

## **DS22EV5110-EVKH HDMI Extender Demo Kit for HDMI Cables**

### **General Description**

The DS22EV5110-EVKH HDMI Cable Extender Demo Kit provides a complete HDMI system extension solution using National's DS22EV5110 - a DVI, HDMI Extended Reach Equalizer with Retimer and Output De-Emphasis.

Two HDMI female connectors are used as the input and the output connections for a HDMI system.

The DDC signals are connected through an I2C buffer.

The Hot Plug, 5V Power and 5V Ground are directly connected between the HDMI connectors, making this demo kit HDCP compliant.

A 3.3V VCC 1-pin header (J22) and a GND 1-pin header (J23) are used for the power supply.

Alternately, an AC/DC power adapter (>800mA) is required for the evaluation kit to provide 5V DC voltage for easy portability. A 1.8mm DC Power Jack is used to connect the AC/DC Power Adapter. National's LP3965, a 3.3V, 1500mA, Fast, Ultra Low Dropout Linear Regulator, converts the 5V power supply voltage to a 3.3V power supply voltage that powers the DS22EV5110.

### **Features**

- Compatible with DTV Resolutions 480i, 480p, 720i, 720p, 1080i, and 1080p with 8 bit and 12 bit deep color depths.
- Compatible with Computer Resolutions of VGA, SVGA, XGA, SXGA, UXGA
- Supports TMDS HDMI Single Link
- Adjustable rotary switches for easy custom EQ boost level setting and De-Emphasis setting to reach maximum length of TMDS Interface with Twisted Pair, HDMI, or DVI Cables
- Single 3.3V Supply
- Ultra Portable with AC/DC Power Adapter (Not included in the kit)
- >8kV ESD Rating
- 0 to 70C Temperature Range

### **Applications**

- Repeater Applications:
  - HDMI / DVI Extender
- Source Applications:
  - Video Cards
  - Blu-ray DVD Players
  - Game Consoles
- Sink Applications:
  - High Definition Displays
  - Projectors

### **Ordering Information**

**PART:** DS22EV5110SQ

**HDMI Demo board:** DS22EV5110-EVKH

**DS22EV5110-EVKH Demo Board ID: 551600199-042**

## Repeater Applications



The DS22EV5110-EVKH demo kit extends TMDS with the 28 AWG STP HDMI cables as follows:

|                                    | Resolution | Pixel bandwidth (MPixel/s)<br>60Hz LCD with 20% blanking | Per channel bandwidth<br>(Gb/s) 60Hz LCD with 20%<br>blanking | HDMI Cable A<br>(28 AWG) | HDMI Cable B<br>(28 AWG) |
|------------------------------------|------------|--|---|--------------------------|--------------------------|
| HDTV (1080i)                       | 1920 x1080 | 75   | 0.75  | > 50m                    | > 20m                    |
| HDTV (1080p)<br>8 bit Color Depth  | 1920 x1080 | 150  | 1.5   | > 35m                    | > 10m                    |
| HDTV (1080p)<br>12 bit Color Depth | 1920 x1080 | 225  | 2.25  | > 25m                    | > 7.5m                   |

### Quick Start Guide:

1. Connect 3.3V DC power to J22 and ground to J23 from the power supply.  
Or, plug the AC/DC power adapter to the DC power Jack  
**AC/DC power adapter requirement: Output DC 4V~6V, Output current > 800mA**
2. Attach two HDMI cables to the HDMI Input and Output Connectors
3. Turn on the DVD/Computer and the Monitor/HDTV.

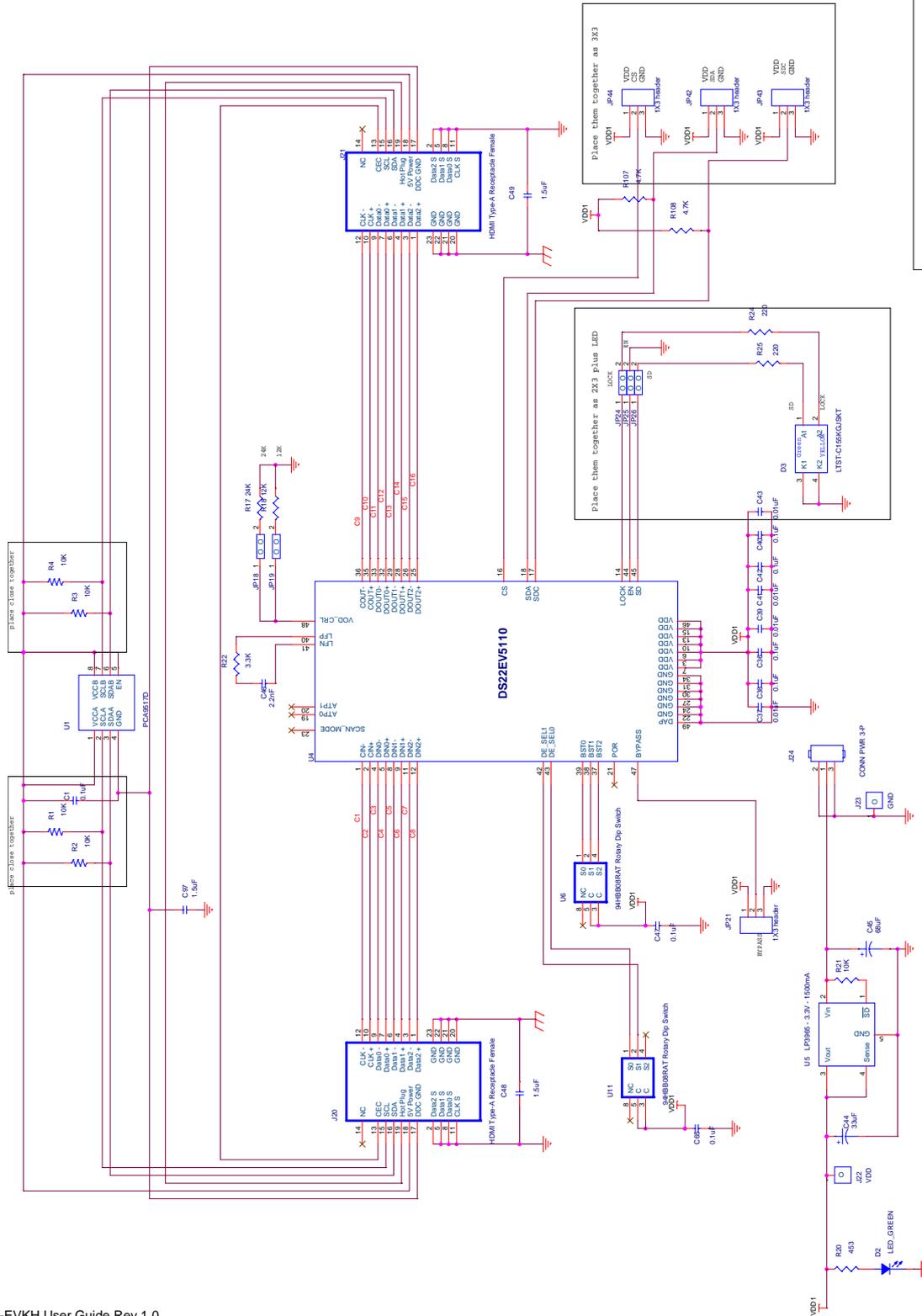
### Adjustment and Control Description

| Component        | Name               | Function   |
|------------------|--------------------|--|
| D2               | PWR                | The LED turns on when 5V DC applies  |
| D3               | SD / LOCK          | The "GREEN" LED turns on when the incoming signal is detected by DS22EV5110<br>The "ORANGE" LED turns on when the PLL of the DS22EV5110 is locked  |
| J24              | 5V DC              | Optional DC Power Jack for 1.5 mm Adaptor Plug   |
| J22              | 3.3V               | 3.3V VCC power supply  |
| J23              | GND                | GND  |
| J44              | CS                 | SMBus Control, Assert HIGH to access SMBus (Optional)  |
| J42, J43         | SDA, SDC           | SDA=SMBus data I/O, SDC=SMBus clock I/O (Optional)   |
| JP18, JP19       | VOD_CRL            | Connect JP18, Sets external resistor = 24K ohm for VO = 1000mVpp<br>Connect JP19, Sets external resistor = 12K ohm for VO = 2000mVpp   |
| JP24, JP25, JP26 | SD / LOCK /EN      | Connect JP24 and JP26 to enable D3<br>Connect JP25 to disable the device outputs<br>Or, use as SD-EN, LOCK-EN auto control. See datasheet  |
| JP21             | BYPASS             | Connect JP21 to VDD to bypass Reclock function   |
| U6               | Rotary Switch (EQ) | Turn the switch to control the EQ boost setting. "0" on the switch refers to the boost setting of "0X00", "7" on the switch refers to the boost setting of "0X07". See datasheet for detail Boost setting information. |
| U11              | Rotary Switch (DE) | Turn the switch to control the DE setting. "0" = 0 dB, "1" = -3 dB, "2" = -6 dB, "3" = -9 dB, "4", "5", "6", "7" = N/A<br>Leave it as "0" in most of the cases.  |

**Bill of Materials**

| DESIGNATION                  | QTY | DESCRIPTION                               |
|------------------------------|-----|---|
| C36, C38, C40, C42, C47, C65 | 6   | 0.1uF $\pm$ 5% Ceramic Capacitor 0402     |
| C37, C39, C41, C43           | 4   | 0.01uF $\pm$ 5% Ceramic Capacitor 0402    |
| C1                           | 1   | 0.1uF $\pm$ 5% Ceramic Capacitor 0603     |
| C46                          | 1   | 2.2nF $\pm$ 5% Ceramic Capacitor 0603     |
| C48, C49, C97                | 3   | 1.5uF $\pm$ 5% Ceramic Capacitor 1206     |
| C44                          | 1   | 33uF $\pm$ 5% Tantalum Capacitor 3528     |
| C45                          | 1   | 68uF $\pm$ 5% Tantalum Capacitor 3528     |
| D2                           | 1   | LED Green Right Angel                     |
| D3                           | 1   | LTST-C155KGJSKT (Orange/Yellow) Dual LED  |
| R20                          | 1   | 453 ohm $\pm$ 5% Resistor 0402            |
| R21                          | 1   | 10K ohm $\pm$ 5% Resistor 0402            |
| R24, R25                     | 2   | 220 ohm $\pm$ 5% Resistor 0402            |
| R107,R108                    | 2   | 4.7K ohm $\pm$ 5% Resistor 0603           |
| R1,R2,R3,R4                  | 4   | 10K ohm $\pm$ 5% Resistor 0603            |
| R17                          | 1   | 24K ohm $\pm$ 5% Resistor 0603            |
| R18                          | 1   | 12K ohm $\pm$ 5% Resistor 0603            |
| R22                          | 1   | 3.3K ohm $\pm$ 5% Resistor 0603           |
| J20,J21                      | 2   | HDMI Receptacle Female 210008715-040      |
| J24                          | 1   | DC Power Jack 1.8 mm                      |
| J22, J23                     | 2   | 1 pin header                              |
| JP18, JP19, JP24, JP25, JP26 | 5   | 1X2 pin header                            |
| JP21,JP42,JP43,JP44          | 4   | 1X3 pin header                            |
| U1                           | 1   | PCA9517D Philips Semiconductor I2C Buffer |
| U4                           | 1   | National DS22EV5110                       |
| U5                           | 1   | National LP3965 – 3.3V -1500mA            |
| U6, U11                      | 2   | 94HBB08RAT Rotary Dip Switch              |

Schematics

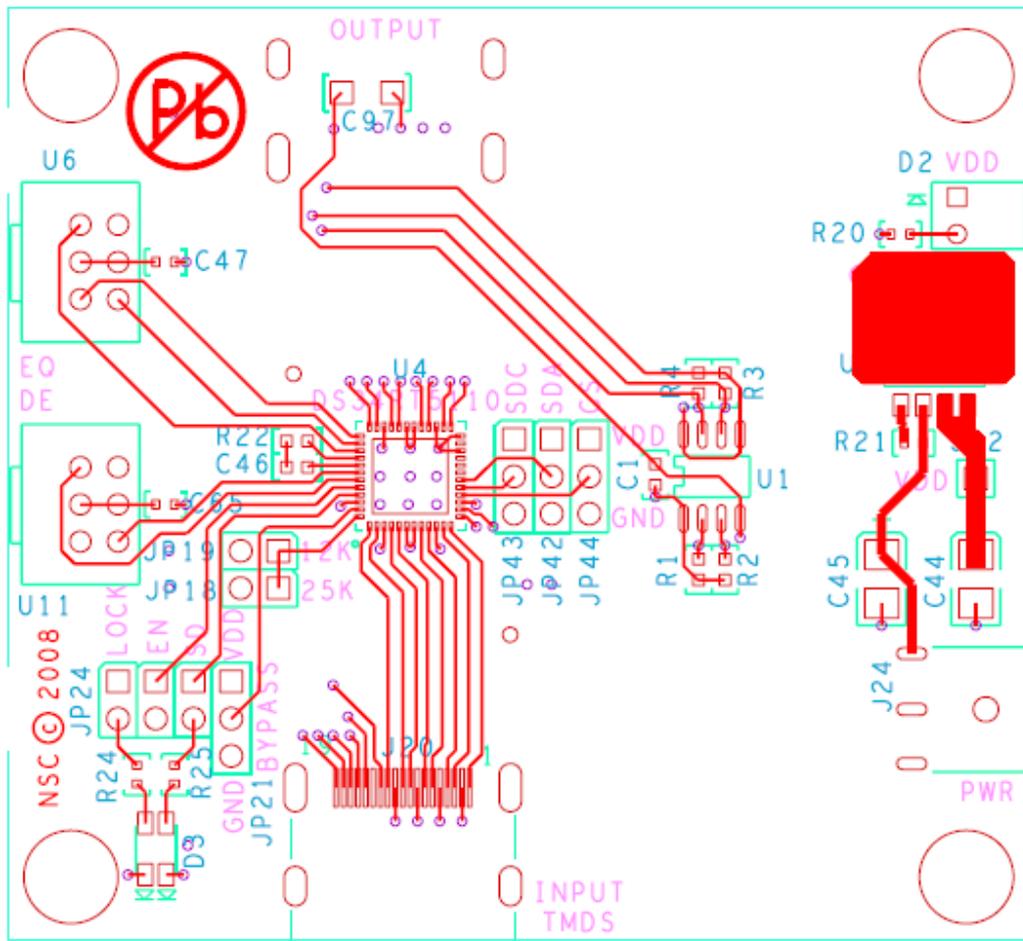


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| Sheet   | DS22EV5110-HDMI        |
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| Author  | Monday, April 09, 2009 |
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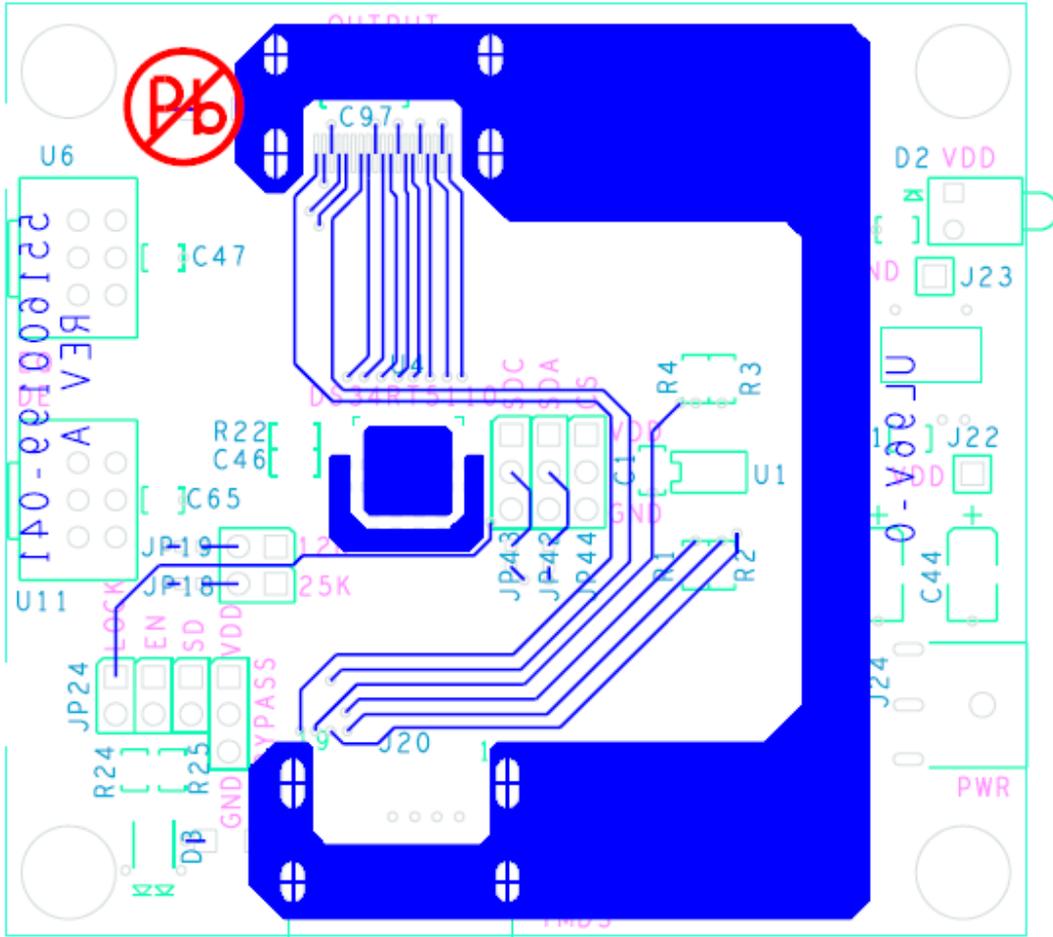
## Layout Considerations

- Keep the clock and data transmission lines as short as possible with controlled 50 ohm single-ended impedance. Or, use differentially coupled traces with 100 ohm impedance.
- Avoid using vias on the clock and data transmission lines on the input side of the DS22EV5110.
- Place power supply decoupling capacitors close to the VCC pins.

## Layout (Top Layer)



**Layout (Bottom Layer)**



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