NCS5651MNSGEVB

NCS5651MNSG Evaluation Board User's Manual

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EVAL BOARD USER'S MANUAL

Introduction

The NCS5651MNSGEVB is an evaluation board for the NCS5651 operational amplifier.

The NCS5651 is a high efficiency, class B, low distortion power line driver. It incorporates two operational amplifiers (opamps). The output opamp is designed to drive up to 2 A peak. At an output current of 1.5 A, the output voltage is guaranteed to swing within 1 V or less of either rail, giving the user improved SNR. In addition to the output amplifier, a small-signal opamp is provided which can be configured as a unity gain follower buffer or can provide a stage of a 4-pole low pass filter.

Although the NCS5651 is designed for power line communication (PLC) applications, it is equally suitable to drive actuators or motors, or for any application where a robust power amplifier is required.

For more information refer to [1, 2, 3].

Description

The evaluation boards are small (26×23.5 mm^2) printed circuit boards (Figure 1) carrying the NCS5651 line driver. The schematic is appended at the end of this document.

An NCP4640H033 linear regulator is provided to derive the 3.3 V V_{uc} voltage. The latter determines the output voltage of the warning output pins of the line driver. These three pins (viz. the thermal warning flag, the thermal shutdown flag, and the current limitation flag) are connected to LEDs.

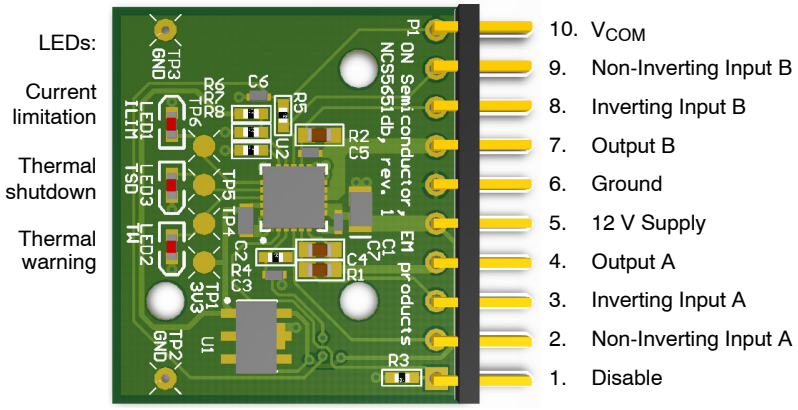

Figure 1. NCS5651MNSGEVB Outline

A 2.54 mm-pitch header with ten pins brings the most important signals outside.

Besides the ground and 12 V supply pin, these include the line driver disable and 6 V V_{com} bias voltage generated by the line driver. Both signals can be left open if unused.

All pins of the two operational amplifiers are available on the header. As a result, any opamp topology can be realized by fitting the appropriate external feedback and biasing network.

To ensure stability, 10 pF ceramic capacitors are fitted on the board between the inverting input and the output of each opamp. This must be taken into account if an external capacitance is added, as is the case with a multi-feedback (MFB) topology.

For convenience, a 3 kΩ resistor is also fitted between the non-inverting input and V_{com}. If this biasing is not required, for instance to realize a Sallen and Key filter topology, the resistor should be removed.

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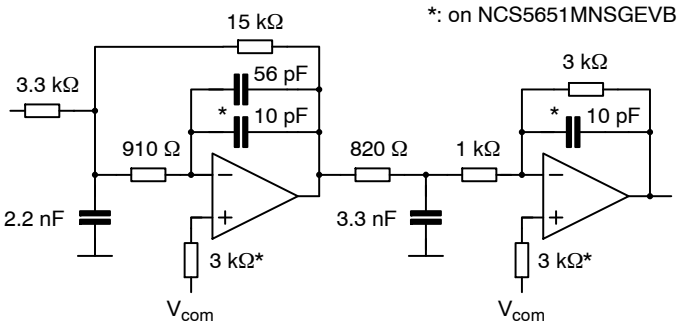

Figure 2. Recommended Transmission Filter for PLC with PL110 Carrier Frequencies

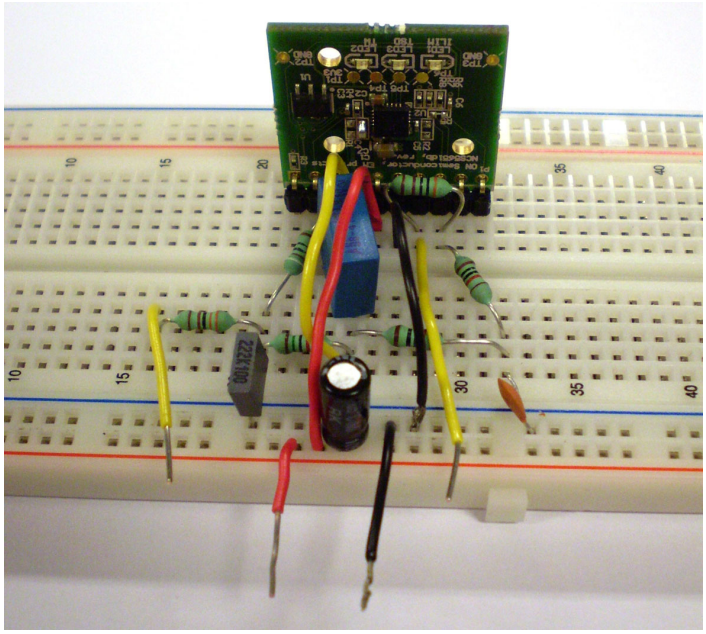

Figure 3. The Schematic of Figure 2 Built on Breadboard with an NCS5651MNSGEVB

Application Ideas

The size and header of the evaluation board make it perfectly suited for breadboarding. For instance, Figure 2 shows the recommended transmission filter for PLC S−FSK* with the PL110 carrier frequencies (105 and 115 kHz). This schematic is easily realized on breadboard (Figure 3).

Some applications require a lower copper-to-ambient thermal resistance (R_{CuA}) to improve line driver cooling. The board design makes it possible to fit a heat sink on the bottom side: solder mask openings and mounting holes are foreseen.

The heat sink can be mounted with thermally conducting adhesive tape (Figure 4). For more information on cooling, refer to [1, 4].

Fischer Elektronik ICK SMD B 19 SA is recommended. It may be obtained through Farnell (ref. 4302266) or Newark (ref. 34M6437).

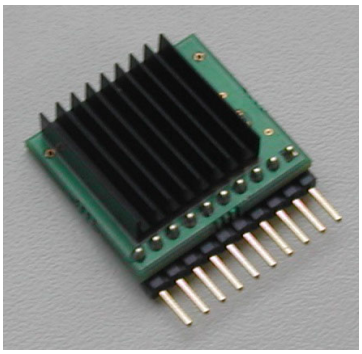

Figure 4. Adding a Heat Sink to Improve Cooling

*Spread-frequency shift keying (S−FSK) is a modulation scheme widely used in power line communication (PLC). It combines simplicity (and thus allows a low cost implementation) with good resilience.

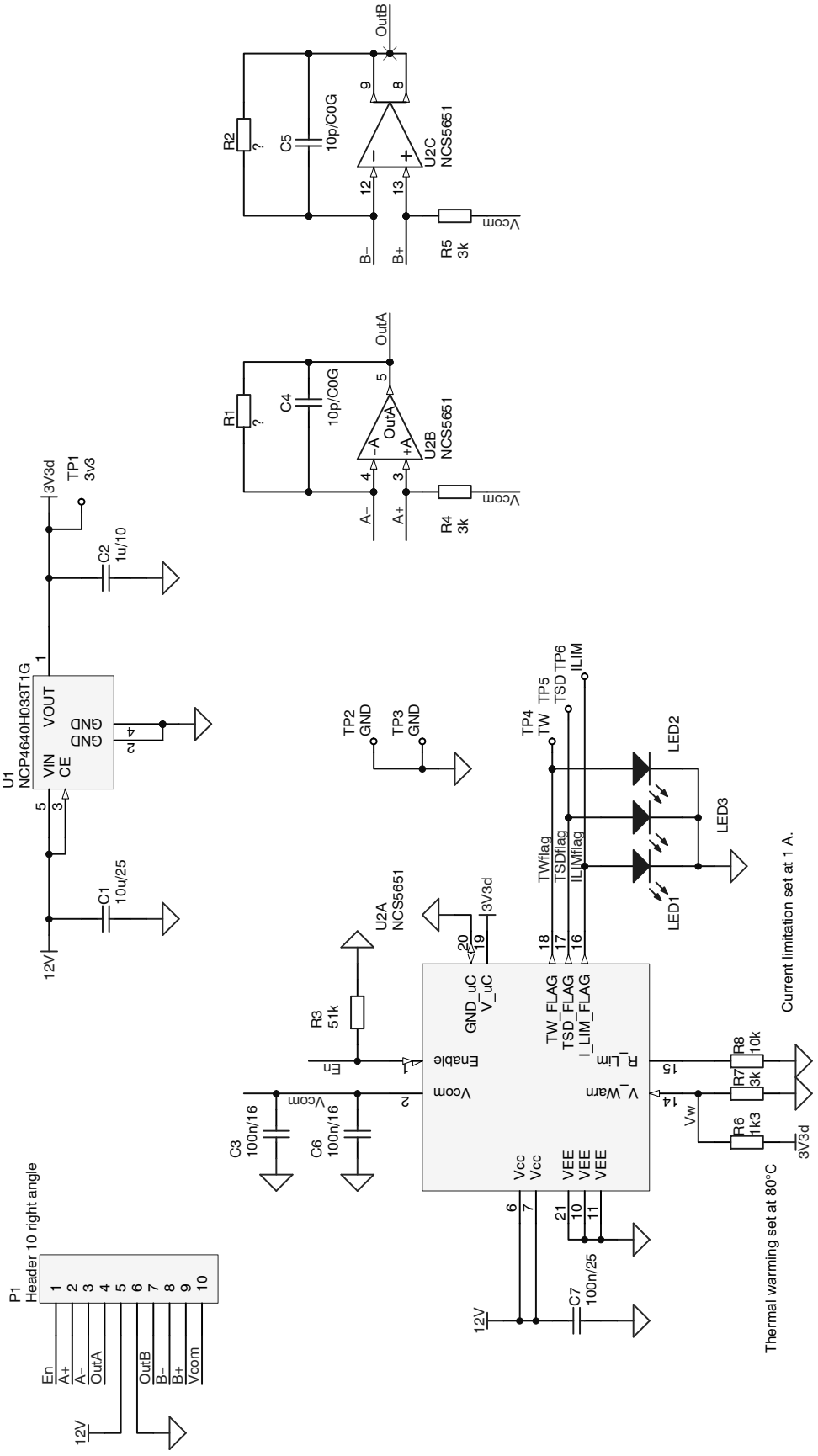

Figure 5. NCS5651MNSGEVB Schematic

References

[1] ON Semiconductor. Evaluation kit for power-line communication user manual, December 2014.

[2] ON Semiconductor. Getting started with power line communication (application note AND9165/D), June 2014. Online at www.onsemi.com/pub_link/Collateral/AND9165−D.PDF.

[3] ON Semiconductor. NCS5651 2 Amp PLC line driver datasheet, December 2014. Online at www.onsemi.com/pub_link/Collateral/NCS5651−D.PDF.

[4] ON Semiconductor, Roger Stout. Thermal considerations for the NCS5651 (application note AND8402/D), August 2014. Online at www.onsemi.com/pub_link/Collateral/AND8402−D.PDF.

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