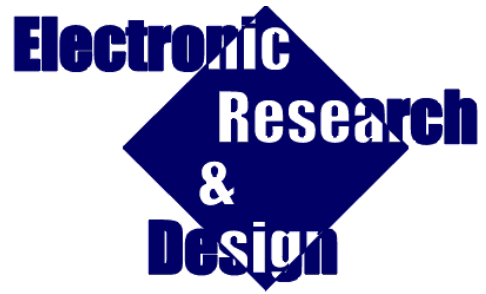
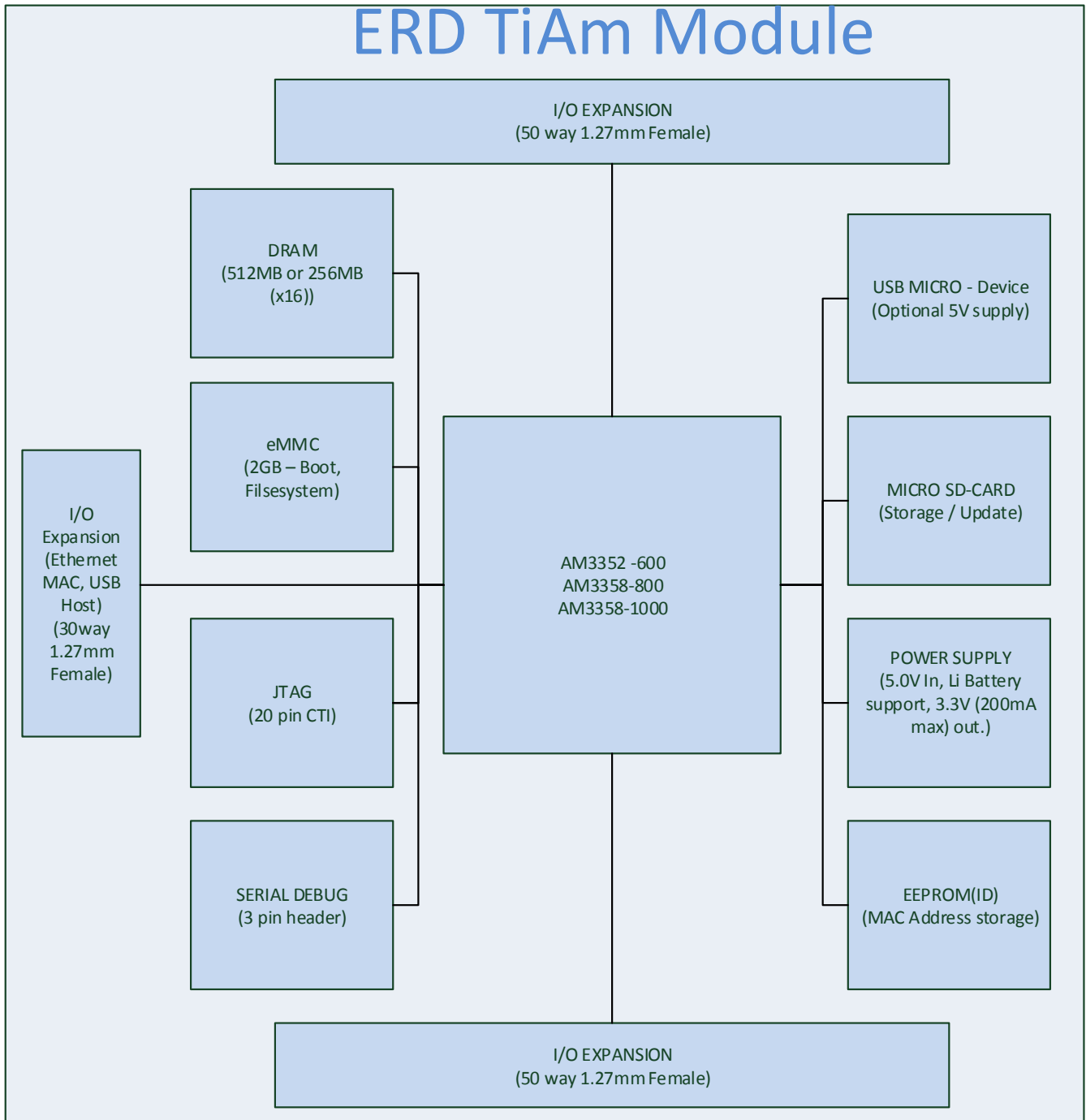


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**Block Diagram**

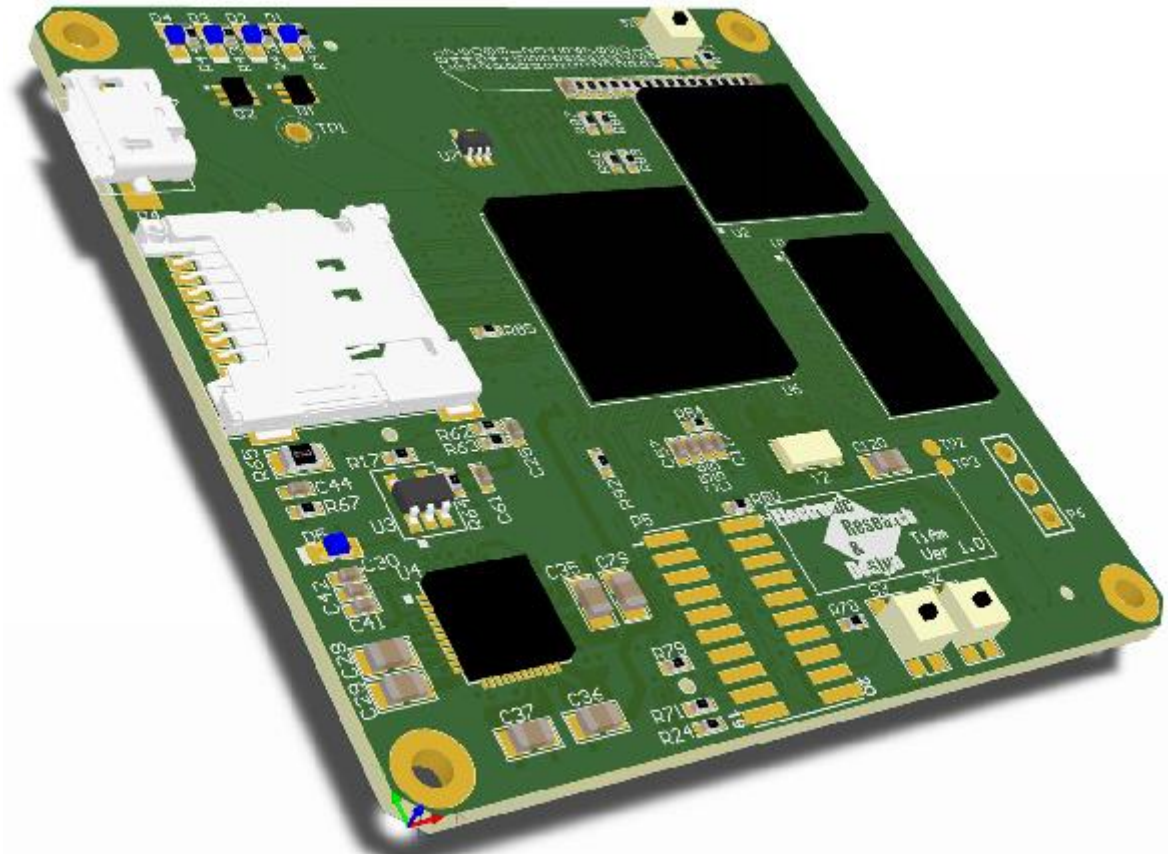


Figure 1- Top

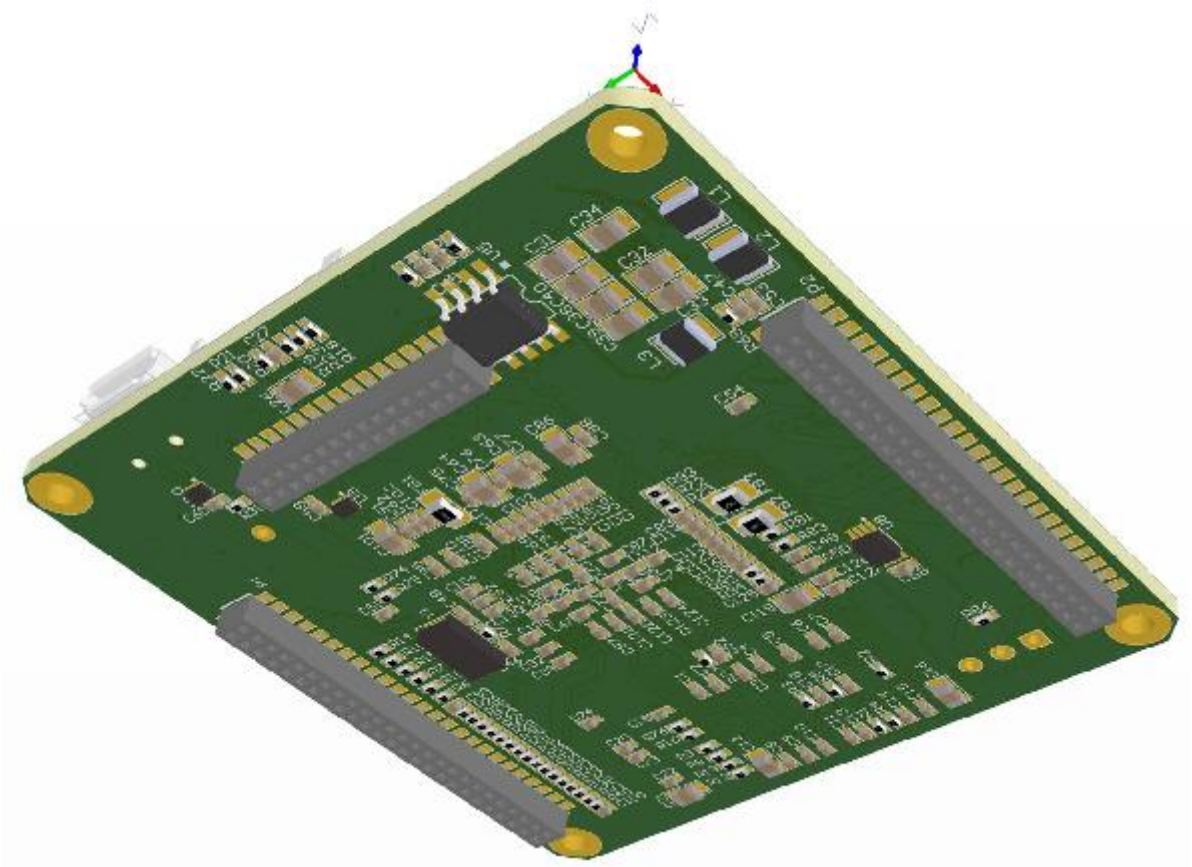


Figure 2- Bottom

# Features

- 55mm x 55mm, 1.6mm PCB
- 5V in (1A max) via USB or expansion connector.
- 3.3V out (200mA max) via expansion connector.
- 3 Processor choices :
  - AM3352 – 600MHz
  - AM3358 – 800MHz
  - AM3358 – 1GHz
- 512MB DDR3 DRAM(256MB DRAM for AM3352 – 600MHz)
- 2GB eMMC storage on-board (Used for boot, filesystem – no SD needed)
- JTAG - 20 pin CTI connector
- Serial debug header ( Terminal output from Linux)
- USB Micro – Device port (High speed)
- Micro-SD card for storage
- EEPROM for parameter storage
- 3 Expansion connectors (1.27mm pitch)

The I/O can be re-mapped on the processor for different functions – refer to the Data Sheet. The following shows the interface primary functions :

- P1(50 way):
  - MMC interface (shared with on-board eMMC)
  - LCD interface (Can be used for HDMI interface – driver circuitry needed)
  - GPIO's
  - Timers, PWMs, Counters
- P2 (50 way):
  - Power in (5V)
  - Battery interface (Li single cell supported)
  - 3.3V supply out (200mA max)
  - Power control
  - Reset
  - UARTS
  - I2C
  - SPI
  - Analog inputs
  - GPIO
  - Clock output
- P3 (30 way):
  - Ethernet MII port
  - USB Host port
  - I2C
- Hardware configurable to run standard Beaglebone Software.

# Connector pin definitions

| Bottom View |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   |    |    |
|-------------|----|----|----|----|----|----|----|----|----|----|----|----|---|---|---|----|----|
|             |    | P3 |    |    |    |    |    |    |    |    |    |    |   |   |   |    |    |
|             |    | 30 | 28 | 26 | 24 | 22 | 20 | 18 | 16 | 14 | 12 | 10 | 8 | 6 | 4 | 2  |    |
|             |    | 29 | 27 | 25 | 23 | 21 | 19 | 17 | 15 | 13 | 11 | 9  | 7 | 5 | 3 | 1  |    |
| P1          |    |    |    |    |    |    |    |    |    |    |    |    |   |   |   | P2 |    |
| 2           | 1  |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 2  | 1  |
| 4           | 3  |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 4  | 3  |
| 6           | 5  |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 6  | 5  |
| 8           | 7  |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 8  | 7  |
| 10          | 9  |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 10 | 9  |
| 12          | 11 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 12 | 11 |
| 14          | 13 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 14 | 13 |
| 16          | 15 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 16 | 15 |
| 18          | 17 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 18 | 17 |
| 20          | 19 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 20 | 19 |
| 22          | 21 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 22 | 21 |
| 24          | 23 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 24 | 23 |
| 26          | 25 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 26 | 25 |
| 28          | 27 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 28 | 27 |
| 30          | 29 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 30 | 29 |
| 32          | 31 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 32 | 31 |
| 34          | 33 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 34 | 33 |
| 36          | 35 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 36 | 35 |
| 38          | 37 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 38 | 37 |
| 40          | 39 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 40 | 39 |
| 42          | 41 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 42 | 41 |
| 44          | 43 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 44 | 43 |
| 46          | 45 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 46 | 45 |
| 48          | 47 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 48 | 47 |
| 50          | 49 |    |    |    |    |    |    |    |    |    |    |    |   |   |   | 50 | 49 |

## 1. Connector P1

| Conn Pin | Proc Pin | Name     | Alternative functions  | Voltage | BBB Function | BBB Pin | Notes     |
|----------|----------|----------|--|---------|--------------|---------|-----------|
| 1        |          | 3.3V I/O | 3.3V out from module   | 3.3V    |              |         | 200mA max |
| 2        |          | 3.3V I/O | 3.3V out from module   | 3.3V    |              |         | 200mA max |
| 3        | R9       | GPIO1_6  | GPMC_AD6/MMC1_DAT6/GPIO1_6   | 3.3V    | MMC1_DAT6    | P8_3    |           |
| 4        | T9       | GPIO1_7  | GPMC_AD7/MMC1_DAT7/GPIO1_7   | 3.3V    | MMC1_DAT7    | P8_4    |           |
| 5        | R8       | GPIO1_2  | GPMC_AD2/MMC1_DAT2/GPIO1_2   | 3.3V    | MMC1_DAT2    | P8_5    |           |
| 6        | T8       | GPIO1_3  | GPMC_AD3/MMC1_DAT3/GPIO1_3   | 3.3V    | MMC1_DAT3    | P8_6    |           |
| 7        | R7       | GPIO2_2  | GPMC_ADV_N_ALE/TIMER4/GPIO2_2  | 3.3V    | TIMER4       | P8_7    |           |
| 8        | T7       | GPIO2_3  | GPMC_OEN_REN/TIMER7/EMU4/GPIO2_3   | 3.3V    | TIMER7       | P8_8    |           |
| 9        | T6       | GPIO2_5  | GPMC_BE0N_CLE/TIMER5/GPIO2_5   | 3.3V    | TIMER5       | P8_9    |           |
| 10       | U6       | GPIO2_4  | GPMC_WEN/TIMER6/GPIO2_4  | 3.3V    | TIMER6       | P8_10   |           |
| 11       | R12      | GPIO1_13 | GPMC_AD13/LCD_DATA18/MMC1_DAT5/MMC2_DAT1/EQEP2B_IN/PR1_MII0_TXD1/PR1_PRU0_PRU_R30_15/GPIO1_13                      | 3.3V    | GPIO1_13     | P8_11   |           |
| 12       | T12      | GPIO1_12 | GPMC_AD12/LCD_DATA19/MMC1_DAT4/MMC2_DAT0/EQEP2A_IN/PR1_MII0_TXD2/PR1_PRU0_PRU_R30_14/GPIO1_12                      | 3.3V    | GPIO1_12     | P8_12   |           |
| 13       | T10      | GPIO0_23 | GPMC_AD9/LCD_DATA22/MMC1_DAT1/MMC2_DAT5/EHRPWM2B/PR1_MII0_CRS//GPIO0_23  | 3.3V    | EHRPWM2B     | P8_13   |           |
| 14       | T11      | GPIO0_26 | GPMC_AD10/LCD_DATA21/MMC1_DAT2/MMC2_DAT6/EHRPWM2_TRIPZONE_INPUT/PR1_MII0_TXEN//GPIO0_26                            | 3.3V    | GPIO0_26     | P8_14   |           |
| 15       | U13      | GPIO1_15 | GPMC_AD15/LCD_DATA16/MMC1_DAT7/MMC2_DAT3/EQEP2_STROBE/PR1_ECAP0_ECAP_CAPIN_APWM_O/PR1_PRU0_PRU_R31_15/GPIO1_15     | 3.3V    | GPIO1_15     | P8_15   |           |
| 16       | V13      | GPIO1_14 | GPMC_AD14/LCD_DATA17/MMC1_DAT6/MMC2_DAT2/EQEP2_INDEX/PR1_MII0_TXD0/PR1_PRU0_PRU_R31_14/GPIO1_14                    | 3.3V    | GPIO1_14     | P8_16   |           |
| 17       | U12      | GPIO0_27 | GPMC_AD11/LCD_DATA20/MMC1_DAT3/MMC2_DAT7/EHRPWM2_SYNCI_O/PR1_MII0_TXD3//GPIO0_27                                   | 3.3V    | GPIO0_27     | P8_17   |           |
| 18       | V12      | GPIO2_1  | GPMC_CLK/LCD_MEM_CLK/GPMC_WAIT1/MMC2_CLK/PRT1_MII1_TXEN/MCASP0_FSR/GPIO2_1   | 3.3V    | GPIO2_1      | P8_18   |           |
| 19       | U10      | GPIO0_22 | GPMC_AD8/LCD_DATA23/MMC1_DAT0/MMC2_DAT4/EHRPWM2A/PR1_MII_MT0_CLK//GPIO0_22   | 3.3V    | EHRPWM2A     | P8_19   |           |
| 20       | V9       | GPIO1_31 | GPMC_CSN2/GPMC_BE1N/MMC1_CMD/PR1_EDIO_DATA_IN7/PR1_EDIO_DATA_OUT7/PR1_PRU1_PRU_R30_13/PR1_PRU1_PRU_R31_13/GPIO1_31 | 3.3V    | MMC1_CMD     | P8_20   |           |
| 21       | U9       | GPIO1_30 | GPMC_CSN1/GPMC_CLK/MMC1_CLK/PRT1EDIO_DATA_IN6/PRT1_EDIO_DATA_OUT6/PR1_PRU1_PRU_R30_12/PR1_PRU1_PRU_R31_12/GPIO1_30 | 3.3V    | MMC1_CLK     | P8_21   |           |
| 22       | V8       | GPIO1_5  | GPMC_AD5/MMC1_DAT5/GPIO1_5   | 3.3V    | MMC1_DAT5    | P8_22   |           |

| Conn Pin | Proc Pin | Name     | Alternative functions  | Voltage | BBB Function | BBB Pin | Notes |
|----------|----------|----------|--|---------|--------------|---------|-------|
| 23       | U8       | GPIO1_4  | GPMC_AD4/MMC1_DAT4/GPIO1_4   | 3.3V    | MMC1_DAT4    | P8_23   |       |
| 24       | V7       | GPIO1_1  | GPMC_AD1/MMC1_DAT1/GPIO1_1   | 3.3V    | MMC1_DAT1    | P8_24   |       |
| 25       | U7       | GPIO1_0  | GPMC_AD0/MMC1_DAT0/GPIO1_0   | 3.3V    | MMC1_DAT0    | P8_25   |       |
| 26       | V6       | GPIO1_29 | GPMC_CSN0/GPIO1_29   | 3.3V    | GPIO1_29     | P8_26   |       |
| 27       | U5       | GPIO2_22 | LCD_VSYNC/GPMC_A8//PR1_EDIO_DATA_IN2/PR1_EDIO_DATA_OUT2<br>/PR1_PRU1_PRU_R30_8/PR1_PRU1_PRU_R31_8/GPIO2_22                 | 3.3V    | LCD_VSYNC    | P8_27   |       |
| 28       | V5       | GPIO2_24 | LCD_PCLK/GPMC_A10//PR1_EDIO_DATA_IN4/PR1_EDIO_DATA_OUT4<br>/PR1_PRU1_PRU_R30_10/PR1_PRU1_PRU_R31_10/GPIO2_24               | 3.3V    | LCD_PCLK     | P8_28   |       |
| 29       | R5       | GPIO2_23 | LCD_HSYNC/GPMC_A9//PR1_EDIO_DATA_IN3/PR1_EDIO_DATA_OUT3<br>/PR1_PRU1_PRU_R30_9/PR1_PRU1_PRU_R31_9/GPIO2_23                 | 3.3V    | LCD_HSYNC    | P8_29   |       |
| 30       | R6       | GPIO2_25 | LCD_AC_BIAS_EN/GPMC_A11//PR1_EDIO_DATA_IN5/PR1_EDIO_DATA_OUT5<br>/PR1_PRU1_PRU_R30_11/PR1_PRU1_PRU_R31_11/GPIO2_25         | 3.3V    | LCD_DE       | P8_30   |       |
| 31       | V4       | GPIO0_10 | LCD_DATA14/GPMC_A18/EQEP1_INDEX/MCASP0_AXR1/UART5_RXD<br>/PR1_MII_MR0_CLK/UART5_CTSN/GPIO0_10                              | 3.3V    | LCD_DATA14   | P8_31   |       |
| 32       | T5       | GPIO0_11 | LCD_DATA15/GPMC_A19/EQEP1_STROBE/MCASP0_AHCLKX<br>/MCASP0_AXR3/PR1_MII0_RXDV/UART5_RTCN/GPIO0_11                           | 3.3V    | LCD_DATA15   | P8_32   |       |
| 33       | V3       | GPIO0_9  | LCD_DATA13/GPMC_A17/EQEP1B_IN/MCASP0_FSR/MCASP0_AXR3<br>/PR1_MII0_RXER/UART4_RTSN/GPIO0_9                                  | 3.3V    | LCD_DATA13   | P8_33   |       |
| 34       | U4       | GPIO2_17 | LCD_DATA11/GPMC_A15/EHRPWM1B/MCASP0_AHCLKR/MCASP0_AXR2<br>/PR1_MII0_RXD0/UART3_RTSN/GPIO2_17                               | 3.3V    | LCD_DATA11   | P8_34   |       |
| 35       | V2       | GPIO0_8  | LCD_DATA12/GPMC_A16/EQEP1A_IN/MCASP0_ACLKR/MCASP0_AXR2<br>/PR1_MII0_RXLINK/UART4_CTSN/GPIO0_8                              | 3.3V    | LCD_DATA12   | P8_35   |       |
| 36       | U3       | GPIO2_16 | LCD_DATA10/GPMC_A14/EHRPWM1A/MCASP0_AXR0//PR1_MII0_RXD1<br>/UART3_CTSN/GPIO2_16  | 3.3V    | LCD_DATA10   | P8_36   |       |
| 37       | U1       | GPIO2_14 | LCD_DATA8/GPMC_A12/EHRPWM1_TRIPZONE_INPUT/MCASP0_ACLKX<br>/UART5_TXD/PR1_MII0_RXD3/UART2_CTSN/GPIO2_14                     | 3.3V    | LCD_DATA8    | P8_37   |       |
| 38       | U2       | GPIO2_15 | LCD_DATA9/GPMC_A13/EHRPWM1_SYNCI_O/MCASP0_FSX/UART5_RXD<br>/PR1_MII0_RXD2/UART2_RTSN/GPIO2_15                              | 3.3V    | LCD_DATA9    | P8_38   |       |
| 39       | T3       | GPIO2_12 | LCD_DATA6/GPMC_A6/PR1_EDIO_DATA_IN6/EQEP2_INDEX<br>/PR1_EDIO_DATA_OUT6/PR1_PRU1_PRU_R30_6<br>/PR1_PRU1_PRU_R31_6/GPIO2_12  | 3.3V    | LCD_DATA6    | P8_39   |       |
| 40       | T4       | GPIO2_13 | LCD_DATA7/GPMC_A7/PR1_EDIO_DATA_IN7/EQEP2_STROBE<br>/PR1_EDIO_DATA_OUT7/PR1_PRU1_PRU_R30_7<br>/PR1_PRU1_PRU_R31_7/GPIO2_13 | 3.3V    | LCD_DATA7    | P8_40   |       |
| 41       | T1       | GPIO2_10 | LCD_DATA4/GPMC_A4//EQEP2A_IN//PR1_PRU1_PRU_R30_4<br>/PR1_PRU1_PRU_R31_4/GPIO2_10   | 3.3V    | LCD_DATA4    | P8_41   |       |
| 42       | T2       | GPIO2_11 | LCD_DATA5/GPMC_A5//EQEP2B_IN//PR1_PRU1_PRU_R30_5<br>/PR1_PRU1_PRU_R31_5/GPIO2_11   | 3.3V    | LCD_DATA5    | P8_42   |       |
| 43       | R3       | GPIO2_8  | LCD_DATA2/GPMC_A2//EHRPWM2_TRIPZONE_INPUT<br>/PR1_PRU1_PRU_R30_2/PR1_PRU1_PRU_R31_2/GPIO2_8                                | 3.3V    | LCD_DATA2    | P8_43   |       |

| Conn Pin | Proc Pin | Name     | Alternative functions   | Voltage | BBB Function | BBB Pin | Notes          |
|----------|----------|----------|---|---------|--------------|---------|----------------|
| 44       | R4       | GPIO2_9  | LCD_DATA3/GPMC_A3//EHRPWM2_SYNCI_O<br>/PR1_PRU1_PRU_R30_3/PR1_PRU1_PRU_R31_3/GPIO2_9      | 3.3V    | LCD_DATA3    | P8_44   |                |
| 45       | R1       | GPIO2_6  | LCD_DATA0/GPMC_A0//EHRPWM2A//PR1_PRU1_PRU_R30_0<br>/PR1_PRU1_PRU_R31_0/GPIO2_6            | 3.3V    | LCD_DATA0    | P8_45   |                |
| 46       | R2       | GPIO2_7  | LCD_DATA1/GPMC_A1//EHRPWM2B//PR1_PRU1_PRU_R30_1<br>/PR1_PRU1_PRU_R31_1/GPIO2_7            | 3.3V    | LCD_DATA1    | P8_46   |                |
| 47       | V17      | GPIO1_27 | GPMC_A11/GMII2_RXD0/RGMII2_RD0/RMII2_RXD0/GPMC_A27<br>/PR1_MII1_RXER/MCASP0_AXR1/GPIO1_27 | 3.3V    | HDMICLK_DISn |         |                |
| 48       | U16      | GPIO1_25 | GPMC_A9/GMII2_RXD2/RGMII2_RD2/MMC2_DAT7/GPMC_A25<br>/PR1_MII_MR1_CLK/MCASP0_FSX/GPIO1_25  | 3.3V    | HDMI_INT     |         |                |
| 49       |          | DGND     |   |         |              |         | Digital Ground |
| 50       |          | DGND     |   |         |              |         | Digital Ground |

## 2. Connector P2

| Conn Pin | Proc Pin | Name          | Alternative functions   | Voltage | BBB Function | BBB Pin | Notes                                       |
|----------|----------|---------------|---|---------|--------------|---------|---|
| 1        |          | BAT_SENSE     | Single Cell Li-ion  | 4.2V    |              |         | Battery Voltage Sense                       |
| 2        |          | VBAT          | Single Cell Li-ion  | 4.2V    |              |         | Battery Voltage Connection                  |
| 3        |          | BAT_TEMPSENSE | Single Cell Li-ion  | 10k     |              |         | Battery Temperature sense                   |
| 4        |          | VBAT          | Single Cell Li-ion  | 4.2V    |              |         | Battery Voltage Connection                  |
| 5        |          | 5V_IN         | 5.0V Input  | 5.0V    |              |         | Up to 1A                                    |
| 6        |          | 5V_IN         | 5.0V Input  | 5.0V    |              |         | Up to 1A                                    |
| 7        |          | DGND          |   |         |              |         | Digital Ground                              |
| 8        |          | DGND          |   |         |              |         | Digital Ground                              |
| 9        |          | 3.3V I/O      | 3.3V out from module  | 3.3V    |              |         | 200mA max                                   |
| 10       |          | 3.3V I/O      | 3.3V out from module  | 3.3V    |              |         | 200mA max                                   |
| 11       |          | WP            |   | 3.3V    |              |         | WP of EEPROM, pull to GND to enable writing |
| 12       | A15      | GPIO0_19      | EVENT_INTR0/TIMER4/CLKOUT1/SPI1_CS1/PR1PRU1R31_16/EMU2/GPIO0_19   |         | CLKOUT1      |         |   |
| 13       |          | SYS_5V        |   |         |              |         | Output from Power Management IC             |
| 14       |          | SYS_5V        |   |         |              |         | Output from Power Management IC             |
| 15       |          | PWR_BUT       |   |         | PWR_BUT      | P9_9    | Switch on/off                               |
| 16       |          | SYS_RESETn    |   |         | SYS_RESE Tn  | P9_10   | System reset signal(Active low)             |
| 17       | T17      | GPIO0_30      | GPMC_WAIT0/GM112_CRS/GPMC_CSN4/RMII2_CRS_DV/MMC1_SDCD/PR1_MII1_RXDV/UART4_RXD/GPIO0_30                  | 3.3V    | UART4_RX D   | P9_11   |   |
| 18       | U18      | GPIO1_28      | GPMC_BE1N/GMII2_COL/GPMC_CSN6/MMC2_DAT3/GPMC_DIR/PR1_MII1_RXLINK/MCASP0_ACLKR/GPIO1_28                  | 3.3V    | GPIO1_28     | P9_12   |   |
| 19       | U17      | GPIO0_31      | GPMC_WPN/GMII2_RXERR/GPMC_CSN5/RMII2_RXERR/MMC2_SDCD/PR1_MDIO_MDCLK/UART4_TXD/GPIO0_31                  | 3.3V    | UART4_TX D   | P9_13   |   |
| 20       | U14      | GPIO1_18      | GPMC_A2/GMII2_TXD3/RGMII2_TD3/MMC2_DAT1/GPMC_A18/PR1_MII1_TXD2/EHRPWM1A/GPIO1_18                        | 3.3V    | EHRPWM1 A    | P9_14   |   |
| 21       | R13      | GPIO1_16      | GPMC_A0/GMII2_TXEN/RGMII2_TCTL/RMII2_TXEN/GPMC_A16/PR1_MII_MT1_CLK/EHRPWM1_TRIPZONE_INPUT/GPIO1_16      | 3.3V    | GPIO1_16     | P9_15   | Coupled to GPIO2_0(T13) via 0R              |
| 22       | T14      | GPIO1_19      | GPMC_A3/GMII2_TXD2/RGMII2_TD2/MMC2_DAT2/GPMC_A19/PR1_MII1_TXD1/EHRPWM1B/GPIO1_19                        | 3.3V    | EHRPWM1 B    | P9_16   |   |
| 23       | A16      | GPIO0_5       | SPI0_CS0/MMC2_SDWP/I2C1_SCL/EHRPWM0_SYNCI_O/PR1_UART0_TX D/PR1_EDIO_DATA_IN1/PR1_EDIO_DATA_OUT1/GPIO0_5 | 3.3V    | I2C1_SCL     | P9_17   |   |



| Conn Pin | Proc Pin | Name     | Alternative functions   | Voltage | BBB Function  | BBB Pin | Notes                      |
|----------|----------|----------|---|---------|---------------|---------|----------------------------|
| 24       | B16      | GPIO0_4  | SPI0_D1/MMC1_SDWP/I2C1_SDA/EHRPWM0_TRIPZONE_INPUT /PR1_UART0_RXD/PR1_EDIO_DATA_IN0/PR1_EDIO_DATA_OUT0/GPIO0_4         | 3.3V    | I2C1_SDA      | P9_18   |                            |
| 25       | D17      | GPIO0_13 | UART1_RTSN/TIMER5/DCAN0_RX/I2C2_SCL/SPI1_CS1 /PR1_UART0_RTS_N/PR1_EDC_LATCH1_IN/GPIO0_13                              | 3.3V    | I2C2_SCL      | P9_19   |                            |
| 26       | D18      | GPIO0_12 | UART1_CTSN/TIMER6/DCAN0_TX/I2C2_SDA/SPI1_CS0 /PR1_UART0_CTS_N/PR1_EDC_LATCH0_IN/GPIO0_12                              | 3.3V    | I2C2_SDA      | P9_20   |                            |
| 27       | B17      | GPIO0_3  | SPI0_D0/UART2_TXD/I2C2_SCL/EHRPWM0B/PR1_UART0_RTS_N /PR1_EDIO_LATCH_IN/EMU3/GPIO0_3                                   | 3.3V    | UART2_TX<br>D | P9_21   |                            |
| 28       | A17      | GPIO0_2  | SPI0_SCLK/UART2_RXD/I2C2_SDA/EHRPWM0A/PR1_UART0_CTS_N /PR1_EDIO_SOF/EMU2/GPIO0_2                                      | 3.3V    | UART2_RX<br>D | P9_22   |                            |
| 29       | V14      | GPIO1_17 | GPMC_A1/GMII2_RXDV/RGMII2_RCTL/MMC2_DAT0/GPMC_A17 /PR1_MII1_TXD3/EHRPWM1_SYNCI_O/GPIO1_17                             | 3.3V    | GPIO1_17      | P9_23   |                            |
| 30       | D15      | GPIO0_15 | UART1_TXD/MMC2_SDWP/DCAN1_RX/I2C1_SCL//PR1_UART0_TXD /PR1_PRU0_PRU_R31_16/GPIO0_15                                    | 3.3V    | UART1_TX<br>D | P9_24   |                            |
| 31       | A14      | GPIO3_21 | MCASP0_AHCLKX/EQEP0_STROBE/MCASP0_AXR3/MCASP1_AXR1/EM U4 /PR1_PRU0_PRU_R30_7/PR1_PRU0_PRU_R31_7/GPIO3_21              | 3.3V    | GPIO3_21      | P9_25   |                            |
| 32       | D16      | GPIO0_14 | UART1_RXD/MMC1_SDWP/DCAN1_TX/I2C1_SDA//PR1_UART0_RXD /PR1_PRU1_PRU_R31_16/GPIO0_14                                    | 3.3V    | UART1_RX<br>D | P9_26   |                            |
| 33       | C13      | GPIO3_19 | MCASP0_FSR/EQEP0B_IN/MCASP0_AXR3/MCASP1_FSX/EMU2 /PR1_PRU0_PRU_R30_5/PR1_PRU0_PRU_R31_5/GPIO3_19                      | 3.3V    | GPIO3_19      | P9_27   |                            |
| 34       | C12      | GPIO3_17 | MCASP0_AHCLKR/EHRPWM0_SYNCI_O/MCASP0_AXR2/SPI1_CS0/ECAP 2_ IN_PWM2_OUT/PR1_PRU0_PRU_R30_3/PR1_PRU0_PRU_R31_3/GPIO3_17 | 3.3V    | SPI1_CS0      | P9_28   |                            |
| 35       | B13      | GPIO3_15 | MCASP0_FSX/EHRPWM0B//SPI1_D0/MMC1_SDCD/PR1_PRU0_PRU_R30_ 1 /PR1_PRU0_PRU_R31_1/GPIO3_15                               | 3.3V    | SPI1_D0       | P9_29   |                            |
| 36       | D12      | GPIO3_16 | MCASP0_AXR0/EHRPWM0_TRIPZONE_INPUT//SPI1_D1/MMC2_SDCD /PR1_PRU0_PRU_R30_2/PR1_PRU0_PRU_R31_2/GPIO3_16                 | 3.3V    | SPI1_D1       | P9_30   |                            |
| 37       | A13      | GPIO3_14 | MCASP0_ACLKX/EHRPWM0A//SPI1_SCLK/MMC0_SDCD/PR1_PRU0_PRU _R30_0 /PR1_PRU0_PRU_R31_0/GPIO3_14                           | 3.3V    | SPI1_SCLK     | P9_31   |                            |
| 38       |          | VDD_ADC  |   | 1.8V    | VDD_ADC       | P9_32   | Analogue Rail – (50mA Max) |
| 39       |          | AIN4     |   | 1.8V    | AIN4          | P9_33   |                            |
| 40       |          | AGND     |   |         | AGND          | P9_34   | Analogue ground            |
| 41       |          | AIN6     |   | 1.8V    | AIN6          | P9_35   |                            |
| 42       |          | AIN5     |   | 1.8V    | AIN5          | P9_36   |                            |
| 43       |          | AIN2     |   | 1.8V    | AIN2          | P9_37   |                            |
| 44       |          | AIN3     |   | 1.8V    | AIN3          | P9_38   |                            |
| 45       |          | AIN0     |   | 1.8V    | AIN0          | P9_39   |                            |
| 46       |          | AIN1     |   | 1.8V    | AIN1          | P9_40   |                            |



### 3. Connector P3

| Conn Pin | Proc Pin | Name     | Alternative functions  | Voltage | BBB Function | Notes     |
|----------|----------|----------|--|---------|--------------|-----------|
| 1        |          | 3.3V I/O | 3.3V out from module   | 3.3V    |              | 200mA max |
| 2        |          | 3.3V I/O | 3.3V out from module   | 3.3V    |              | 200mA max |
| 3        | J15      | GPIO3_2  | GMII1_RXERR/RMII1_RXERR/SPI1_D1/I2C1_SCL/MCASP1_FSX<br>/UART5_RTSM/UART2_TXD/GPIO3_2               | 3.3V    | MII1_RXERR   |           |
| 4        | H16      | GPIO3_0  | GMII1_COL/RMII2_REFCLK/SPI1_SCLK/UART5_RXD/MCASP1_AXR2<br>/MMC2_DAT3/MCASP0_AXR2/GPIO3_0           | 3.3V    | MII1_COL     |           |
| 5        | L16      | GPIO2_19 | GMII1_RXD2/UART3_TXD/RGMII1_RD2/MMC0_DAT4/MMC1_DAT3<br>/UART1_RIN/MCASP0_AXR1/GPIO2_19             | 3.3V    | MII1_RXD2    |           |
| 6        | J18      | GPIO0_16 | GMII1_TXD3/DCAN0_TX/RGMII1_TD3/UART4_RXD/MCASP1_FSX<br>/MMC2_DAT1/MCASP0_FSR/GPIO0_16              | 3.3V    | MII1_TXD3    |           |
| 7        | J17      | GPIO3_4  | GMII1_RXDV/LCD_MEMORY_CLK/RGMII1_RCTL/UART5_TXD<br>/MCASP1_ACLKX/MMC2_DAT0/MCASP0_ACLKR/GPIO3_4    | 3.3V    | MII1_RXDV    |           |
| 8        | J16      | GPIO3_3  | GMII1_TXEN/RMII1_TXEN/RGMII1_TCTL/TIMER4/MCASP1_AXR0<br>/EQEP0_INDEX/MMC2_CMD/GPIO3_3              | 3.3V    | MII1_TXEN    |           |
| 9        | H18      | GPIO0_29 | RMII1_REFCLK/XDMA_EVENT_INTR2/SPI1_CS0/UART5_TXD/MCASP1_AXR3<br>/MMC0_POW/MCASP1_AHCLKX/GPIO0_29   | 3.3V    | MII1_REFCLK  |           |
| 10       | H17      | GPIO3_1  | GMII1_CRS/RMII1_CRS_DV/SPI1_D0/I2C1_SDA/MCASP1_ACLKX<br>/UART5_CTSN/UART2_RXD/GPIO3_1              | 3.3V    | MII1_CRS_DV  |           |
| 11       | L15      | GPIO2_20 | GMII1_RXD1/RMII1_RXD1/RGMII1_RD1/MCASP1_AXR3/MCASP1_FSR<br>/EQEP0_STROBE/MMC2_CLK/GPIO2_20         | 3.3V    | MII1_RXD1    |           |
| 12       | K17      | GPIO0_28 | GMII1_TXD0/RMII1_TXD0/RGMII1_TD0/MCASP1_AXR2/MCASP1_ACLKR<br>/EQEP0B_IN/MMC1_CLK/GPIO0_28          | 3.3V    | MII1_TXD0    |           |
| 13       | L17      | GPIO2_18 | GMII1_RXD3/UART3_RXD/RGMII1_RD3/MMC0_DAT5/MMC1_DAT2<br>/UART1_DTRN/MCASP0_AXR0/GPIO2_18            | 3.3V    | MII1_RXD3    |           |
| 14       | K18      | GPIO3_9  | GMII1_TXCLK/UART2_RXD/RGMII1_TCLK/MMC0_DAT7/MMC1_DAT0<br>/UART1_DCDN/MCASP0_ACLKX/GPIO3_9          | 3.3V    | MII1_TXCLK   |           |
| 15       | L18      | GPIO3_10 | GMII1_RXCLK/UART2_TXD/RGMII1_RCLK/MMC0_DAT6/MMC1_DAT1<br>/UART1_DSRN/MCASP0_FSX/GPIO3_10           | 3.3V    | MII1_RXCLK   |           |
| 16       | K16      | GPIO0_21 | GMII1_TXD1/RMII1_TXD1/RGMII1_TD1/MCASP1_FSR/MCASP1_AXR1<br>/EQEP0A_IN/MMC1_CMD/GPIO0_21            | 3.3V    | MII1_TXD1    |           |
| 17       | M16      | GPIO2_21 | GMII1_RXD0/RMII1_RXD0/RGMII1_RD0/MCASP1_AHCLKX/MCASP1_AHCLKR<br>/MCASP1_ACLKR/MCASP0_AXR3/GPIO2_21 | 3.3V    | MII1_RXD0    |           |
| 18       | K15      | GPIO0_17 | GMII1_TXD2/DCAN0_RX/RGMII1_TD2/UART4_TXD/MCASP1_AXR0<br>/MMC2_DAT2/MCASP0_AHCLKX/GPIO0_17          | 3.3V    | MII1_TXD2    |           |
| 19       | M17      | GPIO0_0  | MDIO_DATA/TIMER6/UART5_RXD/UART3_CTSN/MMC0_SDCD<br>/MMC1_CMD/MMC2_CMD/GPIO0_0                      | 3.3V    | MDIO_DATA    |           |
| 20       | C17      | GPIO3_5  | I2C0_SDA/TIMER4/UART2_CTSN/ECAP2_IN_PWM2_OUT/GPIO3_5   | 3.3V    | I2C0_SDA     |           |
| 21       | M18      | GPIO0_1  | MDIO_CLK/TIMER5/UART5_TXD/UART3_RTSM/MMC0_SDWP<br>/MMC1_CLK/MMC2_CLK/GPIO0_1                       | 3.3V    | MDIO_CLK     |           |

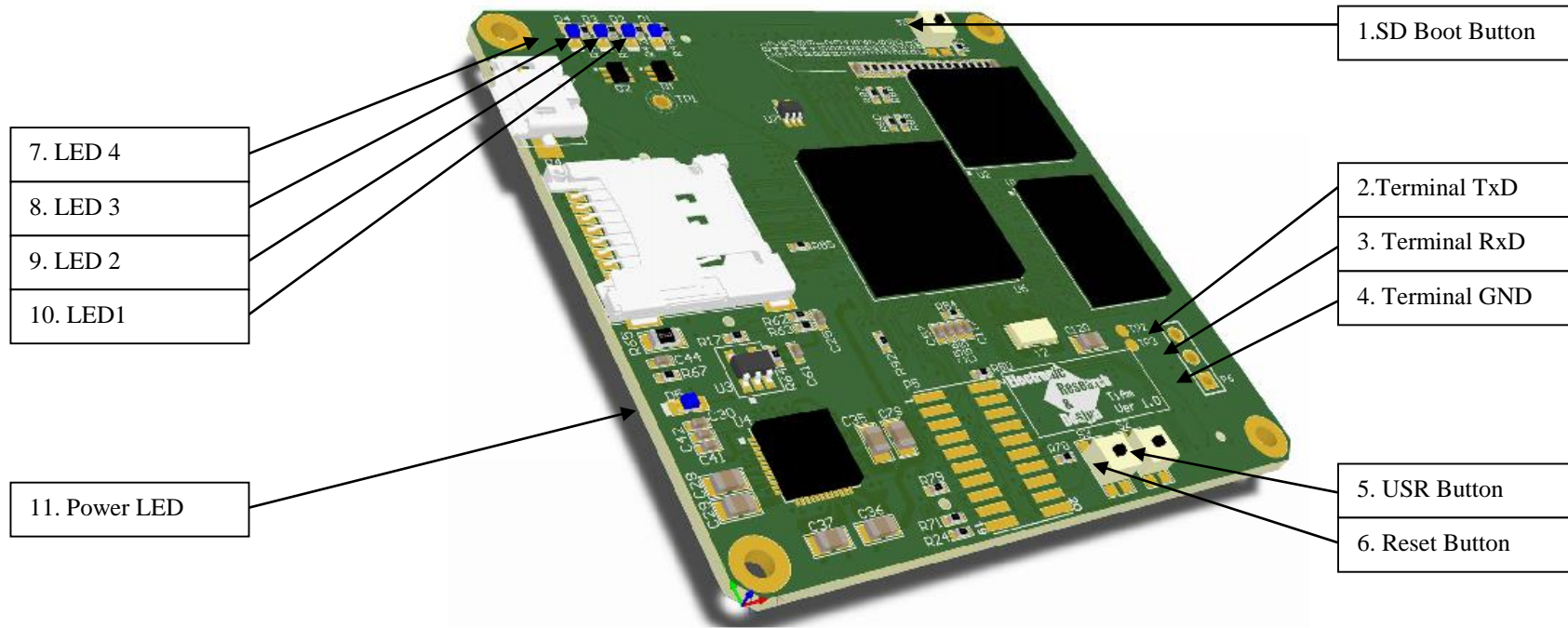
| Conn Pin | Proc Pin | Name      | Alternative functions   | Voltage | BBB Function | Notes          |
|----------|----------|-----------|---|---------|--------------|----------------|
| 22       | C16      | GPIO3_6   | I2C0_SCL/TIMER7/UART2_RTSM/ECAP1_IN_PWM1_OUT/GPIO3_6                                      | 3.3V    | I2C0_SCL     |                |
| 23       | F15      | GPIO3_13  | USB1_DRVVBUS/GPIO3_13   | 3.3V    | USB1_DRVVBUS |                |
| 24       | P17      | USB1_ID   |   | 3.3V    | USB1_ID      |                |
| 25       | R17      | USB1_D_P  |   | 3.3V    | USB1_D_P     |                |
| 26       | T18      | USB1_VBUS |   | 3.3V    | USB1_VBUS    |                |
| 27       | R18      | USB1_D_N  |   | 3.3V    | USB1_D_N     |                |
| 28       | T16      | GPIO1_26  | GPMC_A10/GMII2_RXD1/RGMII2_RD1/RMII2_RXD1/GPMC_A26<br>/PR1_MII1_CRSM/MCASP0_AXR0/GPIO1_26 | 3.3V    | USB1_OCn     |                |
| 29       |          | DGND      |   |         |              | Digital Ground |
| 30       |          | DGND      |   |         |              | Digital Ground |

## 4. Boot Configuration

| BOOT15 | BOOT14 | BOOT13 | BOOT12 | BOOT11 | BOOT10 | BOOT9 | BOOT8 | BOOT7 | BOOT6 | BOOT5 | BOOT4 | BOOT3 | BOOT2 | BOOT1 | BOOT0 |
|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0      | 1      | 0      | 0      | 0      | 0      | 0     | 0     | 0     | 0     | 1     | 1     | 1     | 1     | 0     | 0     |

- a. LCD\_DATA[15:0] terminals are respectively SYSBOOT[15:0] inputs, latched on the rising edge of PWRONRSTn.
- b. Please ensure that the boot pins stay in their correct state during power on reset.
- c. More information on the above could be found in TI document [spruh73k.pdf](#). (Table 26-7)
- d. SD Boot button (see next page) pulls BOOT2 to ground to force booting from Micro SD.

Board definitions



- i. SD Boot Button  
Keep button in during power-up to force boot from SD.
- ii. Terminal TxD  
Connect to **3.3V** level RxD on suitable serial cable.
- iii. Terminal RxD  
Connect to **3.3V** level TxD on suitable serial cable.
- iv. Terminal GND  
Connect to GROUND on suitable serial Cable.
- v. USR Button  
Used by some distributions to shut down Linux.
- vi. Reset Button  
Press button to force a hardware reset.
- vii. LED 4  
Configured to light during eMMC accesses.
- viii. LED 3  
Configured to light during CPU activity.
- ix. LED2  
Configured to light during microSD card accesses.
- x. LED 1  
Configured to blink in a heartbeat pattern.
- xi. Power LED  
Indicates power supply active.

## 5. Software resources.

The ERD TiAm hardware is compatible to the BeagleBone Black except for not having the following on-board:

- i. HDMI – A NXP interface IC () is needed to convert the LCD outputs to HDMI.
- ii. Host USB (Second port) connection and USB output power control.
- iii. Ethernet – A PHY () is necessary to connect to the MII signals from the processor to the Ethernet magnetics and connector.

All signals to achieve the above are available on the expansion connectors. An example baseboard is available on request with full schematics and PCB layout in Altium format.

To connect your ERD TiAm to a Windows host please download and install the following drivers from the official BeagleBone Black site :

For Windows 64 bit :

[http://beagleboard.org/static/Drivers/Windows/BONE\\_D64.exe](http://beagleboard.org/static/Drivers/Windows/BONE_D64.exe)

For Windows 32 bit:

[http://beagleboard.org/static/Drivers/Windows/BONE\\_DRV.exe](http://beagleboard.org/static/Drivers/Windows/BONE_DRV.exe)

It should connect by default to a Linux host without any driver software.

You can then connect to your board via USB:

<http://192.168.7.2/>

This document will be available for download there.



The following is a list of resources to assist in customizing the platform to your requirements:

- a. Host setup ( Done on Ubuntu 14.04 LTS ) for building the mainline Linux kernel

<http://eewiki.net/display/linuxonarm/BeagleBone+Black>

Get the latest versions and recipes from the above link!

To build the Kernel (in ~/bb-kernel):

```
./build_kernel.sh
```

To rebuild the Kernel (in ~/bb-kernel):

```
tools/rebuild.sh
```

After a kernel rebuild (with the board connected via USB) remember to export the kernel version (last line of build result)

```
sudo sh -c "echo 'uname_r=${kernel_version}' > /media/user/rootfs/boot/uEnv.txt"  
sudo cp -v ./bb-kernel/deploy/${kernel_version}.zImage /media/user/rootfs/boot/vmlinuz-${kernel_version}  
sudo mkdir -p /media/user/rootfs/boot/dtbs/${kernel_version}/  
sudo tar xfv ./bb-kernel/deploy/${kernel_version}-dtbs.tar.gz -C /media/user/rootfs/boot/dtbs/${kernel_version}/  
sudo tar xfv ./bb-kernel/deploy/${kernel_version}-modules.tar.gz -C /media/user/rootfs/
```

- b. Setup Host for gateway to internet from device via USB.

On the Host (USB Ether internet access):

```
sudo iptables --table nat --append POSTROUTING --out-interface eth0 -j MASQUERADE  
sudo iptables --append FORWARD --in-interface eth1 -j ACCEPT  
sudo su  
sudo echo 1 > /proc/sys/net/ipv4/ip_forward  
exit
```

```
sudo apt-get install iptables-persistent
```

(This should take the current rules and make them persistent (If you selected 'yes'....))

Edit :

*sudo gedit /etc/sysctl.conf*

Uncomment (remove #) from the line:

*#net.ipv4.ip\_forward=1*

On Device - update :

*sudo apt-get update*

Now you can install software...

c. Install Eclipse and remote debugging for the device:

Set up Eclipse :

<http://www.michaelhleonard.com/cross-compile-for-beaglebone-black/>

(Only difference is use of cross-compile tools installed in host setup above)

On device (enable user root with password root):

*sudo passwd root*

*root*

*root*

Change the following :

*sudo nano /etc/ssh/sshd\_config*

*#PermitRootLogin without-password*

*PermitRootLogin yes*

Then restart service :

*service ssh restart*

Install gdbserver (device):

*sudo apt-get install gdbserver*

d. Pin configuration

Check pin configuration on device:

```
cat /sys/kernel/debug/pinctrl/44e10800.pinmux/pingroups
```

e. Custom pin configuration

On the Host:

```
cd bb-kernel/KERNEL/arch/arm/boot/dts/
```

Start in the text file “am335x-boneblack.dts”

```
gedit am335x-boneblack.dts
```

All the pre-defined peripheral/pin configurations are included from this file.

For the ERD TiAm please remove the line by commenting it out (*/\*..\*/*):

```
#include "am335x-boneblack-nxp-hdmi-no-audio.dtsi"
```

This is necessary as the TiAm board does not have HDMI on the core board. It can be added on the customer's base-board.