# MEAS MS5637
# FOR LINUX® DRIVER

## Digital Barometric Pressure and Temperature
## Digital Component Sensor (DCS) Development Tools

The MS5637 Linux driver provides the necessary software to interface the MS5637 digital barometric pressure and temperature sensor to any Linux driver system that supports the Industrial I/O ecosystem (IIO). The MS5637 sensor is a self-contained pressure and temperature sensor that is fully calibrated during manufacturing. The sensor can operate from 1.5V to 3.6V. The sensor module includes a high-linearity pressure sensor and an ultra-low power 24 bits ΔΣ ADC with internal factory-calibrated coefficients.

Refer to the MS5637 data sheet for detailed information regarding operation of the IC:

http://www.meas-spec.com/downloads/MS5637-02BA01.pdf

## Specifications

- Operating pressure range: 300 to 1200 mbar
- Measures temperature from -40°C to 125°C
- Extended pressure range 10 to 2000 mbar
- Fast response time
- I$^2$C communication
- Very low power consumption

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## Project setup

### Configuration

Linux driver running on any platform is relevant to access sensor information as long as appropriate patch is included in Linux Kernel.

In order to properly use the sensor, it is necessary to describe HW configuration within device tree.
An example of device tree enabling the sensor is provided in next section.

The driver can be compiled with Linux Kernel by selecting it in Linux driver menu configuration (`make nconfig` as shown below in the Linux kernel directory). You can search by driver name, and then enable the appropriate setting in the configuration menu. The driver can also be used as a module, and loaded dynamically (this is done using `insmod` command).

```
make nconfig
```

You need to enable the Industrial I/O subsystem support in the Device Drivers and then you can enable your driver support.

Device Tree

In order to have Linux driver properly configure hardware to access the sensor, you have to inform it where the device is connected on the platform. This is done using device tree.
The example below applies to Raspberry Pi but can be done on any other hardware supporting the Linux driver. You will have to do the same kind of change in the appropriate corresponding file.

`<linux kernel directory>/arch/arm/boot/dts/bcm2708_common.dtsi`

```
i2c1: i2c@7e804000 {
        [...]
        ms5637: ms5637@76 {
                compatible ="measspec,ms5637";
                reg = <0x76>;
        };
};
```

Once this is done, the device tree shall be recompiled and installed using following commands:

```
make -j4 modules dtbs
sudo make modules_install
sudo cp arch/arm/boot/dts/*.dtb /boot/
sudo reboot
```

And appropriate dtb device tree file shall be used when booting Linux driver.

## Driver description

The driver is based on Linux IIO (Industrial I/O) framework. This framework provides services intended to provide support for devices that in some sense are analog to digital converters (ADCs).
See `<Linux Kernel directory>/drivers/staging/iio/Documentation/overview.txt`
Within that framework, some generic attributes are defined that are applicable to the same class of sensors (in our case, pressure and temperature).
The driver is also based on I2C client that provides services to send / receive data on I2C interface. This part is somehow transparent from application standpoint.

The MS5637 is a single chip pressure and temperature sensor.

The driver returns a kPa pressure value and milli-degre celius value using the IIO framework.

Via the IIO sysfs interface (`/sys/bus/iio/devices/`), there are several attributes available:

| IIO Attributes | |
|---|---|
| **Signal** | **Description** |
| in_pressure_input | Current pressure from MS5637 sensor (kPa) |
| in temp_input | Current temperature from MS5637 sensor (milli-°C value) |
| sampling_frequency | Set the desired sampling frequency |
| sampling_frequency_available | Returns all available sampling frequencies |

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