

SPECIFICATIONS FOR LCD MODULE

| | |
|--------------------------|----------------------------|
| CUSTOMER | |
| CUSTOMER PART NO. | |
| AMPIRE PART NO. | AM-480272METMQW-02H |
| APPROVED BY | |
| DATE | |

- Approved For Specifications
- Approved For Specifications & Sample

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|  |  |  |

Date : 2013/10/17

AMPIRE CO., LTD.

1

RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---------------|------|-------------|--------|
| 2013/10/17 | -- | New Release | Rober |

1. FEATURES

- (1) Construction : amorphous silicon TFT-LCD with driving system, Stainless Bezel and White LED Backlight.
- (2) LCD type : Transmissive , Normally White.
- (3) Interface : 24bit RGB interface.
- (4) Power Supply Voltage : 3.3V power input for TFT, built-in power supply circuit.
- (5) RoHS Compliance.

2. PHYSICAL SPECIFICATIONS

| Item | Specifications | unit |
|----------------------------|------------------------------|-------------------|
| Display size (diagonal) | 4.3 | inch |
| Resolution | 480 RGB(H) x 272(V) | Dot |
| Display area | 95.04 (H) x 53.856 (V) | mm |
| Pixel pitch | 0.198 (H) x 0.198 (V) | mm |
| Overall dimension | 105.5 x 67.2 x 2.9 (Typ.) | mm |
| Color configuration | R.G.B Vertical stripe | |
| Surface treatment | Antiglare, Hard-Coating (3H) | |
| (Gray Inversion Direction) | 6 o'clock | |
| Viewing Direction | 12 o'clock | |
| Brightness | 800 | cd/m ² |
| Backlight unit | LED | |

3. ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------------|------------------|------|------|------|------|-----------|
| Power Supply Voltage | VDD | -0.3 | -- | 4 | V | GND=0 |
| Logic Signal Input Level | V _I | -0.3 | -- | 4 | V | |
| LED Current | I _L | -- | 60 | -- | mA | (1)(2)(3) |
| LED voltage | V _L | -- | 16.5 | -- | V | (1)(2)(3) |
| Operating Temperature | T _{ops} | -20 | -- | 70 | °C | |
| Storage Temperature | T _{stg} | -30 | -- | 80 | °C | |

Note :

(1) Permanent damage may occur to the LCD module if beyond this specification.

Functional operation should be restricted to the conditions described under normal operating conditions.

(2) $T_a = 25 \pm 2^\circ\text{C}$

(3) Test Condition: LED current 40 mA. The LED lifetime could be decreased if operating IL is larger than 40mA.

4. OPTICAL CHARACTERISTICS

4.1 Optical specification

| Item | | Symbol | Condition | Min. | Typ. | Max. | Unit | Note |
|------------------------------|---------|------------|------------------------------------|------|------|------|-------------------|------------------------|
| Viewing Angle | Left | Θ_L | $CR \geq 10$ | 60 | 70 | -- | deg. | (1)(4) |
| | Right | Θ_R | | 60 | 70 | -- | | |
| | Up | Θ_U | | 40 | 50 | -- | | |
| | Down | Θ_D | | 60 | 70 | -- | | |
| Contrast ratio | | CR | $\Theta=0$ Normal viewing angle | 400 | 500 | -- | -- | (1)(2) |
| Response Time | Rising | T_R | | -- | 8 | 10 | msec | (1)(3) |
| | Falling | T_F | | -- | 17 | 20 | msec | |
| Color chromaticity (CIE1931) | White | W_x | | 0.26 | 0.31 | 0.36 | -- | (1)(4) |
| | | W_y | | 0.28 | 0.33 | 0.38 | | |
| White Luminance (Center) | | Y_L | | -- | 800 | -- | cd/m ² | (1)(4)(7) (IL=40mA) |
| Brightness Uniformity | | B_{UNI} | | 70 | -- | -- | % | (5)(7) |
| Optima View Direction | | 6 o'clock | | | | | | (6) |

4.2 Measuring Condition

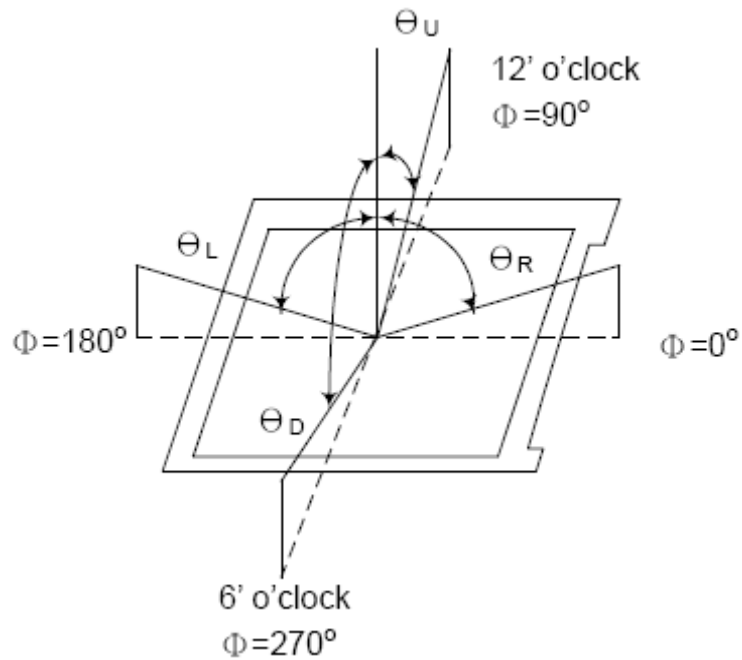
- (1) Measuring surrounding : dark room
- (2) LED current I_L : 40mA
- (3) Ambient temperature : $25 \pm 2^\circ\text{C}$
- (4) 15min. warm-up time.

4.3 Measuring Equipment

- (1) FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

(2) Measuring spot size : 20 ~ 21 m

Note (1) Definition of Viewing Angle :

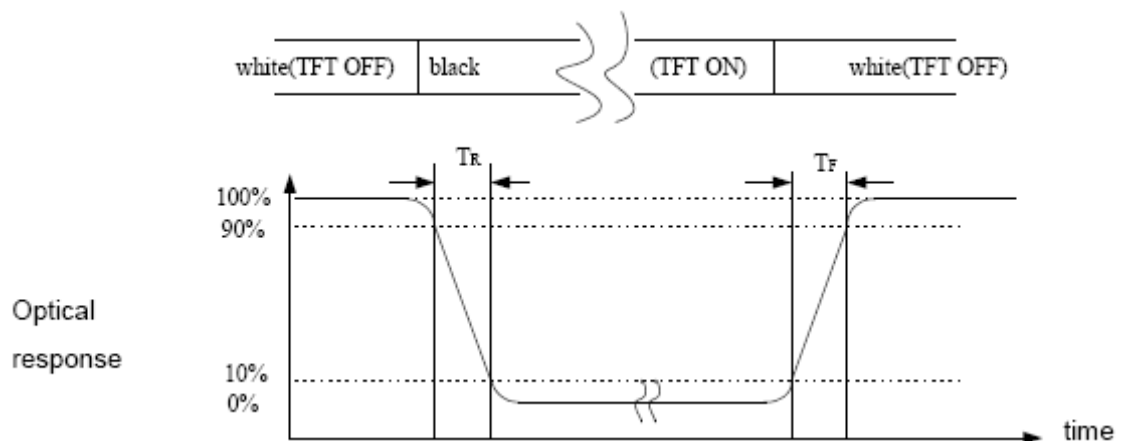


Note (2) Definition of Contrast Ratio (CR) :

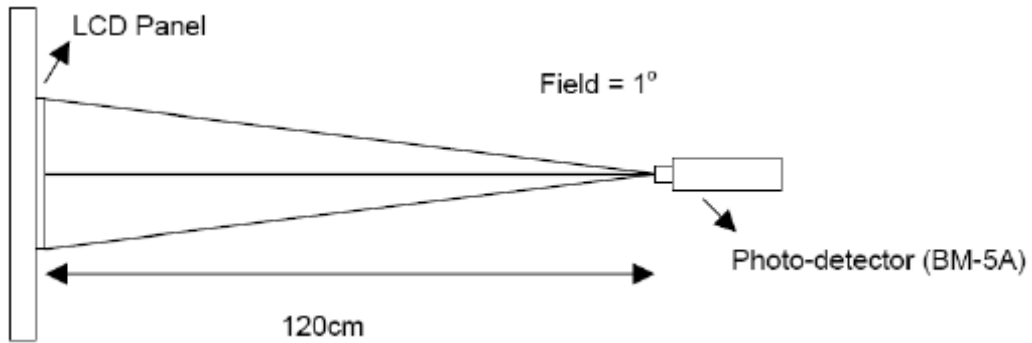
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

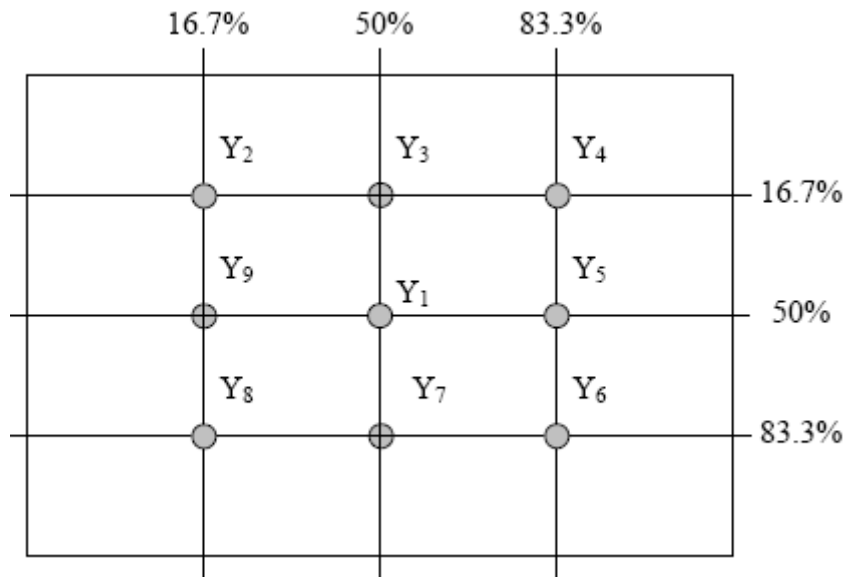
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity



$$\text{Luminance uniformity} = \frac{\text{(Min Luminance of 9 points)}}{\text{(Max Luminance of 9 points)}} \times 100\%$$

Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

5. ELECTRICAL CHARACTERISTICS

5.1 TFT LCD Module

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------|----------|-------------|-------|-------------|------|---------------|
| Supply Voltage | V_{DD} | 3.0 | 3.3 | 3.6 | V | |
| Input signal voltage | V_{IH} | $0.7V_{DD}$ | -- | V_{DD} | V | Note(1) |
| | V_{IL} | 0 | -- | $0.3V_{DD}$ | V | |
| Current of power supply | I_{CC} | -- | T.B.D | T.B.D | mA | $V_{DD}=3.3V$ |

Note (1) : HSYNC , VSYNC , DE , R/G/B Data

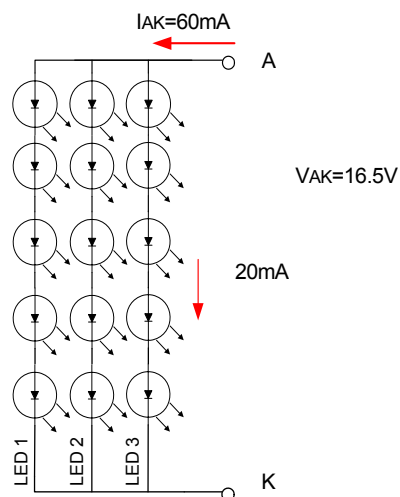
Note (2) : GND = 0V

5.2 Back-Light Unit

The back-light system is an edge-lighting type with 15 LED.

The characteristics of the LED are shown in the following tables.

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------------|--------|------|------|------|-------|--------|
| LED current | I_L | -- | 60 | -- | mA | (2) |
| LED voltage | V_L | -- | 16.5 | -- | V | |
| Operating LED life time | Hr | 20K | 25K | -- | Hours | (1)(2) |

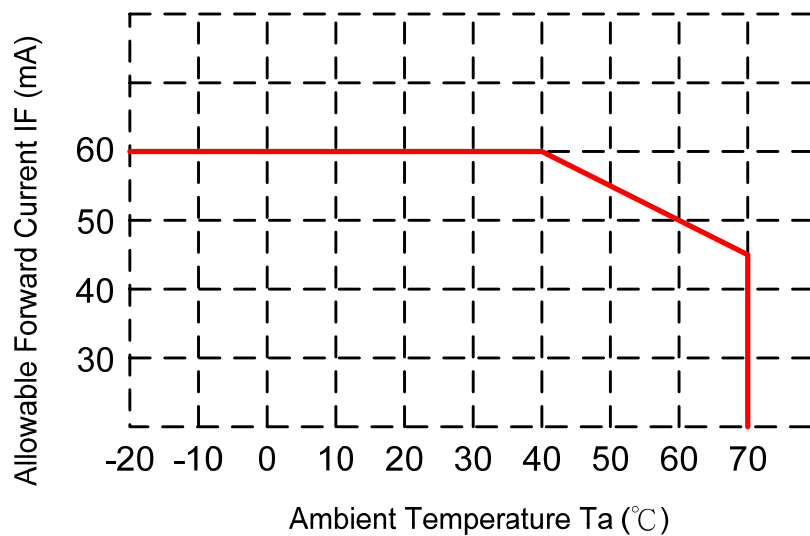


Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^{\circ}\text{C}$, typical I_L value indicated in the above table until the brightness becomes less than 50%.

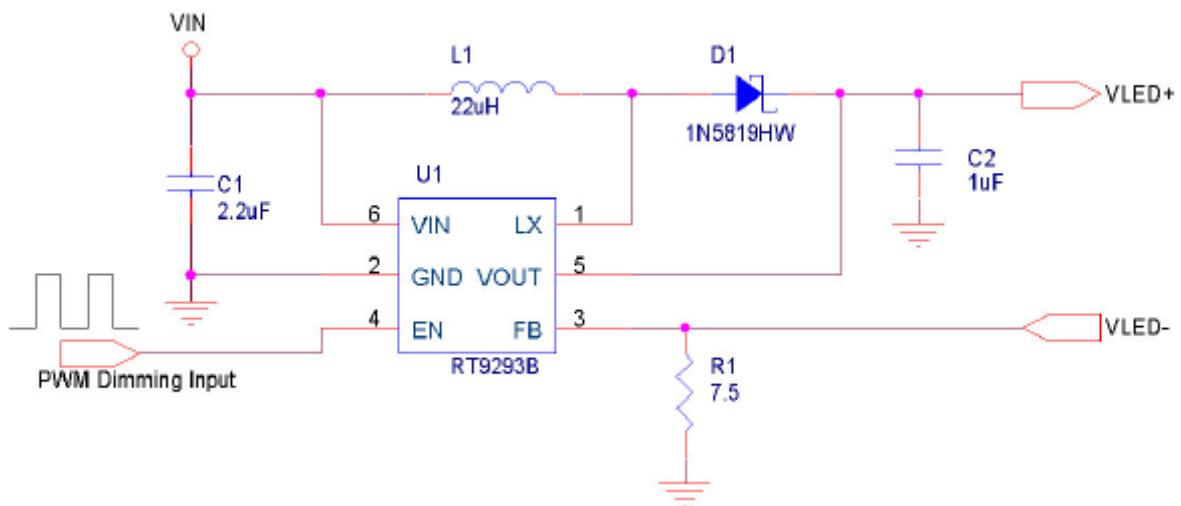
Note (2) The “LED life time” is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=60\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 60mA. The constant current driving method is suggested.

The constant current source is needed for white LED back-light driving.

When LCM is operated over 60°C ambient temperature, the I_L of the LED back-light should be adjusted to 50mA max.

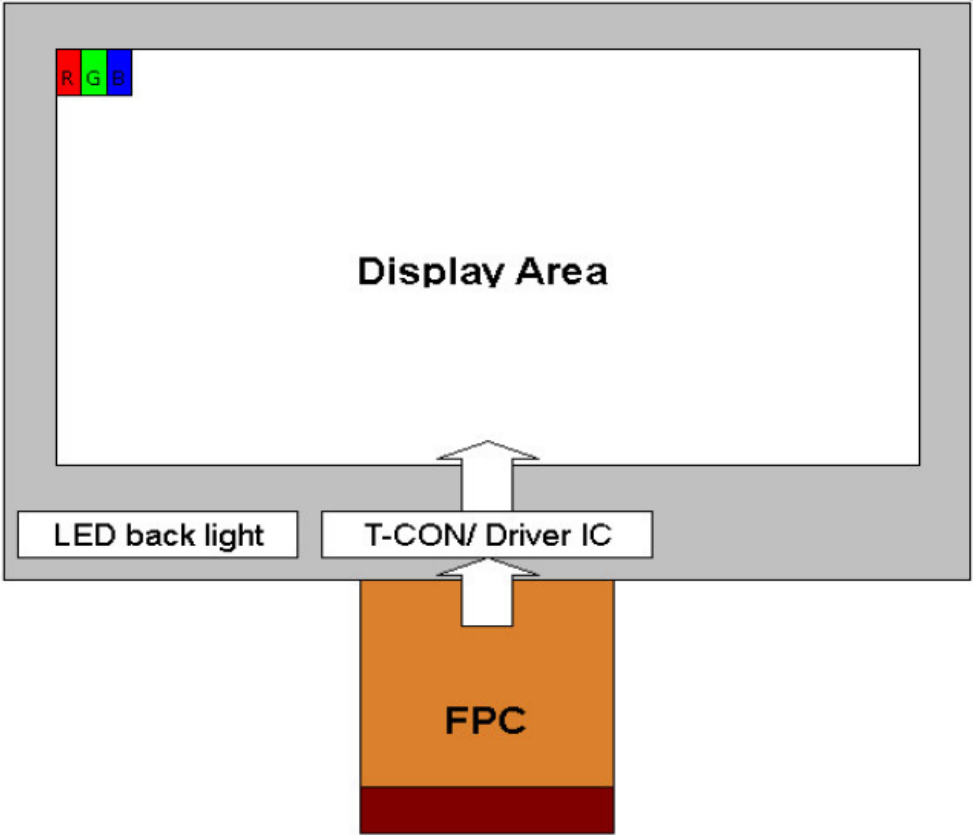


Note (3) Suggested Schematic of LED Back-Light Driver

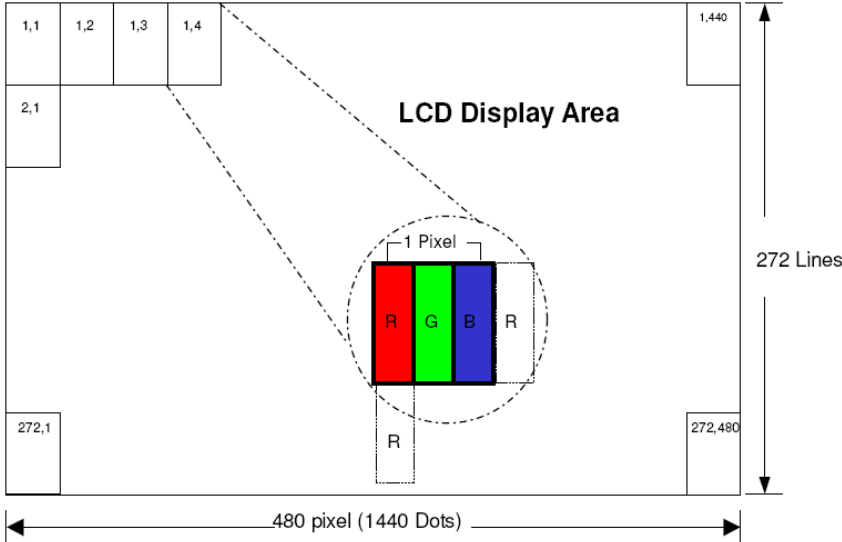


6. BLOCK DIAGRAM

6.1 TFT LCD Module



6.2 Pixel Format



7. INTERFACE PIN ASSIGNMENT

FPC connector is used for electronics interface. The recommended model is FH19SC-40S-0.5SH (05) manufactured by HIROSE

| Pin no | Symbol | I/O | Function | Note |
|--------|--------|-----|---------------------------------|------|
| 1 | VLED- | P | Power for LED Backlight Cathode | |
| 2 | VLED+ | P | Power for LED Backlight Anode | |
| 3 | GND | P | Power Ground | |
| 4 | VDD | P | Power Voltage | |
| 5 | R0 | I | Red Data (LSB) | |
| 6 | R1 | I | Red Data | |
| 7 | R2 | I | Red Data | |
| 8 | R3 | I | Red Data | |
| 9 | R4 | I | Red Data | |
| 10 | R5 | I | Red Data | |
| 11 | R6 | I | Red Data | |
| 12 | R7 | I | Red Data (MSB) | |
| 13 | G0 | I | Green Data (LSB) | |
| 14 | G1 | I | Green Data | |
| 15 | G2 | I | Green Data | |
| 16 | G3 | I | Green Data | |
| 17 | G4 | I | Green Data | |
| 18 | G5 | I | Green Data | |
| 19 | G6 | I | Green Data | |
| 20 | G7 | I | Green Data (MSB) | |
| 21 | B0 | I | Blue Data (LSB) | |
| 22 | B1 | I | Blue Data | |
| 23 | B2 | I | Blue Data | |
| 24 | B3 | I | Blue Data | |
| 25 | B4 | I | Blue Data | |
| 26 | B5 | I | Blue Data | |
| 27 | B6 | I | Blue Data | |
| 28 | B7 | I | Blue Data (MSB) | |

| | | | | |
|----|-------|-----|---|--|
| 29 | GND | P | Power Ground | |
| 30 | DCLK | I | Pixel Clock Data latched at rising edge of this signal. | |
| 31 | DISP | I | Display On(Hi)/ Off(Lo) | |
| 32 | HSYNC | I | Horizontal Sync Signal | |
| 33 | VSYNC | I | Vertical Sync Signal | |
| 34 | DE | I | Data Enable | |
| 35 | NC | -- | No connect | |
| 36 | GND | P | Power Ground | |
| 37 | X_R | I/O | No Connection | |
| 38 | Y_B | I/O | No Connection | |
| 39 | X_L | I/O | No Connection | |
| 40 | Y_T | I/O | No Connection | |

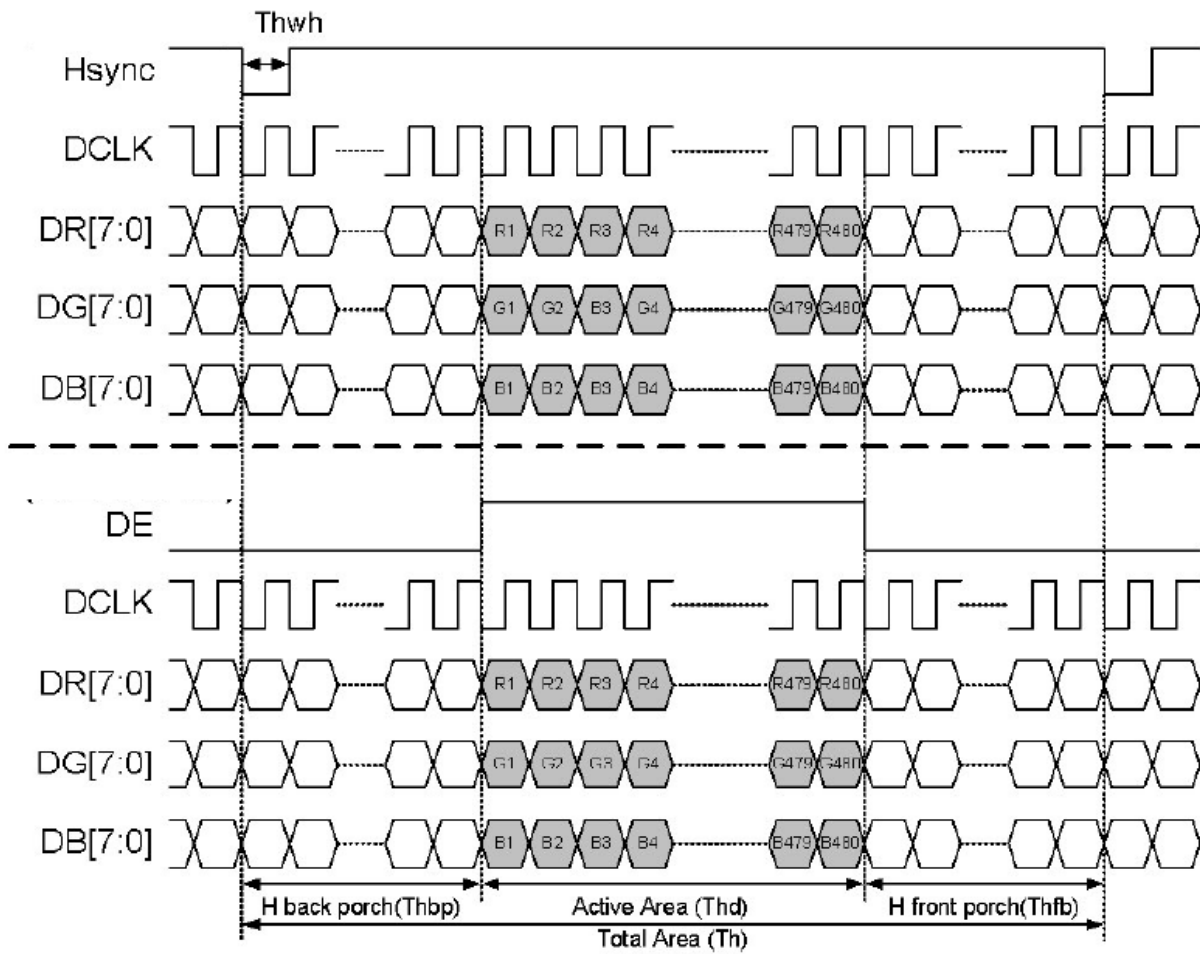
I/O : I: input, O: output, P: power

8. INTERFACE TIMING

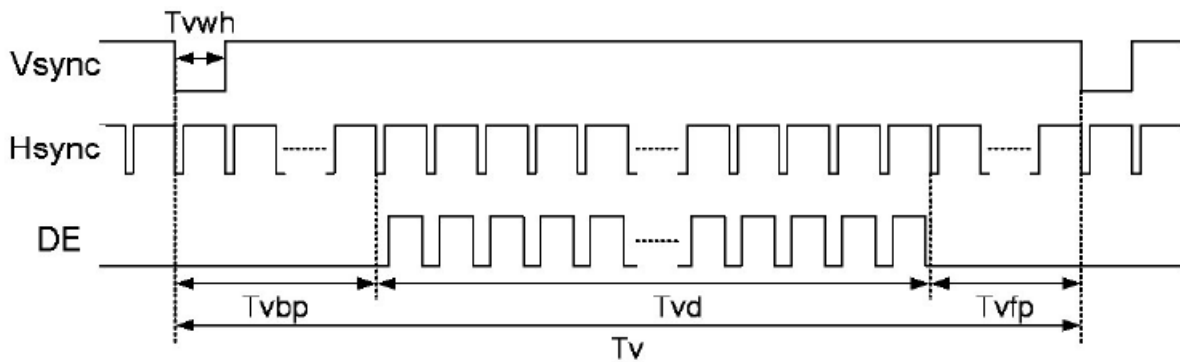
8.1 Parallel 24*bit RGB Input Timing Table

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|--------------------|--------|------|------|------|------|------|
| DCLK frequency | Fclk | 8 | 9 | 12 | MHz | |
| VSYNC period time | Tv | 285 | 286 | 399 | Th | |
| VSYNC display area | Tvd | 272 | | | Th | |
| VSYNC back porch | Tvbp | 1 | 2 | 11 | Th | |
| VSYNC front porch | Tvfp | 1 | 2 | 227 | Th | |
| VSYNC pulse width | Tvwh | 1 | 10 | 11 | Th | |
| HSYNC period time | Th | 525 | 525 | 605 | DCLK | |
| HSYNC display area | Thd | 480 | | | DCLK | |
| HSYNC back porch | Thbp | 36 | 40 | 255 | DCLK | |
| HSYNC front porch | Thfp | 2 | 2 | 82 | DCLK | |
| HSYNC pulse width | Thwh | 2 | 2 | 41 | DCLK | |

Parallel 24-bit RGB Mode Data Format (DE Mode)



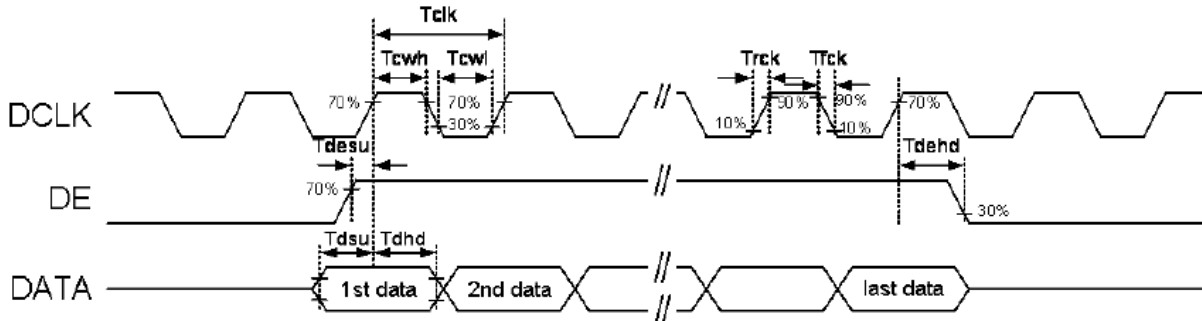
Vertical Input Timing

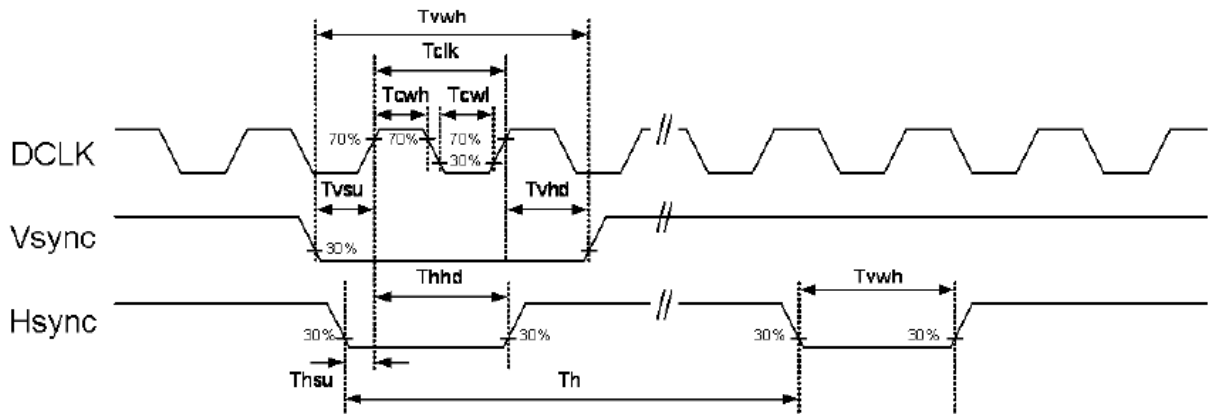


8.2 AC Electrical Characteristics

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|-------------------|--------|------|------|------|------|------|
| DCLK period time | Tclk | 66.7 | -- | -- | ns | |
| DCLK rising time | Trck | -- | -- | 6.65 | ns | |
| DCLK falling time | Tfck | -- | -- | 6.65 | ns | |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | |
| DE setup time | Tdesu | 10 | -- | -- | ns | |
| DE hold time | Tdehd | 10 | -- | -- | ns | |
| HSYNC pulse width | Thwh | 2 | -- | -- | DCLK | |
| HSYNC setup time | Thsu | 10 | -- | -- | ns | |
| HSYNC hold time | Thhd | 10 | -- | -- | ns | |
| VSYNC pulse width | Tvwh | 1 | -- | -- | Th | |
| VSYNC setup time | Tvsu | 10 | -- | -- | ns | |
| VSYNC hold time | Tvhd | 10 | -- | -- | ns | |
| Data setup time | Tdsu | 10 | -- | -- | ns | |
| Data hold time | Tdhd | 10 | -- | -- | ns | |

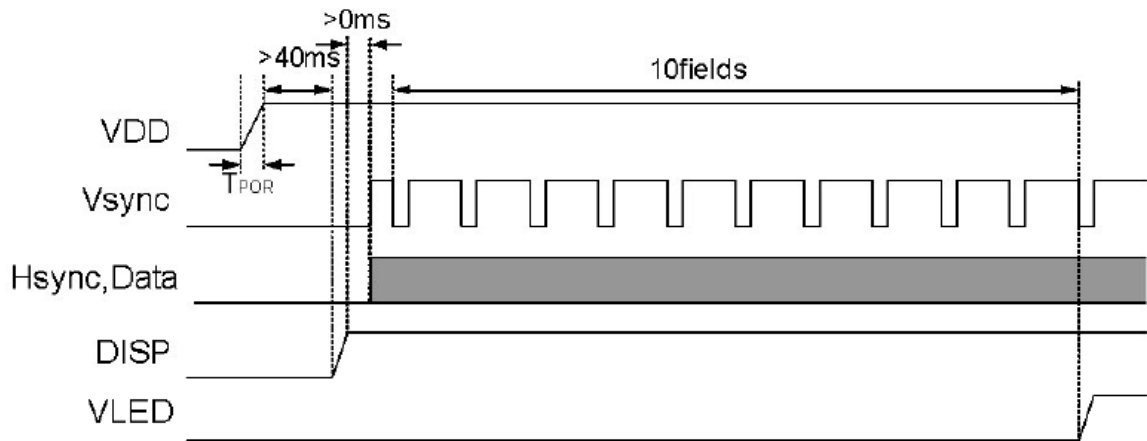
Clock and Data Input Timing Diagram



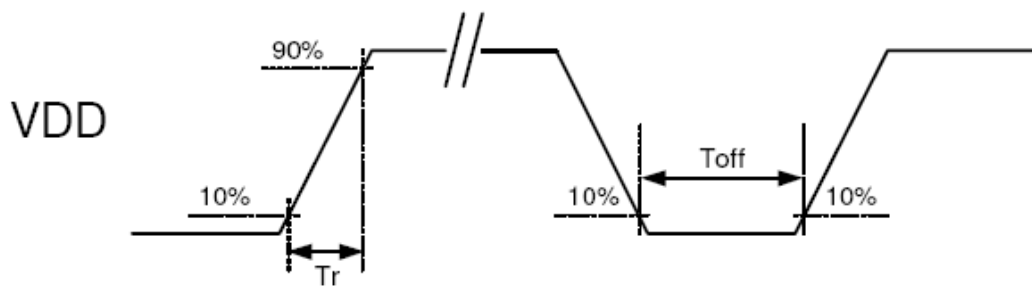
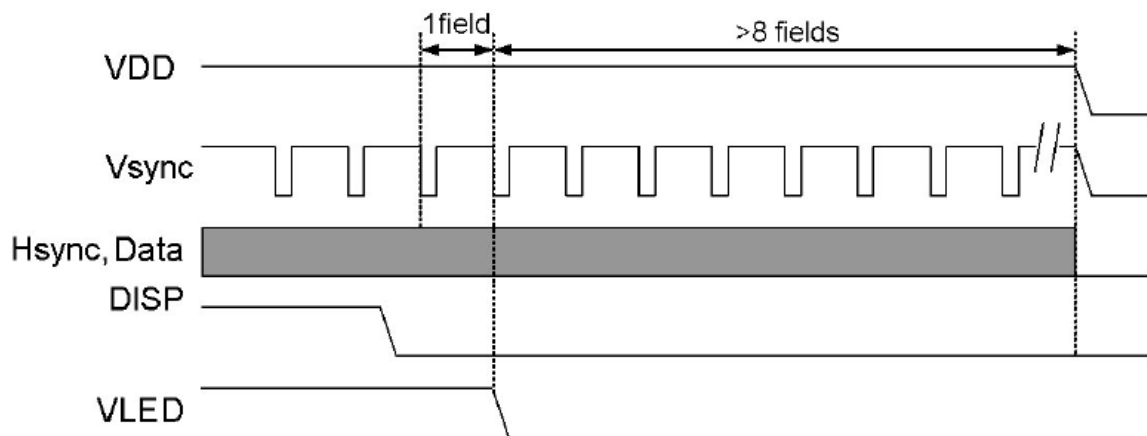


8.3 Power Sequence

Power On Sequence



Power Off Sequence



VDD power input timing

Notes:

- Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE
- Power on sequence: VDD → DISP → Data → V_{LED}
- Power off sequence: DISP → V_{LED} → Data → VDD
- VDD power input timing: 0.5ms < Tr < 10ms; Toff > 500ms

9. RELIABILITY TEST CONDITIONS

| Test Item | Test Conditions | Note |
|----------------------------|---|------|
| High Temperature Operation | 70±3°C , t=240 hrs | |
| Low Temperature Operation | -20±3°C , t=240 hrs | |
| High Temperature Storage | 80±3°C , t=240 hrs | 1,2 |
| Low Temperature Storage | -30±3°C , t=240 hrs | 1,2 |
| Thermal Shock Test | -20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle | 1,2 |
| Humidity Test | 40 °C, Humidity 90%, 96 hrs | 1,2 |
| Vibration Test (Packing) | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis | 2 |

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions

(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

10. GENERAL PRECAUTION

10-1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10-2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. Ampire does not warrant the module, if customers disassemble or modify the module.

10-3 Breakage of LCD Panel

- (1) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.
- (2) If liquid crystal contacts mouth or eyes, rinse out with water immediately.
- (3) If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
- (4) Handle carefully with chips of glass that may cause injury, when the glass is broken.

10-4 Electric Shock

- (1) Disconnect power supply before handling LCD module.
- (2) Do not pull or fold the LED cable.
- (3) Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

10-5 Absolute Maximum Ratings and Power Protection Circuit

- (1) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.
- (2) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.
- (3) It's recommended to employ protection circuit for power supply.

10-6 Operation

- (1) Do not touch, push or rub the polarizer with anything harder than HB pencil lead.
- (2) Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
- (3) When the surface is dusty, please wipe gently with absorbent cotton or other soft material.
- (4) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
- (5) When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10-7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

10-8 Static Electricity

- (1) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
- (2) Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

10-9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

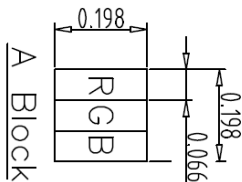
10-10 Disposal

When disposing LCD module, obey the local environmental regulations.

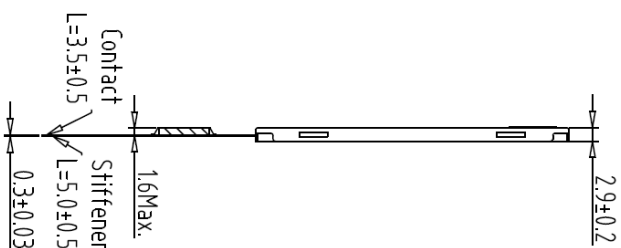
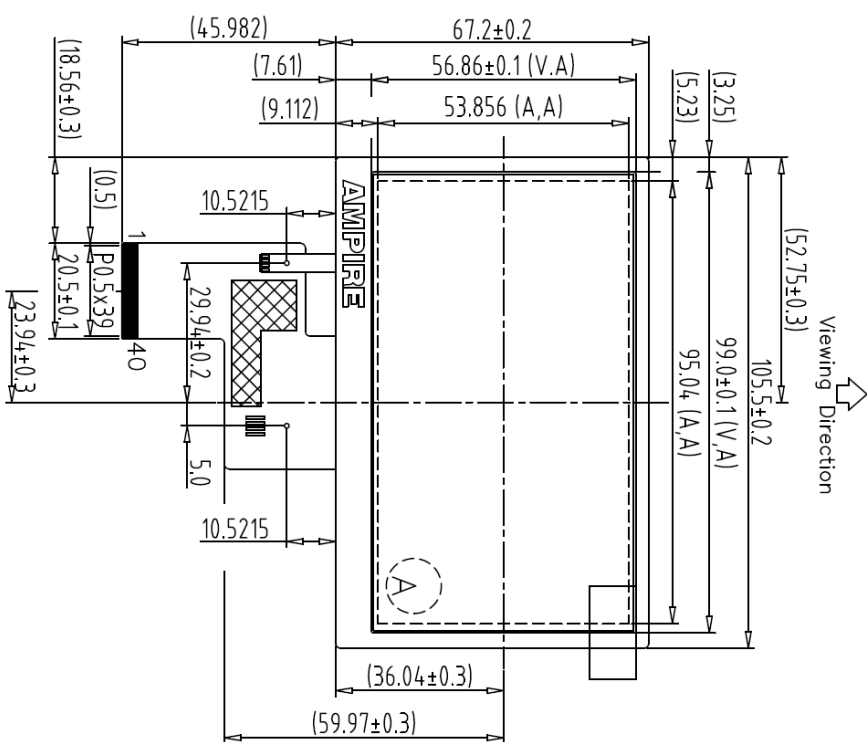
10-11 Others

1. Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.
2. AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

11. OUTLINE DIMENSION



| | | | |
|----|-------|----|-------|
| 1 | VLED- | 21 | B0 |
| 2 | VLED+ | 22 | B1 |
| 3 | GND | 23 | B2 |
| 4 | VDD | 24 | B3 |
| 5 | R0 | 25 | B4 |
| 6 | R1 | 26 | B5 |
| 7 | R2 | 27 | B6 |
| 8 | R3 | 28 | B7 |
| 9 | R4 | 29 | GND |
| 10 | R5 | 30 | DCLK |
| 11 | R6 | 31 | DISP |
| 12 | R7 | 32 | HSYNC |
| 13 | G0 | 33 | VSYNC |
| 14 | G1 | 34 | DE |
| 15 | G2 | 35 | NC |
| 16 | G3 | 36 | GND |
| 17 | G4 | 37 | X_R |
| 18 | G5 | 38 | Y_B |
| 19 | G6 | 39 | X_L |
| 20 | G7 | 40 | Y_T |



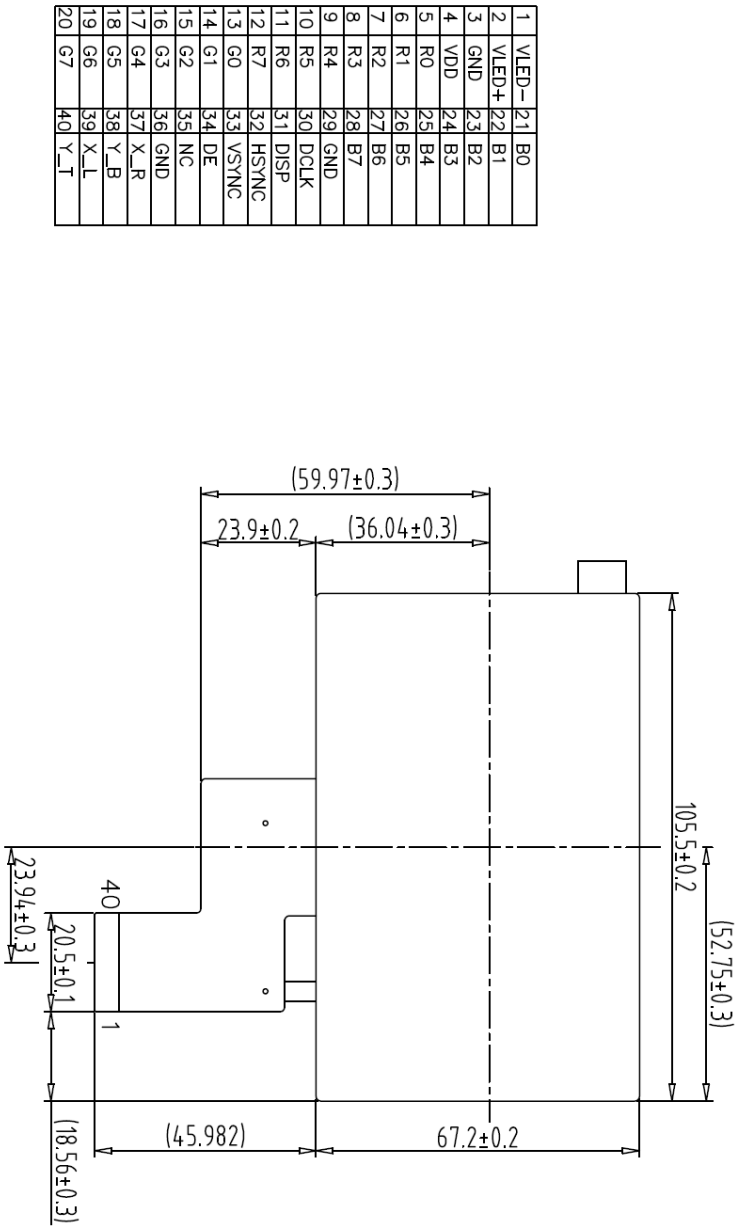
Note:
1. Unless indicated, Tolerance "±0.3".
2. UV Glue For OLB Protection.

| | | | | | | | | | | | | |
|---|-----------------|----|--|--------------------|---|---|---------------|-----------|-----------|----------|-----------|-------|
| 1 | TFI-480272-72-0 | 7 | | TOLERANCE GRADE(F) | A | B | DIM. MM | DWN. CHK. | DATE | TITLE | DWG. NO. | SHEET |
| 2 | | 8 | | | | | | Henry | 01-04-13' | 480272ME | (4.3") | 1 |
| 3 | | 9 | | | | | IB NO. | CHK. | DATE | | | |
| 4 | | 10 | | | | | PARTS NO. LCM | APPD. | DATE | | | |
| 5 | | 11 | | | | | 480272ME | | | | *130105MA | |
| 6 | | 12 | | | | | | | | | | |

| REV | REVISION RECORD | DATE | NAME |
|-----|------------------------------------|----------|-------|
| 0 | NEW RELEASE | 01-04-13 | Henry |
| 1 | TFI-480272-72-0 Rename to 480272ME | 01-28-13 | Henry |



| REV | REVISION RECORD | DATE | NAME |
|-----|------------------------------------|----------|-------|
| 0 | NEW RELEASE | 01-04-13 | Henry |
| 1 | TFT-480272-72-0 Rename to 480272ME | 01-28-13 | Henry |



Back View

- Note:
1. Unless indicated, Tolerance "±0.3".
 2. UV Glue For OLB Protection.

| REV | REV | REV | TOLERANCE | GRADE | A | B | DIM. | MM | DRAW. | CHK. | DATE | DATE | TITLE | DWG. NO. | SHEET | OP |
|-----|-----------------|-----|-----------|-------|---|---|------|----|-------|------|----------|------|----------|----------|-------|----|
| 1 | TFT-480272-72-0 | 7 | | | | | | | Henry | | 01-04-13 | | 480272ME | 480272ME | 1 | 1 |
| 2 | | 8 | | | | | | | | | | | | | | |
| 3 | | 9 | | | | | | | | | | | | | | |
| 4 | | 10 | | | | | | | | | | | | | | |
| 5 | | 11 | | | | | | | | | | | | | | |
| 6 | | 12 | | | | | | | | | | | | | | |

