晶采光電科技股份有限公司
**AMPIRE CO., LTD.**

# SPECIFICATIONS FOR
# LCD MODULE

| CUSTOMER | |
|---|---|
| **CUSTOMER PART NO.** | |
| **AMPIRE PART NO.** | **AM-800480ATZQW-00H** |
| **APPROVED BY** | |
| **DATE** | |

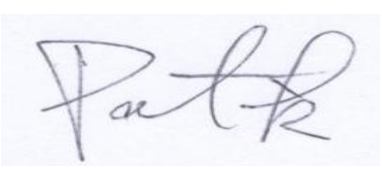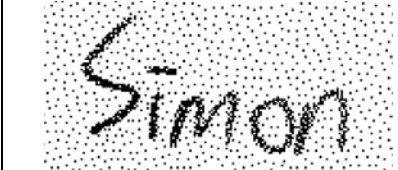■Approved For Specifications
□Approved For Specifications & Sample

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| APPROVED BY | CHECKED BY | ORGANIZED BY |
|---|---|---|
| | Simon | |

# RECORD OF REVISION

| Revision Date | Page | Contents | Editor |
|---|---|---|---|
| 2017/6/16 | -- | New Release | Emil |

# 1. General Specifications

| Feature | | Spec |
|---|---|---|
| **Display Spec.** | Size | 7 inch |
| | Resolution | 800(RGB) x 480 |
| | Interface | RGB 24 bits with TCON |
| | Color Depth | 16.7M |
| | Technology Type | a-Si |
| | Pixel Pitch (mm) | 0.1905 (H) x 0.1905(V) |
| | Pixel Configuration | R.G.B. Vertical Stripe |
| | Display Mode | Normally black |
| | Surface Treatment(Up Polarizer) | Anti Glare |
| **Mechanical Characteristics** | LCM (W x H x D) (mm) | 165x 104.07 x 6.8 |
| | Active Area(mm) | 152.4 (W) x 91.44 (H) |
| | With /Without TSP | Without TSP |
| | LED Numbers | 28 LEDs |

Note 1: Requirements on Environmental Protection: RoHS

Note 2: LCM weight tolerance: +/- 5%

## 2.  Absolute Maximum Ratings

| Item | Symbol | Min | Max | Unit | Remark |
|---|---|---|---|---|---|
| Power Voltage | VCC | -0.3 | 4.5 | V | |
| | AVDD | -0.3 | 14.5 | V | |
| | VGH | -0.3 | VGL+35 | V | |
| | VGL | -15 | 0.3 | V | |
| | VCOM | 4 | 6 | V | |
| Backlight Forward Current | ILED | | 40 | mA | For each LED |
| Operating Temperature | TOPR | -30 | 85 | ℃ | |
| Storage Temperature | TSTG | -40 | 95 | ℃ | |

## 3. Electrical Characteristics

### 3.1 Recommended Operating Condition

AGND=GND=0V, Ta = 25℃

| Item | Symbol | Min | Typ | Max | Unit | Note |
|---|---|---|---|---|---|---|
| Digital Supply Voltage | VCC | 3.0 | 3.3 | 3.6 | V | |
| Analog Supply Voltage | AVDD | - | 12.4 | - | V | |
| Gate On Voltage | VGH | - | 19 | - | V | |
| Gate Off Voltage | VGL | - | -10 | - | V | |
| Common Electrode Driving Signal | VCOM | - | 5.5 | - | V | |
| Input signal voltage | VIH | 0.7*VCC | - | VCC | V | NOTE(1) |
| | VIL | 0 | - | 0.3*VCC | V | |
| Current of power supply | IVCC | - | 15 | - | A | VCC=3.3V, |
| | IAVDD | - | 20 | - | A | AVDD=12.5V, |
| | IVGH | - | 0.25 | - | A | VGH=319V, |
| | IVGL | - | 0.5 | - | A | VGL=-10V, |

Note (1): HSYNC, VSYNC, DE, Digital Data

Note (2): Be sure to apply the power voltage as the power sequence spec.

Note (3): GND=AGND=0V

### 3.2 Recommended Driving Condition for Backlight

| Item | Symbol | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|
| Forward Current | IL | - | 160 | - | mA | Ta=25℃ |
| Forward Voltage | VF | | 21.3 | | V | |
| Operating Life Time | - | 30,000 | - | - | Hrs | |

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3℃, typical IL 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 Ta=25℃. And IL=160mA. The LED lifetime could be decreased if operating IL is larger than 160mA. The constant current driving method is suggested.
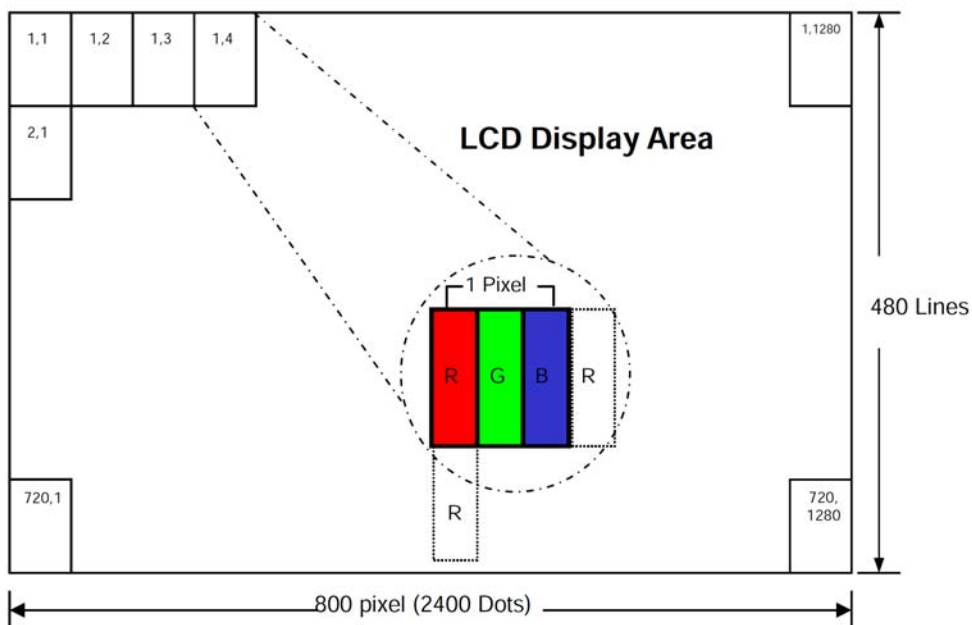
Note (3) LED Light Bar Circuit
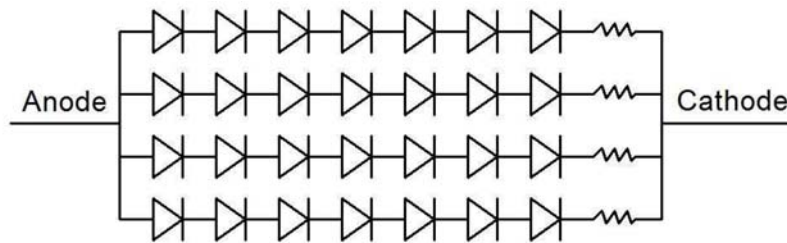
### 3.3 Block Diagram
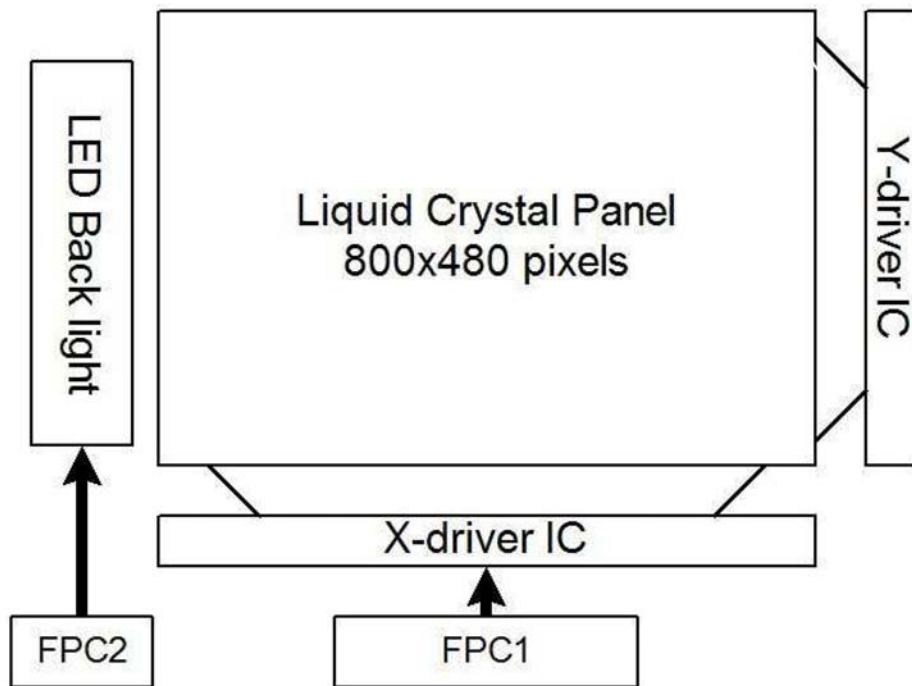


### 3.4 Pixel format

# 4. Input/Output Terminals

## 4.1 FPC1: signal and power input. (Connector: HIROSE FH52-60S-0.5SH)

| Pin No. | Symbol | I/O | function | Remarks |
|---|---|---|---|---|
| 1 | AGND | P | Analog Ground. | |
| 2 | AVDD | P | Analog Power. | |
| 3 | VCC | P | Digital Power. | |
| 4 | R0 | I | Data Input (LSB) of Red. | |
| 5 | R1 | I | Data Input of Red. | |
| 6 | R2 | I | Data Input of Red. | |
| 7 | R3 | I | Data Input of Red. | |
| 8 | R4 | I | Data Input of Red. | |
| 9 | R5 | I | Data Input of Red. | |
| 10 | R6 | I | Data Input of Red. | |
| 11 | R7 | I | Data Input (MSB) of Red. | |
| 12 | G0 | I | Data Input (LSB) of Green. | |
| 13 | G1 | I | Data Input of Red. | |
| 14 | G2 | I | Data Input of Red. | |
| 15 | G3 | I | Data Input of Red. | |
| 16 | G4 | I | Data Input of Red. | |
| 17 | G5 | I | Data Input of Red. | |
| 18 | G6 | I | Data Input of Red. | |
| 19 | G7 | I | Data Input(MSB) of Green. | |
| 20 | B0 | I | Data Input(LSB) of Blue. | |
| 21 | B1 | I | Data Input of Red. | |
| 22 | B2 | I | Data Input of Red. | |
| 23 | B3 | I | Data Input of Red. | |
| 24 | B4 | I | Data Input of Red. | |
| 25 | B5 | I | Data Input of Red. | |
| 26 | B6 | I | Data Input of Red. | |
| 27 | B7 | I | Data Input (MSB) of Blue. | |
| 28 | DCLK | I | Clock input. | |
| 29 | DE | I | Data enable signal. | |
| 30 | HSD | I | Horizontal sync input. | Negative polarity |
| 31 | VSD | I | Vertical sync input. | Negative polarity |
| 32 | MODE | I | DE/SYNC mode select. | normally pull low<br>H: HV mode; L: DE mode |
| 33 | RSTB | I | Global reset pin. Normally pull high. | H: normal operation.<br>L: the controller is in reset state.<br>Suggest to connecting with an RC (10Kohm, 0.1µF) reset circuit for stability. |
| 34 | STBYB | I | Standby mode. Normally pull low. | H: normal operation.<br>L: the controller and source driver will turn off.<br>Suggest to connecting with an RC (10Kohm, 0.47µF) reset circuit for stability. |
| 35 | SHLR | I | Left or Right Display Control. Note1. | |
| 36 | VCC | P | Digital Power. | |
| 37 | UPDN | I | Up / Down Display Control. Note1. | |
| 38 | GND | P | Digital Ground. | |
| 39 | AGND | P | Digital Ground. | |
| 40 | AVDD | P | Analog Power. | |
| 41 | VCOM | P | For external VCOM DC input | |

| 42 | N/C | - | Not connect |  |
|----|-----|---|-------------|--|
| 43 | BIST | - | Aging mode on/off control. | Please float this pin. |
| 44 | N/C | - | Not connect |  |
| 45 | N/C | - | Not connect |  |
| 46 | N/C | - | Not connect |  |
| 47 | N/C | - | Not connect |  |
| 48 | CSB | - | Serial communication chip selection. | Please float this pin. |
| 49 | SCL | - | Serial communication clock pin. | Please float this pin. |
| 50 | SDO | - | Serial communication data out pin. | Please float this pin. |
| 51 | SDI | - | Serial communication data pin. | Please float this pin. |
| 52 | N/C | - | Not connect. |  |
| 53 | VPP_T | - | Power supply for trim function. | Please float this pin. |
| 54 | N/C | - | Not connect. |  |
| 55 | N/C | - | Not connect. |  |
| 56 | VGH | P | Positive Power for TFT. |  |
| 57 | VCC | P | Digital Power. |  |
| 58 | VGL | P | Negative Power for TFT. |  |
| 59 | GND | P | Digital Ground. |  |
| 60 | N/C | - | Not connect. |  |

Note1:

| Scan Control Input | | Scanning Direction |
|-----|-----|-----|
| SHLR | UPDN |  |
| DVDD | GND | Down to Up, Left to Right |
| GND | DVDD | Up to Down, Right to Left |
| GND | GND | Down to Up, Right to Left |
| DVDD | DVDD | Up to Down, Left to Right |
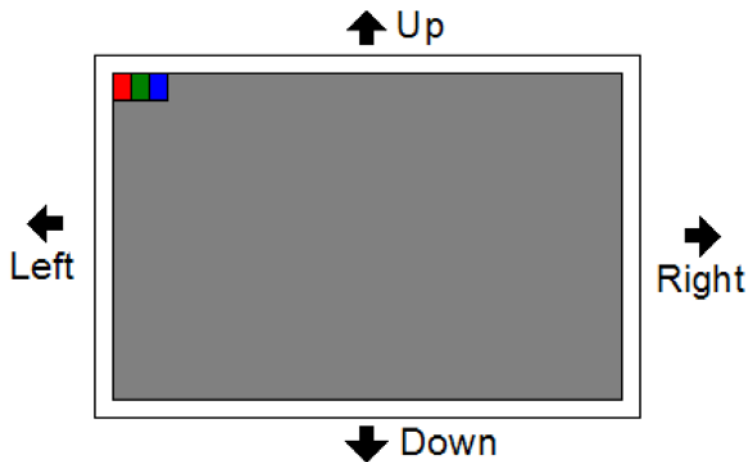
**4.2 LED FPC Pin Assignment:(Connector: HIROSE FH19SC-10S-0.5SH)**

| Terminal No. | Symbol | Function |
|---|---|---|
| 1 | A | Anode |
| 2 | A | Anode |
| 3 | A | Anode |
| 4 | NC | No connect |
| 5 | K1 | Cathode 1 |
| 6 | K2 | Cathode 2 |
| 7 | K3 | Cathode 3 |
| 8 | K4 | Cathode 4 |
| 9 | NC | No connect |
| 10 | NC | No connect |

# 5 Timing Chart

## 5.1 TFT-LCD Input Timing

| Item | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| DCLK cycle time | Tcph | 20 | | 220 | ns | |
| DCLK pulse duty | Tcwh | 35 | 50 | 65 | % | |
| VSD setup time | Tvst | 8 | | | ns | |
| VSD hold time | Tvhd | 8 | | | ns | |
| HSD setup time | Thst | 8 | | | ns | |
| HSD hold time | Thhd | 8 | | | ns | |
| Data setup time | Tdsu | 8 | | | ns | |
| Data hold time | Tdhd | 8 | | | ns | |
| DE setup time | Tesu | 8 | | | ns | |
| DE hold time | Tehd | 8 | | | ns | |
| DCLK frequency | fclk | 28 | 30 | 32 | MHz | |
| Horizontal display area | thd | | 800 | | Tcph | |
| HSD period time | th | 899 | 902 | 915 | Tcph | |
| HSD pulse width | thpw | 5 | 10 | 15 | Tcph | |
| HSD back porch | thb | | 32 | | Tcph | |
| HSD front porch | thfp | 52 | 60 | 68 | Tcph | |
| Vertical display area | tvd | | 480 | | th | |
| VSD period time | tv | 546 | 555 | 564 | th | |
| VSD pulse width | tvpw | 6 | 10 | 14 | Th | |
| VSD back porch | tvb | | 5 | | th | |
| VSD front porch | tvfp | 55 | 60 | 65 | th | |

**Input Clock and Data timing Diagram:**

DE mode

DE

Tesu  Tcph

DCLK

Tcwh  70%  30%  Tcwl

Dx[7:0]

1st data  2nd data  last data

Tdsu  Tdhd

HV mode

DCLK

30%

VSD

Tvst  Tvhd  30%

HSD

Thst  Thhd  30%  th
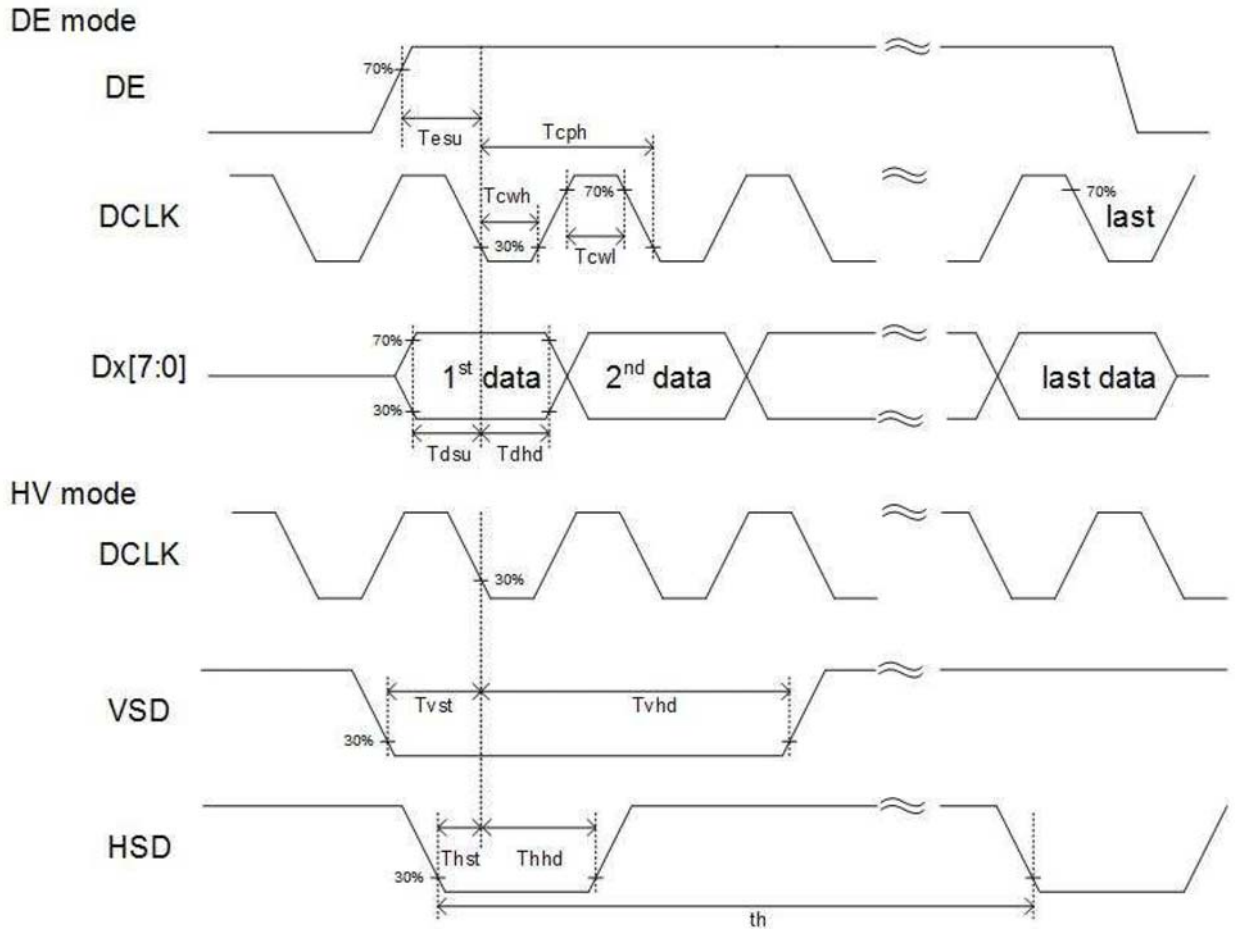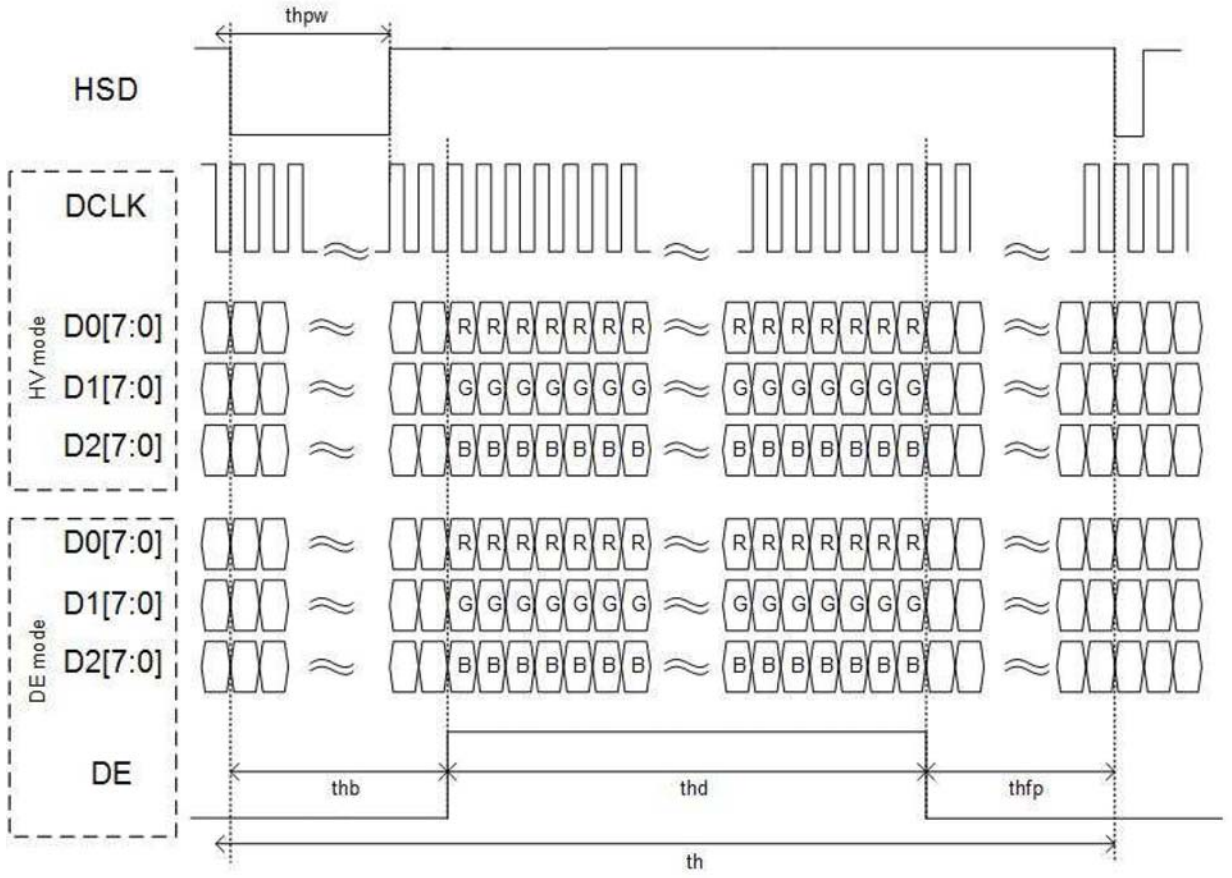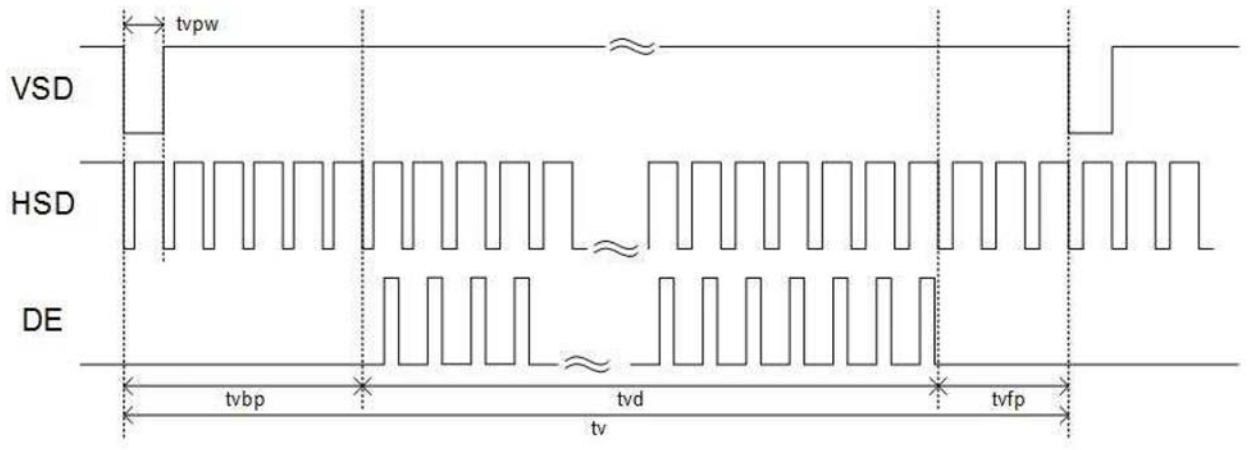
**Data Input Format**

**5.2 POWER ON/OFF SEQUENCE**
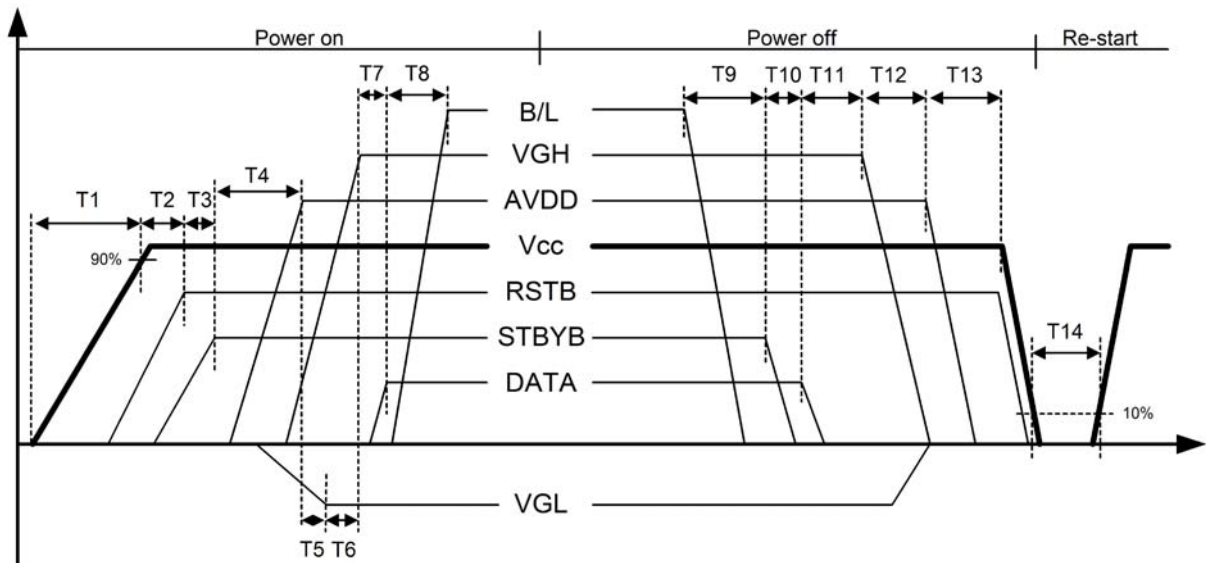


| Item | Min | Typ. | Max. | Unit |
|------|-----|------|------|------|
| T1 | -- | -- | 20 | ms |
| T2 | 1 | -- | -- | ms |
| T3 | 1 | -- | -- | ms |
| T4 | 50 | -- | -- | ms |
| T5 | 32 | -- | -- | ms |
| T6 | 16 | -- | -- | ms |
| T7 | 16 | -- | -- | ms |
| T8 | 32 | -- | -- | ms |
| T9 | 32 | -- | -- | ms |
| T10 | 32 | -- | -- | ms |
| T11 | 50 | -- | -- | ms |
| T12 | 16 | -- | -- | ms |
| T13 | 32 | -- | -- | ms |
| T14 | 1000 | -- | -- | ms |

The Data are included in the R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE, MODE, SHLR, and UPDN.

# 6 Optical Characteristics

| Item | | Symbol | Condition | Min | Typ | Max | Unit | Remark |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | θ=0° | 700 | 1000 | - | | (1)(2) |
| Response Time | | TR+TF | | - | 30 | 40 | msec | (1)(3) |
| White luminance (Center) | | YL | | 750 | 1000 | - | cd/m$^2$ | (1)(4) IL-160mA |
| Color chromaticity (CIE1931) | White | x | θ=0° Backlight is on | 0.273 | 0.313 | 0.373 | - | (1)(4) |
| | | y | | 0.289 | 0.329 | 0.298 | | |
| | Red | x | | T.B.D. | T.B.D. | T.B.D. | | |
| | | y | | T.B.D. | T.B.D. | T.B.D. | | |
| | Green | x | | T.B.D. | T.B.D. | T.B.D. | | |
| | | y | | T.B.D. | T.B.D. | T.B.D. | | |
| | Blue | x | | T.B.D. | T.B.D. | T.B.D. | | |
| | | y | | T.B.D. | T.B.D. | T.B.D. | | |
| Viewing angle | Hor. | $\theta_L$ | CR≧10 | 80 | 85 | - | - | |
| | | $\theta_R$ | | 80 | 85 | - | | |
| | Ver. | $\theta_U$ | | 80 | 85 | - | | |
| | | $\theta_D$ | | 80 | 85 | - | | |
| Uniformity | | $B_{UNI}$ | θ=0° | 70 | 80 | | % | (5) |
| Optima View Direction | | - | - | | Free | | - | (6) |

**Measuring Condition**

_ Measuring surrounding : dark room
_ LED current $I_L$ : 160mA
_ Ambient temperature : 25±2$_o$C
_ 15min. warm-up time.

**Measuring Equipment**

_ FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
_ Measuring spot size : 20 ~ 21 mm

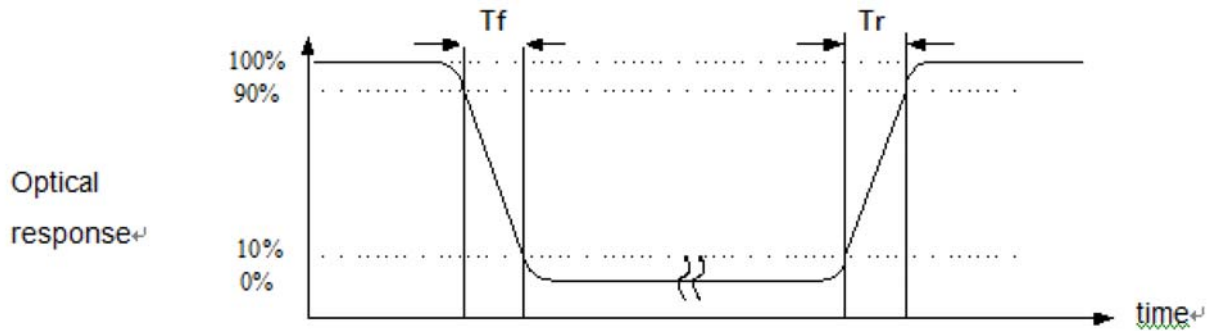**Note (1)** Definition of Viewing Angle:
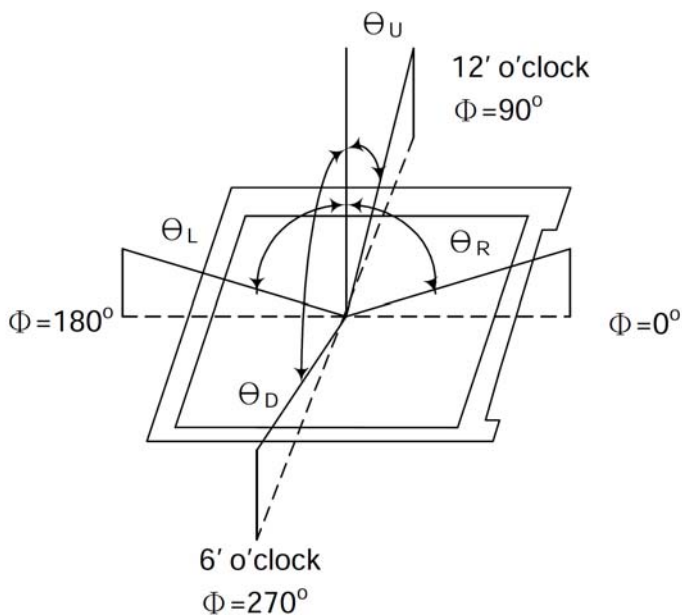


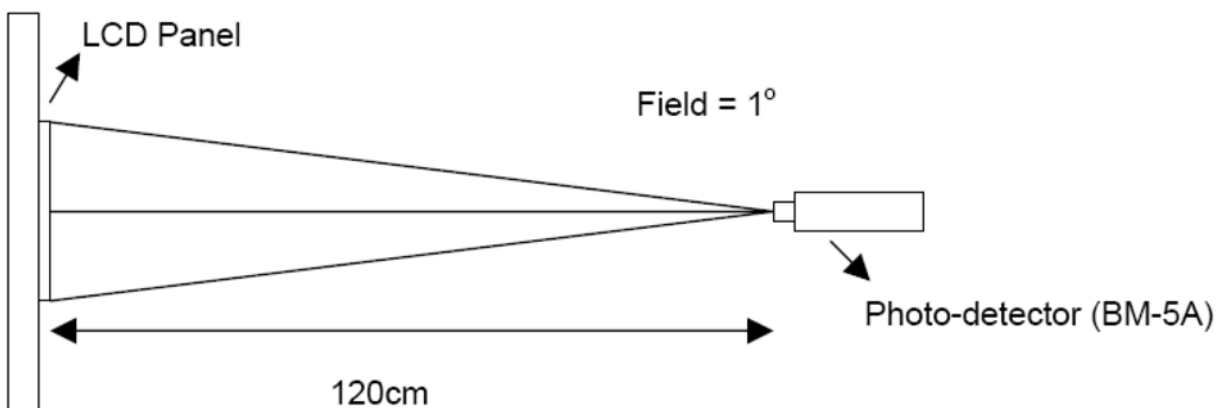**Note (2)** Definition of Contrast Ratio (CR) :

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measured at the center point of panel

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

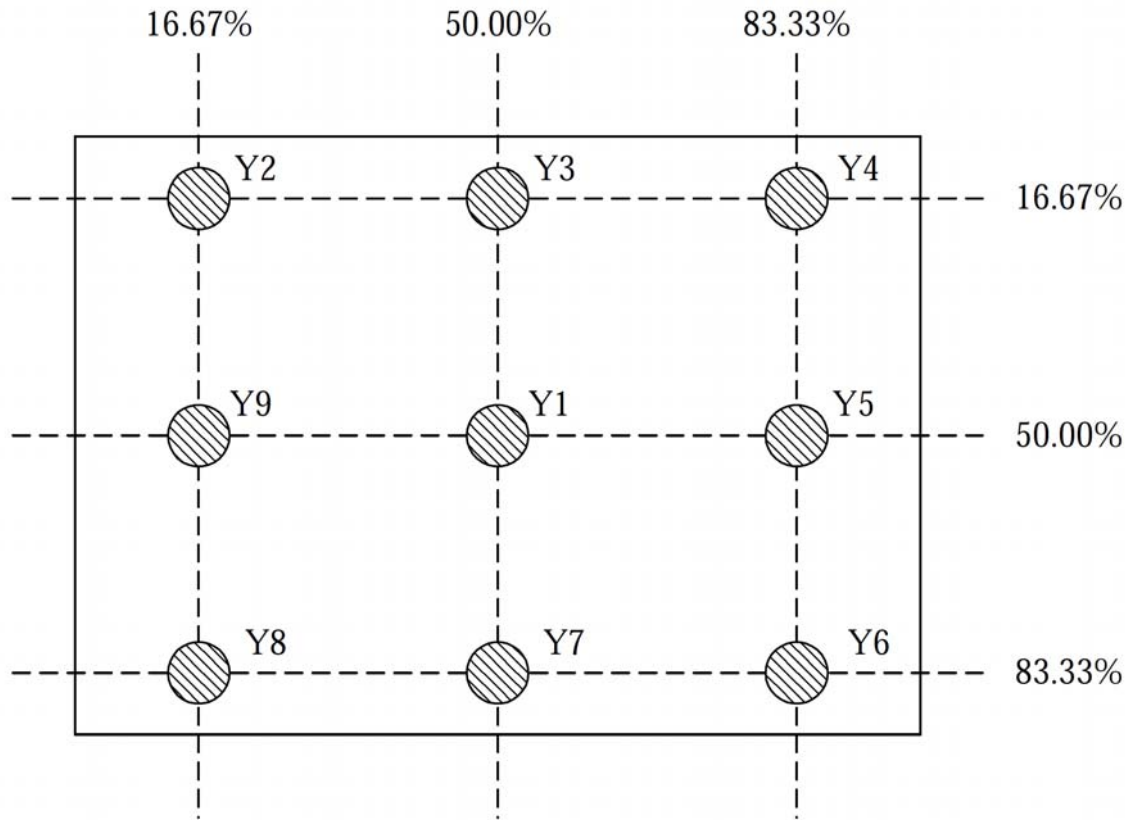**Note (3)** Definition of Response Time: Sum of $T_R$ and $T_F$



**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.

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# 7. Reliability Test Items

| Test Item | Conditions |
|---|---|
| High Temperature Operation | 85±3°C ,   t=240 hrs |
| Low temperature Operation | -30±3°C ,   t=240 hrs |
| High Temperature Storage | 95°C ,   t=1000 hrs |
| Low Temperature Storage | -40±3°C ,   t=1000 hrs |
| High Temperature and High Humidity (operation) | 60°C, 90% RH , 240 hrs |
| Thermal Cycling Test (non operation) | -40oC(30min) _ +85oC(30min), 1000cycles |
| Electrostatic Discharge | ±200V,200pF(0_) 1 time/each termina |
| Shock | Half-Sine, 100G, 6ms, ±XYZ, 1time |
| Vibration (with carton) Random: 0.015G | Random: 0.015G^2/Hz, 5~200Hz -6dB/Octave, 200~400Hz 2hrs/each axis |
| Drop (with carton) | Drop height condition, basis on the product weight and Follow QB100-0027 1 corner, 3 edges, 6 surfaces |
| Vibration Test (Packing) | Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis |

Note1: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

Note2: All of the function & cosmetic Judgment basis base on room temperature.
(The tested module must have enough recovery time at least 2 hours at room temperature.)

Note3: The test condition definition panel's surface temperature.

# 8. General Precautions

## 8-1 Safety

Liquid crystal is poisonous. Do not put it your month. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

## 8-2 Handling

1. The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
2. The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
3. To avoid contamination on the display surface, do not touch the module surface with bare hands.
4. Keep a space so that the LCD panels do not touch other components.
5. Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
6. Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
7. Do not leave module in direct sunlight to avoid malfunction of the ICs.

## 8-3 Static Electricity

1. Be sure to ground module before turning on power or operation module.
2. Do not apply voltage which exceeds the absolute maximum rating value.

## 8-4 Storage

1. Store the module in a dark room where must keep at +25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

## 8-5 Cleaning

1. Do not wipe the polarizer with dry cloth. It might cause scratch.
2. Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

## 8-6 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.
3. The residual image may exist if the same display pattern is shown for hours. This residual image, however, disappears when another display pattern is shown or the drive is interrupted and left for a while. But this is not a problem on reliability.

**CN1**

| Pin | Signal | Pin | Signal |
|---|---|---|---|
| 1 | AGND | 31 | VSD |
| 2 | AVDD | 32 | MODE |
| 3 | Vcc | 33 | RSTB |
| 4 | R0 | 34 | STBYB |
| 5 | R1 | 35 | SHLR |
| 6 | R2 | 36 | Vcc |
| 7 | R3 | 37 | UPDN |
| 8 | R4 | 38 | GND |
| 9 | R5 | 39 | AGND |
| 10 | R6 | 40 | AVDD |
| 11 | R7 | 41 | VCOM |
| 12 | G0 | 42 | N/C |
| 13 | G1 | 43 | BIST |
| 14 | G2 | 44 | N/C |
| 15 | G3 | 45 | N/C |
| 16 | G4 | 46 | N/C |
| 17 | G5 | 47 | N/C |
| 18 | G6 | 48 | CSB |
| 19 | G7 | 49 | SCL |
| 20 | B0 | 50 | SDO |
| 21 | B1 | 51 | SDI |
| 22 | B2 | 52 | N/C |
| 23 | B3 | 53 | VPP_T |
| 24 | B4 | 54 | N/C |
| 25 | B5 | 55 | N/C |
| 26 | B6 | 56 | VGH |
| 27 | B7 | 57 | Vcc |
| 28 | DCLK | 58 | VGL |
| 29 | DE | 59 | GND |
| 30 | HSD | 60 | N/C |

**CN2**

| Pin | Signal |
|---|---|
| 1 | A |
| 2 | A |
| 3 | A |
| 4 | NC |
| 5 | K1 |
| 6 | K2 |
| 7 | K3 |
| 8 | K4 |
| 9 | NC |
| 10 | NC |

A Block
R G B
0.0635  0.1905  0.1905

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:(Connector:HIROSE FH52-60S-0.5SH) or equivalent.
4. CN2:(Connector:HIROSE FH19SC-10S-0.5SH) or equivalent.

Dimensions:
- 104.07±0.3 (LCM Outline w/AL Cover)
- 93.44±0.3 (Bezel Opening)
- 91.44(A,A)
- (8.0)
- (9.0)
- (5.3)
- (6.3)
- (82.5)
- 165.0±0.3 (LCM Outline)
- 154.4±0.3 (Bezel Opening)
- 152.4(A,A)
- (54.65)
- 8.1±0.3 (w/ Component)
- 0.3±0.03
- 0.8
- 6.8±0.3 (w/o FPC)

Title block:
| | |
|---|---|
| TOLERANCE GRADE(±) | |
| PARTS NO.LCM 800480A | |
| DWN. YUPEI | DATE 06-05-17 |
| CHK. | DATE |
| APPD. | DATE |
| TITLE | 800480A |
| DWG. NO. *170610MA | SHEET 1 OF 1 |

AMPIRE 晶采光電科技

REV 0 — REVISION RECORD — NEW RELEASE — DATE 06-05-17 — NAME YUPEI

**CN1**

| Pin | Signal | Pin | Signal | Pin | Signal |
|-----|--------|-----|--------|-----|--------|
| 1 | AGND | 21 | B1 | 41 | VCOM |
| 2 | AVDD | 22 | B2 | 42 | N/C |
| 3 | Vcc | 23 | B3 | 43 | BIST |
| 4 | R0 | 24 | B4 | 44 | N/C |
| 5 | R1 | 25 | B5 | 45 | N/C |
| 6 | R2 | 26 | B6 | 46 | N/C |
| 7 | R3 | 27 | B7 | 47 | N/C |
| 8 | R4 | 28 | DCLK | 48 | CSB |
| 9 | R5 | 29 | DE | 49 | SCL |
| 10 | R6 | 30 | HSD | 50 | SDO |
| 11 | R7 | 31 | VSD | 51 | SDI |
| 12 | G0 | 32 | MODE | 52 | N/C |
| 13 | G1 | 33 | RSTB | 53 | VPP_T |
| 14 | G2 | 34 | STBYB | 54 | N/C |
| 15 | G3 | 35 | SHLR | 55 | N/C |
| 16 | G4 | 36 | Vcc | 56 | VGH |
| 17 | G5 | 37 | UPDN | 57 | Vcc |
| 18 | G6 | 38 | GND | 58 | VGL |
| 19 | G7 | 39 | AGND | 59 | GND |
| 20 | B0 | 40 | AVDD | 60 | N/C |

**CN2**

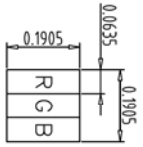| Pin | Signal |
|-----|--------|
| 1 | A |
| 2 | A |
| 3 | A |
| 4 | NC |
| 5 | K1 |
| 6 | K2 |
| 7 | K3 |
| 8 | K4 |
| 9 | NC |
| 10 | NC |

Note:
1. Unless indicated, Tolerance "±0.3"
2. UV Glue For OLB Protection.
3. CN1:(Connector:HIROSE FH52-60S-0.5SH) or equivalent.
4. CN2:(Connector:HIROSE FH19SC-10S-0.5SH) or equivalent.

A Block

R G B

0.0635  0.1905  0.1905

Detail A : CN1

W=0.2
4.35±0.3(對位白線)
30.5±0.07
Pin60
6.0±0.5
0.3±0.03
Pin1
P0.5×(60-1)=29.5±0.05
0.5±0.07

Back view

Detail B : CN2

W=0.2
2.1±0.3(對位白線)
Pin1
7.0±0.5
5.5±0.07
0.3±0.03
Pin1
8.0
2.5±0.1
P0.5×(10-1)=4.5±0.05
0.5±0.07

60.3±1.0
(21.7)
6.0±0.5
Component Area : H=1.1 mm Max
Bending Area
Siffener
CN1
Pin1
GND Pad
Al Cover
Pin1  CN2  Siffener
30.5±0.07
82.5±1.0
33.25±1.0
5.5±0.07
7.0±0.5
70.0±1.0
104.0±0.3(LCM Outline)

**TOLERANCE GRADE(±)**

| DIM. | A | B |
|------|---|---|
| IE NO. | | |
| MM | | |

PARTS NO. LCM-1 800480A

DWN. YUPEI  DATE 06-05-17'
CHK.  DATE
APPD.  DATE

TITLE 800480A
DWG. NO. *170611MA
SHEET 1 OF 1

ampire 晶采光電科技

| REV. | REVISION RECORD | DATE | NAME |
|------|-----------------|------|------|
| 0 | NEW RELEASE | 06-05-17 | YUPEI |

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