



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : HG097QX003T02

Preliminary Specification

Final Specification

Customer Confirmation column:

Approved by : _____ Dept. : _____ Date : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

| Designed by | Checked by | Approved by |
|-------------|------------|-------------|
| | | |



Revision History

| Version NO. | DATE | Description | Remak |
|-------------|------------|-------------|-------|
| V1.0 | 2018.10.28 | FIRST ISSUE | |
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1. GENERAL INFORMATION

1.1 features

- 1) Structure: TFT PANNEL+IC+FPC+BL+CTP+PCBA
- 2) IPS Type LCD 2048 dot-segment and 1536 dot-common outputs
- 3) 16.7M Color can be selected by software
- 4) White LED back light
- 5) EDP 4LANE interface
- 6) Operation Temperature : 0~50°C
- 7) Storage Temperature : -20~60°C
- 8) Cover lens : 3mm tempered glass
- 9) CTP structure : -
- 10) LED life time: -/

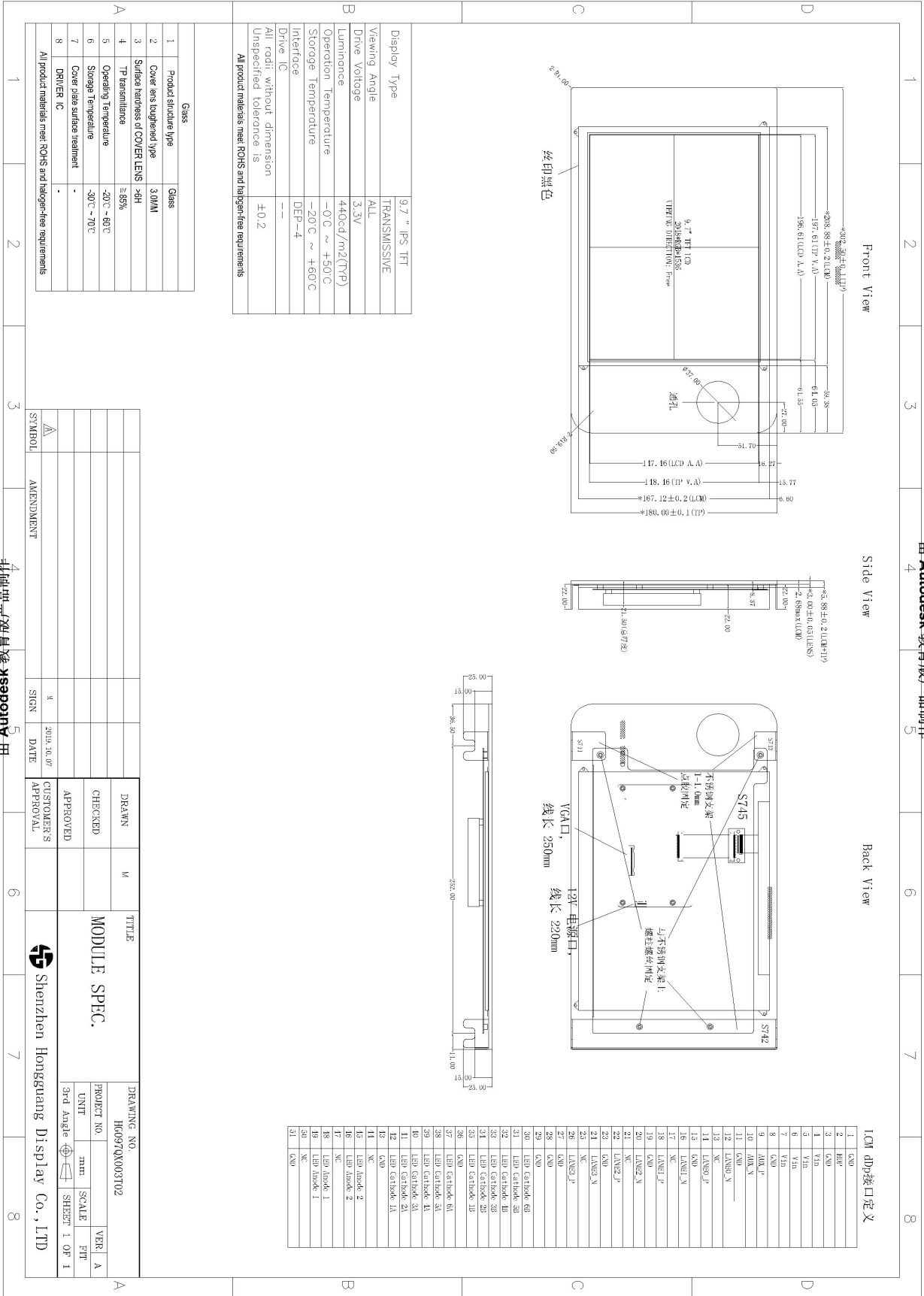
1.2 General specification

| Item of | Contents | Unit |
|-------------------------------|--------------------------------|----------|
| Panel Size | 9.7 | inch |
| LCD Type | a-si/TRANSMISSIVE | / |
| Display mode | Normally Black | / |
| Pixel arrangement | 2048*3(RGB)*1536 | Dots |
| Pixel pitch (W*H) | 0.192(H)*0.192 (V) | um |
| Active Area | 196.608 (V) × 147.456 (H) | Mm |
| Module area (W*H*T) | 302.5 (V) × 180 (H) × 21.5 (T) | Mm |
| Recommended Viewing Direction | ALL | 0' clock |
| IC | - | / |
| Interface | 4 lane EDP | / |
| Luminance for LCM+TP | 400 | cd/m2 |
| NTSC | 70 | % |
| Weight | TBD | g |



2. DIAGRAM FOR LCM+TP+PCBA

由 Autodesk 教育版产品制作



由 Autodesk 教育版产品制作



3. LCM main parameters

3.1 I/O connection

| LCM Pin NO. | Symbol | Description |
|-------------|----------------|---------------------------------|
| 1 | GND | Ground |
| 2 | HPD | Hot Plug detect |
| 3 | GND | Ground |
| 4-7 | Vin | VCC 3.3V |
| 8 | GND | Ground |
| 9 | AUX_P | True Signal Auxiliary Ch. |
| 10 | AUX_N | Complement Signal Auxiliary Ch. |
| 11 | GND | Ground |
| 12 | LANE0_N | Complement Signal Link Lane 0 |
| 13 | NC | NC |
| 14 | LANE0_P | True Signal Link Lane 0 |
| 15 | GND | Ground |
| 16 | LANE1_N | Complement Signal Link Lane 1 |
| 17 | NC | NC |
| 18 | LANE1_P | True Signal Link Lane 1 |
| 19 | GND | Ground |
| 20 | LANE2_N | Complement Signal Link Lane 2 |
| 21 | NC | NC |
| 22 | LANE2_P | True Signal Link Lane 2 |
| 23 | GND | Ground |
| 24 | LANE3_N | Complement Signal Link Lane 3 |
| 25 | NC | NC |
| 26 | LANE3_P | True Signal Link Lane 3 |
| 27-29 | GND | Ground |
| 30 | LED Cathode 6B | LED Cathode (Negative) |
| 31 | LED Cathode 5B | LED Cathode (Negative) |
| 32 | LED Cathode 4B | LED Cathode (Negative) |
| 33 | LED Cathode 3B | LED Cathode (Negative) |
| 34 | LED Cathode 2B | LED Cathode (Negative) |
| 35 | LED Cathode 1B | LED Cathode (Negative) |
| 36 | GND | Ground |
| 37 | LED Cathode 6A | LED Cathode (Negative) |
| 38 | LED Cathode 5A | LED Cathode (Negative) |
| 39 | LED Cathode 4A | LED Cathode (Negative) |



| | | |
|----|----------------|------------------------|
| 40 | LED Cathode 3A | LED Cathode (Negative) |
| 41 | LED Cathode 2A | LED Cathode (Negative) |
| 42 | LED Cathode 1A | LED Cathode (Negative) |
| 43 | GND | Ground |
| 44 | NC | NC |
| 45 | LED Anode 2 | LED Cathode (Positive) |
| 46 | LED Anode 2 | LED Cathode (Positive) |
| 47 | NC | NC |
| 48 | LED Anode 2 | LED Cathode (Positive) |
| 49 | LED Anode 2 | LED Cathode (Positive) |
| 50 | NC | NC |
| 51 | GND | Ground |

3.2. ABSOLUTE MAXIMUM RATINGS

(GND=AGND=0V)

| Parameter of absolute maximum ratings 参数 | Symbol 符号 | Min 最小值 | Max 最大值 | Unit 单位 |
|------------------------------------------|------------------|---------|---------------|------------------|
| Power supply voltage1 | VCC | -0.3 | 4 | V |
| Backlight forward current | I _{LED} | -0.001 | 30 | mA(For each led) |
| Operating temperature | T _{op} | 0 | 50 | °C |
| Storage temperature | T _{st} | -20 | 60 | °C |
| Humidity | RH | - | 90%(Max)/50°C | RH |



3.3. ELECTRO-OPTICAL CHARACTERISTICS

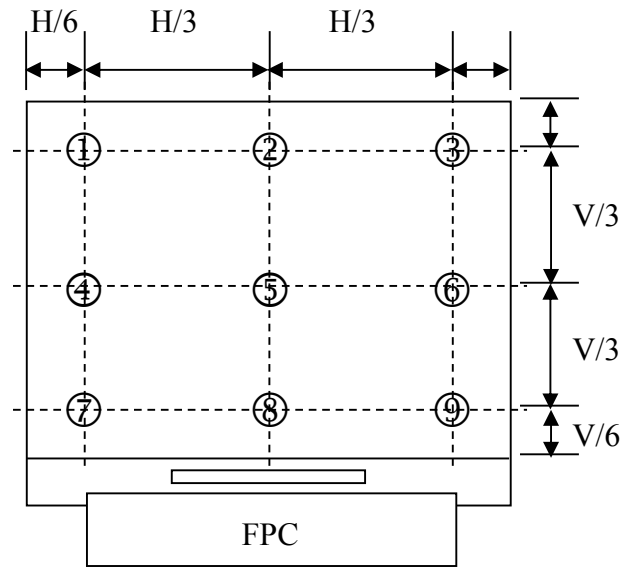
| Parameter | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | |
|-------------------------------------|-------|----------------|---------------------------------------------------------------|-------|-------|------|------|---------|---------|
| Contrast Ratio (Center point) | | C/R | - | 600 | 800 | - | - | Note(1) | |
| Luminance uniformity | | U _w | θ = 0. Normal viewing angle B/L On Note(1) | 70 | 80 | - | % | Note(2) | |
| Response Time | | Tr + Tf | | - | 16 | 25 | ms | Note(3) | |
| Color Chromaticity (CIE 1931) | White | W _x | | | 0.306 | | | 参考 值 | Note(5) |
| | | W _y | | | 0.320 | | | | |
| | Red | R _x | | 0.642 | | | | | |
| | | R _y | | 0.335 | | | | | |
| | Green | G _x | -0.02 | 0.315 | +0.02 | | | | |
| | | G _y | | 0.609 | | | | | |
| | Blue | B _x | | 0.154 | | | | | |
| | | B _y | | 0.054 | | | | | |
| Viewing Angle | Hor. | ∅ 3R | C/R≥10 | | 80 | - | Deg | Note(4) | |
| | | ∅ 9L | | | 80 | - | | | |
| | Ver. | ∅ 12U | | | 80 | - | | | |
| | | ∅ 6D | | - | 80 | - | | | |



Note1 Definition of Contrast Ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note2: Definition of Luminance Uniformity: Active area is divided into 9 measuring areas (Shown in below), every measuring point is placed at the center of each measuring area.



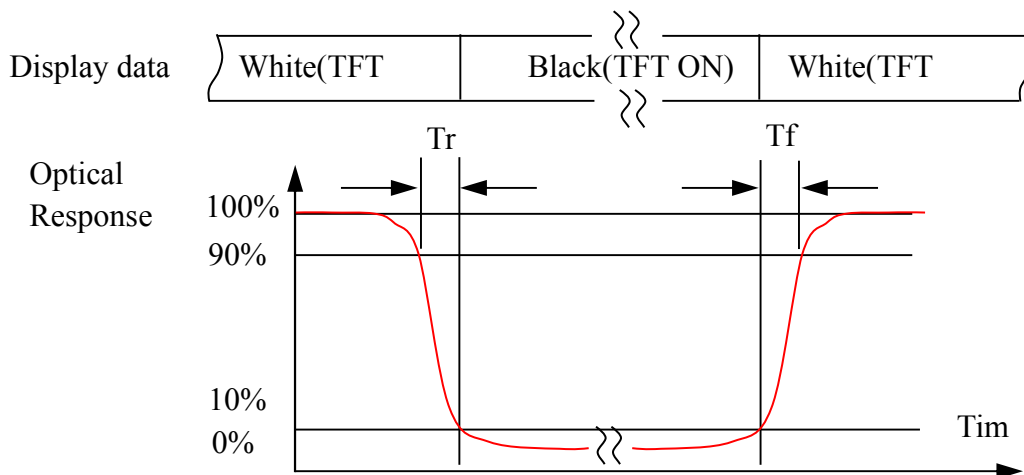
The spot locations for luminance measurement

$$\text{Luminance Uniformity} = \frac{H/6 \cdot B_{\min}}{V/6 \cdot B_{\max}} \times 100\%$$

B_{\max} : The measured maximum luminance of all measurement position.

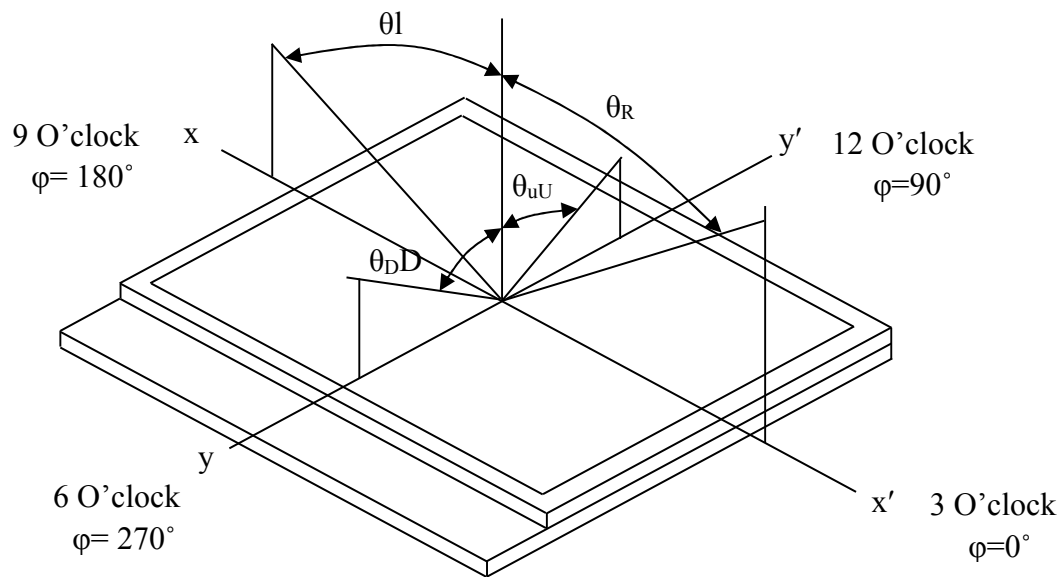
B_{\min} : The measured minimum luminance of all measurement position.

Note 3: Definition of Response time: Sum of T_r and T_f





Note4. Definition of Viewing Angle: The viewing angle range that the $CR \geq 10$



Note 5: Definition of Color Chromaticity (CIE 1931)

Color coordinate of white & red, green, blue at center point.



4. PCB 参数

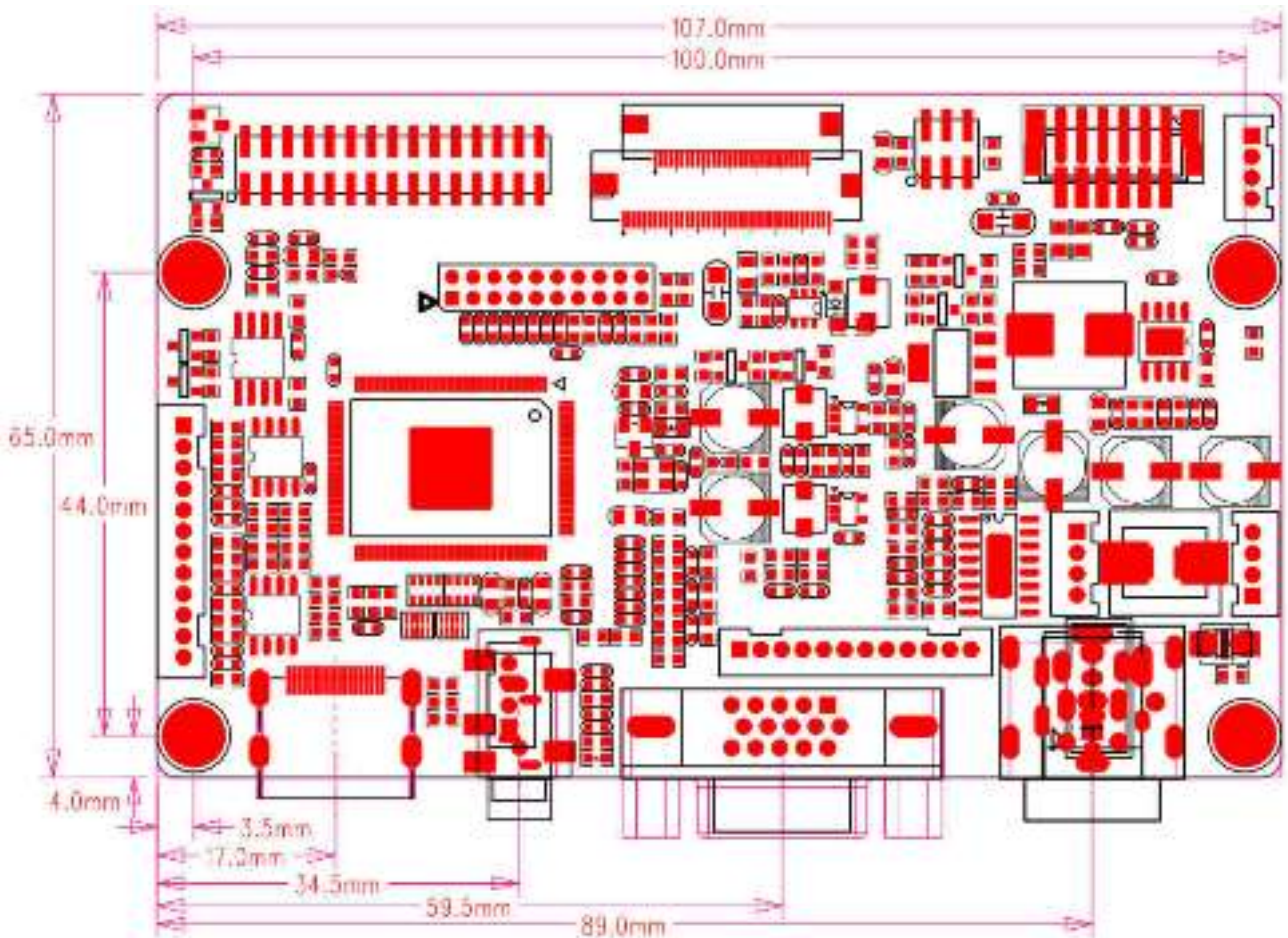
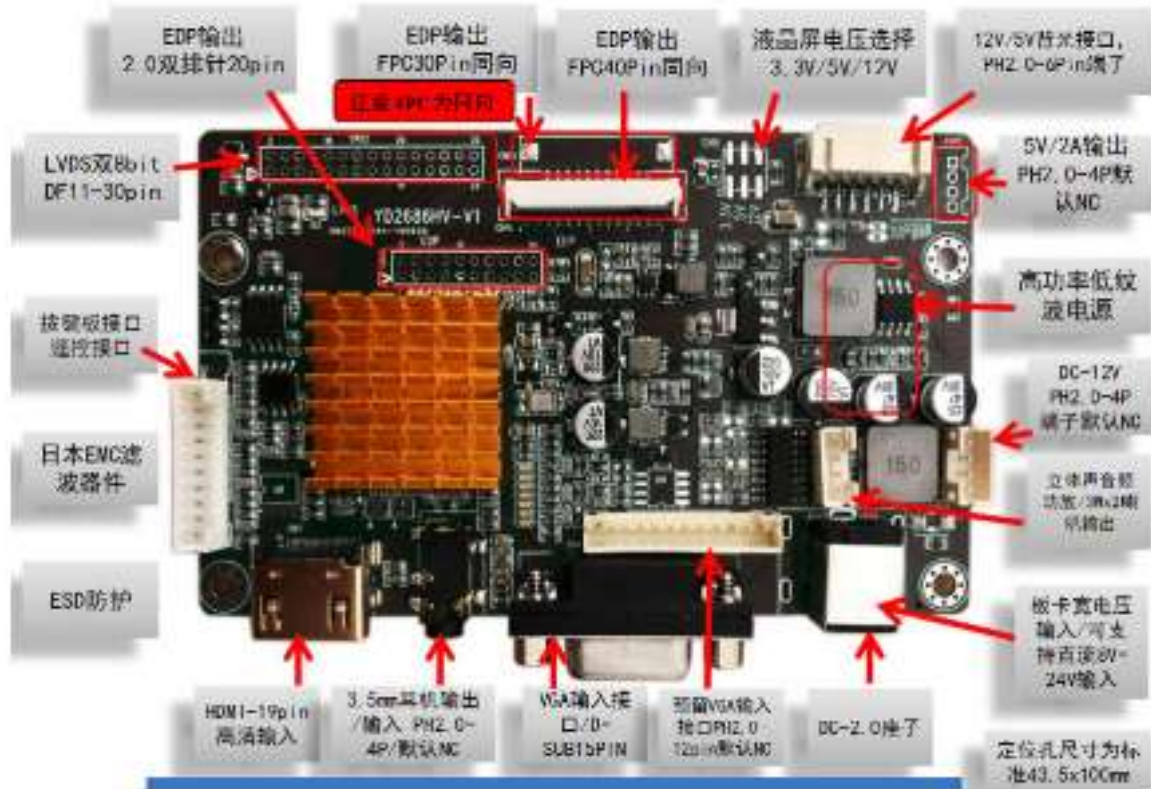
4.1 技术参数

| | | | |
|---------------|---------------------------------------------|--------------------|------------------------------|
| 外形尺寸 | 107mm×65 mm×16.5mm (L×W×H) | | |
| 显示颜色 | 24 位 (16.7M) | | |
| 显示屏接口 | LVDS、EDP | | |
| 控制范围 | 480×272~2048×1536 等分辨率的 LCD | | |
| 信号输入 | 输入信号类型 | VGA、HDMI、AV(默认 NC) | |
| | 输入信号范围 | HDMI 输入范围 | PC (VGA / HDMI) 最高 2048×1536 |
| | | VGA 输入范围 | PC (VGA / HDMI) 最高 2048×1536 |
| 供电电压 | 最小: 8V | 标称: 12V | 最大: 24V |
| 工作电流 | 最小: 0.15A | 标称: 0.17A | 最大: 0.25A |
| 待机功率 | <0.5W | | |
| 显示屏电压 | 3.3V/5V/12V 可跳线选择 | | |
| 最大显示屏负载能力(常温) | 1.2A@3.3V、2.5A@5V、3.5A@12V (12V 屏受限于电源供电能力) | | |
| 操作界面 | 可视化 OSD 操作界面 | | |
| 通信接口 | 数字按键、红外 IR | | |
| 工作温度范围 | -20℃~70℃; -30℃~70℃ (除主芯片外) | | |
| 工作湿度范围 | 10~95%RH (40℃, 95%RH) | | |
| 存储温度范围 | -40℃~70℃ | | |
| 存储湿度范围 | 10~100%RH | | |
| 工作环境大气压范围 | 70kPa~106kPa | | |
| MTBF | >100000 小时 | | |

Note: (仅主板)

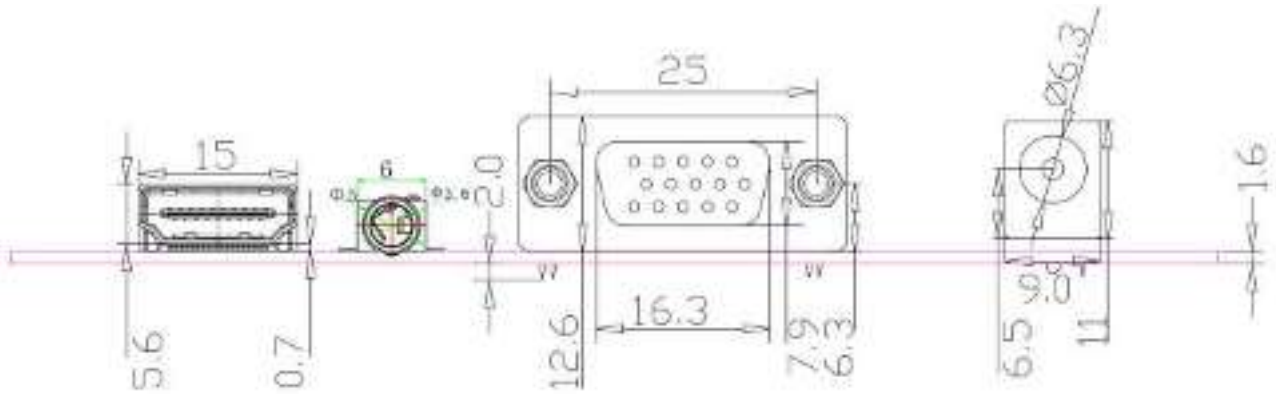


4.2 布局与尺寸图





高度尺寸:



4.2 接口定义

- 标识: CN16
- 用途: EDP 信号输出
- 类型: FFC0.5mm-40pin, 翻盖插座
- 接插件:
- 针脚定义

| 引脚 | 符号 | 说明 | 引脚 | 符号 | 说明 |
|----|-----------|----------------------|----|-----------|----------------------|
| 1 | NC | 无功能 | 2 | GND | 地 |
| 3 | eDP3P/3+ | eDP LANE 3+ Signal数据 | 4 | eDP3N/3- | eDP LANE 3- Signal数据 |
| 5 | GND | 地 | 6 | eDP2P/2+ | eDP LANE 2+ Signal数据 |
| 7 | eDP2N/2- | eDP LANE 2- Signal数据 | 8 | GND | 地 |
| 9 | eDP1P/1+ | eDP LANE 1+ Signal数据 | 10 | eDP1N/1- | eDP LANE 1- Signal数据 |
| 11 | GND | 地 | 12 | Edp0P/0+ | eDP LANE 0+ Signal数据 |
| 13 | eDP0N/0- | eDP LANE 0- Signal数据 | 14 | GND | 地 |
| 15 | AUX_P/+ | Edp AUX_P + Signal数据 | 16 | AUX_N/- | Edp AUX_N - Signal数据 |
| 17 | GND | 地 | 18 | VCC-Panel | 液晶屏 EDP 供电 |
| 19 | VCC-Panel | 液晶屏 EDP 供电 | 20 | VCC-Panel | 液晶屏 EDP 供电 |
| 21 | VCC-Panel | 液晶屏 EDP 供电 | 22 | NC | 无功能 |
| 23 | GND | 地 | 24 | GND | 地 |
| 25 | GND | 地 | 26 | GND | 地 |
| 27 | EDP_HPD | EDP_Hot plug Detect | 28 | BK_GND | 液晶屏背光供电负极 |
| 29 | BK_GND | 液晶屏背光供电负极 | 30 | BK_GND | 液晶屏背光供电负极 |
| 31 | BK_GND | 液晶屏背光供电负极 | 32 | BK_EN | 液晶屏背光开关 |
| 33 | BK_PWM | 液晶屏背光 PWM 亮度调节 | 34 | NC | 无功能 |
| 35 | NC | 无功能 | 36 | BK_VCC | 液晶屏背光供电正极 |
| 37 | BK_VCC | 液晶屏背光供电正极 | 38 | BK_VCC | 液晶屏背光供电正极 |
| 39 | BK_VCC | 液晶屏背光供电正极 | 40 | NC | 无功能 |



- 标识: CN9 (默认 NC)
- 用途: VGA 信号输入替代型接插件
- 类型: PH2.0mm-12PIN,2.0Pitch, 单排, 180°, 插座, 白色
- 接插件: (CVILUX)
- 针脚定义



| 引脚 | 符号 | 说 明 | 引脚 | 符号 | 说 明 |
|----|---------|---------|----|---------|---------|
| 1 | VGA_SCL | DDC串行时钟 | 2 | VGA_SDA | DDC串行数据 |
| 3 | AGND | 模拟地 | 4 | BLU | 模拟蓝色信号 |
| 5 | AGND | 模拟地 | 6 | GRN | 模拟绿色信号 |
| 7 | AGND | 模拟地 | 8 | RED | 模拟红色信号 |
| 9 | GND | 数字地 | 10 | HSYNCIN | 水平同步输入 |
| 11 | VSYNCIN | 垂直同步输入 | 12 | GND | 数字地 |

- 标识: CN1 (默认 NC)
- 用途: 12V 直流电源输入 (默认 NC)
- 类型: 4P, 2.0Pitch, 单排, 180°, 插座 (JST/CVILUX), 白色
- 接插件: PH2.0mm-4PIN直插
- 针脚定义



| 引脚 | 符号 | 说 明 | 引脚 | 符号 | 说 明 |
|----|------|--------------------|----|------|--------------------|
| 1 | +12V | +12V 直流电源输入 (±10%) | 2 | +12V | +12V 直流电源输入 (±10%) |
| 3 | GND | 地 | 4 | GND | 地 |



5. RELIABILITY TEST CONDITIONS

| No | Test Item | Test Condition | STANDARD |
|----|------------------------------------------|----------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | High Temperature Storage | +60°C / 48Hours | 1. Functional test is OK. Missing Segment, short, unclear segment, on-display, display abnormally and liquid crystal leak are un-allowed. 2. No low temperature bubbles, end seal loose and fall, frame rainbow. |
| 2 | Low Temperature Storage | -20°C / 48Hours | |
| 3 | High Temperature Operating | +50°C / 48Hours | |
| 4 | Low Temperature Operating | 0°C / 48Hours | |
| 5 | Thermal and cold shock | 0°C↔+50°C x 10cycles (30min) (5min) (30min) | |
| 6 | Operate at High Temperature and Humidity | 50°C x 90%RH / 24H | |
| 7 | Vibration Test | Frequency: 10Hz~55Hz~10Hz Amplitude:1.5mm, 2 hours for each direction of X, Y, Z | 1. Function test is OK. 2. No glass crack, chipped glass, end seal loose and fall, epoxy frame crack and so on. 3. No structure loose and fall. |
| 8 | Dropping test | Drop to the ground from 0.6m height, 1 corner, 3 edges, 6 surfaces. | |
| 9 | ESD test | Contact: ±6KV Air: ±10KV 150PF/330Ω,5Points/panel,5times | The test results shall be subject to the whole machine test. |

NOTE:

1. The reliability items will be fully performed in new sample qualification,
2. The reliability status will be tested as monitor during mass production. Individual reliability test shall be performed by lot , Moreover, the individual reliability item shall be decided according to reliability plan.
3. All samples are inspected after keeping in the room with normal temperature and humidity for 2 hours or above.
4. Vibration test: It is not necessary to test for those products without assembly frame , backlight , PCB and so on.
5. Dropping test : It is necessary for affirming new package.
6. For the high temperature and high humidity test, pure water of over 10 MΩ.cm should be used.
7. Each test item applies for test LCM only once .Then tested LCM cannot be used again in any other test item.
8. The quantity of LCM examination for each test item is 5pcs to 10pcs.



6. INSPECTION STANDARDS

6.1 AQL Sampling inspection standard

使用 GB/T 2828-2003 一般 II 水平, 采用正常检查一次抽样方式; 具体抽检方式参照《成品检验管理程序》、《抽样管理规范》

| 缺陷区分 | AQL 允收水准 |
|------|----------|
| 严重缺陷 | 0 收 1 退 |
| 重缺 | 0.4 |
| 轻缺 | 1.0 |

6.2 Inspect the condition

6.2.1 在 20—40W 日光灯的照明条件下, 样品离检查者眼睛约 30cm 处进行检查。检验方向以垂直线前后左右 45° (以时钟 3 点、6 点、9 点、12 点)

6.2.2 检验者视力需达到标准视力 1.0 以上。

6.2.3 检验者需戴静电手环、两手八个手指套。

6.2.4 外观检验者以目视检查或以菲林对比卡比对。

6.2.5 电性测试使用电测测架, 主板, 电源线及单片机。

6.2.6 若标准与规格书不符时, 以产品发行之规格书特殊检验规格、工程变更为准

6.2.7 辉色度检测请参照样品, 检测方法依照辉色度检验标准。

6.2.8 电测检验环境: 照度为 200LUX 以下, 外观检验环境: 照度为 600LUX-1000LUX, 检验时间: 1 秒-3 秒。

6.2.9 检验工具: 电测测架, 主板, 电源线及单片机, 菲林对比卡, 游标卡尺, 放大镜, 实体显微镜 (必要时) 等等。

6.3 Judgment criterion

小尺寸点、线判定标准: (6.2 寸以内)

| | | | | | | |
|---|--------------------------------------|--|--------------------------------------------------|--------------------------------------------------------|----|------------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定 (A/B/C 区) | $D \leq 0.10$, 忽略不计, 但密集型不允许 | MI | OK |
| | | | | $0.1 < D \leq 0.15$, $ds \geq 10$ | | $N \leq 2$ |
| | | | | $0.15 < D \leq 0.2$, $ds \geq 10$ | | $N \leq 1$ |
| | | | | LCD 亮点: $0.15 < D$ | | $N \leq 1$ |
| | | | | $D > 0.2$ | | NG |
| | | | 判定 (D 区) | 同背面丝印油墨区杂质判定标准 | | |
| | | | 注: 1) D 区的点状缺陷需在不影响 CTP 功能、客户组装及整机的外观的情况下, 判定 OK | | MI | |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定 (A/B/C 区) | $W \leq 0.03mm$, $L \leq 3mm$, $ds \geq 10$ | MI | $N \leq 2$ |
| | | | | $0.03mm < W \leq 0.05mm$, $L \leq 3mm$, $ds \geq 10$ | | $N \leq 1$ |
| | | | | $W > 0.05mm$ 或 $L > 3mm$ | | NG |



中尺寸点、线判定标准：（6.2 8寸以内）

| | | | | | | |
|---|--------------------------------------|--|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定(A/B/C区) | $D \leq 0.10$, 忽略不计, 但密集型不允许 $0.15 < D \leq 0.25$, $ds \geq 10$ $0.25 < D \leq 3$, $ds \geq 10$ LCD亮点: $0.2 < D$ $D > 0.3$ | MI | OK |
| | | | 判定(D区) | 同背面丝印油墨区杂质判定标准 | | N \leq 2 N \leq 1 N \leq 1 NG |
| | | | 注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK | | MI | |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定(A/B/C区) | $W \leq 0.03mm$, $L \leq 3mm$, $ds \geq 10$ $0.03mm < W \leq 0.05mm$, $L \leq 3mm$, $ds \geq 10$ | MI | N \leq 2 |
| | | | | $W > 0.05mm$ 或 $L > 3mm$ | | N \leq 1 |
| | | | | | | NG |

大尺寸点、线判定标准：（8.1~13.3寸以内）

| | | | | | | |
|---|--------------------------------------|--|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|----|----------------------------------------------|
| 1 | 点状缺陷 (磨伤、异物、针孔、凹痕、缺膜、气泡、白点、彩点、脏点) | | 判定(A/B/C区) | $D \leq 0.1$, 忽略不计, 但密集型不允许 $0.15 < D \leq 0.3$, $ds \geq 10$ $0.3 < D \leq 0.35$, $ds \geq 10$ LCD亮点: $0.25 < D$ $D > 0.35$ | MI | OK |
| | | | 判定(D区) | 同背面丝印油墨区杂质判定标准 | | N \leq 2 N \leq 1 N \leq 1 NG |
| | | | 注: 1) D区的点状缺陷需在不影响CTP功能、客户组装及整机的外观的情况下, 判定OK | | MI | |
| 2 | 线状缺陷 (磨伤、无感划伤、毛屑、纤维等) | | 判定(A/B/C区) | $W \leq 0.05mm$, $L \leq 5mm$, $ds \geq 10$ $0.05mm < W \leq 0.07mm$, $L \leq 5mm$, $ds \geq 10$ | MI | N \leq 2 |
| | | | | $W > 0.07mm$ 或 $L > 5mm$ | | N \leq 1 |
| | | | | | | NG |



7. PACKAGE DRAWING

