

Important Notes

Restrictions in Use

IDT's ZAMC4100 Evaluation Kit, consisting of the ZAMC4100 Evaluation Board, ZAMC4100 Adaptor Board, LIN Communication Board, and the communication/calibration software, is designed for product evaluation, laboratory setup, and application software development only.

IDT's Evaluation Kit hardware and software must not be used for production or production test setups.

Disclaimer

IDT shall not be liable for any damages arising out of defects resulting from

- (i) delivered hardware or software
- (ii) non-observance of instructions contained in this manual and in any other documentation provided to user, or
- (iii) misuse, abuse, use under abnormal conditions, or alteration by anyone other than IDT.

To the extent permitted by law, IDT hereby expressly disclaims and user expressly waives any and all warranties, whether express, implied, or statutory, including, without limitation, implied warranties of merchantability and of fitness for a particular purpose, statutory warranty of non-infringement, and any other warranty that may arise by reason of usage of trade, custom, or course of dealing.



Important Equipment Warning: If not followed properly, these procedures can result damage to the user's equipment. Only trained professionals should connect equipment. Ensure that all kit users have read and understood this document before using the kit.

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1 Introduction

This manual describes the use of the ZAMC4100 Evaluation Kit and the ZAMC4100 Evaluation Software. It also describes the setup of the Keil™ ULINK2 JTAG debugger/programmer (not included in kit).

1.1. Contents of Kit

The kit is designed for the purpose of evaluating a typical rearview mirror application for the automotive industry. However it can be used for other applications as well.

The ZAMC4100 Evaluation Kit includes the following as illustrated in Figure 2.14:

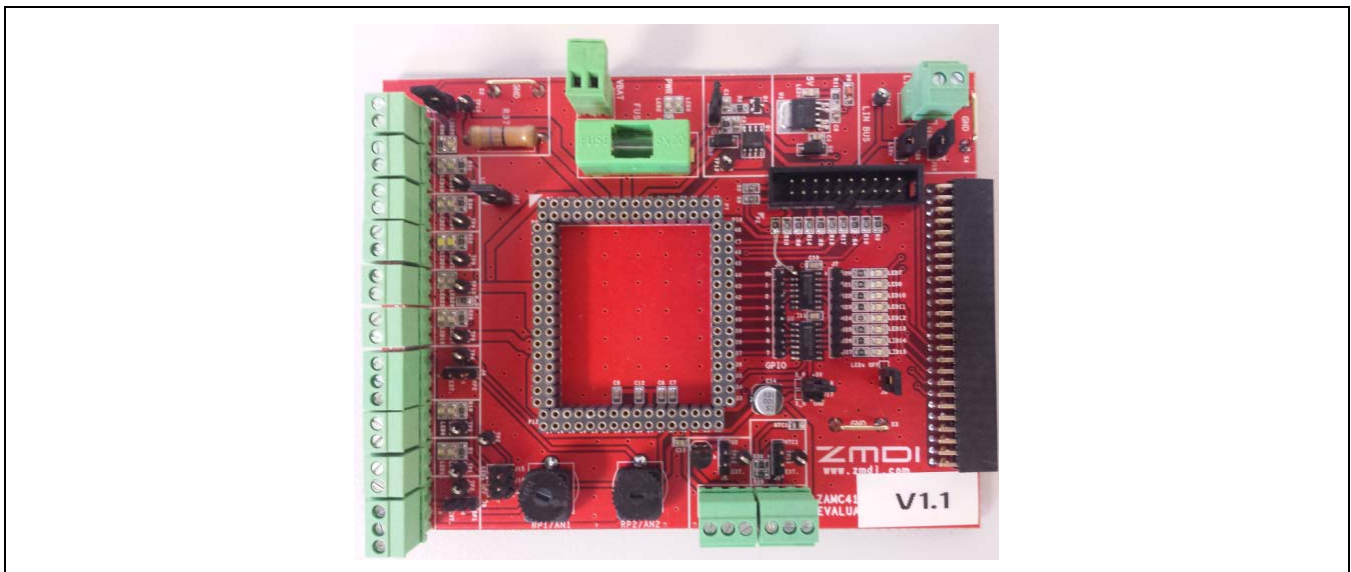
- ZAMC4100 Evaluation Board V1.0 (EVB)
- ZAMC4100 Adaptor Board V1.0
- LIN Communication Board V1.0
- USB cable
- Segger J-LINK® Lite ARM® JTAG debug probe* (optionally included in the Evaluation Kit depending on the order code)

The kit also requires the ZAMC4100 Evaluation Software, which is downloaded from IDT's website as described in section 1.1.3.

1.1.1. ZAMC4100 Evaluation Board V1.1 (EVB)

The EVB is a placeholder where all connections and measurements can be made. There is also a JTAG connector mounted on it. The EVB provides header connectors for mounting the ZAM4100 Adaptor Board above the EVB.

Figure 1.1 ZAMC4100 Evaluation Board



* J-Link® is a trademark of SEGGER Microcontroller GmbH & Co.; ARM® is a trademark of ARM, Ltd.

1.1.1.1. Differences between EVB V1.1 and V1.0

EVB v1.0 and EVB v1.1 are completely functionality compatible. The only difference is a modification of the JTAG circuitry. The EVB v1.1 can function with versions of Keil™ μ Vision®* greater than version 4.7 and also with the Segger J-LINK® Lite ARM® JTAG debug probe.

1.1.2. ZAMC4100 Adaptor Board V1.0

The ZAMC4100 Adaptor Board is a small printed circuit board (PCB) with the ZAMC4100 device soldered on it. It is stacked on top on the EVB.



Important: The adapter board is designed so that it is impossible to stack it in an incorrect position. If it does not fit, check the markings on both the Adaptor Board and EVB (look for pin 1 on both circuit boards).

Figure 1.2 ZAMC4100 Adaptor Board



1.1.3. LIN Communication Board V1.0

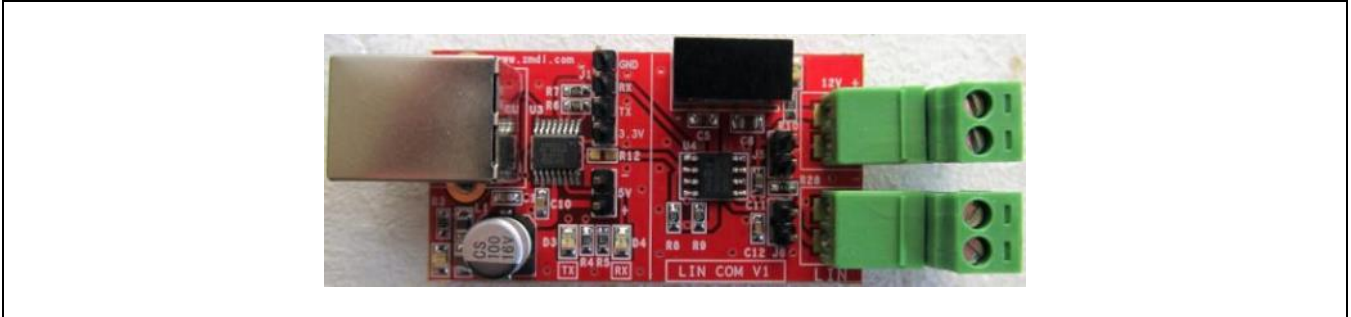
The LIN Communication Board shown in Figure 1.3 is designed to provide simple LIN communication and a power supply to the EVB.



Important Equipment Warning: The LIN Communication Board has limited power; i.e., it can power the EVB if there are not any actual loads connected. In this case, only the LEDs are powered.

* Keil™ μ Vision® is a trademark of ARM Ltd.

Figure 1.3 LIN Communication Board

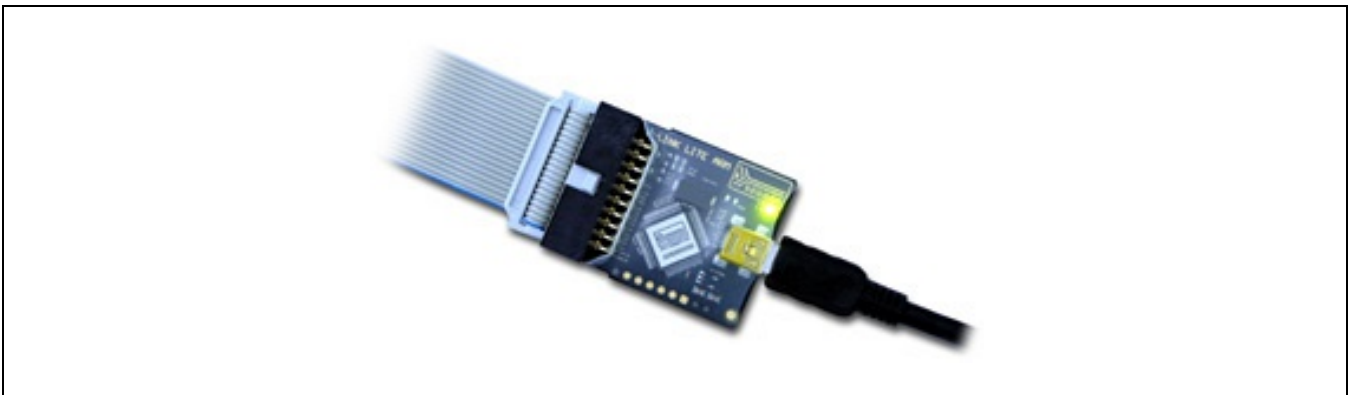


1.1.4. Segger J-LINK® Lite ARM® JTAG Debug Probe (Optional)

The Segger J-LINK® Lite ARM® debug probe is an optional component of the ZAMC4100 Evaluation Kit; i.e., the kit can be ordered with or without the J-LINK® Lite ARM® JTAG Debug Probe. It allows programming and debugging of the EVB. See section 2.2.2 for the set up instructions.

Important Note: The Segger J-LINK® Lite ARM® cannot be ordered separately from IDT.

Figure 1.4 Segger J-LINK® Lite ARM® JTAG Debug Probe



1.1.5. Software

Software package is available for download from the ZAMC4100 product page www.IDT.com/ZAMC4100 and contains everything needed to start the evaluation of the ZAMC4100 as well as to start writing custom firmware.

The software package includes the following:

- Drivers for the Evaluation Kit hardware
- Demonstration software
- *Software Development Kit* for the ZAMC4100 with examples and documentation
- Demonstration graphical user interface (GUI)
- Data sheet, application notes, and schematics for the EVB



Equipment Warning: Although there might be newer versions of the some of the drivers, tools, or libraries available, it is highly recommended that those included in the software package be used initially.

1.2. Required Equipment

Initially, the ZAMC4100 on the EVB is programmed with demonstration firmware so that upon delivery, it can be used in one of two possible ways: with or without an actual load connected.

1.2.1. Operation without any Actual Load Connected

The requirements when operating without actual loads connected (i.e., no mirror or load of any kind connected to the load terminals) are as follows:

- One free USB 2.0 port
- Microsoft® .NET Framework version 3.5 to run the GUI
- Internet connection (for subsequent updates)
- EVB programmed with demonstration firmware (as delivered with the kit)
- LIN Communication Board

1.2.2. Operation with Actual Loads Connected

In addition to the previous requirements, when connecting actual loads to the EVB, it is imperative to use an external power supply capable of powering all loads.

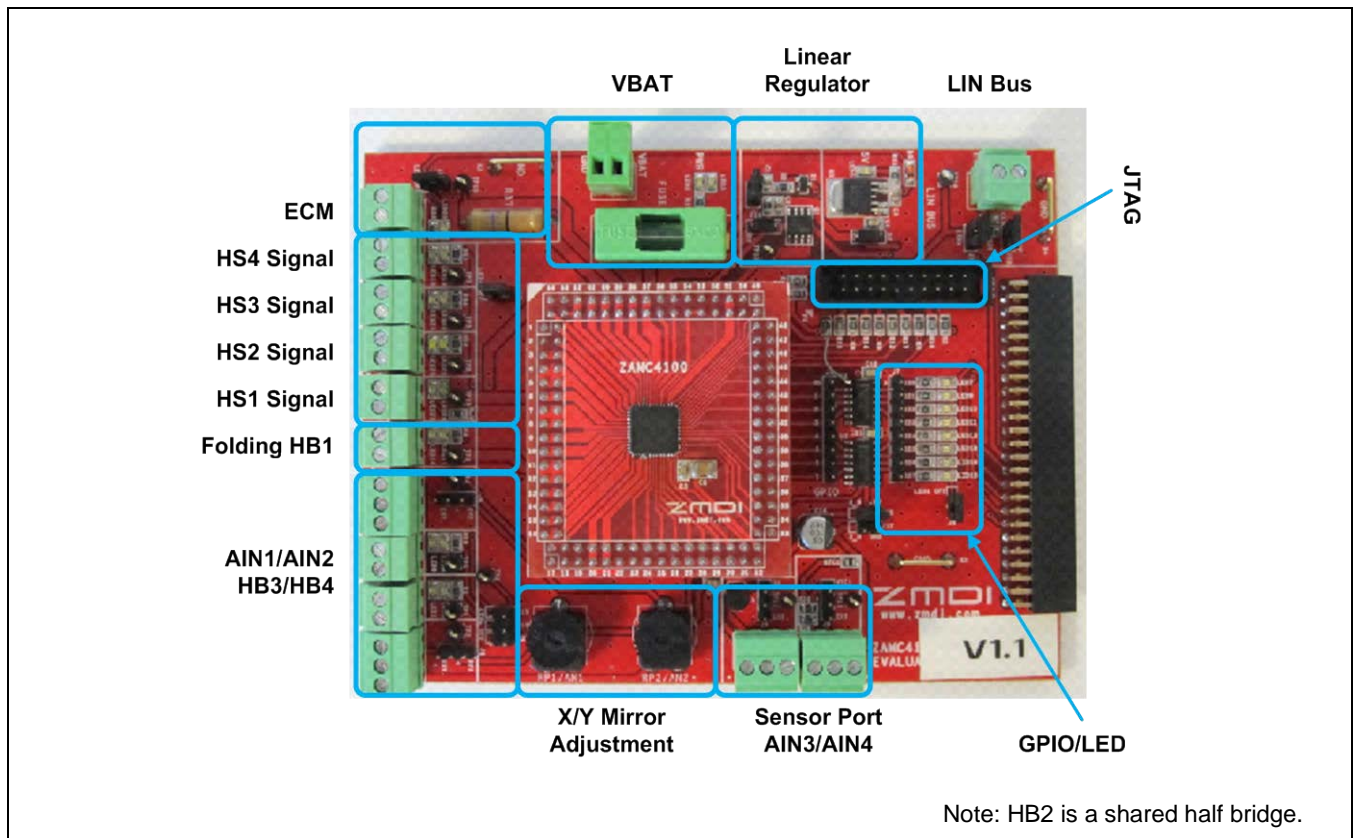


Important Equipment Warning: The LIN Communication Board is not capable of powering external loads. If an attempt is made to operate with an external load without an external power supply, it is possible to damage the USB port of the PC in use.

1.3. Hardware Description

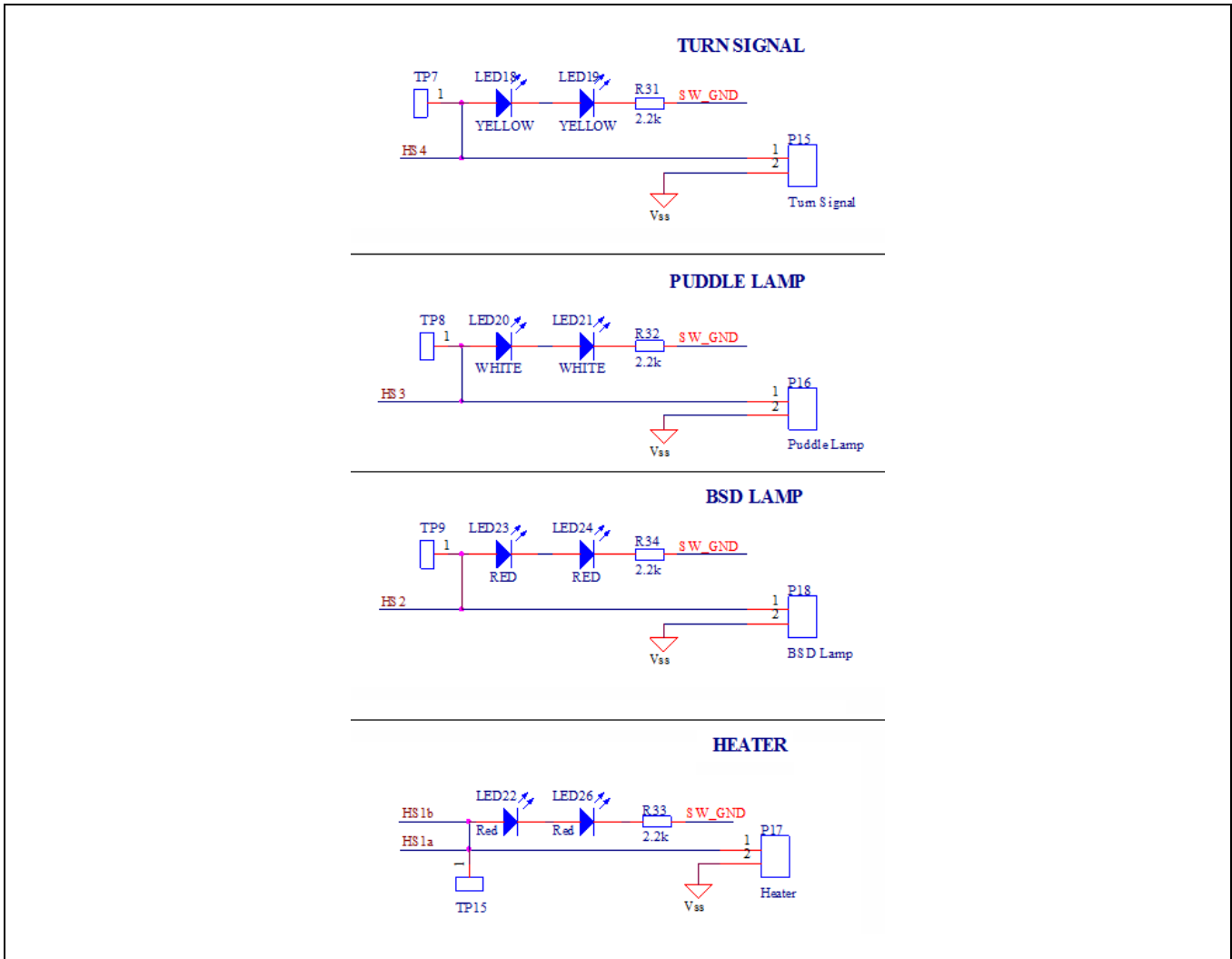
1.3.1. Evaluation Board Feature Overview

Figure 1.5 ZAMC4100 Evaluation Board with Adapter Board Installed – Connectors and Block Description



1.3.2. High Side Drivers (HS1-HS4)

Figure 1.6 Evaluation Board Schematics Sections for the High Side Drivers



1.3.3. Half Bridge Drivers (HB1-HB4) and AIN1/AIN2

1.3.3.1. Mirror Adjustment (HB2, HB3 and HB4) and Mirror Position Sensing

The schematic sections shown on the left in Figure 1.7 have a typical 5A-rated header connector for an X and Y axis mirror motor. The schematic on the right shows the two methods of generating the AIN1 and AIN2 signals; e.g., for sensing the mirror position:

- External potentiometer for X-Y feedback signal
- On-board potentiometer

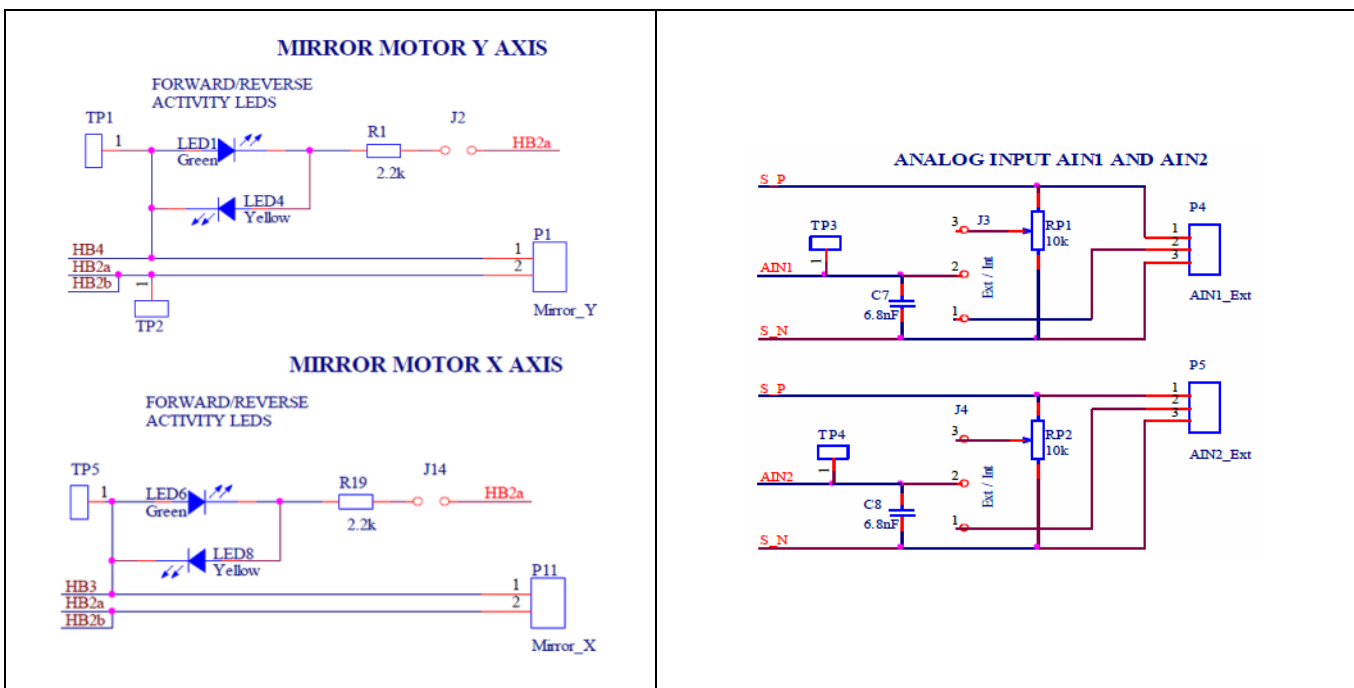
See Figure 2.13 for the locations of the following jumpers. Also see section 1.3.11 regarding AIN3 and AIN4.

Jumper J3 selects the source of the signal for AIN1 – on-board potentiometer or external voltage.

Jumper J4 is the same as J3 but for AIN2.

Jumpers J16 and J17 control the power supply for S_P and S_N respectively (see Figure 1.17 for the schematic showing the jumpers).

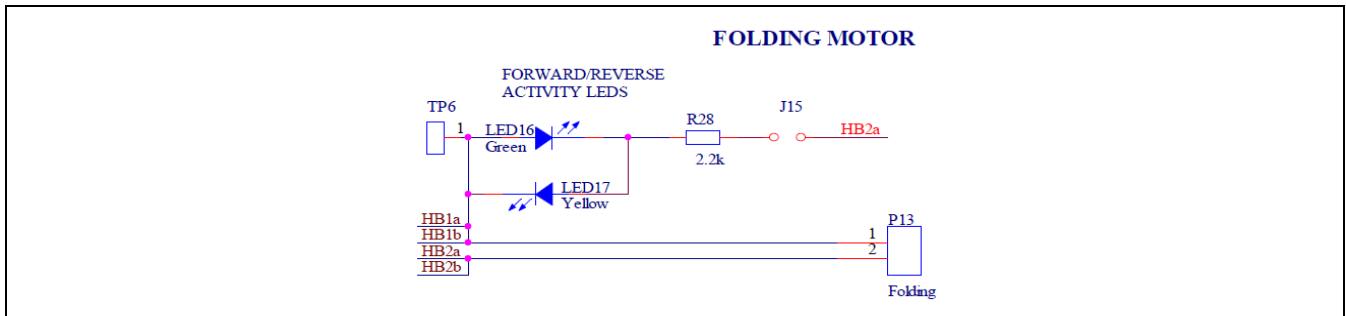
Figure 1.7 Evaluation Board Schematics Sections for Half Bridge Drivers for Adjustment and AIN1/AIN2



1.3.3.2. Folding Motor

The schematic section shown in Figure 1.8 is for the folding motor header. It operates with a bi-directional current, which opens and closes the side mirror.

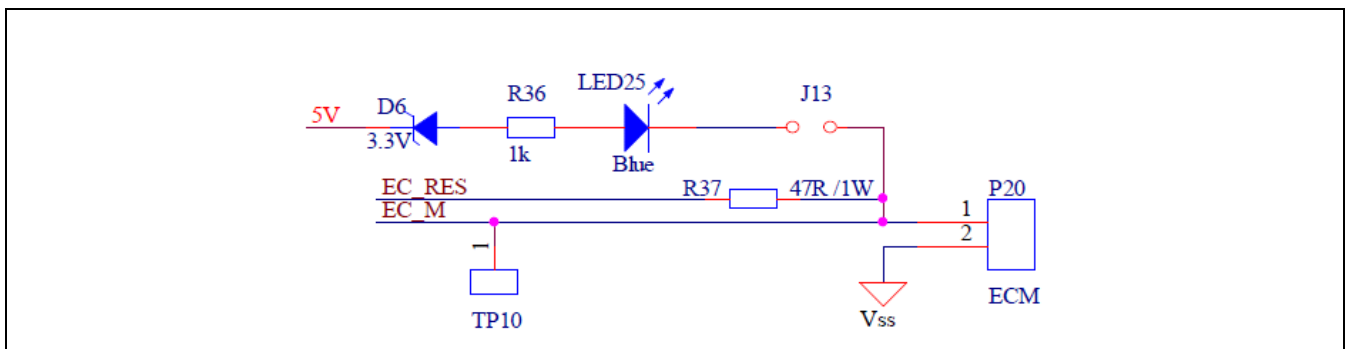
Figure 1.8 Evaluation Board Schematics Section for the Folding Motor



1.3.4. ECM Driver

Figure 1.9 shows the schematics section for the electrochromatic mirror (ECM) connection.

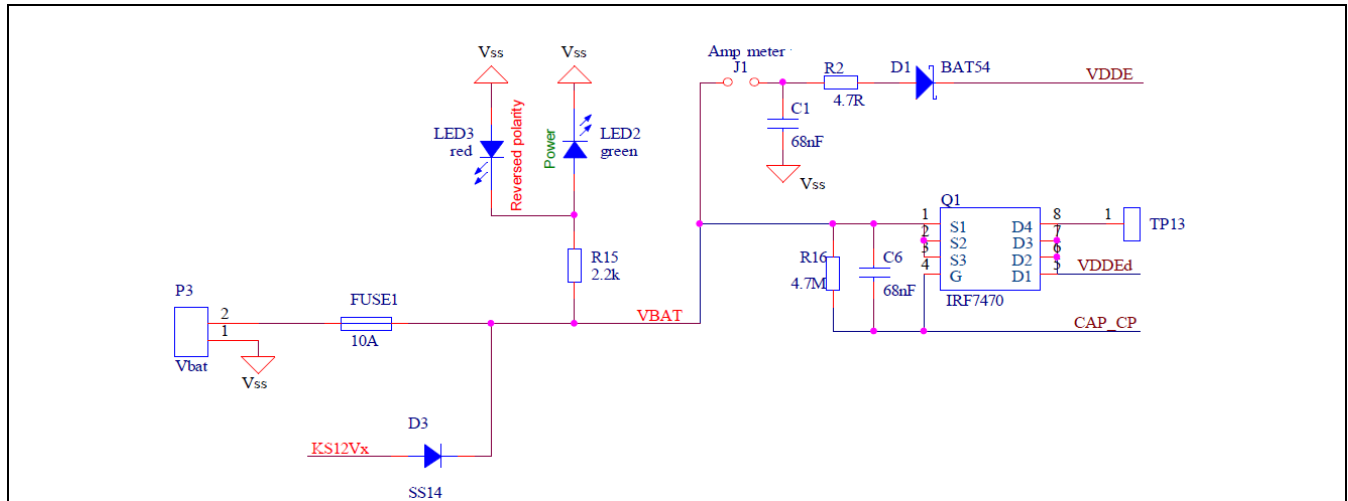
Figure 1.9 Evaluation Board Schematics Section for the ECM Driver



1.3.5. Power Supply Unit (PSU) Circuit (VBAT)

Figure 1.10 shows the PSU circuit used on the EVB, which is a typical PSU circuit for meeting the specifications given in the *ZAMC4100 Data Sheet*. Note that J1 can be used to measure current.

Figure 1.10 Evaluation Board Schematics Section for PSU Circuit



For high current, it is advisable to use a solder link on J1 rather than using a jumper (see Figure 2.13 for location). The D1 diode is used to protect the board in the event that the power cable polarity is incorrectly fitted due to user error.

Note: The EVB has a reverse polarity protection, which prevents the EVB from being damaged provided that the voltage is within acceptable limits. If polarity of the power connection is incorrect, a red LED will turn on. If the power polarity is correct, then a green LED will turn on.

Note: For proper kit operation, the power supply voltage should be approximately 12V.

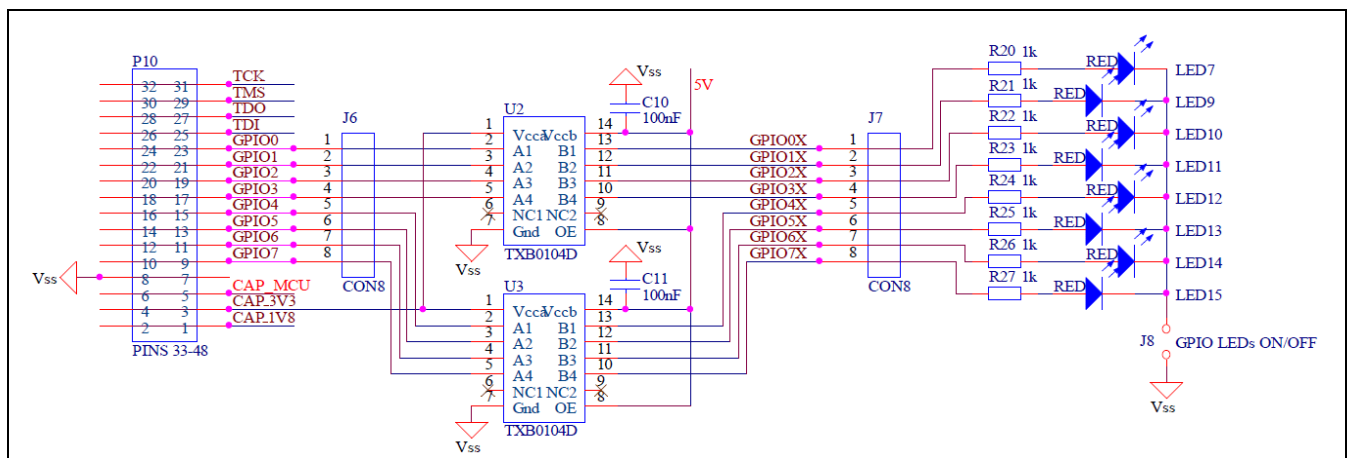
1.3.6. GPIO Interface

The GPIO pins are connected to U2 and U3, which are TXB0104D bidirectional voltage translators with automatic direction sensing. For more information, refer to the data sheet of the manufacturer (Texas Instruments). The TXB0104D is used to avoid excessive loading on the ZAMC4100 when driven by LEDs if it is powered by the linear regulator (refer to the *ZAMC4100 Data Sheet*).

The J7 header allows the user to connect the buffered GPIO signal to an external device or to link the jumper to an LED.

The J8 jumper selects whether the LEDs are to be turned on or off.

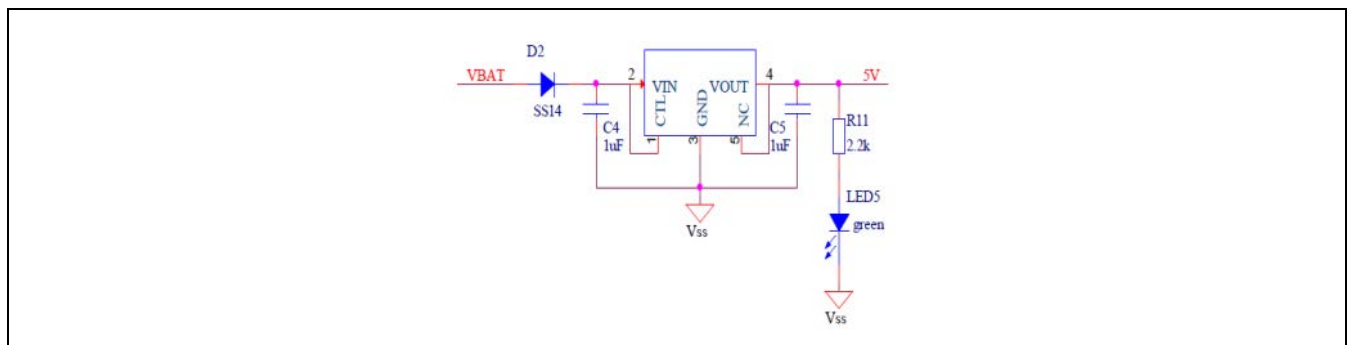
Figure 1.11 Evaluation Board Schematics Section for the GPIO Buffer and Level Shifter



1.3.7. Linear Regulator

The linear regulator provides power for the ECM and GPIO buffer. This avoids unnecessary loading on the ZAMC4100.

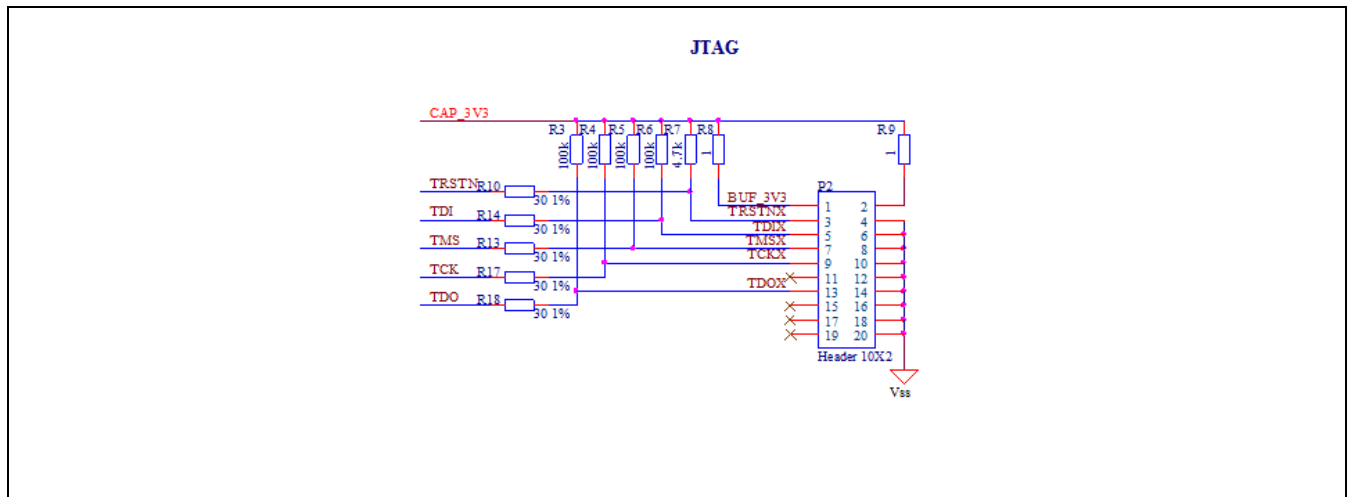
Figure 1.12 Evaluation Board Schematics Section for the 5V Linear Regulator



1.3.8. JTAG Interface

The JTAG connector is based on standard pin layout and functions with the Keil™* ULINK2 JTAG debugger (not included in the ZAMC4100 Evaluation Kit).

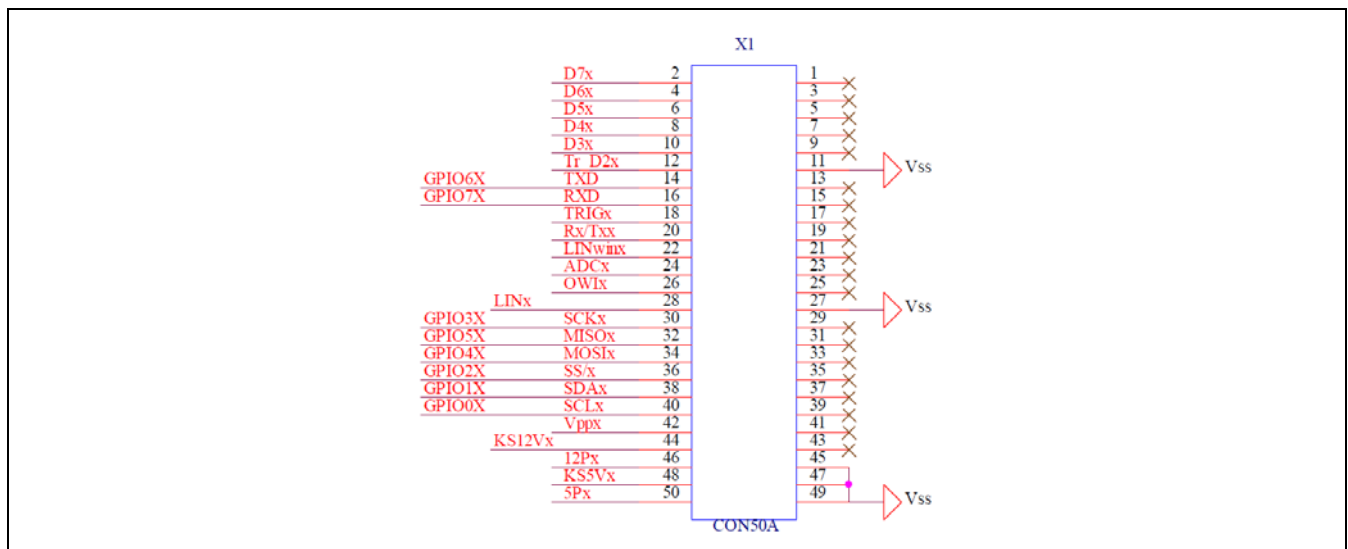
Figure 1.13 Evaluation Board Schematics Section for the JTAG Interface



1.3.9. Expansion Connector

The expansion connection is optional. It should not be used; however, it can provide an additional header for the GPIO lines.

Figure 1.14 Schematics for the Expansion Connector

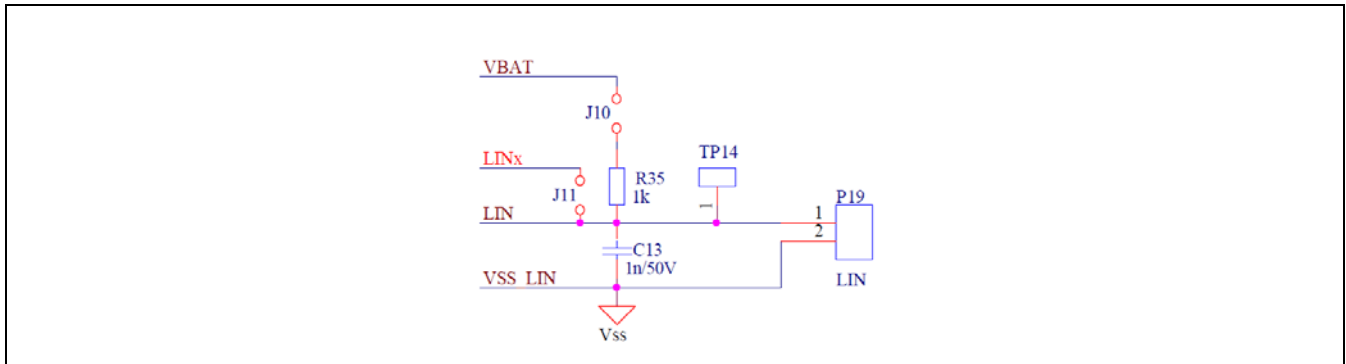


* Keil™ is a trademark of ARM, Ltd.

1.3.10. LIN Bus

Figure 1.15 shows the LIN Bus connector. For any LIN communication, the J11 jumper should be on. Jumper J10 selects whether the pull-up resistor R35 is included or not. For jumper locations, see Figure 2.13.

Figure 1.15 Evaluation Board Schematic Sections for the LIN Bus



1.3.11. AIN3 and AIN4 Sensor Port

The AIN3 and AIN4 sensor ports are highly versatile: each port has two jumper options as shown in Figure 1.16. Jumpers J5 and J9 select whether an on-board or external sensor is used for AIN3 and AIN4 respectively. (See Figure 2.13 for jumper locations.) If jumpers J16 and J17 are shunted, then the ADC reference power is externally supplied as shown in Figure 1.17. Otherwise ADC power is generated internally by the ZAMC4100.

Note: In addition to shunting J16 and J17, the ADC configuration must also be changed via the GUI in order for the external power supply to be used for the ADC.

Figure 1.16 Evaluation Board Schematics Sections for AIN3 and AIN4

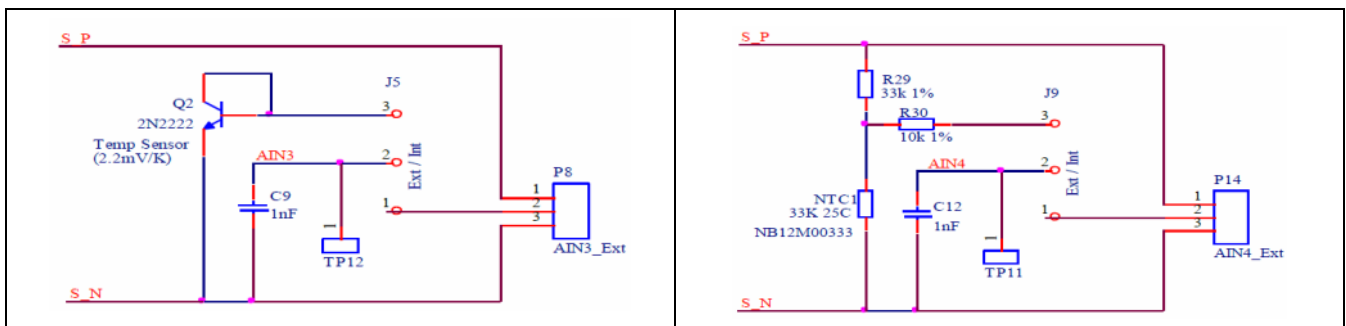
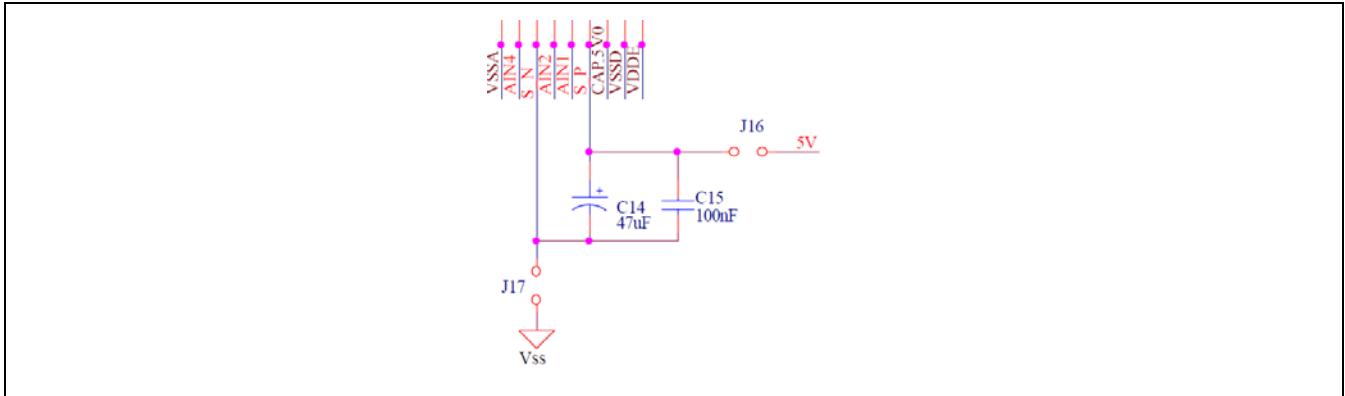


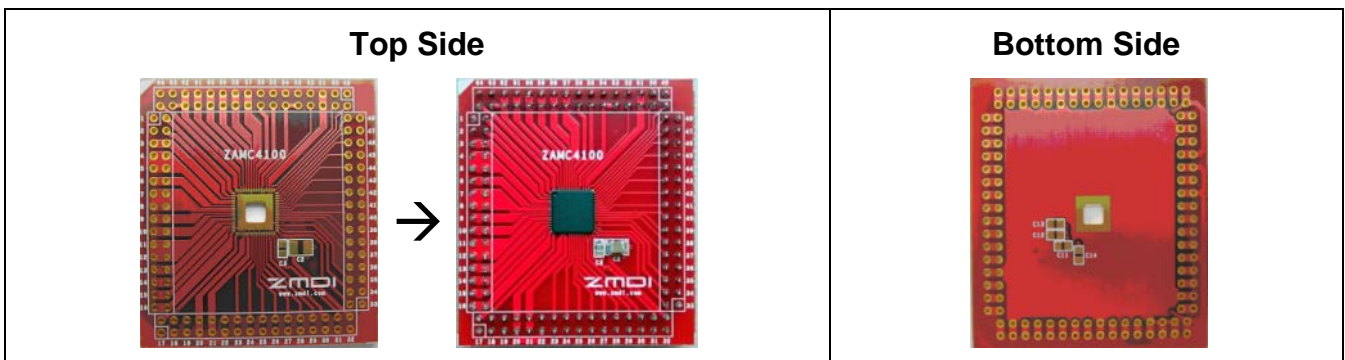
Figure 1.17 Evaluation Board Schematics Section for S_P and S_N



1.3.12. Adaptor Board

The Adaptor Board is used to connect the ZAMC4100 to the Evaluation Board. Figure 1.18 shows the board before and after assembly.

Figure 1.18 Top and Bottom Side of the Adaptor Board Shown Before and After Mounting the ZAMC4100



The Adaptor Board has the following on-board PSU filtering capacitors:

- C11 (47nF) is for CAP_1V8
- C12 (47nF) is for CAP_3V3
- C13 (47nF) is for CAP_MCU
- C14 (220nF) is for CAP_5V0

2 Kit Setup

This section describes setting up the software and usage of the ZAMC4100 graphical user interface (GUI) with the Evaluation Kit after the ZAMC4100 has been programmed with demonstration firmware. The full functions and features of the GUI can be utilized in combination with the ZAMC4100 Evaluation Kit V1.1.

2.1. Directions for Downloading and Installing the ZAMC4100 Evaluation Software

The software tools needed to use the ZAMC4100 Evaluation Kit are provided within a single software package, which installs the ZAMC4100 SDK, drivers, and other components. This ZAMC4100 Evaluation Software package is available for download from the ZAMC4100 product page at www.IDT.com/ZAMC4100.

After downloading this zip file, extract the zip file contents. Complete the following steps to set up the software for the kit in the order given.

2.1.1. PC Prerequisites

The GUI is designed to run on a Microsoft® Windows™ operating system; Windows XP or a newer version is required. The supported resolution is 800x600 or higher. The GUI demonstrates all main functions of the ZAMC4100 and allows READ and WRITE access to the registers of the ZAMC4100.

Table 2.1 Prerequisites

Software Tool Name	Description
Microsoft Chart Control for Microsoft® .Net Framework 3.5	Chart Control is used by the GUI. It can be downloaded from the following link: http://www.microsoft.com/en-us/download/details.aspx?id=14422 This library must be installed prior the using the GUI.

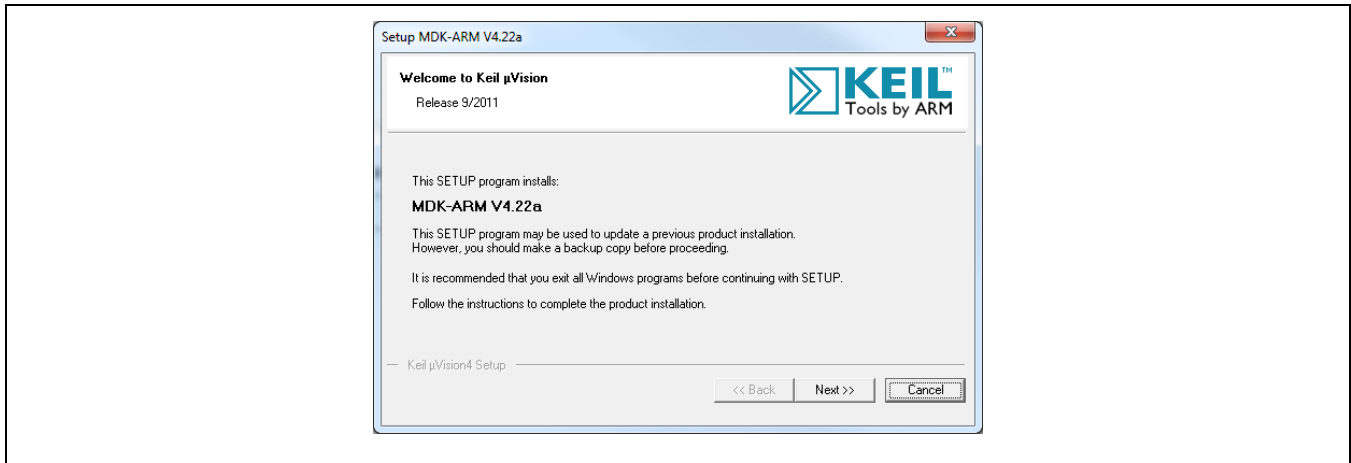
If Microsoft® .Net Framework 3.5 is not installed on the user's computer, it can be obtained from the Microsoft® website.

Note that if a newer version of Microsoft .Net Framework is installed, it cannot be assumed that version 3.5 is installed.

2.1.2. Installation of Keil™ μVision 4 IDE and Setup

Download and install the trial version of Keil™ μVision 4 IDE from <http://www.keil.com>. Start the setup program and follow the on-screen instructions.

Figure 2.1 Keil™ μ Vision4 IDE Installation Window

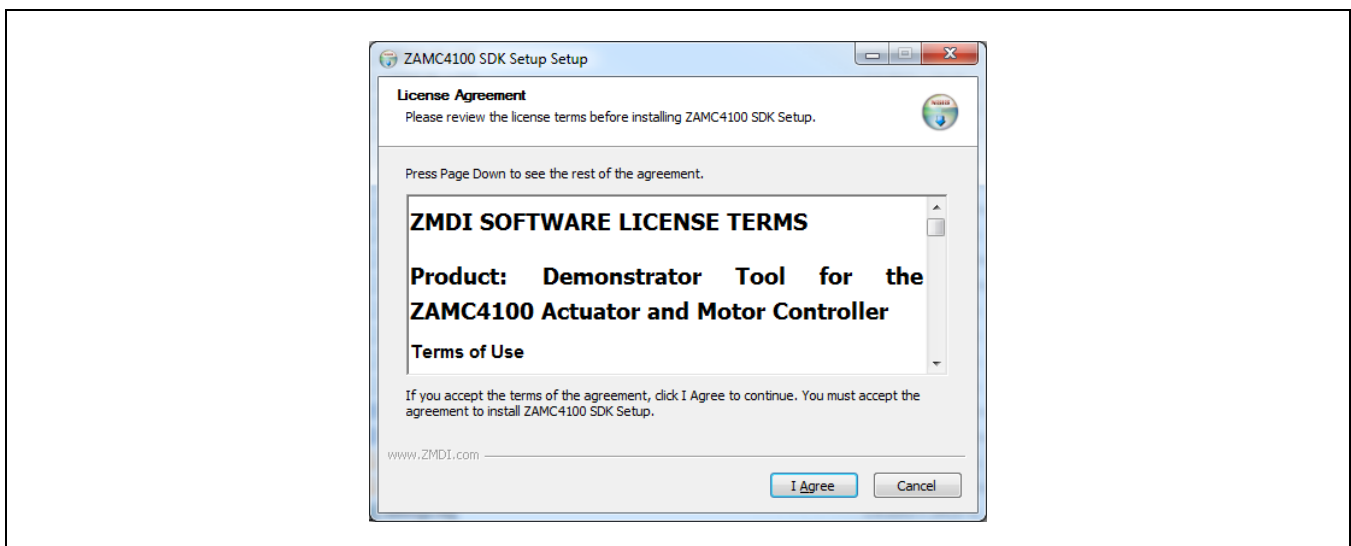


Click the “Next” button and follow the screen instructions.

2.1.2.1. Installation of ZAMC4100 SDK

Double-click *ZAMC4100_SDK-1.0-setup_M.exe* to begin the setup. Note: Because the setup installs device drivers, this step requires administrative privileges on the user’s PC. The first screen displays IDT’s license agreement as shown in Figure 2.2. It must be accepted by clicking the “I Agree” button in order setup to proceed.

Figure 2.2 ZAMC4100 SDK Installation Window



Important: This setup installs third party drivers with separate license agreements that must be accepted in order to have those drivers installed.

Next the ZAMC4100 SDK setup will ask which components are to be installed. The first two components are mandatory, and they must be always installed. The other components are Microsoft .Net 3.5 and the ZAMC4100 SDK. For a first time installation, it is highly recommended that all components are selected. Select the components to be installed and press “Next.”

The setup will start the installation of the selected components and drivers.

Note: During the installation, the setup program will ask for a Keil™ μ Vision destination folder. Ensure that the selected folder is correct.

Figure 2.3 ZAMC4100 SDK Component Selection

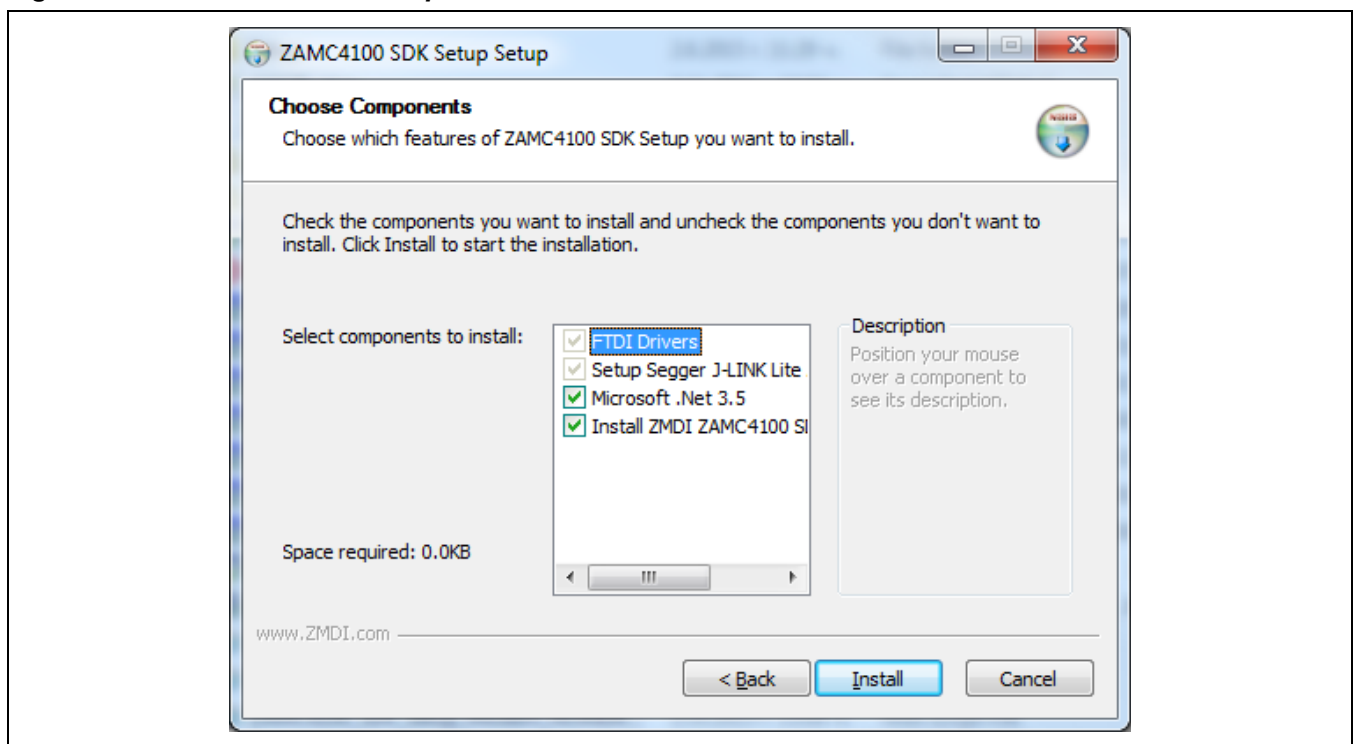
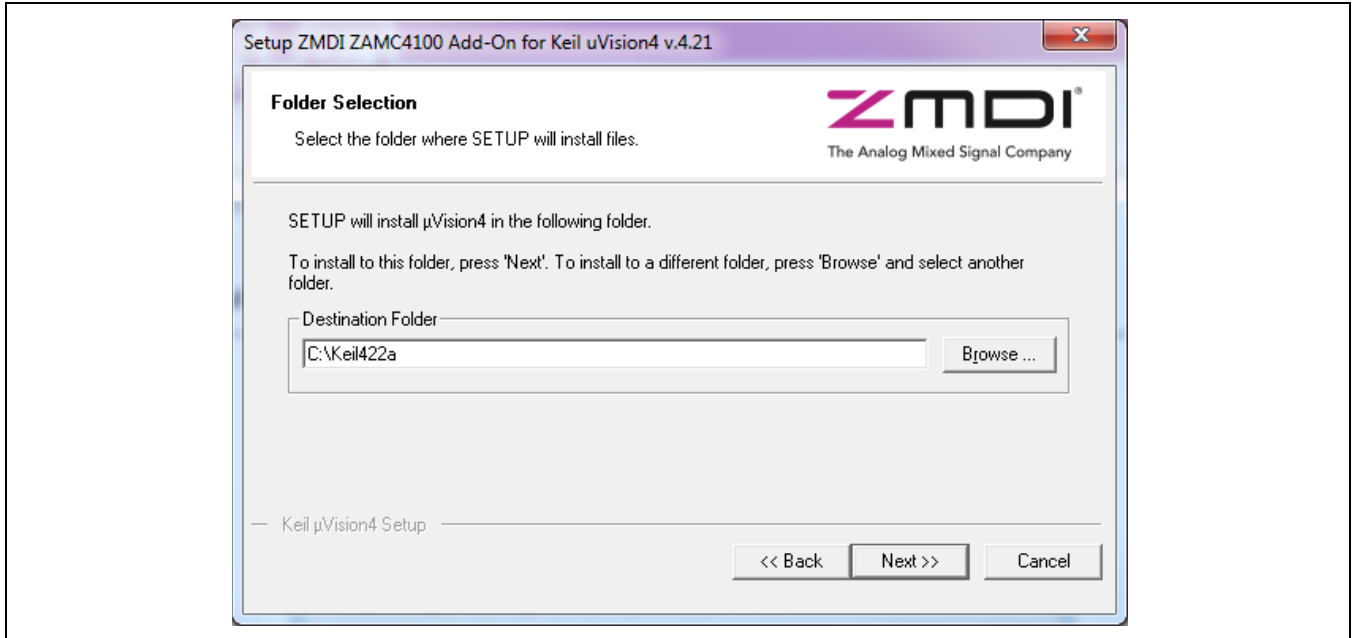


Figure 2.4 FTDI Driver Setup

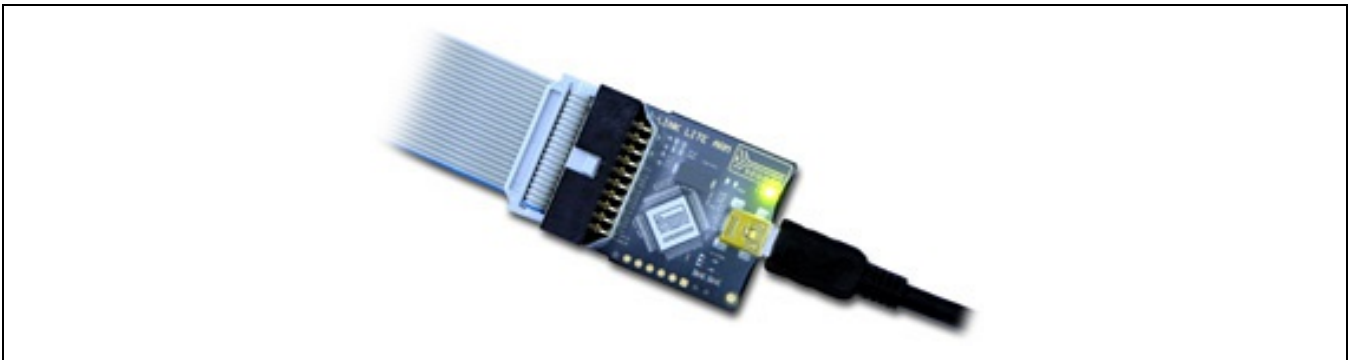


2.2. Hardware Setup

2.2.1. Segger J-LINK® Lite ARM® JTAG Debug Probe Setup

This section describes setting up the Segger® J-LINK Lite ARM® JTAG debugger/programmer to function with the ZAMC4100 Evaluation Board. The Segger J-LINK Lite ARM is an option for the ZAMC4100 Evaluation Kit, and it is shown on Figure 2.5.

Figure 2.5 Segger J-LINK® Lite ARM® JTAG Debug Probe



Connect the 20-pin ribbon cable on the Segger® J-LINK Lite ARM® JTAG Debug Probe to the JTAG connector (P2) shown in Figure 2.13. See section 1.3.8 for more information about P2.

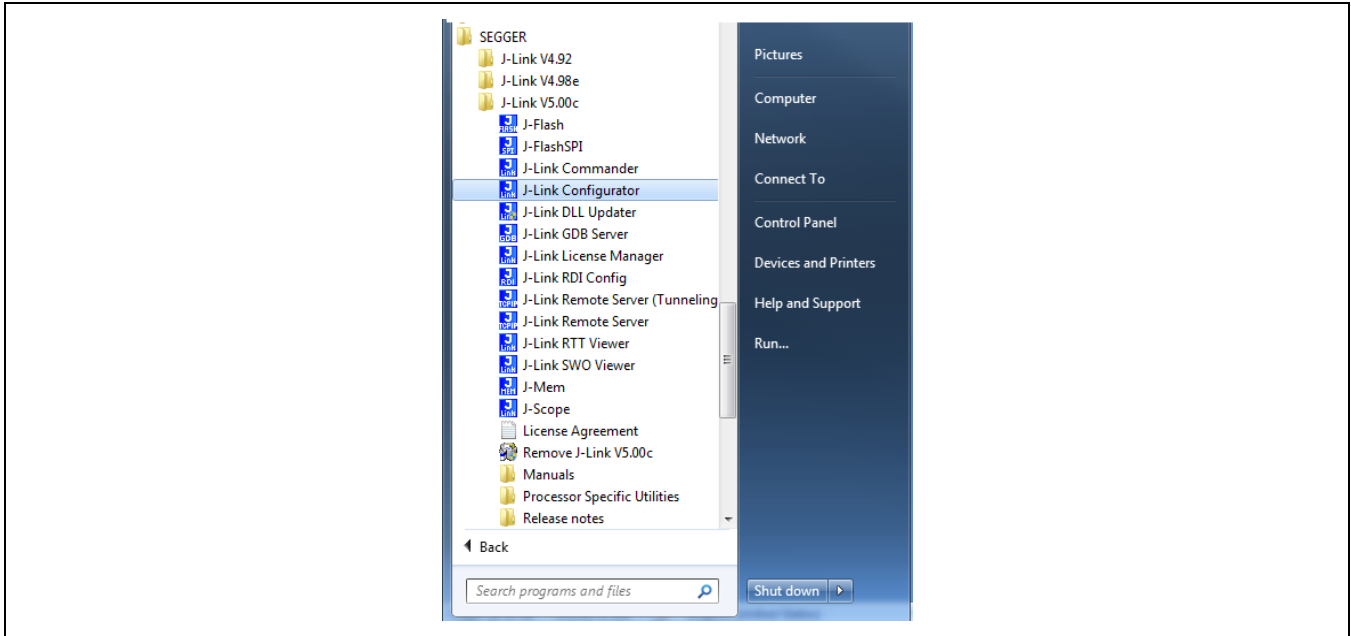
2.2.2. Preparing the Segger J-LINK® Lite ARM® JTAG Debug Probe for Initial Operation

This section describes the first startup of the Segger J-LINK® Lite ARM® JTAG Debug Probe. This step is needed in order to get the latest version of the J-LINK® Lite ARM® firmware that supports the ZAMC4100.

Connect the Debug Probe to a free USB port on the user's PC and wait while the drivers are automatically installed; then from the Windows® start menu, start the J-Link Configurator.

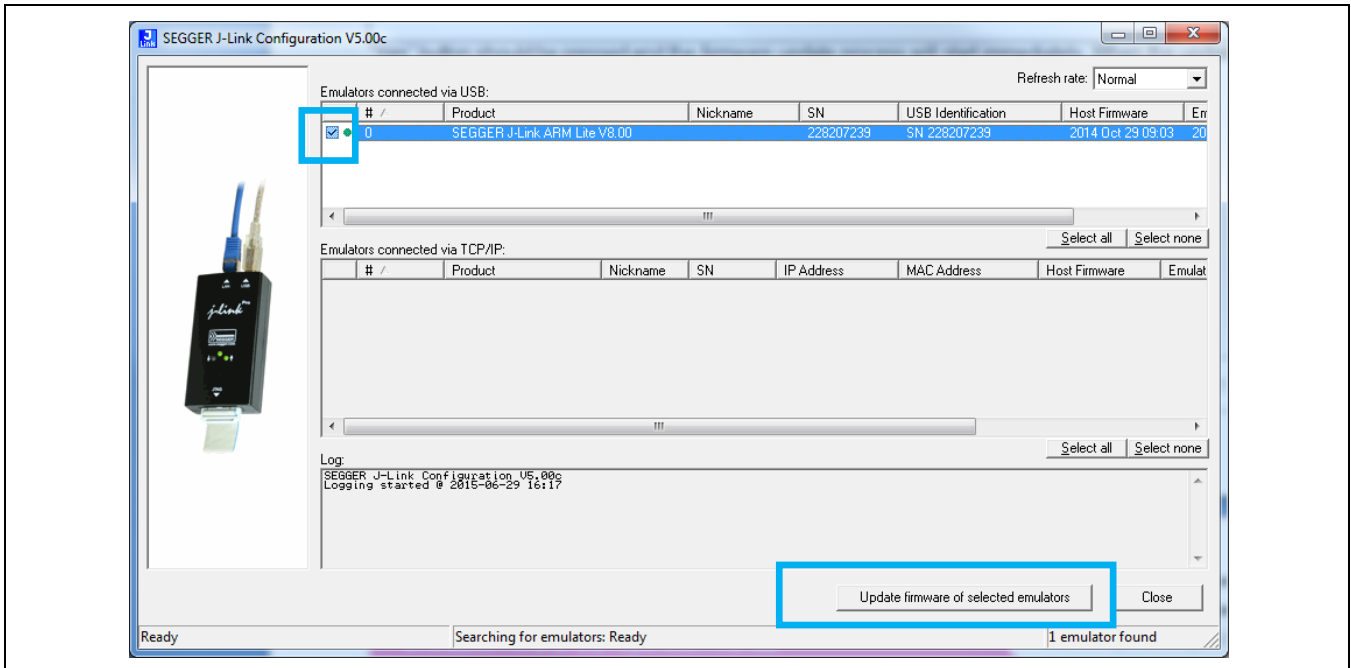
Important recommendation: Check www.segger.com for updated drivers.

Figure 2.6 Starting the J-Link Configurator



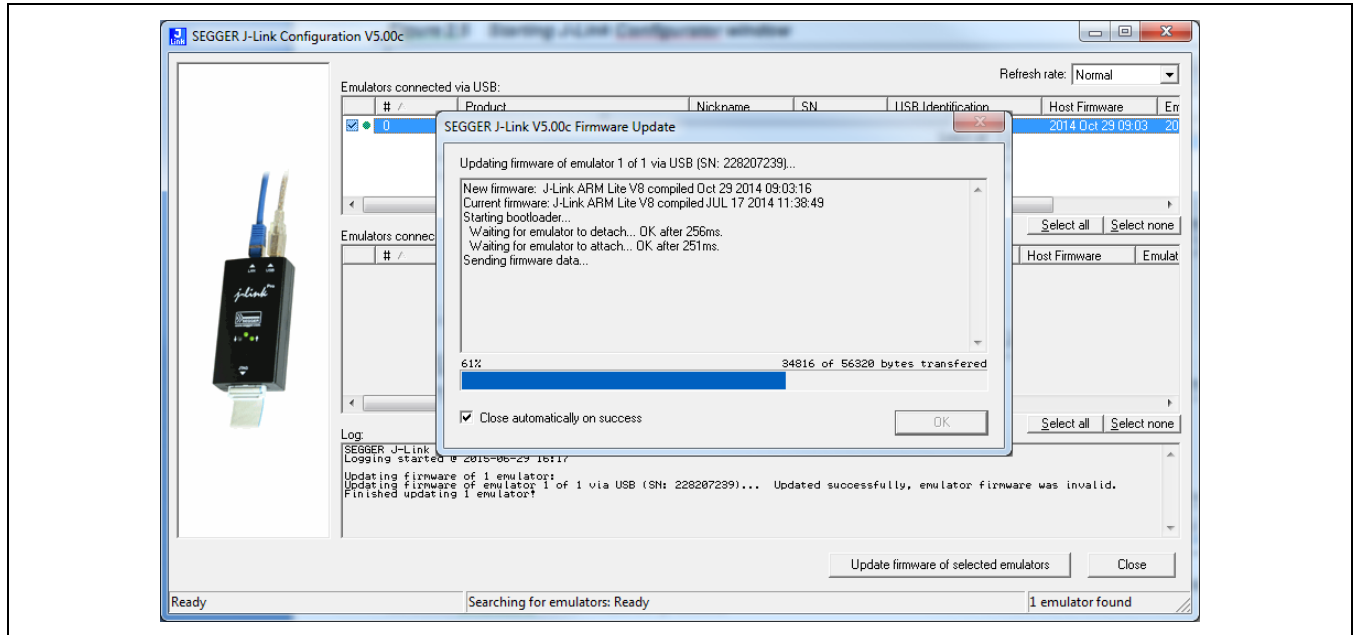
When the J-Link Configurator is started the following window will appear.

Figure 2.7 Starting J-Link Configurator Window



The J-LINK® Lite ARM® probe is listed in the window. Check the check box and then click the “Update firmware of the selected emulators” button. This will initiate the firmware update process.

Figure 2.8 J-Link Configurator Firmware Update in Progress Window



When the firmware update process is completed, the J-Link Configurator can be closed.

2.2.3. Keil™ ULINK2 Setup

This section describes setting up the Keil™ ULINK2 JTAG debugger/programmer to work with the ZAMC4100 Evaluation Board. The Keil™ ULINK2 (not included in the ZAMC4100 Evaluation Kit) is shown in Figure 2.9.

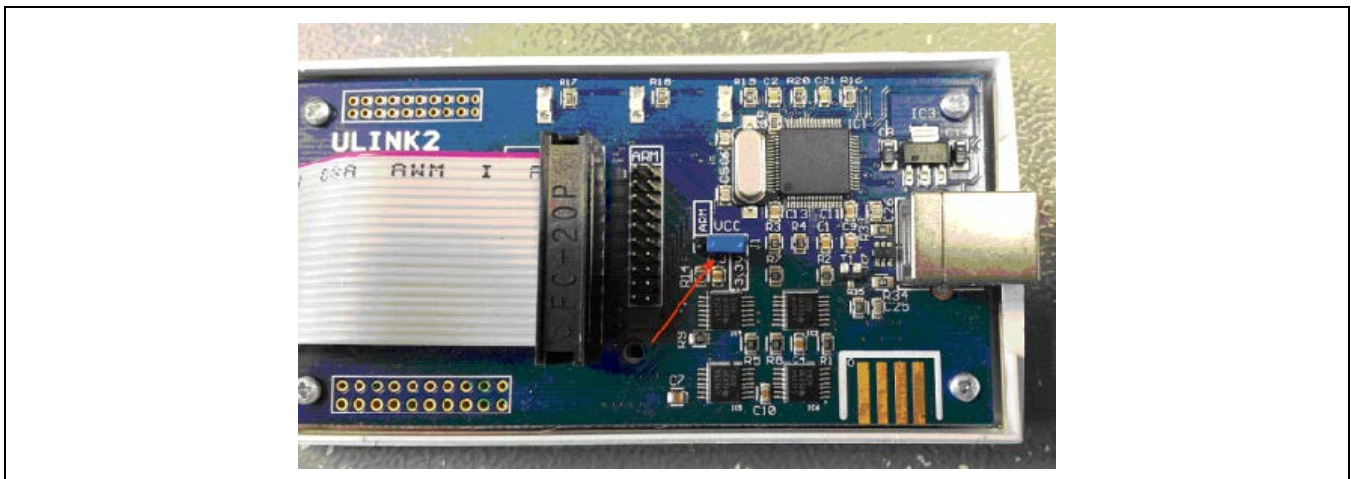
Figure 2.9 Keil™ ULINK2



Disassemble the Keil™ ULINK2 by unscrewing the bottom screw. There should be a jumper on the PCB. Ensure that the jumper is at the same position as shown in Figure 2.10.

Connect the 20-pin ribbon cable on the Keil™ ULINK2 to the JTAG connector (P2) on the ZAMC4100 Evaluation Board shown in Figure 2.13. See section 1.3.8 for more information about P2.

Figure 2.10 Keil ULINK2 Jumper Position



2.2.4. Keil™ μVision4 Project Debugger Selection

This section describes setting up the Keil™ μVision4 IDE to use either the Keil™ ULINK2 or the J-LINK® Lite ARM® JTAG debug probe. First, show the project options from the **Project/Options** menu from the Keil™ μVision IDE and select the appropriate debugger/programmer. Figure 2.11 shows the correct settings for the ULINK2, and Figure 2.12 shows the correct settings for the J-LINK® Lite ARM® JTAG debug probe.

Figure 2.11 Keil™ μVision4 IDE Debugger Setup for the Keil™ ULINK2

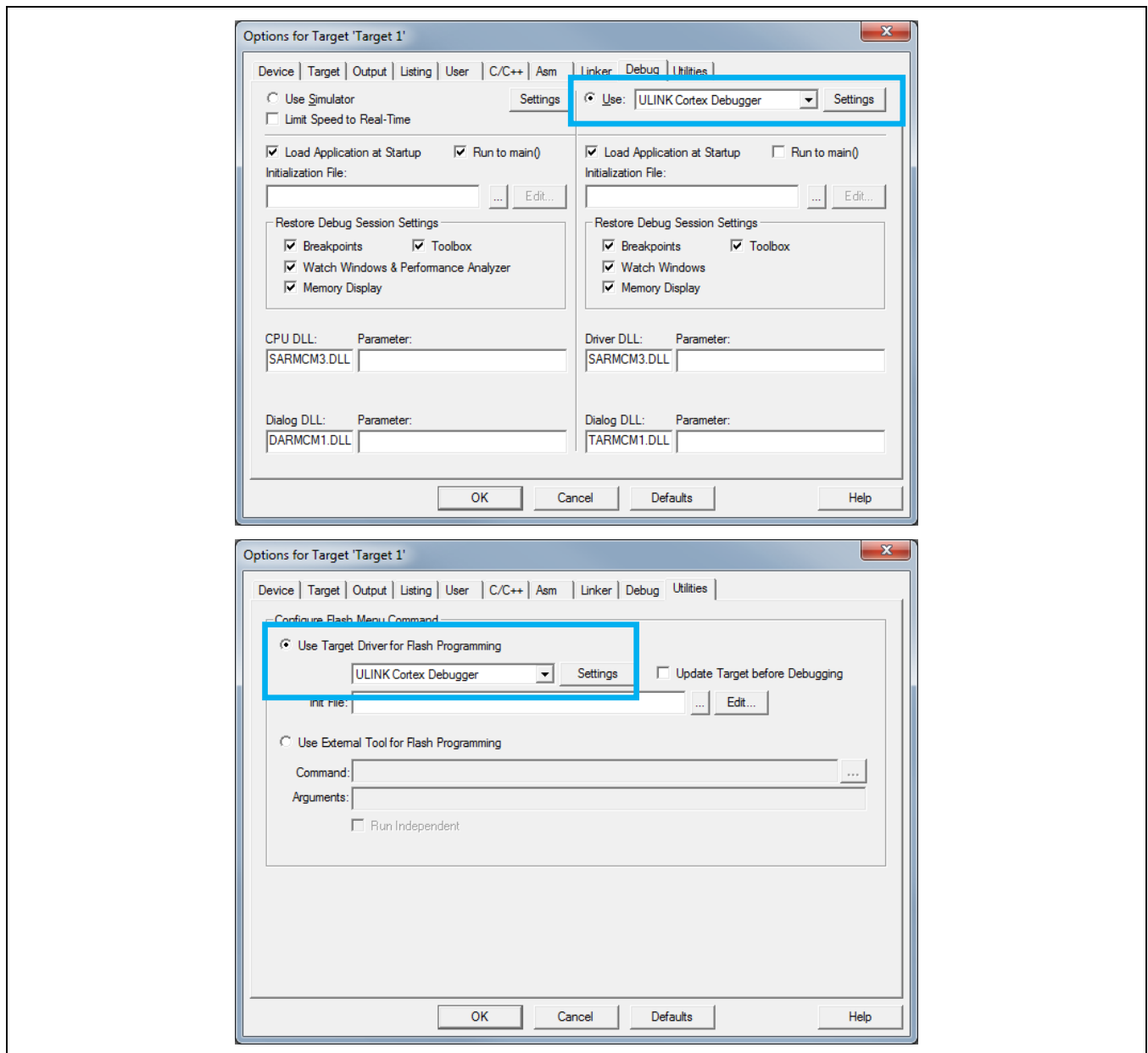
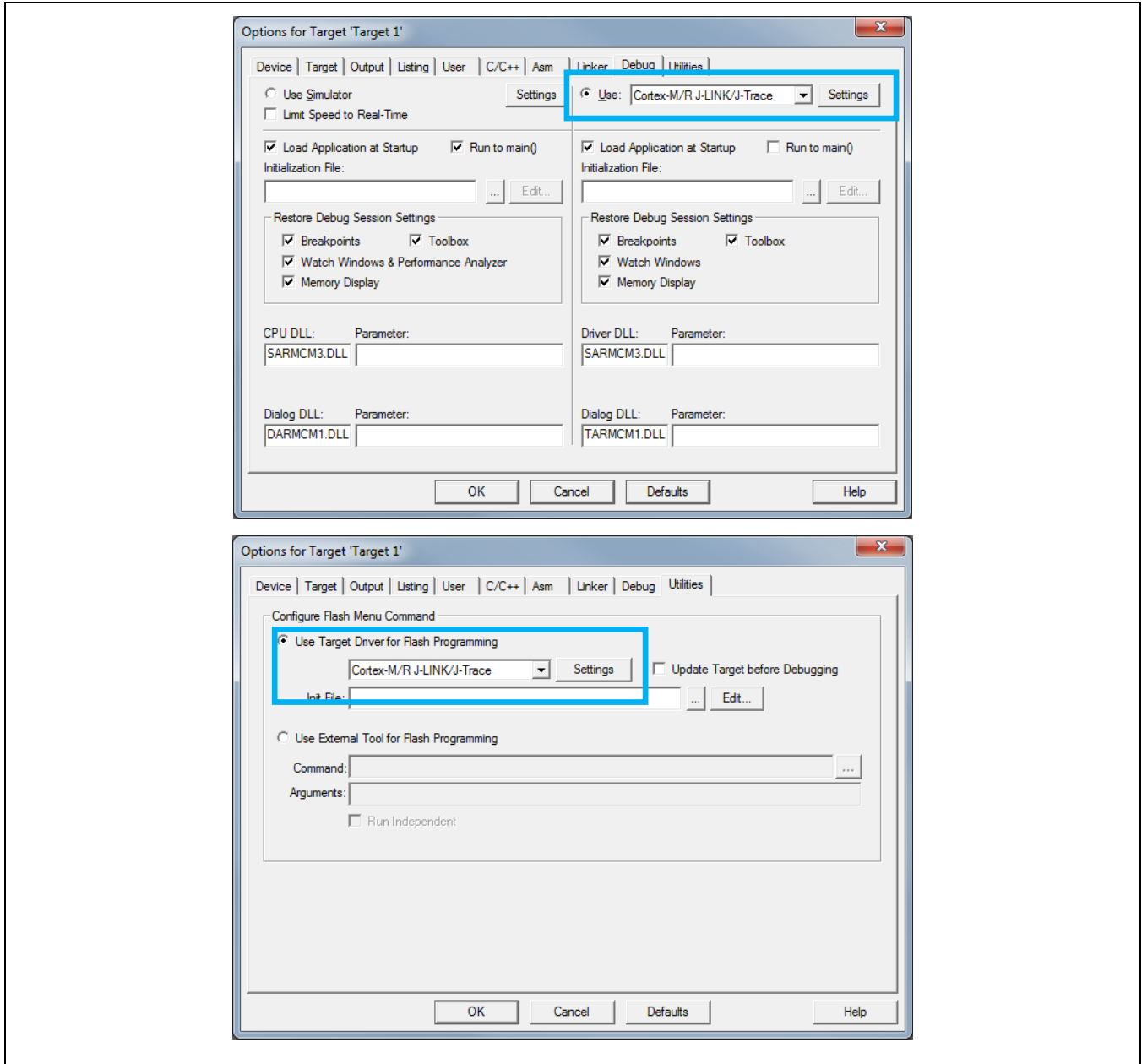


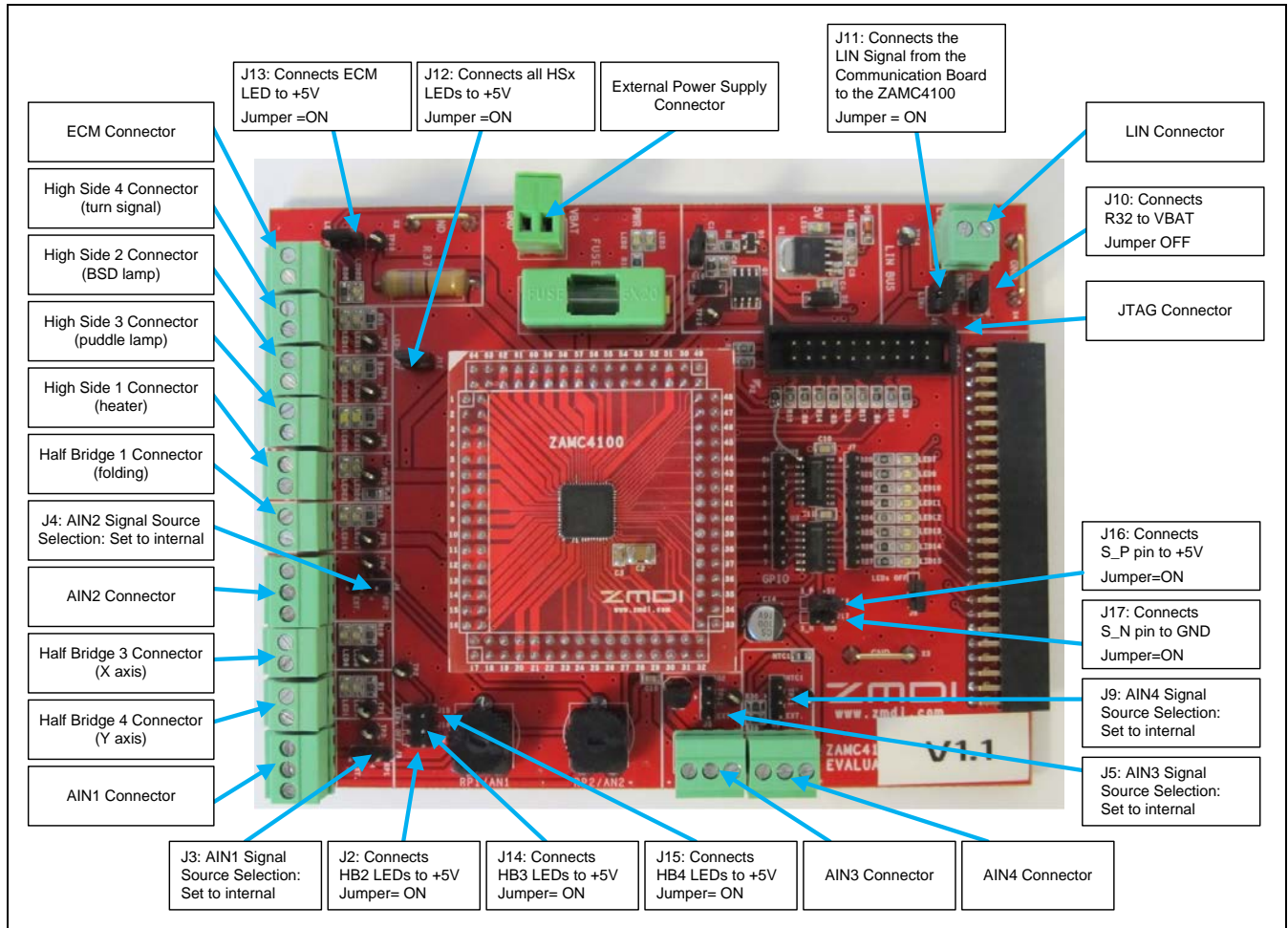
Figure 2.12 Keil™ μ Vision4 IDE Debugger Setup for the Segger J-LINK® Lite ARM® JTAG Probe



2.2.5. EVB Hardware Pre-check

Before connecting the ZAMC4100 Evaluation Board, verify the correct jumper settings on the Evaluation Board. The schematic of the Evaluation Board can be found in Appendix B of this document.

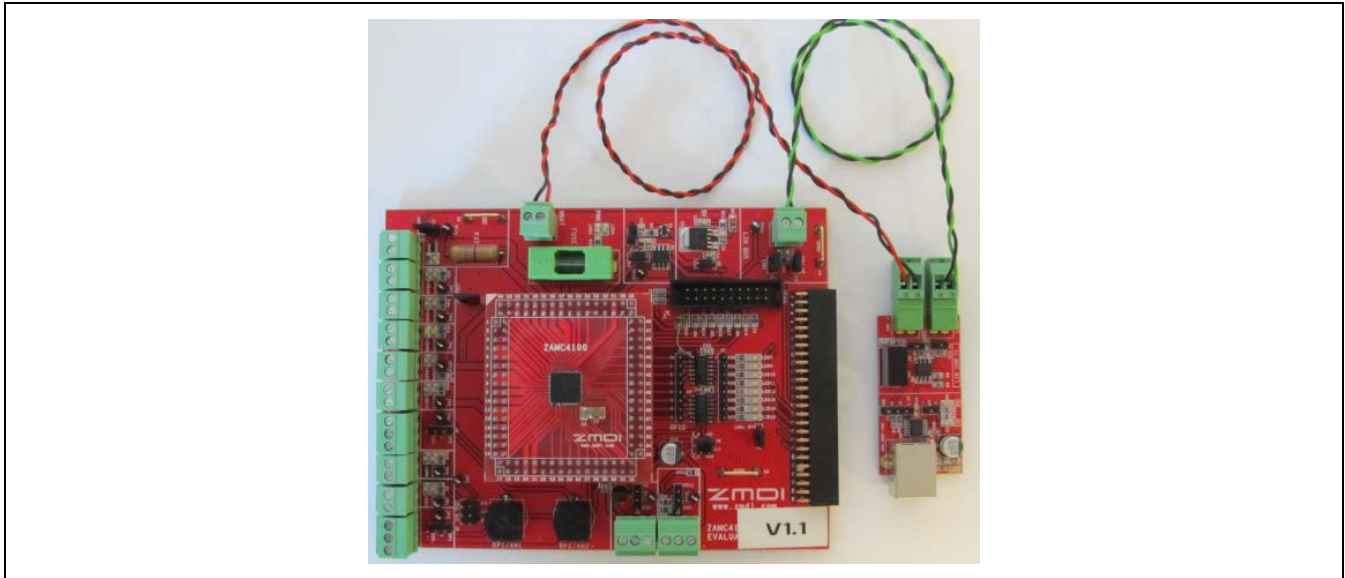
Figure 2.13 ZAMC4100 Evaluation Board – Connector and Jumper Description



2.2.6. Connecting the Hardware

This section describes how the boards should be connected in order to work with the demonstration GUI. Ensure that power and the LIN communication lines between the EVB and LIN Communication Board are properly connected. Polarity of the power supply and LIN ground connection should be checked as well.

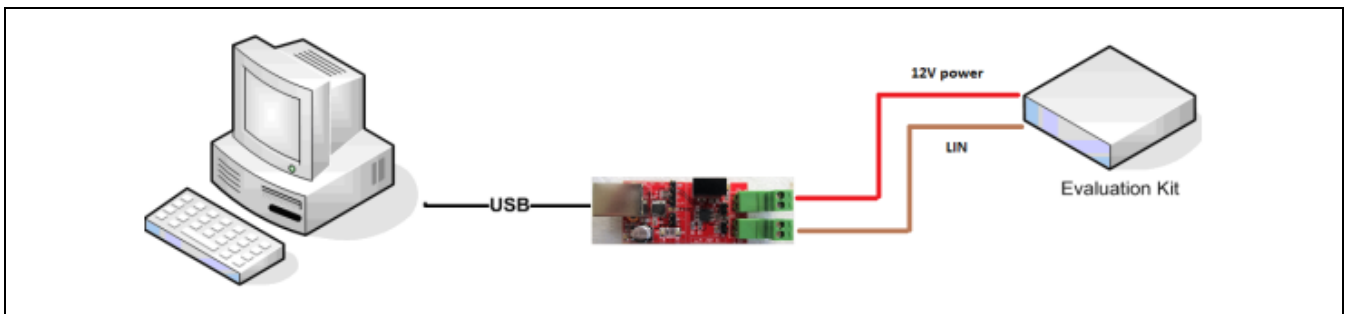
Figure 2.14 Step 1: Hardware Setup ZAMC4100 Evaluation Board with LIN Communication Board



2.2.7. Step 2: Connect the LIN Communication Board to the PC via the USB Cable Type B

Figure 2.15 shows the full hardware connection diagram. The computer must be Windows® based with Microsoft®.Net Framework 3.5 installed.

Figure 2.15 Step 2: Full Hardware Connection Diagram



Important Equipment Warning: This diagram is valid ONLY if no loads are used. If loads are used, then an external power supply must be used instead of the 12V supplied from the LIN Communication Board.

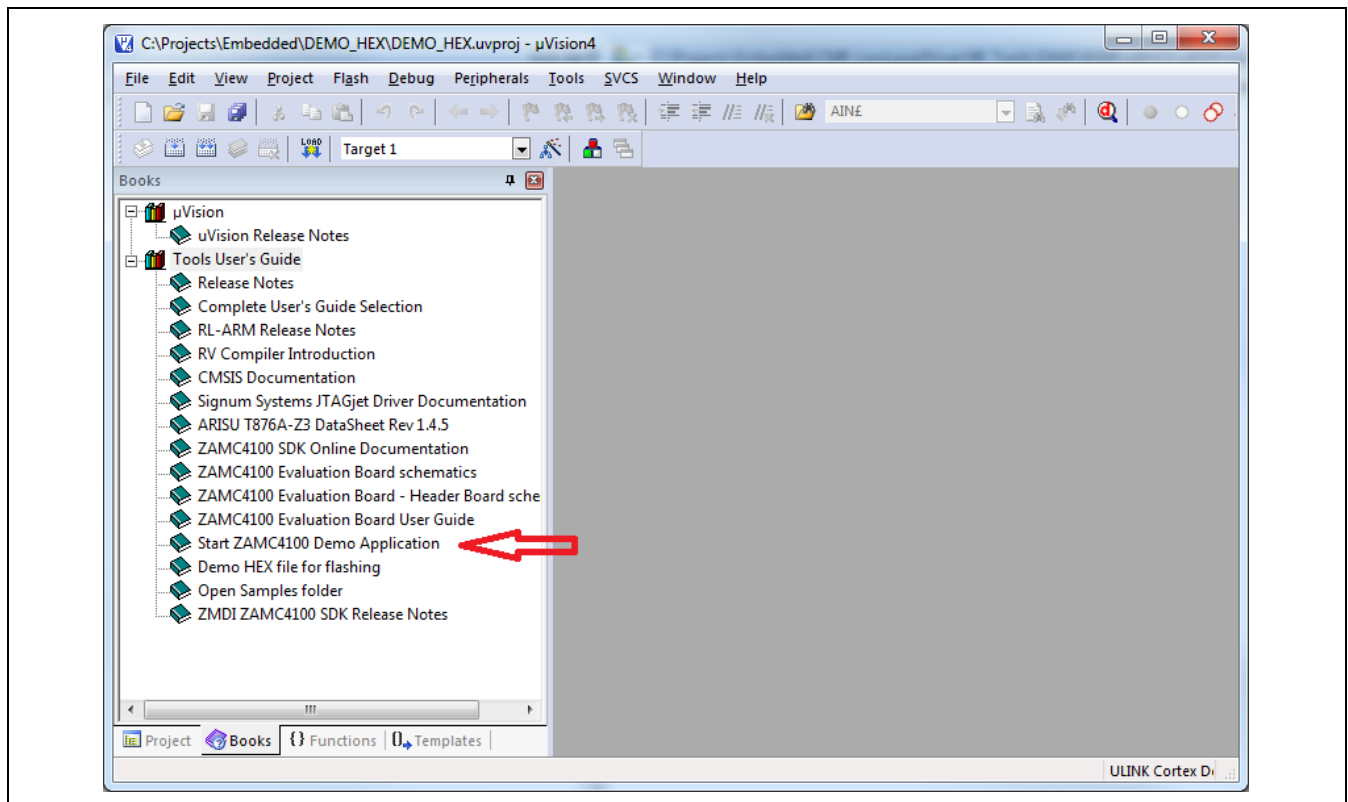
2.3. Using the Graphical User Interface (GUI)

This section describes how to use the demonstration GUI. The GUI is designed to be easy to use and to demonstrate basic features of the ZAMC4100.

2.3.1. Starting the GUI

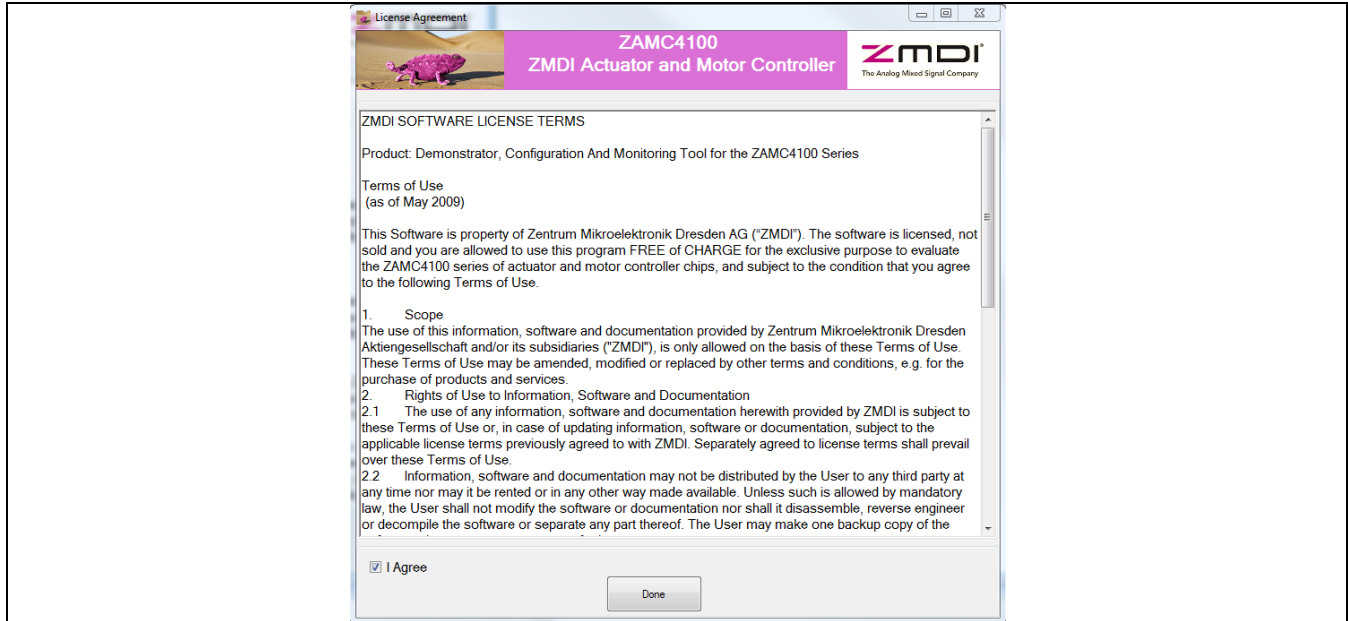
After the Keil™ μ Vision IDE and ZAMC4100 software package are installed, start the Keil™ μ Vision4 IDE by clicking its icon and then select “Books” as shown in Figure 2.16.

Figure 2.16 Keil™ μ Vision4 IDE with ZAMC4100 Package Installed

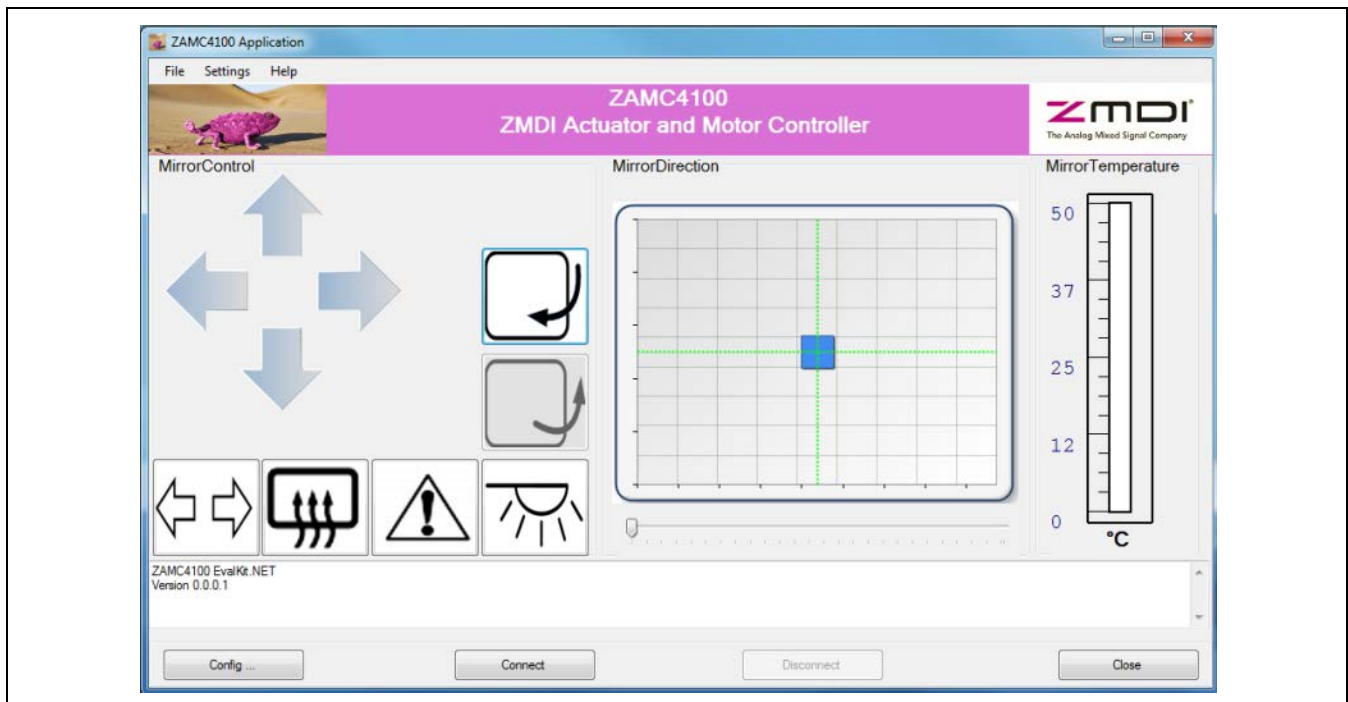


Then double-click on “Start ZAMC4100 Demo Application.” If all prerequisites are set up, the demonstration GUI will appear.

When the GUI is started for the first time, the license agreement dialog will be displayed. Click the “I agree” checkbox and then the “Done” button. The license agreement can be viewed at any time by selecting *Show License* from the *Help* menu.

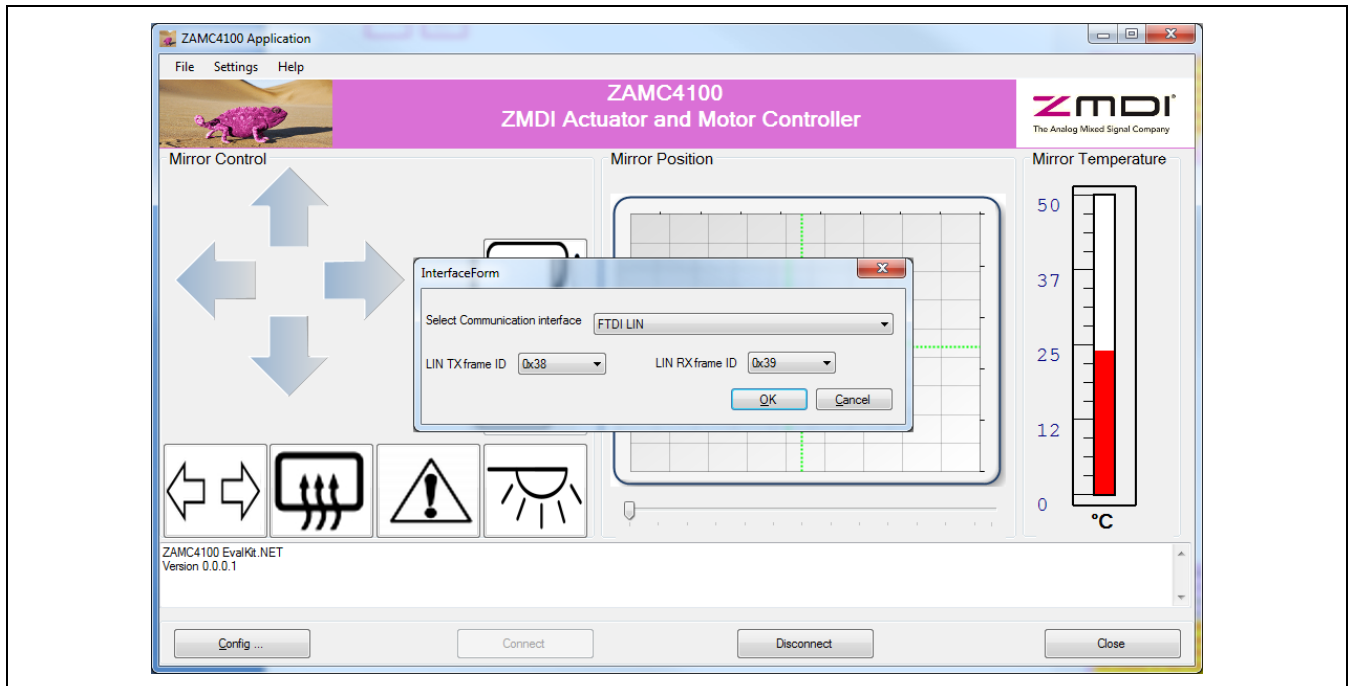
Figure 2.17 License Agreement


After the license has been accepted, the main window appears.

Figure 2.18 ZAMC4100 GUI Main Window


When the GUI is started for the first time or if the configuration has been changed, the GUI will be in offline mode; i.e., no communication with the Evaluation Kit has been established. The communication interface must be setup up first. This is done by clicking the “Config...” button.

Figure 2.19 ZAMC4100 GUI Communication Setup



Select the following settings and then click “OK”:

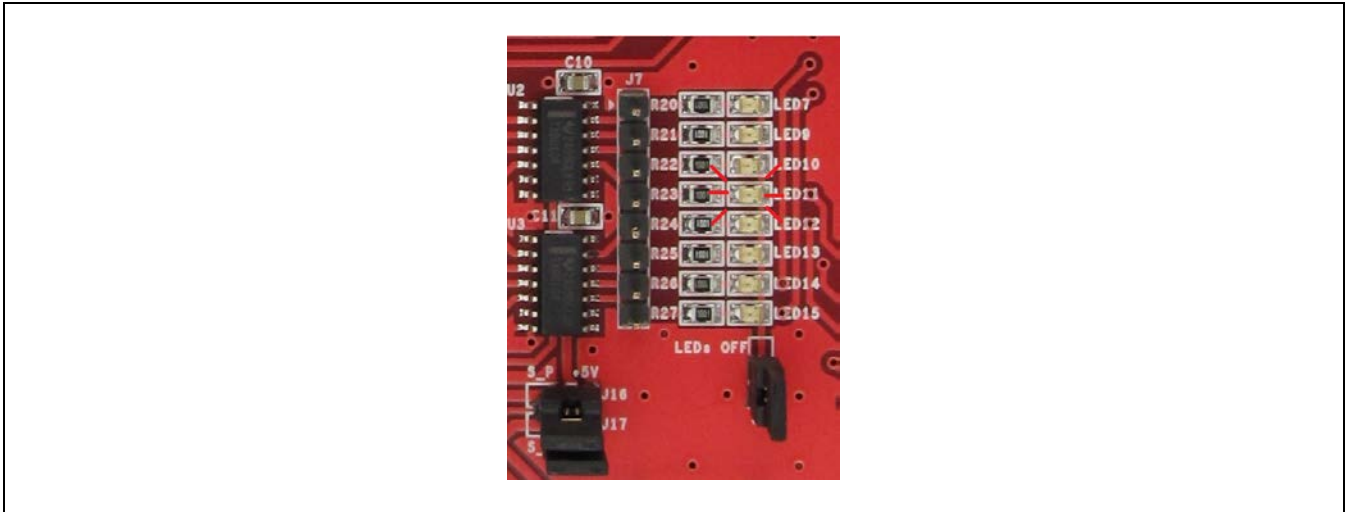
- The communication interface should be “FTDI LIN.”
- The LIN TX Frame ID should be 0x38.
- The LIN RX Frame ID should be 0x39.

When the “OK” button is clicked, the message "New interface selected!" will be displayed in the log area at the bottom of the screen. If instead the “Cancel” button is clicked, the message “Interface selection is cancelled” will be displayed in the log area.

2.3.2. Connect to EVB

Connection to the EVB is established when the “Connect” button is clicked. When the connection is established, the “Connect” button becomes disabled and the “Disconnect” button will be enabled. LED11 will flash as long as the EVB is powered. This LED indicates that the demonstration firmware is running.

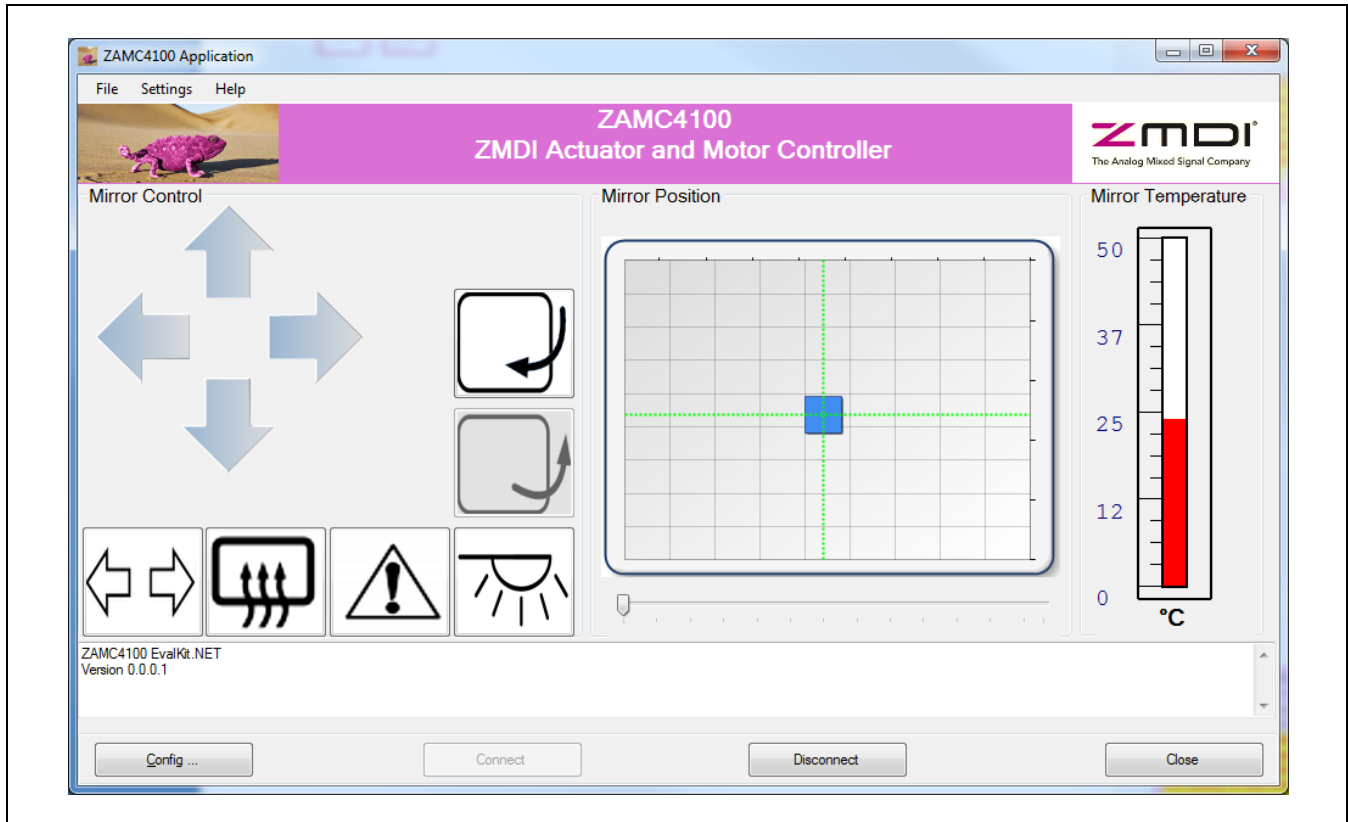
Figure 2.20 LED Indication



Note that in for order LED11 to flash, J8 must be shunted.

When the GUI is in operating mode, it communicates periodically with the EVB. This is indicated by the two flashing LEDs on the LIN Communication Board. When the GUI is disconnected, the LEDs are off.

Figure 2.21 shows a typical screen when the GUI is connected to the EVB.

Figure 2.21 GUI Connected

2.3.3. Mirror Control and Visualization

The main window of the GUI is divided into three parts:

- Mirror Control
- Mirror Position
- Mirror Temperature

The next sections give more detailed information about the purpose of each section of the screen.

2.3.3.1. Mirror Control

This section is located on the left of the main window. It can be used to turn on/off all half bridges (HB1 to HB4) and high side drivers (HS1 to HS4). Figure 2.22 and Table 2.2 provide detailed information about the functions of the buttons.

Figure 2.22 Description of Mirror Control Buttons

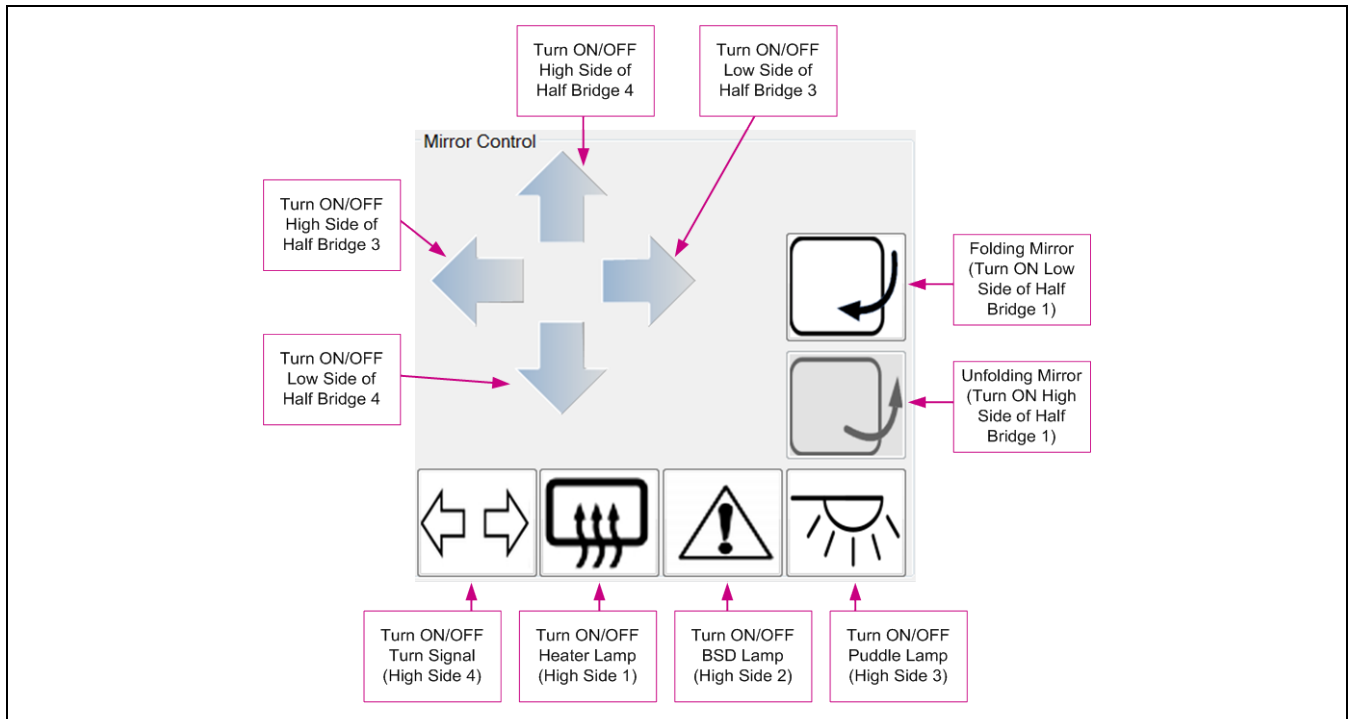



Table 2.2 Mirror Control Buttons

Note: the LEDs referred to in the table are located on the left side of the Evaluation Board adjacent to the edge connectors and can be identified by the silkscreen labels on the board.

Action	Reaction
Click/Hold on the UP arrow	The high side of half bridge 4 and LED4 will be turned ON. When the button is released, they will be turned OFF.
Click/Hold on the DOWN arrow	The low side of half bridge 4 and LED1 will be turned ON. When the button is released, they will be turned OFF.
Click/Hold on the LEFT arrow	The high side of half bridge 3 and LED8 will be turned ON. When the button is released, they will be turned OFF.
Click/Hold on the RIGHT arrow	The low side of half bridge 3 and LED6 will be turned ON. When the button is released, they will be turned OFF.
Click on the TURN SIGNAL  button	If the TURN SIGNAL is ON, then the button will be colored green and LED18 and LED19 will be turned ON. Otherwise, the button will stay as its original color and the LEDs will be turned OFF.






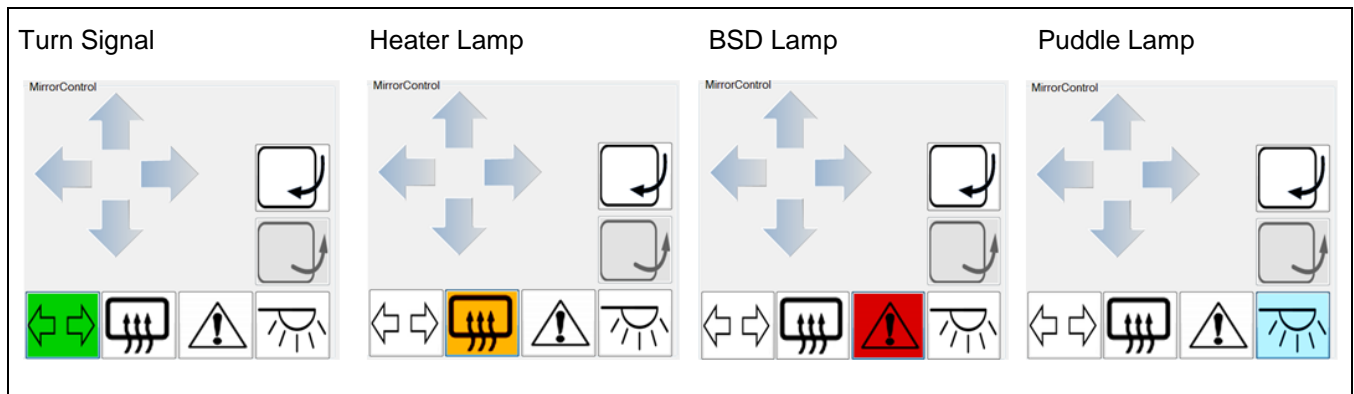
Action	Reaction
Click on the HEATER LAMP  button	If the HEATER LAMP is ON, then the button will be colored orange and LED22 and LED26 will be turned ON. Otherwise, the button will stay as its original color and the LEDs will be turned OFF.
Click on the BSD LAMP  button	If the BSD LAMP is ON, then the button will be colored red and LED23 and LED24 will be turned ON. Otherwise, the button will stay as its original color and the LEDs will be turned OFF.
Click on the PUDDLE LAMP  button	If the PUDDLE LAMP is ON, then the button will be colored light blue and LED20 and LED21 will be turned ON. Otherwise, the button will stay as its original color and the LEDs will be turned OFF.
Click the FOLDING MIRROR  button	The high side of half bridge 1 and LED16 will be turned ON. When the mirror is fully folded, they will be turned OFF. Note: When the button is pushed, all other buttons are disabled except the UNFOLD button, while the mirror is folded. The UNFOLD button can be pushed when the mirror is fully folded.
Click the UNFOLDING MIRROR  button	The low side of half bridge 1 and LED17 will be turned ON. When the mirror is fully unfolded, they will be turned OFF. Note: When the button is pushed, all other buttons are disabled while the mirror is not fully unfolded.

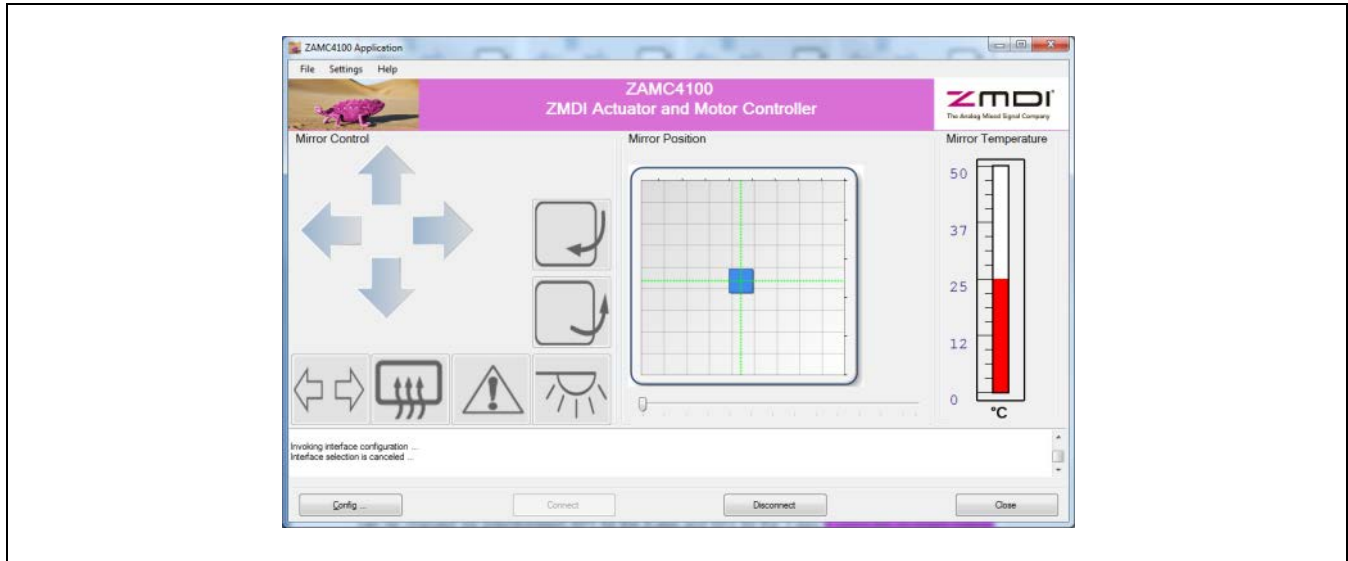
Figure 2.23 illustrates the effects of clicking the buttons.

Figure 2.23 Effects of Clicking Buttons



While the mirror is folding/unfolding, all other buttons are disabled as shown in Figure 2.24.

Figure 2.24 Mirror Folding/Unfolding



2.3.3.2. Mirror Position

The current position of the mirror is shown on the graph illustrated in Figure 2.24 and Figure 2.25. The position can be changed via potentiometers RP1 for the X-axis and RP2 for the Y-axis if using the on-board potentiometers to simulate mirror signals (J3 and J4 should be in the RP1 and RP2 position as illustrated in Figure 2.26). See “X/Y Mirror Adjustment” in Figure 1.5 for the location of RP1 and RP2.

Note that if an actual mirror with potentiometers is connected then J3 and J4 should be in the EXT position.

Figure 2.25 Mirror Position

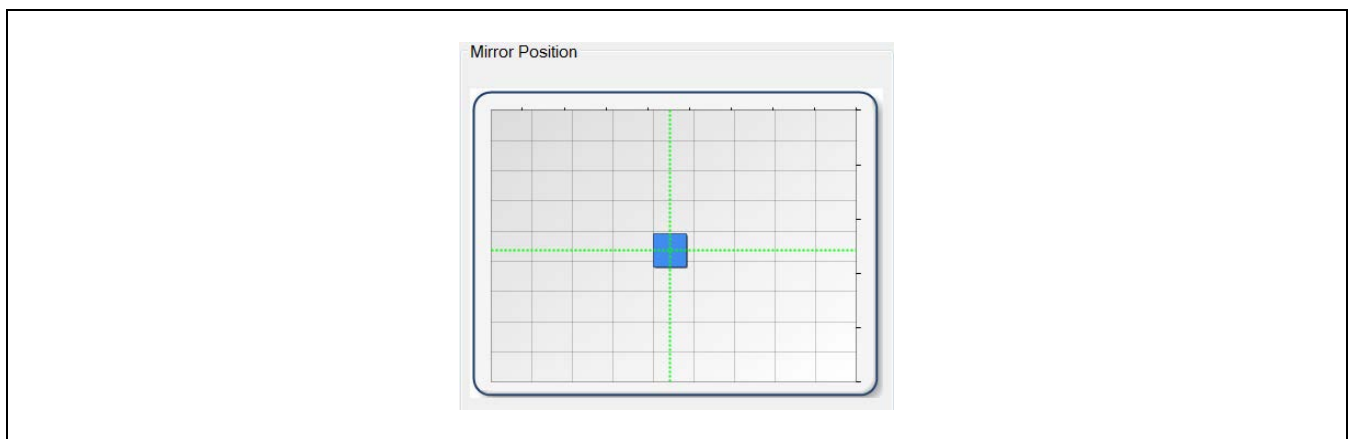
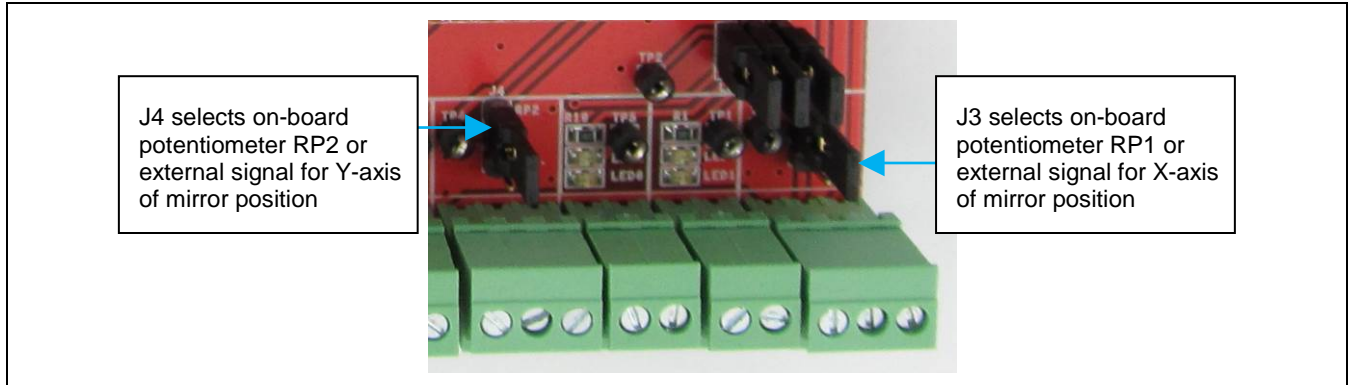


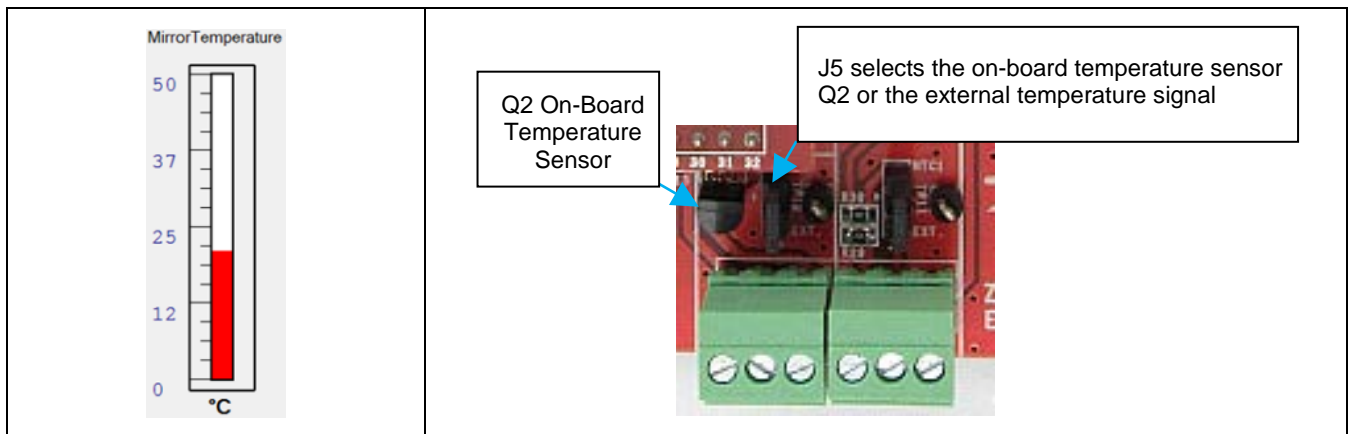
Figure 2.26 Location of J3 and J4



2.3.3.3. Mirror Temperature

The "Mirror Temperature" section of the GUI shows the external temperature of the mirror in degrees Celsius. This temperature can be measured by temperature sensor Q2 mounted on the Evaluation Board. To measure and display the temperature via Q2, set J5 to the INT position.

Figure 2.27 "Mirror Temperature" Display and J5 for External Temperature Selection

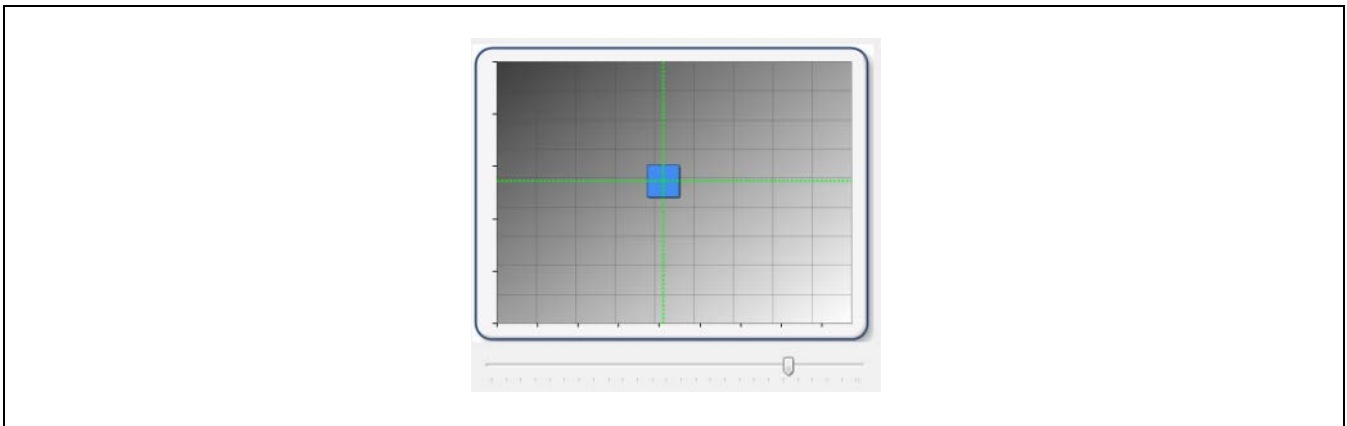


2.3.3.4. Electrochromatic Mirror

It is possible to test the ECM feature via the slider under the mirror graphic. Depending on the position of the slider, the background color of the graphic will be different with a corresponding voltage difference on the ECM output (see Figure 2.28).

Note: When the GUI is started, LED25 is on but it is dim. When the slider is moved, the ECM driver starts and the LED adjacent to the ECM output should glow brightly. If the slider is moved so that the display becomes darker, the LED becomes dimmer.

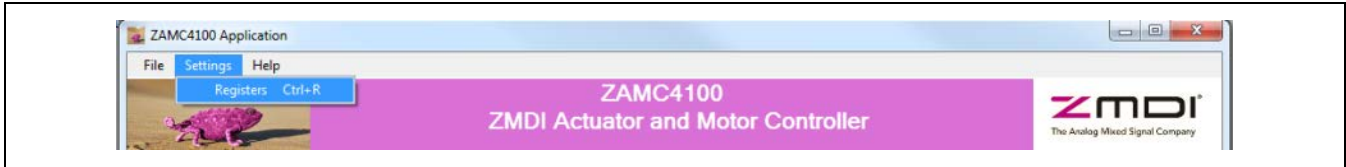
Figure 2.28 Simulation of the ECM Function



2.3.3.5. Registers Window

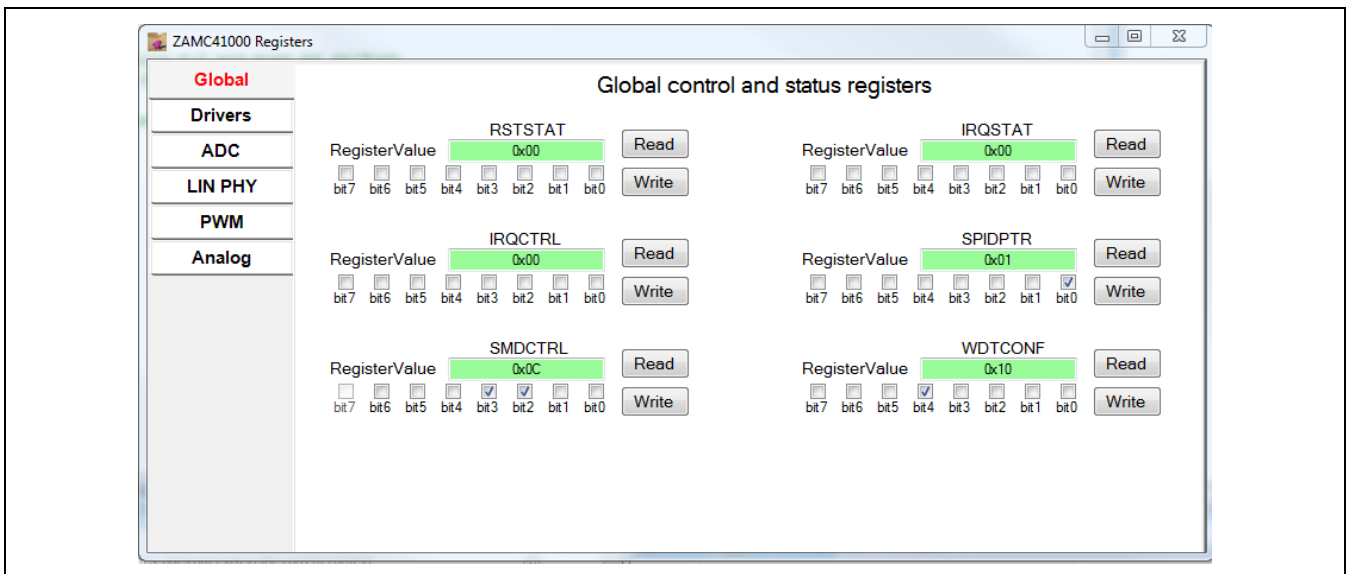
The registers display feature is primarily intended for engineering purposes. It allows the user to view all the SBC registers of the ZAMC4100, which are divided into several groups. To access this feature, click on *Settings > Registers* on the top menu or press Ctrl+R.

Figure 2.29 Displaying the Registers Window



When this command is selected, all SBC registers are read, which takes a few seconds. Then a window similar to Figure 2.30 is displayed. Refer to the *ZAMC4100 Data Sheet* for further details about the registers.

Figure 2.30 Registers Window



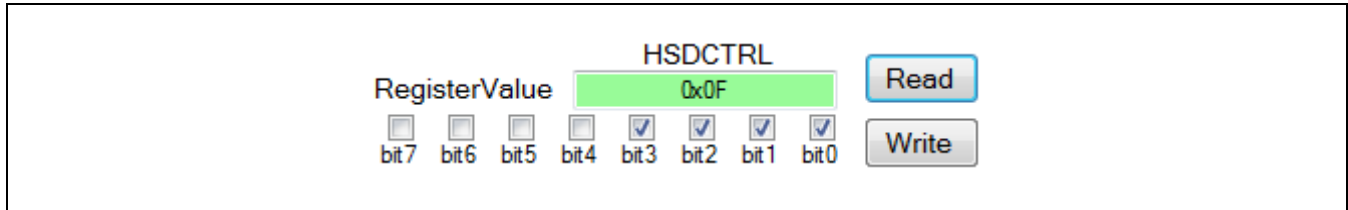
The ZAMC4100 registers available for display are divided into the following six groups. Click the group name to display its registers. Figure 2.30 illustrates the display of registers in the “Global” group.

- Global
- Drivers
- ADC
- LIN PHY
- PWM
- Analog

The registers window allows SBC registers to be read and/or written.

For only reading a register, click the “Read” button next to the register. If the operation is successful, then the background of the register value will change to a green color as shown in Figure 2.31.

Figure 2.31 Reading a Register



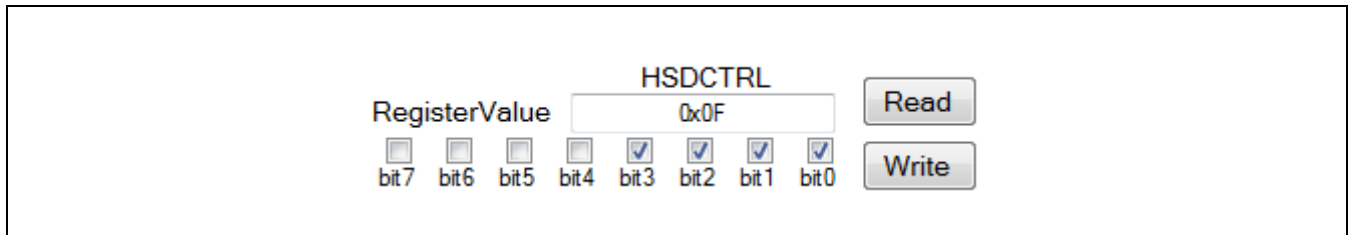
There are two ways modify a value:

- Type the hexadecimal or decimal value in the “Register Value” field, and then press the Enter key.
- Check/uncheck the bits. A check represents a logical 1.

Modifying a value does not initiate a WRITE operation. The “Write” button must be clicked for the value to be written into the corresponding register.

For example, if the value 0x0F is written into the HSDCTRL register then the LEDs for all high sides (LED18, LED19, LED23, LED24, LED20, LED21, LED22, and LED26) should be turned ON.

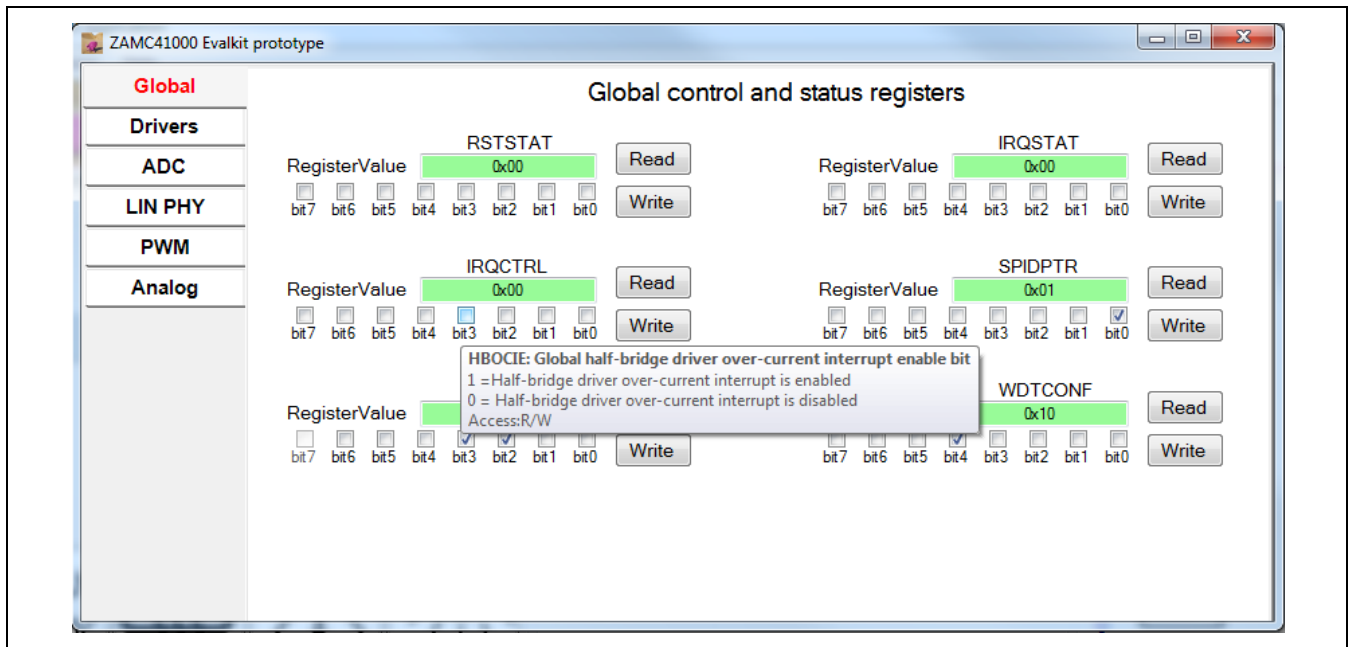
Figure 2.32 Writing to a Register



Furthermore the register display window offers a detailed description about the function of each bit in the register. To access this information for a bit, hold the mouse pointer over the bit. The following information is provided in a tool-tip:

- Short and full name of the bit
- The definitions of each of its two possible states
- Type of access permitted for the bit

Figure 2.33 Accessing Bit Descriptions



3 Related Documents

Document
ZAMC4100 Datasheet
ZAMC4100 Application Kit Description

Visit the ZAMC4100 product page www.IDT.com/ZAMC4100 or contact your nearest sales office for the latest version of these documents.

4 Glossary

Term	Description
AMC	Actuator and Motor Controller
BSD Lamp	Blind Spot Detection (The BSD lamp is lit when there is an object (e.g., another vehicle) in the driver's blind spot.)
ECM	Electrochromatic Mirror
EVB	Evaluation Board
GPIO	General-Purpose Input/Output
GUI	Graphical User Interface
HB	Half Bridge
HS	High Side
JTAG	Based on <i>IEEE 1149.1 Standard Test Access Port and Boundary-Scan Architecture</i>
LS	Low Side
PSU	Power Supply Unit
SBC	System Basis Chip

5 Document Revision History

Revision	Date	Description
1.00	June 4, 2015	First release.
1.10	August 4, 2015	Update for new contents for GUI zip and GUI setup. Addition of J-LINK® Lite® ARM description. Updates for new revision 1.1 of the ZAMC4100 Evaluation Board, including figures, schematics, and BOM.
	April 15, 2016	Changed to IDT branding.



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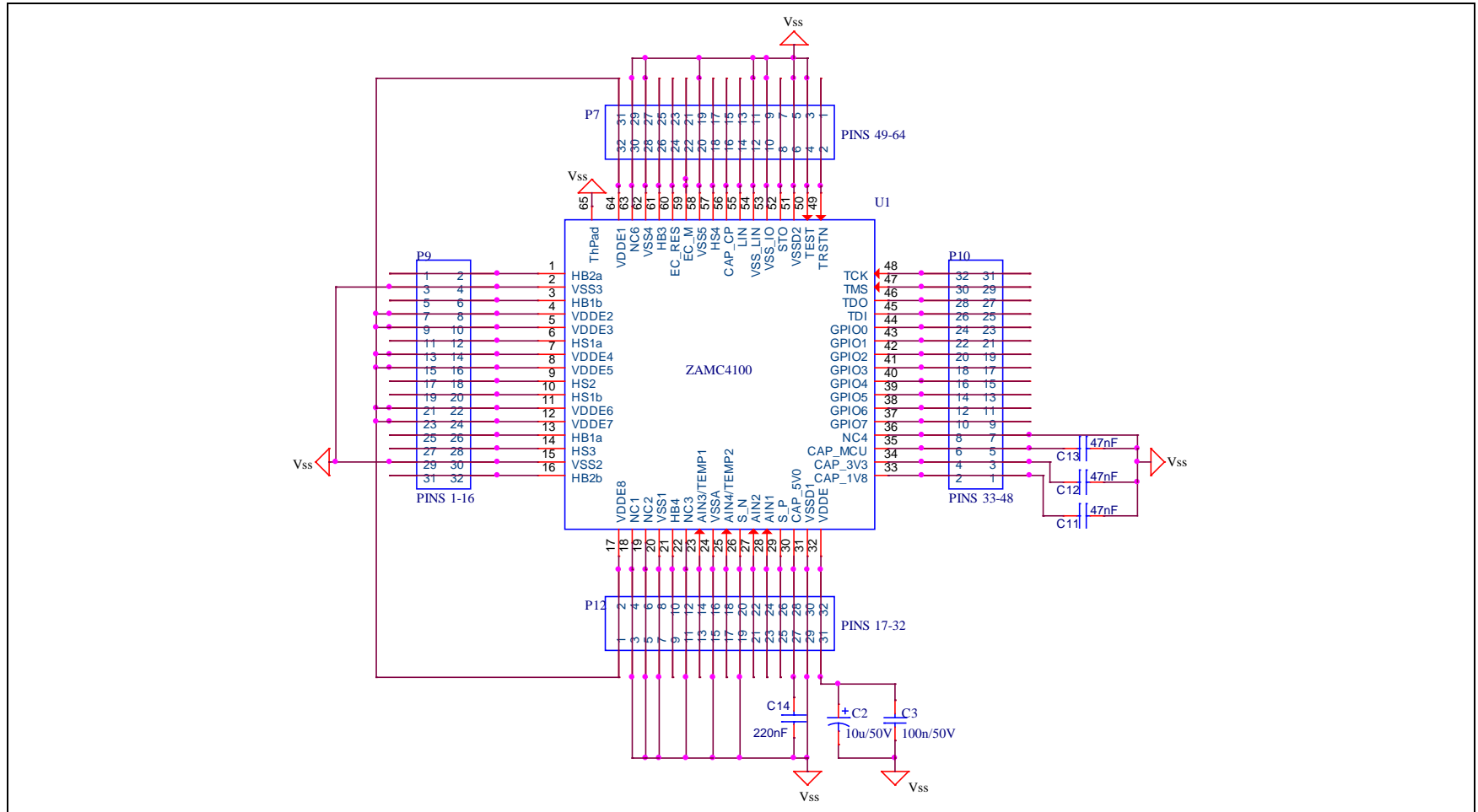
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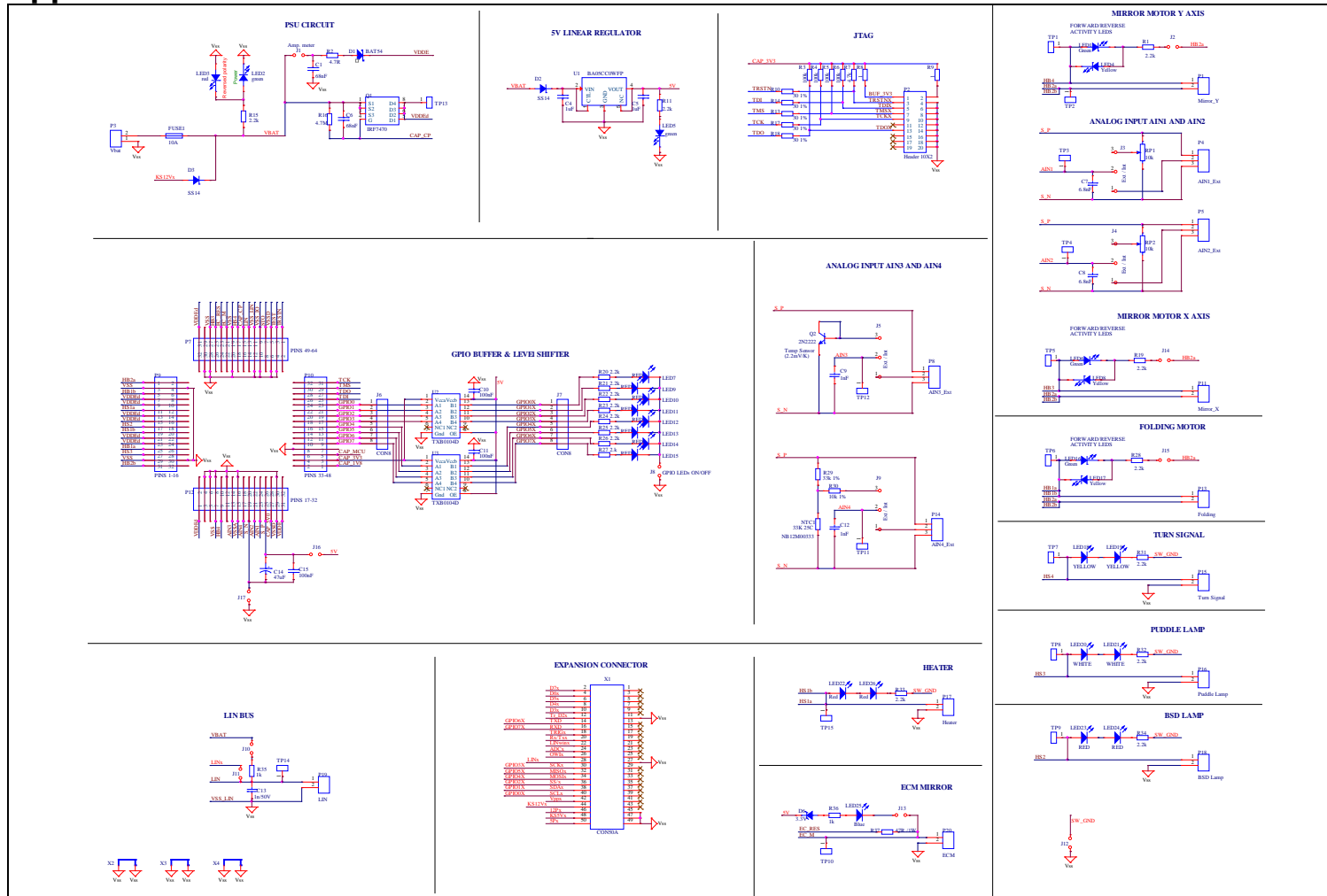
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Appendix A Adaptor Board Schematic



Appendix B Evaluation Board Schematic



Appendix C Bill of Materials

Table 5.1 Bill of Materials

Note: Components marked with an asterisk (*) are for the Adapter Board.

No	Name	Value	Type	Package	Manufacturer	Supplier	Order Code	Pieces
1	U1	BA05CC0WFP ROHM SMD	5.0V±2% 1A, LDO 0.5V, Vinmax=25V, ON/OFF	TO252-5	Rohm	Comet	BA05CC0WFP ROHM SMD	1
2	U2, U3	TXB0104D	IC, SM, LOGIC, TRANSLATOR	SOIC14	TEXAS INS	Farnell	1607890	2
3	TP1 to TP15	KEYSTONE 5006			Keystone	Comet	KEYSTONE 5006	15
4	D1	BAT54C SMD (SOT23)	Schottky 30V 2x200mA 5ns 10pF, konf C	SOT23		Comet	BAT54C SMD (SOT23)	1
5	D2, D3	1N5819 (SS14)	40V 1A UFM0.6V/1A IFM30A IR1mA, Schottky	SMA	Yangjie	Comet	1N5819(SS14) SMD YJ	2
6	D6	BZV55C3V3	500 mW 5% 3.3V minimelf	SOD80C	Vishay	Comet	BZV55C3V3	1
7	LED2, 5, 1, 6, 16,	HI-20129UG-T	Green LED	0805	HITANO	MT1	7419	5
8	LED4, 8, 17, 18, 19	HI-2012HY-T	Yellow LED	0805	HITANO	MT1	8832	5
9	LED3, 7, 9-15, 22, 23, 24	HI-2012HRF-T	Red LED	0805	HITANO	MT1	7418	12
10	LED20, 21	UE-ST170NW1-10T	White LED	0805	HITANO	MT1	8222	2
11	LED25	KP-2012QBC-D	2.0x1.2mm (0805), 100 mcd/20mA, BLUE	0805	Kingbright	Comet	KP-2012QBC-D	1
12	RP1, 2	PNZ 10Z A 10K	PNZ 10Z A 10K lin 20%	10x11mm vert.	ISKRA	Comet	PNZ 10Z A 10K	2
13	Knob for RP	KNOB PNZ10 393 BLACK	PNZ 10/11Z A, black		ISKRA	Comet	KNOB PNZ10 393 BLACK	2

No	Name	Value	Type	Package	Manufacturer	Supplier	Order Code	Pieces
14	C2 *	10uF / 50V	SMD/SMT CAP, MLCC, 1210, 50V X7R 10uF 10%	1210	Taiyo Yuden	Mouser	963-UMK325AB7106KM-T	1
15	C3 *	C0805 100nF 50V X7R SAMSU	100nF 50V X7R +-10%	0805	Samsung	Comet	C0805 100nF 50V X7R SAMSU	1
16	C14 *	C0805 220nF 50V X7R SAMSU	220nF 50V X7R +-10%	0805	Samsung	Comet	C0805 220nF 50V X7R SAMSU	1
17	C11, C12, C13 *	C0805 47nF 50V X7R SAMSUN	47nF 50V X7R +-10%	0805	Samsung	Comet	C0805 47nF 50V X7R SAMSUN	3
18	C4, C5	C0805 1.0uF 50V X7R SAMSUNG	1.0uF 50V X7R +-10%	0805	Samsung	Comet	C0805 1.0uF 50V X7R SAMSUNG	2
19	C10, C11, C15	C0805 100nF 50V X7R SAMSU	100nF 50V X7R +-10%	0805	Samsung	Comet	C0805 100nF 50V X7R SAMSU	3
20	C7, C8	C0805 6.8nF 50V X7R SAMSU	6.8nF 50V X7R +-10%	0805	Samsung	Comet	C0805 6.8nF 50V X7R SAMSU	2
21	C1, C6	C0805 68nF 50V X7R SAMSUN	68nF 50V X7R +-10%	0805	Samsung	Comet	C0805 68nF 50V X7R SAMSUN	2
22	C9, C12, C13	C0805 1.0nF 50V X7R SAMSU	1.0nF 50V X7R +-10%	0805	Samsung	Comet	C0805 1.0nF 50V X7R SAMSU	3
23	C14	CE 100uF 16V SMD Fujicon	El. cap. CS 20%, -40~85°C; D6.3xL5.4mm, base 6.6mm	El. cap 6.3mm	Fujicon	Comet	CE 100uF 16V SMD Fujicon	1
24	R2	R0805 4.7R 1%	RES SMD 0805 1% 4.7R 1/8W	0805	Uni ohm	Comet	R0805 4.7R 1%	1
25	R16	R0805 4.7M 5%	RES SMD 0805 5% 200ppm 4.7M 1/8W	0805	Uni ohm	Comet	R0805 4.7M 5%	1
26	R1, R11, R12, R15, R19, R28, R31-R34, R36	R0805 2.2K 1%	RES SMD 0805 1% 100ppm 2.2K 1/8W	0805	Uni ohm	Comet	R0805 2.2K 1%	11
27	R7	R0805 4.7K 1%	RES SMD 0805 1% 100ppm 4.7K 1/8W	0805	Uni ohm	Comet	R0805 4.7K 1%	1
28	R29	R0805 33K 1%	RES SMD 0805 1% 100ppm 33K 1/8W	0805	Uni ohm	Comet	R0805 33K 1%	1
29	R30	R0805 10K 1%	RES SMD 0805 1% 100ppm 10K 1/8W	0805	Uni ohm	Comet	R0805 10K 1%	1
30	R3-R6	R0805 100K 1%	RES SMD 0805 1% 100ppm 100K 1/8W	0805	Uni ohm	Comet	R0805 100K 1%	5

No	Name	Value	Type	Package	Manufacturer	Supplier	Order Code	Pieces
31	R8, R9	R0805 1.0R 1% YAG/ASJ	RES SMD 0805 1% 100ppm 1R 1/8W	0805		Comet	R0805 1.0R 1% YAG/ASJ	2
32	R10, R13, R14, R17, R18	R0805 30R 1% YAG/ASJ	RES SMD 0805 1% 100ppm 30R 1/8W	0805		Comet	R0805 30R 1% YAG/ASJ	5
33	R20-R27, R35	R0805 1.0K 1% YAG/ASJ	RES SMD 0805 1% 100ppm 1K 1/8W	0805		Comet	R0805 1.0K 1% YAG/ASJ	9
34	R37	R1WCF 47R	Resistor carbon film 1W(5x12) 5% 450ppm 47R	Trh 12.7mm	UniOhm	Comet	R1WCF 47R	1
35	NTC1	THERMISTOR, NTC, 33K	THERMISTOR, NTC, 33K	0805	AVX	Farnell	2103182	1
36	Q1	IRF7470	IRF7470, N channel	SO8	International Rectifier	Farnell	9102868	1
37	Q2	P2N2222AG	P2N2222AG, NPN	TO92	ON SEMI	Farnell	1611371	1
38	J8	JSA41G0	SWITCH, JUMPER, SPST, 1A, 100V, THD	2.54mm	ITW PANCON	Farnell	1386703	3
39	P7, P9, P10, P12	BL6.72Z	HEADER, SOCKET, 2.54MM, 72WAY	2x16x2.54 mm	Fisher	Farnell	9728929	4
40	P2	BH20S	Box Header Connector 2x10	2x10x2.54 mm	Cvilux	Comet	BH20S	1
41	J1, J2, J3, J4, J5, J6, J7, J9, J10, J11, J12	HN1X40	Single row pin header 1x40 , 2.54mm	1x40x2.54 mm	Cvilux	Comet	HN1X40	1
42	X1	HN2X20	Double row pin header 2x20, 2.54mm	2x20x2.54 mm	Cvilux	Comet	HN2X20	2
43	X2, X3, X4	Shorting Link	LINK, SHORTING, 0.4", PK25	10.16mm pitch	Harwin	Farnell	175319	3
44	Jumper hood	MJ14	Jumper 2.54/14mm	-	Cvilux	Comet	MJ14	7
45	P4, P5, P8, P14, P20	DG15V-3.5 3P	8A 300V AC AWG28-16 3. 5mm	3x3.5mm	Degson	Comet	DG15V-3.5 3P	5

No	Name	Value	Type	Package	Manufacturer	Supplier	Order Code	Pieces
46	P1, P3, P11, P13, P15, P16, P17, P18, P19	DG15V-3.5 2P	8A 300V AC AWG28-16 3. 5mm	2x3.5mm	Degson	Comet	DG15V-3.5 2P	9