

**PI3WVR12412**  
**PI3WVR12412 DP/HDMI Source Application**

**Table of Contents**

|            |   |          |
|------------|---|----------|
| <b>1</b>   | <b>Introduction .....</b>                 | <b>2</b> |
| <b>2</b>   | <b>Source Application Topology .....</b>  | <b>2</b> |
| <b>3</b>   | <b>Source Application Schematic .....</b> | <b>3</b> |
| <b>3.1</b> | <b>DP Source Input Port .....</b>         | <b>4</b> |
| <b>3.2</b> | <b>TMDS Source Input Port.....</b>        | <b>4</b> |
| <b>3.3</b> | <b>Power/GND Pins.....</b>                | <b>4</b> |
| <b>3.4</b> | <b>Control Pins.....</b>                  | <b>4</b> |
| <b>4</b>   | <b>References.....</b>                    | <b>4</b> |

## 1 Introduction

Current source devices, such as PC (plus graphic card) and laptop, may have two internal source chipsets – one DisplayPort (DP) and one High-Definition Multimedia Interface (HDMI). These two sources' signals are multiplexed to a dual-mode DP connector. PI3WVR12412 is capable of switching between DP and HDMI source chipsets and handle wide voltage range. PI3WVR12412 is a multi-standard video switch with a common-mode voltage range from 0 to 3.4V. And it has the ability to transmit AC coupled DP signals as well as DC coupled HDMI signals to a dual-mode DP device in the next stage without adding any external level shifter.

## 2 Source Application Topology

PI3WVR12412 can be used in a motherboard, graphic card or laptop design to provide wide voltage range switching feature between a DP source and a DVI/HDMI source. As PI3WVR12412 does not block the equalization of the device in the next stage, a MST Dual-mode DP HUB can be plugged to the source device with PI3WVR12412 without concerning about over-equalization issue.

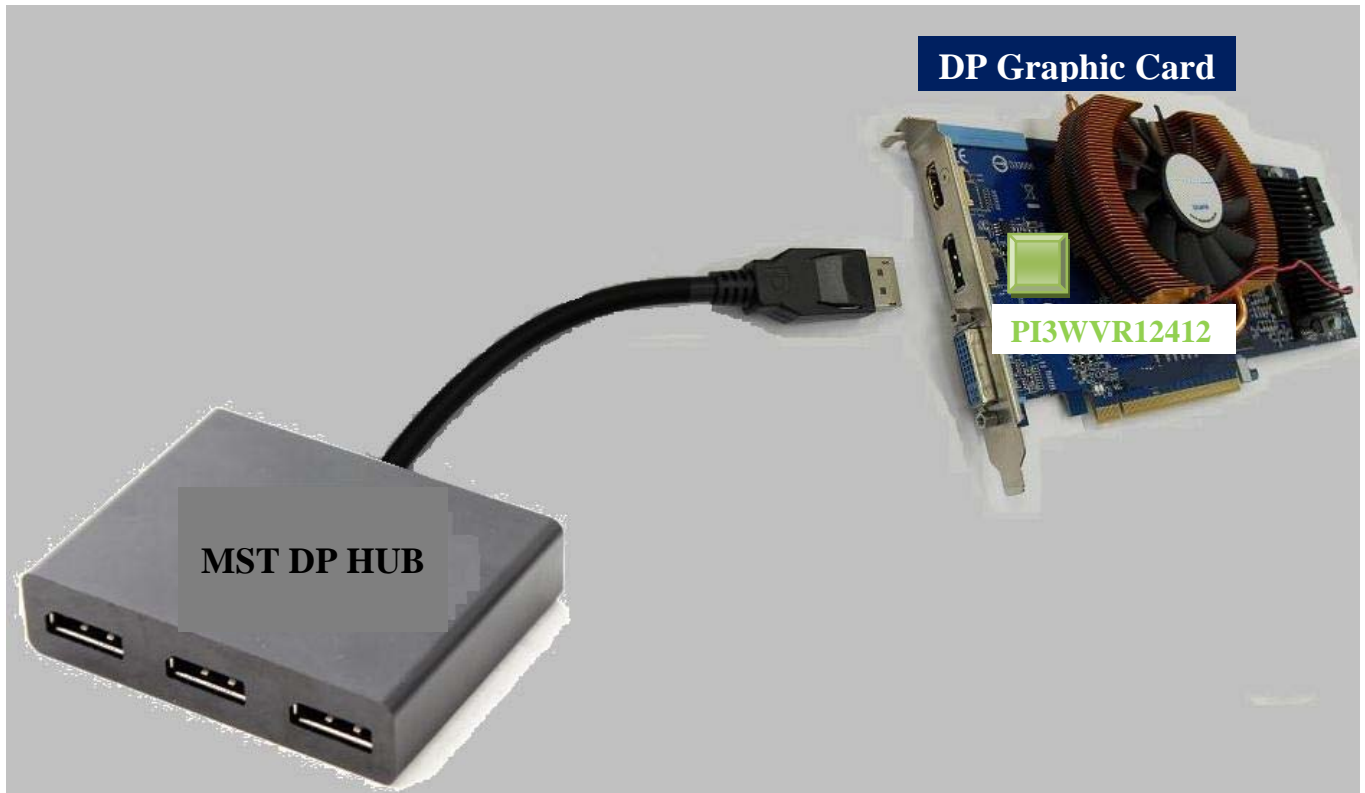


Figure 1: PI3WVR12412 DP/HDMI MUX on Graphic Card

### 3 Source Application Schematic

An application diagram of multiplexing DP and DVI/HDMI sources to a DP connector via PI3WVR12412 is provided.

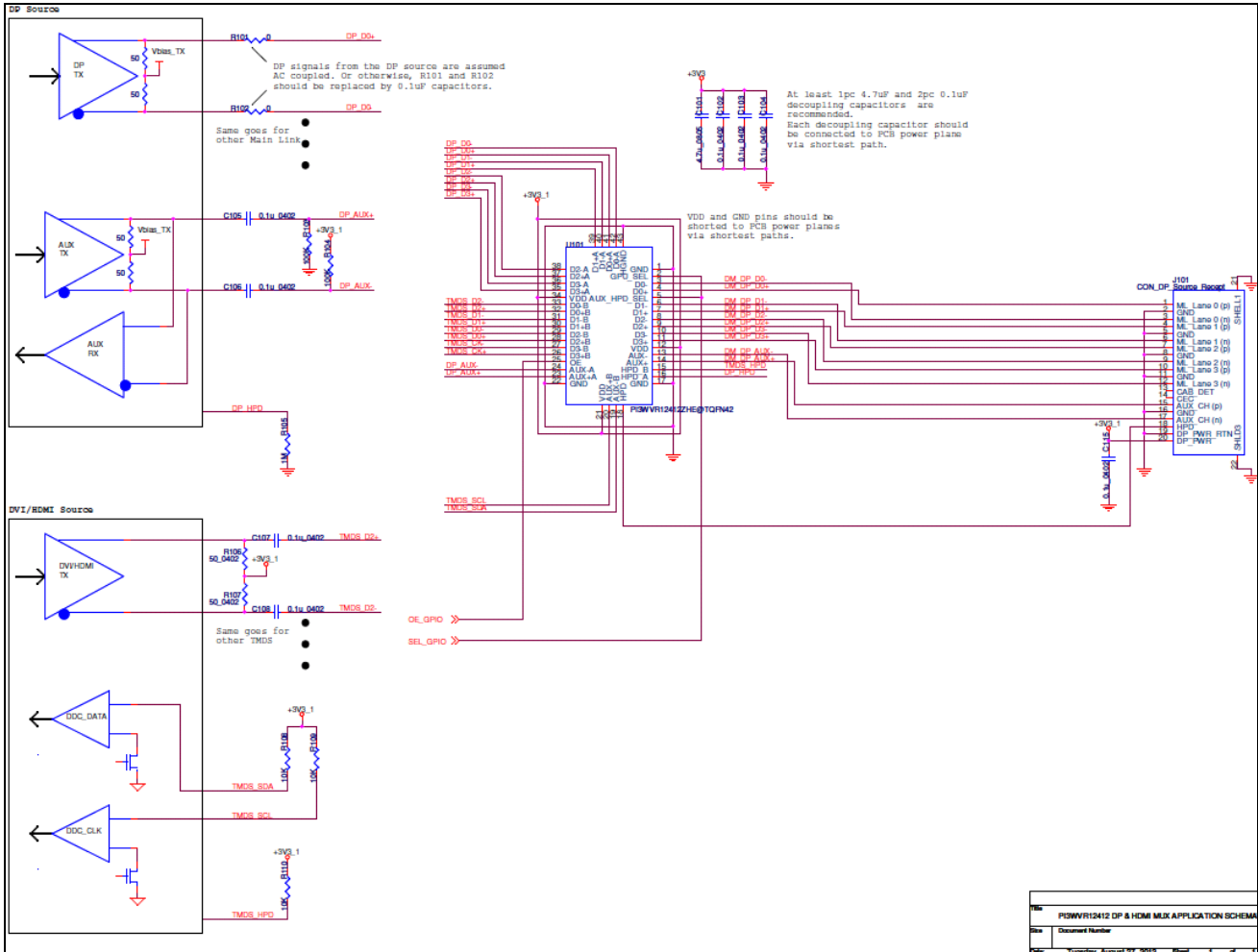


Figure 2: PI3WVR12412 DP and HDMI Source Application Diagram

## 3.1 DP Source Input Port

In source application, AC coupling capacitors at all main link signals are inserted per DP Standard Version 1.2. AC coupling capacitor value in the range of 75 – 200nF is required. It is assumed in the figure above the main link signals from the DP source are AC coupled. Or otherwise, the 0Ω series resistors on the main link signals should be replaced by 0.1uF capacitors.

Per DP Standard Version 1.2, AC coupling capacitor value in the range of 75 – 200nF is required for each AUX signal. After the AC coupling capacitor, source is required to pull AUX+ to GND and AUX- to DP\_PWR, which is 3.3V, via resistors in the range of 10kΩ to 105kΩ. 100kΩ resistor value is recommended per DP Standard Version 1.2. When a DP sink device determines AUX+ and AUX- are being pulled to low and high, respectively, a DP source device is connected.

## 3.2 TMDS Source Input Port

Per TMDS architecture, each TMDS path is terminated to 3.3V by a 50Ω pull-up resistor. As PI3WVR12412 can accept wide voltage range, level shifter is not required before feeding the TMDS signals into PI3WVR12412. As the TMDS signals are fed to a dual-mode DP connector as a source application, all the TMDS paths from the HDMI/DVI source are AC coupled by 0.1uF capacitors to meet the DP Interoperability Guideline Version 1.1a.

Per DP Dual-Mode Standard Version 1, each of SCL and SDA is pulled up to 3.3V via a 10kΩ resistor. As AUX pins of PI3WVR12412 also accept wide voltage range, SCL and SDA signals can be fed into AUX pins directly.

## 3.3 Power/GND Pins

At least one piece of 4.7uF and two pieces of 0.1uF decoupling capacitors for three VDD pins of PI3WVR12412 are recommended. VDD and GND pins should be shorted to PCB power planes via shortest paths for power stability and better GND reference, respectively.

## 3.4 Control Pins

GPU\_SEL and AUX\_HPDP\_SEL pins of PI3WVR12412 are used to select ports of high-speed signals and AUX/HPDP signals, respectively. They can be controlled using one GPIO pin in a source design.

OE pin of PI3WVR12412 is to enable output. It can also be controlled by a GPIO or can be simply pulled up to 3.3V via an external resistor.

## 4 References

- (1) VESA DisplayPort Standard Version 1 Revision 2, Video Electronics Standards Association, January 5, 2010
- (2) VESA DisplayPort Dual-Mode Standard Version 1, Video Electronics Standards Association, February 10, 2012
- (3) VESA DisplayPort Interoperability Guideline Version 1.1a, Video Electronics Standards Association, February 5, 2009
- (4) High-Definition Multimedia Interface Specification Version 1.4b, HDMI Licensing, LLC, October 5, 2011
- (5) High-Definition Multimedia Interface Compliance Test Specification Version 1.4b, HDMI Licensing, LLC, March 4, 2010