

STONE

Intelligent TFT-LCD Module

Model

STWI043WT-01

Equipment Manual

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Preface

This equipment manual is part of our Intelligent TFT-LCD Module documentation. It provides the information in regards of operation, installation, configuration, function, system as well as its technical design and working principle.

Organization of the manual

The STWI043WT-01 equipment manual is organized into the following chapters:

| Chapter | Contents |
|----------|---|
| 1 | Overview of features and functional scope of the STWI043WT-01 |
| 2-4 | Technical Parameters, Interface Description, Coprocessor |
| 5-6 | Accessories, Physical Dimensions |
| 7-9 | Electrical Components, Naming Rule, International Certification |
| Appendix | ESD Guidelines, Glossary |

Customer Online Services

Customer Support offers comprehensive additional information of Intelligent Products through its Online services as follows:

- Official website: <https://www.stone-hmi.com>
<https://www.stoneitech.com>
- Official forum: <https://forum.stoneitech.com>
- Official forum: <https://forum.stoneitech.com>
- Telephone: 0086-10-84351669

Other support

In need of technical queries, please contact STONE representatives in the subsidiaries and branches responsible for your area.

Trademarks

STONE registered trademarks are as below:

- STONE
- STONE TECH
- Intelligent HMI
- Intelligent TFT-LCD Module
- Smart TFT-LCD Module

Abbreviations

The abbreviation table in this equipment manual is as below:

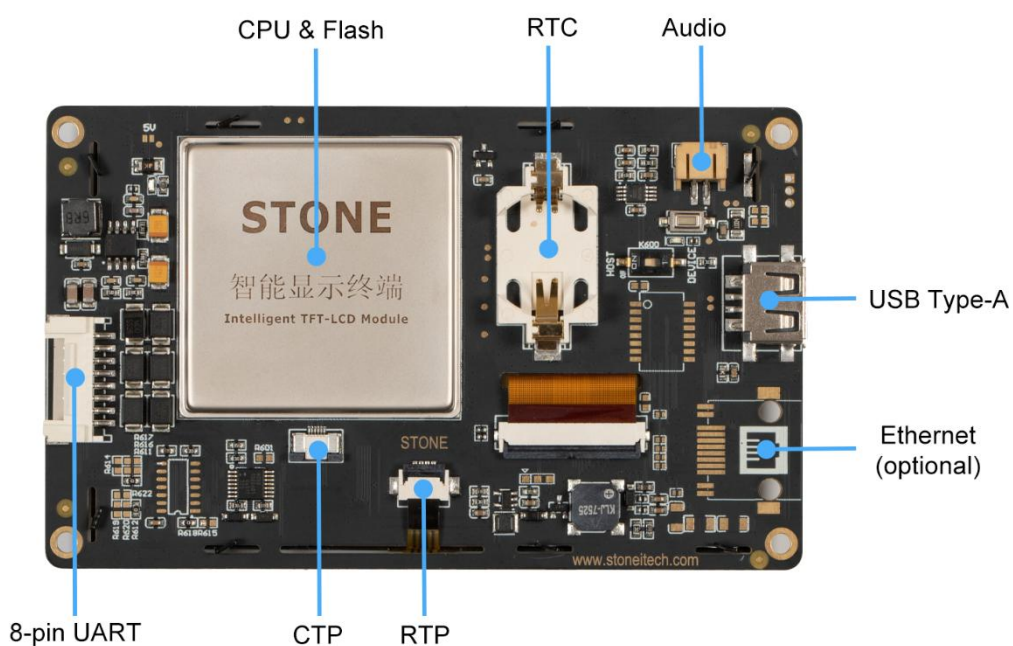
| | |
|------|---|
| LED | Light Emitting Diode |
| CPU | Central Processing Unit |
| ESD | Electrostatic Sensitive Device |
| HMI | Human Machine Interface |
| IF | Interface |
| LCD | Liquid Crystal Display |
| UART | Universal Asynchronous Receiver/Transmitter |
| COM | Commercial |
| DI | Data Input |
| DO | Data Output |
| VIN | Voltage Input |
| GND | Ground |
| TP | Touch Panel |

A list of all the technical terms together with their explanations is provided in the glossary at the end of this manual.

1 Introduction

This chapter contains general information of:

- Brief Introduction
- Warranty
- Product Characteristics
- Application Area
- Working principle
- Operation Processing
- Software Operation



1.1 Brief Introduction

The STWI043WT-01 has been used as **Equipment TFT display & Touch controller**.

It includes processor, control program, TFT driver, flash memory, UART port, touch screen, power supply etc., and the important is it can supply the Json Code & Hex Code instruction sets, **so that it can be controlled by Any MCU**.

The STWI043WT-01 can perform all basic functions, such as **Vector font** display, image display, curve display as well as touch function, Video & Audio function etc. The User Interface can be more abundant and various. And the flash memory can store your data, configuration files, image file, font file, video file and audio file etc.

1.2 Warranty

The warranty period is **3 Years** after delivery. Should there be any technical or quality problem within the warranty period, we guarantee the product can be **replaced by a brand-new one unconditionally**, except human broken.

1.3 Product Characteristics

- With Cortex A8 CPU / 256MB Flash / TFT Driving device
- Controlled by any MCU via Json & Hex Code Instruction
- Display Image / Text / Curve / Video
- 262K (18bit) colour TFT display
- With / without Touch Screen
- RS232 / RS422 / RS485 / TTL UART Interface & USB port Downloading
- Ethernet port / WIFI Remote Control
- Wide voltage range / Strong Working Temperature
- Easy to use! Powerful function! Saving Much Development cost and time!

1.4 Application Area

Widely used in various industrial field

- Medical & Beauty Equipment
- Engineering Machinery and Vehicle Equipment
- Electronic Instrument
- Industrial Control System
- Electric Power Industry
- Civil Electronic Equipment
- Automation Equipment
- Traffic Field
- New Energy Project
- IOT Applications

Etc.

1.5 Working Principle

The Intelligent TFT-LCD Module communicates with the Customer's MCU / CPU / FPGA / PLC via JSON Code and HEX Code Instructions, then the MCU can control its connected equipment to work according to the received instructions.

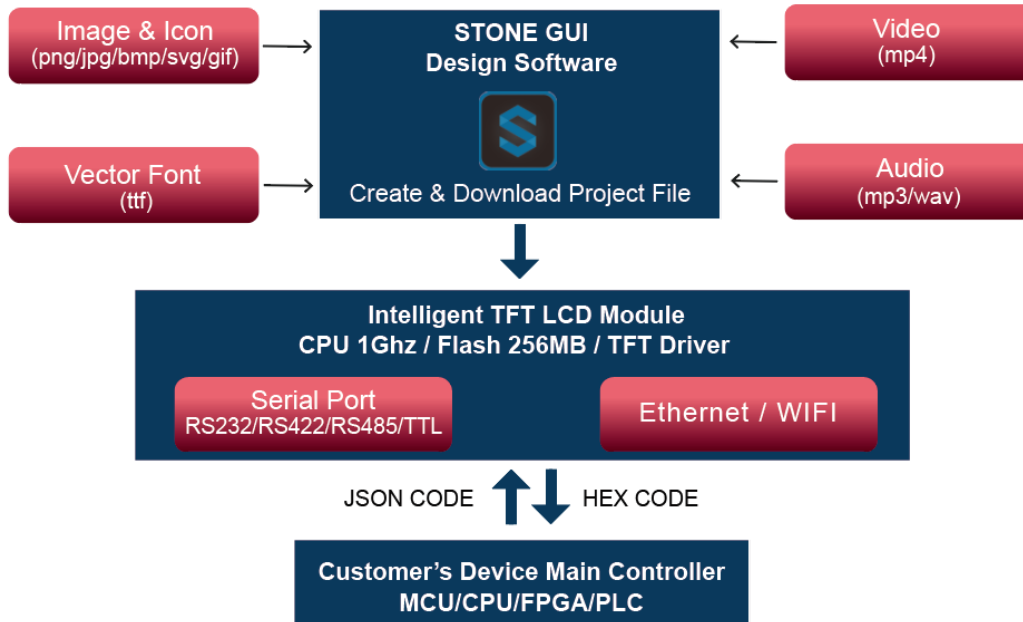


Figure 1.3-1 Configuration and process control phase

1.6 Operation Processing

Only **3 steps** to operate our TFT-LCD Module:

- 1) Build a new GUI project by STONE GUI Designer Software.
- 2) Connect with customer's MCU through RS232,RS422,RS485,TTL directly, Plug & Play.
- 3) Write a simple program for MCU to control the TFT-LCD Module via Instruction Sets.

The communication protocol is built with 2 parts:

1) Initiative Instruction - JSON Code (MCU→TFT-LCD Module)

| | | | | | |
|--------------|--------------------------|-----------------|--------------------|------------|------------|
| Frame header | instruction code | widget type | widget name | data | Frame tail |
| ST< | {"cmd_code":"set_value", | "type":"label", | "widget":"label2", | "value":5} | >ET |

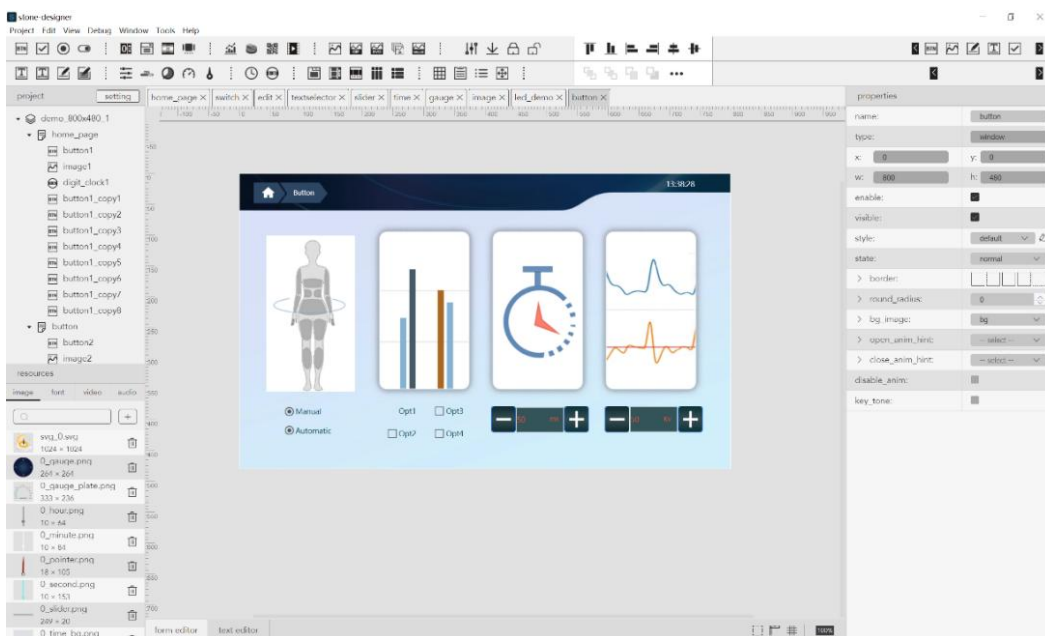
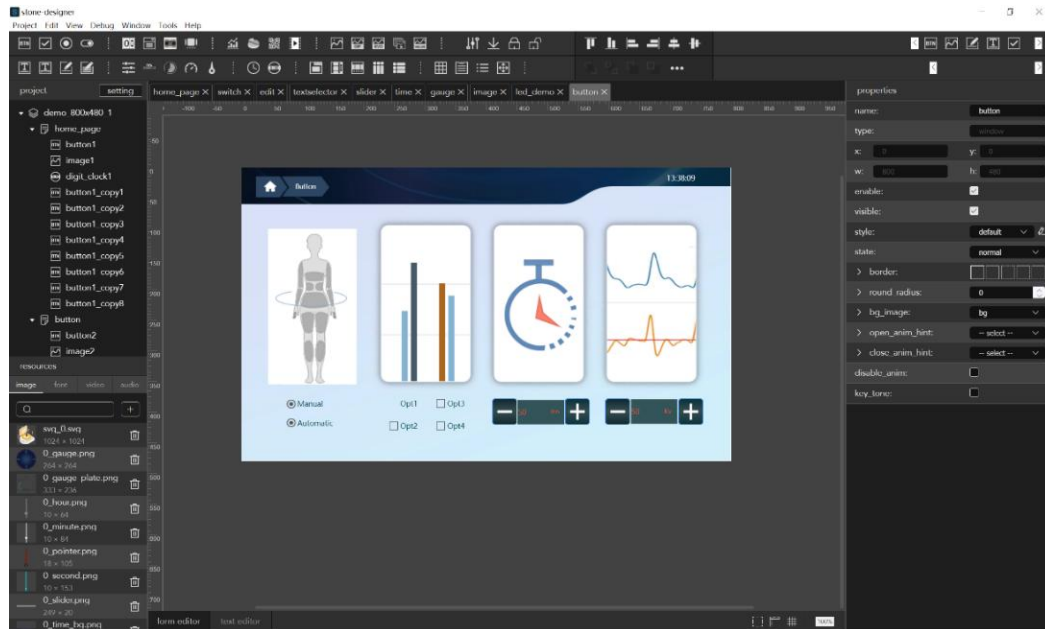
2) Passive Instruction - HEX Code (TFT-LCD Module→MCU)

| | | | | | |
|--------------|-------|-------|----------------------------|------------|-------|
| Frame header | CMD | LEN | DATA | Frame tail | CRC16 |
| 53 54 3C | 10 62 | 00 09 | 6C 61 62 65 6C 3F A1 47 AE | 3E 45 54 | 6C 8B |

More information, please refer to the document of Instruction Sets.

1.7 Software Operation

We will offer a simple & powerful "Stone GUI designer" Software to assist you to design the new GUI project for TFT-LCD Module basic on Windows system, MacOS system or Linux system.



2 Technical Parameters

This chapter contains technical data on:

- **Physical Parameters:**

Physical Parameters

Display

- **Hardware Parameters:**

Processor

Memory

Interface

Power Supply

- **Storage & Test**

Electrical Characteristics

Ambient Conditions

Noise Immunity

Radio Interference

- **Support Device**

Support Device

Technical Parameters

| Physical Parameter | |
|--------------------|---|
| Size | 4.3 inch |
| Resolution | 480×RGB×272 |
| Pixel Spacing | 0.066(W) × 0.198(H) mm |
| Color | 262,144 colors (18 bit) |
| Viewing Area | 95.04(W) × 53.86(H) mm |
| Display Dimension | 106.5mm×68.2mm |
| Overall Dimension | 121.9mm×74.7 mm×15.5mm (T) (Standard type) 121.9mm×74.7 mm× 21.65mm (T) (with Ethernet port) |
| Net Weight | 155g(T) |

| Display | |
|----------------|---|
| Backlight Type | LED |
| Brightness | 500cd/m ² (Brightness can be adjustable in 100 levels) |
| Contrast | 500:1 |
| Backlight Life | 30,000 hours |
| Viewing Angle | 70°/70°/50°/70°(L/R/U/D) |
| TFT Panel | INNOLUX Original TFT Panel |
| Touch Screen | 4-Wire Resistance Touch Screen / Capacitive Touch Screen / Without Touch Screen |
| Screen Mode | Digital |

| Processor | |
|----------------|-----------|
| CPU | Cortex A8 |
| Refresh Rate | 1GHz |
| Max Frame Rate | 60 FPS |

| Memory | |
|-------------------------|--|
| Flash Memory | Standard 256MB |
| Memory Amount for Image | According to the capability of the image, Support "jpg, bmp, png, svg, gif" format. |

| Interface | |
|--------------------|--|
| Serial Interface | RS232 / RS422 / RS485 / TTL level |
| Ethernet Interface | 10M/100M (optional) |
| Wireless Interface | WIFI (optional) |
| Project Download | Suggest U Storage Disk or USB2.0 by PC |

| Power Supply | |
|-----------------------------|----------------------------|
| Rated Voltage | +12V DC or +5V DC |
| Permissible Voltage Range | +9V DC...+28V DC or +5V DC |
| Max. Permissible Transients | +28V |
| Time between Two Transients | 50 sec minimum |
| Internal Fuse | 2A self-recovery fuse |
| Rated Power | 1.0W |
| Recommended Power Supply | 12V, 2A |

| Electrical Characteristics | | | | |
|-----------------------------------|-------------------------------|-----|--------------|-----|
| Parameter | Condition | Min | Type | Max |
| Supply Current | VIN=12V (Max brightness) | | 145mA | |
| | VIN=12V (close brightness) | | 80mA | |
| Baud Rate | Default | | 115200 bps | |
| Static Discharge | | | EN 61000-4-2 | |
| Contact Discharge/Air Discharge | | | 6 kV/8 kV | |

Technical Parameters

| Ambient Conditions | |
|---|--|
| Max. Permissible Ambient Temperature | |
| Operation | -30°C ~ +80°C |
| Storage | -40°C ~ +85°C |
| Relative Humidity | |
| Operation | 55°C, 85% |
| Storage | 60°C, 90% |
| Shock Loading | |
| Operation | 15 g/11 msec |
| Storage | 25 g/6 msec |
| Vibration | |
| Operation | 0.035 mm (10 - 58 Hz)/ 1 g (58 - 500 Hz) |
| Storage | 3.5 mm (5 - 8,5 Hz)/ 1 g (8.5 - 500 Hz) |
| Barometric Pressure | |
| Operation | 706 to 1030 hPa |
| Storage | 581 to 1030 hPa |

| Noise Immunity | |
|-----------------------|---|
| RF Irradiation | EN 61000-4-3 10 V/m, 80% AM 1 kHz |
| Pulse Modulation | ENV 50204 900 MHz ± 5 MHz 10 V/m _{eff.} , 50% ED, 200 Hz |
| RF Conduction | EN 61000-4-6 150 kHz - 80 MHz 10 V, 80% AM, 1 kHz |
| Burst Interference | EN 61000-4-4 |
| Supply Lines | 2kV |
| Process Data Lines | 2kV |
| Signal Lines | 1kV |

| Radio Interference | |
|--|---------|
| Radio Interference Level Complying to EN 55011 | Class A |

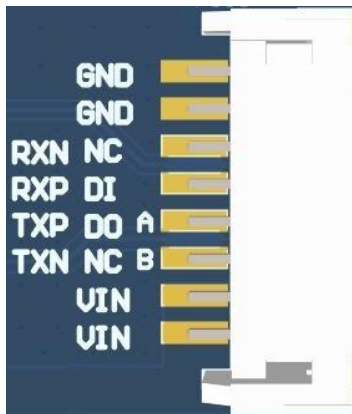
| Support Device | |
|--------------------------|--|
| UART Port | Support RS232 / RS422 / RS485 / TTL |
| Network Port | Support(optional) Ethernet Port / WIFI |
| Flash Memory | Support Standard 256MB |
| Buzzer | Support |
| RTC | Support |
| USB Type A Port | Support Online Download By USB Cable |
| U Storage Disk Interface | Support. Offline Download or Copy User Data |
| Touch Screen | 4 Wire Resistance / Capacitive Touch Screen |
| Coprocessor | Support(optional) STM32F103C8T6 MCU Chip |
| Vector Font | Support Standard ttf Format of Computer |
| Image | Support jpg/bmp/png/svg/gif Format |
| Video Interface | Support avi / mp4 Format |
| Audio Interface | Support wav / mp3 Format |
| Instruction Set | Unified Simplified Instruction Sets |

3 Interface Description

This chapter contains the description of the interfaces:

- VIN
- NC
- DO
- DI
- GND

Communication Interface Definition:



I: Input O: Output P: Power

| Option | Pin Name | Pin NO. | Pin Type | Interpret |
|---------------|----------|---------|----------|--------------------|
| RS232/ TTL | GND | 1,2 | P | Power Ground |
| | DI | 4 | I | Data Input |
| | DO | 5, | O | Data Output |
| | NC | 3,6 | | None |
| | VIN | 7,8 | P | Power Supply Input |
| RS485 | GND | 1,2 | P | Power Ground |
| | A | 5 | I/O | RS485 A |
| | B | 6 | I/O | RS485 B |
| | VIN | 7,8 | P | Power Supply Input |
| RS422 | GND | 1,2 | P | Power Ground |
| | RXN | 3 | I | Data Input - |
| | RXP | 4 | I | Data Input + |
| | TXP | 5 | O | Data Output + |
| | TXN | 6 | O | Data Output - |
| | VIN | 7,8 | P | Power Supply Input |

- Note A:**
- Adopting the 8 Pin 2mm spacing socket. Model Code: A2008WR-S-8P.
 - Direction of the signal was defined with TFT-LCD Module;
 - “I” refers to the signal from the user’s MCU transmitted to the TFT-LCD Module.
 - “O” refers to the signal from the TFT-LCD Module transmitted to the user’s MCU.
 - Pins with the same definition are connected together in the module inside.
 - RS232, TTL, RS422, RS485, port can be default which need to point out in the order.

Note B: The selection of Baud rate for the serial interface:

| | | | | | | | | | | |
|-----------------|------|------|------|------|-------|-------|-------|--------|--------|---------|
| Baud rate (bps) | 1200 | 2400 | 4800 | 9600 | 19200 | 38600 | 57600 | 115200 | 921600 | 1500000 |
|-----------------|------|------|------|------|-------|-------|-------|--------|--------|---------|

Serial Port Defind:

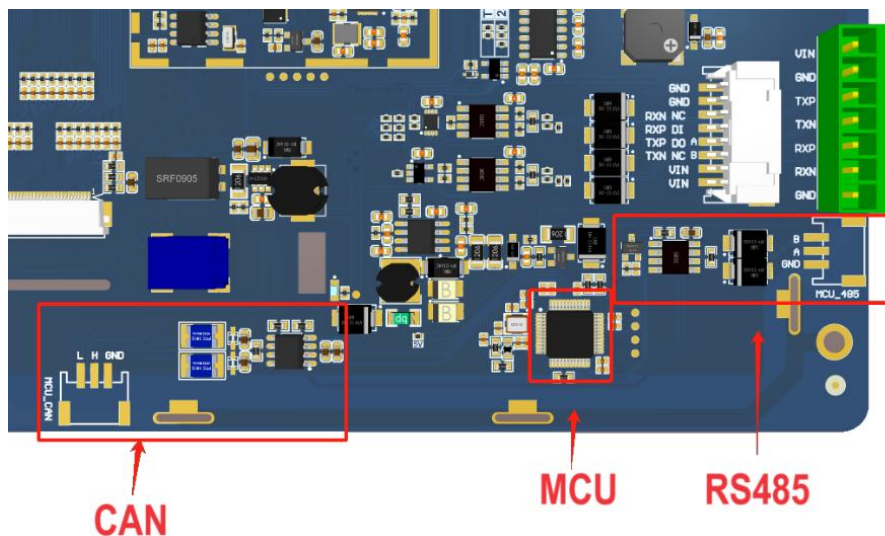
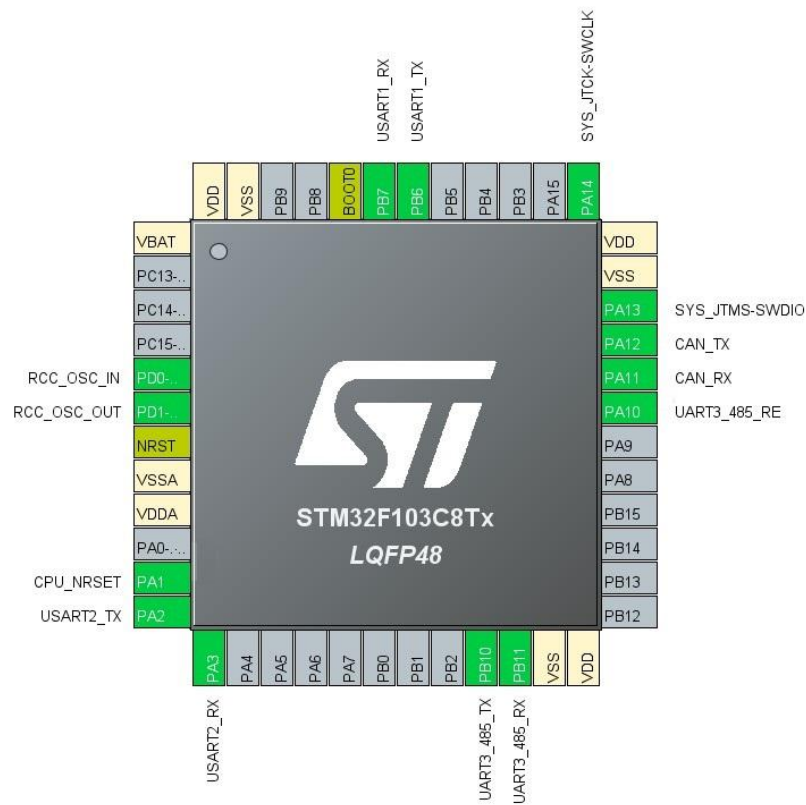


- Note A:** RS232 area connect, TTL area disconnect.
TTL area connect, RS232 area disconnect.
- Note B:** The resistance are 0 Ω with 0402 standard package.
- Note C:** The welding pad of STWI035WT-01 is on the back of the PCB, and the black frame needs to be removed .

4 Coprocessor (optional)

This chapter contains the description of the functions:




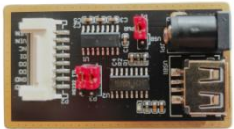

- STM32F103C8T6 MCU Chip
- Instruction Transparent Transmission
- Instruction Translation
- RS485 Bus
- CAN Bus

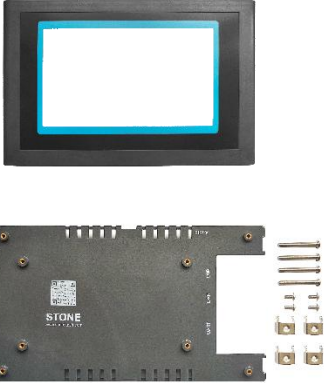



5 Accessories

This chapter contains the accessories:

- Double 8-pin Connect Cable
- 8-pin Socket
- Type A USB Cable
- Converter: USB ⇌ RS232 / RS422 / RS485 / TTL
- IP65 Plastic Box (optional)
- Metal Bezel (optional)

| Accessory Name | Model | Note | Picture |
|--------------------|-------------------------|--|---|
| Double 8-pin Cable | L8 | Optional: 10cm/20cm/35cm/65cm |  |
| 8-pin Socket | S8 | SMD-8 2.0mm with Lock Model:A2008WR-S-8P |  |
| Type A USB Cable | LU | Double USB Port Cable Online Downloading |  |
| Converter | UR2.0 UR4.0 UR1.0 | USB to RS232 USB to RS422 / RS485 USB to TTL |  |
| U Storage Disk | | Offline USB Batch Downloading Function |  |

| Accessory Name | Model | Note | Picture |
|--|--|---|---|
| <p>IP65 Plastic Box (optional)</p> | <p>IP65-043 IP65-050 IP65-056 IP65-070 IP65-080 IP65-101</p> | <p>For: 4.3", 5", 5.6", 7", 8",10.1"</p> |  <p>The image shows a black plastic bezel with a blue inner frame. Below it is a black PCB with gold-plated connectors and the word 'STONE' printed on it.</p> |
| <p>Metal Bezel (optional)</p> | <p>MB-035 MB-043 MB-050 MB-056 MB-070 MB-080 MB-101 MB-104</p> | <p>For: 3.5", 4.3", 5", 5.6", 7", 8",10.1",10.4" Colour: Silver & Black</p> |  <p>The image shows two metal bezels, one silver and one black, with a white inner frame. To the right of the bezels are several screws.</p> |

6 Physical Dimensions

This chapter contains the information of Physical Dimensions.

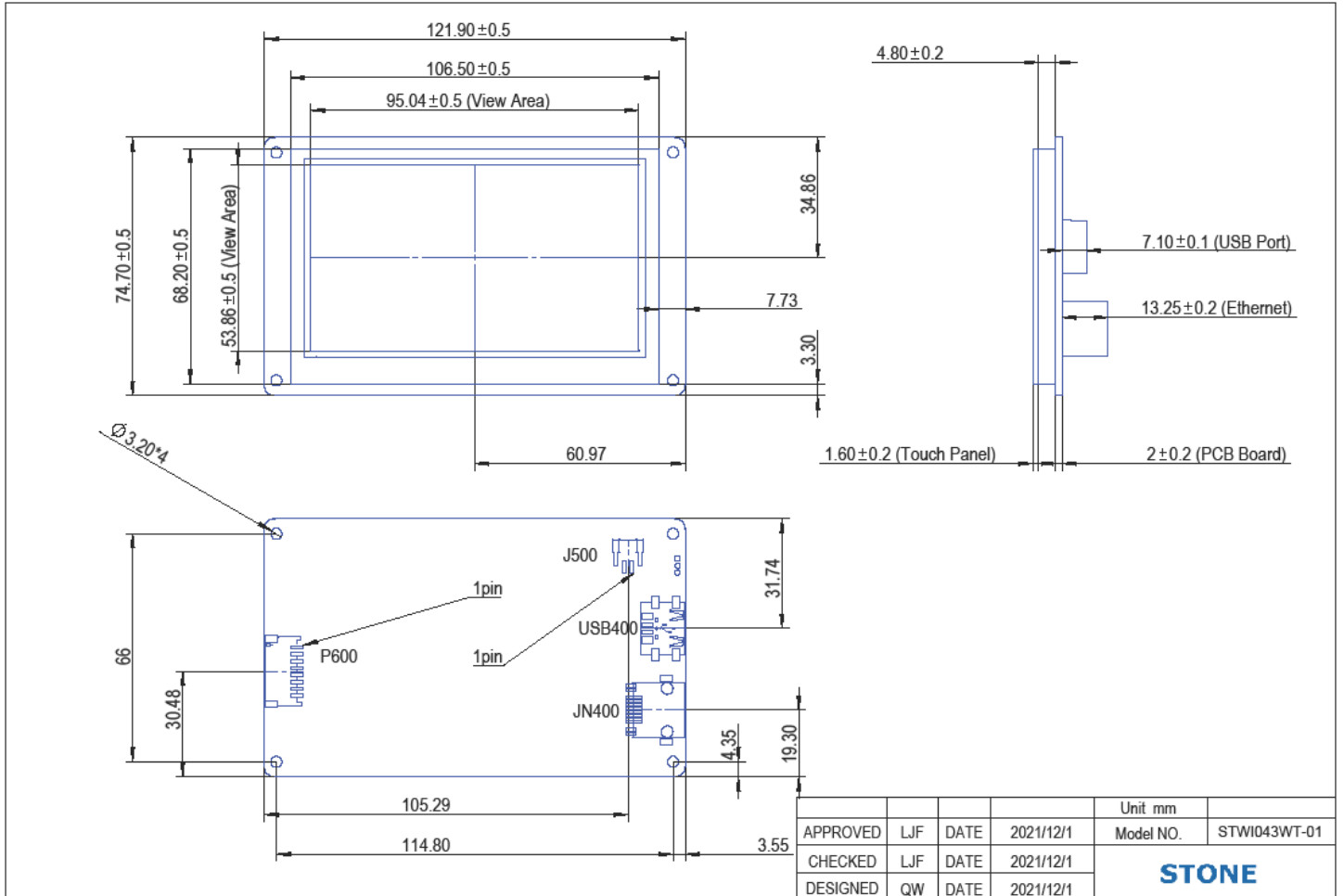

























Figure 6-1 STWI043WT-01 dimension

7 Electrical Components

This chapter contains the brands of the components:

- TFT Panel
- Touch Screen
- CPU
- LCD Controller
- Flash memory
- Connector
- Capacitance
- IC

| Components | Supplier | | | |
|----------------|---|---|--|---|
| TFT Panel |  |  |  |  |
| CPU |  |  |  | |
| LCD Controller |  | | | |
| Touch Screen |  |  | | |
| Flash Memory |  |  | | |
| Connector |  |  |  | |
| Capacitance |  |  |  |  |
| IC |  |  |  |  |

8 Naming Rule

This chapter contains the naming rule:

As sample STWI070WT-01E

| Code | Explain |
|------|---|
| ST | Company Code |
| W | The third version product |
| I | I=Industrial Type ; A=Advanced Type; C=Civil Type |
| 070 | TFT Panel Dimension: 7 inch |
| W | W=Wide Voltage (+7V to +28V) L=Low Voltage (+5V) |
| T | T=With Resistive Touch Screen C=With Capacitive Touch Screen N=Without Touch Screen |
| 0 | 0=RS232 4=RS422 / RS485 1=TTL Level |
| 1 | Hardware Code |
| E | E=Ethernet W=WIFI |

9 International Certification

This chapter contains the certification we passed:

- CE Certificate
- ROHS Certificate
- FCC Certificate
- ISO9001:2008 Quality System

CE Certificate



FCC Certificate



RoHS Certificate



ISO9001:2008



APPENDIX

ESD Guidelines

What does ESD mean?

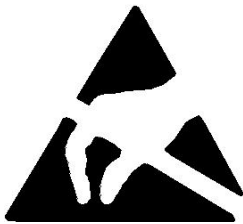
Virtually all present-day modules incorporate highly integrated MOS devices or components. For technological reasons, these electronic components are very sensitive to overvoltages and consequently therefore to electrostatic discharge:

These devices are referred to in German as Elektrostatisch Gefährdeten Baulemente/ Baugruppen: °EGB°

The more frequent international name is:

°ESD° (E lectrostatic Sensitive Device)

The following symbol on plates on cabinets, mounting racks or packages draws attention to the use of electrostatic sensitive devices and thus to the contact sensitivity of the assemblies concerned:



ESDs may be destroyed by voltages and energies well below the perception threshold of persons. Voltages of this kind occur as soon as a device or an assembly is touched by a person who is not electrostatically discharged . Devices exposed to such overvoltages cannot immediately be detected as defective in the majority of cases since faulty behavior may occur only after a long period of operation.

Precautions against electrostatic discharge

Most plastics are capable of carrying high charges and it is therefore imperative that they be kept away from sensitive components.

When handling electrostatic sensitive devices, make sure that persons, workplaces and packages are properly grounded

Handling ESD assemblies

A general rule is that assemblies should be touched only when this cannot be avoided owing to the work that has to be performed on them. Under no circumstances should you handle printed-circuit boards by touching device pins or circuitry.

You should touch devices only if

- you are grounded by permanently wearing an ESD wrist strap or
- you are wearing ESD shoes or ESD shoe-grounding protection straps in conjunction with an ESD floor.

Before you touch an electronic assembly, your body must be discharged. The simplest way of doing this is to touch a conductive, grounded object immediately beforehand ± for example, bare metal parts of a cabinet, water pipe etc.

Assemblies should not be brought into contact with charge-susceptible and highly insulating materials such as plastic films, insulating table tops and items of clothing etc. containing synthetic fibers.

Assemblies should be deposited only on conductive surfaces (tables with an ESD coating, conductive ESD cellular material, ESD bags, ESD shipping containers).

Do not place assemblies near visual display units, monitors or television sets (minimum distance to screen > 10 cm).

Measuring and modifying ESD assemblies

Perform measurements on ESD assemblies only when

- the measuring instrument is grounded ± for example, by means of a protective conductor ± or
- the measuring head has been briefly discharged before measurements are made with a potential-free measuring instrument ± for example, by touching a bare metal control cabinet.

When soldering, use only grounded soldering irons.

Shipping ESD assemblies

Always store and ship assemblies and devices in conductive packing ± for example, metallized plastic boxes and tin cans.

If packing is not conductive, assemblies must be conductively wrapped before they are packed. You can use, for example, conductive foam rubber, ESD bags, domestic aluminum foil or paper (never use plastic bags or foils).

With assemblies containing fitted batteries, make sure that the conductive packing does not come into contact with or short-circuit battery connectors. If necessary, cover the connectors beforehand with insulating tape or insulating material

Glossary



Baud rate

Rate of speed at which data is downloaded. Baud rate is specified in Bit/s.

Boot

A loading process which downloads the operating system in the working memory of the operating unit.



Command Set

Hex Code, the MCU can control the TFT Module via the command set.

Configuration file

It can be created by the softwares.



Download

Download the image, configuration files and data through mini USB port or USB port.

Download mode

Through mini USB port or USB port.



Flash memory

Programmable memory which can be electrically deleted and written to again segment-by-segment.



Half Brightness Life

The period of time after which the brightness tube only achieves 50% of the original value.



Input field

Enables the user to enter values which are subsequently sent to the **MCU**.



MCU

Micro Control Unit, it is widely used in the industrial control.



Normal operation

Operating unit operating mode in which messages are displayed and screens can be operated.



Output field

Displays current values from the **MCU** on the operating unit.



Process screen

The display of process values and process progress on the operating unit in the form of screens, which may contain graphics, texts and values.



RS485

Standard interface for serial data transfer at a very high transmission rate.



Screen

A screen displays all the logically related process data on the operating unit, whereby the individual values can be modified.



Touch panel

This is an operating unit without a keyboard. The touch panel (abbreviated to TP) is operated via the contact-sensitive screen elements.