

Wuhan China Star Optoelectronics Technology Co.,Ltd

Product Specification Sheet

Customer: _____

Model Name: **MNG007JA1-4**

Date: **2022/02/18**

Version: **V02**

| Customer's Approval | | CSOT | |
|---------------------|------|--------------|------|
| Signature | Date | Approved By | Date |
| | | | |
| | | Reviewed By | Date |
| | | | |
| | | Prepared By: | Date |
| | | | |

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Record of Revision

| Version | Revise Date | Page | Content |
|---------|-------------|------|---------------------------|
| V01 | 2021/2/1 | ALL | Preliminary Specification |
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1. GENERAL DESCRIPTION

1.1 OVERVIEW

MNG007JA1-4 is a 16" TFT Liquid Crystal Display Low Blue Light module with LED Backlight unit and 40 pins eDP interface. This module supports 1920 x 1200 mode and can display 1073.7M colors.

1.2 SPECIFICATION SUMMARY

| No. | Item | Specification | Unit | Note |
|-----|--------------------------------|--------------------------------------|------|-------------------|
| 1 | LCD size | 16.0 | inch | |
| 2 | Resolution | 1920x RGB x 1200 | | |
| 3 | Pixel Arrangement | RGB | | |
| 4 | Model Type | LCM | | |
| 5 | TFT Technology | LTPS | | |
| 6 | Display mode | FFS, Normally Black | -- | |
| 7 | Active Area | 344.6784(H) × 215.424(V) | mm | |
| 8 | pixel pitch | 179.52(H)×179.52(V) | mm | |
| 9 | Display Colors | 1073.7M | | @10bit |
| 10 | Contrast Ratio | 1200:1(Typ) 1000:1(Min) | | |
| 11 | Color Gamut | RGB 100% typ,97%min | | |
| 12 | Low Blue Light Ratio | 50%(max) | % | TUV Method-2 spec |
| 13 | LCM Outline Dimension | 349.58×227.42(W/I FPC bent)×2.6(max) | mm | Typical |
| 14 | Luminance | 350(Typ) | nits | 5 Points Average |
| 15 | Surface treatment(OP) | AG | -- | Pol. |
| 16 | Interface | eDP 1.4 | | 4 lane@5.4G |
| 17 | Min/Max Refresh Rate | 48-165 | Hz | |
| 18 | AMD Freesync function | support | | |
| 19 | Method of Inversion | Column Inversion | | |
| 20 | Power consumption of Panel | 1.5 (max) | W | 3.3V@Mosaic 165Hz |
| 21 | Power consumption of Backlight | 3.2 (Max) | W | 12V@350nits |
| 22 | Weight | 325(Max) | g | |

Note :The specified power consumption (with converter efficiency) is under the conditions at VCCS =3.3 V, fv = 165 Hz, LED_VCCS = Typ, fPWM = 200 Hz, Duty=100% and Ta = 25 ±2 ℃, whereas mosaic pattern is displayed.

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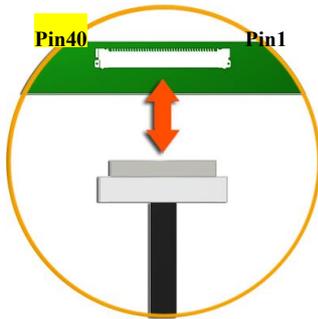
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2. MECHANICAL SPECIFICATIONS

| Parameter | Min. | Typ. | Max. | Unit | Note | |
|-------------------------|--------|--------|--------|--------|------|-------------------|
| Unit outline dimensions | Width | 349.38 | 349.68 | 349.98 | mm | |
| | Height | 223.92 | 224.42 | 224.92 | mm | W/I FPC bent |
| | Depth | 2.3 | 2.45 | 2.6 | mm | Thickness (body) |
| | | - | - | 4.6 | mm | Thickness(w/PCBA) |
| Weight | - | - | 325 | g | | |

2.1 INTERFACE CONNECTION



Please refer Appendix Outline Drawing for detail design

Connector Part No.: STARCONN 300E40-1010PA-G3

3. ABSOLUTE MAXIMUM RATINGS

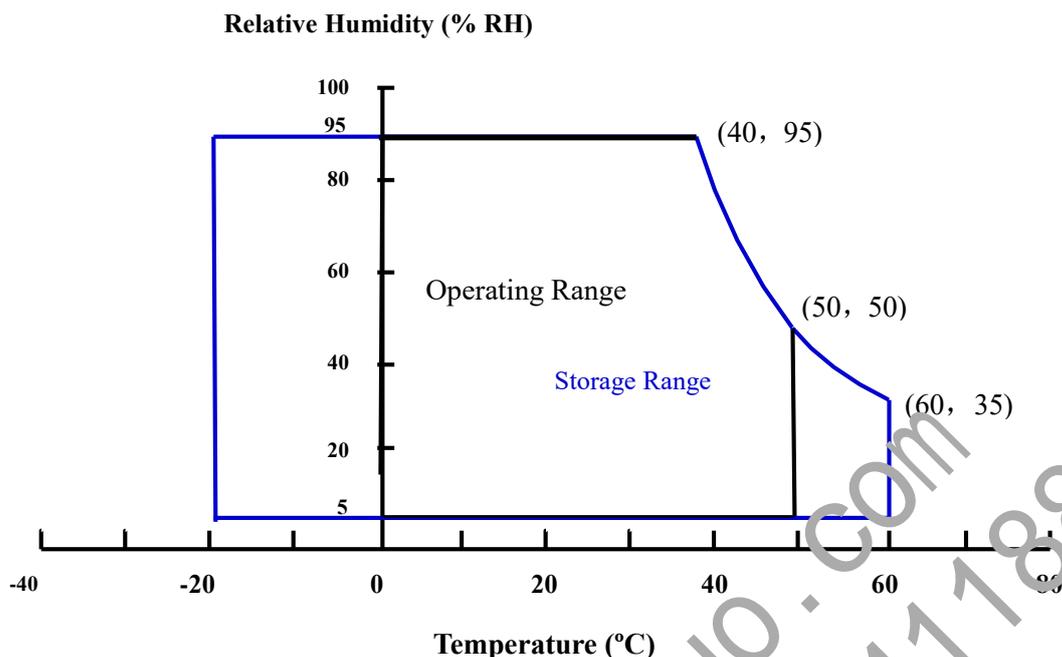
3.1 ABSOLUTE RATINGS OF ENVIRONMENT

| Item | Symbol | Value | | Unit | Note |
|-------------------------------|----------|-------|------|------|----------|
| | | Min. | Max. | | |
| Storage Temperature | T_{ST} | -20 | +60 | °C | (1) |
| Operating Ambient Temperature | T_{OP} | 0 | +50 | °C | (1), (2) |

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Note (1)

(a) 95% RH Max. ($T_a \leq 40^\circ\text{C}$).

(b) Wet-bulb temperature should be 39°C Max. ($T_a > 40^\circ\text{C}$)

(c) No condensation.

Note (2) The temperature of panel surface should be 0°C min. and 60°C max.

3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT-LCD MODULE

| Item | Symbol | Value | | Unit | Note |
|----------------------------------|-----------------|-------|------|------|------|
| | | Min. | Max. | | |
| Power Supply Voltage | VCCS | -0.3 | +4 | V | (1) |
| Logic Input Voltage | V _{IN} | -0.3 | +3.6 | V | (1) |
| Converter Input Voltage | LED_VCCS | -0.3 | 26 | V | (1) |
| Converter Control Signal Voltage | LED_PWM, | -0.3 | +3.6 | V | (1) |
| Converter Control Signal Voltage | LED_EN | -0.3 | +3.6 | V | (1) |

Note (1) Stresses beyond those listed in above “ELECTRICAL ABSOLUTE RATINGS” may cause permanent damage to the device. Normal operation should be restricted to the conditions described in “ELECTRICAL CHARACTERISTICS”.

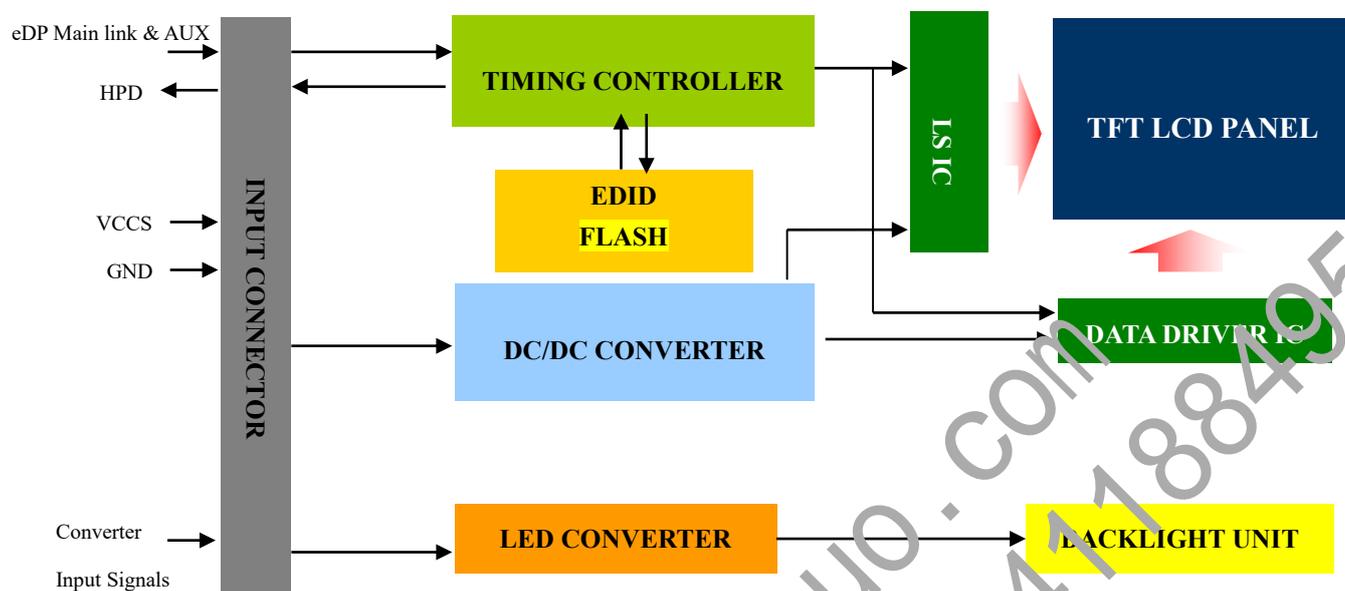
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4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2 INTERFACE CONNECTIONS

PIN ASSIGNMENT

| Pin | Symbol | Description | Note |
|-----|--------|-------------|------------------|
| 1 | #01 | I2C_SCL | For DDS function |
| 2 | #02 | H_GND | |
| 3 | #03 | Lane3_N | |
| 4 | #04 | Lane3_P | |
| 5 | #05 | H_GND | |
| 6 | #06 | Lane2_N | |
| 7 | #07 | Lane2_P | |
| 8 | #08 | H_GND | |
| 9 | #09 | Lane1_N | |
| 10 | #10 | Lane1_P | |
| 11 | #11 | H_GND | |
| 12 | #12 | Lane0_N | |
| 13 | #13 | Lane0_P | |
| 14 | #14 | H_GND | |
| 15 | #15 | AUX_CH_P | |
| 16 | #16 | AUX_CH_N | |
| 17 | #17 | H_GND | |
| 18 | #18 | LCD_VCC | |
| 19 | #19 | LCD_VCC | |

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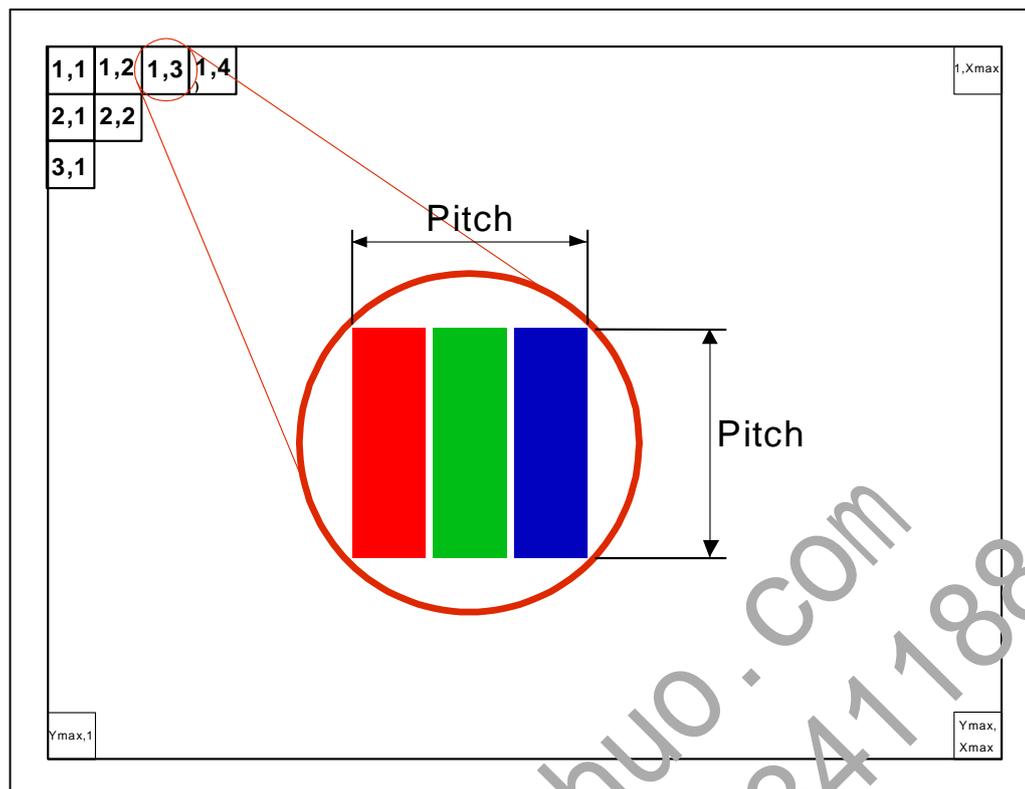
| | | | |
|----|-----|---|-----------------------------------|
| 20 | #20 | LCD_VCC | |
| 21 | #21 | LCD_VCC | |
| 22 | #22 | LCD Self-Test | |
| 23 | #23 | LCD_GND | |
| 24 | #24 | LCD_GND | |
| 25 | #25 | LCD_GND | |
| 26 | #26 | LCD_GND | |
| 27 | #27 | HPD | |
| 28 | #28 | BL_GND | |
| 29 | #29 | BL_GND | |
| 30 | #30 | BL_GND | |
| 31 | #31 | BL_GND | |
| 32 | #32 | BL_Enable | |
| 33 | #33 | BL_PWM_DIM | |
| 34 | #34 | I2C_SDA | For DSS function |
| 35 | #35 | NC | For CSOT use |
| 36 | #36 | BL_PWR | |
| 37 | #37 | BL_PWR | |
| 38 | #38 | BL_PWR | |
| 39 | #39 | BL_PWR | |
| 40 | #40 | Over Drive enable Pull high (1): OD on; Pull low (0): OD off | Suggest to pull low at the system |

Note: The pixel is shown in the following figure.

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4.3 ELECTRICAL CHARACTERISTICS

4.4 LCD ELETRONICS SPECIFICATION

| Parameter | Symbol | Value | | | Unit | Note |
|-------------------------------|-------------------------|-------|------|------|------|--------|
| | | Min. | Typ. | Max. | | |
| Power Supply Voltage | VCCS | 3.0 | 3.3 | 3.6 | V | (1) |
| BIST Control Level | BIST on | 2.2 | 3.3 | 3.6 | V | (1) |
| | BIST off | 0 | - | 0.5 | V | (1) |
| Ripple Voltage | V _{RP} | - | - | 100 | mV | (1) |
| Inrush Current | I _{RUSH} | - | - | 1.5 | A | (1)(2) |
| Power Supply Current of Panel | Mosaic I _{LCD} | - | - | 454 | mA | (3) |
| Power consumption of Panel | Mosaic P _{LCD} | - | - | 1.5 | W | (3) |

Note (1) The ambient temperature is $T_a = 25 \pm 2^\circ\text{C}$.

Note (2) I_{RUSH}: the maximum current when VCCS is rising

I_{IS}: the maximum current of the first 100ms after power-on

Measurement Conditions: Shown as the following figure.

Test pattern: Mosaic

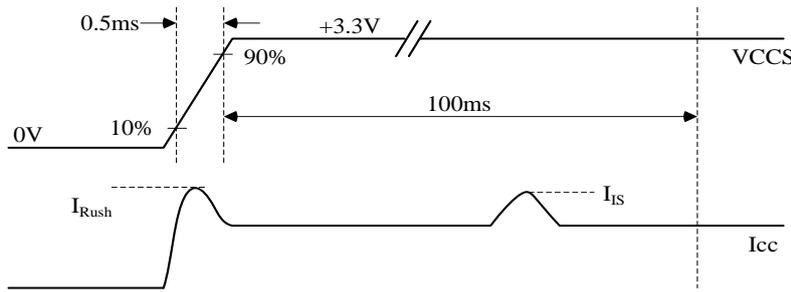
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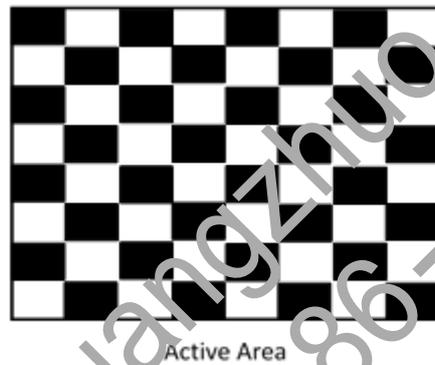
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VCCS rising time is 0.5ms



Note (3) The specified power supply current is under the conditions at VCCS = 3.3 V, Ta = 25 ± 2 °C, DC Current and f_v = 165 Hz, whereas a power dissipation check pattern below is displayed.

Mosaic Pattern



LED CONVERTER SPECIFICATION

| Parameter | Symbol | Value | | | Unit | Note |
|---------------------------------------|-----------------------|-------|------|------|------|------|
| | | Min. | Typ. | Max. | | |
| Converter Input power supply voltage | LED_Vccs | 5.0 | 12.0 | 21.0 | V | |
| Converter Inrush Current | I _{LED_RUSH} | - | - | 1.5 | A | (1) |
| EN Control Level | Backlight On | 1.5 | - | 3.6 | V | |
| | Backlight Off | 0 | - | 0.5 | V | |
| PWM Control Level | PWM High Level | 1.5 | - | 3.6 | V | |
| | PWM Low Level | 0 | - | 0.5 | V | |
| PWM Control Duty Ratio | | 1 | - | 100 | % | |
| PWM Control Permissive Ripple Voltage | V _{PWM_pp} | - | - | 100 | mV | |
| PWM Control Frequency | f _{PWM} | 200 | - | 2000 | Hz | |

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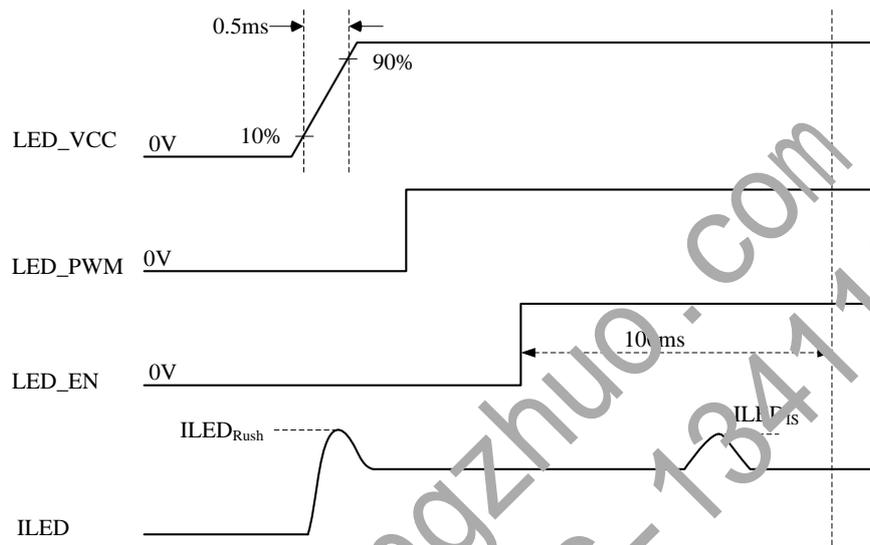
| | | | | | | | |
|-----------------------|----------------|-------|---|---|-----|----|-----|
| LED Power consumption | | P_L | - | - | 3.2 | W | (2) |
| LED Power Current | LED_VCCS =Typ. | - | - | - | 266 | mA | (3) |

Note :ILED_{RUSH}: the maximum current when LED_VCCS is rising,

ILED_{IS}: the maximum current of the first 100ms after power-on,

Measurement Conditions: Shown as the following figure. LED_VCCS = Typ, Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.

VLED rising time is 0.5ms



Note(2) $P_L = I_L \times V_L$ (With LED converter transfer efficiency);

Note (3) The specified LED power supply current is under the conditions at “LED_VCCS = Typ.”, Ta = 25 ± 2 °C, f_{PWM} = 200 Hz, Duty=100%.

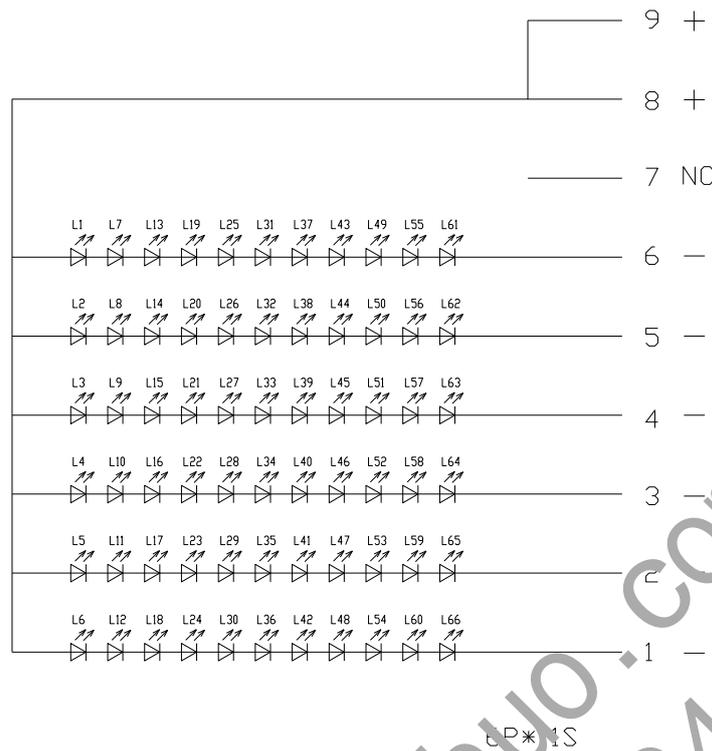
4.4.1 BACKLIGHT UNIT

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Ta = 25 ± 2 °C

| Parameter | Symbol | Value | | | Unit | Note |
|------------------------------------|-----------------|-------|------|-------|------|------------|
| | | Min. | Typ. | Max. | | |
| LED Light Bar Power Supply Voltage | V _L | - | - | 30.8 | V | (1)(2) |
| LED Light Bar Power Supply Current | I _L | - | 90 | - | mA | (Duty100%) |
| Power Consumption | P _L | - | - | 2.772 | W | (3) |
| LED Life Time | L ₅₀ | 15000 | - | - | Hrs | (4) |

Note (1) LED current is measured by utilizing a high frequency current meter :

Note (2) For better LED light bar driving quality, it is recommended to utilize the adaptive boost converter with current balancing function to drive LED light bar.

Note (3) $P_L = I_L \times V_L$ (Without LED converter transfer efficiency)

Note (4) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ± 2 °C and I_L = 20 mA(Per FA) until the brightness becomes ≅ 50% of its original value.

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4.5 INPUT SIGNAL TIMING SPECIFICATIONS

4.5.1 eDP AUX Channel Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------------|--------------------------|------|------|------|------|--------------------|
| Unit Interval for AUX channel | UI _{AUX} | 0.4 | - | 0.6 | μS | |
| Peak-to-peak voltage at TP1 | V _{AUX-DIFF-PP} | 0.18 | 0.2 | 1.38 | V | |
| AUX DC Common mode Voltage | V _{AUX-DC-CM} | 0 | - | 1.2 | V | |
| AUX Short current limit | I _{AUX_SHORT} | - | - | 90 | mA | |
| AUX CH termination DC resistor | R _{AUX_TERM} | 80 | 100 | 120 | Ω | Differential input |
| AUX AC coupling capacitor | C _{AUX} | 75 | - | 200 | nF | |
| Number of pre-charge pulses | Pre-charge pulses | 10 | - | 16 | | |

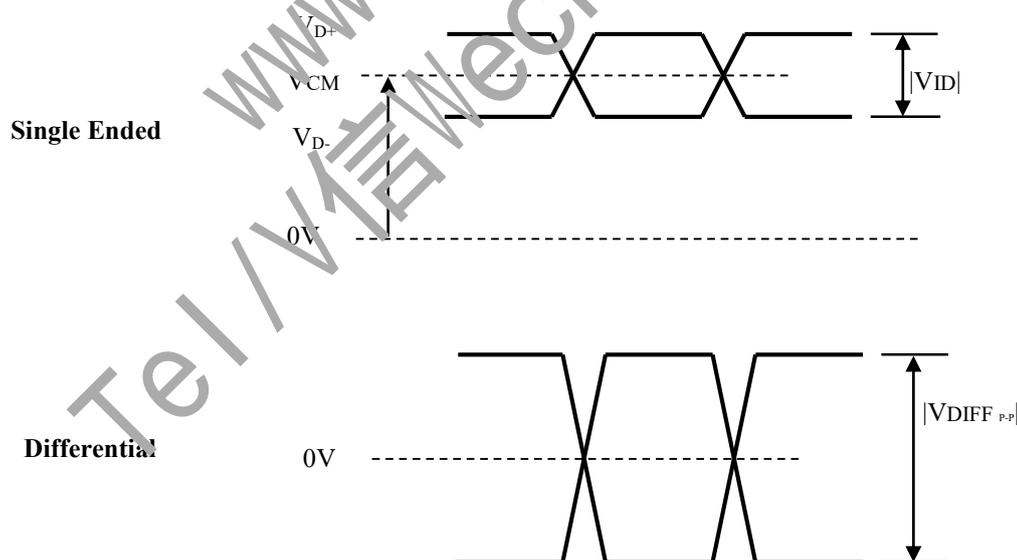
4.5.2 eDP Main Link Receiver Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|--|---|------|------|------|------|------|
| Link clock down spreading | Down_Spread_Amplitude | 0 | | 0.5 | % | |
| Differential Peak-to-peak Input Voltage at Rx package pins | V _{RX-DIFFP-P} | 100 | - | 1320 | mV | |
| Differential termination resistance | R _{RX-TERM} | 80 | 100 | 120 | Ω | |
| RX short circuit Current Limit | I _{RX-SHORT} | - | - | 50 | mA | |
| Lane Intra-pair Skew at RX package pins | T _{RX-SKEW-INTRA-PAIR-High-Bit-Rate} | - | - | 50 | ps | |

4.5.3 eDP AUX Channel Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Note |
|-----------------|-----------------|------|------|------|------|------|
| Hot plug Detect | V _{HD} | 2.5 | - | 2.8 | V | |

Note (1) Display port interface related AC coupled signals are following VESA Display Port Standard V1.4b.



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4.5.4 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

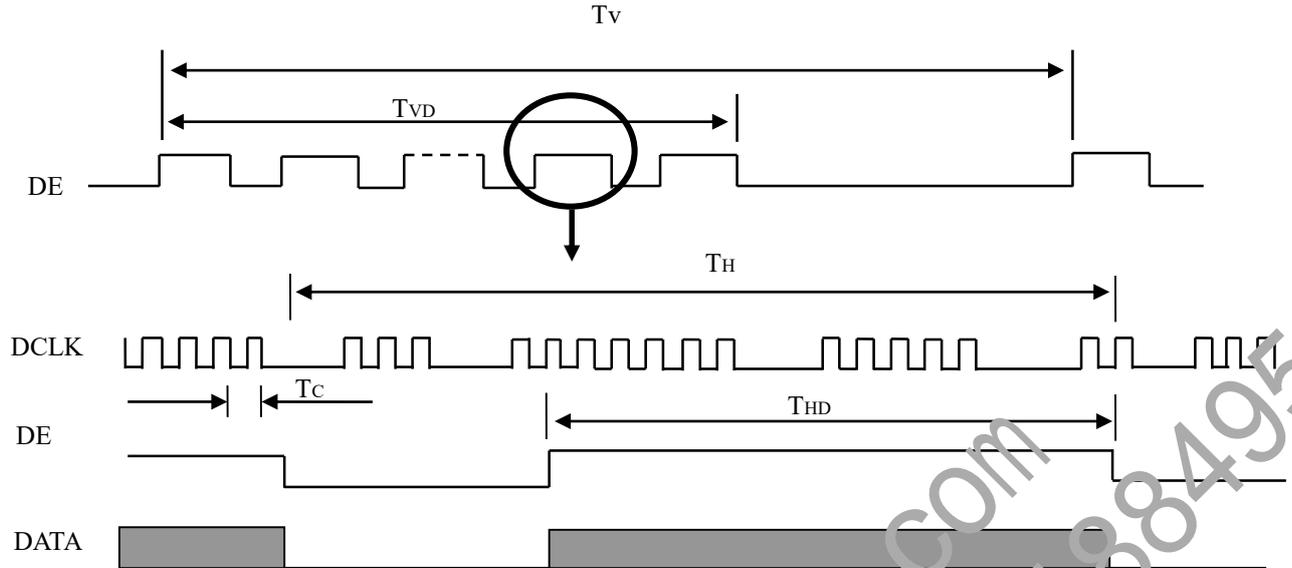
| Color | | Data Signal | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---------------------|---------------|-------------|----|----|----|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|------|----|----|----|----|----|----|----|
| | | Red | | | | | | | | | | Green | | | | | | | | | | Blue | | | | | | | |
| | | R9 | R8 | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G9 | G8 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B9 | B8 | B7 | B6 | B5 | B4 | B3 | B2 |
| Basic Colors | Black | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Cyan | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Magenta | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | Yellow | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | White | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Gray Scale Of Red | Red(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Red(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Red(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Scale : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Of : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Red(1021) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Red(1022) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Red(1023) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Gray Scale Of Green | Green(0)/Dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Green(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Green(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Scale : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Of : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | |
| | Green(1021) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| | Green(1022) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| Green(1023) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | |

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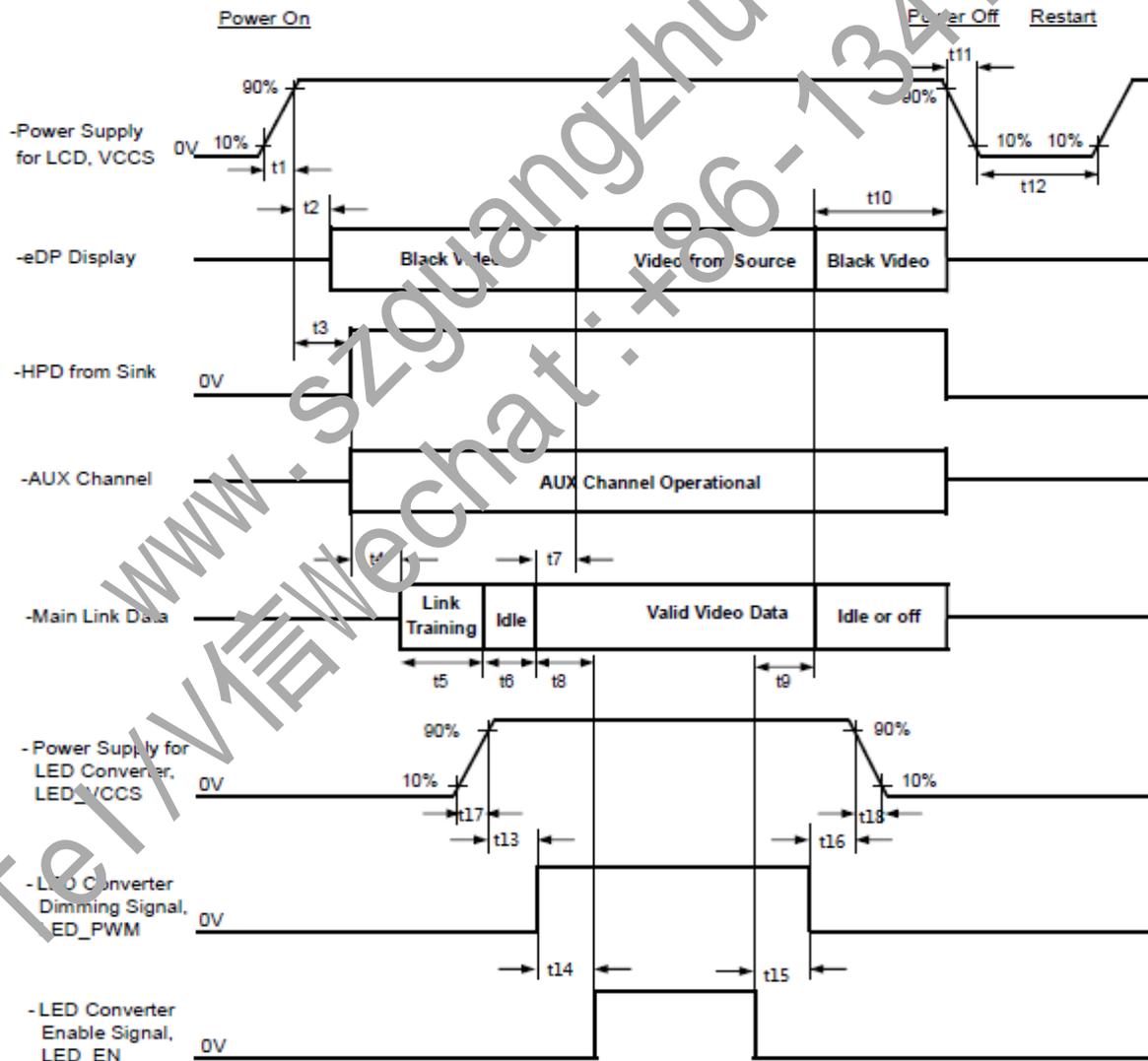
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INPUT SIGNAL TIMING DIAGRAM



4.7 POWER ON/OFF SEQUENCE



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| Symbol | Description | Min | Typ. | Max | Unit | Note |
|--------|---|-----|------|-----|------|------|
| t1 | Power rail rise time, 10% to 90% | 0.5 | | 10 | ms | |
| t2 | Delay from LCD,VCCS to eDP Display | 0 | | 200 | ms | |
| t3 | Delay from LCD,VCCS to HPD high | 0 | | 200 | ms | |
| t4 | Delay from Sink AUX to link training initialization | - | | - | ms | |
| t5 | Link training duration | - | | - | ms | |
| t6 | Link idle | - | | - | ms | |
| t7 | Delay from valid video data from Source to video on display | 0 | | 50 | ms | |
| t8 | Delay from valid video data from Source to backlight on | - | | - | ms | |
| t9 | Delay from backlight off to end of valid video data | - | | - | ms | |
| t10 | Delay from end of valid video data from Source to power off | - | | 500 | ms | |
| t11 | VCCS power rail fall time, 90% to 10% | 0.5 | | 20 | ms | (1) |
| t12 | VCCS Power off time | 500 | | - | ms | |
| t13 | Delay from VCC to PWM | 0 | | - | ms | |
| t14 | Delay from PWM to LED ENABLE | 0 | | - | ms | |
| t15 | Delay from LED ENABLE to PWM Disable | 0 | | - | ms | |
| t16 | Delay from PWM Disable to VBL 90% | 0 | | - | ms | |
| t17 | Delay from VBL 10% to VBL 90% | 0 | | - | ms | |
| t18 | VBL power rail fall time, 90% to 10% | 0 | | - | ms | |

Note (1) Please follow the power on/off sequence described above. Otherwise, the LCD module might abnormal display or be damaged.

Note (2) Please avoid floating state of interface signal at invalid period. When the interface signal is invalid, be sure to pull down the power supply of LCD VCCS to 0 V.

Note (3) The backlight must be turned on after the power supply for the logic and the interface signal is valid.

The backlight must be turned off before the power supply for the logic and the interface signal is invalid.

Note (4) Please follow the LED backlight power sequence as above. If the customer could not follow, it might cause backlight flash issue during display ON/OFF or damage the LED backlight controller

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5. Optical characteristics

Ta=25°C

| Parameter | Symbol | Condition | Min. | Typ. | Max. | Unit | Note | | | |
|-----------------------|-----------------|-----------------|------|----------|------|-------|------------------------------|--------|-------|-------------------|
| Viewing angle range | Left/Right | CR > 10 | - | 89 | - | Deg. | (1), (3), (4), (6) | | | |
| | Upper/Lower | | - | 89 | - | | | | | |
| | Left/Right | CR > 100 | - | 80 | - | | | | | |
| | Upper/Lower | | - | 80 | - | | | | | |
| Contrast ratio | CR | | 1000 | 1200 | | - | (2), (4), (6) | | | |
| GTG AVG(W/I OD) | - | | - | 3 | 4 | ms | (5) | | | |
| GTG AVG(W/O OD) | - | | | 5 | 6 | ms | | | | |
| Chromaticity of white | x | $\theta=0$ deg. | Typ. | 0.313 | Typ. | - | (2), (6) Normal operation | | | |
| | y | | | 0.329 | | - | | | | |
| Chromaticity of red | x | | | 0.640 | | - | | | | |
| | y | | | 0.330 | | - | | | | |
| Chromaticity of green | x | | | -0.025 | | 0.500 | | +0.025 | - | |
| | y | | | | | 0.600 | | | - | |
| Chromaticity of blue | x | | | | | 0.150 | | | - | |
| | y | | | | | 0.060 | | | - | |
| Gamut(1931) | % | | | | | 97% | | 100% | -- | SRGB |
| Luminance of White | Y _{Li} | | | @5 point | | 297.5 | | 350 | 402.5 | cd/m ² |
| gamma | - | | -- | 2.2 | -- | -- | | | | |
| White uniformity 13pt | δ_w | $\theta=0$ deg. | 60% | -- | -- | -- | (8) | | | |
| White uniformity 5pt | δ_w | $\theta=0$ deg. | 80% | -- | -- | -- | | | | |
| Low blue ratio | % | | -- | -- | 50% | % | Method 2 | | | |

※The measurement shall be taken 5 minutes after lighting the LCM at the following rating.

※The optical characteristics shall be measured in a dark room or equivalent.

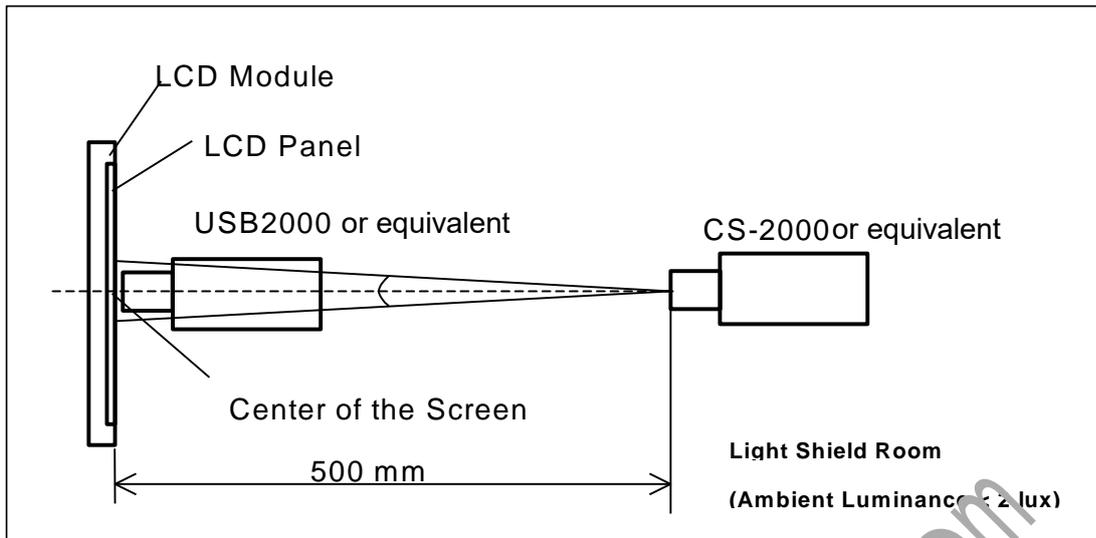
Note (1) Measurement of viewing angle range

Note (2) Measurement of luminance and Chromaticity and Contrast.

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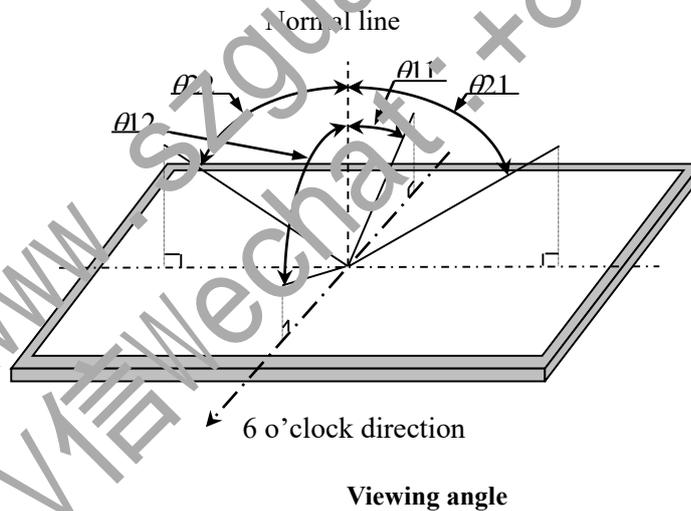
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Measurement of Contrast, Luminance, Chromaticity, White variation, Crosstalk and Color temperature variation

Note (3) Definitions of viewing angle range:



Note (4) Definition of contrast ratio:

The contrast ratio is defined as the following.

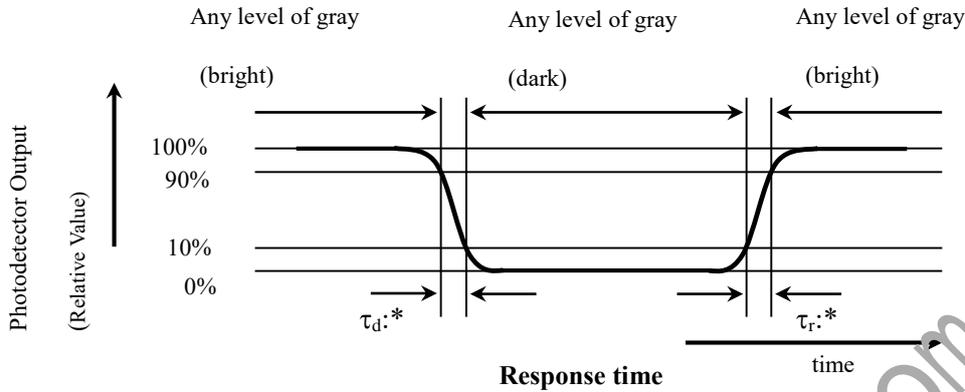
$$\text{Contrast Ratio} = \frac{\text{Luminance(Brightness) with all pixels white}}{\text{Luminance(Brightness) with all pixels Black}}$$

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Note (5) Definition of response time:

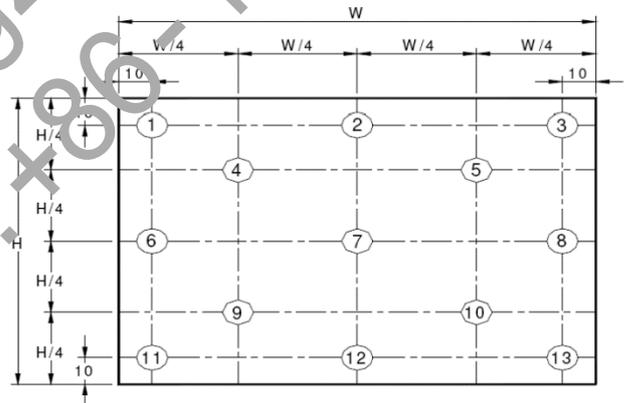
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".

Note (6) This shall be measured at center of the screen.

Note (7) The Luminance of White is the average of 5 points measurements (4,5,7,9,10) showing in the Fig.9-5.

Note (8) Definition of white uniformity:

White uniformity of 5 points is defined as the following with 5 measurements(4,5,7,9,10).



$$\delta_{W1} = \frac{\text{Maximum Luminance of 5 Points(Brightness)}}{\text{Minimum Luminance of 5 Points(Brightness)}}$$

White uniformity of 13 points is defined as the following with 13 measurements(1~13).

$$\delta_{W2} = \frac{\text{Maximum Luminance of 13 Points(Brightness)}}{\text{Minimum Luminance of 13 Points(Brightness)}}$$

Fig.9-5

6. Reliability Test Items

| No. | Test Item | Conditions |
|-----|-----------|--|
| 1 | ESD | 150 pF, 330Ω, Air/contact 10 times/point, 1 times/sec Air :17 KV,9Point @AA Area(1~2mm) Contact : 8 KV,8Point @metal fram/2side I/O pin contact:5 |

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| | | |
|----|------------------|--|
| | | times/pin,1times/sec |
| 2 | IS | 1 Condition: Room temp.(25±3°C), Test pattern : Black window pattern (background L127/255 white) and Full-screen L127/255 white Room ambient 0 - 500 lux Viewing distance 30 - 50cm Viewing Angle: 0 Degree 2: Procedure: Turn off the panel at least 12Hrs before starting the test; 0 minutes、2minutes、 every 5minutes up to 30minutes,2hrs、4hrs and 10hrs Checking IS by using 64Gray scale from Gray0~63 under 30s |
| 3 | Vibration | 1.5G, 10->200Hz, x、y、z/30min |
| 4 | Pressure test | 1. mylar thickness:3.5mm, adhesive thickness: 0.5mm, adhesive width: 8mm; 2. the pressure head diameter: 4mm, test 12 point, test position is at the edge of panel AA; 3. under the condition of 300Lux, 0% ND filter to check panel light leakage status. |
| 5 | DBD | Φ4mm pressure head(Metal or Plastic), press the four points POL edge of the samples, four corners (30*30mm) suspend |
| 6 | shock | 1. 50G 18msec. trapezoidal (2) 210G 5msec. half-sine 1 for each ± x, y, z direction, total 6 times for (1),(2) 2.210G 3msec. half-sine ± x, y, z axis total 6 times for (1),(2) |
| 7 | HTHHO | 50±2°C/80~85%RH, 1000hrs±48hrs |
| 8 | LTO | 0°C, 500hrs±48hrs |
| 9 | HTS | 60±2°C, 240±8hrs |
| 10 | LTS | -20±2°C, 240±8hrs; |
| 11 | TST | -20±2°C/30minutes±5%、60±2°C/30minutes±5% 100cycles |
| 12 | TC | -20±2°C/18minutes±5%、60±2°C/18minutes±5% 100cycles |
| 13 | Altitude test | 53.3±5% KPa (altitude 5000m), 24±2 hrs |
| 14 | Life Test (Life) | Room temperature (25±3°C), 2000hrs±48hrs |
| 15 | ON/OFF test | Room temperature (25±3°C), 500 hours (30sec. On / 30sec. Off, 30,000 cycles) |

[Result Evaluation Criteria] Under the display quality test condition with normal operation state.

Do not change these condition as such changes may affect practical display function.

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[Normal operation state] temperature : + 15°C~ + 35°C · Humidity : 45~75% · Atmospheric pressure : 86~106kPa

7. Display Quality

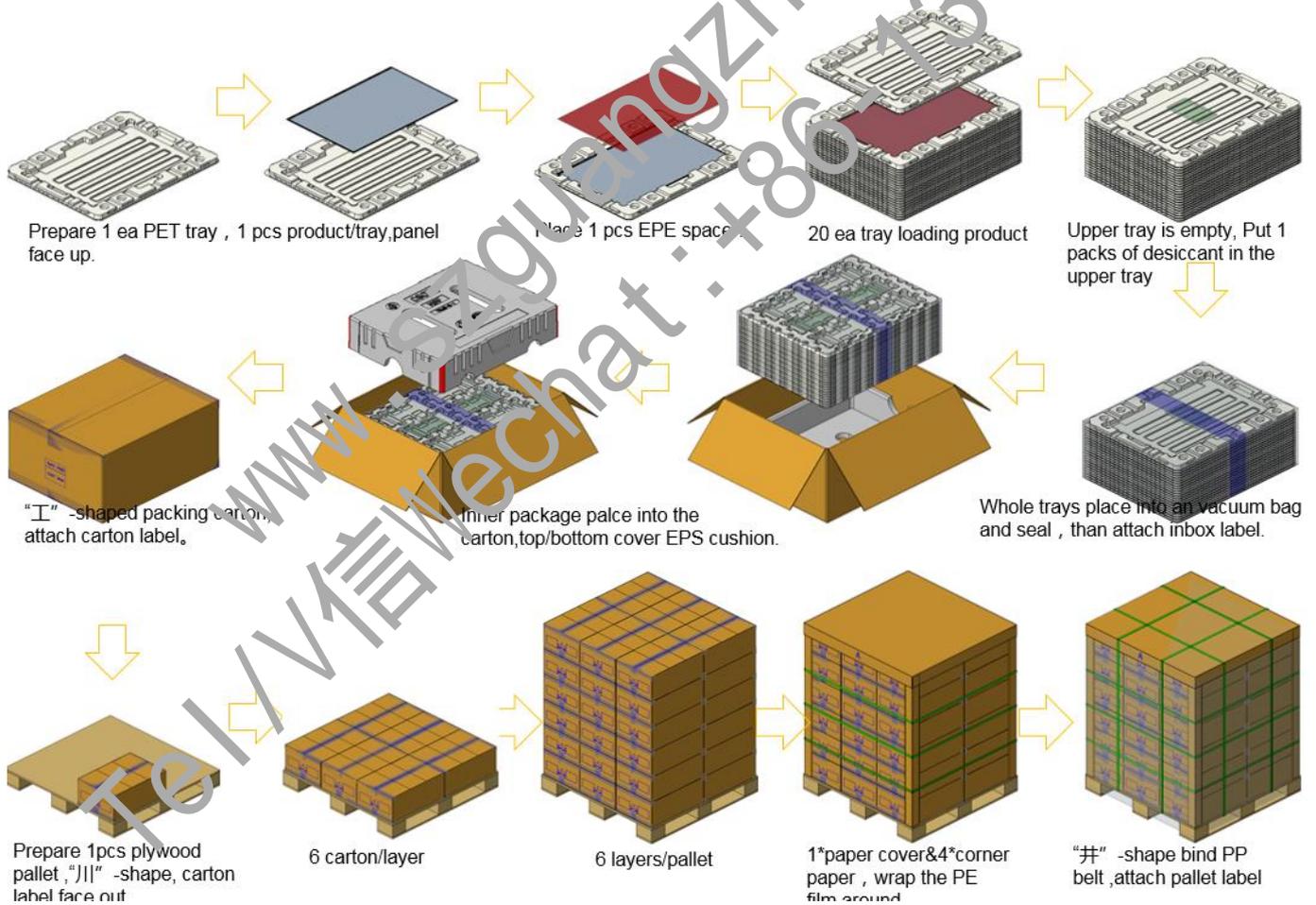
The display quality of the color TFT-LCD Module shall be in compliance with the Incoming Inspection Standard.

8. Packaging Condition

8.1 Packing Specifications

| Item | Specification | Remark |
|--------------------------|------------------------------|-------------------------|
| Carton(Box) Packing | 20 PCS/Carton(Box) | 20+1 |
| Carton(Box) Packing Size | 465mm(L)x375mm(W)x220mm(H) | Length x Width x Height |
| Pallet Packing | 36 Carton(Box)/Pallet | 6*6 |
| Pallet Packing Size | 1140mm(L)x945mm(W)x1450mm(H) | Length x Width x Height |

8.2 Packing Method



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8.3 Label

Model Name: MNG007JA1-4

Part No.: 11NG007JA14001

Customer No.: SD11F50176

FRU: 5D11F50177

REV. 1 1 2 3 4 5 6 7 8 9 10 11 12

Need conform CSOT environmental Protection agreement HSF Degree of secrecy Normal

REV. EC NO. DESCRIPTION CHANGED BY DATE

Ver1.0 / / First Release / /

CSOT inbox label

RoHS
 Model Name: MNG007JA1-4 Ver.: ##
 Part No.: 11NG007JA14001 Qty.: 20
 Customer No.: SD11F50176 WT: ##.## KG

Inbox Id: [Barcode]
 Note: [Barcode]
 Made in China

CSOT Carton label

RoHS
 Model Name: MNG007JA1-4 Ver.: ##
 Part No.: 11NG007JA14001 Qty.: 20
 Customer No.: SD11F50176 WT: ##.## KG
 Date: YYYY.MM.DD

FRU: 5D11F50177
 Carton Id: [Barcode]
 Note: [Barcode]
 Made in China

CSOT Pallet label

RoHS
 Model Name: MNG007JA1-4 Ver.: ##
 Part No.: 11NG007JA14001 Qty.: 20
 Customer No.: SD11F50176 WT: ##.## KG
 Date: YYYY.MM.DD

Pallet Id: [Barcode]
 Note: [Barcode]
 Made in China

QR Code

CSOT PN: MNG007JA1-4
 PN: SD11F50176
 FRU: 5D11F50177
 8SSD11F50176RXWHXXXXXX

H=1.5mm

8SSD11F50176RXWHXXXXXX

version
 Provisional*1, if change, new product type informant FAE,
 M-type informant CQE,
 1-9, A-Z; (exclusive "I", "O", "Q", "U", exclusive "0")

year month
 year: last place in the current year, include "0"
 month: 1(January) → C(December), 1,2,3,4,5,6,7,8,9,A,B,C
 day: 1-9, A-Z; (exclusive "I", "O", "Q", "U")

serial no.
 XXXX, serial no.; (exclusive "I", "O", "Q", "U", include "0")

Qty. the values for reference,base on reality quantity
 WT the values for reference,base on reality weight
 Carton Qty. the values for reference,base on reality carton qty.

NOTES:

- Font:reference(Arial),Height:2mm,Space:1mm;
- CSOT Barcode Style:Code 128;
- Attented position see the R/Packing manual;
- The printing information must be clearly.

| TOL TABLE | UNIT | SIZE | DRAWING NO. | 武汉华星光电技术有限公司 |
|-----------|------|----------|-------------|----------------------------|
| NEP | TOL | mm | A4 | MNG007JA1-4 |
| 35-125 | 20.5 | SCALE | 3RD ANG | MODULE NAME |
| 150-300 | 21.0 | 1:1 | MNG007JA1-4 | LCB 16.0 WUXGA165 HZ Barel |
| 300-600 | 21.5 | DISIGNED | DATE | APPROVED |
| 600-1000 | 22.0 | hua-gu | gqge-zhou | WAYNE |
| 1000- | | | | label |
| ANG 50 | 21" | 20210815 | 20210812 | 20210812 |

CSOT CONFIDENTIAL

9. RoHS Directive

This LCD Module is compliant with RoHS Directive.

10. Handling Precautions

- a) Be sure to turn off the power supply when inserting or disconnecting the cable .Please insert for too much stress not to join a connector in the case of insertion of a connector.

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- b) Be sure to design the cabinet so that the Module can be installed without any extra stress such as warp or twist.
- c) Since the front polarizer is easily damaged, pay attention not to scratch it.
- d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.
- g) Since CMOS LSI is used in this Module, take care of static electricity and injure the human earth when handling. Observe all other precautionary requirements in handling components.
- h) This Open-cell has its circuitry PCBs on the side and should be handled carefully in order not to be stressed.
- i) Laminate film is attached to the Module surface to prevent it from being scratched. Peel the laminate film off slowly just before the use with strict attention to electrostatic charges. Ionized air shall be blown over during the action. Blow off the 'dust' on the polarizer by using an ionized nitrogen gun, etc. Working under the following environments is desirable.
 - All workers wear conductive shoes, conductive clothes, conductive fire-stails and grounding belts without fail.
 - Use Ionized blower for electrostatic removal, and peel of the laminate film with a constant speed. (Peeling of it at over 2 seconds)
- j) The polarizer surface on the panel is treated with Anti Glare. In case of attaching protective board over the LCD, be careful about the optical interface fringe etc. which degrades display quality.
- k) Do not expose the LCD Module to a direct sunlight, for a long period of time to protect the Module from the ultra violet ray.
- l) When handling LCD Modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the Modules.
- m) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets inside your eye or mouth by mistake.
- n) Disassembling the Module can cause permanent damage and should be strictly avoided.(Except for protection film of the panel.)
- o) Be careful when using it for long time with fixed pattern display as it may cause afterimage.(Please use a screen cover etc., in order to avoid an afterimage.)
- p) If a minute particle enters in the Module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

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- q) Epoxy resin (amine series curing agent), silicone adhesive material (dealcoholization series and oxime series), tray forming agent (azo compound) etc, in the cabinet or the packing materials may induce abnormal display with polarizer film deterioration regardless of contact or noncontact to polarizer film. Be sure to confirm the component of them.
- r) Do not use polychloroprene. If you use it, there is some possibility of generating Cl₂ gas that influences the reliability of the connection between LCD panel and driver IC.
- s) Do not put a laminate film on LCD Module, after peeling of the original one. If you put on it, it may cause discoloration or spots because of the occurrence of air gaps between the polarizer and the film.
- t) Ground module bezel to stabilize against EMI and external noise.

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Appendix. EDID DATA STRUCTURE:

| EDID Table Format | | | | | |
|-------------------|------------------|--|--------------------|--------------------|--------------------|
| Address (DEC) | Address (HEX) | Field Name & Comments | Set Value (HEX) | Set Value (BIN) | Set Value (DEC) |
| 0 | 00 | Header | 00 | 00000000 | 0 |
| 1 | 01 | Header | FF | 11111111 | 255 |
| 2 | 02 | Header | FF | 11111111 | 255 |
| 3 | 03 | Header | FF | 11111111 | 255 |
| 4 | 04 | Header | FF | 11111111 | 255 |
| 5 | 05 | Header | FF | 11111111 | 255 |
| 6 | 06 | Header | FF | 11111111 | 255 |
| 7 | 07 | Header | 00 | 00000000 | 0 |
| 8 | 08 | EISA Manuf. Code LSB | 0E | 00001110 | 14 |
| 9 | 09 | Compressed ASCII | 6F | 01101111 | 111 |
| 10 | 0A | Product Code | 13 | 00010011 | 19 |
| 11 | 0B | hex, LSB first | 16 | 00010110 | 22 |
| 12 | 0C | 32-bit ser # | 00 | 00000000 | 0 |
| 13 | 0D | ID S/N - option | 00 | 00000000 | 0 |
| 14 | 0E | ID S/N - option | 00 | 00000000 | 0 |
| 15 | 0F | ID S/N - option | 00 | 00000000 | 0 |
| 16 | 10 | Week of manufacture | 00 | 00000000 | 0 |
| 17 | 11 | Year of manufacture | 1F | 00011111 | 31 |
| 18 | 12 | EDID Structure Ver | 01 | 00000001 | 1 |
| 19 | 13 | EDID revision # | 04 | 00000100 | 4 |
| 20 | 14 | Video input def | B5 | 10110101 | 181 |
| 21 | 15 | Max H image size | 22 | 00100010 | 34 |
| 22 | 16 | Max V image size | 16 | 00010110 | 22 |
| 23 | 17 | Display Gamma | 78 | 01111000 | 120 |
| 24 | 18 | Feature support (no DPMS, Active off, | 03 | 00000011 | 3 |
| 25 | 19 | Red/Green Low bits | EE | 11101110 | 238 |
| 26 | 1A | Blue/White Low bits | 95 | 10010101 | 149 |
| 27 | 1B | Red X Rx | A3 | 10100011 | 163 |
| 28 | 1C | Red Y Ry | 54 | 01010100 | 84 |
| 29 | 1D | Green X Gx | 4C | 01001100 | 76 |
| 30 | 1E | Green Y Gy | 99 | 10011001 | 153 |
| 31 | 1F | Blue X Bx | 26 | 00100110 | 38 |

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| | | | | | | |
|----|----|---|--|----|----------|-----|
| 32 | 20 | Blue Y By | | 0F | 00001111 | 15 |
| 33 | 21 | White X Wx | | 50 | 01010000 | 80 |
| 34 | 22 | White Y Wy | | 54 | 01010100 | 84 |
| 35 | 23 | Established timings 1 | | 00 | 00000000 | 0 |
| 36 | 24 | Established timing 2 | | 00 | 00000000 | 0 |
| 37 | 25 | Established timing 3 | | 00 | 00000000 | 0 |
| 38 | 26 | Standard timing #1 | | 01 | 00000001 | 1 |
| 39 | 27 | Standard timing #1 | | 01 | 00000001 | 1 |
| 40 | 28 | Standard timing #2 | | 01 | 00000001 | 1 |
| 41 | 29 | Standard timing #2 | | 01 | 00000001 | 1 |
| 42 | 2A | Standard timing #3 | | 01 | 00000001 | 1 |
| 43 | 2B | Standard timing #3 | | 01 | 00000001 | 1 |
| 44 | 2C | Standard timing #4 | | 01 | 00000001 | 1 |
| 45 | 2D | Standard timing #4 | | 01 | 00000001 | 1 |
| 46 | 2E | Standard timing #5 | | 01 | 00000001 | 1 |
| 47 | 2F | Standard timing #5 | | 01 | 00000001 | 1 |
| 48 | 30 | Standard timing #6 | | 01 | 00000001 | 1 |
| 49 | 31 | Standard timing #6 | | 01 | 00000001 | 1 |
| 50 | 32 | Standard timing #7 | | 01 | 00000001 | 1 |
| 51 | 33 | Standard timing #7 | | 01 | 00000001 | 1 |
| 52 | 34 | Standard timing #8 | | 01 | 00000001 | 1 |
| 53 | 35 | Standard timing #8 | | 01 | 00000001 | 1 |
| 54 | 36 | Pixel Clock LSB | | 26 | 00100110 | 38 |
| 55 | 37 | Pixel Clock HSB | | AE | 10101110 | 174 |
| 56 | 38 | Horizontal Active (lower 8 bits) | | 80 | 10000000 | 128 |
| 57 | 39 | Hor blanking (lower 8 bits) | | A0 | 10100000 | 160 |
| 58 | 3A | Horizontal Active/Horizontal Blanking | | 70 | 01110000 | 112 |
| 59 | 3B | Vertical active(lower 8 bits) | | B0 | 10110000 | 176 |
| 60 | 3C | Vertical blanking (lower 8 bits) | | 63 | 01100011 | 99 |
| 61 | 3D | Vertical Active / Vertical Blanking | | 40 | 01000000 | 64 |
| 62 | 3E | Horizontal Sync Offset | | 30 | 00110000 | 48 |
| 63 | 3F | Horizontal Sync Pulse Width | | 20 | 00100000 | 32 |
| 64 | 40 | Vertical Sync Offset , Sync Width | | 36 | 00110110 | 54 |
| 65 | 41 | Horizontal Vertical Sync Offset/Width | | 00 | 00000000 | 0 |
| 66 | 42 | Horizontal Image Size | | 59 | 01011001 | 89 |
| 67 | 43 | Vertical image Size | | D7 | 11010111 | 215 |
| 68 | 44 | Horizontal Image Size / Vertical image | | 10 | 00010000 | 16 |
| 69 | 45 | Horizontal Border = (0 for Notebook LCD) | | 00 | 00000000 | 0 |
| 70 | 46 | Vertical Border = (0 for Notebook LCD) | | 00 | 00000000 | 0 |
| 71 | 47 | Signal (non-intr, norm, no stero, sep sync, | | 18 | 00011000 | 24 |

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| | | | | | |
|-----|----|---------------------------|----|----------|-----|
| 72 | 48 | | 00 | 00000000 | 0 |
| 73 | 49 | | 00 | 00000000 | 0 |
| 74 | 4A | | 00 | 00000000 | 0 |
| 75 | 4B | | FD | 11111101 | 253 |
| 76 | 4C | | 00 | 00000000 | 0 |
| 77 | 4D | | 30 | 00110000 | 48 |
| 78 | 4E | | A5 | 10100101 | 165 |
| 79 | 4F | | D7 | 11010111 | 215 |
| 80 | 50 | MRL(Monitor Range Limits) | D7 | 11010111 | 215 |
| 81 | 51 | | 2D | 00101101 | 45 |
| 82 | 52 | | 01 | 00000001 | 1 |
| 83 | 53 | | 0A | 00001010 | 10 |
| 84 | 54 | | 20 | 00100000 | 32 |
| 85 | 55 | | 20 | 00100000 | 32 |
| 86 | 56 | | 20 | 00100000 | 32 |
| 87 | 57 | | 20 | 00100000 | 32 |
| 88 | 58 | | 20 | 00100000 | 32 |
| 89 | 59 | | 20 | 00100000 | 32 |
| 90 | 5A | descriptor#3 | 00 | 00000000 | 0 |
| 91 | 5B | Reserved for definition | 00 | 00000000 | 0 |
| 92 | 5C | Reserved for definition | 00 | 00000000 | 0 |
| 93 | 5D | ASCII String | FE | 11111110 | 254 |
| 94 | 5E | Reserved for definition | 00 | 00000000 | 0 |
| 95 | 5F | Manufacture | 43 | 01000011 | 67 |
| 96 | 60 | Manufacture | 53 | 01010011 | 83 |
| 97 | 61 | Manufacture | 4F | 01001111 | 79 |
| 98 | 62 | Manufacture | 54 | 01010100 | 84 |
| 99 | 63 | Manufacture | 20 | 00100000 | 32 |
| 100 | 64 | Manufacture | 54 | 01010100 | 84 |
| 101 | 65 | Manufacture | 33 | 00110011 | 51 |
| 102 | 66 | Reserved for definition | 0A | 00001010 | 10 |
| 103 | 67 | Reserved for definition | 20 | 00100000 | 32 |
| 104 | 68 | Reserved for definition | 20 | 00100000 | 32 |
| 105 | 69 | Reserved for definition | 20 | 00100000 | 32 |
| 106 | 6A | Reserved for definition | 20 | 00100000 | 32 |
| 107 | 6B | Reserved for definition | 20 | 00100000 | 32 |
| 108 | 6C | descriptor #4 | 00 | 00000000 | 0 |
| 109 | 6D | Reserved for definition | 00 | 00000000 | 0 |
| 110 | 6E | Reserved for definition | 00 | 00000000 | 0 |
| 111 | 6F | Reserved for definition | FE | 11111110 | 254 |

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| | | | | | |
|-----|----|-------------------------|----|----------|----|
| 112 | 70 | Reserved for definition | 00 | 00000000 | 0 |
| 113 | 71 | Manufacture P/N | 4D | 01001101 | 77 |
| 114 | 72 | Manufacture P/N | 4E | 01001110 | 78 |
| 115 | 73 | Manufacture P/N | 47 | 01000111 | 71 |
| 116 | 74 | Manufacture P/N | 30 | 00110000 | 48 |
| 117 | 75 | Manufacture P/N | 30 | 00110000 | 48 |
| 118 | 76 | Manufacture P/N | 37 | 00110111 | 55 |
| 119 | 77 | Manufacture P/N | 4A | 01001010 | 74 |
| 120 | 78 | Manufacture P/N | 41 | 01000001 | 65 |
| 121 | 79 | Manufacture P/N | 31 | 00110001 | 49 |
| 122 | 7A | Manufacture P/N | 2D | 00101101 | 45 |
| 123 | 7B | Manufacture P/N | 34 | 00110100 | 52 |
| 124 | 7C | Reserved for definition | 0A | 00011010 | 10 |
| 125 | 7D | Reserved for definition | 20 | 00100000 | 32 |
| 126 | 7E | Extension Flag | 00 | 00000000 | 0 |
| 127 | 7F | Checksum | 31 | 00111001 | 57 |

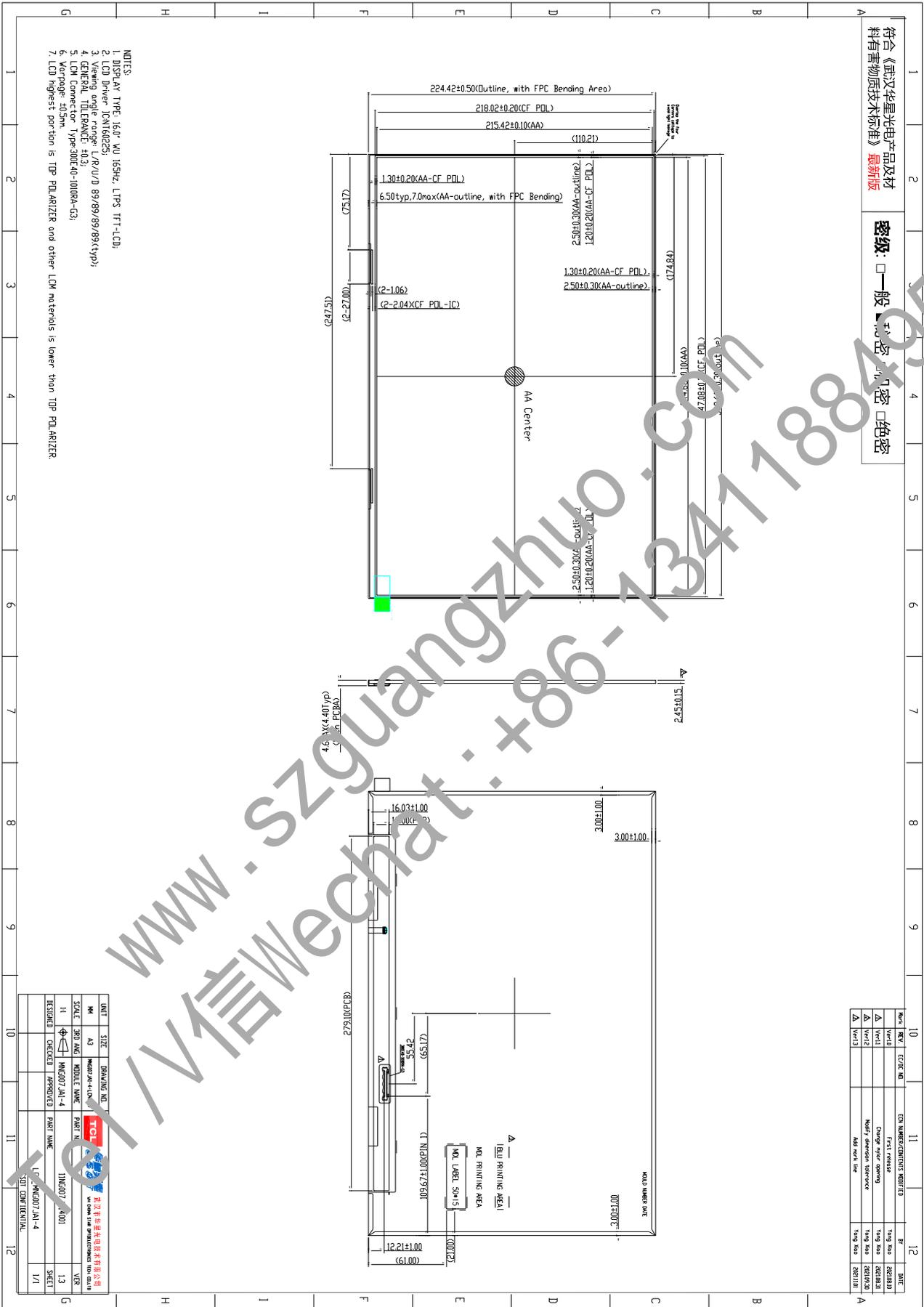
Appendix. OUTLINE DRAWING

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