

# NB7L11MMNEVB

## Evaluation Board Manual for NB7L11M



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### Description

This document describes the NB7L11M evaluation board and the appropriate lab test setups (See Figure 1). It should be used in conjunction with the NB7L11M data sheet which contains full technical details on the device specification and operation.

The evaluation board is designed to facilitate a quick evaluation of the NB7L11M GigaComm™ Clock Driver. The NB7L11M is designed to support the distribution of clock/data signals at high operating frequencies and produces two equal differential clock/data outputs from a single input clock/data. The Current Mode Logic (CML) output ensures minimal noise and fast switching edges.

The evaluation board is implemented in two layers for higher performance.

### Board Lay-up

The board is implemented in two layers and provides a high bandwidth 50 Ω controlled impedance environment for higher performance. The first layer or primary trace layer is 5 mils thick Rogers RO6002 material, which is engineered to have equal electrical length on all signal traces from the NB7L11M device to the sense output. The second layer is 32 mils thick copper ground plane.

### What measurements can you expect to make?

With this evaluation board, the following measurements could be performed in single-ended or differential modes of operation:

- Jitter
- Output Skew
- Gain/Return Loss
- Eye Pattern Generation
- Frequency Performance
- Output Rise and Fall Time
- $V_{CMR}$  (Common Mode Range)

### This Evaluation Board Manual Contains:

- Information on NB7L11MMNEVB Evaluation Board
- Appropriate Lab Setup
- Bill of Materials

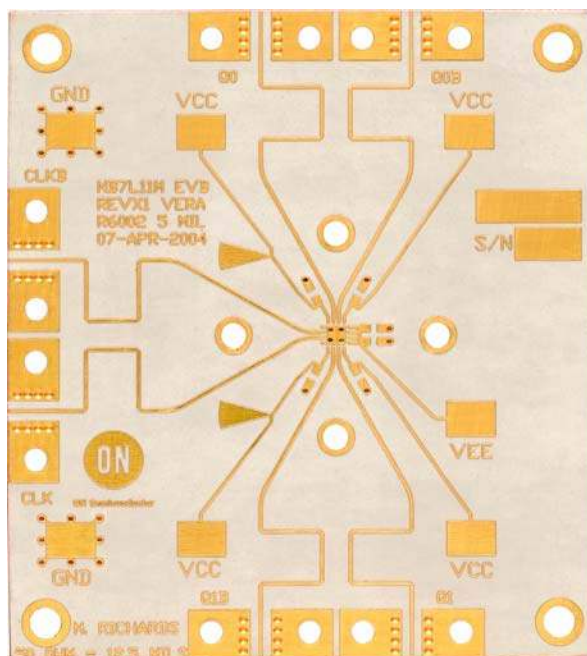


Figure 1. NB7L11M Evaluation Board

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## Setup for Time Domain Measurements

**Table 1. Basic Equipment**

Description	Example Equipment (Note 1)	Qty.
Power Supply with 2 outputs	HP6624A	1
Oscilloscope	TDS8200 or TDS8000	1
Differential Signal Generator	HP 8133A, Advantest D3186	1
Matched high speed cables with SMA connectors	Storm, Semflex	6
Power Supply cables with clips		6

1. Equipment used to generate example measurements within this document.

### Setup

**Step 1:**

**Connect Power**

1a: Two power levels must be provided to the board for  $V_{CC}$ ,  $V_{EE}$ , and GND via the surface mount clips.

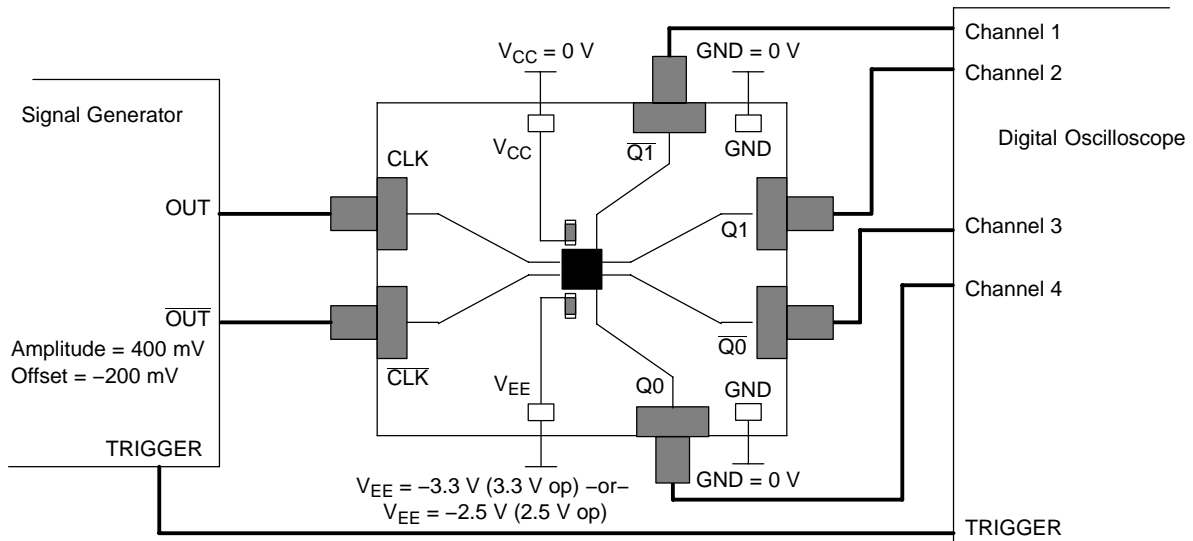
Power Supply Connections	
3.3 V Setup	2.5 V Setup
$V_{CC} = 0\text{ V}$	$V_{CC} = 0\text{ V}$
$GND = 0\text{ V}$	$GND = 0\text{ V}$
$V_{EE} = -3.3\text{ V}$	$V_{EE} = -2.5\text{ V}$

**Step 2:**

**Connect Inputs**

For Differential Mode (3.3 V and 2.5 V operation)

2a: Connect the differential output of the generator to the differential input of the device (CLK and  $\overline{\text{CLK}}$ ).



NOTE: All differential cable pairs **must be** matched.

**Figure 2. NB7L11M Board Setup – Time Domain (Differential Mode)**

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### Setup (continued)

#### Setup Input Signals

##### Step 3:

3a: Set the signal generator amplitude to 400 mV.

NOTE: The signal generator amplitude can vary from 75 mV to 900 mV to produce a 400 mV DUT output.

3b: Set the signal generator offset to  $-200$  mV (the center of a nominal NCML output).

NOTE: The  $V_{CMR}$  (Input Common Mode Range) allows the signal generator offset to vary as long as  $V_{TH}$  is within the  $V_{CMR}$  range. Refer to the device data sheet for further information.

3c: Set the generator output for a PRBS data signal, or for a square wave clock signal with a 50% duty cycle.

#### Connect Output Signals

##### Step 4:

4a: Connect the outputs of the device (Q0, Q1, ...) to the oscilloscope. The oscilloscope sampling head must have internal  $50\ \Omega$  termination to ground.

NOTE: Where a single output is being used, the unconnected output for the pair ***must be*** terminated to  $V_{CC}$  through a  $50\ \Omega$  resistor for best operation. Unused pairs may be left unconnected.

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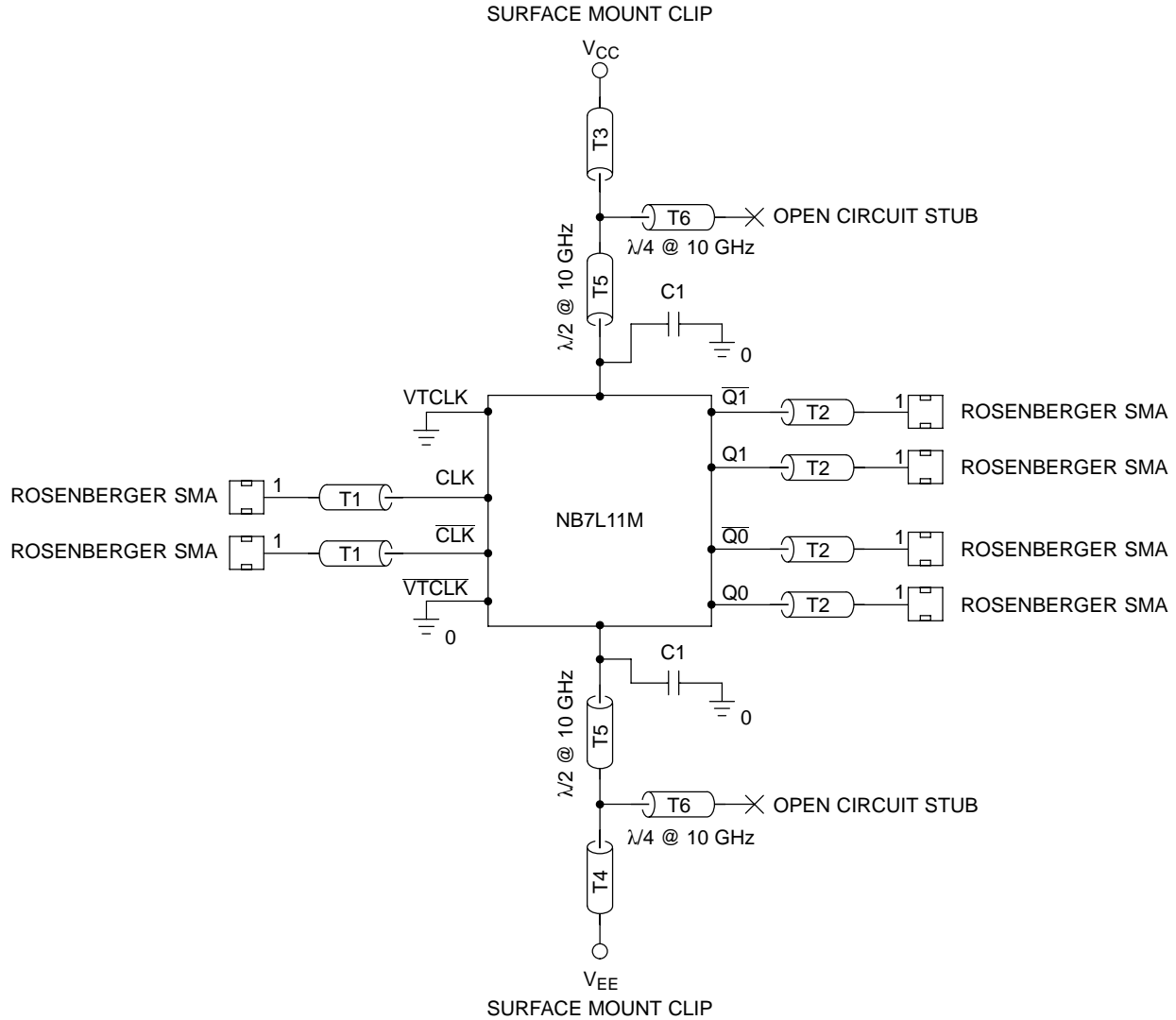
## More Information About Evaluation Board

### Design Considerations for >10 GHz operation

While the NB7L11M is specified to operate at 10 GHz, this evaluation board is designed to support operating frequencies up to 20 GHz.

The following considerations played a key role to ensure this evaluation board achieves high-end microwave performance:

- Optimal SMA connector launch
- Minimal insertion loss and signal dispersion
- Accurate Transmission line matching (50 ohms)
- Distributed effects while bypassing and noise filtering



NOTE: C1 = Decoupling cap and Tx = 50 Ω Transmission line

Figure 3. Evaluation Board Schematic

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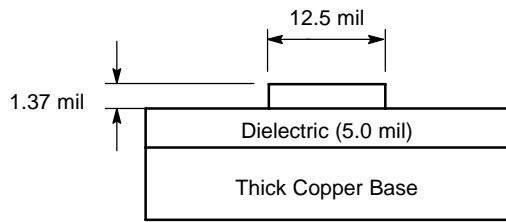
**Table 2. Parts List**

Part No	Qty	Description	Manufacturer	WEB address
NB7L11MMN	1	2.5 V / 3.3 V Differential 1:2 Clock/Data Fanout Buffer/Translator with CML outputs and Internal Termination	ON Semiconductor	<a href="http://www.onsemi.com/NB7L11M">http://www.onsemi.com/NB7L11M</a>
32K243-40ME3	6	Gold plated connector	Rosenberger	<a href="http://www.rosenberger.de">http://www.rosenberger.de</a>
CO6BLBB2X5UX	6	2 MHz – 30 GHz capacitor	Dielectric Laboratories	<a href="http://www.dilabs.com">http://www.dilabs.com</a>
5016	7	Test point – Anvll	Keystone*	<a href="http://www.newark.com">http://www.newark.com</a> <a href="http://www.digikey.com">http://www.digikey.com</a>

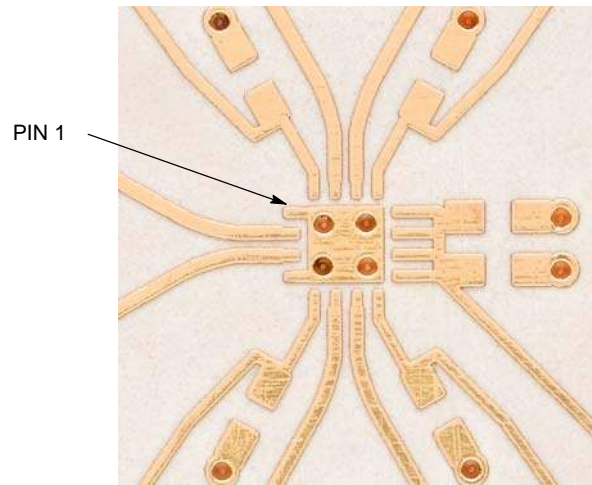
\*Components are available through distribution.

**Table 3. Board Material**

Material	Thickness
Rogers 6002	5.0 mil
Copper Plating	32 mil

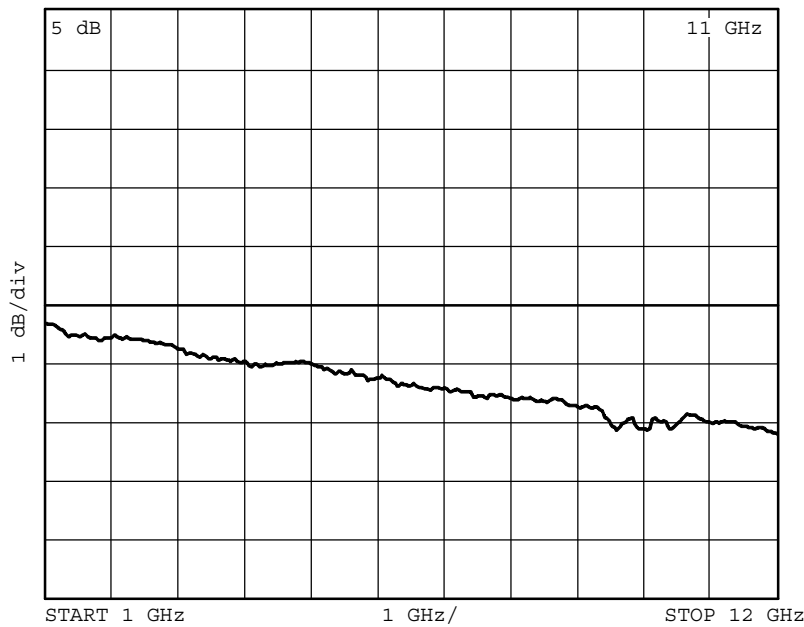


**Figure 4. Board Stack-up**



**Figure 5. Layout Mask for NB7L11M**

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NOTE: The insertion loss curve can be used to calibrate out board loss if testing under small signal conditions.

**Figure 6. Insertion Loss**

## ADDITIONAL EVALUATION BOARD INFORMATION

### www.onsemi.com

In all cases, the most up-to-date information can be found on our website.

- Sample orders for devices and boards
- New Product updates
- Literature download/order
- IBIS and Spice models

### References

NB7L11M/D Data Sheet.

AND8077/D, Application Note, *GigaComm™ (SiGe) SPICE Modeling Kit*.

AND8075/D, Application Note, *Board Mounting Considerations for the FCBGA Packages*.

BRD8017/D, Brochure, *Clock and Data Management Solutions*.

## ORDERING INFORMATION

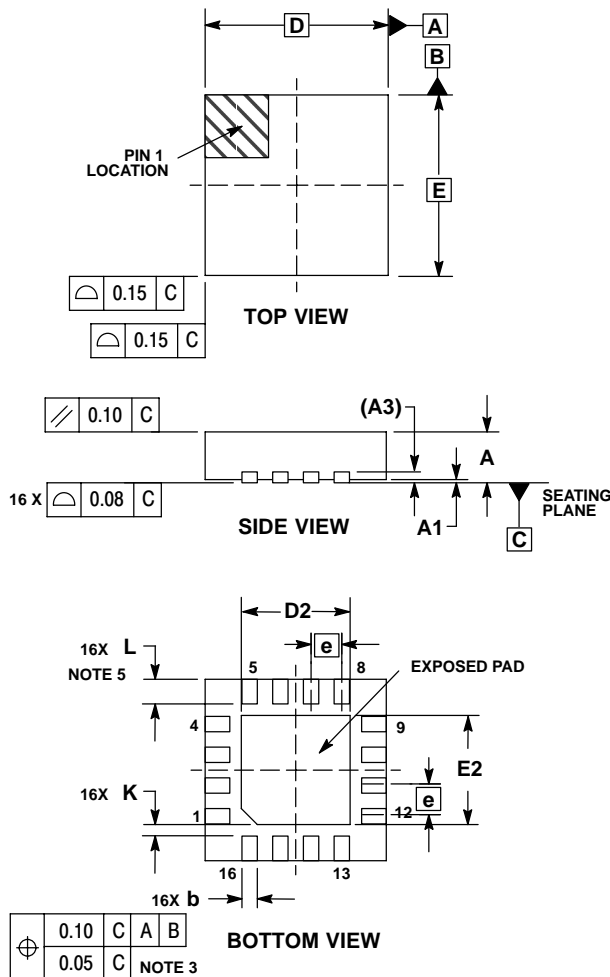
Device	Package	Shipping†
NB7L11MMN	QFN-16	123 Units/Rail
NB7L11MMNG	QFN-16 (Pb-Free)	123 Units/Rail
NB7L11MMNR2	QFN-16	3000 Tape & Reel
NB7L11MMNR2G	QFN-16 (Pb-Free)	3000 Tape & Reel
NB7L11MMNEVB	N/A	N/A

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

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## PACKAGE DIMENSIONS

16 PIN QFN  
CASE 485G-01  
ISSUE C



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSION b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.25 AND 0.30 MM FROM TERMINAL.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.
5. L<sub>max</sub> CONDITION CAN NOT VIOLATE 0.2 MM MINIMUM SPACING BETWEEN LEAD TIP AND FLAG

DIM	MILLIMETERS	
	MIN	MAX
A	0.80	1.00
A1	0.00	0.05
A3	0.20 REF	
b	0.18	0.30
D	3.00 BSC	
D2	1.65	1.85
E	3.00 BSC	
E2	1.65	1.85
e	0.50 BSC	
K	0.18 TYP	
L	0.30	0.50

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**NB7L11MMNEVB/D**