

Kinetic Technologies

Smart Connectivity Product Introduction

April 2020

Smart Connectivity Business Highlights

1

**Strong Global
Business Strategy and
Financial Profile**

- Industry leading customers and partners
- Strong position to support the explosion of USB-C and DP Alt Mode in multiple applications

2

**Superior Technology Provides
Competitive Advantage**

- **Security:** HDCP repeater, hardware root of trust, and secure secrets injection
- **Multi-Stream Transport:** Near-zero latency between views and effective dynamic routing
- **Immersion:** Advanced pixel processing, higher frame rates, high dynamic range, and adaptive sync
- **Interoperability:** Guaranteed PHY performance and link integrity and absorb considerable spec deviations

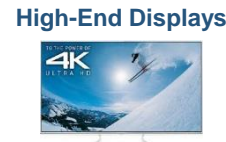
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**Unique Products Lines with
Multiple Applications**

- **Single Port Converters:** Up to 5K3K 60Hz, enhanced security, HDCP2.x Converter/Repeater, Color Format/Pixel Processing
- **Multi-Stream Multiport Converters:** Multi-streaming/daisy chain, USB Type-C multi-function hub
- **Repeaters:** USB Gen2/DP 1.4a re-timer, self adaptive Rx equalizer, configurable Tx emphasis, comprehensive debug features
- **Power Delivery Controllers:** TCPC standard compliance, optimized for default power profile

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**Attractive and Growing
Target Applications**



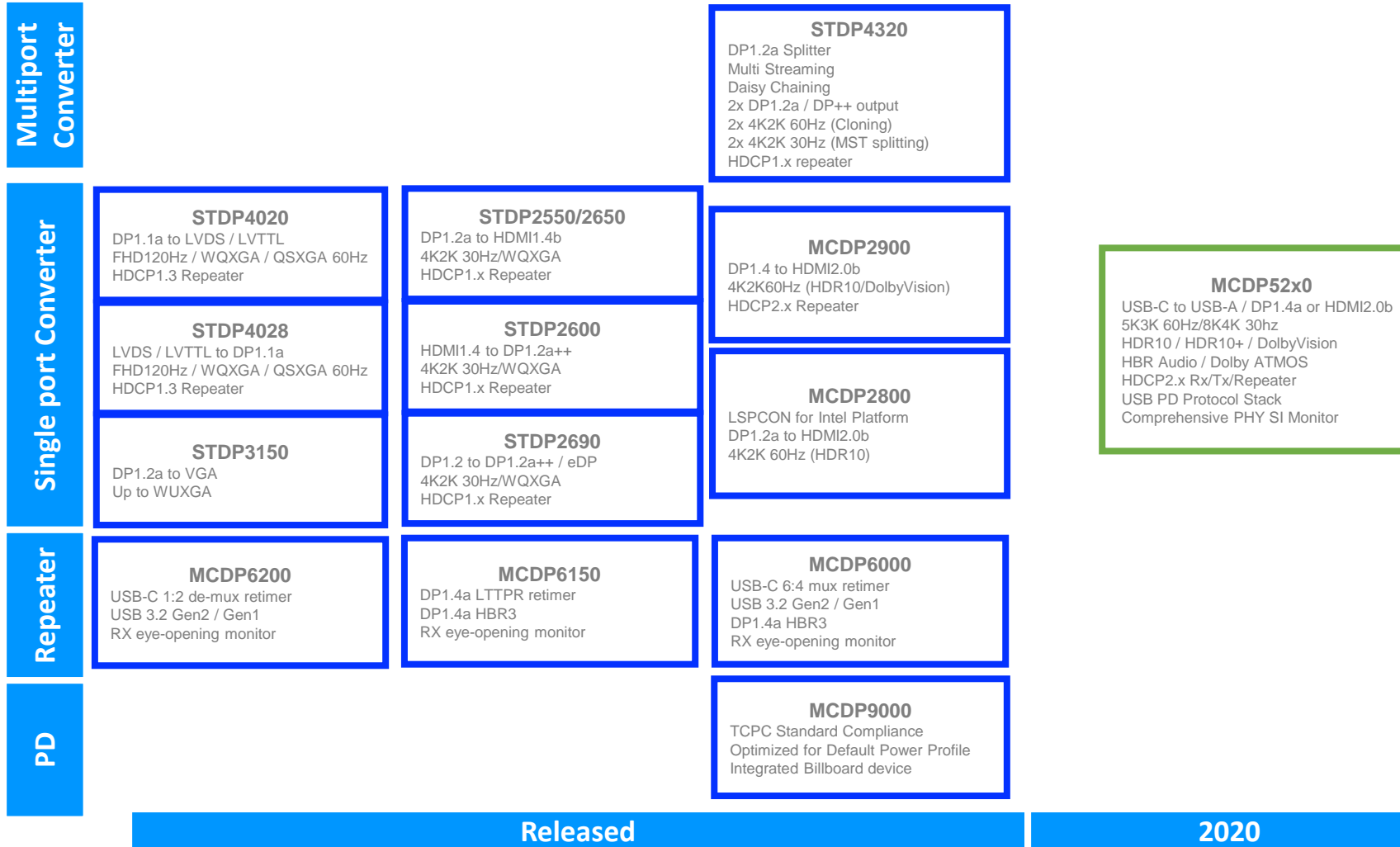
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**Experienced,
Consistent Leadership**

- Smart Connectivity team has proven technical expertise and operating experience in the high-speed connectivity market
- Strategic global presence in technology and talent in Silicon Valley and Taiwan

Market Leader In DisplayPort Converters With Recurring High Volume Design Wins At Top OEM's

Smart Connectivity Product Roadmap



Released

Samples



Smart Connectivity Multi-Port Converters

STDP4320 – DP1.2a MST Hub



Applications

- Docking Station, MST video hub, AR/VR Headset, Digital signage, Daisy-chain monitor

Features

- **Dual mode** TX & RX – DP1.2a & HDMI1.4 compliant
- **Splitter**- 1X DP/HDMI input, 2X DP/HDMI output
- Handles up to 8 audio-visual streams, total BW of 21.6Gbps
- **HDCP repeater**, integrated keys
- Optional ASSR for embedded connectivity (eDP)
- Color depth – Supports transport **up to 36 bit per pixel**
- Message transaction handling as a DP branch device

Benefits

- Conversion of 4k2k 60Hz DP MST in to 2x HDMI output (Left, Right)
- Conversion of 4k2k 60Hz DP SST in to 2x HDMI (Odd, even)
- Cloning 4k2k on two output ports
- Transport 2 independent HDMI AV streams on a single DP cable as MST
- Protected content transmission
- Frame synchronous signal for VR
- Routing up to 8 AV streams on a single cable for daisy chained display



Smart Connectivity Single-Port Converters

MCDP52x0 Overview

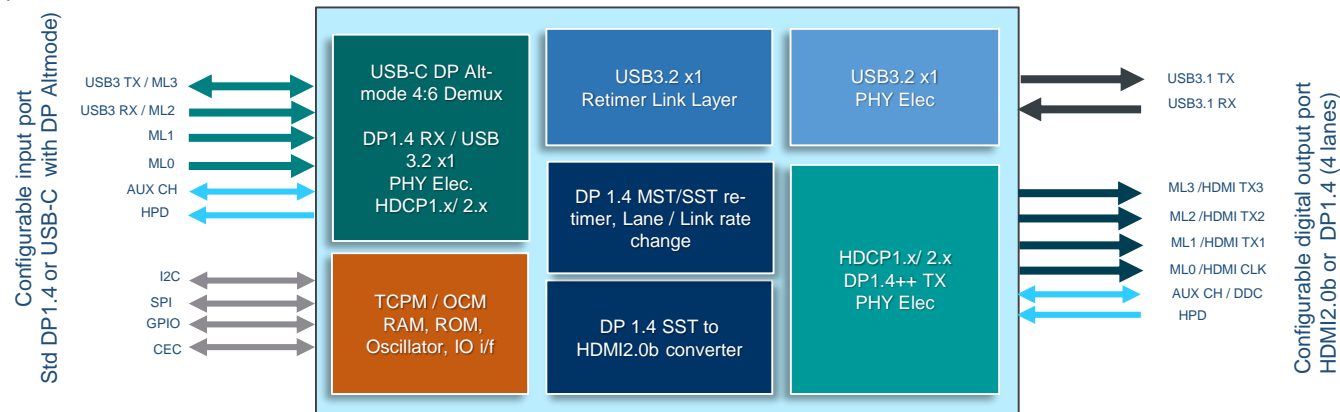
Applications

- AV accessories, Notebooks, Game Console, Media Streaming Device, HMD, TV

Features

- USB Type-C “Alt mode” receiver
- USB3.1 ESS Gen1/Gen2 Re- timer: 5.0 Gbps / 10.0 Gbps pairs
- DP1.4a RX with SST/MST support – Link rate 1.62/2.7/5.4/8.1/Gbps/lane
- DP++ TX configurable as AC coupled DP1.4a or DC coupled HDMI2.0b
- HDMI2.0b PHY compliant transmitter with HDMI2.1 features (VRR, QMS, FVA, QFT)
- Video resolution: Up to 5K3K60Hz (DP to DP); 4K2K 60Hz (DP to HDMI)

- Audio stream handling – LPCM 192KHz 32Ch, HBR 8CH, One Bit, DSD formats
- DP1.4a MST / SST re-timer pass through: Link rate, lane count change
- DP1.4a SST to HDMI2.0b conversion
- HDR Image processing (Static and Dynamic HDR)
- Adaptive sync support (in DP to DP and DP to HDMI mode)
- CEC Tunneling over AUX
- HDCP1.x/2.x repeater with embedded keys
- ARM Cortex M3 core 300MHz / peripheral controllers
- Package: 169 TFBGA, 7x7mm / 0.5mm pitch



MCDP52x0 Value Proposition

- Optimized Protocol converter for **Type-C** applications
 - Integrated USB3.1 De-Mux, retimer, **TCPM** and HDMI level shifter
- Seamless translation of static and dynamic HDR video b/w DP source and HDMI sink
 - **HDR, HDR10+ and Dolby Vision** metadata handling – Supports chainable VSC_EXT SDP packets
 - Dynamic tone mapping reflecting brightness and contrast changes from frame-to-frame and scene-to-scene
 - Deep color video up to 16bpp and BT601, BT709, BT2020, Adobe RGB colorimetry formats
 - **Pixel format conversion** (RGB/YUV444 to YUV422/420) and CVT to CTA timing conversion (HBE)
- Advanced audio video features compliant with **HDMI2.1** specification
 - Fast Vactive (FVA), Qucik Media Switching (QMS), Quick Frame Transport (QFT), Auto Low Latency Mode (ALLM)
 - Dolby **ATMOS**, TrueHD, DTS Master, 3D audio
 - LPCM 32Ch up to 192kHz, HBR 8Ch up to 1536kHz, One Bit 2/8Ch up to 12288 kHz, DST S/D rate up to 22579.2 kHz
- Content protection and **advanced device security**
 - HDCP1.4/2.3 repeater with integrated keys
 - Application code signing using RSA-2048bit keys, Secure boot, Secure ISP, Secure DFT, HW access lock
- Robust **interoperability** and compatibility with legacy, advanced PC/CE devices
 - CEC tunneling over AUX for interfacing with gaming console and media streaming devices



MCDP52x0 HDMI2.1 Capabilities

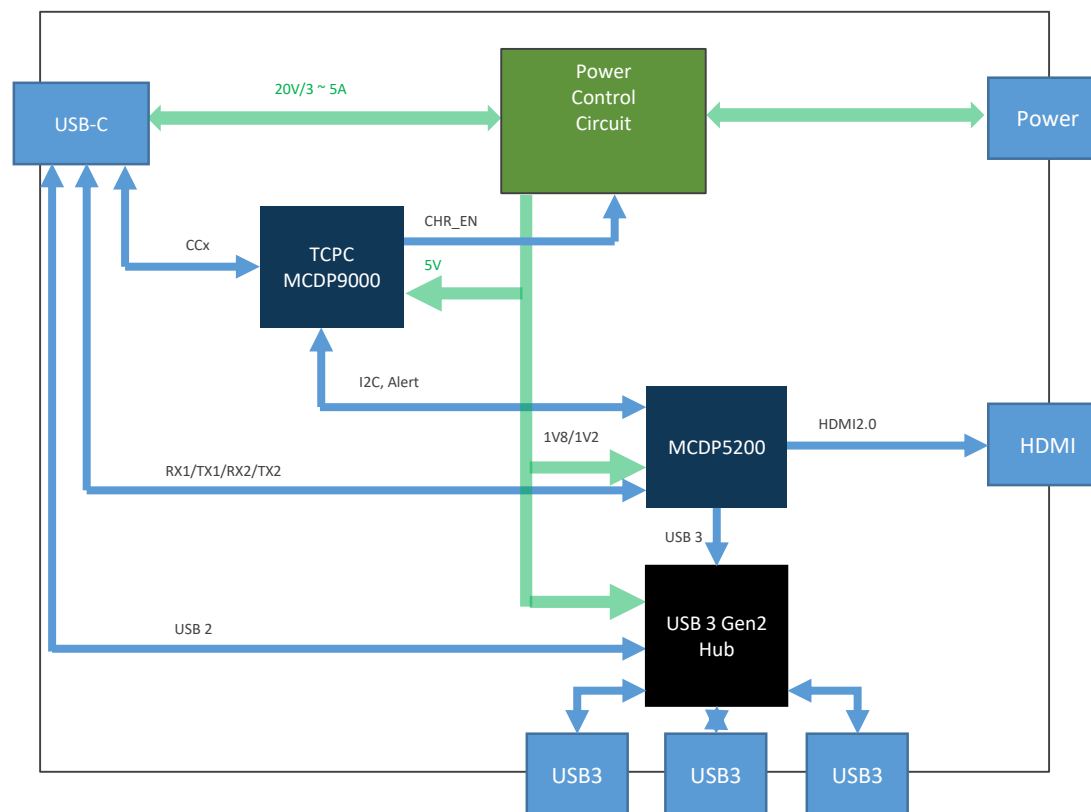


Features	HDMI 2.1 Spec	MCDP52x0
PHY Type	FRL & TMDS	TMDS
Max Link Rate	48Gbps - FRL PHY	18Gbps - TMDS PHY
Max TV Video Mode	10K/120Hz	4K/60Hz
Dynamic HDR Metadata	Yes	Yes
eARC - Enhanced Audio Return Channel	Yes	No
VRR - Variable Refresh Rate	Yes	Yes
FVA - Fast Vactive	Yes	Yes
QMS - Quick Media Switching	Yes	Yes
QFT - Quick Frame Transport	Yes	Yes
ALLM - Auto Low Latency Mode	Yes	Yes
DSC - Display Stream Compression	Yes	No
CEC 2.0+	Yes	Yes
3D Dual-View Signaling	Yes	Yes
3D Independent View Signaling	Yes	Yes
Multi-Stream Audio	Yes	Yes
3D Audio	Yes	Yes
Extended Metadata Packet	Yes	Yes



MCDP52x0 for USB-C 4K 60Hz Monitor

- Monitor with USB-C DP Alt-mode through 2-lane HBR3 (3840 x 2160 60p support)
- HDR10 / HDR10+ / Dolby Vision support
- VRR support
- HBR audio support
- No need for external 4:6 demux to support USB Hub



MCDP2900 - DP1.4 to HDMI2.0b Converter

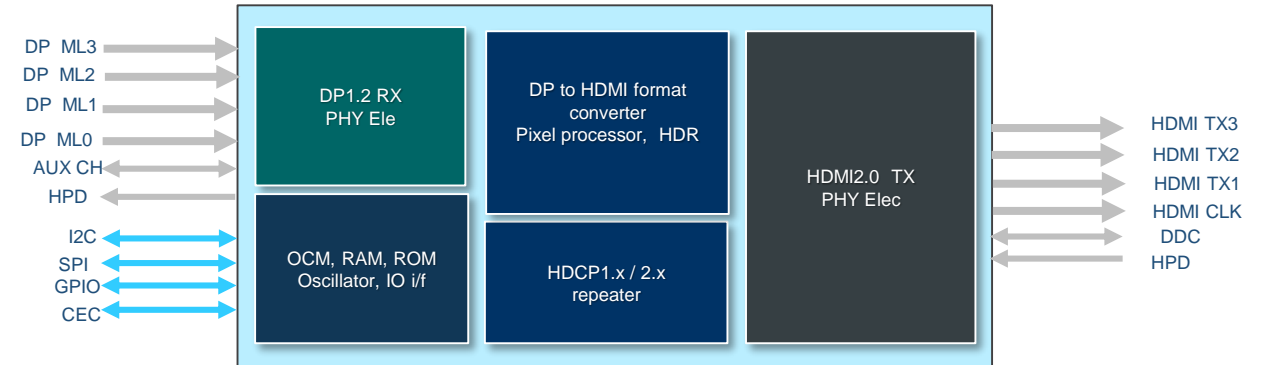
Applications

- DP / USB Type-C accessories, Game consoles, Video Streamers, STB, etc.

Features

- Protocol converter for 4k2k60Hz HDR video and Dolby ATMOS audio
- 4 Lane DisplayPort Receiver - 1.62/2.7/5.4 Gbps/lane
- HDMI Transmitter - link rate up to 6.0Gbps
- Audio formats - LPCM up to 192Kzx8Ch, compressed, HBR audio up to 768Kz
- Static and Dynamic HDR image processing - HDR10, DolbyVision
- Color format conversion from RGB/YCC444 to YCC422 or YCC420
- Programmable filter coefficient for Chroma downscaling

- HDCP2.2 receiver, transmitter, repeater with on-chip keys
- Tamper proof device with advanced security for FW loading and execution
- AUX-to-I2C Bridge; SCDC read request handling; CEC tunneling
- CEC tunneling over AUX with snooping and multi-logical addressing
- Low power operation: 482mW in protocol converter, sleep 11mW
- Package: 64pin TFBGA 7x7mm



MCDP2900 Value Proposition

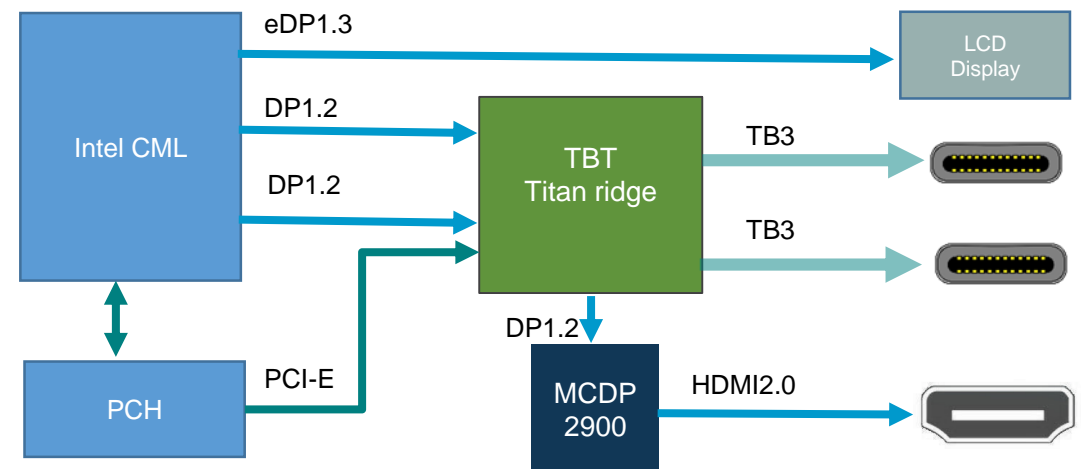


- USB-C / DP to HDMI protocol converter delivering **HDR10 / DolbyVision** content and **Dolby ATMOS** audio
 - BT601, BT709, BT2020, Adobe RGB colorimetry formats
 - Dolby ATMOS immersive audio from any USB-C/DP source to HDMI sink
 - Seamless translation of HDR10 and DolbyVision video with wide color formats b/w DP source and HDMI sink
- Content protection and device **security**
 - HDCP1.x/2.2 TX, RX, repeater with integrated keys
 - Application code signing, Secure boot, Secure ISP using 2048-bit RSA keys, HW port protection
- **Robust interoperability** and compatibility with legacy, advanced and PC / CE devices
 - CVT-RB timing(10bpc) over DP and converts to CTA timing over HDMI through Horizontal blanking expansion
 - Converts pixel format from RGB444 to YCbCr420 with high quality digital scaling (programmable coefficients)
 - CEC tunneling over AUX for interfacing with gaming console and media streaming devices



MCDP2900 for Intel TitanRidge

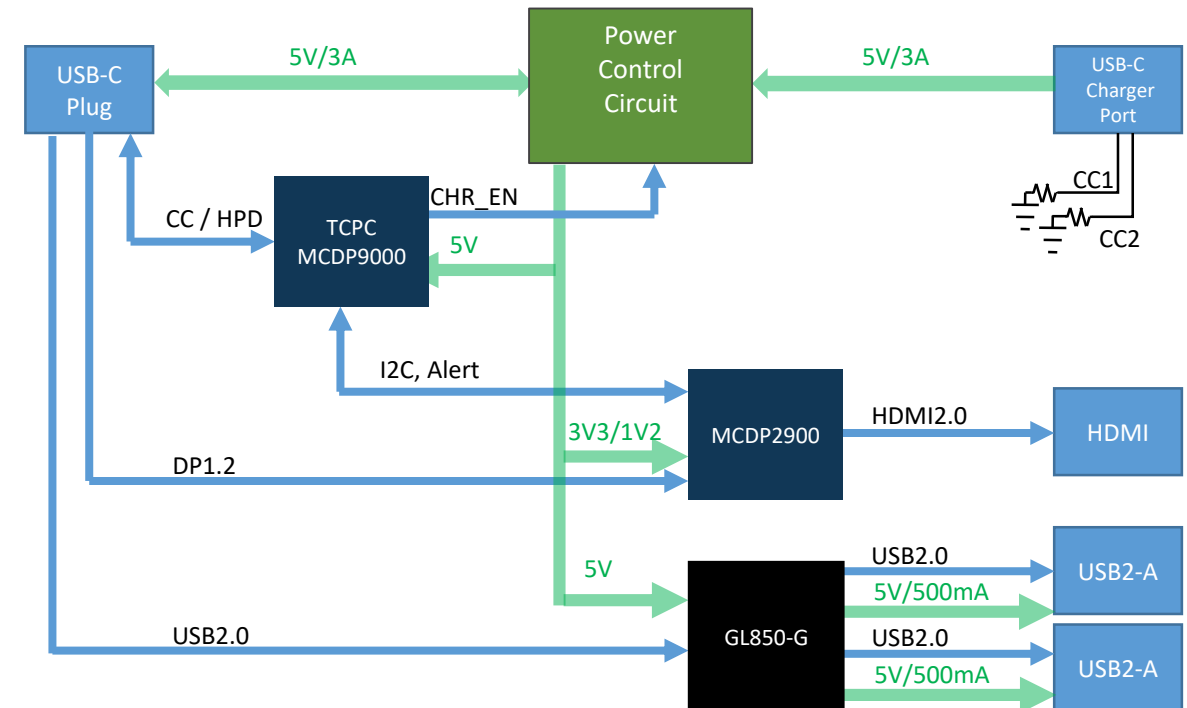
- Qualified by Intel TB and GFx team
- Published on TB dashboard and new developer “welcome package”
- Intel PCL Qualified component – Passed Modern Standby Compliance Test
- DP, HDMI, HDCP repeater CTS compliant
- Field FW upgradable through DP AUX CH or I2C
- Advanced device security and content protection
- Best interoperability- proven with wide range of sinks
- 4k2k60 HDR video (Dolby Vision & HDR10) with Dolby ATMOS audio
- Production proven HW, SW and Tools



MCDP2900 Phone Docking Station Reference Design



- Seamless interface between SmartPhone (USB-C) to TVs and Monitors (HDMI)
- Simultaneous content streaming (Audio, video, data) and charging phone battery
- 4k2k60Hz HDR content (Dolby Vision & HDR10) with Dolby ATMOS audio
- Versatile Travel-Dock or Desk-Dock with Desktop Mode support
- Optimized BOM cost compare to existing solutions in the Market
- Production Ready turn-key solution - Swift time-to-market



MCDP2800 – Intel LSPCON

Application

- Notebook/Desktop Motherboard

Features

- HDMI1.4b-to-HDMI1.4b PHY analog repeater / Level shifter
 - Max link rate 3.4Gbps
- DP1.2a-to-HDMI2.0b Protocol Convertor - Max link rate 6.0Gbps
- Supports video resolution up to 4k2k 60Hz (RGB/YCC 444 / 8bpc)
- HDR imaging (high-dynamic-range) 4k2k 60Hz in YCC 420 /12bpc
- HDCP2.x Transmitter / HDCP1.x repeater
- Enhanced Intel security over DP interface LSPCON mode
- AUX-to-I2C Bridge; SCDC read request handling; CEC tunneling
- Low power operation:
 - 100mW - PHY repeater/level shifter
 - 470mW - Protocol converter,
 - 0.1mW - Connected standby
- Package: 64pin TFBGA 7x7mm

Benefits

- Enables swift deployment of HDMI2.0 for Intel CPU based NB,
- **Companion** device to SKL, KBL, CFL, WHL, CML
- Single device supporting both PHY layer repeater/level shifter (HDMI1.4 to HDMI1.4) and active protocol converter (DP1.2 to HDMI2.0)
- Low standby power to meet **Win10** requirement



STDP2550/2650 – DP1.2a to HDMI1.4b Converter



Application

- DP/USB-C dongle, Phone dock, Gaming dock, ...

Features

- DP1.2a to HDMI1.4b converter
- Supports 4K2K30Hz / 3D FHD 120 Hz video & 7.1 Ch audio
- RGB / YUV video format, deep color support up to 16bpc
- HDCP 1.3/1.4 with on-chip keys & repeater capability
- Spread spectrum for EMI reduction, High RFI immunity
- Optimized for low power (active 500mW, standby 10 mW)
- Small PCB footprint (package: 81pin TFBGA 8x8mm / 5x5mm)

Differentiation

- Field proven product with **highest interoperability and stability**
- Flexible lane count and link rate selection option
- Easily customizable for target applications
- Field firmware **upgrade** option through Windows application utility



STDP2600 – HDMI1.4b to DP1.2a Converter



Application

- Gaming monitor, Wireless dock, Digital Signage...

Features

- HDMI1.4b to DP1.2a converter
- Supports 4K2K30Hz / 3D FHD 120 Hz video & 7.1 Ch audio
- RGB / YUV video format, deep color support up to 16bpc
- HDCP 1.3/1.4 with on-chip keys & repeater capability
- Spread spectrum for EMI reduction, High RFI immunity
- Optimized for low power (active 500mW, standby 10 mW)
- Package: 81pin TFBGA 8x8mm

Differentiation

- Field proven product with **highest interoperability and stability**
- Flexible lane count and link rate selection option
- Easily customizable for target applications
- Field firmware **upgrade** option through Windows application utility



STDP2690 – DP1.2a to DP++/eDP Converter



Application

- DisplayPort dongle, embedded system...

Features

- DP1.2a to DP++/eDP converter
- Supports 4K2K30Hz / 3D FHD 120 Hz video & 7.1 Ch audio
- RGB / YUV video format, deep color support up to 16bpc
- HDCP 1.3/1.4 with on-chip keys & repeater capability
- Optional ASSR for embedded connectivity (eDP)
- Spread spectrum for EMI reduction, High RFI immunity
- Optimized for low power (active 500mW, standby 10 mW)
- Package: 81pin TFBGA 8x8mm

Differentiation

- Field proven product with **highest interoperability and stability**
- Flexible lane count and link rate selection option
- Easily customizable for target applications
- Field firmware **upgrade** option through Windows application utility



STDP3150 – Bridging DP & Legacy VGA Displays



Application

- DP / USB Type-C accessories

Features

- Single-chip DisplayPort to VGA converter
- Based on proven DisplayPort & VGA technology
- DisplayPort CTS1.1 compliant
- 10-bit Video DAC
- Low power operation (380mW Active, 13mW)
- Spread spectrum for EMI reduction, High RFI immunity
- Automatic sink detection based on load sensing & DDC return channel monitoring
- ISP over AUX for FW upgrade through DP cable
- QFN 6mmx6mm 64pin

Differentiation

- In mass production since 2009 with all major PC OEM products
- Highest interoperability with AMD, Intel and NVIDIA DP GFX
- Field proven DAC with **best analog video performance**
- Windows based FW upgrade utility for field and factory deployment



STDP4020/4028 – Enhanced DP TX/RX Chipset



Application

- Digital Signage, Gaming monitor, LCD panel module etc...

Features

- Compliant with DP / eDP / iDP standard (Turbo mode)
- Supports WQXGA / FHD120 Hz 10-bit video & 7.1 Ch audio
- Robust AUX channel - I2C, IR, full duplex UART protocols
- Interface compatibility with wide range of SoCs (QLVDS, LVTTTL)
- HDCP 1.3 with on-chip keys & HDCP repeater capability
- Spread spectrum for EMI reduction
- Optimized for Low power applications
- STDP4020: DPRX application, STDP4028: DPTX application
- 164 LFBGA 12mm x 12mm

Differentiation

- Single chip quad CH LVDS to DP converter
- Single chip DP to quad CH LVDS converter
- Flexible link rate and lane count selection
- Complete SW support to handle IR and UART protocol over sideband CH
- FW upgrade utility for field and factory



Smart Connectivity Repeaters

MCDP6000 – USB Type-C DP Alt-mode Retimer

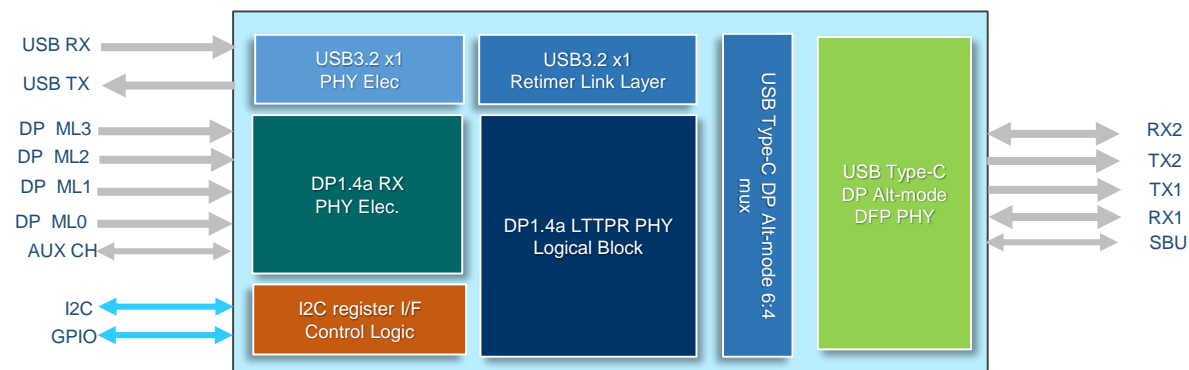
Applications

- DP Alt-mode support USB Type-C Port, Active cable for embedded system, A/V equipment etc.
- 6:4 switching retimer

Features

- USB 3.2 x1 compliant Retimer for both Gen1 and Gen2 mode (5 / 10 Gbps)
- BLR concept originated by Kinetic
- DP 1.4 Retimer (1.62 / 2.7 / 5.4 / 8.1 Gbps)
- Compliant with DP1.4 specification, supports LT tunable PHY repeater
- PHY performance exceeding the standard requirement
- Comprehensive configurability for better interoperability
- Two Wire Interface slave for device configuration (compatible with I2C)

- 1.8V / 1.2V dual supply
- MCDP6000 power consumption
- Typical 520mW in USB 3.1 Gen2 + DP 2-lane HBR3 configuration
- 46pin QFN package (4.5mm x 6.5mm, 0.4mm pitch)
- Sophisticated monitoring features
- DPCD status monitor for DP and RTSSM monitor for USB
- Internal Eye-Opening Monitor



MCDP6150 – DP1.4a LTTPR Retimer

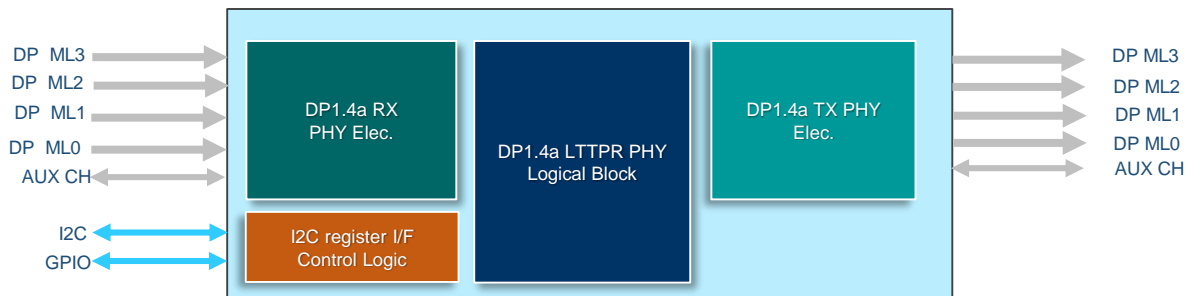
Applications

- Desktop / Laptop for DP channel, DisplayPort active cable, Monitor, DisplayPort extender etc...

Features

- DP 1.4a Retimer (1.62 / 2.7 / 5.4 / 8.1 Gbps)
- Compliant with DP1.4a specification, supports LT tunable PHY repeater (LTTPR)
- Comprehensive AUX_CH message handling to ensure backward compatibility with the legacy DP1.2a / DP1.3 / DP1.4 products
- Robust PHY performance
- Adaptive receiver equalization
- Reliable transmitter jitter performance

- TWI slave for device configuration (compatible with I2C)
- 1.8V / 1.2V dual supply
- MCDP6150 power consumption
- Typical 430mW in DP 4-lane HBR3 configuration
- 46pin QFN package (4.5mm x 6.5mm, 0.4mm pitch)
- Sophisticated monitoring features
- DPCD status monitor
- Eye Opening Monitor



MCDP6200 – USB Type-C USB Gen2 Retimer

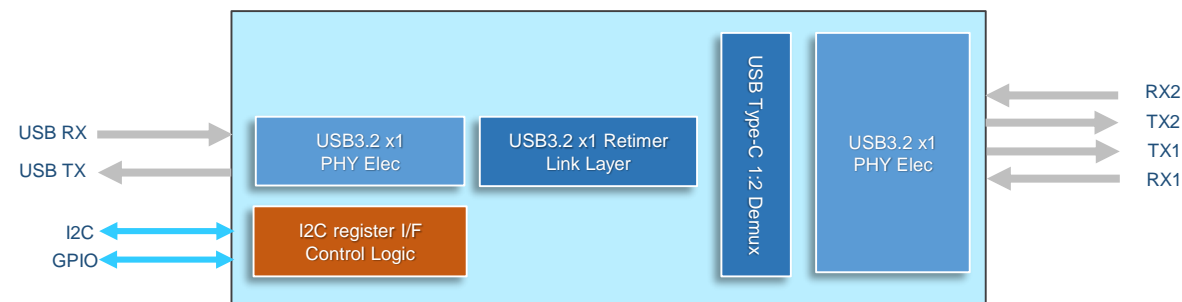
Applications

- Desktop / Laptop for USB Gen2 port, USB active cable, USB device etc...
- USB Gen2 1:2 Switching Retimer

Features

- USB 3.2 x1 compliant Retimer for both SS and ESS mode (5 / 10 Gbps)
- BLR concept originated by Kinetic
- Integrated switch function to support USB Type-C data flippability
- Comprehensive architecture with optional features
- Reliable PHY performance
- Adaptive receiver equalization
- Reliable transmitter jitter performance

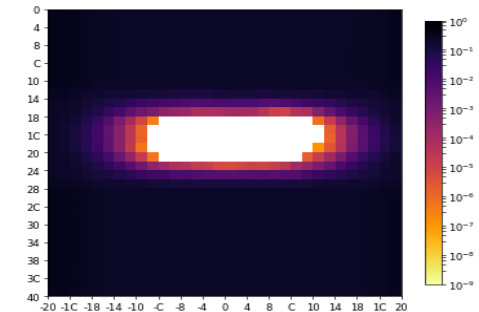
- TWI slave for device configuration (compatible with I2C)
- 1.8V / 1.2V dual supply
- MCDP6200 power consumption
- Typical 280mW in USB Gen2
- 46pin QFN package (4.5mm x 6.5mm, 0.4mm pitch)
- Sophisticated monitoring features
- RTSSM monitor
- Eye Opening Monitor



MCDP6xx0 Value Proposition



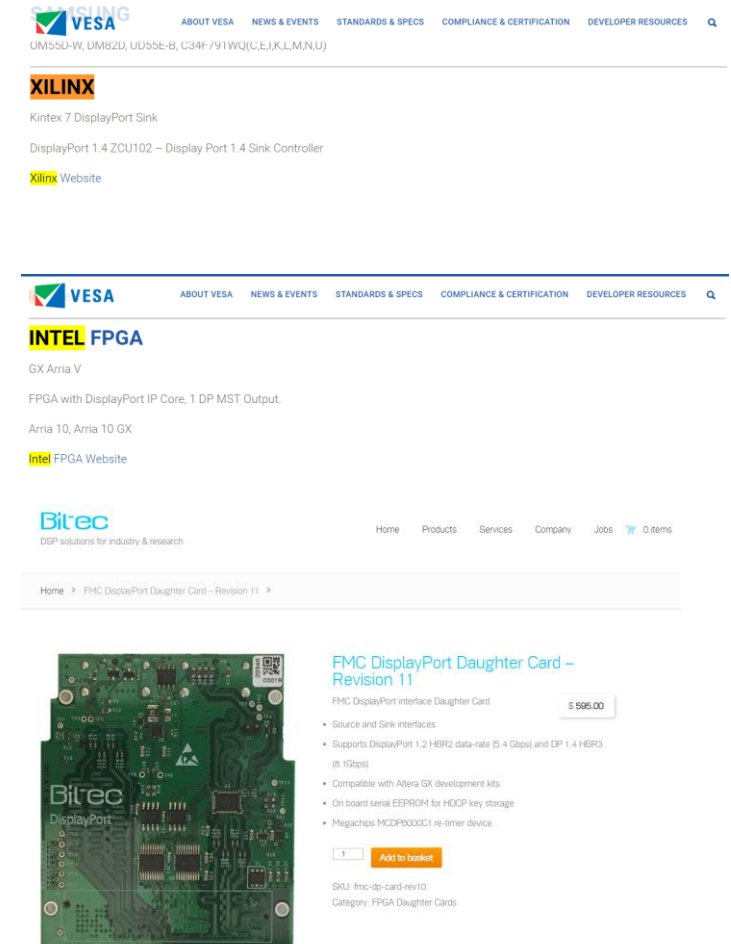
- Superior **signal integrity**
 - Enabling USB Gen2 link / DP HBR3 link over thinner micro coax, ex) 5m 32AWG / 3m 34AWG etc...
 - Proven DisplayPort receiver PHY through 3rd parties reference designs (Xilinx, Intel FPGA etc...)
- Advanced **physical layer monitoring features**
 - Receiver eye-opening monitor to qualify the link quality
 - Adaptive receiver equalizer status monitor to estimate the link margin
- **Configurable** PHY parameters
 - Fine tuning capability to address customer specific PCB / wiring design issue
- Robust **interoperability** and compatibility with legacy, non-compliant PC/CE devices
 - Proprietary feature to address “famous” interoperability issue with legacy, non-compliant USB Gen2 hosts / devices
 - Optional features to address non-compliant GPUs to enable LTTTPR function of DP1.4a
- PHY layer **CTS** support
 - Reference USB retimer for Keysight to develop USB PHY CTS program for the embedded system with a captive retimer and an active cable
 - In-house PHY layer test support



MCDP6xx0 in Ecosystem Partners

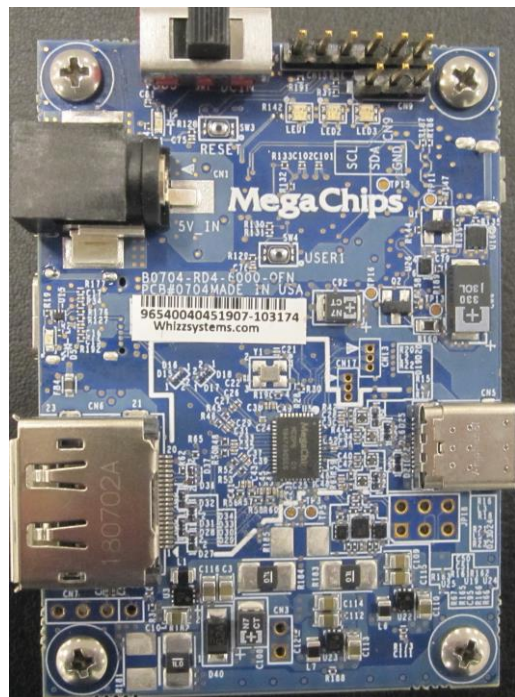


- Nvidia G-sync G4 reference platform
 - Nvidia's G-sync G4 reference design uses MCDP6150 as DisplayPort 1.4a receiver
 - The reference design is solely designed for the implementation with MCDP6150
 - MCDP6150 is expected to be in Nvidia's latest G-sync monitor board reference design
- Xilinx DisplayPort 1.4 RX subsystem
 - Xilinx DisplayPort 1.4 VESA certified solution enabled by MCDP6000
 - Xilinx DisplayPort 1.4 RX driver is solely designed for the implementation with MCDP6000
- Intel FPGA / Bitech DisplayPort 1.4 RX
 - Intel Arria 10 GX VESA certified solution enabled by MCDP6000
 - Bitech DisplayPort 1.4 RX driver is solely designed for the implementation with MCDP6000
- MCDP6xx0 assures **certification and highly reliable interoperability**.

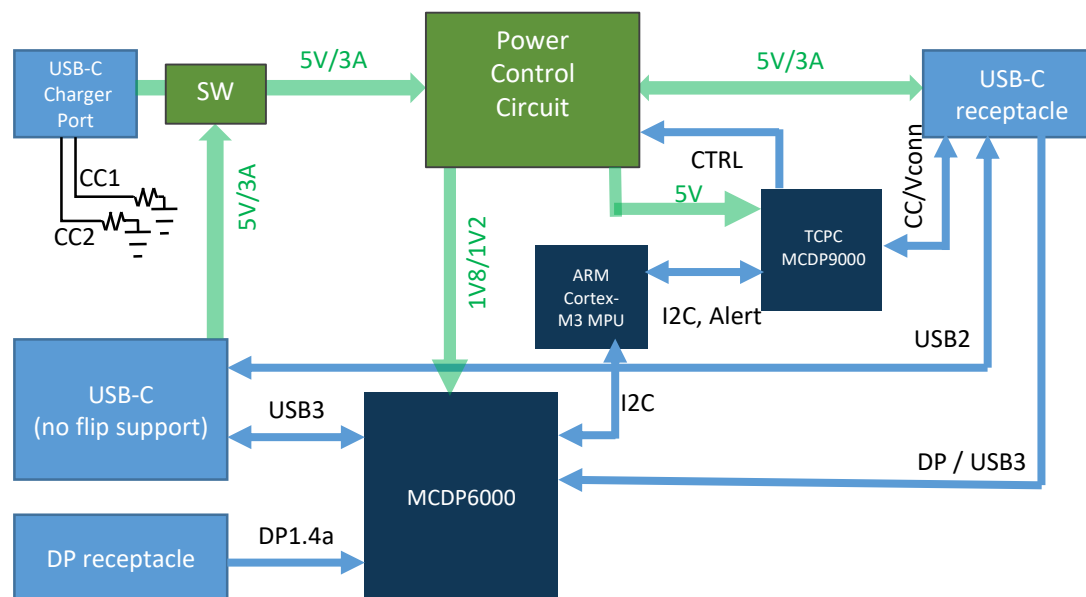


MCDP6xx0 Reference Design

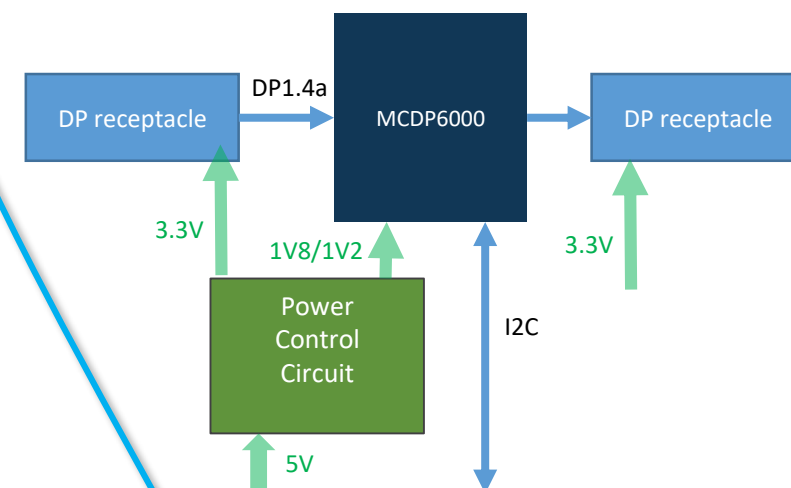
RD4-6000



Conceptual Block diagram



RD1-6150



Smart Connectivity USB-C Power Delivery

MCDP9000 Overview – USB Type-C Port Controller



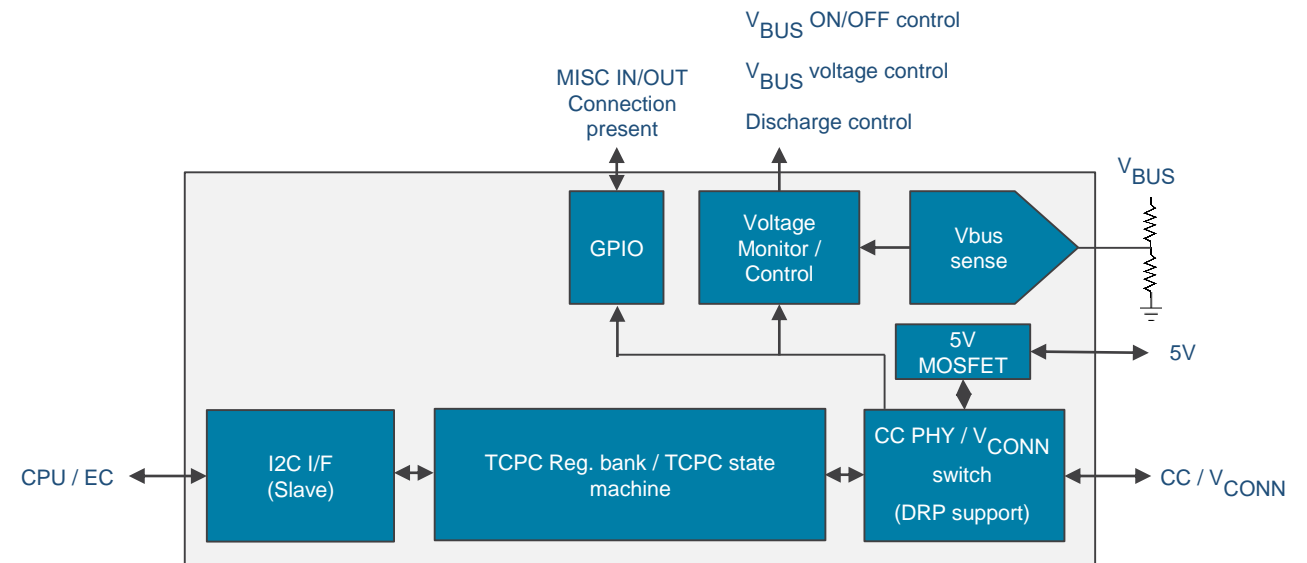
Applications

- Any devices with USB Type-C ports

Features

- TCPC specification compliant device
- PD 3.0 specification compliant with KinetiC's PD protocol stack
- DRP / DFP / UFP support
- Fast-Role-Swap support
- Debug Accessory Detection
- Vconn switch to support 1.5W
- Integrated Billboard device (USB FS mode)

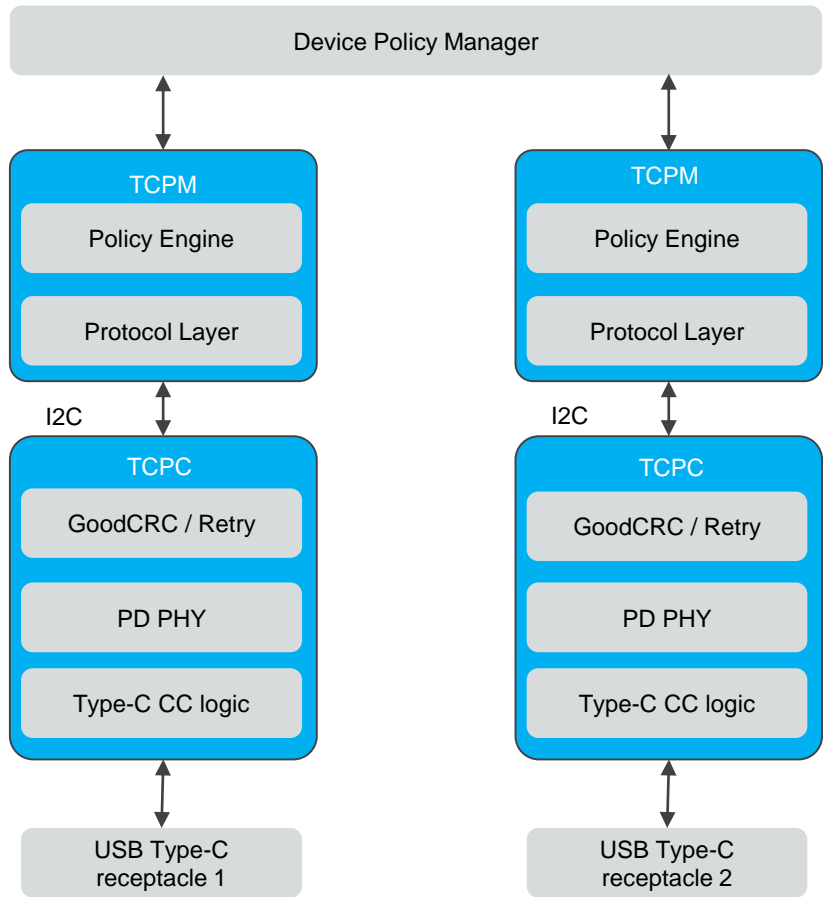
- I2C interface as defined in TCPC standard: Up to 1MHz
- Dead battery operation: Rd expose on both CC1 and CC2
- 5V single power supply
- QFN24



MCDP9000 Value Proposition

- **Optimized BOM** for USB Type-C accessory together with MST Hub / converter product
- Comprehensive support to enable **robust USB Type-C** device with DisplayPort Alt-mode

Application	USB Type-C A/V Dongle	USB Type-C Docking Station
TCPM	Running on STDP2x50 / MCDP2900 / MCDP52x0	
TCPC	MCDP9000	MCDP9000



MCDP9000 Reference Design

RDx-2550

- Two MCDP9000s: PD protocol stack is running on STDP2550/2650
- One USB-C as power supply port to support 60W and the other as PD3.0 compliant DP Alt-mode USB-C port
- USB-C UFP port is plug implementation

RD4-2900

- Reference design for MCDP2900
- PD protocol stack is running on MCDP2900
- One USB-C as power supply port to support 15W and the other as PD3.0 compliant DP Alt-mode USB-C port
- USB-C UFP port is receptacle implementation

RD4-6000

- Reference design for MCDP6000 (MCDP6000)
- MCDP9000 to handle CC communication, Vconn switch and Vbus controller through ARM Cortex-M3 MCU
- PD Protocol Stack is available to be ported to other microcontroller

RD1-5200

- Reference design for Mustang
- Two MCDP9000s: PD protocol stack is running on Mustang
- One USB-C as power supply port to support 60W and the other as PD3.0 compliant DP Alt-mode USB-C port
- USB-C UFP port is receptacle implementation

RD2-5200

- Reference design for Mustang
- Two MCDP9000s: PD protocol stack is running on Mustang
- One USB-C as power supply port to support 60W and the other as PD3.0 compliant DP Alt-mode USB-C port
- USB-C UFP port is plug implementation

Thank You