

ShenZhen Genyu Optical Co.,Ltd

Specification For Approval

| | |
|---------------------|----------------------|
| Customer Name 客户名称 | |
| Customer Model 客户机型 | |
| Project Name 机种名 | <u>GY-TFT028F276</u> |
| Date 日期 | <u>2023.12.21</u> |
| Version 版本 | <u>V0</u> |

☒ Preliminary Specification

☐ Final Specification

Customer' s Acceptance 客户承认:

This module uses RoHS material. 模块使用环保材料.

| Comment 承认意见 | Approved by 承认人 |
|--------------|-----------------|
| | |

晶耀:

| Written by 撰写 | Checked by 审核 | Approved by 批准 |
|---------------|-----------------|----------------|
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Revision Record

修改记录

| Rev No 版本号 | Date 时间 | Description 内容 |
|---------------|--------------|-------------------|
| V0 | 2023. 12. 21 | First Issue |
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1. General Specifications 基本规格

| No. | Item 项目 | Specification 规格 | Unit 单位 | Remark |
|-----|----------------------------|-----------------------------|---------|--------|
| 1 | LCD Size 液晶面板尺寸 | 2.8" | inch | - |
| 2 | Panel Type 面板类型 | | - | - |
| 3 | Resolution 分辨率 | 240 (RGB)*320 | Pixel | - |
| 4 | Display Mode 显示模式 | TN | | - |
| 6 | Viewing Direction 使用视角 | 12 :00 | - | Note1 |
| 7 | Luminance 亮度 | | cd/m2 | Typ. |
| 8 | Module Size 模组尺寸 | 50.00 (H)*69.20 (V)*2.4 (T) | mm | Note1 |
| 9 | Panel Active Area 可视区域 | 43.20 (H)*57.60 (V) | mm | Note1 |
| 10 | Pixel Arrangement 像素排列 | RGB-Stripe | | - |
| 11 | Weight 重量 | | g | - |
| 12 | Driver IC 驱动芯片 | ST7789V3 | - | - |
| 13 | Light Source 背光源 | 4PCS WHITE 并联 | - | - |
| 14 | Interface 接口方式 | 4SPI | - | - |
| 15 | Operating Temperature 工作温度 | -20~70 | ℃ | - |
| 16 | Storage Temperature 存储温度 | -30~80 | ℃ | - |

Note 1: Please refer to the mechanical drawing; 注 1: 请参照模组图;

2. Pin Assignments 接口定义

| Pin No. Pin 序号 | Symbol 符号 | Function 功能描述 |
|-------------------|-----------|--------------------------------------|
| 1 | LEDK1 | Backlight Negative Power Supply |
| 2 | LEDK2 | |
| 3 | LEDK3 | |
| 4 | LEDK4 | |
| 5 | LEDA | Backlight Positive Power Supply |
| 6 | GND | Ground |
| 7 | RESET | Chip reset signal |
| 8 | CS | Chip Select Pin |
| 9 | SCL | SPI interface Clock input/output pin |
| 10 | RS | Command/Data access Select pin |
| 11 | SDA | SPI interface DATA input/output pin |
| 12 | GND | Ground |
| 13 | VCC | Power Supply For LCM |
| 14 | GND | Ground |
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3. Electrical Specification 电气特性

3.1 Absolute Maximum Ratings 极限参数

| Item 项目 | Symbol | Value | Unit | Remark |
|--|--------|-----------|------|--------|
| Analog Power Supply Voltage 模拟供电电压 | VDD | -0.3~+4.6 | V | - |
| Digital Power Supply Voltage 数字电源电压 | VCC | -0.3~+2 | V | - |
| I/O Power Supply Voltage I/O端口供电电压 | VDDI | -0.3~+4.6 | V | - |

3.2 Typical Operation Conditions 典型工作条件

| Item 项目 | Symbol | Min. 最小 | Typ. 典型 | Max. 最大 | Unit |
|--------------------------|-----------------|---------|---------|---------|------|
| System Supply Voltage | VDD | 2.4 | 2.75 | 3.3 | V |
| Digital Supply Voltage | VDDI | 1.65 | 1.8 | 3.3 | V |
| Gate Driver High Voltage | VGH | 12.2 | | 14.97 | V |
| Gate Driver Low Voltage | VGL | -12.5 | | -7.16 | |
| Input High Voltage | V _{IH} | 0.7VDDI | | VDDI | V |
| Input Low Voltage | V _{IL} | VSS | | 0.3VDDI | V |
| Output High Voltage | V _{OH} | 0.8VDDI | | VDDI | V |
| Output Low Voltage | V _{OL} | VSS | | 0.2VDDI | V |

3.3 Backlight Circuit Characteristics 背光功耗

| Item | Symbol | Min. | Typ. | Max. | Unit |
|----------------------|----------|------|------|------|------|
| LED Current 背光电流 | I_B | | 80 | — | mA |
| LED Voltage 背光电压 | Vf | | 3.0 | | V |
| Power Consumption 功耗 | P_{BL} | — | | — | mW |

3.4 LCD Current Consumption 液晶面板功耗

| Item | Symbol | Typ. | Max. | Unit |
|---|--------|------|------|------|
| Full Mode 正常模式 | VDD | — | — | mA |
| 测试条件: VDD=2.8V, VDDI=1.8V; Interface 驱动类型: 行翻转或者列翻转; TN Type=>All Black Pattern. TN型液晶面板=>黑色画面; IPS Type=>All White Pattern. IPS型液晶面板=>白色画面; Temperature: 25℃; 温度: 室温25摄氏度; | | | | |
| Sleep Mode 休眠模式 | VDD | — | — | uA |
| 测试条件: VCI=2.8V, IOVCC=2.8V; DC/DC converter is enabled. Internal oscillator is started and panel scanning is started. 除IC内部晶振和面板扫描外, 其他功能都暂停工作; Temperature: 25℃; 温度: 室温25摄氏度; | | | | |

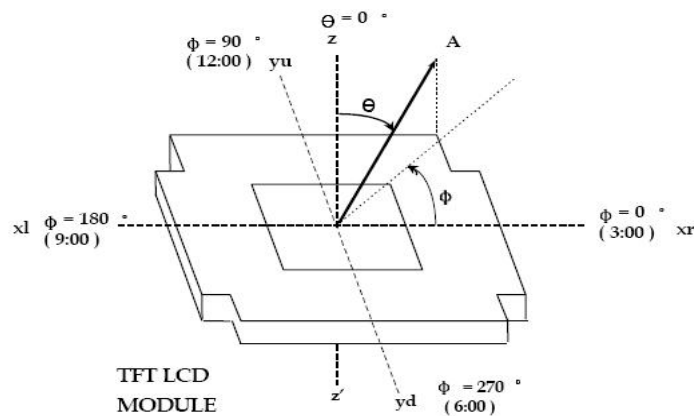
4. Optical Specification 光学参数

4.1 LCM Optical Characteristics 液晶模组光学特性

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit |
|--|--------|---------------------|---------------------------------------|------------|-------|------|-------------------|
| Viewing Angle Range 视角 | Left | θ_{L} | $\text{CR} \geq 10$ | — | 80 | — | degree |
| | Right | θ_{R} | | — | 80 | — | |
| | Top | θ_{T} | | — | 80 | — | |
| | Bottom | θ_{B} | | — | 80 | — | |
| Response Time 响应时间 | | Ton+Toff | $\theta = \Phi = 0^{\circ}$ | — | 30 | | ms |
| Contrast Ratio 对比度 | | CR | $\theta = \Phi = 0^{\circ}$ | — | | — | — |
| Luminance 亮度 | | L | $\theta = \Phi = 0^{\circ}$ | — | | — | cd/m ² |
| Color Chromaticity (CIE1931) 色坐标 | White | W_{x} | Normal $\theta = \Phi = 0^{\circ}$ | — | 0.308 | — | — |
| | | W_{y} | | — | 0.327 | — | |
| | Red | R_{x} | | — | 0.610 | — | |
| | | R_{y} | | — | 0.329 | — | |
| | Green | G_{x} | | — | 0.299 | — | |
| | | G_{y} | | — | 0.567 | — | |
| | Blue | B_{x} | | — | 0.143 | — | |
| | | B_{y} | | — | 0.111 | — | |
| Uniformity 均匀度 | | U_{L} | $\theta = \Phi = 0^{\circ}$ | 80 | — | — | % |
| Flicker 闪烁 | | — | — | No Visible | | | — |

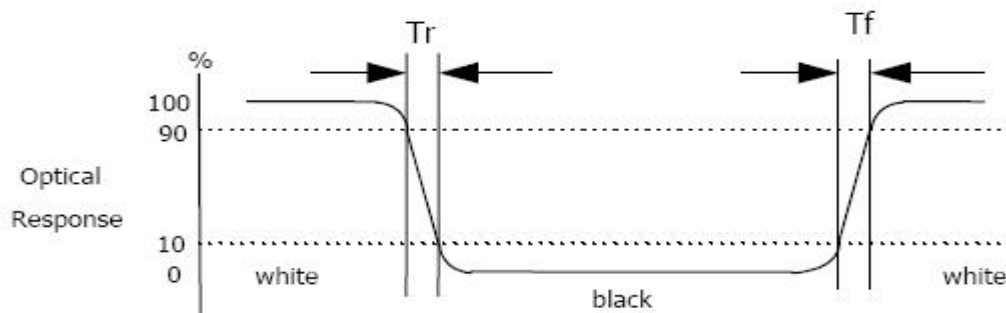
4.2 Measurement system 测量系统

4.2.1 LCM Viewing Angle



Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.

4.2.2 Response time



Response time is the time required for the display to transition from white to black (Rising time, T_r) and from black to white (Falling time, T_f) for additional information.

4.2.3 Contrast Ratio (CR)

Contrast Ratio (CR) is defined mathematically as:

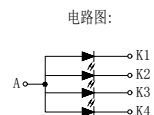
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white

| PIN | Symbol |
|-----|--------|
| 1 | LEDK1 |
| 2 | LEDK2 |
| 3 | LEDK3 |
| 4 | LEDK4 |
| 5 | LED A |
| 6 | GND |
| 7 | RESET |
| 8 | CS |
| 9 | SCL |
| 10 | RS |
| 11 | SDA |
| 12 | GND |
| 13 | VCC |
| 14 | GND |

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| | |
|---------------|---------------|
| LCD型号/类型/分辨率 | 2.8/TN/QVGA |
| 视角方向 | 12 0' Clock |
| 偏光片 | 上磨45° /下光45° |
| 驱动IC | ST7789V3 |
| LED颗数/连接方式/电流 | 4-LED/并联/80mA |
| 背光底色要求 | 正白偏红 |



技术要求:

- 带*尺寸为重点尺寸, 带 () 尺寸为参考尺寸
- LCD切割断面崩边 $\leq 1/3$ (单层LCD厚度)
- 平面翘曲度 $\leq 0.35\text{mm}$
- 符合RoHS指令
- 工作温度: $-20^{\circ}\text{C} \sim 70^{\circ}\text{C}$
- 储存温度: $-30^{\circ}\text{C} \sim 80^{\circ}\text{C}$
- 建议TP V. A开窗比LCD A. A单边大0.4mm
- 泡棉开窗比LCD A. A单边大0.3mm

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|-----|------|--------------|-----|------------|
| V0 | 首次发行 | 原F255改丝印新增型号 | KZH | 2023.05.06 |
| REV | SIGN | DESCRIPTION | PIC | DATE |

| | | | | | |
|------------------|-----|---------------------------------|------------|--------------|------------------|
| PART DESCRIPTION | LCM | ShenZhen Genyu Optical Co., Ltd | | | |
| DESIGNED | | UNIT | SCALE | 3rd ANGLE | SHEET NUMBER |
| | | mm | 1.00 | | 1 of 1 |
| CHECKED | | PART NUMBER | | | |
| APPROVED | | MODEL NAME | TFT028F276 | | |
| | | | | DRAWING REV. | PART NUMBER VER. |
| | | | | A | N/A |

6. Reliability Test Items 可靠性测试项目

| Test Item 测试项目 | Test Condition 测试条件 | Test result determinant gist 实验结果判定 |
|--------------------------------------|--|--|
| High temperature storage 高温存储 | 80±3℃, 24H; | Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 试验结束后, 已测试的LCD样品必须在室内正常温湿度环境下放置2~4个小时以上才能进行功能和外观检查, 样品不允许有以下缺陷: 1. Air bubble in the LCD; 模块中有气泡; 2. Non-display; 不显示; 3. Glass crack; 玻璃破碎; 4. The electrical characteristics requirements shall be satisfied. 需要满足模块电气性能。 |
| Low temperature storage 低温存储 | -30±3℃, 24H; | |
| High temperature operation 高温运行测试 | 70±3℃, 24H; | |
| Low temperature operation 低温运行测试 | -20±3℃, 24H; | |
| High temperature /humidity 高温高湿 | 60℃±3℃, 90%±3%RH, 24H; | |
| Thermal Shock 冷热冲击 | -30℃/0.5h~+80℃/0.5h for a total 24 cycles; | |
| Vibration Test 振动测试 | Frequency 10Hz~55Hz~10Hz Amplitude: 1.5mm, X, Y, Z direction for total 1H; (Packing condition) | |
| ESD test 静电测试 | ±2KV, Human Body Mode, 150pF/330Ω; ±8KV, Air Mode, 150pF/330Ω; | |

Remark: 注意:

1. The test samples should be applied to only one test item.

每个被测试的模块只能用于其中的一个测试项目。

2. Sample size for each test item is 2pcs.

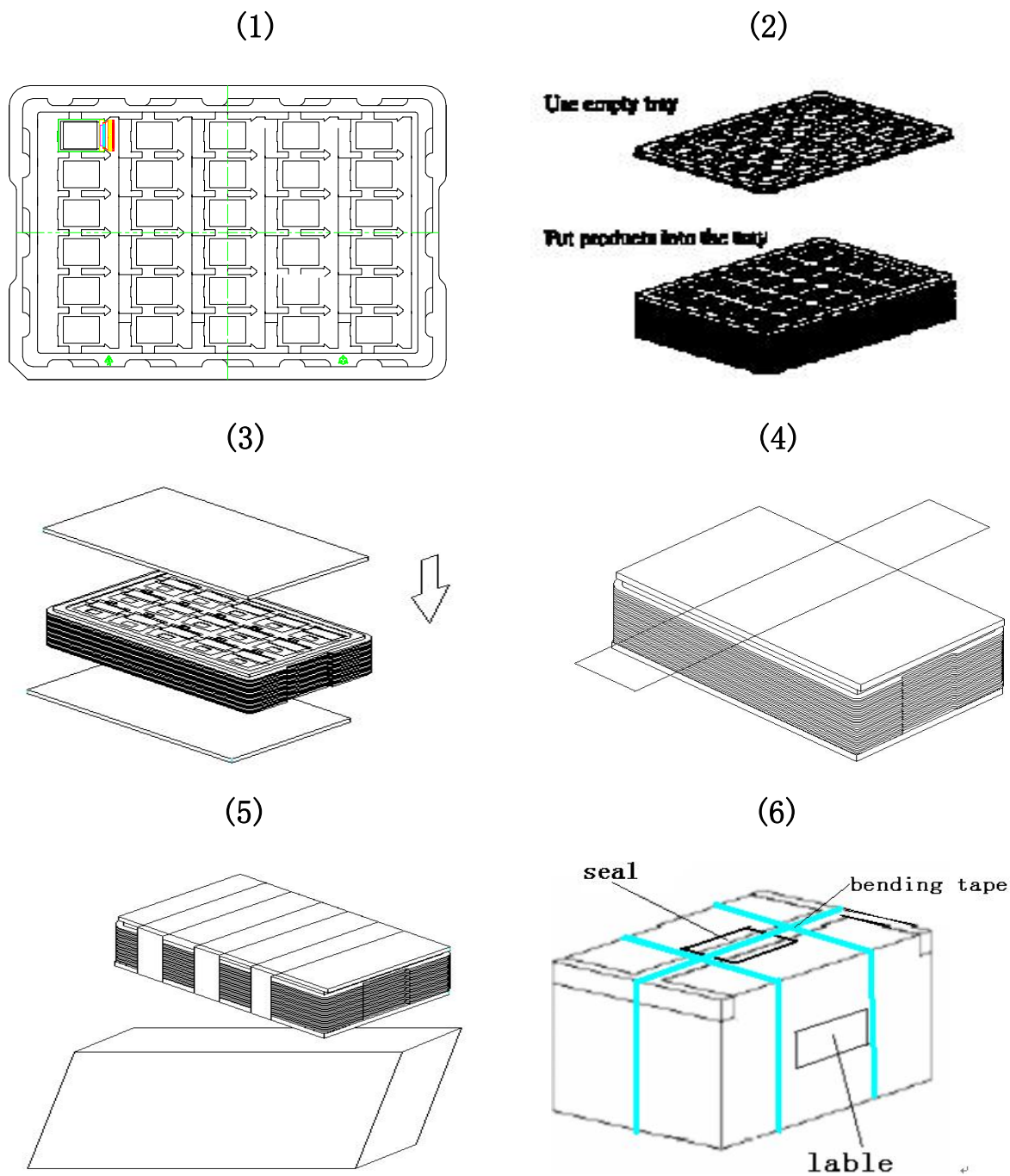
每个测试项目的样品数量为2片。

3. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

故障判断标准: 基本规格, 电气特性, 机械特性, 光电特性。

7. Packing and Storage Specification(Reference Only) 包装存储

7.1 Packing Method 包装方法



1. Put module into tray cavity. 把模块放进托盘.
2. Tray stacking. 托盘叠装.
3. Put 1 foam under the tray stack and 1 foam above. 在托盘上下放卡板.
4. Fix the cardboard to the tray stack with adhesive tape. 绑胶带.
5. Put the tray stack into carton. 把邦好的托盘放进纸箱.
6. Carton sealing with adhesive tape. 封纸箱.

7.2 Storage Method 存储方法

1. Store in an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, and in a relative humidity of $55\% \pm 15\%$. Don't exceed 12 months and expose to sunlight or fluorescent light.

存储环境温度为 $23 \pm 5^{\circ}\text{C}$ ，相对湿度为 $55\% \pm 15\%$ ，存储不能超过 12 个月，不要长时间暴晒。

2. Store in a clean environment, free from dust, active gas, and solvent.

存储在一个干净的环境，不受灰尘，活性气体和溶剂污染。

3. Store in antistatic container.

存储在防静电环境。