# *INNOLUX* DISPLAY CORPORATION

## MT170EN01 V.2 LCD MODULE SPECIFICATION

(   ) Preliminary Specification

(●) Final Specification

| Customer | Checked & Approved by |
|---|---|
|  |  |

| Approved by | Checked by | | Prepared by |
|---|---|---|---|
| MKT | QRA | PD | MKT |
|  |  |  |  |

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# Record of Revision

| Version | Revise Date | Page | Content |
|---------|-------------|------|---------|
| 01 | 2005-04-12 | | First edition to all |
| 02 | 2005-05-19 | 7/13 | Change Lamp operation current from 4 to 2 |
| | | 22/23 | Revise Module Label and Carton Label |
| | | | |
| | | | |
| | | | |
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## A. General specification

| NO. | Item | Specification | Remark |
|---|---|---|---|
| 1 | Display resolution (pixel) | 1280(H) X 1024(V), SXGA resolution | |
| 2 | Active area (mm) | 337.9(H) X 270.3(V) | |
| 3 | Screen size (inch) | 17 inches diagonal | |
| 4 | Pixel pitch (mm) | 0.264(H) X 0.264(V) | |
| 5 | Color configuration | R, G, B vertical stripe | |
| 6 | Overall dimension (mm) | 358.5(W)x296.5(H)x17.5(D) Max | |
| 7 | Weight (g) | 2000 max | |
| 8 | Surface treatment | Anti-glare, Haze = 25%, Hard coating (3H) | |
| 9 | Input color signal | 8 bit LVDS | |
| 10 | Color saturation | 72% NTSC | |
| 11 | Display colors | 16.2M colors (6 bit with FRC) | |
| 12 | Optimum viewing direction | 6 o'clock | |
| 13 | Backlight | 4 CCFL, top & bottom edge side | |

## B. Electrical specifications

### 1. Pin assignment

**Connector**　JAE FI-X30SSL-HF or equivalent

| Pin No | Symbol | Description |
|--------|--------|-------------|
| 1 | RxO0- | LVDS Differential data input Channel 0(-) |
| 2 | RxO0+ | LVDS Differential data input Channel 0(+) |
| 3 | RxO1- | LVDS Differential data input Channel 1(-) |
| 4 | RxO1+ | LVDS Differential data input Channel 1(+) |
| 5 | RxO2- | LVDS Differential data input Channel 2(-) |
| 6 | RxO2+ | LVDS Differential data input Channel 2(+) |
| 7 | GND | Ground |
| 8 | RxOC- | LVDS Differential Clock input (-) |
| 9 | RxOC+ | LVDS Differential Clock input (+) |
| 10 | RxO3- | LVDS Differential data input Channel 3(-) |
| 11 | RxO3+ | LVDS Differential data input Channel 3(+) |
| 12 | RxE0- | LVDS Differential data input Channel 0(-) |
| 13 | RxE0+ | LVDS Differential data input Channel 0(+) |
| 14 | GND | Ground |
| 15 | RxE1- | LVDS Differential data input Channel 1(-) |
| 16 | RxE1+ | LVDS Differential data input Channel 1(+) |
| 17 | GND | Ground |
| 18 | RxE2- | LVDS Differential data input Channel 2(-) |
| 19 | RxE2+ | LVDS Differential data input Channel 2(+) |
| 20 | RxEC- | LVDS Differential Clock input (-) |
| 21 | RxEC+ | LVDS Differential Clock input (+) |
| 22 | RxE3- | LVDS Differential data input Channel 3(-) |
| 23 | RxE3+ | LVDS Differential data input Channel 3(+) |
| 24 | GND | Ground |
| 25 | GND | Ground |
| 26 | GND | Ground or Open |
| 27 | GND | Ground |
| 28 | VCC | Power supply (+5.0V) |
| 29 | VCC | Power supply (+5.0V) |
| 30 | VCC | Power supply (+5.0V) |

#1          #30

#1          #30

Rear view of LCM

## 2. Absolute maximum ratings

| Parameter | Symbol | Values | | Unit | Remark |
|---|---|---|---|---|---|
| | | Min. | Max. | | |
| Power voltage | $V_{DD}$ | - 0.3 | 7.0 | V | At 25°C |
| Input signal voltage | $V_{LH}$ | - 0.3 | 3.6 | V | At 25°C |
| Operating temperature | Top | 0 | 50 | °C | Note 1 |
| Storage temperature | $T_{ST}$ | - 25 | 60 | °C | Note 2 |
| CCFL Current | ICFL | 2 | 8 | [mA] rms | |
| Re-screw | | | 5 | Times | |
| Assured Torque at Side Mount | | | 4 | [kgf.cm] | |

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less.    At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C.
Note 2: The unit should not be exposed to corrosive chemicals.

Relative Humidity(%RH)
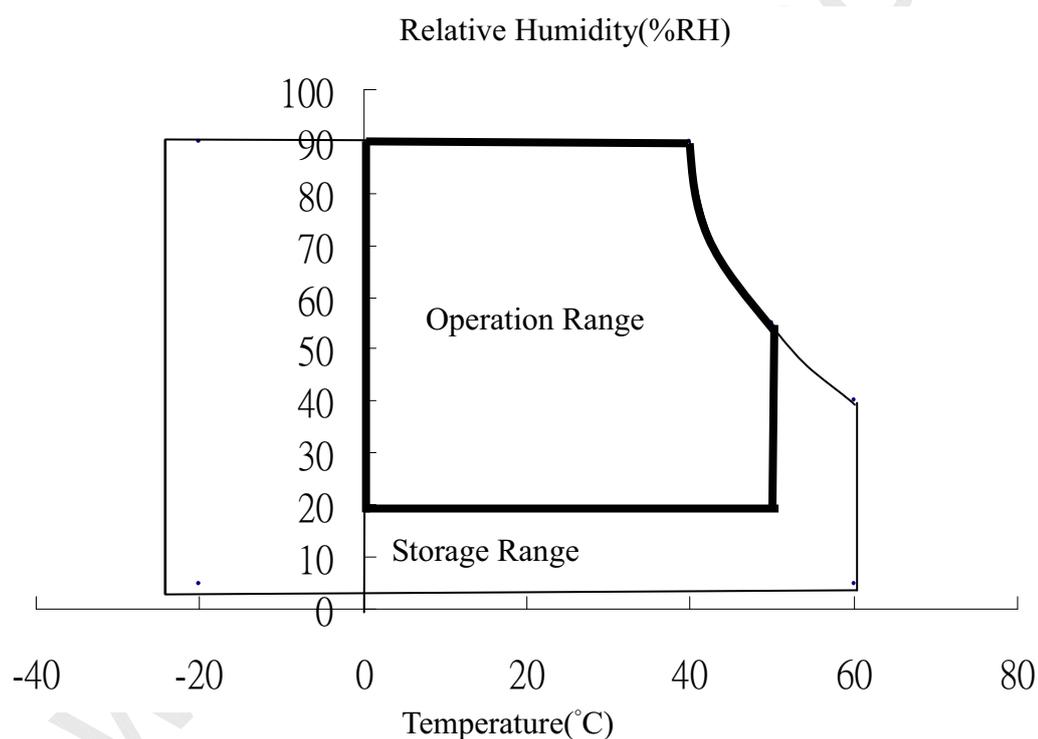
## 3. Electrical characteristics

### a. Typical operating conditions

| Item | | Symbol | Min. | Typ. | Max. | Unit | Remark |
|---|---|---|---|---|---|---|---|
| Input Voltage | | $V_{DD}$ | 4.5 | 5.0 | 5.5 | V | |
| Permissive Power Input Ripple | | $V_{RF}$ | 0.1 | - | - | V | Note 1 |
| Input Current | | $I_{DD}$ | - | 0.55 | 0.75 | A | Note 2 |
| Differential Impedance | | $Z_m$ | 90 | 100 | 110 | ohm | |
| Power Consumption | | $P_C$ | - | 2.75 | 3.75 | Watts | Note 2 |
| Rush Current | | $I_{Rush}$ | - | 2.0 | 3.0 | A | Note 3 |
| Logic Input Voltage LVDS: IN+, IN- | Common Mode Voltage | VCM | 1.125 | 1.25 | 1.375 | V | |
| | Differential Input Voltage | VID | 250 | 350 | 450 | mV | |
| | Threshold Voltage (High) | VTH | - | - | 100 | mV | Note 4 |
| | Threshold Voltage (Low) | VTL | -100 | | | mV | Note 4 |

Note 1: Power input ripple should not exceed min. value.

Note 2: The specified current and power consumption are under the $V_{cc}$ =5V, 25 °C, fV=60Hz

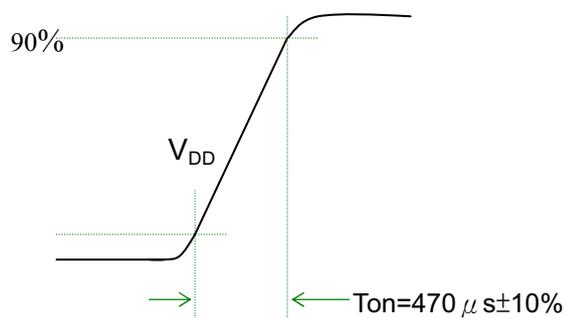(frame frequency) condition whereas mosaic pattern (black & white [8*6] ) is displayed.
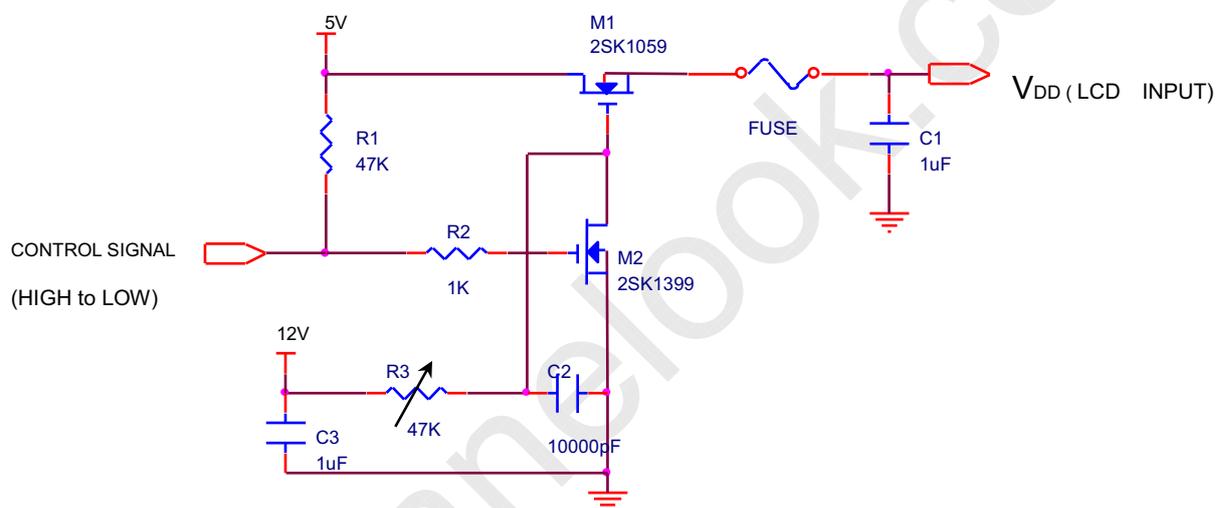
White : 255 Gray

Black : 0Gray
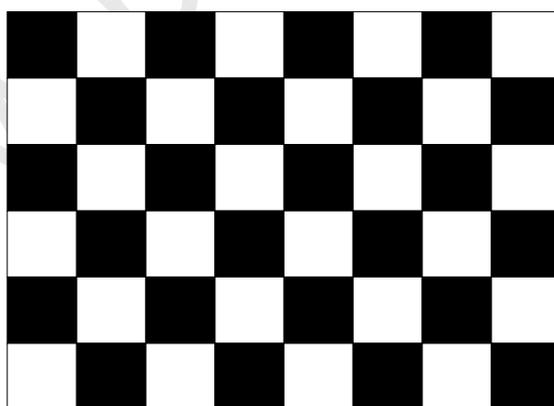


mosaic pattern (black & white [8*6] )
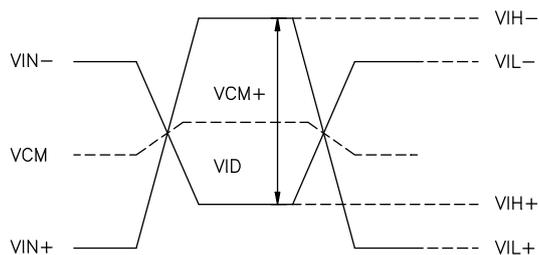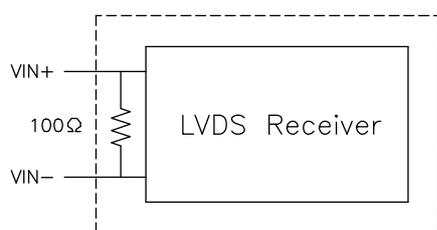
Note 3 : test condition :`
(1) $V_{DD}$ = 5 V, $V_{DD}$ rising time = 470 us ± 10%
(2) Pattern: Mosaic pattern

90%

$V_{DD}$

Ton=470 $\mu$ s±10%

(3) Test circuit

5V

M1
2SK1059

$V_{DD}$ ( LCD   INPUT)

FUSE

R1
47K

C1
1uF

CONTROL SIGNAL

(HIGH to LOW)

R2
1K

M2
2SK1399

12V

R3
47K

C2

C3
1uF

10000pF

Note 4 : LVDS signal definition

VIN+

100Ω

LVDS  Receiver

VIN−

VIN−

VCM+

VIH−

VIL−

VCM

VID

VIN+

VIH+

VIL+

VID = VIN₊ − VIN- ,

VCM = ｜VCM₊–VCM-｜,          VIN₊ = Positive differential DATA & CLK Input

VID = ｜VID₊–VID-｜,          VIN- = Negative differential DATA & CLK Input

VID+ = ｜VIH₊–VIH-｜,

VID- = ｜VIL₊–VIL-｜,

VCM = (VIN₊ +VIN-)/2,

VCM+ = (VIH₊ +VIH-)/2,

VCM- = (VIL₊ +VIL-)/2,

Note 5 : Power on sequence for LCD V$_{DD}$
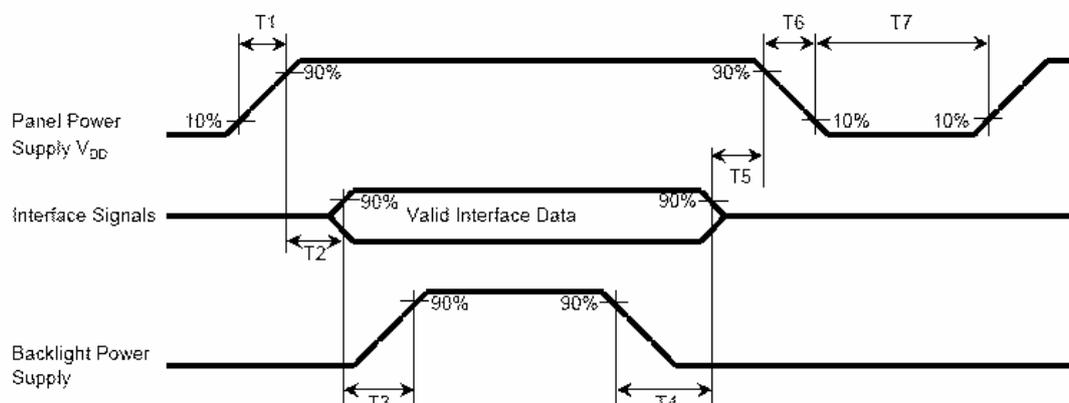


| Parameter | Value | | | Unit |
|-----------|-------|-------|-------|------|
| | Min | Typ | Max | ms |
| T1 | 0.1 | -- | 10 | ms |
| T2 | 0 | -- | 10 | ms |
| T3 | 200 | 250 | -- | ms |
| T4 | 100 | 250 | -- | ms |
| T5 | 0 | 20 | 50 | ms |
| T6 | 0.1 | -- | 10 | ms |
| T7 | 1000 | -- | -- | ms |

b. Display color v.s. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

| Color | | Input color data | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Red (MSB→LSB) | | | | | | | | Green (MSB→LSB) | | | | | | | | Blue (MSB→LSB) | | | | | | | |
| | | R7 | R6 | R5 | R4 | R3 | R2 | R1 | R0 | G7 | G6 | G5 | G4 | G3 | G2 | G1 | G0 | B7 | B6 | B5 | B4 | B3 | B2 | B1 | B0 |
| 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 |
| | Red(255) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Blue(255) | 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 | 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 | 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 | 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 |
| Red | Red(000) 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 |
| | Red(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(002) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Red(253) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(254) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Red(255) bright | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Green | Green(000)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 |
| | Green(001) | 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(002) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Green(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | Green(255)bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Blue | Blue(000) 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 |
| | Blue(001) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | Blue(002) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : | : |
| | Blue(253) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |
| | Blue(254) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 |
| | Blue(255) bright | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

## c. Input signal timing

Support Input Timing Table

| | Item | Description | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Clock | Dclk | period | 14.71 | 18.52 | 22.22 | nS |
| | | frequency | 45 | 54 | 68 | MHz |
| Vertical | $T_{V\_TOTAL}$ | V total line number | 1044 | 1066 | 1300 | $T_{H\_TOTAL}$ |
| | $T_{V\_DATA}$ | Data duration | — | 1024 | — | $T_{H\_TOTAL}$ |
| | $T_{VB}$ | V-blank | 20 | 42 | | $T_{H\_TOTAL}$ |
| | $f_V$ | frequency | 50 | 60 | 75 | Hz |
| Horizontal | $T_{H\_TOTAL}$ | H total pixel number | 710 | 844 | 980 | DClk |
| | $T_{H\_DATA}$ | Data duration | — | 640 | — | DClk |
| | $T_{HB}$ | H-blank | 70 | 204 | | DClk |

Vertical signal

Horizontal signal
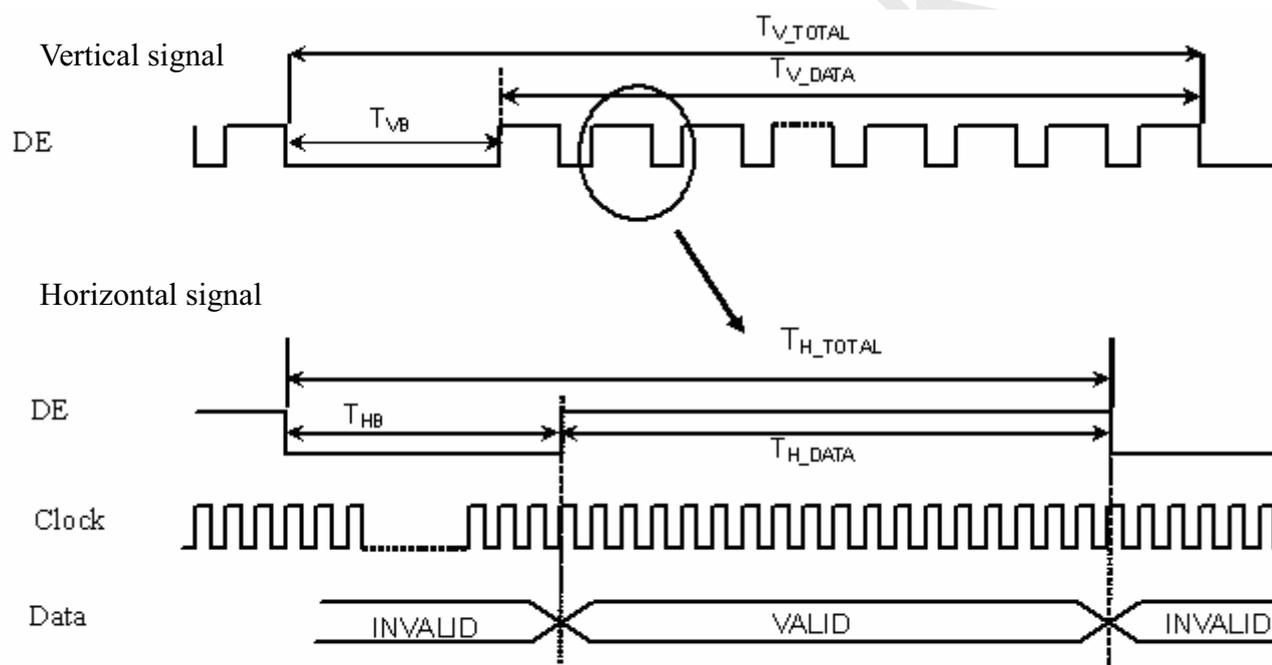
Note : DE is reference signal, DE means the display data valid.

d. Display Position

| D(1, 1) | D(2, 1) | …… | D(640, 1) | …… | D(1279, 1) | D(1280, 1) |
|---|---|---|---|---|---|---|
| D(1, 2) | D(2, 2) | …… | D(640, 2) | …… | D(1279, 2) | D(1280, 2) |
| ⋮ | | …… | ⋮ | …… | ⋮ | ⋮ |
| D(1, 512) | D(2, 512) | …… | D(640, 512) | …… | D(1279, 512) | D(1280, 512) |
| ⋮ | | …… | ⋮ | …… | ⋮ | ⋮ |
| D(1, 1023) | D(2, 1023) | …… | D(640, 1023) | …… | D(1279, 1023) | D(1280, 1023) |
| D(1, 1024) | D(2, 1024) | …… | D(640, 1024) | …… | D(1279, 1024) | D(1280, 1024) |

e. Backlight driving conditions

| Parameter | Symb | Min. | Typ. | Max. | Unit | Remark | Remark |
|---|---|---|---|---|---|---|---|
| Lamp voltage | VL | | 610 | 700 | Vrms | | |
| Lamp operation current | IL | 2 | 7 | 8 | mArms | | Note 1 |
| Power consumption | PL | | 17.08 | 22.4 | W | | |
| Lamp starting voltage | VLstart | 1500 | | | Vrms | T = 25 ℃ | Note 2,3,4,5 |
| | | 1750 | | | | T = 0 ℃ | Note 2,3,4,5 |
| Frequency | F | 40 | 50 | 80 | KHZ | | Note 5 |
| Lamp life time | | 40000 | | | Hr | | Note 6 |
| | | 50000 | | | Hr | | Note 7 |

**Note.** Lamp current is measured by utilizing high-frequency current meters as shown below:
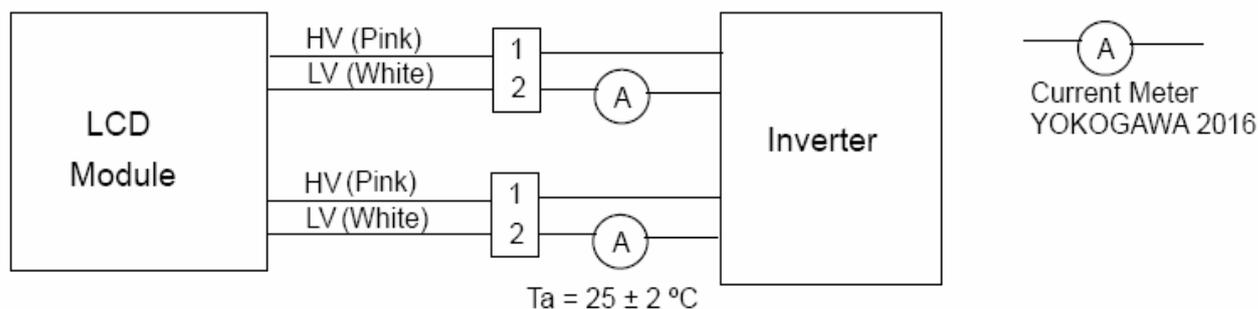


**Note.** The design of the inverter must have specifications for the lamp in LCD Assembly. The performance of the Lamp in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC Inverter. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.   When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) never occurs. When you confirm it, the LCD Assembly should be operated in the same condition as installed in your instrument.

Note 1 :

   The degrees of unbalance: less than 10%

   The ratio of wave height: less than$\sqrt{2}$   ±10%

Ip: high side

I-p: low side

The degrees of umbalance = |Ip-I-p| /Irms*100(%)

The ratio of wave height = Ip(or I-p)/Irms

Lamp should be completely turned on.

Note 2:

Test equipment: AS-114B, Output Capacitor =18pF, f=57KHz

Note 3:

The voltage shown above should be applied to the lamp for more than 1 second after startup.

Otherwise, the lamp may not be turned on normally.

Note 4:

Inverter should provide more than min. value, and then lamp could be completely turned on

Note 5:

Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display.   Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference.

Note 6:

Lamp life definition :

(A) Lamp current IL = (7) mA

(B) The brightness of lamp becomes 50% of the initial brightness or not normal lighting.

Note 7:

Lamp life definition :

(A) Lamp current IL = (4) mA

(B) The brightness of lamp becomes 50% of the initial brightness or not normal lighting.

Backlight connecter : JST BHSR - 02VS-1

| Pin no. | Symbol | Function | Remark |
|---------|--------|----------|--------|
| 1 | VIH | Lamp high voltage input | Cable color: Pink |
| 2 | VIL | Lamp low voltage input | Cable color: White |

## C. Optical specifications

| Item | Symbol | Condition | Specification | | | Unit | Remark |
|------|--------|-----------|------|------|------|------|--------|
| | | | Min. | Typ. | Max. | | |
| Response time | Tr | $\theta = 0°$ | | 2 | 7 | ms | Note 4 |
| | Tf | | | 6 | 11 | | |
| | Tr+Tf | | | 8 | 18 | | |
| Contrast ratio | CR | $\theta = 0°$ | 400 | 500 | | | Note 3,5 |
| Viewing angle | Top | CR$\geqq$10 | 60 | 70 | | deg | Note 3,5,7 |
| | | CR$\geqq$5 | 70 | 80 | | | |
| | Bottom | CR$\geqq$10 | 50 | 60 | | | |
| | | CR$\geqq$5 | 70 | 80 | | | |
| | Left | CR$\geqq$10 | 60 | 70 | | | |
| | | CR$\geqq$5 | 70 | 80 | | | |
| | Right | CR$\geqq$10 | 60 | 70 | | | |
| | | CR$\geqq$5 | 70 | 80 | | | |
| Brightness (Center) | $Y_L$ | | 250 | 300 | | nit | Note 3,6 |
| Color chromaticity(CIE) | Wx | $\theta = 0°$ | -0.03 | 0.313 | +0.03 | | Note 3 |
| | Wy | | | 0.329 | | | |
| | Rx | | | 0.645 | | | |
| | Ry | | | 0.348 | | | |
| | Gx | | | 0.280 | | | |
| | Gy | | | 0.605 | | | |
| | Bx | | | 0.142 | | | |
| | By | | | 0.071 | | | |
| White uniformity (13) | $\delta_W$ | | 0.75 | 0.8 | | | Note 3,8 |
| Cross talk | Ct | | | | 2% | | Note 9 |
| TCO '03 A.2.3.4 (Luminance uniformity) | $\delta_{W2}$ | | | | 1.7 | | Note 10 |
| T CO '03 A.2.4.2 (Luminance contrast) | CR$_2$ | | 0.8 | | | | Note 11 |

Note 1: Ambient temperature = 25°C.

Note 2: To be measured in dark room after backlight warm up 30 minutes.

Note 3: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.

Note 4: Definition of response time:

The output signals of BM-7 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 interval between the 10% and 90% of amplitudes. Refer to figure as below.
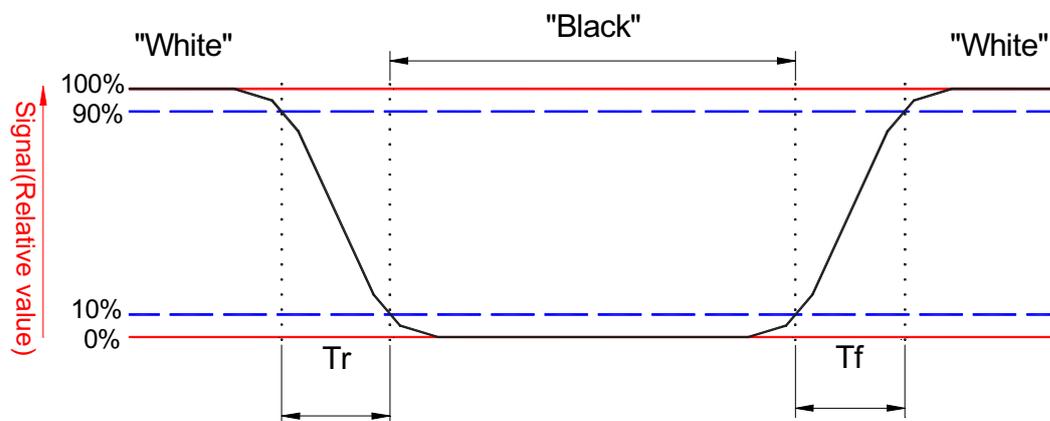
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "white" state}}{\text{Brightness on the "black" state}}$$

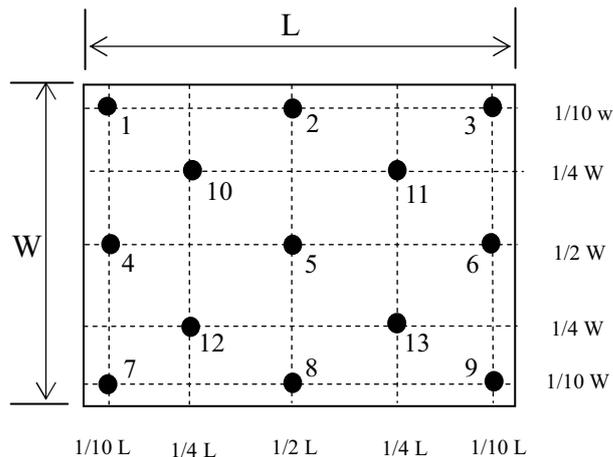Note 6: Driving conditions for CCFL: $I_L$ = 7.0 mA, 50 KHz Frequency.
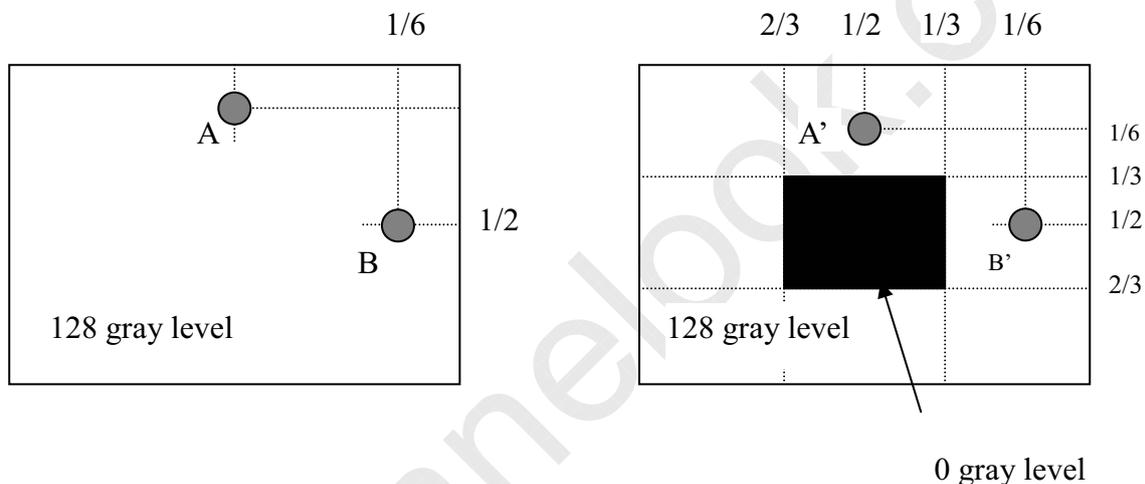
Note 7: Definition of viewing angle
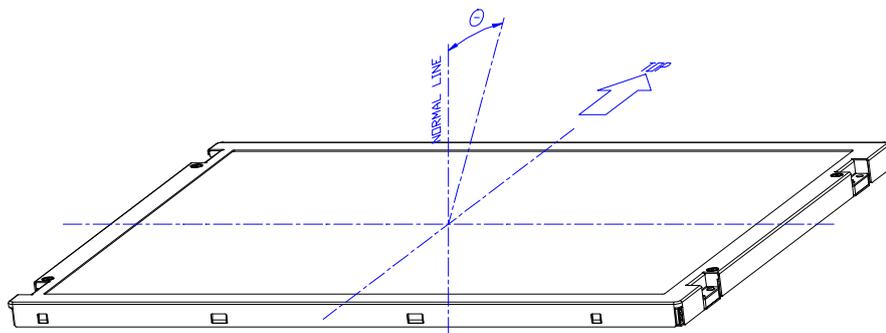
Note 8: Definition white uniformity:

Luminance are measured at the following thirteen points (1~13).

$$\delta_W = \frac{\text{Minimum Brightness of thirteen points}}{\text{Maximum Brightness of thirteen points}}$$

*www.panelook.com*     屏库:全球液晶屏交易中心

Note 9:



Unit: percentage of dimension of display area

I $L_A$-$L_{A'}$ I / $L_A$ x 100%= 2% max., $L_A$ and $L_{A'}$ are brightness at location A and A'

I $L_B$-$L_{B'}$ I / $L_B$ x 100%= 2% max., $L_{B'}$ and $L_{B'}$ are brightness at location B and B'

Note 10:

TCO'03 A.2.3.4: Luminance uniformity - angular dependence.

   1. Refer to Fig.1&2, for FPDs in the horizontal direction, the mean value of the Lmax. to Lmin. ratios at ±30 degrees shell be    1.7.

   Formula: $\dfrac{\left(\dfrac{L+30\,max.}{L+30\,min.}\right)+\left(\dfrac{L-30\,max.}{L-30\,min.}\right)}{2} \leq 1.7$

   2. Refer to Fig.1&3, for FPDs in the vertical direction, the value of Lmax. to Lmin. ratio at +15 degree shell be    1.7 and the largest value of Lmax. to Lmin. ratio at ± 15 degree shell be

   Formula: $\dfrac{L+15\,max.}{L+15\,min.} \leq 1.7$

   Formula: $Max.\left(\dfrac{L+15\,max.}{L+15\,min.}, \dfrac{L-15\,max.}{L-15\,min.}\right) \leq 1.7$

Note 11:

TCO'03 A.2.4.2: Luminance contrast – angular dependence.

Refer to Fig.1&2, center point(Pc) Luminance of White(Lw) and Black(L$_B$) is measured at ±30 degrees.

The luminance contrast values C$_{+30}$,C$_{-30}$ ,shell be calculated using the formula:

$$C = \frac{Lw - LB}{Lw + LB}$$

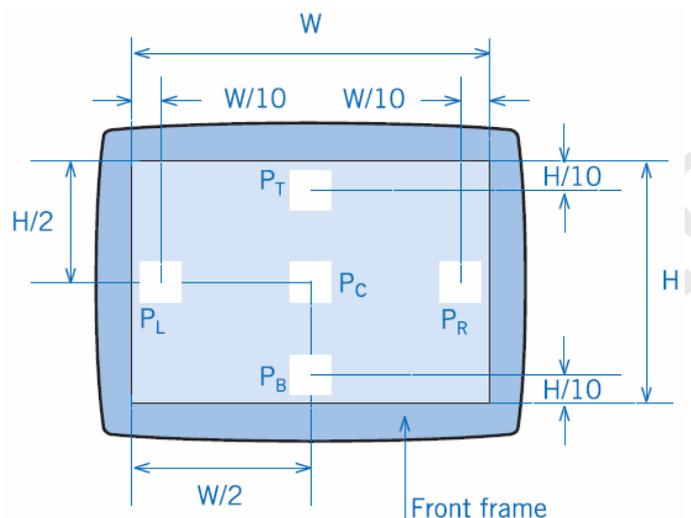For FPDs, Min.**(C$_{+30}$ ,C$_{-30}$ )** shell be    0.8 and reported as luminance contrast.

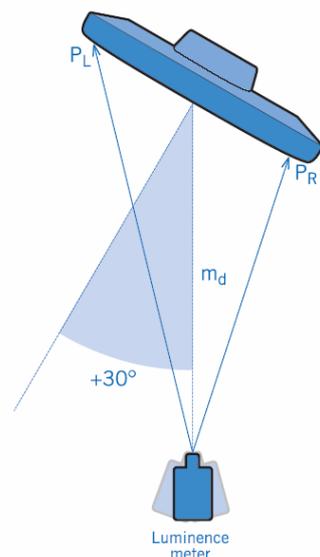Figure1: Measurement positions for angular dependence luminance uniformity.

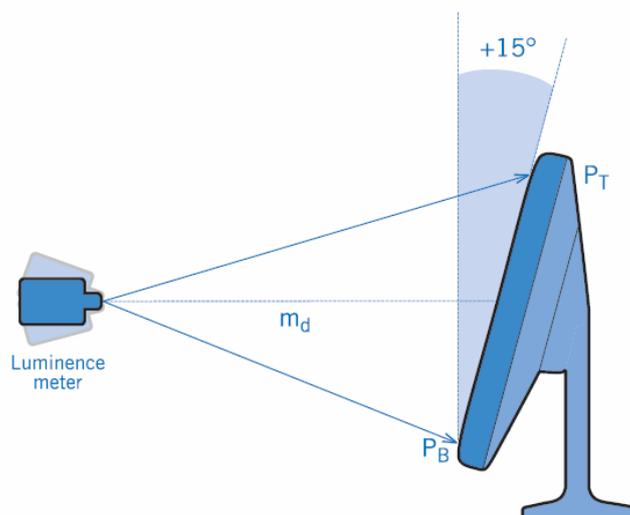Figure2: Top view of test set-up when the screen is rotated ±30 degrees. The +rotation is defined clockwise.

Figure3: Side view of the test set-up when the screen is tilted 15 degrees backwards.

## D. Reliability test items

| Test Item | Test Condition | Judgement | Remark |
|---|---|---|---|
| High temperature storage | 60°C, 40%RH ,240Hrs | Note 1 | Note 2 |
| Low temperature storage | -25°C, 240Hrs | Note 1 | Note 2 |
| High temperature & high humidity operation | 40°C, 90%RH,240Hrs (No condensation) | Note 1 | Note 2 |
| High temperature operation | 50°C, 40%RH, 240Hrs | Note 1 | Note 2 |
| Low temperature operation | 0°C, 240Hrs | Note 1 | Note 2 |
| Thermal Shock (non-operation) | -20°C~60°C 1Hr, 10mins, 1Hr, 100cycles | Note 1 | Note 2 |
| Electrostatic discharge (ESD) (non-operation) | 150 pF,330Ω,10kV,1 second, 9 position on the panel, 10 times each place | Note 1 | Note 2 |
| Vibration (Sine Wave) (non-operation) | Sweep:1G, $10H_Z$ ~ $500H_Z$ ~ $10H_Z$ /30min 1 Hr for each direction X, Y, Z (3 Hrs in total) | Note 1 | Note 2 |
| Vibration (Random) (package) (non-operation) | 0.015G2/Hz from 5~200Hz -6dB/Octave from 200~500Hz 1 Hr for each direction X,Y,Z (3 Hrs in total) | Note 1 | Note 2 |
| Drop (package) | 50cm/1corner,3edges,6sides | Note 1 | Note 2 |
| Mechanical shock (non-operation) | 200G/2ms, ±X, ±Y, ±Z once for each direction | Note 1 | Note 2 |

Note 1 :

Pass:    Normal display image with no obvious non-uniformity and no line defect.
Partial transformation of the module parts should be ignored.

Fail:    No display image, obvious non-uniformity, or line defects.

Note 2 :

Evaluation should be tested after storage at room temperature for one hour.

## E. Safety

### (1) Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

### (2) Materials

#### a. Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

#### b. Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

#### C. Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

## F. Display quality

The display quality of the color TFT-LCD module should be in compliance with the Innolux's Incoming inspection standard.

## G. Handling precaution

The Handling of the TFT-LCD should be in compliance with the Innolux's handling principle standard.

## H. Label

### (1) Module Label

83 mm

28 mm

MT170EN01    V.2

AM1700005    2XX

INNOLUX DISPLAY

$Z_1$ $Z_2$ $Z_3$ $Z_4$ $Z_5$ $Z_6$ **-Z$_7$-**$Z_8$ $Z_9$ $Z_{10}$ $Z_{11}$ $Z_{12}$

$Z_1$'$Z_2$'-$Z_3$' $Z_4$'$Z_5$'$Z_6$'$Z_7$'-$Z_8$' - $Z_9$'-$Z_{10}$'- $Z_{11}$' $Z_{12}$'-$Z_{13}$'-$Z_{14}$' $Z_{15}$' -$Z_{16}$ '-$Z_{17}$ '$Z_{18}$' $Z_{19}$' -$Z_{20}$'$Z_{21}$'$Z_{22}$ ' $Z_{23}$ '

MADE IN XXX

(a)    Model Number : MT170EN01

(b)    Version : V.2

(c)    Serial ID I : $Z_1$    $Z_2$    $Z_3$    $Z_4$    $Z_5$    $Z_6$    $Z_7$    $Z_8$    $Z_9$    $Z_{10}$    $Z_{11}$    $Z_{12}$

Serial No

Code of grade

INL internal use

INL internal use

Year, Month, Date
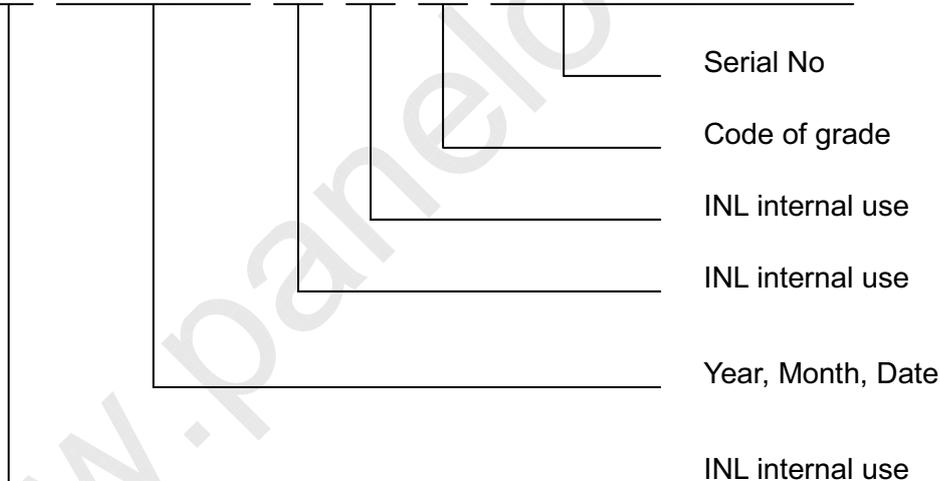
INL internal use

Serial ID includes the information as below :

1.    Manufactured Date: Year: 0~9, for 2000~2009

2.    Month: 1~9 & A~C for Jan.~Dec.

3.    Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th

4.    Code of grade: 1, 3, 5, 7,E

5.    Serial No: Module manufacture sequential no

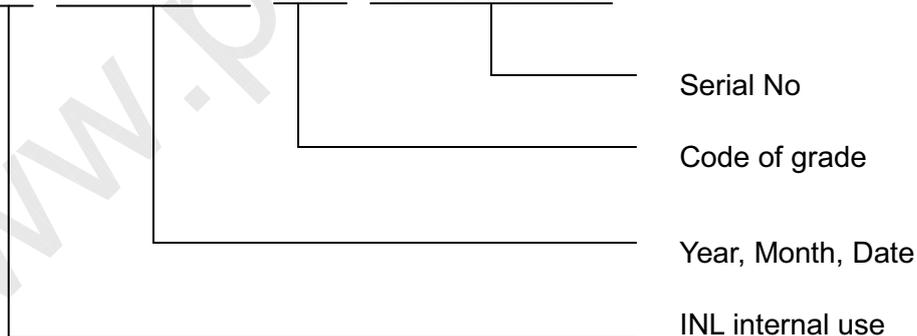(e) Serial ID II (INL internal use)

**(2) Carton Label**

INNOLUX DISPLAY

BOX ID:

□ □ □ □ □ □ □ □

$Z_1$  $Z_2$  $Z_3$  $Z_4$ -- $Z_5$ -- $Z_6$  $Z_7$  $Z_8$  $Z_9$

Model No.   **MT170EN01**            **V.2**
                   **AM1700005**            **2XX**

Quantity :   10 PCS

MFG Date: 20XX/XX/XX            Made in XXX

QC:

100 mm

120 mm
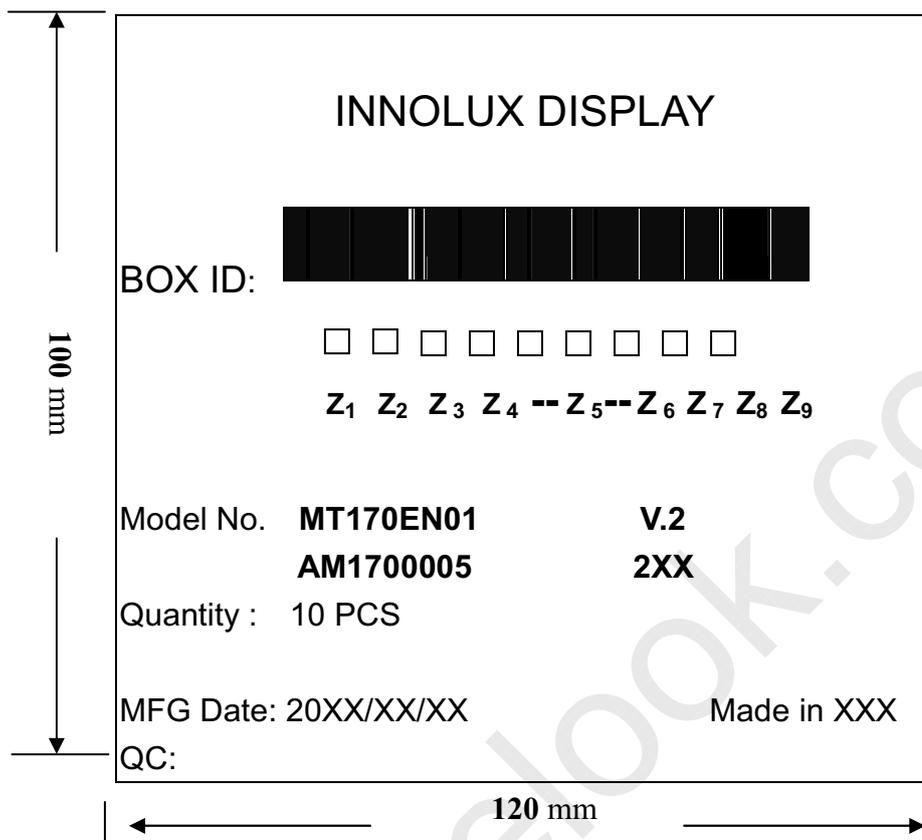
(a)  Model Number : MT170EN01

(b)  Version : V.2

(c)  Packing quantity : 10 pcs

(d)  Serial ID : $Z_1$  $Z_2$  $Z_3$  $Z_4$  $Z_5$  $Z_6$  $Z_7$  $Z_8$  $Z_9$

Serial No

Code of grade

Year, Month, Date

INL internal use

Serial ID includes the information as below :

(a) Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9 & A~C for Jan.~Dec.

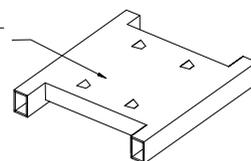Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th

(b) Code of grade: 1, 3, 5, 7, E
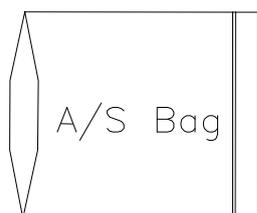
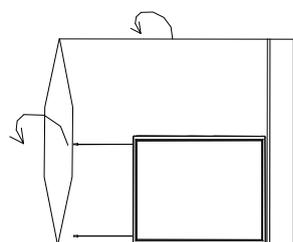(c) Serial No: Module packing sequential no

# I. Packing form

LCM
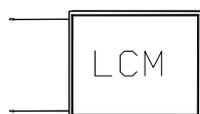
Cushion base-upper
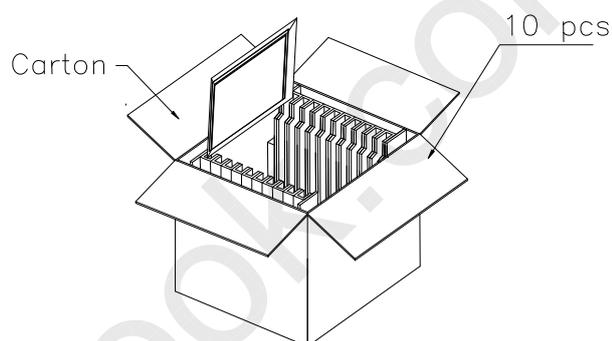
Step A
Put LCM into A/S bag

Carton

10 pcs

A/S Bag

Step B
Turn back A/S bag

Step E

Step C

Step F

Step D
Put LCM with A/S bag into carton

**J. ME Drawing**
**(1) Front view**

SPEC NO.:
PAGE :      26/26

Notes:
1.Max weight=2000g
2.I/F connector:FI-X30SSL-HF(JAE) or equivalent.
3.Lamp connector:JST,BHSR-02VS-1 or equivalent.
4.The min. torque of M3 threaded holes should be 4kg-cm 5 times.
5.Unspecified tolerance refer to Level "3"

MODEL NAME: MT170EN01-V2
PART NUMBER: AM170000520
17" LCM MT170EN01-V2
SIZE A3  SHEET NUMBER 1of2  REVNUMBER B

## (2) Back view

SPEC NO. :

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SECTION H-H
SCALE 2.000

Center of Active Area

Pin 1

SCALE 0.500

INNOLUX

17" LCM MT170EN01-V2

MODEL NAME MT170EN01-V2

AM170000520

| REV | EC NUMBER | DESCRIPTION | DATE |
|---|---|---|---|
| | XXXXXXX | add warning label | 2005/03/08 |

| | MATERIAL | FINISH | | |
|---|---|---|---|---|
| APPROVED | | Edgar Yu | 2005/03/08 | |
| CHECKED | | Kenchin Liu | 2005/03/08 | |
| DESIGNED | | Ifu lin | 2005/03/08 | |