

NB7NPQ7041MMUGEVB

NB7NPQ7041M Evaluation Board User's Manual

Introduction

The NB7NPQ7041M evaluation board was developed to provide a convenient platform to quickly verify the operation of the NB7NPQ7041M redriver in a USB type-A system environment.

This evaluation board manual contains:

- Information on the NB7NPQ7041M Evaluation Board
- Board Schematic
- Bill of Materials

Board Features

- Accommodates the Functional Evaluation of the NB7NPQ7041M
- 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

Part Description

The NB7NPQ7041M 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 NB7NPQ7041M 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 NB7NPQ7041M periodically checks both of the TX output pairs of each port for a 50-Ω termination for a SuperSpeed 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 NB7NPQ7041M 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 which contains full technical details on the device specifications and operation.



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EVAl BOARD USER'S MANUAL

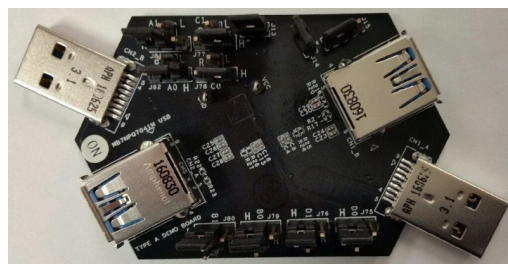


Figure 1. NB7NPQ7041M Demo Board
(Top View)

NB7NPQ7041MMUGEVB

BOARD MAP AND FUNCTIONAL SUMMARY

Resistors R2, R17, R18 and R19: These are 0-Ω resistors that connect the USB 2.0 data lines. These can be removed in order to guarantee that only the Super Speed data lines are active.

VCC and GND pins: These pins can be used to measure the power going to the NB7NPQ7041M devices. They can also be used to power the NB7NPQ7041M directly with a 3.3 V supply and to measure the current through the device.

Jumper J14: This jumper connects the 3.3 V output of the LDO to the VCC pins of the NB7NPQ7041M Device.

Jumper J15: This jumper connects the 5 V USB bus voltage to the input of a 3.3 V LDO when High; when jumper is Low, the LDO is Shut Down.

EQ and Flat Gain Control pin Jumpers : These control the EQ and FG settings. Each 4-level control pin can be set to “H”, Floating, “R”, or “L”. Jumpers are provided for CTRL_A0, CTRL_A1, CTRL_B0, and CTRL_B1, CTRL_C0, CTRL_C1, CTRL_D0, CTRL_D1. Please see the data sheet for the table of control pin settings and corresponding EQ and FG.

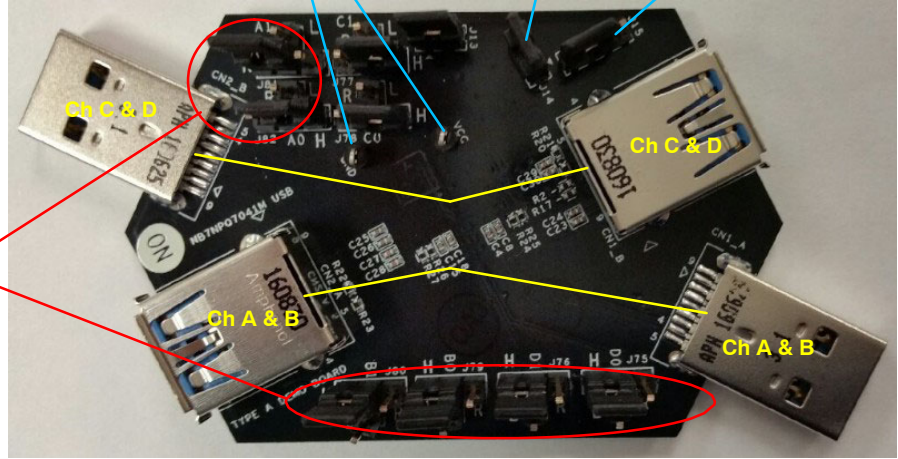


Figure 2. NB7NPQ7041M Evaluation Board – Top View

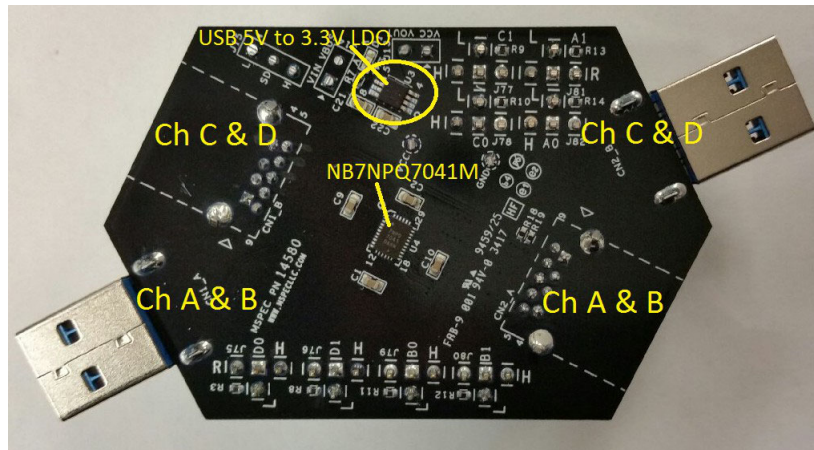


Figure 3. NB7NPQ7041M Evaluation Board – Bottom View

NB7NPQ7041MMUGEVB

Select Power Source

The NB7NPQ7041M 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 NB7NPQ7041M'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.

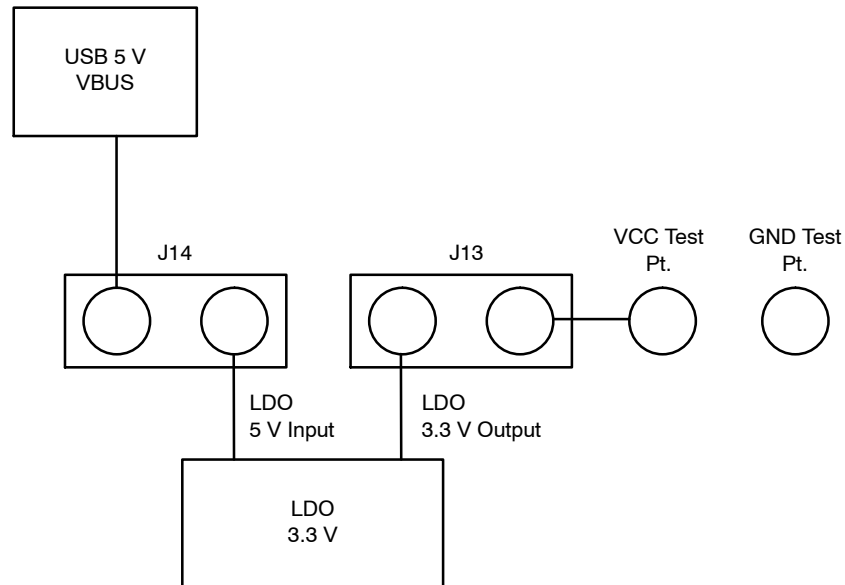


Figure 4. Power Source Selection

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.

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BOARD MAP AND FUNCTIONAL SUMMARY

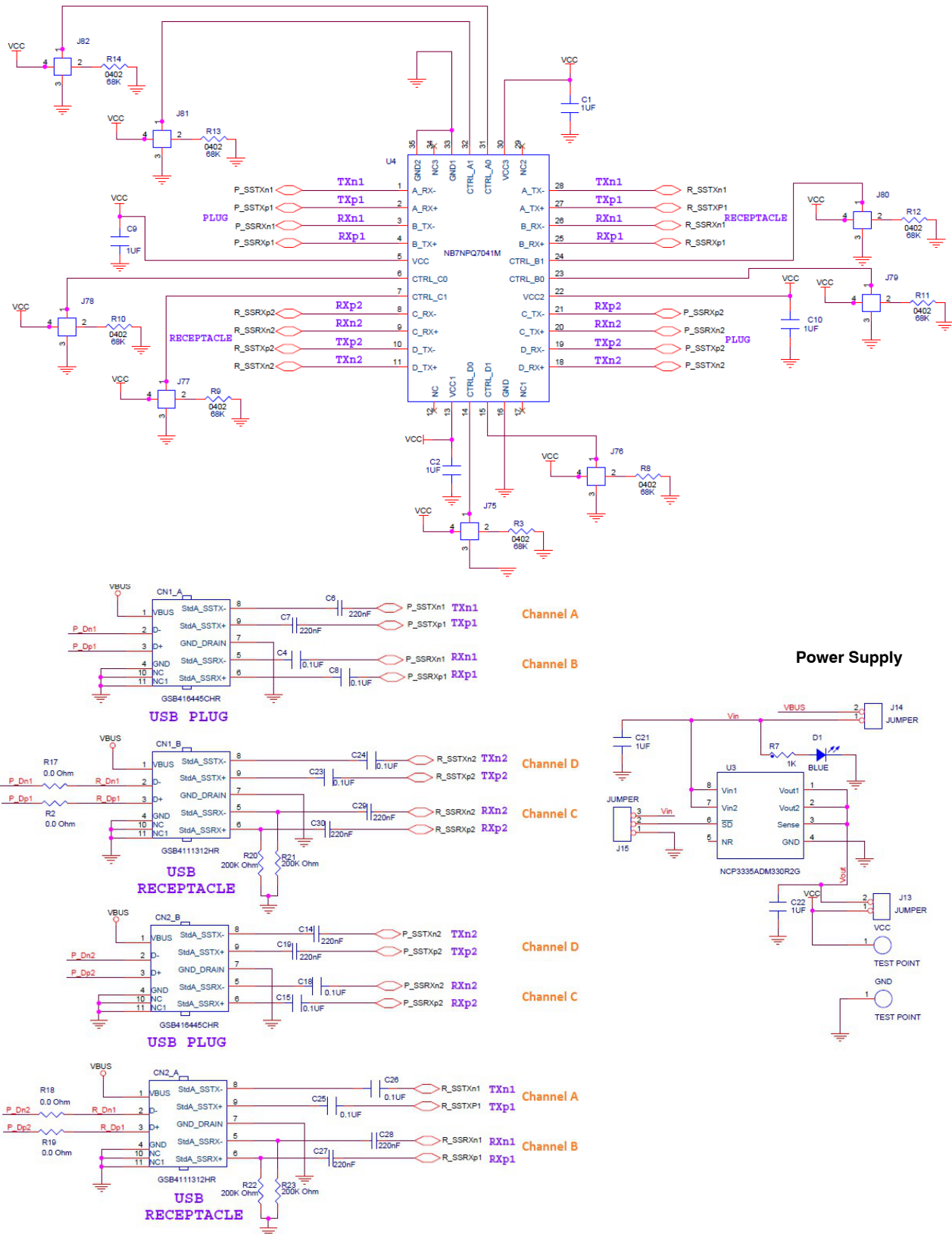


Figure 5. NB7NPQ7041M USB Type-A Evaluation Board Schematics

NB7NPQ7041MMUGEVB

BILL OF MATERIALS

Table 2. BILL OF MATERIALS

Qty.	Description	Reference	Manufacturer	Manufacturer Part Number
1	USB 3.1 Redriver	U4	ON Semiconductor	NB7NPQ7041M
2	USB Type-A Receptacle	CN1_B& CN2_A	Amphenol Commercial Products	GSB4111312HR
2	USB Type-A Plug	CN1_A & CN2_B	Amphenol Commercial Products	GSB416445CHR
6	Capacitor 1 μ F (0603)	C1, C2, C9, C10, C21, C22		
8	Capacitor 0.1 μ F (0402)	C4, C8, C15, C18, C23, C24, C25, C26		
1	Blue LED	D1	Rohm Semiconductor	SMLE12BC7TT86
1	Header, 2 mm	J1	Amphenol FCI	68001-203HLF
11	Header, 2 mm	J75-J82, J13-J15		
4	Resistor 0.0 Ω (0402)	R2, R17, R18, R19		
8	Resistor 68 k Ω (0402)	R3, R8, R9, R10, R11, R12, R13, R14		
1	Resistor 1 k Ω (0402)	R7		
2	TEST POINT	TP1, TP2		
2	Resistor 200 k Ω (0402)	R21, R22, R22, R23		
1	3.3 V Voltage Regulator	U3	ON Semiconductor	NCP3335ADM330R2G

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