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## Revision History

<b>Revision</b>	<b>Date</b>	<b>Notes</b>
0.1	22/07/2013	Preliminary
1.0	16/09/2013	Initial publish revision
1.1	21/12/2014	CSI2 signals description corrected
1.2	07/12/2015	Section 2.3.8- Camera P/N corrected

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# 1 Overview

This chapter gives an overview of the DART-Board.

## 1.1 General Information

The DART BOARD is a complete development board, utilizing all DART-4460 System-on-Module features. It is assembled with large variety of debug & testing means as an OTG interface, two MIPI-CS2 cameras, 10/100BaseT Ethernet, Parallel LCD FFC/FPC connector, serial interfaces and GPIO expansion connectors enables full DART-4460 testing ,evaluating ,and interfacing to custom hardware or a third part evaluation kit.

### 1.1.1 Supporting Variscite products

- DART-4460 SOM
- MIPICSI-2 Camera
- Capacitive touch LCD screen

### 1.1.2 Supporting O.S

- Linux BSP
- Android

### 1.1.3 Additional information

Board schematics as well as mechanical CAD data base is available to download at [www.variscite.com](http://www.variscite.com),

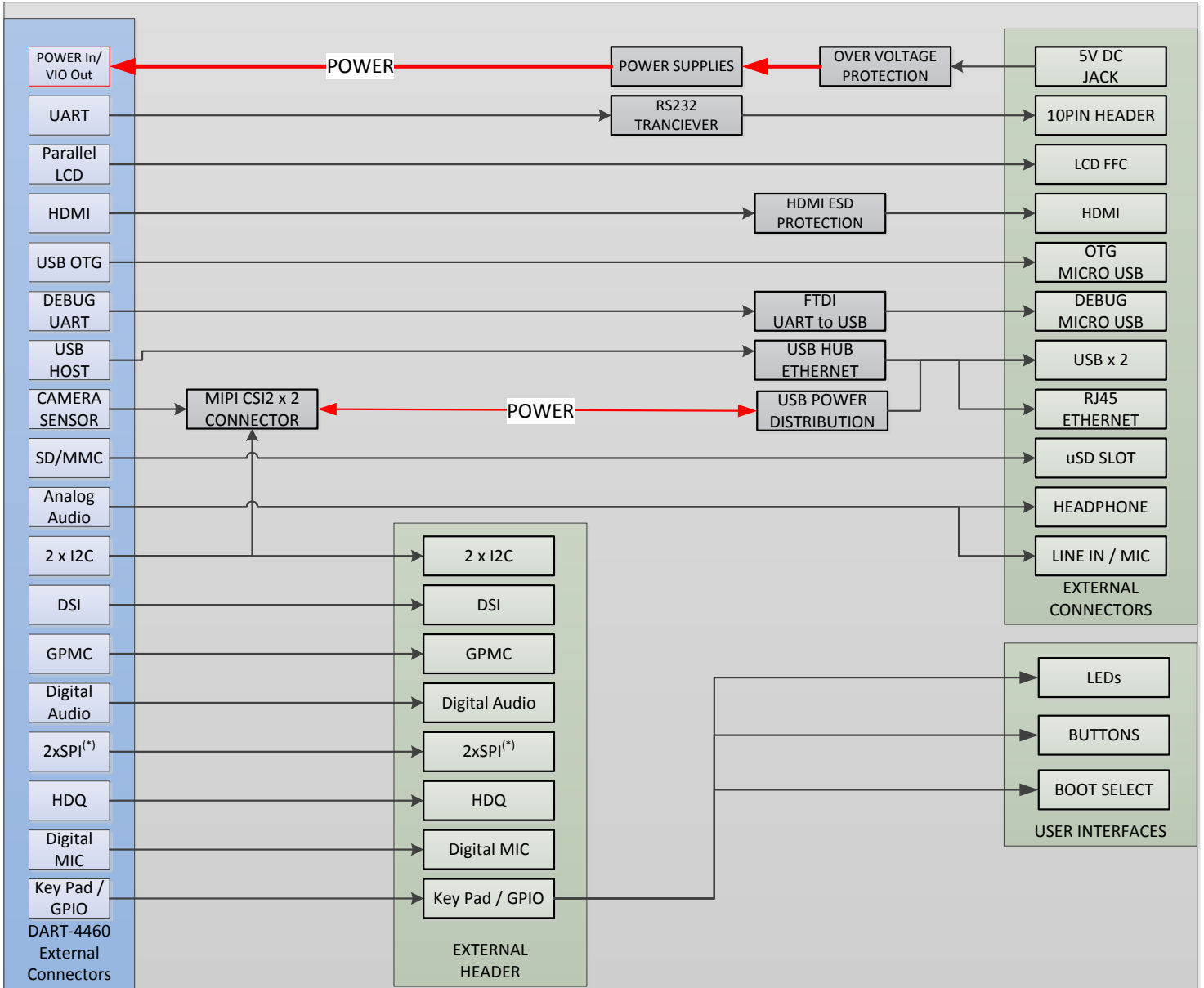
For further information contact Variscite support at <mailto:support@variscite.com>.

## 1.2 DART BOARD features summary:

- DART-4460 socket
- Dual Display
  - HDMI
  - Parallel interface 7" TFT LCD
- Touch panel interface
  - Capacitive - I2C based
- Ethernet
  - 10/100BaseT – RJ45
- USB
  - USB2.0 OTG ,Micro AB type
  - 2 x USB2.0 Host Type A
- AUDIO
  - 3.5mm Headphones jack.
  - 3.5mm Line in jack.
- $\mu$ SD-Card slot
- UART ( RS232 levels)
  - Standard 10pin header
- Expansion connectors:
  - GPMC - Local Bus interface
  - SD/MMC interface
  - RAW image-sensor module interface
  - SPI
  - I2C
  - MSBSP/I2S
  - UART
  - GPIOs
- Power
  - 2.5mm DC jack
  - 5V DC Input.



### 1.3 Block Diagram

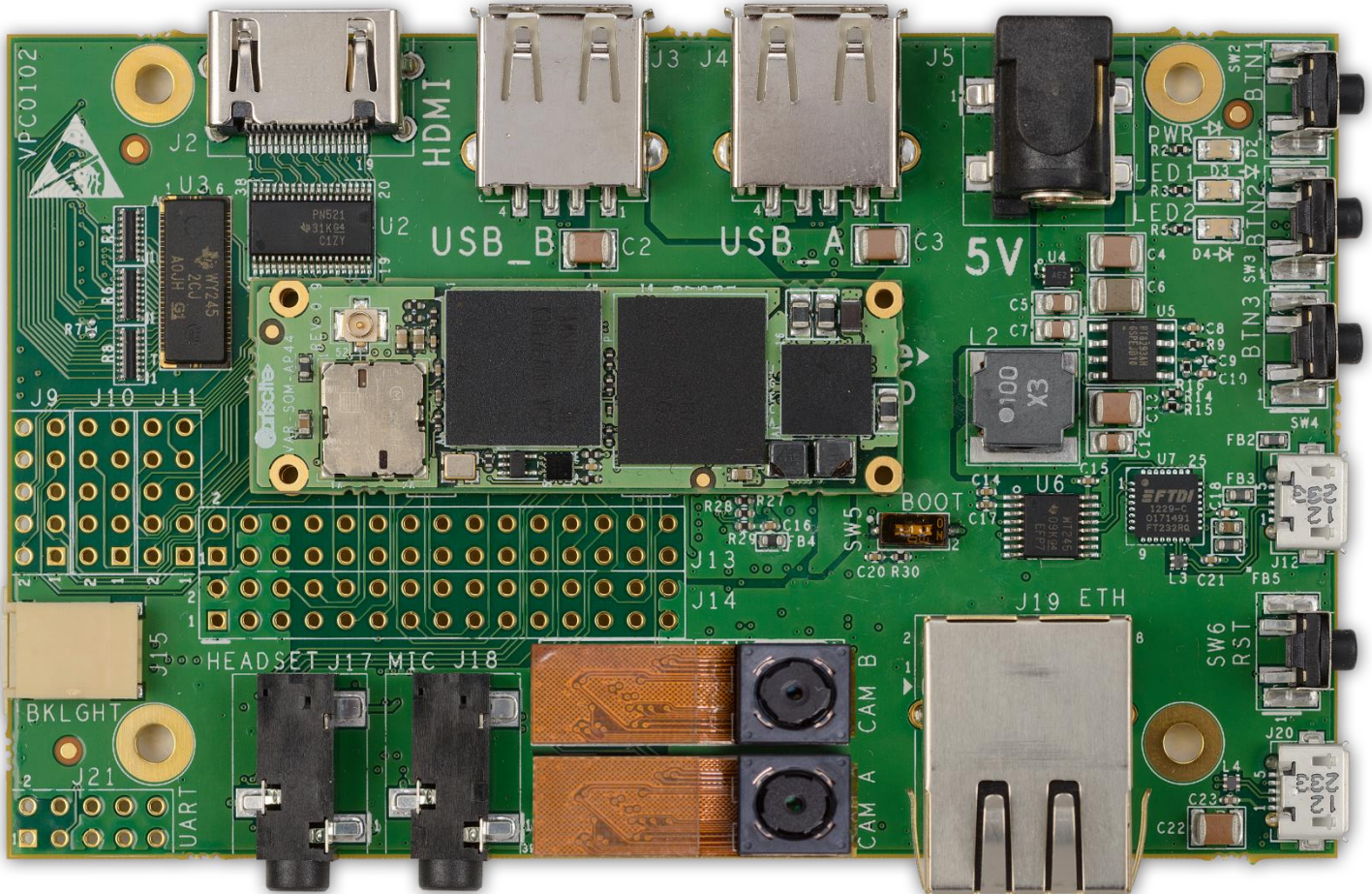


## 1.4 Board Layout

The DART BOARD physical dimensions are 105x65 mm.

Detailed CAD files are available for download at [www.variscite.com](http://www.variscite.com).

Top side - Detailed View



## 1.5 DART BOARD connectors

The below table lists the available connectors on the DART-BOARD, refer to chapter 2 for detailed description and pinout of each connector.

Reference	Function	Type
J2	HDMI	FCI:10029449-001RLF
J3	USB Host	FCI:87583-2010BLF
J4	USB Host	FCI:87583-2010BLF
J5	DC Jack	KOBI CONN:163-0180-EX
J6	40 Pin DART connector J3	HIROSE:DF40C-40DS-0.4V(51)
J7	70 Pin DART connector J2	HIROSE:DF40C-70DS-0.4V(51)
J8	70 Pin DART connector J1	HIROSE:DF40C-70DS-0.4V(51)
J9	GPMC Expansion Header	AMP:87227-5
J10	GPMC Expansion Header	AMP:87227-5
J11	GPMC Expansion Header	AMP:87227-5
J12	Debug	Molex:47589-0001
J13	GPIO Expansion Header	AMP:1-87227-5
J14	GPIO Expansion Header	AMP:1-87227-5
J15	LCD Backlight	JST:SM02B-BHSS-1-TB(LF)(SN)
J16	MIPI CSI-2 Camera interface	Hirose:FX12B-40P-0.4SV
J17	Headphone	CUI INC:SJ-3523-SMT-1
J18	Microphone/Line in	CUI INC:SJ-3523-SMT-1
J19	Ethernet	PULSE:J00-0065NL
J20	OTG	Molex:47589-0001
J21	UART1	AMP:87227-5
J22	MIPI CSI-2 Camera interface	Hirose:FX12B-40P-0.4SV
J23	Capacitive LCD Connector	Molex:54104-4096
J24	LCD Touch Screen	TE:1-1734592-0
J25	Micro SD card slot	Molex:5033980891

Table 1-1 DART BOARD connectors

## 2 Detailed Description

### 2.1 Overview

This chapter details the DART BOARD features and external interfaces, most are driven directly by the DART-4460. Please refer to the DART-4460 data sheet for more information regarding those interfaces.

The following list describes this chapter table’s column header:

Pin#:

Pin Number of the specific connector

DART BOARD Signal:

DART BOARD schematic signal name

Description:

Short Pin functionality description

### 2.2 DART BOARD Interfaces

#### 2.2.1 DART-4460

The DART BOARD features three fine pitch connectors (J6, J7, and J8) to connect with the DART-4460 SOM. Please refer to the DART-4460 module data sheet for a complete signal description.

### 2.3 Standard External Interfaces

#### 2.3.1 HOST USB

The DART BOARD supports two USB 2.0 Type A Host ports. The USB host connectors are driven by an on-board USB hub.

##### 2.3.1.1 HOST USB Pin-out (J3, J4)

Pin #	DART BOARD Signal	Type	Description
1	VCC_USB	O	5V power supply. 500ma max
2	USB_HUB_DN	IO	USB Data Negative
3	USB_HUB_DP	IO	USB Data Positive
4	GND	P	Digital ground

Table 2-1 USB Host1/2 Connector Connector Pin-out (J3, J4)

### 2.3.2 USB OTG Connector Pin-out

The DART BOARD OTG, MICRO AB type connector is driven by the DART-4460 OTG interface.

#### 2.3.2.1 USB OTG Connector Pin-out (J20)

Pin #	DART BOARD Signal	Type	Description
1	USB_OTG_VBUS	IO	5V in/out (Client/host)
2	USB_OTG_DN	IO	USB Data Negative
3	USB_OTG_DP	IO	USB Data Positive
4	USB_OTG_ID	I	USB OTG ID signal ('1' - Device mode)
5	GND	P	Digital ground

Table 2-2 USB OTG connector Pin-out (J20)

### 2.3.3 SD Card

SD-Card interface is based on the SD/MMC1 interface of the OMAP4 of the DART-4460. It supports 3.3V IO interface, so a bidirectional buffer should not be used.

#### 2.3.3.1 SD card slot Connector Pin-out (J25)

Pin #	DART BOARD Signal	Type	Description
1	DAT2	IO	MMC Parallel Data2
2	CD/DAT3	IO	MMC Parallel Data3
3	CMD	IO	MMC command
4	VCC_3V3	P	SD Card VCC 3.3v
5	CLK	O	MMC Clock
6	GND	P	GND
7	DAT0	IO	MMC Parallel Data0
8	DAT1	IO	MMC Parallel Data1
A	CD A	IO	MMC Card Detect
B	CD B	IO	MMC Card Detect

Table 2-3 SD Card slot Connector Pin-out (J25)

### 2.3.4 Ethernet

Ethernet interface is exposed by a standard RJ45 Ethernet jack with an integrated magnetics. The fast Ethernet port is driven by on-board USB-to-fast-Ethernet Bridge IC.

#### 2.3.4.1 10/100BaseT Connector Pin-out (J19)

Pin #	DART BOARD Signal	Type	Description
1	ETH_TXP	DO	Tx Pair- Positive
2	ETH_TXN	DO	Tx Pair- Negative
3	ETH_RXP	DI	Rx Pair- Positive

4	VCC_3V3	AP	3.3V Power Supply
5	VCC_3V3	AP	3.3V Power Supply
6	ETH_RXN	DI	Rx Pair- Negative
7			
8	GND	P	Digital ground
9	SPEED1_A	A	Speed LED Anode
10	SPEED1_K	A	Speed LED Cathode
11	LINK1_K	A	Link LED Anode
12	LINK1_A	A	Link LED Cathode

Table 2-4 10/100/100BaseT RJ45 Connector Pin-out (J19)

### 2.3.5 HDMI

The DART BOARD features an HDMI connector to interface with an external monitor. HDMI signals are driven natively by OMAP4 on the DART-4460

#### 2.3.5.1 HDMI Connector Pin-out (J2)

Pin #	DART BOARD Signal	Type	Description
1	DAT2+	DO	HDMI Data 2 positive
2	DAT2_S	P	Digital ground
3	DAT2-	DO	HDMI Data 2 negative
4	DAT1+	DO	HDMI Data 1 positive
5	DAT1_S	P	Digital ground
6	DAT1-	DO	HDMI Data 1 negative
7	DAT0+	DO	HDMI Data 0 positive
8	DAT0_S	P	Digital ground
9	DAT0-	DO	HDMI Data 0 negative
10	CLK+	DO	HDMI Clock positive
11	CLK_S	P	Digital ground
12	CLK 0-	DO	HDMI Clock negative
13	CEC	IO	CEC signal
14			
15	SCL	IO	HDMI I2C Data
16	SDA	IO	HDMI I2C Clock
17	DDC/CEC GND	P	Digital ground
18	+5V	P	5V Output

Table 2-5 HDMI Connector Pin-out (J2)



### 2.3.6 AUDIO

The DART BOARD feature two 3.5mm jacks for audio interfaces, all are directly driven by DART-4460

- Headphone Jack
- Microphone/Line in

#### 2.3.6.1 Headphone jack Connector Pin-out (J17)

Pin #	DART BOARD Signal	Type	Description
1	GND	AP	Audio Ground
2	AUD_OUT_L	AO	Pre-amped audio signal
3	AUD_OUT_R	AO	Pre-amped audio signal

Table 2-6 Headphone Jack Connector Pin-out (J17)

#### 2.3.6.2 Line In jack Connector Pin-out (J18)

Pin #	DART BOARD Signal	Type	Description
1	GND	AP	Audio Ground
2	AUD_IN_R	AI	Microphone/Line in Right input <sup>(1)</sup>
3	AUD_IN_L	AI	Microphone/Line in Left input <sup>(1)</sup>

Table 2-7 Line In Jack Connector Pin-out (J18)

<sup>(1)</sup> – The inputs are biased for microphone usage. Disconnect R64, R65 for disable the bias or use serial capacitors for DC block.

### 2.3.7 RS232

The RS232 DTE interface is driven by DART-4460 UART1 interface and a RS232 transceiver.

#### 2.3.7.1 RS232 -DTE Connector Pin- out (J21)

Pin #	DART BOARD Signal	Type	Description
1			
2	UART1_RX_C	I	UART1 Receive
3	UART1_TX_C	O	UART1 Transmit
4			
5	DGND	P	Digital Ground
6			
7			
8	UART1_RTS_C	O	UART`1 RTS
9	UART1_CTS_C	I	UART1CTS
10			

Table 2-8 RS232 DTE Connector Pin-out (J21)

### 2.3.8 Camera

The DART BOARD hosts two MIPI CSI2 cameras, both are directly driven by OMAP4 on the DART-4460 .The on board camera connectors are Panasonic conn socket 40POS 0.4mm, AXK7L40227G suggest camera mating connector is Panasonic conn header, AXK8L40125BG.

#### 2.3.8.1 Camera Connector Pin-out (J22, J16)

Pin #	DART BOARD Signal	Type	Description
1	GND	P	Digital Ground
2	GND	P	Digital Ground
3			
4	VCC_2V8	P	Camera 2.8V power supply
5	I2C_A_SDA	IO	Sensor SDA
6	MIPI_CSI-2_A_PDWN	O	Auto Focus Power down
7	I2C_A_SCL	IO	Sensor SCL
8	VCC_2V8	P	Camera 2.8V power supply
9	RESET	O	Reset signal
10	I2C_A_SDA	IO	Auto Focus SDA
11			
12	I2C_A_SCL	IO	Auto Focus SCL
13			
14	GND	P	Digital Ground
15			
16	MIPI_CSI-2_A_DX2	DI	Camera Data 2 Positive
17	SNS PWDN	O	Sensor Power Down
18	MIPI_CSI-2_A_DY2	DI	Camera Data 2 Negative
19			
20	GND	P	Digital Ground
21			
22	MIPI_CSI-2_A_DX0	DI	Camera Clock Positive
23			
24	MIPI_CSI-2_A_DY0	DI	Camera Clock Negative
25			
26	GND	P	Digital Ground
27			
28	MIPI_CSI-2_A_DX1	DI	Camera Data 1 Positive
29			
30	MIPI_CSI-2_A_DY1	DI	Camera Data 1 Negative
31			
32	GND	P	Digital Ground
33			
34	MIPI_CSI-2_CLK_OUT	O	Camera Clock
35			
36			



Pin #	DART BOARD Signal	Type	Description
37			
38	VIO	P	Camera 1.8V power supply
39			
40	GND	P	Digital Ground

Table 2-9 Camera Interface Connector Pin-out (J22, J16)

### 2.3.9 LCD

The DART BOARD exposes the OMAP4's parallel LCD interface through three connectors:

#### 2.3.9.1 Capacitive LCD Connector Pin-out (J23)

Pin #	DART BOARD Signal	Type	Description
1	UD	O	Up/down select
2	LR	O	Left/right select
3			
4	VCC_3v3	P	Mx6CustomBoard peripherals VCC
5	VCC_3v3	P	Mx6CustomBoard peripherals VCC
6	VCC_3v3	P	Mx6CustomBoard peripherals VCC
7	VCC_3v3	P	Mx6CustomBoard peripherals VCC
8	NC		
9	ACBIAS	O	Data enable
10	DGND	P	Digital ground
11	DGND	P	Digital ground
12	DGND	P	Digital ground
13	DB7	O	Blue bit 7
14	DB6	O	Blue bit 6
15	DB5	O	Blue bit 5
16	GND	P	Digital ground
17	DB4	O	Blue bit 4
18	DB3	O	Blue bit 3
19	DB2	O	Blue bit 2
20	GND	P	Digital ground
21	DG7	O	Green bit 7
22	DG6	O	Green bit 6
23	DG5	O	Green bit 5
24	GND	P	Digital ground
25	DG4	O	Green bit 4
26	DG3	O	Green bit 3
27	DG2	O	Green bit 2
28	GND	P	Digital ground
29	DR7	O	Red bit 7

Pin #	DART BOARD Signal	Type	Description
30	DR6	O	Red bit 6
31	DR5	O	Red bit 5
32	GND	P	Digital ground
33	DR4	O	Red bit 4
34	DR3	O	Red bit 3
35	DR2	O	Red bit 2
36	GND	P	Digital ground
37			
38	DCLK	P	DCLK
39	HSYNC	O	Horizontal sync
40	VSYNC	O	Vertical sync

Table 2 –10 Capacitive LCD Connector Pin-out (J23)

### 2.3.9.2 Capacitive Touch Panel Connector Pin-out (J24)

Pin #	DART BOARD Signal	Type	Description
1	GND	P	Digital ground
2	VCC_3V3	P	Power supply 3.3 V
3	I2C_SCL	IO	I2C3 clock signal
4			
5	I2C_SDA	IO	I2C3 data signal
6			
7	RESET	DI	Reset signal
8			
9	CPT_INT	DI	Interrupt signal connected to GPIO3[7]
10	GND	P	Digital ground

Table 2 - 11 Capacitive Touch Panel Connector Pin-out (J24)

### 2.3.9.3 Backlight Power Supply Connector Pin-out (J15)

Pin #	DART BOARD Signal	Type	Description
1	LED_BL_K	Power	Power supply for backlight LED minus
2	GND	P	Digital ground
3	LED_BL_A	Power	Power supply for backlight LED plus
4	GND	P	Digital ground

Table 2 –12 Backlight Power Supply Connector Pin-out (J15)

### 2.3.10 USB - Debug

RS232 Debug port is driven by OMAP4/DART-4460 UART3 interface via UART-to-USB bridge and exposed as MICRO USB connector.

#### 2.3.10.1 USB -Debug Connector Pin-out (J12)

Pin #	DART BOARD Signal	Type	Description
1	VCC_USB	i	5V power input
2	USB_HUB_DN	IO	USB Data Negative
3	USB_HUB_DP	IO	USB Data Positive
4	GND	P	Digital ground

Table 2-13 USB – Debug Connector Pin-out (J12)

### 2.3.11 DC-in Jack

The DC-in power jack is compatible with a standard 2.5 mm / 5.5 mm power plug.

#### 2.3.11.1 DC-in Jack Pin-out (J5)

Pin #	DART BOARD Signal	Type	Description
1	GND	P	Digital ground
2	GND	P	Digital ground
3	5V IN	P	5V power input
4	5V IN	P	5V power input

Table 2 - 14 DC-in Jack Pin-out (J5)

### 2.3.12 GPMC Extension Headers

GPMC expansion connectors pins are directly connected to the OMAP4/DART-4460 pins, refer to DART-4460 data sheet for more details.

#### 2.3.12.1 GPMC Extension Header Pin-out (J11)

Pin #	DART BOARD Signal	Type
1	GPMC_AD0	IO
2	GPMC_AD5	IO
3	GPMC_AD1	IO
4	GPMC_AD6	IO
5	GPMC_AD2	IO
6	GPMC_AD7	IO
7	GPMC_AD3	IO

<b>8</b>	GPMC_AD8	IO
<b>9</b>	GPMC_AD4	IO
<b>10</b>	GND	P

Table 2-15 GPMC Extension Header Pin-out (J11)

### 2.3.12.2 GPMC Extension Header Pin-out (J10)

<b>Pin #</b>	<b>DART BOARD Signal</b>	<b>Type</b>
<b>1</b>	GPMC_AD9	IO
<b>2</b>	GPMC_AD14	IO
<b>3</b>	GPMC_AD10	IO
<b>4</b>	GPMC_AD15	IO
<b>5</b>	GPMC_AD11	IO
<b>6</b>	GPMC_A20	IO
<b>7</b>	GPMC_AD12	IO
<b>8</b>	GPMC_A21	IO
<b>9</b>	GPMC_AD13	IO
<b>10</b>	GND	P

Table 2-16 GPMC Extension Header Pin-out (J10)

### 2.3.12.3 GPMC Extension Header Pin-out (J9)

<b>Pin #</b>	<b>DART BOARD Signal</b>	<b>Type</b>
<b>1</b>	GPMC_A22	IO
<b>2</b>	GPMC_nADV_ALE	IO
<b>3</b>	GPMC_nCS0	IO
<b>4</b>	GPMC_CLK	IO
<b>5</b>	GPMC_NBE0_CLE	IO
<b>6</b>	GPMC_nWP	IO
<b>7</b>	GPMC_nWE	IO
<b>8</b>	VCC_1V8	P
<b>9</b>	GPMC_nOE	IO
<b>10</b>	GND	P

Table 2-17 GPMC Extension Header Pin-out (J9)

### 2.3.13 Miscellaneous Interfaces Extension Headers

All unused interfaces that are available on DART-4460 module exposed through two 30 pin Miscellaneous Interfaces Extension Headers (J13, J14)

2.3.13.1 Miscellaneous Interfaces Extension Header Pin-out (J13)

Pin #	DART BOARD Signal	Type
1	VCC_5V	P
2	VCC_3V3	P
3	GND	P
4	VIO	P
5	MCBSP_B_FSX	IO
6	MCBSP_B_DX	IO
7	MCBSP_B_CLK	IO
8	MCBSP_B_DR	IO
9	GND	P
10	GND	P
11	MCSPi_A_CS0	IO
12	MCSPi_A_SIMO	IO
13	MCSPi_A_SCLK	IO
14	MCSPi_A_SOMI	IO
15	GND	P
16	GND	P
17	UART_B_RX	IO
18	UART_B_RTS	IO
19	UART_B_TX	IO
20	UART_B_CTS	IO
21	GND	P
22	GND	P
23	DMIC_CLK	IO
24	I2C_A_SCL	IO
25	DMIC_DAT	IO
26	I2C_A_SDA	IO
27		
28	I2C_B_SCL	IO
29		
30	I2C_B_SDA	IO

Table 2-18 Miscellaneous Interfaces Extension Header Pin-out (J13)

2.3.13.2 Miscellaneous Interfaces Extension Header Pin-out (J14)

Pin #	DART BOARD Signal	Type
1	VCC_5V	P
2	VCC_3V3	P
3	GND	P
4	VIO	P

Pin #	DART BOARD Signal	Type
5	DSI1_DX0	DO
6	KPD_COL0	IO
7	DSI1_DY0	DO
8	KPD_COL1	IO
9	DSI1_DX1	DO
10	KPD_COL2	IO
11	DSI1_DY1	DO
12	KPD_COL3	IO
13	DSI1_DX2	DO
14	KPD_COL4	IO
15	DSI1_DY2	DO
16	KPD_ROW1	IO
17	DSI1_DX3	DO
18	HDQ_A	IO
19	DSI1_DY3	DO
20	GPIO_17	IO
21	DSI1_DX4	DO
22	GPIO_101	IO
23	DSI1_DY4	DO
24	GPIO_102	IO
25	GND	P
26	GPIO_141	IO
27	GND	P
28	GPIO_142	IO
29	GND	P
30	GPIO_146	IO

Table 2-19 Miscellaneous Interfaces Extension Header Pin-out (J14)

## 2.4 User Interfaces

### 2.4.1 LED Indications

#### 2.4.1.1 Power-On LED (D2)

D5 is indicating that 5V power rail of the DART BOARD is on.

#### 2.4.1.2 GP LEDs (D3, D4)

General purpose functionality LEDs are controlled by DART-4460 pins through level shifter.

## 2.4.2 Control Buttons

### 2.4.2.1 User Buttons (SW2, SW3, and SW4)

User Button (SW2, SW3, and SW4) connected directly to the DART-4460.

### 2.4.2.2 Boot Select (SW5)

Boot select switch (SW5) sets the DART-4460 boot source & sequence.

### 2.4.2.3 Reset Button (SW6)

System hardware-reset button (SW6)

# 3 Electrical Environmental Specifications

## 3.1 Absolute maximum electrical specifications

	Min	Max
Main Power supply, DC-IN	-0.3V	6

Table 3-1 Absolute maximum electrical specifications

## 3.2 Operational electrical specifications

	Min	Max
Main Power supply, DC-IN	4.5V	5.5V

Table 3-2 Operational electrical specifications

## 4 Environmental specifications

	Min	Max
Commercial operating temperature range	0°C	+70°C
MTBF	10000hrs >	
Shock resistance	50G / 20 ms	
Relative humidity, Operational	10%	90%
Relative humidity, Storage	5%	95%
Vibration	20G / 0 - 600 Hz	

Table 4-1 Environmental specifications



## 5 Legal notice

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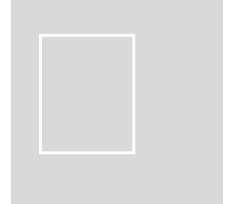
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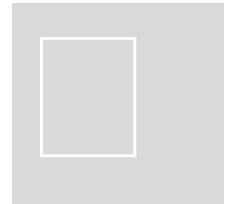
## 7 Contact information

### Headquarters

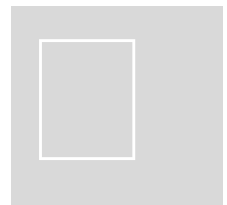
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