



深圳市拓普微科技开发有限公司

SHENZHEN TOPWAY TECHNOLOGY CO., LTD.

# LMT070DICFWD-NFA

## LCD Module User Manual

|                                                                |                                  |                                   |
|----------------------------------------------------------------|----------------------------------|-----------------------------------|
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|----------------------------------------------------------------|----------------------------------|-----------------------------------|

| Rev. | Descriptions        | Release Date |
|------|---------------------|--------------|
| 0.1  | Preliminary release | 2014-05-08   |
|      |                     |              |
|      |                     |              |
|      |                     |              |

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## 1. General Specification

|                         |                                                                   |
|-------------------------|-------------------------------------------------------------------|
| Signal Interface :      | VGA/HDMI                                                          |
| Display Mode :          | Transmissive / Normal White                                       |
| Screen Size(Diagonal) : | 7.0"                                                              |
| Outline Dimension :     | 193.0 x 112.0x 17.8max (mm)<br>(see attached drawing for details) |
| Active Area :           | 154.08 x 85.92 (mm)                                               |
| Color Depth:            | 16.7M                                                             |
| Number of dots :        | 800 x 480                                                         |
| Pixel Pitch :           | 0.1926 x 0.1790 (mm)                                              |
| Pixel Configuration :   | RGB Stripe                                                        |
| Backlight :             | LED                                                               |
| Surface Treatment :     | Anti-Glare Treatment                                              |
| Viewing Direction :     | 12H (*1) (gray scale inverse)<br>6H (*2)                          |
| Operating Temperature : | 0 ~ +50°C                                                         |
| Storage Temperature :   | -10 ~ +60°C                                                       |

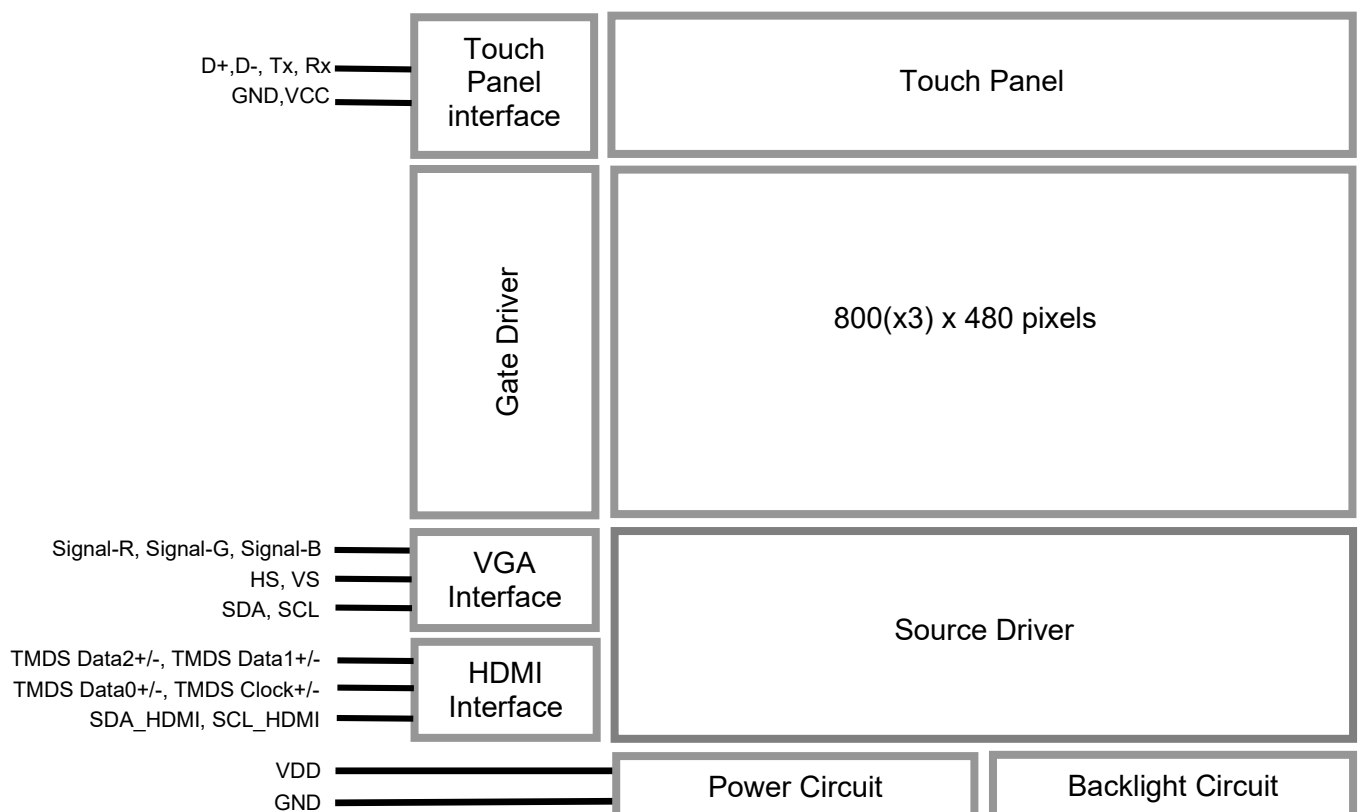
Note:

\*1. For saturated color display content (eg. pure-red, pure-green, pure-blue or pure-colors-combinations).

\*2. For "color scales" display content.

\*3. Color tone may slightly change by temperature and driving condition.

## 2. Block Diagram



### 3. Terminal Function

#### 3.1 K1 Power Terminal

| Pin No. | Pin Name | IO    | Descriptions                 |
|---------|----------|-------|------------------------------|
| 1       | VDD      | Power | Positive Power Supply(12.0V) |
| 2       | VDD      | Power | Positive Power Supply(12.0V) |
| 3       | NC       | -     | No connection                |
| 4       | NC       | -     | No connection                |
| 5       | GND      | Power | Power Supply GND (0V)        |
| 6       | GND      | Power | Power Supply GND (0V)        |

#### 3.2 K2 HDMI Terminal

| Pin No. | Pin Name          | IO     | Descriptions                            |
|---------|-------------------|--------|-----------------------------------------|
| 1       | TMDS Data2+       | Input  | HDMI receiver positive signal channel 2 |
| 2       | TMDS Data2 Shield | Power  | Signal Ground                           |
| 3       | TMDS Data2-       | Input  | HDMI receiver negative signal channel 2 |
| 4       | TMDS Data1+       | Input  | HDMI receiver positive signal channel 1 |
| 5       | TMDS Data1 Shield | Power  | Signal Ground                           |
| 6       | TMDS Data1-       | Input  | HDMI receiver negative signal channel 1 |
| 7       | TMDS Data0+       | Input  | HDMI receiver positive signal channel 0 |
| 8       | TMDS Data0 Shield | Power  | Signal Ground                           |
| 9       | TMDS Data0-       | Input  | HDMI receiver negative signal channel 0 |
| 10      | TMDS Clock+       | Input  | HDMI receiver positive signal clock     |
| 11      | TMDS Clock Shield | Power  | Signal Ground                           |
| 12      | TMDS Clock-       | Input  | HDMI receiver negative signal clock     |
| 13      | NC                | -      | No connection                           |
| 14      | NC                | -      | No connection                           |
| 15      | SCL_HDMI          | Input  | Serial data clock                       |
| 16      | SDA_HDMI          | Output | Serial data out                         |
| 17      | GND               | Power  | Signal Ground                           |
| 18      | +5V Power         | Power  | Power supply for DDC memory             |
| 19      | Hot Plug Detect   | Output | Hot Plug Detect signal                  |

Note:

1. HDMI terminal should be well connect before power on (hot-plug is not allowed)
2. Support Standard HDMI Signal, from PC:
  - 640x480,60Hz
  - 800x480,60Hz
  - 800x600,60Hz

### 3.3 K3 VGA Terminal

| Pin No. | Pin Name | IO     | Descriptions                              |
|---------|----------|--------|-------------------------------------------|
| 1       | GND      | Power  | Signal Ground                             |
| 2       | VS       | Input  | Analogue VGA Vertical Sync signal input   |
| 3       | HS       | Input  | Analogue VGA Horizontal Sync signal input |
| 4       | GND      | Power  | Signal Ground                             |
| 5       | Signal-R | Input  | Analogue VGA Red signal input             |
| 6       | GND      | Power  | Signal Ground                             |
| 7       | Signal-G | Input  | Analogue VGA Green signal input           |
| 8       | GND      | Power  | Signal Ground                             |
| 9       | Signal-B | Input  | Analogue VGA Blue signal input            |
| 10      | GND      | Power  | Signal Ground                             |
| 11      | SDA      | Output | Serial data out                           |
| 12      | SCL      | Input  | Serial data clock                         |

Note:

1. VGA terminal should be well connect before power on (hot-plug is not allowed).
2. Support Standard VGA Signal, from PC:
  - 640x480,60Hz
  - 800x480,60Hz
  - 800x600,60Hz

### 3.4 K4 Touch Panel Controller Terminal

| Pin No. | Pin Name | I/O    | Descriptions                |
|---------|----------|--------|-----------------------------|
| 1       | GND      | Power  | Ground                      |
| 2       | VCC      | Power  | Positive Power Supply(5.0V) |
| 3       | GND      | Power  | Ground                      |
| 4       | D+       | I/O    | USB D+ signal               |
| 5       | D-       | I/O    | USB D- signal               |
| 6       | GND      | Power  | Ground                      |
| 7       | VCC      | Power  | Positive Power Supply(5.0V) |
| 8       | GND      | Power  | Ground                      |
| 9       | Tx       | Output | RS-232 Tx signal            |
| 10      | Rx       | Input  | RS-232 Rx signal            |

## 4. Absolute Maximum Ratings

Top=25℃, VDD =12.0V ,GND=0V

| Items                 | Symbol          | Min. | Max.  | Unit | Condition       |
|-----------------------|-----------------|------|-------|------|-----------------|
| Power Supply Voltage  | VDD             | -0.3 | +13.0 | V    |                 |
| Operating Temperature | T <sub>OP</sub> | 0    | 50    | ℃    | No Condensation |
| Storage Temperature   | T <sub>ST</sub> | -10  | 60    | ℃    | No Condensation |

Note:

- \*1. This rating applies to all parts of the module. And should not be exceeded.
- \*2. The operating temperature only guarantees operation of the circuit. The contrast, response speed, and the other specification related to electro-optical display quality is determined at the room temperature, T<sub>OP</sub>=25℃.
- \*3. Ambient temperature when the backlight is lit (reference value).
- \*4. Any Stresses exceeding the Absolute Maximum Ratings may cause substantial damage to the device. Functional operation of this device at other conditions beyond those listed in the specification is not implied and prolonged exposure to extreme conditions may affect device reliability.

## 5. Electrical Characteristics

### 5.1 Driving TFT LCD Panel

Top=25℃, VDD =12.0V ,GND=0V

| Items                 | Symbol           | MIN. | TYP. | MAX. | Unit | Note |
|-----------------------|------------------|------|------|------|------|------|
| Supply Voltage        | VDD              | 11.5 | 12.0 | 12.5 | V    |      |
| VDD Power Consumption | I <sub>VDD</sub> | -    | 215  | -    | mA   |      |

### 5.2 Driving Touch Panel

Top=25℃, VCC =5.0V ,GND=0V

| Items             | Symbol           | MIN. | TYP. | MAX. | Unit | Note |
|-------------------|------------------|------|------|------|------|------|
| Supply Voltage    | VCC              | 4.8  | 5.0  | 5.2  | V    |      |
| Operating Current | I <sub>VCC</sub> | -    | 21.8 | -    | mA   |      |

## 6. Optical Characteristics

| Item                 |       | Symbol           | Condition       | MIN.  | TYP.  | MAX.  | UNIT              | Note.    |
|----------------------|-------|------------------|-----------------|-------|-------|-------|-------------------|----------|
| Viewing angle        |       | θ <sub>U</sub>   | (CR≥10)         | 40    | 50    | -     | degree            | Note 2   |
|                      |       | θ <sub>D</sub>   |                 | 60    | 70    | -     |                   |          |
|                      |       | θ <sub>L</sub>   |                 | 60    | 70    | -     |                   |          |
|                      |       | θ <sub>R</sub>   |                 | 60    | 70    | -     |                   |          |
| Contrast ratio       |       | CR               | θ=0°            | 500   | 600   | -     | -                 | Note 1,3 |
| Response Time        |       | T <sub>on</sub>  | 25℃             | -     | 20    | 30    | msec              | Note 1,4 |
|                      |       | T <sub>off</sub> |                 |       |       |       | msec              |          |
| Chromaticlty         | White | X                | Backlight is on | 0.260 | 0.310 | 0.360 |                   | Note 1,5 |
|                      |       | Y                |                 | 0.280 | 0.330 | 0.380 |                   |          |
|                      | Red   | X                |                 | 0.540 | 0.590 | 0.640 |                   |          |
|                      |       | Y                |                 | 0.300 | 0.350 | 0.400 |                   |          |
|                      | Green | X                |                 | 0.298 | 0.348 | 0.398 |                   |          |
|                      |       | Y                |                 | 0.520 | 0.570 | 0.620 |                   |          |
|                      | Blue  | X                |                 | 0.095 | 0.145 | 0.195 |                   |          |
|                      |       | Y                |                 | 0.060 | 0.110 | 0.160 |                   |          |
| Luminance            |       | L                |                 | -     | 300   | -     | cd/m <sup>2</sup> | Note 1,6 |
| NTSC                 |       |                  |                 | -     | 50    |       | %                 | Note 5   |
| Luminance uniformity |       | U                |                 | 75    | 80    | -     | %                 | Note 1,7 |

Test Conditions:

1. IF= 120 mA, VF=9.2V, and the ambient temperature is 25. ℃
2. The test systems refer to Note 1 and Note 2.

### Note 1:

The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment SR-3A (1°)

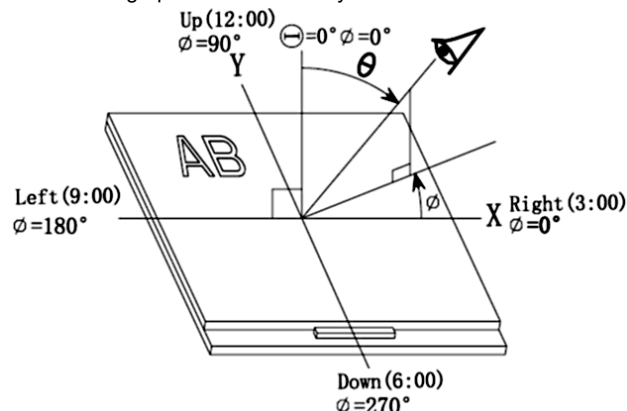
Measuring condition:

- Measuring surroundings: Dark room
- Measuring temperature: Ta=25°C.
- Adjust operating voltage to get optimum contrast at the center of the display.

### Note 2:

The definition of viewing angle:

Refer to the graph below marked by  $\theta$  and  $\phi$



### Note 3:

The definition of contrast ratio (Test LCM using SR-3A (1°)):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

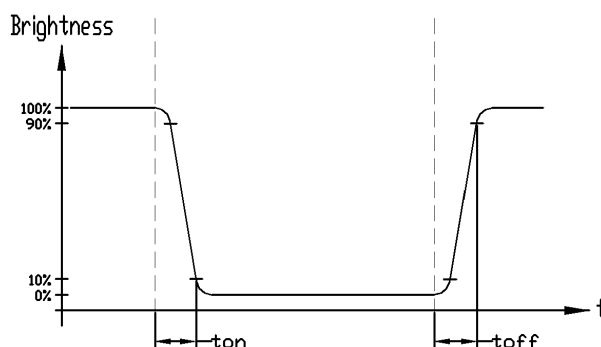
(Contrast Ratio is measured in optimum common electrode voltage)

### Note 4:

Definition of Response time. (Test LCD using BM-7A(2°)):

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

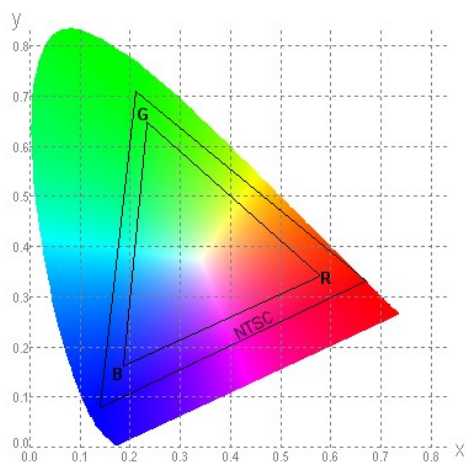


### Note 5:

Definition of Color of CIE1931 Coordinate and NTSC Ratio.

Color gamut:

$$S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$$



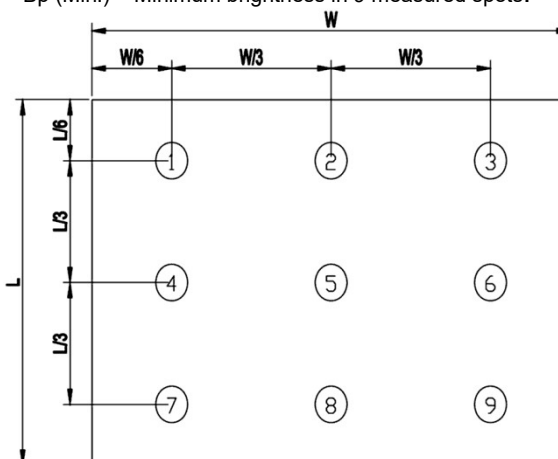
### Note 6:

The luminance uniformity is calculated by using following formula.

$$\Delta Bp = Bp (\text{Min.}) / Bp (\text{Max.}) \times 100 (\%)$$

Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.



### Note 7:

Measured the luminance of white state at center point

## **7. Precautions of using LCD Modules**

Please refer to "LCD-Module-Design-Handling-Precaution.pdf".

| K2 Terminal |                   |
|-------------|-------------------|
| No          | Pin Name          |
| 1           | TMDS_D2+          |
| 2           | TMDS_D2+          |
| 3           | TMDS_D2-          |
| 4           | TMDS_D1+          |
| 5           | TMDS_D1+ Shield   |
| 6           | TMDS_D1-          |
| 7           | TMDS_D0+          |
| 8           | TMDS_D0 Shield    |
| 9           | TMDS_D0-          |
| 10          | TMDS_Clock+       |
| 11          | TMDS_Clock Shield |
| 12          | TMDS_Clock-       |
| 13          | NC                |
| 14          | NC                |
| 15          | SCL_HDMI          |
| 16          | SDA_HDMI          |
| 17          | GND               |
| 18          | +5V_Power         |
| 19          | Hot_Plug_Detect   |

| K3 Terminal |          |
|-------------|----------|
| No          | Pin Name |
| 1           | GND      |
| 2           | VS       |
| 3           | HS       |
| 4           | GND      |
| 5           | Signal-R |
| 6           | GND      |
| 7           | Signal-G |
| 8           | GND      |
| 9           | Signal-B |
| 10          | GND      |
| 11          | SDA      |
| 12          | SCL      |

|             |                    |
|-------------|--------------------|
| C           |                    |
| B           |                    |
| A           | Revise Orientation |
| Rev/Note    | Deng Junjie        |
| Dwg Title   | 2014-07-10         |
| Dwg No.     | LMT070D1CFWD-NFA   |
| Outline Dwg | Date               |
| Scale       | MK-004790a-1-1     |
| Unit        | 2014-04-16         |
| mm          | 1/1                |
| ±0.5        | mm                 |
| Checked     | Approved           |
| Drawn       | Deng Junjie        |

| K1 Terminal |          |
|-------------|----------|
| No          | Pin Name |
| 1           | VDD      |
| 2           | VDD      |
| 3           | NC       |
| 4           | NC       |
| 5           | GND      |
| 6           | GND      |

| K4 Terminal |          |
|-------------|----------|
| No          | Pin Name |
| 1           | GND      |
| 2           | VCC      |
| 3           | GND      |
| 4           | D+       |
| 5           | D-       |
| 6           | GND      |
| 7           | VCC      |
| 8           | GND      |
| 9           | TX       |
| 10          | RX       |

- Note:
- \*1. LCD Display Type: TFT-Transmissive
  - \*2. Pixel Arrangement: RGB-STRIPE
  - \*3. Operating Voltage : 12.0V
  - \*4. Color Depth : 16.7M (24bit) color
  - \*5. Backlight : White LED
  - \*6. K1: 6Pin, JST-06HR-6S-P-N or equivalent
  - \*6. K2: 19Pin, HDMI A TYPE
  - \*6. K3: 12Pin, JST B12B-PH-K-S or equivalent
  - \*6. K4: 2x5Pin P2.0 mini IDC header
  - \*7. Operating Temperature : 0°C~50°C
  - \*8. Storage Temperature : -10°C~60°C

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