

DS22EV5110-EVKC

HDMI Extender Demo Kit for Cat5 Cables

Rev 1.0
June, 2009

General Description

The DS22EV5110-EVKC CAT5 / CAT6 Cable Extender Demo Kit provides a complete HDMI system extension solution with cost effective CAT5 or CAT6 cables, using National's DS22EV5110 - a DVI, HDMI Extended Reach Equalizer with Retimer and Output De-Emphasis.

The kit consists of following boards for different application needs:

- a DS22EV5110 receiver board with RJ45-in and HDMI-out connectors
 - o **Board ID 551600199-022**
- a passive adapter board with RJ-45 and HDMI connectors
 - o **Board ID 980013178**

The DS22EV5110 receiver board has two RJ45 jacks as the inputs and one HDMI female receptacle connector as the output.

The passive adapter board has two RJ45 jacks and one HDMI female receptacle connector, can be either the input(s) or the output(s).

The DS22EV5110 on the boards equalizes the long reach HDMI or CAT5 cable at the input, then sends out the low jitter TMDS signal to the HDMI cable through output.

All the TMDS signals are connected through one RJ45 jack between two boards.

The DDC signals are connected through an I2C buffer; the Hot Plug, 5V Power and 5V Ground are directly connected between the connectors, making this demo kit HDCP compliant.

A 3.3V VCC 1-pin header and a GND 1-pin header are used for the power supply for the DS22EV5110 boards.

Alternately, an AC/DC power adapter (>800mA) is required for each driver or receiver board of 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
- DC coupled configurations
- Adjustable rotary switches for easy custom EQ boost level setting and De-Emphasis setting to reach maximum length of TMDS Interface with CAT5, HDMI, or DVI Cables
- Single 3.3V Supply
- Ultra Portable with AC/DC Power Adapters (Two are included in this kit)
- 8kV ESD Rating
- 0 to 70C Temperature Range

national.com

1



© National Semiconductor Corporation 2009

Applications

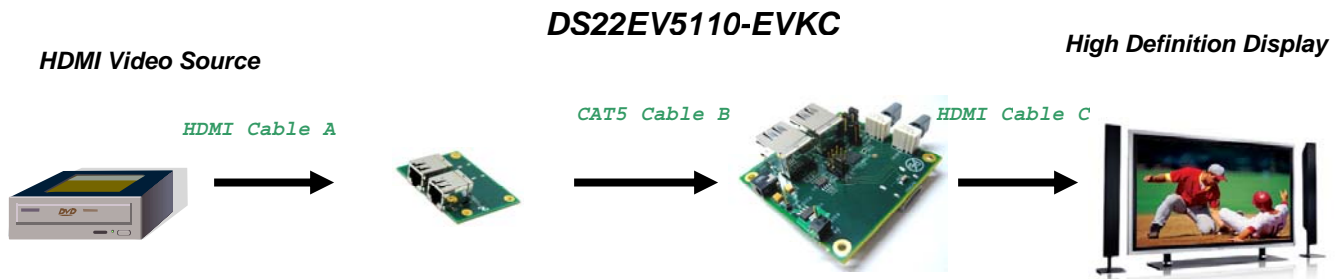
- Repeater Applications:
 - DVI / HDMI Extender Box
- Source Applications:
 - Video Cards
 - Blu-ray DVD Players
 - Game Consoles
- Sink Applications:
 - High Definition Displays
 - Projectors

Ordering Information

PART: DS22EV5110SQ

Demo board: DS22EV5110-EVKC

Typical Configuration



The DS22EV5110 demo kit extends TMDS with the HDMI or CAT5 / CAT6 cables as follows:

	Pixel bandwidth (MPixel/s) 60Hz LCD with 20% blanking	Per channel bandwidth (Gb/s) 60Hz LCD with 20% blanking	HDMI Cable A + CAT5 Cable B (Total Lengths)	HDMI Cable C (28 AWG)
HDTV (1080i)	75	0.75	> 50m	> 20m
HDTV (1080p) 8 bit Color Depth	150	1.5	> 35m	> 15m
HDTV (1080p) 12 bit Color Depth	225	2.25	> 25m	> 7.5m

Quick Start Guide:

1. Connect 3.3V DC power and ground of the boards to the headers 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 all the applicable cables to the boards
 - a. Attach one pair of CAT5 / CAT6 cable between "JR1" and "JR3" for TMDS links
 - b. Attach one pair of CAT5 / CAT6 cable between "JR2" and "JR4" for other control signals
3. Turn on the DVD/Computer and the Monitor/HDTV.

Adjustment and Control Description

Component	Name	Function
Receiver Board (Board ID: 551600199-022)		
D6	PWR	The LED turns on when power applies
D7	SD / LOCK	The "GREEN" LED turns on when the incoming signal is detected by DS22EV5110 The "ORANGE" LED turns on when the PLL of the DS22EV5110 is locked
J31	5V DC	Optional DC Power Jack for 1.5 mm Adaptor Plug
J29	3.3V	3.3V VCC power supply
J30	GND	GND
JP14	CS	SMBus Control, Assert HIGH to access SMBus (Optional)
JP12, J13	SDA, SDC	SDA=SMBus data I/O, SDC=SMBus clock I/O (Optional)
JP38, JP39	VOD_CRL	Connect JP38, Sets external resistor = 24K ohm for VO = 1000mVpp Connect JP39, Sets external resistor = 12K ohm for VO = 2000mVpp
JP27, JP28, JP29	SD / LOCK /EN	Connect JP27 and JP29 to enable D3 Connect JP28 to disable the device outputs Or, use as SD-EN, LOCK-EN auto control. See datasheet
JP22	BYPASS	Connect JP22 to VDD to bypass Reclock function
U15	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.
U14	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 Set to "0" in most of the cases.

Bill of Material

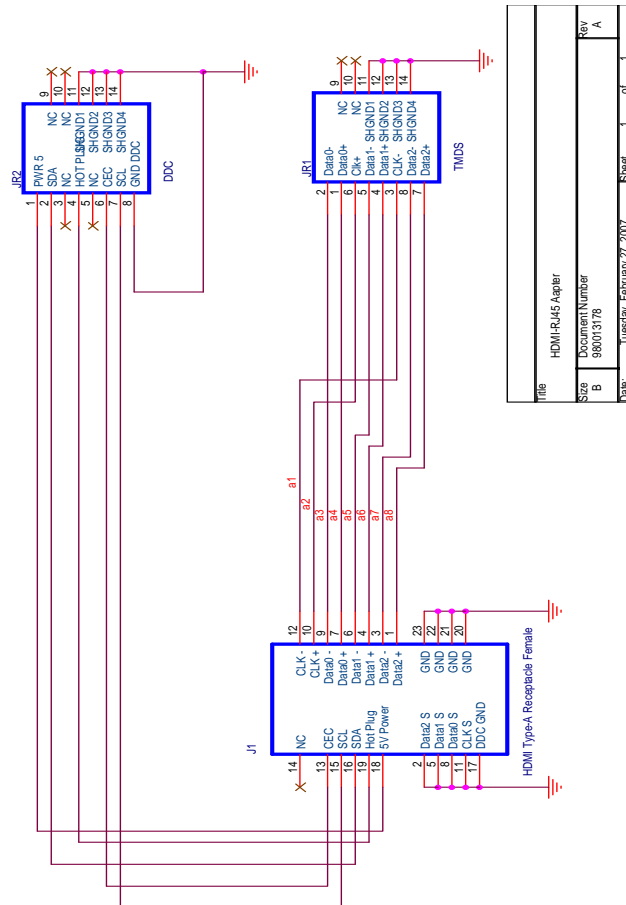
Receiver Board (Board ID: 551600199-022)		
DESIGNATION	QTY	DESCRIPTION
C70,C72,C73,C75,C77,C80	6	0.1uF +5% Ceramic Capacitor 0402
C71,C74,C76,C78	4	0.01uF +5% Ceramic Capacitor 0402
C6	1	0.1uF +5% Ceramic Capacitor 0603
C79	1	2.2nF +5% Ceramic Capacitor 0603
C67,C99	2	1.5uF +5% Ceramic Capacitor 1206
C68	1	33uF +5% Tantalum Capacitor 3528
C69	1	68uF +5% Tantalum Capacitor 3528
D6	1	LED Green Right Angel
D7	1	LTST-C155KGJSKT (Orange/Yellow) Dual LED
R32	1	453 ohm +5% Resistor 0402
R33	1	10K ohm +5% Resistor 0402
R34,R35	2	220 ohm +5% Resistor 0402
R103,R104	2	4.7K ohm +5% Resistor 0603
R9,R10,R11,R12	4	10K ohm +5% Resistor 0603
R31	1	24K ohm +5% Resistor 0603
R56	1	12K ohm +5% Resistor 0603
R36	1	3.3K ohm +5% Resistor 0603
J33	1	HDMI Receptacle Female 210008715-040
JR3, JR4	2	RJ45
J31	1	DC Power Jack 1.8 mm
J29, J30	2	1 pin header
JP27,JP28,JP33,JP38,JP39	5	1X2 pin header

JP12,JP13,JP14,JP22	4	1X3 pin header
U3	1	PCA9517D Philips Semiconductor I2C Buffer
U13	1	National DS22EV5110
U12	1	National LP3965 – 3.3V -1500mA
U14, U15	2	94HBB08RAT Rotary Dip Switch
Passive Driver Board (Board ID: 980013178)		
DESIGNATION	QTY	DESCRIPTION
JR1, JR2	2	RJ45 Jack
J1	1	HDMI Receptacle Female

Board Design Consideration

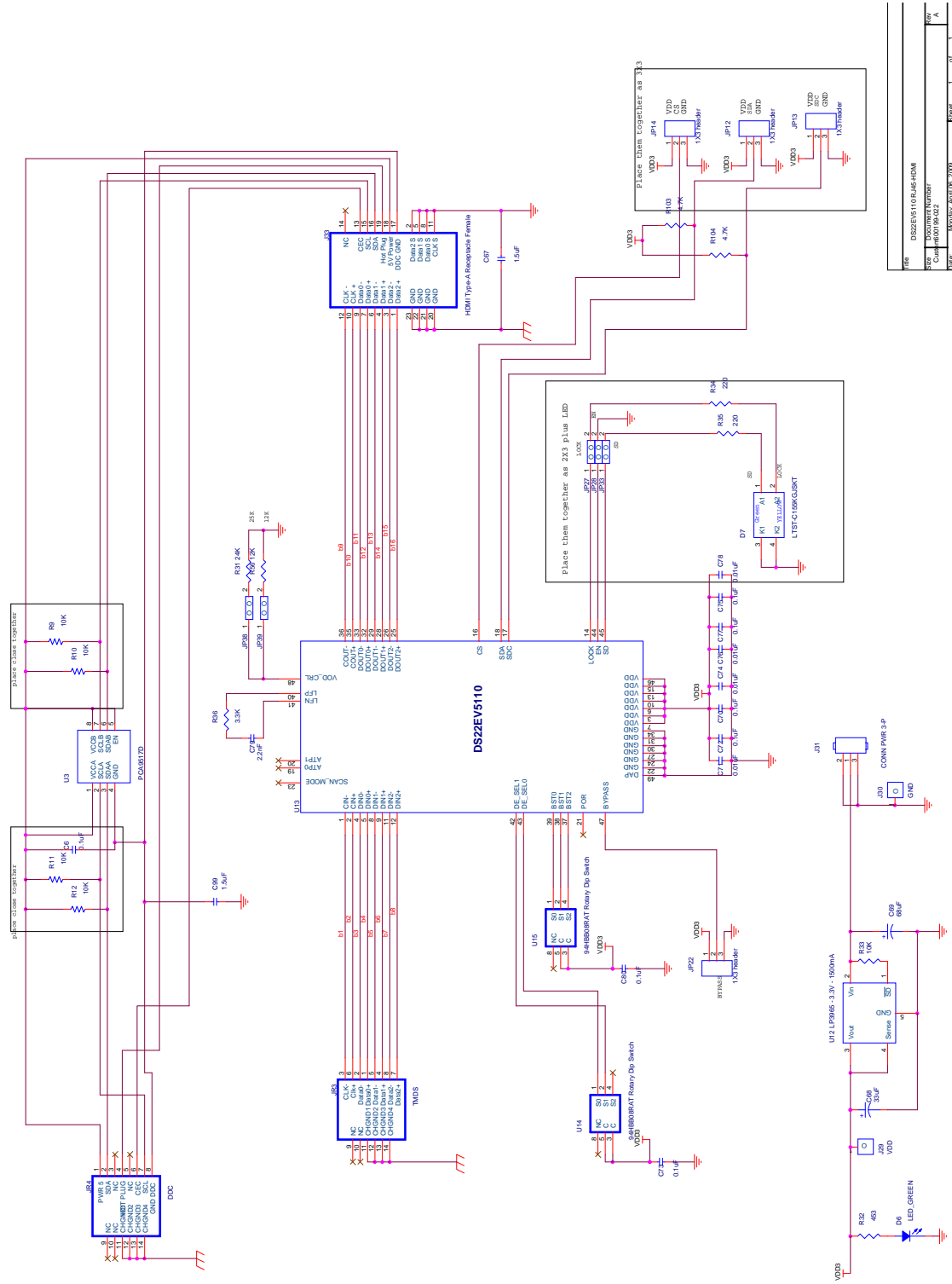
- Using One RJ45 Jack for all TMDS signals in order to minimize the inter pair skew.
- Using another RJ45 Jack for all rest of control pins, plus at least one ground connection between two boards to set the common ground.
- Use pin 3 and pin 6 on the RJ45 Jack for the TMDS clock path.

Schematics (Passive Adapter Board)



Title		HDMI-RJ45 Adapter
Size	Document Number	980013178
Date:	Issue:	Tuesday, February 27, 2007
	Sheet	1 of 1
	Rev	A

Schematics (Receiver Board)

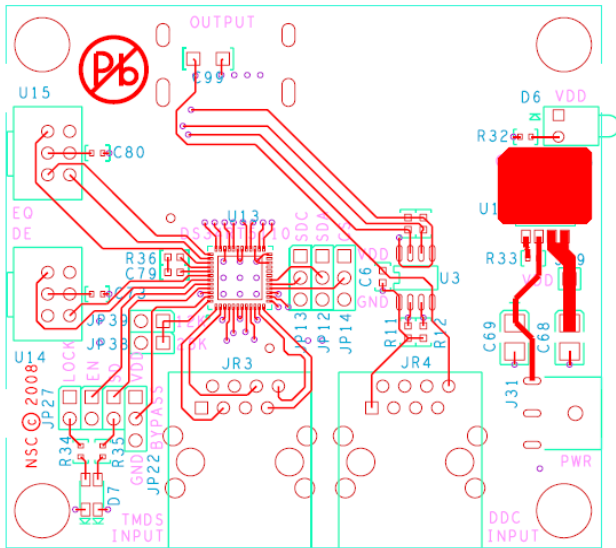


FILE	DS22EV5110R046.FHM
REV	PCB Layout Number
COMP	CompRev0109.02.2
DATE	MO:03/27/06 06:20:00
SHEET	01
OF	1

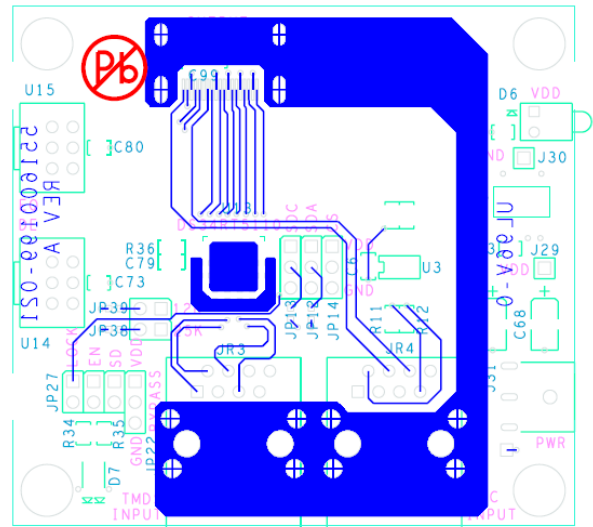
Layout Considerations

- Keep the clock and data transmission lines as short as possible with controlled 50 ohm single-ended impedance with matched lengths for any TMDS signals connected to RJ45 Jack.
- Use differentially coupled traces with 100 ohm impedance for DS22EV5110 TMDS outputs.
- Avoid using vias on the data transmission lines on the input side of the DS22EV5110.
- Place power supply decoupling capacitors close to the VCC pins.

Layout (Receiver Board)

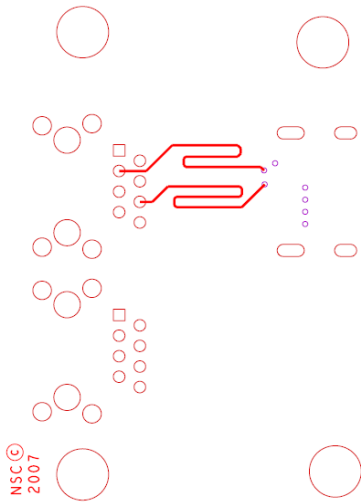


Top View

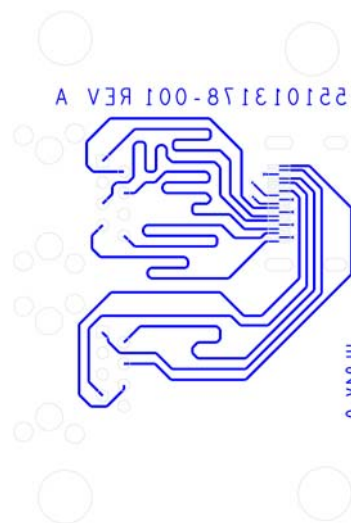


Bottom View

Layout (Passive Adapter Board)



Top View



Bottom View

national.com

