User Guide
NH2D0245 Evaluation Board

Abstract:

This document presents the NH2D0245 Evaluation Board. It shows in detail the required components and set-up to evaluate the performance of NH2D0245 IC.

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1. Evaluation Board Overview

Figure 1 shows the Evaluation Board of NH2D0245. This board is designed to evaluate and test the NH2D0245 PMIC performance and features. To evaluate the PMIC performance and features, an energy harvester, a battery, and multimeters are necessary. When using an energy harvester with an AC output, such as piezoelectric harvesters, AC to DC rectification is necessary before connecting it to the evaluation board.

Figure 1: *NH2D0245 Evaluation Board*

Figure 2 shows the schematic of the evaluation board of the NH2D0245 energy harvesting PMIC.

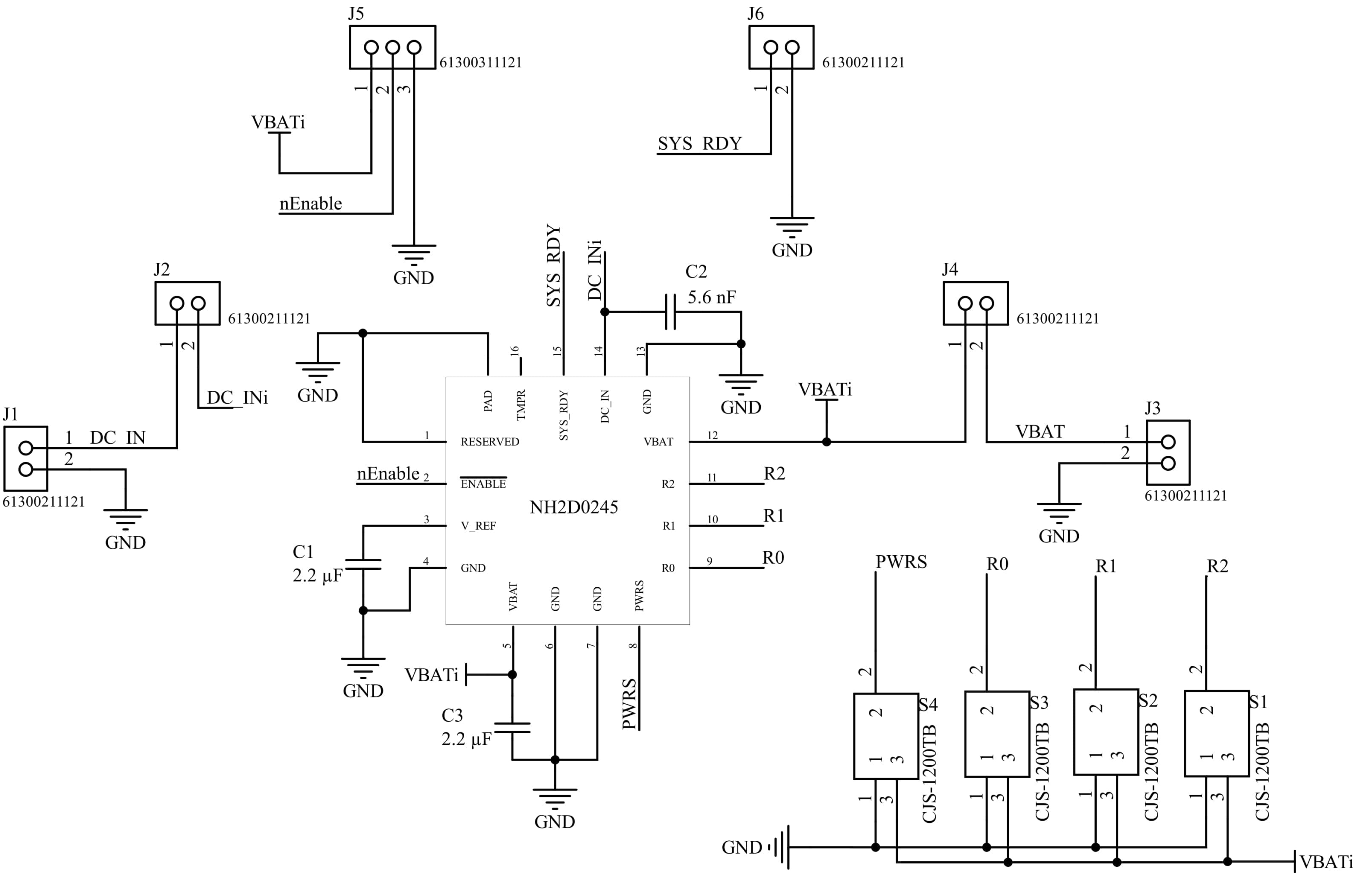

Figure 2: *NH2D0245 EVB Schematic*

2. Connectors

The Evaluation Board contains several connectors to connect a harvester and battery or supercapacitor. And if desired voltages and currents can be measured. Table 1 describes the functionalities of each connector.

Table 1: *Connector functionalities*

Connector	Description
J1	PMIC DC input connector. Connect positive terminal to DC_IN and negative terminal to GND.
J2	DC_IN current. Remove the jumper and connect the current meter to measure the DC input current.
J3	PMIC VBAT connector. Connect the positive terminal of the storage solution to VBAT and the negative terminal to GND.
J4	VBAT current. Remove the jumper and connect the current meter to measure the charging current.
J5	$\overline{\text{ENABLE}}$ pin of the PMIC. Set jumper to VBAT to disable the PMIC. Set jumper to GND to enable the PMIC.
J6	System ready pin of the PMIC. Measure between SRDY and GND to determine if the PMIC can convert. If SRDY is equal to VBAT the PMIC is ready to convert, if it is equal to GND the PMIC is not ready for conversion yet.

3. Power range switches

The Evaluation Board contains several switches to select the optimal power range for the Maximum Power Point Tracker. To set the switch to 1 toggle the switch to the right, to set the switch to 0, toggle the switch to the left. Please refer to the efficiency curves in the datasheet of the NH2D0245 to see which settings optimal for your selection of battery voltage and input power range.

4. Connecting a harvester and battery

To use the EVB, connect a harvester to **J1** and a battery to **J3** as shown in figure 3. Caution should be taken when making the connections. The positive terminal of the harvester should be connected to DC_IN and the negative terminal to GND. The positive terminal of the battery should be connected to VBAT and the negative terminal to GND. To use a harvester with an AC output like piezoelectric harvesters or inductive harvesters, rectify the signal before connecting to the EVB.

Figure 3: *Connecting a harvester and battery*

Connector **J5**, pin $\overline{\text{EN}}$ is used to enable or disable the PMIC. Connecting the jumper between $\overline{\text{EN}}$ and GND will enable the chip. To force the chip into standby mode move the jumper from GND to VBAT. This will force the chip into standby mode and set the internal clock to minimum frequency.

Connector **J6**, pin SRDY is used to indicate if the PMIC started operation. If SRDY is equal to the VBAT, it means that the PMIC started operation. If SRDY is equal to GND it means that the PMIC cannot convert. To see if the PMIC started operation, the voltage between SRDY and GND on connector **J6** can be measured as shown in figure 3.

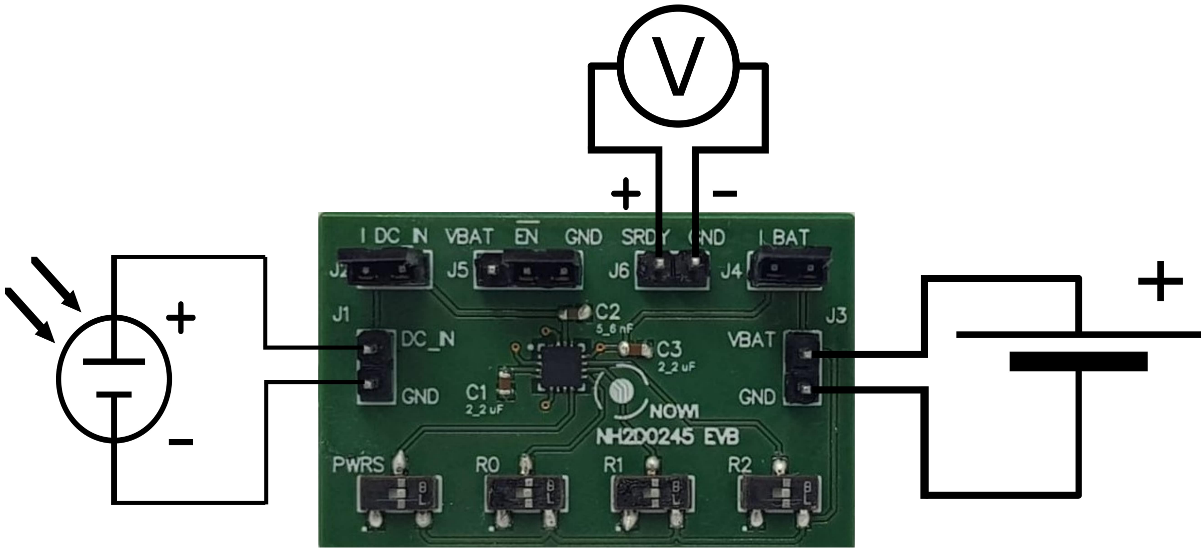

Figure 4: *Measuring the SRDY voltage*

5. Measuring currents

Connectors **J2** and **J4** are to measure the input and output current of the PMIC. To measure the input current, remove the jumper on **J2** and replace it with a current meter as shown in figure 5. To measure the output current, remove the jumper on **J4** and replace it with a current meter as shown in figure 5.

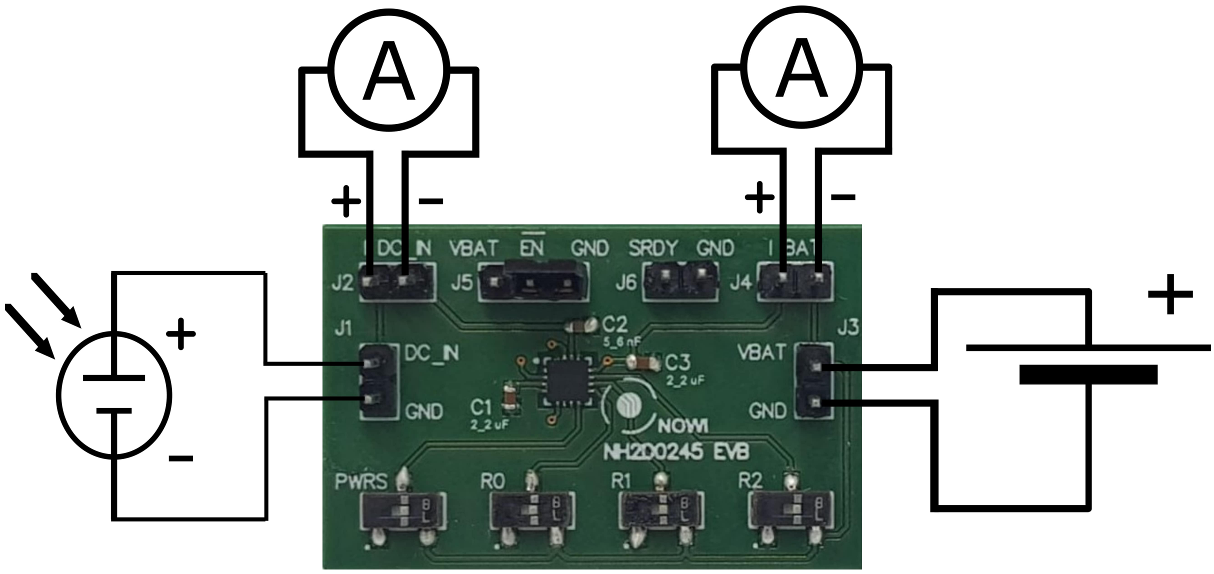

Figure 5: *Measuring input and output current*

6. Measuring PMIC efficiency

To determine PMIC efficiency, it is required to determine the input and output power of the PMIC, this can be measured using two current meters and two voltage meters as shown in figure 6.

To determine the input power, one voltmeter should be connected to the input of the PMIC between DC_IN and GND at **J1** and a current meter should be connected to connector **J2**, by multiplying the voltage V_DC_IN with the current I_DC_IN the input power Pin can be determined.

To determine the output power, one voltmeter should be connected to the output of the PMIC between V_BAT and GND at **J3** and a current meter should be connected to connector **J4**, by multiplying the voltage V_BAT with the current I_BAT the output power Pout can be determined.

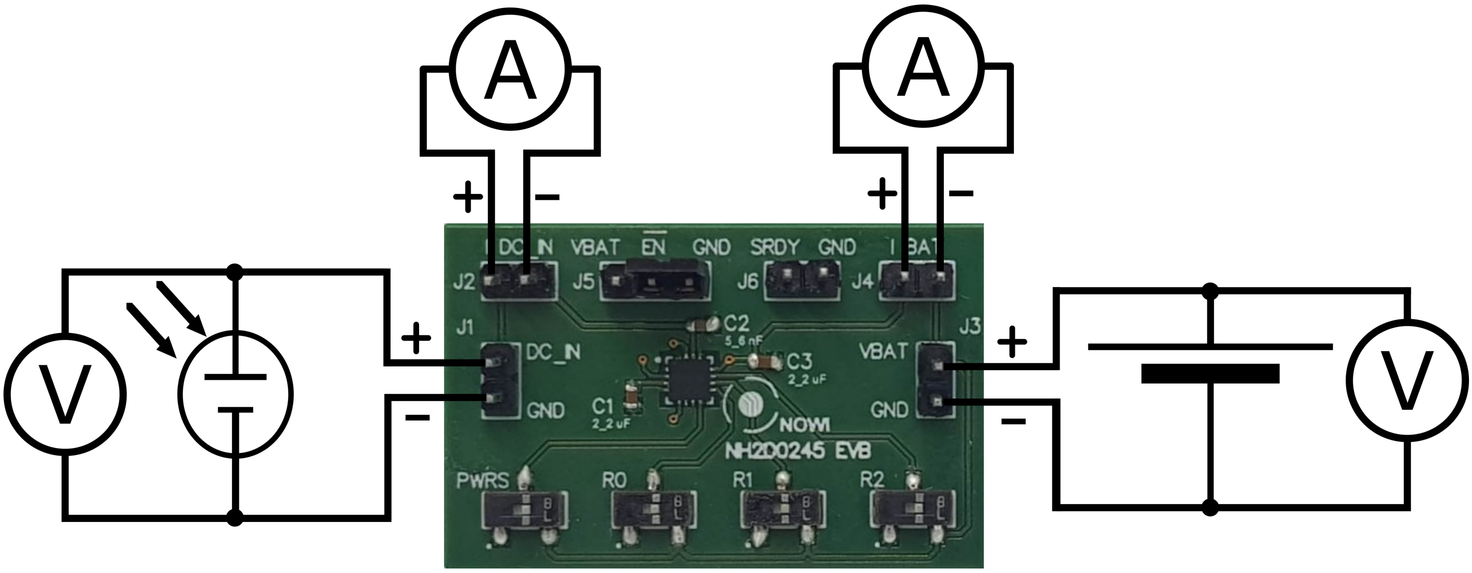

Figure 6: *Measuring PMIC efficiency*

Now that Pin and Pout are determined, the efficiency of the PMIC can simply be calculated using the following formula:

$$Efficiency = \frac{Pout}{Pin} \cdot 100\%$$

7. Bill of Materials and Board Layout

This section contains the bill of materials (BOM) and the PCB layout for NH2D0245 EVB.

7.1. Bill of Materials

Table 2: *EVB Bill of Materials*

Designator	Description	Manufacturer	Manufacturer Part Number	Quantity
U1	NH2 Energy Harvesting PMIC	Nowi	NH2D0245	1
C1, C3	2.2 uF 0603 X5R	Würth Elektronik	885012106018	2
C2	5.6 nF 0603 X7R	KEMET	C0603C562K3RAC7867	1
J1, J2, J3, J4, J5, J6	2.54 mm male connector	Wurth Elektronik	61300211121	6
PWRS, R0, R1, R2	switch	Copal Electronics	CJS-1200TB	4

7.2. Board layout

Figure 7 show the assembly drawing of the top side of the EVB. Figures 8 to 9 show the top and bottom copper layers.

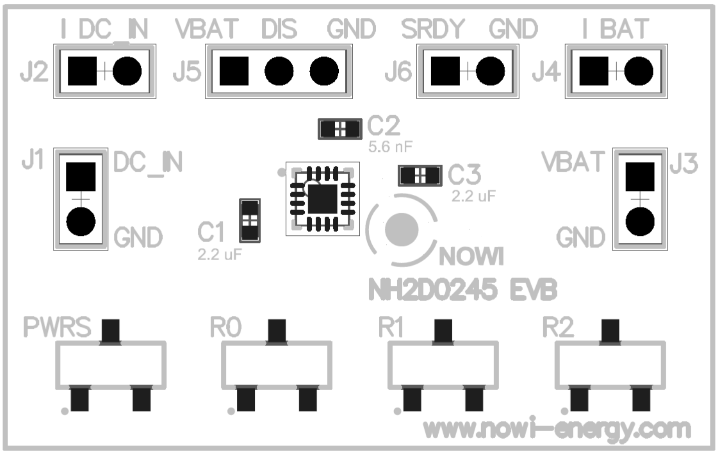

Figure 7: *Top side assembly drawings*

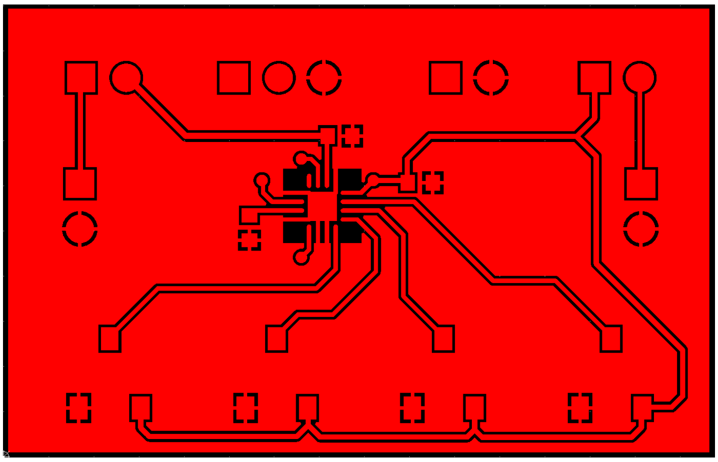

Figure 8: *Top layer layout*

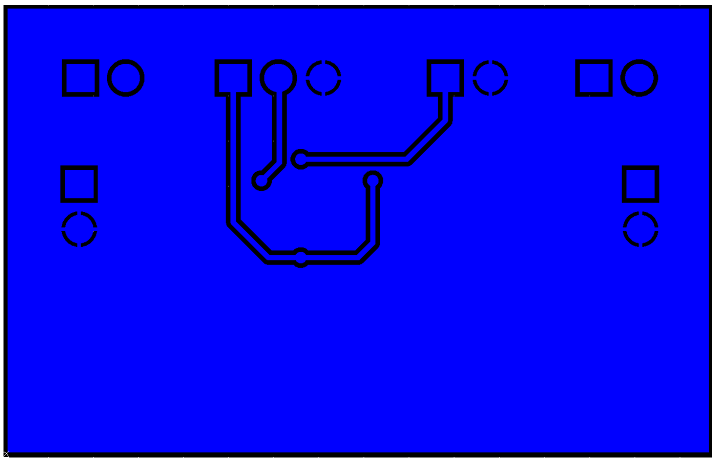

Figure 9: *Bottom layer layout*

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