

SPECIFICATION

PRODUCT NO. : TCXD013IBLGA-5

VERSION : Ver 1.0

ISSUED DATE : 2023-07-07

FOR CUSTOMER: _____

☐ : APPROVAL FOR SPECIFICATION

☒ : APPROVAL FOR SAMPLE

DATE	APPROVED BY

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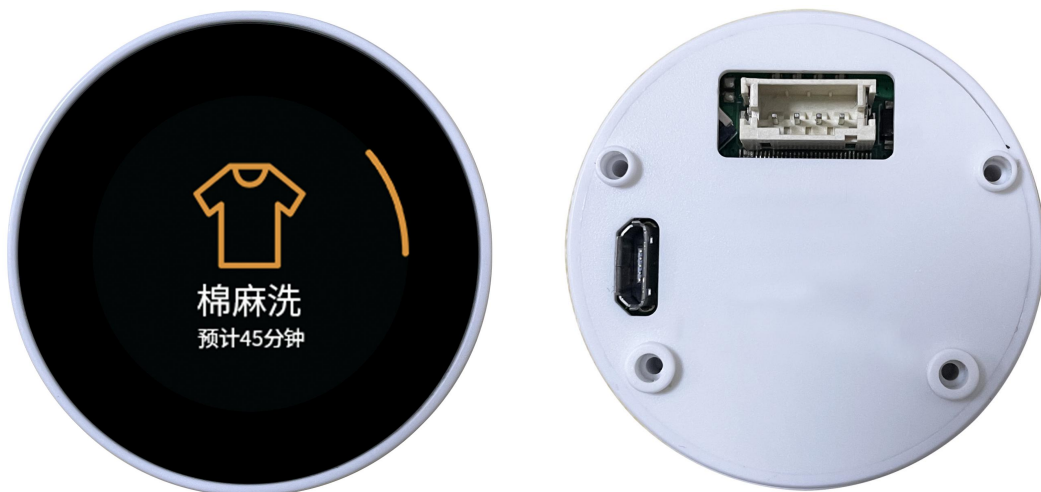
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产品特点:

- 基于 T5L0 芯片, 运行 DGUS II 系统, 商业级产品。
- 1.28 英寸, 240*240 分辨率, 262K 色, IPS 屏, 宽视角。
- 圆形旋钮屏, 带编码器外壳。

Features:

- Based on T5L0, running DGUS II system, commercial grade.
- 1.28-inch, 240*240 Pixels resolution, 262K Colors, IPS-TFT-LCD, Wide viewing angle.
- Circular rotary screen with encoder shell.



1、硬件及接口说明 Hardware and interface description

序号 No.	名称 Name	说明 Description
1	T5L0 芯片 T5L0 ASIC	新力自主研发，2020 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 XINLI. Mass production in 2020,1MBytes 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	FPC12_0.5mm, 4SPI 接口 FPC12_0.5mm, 4SPI interface
3	用户接口 User interface	用于供电和串口通讯，4Pin_2.0mm 座子。串口下载速率（典型值）：12KByte/s 4Pin_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	FPC10_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 FPC10_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	240×240 (支持 0°/90°/180°/270°显示模式) 240×240 pixels (0°/90°/180°/270°)
色彩 Color	18 位 6R6G6B 18-bit 6R6G6B
AA 区 Active Area (A.A.)	直径=32.4mm Diameter=32.4mm
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	400nit
背光调节 Brightness Control	不可调 Non adjustable
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 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°)
寿命 Life	开关：30,000 次，编码器：30,000 次 Switch: 30000 times, Encoder: 30000 times
开关回弹力 Switch return force	450g±200g

2.3 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	4Pin_2.0mm				

2.4 电气规格 Electrical specifications

额定功率 Rated Power	<1W
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	95mA @ 5V
推荐工作电源: 5V 0.2A 的直流稳压电源 Recommended power supply: 5V 0.2A DC	

2.5 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

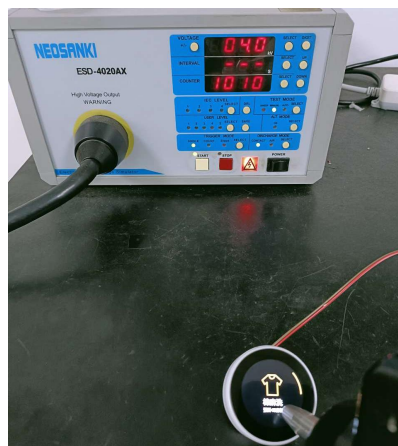
3.1 静电放电测试 Electrostatic discharge test

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

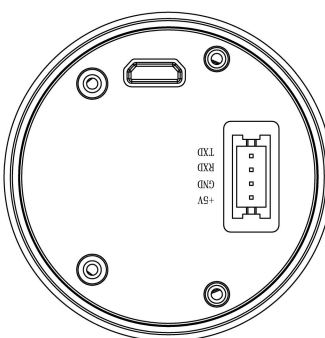
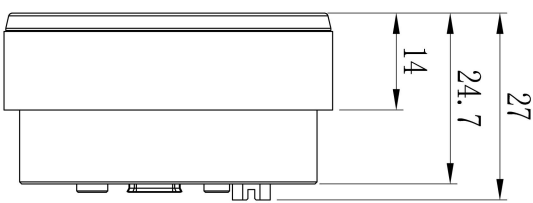
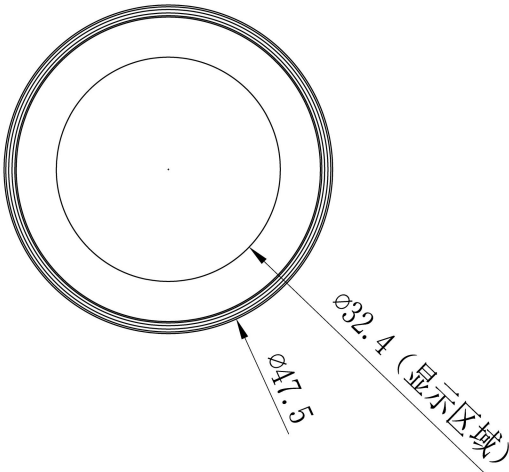
Electrostatic discharge test

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

外形尺寸 Form Factor	直径 47.5mm*高度 27.0mm 47.5mm diameter * 27.0mm height			
净重量 Net Weight	35g			
包装标准 Packaging Standards				
包装箱型号 Model	包装箱尺寸 Dimensions	层数（层） Layer	数量/层（片） Quantity/Layer	总数量（片） Quantity(Pcs)
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)	-	-	-

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
RXD	3	I	串口输入 Input
TXD	4	O	串口输出 Output



图号 Model	TCXD0131BLGA-5					
图例 Drawing	A 4	绘制 Drawn		日期 Date		
比例 Scale	1:1	审核 Review		日期 Date		
单位 Unit	MM	批准 Approval		日期 Date		

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

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Zhejiang Xinli Optoelectronics Technology Co., Ltd

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 XINLI 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-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 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，新力专利加密技术，确保代码和数据安全，杜绝山寨和克隆。

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

- (5) -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℃).