3.3 V USB 3.2 10 Gb Q ad C a / D a P L a R d

NB7NPQ1404E2M

Description

The NB7NPQ1404E2M is a high performance 2−Port linear redriver designed for USB 3.2 applications that supports both 5 Gbps and 10 Gbps data rates. Signal integrity degrades from PCB traces, transmission cables, and inter−symbol interference (ISI). The NB7NPQ1404E2M compensates for these losses by engaging varying levels of equalization at the input receiver, and flat gain amplification on the output transmitter.

The NB7NPQ1404E2M offers programmable equalization and flat gain for each independent channel to optimize performance over various physical mediums.

The NB7NPQ1404E2M contains an automatic receiver detect function which will determine whether the output is active. The receiver detection loop will be active if the corresponding channel's signal detector is idle for a period of time. The channel will then move to Unplug Mode if a load is not detected, or it will return to Low Power Mode (Slumber mode) due to inactivity.

The NB7NPQ1404E2M comes in a 2.5 x 4.5 x 0.55 mm UQFN34 package and is specified to operate across the entire industrial temperature range, –40°C to 85°C.

Device	Package	Shipping†

Features

- 3.3 V 0.3 V Power Supply
- 5 Gbps & 10 Gbps Serial Link with Linear Amplifier
- Device Supports USB 3.2 Gen2 and Gen1
- Automatic Receiver Detection
- Supports USB−IF VCM Requirement
- Integrated Input and Output Termination
- Pin Adjustable Receiver Equalization and Flat Gain
- 100 Ω Differential CML I/O's
- Auto Slumber Mode for Adaptive Power Management
- Hot−Plug Capable
- ESD Protection 4 kV HBM
- Operating Temperature Range Industrial: −40°C to +85°C
- Package: UQFN34, 2.5 x 4.5 x 0.55 mm
- This is a Pb−Free Device

Typical Applications

- USB3.2 Type−A and Type−C Signal Routing
- Mobile Phone and Tablet
- Computer, Laptop and Notebook
- External Storage Device
- Docking Station and Dongle
- Active Cable, Back Planes
- Gaming Console, Smart T.V.

Table 1. PIN DESCRIPTION

Pin Number	Pin Name	Type	Description
1	A_RX+	INPUT	

Power Management

The NB7NPQ1404E2M has an adaptive power management feature in order to minimize power consumption. When the receiver signal detector is idle, the corresponding channel will change to low power slumber mode. Accordingly, both channels will move to low power slumber mode individually.

While in the low power slumber mode, the receiver signal detector will continue to monitor the input channel. If a channel is in low power slumber mode, the receiver detection loop will be active again. If a load is not detected,

ie 0 71 Tw/F304E2M 3.6142 er slM [0 d1 NB7NPQ14MpoweGND)891 Tm317.934 551.1124.902131575.741.508317.934 565.5. I11

Table 11. CML RECEIVER AC/DC CHARACTERISTICS
VDD = 3.3 V +/ 0.3 V Over operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$R_{RX\ DIFF\ DC}$	Differential Input Impedance (DC)		72	100	120	Ω
$R_{RX\ SINGLE\ DC}$	Single ended Input Impedance (DC)	Measured with respect to GND over a voltage of 500 mV max.	18		30	Ω
ZRX HIZ DC PD	Common mode input impedance for V>0 during reset or power down (DC)	VCM = 0 to 500 mV	25			kΩ
Cac_coupling	AC coupling capacitance		75		265	nF
VRX CM AC P	Common mode peak voltage	AC up to 5 GHz			150	mVpeak

Table 12. TRANSMITTER AC/DC CHARACTERISTICS
VDD = 3.3 V +/ 0.3 V Over operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{TX\ CM\ DC}$ Active_ Idle Delta	Common mode delta voltage |AvgU0(|$V_{TX\ D+}$					

PARAMETER MEASUREMENT DIAGRAMS

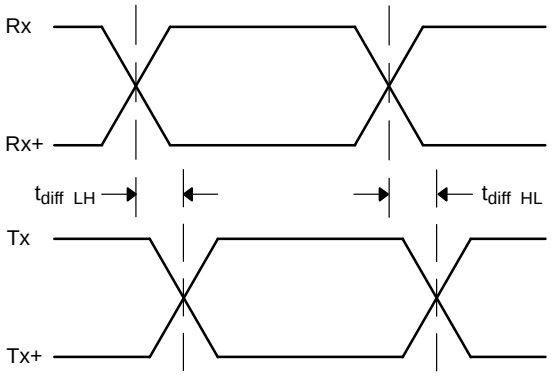


Figure 3. Propagation Delay

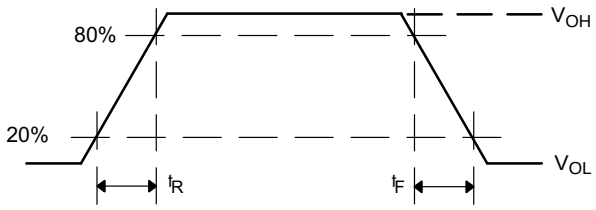


Figure 4. Output Rise and Fall Times

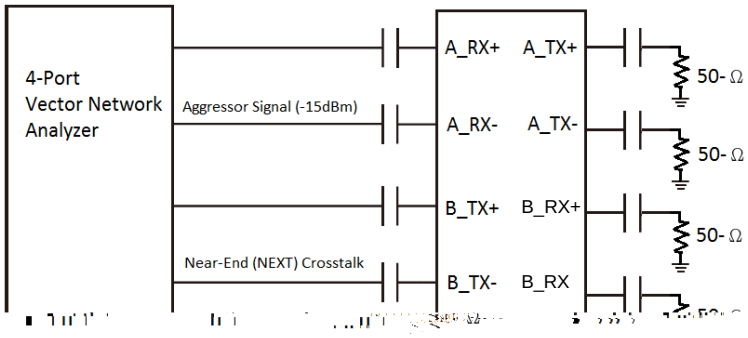


Figure 5. Channel−Isolation Test Configuration

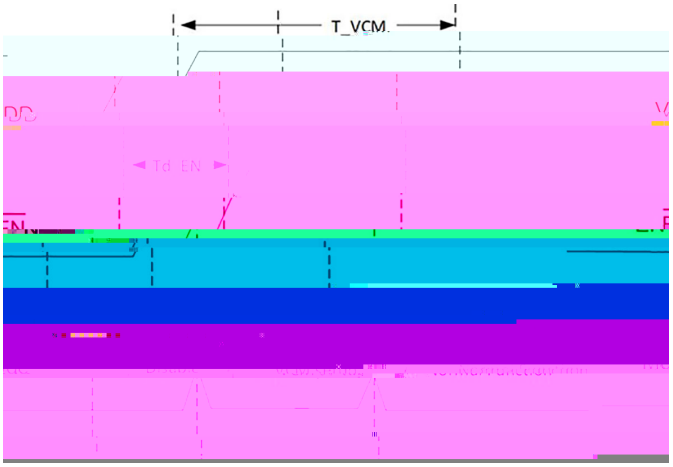


Figure 6. Power Up Timing

Table 13. POWER UP TIMING

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Td_EN	VDD to Enable Assertion timing requirement	Figure 6.	0			ms
T_VCM	Stabilization time for VCM	Figure 6.		330	400	ms

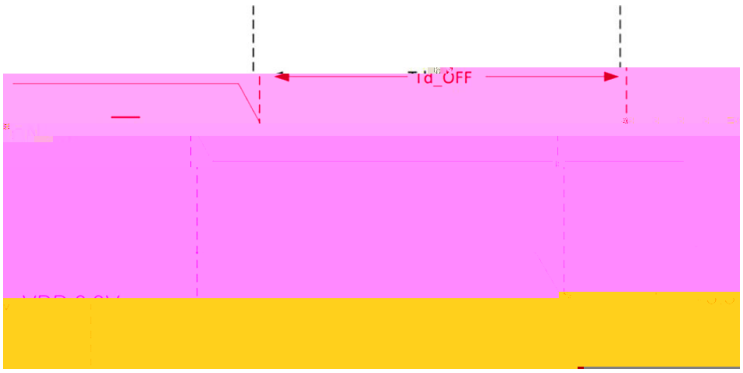


Figure 7. Power Down Timing

Table 14. POWER DOWN TIMING

Symbol	Parameter

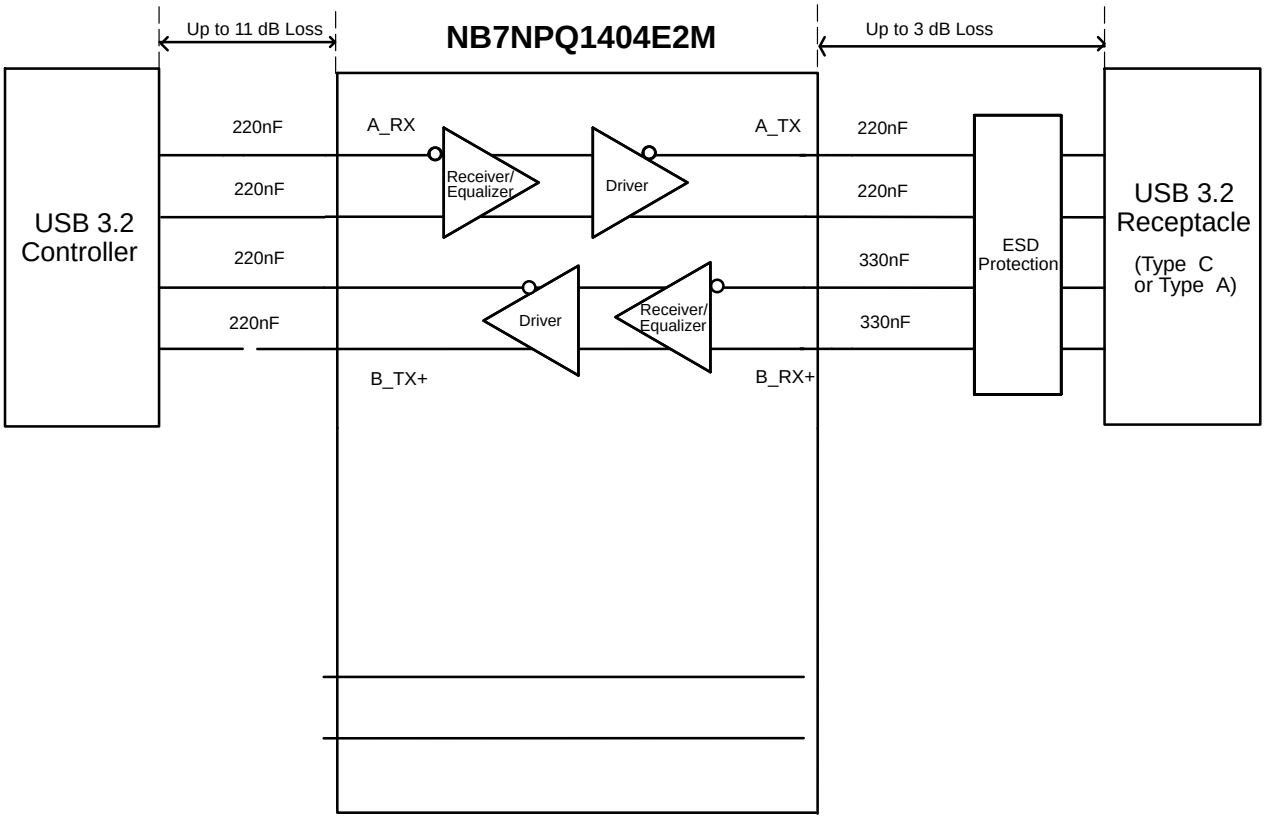
APPLICATION GUIDELINES

LFPS Compliance Testing

As part of USB 3.2 compliance test, the host or peripheral must transmit a LFPS signal that adheres to the spec parameters. The NB7NPQ1404E2M is tested as a part of a USB compliant system to ensure that it maintains compliance while increasing system performance.

LFPS Functionality

USB 3.2 Low Frequency Periodic Signaling.
(LFPS) to implement functions like exiting low


Up to 11 dB Loss
NB7NPQ1404E2M
Up to 3 dB Loss
USB 3.2
Controller
220nF
220nF
220nF
220nF
A_RX
Receiver/
Equalizer
Driver
A_TX
220nF
220nF
330nF
330nF
ESD
Protection
USB 3.2
Receptacle
(Type C
or Type A)
Driver
Receiver/
Equalizer
B_TX+
B_RX+

UQFN34 2.5x4.5, 0.35P
CASE 523BR
ISSUE A

DATE 10 DEC 2020

*This information is generic. Please refer to

ADDITIONAL INFORMATION

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