STONE

Intelligent TFT-LCD Module

Model
STWI056WT/N-01

Equipment Manual

Contents

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 STWI056WT/N-01 equipment manual is organized into the following chapters:

Chapter	Contents
1	Overview of features and functional scope of the STWI056WT/N-01
2-3	Technical Parameters, Interface Description
4-5	Accessories, Physical Dimensions
6-8	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: http://www.stoneitech.com/
  http://www.stone-hmi.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

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
DIN	Data Input
DOUT	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 STWI056WT/N-01 has been conceived as **TFT monitor** & **Touch controller.** It includes processor, control program, driver, flash memory, RS232 / RS422 / RS485 / TTL / LAN port, Wi-Fi / Bluetooth, touch screen, power supply etc., so it is a whole display system based on the powerful & easy operating system, **which can be controlled by Any MCU.**

The STWI056WT/N-01 can be used to perform all basic functions, such as text 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

All products purchased from our company are guaranteed to keep in good repair for **3 years**. If quality problems (except human error) happen in guarantee period, our compa ny will maintain for free to replace the broken one unconditionally.

1.3 Product Characteristics

- With Cortex A8 CPU & Driving device
- Controlled by any MCU
- Display Picture / Text / Curve / Video
- 262K (18bit) colour TFT display
- With / without Touch Screen
- RS232 / RS422 / RS485 / TTL UART Interface & USB port
- Ethernet port / WI-FI / Bluetooth optional
- Wide voltage range
- 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
- 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 Commands (JSON command and HEX Code), and then the MCU would control its connected equipment to work according to the received commands.

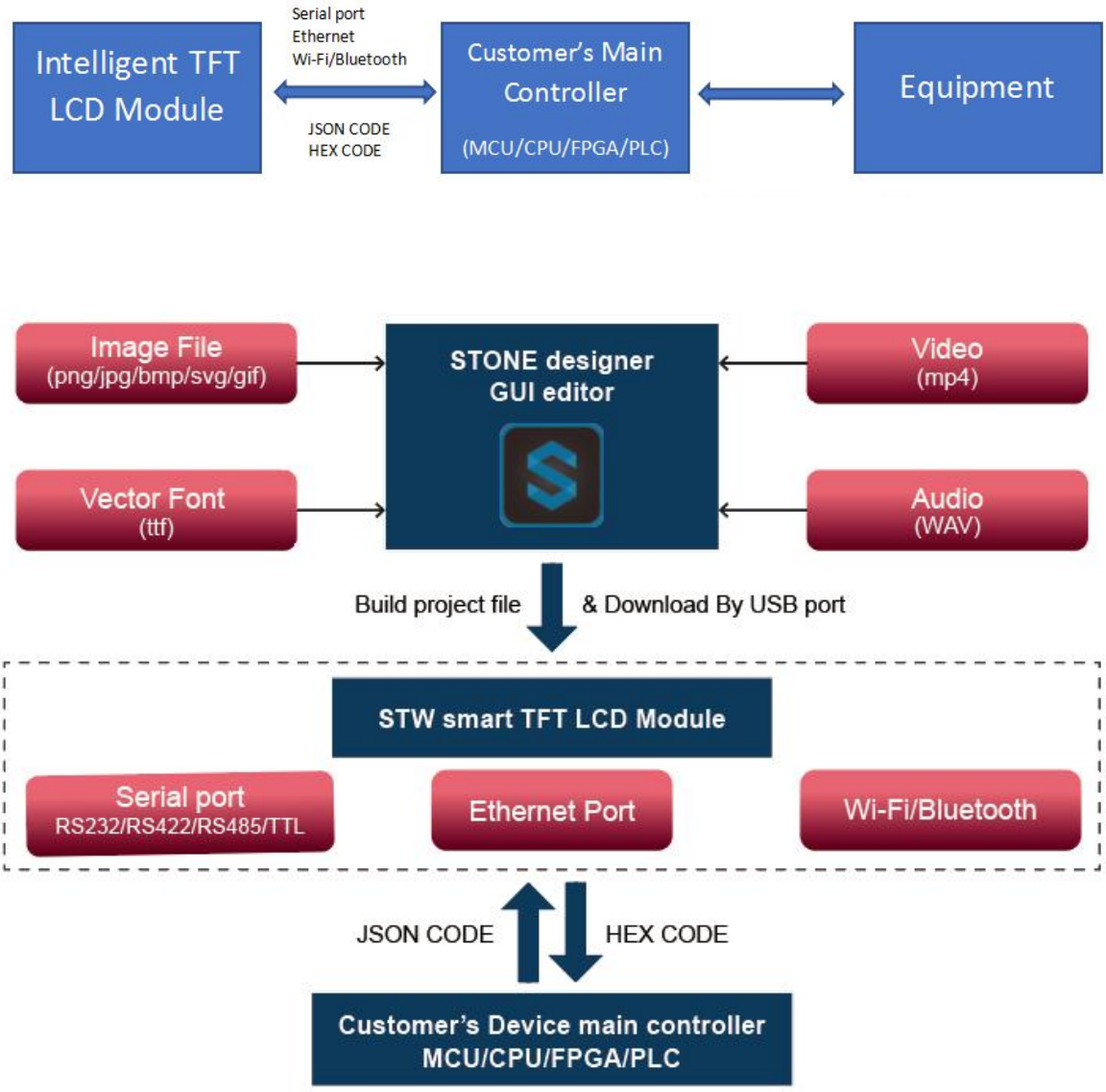


Figure 1.3-1 Configuration and process control phase

1.6 Operation Processing

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

1. Build a GUI project by STONE designer GUI editor with png/jpg/bmp/svg/gif image files.
2. Connect with customer's MCU through RS232,RS422,RS485,TTL directly. Plug and play.
3. Write a simple program for MCU to control the TFT-LCD Module via Command Set.
   (JSON code to TFT-LCD Module and HEX Code to Customer's MCU).

That's all.

The communication protocol (customized command set) is built with 2 parts:

1. Initiative command (MCU→TFT-LCD Module)

   Frame head: ST<
   Command content: { json }
   Frame end: >ET

   For example:
   ST<{"cmd_code":"open_win","widget":"label_value"}>ET
   ST<{"cmd_code":"set_value","widget":"label_value",”value”:100}>ET

Important: The text content should be with the quotes(“”), including widgets' name but the value content shouldn't be with the quotes, such as value or true/false states.

2. Passive command (TFT-LCD Module→MCU)

   Basic command format:
   Frame head + CMD + LEN + DATA + Frame tail + CRC16
   Example: ST< 0x1068 0x0004 0x01 0x02 0x03 0x04 >ET CRC16

The TFT LCD module serial port command frame is composed of 5 data blocks, shown as the table 1-1.6. All serial port commands or data are represented with hex format. The data transfer in MSB manner. E.g. for 0x1234, first send 0x12 and then send 0x34.

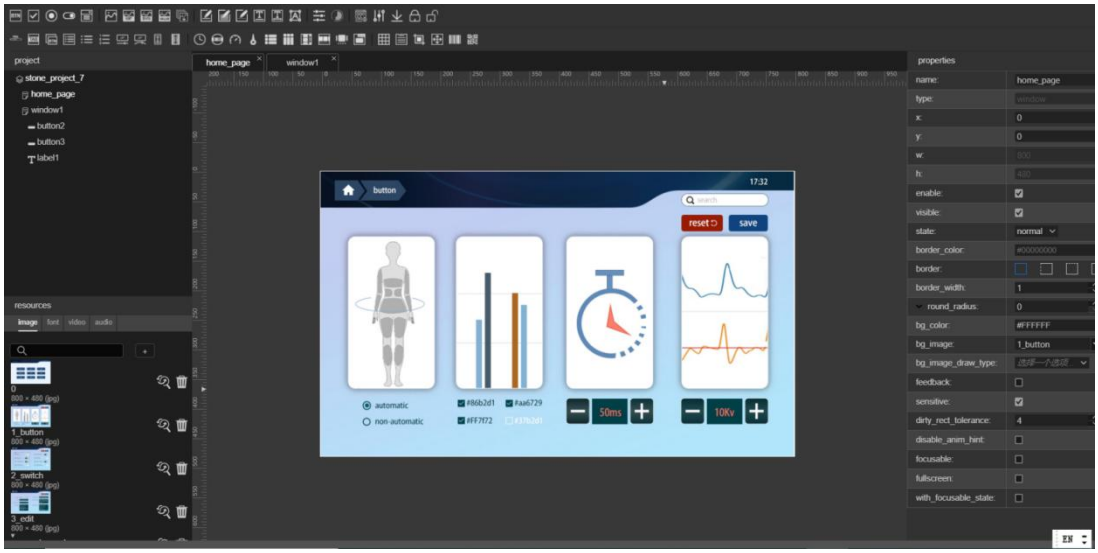
Table 1-1.6 Command Frame

Definition	Frame header	Command	length	Data	Frame tail	CRC check code
Length (byte)	3	2	2	N	3	2
Description	Could be customized	Specific command function, default setting	The bytes number of Data	-	Could be customized	Default setting
Example	ST<	0x1068	0x0004	0x01, 0x02, 0x03, 0x04	>ET	CRC16

More information, please refer to the document of Development Guide.

1.7 Software Operation

We will offer simple "Stone Desinger GUI editor" to help you to design the new project file for Intelligent TFT-LCD Module on Windows system PC or MacOS PC, or it also can Design on website version directly.



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

Physical Parameter	
Size	5.6 inch
Resolution	640×RGB×480
Pixel Spacing	0.0588(W) × 0.1764(H) mm
Color	262,144 colors (18 bit)
Viewing Area	112.896 (W) × 84.672(H) mm
Display Dimension	115.1mm× 86.9mm
Overall Dimension	143.5mm×107.4mm×17.4mm (T) (Standard type) 143.5mm×107.4mm×23.8mm (T) (with Ethernet port)
Net Weight	275g (T)

Display	
Backlight Type	LED
Brightness	300cd/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	A Class Industry Panel
Touch Screen	4 Wire Resistance Touch /Capacitive Touch / Without Touch Screen
Screen Mode：	Digital

Processor	
CPU	Cortex A8
Refresh Rate	1G Hz
Max Frame rate	60 FPS

Memory	
Flash Memory	Standard 256MB, Extension 1GB or 2GB
Memory Amount for Image	According to the capability of the image, Suggest "PNG, BMP, JPG, SVG, GIF" format.

Interface	
Serial Interface	RS232 / RS422 / RS485 / TTL level
Ethernet interface	10M/100M (Optional)
Wireless interface	Wi-Fi / Bluetooth (Optional)
Project file downloading	USB2.0 port or U storage Disk

Power Supply	
Rated voltage	+12V DC or +5V DC
Permissible voltage range	+7V DC...+28V DC or +5V DC
Max. permissible transients	+28V
Time between two transients	50 sec minimum
Internal Fuse	2A self-recovery fuse
Power consumption	2.2 W

Electrical Characteristics

Parameter	**Condition**	**Min**	**Type**	**Max**
Supply Current	VIN=12V (Max brightness)		240mA	
	VIN=12V (close brightness)		130mA	
Baud Rate			115200 bps	
Signal				

Ambient Conditions	
Max. permissible ambient temperature	
Operation	-30℃～ +80℃
Storage	-30℃～ +80℃
Relative humidity	
Operation	55℃,85%
Storage	60℃,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	
Static discharge (contact discharge/air discharge)	EN 61000-4-2 6 kV/8 kV
RF irradiation	EN 61000-4-3 10 V/m, 80% AM 1 kHz
Pulse modulation	ENV 50204 900 MHz ±5 MHz 10 V/meff., 50% ED, 200 Hz
RF conduction	EN 61000-4-6 150 kHz - 80 MHz 10 V, 80% AM, 1 kHz
Burst interference Supply lines Process data lines Signal lines	EN 61000-4-4 2kV 2kV 1kV

Radio Interference	
Radio interference level complying to EN 55011	Class A

Support Device	
UART Port	Support RS232 / RS422 / RS485 / TTL
Network Port	Support Ethernet Port / Wi-Fi / Bluetooth
Flash Memory	Support Standard 256MB, Extend 1GB or 2GB
Buzzer	Support
RTC	Support
USB port	Support Online Download By USB Cable
U Storage Disk Interface	Support. Offline Download or Copy User Data
Touch Screen	4 Wire Resistance / Capacitive
Vector Font	Standard TTF Format
Image	Support PNG/JPG/BMP/SVG/GIF Format
Audio Interface	Support WAV format The length of single audio file is not limited, theoretically up to 4096 audio files, speaker power is 8 ohms 2 watts or 4 ohms 3 watts
Command Set	Unified Simplified Command Sets

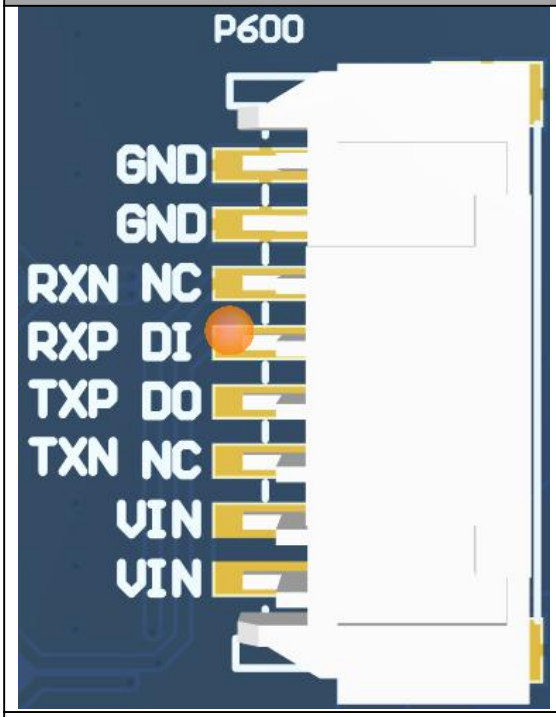
3 Interface Description

This chapter contains the description of the interfaces:

- VVC
- NC
- DOUT
- DIN
- GND

Please notify the interface type before ordering. RS232/ RS422/ RS485/ TTL Interface.

Communication Interface Definition：



Pin Name	Pin NO.	Pin Type	Interpret
GND	1,2	P	Power Ground
DIN	4	I	Data Input
DOUT	5,	O	Data Output
NC	3,6		None
VCC	7,8	P	Power Supply Input

I: Input O: Output P: Power

Note A: 1. Adopting the 8 Pin 2mm spacing socket. Model Code: A2006WF-08A.
2. 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.
3. Pins with the same definition are connected together in the module inside.
4. RS232, RS422, RS485, TTL 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

4 Accessories

This chapter contains the accessories:

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

Accessory Name	Model	Note	Picture
Double 8-pinCable	L8	Optional： 10cm/20cm/35cm/65cm	
8-pin Socket	S8	SMD-8 2.0mm with Lock	
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
IP65 Plastic Box (optional)	PB-043 PB-050 PB-056 PB-070 PB-080 PB-104	For: 4.3”, 5”, 5.6”, 7”, 8”,10.4”	
Metal Bezel (optional)	MB-035 MB-043 MB-050 MB-056 MB-070 MB-080 MB-101 MB-104	For: 3.5”, 4.3”, 5”, 5.6”, 7”, 8”,10.1”,10.4”	

5 Physical Dimensions

This chapter contains the information of Physical Dimensions.

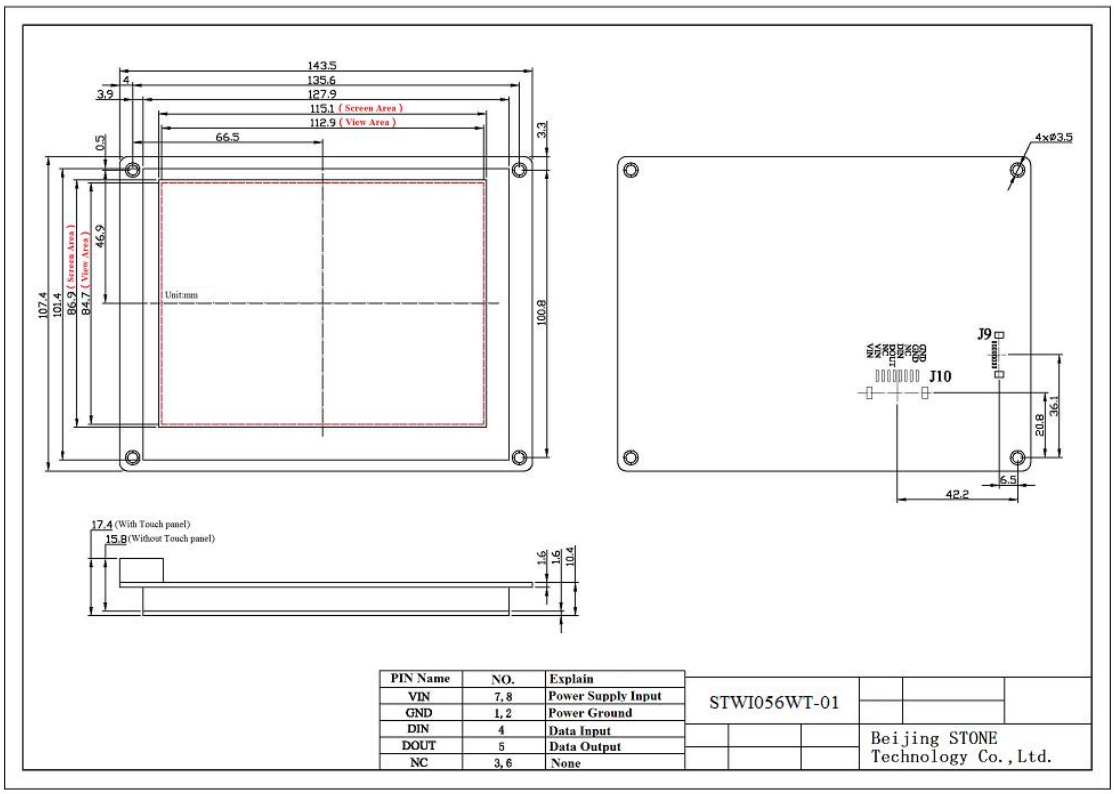


Figure 5-1 STWI056WT/N-01 dimension

6 Electrical Components

This chapter contains the brands of the components:

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

Electrical Components

Components	Supplier
TFT Panel	INNOLUX, AUO, CHIMEI 奇美實業, SHARP 夏普
CPU	Texas Instruments, ST, nuvoTon
LCD Controller	ALTERA
Touch Screen	FUJITSU, AMT
Flash Memory	TOSHIBA, winbond
Connector	molex, Tyco Electronics, OMRON
Capacitance	SAMSUNG, TDK, muRata, UniOhm
IC	SAMSUNG, ISSI, LINEAR TECHNOLOGY, Texas Instruments, nuvoTon

7 Naming Rule

This chapter contains the naming rule:

As sample STWI070WT-01N

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 N=Without Touch Screen C=With Capacitive Touch Screen
0	0=RS232　　4=RS422 / RS485　　1=TTL Level
1	Hardware Code
N	N=Ethernet　　W=Wi-Fi/Bluetooth

8 International Certification

This chapter contains the certification we passed:

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

CE Certificate

Shenzhen Toby Technology CO.,Ltd.

CERTIFICATE OF CONFORMITY

Certificate No.: TB190421578

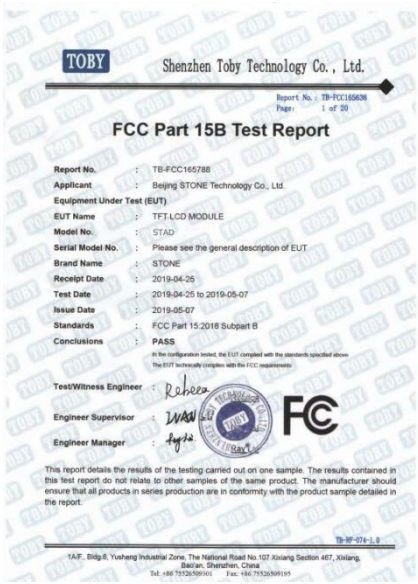
Applicant	:	Beijing STONE Technology Co., Ltd.
Address	:	Room 1407, Building C, Yuanyang International Center, Chaoyang District, Beijing, China
Manufacturer	:	Beijing STONE Technology Co., Ltd.
Address	:	Room 1407, Building C, Yuanyang International Center, Chaoyang District, Beijing, China
Product	:	TFT LCD MODULE
Brand Name	:	STONE
Model(s)	:	STVI070WT-01, STVI043WT-01, STVI080WT-01, STVI101WT-01, STVI104WT-01, STVA101WT-01, STVC035WT-01, STVC050WT-01, STVC070WT-01, STAD045WT-01,STAD070WT-05,STAD080WC-01, STAD101WC-01, STAD150WT-15,STAD185WT-05,STAD315WT-15
Test Standard(s):		EN 55032: 2015; EN 55024: 2010+A1: 2015.

The EUT described above has been tested by us with the listed standards according to the Council Directive 2014/30/EU relating to electromagnetic compatibility, and found in compliance with all essential requirements of the Directive. It is possible to use CE marking to demonstrate the compliance with the EMC Directive.
The certificate applies to the tested sample above mentioned only and shall not imply an assessment of the whole production. It is only valid in connection with the test report number: TB-EMC165635.

CE

Justin Zhang
(Manager)
May 08, 2019

FCC Certificate



TOBY Shenzhen Toby Technology Co., Ltd.

Report No.: TB-FCC165636
Page: 1 of 20

FCC Part 15B Test Report

Report No.	:	TB-FCC165788
Applicant	:	Beijing STONE Technology Co., Ltd.
Equipment Under Test (EUT)		
EUT Name	:	TFT LCD MODULE
Model No.	:	STAD
Serial Model No.	:	Please see the general description of EUT
Brand Name	:	STONE
Receipt Date	:	2019-04-25
Test Date	:	2019-04-25 to 2019-05-07
Issue Date	:	2019-05-07
Standards	:	FCC Part 15.2018 Subpart B
Conclusions	:	PASS

In the configuration tested, the EUT complied with the standards specified above
The EUT technically complies with the FCC requirements

Test/Witness Engineer : Rebeca
Engineer Supervisor : Wan
Engineer Manager : Ryan

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in the report.

TB-RF-074-1.0

1AF., Bldg.6, Yusheng Industrial Zone, The National Road No.107 Xixiang Section 467, Xixiang, Bao'an, Shenzhen, China
Tel: +86 75526588301 Fax: +86 75526589195

RoHS Certificate

Shenzhen Toby Technology CO.,Ltd.

CERTIFICATE OF CONFORMITY

Certificate No.: TB190421567

Applicant	:	Beijing STONE Technology Co.,Ltd.
Address	:	Room 1407, Building C, Yuanyang International Center, Chaoyang District, Beijing, China
Manufacturer	:	Beijing STONE Technology Co.,Ltd.
Address	:	Room 1407, Building C, Yuanyang International Center, Chaoyang District, Beijing, China
Product	:	TFT LCD MODULE
Brand Name	:	STONE/斯通恩
Model(s)	:	STVI070WT-01, STVI043WT-01, STVI080WT-01, STVI101WT-01, STVI104WT-01, STAD045WT-01,STAD070WT-05, STAD080WC-01, STAD101WC-01, STAD150WT-15,STAD185WT-05,STAD315WT-15
Test Standard(s):		2011/65/EU&2015/863/EU; 2013/56/EU; IEC 62321: 2013/2015/2017.

The EUT described above has been examined by us with the listed standards and found in compliance with the Council RoHS Directive 2015/863/EU amending Annex II Directive 2011/65/EU and Directive 2013/56/EU. It is possible to use CE marking to demonstrate the compliance with the CE requirement.
The preparation of necessary technical documents according to the requirement of EN50581. The report shall not be reproduced in part without written approval of us. It is only valid in connection with the test report number: TB-RoHS165620.

RoHS

Justin Zhang
(Manager)
Apr. 24, 2019

ISO9001:2008

EACC

Certificate

This is to certify that the Quality Management System of

Beijing STONE Technology Co.,Ltd.

Unified Social Credit Code: 91110105565758870

Room 1905, Building D, Yuanyang International Center, Chaoyang District, Beijing, China

Has been audited to conform to the following Quality Management System standard

GB/T 19001-2016/ISO 9001:2015

This Quality Management System is valid for the

Design, development and production of industrial color LCD module

Date of initial issuance: Feb. 20, 2019
Date of issuance: Feb. 20, 2019
Date of expiry: Feb. 19, 2022

Issued by: Wu Fangyu

Beijing East Allreach Certification Center Co., Ltd.

EACC IAF CNAS

MANAGEMENT SYSTEM CNAS C114-M

ISO 9001 ISO 9001

APPENDIX

ESD Guidelines

What does ESD mean?

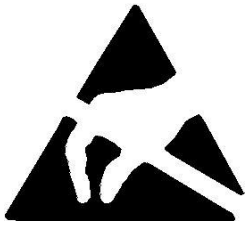
Virtually all present-day modules incorporate highly integrated MOS devices or components. For technological reasons, these electronic components are very sensitive to overvoltages and consequently therefore to electrostatic discharge:

These devices are referred to in German as Elektrostatisch Gefährdeten Bauelemente/ Baugruppen: ºEGBº

The more frequent international name is:

ºESDº (Electrostatic 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 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.