

# NB6L239MNEVB

## NB6L239MNEVB Evaluation Board User's Manual



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### EVAL BOARD USER'S MANUAL

#### Description

The NB6L239 Evaluation Board was designed to provide a flexible and convenient platform to quickly evaluate, characterize and verify the performance and operation of the NB6L239. This user's manual provides detailed information on board contents, layout and its use. It should be used in conjunction with the NB6L239 data sheet: ([www.onsemi.com](http://www.onsemi.com)).

The NB6L239 is a differential Receiver to differential LVPECL Clock Divider. The board features Output Enable control of the Outputs.

#### Board Features

- Accommodates the electrical characterization of the NB6L239
- Selectable Jumper for the VT pin, minimizing cabling
- CLK/ $\overline{\text{CLK}}$  input and QA/ $\overline{\text{QA}}$  and QB/ $\overline{\text{QB}}$  output pins are accessed via SMA connectors
- $\overline{\text{MR}}$ ,  $\overline{\text{EN}}$  and Clock Divide Select pins are accessed via SMA Connectors or by the Logic Switches
- Convenient and compact board layout
- 2.5 V, 3.3 V Power Supply Operating Range

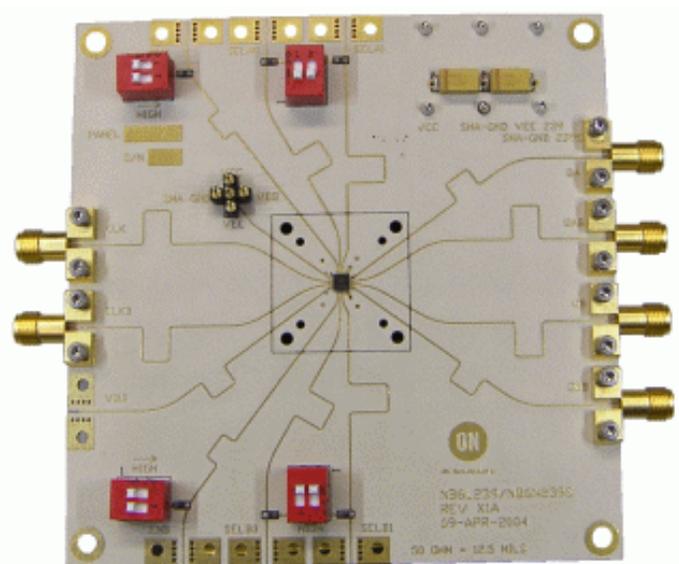
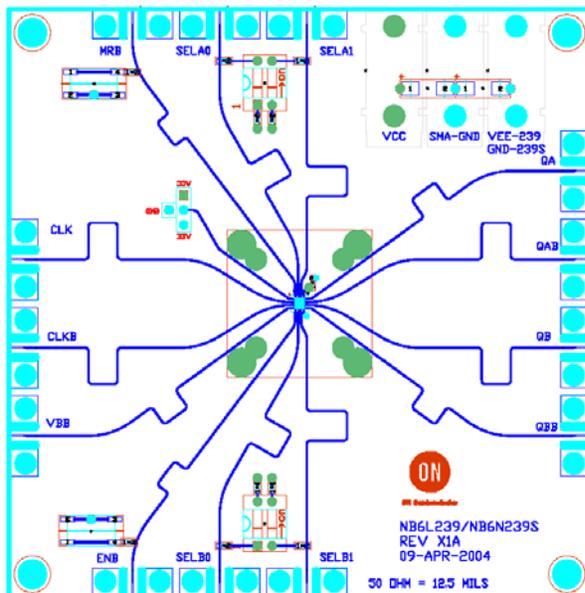


Figure 1. Evaluation Board

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## PROCEDURE

### Lab Setup and Measurement Procedure

#### Equipment Used

- Agilent Signal Generator #8133A
- Tektronix TDS8000 Oscilloscope
- Agilent #6624A DC Power Supply
- Digital Voltmeter
- Matched High-Speed Cables with SMA Connectors

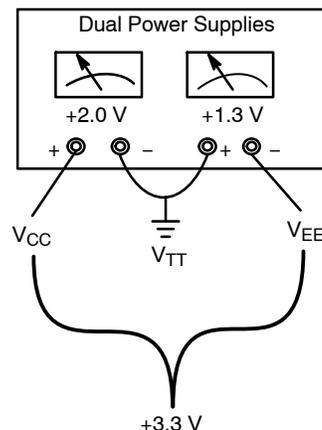
#### Power Supply Connections

The NB6L239 has a positive supply pin,  $V_{CC}$ , and a negative supply pin,  $V_{EE}$ .  $SMAGND = V_{TT} = V_{CC} - 2.0\text{ V}$  is the termination supply for the LVPECL outputs, only.

Power supply terminals  $V_{CC}$ ,  $V_{EE}$  and  $SMAGND$  are provided. The  $SMAGND$  terminal is for the isolated SMA connector GROUND plane, and is not to be confused with a device  $V_{EE}$  pin. Since  $SMAGND = V_{TT} = V_{CC} - 2.0\text{ V}$ , is the termination supply for the LVPECL outputs, by offsetting  $V_{CC}$  by  $+2.0\text{ V}$  yields  $V_{TT} = 0\text{ V}$  or Ground. A “split” or dual power supply technique can be used to take advantage of terminating the PECL outputs into  $50\ \Omega$  to Ground of an oscilloscope or a frequency counter. (see AND8020/D for more information on terminating ECL).

**Table 1. POWER SUPPLY CONFIGURATIONS**

Device Pin	Power Supply Connector Color	“Split” Power Supply
$V_{CC}$	RED	$V_{CC} = +2.0\text{ V}$
-	BLACK - SMAGND	$V_{TT} = V_{CC} - 2\text{ V} = 0\text{ V}$
$V_{EE} - 239$	YELLOW	$V_{EE} = -1.3\text{ V}$ (or $-0.5\text{ V}$ )



**Figure 2. “Split” or Dual Power Supply Connections**

#### NB6L239

To monitor the  $QA/\overline{QA}$  and  $QB/\overline{QB}$  outputs on an oscilloscope, the power supply needs to be DC offset:

1. Connect a “split” power supply to the evaluation board. (Figure 1)
  - Connect  $V_{CC}$  to  $+2.0\text{ V}$
  - Connect  $SMAGND$  to  $0\text{ V}$
  - Connect  $V_{EE}$  to  $-1.3\text{ V}$  for  $3.3\text{ V}$  operation; or  $-0.5\text{ V}$  for  $2.5\text{ V}$  operation

2. Ensure the oscilloscope is triggered properly and has  $50\ \Omega$  termination to ground. The board does not provide  $50\ \Omega$  source termination resistors. Trigger the oscilloscope from trigger output of signal generator.

3. Connect the LVPECL  $QA/\overline{QA}$  and  $QB/\overline{QB}$  outputs to the oscilloscope with matched cables. The outputs are terminated with  $50\ \Omega$  to  $V_{TT}$  ( $V_{CC} - 2.0\text{ V}$ ) =  $0\text{ V}$  = Ground internal to the oscilloscope.

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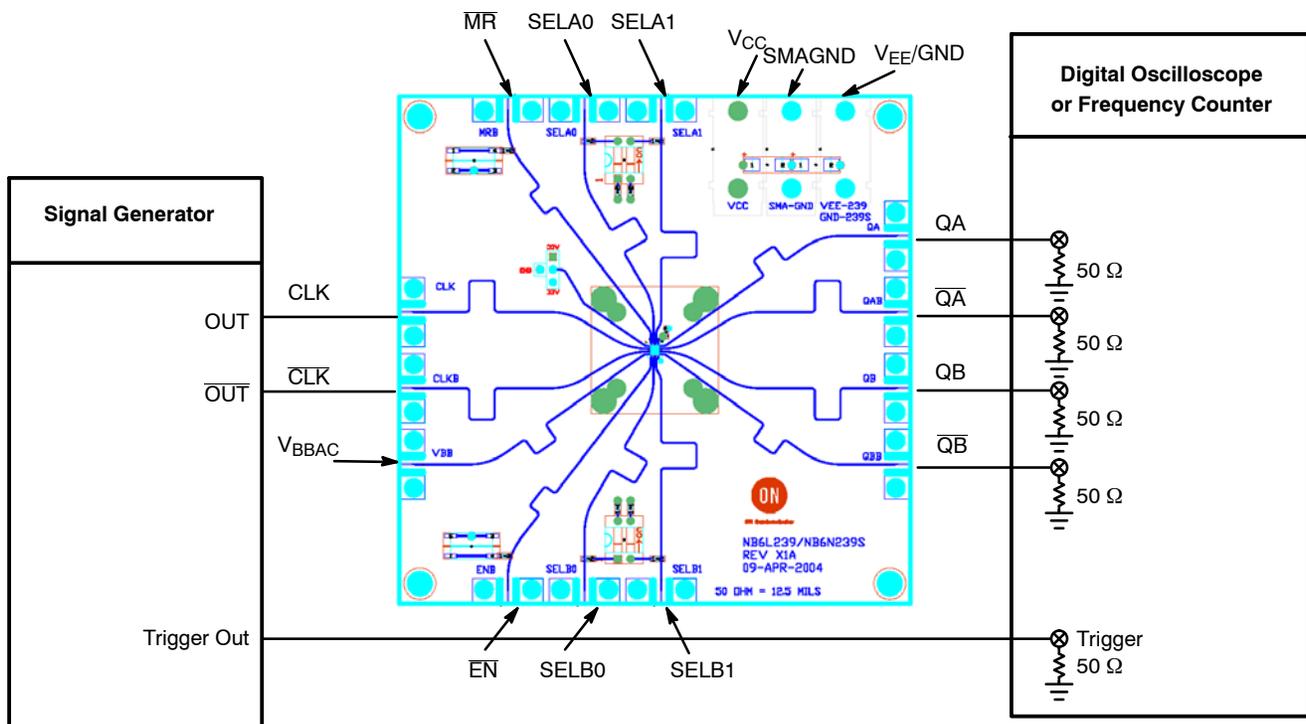


Figure 3. Evaluation Board

### Board Layout

The evaluation board is constructed with Rogers material with 50  $\Omega$  trace impedances designed to minimize noise, achieve high bandwidth and minimize crosstalk.

### Layer Stack

- L1 Signal (top) (Rogers)
- L2 SMA Ground
- L3  $V_{CC}$  and  $V_{EE}$  (positive and negative power supply)
- L4 Signal (bottom)

### Control and Select Pins

The Control / Select pins,  $\overline{MR}$ ,  $SELX_n$  and  $\overline{EN}$ , can be accessed via the appropriate SMA connector. These pins can also be manually controlled by using the H/L switch. When using the switch, the SMA connector should be left open. When using the SMA connector, the switch must be in the “OPEN” position.

The  $SELX_n$  and  $\overline{EN}$  device pins have internal pulldown resistors. The NB6L239 evaluation board was designed to take advantage of this attribute. When the  $SELX_n$  and  $\overline{EN}$  switch is in the logic LOW position, the input pin “floats” to

a logic LOW owing to the pulldown resistor; a logic LOW voltage is not forced on the pin. In the HIGH position, the switch forces the  $SELX_n$  and  $\overline{EN}$  pin to the positive power supply rail, a logic HIGH.

The  $\overline{MR}$  device pin has an internal pullup resistor. When the  $\overline{MR}$  switch is in the logic HIGH position, the input pin “floats” to a logic HIGH owing to the pullup resistor; a logic HIGH voltage is not forced on the pin. In the LOW position, the switch forces the  $\overline{MR}$  pin to the negative power supply rail, a logic LOW.

### $V_{BB} = V_{BBAC}$

$V_{BB}$  labeled on the board is actually  $V_{BBAC}$  per the data sheet.

### $V_T$

The  $V_T$  pin can be set to  $V_{CC}$ ,  $V_{EE}$  (239) GND (239S),  $V_{BB}$  or SMAGND by using a jumper.

### $V_{EE} / GND$

$V_{EE}$  is the negative supply for the NB6L239. GND is the negative supply for NB6N239S.

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**Table 2. PIN DESCRIPTION** (refer to data sheet, NB6L239/D)

Pin # 16-QFN	Pin Name	I/O	Open Pin Default	Type	Function
1	VT				Internal 100 $\Omega$ Center
2	CLK	Input		LVPECL, CML, LVDS, HSTL	Noninverted Differential CLOCK Input.
3	$\overline{\text{CLK}}$	Input		LVPECL, CML, LVDS, HSTL	Inverted Differential CLOCK Input.
4	V <sub>BBAC</sub>	Output		Reference Voltage	Output Voltage Reference for Capacitor Coupled Inputs, Only.
5	$\overline{\text{EN}}$	Input	L	LVC MOS/LVTTL Input	Synchronous Output Enable
6	SELB0	Input	L	LVC MOS/LVTTL Input	Clock Divide Select Pin
7	SELB1	Input	L	LVC MOS/LVTTL Input	Clock Divide Select Pin
8	V <sub>EE</sub>	Negative Power Supply			Negative Supply Voltage
9	$\overline{\text{QB}}$	Output		LVPECL	Inverted Differential Output. Typically terminated with 50 $\Omega$ resistor to V <sub>TT</sub> .
10	QB	Output		LVPECL	Noninverted Differential Output. Typically terminated with 50 $\Omega$ resistor to V <sub>TT</sub> .
11	$\overline{\text{QA}}$	Output		LVPECL	Inverted Differential Output. Typically terminated with 50 $\Omega$ resistor to V <sub>TT</sub> .
12	QA	Output		LVPECL	Noninverted Differential Output. Typically terminated with 50 $\Omega$ resistor to V <sub>TT</sub> .
13	V <sub>CC</sub>	Positive Power Supply			Positive Power Supply
14	SELA1	Input	L	LVC MOS/LVTTL	Clock Divide Select Pin
15	SELA0	Input	L	LVC MOS/LVTTL Input	Clock Divide Select Pin
16	$\overline{\text{MR}}$	Input	H	LVC MOS/LVTTL Input	Master Reset Asynchronous, Default Open High, Asserted LOW
	EP	Negative Power Supply (opt)			The Exposed Pad on the QFN-16 package bottom is thermally connected to the die for improved heat transfer out of package. The pad is not electrically connected to the die, but is recommended to be electrically and thermally connected to V <sub>EE</sub> on the PC board.

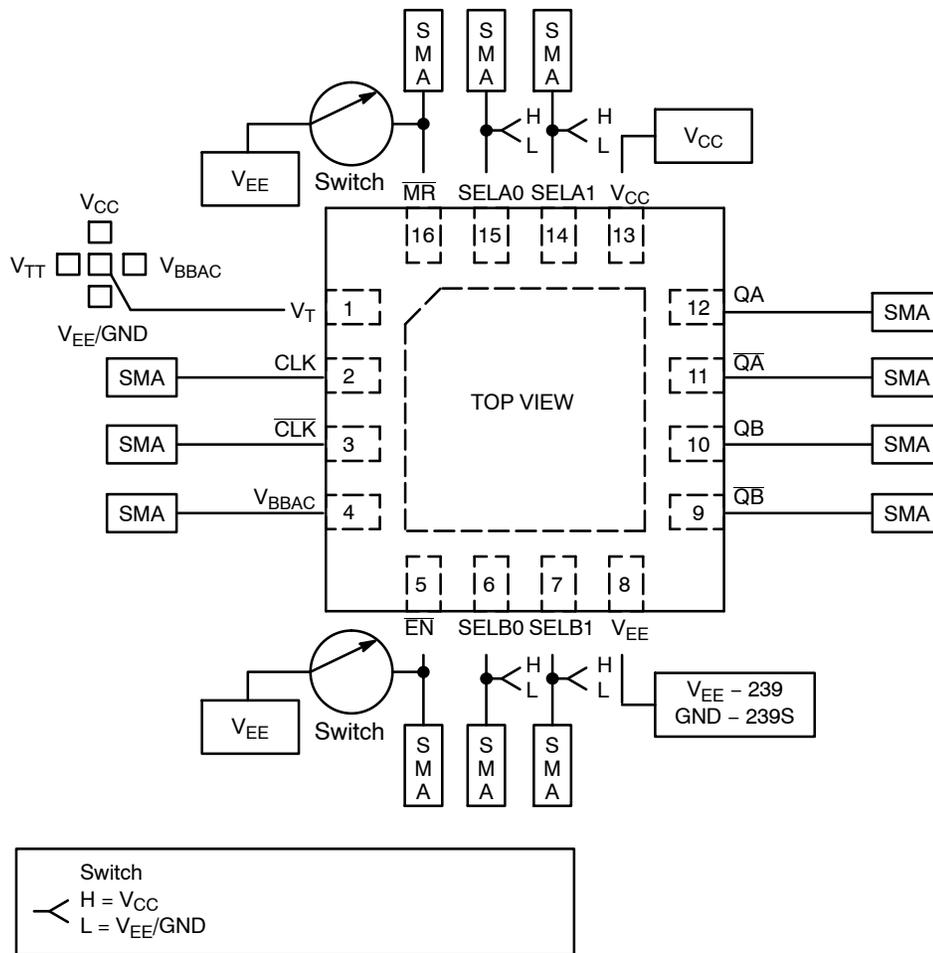
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## EVALUATION BOARD APPLICATION INFORMATION

**Table 3. EVALUATION BOARD BILL OF MATERIALS**

<b>Component</b>	<b>Description</b>	<b>Qty</b>
Connector	Rosenberger SMA #32K243-40ME3	6
Capacitor	22 $\mu$ F, 10%, KEMET T491D226K016AS, Case C or D	2
Capacitor	0.1 $\mu$ F, 10%, KEMET C060C104K5RAC	4
Switch	Grayhill #78B02	4
Jumper Header	100 mil, Berg	5
Jumper/Shunt		1
Resistor	1 k $\Omega$ , 0603	6
Banana Jack	Deltron #EF681 150-039 Red	1
Banana Jack	Deltron #EF681 150-040 Black	1
Banana Jack	Deltron #EF681 150-043 Yellow	1
Stand-offs with Screws	Optional	4
NB6L239 or NB6N239S	QFN-16 Part Mounted on Board	1
QFN-16 Socket	Optional, M&M #50-000-00350	1

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Rosenberger connectors with matched trace launches  
 Switch for  $\overline{MR}$   
 Normally open switch for  $\overline{EN}$   
 CLK &  $\overline{CLK}$  traces – equal length  
 All Q Output traces – equal length  
 “Side-mount” banana jacks for power supplies (can be located on backside of board)  
 $V_T$  pin has a “jumper capability to  $V_{CC}$ ,  $V_{EE} / GND$ ,  $V_{TT}$  (SMAGND), or  $V_{BBAC}$ ”

Figure 4. Evaluation Demo Board

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