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ZMOTION™ Detection Module Evaluation Kit

User Manual

UM022305-1110

Revision History

Each instance in the Revision History table reflects a change to this document from its previous revision. For more details, refer to the corresponding pages and appropriate links in the table below.

Date	Revision	Description	Page No.
September 2010	04	Added ZMOTION product logo.	i
June 2010	03	Updated references to ZMOTION Detection Module Provided clarifications and added sections	All
October 2008	02	Remove references to General Purpose (GP).	All
October 2008	01	Original Issue.	All

Safeguards

The following precaution must be observed when working with the devices described in this document:

⚠️ Caution: *Always use a grounding strap to prevent damage resulting from electrostatic discharge (ESD).*

Table of Contents

Introduction

Zilog's ZMOTION^{TM} Detection Module Evaluation Kit includes all the necessary components needed to evaluate and begin development with the ZMOTION^{TM} Detection Module.

The kit includes an Evaluation Board into which the ZMOTION^{TM} Detection Module is plugged and a prototyping area to add your own custom application hardware.

The ZMOTION^{TM} Detection Module Evaluation Kit is intended for the following purposes:

1. Evaluate the ZMOTION^{TM} Detection Module in hardware mode using jumpers and trim pots located on the base board to control sensitivity, range and output timing.

2. Evaluate the ZMOTION^{TM} Detection Module using the built-in serial interface to gain advanced control over its settings and performance. Use the kit to tailor the settings needed for your own custom application.

3. Experiment with your own hardware using the prototype area on the Evaluation Board.

4. Using a separately purchased USB Smart cable (debugger) and ZDS-II - Zilog's Integrated Development Environment, develop your own custom S/W applications on the ZMOTION^{TM} Detection Module.

ZMOTION^{TM} Detection Module

Zilog's ZMOTIONTM Detection Module is a complete and fully functional motion detection solution ideal for lighting control and other occupancy and proximity detection applications. It is a board level module that combines the unique features of Zilog's Z8FS040 ZMOTION™ Detection Microcontroller with a Pyroelectric Sensor and a low profile Fresnel lens.

The ZMOTION™ Detection Module can operate in a simple to use Hardware mode which provides an output signal when motion is detected; or in an advanced asynchronous serial mode when greater control over the motion detection performance is needed. In both modes sensitivity and delay time can be controlled to match the application requirements.

The features of ZMOTION^{TM} Detection Module include:

- Complete, fully functional motion detector including lens
- Small form factor: 25.5 mm x 16.7 mm
- Wide 5 m x 5 m, 60 degree detection pattern
- Sensitivity control via simple hardware configuration
- Advanced commands and control via serial (asynchronous) interface
- Sleep mode for low power applications
- No temperature compensation required
- Input to support CDS photocell input for ambient light detection
- Minimal components ensure highest possible Mean Time Between Failures (MTBF)
- Operates from 2.7 V to 3.6 V power supply
- Simple 8-pin interface
- Standard operating temperature 0 ºC to 70 ºC

Kit Contents

The ZMOTION[TM] Detection Module Evaluation Kit contains the following components:

- Evaluation Board
- ZMOTION[TM] Detection Module
- RS-232 Serial Cable DB9-DB9
- 5 V DC Universal Power Supply
- Documentation CD

Figure 1. ZMOTION[TM] **Detection Module Evaluation Kit Components**

Evaluation Board

The Evaluation Board provides all the support functions required to evaluate the ZMOTION™ Detection Module plus a prototype area and debug interface to be used when developing your own hardware or software.
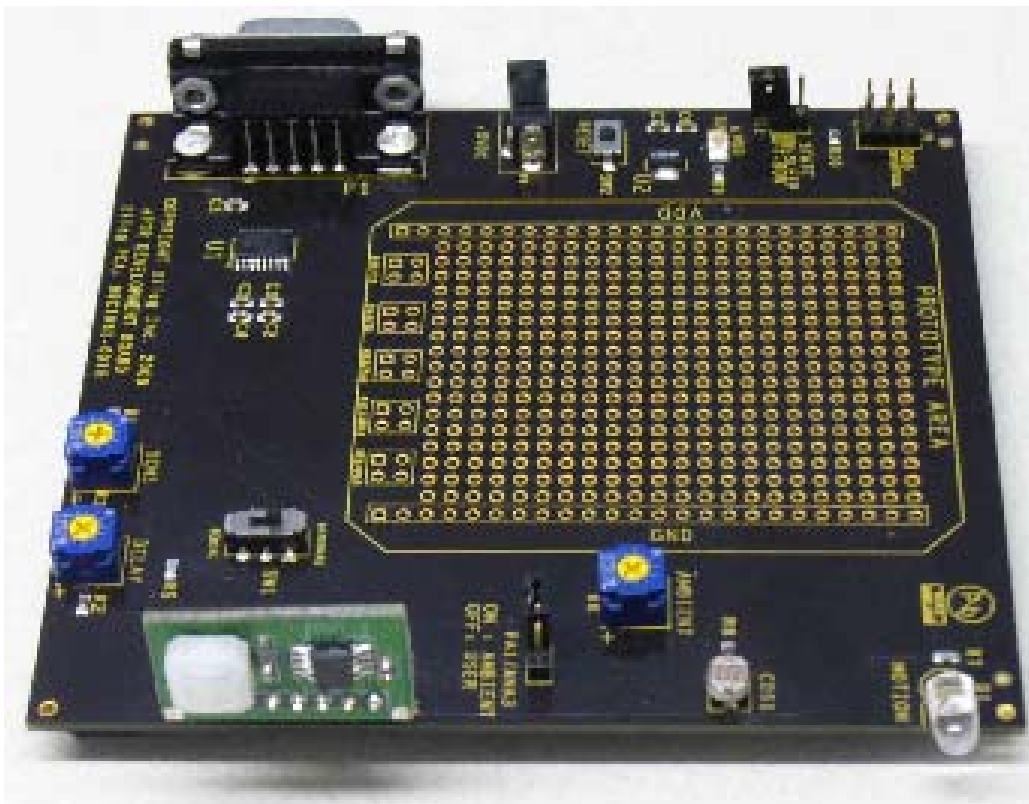
Figure 2. ZMOTION™ Detection Evaluation Board and ZMOTION™ Detection Module

The Evaluation Board provides the following features:

- 8 pin connector for the ZMOTION™ Detection Module

- 3.3 V regulated power supply for ZMOTION™ Detection Module

- Trim Pot's for motion sensitivity, ambient light sensitivity and output delay timing

- Switch selection for hardware or serial interface modes

- Reset button

- CDS Photocell for ambient light detection

- Red LED for power indication

- Blue LED for 'Motion Detected' status

- RS-232 interface with DB-9 connector to support serial interface mode

- On-Chip Debugger (OCD) interface

- Prototype area for custom hardware

Operation

The ZMOTION™ Detection Module Evaluation Kit provides various features to control its overall operation. It operates in two basic modes:

- Hardware Interface Mode

- Serial Interface Mode

Hardware Interface Mode

Hardware Interface Mode provides the simplest mode of operation and allows basic control of the ZMOTION™ Detection Module with hardware jumpers and potentiometers. In this mode, the serial interface is disabled and the trim pots on the Evaluation board (Sensitivity, Delay and Ambient Light Threshold) are used to control operation.

To enable Hardware Interface Mode and test out the basic operation:

1. Place SW1 in the 'HARDWARE' position

2. Turn the Ambient Pot fully clockwise (towards '+') to set the ambient light threshold to maximum. This means that it will require the maximum amount of ambient light to disable the Motion Detection output (LED).

3. Turn the Delay Pot fully counter-clockwise (towards '-') to select minimum LED on time (2 seconds).

4. Turn the Sensitivity Pot fully clockwise (towards '+' to select maximum motion detection sensitivity.

5. Press Reset or apply power.

   At this point the ZMOTION™ Detection Module will power up and check the voltage applied to the TXD/SNS pin to determine the Interface Mode. With SW1 in the "HARDWARE" position, the voltage on this pin will be between 0V and 1.8V, selecting **Hardware Interface Mode**. The interface mode is detected once only after reset, while the ambient light threshold, delay and sensitivity are monitored continuously.

6. After power-on, the ZMOTION™ Detection Module waits for the pyroelectric sensor stabilize before it starts 'looking' for motion. This power up delay can take a few seconds up to a maximum of about 30 seconds.

7. Create some motion in front of the ZMOTION™ Detection Module and observe that the Blue LED turns on for 2 seconds.

Controlling Operation in Hardware Interface Mode

1. Slowly rotate the "AMBIENT" potentiometer while creating motion in front of the lens (wave your hand in front) until the LED stops turning on. This is the threshold of the ambient light in your room. In lighting control applications, this allows you to adjust the amount of ambient light allowed in the room without turning the lights on when motion is detected – That is; the lights are not turned on when it is already bright enough in the room.

2. Return the "AMBIENT" potentiometer to its fully clockwise position.

3. Rotate the "DELAY" potentiometer *slightly* clockwise to increase the amount of time the LED stays on after motion is detected.

4. Return the "DELAY" potentiometer to its fully counter-clockwise position.

5. Decrease the sensitivity by rotating the "SENS" Potentiometer counter-clockwise and observe that additional motion is required to turn on the LED or that the "range/distance" of detection is decreased.

Serial Interface Mode

Serial Interface Mode provides more control over the operation of the ZMOTION™ Detection Module by providing a serial command interface to monitor and control the device. In Serial Interface Mode commands are sent over the provided DB-9 RS-232 interface. Refer to PS0284 for a complete list and description of commands supported.

1. Connect the provided serial cable between the DB9 connector on the Evaluation Board and a serial port on your PC.

2. Using HyperTerm or some other serial terminal program, set the interface to:

    9600 bps, No Parity, 8 Data bits, 1 Stop bit, No Flow Control

3. Place SW1 in the 'SERIAL' position

4. Turn the Ambient Pot fully clockwise (towards '+') to set the ambient light threshold to maximum. This means that it will require the maximum amount of ambient light to disable the Motion Detection output (LED).

5. The DELAY and SENS potentiometers are not used in Serial Interface Mode

6. Press Reset or apply power.

    At this point the ZMOTION™ Detection Module will power up and check the voltage applied to the TXD/SNS pin to determine the Interface Mode. With SW1 in the "SERIAL" position, the voltage on this pin will be greater than 2.5V, selecting **Serial Interface Mode**. The interface mode is detected once only after reset, while the ambient light threshold is monitored continuously.

7. After power-on, the ZMOTION™ Detection Module waits for the pyroelectric sensor stabilize before it starts 'looking' for motion. This power up delay can take a few seconds up to a maximum of about 30 seconds.

8. During this stabilization time, the module still accepts commands over the serial interface.

9. Send the follow commands to the module to put it into a convenient testing mode (without the quotations or comma):

> 'C', 'M'   Configure the MD/RST pin as MD (causes the Blue LED to turn on when motion is detected.
>
> 'K', 'A'   Enable ASCII command mode.
>
> 'M', 'Y'   Send motion status automatically over the serial interface (without polling).

10. Create some motion in front of the ZMOTION™ Detection Module and observe that the Blue LED turns on for 2 seconds.

11. Also notice that an uppercase 'M' was transmitted from the module.

12. Test other commands and status listed in PS0284. This has a complete list and description of all commands supported.

Ambient Light Threshold (AMBIENT Potentiometer)

In various lighting control applications, the decision of when to turn ON the lights can depend on the current ambient light level in addition to detecting motion. A CDS photocell is provided on the kit to demonstrate this function. When light shines on the photocell, its resistance decreases providing a lower voltage to the light gate (LG) signal on the ZMOTION™ Detection Module. When the module detects this voltage to be below 1.0 V in Hardware Mode or the programmed threshold in Serial Mode, the MOTION LED (/MD signal) will not activate when motion is detected. The AMBIENT potentiometer (R6) sets the amount of ambient light required to cross the threshold.

Sensitivity (SENS Potentiometer)

The amount of motion required to trigger the MOTION LED (/MD signal) can be adjusted using the SENS potentiometer (R3). This also has the effect of controlling the range that the detector can 'see'—lower sensitivity reduces the range of the detection pattern. The SENS potentiometer provides a voltage between 0 V and 1.8 V to the TXD/SNS signal on the ZMOTION™ Detection Module. A higher voltage means lower sensitivity. The SENS potentiometer is used only in Hardware Interface Mode. In Serial Interface Mode, the sensitivity is set via commands sent over the serial interface.

/MD Output Delay Time (DELAY Potentiometer)

The amount of time that the MOTION LED (/MD signal) is activated can be controlled by the DELAY (R4) potentiometer. You can set this time between 2 seconds and 15 minutes. This feature is typically used in power control applications where the amount of time that a device is activated needs to be controlled. The potentiometer provides a voltage between 0 V and 1.8 V to the RXD/DELAY input on the ZMOTION™ Detection Module. A higher voltage gives a longer activation time.

Hardware and S/W Development Support

The ZMOTION^{TM} Detection Module Evaluation Kit provides support for developing hardware and S/W for the module. Signals from the ZMOTION^{TM} Detection Module are available to the prototype area as four through-hole connections. 3.3 V (VDD) and ground are also provided to this area. Do not exceed 90mA current draw from the 3.3 V supply.

Software development is supported on the ZMOTION^{TM} Evaluation Board by using the Debug connector (J9) with a separately available USB Smart Cable and ZDS-II. ZDS-II is Zilog's integrated development environment (IDE) and is available for free from the Zilog website: www.zilog.com. The USB Smart Cable provides a means to download and debug the software developed on ZDS-II.

See the Schematics section of this Users Manual and refer to the ZMOTION^{TM} Detection Module Product Specification (PS0284) for more information on developing your own hardware and Software.

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Evaluation Board Hardware Functions

Table 1 describes the functions provided by the hardware of the ZMOTION^{TM} Detection Module Evaluation Kit.

Table 1. ZMOTION^{TM} Detection Module Evaluation Kit Operational Functions

|			Operational Mode (SW1—MODE)	
Feature	**Evaluation Board Name**	**Function Type**	**Hardware Mode**	**Serial Mode**
System Reset	RESET (SW2)	Push Button	Reset the ZMOTION Detection Module by momentarily interrupting power.	
Ambient Light Threshold	AMBIENT (R6)	Potentiometer	Sets the amount of ambient light required to prohibit the MOTION LED from activating. Turn clockwise to increase the amount of light required.	
Sensitivity	SENS (R3)	Potentiometer	Controls the ZMOTION Detection Module's sensitivity to motion. It provides an adjustable voltage between 0 V and 1.8 V to the SBC's TXD/SNS input. Turn clockwise to increase sensitivity.	No effect. Use the serial interface to control sensitivity.
/MD Output Delay Time	DELAY (R4)	Potentiometer	Controls the amount of time that the MOTION LED is activated after motion has been detected. Turn clockwise to increase the time.	No effect. Use the serial interface to control /MD output delay time.
SBC State	STATE (J11)	Jumper	Places the ZMOTION Detection Module into a low power sleep mode.	
CDS Enable	CDS ENABLE (J7)	Jumper	When this jumper is installed, the CDS Photo Cell is used. When this jumper is not installed, you can control the LG signal from the prototype area.	
OCD Interface	DBG INTERFACE (J9)	6-pin Header	This 6-pin header provides the interface to the USB Smart Cable (debugger) when developing software on the ZMOTION Detection Module.	

Schematics
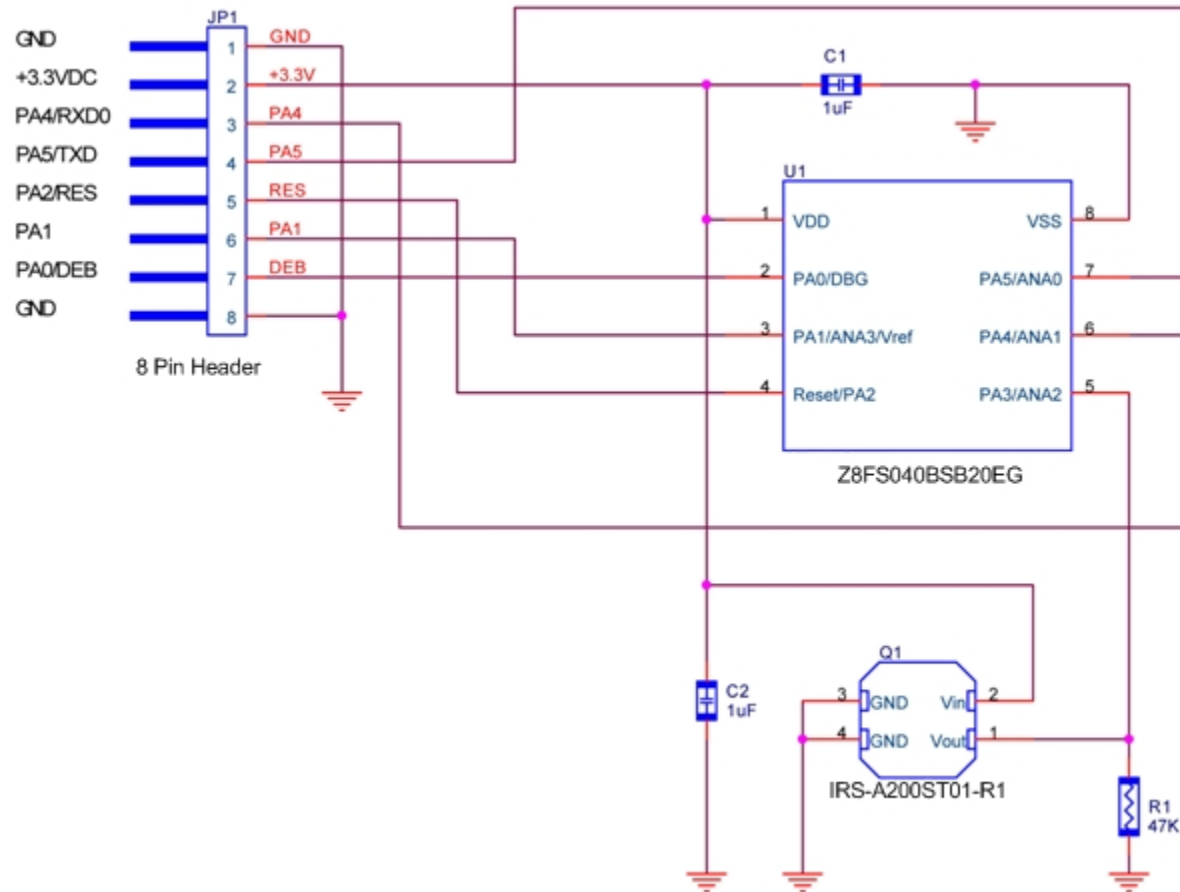
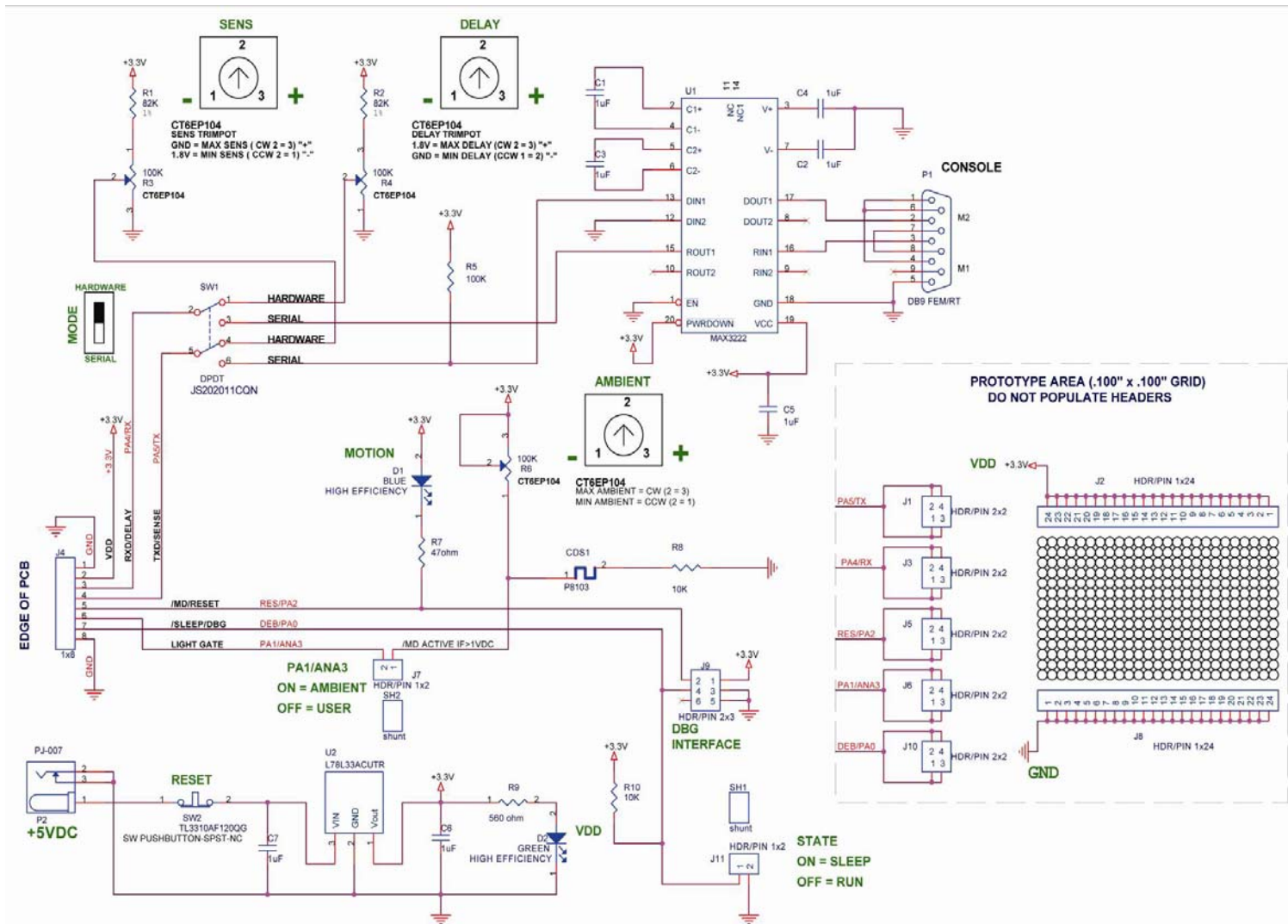**Figure 3. Schematic of ZMOTION™ Detection Module**

Figure 4. Schematic of ZMOTION™ Evaluation Board

Customer Support

For answers to technical questions about the product, documentation, or any other issues with Zilog's offerings, please visit our Technical Support at: http://support.zilog.com

Warning: Do Not Use In Life Support

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As used herein

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