

Sharp® 128x128 Memory LCD and microSD Card BoosterPack™ Plug-in Module (BOOSTXL-SHARP128)

This user's guide provides an overview of the features and options of the [BOOSTXL-SHARP128](#), including power, header pinouts and connections, and communication interfaces.

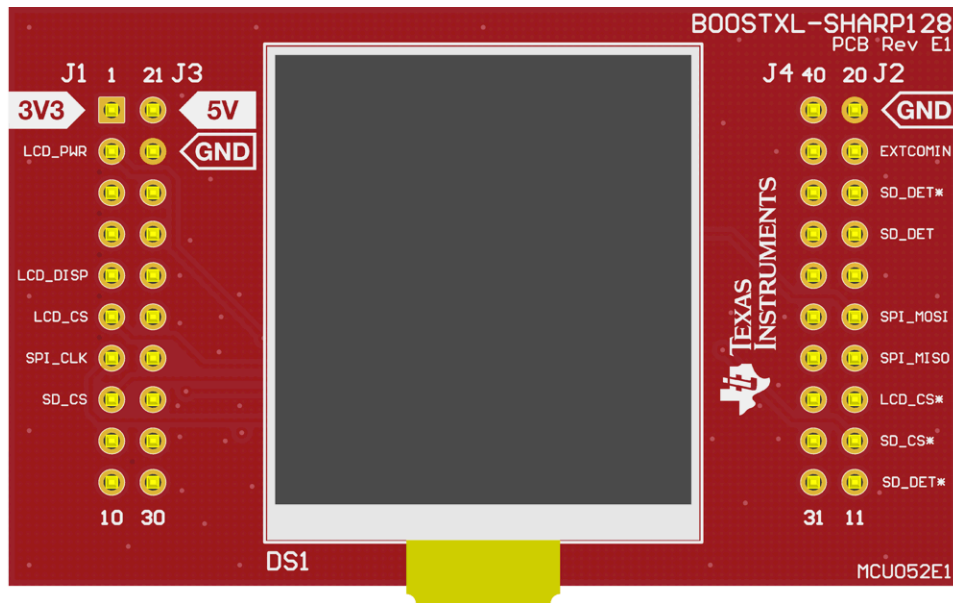


Figure 1. BOOSTXL-SHARP128 BoosterPack™ Plug-In Module

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1 Board Overview

1.1 Introduction

The Sharp® 128x128 Memory LCD and microSD Card TI BoosterPack™ Plug-in Module ([BOOSTXL-SHARP128](#)) is based on the LS013B7DH03 super-low-power TFT display panel from Sharp Electronics and also features a microSD card expansion slot. Both the LCD and SD card can be controlled using the serial peripheral interface (SPI).

TI MCU LaunchPad™ development kit developers can use this BoosterPack plug-in module to display sensor readings, time, graphics, or other information using the 128-x128-pixel LCD as well as to expand embedded applications with SD card read/write capabilities.

NOTE: The BOOSTXL-SHARP128 supersedes the obsoleted 430BOOST-SHARP96, which used the discontinued Sharp LS013B4DN04 LCD module. The 128x128 LS013B7DH03 and the 96x96 LS013B4DN04 LCD modules are pin-to-pin compatible with reusable firmware and drivers.

1.2 Key Features

- Sharp LS013B7DH03 memory LCD
 - 1.28-inch screen offering 128x128 monochrome pixels
 - Super-low power consumption TFT panel
 - microSD card expansion slot (no SD Card included)
- DCDC 3-V to 5-V converter available to also support 5-V Sharp displays

1.3 What's Included

1.3.1 Kit Contents

- 1x BOOSTXL-SHARP128 BoosterPack plug-in module
- 1x quick start guide

1.3.2 Software Examples

- SimpleLink™ SDK
- MSP430Ware™ software

1.4 First Steps: Example Projects

A good method to get familiar with the EVM is by using available example code online. The examples demonstrate the key features of the BoosterPack plug-in module.

3. Choose a LaunchPad development kit that fits your needs - Visit [TI's LaunchPad portal](#)

2. Download example code from the SimpleLink SDKs or MSP430Ware - See [Section 3](#)

1. Plug the BoosterPack into the LaunchPad

Launch!

1.5 Next Steps: Looking Into Provided Code and Examples

It is now time to start exploring more features of the EVM!

<http://www.ti.com/tool/boostxl-sharp128>

To get started, you need an integrated development environment (IDE) to explore and start editing the code examples. Refer to [Section 3](#) for more information on IDEs and where to download them.

The available code examples are provided inside the SimpleLink SDKs and MSP430Ware software. All code is licensed under BSD, and TI encourages reuse and modifications to fit specific needs.

2 Hardware

Figure 2 shows an overview of the EVM hardware.

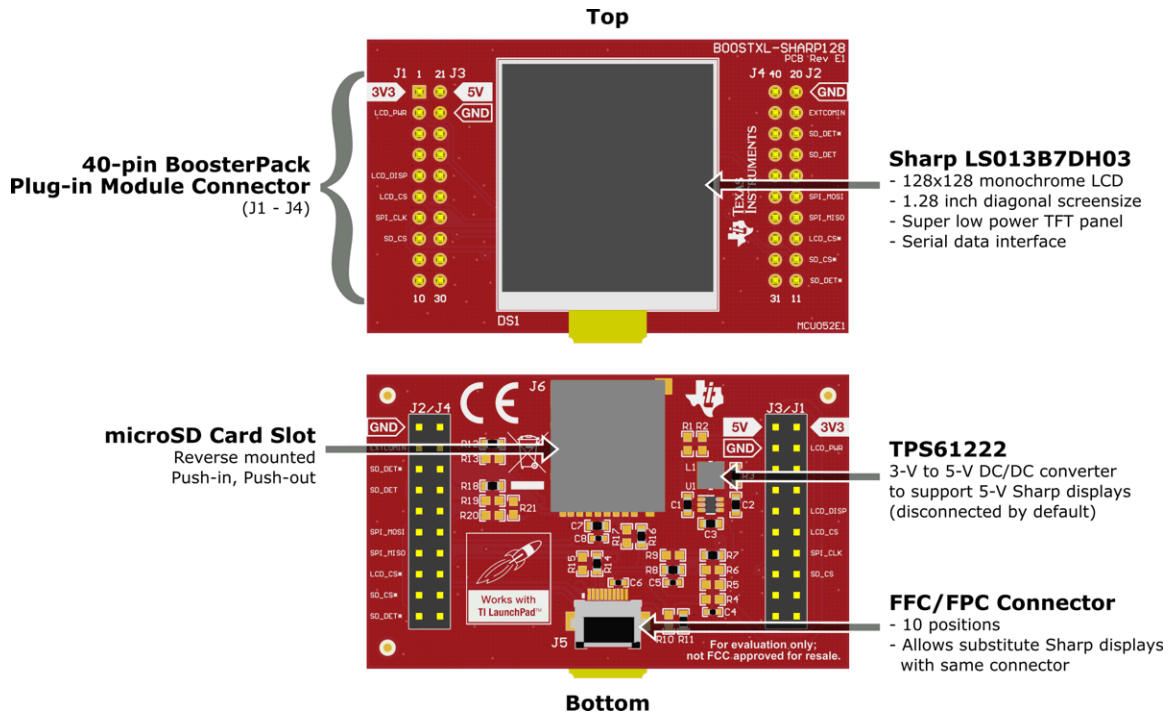


Figure 2. BOOSTXL-SHARP128 Overview

2.1 Block Diagram

Figure 3 shows the block diagram.

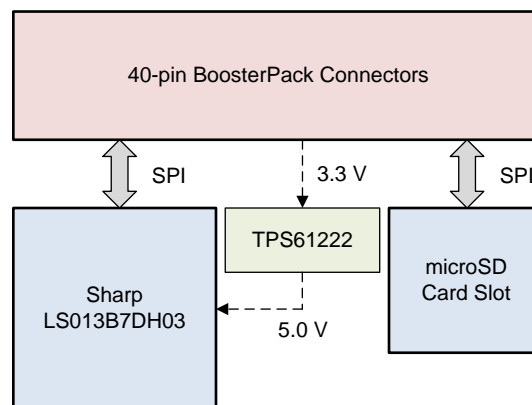


Figure 3. BOOSTXL-SHARP128 Block Diagram

2.2 BoosterPack Plug-In Module Pinout

The BOOSTXL-SHARP128 BoosterPack plug-in module adheres to the 40-pin [BoosterPack plug-in module pinout standard](#). This standard aids compatibility between LaunchPad development kits and BoosterPack plug-in modules across the TI ecosystem.

The 40-pin standard is compatible with the 20-pin standard that is used by other LaunchPad development kits and BoosterPack plug-in modules. This allows some subset of functionality of 40-pin BoosterPack plug-in modules to be used with 20-pin LaunchPad development kits.

The BOOSTXL-SHARP128 BoosterPack plug-in module is compatible with all 20-pin and 40-pin LaunchPad development kits that are compliant with the standard. For more information about compatibility between LaunchPad development kits and BoosterPack plug-in modules, visit <http://www.ti.com/launchpad>.

Figure 4 shows the 40-pin pinout of the BOOSTXL-SHARP128 BoosterPack plug-in module.

NOTE: Some pins are not connected by default, and some functionality can be switched to a different pin on the BoosterPack plug-in module using 0-Ω selection resistors on the bottom of the board.

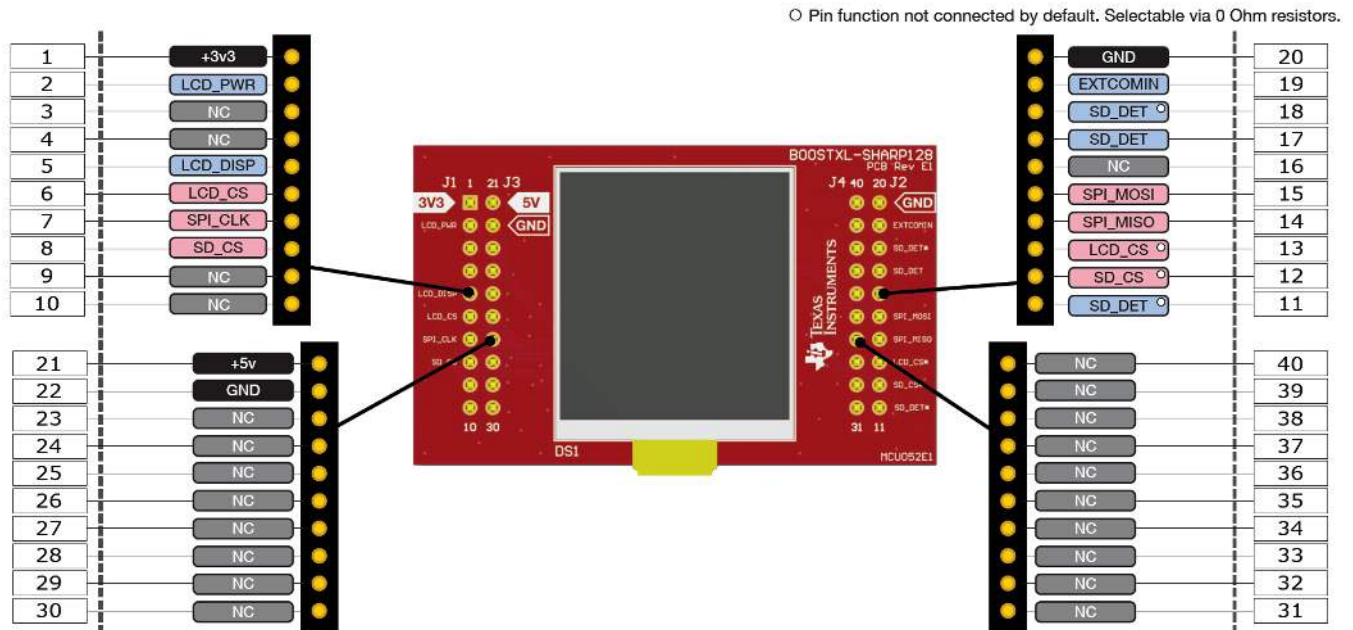


Figure 4. Connector Pinout for LaunchPad Development Kit and BoosterPack Plug-in Module

2.3 Hardware Features

2.3.1 Ultra-Low-Power LCD

The Sharp Microelectronics LS013B7DH03 is a 1.28-inch 128- x 128-pixel monochrome HR-TFT transfective LCD panel. This thin, light, and compact module has 18% reflectivity, 0.2% transmissivity, and super-low-power consumption.

2.3.2 microSD Card Slot

The BOOSTXL-SHARP128 BoosterPack plug-in module features an onboard microSD card slot. This provides another form of data storage for users.

The microSD card slot can detect if a card is present by generating an active-low interrupt signal on the SD card detect pin. The SD_DETECT signal can be selected between three different pins of the BoosterPack plug-in module using 0-Ω resistors (see Table 1).

Table 1. SD Card Detection Configuration

| Selectable Pin Function | Selection Resistor | BoosterPack Plug-in Module Pin |
|-------------------------|--------------------|--------------------------------|
| SD_DETECT | R18 (default) | BP Pin 17 |
| | R19 | BP Pin 18 |
| | R20 | BP Pin 11 |

2.3.3 Customizable LCD Power

The default setting uses a GPIO pin (BP2) to power the BoosterPack plug-in module at the GPIO voltage of the LaunchPad development kit. This allows removing power from the BoosterPack plug-in module entirely through software on the LaunchPad development kit. It is often beneficial to control the power of the LCD directly, and although the LCD is ultra-low power, completely powering it down can extend battery life.

By modifying the 0-Ω resistors, the setup can be changed to connect to V_{CC} all the time. This frees up one pin on the header of the BoosterPack plug-in module.

Additionally, there is a 3-V to 5-V DC/DC converter on board. In the default configuration this DC/DC converter is completely disconnected. Using 0-Ω resistors or solder bridges the converter can be enabled and the output used to power the display. Resistor R1 or R2 can be populated to supply the input voltage to the DC/DC converter. This can be useful to interface other displays that come with the same connector but require 5 V.

Table 2 lists the possible LCD power sources selectable with 0-Ω resistors on the back of the board.

Table 2. LCD Power Configuration

| Selectable Pin Function | Selection Resistor | LCD Power Source |
|-------------------------|--------------------|--|
| LCD_VCC | R7 (default) | GPIO - BP Pin 2 |
| | R1, R6 | DC/DC 5V - Onboard (3V3 as DC/DC Vin) |
| | R2, R6 | DC/DC 5V - Onboard (GPIO as DC/DC Vin) |
| | R5 | 3V3 - BP Pin 1 |
| | R4 | 5V - BP Pin 21 |

2.3.4 Configurable Chip Select Pins

By default, the LCD Chip Select and SDCard Chip Select pins are connected on the J1 BoosterPack header to maintain backwards compatibility with existing software that was developed on the old 430BOOST-SHARP96 and the Card Reader SDCard BoosterPack plug-in module.

However, to provide compatibility with the [BoosterPack plug-in module pinout standard](#), 0-Ω resistors R14 and R16 can be removed, while R15 and R17 can be shorted, to switch the chip select pins from J1 to J2 to conform to the BoosterPack plug-in module standard.

Table 3. Chip Select Pin Configurations

| Selectable Pin Function | Selection Resistor | BoosterPack Plug-in Module Pin |
|-------------------------|--------------------|--------------------------------|
| LCD_SPI_CS | R14 (default) | BP Pin 6 |
| | R15 | BP Pin 13 |
| SD_SPI_CS | R16 (default) | BP Pin 8 |
| | R17 | BP Pin 12 |

2.4 Design Files

2.4.1 Hardware Design Files

Schematics can be found in [Section 4](#). All design files including schematics, layout, bill of materials (BOM), Gerber files, and documentation are available for download in the [BOOSTXL-SHARP128 Design Files](#).

2.5 Hardware Change Log

[Table 4](#) lists the revision history of the BOOSTXL-SHARP128 BoosterPack plug-in module.

Table 4. Hardware Change Log

| PCB Revision | Date | Description |
|--------------|-------------|--------------------|
| Rev A | August 2018 | Production Release |

3 Software and Additional Resources

3.1 Website for LaunchPad Development Kits

More information about LaunchPad development kits, supported BoosterPack plug-in modules, and available resources can be found at [TI's LaunchPad portal](#).

3.2 TI Resource Explorer

[TI Resource Explorer](#) is a cloud-enabled repository that consolidates everything you need to start your development. Using TI Resource Explorer, you will find code examples, documentation, hardware design files, training, and more. TI Resource Explorer is context-aware, delivering relevant material as you navigate the folder structure to the left.

It is easy to find all of the relevant material associated to your development kit, device, or SDK. Use the search bars above to look for your specific LaunchPad development kit. The content in TI Resource Explorer filters appropriately. The content is in three main sections: Device, Development Tools, and Software.

3.3 SimpleLink SDKs

The SimpleLink SDK is designed for simplified development within one environment using industry standard APIs, TI Drivers, and TI RTOS to provide a robust foundation for application development. Within the SDK, you will find code examples, drivers, middleware, documentation, migration guides, and more.

For more information, visit www.ti.com/simplelinksdk.

3.4 MSP430Ware Software

MSPWare software is a collection of code examples, software libraries, data sheets, and other design resources for all MSP devices delivered in a convenient package – essentially everything developers need to become MSP experts. In addition to providing a complete collection of existing MSP design resources, MSPWare also includes a high-level API called MSP Driver Library. This library makes it easy to program MSP hardware.

For more information, see www.ti.com/tool/mspware.

3.5 Tool Options

The source code installation includes directories containing projects, makefiles, and binaries for the following tool-chains:

- Arm® Keil® RealView® Microcontroller Development System
- IAR Embedded Workbench® for Arm
- TI Code Composer Studio™ IDE for Arm and GCC compilers
- Energia open-source electronics prototyping platform

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

3.6 Community Resources

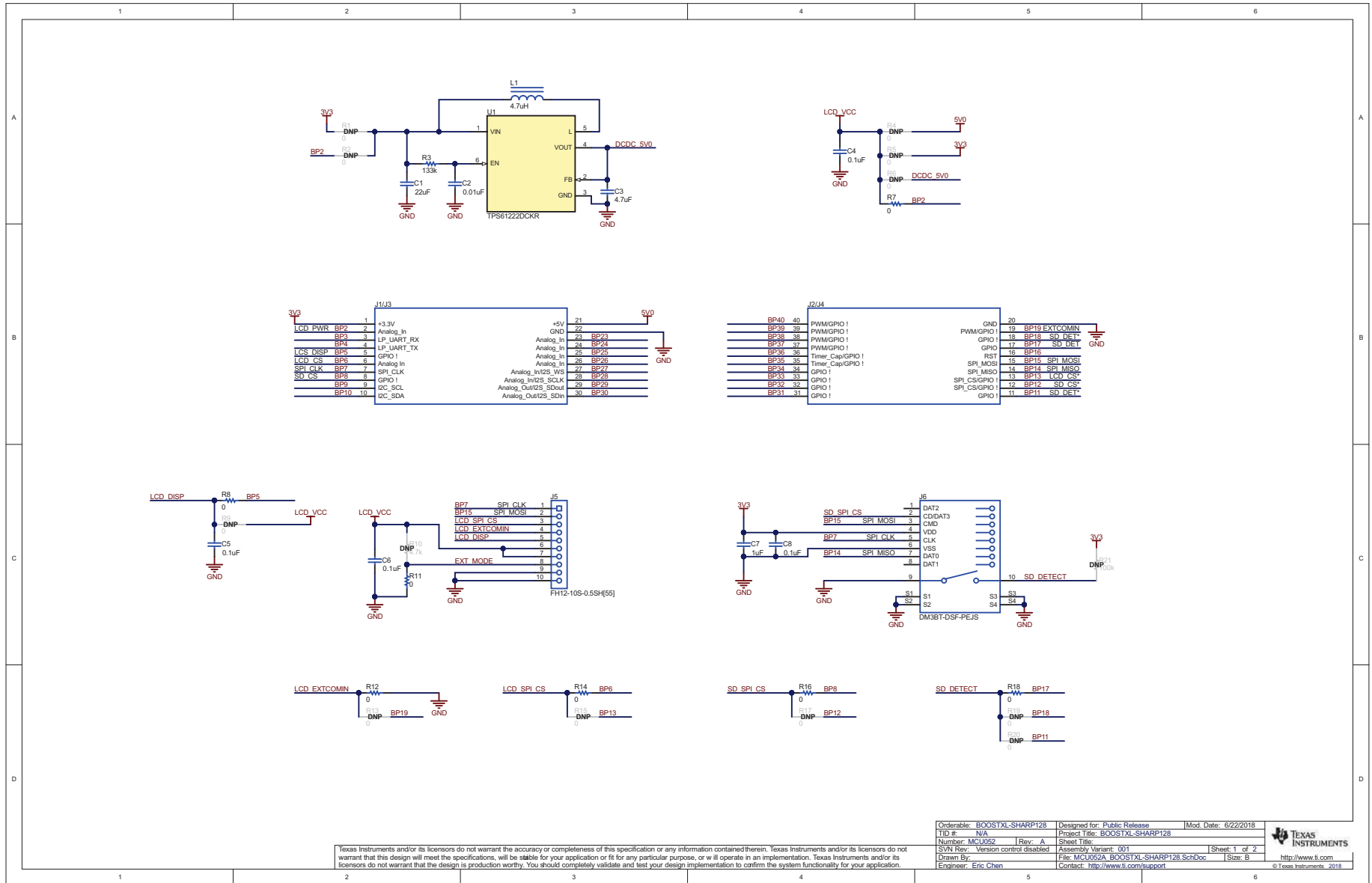
3.6.1 TI E2E™ Community

Search the TI E2E community forums at e2e.ti.com. If you cannot find your answer, post your question to the community!

3.6.2 Community at Large

Many online communities focus on the LaunchPad development kit – for example, <http://www.43oh.com>. You can find additional tools, resources, and support from these communities.

4 Schematics



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| | | |
|-----------------------------------|--|---------------------------|
| Orderable: BOOSTXL-SHARP128 | Designed for: Public Release | Mod. Date: 6/22/2018 |
| TID #: N/A | Project Title: BOOSTXL-SHARP128 | |
| Number: MCU052 | Rev: A | Sheet Title: |
| SVN Rev: Version control disabled | Assembly Variant: 001 | Sheet: 1 of 2 |
| Drawn By: | File: MCU052A_BOOSTXL-SHARP128_SchDoc | Size: B |
| Engineer: Eric Chen | Contact: http://www.ti.com/support | © Texas Instruments, 2018 |

Figure 5. Schematics

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FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.
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CAUTION

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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

NOTE: 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

NOTE: 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.

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3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

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(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.

Concernant les EVMs avec appareils radio:

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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.

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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.

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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