4D SYSTEMS
TURNING TECHNOLOGY INTO ART

DATASHEET

4D 7.0" LCD CAPE

Beagle Bone Black 7.0" LCD CAPE

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Contents

4D 7.0"LCD CAPE – BBB

1. Description

The 4D 7.0" LCD CAPE is a cape specifically designed for the Beagle Bone Black (BBB), and provides a 7.0" primary display for the BBB for direct user interaction and information display, along with the ability for additional CAPES to be attached at the same time.

The 4DCAPE-70T is <u>not</u> compatible with the previous Beagle Bone (Beagle Bone White), and can only be used with the Beagle Bone Black.

The 4D 7.0" LCD CAPE features a 7.0" TFT LCD 800x480 resolution display with Resistive Touch.

The 4DCAPE-70T utilises the drivers developed for the CircuitCo LCD7 00A3, however provides a different form factor and pricing point to the LCD7.

The Beagle Bone Black connects directly to the back of the 4DCAPE-70T, and provides everything the CAPE requires such as power and display signals. Another CAPE can be added to the secondary connectors on the back of the 4DCAPE-70T if required.

The 4D 7.0" LCD CAPE features 7 push buttons below the screen, LEFT, RIGHT, UP, DOWN, ENTER, RESET and POWER, along with 2 LED's to indicate Power and User Status (normally heartbeat).

Mounting of the 4DCAPE-7.0T is achieved with the 4x 3.5mm mounting holes present on the CAPE, enabling standard M3 or #6-32 screws to fasten the 4DCAPE-7.0 as required.

2. Features

- 7.0" TFT LCD CAPE for the Beagle Bone Black
- Available only with Resistive Touch (4DCAPE-70T)
- 7 push buttons including LEFT, RIGHT, UP, DOWN, ENTER, RESET and POWER
- 2 LED Lights for Power and User
- 2x2 Jumper with shunts for EEPROM CAPE ID selection
- Module dimensions: 179.9 x 114.9 x 19.5mm
- Module dimensions with Beagle Bone Black connected: Approx 179.9 x 114.9 x 19.5mm
- 4x 3.5mm Mounting holes
- RoHS and CE Compliant.
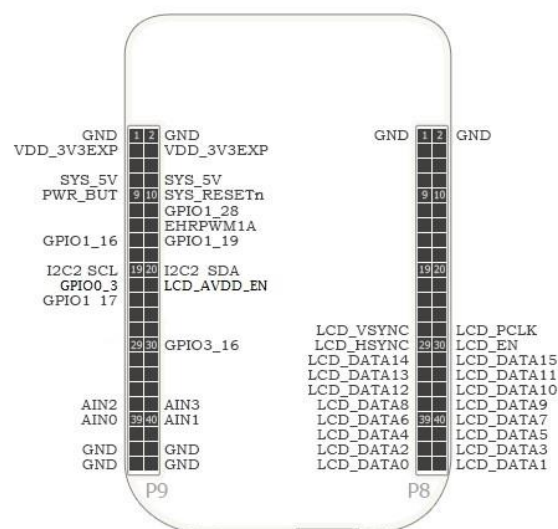
Used pins for 4DCAPE-70T (Header's P1)
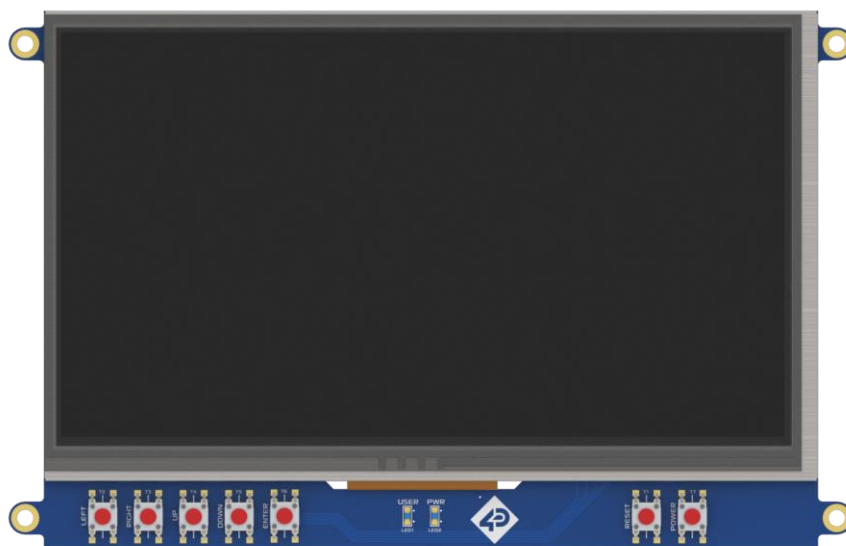
3. Getting Started

3.1. Requirements

The 4D 7.0" LCD CAPE is designed to work with existing software and drivers already developed for the Beagle Bone Black.

The Requirements for use are:
- 4DCAPE-70T Cape
- Beagle Bone Black (BBB) with suitable distribution loaded
- 5V DC Supply suitable for the Beagle Bone Black, recommended 2A @ 5V.
- A Stylus is recommended for accurate touch, however is not required.

3.2. How to use the 4D 7.0" LCD CAPE

The following steps should be all that is required in order to use the 4DCAPE-70T:

1. Connect the 4DCAPE-70T to the Beagle Bone Black while the Beagle Bone Black is not powered. Outline of the BBB is printed on the back of the 4DCAPE-70T as a guide for orientation.
2. If using with other cape's, ensure the 4DCAPE-70T is not conflicting pin wise to any other cape installed.
3. Ensure the DIP Switch on the CAPE is set to a different EEPROM ID to any other capes.
4. Ensure your Beagle Bone Black is loaded with a suitable Linux distribution which is compatible with the existing CircuitCo LCD7 00A3 CAPE or 4D Systems 4DCAPE-70T – See Section 6. Angstrom release 20.06.2013 or later is required. Android 4.2.2 has also been tested and functions correctly. Other distributions may also be compatible with this display.
5. Connect a 5V Supply to the DC Jack of the Beagle Bone Black. It is recommended to use a 2A supply to ensure sufficient supply.
6. Once power is connected, something should be displayed on the 4DCAPE-70T as it is booted. Once booted, the system should automatically log in (assuming Angstrom Linux distribution is used), and the Touch Screen Calibration Utility should load automatically. If using the 4DCAPE-70T without touch, this can be exited and ignored.
7. Calibrate the 4DCAPE-70T using the utility by following the on screen instructions. If the utility is closed, it is available again under the System – Administration menu.
8. Complete – the Angstrom desktop should be displayed on the 4DCAPE-70T and is ready for use, else Andoid etc.

For support of the BBB and various distributions, please seek support from the respective websites associated with the BBB itself or the distributions.

A good place to start for information and support regarding the BBB and various distributions available, is www.beagleboard.org

This website details how to update your software on the BBB and the current version of Angstrom available for the BBB
http://circuitco.com/support/index.php?title=Updating_The_Software

This website details how to update your software on the BBB for the current version of Andoid.
http://downloads.ti.com/sitara_android/esd/TI_Android_DevKit/TI_Android_JB_4_2_2_DevKit_4_1_1/index_FDS.html

For support regarding the 4DLCD-70T CAPE hardware itself, please go to the 4D Systems website and either contact Support directly, or use the 4D Systems Forum. www.4dsystems.com.au

3.3. Changing the brightness (Angstrom)

By default the backlight brightness of the 4D CAPE 7.0 is set to 50% with Angstrom distribution (20.06.2013). It is possible to change the backlight brightness as the backlight is PWM controlled.

Please note, these instructions may become obsolete as new versions of Angstrom are released, or if different distributions are used.

One method is to SSH into the Beaglebone Black from your PC, and set the backlight value that way. Note this does not persist over restarts, so this would need to be entered into a startup script if the setting is required to be set each startup.

At the command prompt, type the following:

```
cd /sys/class/backlight/backlight.10/
echo 100 > brightness
```

Where 100 represents 100%, this can be changed to any number from 0 to 100 as required.

3.4. Changing the brightness (Android)

Changing the brightness on Android is simple. Navigate to the Settings menu, and to the Display option, and then to Brightness. Slide the slider to the desired position.

### 3.5. Calibrating resistive touch (Angstrom)

When a distribution is used for the first time with a 4DCAPE-70T, the default calibration application that comes with the Angstrom distribution is started automatically (Refer to section 3.2) on startup of Angstrom. If the calibration is however input incorrectly and it is required to be set again, a file must be deleted manually in order to then recalibrate the display.

Note, this may change as newer distributions of Angstrom become available, or if different distributions are used, so these instructions may become obsolete or inaccurate.

One method is to SSH into the BBB using your PC, navigate to the following folder and delete the specified file. Another is to connect a USB Mouse to navigate around using the 4DCAPE-70T, and delete the file that way.

```
/etc/pointercal.xinput
```

One this file has been deleted, the calibration utility can be run again.
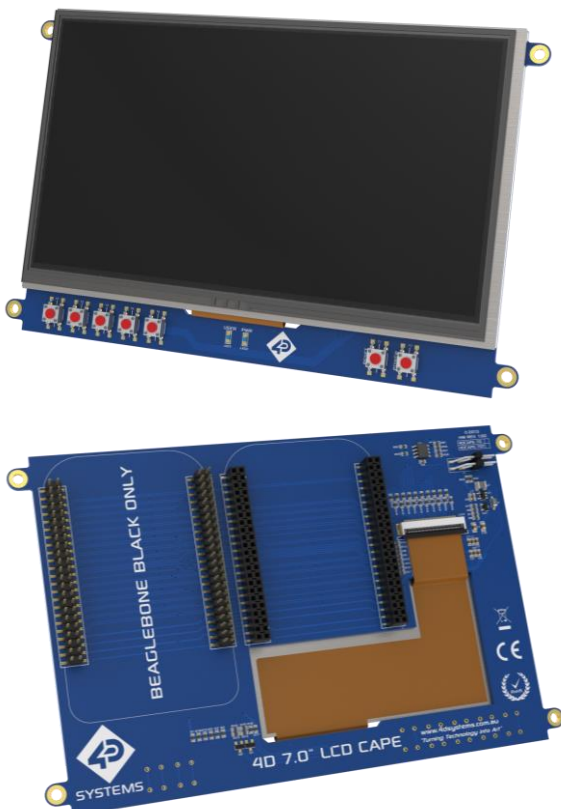
3.6. Android Information

The 4DCAPE-70T is compatible with Android 4.2.2 and has been tested with an image from TI (see section 3.2).
It has been noticed however that the EEPROM Jumpers both need to be connected/closed otherwise the CAPE may not be detected by the Android OS.

3.7. Secondary Headers

The 4DCAPE-70T features secondary headers (P2_A and P2_B) for another cape to be attached. Please refer to the schematic at the end of this datasheet in Section 7 to see which pins/IO from the BBB feature on the secondary headers.

It is up to the user to determine which capes are compatible based on which I/O is available.

4. EEPROM Details

On the 4D 7.0" LCD CAPE there is an EEPROM which is used to configure the Beagle Bone Black with the appropriate configuration in order to use the Cape.

Please note: some EEPROM content refers to the LCD7 00A3 which is made by CircuitCo. This is the case due to how the BBB identifies the CAPE and what drivers to apply to it. Since the 4DCAPE-70T utilises the LCD7 drivers, this must be the case.

4.1. 4DCAPE-70T EEPROM

EEPROM Support: YES
Board Name: 4D 7.0 LCD CAPE - 4DCAPE-70T
Manufacturer: 4D Systems

Note (*): The Beaglebone, Beaglebone Black and Beagleboard remains the property of beaglebone.org. All references to the words Beaglebone, Beaglebone Black, Beagleboard are licensed under a Creative Commons Attribution-Share Alike 3.0 license.

All references to CircuitCo and LCD7 remain the property of CircuitCo and beagleboardtoys.org and are not affiliated to 4D Systems in any way.

5. Display Precautions

• Avoid having to display the same image/object on the screen for lengthy periods of time. This will cause a burn-in which is a common problem with all types of display technologies. Blank the screen after a while or dim it very low by adjusting the contrast. Better still; implement a screen saver feature.

• Moisture and water can damage the display. Moisture on the surface of a powered display will cause the electrodes to corrode. Wipe off any moisture gently or let the display dry before usage.

• Dirt from fingerprint oil and fat can easily stain the surface of the display. Gently wipe off any stains with a soft lint-free cloth.

• The performance of the display will degrade under high temperature and humidity. Avoid such conditions when storing.

• Do not tamper with the display flex cable that is connected to the control board. This may affect the connection between the display and the driving circuitry and cause failure. Under no circumstances should the display flex be disconnected from the PCB and power applied to the PCB, as this could result in instant failure of the CAPE.

• Displays are susceptible to mechanical shock and any force exerted on the module may result in deformed zebra stripes, a cracked display cell and broken backlight

• Always use the mounting holes on the module to mount the display.

4D 7.0" LCD CAPE – BBB

6. Software / Driver Disclaimer

4D Systems has developed this 4DCAPE-70T CAPE for the Beaglebone Black, and is based on hardware already present in the market. 4D Systems does NOT support any software associated with the BBB nor software and drivers associated with this CAPE. It is up to the user to determine which software is used on the BBB and which distributions are used on the BBB, and therefore which are compatible with this CAPE.

4D Systems has been made aware that there may be touch related issues with the Angstrom Distribution (Possibly others if based on the same issue source) of Linux, and the mouse may appear to 'self touch' or jump around the screen on touch, or generally behave erratically. Since 4D Systems has not developed nor supports anything to do with the software associated with this hardware, 4D Systems is unable to assist or offer support regarding this matter. ** A Fixed Kernel is now available, 3.8.13-bone37 while solves this issue **

The Android distribution listed in this document does not feature this erratic touch behaviour and effectively illustrates the issues are software or driver related, and not hardware.

If these issues are encountered, it is encouraged to try the Android distribution to verify it is not a hardware issue. If the issue remains, please contact the 4D Systems Technical Support. If the issue is no longer present and touch works correctly on Android, then please contact the beaglebone.org community.

The 4DCAPE-70T utilises drivers which have been written for other devices on the market and the hardware is set up in a similar fashion. Drivers for the Circuitco LCD7 are utilised for this CAPE and therefore if fixes are made to improve compatibility with the LCD4, they should also function correctly for the 4DCAPE-70T.
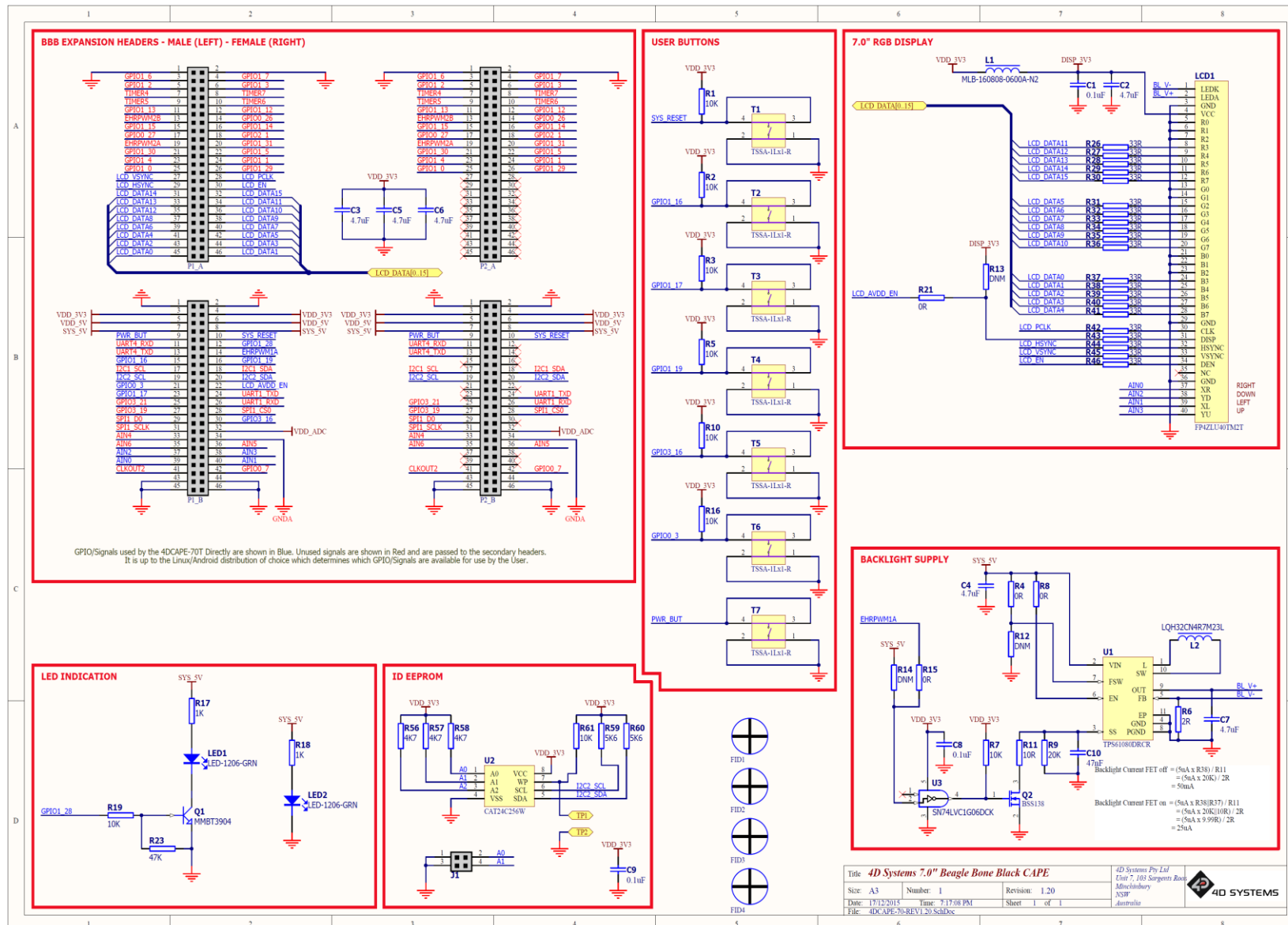
4D Systems is not responsible for issues regarding software or drivers associated with the BBB and the compatibility with this product. Only Community software support is allowed via resources at www.beaglebone.org/discuss
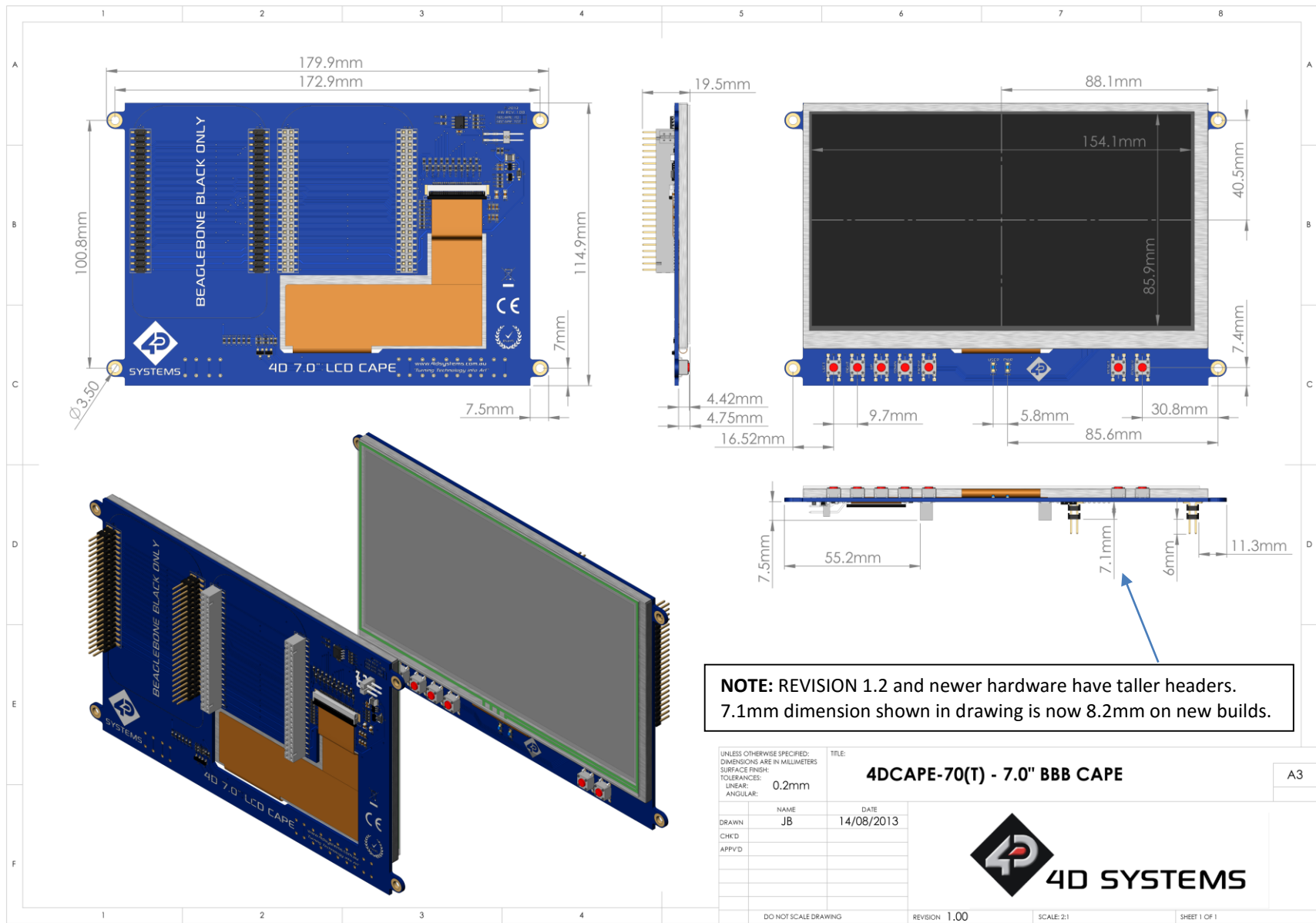
7. Notes

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8. Schematic Diagram – HW REV 1.01

9. Schematic Diagram – HW REV 1.20

10. Mechanical Details

NOTE: REVISION 1.2 and newer hardware have taller headers. 7.1mm dimension shown in drawing is now 8.2mm on new builds.

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS SURFACE FINISH: TOLERANCES: LINEAR: 0.2mm ANGULAR:	TITLE: **4DCAPE-70(T) - 7.0" BBB CAPE**	A3

	NAME	DATE
DRAWN	JB	14/08/2013
CHK'D		
APPV'D		

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| DO NOT SCALE DRAWING | REVISION 1.00 | SCALE: 2:1 | SHEET 1 OF 1 |

4D 7.0" LCD CAPE – BBB

11. Ordering Information

ORDERING INFORMATION
Order Code: 4DCAPE-70T **Packaging:** Module sealed in antistatic foam padded 4D Systems Box

12. Legal Notice

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