

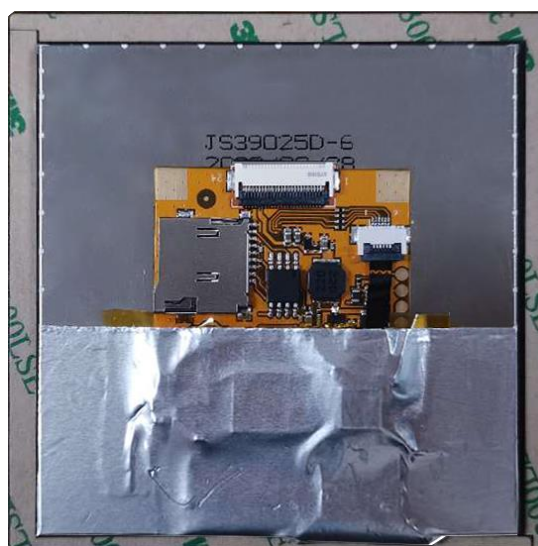
# DMG48480F040\_02WTCZ02

## 产品概述:

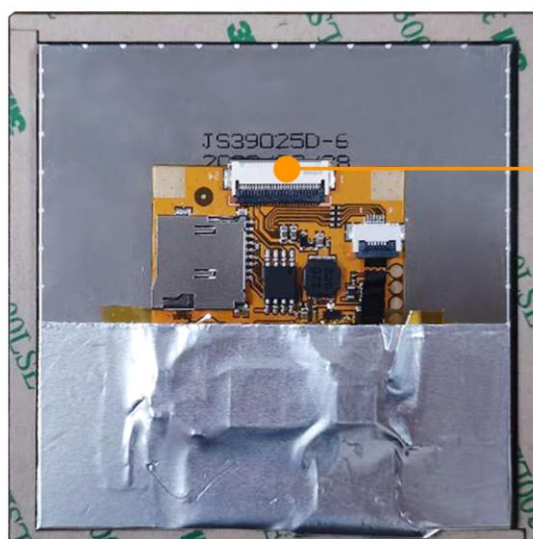
- 基于 T5L0\_Q88 芯片，运行 DGUS II 系统。
- 4 英寸，480\*480 分辨率，262K 色，IPS 屏，宽视角。
- 一体黑全贴合电容触摸屏。
- COF 结构，智能屏的整个核心电路整合在液晶模组 FPC 上，适合结构要求轻、薄，成本要求苛刻，生产简单的应用。

## Features:

- Based on T5L0\_Q88, running DGUS II system.
- 4 inch, 480\*480 pixels resolution, 262K colors, IPS-TFT-LCD, wide viewing angle.
- Integrated black and OCA bonded capacitive touch panel.
- COF structure. The entire core circuit of the smart screen is fixed on the FPC of LCM, featured by light and thin structure, low cost and easy production.



## 1 接口定义 Interface definition



用户接口  
 User interface

| 序号<br>PIN | 定义<br>Definition | 类型<br>Type | 功能描述<br>Functional Description                                                                                                                                  |
|-----------|------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | CAN_TX           | O          | CAN 接口（需外接 CAN 芯片驱动，电路参考见 5）<br>CAN interface (CAN interface (External CAN chip drive is required. See 5 for circuit reference) )                               |
| 2         | CAN_RX           | I          |                                                                                                                                                                 |
| 3         | TX3              | O          | 串口 3 数据输出<br>UART3 DOUT                                                                                                                                         |
| 4         | RX3              | I          | 串口 3 数据输入<br>UART3 DIN                                                                                                                                          |
| 5         | TX2              | I/O        | 串口 2 数据输出<br>UART2 DOUT                                                                                                                                         |
| 6         | RX2              | I/O        | 串口 2 数据输入<br>UART2 DIN                                                                                                                                          |
| 7         | TR4              | -          | -                                                                                                                                                               |
| 8         | TX4              | O          | 串口 4 数据输出<br>UART4 DOUT                                                                                                                                         |
| 9         | RX4              | I          | 串口 4 数据输入<br>UART4 DIN                                                                                                                                          |
| 10        | TX1              | O          | 串口 1 数据输出<br>UART1 DOUT                                                                                                                                         |
| 11        | RX1              | I          | 串口 1 数据输入<br>UART1 DIN                                                                                                                                          |
| 12        | ADC0             | I          | ADC 输入，3.3V 电源作为参考，12bit 分辨率，输入电压范围 0-3.3V。<br>ADCs. 12-bit resolution in case of 3.3V power supply. 0-3.3V input voltage.                                      |
| 13        | ADC1             | I          |                                                                                                                                                                 |
| 14        | ADC6             | I          | 接位于壳内的 NTC<br>Connect the NTC inside the housing.                                                                                                               |
| 15        | ADC7             | I          | 接位于壳壁的 NTC<br>Connect the NTC located on the housing wall.                                                                                                      |
| 16        | PWM3             | O          | 蜂鸣器/扬声器驱动。外部要10K 下拉到GND 确保上电是低电平。<br>Buzzer/speaker driver. The external 10K resistor should be pulled down to the ground to ensure that power-on is low level. |
| 17        | GND              | P          | 公共地<br>GND                                                                                                                                                      |
| 18        | GND              | P          |                                                                                                                                                                 |

| 序号<br>PIN | 定义<br>Definition | 类型<br>Type | 功能描述<br>Functional Description                                            |
|-----------|------------------|------------|---------------------------------------------------------------------------|
| 19        | +5V              | P          | 供电输入，DC4.5-5.5V。<br>Power supply, DC4.5-5.5V.                             |
| 20        | +5V              | P          |                                                                           |
| 21        | I2C_SDA          | I/O        | RTC/接近传感器/温湿度传感器复用。<br>RTC/proximity sensor/humidity sensor multiplexing. |
| 22        | I2C_SCL          | I/O        |                                                                           |
| 23        | EX1              | I          | 外部中断 1 输入<br>External interrupt (INT1)                                    |
| 24        | EX0              | I          | 外部中断 0 输入<br>External interrupt (INT0)                                    |

## 2 规格参数 Specification Parameters

### 2.1 产品参数 Product Parameters

|                                |                                                                                                                                                                                                             |
|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 主控芯片<br>Main Chip              | T5L0_Q88                                                                                                                                                                                                    |
| 用户接口方式<br>User Interface       | 24Pin_0.5mm                                                                                                                                                                                                 |
| FLASH                          | 16M Bytes                                                                                                                                                                                                   |
| UI 版本<br>UI Version            | DGUSII / TA                                                                                                                                                                                                 |
| 供电方式<br>Power Supply           | 5V                                                                                                                                                                                                          |
| 显示色彩<br>Display Color          | 262K 色<br>262K colors                                                                                                                                                                                       |
| 尺寸<br>Dimensions               | 4 英寸<br>4 inches                                                                                                                                                                                            |
| 分辨率<br>Resolution              | 480*480                                                                                                                                                                                                     |
| 显示尺寸 (A.A)<br>Active Area      | 71.86mm (W) × 70.18mm (H)                                                                                                                                                                                   |
| 视域尺寸 (V.A)<br>View Area        | 71.46mm (W) × 69.78mm (H)                                                                                                                                                                                   |
| 可视角度 L/R/U/D<br>Viewing Angle  | 宽视角, 典型值 85° /85° /85° /85° (L/R/U/D)<br>Wide viewing angel, typical value of 85° /85° /85° /85° (L/R/U/D)                                                                                                  |
| 背光寿命<br>Backlight Service Life | >10000 小时 (以最高亮度连续工作, 亮度减半时间)<br>> 10000 hours (Time of the brightness decaying to 50% on the condition of continuous working with the maximum brightness)                                                  |
| 亮度<br>Brightness               | 50nit                                                                                                                                                                                                       |
| 背光调节<br>Brightness Control     | 100 级亮度调节 (当亮度调节至最高亮度的 1%~30%时, 可能出现闪烁现象, 不建议在此范围使用)<br>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) |
| 触摸屏类型<br>Type                  | 电容式触摸屏 (一体黑盖板)。<br>CTP (Integrated black cover plate).                                                                                                                                                      |
| 触摸屏结构<br>Structure             | G+G 结构, 表层为钢化玻璃, 玻璃硬度 ≥6H。<br>G+G structure with tempered glass surface and hardness ≥6H.                                                                                                                   |
| 透光率<br>Light Transmittance     | 20~30%                                                                                                                                                                                                      |

## 2.2 串口参数 Interface Parameters

| 参数<br>Item                    | 测试条件<br>Conditions                                                                                                                                  | 最小值<br>Min | 典型值<br>Typ | 最大值<br>Max | 单位<br>Unit |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------|------------|------------|
| 串口波特率<br>Baud rate            | 用户自定义（硬件配置文件设置）<br>User Set(Configure the CFG file)                                                                                                 | 3150       | 115200     | 3225600    | bps        |
| 串口输出电平<br>Output Voltage(TXD) | Output 1                                                                                                                                            | 3.0        | 3.3        | -          | V          |
|                               | Output 0                                                                                                                                            | -          | 0          | 0.3        | V          |
| 串口输入电平<br>Input Voltage(RXD)  | Input 1                                                                                                                                             | -          | -          | 3.3        | V          |
|                               | Input 0                                                                                                                                             | 0          | -          | 0.5        | V          |
| 串口模式<br>Interface             | UART2: TTL;<br>UART3: TTL; (OS 配置后才能使用 Only available after OS configuration)<br>UART4: TTL; (OS 配置后才能使用 Only available after OS configuration)     |            |            |            |            |
| 数据格式<br>Data Format           | UART2: N81;<br>UART3: N81/E81/O81/N82;四种模式可选 (OS 配置) 4 modes (OS configuration)<br>UART4: N81/E81/O81/N82;四种模式可选 (OS 配置) 4 modes (OS configuration) |            |            |            |            |

## 2.3 电气规格 Electrical specifications

|                                                             |                                                   |                                         |
|-------------------------------------------------------------|---------------------------------------------------|-----------------------------------------|
| 额定功率<br>Rated Power                                         | <2W                                               |                                         |
| 工作电压<br>Operating Voltage                                   | 4.5~5.5V, 典型值 5V<br>4.5~5.5V, typical value of 5V |                                         |
| 工作电流<br>Operating Current                                   | 280mA                                             | VCC=5V, 背光亮度最大<br>VCC=5V, max backlight |
|                                                             | 100mA                                             | VCC=5V, 背光关闭<br>VCC=5V, backlight off   |
| 推荐工作电源: 5V 1A 的直流稳压电源<br>Recommended power supply: 5V 1A DC |                                                   |                                         |

## 2.4 工作环境 Operating Environment

|                               |                                                            |
|-------------------------------|------------------------------------------------------------|
| 工作温度<br>Operating Temperature | -10°C~60°C                                                 |
| 存储温度<br>Storage Temperature   | -20°C~70°C                                                 |
| 工作湿度<br>Operating Humidity    | 10%~90%RH, 典型值 60%RH<br>10%~90%RH, typical value of 60% RH |

### 3 可靠性测试 Reliability Test

智能屏产品在量产前需根据实际应用需求及产品规格管控标准进行系列流程化可靠性检测，确保产品质量。

Before mass production of smart screens, a series of procedural reliability tests need to be conducted according to actual application requirements and product specification control standards to ensure product quality.

#### 3.1 静电放电 ESD 测试 ESD Test

测试环境温度：25°C，测试环境湿度：50%RH。

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

试验过程：将产品平置于测试台上，针对串口屏铁框和显示区域依次进行接触和空气放电；实验过程观察屏幕有无死机、黑屏、白屏、花屏、重启等异常现象。性能符合判据 GB/T 17626.2 B 级及以上。

Test process: the product was placed on the test bench to perform contact and air discharge in turn of the serial screen iron frame and display area. 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 |
| 屏幕                    |             |      |      |      | A    | A    | /     | /     |
| /                     | /           | /    | /    | /    | /    | /    | /     | /     |
| /                     | /           | /    | /    | /    | /    | /    | /     | /     |

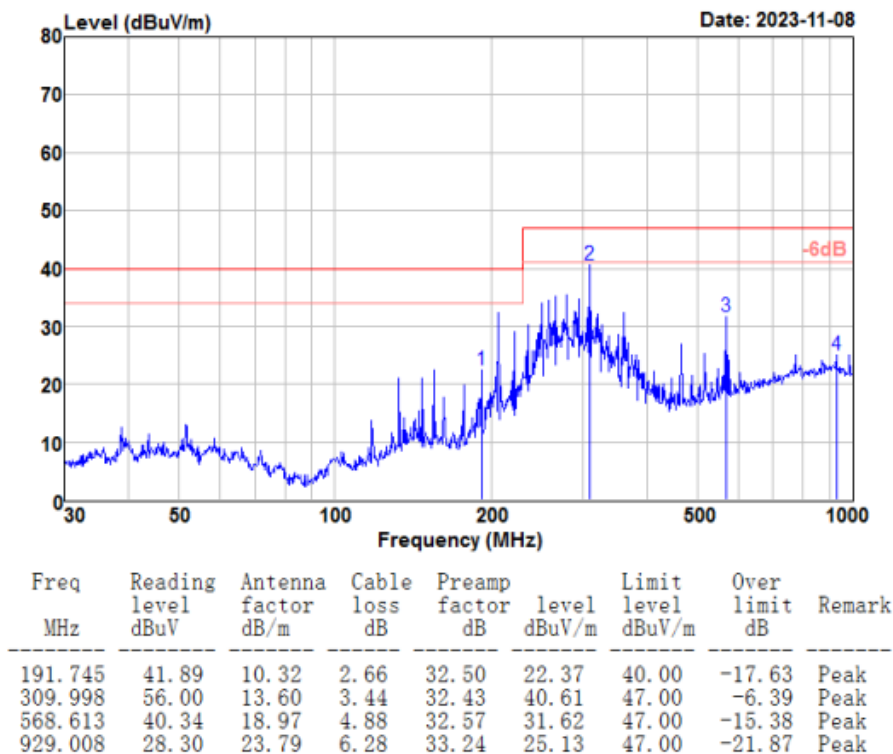
Table 2: Electrostatic Discharge Immunity (Direct Contact)

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

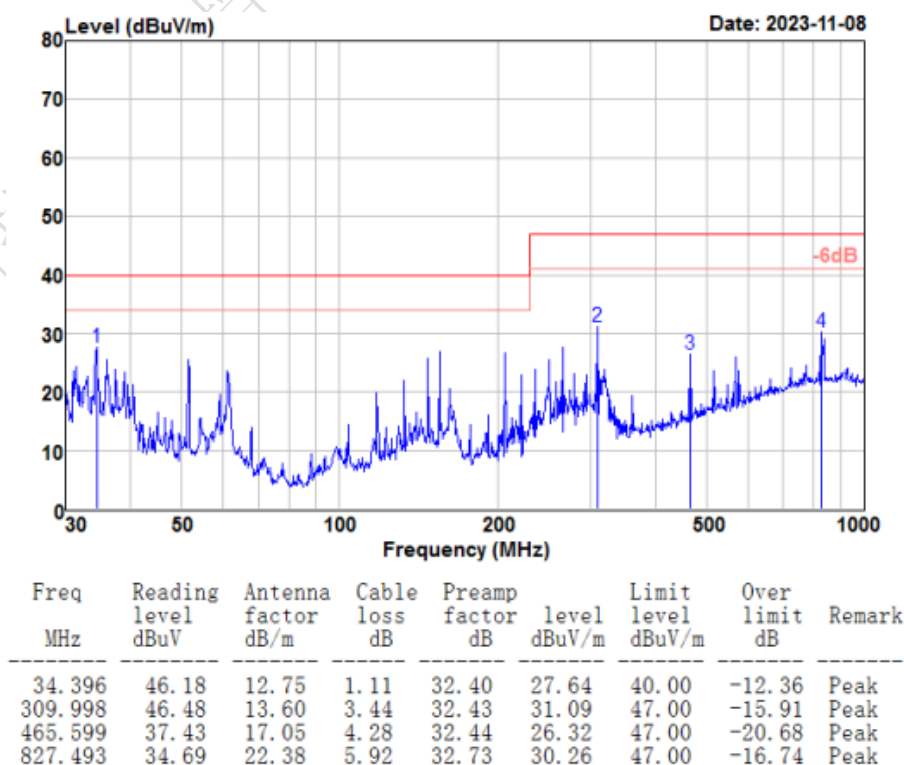
### 3.2 辐射干扰测试 RE test

| 测试项目<br>Test Item | 测试标准<br>Test Standard | 结果<br>Result |
|-------------------|-----------------------|--------------|
| 辐射干扰<br>RE        | Class B               | 合格<br>Pass   |

#### HORIZONTAL



#### VERTICAL



### 3.3 高低温储存测试 High and Low Temperature Test

试验环境温度：-20~70℃

Test temperature:-20~70℃

试验过程：将产品斜置放在高低温测试箱内，测试时间 12H，进行 20 次开机、关机循环，自然恢复至常温后上电检查外观及功能，电容屏无偏移、跳点、乱跳和失效等问题。

Test process: the product will be placed obliquely in the high and low temperature test chamber for 12h for 20 on and off cycles. Then it will be check at room temperature after power on for the appearance and function, CTP offset situation, jumping point, page random switching and failure.

| 温度<br>Temperature                 | 结果<br>Result |
|-----------------------------------|--------------|
| 高温（70℃）<br>High temperature（70℃）  | A            |
| 低温（-20℃）<br>Low temperature（-20℃） | A            |

#### 性能标准：

- A.在制造商、委托方或购买方规定的限值内性能正常；
- B.功能或性能暂时丧失或降低，但在骚扰停止后能自行恢复，不需要操作者干预；
- C.功能或性能暂时丧失或降低，但需操作者干预才能恢复；
- D.因设备硬件或软件损坏，或数据丢失而造成不能恢复的功能丧失或性能降低。

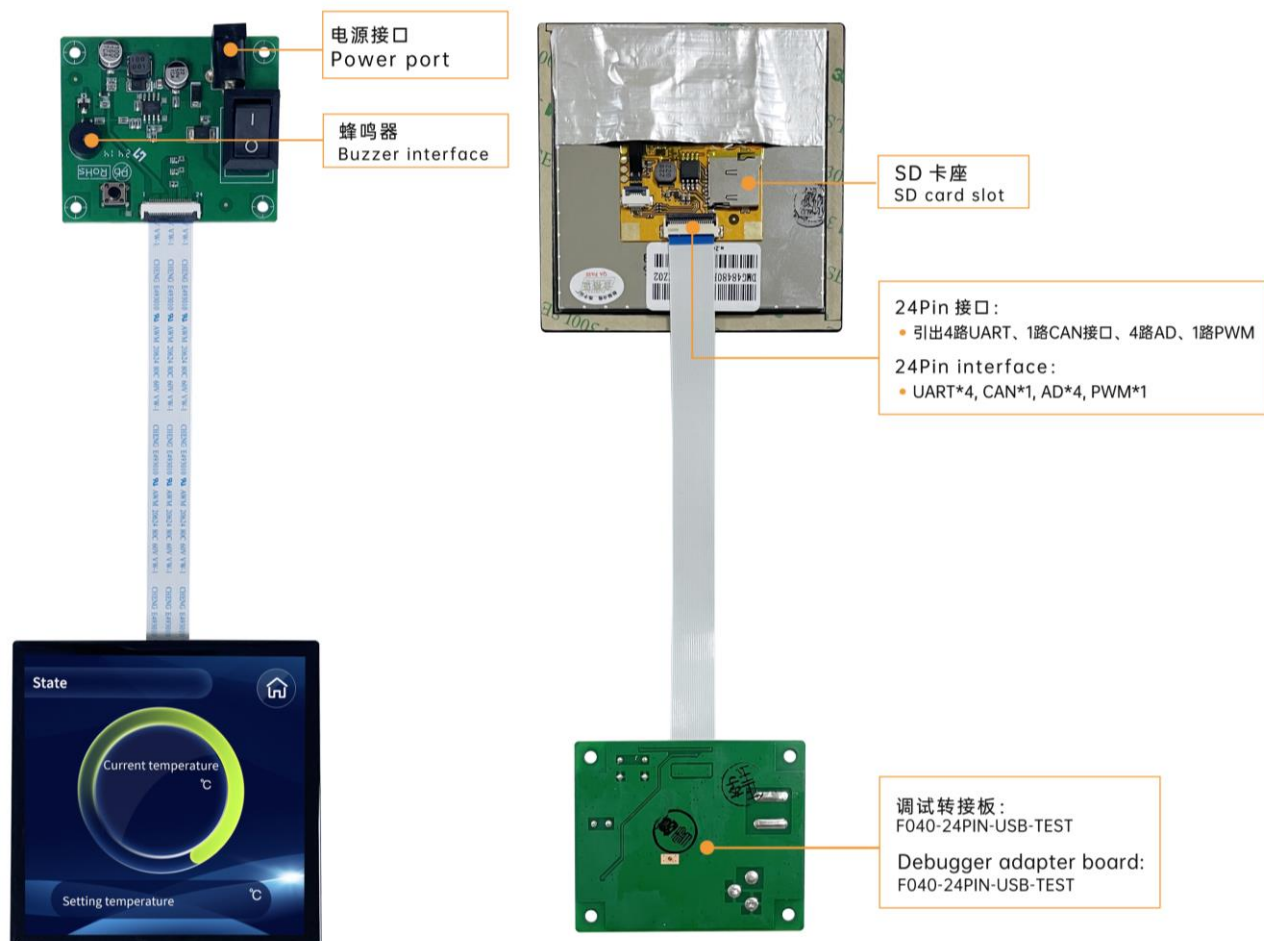
#### Performance Criterion:

- 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.

## 4 调试示例 Debugging Example

建议首次使用迪文智能屏的用户购买标准配件。详细信息可联系客服人员。

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



## 5 T5L0-Q88 主控芯片 T5L0-Q88 ASIC

T5L0-Q88ASIC 是迪文科技针对小尺寸液晶应用显示而设计的小封装、低功耗、低成本、GUI 和应用高度整合的单芯片双核 ASIC，2023 年正式量产。

T5L0-Q88 ASIC is a small package, low-power, cost-effective, GUI and application highly integrated single-chip dual-core ASIC designed by DWIN Technology for small-size LCD and mass produced in 2023.

- (1) 采用应用最广泛、成熟和稳定的 8051 核，1T（单指令周期）高速工作，最高主频 400MHz。

Mature and stable 8051 core which is the most widely used with the maximum operating frequency of T5L is up to 400MHz, 1T(single instruction cycle)high speed operation.

- (2) 在 T5L0 芯片基础上缩小封装，新封装为 QFN88，大小 9\*9mm，裁剪了 OS 核外设接口，GUI 核性能一致。

On the basis of the T5L0 chip, the package size is reduced to QFN88, with dimensions of 9\*9mm. The peripheral interfaces of the OS core have been trimmed, while maintaining consistent performance of the GUI core.

- (3) 单独 CPU 核（GUI CPU）运行 DGUS II 系统：

Separate GUI CPU core running DGUS II System:

- 内置高速显存，2.4GB/S 带宽，18bit 彩色显示分辨率支持到 1024\*768（TA 模式），854\*480（DGUS 模式）。  
High-speed display memory, 2.4GB/S bandwidth. 18-bit color display resolution support up to 1024\*768 (TA mode), 854\*480 (DGUS mode).
- 2D 硬件加速，动画和图标为主的 UI 极其炫酷、流畅。  
2D hardware acceleration and the UI with animation and icons as its main feature is extremely cool and smooth.
- JPEG 压缩模式存储图片、图标，大幅度缩小外置存储器到低成本的 16Mbytes SPI Flash。  
Images and icons stored in JPEG format. Adopt Low-cost 16Mbytes SPI Flash.
- 高品质语音压缩存储和播放。  
High quality ratio and sound restoration and playback.
- 128Kbytes 变量存储器空间，存储器接口和 OS CPU 核交换数据，应用简单。  
128Kbytes variable storage space for exchanging data with OS CPU Core and memory.
- 2 路 10bit 800KHz DC/DC 控制器，简化 LED 背光、模拟电源设计并节约成本和空间。  
2 10-bit 800KHz DC/DC controllers simplify LED backlight, analog power design and save cost and space.
- 支持 PC 端组态开发和仿真，支持后台远程升级。  
Support DGUS development and simulation on PC. Support backend remote upgrade.

- (4) 单独 CPU 核（OS CPU）运行用户 8051 代码或迪文 DWIN OS 系统，应用中省掉用户 CPU：

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

- 标准 8051 架构和指令集，64Kbytes 代码空间，32Kbytes 片内 RAM。

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

- 64bit 整数型数学运算单元（MDU），包括 64bit MAC 和 64bit 除法器。

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

- 15 个 IO，4 路 UARTs，1 路 CAN 接口，最多 8 路 12bit A/D，2 路 16bit 分辨率可调的 PWM。

15 IOs, 4-channel UARTs, 1-channel CAN, up to 8-channel 12-bit A/Ds and 2-channel 16-bit PWM of adjustable resolution.

- 支持 IAP 在线仿真和调试，断点数量无限制。

Support IAP online simulation and debugging with unlimited breakpoints.

- 可以透过 DGUS 系统在线升级代码。

Upgrade code online through DGUS system.

- (5) 1Mbytes 片内 Flash，迪文专利加密技术，确保代码和数据安全，杜绝山寨和克隆。

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

- (6) -40℃~+85℃工作温度范围（可定制-55℃~105℃工作温度范围 IC）。

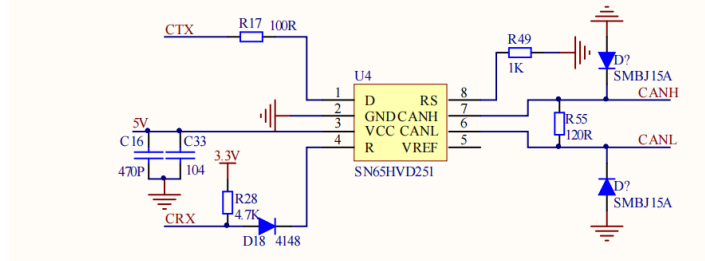
Operating temperature ranges from -40℃ to +85℃ (IC operating temperature customizable from -55℃ to 105℃).

**迪文欢迎广大用户基于 T5L 自主设计客制化产品。**

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

## 6 CAN 电路设计参考 CAN circuit design parameters

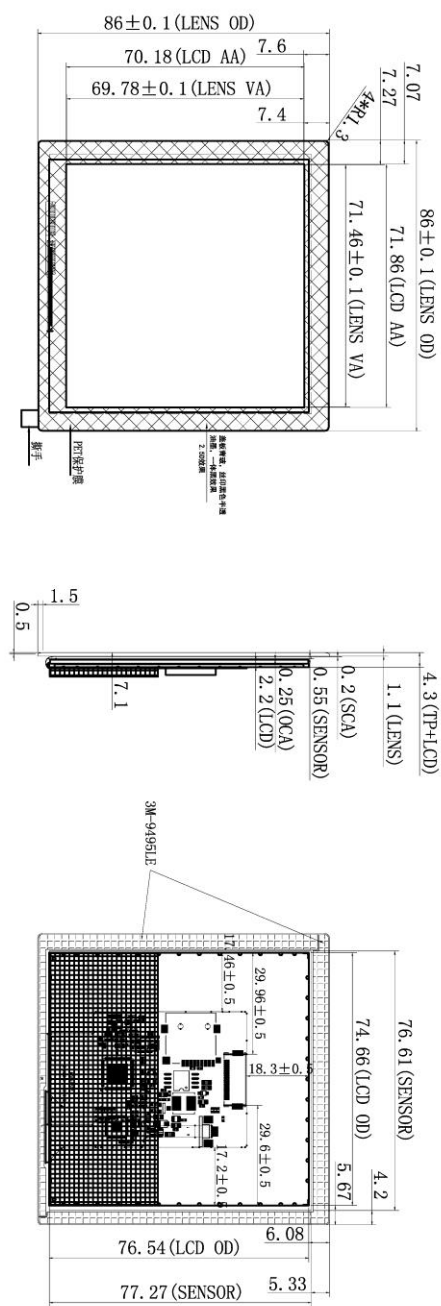
### CAN\_SN65HVD251



## 7 包装和物理尺寸 Packing Capacity & Dimension

| 尺寸 Dimension          |                               |                |                           |                         |
|-----------------------|-------------------------------|----------------|---------------------------|-------------------------|
| 外形尺寸<br>Dimension     | 86.0(W) ×86.0 (H) × 4.3(T) mm |                |                           |                         |
| 净重量<br>Net Weight     | 70g                           |                |                           |                         |
| 包装标准 Packing Capacity |                               |                |                           |                         |
| 包装箱型号<br>Model        | 包装箱尺寸<br>Size                 | 层数（层）<br>Layer | 数量/层（片）<br>Quantity/Layer | 总数量（片）<br>Quantity(Pcs) |
| 纸箱<br>Carton:         | 415mm(L)×250mm(W)×200mm(H)    | -              | -                         | 100                     |

正视图      侧视图      背视图



## 液晶屏PIN 定义

| Ptms | Name   |         |
|------|--------|---------|
| 1    | CAN TX | 13 AOC1 |
| 2    | CAN RX | 14 AOC6 |
| 3    | TX3    | 15 AOC7 |
| 4    | RX3    | 16 PNM3 |
| 5    | TX2    | 17 GND  |
| 6    | RX2    | 18 GND  |
| 7    | TX4    | 19 +5V  |
| 8    | TX4    | 20 +5V  |
| 9    | RX4    | 21 P33  |
| 10   | TX1    | 22 P32  |
| 11   | RX1    | 23 P31  |
| 12   | AD00   | 24 P30  |

\*.Circuit Diagram电路图  
(LED 10PCS) Color颜色:WHITE

[illegible]

8 修订记录 Record of Revision

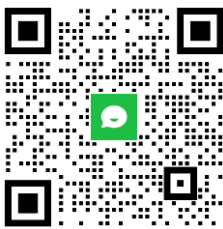
| 版本 Rev | 日期 Date    | 描述 Content                                       | 编辑人 Editor |
|--------|------------|--------------------------------------------------|------------|
| 00     | 2023-12-27 | 首次发布 First Edition                               | 郑运佳        |
| 01     | 2024-01-17 | 更新实物图 Update the actual picture                  | 陈律志        |
| 02     | 2024-01-19 | 修改型号和接口定义 Modify model number and pin definition | 陈律志        |
| 03     | 2024-06-18 | 添加调试示例 Add debugging example                     | 陈律志        |
| 04     | 2024-07-04 | 更新 CAD Update dimension diagram                  | 陈律志        |

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客服邮箱 Customer service email: [dwinhmi@dwin.com.cn](mailto:dwinhmi@dwin.com.cn)

迪文开发者论坛 DWIN Developer Forum: <http://inforum.dwin.com.cn:20080/forum.php>

感谢大家一直以来对迪文的支持，您的支持是我们进步的动力！

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

## 重要声明

### Important Disclaimer

迪文有权进行产品设计的任何改善或变更，且不另行单独通知客户。

客户应自行确保在产品应用过程中严格遵循所有相关标准及其他要求，包括但不限于功能安全、信息安全及监管等方面的规定。

对于客户在其产品中采用迪文产品可能引发的任何后果，迪文不承担连带责任。特别地，对于可能导致的重大财产损失、环境危害、人身伤害甚至死亡等风险，尤其是在军事、易燃易爆、生命医疗设备等高风险应用领域，客户应自行评估风险，并采取相应的预防和保护措施，迪文不承担相关责任。

DWIN reserves the right to make any changes to product designs without prior notice.

Customers should ensure strictly adhering to all the relevant standards and requirements during the product application process, including but not limited to functional safety, information security, and regulatory provisions.

DWIN shall not bear any joint and several liability for any consequences that may arise from customers' adoption of DWIN products. In particular, for risks that may lead to significant property losses, environmental hazards, personal injury, or even death, especially in high-risk application areas such as military applications, flammable and explosive places, and life-saving medical equipment, customers should independently assess the risks and take corresponding preventive and protective measures. DWIN shall not bear any relevant responsibility.