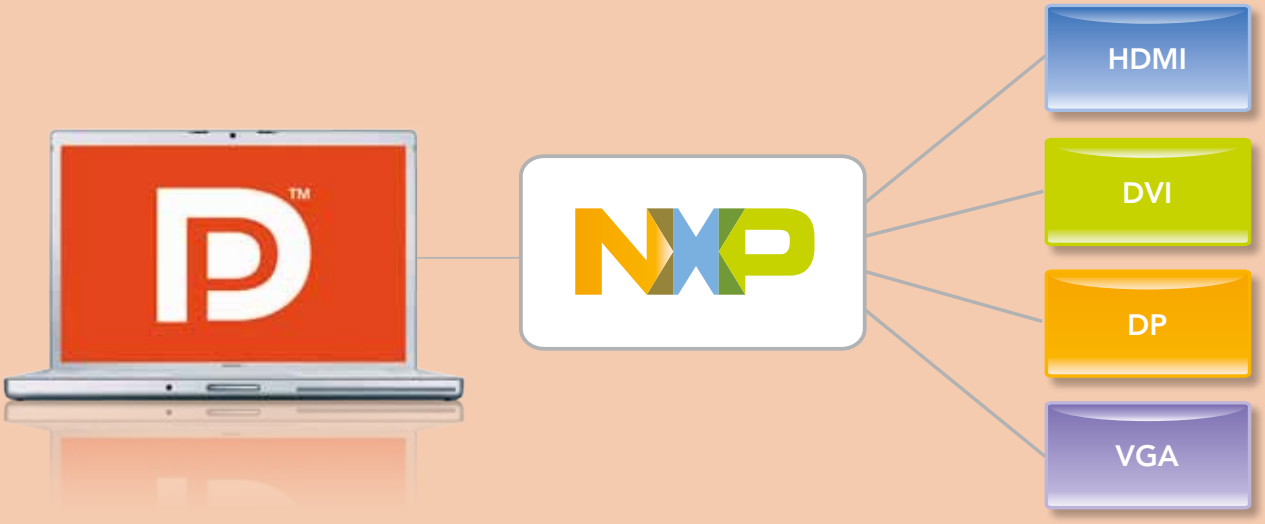
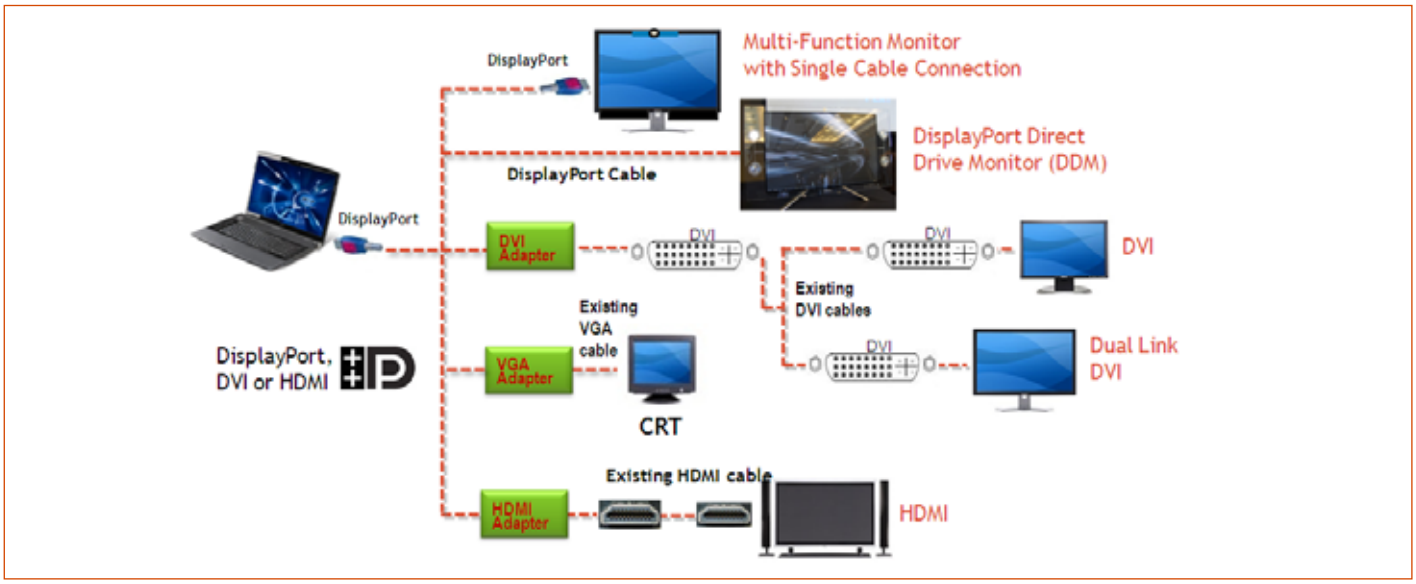


NXP enables DisplayPort

NXP DisplayPort Level Shifters, Multiplexers and Adapter selection guide

DisplayPort is becoming increasingly popular within the computing industry. It is a royalty-free digital interface supported by VESA. The DisplayPort standard can potentially replace analog VGA. As more and more computers are now supporting DisplayPort, demand is growing for adapters that support monitors, TVs, projectors, and other hardware peripherals that have DVI, HDMI, LVDS, and VGA interfaces.

DisplayPort Interoperability Examples



In order to support the trend to DisplayPort interconnectivity, NXP has developed several families of part types to address the growing demand for Level Shifters, Adapters, and Multiplexers used in Cable adapters and motherboards.

NXP supports Reference Designs for DP-DVI, DP-HDMI, and DP-VGA (regular and mini connectors) adapters. For all of these adapter types NXP provides reference designs with:

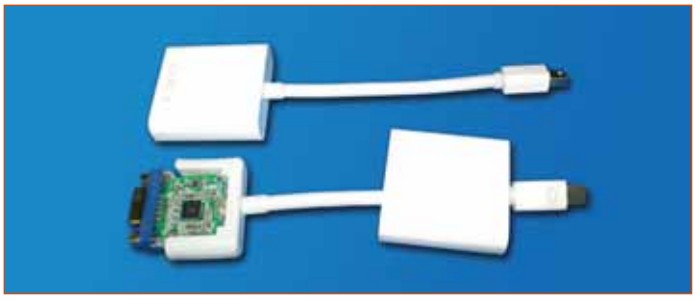
- Best-in-class BOM cost
- Full schematic and layout information
- Bill of Materials
- Design and layout guidelines which help optimize performance and lower EMI
- Minimal use of external components
- Excellent signal integrity and interoperability results
- Production-ready form factor

These designs support quick time-to-market requirements which are essential in today's rapidly evolving market. Additionally, NXP provides interoperability testing and application support that can help to quickly validate designs. Following are examples of cable adapter products using NXP ICs.

NXP DP-DVI Reference Design using PTN3380B

NXP DP-HDMI Reference Design using PTN3381B

NXP DP-VGA Reference Design using PTN3392



Application Support

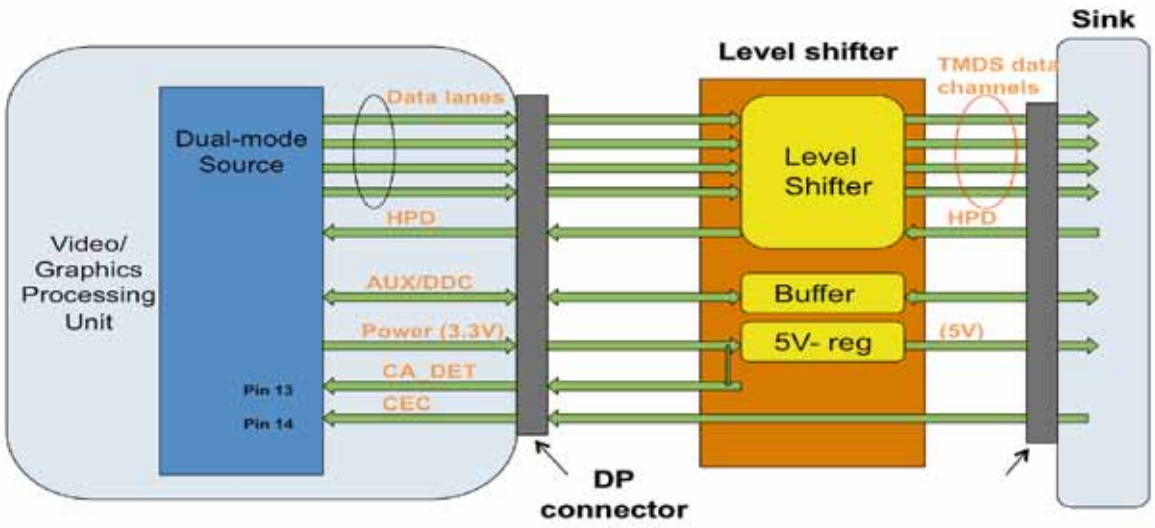
NXP provides a head start on your designs with these reference designs. Further, NXP offers the complete design files and design-in support including testing and applications support. The following application reports are available upon request.

- DP-DVI Reference Design 1.1
- DP-HDMI Reference Design 1.2
- DP-VGA App Note 10873

For more information, visit http://ics.nxp.com/products/displayport/

NXP DisplayPort-DVI/HDMI Level Shifter solutions

DVI and HDMI are widely adopted digital video standards in the industry. Market data shows that DVI is the most widely supported standard by computer monitors in the market today. HDMI has been well established in the consumer electronics market. All HDTVs, DVD players, gaming consoles, and set-top boxes support the HDMI standard. As DisplayPort is being adopted more and more by the computing industry, there is a strong need for these standards to interoperate.



Most of the graphic sources in the market currently support Dual-Mode DisplayPort. This allows for using a simple level-shifter solution as the adapter. Level-Shifters convert the 3.3 V domain DisplayPort side source signal to a 5 V domain making it suitable for the sink side which supports DVI and HDMI. NXP offers a suite of DisplayPort to DVI and HDMI adapter solutions enabling adoption of DisplayPort in multiple applications.

NXP level-shifters offer various optional features like:

- Integrated 5 V regulator (required in cable adapters)
- Integrated HDMI dongle detect mechanism (required for HDMI adapter)
- Deep color support (as specified in the latest HDMI specification)

NXP High Speed Level Shifter

Feature	PTN3360A	PTN3360B	PTN3361B	PTN3380B	PTN3360D	PTN3381B	PTN3381D
TMDS level shifters	2.5 Gb/s	2.5 Gb/s	1.65 Gb/s	1.65 Gb/s	2.5 Gb/s (Deep Color HDMI)	1.65 Gb/s	2.5 Gb/s (Deep Color HDMI)
3.3 V to 5 V voltage regulator	•	•	•	√	•	√	√
DDC level shifter	Pass-gate	Pass-gate	Buffer	Pass-gate	Buffer	Buffer	Buffer
HPD level shifter	1.1 V inverting	3.3 V non-inverting	3.3 V non-inverting	3.3 V non-inverting	3.3 V non-inverting	3.3 V non-inverting	3.3 V non-inverting
Respond to I^2C HDMI dongle detect	-	-	√ Option pin	-	-	√ Option pin	√ Option pin
Programmable Equalization	•	•	•	•	√	•	√
ESD HBM	8 kV	8 kV	7 kV	8 kV	6 kV	4 kV	6 kV
Package	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm	HVQFN-48 7x7x-0.5mm

NXP High Speed Level Shifter Options for Cable Adapters and Motherboards

Application	Cable Adapters				Motherboard			
Type	++DP - DVI	++DP - HDMI		DP-VGA	++DP - DVI	++DP - HDMI		DP-VGA
		No Deep Color	Deep Color			No Deep Color	Deep Color	
PTN3360A					Yes	Yes		
PTN3360B	Yes				Yes	Yes		
PTN3360D	Yes				Yes	Yes	Yes	
PTN3361B	Yes	Yes						
PTN3361D	Yes	Yes	Yes					
PTN3380B	Yes							
PTN3381B	Yes	Yes						
PTN3381D	Yes	Yes	Yes					
PTN3392				Yes				Yes

NXP DisplayPort – VGA adapter Solution

The VGA standard has been in existence for decades and is supported by almost all display devices. With the rapid adoption of DisplayPort, there is a strong need to support legacy monitors, projectors, etc. NXP offers a best-in-class DisplayPort to VGA adapter solution that is useful in a wide range of applications that require DisplayPort and VGA to interoperate. The PTN3392 is a DisplayPort to VGA adapter with integrated flash supporting resolutions up to WUXGA (1900x1200, 60 Hz).

Some of the features of this adapter are as follows:

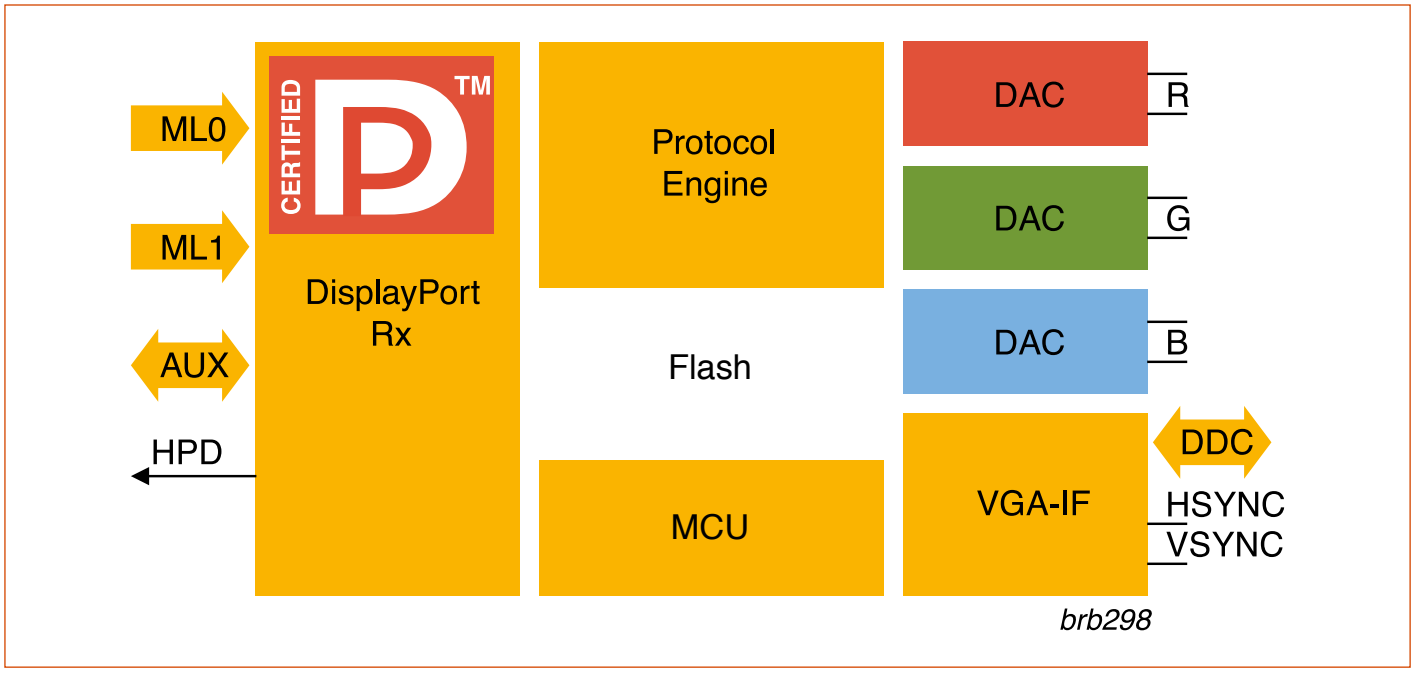
- DisplayPort receiver v1.1a
  - 1-lane / 2-lane 2.7 Gb/s / 1.62 Gb/s
  - AUX channel, HPD support
- Output
  - Analog RGB, HSYNC, VSYNC
  - Up to 240 MHz, 8 bits color
  - DDC
- Resolution supported
  - (Up to) WUXGA: 1920x1200, 60 Hz, 193 MHz clock
- AUX channel to I^2C DDC channel bridge
- Supports Flash over AUX field upgradability
- Use only power from DP connector 3.3 V
- <610 mW Active @ 1920x1200; 150 mW Standby; 500 mW Init
- HVQFN48, 7x7 mm, 0.5 mm pitch
- ESD 7 kV HBM

Flash-over-Aux capability of PTN3392

DisplayPort is a Digital standard and is still evolving, while VGA is an Analog standard. Hence, going from the Digital domain to the Analog domain requires protocol conversion. The role of firmware driving this conversion becomes very important in a DisplayPort-VGA adapter. Every GPU that supports DisplayPort can have a different implementation of the DisplayPort source. They all have to be compliant to the specification; however implementation can be very different. With a fixed firmware solution, the adapter cannot be upgraded to support any new interoperability issues discovered in the field. One potential solution to this problem can be the flexibility to change the firmware inside a DisplayPort-VGA adaptor.

The PTN3392 has an integrated Flash inside that can be re-programmed on the fly. It does not require any additional hardware and programming is done over the AUX channel of DisplayPort. NXP PTN3392 Flash-over-Aux feature has been extensively tested with multiple platforms with different OS versions and different GPU drivers. The application is executed by simply running one .exe file. This feature is great for system integrators as it gives them a quick solution for solving field interoperabililty issues.

PTN3392 DP-VGA Adapter Block Diagram



NXP DisplayPort Multiplexers

NXP offers a wide portfolio of DisplayPort multiplexers optimized for performance and targeted applications. NXP offers switching/multiplexing solutions supporting both DisplayPort v1.1a and DisplayPort v1.2.

Product	Function	Production	Package
CBTL06121AHF	DisplayPort v1.1a (2.7 Gbps) Hex Mux for ATX motherboards	NOW	HWQFN-56
CBTL06121BHF	DisplayPort v1.1a (2.7 Gbps) Hex Mux for BTX motherboards	NOW	HWQFN-56
CBTL06122AHF	DisplayPort v1.2 (5.4 Gbps) Hex Mux for ATX motherboards	NOW	HWQFN-56
CBTL06122BHF	DisplayPort v1.2 (5.4 Gbps) Hex Mux for BTX motherboards	NOW	HWQFN-56
CBTL06123AHF	DisplayPort v1.1a (2.7 Gbps) Hex Mux for ATX motherboards and PCIe Gen2 Mux (5.4 Gbps)	Feb 2011	HWQFN-56
CBTL06123ABHF	DisplayPort v1.1a (2.7 Gbps) Hex Mux for BTX motherboards and PCIe Gen2 Mux (5.4 Gbps)	Feb 2011	HWQFN-56
CBTL06DP211EE/G	DisplayPort v1.1a (2.7 Gbps) Hex Mux	NOW	HVQFN-32
CBTL06DP212EE/G	DisplayPort v1.2 (5.4 Gbps) Hex Mux	Apr 2011	HVQFN-32
CBTL03SB212BS	DisplayPort v1.2 (5.4 Gb/s) FAUX Mux	NOW	HVQFN-20
CBTL04DP211	DisplayPort v1.1a (2.7 Gbps) 2:1 Mux (ML/AUX/HPD)	NOW	TFBGA-48
CBTL04DP212	DisplayPort v1.2 (5.4 Gbps) 2:1 Mux (ML/AUX/HPD)	Feb 2011	TFBGA-48
CBTL12131ET	DisplayPort v1.1a (2.7 Gbps) mux for All-in-one computers enabling Bi-directional use of DisplayPort	NOW	TFBGA-64

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