

# NB7L111M

## 2.5V / 3.3V, 6.125Gb/s 1:10 Differential Clock/Data Driver with CML Output

### Description

The NB7L111M is a low skew 1-to-10 differential clock/data driver, designed with clock/data distribution in mind. It accepts two clock/data sources into multiplexer input and reproduces ten identical CML differential outputs. This device is ideal for clock/data distribution across the backplane or a board, and redundant clock switchover applications.

The input signals can be either differential or single-ended (if the external reference voltage is provided). Differential inputs incorporate internal 50  $\Omega$  termination resistors and accept Negative ECL (NECL), Positive ECL (PECL), LVCMOS, LVTTTL, CML, or LVDS (using appropriate power supplies). The differential 16 mA CML output provides matching internal 50  $\Omega$  termination, and 400 mV output swing when externally terminated 50  $\Omega$  to  $V_{CC}$ .

The NB7L111M operates from a 2.5 V  $\pm 5\%$  supply or a 3.3 V  $\pm 5\%$  supply and is guaranteed over the full industrial temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . This device is packaged in a low profile 8x8 mm, QFN-52 package with 0.5 mm pitch (see package dimension on the back of the datasheet).

Application notes, models, and support documentation are available at [www.onsemi.com](http://www.onsemi.com).

### Features

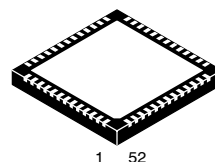
- Maximum Input Clock Frequency > 5.5 GHz Typical
- Maximum Input Data Rate > 6.125 Gb/s Typical
- < 0.5 ps Maximum Clock RMS Jitter
- < 15 ps Maximum Data Dependent Jitter at 3.125 Gb/s
- 50 ps Typical Rise and Fall Times
- 240 ps Typical Propagation Delay
- 2 ps Typical Duty Cycle Skew
- 10 ps Typical Within Device Skew
- 15 ps Typical Device-to-Device Skew
- Operating Range:  $V_{CC} = 2.5 \text{ V} \pm 5$  and  $3.3 \text{ V} \pm 5$
- 400 mV Differential CML Output Swing
- 50  $\Omega$  Internal Input and Output Termination Resistors
- Pb-Free Packages are Available\*

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



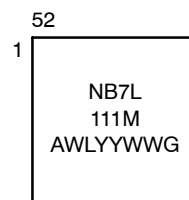
ON Semiconductor®

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QFN-52  
MN SUFFIX  
CASE 485M

### MARKING DIAGRAM\*



A = Assembly Site  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

\*For additional marking information, refer to Application Note AND8002/D.

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

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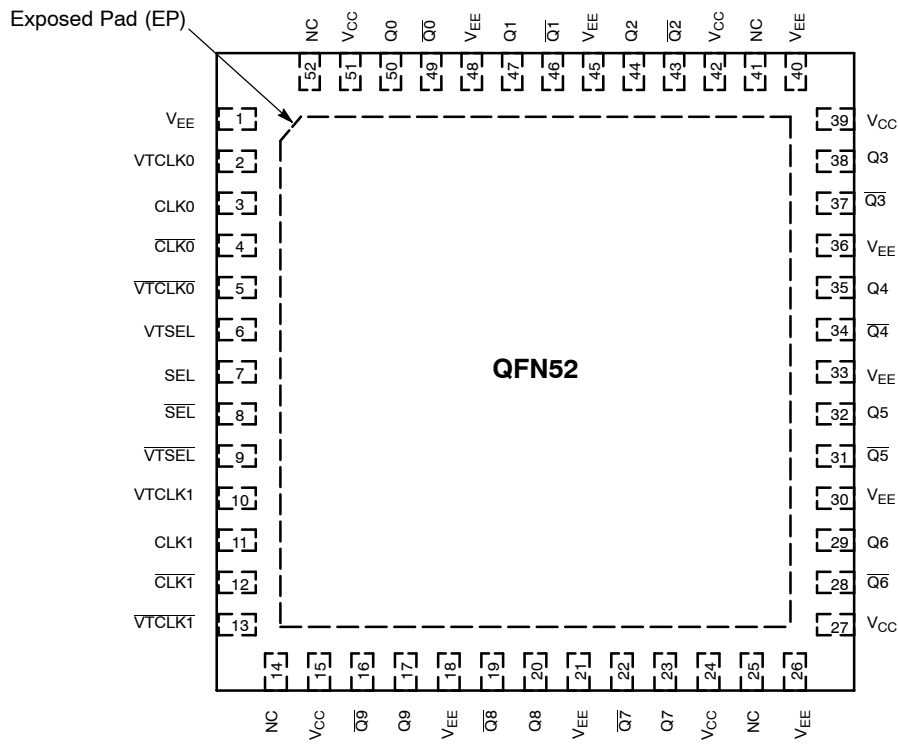


Figure 1. Pinout (Top View)

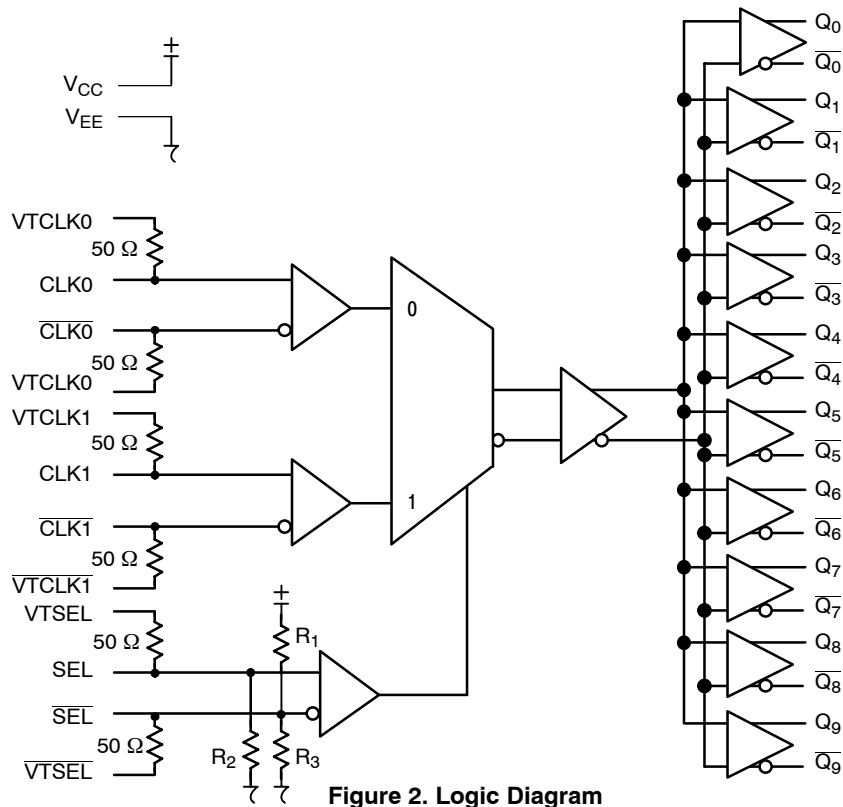


Figure 2. Logic Diagram

Table 1. FUNCTION TABLE

| SEL  | SEL  | CLK0/CLK0 | CLK1/CLK1 |
|------|------|-----------|-----------|
| LOW  | HIGH | ON        | OFF       |
| HIGH | LOW  | OFF       | ON        |

Table 2. PIN DESCRIPTION

| Pin                                    | Name                       | I/O                                     | Description                                                                                                                                                           |
|----------------------------------------|----------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 15, 24, 27, 39, 42, 51                 | V <sub>CC</sub>            | –                                       | Positive supply voltage. All V <sub>CC</sub> pins must be externally connected to power supply to guarantee proper operation.                                         |
| 1, 18, 21, 26, 30, 33, 36, 40, 45, 48  | V <sub>EE</sub>            | –                                       | Negative supply voltage. All V <sub>EE</sub> pins must be externally connected to power supply to guarantee proper operation.                                         |
| 2                                      | VTCLK0                     | –                                       | Internal 50 Ω termination pin for CLK0. (Note 2)                                                                                                                      |
| 3                                      | CLK0                       | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Non-inverted differential clock/data input 0 (Note 2).                                                                                                                |
| 4                                      | $\overline{\text{CLK0}}$   | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Inverted differential clock/data input 0 (Note 2).                                                                                                                    |
| 5                                      | $\overline{\text{VTCLK0}}$ | –                                       | Internal 50 Ω termination pin for $\overline{\text{CLK0}}$ . (Note 2)                                                                                                 |
| 6                                      | VTSEL                      | –                                       | Internal 50 Ω termination pin for SEL. (Note 2)                                                                                                                       |
| 7                                      | SEL                        | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Non-inverted differential clock/data select input. Internal 75 kΩ to V <sub>EE</sub> .                                                                                |
| 8                                      | $\overline{\text{SEL}}$    | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Inverted differential clock/data select input. Internal 56 kΩ to V <sub>CC</sub> and 56 kΩ to V <sub>EE</sub> bias this pin to (V <sub>CC</sub> –V <sub>EE</sub> )/2. |
| 9                                      | VTSEL                      | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Internal 50 Ω termination pin for $\overline{\text{SEL}}$ . (Note 2)                                                                                                  |
| 10                                     | VTCLK1                     | –                                       | Internal 50 Ω termination pin for CLK1. (Note 2)                                                                                                                      |
| 11                                     | CLK1                       | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Non-inverted differential clock/data input 1 (Note 2).                                                                                                                |
| 12                                     | $\overline{\text{CLK1}}$   | LVPECL, CML, LVCMOS, LVTTTL, LVDS Input | Inverted differential clock/data input 1 (Note 2).                                                                                                                    |
| 13                                     | $\overline{\text{VTCLK1}}$ | –                                       | Internal 50 Ω termination pin for $\overline{\text{CLK1}}$ . (Note 2)                                                                                                 |
| 14, 25, 41, 52                         | NC                         | –                                       |                                                                                                                                                                       |
| 17, 20, 23, 29, 32, 35, 38, 44, 47, 50 | Q[0–9]                     | CML Outputs                             | Non-inverted CML outputs [0–9] with internal 50 Ω source termination resistor (Note 1).                                                                               |
| 16, 19, 22, 28, 31, 34, 37, 43, 46, 49 | $\overline{\text{Q[0–9]}}$ | CML Outputs                             | Inverted CML outputs [0–9] with internal 50 Ω source termination resistor (Note 1).                                                                                   |
| EP                                     | –                          | –                                       | Exposed Pad (EP). The thermally exposed pad on package bottom (see case drawing) must be attached to a heat-sinking conduit on the printed circuit board.             |

1. CML output requires 50 Ω receiver termination resistor to V<sub>CC</sub> for proper operation.
2. In the differential configuration when the input termination pin (VTCLK,  $\overline{\text{VTCLK}}$ ) are connected to a common termination voltage or left open, and if no signal is applied on CLK and  $\overline{\text{CLK}}$  then the device will be susceptible to self-oscillation.

Table 3. ATTRIBUTES

| Characteristics                                        |                                   | Value                |             |
|--------------------------------------------------------|-----------------------------------|----------------------|-------------|
| Input Default State Resistors                          | R1, R3<br>R2                      | 56 kΩ<br>75 kΩ       |             |
| ESD Protection                                         | Human Body Model<br>Machine Model | > 1400 V<br>> 80 V   |             |
| Moisture Sensitivity (Note 3)                          |                                   | Pb Pkg               | Pb-Free Pkg |
|                                                        | QFN-52                            | Level 2              | Level 1     |
| Flammability Rating                                    | Oxygen Index: 28 to 34            | UL 94 V-0 @ 0.125 in |             |
| Transistor Count                                       |                                   | 339                  |             |
| Meets or exceeds JEDEC Spec EIA/JESD78 IC Latchup Test |                                   |                      |             |

3. For additional information, see Application Note AND8003/D.

Table 4. MAXIMUM RATINGS (Note 4)

| Symbol            | Parameter                                                   | Condition 1                                                                            | Condition 2                                        | Rating                                    | Unit         |
|-------------------|-------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------|--------------|
| V <sub>CC</sub>   | Positive Power Supply                                       | V <sub>EE</sub> = 0 V                                                                  |                                                    | 3.6                                       | V            |
| V <sub>I</sub>    | Input Voltage                                               | V <sub>EE</sub> = 0 V                                                                  | V <sub>EE</sub> ≤ V <sub>I</sub> ≤ V <sub>CC</sub> | 3.6                                       | V            |
| V <sub>INPP</sub> | Differential Input Voltage  CLK – $\overline{\text{CLK}}$   | V <sub>CC</sub> – V <sub>EE</sub> ≥ 2.8 V<br>V <sub>CC</sub> – V <sub>EE</sub> < 2.8 V |                                                    | 2.8<br> V <sub>CC</sub> – V <sub>EE</sub> | V<br>V       |
| I <sub>in</sub>   | Input Current Through R <sub>T</sub> (50 $\Omega$ Resistor) | Continuous<br>Surge                                                                    |                                                    | 25<br>50                                  | mA<br>mA     |
| I <sub>out</sub>  | Output Current                                              | Continuous<br>Surge                                                                    |                                                    | 25<br>50                                  | mA<br>mA     |
| T <sub>A</sub>    | Operating Temperature Range                                 | QFN52                                                                                  |                                                    | –40 to +85                                | °C           |
| T <sub>stg</sub>  | Storage Temperature Range                                   |                                                                                        |                                                    | –65 to +150                               | °C           |
| $\theta_{JA}$     | Thermal Resistance (Junction-to-Ambient)<br>(Note 5)        | 0 lfpm<br>500 lfpm                                                                     | QFN52                                              | 25<br>19.6                                | °C/W<br>°C/W |
| $\theta_{JC}$     | Thermal Resistance (Junction-to-Case)                       | 1S2P (Note 8)                                                                          | QFN52                                              | 21                                        | °C/W         |
| T <sub>sol</sub>  | Wave Solder<br>Pb<br>Pb-Free                                |                                                                                        |                                                    | 265<br>265                                | °C           |

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

4. Maximum Ratings are those values beyond which device damage may occur.

5. JEDEC standard multilayer board – 1S2P (1 signal, 2 power).

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**Table 5. DC CHARACTERISTICS**  $V_{CC} = 2.375\text{ V}$   $2.625\text{ V}$  and  $3.135\text{ V}$  to  $3.465\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$  (Notes 6 and 7)

| Symbol   | Characteristic                                                                                                                                   | Min                              | Typ                              | Max                              | Unit |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------|----------------------------------|------|
| $I_{CC}$ | Power Supply Current (Inputs and Outputs Open)<br>$V_{CC} = 2.375\text{ V}$ to $2.625\text{ V}$<br>$V_{CC} = 3.135\text{ V}$ to $3.465\text{ V}$ | 255<br>270                       | 290<br>305                       | 325<br>340                       | mA   |
| $V_{OH}$ | Output HIGH Voltage (Notes 6 and 7)                                                                                                              | $V_{CC} - 40$                    | $V_{CC} - 20$                    | $V_{CC}$                         | mV   |
| $V_{OL}$ | Output LOW Voltage (Notes 6 and 7)<br>$V_{CC} = 2.375\text{ V}$ to $2.625\text{ V}$<br>$V_{CC} = 3.135\text{ V}$ to $3.465\text{ V}$             | $V_{CC} - 440$<br>$V_{CC} - 490$ | $V_{CC} - 350$<br>$V_{CC} - 400$ | $V_{CC} - 290$<br>$V_{CC} - 340$ | mV   |

## DIFFERENTIAL INPUT DRIVEN SINGLE-ENDED (See Figures 13 and 15)

|          |                                                  |               |  |                |    |
|----------|--------------------------------------------------|---------------|--|----------------|----|
| $V_{th}$ | Input Threshold Reference Voltage Range (Note 8) | 1125          |  | $V_{CC} - 75$  | mV |
| $V_{IH}$ | Single-ended Input HIGH Voltage (Note 7)         | $V_{th} + 75$ |  | $V_{CC}$       | mV |
| $V_{IL}$ | Single-ended Input LOW Voltage (Note 7)          | $V_{EE}$      |  | $V_{CC} - 150$ | mV |

## DIFFERENTIAL INPUTS DRIVEN DIFFERENTIALLY (See Figures 14 and 16)

|                    |                                                                                            |              |       |               |               |
|--------------------|--------------------------------------------------------------------------------------------|--------------|-------|---------------|---------------|
| $V_{IHD}$          | Differential Input HIGH Voltage                                                            | 1200         |       | $V_{CC}$      | mV            |
| $V_{ILD}$          | Differential Input LOW Voltage                                                             | $V_{EE}$     |       | $V_{CC} - 75$ | mV            |
| $V_{CMR}$          | Input Common Mode Range (Differential Configuration) (Note 9)                              | 1163         |       | $V_{CC} - 37$ | mV            |
| $V_{ID}$           | Differential Input Voltage ( $V_{IHD} - V_{ILD}$ )                                         | 75           |       | 2500          | mV            |
| $I_{IH}$           | Input HIGH Current<br>(Termination Pins Open) $\text{CLK}[0-1]/\text{CLK}[0-1]$<br>SEL/SEL | -100<br>-150 | 5     | 100<br>150    | $\mu\text{A}$ |
| $I_{IL}$           | Input LOW Current<br>(Termination Pins Open) $\text{CLK}[0-1]/\text{CLK}[0-1]$<br>SEL/SEL  | -100<br>-150 | 5     | 100<br>150    | $\mu\text{A}$ |
| $R_{TIN}$          | Internal Input Termination Resistor                                                        | 45           | 50    | 55            | $\Omega$      |
| $R_{TOUT}$         | Internal Output Termination Resistor                                                       | 45           | 50    | 55            | $\Omega$      |
| $R_{Temp}$<br>Coef | Internal I/O Termination Resistor Temperature Coefficient                                  |              | -3.75 |               | m $\Omega$ /C |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

6. CML outputs require  $50\ \Omega$  receiver termination resistors to  $V_{CC}$  for proper operation.
7. Input and output parameters vary 1:1 with  $V_{CC}$ .
8.  $V_{th}$  is applied to the complementary input when operating in single-ended mode.
9.  $V_{CMR}(\text{MIN})$  varies 1:1 with  $V_{EE}$ ,  $V_{CMR}(\text{MAX})$  varies 1:1 with  $V_{CC}$ .

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**Table 6. AC CHARACTERISTICS**  $V_{CC} = 2.375\text{ V to }2.625\text{ V and }3.135\text{ V to }3.465\text{ V}$ ,  $V_{EE} = 0\text{ V}$ ; (Note 10)

| Symbol                   | Characteristic                                                                                                                                                                                                                                                                                        | -40°C      |                             |                              | 25°C       |                             |                              | 85°C       |                             |                              | Unit |
|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----------------------------|------------------------------|------------|-----------------------------|------------------------------|------------|-----------------------------|------------------------------|------|
|                          |                                                                                                                                                                                                                                                                                                       | Min        | Typ                         | Max                          | Min        | Typ                         | Max                          | Min        | Typ                         | Max                          |      |
| $V_{OUTPP}$              | Output Voltage Amplitude (@ $V_{inppmin}$ )<br>(See Figures 3, 4, 5, and 6)<br>$V_{CC} = 2.375\text{ V to }2.625\text{ V}$<br>$f_{in} \leq 3\text{ GHz}$<br>$f_{in} \leq 5.5\text{ GHz}$<br>$V_{CC} = 3.135\text{ V to }3.465\text{ V}$<br>$f_{in} \leq 3\text{ GHz}$<br>$f_{in} \leq 5.5\text{ GHz}$ | 240<br>115 | 330<br>220                  |                              | 240<br>115 | 330<br>220                  |                              | 240<br>115 | 330<br>220                  |                              | mV   |
| $f_{DATA}$               | Maximum Operating Data Rate                                                                                                                                                                                                                                                                           | 5          | 6                           |                              | 5          | 6                           |                              | 5          | 6                           |                              | Gb/s |
| $t_{PLH}$ ,<br>$t_{PHL}$ | Differential Input-to-Output Propagation Delay<br>@ 1 GHz (See Figures 7 and 11)<br>CLK-Q<br>SEL-Q                                                                                                                                                                                                    | 200<br>290 | 240<br>340                  | 280<br>390                   | 200<br>290 | 240<br>340                  | 280<br>390                   | 200<br>290 | 240<br>340                  | 280<br>390                   | ps   |
| $t_{SKEW}$               | Duty Cycle Skew (Note 11)<br>Within Device Skew<br>Device-to-Device Skew (Note 15)                                                                                                                                                                                                                    |            | 2<br>10<br>15               | 15<br>20<br>80               |            | 2<br>10<br>15               | 15<br>20<br>80               |            | 2<br>10<br>15               | 15<br>20<br>80               | ps   |
| $t_{JITTER}$             | RMS Random Clock Jitter (Note 13)<br>$f_{in} = 3\text{ GHz}$<br>$f_{in} = 5.5\text{ GHz}$<br>Peak-to-Peak Data Dependent Jitter<br>(Note 14)<br>$f_{DATA} = 3.125\text{ Gb/s}$<br>$f_{DATA} = 5\text{ Gb/s}$<br>$f_{DATA} = 6.125\text{ Gb/s}$                                                        |            | 0.2<br>0.2<br>6<br>15<br>15 | 0.5<br>0.5<br>15<br>25<br>25 |            | 0.2<br>0.2<br>6<br>15<br>15 | 0.5<br>0.5<br>15<br>25<br>25 |            | 0.2<br>0.2<br>6<br>15<br>15 | 0.5<br>0.5<br>15<br>25<br>25 | ps   |
| $V_{INPP}$               | Input Voltage Swing/Sensitivity<br>(Differential Configuration)<br>(Note 12 and Figures 3, 4, 5, and 6)                                                                                                                                                                                               | 75         | 400                         | 2500                         | 75         | 400                         | 2500                         | 75         | 400                         | 2500                         | mV   |
| $t_r$ ,<br>$t_f$         | Output Rise/Fall Times @ 1 GHz<br>(20% – 80%)                                                                                                                                                                                                                                                         |            | 50                          | 75                           |            | 50                          | 75                           |            | 50                          | 75                           | ps   |

NOTE: Device will meet the specifications after thermal equilibrium has been established when mounted in a test socket or printed circuit board with maintained transverse airflow greater than 500 lfm. Electrical parameters are guaranteed only over the declared operating temperature range. Functional operation of the device exceeding these conditions is not implied. Device specification limit values are applied individually under normal operating conditions and not valid simultaneously.

10. Measured by forcing  $V_{INPP(MIN)}$  from a 50% duty cycle clock source. All loading with an external  $R_L = 50\ \Omega$  to  $V_{CC}$ . Input edge rates 40 ps (20% – 80%).

11. Duty cycle skew is measured between differential outputs using the deviations of the sum of  $T_{pw-}$  and  $T_{pw+}$  @ 1 GHz.

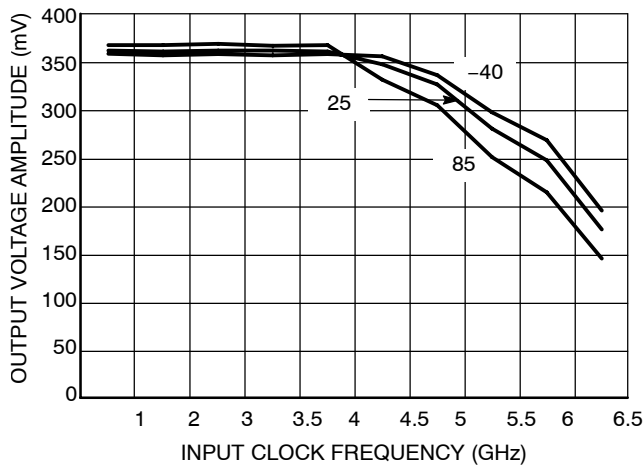
12.  $V_{INPP(MAX)}$  cannot exceed  $V_{CC} - V_{EE}$ . Input voltage swing is a single-ended measurement operating in differential mode.

13. Additive RMS jitter with 50% duty cycle clock signal.

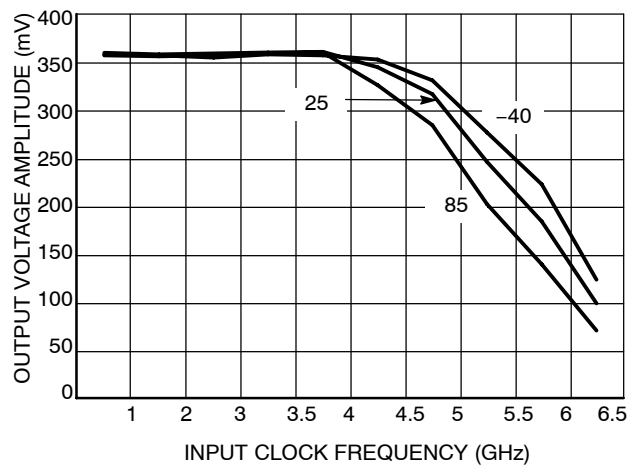
14. Additive peak-to-peak data dependent jitter with input NRZ data at PRBS  $2^{23}-1$ .

15. Device-to-device skew is measured between outputs under identical transition and conditions @ 1 GHz.

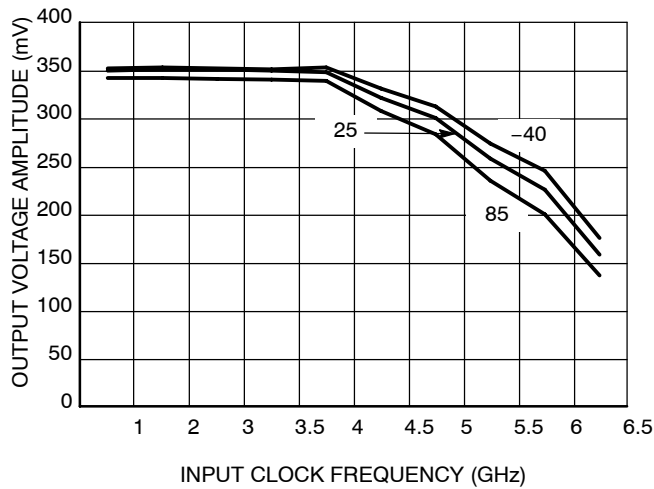
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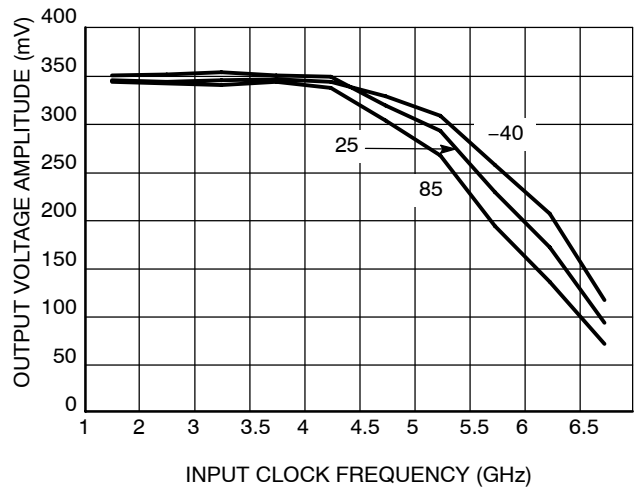
**Figure 3. Output Voltage Amplitude vs. Input Clock Frequency and Temperature**  
( $V_{inpp} = 400 \text{ mV}$ ;  $V_{CC} = 3.3 \text{ V}$ )



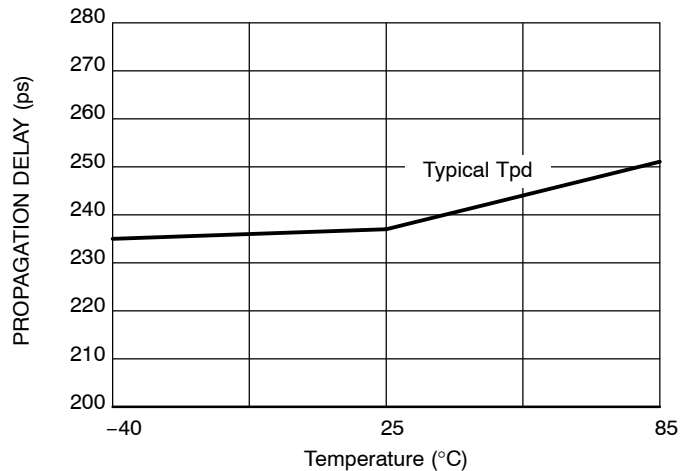
**Figure 4. Output Voltage Amplitude vs. Input Clock Frequency and Temperature**  
( $V_{inpp} = 75 \text{ mV}$ ;  $V_{CC} = 3.3 \text{ V}$ )



**Figure 5. Output Voltage Amplitude vs. Input Clock Frequency and Temperature**  
( $V_{inpp} = 400 \text{ mV}$ ;  $V_{CC} = 2.5 \text{ V}$ )



**Figure 6. Output Voltage Amplitude vs. Input Clock Frequency and Temperature**  
( $V_{inpp} = 75 \text{ mV}$ ;  $V_{CC} = 2.5 \text{ V}$ )



**Figure 7. Propagation Delay versus Temperature**

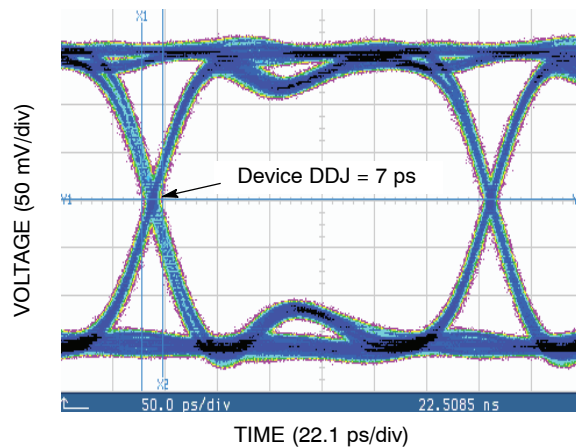
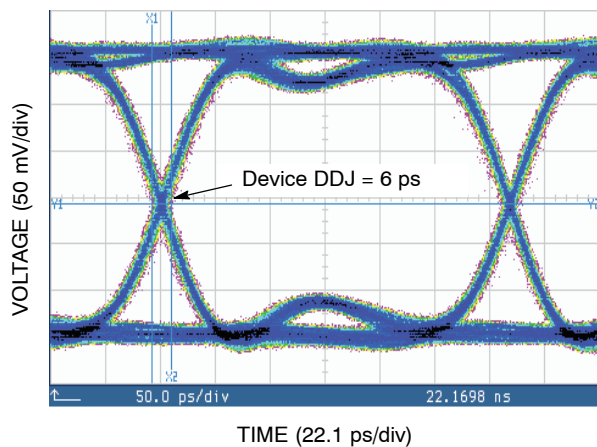


Figure 8. Typical Output Waveform at 3.125 Gb/s with PRBS  $2^{23}-1$  ( $V_{inpp} = 75$  mV–left and 400 mV–right)

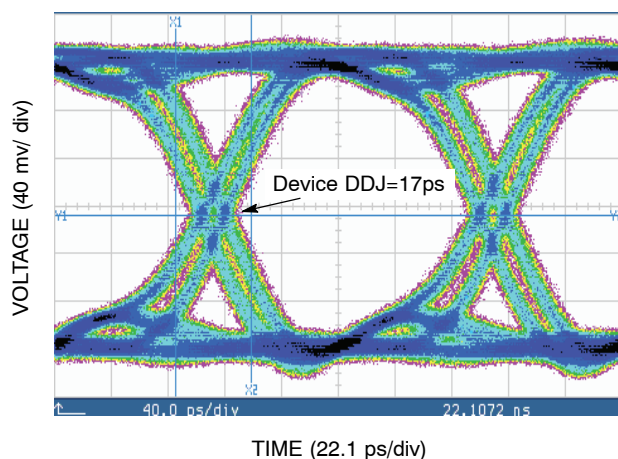
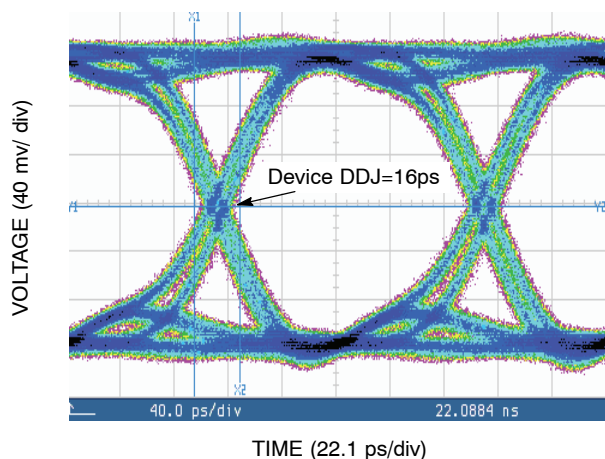


Figure 9. Typical Output Waveform at 5 Gb/s with PRBS  $2^{23}-1$  ( $V_{inpp}=75$  mV–left and 400 mV–right)

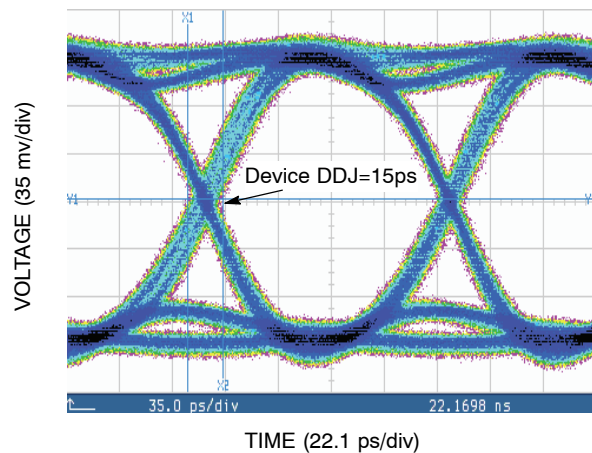
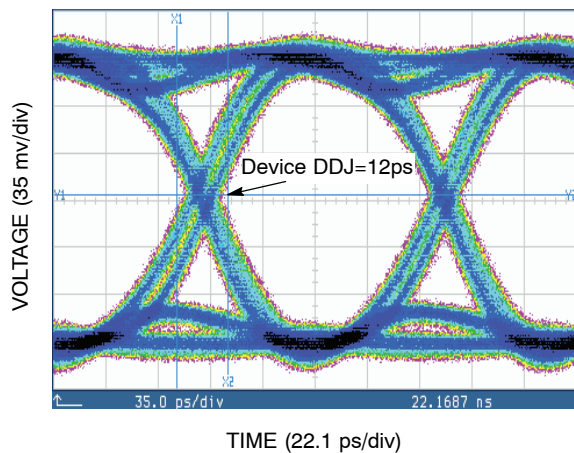


Figure 10. Typical Output Waveform at 6.125 Gb/s with PRBS  $2^{23}-1$  ( $V_{inpp} = 75$  mV–left and 400 mV–right)



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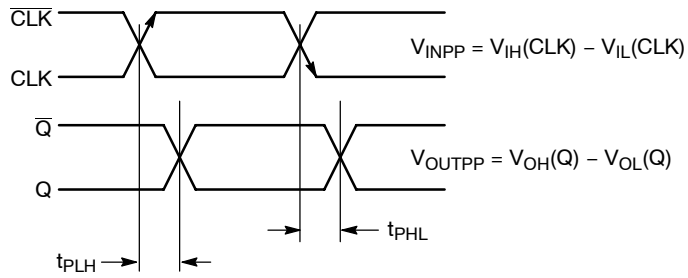


Figure 11. AC Reference Measurement

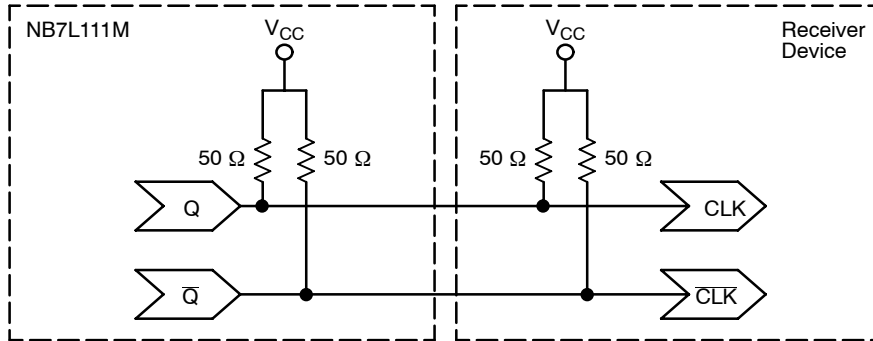


Figure 12. Typical Termination for 16 mA Output Drive and Device Evaluation

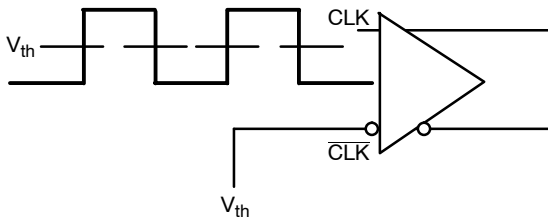


Figure 13. Differential Input Driven Single-Ended

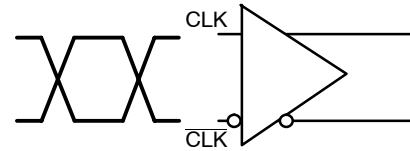


Figure 14. Differential Inputs Driven Differentially

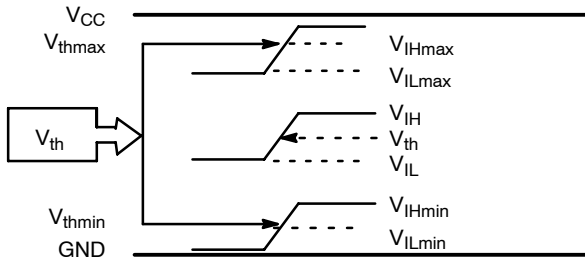


Figure 15.  $V_{th}$  Diagram

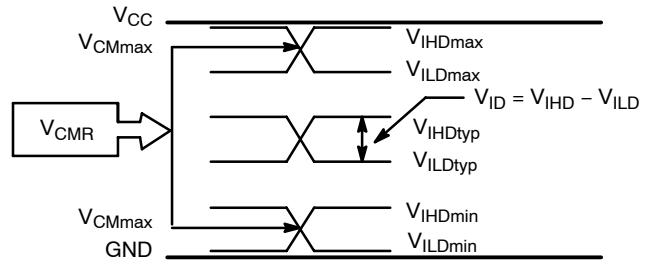


Figure 16.  $V_{CMR}$  Diagram

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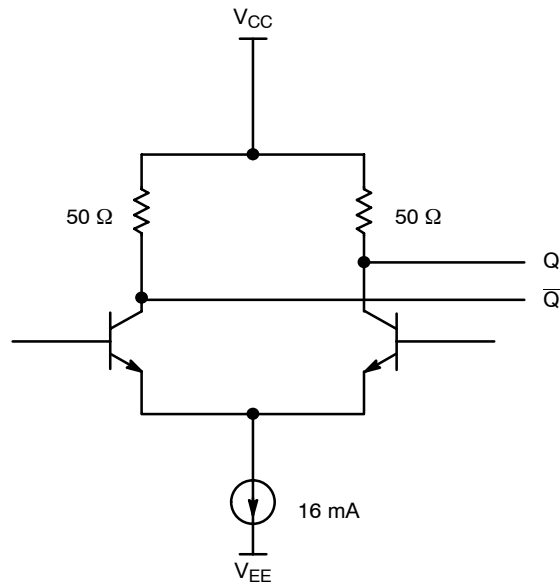


Figure 17. CML Output Structure

Table 7. Interfacing Options

| INTERFACING OPTIONS | CONNECTIONS                                                                                                                                                                                                      |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CML                 | Connect VTCLK0, $\overline{\text{VTCLK0}}$ , VTCLK1, $\overline{\text{VTCLK1}}$ , VTSEL, $\overline{\text{VTSEL}}$ to $V_{CC}$                                                                                   |
| LVDS                | Connect VTCLK0, $\overline{\text{VTCLK0}}$ together for CLK0 input; Connect VTCLK1, $\overline{\text{VTCLK1}}$ together for CLK1 input; Connect VTSEL, $\overline{\text{VTSEL}}$ together for SEL control input. |
| AC-COUPLED          | Bias VTCLK0, $\overline{\text{VTCLK0}}$ , VTSEL, $\overline{\text{VTSEL}}$ and VTCLK1, $\overline{\text{VTCLK1}}$ inputs within (VCMR) Common Mode Range.                                                        |
| RSECL, LVPECL       | Standard ECL termination techniques. See AND8020.                                                                                                                                                                |
| LVTTL, LVCMOS       | An external voltage should be applied to the unused complementary differential input. Nominal voltage 1.5 V for LVTTL and $V_{CC}/2$ for LVCMOS inputs.                                                          |

# NB7L111M

## Application Information

All NB7L111M inputs can accept PECL, CML, LVTTTL, LVCMOS and LVDS signal levels. The limitations for differential input signal (LVDS, PECL, or CML) are

minimum input swing of 100 mV and the maximum input swing of 450 mV. Within these conditions, the input voltage can range from  $V_{CC}$  to 1.2 V. Examples interfaces are illustrated below in a 50  $\Omega$  environment ( $Z = 50 \Omega$ ).

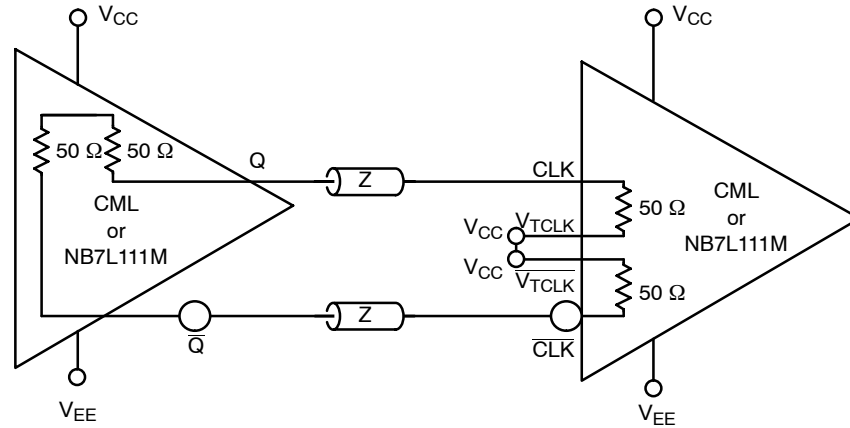


Figure 18. CML to CML Interface

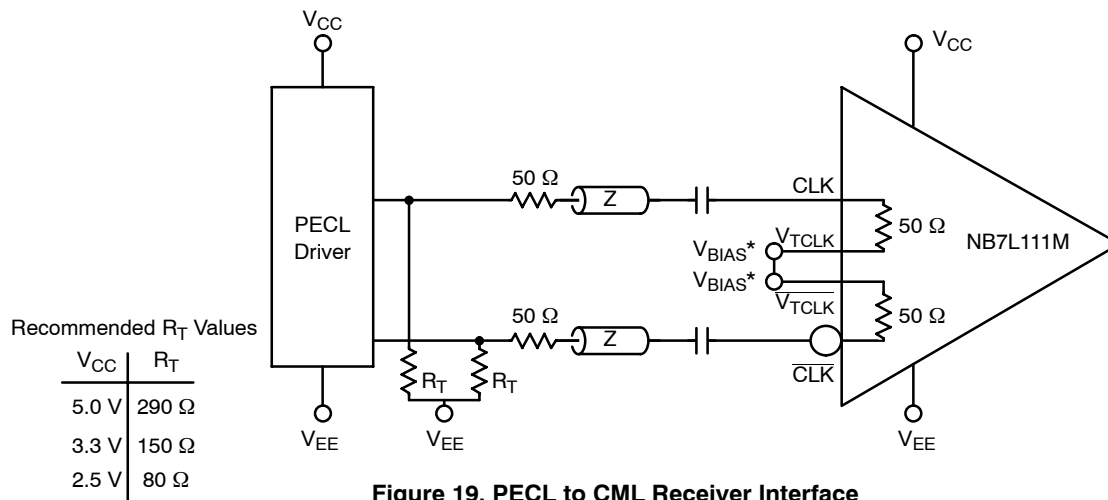


Figure 19. PECL to CML Receiver Interface

\* $V_{BIAS}$  is within  $V_{CMR}$  Range.

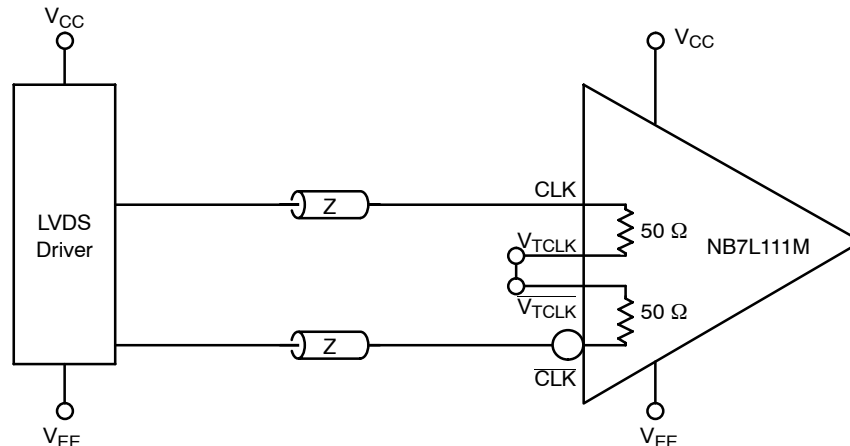
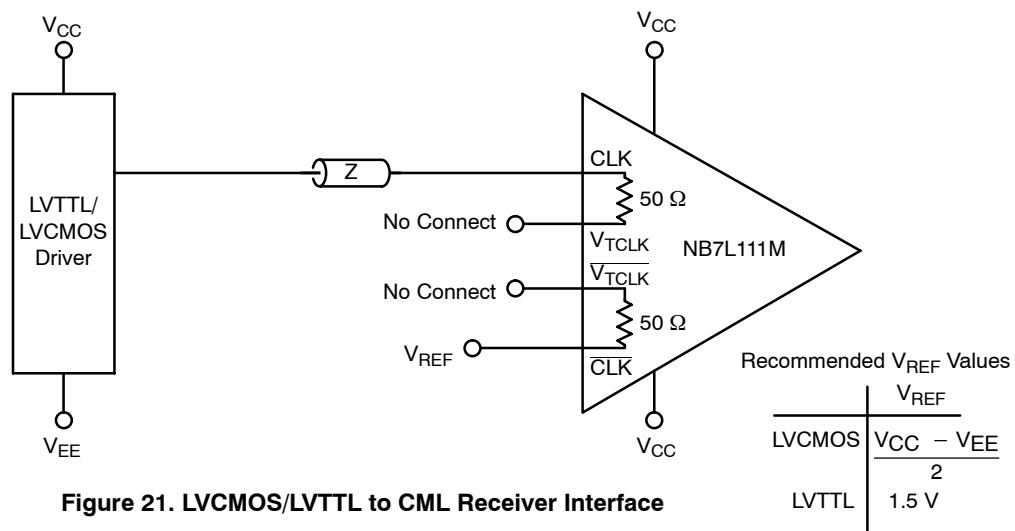


Figure 20. LVDS to CML Receiver Interface

**NB7L111M**

### Figure 21. LVCMOS/LVTTL to CML Receiver Interface

## ORDERING INFORMATION

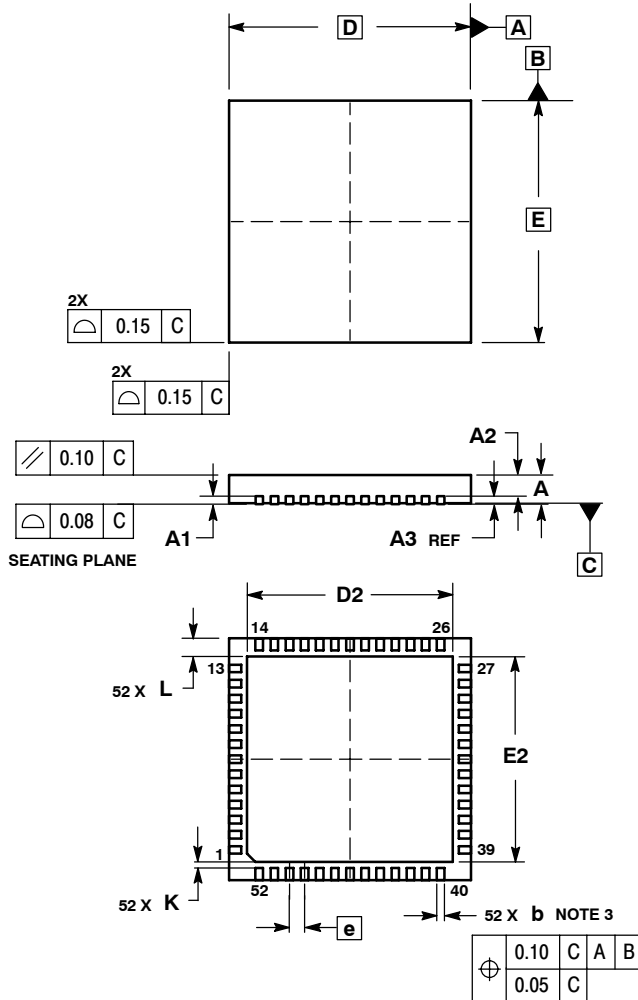
| Device      | Package             | Shipping†          |
|-------------|---------------------|--------------------|
| NB7L111MMN  | QFN-52              | 46 Units / Rail    |
| NB7L111MMNG | QFN-52<br>(Pb-Free) | 46 Units / Rail    |
| NB7L1MMNR2  | QFN-52              | 2000 / Tape & Reel |
| NB7L1MMNR2G | QFN-52<br>(Pb-Free) | 2000 / Tape & Reel |

†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.

# NB7L111M

## PACKAGE DIMENSIONS

52 PIN QFN 8x8  
CASE 485M-01  
ISSUE A



- 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.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 0.80        | 1.00 |
| A1  | 0.00        | 0.05 |
| A2  | 0.60        | 0.80 |
| A3  | 0.20        | REF  |
| b   | 0.18        | 0.30 |
| D   | 8.00        | BSC  |
| D2  | 6.50        | 6.80 |
| E   | 8.00        | BSC  |
| E2  | 6.50        | 6.80 |
| e   | 0.50        | BSC  |
| K   | 0.20        | ---  |
| L   | 0.30        | 0.50 |

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