

**TFT LCD Module with
Metallized Projective Capacitive Touch Panel**

Hardware Specification

Model: GTWV070S3A00P

Specification No: DS-2154-0001-00

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This specification is subject to change without prior notice.

This product complies with RoHS Directive
Please contact our sales consultant for details and to confirm the current status

Notice for the Cautious Handling of LCD Modules

Handling and usage precautions:

Please carefully follow the appropriate product application notes and operation standards for proper usage, safe handling, and maximum performance.

【Construction】



The touch panel is made of glass.
When using this product, please be sure to install a protective overlay such as cover glass, acrylic plate, etc.



Please handle the touch panel very carefully as it may crack if it is pressed with excessive force.



If this product is bent or twisted, it may cause the breakage of the product. Please handle it very carefully without bending or twisting.



Please do not hold the FPC or other cables on this product as it may disconnect vital components.



The end faces of the touch panel are not polished. Please handle it very carefully to avoid injury.



The touch panel is made of glass.
It may be damaged by falling / impact / excessive vibration. In the unlikely event that the glass shatters, please handle the glass fragments very carefully to avoid injury.



The LCD panel generates heat. Please provide clearance for heat dissipation between this product and its enclosure. Also, if a structure has electronic parts that are densely collected near this product, we recommend that it be cooled with a fan or something similar.

【Cable Connection】



Please do not remove the power cable and signal cable if the product is in an energized state. It may cause damage to the power supply circuit and/or the I/O circuit of this product.



As a rule of thumb, please do not input any signals while the product is not receiving adequate power. It may cause damage to the input/ output circuit.



When plugging-in or unplugging the cable for this product, please do not apply excessive force, such as pulling the cable.

Please plug-in or unplug in a straight direction (alignment) with the terminal, without bending or twisting forces.

If it is not properly plugged-in or unplugged, damage may occur to the cable or connector.



Please avoid sudden bending of the cable from the base of the plug. It may cause damage to the cable or disconnection of the connector. If loads are expected on connectors and cables, use cable ties, etc.

【Electrostatic Charge】



This product uses semiconductor components, so please take precautions against electrostatic discharge during handling and transportation.

(If it is judged that the product is defective due to electrostatic destruction during its return to our company, it may be repaired for a fee.)

【Power】



Please use a fully stabilized power supply. If the power supply's voltage is outside of the product's rated supply voltage, the operation of the power supply circuit may become unstable.



In-rush current flows when turning the power on. Please use a power supply that can withstand more than twice the normal current.



As a safety measure, we recommend using a power supply with overcurrent protection and a fuse.



Please confirm that the power supply voltage is within the rating of the connector. Please use a power cable with the appropriate thickness and length.

【Interface】



Please use an interface cable that has a length that has been thoroughly verified.

【Implementation】



When installing this product, please make sure that the on-board electronic components and FPC do not touch the metal chassis. It may cause the product to malfunction.



If you need to make the product drip-proof, please use waterproof measures for products by using rubber etc.



Please handle the product carefully when you take it out from the case and when you install the product, since it is a precision part.

【Storage and Operating Environment】



Please use this product within the environmental condition range stated in its specification.

Exceeding the stated temperature, humidity, vibration, and impact limitations (or other stated limitations) may cause malfunction.



Please do not exceed the absolute maximum ratings stated in the specification even for a moment. It may cause malfunction.



Under a high temperature environment, the touch panel surface also becomes hot.

If you touch the panel with your bare hand, please be careful of burns, injury, etc.



Malfunction may occur when the product is stored and/or used in environments with a lot of salt, sulfur, dust, etc.

【Disposal】



When disposing of this product, please follow the relevant regulations.

【Others】



Do not reverse engineer this product (i.e. firmware disassembly).



Do not modify, disassemble, repair, replace parts, etc.

It may cause EMI failure, etc. (We cannot assume responsibility for troubles caused by modifying these products.)



This specification does not give license of the intellectual property rights that our company owns. Also, it does not guarantee the implementation of a third party's rights.



Neither whole nor partial copying of these specifications is permitted without our approval. If necessary, please ask for assistance from one of our sales consultants.



This product is designed with careful attention to EMI and ESD. However, the characteristics of EMI and ESD change when the product is incorporated into a system. Please be sure to perform testing with the finished product. When used in noisy environments, please take measurements against noise around the casing.



This product is not designed for military, aerospace, medical, or other life-critical applications. If you choose to use this product for these applications, please ask us for prior consultation or we cannot accept responsibility for problems that may occur.



Image persistence may occur if the same screen is displayed for a prolonged period of time. The effect will gradually disappear by displaying a screensaver pattern, etc, or by powering off the display. The time needed for the effect to disappear is not fixed, as it depends on the exact usage, screen settings, power settings, and environmental temperature, etc.

To avoid image persistence, it is recommended to avoid displaying a fixed pattern or the same image for a prolonged period of time.

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1 General Description

This specification corresponds to the hardware aspects of the GTWV070S3A00P, which is a TFT-LCD graphic display module with metallized projective capacitive touch (touch panel). This product enables visual components (objects) to be arranged within display screens (pages), combined with integrated touch function, thus creating a complete graphical user interface.

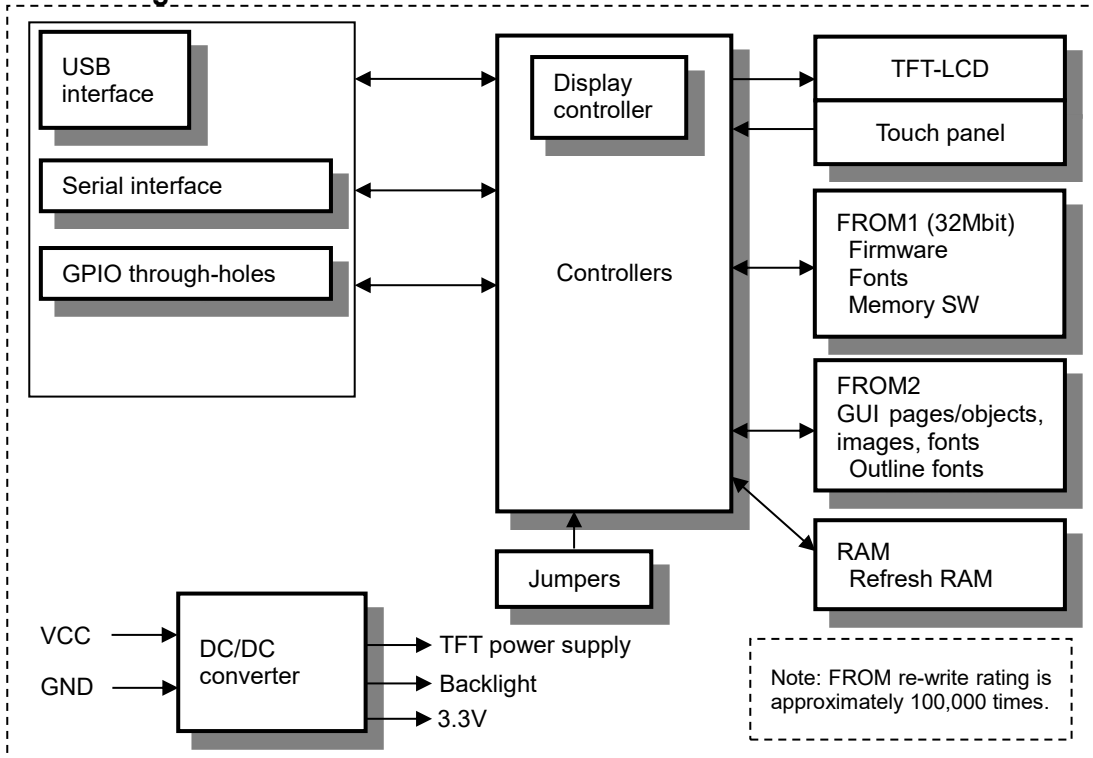
1.1 Construction

The module consists of an 800 x RGB X 480 color graphic TFT-LCD with touch panel, refresh RAM, character generator, DC/DC converter, microcontroller, and all necessary control logic.

1.2 Outline

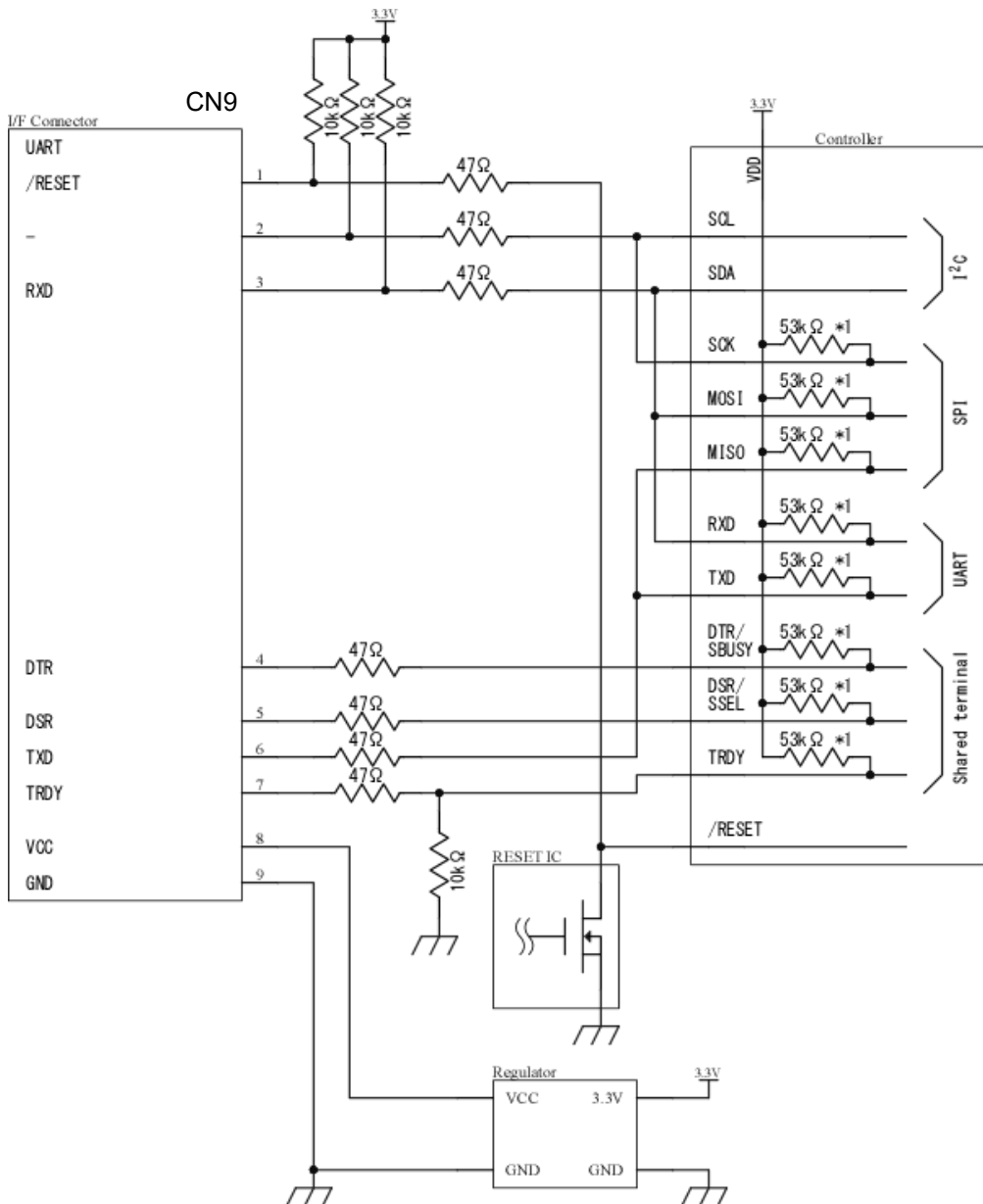
Display:	Diagonal 7.0 inches, 800×480 pixels, 32K colors (15-bit color (RGB 5-5-5)) 65K colors (16-bit color (RGB 5-5-5 + 1bit intensity)) (Intensity : RGB common least-significant bit.)
Power supply:	Single 5 VDC
Interface:	Serial interface (UART CMOS 3.3V) USB interface (High-speed / full-speed)
I/O port:	26 bits general-purpose I/O port
Function:	GUI control functions: <ul style="list-style-type: none"> GUI operation control Page control Object control Register / Readback function Page/Object Register, Backup Image register Font register Memory Switch setting Touch Panel control function Overall control function Other functions Character display, outline fonts
Related specifications:	DS-2154-0003-xx: "General Function" Software Specification.

1.3 Block Diagram



1.3.1 Serial Interface

The figure below is a schematic diagram of the internal connection of the serial interface and power.



Refer to 7.2 "Serial Interface (CN9)".

Note:

- *1: The CPU's internal pull-up resistor will turn on at power-on, reset input, and internal initialization of the display.

Pull-up resistors are connected to the internal power (3.3V).

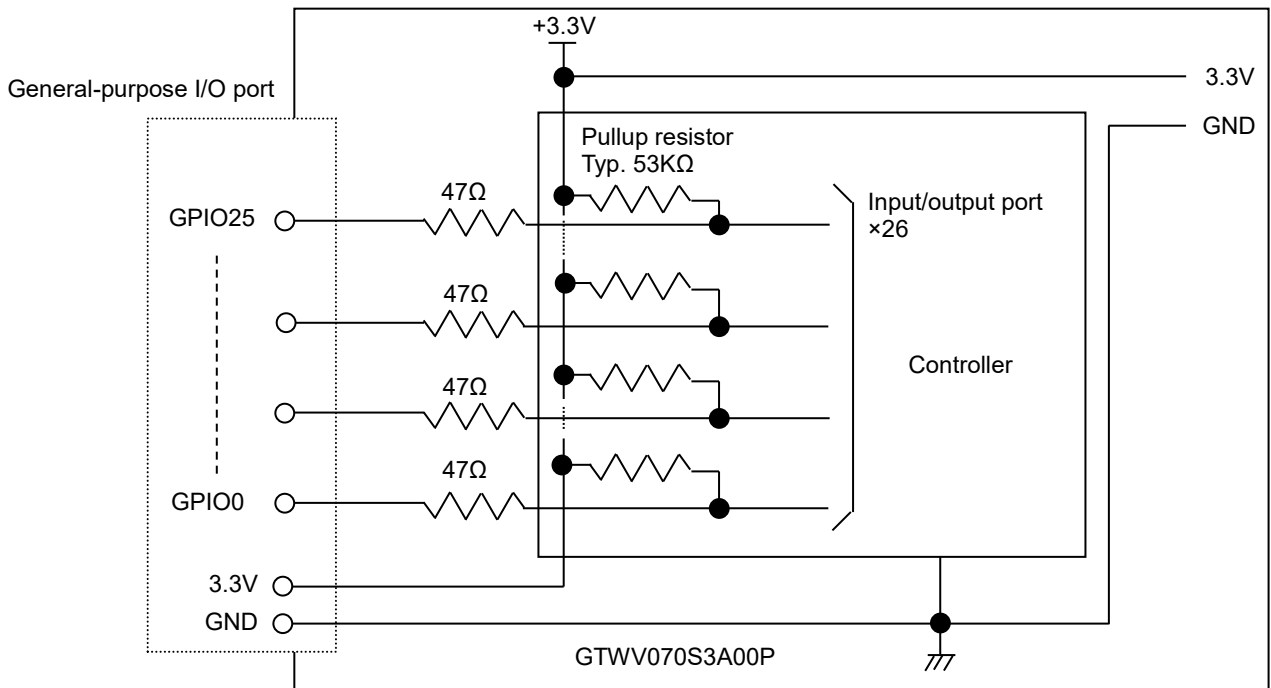
The controller's internal pull-up resistors do not function at power-on until the internal 3.3V rises, which means that those signals shown above which are not connected to a 10k pull-up or pull-down resistor will be high-impedance during this time.

The /RESET signal must only be driven (if necessary) by an open drain output.

Internal 3.3V power rises up to 300ms after VCC (5V) power reaches 4.75V. HI-level signal input prior to the internal 3.3V rising may cause boot failure. Input terminals should therefore be held LO, or left in high-impedance state for 300ms after applying VCC power.

1.3.2 General Purpose I/O Port

The figure below is a schematic diagram of the internal connection of the general-purpose I/O port.



Refer to 2.3 Electrical Characteristics, “General purpose I/O port and power 3.3V”.
 For controlling, refer to “General Function” Software Specification, “I/O Port Input / Output Setting”, “I/O Port Output”, and “I/O Port Input”.

2 Electrical Specifications

2.1 Absolute Maximum Ratings

Power supply voltage

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Power supply voltage	VCC	-0.3	-	+6.0	V	-

Logic voltage

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note	
UART	Logic input voltage RXD, DSR	VsIN1	-0.3	-	+3.6	V	VCC=5.0V
RESET	Logic input voltage /RESET	VsIN4	-0.3	-	+3.6	V	VCC=5.0V
I/O port	Logic input voltage port 0, 1, 2, 3	ViIN	-0.3	-	+3.6	V	VCC=5.0V

2.2 Electrical Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note	
Power supply	Power supply voltage	VCC	4.75	5.0	5.25	VDC	-
UART	Logic input voltage RXD, DSR	VsIH1	2.7	-	-	VDC	-
		VsIL1	-	-	0.6	VDC	-
RESET *1	Logic input voltage /RESET	VsIL4	-	-	0.6	VDC	-

*1: Please use open-drain output.

All driving voltage for the TFT-LCD is generated from the on-board DC/DC converter.

2.3 Electrical Characteristics

Logic input / output condition

Measuring conditions: ambient temperature = 25 °C, VCC=5.0VDC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
UART	Logic output voltage TXD, DTR *1	VsOH1	2.8	-	-	VDC	IOH = -1.6mA
		VsOL1	-	-	0.4	VDC	IOL = 1.6mA

Note:

*1 Output is high-impedance (Hi-Z) + pull-up resistor (53kΩ typ.) during power-on, reset input, and display internal initialization. Pull-up resistor is connected to internal power (3.3V).

General purpose I/O port and power 3.3V

Measuring conditions: ambient temperature = 25 °C, VCC=5.0VDC

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
General-purpose I/O port	Logic input current Port 0,1,2,3	IiIH	-	-	1.0	μADC	-
		IiIL	-	-	-200	μADC	-
	Logic input voltage Port 0,1,2,3	ViIH	2.4	-	3.3	VDC	-
		ViIL	0	-	0.8	VDC	-
Logic output voltage Port 0,1,2,3	ViOH	2.8	-	-	VDC	IiOHp = -200μA	
	ViOL	-	-	0.4	VDC	IiOLp = 1.6mA	
Power 3.3V	Logic output voltage 3.3V	VpOH	3.0	-	3.6	VDC	IpOHp = -20mA

Note:

Power 3.3V is used for internal logic, so external noise injection must be avoided to prevent product malfunction.

General purpose I/O port and power 3.3V output permissible current

Measuring conditions: ambient temperature = 25 °C, VCC=5.0VDC

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
General-purpose I/O port	Output permissible current port 0,1,2,3 (Single port)	liOHp	0	-	-5	mADC	-
		liOLp	0	-	5	mADC	-
	Output permissible current port 0,1,2,3 (Sum of all port)	liOHt	0	-	-80	mADC	Including power 3.3V (IpOHp)
		liOLt	0	-	80	mADC	-
Power 3.3V	Output permissible current 3.3V (Single port)	IpOHp	0	-	-20	mADC	-

Note:**Output current should not exceed the above values.****Please be sure to add a current limiting resistor in the output line if driving an LED or other device that may otherwise draw excessive current.****Power supply condition**

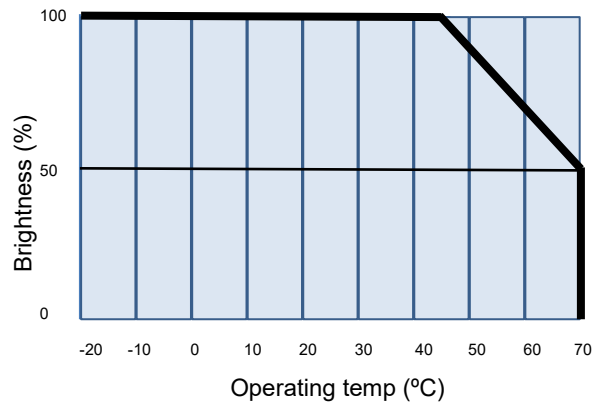
Measuring conditions: ambient temperature = 25 °C, VCC=5.0VDC, liOHt=0mA

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Power supply current	ICC-1	-	720	940	mADC	Brightness 100% All black display	
	ICC-2	-	460	-	mADC	Brightness 50% All white display	
	ICC-3	-	230	300	mADC	Display power OFF	
	ICC-4	-	65	95	mADC	Sleep mode Wakeup on GPIO	
Power consumption	P-1	-	3.6	4.7	W	Brightness 100% All black display	
	P-2	-	2.3	-	W	Brightness 50% All white display	
	P-3	-	1.2	1.5	W	Display power OFF	
	P-4	-	0.3	0.5	W	Sleep mode Wakeup on GPIO	

Note:**The rise time of supply voltage should not exceed 100ms.****Inrush current at power-on may exceed twice normal current.**

3 Environmental Specifications

Operating temperature:	-20 to +70 °C
Storage temperature:	-30 to +80 °C
Operating humidity:	Temp. ≤ 60 °C, 80% RH MAX. (No condensation) Temp. > 60 °C, Absolute humidity shall be less than 80% RH at 60 °C (No condensation)
Storage humidity:	Temp. ≤ 60 °C, 80% RH MAX. (No condensation) Temp. > 60 °C, Absolute humidity shall be less than 80% RH at 60 °C (No condensation)
Vibration (non-operating):	10-55-10Hz, all amplitude 1mm, 30 minutes, X-Y-Z
Shock (non-operating):	392m/s ² (40G) 9ms X-Y-Z, 3 times each direction
Brightness derating:	



4 Optical Specifications (at 25°C)

LCD type:	Transmissive TFT
Brightness TFT with touch panel:	Typ. 425 cd/ m ² (nit) 50% brightness Min. 500 cd/ m ² (nit) Typ. 850 cd/ m ² (nit) 100% brightness (White screen at the center of display)
Color:	RGB
View direction:	12 o'clock
Gray scale inversion direction:	6 o'clock

5 Physical Specifications

Number of pixels:	800 × RGB × 480
Display area:	154.08mm × 85.92mm (Diagonal 7.0 inches)
Pixel pitch:	0.1926mm × 0.179mm
Weight:	Approximately 267g

6 Applicable Specifications

Applicable reliability specification:	TT-99-3102x
Applicable production specification:	TT-98-3413x

7 Interface Details

USB and UART serial interfaces are included on this module. The module will accept data from any configured interface. Response data is generally transmitted via the USB interface if it is active or via the configured serial interface otherwise (refer to 7.3 Transmit Data Interface).

7.1 USB Interface (CN3)

7.1.1 USB Interface – Summary

The USB interface is USB 2.0 high-speed (480Mbps) / full-speed (12 Mbps) capable.

The display module can be used as a *WinUSB* device, using the standard *WinUSB* driver.

Alternatively, refer to USB Interface – Technical details (below) if using the USB interface with a custom driver or embedded system, etc.

Refer to the [USB 2.0 Specification \(http://www.usb.org/developers/docs/usb20_docs/\)](http://www.usb.org/developers/docs/usb20_docs/) for further details.

7.1.2 USB Interface – Technical Details

The device has a single configuration, with a single interface, supporting two endpoints for data transfer:

Endpoint	Type	Maximum packet size
Endpoint 0	Control	64 bytes
Endpoint 1	Bulk IN	Full speed: 64 bytes, high speed: 512 bytes
Endpoint 2	Bulk OUT	Full speed: 64 bytes, high speed: 512 bytes

Vendor ID: 0EDA (hex)

Product ID: 1200 (hex)

Device class and interface class: FF (hex) (vendor-specific)

USB serial number: Unique serial number

WinUSB compatibility:

Firmware supports *Microsoft OS String Descriptors*, which enable automatic recognition of *WinUSB* compatibility for applicable operating systems (manual configuration, using an .inf file, is also possible). The Device Interface GUID reported by the device is {6120D798-D192-4463-B0DE-2B65ED2F4870}. This GUID is used by applications on the host in order to access the device.

7.2 Serial Interface (CN9)

Serial interface mode must be set using jumpers J5 and J6. For all modes, the DTR signal reflects the state of the receive buffer. This can be used for flow control if necessary. Data received is stored in the internal receive buffer, and processed in order of receipt. The TRDY signal indicates whether or not there is data currently held in the transmit buffer.

Buffer capacity

Receive buffer	2,047 bytes
Transmit buffer	2,047 bytes

DTR signal change timing

DTR change	Interface	'L'(READY) → 'H'(BUSY)	'H'(BUSY) → 'L'(READY)
Receive buffer space	UART	62 bytes or less	128 bytes or more

TRDY signal change timing

TRDY	READY('H')	EMPTY('L')
Condition	Data in transmit buffer	No data in transmit buffer

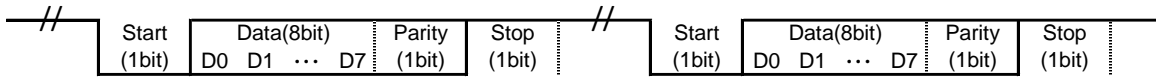
7.2.1 UART Mode (J5 = SHORT, J6 = SHORT)

Interface conditions:

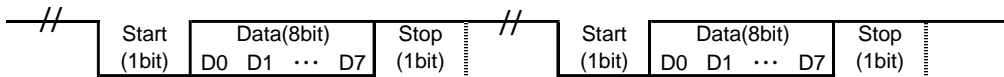
Baud rate	4,800 to 115,200bps (set by jumper and memory SW) Default setting: 38,400bps
Parity	None, even, odd (set by memory SW) Default setting: None
Format	Start (1 bit) + data (8 bit) + parity (0 or 1 bit) + stop (1 bit)
Communication control signal	DSR, DTR, TRDY

- Data transmitted from the display is placed in the internal transmit buffer and sent, in order, when DSR = READY.
- The TRDY signal does not need to be used.

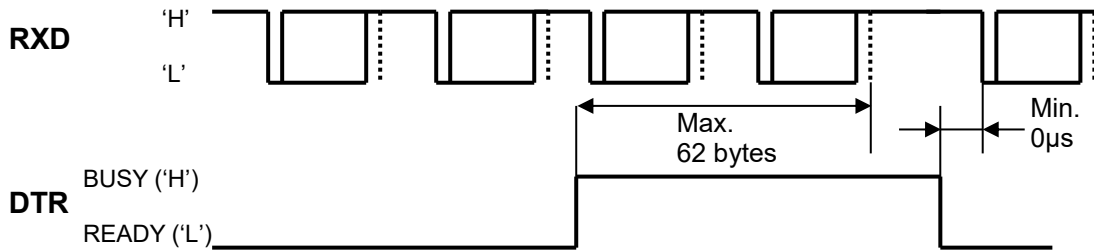
Data Frame (When using parity bit)



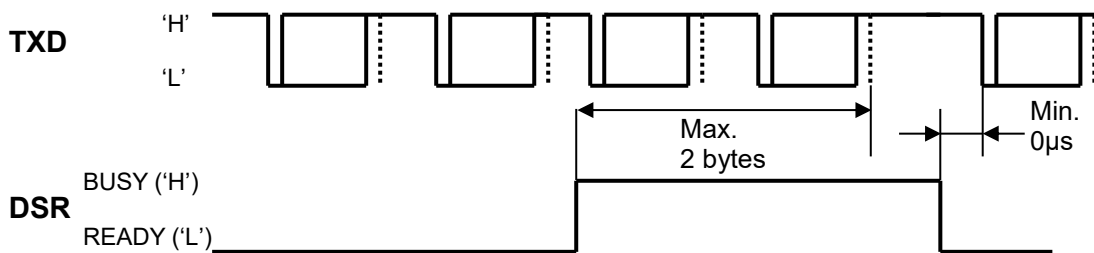
Data Frame (When parity bit is not used)



Timing (data write)



Timing (data read)



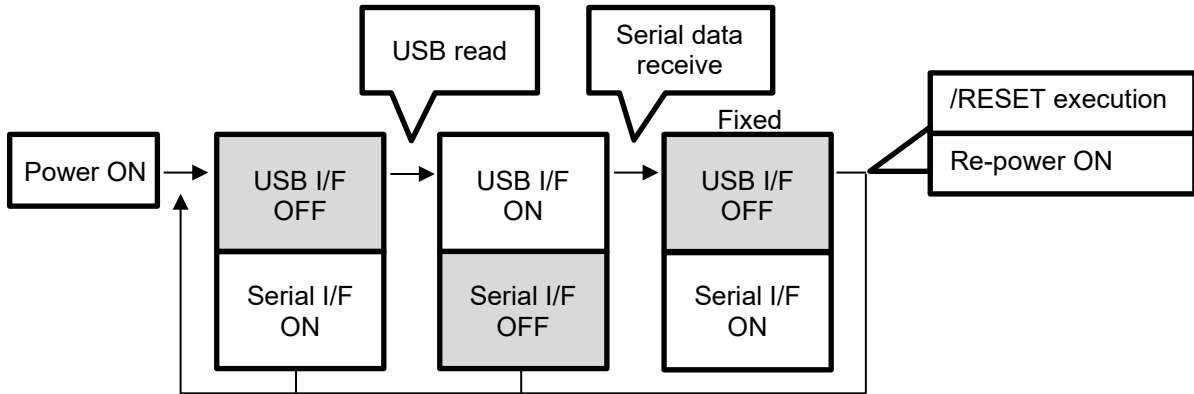
7.3 Transmit Data Interface

If the USB interface is used in addition to the serial interface (UART), confusion can arise over which interface data transmitted from the display module is sent via.

Initially, the configured serial interface is selected for transmit data.

If the USB interface is active and a USB read is attempted by the host (i.e., a USB bulk-IN transaction is directed at the device's Endpoint 1), the USB interface is selected for transmit data.

However, if data is subsequently received on the configured serial port, the configured serial port is then used instead, from that point onwards, for all transmit data (regardless of USB activity). This state continues until an external reset or power cycle.

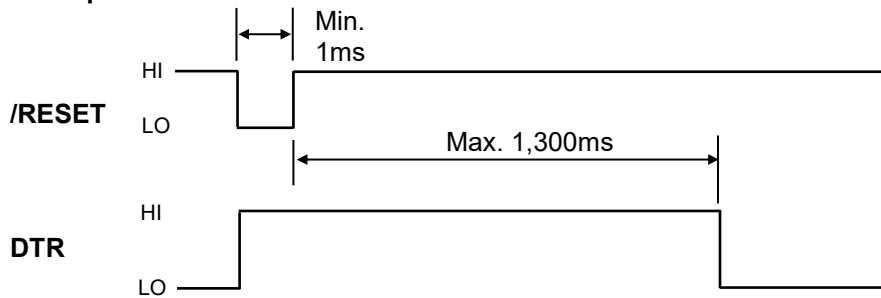


7.4 Reset

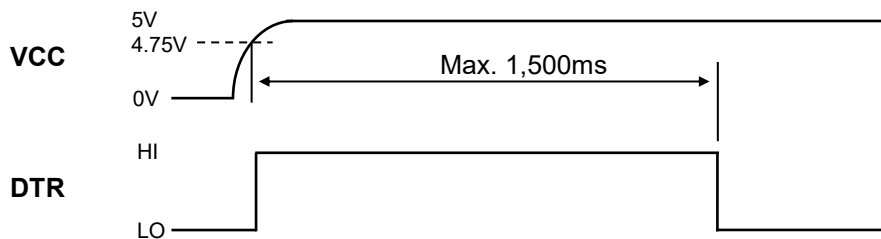
This product can be reset by inputting a LO signal to /RESET.

Note: After releasing /RESET, there is a delay, as shown below, before the module is ready to receive data. The DTR signal should be monitored to confirm that data is able to be received. Output is high-impedance (Hi-Z) + pull-up resistor (53kΩ typ.) during power-on, reset input, and display internal initialization.

Reset Input



Power-On



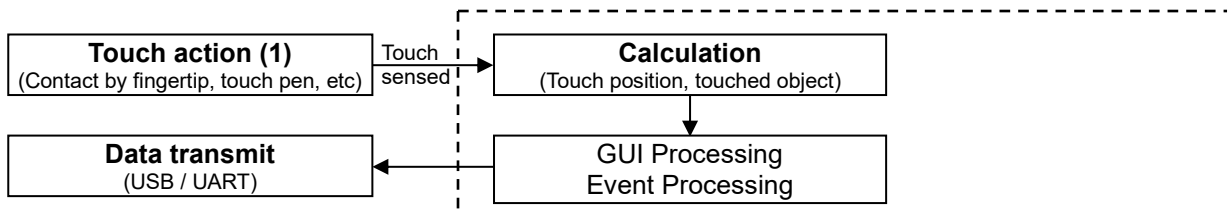
8 Touch Panel

8.1 Outline

Detection method: MPCT (Metallized Projective Capacitive Touch) supporting multi-touch.
Material: Glass

8.2 Basic Operation

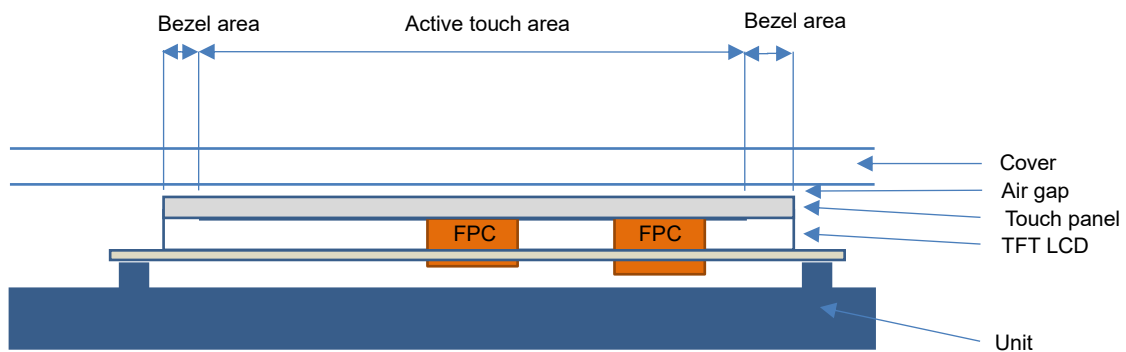
The display module features a touch panel for handling input by fingertip or touch pen, etc. The touch panel function sends data for the input position or operation of user-defined switch buttons.



Refer to “General Function” Software Specification for details.

9 Installation Method

touch panels are made of glass. When using this product, please be sure to install a protective overlay such as cover glass, acrylic plate, etc. Since this touch panel is capacitive type, touch won't work if a conductive material is placed on the touch area or bezel area. Please use non-conductive material like a glass or acrylic panel as a cover. An example is shown below.



Installation example

- Because edges and corners are sharp of touch panel, please be careful with installation.
- If it gives a strong shock it may cause destruction.
- Do not hold a cable (FPC) of touch panel. Also, do not install such as to stress the cable.
- Please handle this product carefully because it is a precision part. When holding this product, please touch PCB edge, not touch panel.

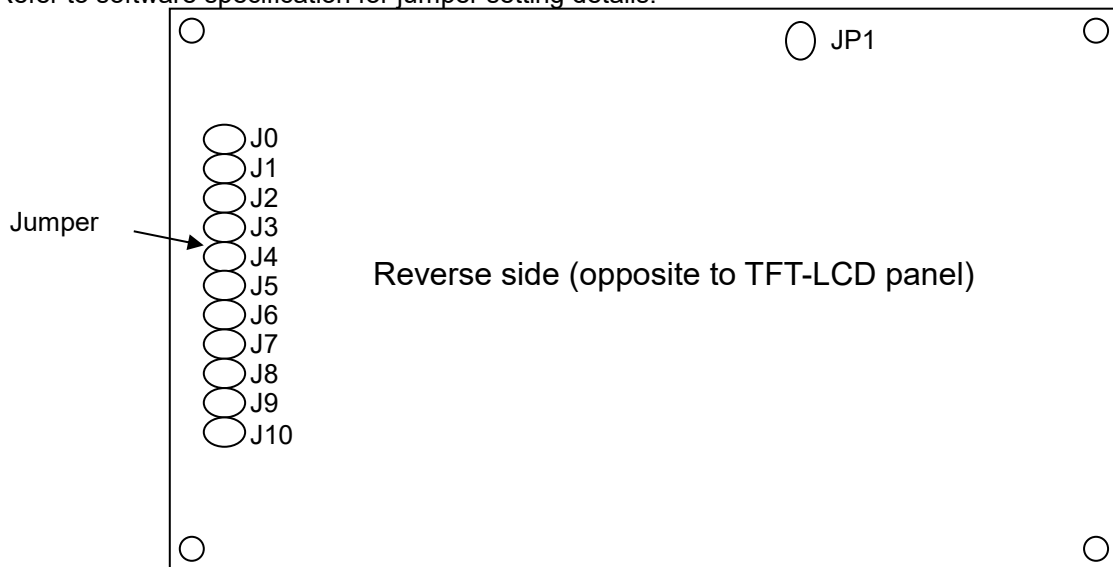
10 Setup

10.1 Jumper

Jumper	Function	Default
J0	Reserved	Open
J1		Open
J2	Reserved	Open
J3	Baud rate	Open
J4		Open
J5	Serial interface (CN9) mode	Open
J6		Open
J7	GUI Start selection	Open
J8	Reserved	Open
J9	Reserved	Open
J10	touch panel calibration mode Factory use only	Open

Open = "H", Short = "L"

Refer to software specification for jumper setting details.



11 Connectors

11.1 USB Interface (CN3)

Pin No.	Signal name
1	VBUS
2	D-
3	D+
4	ID
5	GND

Shorting JP1 enables power supply from VBUS.

11.2 Power Through-holes (CN8)

Pin No.	Signal name	Function
1	VCC	Power supply (5V)
2	/TEST	No connection (Test mode) *1
3	GND	Ground

*1: Test mode can be executed by shorting the /TEST terminal and GND. Refer to “General Function” Software Specification. Normally use it open.

11.3 Serial Interface & Power Through-holes (CN9)

Pin No.	UART		Direction
	Signal name	Function	
1	/RESET	Reset	Input
2	-	-	-
3	RxD	Data receive	Input / Output
4	DTR	Display busy	Output *1
5	DSR	Host busy	Input
6	TXD	Data send	Output *1
7	TRDY	Transmit ready	Output *1
8	VCC	Power supply (5V)	-
9	GND	Ground	-

*1: Output is high-impedance (Hi-Z) + pull-up resistor (53kΩ typ.) during power-on, reset input, and display internal initialization.

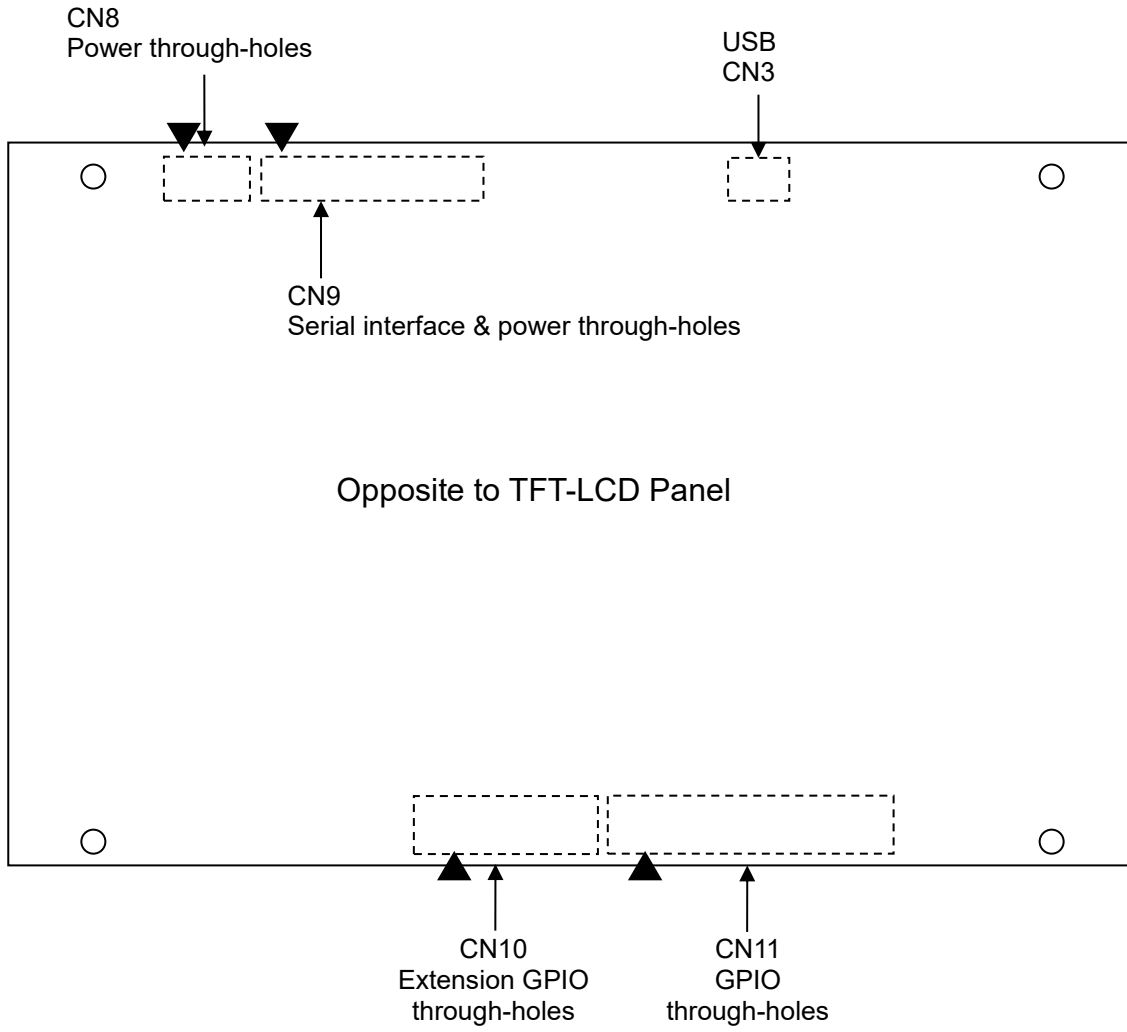
11.4 Extension General Purpose I/O Port Through-holes & Power Through-holes (CN10)

Pin No.	Signal name	Function	Direction	Pin No.	Signal name	Function	Direction
1	VCC	Power supply (5V)	Input	2	3.3V	3.3V	Output
3	GPIO 25	Port 3	Input / output	4	GPIO 24	Port 3	Input / output
5	GPIO 23			6	GPIO 22		
7	GPIO 21	Port 2	Input / output	8	GPIO 20	Port 2	Input / output
9	GPIO 19			10	GPIO 18		
11	GPIO 17			12	GPIO 16		
13	GND	Ground	Input	14	GND	Ground	Input

11.5 General Purpose I/O Port Through-holes & Power Through-holes (CN11)

Pin No.	Signal name	Function	Direction	Pin No.	Signal name	Function	Direction
1	VCC	Power supply (5V)	Input	2	3.3V	3.3V	Output
3	GPIO 15	Port 1	Input / output	4	GPIO 14	Port 1	Input/output
5	GPIO 13			6	GPIO 12		
7	GPIO 11			8	GPIO 10		
9	GPIO 9			10	GPIO 8		
11	GPIO 7	Port 0	Input / output	12	GPIO 6	Port 0	Input/output
13	GPIO 5			14	GPIO 4		
15	GPIO 3			16	GPIO 2		
17	GPIO 1			18	GPIO 0		
19	GND	Ground	Input	20	GND	Ground	Input

11.6 Connector Position



"▲" : 1pin mark.

12 Memory SW

The default settings for the Memory SW related to the touch panel are as follows.

For details of the Memory SW, refer to the "General Function" software specification.

MSW No.	Function	Valid range	Default
58	Touch sensitivity (signal gain) setting	00h – 0Fh	06h
59	Touch sensitivity (threshold) setting	00h – FFh	50h
61	Touch scan period setting at power saving mode (ms)	05h(5ms) – FEh(254ms)	20h(32ms)
62	Touch sensitivity setting selection at startup 00h: Apply the setting values of MSW58 and 59 01h: Apply touch setting package value	00h, 01h	00h
63	Touch setting package selection at startup 00h: Factory setting 01h: Touch setting package 1 02h: Touch setting package 2 03h: Touch setting package 3 04h: Touch setting package 4	00h – 04h	00h

Note: Module operates with default value if Memory SW value is outside the valid range.

13 Lot No. / Firmware Version Specification

Lot No. and firmware version are attached on the product. They are determined based on the following specifications.

Example:

Lot No.	Firmware Ver.
18C22EH	F100b
A B C D E	F

A: Production year

B: Production month

C: Production date

D: Manufacturing factory

E: Omiya factory in Japan

E: Identification of RoHS compliant

H: RoHS compliant

F: Firmware version

The last two digits of the year are indicated.

The production month is indicated by one alphabetic character.

January: A, February: B to December: L

The production date is indicated by one or two digits.

Indicates the factory that was manufactured.

Indicates the identification of RoHS compliant products.

Indicates the firmware version.

In test mode and information read command, F100 may be described as 1.00.

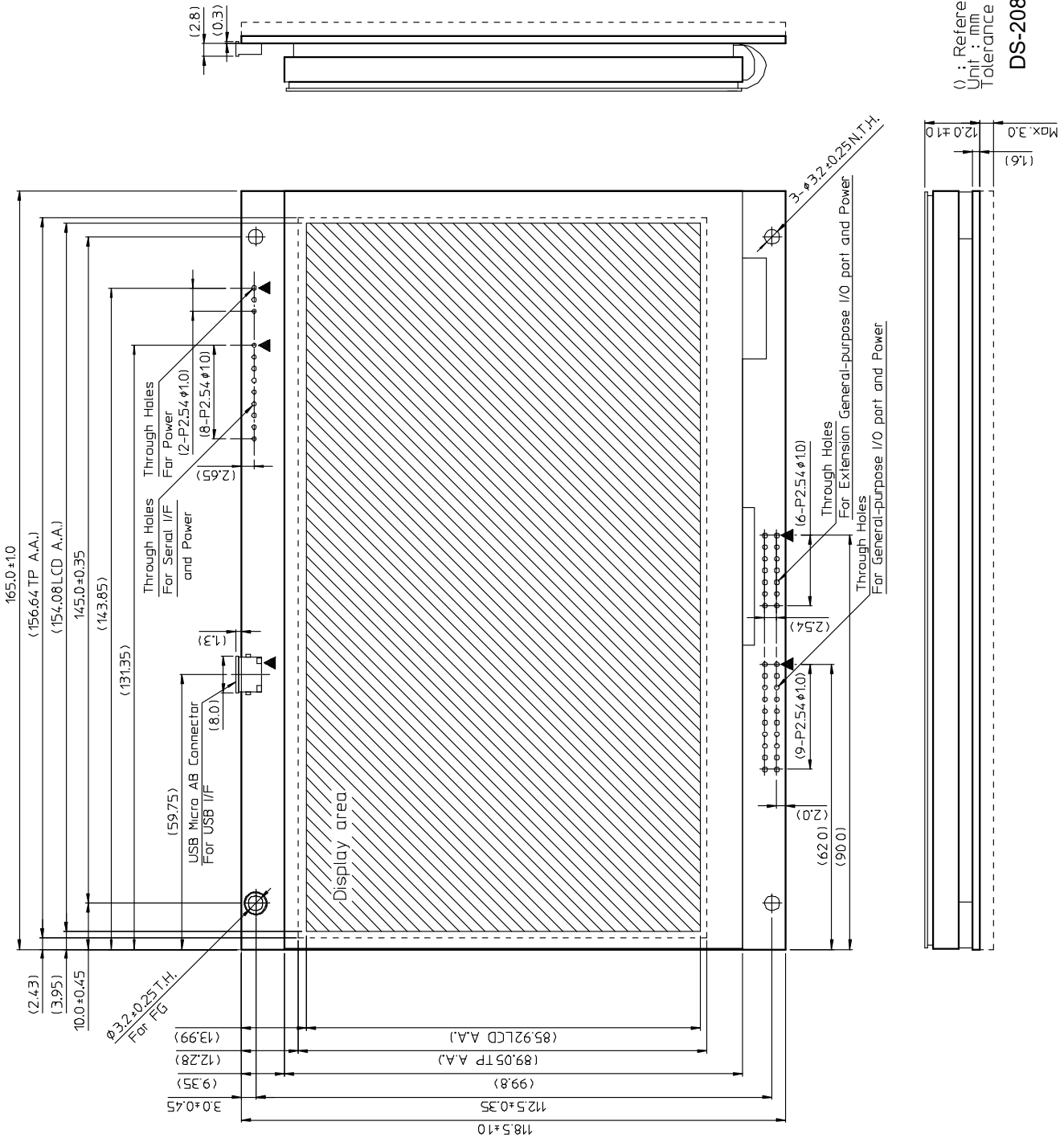
Lowercase letters indicate font versions.

First edition: a, 2nd edition: b, 3rd edition: c ...

The example above is a RoHS compliant product with firmware version 1.00b manufactured at the Omiya Plant on March 22, 2018.

14 Physical Dimensions

Mounting holes are close to the panel; use caution when assembling.



(): Reference only
 Unit : mm
 Tolerance : ±0.5
DS-2082-0100-00

Revision history

Specification number	Date	Revision
DS-2154-0001-00	Jun. 21, 2023	Initial issue