Schematic

DH electronics GmbH

Project: Avenger

PCB number: 588-100

Date: 14.12.2018 Created: MH

Notes:

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I2C4 Addresses:
PMIC STPMU1A: 0110011 = 0x34
MIPI CSI Bridge: 0010100 = 0x15
HDMI Transmitter: 1111010 = 0x7A
EEPROM (MAC Address): 1010011 = 0x54
# Preliminary Energy Balance

*Supply with the DC-Jack Power Connector*

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</table>
1% 43k Ohm at RT sets fsw to 1.192MHz

Design Guide: Layout Recommendations available in the datasheet

Connect a capacitor from SS to GND to program the soft start time. If this pin is open, the regulator uses the internal soft start time.

**PIN SS:**

- 15nF ~ 3ms soft start time

**PIN RT:**

X5R or X7R

Input Step-Down Converter

8 V to 18 V -> 5 V / 4 A

Input Filter

Power-Jack
Vin = 8 V to 18 V

Input Filter
**VBUS_DET:**
For self-powered applications with a permanently attached host, this pin must be connected to a dedicated host control output, or connected to the 3.3 V domain that powers the host (typically VDD33).

**CFG_SEL0[0] = 0 and CFG_SEL1[1] = 0 defines default configuration:**
- Strap options enabled
- Self-powered operation enabled
- Individual power switching
- Individual over-current sensing

**NON_REM0[0] = 0 and NON_REM1[1] = 0 indicates all ports as removable**

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This port is connected to the Expansion Connector with its own +5V supply.
Current Sensing and Limiting

FLGA and FLGB are set LOW during an overcurrent or thermal shutdown.

USB HOST

2x USB 2 Standard-A connector

USB OTG

USB 2 Micro-AB connector 8 mA USB OTG compliant

Do not place Reverse current blocking in case of no power supply over the power jack.
Do not place a resistor to the Low-Speed Connector to avoid a short circuit in case someone ties PONKEY#_LSC of the Low Speed Expansion Connector to VDD while pushing the power button.

Reset Button

Power Button
The high speed signal pairs (CLKP1, CLKN1), (DATA1P1, DATA1N1) and (DATA2P1, DATA2N1) should be routed as balanced transmission lines with a characteristic differential impedance (Z_0) of 100 Ohm and matched in length.

**Design Guide:**
- **LDO_TST, TDI, TMS, TCK and TDO** are Test interfaces for ST.
- **INT:** This is a status showing reception of short packet in CSI stream which needs to be cleared by user.
- **ERROR:** This is an accumulated status of all errors found in the chip. The individual status can be checked via I2C.

**Chip Shutdown** is connected GPIO to fit the power-up sequencing requirements.

**MIPI CSI Bridge**

Design Guide:
- The CSI-2 Clock lanes must be in the middle of the 2 data lanes
- The PCLK, HSYNC, VSYNC must be routed in the middle of the output data bus for skew management reasons.

I2C Address
- Address: 0b00101000 = 0x14
- Write: 0b00101000 = 0x28
- Read: 0b00101001 = 0x29

**U5**
- STMIPID02-VFBGA
- VFBGA49
- DATA1P2A1
- TCKA2
- TDOA3
- POR_TSTA4
- EXTCLK A6
- DATA1N2B1
- CLKP2B2
- TDIB3
- POR_SGNB4
- D10 A5
- D11 B5
- D8 B6
- D9 B7
- DATA2P1C1
- CLKN2C2
- TMSC3
- VDDE_1V8_1C4
- GNDE0C5
- VDD_1V2D4
- GND_1V2D5
- DATA1P1E1
- CLKN1E2
- GND_PHYE3
- ERROR E4
- VSYNC E5
- D3 E6
- D2 E7
- DATA1N1F1
- VDDOUT_LDO F2
- XSDNF3
- INT F4
- SCL F5
- D0 G7
- VDDIN_LDOG1
- GNDE_LDOG2
- VDDE_1V8_0G3
- HSYNC G4
- PCLK G5
- SDA G6
- D0 G7
- VDDOUT_LDO F2
- XSDNF3
- INT F4
- SCL F5
- D0 G7
- VDDIN_LDOG1
- GNDE_LDOG2
- VDDE_1V8_0G3
- HSYNC G4
- PCLK G5
- SDA G6
Depending on the signaling level at pin SEL, the regulator delivers 1.8 V (SEL = HIGH) or 2.9 V (SEL = LOW, VSD_REF < 1 V).

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**Diagram Details:**

- **PCB Number:** R06
- **Revision:** HS00007
- **Project:** Avenger
- **Description:** SD 3.0 switch
- **Variant:** 588-100
- **Page:** 11 of 14
VDDI Trace Requirements
- Resistance < 2 Ohm
- Inductance < 5 nH

Design Guide
- Core voltage 2.7 - 3.6 V
- VCC (VCCQ) voltage, either 1.7 - 1.95 V or 2.7 - 3.6 V

Core voltage 2.7 - 3.6 V
VCC (VCCQ) voltage, either 1.7 - 1.95 V or 2.7 - 3.6 V

Design Guide
- The design guide is available at the datasheet chapter 4

Project: Avenger
Description: eMMC
PCB number: 588-100
Revision: R06
### Changelog:

**588-100 R01 -> R02**
- MH/07-08-2018: Included footprint for the DHCOR Module and updated the pin assignment with the current version of the DHCOR Module.
- MH/21-08-2018: Replaced Solder with a CR120 battery connector.
- MH/22-08-2018: Added Testpoints for needled adapter and added new connector for the AP2204.
- MH/27-08-2018: Connected PAL_0150_WKUP1 to Expansion Connector.
- MH/03-09-2018: Added the changes recommended by the review.
- MH/04-09-2018: Added parts to the correct variant in the part manager.

**588-100 R02 -> R03**
- MH/07-09-2018: Changed pinning of HDMI connector in order to achieve a smoother layout.
- MH/10-09-2018: Added net-names and indicators for the differential pairs at USB.
- MH/12-09-2018: Added testpoints for HDMI.
- MH/13-09-2018: Added a 10kΩ pull-up resistor at D1 pins.
- MH/17-09-2018: Added a 10kΩ pull-up resistor on JTAG. Pin 9 to GND.
- MH/17-09-2018: Switched the regular GPIOs on the Late Speed Expansion Connector with the GPIO which are capable of CAN/DAC to have more functions available to the user. Corrected project name to "STM32MP15 96Boards".
- SH/17-09-2018: Added R135, R187, R27 and R146 as "Do not place".
- SH/19-09-2018: Added C134, R137, R139, R190, R192, U14, TP4, TP5.
- MH/25-09-2018: Switched the Port 1 with Port 3 of the USB-Hub to avoid the crossing between them on the layout and inverted some pinning on the decoder and inducer on the USB connectors.
- MH/25-09-2018: Connected the mechanical pins of the HDMI connector to GND and corrected the description of the HDMI switch (Switch "01" means "0") and updated symbol of the LAN-Transformer.

**588-100 R03 -> R04**
- MH/21-10-2018: Corrected wrong cosmetics of HDMI connector and set the battery connector to be placed in the variant HS00007.

**588-100 R04 -> R05**
- MH/15-10-2018: Updated DH-part LD0037 to LD0037-R01 which is the same LED with some additional alternative LEDs recomended by BMK. In the schematic these LEDs are LD6, LD10, LD14 and LD17. Updated ordering information of U11.
- Changed C132 and C133 to new type due to PCN of the part used before.

**588-100 R05 -> R06**
- MH/12-10-2018: R06 is the updated version for the first order (about 200 pcs) of the embedded World-Set U11 and its peripherals to DNP (NRF52840) because of the wrong connection to 3.3V instead of 1.8V. Changed manufacturer of C1 and C6 to Vishay.
- Set C6 to DNP and placed C1 instead. Updated ordering information of U11.
- Changed G4 to 100kΩ instead of 10kΩ and set it to be placed in standard. Set X12 to do not place. Changed Project name.

**588-100 R06 -> R07**
- Change Project name.