

Stellaris® LM3S818 controlCARD Module

User's Manual



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Stellaris® LM3S818 controlCARD Module Overview

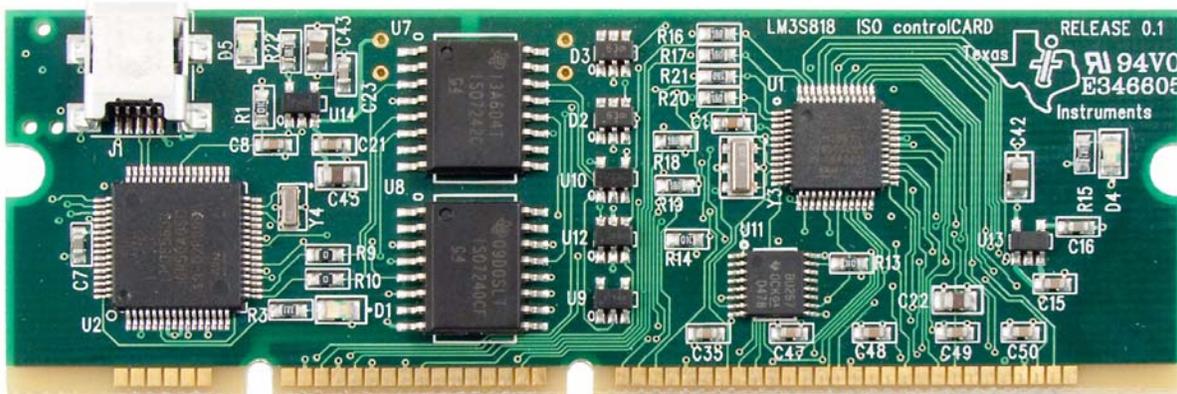
The Stellaris® LM3S818 controlCARD module is a DIMM form-factor module that can be used standalone or with a range of baseboards to accelerate evaluation and development.

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-LM3S818CNCD is part of a controlCARD lineup that includes cards for C2000 and MSP430 devices.

Not all controlCARD and baseboards configurations are supported. See the “Compatibility Matrix” on page 7 for more information on baseboards options.

The Stellaris LM3S818 is an ARM® Cortex™-M3 microcontroller with 64 KB Flash with single-cycle operation at 50 MHz.

Figure 1-1. MDL-LM3S818CNCD controlCARD Module



MDL-LM3S818CNCD Kit Contents

The LM3S818 controlCARD module kit comes with the following:

- MDL-LM3S818CNCD controlCARD module
 - On board Stellaris In-Circuit Debug Interface
- Cables/Accessories
 - USB-miniB to USB-A plug cable (for debug and serial communication)
 - 1/2-inch blue jumper wires (for bridging power)
- Development Kit CD containing:
 - For the controlCARD module in standalone use:
 - Complete documentation
 - StellarisWare® Peripheral Driver Library and example source code
 - For the controlCARD module when used with a supported baseboard:
 - Source-code and binaries

- 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.

Table 1-1. Compatibility Matrix

Baseboard	Description	Electrical compatibility?	Supported with Software?	Complete Kit available?
DRV8312	3-Phase 6.5A BLDC motor driver	Yes	Yes	DK-LM3S-DRV8312
DRV8301	3-Phase BLDC motor pre-driver	Yes	No	No

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 document specific to that platform.

- EK-LM3S-DRV8312 Read Me First

Features

The Stellaris MDL-LM3S818CNCD controlCARD module includes the following features:

- LM3S818IQN50 Stellaris microcontroller
 - 32-bit ARM® Cortex™-M3 core
 - 50 MHz max speed
 - 64 KB Flash, 8 KB RAM
- DIMM form-factor
- GPIO signals available on DIMM edge-connector
- User LED
- Debug
 - Stellaris In-Circuit Debug Interface (ICDI)
 - Isolated to 560 V working-voltage using Texas' Instruments' digital isolators

Board Dimensions

3.55"x 1.40" (LxW)

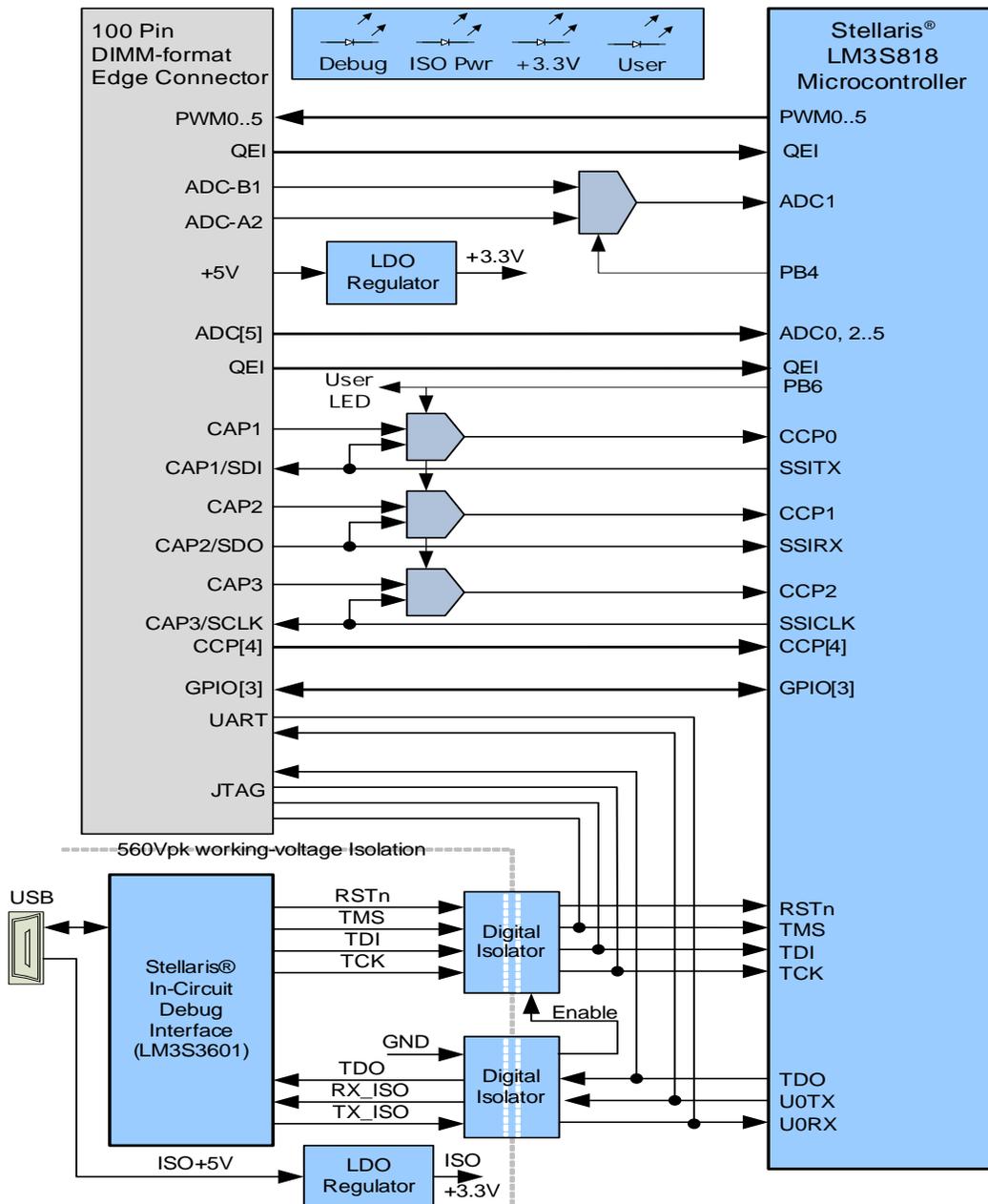
See Appendix B, "Component Locations," on page 19 for more details

CHAPTER 2

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.

An analog switch (U12) under the control of PB4 selects between bus current (I-total) and Phase B current (IB-FB).

Table 2-1. Signal Table

LM3S818 Pin #	LM3S818 Name	Edge Connector Pin #	DRV8301 Use	DRV8312 Use	Notes
25	PWM0	23	PWM_AH	PWM_A	
26	PWM1	73	PWM_AL	RESET_A	
29	PWM2	24	PWM_BH	PWM_B	
30	PWM3	74	PWM_BL	RESET_B	
35	PWM4	25	PWM_CH	PWM_C	
36	PWM5	75	PWM_CL	RESET_C	
34	Fault	84	FAULTn	FAULTn	
14	PhA	40	QEPA	QEPA	
12	PhB	90	QEPB	QEBB	
33	IDX	91	QEPI	QEPI	
45	CCP0	30(DRV8301), 35(DRV8312)	CAP1	CAP1	Hall inputs (CAPx) needed to be moved on the DRV8301 board to gain access to an SPI port.
13	CCP1	80(DRV8301), 85(DRV8312)	CAP2	CAP2	

Table 2-1. Signal Table (Continued)

LM3S818 Pin #	LM3S818 Name	Edge Connector Pin #	DRV8301 Use	DRV8312 Use	Notes
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 header)	GPIO-28 (spare SCI header)	
18	U0Tx	93	GPIO-29 (spare SCI header)	GPIO-29 (spare SCI header)	
19	SSICLK	36(DRV8301)	SCLK		DRV8301 has an SPI config port.
20	SSIFss	86(DRV8301)	/SCS		
21	SSIRx	85(DRV8301)	SDO		
22	SSITx	35(DRV8301)	SDI		
27	PD2	83	OTWn	OTWn	
28	PD3	42	EN_GATE		
44	PB4	45			Switch signal for choosing between IB current or DC Bus Current measurement
43	PB5	81	DC_CAL		
42	PB6				This signal sets the SPI and CCP signal muxing for either DRV8312 or DRV8301 support.
1	ADC0	59	IA-FB	IA-FB	
2	ADC1	9 or 61	IB-FB or ITOTAL	IB-FB or ITOTAL	
3	ADC2	11	VDCBUS	VDCBUS	
4	ADC3	21	ADC-Vhb1	ADC-Vhb1	
48	ADC4	71	ADC-Vhb2	ADC-Vhb2	
47	ADC5	15	ADC-Vhb3	ADC-Vhb3	

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 high-voltage applications, the power supplies must remain electrically isolated for personal safety.

Debug Interface, Virtual COM Port, and Isolators (Schematic Page 3)

Stellaris In-Circuit Debug Interface (ICDI) and Virtual COM Port

The MDL-LM3S818CNCD controlCARD module includes an on-board Stellaris In-Circuit Debug Interface (ICDI). The Stellaris ICDI allows for the programming and debug of the LM3S818 using LM Flash and/or any of the supported tool chains.

The debug interface incorporates Texas Instruments' digital isolators (ISO7240M and ISO7242M) for safety isolation between the the ICDI and the Stellaris microcontroller. Due to the presence of the uni-directional isolators, only JTAG debugging and programming is supported. Serial Wire Debug (SWD) and Serial Wire Trace (SWT) are not supported.

Virtual COM Port

When plugged in to a PC, the device enumerates as a debugger and a virtual COM port. The COM port is connected to the following pins on the microcontroller as shown in Table 2-2.

Table 2-2. COM Port Pin Connections

GPIO Pin	Pin Function	Virtual COM Port
PA0	U0RX	TXD
PA1	U0TX	RXD

The UART signals are also electrically isolated.

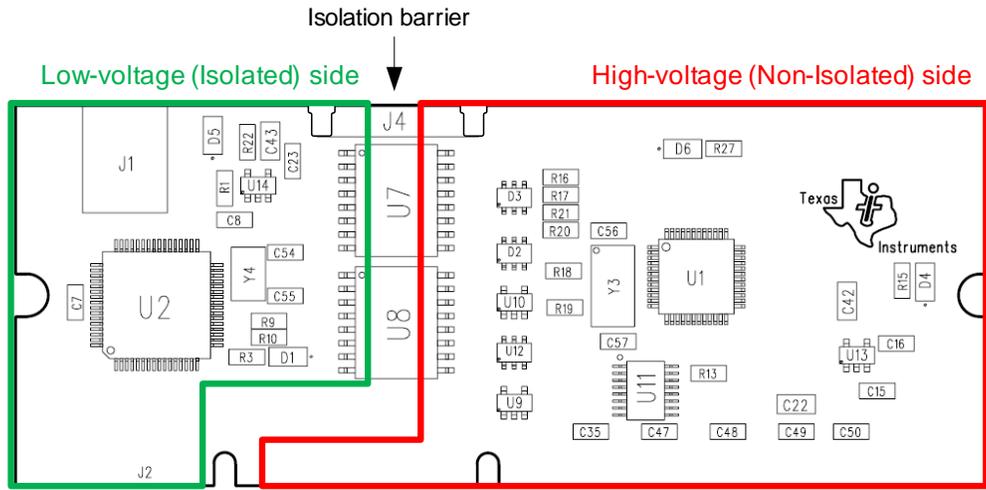
Electrical Isolation

The PCB layout incorporates IEC standard reinforced isolation for over-voltage category II and pollution degree 2. Creepage and clearance distances are 6.4 mm. The digital isolators limit the working voltage to 560 Vpk, which is sufficient for most 115 Vrms and 230 Vrms line-powered designs. If using the controlCARD as a module in a new design, refer to the safety regulations that apply to that product and its environment to determine the safe working voltage.

The integrated isolation feature allows the Stellaris microcontroller to operate at the same common-mode voltage as the baseboards which simplifies circuit design in high-voltage motor control designs. Firmware programming, debugging, and serial communication is supported using the isolated, low-voltage debug interface. Figure 2-2 shows controlCARD module isolation.

WARNING – When installed in a high-voltage power board, the microcontroller and non-isolated circuitry may be at a high-voltage. Read and understand the safety warnings included in the power board documentation before using the controlCARD module in a high-voltage application.

Figure 2-2. controlCARD Module Isolation



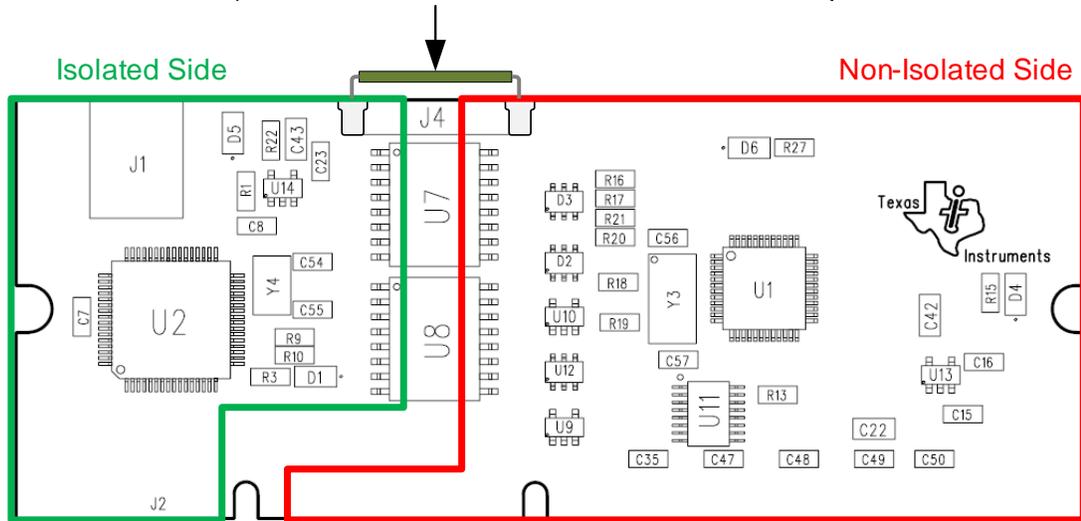
Note: Non-isolated means that these circuits will be at the same voltage potential as the base-board.

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.

WARNING – Do not install the controlCARD module in a baseboard if the jumpers are installed. The isolation barrier is compromised and an electric shock hazard exists. Power supply contention may also damage the controlCARD module or the baseboard.

Figure 2-3. controlCARD Module Jumpers

To bridge power install 0.5" wire power-jumpers into J4 and J5 (both sides of PCB). Ensure that wires do not short to other components



WARNING: Do not install controlCARD in a baseboard when wire power-jumpers are installed

CHAPTER 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:

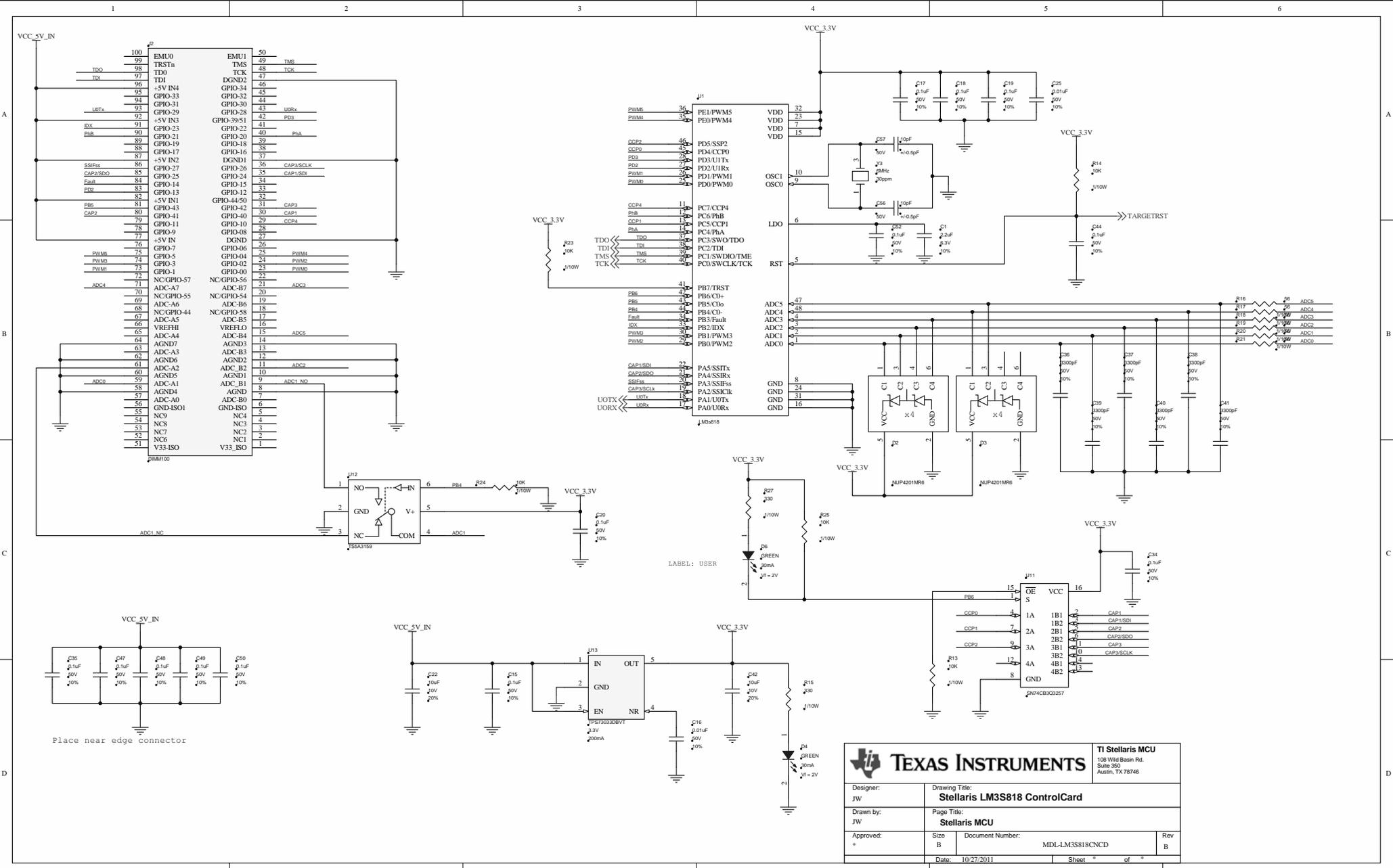
- Stellaris Contents on page 16
- Stellaris MCU on page 17
- Stellaris ICDI on page 18

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

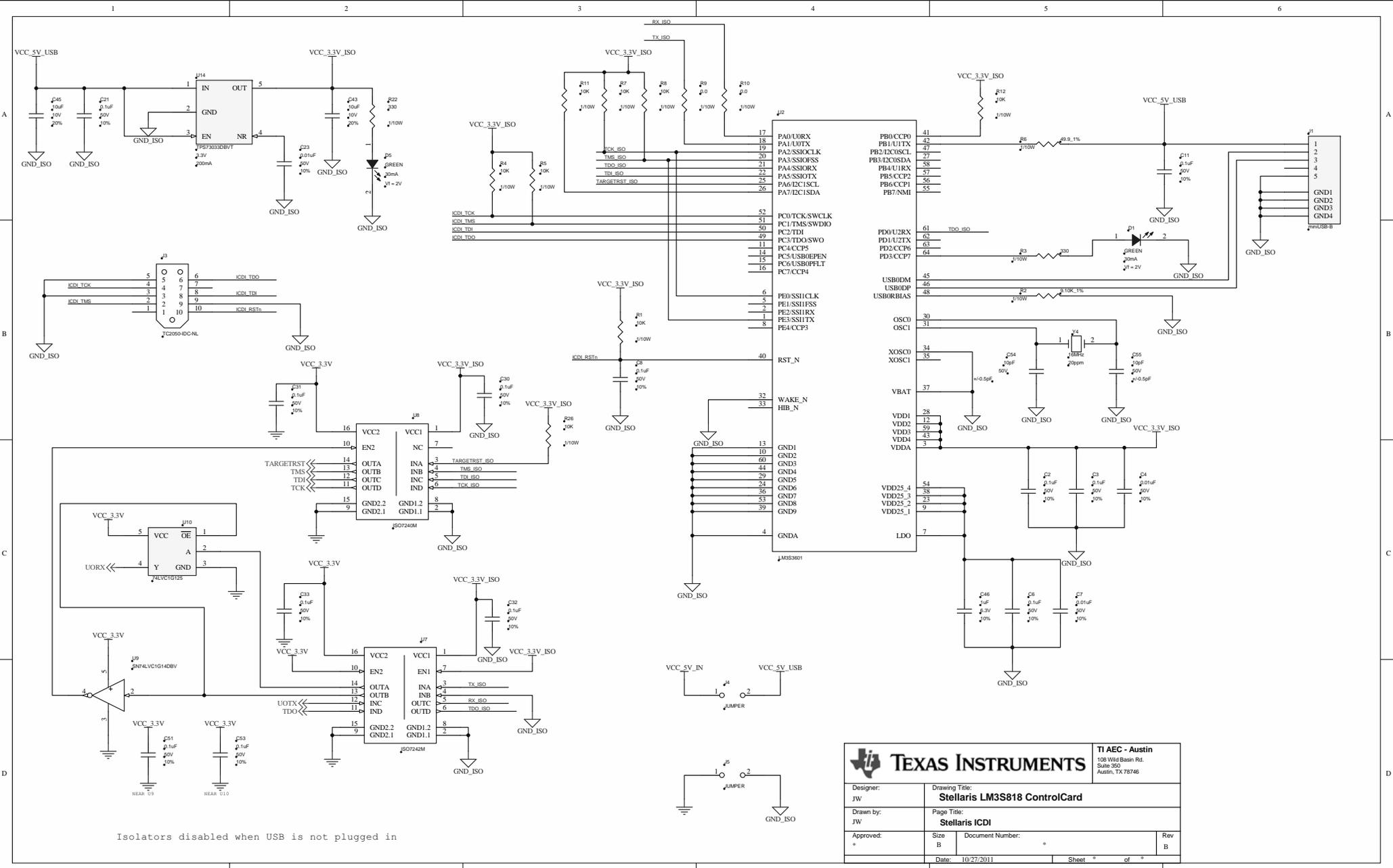
Revision	Date	Description
A	Aug 15, 11	Internal Prototype
B	Oct 27, 11	Release to production.

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

 TEXAS INSTRUMENTS		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 *	



TEXAS INSTRUMENTS		TI Stellaris MCU 108 Wild Basin Rd. Suite 350 Austin, TX 78746	
		Designer: JW	Drawing Title: Stellaris LM3S818 ControlCard
Drawn by: JW	Page Title: Stellaris MCU		
Approved: *	Size: B	Document Number: MDL-LM3S818CNCDC	Rev: B
Date: 10/27/2011		Sheet * of *	



Isolators disabled when USB is not plugged in

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

APPENDIX B

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

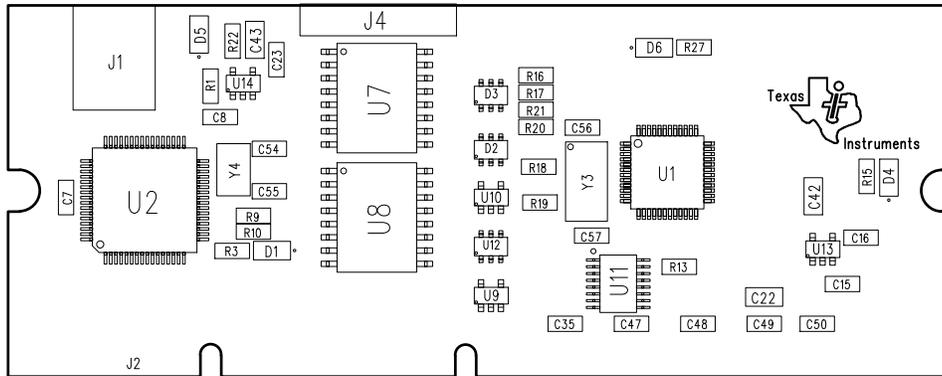
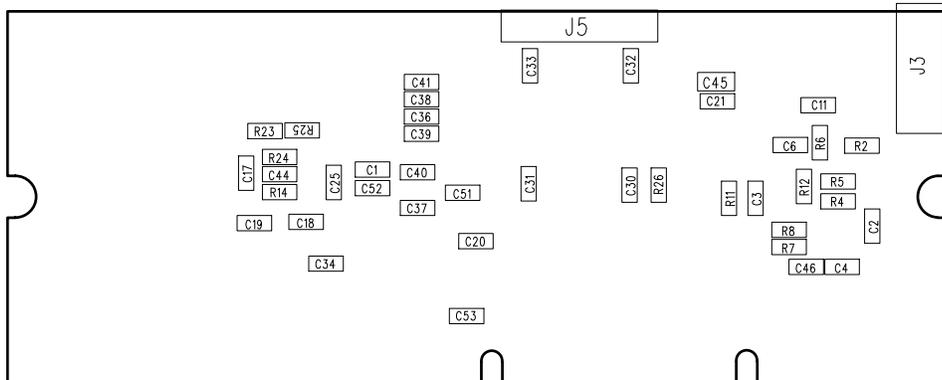


Figure B-2. Bottom-Side Component Location



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

EVALUATION BOARD/KIT/MODULE (EVM) ADDITIONAL TERMS

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

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user indemnifies TI from all claims arising from the handling or use of the goods.

Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

No license is granted under any patent right or other intellectual property right of TI covering or relating to any machine, process, or combination in which such TI products or services might be or are used. TI currently deals with a variety of customers for products, and therefore our arrangement with the user is not exclusive. TI assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or services described herein.

REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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

FCC Interference Statement for Class A EVM devices

This equipment 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 are designed to 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 instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

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.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

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.

Concerning EVMs including radio transmitters

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.

Concerning EVMs including detachable antennas

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.

Concernant les EVMs avec appareils radio

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.

Concernant les EVMs avec antennes détachables

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, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

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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EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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