Application Note

PI3HDMI221-A
PI3HDMI221-A in Source Application
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Application Note

1   Introduction

Switching between two sources, e.g. chipset and graphic card, is a common HDMI source application. A 2:1 active HDMI switch, PI3HDMI221-A, supports deep color application and ±8kV ESD protection at each TMDS output pin. Its Dual Selection Control and Input Clock Detection are specialized for source application design. With two selections of equalization settings, PI3HDMI221-A allows user to place the source up to 18 inch away from the switch device on PCB. It is an ideal device to handle the switching in a notebook.

2   PI3HDMI221-A in Source Application

PI3HDMI221-A can be employed in HDMI source application to perform re-driver function with either 6dB or 12dB equalization settings. Dual SEL control configuration offers user to configure TMDS output and sideband signals individually. Reference design is provided in this application note.

3   Equalization Setting

Two equalization settings for different input trace lengths are designed in PI3HDMI221-A. EQ_S0 control pin is used to select a desired EQ setting.

Input PCB Trace Length	Recommended EQ	EQ_S0
4 – 16 inch	6 dB	0
12 – 18 inch	12 dB	1

Table 1: Recommended EQ Setting for Source Application

As a 100kΩ internal pull-down resistor is implemented in the EQ pin of PI3HDMI221-A, only external pull-up resistor is required to adjust equalization setting.

4   Input Clock Detection

In the absence of input TMDS CLK, output TMDS channels will be disabled by putting TMDS output to High-Z condition so as to prevent noise from passing through PI3HDMI221-A from source to sink devices. Current consumption can be lowered to less than 5mA in this automatic power down condition.

5   Dual Source Selection Configuration

TMDS output and sideband signals passing through PI3HDMI221-A can be configured as normal operation, power down mode, or hot plug detect mode by four control pins. S_HS2 and S_HS1 are used for TMDS output configuration. S_DDC2 and S_DDC1 are for SCL_Sink, SDA_Sink and HPD1/2 configuration.

In Normal Operation (S_xxx2=S_xxx1=H when selecting port 1, or S_xxx2=H and S_xxx1=L when selecting port 2), the 50Ω integrated TMDS terminations are active at selected port and sideband signals between source and sink devices are connected. In Power Down Mode (S_xxx2=S_xxx1=L), all integrated TMDS terminations are disconnected and DDC signals are high-Z so as to save power. When both Ports 1 and 2 are deselected by user, Power Down Mode can be selected to lower power consumption to less than 5mA. In Hot Plug Detect Mode (S_xxx2=L and S_xxx1=H), TMDS terminations are disconnected and DDC signals are float, and only HPD of sink device is connected to the HPD of both input ports 1 and 2. In this mode, both sources can detect the presence of sink device while current consumption can be lowered to less than 35mA. After detecting the presence of HPD, either port 1 or 2 can be chosen to wake up to deliver signals from source to sink devices.

S_HS2	S_HS1	TMDS Output Configuration	Comment
H	H	TMDS port 1 is active and port 2 has 50Ω termination disconnected	Port 1 is Selected; Automatic termination turn-off circuitry at port 2
H	L	TMDS port 2 is active and port 1 has 50Ω termination disconnected	Port 2 is Selected; Automatic termination turn-off circuitry at port 1
L	L	Hi-Z, all terminations are disconnected	Power Down Mode
L	H	All terminations are disconnected	Hot Plug Detect Mode

Table 2: TMDS Output Configuration for Source Application

S_DDC2	S_DDC1	SCL_SINK / SDA_SINK	HPD1	HPD2	Comment
H	H	SCL1/SDA1	HPD_SINK	L	Port 1 is Selected
H	L	SCL2/SDA2	L	HPD_SINK	Port 2 is Selected
L	L	Hi-Z	L	L	Power Down Mode
L	H	All are pulled high by external pull-up termination	HPD_SINK	HPD_SINK	Hot Plug Detect Mode

Table 3: Output Sideband Configuration for Source Application

6   Reference Design for Source Application

Assuming that PI3HDMI221-A is located close to the output HDMI connector, below is a reference design of in source application. To offer flexibility to customers, TMDS+ and – of PI3HDMI221-A are swappable.
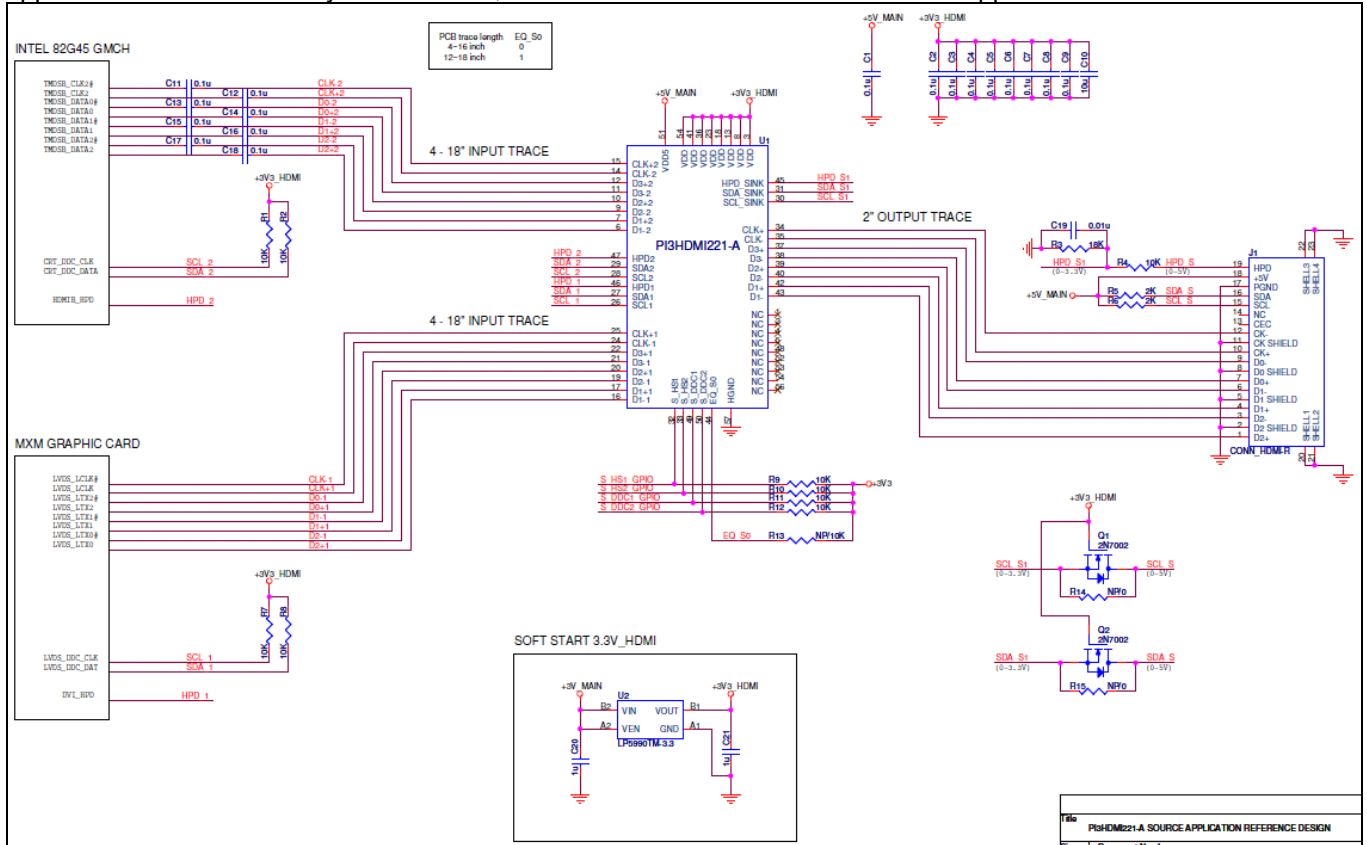

Figure 1: Reference Design of PI3HDMI221-A Source Application

Intel 82G45 north bridge and MXM graphic card are used as sources in the reference design above. Due to the fact that TMDS output of Intel 82G45 GMCH is a SDVO interface but PI3HDMI221-A has integrated 50Ω termination resistor at each TMDS input, AC coupling capacitor has to be added between each TMDS output of 82G45 and TMDS input of PI3HDMI221-A to prevent SDVO from being damaged.
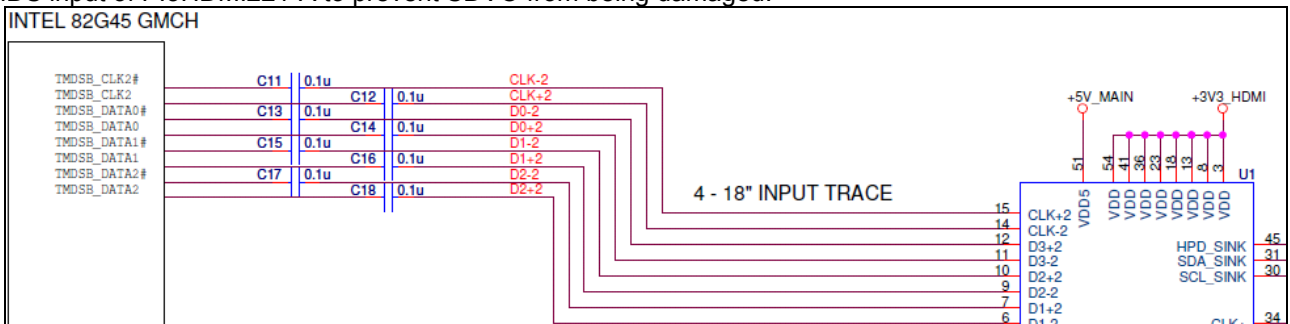

Figure 2: AC Coupling Capacitors between 82G45 TMDS Output and PI3HDMI221-A TMDS Input

In addition to AC coupling implementation, VDD of PI3HDMI221-A has to be soft started to avoid inrush current charging up the capacitor and avoid overshoot creation.
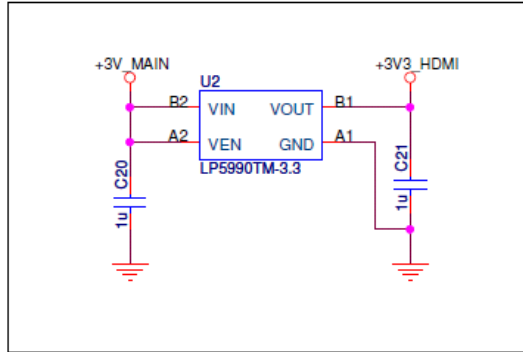
SOFT START 3.3V_HDMI

Figure 3: Soft Start Circuit of PI3HDMI221-A VDD

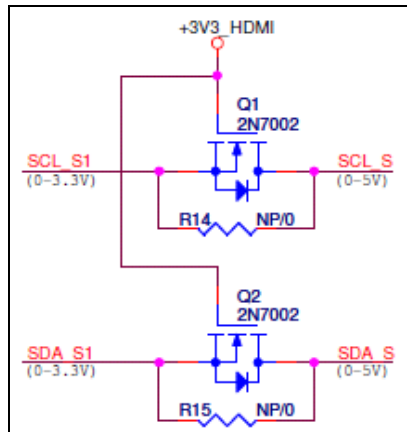To level shift the high level of DDC lines from 3.3V to 5V for external connection, 2N7002 FET is implemented in each DDC line.

Figure 4: DDC Level Shifter of PI3HDMI221-A