LMP7312 Evaluation Board User Guide (551600360-001 REV A)

This evaluation board contains the LMP7312, along with a SPI command generator to program the registers in the LMP7312

.Connectors, Jumpers, Test Point

POWER SUPPLY

+Vs banana plug for the positive power supply of the LMP7312 and the on-board SPI command generator.

VIO banana plug to power the SPI of the LMP7312 when an external micro is used to program the SPI.

GND banana plug for ground connection.

SIGNAL CONNECTORS

Input signals

+IN_CL banana plug for non-inverting input of the amplification pair.

-IN_CL banana plug for inverting input of the amplification pair.

+IN_LS BNC for non-inverting input of the attenuation pair.

-IN_LS BNC for inverting input of the attenuation pair.

J7 14-pin header available for microcontroller connection. The pin out is shown in Table 3.

Reference Signals

V_{ocm} banana plug for the common mode output signals and the output configuration (single ended, differential). See the Output Configuration section.

VR banana plug for the output reference when the output of the LMP7312 is used in single ended mode.

Output signals

OUT- BNC for the inverting Output in the differential output configuration

OUT+ BNC for the non-inverting output.

DP Differential Probe Header connector.

P1 5-pin header for ADC141S626 or ADC161S626 Eval Board connection.

JUMPERS

The eval board has 6 jumpers:

J1 connects the CSB pin of the LMP7312 to either the onboard SPI commands generator or to pin 1 of J7.

J2 connects the SCK pin of the LMP7312 to either the onboard SPI commands generator or to pin 3 of J7.

J3 connects the SDI pin of the LMP7312 to either the onboard SPI commands generator or to pin 5 of J7.

J4 connects the -VOUT/VR pin of the LMP7312 either to the VR reference or to the LOAD. (see the Output Configuration section).

J5 connects the VOCM pin of the LMP7312 to either the ground or to the VOCM reference. (see the Output Configuration section).

J6 connects the VIO pin of the LMP7312 to either the +Vs plug or to the VIO plug.

TEST POINTS
The test points are connected as follows:

TP1 GND
TP2 -IN pin
TP3 -VIN pin
TP4 -VOUT/VR pin
TP5 +IN pin
TP6 +VIN pin
TP7 +VOUT pin
TP8 VR
TP9 VOCM
TP10 +Vs
TP11 VIO

Hardware Setup

REGISTER PROGRAMMING SETUP
In order to use the on board SPI commands generator to program the LMP7312 the following jumpers need to be configured as follows:
- J1   open
- J2   open
- J3   open
- J6   short pin1 to pin 2

In order to use a microcontroller to program the LMP7312 the following jumpers need to be configured as follows:
- J1   short
- J2   short
- J3   short
- J6   short pin2 to pin 3

Connect the external microcontroller to J7.
Refer to Table 3 for J7 pin out.

POWER SUPPLY SETUP
When the LMP7312 is programmed through the onboard SPI command generator, a 5V supply is needed to power the eval board:
- Connect a +5V supply to the +Vs and GND banana plugs

When the LMP7312 is programmed through a microcontroller:
- Connect a +5V supply between +Vs and GND banana plugs
- Connect a supply (2.7V – 5.5V) that matches microcontroller voltage range between +VIO and GND banana plugs

SOURCE SETUP
Attenuation input pair
If signal source impedance matching is desired, solder the resistors R8 and R9 of appropriate value.

Amplification input pair
The 50Ω shunt resistor (R1) between the inputs needs to be removed if the amplification input pair is not used as a current loop receiver.

OUTPUT CONFIGURATION
The LMP7312 is able to work in both single ended and differential output mode. The selection of the output is made through the Vocm (output common mode voltage) pin.
Differential mode
- Open jumper J4
- Short pin1 and pin2 of J5

- Connect a supply in the range between 1V and 5V to the +Vocm and GND banana plugs

Single ended mode
- Short jumper J4
- Short pin2 and pin3 of J5
- Connect a supply in the range between 0V and 5V between VR and GND banana plugs

COMPONENTS
If the device is configured in the differential output mode, the series resistances R2 and R3, RLd and the capacitance CLd can be changed in order to build a first order low pass filter with desired bandwidth. In this configuration the capacitance CLs and the resistance RLs should be removed.
If the device is configured in the single-ended output mode, the series resistance R3, RLs and capacitance CLs can be changed in order to build a first order low pass filter with desired bandwidth. In this configuration the capacitance CLd and the resistance RLd should be removed.
If the value of the shunt resistance R1 does not fit the application needs, replace it as needed

Using the Board

INPUT AND OUTPUT SIGNALS
Attenuation mode
Connect a signal at +IN_LS and –IN_LS BNC; refer to the Datasheet for the allowed amplitude according to the set gain.
Amplification mode
Connect a signal at +IN_CL and –IN_CL banana; refer to the Datasheet for the allowed amplitude according to the set gain.

PROGRAMMING THE LMP7312
The register in the LMP7312 can be programmed using switches S1 and S2. S2 consists of five switches labeled B0, B1, B2, B3, B4, corresponding to the five bits of the LMP7312 register. If the switch is up a "0" is programmed to the corresponding bit. S1 is used to load the data into the register of the LMP7312.
For example, to load the gain of 0.384V/V set S2 as follows:

Gain_1   –   Down   1
Gain_0   –   Up   0
EN_CL   –   Up   0
Null_SW   –   Up   0
HiZ   –   Up   0

Then Push the switch S1 to load the data into the register of the LMP7312.
Table 1 shows the allowed register values.

Table 1 Register Values

LSB				MSB		
HI_Z	NULL_SW	EN_CL	Gain_0	Gain_1	Gain Value (V/V)	Mode of Operation
0	0	0	0	0	0.096	Attenuation
0	0	0	1	0	0.192	Attenuation
0	0	0	0	1	0.384	Attenuation
0	0	0	1	1	0.768	Attenuation
0	0	1	0	1	1	Amplification
0	0	1	1	1	2	Amplification
1	x	x	x	x	-	High Impedance output
0	1	x	x	x	1	Null Switch mode

Table 2 S2 Dip switch description

PINS	NAME
1-2	Hiz
3-4	Null_SW
5-6	EN_CL
7-8	Gain_0
9-10	Gain_1

WRITING TO THE REGISTER USING A MICROCONTROLLER

A microcontroller can be used to program the LMP7312. If the microcontroller is provided with a TTL logic signal connect pin1 and pin2 of J6 together, otherwise, apply a voltage compliant with the microcontroller logic value to the VIO banana plug, and short pin2 and pin3 of J6. The microcontroller signals are connected to the LMP7312 through J7. More information on the SPI configuration is provided in the SPI section of the LMP7312 datasheet.

Table 3 J7 connector description

| PIN	NAME	PIN	NAME
1	CSB	8	NC
2	GND	9	NC
3	SCK	10	NC
4	NC	11	NC
5	SDI	12	NC
6	NC	13	NC
7	SDO	14	NC

Interfacing ADC Eval Board

The LMP7312 Eval Board can be interfaced with the ADC141S626 and ADC161S626 Eval Boards through the P1 connector only when the LMP7312 is configured in the differential output mode (see Output Configuration section).
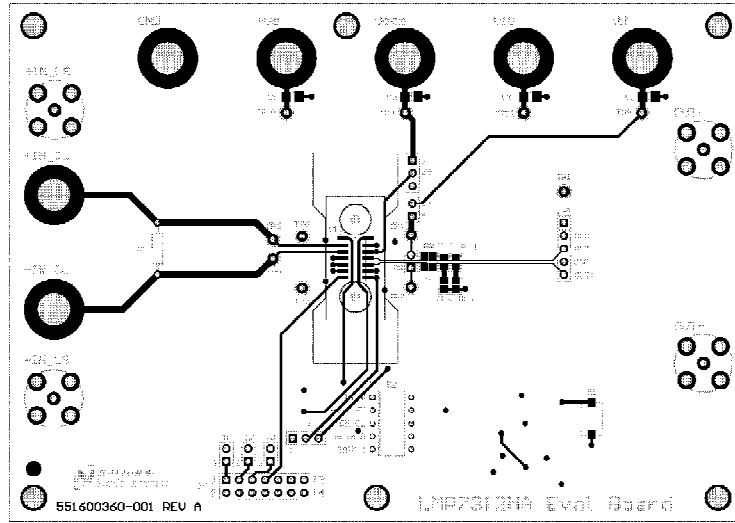
Table 4 P1 connector description

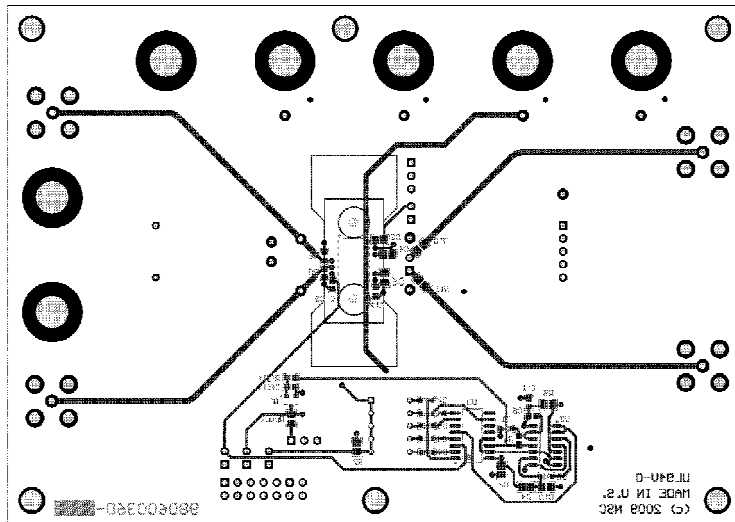| PIN	1	2	3	4	5
NAME	Vs	GND	OUT-	GND	OUT+

Schematic

4
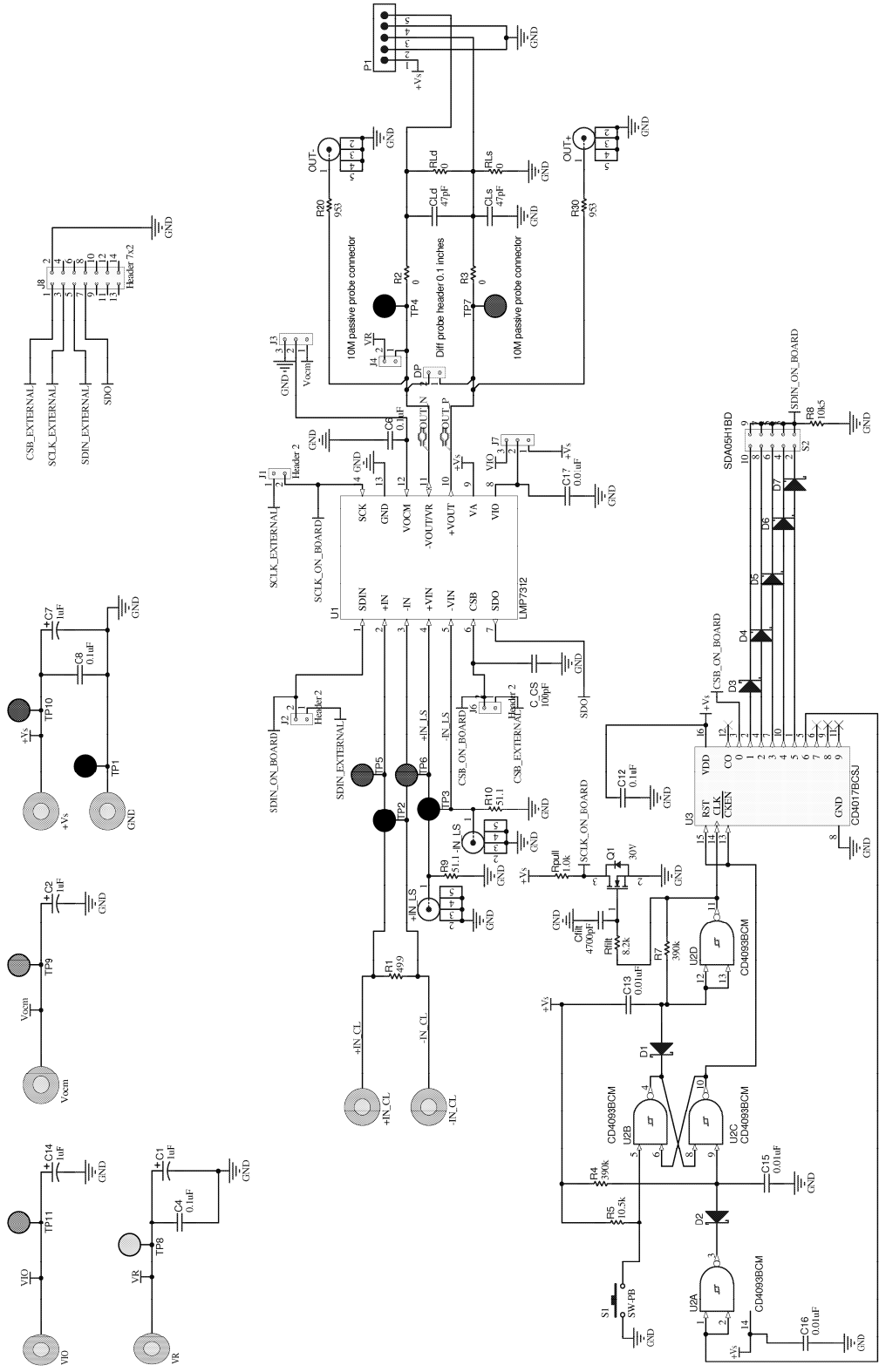
Board Layout

Top layer

Bottom layer

IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

Products		**Applications**	
Audio	www.ti.com/audio	Automotive and Transportation	www.ti.com/automotive
Amplifiers	amplifier.ti.com	Communications and Telecom	www.ti.com/communications
Data Converters	dataconverter.ti.com	Computers and Peripherals	www.ti.com/computers
DLP® Products	www.dlp.com	Consumer Electronics	www.ti.com/consumer-apps
DSP	dsp.ti.com	Energy and Lighting	www.ti.com/energy
Clocks and Timers	www.ti.com/clocks	Industrial	www.ti.com/industrial
Interface	interface.ti.com	Medical	www.ti.com/medical
Logic	logic.ti.com	Security	www.ti.com/security
Power Mgmt	power.ti.com	Space, Avionics and Defense	www.ti.com/space-avionics-defense
Microcontrollers	microcontroller.ti.com	Video and Imaging	www.ti.com/video
RFID	www.ti-rfid.com		
OMAP Mobile Processors	www.ti.com/omap		
Wireless Connectivity	www.ti.com/wirelessconnectivity		

TI E2E Community Home Page   e2e.ti.com