Functional description for evaluation module DigitalSensor3_smd2

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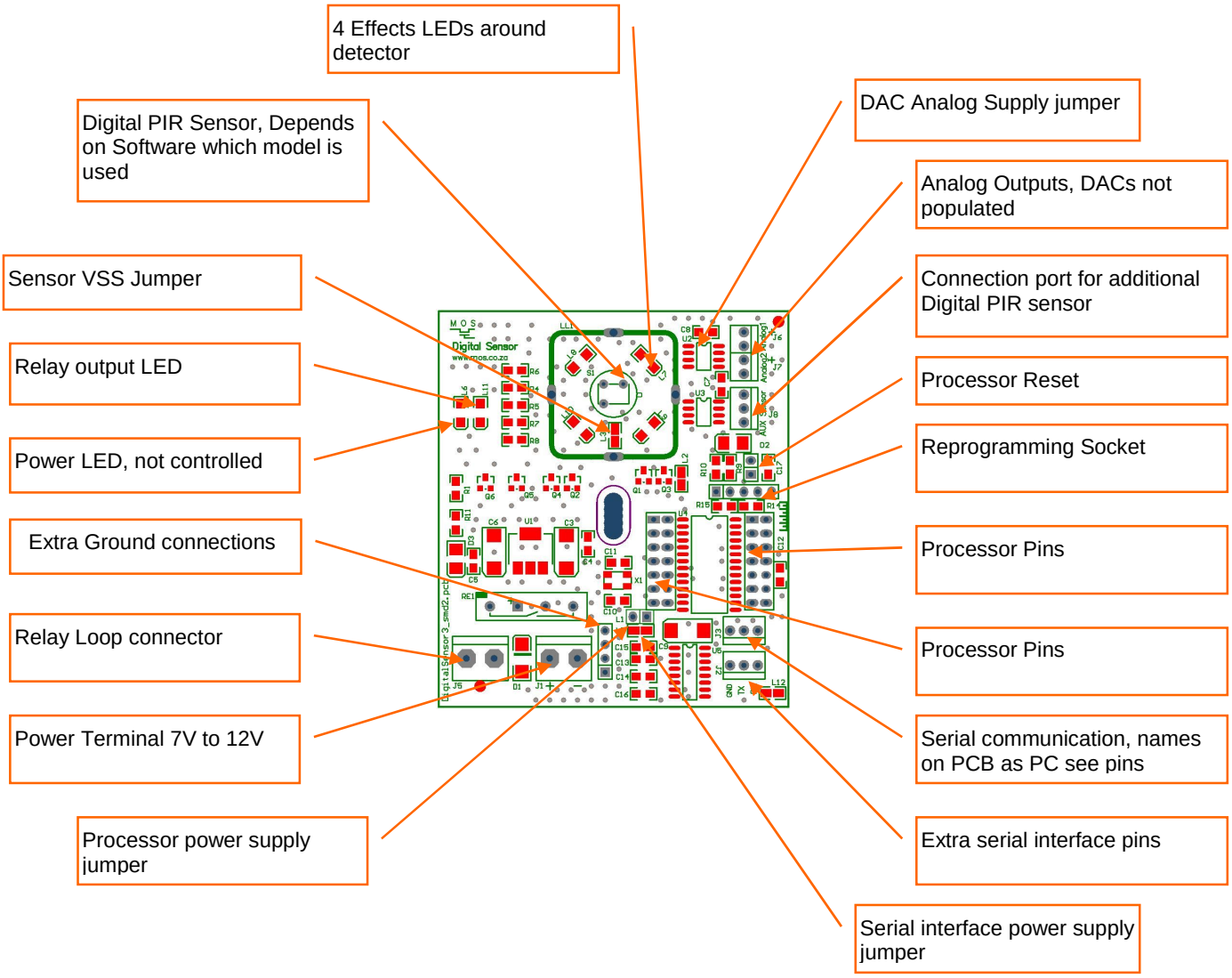
The DigitalSensor3_smd2 module contains everything needed to evaluate a digital PIR sensor. The microcontroller on the module interfaces with the detector and reads periodically data from the detector. It is recommended that the module be connected via a serial cable to a PC to visualize and capture the information generated by the digital sensor. The module will be hardware compatible to any 3 pin digital PIR sensor from MOS, the software on the microcontroller may need to be changed for different device versions.



Notes:

1. Open HyperTerminal on PC, connect to serial port of PC, 115200-N-8
2. Take care that the thermal feedback from the LED's and resistors don't influence the PIR detector
3. Ensure that all the power supply jumpers is connected for your specific evaluation

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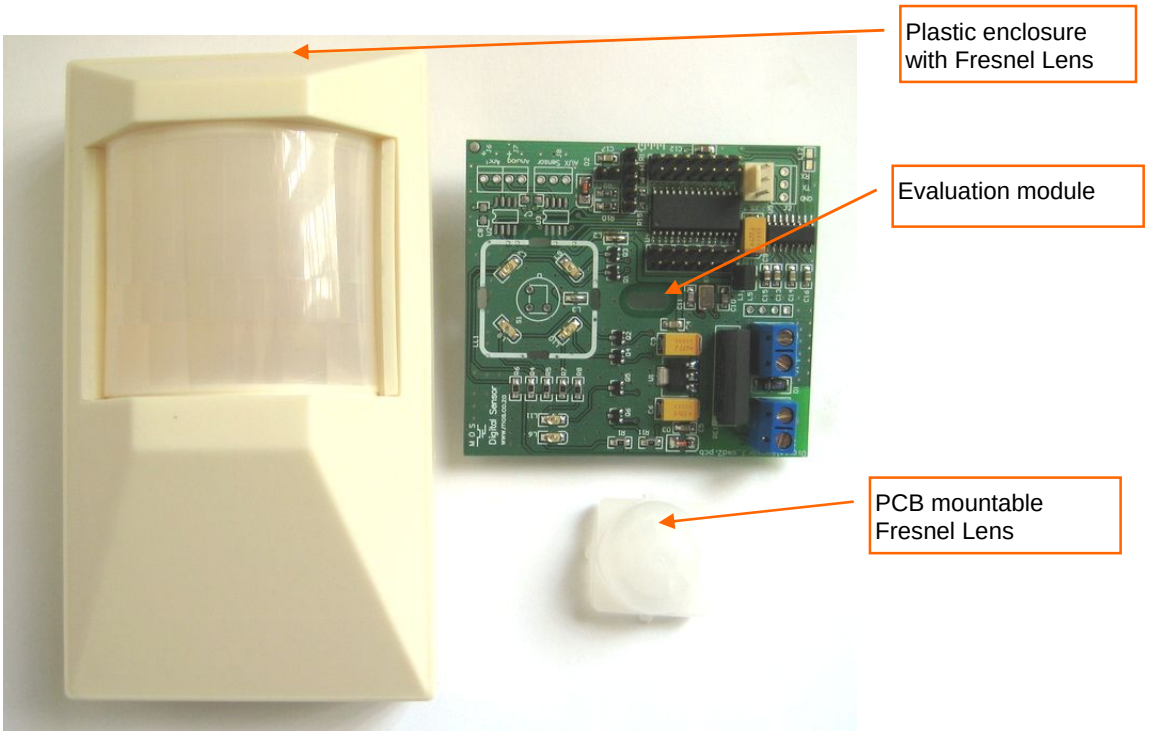
Evaluation kit



Module Description

1. Power Supply
An unregulated DC voltage from 6V to 18V is to be connected to J1. Diode D1 protects against accidental polarity reversal. The regulator MCP1790-3302E generates a stable 3.3V for the circuitry on the module.

2. Sensor Readout and Signal Processing
The Microchip PIC reads the data from the digital PIR sensor through the DOCI interface.

3. Digital to analog converters
Provision is made for two LT1655 16bit DAC Ics, For evaluation it is sometimes convenient to look at an analog representation of the output of the PIR sensor. The devices are not fitted. Software need to be changed to implement the DACs. Please request it from info@mos.co.za if needed.

4. LED drivers
LEDs are placed around the PIR sensor for a bright visual effect when movement is detected. Be careful of using these LEDs too often it may heat up and disturb the PIR detector due to the heat generated by the LEDs.

5. Relay output
A relay output is provides to be used for evaluation of the complete unit in a normal residential alarm system.

6. Programming connector
The programming connector can be used to reprogram the MCU. The pins on the programming on the connector are compatible to the low cost MPLAB ICD2 LE and PICKit 2 programmers.

7. Serial interface with a Personal Computer (PC)
A RS232 interface allows the connection of a PC to the demo module. A suitable cable may be connected to connector J2.
The data format is as follows:
115kb/s
8 data bits, 1 start bit, 1 stop bit, no parity
Values are transferred as ASCII characters, highest digit first.
The amount of characters changes according to the required number of digits.
Each value ends with a <CR> <LF> combination.
Examples:
8192<CR> <LF>
16191<CR> <LF>
711<CR> <LF>
The module starts operating as soon as the supply voltage is applied and an E910.91 based sensor is inserted correctly into the provided socket.

Software Description

Parameters

Press 'q' or '?' during any display of data the following choices will be shown on the terminal window.

```
Compiled on 11-Aug-09 17:02:43

Single Channel DOCI Interface Digital Sensor Evaluation

        Threshold       :  26 Counts    : 1.689E-04 Volt
Press to change:
        + = inc threshold
        - = dec threshold
        p = Pulse count : 2
        t = Window time : 4 sec
        m = LED mode    : 1
        l = LED on/off  : 1
        e = REL on /off : 1

Read sensor and display:
        w = raw sensor values
        a = all motion sensor param.
        d = sensor & filter output
        c = motion pulse count
        b = bin data,  needs PC software
```

Parameters that control the movement detection algorithm running on the MCU can be changed simply by pressing the '+' '-' 'p' 't' 'm' 'l' 'e' keys on the keyboard. When a variable is changed or updated the new value will be reflected back on the terminal. The values are saved to EEPROM on the MCU. The module will start up with the saved values on the EEPROM.
The EEPROM on the device is resettled by connecting Pin 28 (RB7) to VSS during start-up, It can easily done by putting a jumper on the programming connector during start up of the module.

Output Options

The output on the terminal window can be saved to a text file and and imported to a spreadsheet program for further analysis.

Press 'w' to see the values read directly from the Digital PIR sensor. Once the sensor is thermally stable a value of around 8100 +- 10% can be expected.

```
8007
8007
8008
8008
8008
8008
8009
8009
8009
8010
8010
8010
8011
8011
8011
8012
8012
8012
8012
8012
8013
```

Press 'd' to see the values read directly from the Digital PIR sensor as well as the output of a software implemented second order high pass filter.

Once the sensor is thermally stable a value of around 8100 +- 10% can be expected for the raw values and with no movement a value of +-1 on the filter value is expected.

```
9481    -35
9481    -36
9482    -36
9482    -37
9482    -37
9482    -38
9482    -39
9482    -39
9482    -39
9482    -39
9482    -40
9482    -39
9482    -39
9481    -41
9481    -40
9480    -40
9479    -41
9479    -40
9478    -41
9477    -41
9476    -42
```

Press 'a' to see values of the implemented motion sensing algorithm

See the attached C code for the function of the values displayed
Sensor data, filter output, motion, signal greater than threshold, set threshold, relay enabled, led enabled, led mode, pulse count

7932	-4	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7933	-4	1	0	26	1	1	1	2
7933	-4	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7932	-6	1	0	26	1	1	1	2
7932	-5	1	0	26	1	1	1	2
7933	-4	1	0	26	1	1	1	2
7933	-5	1	0	26	1	1	1	2
7933	-4	1	0	26	1	1	1	2
7934	-3	1	0	26	1	1	1	2
7934	-4	1	0	26	1	1	1	2
7934	-4	1	0	26	1	1	1	2
7935	-2	1	0	26	1	1	1	2
7935	-2	1	0	26	1	1	1	2
7935	-3	1	0	26	1	1	1	2
7935	-3	1	0	26	1	1	1	2

Press 'c' to see values of the implemented motion sensing algorithm

See the attached C code for the function of the values displayed
motion, signal greater than threshold, pulse count, threshold, time window[3], pulses in window[]

1	0	2	26	0	565	684	0	2	1
1	0	2	26	0	561	680	0	2	1
1	0	2	26	0	557	676	0	2	1
1	0	2	26	0	553	672	0	2	1
1	0	2	26	0	549	668	0	2	1
1	0	2	26	0	545	664	0	2	1
1	0	2	26	0	541	660	0	2	1
1	0	2	26	0	537	656	0	2	1
1	0	2	26	0	533	652	0	2	1
1	0	2	26	0	529	648	0	2	1
1	0	2	26	0	525	644	0	2	1
1	0	2	26	0	521	640	0	2	1
1	0	2	26	0	517	636	0	2	1
1	0	2	26	0	513	632	0	2	1
1	0	2	26	0	509	628	0	2	1
1	0	2	26	0	505	624	0	2	1
1	0	2	26	0	501	620	0	2	1
1	0	2	26	0	497	616	0	2	1
1	0	2	26	0	493	612	0	2	1
1	0	2	26	0	489	608	0	2	1
1	0	2	26	0	485	604	0	2	1

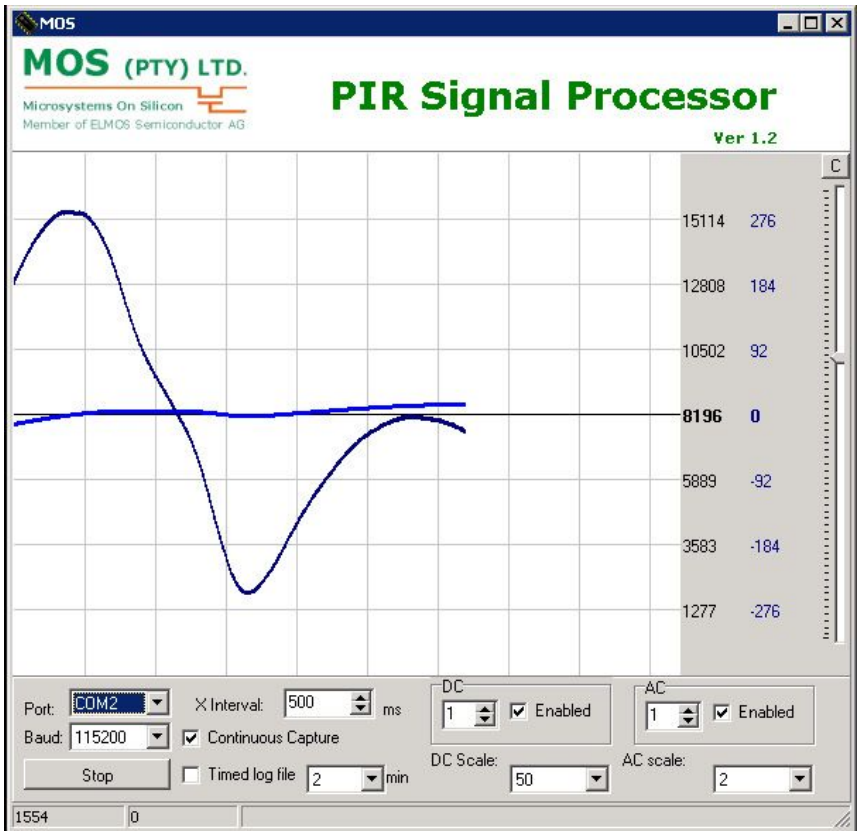
Press 'b' to user the scope.exe program to visualize the pir data from the module.

The data format for the scope.exe file is binary so it cannot be displayed on the terminal program. Once the binary data format is selected the terminal program needs to be closed and the scope.exe needs to run.

```
Quit terminal program now
                and
Start the Scope PC SW
```

The scope.exe and documentation can be downloaded from the mos website.

After installing and running the scope.exe software, the display on the scope should look like this.



Appendix

Schematic for DigitalSensor3_smd2 module.
Attached Separate pdf
DigitalSensor3_smd2 sch.pdf

C program for PIC microcontroller.
Attached MPLAB project zipped.
DSensor3.zip

Executable for Scope.exe visualization program
http://www.mos.co.za/downloads/m2012a/scopebin.zip

Instructions for Scope.exe visualization program
http://www.mos.co.za/downloads/m2012a/scopedoc.pdf

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