User's Guide

Quick-Start Guide for TLV320AIC310xEVM Control Software

ABSTRACT

This quick-start guide describes the installation, operation, and use of the TLV320AIC310x evaluation module (EVM) control software. The EVM control software allows for the evaluation of the TLV320AIC310x family of audio codecs by providing a user-friendly graphical user interface (GUI) to configure the TLV320AIC310xEVM.

Table of Contents

1 TLV320AIC310xEVM Control Software Installation ................................................................. 3
   1.1 Software Installation ........................................................................................................... 3
   1.2 EVM Connections ........................................................................................................... 8
2 TLV320AIC310xEVM Control Software .................................................................................. 9
   2.1 Device Selection for Operation With the AIC310xEVM.................................................... 9
   2.2 Front-Page Indicators and Functions ................................................................................. 10
   2.3 Default Configuration (Presets) Tab ................................................................................ 12
   2.4 Command Line Interface Tab ........................................................................................... 13
3 USB-MODEVM ...................................................................................................................... 14
   3.1 USB-MODEVM Operation ............................................................................................... 14
   3.2 USB-MODEVM Schematic ............................................................................................. 17
   3.3 USB-MODEVM Bill of Materials ...................................................................................... 19
   3.4 USB-MODEVM Protocol ............................................................................................... 20
   3.5 GPIO Capability ............................................................................................................... 23
   3.6 Writing Scripts .................................................................................................................. 24

List of Figures

Figure 1-1. AIC310x Control Software Setup............................................................................ 3
Figure 1-2. Driver Selection ..................................................................................................... 4
Figure 1-3. Error Message ....................................................................................................... 4
Figure 1-4. Ready to Install ..................................................................................................... 5
Figure 1-5. USB-MODEVM Driver Setup ............................................................................... 5
Figure 1-6. Device Driver Installation Wizard ........................................................................... 6
Figure 1-7. Completing USB-MODEVM Driver Setup ............................................................ 6
Figure 1-8. USB AUDIO Device Driver Setup ......................................................................... 7
Figure 1-9. Setup Finished ...................................................................................................... 8
Figure 2-1. Device Selection Window ....................................................................................... 9
Figure 2-2. Default Software Screen ......................................................................................... 10
Figure 2-3. Preset Configurations Tab ....................................................................................... 12
Figure 2-4. Command Line Interface Tab ................................................................................ 13
Figure 2-5. File Menu ............................................................................................................... 14
Figure 3-1. TLV320AIC310xEVM-PDK Block Diagram ............................................................ 15
Figure 3-2. USB-MODEVM Schematic ................................................................................... 17
Figure 3-3. USB-MODEVM Schematic 2 ................................................................................ 18

List of Tables

Table 3-1. USB-MODEVM SW2 Settings ..................................................................................... 16
Table 3-2. USB-MODEVM Bill of Materials .............................................................................. 19
Table 3-3. USB Control Endpoint HIDSETREPORT Request .................................................. 20
Table 3-4. Data Packet Configuration ......................................................................................... 20
Table 3-5. GPIO Pin Assignments ............................................................................................. 23
Trademarks

LabVIEW® is a registered trademark of National Instruments.
SPI® is a registered trademark of Motorola, Inc.
All trademarks are the property of their respective owners.
1 TLV320AIC310xEVM Control Software Installation

This section provides information on the installation process for the TLV320AIC310xEVM control software and the necessary drivers.

1.1 Software Installation

1. Download the latest version of the software located on the device product page. For example, if you are evaluating the TLV320AIC3106, please see the AIC3106 product page.

2. Unzip the installation file by right-clicking the zip file and selecting Extract All. Extract the zip file contents to a known location.

3. When the zip file is extracted, run the executable by double-clicking the .exe file. Running the executable as an administrator is recommended.

4. After running the executable, the TLV320AIC310xEVM control software setup begins. Follow the prompts in the pop-up window, accept the license agreements, and choose an installation directory. Figure 1-1 shows this process.

Figure 1-1. AIC310x Control Software Setup
5. The next window prompts for component selection, such as the LabVIEW® runtime engine, USB-MODEVM drivers, and AC-MODEVM drivers. Ensure that all three components are selected and click Next. Figure 1-2 shows this selection.

![Figure 1-2. Driver Selection](image)

**Note**

If there are previous USB-MODEVM drivers already installed, an error message (Figure 1-3) may appear. Click OK and the Texas Instruments USB audio device driver wizard will appear. If you receive this error message, you may skip to step 10.

![Figure 1-3. Error Message](image)
6. The setup is now ready to begin installing. A window similar to Figure 1-4 should appear.

![Figure 1-4. Ready to Install](image)

7. When the setup is done installing, install the USB-MODEVM driver. Follow the prompts in the pop-up windows, accept the license agreement, and choose the driver installation directory. Click Next and the drivers will begin installing. Figure 1-5 shows this process.

![Figure 1-5. USB-MODEVM Driver Setup](image)
8. Next, the device driver installation wizard windows (Figure 1-6) pops up. Click Next and then Finish.

![Figure 1-6. Device Driver Installation Wizard](image)

9. The USB-MODEVM driver setup has now finished installing. Click Finish (Figure 1-7) to continue.

![Figure 1-7. Completing USB-MODEVM Driver Setup](image)
10. The USB audio device driver setup now begins. Follow the prompts by confirming the installation and choosing the installation location. Click *Install* when ready. When the installation is complete, click *Next*. Figure 1-8 shows this process.

![Figure 1-8. USB AUDIO Device Driver Setup](image)

11. The USB audio device driver is now installed. Click *Finish* to close the setup wizard.
12. A pop-up window will appear asking the user to disconnect and reconnect the device to complete the driver installation. Click *Yes* to continue.
13. The setup has now finished (Figure 1-9). Check whether you wish to have a shortcut created and then click *Finish*.
The installation process is now complete for the TLV320AIC310x control software and required drivers. Prior to connecting the EVM, TI recommends restarting the PC.

1.2 EVM Connections

1. Ensure that the TLV320AIC310xEVM is installed on the USB-MODEVM interface board, aligning J11A, J12A, J16A, J17A, and J18A with the corresponding connectors on the TLV320AIC310xEVM.
2. Verify that the jumpers and switches are in their default positions. The default positions of the jumper and switches are provided in the corresponding TLV320AIC310x user's guide.
3. Attach a USB cable from the PC to the USB-MODEVM interface board. The default configuration provides power, control signals, and streaming audio via the USB interface from the PC. On the USB-MODEVM, LED D2 lights up to indicate that the USB interface is active.
4. For the first connection, the PC recognizes new hardware and begins an initialization process. The user may be prompted to identify the location of the drivers or to allow the PC to automatically search for them. If prompted, choose to allow the automatic detection option to locate the drivers.

After the TLV320AIC310xEVM-PDK software installation (described in Section 1.1) is complete, evaluation and development with the TLV320AIC310xEVM can begin.
2 TLV320AIC310xEVM Control Software

This section discusses how to quickly start the control software and load a record or playback preset into the EVM using the TLV320AIC310x control software.

---

**Note**

For configuration of the codec, the TLV320AIC310x block diagram is located in the device data sheet. The block diagram is a good reference to help determine the signal routing.

---

2.1 Device Selection for Operation With the AIC310xEVM

The installed software provides operation for several devices in the TLV320AIC310x family. An initial window appears similar to Figure 2-1 when the software is run. As an example, for operation with the TLV320AIC3106EVM, select AIC3106 from the drop-down menu and click **Accept**. The software takes a few seconds to be configured for operation before proceeding. A progress bar shows the status of the configuration. When configured, a default software screen (see Figure 2-2) displays the EVM GUI.

![Device selection window](image-url)

**Figure 2-1. Device Selection Window**
2.2 Front-Page Indicators and Functions

Figure 2-2 shows the main screen of the EVM software. The indicators and buttons located above the tabbed section of the front page are visible regardless of which tab is currently selected.

At the top left of the screen is an **Interface** indicator. This indicator shows which interface is selected for controlling the TLV320AIC310xEVM.

To the right of the **Interface** indicator is a group box called **Firmware**. This box indicates where the firmware being used is operating from—in this release, the firmware is on the USB-MODEVM, so the user should see **USB-MODEVM** in the box labeled **Located On**. The version of the firmware appears in the **Version** box below this box.

To the right, the next group box contains controls for resetting the TLV320AIC310x. A software reset can be done by writing to a register in the TLV320AIC310x, which is accomplished by pushing the button labeled **Software Reset**. The TLV320AIC310x also may be reset by toggling a pin on the TLV320AIC310x, which is done by pushing the **Hardware Reset** button.

**CAUTION**

In order to perform a hardware reset, the RESET jumper must be installed and SW2-7 on the USB-MODEVM must be turned OFF. Failure to do either of these steps results in not generating a hardware reset or causing unstable operation of the EVM, which may require cycling power to the USB-MODEVM.
On the lower left portion of the screen, the **Device Connected** LED must be green when the EVM is connected. If the indicator is red, the EVM is not properly connected to the PC. Disconnect the EVM and verify that the drivers were correctly installed, then reconnect and try restarting the software.

On the upper right portion of the screen, several indicators are located that provide the status of various portions of the TLV320AIC310x. These indicators are activated by pressing the **Indicator Updates** button below the **Firmware** section. These indicators, as well as the other indicators on this panel, are updated only when the front panel of the software is inactive, once every 20 ms.

The **ADC Overflow** and **DAC Overflow** indicators light up when the overflow flags are set in the TLV320AIC310x. Below these indicators are the **AGC Noise Threshold Exceeded** indicators that show when the AGC noise threshold is exceeded. To the far right of the screen, the **Short Circuit Detect** indicators show when a short-circuit condition is detected, if this feature is enabled. Below the short-circuit indicators, the **AGC Gain Applied** indicators use a bar graph to show the amount of gain applied by the AGC, and indicators that light when the AGC is saturated.
2.3 Default Configuration (Presets) Tab

The default configuration tab in Figure 2-3 provides several different preset configurations of the codec. The Preset Configurations buttons allow the user to choose from the provided defaults. When the selection is made, the Preset Configuration Description box shows a summary of the codec setup associated with the choice made. If the choice is acceptable, the Load button can be pressed and the preset configuration is loaded into the codec. The user can change to the Command Line Interface tab (see Figure 2-4) to view the actual settings that were programmed into the codec.

![Figure 2-3. Preset Configurations Tab](image)

Figure 2-3. Preset Configurations Tab
2.4 Command Line Interface Tab

A simple scripting language controls the processor on the USB-MODEVM from the LabView®-based PC software. The main program controls throughout the control software do nothing more than write a script that is then handed off to an interpreter that sends the appropriate data to the correct USB endpoint. Because this system is script-based, a provision is made in this tab (Figure 2-4) for the user to view the scripting commands created when the controls are manipulated, as well as load and execute other scripts that are written and saved. This design allows the software to be used as a quick test tool or to help provide troubleshooting information in the rare event that the user encounters a problem with this EVM.

![Command Line Interface Tab](image.png)

Figure 2-4. Command Line Interface Tab

A script is loaded into the command buffer, either by operating the controls on the other tabs or by loading a script file. When executed, the return packets of data that result from each command are displayed in the Read Data array control. When executing several commands, the read data control shows only the results of the last command. To see the results after every executed command, use the logging function described in this section.

The file menu (Figure 2-5) provides some options for working with scripts. The first option, Open Command File..., loads a command file script into the command buffer. This script can then be executed by pressing the Execute Command Buffer button. The second option, Save Command File, allows the user to save a script from the command line interface. The saved commands are then saved as a text file in a location specified by the user.

The third option is Log Script and Results..., which opens a file save dialog box. Choose a location for a log file to be written using this file save dialog box. When the Execute Command Buffer button is pressed, the script runs and the script, along with the resulting data read back during the script, is saved to the file specified. The log file
is a standard text file that can be opened with any text editor, and looks much like the source script file, but with the additional information of the result of each script command executed.

The fourth menu item is a submenu of Recently Opened Files. This option is simply a list of script files that have previously been opened, allowing fast access to commonly used script files. The final menu item is Exit, which terminates the TLV320AIC310xEVM control software.

![Image of File Menu]

**Figure 2-5. File Menu**

Under the Help menu is an About... menu item that displays information about the TLV320AIC310xEVM control software.

### 3 USB-MODEVM

#### 3.1 USB-MODEVM Operation

This section provides information on the analog input and output, digital control, power, and general connection of the TLV320AIC310xEVM using the USB-MODEVM.

#### 3.1.1 TLV320AIC310xEVM-PDK Block Diagram

The TLV320AIC310xEVM-PDK consists of two separate circuit boards, the USB-MODEVM and the TLV320AIC310xEVM. The USB-MODEVM is built around a TAS1020B streaming audio USB controller with an 8051-based core. The motherboard features two positions for modular EVMs, or one double-wide serial modular EVM can be installed. The TLV320AIC310xEVM is one of the double-wide modular EVMs that is designed to work with the USB-MODEVM.

The simple diagram in Figure 3-1 shows how the TLV320AIC310xEVM is connected to the USB-MODEVM. The USB-MODEVM interface board is intended to be used in USB mode, where control of the installed EVM is accomplished using the onboard USB controller device. Provisions are made, however, for driving all the data buses (I²C, SPI®, I²S, and AC97) externally. The source of these signals is controlled by SW2 on the USB-MODEVM. See Table 3-1 for details on the switch settings.

The USB-MODEVM has two EVM positions that allow for the connection of two small evaluation module or one larger evaluation module. The TLV320AIC310xEVM is designed to fit over both of the smaller evaluation module slots as illustrated in Figure 3-1.
3.1.1.1 USB-MODEVM Interface Board

The simple diagram in Figure 3-1 shows only the basic features of the USB-MODEVM interface board. Because the TLV320AIC310xEVM is a double-wide modular EVM, the TLV320AIC310xEVM is installed with connections to both EVM positions, which connects the TLV320AIC310x digital control interface to the I²C port realized using the TAS1020B, as well as the TAS1020B digital audio interface.

In the factory configuration, the board is ready to use with the TLV320AIC310xEVM. To view all functions and configuration options available on the USB-MODEVM board, see the USB-MODEVM interface board schematic in Section 3.

![Figure 3-1. TLV320AIC310xEVM-PDK Block Diagram](image)
3.1.2 Default Configuration and Connections

3.1.2.1 USB-MODEVM SW2 Settings

Table 3-1 provides a list of the SW2 settings on the USB-MODEVM. For use with the TLV320AIC310xEVM, SW-2 positions 1 through 7 must be set to ON, while SW-2.8 must be set to OFF.

Table 3-1. USB-MODEVM SW2 Settings

<table>
<thead>
<tr>
<th>SW-2 Switch Number</th>
<th>Label</th>
<th>Switch Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A0</td>
<td>USB-MODEVM EEPROM I²C address A0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: A0 = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: A0 = 1</td>
</tr>
<tr>
<td>2</td>
<td>A1</td>
<td>USB-MODEVM EEPROM I²C address A1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: A1 = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: A1 = 1</td>
</tr>
<tr>
<td>3</td>
<td>A2</td>
<td>USB-MODEVM EEPROM I²C address A2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: A2 = 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: A2 = 1</td>
</tr>
<tr>
<td>4</td>
<td>USB I²S</td>
<td>I²S bus source selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: I²S bus connects to TAS1020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: I²S bus connects to USB-MODEVM J14</td>
</tr>
<tr>
<td>5</td>
<td>USB MCK</td>
<td>I²S bus MCLK source selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: MCLK connects to TAS1020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: MCLK connects to USB-MODEVM J14</td>
</tr>
<tr>
<td>6</td>
<td>USB SPI</td>
<td>SPI bus source selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: SPI bus connects to TAS1020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: SPI bus connects to USB-MODEVM J15</td>
</tr>
<tr>
<td>7</td>
<td>USB RST</td>
<td>RST source selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: EVM reset signal comes from TAS1020</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: EVM reset signal comes from USB-MODEVM J15</td>
</tr>
<tr>
<td>8</td>
<td>EXT MCK</td>
<td>External MCLK selection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: MCLK signal is provided from USB-MODEVM J10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: MCLK signal comes from either selection of SW2-5</td>
</tr>
</tbody>
</table>

3.1.2.2 USB-MODEVM Operation

The USB-MODEVM interface board can be powered from several different sources:

- USB
- 6 Vdc–10 Vdc AC/DC external wall supply (not included)
- Lab power supply

When powered from the USB connection, JMP6 must have a shunt from pins 1–2 (the default factory configuration). When powered from 6 V–10 Vdc, either through the J8 terminal block or J9 barrel jack, JMP6 must have a shunt installed on pins 2–3. If power is applied in any of these ways, onboard regulators generate the required supply voltages and no further power supplies are necessary.

If lab supplies are used to provide the individual voltages required by the USB-MODEVM interface, JMP6 must have no shunt installed. Voltages are then applied to J2 (+5VA), J3 (+5VD), J4 (+1.8VD), and J5 (+3.3VD). The +1.8VD and +3.3VD can also be generated on the board by the onboard regulators from the +5VD supply; to enable this configuration, the switches on SW1 must be set to enable the regulators by placing them in the ON position (lower position, looking at the board with text reading right-side up). If +1.8VD and +3.3VD are supplied externally, disable the onboard regulators by placing SW1 switches in the OFF position.

Each power-supply voltage has an LED (D1-D7) that lights when the power supplies are active.
3.2 USB-MODEVM Schematic

The schematic diagrams (see Figure 3-2 and Figure 3-3) for the USB-MODEVM interface board are provided for reference.

![USB-MODEVM Schematic Diagram](image)

*Figure 3-2. USB-MODEVM Schematic*
Figure 3-3. USB-MODEVM Schematic 2
The complete bill of materials, listed in Table 3-2, for the USB-MODEVM interface board (included only in the TLV320AIC3106EVM-PDK) is provided as a reference.

<table>
<thead>
<tr>
<th>Designators</th>
<th>Description</th>
<th>Manufacturer</th>
<th>Mfg. Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>R4</td>
<td>10Ω 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ1300V</td>
</tr>
<tr>
<td>R10, R11</td>
<td>27.4Ω 1/16W 1% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3EKF27F4V</td>
</tr>
<tr>
<td>R20</td>
<td>75Ω 1/4W 1% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-14NF75F0U</td>
</tr>
<tr>
<td>R19</td>
<td>220Ω 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ22F1V</td>
</tr>
<tr>
<td>R14, R21, R22</td>
<td>390Ω 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ39F1V</td>
</tr>
<tr>
<td>R13</td>
<td>649Ω 1/16W 1% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3EKF64F90V</td>
</tr>
<tr>
<td>R9</td>
<td>1.5KΩ 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ35F2V</td>
</tr>
<tr>
<td>R1–R3, R5–R8</td>
<td>2.7KΩ 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ35F2V</td>
</tr>
<tr>
<td>R12</td>
<td>3.09KΩ 1/16W 1% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3EKF30F1V</td>
</tr>
<tr>
<td>R15, R16</td>
<td>10KΩ 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ30F3V</td>
</tr>
<tr>
<td>R17, R18</td>
<td>100kΩ 1/10W 5% chip resistor</td>
<td>Panasonic</td>
<td>ERJ-3GELYJ30F4V</td>
</tr>
<tr>
<td>RA1</td>
<td>10KΩ 1/8W octal isolated resistor array</td>
<td>CTS Corporation</td>
<td>742C163103JTR</td>
</tr>
<tr>
<td>C18, C19</td>
<td>33pF 50V ceramic chip capacitor, ±5%, NPO</td>
<td>TDK</td>
<td>C160C0G1H330J</td>
</tr>
<tr>
<td>C13, C14</td>
<td>47pF 50V ceramic chip capacitor, ±5%, NPO</td>
<td>TDK</td>
<td>C160C0G1H470J</td>
</tr>
<tr>
<td>C20</td>
<td>100pF 50V ceramic chip capacitor, ±5%, NPO</td>
<td>TDK</td>
<td>C160C0G1H101J</td>
</tr>
<tr>
<td>C21</td>
<td>1000pF 50V ceramic chip capacitor, ±5%, NPO</td>
<td>TDK</td>
<td>C160C0G1H102J</td>
</tr>
<tr>
<td>C15</td>
<td>0.1μF 16V ceramic chip capacitor, ±10%, X7R</td>
<td>TDK</td>
<td>C160BXR1C104K</td>
</tr>
<tr>
<td>C16, C17</td>
<td>0.33μF 16V ceramic chip capacitor, ±20%, Y5V</td>
<td>TDK</td>
<td>C160BXR1C334K</td>
</tr>
<tr>
<td>C9–C12, C22–C28</td>
<td>1μF 6.3V ceramic chip capacitor, ±10%, X5R</td>
<td>TDK</td>
<td>C160BX5R0J1305K</td>
</tr>
<tr>
<td>C1–C8</td>
<td>10μF 6.3V ceramic chip capacitor, ±10%, X5R</td>
<td>TDK</td>
<td>C3216X5R0J1306K</td>
</tr>
<tr>
<td>D1</td>
<td>50V, 1A, diode MELF SMD</td>
<td>Micro Commercial Components</td>
<td>DL4001</td>
</tr>
<tr>
<td>D2</td>
<td>Yellow light emitting diode</td>
<td>Lumex</td>
<td>SML-LX0603YW-TR</td>
</tr>
<tr>
<td>D3–D7</td>
<td>Green light emitting diode</td>
<td>Lumex</td>
<td>SML-LX0603GW-TR</td>
</tr>
<tr>
<td>D5</td>
<td>Red light emitting diode</td>
<td>Lumex</td>
<td>SML-LX0603W-TR</td>
</tr>
<tr>
<td>Q1, Q2</td>
<td>N-channel MOSFET</td>
<td>Zetex</td>
<td>ZXMN6A07F</td>
</tr>
<tr>
<td>X1</td>
<td>6MHz crystal SMD</td>
<td>Epson</td>
<td>MA-505 6.000M-C0</td>
</tr>
<tr>
<td>U8</td>
<td>USB streaming controller</td>
<td>Texas Instruments</td>
<td>TAS1020BPB</td>
</tr>
<tr>
<td>U2</td>
<td>5V LDO regulator</td>
<td>Texas Instruments</td>
<td>REG1117-5</td>
</tr>
<tr>
<td>U9</td>
<td>3.3V/1.8V dual output LDO regulator</td>
<td>Texas Instruments</td>
<td>TPS767D318PW</td>
</tr>
<tr>
<td>U3, U4</td>
<td>Quad, 3-state buffers</td>
<td>Texas Instruments</td>
<td>SN74LVC125APW</td>
</tr>
<tr>
<td>U5–U7</td>
<td>Single IC buffer driver with open drain o/p</td>
<td>Texas Instruments</td>
<td>SN74LVC1G07DBVR</td>
</tr>
<tr>
<td>U10</td>
<td>Single 3-state buffer</td>
<td>Texas Instruments</td>
<td>SN74LVC1G125DBVR</td>
</tr>
<tr>
<td>U1</td>
<td>64K 2-wire serial EEPROM i2C</td>
<td>Microchip</td>
<td>24LC64I/16K</td>
</tr>
<tr>
<td>U2</td>
<td>USB-MODEVM PCB</td>
<td>Texas Instruments</td>
<td>6463995</td>
</tr>
<tr>
<td>TP1–TP6, TP9–TP11</td>
<td>Miniature test point terminal</td>
<td>Keystone Electronics</td>
<td>5000</td>
</tr>
<tr>
<td>TP7, TP8</td>
<td>Multipurpose test point terminal</td>
<td>Keystone Electronics</td>
<td>5011</td>
</tr>
<tr>
<td>J7</td>
<td>USB Type B slave connector thru-hole</td>
<td>Mill-Max</td>
<td>897-30-004-90-000000</td>
</tr>
<tr>
<td>J13, J2–J5, J8</td>
<td>2-position terminal block</td>
<td>On Shore Technology</td>
<td>ED5552DS</td>
</tr>
<tr>
<td>J9</td>
<td>2.5mm power connector</td>
<td>CUI Stack</td>
<td>PJ-102B</td>
</tr>
<tr>
<td>J130</td>
<td>BNC connector, female, PC mount</td>
<td>AMP/Tyco</td>
<td>414305-1</td>
</tr>
<tr>
<td>J133A, J23A</td>
<td>10-pin SMT plug</td>
<td>Samtec</td>
<td>TSM-105-01-L-DV-P</td>
</tr>
<tr>
<td>J133B, J23B</td>
<td>10-pin SMT socket</td>
<td>Samtec</td>
<td>SSW-105-322-F-D-VS-K</td>
</tr>
<tr>
<td>J6</td>
<td>4-pin double row header (2x2) 0.1&quot;</td>
<td>Samtec</td>
<td>TSW-102-07-L-D</td>
</tr>
<tr>
<td>J134, J135</td>
<td>12-pin double row header (2x6) 0.1&quot;</td>
<td>Samtec</td>
<td>TSW-106-07-L-D</td>
</tr>
<tr>
<td>JMP1–JMP4</td>
<td>2-position jumper, 0.1&quot; spacing</td>
<td>Samtec</td>
<td>TSW-102-07-L-S</td>
</tr>
</tbody>
</table>
### 3.4 USB-MODEVM Protocol

The USB-MODEVM is defined as a vendor-specific class, and is identified on the PC system as an NI-VISA device. Because the TAS1020 has several routines in its ROM that are designed for use with HID-class devices, HID-like structures are used, even though the USB-MODEVM is not an HID-class device. Data are passed from the PC to the TAS1020 using the control endpoint.

As Table 3-3 describes, data are sent in an HIDSETREPORT.

#### Table 3-3. USB Control Endpoint HIDSETREPORT Request

<table>
<thead>
<tr>
<th>Part</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>bmRequestType</td>
<td>0x21</td>
<td>00100001</td>
</tr>
<tr>
<td>bRequest</td>
<td>0x09</td>
<td>SET_REPORT</td>
</tr>
<tr>
<td>wValue</td>
<td>0x00</td>
<td>don't care</td>
</tr>
<tr>
<td>wIndex</td>
<td>0x03</td>
<td>HID interface is index 3</td>
</tr>
<tr>
<td>wLength</td>
<td></td>
<td>calculated by host</td>
</tr>
<tr>
<td>Data</td>
<td></td>
<td>Data packet as described below</td>
</tr>
</tbody>
</table>

Table 3-4 lists the bytes that comprise the data packet.

#### Table 3-4. Data Packet Configuration

<table>
<thead>
<tr>
<th>Byte Number</th>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Interface</td>
<td>Specifies the serial interface and operation. The two values are logically OR'd.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operation:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>READ 0x00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WRITE 0x10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Interface:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>GPIO 0x08</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPI_16 0x04</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2C_FAST 0x02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2C_STD 0x01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPI_8 0x00</td>
</tr>
<tr>
<td>1</td>
<td>I2C slave address</td>
<td>Slave address of the I2C device or the MSB of the 16-bit register address for SPI</td>
</tr>
<tr>
<td>2</td>
<td>Length</td>
<td>Length of data to write/read (number of bytes)</td>
</tr>
<tr>
<td>3</td>
<td>Register address</td>
<td>Address of the register for I2C or 8-bit SPI; LSB of the 16-bit address for SPI</td>
</tr>
<tr>
<td>4...64</td>
<td>Data</td>
<td>Up to 60 data bytes can be written at a time. EP0 maximum length is 64. The return packet is limited to 42 bytes, so advise only sending 32 bytes at any one time.</td>
</tr>
</tbody>
</table>
Example usages:

Write two bytes (AA, 55) to the device starting at register 5 of an I²C device with address A0:

[0] 0x11
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

Do the same with a fast mode I²C device:

[0] 0x12
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

Now do the same with an SPI device that uses an 8-bit register address:

[0] 0x10
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

Do the same process for a 16-bit register address, as found on parts like the TSC2101. Assume the register address (command word) is 0x10E0:

[0] 0x14
[1] 0x10
[2] 0x02
[3] 0xE0
[4] 0xAA
[5] 0x55

Note

The I²C address now serves as the MSB of the register address.
In each case, the TAS1020 returns, in an HID interrupt packet, the following:

<table>
<thead>
<tr>
<th>Status Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REQ_ERROR  0x80</td>
<td>Request Error</td>
</tr>
<tr>
<td>INTF_ERROR 0x40</td>
<td>Interface Error</td>
</tr>
<tr>
<td>REQ_DONE 0x20</td>
<td>Request Done</td>
</tr>
</tbody>
</table>

For I²C interfaces, the I²C address is as sent.
For SPI interfaces, the read back data from the SPI line for transmission of the corresponding byte is as sent.

Length is as sent.
For I²C interfaces, the register address is as sent.
For SPI interfaces, the read back data from the SPI line for transmission of the corresponding byte is as sent.

The echo of the data packet is sent.

If the command is sent with no problem, the returning byte [0] must be the same as the sent one logically or'd with 0x20. In the first example usage, the returning packet is:

[0] 0x31
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

If for some reason the interface fails (for example, the I²C device does not acknowledge), the returning byte comes back as:

[0] 0x51 → interface | INTF_ERROR
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

If the request is malformed, that is, the interface byte (byte [0]) takes on a value that is not described above, the return packet is:

[0] 0x93 → the user sent 0x13, which is not valid, so 0x93 is returned
[1] 0xA0
[2] 0x02
[3] 0x05
[4] 0xAA
[5] 0x55

The examples above used writes. Reading is similar:
Read two bytes from the device starting at register 5 of an I²C device with address A0:
The return packet is:

```
[0] 0x21  
[1] 0xA0  
[2] 0x02  
[3] 0x05  
[4] 0xAA  
[5] 0x55  
```

This result is assuming that the values written above starting at register 5 were actually written to the device.

### 3.5 GPIO Capability

The USB-MODEVM has seven GPIO lines. Access them by specifying the interface to be 0x08, and then using the standard format for packets—but addresses are unnecessary. The GPIO lines, as shown in Table 3-5 are mapped into one byte.

#### Table 3-5. GPIO Pin Assignments

<table>
<thead>
<tr>
<th>Bit 7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>x</td>
<td>P3.5</td>
<td>P3.4</td>
<td>P3.3</td>
<td>P1.3</td>
<td>P1.2</td>
<td>P1.1</td>
<td>P1.0</td>
</tr>
</tbody>
</table>

Example: write P3.5 to a 1, set all others to 0:

```
[0] 0x18  → Write, GPIO  
[1] 0x00  → This value is ignored  
[2] 0x01  → Length is always a 1  
[3] 0x00  → This value is ignored  
[4] 0x40  → 01000000  
```

The user may also read back from the GPIO to see the state of the pins. For this example, assume the previous example was written to the port pins.

Example: read the GPIO

```
[0] 0x08  → Read, GPIO  
[1] 0x00  → This value is ignored  
[2] 0x01  → Length is always a 1  
[3] 0x00  → This value is ignored  
```

The return packet is:

```
[0] 0x28  
[1] 0x00  
[2] 0x01  
[3] 0x00  
[4] 0x40  
```
3.6 Writing Scripts

A script is simply a text file that contains data to send to the serial control buses. The scripting language is quite simple, as is the parser for the language. Therefore, the program is not very forgiving about mistakes made in the source script file, but the formatting of the file is simple. Consequently, mistakes tend to be rare.

Each line in a script file is one command. There is no provision for extending lines beyond one line. A line is terminated by a carriage return.

The first character of a line is the command. Commands are listed in Table 3-6.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Set interface bus to use</td>
</tr>
<tr>
<td>r</td>
<td>Read from the serial control bus</td>
</tr>
<tr>
<td>w</td>
<td>Write to the serial control bus</td>
</tr>
<tr>
<td>#</td>
<td>Comment</td>
</tr>
<tr>
<td>b</td>
<td>Break</td>
</tr>
<tr>
<td>d</td>
<td>Delay</td>
</tr>
</tbody>
</table>

The first command, i, sets the interface to use for the commands to follow. This command must be followed by one of the parameters listed in Table 3-7.

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>i2cstd</td>
<td>Standard mode I(^2)C Bus</td>
</tr>
<tr>
<td>i2cfast</td>
<td>Fast mode I(^2)C bus</td>
</tr>
<tr>
<td>spi8</td>
<td>SPI bus with 8-bit register addressing</td>
</tr>
<tr>
<td>spi16</td>
<td>SPI bus with 16-bit register addressing</td>
</tr>
<tr>
<td>gpio</td>
<td>Use the USB-MODEVM GPIO capability</td>
</tr>
</tbody>
</table>

For example, if a fast mode I\(^2\)C bus is used, the script begins with i i2cfast.

No data follows the break command. The text following a comment command is ignored by the parser, provided that the text is on the same line. The delay command allows the user to specify a time, in milliseconds, that the script pauses before proceeding.

Note

Unlike all other numbers used in the script commands, the delay time is entered in a decimal format. Also, because of latency in the USB bus as well as the time required for the processor on the USB-MODEVM to handle requests, the delay time may not be precise.

A series of byte values follows either a read or write command. Each byte value is expressed in hexadecimal, and each byte must be separated by a space. Commands are interpreted and sent to the TAS1020 by the program using the protocol described in Section 3.4.

The first byte following a read or write command is the I\(^2\)C slave address of the device (if I\(^2\)C is used) or the first data byte to write (if SPI is used, SPI interfaces are not standardized on protocols, so the meaning of this byte varies with the device being addressed on the SPI bus). The second byte is the starting register address that data are written to (with I\(^2\)C the SPI varies, see Section 3.4 for additional information about what variations may be necessary for a particular SPI mode). If reading, data follow these two bytes. If reading, the third byte value is the number of bytes to read, (expressed in hexadecimal).
For example, to write the values 0xAA 0x55 to an I\(^2\)C device with a slave address of 0x90, starting at a register address of 0x03, write:

```
#example script
i i2cfast
w 90 03 AA 55
r 90 03 2
```

This script begins with a comment, specifying that a fast I\(^2\)C bus will be used, then writes 0xAA 0x55 to the I\(^2\)C slave device at address 0x90, and writes the values into registers 0x03 and 0x04. The script then reads back two bytes from the same device starting at register address 0x03. The slave device value does not change. The R/W bit does not need to be set for I\(^2\)C devices in the script; the read or write commands will do that.

Here is an example of using an SPI device that requires 16-bit register addresses:

```
# setup TSC2101 for input and output
# uses SPI16 interface
# this script sets up DAC and ADC at full volume, input from onboard mic
#
# Page 2: Audio control registers
w 10 00 00 00 80 00 00 00 45 31 44 FD 40 00 31 C4
w 13 60 11 20 00 00 00 80 7F 00 C5 FE 31 40 7C 00 02 00 C4 00 00 00 23 10 FE 00 FE 00
```

Blank lines are allowed. However, be sure that the script does not end with a blank line. Although ending with a blank line does not cause the script to fail, the program executes that line, and therefore, may prevent the user from seeing data written or read back on the previous command.

In this example, the first two bytes of each command are the command word to send to the TSC2101 (0x1000, 0x1360); these are followed by data to write to the device starting at the address specified in the command word. The second line may wrap in the viewer being used to look like more than one line; careful examination will show, however, that there is only one carriage return on that line, following the last 00.

Any text editor may be used to write these scripts; Jedit is an editor that is highly recommended for general usage. For more information, go to: http://www.jedit.org.

Once the script is written, this script can be used in the command window by running the program, and then selecting Open Command File... from the File menu. Locate and open the script. The script is then displayed in the command buffer. The user may also edit the script when in the buffer, but saving of the command buffer is not possible at this time (this feature may be added at a later date).

Once the script is in the command buffer, the script may be executed by pressing the Execute Command Buffer button. If there are breakpoints in the script, the script executes to that point, and the user is presented with a dialog box with a button to press to continue executing the script. When ready to proceed, push that button and the script continues.
Here an example of a (partial) script with breakpoints:

```bash
# setup AIC33 for input and output
# uses I2C interface
i i2cfast
# reg 07 - codec datapath
w 30 07 8A
r 30 07 1
d 1000
# regs 15/16 - ADC volume, unmute and set to 0dB
w 30 0F 00 00
r 30 0F 2
b
```

This script writes the value 8A at register 7, then reads the register back to verify that the write was good. A delay of 1000 ms (one second) is placed after the read to pause the script operation. When the script continues, the values 00 00 are written starting at register 0F. This output is verified by reading two bytes, and pausing the script again, this time with a break. The script does not continue until the user presses OK in the dialog box that will be displayed because of the break.
STANDARD TERMS FOR EVALUATION MODULES

1. **Delivery**: TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User’s acceptance of the EVM is expressly subject to the following terms.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software.

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 **Limited Warranty and Related Remedies/Disclaimers:**

2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

**WARNING**

Evaluation Kits are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems.

User shall operate the Evaluation Kit within TI’s recommended guidelines and any applicable legal or environmental requirements as well as reasonable and customary safeguards. Failure to set up and/or operate the Evaluation Kit within TI’s recommended guidelines may result in personal injury or death or property damage. Proper set up entails following TI’s instructions for electrical ratings of interface circuits such as input, output and electrical loads.

NOTE:
EXPOSURE TO ELECTROSTATIC DISCHARGE (ESD) MAY CAUSE DEGREDATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.
3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

**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.

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

**CAUTION**

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

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

**FCC Interference Statement for Class A EVM devices**

*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.

3.2 Canada

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

**Concerning EVMs Including Radio Transmitters:**

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

**Concernant les EVMs avec appareils radio:**

Le présent appareil est conforme aux CNR d’Industrie Canada applicables aux appareils radio exempts de licence. L’exploitation est autorisée aux deux conditions suivantes: (1) l’appareil ne doit pas produire de brouillage, et (2) l’utilisateur de l’appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d’en compromettre le fonctionnement.

**Concerning EVMs Including Detachable Antennas:**

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.
Concernant les EVMs avec antennes détachables
Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_01.page

3.3.2 Notice for Users of EVMs Considered “Radio Frequency Products” in Japan: EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry’s Rule for Enforcement of Radio Law of Japan.
2. Use 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.

【無線電波を送信する製品の開発キットをお使いになる際の注意事項】 開発キットの中には技術基準適合証明を受けていないものがあります。技術基準適合証明を受けていないもののご使用に際しては、電波法遵守のため、以下のいずれかの措置を取っていただく必要がありますのでご注意ください。

1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

なお、本製品は、上記の「ご使用にあたっての注意」を譲渡先、移転先に通知しない限り、譲渡、移転できないものとします。譲渡を遵守頂けない場合は、電波法の罰則が適用される可能性があることをご留意ください。日本テキサス・インスツルメンツ株式会社
東京都新宿区西新宿6丁目24番1号
西新宿三井ビル

3.3.3 Notice for EVMs for Power Line Communication: Please see http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page 電力線搬送波通信についての開発キットをお使いになる際の注意事項については、次のところをご覧ください。http://www.tij.co.jp/lstds/ti_ja/general/eStore/notice_02.page

3.4 European Union

3.4.1 For EVMs subject to EU Directive 2014/30/EU (Electromagnetic Compatibility Directive):
This is a class A product intended for use in environments other than domestic environments that are connected to a low-voltage power-supply network that supplies buildings used for domestic purposes. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.
4. **EVM Use Restrictions and Warnings:**

4.1 **EVMs are not for use in functional safety and/or safety critical evaluations, including but not limited to evaluations of life support applications.**

4.2 User must read and apply the user guide and other available documentation provided by TI regarding the EVM prior to handling or using the EVM, including without limitation any warning or restriction notices. The notices contain important safety information related to, for example, temperatures and voltages.

4.3 **Safety-Related Warnings and Restrictions:**

4.3.1 User shall operate the EVM within TI's recommended specifications and environmental considerations stated in the user guide, other available documentation provided by TI, and any other applicable requirements and employ reasonable and customary safeguards. Exceeding the specified performance ratings and specifications (including but not limited to input and output voltage, current, power, and environmental ranges) for the EVM may cause personal injury or death, or property damage. If there are questions concerning performance ratings and specifications, User should contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may also result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM user guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, even with the inputs and outputs kept within the specified allowable ranges, some circuit components may have elevated case temperatures. These components include but are not limited to linear regulators, switching transistors, pass transistors, current sense resistors, and heat sinks, which can be identified using the information in the associated documentation. When working with the EVM, please be aware that the EVM may become very warm.

4.3.2 EVMs are intended solely for use by technically qualified, professional electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems, and subsystems. User assumes all responsibility and liability for proper and safe handling and use of the EVM by User or its employees, affiliates, contractors or designees. User assumes all responsibility and liability to ensure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard. User assumes all responsibility and liability for any improper or unsafe handling or use of the EVM by User or its employees, affiliates, contractors or designees.

4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User’s handling and use of the EVM and, if applicable, User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. **Accuracy of Information:** To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.

6. **Disclaimers:**

6.1 Except as set forth above, EVMs and any materials provided with the EVM (including, but not limited to, reference designs and the design of the EVM itself) are provided “as is” and “with all faults.” TI disclaims all other warranties, express or implied, regarding such items, including but not limited to any epidemic failure warranty or implied warranties of merchantability or fitness for a particular purpose or non-infringement of any third party patents, copyrights, trade secrets or other intellectual property rights.

6.2 Except for the limited right to use the EVM set forth herein, nothing in these terms shall be construed as granting or conferring any rights by license, patent, or any other industrial or intellectual property right of TI, its suppliers/licensors or any other third party, to use the EVM in any finished end-user or ready-to-use final product, or for any invention, discovery or improvement, regardless of when made, conceived or acquired.

7. **User’s Indemnity Obligations and Representations.** User will defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, “Claims”) arising out of or in connection with any handling or use of the EVM that is not in accordance with these terms. This obligation shall apply whether claims arise under statute, regulation, or the law of tort, contract or any other legal theory, and even if the EVM fails to perform as described or expected.
8. **Limitations on Damages and Liability:**

8.1 **General Limitations.** IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMs, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 **Specific Limitations.** IN NO EVENT SHALL TI'S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. **Return Policy.** Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

10. **Governing Law:** These terms and conditions shall be governed by and interpreted in accordance with the laws of the State of Texas, without reference to conflict-of-laws principles. User agrees that non-exclusive jurisdiction for any dispute arising out of or relating to these terms and conditions lies within courts located in the State of Texas and consents to venue in Dallas County, Texas. Notwithstanding the foregoing, any judgment may be enforced in any United States or foreign court, and TI may seek injunctive relief in any United States or foreign court.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2019, Texas Instruments Incorporated
IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (https://www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2021, Texas Instruments Incorporated