

# NCN8026AMNGEVB

## NCN8026A Evaluation Board User's Manual



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### EVAL BOARD USER'S MANUAL

#### INTRODUCTION

This document gives a detailed description of the NCN8026A Evaluation Board (QFN-24) with the bill of materials (BOM), board schematic, and layout. The appropriate laboratory test setups are also provided. The NCN8026A Evaluation Board has been designed to help for a quick evaluation of the NCN8026A Smart Card Interface device.

This document has to be used with the NCN8026A datasheet. The datasheet contains full technical details regarding the NCN8026A 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. Evaluation Board

#### TEST EQUIPMENT

The following equipment listed in Table 1 is suggested for the evaluation.

Table 1. TEST EQUIPMENT

| Description            | Main Features  | Example of Equipment (Note 1)   | Qty. |
|------------------------|--|---|------|
| Regulated Power Supply | 200 mA DC current capability   | Tektronix PS2520G   | 2    |
| Multimeter             |  | Keithley 2000 or 2001   | 2    |
| Sourcemeater           |  | Keithley 2400   | 1    |
| Oscilloscope           | 500 MHz bandwidth, four channel scope, minimum 1MB memory per channel (Note 2) | Tektronix TDS744, 754 or 784 / TDS5054 series or LeCroy WR5060, TDS5104B, 1 Ghz, 5 GS/s | 1    |
| Voltage probe          | 4 probes, 500MHz bandwidth   | Tektronix or LeCroy   | 4    |
| Waveform generator     | Pattern generator  | Agilent 81104A 80 MHz or HP8110A 150 MHz 2 outputs                                      | 1    |
| SMB Cable              |  |   | 1    |

1. Equipment used in the context of this Evaluation Board User's Manual
2. Greater scope memory per channel offers better resolution

## TEST PROCEDURE

Refer to Figure 2 for an overview of the main features of the evaluation board.

### Initial Setup

The initial setup given here is recommended before starting measurements on the board.

- Set the CMDVCC/ in the OFF position (High).
- Set CS/ in the ON position: Chip selected, position Low.
- Set CLKDIV1 and CLKDIV2 into low position (lowest frequency  $f_{CLKIN}$ )
- VSEL0 and VSEL1 are used to change the output CVCC (card power supply) or the smart card interface mode which can be 1.8 V, 3.0 V or 5.0 V. Change VSEL0 and VSEL1 using the switches (see Figure 2) according to Table 2 below. When VSEL0 = 0 then VSEL1 is in the mode 5 V / 3 Vbar, when VSEL0=1 then VSEL1 is in the mode 1.8 V / 3 Vbar. The initial setup can be VSEL0 = 0 and VSEL1 = 1 for selecting the 5 V mode. The CVCC output voltage can be changed on the fly when the smart card interface is active (/CMDVCC = Low). Nevertheless, it is recommended to change CVCC after having deactivated the device then reconfiguring CVCC by setting the appropriate VSEL0 and VSEL1 and reactivating the smart card interface.

**Table 2. 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, if using the built-in resistive load, 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 NCN8026A 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 J4 and J3

respectively. Refer to the recommended operating ranges for VDD and VDDP in the datasheet. Use VDD = VDDP = 5 V to get started.

### Clock Frequency

CLKDIV1 and CLKDIV2 select the frequency divider for the card clock CCLK according to Table 3 given below.

**Table 3. CVCC PROGRAMMING**

| CLKDIV1 | CLKDIV2 | CCLK Frequency  |
|---------|---------|-----------------|
| 1       | 0       | $f_{CLKIN} / 1$ |
| 1       | 1       | $f_{CLKIN} / 2$ |
| 0       | 1       | $f_{CLKIN} / 4$ |
| 0       | 0       | $f_{CLKIN} / 8$ |

### The Clock

The clock is applied externally (SMB connector). Refer to the datasheet for the recommended frequency and voltage levels that can be applied at CLKIN.

### Card Presence

The typical socket is 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. If not using a smart card, connect PRES/ to ground.

### Start the measurement

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

1. Set CLKDIV1 and CLKDIV2 to select the correct frequency.
2. Set VSEL0 and VSEL1 to select the correct output voltage.
3. Check that the 1 k $\Omega$  potentiometer jumper is turned to 1 k $\Omega$ .
4. Set /CS low.
5. Set CMDVCC/ high.
6. Check that VDD and VDDP are set to 5 V, and set the current limit to 100 mA. Turn on the power supplies VDD and VDDP.
7. Toggle /CMDVCC from High to Low to start the device (activation sequence run).
8. Change the CVCC output voltage with the VSEL0 and VSEL1 switches.
9. Apply a clock to CLKIN and observe the card clock at CCLK. Use CLKDIV1 and CLKDIV2 to change the clock frequency.

# NCN8026AMNGEVB

## EVALUATION BOARD DESCRIPTION

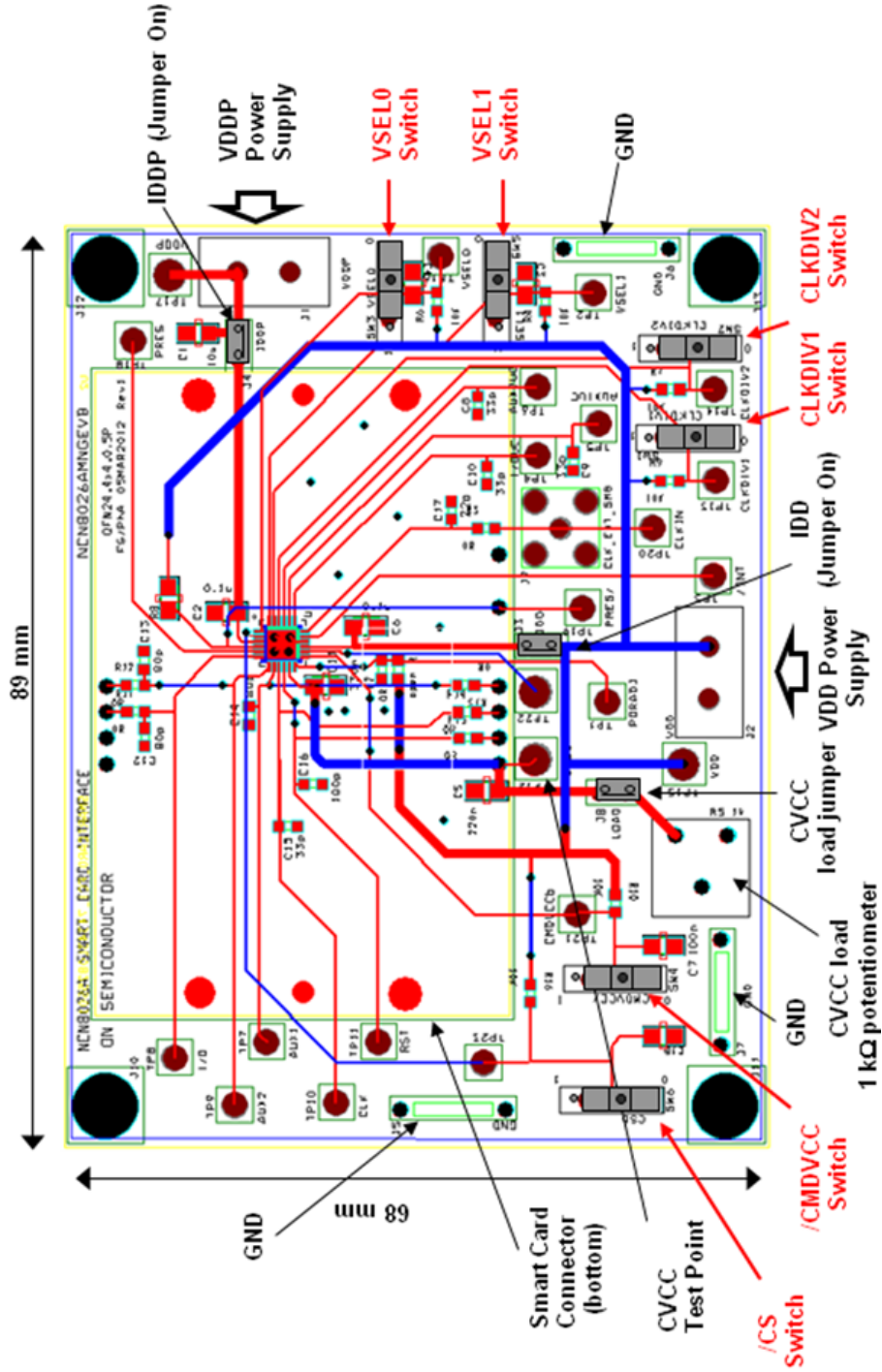


Figure 2. Board Description

# NCN8026AMNGEVB

## EVALUATION BOARD SCHEMATIC

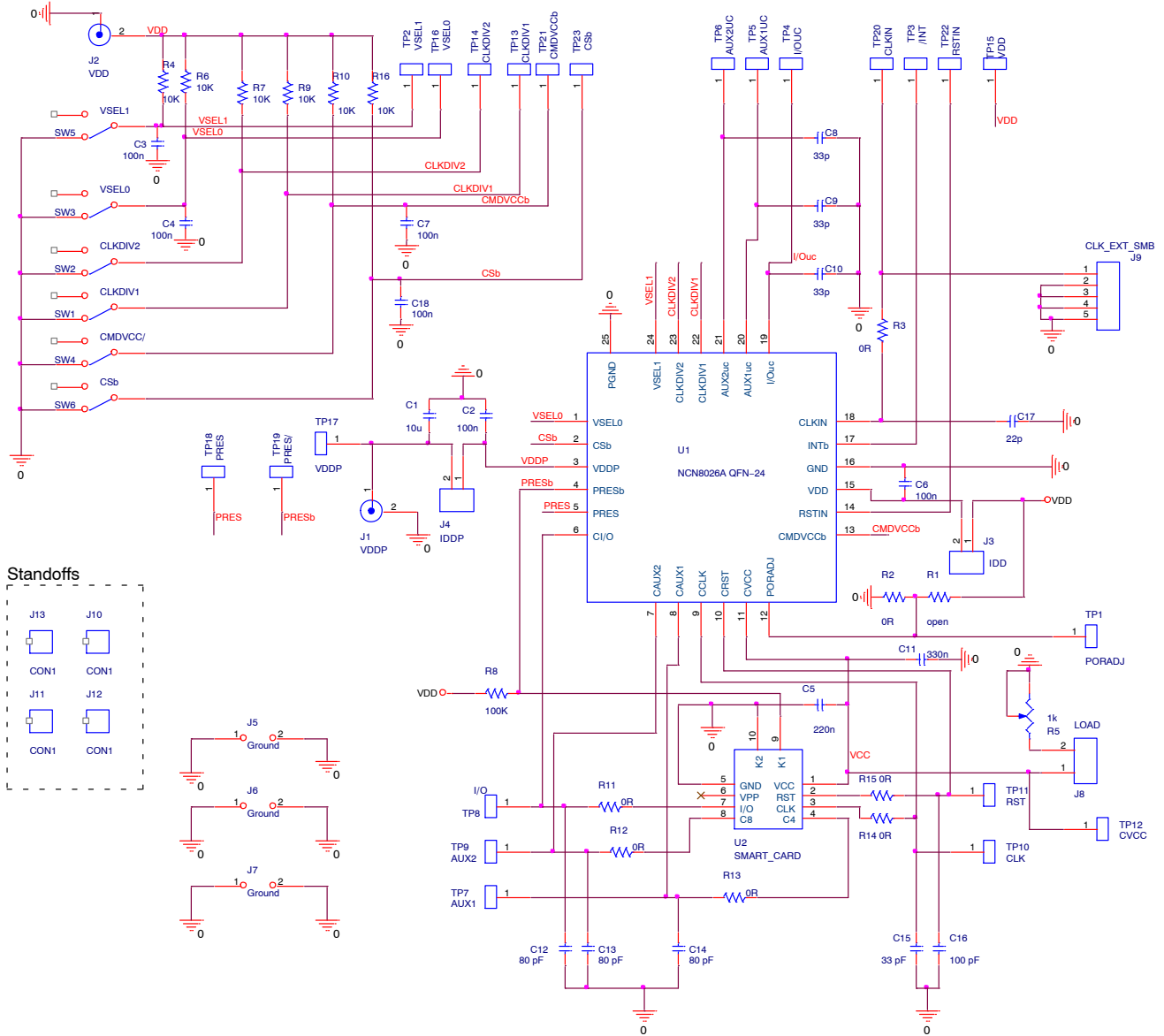


Figure 3. Board Schematic

# NCN8026AMNGEVB

## BILL OF MATERIALS – NCN8026A EVALUATION BOARD

**Table 4. BILL OF MATERIALS**

| Designator  | Qty | Description  | Value  | Tol | Footprint                       | Manufacturer                 | Manufacturer Part #    | Lead Free |
|---|-----|--|--------|-----|---------------------------------|------------------------------|------------------------|-----------|
| C1  | 1   | CAP CER 10 UF 6.3 V<br>20% X5R 0805  | 10 uF  | 20% | 0805                            | Murata                       | GRM21BR60J106ME19L     | Yes       |
| C2, C6, C7,<br>C18  | 3   | CAP CER .1 UF 25 V<br>10% X7R 0805   | 100 nF | 10% | 0805                            | Murata                       | GRM21BR71E104KA01L     | Yes       |
| C3, C4  | 2   | CAP CER .1 UF 25 V<br>10% X7R 0603   | 100 nF | 10% | 0603                            | Murata                       | GRM188R71E104KA01      | Yes       |
| C5  | 1   | CAP CER .22 UF 16 V<br>X7R 10% 0805  | 220 nF | 10% | 0805                            | TDK Corporation              | C2012X7R1C224K         | Yes       |
| C8, C9, C10,<br>C15   | 4   | CAP CER 33 PF 16 V<br>X7R 0603   | 33 pF  | 5%  | 0603                            | AVX Corporation              | <b>Do not populate</b> | Yes       |
| C11   | 1   | CAP CER .33 UF 16 V<br>X7R 10% 0805  | 330 nF | 10% | 0805                            | TDK Corporation              | C2012X7R1C334K/1.25    | Yes       |
| C12, C13,<br>C14  | 3   | Do not populate  | 80 pF  | -   | 0603                            | <b>Do not populate</b>       | <b>Do not populate</b> | -         |
| C16   | 1   | Do not populate  | 100 pF | -   | 0603                            | <b>Do not populate</b>       | <b>Do not populate</b> | -         |
| C17   | 1   | CAP CERAMIC 22 PF<br>50 V NP0 0603   | 22 pF  | 5%  | 0603                            | Yageo                        | CC0603JRNP09BN220      | Yes       |
| R1  | 1   | Do not populate  | Open   | -   | 0805                            | <b>Do not populate</b>       | <b>Do not populate</b> | -         |
| R2, R3, R11,<br>R12, R13,<br>R14, R15                         | 7   | RES 0.0 OHM 1/8 W<br>0603 SMD  | 0R     | -   | 0603                            | Stackpole<br>Electronics Inc | RMCF0805ZT0R00         | Yes       |
| R4, R6, R7,<br>R9, R10, R16                                   | 5   | CMS resistor 1%,<br>1/4 W  | 10k    | 1%  | 0603                            | Philips Components           | 232272461003           | Yes       |
| R5  | 1   | Single turn Cermet<br>trimmer, 1k, 0.5 W,<br>10%                             | 1k     | -   | CERMET-72PT                     | Bourns                       | 3386F-102LF-ND         | Yes       |
| R8  | 1   | CMS resistor 1%, 1/4<br>W  | 100k   | 1%  | 0805                            | Philips Components           | 232272461004           | Yes       |
| SW1 to SW6  | 5   | PCB slide switches   | -      | -   | INTER3-2,54                     | EAO                          | 09.03290.01            | Yes       |
| TP1 to TP11,<br>TP13, TP14,<br>TP16, TP18<br>to TP21,<br>TP23 | 18  | Clip Test Point, Hole<br>Diameter 1.0 mm<br>(0.040 mil)                      | -      | -   | TP_1.0MMHOLE_<br>KEYSTONE_5000  | Keystone                     | 5000                   | Yes       |
| TP12, TP15,<br>TP17, TP22                                     | 4   | Clip Test Point, Hole<br>Diameter 1.6 mm<br>(0.063 mil)                      | -      | -   | TP_1.6MMHOLE_<br>KEYSTONE_5010  | Keystone                     | 5010                   | Yes       |
| J1,J2   | 2   | VDD, VDDP, 2-Pins<br>Male Connector,<br>5.08 mm Step                         | -      | -   | MSTBA2                          | Phoenix Contact              | MSTBA2.52G5.08         | Yes       |
| J3, J4, J8  | 3   | IDD, IDDP, LOAD,<br>Breakable Single Row<br>Header (2 Pins)                  | -      | -   | CON2-2.54                       | TYCO Amp                     | 5-826629-0             | Yes       |
| J5, J6, J7  | 3   | Ground Strap, Brass,<br>Diameter 1.0 mm,<br>Pitch 10.16 mm,<br>Height 9.9 mm | -      | -   | GND_STRP                        | HARWIN                       | D3082-46               | Yes       |
| J9  | 1   | SMB connector  | -      | -   | SMB/V                           | IMS                          | 111510001              | Yes       |
| U1  | 1   | NCN8026A Smart Card<br>Interface   | -      | -   | QFN 24 4X4<br>ENGINEERING       | ON Semiconductor             | NCN8026AMNTXG          | Yes       |
| U2  | 1   | Smart card socket  | -      | -   | SMARTCARD_FC<br>I_74343L0825S01 | FCI                          | 7434L0825S01LF         | Yes       |
| none  | 4   | Standoff nut   | -      | -   | STANDOFF<br>HOLE                | Keystone<br>Electronics      | 1903C                  | Yes       |
| none  | 4   | Standoff screw   | -      | -   | STANDOFF<br>HOLE                | Keystone<br>Electronics      | 4814K-ND               | Yes       |

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