on Chip) mounted on a small PCB. The SoC runs Chirp’s advanced ultrasonic DSP algorithms and includes an integrated microcontroller that provides digital range readings via I²C.

The MOD_CH101-0x-03 is easily integrated with an acoustic housing allowing for a wide range of ToF applications. It incorporates a removable release liner that protects the pressure sensitive adhesive used for mounting an acoustic housing (the sensor module is shipped without an acoustic housing). The module integrates a particle ingress filter (Saati part number B042H)



DEVICE INFORMATION

PART NUMBER	OPERATION	PACKAGE
MOD_CH101-01-03	Pitch-Catch & Pulse -Echo	8.0mm x 8.0mm x 3.68mm Module

RoHS and Green-Compliant Package

APPLICATIONS

- Augmented and Virtual Reality
- Robotics
- Obstacle avoidance
- Mobile and Computing Devices
- Proximity/Presence sensing
- Ultra-low power remote presence-sensing nodes
- Home/Building automation

FEATURES

- Fast, accurate range-finding
 - Operating range dependent upon final acoustic housing design
 - Sample rate up to 100 samples/sec
 - Programmable modes optimized for multiple range sensing applications
 - Customizable field of view (FoV) up to 180°
 - Multi-object detection
 - Works in any lighting condition, including full sunlight to complete darkness
 - Insensitive to object color, detects optically transparent surfaces (glass, clear plastics etc.)
- Easy to integrate
 - Integrated Particle Ingress Filter (PIF)
 - Easy to remove Release Liner (for acoustic housing mounting)
 - Acoustic housing design files available from Chirp
 - Single sensor for receive and transmit
 - Single 1.8V supply
 - I²C Fast-Mode compatible interface, data rates up to 400 kbps
 - Dedicated programmable range interrupt pin
 - Platform-independent software driver enables turnkey range-finding
- Miniature integrated module
 - 8.0 mmx 8.0 mm x 3.68mm module
 - Low-power SoC running advanced ultrasound firmware
 - Operating temperature range: -40°C to 85°C
- Ultra-low supply current
 - 1 sample/s:
 - 13 μ A (10 cm range)
 - 15 μ A (1.0m range)
 - 30 samples/s:
 - 20 μ A (10 cm range)
 - 50 μ A (1.0m range)

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1 MOD_CH101-0X-03 SCHEMATIC

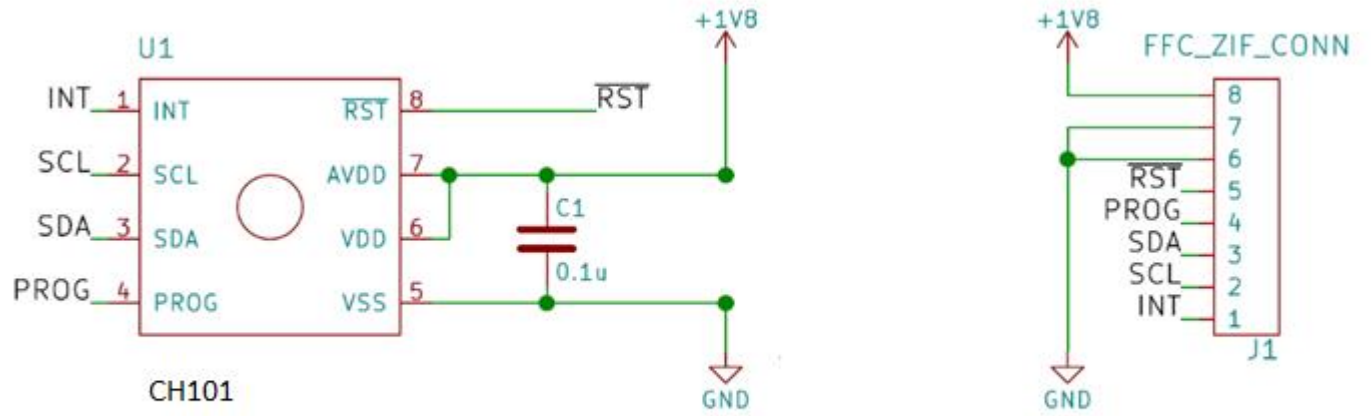


Figure 1. Module Schematic

2 MODULE INTEGRATION

Electrical connection to the CH101 module is via an 8-pin 0.5 mm pitch flat flex cable (FFC) connector. Part numbers of the FFC connectors on the module PCB and the recommended FFC cables are shown in Table 1. The electrical schematic of the module, including the connector pinout and the connections to the CH101 sensor, is shown in Figure 1. Note that the 0.1 μF decoupling capacitor, as recommended in the CH101 datasheet, is included in the module. Consult the DS-000331 CH101 datasheet and application notes for additional information on electrical connection and operation of the CH101 sensor.

In Figure 2, the MOD_CH101-0x-03 is shown connected through a flat flex cable. Each CH101 requires its own PROG line and INT line. The remaining connections can be shared. Refer to the CH101 datasheet for additional information.

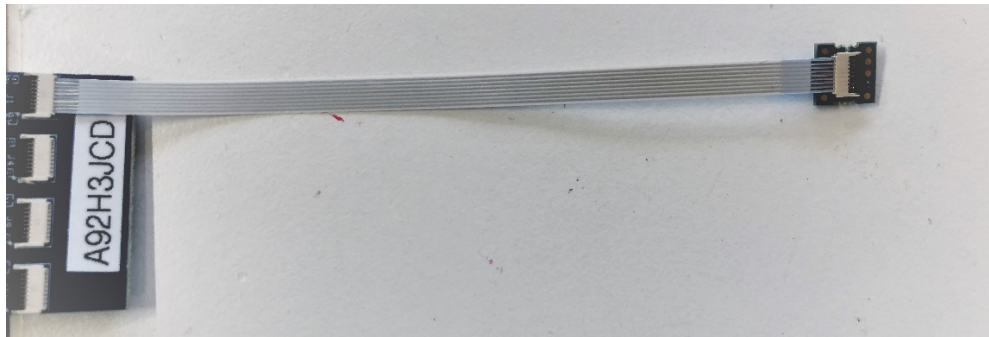


Figure 2. MOD_CH101-0x-03 Connection

FLAT CABLE CONNECTOR TYPE	Molex 503480-0800
RECOMMENDED FLAT CABLE	Molex 151660073...151660094

Table 1. Recommended Flat Flex Cable and Connector

3 PIN DESCRIPTION (MODULE ZIF CONNECTOR J1)

PIN	NAME	DESCRIPTION
1	INT	Interrupt output. Can be switched to input for triggering and calibration functions
2	SCL	SCL Input. I ² C clock input. This pin must be pulled up to VDD externally.
3	SDA	SDA Input/Output. I ² C data I/O. This pin must be pulled up to VDD externally.
4	PROG	Program Enable. This pin must be pulled down to ground externally.
5	RESET_N	Active-low reset. This pin must be pulled up to VDD externally.
6	VSS	Power return.
7	VSS	Power return.
8	VDD	Power supply input. Connect to externally regulated 1.8V supply.

Table 2. Pin description

4 PACKAGE DIMENSIONS

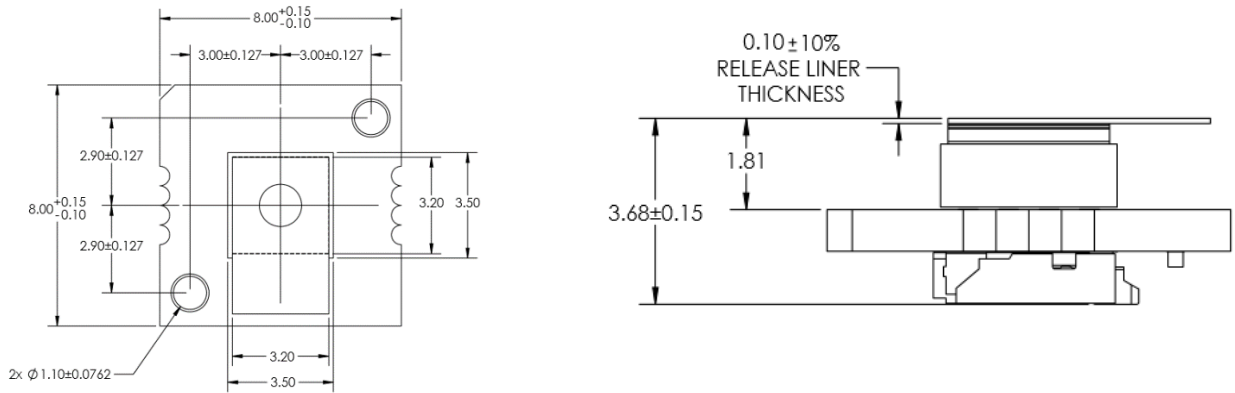


Figure 3. Module Dimensions

5 PACKAGE CONNECTOR ORIENTATION

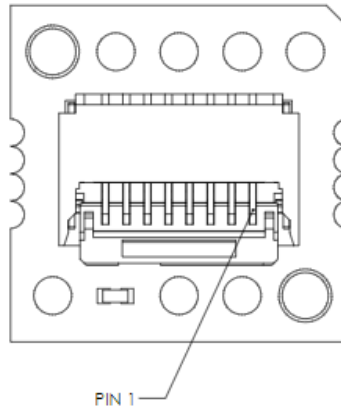


Figure 4. Module Connector Orientation

6 PACKAGE INFORMATION

DESCRIPTION	DOCUMENT NUMBER
CH101 Mechanical Integration Guide	AN-000158

Table 3. Package information

7 ***ELECTRICAL CHARACTERISTICS***

Please refer to CH101 Data Sheet DS-000331 for information on the device's electrical characteristics.

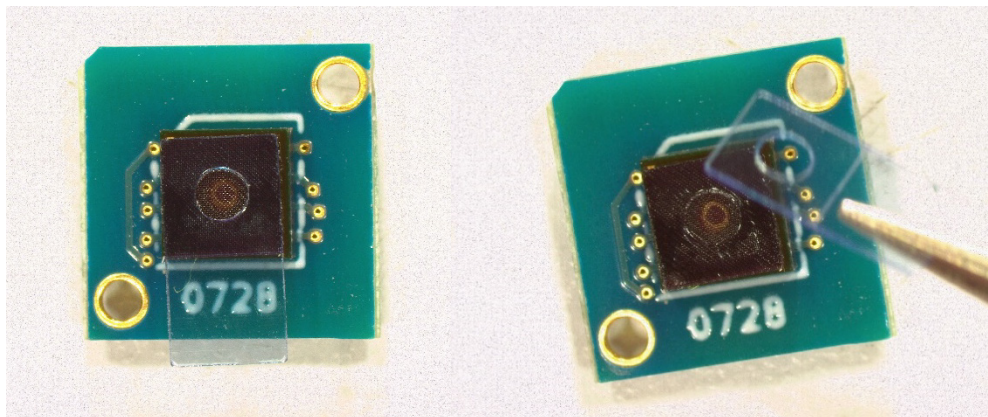
8 APPLICATIONS

8.1 MECHANICAL INTEGRATION

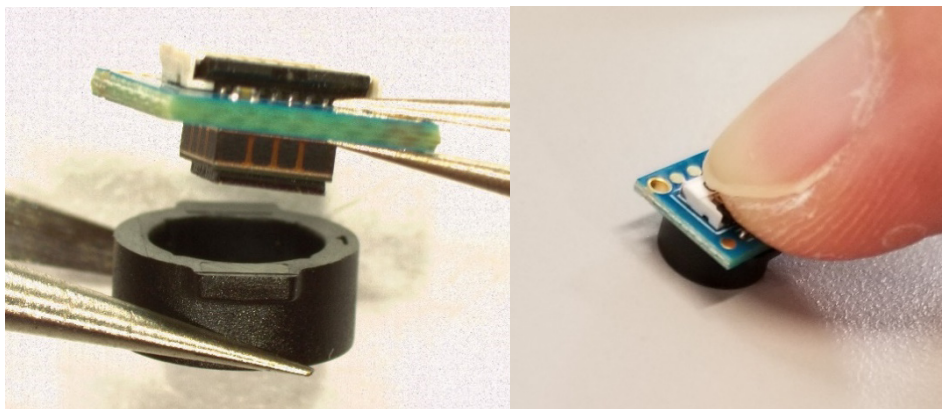
The MOD_CH101-0x-03 is designed to be used with an Acoustic Interface. The Acoustic Interface is a specific geometry acoustic path that serves to improve the transfer of acoustic energy from the sensor out to air (i.e. it improves the acoustic impedance mismatch between the sensor and air). The Acoustic Interface also configures the FoV for the CH101 sensor and dictates the range performance. Please see Chirp’s website for the appropriate acoustic interface for your design. The release liner that comes pre-applied on top of the module protects the PSA (pressure-sensitive adhesive) and needs to be removed in order to use the module. This PSA serves two purposes: 1) to assist attachment of the module to the Acoustic Interface and 2) provide ingress protection from the environment to the application device by forming a seal against the Acoustic Interface. The PIF (Particle Ingress Filter) that is integrated into the module will protect the sensor against environmental ingress into the sensor package.

How to attach the MOD_CH101-0x-03 to your Acoustic Interface:

1. Remove the release liner to expose the adhesive



2. Assemble the module and Acoustic Interface together. Press against the back (connector-side) of the module with light pressure (evenly apply with 1 kg ± 25% of force) to ensure a good seal with the Acoustic Interface.



3. Optional but recommended: Apply liquid adhesive between the Acoustic Interface and the module’s PCB to ensure a stable and robust attachment. Recommended liquid adhesives and detailed gluing instructions can be found in the CH101 Mechanical Integration Guide (AN-000158) and the Acoustic Interface Gluing Procedure (AN-000223).

9 ORDERING INFORMATION

9.1 PART NUMBER DESIGNATION

This datasheet specifies the following part numbers:

PART NUMBER	OPERATION	PACKAGE BODY	QUANTITY	PACKAGING
MOD_CH101-03-03	Pitch-Catch Pulse-Echo	8.0 mm x 8.0 mm x 3.68 mm	165	Custom Tray

Table 4. Part number designation

9.2 PACKAGE MARKING

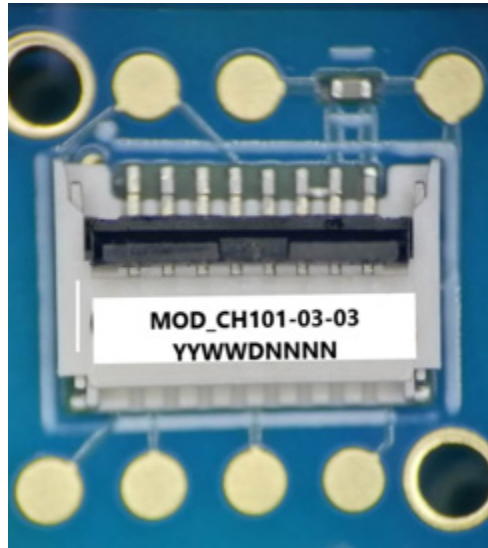


Figure 5. Example Package Marking

10 TRAY PACKAGING SPECIFICATION

Custom tray packages shall be used to ship devices in. The nominal tray dimensions are 225 mm x 275 mm x 13 mm height. The package carrier holds 165 devices maximum.

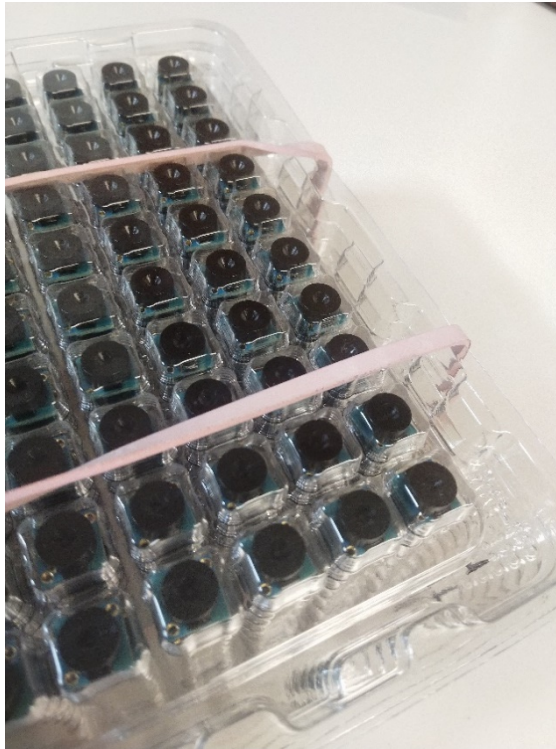


Figure 6. Tray Packaging

11 ORDERING INFORMATION (CONTINUED)

11.1 SHIPPING LABEL

A Shipping Label will be attached to the tray and box. The information provided on the label is as follows:

Device: This is the full part number

Lot Number: Chirp manufacturing lot number

Date Code: Date the lot was sealed in the moisture proof bag

Quantity: Number of components in the tray

2D Barcode: Contains Lot No., quantity and tray/box number

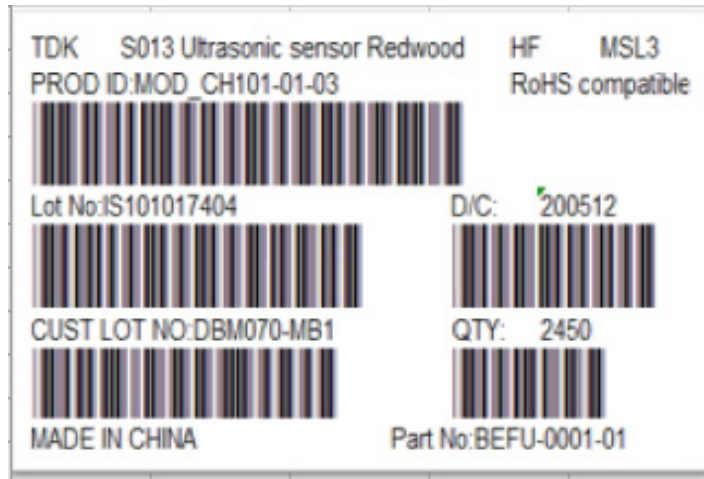


Figure 7. Example Shipping Label

12 REVISION HISTORY

DATE	REVISION	CHANGES
07/30/20	1.0	Initial Release

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