

Stellaris® LM3S818 controlCARD Module

User's Manual



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Stellaris® LM3S818 controlCARD Module Overview

The Stellaris® LM3S818 controlCARD module is a DIMM form-factor module that can be used standalone or with a range of baseboards to accelerate evaluation and development.

Texas Instruments offers a range of controlCARD baseboards for motor and power-control application. In most cases, these are available as complete kits that include a controlCARD module and a baseboard. The Stellaris MDL-LM3S8

- Documentation specific to each supported baseboard
- CrossHairs control GUI Windows application

Tools CD(s)

- Texas Instruments' Code Composer Studio™ IDE

Compatibility Matrix

Table 1-1 shows which baseboards are compatible with the MDL-LM3S818CNCD controlCARD module.

Using the LM3S818 controlCARD Module

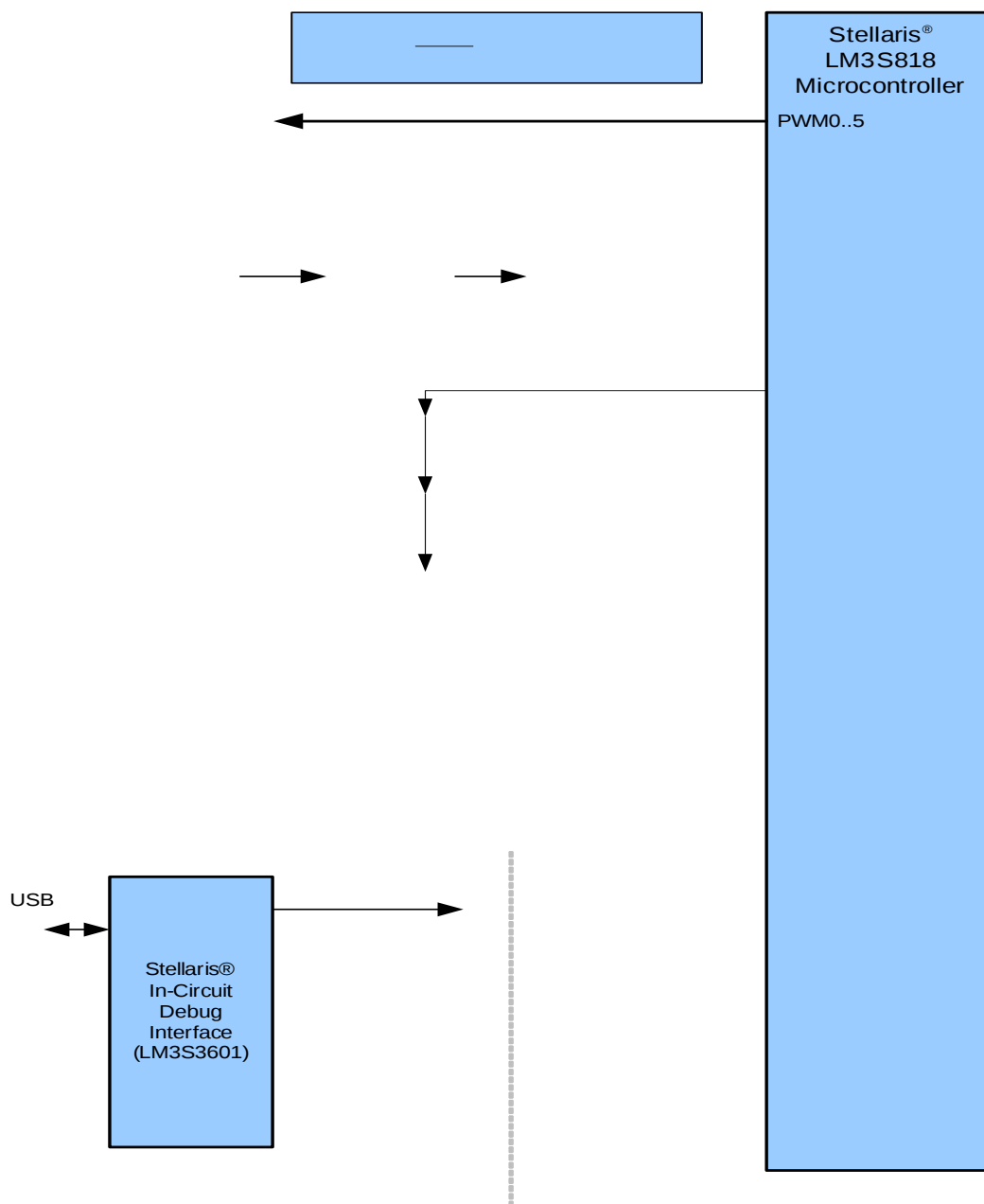
To start using the controlCARD module as a standalone module, see the MDL-LM3S818CNCD Read Me First document.

To start using the controlCARD module in conjunction with a Texas Instruments' controlCARD baseboard, see the Read Me First do

Hardware Description

In addition to an LM3S818 microcontroller, the controlCARD module includes some simple multiplexing logic and an integrated Stellaris in-circuit debug interface (ICDI). This chapter describes how the hardware interfaces to the microcontroller. Figure 2-1 shows the controlCARD module block diagram.

Figure 2-1. Block Diagram



Functional Description

This section provides a detailed description of the LM3S818 controlCARD module hardware.

Microcontroller and Interfaces (Schematic Page 2)

LM3S818 Microcontroller

The Stellaris LM3S818 is an ARM Cortex-M3-based microcontroller with 64-KB flash memory, 8-KB SRAM, 50-MHz operation, Motion control PWMs, and a wide range of other peripherals. Refer to the LM3S818 data sheet for complete device details.

The LM3S818 microcontroller is factory-programmed with a simple 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.

DIMM Edge Connector

Most of the Stellaris microcontroller GPIO signals are routed to the DIMM edge connector.

The controlCARD module is compatible with standard DIMM sockets, such as Molex Part number 87630-1001.

User LED

The board also has a green User LED connected to GPIO PB6. This GPIO signal is also used to control the multiplexing of the CCP (Timer) signals and may not be available in some baseboards applications.

Signal Multiplexing

The DRV8312 and DRV8301 baseboards have Hall-inputs on different DIMM pins. U11 multiplexes these signals under the control of GPIO PB6.

46	CCP2	31(DRV8301), 36(DRV8312)	CAP3	CAP3
11	CCP4	29	DAC_PWM1	DAC_PWM1
41	TRSTn	99	TRSTn	TRSTn
40	TCK	48	TCK	TCK
39	TMS	49	TMS	TMS
38	TDI	97	TDI	TDI
37	TDO	98	TDO	TDO
17	U0Rx	43	GPIO-28 (spare SCI	

Reset

The $\overline{\text{RESET}}$ signal into the LM3S818 microcontroller connects to an R-C network (R1/C8) and to the ICDI circuit for a debugger-controlled reset.

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

- Power-on reset

- By the ICDI circuit when instructed by the debugger (this capability is optional, and may not be supported by all debuggers).

Power Supplies

The controlCARD module is typically powered by the baseboards via the DIMM edge connector. When used as a standalone module, without a baseboard, install wire jumpers to support USB-powered operation.

WARNING – Do not install the wire power links if the controlCARD module is installed in a baseboard. Damage to the board may result. In hi

Figure 2-2. controlCARD Module Isolation

The controlCARD module may be used without a baseboard. In order to power the non-isolated circuitry, power must be bridged across the isolation barrier as shown in Figure 2-3.

Software Development

This chapter provides general information on software development as well as instructions for Flash memory programming.

Software Description

The CD supplied with the controlCARD module includes the StellarisWare® Peripheral Driver Library which contains a rich set of functions for developing software for the Stellaris microcontroller and its on-chip peripherals.

The software includes a set of example applications that utilize the StellarisWare® Peripheral Driver Library. These applications demonstrate the capabilities of the LM3S818 microcontroller, as well as providing a starting point for developing user applications.

Source Code

The complete source code is included on the Development Kit CD. See your selected toolchain's Quickstart guide for information on how to install the source code and toolchain. The source code and binary files are installed in the StellarisWare tree.

Tool Options

The source code installation includes directories containing projects and/or makefiles for the following toolchains:

- Keil ARM RealView® Microcontroller Development System

- IAR Embedded Workbench for ARM

- Sourcery CodeBench™ (RDP checking on full name for this product--however, not supported now for controlCARD)

- Code Red Technology Red Suite

- Generic Gnu C compiler

- Texas Instruments' Code Composer Studio™ IDE

Baseboards from Texas Instruments may not support all toolchain options.

Evaluation versions of these tools may be downloaded from www.ti.com/stellaris. Due to code size restrictions, the evaluation tools may not build all example programs. A full license is necessary to re-build or debug all examples.

Instructions for installing and using each of the evaluation tools can be found in each toolchain's Quickstart guide (for example, Quickstart-Keil, Quickstart-IAR) which are available for download from the evaluation kit section of our web site at www.ti.com/stellaris.

For detailed information on using the tools, see the documentation included in the toolchain installation or visit the website of the tools supplier.

Programming the MDL-LM3S818CNCD controlCARD Module

The MDL-LM3S818CNCD software package includes pre-built binaries for each of the example applications. If you installed StellarisWare to the default installation path (C:\StellarisWare), you can find the example applications in "C:\StellarisWare\boards\mdl-lm3s818cncd". The on-board Stellaris ICDI is used along with the Stellaris LM Flash Programmer tool to program applications on the MDL-LM3S818CNCD board.

To program example applications into the MDL-LM3S818CNCD evaluation board using the Stellaris ICDI:

1. Install LM Flash Programmer on a Windows PC.
2. Connect the USB cable A-plug to an available port on the PC and the miniB-plug to the board.
3. Verify that both power LEDs are lit. LED D4 indicates the status of the non-isolated microcontroller power and LED D5 indicates the status of the isolated USB power.
4. Run LM Flash Programmer.
5. In the Configuration tab, use the Quick Set control to select LM3S811 Evaluation Board. Move to the Program tab and click the Browse button. Navigate to the example applications directory (the default location is "C:\StellarisWare\boards\MDL-LM3S818CNCD").
6. Each example application has its own directory. Navigate into the example directory that you want to load and then into the directory which contains the binary (*.bin) files. Select the binary file and click Open.
7. Set the "Erase Method" to "Erase Necessary Pages", check the "Verify After Program" box, and check "Reset MCU After Program."
8. Next, click the Program button to start the Erase, Download and Verify process. The DEBUG ACTIVE LED (D1) on the board turns on at this time.
9. Program execution starts once Verify is complete.

Schematics

This section contains the schematics for the LM3S818 controlCARD module:

Stellaris Contents on page 16

Stellaris MCU on page 17

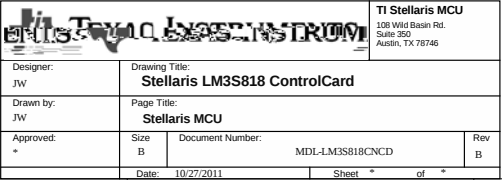
Stellaris ICDI on page 18

Revision	Date	Description
A	Aug 15, 11	Internal Prototype
B	Oct 27, 11	Release to production.

Notes - Unless otherwise noted
1. Resistances values in Ohms
2. Capacitance values in microfarads (uF)
3. All 0.1uF and 0.01uF capacitors are decoupling and should be placed near the IC they are shown with

Page 1 - Title - Index - Revisions
Page 2 - Stellaris - Edge Connector
Page 3 - USB Debugger - Isolation

		TI Stellaris MCU 108 Wild Basin Rd. Suite 350 Austin, TX 78746	
Designer: JW		Drawing Title: Stellaris LM3S818 ControlCard	
Drawn by: JW		Page Title: Title Page	
Approved: JAG	Size B	Document Number: MDL-LM3S818CNCD	Rev B
Date: 10/27/2011		Sheet * of *	



	1	2	3	4	5	6
A						
B						
C						
D						
	1	2	3	4	5	6

Component Locations

Figure B-1 shows the plot of the top-side component location and Figure B-2 shows the plot of the bottom-side component location.

Figure B-1. Top-Side Component Location



Figure B-2. Bottom-Side Component Location

References

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

Stellaris® LM3S818 controlCARD Module (MDL-LM3S818CNCD) User's Manual, publication MDL-LM3S818CNCD-UM

Stellaris® Development and Evaluation Kits for Code Composer Studio™ Quickstart Guide

Stellaris® LM3S818 Microcontroller Data Sheet, publication DS-LM3S818

StellarisWare Driver Library

StellarisWare Driver Library User's Manual, publication SW-DRL-UG

Stellaris® DK-LM3S-DRV8312 InstaSPIN™-BLDC README First, publication DK-LM3S-DRV8312-RMF

Medium Voltage Digital Motor Control Kit for Stellaris® Microcontrollers (DK LM3S DRV8312) Baseboard Hardware Reference Guide, publication DK-LM3S-DRV8312-RG

Three-Phase PWM Motor Driver (DRV8312) Data Sheet, publication SLES256

Sensorless Trapezoidal Control of BLDC Motors Using BEMF Integration (InstaSPIN™ BLDC) on Stellaris® Microcontrollers Application Note, publication AN01289

Information on development tool being used:

Texas Instruments' Code Composer Studio™ IDE web site, www.ti.com/ccs

Texas Instruments (TI) provides the enclosed Evaluation Board/Kit/Module (EVM) under the following conditions:

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Under the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. The device can radiate radio frequency energy and has not been tested for compliance with the limits of computing equipment under FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. The equipment may cause interference with radio communications, in which case the user at his own expense will be required to take measures to correct this interference.

Obligations: This radio is intended for development/professional use only in legally allocated frequency and power bands. The frequency and/or power availability of this EVM and its development application(s) must comply with local regulatory requirements. It is the user's sole responsibility to only operate this device in the allocated frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and void. The user must obtain appropriate experimental/development licenses from local regulatory authorities unless user has obtained appropriate experimental/development licenses from local regulatory authorities. The responsibility of user including its acceptable authorization.

Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference received, including interference that may cause undesired operation. If the device is not expressly approved by the party responsible for compliance could void the user's authority to operate the device.

The device has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference, in which case the user will be required to correct the interference at his own expense.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué -9 TJ c ler0(ltyp0(de)-3avec)-3iuis esttedestn type dan4t

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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Unless otherwise indicated, this EVM is not a finished

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