Test Procedure for the NCV47821 Evaluation Board

The NCV47821 is dual channel adjustable Low Dropout Regulator with:

- Two adjustable output voltages from 3.3 V to 20 V
- Two adjustable current limits up to 300 mA
- Enable inputs with 3.3 V Logic compatible thresholds
- Diagnostic Features:
  - Short To Battery (STB) and Open Load (OL) in OFF State
  - Internal Components for OFF State Diagnostics
  - Open Collector Flag Output

For detailed information read the technical specification.

Power supplying of the chip is possible from one or two independent sources. **INPUT1** must be always supplied and **INPUT2** as optional for $\mathbf{V_{in2}}$ supply.

Basic procedure of function verification, Diagnostic Functions inactive

1. **Power supplying**
   a. **Power supplying from one source**
   Connect the test setup as is shown in **Figure 1** (See **Table 1** with required equipment). Connect power supply to **INPUT1** connector $\mathbf{J_1}$ (Power supplying of **INPUT2** is not needed).
   - **Hi_F –** Positive Force line
   - **Hi_S –** Positive Sense line
   - **Lo_F** – Negative Force line
   - **Lo_S** – Negative Sense line

   Connect $\mathbf{V_{in2}}$ pin to **INPUT1** via appropriate position of jumper "**$\mathbf{V_{in2}}$ to IN1 or IN2 connection**".

   b. **Power supplying from two sources**
   Connect the test setup as is shown in **Figure 1** (See **Table 1** with required equipment). Connect two power supplies to **INPUT1** connector $\mathbf{J_1}$ and to **INPUT2** connector $\mathbf{J_2}$, respectively.
   - **Hi_F –** Positive Force line
   - **Hi_S –** Positive Sense line
   - **Lo_F** – Negative Force line
   - **Lo_S** – Negative Sense line

   Values of input voltages $\mathbf{V_{in1}}$ and $\mathbf{V_{in2}}$ can be different. This option is suitable for reducing of power dissipation on chip.
   Connect $\mathbf{V_{in2}}$ pin to **INPUT2** via appropriate position of jumper "**$\mathbf{V_{in2}}$ to IN1 or IN2 connection**".

2. **Current Limit settings**
   Connect jumpers $\mathbf{J_{10} – J_{13}}$ for output current limitation from $\mathbf{V_{out1}}$ pin and $\mathbf{J_{20} – J_{23}}$ for output current limitation from $\mathbf{V_{out2}}$ pin.
   - $\mathbf{J_{n0}} – I_{LIMn0} \sim 17$ mA
   - $\mathbf{J_{n1}} – I_{LIMn1} \sim 170$ mA
   - $\mathbf{J_{n2}} – I_{LIMn2} \sim 280$ mA
   - $\mathbf{J_{n3}} – I_{LIMn3} – R_{CSOn3}$ positions available for individual current limit setting by resistor from range 850 Ω to 25.5 kΩ

3. **Diagnostic Function (inactive)**
   Connect **DE** and **CS** inputs to GND via appropriate jumper to disable diagnostic function.

4. **Power ON**
   Set Input Voltage and turn on Power Supply/Supplies.
   Enable output of the channel to power the regulated output voltage by connecting the **ENABLE** input to corresponding $\mathbf{V_{in}}$ via jumper. Enabling can be performed by external voltage source as well.

5. Load the outputs by resistive loads connected via jumpers:
   - $\mathbf{J_5}$, $\mathbf{J_7}$ – 22 Ω (I_{out} ~ 225 mA)
   - $\mathbf{J_6}$, $\mathbf{J_8}$ – 330 Ω (I_{out} ~ 15 mA)

   External loads can be used instead build-in resistive loads as well.

6. Monitor Output Voltages, given according to Equation 1.

$$V_{out\_nom\_n} = 1.275 \left(1 + \frac{R_{n1}}{R_{n2}}\right) \qquad \text{(eq. 1)}$$

7. Monitor Current Sense Output voltages on appropriate connector. They should be max 2.55 V in steady state. The CSO voltages are proportional to output currents according to Equation 2.

$$V_{CSO\_n} = I_{out\_n} \left(R_{CSO\_n} \times \frac{1}{100}\right) \qquad \text{(eq. 2)}$$

8. Compare your results with measured results in **Table 2.**

Table 2: Measured Results

Parameter	Test Conditions	Symbol	Value		Unit
			Nominal	Measured	
Output Voltage	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, I_{out_n} = 5 mA, R_{CSO_n} = Short to ground	V_{out1}	5.02	4.98	V
		V_{out2}		4.98	
	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, I_{out_n} = 200 mA, R_{CSO_n} = Short to ground	V_{out1}		4.99	
		V_{out2}		4.99	
Output Current	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 90 % of $V_{out\_nom\_n}$, R_{CSO_n} = 15 kΩ	I_{out1}	17	16.7	mA
		I_{out2}		16.8	
	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 90 % of $V_{out\_nom\_n}$, R_{CSO_n} = 1.5 kΩ	I_{out1}	170	169	
		I_{out2}		170	
	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 90 % of $V_{out\_nom\_n}$, R_{CSO_n} = 910 Ω	I_{out1}	280	281	
		I_{out2}		281	
Output Current	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 0 V, R_{CSO_n} = 15 kΩ	I_{out1}	17	17.3	mA
		I_{out2}		17.4	
	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 0 V, R_{CSO_n} = 1.5 kΩ	I_{out1}	170	174	
		I_{out2}		174	
	V_{in} = 13.5 V, $V_{out\_nom\_n}$ = 5.02 V, V_{out_n} = 0 V, R_{CSO_n} = 910 Ω	I_{out1}	280	289	
		I_{out2}		290	

9. **Power OFF**
   Disable output of the channel by connecting the **ENABLE** input to **GND** via jumper. Or Turn OFF external voltage source.

Diagnostic Functions verification

1. **Diagnostic Function (active)**
   Perform steps from 1 to 4 of Basic procedure of function verification and keep both channels disabled.

   Short to battery detection (in OFF State)

   Set **DE** input to **5 V** via appropriate jumper.
   Set **CS** input to **GND.** If **EF** is **LOW**, Short to Battery on **CH1** event occurred.
   Set **CS** input to **5 V.** If **EF** is **LOW**, Short to Battery on **CH2** event occurred.

   Open Load detection (in OFF State)

   Set **DE** input to **5 V** via appropriate jumper.
   Enable detection by connecting the **ENABLE** input to corresponding $\mathbf{V_{in}}$ via jumper. Enabling can be performed by external voltage source as well.
   Set **CS** input to **GND.** If **EF** is **LOW**, Open Load on **CH1** event occurred.
   Set **CS** input to **5 V.** If **EF** is **LOW**, Open Load on **CH2** event occurred.
   Combine selection $\mathbf{R_{CSO1,2}}$ and Resistive Loads. You can use external load as well.

   Overcurrent detection

   Set **DE** input to **GND** via appropriate jumper.
   Enable output of the channel to power the regulated output voltage by connecting the **ENABLE** input to corresponding $\mathbf{V_{in}}$ via jumper. Enabling can be performed by external voltage source as well.
   Set **CS** input to **GND.** If **EF** is **LOW**, Overcurrent on **CH1** occurred and $\mathbf{CSO_1}$ output is **HIGH**.
   Set **CS** input to **5 V.** If **EF** is **LOW**, Overcurrent on **CH2** occurred and $\mathbf{CSO_2}$ output is **HIGH**.
   Combine selection $\mathbf{R_{CSO1,2}}$ and Resistive Loads. You can use external load as well.

   For supplying **DE** and **CS** inputs is used an 5 V LDO regulator $\mathbf{U_2}$ powered from **INPUT1**.

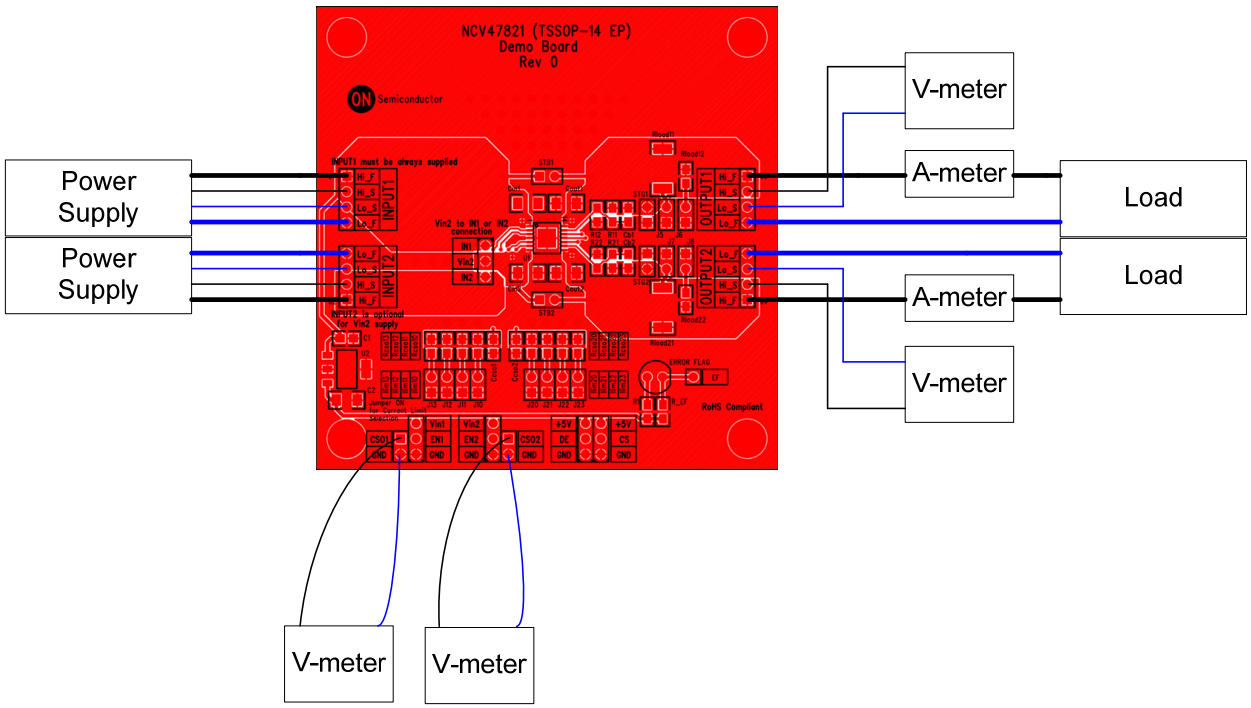

Figure 1. General Test Setup

Table 1: Required Equipment

Equipment	Ranges
Power Supply	0 V – 45 V / 2 A
Load	0 mA – 1 A
V - meter	0 V – 45 V
A - meter	0 mA – 1 A

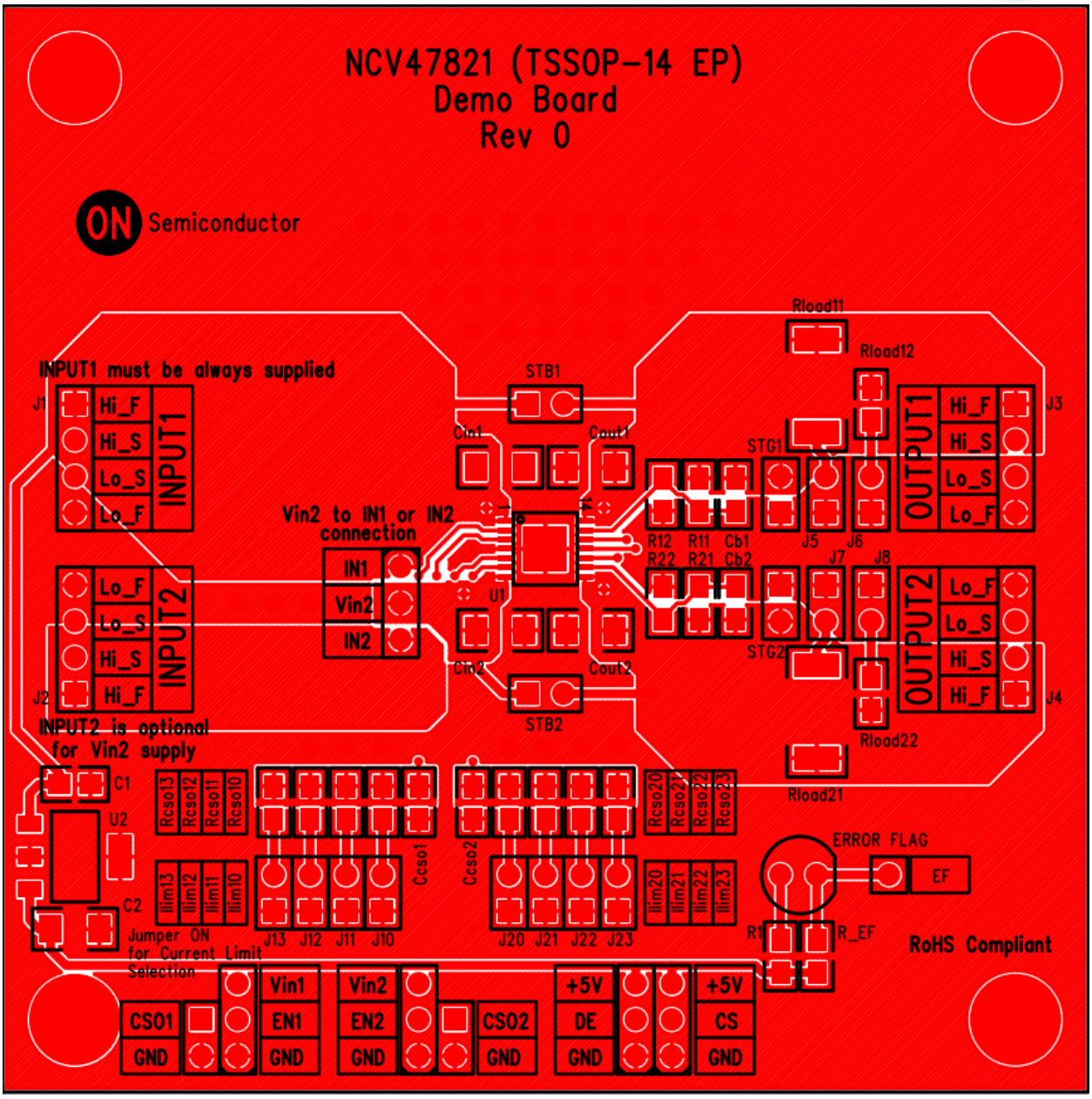

Figure 2. Top side PCB Layout (3 x 3 inch)