

# DMG48480C021\_13WTC

## 产品特点:

- 基于 T5L0-Q88 芯片，运行 DGUS II 系统，商业级产品。
- 2.1 英寸，480\*480 分辨率，262K 色，IPS 屏，宽视角。
- 全贴合工艺电容触摸屏。
- 圆形旋钮屏，带编码器外壳。

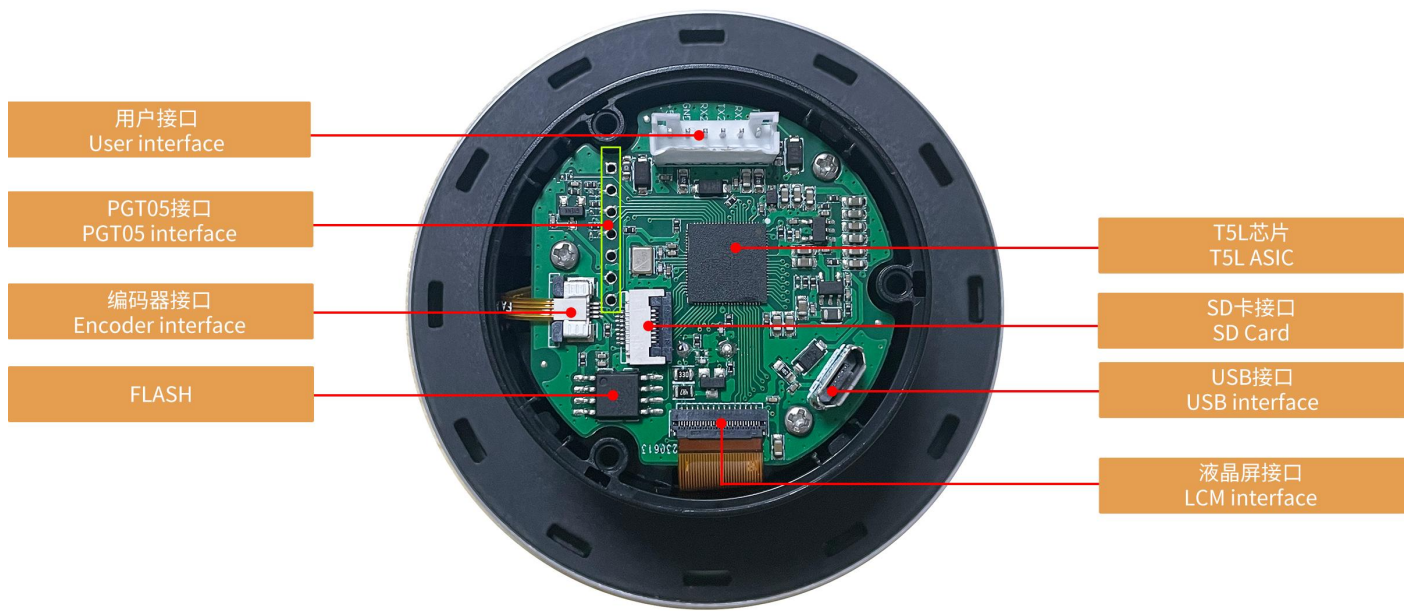
## Features:

- Based on T5L0-Q88, running DGUS II system, commercial grade.
- 2.1-inch, 480\*480 Pixels resolution, 262K Colors, IPS-TFT-LCD, Wide viewing angle.
- Full-laminated capacitive touch screen.
- Circular rotary screen with encoder shell.



## 1、硬件及接口 Hardware and interface

### 1.1 硬件接口图 Hardware interface



硬件接口图  
Hardware interface

## 1.2 硬件及接口说明 Hardware and interface description

序号 No.	名称 Name	说明 Description
1	T5L0-Q88 芯片 T5L0-Q88 ASIC	迪文自主研发，2023 年量产，1MBytes 片内 Nor Flash，其中 512KBytes 用于存储用户数据库，擦写次数>100,000 次 Developed by DWIN. Mass production in 2023,1MBytes Nor Flash on the chip, 512KBytes used to store the user database. Rewrite cycle: over 100,000 times
2	液晶屏接口 LCM interface	FPC31_0.5mm, 3SPI+16RGB 接口 FPC31_0.5mm, 3SPI+16RGB interface
3	用户接口 User interface	用于供电和串口通讯，6Pin_2.0mm 座子。串口下载速率（典型值）：12KByte/s 6Pin_2.0mm socket for power supply and serial communication. Download rate(typical value): 12KByte/s
4	USB 接口 USB interface	MICRO USB，供电接口（5V） MICRO USB, power supply interface (5V)
5	Flash	16MBytes NOR Flash，存放字库、图片、音乐文件，擦写次数>100,000 次 16MBytes NOR Flash, for fonts, pictures and audio files. Rewrite cycle: over 100,000 times
6	SD 卡接口 SD card interface	FPC8_0.5mm 接口，无 SD 卡卡座，下载需外接转接板。FAT32 格式，下载文件，文件可在屏幕统计显示，下载速率：4Mb/s FPC8_0.5mm interface, without SD card slots, external adapter board is required for downloading. FAT32, Download files by SD interface can be displayed in statistics. Download rate: 4Mb/s
7	PGT05 接口 PGT05 interface	当产品因意外无法正常运行时，可通过 PGT05 更新 DGUS 底层，使产品重新恢复正常 When product crashes by accident, you can use PGT05 to update DGUS kernel and make the product return to normal

## 2、规格参数 Specification parameters

### 2.1 显示参数 Display parameters

显示屏类型 LCD Type	IPS, TFT LCD
视角 Viewing Angle	宽视角, 典型值 85°/85°/85°/85° (L/R/U/D) Wide viewing angle, 85°/85°/85°/85° (L/R/U/D)
分辨率 Resolution	480×480 (支持 0°/90°/180°/270°显示模式) 480×480 pixels (0°/90°/180°/270°)
色彩 Color	18 位 6R6G6B 18-bit 6R6G6B
AA 区 Active Area (A.A.)	直径=53.28mm Diameter=53.28mm
VA 区 View Area (V.A.)	直径=53.88mm Diameter=53.88mm
背光模式 Backlight Mode	LED
背光寿命 Backlight Service Life	>20000 小时 (以最高亮度连续工作, 亮度减半时间) >20000 hours (Time of the brightness decaying to 50% on the condition of continuous working with the maximum brightness)
背光亮度 Brightness	350nit
背光调节 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) 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)
注: 长时间固定画面显示可能导致屏幕残影, 可以用动态图片切换做屏保解决。 Note: You can use dynamic screen saver wallpapers to avoid afterimages caused by fixed page display for a long time.	

### 2.2 触摸参数 Touch parameters

触摸屏类型 Type	电容式触摸面板 CTP (Capacitive touch panel)
触摸屏结构 Structure	G+FF 结构, 表面盖板为钢化玻璃 G+FF structure with surface cover of tempered glass
触摸方式 Touch Mode	单点触摸, 支持连续滑动触摸 Support point touch and drag
表面硬度 Surface Hardness	6H
透光率 Light Transmittance	90%以上 Over 90%
触控次数 Life	>1,000,000 次 Over 1,000,000 times touch

## 2.3 机械性能 Mechanical characteristics

卡点出脱力矩 Detent torque	只适用于附卡点装置: 300±100gf.cm Only suitable for C.C, equipment.: 300±100gf.cm
定位点数及位置 Number and Position of detents	只适用于附卡点装置: 24 点定位 (间隔角度 15° ±3° ) Only suitable for C.C, equipment.: 24 detents (Step angle : 15° ±3° )
回转寿命 Rotational life	在无负荷条件下轴以 600~1000/h 速度回转 30,000 周 The shaft of encoder shall be rotated to 30,000 cycles at a speed of 600~1000/h without electrical load, after which measurements shall be made
开关电路、接点数 Switch circuit and Number of pulse	单极单投 (推 ON) Single pole and single throw (push on)
开关移动量 Travel of switch	1.7±0.5mm
开关动作力 Operating force	6±3N (610±306gf)

## 2.4 串口参数 Serial interface parameters

串口模式 Mode	UART2: TTL/CMOS;				
串口电平 Voltage Level	测试条件 Test Condition	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
	Output 1, Iout = -4mA	3.0	3.3	-	V
	Output 0, Iout = 4mA	-	0	0.3	V
	Input 1	2.4	3.3	5.0	V
	Input 0	0	-	0.5	V
串口波特率 Baud Rate	3150~3225600bps, 典型值: 115200bps 3150~3225600bps, typical value of 115200bps				
数据格式 Data Format	N81				
接口排线 Interface Cable	6Pin_2.0mm				

## 2.5 电气规格 Electrical specifications

额定功率 Rated Power	<2W	
工作电压 Operating Voltage	4.5~5.5V, 典型值 5V 4.5~5.5V, typical value of 5V	
工作电流 Operating Current	155mA	VCC=5V, 背光亮度最大 VCC=5V, max backlight
	70mA	VCC=5V, 背光关闭 VCC=5V, backlight off
推荐工作电源: 5V 0.5A 的直流稳压电源 Recommended power supply: 5V 0.5A DC		

## 2.6 工作环境 Operating environment

工作温度 Operating Temperature	-20℃~70℃ (5V @ 60% RH)	
存储温度 Storage Temperature	-30℃~80℃	
三防漆工艺 Conformal coating	无 None	
工作湿度 Operating Humidity	10%~90%RH, 典型值 60%RH 10%~90%RH, typical value of 60% RH	

### 3、可靠性测试 Reliability test

#### 3.1 静电放电测试 Electrostatic discharge 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，如下图 3.1 所示；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 as shown in Fig.3.1 below. 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.



3.1 静电放电测试图

Electrostatic discharge test

放电类型 Discharge Type	放电值 Discharge Value	结果 Result
空气放电 Air discharge	±4KV	正常工作 Normal operation

#### 4、包装和物理尺寸 Packaging & dimensions

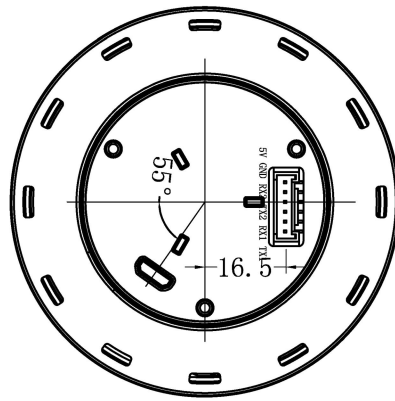
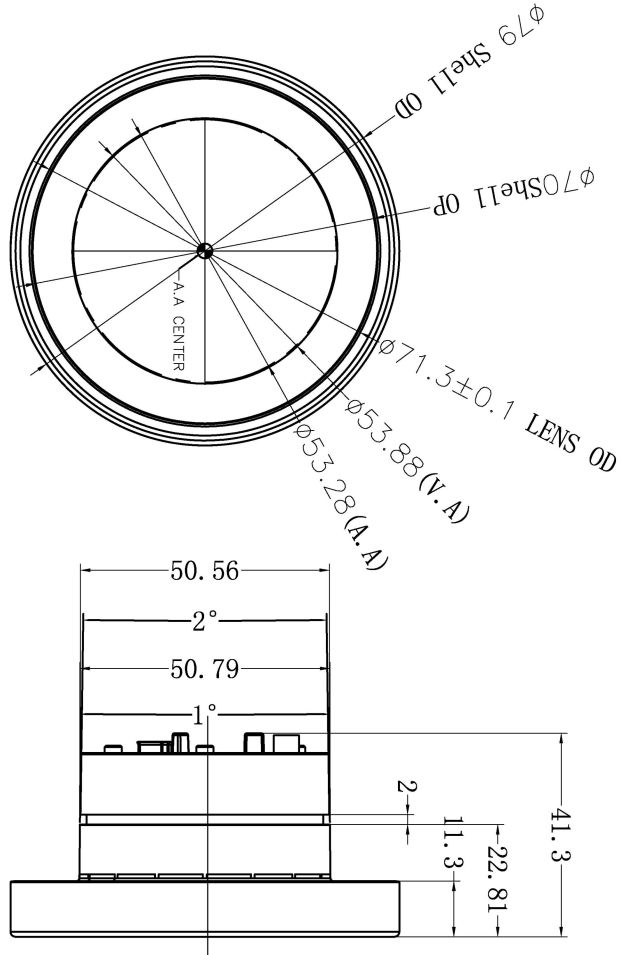
<b>外形尺寸</b> <b>Form Factor</b>	直径 79mm*高度 41.3mm 79mm diameter * 41.3mm height
<b>安装尺寸</b> <b>Installation dimensions</b>	直径 50.56mm*深度 16.5mm (非旋钮区) 50.56mm diameter * 16.5mm depth (Non knob area)
<b>净重量</b> <b>Net Weight</b>	85g

##### 包装标准 Packaging Standards

包装箱型号 <b>Model</b>	包装箱尺寸 <b>Dimensions</b>	层数 (层) <b>Layer</b>	数量/层 (片) <b>Quantity/Layer</b>	总数量 (片) <b>Quantity(Pcs)</b>
1 号箱 Carton1:	220mm(L)×160mm(W)×47mm (H)	-	-	-
2 号箱 Carton2:	250mm(L)×200mm(W)×80mm (H)	-	-	-
3 号箱 Carton3:	320mm(L)×270mm(W)×80mm (H)	-	-	-
4 号箱 Carton4:	435mm(L)×335mm(W)×290mm(H)	-	-	-
5 号箱 Carton5:	600mm(L)×430mm(W)×290mm(H)	2	30	60



定义 Definition	序号 Pin#	类型 Type	说明 Description
5V	1	P	电源输入 Power Input
GND	2	P	公共接地 GND
RX2	3	I	串口2输入 Input
TX2	4	O	串口2输出 Output
RX1	5	I	串口1输入 Input
TX1	6	O	串口1输出 Output



1. 尺寸定位基准为定位孔  
Location hole is used as position reference.  
2. 未标注公差为 $\pm 0.3\text{mm}$   
Unmarked Tolerance is  $\pm 0.3\text{mm}$   
注：虚线标注为有效显示区域  
Active area is marked in Dash lines

型号 Model	DMG48480C021-13WTC			
图纸 Drawing	A 4	绘制 Drawn	DWIN	日期 Date
比例 Scale	1:1	审核 Review		2023.07.20
单位 Unit	MM	批准 Approval		
迪文科技 DWIN Technologies				

## 5、T5L 系列芯片特点 T5L series IC features

(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 250MHz。

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) 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。

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

- 2D 硬件加速，JPEG 解压缩速度高达 200fps@1280\*800，UI 极其流畅。

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.

- 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.

- 支持电阻或电容触摸屏，灵敏度可以调节，最快 400Hz 触控打点速度。

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

- 1 路 15bit 32Ksps PWM 数字功放驱动扬声器，实现高品质语音压缩存储和播放。

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 变量存储器空间，存储器接口和 OS CPU 核交换数据，应用及其简单。

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

- 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 background remote upgrade.

(3) 单独 CPU 核（OS CPU）运行用户 8051 代码，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 architecture 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.

- 28 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。

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.

- 支持 IAP 在线仿真和调试，断点数量无限制。

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

- 可以透过 DGUS 系统在线升级代码。

Upgrade code online through DGUS system.

- (4) 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.

- (5)  $-40^{\circ}\text{C}\sim+85^{\circ}\text{C}$  工作温度范围 (可定制  $-55^{\circ}\text{C}\sim105^{\circ}\text{C}$  工作温度范围 IC)。

Operating temperature ranges from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  (IC operating temperature customizable from  $-55^{\circ}\text{C}$  to  $105^{\circ}\text{C}$ ).

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、修订记录 Revision records

版本 Rev	日期 Revise Date	描述 Content	编辑人 Editor
00	2023-07-21	首次发布 First edition	郑运佳

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