DS34RT5110-EVKH
HDMI Extender Demo Kit for HDMI Cables

User's Guide

Literature Number: SNLU033A
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DS34RT5110-EVKH HDMI Extender Demo Kit for HDMI Cables

The DS34RT5110-EVKH HDMI Cable Extender Demo Kit provides a complete HDMI system extension solution using Texas Instruments DS34RT5110 - a DVI, HDMI retimer with input equalization and output de-emphasis.

Topic **Page**

1 Description

- 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 (>800 mA) can be used for the evaluation kit to provide 5V DC voltage for easy portability. A 1.8 mm DC power jack is used to connect the AC/DC power adapter. Texas Instruments LP3965, a 3.3V, 1500 mA, fast, ultra low dropout linear regulator, converts the 5V power supply voltage to a 3.3V power supply voltage that powers the DS34RT5110.

2 Features

- Compatible with DTV Resolutions 480i, 480p, 720i, 720p, 1080i, and 1080p with 8-bit, 12-bit and 16-bit Deep Color Depths
- Compatible with Computer Resolutions of VGA, SVGA, XGA, SXGA, and 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 this kit)
- 8 kV ESD Rating
- 0 to 70°C Temperature Range

3 Applications

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

4 Typical Configuration

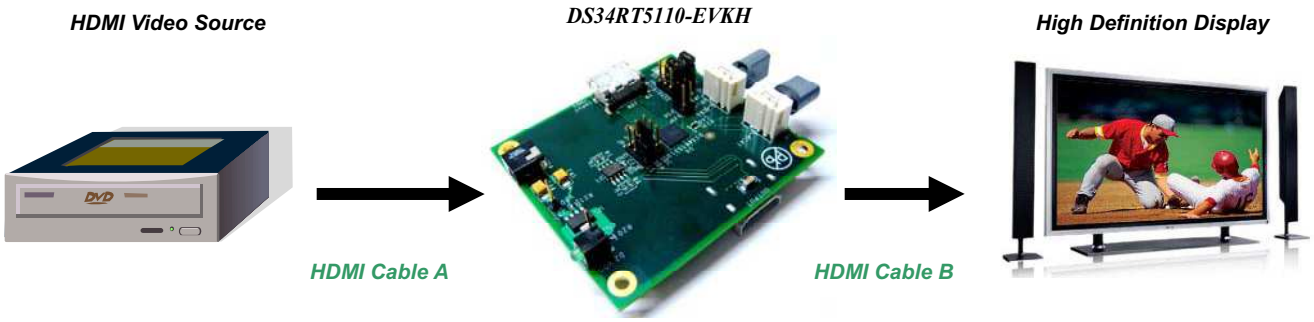

Figure 1. DS34RT5110-EVKH

The DS34RT5110 demo kit extends TMDS with the 28 AWG STP DVI cable as follows:

	Resolution	Pixel Bandwidth (MPixel/s) 60 Hz LCD with 20% Blanking	Per Channel Bandwidth (Gb/s) 60 Hz LCD with 20% Blanking	HDMI Cable A (28 AWG)	HDMI Cable B (28 AWG)
HDTV (1080i)	1920 x1080	75	0.75	>70m	>20m
HDTV (1080p) 8-bit Color Depth	1920 x1080	150	1.5	>35m	>10m
HDTV (1080p) 12-bit Color Depth	1920 x1080	225	2.25	>25m	>7.5m
HDTV (1080p) 16-bit Color Depth	1920 x1080	300	3	>20m	>5m

5 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 >800 mA)
2. Attach two HDMI cables to the HDMI input and output connectors
3. Turn on the DVD/Computer and the Monitor/HDTV

6 Adjustments and Controls

Table 1. Adjustments and Controls

Component	Name	Function
D2	PWR	LED turns on when 5V DC is applied
D3	SD / LOCK	GREEN LED turns on when the incoming signal is detected by DS34RT5110 ORANGE LED turns on when the PLL of the DS34RT5110 is locked
J24	5 V DC	Optional DC power jack for 1.5 mm adaptor plug
J22	3.3 V	3.3V VCC power supply
J23	GND	GND
JP19, JP21	VOD_CRL	Connect JP19 - sets external resistor = 24 kΩ for VO = 1000 mVpp Connect JP21 - sets external resistor = 12 kΩ for VO = 2000 mVpp
JP24, JP25, JP26	LOCK /EN /SD	Connect JP24 and JP26 to enable D3 Connect JP25 to disable the device outputs Or, use as SD-EN, LOCK-EN auto control (see datasheet)
JP48	BYPASS	Connect JP48 to VDD to bypass reclock function
JP52	MODE	Connect JP52 to VDD to bypass the clock PLL 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 detailed 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

7 Schematic

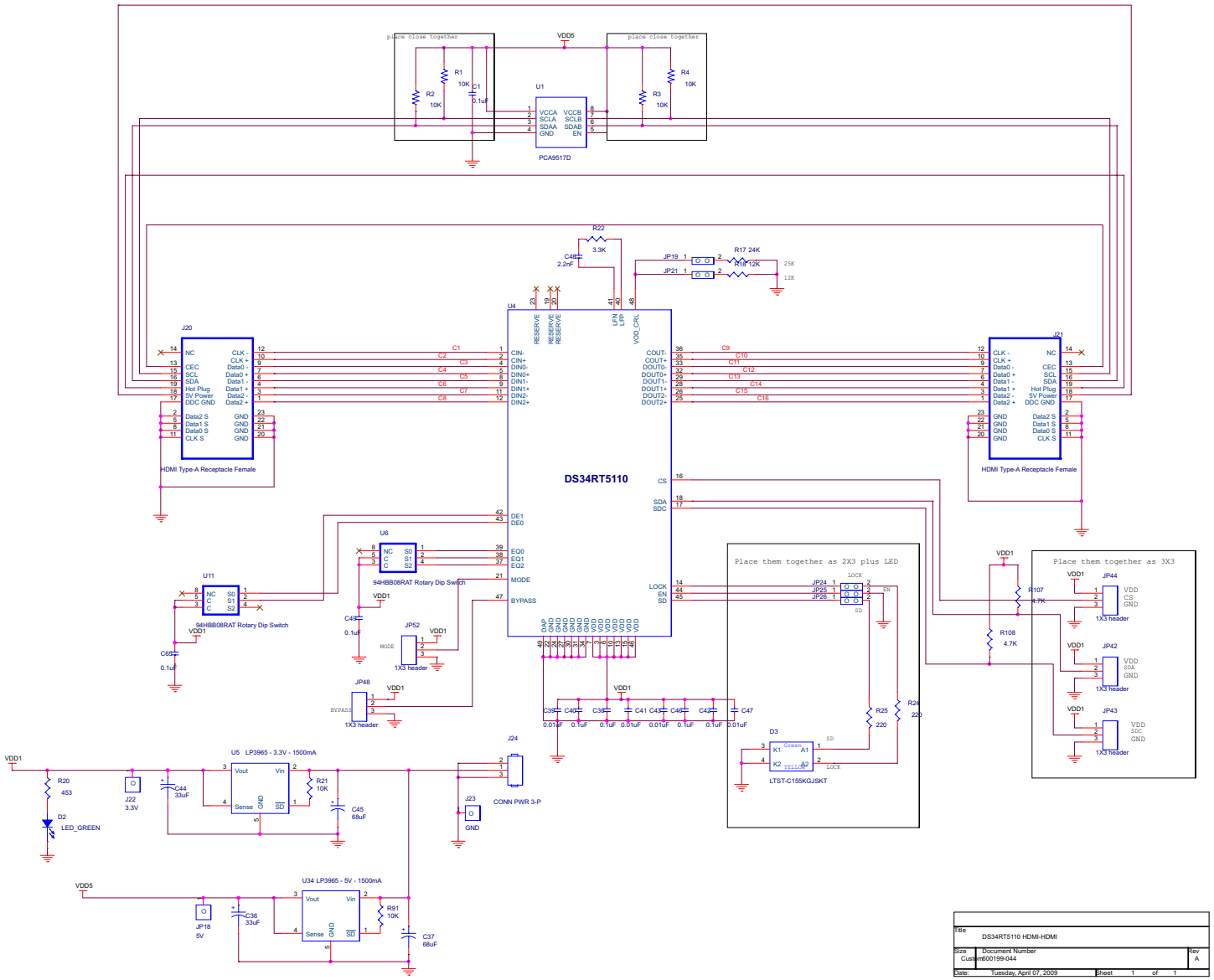

Figure 2. Schematic

8 Layout Considerations

- Keep the clock and data transmission lines as short as possible with controlled 50Ω single-ended impedance. Or, use differentially coupled traces with 100Ω impedance.
- Avoid using vias on the clock and data transmission lines on the input side of the DS34RT5110.
- Place power supply decoupling capacitors close to the VCC pins.

9 Layout

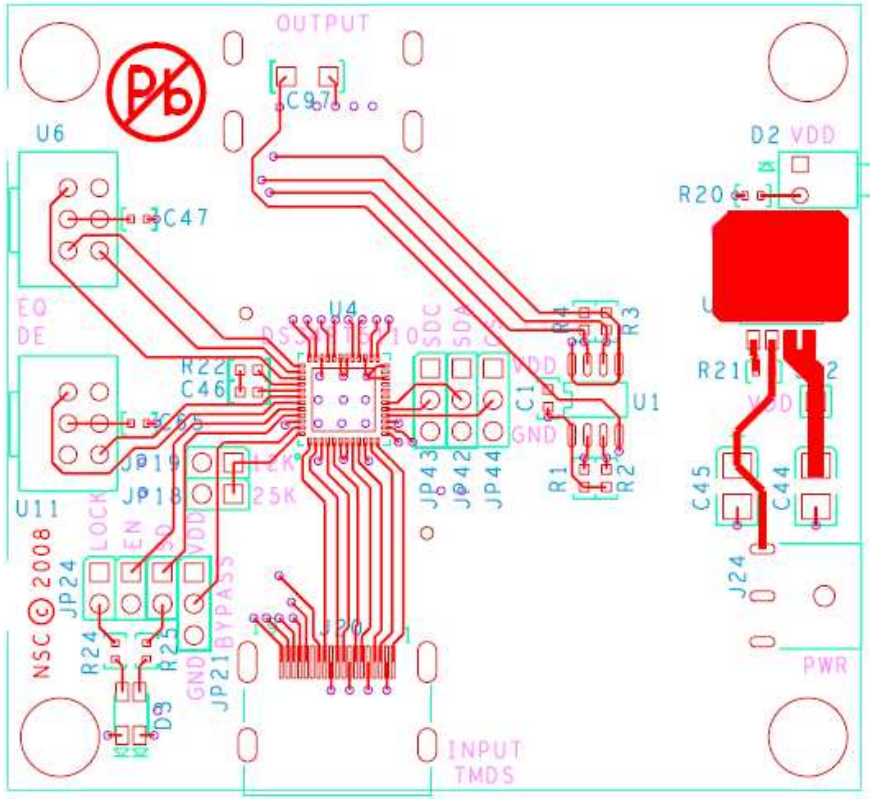

Figure 3. Top Layer

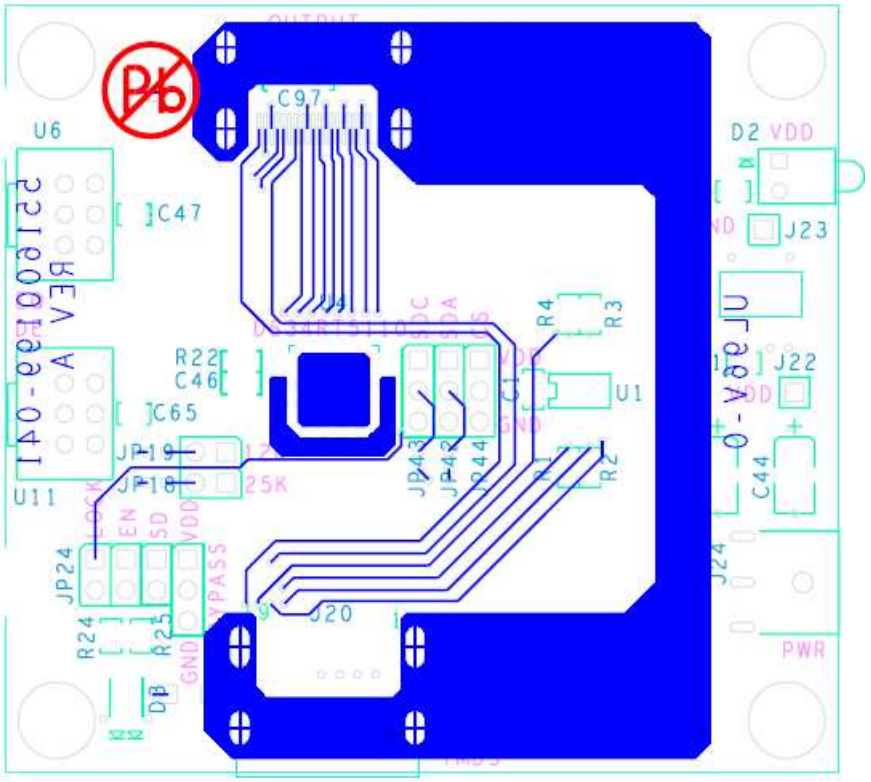

Figure 4. Bottom Layer

10 Bill of Materials

Table 2. DS34RT5110-EVKH Bill of Materials

Qty	Reference	Description
7	C1, C38, C40, C42, C46, C49, C65	0.1 uF ±10% 16V 0402
2	C36, C44	33 uF ±10% 16V 3528
2	C37, C45	68 uF ±10% 16V 3528
4	C39, C41, C43, C47	0.01 uF ±10% 16V 0402
1	C48	2.2 nF ±10% 16V 0402
1	D2	LEDSSF-LXH103LGD
1	D3	LTST-C155KGJSKT
1	JP18	HDR1x1
5	JP19, JP21, JP24, JP25, JP26	HDR1x2
2	JP48, JP52	HDR1x3
2	J20, J21	HDMI Female 500254-1927
1	J22	HDR1x1
1	J23	HDR1x1
1	J24	PJ-014D
6	R1, R2, R3, R4, R21, R91	10 kΩ ±1% 1/10W 0402
1	R17	24 kΩ ±1% 1/10W 0402
1	R18	12 kΩ ±1% 1/10W 0402
1	R20	453Ω ±1% 1/10W 0402
1	R22	3.3 kΩ ±1% 1/10W 0402
2	R24, R25	220Ω ±1% 1/10W 0402
1	U1	PCA9517D
1	U4	DS34RT5110 QFN48
1	U5	LP3965 - 3.3 V - 1500 mA SOT223-5
2	U6, U11	94HBB08RAT Rotary Dip Switch
1	U34	LP3965 - 5 V - 1500 mA SOT223-5

Changes from Original (January, 2012) to A Revision	Page
• Added "(not included in this kit)"	3

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

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For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

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Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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