

## VAR-DT8MCUSTOMBOARD



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04.	POWER, RTC, BOARDID
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### Disclaimer:

Schematics are for reference only.  
Variscite LTD provides no warranty for the use of these schematics.  
Schematics are subject to change without notice.

### Revision History

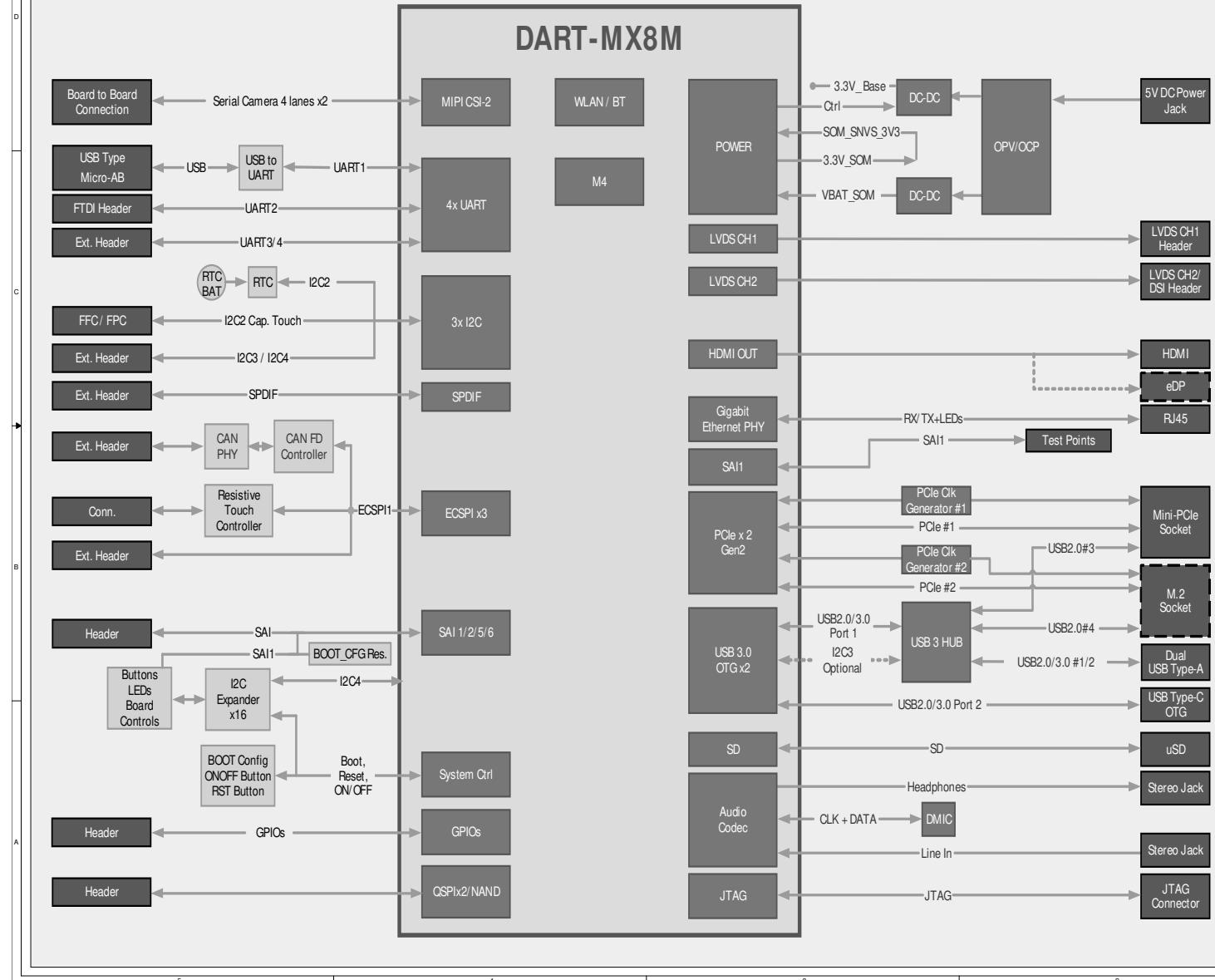
Document	Carrier	Description
1.0	2.0	<p>Changes from DOC 1.9 Carrier 1.4D include:</p> <ul style="list-style-type: none"><li>* Optimisation for DART-MX8MP:<ul style="list-style-type: none"><li>- Added external ethernet PHY</li><li>- Control IOs used on previous version over SAI1 now controlled via I2C expander</li><li>- Added DS1 header option for DART-MX8MP stock item exposed pins; Pinout compatible to Symphony J7+J8</li><li>- Native USB ID usage added important note</li><li>- USB Type C active discharge replaced with bleeder</li><li>- USB Type C crossbar differential switch simplified.</li><li>- Removed DT8M NAND option</li><li>- Added QSPI header J41 - located in location of J25</li><li>- J27 &amp; J28 pinout aligned to Symphony</li><li>- Added PD on J1.38 for BSP CustomV2.0 signal.</li><li>- Added additional CAN PHY on iMX8MP</li><li>- U44 footprint modified from SOIC to DFN</li><li>- SD card power switch modified</li><li>- Main power switch type align to Symphony</li><li>- DART-MX8M DP connector replaced with 40pin eDP REF. design</li><li>- HDMI path simplified</li><li>- PINMUX page deleted - reference to XLS</li><li>- Added reference design for 12Mb/s CAN-FD transceiver</li><li>- Added M.2. PCIe reference design</li><li>- Add option on bottom to route PCIe port 1 to M.2 connector</li><li>- Replace boot config drivers to 3state type</li><li>- Replace MCP2518 crystal to 40MHz and connect RX_INT</li><li>- Updated Block Diagrams</li><li>- VCC_SOM Increased to 3.8V (R145 changed to 18K)</li><li>- D9, C58 Removed. VCC_BASE_3V3 goes up just after NVCC_3V3</li></ul></li></ul>
1.1	2.1	<ul style="list-style-type: none"><li>* GPLED4 controlled via FET Q14 to support DART-MX8M-PLUS 1.8V voltage level</li><li>* Updated GPIO expanders U56,U57 footprint</li><li>* Added note for U53 recommended P/N</li></ul>
1.2	3.0	<ul style="list-style-type: none"><li>* Due to EOL:<ul style="list-style-type: none"><li>- Changed BOM P/N: U23,U45,U46,U56,U59,U57</li><li>- Added optional resistors R291-R294</li><li>- Changed Assembly: U31 Not assembled, R167 assembled</li><li>- Changed Ethernet PHY to ADIN1300: Changed Ethernet2 schematics, Added R295</li><li>* Changed J5 P/N and schematics to support ADIN1300 PHYs</li><li>* Updated comments on schematic nets</li><li>* R94-R97, R114-R117 assembled with Ferrite Bead</li></ul></li></ul>
1.3	3.0A	<ul style="list-style-type: none"><li>* Due to EOL: U60,U62 changed to NFL18ZT207H1A3D</li><li>* Due to Allocation Problems: U45,U59 changed to SN65HVD232QDR</li></ul>

Title 01. Cover			
Size A3	Document Number VAR-DT8MCUSTOMBOARD	Project VAR-DT8MCUSTOMBOARD	Rev 3.0A R1.3
Designer: Monday, April 04, 2022	Approved By: Sheet 1 of 17		

## 02A. Block Diagram – DART-MX8M

### VAR-DT8MCustomBoard V2.x

Doc rev 1.0



#### I2C BUS ADDRESS:

I2C1: Internal to SOM  
I2C2: PU – 10K on U8  
10K on custom  
0x54 BOARD ID EEPROM Page0  
0x55 BOARD ID EEPROM Page1  
0x56 BOARD ID EEPROM Page2  
0x58 CAPACITIVE TOUCH CTRLR  
0x3D USB-C CC Logic PTNS150AHXMP  
0x3C CSI PI Camera (IVB) OV5640

I2C3: PU – 5K on SOM  
0x60 SOM - Int. power ctrl.  
0x2D USB3 HUB  
0xXX Header J12

I2C4: PU – 10K on U8  
10K on custom  
0x3C CSI PI Camera (IVB) OV5640  
0xXX Header J12  
0xXX mPCIe J23 & J32

#### Important Notes:

1. Length match for HS signals according to SOM DS
2. USB routed as 90 ohm Diff pairs
3. PCIe/SATA routed as 85 ohm Diff pairs
4. LVDS routed as 100 ohm Diff pairs
5. Other fast changing signals routed as 50 ohm



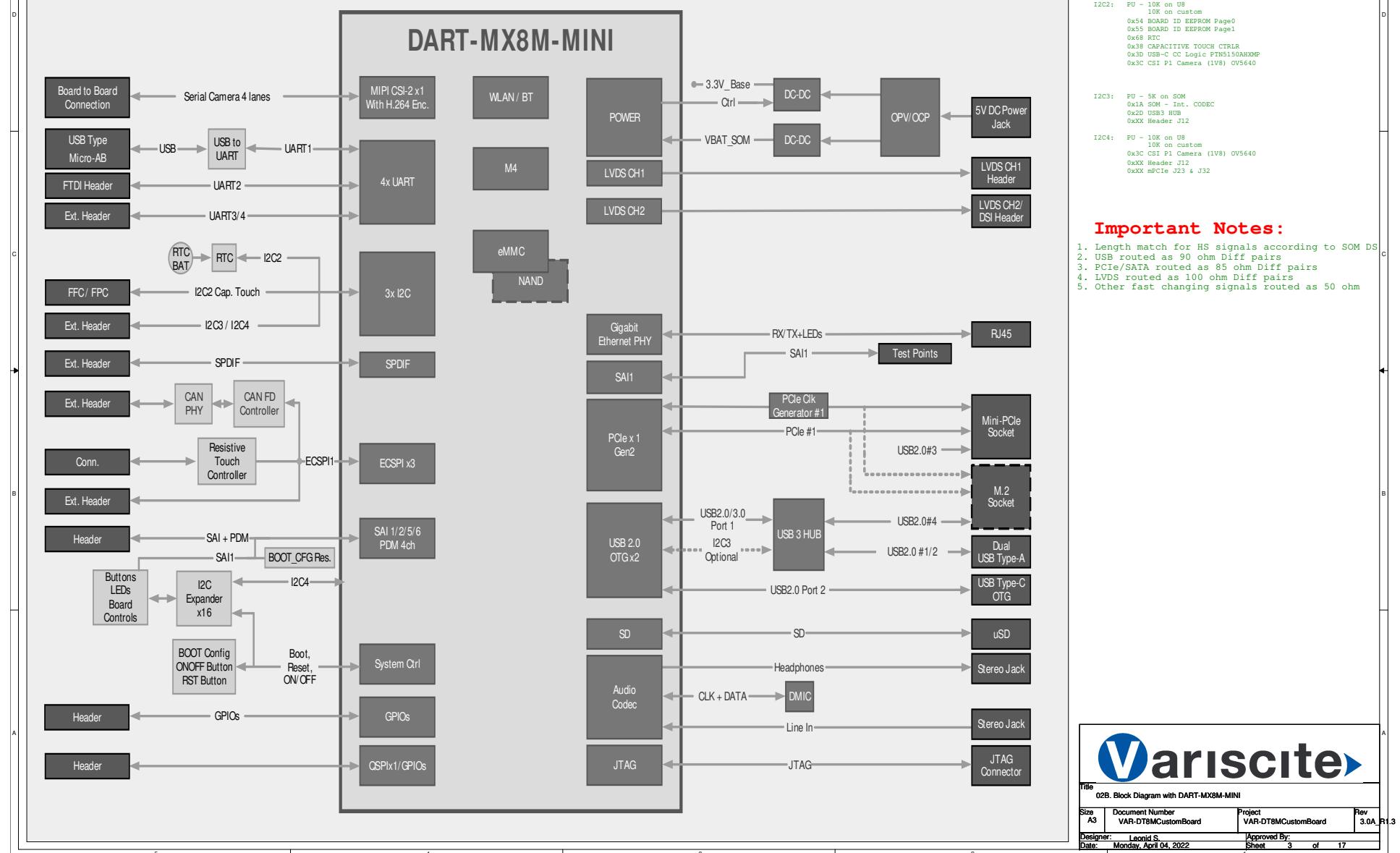
Title: 02A. Block Diagram with DART-MX8M

Size	Document Number	Project	Rev
A3	VAR-DT8MCustomBoard	VAR-DT8MCustomBoard	3.0A
Date:	Monday, April 04, 2022	Approved By:	Sheet 2 of 17

## 02B. Block Diagram – DART-MX8M-MINI

### VAR-DT8MCustomBoard V2.x

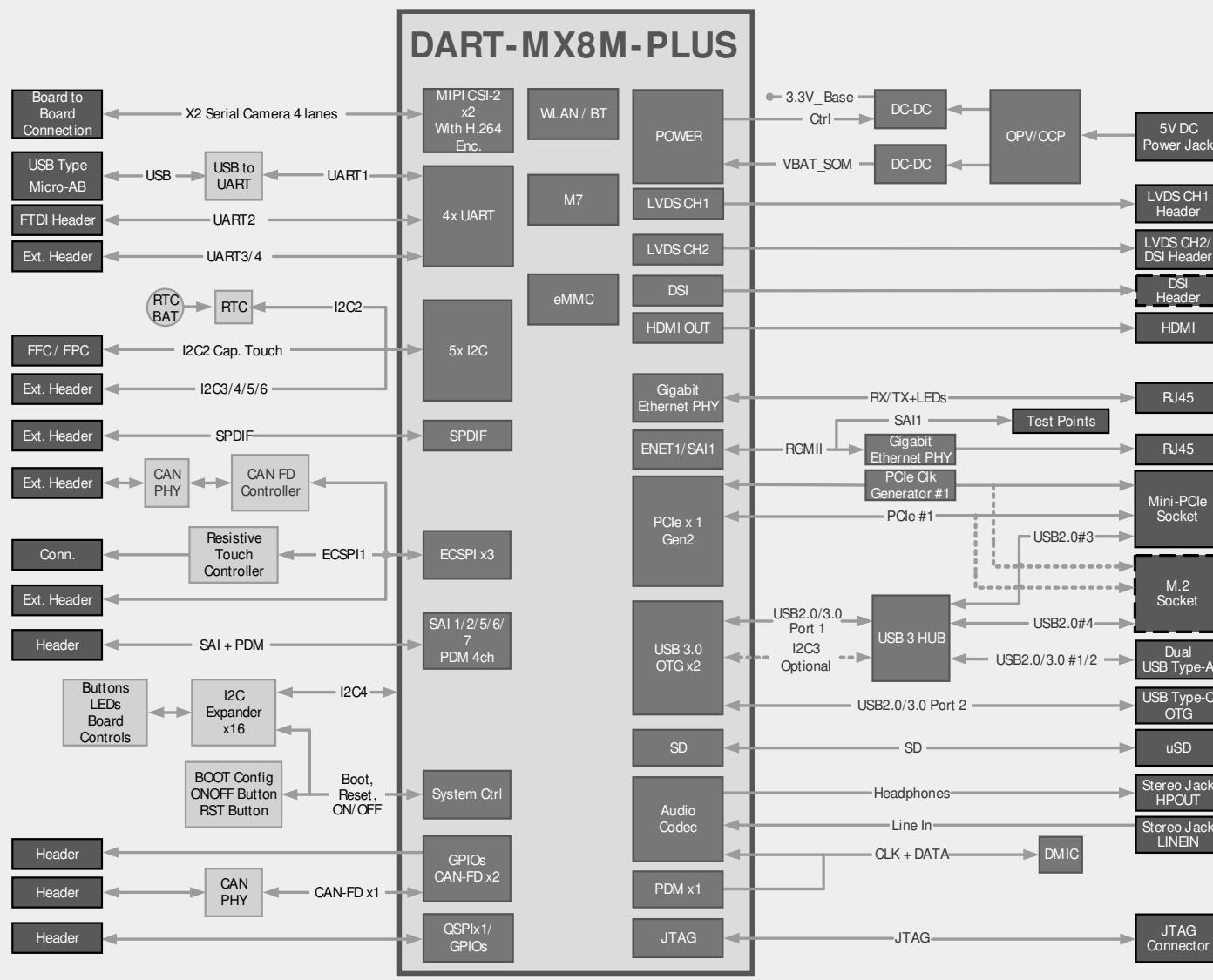
Doc rev 1.0



## 02C. Block Diagram – DART-MX8M-PLUS

### VAR-DT8MCustomBoard V2.x

Doc rev 1.1



#### I2C BUS ADDRESS:

I2C1: Internal to SOM  
I2C2: PU – 10K on U8  
10K on custom  
0x54 BOARD ID EEPROM Page0  
0x55 BOARD ID EEPROM Page1  
0x56 BOARD ID EEPROM Page2  
0x58 CAPACITIVE TOUCH CTRLR  
0x3D USB-C CC Logic PTNS150AHXMP  
0x3C CSI PI Camera (IVB) OV5640

I2C3: PU – 5K on SOM  
0x2D USB3 HUB  
0xXX Header J12  
I2C4: PU – 10K on U8  
10K on custom  
0x3C CSI PI Camera (IVB) OV5640  
0xXX Header J12  
0xXX mPCIe J23 & J32

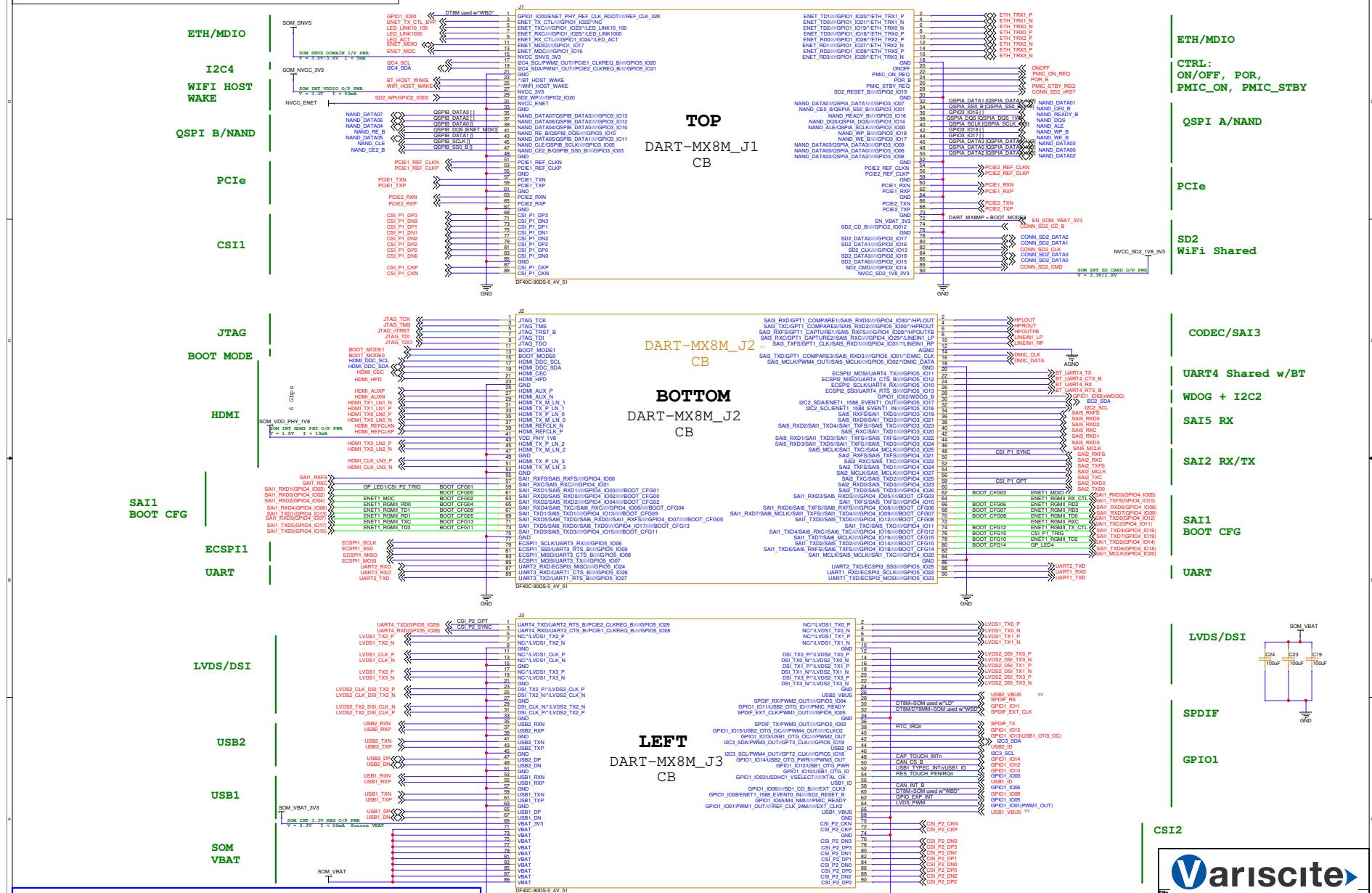
#### Important Notes:

- Length match for HS signals according to SOM DS
- USB routed as 90 ohm Diff pairs
- PCIe/SATA routed as 85 ohm Diff pairs
- LVDS routed as 100 ohm Diff pairs
- Other fast changing signals routed as 50 ohm

02B. Block Diagram with DART-MX8M-MINI			
Size	Document Number	Project	Rev
A3	VAR-DT8MCustomBoard	VAR-DT8MCustomBoard	3.0A 21.3

Designer: Leonid S. Date: Monday, April 04, 2022 Approved By: Sheet 4 of 17

03A - DART-MX8M Connectors

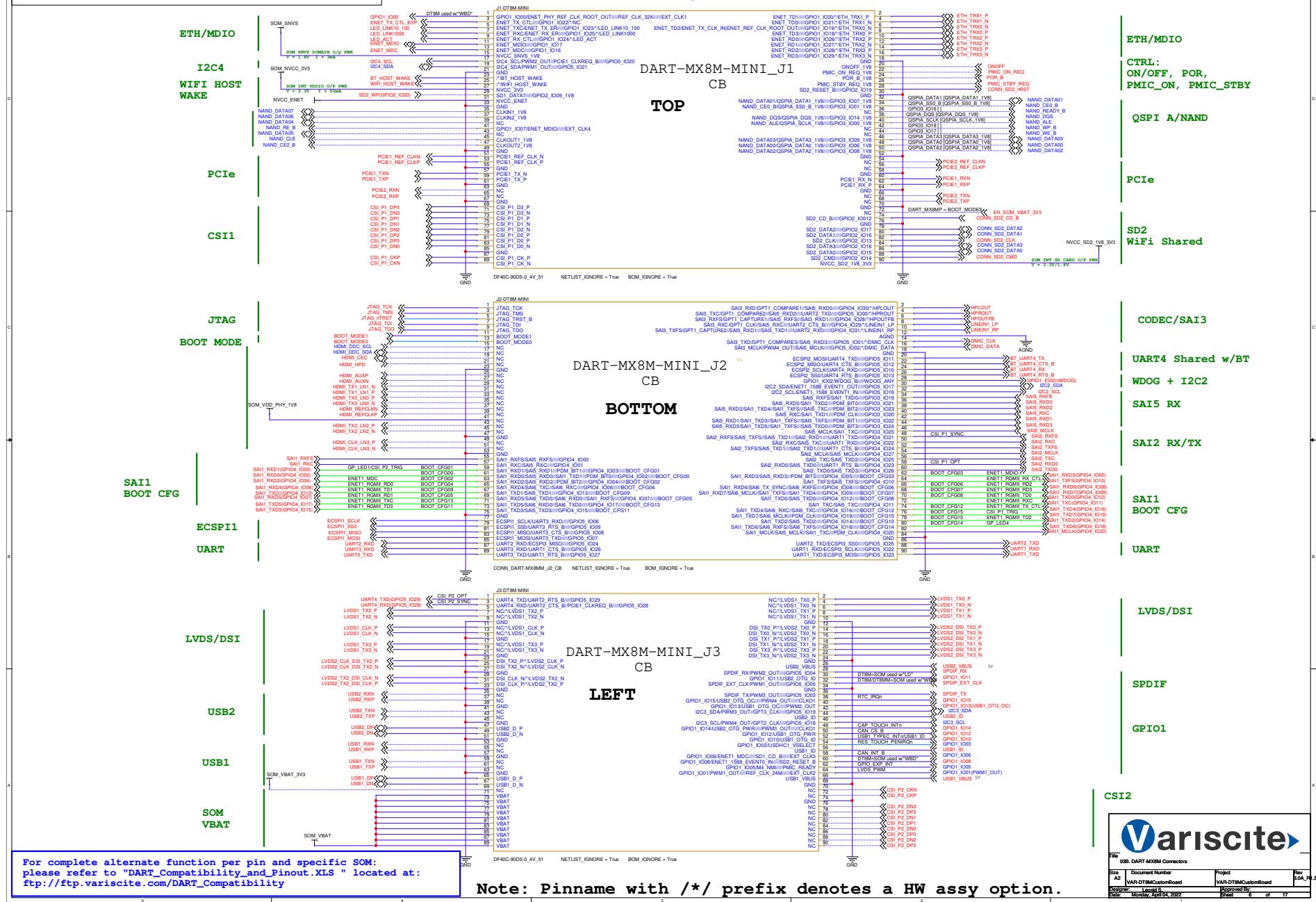


For complete alternate function per pin and specific SOM:  
please refer to "DART\_Compatibility\_and\_Pinout.XLS" located at  
[ftp://ftp.variscite.com/DART\\_Compatibility](ftp://ftp.variscite.com/DART_Compatibility)

Note: Pinname with /\*/ prefix denotes a HW assy option.

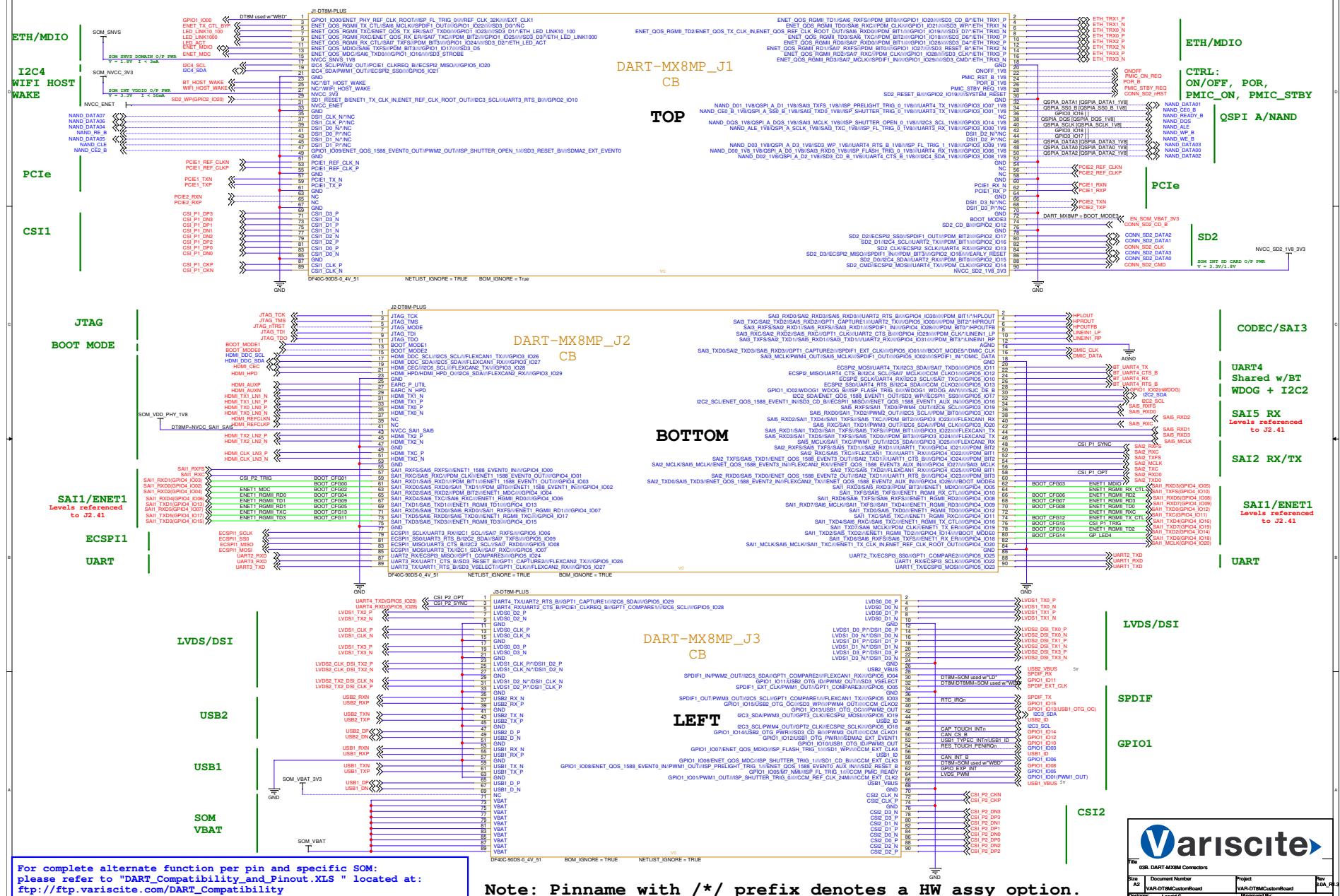
03B - DART-MX8M-MINI Connectors

\*\*\* Dotted nets - Functionality differ from DART-MX8M. \*\*\*



03C - DART-MX8M-PLUS Connectors

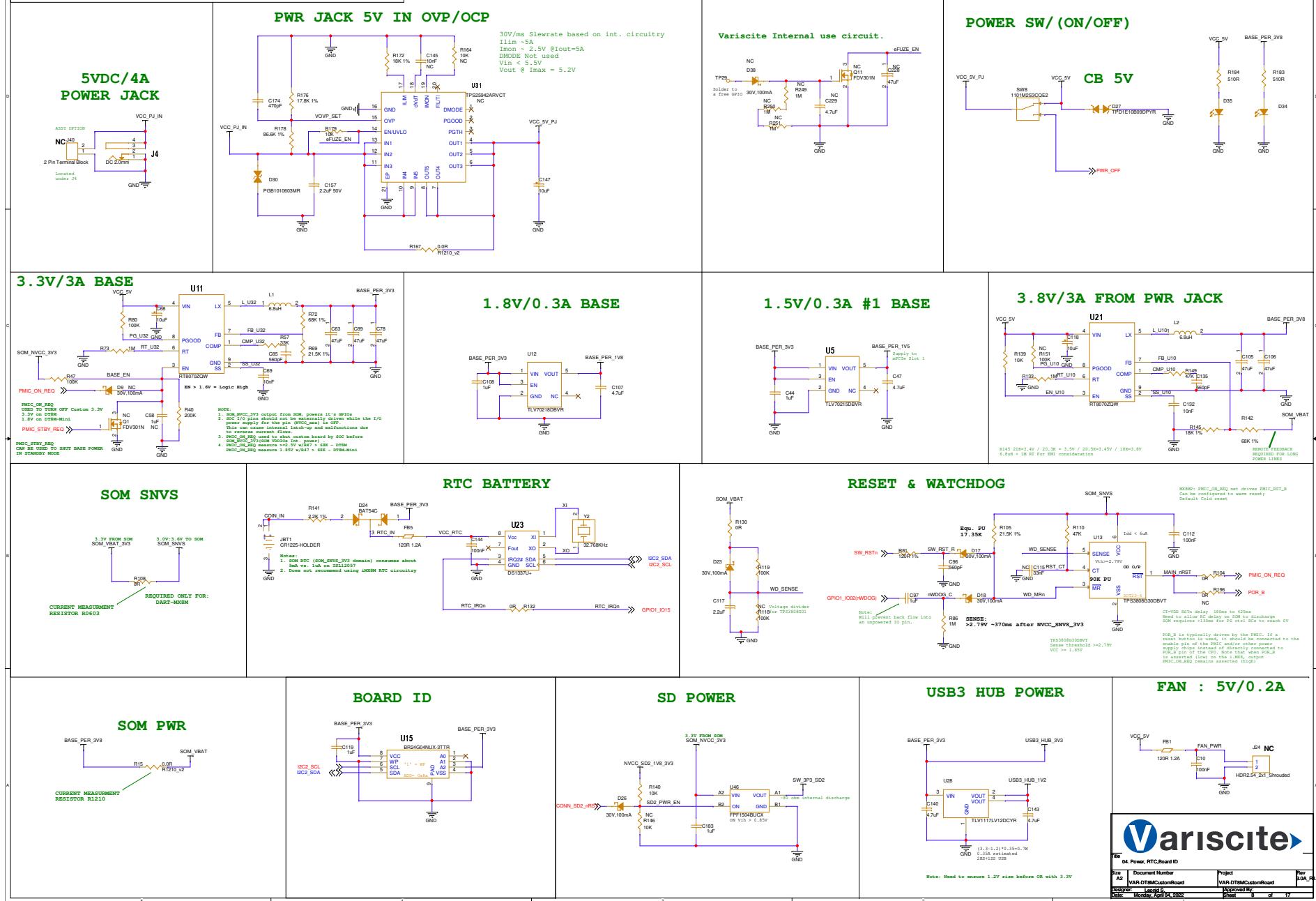
\*\*\* Dotted nets - Functionality differ from DART-MX8M. \*\*\*



For complete alternate function per pin and specific SOM:  
please refer to "DART\_Compatibility\_and\_Pinout.xls" located at:  
[ftp://ftp.variscite.com/DART\\_Compatibility](ftp://ftp.variscite.com/DART_Compatibility)

Note: Pinname with /\*/ prefix denotes a HW assy option.

#### **04. Power, RTC, Board ID**



## 05. ETH, uSD, AUDIO, MIPI-CSI

### uSD CARD

SDR104

#### LAYOUT NOTE:

Place close to SOM connector

DDR 50 MHz

CONN\_SD2\_CLK

CONN\_SD2\_CD\_B

CONN\_SD2\_CD\_N

CONN\_SD2\_DATA1

CONN\_SD2\_DATA2

CONN\_SD2\_DATA3

CONN\_SD2\_CMD

CONN\_SD2\_CLK\_R

CONN\_SD2\_VDD

CONN\_SD2\_VSS

CONN\_SD2\_VSH

CONN\_SD2\_VTH

CONN\_SD2\_VTL

J9

CD

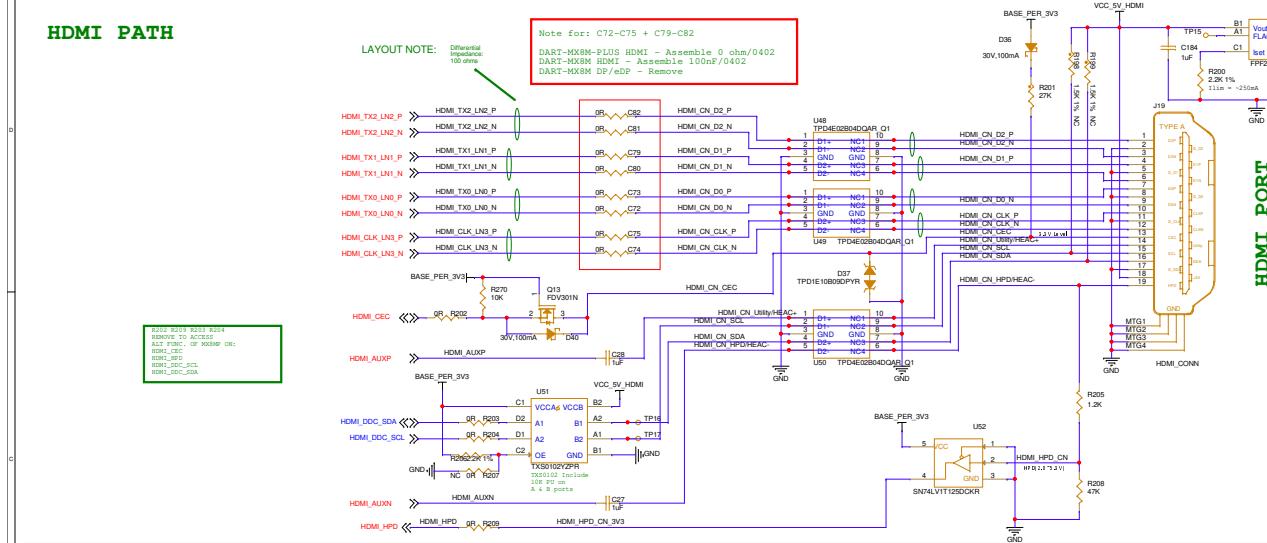
GND

uSD Connector

GND

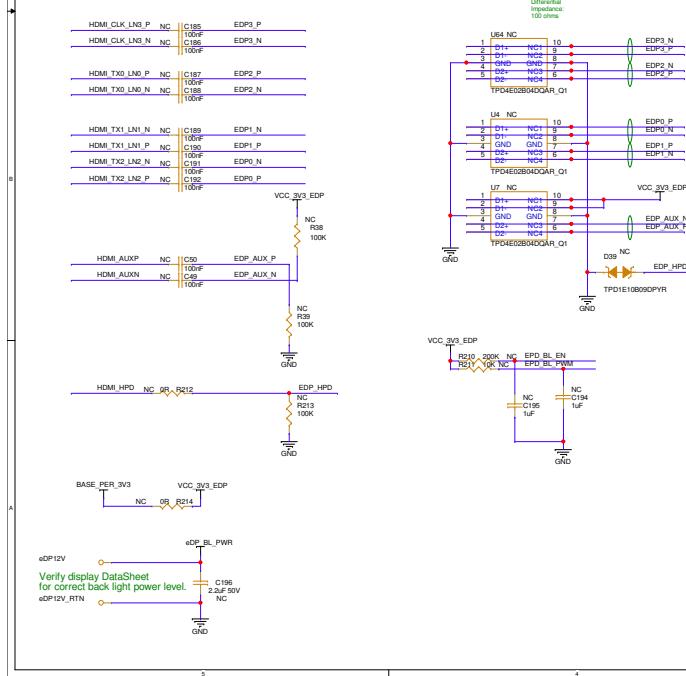
06. HDMI, eDP - DART-MX8M-PLUS Optimised

HDMI PATH



DART-MX8M eDP/DP PATH - [Reference Design] LAYOUT NOTE

IMX8M REQUIRES CROSS BETWEEN LANE0 & LANE2 !

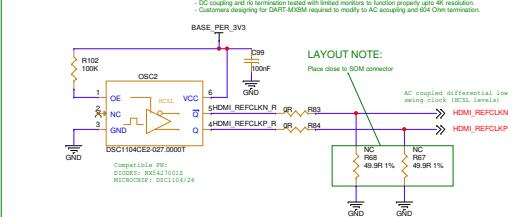


## DART-MX8M Notes and required circuitry:

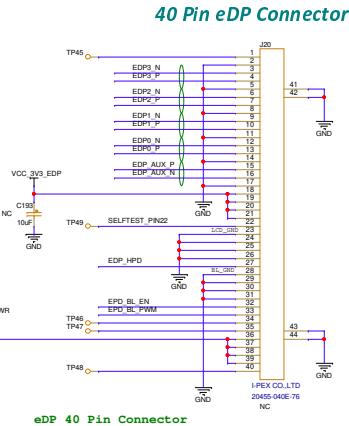
**NOTE :**

MX8M CAN CONNECT DIRECTLY TO  
HDMI\_CN\_SCL & HDMI\_CN\_SDA  
HDMI\_CN\_CEC  
HDMI\_CN\_HPD

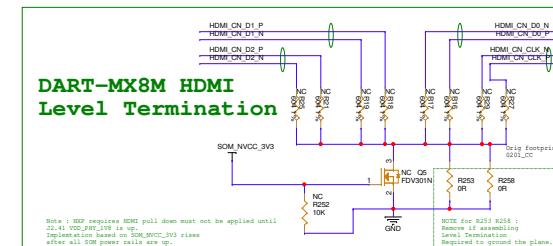
HDMI REFCLK



DART-MX8M HDMI  
Level Termination



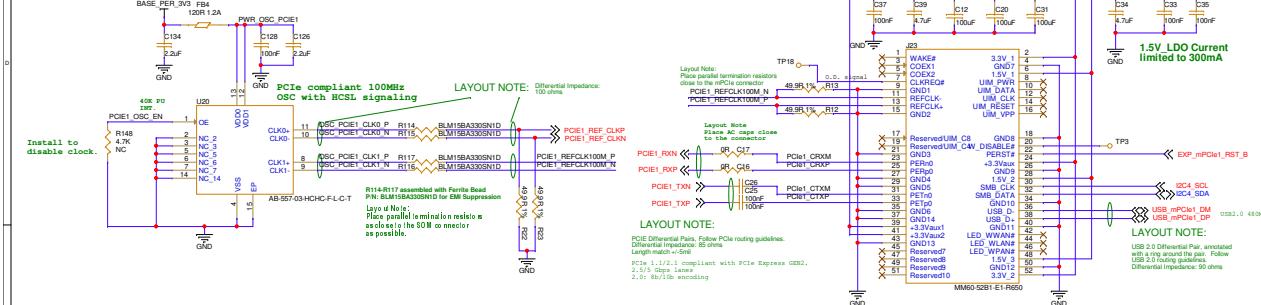
Board Connector: IPEX 20455-040E-76 (44 Pin)  
Cable: IPEX 20453-040T-11 Assembly  
Display Type: B156ZAN03.1 (H/W:0A)



07. PCIe, QSPI, MIPI-DSI, USB DEBUG

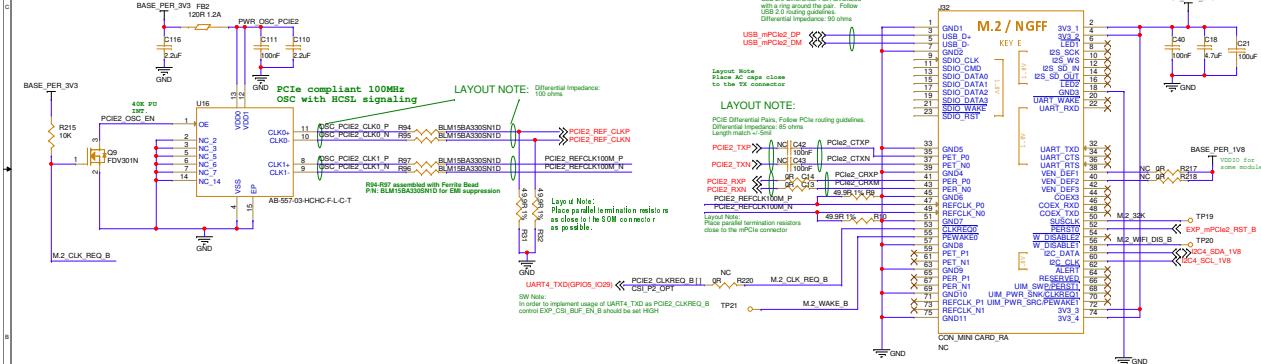
mPCIexp CS

PCIe CLK DIST.

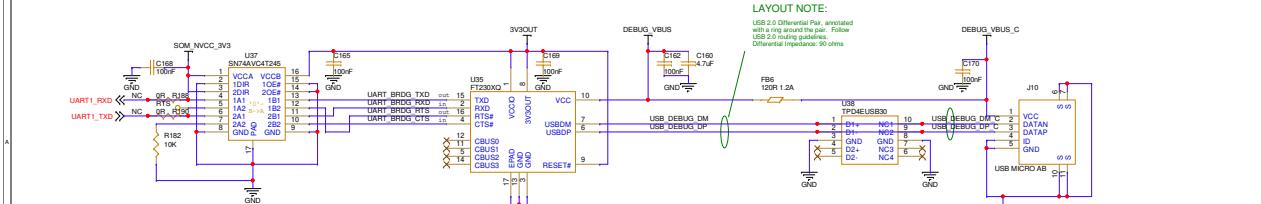


## M.2. ON PS - [Reference Design]

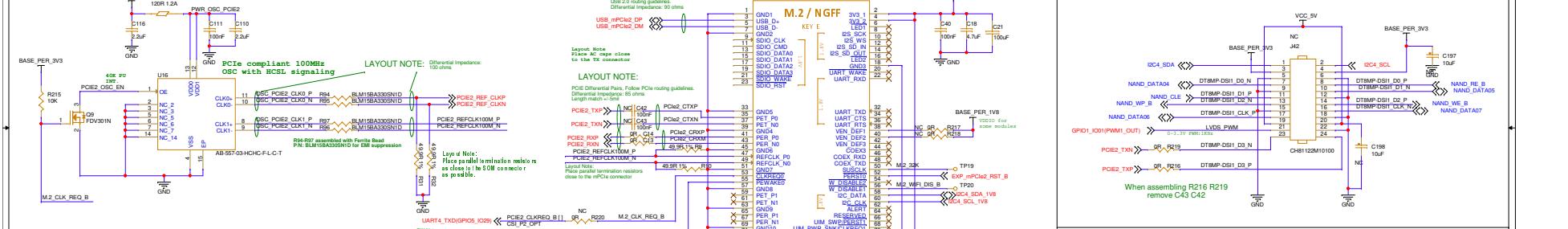
PCIe CLK DIST.



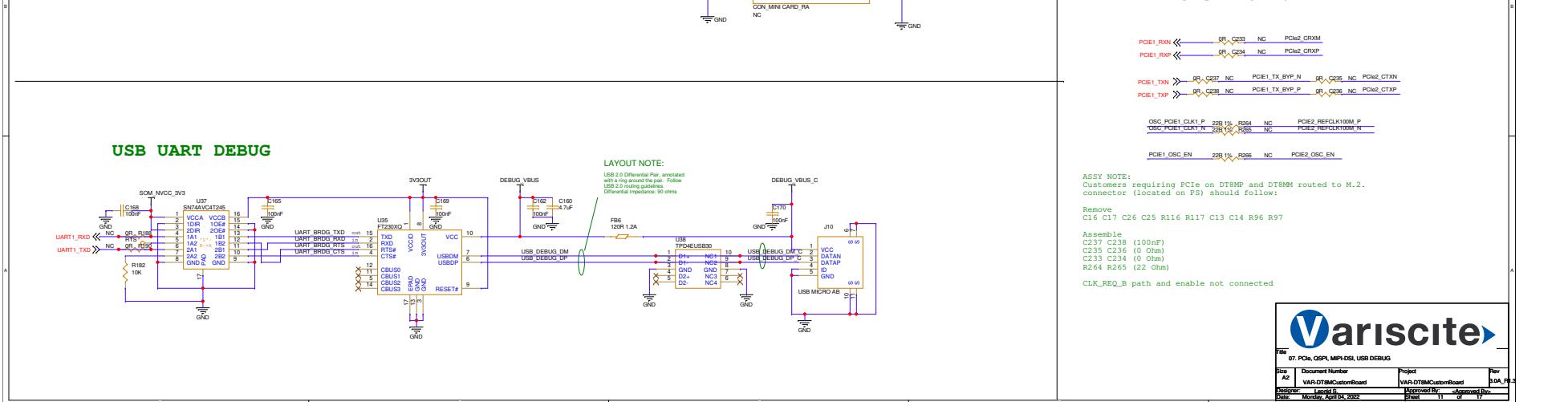
USB UART DEBUG



DART-MX8MP MIPI-DSI ON PS  
Compatible to Symphony J7+J8

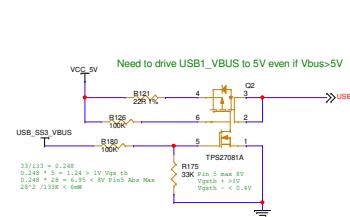


PCIe1 TO M.2 PATH

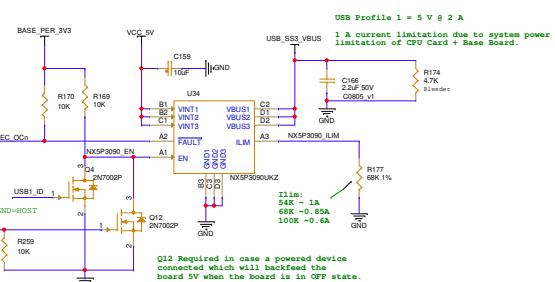


## **08. USB TYPE C, USB 3 HUB**

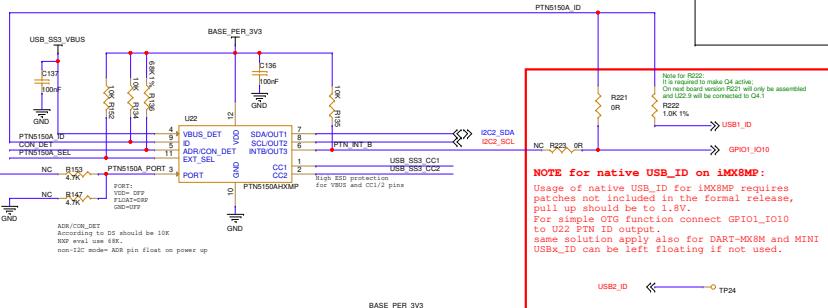
USB#1 - DRP  
USB TYPE C



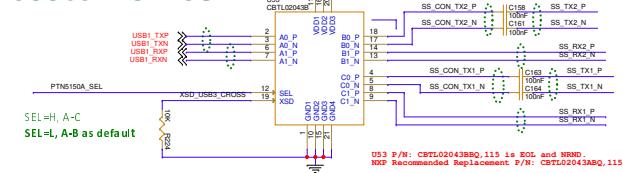
## 5V Source Load Switch



## Config Channel Logic Detection & Indication of Plug Orientation



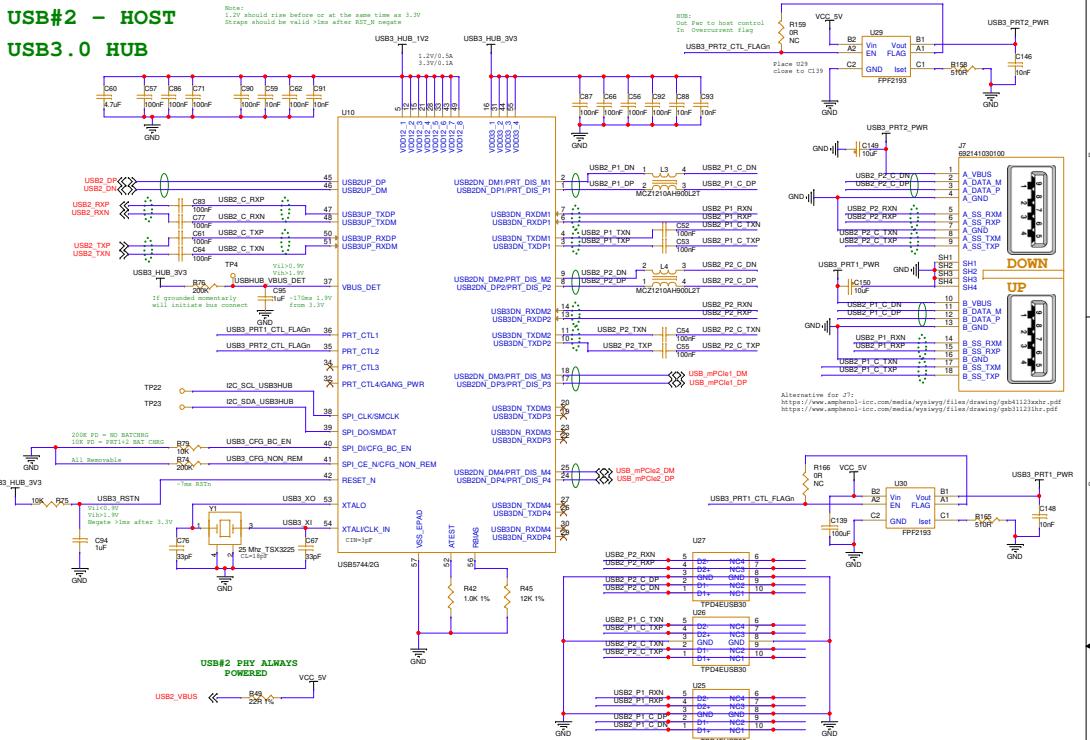
# USB3.0 Type-C crossbar switch



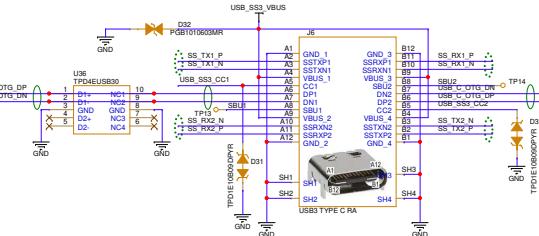
BTL02043BBQ, 115 is EOL and NRND.  
Suggested Replacement P/N: CBTBL02043ABO, 115

USB#2 - HOST

USB3.0 HUB



 **LAYOUT NOTE:**  
USB 2.0 DIL pair, annotated with a ring around the pair.  
USB 3.0 DIL Pair annotated with dashed ring  
Follow USB 2.0/3.0 routing guidelines.

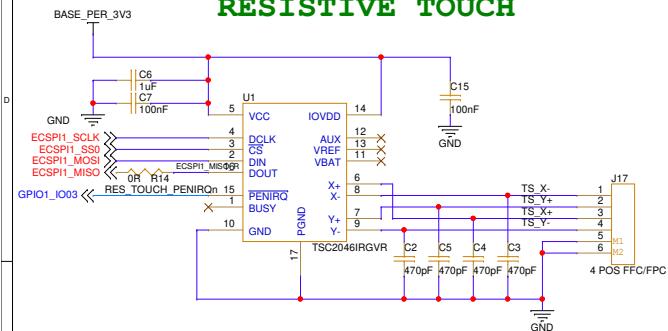


Note:  
VBUS active discharge  
replaced with bleeder

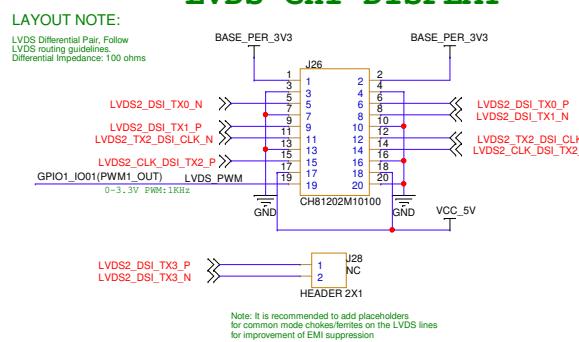


## 09. LVDS, TOUCH, JTAG, I2C EXP

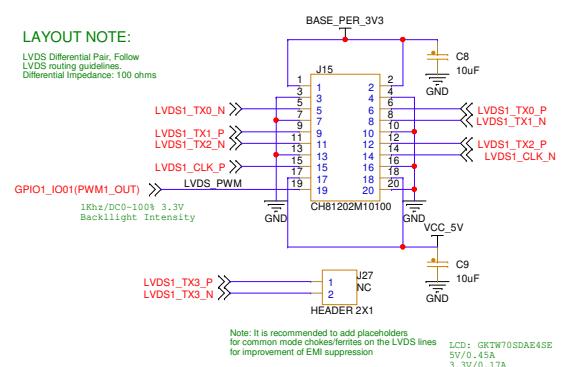
### RESISTIVE TOUCH



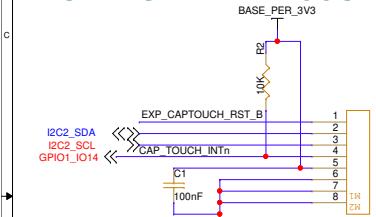
### LVDS CH1 DISPLAY



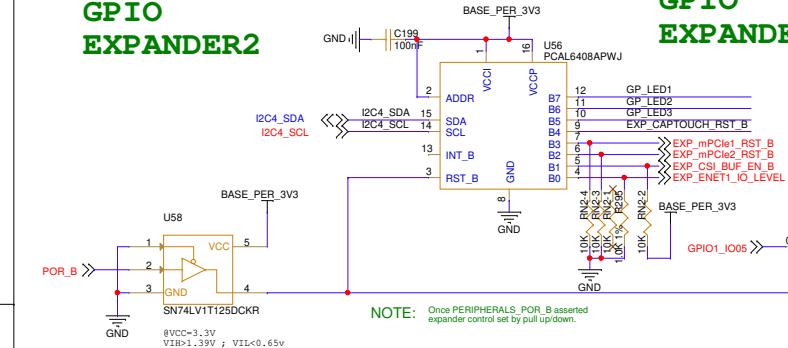
### LVDS DISPLAY CH0



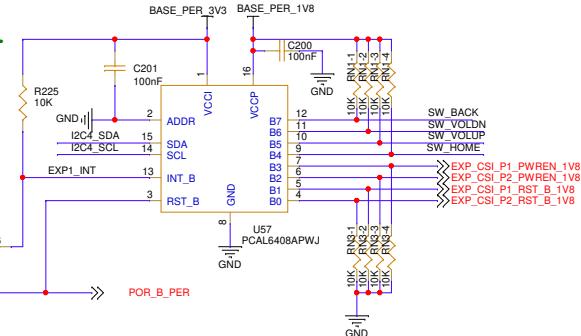
### CAPACITIVE TOUCH



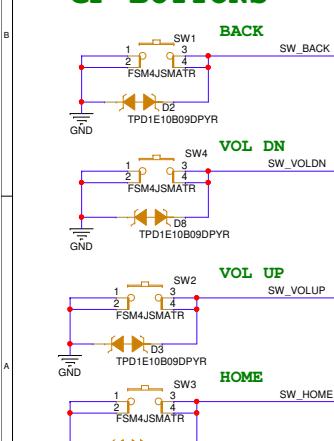
### GPIO EXPANDER2



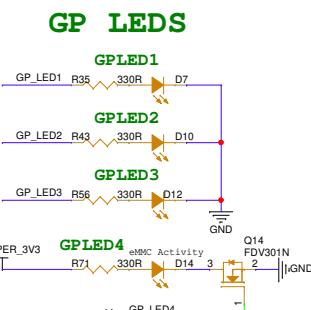
### GPIO EXPANDER1



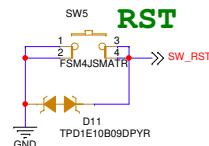
### GP BUTTONS



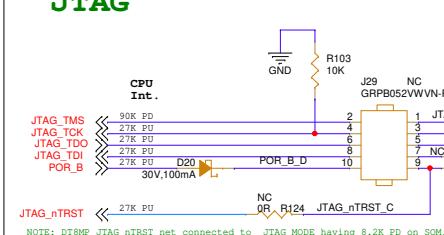
### GP LEDs



### RST



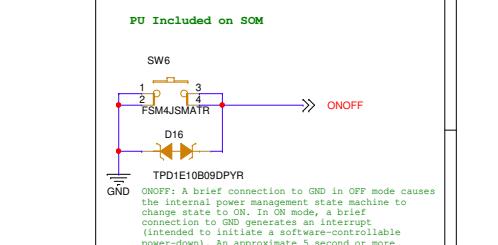
### JTAG



The ARM DStream comes with a 10-pin connector. If you need to expand to a 20-pin connector for a different JTAG device, the expander board can also be purchased at Digikey:  
Olimex LTD MPN: ARM-JTAG-20-10

<https://www.digikey.com/products/en/development-boards-kits-programmers-accessories/783?k=JTAG%20adapter>

### ON/OFF

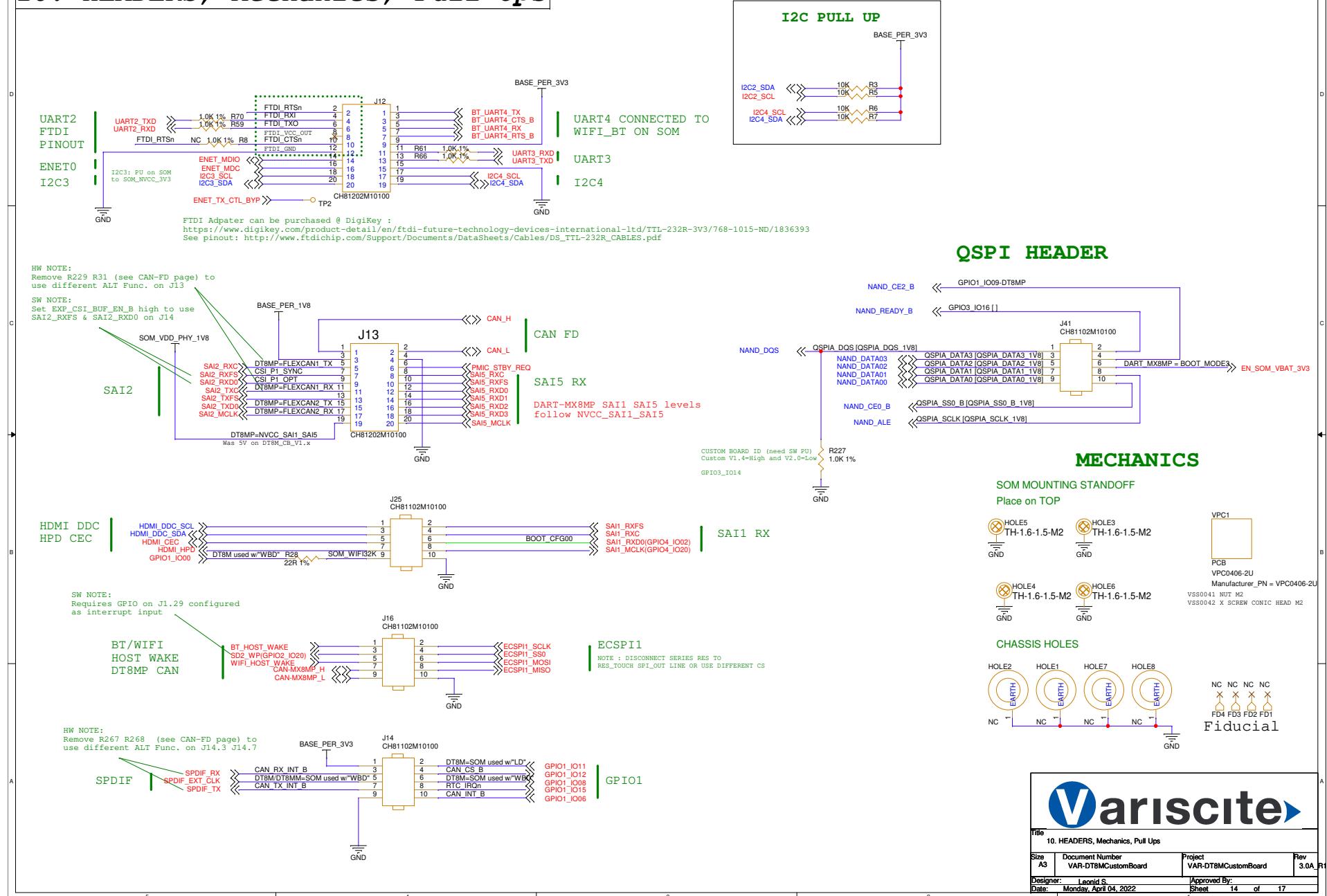


Not used leave NC  
**Variscite**

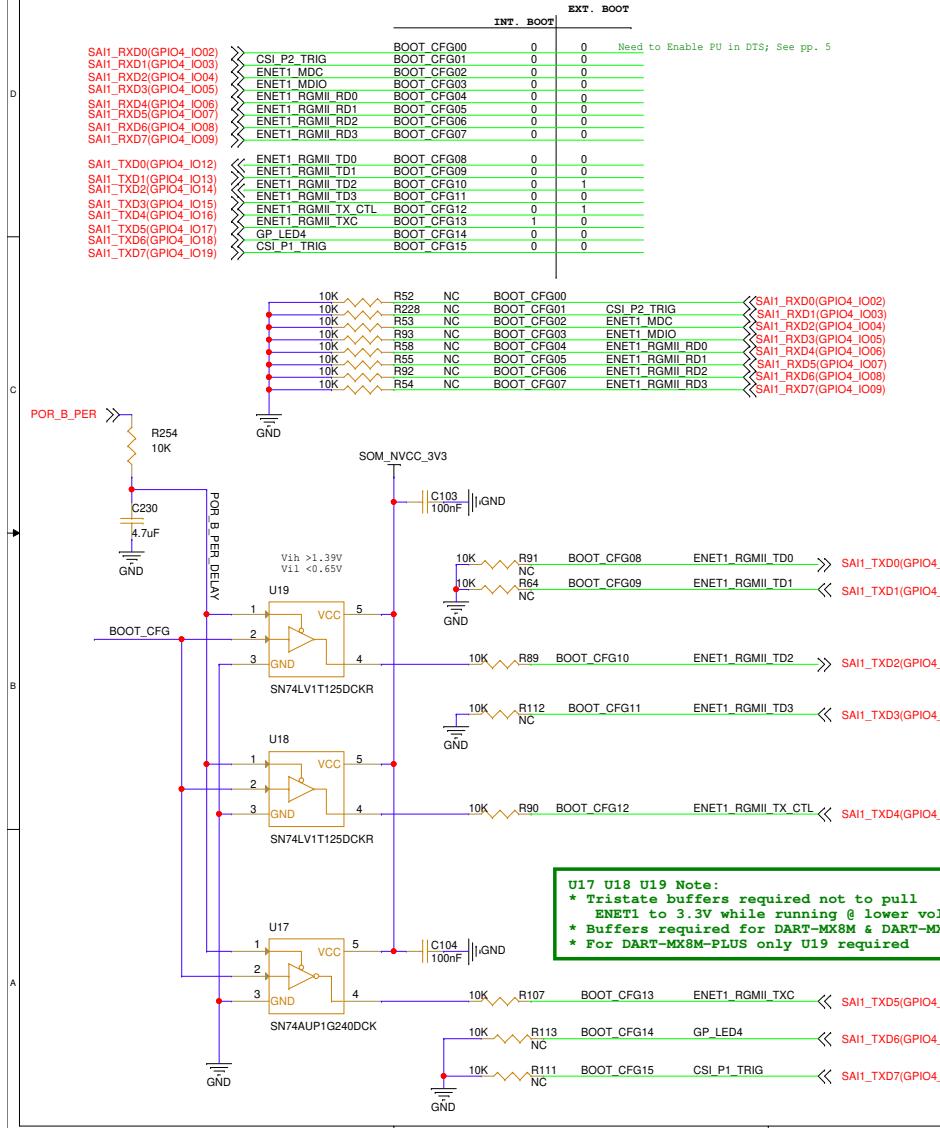
Title: 09. LVDS, TOUCH, JTAG, I2C EXP

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Designer: Leonid S.	Approved By:		
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## 10. HEADERS, Mechanics, Pull Ups



## 11. BOOT CONFIG & MODE



Notes:

- Sampled on rising edge of POR\_B
- SOC PD during POR\_B and after on BOOT CFG[15:0] and BOOTMODE[1:0]
- BOOT\_MODE[1:0] = "10" is Internal Boot - Always used.
- Active boot cfg for one dip sw sel EXTERNAL/INTERNAL

**DART-MX8M-MINI Notes:**

b. Boot config lines do not follow the Mini datasheet in full  
DART-MX8M-MINI have added logic to be compatible to DART-MX8M

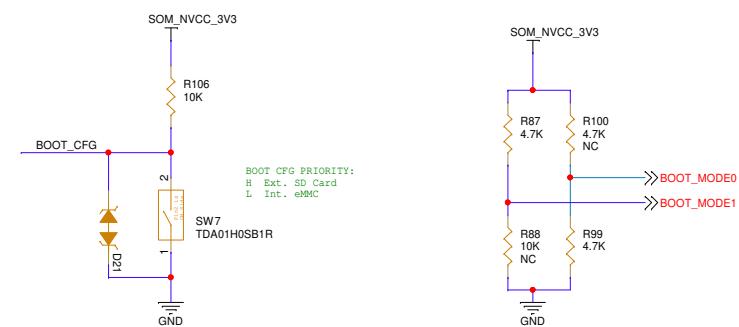
**DART-MX8M-PLUS Notes:**

a. Boot configuration set only by SAI1\_TXD2 connected on DART via buffer to BOOT\_MODE0

*i.MX8M Plus Boot Mode*

BOOT_MODE0	BOOT_MODE2	BOOT_MODE1	BOOT_MODE0	Boot Modes
0	0	0	0	Boot From Internal Fuses
0	0	0	1	USB Serial Download
0	0	1	0	USDHC3 (eMMC boot only, SD3 8-bit) Default
0	0	1	1	USDHC2 (SD boot only, SD2)

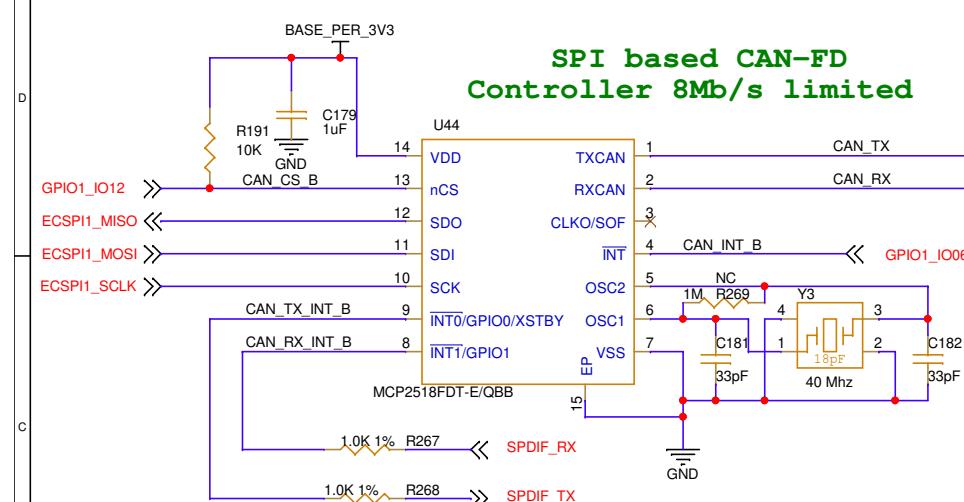
CustomBoard Net:   
 BOOT\_MODE0 EN\_SOM\_VBAT\_3V3 BOOT\_MODE1 SAI1\_TXD2  
**DART-MX8MP BOOT MODE**



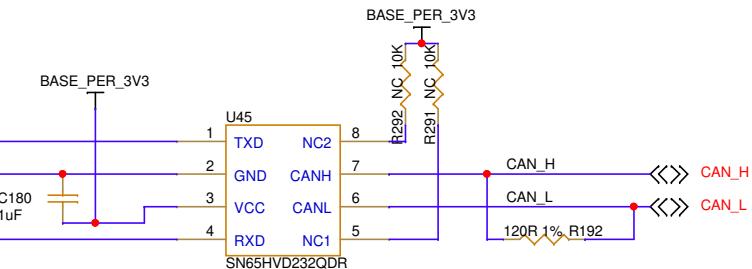
Title 11. BOOT CONFIG & MODE

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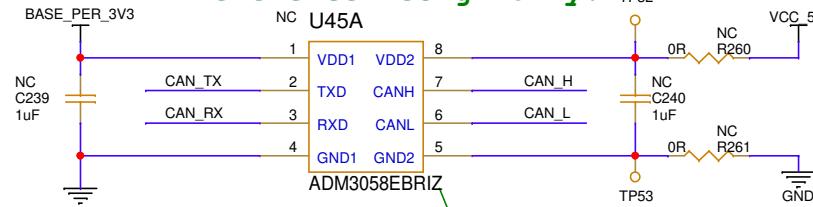
## 13. CAN FD Interface



## SPI based CAN-FD Controller 8Mb/s limited

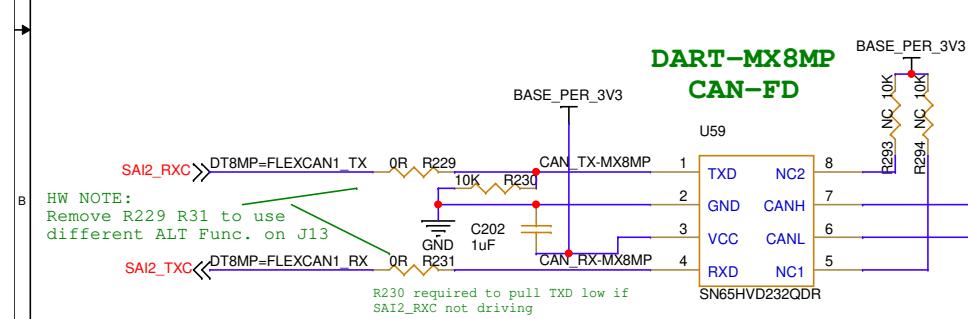


CAN PHY 12Mb/s  
Reference Design Only

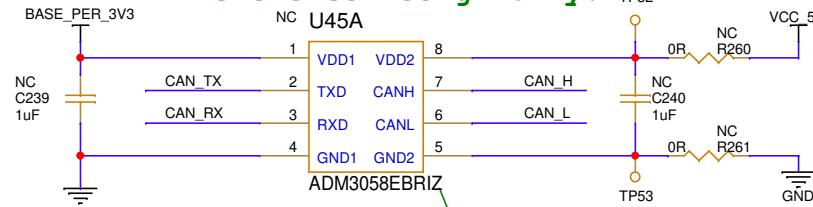


**NOTE FOR U59A U45A**

- Located on bottom side
  - When assembling the ADM3058E IC removal of TCAN332 is a must!

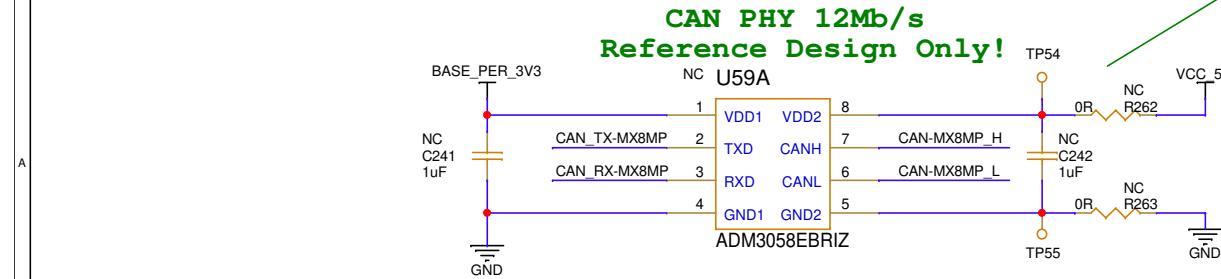


DART-MX8ME  
CAN-FD



**NOTE FOR U59A U45A**

- Located on bottom side
  - When assembling the ADM3058E IC removal of TCAN332 is a must!



CAN PHY 12Mb/s  
Reference Design



**Title**

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Designer:	Leonid S.	Approved By:	
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## 13. DART-MX8MP- ENET1 Gigabit Ethernet

