VR/AR技术应用及渠道对接高峰论坛资料下载

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DisplayPort over USB-C
High-Performance Video Out for VR
Analogix – Corporate Overview

The global leader in digital display markets

- Founded in 2002
- ~250 employees

Over One Billion DisplayPort Devices Shipped
Who is Analogix?

Technology-leading fabless semiconductor IC/IP company for mobile display
Over One Billion DisplayPort Devices Shipped

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<th>Three Mobile Markets</th>
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<td>SmartPhones</td>
<td>Tablets</td>
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<th>Five Product Lines</th>
<th>SlimPort®</th>
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<th>Top-tier &amp; Diverse Customers</th>
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<td>Apple</td>
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SlimPort® Enables Video Out, Continuum for Phones and VR-Ready

DisplayPort over Micro-B

- LG G2
- LG G Pad
- Google Nexus-7
- Fujitsu Arrows Tab
- HP Chromebook
- ASUS PadFone Infinity
- Asus Memo Pad 8
- ZTE Nubia X6
- ZTE Nubia Z5S
- Fujitsu Astra Tab
- Google Nexus-5

DisplayPort over USB-C

- LG G4
- Acer Predator Iconia Tab 10
- LG G Flex
- Lenovo ThinkPad 10
- Amazon Fire HDX 8.9 HD 6, 7, & Kids Edition
- LG G3
- Blackberry Passport & Classic
- Fujitsu Mebius Pad
- Amazon Fire HD 8.9
- ZTE Astra Tab
- Asus Memo Pad 8
- Venezuela
- LG G3
- Blackberry PASSPORT & Classic
- HTC 10
- LG G5
- HP Elite x3
- Acer Liquid Jade Primo
- Amazon Fire HDX 8.9
- HD 6, 7, & Kids Edition
- YotaPhone2
- LG G Flex 2 V10
- LG G Flex 2 V10
- HP Slate Pro
- LG G5
- HP Slate Pro

Many more design wins underway…
Full Function USB-C – Leading the Way

Plug-n-Play any accessory – it works.
SlimPort® – Enables Microsoft Continuum for Phones

- Microsoft Windows 10 Continuum
  - Optimizes the experience on any screen and any device
  - Creates an ‘office productivity’ experience on your phone
  - Available for free with Windows 10 upgrade
- USB Type-C gives SlimPort a boost
  - ANX7816 used in Lumia 950, 950XL
Do Everything with Your Phone using High-Performance Video Out

- Video
- VR
- Gaming
- Work

Only DisplayPort is robust to use for hours.
DisplayPort over USB-C Adoption
Interoperability Testing Ensures a Good User Experience

- DisplayPort over USB-C is the video interface of choice for PC, Tablets, Phones, Monitor and HDTV.
- USB-C ecosystem has been built to interoperate and minimize confusion.
VR Market Landscape

Connected VR Delivers Best Performance and Mobility

- VR market will be big – with low, middle and high-end.
- All four approaches will exist.
- The “connected VR” approach is the best solution in performance and mobility.
- Dedicated electronics will be used, one display per eye, etc. In a few years HMD will be much less bulky than current products. The “cardboard” approach will go away.
- Resolutions & refresh rates will go up faster than TV.

**Portability**
- Portable and Lightweight (Can be used on the go)
- Tethered and Heavy (Can only be used at home)

**Performance, Realism**
- Lowest
- Highest

Connected VR connects via phone
- Battery, radio, CPU included in HMD
- Google cardboard
- Insert phone
- Tethered to PC
- Insert phone
## Connected VR Delivers Best Performance and Mobility

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Why</th>
<th>Connected VR</th>
<th>PC VR</th>
<th>Cardboard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution 8K *</td>
<td>Cannot see pixels</td>
<td>Good</td>
<td>Good</td>
<td>Not good</td>
</tr>
<tr>
<td>Refresh rate 120FPS</td>
<td>Fluid motion, no dizziness</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Low latency &lt; 6 ms</td>
<td>Interactive</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Field of view 135˚</td>
<td>Immersive</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Portable Via Phone</td>
<td>Use outside the house</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Light weight &lt; 10 ounces</td>
<td>Easy movement &amp; comfortable</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Interoperable DP over USB-C</td>
<td>Use with any phone or PC</td>
<td>Good</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Low cost &lt; $100</td>
<td>Accessible to all</td>
<td>$50</td>
<td>$100</td>
<td>$25</td>
</tr>
</tbody>
</table>

- Connected VR will replace Cardboard due to better performance, comfort and usability.
DisplayPort and USB3 Needed for VR

Today’s PC VR

• USB3 required to transfer sensor data: gyro, accelerometer, position, front camera, etc.
• Very low latency needed for interactive experience

Simplified VR Connectivity

• Replace two cables with one
• USB-C carries video, data and power
• Reduces cost & complexity
Only DisplayPort over USB-C™ meets the needs of VR

- VR drives higher resolutions and faster refresh rates.
- 8K is needed to make pixels too small to see with a field of view of 135°. It is equivalent to 4000 PPI on a 3” screen.
- USB-C carries audio and video, data and up to 15W of power delivery. SuperSpeed USB3 needed for sensor data.
- Only DisplayPort over USB-C meets the VR requirements. Wireless is not an option.
USB Type-C and DisplayPort®

- **USB Type-C is**
  - Reversible, consumer friendly cable
  - Multi-function: power, data, video
  - Analogix is a contributor to USB-IF and has a comprehensive roadmap for USB-C

- **DisplayPort is**
  - Digital AV interface architected for mobile
  - Royalty-free
  - DP1.2 released August 2014, DP1.3 coming soon
  - Analogix is the market leader for DisplayPort
DisplayPort is the Best Choice for Video Connectivity

DisplayPort offers the highest performance at the lowest cost.
- Lowest power
- Fewest wires
- Easiest integration

- Wi-Gig power and cost is prohibitive
- WIFI performance is mediocre
- HDMI2 can do 4K but license fees make it costly
- LVDS cost becomes prohibitive at 4K

- Lowest power
- Fewest wires
- Easiest integration
Oculus Rift

HDMI Source: PC or Console

Custom 4m 2in1 cable with USB and HDMI

Display centered around a Toshiba HDMI to dual MIPI converter

HDMI to MIPI converter  MIPI Panel1  MIPI Panel2

USB Hub  USB Audio  Bluetooth  Gyroscope
Existing VR System Implementations

- Existing solutions have several display ICs
**Integrated VR System Implementations**

- Simplified display electronics
  - Improve performance (lower latency)
  - Reduce cost and complexity

![Chicago VR Solution Diagram]

- USB3 needed for transferring sensor data
- One MIPI DSI port can support up to FHD 90FPS.
- Higher resolutions require dual MIPI DSI ports or DSC.
SlimPort VR - Key Points

• Connected VR (connected via phone) will replace Google Cardboard over time due to better performance, comfort and interoperability.

• DisplayPort over USB-C™ provides the best interface to the Head Mounted Display (HMD).

• Analogix SlimPort ICs reduce cost and complexity.
USB-C Port Controllers
HDMI (includes eDP Tx)

DisplayPort (includes eDP Tx)

USB-C
  - Full Feature
    - ANX7428
      - Mux, CC, Full PD
      - USB 3.1 (5G), DP, 4L
    - ANX7408
      - Mux, CC, Full PD
      - USB 3.1 (1G)
    - ANX7401
      - CC, Full PD
    - ANX7413
      - CC + 5V PD

USB3 Port

USB-C CC Port

HDMI

Production
Sampling
Planning

2015

2016

2017

ANX7688
- HDMI (4K60, HDCP 2.2) to USB-C, DP, USB3, CC, Full PD CTRL
  - ES: Q1-16
  - MP: Q2-16

Lexington
- Active Mux
  - USB 3.1 (10G), DP, 4L
  - MP: Q2-16

Ohio-3
- Active Mux, CC, Full PD
  - USB 3.1 (10G), DP, 4L

Brooklyn
- Re-timer, USB 3.1 (10G)

RedLeaf-2
- 2-Port PD, OCM, USB2/Debug Mux
  - ES: Q2-16
  - MP: Q3-16

Tesla
- 2-Port PD, PMIC

Hollywood-R
- DisplayPort Lane Converter (2L -> 4L)
  - Dual CC and PD Controller

Memphis
- DisplayPort to HDMI 2.1* Converter
  - Dual CC and PD Controller

* HDMI 2.1 spec is under draft as of Sept-2015.
ARM / MIPS Platform Roadmap

**USB-C: Full Feature**
- **ANX7816**
  - HDMI to DP 1L (4K30)
- **ANX7418**
  - SW, CD, PD
  - USB 3.1 (5G), DP 1L
- **ANX7805**
  - MIPI to DP 1L (1080p60)
- **ANX7418**
  - SW, CD, PD
  - USB 3.1 (5G), DP 1L

**USB-C: USB3 Port**
- **ANX7408**
  - MUX, CC, FULL PD
  - USB 3.1 (5G)

**USB-C: CC Port**
- **ANX7401**
  - CC, FULL PD CTRL
- **ANX7413**
  - CC + 5V PD
  - MP: Q1-16

**2015**
- **ANX7816**
- **ANX7418**
- **ANX7408**

**2016**
- **ANX7688**
  - HDMI (4K60, HDCP2.2) to USB-C, DP, USB3, CC, PD CTRL
  - ES: Q1-16
- **ANX7668**
  - HDMI 1.4 (1080p60) to USB-C
  - MP: Q2-16

**2017**
- **Mississippi-4**
  - HDMI 2.0 (4K60, 30bpp) to USB-C
  - DP (DSC), USB3, CC, PD CTRL
- **Mississippi-2**
  - MIPI to USB-C
  - DP, CC, PD CTRL
- **GreenLeaf-2**
  - Active Mux, CC, Full PD
  - USB 3.1 (10G)

**Production**

**Sampling**

**Planning**
ANX7413 Product Placement (CC + 5V PD)

- Bridges: I²C to USB-C Connector
- Supports: **USB 2.0, up to 15W charging**
- Power delivery:
  - Up to 15W (5V@3A) USB-C hardware based delivery
- Works with any USB-C charger or USB 2.0 device
- Small footprint
ANX7401 Port Product Placement (CC + Full PD)

- Bridges: I²C to USB-C Connector
- Supports: USB2.0, **higher power charging**
- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0 or QC2.0
- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.
- Small footprint
USB3 Port (5V or Full PD) Product Placement

- Supports: **5G data, higher power charging over USB-C**
- Bridges: USB3.1 to USB-C connector
- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0 or QC2.0 (ANX7408 ONLY)
- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.
- Small footprint
ANX7428 USB-C Port Placement (Full Function)

- Bridges: DP, USB3.1 to USB-C connector
- Supports: **4K60 display, 5G data, higher power charging over USB-C**
- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0
- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.
- Small footprint

Motherboard PCB
ANX7805+ANX7418 Placement (Full Function)

- Supports: **1080p60 audio-video, 5G data, higher power charging over USB-C**

- Bridges: MIPI-DSI, RGB-24, I²S/SPDIF and USB3.1(optional) to USB-C connector

- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0 or QC2.0

- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.

- Small package:
  - ANX7805: 4.5x4.5mm 81-BGA
  - ANX7418: 4x4mm 49-BGA
ANX7816+ANX7418 (Full Function)

- Bridges: HDMI 1.4 with HDCP 1.4, USB3.1 (optional) to USB-C connector

- Supports: **4K30 audio-video, 5G data, higher power charging over USB-C**

- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0 or QC2.0

- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.

- Small footprints
ANX7688 Placement (Full Function)

- Bridges: HDMI 2.0 with HDCP 2.2, USB3.1 (optional) to USB-C connector

- Supports: **4K60 audio-video, 5G data, higher power charging over USB-C**

- Power delivery:
  - 15W (5V@3A) USB-C hardware based delivery
  - Higher power delivery with USB PD2.0 or QC2.0

- Works with any USB-C accessory – charger, dongles, dock, TV, monitor etc.

- Small footprint
Notes:
1. **5V PD**: Type-C port is power provider – powering cables, USB drives, phones, tablets (3A and 5V max)
2. **Full PD**: Power provider (powering cables, USB drives, phones, tablets) and power consumer (charging port)
3. **Full feature**: In addition to one or more alternate modes, the port may support 5V PD or Full PD.
4. **Alt. mode Power delivery**: VCONN FET powers the display adapters. VBUS FET accepts up to 20V and tolerates up to 28 OVP.
DisplayPort Receivers for USB-C Accessories
Products Roadmap: USB-C Sink Solutions

**2015**
- **ANX7750**
  - DP 1L to DP 4L
  - (4K30, HDCP 1.4)

**2016**
- **Kentucky-1**
  - DE-MUX(10G), CC, PD CTLR
  - Re-timer, USB3.1(10G), DP

- **Memphis**
  - DisplayPort to HDMI 2.1a Converter with Dual CC and PD Controller

- **Hollywood-R**
  - DisplayPort Lane Converter (2L -> 4L)
  - with Dual CC and PD Controller

- **ANX7737**
  - DP 1L to HDMI
  - (4K30, HDCP 1.4)

- **ANX9837**
  - DP 2L to VGA (WUXGA)

- **ANX7402**
  - CC, PD CTLR

**2017**
- **Hudson-2**
  - MUX(10G), CC, Dual-PD, BB,
  - USB3.1(10G), DP, HDMI 2.0,
  - HDCP 2.2

- **Texas**
  - USB-C to VGA
Gen 2 Features:

- Supports both VGA and HDMI output
- DisplayPort Alt Mode over USB-C Compliant
- USB Billboard support through MCU
- Device Firmware Update through USB 2.0
- Support Charging Function (supported by 2nd ANX7402)
THANKS