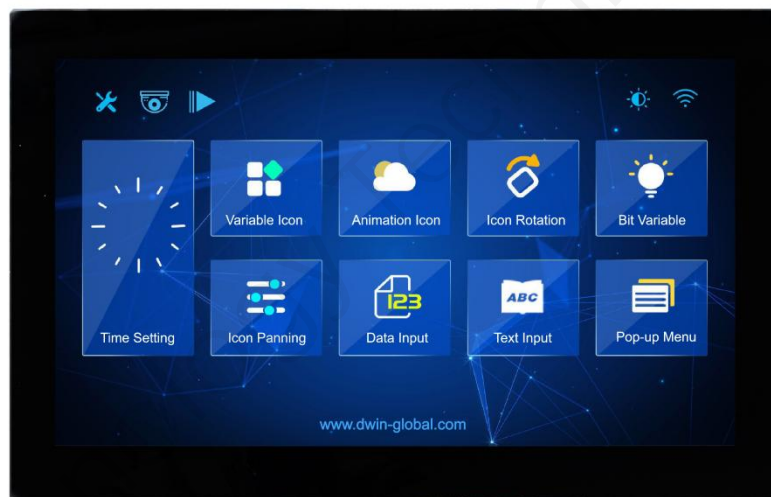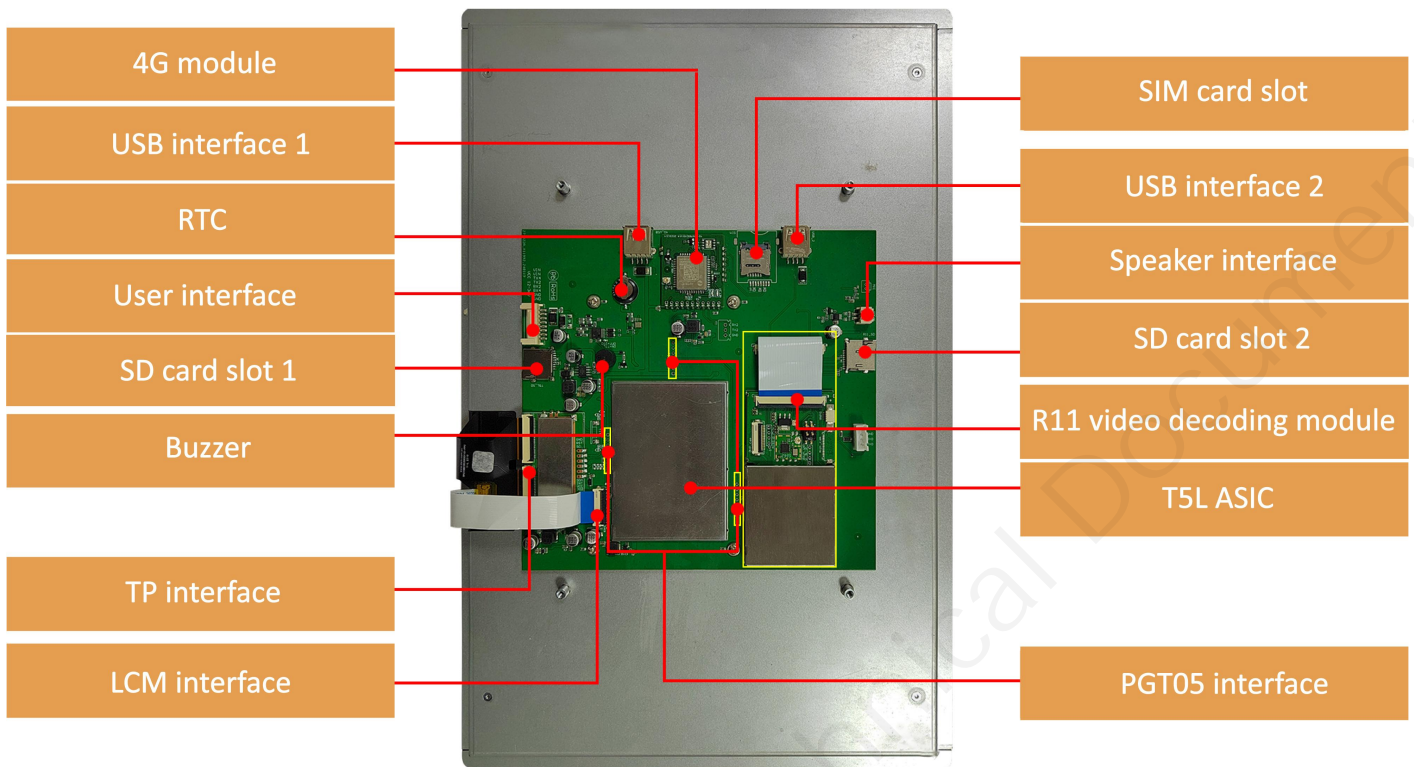# DT321X190020Z240101H

Features:

- **Based on the T5L2 ASIC CPU, running the DGUS II human-machine interaction software platform, smart LCM for commercial-grade applications.**

- **15.6-inch, 1920*1080 pixels, 16.7 M colors true-color display, IPS LCD screen, 2K HD smart screen.**

- **Onboard R11 module for video decoding, enabling WIFI/4G connectivity and audio/video playback functionality.**

- **Capacitive touch screen with GFF structure.**

1. Hardware and interface

1.1 Hardware interface

| 4G module |
| USB interface 1 |
| RTC |
| User interface |
| SD card slot 1 |
| Buzzer |
| TP interface |
| LCM interface |

| SIM card slot |
| USB interface 2 |
| Speaker interface |
| SD card slot 2 |
| R11 video decoding module |
| T5L ASIC |
| PGT05 interface |

Hardware interface

1.2 Hardware and interface description

No.	Name	Description
1	T5L2 ASIC*3	DWIN independently developed, mass production in 2019; patented encryption technology ensures code and data security; low power consumption, strong anti-interference capability, easily passes EMC/EMI tests with dual-sided PCB design
2	User interface	8Pin_2.0mm socket for power supply and serial communication. Download rate(typical value): 12KByte/s
3	Flash	32MBytes (2*16MBytes NOR Flash), can be used to store user UI files such as fonts, images, music, etc., with erase/write cycles >100,000 times
4	Expand Flash pads	Two expansion slots are available, supporting expansion of NOR Flash and NAND Flash. The maximum expansion for NOR Flash is up to 64Mbytes. When combining NOR Flash and NAND Flash, the maximum expansion is up to 48Mbytes (using one expansion slots) + 512Mbytes (Inside the shield)
5	RTC	Super-capacitor supplies power to RTC, accuracy: ±20ppm @25℃. Can maintain normal operation for 7 days after power-off. Reserved button cell power supply compatible circuit
6	Buzzer	3V passive buzzer
7	Speaker interface	2Pin_2.0mm socket, external speaker interface
8	SD card slot	SD card slot 1 is for use with T5L2 and supports downloading all files (user UI files, CFG files, underlying kernel firmware). The screen displays download statistics, with a download speed of 4Mb/s. When downloading files, the SD card needs to be formatted in FAT32 format, with a recommended block size of 4096. SD card slot 2 is for use with the R11 video decoding module and can be used to store MP4 video files, among others.
9	USB interface	For use with the R11 video decoding module, it can be used to store MP4 video files or connect USB peripherals (such as USB cameras, etc.)
10	4G module	Enable 4G connectivity
11	R11 video decoding module	Model:DG-T20-10B,Built-in WIFI module, supports 2.4GHz/5GHz frequency bands
12	PGT05 interface	Used for reprogramming the underlying DGUS firmware

2. Specification parameters

2.1 Display parameters

LCD Type	IPS process TFT display screen
Viewing Angle	Wide viewing angle (typical values are 85°/85°/85°/85°), high contrast, and good color reproduction
Resolution	1920×1080 pixels (0°/90°/180°/270°)
Color	16.7M color (24-bit 8R8G8B)
View Area (V.A.)	344.16mm (W)×193.59mm (H)
Active Area (A.A.)	343.16mm (W)×192.59mm (H)
Interface	eDP
Backlight Mode	LED
Backlight Service Life	>20000 hours (Time of the brightness decaying to 50% on the condition of continuous working with the maximum brightness)
Brightness	250nit
Brightness Control	0~100 grade (When the brightness is adjusted to 1%~30% of the maximum brightness, flickering may occur and is not recommended to use in this range)
Note:You can use dynamic screen saver wallpapers to avoid afterimages caused by fixed page display for a long time.	

2.2 Touch parameters

Type	Capacitive touch panel
Interface	I^{2}C
Structure	G+FF structure with surface cover of tempered glass
Touch Mode	Single point touch and support continuous sliding touch
Surface Hardness	6H
Light Transmittance	>85%
Life	Over 20,000 hours touch

2.3 Serial interface parameters

Mode	UART2: ON=TTL/CMOS; OFF=RS232
	UART4: ON=TTL/CMOS; OFF=RS232 (Only available after OS configuration)

	Test Condition	Min	Typ	Max	Unit
Voltage Level	Output 1, Iout = -4mA	4.78	5.0	-	V
	Output 0, Iout = 4mA	-	-	0.4	V
	Input 1	2.5	5.0	-	V
	Input 0	-	-	1.0	V

Baud Rate	3150~3225600bps, typical value of 115200bps
Data Format	UART2: N81
	UART4: N81/E81/O81/N82 , 4 modes (OS configuration)
Interface Cable	8Pin_2.0mm

2.4 Electrical specifications

Rated Power	<12W	
Operating Voltage	12~36V, typical value of 12V	
Operating Current	650mA	VCC=12V, max backlight
	170mA	VCC=12V, backlight off
Recommended power supply: 12V 1A DC		

2.5 Operating environment

Operating Temperature	-10℃~60℃ (12V @ 60% RH)
Storage Temperature	-20℃~60℃
Conformal Coating	None
Operating Humidity	10%~90%RH, typical value of 60% RH

3. Reliability test

3.1 Electrostatic discharge test

Test temperature: 25°C. Test humidity: 50%RH.

Test process: Place the product on the testing fixture of the test bench (fixture height approximately 15cm), and conduct contact discharge and air discharge tests on the smart screen, during the experimental process, it was observed whether the screen is dead, black, white, splash, or reboot. According to the experiment results, the performance is in line with the criteria GB/T 17626.2 B level and above.

■ Test standard : ☐EN 61000-4-2:2009　　☐IEC 61000-4-2:2008　　☐GB/T 17626.2-2018
　　　　　　　　☐Other:

Table 1: Electrostatic Discharge Immunity (Air Discharge)

Test Points Locations	Test Levels							
	-2kV	+2kV	-4kV	+4kV	-8kV	+8kV	-15kV	+15kV
Screen					✗	✗		
/	/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/	/

Table 2: Electrostatic Discharge Immunity (Direct Contact)

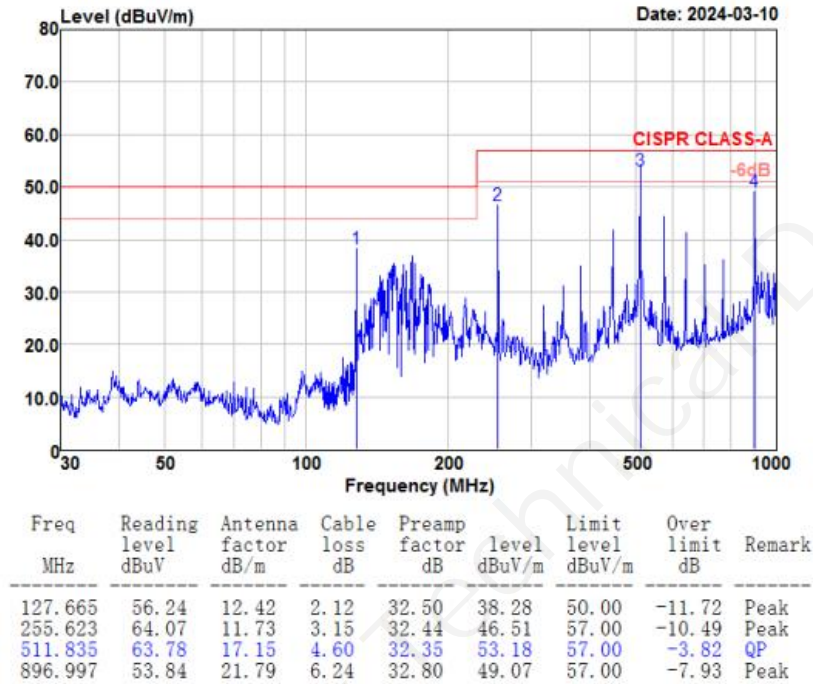| Test Points Locations	Test Levels							
	-2kV	+2kV	-4kV	+4kV	-6kV	+6kV	-8kV	+8kV
✓	✓	✓	✓	✓	✓	✓	✓	✓
/	/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/	/

Performance Criterion:

A. Normal performance within limits specified by the manufacturer, requestor or purchaser;

B. Temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention;

C. Temporary loss of function or degradation of performance, the correction of which requires operator intervention;

D. Loss of function or degradation of performance which is not recoverable, due to damage to hardware or software, or loss of data.
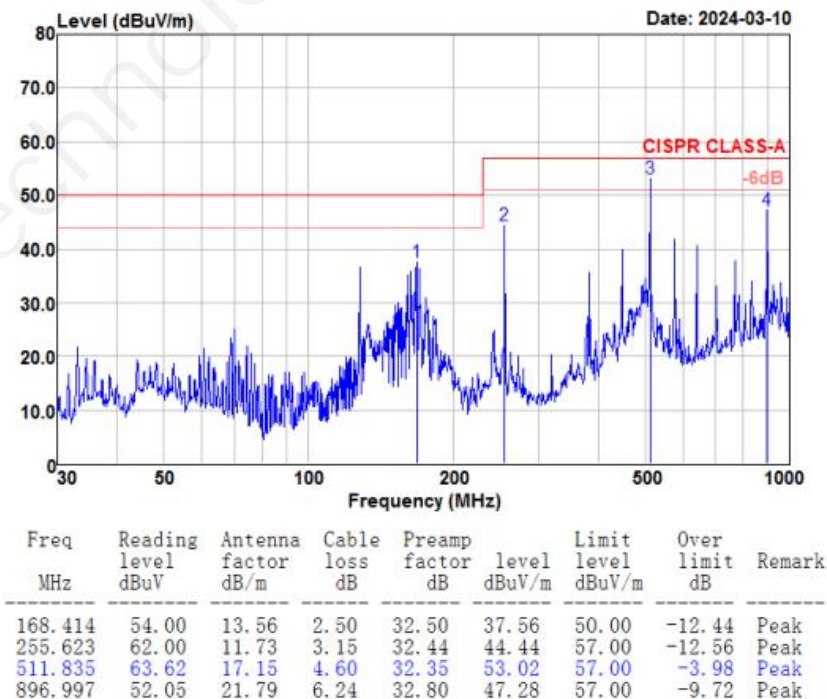
3.2 RE test

Test Item	Test Standard	Result
RE	Class A	Normal operation

HORIZONTAL


```
  Freq    Reading  Antenna  Cable   Preamp          Limit    Over
          level    factor   loss    factor  level   level    limit   Remark
  MHz     dBuV     dB/m     dB      dB      dBuV/m  dBuV/m   dB
-------   -------  -------  ------  ------  ------  -------  ------   -------
127.665   56.24    12.42    2.12    32.50   38.28   50.00   -11.72   Peak
255.623   64.07    11.73    3.15    32.44   46.51   57.00   -10.49   Peak
511.835   63.78    17.15    4.60    32.35   53.18   57.00    -3.82   QP
896.997   53.84    21.79    6.24    32.80   49.07   57.00    -7.93   Peak
```

VERTICAL


```
  Freq    Reading  Antenna  Cable   Preamp          Limit    Over
          level    factor   loss    factor  level   level    limit   Remark
  MHz     dBuV     dB/m     dB      dB      dBuV/m  dBuV/m   dB
-------   -------  -------  ------  ------  ------  -------  ------   -------
168.414   54.00    13.56    2.50    32.50   37.56   50.00   -12.44   Peak
255.623   62.00    11.73    3.15    32.44   44.44   57.00   -12.56   Peak
511.835   63.62    17.15    4.60    32.35   53.02   57.00    -3.98   Peak
896.997   52.05    21.79    6.24    32.80   47.28   57.00    -9.72   Peak
```

3.3 CE test

Test Item	Test Standard	Result
CE	Class A	Normal operation

LINE


```
 Freq    Reading  LISN/ISN  Cable    Result   Limit    Over
         level    factor    loss     level    level    limit    Remark
 MHz     dBuV     dB        dB       dBuV     dBuV     dB
-------- -------- --------  -------- -------- -------- -------- --------
 0.222   34.23    9.58      0.01     43.82    79.00    -35.18   Peak
 0.479   39.79    9.60      0.02     49.41    79.00    -29.59   Peak
 0.938   32.51    9.61      0.02     42.14    73.00    -30.86   Peak
 1.381   32.48    9.60      0.03     42.11    73.00    -30.89   Peak
 1.662   31.73    9.60      0.03     41.36    73.00    -31.64   Peak
 19.326  33.17    9.92      0.11     43.20    73.00    -29.80   Peak
```

NEUTRAL


```
 Freq    Reading  LISN/ISN  Cable    Result   Limit    Over
         level    factor    loss     level    level    limit    Remark
 MHz     dBuV     dB        dB       dBuV     dBuV     dB
-------- -------- --------  -------- -------- -------- -------- --------
 0.222   35.70    9.58      0.01     45.29    79.00    -33.71   Peak
 0.334   32.83    9.60      0.02     42.45    79.00    -36.55   Peak
 0.484   44.53    9.60      0.02     54.15    79.00    -24.85   Peak
 0.994   36.66    9.61      0.02     46.29    73.00    -26.71   Peak
 1.381   36.06    9.61      0.03     45.70    73.00    -27.30   Peak
 13.768  34.41    9.90      0.09     44.40    73.00    -28.60   Peak
```
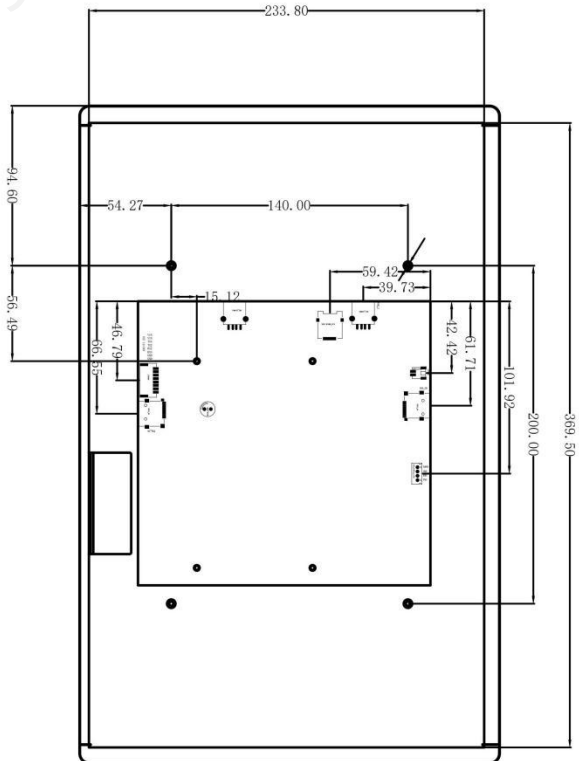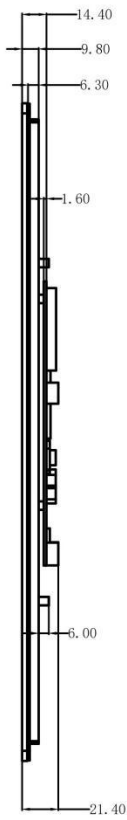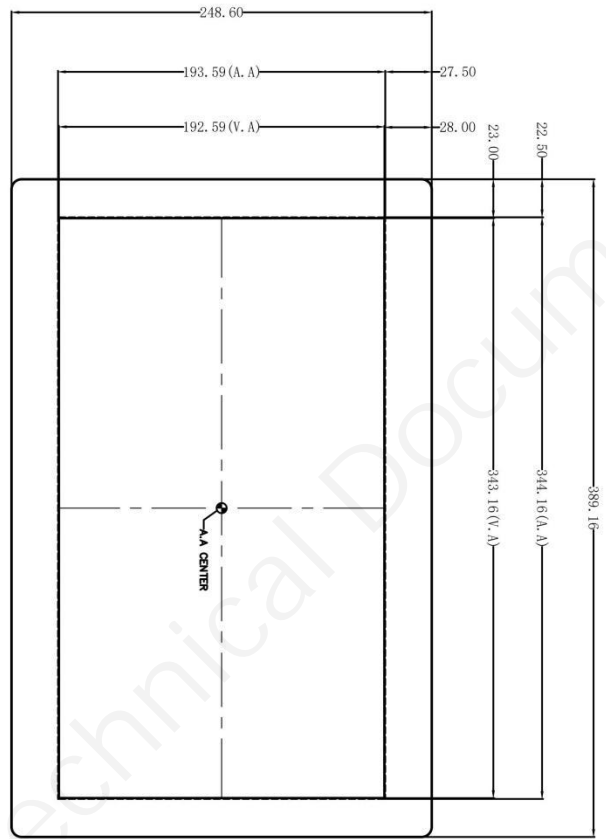
4. Packaging & dimensions

Form Factor	389.16mm (W)×248.60mm (H)×21.40mm (T)
Installation Dimensions	Positioning hole: 369.50(+0.3mm)×233.80(+0.3mm)
Net Weight	1800g

Packaging Standards

Model	Dimensions	Layer	Quantity/Layer	Quantity(Pcs)
Carton1：	525mm(L)×330mm(W)×80mm (H)	1	1	1
Carton2：	570mm(L)×340mm(W)×385mm (H)	1	5	5

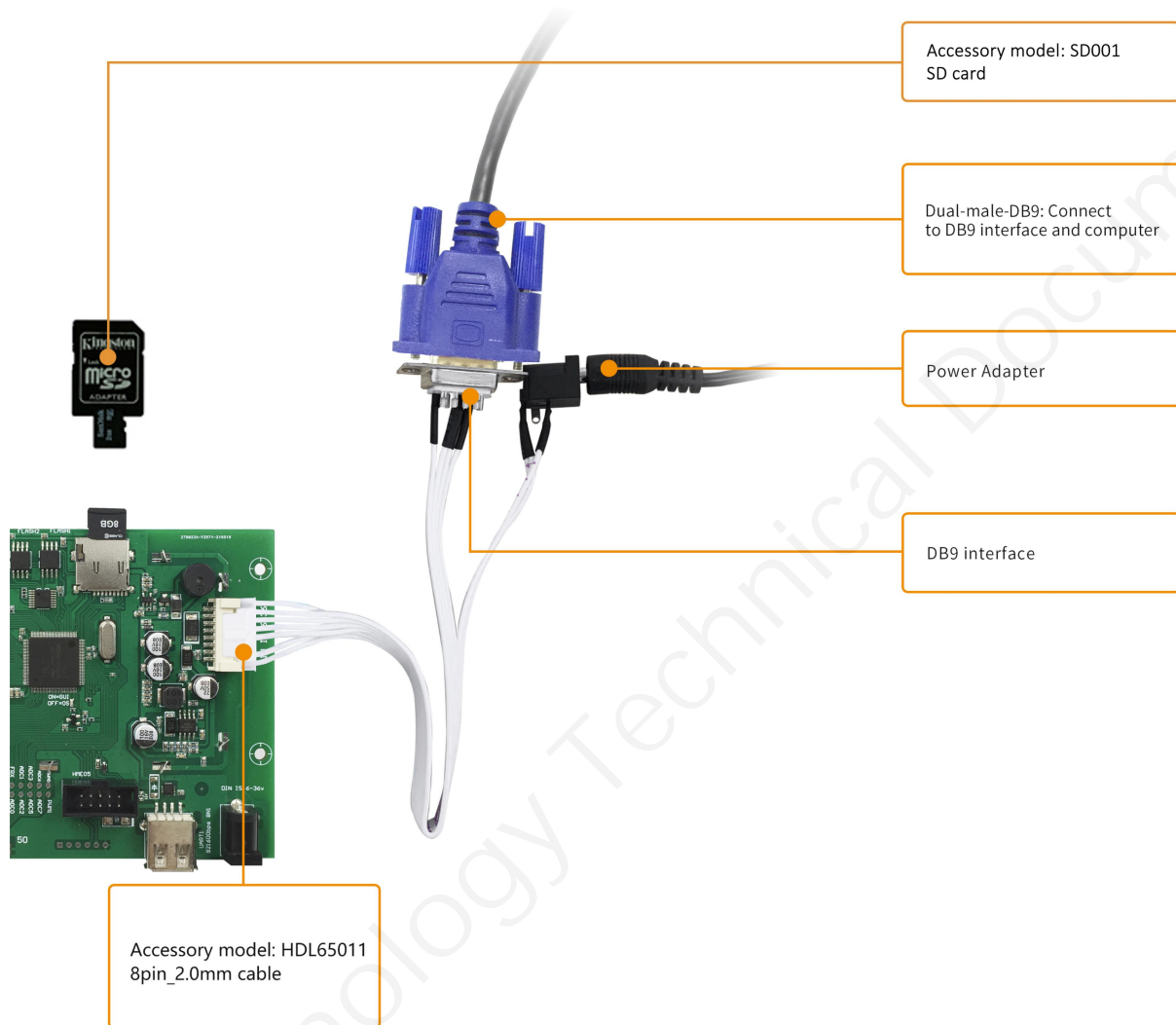| Definition	Pin#	Type	Description
VIN	1, 2	P	Power Input
TX4	3	O	UART4 Output
TX2	4	O	UART2 Output
RX2	5	I	UART2 Input
RX4	6	I	UART4 Input
GND	7, 8	P	GND

1. Location hole is used as position reference.

2. Unmarked Tolerance is +/−0.3mm

Note: Active area is marked in Dash lines

Model		DT321X190020Z240101H			
Drawing	A 4	Drawn	DWIN	Date	Date
Scale	1:1	Review		Date	2024.2.29
Unit	MM	Approval		Date	

DWIN Technology

Professional, Creditable, Successful

5. Debugging tools

It is recommended for new users of DWIN smart LCMs to purchase official accessories. For more details, please refer to customer service center.

Accessory model: SD001
SD card

Dual-male-DB9: Connect to DB9 interface and computer

Power Adapter

DB9 interface

Accessory model: HDL65011
8pin_2.0mm cable

6. T5L series IC features

(1) Mature and stable 8051 core which is the most widely used with the maximum operating frequency of T5L is up

to 250MHz, 1T(single instruction cycle)high speed operation.

(2) Separate GUI CPU Core running DGUS II System:

● High-speed display memory, 2.4GB/S bandwidth.

● 2D hardware acceleration, the decompression speed of JPEG is up to 200fps@1280*800 and the UI with

animation and icons as its main feature is extremely cool and smooth.

● Images and icons stored in JPEG format. Adopt Low-cost 16Mbytes SPI Flash.

● Support CTP or RTP with adjustable sensitivity and maximum 400 Hz touch frequency.

● 1-way 15bit 32Ksps PWM digital power amplifier driver loudspeaker, save power amplifier cost and achieve

high signal-to-noise ratio and sound quality restoration.

● 128Kbytes variable storage space for exchanging data with OS CPU Core and memory.

● Support DGUS development and simulation on PC. Support background remote upgrade.

(3) Separate CPU (OS CPU) core runs user 8051 code or DWIN OS system and user CPU is omitted in practical

application:

● Standard 8051 architecture and instruction set, 64Kbytes code space, 32Kbytes on-chip RAM.

● 64 bit integer mathematical operation unit (MDU), including 64 bit MAC and 64 bit divider.

● 28 IOs, 4-channel UARTs, 1-channel CAN, up to 8-channel 12-bit A/Ds and 2-channle 16-bit PWM of

adjustable resolution.

● Support IAP on-line simulation and debugging with unlimited number of breakpoints.

● Upgrade code online through DGUS system.

(4) 1Mbytes on-chip Flash with DWIN patent encryption technology ensure code and data security.

(5) Operating temperature ranges from -40°C to +85°C(IC operating temperature customizable from

-55°C to 105°C).

DWIN encourages users to design your own customized product based on T5L

7. Revision records

Rev	Revise Date	Content	Editor
00	2024-05-29	First Edition	Xu Ying

Please contact us if you have any questions about the use of this document or our products, or if you would like to know the latest information about our products:

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- DWIN Developer Forum: https://forums.dwin-global.com/

Thank you all for continuous support of DWIN, and your approval is the driving force of our progress!

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