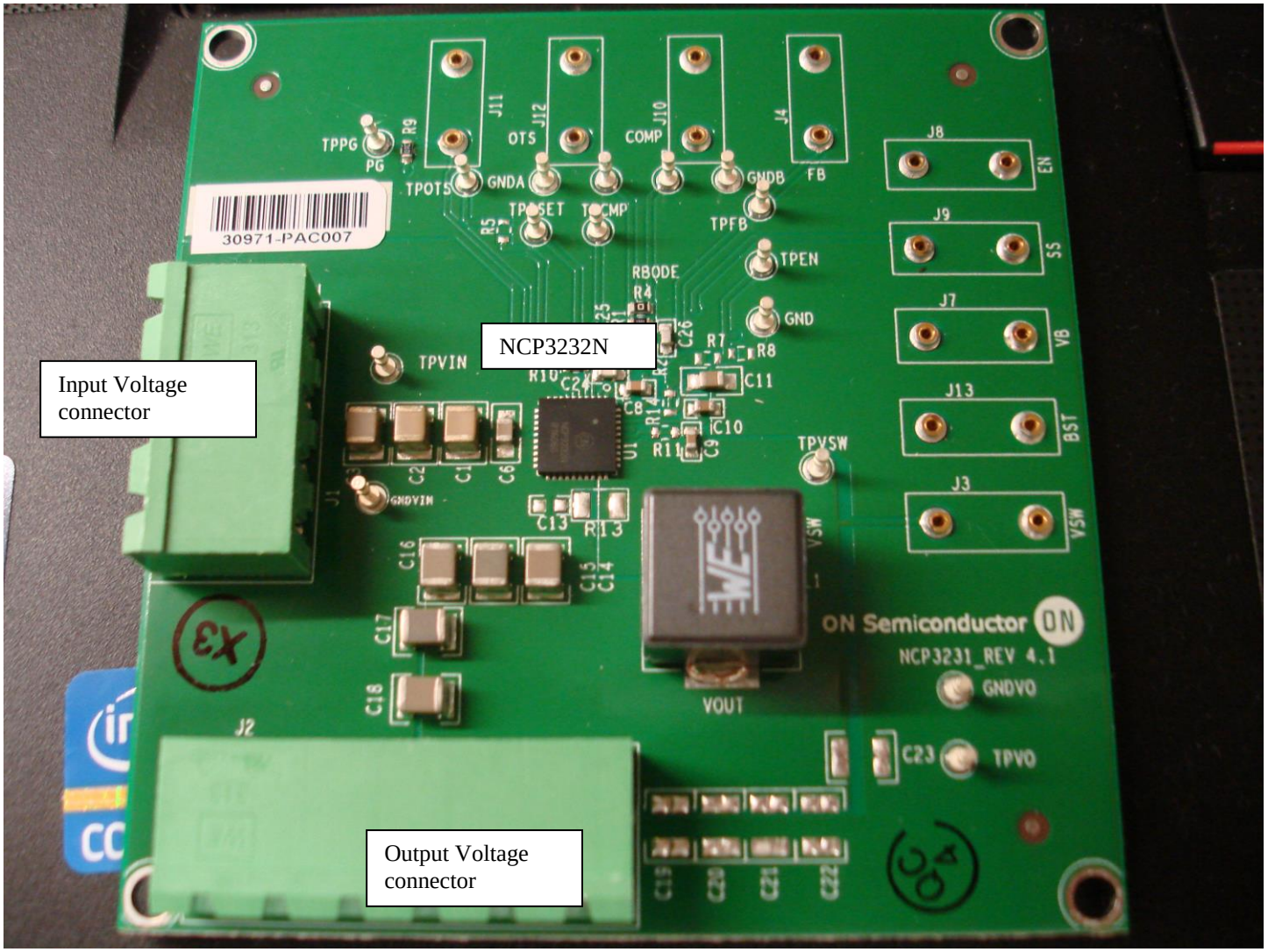
Test Procedure for the NCP3232NGEVB Evaluation Board

I. Description and scope – This document applies to the NCP3231 Rev. 4.1 Evaluation Board (EVB) PCB fab with an NCP3232N High Current Synchronous Buck Converter IC soldered into the QFN-40 footprint.

This document will assist the user in applying power and testing the assembly.

II. EVB Photo - Below is a photo of the standard NCP3231GEVB. The NCP3232NGEVB is simply a version of this board with a different value for R10 (current limit setting resistor) and a different IC (NCP3232N) installed.



The EVB has two large green receptacles – one (4-pin) for input voltage and one (6-pin) for output voltage. The mating connectors should have been shipped with the board. The mating connectors have screw terminal connections to allow single wires to be attached to the connector pins and then the connector can be plugged into the corresponding receptacle on the EVB. Because of the potentially high currents involved, we advise that the gauge of the individual wires be at least 20 AWG x 4 for the input voltage and 18 AWG x 6 for the output voltage.

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III Equipment Needed –

DC power supply, 25 V, 10 A capability
Oscilloscope, 2-channel, 20 MHz or greater bandwidth
Electronic load, ≥30 A @1 V input capability
Digital Multimeter, 4½ to 5½ digits

IV. Setup and Procedure – Using the mating connectors provided, connect a power supply capable of 25 V and 10 A to the input voltage connector (J1). **Set the input voltage to ~5 V and the current limit to 2 A or less.** Connect the mating connector for the output voltage (J2) to the EVB and the other end to an electronic load capable of sinking at least 30 A, which is greater than the typical current limit of the NCP3232NGEVB. Make sure that the load is turned OFF at this time.

After verifying the correct input and load connections and verifying the input voltage and current limit settings of the input supply, turn on power to the EVB. If no values were changed on the EVB prior to this, the output voltage should read 1 V ±10 mV on the DMM. Connect an oscilloscope probe to the TPVSW test point and verify that the switching frequency is 500 kHz ±5 kHz. At this time, you may also start raising the input supply voltage up to the maximum of 21 V to verify that the EVB will operate at that voltage.

To test the current limit of the EVB, set the electronic load to 15 A. Increase the current limit of the input supply to at least 5 A and set the input voltage to a value of 12 V. This is a good starting point for testing the current limit.

With the EVB operating with these conditions, turn on the load and verify that the EVB can source the typical maximum of 15 A. Slowly increase the load setting until current limit is reached and the EVB enters hiccup operation. This can be detected by observing the switch node waveform on the oscilloscope and noting when the waveform has long periods of no switching activity. The scope's time base may need to be slowed to ~ 1 ms/div. in order to observe this correctly. This behavior can also be detected by noting that the output voltage will be close to zero volts. Releasing the load will cause the EVB re-start and return to the regulated output voltage.

The typical current limit is approx. 20-25 A. This value is highly dependent on the low-side (LS) MOSFET ON resistance, so this will not necessarily be the same from board to board. The formula for selecting the value of RSET (R10) can be found on page 13 of the NCP3232N data sheet. According to this formula, the value of RSET is:

$$RSET = 2*i_{LS}*R_{DS(on)}/33x10^{-6},$$

where, iLS is the peak inductor current at the desired OCP threshold (or the valley current in the low-side (LS) MOSFET), $R_{DS(on)}$ is the LS MOSFET ON resistance from the specification table, and 33 uA is the typical ISET current. Using the default values on the EVB (R10 = 6.04 kΩ) and the typical values for $R_{DS(on)}$ of 2.9 mΩ and 33 uA for ISET, and solving for iLS, we get i_{LS} = 34 A pk. Subtracting one half of the inductor ripple of approx. 4 A p-p gives 32 A DC. The $R_{DS(on)}$ of the LS MOSFET has a maximum of 5.2 mΩ, and the ISET has a ±9% tolerance. Using the minimum value of ISET (30.5 uA) and the maximum value of $R_{DS(on)}$ gives approx. 18 A pk for the same calculation. This is the minimum OCP threshold with the default value of 6.04 kΩ.

After verifying that the OCP threshold is functional and of the minimum value noted above, you may power off the input supply and remove the board from the input and output connectors.

This ends the test procedure for the NCP3232NGEVB.