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Custom Display

PCAP

Mechanical design

Production Custom designs Installation



Product
Datasheet

ET016DB4040-DC Datasheet V1.0

ISO9001:2015 Quality System Certification

Customer			
Keywords	DB series, 1.6 inch, 400*400, with configuration, LUA script, circular UI		
Model	ET016DB4040-DC		
Signature of Customer		Signature of Engineer	
Date		Date	2024.09.12



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1. Introduction of Hardware

This section describes some of the product's appearance reference diagrams, hardware configuration diagrams, pin definitions, and tools required for debugging.

1.1 Product Appearance

The following is a reference drawing of the appearance of the product of this size, as shown in Figure 1-1.

Note: The company does not initiate changes to the outside world without involving key structural process modifications or layout adjustments, only changes and iterations in product process or reliability, and the specific physical objects received shall prevail.

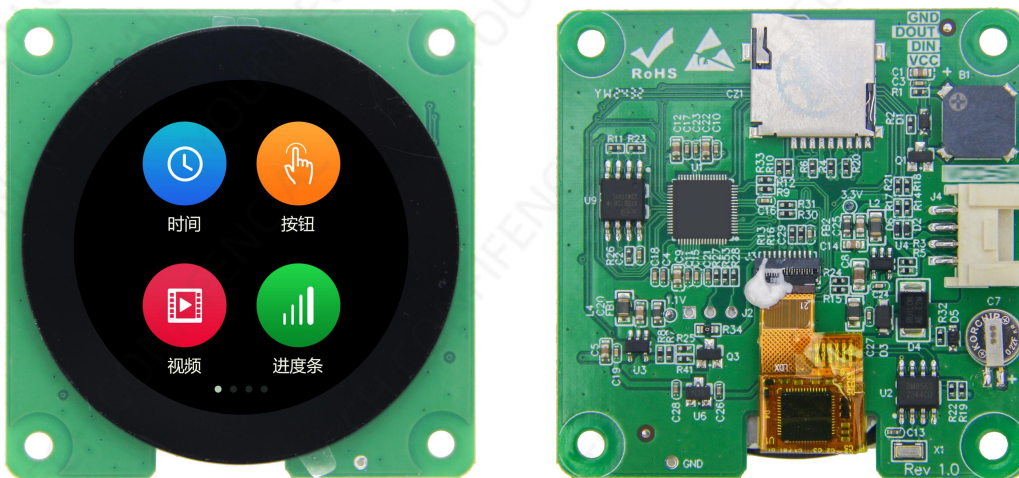


Figure 1-1 1.6 inch capacitive touch reference diagram

1.2 Hardware configuration

The following is a reference diagram of the hardware configuration of a product of this size, with a capacitive screen as an example, as shown in Figure 1-2.

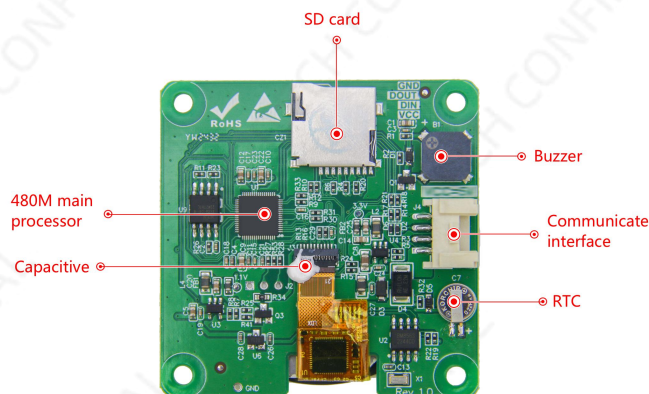


Figure 1-2 Hardware configuration



1.3 Pin Definition

Number	Definition	Description	Reference Diagram
1	VCC	Power input 5V	
2	DIN	Serial port screen input, connected to the user's TXD terminal	
3	DOUT	Serial port screen output, connected to the user's RXD terminal	
4	GND	Power Ground	

1.4 Debugging tool

The following is a reference diagram of the debugging tool of this product, with a capacitive screen as an example, as shown in Figure 1-3.

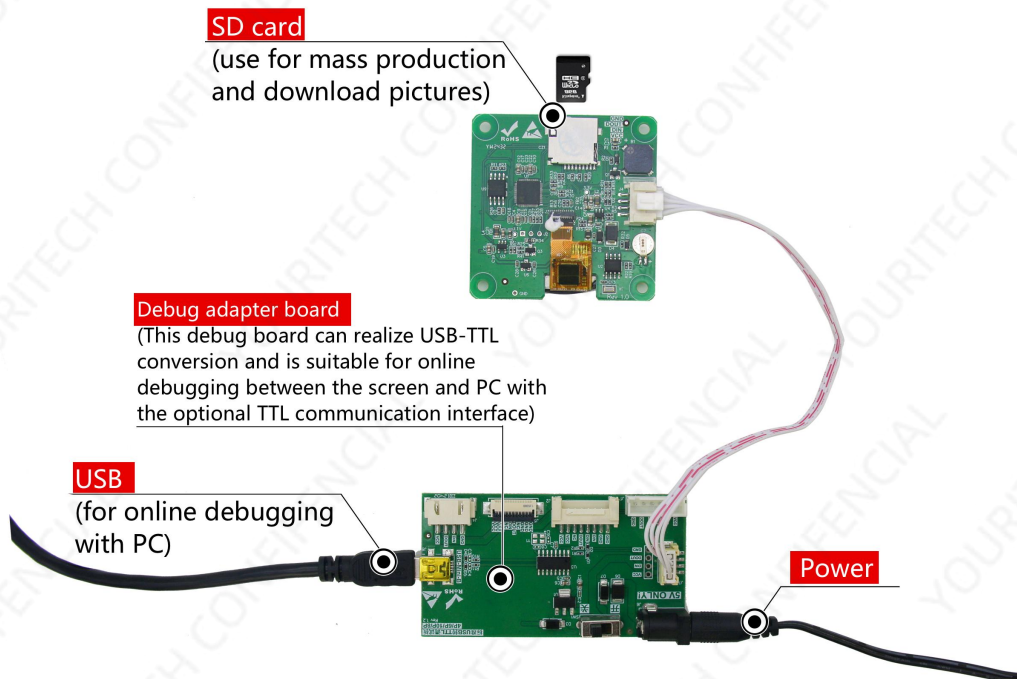


Figure 1-3 Diagram of the TTL debugging tool

◆ Development and debugging accessories (optional)	
Name	Accessory Model
Power supply	Power adapter 5V
Debugging the interposer	USB to TTL multi-interface debug board
Serial cable	mini USB cable
SD card	Capacity up to 32G, format: FAT32 (Kingston, SanDisk)



2. Product Structure

The HMI human-machine interface launched by YOURITECH Technology is a serial port display terminal integrating LCD display driver, picture font storage, GUI operation, audio playback and various configuration controls. The user microcontroller only needs to send and receive the corresponding serial port instructions to easily realize text, picture and curve display.

The DB series serial screen processor adopts a 32-bit 480M SOC processor, which integrates PSRAM memory, JPEG, PNG image hardware decoding and other functions, and the system architecture is shown in Figure 2-1.

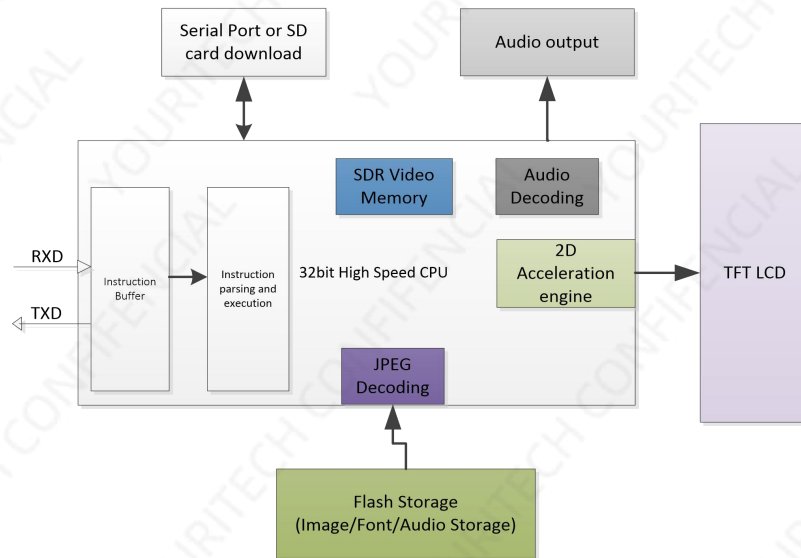


Figure 2-1 DB series serial port screen internal structure diagram

The main advantages of choosing a high-performance 32-bit dual-core processor architecture are:

1. Dedicated 32-bit 480M SOC processor optimized for image display, with 2D acceleration engine and JPEG/PNG image hardware decoding, so that the display can be matched with various special effects, and the display effect is smooth and gorgeous.
2. No operating system, continuous 24*365 hours of uninterrupted power can work reliably, no garbage redundant files.



3. Product Specification

◆ Product Specification	
Model Description	ET016DB4040-DC(TTL, Capacitive touch)
Product Series	DB series
Core Processor	480M SOC processor
Operating System	No operating system, it can run when it is powered on, and the startup time is about 1 second
Protocol Type	The default color configuration instruction set, the host computer can be configured to run MODBUS RTU, XGUS protocol
Script language	Version 5.3 LUA scripts with user-written logic, protocols and algorithm functions running inside the screen
Size	1.6 inch
Resolution	400*400
Installation Orientation	It supports 0°, 90°, 180°and 270°rotation mounted displays
Storage Space	128Mbit
Font	Built-in vector font, edge anti-aliasing, support any size ASCII, GBK, GB2312, UNICODE (global language) font library, can also customize any computer font display
Image Storage	It supports JPEG and PNG (transflective/fully transparent) compression, and supports image storage of any size. Accumulation can be stored approximately 160 full-screen images (calculated according to the size of 65KB/piece, BMP format is not recommended). The image compression ratio is different, this value fluctuates up and down
Color	65K color, 16-bit RGB
Voltage	5V
Power Consumption	Darkest backlight: 0.5W
	Brightest backlight: 1.0W
Communicate Interface	TTL
Communicate Baud-rate	1200~921600bps, typical baud rate: 115200bps
Communication Connector Specifications	HY2.0-4P
Image Download	SD card, serial port
Firmware local/remote upgrade	Insert SD card/U disk local upgrade/support remote serial port of user motherboard to upgrade screen firmware
Picture remote upgrade	Support users to remotely use their motherboard serial port to upgrade screen-related picture projects, font libraries, configuration files, etc
Real-time clock (RTC)	Support clock, timer, countdown and other functions
Screen Active Display Area (AA)	φ 39.8mm
Product Dimensions	56.0mm*56.0mm*9.9mm



(L*W*H)	
Equipped with host computer software	VisualTFT®

◆ Reliability Parameters

Operating temperature	-20~+70°C
Storage temperature	-30~+80°C
ESD Test	Test standard: IEC 61000-4-2 Air: ±8KV
EFT test	Test standard: IEC 61000-4-4 GB standard 3 (voltage: ±2KV; FREQUENCY: 100/5KHZ; TIME: 120S), no restart, no abnormal display, no abnormal touch, etc., the test function is normal
Radiation test	Test standard: EN55022 ClassB margin - 6dB Test environment: three-meter dark wave chamber

◆ Product Core Competitiveness

Learning Cycle	30 minutes to familiarize yourself with the development environment, 3 days to complete the HMI design
Program debugging	The host computer integrates a "virtual serial port screen", which does not need to be connected to the hardware, and Keil IDE is directly bound to it for debugging
Startup time	It can be displayed when powered on
Configure Controls	In addition to traditional buttons, text, progress bars, QR codes and other controls, a variety of new configuration controls have been added, such as: multi-status indicators, recipes, operation records, flow blocks, alarm bars and other configuration controls
System Keyboard	Built-in virtual number, character keyboard, support Chinese and English input methods, customize keyboard
Data logging	Supports exporting data logging control content to SD card
Layer technology	The system has multiple built-in display layers for faster switching
Multi-language capabilities	Factory preset up to 15 global languages of any country, one-click switch of the required language, without the need for multiple sets of UI
Logical operation processing	The LUA script parser is embedded in the host computer, and users can customize various complex logical relationships and protocols on the screen, meeting 99.9% of the product function requirements of customers
Reliability	Products are tested for high and low temperature, ESD, group pulse and radiation by industry standards

◆ LCD

Display Type	IPS LCD
Backlight Tube	LED
Brightness (cd/m²)	230
Backlight Life (h)	>20,000
Contrast Ratio	800:1
Visual Angle	80/80/80/80



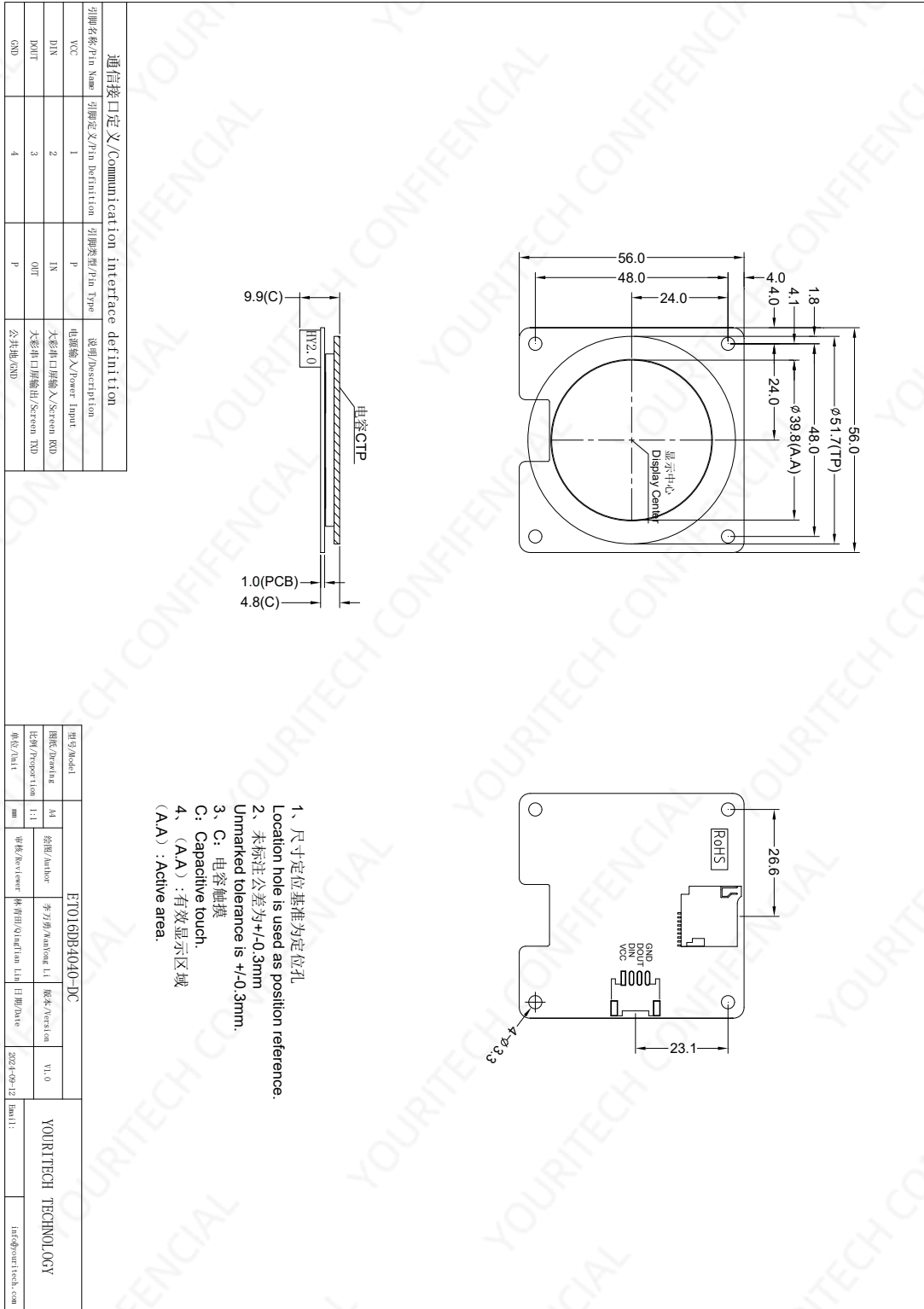
(L/R/T/B)	
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◆ Touch Panel	
Touch type	Capacitive touch screen (IC:TW3118)
Capacitive screen touch mode	Single-point, swipe touch
Capacitive screen light transmittance	More than 90%
The number of capacitive screen touches	The number of capacitive screen touches is theoretically unlimited, and the touch life is related to the working environment (dust, humidity).
Capacitor cover is customized	The "glass cover + capacitive touch" integrated lamination service can be customized according to the user's drawing size

◆ Customization Service	
Customization Fee	One-time order 1000PCS can partial exempt customized fee
Hardware Circuit	Can customize PCB size, circuit thickness, add user circuit, military-grade temperature display, etc.
Software Customization	Customize special instructions or controls according to user needs to reduce user development difficulty
UI design Service	Can provide picture art and product structure design services
Others	Customized on demand to meet all user needs



4. Product Dimensions



5. Reliability Test

All serial port screens of YOURITECH Technology have carried out a series of process reliability tests before mass production: high and low temperature, ESD, pulse burst, radiation, touch life and other tests to ensure product quality, as shown in Figure 5-1.



Figure 5-1 Reliability test equipment

5.1 ESD Test

5.1.1 Executive Standard

Executive Standard

IEC 61000-4-2

5.1.2 Test Ambient

Test ambient temperature: 25°C

Test ambient humidity: 50%

Test process: Place the product on the test stand, lay down on the serial port screen buckle and the display area in order to make contact and air discharge as shown in Figure 5-2. Observe whether if the screen have reset or restarted, or abnormal display.



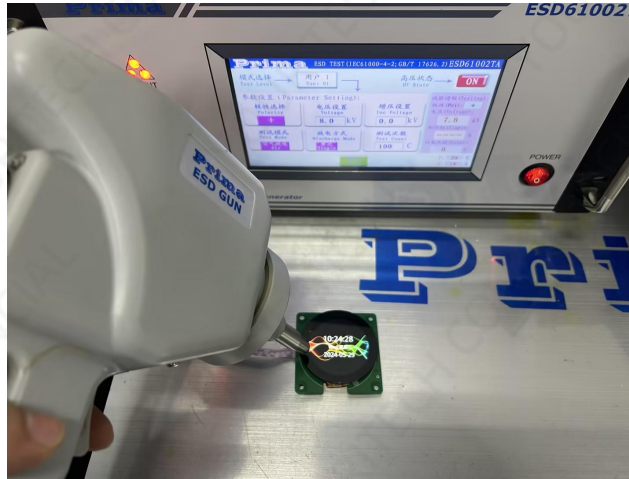


Figure 5-2 ESD Test

5.1.3 Test Data

Product Model	Discharge type	Humidity	Test result
ET016DB4040-DC	Air	±8KV	No restart, no abnormal display, normal function
	Air	±9KV	Occasional reset and restart, no abnormal display, normal function

Note: The current test tests are all product bare tests, and the ESD performance index of the whole machine will be higher if the screen and machine are well grounded on the actual product assembly machine, or the surface of the touchpad is protected by PVC or cover

5.2 High and Low Temperature Aging Test

5.2.1 Test environment

Test ambient temperature: -20~+70°C

Test ambient humidity: 60%±3%RH

Test process: the product is placed obliquely in the high and low temperature test box as shown in Figure 5-3, through the 72H high temperature, low temperature, high and low temperature alternating transformation aging test, observe whether the screen during the test and after the experimental test whether the screen has reset and restart, display abnormality, abnormal function and other phenomena.





Figure 5-3 High and low temperature aging test

5.2.2 Test data

Product Model	Temperature	Humidity	Test results
ET016DB4040-DC	High temperature (70°C)	65%	No restart, no abnormal display, normal function
	Low temperature (-20°C)	65%	No restart, no abnormal display, normal function
	Alternating high and low temperature (-20~70°C)	65%	No restart, no abnormal display, normal function

5.3 Group Pulse Test

5.3.1 Executive Standard

Executive Standard	IEC 61000-4-4
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5.3.2 Test environment

Test ambient temperature: 25°C

Test ambient humidity: 50%

Test process: the product is placed flat on the test bench, and the power supply after coupling the pulse group generator is used to power the screen, as shown in Figure 5-4, and observe whether the screen is reset and restarted, display abnormal, touch abnormality and other phenomena during the experiment.



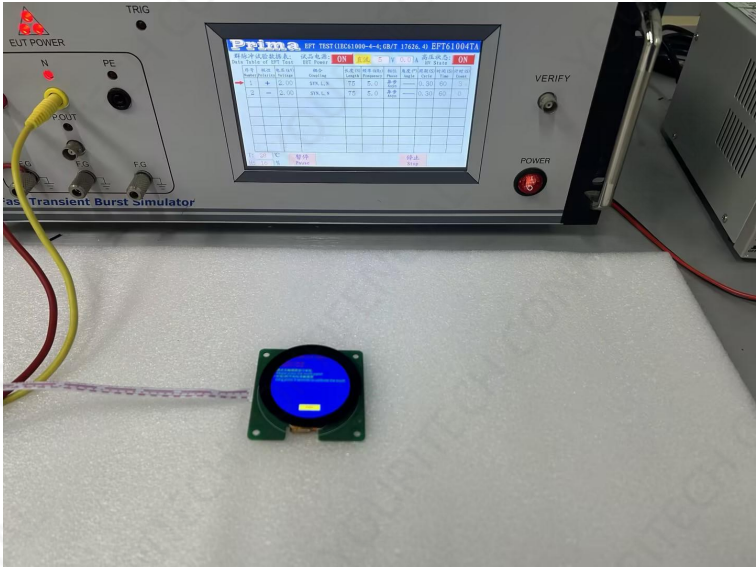


Figure 5-4 group pulse test diagram

5.3.3 Test Data

Product Model	Test Standard			Test Result
ET016DB4040-DC	International Standard 3			No restart, normal
	Voltage (KV)	Frequency (KHZ)	Time (S)	communication, normal
	±2.0	5	120	function



5.4 Radiation Test

5.4.1 Executive Standard

Executive Standard

EN55022 ClassB

5.4.2 Test environment

The radiation test laboratory environment is shown in Figure 5-5.

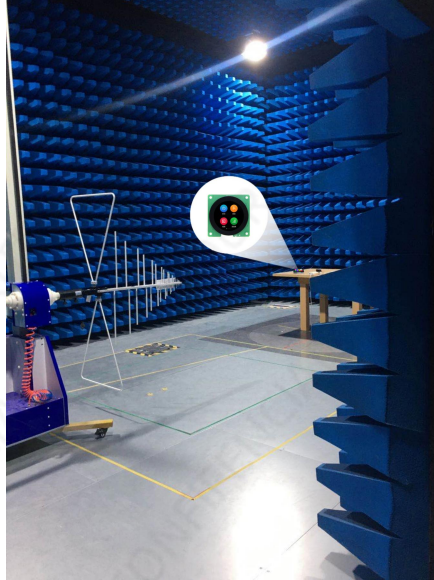


Figure 5-5 Radiation test chart

5.4.3 Test Data

1. Radiation test horizontal test data, shown in Figure 5-6.



Figure 5-6: Horizontal direction of radiation measurement



2. Radiation test data in the vertical direction, as shown in Figure 5-7.



Figure 5-7: Radiation test in the vertical direction



6. Protocol Configuration

VisualHMI is a configuration development platform independently developed by YOURITECH for human-machine interface applications, which integrates the "HMI simulator" and is free to use for life. After the user creates a new project, imports the designed art pictures, and then configures the buttons and other controls in each screen, and finally downloads the entire project to the serial port screen after the simulation is correct. The software interface is shown in Figure 6-1.

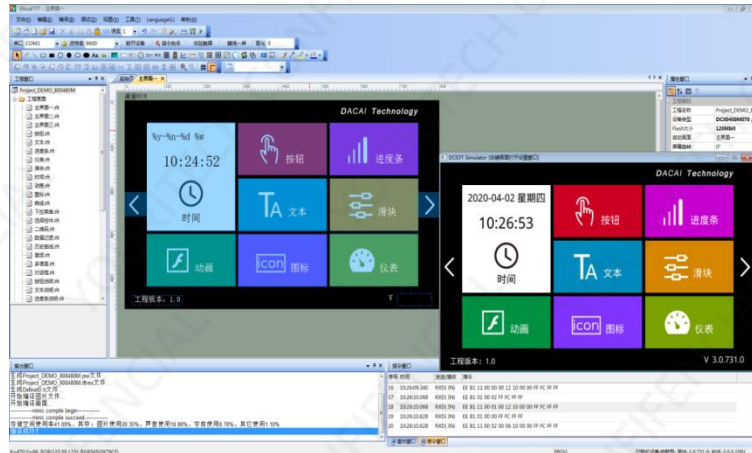


Figure 6 - 1 VisualHMI main interface

Any user only needs 3 steps to complete complex human-computer interaction design within 30 minutes.

1. Prepare art design materials

Arrange UI designers to design the images required for products such as start-up image, text background, button icon and prompt box.

2. Conduct image editing, scripting, control configuration and image downloading with VisualHM software

First of all, using the supporting host computer VisualHM software, then typeset interface and configure controls of the pre-designed artwork pictures, run the "virtual serial port screen" for simulation, and finally the entire project can be completed download through SD / UART (depending on the hardware configuration of different models) to the internal memory of the serial port screen. The PC software will assign a unique ID number to each screen, picture and control in the project. Users can also write the required logic and algorithms through the script editor embedded in the host computer to reduce the communication frequency between the screen and the motherboard.

3. User's single-chip micro computer monitors and sends the corresponding serial port instructions to control the image display

After the project is downloaded to the screen, once a button is pressed on the screen, the user MCU serial port will receive the button information uploaded on the screen. By judging the value of the variable according to the binding address, the user can obtain the current button's screen position and functional attributes, so that it can control the relevant peripheral device action or screen update display.



6.1 What is a virtual serial screen

"Virtual Serial Screen"

is the first exclusive serial screen emulator developed by YOURITECH Technology in China. After the user installs the VisualTFT software of the host computer, it can be run and used. The simulation results of the virtual serial screen are exactly the same as those of the real serial screen. Therefore, there is no need to purchase hardware during the early evaluation of R&D, and it can communicate with each other through its own single-chip microcomputer serial port, and the button control information will be uploaded immediately when the mouse clicks the button, as shown in Figure 6-2. Once the developer has debugged, the real hardware



Figure 6-2 The serial port of the user's single-chip microcomputer is debugged online with the "virtual serial port screen".

6.2 Keil is bound and debugged with the virtual serial port screen

In order to further improve the development efficiency, users can also bind Debug and debug the "virtual serial port screen" through the Keil development environment. When the program is single-step debugged, all the running results can be displayed on the "virtual serial port screen", which greatly saves the development time of engineers, as shown in Figure 6-3. Once the project interface is changed, users no longer need to re-download the images to the serial screen, and all pre-project evaluations can be completed based on the PC side.

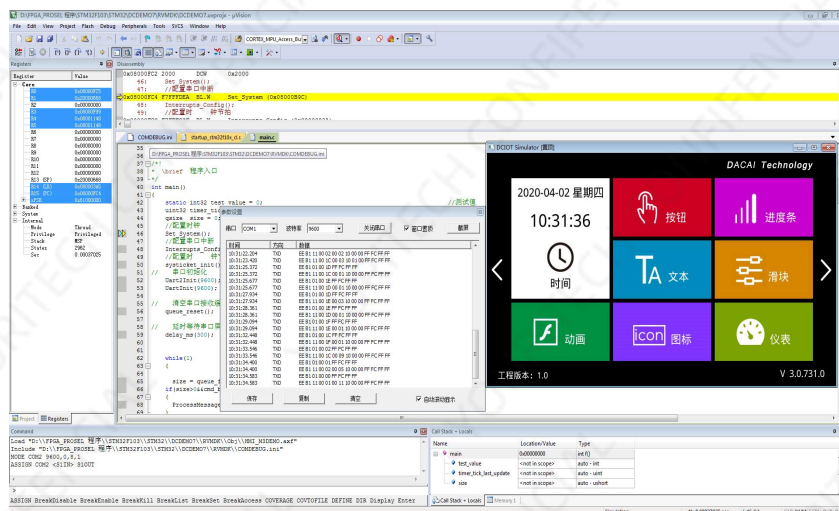


Figure 6-3 Debugging the Keil development environment and the virtual serial port screen



Note: The debugging of "virtual serial port screen" needs keil software support, in the debug process, enter dirvtreg in the command serial port, you need to list SxIN (according to the different microcontrollers, x may represent 0,1,2), if there is a list, it means that keil has virtualized the serial port of the single-chip microcomputer to the register, so that it can be used.



7. Protocol Configuration

Most of the serial port screens launched by YOURITECH Technology are default to YOURITECH configuration instruction set, and users can run MODBUS RTU, XGUS and other protocols through the host computer configuration.

Open the VisualTFT host computer software, click [Tools] → [Protocol and Variable Settings] in the menu bar, as shown in Figure 7-1, to enter the protocol configuration interface, and users can choose to enable the corresponding protocol according to their own needs, as shown in Figure 7-2.

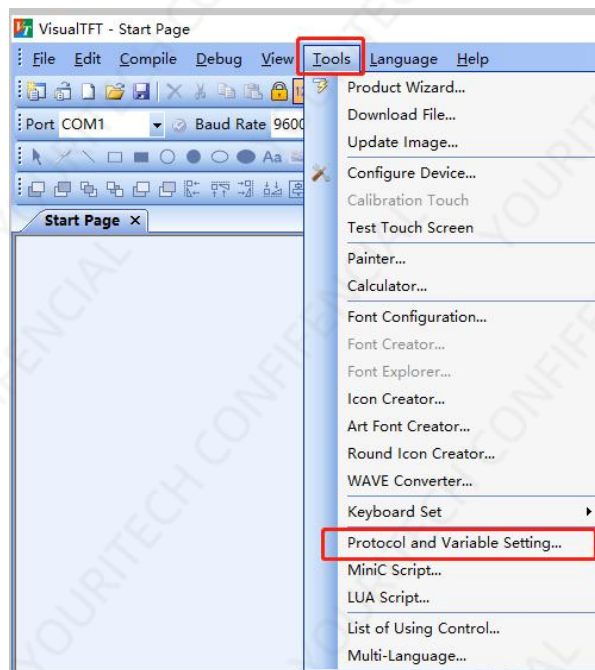


Figure 7-1 LUA script programming

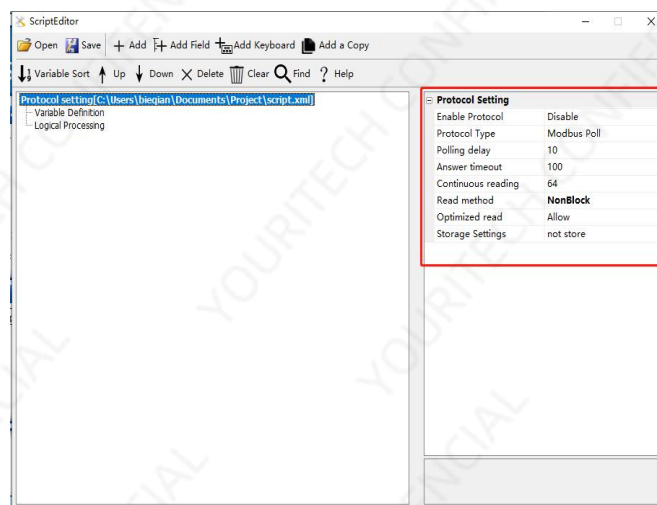


Figure 7-2 Protocol configuration interface



8. LUA Script Configuration

The serial port screens of M-type, S-type and IoT series launched by YOURITECH Technology all support LUA language scripts. The serial port screen provides a wealth of LUA script API and callback interface, users can directly set and obtain the running status of all configuration controls by calling the API interface, combined with the written logic processing, the screen can complete the predetermined action without the participation of the external MCU, reducing the data communication between the MCU and the screen.

LUA is a lightweight scripting language with simpler syntax logic than C, and developers can get started directly. The LUA language comes with a well-functioning mathematical function library, string processing, JSON and other libraries, and has function support for common mathematical operations, such as square, sine cosine, and absolute value; Due to the high main frequency of the screen itself, all complex algorithms are processed by the screen, which greatly reduces the execution overhead of the user's MCU.

To write the LUA script of the project in the VisualTFT software, you can click [Tools] → [LUA Script Programming] in the menu bar to open it, as shown in Figure 8-1 and enter the LUA scripting interface, as shown in Figure 8-2.

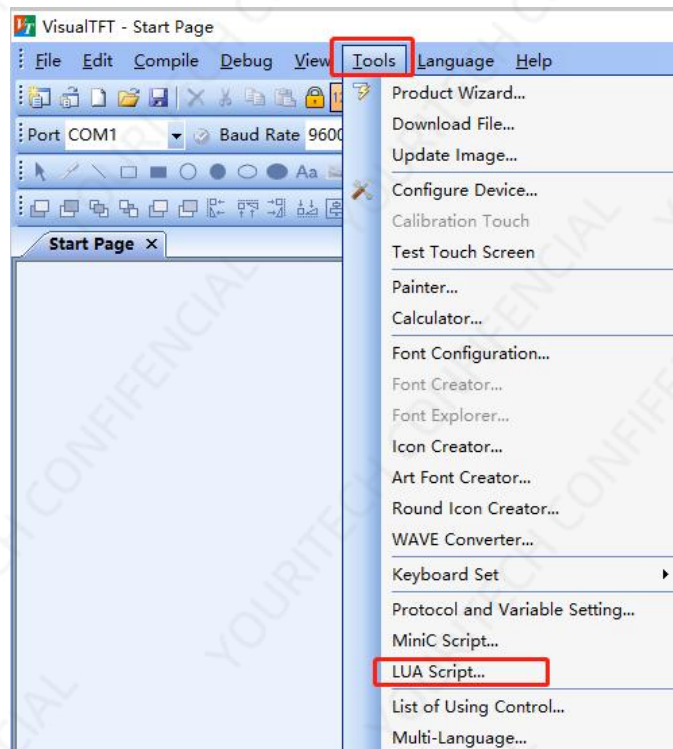


Figure 8-1 LUA script programming



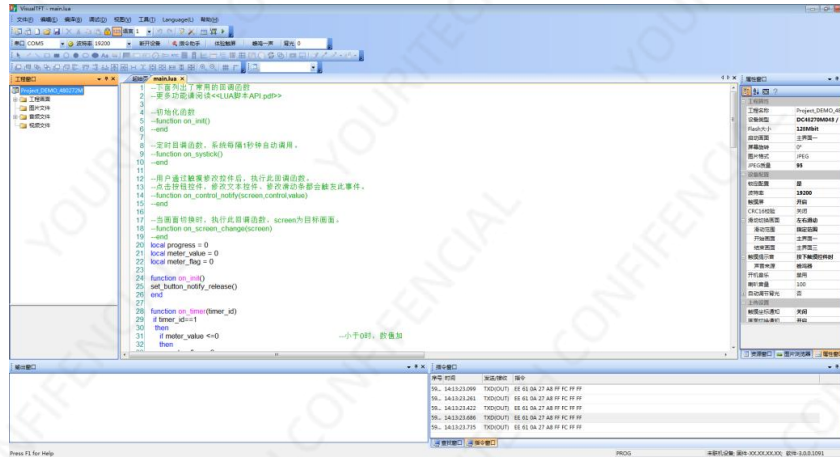


Figure 8-2 Lua scripting interface



9. Packaging and Physical Dimensions

Unit weight					
Net weight (KG)	0.02				
Packaging standard and total weight					
Box model	Box size (length * width * height, unit mm)	Number of layers	Quantity (PCS)/layer	Total quantity (pieces)	Total weight(KG)
Box 1	520*500*190	1	100	100	5

Note: The total weight does not include the weight of the accessory; The above weight information is an estimated weight for reference only, and the actual weight is subject to the actual weight.



10. Disclaimer

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