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The Stellaris® LM3S8962 Evaluation Board is a compact and versatile evaluation platform for the Stellaris LM3S8962 ARM® Cortex™-M3-based microcontroller. The evaluation kit design highlights the LM3S8962 microcontroller’s integrated CAN and 10/100 Ethernet controllers.

As well as implementing an embedded web server, the kit functions as a complete controller area network (CAN) by providing two boards each with a Stellaris microcontroller. The main evaluation board (EVB) is the CAN host. A small CAN device board, linked with a ribbon cable, uses a Stellaris LM3S2110 microcontroller. The function of each board is fully configurable in software.

You can use the EVB either as an evaluation platform or as a low-cost in-circuit debug interface (ICDI). In debug interface mode, the on-board microcontroller is bypassed, allowing connection of the debug signals to an external Stellaris microcontroller target. The kit is also compatible with high-performance external JTAG debuggers.

This evaluation kit enables quick evaluation, prototype development, and creation of application-specific designs for Ethernet and CAN networks. The kit also includes extensive source-code examples, allowing you to start building C code applications quickly.

Figure 1-1. Stellaris LM3S8962 Evaluation Board Layout

- USB Device Interface
- 10/100baseT Ethernet Jack
- microSD Card Memory Slot
- 30 pin I/O break-out header
- OLED Graphics Display
- Navigation Switches
- Debug-out LED
- JTAG/SWD input and output
- Power LED
- CAN Bus connector
- Stellaris™ LM3S8962 Microcontroller
- Status LED
- Speaker
- Select switch
- Reset switch
- In-circuit Debug Interface
- Stellaris™
The Stellaris LM3S8962 Evaluation Kit includes the following features:

- Stellaris LM3S8962 microcontroller with fully-integrated 10/100 embedded Ethernet controller and CAN module
- Simple setup; USB cable provides serial communication, debugging, and power
- OLED graphics display with 128 x 96 pixel resolution
- User LED, navigation switches, and select pushbuttons
- Magnetic speaker
- MicroSD card slot
- USB interface for debugging and power supply
- Standard ARM® 20-pin JTAG debug connector with input and output modes
- LM3S8962 I/O available on labeled break-out pads
- Standalone CAN device board using Stellaris LM3S2110 microcontroller
Block Diagram

Figure 1-3. LM3S8962 Evaluation Board Block Diagram

Figure 1-4. LM3S2110 CAN Device Block Diagram
Evaluation Kit Contents

The evaluation kit contains everything needed to develop and run applications for Stellaris microcontrollers including:

- LM3S8962 evaluation board (EVB)
- LM3S2110 CAN device board
- USB cable
- 20-pin JTAG/SWD target cable
- 10-pin CAN cable

CD containing:
- A supported version of one of the following (including a toolchain-specific Quickstart guide):
  - Keil™ RealView® Microcontroller Development Kit (MDK-ARM)
  - IAR Embedded Workbench
  - Code Sourcery GCC development tools
  - Code Red Technologies development tools
  - Texas Instruments’ Code Composer Studio™ IDE
- Complete documentation
- Quickstart application source code
- Stellaris® Firmware Development Package with example source code

Evaluation Board Specifications

- Board supply voltage: 4.37–5.25 V<sub>dc</sub> from USB connector
- Board supply current: 240 mA typ (fully active, CPU at 50 MHz)
- Break-out power output: 3.3 V<sub>dc</sub> (60 mA max), 15 V<sub>dc</sub> (15 mA max)
- Dimensions: 4.55” x 2.45” x 0.7” (L x W x H)
- RoHS status: Compliant

Features of the LM3S8962 Microcontroller

- 32-bit RISC performance using ARM® Cortex™-M3 v7M architecture
  - 50-MHz operation
  - Hardware-division and single-cycle-multiplication
  - Memory protection unit (MPU), provides a privileged mode for protected operating system functionality
  - Integrated Nested Vectored Interrupt Controller (NVIC)
  - 42 interrupt channels with eight priority levels
- 256-KB single-cycle Flash
- 64-KB single-cycle SRAM
- Four general-purpose 32-bit timers
- Integrated Ethernet MAC and PHY
- Controller area network (CAN) module
- Three fully programmable 16C550-type UARTs
- Four 10-bit ADC channels (inputs) when used as single-ended inputs
- One integrated analog comparator
- One I²C module
- Two PWM generator blocks
  - One 16-bit counter
  - Two comparators
  - Produces two independent PWM signals
  - One dead-band generator
- Two QEI modules with position integrator for tracking encoder position
- Two synchronous serial interfaces (SSIs)
- 0 to 42 GPIOs, depending on user configuration
- On-chip low drop-out (LDO) voltage regulator
LM3S8962 Evaluation Board Hardware Description

In addition to a microcontroller, the Stellaris LM3S8962 evaluation board includes a range of useful peripherals and an integrated in-circuit debug interface (ICDI). This chapter describes how these peripherals operate and interface to the microcontroller.

LM3S8962 Evaluation Board

LM3S8962 Microcontroller Overview

The heart of the EVB is a Stellaris LM3S8962 ARM Cortex-M3-based microcontroller. The LM3S8962 offers 256-KB Flash memory, 50-MHz operation, an Ethernet controller, a CAN module, and a wide range of peripherals. Refer to the LM3S8962 data sheet (order number DS-LM3S8962) for complete device details.

The LM3S8962 microcontroller is factory-programmed with a quickstart demo program. The quickstart program resides in the LM3S8962 on-chip Flash memory and runs each time power is applied, unless the quickstart has been replaced with a user program.

Ethernet

A key feature of the LM3S8962 microcontroller is its fully integrated Ethernet controller. Only an RJ45 jack with integrated magnetics and a few passive components are needed to complete the 10/100baseT interface. The RJ45 jack incorporates LEDs that indicate traffic and link status. These are automatically managed by on-chip microcontroller hardware. Alternatively, the LEDs can be software-controlled by configuring those pins as general-purpose outputs.

The LM3S8962 supports automatic MDI/MDI-X so the EVB can connect directly to a network or to another Ethernet device without requiring a cross-over cable.

CAN Module

A CAN module enables highly reliable communications at up to 1 Mbits/s. The LM3S8962 evaluation board includes a standard CAN transceiver and a 10-pin CAN connector whose signal assignments follow a commonly used CAN standard. A simple adaptor (not included in the kit) can be used to allow the use of standard DB-9 CAN cables (as specified by CAN in Automation CiA DS102).

An on-board 120-ohm resistor provides bus termination. This resistor can be removed if the board is not a network endpoint.

The CAN transceiver is configured in hardware to support speeds up to 1 Mbits/s. A resistor can be added to reduce the transceiver's drive slew-rate for slower data rates over longer distances.

Clocking

The LM3S8962 microcontroller has four on-chip oscillators, three are implemented on the EVB. An internal 12 MHz oscillator is the clock source the microcontroller uses during and following POR. An 8.0-MHz crystal completes the LM3S8962’s main internal clock circuit. An internal PLL, configured in software, multiplies this clock to 50-MHz for core and peripheral timing. The internal 12MHz oscillator is the primary clock source during start-up.
A small, 25-MHz crystal is used by the LM3S8962 microcontroller for Ethernet physical layer timing and is independent of the main oscillator.

**Reset**

The LM3S8962 microcontroller shares its external reset input with the OLED display. In the EVB, reset sources are gated through the CPLD, though in a typical application a simple wired-OR arrangement is sufficient.

External reset is asserted (active low) under any one of three conditions:

- Power-on reset
- Reset push switch SW1 held down
- Internal debug mode—By the USB device controller (U4 FT2232) when instructed by debugger

**Power Supplies**

The LM3S8962 is powered from a +3.3-V supply. A low drop-out (LDO) regulator regulates +5-V power from the USB cable to +3.3-V. +3.3-V power is available for powering external circuits.

A +15-V rail is available when the OLED display power supply is active. The speaker and the OLED display boost-converter operate from the +5-V rail.

**Debugging**

Stellaris microcontrollers support programming and debugging using either JTAG or SWD. JTAG uses the signals \textit{TCK}, \textit{TMS}, \textit{TDI}, and \textit{TDO}. SWD requires fewer signals (\textit{SWCLK}, \textit{SWDIO}, and, optionally, \textit{SWO} for trace). The debugger determines which debug protocol is used.

**Debugging Modes**

The LM3S8962 evaluation board supports a range of hardware debugging configurations. Table 2-1 summarizes these configurations.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Debug Function</th>
<th>Use</th>
<th>Selected by</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal ICDI</td>
<td>Debug on-board LM3S8962 microcontroller over USB interface.</td>
<td>Default mode</td>
</tr>
<tr>
<td>2</td>
<td>ICDI out to JTAG/SWD header</td>
<td>The EVB is used as a USB to SWD/JTAG interface to an external target.</td>
<td>Connecting to an external target and starting debug software. The red Debug Out LED will be ON.</td>
</tr>
<tr>
<td>3</td>
<td>In from JTAG/SWD header</td>
<td>For users who prefer an external debug interface (ULINK, JLINK, etc.) with the EVB.</td>
<td>Connecting an external debugger to the JTAG/SWD header.</td>
</tr>
</tbody>
</table>

Modes 2 and 3 automatically detect the presence of an external debug cable. When the debugger software is connected to the EVB’s USB controller, the EVB automatically selects Mode 2 and illuminates the red Debug Out LED.
Debug In Considerations

Debug Mode 3 supports evaluation board debugging using an external debug interface. Mode 3 is automatically selected when a device such as a Segger J-Link or Keil ULINK is connected.

Boards marked Revision B or later automatically configure pin 1 to be a 3.3-V reference, if an external debugger is connected. To determine the revision of your board, locate the product number on the bottom of the board; for example, EK-LM3S8962-B. The last character of the product number identifies the board revision.

A configuration or board-level change may be necessary when using an external debug interface with revision A of this evaluation board. Because the evaluation board supports both debug out and debug in modes, pin 1 of the 20-pin JTAG/SWD header is, by default, not connected to +3.3 V. Consequently, devices requiring a voltage on pin 1 to power their line buffers may not work.

Two solutions exist. Some debugger interfaces (such as ULINK) have an internal power jumper that, in this case, should be set to internal +3.3 V power. Refer to debugger interface documentation for full details. However, if your debugger interface does not have a selectable power source, it may be necessary to install a 0-Ω resistor on the evaluation board to route power to pin 1. Refer to the schematics and board drawing in the appendix of this manual for the location of this resistor.

USB Device Controller Functions

USB Overview

An FT2232 device from Future Technology Devices International Ltd. manages USB-to-serial conversion. The FT2232 is factory-configured to implement a JTAG/SWD port (synchronous serial) on channel A and a Virtual COM Port (VCP) on channel B. This feature allows two simultaneous communications links between the host computer and the target device using a single USB cable. Separate Windows drivers for each function are provided on the Documentation and Software CD.

A small serial EEPROM holds the FT2232 configuration data. The EEPROM is not accessible by the LM3S8962 microcontroller.

For full details on FT2232 operation, go to www.ftdichip.com.

USB to JTAG/SWD

The FT2232 USB device performs JTAG/SWD serial operations under the control of the debugger. A CPLD (U6) multiplexes SWD and JTAG functions and, when working in SWD mode, provides direction control for the bidirectional data line. The CPLD also implements logic to select between the three debug modes. The internal or external target selection is determined by multiplexing TCK/SWCLK and asserting TRST.

Virtual COM Port

The Virtual COM Port (VCP) allows Windows applications (such as HyperTerminal) to communicate with UART0 on the LM3S8962 over USB. Once the FT2232 VCP driver is installed, Windows assigns a COM port number to the VCP channel.

Serial Wire Out

The evaluation board supports the Cortex-M3 serial-wire output (SWO) trace capabilities. Under debugger control, the CPLD can route the SWO datastream to the virtual communication port (VCP) transmit channel. The debugger can then decode and interpret the trace information.
received from the VCP. The normal VCP connection to UART0 is interrupted when using SWO. Not all debuggers support SWO. Refer to the Stellaris LM3S8962 data sheet for additional information on the trace port interface unit (TPIU).

Organic LED Display

The EVB features an Organic LED (OLED) graphics display with 128 x 96 pixel resolution. OLED is a new technology that offers many advantages over LCD display technology. The display is protected by a thin protective plastic film. If desired the film can be removed using a pair of tweezers.

Features

- RiT P14201 series display
- 128 columns by 96 rows
- High-contrast (typ. 500:1)
- Excellent brightness (120 cd/m²)
- Fast 10 us response

Control Interface

The OLED display has a built-in controller IC with synchronous serial and parallel interfaces. Synchronous serial (SSI) is used on the EVB as it requires fewer microcontroller pins. Data cannot be read from the OLED controller; only one data line is necessary. Note that the SSI port is shared with the MicroSD card slot. The Stellaris® Firmware Development Package (included on the Documentation and Software CD) contains complete drivers with source-code for the OLED display.

Power Supply

A +15-V supply is needed to bias the OLED display. A FAN5331 device from Fairchild combines with a few external components to complete a boost converter. A GPIO (PA7) is assigned to turn on and off the controller as necessary for power rail sequencing. When the OLED display is operating, a small amount of power can be drawn from the +15-V rail to power other devices.

Design Guidelines

The OLED display has a lifetime of about 13,000 hours. It is also prone to degradation due to burn-in, similar to CRT and plasma displays. The quickstart application includes both a screen saver and a power-down mode to extend display life. These factors should be considered when developing EVB applications that use the OLED display.

Further Reference

For additional information on the RiT OLED display, visit www.ritekdisplay.com.

Other Peripherals

Speaker

A small, magnetic audio transducer connects through a MOSFET to PG1/PWM1, allowing a range of options for generating simple and complex tones. Use of the +5-V rail reduces switching noise on the +3.3-V rail.
MicroSD Card Slot

Removable Flash cards are an ideal media for storing data such as web page content. The source code on the CD includes example code for reading data from standard FAT-formatted SD cards. All data and control transactions use the SD card’s SPI mode. Note that the SD card specification does not require that a card supports the SPI mode, but most cards do so in practice. Cards from several vendors have been used with the EVB.

MicroSD cards are very small and require careful handling. The SD card slot on the EVB is a push-push type (push to insert; push again to eject).

**NOTE:** To avoid damage, remove power before inserting or removing cards. The EVB does not implement SD card power control.

Push Switches

The EVB has five general-purpose input switches. Four are arranged in a navigation-style configuration. The fifth functions as a Select switch.

User LED

A user LED (LED1) is provided for general use. The LED is connected to PF0/PWM0, allowing the option of either GPIO or PWM control (brightness control). Refer to the Quickstart Application source code for an example of PWM control.

Bypassing Peripherals

Excluding Ethernet and CAN, the EVB’s on-board peripheral circuits require 16 GPIO lines. Two additional GPIO lines are assigned to Ethernet LEDs. This leaves 20 GPIO lines and 4 ADC channels immediately available for connection to external circuits. If an application requires more GPIO lines, the on-board hardware can be disconnected. The EVB is populated with 16 jumper links, which can be cut with a knife to isolate on-board hardware. The process can be reversed by installing 0603-0-ohm chip resistors. Table 2-2 shows the microcontroller assignments and how to isolate specific pins.

**Important:** The quickstart application will not run if one or more jumpers are removed.

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To Isolate, Remove…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 26 PA0/U0RX</td>
<td>Virtual COM port receive</td>
<td>JP1</td>
</tr>
<tr>
<td>Pin 27 PA1/U0TX</td>
<td>Virtual COM port transmit</td>
<td>JP2</td>
</tr>
<tr>
<td>Pin 19 PG0</td>
<td>SD card chip select</td>
<td>JP4</td>
</tr>
<tr>
<td>Pin 30 PA4/SSI0RX</td>
<td>SD card data out</td>
<td>JP5</td>
</tr>
<tr>
<td>Pin 31 PA5/SSI0TX</td>
<td>SD card and OLED display data in</td>
<td>JP6</td>
</tr>
<tr>
<td>Pin 28 PA2/SSI0CLK</td>
<td>SD card and OLED display clock</td>
<td>JP7</td>
</tr>
<tr>
<td>Pin 34 PA6/CCP1</td>
<td>OLED display data/control select</td>
<td>JP8</td>
</tr>
<tr>
<td>Pin 19 PG0</td>
<td>OLED display chip select</td>
<td>JP9</td>
</tr>
<tr>
<td>Pin 18 PG1/PWM1</td>
<td>Sound</td>
<td>JP10</td>
</tr>
<tr>
<td>Pin 61 PF1/IDX1</td>
<td>Select switch</td>
<td>JP11</td>
</tr>
</tbody>
</table>
Interfacing to the EVB

An array of accessible I/O signals makes it easy to interface the EVB to external circuits. All LM3S8962 I/O lines (except those with both JTAG and SWD functions) are brought out to 0.1” pitch pads. For quick reference, silk-screened labels on the PCB show primary pin functions.

Most LM3S8962 I/O signals are +5-V tolerant. Refer to the LM3S8962 microcontroller data sheet for detailed electrical specifications.

Using the In-Circuit Debugger Interface

The Stellaris LM3S8962 Evaluation Kit can operate as an In-Circuit Debugger Interface (ICDI). ICDI acts as a USB to the JTAG/SWD adaptor, allowing debugging of any external target board that uses a Stellaris microcontroller. See “Debugging Modes” on page 16 for a description of how to enter Debug Out mode.

Figure 2-1. ICD Interface Mode

The debug interface operates in either serial-wire debug (SWD) or full JTAG mode, depending on the configuration in the debugger IDE.

The IDE/debugger does not distinguish between the on-EVB Stellaris microcontroller and an external Stellaris microcontroller. The only requirement is that the correct Stellaris device is selected in the project configuration.
CAN Device Board Hardware Description

The CAN device board uses a Stellaris LM3S2110 microcontroller to demonstrate a complete two-node network. The board can be used with the main LM3S8962 evaluation board or as a standalone board.

Device Overview

The Stellaris LM3S2110 ARM Cortex-M3-based microcontroller has 64-KB Flash memory, 25-MHz operation, a CAN module, and a wide range of peripherals. For complete device details, see the LM3S2110 data sheet (order number DS-LM3S2110).

The LM3S2110 microcontroller is factory programmed with a quickstart demonstration program that adds a remote volume control feature to the quickstart application. The quickstart program resides in the LM3S2110 on-chip Flash memory and runs each time power is applied, unless the quickstart has been replaced with a user program.

Power Supply

The CAN device board receives +5.0-V power from the CAN bus and should not be connected to a CAN bus that has a power wire voltage of greater than 10.0 V. If the bus is unpowered, a +5.0-V local power supply must be provided. The LM3S2110 microcontroller is powered from a +3.3-V rail, supplied by a low drop-out (LDO) regulator. +3.3-V power is available for powering external circuits.

Programming and Debugging

A standard 20-pin header supports both JTAG And SWD programming and debugging using either the main LM3S8962 board in ICDI out mode or a full-featured debug interface.

Interfacing

Two push switches and an LED implement a very simple user interface. The board's capabilities are easily expanded using the I/O breakout headers. For breakout header signal assignments, see “LM3S2110 CAN Device Board Connections” on page 33.
Schematics

This section contains the schematics for the LM3S8962 Evaluation Board.

- LM3S8962 Micro, Ethernet, and CAN on page 24
- OLED Display, Switches, and Audio on page 25
- USB, Debugger Interfaces, and Power on page 26
- CAN Device using LM3S2110 on page 27
- JTAG Logic with Auto Mode Detect and Hibernate on page 28
NOTE: Some LM3S2110 pins are no-connects. These pins have been brought out to pads to allow other Stellaris CAN devices to be used instead of LM3S2110.

Power Rail Break-out

Stellaris LM3S2110 Microcontroller

CAN Transceiver

Power Rail Break-out

CAN Device Evaluation Board

+5V to +3.3V 500mA Power Supply

Texas Instruments
Ethernet and CAN Evaluation Board

Document Number: EK-LM3S2110

RevSheet Date: of 9/25/2008

Drawing Title: CAN Device Evaluation Board

Page Title: CAN Device using LM3S2110

Size: 5" x 7"
APPENDIX B

Connection Details

This appendix contains the following sections:

- Component Locations (see page 30)
- Evaluation Board Dimensions (see page 31)
- I/O Breakout Pads (see page 32)
- LM3S2110 CAN Device Board Connections (see page 33)
- Recommended Connectors (see page 33)
- ARM Target Pinout (see page 34)
- References (see page 35)
Component Locations

Figure B-1. LM3S8962 Evaluation Board Component Locations
Evaluation Board Dimensions

Figure B-2. LM3S8962 Evaluation Board Dimensions

Figure B-3. LM3S2110 CAN Device Board Dimensions
I/O Breakout Pads

The LM3S8962 EVB has 42 I/O pads, 14 power pads, 2 crystal connections, and 2 no-connects, for a total of 60 pads. Connection can be made by soldering wires directly to these pads, or by using 0.1" pitch headers and sockets.

**Note:** In Table B-2, an asterisk (*) by a signal name (also on the EVB PCB) indicates the signal is normally used for on-board functions. Normally, you should cut the associated jumper (JP1-15) before using an assigned signal for external interfacing.

Table B-1. I/O Breakout Pads

<table>
<thead>
<tr>
<th>Description</th>
<th>Pad No.</th>
<th>Description</th>
<th>Pad No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>1</td>
<td>GND</td>
<td>21</td>
</tr>
<tr>
<td>PA7*</td>
<td>2</td>
<td>ADC3</td>
<td>22</td>
</tr>
<tr>
<td>PA6/CCP1*</td>
<td>3</td>
<td>ADC2</td>
<td>23</td>
</tr>
<tr>
<td>PA5/SS10TX*</td>
<td>4</td>
<td>ADC1</td>
<td>24</td>
</tr>
<tr>
<td>PA4/SS10RX*</td>
<td>5</td>
<td>ADC0</td>
<td>25</td>
</tr>
<tr>
<td>PA3/SS10FSS*</td>
<td>6</td>
<td>GND</td>
<td>26</td>
</tr>
<tr>
<td>PA2/SS10CLK*</td>
<td>7</td>
<td>PD7/IDX0</td>
<td>27</td>
</tr>
<tr>
<td>PA1/U0TX*</td>
<td>8</td>
<td>PD6/FAULT</td>
<td>28</td>
</tr>
<tr>
<td>PA0/U0RX*</td>
<td>9</td>
<td>PD5</td>
<td>29</td>
</tr>
<tr>
<td>GND</td>
<td>10</td>
<td>PD4/CCP0</td>
<td>30</td>
</tr>
<tr>
<td>PC4/PHA0</td>
<td>11</td>
<td>+15V</td>
<td>31</td>
</tr>
<tr>
<td>+3.3V</td>
<td>12</td>
<td>No connect</td>
<td>32</td>
</tr>
<tr>
<td>PC5</td>
<td>13</td>
<td>+5V</td>
<td>33</td>
</tr>
<tr>
<td>PC6/PHB0</td>
<td>14</td>
<td>GND</td>
<td>34</td>
</tr>
<tr>
<td>PC7</td>
<td>15</td>
<td>PB4/C0-</td>
<td>35</td>
</tr>
<tr>
<td>PG0*</td>
<td>16</td>
<td>GND</td>
<td>36</td>
</tr>
<tr>
<td>PG1/PWM1*</td>
<td>17</td>
<td>PB6/C0+</td>
<td>37</td>
</tr>
<tr>
<td>PD3/U1TX</td>
<td>18</td>
<td>PB5/C0O</td>
<td>38</td>
</tr>
<tr>
<td>PD2/U1RX</td>
<td>19</td>
<td>PC2/TDI</td>
<td>39</td>
</tr>
<tr>
<td>No connect</td>
<td>20</td>
<td>PB7/TRST</td>
<td>40</td>
</tr>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>PC3/TDO</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GND</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE2/PhB1*</td>
<td>43</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE3/PhA1*</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE0/PWM4*</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PE1/PWM5*</td>
<td>46</td>
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<tr>
<td></td>
<td></td>
<td>PB2/I2C0SCL</td>
<td>47</td>
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<td></td>
<td></td>
<td>PB3/I2C0SDA</td>
<td>48</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td>PF1/IDX1*</td>
<td>51</td>
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<tr>
<td></td>
<td></td>
<td>PB0/PWM2</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PF3/LED0*</td>
<td>53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PF2/LED1*</td>
<td>54</td>
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<tr>
<td></td>
<td></td>
<td>GND</td>
<td>55</td>
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<tr>
<td></td>
<td></td>
<td>OSC32OUT</td>
<td>56</td>
</tr>
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<td></td>
<td></td>
<td>GND</td>
<td>57</td>
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<tr>
<td></td>
<td></td>
<td>OSC32IN</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PF0/PWM0*</td>
<td>59</td>
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<tr>
<td></td>
<td></td>
<td>+3.3V</td>
<td>60</td>
</tr>
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</table>
LM3S2110 CAN Device Board Connections

Recommended Connectors

Connection can be made by soldering wires directly to pads or using 0.1” pitch headers and sockets.

Table B-2. Recommended Connectors

<table>
<thead>
<tr>
<th>Pins 1-30, 31-60 (2 x 15 way)</th>
<th>PCB Socket</th>
<th>Sullins PPPC152LFBN-RC</th>
<th>Digikey S7118-ND</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cable Socket</td>
<td>3M 89130-0101</td>
<td>Digikey MKC30A-ND</td>
</tr>
<tr>
<td></td>
<td>Pin Header</td>
<td>Sullins PEC15DAAN</td>
<td>Digikey S2011E-15-ND</td>
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</table>

February 9, 2010
**ARM Target Pinout**

In ICDI input and output mode, the Stellaris LM3S8962 Evaluation Kit supports ARM’s standard 20-pin JTAG/SWD configuration. The same pin configuration can be used for debugging over serial-wire debug (SWD) and JTAG interfaces. The debugger software, running on the PC, determines which interface protocol is used.

The Stellaris target board should have a 2x10 0.1” pin header with signals as indicated in Table B-3. This applies to both an external Stellaris microcontroller target (Debug Output mode) and to external JTAG/SWD debuggers (Debug Input mode).

**Table B-3. 20-Pin JTAG/SWD Configuration**

<table>
<thead>
<tr>
<th>Function</th>
<th>Pin</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>VCC (optional)</td>
<td>1</td>
<td>2</td>
<td>nc</td>
</tr>
<tr>
<td>nc</td>
<td>3</td>
<td>4</td>
<td>GND</td>
</tr>
<tr>
<td>TDI</td>
<td>5</td>
<td>6</td>
<td>GND</td>
</tr>
<tr>
<td>TMS</td>
<td>7</td>
<td>8</td>
<td>GND</td>
</tr>
<tr>
<td>TCK</td>
<td>9</td>
<td>10</td>
<td>GND</td>
</tr>
<tr>
<td>nc</td>
<td>11</td>
<td>12</td>
<td>GND</td>
</tr>
<tr>
<td>TDO</td>
<td>13</td>
<td>14</td>
<td>GND</td>
</tr>
<tr>
<td>nc</td>
<td>15</td>
<td>16</td>
<td>GND</td>
</tr>
<tr>
<td>nc</td>
<td>17</td>
<td>18</td>
<td>GND</td>
</tr>
<tr>
<td>nc</td>
<td>19</td>
<td>20</td>
<td>GND</td>
</tr>
</tbody>
</table>

ICDI does not control RST (device reset) or TRST (test reset) signals. Both reset functions are implemented as commands over JTAG/SWD, so these signals are not necessary.

It is recommended that connections be made to all GND pins; however, both targets and external debug interfaces must connect pin 18 and at least one other GND pin to GND.
References

In addition to this document, the following references are included on the Stellaris LM3S8962 Evaluation Kit CD-ROM and are also available for download at www.ti.com/stellaris:

- Stellaris LM3S8962 Evaluation Kit Quickstart Guide for appropriate tool kit (see “Evaluation Kit Contents," on page 12)
- Stellaris LM3S8962 Evaluation Kit Read Me First
- StellarisWare® Driver Library
- StellarisWare® Driver Library User’s Manual, publication SW-DRL-UG
- Stellaris LM3S8962 Data Sheet, publication DS-LM3S8962
- Stellaris LM3S2110 Data Sheet, publication DS-LM3S2110

Additional references include:

- RiT Display Corporation RGS13128096WH000 OLED Display Data Sheet
- Future Technology Devices Incorporated FT2232D Data Sheet

Information on development tool being used:

- RealView MDK web site, www.keil.com/arm/rvmdkkit.asp
- IAR Embedded Workbench web site, www.iar.com
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<td>Audio</td>
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<tr>
<td>Data Converters</td>
<td>Automotive</td>
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<tr>
<td>DLP® Products</td>
<td>Communications and Telecom</td>
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<td>DSP</td>
<td>Computers and Peripherals</td>
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