User’s Guide
TPA6304-Q1 Evaluation Module

Robert Clifton

ABSTRACT
This manual describes the operations of the TPA6304Q1EVM. The TPA6304Q1EVM is a stand-alone Evaluation Module (EVM). The PurePath™ Control Console 3 GUI (PPC3) is used to initialize and operate the EVM.

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Trademarks

PurePath™ is a trademark of Texas Instruments.
All other trademarks are the property of their respective owners.
1 Required Equipment and Accessories:
1. TPA6304Q1EVM
2. USB A male to micro B male cable
3. Power Supply Unit (PSU) up to 18 V, 6 A capable
4. 1-4 resistive loads or speaker loads
5. 2-6 pair of wires stripped both ends
6. 2-mm slotted screwdriver
7. 1-4 RCA cables
2 Hardware Overview

2.1 TPA6304Q1 Evaluation Module Description

The TPA6304Q1EVM is a stand-alone EVM. USB adapter is provided for a more thorough evaluation of the device. Figure 2-1 shows the EVM board.

![Figure 2-1. TPA6304Q1EVM](image)
Figure 2-2 shows the TPA6304Q1EVM signal flow:

Figure 2-2. EVM Block Diagram

2.2 TPA6304-Q1 Evaluation Module Functions

- There are two switches
  - Standby switch puts the device on or out of standby.
  - XMOS Disable switch enables or disables the onboard XMOS.
- The board has 8 jumpers
  - J3 enables or disables the onboard XMOS.
  - J5 allows VBAT to be supplied by PVDD or another power supply.
  - J11 ties INREF to GND.
  - J12 and J13 allow for external I2C controller to run I2C commands the the TPA6304-Q1.
  - J14, J15, and J16 allow multiple input channels to be tied to the same input source.
3 Software Overview

3.1 PurePath™ Console 3 (PPC3) Access and Description

PPC3 is a server-based tool. Request access at PUREPATHCONSOLE: PurePath Console Graphical Development Suite for Audio System design and Development. Once approval is given, download the software from Texas Instruments mySecure Software site.

Run the installation program. Also download the PPC3 User Manual (slou408) for further instructions. Figure 3-2 shows the window displayed when first running PPC3. Click Sign in to see TPA6304 EVM application.

Different Apps might be displayed in Figure 3-3 depending on the user's access.
Click the TPA6304 EVM App box to download the TPA6304-Q1 application. An Installation window appears, next click Install. Figure 3-4 shows the downloading progress of the application.

The TPA6304 EVM box appears in the Installed EVM Apps section, see Figure 3-5. Click the TPA6304 EVM box to launch the TPA6304 EVM App.
3.2 PurePath™ Console 3 – TPA6304Q1EVM Home Window

There are three windows available with the TPA6304Q1EVM PPC3: Home Window, Register Map Window, and Device Monitor & Control Window. When the TPA6304Q1EVM PPC3 is launched, the Home Window displays (see Figure 3-6). If the EVM is powered on and the USB is connected to the PC, the Home Window displays the Connect box in the bottom left hand corner. If the EVM is not powered on or the USB is not connected, only TPA6304Q1EVM – Offline is displayed.
3.3 PurePath™ Console 3 – TPA6304Q1EVM Register Map Window

Click on the Register Map Box in the Home Window to display the Register Map Window. The Register Map indicates the current setting of all the registers in the TPA6304-Q1 device.

Figure 3-7. TPA6304Q1EVM Register Map Window
3.4 PurePath™ Console 3 – TPA6304Q1EVM Monitor & Control Window

Click on Device Monitor & Control box in the Home Window to display Device Monitor & Control window.

Figure 3-8. TPA6304Q1EVM Device Monitor & Control Window
4 TPA6304-Q1 Start Up

This section describes the TPA6304-Q1 start up procedure. Have all the equipment and accessories listed on the first page of this document available.

4.1 TPA6304Q1EVM Setup

Hardware and software connections:

- Desktop or laptop PC running Windows 7 or 10, open PPC3 GUI
- Connect 14.4-VDC PSU to the TPA6304Q1EVM
- Connect speakers or resistive loads to the TPA6304Q1EVM
- Connect USB micro cable from the PC to the EVM
- Set the STANDBY switch to down position and the XMOS DISABLE switch to the up position
- Turn on the PSU
- Connect the audio source – this can be a 3-mm stereo connector connected from the PC to the EVM as shown in Figure 4-1
- At this point, 3.3V LED, and USB-LOCK LED are on
- On the PPC3 window, launch the TPA6304Q1EVM application
4.2 TPA6304-Q1 Settings on Device Monitor & Control Window

Most of the register settings are done on the Device Monitor & Control window. The TPA6304-Q1 Register Map window is for reference.

Click the CONNECT button on the bottom left corner of the TPA6304Q1EVM application window, see Figure 3-6. The LED next to the TPA6304Q1EVM changes from gray to green and the CONNECT button changes to a DISCONNECT button.

Click on the TPA6304-Q1 Device Monitor & Control box, the window should now display Figure 4-2.

4.2.1 Device State Control Section

This section allows the user to control all 4 channels at the same time instead of changing one channel at a time. When Hi-Z is selected, all 4 channels are put in Hi-Z. The display for each channel in the channel control section reflects these button selections.
To the right hand side of the Device State Control section is the Master/Slave Mode Selector switch. The default state of the device is Master Mode.

4.2.2 Channel Control Section

Each channel has the same setting selections: Hi-Z, Mute, Play, Gain, Line Output mode and Speaker mode. The drop down menu allows the user to select either Hi-Z, Mute or Play Mode for each channel.

The default gain for each channel is 28 dB. The other gain options are 10 dB, 16 dB and 22 dB. If another gain is needed, select the button to the corresponding gain.

The default setting for each channel is Speaker mode. If Line Output is used select the Line Output button.

4.2.3 Miscellaneous Control Section

There are miscellaneous settings that are available on the GUI for easy access (see Figure 4-6).

This device supports parallel bridged-tied load operations. Channels 1 and 2 can be one PBTL channel and channels 3 and 4 can be the other. Before setting the channels to PBTL mode, connect the (+) terminals of channels 1 and 2 and/or channels 3 and 4. Then connect the same channels together for their respective (-) terminals. The device needs to be in standby before reconfiguring the output to PBTL.

The Clip Detect can be set to either disable or enable, with disable being the default setting.

The overcurrent (OC) has four level that can be changed via the drop-down menu in the OC box. The default level is 1.

Overtemperature warning (OTW) can be programmed using the pull-down menu to choose the OTW temperature. The default setting is 130°C.

The output switching frequency (FSW) or Pulse Width Modulation (PWM) frequency is set at 2.1 MHz. The pull-down menu on the Frequency box is used to change the PWM to 384kHz, 576kHz, and 2.3MHz.

Another feature this device has is being able to adjust at what THD level the clip detect goes off. The pull-down menu on the Clip Level box allows the user to set the detect threshold to go off at either 1% THD, 2% THD, 3% THD or 10% THD. 1% THD is the default value.
PWM Mode allows the user to choose between a BD modulation scheme or a BDHE/1SPW modulation scheme. BD modulation is the default value.

GPIO 1 and GPIO 2 pull-down menus have the same configuration options but are for their respective pins. Each one can be used to output specific signals or as inputs depending on the setting chosen. The states that can be selected for GPIO 1 and GPIO 2 are the following: Hi-Z, WarningZ, FaultZ, Clip Detect 1, Clip Detect 2, Sync Out, DVDD, GND, Sync In, and Mute Z. WarningZ and FaultZ are the Warning and Fault output signals and the MuteZ setting allows the device to have a hardware control mute pin. Default setting is Hi-Z for both GPIO 1 and GPIO 2.

The final part of the Miscellaneous Controls section is the Fault Pin pull-down menu. This changes the corresponding device fault pin. It can be selected to read out either FaultZ, WarningZ, Clip Detect 1 or Clip Detect 2. FaultZ is the default setting.

### 4.2.4 Fault / Warning Signal Configuration Section

This section controls what the Fault and Warning signals report when selected. To get to this section click the icon on the top right of the Miscellaneous Control Section. This changes the display to show Figure 4-7.

![Figure 4-7. Fault / Warning Signal Configuration Section](image)

The Warning signal can be set to report when a Clip, Invalid Clock, Overtemperature Shutdown (OTSD), Power Fault, overtemperature warning (OTW), Temperature Gain Foldback (TGBF), or ILimit event is triggered. By default, Warning does not have any event selected.

The Fault signal can be set to report when a Protective Shutdown, Invalid Clock, OTSD, Power Fault, DC fault detection, Overcurrent (OC), or ILimit event is triggered. By default the Fault signal will report a fault only when a DC, OC, or ILimit event is detected.

### 4.2.5 Faults / Warnings Section

The top right buttons on the Faults / Warnings box serve as controlling and monitoring faults. Clip enable route the clip detection bit to the warning pin. This is displayed as a yellow LED on the EVM. Thermal enable route the overtemperature warning bit to the warning pin. This is displayed as the same yellow LED on the EVM. The Clear button clears all the faults and warnings. The Read button manually read the faults and warnings.

![Figure 4-8. Faults / Warnings Section](image)

### 4.2.6 AC Load Diagnostics Section

The AC load diagnostics report speaker impedance and phase. The diagnostics can be performed with one or all four channels.
Select the correct output impedance and click the Start > button. Follow the pop up instructions to run the load diagnostics.

Click on the icon located on the top right of the AC load diagnostics box to see the results.

### 4.2.7 DC Load Diagnostics Section

The DC load diagnostics report if a channel's output is short to power, short to ground, short to load, or open.

Select the impedance of the load from 0.5 to 5 Ω. Click "Start >" and then click the icon on the top right of the box to view results.

### 4.2.8 Spread Spectrum Control Section

The Spread Spectrum Controls Section allows the user to control features related to spread spectrum and managing electromagnetic conductivity/interference.

By default, spread spectrum is enabled. This can be disabled by clicking on the Spread Spectrum Enabled button. To re-enable, simply click the box again.

Another button found in this section is the Automatic Channel Phasing. By default Automatic Channel Phasing is disabled but can be enabled the same way as Spread Spectrum is.

The three drop-down menus, Dephase Ch2 to Ch1, Dephase Ch3 to Ch1, and Dephase CH4 to Ch1, all control the channels output phases from each other. Each can be set to be either 0 degrees, 45 degrees, 90 degrees,
135 degrees, 180 degrees, 225 degrees, 270 degrees or 315 degrees out of phase from channel 1. The default values for Dephase Ch2 to Ch1, Dephase Ch3 to Ch1, and Dephase CH4 to Ch1 are 180 degree, 90 degree, and 270 degree, respectively.
4.3 TPA6304-Q1 Settings on Register Map Window

Select a particular register then double click on any bit, that isn’t reserved, and the bit changes state. This state is executed at the end of the click.

![Register Map Window](image)

**Figure 4-12. Register Map Window**

4.4 I2C Monitor Window

The PPC3 has an I2C monitor and also configuration program options (see Figure 4-13).

![I2C Monitor Window](image)

**Figure 4-13. I2C Monitor Window - I2C Logging**
When this window is first open, the round button is green. To record I2C commands, click on this button to turn it red. This button can be clicked again to stop recording I2C commands. Doing this will turn the button back to green. The recording can be saved for later use by clicking the save icon.

The I2C commands can also be copied to the clipboard by clicking the icon next to trash bin icon.

![Figure 4-14. I2C Monitor Window - I2C Logging](image)

A set of I2C commands can be loaded and executed from this window. On the top right corner, click on the I/O button to display the window in Figure 4-14. Write I2C commands here, or open an existing *.cfg file then click the Execute button on the bottom left corner of the I2C Monitor window. The I2C commands are sent to the device when the Execute button is pressed.
5 Board Layout, Schematic and Bill of Materials

5.1 Board Layout

Figure 5-1. TPA6304Q1EVM Top
Figure 5-2. TPA6304Q1EVM Bottom
5.2 Schematic

Figure 5-3. Schematic (Page 1)
Figure 5-4. Schematic (Page 2)
Figure 5-5. Schematic (Page 3)
### 5.3 Bill of Materials

#### Table 5-1. Bill of Materials

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<th>Designator</th>
<th>Qty</th>
<th>Value</th>
<th>Description</th>
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<th>Part Number</th>
<th>Manufacturer</th>
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D1  Green LED, Green, SMD

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Board Layout, Schematic and Bill of Materials

[www.ti.com](http://www.ti.com)

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<thead>
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<th>Designator</th>
<th>Qty</th>
<th>Value</th>
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<tr>
<td>J1</td>
<td>1</td>
<td>Terminal Block, 4x1, 5.08mm, TH</td>
<td>4x1 Terminal Block</td>
<td>39544-3004</td>
<td>Molex</td>
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</tr>
<tr>
<td>J2, J4, J6, J7</td>
<td>4</td>
<td>RCA Jack, 1Pos, Tin, R/A, TH</td>
<td>RCA Jack, 1Pos, R/A, TH</td>
<td>RCJ-041</td>
<td>CUI Inc.</td>
<td></td>
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<tr>
<td>J3, J5, J11, J14, J15, J16</td>
<td>6</td>
<td>Header, 100mil, 1x2, Gold, TH</td>
<td>Sullins 100mil, 1x2, 230 mil above insulator</td>
<td>PBC02SAAN</td>
<td>Sullins Connector Solutions</td>
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<tr>
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<td>Terminal Block, 3.5mm, 8x1, Tin, TH</td>
<td>Terminal Block, 3.5mm, 8x1, TH</td>
<td>393570008</td>
<td>Molex</td>
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<tr>
<td>J9</td>
<td>1</td>
<td>Receptacle, 50mil, 6x1, Gold, R/A, TH</td>
<td>6x1 Receptacle</td>
<td>LPPB061NGC-RC</td>
<td>Sullins Connector Solutions</td>
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<td>J10</td>
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<td>Connector, Receptacle, Micro-USB Type AB, R/A, Bottom Mount SMT</td>
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<td>475890001</td>
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<tr>
<td>J12, J13</td>
<td>2</td>
<td>Header, 100mil, 1x1, Gold, TH</td>
<td>3x1 Header</td>
<td>TSW-103-07-G-S</td>
<td>Samtec</td>
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<tr>
<td>L1, L2, L3, L4, L5, L6, L7, L8</td>
<td>8</td>
<td>3.3uH Shielded Wirewound Inductor 2.9A 0.058Ohm Max Nonstandard</td>
<td>SMT_IND_4MM0_4MM0</td>
<td>ASWPA4035S3R3MT</td>
<td>Sunlord</td>
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<tr>
<td>L9</td>
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<td>FIXED IND 150NH 16A 4.1 MOHM SMD</td>
<td>SMD2</td>
<td>SRP5015TA-R15Y</td>
<td>Bourns</td>
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<td>SMD2</td>
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<td>Taiyo Yuden</td>
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<td>180 ohm</td>
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<td>0806</td>
<td>MuRata</td>
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<td>Stackpole Electronics Inc</td>
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<tr>
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<td>RES, 40.2 k, 1%, 0.1 W, AEC-Q200 Grade 0, 0402</td>
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<td>2.20k</td>
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<td>R9, R10</td>
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<td>RES, 0, 5%, 0.05 W, AEC-Q200 Grade 1, 0201</td>
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<td>RES, 1.00 M, 1%, 0.1 W, 0603</td>
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<td>33.2</td>
<td>RES, 33.2, 1%, 0.05 W, 0201</td>
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<td>7 X 11 X4.5 mm</td>
<td>G12AP</td>
<td>NKK Switches</td>
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<td>SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8</td>
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<td>1x2</td>
<td>Shunt, 100mil, Gold plated, Black</td>
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<td>Red Multipurpose Testpoint</td>
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<td>Black Compact Testpoint</td>
<td>5006</td>
<td>Keystone</td>
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<td>Test Point, Miniature, Orange, TH</td>
<td>Orange Miniature Testpoint</td>
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<td>45-W, 2.1-MHz Analog Input 4-Channel Automotive Class-D Audio Amplifier with Load Dump Protection and I2C Diagnostics, DDV0044E (TSSOP-44)</td>
<td>DDV-44</td>
<td>TPA6304Q1DDV</td>
<td>Texas Instruments</td>
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<td>3-A Step-Down Converter with DCS-Control and Hiccup Short Circuit Protection in 2x2 HolRod Package, RLT0007A (VSDN-HR-7)</td>
<td>RLT0007A</td>
<td>TPS62085RLTR</td>
<td>Texas Instruments</td>
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<td>U3</td>
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<td>Low Dropout Positive Regulators, 3-pin TO-220, Pb-Free</td>
<td>NDE0003A</td>
<td>LM1086IT-3.3/NOPB</td>
<td>Texas Instruments</td>
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<td>IC MCU 512KB RAM, 128TQFP</td>
<td>TQP-128</td>
<td>XEF216-512-TQ128-C20</td>
<td>Xmos semiconductor</td>
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<td>U5</td>
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<td>Single-Channel Ultra-Small Adjustable Supervisory Circuit With Active-High Open-Drain Output, DRY0006A (USON-6)</td>
<td>DRY0006A</td>
<td>TPS3897ADRYR</td>
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<td>Enhanced Product Dual Buffer/Driver with Open-Drain Output, DCK0006A (SOT-SC70-6)</td>
<td>DSF0006A</td>
<td>SN74LVC2G07DSFR</td>
<td>Texas Instruments</td>
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<td>Programmable 1-PLL VCXO Clock Synthesizer with 2.5-V or 3.3-V LVCMOS Outputs, PW0014A (TSSOP-14)</td>
<td>PW0014A</td>
<td>CDCE913PWR</td>
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<td>U8</td>
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<td>Single Output LDO, 400mA, Adj (1.2 to 5.5V), Cap free, Low Noise, Reverse Current Protection, DBV0005A (SOT-23-5)</td>
<td>DBV0005A</td>
<td>TPS73618DBVR</td>
<td>Texas Instruments</td>
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<td>U9</td>
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<td>Dual-Bit Dual-Supply Bus Transceiver, DQM0006A (X2SON-8)</td>
<td>DQM0006A</td>
<td>SN74AVC2T244DQMR</td>
<td>Texas Instruments</td>
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<td>Y1</td>
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<td>OSC, 24 MHz, 2.25 - 3.63 V, SMD</td>
<td>2x1.6mm</td>
<td>ASTMLPA-24.000MHZ-EJ-E-T</td>
<td>Abracon Corporation</td>
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<td>C24, C34, C97, C99, C101</td>
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<td>1000pF</td>
<td>CAP, CERM, 1000 pF, 50 V, +/- 10%, X7R, 0603</td>
<td>0603</td>
<td>C0603X102K5RACTU</td>
<td>Kemet</td>
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<td>Fiducial mark. There is nothing to buy or mount.</td>
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<td>R36, R37, R38, R39, R40, R41, R42, R43</td>
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<td>CRCW06033R30JNEA</td>
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### Table 5-1. Bill of Materials (continued)

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<th>Designator</th>
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<th>Description</th>
<th>Package Reference</th>
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<td>TP3</td>
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<td>Test Point, Multipurpose, Red, TH</td>
<td>Red Multipurpose Testpoint</td>
<td>5010</td>
<td>Keystone</td>
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# Revision History

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

## Changes from Revision + (September 2019) to Revision A (October 2020)

<table>
<thead>
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<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Added Spread Spectrum Control Section</td>
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</tbody>
</table>
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 DEGRADATION OR FAILURE OF THE EVALUATION KIT; TI RECOMMENDS STORAGE OF THE EVALUATION KIT IN A PROTECTIVE ESD BAG.
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 par 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/lsds/tp_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/lsds/tp_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。
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「ご使用におかれての注意」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。
上記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/lsds/tp_ja/general/eStore/notice_02.page
電力線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/lsds/tp_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.
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.

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.

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.

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