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The Stellaris® LM3S3748 Evaluation Board (EVB) is a compact and versatile evaluation platform for the Stellaris LM3S3748 ARM® Cortex™-M3-based microcontroller. The evaluation board design highlights the LM3S3748 microcontroller's key features including USB 2.0 full-speed (12 Mbps) controller, Analog-to-Digital Converter (ADC), and serial interfaces.

The LM3S3748 EVB has connectors for both embedded USB Host and USB Device operation; allowing a range of USB application options to be evaluated. In USB Device mode, a small switch selects between bus-powered and self-powered options.

Four ADC signals are paired as two differential channels to implement a 1MS/s oscilloscope application on the LCD panel. The oscilloscope feature set includes USB host and device connectivity as well as SD card support.

The LM3S3748 EVB may be used 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 programming or debugging of an external target.

The LM3S3748 Evaluation Kit enables rapid evaluation and prototyping of LM3S3748 microcontroller designs. The kit also includes extensive example applications and complete source code. Figure 1-1 shows the LM3S3748 EVB in detail.

Figure 1-1. LM3S3748 Evaluation Board
Features

The Stellaris LM3S3748 Evaluation Board includes the following features:

- Stellaris LM3S3748 microcontroller
- 2-channel oscilloscope demo application
- USB Host and Device connectors
- Bus-powered or self-powered
- Simple setup; USB cable provides serial communication, debugging, and power
- Color LCD graphics display with 128 x 128 pixel resolution
- User LED, and navigation switch with press to select
- 8Ω Magnetic speaker with amplifier
- microSD card slot
- USB interface for debugging and power supply
- DC jack for optional 5 V power supply
- Standard ARM® 20-pin JTAG debug connector with input and output modes
- LM3S3748 microcontroller I/O available on labeled break-out pads

Block Diagram

Figure 1-2 on page 11 shows the LM3S3748 EVB block diagram.
Kit Contents

The Stellaris LM3S3748 Evaluation Kit contains everything needed to develop and run USB applications using Stellaris microcontrollers including:

- LM3S3748 Evaluation Board (EVB)
- USB cables (1 each for device and debugger use)
- USB flash memory stick
- Four oscilloscope test leads
- 20-pin JTAG/SWD target cable
- CD containing:
  - A supported, evaluation version of one of the following:
    - Keil™ RealView® Microcontroller Development Kit (MDK-ARM)
    - IAR Embedded Workbench® development tools
Kit Contents

- Code Sourcery GCC development tools
- CodeRed Technologies development tools

Complete documentation
  - Quickstart guide
  - Quickstart source code
  - DriverLib and example source code

Evaluation Board Specifications

- Board supply voltage: 4.85–5.25 Vdc from one of the following sources:
  - Debugger USB cable (connected to a PC)
  - Device USB cable (connected to a PC)
  - DC power jack
- Board supply current: 130 mA typ (fully active, CPU at 50 MHz, no audio)
- Break-out power output: 3.3 Vdc (100 mA max)
- Speaker power: 0.3 W max
- Dimensions: 4.65” x 2.45” x 0.33” (L x W x H)
- RoHS status: Compliant

When the EVB is used in USB Host mode, the host connector is capable of supplying power to the connected USB device. The available supply current is limited to ~250 mA unless the EVB is powered from an external 5 V supply with a ≥ 600 mA rating.

Microcontroller Features

The LM3S3748 microcontroller includes the following product features:

- 32-bit RISC performance using ARM® Cortex™-M3 v7M architecture
  - 50-MHz operation
  - Hardware-division and single-cycle-multiplication
  - Integrated Nested Vectored Interrupt Controller (NVIC)
  - 37 interrupt channels with eight priority levels
- 128 KB single-cycle flash
- 64 KB single-cycle SRAM
- Pre-programmed ROM
- DMA controller
- Two SSI modules
- One USB Host controller
- Four general-purpose 32-bit timers
- Two fully programmable 16C550-type UARTs
- Eight 10-bit ADC channels (inputs) when used as single-ended inputs
- Two integrated analog comparators
- Two I\textsuperscript{2}C modules
- Four PWM generator blocks
- One QEI module with position integrator for tracking encoder position
- 3 to 61 GPIOs, depending on user configuration
- On-chip low drop-out (LDO) voltage regulator
- Hibernation module
CHAPTER 2

Hardware Description

In addition to a microcontroller, the Stellaris® LM3S3748 evaluation board includes a range of useful peripheral features and an integrated in-circuit debug interface (ICDI). This chapter describes how these peripherals operate and interface to the microcontroller.

LM3S3748 Microcontroller Overview

The heart of the EVB is a Stellaris LM3S3748 ARM® Cortex™-M3-based microcontroller. The LM3S3748 microcontroller offers 128-KB flash memory, 64-KB SRAM memory, 50-MHz operation, USB, and a wide range of peripherals. See the LM3S3748 microcontroller data sheet (order number DS-LM3S3748) for complete device details.

The LM3S3748 microcontroller is factory-programmed with a quickstart demo program. The quickstart program resides in on-chip flash memory and runs each time power is applied, unless the quickstart has been replaced with a user program.

Clocking

The EVB uses an 8.0-MHz crystal to complete the LM3S3748 microcontroller's main internal clock circuit. An internal PLL, configured in software, multiplies this clock to 50 MHz for core and peripheral timing.

The real-time clock oscillator is part of the microcontroller's Hibernation module and uses a 4.194304 MHz crystal for timing. This frequency divides by 128 to generate a 32.7680 kHz standard timing frequency.

Reset

The LM3S3748 microcontroller shares its external reset input with the LCD display. In the EVB, reset sources are gated through the CPLD, though in a typical application, a simple wired-OR arrangement, with a resistor to +3.3 V, is sufficient.

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

- Power-on reset
- Reset push switch SW1 held down
- By the USB device controller (U5 FT2232) when instructed by the debugger

Power Supplies

The EVB has two main power rails. A +3.3 V supply powers the microcontroller and most other circuitry. A +5 V supply is used by the Host USB port and In-circuit Debug Interface (ICDI) USB controller. A low drop-out (LDO) regulator (U8) converts the +5 V power rail to +3.3 V. Both rails are routed to pads on the I/O break-out headers and may be used to power external circuits.
EVB power can be supplied through three different connectors as shown in Table 2-1.

**Table 2-1. Board Power Options**

<table>
<thead>
<tr>
<th>Power Source</th>
<th>Reference</th>
<th>Main Features Powered?</th>
<th>USB Host Feature Powered</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Jack</td>
<td>J5</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>USB Device connector</td>
<td>J6</td>
<td>Yes(^a)</td>
<td>No</td>
</tr>
<tr>
<td>Debug Interface USB connector</td>
<td>J7</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

\(^a\) To power the EVB, the USB power switch (SW3) must be in the “BUS” position.

Only one power source should be connected to the EVB. If the USB Power switch (SW3) is in the BUS position, the board should be powered from J6 (USB Device connector). If the USB Power switch is in the SELF position, the board should be powered from J7 (Debug USB connector) or from J5 (DC power jack). Do not apply power to J5 and J7 at the same time.

The current and voltage available on the USB host port is a function of the EVB power source. If board power is provided by a USB cable, the host port power is limited to 500 mA minus the EVB power requirements. Use the DC jack to provide power from a +5 V source if a full 500 mA USB host supply is necessary on J7.

**USB**

The LM3S3748's full-speed USB controller supports both Host and Device configurations. In Host mode, the EVB acts as a host for USB devices connected to J1. In Device mode, the EVB acts as a device and can be connected to another USB host, such as a PC.

The EVB has dedicated USB Host and USB Device connectors. A multiplexer (U9), controlled by a GPIO pin (PH2/PB0), determines which port is active by switching D+ and D- signals. Each port has additional ESD protection diode arrays (D9, D10) for up to 15 kV of electrostatic discharge (ESD) protection.

**Table 2-2. USB-Related Signals**

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To isolate, remove...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 70 USBDM</td>
<td>USB Data-</td>
<td>-</td>
</tr>
<tr>
<td>Pin 71 USBDP</td>
<td>USB Data+</td>
<td>-</td>
</tr>
<tr>
<td>Pin 73 USBRBBIAS</td>
<td>USB bias resistor</td>
<td>-</td>
</tr>
<tr>
<td>Pin 66 PB0</td>
<td>Input (see Rev A0 errata)</td>
<td>-</td>
</tr>
<tr>
<td>Pin 67 PB1</td>
<td>Input (see Rev A0 errata)</td>
<td>-</td>
</tr>
<tr>
<td>Pin 84 PH2</td>
<td>USB Host/Device mux control</td>
<td>JP33</td>
</tr>
<tr>
<td>Pin 83 PH3/USB0EPEN</td>
<td>Host power enable (active high)</td>
<td>-</td>
</tr>
<tr>
<td>Pin 76 PH4/USB0FFLT</td>
<td>Host power fault (active low)</td>
<td>-</td>
</tr>
</tbody>
</table>

U7, a fault-protected switch, controls and monitors power to the USB Host port. USB0EPEN, the control signal from the microcontroller, has a pull-down resistor to ensure Host-port power remains
off during reset. The power switch immediately cuts power if the attached USB device draws more than 1 Amp, or if the switches' thermal limits are exceeded by a device drawing more than 500 mA. Under fault conditions, U7 will set its over-current output pin low. This is an open-drain signal, so a pull-up must be enabled by the microcontroller. The USB controller can be configured to generate an interrupt if \texttt{USB0PFLT} is asserted.

The EVB can be either a bus-powered USB device or self-powered USB device depending on the position of the USB power switch (SW3).

\textbf{WARNING} – Do not change the USB power selection while power is applied. Doing so may damage the switch contacts.

When using the EVB in USB-Host mode, power to the EVB should be supplied by the In-circuit Debugger (ICDI) USB cable or by a +5 V source connected to the DC power jack. Set the USB power switch to self-power.

Note that the LM3S3748 microcontroller's USB capabilities are completely independent from the ICDI USB functionality.

**Debugging**

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

**Debugging Modes**

The LM3S3748 EVB supports a range of hardware debugging configurations. Table 2-3 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 LM3S3748 microcontroller over Debug 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 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 to the EVB.
Debug USB

An FT2232 device from Future Technology Devices International Ltd manages USB-to-serial conversion. The FT2232 is factory-configured by Luminary Micro 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.

The ICDI USB capabilities are completely independent from the LM3S3748’s on-chip USB functionality.

A small serial EEPROM holds the FT2232 configuration data. The EEPROM is not accessible by the LM3S3748 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 target microcontroller selection is determined by multiplexing TCK/SWCLK.

Virtual COM Port

The Virtual COM Port (VCP) allows Windows applications (such as HyperTerminal) to communicate with UART0 on the LM3S3748 over USB. Once the FT2232 VCP driver is installed, Windows assigns a COM port number to the VCP channel.

Table 2-4. Debug-Related Signals

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To isolate, remove...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 77 TDO/SWO</td>
<td>JTAG data out or trace data out</td>
<td>-</td>
</tr>
<tr>
<td>Pin 78 TDI</td>
<td>JTAG data in</td>
<td>-</td>
</tr>
<tr>
<td>Pin 79 TMS/SWDIO</td>
<td>JTAG TMS or SWD data in/out</td>
<td>-</td>
</tr>
<tr>
<td>Pin 80 TCK/SWCLK</td>
<td>JTAG Clock or SWD clock</td>
<td>-</td>
</tr>
<tr>
<td>Pin 26 PA0/U0RX</td>
<td>Virtual Com port data to LM3S3748</td>
<td>JP12</td>
</tr>
<tr>
<td>Pin 27 PA1/U0TX</td>
<td>Virtual Com port data from LM3S3748</td>
<td>JP25</td>
</tr>
</tbody>
</table>

Serial Wire Out

The EVB supports the Cortex-M3 Serial-Wire Output (SWO) trace capabilities. Under debugger control, the CPLD can route the SWO datastream to the VCP transmit channel. The debugger can then decode and interpret the trace information received from the Virtual Com Port (VCP). The normal VCP connection to UART0 is interrupted when using SWO.

Not all debuggers support SWO.

Refer to the Stellaris LM3S3748 Datasheet for additional information on the Trace Port Interface Unit (TPIU).
Color LCD

The EVB features a liquid crystal graphics display with 128 x 128 pixel resolution. The display is protected during shipping by a thin, protective plastic film. Remove the film by gently pulling the green tab.

Features

The color LCD includes the following features:

- Formike Electronic KWH015C04-F01 display
- CSTN 128 x 128 resolution
- 16-bit color
- White LED backlight
- 8-bit data bus
- ST7637 Drive IC

Control Interface

The color LCD module has a built-in controller IC with an 8-bit parallel interface. Port G is used to transfer data to and from the LCD module. Three control signals (A0, WR, RD) provide read/write and register/data control using GPIO pins.

Table 2-5. LCD-Related Signals

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To isolate, remove...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 19 PG0</td>
<td>LCD Data 0</td>
<td>JP16</td>
</tr>
<tr>
<td>Pin 18 PG1</td>
<td>LCD Data 1</td>
<td>JP14</td>
</tr>
<tr>
<td>Pin 19 PG2</td>
<td>LCD Data 2</td>
<td>JP17</td>
</tr>
<tr>
<td>Pin 16 PG3</td>
<td>LCD Data 3</td>
<td>JP18</td>
</tr>
<tr>
<td>Pin 41 PG4</td>
<td>LCD Data 4</td>
<td>JP26</td>
</tr>
<tr>
<td>Pin 40 PG5</td>
<td>LCD Data 5</td>
<td>JP27</td>
</tr>
<tr>
<td>Pin 37 PG6</td>
<td>LCD Data 6</td>
<td>JP28</td>
</tr>
<tr>
<td>Pin 36 PG7</td>
<td>LCD Data 7</td>
<td>JP29</td>
</tr>
<tr>
<td>Pin 25 PC4</td>
<td>LCD Write Enable (active low)</td>
<td>JP30</td>
</tr>
<tr>
<td>Pin 24 PC5</td>
<td>LCD Read Enable (active low)</td>
<td>JP21</td>
</tr>
<tr>
<td>Pin 72 PB2</td>
<td>LCD Register / Data select</td>
<td>JP11</td>
</tr>
<tr>
<td>Pin 61 PF1/PWM1</td>
<td>Backlight control</td>
<td>JP19</td>
</tr>
</tbody>
</table>

Backlight

The white LED backlight must be powered for the display to be visible. Set PF1/PWM1 high to turn on the backlight. For brightness control, use the pin’s PWM function to reduce the normal 34 mA supply current.
Oscilloscope

**Power**

The LCD module has internal bias voltage generators and requires only a single 3 Vdc supply, which is provided via D2 and D3.

**Oscilloscope**

The oscilloscope feature has two differential measurement channels which provide waveform acquisition using the LM3S3748 microcontroller's Analog-to-Digital Converter (ADC). This section describes the oscilloscope hardware. For a detailed description of the oscilloscope operation and software, see the *Stellaris® Peripheral Driver Library User's Guide* in the LM3S3748 Evaluation Kit’s Example Applications section.

**Voltage Reference**

The oscilloscope circuit can measure negative voltages by biasing the oscilloscope input channels to +1.5 V. A voltage divider is buffered by an op-amp (U2) for a low impedance voltage reference. The reference voltage varies proportionally with the 3.3 V rail, but the differential measurement configuration will successfully reject this error.

**Differential Inputs**

Both input channels have 11:1 differential input voltage dividers. For accuracy, 0.1% resistors are used. The ADC inputs to the LM3S3748 microcontroller have two key parameters sets in this application circuit. The first are the common-mode (absolute) voltage limits of 0 to 3.0 V. This sets the voltage limit on any oscilloscope input signal to +16.5 V to -16.5 V, using the following equations:

\[ V_{\text{cm(max+)}} = (V_{\text{adc(max)}} - V_{\text{ref}}) \times 11 = +16.5 \, \text{V} \]
\[ V_{\text{cm(max-)}} = (V_{\text{adc(min)}} - V_{\text{ref}}) \times 11 = -16.5 \, \text{V} \]

The second key parameter set is the differential mode voltages limits, which are +1.5 V and -1.5 V. These values are important in defining the maximum voltage between the inputs to each channel.

\[ V_{\text{dm}} = V_{\text{adc(diff)}} \times 11 = +/-16.5 \, \text{V} \]

**Table 2-6. Oscilloscope Electrical Specifications**

<table>
<thead>
<tr>
<th>Parameter Name</th>
<th>Min</th>
<th>Nom</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Mode Input Voltage</td>
<td>-16.5</td>
<td>–</td>
<td>+16.5</td>
<td>V</td>
</tr>
<tr>
<td>Differential Input Voltage</td>
<td>–</td>
<td>–</td>
<td>+16.5</td>
<td>V</td>
</tr>
<tr>
<td>Differential Input Voltage</td>
<td>–</td>
<td>–</td>
<td>-16.5</td>
<td>V</td>
</tr>
<tr>
<td>Input Impedance</td>
<td>–</td>
<td>220K</td>
<td>–</td>
<td>Ω</td>
</tr>
</tbody>
</table>
Test Signals

The oscilloscope inputs may be used to measure voltages and waveforms at various points on the board. Consider the oscilloscope's input impedance (220 kΩ) when selecting signals to measure. The EVB has two defined test points that can be easily accessed on the oscilloscope header.

Optimizing the Oscilloscope

The oscilloscope hardware is a simple design that balances trade-offs between input impedance, signal bandwidth, and measurement error.
Measurement error is introduced when an ADC is fed from a high-impedance source. Each time the ADC makes a conversion, a very small capacitor in the ADC input-stage must be charged. During the charging period, the voltage may drop slightly.

Using only one oscilloscope channel will reduce the error, because the internal capacitance charges to approximately the same level for each conversion. The error can also be reduced by adding a capacitor across the differential inputs to the ADC (for example, between ADC0 and ADC1).

Adding 33 pF capacitors will stabilize the input to the ADC, however, it will also create a 24-kHz low-pass filter. This will limit the usable bandwidth of the oscilloscope, but will optimize it for DC level measurements.

Another method is to reduce the values of the input divider resistors. The best overall solution would be a high-performance op-amp buffer stage.

**Other Peripherals**

**Speaker**

The LM3S3748 evaluation board's speaker circuit can be used in either tone or waveform mode.

In tone mode, the LM3S3748 microcontroller's PWM module directly generates tones within the audible frequency range. The width of the pulses determines the volume. If only one PWM signal (PWM2 or PWM3) is used, then the non-PWM signal should be configured as a general-purpose output. For increased speaker volume, PWM2 and PWM3 can be configured as complementary drive signals. In tone and waveform modes, be careful to avoid large DC currents in the speaker. Do not drive the PWM levels to opposite polarities for more than 10 ms.

Waveform mode uses two high-frequency PWM signals to drive a MOSFET H-bridge with an output filter. This circuit is essentially a Class-D amplifier. The symmetrical 2nd order low-pass L-C filter has a cut-off frequency of approximately 33 kHz. The microcontroller's PWM module should be configured with a PWM frequency of at least 66 kHz. Using higher frequencies (for example, 500 kHz) improves audio quality. Once configured, audio waveform data can be used to update the PWM duty cycle at a rate equal to the audio sampling rate.

The speaker on the evaluation board has standard 8Ω impedance. Audio quality can be enhanced by adding a small, vented enclosure around the speaker.

**Table 2-7. Speaker-Related Signals**

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To isolate, remove...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 60 PF2/PWM2</td>
<td>Audio PWM +</td>
<td>JP22</td>
</tr>
<tr>
<td>Pin 59 PF3/PWM3</td>
<td>Audio PWM -</td>
<td>JP20</td>
</tr>
</tbody>
</table>
Navigation Switch

The EVB has a four-way navigation switch (SW2) with press-to-select functionality. Each of the five signals connects to GPIO pins on the LM3S3748 microcontroller. The internal 200 kΩ pull-up resistors should be enabled before reading switch status.

Table 2-8. Navigation Switch-Related Signals

<table>
<thead>
<tr>
<th>Microcontroller Pin</th>
<th>EVB Function</th>
<th>To isolate, remove...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin 65 PB3</td>
<td>Up Switch</td>
<td>JP13</td>
</tr>
<tr>
<td>Pin 92 PB4</td>
<td>Down Switch</td>
<td>JP10</td>
</tr>
<tr>
<td>Pin 91 PB5</td>
<td>Left Switch</td>
<td>JP9</td>
</tr>
<tr>
<td>Pin 90 PB6</td>
<td>Right Switch</td>
<td>JP23</td>
</tr>
<tr>
<td>Pin 89 PB7</td>
<td>Select Switch</td>
<td>D1</td>
</tr>
</tbody>
</table>

The press-to-select switch also connects to the WAKE signal on the LM3S3748’s microcontroller’s Hibernate module. Diode D1 blocks current from the WAKE internal pull-up when in Hibernate mode. The diode is transparent in normal switch operation.

Status LED

A user LED (LED3) is provided for general use. The LED is connected to PG2/PWM0, allowing the option of either GPIO or PWM control (brightness control).

Interfacing to the EVB

An array of accessible I/O signals makes it easy to interface the EVB to external circuits. All LM3S3748 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. Table x on page y has a complete list of I/O signals as well as recommended connectors. Most LM3S3748 I/O signals are +5-V tolerant. Refer to the LM3S3748 microcontroller data sheet for detailed electrical specifications.

Bypassing Peripherals

The EVB’s on-board peripheral circuits require 30 GPIO lines. This leaves 23 GPIO lines 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 30 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.

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

In-Circuit Debugger Interface

The LM3S3748 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” on page 17 for a description of how to enter Debug Out 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.

The Stellaris target board should have a 2x10 0.1" pin header with signals as indicated in Table D-2 on page 38. This applies to both an external Stellaris microcontroller target (Debug Output mode) and to external JTAG/SWD debuggers (Debug Input mode).

ICDI does not control \texttt{RST} (device reset) or \texttt{TRST} (test reset) signals. Both reset functions are implemented as commands over JTAG/SWD, so these signals are usually 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. Some external debug interfaces may require a voltage on Pin 1 to set line driver thresholds. The EVB ICDI circuit automatically sets Pin 1 high if an external debugger is connected. In other modes, this pin is unused.
Schematics

This section contains the following schematic diagrams for the LM3S3748 evaluation board:

- Microcontroller on page 26
- Power, USB Selection on page 27
- LCD, Switches, and Audio on page 28
- Debugger Interfaces on page 29
- JTAG Logic with Auto Mode Detect, Hibernate, and TVcc Control on page 30
FTDI_DBG

VCP_TX
SWO_EN
FTDI_TCK
FTDI_TDI_DO
FTDI_TDO_DI
FTDI_TMS
FTDI_JTAGEN
FTDI_SRSTn
RSTSW
RC
EXTCABLEn
HiBn

DBGOUT
FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG

ITCK
XTCK
U0TX
XTDO
XTDI
XTMS
DBGLED
TEST
TRSTn
MCURSTn
TVCC

FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG
FTDI_DBG

INTDBG

Sept 28, 2007 JTAG Logic with Auto Mode Detect, Hibernate and TVcc Control
APPENDIX B

PCB

This appendix contains plots showing component locations and board dimensions.

- Component Locations (see page 31)
- Evaluation Board Dimensions (see page 32)

Component Locations

Figure B-1. LM3S3748 Evaluation Board Component Locations

-board LCD Signals

- can be cut to

3PIO lines if required.

Stellaris LM3S3748 Microcontroller

Note 1: PLL controls USB mux (and PB0 input per errata). PB0 to HOSTEn connection required for Rev A0 silicon.

Note 2: PB1 tied to +5V per Rev A0 errata.

Oscilloscope

Jumpers can be in free GPIO/ADC lin.

April 2, 2008

31
Evaluation Board Dimensions

Figure B-2. LM3S3748 Evaluation Board Dimensions
### Table C-1. LM3S3748 Bill of Materials

<table>
<thead>
<tr>
<th>Reference</th>
<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
<th>Mfg</th>
<th>Supplier</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2</td>
<td>2</td>
<td>C0603C100J5GACTU</td>
<td>Capacitor 10pF 50V 5% Ceramic NPO/COG 0603</td>
<td>Kemet</td>
<td>Mouser</td>
<td>80-C0603C100J5G</td>
</tr>
<tr>
<td>C3, C4, C25, C26</td>
<td>4</td>
<td>C0603C270J5GACTU</td>
<td>Capacitor 27pF 50V 5% Ceramic NPO/COG 0604</td>
<td>Kemet</td>
<td>Mouser</td>
<td>80-C0603C270J5G</td>
</tr>
<tr>
<td>C39</td>
<td>1</td>
<td>T491D157M010AT</td>
<td>Capacitor 150uF 10V Tantalum Size D</td>
<td>Kemet</td>
<td>Digikey</td>
<td>399-3778-2-ND</td>
</tr>
<tr>
<td>C6, C11, C12, C13, C14, C16, C17, C18, C20, C21, C22, C23, C27, C28, C29, C30, C31, C32, C33, C34, C40, C41, C42</td>
<td>23</td>
<td>C0603C104K4RACTU</td>
<td>Capacitor, 0.1uF 16V 10% 0603 X7R</td>
<td>Kemet</td>
<td>Mouser</td>
<td>80-C0603C104K4R</td>
</tr>
<tr>
<td>C7, C15, C19, C35, C36, C38</td>
<td>6</td>
<td>TMK212BJ105KG-T</td>
<td>Capacitor 1.0uF 25V X5R 0805</td>
<td>Taiyo Yuden</td>
<td>Digikey</td>
<td>587-1291-1-ND</td>
</tr>
<tr>
<td>C8, C9, C10, C24, C37</td>
<td>5</td>
<td>C0603C103J5RACTU</td>
<td>Capacitor, 0.01uF 50V 5% 0603 X7R</td>
<td>Kemet</td>
<td>Mouser</td>
<td>80-C0603C103J5R</td>
</tr>
<tr>
<td>D2, D3, D4, D5</td>
<td>4</td>
<td>MBR0520L</td>
<td>Diode, Schottky 500mA 20V SOD123</td>
<td>Fairchild</td>
<td>Arrow/ Mouser</td>
<td>MBR0520L</td>
</tr>
<tr>
<td>D1, D6, D7</td>
<td>3</td>
<td>MA2J728</td>
<td>Diode, Schottky 30mA 30V Low Ir</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>MA2J72800LTR-ND</td>
</tr>
<tr>
<td>D8, D9, D10</td>
<td>3</td>
<td>TPD2E001DRLR</td>
<td>Diode, ESD protection array Low-cap SOT-533</td>
<td>TI</td>
<td>Digikey</td>
<td>296-21883-1-ND</td>
</tr>
<tr>
<td>J1</td>
<td>1</td>
<td>AU-Y1006-R 154- UAR42-E</td>
<td>Connector, USB Type A</td>
<td>Assmann Kobiconn</td>
<td>Digikey Mouser</td>
<td>AE9924-ND 154- UAR42-E</td>
</tr>
<tr>
<td>J2</td>
<td>1</td>
<td>538-22-28-4083</td>
<td>Connector, 8 way SIL header 0.1&quot;</td>
<td>Molex</td>
<td>Mouser</td>
<td>22-28-4083</td>
</tr>
<tr>
<td>J5</td>
<td>1</td>
<td>PJ-014D-SMT</td>
<td>Connector, DC Jack SMT 1.3x3.8mm</td>
<td>CUI</td>
<td>Digikey</td>
<td>CP-014DPJTR-ND</td>
</tr>
<tr>
<td>J6, J7</td>
<td>2</td>
<td>S4819-0572</td>
<td>Connector, USB Mini-B SMT Spin</td>
<td>Molex</td>
<td>Mouser</td>
<td>538-54819-0572</td>
</tr>
</tbody>
</table>
Table C-1. LM3S3748 Bill of Materials (Continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
<th>Mfg</th>
<th>Supplier</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1, L2</td>
<td>2</td>
<td>CBC2012T4R7M</td>
<td>Inductor 4.7uH 360mA 0805 Chip Inductor</td>
<td>Taiyo Yuden</td>
<td>Digikey</td>
<td>587-1602-1-ND</td>
</tr>
<tr>
<td>LED1, LED3</td>
<td>2</td>
<td>LTST-C171GKT</td>
<td>LED, 0805 SMT Green</td>
<td>LiteOn</td>
<td>Mouser / Arrow</td>
<td>LTST-C171GKT</td>
</tr>
<tr>
<td>LED2, LED4</td>
<td>2</td>
<td>LTST-C171EKT</td>
<td>LED, 0805 SMT Red</td>
<td>LiteOn</td>
<td>Mouser / Arrow</td>
<td>LTST-C171EKT</td>
</tr>
<tr>
<td>P1</td>
<td>1</td>
<td>2908-05WB-MG</td>
<td>Connector, Micro SD card, push-push SMT</td>
<td>3M</td>
<td>Mouser</td>
<td>517-2908-05WB-MG</td>
</tr>
<tr>
<td>Q1, Q2, Q3</td>
<td>3</td>
<td>FDG6322C</td>
<td>Mosfet, P-N Channel Complementary Pair 25V SC70-6</td>
<td>Fairchild</td>
<td>Digikey</td>
<td>FDG6322CTR-ND</td>
</tr>
<tr>
<td>R1</td>
<td>1</td>
<td>ERJ-3GEYJ105V</td>
<td>Resistor 1M Ohms 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P1.0MGCT-ND</td>
</tr>
<tr>
<td>R12, R14, R15, R38, R39</td>
<td>5</td>
<td>ERJ-3EKF1003V</td>
<td>Resistor 100K 1% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P100KHCT-ND</td>
</tr>
<tr>
<td>R13</td>
<td>1</td>
<td>ERJ-3EKF1203V</td>
<td>Resistor 120K 1% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P120KHCT-ND</td>
</tr>
<tr>
<td>R18, R19, R20, R21, R28</td>
<td>5</td>
<td>ERJ-3GEYJ331V</td>
<td>Resistor 330 ohms 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P330GCT-ND</td>
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<tr>
<td>R2, R16, R17, R23, R31</td>
<td>5</td>
<td>ERJ-3GEYJ103V</td>
<td>Resistor, 10K 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P10KGCT-ND</td>
</tr>
<tr>
<td>R22</td>
<td>1</td>
<td>ERJ-3GEYJ470V</td>
<td>Resistor 47 Ohms 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P47GCT-ND</td>
</tr>
<tr>
<td>R24, R27, R42</td>
<td>3</td>
<td>ERJ-3GEYJ152V</td>
<td>Resistor, 1.5K 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P1.5KGCT-ND</td>
</tr>
<tr>
<td>R25, R26, R32, R33, R34, R35, R36</td>
<td>7</td>
<td>ERJ-3GEYJ270V</td>
<td>Resistor 27 Ohms 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P27GCT-ND</td>
</tr>
<tr>
<td>R29, R30, R37</td>
<td>3</td>
<td>ERJ-3GEYJ472V</td>
<td>Resistor 4.7K 5% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P4.7KGCT-ND</td>
</tr>
<tr>
<td>R3</td>
<td>1</td>
<td>ERJ-3EKF9101V</td>
<td>Resistor 9.10K 1% 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P9.1KHCT-ND</td>
</tr>
<tr>
<td>R4, R5, R6, R7</td>
<td>4</td>
<td>ERA-3AEB104V</td>
<td>Resistor 100K 0.1% 25ppm 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P100KDBTR-ND</td>
</tr>
<tr>
<td>R8, R9, R10, R11</td>
<td>4</td>
<td>ERA-3AEB103V</td>
<td>Resistor 10K 0.1% 25ppm 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P10KDBTR-ND</td>
</tr>
<tr>
<td>SPK1</td>
<td>1</td>
<td>NDT-03C</td>
<td>Speaker, 8 ohm 0.3W Surface mount</td>
<td>Star Micronics</td>
<td>Hawk</td>
<td>NDT-03C</td>
</tr>
<tr>
<td>SW2a</td>
<td>1</td>
<td>TPA511GLFS</td>
<td>Switch, 4-way Navigation SMT w/ select</td>
<td>C&amp;K</td>
<td>Digikey</td>
<td>401-1130-2-ND</td>
</tr>
<tr>
<td>SW2b</td>
<td>1</td>
<td>BOUTON TPA</td>
<td>Cap for Nav Switch, Black</td>
<td>C&amp;K</td>
<td>Digikey</td>
<td>401-1997-ND</td>
</tr>
<tr>
<td>SW1</td>
<td>1</td>
<td>BS3-1000P</td>
<td>Switch, Momentary Tact 160gmf 6mm</td>
<td>Omron</td>
<td>Arrow / Future</td>
<td>SW415-ND</td>
</tr>
<tr>
<td>U1</td>
<td>1</td>
<td>LM3S3748</td>
<td>IC, Microcontroller ARM Cortex TQFP-100</td>
<td>Luminary</td>
<td>Luminary</td>
<td>LM3S3748</td>
</tr>
<tr>
<td>U2</td>
<td>1</td>
<td>FAN4174IS5X_NL</td>
<td>IC, Op-amp Rail-to-Rail SOT23-5</td>
<td>Fairchild</td>
<td>Mouser</td>
<td>512-FAN4174IS5X</td>
</tr>
</tbody>
</table>
### Table C-1. LM3S3748 Bill of Materials (Continued)

<table>
<thead>
<tr>
<th>Reference</th>
<th>Qty</th>
<th>Part Number</th>
<th>Description</th>
<th>Mfg</th>
<th>Supplier</th>
<th>Stock No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>U3a</td>
<td>1</td>
<td>KWH015C04-F01</td>
<td>LCD Module 128x128 1.5&quot; CTN</td>
<td>Formike Display</td>
<td>Wan Display</td>
<td>KWH015C04-F01</td>
</tr>
<tr>
<td>U3b</td>
<td>1</td>
<td>SFW20R-2STE1LF</td>
<td>Connector, 20 way 1mm ZIF flat-flex connector</td>
<td>FCI</td>
<td>Digikey</td>
<td>609-1914-2-ND</td>
</tr>
<tr>
<td>U4</td>
<td>1</td>
<td>CAT93C46YI-G / AT93C46A-10TU-2.7</td>
<td>Serial EEPROM 1Kbit TSSOP8</td>
<td>Catalyst Atmel Mouser</td>
<td>Digikey</td>
<td>CAT93C46YI-G</td>
</tr>
<tr>
<td>U5</td>
<td>1</td>
<td>FT2232D</td>
<td>IC, USB to Serial Interface TQFP48</td>
<td>Ftdi</td>
<td>Digikey</td>
<td>FT2232D</td>
</tr>
<tr>
<td>U6</td>
<td>1</td>
<td>LC4032V-75TN48C</td>
<td>IC, CPLD 32 macro-cell TQFP48</td>
<td>Lattice Arrow</td>
<td>Digikey</td>
<td>LC4032V-75TN48C</td>
</tr>
<tr>
<td>U7</td>
<td>1</td>
<td>TPS2051BGDN</td>
<td>IC, Fault protected power switch TSSOP8</td>
<td>TI</td>
<td>Digikey</td>
<td>296-17313-1-ND</td>
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<tr>
<td>U8</td>
<td>1</td>
<td>PQ1LA333MSPQ</td>
<td>IC, Voltage regulator 3.3V 500mA SOT89-5</td>
<td>Sharp</td>
<td>Mouser</td>
<td>852-PQ1LA333MSPQ</td>
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<tr>
<td>U9</td>
<td>1</td>
<td>FSUSB11MTCX</td>
<td>IC, Full-speed USB switch TSSOP-14</td>
<td>Fairchild</td>
<td>Digikey Mouser</td>
<td>512-FSUSB11MTCX</td>
</tr>
<tr>
<td>Y1</td>
<td>1</td>
<td>NX8045GB-8.000000MHZ</td>
<td>Crystal, 8.00MHz 8.0x4.5mm SMT</td>
<td>NDK</td>
<td>Digikey</td>
<td>644-1018-2-ND</td>
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<tr>
<td>Y2</td>
<td>1</td>
<td>HCM49-4.194304MABJT</td>
<td>Crystal, 4.194304MHz HC49US SMT</td>
<td>Citizen</td>
<td>Mouser / Digikey</td>
<td>695-HCM49-419-U 300-8529-1-ND</td>
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<tr>
<td>Y3</td>
<td>1</td>
<td>FOXSDLF/060-20</td>
<td>Crystal, 6.00MHz HC49US SMT</td>
<td>Fox</td>
<td>Digikey</td>
<td>559-FOXSDLF/060-20 631-1008-2-ND</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>EK-LM3S3748-A</td>
<td>PCB, FR-4 4-layer Rev A</td>
<td>Advanced</td>
<td>Advanced</td>
<td>EK-LM3S3748</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3M 4949</td>
<td>Tape, VHB Foam Double coat 45mil 0.25&quot; x 1.25&quot; cut piece</td>
<td>3M</td>
<td>Uline</td>
<td>S-10144</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>DI002860</td>
<td>Adhesive label for speaker LMI logo 0.5”x0.5”</td>
<td>Drake</td>
<td>Drake</td>
<td>DI002860</td>
</tr>
<tr>
<td>SW3</td>
<td>1</td>
<td>SSSS820201 CUS22-TB</td>
<td>Slide Switch SMT verticle SPCO</td>
<td>Alps Copal Mouser</td>
<td>Digikey</td>
<td>688-SSSS820201 563-1105-1-ND</td>
</tr>
<tr>
<td>R40, JP33</td>
<td>2</td>
<td>ERJ-3GEO0R00V</td>
<td>Resistor 0 Ohms 0603</td>
<td>Panasonic</td>
<td>Digikey</td>
<td>P0.0GTR_ND</td>
</tr>
</tbody>
</table>

Do not populate J3 (0.05” JTAG header), R41, R43, BAT1
This appendix contains the following sections:

- I/O Breakout Pads (see page 37)
- DC Power Jack (see page 38)
- ARM Target Pinout (see page 38)
- Oscilloscope Header Pinout (see page 38)

### I/O Breakout Pads

The LM3S3748 EVB has 55 I/O pads and 13 power pads for a total of 68 pads. Connection can be made by soldering wires directly to these pads, or by using 0.1” pitch headers and sockets.

**NOTE:** In Table D-1, an asterisk (*) by a signal name (also on the EVB PCB) indicates the signal is typically used for on-board functions. Normally, you should cut the associated jumper (JP1-30) before using an assigned signal for external interfacing.

#### Table D-1. I/O Breakout Pads

<table>
<thead>
<tr>
<th>Description</th>
<th>Pad No.</th>
<th>Description</th>
<th>Pad No.</th>
<th>Description</th>
<th>Pad No.</th>
<th>Description</th>
<th>Pad No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>GND</td>
<td>34</td>
<td>PB7/NMI *</td>
<td>33</td>
<td>GND</td>
<td>31</td>
<td>+VBUS</td>
<td>66</td>
</tr>
<tr>
<td>PH0/CCP6</td>
<td>32</td>
<td>PB4/C0- *</td>
<td>29</td>
<td>PB5/C1- *</td>
<td>64</td>
<td>PC2/TDI *</td>
<td>62</td>
</tr>
<tr>
<td>PB6/C0+ *</td>
<td>30</td>
<td>PE3/SSI1TX</td>
<td>27</td>
<td>PC1/CCP7</td>
<td>60</td>
<td>PH1/SSI1FSS</td>
<td>58</td>
</tr>
<tr>
<td>PE2/SSI1RX</td>
<td>28</td>
<td>PD5/ADC6</td>
<td>25</td>
<td>PE2/SSI1FSS</td>
<td>58</td>
<td>PB2/I2C0SCL</td>
<td>56</td>
</tr>
<tr>
<td>PD4/ADC7</td>
<td>26</td>
<td>PD7/ADC4</td>
<td>23</td>
<td>GND</td>
<td>44</td>
<td>PB3/I2C0SDA*</td>
<td>52</td>
</tr>
<tr>
<td>PD6/ADC5</td>
<td>24</td>
<td>PE6/ADC1 *</td>
<td>21</td>
<td>PF1/PWM1 *</td>
<td>50</td>
<td>PE0/SSI1CLK</td>
<td>55</td>
</tr>
<tr>
<td>PE7/ADC0 *</td>
<td>22</td>
<td>PE4/ADC3 *</td>
<td>19</td>
<td>PF3/PWM3 *</td>
<td>48</td>
<td>PG0/PWM4 *</td>
<td>53</td>
</tr>
<tr>
<td>PE5/ADC2 *</td>
<td>20</td>
<td>PD1/PHA0</td>
<td>17</td>
<td>GND</td>
<td>44</td>
<td>PG3/FAULT2 *</td>
<td>51</td>
</tr>
<tr>
<td>PD0/IDX0</td>
<td>18</td>
<td>PD3/CCP0</td>
<td>15</td>
<td>GND</td>
<td>44</td>
<td>+3.3V</td>
<td>49</td>
</tr>
<tr>
<td>PD2/CCP5</td>
<td>16</td>
<td>PG1/PWM5 *</td>
<td>13</td>
<td>PF2/PWM2 *</td>
<td>47</td>
<td>PF2/FAULT0</td>
<td>45</td>
</tr>
<tr>
<td>PG2 *</td>
<td>14</td>
<td>PC6/U1RX</td>
<td>11</td>
<td>GND</td>
<td>44</td>
<td>GND</td>
<td>42</td>
</tr>
<tr>
<td>PC7/U1TX</td>
<td>12</td>
<td>PC4/CCP4 *</td>
<td>9</td>
<td>GND</td>
<td>44</td>
<td>PF6/CCP1</td>
<td>40</td>
</tr>
<tr>
<td>PC5/C1+ *</td>
<td>10</td>
<td>PA2/SSI0CLK*</td>
<td>7</td>
<td>GND</td>
<td>42</td>
<td>PG6/PWM6 *</td>
<td>36</td>
</tr>
<tr>
<td>PA1/U0TX *</td>
<td>8</td>
<td>PA5/SSI0TX*</td>
<td>5</td>
<td>F0/PWM0 *</td>
<td>41</td>
<td>PG5/FAULT1 *</td>
<td>35</td>
</tr>
<tr>
<td>PA4/SSI0RX</td>
<td>6</td>
<td>PA7/I2C1SDA</td>
<td>3</td>
<td>F0/PWM0 *</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PA6/I2C1SCL</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PG7/PWM7 *</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

April 2, 2008
**DC Power Jack**

The EVB provides a DC power jack for connecting an external +5V regulated (±5%) power source as shown in Figure D-1.

*Figure D-1. DC Power Jack*

![DC Power Jack](image)

The socket is 3.5 mm dia with a 1.3 mm pin. Suitable plugs include CUI PP3-002D.

**ARM Target Pinout**

In ICDI input and output mode, the LM3S3748 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 (see Table D-2).

*Table D-2. ARM Target Pinout*

<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>

**Oscilloscope Header Pinout**

Table D-3 shows the header pinout for the oscilloscope.

*Table D-3. Oscilloscope Header Pinout*

<table>
<thead>
<tr>
<th>Pad No.</th>
<th>Description</th>
<th>Test Wiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Test Point 1</td>
<td>Wire this pair</td>
</tr>
<tr>
<td>2</td>
<td>Channel 1 +</td>
<td></td>
</tr>
</tbody>
</table>
Table D-3. Oscilloscope Header Pinout (Continued)

<table>
<thead>
<tr>
<th>Pad No.</th>
<th>Description</th>
<th>Test Wiring</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Channel 1-</td>
<td>Wire this pair</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Test Point 2</td>
<td>Wire this pair</td>
</tr>
<tr>
<td>6</td>
<td>Channel 2 +</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Channel 2 -</td>
<td>Wire this pair</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>
References

In addition to this document, the following references are included on the Stellaris LM3S3748 Evaluation Kit documentation CD-ROM and are also available for download at www.luminarymicro.com:

- Stellaris LM3S3748 Evaluation Kit Quickstart Guide for appropriate tool kit (see "Evaluation Kit Contents," on page 12)
- Stellaris LM3S3748 Evaluation Kit Read Me First
- Stellaris Family Peripheral Driver Library User’s Guide, publication PDL-LM3S3748
- Stellaris LM3S3748 Microcontroller Data Sheet, publication DS-LM3S3748

Additional references include:

- Formike Electronic KWH015C04-F01 LCD Display Data Sheet
- Sitronix ST7637 Color LCD Controller/Driver 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
  - Code Red Technologies development tools web site: www.code-red-tech.com
Contact Information

Company Information

Luminary Micro, Inc. designs, markets, and sells ARM Cortex-M3-based microcontrollers (MCUs). Austin, Texas-based Luminary Micro is the lead partner for the Cortex-M3 processor, delivering the world's first silicon implementation of the Cortex-M3 processor. Luminary Micro's introduction of the Stellaris® family of products provides 32-bit performance for the same price as current 8- and 16-bit microcontroller designs. With entry-level pricing at $1.00 for an ARM technology-based MCU, Luminary Micro's Stellaris product line allows for standardization that eliminates future architectural upgrades or software tool changes.

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