

# LP-MSPM0G3519 Evaluation Module



## Description

The MSPM0G3519 LaunchPad™ development kit is an easy-to-use evaluation module for the MSPM0G3519 microcontroller (MCU). The LaunchPad kit contains everything needed to start development on the MSPM0Gx51x microcontroller platform, including an onboard debug probe for programming, debugging, and EnergyTrace™ technology. The board includes three buttons, two LEDs (one is an RGB LED) and 80+ pins. Improve analog results with ADC and DAC low-pass filter placeholders placed in excellent positions and external reference options available on the back of the launchpad.

## Get Started

1. Order the [LP-MSPM0G3519](#) from ti.com.
2. Navigate to [dev.ti.com](#) to browse for code examples.
3. Plug LP-MSPM0G3519 into a PC with the provided USB cable.
4. Download code directly from the browser to the MSPM0G3519 with CCS Cloud.

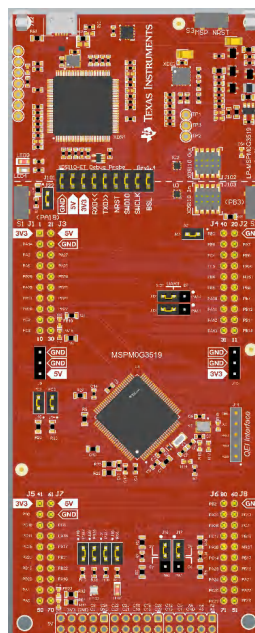
5. Download [CCS Theia](#) for a desktop integrated development environment.
6. Download the [MSPM0 SDK](#) for desktop stored examples, demos, and software libraries.

## Features

- Onboard XDS110 debug probe
- Backchannel UART through USB to PC
- USB-powered
- 80-pin BoosterPack™ headers
- Hardware user interfaces
  - Two buttons, 1 RGB LED, and 1 RED LED
- External clock crystals

## Applications

- [Grid infrastructure](#)
- [Factory automation](#)
- [Appliances](#)
- [Body electronics and lighting](#)
- [Infotainment and cluster](#)
- [Building automation](#)



LP-MSPM0G3519

# 1 Evaluation Module Overview

## 1.1 Introduction

The MSPM0G3519 is an Arm® Cortex® M0+ 32-bit CPU with dual-bank flash and enhanced security features and a frequency up to 80MHz. The device can be used in a variety of tasks from a IO-expander with the 100 pin variant to a full-application utilizing Dual-CAN interface, flash ECC, and SRAM ECC to fulfill automotive applications. The easiest way to get started with the MSPM0G3519 is with the LP-MSPM0G3519 Launchpad. The LaunchPad has all the features to load code, debug, and prototype right out of the box.

The device features 512kB of dual-bank flash with 128kB of SRAM and 16kB of data flash memory. The device also has internal analog such as two internal ADCs, a voltage reference, a buffered 12-bit DAC, and three comparators with 8-bit reference DACs. The MSPM0G3519 is the first 100 pin MSPM0 device that features dual CAN interfaces.

Rapid prototyping is simplified by the 80-pin BoosterPack plug-in module headers, which support a wide range of available BoosterPack plug-in modules. Users can quickly add features like wireless connectivity, graphical displays, environmental sensing and much more. Design your own BoosterPack plug-in module or choose among many already available from TI and third-party developers.

To make prototyping easier, TI provides the MSPM0 software development kit (SDK), which has a variety of code examples to demonstrate how to use the internal peripherals.

Free software development tools are also available, such as TI's [Code Composer Studio™ IDE](#). TI also supports 3rd party IDEs, such as [IAR Embedded Workbench® IDE](#) and [Arm®Keil®µVision® IDE](#). Code Composer Studio IDE supports [EnergyTrace technology](#) with the MSPM0G3519 LaunchPad development kit. More information about the LaunchPad development kit, the supported BoosterPack plug-in modules, and the available resources can be found at TI's [LaunchPad development kit portal](#). To get started quickly and find available resources in the MSPM0 software development kit (SDK), visit the [TI Developer Zone](#). The MSPM0 MCUs are also supported by extensive online collateral, training with [MSPM0 Academy](#) and online support through the [TI E2E support forums](#).

## 1.2 Kit Contents

- LP-MSPM0G3519 LaunchPad Development Kit
- USB cable
- Quick-start guide

## 1.3 Specification

LP-MSPM0G3519 is designed to be used in conjunction with a PC, Mac®, or Linux® workstation running Code Composer Studio (CCS). CCS can run as a stand-alone on a workstation or be accessed through the web (CCS Cloud) without the need for a software installation. Alternatively, LP-MSPM0G3519 ships with an example loaded, which can be controlled by a GUI. See the out of box description below.

The device can be powered from a power supply other than the build in USB power supply. This allows the user to forgo the PC connection. Power can be applied directly either to the 3.3V rail. When using an external power supply, make sure to not exceed 3.3V. Programming can be done externally with a separate XDS110 external debugger utilizing the on board Arm 10-pin connector.

## 1.4 Device Information

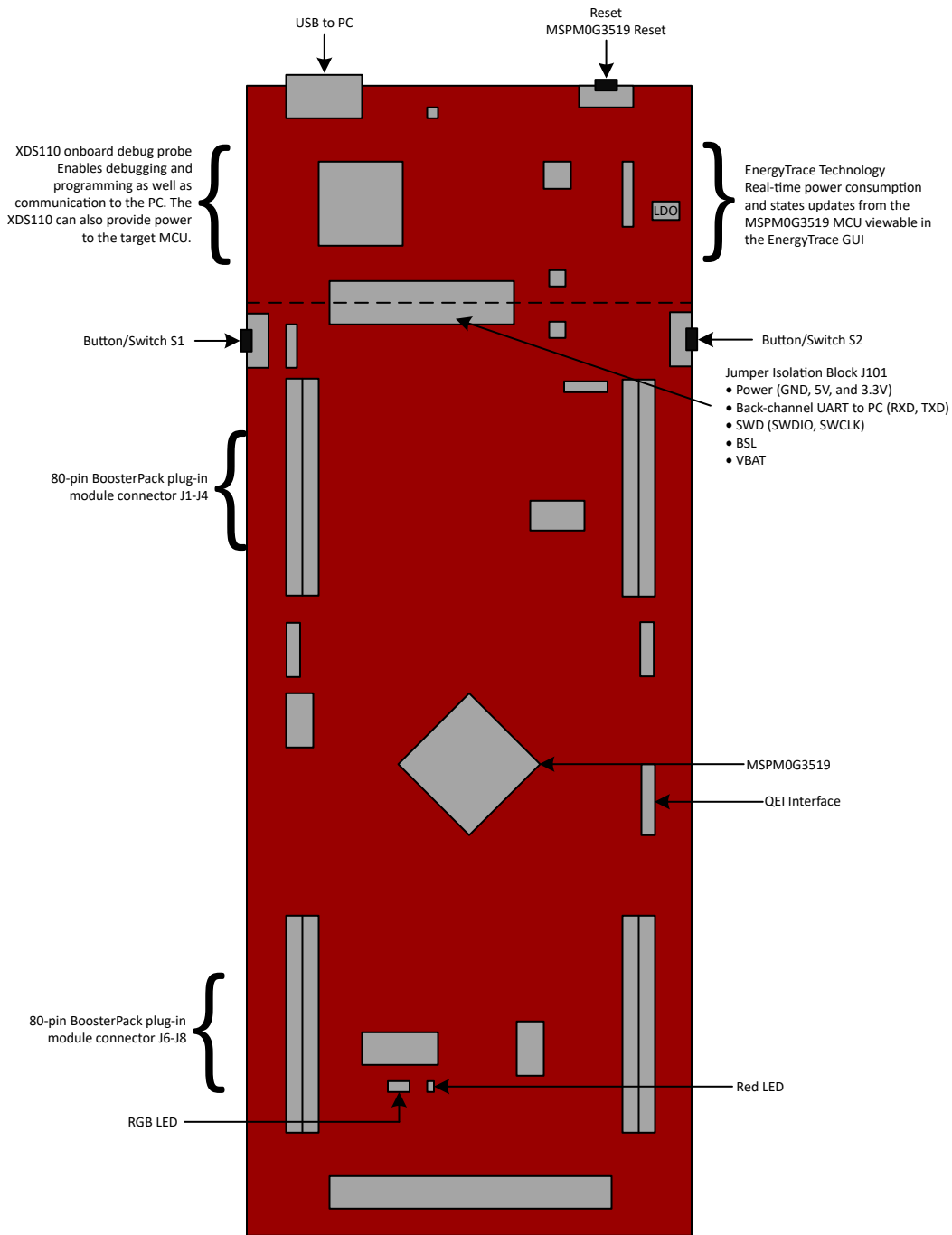
LP-MSPM0G3519 uses the following devices from Texas Instruments.

**Table 1-1. Device Information**

Device Name	Description	Purpose
MSP432E401YTPDT	SimpleLink™ 32-bit ARM Cortex-M4F MCU with Ethernet™, CAN, 1MB Flash and 256kB RAM	XDS110 Host Device
MSPM0G3519SPZR	Mixed-Signal Microcontroller with 80MHz Arm Cortex 32-bit-M0+ CPU, 512kB flash, and 128kB SRAM	Evaluation device
MSP430G2452IRSA16R	Mixed-Signal Microcontroller with 16-bit RISC CPU, 8kB Flash, and 256B SRAM	DC/DC controller for EnergyTrace Technology
TPD4E004RSER	ESD-protection array for high-speed data interfaces, 4 channels	Protect LP-MSPM0G3519 from ESD damage through USB connector
TPS73533DRBT	500mA, adjustable, low quiescent current, low-noise, high-PSRR, single-output LDO regulator	3.3V power XDS110 and MSPM0G3519
TPS2102DBVR	2.7V to 4V power mux, dual-input, single-output power switch	Switches XDS110 power

## 2 Hardware

### 2.1 Hardware Overview



**Figure 2-1. Diagram of LP-MSPM0G3519 Jumpers and Connections**

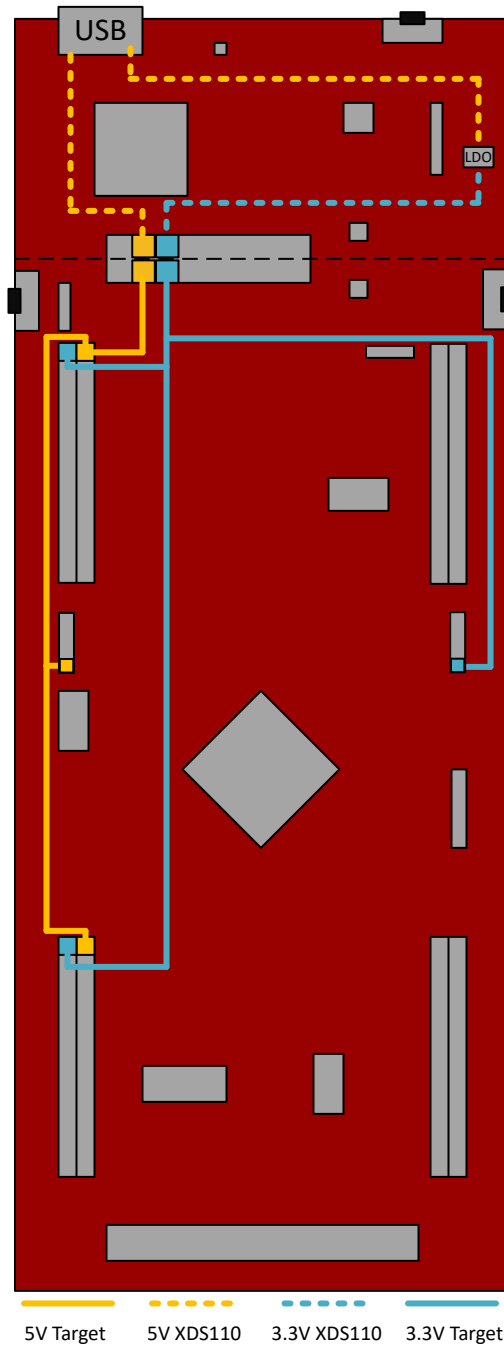
LP-MSPM0G3519 has many hardware features, which allow the user full access to the MSPM0G3519 pins, while still providing onboard connectivity for easy use. Shunt connections provide a way for the user to easily change LaunchPad configuration. The location of these shunts is shown in [Figure 2-1](#). The connection of each shunt is described in [Table 2-1](#). The default configuration is to have all shunts populated.

**Table 2-1. Jumper Information**

Jumper	Description	Default Setting	Connected Signal
J1-J4	BoosterPack Header Block 1	Unpopulated	BoosterPack standard connection for pins 1-40
J5-J8	BoosterPack Header Block 2	Unpopulated	BoosterPack standard connection for pins 41-80
J9	5V Power Header	Unpopulated	Additional pin connections for GND and 5V
J10	3.3V Power Header	Unpopulated	Additional pin connections for GND and 3.3V
J11	QEI Interface	Unpopulated	Interface connection for QEI standard
J12	PA10 Function Selector	Populated: Left and center (2-3)	Selects the connection for PA10 between the XDS110 UART TX and the boosterpack connection
J13	PA11 Function Selector	Populated: Left and center (2-3)	Selects the connection for PA11 between the XDS110 UART RX and the boosterpack connection
J14	I2C Pull-up	Populated	I2C SDA Pull-up for PC3
J15	I2C Pull-up	Populated	I2C SCL Pull-up for PC2
J16	Open Drain Pull-up Selector	Populated: Top and Center (1 - 2)	Pull-up selector for 3.3 or 5V connection for PA0
J17	Open Drain Pull-up Selector	Populated: Top and Center (1 - 2)	Pull-up selector for 3.3 or 5V connection for PA1
J18	Red LED	Populated	Connects PA0 to the Red LED
J19	RGB (Blue) LED	Populated	Connects PB22 to the RGB (Blue) LED
J20	RGB (Red) LED	Populated	Connects PB26 to the RGB (Red) LED
J21	RGB (Green) LED	Populated	Connects PB27 to the RGB (Green) LED
J22	BSL Invoke	Populated	Connects PA18 to the S1 button.
J23	S2 Jumper	Populated	Connects PB3 to the S2 button.

## 2.2 Power Requirements

The LP-MSPM0G3519 only needs the USB plugged in and the debugger jumper block populated to power the device. With the onboard LDO, the 5V USB supply is converted to 3.3V with a supply of 500mA. The LaunchPad can also be powered by the 3.3V or 5V headers via an external supply. Do not exceed 3.3V on the 3.3V rail or 5V on the 5V rail.



**Figure 2-2. LP-MSPM0G3519 Power Connections**

## 2.3 XDS110 Debug Probe

LP-MSPM0G3519 features an onboard debug probe to streamline prototyping. The debugger used on this LaunchPad is the XDS110 variant, which supports all MSPM0 device derivatives. The integrated XDS110 debug probe is separated from the rest of the MSPM0G3519 circuitry, which is shown by the dashed silkscreen on the LaunchPad. The XDS110 is only connected through signals that pass through J101, in addition to a common ground.

### Isolation Jumper Block

The isolation jumper block J101 allows the user to connect or disconnect signals that cross from the XDS110 domain into the MSPM0G3519 target domain. This includes XDS110 SWD signals, application UART signals, 3.3V and 5V power, and reset.

Jumper	Description
5V	5V rail from the USB
3V3	3.3V rail from the LDO
RXD<<	Backchannel UART: The target MSPM0G3519 receives data through this signal. The arrows indicate the direction of the signal.
TXD>>	Backchannel UART: The target MSPM0G3519 sends data through this signal. The arrows indicate the direction of the signal.
NRST	Reset signal
SWDIO	Serial Wire Debug: SWDIO data signal.
SWCLK	Serial wire debug: SWCLK clock signal.
BSL	Invoke pin for bootstrap loader. Allows the XDS110 to invoke BSL.

## 2.4 Measure Current Draw of the MSPM0G3519

To measure the current draw of the MSPM0G3519 MCU using a multimeter, use the 3V3 jumper on the J101 jumper isolation block. The current measured includes the target device, LaunchPad circuits, and any current drawn through the BoosterPack plug-in module headers. To measure ultra-low power, follow these steps:

1. Remove the 3V3 jumper in the J101 isolation block, and attach an ammeter across the 3V3 jumper.
2. Consider the effect that the backchannel UART and any circuitry attached to the MSPM0G3519 can have on the current draw. Consider disconnecting the backchannel uart at the isolation jumper block, or at least consider the current sinking and sourcing capability in the final measurement.
3. Make sure there are no floating inputs or outputs (I/Os) on the MSPM0G3519. This causes unnecessary extra current draw. Every I/O is either driven or, if the I/O is an input, is pulled or driven to a high or low level.
4. Begin target execution.
5. For the most accurate current measurements, place the device in Free Run mode and disconnect programming signals between the MSPM0G3519 and the debug portion of the board (header J101).
6. Measure the current. Remember that if the current levels are fluctuating, then getting a stable measurement can be difficult. Measuring the quiescent states is easier.

## 2.5 Clocking

The internal SYSOSC is 32MHz by default with an accuracy of 2.5%. The MCLK is sourced by the SYSOSC by default. The SYSPLL can be used to generate a clock signal up to 80MHz, which can be used to source MCLK. CPUCLK is sourced directly from MCLK in RUN mode and disabled in other modes. The low-power clock (ULPCLK) can be sourced by MCLK and active in RUN and SLEEP mode by configuration. The part also includes an internal 32kHz oscillator, LFOSC, which is the default low frequency source. Included on the LaunchPad are two clock crystal options, one high-frequency 40MHz crystal (HFXT), and one low-frequency 32.768kHz crystal (LFXT). The crystals can be selected during application programming as the clock source for the high frequency and low frequency clocks. For more clock tree details, see the Clock Module (CKM) section of the [MSPM0 G-Series Microcontrollers Technical Reference Manual](#).

## 2.6 BoosterPack Plug-in Module Pinout

The LaunchPad development kit adheres to the 80-pin LaunchPad development kit pinout standard, where pins are available. A standard was created to aid compatibility between LaunchPad development kits and BoosterPack plug-in modules across the TI ecosystem.

While most BoosterPack plug-in modules are compliant with the standard, some are not. If the reseller or owner of the BoosterPack plug-in module does not explicitly indicate compatibility with the MSPM0G3519 LaunchPad development kit, then compare the schematic of the candidate BoosterPack plug-in module with the LaunchPad development kit to verify compatibility. Conflicts can be resolved by changing the MSPM0G3519 device pin function configuration in software.

## 3 Software

### 3.1 Software Development Options

There are multiple ways to prototype with LP-MSPM0G3519:

1. Out-of-box GUI - Choose this option for an easy demo of the LP-MSPM0G3519.
2. [CCS Cloud](#) - Choose this option to get started quickly with minimal installation.
3. [CCS Theia](#) - Choose this option to work offline and have full access to debug features.
4. [CCS Eclipse](#) - This option is supported but is a legacy tool and is not covered in this guide.

### 3.2 Out-of-Box GUI

Get started with the out-of-box example on LP-MSPM0G3519. Simply navigate to the Out-of-Box GUI and plug in LP-MSPM0G3519 to a PC, Mac, or Linux workstation. This GUI provides control of the build in LED and a dashboard of the current state of LP-MSPM0G3519. TI Cloud Agent browser extension can be necessary for the GUI functionality.

More GUI information will be available at full release and can be found on [TI Developer Zone](#).

### 3.3 CCS Cloud

1. Navigate to [dev.ti.com](#). User are required to install CCS Cloud Agent. If CCS Cloud Agent is not installed yet, then follow the steps to complete this installation.
2. Plug LP-MSPM0G3519 using a micro-USB cable. TI Developer Zone automatically detects that LP-MSPM0G3519 has been plugged in.
3. Click *Browse Software And Examples*, which opens the MSPM0 SDK in a new window. In the left bar, navigate to Arm-based microcontrollers > Embedded Software > MSPM0 SDK > Examples > Development Tools > DriverLib > gpio\_toggle\_output > No RTOS > TI Clang Compiler > gpio\_toggle\_output.
4. Click the *Import* button at the top right corner of the screen. This action imports the project into CCS Cloud and open in a new window.
5. In CCS Cloud, click the *debug* icon in the left bar to open the debug view.
6. Click the *play* button to deploy the code to the device and open a debug session. By default, the debugger pauses the first line of code.
7. Click the blue *play* button to start the application.
8. The RGB LED on LP-MSPM0G3519 needs to be blinking.

Now, users are ready to begin prototyping by modifying the code or by importing a different example code.



# 4 Hardware Design Files

## 4.1 Schematics

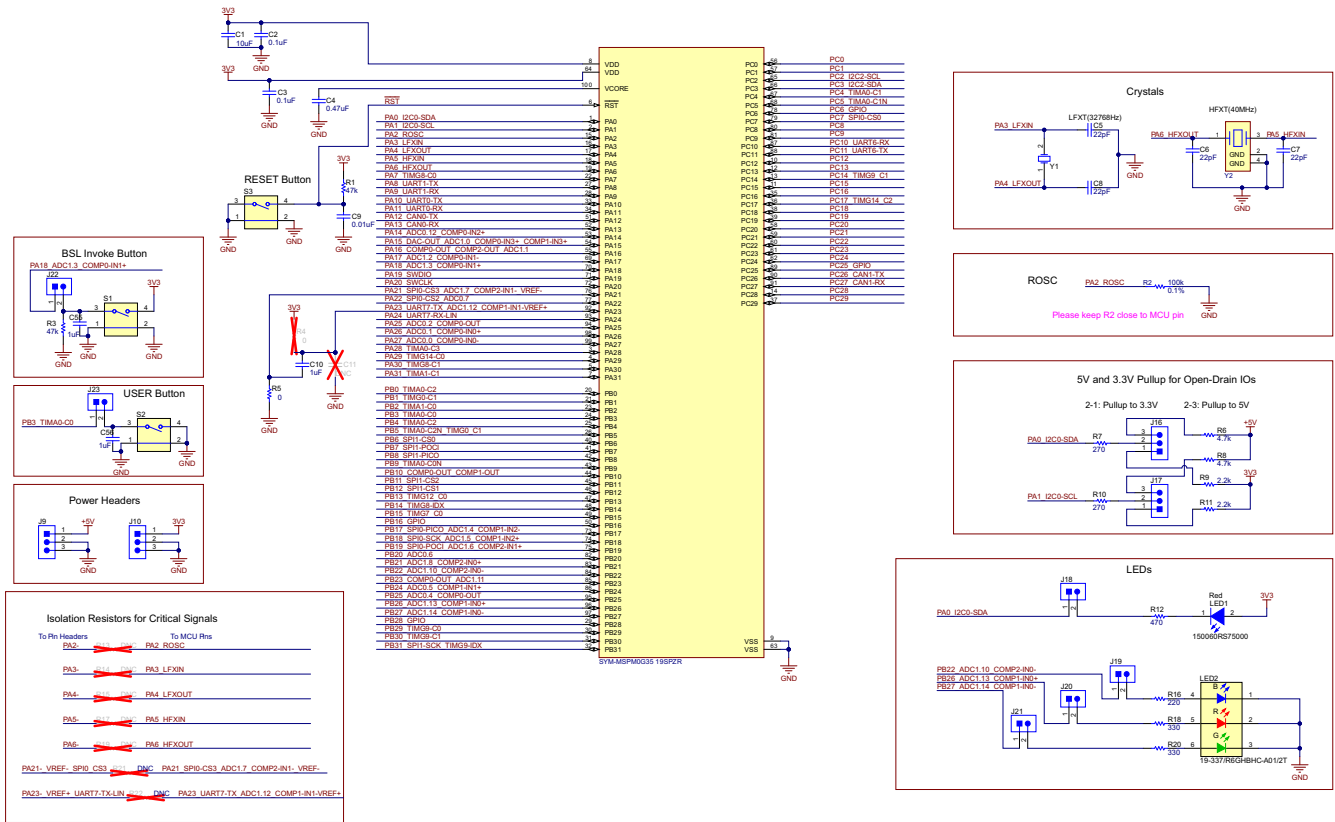


Figure 4-1. MSPM0G3519 Target Device Schematic

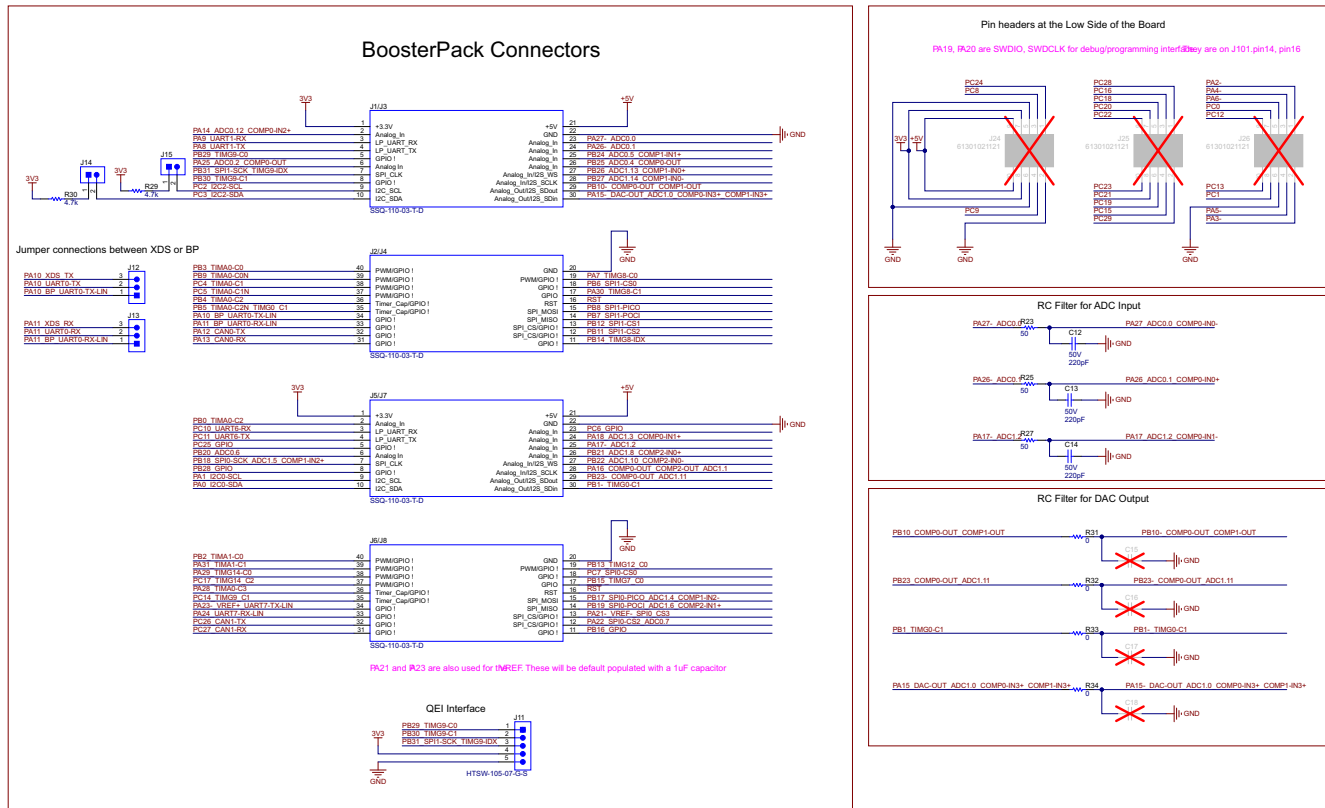


Figure 4-2. BoosterPack Connectors

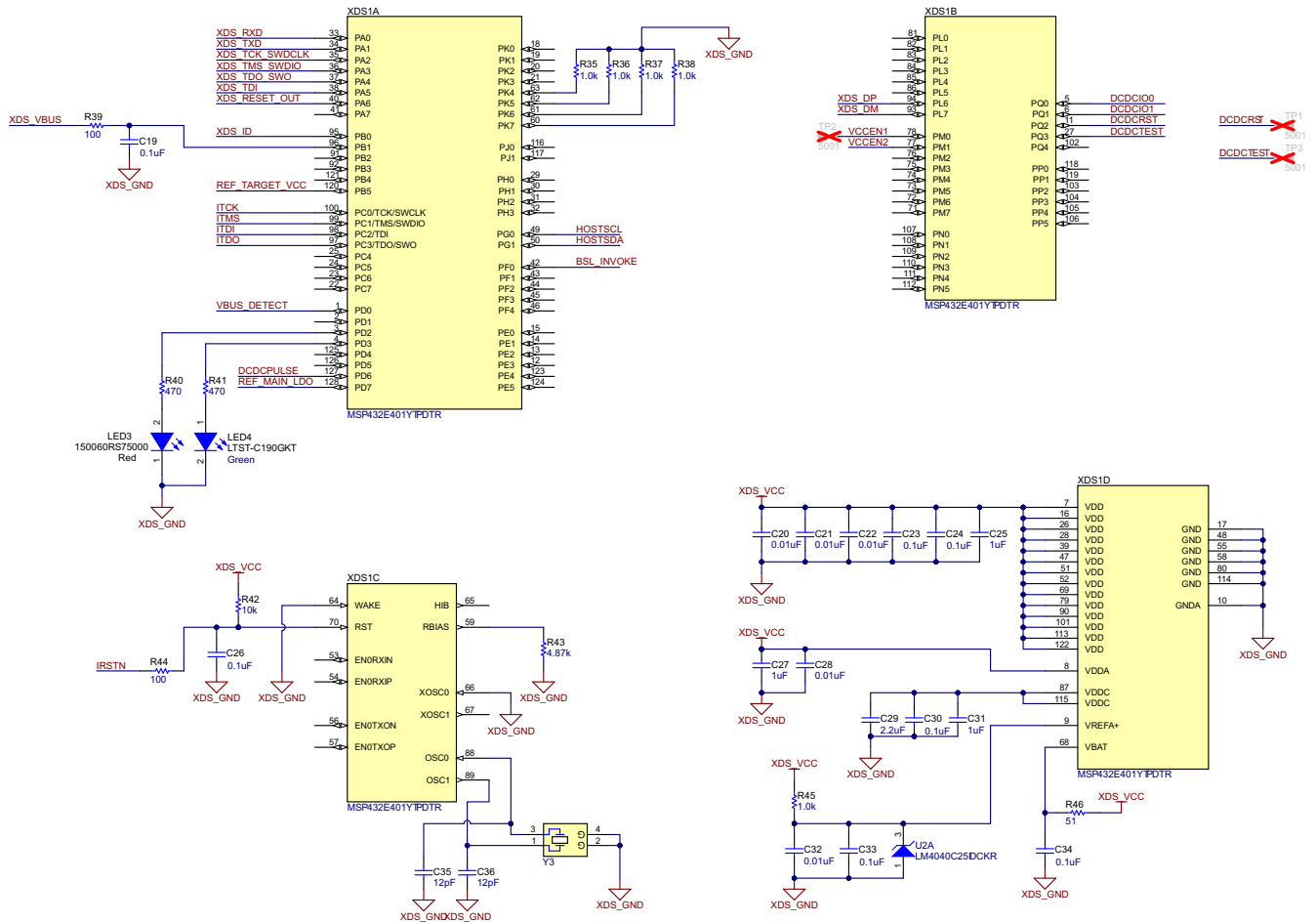


Figure 4-3. XDS110 Debug Probe Emulator Schematic

Software-controlled DCDC converter

Energy measurement method protected under U.S. Patent Application 13/329,073 and subsequent patent applications

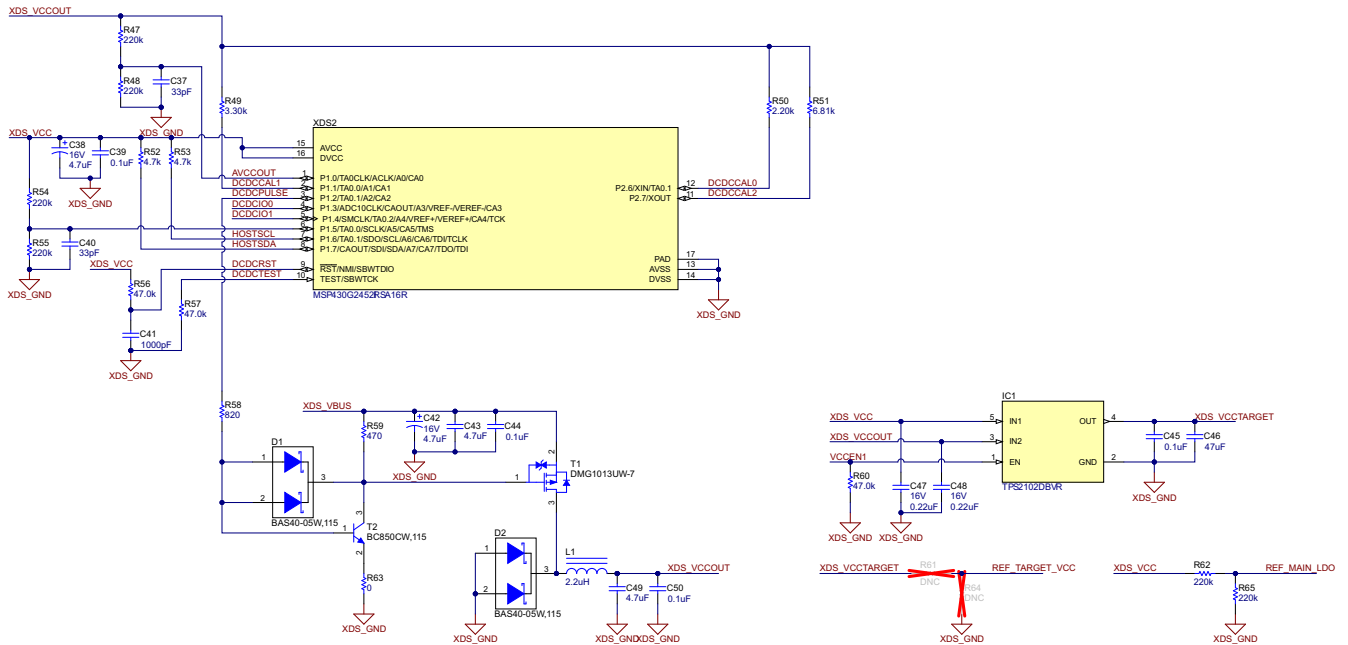
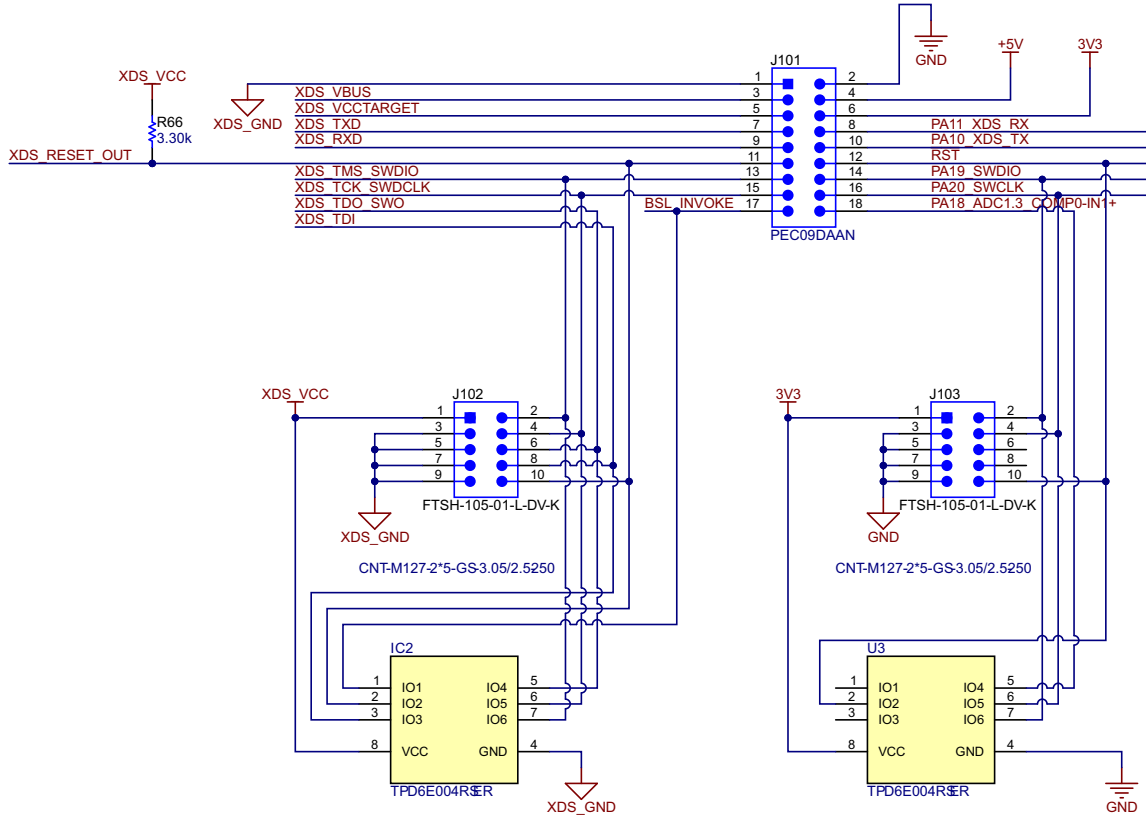
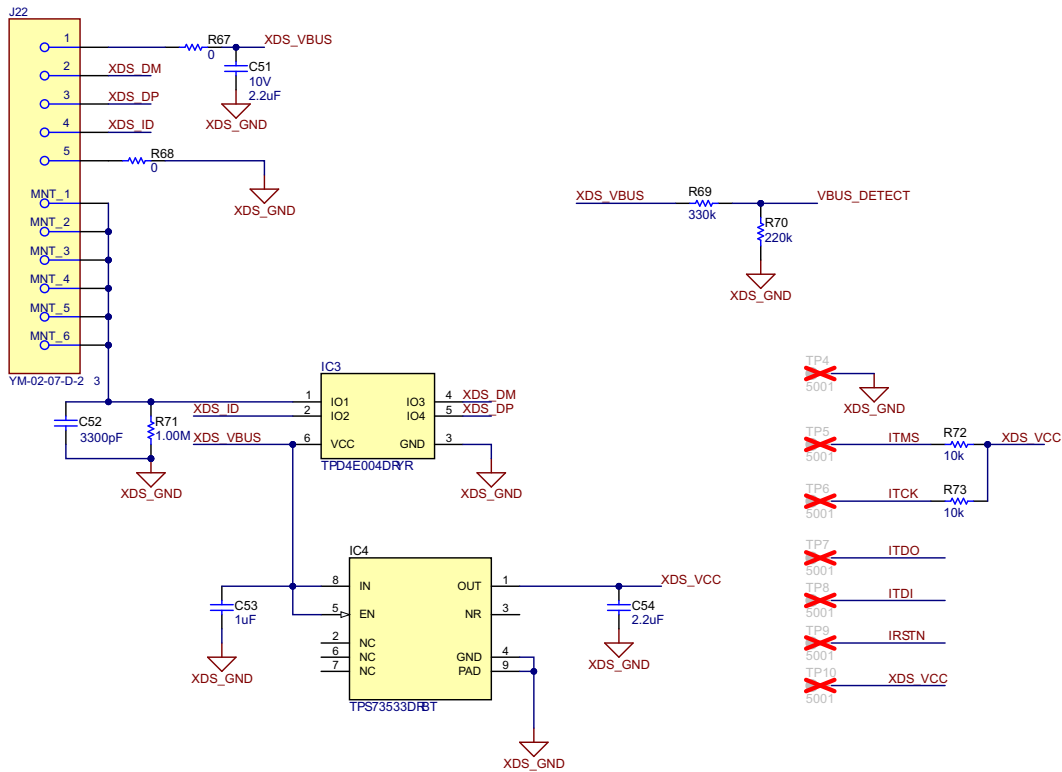


Figure 4-4. XDS110 EnergyTrace Schematic

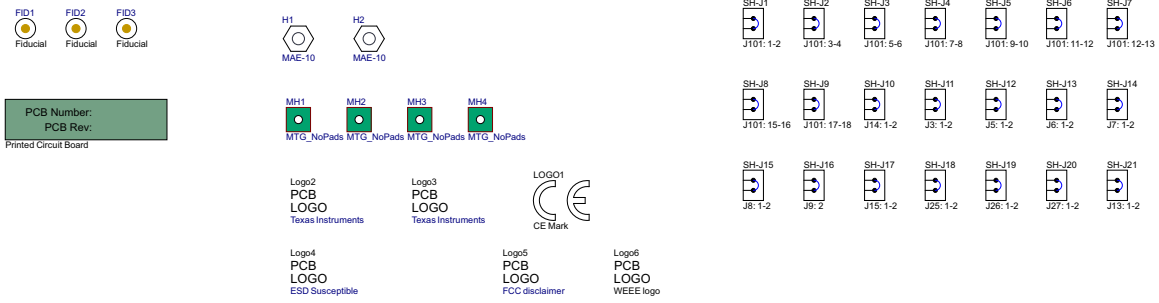
XDS110-ET <-----> LaunchPad



**Figure 4-5. XDS110 Target Interface Schematic**



**Figure 4-6. XDS110 USB Power Schematic**



USB1  
MECH  
AK67421-0.3

**ZZ1**  
**Assembly Note**  
These assemblies are ESD sensitive, ESD precautions shall be observed.

**ZZ2**  
**Assembly Note**  
These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable.

**ZZ3**  
**Assembly Note**  
These assemblies must comply with workmanship standards IPC-A-610 Class 2, unless otherwise specified.

**ZZ4**  
**Assembly Note**  
Place a click-in Standoff (MAE-10, KangYang) in hole MH1/MH2

**Figure 4-7. Jumpers and Standoffs**

## 4.2 PCB Layouts

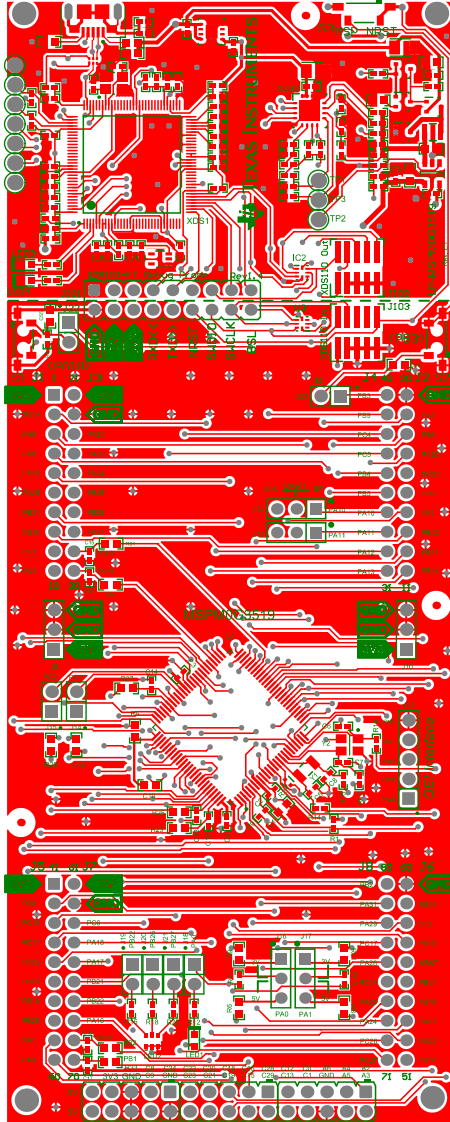


Figure 4-8. Top Layer and Overlay (1st Layer)

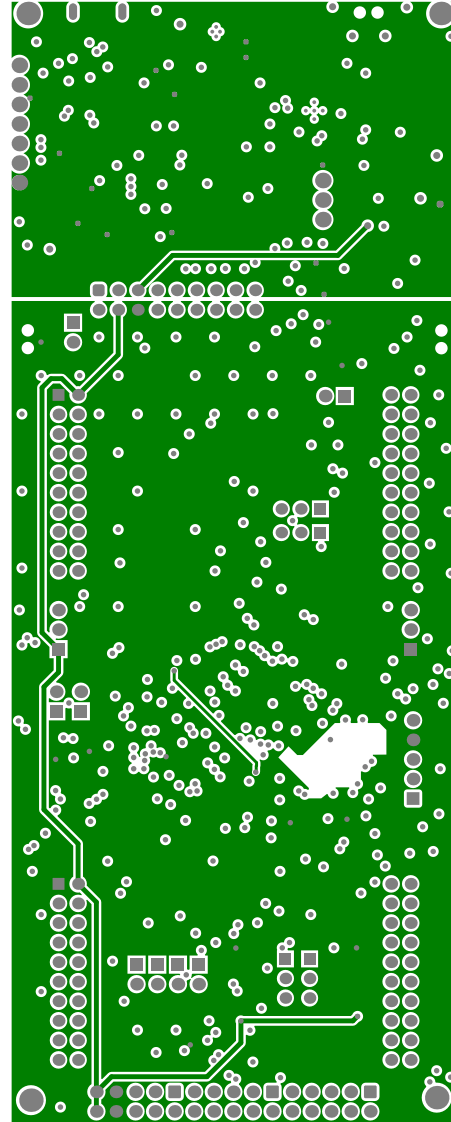


Figure 4-9. VCC Plane (2nd Layer)

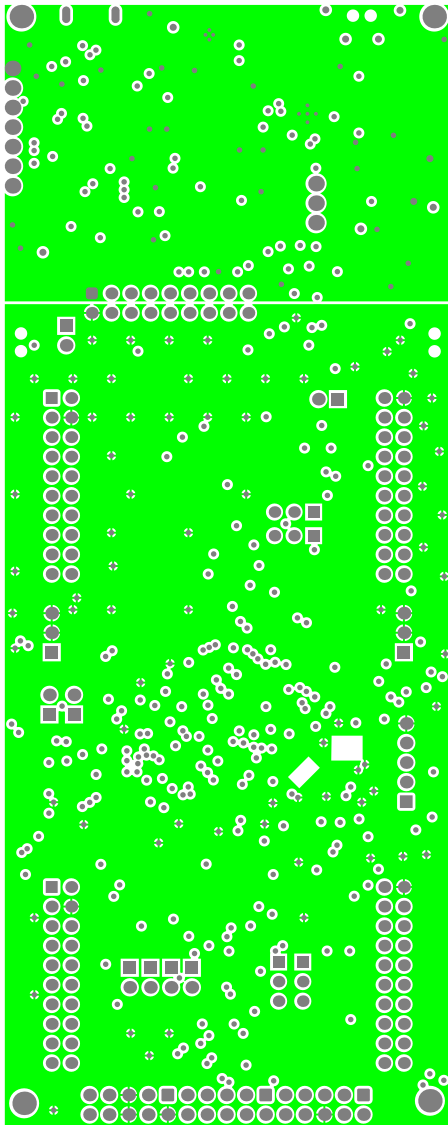


Figure 4-10. Ground Plane (3rd Layer)

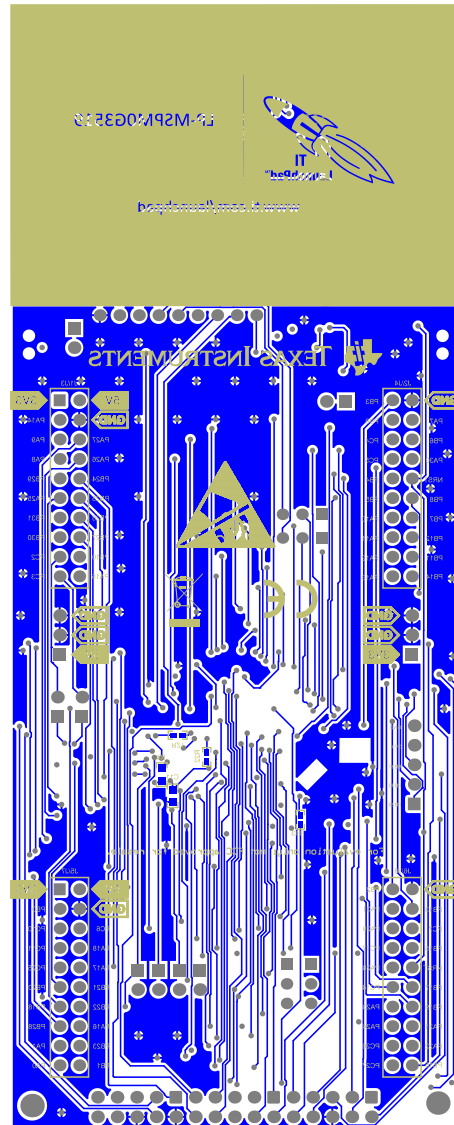


Figure 4-11. Bottom Layer and Overlay (4th Layer)

### 4.3 Bill of Materials (BOM)

**Table 4-1. Bill of Materials**

Designator	Quantity	Value	Description	Part Number	Package Reference	Manufacturer
!PCB1	1		Printed Circuit Board	MCU148		Any
C1	1	10uF	CAP, CERM, 10uF, 6.3V, +/- 20%, X5R, 0603	GRM188R60J106ME84	0603	MuRata
C2, C3	2	0.1uF	CAP, CERM, 0.1uF, 50V, +/- 20%, X5R, 0402	GRM155R61H104ME14D	0402	MuRata
C4	1	0.47uF	CAP, CERM, 0.47uF, 6.3V, +/- 10%, X5R, 0402	GRM155R60J474KE19D	0402	MuRata
C5, C6, C7, C8	4	22pF	CAP, CERM, 22pF, 50V, +/- 5%, C0G/NP0, 0402	GRM1555C1H220JA01D	0402	MuRata
C9	1	0.01uF	CAP, CERM, 0.01uF, 16V, +/- 10%, X5R, 0402	GRM155R61C103KA01D	0402	MuRata
C10, C55, C56	3	1uF	CAP, CERM, 1uF, 25V, +/- 10%, X5R, 0603	C1608X5R1E105K080AC	0603	TDK
C12, C13, C14	3	220pF	CAP, CERM, 220pF, 50V, +/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0402	CGA2B2C0G1H221J050BA	0402	TDK
C19, C23, C24, C26, C30, C33, C34, C39, C44, C45, C50	11	0.1uF	CAP, CERM, 0.1uF, 6.3V, +/- 10%, X7R, 0402	GRM155R70J104KA01D	0402	MuRata
C20, C21, C22, C28, C32	5	0.01uF	CAP, CERM, 0.01uF, 25V, +/- 10%, X7R, 0402	GRM155R71E103KA01D	0402	MuRata
C25, C27, C31, C53	4	1uF	CAP, CERM, 1uF, 25V, +/- 10%, X5R, 0402	C1005X5R1E105K050BC	0402	TDK
C29, C54	2	2.2uF	CAP, CERM, 2.2uF, 6.3V, +/- 10%, X5R, 0402	GRM155R60J225KE95D	0402	MuRata
C35, C36	2	12pF	CAP, CERM, 12pF, 50V, +/- 5%, C0G/NP0, 0402	GRM1555C1H120JA01D	0402	MuRata
C37, C40	2	33pF	CAP, CERM, 33pF, 50V, +/- 5%, C0G/NP0, 0402	GRM1555C1H330JA01D	0402	MuRata
C38, C42	2	4.7uF	CAP, TA, 4.7uF, 16V, +/- 10%, 4 ohm, SMD	TAJA475K016RNJ	3216-18	AVX
C41	1	1000pF	CAP, CERM, 1000pF, 50V, +/- 10%, X7R, AEC-Q200 Grade 1, 0402	GCM155R71H102KA37D	0402	MuRata
C43, C49	2	4.7uF	CAP, CERM, 4.7uF, 16V, +/- 10%, X5R, 0603	GRM188R61C475KAAJ	0603	MuRata
C46	1	47uF	CAP, CERM, 47uF, 6.3V, +/- 20%, X5R, 0603	GRM188R60J476ME15D	0603	MuRata
C47, C48	2	0.22uF	CAP, CERM, 0.22uF, 16V, +/- 10%, X7R, 0402	GRM155R71C224KA12D	0402	MuRata
C51	1	2.2uF	CAP, CERM, 2.2uF, 10V, +/- 10%, X5R, 0603	C0603C225K8PACTU	0603	Kemet
C52	1	3300pF	CAP, CERM, 3300pF, 50V, +/- 10%, X7R, 0402	GRM155R71H332KA01D	0402	MuRata
D1, D2	2	40V	Diode, Schottky, 40V, 0.12A, AEC-Q101, SOT-323	BAS40-05W,115	SOT-323	Nexperia
FID1, FID2, FID3	3		Fiducial mark. There is nothing to buy or mount.	N/A	N/A	N/A



**Table 4-1. Bill of Materials (continued)**

Designator	Quantity	Value	Description	Part Number	Package Reference	Manufacturer
H1, H2	2		Spacer Support, Nylon 66	MAE-10	Spacer Nylon Support	Kang Yang
IC1	1		2.7-4V Dual In/Single Out MOSFET, 0.5A Main/ 0.1A Aux Input, Act-Low Enable, Comm. Temp., DBV0005A (SOT-23-5)	TPS2102DBVR	DBV0005A	Texas Instruments
IC2, U3	2		Low-Capacitance 6-Channel +/-15 kV ESD Protection Array for High-Speed Data Interfaces, RSE0008A (UQFN-8)	TPD6E004RSER	RSE0008A	Texas Instruments
IC3	1		4-Channel ESD Protection Array for High-Speed Data Interfaces, DRY0006A (USON-6)	TPD4E004DRYR	DRY0006A	Texas Instruments
IC4	1		500mA, Adjustable, Low Quiescent Current, Low-Noise, High-PSRR, Single-Output LDO Regulator, DRB0008A (VSON-8)	TPS73533DRBT	DRB0008A	Texas Instruments
J1/J3, J2/J4, J5/J7, J6/J8	4		Receptacle, 2.54mm, 10x2, Tin, TH	SSQ-110-03-T-D	10x2 Receptacle	Samtec
J9, J10, J12, J13, J16, J17	6		Header, 100mil, 3x1, Tin, TH	PEC03SAAN	Header, 3 PIN, 100mil, Tin	Sullins Connector Solutions
J14, J15, J18, J19, J20, J21, J22, J23	8		Header, 100mil, 2x1, Tin, TH	90120-0122	Header 2x1	Molex
J22	1		Micro USB 5F B Type Smt	YM-02-07-D-23	CONN_USB_8MM10_5M M88	Yang Ming
J101	1		Header, 2.54mm, 9x2, Tin, TH	PEC09DAAN	Header, 2.54mm, 9x2, TH	Sullins Connector Solutions
J102, J103	2		Header(Shrouded), 1.27mm, 5x2, Gold, SMT	FTSH-105-01-L-DV-K	Header(Shrouded), 1.27mm, 5x2, SMT	Samtec
L1	1	2.2uH	Inductor, Wirewound, Ceramic, 2.2uH, 0.89A, 0.13 ohm, SMD	CBC2518T2R2M	2.5x1.8x1.8mm	Taiyo Yuden
LED1, LED3	2	Red	LED, Red, SMD	150060RS75000	LED_0603	Würth Elektronik
LED2	1	RGB	LED, RGB, TH	19-337/R6GHBHC-A01/2T	1.6x1.6mm	Everlight
LED4	1	Green	LED, Green, SMD	LTST-C190GKT	1.6x0.8x0.8mm	Lite-On
R1, R3	2	47k	RES, 47 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW040247K0JNED	0402	Vishay-Dale

**Table 4-1. Bill of Materials (continued)**

Designator	Quantity	Value	Description	Part Number	Package Reference	Manufacturer
R2	1		Res Thin Film 0402 100K Ohm 0.1% 1/16W ±25ppm/°C Molded SMD SMD Punched Carrier T/R	ERA-2AEB104X	0402	Panasonic
R5, R31, R32, R33, R34, R63, R67, R68	8	0	RES, 0, 5%, 0.1 W, 0603	RC0603JR-070RL	0603	Yageo
R6, R8, R29, R30	4	4.7k	RES, 4.7 k, 5%, 0.1 W, 0603	RC0603JR-074K7L	0603	Yageo
R7, R10	2	270	RES, 270, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW0402270RJNED	0402	Vishay-Dale
R9, R11	2	2.2k	RES, 2.2 k, 5%, 0.1 W, 0603	RC0603JR-072K2L	0603	Yageo
R12, R40, R41, R59	4	470	RES, 470, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW0402470RJNED	0402	Vishay-Dale
R16	1	220	RES, 220, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW0402220RJNED	0402	Vishay-Dale
R18, R20	2	330	RES, 330, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW0402330RJNED	0402	Vishay-Dale
R23, R25, R27	3	50	RES, 50, 1%, 0.1 W, AEC-Q200 Grade 0, 0603	CRCW060350R0FKEA	0603	Vishay-Dale
R35, R36, R37, R38, R45	5	1.0k	RES, 1.0 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04021K00JNED	0402	Vishay-Dale
R39, R44	2	100	RES, 100, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW0402100RJNED	0402	Vishay-Dale
R42, R72, R73	3	10k	RES, 10 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW040210K0JNED	0402	Vishay-Dale
R43	1	4.87k	RES, 4.87 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04024K87FKED	0402	Vishay-Dale
R46	1	51	RES, 51, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW040251R0JNED	0402	Vishay-Dale
R47, R48, R54, R55, R62, R65, R70	7	220k	RES, 220 k, 1%, 0.0625 W, 0402	RC0402FR-07220KL	0402	Yageo America
R49, R66	2	3.30k	RES, 3.30 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0402	ERJ-2RKF3301X	0402	Panasonic
R50	1	2.20k	RES, 2.20 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04022K20FKED	0402	Vishay-Dale

**Table 4-1. Bill of Materials (continued)**

Designator	Quantity	Value	Description	Part Number	Package Reference	Manufacturer
R51	1	6.81k	RES, 6.81 k, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04026K81FKED	0402	Vishay-Dale
R52, R53	2	4.7k	RES, 4.7 k, 5%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04024K70JNED	0402	Vishay-Dale
R56, R57, R60	3	47.0k	RES, 47.0 k, 1%, 0.0625 W, 0402	RC0402FR-0747KL	0402	Yageo America
R58	1	820	RES, 820, 1%, 0.063 W, 0402	RC0402FR-07820RL	0402	Yageo America
R69	1	330k	RES, 330 k, 1%, 0.0625 W, 0402	RC0402FR-07330KL	0402	Yageo America
R71	1	1.00Meg	RES, 1.00M, 1%, 0.063 W, AEC-Q200 Grade 0, 0402	CRCW04021M00FKED	0402	Vishay-Dale
S1, S2, S3	3		Switch, SPST, 0.05A, 12 VDC, SMD	1188E-1K2-V-TR	7.8x3.5mm	Diptronics
SH-J1	1	J101: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J2	1	J101: 3-4	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J3	1	J101: 5-6	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J4	1	J101: 7-8	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J5	1	J101: 9-10	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J6	1	J101: 11-12	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J7	1	J101: 12-13	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J8	1	J101: 15-16	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J9	1	J101: 17-18	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J10	1	J14: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J11	1	J3: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J12	1	J5: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J13	1	J6: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J14	1	J7: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J15	1	J8: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J16	1	J9: 2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J17	1	J15: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J18	1	J25: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J19	1	J26: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec

**Table 4-1. Bill of Materials (continued)**

Designator	Quantity	Value	Description	Part Number	Package Reference	Manufacturer
SH-J20	1	J27: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
SH-J21	1	J13: 1-2	Shunt, 100mil, Gold plated, Black	SNT-100-BK-G	Shunt	Samtec
T1	1	-20V	MOSFET, P-CH, -20 V, -0.82 A, SOT-323	DMG1013UW-7	SOT-323	Diodes Inc.
T2	1	45V	Transistor, NPN, 45V, 0.1A, SOT-323	BC850CW,115	SOT-323	NXP Semiconductor
U1	1		Mixed-Signal Microcontroller With CAN-FD Interface, LQFP100	MSPM0G3519SPZR	LQFP100	Texas Instruments
U2	1		Precision Micropower Shunt Voltage Reference, 0.5% accuracy, 2.5V, 15ppm / degC, 15mA, -40 to 85 degC, 5-pin SC70 (DCK), Green (RoHS & no Sb/Br)	LM4040C25IDCKR	DCK0005A	Texas Instruments
USB1	1		Cable, USB-A to micro USB-B, 0.3m	AK67421-0.3		Assman WSW
XDS1	1		MSP432E401YTPDT, PDT0128A (TQFP-128)	MSP432E401YTPDTR	PDT0128A	Texas Instruments
XDS2	1		MSP430G2x52, MSP430G2x12 Mixed Signal Microcontroller, RSA0016B (VQFN-16)	MSP430G2452IRSA16R	RSA0016B	Texas Instruments
Y1	1		Crystal, 32.768KHz, 12.5pF, SMD	FC-135 32.7680KA-A3	SMD, 2-Leads, Body 3.2x1.5mm	Epson
Y2	1		Crystal 40MHz ±10ppm (Tol) ±20ppm (Stability) 12pF FUND 40Ohm 4-Pin Mini-CSMD T/R	X1E0000210179	TSX-3225	Seiko Epson
Y3	1		Crystal, 16MHz, 8pF, SMD	NX3225GA-16.000M-STD-CRG-1	3.2x0.75x2.5mm	NDK
C15, C16, C17, C18	0	220pF	CAP, CERM, 220pF, 50V,+/- 5%, C0G/NP0, AEC-Q200 Grade 1, 0402	CGA2B2C0G1H221J050BA	0402	TDK
J24, J25, J26	0		Header, 2.54mm, 5x2, Gold, TH	61301021121	Header, 2.54mm, 5x2, TH	Würth Elektronik
R4	0	0	RES, 0, 5%, 0.1 W, 0603	RC0603JR-070RL	0603	Yageo
R21, R22	0	0	RES, 0, 5%, 0.063 W, 0402	RC0402JR-070RL	0402	Yageo America
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	0		Test Point, Miniature, Black, TH	5001	Black Miniature Testpoint	Keystone Electronics

## 5 Compliance Information

### 5.1 Compliance and Certifications

[LP-MSPM0G3519 EU Declaration of Conformity \(DoC\)](#)

## 6 Additional Information

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## 7 Related Documentation

### 7.1 Supplemental Content

The following items are important learning materials to get started with MSPM0.

- [MSPM0 Academies](#)
- [MSPM0-SDK Code examples](#)
- [TI Precision Labs](#)

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