

## DS16EV5110-EVKC HDMI-RJ45 Extender Demo Kit for CATx Cables

### General Description

The DS16EV5110-EVKC CATx Cable Extender Demo Kit provides a complete HDMI system extension solution with cost effective CATx cables, using National's DS16EV5110 - a Video Equalizer.

The kit consists of a driver adapter board and a receiver equalizer board. The driver board has one HDMI female receptacle connector and two RJ45 jacks. It is a passive board without power supply. It serves as an adapter between HDMI and CATx interfaces. The receiver equalizer board has two RJ45 jacks and one HDMI female receptacle connector with other components, including a DS16EV5110 device.

All the TMDS signals are connected through first RJ45 jack between two boards. The DDC signals, Hot Plug, 5V Power and 5V Ground are directly connected between the HDMI connectors to the second RJ45 jack on both boards, making this demo kit HDCP compliant.

A 3.3V VCC 1-pin header (J4) and a GND 1-pin header (J5) are used for the power supply for the receiver equalizer board.

Alternately, an AC/DC power adapter (>300mA) can be used for the receiver equalizer board 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 LP3964, a 3.3V, 800mA, Fast, Ultra Low Dropout Linear Regulator, converts the 5V power supply voltage to a 3.3V power supply voltage that powers the DS16EV5110 and other active components on the receiver board.

### Features

- **Compatible with DTV Resolutions 480i, 480p, 720i, 720p, 1080i, 1080p, and 1080p with 12 bit deep color depth.**
- **Compatible with Computer Resolutions of VGA, SVGA, XGA, SXGA, UXGA**
- **Supports TMDS HDMI or DVI Single Link**
- **Adjustable rotary switch for easy custom EQ boost level 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)**
- **500 mW Typical Power Consumption**
- **8kV ESD Rating**
- **-40 to 85C Industrial Temperature Range**
- **The DS16EV5110-EVKC demo kit extends TMDS with the UTP (Unshielded Twist Pairs) CAT5e or CAT6 cable as follows:**

	<b>Resolution</b>	<b>Pixel bandwidth (MPixel/s) 60Hz LCD with 20% blanking</b>	<b>Per channel bandwidth (Gb/s) 60Hz LCD with 20% blanking</b>	<b>UTP CAT5e/6 Length</b>
<b>SDTV (480p)</b>	704 x 480	25	0.25	> 80 m
<b>HDTV (720p)</b>	1280 x 720	66.4	0.664	> 55 m
<b>HDTV (1080i)</b>	1920 x1080	75	0.75	> 50 m
<b>HDTV (1080p)</b>	1920 x1080	150	1.5	> 30 m
<b>HDTV (1080p) 12 bit Deep Color Depth</b>	1920 x1080	225	2.25	> 25 m

### Applications

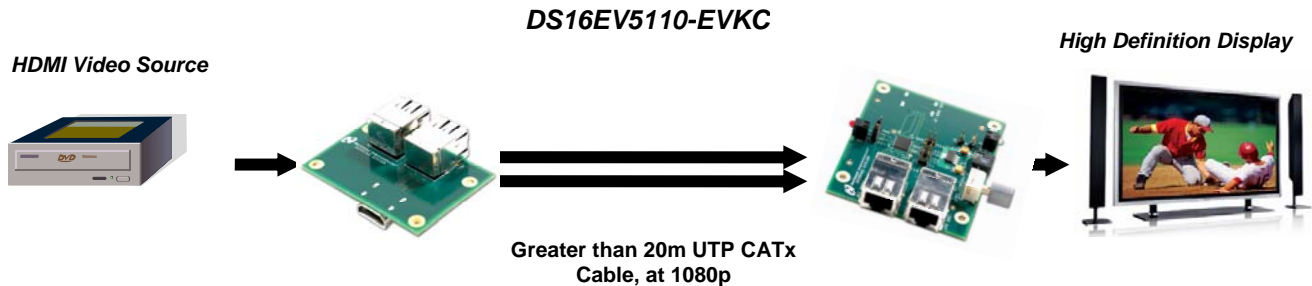
High Definition Displays and Televisions  
High Definition Front- Projectors  
LCD Computer Monitors  
HDMI Cable Extender

## Ordering Information

**PART:** DS16EV5110SQ

**Demo Board for CATx Cables:** DS16EV5110-EVKC

## Typical Applications



## Bill of Materials

### Passive Driver Board

DESIGNATION	QTY	DESCRIPTION
JR1, JR2	2	RJ45 Jack
J1	1	HDMI Receptacle Female

### Equalizer Receiver Board

DESIGNATION	QTY	DESCRIPTION
C2, C4, C8, C10	4	0.01uF $\pm$ 10% Ceramic Capacitor 0402
C1, C3, C7, C9, C11	5	0.1uF $\pm$ 10% Ceramic Capacitor 0402
C5	1	33uF $\pm$ 10% Tantalum Capacitor 3528
C6	1	68uF $\pm$ 10% Tantalum Capacitor 3528
D1	1	LED Green
D2	1	LED Red
JR1, JR2	2	RJ45 Jack
R1, R2	2	453 ohm $\pm$ 5% Resistor 0402
R7	1	10K ohm $\pm$ 5% Resistor 0402
J2	1	HDMI Receptacle Female
J3	1	DC Power Jack 1.8 mm
J4, J5	2	1 pin header (J4: VDD=3.3V, J5:GND)
J7, J8, J10, J11	4	1X2 pin header
J9	1	1X4 pin header
U1	1	National DS16EV5110
U2	1	National LP3965 – 3.3V -1500mA
U3	1	94HBB08RAT Rotary Dip Switch

### Quick Start Guide:

1. Attach HDMI cable from the source to the drive board.
2. Attach HDMI cable from the sink to the receiver board.
3. Connect 3.3V DC power to J4 and ground to J5 from the power supply on the receiver board.  
Or, plug the AC/DC power adapter to the DC power Jack  
***AC/DC power adapter requirement: Output DC 4V~6V, Output current > 800mA***
4. Attach two CATx cables between the driver board and the receiver board with JR1 to JR1, and JR2 to JR2.
5. Turn on the source (DVD/Computer) and the sink (Monitor/HDTV).

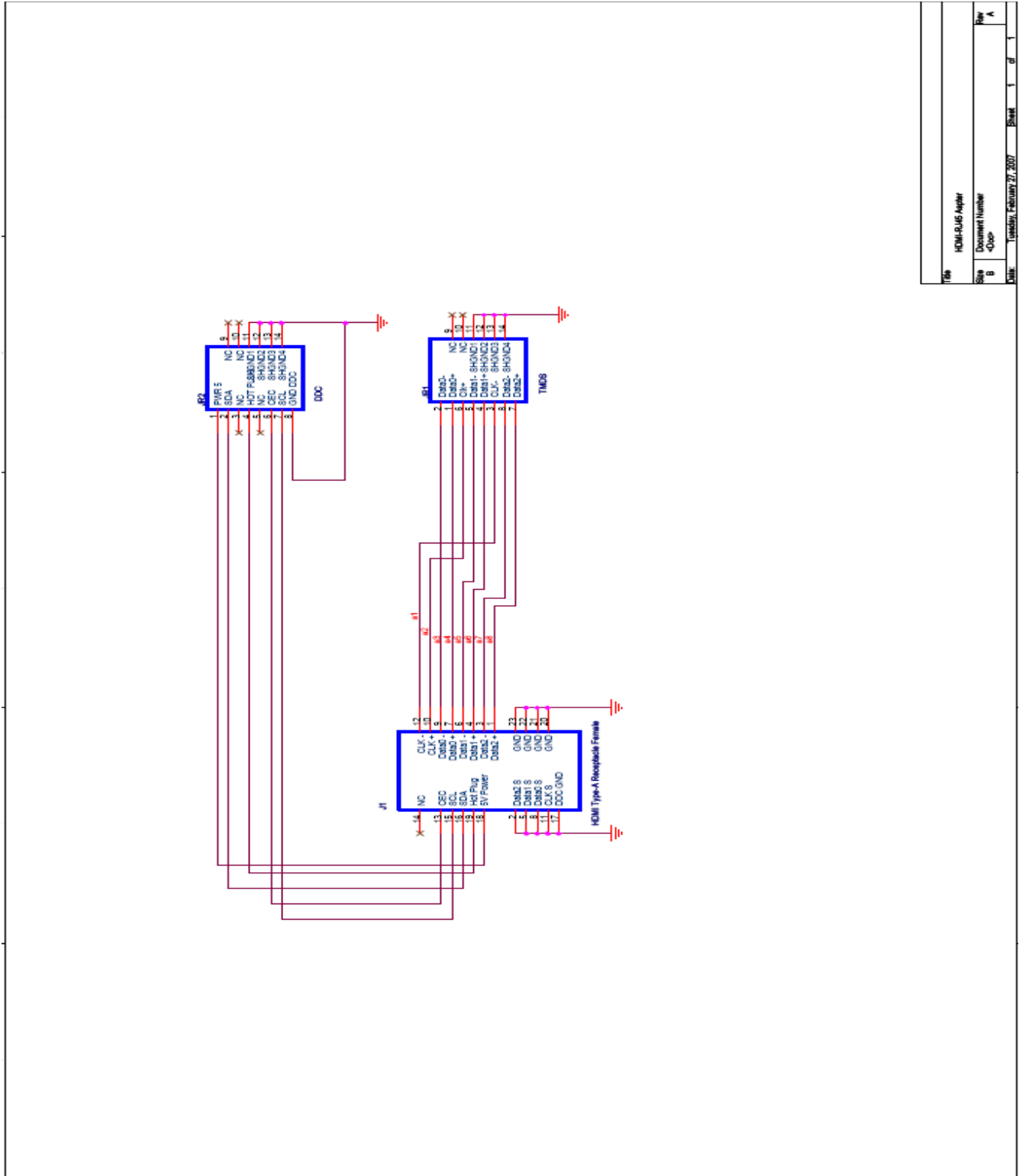
### Adjustment and Control Description on Receiver Board

Component	Name	Function
D1	PWR	The LED turns on when 5V DC applies
D2	SD	The LED turns on when the DS16EV5110 does not detect input signal
J3	5V DC	Optional DC Power Jack for 1.5 mm Adaptor Plug
J4	3.3V	3.3V VCC power supply
J5	GND	GND
J7	FEB	Optional SMBus Control. See Datasheet.
J8	CS	Optional SMBus Control. See Datasheet
J10, J11	SDA, SDC	Optional SMBus access. See Datasheet
J9	Loop Back Control	Connect "LED" and "SD" to enable D2 function. Connect "SD" and "EN" to enable look back control function. When the clock signal is not detected, the DS16EV5110 sets to power down mode.
U3	Rotary Switch	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.

### Board Design Consideration

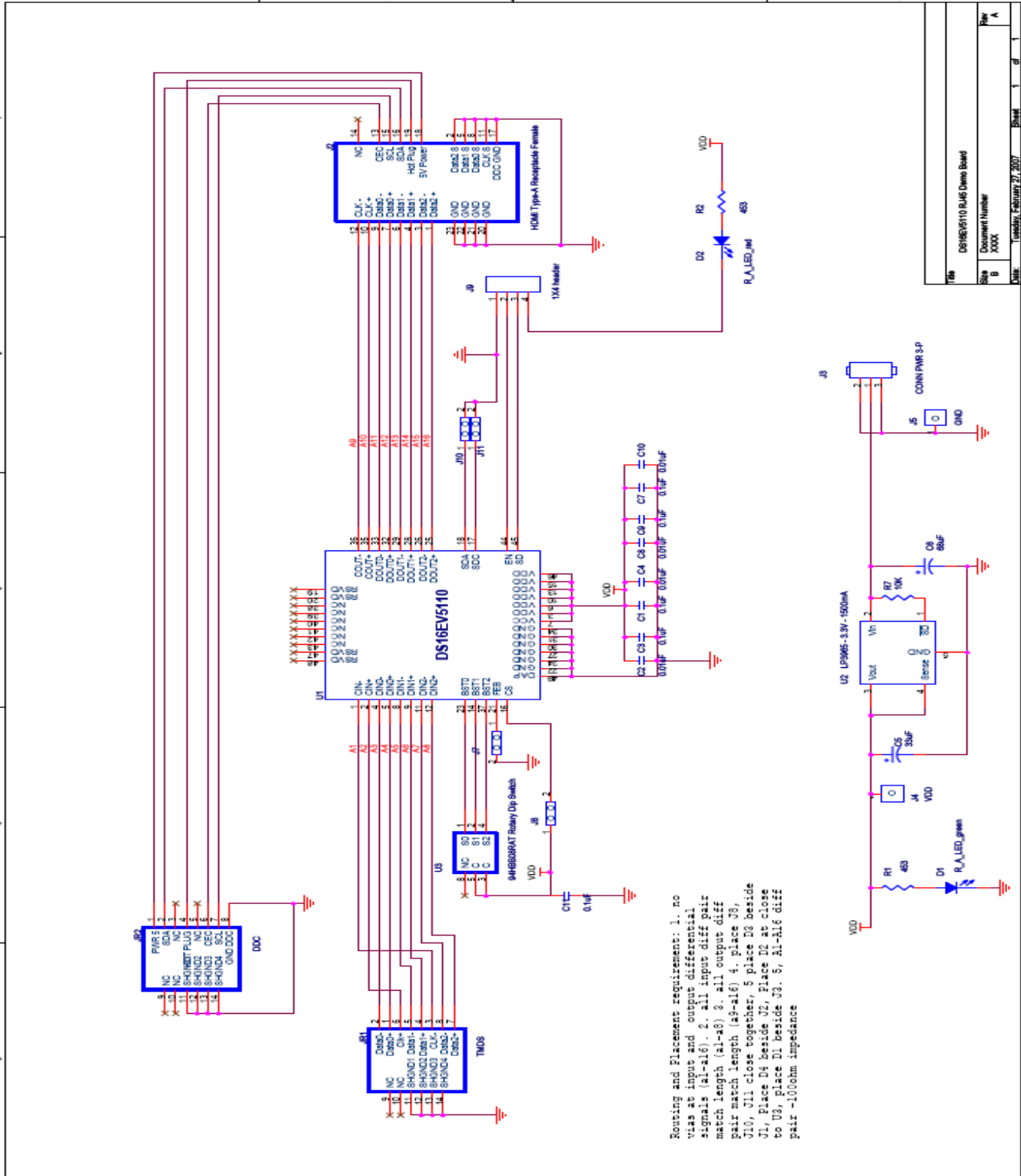
- Using One RJ45 Jack for all TMDS signals in order to minimize the inter pair skew.
- Using another RJ45 Jack for all rest of control pins, plus at least one ground connection between two boards to set the common ground.
- Use pin 3 and pin 6 on the RJ45 Jack for the TMDS clock path.

**Schematics (Driver Adapter Board)**



Title	HDMI-RJ45 Adapter
Size	B
Document Number	4000
Rev	A
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**Schematics (Receiver Equalizer Board)**

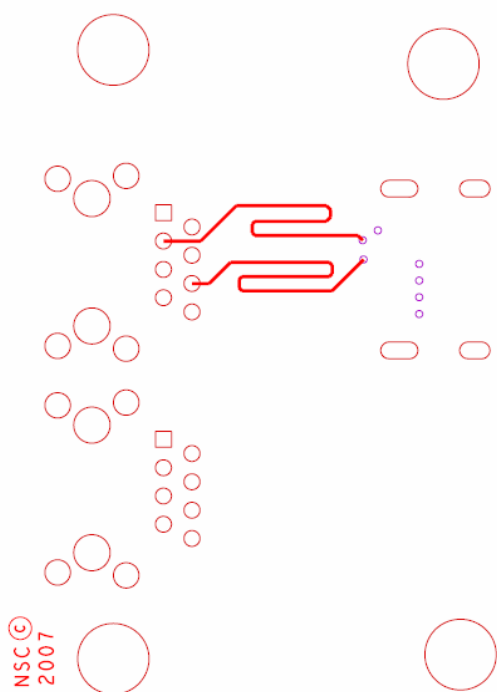


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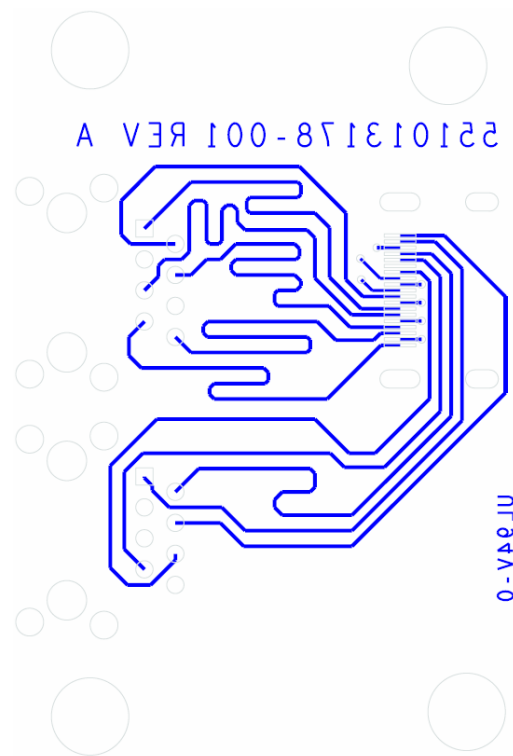
## Layout Considerations

- 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 DS16EV5110 TMDS outputs.
- Avoid using vias on the data transmission lines on the input side of the DS16EV5110.
- Place power supply decoupling capacitors close to the VCC pins.

## Layout (Driver Adapter Board)

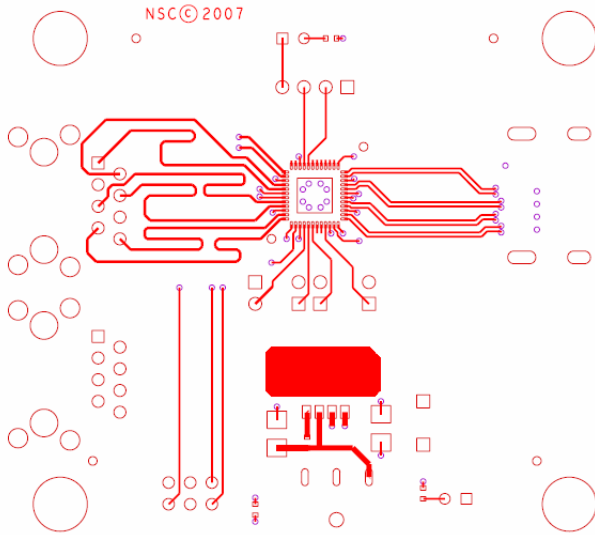


**Top View**

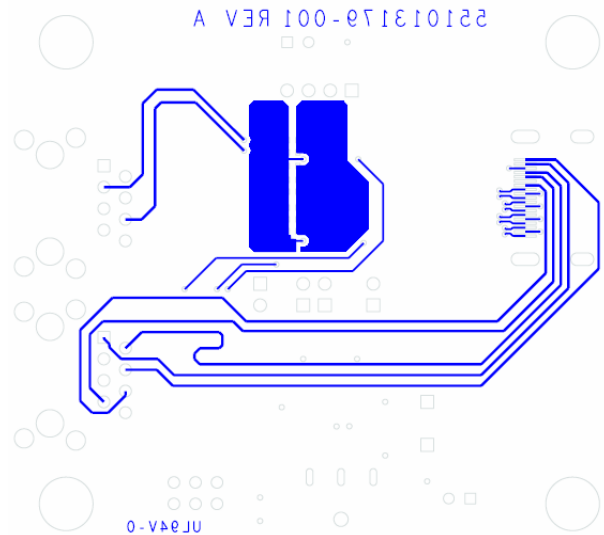


**Bottom View**

### Layout (Receiver Equalizer Board)



**Top View**



**Bottom View**