PI3HDMI101
Source Application by Ada Yip

PI3HDMI101 on Source Application

Pericom's PI3HDMI101 can be employed on HDMI Source Application to perform re-driver function with optimized pre-emphasis and equalization settings. To give more flexibility to customers, CLOCK and DATA channels of PI3HDMI101 are interchangeable, provided that 50Ω termination in RxSense circuitry, which is implemented at CLK+/- of PI3HDMI101, is chosen. Assuming that the PI3HDMI101 is located close to HDMI output connector, optimum output swing, pre-/de-emphasis and equalization settings are recommended in this application note.

The CLOCK and DATA channels of PI3HDMI101 shown in the schematic above are interchanged, i.e. Tx2+/- of HDMI transmitter, AD9889B for instance, are connected to CLK-/+ of PI3HDMI101, respectively. Consequently, for full active operation, RxSense pin (pin 16) is required to be set to high level so as to keep CLK+/- termination 50Ω instead of 250kΩ high impedance.

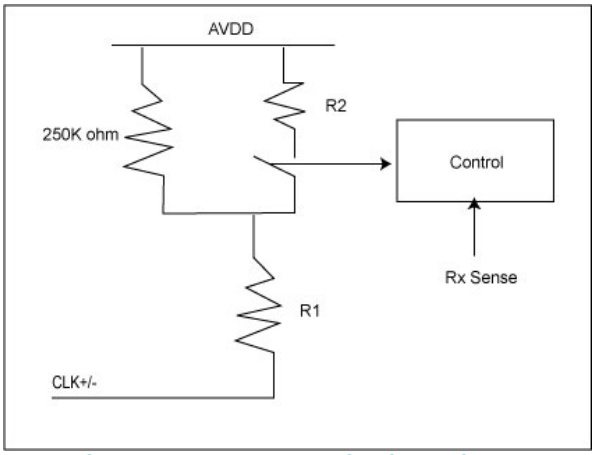

Figure 1: RxSense Termination Scheme

To enable I2C buffer on PI3HDMI101 for Source, DDC_EN pin (pin 17) is set to high voltage level. Since DDC pull-up resistors in Source Application are not larger than 3kΩ, IADJ pin (pin 42) on PI3HDMI101 is required to be pulled high.

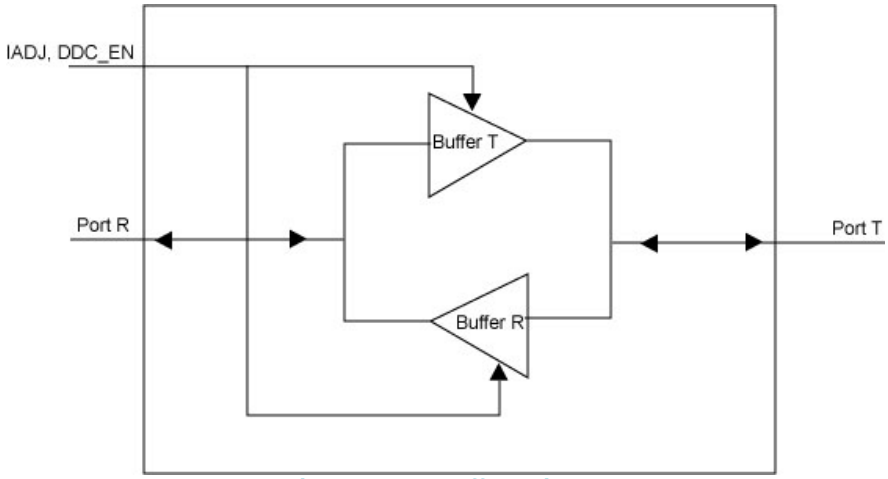

Figure 2: I2C Buffer Scheme

For full active, /OE pin (pin 18) of PI3HDMI101 has to be pulled to low level. /OE pin can be controlled or disabled by software in customer's application.

As 100kΩ internal pull-up resistors are implemented in OC and EQ pins of PI3HDMI101, only external pull-down resistors are required to adjust output swing, pre-/de-emphasis and equalization settings.

Table 1: OC & EQ Pin Definition

Pin #	Pin Name	I/O	Description
1, 2	EQ_S0, EQ_S1	I	Equalizer controls, both pins with internal pull-ups
19, 20, 21, 22	OC_S0, OC_S1, OC_S2, OC_S3	I	Output buffer controls Note: All 4 pins have internal pull-ups

Source Application Schematic (1)

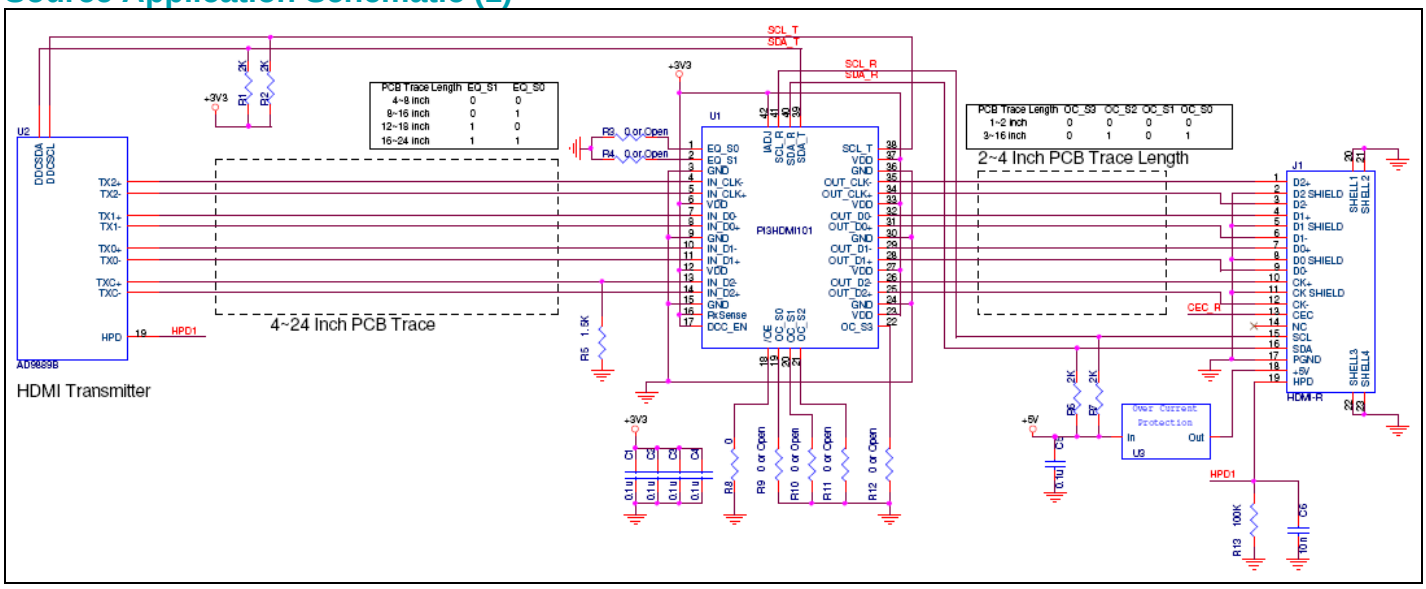

Figure 3: Source Application Schematic without RxSense Function

Source Application Schematic (2)

The following schematic applies RxSense Function. On PCB, stubs between pull-down resistors (R14-15) in external RxSense circuit and output CLK+/- traces must be avoided to prevent from signal reflection.

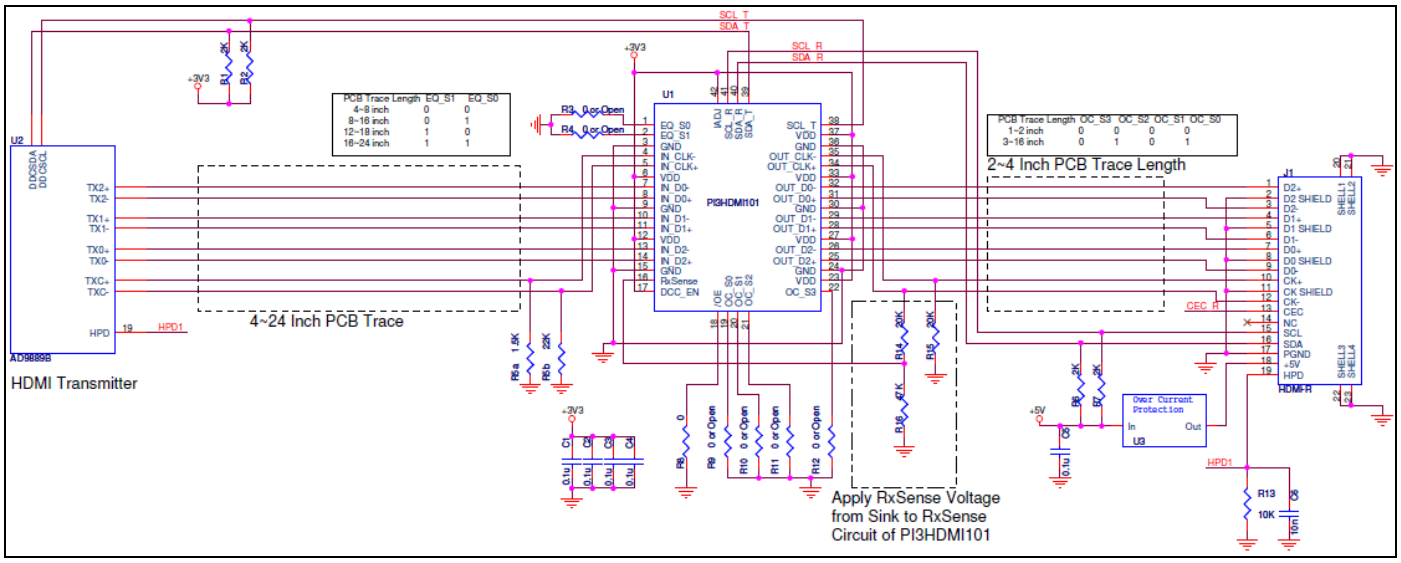

Figure 4: Source Application Schematic with RxSense Function

PI3HDMI101 Swing and Pre-/De-emphasis Settings

Swing and Pre-/De-emphasis are used for compensating PCB trace or cable loss at output of PI3HDMI101. Swing is the peak-to-peak voltage of transmitted signal.

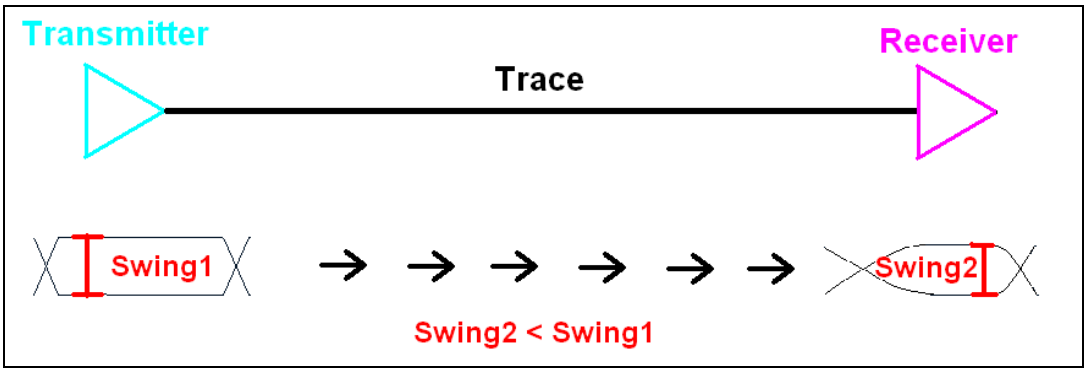

Figure 5: Function of Swing

Pre-emphasis increases initial drive to pre-compensate insertion loss through trace.

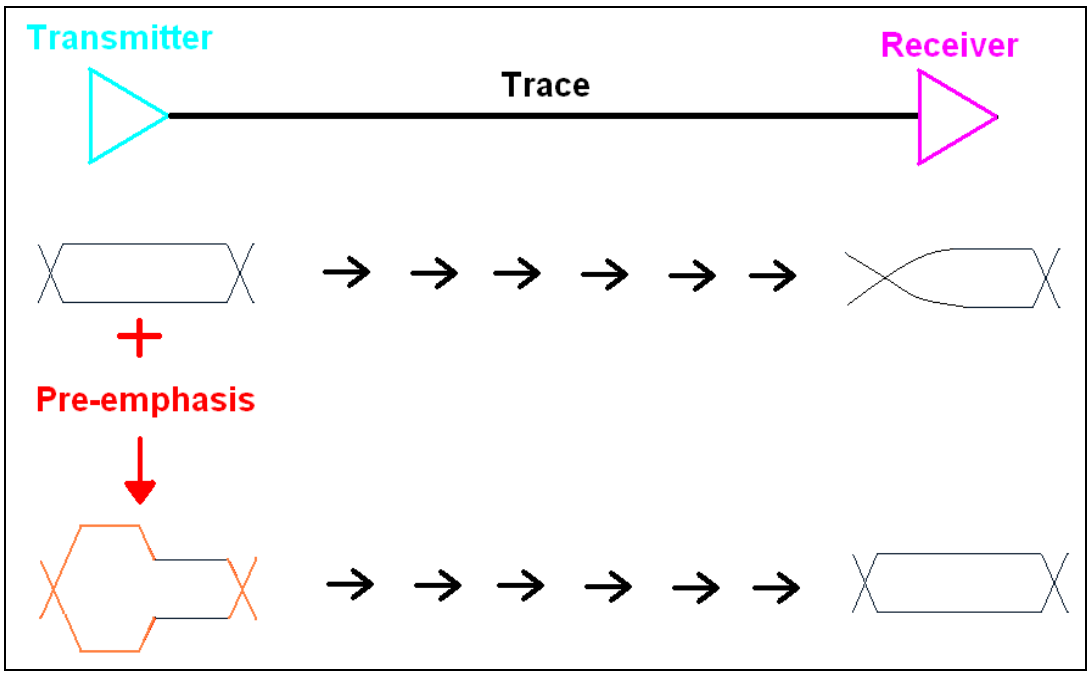

Figure 6: Function of Pre-emphasis

De-emphasis controls the swing of signal to prevent from inter-symbolic interference.

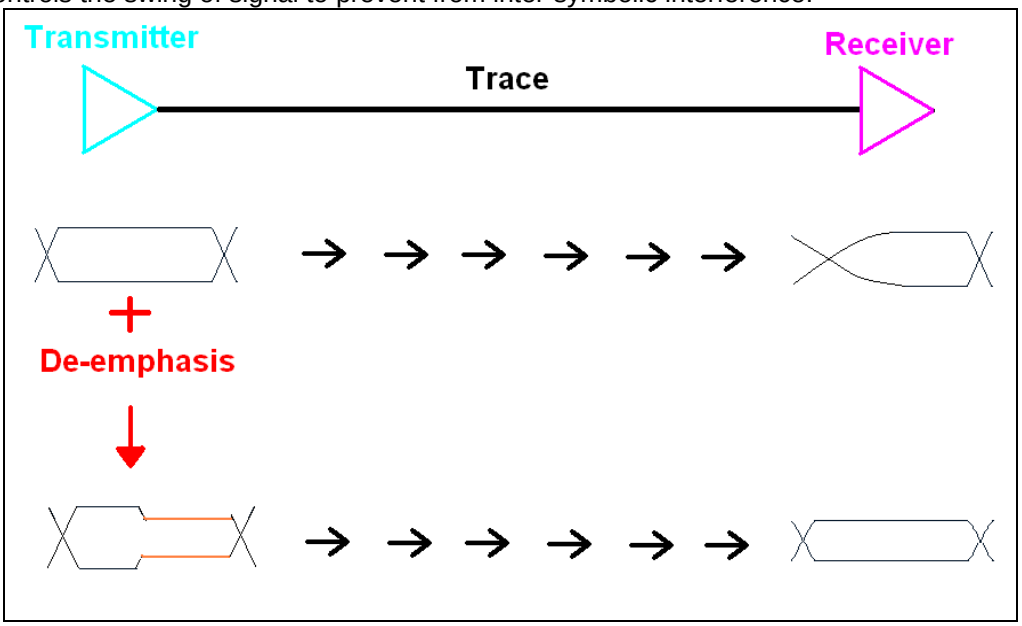

Figure 7: Function of De-emphasis

Four OC pins, OC_S[3:0], are used to control TMDS output voltage swing (Vswing) as well as the degree of pre-/de-emphasis. Table 2 below highlights typical OC control pin settings for Source Application.

Table 2: OC Settings

OC_S3	OC_S2	OC_S1	OC_S0	Vswing (mV)	Pre-/De-emphasis (dB)	Cable Length	Source Application
0	0	0	0	500	0	Short Cable	Standard
0	0	0	1	600	0	Long Cable	
0	0	1	0	750	0		
0	0	1	1	1000	0		
0	1	0	0	500	0	Short Cable	Standard / Deep Color (2)
0	1	0	1	500	1.5	Short Cable	Standard / Deep Color (2)
0	1	1	0	500	3.5	Long Cable	Standard / Deep Color (2)
0	1	1	1	500	6		Internal Connection (1)
1	0	0	0	400	0		
1	0	0	1	400	3.5		
1	0	1	0	400	6		
1	0	1	1	400	9		
1	1	0	0	1000	0		
1	1	0	1	1000	-3.5		
1	1	1	0	1000	-6		
1	1	1	1	1000	-9		

(1) For instance, cable connection between motherboard and docking
(2) For deep color support, an HDMI transmitter that can support HDTV formats with deep color is required

PI3HDMI101 Equalization Settings

Equalization is used to remove deterministic jitter introduced by impedance mismatch along PCB trace. It also reduces signal swing.

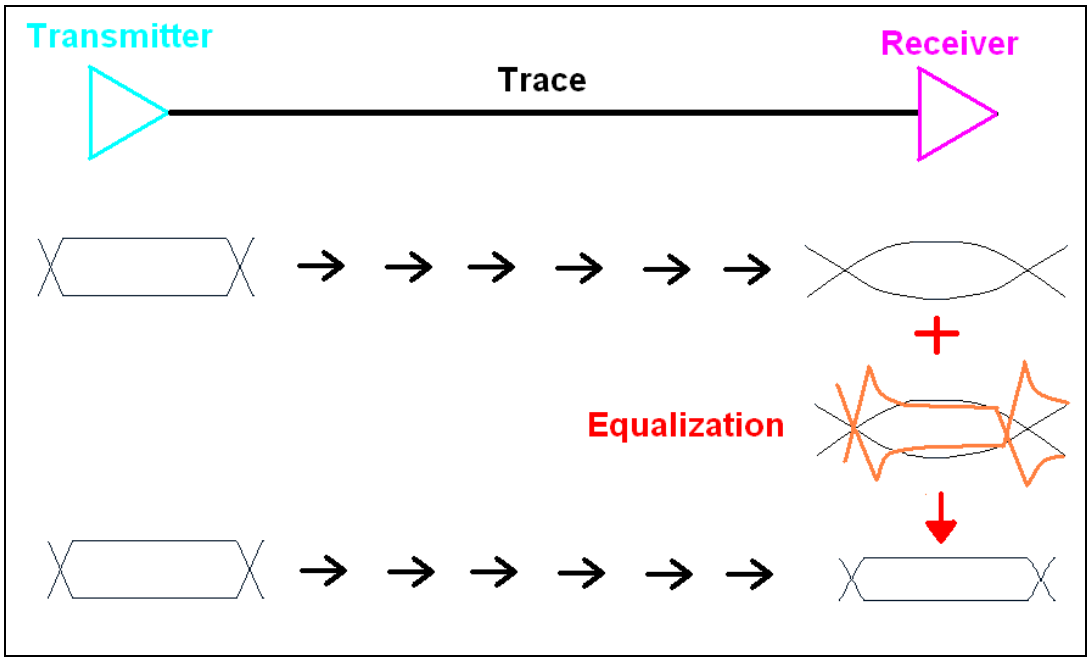

Figure 8: Function of Equalization

Two pins, EQ_S[1:0], give us four choices of equalization to optimize the performance with different trace lengths. For Source Application, the optimum EQ setting is 3dB.

Table 3: EQ Settings

EQ_S1	EQ_S0	Equalization (dB)	Application
0	0	3	Shortest Trace Length
0	1	8	Shorter Trace Length
1	0	12	Longer Trace Length
1	1	16	Longest Trace Length