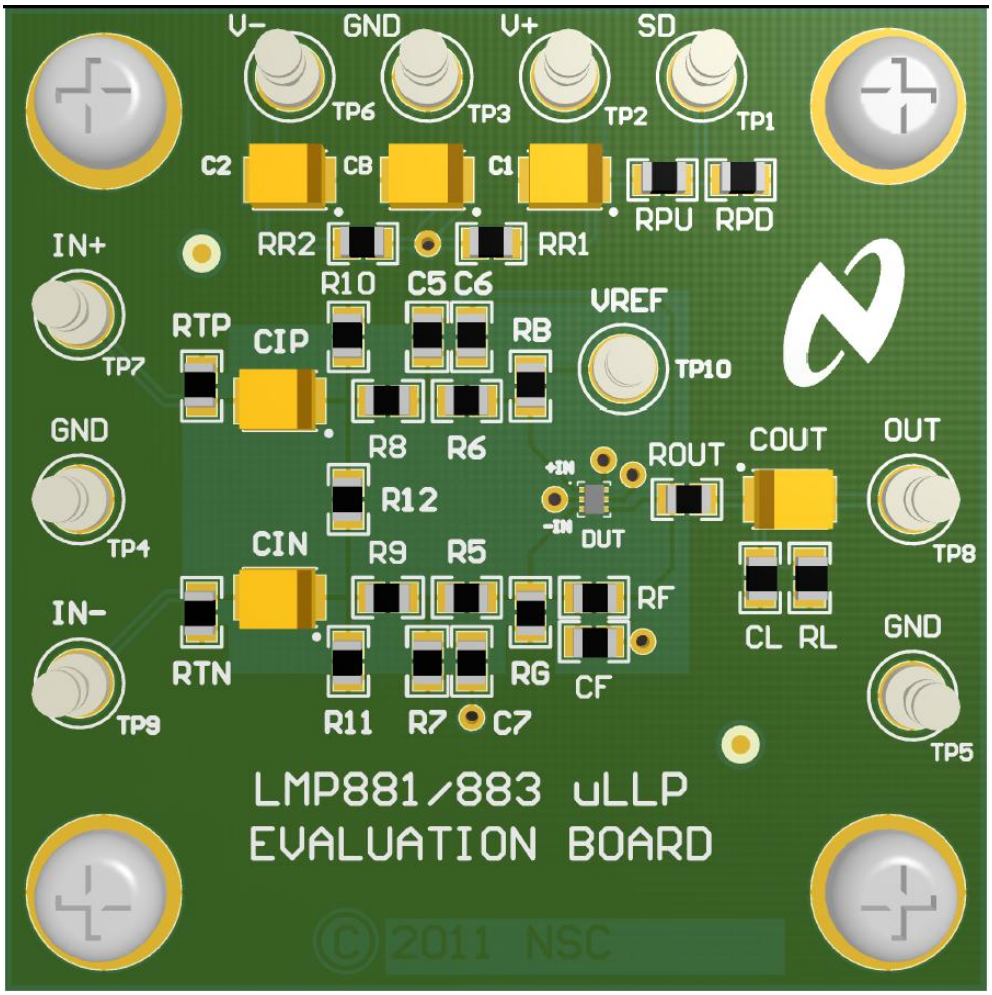
Dec 2, 2011
Rev - 0.0.2

LMV881 µLLP Evaluation Board Users' Guide



(Board shown with optional components installed)

Overview

The LMV881 Evaluation Board is designed to aid in the evaluation and testing of the LMV881 micro-LLP operational amplifier.

Many basic functions and filters can be implemented by placing the appropriate resistors or capacitors on the appropriate pads.

The circuits can be powered with single or dual supplies.

1. Hardware Setup

1.1. Component Notation

While the components are annotated with “R’s” or “C’s”, the mounting pads are the same size, so either R’s or C’s can be placed on the pads – depending on the circuit requirements.

The pads are large enough to accommodate 1206 though 0602 surface mount devices.

1.2. Power

Power is applied to the points labeled V−, GND, and V+.

If a single supply is used, then V− should be connected to GND. It is recommended to short C3 and C4 to tie ground to the V- line.

1.3. Supply Bypassing

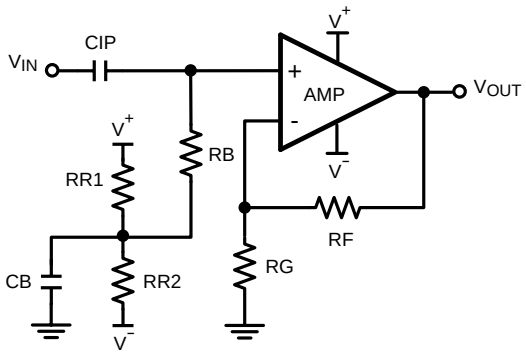
C1 and C2, and C3 and C4 (located rear of board), provide power supply bypassing.

Recommended values are 2.2uF to 33uF for C1 and C2, and 0.1uF for C3 and C4.

1.4. Reference Voltage and Single Supplies

The RR1 and RR2 resistor divider string can be used to generate V+/2 or any other required bias voltage from the V+ and V- supply lines.

CB is provided for filtering and /or AC grounding of the bias point.



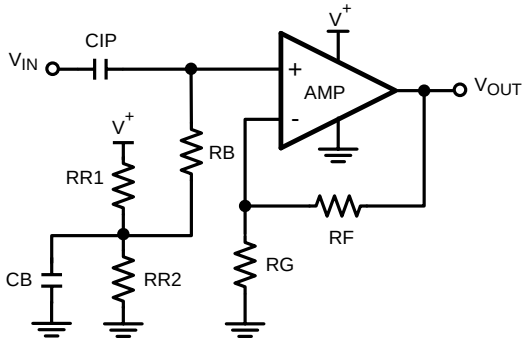
Short R8, R6

Figure 1. Split Supply Reference Divider

Single-supply operation requires the generation of this virtual ground, usually at a voltage equal to V+/2.

For single supply circuits where the positive input is grounded directly (as in the multiple feedback filter circuits in the next section), the RR1 and RR2 bias resistors can provide the reference voltage for this point.

For lowest noise on a directly “grounded” positive input, RB should be shorted.



Short R8, R6, C2, C4

Figure 2. Single Supply Reference Divider

For the circuit in Single Supply Reference DividerFigure 2, the AC input impedance is equal to RB.

1.5. Shutdown

The LMP881 has shutdown with output clamping feature. The output will be internally connected to V- during shutdown.

The LMV881 will be in shutdown mode when the SD pin is below 0.68V. RPU and RPD are optional and provide for adding pull-up, pull-down or voltage divider resistors.

The shutdown input does not have internal pullup resistors and should not be left floating.

RPU can be used to pull-up the shutdown pin to V+. If shutdown is not required, place a short across RPU.

RPD can be used as a pull-down or line termination resistor for the shutdown pin.

RPU and RPD can be used together to create a voltage divider to create a precise shutdown voltage if needed.

2. Basic Circuit Configurations

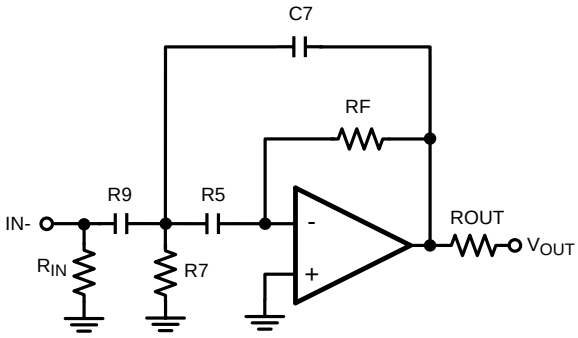
The following section shows how to configure the board for various basic amplifer configurations. Specific details of the circuit topology are available elsewhere and not covered here.

Circuits will depict the split supply application for simplicity.

Circuits can also be used in single-supply applications by adding the reference voltage dividers or an external reference voltage. See the Reference Voltage section for more biasing details.

To reduce clutter, the schematics only show the parts used in the circuit. The text below the schematic will specify which component pads should be shorted. All other components not listed should have their pads left open.

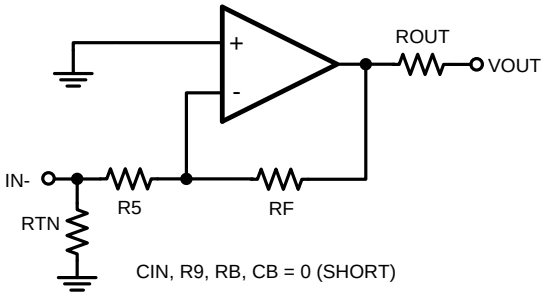
2.1. Non-Inverting Amplifer



CIN, RB, CB = 0 (SHORT)

Figure 3. Non-Inverting Amplifer

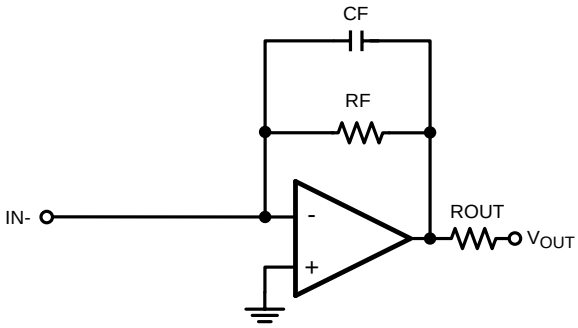
2.2. Inverting Amplifer



CIN, R9, RB, CB = 0 (SHORT)

Figure 4. Inverting Amplifer

2.3. Transimpedance (I to V) Amplifer

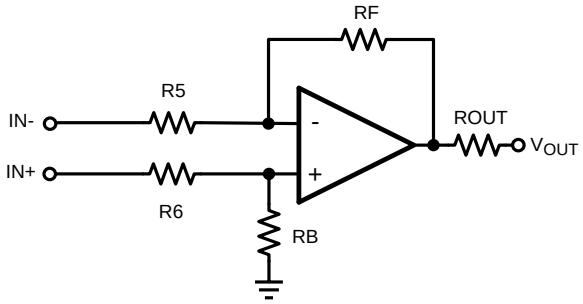


CIN, R9, R5, RB, CB = 0 (SHORT)

Figure 5. Transimpedance Amplifer

CF is generally required for stability in transimpedance applications. See application note AN-1803 for more details.

2.4. Single Stage Differential Amplifer



CIN, CIP, R8, R9, CB = 0 (SHORT)

Figure 6. Differential to Single Ended Converter

R12 can be used as a differential termination across the input terminals, if required.

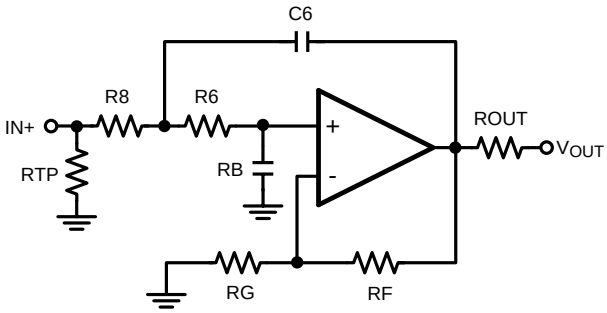
3. Active Filter Configurations

Both Multiple Feedback and Sallen-Key filters of up to 2 poles can be built on this evaluation board.

For assistance designing a filter, see the WEBENCH® tool at http://www.national.com/filters or the TI FilterPro software from http://www.ti.com/tool/filterpro.

Note that the ground plane has been removed under the input circuitry area to reduce the de-tuning effects of stray capacitance. This should be considered in your final design.

3.1. Sallen-Key Low-Pass Filter



CB, CIP = 0 (SHORT)

Figure 7. Sallen-Key Low Pass Filter

3.2. Multiple Feedback Low Pass Filter

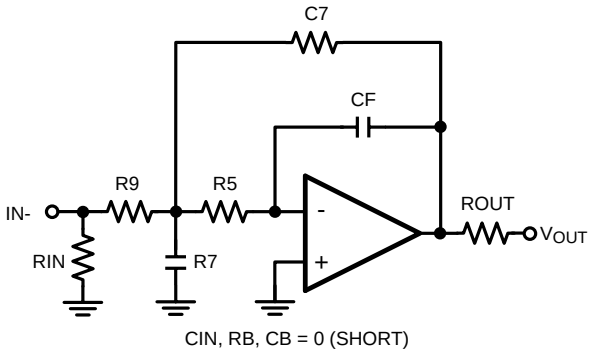


Figure 8. Multiple Feedback Low Pass Filter

3.3. Sallen Key High-Pass Filter

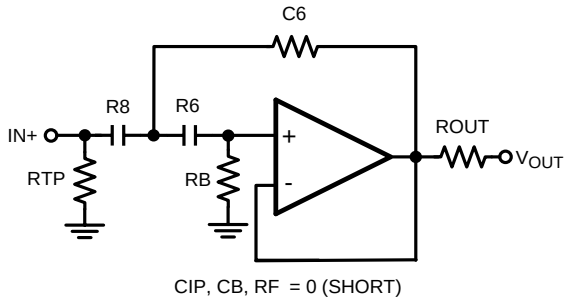


Figure 9. Sallen-Key High-Pass Filter

3.4. Multiple Feedback High Pass Filter

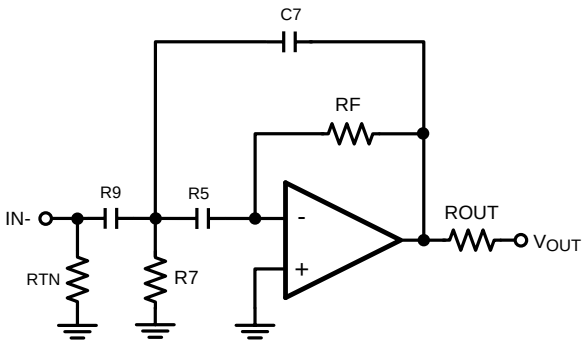


Figure 10. Multiple Feedback High Pass Filter

3.5. Sallen-Key Band Pass Filter

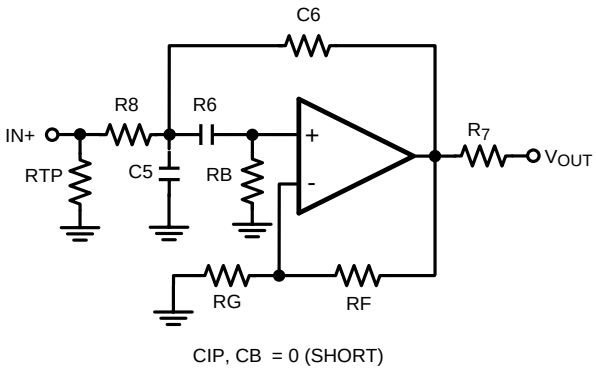


Figure 11. Sallen-Key Band Pass Filter

3.6. Multiple Feedback Band-Pass Filter

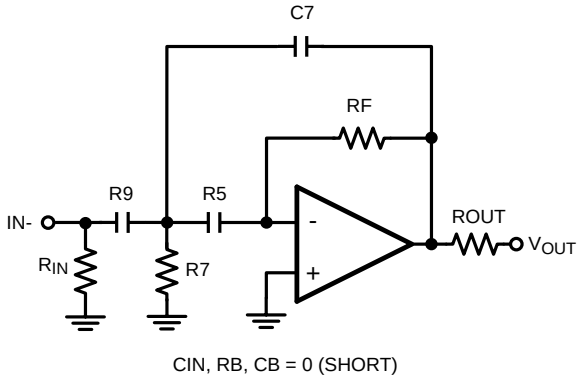


Figure 12. Multiple Feedback Band Pass Filter

4. LMV881 Evaluation Board Schematic

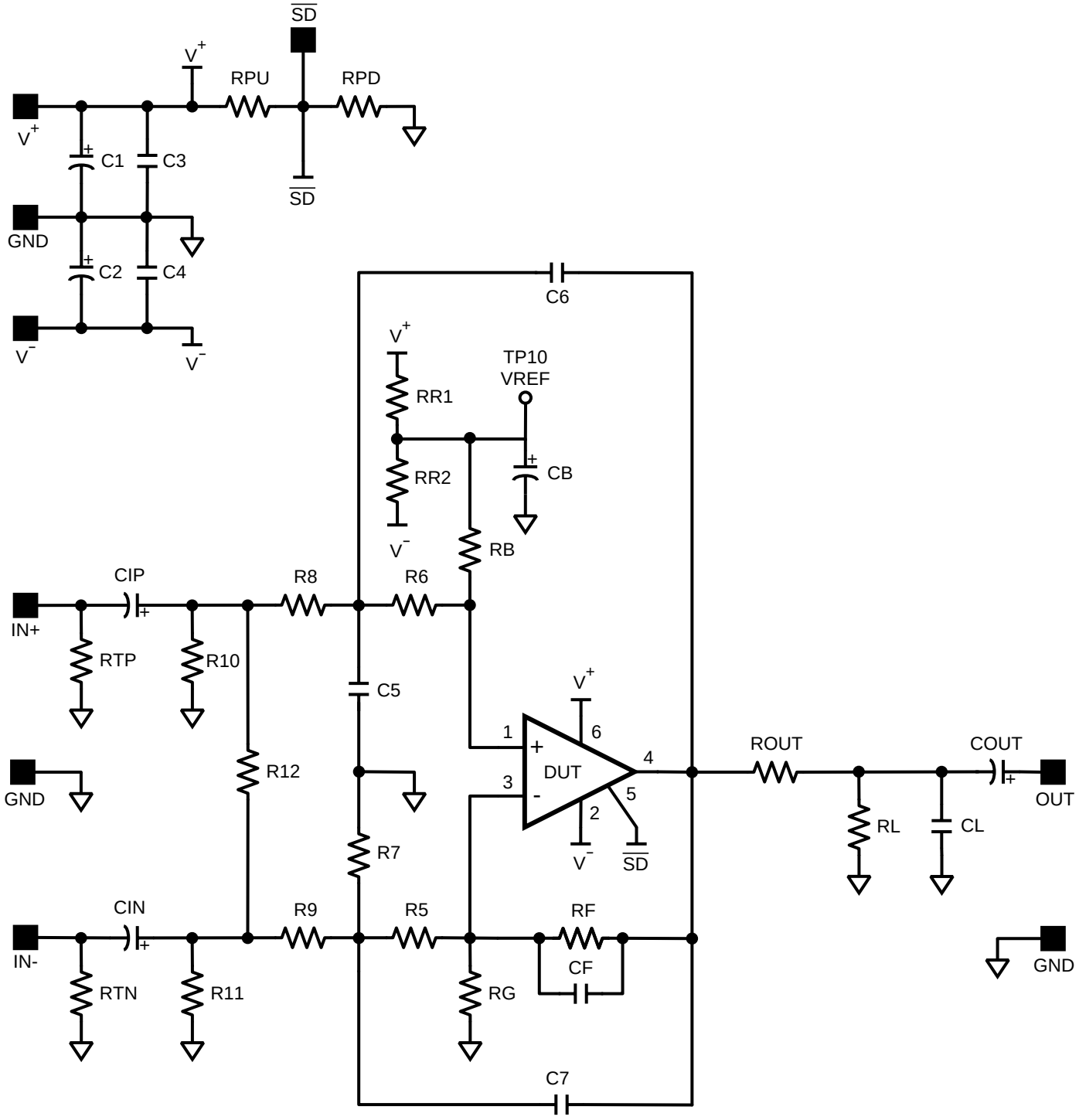


Figure 13. Demo Board Schematic

5. Bill of Materials

Designator	Description	Manufacturer	PartNumber
C5, C6, CF, CL, R5, R6, R7, R8, R9, R10, R11, R12, RB, RF, RG, RL, ROUT, RPD, RPU, RR1, RR2, RTN, RTP, CB, CIN, CIP, COUT	Customer Defined Components		
C1, C2	CAP, TANT, 33uF, 10V, +/-10%, 3528-21 SMD	Vishay-Sprague	293D336X9010B2TE3
C3, C4	CAP, CERM, 0.1uF, 16V, +/-10%, X7R, 0603	MuRata	GRM188R71C104KA01D
DUT	LMV881 23MHz OpAmp with Shutdown	National Semiconductor	LMV881LE
H1, H2, H5, H6	Standoff, Hex, 0.5"L #4-40 Nylon	Keystone	1902C
H3, H4, H7, H8	Machine Screw, Round, #4-40 x 1/4, Nylon, Philips panhead	B&F Fastener Supply	NY PMS 440 0025 PH
TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10	Terminal, Turret, TH, Double	Keystone	1502-2

'* = Optional – not stuffed – customer provided

6. Notes

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