

# NCN8025AEVB

## Evaluation Board Manual for NCN8025A QFN-24

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### EVALUATION BOARD MANUAL

#### INTRODUCTION

This document gives a detailed description of the NCN8025A Evaluation Board (QFN-24 version) with the Bill Of Material (BOM), board schematic and layout. The appropriate lab test setups are also provided. The NCN8025A Evaluation Board has been designed to help for a quick evaluation of the NCN8025A Compact and Cost-Effective Smart Card Interface device.

This document has to be used with the NCN8025A datasheet. The datasheet contains full technical details regarding the NCN8025A specifications and operation. The board (FR4 material) is implemented in two metal layers. The top and bottom layers have thicknesses of 35 µm. The PCB thickness is 1.6 mm with dimensions of 89 mm by 68 mm (see Figure 1).

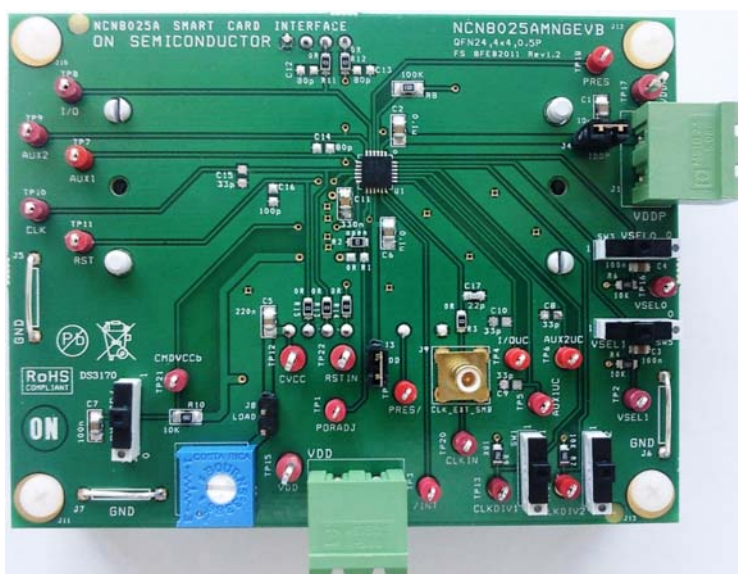


Figure 1. Demo Board

#### EQUIPMENT

| Description            | Main Features                                                                 | Example of Equipment (Note 1)                                                             | Qty. |
|------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------|
| Regulated Power Supply | 200 mA DC current capability                                                  | Tektronix PS2520G                                                                         | 2    |
| Multimeter             |                                                                               | Keitley 2000 or 2001                                                                      | 2    |
| Sourcemeter            |                                                                               | Keitley 2400                                                                              | 1    |
| Oscilloscope           | 500 MHz Bandwidth, four channel scope, min 1 Mbit memory per channel (Note 2) | Tecktronix TDS744, 754 or 784 / TDS5054 series or Lecroy WR5060<br>TDS5104B, 1 GHz, 5GS/s | 1    |
| Voltage probe          | 4 probes 500 MHz Bandwidth                                                    | Tektronix or Lecroy                                                                       | 4    |
| Waveform generator     | Pattern genarator                                                             | Agilent 81104A 80 MHz or HP8110A 150 MHz 2 outputs                                        | 1    |
| SMB Cable              |                                                                               | External Clock Input                                                                      | 1    |

1. Equipment used in the context of this Application Note Manual.
2. Greater Scope memory per channel offers better resolution.

## TEST PROCEDURE

See Figure 2.

### Initial Setups

The initial setups given here are recommended before starting measurements on the board.

- Set the CMDVCC/ in the OFF position (High).
- Set CLKDIV1 and CLKDIV2 into low position (lowest frequency Fclk)
- 2 pins are used to change the Card V<sub>CC</sub> power supply or the smart card interface mode which can be 1.8 V, 3.0 V or 5.0 V. These 2 pins are VSEL0 and VSEL1 and on the board, changing VSEL0 and VSEL1 is done using 2 corresponding switches (see Figure 2) according to the below Table 1. When VSEL0 = 0 then VSEL1 is in the mode 5 V / 3 V<sub>bar</sub>, when VSEL0=1 then VSEL1 is in the mode 1.8 V / 3 V<sub>bar</sub>. The initial setup can be VSEL0 = 0 and VSEL1 = 1 for selecting the 5 V mode. The card V<sub>CC</sub> (CVCC) output voltage cannot be changed on the fly when the smart card interface is active (/CMDVCC = Low). For changing card V<sub>CC</sub> it is necessary to deactivate the device then to reconfigure the card V<sub>CC</sub> by setting the appropriate VSEL0 and VSEL1 finally the smart can be activated again with this new smart card power supply voltage.

**Table 1. CVCC Programming**

| VSEL0 | VSEL1 | CVCC  |
|-------|-------|-------|
| 0     | 0     | 3.0 V |
| 0     | 1     | 5.0 V |
| 1     | 0     | 3.0 V |
| 1     | 1     | 1.8 V |

- As a precaution, turn the 1 k $\Omega$  potentiometer to obtain a resistor output value of 1 k $\Omega$ , and then connect the jumper.

### DC Power Supplies

Two power supplies are used to bias the demo board. VDDP is the input voltage of LDO Regulator. VDD is the

“digital” power supply which biases the input stages of the NCN8025A device (control and signal inputs).

VDD and VDDP must be connected to the board to ensure correct operation. Connect the VDD and VDDP power supplies using the 2 pin male connectors J2 and J1 respectively.

### Clock Frequency

CLKDIV1 and CLKDIV2 select the frequency divider according to the table given below.

**Table 2. Clock Division Ratio Programming**

| CLKDIV1 | CLKDIV2 | Divider |
|---------|---------|---------|
| 1       | 0       | DIV 1/1 |
| 1       | 1       | DIV 1/2 |
| 0       | 1       | DIV 1/4 |
| 0       | 0       | DIV 1/8 |

### Card Presence

The socket we use is a normally open, so PRES/ has been chosen; nevertheless the PRES and PRES/ test points can also be used for signaling the presence of a card and starting up the circuit.

### The Clock

The clock is applied externally (SMB connector).

### Start the Measurement

To start the measurements, set the board as it follows:

- Set CLKDIV1 and CLKDIV2 to select the correct frequency.
- Set 5 V / 3 V<sub>bar</sub> to select the correct output voltage.
- Jumpers:
  - 1 k $\Omega$  potentiometer jumper: not connected to start the measure.
- Finally, toggle /CMDVCC from High to Low to start the device (activation sequence run).

# NCN8025AEVB

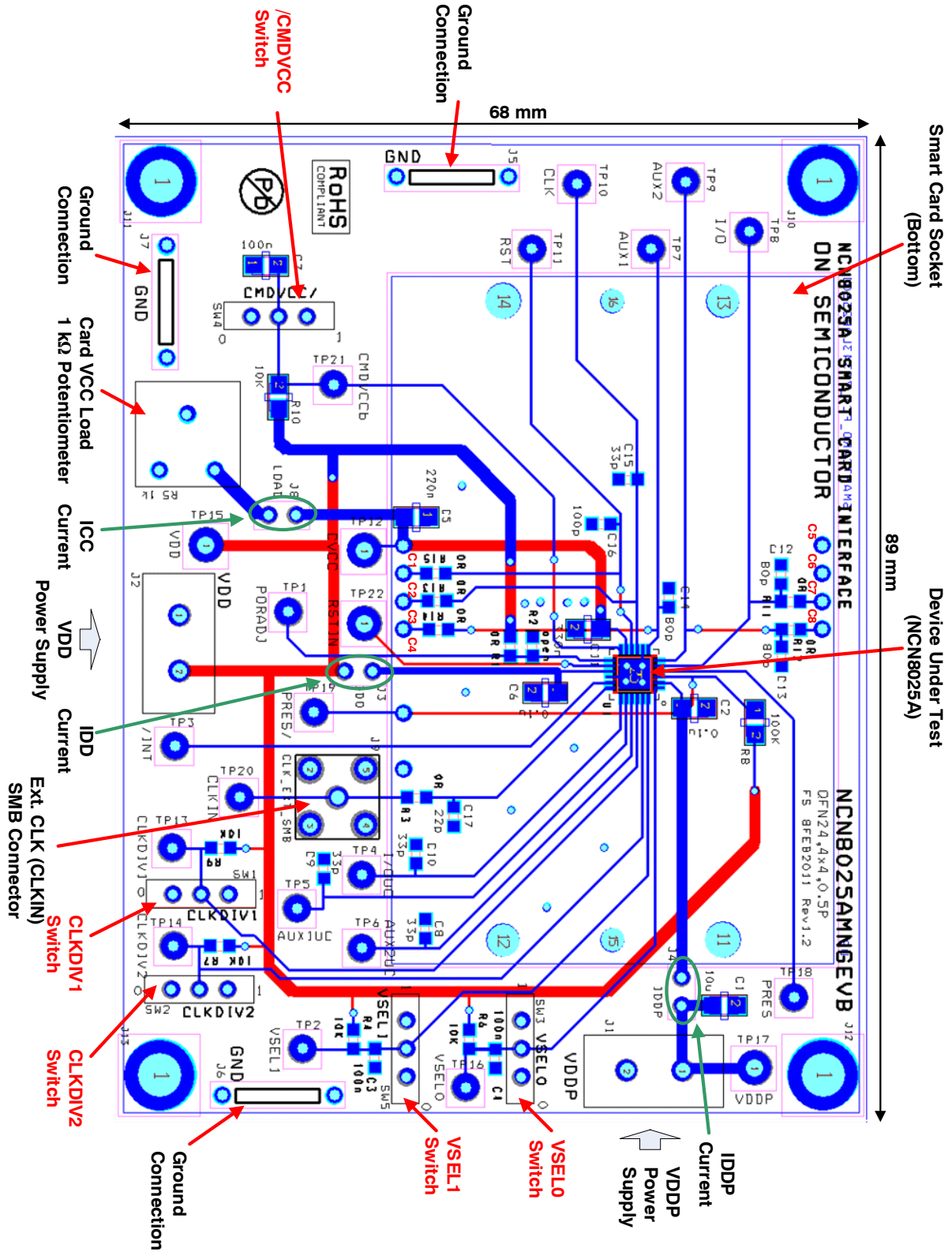


Figure 2. Board Description

# NCN8025AEVB

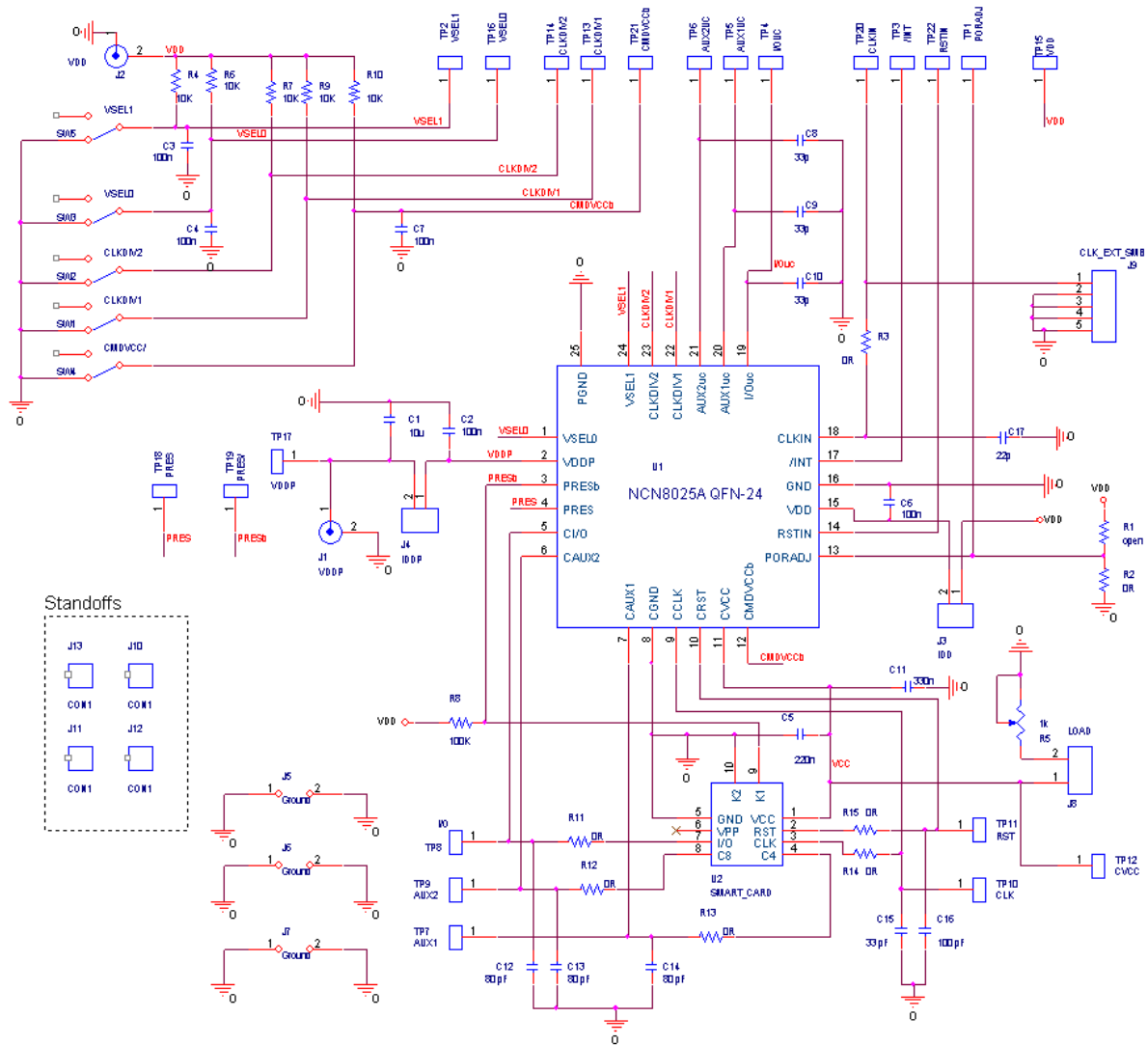


Figure 3. Board Schematic

# NCN8025AEVB

## Bill of Material

| Designator                                                    | Qty | Description                                               | Value | Tol | Footprint                          | Manufacturer                 | Manufacturer Part # | Lead Free |
|---------------------------------------------------------------|-----|-----------------------------------------------------------|-------|-----|------------------------------------|------------------------------|---------------------|-----------|
| C1                                                            | 1   | CAP CER 10UF<br>6.3V 20% X5R<br>0805                      | 10uF  | 20% | 0805                               | Murata                       | GRM21BR60J106ME19L  | Yes       |
| C2, C6,<br>C7                                                 | 3   | CAP CER .1UF<br>25V 10% X7R<br>0805                       | 100nF | 10% | 0805                               | Murata                       | GRM21BR71E104KA01L  | Yes       |
| C3, C4                                                        | 2   | CAP CER .1UF<br>25V 10% X7R<br>0603                       | 100nF | 10% | 0603                               | Murata                       | GRM188R71E104KA01D  | Yes       |
| C5                                                            | 1   | CAP CER .22UF<br>16V X7R 10%<br>0805                      | 220nF | 10% | 0805                               | TDK<br>Corporation           | C2012X7R1C224K      | Yes       |
| C8, C9,<br>C10, C15                                           | 4   | CAP CER 33PF<br>16V X7R 0603                              | 33pF  | 5%  | 0603                               | AVX<br>Corporation           | Do not populate     | Yes       |
| C11                                                           | 1   | CAP CER .33UF<br>16V X7R 10%<br>0805                      | 330nF | 10% | 0805                               | TDK<br>Corporation           | C2012X7R1C334K/1.25 | Yes       |
| C12, C13,<br>C14                                              | 3   | Do not populate                                           | 80pF  | -   | 0603                               | Do not<br>populate           | Do not populate     | -         |
| C16                                                           | 1   | Do not populate                                           | 100pF | -   | 0603                               | Do not<br>populate           | Do not populate     | -         |
| C17                                                           | 1   | CAP CERAMIC<br>22PF 50V NPO<br>0603                       | 22pF  | 5%  | 0603                               | Yageo                        | CC0603JRNP09BN220   | Yes       |
| R1                                                            | 1   | Do not populate                                           | Open  | -   | 0805                               | Do not<br>populate           | Do not populate     | -         |
| R2, R3,<br>R11, R12,<br>R13, R14,<br>R15                      | 7   | RES 0.0 OHM<br>1/8W 0603 SMD                              | 0R    | -   | 0603                               | Stackpole<br>Electronics Inc | RMCF0805ZT0R00      | Yes       |
| R4, R6,<br>R7, R9,<br>R10                                     | 5   | CMS resistor<br>1%, 1/4W                                  | 10k   | 1%  | 0603                               | Philips<br>Components        | 232272461003        | Yes       |
| R5                                                            | 1   | Single turn<br>Cermet trimmer,<br>1k, 0.5W, 10%           | 1k    | -   | CERMET-72P<br>T                    | Bourns                       | 3386F-102LF-ND      | Yes       |
| R8                                                            | 1   | CMS resistor<br>1%, 1/4W                                  | 100k  | 1%  | 0805                               | Philips<br>Components        | 232272461004        | Yes       |
| SW1 to<br>SW5                                                 | 5   | PCB slide<br>switches                                     | -     | -   | INTER3-2,54                        | EAO                          | 09.03290.01         | Yes       |
| TP1 to<br>TP11,<br>TP13,<br>TP14,<br>TP16,<br>TP18 to<br>TP21 | 18  | Clip Test Point,<br>Hole Diameter<br>1.0mm (0.040<br>mil) | -     | -   | TP_1.0MMHO<br>LE_KEYSTON<br>E_5000 | Keystone                     | 5000                | Yes       |
| TP12,<br>TP15,<br>TP17,<br>TP22                               | 4   | Clip Test Point,<br>Hole Diameter<br>1.6mm (0.063<br>mil) | -     | -   | TP_1.6MMHO<br>LE_KEYSTON<br>E_5010 | Keystone                     | 5010                | Yes       |
| J1,J2                                                         | 2   | VDD, VDDP,<br>2-Pins Male<br>Connector,<br>5.08mm Step    | -     | -   | MSTBA2                             | Phoenix<br>Contact           | MSTBA2.52G5.08      | Yes       |

# NCN8025AEVB

## Bill of Material

| Designator | Qty | Description                                                      | Value | Tol | Footprint                    | Manufacturer         | Manufacturer Part # | Lead Free |
|------------|-----|------------------------------------------------------------------|-------|-----|------------------------------|----------------------|---------------------|-----------|
| J3, J4, J8 | 3   | IDD, IDDP, LOAD, Breakable Single Row Header (2 Pins)            | -     | -   | CON2-2.54                    | TYCO Amp             | 5-826629-0          | Yes       |
| J5, J6, J7 | 3   | Ground Strap, Brass, Diameter 1.0mm, Pitch 10.16mm, Height 9.9mm | -     | -   | GND_STRP                     | HARWIN               | D3082-46            | Yes       |
| J9         | 1   | SMB connector                                                    | -     | -   | SMB/V                        | IMS                  | 111510001           | Yes       |
| U1         | 1   | NCN8025A Smart Card Interface                                    | -     | -   | QFN 24 4X4 ENGINEERING       | ON Semiconductor     | NCN8025AMNTXG       | Yes       |
| U2         | 1   | Smart card socket                                                | -     | -   | SMARTCARD_FCI_74343L_0825S01 | FCI                  | 7434L0825S01LF      | Yes       |
| none       | 4   | Standoff nut                                                     | -     | -   | STANDOFF HOLE                | Keystone Electronics | 1903C               | Yes       |
| none       | 4   | Standoff screw                                                   | -     | -   | STANDOFF HOLE                | Keystone Electronics | 4814K-ND            | Yes       |

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