NB7L14MMNEVB

NB7L14M Evaluation Board User's Manual

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EVAL BOARD USER'S MANUAL

Description

This document describes the NB7L14M evaluation board and the appropriate lab test setups. It should be used in conjunction with the NB7L14M data sheet which contains full technical details on the device specifications and operation.

The evaluation board is designed to facilitate a quick evaluation of the NB7L14M GigaComm™ clock/data receiver/driver/translator device. The NB7L14M is designed to support the distribution of clock/data signals at high operating frequencies and produces four 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 NB7L14M 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
- Gain/Return Loss
- Eye Pattern Generation
- Frequency Performance
- Output Rise and Fall Time
- V_{CMR} (Common Mode Range)

This Evaluation Board User's Manual Contains:

- Information on NB7L14MMNEVB Evaluation Board
- Appropriate Lab Setup
- Bill of Materials

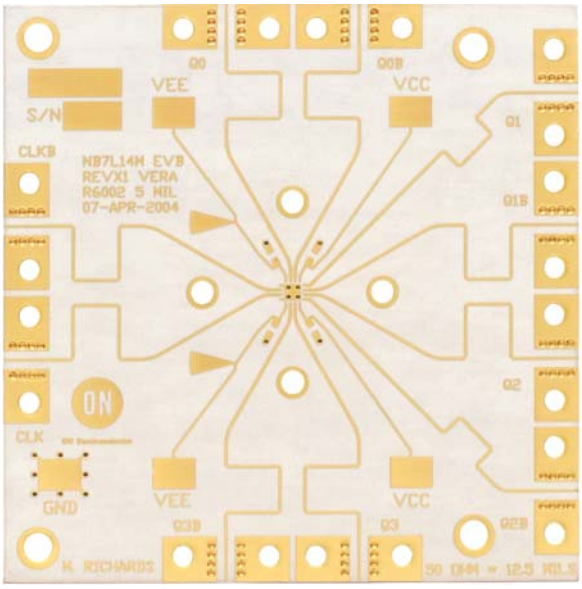


Figure 1. NB7L14M Evaluation Board

SETUP FOR TIME DOMAIN MEASUREMENTS

Table 1. BASIC EQUIPMENT

Description	Example Equipment (Note 1)	Qty.
Power Supply with 2 outputs	HP6624A	1
Oscilloscope	TDS8000 with 80E01 Sampling Head (Note 2)	1
Differential Signal Generator	HP 8133A, Advantest D3186	1
Matched high speed cables with SMA connectors	Storm, Semflex	10
Power Supply cables with clips		4

1. Equipment used to generate example measurements within this document.
2. 50 GHz sample module used (for effective rise, fall and jitter performance measurement)

Setup

Step 1: Connect Power

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

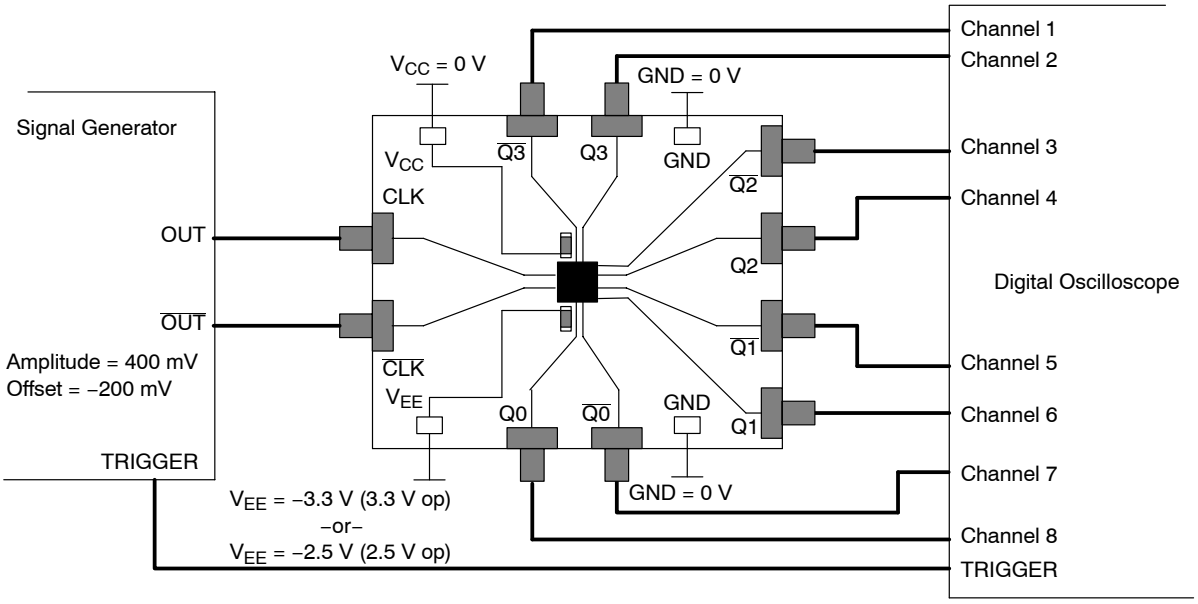
Table 2. POWER SUPPLY CONNECTIONS

3.3 V Setup	2.5 V Setup
V_{CC} = 0 V	V_{CC} = 0 V
GND = 0 V	GND = 0 V
V_{EE} = −3.3 V	V_{EE} = −2.5 V

Step 2: Connect Inputs

For Differential Mode

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



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

Figure 2. NB7L14M Board Setup − Time Domain (Differential Mode)

Setup (continued)

Step 3: Setup Input Signals

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} (Voltage 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.

Step 4: Connect Output Signals

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

NOTE: Where a single output is being used, the unconnected output for the pair ***must be*** terminated to V_{CC} = GND through a 50 Ω resistor for best operation. Unused pairs may be left unconnected. Since V_{CC} = GND, a standard 50 Ω SMA termination is recommended.

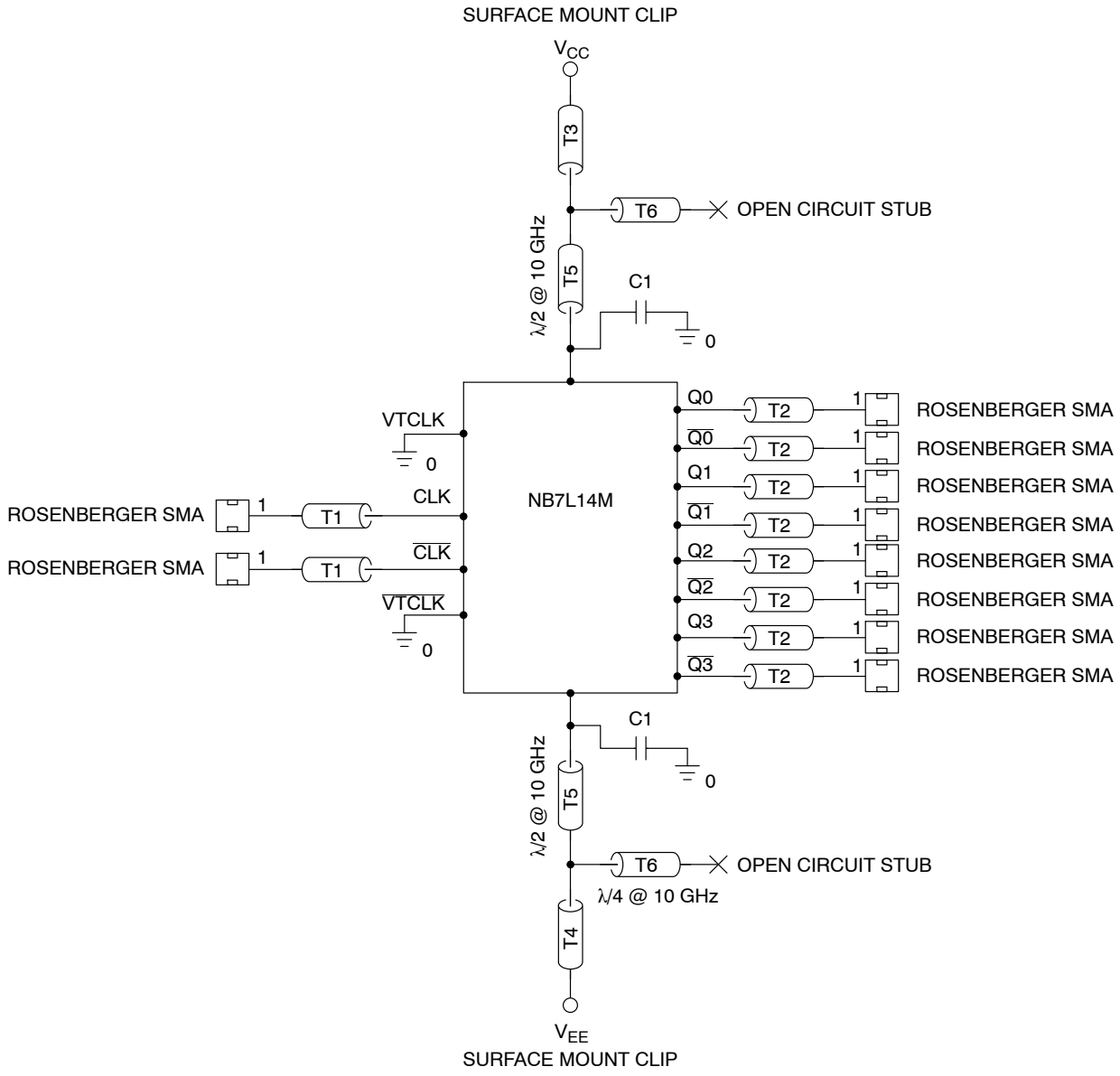
MORE INFORMATION ABOUT EVALUATION BOARD

Design Considerations for >10 GHz operation

While the NB7L14M 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 (broadband cap with the range from 2 MHz to 30 GHz)
Tx = 50 Ω Transmission line

Figure 3. Evaluation Board Schematic

Table 3. BILL OF MATERIALS

Part No.	Qty.	Description	Manufacturer	WEB Address
NB7L14M	1	2.5V/3.3V SiGe Differential 1:4 Clock/Data Driver with CML Outputs and Internal Termination	ON Semiconductor	http://www.onsemi.com
32K243−40ME3	10	Gold plated connector	Rosenberger	http://www.rosenberger.de
CO6BLBB2X5UX or C0603C104K4RAC	4	2 MHz − 30 GHz capacitor 0603 0.1 μF ± 10%	Dielectric Laboratories Kemet*	http://www.dilabs.com www.newark.com
5016	4	Test Point − Anvil	Keystone*	

*Components are available through most distributors, i.e. www.newark.com or www.digikey.com.

Table 4. BOARD MATERIAL

Material	Thickness
Rogers 6002	5.0 mil
Copper Plating	32 mil

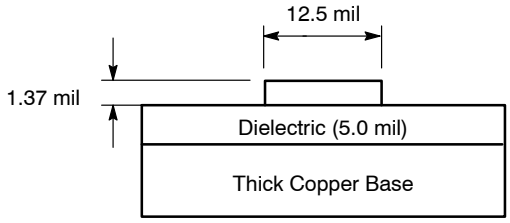


Figure 4. Board Stack−up

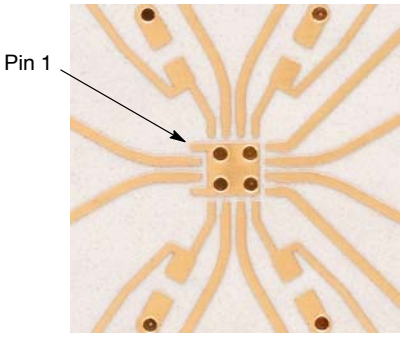
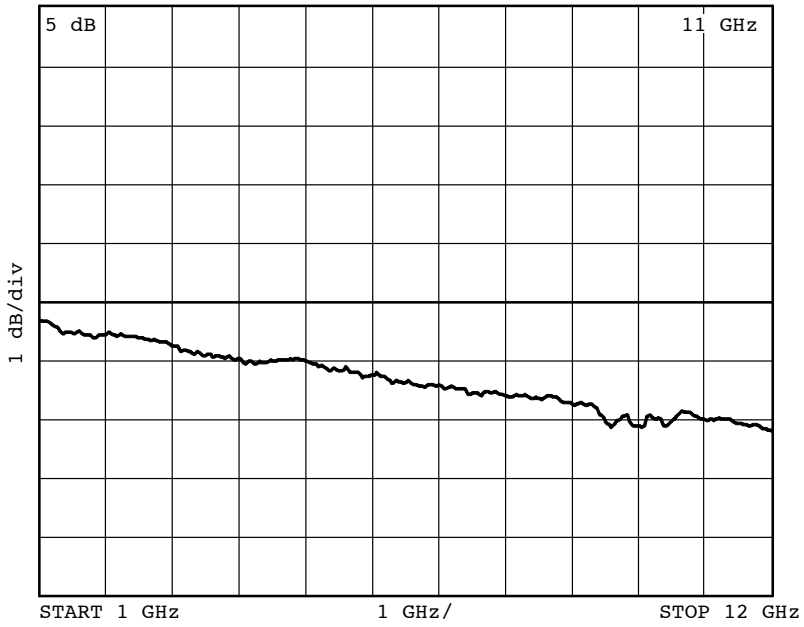


Figure 5. Layout Mask for NB7L14M



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

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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

NB7L14M/D, Data Sheet.

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

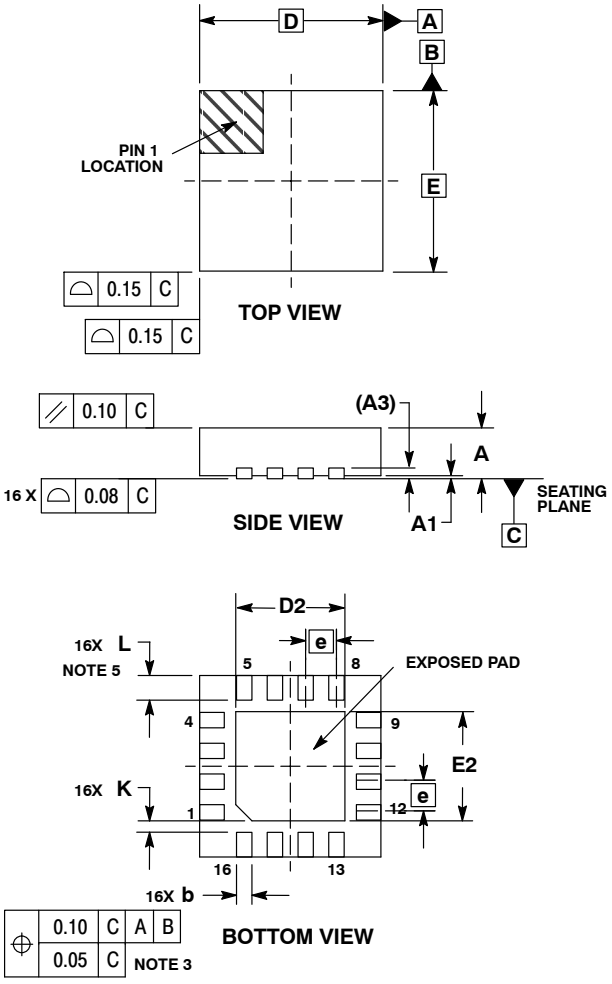
AND8075/D, Application Note, *Board Mounting Considerations for the FCBGA Packages.*

ORDERING INFORMATION

Device	Package	Shipping†
NB7L14MMN	QFN−16	123 Units/Rail
NB7L14MMNG	QFN−16 (Pb−Free)	123 Units/Rail
NB7L14MMNR2	QFN−16	3000 Tape & Reel
NB7L14MMNR2G	QFN−16 (Pb−Free)	3000 Tape & Reel
NB7L14MMNEVB	N/A	N/A

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_{max} CONDITION CAN NOT VIOLATE 0.2 MM MINIMUM SPACING BETWEEN LEAD TIP AND FLAG

	MILLIMETERS	
DIM	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

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
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