PI3HDMI412AD
PI3HDMI412AD HDMI Splitter Application

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1 Introduction

Pericom PI3HDMI412AD 1:2 active HDMI switch offers splitter mode for transmitting 1920x1080p HDMI or DVI signals from one source device to two sink devices at a time. Input equalization, output swing and output pre-emphasis for both output ports of PI3HDMI412AD can be adjusted via device pins or I2C control. The connections among one source device and two sink devices to form one-stage splitter are described in this application note. As signal integrity is a key concern for high-speed transmission, the quality of multi-stage splitter will not be guaranteed.

2 Input and Output TMDS Control

Equalization, Output Swing and Output Pre-emphasis of PI3HDMI412AD can be controlled via two modes – pin control and I2C control. MS pin at pin 1 of PI3HDMI412AD is used to select the desired mode. If MS pin is set to high, I2C control is active. Pins 19 and 20 of PI3HDMI412AD become I2C clock and data signals for controlling I2C registers of PI3HDMI412AD. Pins 49-52 (A0-3) of PI3HDMI412AD are used to set I2C address. If MS pin is set to low, pin control mode is active. Pins 49-52 (S4-7) of PI3HDMI412AD are used to control output swing and pre-emphasis settings. Pins 19-20 become S3/2, which are used to control input equalization setting.

2.1 Pin Control Mode

The settings of input equalization, output swing and output pre-emphasis set by pins 19-20 and pins 49-52 for input port and output port A of PI3HDMI412AD can be referred to I2C Byte 2 Truth Table on PI3HDMI412AD datasheet. Output swing and pre-emphasis of output port B are fixed to 500mV and 0dB, respectively.

Port A and Input Control	S7	S6	S5	S4	S3	S2	S1	S0	Outputs		
									Swing (mV)	Pre-emp (dB)	De-emp (dB)
Swing Control	0	0	0	0	x	x	x	x	500	0	0
	0	0	0	1	x	x	x	x	750	0	0
	0	0	1	0	x	x	x	x	1000	0	0
	0	0	1	1	x	x	x	x	N/A	N/A	N/A
Pre-Emphasis	0	1	0	0	x	x	x	x	500	0	0
	0	1	0	1	x	x	x	x	500	1.5	0
	0	1	1	0	x	x	x	x	500	3.5	0
	0	1	1	1	x	x	x	x	500	6.0	0
De-Emphasis	1	0	0	0	x	x	x	x	750	0	0
	1	0	0	1	x	x	x	x	750	0	-1.5
	1	0	1	0	x	x	x	x	750	0	-3.5
	1	0	1	1	x	x	x	x	750	0	-6.0
Output Port Select	x	x	x	x	x	x	0	1	Port A is active		
	x	x	x	x	x	x	1	1	Port B is active		
	x	x	x	x	x	x	x	0	Port A = Hi-Z		
Equalization (dB)	x	x	x	x	0	0	x	x	1		
	x	x	x	x	0	1	x	x	3.5		
	x	x	x	x	1	0	x	x	6		
	x	x	x	x	1	1	x	x	8		

Table 1: Byte 2 Input and Output Port A Settings of PI3HDMI412AD

2.2 I2C Control Mode

Pins 49-52 (A0-3) of PI3HDMI412AD are used to set I2C address as below.

Address	A6	A5	A4	A3	A2	A1	A0	R/W
Value	1	1	0	A3	A2	A1	A0	R=1/W=0

Table 2: Byte 1 I2C Address of PI3HDMI412AD

The settings of input equalization, output swing and output pre-emphasis for input port and both output ports of PI3HDMI412AD are referred to I2C Bytes 2 and 3 Truth Tables on PI3HDMI412AD datasheet.

Port B Control only	S7	S6	S5	S4	S3	S2	S1	S0	Outputs		
									Swing (mV)	Pre-emp (dB)	De-emp (dB)
Swing Control	0	0	0	0	x	x	x	x	500	0	0
	0	0	0	1	x	x	x	x	750	0	0
	0	0	1	0	x	x	x	x	1000	0	0
	0	0	1	1	x	x	x	x	N/A	N/A	N/A
Pre-Emphasis	0	1	0	0	x	x	x	x	500	0	0
	0	1	0	1	x	x	x	x	500	1.5	0
	0	1	1	0	x	x	x	x	500	3.5	0
	0	1	1	1	x	x	x	x	500	6.0	0
De-Emphasis	1	0	0	0	x	x	x	x	750	0	0
	1	0	0	1	x	x	x	x	750	0	-1.5
	1	0	1	0	x	x	x	x	750	0	-3.5
	1	0	1	1	x	x	x	x	750	0	-6.0
Output Port Select	x	x	x	x	x	x	0	1	Normal		
	x	x	x	x	x	x	1	1	TEST MODE		
	x	x	x	x	x	x	x	0	Port B = Hi-Z		

Table 3: Byte 3 Output Port B Setting of PI3HDMI412AD

3 Sink Application Schematic

A reference design of PI3HDMI412AD splitter mode in sink application is shared below. Pin control mode is used in the reference design.

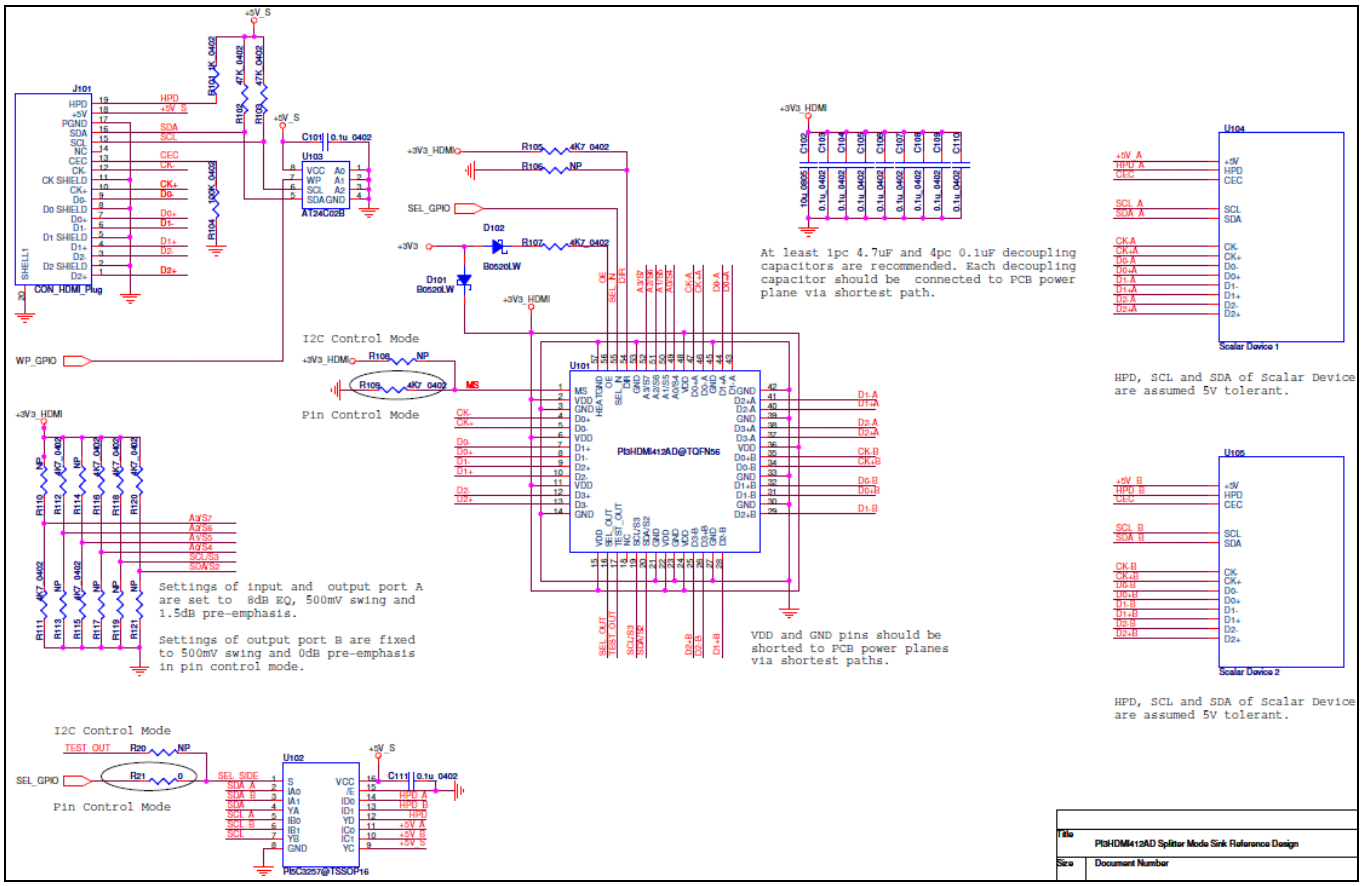

Figure 1: PI3HDMI412AD Splitter Mode Sink Reference Design

3.1 Splitter Mode Activation

In order to enable splitter mode of PI3HDMI412AD, DIR(Test_In) at pin 54 should be set to high if using pin control mode. Or S1 of I2C Byte 3 of PI3HDMI412AD should be set to '1' if using I2C control mode.

3.2 Output Port Selection

Although splitter mode is enabled, SEL_IN at pin 55 of PI3HDMI412AD or S1 of I2C Byte 2 equivalently is still active to select primary output port. S pin at pin 1 of PI5C3257 is in synchronized with the SEL_IN pin of PI3HDMI412AD in pin control mode or the SEL_OUT pin of PI3HDMI412AD in I2C control mode. Input source will read the DDC content of the primary sink device and deliver video signals of the highest supportive timing of the primary sink device to both output ports. Thus, the two sink devices should accept the same timings. If the two sink devices are with different highest supportive timings, a timing format that both sink devices can support should be stored in the EEPROM at reference U103.

3.3 TMDS Connection

TMDS signals are delivered to the selected port at the highest supportive timing of the selected sink device and multi-casted to the de-selected port.

3.4 DDC and HPD Connections

As PI3HDMI412AD does not carry switches for sideband signals, DDC and HPD signals are de-mux through PI5C3257 in the reference design. Port selection of PI5C3257 is aligned with that of PI3HDMI412AD.

3.5 VDD and OE Connections

As in source application, VOFF test will be performed by pulling output TMDS signals to 3.3V AVcc through 50Ω resistors externally. The AVcc will forward bias the ESD diode in the protection architecture of PI3HDMI412AD. Thus, a leakage path is created from AVcc to internal 3.3V power supply of PI3HDMI412AD. Around 2.6V will be observed on VDD pins of PI3HDMI412AD. External low voltage drop diodes, i.e. B0520LW at reference D1 for VDD pins and reference D2 for OE pin in the reference design above, are recommended to block any leakage path to VDD of PI3HDMI412AD. Please refer to AN206 for HDMI Source Test ID 7-3 VOFF Test Setup.

3.6 HDCP Authentication

HDCP engine is not implemented in PI3HDMI412AD. Thus, HDCP encryption and decryption must be handled by other devices.