
13. Starter Kit

4D Systems highly recommends all first-time buyers of 4D Systems' displays, to purchase the Starter Kit when purchasing their first 4D Systems display solution.

The Starter Kit provides all the hardware that is required to get the User up and running.

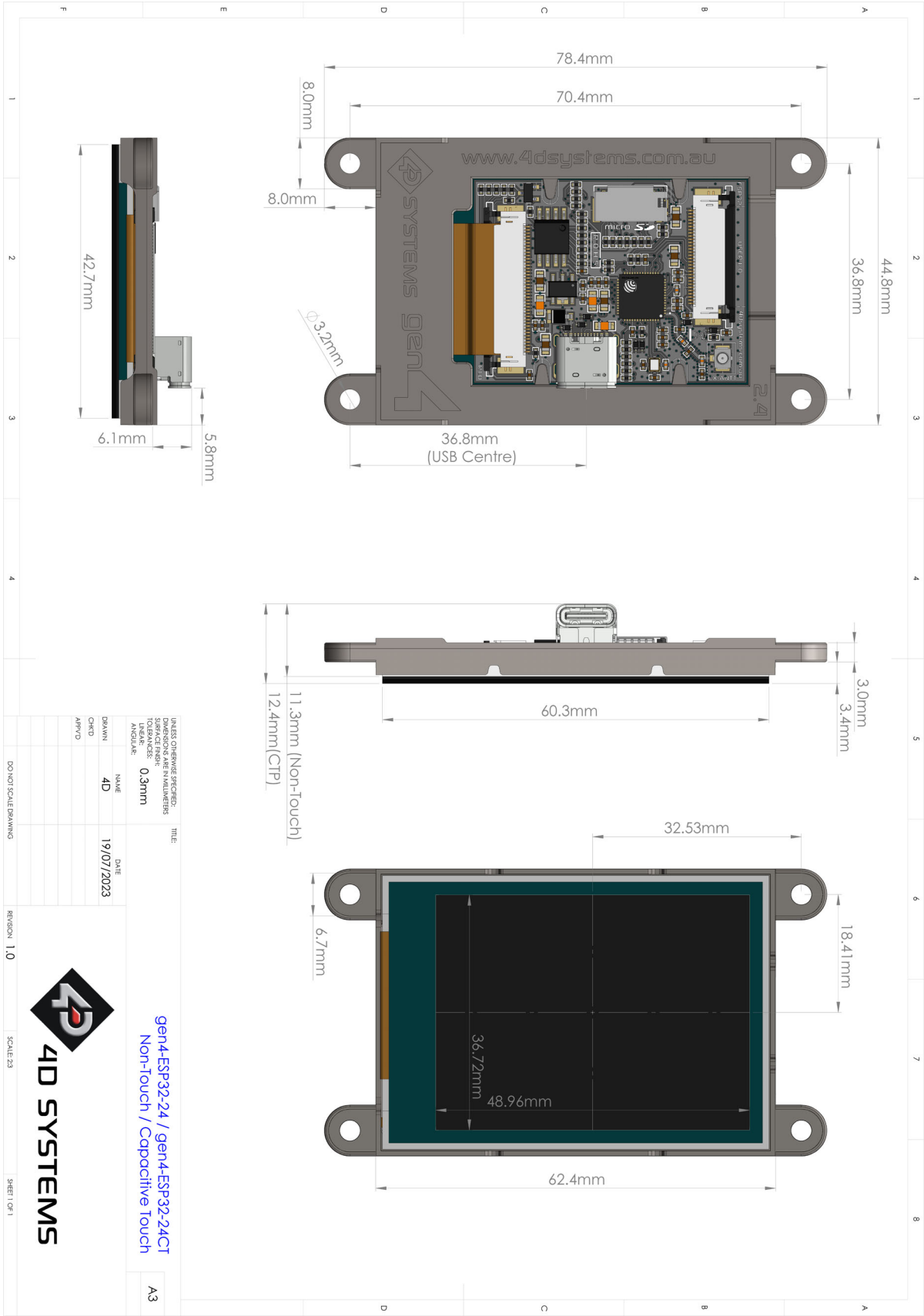
Starter Kits typically include:

- gen4 ESP32 Display Module
- gen4 Breakout Board (gen4-Breakout)
- 4D Universal Programming Adaptor (4D-UPA REV1.4 or higher)
- 4GB micro-SD Card
- 150mm 30-way FFC cable for connecting display to gen4-Breakout, 4D-UPA, or Users System
- Wi-Fi Antenna (u.FL to SMA, and screw on SMA antenna)

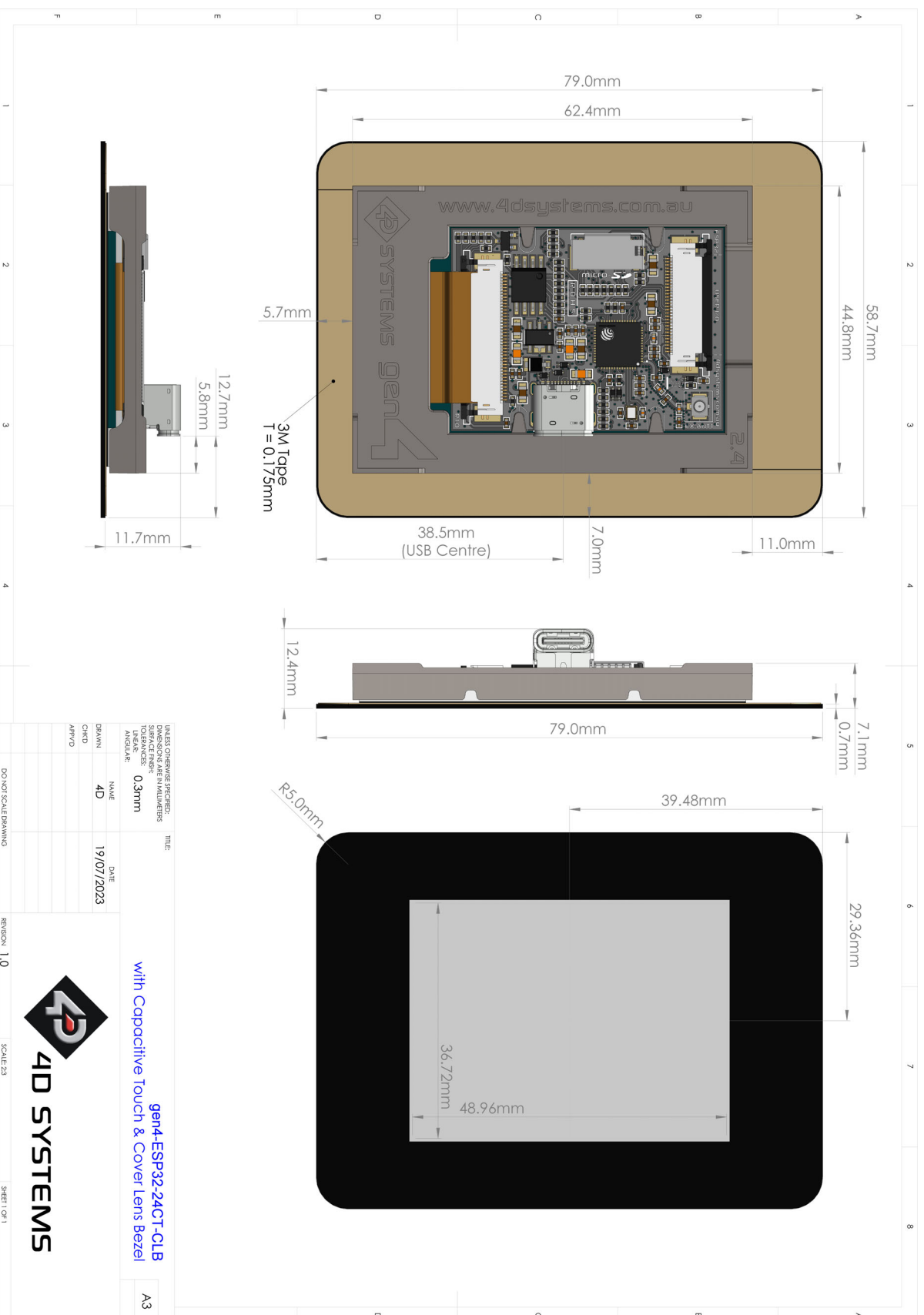
Please refer to the [4D Systems website](#) for the current components included in the Starter Kit.

Simply select the Starter Kit option when purchasing the chosen display module on the 4D Systems shopping cart, or from your local distributor.

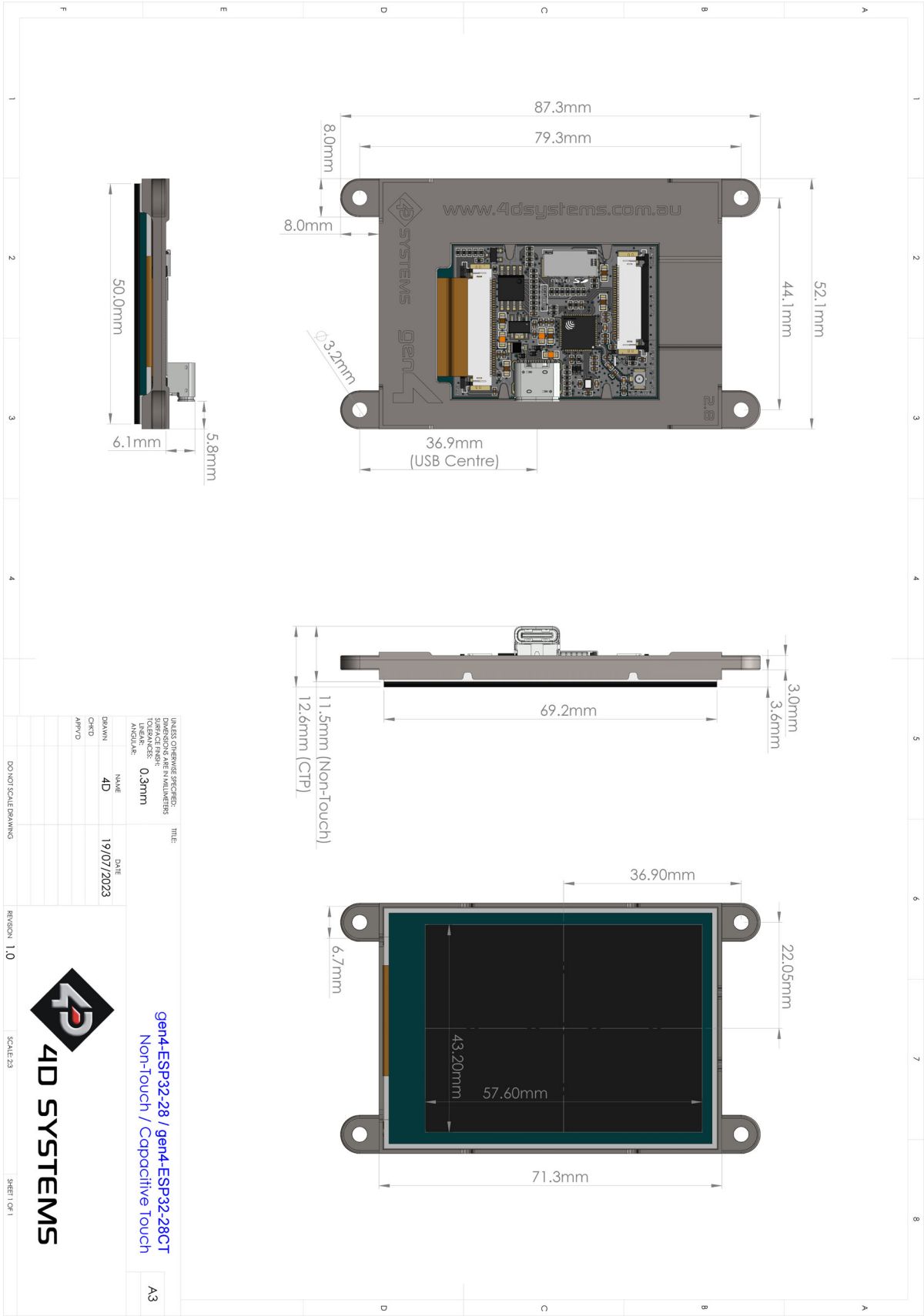
14. 2.4" Mechanical Details (Non-Touch, Capacitive Touch)



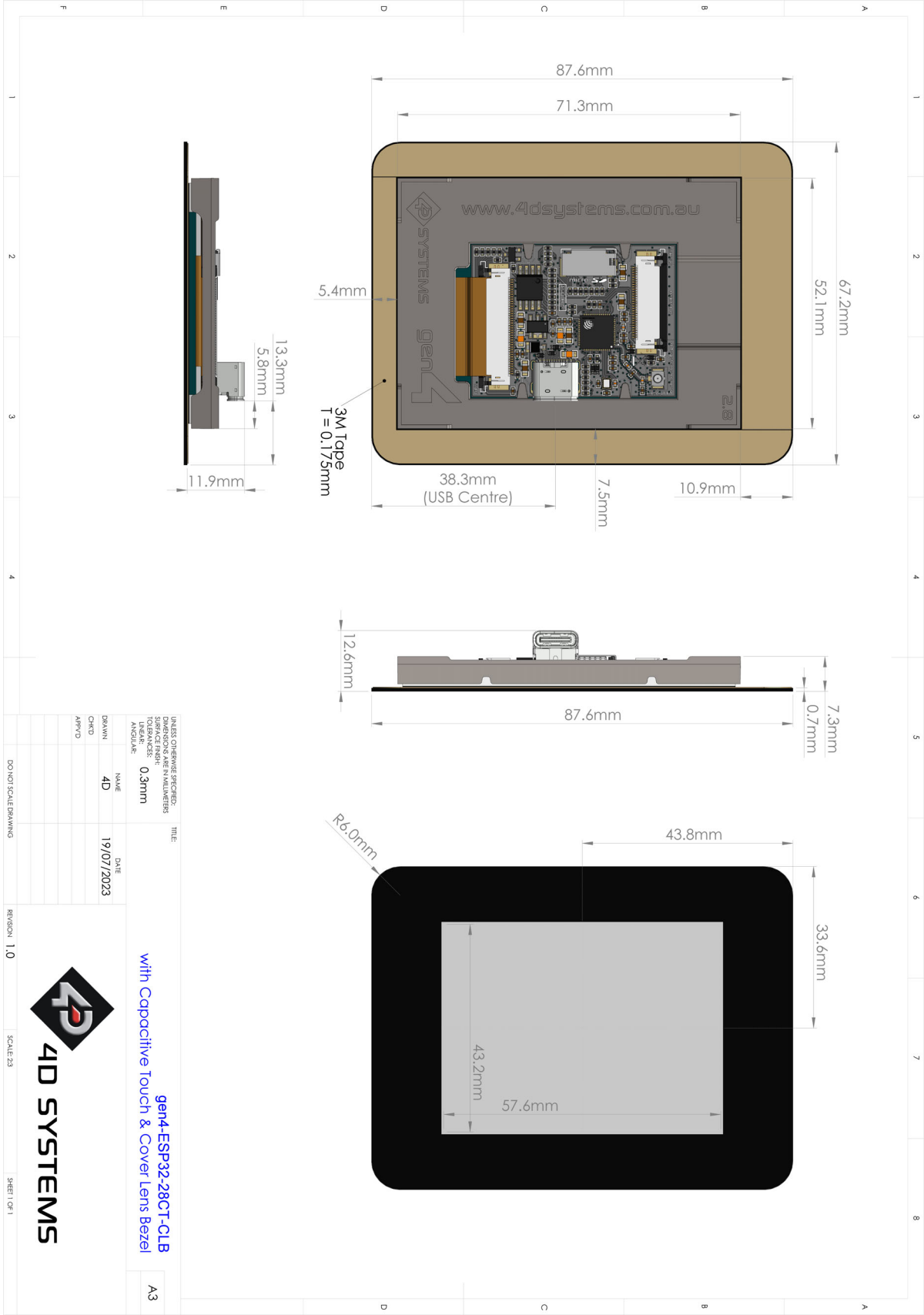
15.2.4" Mechanical Details (Capacitive Touch with CLB)



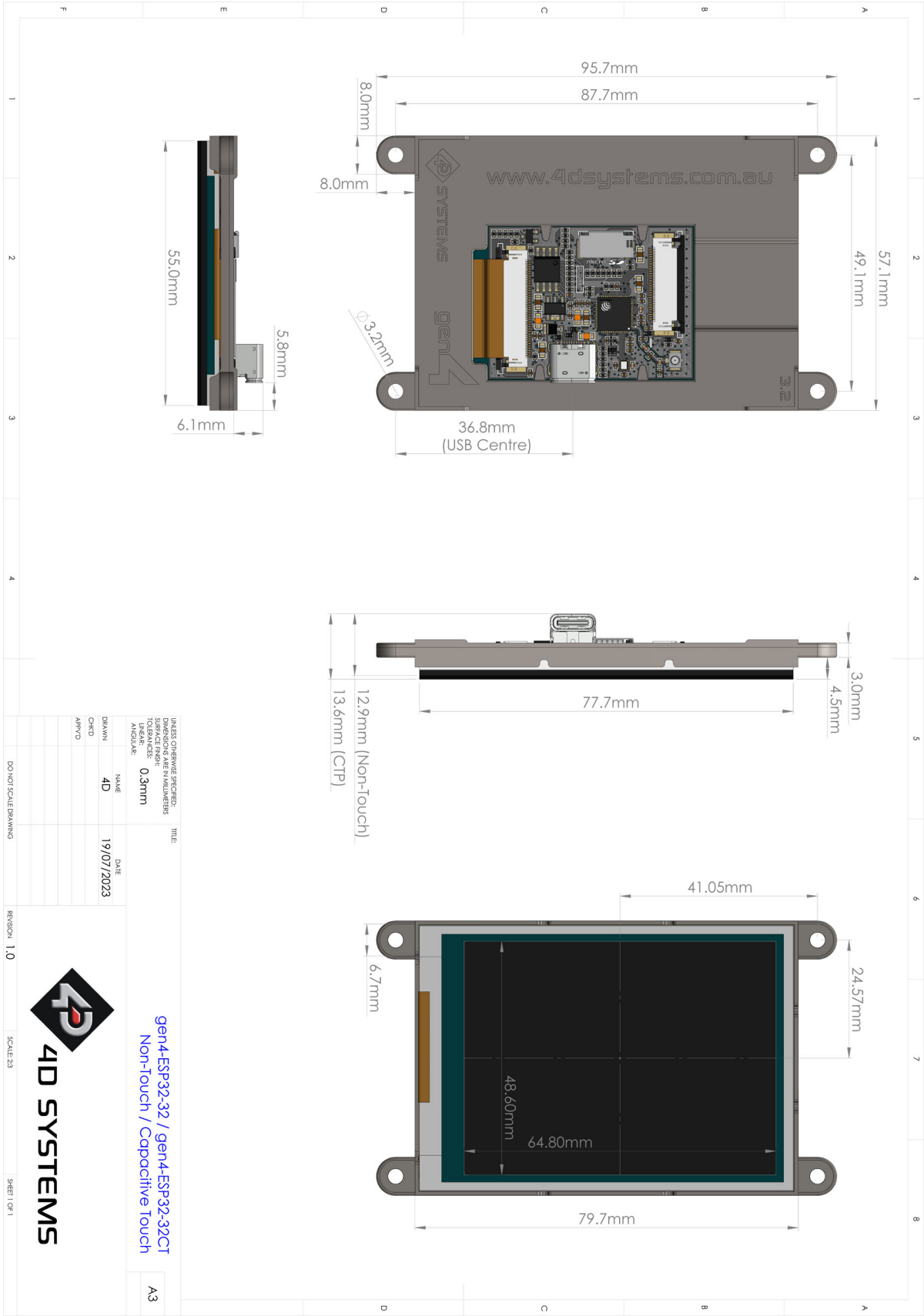
16. 2.8" Mechanical Details (Non-Touch, Capacitive Touch)



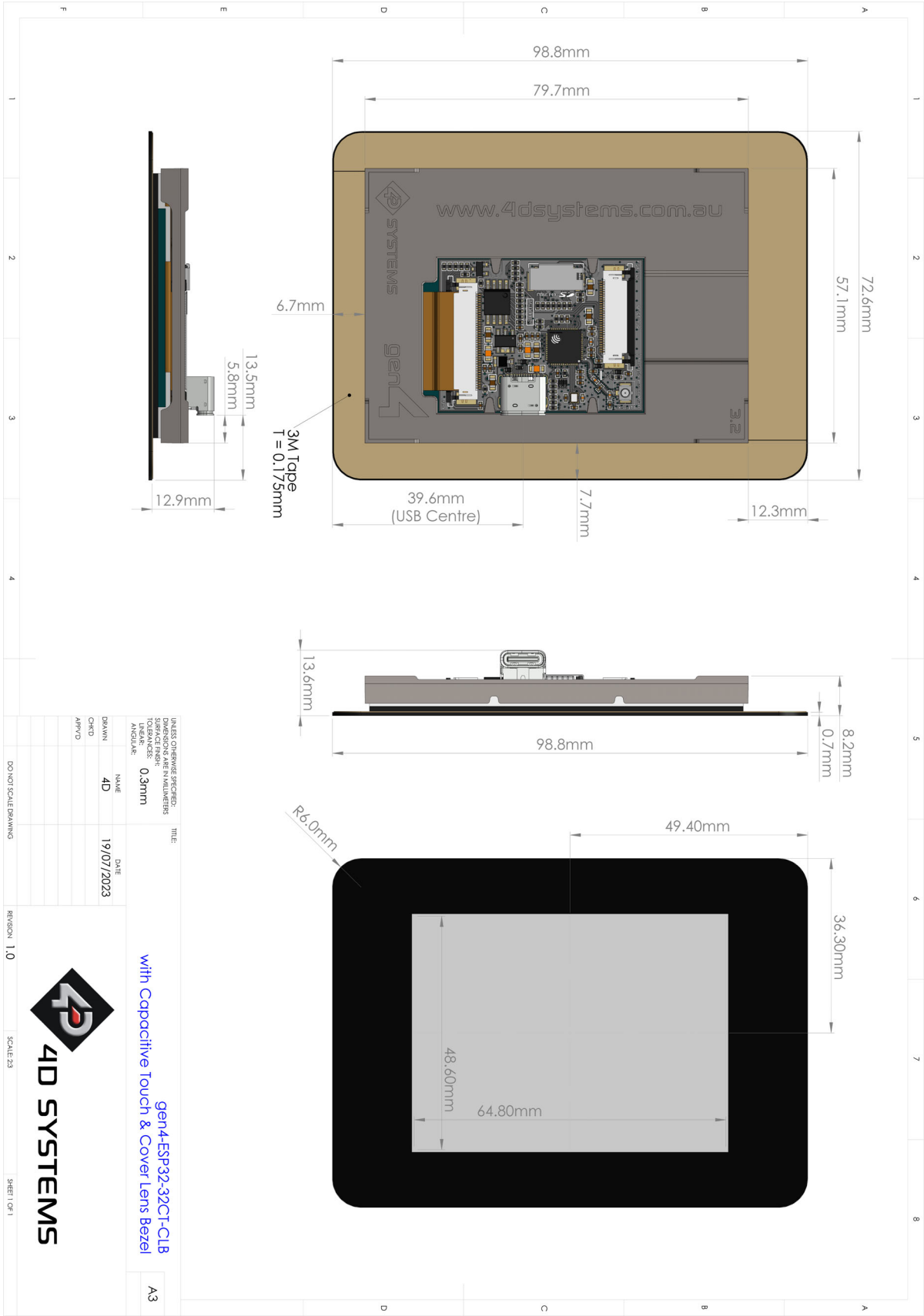
17.2.8" Mechanical Details (Capacitive Touch with CLB)



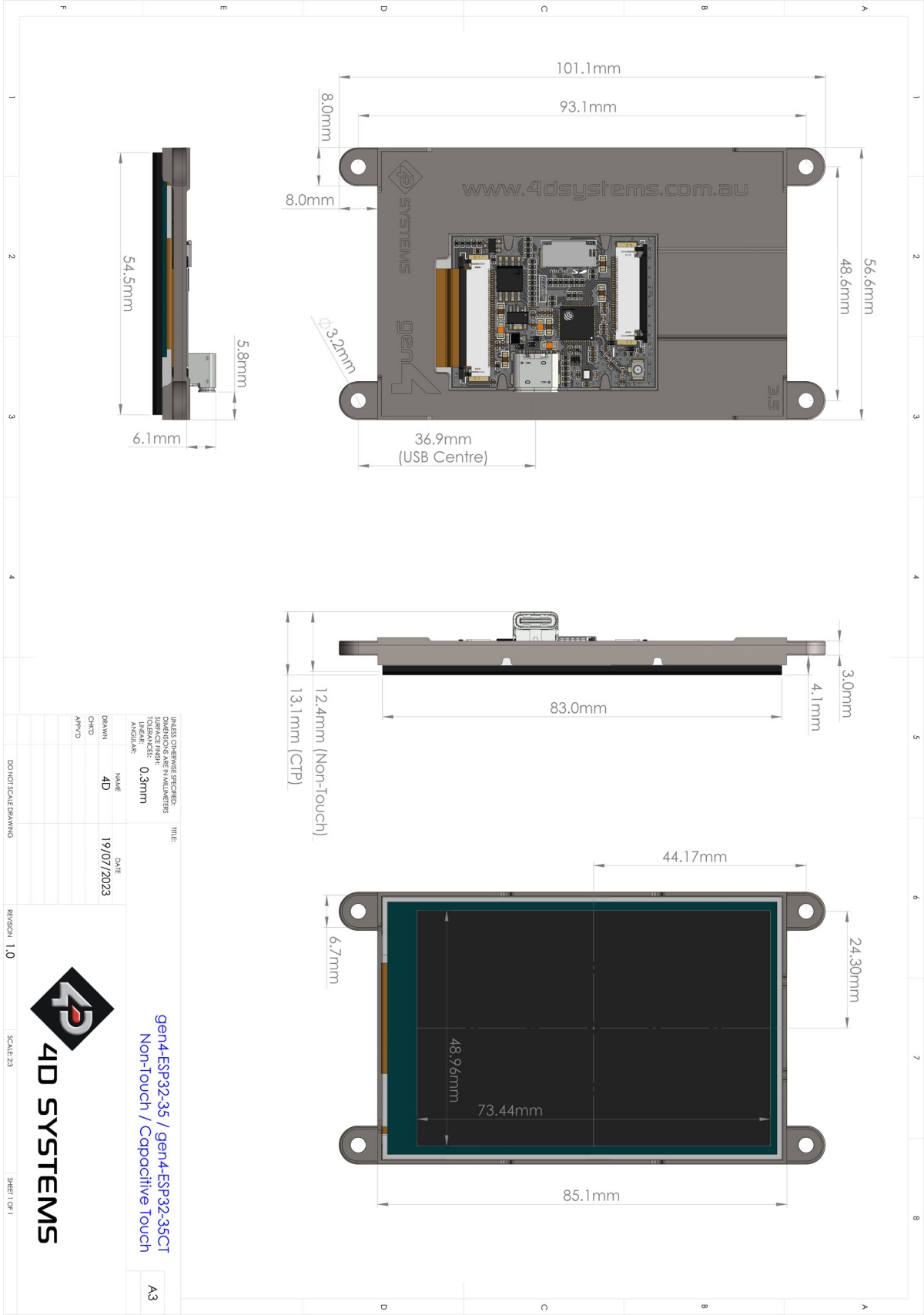
18. 3.2" Mechanical Details (Non-Touch, Capacitive Touch)



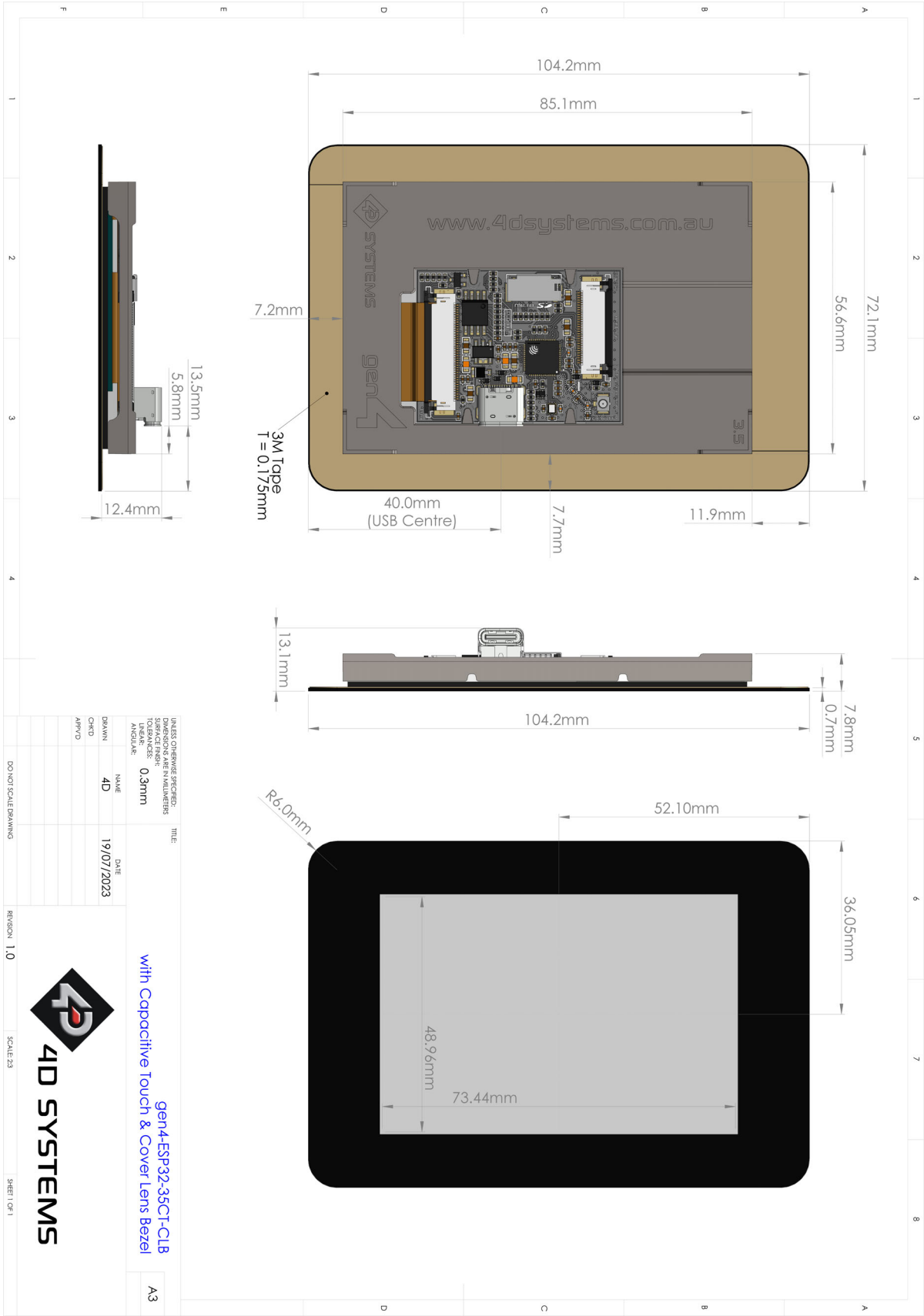
19. 3.2" Mechanical Details (Capacitive Touch with CLB)



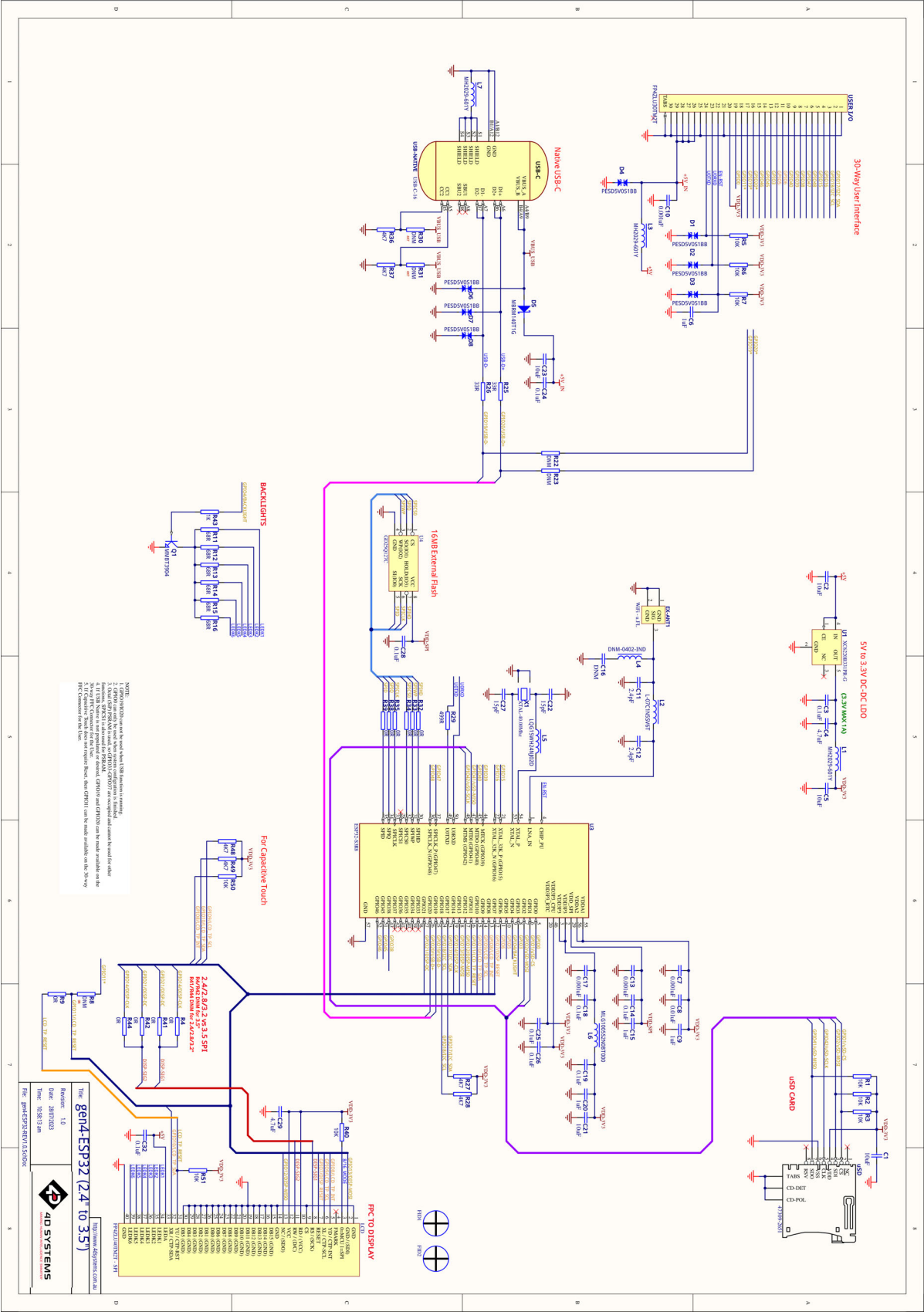
20. 3.5" Mechanical Details (Non-Touch, Capacitive Touch)



21. 3.5" Mechanical Details (Capacitive Touch with CLB)



22. Schematic Circuit Details



23. Specifications

Absolute Maximum Ratings	
Operating ambient temperature	-20°C to +65°C (see note 1 and 2)
Storage temperature	-30°C to +80°C
Voltage on any digital input pin (ESP32) with respect to GND	-0.3V to 3.6V
Voltage on any digital input pin (IO Expander) with respect to GND	-0.3V to 6.0V
Voltage on VCC with respect to GND	-0.3V to 6.5V

Note

1. Quote Espressif

"Ambient temperature specifies the recommended temperature range of the environment immediately outside an Espressif chip. For ESP32-S3R8 if the PSRAM ECC function is enabled, the maximum ambient temperature can be improved to 85°C, while the usable size of PSRAM will be reduced by 1/16"

2. Temperature range for Ambient and Storage, are determined by a combination of components used on these modules. While some components may be capable of exceeding these temperatures, some are not, so the minimums/maximums are determined by the weakest device on the modules. Based on the 65°C/85°C note above, if the ESP32-S3R8 is increased to 85°C capability, the next 'weakest' component on the module is the TFT LCD, which is capable of -20°C to 70°C Operating Temp.

3. Stresses above those listed here may cause permanent damage to the device. This is for stress rating only and functional operation of the device at those or any other conditions above those indicated in the recommended operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Recommended Operating Conditions					
Parameter	Conditions	Min	Typ	Max	Units
Supply Voltage (VCC)	Stable external supply required	4.0	5.0	6.0	V
Processor voltage (VP)		—	3.3	—	V
Input Low Voltage (VIL)	all pins	0	—	0.25VP	V
Input High Voltage (VIH)	all pins	0.8VP	—	5.5	V

Global Characteristics Based on Operating Conditions					
Parameter	Conditions	Min	Typ	Max	Units
Supply Current (ICC) ***	gen4-ESP32-24 (Contrast = 15)	—	149	—	mA
	gen4-ESP32-24CT (Contrast = 15)	—	150	—	mA
	gen4-ESP32-24CT-CLB (Contrast = 15)	—	150	—	mA
	gen4-ESP32-28 (Contrast = 15)	—	149	—	mA
	gen4-ESP32-28CT (Contrast = 15)	—	150	—	mA
	gen4-ESP32-28CT-CLB (Contrast = 15)	—	150	—	mA
	gen4-ESP32-32 (Contrast = 15)	—	188	—	mA
	gen4-ESP32-32CT (Contrast = 15)	—	190	—	mA
	gen4-ESP32-32CT-CLB (Contrast = 15)	—	190	—	mA
	gen4-ESP32-35 (Contrast = 15)	—	183	—	mA
	gen4-ESP32-35CT (Contrast = 15)	—	184	—	mA
	gen4-ESP32-35CT-CLB (Contrast = 15)	—	184	—	mA
Display Endurance	Hours of operation, measured to when display is 50% original brightness	30000	—	—	H
Touch Screen Transparency	Capacitive Touch	90	—	—	%
CLB Hardness	Cover Lens Bezel Glass Hardness	—	6	—	H

Note

Typical Supply Current (ICC) figures are without WiFi enabled, without microSD card inserted, and using simple display operations only. Any additional load such as GPIO sourcing, WiFi etc, will increase this figure. This is a Typical figure only, not a Maximum.

LCD DISPLAY INFORMATION (TN DISPLAY)		
Parameter	Conditions	Specification
Display Type		TN - TFT Transmissive LCD
Display Size		3.2" Diagonal
Display Resolution		240 x 320 (Portrait Viewing)
Display Brightness	gen4-ESP32-32 (Contrast = 15)	200 cd/m2
	gen4-ESP32-32CT (Contrast = 15)	190 cd/m2
	gen4-ESP32-32CT-CLB (Contrast = 15)	190 cd/m2
Display Contrast Ratio	Typical	250:1
Display Viewing Angles	Above Centre	35 Degrees
	Below Centre	55 Degrees
	Left of Centre	55 Degrees
	Right of Centre	55 Degrees
Display Viewing Direction		6 O'clock Display (Optimal viewing is from below when in Portrait mode)
Display Backlighting	White LED Backlighting	1x6 Parallel LED's
Pixel Pitch		0.2025 x 0.2025mm (Square pixels)
Pixel Density	Number of pixels in 1 row in 25.4mm1	127 DPI/PPI

LCD DISPLAY INFORMATION (IPS DISPLAY)

Parameter	Conditions	Specification
Display Type		IPS - TFT Transmissive LCD
Display Size	2.4" Models	2.4" Diagonal
	2.8" Models	2.8" Diagonal
	3.5" Models	3.5" Diagonal
Display Resolution	2.4" and 2.8" Models	240 x 320 (Portrait Viewing)
	3.5" Models	320 x 480 (Portrait Viewing)
Display Brightness	gen4-ESP32-24 (Contrast = 15)	320 cd/m2
	gen4-ESP32-24CT (Contrast = 15)	300 cd/m2
	gen4-ESP32-24CT-CLB (Contrast = 15)	300 cd/m2
	gen4-ESP32-28 (Contrast = 15)	300 cd/m2
	gen4-ESP32-28CT (Contrast = 15)	280 cd/m2
	gen4-ESP32-28CT-CLB (Contrast = 15)	280 cd/m2
	gen4-ESP32-35 (Contrast = 15)	320 cd/m2
	gen4-ESP32-35CT (Contrast = 15)	295 cd/m2
Display Contrast Ratio	gen4-ESP32-35CT-CLB (Contrast = 15)	295 cd/m2
	Typical (2.4", 2.8")	800:1
	Typical (3.5")	1000:1
Display Viewing Angles	Above Centre	80 Degrees
	Below Centre	80 Degrees
	Left of Centre	80 Degrees
	Right of Centre	80 Degrees
Display Viewing Direction		ALL (wide viewing IPS Display)
Display Backlighting	2.4" and 2.8" Models	1x4 Parallel LED's
	3.5" Models	1x6 Parallel LED's
Pixel Pitch	2.4" Models	0.153 x 0.153mm (Square pixels)
	2.8" Models	0.180 x 0.180mm (Square pixels)
	3.5" Models	0.153 x 0.153mm (Square pixels)
Pixel Density	Number of pixels in 1 row in 25.4mm, 2.4"	166 DPI/PPI
	Number of pixels in 1 row in 25.4mm, 2.8"	141 DPI/PPI
	Number of pixels in 1 row in 25.4mm, 3.5"	166 DPI/PPI

Note

Relevant for all TN and IPS displays, the Displays used are of the highest rated 'Grade A', which allows for 0-4 defective pixels.

A defective pixel could be solid Black (Dead), White, Red, Green or Blue.

24. Revision History

Datasheet Revision		
Revision Number	Date	Description
0.1	25/05/2023	Internal Use Only
1.0	12/09/2023	Initial Public Release Version
1.1	12/06/2024	Table and paragraph formatting changes Added missing GPIO 45 and 46 descriptions Fixed link to datasheet and API references

Hardware Revision		
Revision Number	Date	Description
1.0	17/04/2023	Initial Public Release Version

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FCC Warning:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Any changes or modifications to this device not explicitly approved by manufacturer could void your authority to operate this equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.