



ZMOTIONL100ZCOG

ZMOTION™ Detection and Control Development Kit

User Manual

UM023001-1110



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Revision History

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

Date	Revision Level	Description	Page No.
November 2010	01	Original issue	All

Table of Contents

Revision History	iii
Introduction	1
Kit Contents	2
System Requirements	5
Safeguards	5
ZMOTION™ Detection and Control Development Board	6
Features	7
MCU Features	8
ZMOTION Detection and Control Development Kit Lens and Pyroelectric Sensors	9
ZMOTION Development Kit Application Software	11
Board Design Information	13
Customer Support	15

Introduction

Zilog's ZMOTION Development Kit provides a general-purpose platform for evaluating the capabilities and operation of the ZMOTION Detection and Control Family of microcontrollers featuring Zilog's passive infrared (PIR) technology. The family includes a series of high-performance microcontrollers with integrated motion detection algorithms. A variety of included lenses and pyroelectric sensors demonstrate the flexibility of the integrated motion detection algorithms to provide the best possible performance for a range of lighting, detection and control applications.

The Z8FS040 MCU, a prominent member of the ZMOTION Detection and Control Family, combines the programmability and rich peripheral set of Zilog's Flash Z8 Encore! XP® Family of MCUs with built-in motion detection software algorithms to provide the functions necessary for PIR motion detection applications. These motion detection algorithms comprise Zilog's PIR technology and run in the background while control and status of the motion detection engine is accessed through a software Application Programmer Interface (API). As a result, the designer can create his or her own application-specific software while taking advantage of Zilog's ZMOTION Motion Detection Technology.

Within this kit, API settings are provided to match the Engine operation to each of the lens and pyroelectric sensor combinations provided.

For more details about the ZMOTION MCU, refer to the ZMOTION Product Specification (PS0284), available for download at www.zilog.com.

Kit Contents

The ZMOTION Detection and Control development kit contains the following hardware, software and documentation:

Hardware

- ZMOTION Development Board
- USB Smart Cable Debugger
- 0.9" Focal Flat Lens Holder
- 0.77" Focal Circular Lens Holder
- Selection of lenses
- Selection of pyroelectric sensors
- Mica insulating washers
- DB9–DB9 serial cable
- Wall mount 5 V DC power supply
- An assortment of mounting hardware

The contents of the kit are shown in Figure 1.

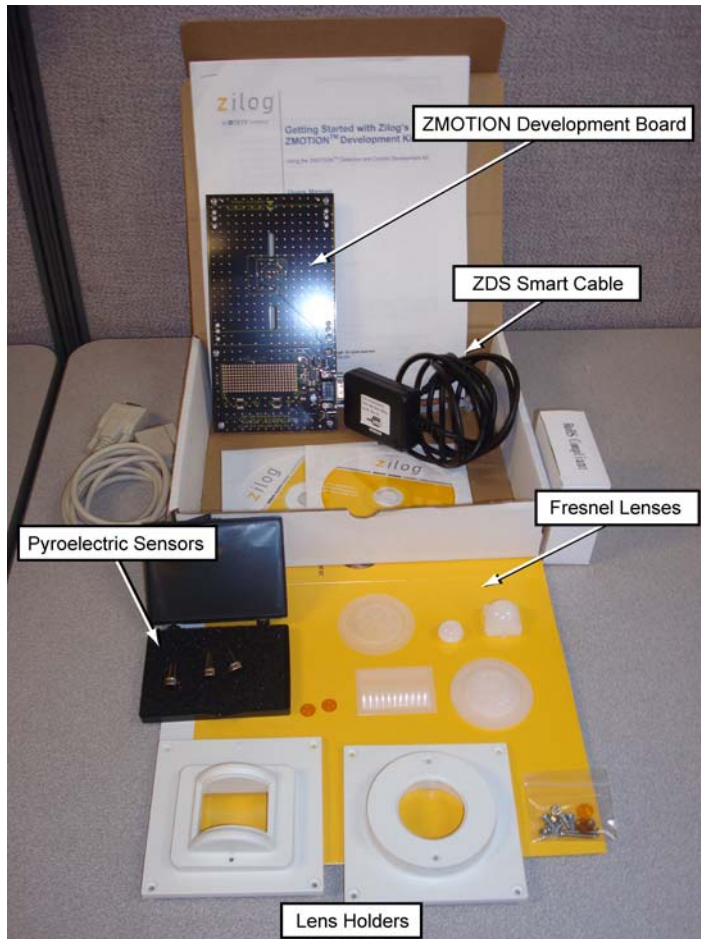


Figure 1. ZMOTION Detection and Control Development Kit Contents

Software (on CD-ROM)

- ZDSII – Z8 Encore! IDE with ANSI C-Compiler
- Sample Code:
 - ZMOTION Basic
 - ZMOTION Serial

Documentation

- ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076)
- ZMOTION Family Technical Documentation (on CD-ROM)
 - ZMOTION Detection Module Product Brief (PB0223)
 - Zilog’s ZMOTION Detection and Control Family Featuring PIR Technology Product Brief (PB0225)
 - ZMOTION Detection and Control Family Featuring PIR Technology Product Specification (PS0285)
 - ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286)
 - ZMOTION Detection and Control Development Kit User Manual (UM0230)
 - ZMOTION – A New PIR Motion Detection Architecture White Paper (WP0017)
 - ZMOTION Detection Lens and Pyro Sensor Configuration Guide (WP0018)
 - Board Schematic, assembly drawing and artwork

Sample code files are included on the ZMOTION Sample Apps CD, and are located in the `ZMOTION_Basic` and `ZMOTION_Serial` folders.

System Requirements

An IBM PC (or compatible computer) with the following minimum configurations is required:

- Microsoft Windows XP Professional SP1/Windows 2000 SP3/Windows NT 4.0 SP6/Windows 98 SE
- Pentium II/233 MHz processor or higher up to Pentium IV, 2.8 GHz
- 96 MB RAM or more
- 25 MB hard disk space or more
- Super VGA video adapter
- CD-ROM drive
- One or more RS-232 communication ports
- USB 2.0 interface port

Installation

For details about installation and setup, refer to the Using the ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076).

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).

ZMOTION™ Detection and Control Development Board

Zilog's ZMOTION development board is a development and prototyping platform for the ZMOTION Detection and Control silicon and software as well as for lens/pyroelectric sensor/silicon and software bundled solutions. The board provides the user with a tool to evaluate the many features of ZMOTION PIR technology as well as the actual performance of each lens and pyro combination.

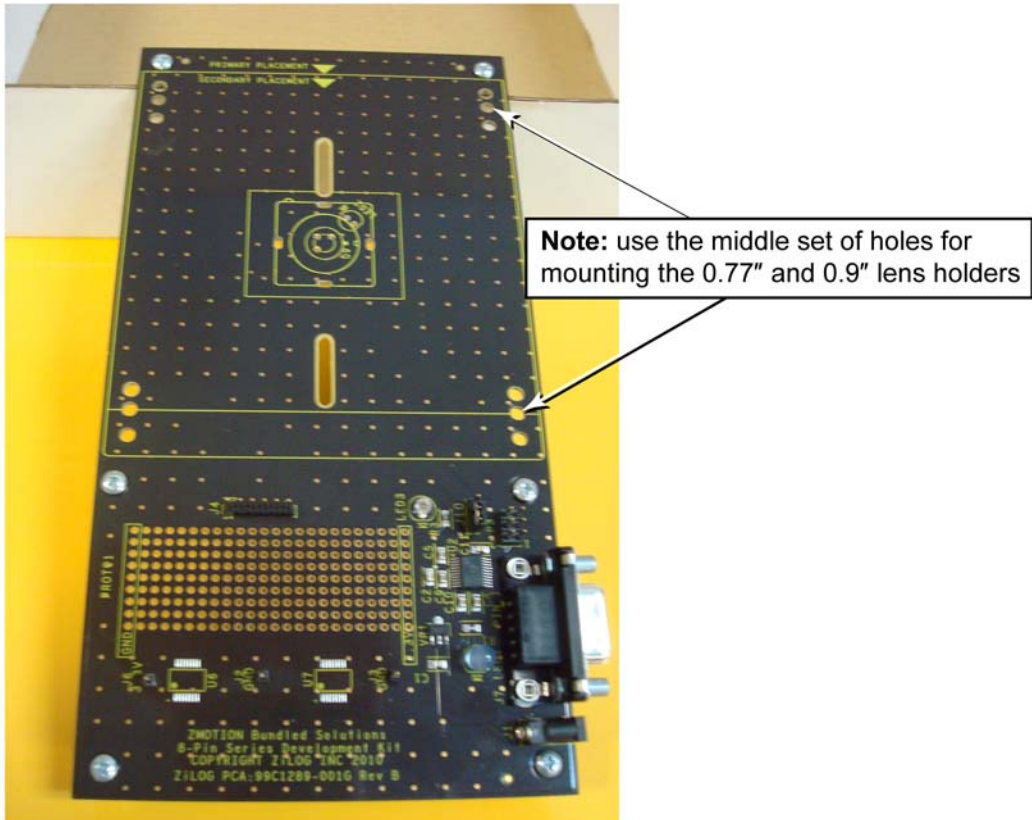


Figure 2. ZMOTION Detection and Control Development Board

Features

The ZMOTION Detection and Control development board features the following elements:

- Z8FS040 ZMOTION Detection MCU (8-pin SOIC)
- RS-232 serial interface

- 5V DC power connector
- Power-On and Detection LED
- On-chip debugger interface
- Board openings for an assortment of lens holders and clip-on lens attachments

► **Note:** The middle set of holes on the board is used to attach the 0.9" and .77" lens holders (see Figure 2).

- Prototyping area
- 2.7V–3.6V operating voltage with 5V tolerant inputs

MCU Features

The Z8FS040 ZMOTION Detection MCU combines the programmability and rich peripheral set of Zilog's Flash Z8 Encore! XP Family of MCUs with built-in motion detection software algorithms to provide the functions necessary for PIR motion detection applications.

The Z8FS040 MCU includes the following features:

- High performance eZ8® MCU core
- 4KB in-circuit programmable Flash memory available for application code
- Single-pin debug with unlimited breakpoints
- Flexible clocking scheme
- Internal precision oscillator running at 5.53MHz
- External oscillator operating up to 20MHz
- Sigma Delta ADC
- Up to 6 single-ended channels or 3 differential channels available

- On-chip analog comparator with independent programmable reference voltage
- Full-duplex UART with dedicated BRG
- Two 16-bit timers with input capture, output compare and PWM capability (11 modes total)
- Watchdog timer (WDT) with dedicated internal oscillator
- Up to 20 vectored interrupts
- 6 to 25 I/O pins depending upon package
- 2.7V to 3.6V operating voltage with extended operating temperature range -40°C to $+105^{\circ}\text{C}$
- Zilog PIR technology controlled and monitored via software API registers
- Selection capability from an assortment of lenses and pyroelectric sensors to best fit your application
- API settings provided for each lens and pyroelectric sensor combination
- Directly supports 1 or 2 pyroelectric sensors
- Sensitivity control, range control and directionality detection
- Extended detection modes for occupancy sensing
- Low power modes

ZMOTION Detection and Control Development Kit Lens and Pyroelectric Sensors

The ZMOTION Detection and Control Development Kit includes five different types of lenses and three different types of pyroelectric sensors to fill a wide variety of lighting control, occupancy sensing, HVAC, display, proximity and power management applications. These applications

also demonstrate the flexibility, and superior performance of Zilog’s PIR motion detection technology.

Please refer to the ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286) for part-specific details about the individual lenses and pyroelectric sensors. Refer to the ZMOTION™ Detection and Control Development Kit Quick Start Guide (QS0076) for specific installation instructions for the lenses and pyroelectric sensors.

Lens Mounting Options

The ZMOTION Development Board supports four lens-mounting options, as indicated in Table 1.

Table 1. Four Supported Lens-Mounting Options

Lens Mounting	Lens Supported
PIR Sensor Clip-On	NCL-9(26)
Circuit Board Clip-In	CWM 0.5 GI V1
Circular Lens Holder 0.77 Focal	CM 0.77 GI V3
	CM 0.77 GI V5
Flat Lens Holder 0.9 Focal	AA 0.9 GI T1

Pyroelectric Sensor Options

Table 2 lists three types of pyroelectric sensors offered in the ZMOTION Detection and Control Development Kit.

Table 2. Three Supported Pyroelectric Sensor Options

Pyro Sensor Description	Part Number
Basic Dual Element	RE200B-P
Premium Dual Element	SDA02-54-P
Quad Element	SBDI46-504AA

ZMOTION Development Kit Application Software

Included in the ZMOTION Application Software are two motion detection software projects: `ZMOTION_Basic` and `ZMOTION_Serial`. Each is described in this section.

ZMOTION_Basic

`ZMOTION_Basic` is an application program that demonstrates the basic functionality of motion detection for the board. It enables the user to select between lenses in the `main.h` file as well as make changes to the individual API lens configuration settings. Other changeable options in `main.h` are the LED duration time (0 sec to 30 minutes), hypersense on/off and duration time. Detected movement is indicated via LED3.

ZMOTION_Serial

The `ZMOTION_Serial` project allows all the same options for making changes to key parameters within the application project. Detected movement is indicated via the following Hyperterminal menu options (see Figure 3).

Menu. Select at any time to return to the main menu.

Read RAM. Allows any 3-digit hexadecimal register address location in RAM to be read and displayed.

Write RAM. Allows any 3-digit hexadecimal register address location in RAM to be written to.

Real Time Log & Display. Selecting a **1** will turn on the motion detection log. The display is formatted by an **M** or **E** to indicate basic motion detection or extended detection, followed by the detection count and a relative time stamp. Selecting a **0** turns off the detection log.

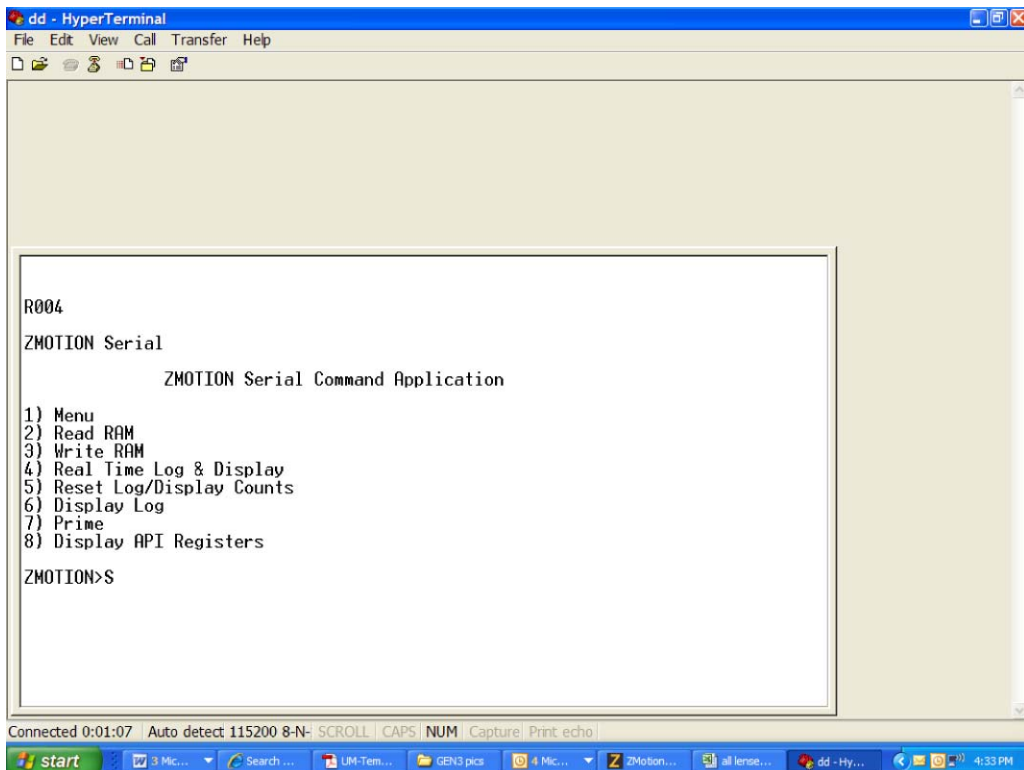
Reset Log/Display Counts. Clears out the display log and resets the count.

Display Log. Displays the relative time stamp of each motion event, starting with the most recent event (highest time stamp).

Prime. Selecting **Prime** will causes the Z8FS040 MCU to calculate and display sequential prime numbers. Motion detection continues to operate.

Display API Registers. Displays the current values in each API register.

For further information about API register settings, please refer to the *ZMOTION Detection and Control Family Featuring Zilog's PIR Technology Product Specification (PS0285)*.



```
dd - HyperTerminal
File Edit View Call Transfer Help
R004
ZMOTION Serial
      ZMOTION Serial Command Application
1) Menu
2) Read RAM
3) Write RAM
4) Real Time Log & Display
5) Reset Log/Display Counts
6) Display Log
7) Prime
8) Display API Registers
ZMOTION>S
Connected 0:01:07 Auto detect: 115200 8-N- SCROLL CAPS NUM | Capture! Print echo
```

Figure 3. The ZMOTION_Serial project running in Hyperterminal

Board Design Information

Figure 4 displays the schematics for the ZMOTION Development Board.

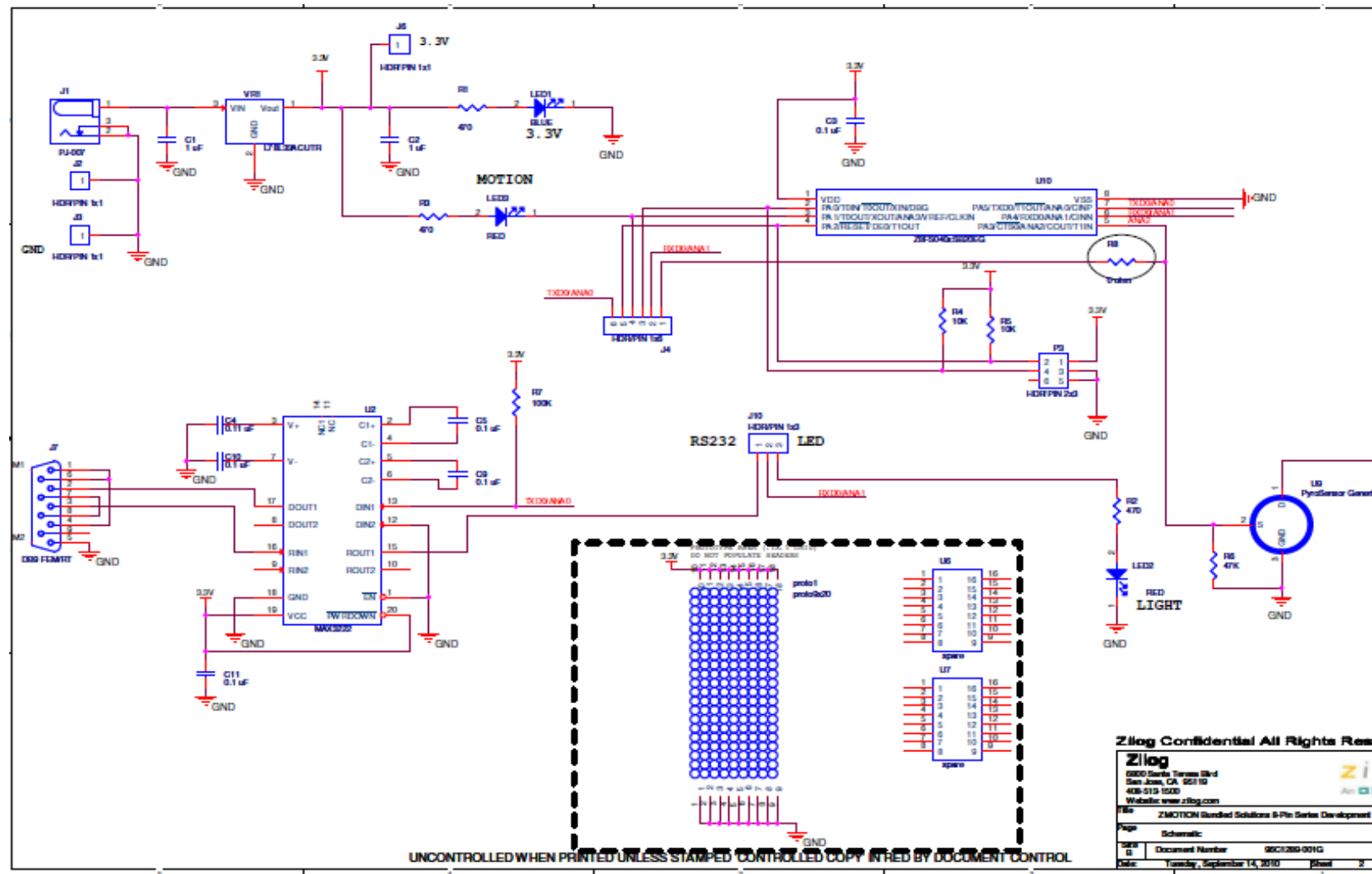


Figure 4. ZMOTION Development Board Schematic Diagram

Figure 5 displays a mechanical drawing of the ZMOTION Development Board.

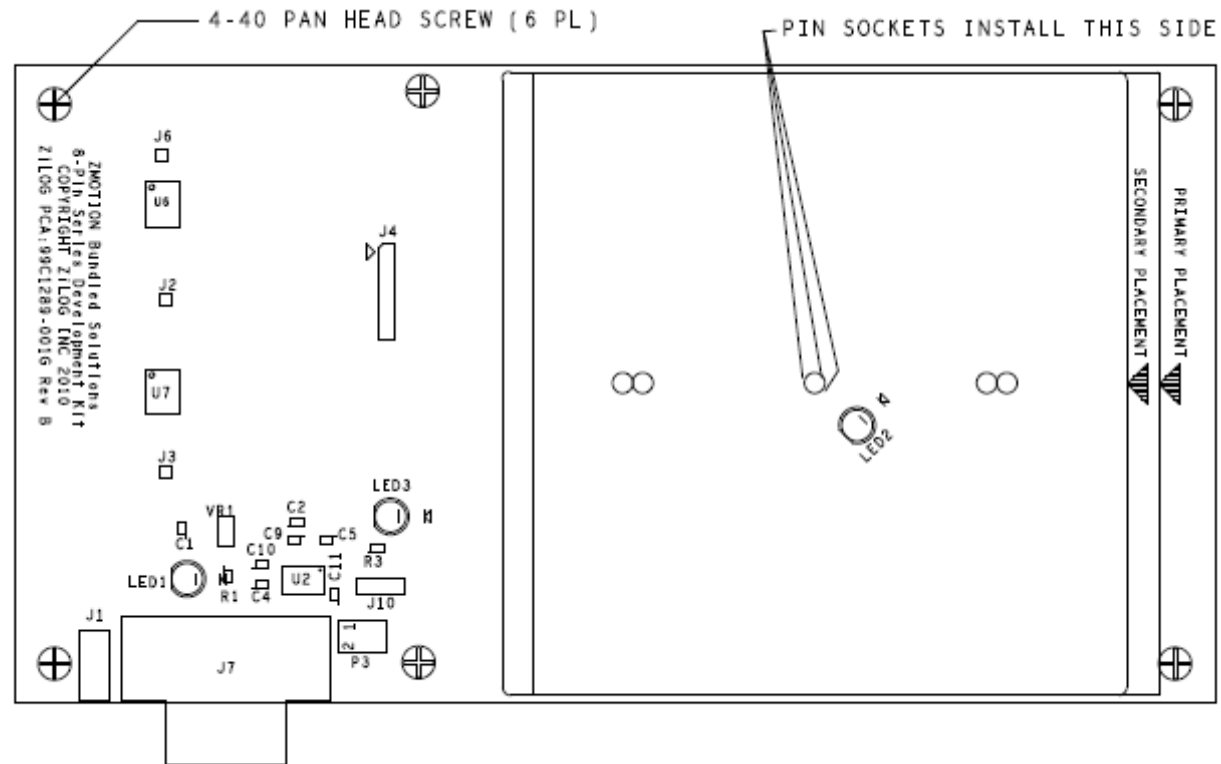


Figure 5. ZMOTION Development Board Mechanical Diagram

Customer Support

To learn more about this product, find additional documentation, or to discover other facets about Zilog development tools offerings, please visit the [Zilog Knowledge Base](#).

If you have comments, technical questions, or are experiencing reporting problems, please visit the [Zilog Technical Support page](#) or the [Zilog Online Community Forum](#).

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