Signal Chain Power Passive Filter Board

DESCRIPTION

Demonstration circuit SCP-FILTER-EVALZ is a companion hardware tool designed to allow passive RCL filter networks in a Signal Chain Power hardware evaluation matrix. It accommodates an Nth-order filter network as well as specialty 3-terminal feedthrough filters.

Like all boards in the Signal Chain Power series, this board is designed to be easily plugged into other SCP boards to form a complete signal chain power system, enabling fast evaluation of low power signal chains. To evaluate this board, some universal SCP hardware is required, namely:

SCP-INPUT-EVALZ
SCP-OUTPUT-EVALZ
SCP-1X5BKOUT-EVALZ
SCP-THRUBRD-EVALZ
SCP-1X2BKOUT-EVALZ
SCP-5X1-EVALZ

To properly evaluate SCP series demo boards, you will need the SCP Configurator companion software. SCP Configurator can help you choose the right board and topology for your design.

Design files for this circuit board are available.

Table 1. Performance Summary

SYMBOL	PARAMETER	NOTES	MIN	TYP	MAX	UNITS
$V_{IN(MAX)}$	Max Input Voltage				50	V
$V_{OUT(MAX)}$	Max Output Voltage				50	V
$I_{OUT(MAX)}$	Max Output Current				2	A

BOARD IMAGE

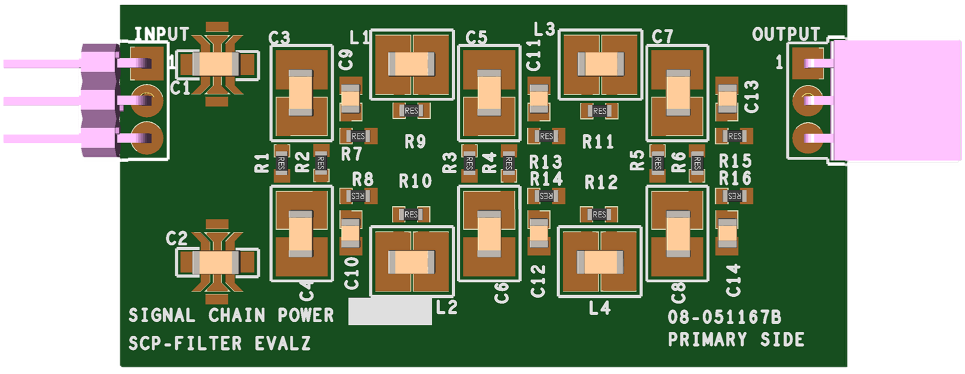


Figure 1. Signal Chain Power Passive Filter Board

QUICK START PROCEDURE

Demonstration circuit SCP-FILTER-EVALZ is easy to set up to evaluate the performance of any SCP hardware configuration.

1. The SCP-FILTER-EVALZ ships with a bi-directional LED to indicate applied voltage. To set the limiting resistor, see "Configuration Settings" section, and modify the board accordingly. Be sure to check for open connections or solder shorts after making any modifications.
2. Connect the SCP-INPUT-EVALZ and SCP-OUTPUT-EVALZ boards to the SCP board under evaluation (refer to Figure 2) and connect the input board to a voltage source, V_{SOURCE}. Connect the output board to a voltmeter or dynamic load. Slowly raise the input voltage until the SCP-FILTER-EVALZ powers up the device under test into regulation and sweep V_{SOURCE} through the desired range of operation.

   NOTE: Make sure that the input voltage is always within spec. If using a dynamic load to measure output voltage, make sure the load is initially set to zero.
3. Check for proper output voltage. The output should be regulated at the programmed value (±5%).
4. Once the proper output voltage is established, power off V_{SOURCE} and similarly test other boards in the SCP system until all elements have been individually verified prior to assembling into the final circuit configuration.

   NOTE: When measuring the input or output voltage ripple, use the optional SMA connector locations available on the input, output, 1 × 5, 1 × 2, and 5 × 1 breakout boards. Avoid using the test point connections with long scope leads.

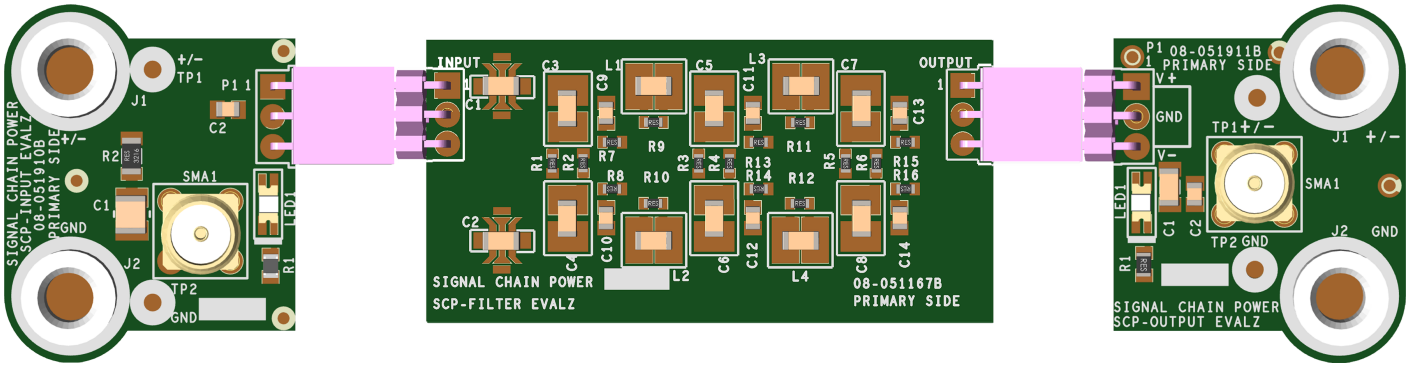


Figure 2. Proper Measurement Equipment Setup (Use SMA connectors for Measuring Input or Output Ripple)

CONFIGURATION SETTINGS

Demonstration circuit SCP-FILTER-EVALZ is a companion hardware tool designed to allow passive RCL filter networks in a Signal Chain Power hardware evaluation matrix. It accommodates an Nth-order filter network as well as specialty 3-terminal feedthrough filters.

FILTER CONFIGURATION

The filter board can be configured with standard L-C-R components to create multiple-ordered passive filter networks for those applications which might require selective notch filtering or cascaded low-pass networks.

Additionally, the filter boards feature a placement location for a highly effective 3-terminal feedthrough filter (TDK YFF series) on both positive and negative rails. This can be used alone or with additional ferrite beads placed across the series component locations.

If de-Q'ing is required to eliminate sharp resonances associated with ceramic capacitors and ferrite-based inductors, capacitors have series resistance elements and inductors have parallel resistance element options.

FREQUENCY RESPONSE

The filter board PCB layout was designed to have as maximally flat frequency response as possible to test the actual effects of the chosen filter components.

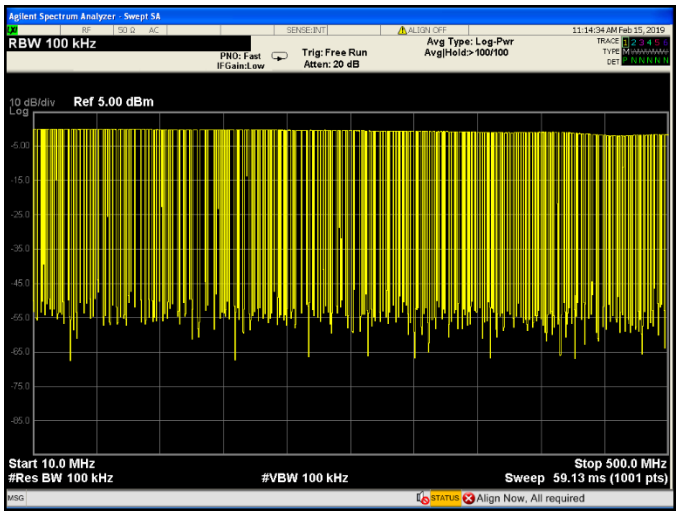


Figure 3. Swept spectrum power plot of filter board; series components shorted across; RBW: 100kHz; VBW: 100kHz

3-TERMINAL FEEDTHROUGH FILTER CONFIGURATION

Locations C1 and C2 support the TDK YFF series family of 3-terminal feedthrough capacitors. Refer to Figure 4 to utilize these locations for excellent RF noise suppression.

Table 2. TDK YFF Family (xx: size codes, see Table 3)

TDK PART #	FUNCTION
YFFxxPC	Feedthrough filter for power line
YFFxxPH	Feedthrough filter for power line
YFFxxPW	Feedthrough filter for power line
YFFxxHC	Feedthrough filter for high current line
YFFxxSC	Feedthrough filter for signal line

Table 3. TDK YFF Size Codes (xx from Table 2)

SIZE CODE	SIZE
15	1005 [0402 inch]
18	1608 [0603 inch]
21	2012 [0805 inch]
31	3216 [1206 inch]

To make shorting across the center ground pad easier when the component is not stuffed, the pad is intentionally isolated. When stuffing these filter components, make sure to bridge the pad to ground on both sides as shown in Figure 4.

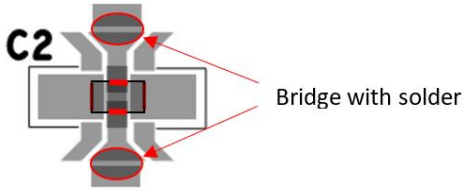


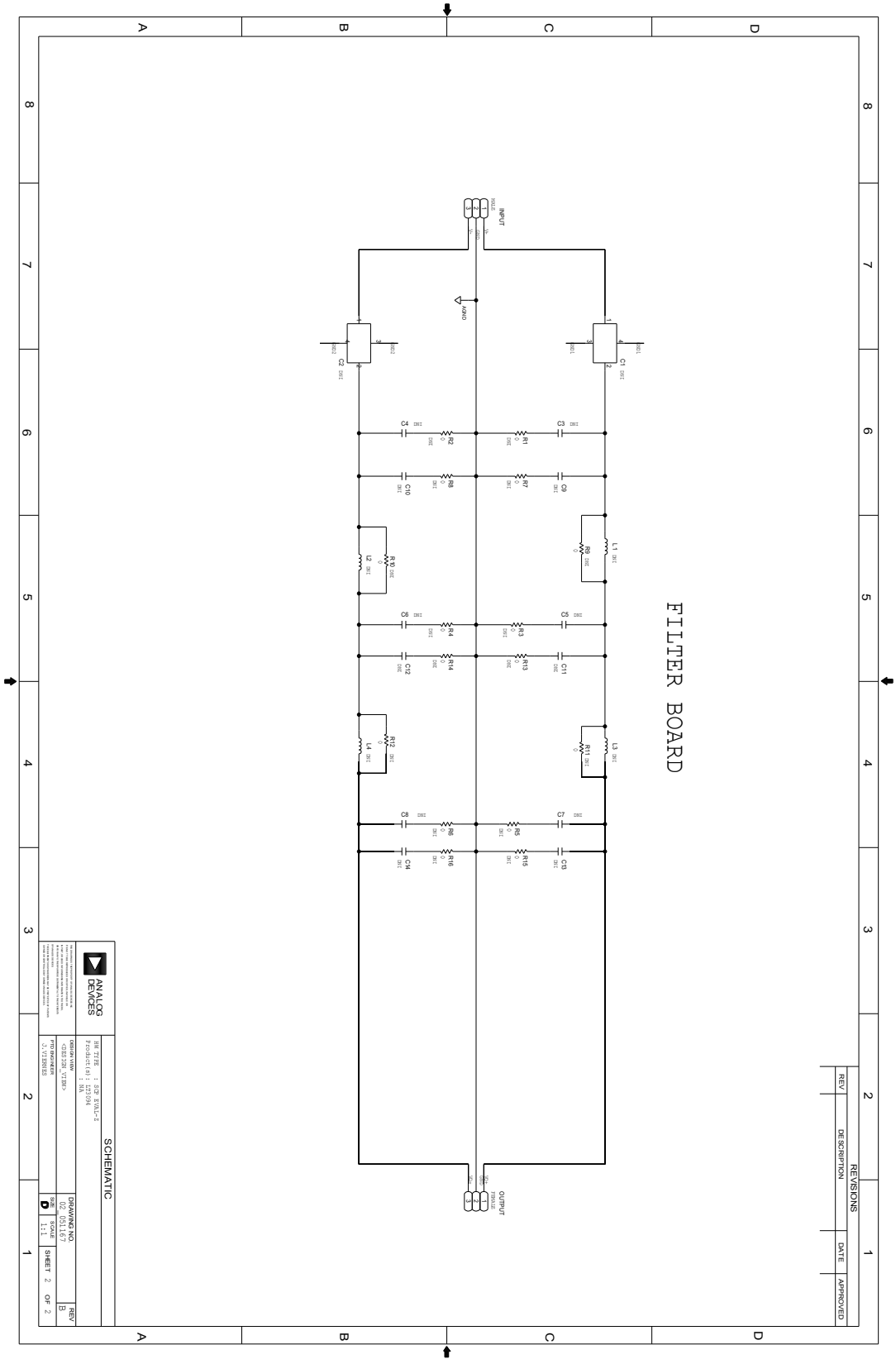
Figure 4. Connection for YFF center ground pad

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
1	1	PCB	PCB	ANALOG DEVICES 08_051167b
2	6	C9, C10, C11, C12, C13, C14	CAP MLCC 0805 (Note 1)	N/A
3	1	INPUT	CONN MALE 3POS 2.54MM PITCH R/A	SULLINS PBC03SBAN
4	1	OUTPUT	CONN FEMALE 3POS 2.54MM PITCH R/A	SULLINS PPPC031LGBN-RC
5	16	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R12, R13, R14, R15, R16	RES THICK FILM 0603 (Note 1)	N/A

Note 1. These items are not stuffed (DNI).

SCHEMATIC DIAGRAM



ESD Caution
ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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