BeagleBone Black Expansion Board User Reference

BeagleBone Black Expansion board designed by ChipSee. It can support Beaglebone and Beaglebone black at the same time. And it has two Versions: Capacitive Touch Version and Resistive Touch Version. Hardware features:

1. Display: 7 Inch LCD,1024*600 Pixel;
2. Touch: Five Point Capacitive touch, Covered with Amorplate Glass (Or Reisistive Touch);
3. Audio: 1 Audio out,1 Mic In(Can change to Line in by change resistor);
4. RS232: 2 Channel;
5. RS485: 2 Channel;
6. CAN: 1 Channel;
7. Buzzer: 1;
8. User Key: 5 ;
9. User LED: 2;

Figure 1. BeagleBone Black Expansion Board(Capacitive,Android 4.1)
1. How to connect Expansion board with Beaglebone and BeagleBone Black

When connect the Expansion board with BeagleBone and BeagleBone Black, Figure 3 shows the right connect direction. If connect on the wrong direction, the Beaglebone Black can’t be push down to connect tightly: The LAN connector on Beaglebone Black will conflict with the Audio connector on the Expansion board.

2. How to connect Power to the System

BeagleBone and BeagleBone Black use 5V DC power Input, the expansion board use 5V DC power also. When the Expansion board connect with the the BeagleBone
and Beaglebone black, the Power connector on BeagleBone black will be hide by the RS485 connector. Customer can provide 5V power to the power connector on the Expansion board connector **P4 ONLY** as Figure 4 shows. This 5V power will be connect to Beaglebone Black on the Expansion board. **5V/2A** power adapter will be necessary.

Figure 4

3. **How to change Boot Method**

Beaglebone Black can be changed boot method by push the Button **S2**. When pushed button **S2** when system power on, BeagleBone Black will boot from uSD card, or it will boot from eMMC by default.

When connect with expansion board, the Button **S2** on the Beaglebone black will be hide and not easy to touch. The Expansion board connect this boot signal to switch **SW8** as Figure 5 shows. When user switch it to upside, the system will boot from uSD card, when user switch it to downside, the system will boot from eMMC.
4. **Power and Reset Button**

BeagleBone Black use Button **S3** as Power button, Expansion board connect this signal to Button **SW6** as Figure 6 shows. So the Expansion board button SW6 will have the same effect with S3 on the BeagleBone Black.

BeagleBone Black use Button **S1** as Reset button, Expansion board connect this signal to Button **SW7** as Figure 5 shows. So the Expansion board button SW7 will have the same effect with S1 on the BeagleBone Black.

5. **Use Keys and user LED**

BeagleBone Black Expansion board have add 5 user keys as **SW1 to SW5** as Figure 6 shows, User can define the key function in software, ChipSee have define it
in Android 4.1 as “HOME”, “BACK”, “MENU”, “VOLUME UP”, “VOLUME DOWN”.

BeagleBone Black Expansion Board add two user LEDs as Figure 7 shows. User can define its function in software.

![User LED and User Key](image)

**Figure 7**

6. **Audio Input and Output**

BeagleBone Black Expansion board have audio input and output as Figure 8 shows. The expansion board use standard 3.5mm connector. Blue connector P8 is output, Pink Connect P9 is input.

User can connect the output to any other speaker. As for the Input, it’s “MIC in”, NOT “Line In”, that means user can connect Microphone to the connector directly.

![Audio Output and Mic Input](image)

**Figure 8**

7. **About the RS232, RS485 and CAN on Expansion board.**

The Expansion board have add RS232, RS485, CAN function to the connector
**P10** and **P12** as Figure 2 shows.

DB9 Connector **P10** connect to the CPU UART1:

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Definition</th>
<th>CPU Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TXD</td>
<td>UART1, CPU PIN D15 and D16</td>
</tr>
<tr>
<td>3</td>
<td>RXD</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>1,4,6,7,8,9</td>
<td>Not Connected</td>
<td></td>
</tr>
</tbody>
</table>

Connector **P12** definition:

<table>
<thead>
<tr>
<th>Pin Number</th>
<th>Definition</th>
<th>CPU Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CAN0_L</td>
<td>DCAN0, CPU PIN D17 and D18</td>
</tr>
<tr>
<td>3</td>
<td>CAN0_H</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>RS485_2+</td>
<td>UART4, CPU PIN T17 and U17</td>
</tr>
<tr>
<td>5</td>
<td>RS485_2-</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>RS485_1+</td>
<td>UART2, CPU PIN A15 and B17</td>
</tr>
<tr>
<td>7</td>
<td>RS485_1-</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RS232_2_TXD</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>RS232_2_RXD</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>RS232_1_TXD</td>
<td>UART1, CPU PIN D15 and D16</td>
</tr>
<tr>
<td>11</td>
<td>RS232_1_RXD</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>+5V</td>
<td></td>
</tr>
</tbody>
</table>

Be Attention:

a) The RS232_1 signal have been connect to the DB9 connector P10 and connector P12 Pin 10 and Pin 10 at the same time. As for this function, you can use one connector one time.

b) The RS232_2 signal and RS485_1 signal use the same UART2 signal from CPU, so these two functions User can use only one at one time. That means, if user used RS232_2 function, user can’t use RS485_1 function, user can’t use RS232_2 function.

c) BeagleBone black use UART0 as the default DEBUG signal output, but it’s TTL signal output. ChipSee Software changed the Debug signal to UART1 by default. So this can make user very easy to use the Debug.
8. **Mechanical Dimension:**
   As Figure 9 shows. The mounting hole is 3mm Inner diameter.

![Mechanical Dimension Diagram](image)

9. **Product Video**
   - Android 4.1   [http://youtu.be/FebYqMws0g4](http://youtu.be/FebYqMws0g4)

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