

# NBA3N206SDGEVB

## NBA3N206SDGEVB Evaluation Board User's Manual



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### Introduction

The NBA3N206S is a 3.3 V differential Multipoint (M-LVDS) line Driver and Receiver. NBA3N206S supports Simplex or Half Duplex bus configurations.

The NBA3N206S has Type-2 receivers that detect the bus state with as little as 50 mV of differential input voltage over a common-mode voltage range of -1 V to 3.4 V. Type-2 receivers include an offset threshold of 0.1 V to provide a detectable voltage under open-circuit, idle-bus, and other fault conditions.

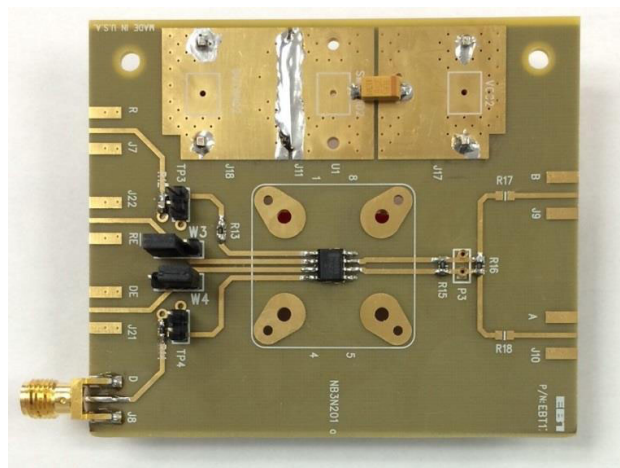
The NBA3N206SDGEVB evaluation board was developed to accommodate the NBA3N206S device. This evaluation board was designed to provide a flexible and convenient platform to quickly evaluate, characterize and verify the operation of the NBA3N206S.

### EVAL BOARD USER'S MANUAL

This manual should be used in conjunction with the device datasheet which contains full technical details on the device specifications and operation.

#### Evaluation Board User's Manual Contents:

- NBA3N206S Evaluation Board Information
- Board Features
- Board Layout Map
- Test and Measurement Setup Procedures
- Board Schematic and Bill of Materials



# NBA3N206SDGEVB

## Section 1: Board Features

- Board supplied includes an 8-Pin SOIC.
- Board is configured to operate from a single VCC supply and a single GND supply.
- Single-ended and differential inputs/outputs are accessed via SMA connectors or high impedance probes.
- Board may be configured for bus operation as:
  1. Point-to-Point with Simplex Single Termination
  2. Point-to-Point with Simplex Parallel Termination
  3. Multipoint Two-Node with Single Termination
  4. Multipoint Two-Node with Parallel Termination
- Two 100  $\Omega$  Parallel Termination resistors are mounted on each bus (Driver/Receiver) transceiver I/O pin pair. Resistors may be removed for added configuration flexibility.
- All layers are constructed with FR4 dielectric material.
- The first layer is the primary signal layer, including all of the differential inputs and outputs.
- The second layer is a ground plane. It is dedicated for the SMA ground plane.
- The third layer is a dedicated power plane. A portion of the 3<sup>rd</sup> layer is designated for the device VCC and DUTGND power planes.

## Layer Stack

The NBA3N206SDGEVB SOIC-8 Evaluation Board provides a high bandwidth, 50  $\Omega$  controlled trace impedance environment (100  $\Omega$  line-to-line differential) and is implemented in four layers.

- L1 (Top) Signal
- L2 SMA Ground
- L3 VCC and DUT Ground
- L4 (Bottom) Power Supply Bypass Capacitors, Control Pin Traces and Banana Jacks

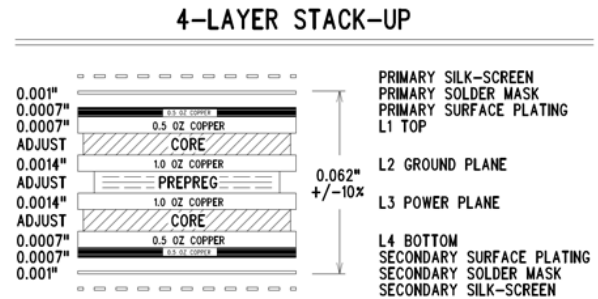


Figure 2. Four Layer Stack-up

## Section 2: Board Layout Map

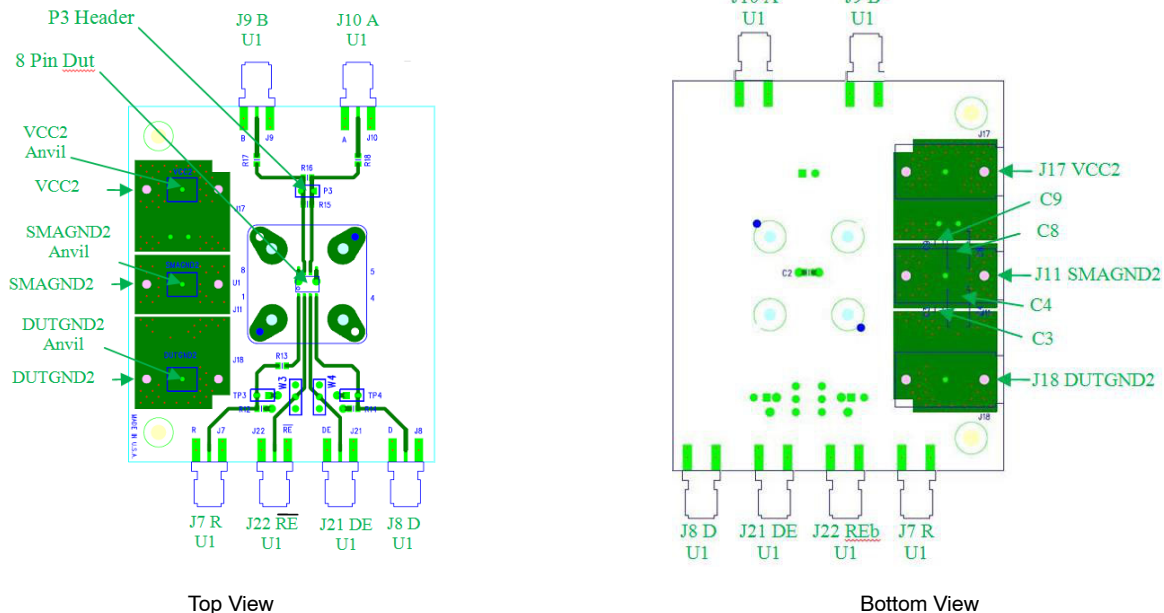


Figure 3. NBA3N206SDGEVB Evaluation Board

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**Table 1. LOAD BOARD CONNECTIONS AND COMPONENTS**

Board	Transceiver	Device Pin	Function
VCC2	U1 (8 Pin)	U1 Pin 8	VCC2 Power Supply connection point to U1
VCC2 Anvil	U1 (8 Pin)	U1 Pin 8	Alternative connection point for VCC2
SMAGND2	U1 (8 Pin)	–	U1 SMA (J7/8/9/10/21/22) ground shields connection point
SMAGND2 Anvil	U1 (8 Pin)	–	Alternative connection point for U1 SMA shields
DUTGND2	U1 (8 Pin)	U1 Pin 5	U1 DUT ground pin
DUTGND2 Anvil	U1 (8 Pin)	U1 Pin 5	Alternative connection point for U1 DUT ground pin
J7 R	U1 (8 Pin)	U1 Pin 1	U1 R input (Note 1)
J8 D	U1 (8 Pin)	U1 Pin 4	U1 D input
J9 B	U1 (8 Pin)	U1 Pin 7	U1 B input/output (Note 1)
J10 A	U1 (8 Pin)	U1 Pin 6	U1 B input/output (Note 1)
J21 DE	U1 (8 Pin)	U1 Pin 3	U1 DE input (Note 1)
J22 REb	U1 (8 Pin)	U1 Pin 2	U1 REb input (Note 1)
P3 Header	U1 (8 Pin)	U1 Pins 6, 7	U2 Connection Header for A & B
TP3	U1 (8 Pin)	U1 Pin 1	Test Point for U1 R input
TP4	U1 (8 Pin)	U1 Pin 4	Test Point for U1 D input
W3 Pad	U1 (8 Pin)	U1 Pin 2	Program point for U1 Reb
W4 Pad	U1 (8 Pin)	U1 Pin 3	Program point for U1 DE
*R12	U1 (8 Pin)	U1 Pin 1	U1 15pF R pin
R13	U1 (8 Pin)	U1 Pin 1	U1 0 $\Omega$ R pin
R14	U1 (8 Pin)	U1 Pin 4	U1 D input optional termination location
R15	U1 (8 Pin)	U1 Pins 6, 7	U1 100 $\Omega$ termination location
R16	U1 (8 Pin)	U1 Pins 6, 7	U1 100 $\Omega$ termination location
R17	U1 (8 Pin)	U1 Pins 7	U1 0 $\Omega$ A pin
R18	U1 (8 Pin)	U1 Pins 6	U1 0 $\Omega$ B pin

\*Replaced with  $C_L=15\text{pF}$  capacitor

1. Not populated on board

## NBA3N206SDGEVB

### Section 3: Test and Management Setup Procedures

#### Basic Operation Setup

1. Set VCC to 3.3V
2. Set DE, Move Jumper to Logic High
3. Set REb, Move Jumper to Logic Low
4. Apply LVCMOS Input Signal to D. (See datasheet for appropriate levels)
5. Monitor Differential Bus Voltage  $V_{AB}$  with a *Differential Probe*
6. Monitor Receiver Output  $V_R$  with a *Hi-Z Probe*

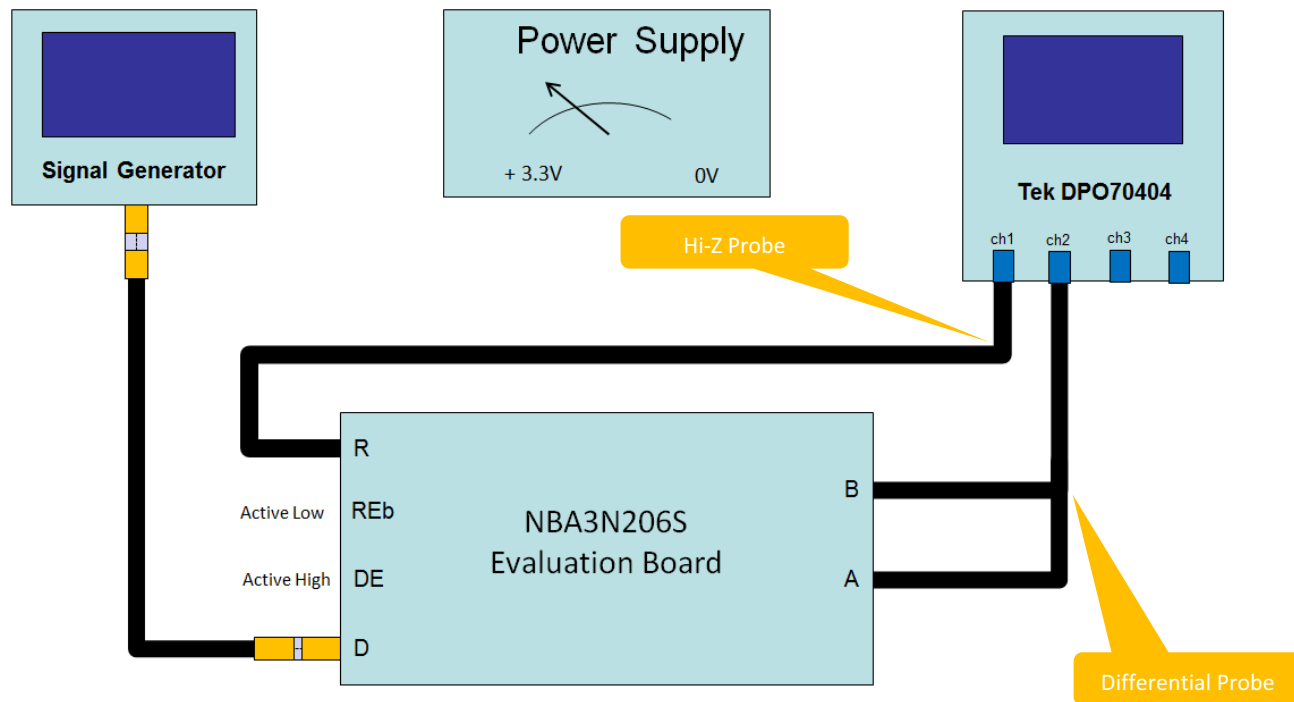


Figure 4. NBA3N206S Evaluation Board Test Block Diagram

#### Equipment Used (or equivalent)

1. Generator (HP 8133A or similar)
2. Oscilloscope (Tektronix TDS8000 or similar)
3. Power Supply (Agilent #6624A DC or similar)
4. Digital Voltmeter
5. Differential Probe
6. Hi-Z Probe

## Test Configurations

**Simplex Theory Configurations:** Data flow is unidirectional and Point-to-Point from one Driver to one Receiver. NBA3N206SDG devices provide a high signal current allowing long drive runs and high noise immunity. Single terminated interconnects yield high amplitude levels.

Parallel terminated interconnects yield typical MLVDS amplitude levels and minimize reflections. See Figures 5 and 6. NBA3N206SDG can be used as a driver or as a receiver.

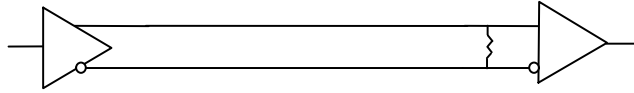


Figure 5. Point-to-Point Simplex Single Termination

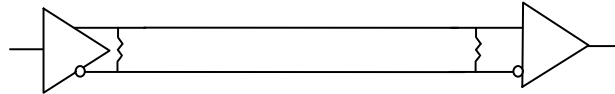


Figure 6. Parallel-Terminated Simplex

**Simplex Multidrop Theory Configurations:** Data flow is unidirectional from one Driver with one or more Receivers (Multiple boards required). Single terminated interconnects yield high amplitude levels. Parallel terminated interconnects yield typical MLVDS amplitude

levels and minimize reflections. Header P3 may be used as needed to interconnect transceivers to each other or to a bus. See Figures 1, 7, and 8. A NBA3N206SDG can be used as the driver or as a receiver.

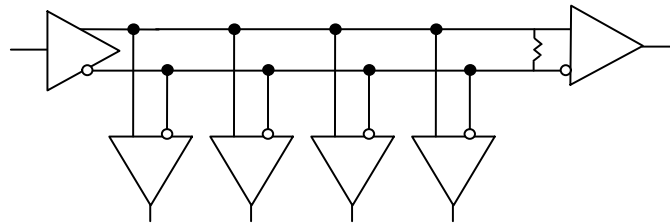


Figure 7. Multidrop or Distributed Simplex with Single Termination

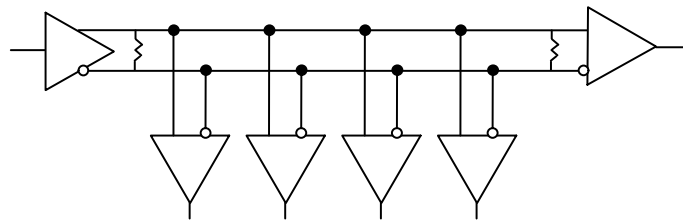


Figure 8. Multidrop or Distributed Simplex with Double Termination

**Half Duplex Multinode Multipoint Theory Configurations:** Data flow is unidirectional and selected from one of multiple possible Drivers to multiple Receives. One “Two Node” multipoint connection can be accomplished with a single board. Multipoint connection with more than two nodes require multiple boards. Parallel

terminated interconnects yield typical MLVDS amplitude levels and minimize reflections. Header P3 may be used as needed to interconnect transceivers to each other or to a bus. See Figure 9. NBA3N206SDG can be used as a driver or as a receiver.

## NBA3N206SDGEVB

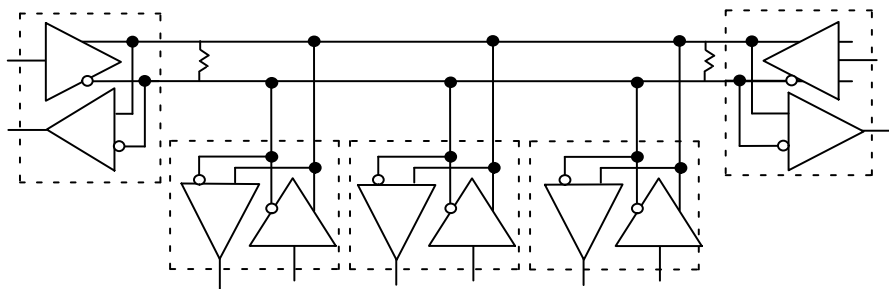


Figure 9. Multinode Multipoint Half Duplex (requires Double Termination)

### Output Waveforms

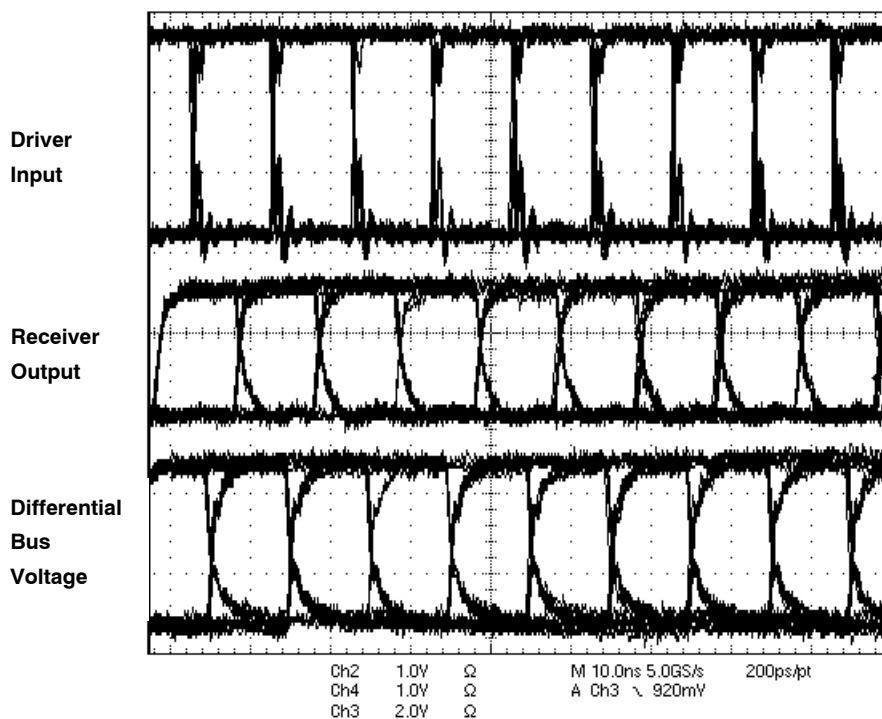


Figure 10. High Impedance Output Termination

Figure 10 shows typical NBA3N206S waveforms. The Driver Input is supplied by a 100 Mbps data signal via an HP8133A generator. The Receiver Output ( $V_R$ ) can be

monitored using a *Hi-Z probe*; the Differential Bus Voltage ( $V_{AB}$ ) can be monitored using a *Differential probe*.

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## Section 4: Board Schematic and Bill of Materials

### Board Schematic

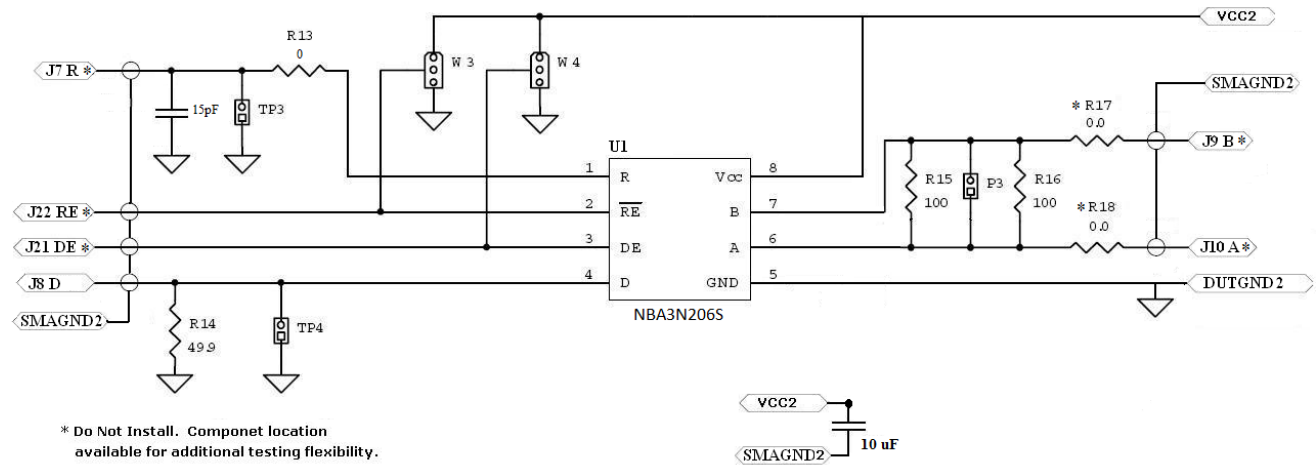


Figure 11. Board Schematic

Table 2. BILL OF MATERIALS AND LAMINATION STACKUP

Component Designation	Case	Value	Manufacturer	Part Number	Description	Qty
U1			ON Semiconductor	NBA3N206S		1
J18			Deltron	571-0100	Banana Jacks – Black	1
J17			Deltron	571-0500	Banana Jacks – Red	1
J8			Johnson	#142-0711-821	SMA Connector Side Launch Narrow	1
P3			AMP	4-103239-0x2	Header (make from 4-103239-0)	1
VCC2, SMAGND2, DUTGND2			Keystone	5015	Anvil Clips	6
W3, W4			FCI	68000-103HLF	3 Pin Header	2
TP3, TP4			3M	961102-6404-AR	2 Pin Header	2
R14	O603	50 $\Omega$	Panasonic		Precision Thick Film Chip Resistor	1
R15, R16	O603	100 $\Omega$	Panasonic		Precision Thick Film Chip Resistor	2
R13, R17, R18	O603	0 $\Omega$	Panasonic		Precision Thick Film Chip Resistor	1
C4		10 $\mu$ F	KEMET	C1210X106K3RACTU	Chip Capacitor	1
C11	O603	15 pF	Murata	GRM1555C1E150JA01D	Chip Capacitor	1

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