



ZMOTIONL100ZCOG

ZMOTION™ Detection and Control Development Kit

User Manual

UM023002-0112



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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
Dec 2011	02	Updated to include lens attachment instructions, ZDSII installation, a discussion about the sample project, plus modified schematic diagrams.	11 , 18 , 24 , 34
Nov 2010	01	Original issue	All

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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.

► **Note:** This user manual acquaints users with Zilog's ZMOTION Detection and Control Development Kit Revision D.

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 Detection and Control Product Specification \(PS0285\)](#), available free for download from the Zilog website.

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, including a RE200B-P sensor installed on the Board
- Mini-USB serial cable
- Wall-mount mini-USB 5 V DC power supply¹
- An assortment of mounting hardware

The contents of the kit are shown in Figure 1.

1. Zilog recommends using only the power supply provided in the ZMOTION Detection and Control Development Kit.

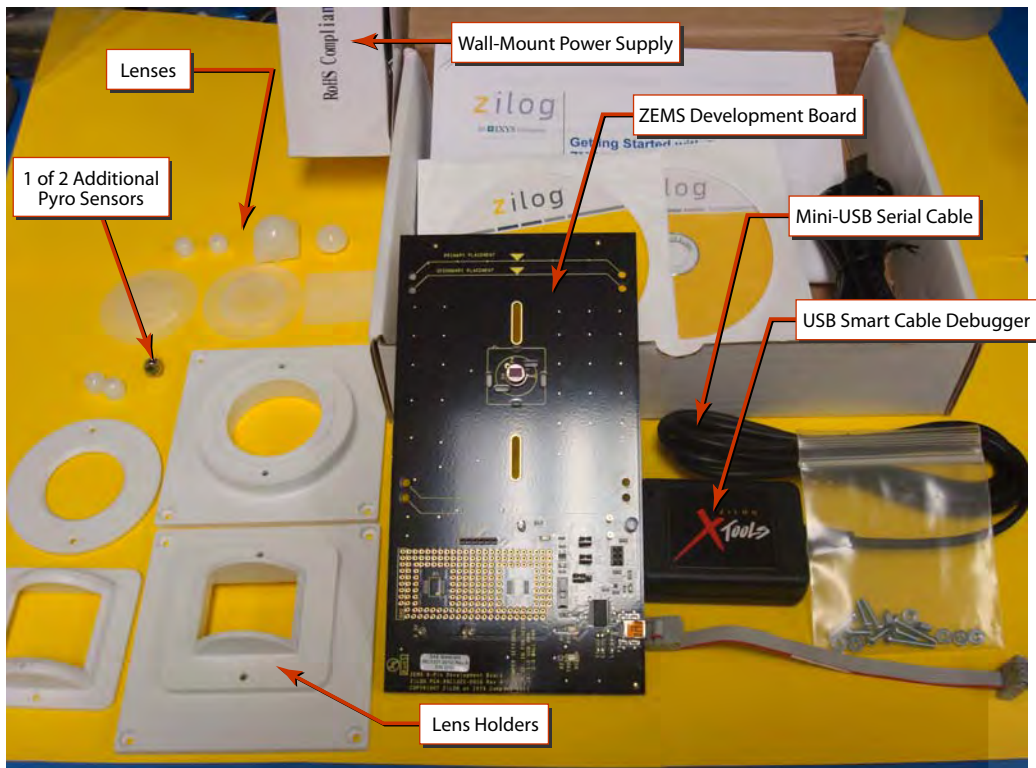


Figure 1. ZMOTION Detection and Control Development Kit Contents

Software (on CD-ROM)

- ZDSII – Z8 Encore! IDE with ANSI C-Compiler
- USB to Serial Driver
- Sample Code:
 - ZMOTION_Serial_Config
 - ZMOTION_Serial_Command

- ZMOTION_Low_Scan

Documentation

The CD-ROM provided in the ZMOTION Detection and Control Development Kit contains the following documentation:

- ZMOTION Detection and Control Product Brief (PB0225)
- ZMOTION Detection and Control Development Kit Quick Start Guide (QS0076)
- ZMOTION Detection and Control Product Specification (PS0285)
- This ZMOTION Detection and Control Development Kit User Manual (UM0230)
- Board schematic, assembly drawing and artwork

The CD-ROM also contains the following related ZMOTION documentation:

- ZMOTION Detection Module:
 - ZMOTION Detection Module Product Brief (PB0223)
 - ZMOTION Detection Module Product Specification (PS0284)
- ZMOTION Intrusion Detection:
 - ZMOTION Intrusion Detection Product Brief (PB0230)
 - ZMOTION Intrusion Detection Product Specification (PS0288)
- Supporting Documentation:
 - ZMOTION Lens and Pyroelectric Sensor Product Specification (PS0286)
 - ZMOTION – A New PIR Motion Detection Architecture White Paper (WP0017)
 - ZMOTION Detection Lens and Pyro Sensor Configuration Guide (WP0018)

- Power Management and Customer Sensing with Zilog’s ZMOTION Detection Module (AN0301)
- ZMOTION Detection Module Application Walkthrough (AN0307)
- Controlling Power with the ZMOTION Detection Module and Clare Solid State Relays Application Note (AN0319)

System Requirements

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

- Microsoft Windows 7/Windows XP Professional SP1/Windows 2000 SP3/Windows Vista 32-bit/Windows NT 4.0 SP6
- 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
- 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 Detection and Control Development Board is a development and prototyping platform for the ZMOTION silicon and software, as well as for its 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.

Features

The ZMOTION Detection and Control Development Board features the following elements:

- Z8FS040 ZMOTION Detection and Control MCU (8-pin SOIC)
- Mini-USB power connector and serial interface
- Power-On and Detection LED
- On-chip debugger interface
- Board openings for an assortment of lens holders and clip-on lens attachments
- Prototyping area
- 2.7 V–3.6 V operating voltage with 5 V-tolerant inputs

MCU Features

The Z8FS040 ZMOTION Detection and Control 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
- 2.7 V to 3.6V operating voltage with extended operating temperature range –40°C to +105°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 Lenses and Pyroelectric Sensors

The ZMOTION Detection and Control Development Kit includes five different types of lenses and pyroelectric sensors 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.

Pyroelectric Sensor Options

The ZMOTION Detection and Control Development Kit includes the following three pyroelectric sensors:

- RE200B-P: a basic dual element sensor installed on the board
- SDA02-54-P, a premium dual-element sensor
- SBDI46-504AA, a quad-element sensor



Figure 2. Two Additional Pyroelectric Sensors (L–R): SDA02-54-P and SBDI46-504AA

► **Note:** The type of sensor you use depends on your application requirements; however, not all sensors are suitable for all lenses.

Lens Mounting Options

The ZMOTION Detection and Control Development Board supports four lens-mounting options, as indicated in Table 1. For lens installation instructions, please refer to the sections that follow.

Table 1. Four Supported Lens-Mounting Options

Lens Mounting	Supported Lens
PIR Sensor Clip-On	NCL-9(26)
	NCL-3B
	NCL-3R
	NCL-10S
	NCL-10IL
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

Attaching the PIR Sensor Lens

Each of the clip-on lenses slide atop the PIR sensor, and the notch on the PIR sensor aligns with the notch in the base of the lens, as shown in Figure 3.



**Figure 3. NCL-9(26) Lens and PIR Sensor Installed
on the ZMOTION Development Board**

Attaching the Circuit Board Lens

This clip-in lens style clips directly into the circuit board over the top of the PIR sensor. There are 4 mounting clips on the lens that are aligned with the slots in the circuit board. Note the locating tab on the side of the lens is to be aligned with the silkscreened tab, as indicated in Figure 4.



Figure 4. Assembled Clip-In Lens Installed on the ZMOTION Development Board

Assembling the Circular Lens Holder

The circular lens holder, shown in Figure 5, is a 2-piece assembly that provides a 0.77" focal length mounting.



Figure 5. Circular 0.77" Lens Holder (Cap and Base)

To assemble the lens and lens holder, observe the following brief procedure.

1. Place the circular lens into the base of the lens holder, aligning the notch on the lens with the inside notch on the base.
2. Place the circular cap over the lens and the base ensuring the outside tab on the cap aligns with the outside tab on the base. Use the provided $\frac{3}{4}$ " machine screws (2) with a nut to secure the cap in place.

3. Place the lens and lens holder assembly on the to ZMOTION Development Board aligning the primary placement arrow on the lens holder with the primary placement arrow on the circuit board, as shown in Figure 6. The 4 screw holes in the circuit board should line up with the four center-mounting holes in the lens holder.



Figure 6. Top of Lens Holder on the ZMOTION Development Board

4. Use the provided $\frac{3}{8}$ " machine screws (4) with a nut to secure the lens holder in place. See Figure 7.



Figure 7. Assembled Circular 0.77" Lens Holder and Circular Lens Installed on the ZMOTION Development Board

Assembling the Flat Lens Holder

The flat lens holder, shown in Figures 8 and 9, is a two-piece assembly that provides a 0.9" focal length mounting.



Figure 8. Flat 0.9" Lens Holder (Cap and Base)

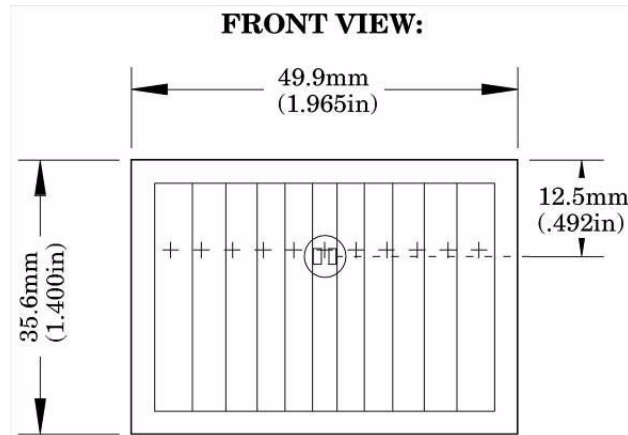


Figure 9. Flat Lens: AA 0.9 GI T1

To assemble this flat lens and holder, observe the following brief procedure.

1. Place the lens into the inside of the cap, ensuring that the grooves of the lens are facing inward.
2. Place the cap over the base, ensuring that the top of the lens is toward the arrow on the base. Use the provided ½" machine screws (2) with a nut to secure the cap in place.
3. Place the lens and lens holder assembly onto the ZMOTION Development Board with the arrow on the lens holder aligned with the primary placement arrow on the circuit board, as shown in Figure 10. The four screw holes in the circuit board should line up with the four center-mounting holes in the lens holder.
4. Use the provided ⅜" machine screws (4) with a nut to secure the lens holder in place. See Figure 10.



Figure 10. Assembled Flat 0.9" Lens Holder and Flat Lens

Installing ZDSII and the USB Smart Cable

Observe the following the steps to install Zilog Developer Studio (ZDSII) and its associated documentation.

1. Insert the ZDSII CD into the CD-ROM drive. The DemoShield installer launches automatically. If DemoShield does not launch automatically, open Windows Explorer, browse to your CD-ROM drive and double-click `launch.exe` to launch DemoShield.
2. From the product installer list, you can choose to install ZDSII alone, or both ZDSII and its associated documentation. You can also copy the documentation directly from your CD-ROM drive to your hard disk using Windows Explorer, or read the documentation directly from the CD-ROM itself.

For customer service and technical support, Zilog recommends that you create an account at support.zilog.com.

Installing the USB Smart Cable

This section describes how to install the USB Smart Cable and associated driver software for your particular operating system.

Windows 7 32/64

Observe the following steps to install the USB Smart Cable for Windows Vista 32-bit systems.

1. Connect the USB Smart Cable to the Host PC. A window message stating **Driver Software Installation** appears.
2. Windows automatically searches the driver; this process can sometimes take a few minutes to complete. In this case, wait for the search to complete, since there is no option to terminate this process immediately. If the driver was previously installed, Windows automatically installs the USB Smart Cable driver. If this is the case, proceed to [Step 9](#). If Windows cannot find the driver, close the Search dialog and continue to Step 3.
3. In the Windows Start menu's **Search programs and files** field, enter `Device Manager` and click the Enter key. A **Device Manager** link will appear in the Start menu's resulting Program list; click to launch it.
4. In the Device Manager, under **Other devices**, right-click **USB Smart Cable**.
5. Select **Update Driver Software**.
6. In the **Update Driver Software – USB Smart Cable** dialog, select the **Browse my computer for driver Software** option.
7. Browse to one of the following driver directories:

For 32-bit versions:

```
<ZDS II Installation Directory>\device drivers\USB\x32  
<ZDS II Installation CD>\device drivers\USB\x32
```

For 64-bit versions:

```
<ZDS II Installation Directory>\device drivers\USB\x64  
<ZDS II Installation CD>\device drivers\USB\x64
```

8. Click **Next** to install the driver. On 32-bit systems, a **Windows Security** dialog will appear; select **Install this driver software anyway**.
9. After the Wizard finishes the installation, click the **Close** button.

Windows Vista, 32-bit OS

Observe the following steps to install the USB Smart Cable for Windows Vista 32-bit systems.

1. Connect the USB Smart Cable to the host PC. The **Found New Hardware** dialog box is displayed.
2. Select **Locate and install the driver software (recommended)**. The **Driver Software Installation** window is displayed, followed by the **Found New Hardware-USB Smart Cable** dialog box.
3. When prompted, select **I don't have the disc. Show me other options**.
4. When prompted, select **Browse my computer for driver software (advanced)**.
5. Browse to the following driver directory:

```
<ZDS II Installation Directory>\device drivers\USB
```
6. The Windows Security dialog box is displayed; select **Install this driver software anyway**.

7. Upon successful installation, click **Close**.

Windows XP

Observe the following steps to install the USB Smart Cable for Windows XP systems.

1. Connect the Zilog USB device to the host PC. The **Found New Hardware** wizard should activate automatically after connecting the Zilog USB device for the first time. If prompted to connect to Windows Update, select **No, not at this time**.
2. Select **[Install from a list or specific location (Advanced)]**; then click **Next**.

► **Note:** If the Windows Logo testing dialog appears, select **Continue Anyway**.

3. Select **Search for the best driver in these locations and Include this location in search**.
4. Browse to the following driver directory, then click **Next**.
`<ZDS installation>\device drivers\USB\`
5. After you find the appropriate driver, click **Next**.
6. Click **Finish** to complete the installation.

Windows 2000

Observe the following steps to install the USB Smart Cable for Windows 2000 systems.

1. Connect the Zilog USB device to the host PC. The **Found New Hardware** wizard should activate automatically after connecting the Zilog USB device for the first time.

2. After the **Found New Hardware** wizard has been activated, click **Next**.
3. Select **Search for a suitable driver for my device (Recommended)**, then click **Next**.
4. Select **Specify a location** and click **Next**.
5. Browse to the following driver directory, then click **OK**.
`<ZDS installation>\device drivers\USB\`
6. After you find the appropriate driver, click **Next**.
7. Click **Finish** to complete the installation.

Connecting the USB Smart Cable

Observe the following steps to connect the USB Smart Cable to the ZMOTION Development Board.



Caution: The power to the development board must be disconnected or turned OFF before connecting or disconnecting the USB Smart Cable.

1. Attach one end of the six-conductor ribbon cable (included) to the USB Smart Cable six-pin DBG connector, as shown in Figure 11.

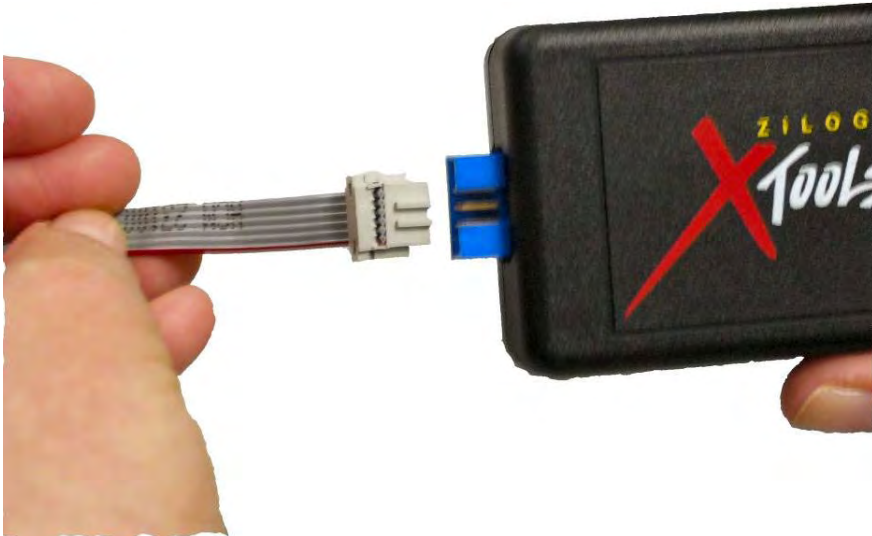


Figure 11. Connecting the Six-Conductor Ribbon Cable to the USB Smart Cable

2. Attach the free end of the ribbon cable to the DBG connector (ZDI Interface) on the development board. Ensure that pin 1 on the ribbon cable (indicated by the dark stripe) is aligned with pin 1 on the target connector (indicated by a 1 on P2 of the board).

Installing the FTDI USB to Serial Driver

Observe the following steps to install the FTDI USB to Serial Driver.

1. Make sure that the USB cable is not plugged into the ZMOTION Development Board.
2. On the CDROM, double-click the `CDM20802_Setup.exe` file (located in the USB to Serial Driver folder) to start the driver installation. The installation process will begin, and will appear similar to the following code statements:

```
32-bit OS detected
<installation path>\dpinstx86.exe
Installation driver
FTDI CDM driver installation process completed.
```

3. When the installation is complete, plug the USB cable into the ZMOTION Development Board.
4. If driver installation was successful, **USB Serial Port (COMx)** should appear in the list displayed in the Device Manager's **Ports (COM & LPT)** interface.

To open the Device Manager on Windows 7 systems, launch the Start menu, enter `Device Manager` in the **Search program and files** field, and press the Enter key.

To open the Device Manager on earlier Windows systems, observe the following navigation:

Start → Control Panel → System → Hardware → Device Manager → Ports (COM & LPT).

Downloading and Running the Sample Project

Sample projects are included on the Application CD. Copy these projects to a convenient folder on your PC. Once copied, ensure the folders are not set to **Read Only** by right-clicking the folder and selecting properties. Deselect the **Read Only** attribute and click **OK**. Make sure you apply changes to this and the other subfolders when prompted.

In this example, we reference the `ZMOTION_Serial_Config` project, which is the project that the kit is initially programmed with. The steps that follow show you how to build the project and run it on the ZMOTION Module in a debug session; these steps also apply to any of the other projects provided in the kit.

► **Note:** At this point, you should have installed the FTDI to USB Serial Driver and loaded ZDSII and the USB Smart Cable driver onto your computer. If you haven't yet done so, refer to the [Installing the FTDI USB to Serial Driver](#) section on page 23 and/or the [Installing ZDSII and the USB Smart Cable](#) section on page 18 for information about how to install these items.

1. Open ZDSII and select **File** → **Open Project**, then navigate to the project folder labeled ZMOTION_Serial_Config.
2. Open the ZMOTION_Serial_Config.zdsproj project. When you first receive your kit, this project is already loaded into the ZMOTION MCU. Right-click within the open grey area below the menu icons and select **Workbook Mode** to turn on the tabs at the bottom of the editor and therefore make it easier to switch between files.
3. Click the **Rebuild All** icon to build the project. The build output should not indicate any errors. If you receive errors, try reloading the projects from the original Application CD and ensure that the folders are not set to **Read Only**. See Figure 12 for an example; Figure 13 indicates the location of the **Rebuild All** icon in the ZDSII menu bar.

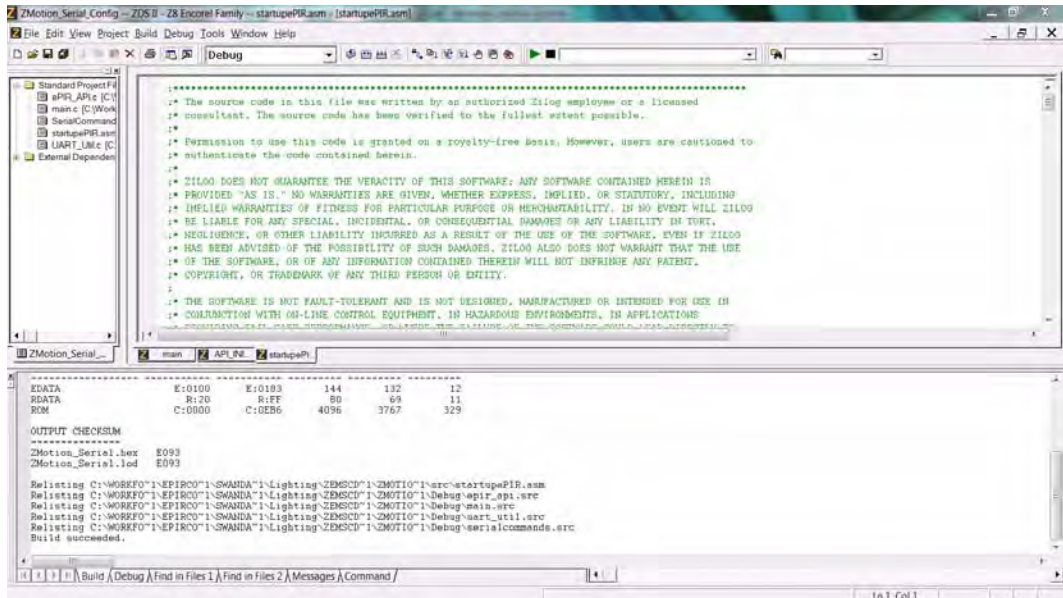


Figure 12. Building the ZMOTION_Serial_Config project in ZDSII

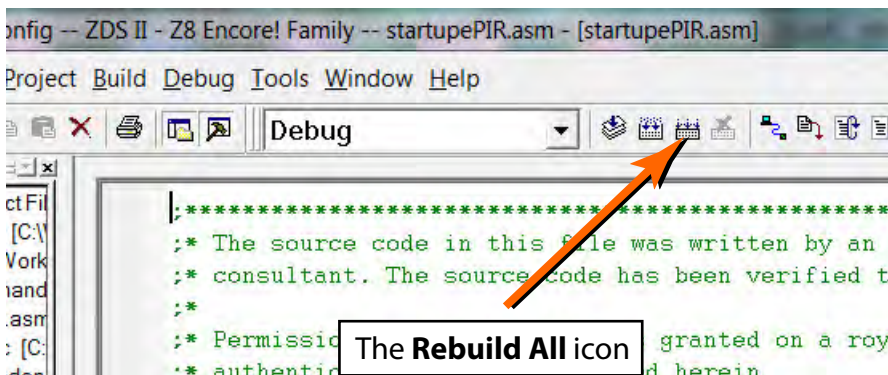


Figure 13. The Location of the Rebuild All Icon

4. Make sure that the ZMOTION Development Board is powered OFF, then connect the USB Smart Cable (Debugger) to P2, as described above.
5. Ensure that the J4 jumper is closed in position 1–2, to control the USB power supply.
6. Apply power to the Development Board by plugging in the USB cable and setting SW1 to the ON position. Next, click the **Reset** icon in ZDSII. Figure 14 indicates the location of both the **Reset** and **Go** icons in the ZDSII menu bar.

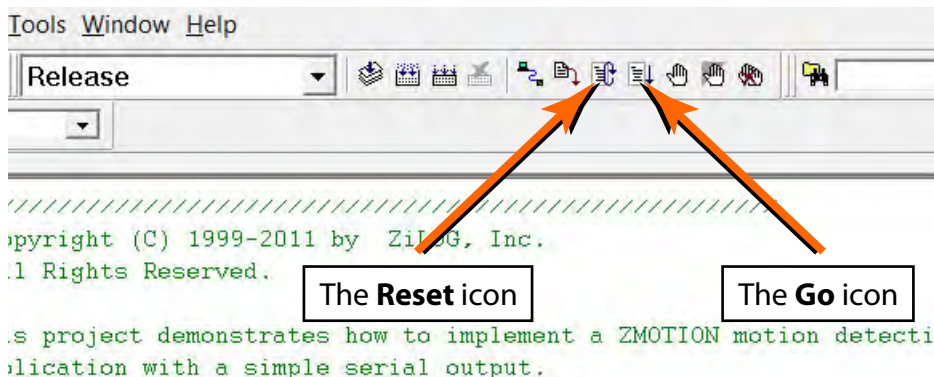


Figure 14. The Location of the Rest and Go Icons

7. An information notice may appear, indicating that the silicon is not the latest version. This occurrence is normal and is not an issue. Click **OK** to continue. You should see a message in the Debug Output Window indicating that the load was successful, as shown in Figure 15.

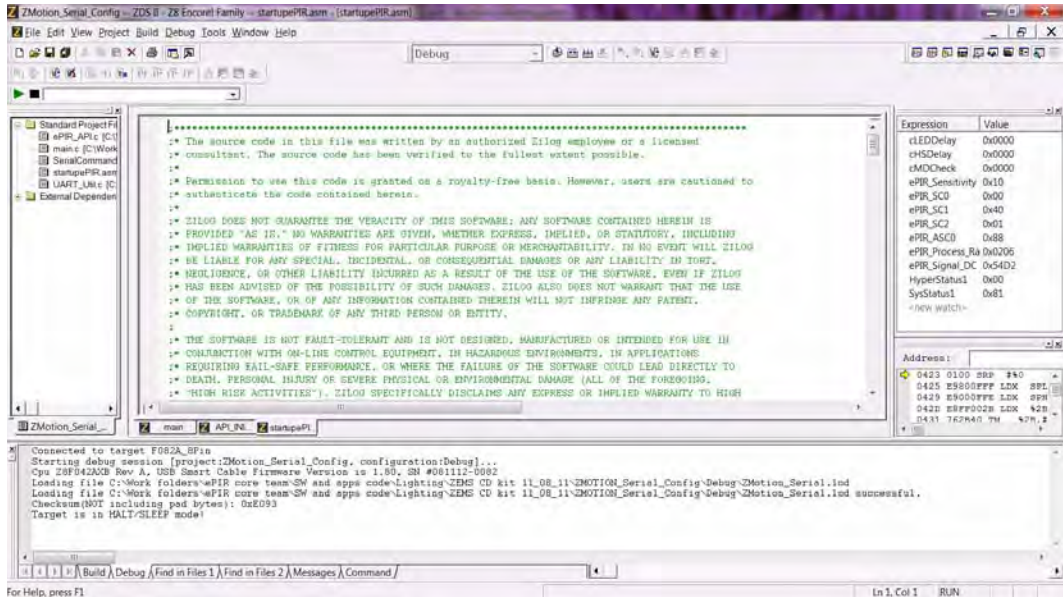


Figure 15. ZDSII's Debug Output Window for the ZMOTION_Basic project

8. Click the **Go** icon to start the application running. The Red LED (LED3) will be ON initially until the pyroelectric sensor stabilizes – a period that can take up to 30 seconds. After it has stabilized, (LED3) turns OFF, to turn ON only when motion is detected.
9. To test this procedure, wave your hand over the lens and notice (LED3) turning ON for approximately 1 second.

ZMOTION Development Kit Application Software

The ZMOTION application software includes the ZMOTION_Serial_Config motion detection project, which is described in this section.

ZMOTION_Serial_Config

The ZMOTION_Serial_Config project demonstrates the basic motion detection functionality of the ZMOTION Development Board. The MCU included with the Board is programmed with this project.

Each lens type is supported by an associated lens configuration header file which displays a name format of `API_INIT_xx.h`. Header files for all supported lens types are included in the include project folder of the ZMOTION_Serial_Config project. The `main.c` source file contains the `include` directive to add the header file to the project. Changes to these header files should not be required, but any modifications you make should be made to a copy of the original header file; *do not modify the original versions*. As new lens types are added to the ZMOTION family, an associated lens configuration file is made available on the Zilog website.

Table 2 lists additional project features that can be modified or enabled in `main.c` and `main.h`.

Table 2. Additional Project Features

Feature	File	Define/Variable	Default Values
LED ON time duration	<code>main.h</code>	<code>DEF_LED_ON_TIME</code>	<code>DELAY_500MSEC</code> (500 milliseconds)
Lens Support	<code>main.c</code>	<code>#include "API_INIT_xx.h"</code>	<code>API_INIT_04.h</code>

When motion is detected, the LED is turned ON for 500msec (`DEF_LED_ON_TIME`). A serial terminal program such as HyperTerminal can be used to view the detection messages from the ZMOTION Development Board. In Figure 16, **23** indicates the version of the application; the *S* following the `ZMOTION>` prompt is displayed when the pyroelectric

sensor has become stable and the system is ready to detect motion. When motion is detected, an *N* or *E* is displayed to indicate the type of detection (Normal motion or *E*xtended motion), along with the count and a time stamp (in seconds) after power-up.



```

ZEMS - HyperTerminal
File Edit View Call Transfer Help
[Icons]

ZMOTION>23
ZMOTION Serial Command Application
0) Display API Registers
1) Read/Write RAM
2) MCU Reset
3) LED On/Off Time
4) Display Events On/Off
5) Dump Event Log
6) Reset Event Log/Counts
7) Hypersense On Time
8) Hypersense Mode/Level
9) Normal Sense Level

ZMOTION>S
4
Display Events On

ZMOTION>N 01 @ 0070
N 02 @ 0079

Connected 0:09:29   Auto detect   115200 8-N-1  SCROLL  CAPS  NUM  Capture  Printed
  
```

Figure 16. The ZMOTION_Serial_Config Project Running in HyperTerminal

The menu shown in Figure 16 allows you to monitor and make real-time changes to the operation of the motion detection software (a description of this menu's selections follows). When the ZMOTION device is reset or power-cycled, all settings return to their default values.

0) Display API Registers. Displays the current setting of the ZMOTION Engine registers.

1) Read/Write RAM. Allows you to make direct modifications to specific RAM locations (Peek/Poke).

2) MCU Reset. Reset the ZMOTION MCU.

3) LED On/Off Time. Sets the duration of the LED ON time and minimum LED OFF time.

4) Display Events On/Off. Turns the automatic display of motion events ON or OFF. When OFF, events are still stored in the log.

5) Dump Event Log. Displays a history of motion events since power-on.

6) Reset Event Log/Counts. Clears the Event Log and resets the time stamp to 0.

7) Hypersense On Time. If Hypersense mode (menu item 8) is enabled when motion is detected, the sensitivity of the system can be increased for a set amount of time; `Hypersense On Time` sets this time. If motion is detected while sensitivity is increased, the ON time starts over.

8) Hypersense Mode/Level. There are three settings that control sensitivity to motion during Hypersense; these settings are `Major Sensitivity`, `Minor Sensitivity` and `Range`. This menu option allows you to enable and set each of these settings individually.

9) Normal Sense Level. When in `Normal` motion sense mode (i.e., not in Hypersense mode), this selection allows you to set the sensitivity levels of the three settings (`Major Sensitivity`, `Minor Sensitivity` and `Range`).

Making Changes to the ZMOTION_Serial_Config Project

The operation of the motion detection software can be changed by making modifications directly to the source code. Follow the comments in the code (generally in `main.h` and `main.c`) to make any permanent changes.

For example, to change the lens configuration file and the duration of the LED ON time, observe the following procedure.

1. Change the following line in the `main.h` file:

```
#define DEF_LED_ON_TIME DELAY_500MSEC           //Time the LED
                                                  //stays on
                                                  //when motion
                                                  //is detected
```

2. Change the line as follows to select a five-second LED ON time:

```
#define DEF_LED_ON_TIME DELAY_5SEC             //Time the LED
                                                  //stays on when
                                                  //motion is
                                                  //detected
```



Note: LED ON time definitions are provided in the `main.h` file for values from 50ms to 30 minutes.

3. Click the **Rebuild** icon to build the project. The build output should not indicate any errors. Click the **Go** icon to download the modified project and start the application running. Generate motion and notice that the LED now stays on for 5 seconds.

```
// This file must match the lens and PIR sensor used in the application
// #include "API_INIT_00.h"           // Generic settings: non-lens-specific
// #include "API_INIT_01.h"           // API configuration file for AA 0.9 GI V1 Lens
// #include "API_INIT_02.h"           // API configuration file for CM 0.77 GI V3 Lens
// #include "API_INIT_03.h"           // API configuration file for CM 0.77 GI V5 Lens
#include "API_INIT_04.h"              // API configuration file for CWM 0.5 GI V1 Lens
// #include "API_INIT_05.h"           // API configuration file for NCL-9(26) Lens
// #include "API_INIT_06.h"           // API configuration file for NCL-10IL Lens
// #include "API_INIT_07.h"           // API configuration file for NCL-3B Lens
// #include "API_INIT_08.h"           // API configuration file for NCL-3R Lens
```

```
//#include "API_INIT_09.h"           // API configuration file for NCL-10S Lens
//#include "API_INIT_0A.h"           // API configuration file for NCL-11 Lens
//#include "API_INIT_IML-0643.h+"    // API configuration file for IML-0643 Lens
```

► **Note:** As the code listed above demonstrates, the `API_INIT` file must match the lens and pyroelectric sensor being used on the Development Board. Use the Lens Selection Guide in the [ZMOTION Lens and Pyroelectric Sensor Product Specification \(PS0286\)](#) to determine which `API_INT` file is required for each lens setting.

4. To change the lens used by the project, edit the `include` line at the top of the `main.c` file to include the appropriate `API_INIT` file. The project initially uses `API_INIT_04.h` to support the CWM 0.5 GI V1 (board clip-in) lens; see the above code example. To use a different lens, edit out the comment characters (`//`) in the `main.c` file that correspond to the new lens, and comment out the lens that is no longer in use.

Board Design Information

Figure 17 displays the schematics for the ZMOTION Development Board.

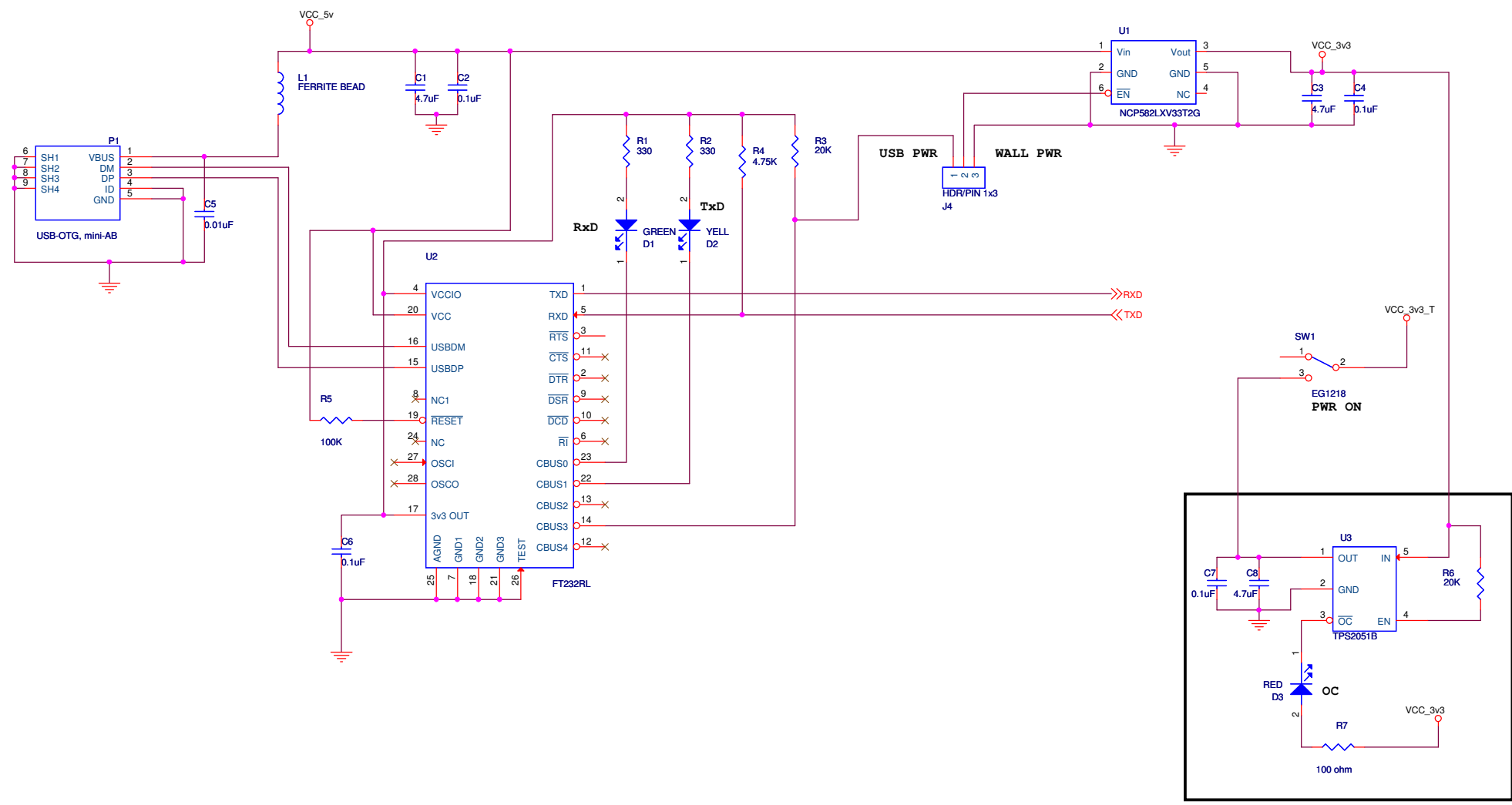


Figure 17. ZMOTION Development Board Schematic Diagram, #1 of 2

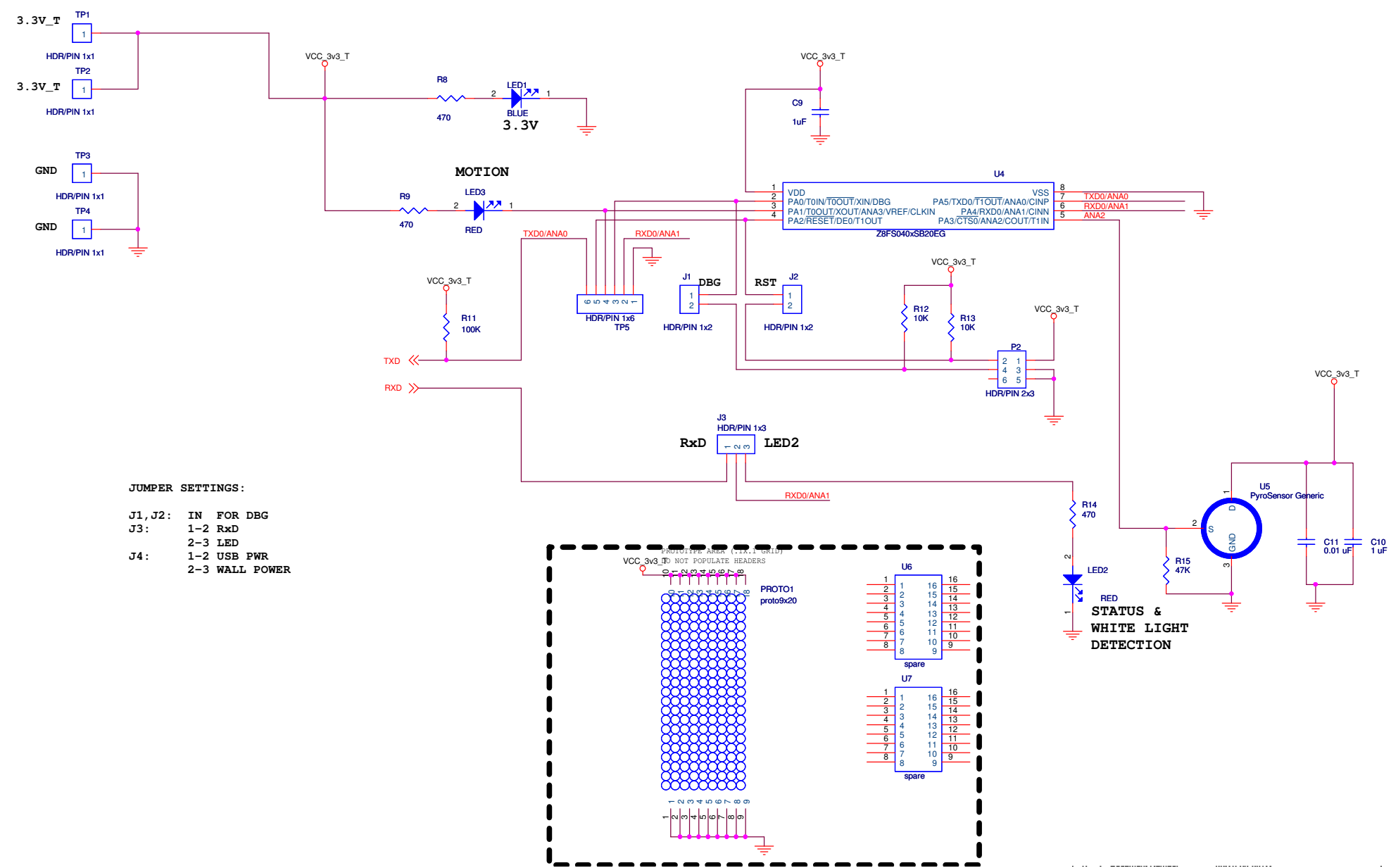


Figure 18. ZMOTION Development Board Schematic Diagram, #2 of 2

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