This user’s guide describes the characteristics, operation, and use of the SmartAmp Learning board 2. The boards connections and the examples setup are included in this document.

Contents
1 Description .................................................................................................................... 2
2 Specifications ................................................................................................................ 2
3 Software ....................................................................................................................... 2
4 Connections .................................................................................................................. 3
5 Example Setups ............................................................................................................ 4

List of Figures
1 Software Request ............................................................................................................ 2
2 Learning Board 2 .......................................................................................................... 3
3 Learning Board 2 with a TAS2562 EVM .................................................................... 4
4 Learning Board 2 with a TAS2559 EVM .................................................................... 6
5 Learning Board 2 with a TAS2557 EVM .................................................................... 8
6 Learning Board 2 With a TAS2555 EVM .................................................................... 10

List of Tables
1 SmartAmp Learning Board 2 Specifications .................................................................. 2

Trademarks
PurePath is a trademark of Texas Instruments.
1 Description

The SmartAmp Learning Board 2 (LB2) is an accessory board for TI SmartAmp products like the TAS2555, TAS2557, and TAS2562 amplifiers which is required for speaker characterization. LB2 includes a digital audio generator, several inputs (microphone, laser, amplifier, SPDIF (optical and coaxial)), and precision circuitry to measure speaker parameters.

The LB2 is intended for use with a TI SmartAmp EVM.

2 Specifications

Table 1 lists the LB2 specifications:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>3.3-V via SmartAmp EVM</td>
</tr>
<tr>
<td>Digital IO / Connectivity</td>
<td>34-pin, 100-mil dual header</td>
</tr>
</tbody>
</table>

3 Software

The LB2 requires PurePath™ Console 3 with a compatible SmartAmp plug-in (for example, TAS2555EVM plug-in, TAS2557EVM plug-in, TAS2562EVM plug-in, etc).

The audio plug-ins can be requested in the device product folders. On the main window of each product folder, there is an information box as shown below. It is just necessary to click on the “Request now” option from the information box and fill in all the requested information.

![Figure 1. Software Request](image)

The product folder links are listed below:

4 Connections

Figure 2 illustrates the LB2.

<table>
<thead>
<tr>
<th>Port</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J21:</td>
<td>Digital Interface to SmartAmp EVM</td>
</tr>
<tr>
<td>J1:</td>
<td>5-mm TRS MIC connection with microphone bias</td>
</tr>
<tr>
<td>J2:</td>
<td>Line in</td>
</tr>
<tr>
<td>J5:</td>
<td>Laser voltage input (10 V/mm), BNC</td>
</tr>
<tr>
<td>J6:</td>
<td>Optical SPDIF input</td>
</tr>
<tr>
<td>J9:</td>
<td>Optical SPDIF output</td>
</tr>
<tr>
<td>J4:</td>
<td>Digital microphone input (select voltage with J20)</td>
</tr>
<tr>
<td>J17:</td>
<td>I2C interface</td>
</tr>
<tr>
<td>J24, J25:</td>
<td>Line out</td>
</tr>
<tr>
<td>J8:</td>
<td>Coax SPDIF output</td>
</tr>
<tr>
<td>J7:</td>
<td>Coax SPDIF input</td>
</tr>
<tr>
<td>J14, J15:</td>
<td>Speaker connection</td>
</tr>
<tr>
<td>J12, J13:</td>
<td>Amplified audio input</td>
</tr>
<tr>
<td>J22:</td>
<td>FPGA programming header (TI internal use only)</td>
</tr>
</tbody>
</table>

Figure 2. Learning Board 2
5 Example Setups

5.1 TAS2562 Setup

Figure 3 shows the LB2 with a TAS2562 EVM.

![Image of Learning Board 2 with a TAS2562 EVM]

Figure 3. Learning Board 2 with a TAS2562 EVM
The LB2 is connected to a TAS2562 EVM with a ribbon cable, which supplies power to the Learning Board 2 as well as control (I²C) and digital audio (several I²S instances). TAS2562 EVM must be using the default jumper settings found in the **TAS2562 EVM User's Guide**. Alternatively, J3 can be also disconnected from the TAS2562EVM since only one amplifier output will be used.

In this example, the LB2 uses the following IOs:

1. Digital interface to EVM: ribbon cable
2. AMP IN (J12): Amplified audio signal from EVM (J8):
   - The LB2 measures the voltage from this signal
3. AMP OUT (J14): Amplified audio to the speaker
   - The LB2 measures the current for this signal
4. Laser (J5)
   - The laser measures the excursion of the speaker membrane. The excursion data is converted to an electrical signal 10 V / mm. The LB2 has a BNC connector for this signal.
5. Microphone (J1)
   - This uses a 5-mm TRS jack (internal mic bias)

The LB2 is fully controlled through PPC3. There is no direct user input required.
Figure 4 shows the LB2 with a TAS2559 EVM.

The LB2 is connected to a TAS2559 EVM with a ribbon cable, which supplies power to the Learning Board 2 as well as control (I2C) and digital audio (several I2S instances). TAS2559 EVM must be using the default jumper settings found in the *TAS2559 EVM User's Guide*.
In this example, the LB2 uses the following IOs:

1. Digital interface to EVM: ribbon cable
2. AMP IN (J12): Amplified audio signal from EVM (J8):
   - The LB2 measures the voltage from this signal
3. AMP OUT (J14): Amplified audio to the speaker
   - The LB2 measures the current for this signal
4. Laser (J5)
   - The laser measures the excursion of the speaker membrane. The excursion data is converted to an electrical signal 10 V / mm. The LB2 has a BNC connector for this signal.
5. Microphone (J1)
   - This uses a 5-mm TRS jack (internal mic bias)

The LB2 is fully controlled through PPC3. There is no direct user input required.
5.3 TAS2557 Setup

Figure 5 shows the LB2 with a TAS2557 EVM.

The LB2 is connected to a TAS2557 EVM with a ribbon cable, which supplies power to the Learning Board 2 as well as control (I2C) and digital audio (several I2S instances). TAS2557 EVM must be using the default jumper settings found in the TAS2557 EVM User's Guide.
In this example, the LB2 uses the following IOs:

1. Digital interface to EVM: ribbon cable
2. AMP IN (J12): Amplified audio signal from EVM (J8):
   • The LB2 measures the voltage from this signal
3. AMP OUT (J14): Amplified audio to the speaker
   • The LB2 measures the current for this signal
4. Laser (J5)
   • The laser measures the excursion of the speaker membrane. The excursion data is converted to an electrical signal 10 V / mm. The LB2 has a BNC connector for this signal.
5. Microphone (J1)
   • This uses a 5-mm TRS jack (internal mic bias)

The LB2 is fully controlled through PPC3. There is no direct user input required.
5.4 TAS2555 Setup

Figure 6 shows the LB2 with a TAS2555 EVM.

The LB2 is connected to a TAS2555 EVM with a ribbon cable, which supplies power to the Learning Board 2 as well as control (I^2C) and digital audio (several I^2S instances). TAS2555 EVM must be using the default jumper settings found in the **TAS2555 EVM User’s Guide**.
In this example, the LB2 uses the following IOs:

1. Digital interface to EVM: ribbon cable
2. AMP IN: Amplified audio signal from EVM (J8):
   - The LB2 measures the voltage from this signal
3. AMP OUT: Amplified audio to the speaker
   - The LB2 measures the current for this signal
4. Laser
   - The laser measures the excursion of the speaker membrane. The excursion data is converted to an electrical signal 10 V / mm. The LB2 has a BNC connector for this signal.
5. Microphone
   - This uses a 5-mm TRS jack (internal mic bias)

The LB2 is fully controlled through PPC3. There is no direct user input required.

Please refer to the respective tuning guide (for example, *Smart Amp Tuning Guide* for detailed information about speaker characterization and tuning with the LB2.)
### Revision History

#### Changes from Original (August 2015) to A Revision

<table>
<thead>
<tr>
<th>Change Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changed Abstract</td>
<td>1</td>
</tr>
<tr>
<td>Changed Description</td>
<td>2</td>
</tr>
<tr>
<td>Added plug-ins to Software section paragraph</td>
<td>2</td>
</tr>
<tr>
<td>Changed J7 to J9 in Connections section</td>
<td>3</td>
</tr>
<tr>
<td>Added Section 5.1</td>
<td>4</td>
</tr>
<tr>
<td>Added Section 5.2</td>
<td>6</td>
</tr>
<tr>
<td>Added Section 5.3</td>
<td>8</td>
</tr>
</tbody>
</table>
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 (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 © 2019, Texas Instruments Incorporated