

# NB7NQ621MMUGEVK

## HDMI<sup>®</sup> Demonstration Board User's Manual

### Introduction

The NB7NQ621M evaluation board was developed to provide a convenient platform to quickly verify the operation of the NB7NQ621M redriver in an HDMI system.

This evaluation board manual contains:

- Information on the NB7NQ621M Evaluation Board
- Board Schematics
- Bill of Materials

### Board Features

- Accommodates the functional evaluation of the NB7NQ621M in an HDMI environment
- Acts as a reference design that can easily be modified for most system applications
- HDMI plug and receptacle to easily place in an existing System Environment
- On board GPIO control pins for selectable settings
- On board standalone I<sup>2</sup>C control pins and Aardvark compatible connector for easy to use programming.
- HPD level shifting selector, for sources limited to 3.3 V potentials

### Part Description

The NB7NQ621M is a 3.3 V Dual-Mode DisplayPort™ (DP++), quad-channel, linear redriver supporting HDMI 2.1 Fixed Rate Link (FRL) up to 12 Gbps and TMDS up to 6 Gbps, as well as DisplayPort v1.4a Main Link (ML) up to 8.1 Gbps (HBR3).

Signal integrity degrades from PCB traces, transmission cables, and inter-symbol interference (ISI). The NB7NQ621M compensates for these losses by engaging varying levels of user selectable flat gain, transmitter termination, and equalization to create the best eye opening for the outgoing data signals.

The NB7NQ621M is a linear redriver and is inherently transparent to link training signals resulting in shorter system integration and software development cycles. The redriver input and outputs signals may be either AC or DC coupled, which can eliminate the need for additional level shifter components from the data channels.

The NB7NQ621M is equipped with I<sup>2</sup>C programmability to easily control operation mode, channel power down, flat gain, equalization and output -1 dB compression settings independently.

This manual should be used in conjunction with the NB7NQ621M datasheet which contains full details regarding the specifications and operation of the device.



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## EVAL BOARD USER'S MANUAL

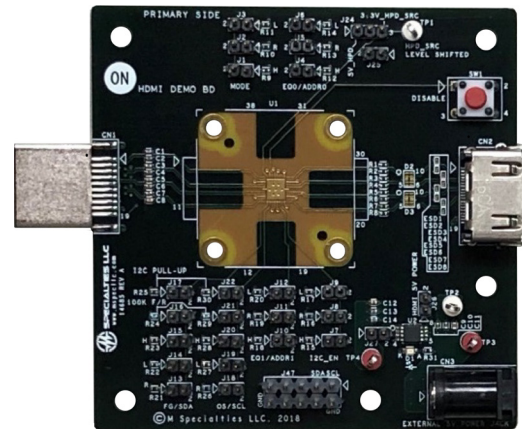


Figure 1. HDMI Demonstration Board

# NB7NQ621MMUGEVK

## DEMONSTRATION BOARD MAP AND FUNCTIONAL SUMMARY

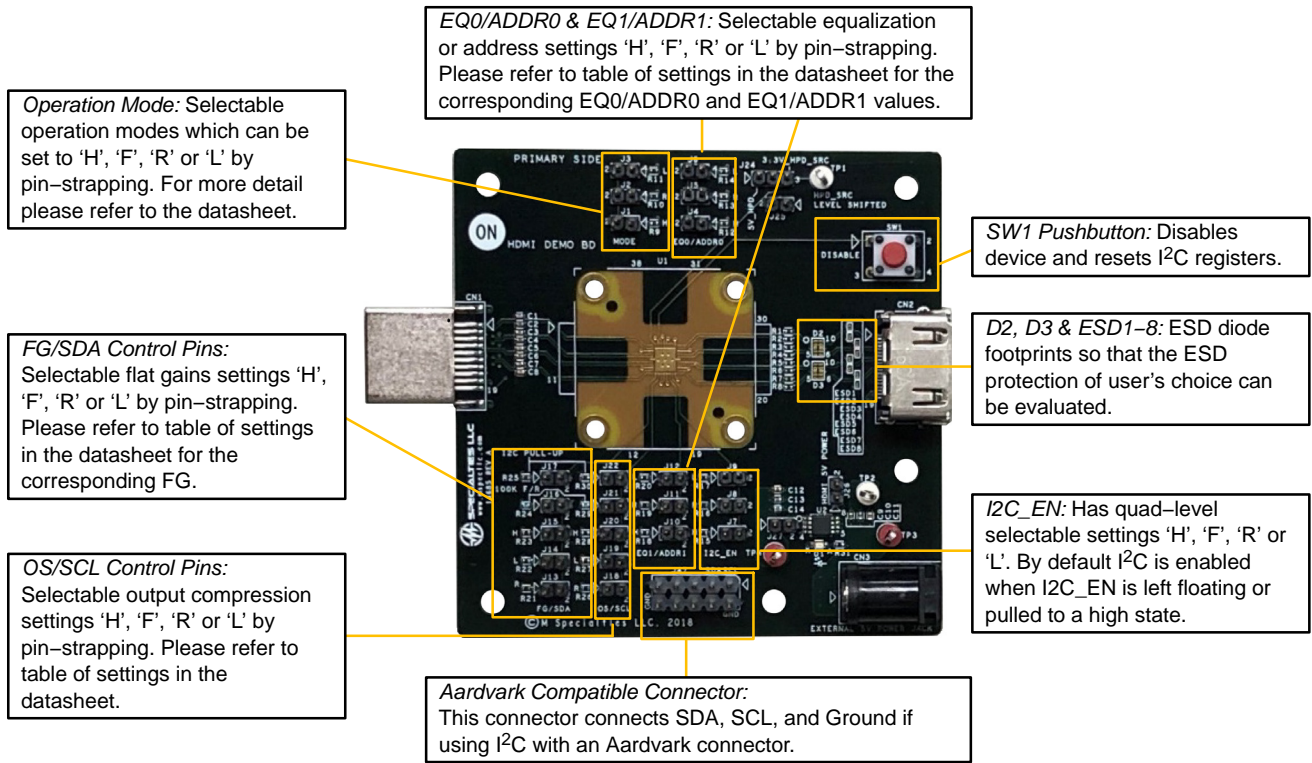


Figure 2. NB7NQ621M Evaluation Board Important Connection Information

# NB7NQ621MMUGEVK

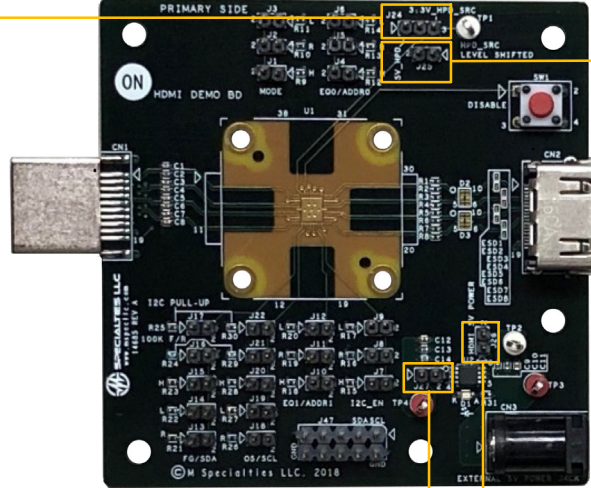
## POWERING DEMO BOARD

The NB7NQ621M has the flexibility to be powered either by the 5 V power from the HDMI connector, or from a power jack externally. It is suggested to power the demo board

using the external power jack. Some HDMI systems can limit the current to the demo board and it may not function properly.

### Direct HDMI Powering

**Jumper J24:**  
Connecting pins 1 & 2 will select the 5 V HPD signal as a flow through from sink to source.  
  
Connecting pins 2 & 3 will select the 3.3 V HPD\_SRC level shifted voltage to go to the source.



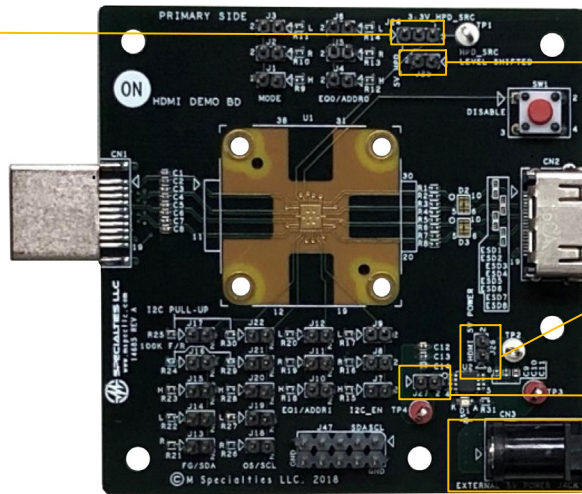
**Jumper J25:**  
J25 Must be connected.

**Jumpers J26 and J27:**  
Jumpers J26 and J27 need to be connected in order to power the redriver from the 5 V HDMI power rail. Do not connect the power jack in this for this set up.

Figure 3. NB7NQ621M Evaluation Board – Connecting to Power

### Externally Powering

**Jumper J24:**  
Connecting pins 1 & 2 will select the 5 V HPD signal as a flow through from sink to source.  
  
Connecting pins 2 & 3 will select the 3.3 V HPD\_SRC level shifted voltage to go to the source.



**Jumper J25:**  
J25 Must be connected.

**Jumper J26:**  
J26 Do not connect.

**Jumper J27:**  
J27 Must be connected.

**External 5 V Power Jack:**  
Must be used to power board externally.

Figure 4. NB7NQ621M Evaluation Board – Externally Powering, Recommended Method

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## USING I<sup>2</sup>C WITH THE DEMONSTRATION BOARD

The most efficient method of evaluating the NB7NQ621M is to utilize the I<sup>2</sup>C interface and ON Semiconductor graphical user interface. Please see the NB7NQ621M GUI manual for a more detailed explanation of installation and usage.

Once the redriver is powered, connect the I<sup>2</sup>C module to the demo board and enable the device I<sup>2</sup>C. Please see *Figure 5* for I<sup>2</sup>C connections while using external power. To avoid erroneous connections, remove all other jumpers from the board that are not specified in *Figure 5*.

### I<sup>2</sup>C Connections using External Power

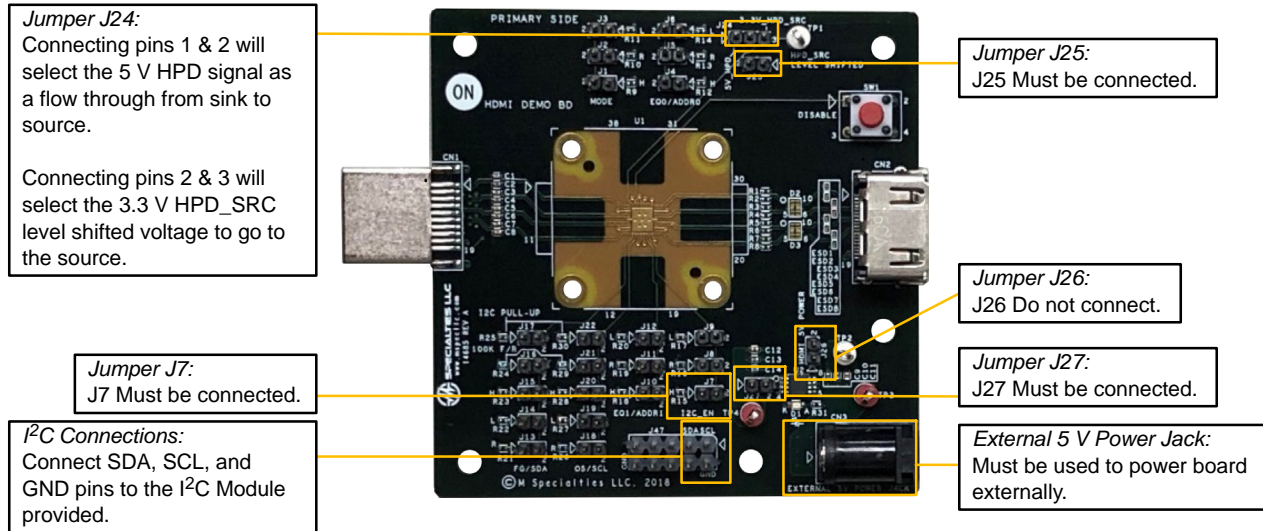


Figure 5. NB7NQ621M Evaluation Board – I<sup>2</sup>C Connections with External Power

### I<sup>2</sup>C Module and Connections

The ON Semiconductor I<sup>2</sup>C Control Module connects to the user's computer by a USB cable. It can then be connected to the redriver demonstration board with its SDA, SCL, and

GND connector pins as it is in *Figure 6*. The NB7NQ621M GUI is designed to work with the I<sup>2</sup>C Control Module for easy setup and evaluation.

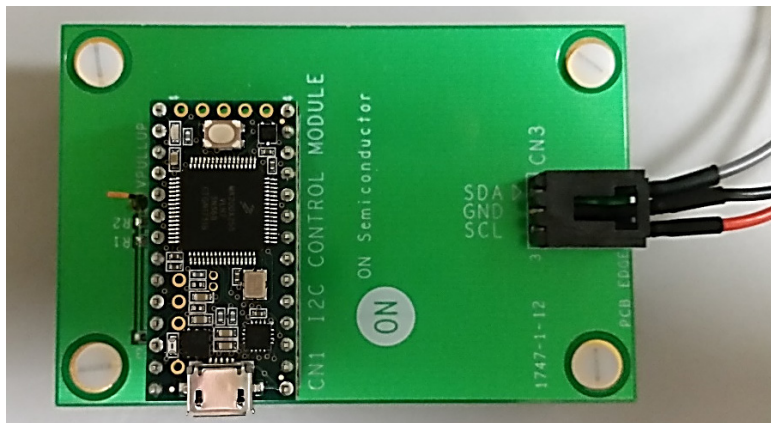


Figure 6. I<sup>2</sup>C Control Module

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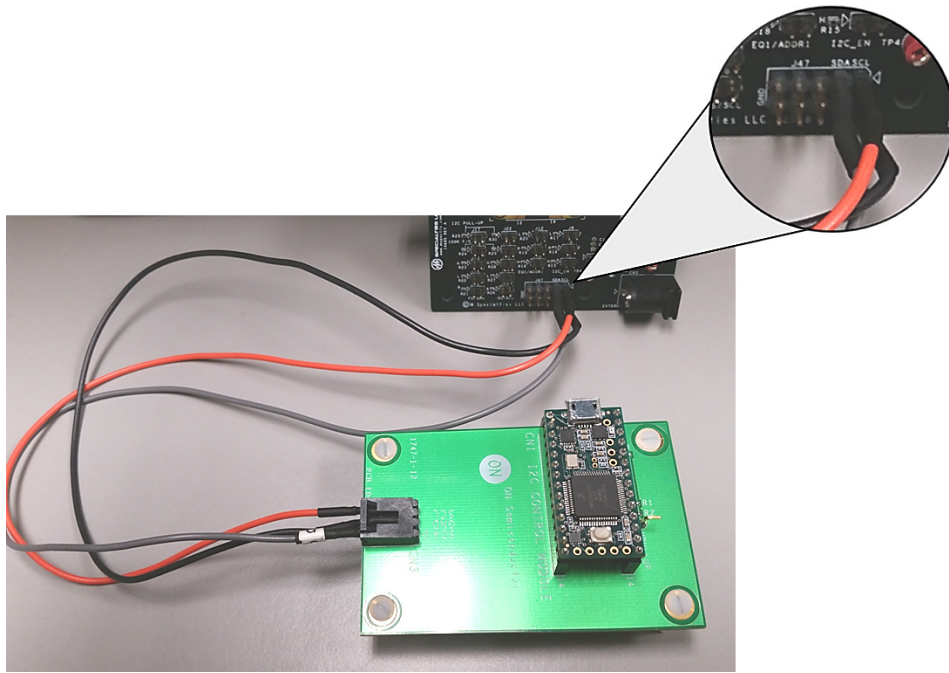


Figure 7. I<sup>2</sup>C Control Module Connected to Demonstration Board

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## Complete Board Schematic

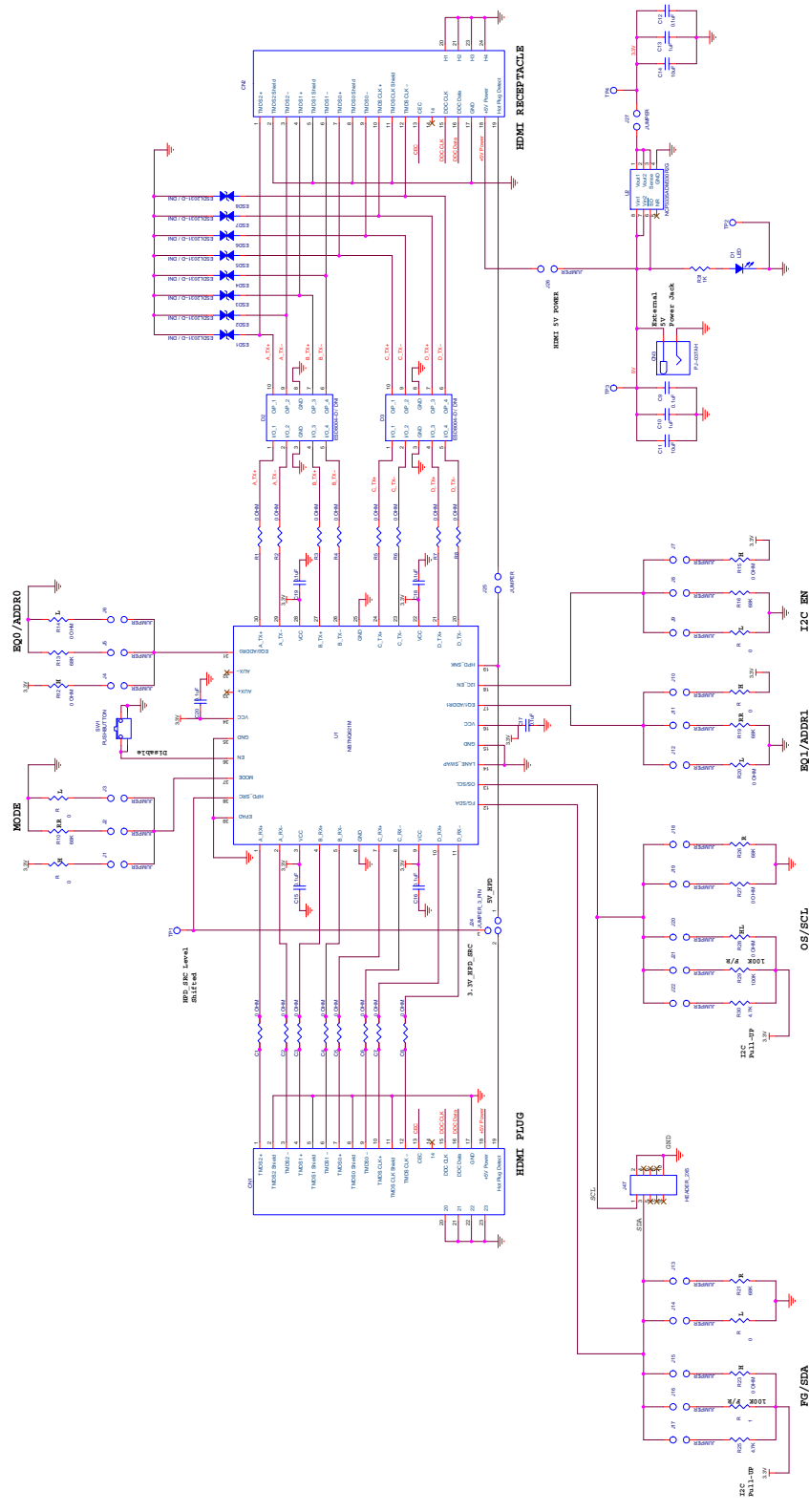


Figure 8. Complete Board Schematic

# NB7NQ621MMUGEVK

## BILL OF MATERIAL

**Table 1. BILL OF MATERIALS**

Qty	Description	Schematic Reference	Manufacturer	Manufacturer Part Number
1	2.0 mm Center Pin, 5.0 A, Right Angle, Through Hole, Dc Power Jack Connector	CN3	CUI	80-080-00384 (PJ-037AH)
8	0402 0.1 $\mu$ F 16 V $\pm$ 10% Tolerance X7R SMT Multilayer Ceramic Capacitor	C9, C12, C15, C16, C17, C18, C19, C20	Murata	80-111-00348 (GRM155R71C104KA88D)
2	CAP CER 1 $\mu$ F 16 V X5R 0402	C10, C13	TDK	80-111-00690 (C1005X5R1C105K050BC)
8	RC Series 0402 0.063 W 0 $\Omega$ Jumper Surface Mount Thick Film Chip Resistor	C1, C2, C3, C4, C5, C6, C7, C8	Yageo	80-114-01524 (RC0402JR-070RL)
2	CL05 Series 0402 10 $\mu$ F 10 V $\pm$ 20% X5R SMT Multilayer Ceramic Capacitor	C11, C14	Samsung	80-111-01096 (CL05A106MP5NUNC)
1	Conn Unshrouded Header HDR 50 POS 2.54 mm Solder ST Thru-Hole Bulk	J24	Samtec	80-112-00108 (TSW-150-14-G-S)
25	Conn Unshrouded Header HDR 50 POS 2.54 mm Solder ST Thru-Hole Bulk	J1, J2, J3, J4, J5, J6, J7, J8, J9, J10, J11, J12, J13, J14, J15, J16, J17, J18, J19, J20, J21, J22, J25, J26, J27	Samtec	80-112-00108 (TSW-150-14-G-S)
1	Conn Unshrouded Header HDR 50 POS 2.54 mm Solder ST Thru-Hole Bulk	J47	Samtec	80-112-00108 (TSW-150-14-G-S)
1	Conn Unshrouded Header HDR 50 POS 2.54 mm Solder ST Thru-Hole Bulk	J23	Samtec	80-112-00369 (TSW-150-17-G-S)
2	Test Point; Red; Thru-Hole; Snap-Fit; SilverPlate; 0.063 in. Dia.; 0.35 In.	TP3, TP4	Keystone	80-112-00392 (5005)
2	Test Point; White; Thru-Hole; Snap-Fit; SilverPlate; 0.063 in. Dia.; 0.35 In.	TP1, TP2	Keystone	80-112-00406 (5007)
2	4.7 k $\Omega$ , 7 inch reel	R25, R30	Panasonic	80-114-00758 (ERJ-2GEJ472X)
1	Res Thick Film 0402 1 k $\Omega$ 1% 0.063 W (1/16 W) $\pm$ 100 ppm/C Molded SMD Automotive Paper T/R	R31	Vishay Dale	80-114-00831 (CRCW04021K00FKED)
2	Res Thick Film 0402 100 k $\Omega$ 1% 1/16 W $\pm$ 100 ppm/C Molded SMD Punched Paper T/R	R24, R29	KOA Speer	80-114-00868 (RK73H1ETTP1003F)
20	RC Series 0402 0.063 W 0 $\Omega$ Jumper Surface Mount Thick Film Chip Resistor	R1, R2, R3, R4, R5, R6, R7, R8, R9, R11, R12, R14, R15, R17, R18, R20, R22, R23, R27, R28	Yageo	80-114-01524 (RC0402JR-070RL)
6	Res Thin Film 0402 68 k $\Omega$ 0.1% 1/16 W $\pm$ 25 ppm/ $^{\circ}$ C Molded SMD SMD Punched Carrier T/R	R10, R13, R16, R19, R21, R26	Panasonic	80-114-01811 (ERA-2AEB683X)
1	SML-E12 Series Blue 0603 Clear 22 mcd 2.9 V Surface Mount EXCELED LED	D1	Rohm Semiconductor	80-115-00300 (SMLE12BC7TT86)

## NB7NQ621MMUGEVK

**Table 1. BILL OF MATERIALS** (continued)

Qty	Description	Schematic Reference	Manufacturer	Manufacturer Part Number
1	Linear Voltage Regulator, LDO, Ultra High Accuracy, Low Iq, 500 mA, V out: 3.3 V	U2	ON Semiconductor	80-116-00623 (NCP3335ADM330R2G)
1	Switch Tactile OFF (ON) SPST Round Button PC Pins 0.05 A 24 VDC 100000 Cycles 2.55 N Thru-Hole Loose	SW1	TE Connectivity	80-119-00093 (1825910-7)
1	-	CN2	-	-
1	-	CN1	-	-
2	-	D2, D3	-	-
8	-	ESD1, ESD2, ESD3, ESD4, ESD5, ESD6, ESD7, ESD8	-	-
1	HDMI, DP, Linear Redriver	U1	ON Semiconductor	NB7NQ621M

NOTE: The bill of materials is subject to change based on component availability and application requirements.

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