| EXAMINED BY : | EMERGING  DISPLAY | FILE NO . CAS-0006809 |
|---|---|---|
| *Vincent Uh* | | ISSUE : MAR.01, 2012 |
| APPROVED BY: | TECHNOLOGIES  CORPORATION | TOTAL  PAGE : 24 |
| *David Chang* | | VERSION : 8 |

# CUSTOMER     ACCEPTANCE     SPECIFICATIONS

MODEL   NO. :

## E T 0 4 3 0 G 0 D M 6

### (GP)

FOR    MESSRS :

_____

CUSTOMER'S  APPROVAL

DATE :

_____

BY :

_____

02101300-01-02

## R E C O R D S   O F   R E V I S I O N

DOC . FIRST ISSUE

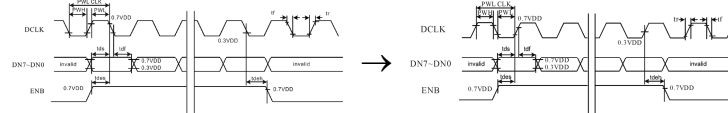JAN.23, 2009

| DATE | REVISED PAGE NO. | SUMMARY |
|---|---|---|
| FEB.16, 2009 | 6 | 5.2 INPUT SETUP TIMING REQUIREMENT  |
| | 14 | ADD 11.2.  THE BRIGHTNESS CONTROLLED BY BACKLIGHT CURRENT OF LEDCTRL. |
| MAR.09, 2009 | 3 | 4. ELECTRICAL CHARACTERISTIC POWER SUPPLY CURRENT FOR LED DRIVER : TYP.= (50) → (390), MAX.= (70) → (510) |
| | 9 | 7. OUTLINE DIMENSIONS MARK △ : CHANGE CONNECTOR & MODIFY DIMENSION |
| | 10 | 8. BLOCK DIAGRAM ADD FRAME GROUND |
| APR.07, 2009 | 9 | 7. OUTLINE DIMENSIONS MARK △ :  MODIFY CN1 TYPE |
| SEP.02, 2009 | 3 | 4. ELECTRICAL CHARACTERISTICS  |
| | 7 | 6.1 OPTICAL CHARACTERISTICS  |
| | 9 | 7. OUTLINE DIMENSIONS MARK △ :  MODIFY CN2 TYPE. |
| FEB.24, 2010 | 3 | 4. ELECTRICAL CHARACTERISTICS POWER SUPPLY VOLTAGE FOR LED DRIVER：MAX.=3.6 → 5.5 |
| MAR.22,2010 | 7 | 6.1 OPTICAL CHARACTERISTICS CONTRAST RATIO : TYP. = — → 450 THE BRIGHTNESS OF  MODULE : TYP. = — → 440 |
| MAR.01 , 2012 | 5 | 5.1  PARALLEL RGB INPUT TIMING REQUIREMENT  |

| | | DOC . FIRST ISSUE | |
|---|---|---|---|
| RECORDS  OF  REVISION | | | JAN.23, 2009 |

| DATE | REVISED PAGE NO. | SUMMARY |
|---|---|---|
| MAR.01 , 2012 | 6 | 5.2  INPUT SETUP TIMING REQUIREMENT  |
| | 8 | 6.1 OPTICAL  CHARACTERISTICS<br>NOTE (2) : DEFINITION OF VIEWING ANGLE :<br>12o'clock direction $\theta y- = 90°$  $\rightarrow \theta y+ = 90°$<br>NOTE (4) : DEFINITION OF RESPONSE TIME :<br>TR AND TF  $\rightarrow T_R$ AND $T_F$ |

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# TABLE OF CONTENTS

1.    GENERAL  SPECIFICATIONS

   1 . 1   APPLICATION NOTES FOR CONTROLLER/DRIVER
         PLEASE REFER TO：

            H I M A X     H X 8 2 5 7 - A

   1 . 2   MATERIAL SAFETY DESCRIPTION
         ASSEMBLIES SHALL COMPLY WITH EDT GREEN PRODUCT (GP)
         REQUIREMENTS, INCLUDING PROHIBITED MATERIALS/COMPONENTS
         CONTAINING LEAD, MERCURY, CADMIUM, HEXAVALENT CHROMIUM,
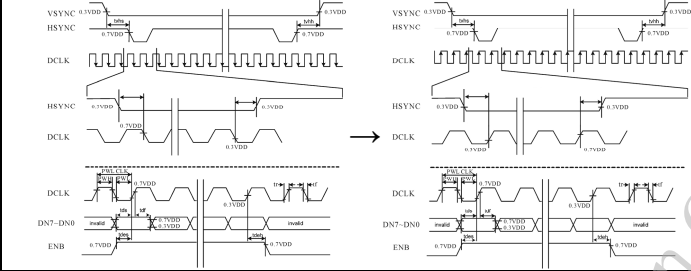         POLYBROMINATED BIPHENYLS (PBB), POLYBROMINATED
         DIPHENYL ETHERS  (PBDE), POLYCHLORINATED BIPHENYLS (PCB)
         CATEGORY, POLYCHLORINATED NAPHTHALENE (PCN) CATEGORY,
         POLYCHLORINATED TERPHENYLS (PCT) CATEGORY, CHLORINATED
         PARAFFINS (CP) CATEGORY, TRIBUTHYL TIN CATEGORY / TRIPHENYL
         TIN CATEGORY, ASBESTOS, SPECIFIC AZO COMPOUNDS,
         FORMALDEHYDE, POLYVINYL CHLORIDE (PVC) AND PVC BLENDS,
         OTHER BROMINATED ORGANIC COMPOUNDS AND OTHER CHLORINATED
         ORGANIC COMPOUNDS.

2 .    MECHANICAL  SPECIFICATIONS
         ( 1 ) DIAGONALS          ---------------------------------- 4.3 inch
         ( 2 ) NUMBER  OF  DOTS       ---------------------------- 480W * (RGB) * 272H DOTS
         ( 3 ) MODULE  SIZE        ----------------------------------- 105.5W * 67.2H *7.95D(MAX.)  mm
                                                                (WITHOUT FPC)
         ( 4 ) EFFECTIVE AREA          --------------------------- 98.7W * 56.4H  mm
         ( 5 ) ACTIVE AREA         --------------------------------- 95.04W * 53.856H  mm
         ( 6 ) DOT SIZE        ------------------------------------- 0.066W * 0.198H mm
         ( 7 )  PIXEL SIZE        --------------------------------- 0.198W * 0.198H mm
         ( 8 ) LCD  TYPE     ------------------------------------ TFT , TRANSMISSIVE
         ( 9 ) COLOR      ----------------------------------------- 262K
         ( 10 )  VIEWING  DIRECTION     ----------------------- 6  O'CLOCK
         ( 11 )  BACK  LIGHT     ------------------------------- LED , COLOR : WHITE
         ( 12 ) INTERFACE MODE     ---------------------------- RGB(18 BIT ) PARALLEL

## 3. ABSOLUTE MAXIMUM RATINGS

### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

| PARAMETER | SYMBOL | MIN. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|
| POWER SUPPLY VOLTAGE | VDD-VSS | -0.3 | 4.0 | V | |
| STATIC ELECTRICITY | — | — | — | V | NOTE (1) |
| LED BACKLIGHT POWER DISSIPATION | PD | — | 1.3 | W | |
| LED BACKLIGHT FORWARD CURRENT | IF | — | 60 | mA | |

NOTE (1):LCD SHOULD BE GROUNDED DURING HANDING LCM.

### 3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

| ITEM | OPERATING | | STORAGE | | REMARK |
|---|---|---|---|---|---|
| | MIN. | MAX. | MIN. | MAX. | |
| AMBIENT TEMPERATURE | -20°C | 70°C | -30°C | 80°C | NOTE ( 1 ) , ( 2 ) |
| HUMIDITY | NOTE ( 3 ) | | NOTE ( 3 ) | | WITHOUT CONDENSATION |
| VIBRATION | — | 3.92 m/s$^2$ ( 0.4 G ) | — | 19.6 m/s$^2$ ( 2.0 G ) | 10~55Hz X, Y, Z, EACH 2HRS |
| SHOCK | — | 58.8 m/s$^2$ ( 6 G) | — | 980 m/s$^2$ ( 100 G ) | 6 m SECONDS XYZ DIRECTIONS 3 TIMES EACH |
| CORROSIVE GAS | NOT ACCEPTABLE | | NOT ACCEPTABLE | | |

NOTE ( 1 ) : Ta AT -30°C : 48HRS MAX .
　　　　　　　　80°C : 168HRS MAX .
NOTE ( 2 ) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT
　　　　　　　TEMPERATURE THIS PHENOMENON IS REVERSIBLE .
NOTE ( 3 ) : Ta ≤ 60°C : 90%RH MAX (96HRS MAX).
　　　　　　　Ta > 60°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY
　　　　　　　　　　　OF 90%RH AT 60°C (96HRS MAX).
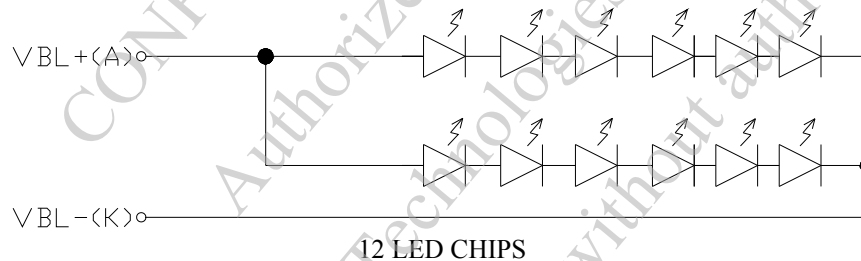
## 4 .   ELECTRICAL  CHARACTERISTICS

Ta = 25 °C

| PARAMETER | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|
| POWER SUPPLY VOLTAGE | VDD-VSS | — | 3 | 3.3 | 3.6 | V | |
| POWER SUPPLY VOLTAGE FOR LED DRIVER | VCC-VSS | — | 2.7 | 3.3 | 5.5 | V | |
| LOGIC HIGH INPUT VOLTAGE | VIH | — | 0.7*VDD | — | VDD | V | NOTE (1) |
| LOGIC LOW INPUT VOLTAGE | VIL | — | 0 | — | 0.3*VDD | V | |
| POWER SUPPLY CURRENT | IDD | VDD-VSS=3.3V | — | 15 | 20 | mA | NOTE (2) |
| POWER SUPPLY CURRENT FOR LED DRIVER | ICC | VCC-VSS=3.3V LED B/L=ON | — | 390 | 510 | mA | |
| POWER SUPPLY FOR LED BACKLIGHT | $V_{BL}+ - V_{BL}-$ | IF = 36mA | 17.4 | 19.8 | 21.6 | V | NOTE (3) |
| LED LIFE TIME | — | — | 30K | 40K | — | HRS | |

NOTE ( 1 ) : APPLIED TO TERMINALS  B5~B0 , G5~G0 , R5~R0 , DCLK , HSYNC , VSYNC ,ENB.
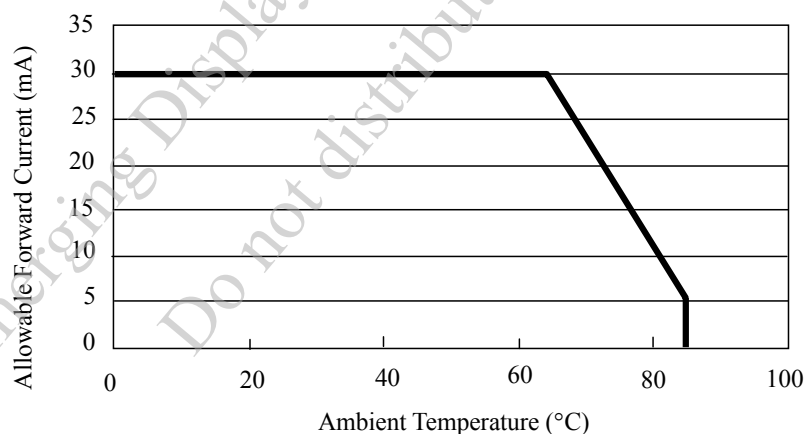NOTE ( 2 ) : THE DISPLAY PATTERN IS ALL "WHITE"
NOTE ( 3 ) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT

VBL+(A)○

VBL-(K)○

12 LED CHIPS

NOTE ( 4 ) : AMBIENT TEMP. VS. ALLOWABLE FORWARD CURRENT.(PER LED)



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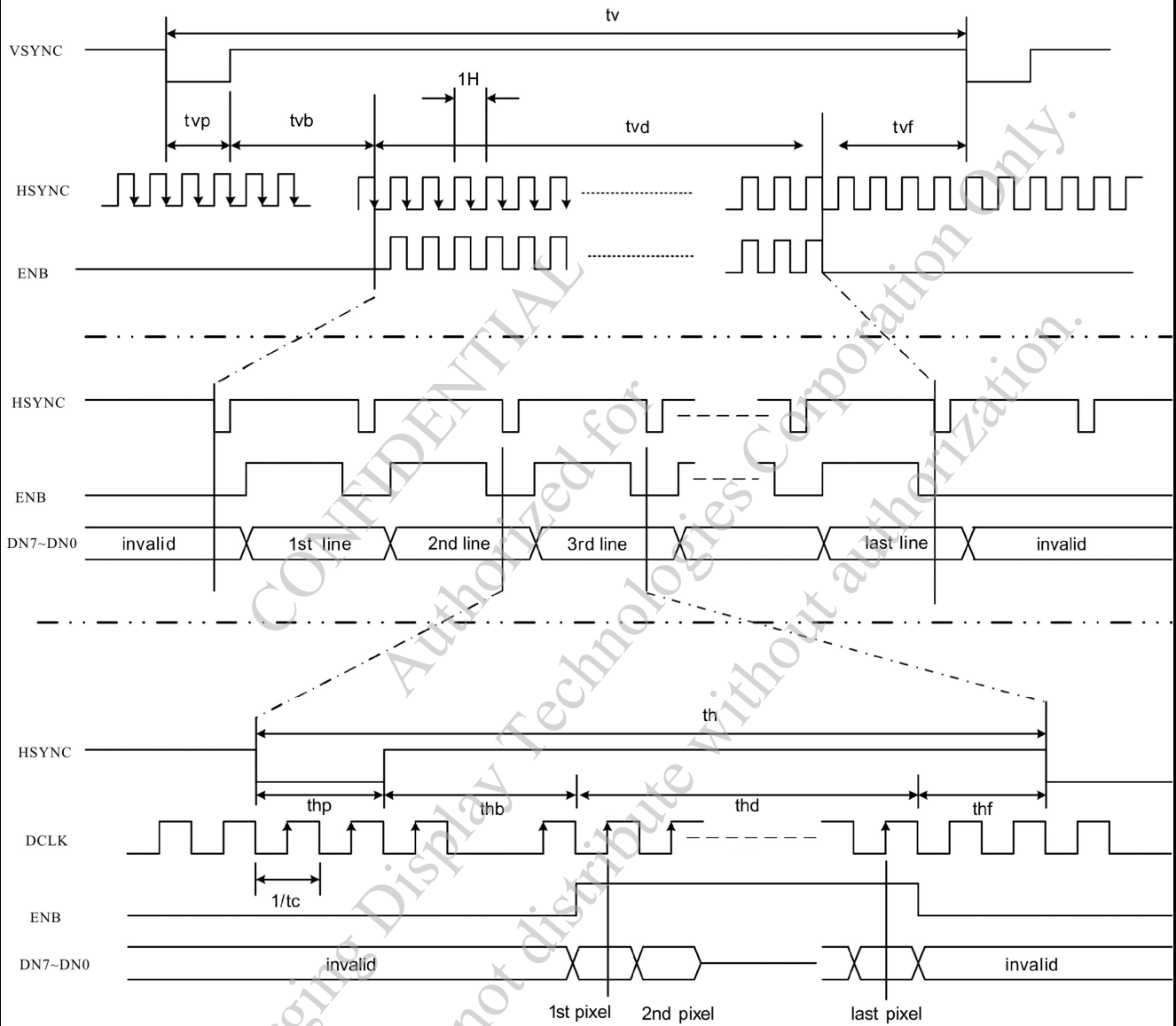4

5 . TIMING CHARACTERISTICS
   THE HX8257-A BOTH SUPPORTS DE MODE AND SYNC MODE TIMING. THE
   MODE WAS DECIDED BY DE SIGNAL INTERNALLY. WHEN DE IS PULLED
   LOW, THE HX8257-A USES HS+VS FOR TIMING CONTROL AND THIS TIMING
   MODE IS SYNC MODE. WHEN DE IS PULLED HIGH FOR ACTIVE DATA AND
   PULLED LOW FOR BLANKING DATA, THE HX8257-A USES DE FOR TIMING
   CONTROL AND THIS TIMING MODE IS DE MODE. THE DETAIL TIMING CHART
   SHOWED BELOW.

   5.1  PARALLEL RGB INPUT TIMING REQUIREMENT

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| CLOCK CYCLE | $f_{CLK}$ [1] | — | 9 | 15 | MHz |
| HSYNC CYCLE | 1/th | — | 17.14 | — | KHz |
| VSYNC CYCLE | 1/tv | — | 59.94 | — | Hz |
| HORIZONTAL SIGNAL | | | | | |
| HORIZONTAL CYCLE | th | 525 | 525 | 605 | CLK |
| HORIZONTAL DISPLAY PERIOD | thd | 480 | 480 | 480 | CLK |
| HORIZONTAL FRONT PORCH | thf | 2 | 2 | 82 | CLK |
| HORIZONTAL PULSE WIDTH | thp [2] | 2 | 41 | 41 | CLK |
| HORIZONTAL BACK PORCH | thb [2] | 2 | 2 | 41 | CLK |
| VERTICAL SIGNAL | | | | | |
| VERTICAL CYCLE | tv | 285 | 286 | 399 | H [1] |
| VERTICAL DISPLAY PERIOD | tvd | 272 | 272 | 272 | H [1] |
| VERTICAL FRONT PORCH | tvf | 1 | 2 | 227 | H [1] |
| VERTICAL PULSE WIDTH | tvp [2] | 1 | 10 | 11 | H [1] |
| VERTICAL BACK PORCH | tvb [2] | 1 | 2 | 11 | H [1] |

NOTE：1.UNIT: CLK=1/ $f_{CLK}$ , H=th,
        2. IT IS NECESSARY TO KEEP tvp+tvb=12 AND thp+thb=43 IN SYNC
          MODE. DE MODE IS UNNECESSARY TO KEEP IT.

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## 5.2    INPUT SETUP TIMING REQUIREMENT

$(tr^{(1)} = tf^{(1)} = 2ns)$

| ITEM | SYMBOL | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|
| CLOCK PERIOD | $PW_{CLK}$ (2) | 66.7 | — | — | ns |
| CLOCK PULSE HIGH PERIOD | PWH (2) | 26.7 | — | — | ns |
| CLOCK PULSE LOW PERIOD | PWL (2) | 26.7 | — | — | ns |
| HSYNC SETUP TIME | $t_{hs}$ | 10 | — | — | ns |
| HSYNC HOLD TIME | $t_{hh}$ | 10 | — | — | ns |
| DATA SETUP TIME | $t_{ds}$ | 10 | — | — | ns |
| DATA HOLD TIME | $t_{dh}$ | 10 | — | — | ns |
| ENB SETUP TIME | $t_{des}$ | 10 | — | — | ns |
| ENB HOLD TIME | $t_{deh}$ | 10 | — | — | ns |
| VSYNC SETUP TIME | $t_{vhs}$ | 10 | — | — | ns |
| VSYNC HOLD TIME | $t_{vhh}$ | 10 | — | — | ns |

NOTE : 1. tr, tf IS DEFINED 10% TO 90% OF SIGNAL AMPLITUDE.
2.  FOR PARALLEL INTERFACE, MAXIMUM CLOCK FREQUENCY IS 15MHz.
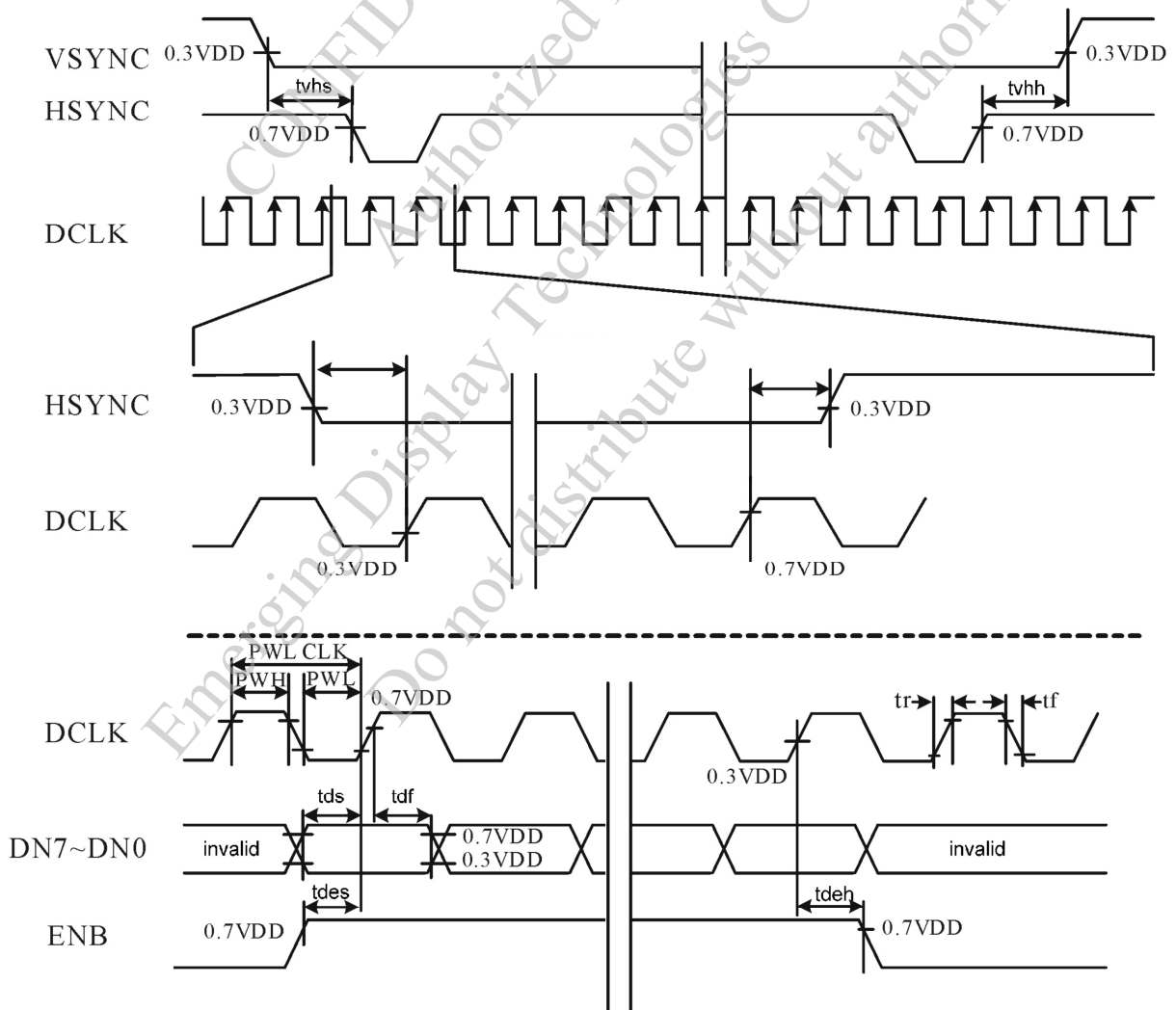
## 6.  OPTICAL  CHARACTERISTICS (NOTE 1)
### 6.1  OPTICAL  CHARACTERISTICS

Ta = 2 5°C

| I T E M | | SYMBOL | CONDITION | | MIN. | TYP. | MAX. | UNIT | REMARK |
|---|---|---|---|---|---|---|---|---|---|
| VIEWING ANGLE | | $\theta_{y+}$ | CR ≥ 10 | $\theta_x=0°$ | 56 | 63 | — | deg. | NOTE (2) NOTE (3) |
| | | $\theta_{y-}$ | | | 68 | 75 | — | | |
| | | $\theta_{x+}$ | | $\theta_y=0°$ | 68 | 75 | — | | |
| | | $\theta_{x-}$ | | | 68 | 75 | — | | |
| CONTRAST RATIO | | CR | $\theta x=0°$ , $\theta y=0°$ | | 300 | 450 | — | — | NOTE (3) |
| RESPONSE TIME | | $T_R$ ( rise ) | $\theta x=0°$ , $\theta y=0°$ | | — | 5 | — | msec | NOTE (4) |
| | | $T_F$ ( fall ) | | | — | 15 | — | | |
| COLOR OF CIE COORDINATE | WHITE | Wx | $\theta x=0°$ , $\theta y=0°$ IF = 36mA (NTSC : 55%) | | 0.26 | 0.31 | 0.36 | — | NOTE (5) |
| | | Wy | | | 0.28 | 0.33 | 0.38 | | |
| | RED | Rx | | | 0.55 | 0.60 | 0.65 | — | |
| | | Ry | | | 0.28 | 0.33 | 0.38 | | |
| | GREEN | Gx | | | 0.28 | 0.33 | 0.38 | | |
| | | Gy | | | 0.49 | 0.54 | 0.59 | | |
| | BLUE | Bx | | | 0.09 | 0.14 | 0.19 | — | |
| | | By | | | 0.04 | 0.09 | 0.14 | | |
| THE BRIGHTNESS OF  MODULE | | B | $\theta x=0°$ , $\theta y=0°$ IF = 36mA | | 400 | 440 | — | cd/m$^2$ | NOTE (6) |
| THE UNIFORMITY OF MODULE | | — | | | 70 | 75 | — | % | |

NOTE (1) : TEST EQUIPMENT SETUP :
AFTER STABILIZING AND LEAVING THE PANEL ALONE AT A GIVEN TEMPERATURE FOR 30 MINUTES, THE MEASUREMENT SHOULD BE EXECUTED. MEASUREMENT SHOULD BE EXECUTED IN A STABLE, WINDLESS, AND DARK ROOM. OPTICAL SPECIFICATIONS ARE MEASURED BY TOPCON BM-7 (FAST) WITH A VIEWING ANGLE OF 1° AT A DISTANCE OF 50cm AND NORMAL DIRECTION.
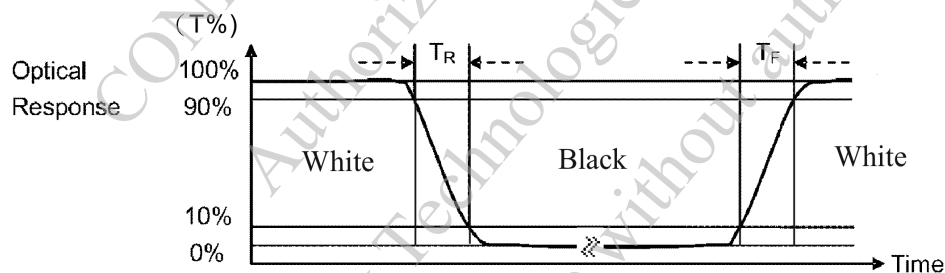


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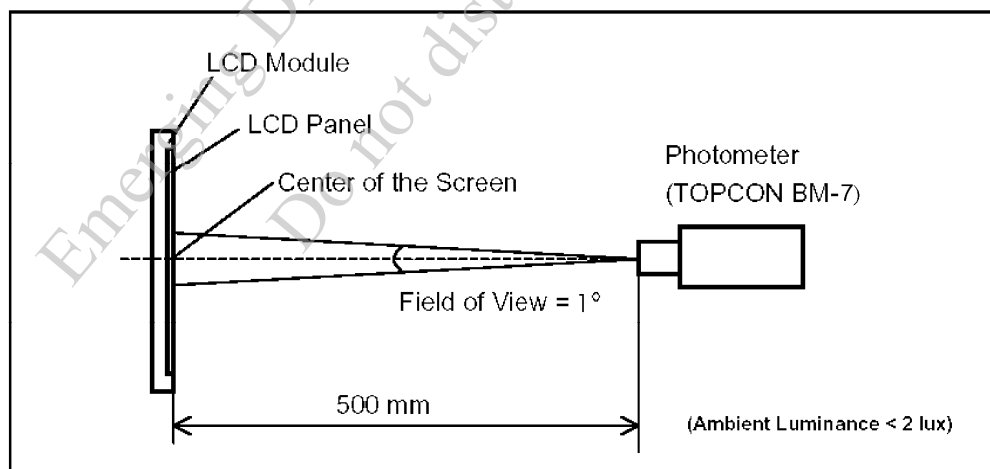
NOTE (2) : DEFINITION OF VIEWING ANGLE :
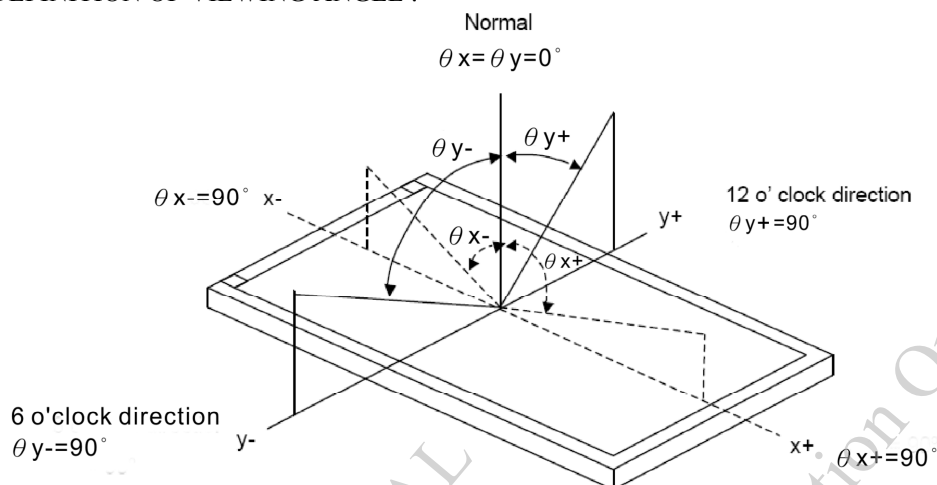


NOTE (3) : DEFINITION OF CONTRAST RATIO :

$$CONTRAST\ RATIO(CR) = \frac{BRIGHTNESS\ MEASURED\ WHEN\ LCD\ IS\ AT\ "WHITE\ STATE"}{BRIGHTNESS\ MEASURED\ WHEN\ LCD\ IS\ AT\ "BLACK\ STATE"}$$

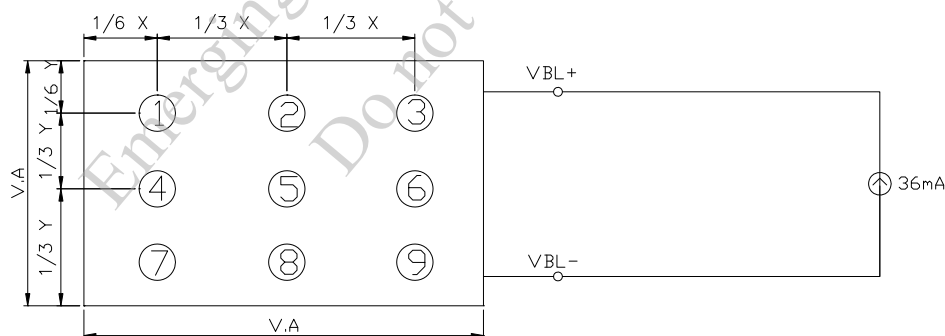NOTE (4) : DEFINITION OF RESPONSE TIME : $T_R$ AND $T_F$
THE FIGURE BELOW IS THE OUTPUT SIGNAL OF THE PHOTO DETECTOR.



NOTE (5) : THE 100% TRANSMISSION IS DEFINED AS THE TRANSMISSION OF LCD PANEL WHEN ALL
THE INPUT TERMINALS OF MODULE ARE ELECTRICALLY OPENED.

NOTE (6) : BRIGHTNESS MEASURED WHEN LCD IS AT "WHITE STATE".

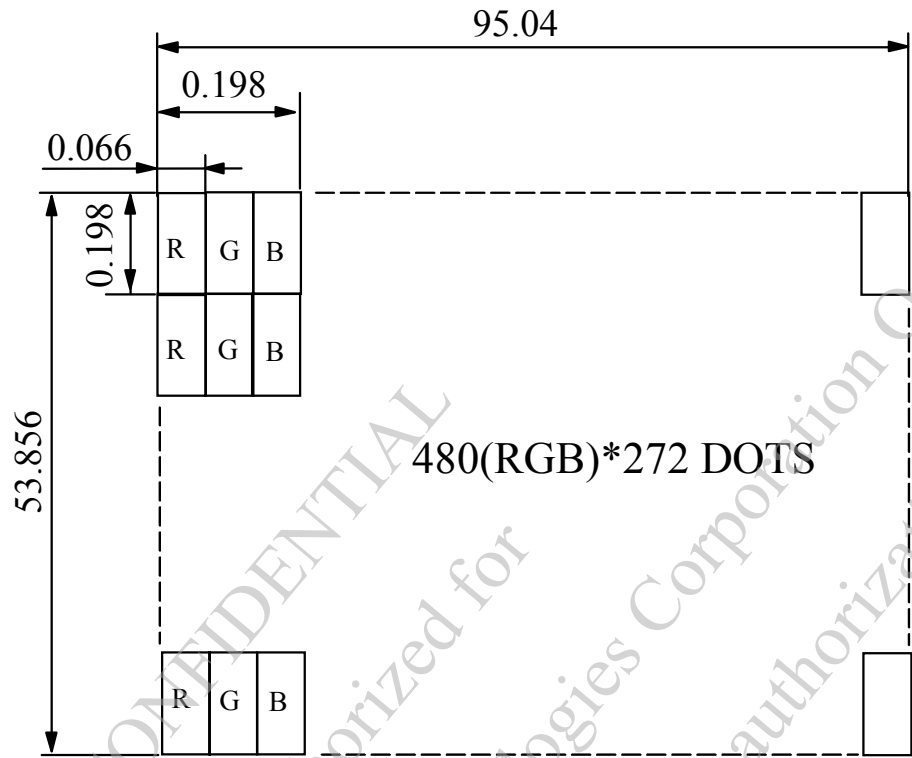6.2  THE TEST METHOD OF BRIGHTNESS AND UNIFORMITY.



UNIT：mm

6.3  THE CALCULATING OF METHOD UNIFORMITY

$$UNIFORMITY : \left[1 - \frac{MAXIMUM\ BRIGHTNESS - MINIMUM\ BRIGHTNESS}{AVERAGE\ BRIGHTNESS}\right] \times 100\%$$

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## 7. OUTLINE DIMENSIONS



105.5

V.A. 98.7 (FRAME OPENING)

(3.4)

A.A. 95.04±0.1

(5.23)

(3.5)

(4.22)

480(RGB)*272 DOTS

V.A. 56.4 (FRAME OPENING)

A.A. 53.856±0.1

67.2

(1)

⬆
VIEWING DIRECTION
Best Contrast but with Gray Level Inversion

7.95 MAX.

3.95±0.3

I(PCB)

74.35

COMPONENT AREA

⚠ XF2M-4015-1A(Omron)
⚠ OR EQUIVALENT

(28.11)

34.29

△(9.4)

40    CN1

⚠

COMPONENT AREA
(H=1.5mm MAX.)

UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ±0.3mm
NOTE : MARK △ MODIFY (NUMBER NOTE MODIFY VERSION)

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## 8. BLOCK DIAGRAM



G2 LINE1
G4 LINE2

LINE1 G1
LINE2 G3

TFT LCD PANEL
480(RGB)*272 DOTS

G544 LINE272

LINE272 G543

S1                                    S720

HX8257-A

FRAME GROUND — R 0Ω

FPC

LED BACKLIGHT

PCB

1.NC
2.VSS
3.B5
4.B4
5.B3
6.B2
7.B1
8.B0
9.VSS
10.G5
11.G4
12.G3
13.G2
14.G1
15.G0
16.VSS
17.R5
18.R4
19.R3
20.R2
21.R1
22.R0
23.VSS
24.DCLK
25.VSS
26.HSYNC
27.VSYNC
28.ENB
29.PWCTRL
30.VDD
31.VSS
32.VSS
33.VCC
34.VCC
35.NC
36.LEDCTRL
37.NC
38.NC
39.NC
40.NC

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9．  DETAIL DRAWING OF DOT MATRIX



480(RGB)*272 DOTS

UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1
DOTS MATRIX TOLERANCE IS ± 0.01

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## 10. INTERFACE SIGNALS

| PIN NO | SYMBOL | I/O | FUNCTION |
|---|---|---|---|
| 1 | NC | — | NON CONNECTION |
| 2 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 3 | B5 | I | BLUE DATA BIT 5 |
| 4 | B4 | I | BLUE DATA BIT 4 |
| 5 | B3 | I | BLUE DATA BIT 3 |
| 6 | B2 | I | BLUE DATA BIT 2 |
| 7 | B1 | I | BLUE DATA BIT 1 |
| 8 | B0 | I | BLUE DATA BIT 0 |
| 9 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 10 | G5 | I | GREEN DATA BIT 5 |
| 11 | G4 | I | GREEN DATA BIT 4 |
| 12 | G3 | I | GREEN DATA BIT 3 |
| 13 | G2 | I | GREEN DATA BIT 2 |
| 14 | G1 | I | GREEN DATA BIT 1 |
| 15 | G0 | I | GREEN DATA BIT 0 |
| 16 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 17 | R5 | I | RED DATA BIT 5 |
| 18 | R4 | I | RED DATA BIT 4 |
| 19 | R3 | I | RED DATA BIT 3 |
| 20 | R2 | I | RED DATA BIT 2 |
| 21 | R1 | I | RED DATA BIT 1 |
| 22 | R0 | I | RED DATA BIT 0 |
| 23 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 24 | DCLK | I | DOT DATA CLOCK |
| 25 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 26 | HSYNC | I | HORIZONTAL SYNC INPUT WITH NEGATIVE POLARITY. INTERNALLY PULL HIGH. |
| 27 | VSYNC | I | VERTICAL SYNC INPUT WITH NEGATIVE POLARITY. INTERNALLY PULL HIGH. |
| 28 | ENB | I | INPUT DATA ENABLE CONTROL. INTERNALLY PULLED LOW. |

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| PIN NO. | SYMBOL | I/O | FUNCTION |
|---|---|---|---|
| 29 | PWCTRL | I | LOGIC LEVEL H=3.3V L=0V — PWCTRL H : POWER ON ; L : SHUTDOWN. WHEN INTERNAL LED DRIVER : JP4 1-2(DEFAULT) WHEN EXTERNAL LED DRIVER : JP4 2-3 |
| 30 | VDD | P | POWER SUPPLY VOLTAGE |
| 31 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 32 | VSS | P | GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE) |
| 33 | VCC | P | POWER SUPPLY FOR LED DRIVER CIRCUIT |
| 34 | VCC | P | POWER SUPPLY FOR LED DRIVER CIRCUIT |
| 35 | NC | — | NON CONNECTION (USING INTERNAL LED DRIVER) OR ANODE (USING EXTERNAL LED DRIVER) WHEN INTERNAL LED DRIVER：JP1 1-2 (DEFAULT) WHEN EXTERNAL LED DRIVER：JP1 2-3 |
| 36 | LEDCTRL | I | BRIGHTNESS CONTROL FOR LED BACKLIGHT ; LEDCTRL (USING INTERNAL LED DRIVER) OR CATHODE (USING EXTERNAL LED DRIVER) WHEN INTERNAL LED DRIVER：JP2 1-2 (DEFAULT) JP3 1-2 CONNECT(DEFAULT) WHEN EXTERNAL LED DRIVER：JP2 2-3 JP3 NON CONNECTION |
| 37 | NC | — | NON CONNECTION |
| 38 | NC | — | NON CONNECTION |
| 39 | NC | — | NON CONNECTION |
| 40 | NC | — | NON CONNECTION |

Inner table for pin 29:

| LOGIC LEVEL H=3.3V L=0V | PWCTRL | REMARK |
|---|---|---|
| | H | POWER ON |
| | L | SHUTDOWN |

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## 11．POWER SUPPLY

### 11.1 POWER SUPPLY FOR LCM



### 11.2 THE BRIGHTNESS CONTROLLED BY BACKLIGHT CURRENT OF LEDCTRL.



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E M E R G I N G  D I S P L A Y
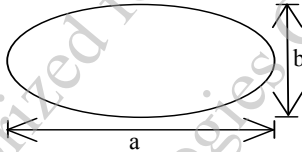TECHNOLOGIES CORPORATION

MODEL NO.
E T 0 4 3 0 G 0 D M 6

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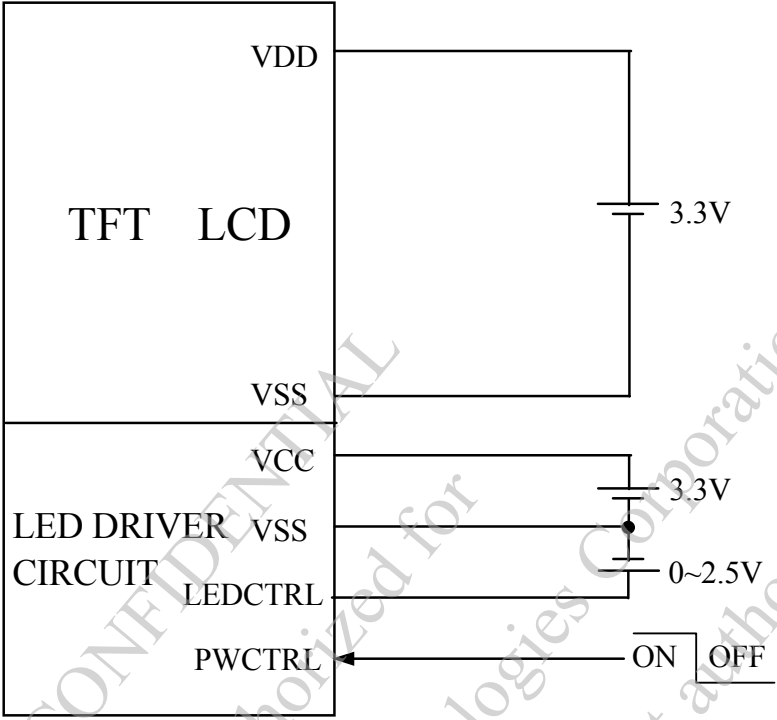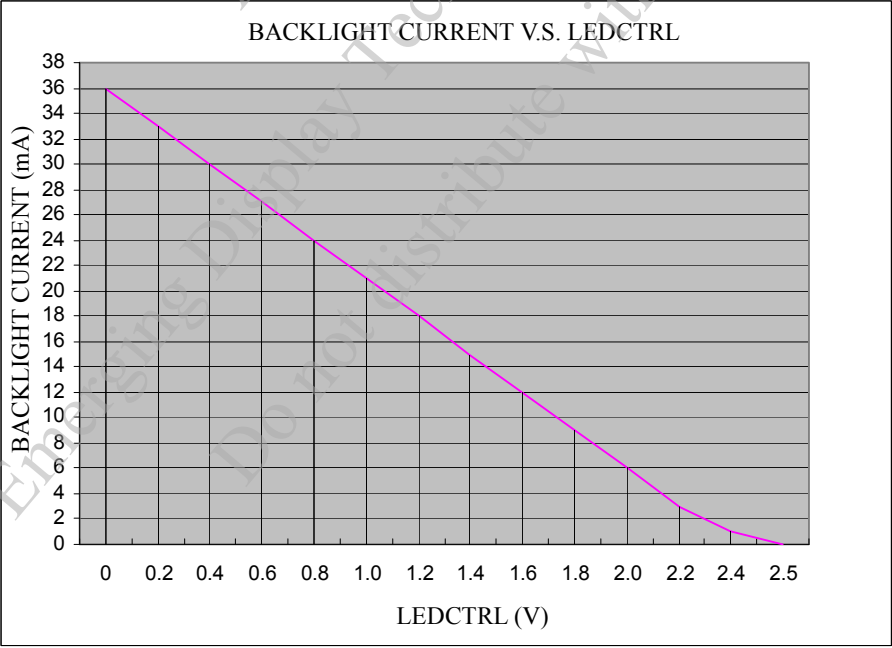
1 2 . INSPECTION CRITERION

12.1 APPLICATION

THIS INSPECTION STANDARD IS TO BE APPLIED TO THE LCD MODULE
DELIVERED FROM EMERGING DISPLAY TECHNOLOGIES CORP.( E.D.T ) TO
CUSTOMERS

12.2 INSPECTION CONDITIONS

12.2.1 (1)OBSERVATION DISTANCE：35cm±5cm
(2)VIEW ANGLE：
NON-OPERATION CONDITION：±5°
(PERPENDICULAR TO LCD PANEL SURFACE)
OPERATION CONDITION：±45°
(PERPENDICULAR TO LCD PANEL SURFACE)
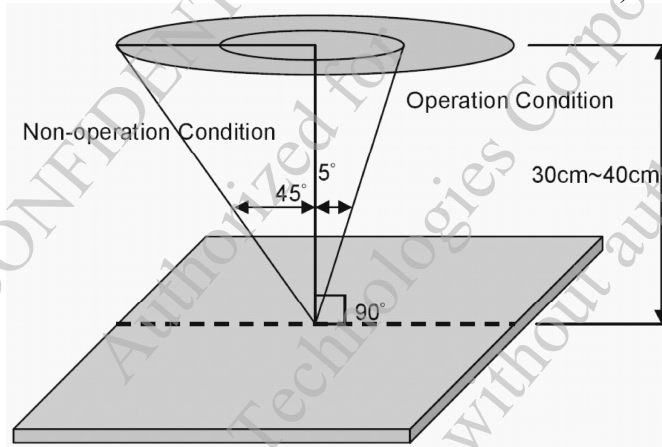


12.2.2 ENVIRONMENT CONDITIONS：

| AMBIENT TEMPERATURE | | 20°C~25°C |
|---|---|---|
| AMBIENT HUMIDITY | | 65±20%RH |
| AMBIENT ILLUMINATION | COSMETIC INSPECTION | MORE THAN 600Lux |
| | FUNCTIONAL INSPECTION | 300~500 Lux |

12.2.3 INSPECTION LOT
QUANTITY PER DELIVERY LOT FOR EACH MODEL

12.2.4 INSPECTION METHOD
A SAMPLING INSPECTION SHALL BE MADE ACCORDING TO THE
FOLLOWING PROVISIONS TO JUDGE THE ACCEPTABILITY
(a)APPLICABLE STANDARD：
MIL-STD-105E
NORMAL INSPECTION, SINGLE SAMPLING
LEVEL Ⅱ
(b)AQL：MAJOR DEFECT：AQL 0.65
MINOR DEFECT：AQL 1.0
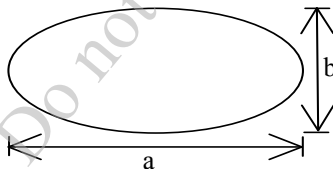
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12.3  INSPECTION STANDARDS
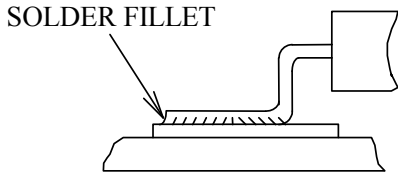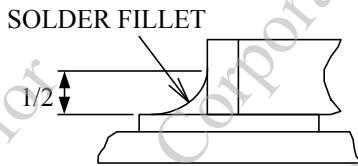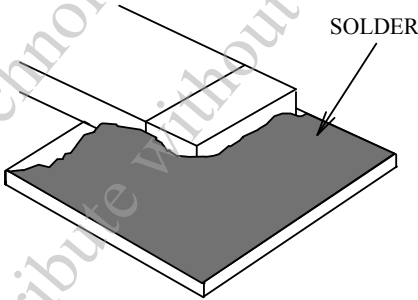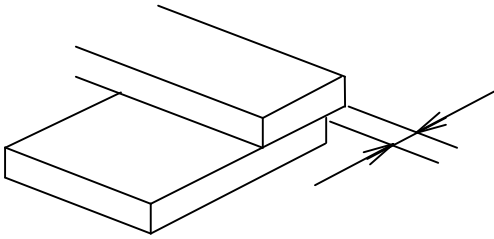
12.3.1  VISUAL DEFECTS CLASSIFICATION
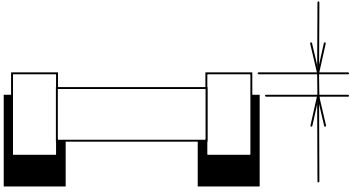
| TYPE OF DEFECT | INSPECTION ITEM | DEFECT FEATURE | AQL |
|---|---|---|---|
| MAJOR DEFECT | 1.DISPLAY ON | • DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS EX: DISCONNECTION, SHORT CIRCUIT ETC | 0.65 |
| | 2.BACKLIGHT | • NO LIGHT<br>• FLICKERING AND OTHER ABNORMAL ILLUMINATION | |
| | 3.DIMENSIONS | • SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS | |
| MINOR DEFECT | 1.DISPLAY ZONE | • BLACK/WHITE SPOT<br>• BUBBLES ON POLARIZER<br>• NEWTON RING<br>• BLACK/WHITE LINE<br>• SCRATCH<br>• CONTAMINATION<br>• LEVER COLOR SPREED | 1.0 |
| | 2.BEZEL ZONE | • STAINS<br>• SCRATCHES<br>• FOREIGN MATTER | |
| | 3.SOLDERING | • INSUFFICIENT SOLDER<br>• SOLDERED IN INCORRECT POSITION<br>• CONVEX SOLDERING SPOT<br>• SOLDER BALLS<br>• SOLDER SCRAPS | |
| | 4.DISPLAY ON (ALL ON) | • LIGHT LINE | |

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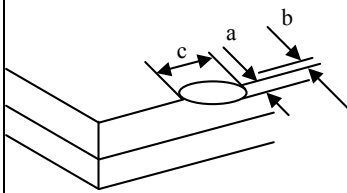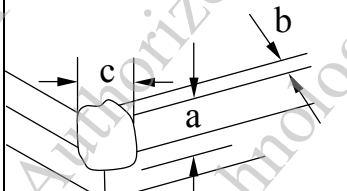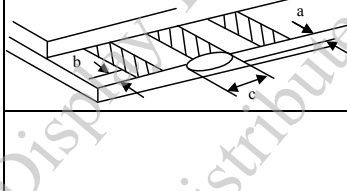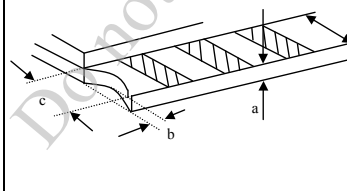
### 12.3.2 MODULE DEFECTS CALSSIFICATION

| NO. | ITEM | CRITERIA | | |
|---|---|---|---|---|
| 1. | DISPLAY ON INSPECTION | (1)INCORRECT PATTERN<br>(2)MISSING SEGMENT<br>(3)DIM SEGMENT<br>(4)OPERATING VOLTAGE BEYOND SPEC | | |
| 2. | OVERALL DIMENSIONS | (1)OVERALL DIMENSION BEYOND SPEC | | |
| 3. | DOT DEFECT | (1) INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS.<br>(2)<br><table><tr><td>ITEMS</td><td>ACCEPTABLE COUNT</td></tr><tr><td>BRIGHT DOT</td><td>N ≤ 2</td></tr><tr><td>DARK DOT</td><td>N ≤ 3</td></tr><tr><td>TOAL BRIGHT AND DARK DOTS</td><td>N ≤ 4</td></tr></table>NOTE：<br>1. THE DEFINITION OF DOT：<br>  THE SIZE OF A DEFECTIVE DOT OVER 1/2 OF WHOLE DOT IS REGARDED AS ONE DEFECTIVE DOT.<br>2. BRIGHT DOT：<br>  DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN.<br>3. DARK DOT：<br>  DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE. | | |
| 4. | FOREIGN BLACK/WHITE/ BRIGHT LINE/ SCRATCH OF VIEWING AREA | <table><tr><td>LENGTH：L</td><td>WIDTH：W</td><td>PERMISSIBLE NO.</td></tr><tr><td>L ≤ 0.3</td><td>W ≤ 0.05</td><td>IGNORE</td></tr><tr><td>0.3 < L ≤ 2.5</td><td>0.05 < W ≤ 0.1</td><td>4</td></tr><tr><td>2.5 < L</td><td>0.1 < W</td><td>NONE</td></tr></table>WIDTH：W mm, LENGH：L mm | | |
| 5. | FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.) | <table><tr><td>AVERAGE DIAMETER (mm): D</td><td>NUMBER OF PIECES PERMITTED</td></tr><tr><td>D ≤ 0.15</td><td>IGNORE</td></tr><tr><td>0.15 < D ≤ 0.5</td><td>4</td></tr><tr><td>0.5 < D</td><td>NONE</td></tr></table>NOTE ： DIAMETER D=(a+b)/2<br> | | |

| NO. | ITEM | CRITERIA | | |
|---|---|---|---|---|
| 6. | BUBBLES OF POLARIZER /DIRT/CF FAIL /SURFACE STAINS | | AVERAGE DIAMETER (mm)：D | NUMBER OF PIECES PERMITTED |
| | | BUBBLE ON THE POLARIZER | D ≤ 0.25 | IGNORE |
| | | | 0.25 < D ≤ 0.5 | N ≤ 5 |
| | | | 0.5 < D | NOTE |
| | | SURFACE STATUS | D < 0.1 mm | IGNORE |
| | | | 0.1 < D ≤ 0.3mm | N ≤ 3 |
| | | CF FAIL / SPOT | D < 0.1 mm | IGNORE |
| | | | 0.1 < D ≤ 0.3mm | N ≤ 3 |

NOTE : (1)POLARIZER BUBBLE IS DEFINED AS THE BUBBLE APPEARS ON ACTIVE DISPLAY AREA. THE DEFECT OF POLARIZER BUBBLE SHALL BE IGNORED IF THE POLARIZER BUBBLE APPEARS ON THE OUTSIDE OF ACTIVE DISPLAY AREA.
(2)THE EXTRANEOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON.
(3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING.
AVERAGE DIAMETER (D)=(a+b)/2

| NO. | ITEM | CRITERIA |
|---|---|---|
| 7. | LINE DEFECT ON DISPLAY | OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOW |
| 8. | MURA ON DISPLAY | IT'S OK IF MURA IS SLIGHT VISIBLE THROUNG 6% ND FILTER |
| 9. | UNEVEN COLOR SPREAD, COLORATION | (1)TO BE DETERMINED BASED UPON THE STANDARD SAMPLE. |
| 10. | BEZEL APPEARANCE | (1)BEZEL MAY NOT HAVE RUST, BE DEFORMED OR HAVE FINGER PRINTS STAINS OF OTHER CONTAMINATION. (2)BEZEL MUST COMPLY WITH JOB SPECIFICATIONS. |
| 11 | PCB | (1)THERE MAY NOT BE MORE THAN 2mm OF SEALANT OUTSIDE THE SEAL AREA ON THE PCB, AND THERE SHOULD BE NO MORE THAN THREE PLACES. (2)NO OXIDATION OR CONTAMINATION PCB TERMINALS. (3)PARTS ON PCB MUST BE THE SAME AS ON THE PRODUCTION CHARACTERISTIC CHART. THERE SHOULD BE NO WRONG PARTS, MISSING PARTS OR EXCESS PARTS. (4)THE JUMPER ON THE PCB SHOULD CONFORM TO THE PRODUCT CHARACTERISTIC CHART. (5)IF SOLDER GETS ON BEZEL TAB PADS, LED PAD, ZEBRA PAD OR SCREW HOLD PAD; MAKE SURE IT IS SMOOTHED DOWN. |

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| NO. | ITEM | CRITERIA |
|---|---|---|
| 12. | SOLDERING | (1)NO SOLDERING FOUND ON THE SPECIFIED PLACE<br>(2)INSUFFICENT SOLDER<br>  (a)LSI, IC<br>    A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR<br>    "HEEL" OF LEAD AND PAD<br><br>SOLDER FILLET<br><br>  (b)CHIP COMPONENT<br>    · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE<br>    WETTING<br><br>SOLDER FILLET<br>1/2<br><br>· SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF<br>  SIDES AND FRONT SURFACE AREA ARE COVERED<br><br>SOLDER<br><br>(3)PARTS ALIGMENT<br>  (a)LSI, IC<br>    LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE |

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| NO. | ITEM | CRITERIA |
|---|---|---|
| 12. | SOLDERING | (b)CHIP COMPONENT<br>   COMPONENT IS OFF CENTER, AND MORE THAN 50% OF THE LEADS IS OFF THE PAD OUTLINE<br><br><br><br>(4)NO UNMELTED SOLDER PASTE MAY BE PRESENT ON THE PCB.<br>(5)NO COLD SOLDER JOINTS, MISSING SOLDER CONNECTIONS, OXIDATION OR ICICLE.<br>(6)NO RESIDUE OR SOLDER BALLS ON PCB.<br>(7)NO SHORT CIRCUITS IN COMPONENTS ON PCB. |
| 13. | BACKLIGHT | (1)NO LIGHT<br>(2)FLICKERING AND OTHER ABNORMAL ILLUMINATION<br>(3)SPOTS OR SCRATCHES THAT APPEAR WHEN LIT MUST BE JUDGED USING LCD SPOT, LINES AND CONTAMINATION STANDARDS.<br>(4)BACKLIGHT DOESN'T LIGHT OR COLOR IS WRONG. |
| 14. | GENERAL APPEARANCE | (1)NO OXIDATION, CONTAMINATION, CURVES OR, BENDS ON INTERFACE PIN (OLB) OF TCP.<br>(2)NO CRACKS ON INTERFACE PIN (OLB) OF TCP.<br>(3)NO CONTAMINATION, SOLDER RESIDUE OR SOLDER BALLS ON PRODUCT.<br>(4)THE IC ON THE TCP MAY NOT BE DAMAGED, CIRCUITS.<br>(5)THE UPPERMOST EDGE OF THE PROTECTIVE STRIP ON THE INTERFACE PIN MUST BE PRESENT OR LOOK AS IF IT CAUSE THE INTERFACE PIN TO SEVER.<br>(6)THE RESIDUAL ROSIN OR TIN OIL OF SOLDERING (COMPONENT OR CHIP COMPONENT) IS NOT BURNED INTO BROWN OR BLACK COLOR.<br>(7)SEALANT ON TOP OF THE ITO CIRCUIT HAS NOT HARDENED.<br>(8)PIN TYPE MUST MATCH TYPE IN SPECIFICATION SHEET.<br>(9)LCD PIN LOOSE OR MISSING PINS.<br>(10)PRODUCT PACKAGING MUST THE SAME AS SPECIFIED ON PACKAGING SPECIFICATION SHEET.<br>(11)PRODUCT DIMENSION AND STRUCTURE MUST CONFORM TO PRODUCT SPECIFICATION SHEET.<br>(12)THE APPEARANCE OF HEAT SEAL SHOULD NOT ADMIT ANY DIRT AND BREAK. |

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| NO. | ITEM | CRITERIA |
|---|---|---|
| 15. | CRACKED GLASS | THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE |

THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE

**GENERAL GLASS CHIP :**



| a | b | c |
|---|---|---|
| $\leq t/2$ | < VIEWING AREA | $\leq 1/8X$ |
| $t/2 >, \leq 2t$ | $\leq W/2$ | $\leq 1/8X$ |

*W=DISTANCE BETWEEN
  SEALANT AREA AND LCD
  PANEL EDGE
 X = LCD SIDE LENGTH
 t = GLASS THICKNESS

**CORNER PART :**



| a | b | c |
|---|---|---|
| $\leq t/2$ | < VIEWING AREA | $\leq 1/8X$ |
| $> t/2$ , $\leq 2t$ | $\leq W/2$ | $\leq 1/8X$ |

*W=DISTANCE BETWEEN
  SEALANT AREA AND LCD
  PANEL EDGE
 X = LCD SIDE LENGTH
 t = GLASS THICKNESS

**CHIP ON ELECTRODE PAD**



| a | b | c |
|---|---|---|
| $\leq t$ | $\leq 0.5mm$ | $\leq 1/8X$ |

* X=LCD SIDE WIDTH
 t =GLASS THICKNESS



| a | b | c |
|---|---|---|
| $\leq t$ | $\leq 1/8X$ | $\leq L$ |

*X=LCD SIDE WIDTH
 t = GLASS THICKNESS
 L=ELECTRODE PAD LENGTH
①IF GLASS CHIPPING THE ITO
  TERMINAL, OVER 2/3 OF THE ITO MUST
  REMAIN AND BE, INSPECTED
  ACCORDING TO ELECTRODE
  TERMINAL SPECIFICATIONS
②IF THE PRODUCT WILL BE HEAT
  SEALED BY THE CUSTOMER,
  THE ALIGNMENT MARK MUST NOT
  BE DEMAGED

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## 12.4  RELIABILITY TEST

### 12.4.1   STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE

| NO | ITEM | DESCRIPTION |
|---|---|---|
| 1 | HIGH TEMPERATURE OPERATION | THE SAMPLE SHOULD BE ALLOWED TO STAND AT +70°C FOR 240 HRS |
| 2 | LOW TEMPERATURE OPERATION | THE SAMPLE SHOULD BE ALLOWED TO STAND AT -20°C FOR 240 HRS |
| 3 | HIGH TEMPERATURE STORAGE | THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 HRS |
| 4 | LOW TEMPERATURE STORAGE | THE SAMPLE SHOULD BE ALLOWED TO STAND AT -30°C FOR 240 HRS |
| 5 | HIGH TEMP / HUMIDITY TEST STORAGE | THE SAMPLE SHOULD BE ALLOWED TO STAND AT 60°C, 90% RH 240 HRS |
| 6 | THERMAL SHOCK (NOT OPERATED) | THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION: -40°C FOR 30 MINUTES ~ +85°C FOR 30 MINUTES |
| 7 | ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED) | AIR DISCHARGE ± 12KV CONTACT DISCHARGE ± 8KV |

NOTE (1) : THE TEST SAMPLES HAVE RECOVERY TIME FOR 2 HOURS AT ROOM
TEMPERATURE BEFORE THE FUNCTION CHECK. IN THE STANDARD
CONDITIONS, THERE IS NO DISPLAY FUNCTION NG ISSUE OCCURRED.

12.5 TESTING CONDITIONS AND INSPECTION CRITERIA

FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 12.5, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

| NO | ITEM | TEST MODEL | INSPECTION CRITERIA |
|---|---|---|---|
| 1 | CURRENT CONSUMPTION | REFER TO SPECIFICATION | THE CURRENT CONSUMPTION SHOULD CONFORM TO THE PRODUCT SPECIFICATION. |
| 2 | CONTRAST | REFER TO SPECIFICATION | AFTER THE TESTS HAVE BEEN EXECUTED, THE CONTRAST MUST BE LARGER THAN HALF OF ITS INITIAL VALUE PRIOR TO THE TESTS. |
| 3 | APPEARANCE | VISUAL INSPECTION | DEFECT FREE |

12.6 OPERATION

12.6.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED .

12.6.2 USE THE MODULE WITHIN SPECIFIED TEMPERATURE ; LOWER TEMPERATURE CAUSES THE RETARDATION OF BLINKING SPEED OF THE DISPLAY ; HIGHER TEMPERATURE MAKES OVERALL DISPLAY DISCOLOR . WHEN THE TEMPERATURE RETURNS TO NORMALITY, THE DISPLAY WILL OPERATE NORMALLY.

12.6.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST .

12.6.4 POWER ON SEQUENCE INPUT SIGNALS SHOULD NOT BE SUPPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES THE SPECIFIED VALUE.
IF ABOVE SEQUENCE IS NOT FOLLOWED , CMOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH - UP PROBLEM.

12.6.5 NOT ALLOWED TO INFLICT ANY EXTERNAL STRESS AND TO CAUSE ANY MECHANICAL INTERFERENCE ON THE BENDING AREA OF FPC DURING THE TAIL BENDING BACKWARDS!
DO NOT STRESS FPC AND IC ON THE MODULE!



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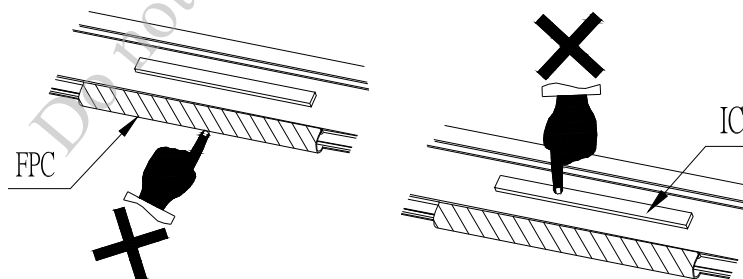
12.7  NOTICE

12.7.1  USE A GROUNDED SOLDERING IRON WHEN SOLDERING CONNECTOR I/O TERMINALS . FOR  SOLDERING OR REPAIRING, TAKE PRECAUTION AGAINST THE TEMPERATURE OF THE SOLDERING IRON AND THE SOLDERING TIME TO PREVENT PEELING OFF THE THROUGH-HOLE-PAD .

12.7.2  DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED.

12.7.3  DO NOT CHARGE STATIC ELECTRICITY, AS THE CIRCUIT OF THIS MODULE CONTAINS CMOS LSIS. A WORKMAN'S BODY SHOULD ALWAYS BE STATIC-PROTECTED BY USE OF AN ESD STRAP. WORKING CLOTHES FOR SUCH PERSONNEL SHOULD BE OF STATIC-PROTECTED MATERIAL.

12.7.4  ALWAYS GROUND THE ELECTRICALLY-POWERED DRIVER BEFORE USING IT TO INSTALL THE LCD MODULE. WHILE CLEANING THE WORK STATION BY VACUUM CLEANER, DO NOT BRING THE SUCKING MOUTH NEAR THE MODULE ; STATIC ELECTRICITY OF THE ELECTRICALLY-POWERED DRIVER OR THE VACUUM CLEANER MAY DESTROY THE MODULE.

12.7.5  DON'T GIVE EXTERNAL SHOCK.

12.7.6  DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.

12.7.7  LIQUID IN LCD IS HAZARDOUS SUBSTANCE. MUST NOT LICK AND SWALLOW. WHEN THE LIQUID IS ATTACH TO YOUR, SKIN, CLOTH ETC. WASH IT OUT THOROUGHLY AND IMMEDIATELY.

12.7.8  DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.

12.7.9  STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.

12.7.10  STORE WITHOUT ANY PHYSICAL LOAD.

12.7.11  REWIRING: NO MORE THAN 3 TIMES.

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