

APPNOTE NUMBER – AN1139

PI3WVR13412 DP1.4/HDMI2.0 Mux/Demux Application Guidelines

Justin Lee

1. Introduction

PI3WVR13412 is video switch that supports wide input voltage range. It can be employed in DP1.3/4 or HDMI2.0 switch application. This application note explains how it can be used for HDMI2.0 mux applications.

2. Application Guidelines

The PI3WVR13412 is a passive switch, and therefore it can fit in both source and sink applications. The switch can be used as MUX and DEMUX.

2.1 HDMI 2 to 1 Application

Below is a source application diagram of PI3WVR13412 as a HDMI2.0 2-to-1 Mux

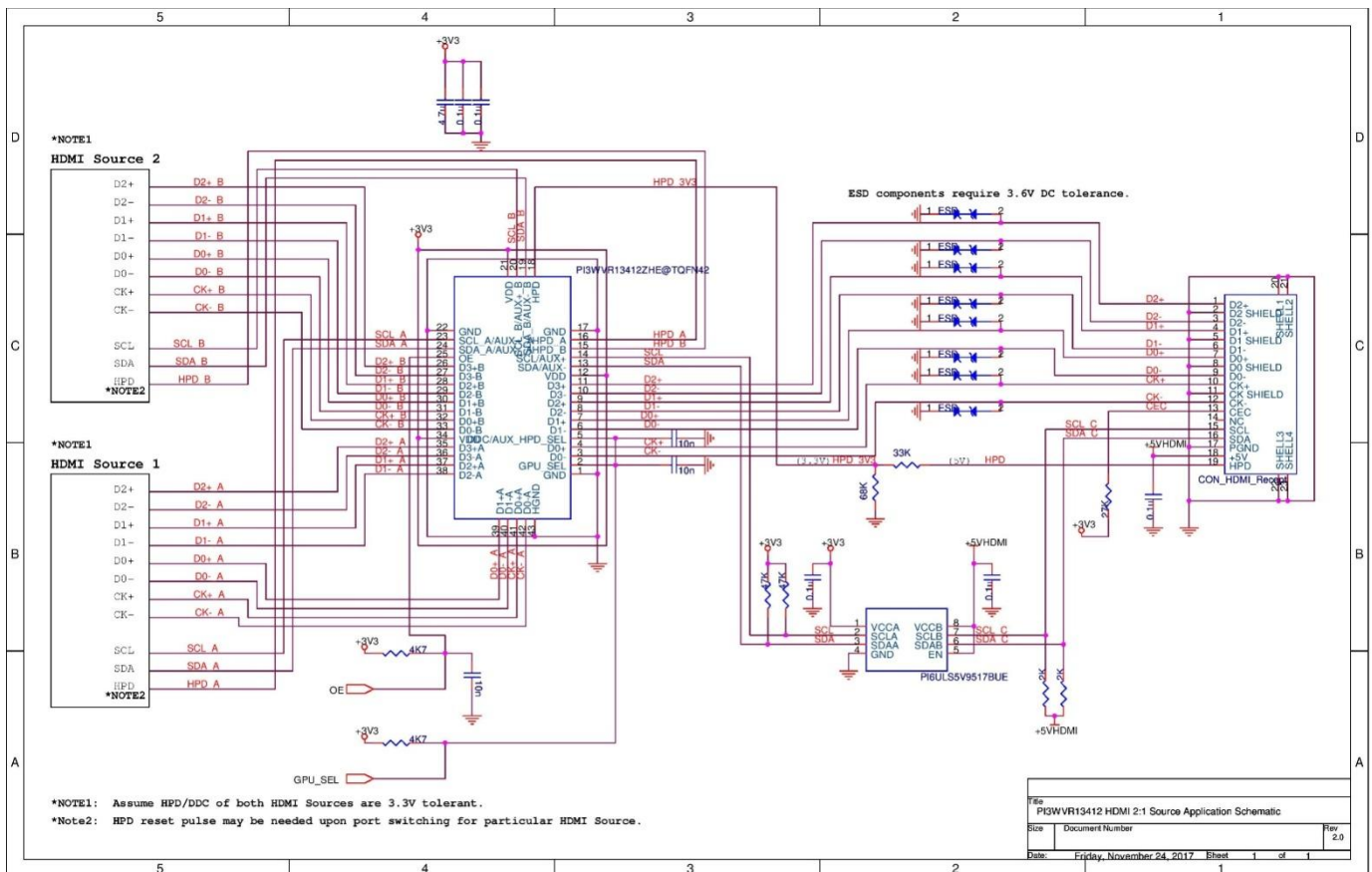


Figure 1: HDMI 2 to 1 Source Application Diagram

2.1.1 GPU_SEL and DDC/AUX_HPDP_SEL Pin

In order to achieve better high-speed signal isolation, decoupling capacitors of 10n-100nF at GPU_SEL pin and DDC/AUX_HPDP_SEL are recommended.

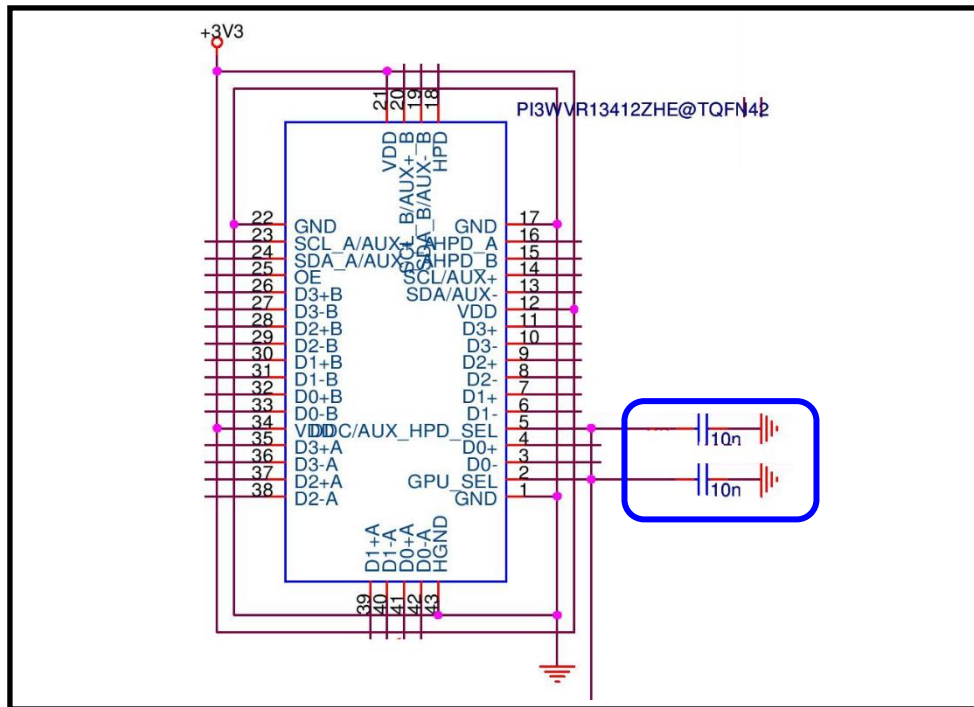


Figure 2: GPU_SEL and DDC/AUX_HPDP_SEL Decoupling Design

2.1.2 OE Pin Design

A 10n-100nF capacitor is also recommended for OE pin. Since HPD from HDMI connector is 5V, if OE pin is controlled by HPD signal, voltage divider must be considered. 33kΩ and 68kΩ resistors are to form a voltage divider in the above application diagram.

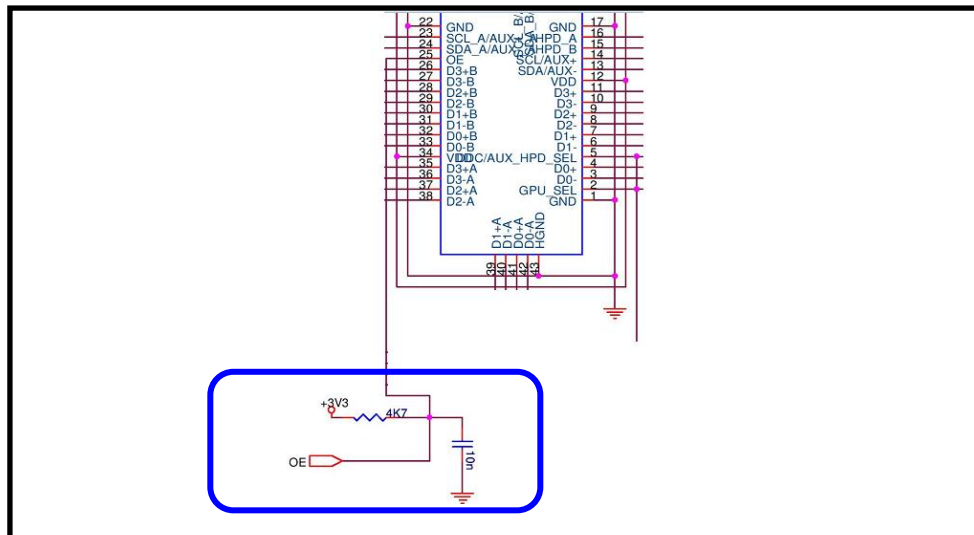


Figure 3: OE Controlled by GPIO

Similar to GPU_SEL pin, a decoupling capacitor of 10n-100nF at OE pin is recommended for better isolation.

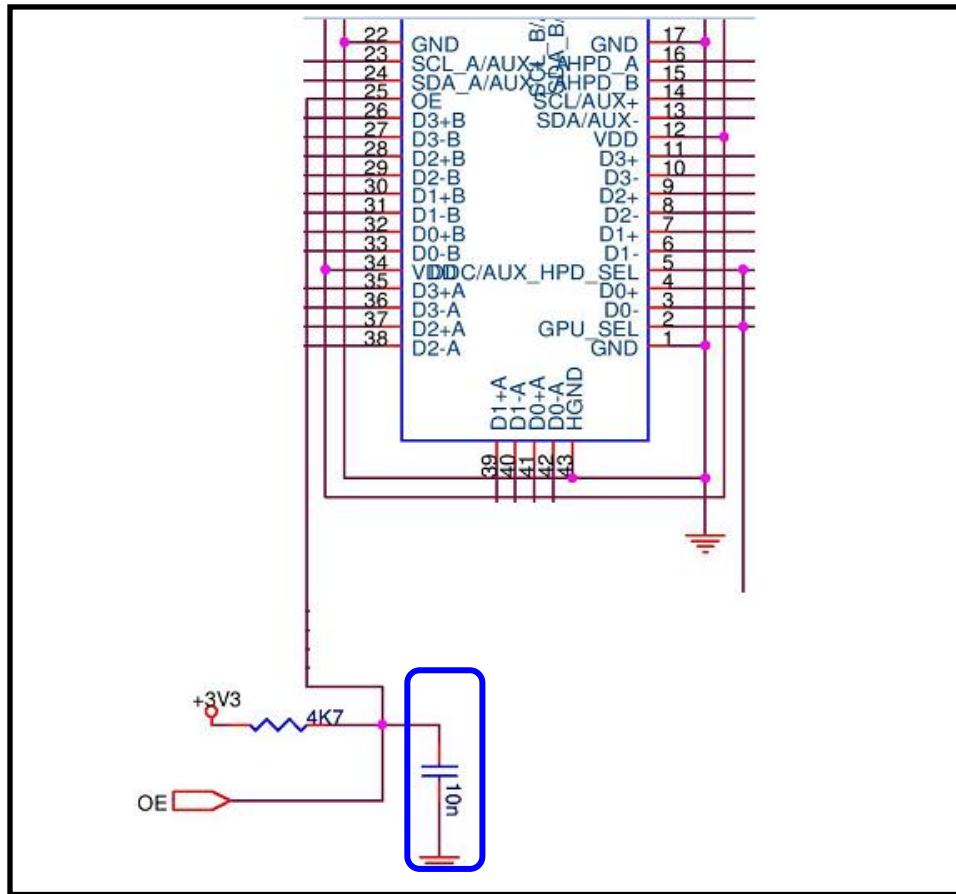


Figure 4: OE Decoupling Design

2.1.3 DDC Design

As DDC path of PI3WVR13412 is 4V tolerant, SCL and SDA signals from PI3WVR13412 cannot be connected to HDMI connector directly. DDC level shifters must be added in between.

2.1.4 TMDS Design

Per HDMI specification, TMDS path is DC coupled. HDMI input and HDMI output are connected to PI3WVR13412 directly. To provide high-speed path from ESD damage, ESD protectors are recommended. 2-pin ESD protector, i.e. DESD3V3Z1BCSF, is more preferable for better control of PCB impedance.

2.1.5 HPD Signal

In HDMI source application, as shown in figure 5, 100kΩ pull-down resistor is implemented at HPD in order to have a known state for HDMI source device when no sink device is attached to it. Since PI3WVR13412ZHE HPD pin is 4V tolerant, voltage divider must be considered - 33kΩ and 68kΩ resistors are to form a voltage divider.

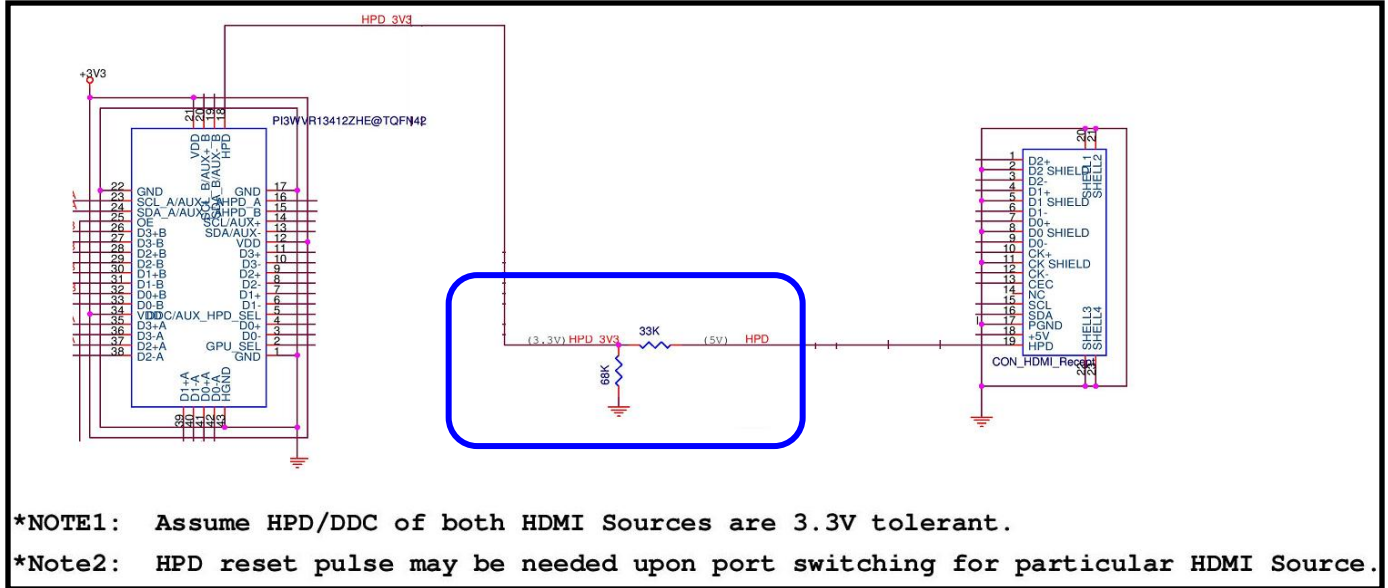


Figure 5: HPD Signal pull-down requirement in HDMI 2 to 1 Source Application

2.2 HDMI 1 to 2 Application

Below is a source application diagram of PI3WVR13412 HDMI 1 to 2 switch.

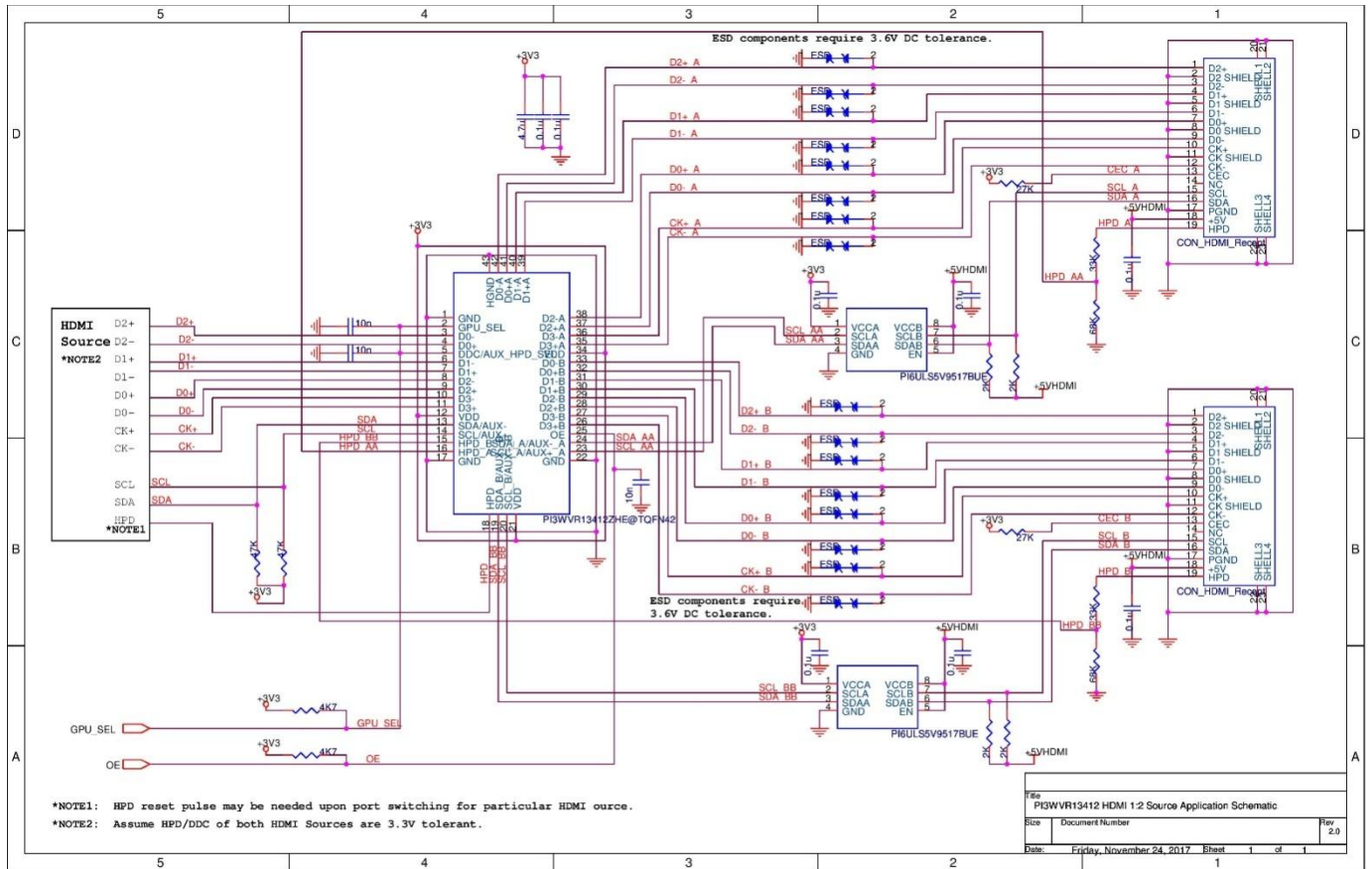


Figure 6: HDMI 1 to 2 Source Application Diagram

2.2.1 GPU_SEL Pin and DDC/AUX_HP_SEL Design

As shown in figure 2, decoupling capacitors of 10n-100nF at GPU_SEL pin and DDC/AUX_HP_SEL pin are recommended for better high-speed signal isolation.

2.2.2 OE Pin Design

OE pin of PI3WVR13412 is active HIGH. It should be pulled to VDD for output enabled. To save power, it can be controlled by GPIO.

Similar to GPU_SEL pin, a decoupling capacitor of 10n-100nF at OE pin is recommended for better isolation.

2.2.3 DDC Design

Please refer to Section 2.1.3

2.2.4 TMD5 Design

Please refer to Section 2.1.4.

2.2.5 HPD Signal

In HDMI source application, as shown in figure 7, 100kΩ pull-down resistor is implemented at HPD in order to have a known state for HDMI source device when no sink device is attached to it. Since PI3WVR13412 HPD_A and HPD_B pins are 4V tolerant, voltage divider must be considered. 33kΩ and 68kΩ resistors are to form a voltage divider.

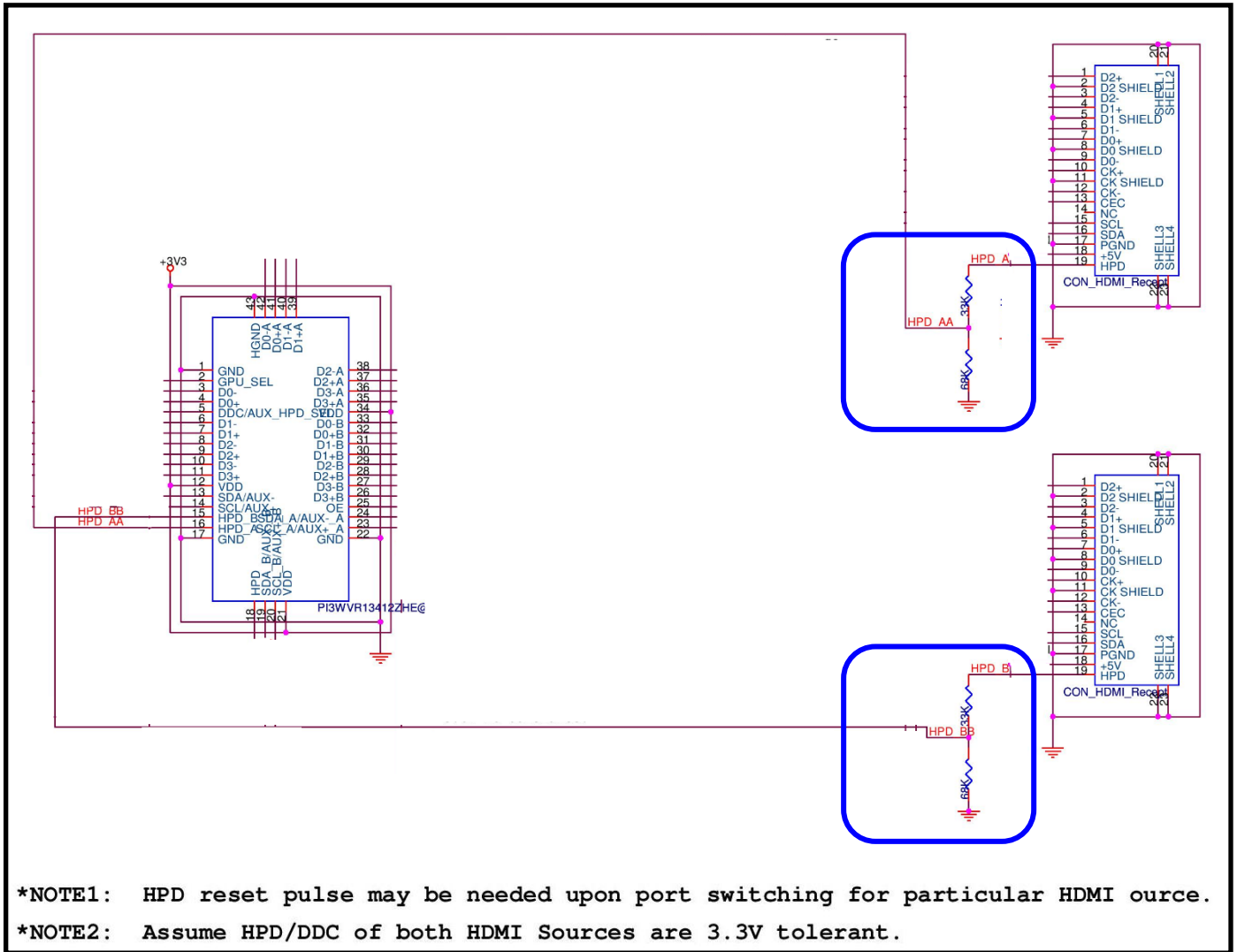


Figure 7: HPD Signal pull-down requirement in HDMI 1 to 2 Source Application

3. References

- (1) VESA DisplayPort (DP) Standard Version 1.4, Video Electronics Standards Association, February 23, 2016
- (2) High-Definition Multimedia Interface Specification Version 2.0b, HDMI Forum, March 3, 2016
- (3) High-Definition Multimedia Interface Specification Version 2.0n Compliance Test Specification, HDMI Forum, January 4, 2016
- (4) DESD3V3Z1BCSF datasheet, Diodes Incorporated, Document Number: DS39330 Rev.1-0, November 2016

Revision History

Revision	Date	Description
1.0	24 Nov., 2017	This Doc. 1. Initial release.

IMPORTANT NOTICE

DIODES INCORPORATED MAKES NO WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, WITH REGARDS TO THIS DOCUMENT, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION).

Diodes Incorporated and its subsidiaries reserve the right to make modifications, enhancements, improvements, corrections or other changes without further notice to this document and any product described herein. Diodes Incorporated does not assume any liability arising out of the application or use of this document or any product described herein; neither does Diodes Incorporated convey any license under its patent or trademark rights, nor the rights of others. Any Customer or user of this document or products described herein in such applications shall assume all risks of such use and will agree to hold Diodes Incorporated and all the companies whose products are represented on Diodes Incorporated website, harmless against all damages.

Diodes Incorporated does not warrant or accept any liability whatsoever in respect of any products purchased through unauthorized sales channel. Should Customers purchase or use Diodes Incorporated products for any unintended or unauthorized application, Customers shall indemnify and hold Diodes Incorporated and its representatives harmless against all claims, damages, expenses, and attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized application.

Products described herein may be covered by one or more United States, international or foreign patents pending. Product names and markings noted herein may also be covered by one or more United States, international or foreign trademarks.

This document is written in English but may be translated into multiple languages for reference. Only the English version of this document is the final and determinative format released by Diodes Incorporated.

LIFE SUPPORT

Diodes Incorporated products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Diodes Incorporated. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body, or
2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labeling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Customers represent that they have all necessary expertise in the safety and regulatory ramifications of their life support devices or systems, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of Diodes Incorporated products in such safety-critical, life support devices or systems, notwithstanding any devices- or systems-related information or support that may be provided by Diodes Incorporated. Further, Customers must fully indemnify Diodes Incorporated and its representatives against any damages arising out of the use of Diodes Incorporated products in such safety-critical, life support devices or systems.

Copyright © 2018, Diodes Incorporated

www.diodes.com