NB7NPQ1004MMTGEVB

NB7NPQ1004MMTGEVB Evaluation Board User's Manual

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EVAL BOARD USER'S MANUAL

Introduction

The NB7NPQ1004MMTGEVB evaluation board was developed to provide a convenient platform to quickly verify the operation of the NB7NPQ1004M redriver in a USB type−A system environment.

This evaluation board manual contains:

- Information on the NB7NPQ1004M Evaluation Board
- Board Schematics
- Bill of Materials

Features

- Accommodates the Functional Evaluation of the Device
- Acts as a Reference Design that can Easily be Modified for Active Cables, UFP (Upstream Facing Port), DFP (Downstream Facing Port), and DRP (Dual Role Port) Applications
- Type−A Plug and Receptacle to Easily Place in the Existing System Environment
- On Board Control Pins for Adjusting Settings without Compromising Form Factor

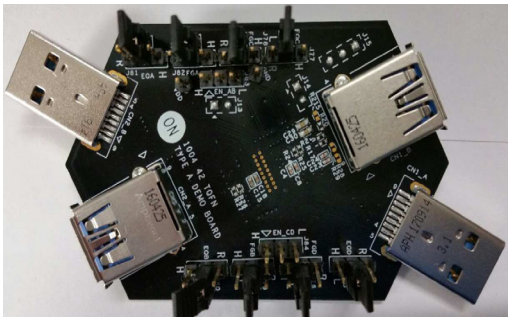

Figure 1. NB7NPQ1004M Demo Board (Top View)

Part Description

The NB7NPQ1004M is a 3.3 V quad channel, linear redriver for USB 3.1 applications that supports both 5 and 10 Gbps data rates. Signal integrity degrades from PCB traces and transmission cables which may cause inter symbol interference (ISI). The NB7NPQ1004M compensates for these losses by engaging varying levels of equalization at the input receiver. The output transmitter circuitry provides user selectable flat gain settings to create the best eye openings for the outgoing data signals. The flexibility of this part allows it to fit into many system applications.

After power up, the NB7NPQ1004M periodically checks both of the TX output pairs of each port for a 50 Ω termination for a Super Speed USB receiver. When the receiver is detected on either channel of a port, the internal RX termination will be enabled of that respective channel. The port becomes active once both TX outputs have detected 50 Ω termination, and the NB7NPQ1004M is set to perform the redriver function. Port AB (channels A & B) and port CD (channels C & D) are independent of each other.

This manual should be used in conjunction with the device datasheet NB7NPQ1004M which contains full technical details on the device specifications and operation.

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BOARD MAP AND FUNCTIONAL SUMMARY

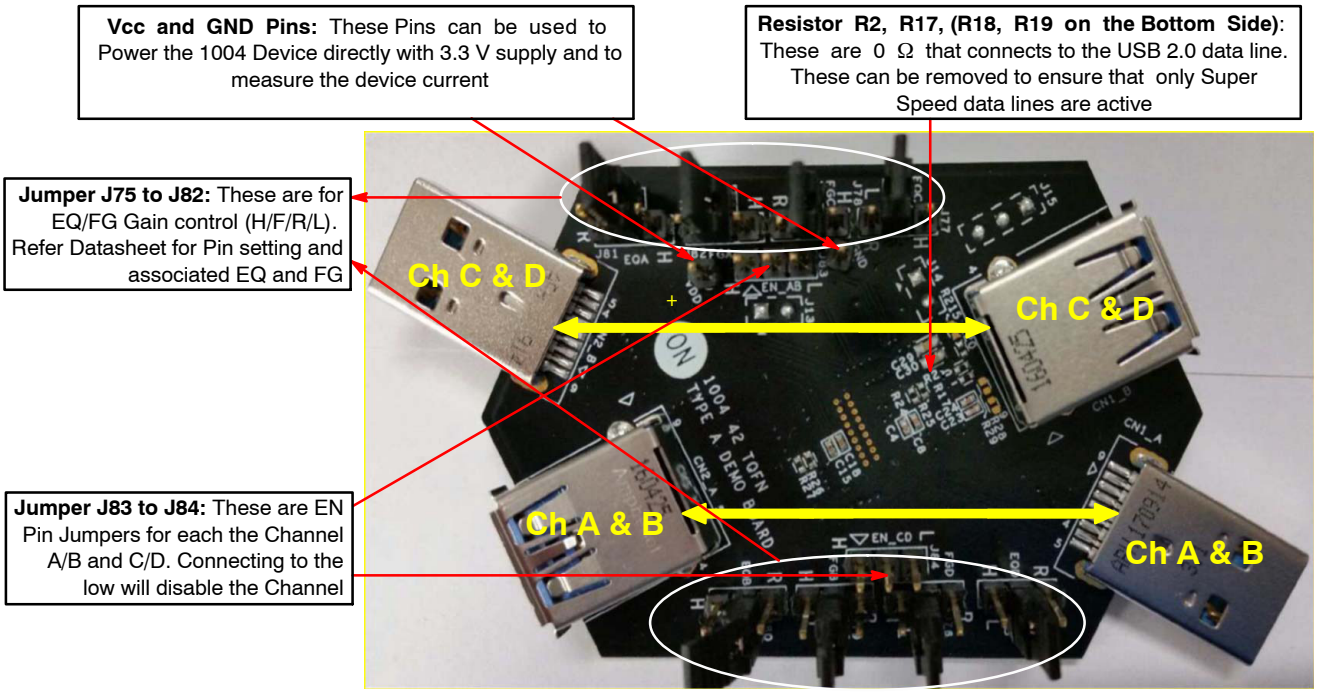

Figure 2. NB7NPQ1004M Evaluation Board (Top View)

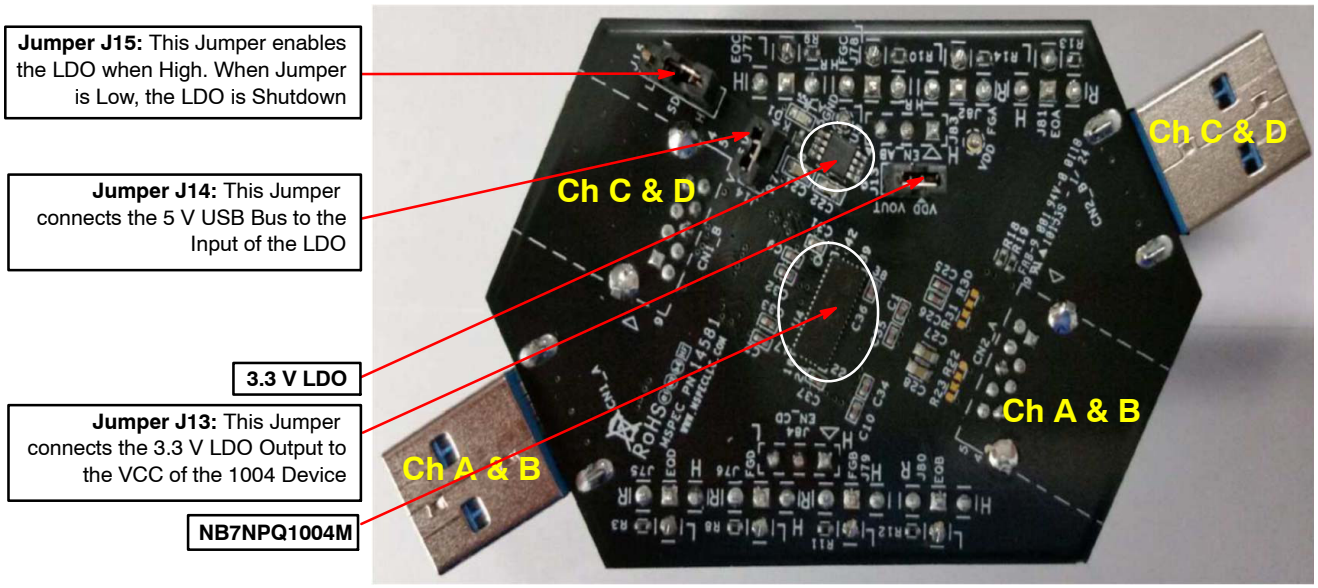

Figure 3. NB7NPQ1004M Evaluation Board (Bottom View)

Select Power Source

The NB7NPQ1004MMTGEVB has the flexibility to be powered through USB's VBUS, or an external power supply. Table 1 and Figure 4 describe the jumper settings for each of the configuration.

Monitoring Current / Power

There are two easy ways to monitor the current consumed by the redriver. If you are using an external power supply, you can simply use the current meter commonly found on the power supplies. If you would like to use a current probe, simply solder the probe between the VCC pin and the power supply. This will allow monitoring of the NB7PQ1004M's current consumption.

USB 2.0 Data Lines

The USB 2.0 lines can be disconnected by removing the 0 Ω resistors R2, R17, R18 and R19 on the D+ and D− lines. This is useful if you cannot easily tell whether the downstream facing port has acknowledged a Super Speed (+) connection with the inserted loss, or if it stepped down to High Speed data rates. When a receiver is detected through RxDetect, the DFP will initialize link training. It will send a test signal out at the highest data rate and expect to see the same signal sent back by the UFP. If the signals do not match due to ISI (or any other connection issues) then it will drop down the data rate to USB 2.0 speeds.

On Windows machines, an easy way to tell that a Super Speed connection was not established is to look for a pop up in the task bar letting the user know that "This device can perform faster". A disk benchmarking tool like Crystal Disk Mark that lets you test read and write speeds to a peripheral storage can also be used.

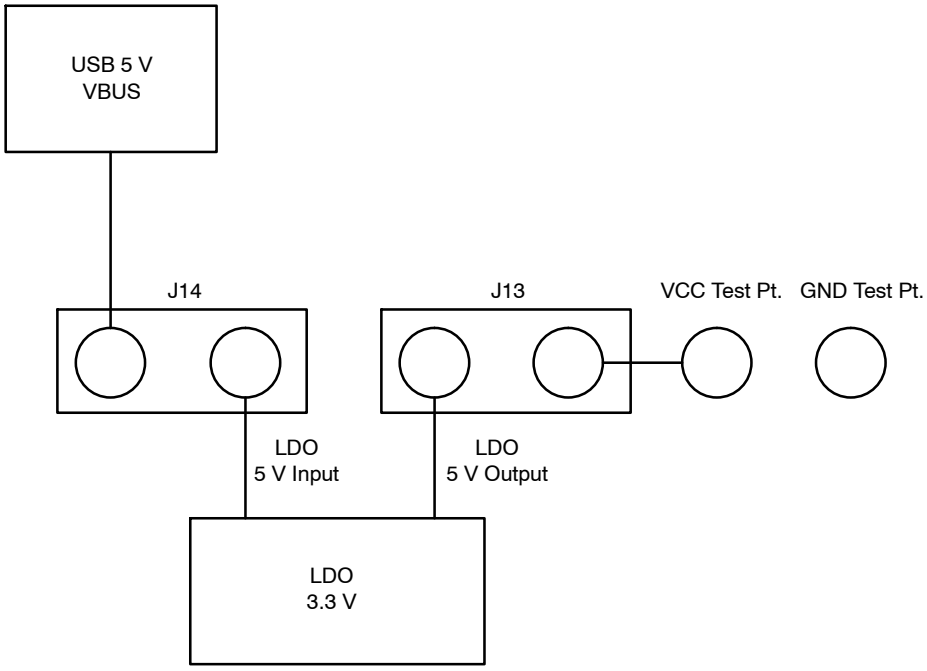

Figure 4. Power Source Selection

Table 1. SELECTING A POWER SOURCE

USB VBUS	Place jumper on J14 and J13
EXTERNAL SUPPLY	Open J14 and connect a positive lead of an external supply to VCC and apply 3.3 V. Ensure that GND is connected to ground and that current limit is set to 300 mA.

COMPLETE BOARD SCHEMATICS

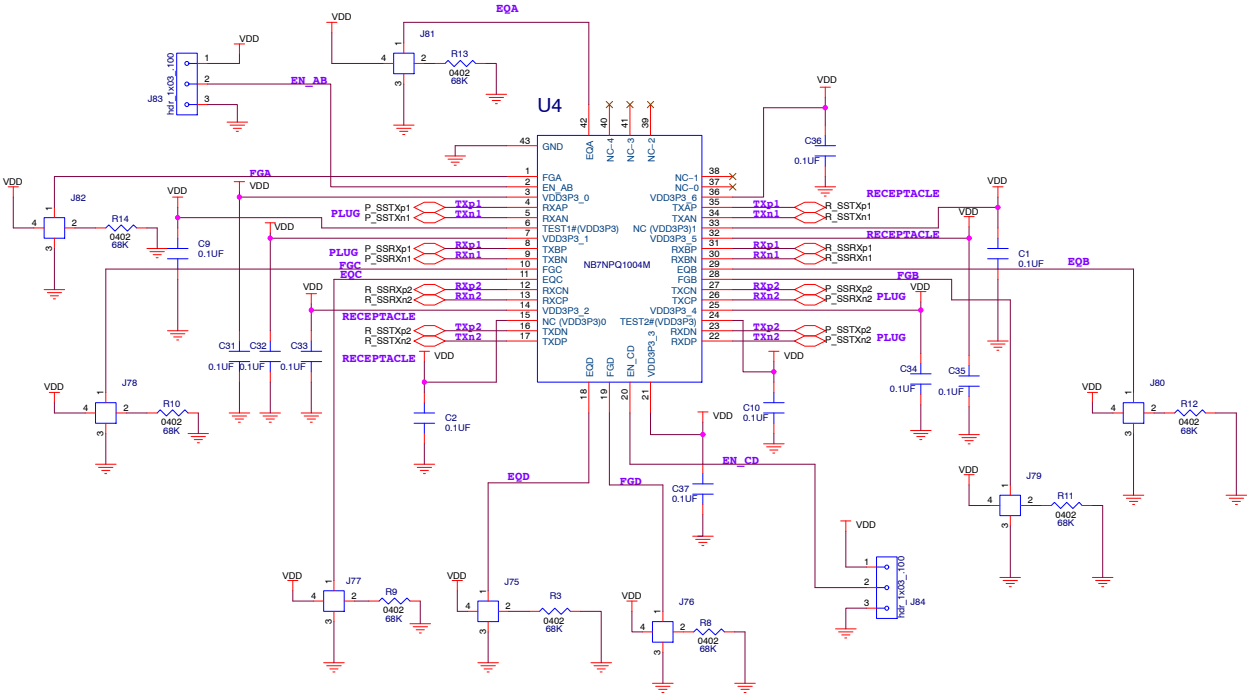

Figure 5. RE−Driver

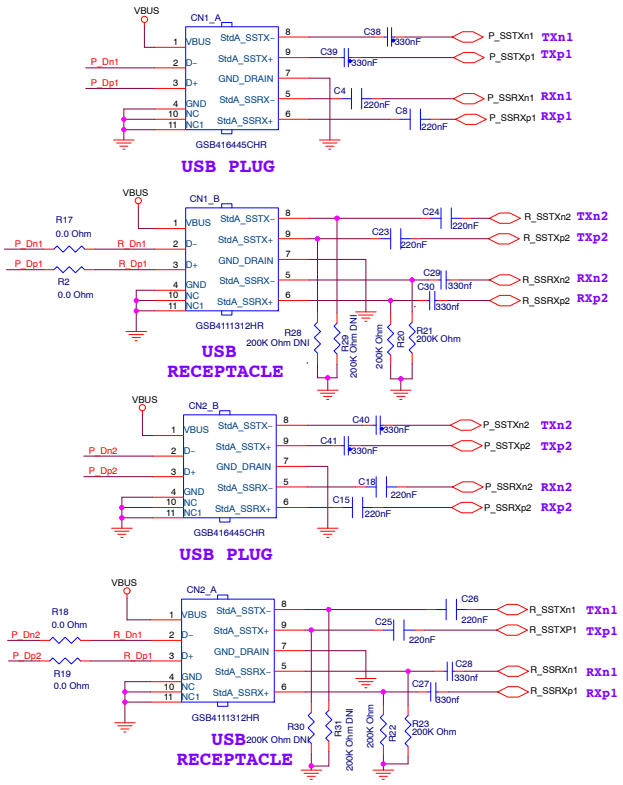

Figure 6. NB7NPQ1004M USB Type−A Evaluation Board Schematics

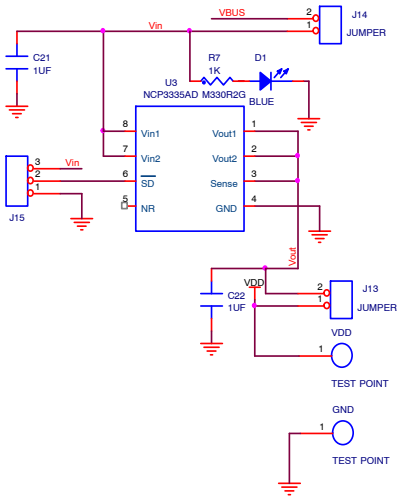

Figure 7. Power Supply Section

NB7NPQ1004MMTGEVB

BILL OF MATERIALS

Table 2. BILL OF MATERIALS

Sl. No.	Qty	Description	Reference	Manufacturer	Manufacturer PN
1	1	USB 3.1 Redriver	U4	ON Semiconductor	NB7NPQ1004M
2	1	3.3 V Voltage Regulator	U3	ON Semiconductor	NCP3335ADM330R2G
3	2	USB Type−A Receptacle	CN1_B, CN2_A	Amphenol Commercial Products	GSB4111312HR
4	2	USB Type−A Plug	CN1_A, CN2_B	Amphenol Commercial Products	GSB416445CHR
5	2	Capacitor 1 μF (0603)	C21, C22	Samsung	CL10A105KA5LNNC
6	8	Capacitor 0.220 μF (0402)	C4, C8, C15, C18, C23, C24, C25, C26	TDK	C1005X5R1C22M050BB
7	8	Capacitor 0.33 μF (0402)	C27, C28, C29, C30, C38, C39, C40, C41	TDK	C1005X5R1C334K050BB
8	1	Blue LED	D1	Rohm Semiconductor	SMLE12BC7TT86
9	11	Header, 0.100”	J75 to J84, J15	Amphenol FCI	68001−203HLF
10	7	Header, 0.100”	J13, J14	Amphenol FCI	77311−118−02LF
11	4	Resistor 0.0 Ω (0402)	R2, R17, R18, R19	YAGEO	RC0402JA−070RL
12	8	Resistor 68 kΩ (0402)	R3, R8, R9, R10, R11, R12, R13	Panasonic	ERJ−2RKF6802X
13	8	Resistor 200 kΩ (0402)	R20 to R23, R28 to R31	Panasonic	ERJ−2RKF2003X
14	1	Resistor 1 kΩ (0402)	R7	Panasonic	ERJ−2RKF1001X
15	2	TEST POINT	TP1, TP2	Keystone	5016

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