EVM User's Guide: TMP115EVM

TMP115 Evaluation Module

Description

The TMP115 is a I2C-compatible digital temperature sensor in an ultra-small (0.72mm2) 5-pin DPW package along with 1.6mm × 1.6mm 6-pin DRL package. The TMP115 evaluation module (EVM) allows users to evaluate the performance of the TMP115 digital temperature sensor.

Get Started

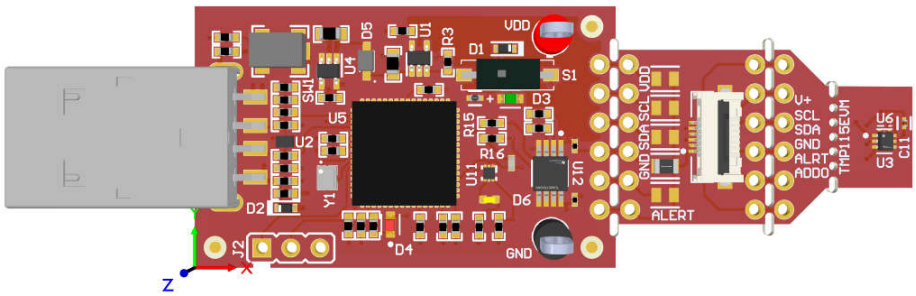
1. Order the TMP115EVM
2. Detach the sensor breakout PCB section (optional)
3. Connect the EVM to computer or user system
4. Go to the TMP115EVM gallery page on dev.ti.com to either download the GUI or run on the web
5. Refer to the TMP115 datasheet for IC details
6. Visit our E2E forums for support or questions

Features

- Easy to use cloud-based graphical user interface (GUI) is available on the web or can be downloaded for offline use
- Showcase the ultra-small digital temperature sensor with alert functionality
- Breakable sensor board with 0.1" pitch header footprint to interface with the TMP115
- Attachable connector for flex PCB board option for temperature sensing
- Hardware selectable addressing available
- Data logging with the GUI

Applications

- Building automation
  - Occupancy detection
  - Video doorbell
  - HVAC: Wireless environmental sensor
- Factory automation and control
  - Machine vision camera
  - Power Delivery Units
  - Industrial PC: Single board computer
  - CPU (PLC controller)
- Medical equipment
  - Continuous glucose monitor
- Data center and enterprise computing
  - Solid State Drive (SSD)
  - Rack Server Motherboard
- Personal electronics
  - PC and notebooks, tablets
  - Digital still and video camera
  - Augmented reality glasses
  - Smart speakers



TMP115EVM

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1 Evaluation Module Overview

1.1 Introduction

The TMP115EVM is designed to be used as is, along with the evaluation module graphical user interface (GUI). Alternatively, the sensor can be detached to be evaluated in the user's system. For this purpose, there are multiple alternatives to interface with the sensor for best user experience.

The EVM comes in a USB stick form factor, with an onboard MSP430F5528 microcontroller that interfaces with both the host computer and the TMP115 device using an Inter-Integrated Circuit (I2C) interface. The module is designed with perforations between the sensor and host controller on the EVM board. The perforation allows the user flexibility in the evaluation:

- The user can connect the TMP115 sensor breakout section to the user's system/host.
- The user can connect the EVM host and software to the user's system with TMP115 devices.
- Small individual boards allow the user to place sensors in the user's system or in a temperature-controlled environment to evaluate performance.
- Hole spacing is compatible with common 0.1in prototyping breadboards.

This user's guide describes the characteristics, operation, and use of the TMP115EVM evaluation board by explaining how to set up and configure the software, describing the hardware, and reviewing various aspects of the software operation. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the TMP115EVM. This user's guide also provides information on the operating procedure, input and output connections, an electrical schematic, printed-circuit board (PCB) layout drawings, and a parts list for the EVM.

1.2 Kit Contents

The content of the EVM kit is shown below. Contact the Texas Instruments Product Information Center nearest you if any components are missing. TI highly recommends that users check the TI website at https://www.ti.com to verify that the latest versions of the related software is downloaded.

- 1 - TMP115EVM

1.3 Specification

Table 1-1 defines the absolute maximum thermal conditions of each section of the EVM. The main 2 sections are the controller section and the sensor breakout section. These limits must be considered when evaluating the performance of the device at extreme temperatures. In this case, if the setup conditions exceed the controller absolute maximum thermal specifications, then the sensor breakout section must be detached so that only the sensor (and not the MCU) is evaluated at these temperatures.

Table 1-1. Thermal Specifications

BOARD SECTION	CONDITIONS	TEMPERATURE RANGE
Controller board	Recommended operating free-air temperature, T_A	-40°C to 85°C
	Absolute maximum junction temperature, T_J	95°C
TMP115 breakout section	Recommended operating free-air temperature, T_A	-55°C to 175°C

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1.4 Device Information

The TMP115 is a digital output temperature sensor that is calibrated in production to achieve high accuracy. This device communicates in a two-wire environment compatible with SMBus and I2C interfaces. The device can be set to make continuous or one-shot conversions and additionally has alert or diverse address functionality depending on the OPN. For more information of the IC, please refer to the device datasheet.

2 Hardware

2.1 Overview

The EVM is divided into two sections: the controller section and the sensor breakout section. The sensor breakout section can be detached to use the sensor in the following scenarios:

- Using the controller section with the sensor section connected by soldered wires or connectors to evaluate the sensor far from the controller and PC at extreme temperatures or other conditions.
- Using the sensor section with the user's system by interfacing through I^2C with the TMP115.
- Using the controller section with TMP115 sensors in the user's system.

TMP115EVM Board Sections highlights the EVM sections as well as some components that must be identified by the user to understand the purpose and use. The components are further explained in detail in the sections below.

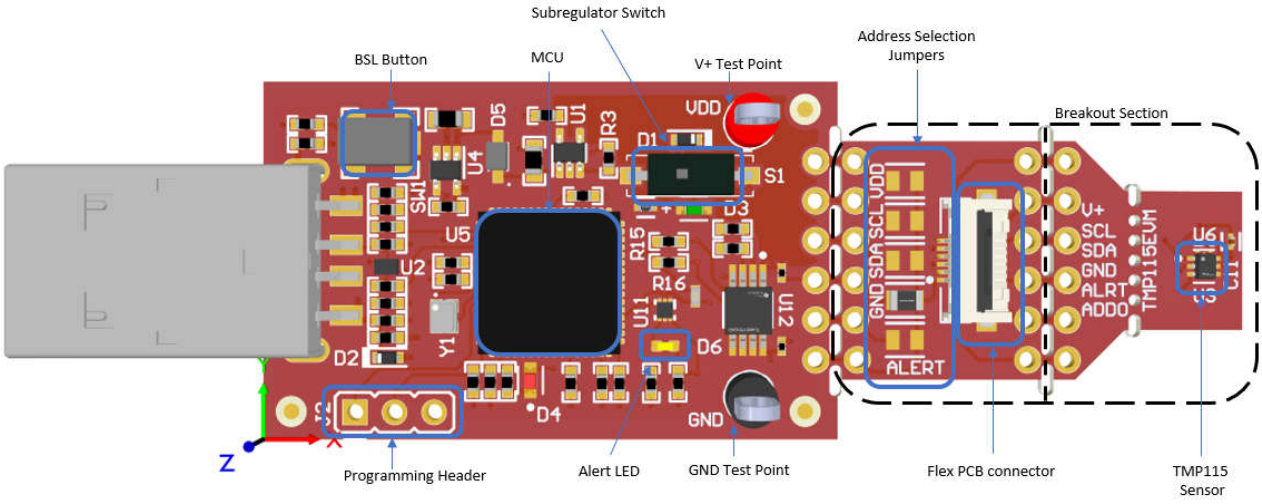


Figure 2-1. TMP115EVM Board Sections

2.2 Perforations and Connectability

The perforation between the USB controller and TMP115 sensor breakout section is labeled on the bottom of the board on both sides for pin connections. Once the sensor section is detached from the controller section, the user can interface with the sensor section by soldering wires or 0.1in header connectors. With this approach, the user has access to all 6 pins of the device.

Note that pullup resistors and protection diodes are on the controller section. Thus, when interfacing with other controller boards, TI recommends to verify that pullup resistors and protection circuitry are present on any controller board for safe and proper functionality.

Additionally, the EVM configuration allows for different address selection through a jumper. The DPW package has either an alert or address variant. Depending on the DPW variant, you can select either an address or alert with a jumper as shown in Figure 2-1. This configuration allows you access to the GUI features while changing the device to a DPW package on the EVM.

The TMP115EVM has the option to connect TMP115FLXEVM, a flex PCB with an attached TMP115. The TMP115 flex PCB connection has a different orderable online and needs to be ordered separately. Either the

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default FR-4 breakable section can be connect or the flex PCB can be connected. Both cannot be connected to the USB at the same time.



Figure 2-2. TMP115FLX Connection

2.3 Status LEDs and Sub-regulator

The green LED D3 illuminates when VDD is supplied. VDD must be supplied for normal operation of the TMP115EVM as VDD is used for device power and communication line pullup voltages. VDD can be supplied via the on-board sub-regulator U1 or external power. See Section 2.5 for more details.

The yellow LED D6 illuminates when the ALERT pin is low. The default software configuration of the ALERT pin is active-low, and the LED illuminates when ALERT becomes active or "trips".

The red LED D4 is the MSP430F5528 status LED. Table 2-1 shows how the different modes of operation are displayed by the LED status.

Table 2-1. Status LED Mode of Operation

D4 LED STATUS	MSP430F5528 MODE OF OPERATION
Off	EVM is connected to EVM GUI
Blinking in bursts of 4 blinks	EVM is plugged into PC, not connected to EVM GUI
Steady blinking	Connected to USB power

2.4 Address Selection

The TMP115EVM has an Address Selection portion of the breakout section. A resistor can be moved to ALERT, GND, SDA, SCL, or VDD for address selection. Refer to the datasheet to understand what I2C address your device is configured to. Take care to only install 1 resistor at a time to avoid shorts. Depending on the DPW variant, you can select either an address or alert with a resistor. This configuration allows you access to the GUI features while changing the device to a DPW package on the EVM.

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2.5 Power Supply

VDD supplies power to the TMP115 device and pullup voltage of the communication lines. The supply range is listed in the datasheet. The on-board regulator U1 regulates USB power down to 3.3V. The user can also disable the sub-regulator to apply a different supply voltage. To use an external power supply, follow these instructions:

1. Flip the switch S1 to disable the sub-regulator; the green LED D3 turns off
2. Connect the external power supply using the V+ and GND test points, or by soldering headers or wires on the breakout section
3. Supply VDD; the green LED D3 turns on
4. Use the GUI as normal

2.6 Programming Header

The TMP115EVM comes pre-loaded with firmware that is necessary for the correct operation of the USB interface and PC GUI software. The unpopulated header, J2, is provided for Spy-Bi-Wire access to the MSP430F5528. TI does not recommend that users access this header or reprogram the device.

2.7 BSL Button

The TMP115EVM features push-button SW1 for entering USB BSL mode. This can be used for firmware updates. To enter USB BSL mode, connect the EVM to a PC USB port while holding down SW1.

3 Software

3.1 Software Download

The PC GUI Software for TMP115EVM runs on TI's GUI Composer framework. The software is available as a live version which runs in your browser, and is available as a download for offline use. The software is compatible with Windows®, Mac®, and Linux® operating systems.

3.1.1 Live Software on dev.ti.com

The live software currently works on Chrome, Firefox, and Safari browsers. Internet Explorer is not supported. Users can access the live version through one of the following actions:

- Go to the EVM tool page and click on the View button
- Go to https://dev.ti.com/gallery/search/tmp115

Click on the application icon within the gallery to launch the software. Click on the prompt to install the TI Cloud Agent Bridge browser plugin.

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3.1.2 Offline Software

3.1.2.1 Download From dev.ti.com

Users can access the latest version of the offline software by navigating to the live version as noted above. Look for the download icon and download both the application and runtime for the operating system as shown in the Gallery Download.

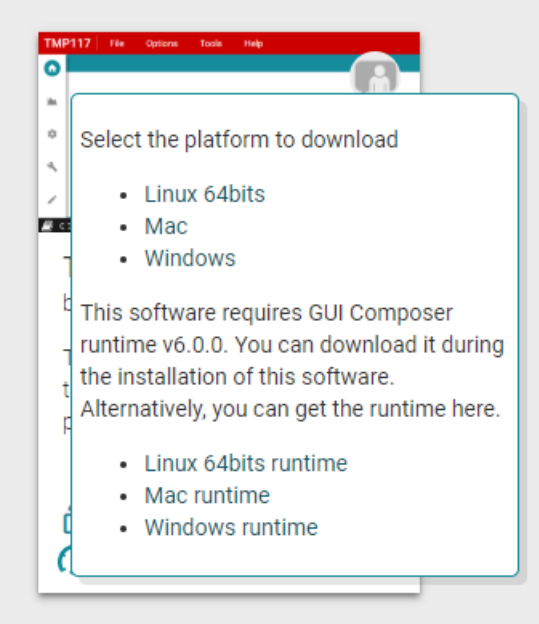


Figure 3-1. Download Pop-Up

3.2 Home Tab

The Home Tab is shown at software launch. From here, you can access the Getting Started, Information, Data, Registers and Collateral tabs which are explained below. The icons on the left side of the screen are shortcuts to the tabs.

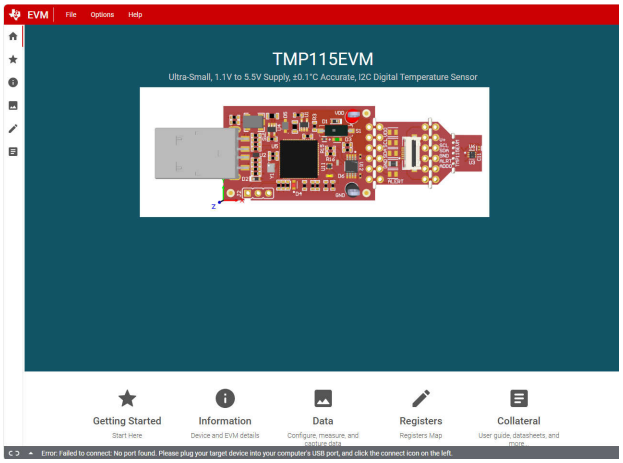


Figure 3-2. Home

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3.3 Getting Started

The Getting Started tab is used to set the target I^2C address based on the ADDR pin connection. The default setting assumes that the ADDR pin is connected to GND. To change the I^2C configuration, make the appropriate selection from the dropdown list. Then, click the button on the bottom left of the GUI to reinitialize communication.

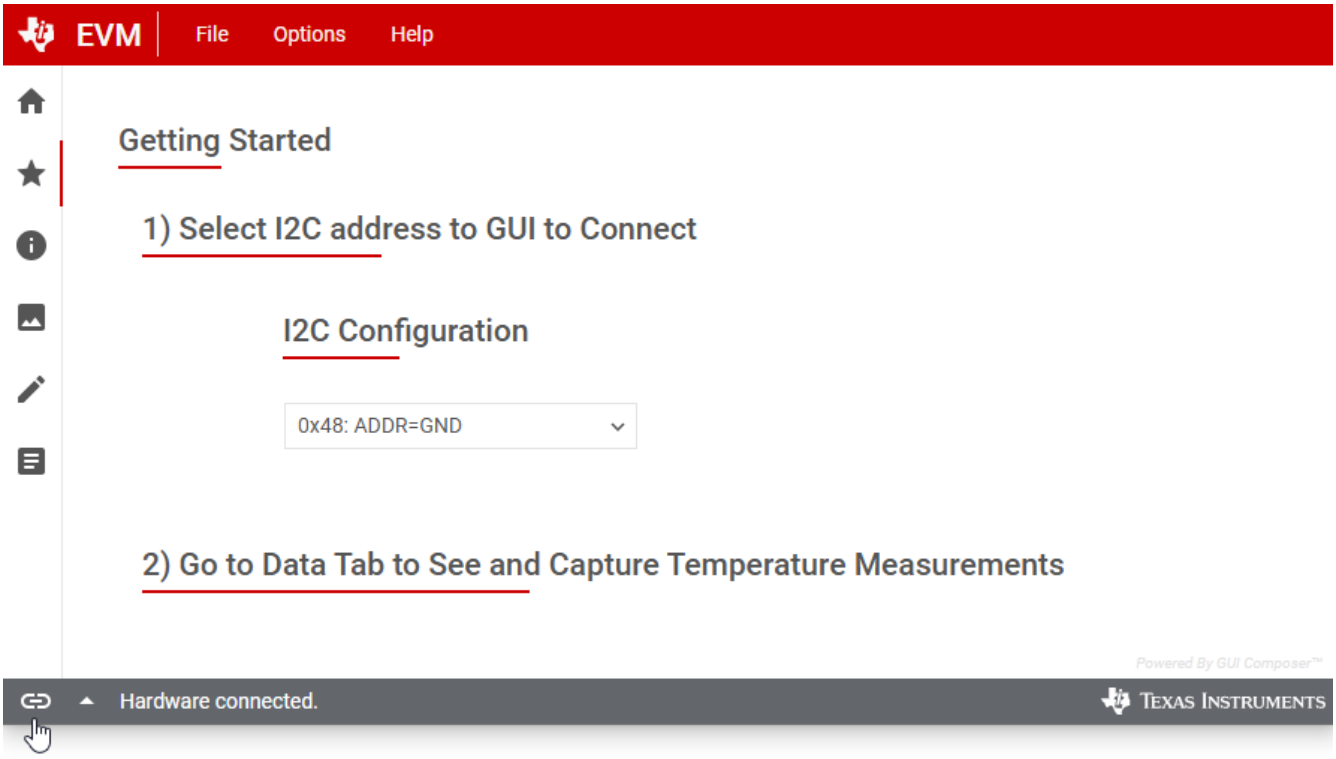


Figure 3-3. Getting Started

3.4 Information Tab

The Information tab shows device details and features of the TMP115 and EVM. The Device Information & Features sub-tab includes a specifications summary, device block diagram, and description of functional modes. The EVM Details sub-tab includes the EVM schematic and legend.

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3.5 Data Tab

The Data Capture tab reports the temperature from the TMP115 device included on the TMP115EVM. By default, once the EVM is connected and the GUI is loaded and running properly, the device starts in continuous conversion mode and the MCU starts polling the device. The conversion results are automatically reported and displayed in the Data tab graph.

On the right side of this tab, the user can view the latest temperature read value. There is also a chart controls box which allows the user to:

- Set the polling rate. Once a value is selected from the dropdown, the MCU automatically starts reading the TMP115 at the set polling rate.
- Write to the Conversion Rate bits using the Device Rate field. Once a value is selected from the dropdown, the MCU automatically writes to the TMP115, which then starts converting at the programmed rate.
- Start and stop polling the data read to export to CSV format for temperature monitoring. The user must start polling by clicking the Start button and the data (CSV) automatically exports once the stop button is clicked.

The Alert Config box allows the user to easily configure the alert functionality settings of the TMP115 such as polarity, mode, and limits. The limits can be written on the left box in decimal format, and the corresponding hexadecimal value is automatically displayed in the right box for reference. Once selected or updated, all of the settings are written automatically to the TMP115 by the MCU.

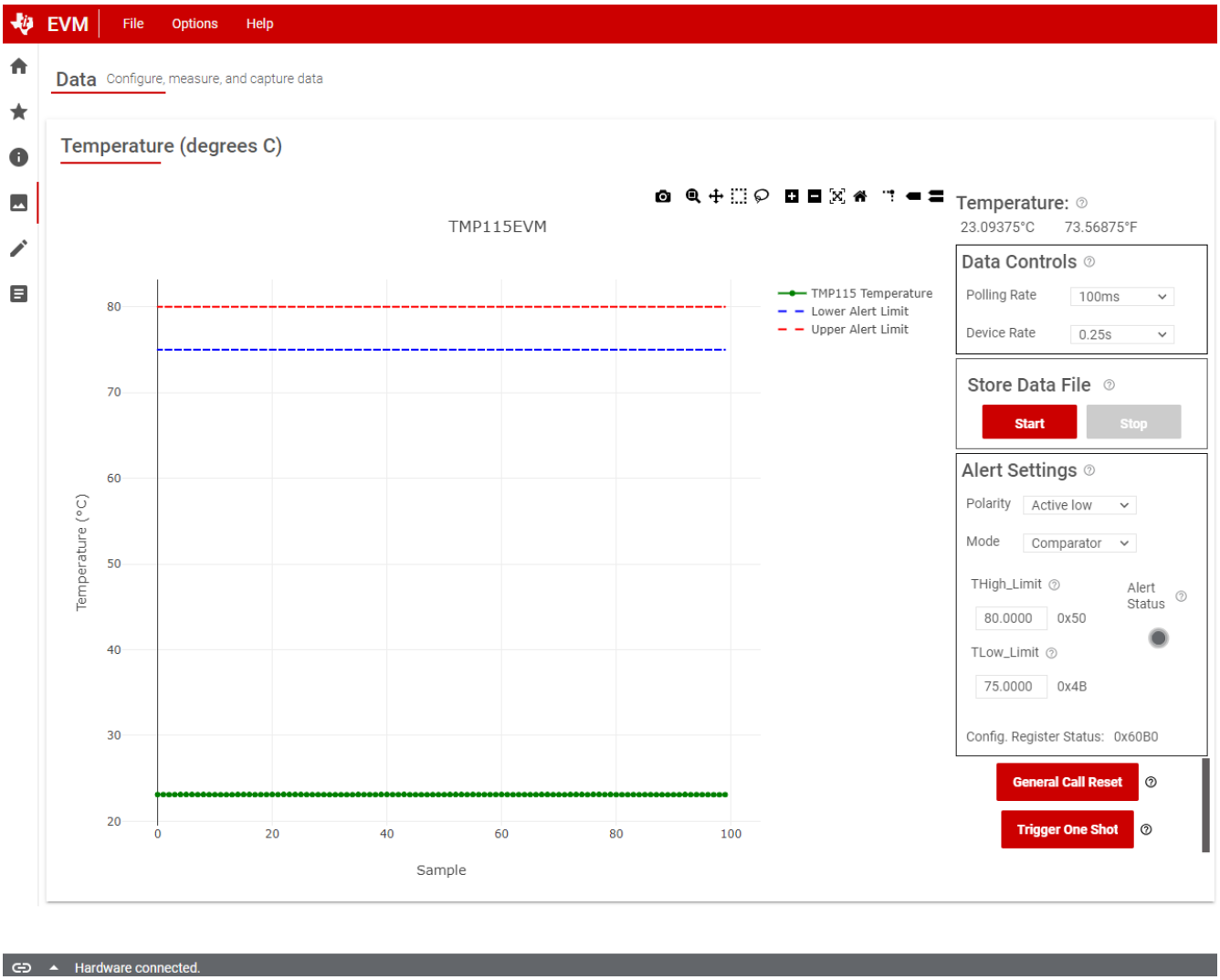


Figure 3-4. Data Capture

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3.6 Registers Tab

The Registers tab interacts with the registers and bits within the TMP115 device. For more information on each register or bit, select on a register name to see what each bit defines.

The Auto Read dropdown box configures the polling rate of the register contents. By default, the MCU polls the registers with a 100ms delay. When Auto Read is Off, select Read Register to fetch the contents of the selected register. Read All Registers can be used to fetch the contents of all registers at once.

By default, the Write Register button is grayed and disabled when the Write Mode button is set to Immediate. Immediate mode triggers a Write operation each time a register is modified. When Deferred mode is selected, the Write Register button is enabled, and write operations are not performed unless the Write Register button is clicked.

These settings give the user total control over I^2C Bus activity, and enable individual transactions to be easily observed with an oscilloscope, logic analyzer, or bus-sniffing device.

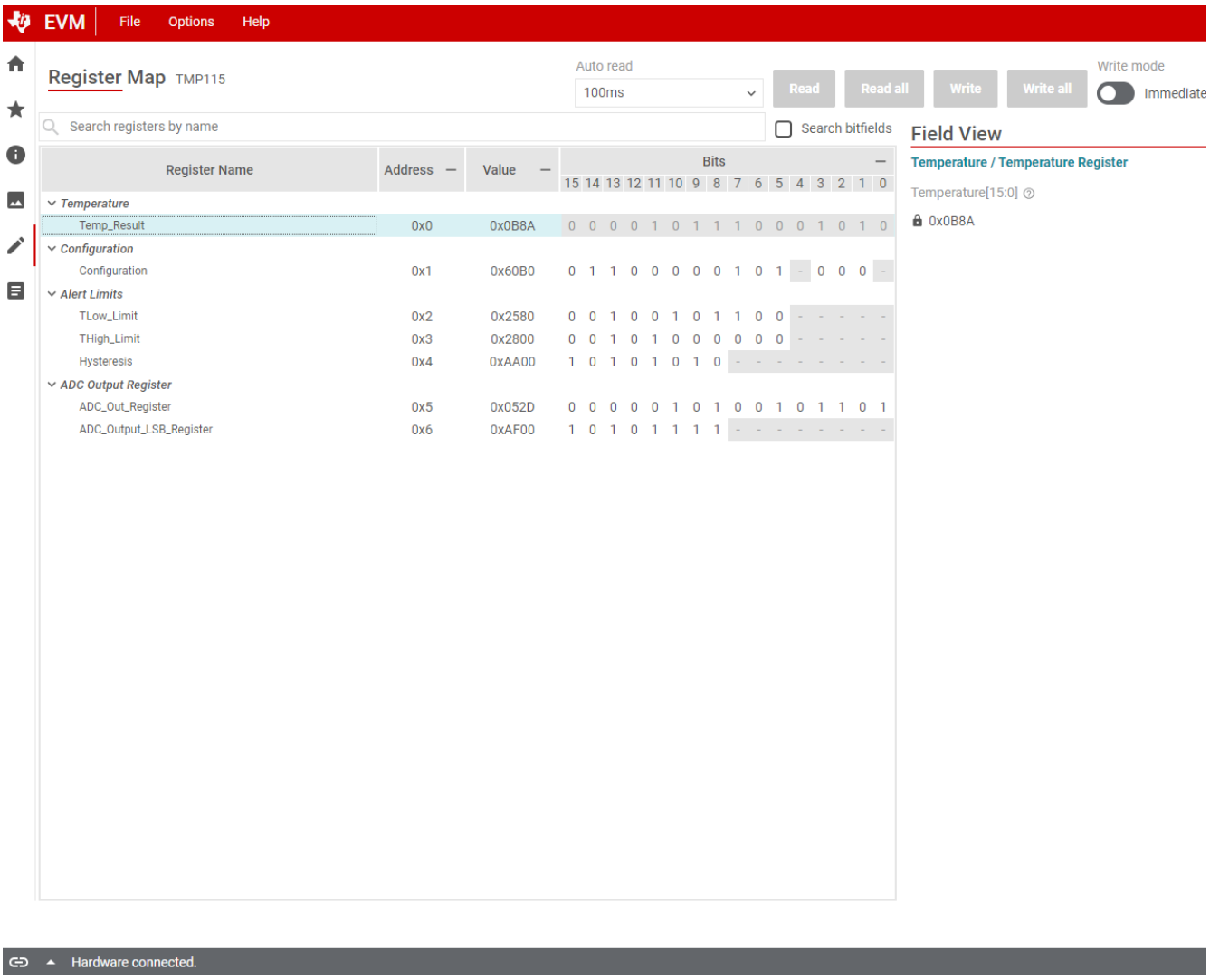


Figure 3-5. Registers

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3.7 Collateral Tab

The Collateral tab contains links to the EVM user's guide, the tool page on ti.com, as well as links to the product datasheet and other relevant links.

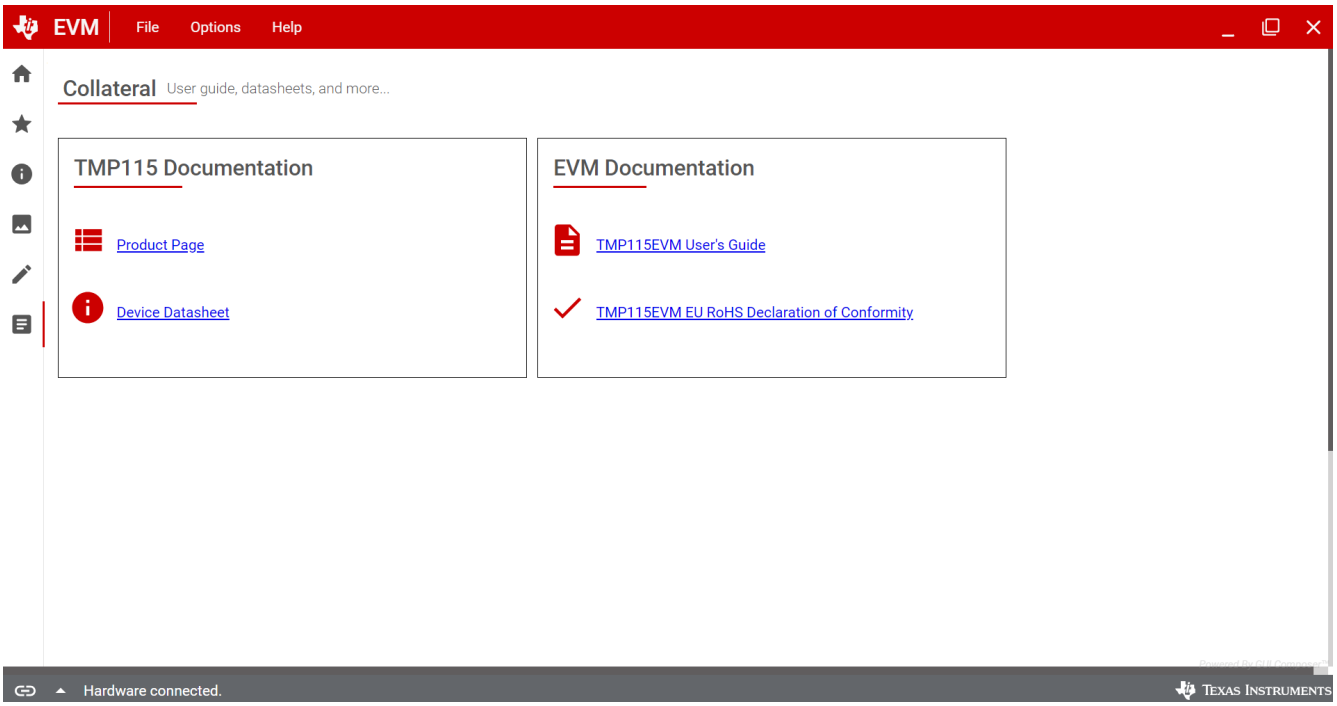


Figure 3-6. Collateral

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4 Hardware Design Files

4.1 Schematic

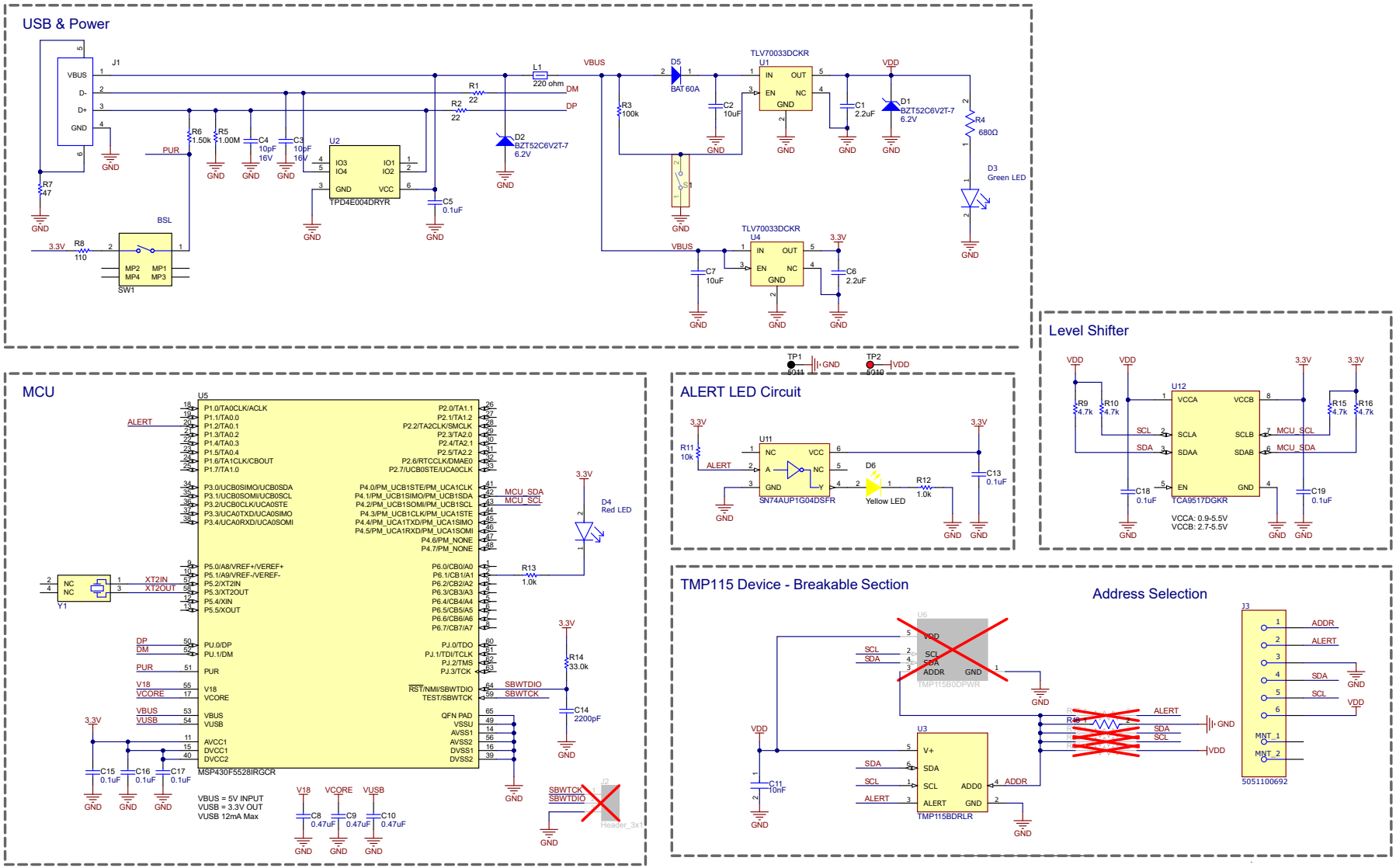


Figure 4-1. Schematic

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4.2 PCB Layouts

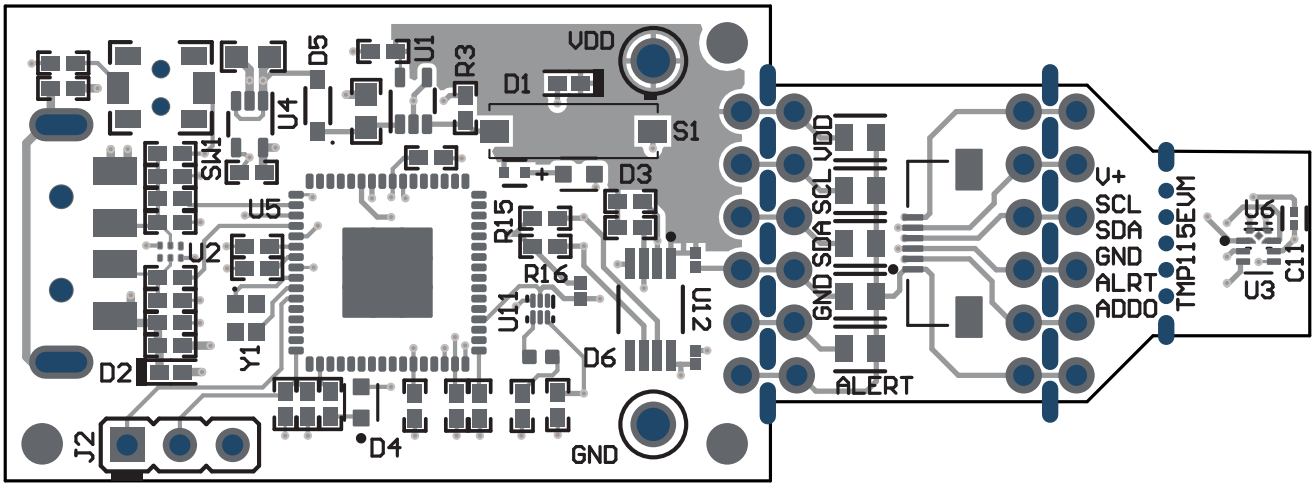


Figure 4-2. Top View

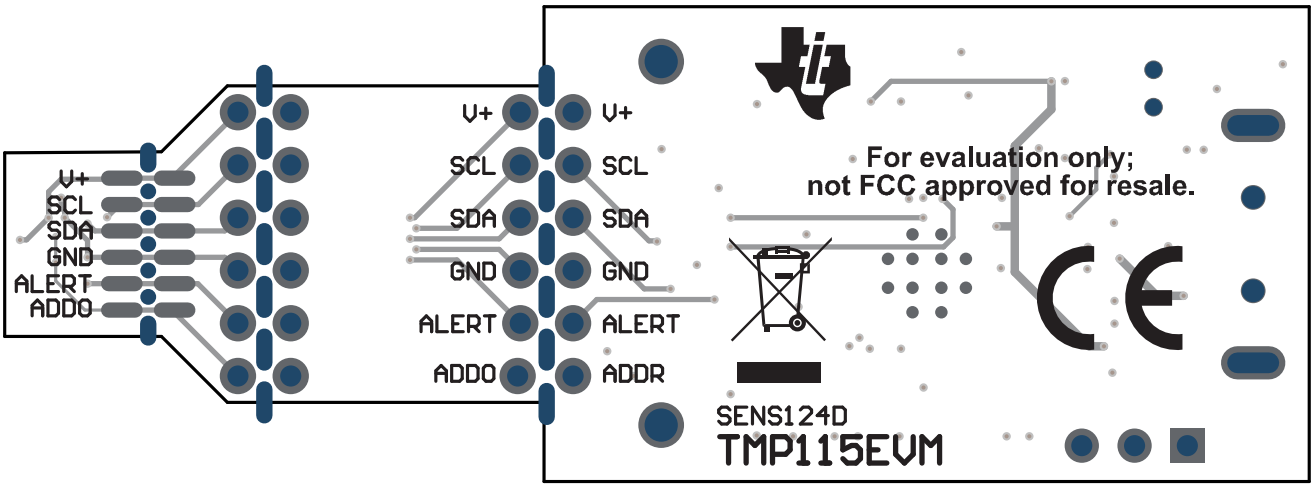


Figure 4-3. Bottom View

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4.3 Bill of Materials

Table 4-1. Bill of Materials

Fitted	Description	Designator	Part Number	Quantity	Manufacturer	Package Reference	Value
Fitted	Printed Circuit Board	!PCB1	SENS124	1	Any		
Fitted	CAP, CERM, 2.2uF, 16V, +/- 10%, X5R, 0402	C1, C6	GRM155R61C225KE11D	2	MuRata	0402	2.2uF
Fitted	CAP, CERM, 10uF, 10V, +/- 20%, X5R, 0603	C2, C7	C1608X5R1A106M080AC	2	TDK	0603	10uF
Fitted	CAP, CERM, 10pF, 16V,+/- 10%, C0G, 0402	C3, C4	C0402C100K4GACTU	2	Kemet	0402	10pF
Fitted	CAP, CERM, 0.1uF, 10V,+/- 10%, X5R, 0402	C5, C13, C15, C16, C17	LMK105BJ104KV-F	5	Taiyo Yuden	0402	0.1uF
Fitted	CAP, CERM, 0.47uF, 6.3V, +/- 10%, X7R, 0402	C8, C9, C10	JMK105B7474KVHF	3	Taiyo Yuden	0402	0.47uF
Fitted	Chip Multilayer Ceramic Capacitors for General Purpose, 0201, 10000pF, X7R, 15%, 10%, 10V	C11		1			
Fitted	CAP, CERM, 2200pF, 50V, +/- 5%, X7R, 0402	C14	CL05B222JB5NNNC	1	Samsung Electro-Mechanics	0402	2200pF
Fitted	CAP, CERM, 0.1uF, 10V, +/- 10%, X5R, 0201	C18, C19	CL03A104KP3NNNC	2	Samsung Electro-Mechanics	0201	0.1uF
Fitted	Diode, Zener, 6.2V, 300 mW, SOD-523	D1, D2	BZT52C6V2T-7	2	Diodes Inc.	SOD-523	6.2V
Fitted	Green LED Indication - Discrete 2.2V 0603 (1608 Metric)	D3	SML-LX0603GW-TR	1	Lumex	0603	
Fitted	Red - LED Indication - Discrete 2V 0603 (1608 Metric) 2V @ 20mA 71.5mcd 48mW	D4	SML-LX0603SIW-TR	1	Lumex	0603	
Fitted	Silicon Schottky Diode, -55 to 85 degC, SOD323, Reel, Green	D5	BAT60A	1	Infineon	SOT323	
Fitted	LED, Yellow, SMD	D6	150040YS73240	1	Wurth Elektronik	1x0.5mm	Yellow
Fitted	Connector, Plug, USB Type A, R/A, Top Mount SMT	J1	48037-1000	1	Molex	USB Type A right angle	
Fitted	6 Position FFC, FPC Connector Contacts, Bottom 0.020" (0.50mm) Surface Mount, Right Angle	J3	5051100692	1	Molex	FPC6	
Fitted	Ferrite Bead, 220ohm @ 100MHz, 0.45A, 0402	L1	BLM15AG221SN1D	1	MuRata	0402	220ohm
Fitted	RES, 22, 5%, 0.1W, AEC-Q200 Grade 0, 0402	R1, R2	ERJ-2GEJ220X	2	Panasonic	0402	22
Fitted	RES, 100k, 5%, 0.1W, AEC-Q200 Grade 0, 0402	R3	ERJ-2GEJ104X	1	Panasonic	0402	100k
Fitted		R4		1			

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Table 4-1. Bill of Materials (continued)

Fitted	Description	Designator	Part Number	Quantity	Manufacturer	Package Reference	Value
Fitted	RES, 1.00M, 1%, 0.063W, AEC-Q200 Grade 0, 0402	R5	RMCF0402FT1M00	1	Stackpole Electronics Inc	0402	1.00Meg
Fitted	RES, 1.50k, 1%, 0.063W, AEC-Q200 Grade 0, 0402	R6	RMCF0402FT1K50	1	Stackpole Electronics Inc	0402	1.50k
Fitted	RES, 47, 5%, 0.1W, AEC-Q200 Grade 0, 0402	R7	ERJ-2GEJ470X	1	Panasonic	0402	47
Fitted	RES, 110, 1%, 0.1W, AEC-Q200 Grade 0, 0402	R8	ERJ-2RKF1100X	1	Panasonic	0402	110
Fitted	RES, 4.7k, 5%, 0.063W, AEC-Q200 Grade 0, 0402	R9, R10, R15, R16	CRCW04024K70JNED	4	Vishay-Dale	0402	4.7k
Fitted		R11		1	KOA Speer		10k
Fitted	RES, 1.0k, 5%, 0.1W, AEC-Q200 Grade 0, 0402	R12, R13	ERJ-2GEJ102X	2	Panasonic	0402	1.0k
Fitted	RES, 33.0k, 1%, 0.063W, 0402	R14	RC0402FR-0733KL	1	Yageo America	0402	33.0k
Fitted	Thick Film Chip Resistors 0805 0Ω 0.125W 5%	R18		1			
Fitted	Switch, Slide, SPST, Top Slide, SMT	S1	CHS-01TB	1	Copal Electronics	Switch, Single Top Slide, 2.5x8x2.5mm	
Fitted	Switch, SPST-NO, Off-Mom, 0.05A, 12VDC, SMD	SW1	PTS820J20M SMTR LFS	1	C&K Components	3.9x2.9mm	
Fitted	Test Point, Black, Through Hole, RoHS, Bulk	TP1		1	Keystone	5011	
Fitted	Test Point, Red, Through Hole, RoHS, Bulk	TP2		1	Keystone	5010	
Fitted	Single Output LDO, 200mA, Fixed 3.3V Output, 2 to 5.5V Input, with Low IQ, 5-pin SC70 (DCK), -40 to 125 degC, Green (RoHS & no Sb/Br)	U1, U4	TLV70033DCKR	2	Texas Instruments	DCK0005A	
Fitted	4-Channel ESD Protection Array for High-Speed Data Interfaces, DRY0006A (USON-6)	U2	TPD4E004DRYR	1	Texas Instruments	DRY0006A	
Fitted	Ultra-Small, 1.1V to 5.5V Supply, ±0.2°C Accurate, I2C Digital Temperature Sensor	U3	TMP115BDRLR	1	Texas Instruments	SOT6	
Fitted	16-Bit Ultra-Low-Power Microcontroller, 128KB Flash, 8KB RAM, USB, 12Bit ADC, 2 USCIs, 32Bit HW MPY, RGC0064B (VQFN-64)	U5	MSP430F5528IRGCR	1	Texas Instruments	RGC0064B	
Fitted	Low-Power Single Inverter Gate, DSF0006A, LARGE T&R	U11	SN74AUP1G04DSFR	1	Texas Instruments	DSF0006A	
Fitted	IC TRNSLTR BIDIRECTIONAL 8VSSOP	U12		1	Texas Instruments		
Fitted	Crystal, 24MHz, SMD	Y1	XRCGB24M000F2P00R0	1	MuRata	2x1.6mm	
Not Fitted	Header, 2.54mm, 3x1, Gold, TH	J2	GBC03SAAN	0	Sullins Connector Solutions	Header, 2.54mm, 3x1, TH	

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Table 4-1. Bill of Materials (continued)

Fitted	Description	Designator	Part Number	Quantity	Manufacturer	Package Reference	Value
Not Fitted	Thick Film Chip Resistors 0805 0Ω 0.125W 5%	R17, R19, R20, R21		0			
Not Fitted	Ultra-Small, 1.1V to 5.5V Supply, ±0.2°C Accurate, I2C Digital Temperature Sensor	U6	TMP115B0DPWR	0	Texas Instruments	X2SON5	

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6 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

Changes from Revision B (January 2026) to Revision C (September 2026) **Page**

- Updated information about flex PCB throughout the document ... 1
- Updated all EVM images throughout the document ... 1
- Updated the *Schematic* section ... 11
- Updated the *PCB Layouts* section ... 12
- Updated the *Bill of Materials* section ... 13

Changes from Revision A (October 2025) to Revision B (January 2026) **Page**

- Updated descriptions for address selection throughout the document ... 1
- Updated hardware images throughout the document to reflect changes to the EVM ... 1
- Updated the *TMP115EVM Board Sections* figure in the *Overview* section ... 3
- Updated the *Bill of Materials* section ... 13

Changes from October 13, 2025 to October 22, 2025 (from Revision * (October 2025) to Revision A (October 2025)) **Page**

- Corrected the GPN of the EVM device in the title ... 1
- Changed the temperature values for the TMP115 breakout section in Table 1-1 ... 2

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