

# DMG40400F016\_06WTCZ02

## 产品概述:

- 基于 T5L0-Q88 芯片，运行 DGUS II 系统。
- 1.6 英寸，400\*400 分辨率，262K 色，IPS 圆形液晶屏，宽视角。
- 全贴合工艺电容触摸屏，一体黑盖板。
- 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.
- 1.6-inch, 400\*400 Pixels resolution, 262K Colors, IPS circular LCD , Wide viewing angle.
- Full-laminated CTP, Integrated black cover plate.
- 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 外部接口 External Interface

序号 PIN	定义 Definition	类型 Type	功能描述 Functional Description
1	+5V	P	供电输入, DC4.5-5.5V Power supply, DC4.5-5.5V
2	+5V		
3	RX2	I	串口 2 输入 UART2 DIN
4	TX2	O	串口 2 输出 UART2 DOUT
5	RX1	I	串口 1 输入 UART2 DIN
6	TX1	O	串口 1 输出 UART2 DOUT
7	SPK	O	外接 MOSFET 驱动蜂鸣器或扬声器 External MOSFET to drive buzzer or speaker
8	GND	P	公共地 GND
9	GND		
10	GND		



## 2 规格参数 Specification Parameters

### 2.1 产品参数 Product Parameters

主控芯片 Main Chip	T5L0-Q88*2
用户接口方式 User Interface	10Pin_1.0mm FPC
FLASH	16M Bytes
UI 版本 UI Version	DGUSII / TA
供电方式 Power Supply	HDL662K 转接板供电 HDL662K adapter board power supply
显示色彩 Display Color	262K 色 262K colors
尺寸 Dimensions	1.6 英寸 1.6-inch
分辨率 Resolution	400*400
显示尺寸 (A.A) Active Area	39.84mm (W)×39.84mm (H)
视域尺寸 (V.A) View Area	39.84mm (W)×39.84mm (H)
可视角度 L/R/U/D Viewing Angle	IPS 宽视角, 典型值 85° /85° /85° /85° (L/R/U/D) IPS wide viewing angle, 85° /85° /85° /85° (L/R/U/D)
背光寿命 Backlight Service Life	>10000 小时 (以最高亮度连续工作, 亮度减半时间) > 10000 hours (Time of the brightness decaying to 50% on the condition of continuous working with the maximum brightness)
亮度 Brightness	50nit
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)
触摸屏类型 Type	电容式触摸面板。 Capacitive touch panel.
触摸屏结构 Structure	G+FF 结构, 表层为钢化玻璃, 玻璃硬度≥6H。 G+FF structure with tempered glass surface and hardness ≥ 6H.
透光率 Light Transmittance	>85%

## 2.2 串口参数 Interface Parameters

参数 Item	测试条件 Conditions	最小值 Min	典型值 Typ	最大值 Max	单位 Unit
串口波特率 Baud rate	用户自定义（硬件配置文件设置） User Set(Configure the CFG file)	3150	115200	3225600	bps
串口输出电平 Output Voltage(TXD)	Output 1	3.0	3.3	-	V
	Output 0	-	0	0.3	V
串口输入电平 Input Voltage(RXD)	Input 1	-	-	3.3	V
	Input 0	0	-	0.5	V
串口模式 Interface	UART1: TTL; UART2: TTL;				
数据格式 Data Format	N81				

## 2.3 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	160mA	VCC=5V, 背光亮度最大 VCC=5V, max backlight
	80mA	VCC=5V, 背光关闭 VCC=5V, backlight off
推荐工作电源: 5V 1A 的直流稳压电源 Recommended power supply: 5V 1A DC		

## 2.4 工作环境 Operating Environment

工作温度 Operating Temperature	-10°C~60°C (5V @ 60% RH)
存储温度 Storage Temperature	-20°C~70°C
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

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

试验环境温度：25℃

Test temperature: 25℃

■ 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	/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/	/
/	/	/	/	/	/	/	/	/

### 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 Temperature	结果 Result
高温（70℃） High temperature（70℃）	A
低温（-20℃） 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。

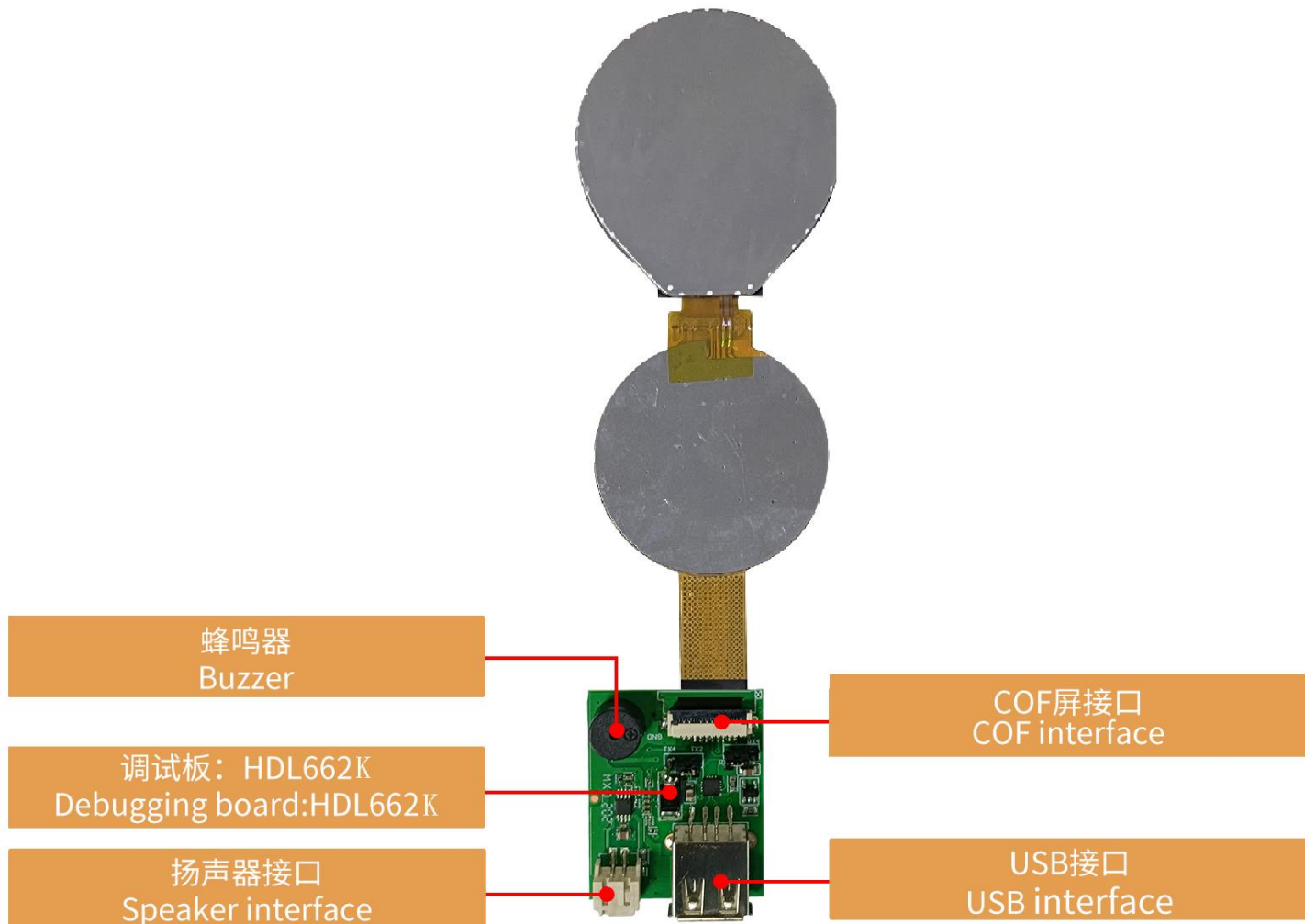
#### Performance Criterion:

- 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 Debug

建议首次使用迪文智能屏的用户购买测试套件。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.



请注意调试板与 COF 屏线序，请勿反接。

Please pay attention to the wiring sequence between the debugging board and the COF screen, do not reverse connect.

调试步骤：打开串口助手—自定义功能指令—设置指令—发送。

Operation steps: open serial assistant - custom function command - set command - send.

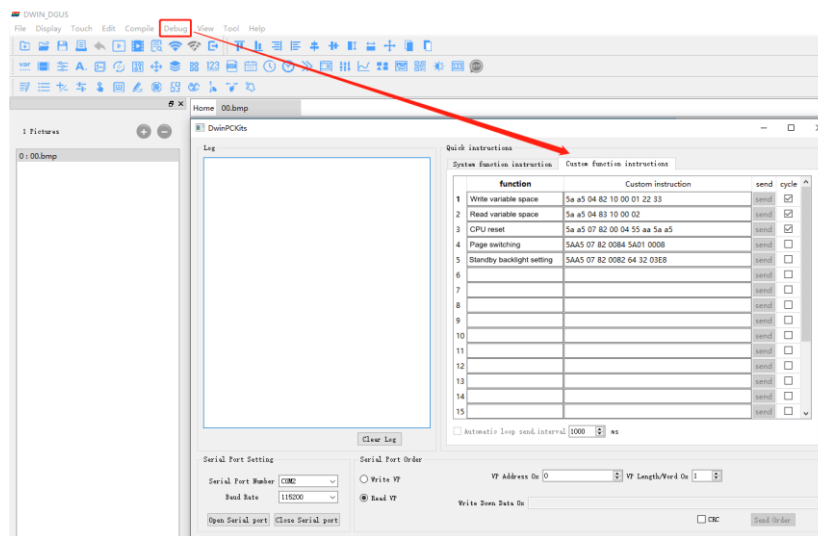
功能示例 For example:

(1) 调试切页 Page switching

Tx: 5AA5 07 82 0084 5A01 0008

(2) 待机设置 Standby backlight setting

Tx: 5AA5 07 82 0082 64 32 03E8



DGUS 操作图

DGUS operation



## 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) 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.

- (3) 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.

- (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°C~+85°C工作温度范围 (可定制-55°C~105°C工作温度范围 IC)。

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

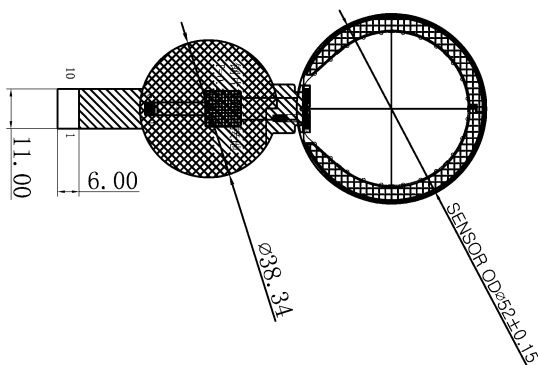
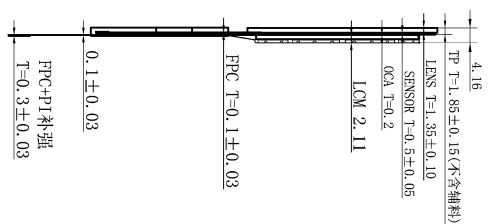
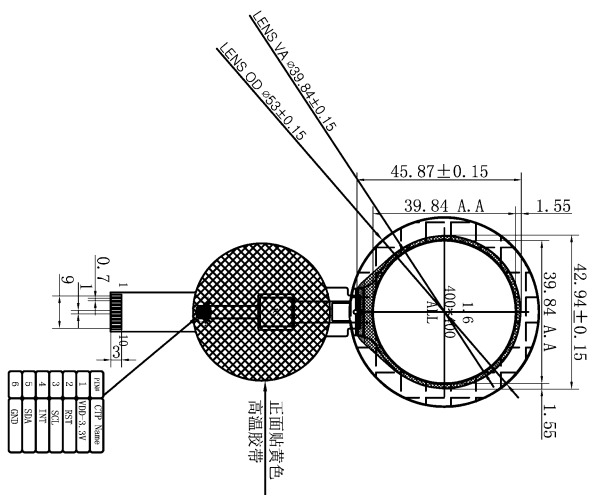
**迪文欢迎广大用户基于 T5L 自主设计客制化产品。**

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



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

尺寸 Dimension				
外形尺寸 Dimension	53.00(W) x53.00(H) x4.16(T) mm			
净重量 Net Weight	25g			
包装标准 Packing Capacity				
包装箱型号 Model	包装箱尺寸 Size	层数（层） Layer	数量/层（片） Quantity/Layer	总数量（片） Quantity(Pcs)
纸箱 Carton:	450mm(L)x385mm(W)x205mm(H)	-	-	100



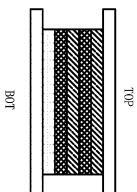
Pin	CTP Name
1	VDD-3.3V
2	RST
3	SCL
4	INT
5	SDA
6	GND


row	name
1	+TV
2	+TV
3	R2E
4	T2E
5	R2L
6	T2L
7	SPK
8	GRD
9	GRD
10	GRD

正视图  
侧视图  
背视图

### 技术要求:

1. G+T结构:  $\approx 1.85$  (一体模压成, LENS: 1.35 SINOSON 0.5);
2. IC透射:  $\phi 19.1$ , 通差 $\pm 0.7$ , 导电面朝上;
3. 透射率: 30% MIN;
4. \*为重要尺寸, LENS未标注边缘边
5. C: 0.125 $\pm$ 0.05, 最小R角: 0.5 $\pm$ 0.1;
5. 表面硬度:  $\geq 6H$ ;
6. 工作温度: -20~70°C;
7. 存储温度: -20~70°C;
8. 未标注尺寸公差 $\pm 0.2$ mm;
9. 符合RoHS标准;
10. SDA 4, 7K上电阻设计在PPC上面。
11. 通讯电压: 3.3V, 工作电压: 3V;

[illegible]

REVISION RECORD		VER	DATE	迪文科技有限公司			
1	初次发行	V1	20200612	FILE NAME :	DWC40000916 用户资料卡规格		TOLERANCES : $\pm 0.0$
2				CUSTOMER NAME :	SPONSOR:		ANGLES : $\pm 0.1^{\circ}$
3				DESIGN :	RELEASE:		SCALE : 1:1
4				DRAWN BY : L.L	DATE: 20200620		UNIT : mm
5				CHECKED BY	DATE		PRO. (3X)
6				APPROVED BY	DATE		SHEET : 1/1
							



## 7 修订记录 Record of Revision

版本 Rev	日期 Date	描述 Content	编辑人 Editor
00	2023-10-18	首次发布 First Edition	郑运佳
01	2023-12-06	调整配件 Adjusting accessories	郑运佳

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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

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