TI Designs
TIDA-01243 USB Type-CTM Mini Dock

Design Overview

The USB-C™ mini dock board is a docking system that can support additional functions to the basic USB transfers with default VBUS over a USB-C™ connection. This board features USB3.1 (Gen1) data, DisplayPort video transfers and charging up to 20V at 3A, all over a single USB-C™ cable connection; additionally, it includes a protocol converter to support different video data types (DisplayPort and HDMI)

- Data, audio and video port expansion.
- The dock can provide up to 20V @3A through Type-C connection
- The dock provides multiple USB DFP connectors for Type-C and legacy USB operation.
- The Dual Role Type-C port of the dock can be connected directly to a Type-C Notebook or tablet systems.
- Video and power delivery can be enabled over the Type-C connection.

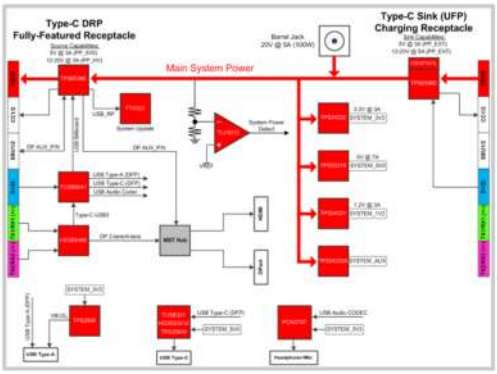
Design Resources

TIDA-0143	Tool Folder
HD3SS460	Product Folder
TPS53318	Product Folder
TPS54331	Product Folder
TLV3012	Product Folder
TPD6E05U06	Product Folder
TPD4E05U06	Product Folder
TUSB8041	Product Folder
TPD13S523	Product Folder
TPS3831K33	Product Folder
TPS2500	Product Folder
TPS54332	Product Folder
PCM2707C	Product Folder
TPS65982	Product Folder
CSD87501L	Product Folder
HD3SS3212	Product Folder
TPS25910	Product Folder
TPS65986	Product Folder
TUSB321	Product Folder
TUSB3410	Product Folder
TPS2013A	Product Folder

Block Diagram

TIDA-01243 USB-C™ Mini Dock EVM

Block Diagram



Design Features

- Feature #1 Bi-Directional Power Capabilities
- Feature #2 Includes a USB3 hub TUSB8041 for USB port expansion
- Feature #3 Dual Video (up to 4K) via HDMI or miniDP
- Feature #4 Flash Update over Type-C via USB 2.0 EndPoint

Featured Applications

- Application #1 Designed to help evaluate Type-C Dock implementations with audio, video and charging support.

Board Image

1 System Description

The USB-C™ mini dock board is a docking system that can support additional functions to the basic USB transfers with default VBUS over a USB-C™ connection. This board features USB3.1 (Gen1) data, DisplayPort video transfers and charging up to 20V at 3A, all over a single USB-C™ cable connection; additionally, it includes a protocol converter to support different video data types (DisplayPort and HDMI)

1.1 HD3SS460 USB Type-C™ Alternate Mode 4x6 Differential Switch

The HD3SS460 is a high-speed bi-directional passive 4-6 cross-point switch in mux or demux configurations. Based on control pin POL the device provides switching to accommodate USB Type-C plug flipping. The device provides multiple signal switching options that allow system implementation flexibility. The HD3SS460 is a generic analog, differential passive switch that can work for any high speed interface applications as long as it is biased at a common mode voltage range of 0-2 V and has differential signaling with differential amplitude up to 1800 mVpp. It employs an adaptive tracking that ensures the channel remains unchanged for entire common mode voltage range Excellent dynamic characteristics of the device allow high speed switching with minimum attenuation to the signal eye diagram with very little added jitter.

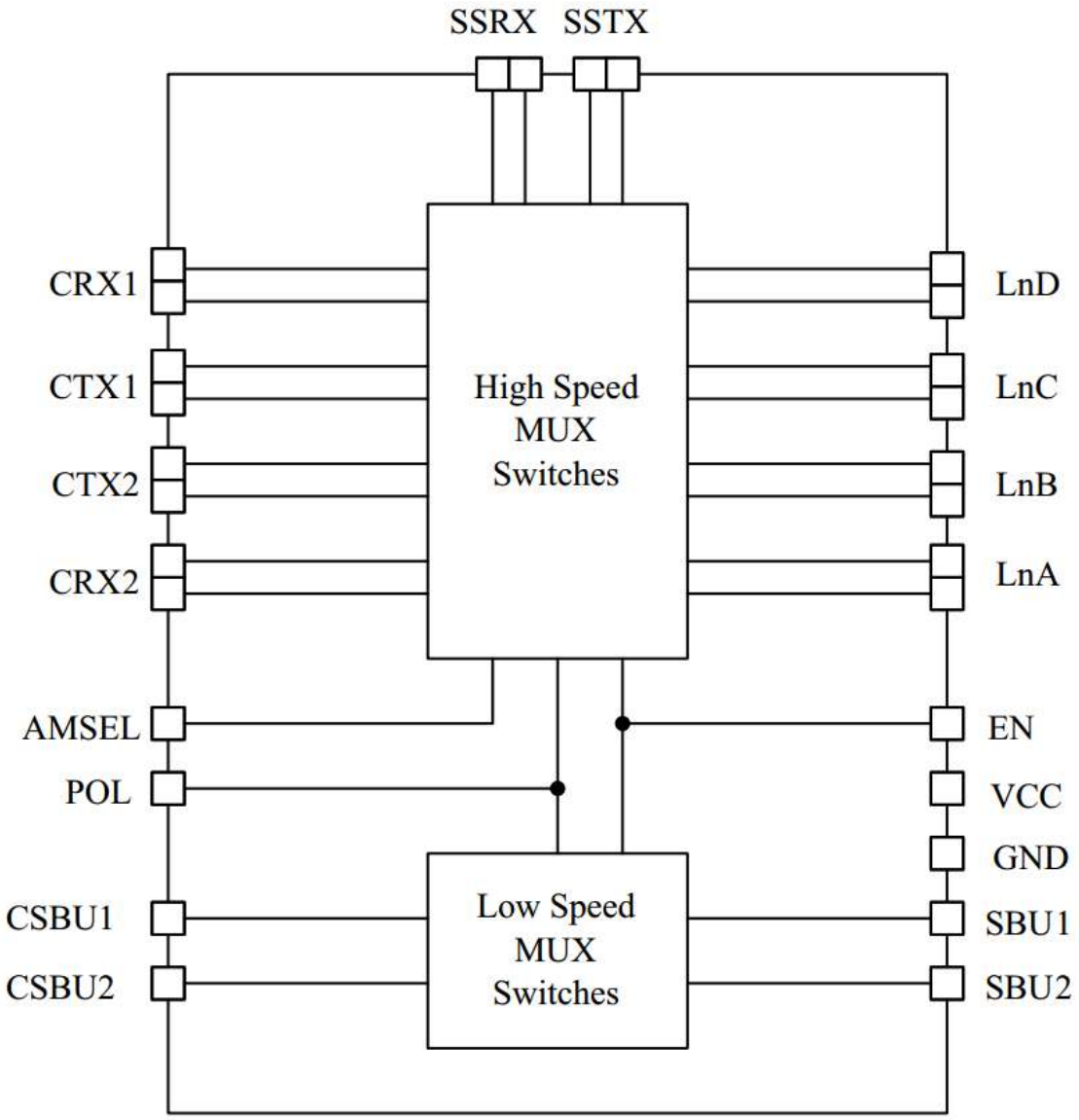


Figure 1: HD3SS460

1.2 TPS53318 High-Efficiency 8-A Synchronous Buck Converter with Eco-mode™

The TPS53318 and TPS53319 devices are D-CAP mode, 8-A or 14-A synchronous switchers with integrated MOSFETs. They are designed for ease of use, low external component count, and spaceconscious power systems.

These devices feature accurate 1%, 0.6-V reference and integrated boost switch. A sample of competitive features include: 1.5-V to 22-V wide conversion input voltage range, very low external component count, D-CAP™ mode control for super fast transient, auto-skip mode operation, internal soft-start control, selectable frequency, and no need for compensation.

The conversion input voltage ranges from 1.5 V to 22 V, the supply voltage range is from 4.5 V to 25 V and the output voltage range is from 0.6 V to 5.5 V.

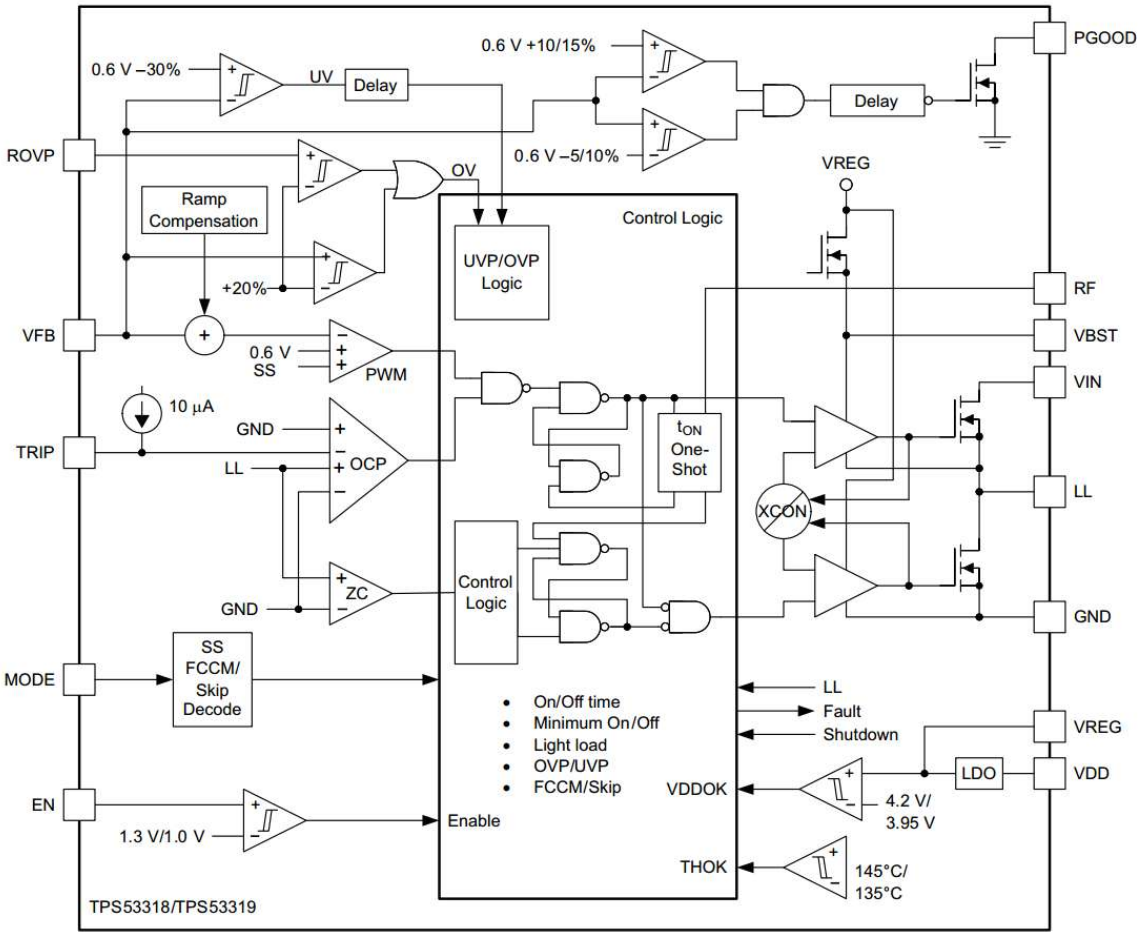


Figure 3: TPS53318

1.3 TPS54331 3.5 To 28V Input, 3A 570kHz Step-Down Converter with Eco-mode™

The TPS54331 device is a 28-V, 3-A non-synchronous buck converter that integrates a low RDS(on) high-side MOSFET. To increase efficiency at light loads, a pulse skipping Eco-mode feature is automatically activated. Furthermore, the 1-µA shutdown supply-current allows the device to be used in battery-powered applications. Current mode control with internal slope compensation simplifies the external compensation calculations and reduces component count while allowing the use of ceramic output capacitors. A resistor divider programs the hysteresis of the input undervoltage lockout. An overvoltage transient protection circuit limits voltage overshoots during startup and transient conditions. A cycle-by-cycle current-limit scheme, frequency foldback and thermal shutdown protect the device and the load in the event of an overload condition. The TPS54331 device is available in an 8-pin SOIC package and 8-pin SO PowerPAD package that have been internally optimized to improve thermal performance.

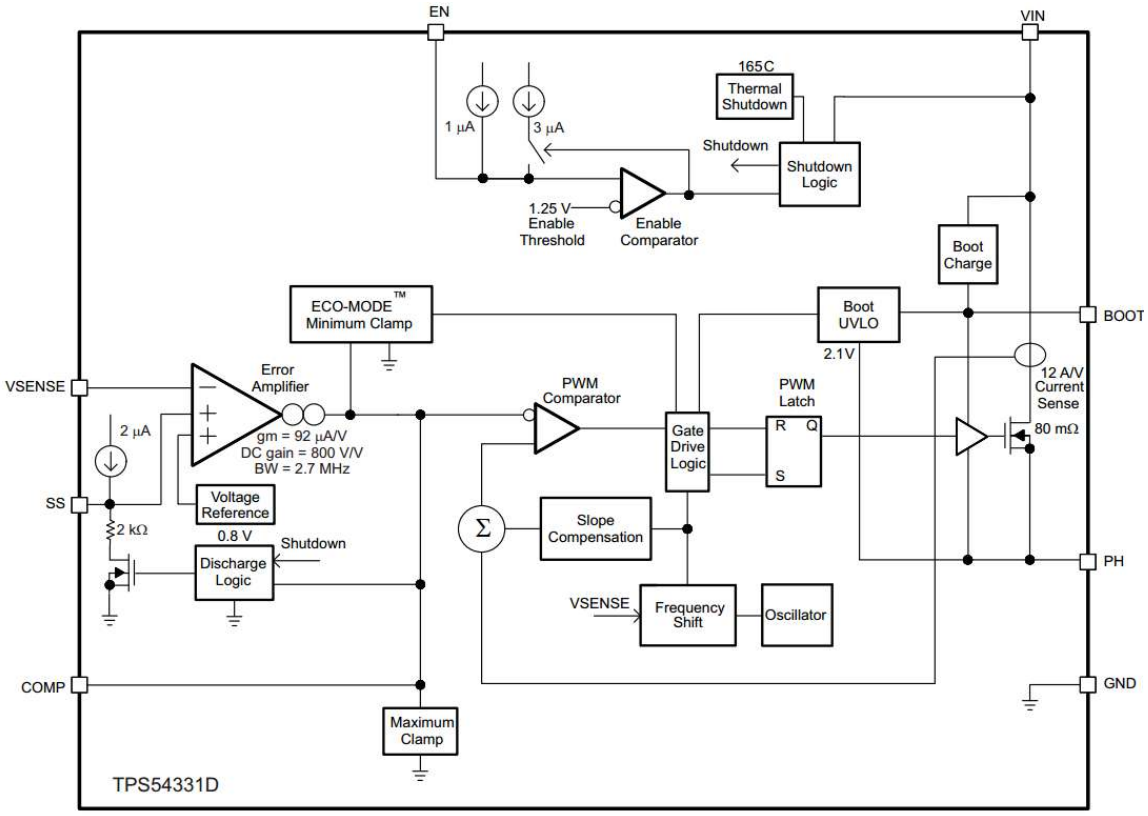


Figure 3: TPS54331

1.4 TLV3012 Nanopower, 1.8V, SOT23 Push-pull Comparator with Voltage Reference

The TLV3011 is a low-power, open-drain output comparator;the TLV3012 is a push-pull output comparator. Both feature an uncommitted on-chip voltage reference. Both have 5µA (max) quiescent current, input common-mode range 200mV beyond the supply rails, and single-supply operation from 1.8V to 5.5V. The integrated 1.242V series voltage reference offers low 100ppm/°C (max) drift, is stable with up to 10nF capacitive load, and can provide up to 0.5mA (typ) of output current.
The TLV3011 and TLV3012 are available in the tiny SOT23-6 package for the most space-conservative designs. It is also available in the SC70 package for even greater board area savings. Both versions are specified for the temperature range of –40°C to +125°C.

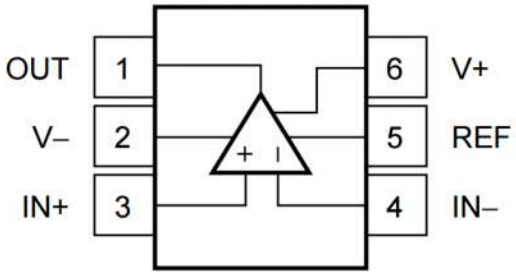


Figure 4: TLV3011

1.5 TPD6E05U06 6-Channel Ultra Low Capacitance IEC ESD Protection Diodes

The TPDxE05U06 is a family of unidirectional Transient Voltage Suppressor (TVS) based Electrostatic Discharge (ESD) protection diodes with ultra-low capacitance. Each device can dissipate ESD strikes above the maximum level specified by the IEC 61000-4-2 international standard. The TPDxE05U06's ultra-low loading capacitance makes it ideal for protecting any high-speed signal pins.

Typical applications for TPDxE05U06 includes high speed signal lines in HDMI 1.4, HDMI 2.0, USB 3.0, MHL, LVDS, DisplayPort, PCI-Express, eSata, and V-by-One HS.

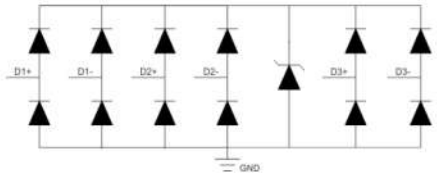


Figure 5: TPD6E05U06

1.6 TPD4E05U06 4-Channel Ultra Low Capacitance IEC ESD Protection Diodes

The TPDxE05U06 is a family of unidirectional Transient Voltage Suppressor (TVS) based Electrostatic Discharge (ESD) protection diodes with ultra-low capacitance. Each device can dissipate ESD strikes above the maximum level specified by the IEC 61000-4-2 international standard. The TPDxE05U06's ultra-low loading capacitance makes it ideal for protecting any high-speed signal pins.

Typical applications for TPDxE05U06 includes high speed signal lines in HDMI 1.4, HDMI 2.0, USB 3.0, MHL, LVDS, DisplayPort, PCI-Express, eSata, and V-by-One HS.

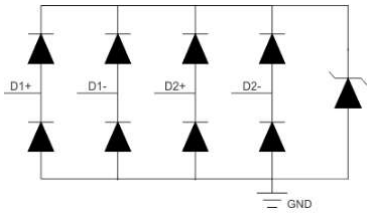


Figure 6: TPD4E05U06

1.7 TUSB8041 4-Port SuperSpeed 5.0 Gbps USB 3.0 Hub

The TUSB8041 is a four-port USB 3.0 hub. It provides simultaneous SuperSpeed USB and high-speed/full-speed connections on the upstream port and provides SuperSpeed USB, high-speed, full-speed, or low-speed connections on the downstream ports. When the upstream port is connected to an electrical environment that only supports high-speed or full-speed/low-speed connections, SuperSpeed USB connectivity is disabled on the downstream ports. When the upstream port is connected to an electrical environment that only supports full-speed/low-speed connections, SuperSpeed USB and high-speed connectivity are disabled on the downstream ports.

The TUSB8041 supports per port or ganged power switching and over-current protection, and supports battery charging applications.

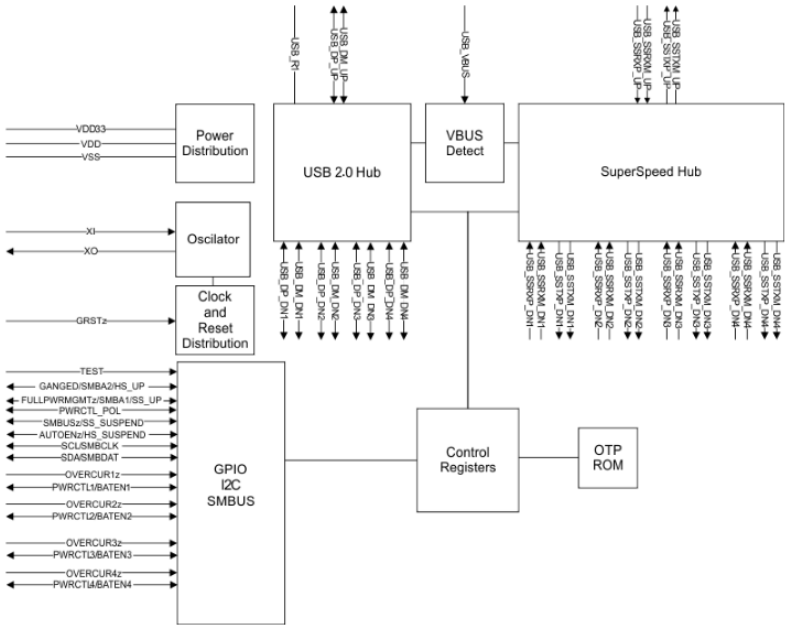


Figure 7: TUSB8041

1.8 TPD13S523 13-Channel HDMI Port Solution With Protection and Current-Limit Load Switch

The TPD13S523 device is a single-chip integrated IEC 61000-4-2 ESD protection solution for HDMI 1.4 or HDMI 1.3 interfaces. This device offers 13 channels of TVS diodes with flow-through pin mapping that matches HDMI connector high-speed lines. While providing ESD protection, the TPD13S523 adds little to no additional distortion to the high-speed differential signals. The monolithic integrated circuit technology ensures that there is excellent matching between the two-signal pair of

the differential line (< 0.05-pF differential matching between TMDS lines). This offers an advantage over discrete ESD solutions where variations between two different ESD protection circuits may significantly degrade the differential signal quality.
The TPD13S523 incorporates an on-chip current limited load switch that is compliant with HDMI 5-V out electrical specifications. The short-circuit protection at 5V_OUT ensures that the device is not damaged in case there is an accidental short to GND. The load switch also incorporates a reverse-current blocking feature which ensures that the HDMI driver side is not erroneously turned on when two HDMI drivers are connected together.
Typical applications for the TPD13S523 include set top boxes (STB), e-books, tablets, smart phones, and camcorders.

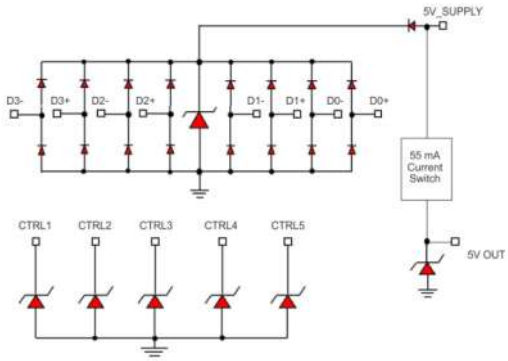


Figure 8: TPD13S523

1.9 TPS3831K33 Ultra-Low 150nA, Ultra-small Voltage Supervisor

The TPS3831 and TPS3839 devices (both referred to as *TPS383x*) are ultralow current (150 nA, typical), voltage supervisory circuits that monitor a single voltage. Both devices initiate an active-low reset signal whenever the VDD supply voltage drops below the factory-trimmed reset threshold voltage. The reset output remains low for 200 ms (typical) after the VDD voltage rises above the threshold voltage and hysteresis. These devices are designed to ignore fast transients on the VDD pin. The TPS3831 device includes a manual reset input that forces RESET low when MR is low.
The ultralow current consumption of 150 nA makes these voltage supervisors ideal for use in low-power and portable applications. The TPS383x devices are specified to have the correct output logic state for supply voltages down to 0.6 V.

The TPS383x devices feature precision factory-trimmed threshold voltages and extremely low-power operation. The TPS3831 device is available in a 4-pin, 1-mm × 1-mm (DQN) X2SON package. The TPS3839 device is available in a 3-pin SOT23 (DBZ) package or a 4-pin, 1-mm × 1-mm (DQN) X2SON package

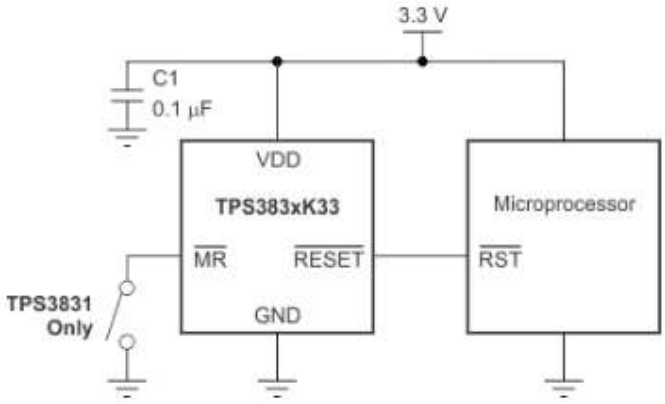


Figure 9: TPS3831K33

1.10 TPS2500 Integrated USB Power Switch with Boost Converter

The TPS2500 and TPS2501 provide an integrated solution to meet USB 5-V power requirements from a 1.8-V to 5.25-V input supply. The features include a Hi-Speed USB compliant power output, output switch enable, current limit, and overcurrent fault reporting.

The 1.8-V to 5.25-V input can be supplied by sources including dc/dc regulated supplies (e.g., 3.3 V), or batteries such as single-cell Li+ or three-cell NiCd, NiMH, or alkaline.

The USB power-switch current limit is programmable via an external resistor from as low as 130 mA to as high as 1400 mA (typical). Two standard USB ports can be supported from a single TPS2500 or TPS2501 at the 1400-mA setting.

Additionally, the boost converter output is available as an auxiliary 5.1-V output to power additional loads. The total current supplied by the USB output and the auxiliary cannot exceed 1148 mA at VIN = 3 V.

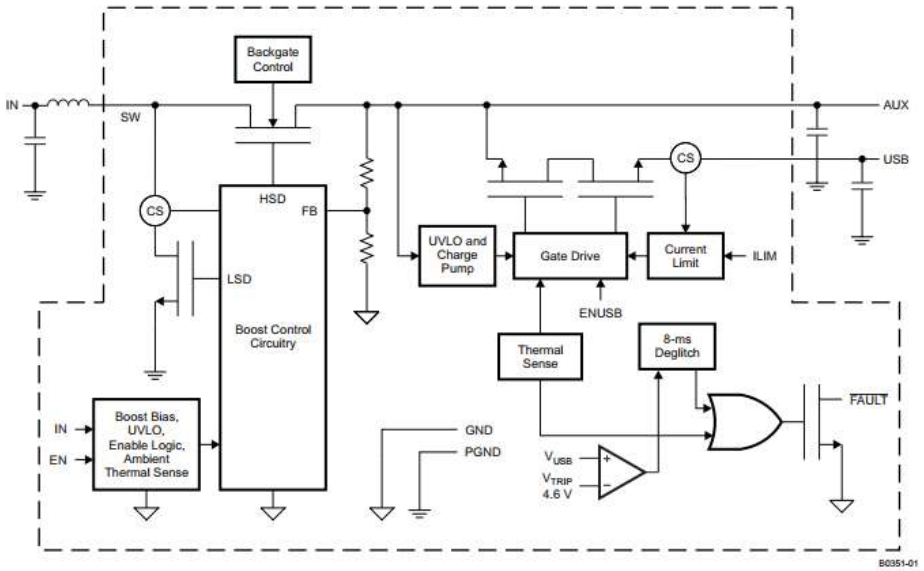


Figure 10: TPS2500

1.11 TPS54332 3.5V to 28V Input, 3.5A, 1MHz Step-Down Converter with Eco-model

The TPS54332 is a 28-V, 3.5-A non-synchronous buck converter that integrates a low-RDS(on) high-side MOSFET. To increase efficiency at light loads, a pulse-skipping Eco-Mode feature is automatically activated. Furthermore, the 1-µA shutdown supply current allows the device to be used in battery-powered applications. Current mode control with internal slope compensation simplifies the external compensation calculations and reduces component count while allowing the use of ceramic output capacitors. A resistor divider programs the hysteresis of the input undervoltage lockout. An overvoltage transient protection circuit limits voltage overshoots during start-up and transient conditions. A cycle-by-cycle current limit scheme, frequency foldback and thermal shutdown protect the device and the load in the event of an overload condition. The TPS54332 is available in an 8-pin SOIC PowerPAD™ package.

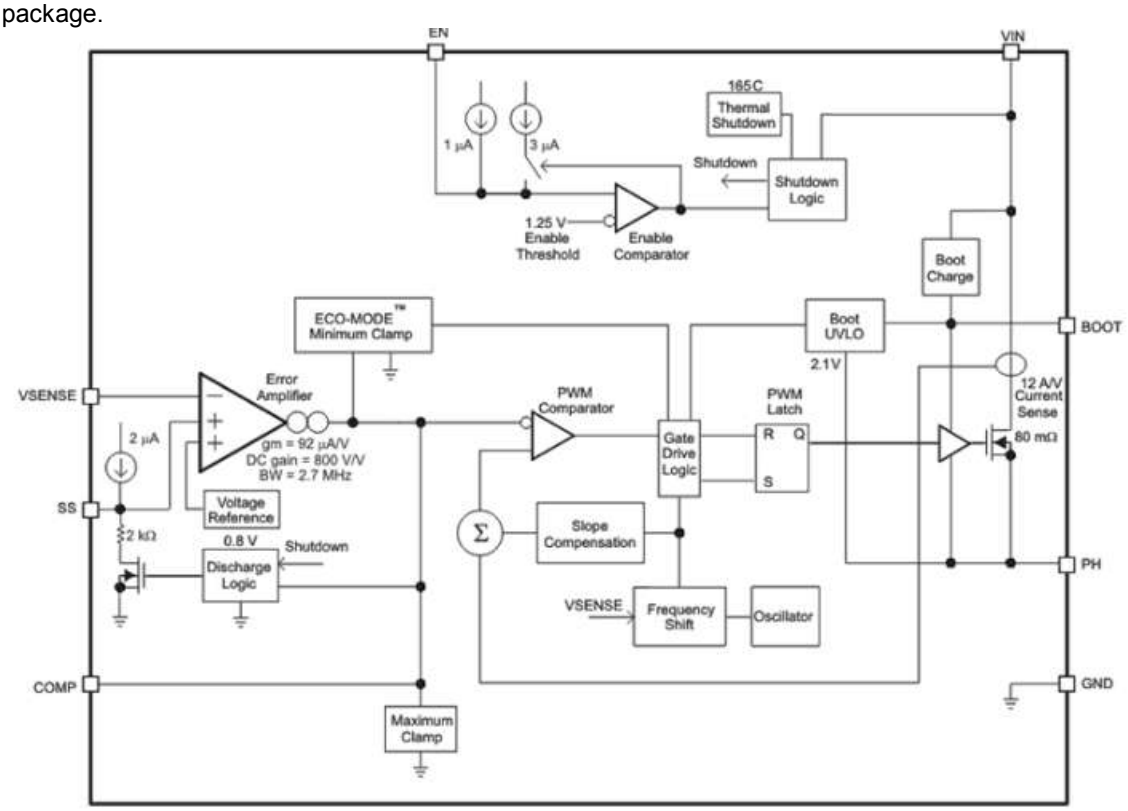


Figure 11: TPS54332

1.12 PCM2707C Stereo Audio DAC with Full Speed USB Interface, Single-Ended Headphone Output, and S/PDIF

The PCM270xC are TI's single-chip USB stereo audio digital-to-analog converters (DACs) with USB 2.0 compliant full-speed protocol controller and S/PDIF. The USB-protocol controller works with no software code, but USB descriptors can be modified in some areas (for example, vendor ID/product ID) through the use of an external ROM (PCM2704C and PCM2706C) or serial peripheral interface (SPI) (PCM2705C and PCM2707C). The PCM270xC also employ SpAct architecture, TI's unique system that recovers the audio clock from USB packet data. On-chip analog phase-locked loops (PLLs) with SpAct enable playback with low clock jitter.

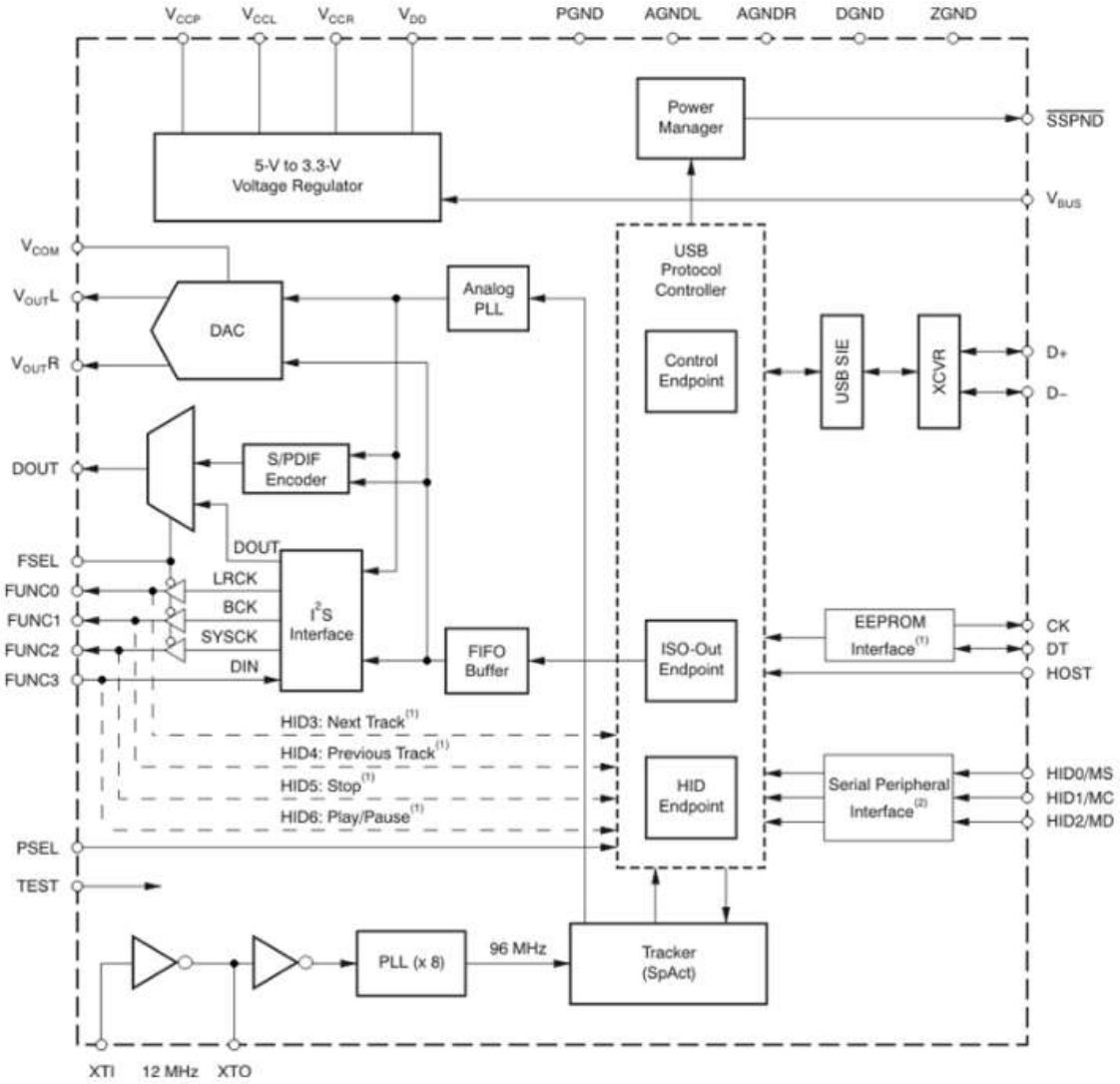


Figure 12: PCM2707C

1.13 TPS65982 USB Type-C & USB PD Controller Power Switch & High Speed Multiplexer

The TPS65982 device is a stand-alone USB Type-C and power delivery (PD) controller providing cable-plug and orientation detection at the USB Type-C connector. Upon cable detection, the TPS65982 device communicates on the CC wire using the USB PD protocol. After successful USB PD negotiation is complete, the TPS65982 enables the appropriate power path and configures alternate mode settings for internal and (optional) external multiplexers.

The mixed-signal front end on the CC pins advertises default, 1.5 A or 3 A for USB Type-C power sources, detects a plug event and determines the Type-C cable orientation, and autonomously negotiates USB PD contracts using bi-phase marked coding (BMC) and the physical layer (PHY) protocol.

The port power switch provides up to 3 A downstream at 5 V for legacy and Type-C USB power. An additional bidirectional switch path provides USB PD power up to 3 A at a maximum of 20 V as either a source (host), sink (device), or source-sink.

The TPS65982 is also an upstream-facing port (UFP), downstream-facing port (DFP), or dual-role port for data. The port data multiplexer passes data to or from the top or bottom D+/D– signal pair at the port for USB 2.0 HS; additionally, the Sideband-Use (SBU) signal pair is used for Alternate Modes. The power management circuitry supports dead battery or no-battery operation using VBUS as a primary power supply when 3.3 V is not available.

For all available packages, see the orderable addendum at the end of the data sheet

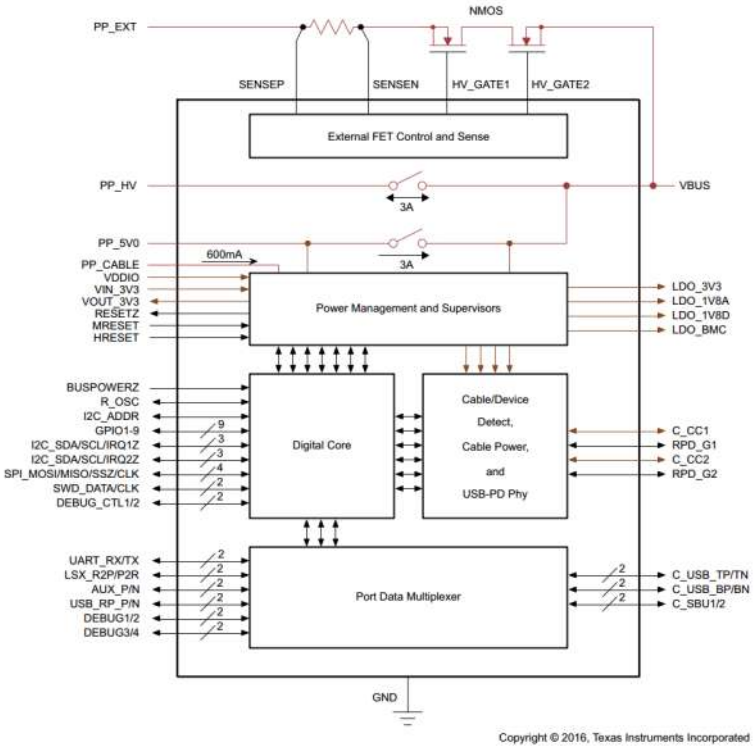


Figure 13: TPS65982

1.14 CSD87501L 30-V Dual N-Channel Common Drain NexFET™ Power MOSFET

This 30 V, 6.6 mΩ, 3.37 mm × 1.47 mm LGA Dual NexFET™ power MOSFET is designed to minimize resistance and gate charge in a small footprint. Its small size and common drain configuration make the device ideal for multi-cell battery pack applications and small handheld devices.

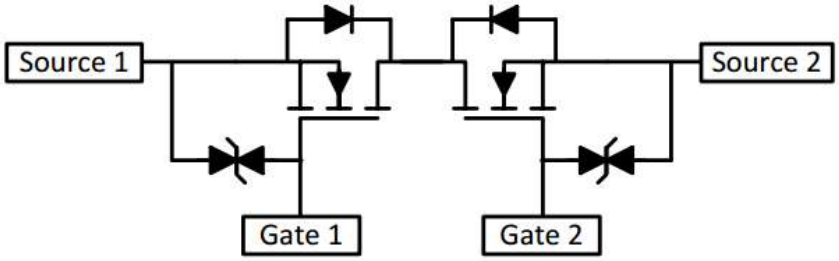


Figure 3: CSD87501L

1.15 HD3SS3212 Two Channel Differential 2:1/1:2 10Gbps Mux/Demux

The HD3SS3212 is a high-speed bidirectional passive switch in mux or demux configurations suited for USB Type-C™ application supporting USB 3.1 Gen 1 and Gen 2 data rates. Based on control pin SEL, the device provides switching on differential channels between Port B or Port C to Port A.

The HD3SS3212 is a generic analog differential passive switch that can work for any high-speed interface applications requiring a common mode voltage range of 0 to 2 V and differential signaling with differential amplitude up to 1800 mVpp. It employs adaptive tracking that ensures the channel remains unchanged for the entire common mode voltage range.

Excellent dynamic characteristics of the device allow high-speed switching with minimum attenuation to the signal eye diagram with very little added jitter. It consumes <2 mW of power when operational and has a shutdown mode exercisable by OEn pin resulting <20 µW.

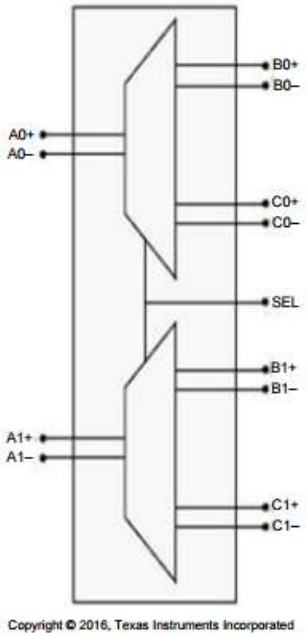


Figure 15: HD3SS3212

1.16 TPS25910 20V, 6.5A, 30M Ω eFuse With Adjustable +/-15% Accurate Current Limit

The TPS25910 device provides highly integrated hot-swap power management and superior protection in applications up to 20 V. The maximum UV turn-on threshold of 2.9 V makes the TPS25910 device well suited to standard bus voltages as low as 3.3 V. This device is intended for systems where a voltage bus must be protected from undesired permanent and transient overload.

At start-up or when hot plugging into the system bus, the TPS25910 device limits the inrush current by controlling the ramp rate of the output voltage, VOUT. The slew rate of VOUT can be adjusted with a capacitor between the GATE pin and the GND pin.

Built in SOA protection ensures that the internal MOSFET operates inside a safe operating area (SOA) under the harshest operating conditions. In addition, the current-limit threshold, which is independent of the power limit, can be adjusted with a resistor between the ILIM pin and the GND pin.
The TPS25910 device provides a fault indicator output when in thermal fault.
The TPS25910 device is available in a 16-pin QFN package.

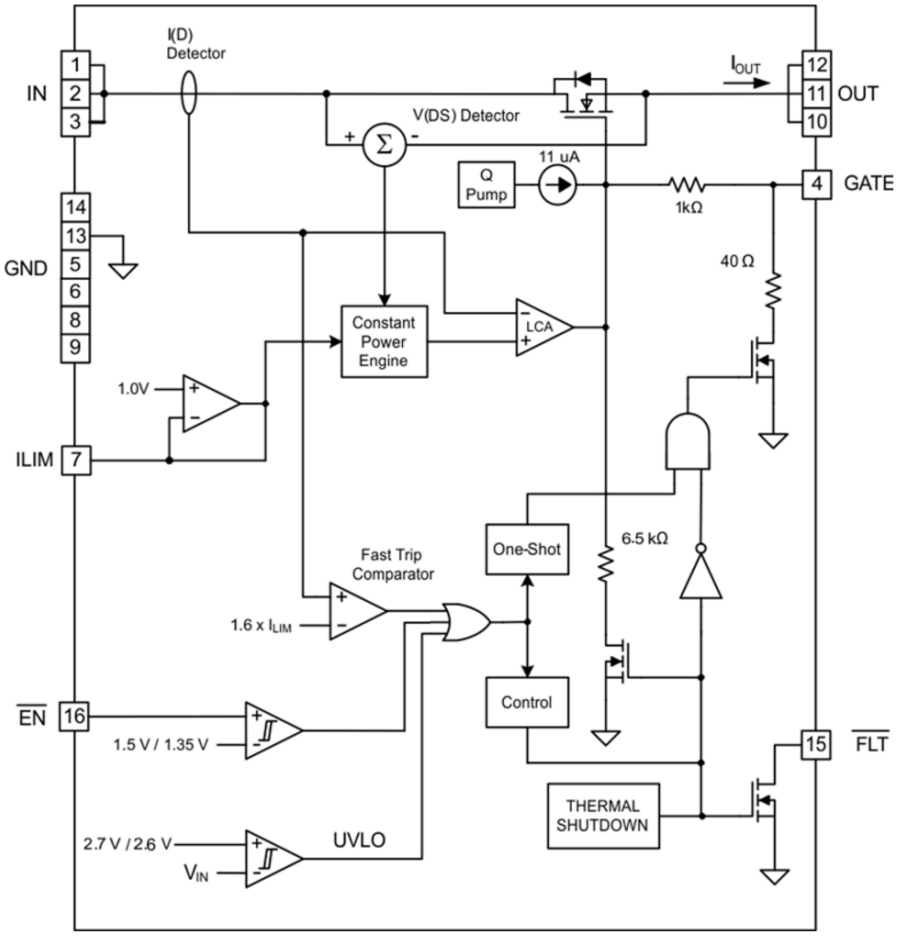


Figure 16: TPS25910

1.17 TPS65986 usb Type-C & USB PD Controller & Power Switch

The TPS65986 is a stand-alone USB Type-C and Power Delivery (PD) controller providing cable plug and orientation detection at the USB Type-C connector. Upon cable detection, the TPS65986 communicates on the CC wire using the USB PD protocol. When cable detection and USB PD negotiation are complete, the TPS65986 enables the appropriate power path and configures alternate mode settings for (optional) external multiplexers.

The mixed-signal front end on the CC pins advertises default (900 mA), 1.5 A, or 3 A for Type-C power sources, detects a plug event and determines the USB Type-C cable orientation, and autonomously negotiates USB PD contracts by adhering to the specified bi-phase marked coding (BMC) and physical layer (PHY) protocol.

The port power switch passes up to 3 A downstream at 5 V for legacy and Type-C USB power. An additional bi-directional switch path provides USB PD power up to 3 A at a maximum of 20 V as either a source (host), sink (device), or source-sink.

The TPS65986 is also an Upstream-Facing Port (UFP), Downstream-Facing Port (DFP), or Dual-Role Port for data. The port data termination passes data to or from the top or bottom D+/D– signal pair to the USB 2.0 Low Speed Endpoint. The power management circuitry can utilizes a 3.3-V power supply inside the system and also uses VBUS to start up and negotiate power from a dead battery or no battery condition.

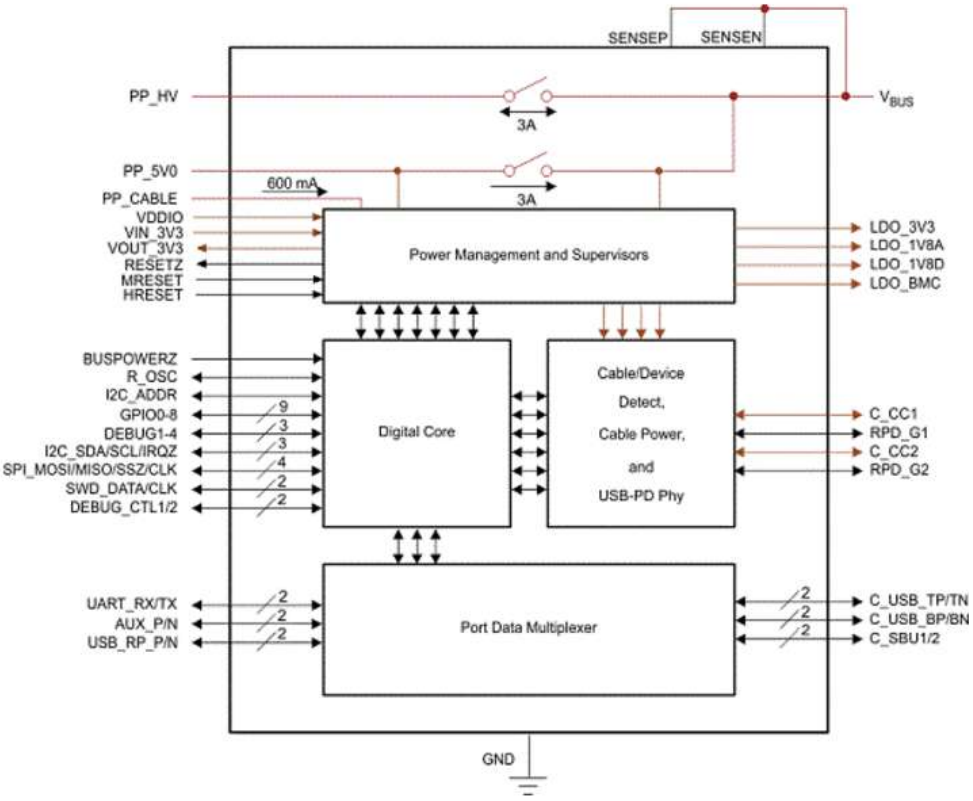


Figure 17: TP65986

1.18 TUSB321 USB Type-C Configuration Channel Logic and Port Control with VCONN

The TUSB321 device enables USB Type-C ports with the configuration channel (CC) logic needed for Type-C ecosystems. The TUSB321 device uses the CC pins to determine port attach and detach, cable orientation, role detection, and port control for Type-C current mode. The TUSB321 device can be configured as a downstream facing port (DFP), upstream facing port (UFP) or a dual role port (DRP) making it ideal for any application.

The TUSB321 device when configured as a DRP alternates configuration as a DFP or UFP according to the Type-C Specifications. The CC logic block monitors the CC1 and CC2 pins for pullup or pulldown resistances to determine when a USB port has been attached, the orientation of the cable, and the role detected. The CC logic detects the Type-C current mode as default, medium, or high depending on the role detected. V_{BUS} detection is implemented to determine a successful attach in UFP and DRP modes.

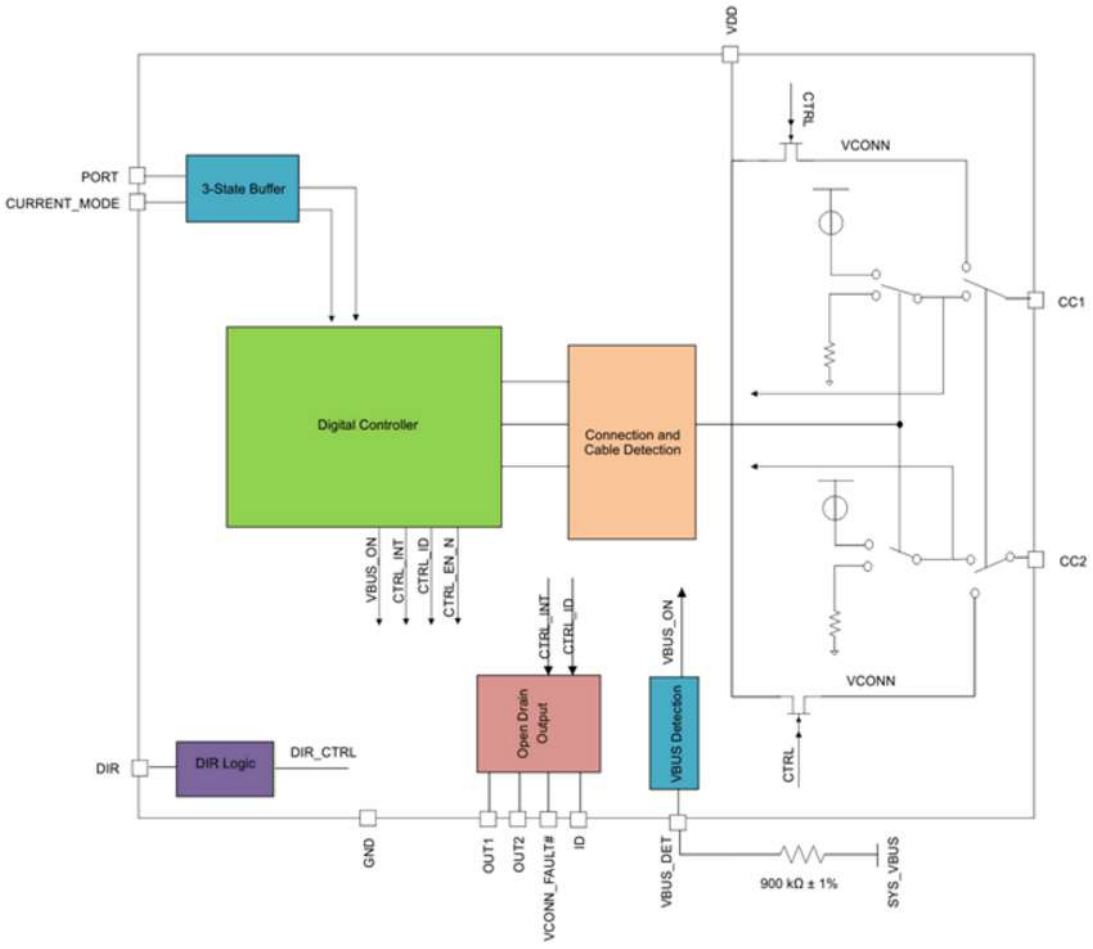


Figure 18: TPS25910

1.19 TUSB3410 UART/I2C/IrDA Serial Port to USB Bridge

The TUSB3410 device provides bridging between a USB port and an enhanced UART serial port. The device contains an 8052 microcontroller unit (MCU) with 16KB of RAM that can be loaded from the host or from the external onboard memory through an I^2C. The device also contains 10KB of ROM that allows the MCU to configure the USB port at boot time. The ROM code also contains an I^2C bootloader. All device functions (such as the USB command decoding, UART setup, and error reporting) are managed by the internal MCU firmware in unison with the PC host.

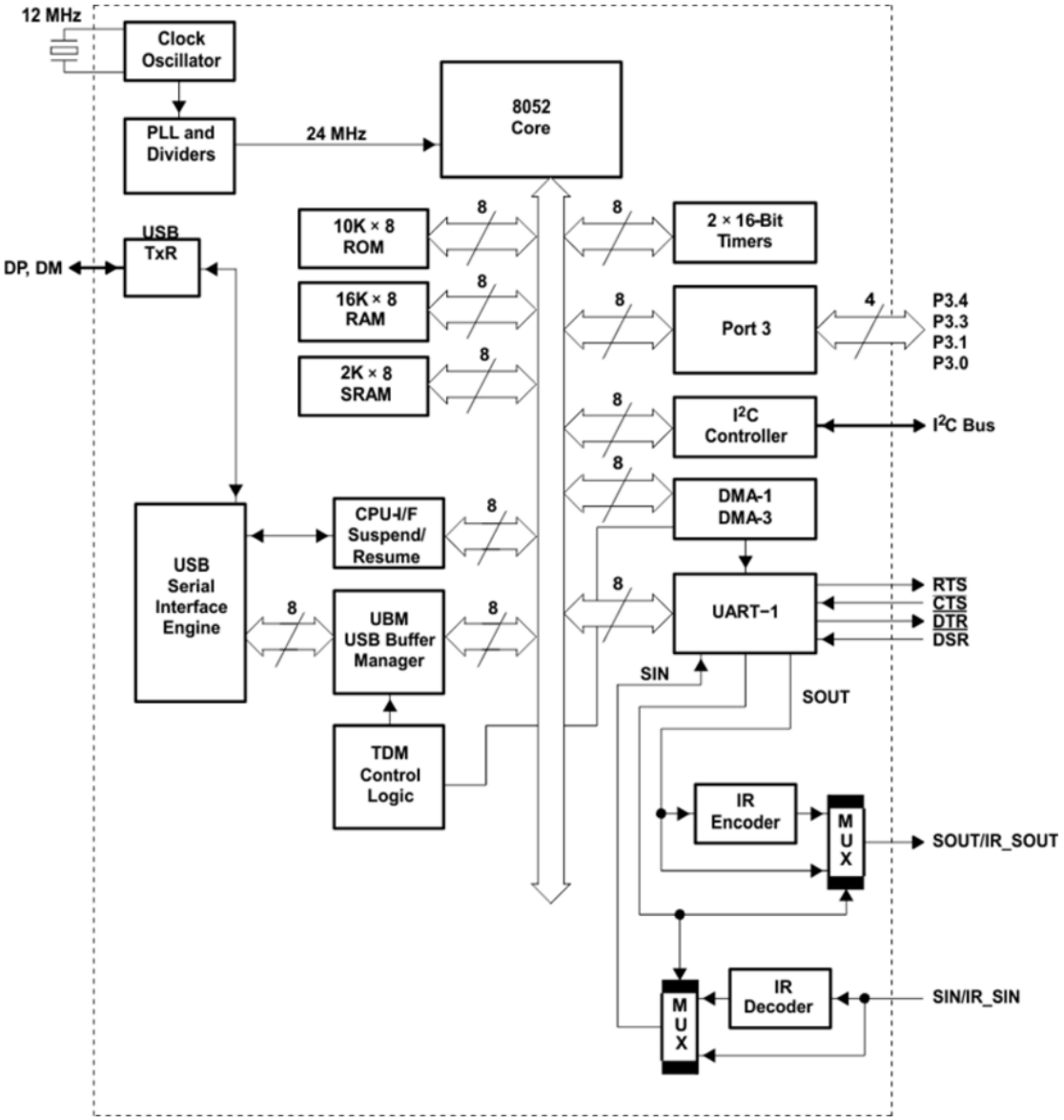


Figure 19: TUSB3410

1.20 TPS2013A

The TPS201xA family of power distribution switches is intended for applications where heavy capacitive loads and short circuits are likely to be encountered. These devices are 50-mΩ N-channel MOSFET high-side power switches. The switch is controlled by a logic enable compatible with 5-V logic and 3-V logic. Gate drive is provided by an internal charge pump designed to control the power-switch rise times and fall times to minimize current surges during switching. The charge pump requires no external components and allows operation from supplies as low as 2.7 V.

When the output load exceeds the current-limit threshold or a short is present, the TPS201xA limits the output current to a safe level by switching into a constant-current mode. When continuous heavy overloads and short circuits increase the power dissipation in the switch, causing the junction temperature to rise, a thermal protection circuit shuts off the switch to prevent damage. Recovery from a thermal shutdown is automatic once the device has cooled sufficiently. Internal circuitry ensures the switch remains off until valid input voltage is present.

The TPS201xA devices differ only in short-circuit current threshold. The TPS2010A limits at 0.3-A load, the TPS2011 at 0.9-A load, the TPS2012A at 1.5-A load, and the TPS2013A at 2.2-A load (see Available Options). The TPS201xA is available in an 8-pin small-outline integrated-circuit (SOIC) package and in a 14-pin thin-shrink small-outline package (TSSOP) and operates over a junction temperature range of -40°C to 125°C.)

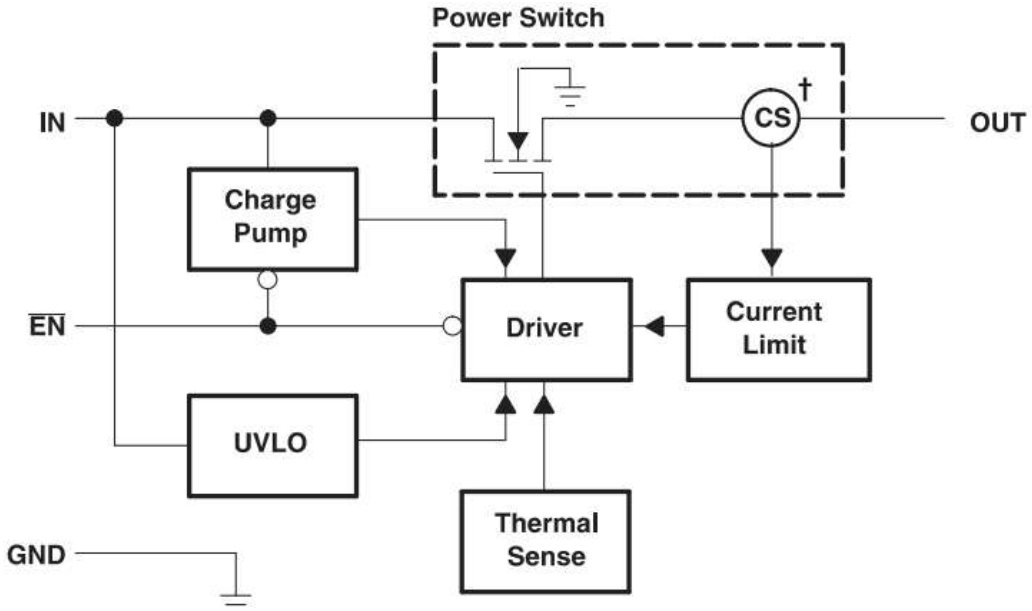


Figure 20: TPS2013A

2 Block Diagram

TIDA-01243 USB-C™ Mini Dock EVM

Block Diagram

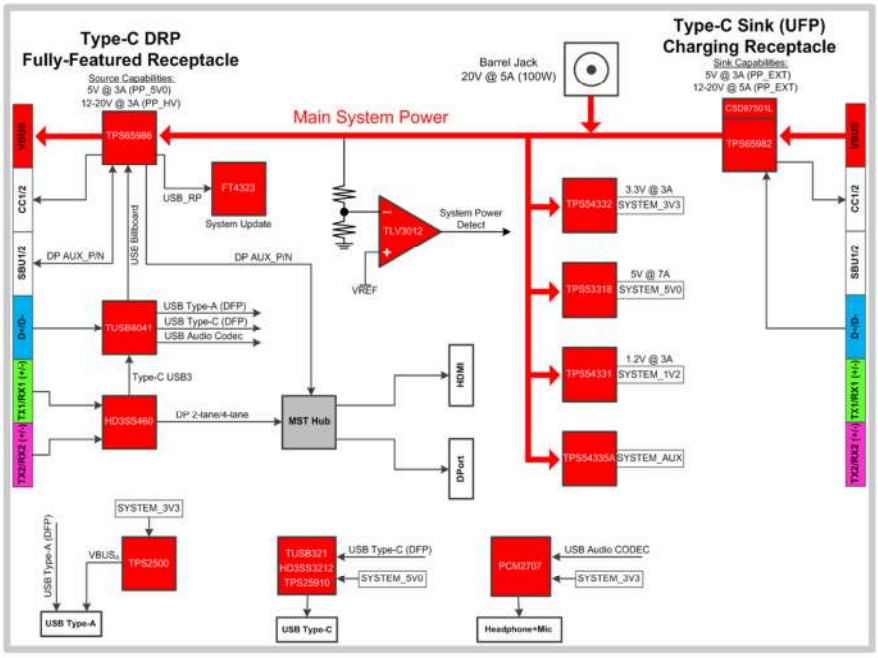


Figure 21: TIDA-01243 Block Diagram

2.1 Highlighted Products

2.1.1 HD3SS460

- Provides MUX Solution for USB Type-C™ Ecosystem Including Alternate Mode (AM)
- Provides Wide Channel Selection Choices Including USBSS and 2 Ch AM, 4 Ch AM
- Compatible with 5 Gbps USB3.1 Gen 1 and AM Including 5.4 Gbps DisplayPort 1.2a
- Compatible for Source/Host and Sink/Device Applications
- Provides Cross-point MUX for Low Speed SBU Pins
- Bidirectional "Mux/De-Mux" Differential Switch
- Supports Common Mode Voltage 0-2V
- Low Power with 1-µA Shutdown and 0.6 mA Active
- Single Supply Voltage VCC of 3.3V ±10%
- Industrial Temperature Range of –40 to 85°C

2.1.2 TUSB321

- USB Type-C Specification 1.1
- Backward Compatible with USB Type-C Specification 1.0
- Supports Up to 3 A of Current Advertisement through dedicated Current Mode pin
- Mode Configuration
  - Host Only – DFP (Source)
  - Device Only – UFP (Sink)
  - Dual Role Port – DRP
- Channel Configuration (CC)
  - Attach of USB Port Detection
  - Cable Orientation Detection
  - Role Detection
  - Type-C Current Mode advertisement and detection (Default, Medium, High)
- V_{BUS} Detection
- VCONN Support for Active Cables
- Cable Detection and Direction Control for External Switches
- Supply Voltage: 4.5 V to 5.5 V
- Low Current Consumption
- Industrial Temperature Range of –40 to 85°C

2.1.3 HD3SS3212

- Provides MUX/DEMUX Solution for USB Type-C™ Ecosystem for USB 3.1 Gen 1 and Gen 2 Data Rates
- Compatible With MIPI DSI/CSI, FPDLinkIII, LVDS, and PCIE Gen II, III
- Operates up to 10 Gbps
- Wide –3-dB Differential BW of over 8 GHz
- Excellent Dynamic Characteristics (at 5 GHz)
  - Crosstalk = –32 dB
  - Off Isolation = –19 dB
  - Insertion Loss = –1.6 dB
  - Return Loss = –12 dB
- Bidirectional "Mux/De-Mux" Differential Switch
- Supports Common Mode Voltage 0 to 2 V

- Single Supply Voltage V_{CC} of 3.3 V
- Commercial Temperature Range of 0°C to 70°C (HD3SS3212RKS)
- Industrial Temperature Range of –40°C to 85°C (HD3SS3212IRKS)

2.1.4 TPS65982

- USB Power Delivery (PD) Controller
  - Mode Configuration for Source (Host), Sink (Device), or Source-Sink
  - Bi-Phase Marked Encoding/Decoding (BMC)
  - Physical Layer (PHY) Protocol
  - Policy Engine
  - Configurable at Boot and Host-Controlled
- USB Type-C Specification Compliant
  - Detect USB Cable Plug Attach
  - Cable Orientation and Role Detection
  - Assign CC and VCONN Pins
  - Advertise Default, 1.5-A or 3-A Current for 5-V USB Type-C Power
- Port Power Switch
  - 5-V, 3-A Switch to VBUS for Type-C Power
  - 5-V to 20-V, 3-A Bidirectional Switch to or from VBUS for USB PD Power
  - 5-V, 600-mA Switches for VCONN
  - Overcurrent Limiter, Overvoltage Protector
  - PD Slew Rate Control and Hard Reset Support
- Port Data Multiplexer
  - USB 2.0 HS Data, UART Data, and Low Speed Endpoint
  - Sideband Use Data for Alternate Modes (DisplayPort and Thunderbolt)
- Power Management
  - Gate Control and Current Sense for External 5-V to 20-V, 5-A Bidirectional NFET Switch
  - Power Supply from 3.3-V or VBUS Source
  - 3.3-V LDO Output for Dead Battery Support
- BGA MicroStar Junior Package
  - 0.5-mm Pitch
  - Through-Hole Via Compatible for All Pins
- UL Recognized: E169910 and E339631
  - Standards Used: 2367
- IEC Certification: NO88109
  - Standards Used: 60950-1(ed.2);am1;am2

2.1.5 TPD65986

- USB Power Delivery (PD) Controller
  - Mode Configuration for Source (Host), Sink (Device), or Source-Sink
  - Bi-phase Marked Encoding/Decoding (BMC)
  - Physical Layer (PHY) Protocol
  - Policy Engine
  - Configurable at Boot and Host-Controlled
- USB Type-C Specification Compliant
  - Detect USB Cable Plug Attach
  - Cable Orientation and Role Detection
  - Assign CC and VCONN Pins
  - Advertise Default, 1.5 A, or 3 A for Type-C Power
- Port Power Switch
  - 5-V, 3-A Switch to VBUS for Type-C Power
  - 5-V to 20-V, 3-A Bidirectional Switch to or from VBUS for USB PD Power
  - 5-V, 600-mA Switches for VCONN
  - Over-Current Limiter, Overvoltage Protector
  - Slew Rate Control
  - Hard Reset Support
- Port Data Termination
  - USB 2.0 Low Speed Endpoint
- Power Management
  - Power Supply from 3.3 V or VBUS Source
  - 3.3-V LDO Output for Dead Battery Support
- BGA MicroStar Junior Package
  - 0.5-mm Pitch
  - Through-Hole Via Compatible for All Pins
- UL Recognized: E169910 and E339631
  - Standards Used: 2367
- IEC Certification: NO88109
  - Standards Used: 60950-1(ed.2);am1;am2

3 Getting Started Firmware

3.1 How to Program SPI Flash (TPS6598x) using Aardvark SPI Controller

3.1.1. Start Total Phase Flash center.
3.1.2. Plug Aardvark dongle into Aardvark Header (J17).
3.1.3. Plug Aardvark dongle into Aardvark Header (J17).
3.1.4. Select “Adapters”=> “Add Adapter”
3.1.5. The Aardvark dongle connected to the PC running the flash center should appear in pop-up window. Select the dongle.
3.1.6. Choose Target via menu option or shortcut icon: 
3.1.7. Choose “SPI Flash”=> Windbond/NexFlash => W25Q80

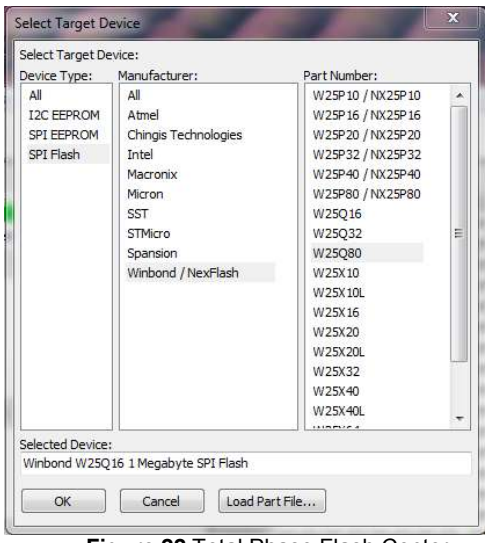


Figure 22 Total Phase Flash Center

3.1.8. Load binary file (USBCMINIDKEVM_v1.7.12_flash_image.bin)
via “Load File” icon: 

.

3.1.9. Program target (Or Program and verify-optional) via either of these icons: 
under Operations menu option.

3.2 How to Program TUSB8041 EEPROM

3.2.1. Connect USB A-to-USB C cable from PC to the DRP port (J28)
3.2.2. TUSB8041 enumerates as a Programming End Point.
3.2.3. Invoke TUSB80xx EEPROM Programmer.

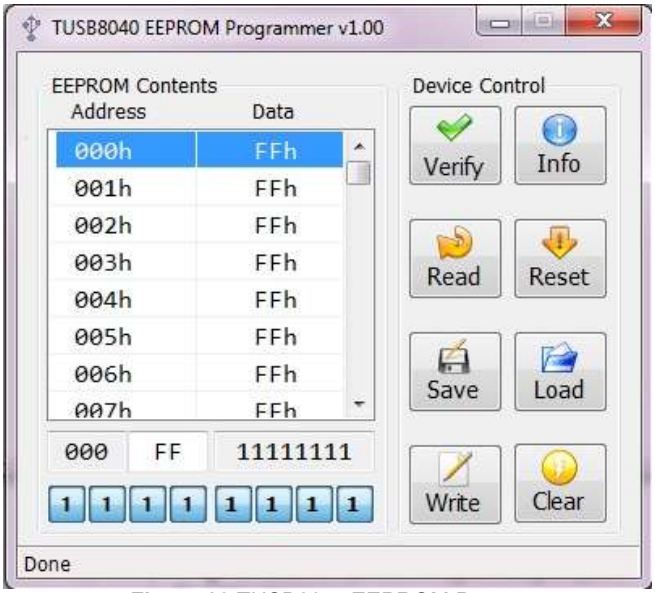


Figure 23 TUSB80xx EEPROM Programmer

3.2.4. Click Load and load in the TUSB8041_POL_HI_ECRON_FULLPWROFF_U1U2On.txt file
3.2.5. Click Write to program.
3.2.6. Close EEPROM programmer window when programming is done.
3.2.7. Disconnect connection to the host PC then power cycle the dock EVM

3.3 How to Program the Megachip Devices: Bobcat and Pegasus

3.3.1. Start Gprobe 7 program

3.3.2. Connect Type A-to-micro B Cable with Megachips programming board to Bobcat, should look like the below image

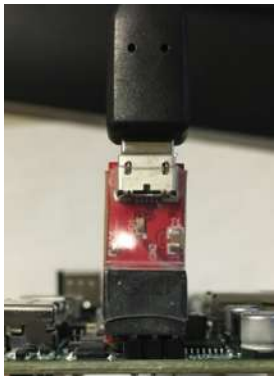


Figure 24 Megachip's Bobcat with Programmer

3.3.3. *First time Set-up Only* – make sure Connection Settings look like the below image. Note the COM7 to UART0 will utilize the COM Port that the Type A-to-Type micro B cable is connected to on the PC.

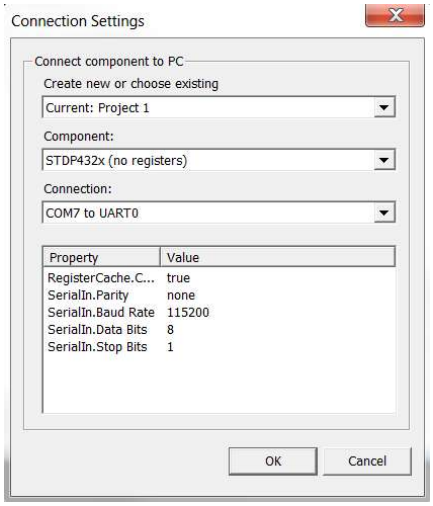


Figure 25 Gprobe 7 Connection Settings

3.3.4. Open the Console

3.3.5. Navigate to the Bobcat FW file.
Go to Options→ Commands → Batch Filename →

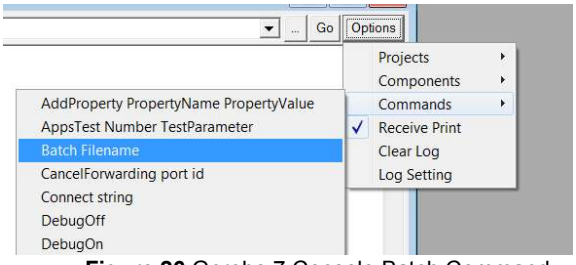


Figure 26 Gprobe 7 Console Batch Command

ISP_UART_FW_LS_PCON_8M_V1_09_Batch_2800.txt → Open → Ok

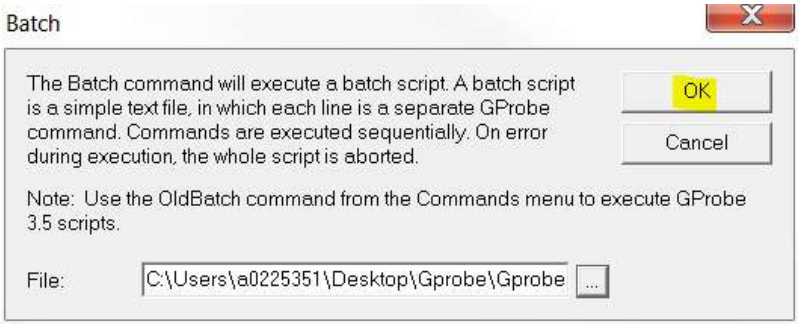


Figure 27 Gprobe 7 Batch Command Program

3.3.6. Once Programming is finished move the programmer cable from Bobcat to Pegasus, orientated as shown below

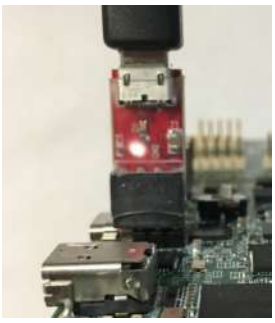


Figure 28 Megachip's Pegasus with Programmer

3.3.7. Navigate to the Pegasus File, PegasusIsp.txt, and click ok to program

3.3.8. Once programming is finished disconnected the programmer cable and power cable from the TIDA-01243

4. Getting Started Hardware

4.1. Connect the Type-C Enabler Board to the PC with a USB Type-A to USB-B cable and a DisplayPort Cable.

4.2. Connect the Type-C Enabler Board to the TIDA-01243 with a Type-C cable

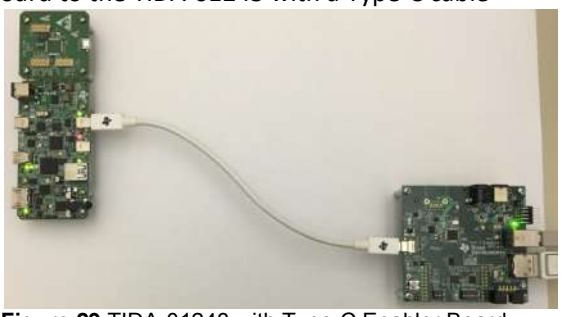


Figure 29 TIDA-01243 with Type-C Enabler Board

4.3. Confirm that the following 6 LEDS are lit as shown below

Figure 10 TIDA-01243 Bus-powered

4.4. Connect the Dell adapter and confirm that the following 6 LEDS are lit as shown below

Figure 11 TIDA-01243 Self-powered

4.5. Connect a USB Flash Drive to the TIDA-01243 and confirm that data can be transferred to and from the USB Flash Drive

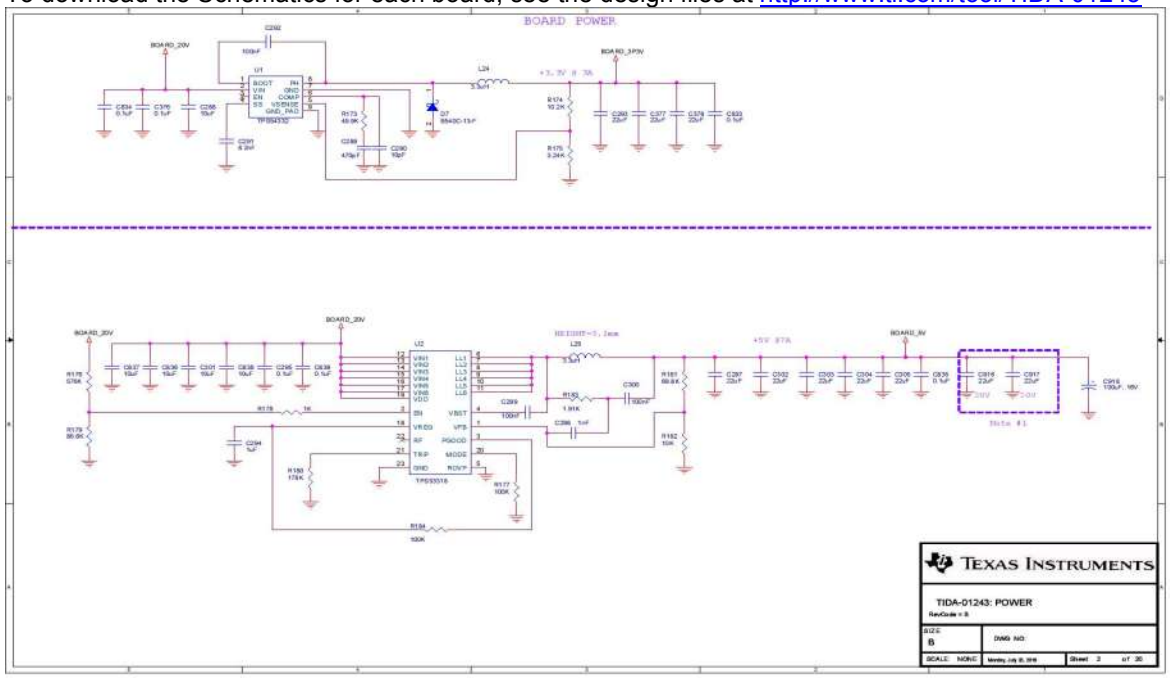
4.6. Connect the HDMI cable to the TIDA-01243 and to a monitor, confirm PC video is displayed on the monitor

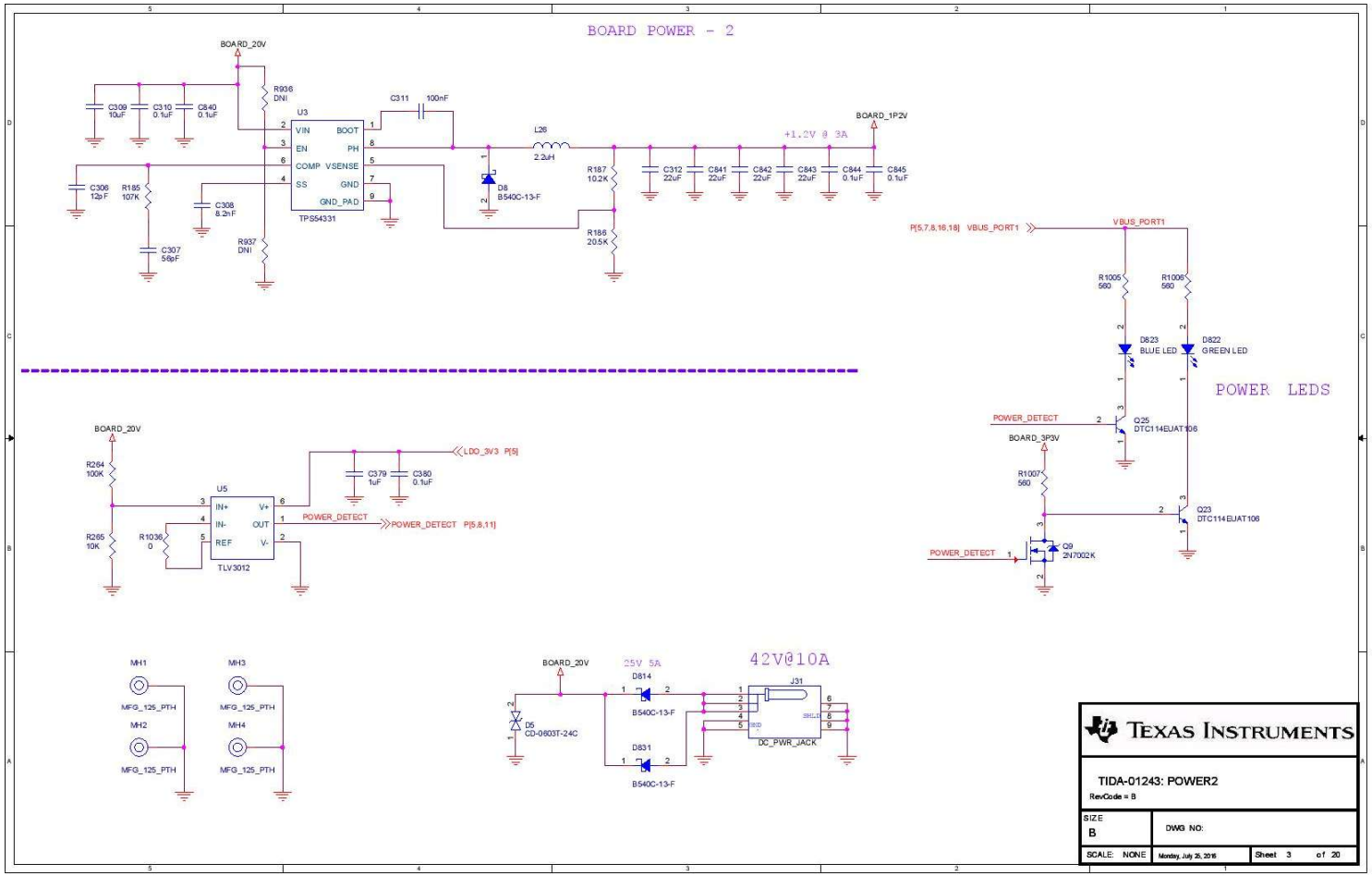
4.7. Disconnect the HDMI cable and connect a miniDP cable to the TIDA-01243 and to a monitor, confirm PC video is displayed on the monitor.

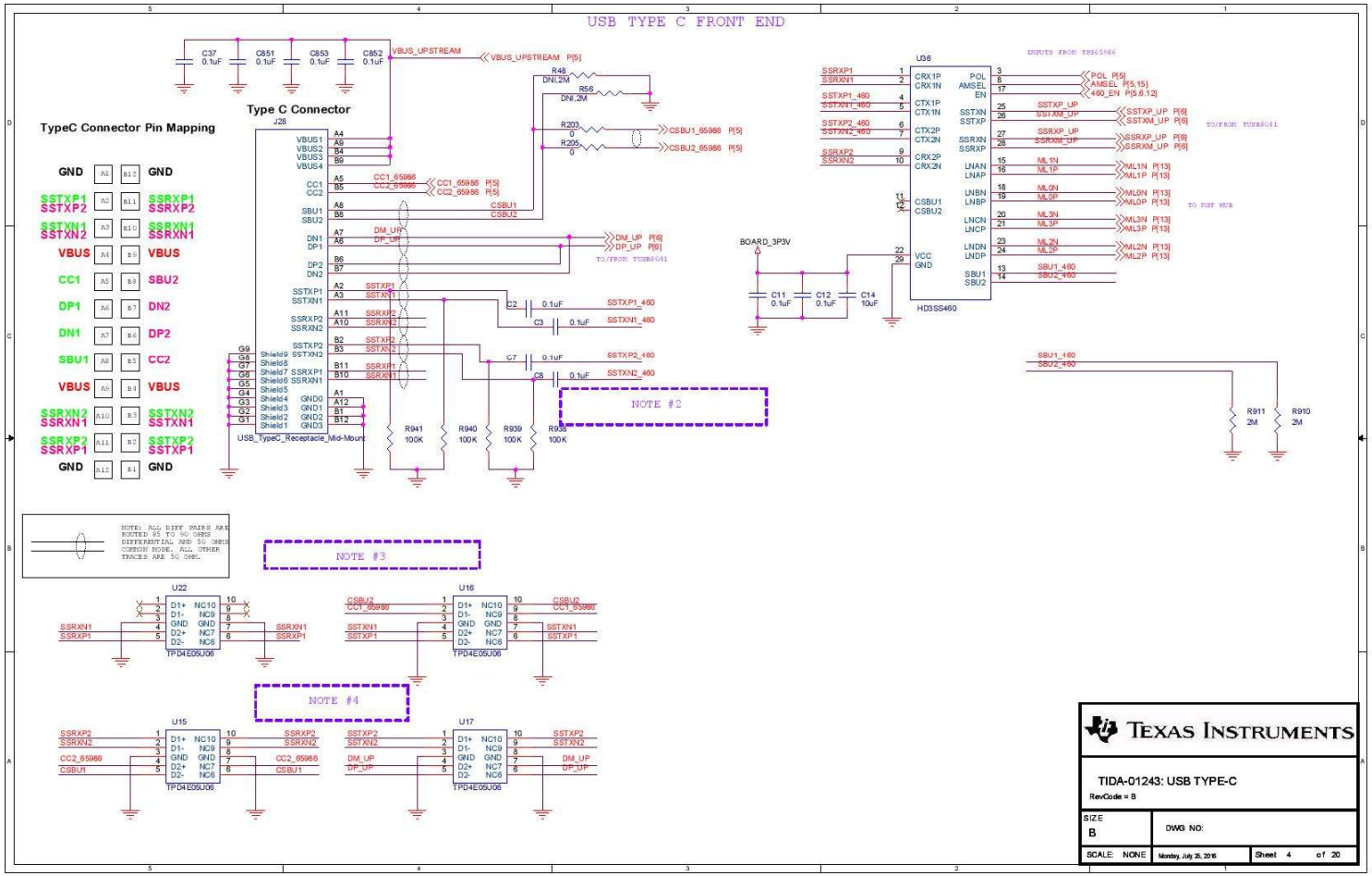
5. Design Files

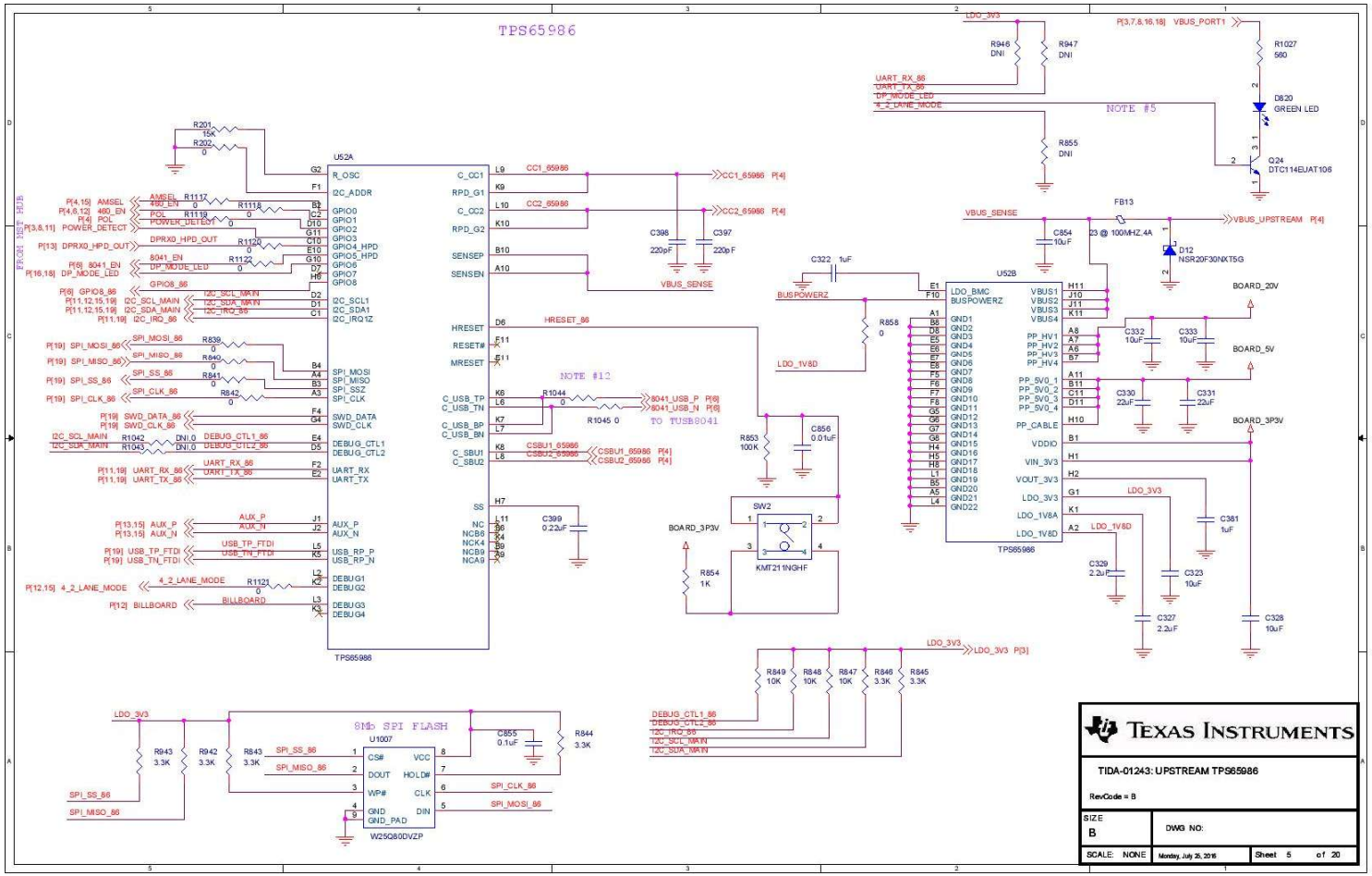
5.1 Schematics

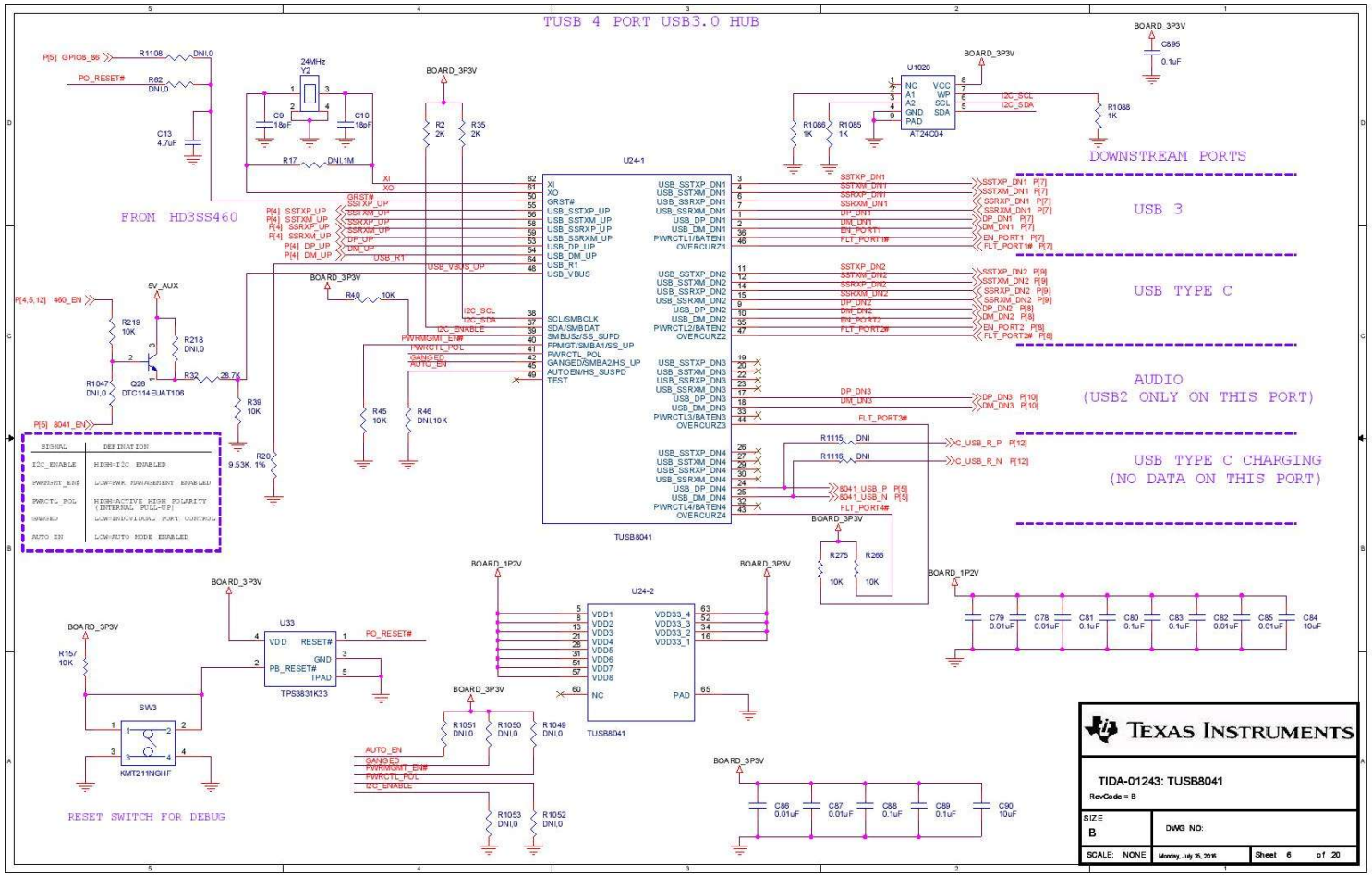
To download the Schematics for each board, see the design files at http://www.ti.com/tool/TIDA-01243

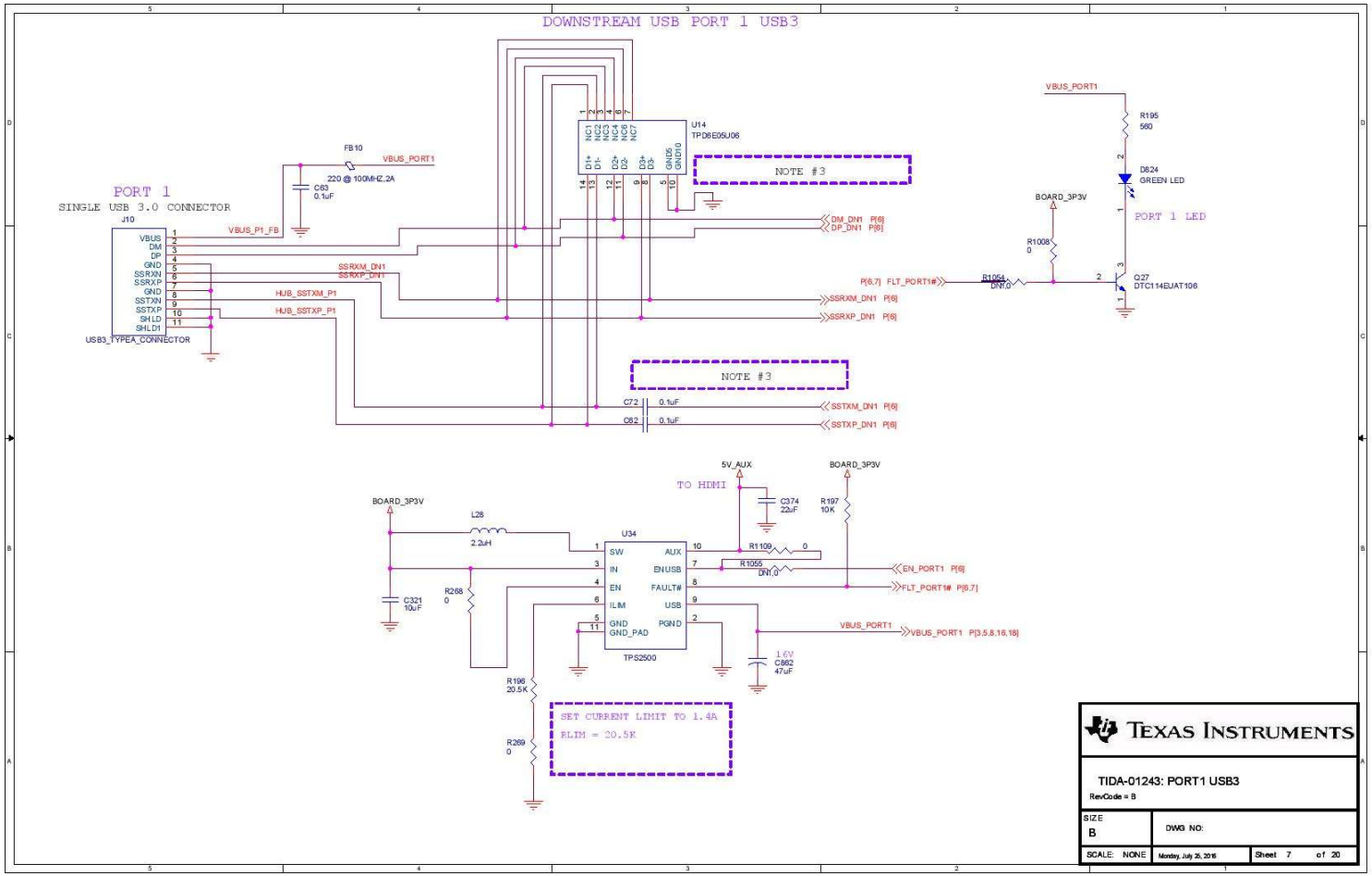


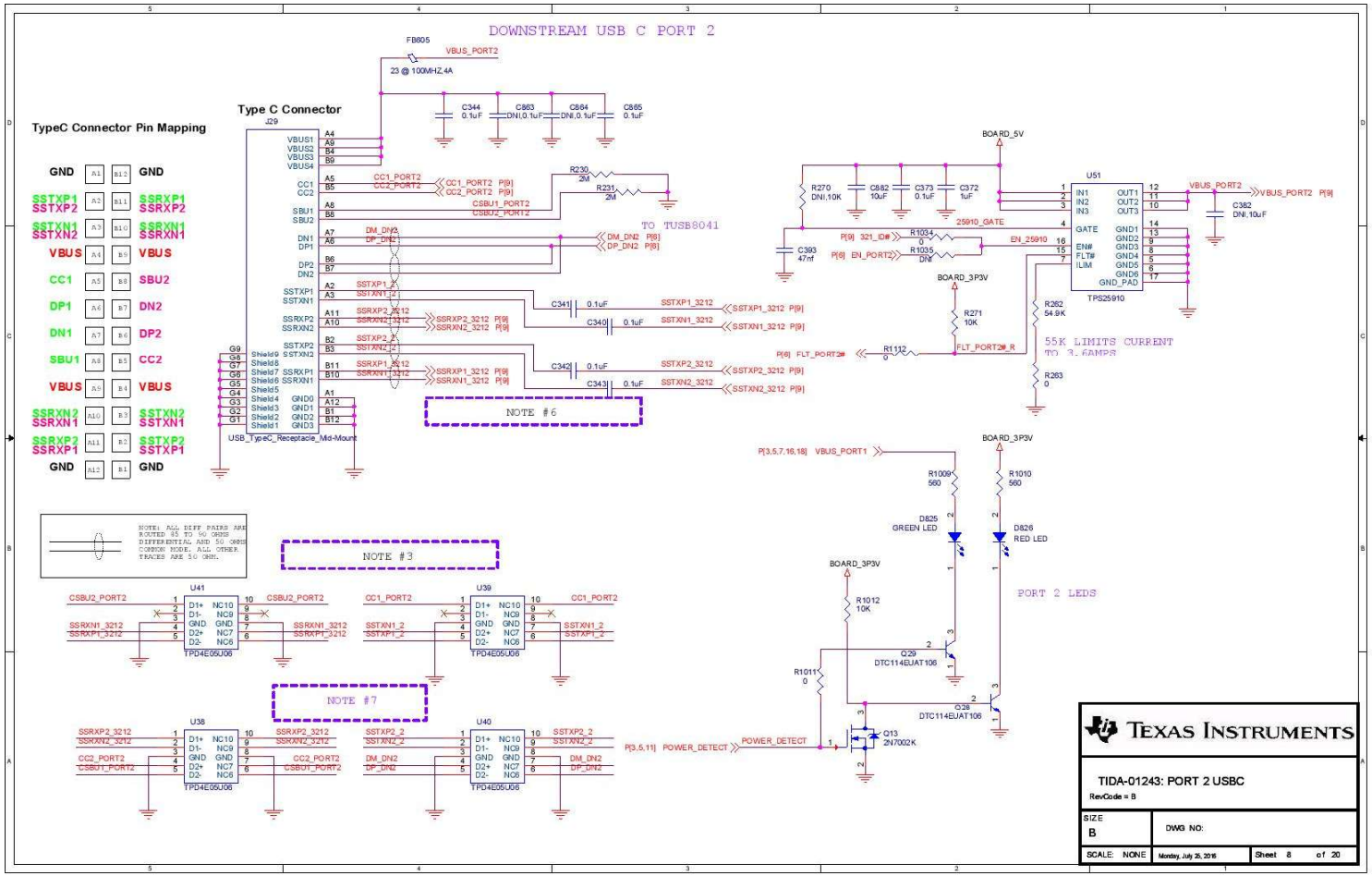

BOARD POWER - 2
BOARD_20V
U3
TPS54331
VIN
EN
COMP
SS
BOOT
PH
VSENSE
GND
GND_PAD
C309 10uF
C310 0.1uF
C840 0.1uF
R936 DNI
C311 100nF
L26 2.2uH
BOARD_1P2V
+1.2V @ 3A
C306 12pF
R185 107K
C308 8.2nF
C307 56pF
R937 DNI
D8 B540C-13-F
R187 10.2K
R186 20.5K
C312 22uF
C841 22uF
C842 22uF
C843 22uF
C844 0.1uF
C845 0.1uF
P[5,7,8,16,18] VBUS_PORT1
VBUS_PORT1
R1005 560
R1006 560
D823 BLUE LED
D822 GREEN LED
POWER LEDS
POWER_DETECT
Q25 DTC114EUAT106
BOARD_3P3V
R1007 560
Q23 DTC114EUAT106
Q9 2N7002K
BOARD_20V
R264 100K
R265 10K
R1036 0
U5
TLV3012
IN+
IN-
REF
V+
OUT
V-
C379 1uF
C380 0.1uF
LDO_3V3 P[5]
POWER_DETECT
POWER_DETECT P[5,8,11]
MH1
MH2
MH3
MH4
MFG_125_PTH
BOARD_20V
25V 5A
42V@10A
D814
B540C-13-F
D831
B540C-13-F
D5 CD-0603T-24C
J31
DC_PWR_JACK
TEXAS INSTRUMENTS
TIDA-01243: POWER2
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 3 of 20

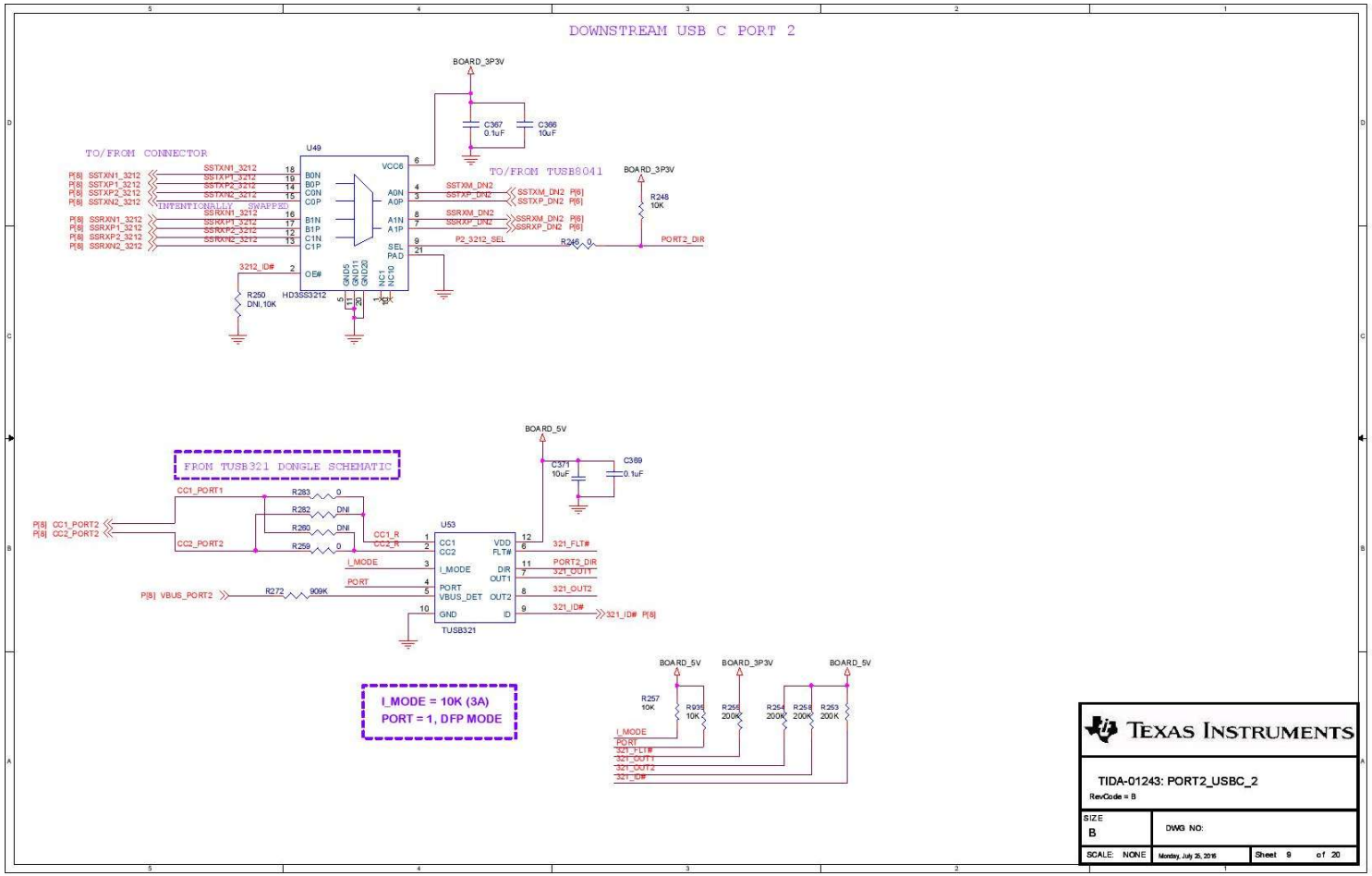

USB TYPE C FRONT END
Type C Connector
TypeC Connector Pin Mapping
GND
SSTXP1
SSTXP2
SSRXP1
SSRXP2
SSTXN1
SSTXN2
SSRXN1
SSRXN2
VBUS
CC1
DP1
DN1
SBU1
SBU2
DP2
DN2
CC2
SBU2
USB_TypeC_Receptacle_Mid-Mount
TPD4E05U06
HD3SS460
BOARD_3P3V
NOTE #2
NOTE #3
NOTE #4
TIDA-01243: USB TYPE-C
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 4 of 20

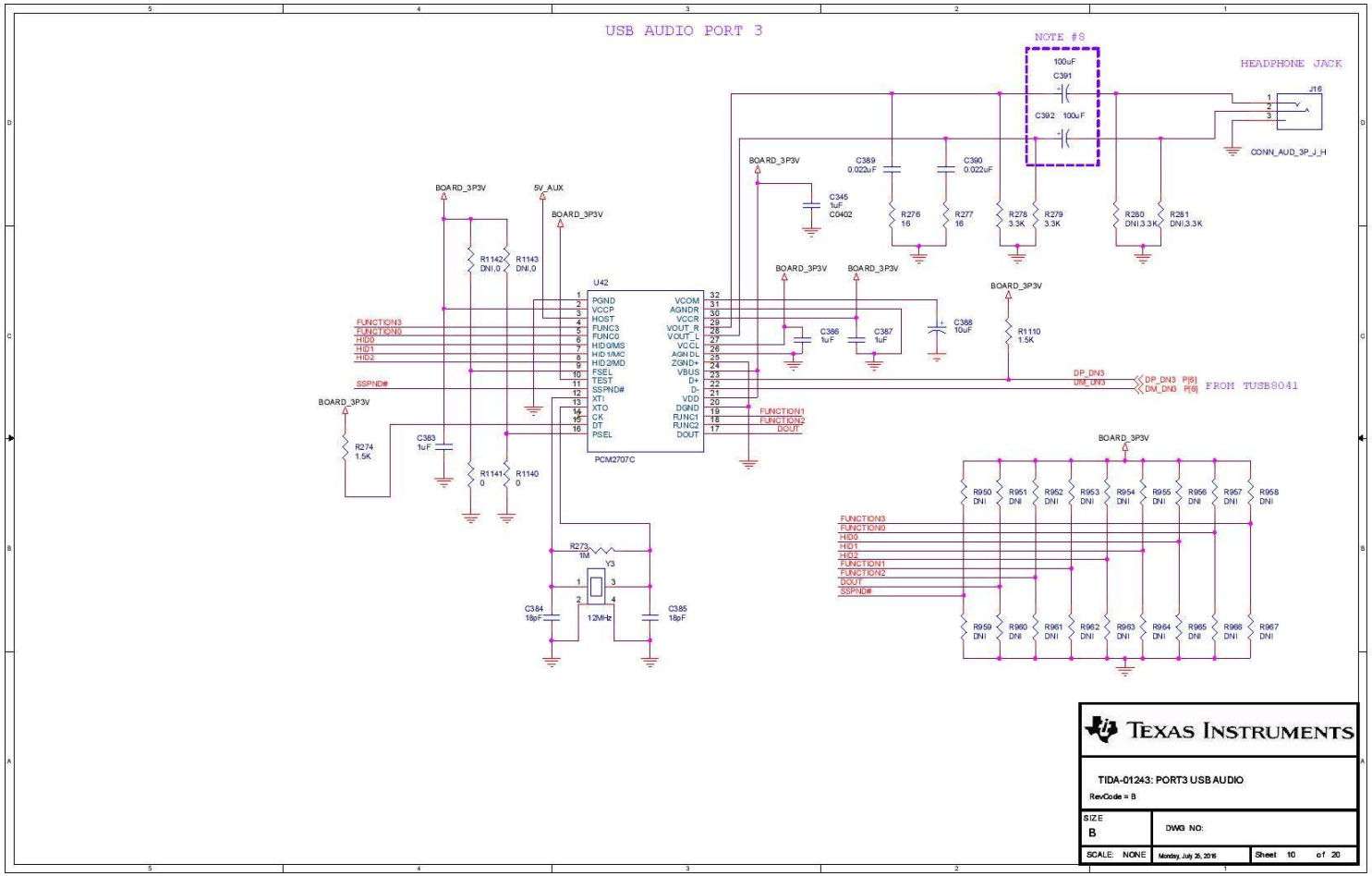

TPS65986
NOTE #5
NOTE #12
TO TUSB8041
TPS65986
W25Q80DVZP
TEXAS INSTRUMENTS
TIDA-01243: UPSTREAM TPS65986
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 5 of 20


TUSB 4 PORT USB3.0 HUB
FROM HD3SS460
DOWNSTREAM PORTS
USB 3
USB TYPE C
AUDIO
(USB2 ONLY ON THIS PORT)
USB TYPE C CHARGING
(NO DATA ON THIS PORT)
RESET SWITCH FOR DEBUG
U24-1
U24-2
TUSB8041
U1020
AT24C04
U33
TPS3831K33
SW3
KMT211NGHF
Q26
DTC114EUAT106
BOARD_3P3V
BOARD_1P2V
5V_AUX
24MHz
TEXAS INSTRUMENTS
TIDA-01243: TUSB8041
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 20, 2015
Sheet 6 of 20


DOWNSTREAM USB PORT 1 USB3
PORT 1
SINGLE USB 3.0 CONNECTOR
J10
USB3_TYPEA_CONNECTOR
VBUS
DM
DP
GND
SSRXN
SSRXP
GND
SSTXN
SSTXP
SHLD
SHLD1
VBUS_P1_FB
SSRXM_DN1
SSRXP_DN1
HUB_SSTXM_P1
HUB_SSTXP_P1
FB10
VBUS_PORT1
220 @ 100MHZ,2A
C63
0.1uF
U14
TPD6E05U06
NOTE #3
DM_DN1 P[6]
DP_DN1 P[6]
SSRXM_DN1 P[6]
SSRXP_DN1 P[6]
C72
0.1uF
C82
0.1uF
SSTXM_DN1 P[6]
SSTXP_DN1 P[6]
VBUS_PORT1
R195
560
D824
GREEN LED
PORT 1 LED
BOARD_3P3V
R1008
0
P[6,7] FLT_PORT1#
R1054
DNI,0
Q27
DTC114EUAT106
5V_AUX
TO HDMI
C374
22uF
R197
10K
BOARD_3P3V
L28
2.2uH
U34
SW
IN
EN
ILIM
GND
GND_PAD
AUX
ENUSB
FAULT#
USB
PGND
TPS2500
R1109
0
R1055
DNI,0
EN_PORT1 P[6]
FLT_PORT1# P[6,7]
VBUS_PORT1
VBUS_PORT1 P[3,5,8,16,18]
C321
10uF
R268
0
1.6V
C862
47uF
R196
20.5K
R269
0
SET CURRENT LIMIT TO 1.4A
ILIM = 20.5K
TEXAS INSTRUMENTS
TIDA-01243: PORT1 USB3
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 7 of 20


DOWNSTREAM USB C PORT 2
Type C Connector
TypeC Connector Pin Mapping
J29
USB_TypeC_Receptacle_Mid-Mount
TO TUSB8041
NOTE #6
NOTE #3
NOTE #7
55K LIMITS CURRENT TO 3.6AMPS
PORT 2 LEDS
TPS25910
TPD4E05U06
TIDA-01243: PORT 2 USBC
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 8 of 20


DOWNSTREAM USB C PORT 2
BOARD_3P3V
C367 0.1uF
C366 10uF
TO/FROM CONNECTOR
U49
VCC6
TO/FROM TUSB8041
BOARD_3P3V
R248 10K
SSTXN1_3212
SSTXP1_3212
SSTXP2_3212
SSTXN2_3212
INTENTIONALLY SWAPPED
SSRXN1_3212
SSRXP1_3212
SSRXP2_3212
SSRXN2_3212
B0N
B0P
C0N
C0P
B1N
B1P
C1N
C1P
A0N
A0P
A1N
A1P
SEL
PAD
SSTXM_DN2
SSTXP_DN2
SSRXM_DN2
SSRXP_DN2
P2_3212_SEL
R246 0
PORT2_DIR
3212_ID#
OE#
R250 DNI,10K
HD3SS3212
GND5
GND11
GND20
NC1
NC10
FROM TUSB321 DONGLE SCHEMATIC
BOARD_5V
C371 10uF
C369 0.1uF
CC1_PORT1
CC2_PORT2
R283 0
R282 DNI
R280 DNI
R259 0
U53
CC1
CC2
I_MODE
PORT
VBUS_DET
GND
VDD
FLT#
DIR
OUT1
OUT2
ID
TUSB321
321_FLT#
PORT2_DIR
321_OUT1
321_OUT2
321_ID#
R272 909K
I_MODE = 10K (3A)
PORT = 1, DFP MODE
R257 10K
R935 10K
R255 200K
R254 200K
R256 200K
R253 200K
TEXAS INSTRUMENTS
TIDA-01243: PORT2_USBC_2
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 9 of 20


USB AUDIO PORT 3
NOTE #8
100uF
C391
C392 100uF
HEADPHONE JACK
J16
CONN_AUD_3P_J_H
BOARD_3P3V
5V_AUX
C389 0.022uF
C390 0.022uF
C345 1uF C0402
R276 16
R277 16
R278 3.3K
R279 3.3K
R280 DNI,3.3K
R281 DNI,3.3K
R1142 DNI,0
R1143 DNI,0
U42
PCM2707C
PGND
VCCP
HOST
FUNC3
FUNC0
HID0/MS
HID1/MC
HID2/MD
FSEL
TEST
SSPND#
XTI
XTO
CK
DT
PSEL
VCOM
AGNDR
VCCR
VOUT_R
VOUT_L
VCCL
AGNDL
ZGND+
VBUS
D+
D-
VDD
DGND
FUNC1
FUNC2
DOUT
C386 1uF
C387 1uF
C388 10uF
R1110 1.5K
DP_DN3
DM_DN3
DP_DN3 P[6]
DM_DN3 P[6]
FROM TUSB8041
FUNCTION3
FUNCTION0
HID0
HID1
HID2
SSPND#
FUNCTION1
FUNCTION2
DOUT
R274 1.5K
C383 1uF
R1141 0
R1140 0
R273 1M
Y3
12MHz
C384 18pF
C385 18pF
R950 DNI
R951 DNI
R952 DNI
R953 DNI
R954 DNI
R955 DNI
R956 DNI
R957 DNI
R958 DNI
R959 DNI
R960 DNI
R961 DNI
R962 DNI
R963 DNI
R964 DNI
R965 DNI
R966 DNI
R967 DNI
TEXAS INSTRUMENTS
TIDA-01243: PORT3 USB AUDIO
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
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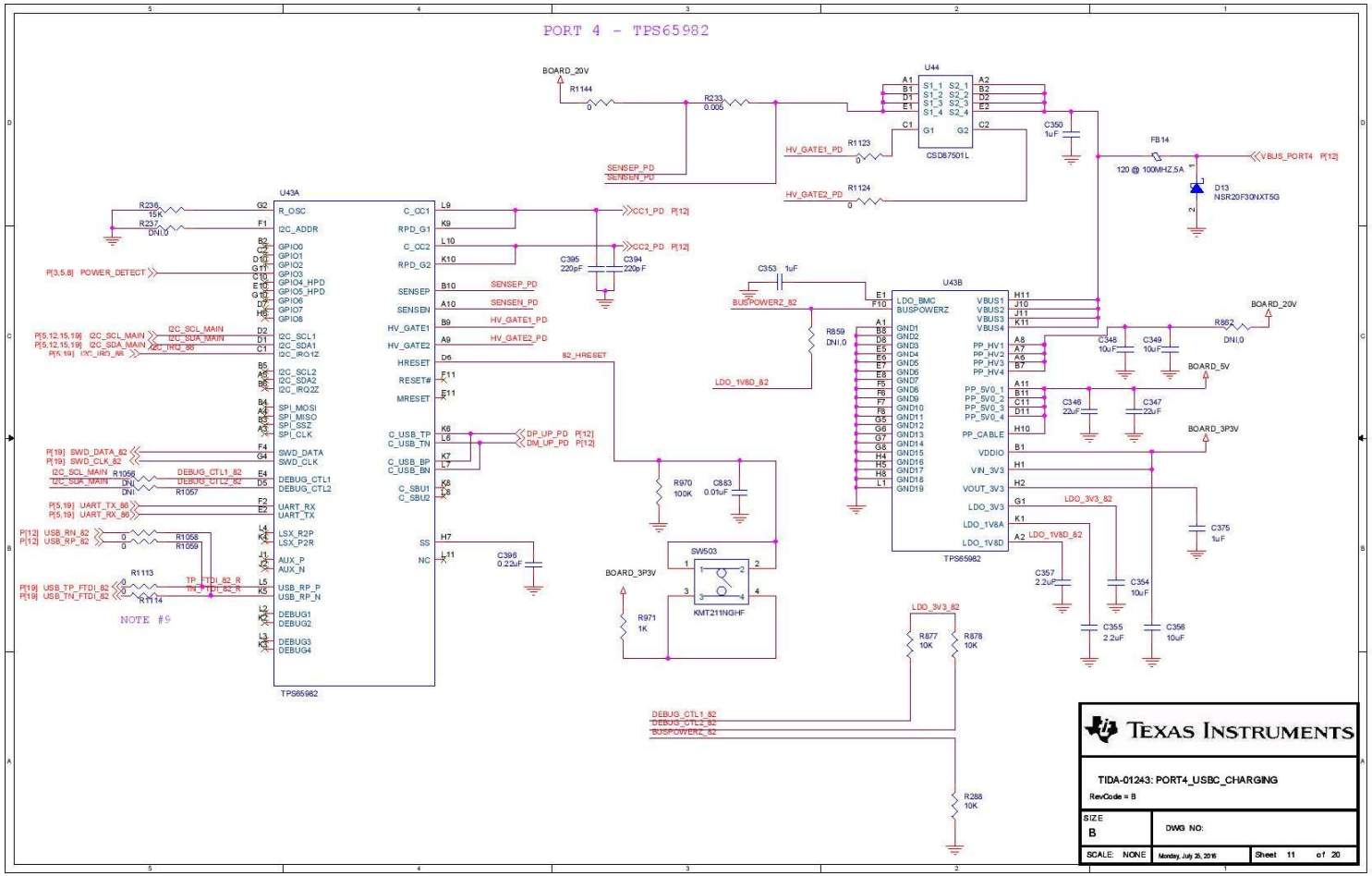
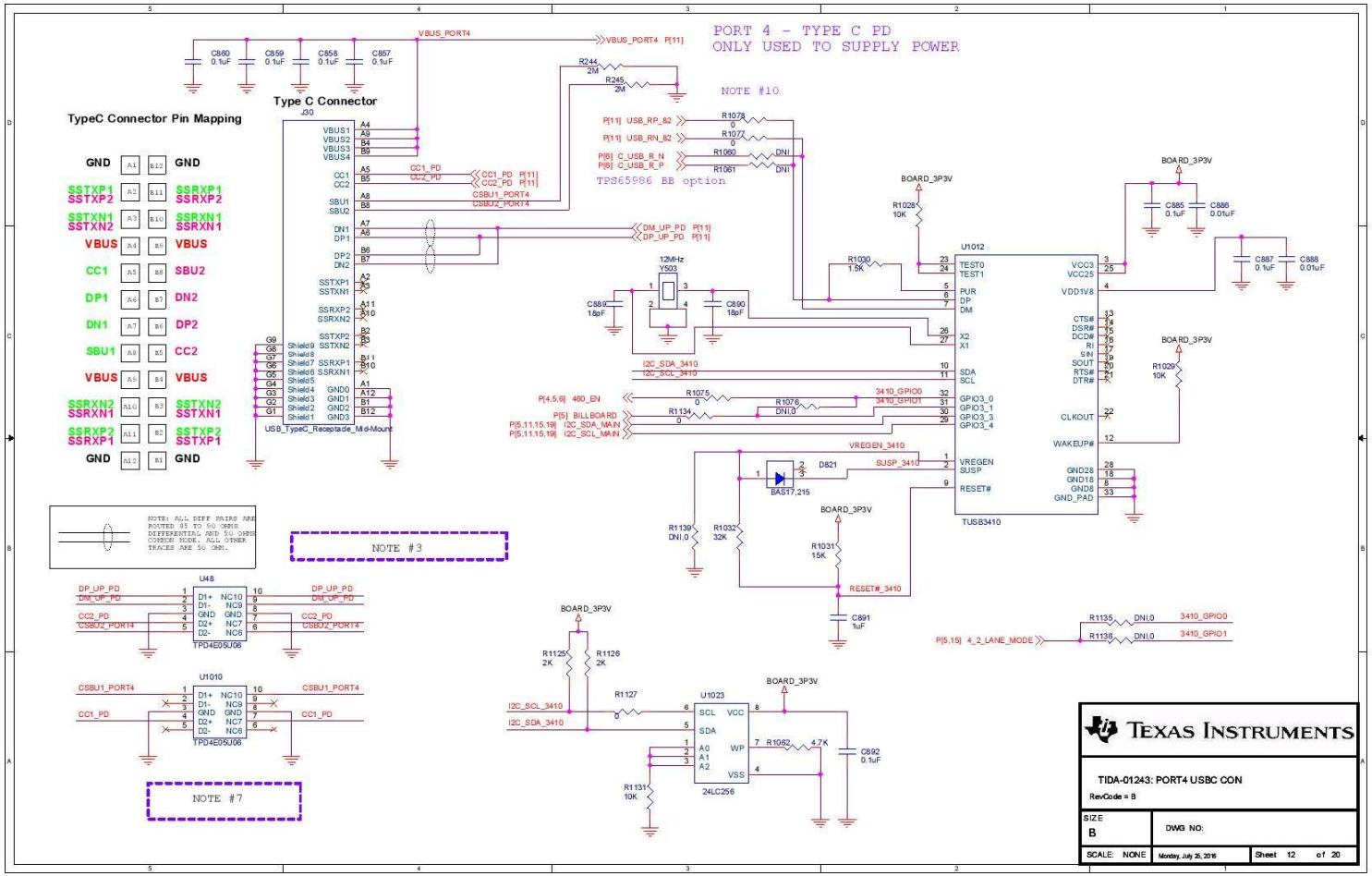

PORT 4 - TPS65982
U43A
TPS65982
U43B
TPS65982
U44
CSD87501L
SW503
KMT211NGHF
NOTE #5
TEXAS INSTRUMENTS
TIDA-01243: PORT4_USBC_CHARGING
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 11 of 20


PORT 4 - TYPE C PD
ONLY USED TO SUPPLY POWER
NOTE #10
TPS65986 BB option
Type C Connector
TypeC Connector Pin Mapping
J30
USB_TypeC_Receptacle_Mid-Mount
U1012
TUSB3410
U48
TPD4E05U06
U1010
TPD4E05U06
U1023
24LC256
D821
BAS17,215
Y503
12MHz
NOTE #3
NOTE #7
TIDA-01243: PORT4 USBC CON
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
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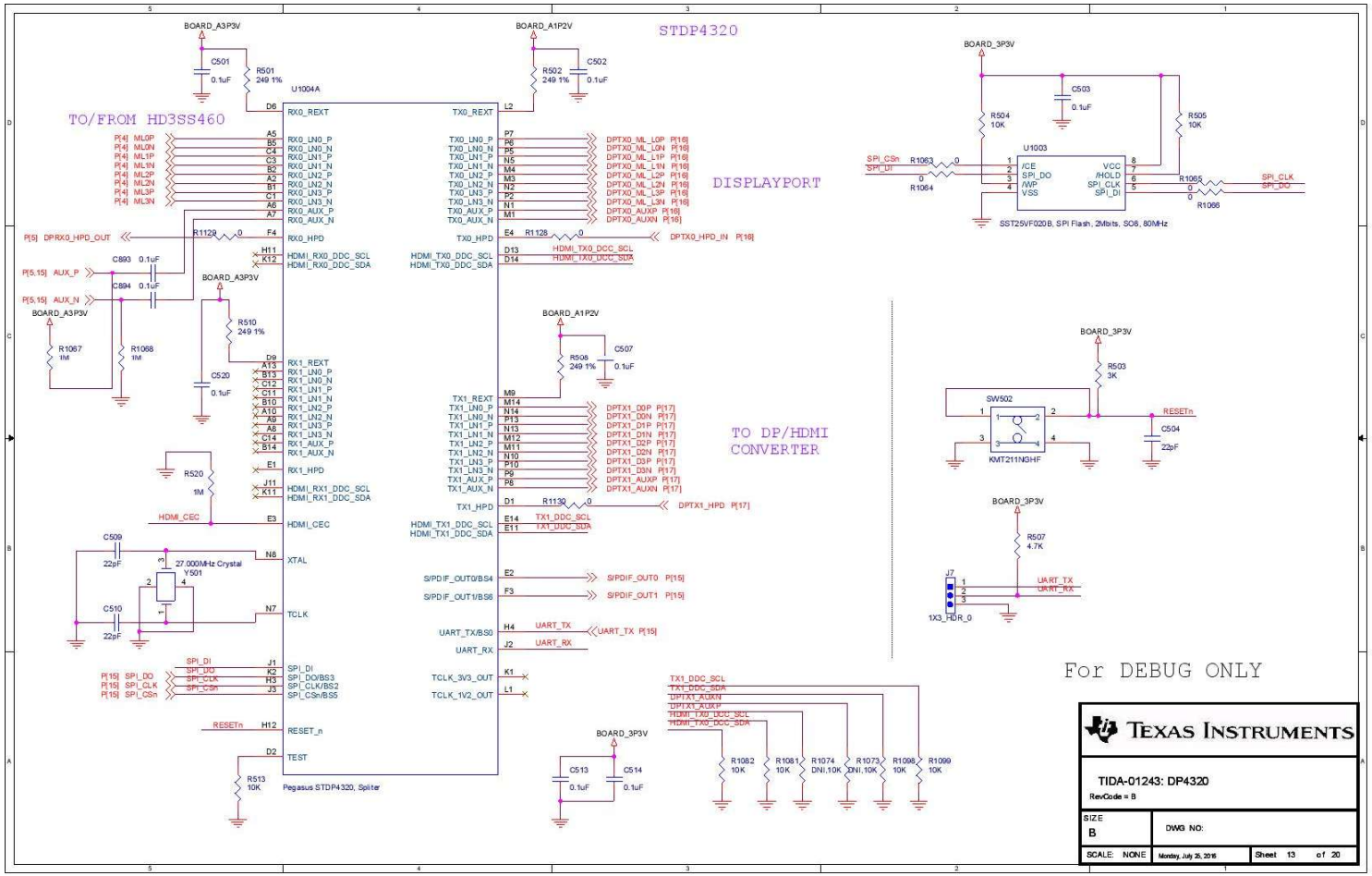
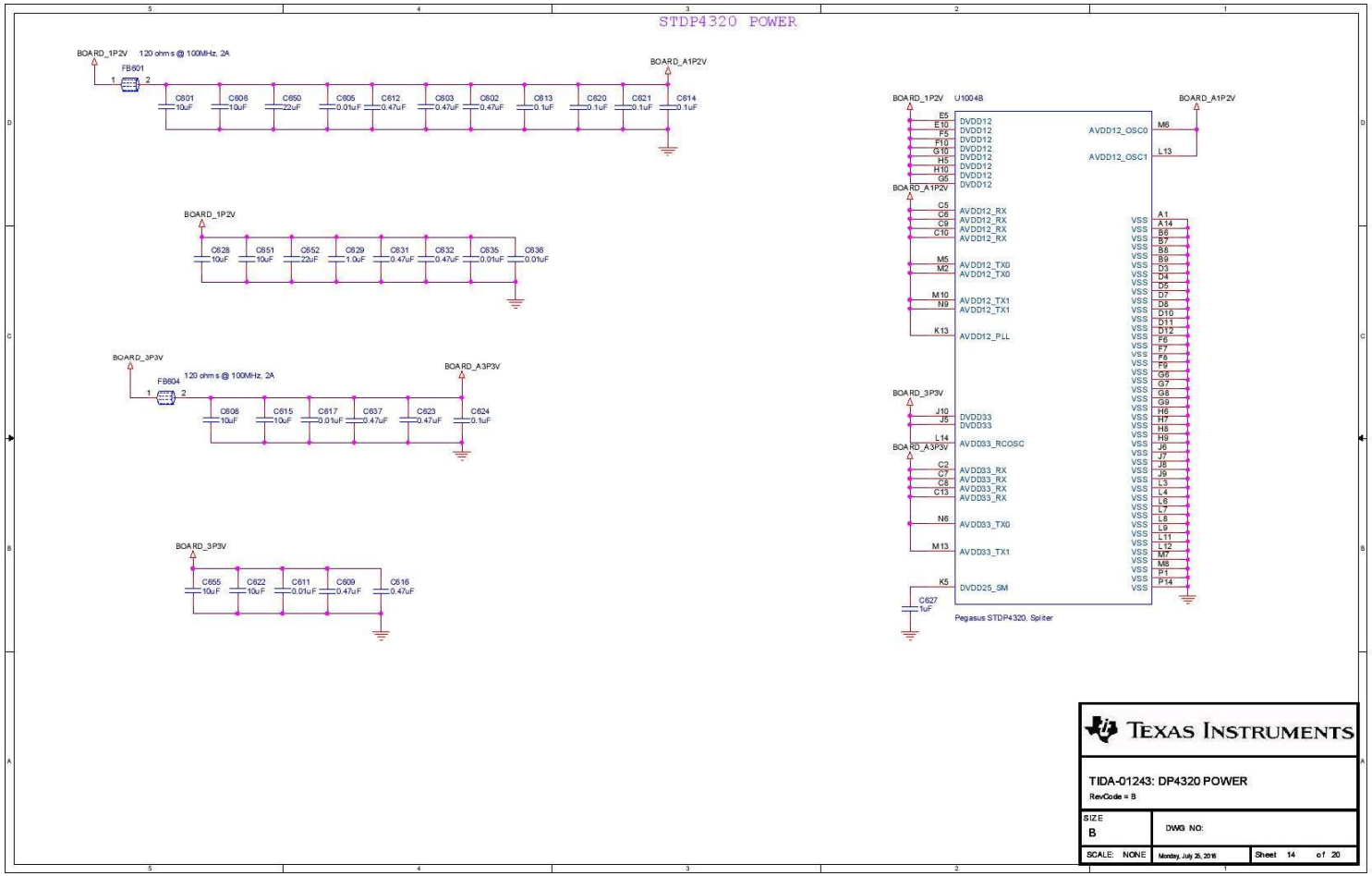
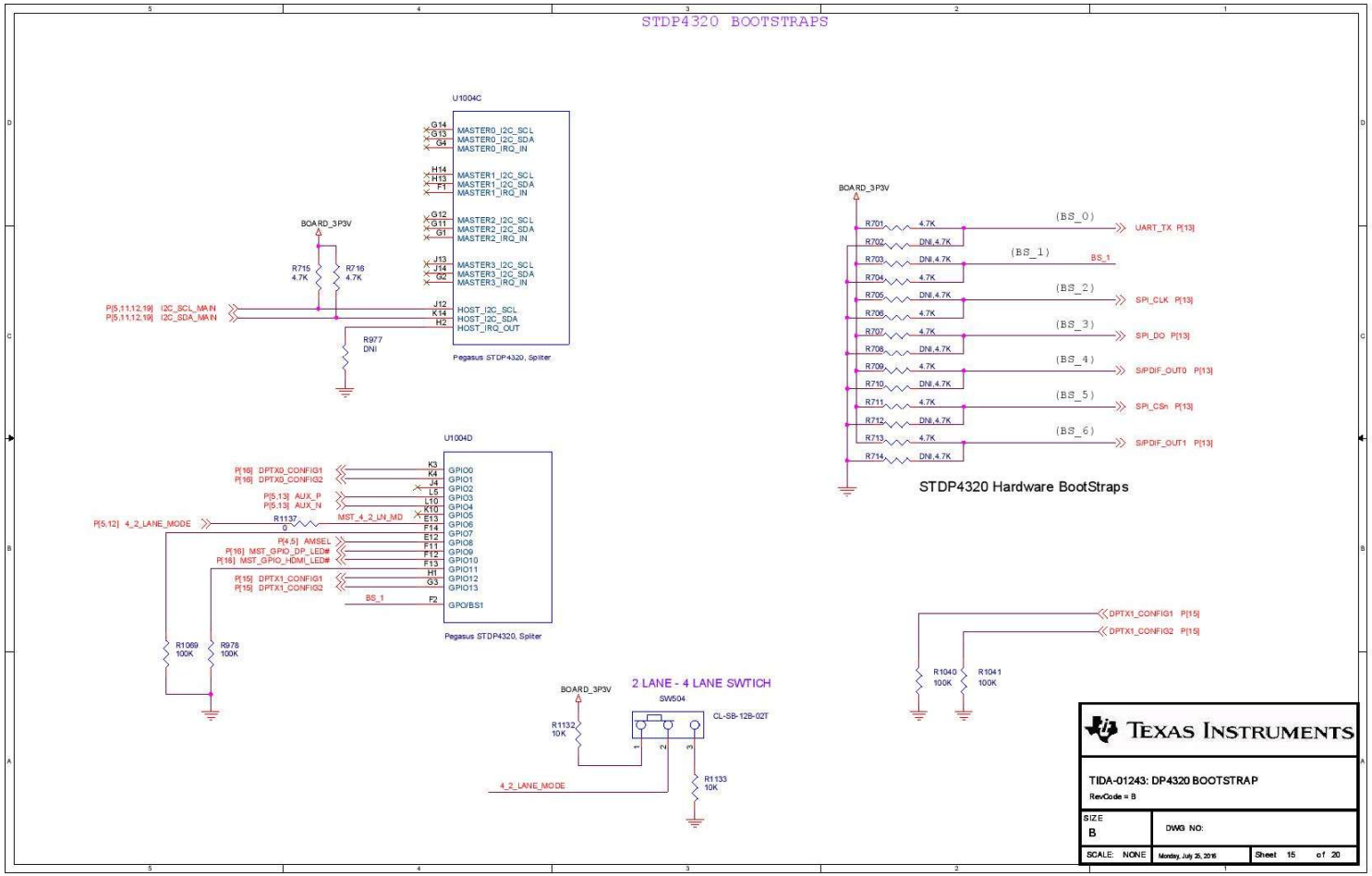

STDP4320
TO/FROM HD3SS460
DISPLAYPORT
TO DP/HDMI CONVERTER
For DEBUG ONLY
U1004A
Pegasus STDP4320, Splitter
U1003
SST25VF020B, SPI Flash, 2Mbits, SO8, 80MHz
KMT211NGHF
1X3_HDR_0
27.000MHz Crystal
Y501
TIDA-01243: DP4320
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 13 of 20


STDP4320 POWER
BOARD_1P2V
120 ohms @ 100MHz, 2A
FB601
BOARD_A1P2V
C601 10uF
C606 10uF
C650 22uF
C605 0.01uF
C612 0.47uF
C603 0.47uF
C602 0.47uF
C613 0.1uF
C620 0.1uF
C621 0.1uF
C614 0.1uF
BOARD_1P2V
C628 10uF
C651 10uF
C652 22uF
C629 1.0uF
C631 0.47uF
C632 0.47uF
C635 0.01uF
C636 0.01uF
BOARD_3P3V
FB604
120 ohms @ 100MHz, 2A
BOARD_A3P3V
C608 10uF
C615 10uF
C617 0.01uF
C637 0.47uF
C623 0.47uF
C624 0.1uF
BOARD_3P3V
C655 10uF
C622 10uF
C611 0.01uF
C609 0.47uF
C616 0.47uF
BOARD_1P2V U1004B
BOARD_A1P2V
E5 E10 F5 F10 G10 H5 H10 G5 DVDD12
AVDD12_OSC0 M6
AVDD12_OSC1 L13
BOARD_A1P2V
C5 C6 C9 C10 AVDD12_RX
M5 M2 AVDD12_TX0
M10 N9 AVDD12_TX1
K13 AVDD12_PLL
BOARD_3P3V
J10 J5 DVDD33
L14 AVDD33_RCOSC
BOARD_A3P3V
C2 C7 C8 C13 AVDD33_RX
N6 AVDD33_TX0
M13 AVDD33_TX1
K5 DVDD25_SM
C627 1uF
VSS A1 A14 B6 B7 B8 B9 D3 D4 D5 D7 D8 D10 D11 D12 F6 F7 F8 F9 G5 G7 G8 G9 H6 H7 H8 H9 J6 J7 J8 J9 L3 L4 L6 L7 L8 L9 L11 L12 M7 M8 P1 P14
Pegasus STDP4320, Spliter
TEXAS INSTRUMENTS
TIDA-01243: DP4320 POWER
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
Sheet 14 of 20


STDP4320 BOOTSTRAPS
U1004C
MASTER0_I2C_SCL
MASTER0_I2C_SDA
MASTER0_IRQ_IN
MASTER1_I2C_SCL
MASTER1_I2C_SDA
MASTER1_IRQ_IN
MASTER2_I2C_SCL
MASTER2_I2C_SDA
MASTER2_IRQ_IN
MASTER3_I2C_SCL
MASTER3_I2C_SDA
MASTER3_IRQ_IN
HOST_I2C_SCL
HOST_I2C_SDA
HOST_IRQ_OUT
BOARD_3P3V
R715 4.7K
R716 4.7K
R977 DNI
P[5,11,12,19] I2C_SCL_MAIN
P[5,11,12,19] I2C_SDA_MAIN
Pegasus STDP4320, Spliter
U1004D
GPIO0
GPIO1
GPIO2
GPIO3
GPIO4
GPIO5
GPIO6
GPIO7
GPIO8
GPIO9
GPIO10
GPIO11
GPIO12
GPIO13
GPO/BS1
P[16] DPTX0_CONFIG1
P[16] DPTX0_CONFIG2
P[5,13] AUX_P
P[5,13] AUX_N
P[5,12] 4_2_LANE_MODE
R1137 0
MST_4_2_LN_MD
P[4,5] AMSEL
P[16] MST_GPIO_DP_LED#
P[16] MST_GPIO_HDMI_LED#
P[15] DPTX1_CONFIG1
P[15] DPTX1_CONFIG2
BS_1
R1069 100K
R978 100K
Pegasus STDP4320, Spliter
BOARD_3P3V
R701 4.7K
R702 DNI,4.7K
R703 DNI,4.7K
R704 4.7K
R705 DNI,4.7K
R706 4.7K
R707 4.7K
R708 DNI,4.7K
R709 4.7K
R710 DNI,4.7K
R711 4.7K
R712 DNI,4.7K
R713 4.7K
R714 DNI,4.7K
(BS_0) UART_TX P[13]
(BS_1) BS_1
(BS_2) SPI_CLK P[13]
(BS_3) SPI_DO P[13]
(BS_4) S/PDIF_OUT0 P[13]
(BS_5) SPI_CSn P[13]
(BS_6) S/PDIF_OUT1 P[13]
STDP4320 Hardware BootStraps
2 LANE - 4 LANE SWTICH
SW504
CL-SB-12B-02T
BOARD_3P3V
R1132 10K
R1133 10K
4_2_LANE_MODE
DPTX1_CONFIG1 P[15]
DPTX1_CONFIG2 P[15]
R1040 100K
R1041 100K
TEXAS INSTRUMENTS
TIDA-01243: DP4320 BOOTSTRAP
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
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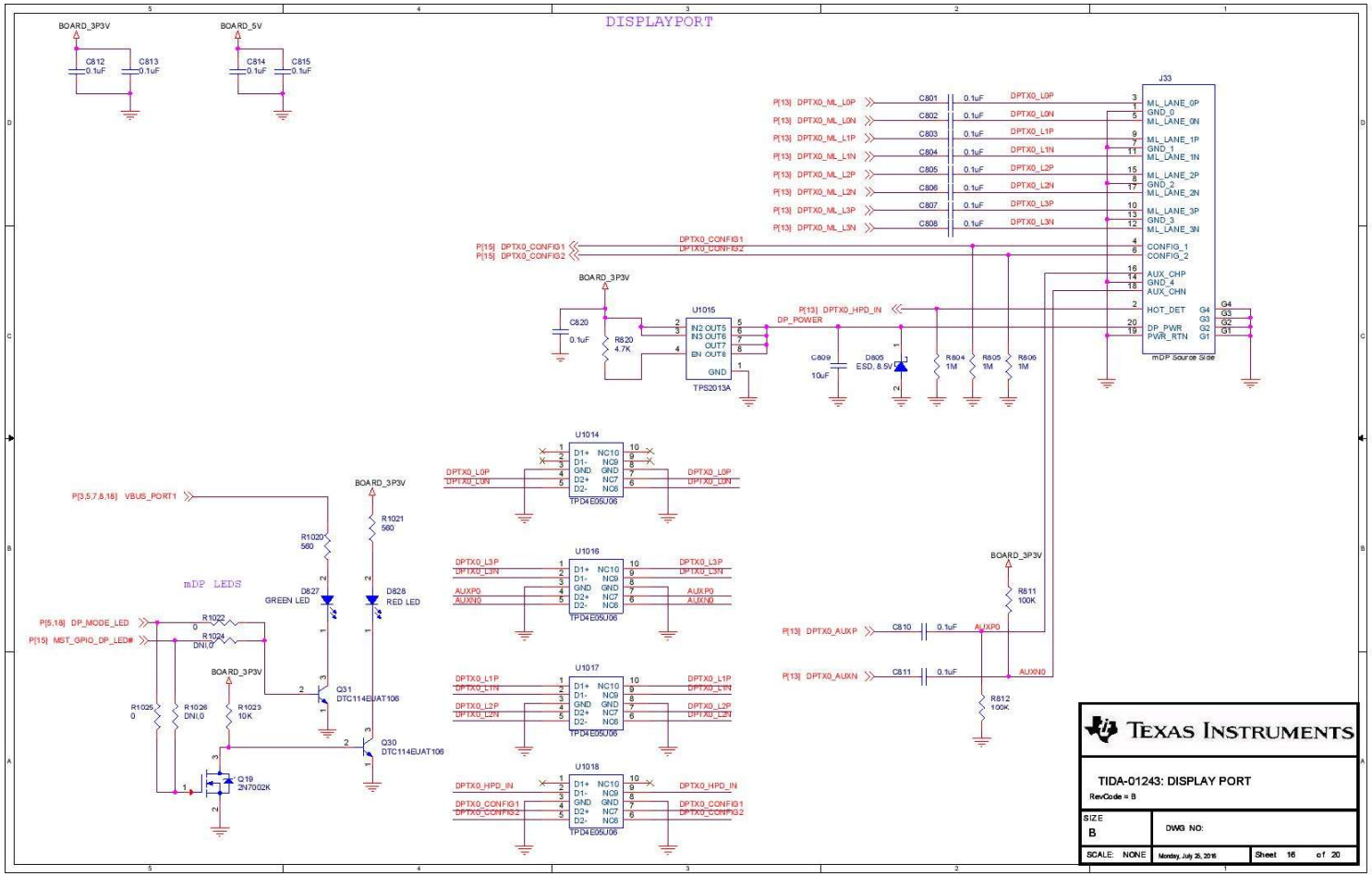
DISPLAYPORT
BOARD_3P3V
BOARD_5V
C812 0.1uF
C813 0.1uF
C814 0.1uF
C815 0.1uF
J33
mDP Source Side
C801 0.1uF DPTX0_L0P
C802 0.1uF DPTX0_L0N
C803 0.1uF DPTX0_L1P
C804 0.1uF DPTX0_L1N
C805 0.1uF DPTX0_L2P
C806 0.1uF DPTX0_L2N
C807 0.1uF DPTX0_L3P
C808 0.1uF DPTX0_L3N
ML_LANE_0P
GND_0
ML_LANE_0N
ML_LANE_1P
GND_1
ML_LANE_1N
ML_LANE_2P
GND_2
ML_LANE_2N
ML_LANE_3P
GND_3
ML_LANE_3N
CONFIG_1
CONFIG_2
AUX_CHP
GND_4
AUX_CHN
HOT_DET
DP_PWR
PWR_RTN
U1015
TPS2013A
C820 0.1uF
R820 4.7K
C809 10uF
D805 ESD, 8.5V
R804 1M
R805 1M
R806 1M
U1014
U1016
U1017
U1018
TPD4E05U06
R1020 560
R1021 560
D827 GREEN LED
D828 RED LED
mDP LEDS
R1022 0
R1024 DNI,0
R1025 0
R1026 DNI,0
R1023 10K
Q31 DTC114EUAT106
Q30 DTC114EUAT106
Q19 2N7002K
R811 100K
R812 100K
C810 0.1uF
C811 0.1uF
TEXAS INSTRUMENTS
TIDA-01243: DISPLAY PORT
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 20, 2015
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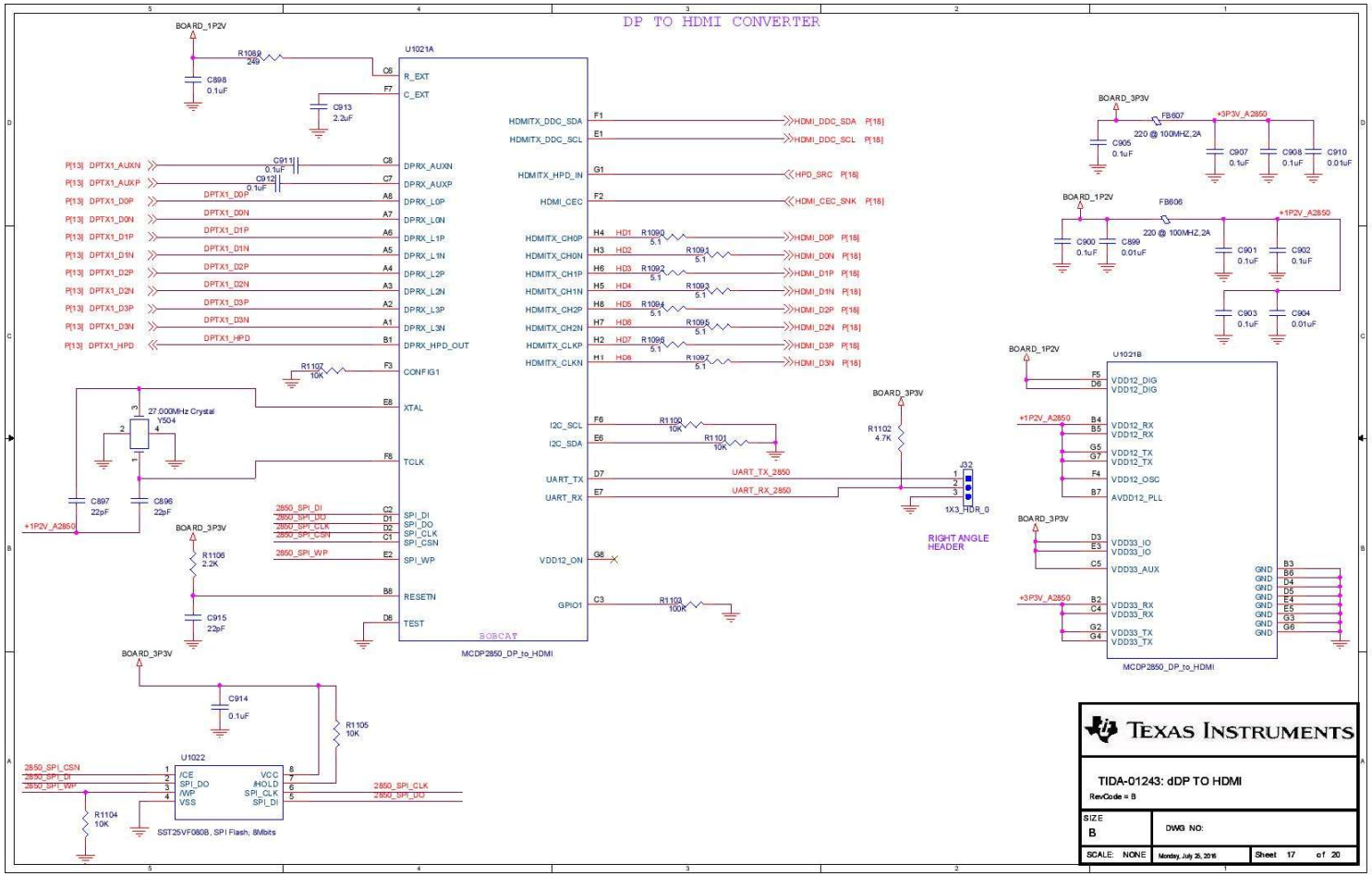
DP TO HDMI CONVERTER
U1021A
MCDP2850_DP_to_HDMI
U1021B
MCDP2850_DP_to_HDMI
U1022
SST25VF080B, SPI Flash, 8Mbits
RIGHT ANGLE HEADER
TIDA-01243: dDP TO HDMI
RevCode = B
SIZE B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
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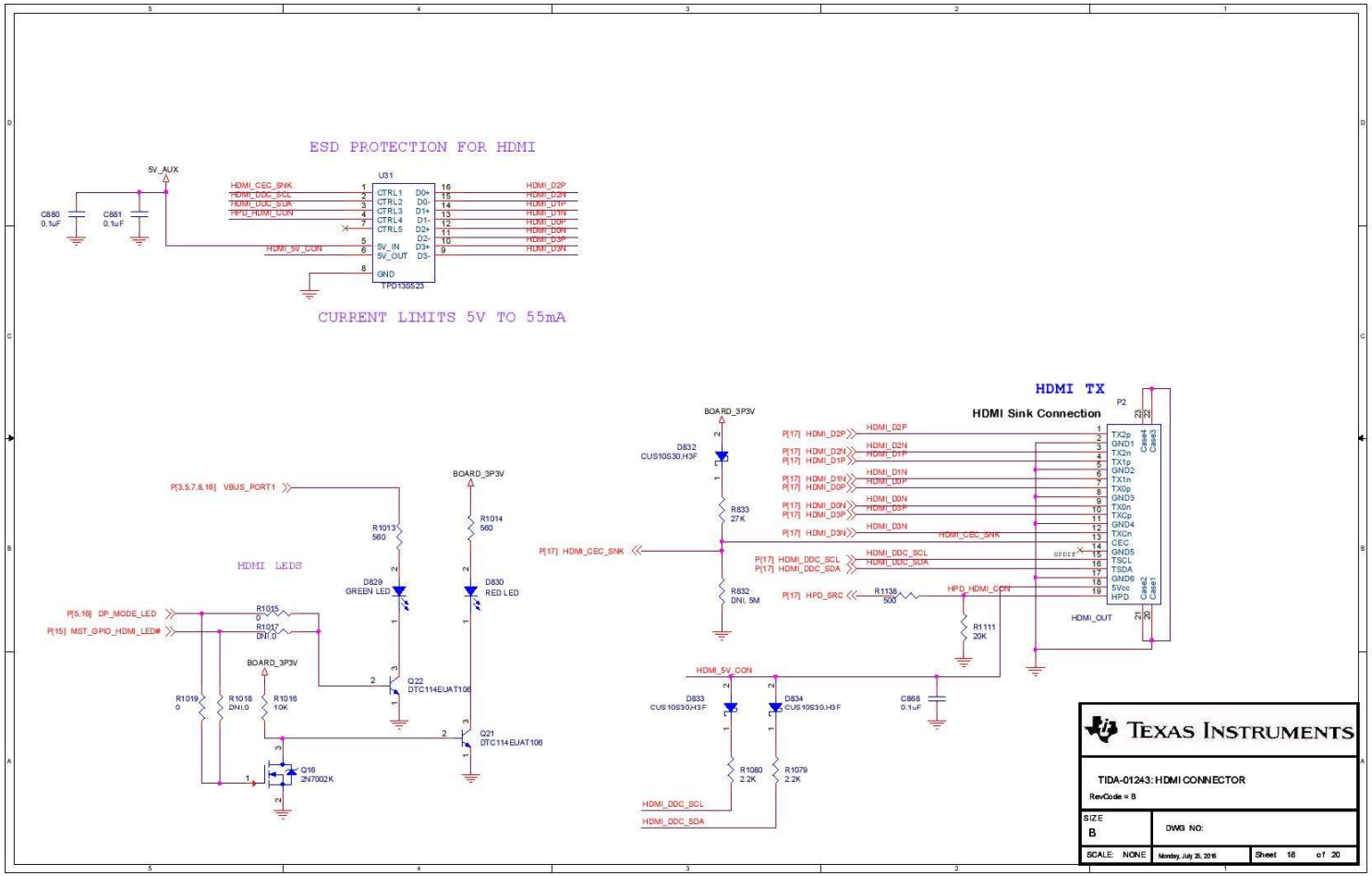
ESD PROTECTION FOR HDMI
5V_AUX
U31
TPD13S523
CURRENT LIMITS 5V TO 55mA
HDMI TX
HDMI Sink Connection
HDMI LEDS
BOARD_3P3V
HDMI_5V_CON
HDMI_OUT
TEXAS INSTRUMENTS
TIDA-01243: HDMI CONNECTOR
RevCode = B
SIZE
B
DWG NO:
SCALE: NONE
Monday, July 25, 2016
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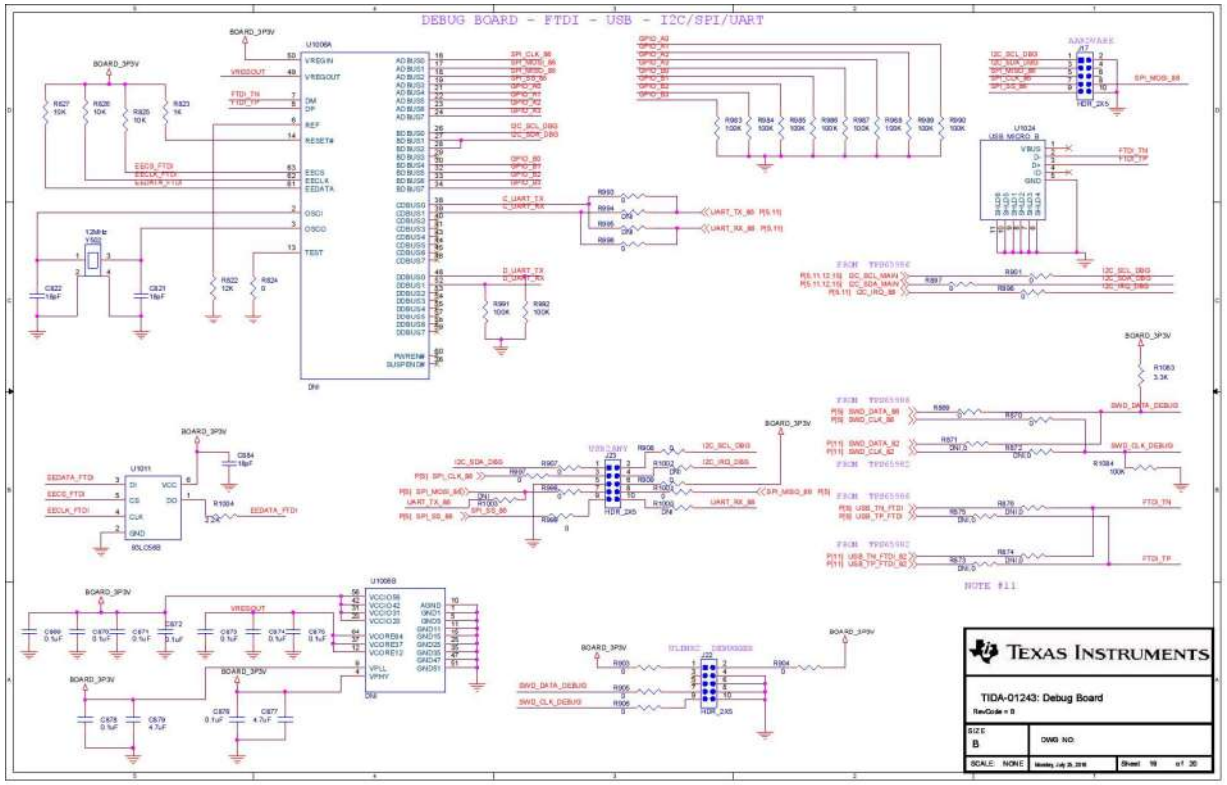


Figure 32: TIDA-01243 Schematic

5.3. Bill of Materials

To download the Bill of Materials for each board, see the design files at http://www.ti.com/tool/TIDA-01243

Table 1: To insert a table caption, right click picture > Insert Caption

Line No	Qty	Ref Des	Value	Customer Part Value	Package_Case	Temp Coeff_Power	Tolerance	Voltage Rating	Part Category	Manufacturer	Manufacturer Part No
1	17	C2,C3,C7,C8,C62,C72,C295,C340,C341,C342,C343,C376,C833,C834,C835,C839,C855	0.1µF	0.1uF	0201	X5R	10	16V	Capacitors	TDK Corporation	C0603X5R1C104K
2	9	C9,C10,C384,C385,C821,C822,C884,C889,C890	18pF	18pF	0402	C0G (NP0)	5	50V	Capacitors	Murata Electronics North America	GRM1555C1H180JA01D
3	82	C11,C12,C37,C63,C80,C81,C83,C88,C89,C310,C344,C367,C369,C373,C380,C501,C502,C503,C507,C513,C514,C520,C613,C614,C620,C621,C624,C801,C802,C803,C804,C805,C806,C807,C808,C810,C811,C812,C813,C814,C815,C820,C840,C844,C845,C851,C852,C853,C857,C858,C859,C860,C865,	0.1µF	0.1uF	0402	X7R	10	50V	Capacitors	Murata Electronics North America	GRM155R71H104KE14D

		C868,C869,C870,C871,C872,C873,C874,C875,C876,C878,C880,C881,C885,C887,C892,C893,C894,C895,C898,C900,C901,C902,C903,C905,C907,C908,C911,C912,C914									
4	3	C13,C877,C879	4.7µF	4.7uF	0402	X5R	10	6.3V	Capacitors	TDK Corporation	C1005X5R0J475K
5	8	C14,C84,C90,C323,C328,C354,C356,C366	10µF	10uF	0402	X5R	20	6.3V	Capacitors	Samsung	CL05A106MQ5NUNC
6	16	C78,C79,C82,C85,C86,C87,C605,C611,C617,C635,C636,C886,C888,C899,C904,C910	10000pF	0.01uF	0402	X7R	10	50V	Capacitors	Murata Electronics North America	GRM155R71H103KA88D
7	11	C288,C301,C309,C332,C333,C348,C349,C836,C837,C838,C854	10µF	10uF	0805	X5R	10	25V	Capacitors	Murata Electronics North America	GRM21BR61E106KA73L
8	1	C289	470pF	470pF	0201	X7R	10	25V	Capacitors	Murata Electronics North America	GRM033R71E471KA01D
9	1	C290	10pf	10pF	0201	C0G	0.5	50V	Capacitors	TDK Corporation	C0603C0G1H100D

10	2	C291,C308	8200PF	8.2nF	0201	X5R	10	10V	Capacitors	Murata Electronics North America	GRM033R61A822KA01D
11	4	C292,C299,C300,C311	0.1µF	100nF	0402	X7R	10	50V	Capacitors	Murata Electronics North America	GRM155R71H104KE14D
12	19	C293,C297,C302,C303,C304,C305,C312,C330,C331,C346,C347,C374,C377,C378,C650,C652,C841,C842,C843	22µF	22uF	0603	X5R	20	4V	Capacitors	Taiyo Yuden	AMK107BJ226MA-T
13	1	C294	1.0µF	1uF	0603	X7R	10	16V	Capacitors	TDK Corporation	C1608X7R1C105K080AC
14	1	C298	1000pF	1nF	0402	X7R	10	50V	Capacitors	TDK Corporation	C1005X7R1H102K
15	1	C306	12pF	12pF	0201	C0G	5	50V	Capacitors	TDK Corporation	C0603C0G1H120J030BA
16	1	C307	56pF	56pF	0201	C0G (NP0)	5	50V	Capacitors	TDK Corporation	C0603C0G1H560J030BA
17	12	C321,C371,C601,C606,C608,C615,C622,C628,C651,C655,C809,C882	10µF	10uF	0603	X5R	20	10V	Capacitors	Murata Electronics North America	GRM188R61A106ME69D
18	2	C322,C353	1.0µF	1uF	0201	X5R	20	6.3V	Capacitors	TDK Corporation	C0603X5R0J105M
19	5	C327,C329,C355,C357,C913	2.2µF	2.2uF	0402	X5R	20	6.3V	Capacitors	TDK Corporation	C1005X5R0J225M
20	11	C345,C350,C372,C375,C379,C381,C383,C386,C387,C627,C891	1.0µF	1uF	0402	X5R	10	16V	Capacitors	Samsung Electro-Mechanics America, Inc.	CL05A105KO5NNND
21	0	C382	DNI	DNI,10	DNI				Undefined	DNI	DNI

				uF					Category		
22	1	C388	10µF	10uF	0805	X7R	10	16V	Capacitors	Samsung	CL21B106KOQNNNE
23	2	C389,C390	0.022µF	0.022uF	0402	X7R	10	25V	Capacitors	Murata Electronics North America	GRM155R71E223KA61D
24	2	C391,C392	100µF	100uF	D5 H5.4	85°C	20	10V	Capacitors	Panasonic Electronic Components	EEE-1AA101WR
25	1	C393	47000pF	47nf	0402	X7R	10	25V	Capacitors	Murata Electronics North America	GRM155R71E473KA88D
26	4	C394,C395,C397,C398	220pf	220pF	0201	X7R	10	25V	Capacitors	TDK Corporation	C0603X7R1E221K030BA
27	2	C396,C399	0.22µF	0.22uF	0201	X5R	10	10V	Capacitors	TDK Corporation	C0603X5R1A224K
28	6	C504,C509,C510,C896,C897,C915	22pF	22pF	0402	C0G (NP0)	5	50V	Capacitors	Taiyo Yuden	UMK105CG220JV-F
29	9	C602,C603,C609,C612,C616,C623,C631,C632,C637	0.47µF	0.47uF	0402	X5R	10	10V	Capacitors	Murata Electronics North America	GRM155R61A474KE15D
30	1	C629	1.0µF	1.0uF	0402	X5R	10	16V	Capacitors	Samsung Electro-Mechanics America, Inc.	CL05A105KO5NNND
31	2	C856,C883	10000pF	0.01uF	0201	X7R	10	10V	Capacitors	Murata Electronics North America	GRM033R71A103KA01D
32	1	C862	47µF	47uF	D4 H6.1	105°C	20	16V	Capacitors	Panasonic Electronic Components	EEE-FT1C470AR
33	0	C863,C864	DNI	DNI,0.1uF	DNI				Undefined Category	DNI	DNI

34	2	C916,C917	22µF	22uF	0805	X5R	10	16V	Capacitors	TDK Corporation	C2012X5R1C226K
35	1	C918	100µF	100uF, 16V	7343-31 (EIA)	125°C	10	16V	Capacitors	Kemet Electronic Components	T491D107K016AT
36	1	D5	DIODE ZENER	CD-0603T-24C	0603	1A		47V	Circuit Protection	Bourns Inc	CD0603-T24C
37	4	D7,D8,D814,D831	single	B540C-13-F	SOD-128	5A		30V	Discrete Semiconductor Products	NXP Semiconductors	PMEG3050EP,115
38	1	D12	Single	NSR20F30NXT5G	2-XFDFN	2A		30V	Discrete Semiconductor Products	ON Semiconductor	NSR20F30NXT5G
39	1	D13	Single	NSR20F30NXT5G	2-XFDFN	2A		30V	Discrete Semiconductor Products	ON Semiconductor	NSR20F30NXT5G
40	1	D805	1 Channel - Bidirectional	ESD, 8.5V	ST0201			3V	Circuit Protection	STMicroelectronics	ESDAVLC8-1BU2
41	6	D820,D822,D824, D825,D827,D829	LED - Green Clear	GREEN LED	0603	20mA	12	2.1V	Optoelectronics	Lite-On Inc	LTST-C191GKT
42	1	D821	BAS17,215	BAS17, 215	SOT-23-3	200mA		5V	Discrete Semiconductor Products	NXP Semiconductors	BAS17,215

43	1	D823	LED - Ultra Bright Blue Clear	BLUE LED	0603	10mA	5	3.9V	Optoelectronics	Vishay Semiconductor Opto Division	TLMB1100-GS08
44	3	D826,D828,D830	LED - Red Clear	RED LED	0603	10mA	2	2V	Optoelectronics	Lite-On Inc	LTST-C190EKT
45	3	D832,D833,D834	CUS10S30,H3F	CUS10S30,H3F	SOD-323	1A		30V	Discrete Semiconductor Products	Toshiba	CUS10S30,H3F
46	3	FB10,FB606,FB607	220	220 @ 100MHZ,2A	0603	2A			Filters	Murata Electronics North America	BLM18EG221SN1D
47	2	FB13,FB605	23	23 @ 100MHZ,4A	0603	4A			Filters	Taiyo Yuden	FBMJ1608HM230NT
48	1	FB14	120	120 @ 100MHZ,5A	0805	5A			Filters	Samsung	CIS21J121NE
49	2	FB601,FB604	120	120 ohms @ 100MHz, 2A	0603	2A			Filters	Murata Electronics North America	BLM18PG121SN1D
50	2	J7,J32	1 x 3	1X3_HDR_0	0.1"	High Temp			Connectors	Samtec Inc	HTSW-150-07-G-S
51	1	J10	USB 3.0, Super Speed	USB3_TYPEA_CONNECTOR	USB - A, Receptacle				Connectors	Amphenol Commercial Products	GSB311131HR

52	1	J16	Mini Jack - 3.5mm_ R/A	CONN _AUD_ 3P_J_H	SMT				Connectors	CUI	SJ-3523-SMT
53	3	J17,J22,J23	2 x 5	HDR_2 X5	0.1x0.1"	High Temp			Connectors	Samtec Inc	HTSW-150-07-G-D
54	3	J28,J29,J30	Receptacle - Mid mount	USB_TypeC_ Receptacle_ Mid-Mount	SMT				Connectors	LINTES	AUSB0129
55	1	J31	Power Jack	61400 46600 _DC_PWR_JACK	Through Hole				Connectors	Foxconn	JPD1135-509-7F-
56	1	J33	DP3AR020SU32JQ1	MINI_ DISPLAY_PORT	T/H				Connectors	JAE Electronics	DP3AR020SU32JQ1
57	2	L24,L25	3.3uH	3.3uH	5.48 mm x 5.28 mm x 3.1 mm				Inductors _Coils_Chokes	Coilcraft	XAL5030-332MEB
58	1	L26	2.2µH	2.2uH	4.0mm x 4.0mm x 2.1mm	5.6A			Inductors _Coils_Chokes	Coilcraft	XAL4020-222MEB
59	1	L28	2.2µH	2.2uH	7.6mm x 7.6mm x 4.35mm	4.76A	20		Inductors _Coils_Chokes	Cooper Bussmann	DR74-2R2-R
60	1	P2	HDMI WITH BACK	HDMI_ OUT	19pin - R/A				Connectors	Molex Inc	0471511001

			COVER								
61	4	Q9,Q13,Q16,Q19	N-CH	2N7002K	SOT-23-3	300mA	350	60V	Discrete Semiconductor Products	Vishay Siliconix	2N7002K-T1-E3
62	1	Q21	NPN	DTC114EUAT106	SOT-323	50mA		50V	Discrete Semiconductor Products	ROHM Semiconductor USA, LLC	DTC114EUAT106
63	10	Q22,Q23,Q24,Q25,Q26,Q27,Q28,Q29,Q30,Q31	NPN	DTC114EUAT106	SOT-323	50mA		50V	Discrete Semiconductor Products	ROHM Semiconductor USA, LLC	DTC114EUAT106
64	4	R2,R35,R1125,R1126	2.00K	2K	0402	1/16W	1	50V	Resistors	Stackpole	RMCF0402FT2K00
65	0	R17	DNI	DNI,1M	DNI				Undefined Category	DNI	DNI
66	1	R20	9.53K	9.53K, 1%	0402	1/16W	1		Resistors	Vishay Dale	CRCW04029K53FKED
67	1	R32	28.7K	28.7K	0402	1/16W	1		Resistors	Yageo	RC0402FR-0728K7L
68	33	R39,R40,R45,R157,R182,R197,R219,R265,R266,R275,R504,R505,R513,R825,R826,R827,R1012,R1016,R1023,R1028,R1029,R1081,R1082,R1098,R1099,R1100,R1101,R1104,R1105,R1107,R1131,R11	10.0K	10K	0402	±100ppm/°C	1	0.1W, 1/10W	Resistors	Panasonic Electronic Components	ERJ-2RKF1002

		32,R1133									
69	0	R46,R1073,R1074	DNI	DNI,10K	DNI				Undefined Category	DNI	DNI
70	0	R48,R56	DNI	DNI,2M	DNI				Undefined Category	DNI	DNI
71	0	R62,R218,R871,R872,R1017,R1018,R1024,R1026,R1047,R1049,R1050,R1051,R1052,R1053,R1054,R1055,R1076,R1108,R1135,R1136,R1139,R1142,R1143	DNI	DNI,0	DNI				Undefined Category	DNI	DNI
72	1	R173	49.9K	49.9K	0201	1/20W	1	25V	Resistors	Panasonic Electronic Components	ERJ-1GEF4992C
73	2	R174,R187	10.2K	10.2K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF1022C
74	1	R175	3.24K	3.24K	0201	1/20W	1		Resistors	Samsung	RC0603F3241CS
75	1	R176	576K	576K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF5763C
76	6	R177,R184,R938,R939,R940,R941	100K	100K	0201	1/20W	1		Resistors	Yageo America	RC0201FR-07100KL

77	1	R178	1.00K	1K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF1001C
78	1	R179	86.6K	86.6K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF8662C
79	1	R180	178K	178K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF1783C
80	1	R181	69.8K	69.8K	0402	±100ppm/°C	1	1/10W	Resistors	Vishay Dale	CRCW040269K8FKED
81	1	R183	1.91K	1.91K	0402	1/10W	1		Resistors	Panasonic - ECG	ERJ-2RKF1911X
82	1	R185	107K	107K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF1073C
83	1	R186	20.5K	20.5K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF2052C
84	11	R195,R1005,R1006,R1007,R1009,R1010,R1013,R1014,R1020,R1021,R1027	560	560	0402	1/10W	1	75V	Resistors	Yageo	RC0402JR-07560RL
85	1	R196	20.5K	20.5K	0402	1/10W	1		Resistors	Panasonic Electronic Components	ERJ-2RKF2052X
86	3	R201,R236,R1031	15.0K	15K	0402	1/16W	1		Resistors	Panasonic Electronic Components	ERJ-2RKF1502X

87	30	R202,R203,R205, R246,R259,R263, R283,R839,R840, R841,R842,R858, R1034,R1044,R10 45,R1058,R1059,R 1077,R1078,R111 2,R1113,R1114,R1 117,R1118,R1119, R1120,R1121,R11 22,R1123,R1124	0.0 (Zero Ohm)	0	0201	1/20W	5	50V	Resistors	Vishay Dale	CRCW02010 000Z0ED
88	2	R230,R231	2.00M	2M	0201	0.05W, 1/20W	5		Resistors	Panasonic Electronic Components	ERJ-1GEJ205C
89	1	R233	0.005	.005	0805	1/2W	1	±100ppm/°C	Resistors	Bourns Inc.	CRF0805-FX-R005ELF
90	0	R237,R859,R873, R874,R875,R876, R1042,R1043	DNI	DNI,0	DNI				Undefined Category	DNI	DNI
91	4	R244,R245,R910, R911	2.00M	2M	0402	1/16W	1		Resistors	Vishay Dale	CRCW04022 M00FKED
92	10	R248,R257,R271, R288,R847,R848, R849,R877,R878, R935	10.0K	10K	0201	1/20W	1	75V	Resistors	Panasonic Electronic Components	ERJ-1GEF1002C
93	0	R250,R270	DNI	DNI,10 K	DNI				Undefined Category	DNI	DNI
94	4	R253,R254,R255, R258	200K	200K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF2003C
95	0	R260,R282,R855, R936,R937,R946, R947,R1035,R105	DNI	DNI	DNI				Undefined Category	DNI	DNI

		6,R1057,R1060,R1061,R1115,R1116									
96	1	R262	54.9K	54.9K	0201	1/20W	1		Resistors	Yageo America	RC0201FR-0754K9L
97	19	R264,R811,R812,R853,R970,R978,R983,R984,R985,R986,R987,R988,R989,R990,R1040,R1041,R1069,R1084,R1103	100K	100K	0402	1/16W	1		Resistors	Yageo	RC0402FR-07100KL
98	42	R268,R269,R824,R869,R870,R897,R898,R901,R903,R904,R905,R906,R907,R908,R909,R993,R996,R997,R998,R999,R1001,R1008,R1011,R1015,R1019,R1022,R1025,R1036,R1063,R1064,R1065,R1066,R1075,R1109,R1127,R1128,R1129,R1130,R1134,R1137,R1140,R1141	0.0 (Zero Ohm)	0	0402	1/16W	5		Resistors	Yageo	RC0402JR-070RL
99	1	R272	909K	909K	0402	1/10W	1		Resistors	Panasonic Electronic Components	ERJ-2RKF9093X
100	3	R273,R1067,R1068	1.00M	1M	0402	1/16W	1		Resistors	Vishay Dale	CRCW04021M00FKED

101	3	R274,R1030,R1110	1.50K	1.5K	0402	1/16W	1		Resistors	Yageo	RC0402FR-071K5L
102	2	R276,R277	16	16	0402	1/16W	1		Resistors	Vishay Dale	CRCW040216R0FKED
103	3	R278,R279,R1083	3.30K	3.3K	0402	1/16W	1		Resistors	Vishay Dale	CRCW04023K30FKED
104	0	R280,R281	DNI	DNI,3.3K	DNI				Undefined Category	DNI	DNI
105	4	R501,R502,R508,R510	249	249 1%	0402	±100ppm/C	1	1/16W	Resistors	Yageo	RC0402FR-07249RL
106	1	R503	3K	3K	0402	1/16W	1	75V	Resistors	Yageo	RC0402JR-073K
107	2	R507,R1102	4.70K	4.7K	0603	1/10W	1		Resistors	Rohm Semiconductor	MCR03ERTF4701
108	4	R520,R804,R805,R806	1.00Mohm	1M	0603	1/10W	1		Resistors	Yageo	RC0603FR-071ML
109	11	R701,R704,R706,R707,R709,R711,R713,R715,R716,R820,R1062	4.70K	4.7K	0402	1/16W	1		Resistors	Vishay Dale	CRCW04024K70FKED
110	0	R702,R703,R705,R708,R710,R712,R714	DNI	DNI,4.7K	DNI				Undefined Category	DNI	DNI
111	1	R822	12.0K	12K	0402	1/16W	1		Resistors	Yageo	RC0402FR-0712KL
112	6	R823,R854,R971,R1085,R1086,R1088	1.00K	1K	0402	1/16W	1		Resistors	ROHM Semiconductor USA, LLC	MCR01MRTF1001
113	0	R832	DNI	DNI,5M	DNI				Undefined Category	DNI	DNI
114	1	R833	27K	27K	0402	1/16W	1	75V	Resistors	Yageo	RC0402FR-0727KL

115	6	R843,R844,R845, R846,R942,R943	3.3K	3.3K	0201	1/20W	1		Resistors	Panasonic Electronic Components	ERJ-1GEF3301C
116	0	R862	DNI	DNI,0	DNI				Undefined Category	DNI	DNI
117	0	R950,R951,R952, R953,R954,R955, R956,R957,R958, R959,R960,R961, R962,R963,R964, R965,R966,R967, R977,R994,R995, R1000,R1002,R10 03	DNI	DNI	DNI				Undefined Category	DNI	DNI
118	2	R991,R992	100K	100K	0603	1/10W	1		Resistors	Yageo	RC0603FR-07100KL
119	4	R1004,R1079,R10 80,R1106	2.20K	2.2K	0402	1/10W	5		Resistors	Panasonic Electronic Components	ERJ-2GEJ222X
120	1	R1032	32K	32K	0402	1/16W	1		Resistors	Vishay Dale	TNPW040232K0BEED
121	1	R1089	249	249	0402	±100ppm/C	1	1/16W	Resistors	Yageo	RC0402FR-07249RL
122	8	R1090,R1091,R10 92,R1093,R1094,R 1095,R1096,R109 7	5.1	5.1	0201	1/20W	5		Resistors	Samsung	RC0603J5R1CS
123	1	R1111	20.0K	20K	0402	1/16W	1		Resistors	Vishay Dale	CRCW040220K0FKED
124	1	R1138	500	500	0402	±100ppm/°C	1	1/10W	Resistors	Vishay Dale	PNM0402E5000BST1
125	1	R1144	0.0 (Zero	0	0805	1/8W	5		Resistors	Yageo	RC0805JR-070RL

			Ohm)								
126	4	SW2,SW3,SW502, SW503	SPST-NO Off-Mom	KMT211NGHF	3.00mm x 2.60mm	0.05A		32V	Switches	C&K Components	KMT211NGHF LFS
127	1	SW504	SPDT ON-ON	CL-SB-12B-02T	Gull Wing	0.2A		12V	Switches	Copal Electronics Inc	CL-SB-12B-01
128	1	U1	TPS54332DDA	TPS54332	8-SOIC	3.5A		0.8 ~ 25 V	Integrated Circuits	Texas Instruments	TPS54332DDA
129	1	U2	TPS53318DQPT	TPS53318	22-QFN				Integrated Circuits	Texas Instruments	TPS53318DQPT
130	1	U3	TPS54331DDA	TPS54331	8-SOIC PowerPAD				Integrated Circuits	Texas Instruments	TPS54331DDA
131	1	U5	TLV3012AIDCK	TLV3012	6-TSSOP				Integrated Circuits	Texas Instruments	TLV3012AIDCKR
132	1	U14	TPD6E05U06RVZR	TPD6E05U06	14-UFDFN			14V	Circuit Protection	Texas Instruments	TPD6E05U06RVZR
133	14	U15,U16,U17,U22,U38,U39,U40,U41,U48,U1010,U1014,U1016,U1017,U1018	TPD4E05U06DQAR	TPD4E05U06	SON-10				Integrated Circuits	Texas Instruments	TPD4E05U06DQAR
134	1	U24	TUSB8041RGCR	TUSB8041	64-VQFN				Integrated Circuits	Texas Instruments	TUSB8041RGCR
135	1	U31	TPD13S523PWR	TPD13S523	16-TSSOP				Circuit Protection	Texas Instruments	TPD13S523PWR
136	1	U33	TPS3831K50DQNR	TPS3831K33	4-X2SON				Integrated Circuits	Texas Instruments	TPS3831K50DQNR
137	1	U34	TPS2500DRCR	TPS2500	10-SON				Integrated Circuits	Texas Instruments	TPS2500DRCR

138	1	U36	HD3SS460	HD3SS460	28-QFN				Integrated Circuits	Texas Instruments	HD3SS460RHRR
139	1	U42	PCM2707	PCM2707C	TQFP-32				Integrated Circuits	Texas Instruments	PCM2707CPJTR
140	1	U43	TPS65982ABZQZR	TPS65982	96-BGA				Integrated Circuits	Texas Instruments	TPS65982ABZQZR
141	1	U44	CSD87501L	CSD87501L	10-PICOSTAR				Discrete Semiconductor Products	Texas Instruments	CSD87501L
142	1	U49	HD3SS3212IRKSR	HD3SS3212	20-VQFN				Integrated Circuits	Texas Instruments	HD3SS3212IRKSR
143	1	U51	TPS25910RSA	TPS25910	QFN-16				Integrated Circuits	Texas Instruments	TPS25910RSA
144	1	U52	TPS65986	TPS65986	96-BGA				Integrated Circuits	Texas Instruments	TPS65986ABZQZR
145	1	U53	TUSB321RWBR	TUSB321	12-XQFN				Integrated Circuits	Texas Instruments	TUSB321RWBR
146	1	U1003	SST25VF020B-80-4I-SAE	SST25VF020B, SPI Flash, 2Mbits, SO8, 80MHz	8-SOIC				Integrated Circuits	Silicon Storage Technology	SST25VF020B-80-4I-SAE
147	1	U1004	STDP4320	Pegasus STDP4320, Spliter	172-BGA				Integrated Circuits	Megachip	STDP4320
148	1	U1006	FT4232	FT423	64-LQFP			3.0 V ~ 3.6 V	Integrated	Parallax	FT4232HL

			HL	2H					Circuits		
149	1	U1007	8M (1M x 8)	W25Q80DVZP	8-WSON (6X5 mm)			2.7 V ~ 3.6 V	Integrated Circuits	Winbond Electronics	W25Q80DVZPIG
150	1	U1011	93LC56B-I/OT	93LC56B	SOT-23-6				Integrated Circuits	Microchip Technology	93LC56B-I/OT
151	1	U1012	TUSB3410IRHB	TUSB3410	32-QFN				Integrated Circuits	Texas Instruments	TUSB3410IRHB
152	1	U1015	TPS2013AD	TPS2013A	8-SOIC				Integrated Circuits	Texas Instruments	TPS2013AD
153	1	U1020	4KBIT Eeprom	AT24C04	8-UDFN 2.0mm x 3.0mm	400kHz, 1MHz	45128	1.7 V ~ 3.6 V	Integrated Circuits	Atmel	AT24C04D-MAHM
154	1	U1021	MCDP2850	MCDP2850_DP_to_HDMI	64-BGA				Integrated Circuits	Megachip	MCDP2850
155	1	U1022	SST25VF080B-80-4I-SAE	SST25VF080B, SPI Flash, 8Mbits	8-SOIC				Integrated Circuits	Silicon Storage Technology	SST25VF080B-80-4I-SAE
156	1	U1023	24LC256T-I/SN	24LC256	8-SOIC			2.5V ~ 5.5V	Integrated Circuits	Microchip Technology	24LC256T-I/SN
157	0	U1024	USB - micro AB Pin 1 left	USB_MICRO_B	DNI				Connectors	Hirose	ZX62D-AB-5P8
158	1	Y2	24MHz	24MHz	4-SMD (2.50mm x 2.00mm)	-20°C ~ 70°C	30		Crystals & Oscillators	TXC CORPORATION	8Z-24.000MAAJ-T
159	3	Y3,Y502,Y503	12MHz	12MHz	4-SMD (2.50mm x	-20°C ~ 70°C	30		Crystals & Oscillators	TXC CORPORATION	8Z-12.000MAAJ

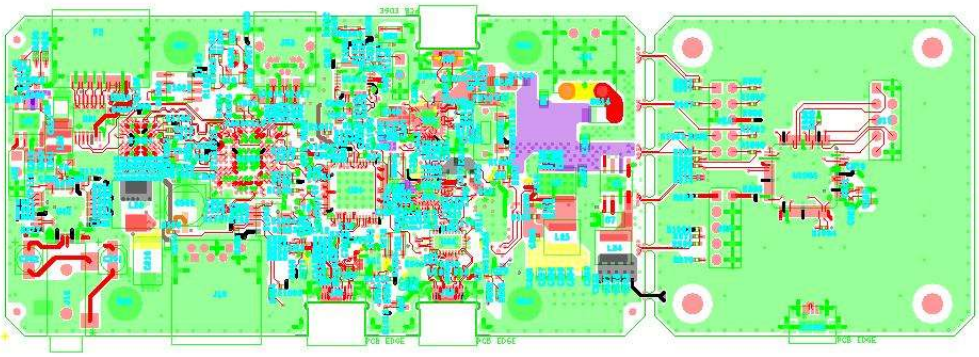
					2.00mm)						-T
160	2	Y501,Y504	27MHZ	27.000 MHz Crystal	4-SMD	20PF	50		Crystals & Oscillators	ECS Inc	ECS-270-20-33-TR
161	1	PCB							PCB BOARD	ANY	TID-01243

5.4. PCB Layout Recommendations

5.4.1. Layout Prints

To download the Layout Prints for each board, see the design files at http://www.ti.com/tool/tida-01243

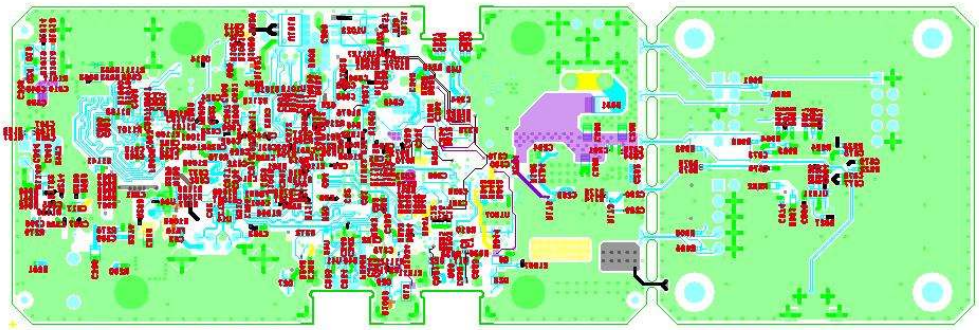
ART FILM - TOP



BOARD NAME:	BOARD REV:	REID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 1 - TOP SIDE		

ART FILM - TOP

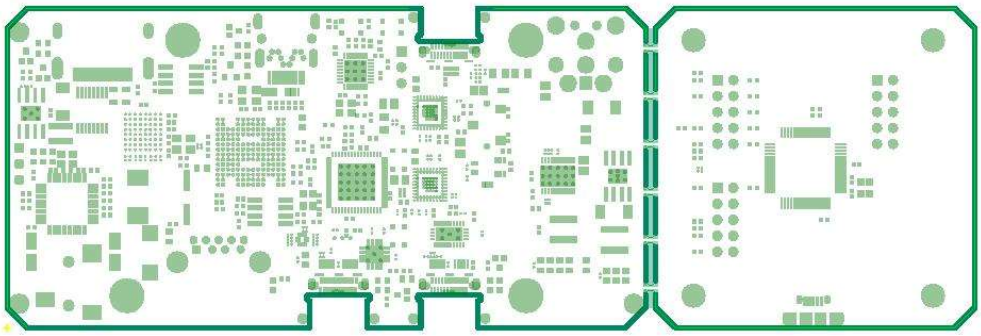
ART FILM - BOTTOM



BOARD NAME:	BOARD REV:	ASSY:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 10 - BOTTOM SIDE		

ART FILM - BOTTOM

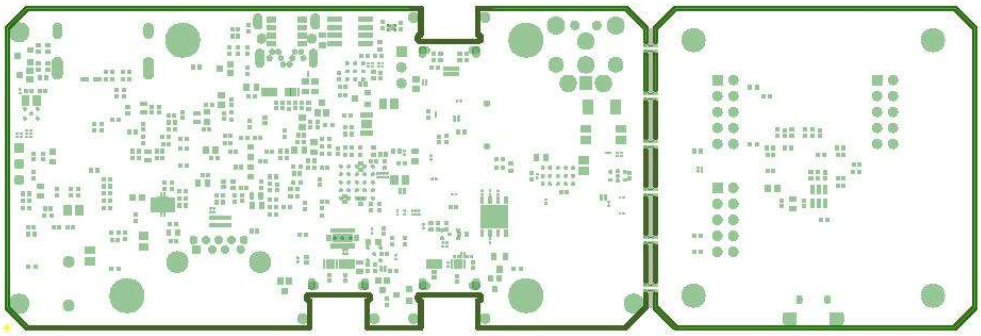
ART FILM - SMASK_TOP



BOARD NAME:	BOARD REV:	KAID:	JOB NUMBER:
USB TYPE C DOCK	3.0	16871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: SOLDERMASK TOP		

ART FILM - SMASK_TOP

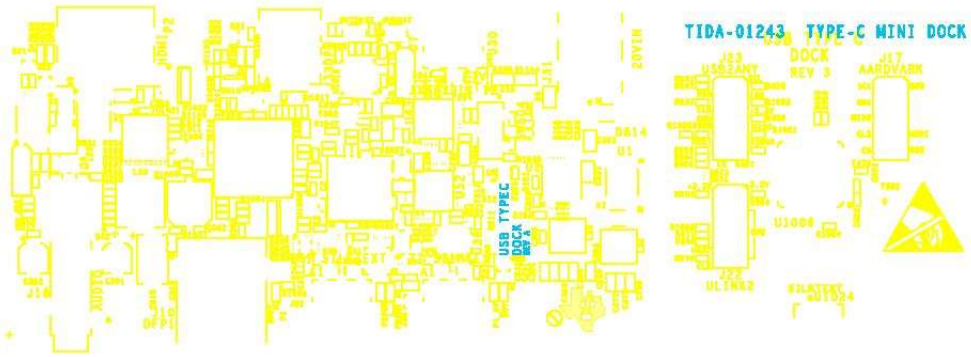
ART FILM - SMASK_BOT



BOARD NAME:	BOARD REV:	KNID:	JOB NUMBER:
USB TYPE C DOCK	3.0	16871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: SOLDERMASK BOTTOM		

ART FILM - SMASK_BOT

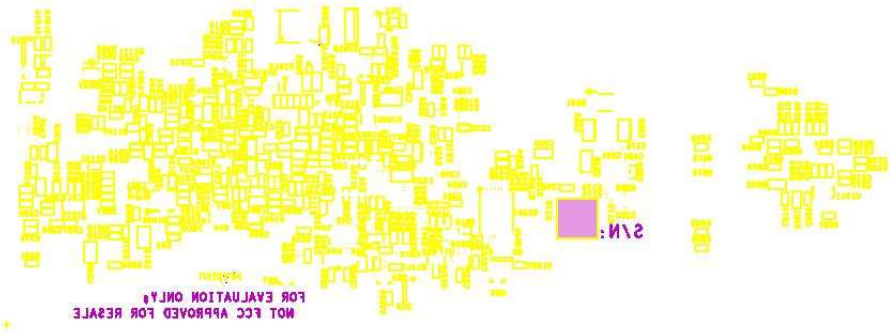
ART FILM - SILK_TOP



BOARD NAME: USB TYPE C DOCK	BOARD REV: 3.0	KSID: 16871	JOB NUMBER: 129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: SILKSCREEN TOP		

ART FILM - SILK_TOP

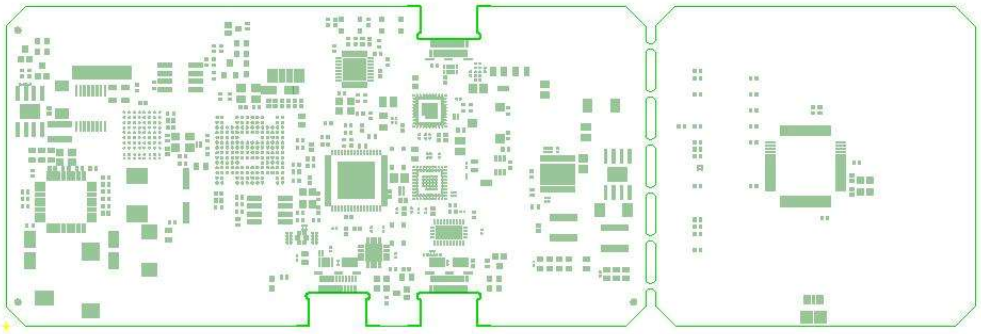
ART FILM - SILK_BOT



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: SILKSCREEN BOTTOM		

ART FILM - SILK_BOT

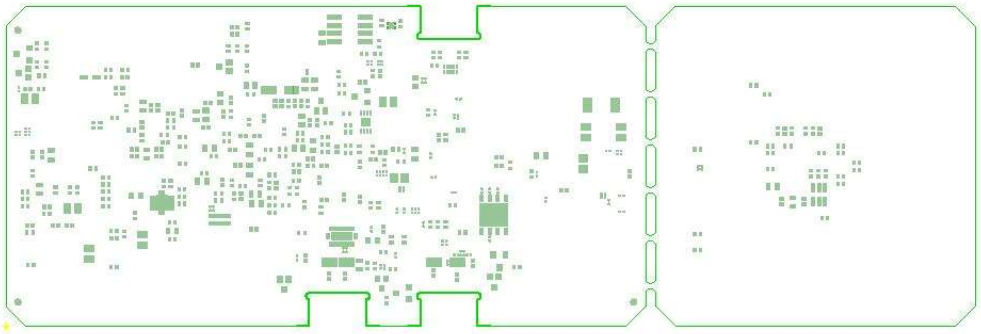
ART FILM - PMASK_TOP



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	16871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: PASTEMASK TOP		

ART FILM - PMASK_TOP

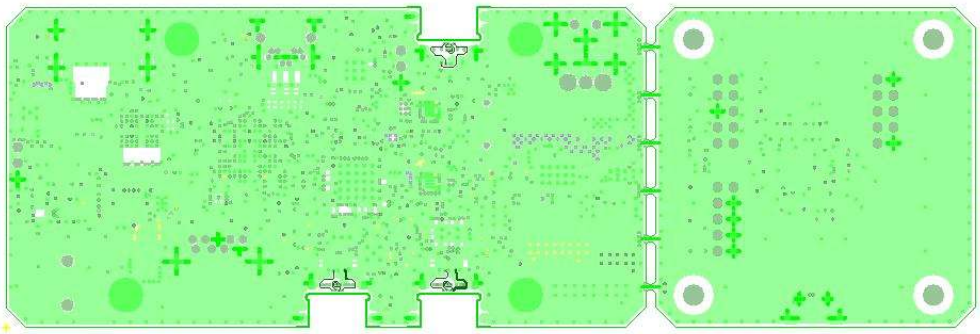
ART FILM - PMASK_BOT



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	16871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: PASTEMASK BOTTOM		

ART FILM - PMASK_BOT

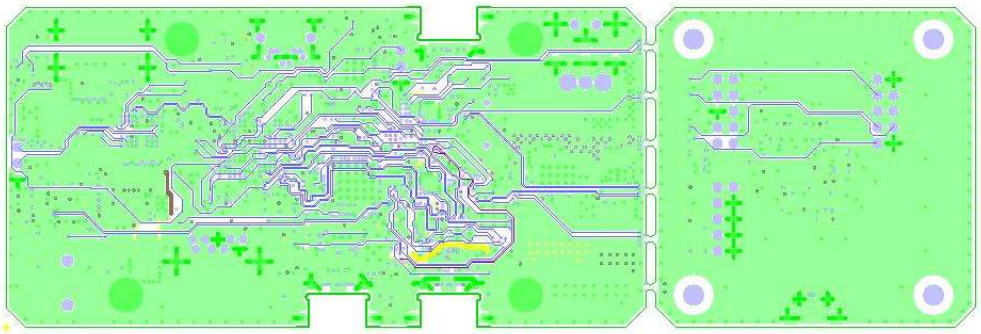
ART FILM - L2_GND



BOARD NAME:	BOARD REV:	RSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 2 - GND PLANE		

ART FILM - L2_GND

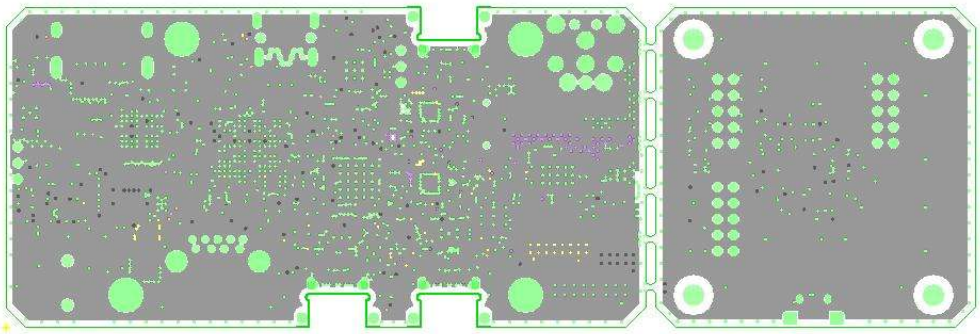
ART FILM - L3_SIG



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 3 - SIG		

ART FILM - L3_SIG

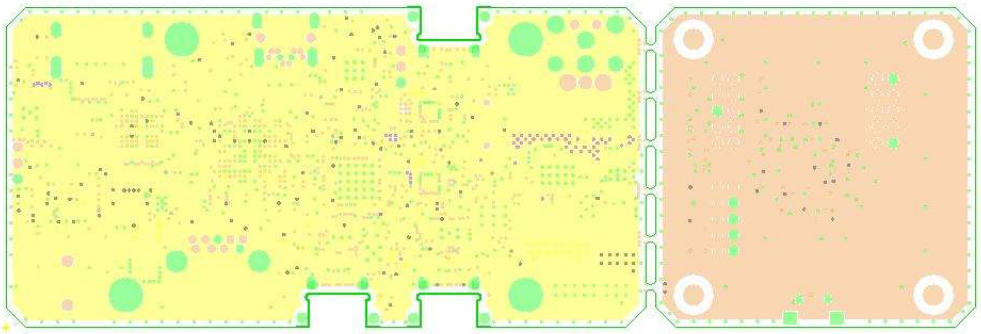
ART FILM - L4_PWR



BOARD NAME:	BOARD REV:	RSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 4 - 3P3V		

ART FILM - L4_PWR

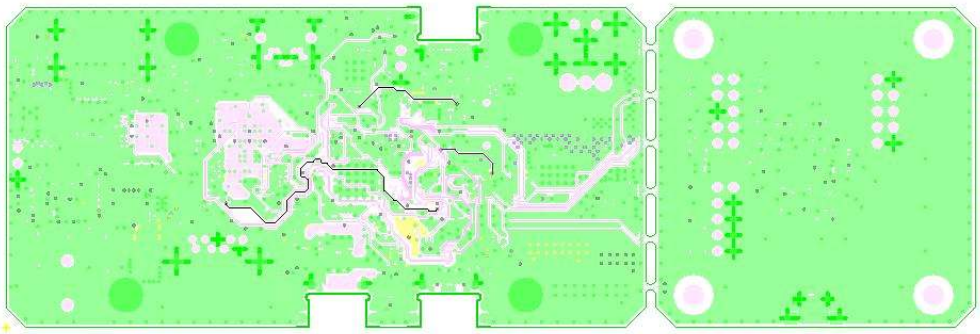
ART FILM - L7_PWR



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 5 - PWR		

ART FILM - L7_PWR

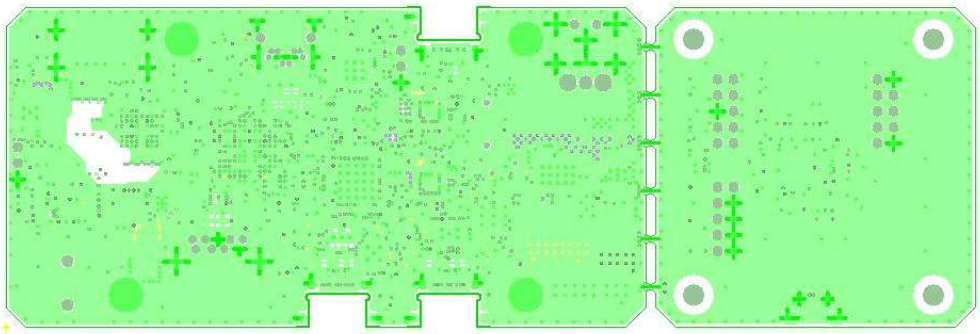
ART FILM - L8_SIG



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 8 - SIG		

ART FILM - L8_SIG

ART FILM - L9_GND



BOARD NAME:	BOARD REV:	KSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION: LAYER 9 - GND PLANE		

ART FILM - L9_GND

ART FILM - L5_VBUS_GND

BOARD NAME:	BOARD REV:	RSID:	JOB NUMBER:
USB TYPE C DOCK	3.0	18871	129072
ALL ARTWORK LAYERS VIEWED FROM TOP	LAYER DESCRIPTION:		

ART FILM - L5_VBUS_GND

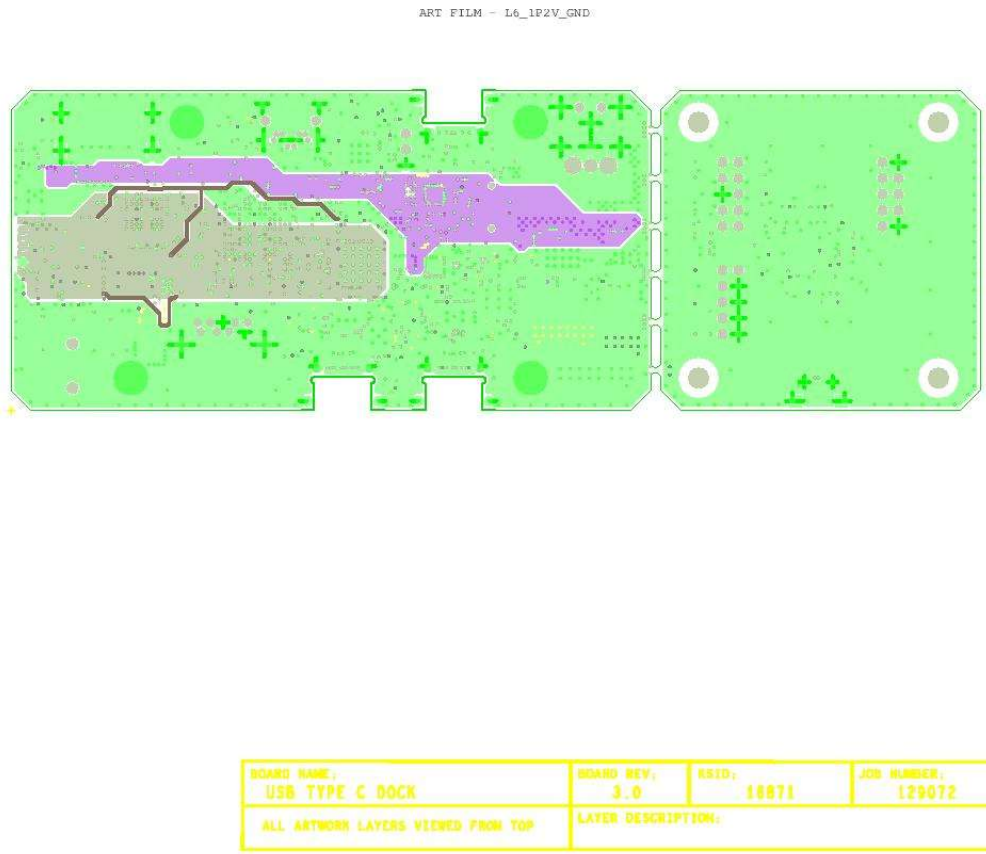


Figure33: TIDa-01243 Layout

5.5. Altium Project

To download the Altium project files for each board, see the design files at
http://www.ti.com/tool/tida-01243

5.6. Layout Guidelines

Figure34: To insert a caption, right click picture > Insert Caption

5.7. Gerber files

To download the Gerber files for each board, see the design files at http://www.ti.com/tool/tida-01243

5.8. Assembly Drawings

To download the Assembly Drawings for each board, see the design files at http://www.ti.com/tool/DESIGNNUMBER

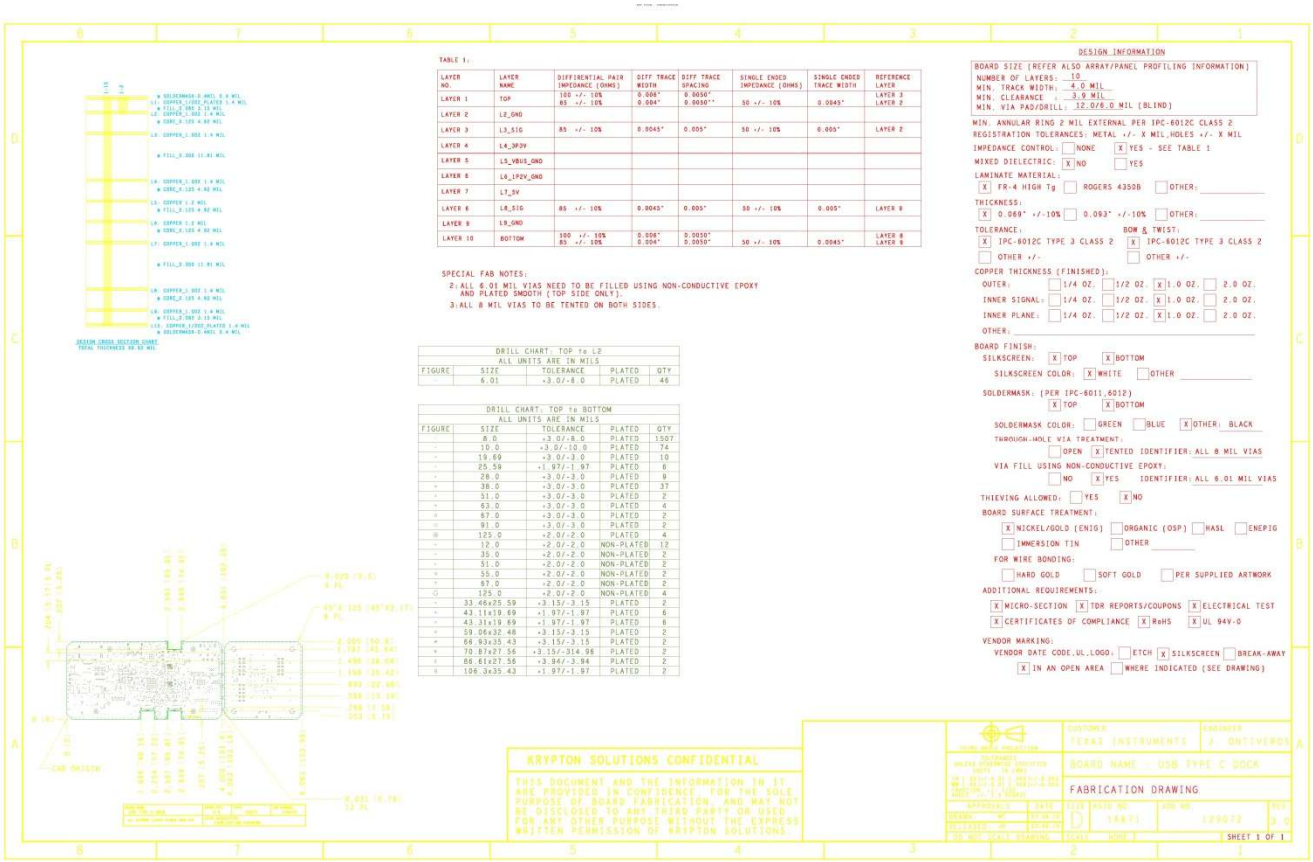


Figure35: To insert a caption, right click picture > Insert Caption

5.9. Software Files

To download the software files for this reference design, please see the link at http://www.ti.com/tool/tida-01243

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