

# Single-Wire FRAM Evaluation Module



## Description

The TMF0008EVM allows users to evaluate the performance of TMF0008 Single-Wire FRAM devices. The EVM comes in a USB stick form factor for interfacing with the host PC. The microcontroller is preloaded with the firmware required to communicate between the device under test and the host PC. The Single-Wire\_MEM\_EVM\_GUI software (referred to as *GUI*) is an all-in-one suite capable of managing registers, modifying memory pages, and reporting device status.

### Note

The TMF0008 was previously released as the BQF0008.

## Get Started

1. Order the [TMF0008EVM](#).
2. Download the latest version of the [Single-Wire\\_MEM\\_EVM\\_GUI software](#).
3. Follow this EVM user's guide.

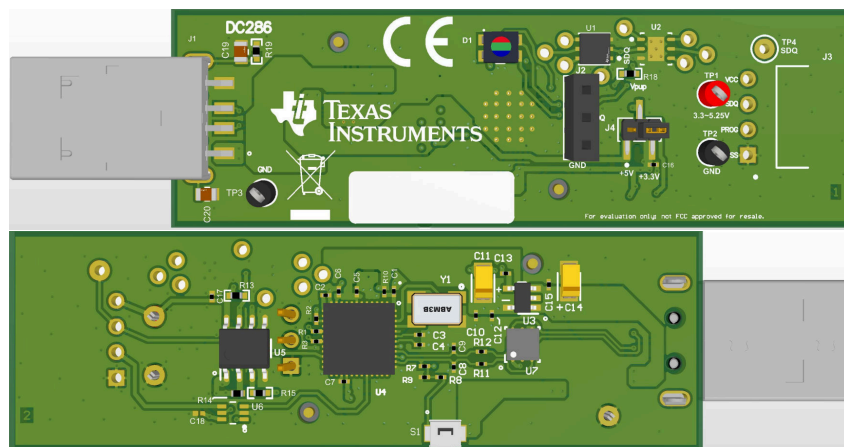
## Features

- Direct USB connection to PC for power and data transfer

- Control SDQ pull-up voltage control to 5V and 3.3V by jumpers
- Multiple test points for relevant signal probing
- Onboard MSP430F5509 MCU with hardware Single-Wire support
- Optional firmware reprogramming over USB
- TMF0008DRS device included onboard
- Header available for external device interfacing
- Plug-and-play operation for use with Single-Wire\_MEM\_EVM\_GUI software
- Support for standard (15.4Kbps) and overdrive (90Kbps) Single-Wire data transfer speeds
- Read and write to FRAM, modify status registers, and read device identifiers

## Applications

- Medical disposables
- Cable identification
- [Asset tracker](#)
- [Energy infrastructure](#)
- [Connected peripherals and printers](#)
- Counterfeit hardware detection



TMF0008EVM (Top and Bottom View)

# 1 Evaluation Module Overview

## 1.1 Introduction

The TMF evaluation module demonstrates the performance, behavior, and function of TI's family of FRAM devices using the Single-Wire communication protocol. This user's guide details the required hardware and software setup process, schematic, and PCB layout. References within this document to *evaluation board*, *evaluation module*, and *EVM* refers to the TMF0008EVM.

## 1.2 Kit Contents

[Table 1-1](#) summarizes the contents of the TMF0008EVM kit. Contact the nearest [Texas Instruments Product Information Center](#) if any component is missing. TI recommends checking the product folder on ti.com for the latest versions of released software.

**Table 1-1. TMF0008EVM Kit Contents**

Item	Quantity
TMF0008EVM Evaluation Board	1

## 1.3 Specifications

Supported features in this version:

- Manage up to 6 TMF memories simultaneously
- Access to status registers, ID, and memory space
- Read and write to memory pages
- View stored memory at a glance
- Manage communication speed between standard and overdrive
- Error console for quick troubleshooting and logging
- Optional firmware upgrades over USB

## 1.4 Device Information

The TMF0008 stores data in FRAM non-volatile memory and facilitates data transfer over the **SDQ™** Single-Wire interface. The device supports 15.4kbps (standard) and 90kbps (overdrive) maximum speeds. Each device contains a unique factory-programmed 64-bit identification number used for addressing and identification. Data communication and power are facilitated via the SDQ line and GND. The memory is structured as 30 memory pages, each storing 32 bytes. Data is written to a 32-byte scratchpad for verification before copying to memory. Each adjacent set of 4 pages constitutes a single memory block, which can be configured for write-protect, or emulated EPROM modes.

EVM	Device	Description
TMF0008EVM	TMF0008	8Kb Serial FRAM with SDQ Interface

## 2 Single-Wire\_MEM\_EVM\_GUI Software

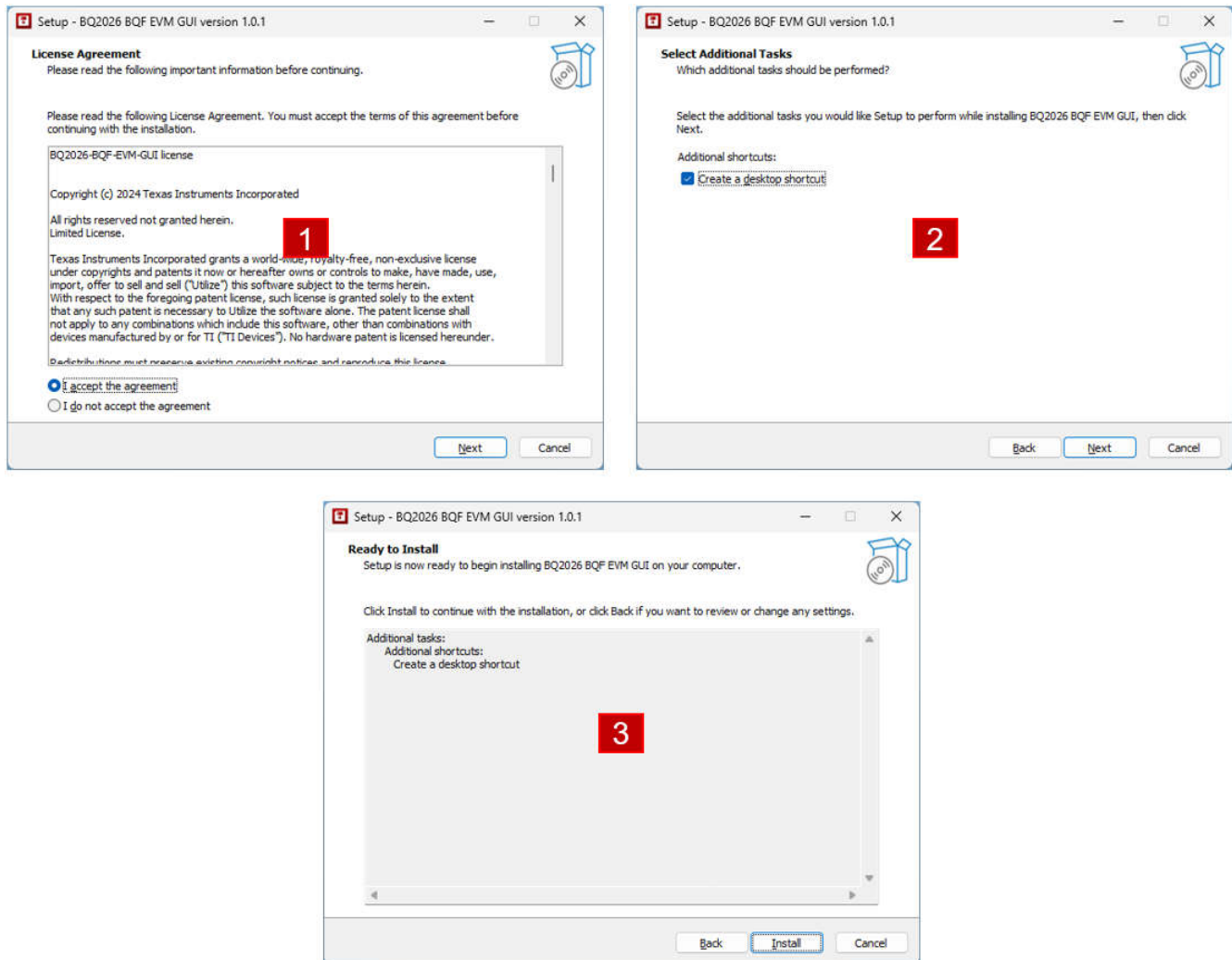
The Single-Wire\_MEM\_EVM\_GUI Software (referred to as *GUI*) is a unified platform for evaluating TI's Single-Wire memory devices. This section describes the installation and operation of the GUI software. The GUI allows the user to adjust the communication speed, modify stored memory, and access status registers.

### 2.1 Hardware Requirements

The TMF EVM software has been tested on 64-bit versions of Windows 10 or Windows 11. Proper software function requires a PC with at minimum a dual-core 64-bit processor, 2GB of available memory, 2GB of available storage, and 1 available USB2.0 port.

### 2.2 Software Installation

The EVM GUI software is available at [Single-Wire\\_MEM\\_EVM\\_GUI](#). Download and install the GUI and follow the prompts as shown in [Figure 3-1](#).



**Figure 2-1. EVM GUI Software Install (EULA, Options, Install)**

## 2.3 GUI Software Operation

This section discusses how to operate the Single Wire Memory EVM GUI software.

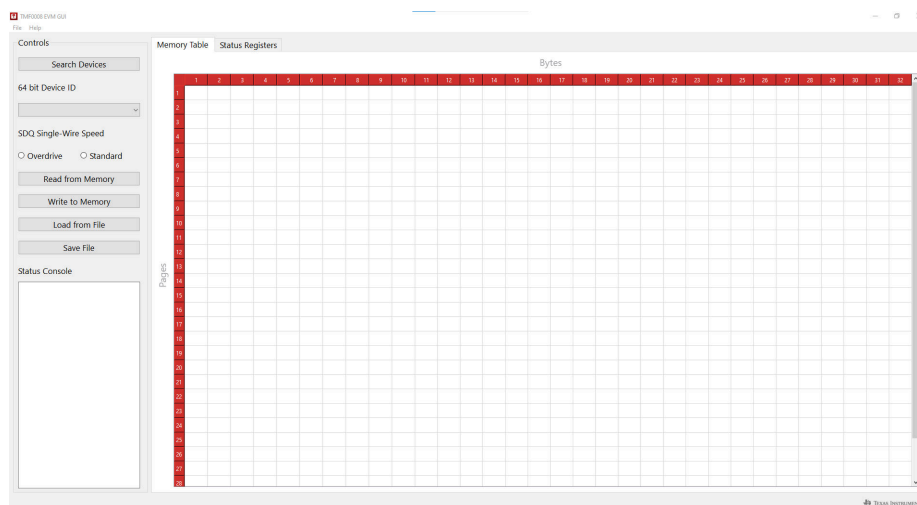
### 2.3.1 Launching GUI

With the EVM properly connected and software installed, launch the Single Wire Memory EVM GUI application. The software launches with a screen similar to that shown in [Figure 3-2](#).



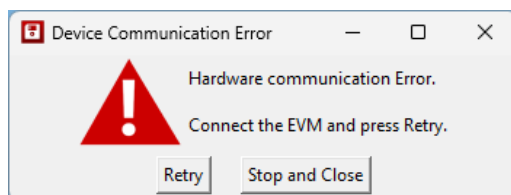
**Figure 2-2. TMF0008 EVM GUI Splash Screen**

The GUI has two main sections: *Memory Table*, which enables manipulation of the main memory space on the device, and *Status Registers*, used to modify memory settings. *Controls* is always available, and is for controlling device communication.



**Figure 2-3. EVM GUI Main Screen**

The message shown in [Figure 3-4](#) appears when the GUI is launched and the EVM was not detected. Check the USB connection and that the board appears in Device Manager.



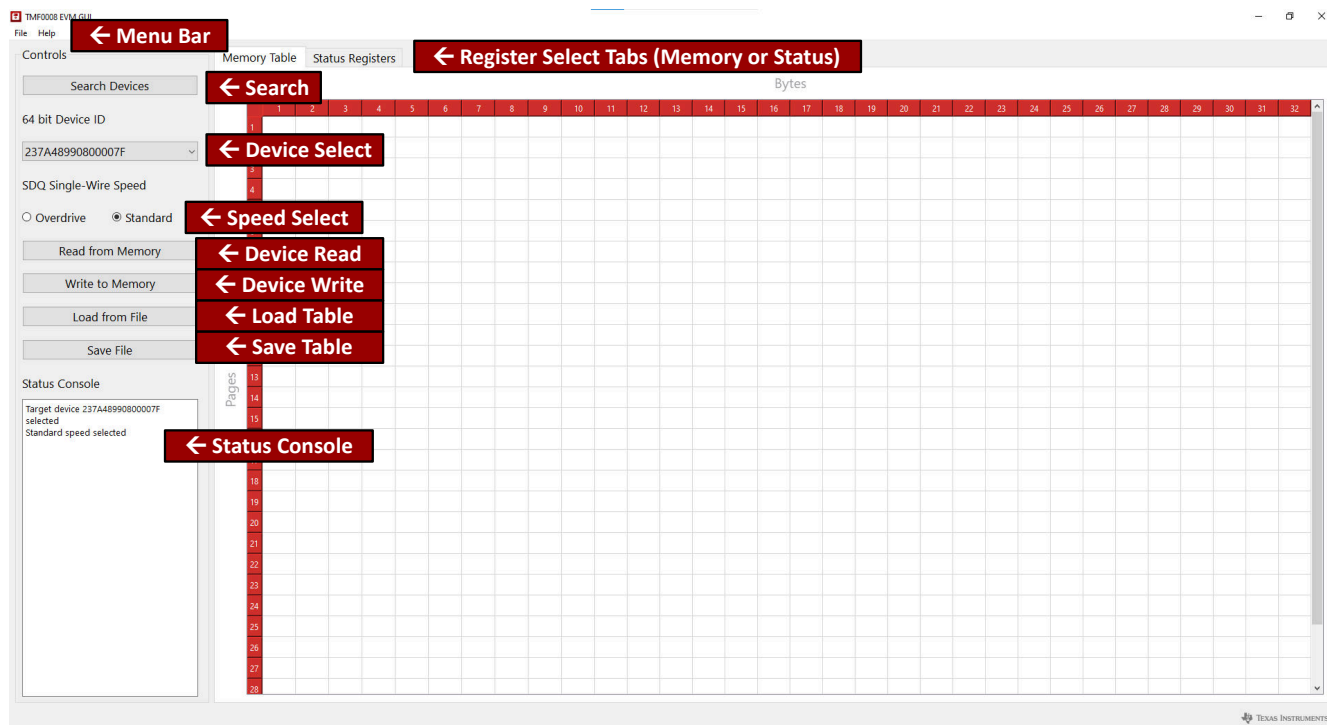
**Figure 2-4. Device Communication Error**

### 2.3.2 Menu Bar

The menu bar at the top contains *File* and *Help* options, shown in [Figure 3-5](#). The program can be closed by *File* -> *Exit*. The *Help* tab contains the *About* and *Product Safety Warnings* for the device and EVM GUI.

### 2.3.3 Main Controls

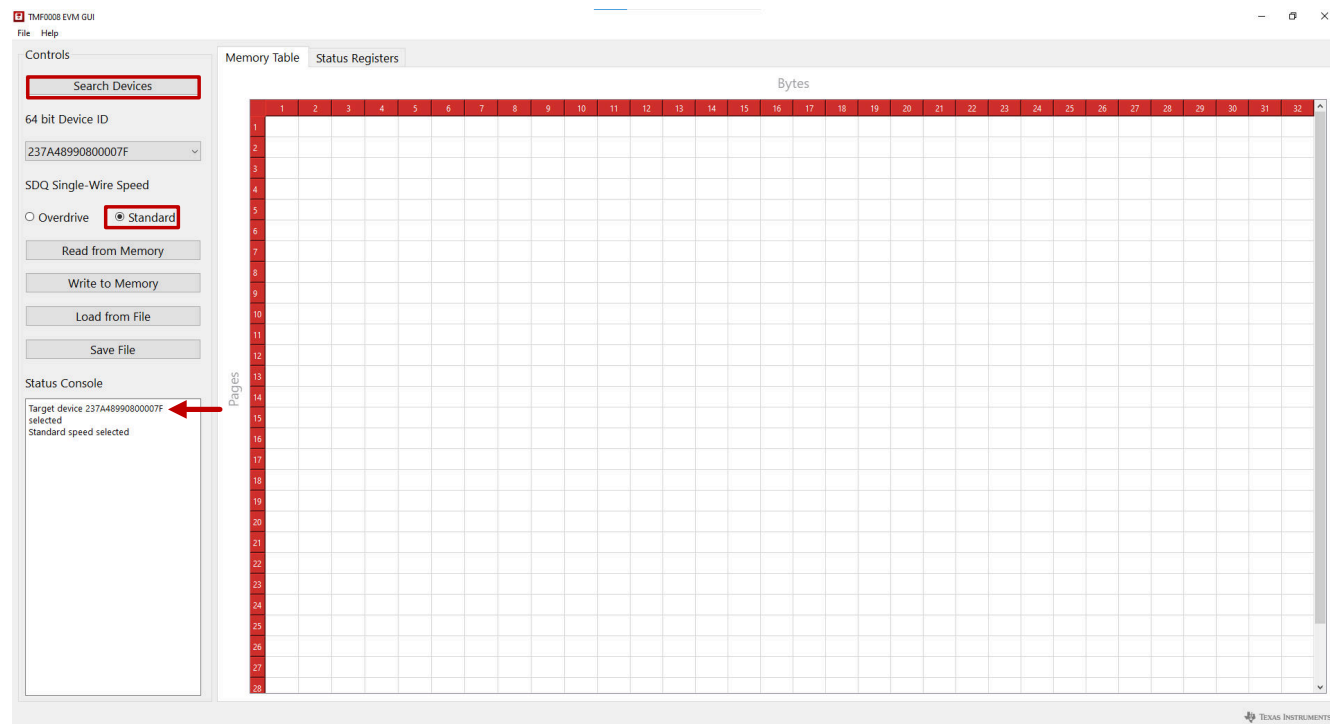
The Main Controls are always available for changes and appear in the left side of the application window. The Status Console, located at the bottom left, relays back error messages while the application is running. Any fatal errors appear in a pop-up window. Please note that if the software is used in a multiple monitor setup, then pop-up messages appear on the main screen, regardless of the screen that the GUI is on.



**Figure 2-5. Main Controls**

### 2.3.3.1 Search Devices

The *Search Devices* button is located at the top left of the controls area in the program. This function is used to collect information on the Single-Wire devices present on the bus. Shown in [Figure 3-6](#), clicking *Search Devices* populates the device list with all Single-Wire sub-devices in the *Select 64 bit Device ID* drop-down menu. This also clears the *Memory Table* and *Status Registers*. If any devices are detected, then the first device is automatically selected and set to the standard speed.



**Figure 2-6. Search Devices**

**Table 2-1. Search Device Error Messages**

Error	Explanation
There are more than 6 devices on the bus	Limit total number of connected SDQ devices to 6 or fewer.
CRC Fail	The CRC-8 value given by the device doesn't match the calculated CRC-8 value derived from the received data.
No devices connected	No presence pulse was detected on the SDQ line. Verify Single-Wire devices are connected to SDQ and Jumper J4 is installed in <a href="#">Figure 2-1</a> .

### 2.3.3.2 Select 64 bit Device ID

The *64 bit Device ID* drop-down list is for selecting a Single-Wire device on the bus, which is below *Search Devices* as shown in [Figure 3-5](#). The ID selected from this list is what the rest of the controls applies to. The *Search Devices* button must be clicked before the IDs are populated into the menu. A device selection is only required if more than one device is on the bus.

**Table 2-2. Select Device Error Messages**

Error	Explanation
Your device has NOT been selected. A device has been added or removed from the bus. Please search for devices again or reconnect your device	Removing or adding a device to the bus without searching for devices again causes this. Search for devices again.
Target device is not present. Search again or select another device	The target device is not present on the bus. Check the physical connection of the memory device.
Unknown error occurred	This is usually due to a connection issue. Check the hardware connections and try reinstalling the GUI. Make sure the device appears in Device Manager.

### 2.3.3.3 Speed Selection

The TMF0008 device has two speeds for communication, *Standard Speed* (15.4kbps) and *Overdrive Speed* (90kbps). Shown in [Figure 3-5](#), these options are available in the Controls sidebar. Standard Speed is automatically selected following a device selection. Overdrive speed can only be accessed for TMF devices operating at 5V  $V_{PUP}$ .

**Table 2-3. Speed Selection Error Messages**

Error	Explanation
No <b>One-Wire</b> devices detected	There are no devices on the bus. Make sure jumper J4 in <a href="#">Figure 2-1</a> is installed in a proper position.
Please select a device	No device has been selected from the "Select 64 bit Device ID" drop down menu.
Unknown error occurred	Check the hardware connections and try reinstalling the GUI.
Target device is not present. Search again or select another device	The target device is not present on the bus. Check the physical connection of the memory device.

### 2.3.4 Memory Table

In the center of the GUI window, users see the *Memory Table* that displays the data stored in the memory. Each row represents individual memory *pages* on the device, while columns represent bytes in each page. Scrolling is necessary to view the entire table.

**Table 2-4. Memory Table Error Messages**

Error	Explanation
Invalid character at row X and column Y	A cell in the table is edited to contain no value or an invalid byte. Cell is automatically filled with 0xFF values.
The data at row X and column Y has been padded.	A cell contains a valid byte, but is only 1 character. The upper nibble is padded with 0x0 ( <a href="#">Figure 3-8</a> ).
Data in table is not valid hexadecimal	Select <i>Read from Memory</i> again.

### 2.3.4.1 Memory Table Auto Corrections

When inputting values into the data table, the data must be hexadecimal bytes. Lowercase entries are automatically capitalized. If only a single character is entered, then the table pads the upper nibble with 0x0. If more than 2 characters are entered, then the leftmost 2 are kept. If the data cannot be interpreted as a hexadecimal byte value, then the table is overwritten with a 0xFF value. To make changes to bytes, click on the cell and type in a 2-character representation of the byte. For example, to write 0x36 to a cell, enter 36.

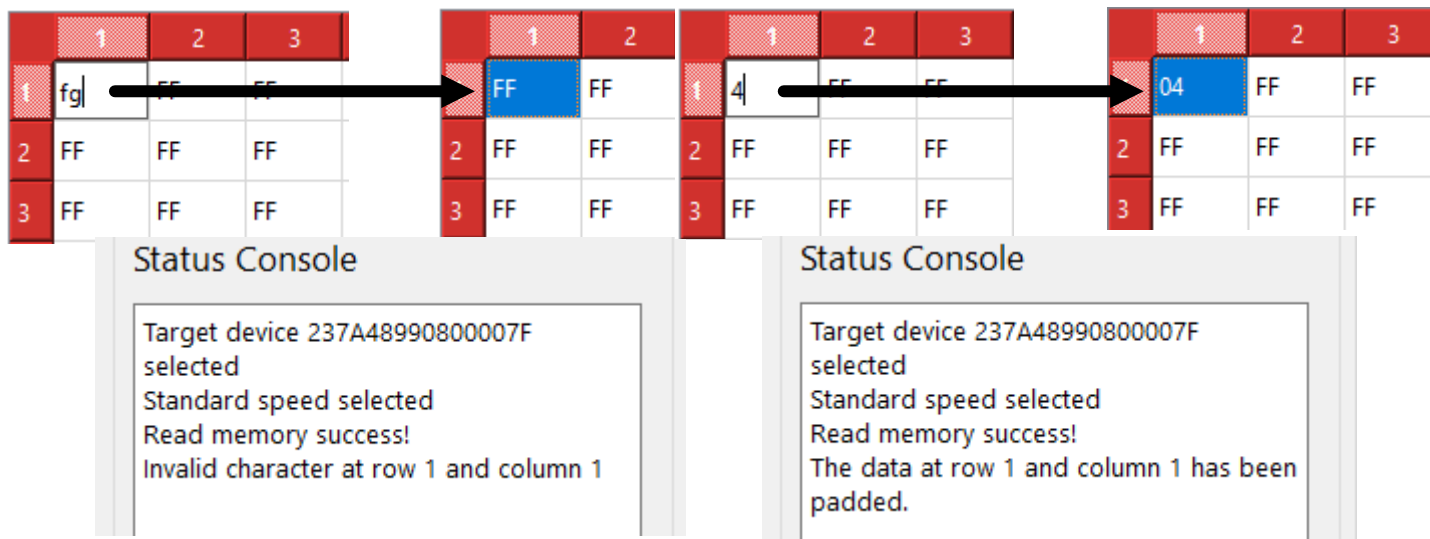


Figure 2-7. Invalid Byte Entered and Capitalization

Figure 2-8. Padded Byte

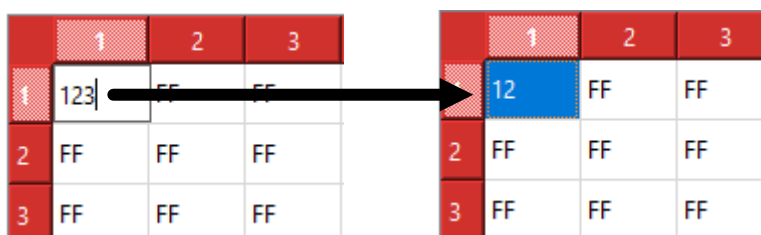


Figure 2-9. Truncated Input



### 2.3.4.2 Memory Table Controls

The Memory Table Controls allow access to manipulate the device's stored information. These controls are only available when accessing the Main Memory table.

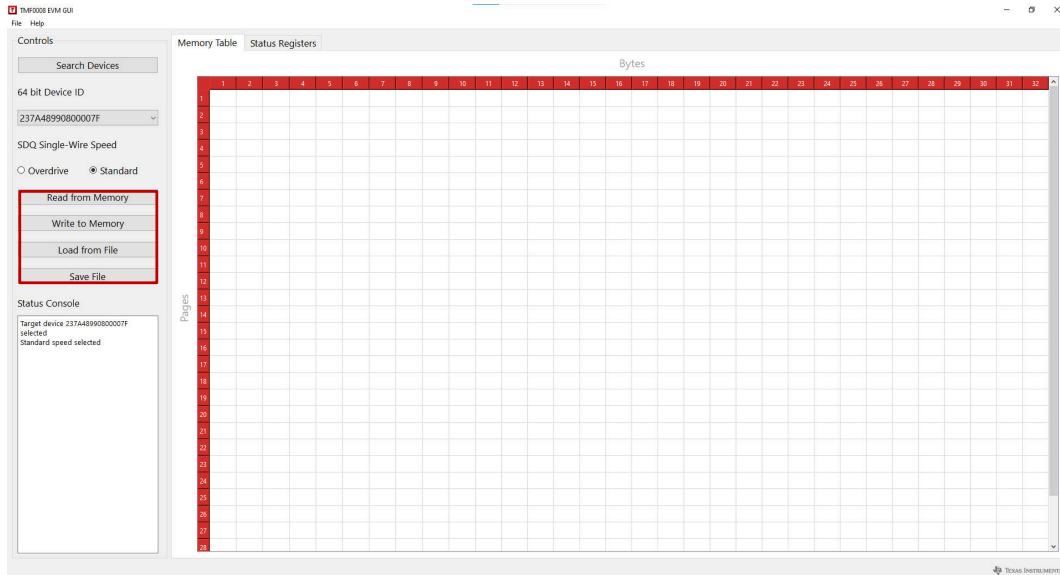


Figure 2-10. Memory Table Controls

#### 2.3.4.2.1 Read from Memory

Selecting *Read from Memory* automatically populates that main device memory into the table. Allow a few moments for the read to occur. A *Read memory success!* message appears in the Status Console on a good read (for example, see Figure 3-11).

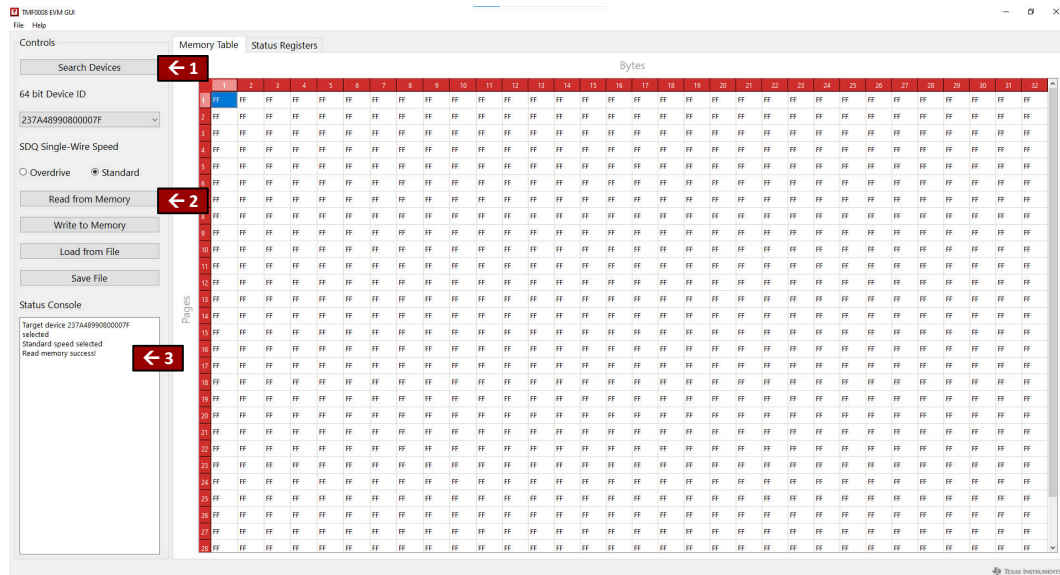


Figure 2-11. Read Memory Steps

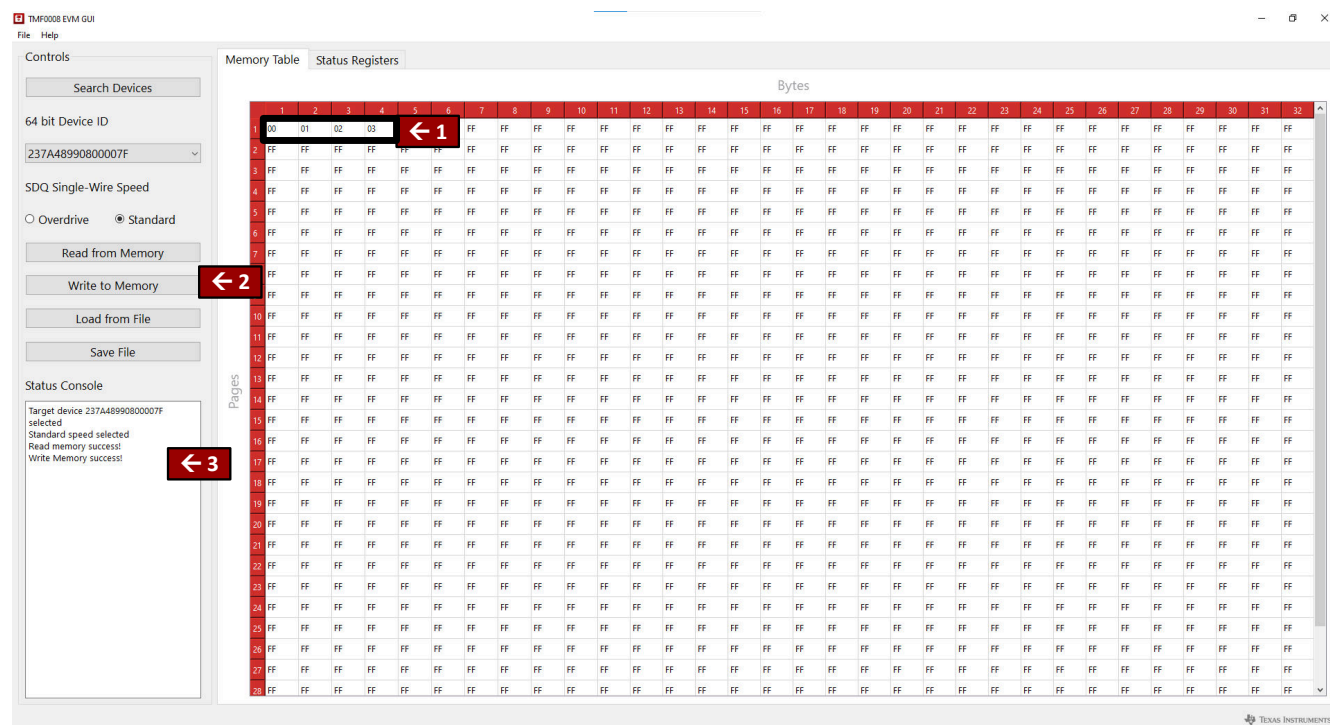
**Table 2-5. Memory Read Error Messages**

Error	Explanation
Please select a device	Device was not selected. Press <i>Search Devices</i> again and select a new device.
No Single-Wire devices detected	No Single-Wire devices were detected on the bus. Check the USB connection and the presence of the board in device manager. Make sure jumper J4 is installed in a position that powers the SDQ bus (Figure 3-1).
Target device is not present. Search again or select another device	The target device is not present on the bus. Check the physical connection of the memory device.

Please note that in a situation where there are multiple devices on the bus and the user removes the target device from the bus, a *Read Memory* command populates the data table with values of *FF* and still receives a success message. This is because a presence pulse is pulled low from another device, but no device on the bus responds to the match ROM or subsequent read memory command. Due to the communication behavior as open-drain of Single-Wire, no response is interpreted as a 1 on the bus.

### 2.3.4.2.2 Write to Memory

The *Write to Memory* button, shown in Figure 3-12, is used to write the values in the *Memory Table* to the target device. Please be patient as the memory is being written to. TI recommends to read from the memory to verify a successful write.


**Figure 2-12. Write to Memory**

**Table 2-6. Memory Write Error Messages**

Error	Explanation
Please load from file or read from memory.	The user has not read from memory or loaded data in from a file. Click the <i>Read from Memory</i> button to read in the values on the memory device or click the <i>Load from file</i> to load values to be written into the memory table.
Please make sure entire table has data. Error found at row X and column Y.	There are blank cells in the table. Go to the error cell at the X and Y values given and add a hex value.
Data must be in byte format. Error found at row X and column Y	A cell contains more than 2 characters. Go to the error cell and enter new values.
Invalid character at row X and column Y	A cell contains a special character. Go to the error cell and enter new values.
Copy Scratchpad failure	A communication error has occurred when sending the command to copy the device scratchpad data into memory. Try writing again.
No Single-Wire devices detected	No devices are connected to the bus. Check the USB connection and that the board appears in the device manager.
Read Scratchpad memory failure Read Scratchpad command fail	The values in the scratchpad were read back and were an unexpected value. There was likely a communication error when sending data to the device. Try writing again.
Write scratchpad command fail	There is a write scratchpad command failure. There was most likely a communication error. Check setup connections.
Target device is not present. Search again or select another device	Device selected to send data to was disconnected from the bus between Search and Write commands. Make sure SDQ line is powered and check device connections.
Invalid CRC	There is a mismatch with the calculated CRC and the returned CRC from the device. This indicates a data transmission error or device malfunction.
Unknown error occurred	This is a catch-all for any error not listed. Retry sending the command. If the error persists, check the hardware connections and try reinstalling the GUI.

### 2.3.4.2.3 Load from File

The *Load from File* button, shown in Figure 3-13, is used to load in a .csv file into the table. This can only be accessed once a device has been selected. Once the file dialog is opened, the user can select a .CSV file to load into the *Memory Table*.

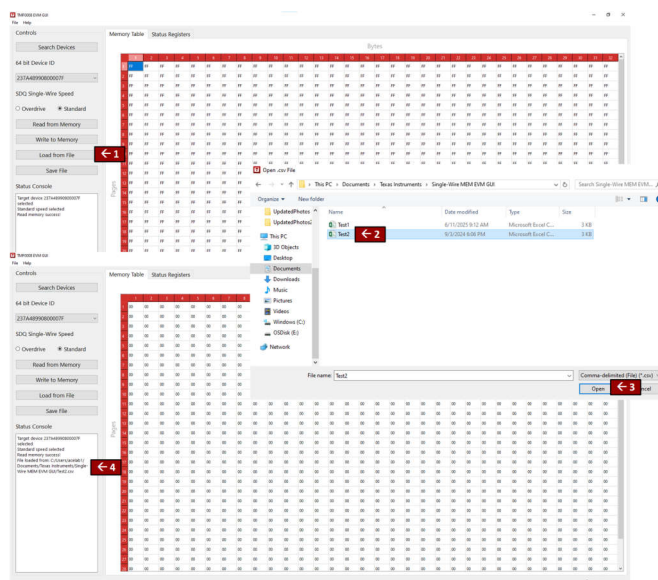


Figure 2-13. File Load Process

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 2-14. Example .CSV file loaded in spreadsheet software

Error	Explanation
Please select a device before loading from file	Device must be selected before populating table. Press <i>Search Devices</i> and then load from file.
Loaded csv file does not match memory map dimensions [col]/[row]	The loaded file contains a special character in a data cell, or the table loaded did not match the dimensions of the memory space of the device. Edit the CSV in a spreadsheet application and reload after fixing. Make sure CSV loaded was for the right type of memory. BQ2026 files does not load for a TMF0008 , for example.

#### 2.3.4.2.3.1 Load from File Auto Corrections

If the user loads in a file containing more than two characters per cell, then this truncates the data in any of the relevant cells and only loads the last two characters into the cell. If a loaded file contains only one character per cell, then this pads the upper nibble with 0x0.

### 2.3.4.2.3.2 Tips for Creating a .CSV File

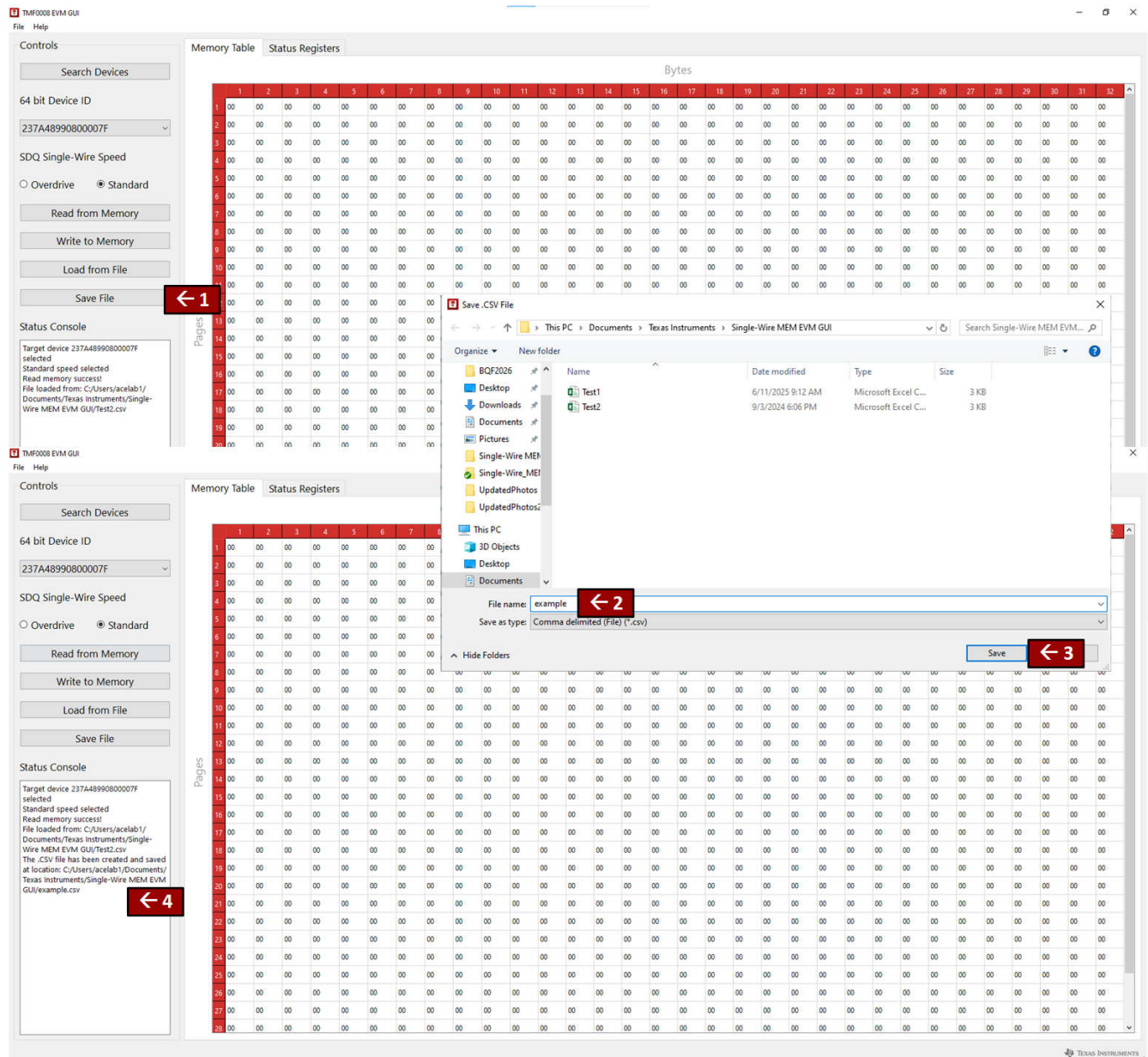
The recommended way to create the .csv files is by opening an Excel® sheet and use the following formulas to fill the table with values. When ready, save as a .csv comma-delimited file.

**Table 2-7. Excel Cell Formulas**

Fill cell with random byte value	=BIN2HEX(TEXT(DEC2BIN(RANDBETWEEN(0,255)),"00000000"),2)
Fill cell with 0x00	=BIN2HEX(TEXT(DEC2BIN(0),"00000000"),2)
Fill cell with 0x00	=BIN2HEX(TEXT(DEC2BIN(RANDBETWEEN(0,0)),"00000000"),2)

### 2.3.4.2.4 Save File

The *Save File* button, shown in Figure 3-15, saves a .csv file to a location with the data displayed in the *Memory Table*. Writing to memory is not required before saving to file. The table must be populated to save.



**Figure 2-15. File Save Process**

**Table 2-8. Save File Errors**

Error	Explanation
Please load from file or read from memory	The table has not been populated. <i>Search Devices</i> again and select device.
Please make sure entire table has data. Error found at row X and column Y	There are blank cells in the <i>Memory Table</i> . Go to the error cell and enter a valid byte.
Data must be in byte format. Error found at row X column Y	There are cells with more than two characters. Go to the error cell and enter a valid byte.
Invalid character at row X and column Y	A cell has a special character. Go to the error cell and remove the special characters.

### 2.3.5 Status Registers

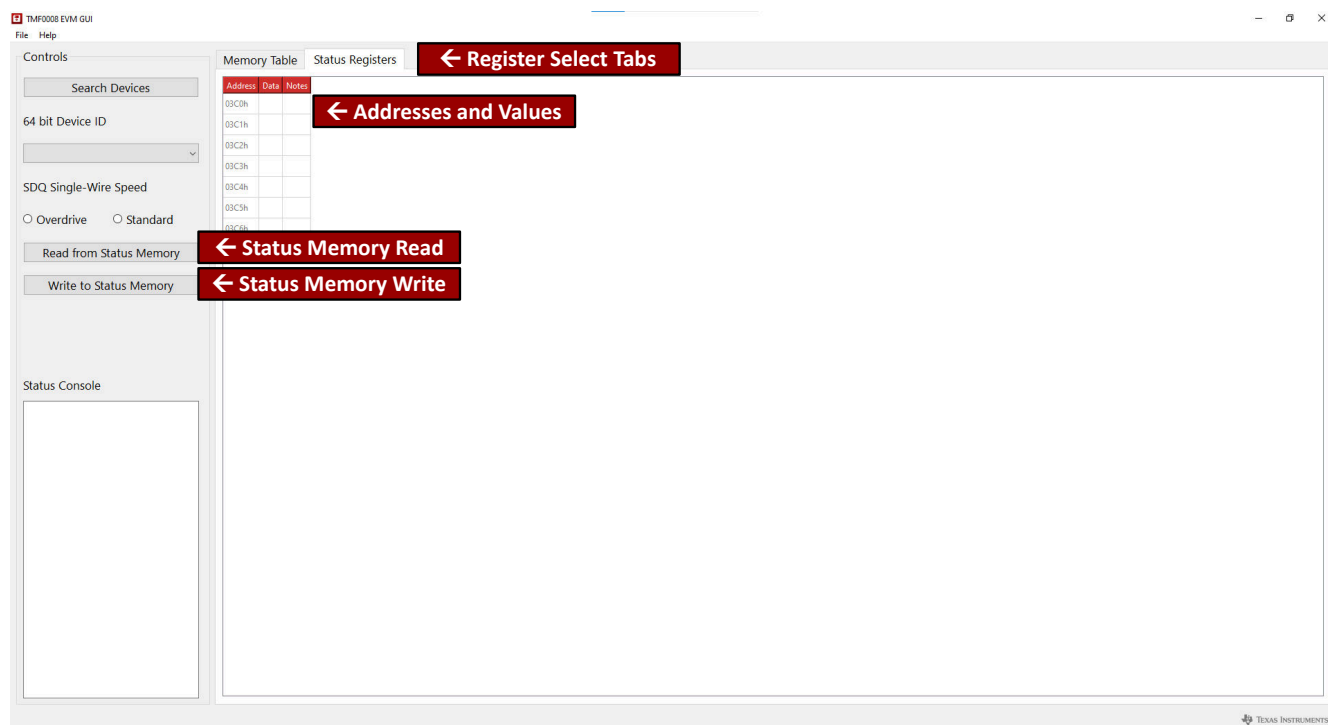
Click on the tab next to *Memory Table* labeled *Status Registers*. This displays the stored values at the status and control registers of the device, shown in [Figure 3-16](#). Only the *Data* column can be edited. These cells accept single bytes as valid entries. Refer to the [TMF0008 8K bits Serial FRAM with SDQ Interface](#) data sheet for more information on these values.

#### 2.3.5.1 Status Registers Auto Corrections

All entered bytes in the Status Register section are automatically capitalized. However, entering an invalid byte throws a fatal error. Do not ignore. Make sure entered bytes are valid.

#### 2.3.5.2 Status Registers Controls

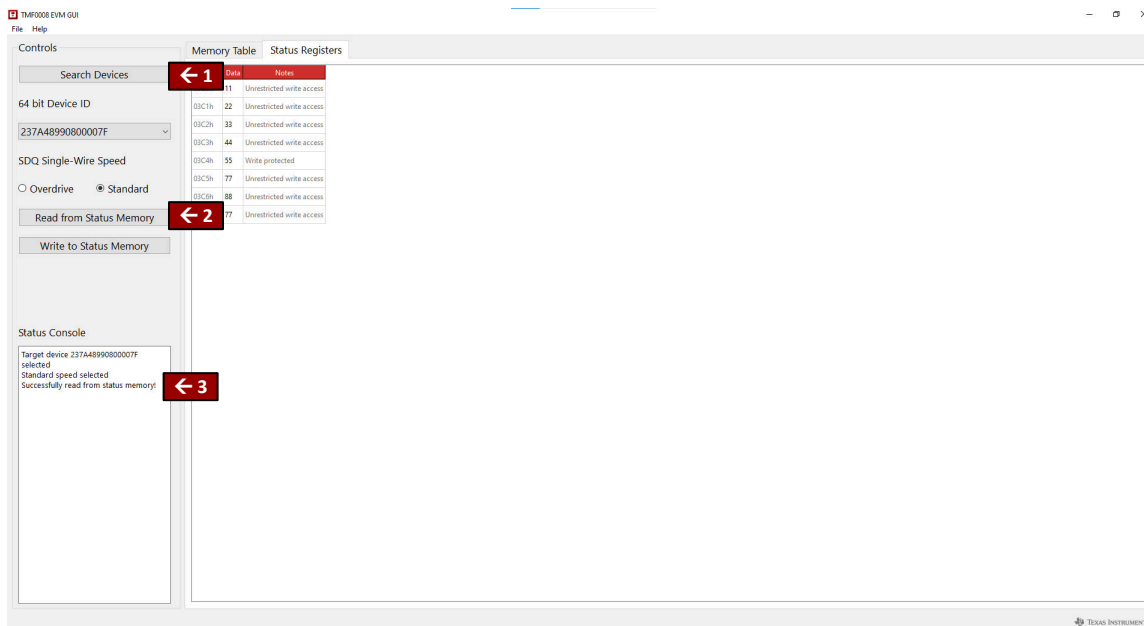
The Status Registers Table Controls refer to the controls shown in the red box. These commands are only available when accessing the *Status Registers* tab.

**Figure 2-16. Status Registers Table and Controls**

##### 2.3.5.2.1 Read from Status Memory

The *Read from Status Memory* button, shown in [Figure 3-17](#), is used to read from the status memory of the selected device and automatically populates that memory data into the table.

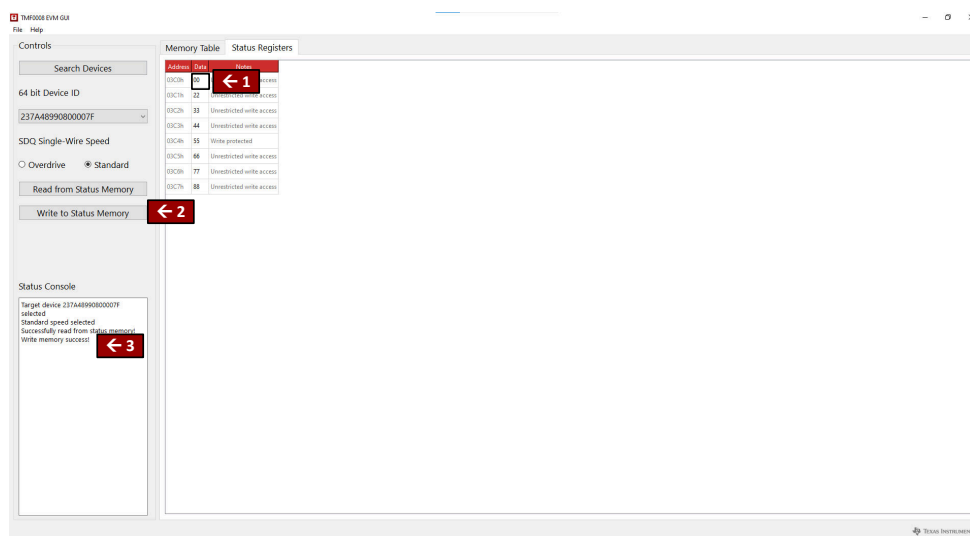




**Figure 2-17. Read from Status Memory**

### 2.3.5.2.2 Write to Status Memory

The *Write to Status Memory* button, shown in [Figure 3-18](#), writes the status register table to the device.



**Figure 2-18. Write to Status Registers**

**Table 2-9. Status Register Error Messages**

Error	Explanation
CRC Fail	The status memory stored values are bitwise AND'd with the input values. For Version 1.0.1, the Status Register section does not warn for writing a 1 to a bit already written to '0'. The CRC values do not match in this situation.

### 3 TMF0008EVM Hardware Overview

The TMF0008EVM is a USB-stick form factor board designed for evaluating TMF0008 Single-Wire memory devices. The connected PC runs the graphical user interface (GUI) software for communication with the device. The MSP430F5509 MCU on the EVM receives USB commands from the PC and communicates with the device over SDQ. The EVM requires a PC running x64 Windows® 10 or later, equipped with a USB 2.0 Type-A port. The EVM firmware is preloaded for out-of-the-box operation.

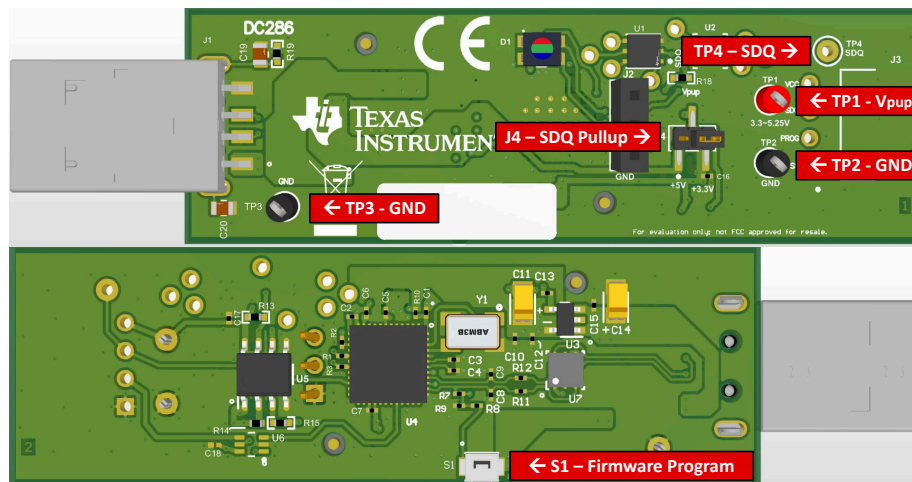


Figure 3-1. TMF0008EVM Test Points and Switches

#### 3.1 SDQ Pullup Selection Jumper

Figure 3-1 shows jumper J4, responsible for control of the SDQ pullup voltage. Table 2-1 shows the configuration options of the jumper.

Table 3-1. SDQ Jumper to Voltages

J4 Jumper Connection	SDQ Voltage
1 - 2	+5V
Not installed	User-supplied voltage at TP1 ( $V_{PUP}$ )
2 - 3	+3.3V

#### 3.2 Test Points

Table 2-2 lists the EVM test points for probing device voltages and signals

Table 3-2. TMF0008EVM Test Points

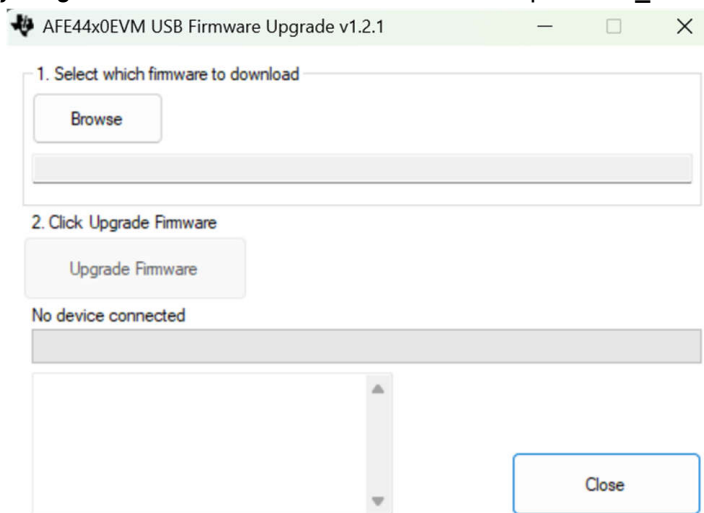
Test Point	Signal
TP1	$V_{PUP}$
TP2	GND
TP3	GND
TP4	SDQ



## 4 Updating Firmware

To upgrade the TMF0008EVM firmware, follow the steps below:

1. Go to {install directory}\Single-Wire MEM EVM GUI\firmware and open **BSL\_USB\_GUI.exe**

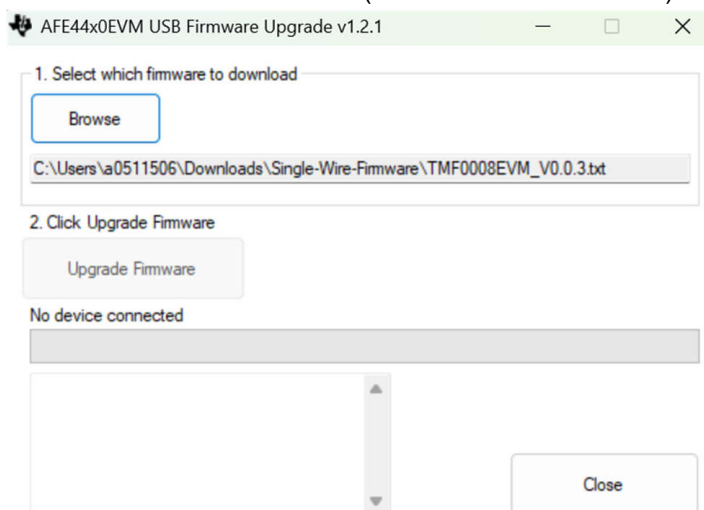


**Figure 4-1. Launching the Firmware Upgrader**

### Note

The firmware can be found at {install directory}\Single-Wire MEM EVM GUI\firmware. If there is a newer version available [online](#), then download the latest version and select that firmware file.

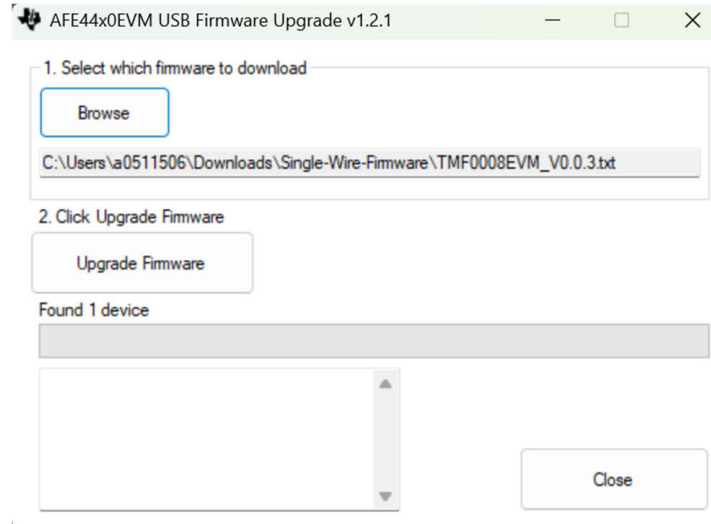
2. Click the **Browse** button and select the firmware file (*TMF0008EVM V.x.x.x.txt*)



**Figure 4-2. Locating the Firmware File**

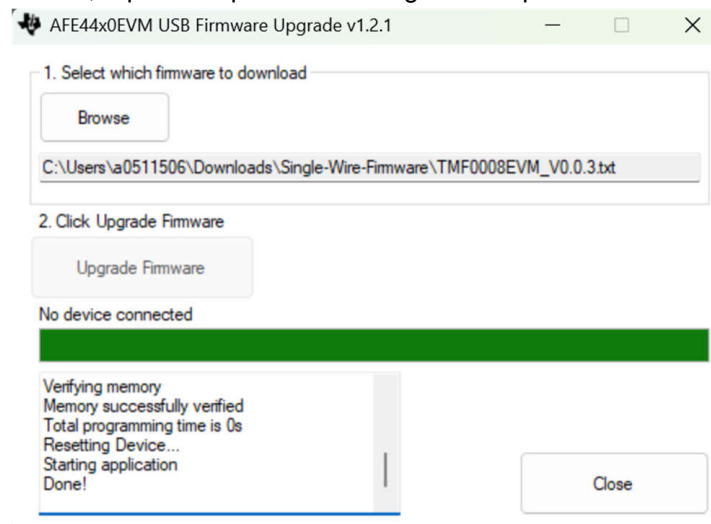
3. To enter BSL mode, press and hold the S1 switch, located on the back of the EVM (see [Figure 3-1](#)) while connecting the USB to the MCU

4. If the MCU enters BSL mode, then the GUI shows *"Found 1 device"* under the **Upgrade Firmware** button - if it does not, repeat the process from step 3



**Figure 4-3. Entering BSL Mode**

5. Click the **Upgrade Firmware** button and wait for the upgrade to complete
6. After successfully upgrading the firmware, the log window shows the status of the upgrade - if the upgrade breaks before it was finished, repeat the process starting from step 3



**Figure 4-4. Upgrading Firmware**



## 5.2 PCB Layouts

Figure 5-2 through Figure 5-4 show the top PCB layers. These layers are from the TMF0008EVM. Other variations of the TMF EVM are similar.

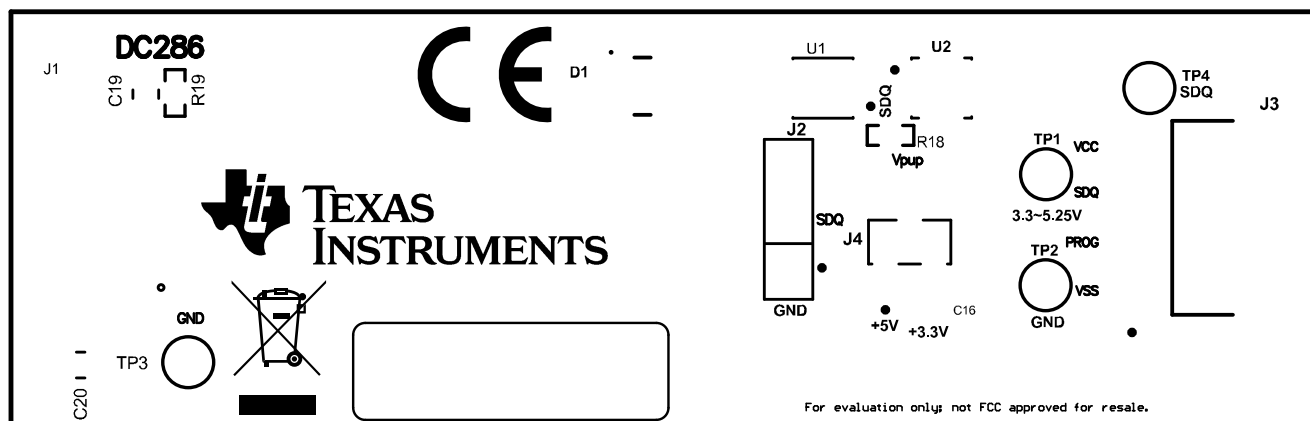


Figure 5-2. TMF0008EVM Silkscreen (Top)

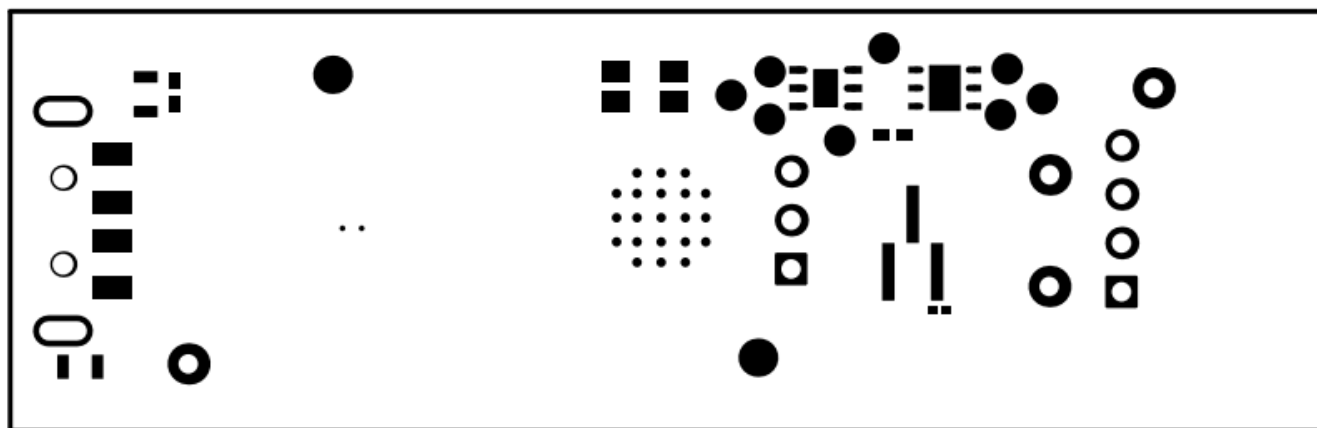


Figure 5-3. TMF0008EVM Solder Mask (Top)

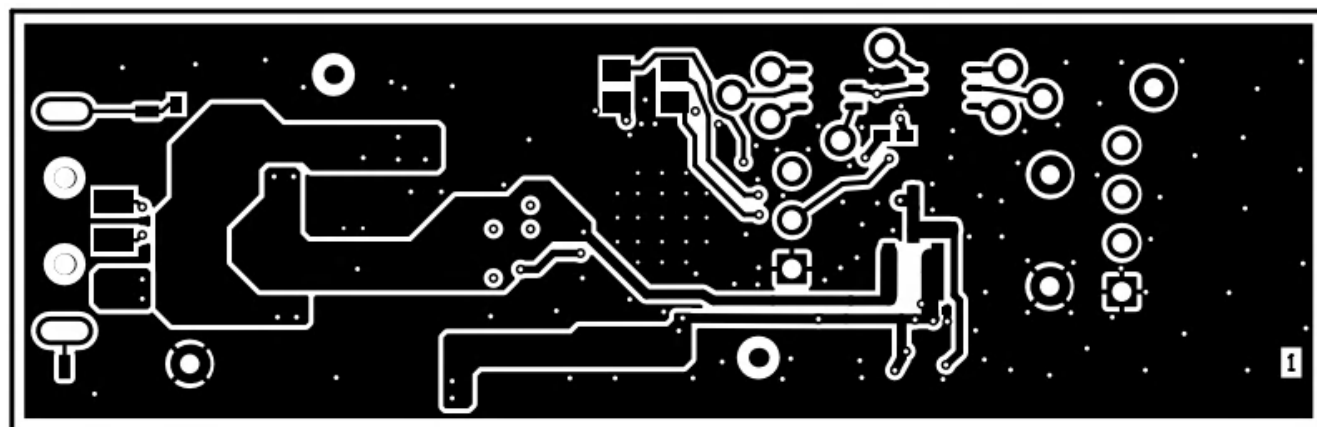


Figure 5-4. TMF0008EVM Copper (Top)

Figure 5-5 through Figure 5-7 show the bottom PCB layers. These layers are from the TMF0008EVM. Other variations of the TMF EVM are similar.

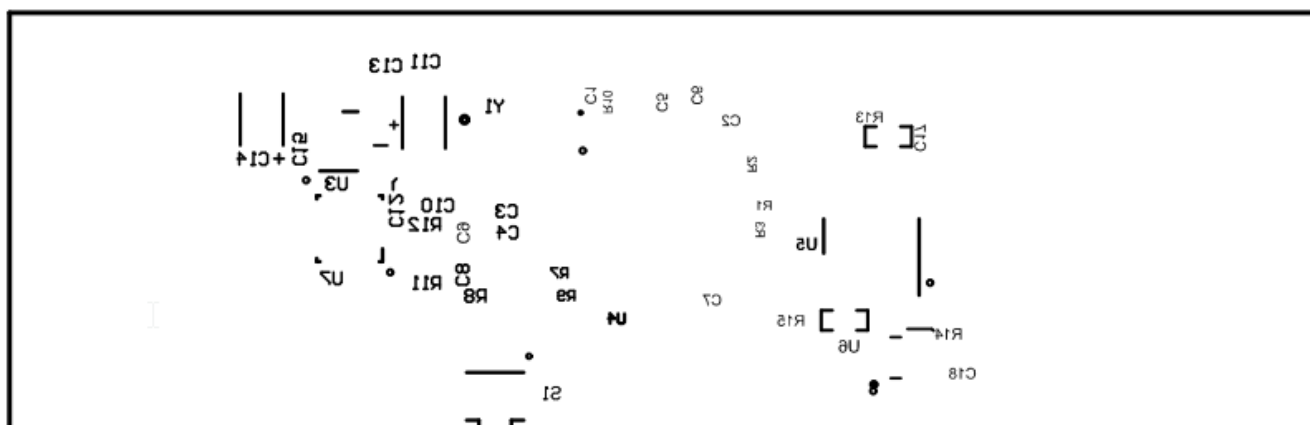


Figure 5-5. TMF0008EVM Silkscreen (Bottom)

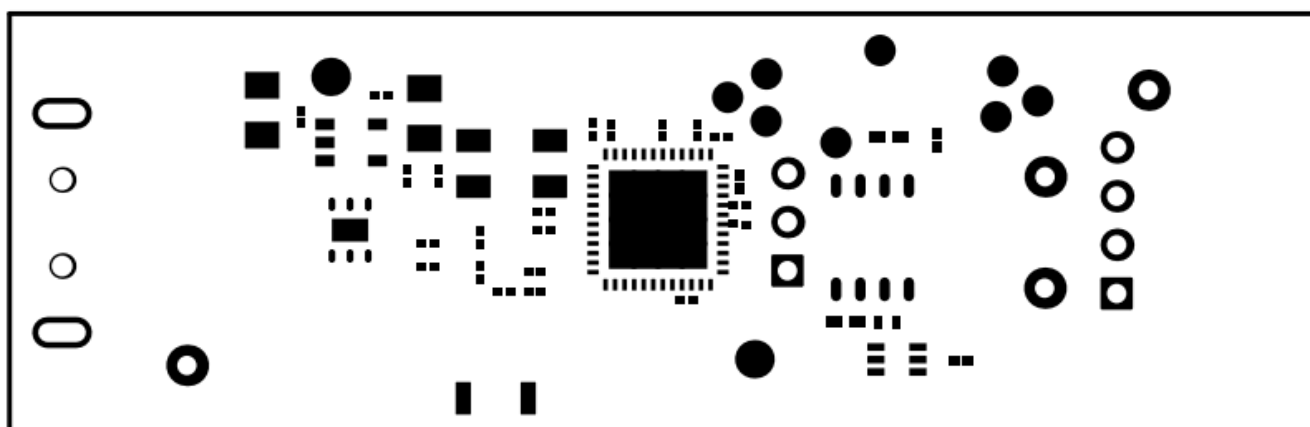


Figure 5-6. TMF0008EVM Solder Mask (Bottom)

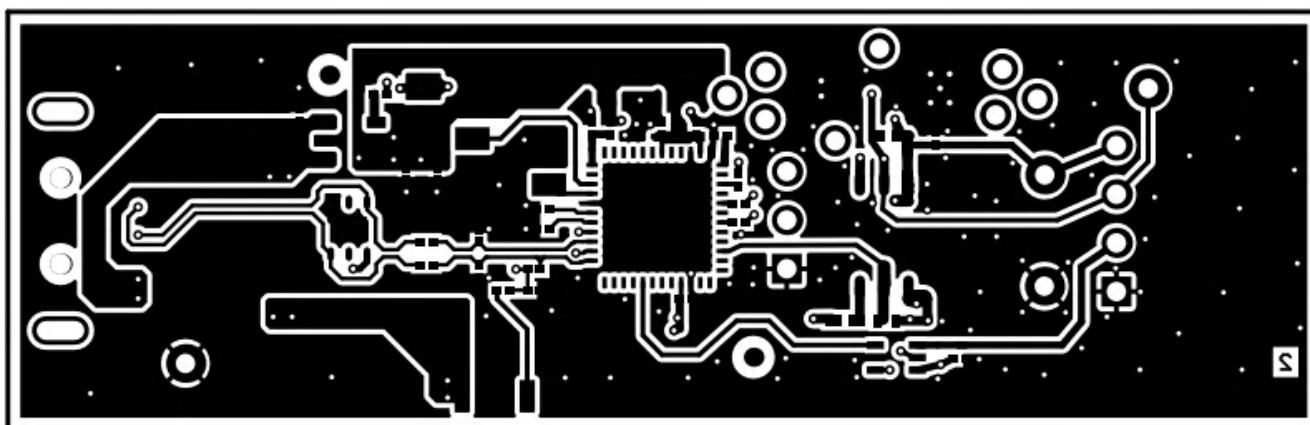
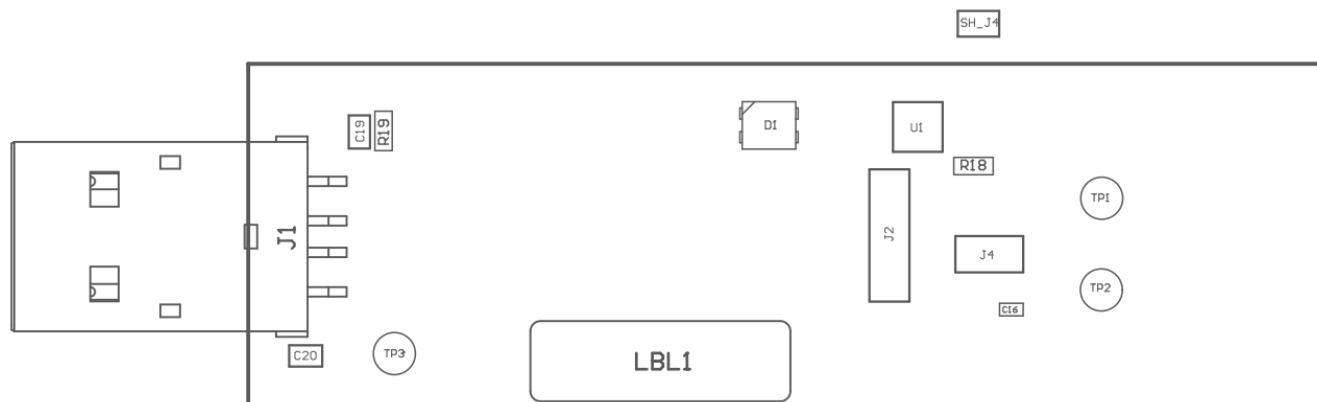


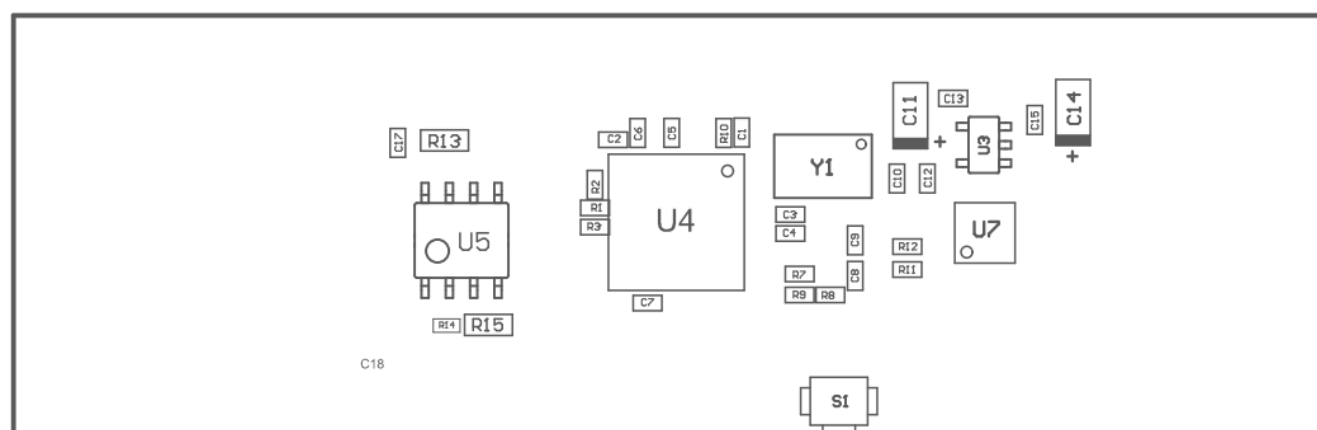
Figure 5-7. TMF0008EVM Copper (Bottom)

### 5.2.1 Assembly Files

Figure 4-8 and Figure 4-9 show the assembly drawings of the top and bottom PCB layers, respectively. These drawings are from the TMF0008EVM. Other variations of the EVM are similar.



**Figure 5-8. PCB Assembly Drawing (Top)**



**Figure 5-9. PCB Assembly Drawing (Bottom)**

### 5.3 Bill of Materials (BOM)

Table 4-1 lists the bill of materials for the TMF0008EVM.

Reference	Quantity	Part Number	Manufacturer	Description
C1	1	CGA1A2X7R1E102K030BA	TDK	CAP, CERM, 1000pF, 25V, +/- 10%, X7R, AEC-Q200 Grade 1, 0201
C2	1	CL03A474KQ3NNNC	Samsung Electro-Mechanics	CAP, CERM, 0.47uF, 6.3V, +/- 10%, X5R, 0201
C3, C4	2	LMK063BJ224MP-F	Taiyo Yuden	CAP, CERM, 0.22uF, 10V, +/- 20%, X5R, 0201
C5, C6, C7, C12, C13, C15	6	GRM033R61E104KE14J	MuRata	CAP, CERM, 0.1uF, 25V, +/- 10%, X5R, 0201
C8, C9	2	GJM0335C1E100JB01D	MuRata	CAP, CERM, 10pF, 25V, +/- 5%, C0G/NP0, 0201
C10, C16, C17	3	CL03A105MP3NSNC	Samsung Electro-Mechanics	CAP, CERM, 1uF, 10V, +/- 20%, X5R, 0201
C11, C14	2	TPSA106M010R1800	AVX	CAP, TA, 10uF, 10V, +/- 20%, 1.8 ohm, SMD
C19, C20	2	GRM2165C2A103JA01D	Murata	Chip Multilayer Ceramic Capacitors for General Purpose, 0805, 10000pF, C0G, 30ppm/°C, 5%, 100V
D1	1	CLVBA-FKA-CAEDH8BBB7A363	Cree	LED, RGB, SMD
J1	1	48037-1000	Molex	Connector, Plug, USB Type A, R/A, Top Mount SMT
J2	1	SSQ-103-03-T-S	Samtec	Conn Socket Strip SKT 3 POS 2.54mm Solder ST Thru-Hole
J4	1	M50-3630342R	Harwin	Connector Header Surface Mount 3 position 0.050" (1.27mm)
LBL1	1	THT-14-423-10	Brady	Thermal Transfer Printable Labels, 0.650" W x 0.200" H - 10,000 per roll
R1, R3	2	RC0201FR-07300RL	Yageo America	RES, 300, 1%, 0.05 W, 0201
R2	1	RC0201JR-07620RL	Yageo America	RES, 620, 5%, 0.05 W, 0201
R7	1	RC0201JR-071K5L	Yageo America	RES, 1.5 k, 5%, 0.05 W, 0201
R8	1	RC0201FR-07100RL	Yageo America	RES, 100, 1%, 0.05 W, 0201
R9	1	RC0201FR-071ML	Yageo America	RES, 1.00M, 1%, 0.05W, 0201
R10	1	RC0201JR-0747KL	Yageo America	RES, 47 k, 5%, 0.05 W, 0201
R11, R12	2	RC0201JR-0727RL	Yageo America	RES, 27, 5%, 0.05 W, 0201
R13	1	PNM0402E5000BST1	Vishay Thin Film	RES, 500, 0.1%, 0.05 W, 0402
R14	1	MCS0402MD1002BE100	Vishay/Beyschlag	RES, 10.0 k, 0.1%, 0.1 W, AEC-Q200 Grade 0, 0402
R15, R18	2	RT0402BRD0710KL	Yageo America	RES, 10.0 k, .1%, .0625 W, 0402
R19	1	CRCW04021M00JNED	Vishay-Dale	RES, 1.0M, 5%, 0.063W, AEC-Q200 Grade 0, 0402
S1	1	B3U-3000P	Omron Electronic Components	Switch, SPST-NO, Off-Mom, 0.05A, 12 VDC, SMT
SH_J4	1	M50-1900005	Harwin	CONN SHUNT 1.27MM BLACK
TP1	1	5000	Keystone	Test Point, Miniature, Red, TH
TP2, TP3	2	5001	Keystone	Test Point, Miniature, Black, TH

Reference	Quantity	Part Number	Manufacturer	Description
U1	1	TMF0008 DRS	Texas Instruments	8k-bit Serial FRAM with SDQ Interface
U3	1	TPS73633DBVT	Texas Instruments	Single Output Low Noise LDO, 400mA, Fixed 3.3V Output, 1.7 to 5.5V Input, with Reverse Current Protection, 5-pin SOT-23 (DBV), -40 to 85 degC, Green (RoHS & no Sb/Br)
U4	1	MSP430F5509IRGZR	Texas Instruments	Mixed Signal Microcontroller, RGZ0048A (VQFN-48)
U5	1	ISO1541QDRQ1	Texas Instruments	Low-Power Bidirectional I2C Isolators, D0008B (SOIC-8)
U7	1	TPD2E001DRST-NM	Texas Instruments	Low-Capacitance + / - 15 kV ESD-Protection Array for High-Speed Data Interfaces, 2 Channels, -40 to +85 degC, 6-pin SON (DRS), Green (RoHS & no Sb/Br)
Y1	1	ABM3B-24.000MHZ-10-1-U-T	Abrakon Corporation	Crystal, 24MHz, 10pF, SMD

## 6 Additional Information

### 6.1 Trademarks

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## 7 Related Documentation from Texas Instruments

The following documents provide information regarding Texas Instruments' integrated circuits used in the assembly of the TMF0008EVM. This user's guide is available from the [TI website](#) under literature number SLAU918. Access to device data sheets, application notes, and product briefs can also be found on the TI website. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. The latest revision can be found by clicking the link and is also available from the TI website, the Texas Instruments' Literature Response Center at (800) 477-8924, and the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

**Table 7-1. Related Documentation**

Document	Literature Number
Texas Instruments, <i>TMF0008 8K bits Serial FRAM with SDQ Interface</i> , data sheet	<a href="#">SLASF14</a>
Texas Instruments, <i>Applications Driving the Need for Single-Wire FRAM Devices</i> , application brief	<a href="#">SLAAEI8</a>



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