# KENTEC

Kentec Electronics Limited

# K430WQA-V4-F

**Product**

Standard LCD Module
480 x RGB x 272 Dots
4.3" 16.7M colors TFT display
Wide temperature
With white LED backlight
With touch screen

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# 1. Document revision history :

| DOCUMENT REVISION | DATE | DESCRIPTION | PREPARED BY | APPROVED BY |
|---|---|---|---|---|
| 01 | 2009.07.21 | First Release. | MF Zou | |

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## 2. General Description

- 4.3"(diagonal), 480 x RGB x 272 dots, 16.7M colors, Normal white TN, TFT LCD module.
- Viewing Direction: 6 o'clock.
- RGB 24-bits
- With internal voltage booster.
- Logic voltage: 3.3V (typ.).
- With 4-wire resistive touch screen

## 3. Mechanical Specifications

The mechanical detail is shown in Fig. 1 and summarized in Table 1 below.

Table 1

| Parameter | | Specifications | Unit |
|---|---|---|---|
| Outline dimensions | | 105.5(W) x 67.2(H) x 4.1(D) (Exclude FPC, cables of backlight) | mm |
| Color TFT 480xRGBx272 | View area | 98.7(W) x 57.5(H) | mm |
| | TP view area | 98.7(W) x 57.5(H) | mm |
| | LCD active area | 95.04(W) x 53.86(H) | mm |
| | Display format | 480 x RGB x 272 | dots |
| | Color configuration | RGB Side-stripes | - |
| | Dot size | 0. 198 (W) x 0.198(RGB) | mm |
| Weight | | TBD | grams |
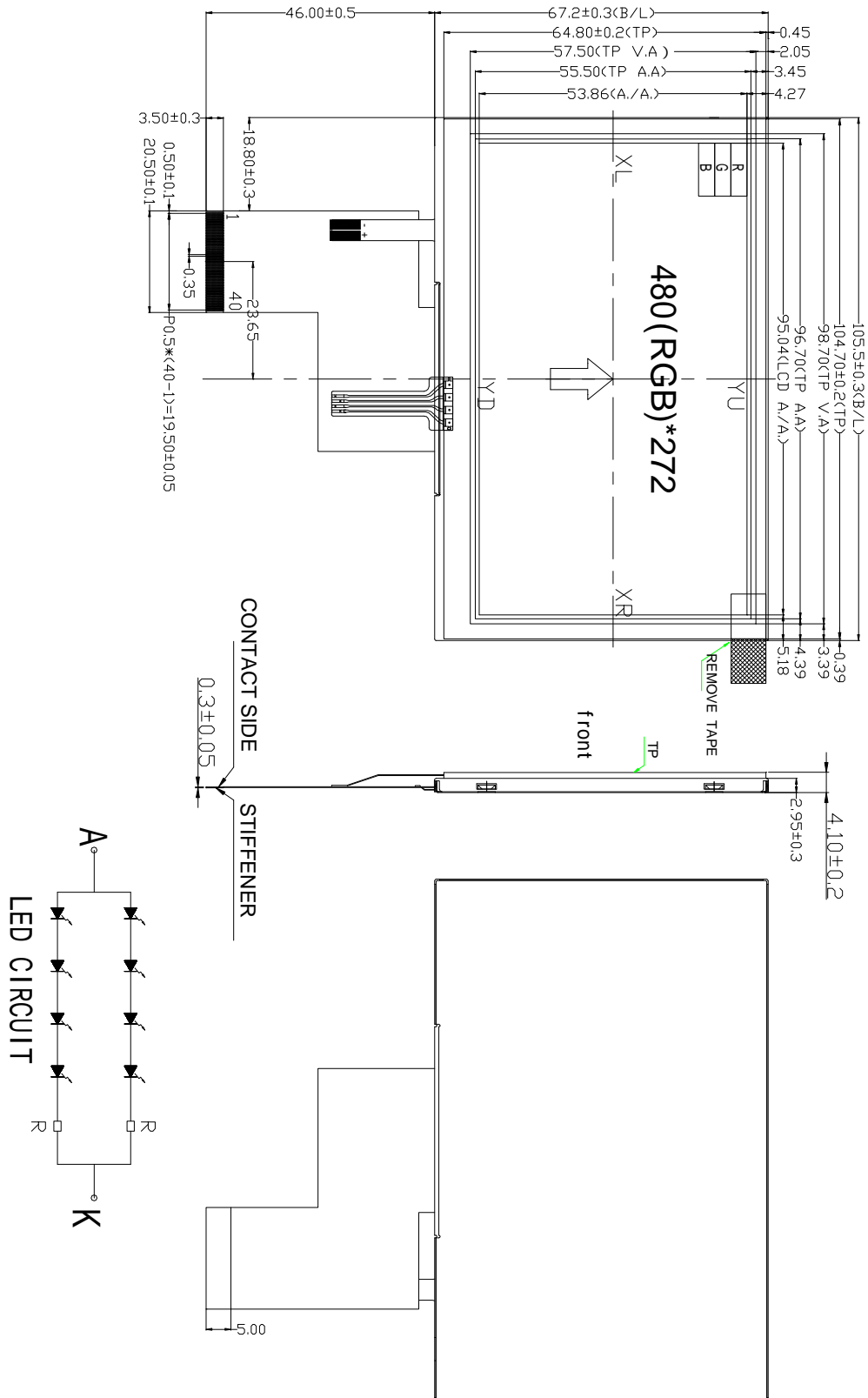
**Figure 1: Outline Drawing**

## 4. Interface signals

Table 2: Pin assignment

| Pin No | Symbol | I/O | Function |
|--------|--------|-----|----------|
| 1 | $V_{LED-}$ | P | Power for LED backlight cathode |
| 2 | $V_{LED+}$ | P | Power for LED backlight anode |
| 3 | GND | P | Power ground |
| 4 | $V_{DD}$ | P | Power voltage |
| 5 | R0 | I | Red data (LSB) |
| 6 | R1 | I | Red data |
| 7 | R2 | I | Red data |
| 8 | R3 | I | Red data |
| 9 | R4 | I | Red data |
| 10 | R5 | I | Red data |
| 11 | R6 | I | Red data |
| 12 | R7 | I | Red data (MSB) |
| 13 | G0 | I | Green data (LSB) |
| 14 | G1 | I | Green data |
| 15 | G2 | I | Green data |
| 16 | G3 | I | Green data |
| 17 | G4 | I | Green data |
| 18 | G5 | I | Green data |
| 19 | G6 | I | Green data |
| 20 | G7 | I | Green data (MSB) |
| 21 | B0 | I | Blue data (LSB) |
| 22 | B1 | I | Blue data |
| 23 | B2 | I | Blue data |
| 24 | B3 | I | Blue data |
| 25 | B4 | I | Blue data |
| 26 | B5 | I | Blue data |
| 27 | B6 | I | Blue data |
| 28 | B7 | I | Blue data (MSB) |
| 29 | GND | P | Power ground |
| 30 | DCLK | I | Pixel clock |
| 31 | DISP | I | Display on/ off |
| 32 | HSYNC | I | Horizontal sync signal |
| 33 | VSYNC | I | Vertical sync signal |
| 34 | DE | I | Data enable |
| 35 | NC | - | No connect |
| 36 | GND | P | Power ground |
| 37 | X_R | I/O | Right electrode - differential analog |
| 38 | Y_B | I/O | Bottom electrode - differential analog |
| 39 | X_L | I/O | Left electrode - differential analog |
| 40 | Y_T | I/O | Top electrode - differential analog |

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

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## 5. Absolute Maximum Ratings

### 5.1    Electrical Maximum Ratings – for IC Only

Table 3: Electrical Maximum Ratings – for IC

| Parameter | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Supply voltage | VCC | -0.3 | +4.0 | V | 1 |
| Input voltage | AVDD | -0.3 | +5.0 | V | |

Note:

1.VCC, GND must be maintained.

2.The modules may be destroyed if they are used beyond the absolute maximum ratings.

### 5.2    Environmental Condition

Table 4

| Item | Operating temperature (Topr) | | Storage temperature (Tstg) (Note 1) | | Remark |
|---|---|---|---|---|---|
| | Min. | Max. | Min. | Max. | |
| Ambient temperature | -20°C | +70°C | -30°C | +80°C | Dry |
| Humidity (Note 1) | 80% max. RH for Ta $\leq$ 40°C<br>$<$ 50% RH for 40°C $<$ Ta $\leq$ Maximum operating temperature | | | | No condensation |

Note 1: Product cannot sustain at extreme storage conditions for long time.

## 6. Electrical Specifications

### Typical Electrical Characteristics

At Ta = 25 °C, VCC=IOVCC= 3.3V, GND=0V.

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| Supply voltage | $V_{DD}$ | 3.0 | 3.3 | 3.6 | V | |
| Input signal voltage | $V_{iH}$ | 0.7 $V_{DD}$ | — | $V_{DD}$ | V | Note (1) |
| | $V_{iL}$ | GND | — | 0.3 $V_{DD}$ | V | Note (1) |
| Current of power supply | $I_{DD}$ | — | TBD | — | mA | $V_{DD}$ = 3.3V |

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

Note (2): GND = 0V

## 7. Optical Characteristics

Table 7: Optical specifications

| Items | | Symbol | Condition | Specifications Min. | Specifications Typ. | Specifications Max. | Unit | |
|---|---|---|---|---|---|---|---|---|
| Contrast Ratio | | CR | | 150 | 300 | - | - | |
| Response Time | | $T_R$ | | - | 15 | 30 | ms | |
| | | $T_F$ | | - | 35 | 50 | ms | |
| Chromaticity | Red | $X_R$ | | 0.604 | 0.624 | 0.644 | - | Note |
| | | $Y_R$ | | 0.302 | 0.322 | 0.342 | - | |
| | Green | $X_G$ | | 0.268 | 0.288 | 0.308 | - | |
| | | $Y_G$ | | 0.540 | 0.560 | 0.580 | - | |
| | Blue | $X_B$ | | 0.127 | 0.147 | 0.167 | - | |
| | | $Y_B$ | | 0.097 | 0.117 | 0.137 | - | |
| | White | $X_W$ | | - | 0.307 | - | - | |
| | | $Y_W$ | | - | 0.328 | - | - | |
| Viewing angle | Hor. | $\phi1$(3 o'clock) | Center CR=10 | - | 45 | - | deg. | |
| | | $\phi2$(9 o'clock) | | - | 45 | - | | |
| | Ver. | $\theta2$(12 o'clock) | | - | 15 | - | | |
| | | $\theta1$(6 o'clock) | | - | 35 | - | | |
| NTSC ratio | | | | | 61.5 | | % | |

Note 1: Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63

L0: Luminance of gray level 0

CR = CR (10)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note 5.

Note 2: Definition of Response Time (TR, TF):
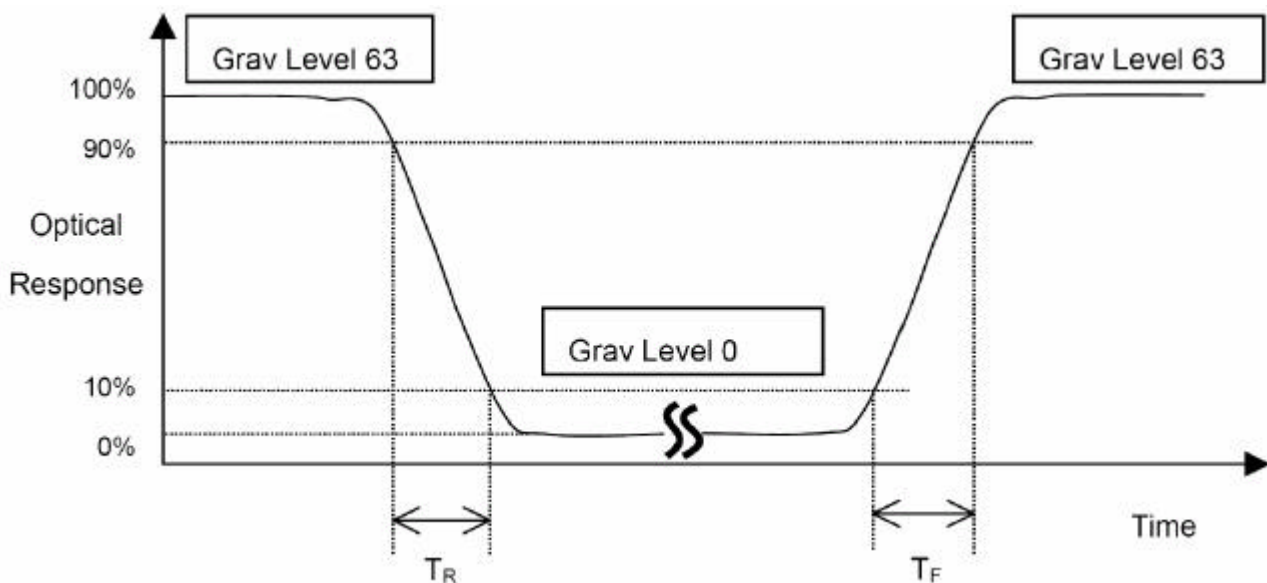


Figure 3

Note 3: Viewing Angle

NORMAL
$\theta, \phi = 0^o$

12 O'CLOCK DIRECTION

9 O'CLOCK

$\theta 1$    $\theta 2$

$\phi 2$

$\phi 1$

3 O'CLOCK
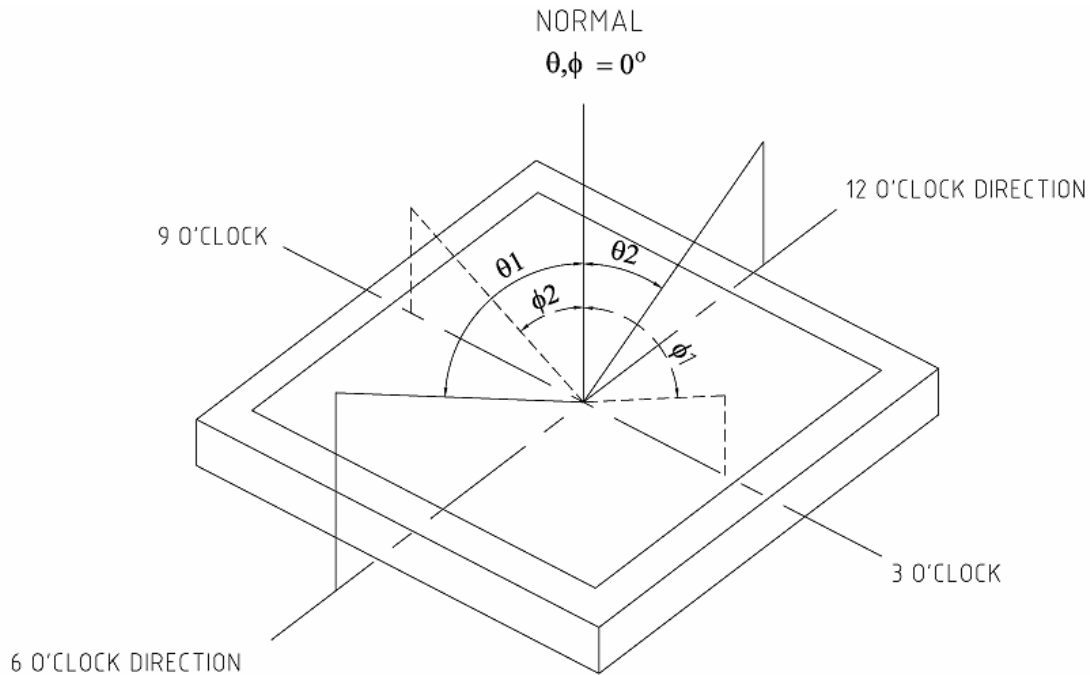
6 O'CLOCK DIRECTION

Figure 4

The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

Note 4: Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.

LCD Module

LCD Panel

Center of the Screen

Photometer
(TOPCON BM-5A)

Field of View = 2°

500 mm

Light Shield Room
(Ambient Luminance < 2 lux)
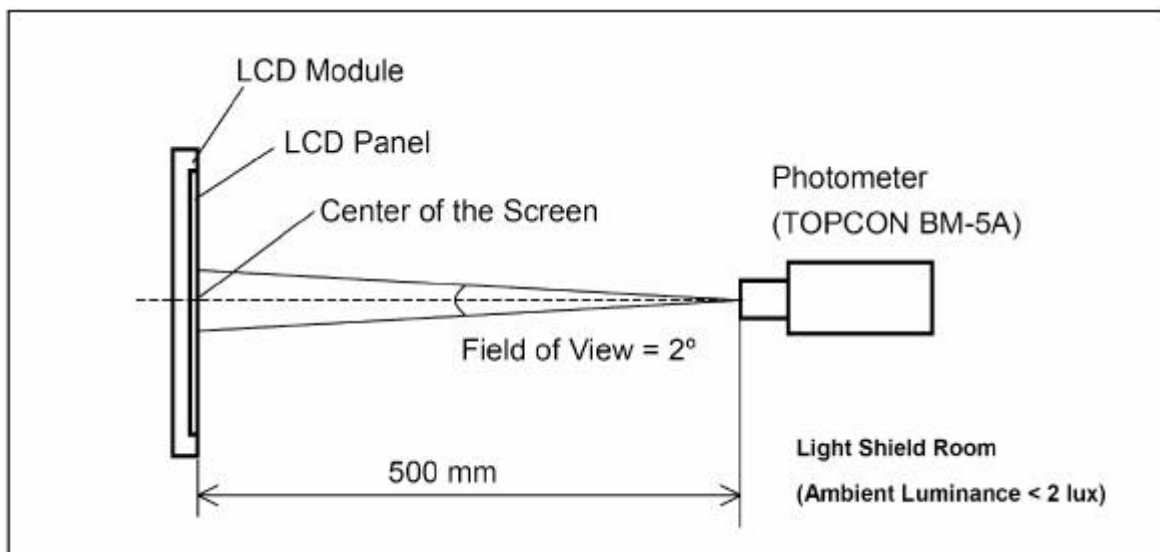
Figure 5

## 8. AC Characteristics

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| DCLK period time | Tclk | 83.3 | 111.1 | 200 | ns | Parallel 24-bit RGB mode |
| | | 33.3 | 37.0 | 41.7 | ns | Serial 8-bit RGB mode |
| DCLK rising time | Trck | - | - | 9 | ns | |
| DCLK falling time | Tfck | - | - | 9 | ns | |
| DCLK pulse duty | Tcwh | 40 | 50 | 60 | % | |
| DE setup time | Tdesu | 12 | - | - | ns | |
| DE hold time | Tdehd | 12 | - | - | ns | |
| HSYNC pulse width | Thwh | 1 | - | - | DCLK | |
| HSYNC setup time | Thsu | 12 | - | - | ns | |
| HSYNC hold time | Thhd | 12 | - | - | ns | |
| VSYNC pulse width | Tvwh | 1 | - | - | Th | |
| VSYNC setup time | Tvsu | 12 | - | - | ns | |
| VSYNC hold time | Tvhd | 12 | - | - | ns | |
| Data setup time | Tdsu | 12 | - | - | ns | |
| Data hold time | Tdhd | 12 | - | - | ns | |

**Clock and Data Input Timing Diagram**
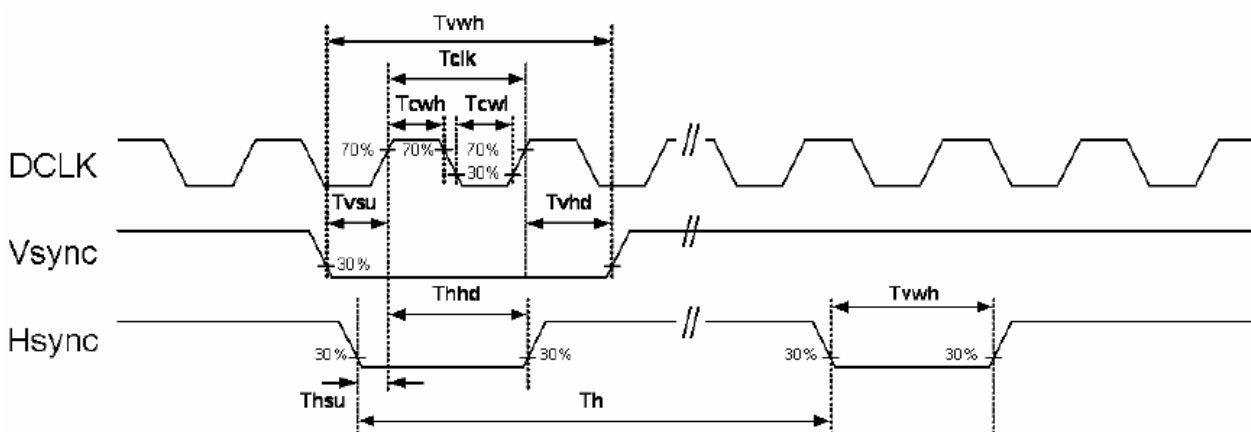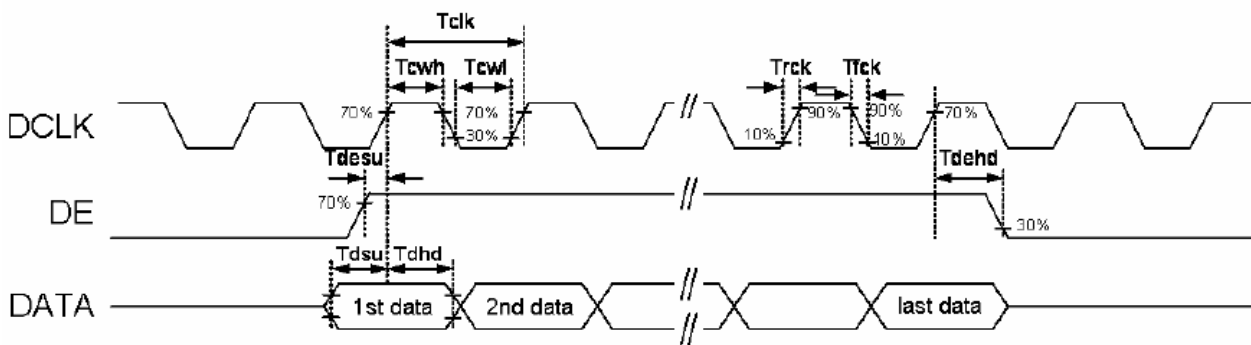
**Power On Sequence**
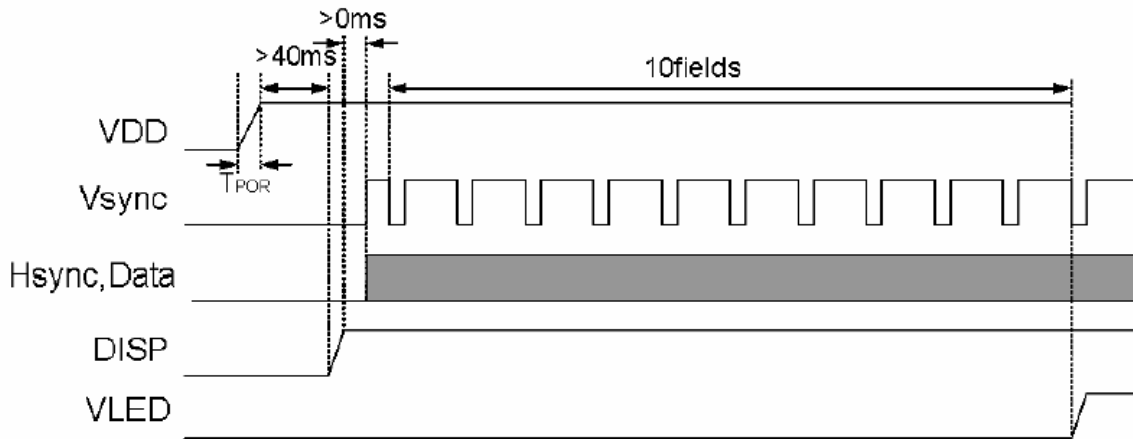


**Power Off Sequence**
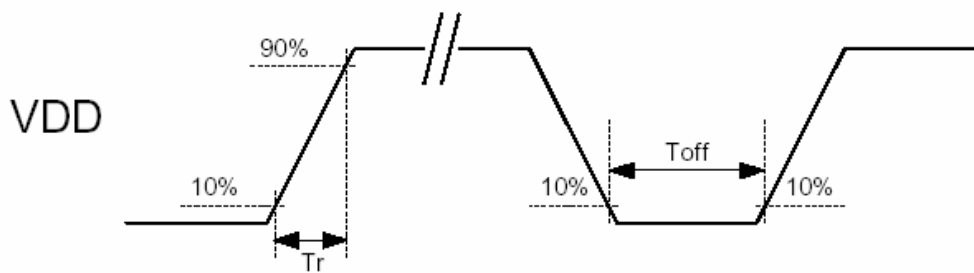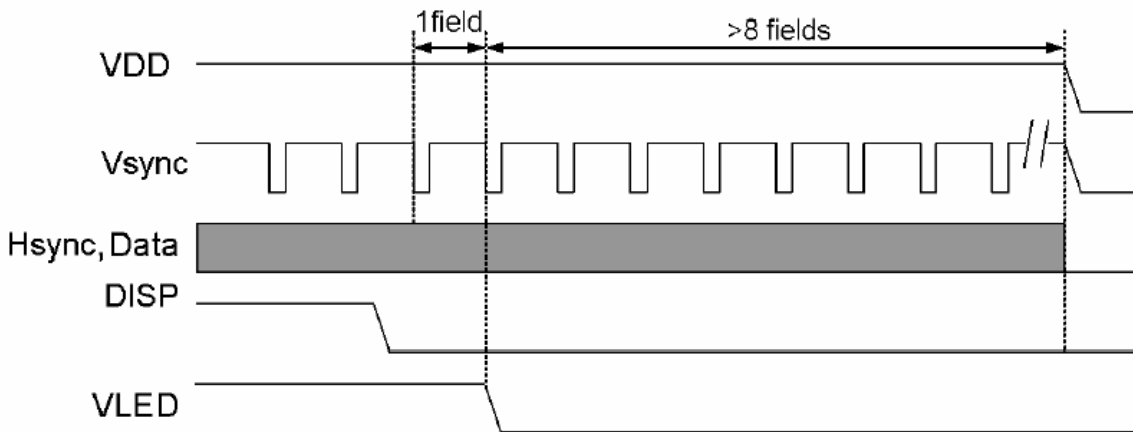




VDD power input timing

Notes:

Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, DE

Power on sequence: VDD → DISP → Data → $V_{LED}$

Power off sequence: DISP → $V_{LED}$ → Data → VDD

VDD power input timing: 0.5ms < Tr < 10ms; Toff > 500ms

## Parallel 24-bit RGB Input Timing Table

| Parameters | Symbol | Min. | Typ. | Max. | Unit | Conditions |
|---|---|---|---|---|---|---|
| DCLK frequency | fclk | 5 | 9 | 12 | MHz | |
| VSYNC period time | Tv | 277 | 288 | 400 | Th | |
| VSYNC display area | Tvd | | 272 | | Th | |
| VSYNC back porch | Tvbp | 3 | 8 | 31 | Th | |
| VSYNC front porch | Tvfp | 2 | 8 | 93 | Th | |
| HSYNC period time | Th | 520 | 525 | 800 | DCLK | |
| HSYNC display area | Thd | | 480 | | DCLK | |
| HSYNC back porch | Thbp | 36 | 40 | 255 | DCLK | |
| HSYNC front porch | Thfp | 4 | 5 | 65 | DCLK | |

## Vertical Input Timing
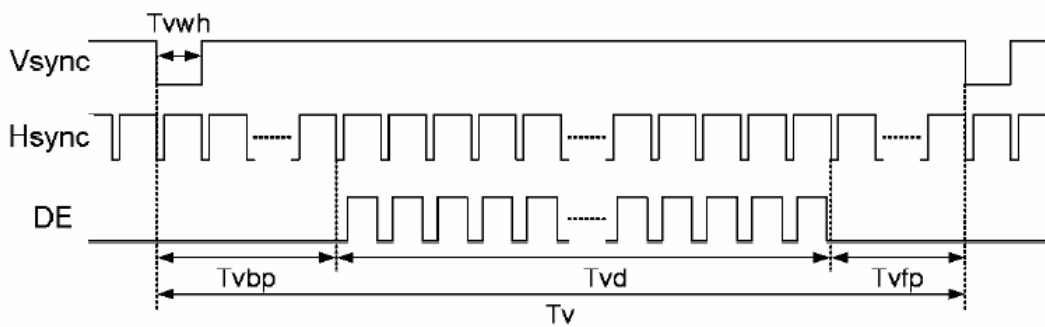


## Parallel 24-bit RGB Mode Data Format (DE Mode)
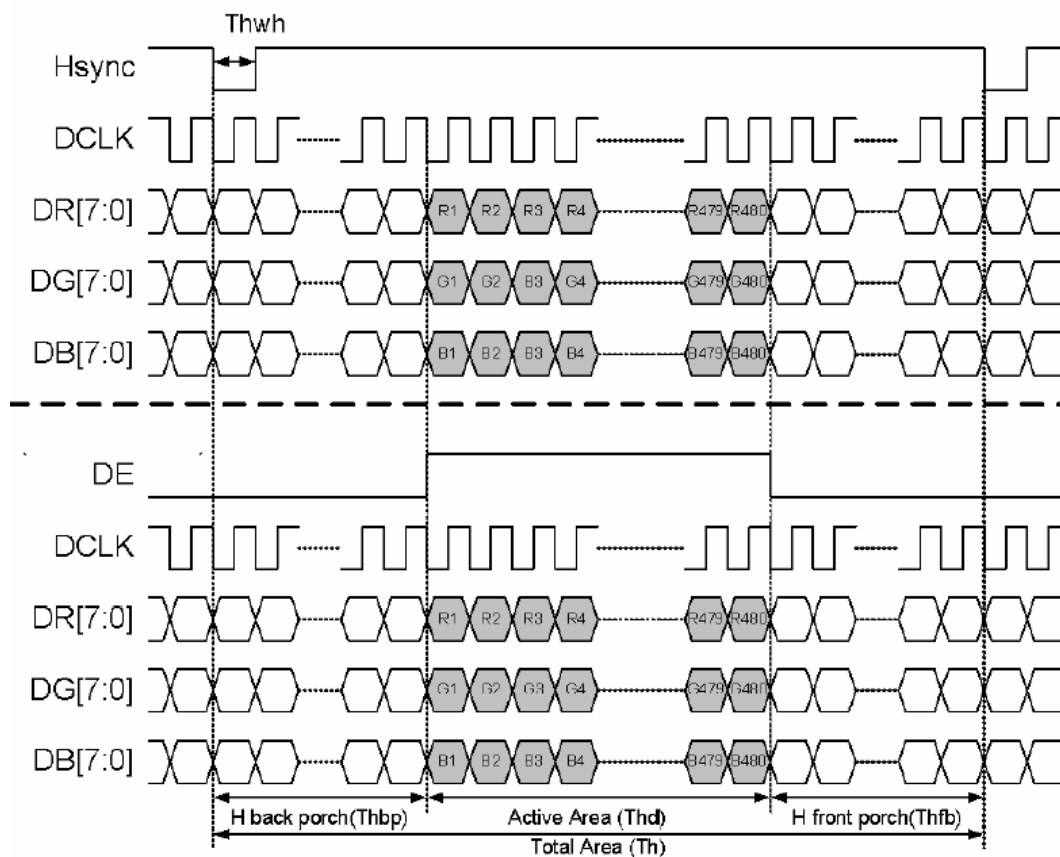
## 9. Reliability Test Item

| Test Item | Test Condition | Test result determinant gist |
|---|---|---|
| High temperature storage | 80±3  ;96H | the inspection of appearance and function character. |
| Low temperature storage | -30±3   ;120H | |
| High temperature /humidity storage | 50  ±3  ,90%±3%RH;96H | |
| High temperature operation | 70±3   ;96H | no objection of the function character; no fatal objection of the appearance. |
| Low temperature operation | -20±3   ;96H | |
| Temperature Shock | -20±3  ,30min? 70±3  , 30min;10cycle | inspect the objections appearance  function & the whole structure |

## 10. Suggestions for using LCD modules

### 10.1 Handling of LCM

1. The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

2. If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

3. Don't apply excessive force on the surface of the LCM.

4. If the surface is contaminated ,clean it with soft cloth. If the LCM is severely contaminated , use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer . The following solvents is especially prohibited: water , ketone Aromatic solvents etc.

5. Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

6. Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

7. Don't disassemble the LCM.

8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work

environment.

- Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

9. Do not alter, modify or change the the shape of the tab on the metal frame.

10. Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

11. Do not damage or modify the pattern writing on the printed circuit board.

12. Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

13. Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

14. Do not drop, bend or twist LCM.


**10.2 Storage**

1. Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

2. Storage in a clean environment, free from dust, active gas, and solvent.

3. Store in antistatic container.

## 11. Inspection Standard

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM with touch pannel.

### 11.1 Sample plan and Inspection condition
11.1.1 Sample plan

Sampling plan according to MIL-STD-105E , normal level 2 and based on:

Major defect: AQL 0.65;

Minor defect: AQL 1.5.

11.1.2 Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45 against perpendicular line.

### 11.2 Definition of inspection zone in LCD
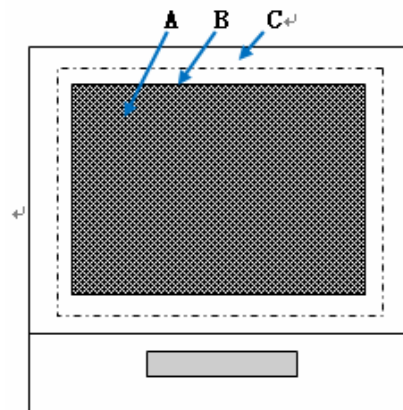


Inspection zones in an LCD

Zone A: character/Digit area;

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area);

Zone C: Outside viewing area (invisible area after assembly in customer's product);

Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product. Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein.

### 11.3 Major defects and Minor defects
11.3.1 Major defects

A major defect is a defect that is likely to result in failure, or to reduce the usability of the product for its intended purpose.

11.3.1.1 Abnormal operation: modules cannot display normally;

11.3.1.2 Line defect;

11.3.1.3 There is serious distortion or sharp burr on mechanical housing;

11.3.1.4 Glass breakage.

11.3.2 Minor defects:

A minor defect is a defect that is not likely to reduce the usability of the product for its intended purpose.

11.3.2.1 Dot defect:

11.3.2.1.1 Inspection pattern : Full white, full black, red, green and blue screens;

11.3.2.1.2 Criteria :(acceptable);



1/5

3/5

? area

? area

1/5

Sub-pixel

1/5  3/5  1/5
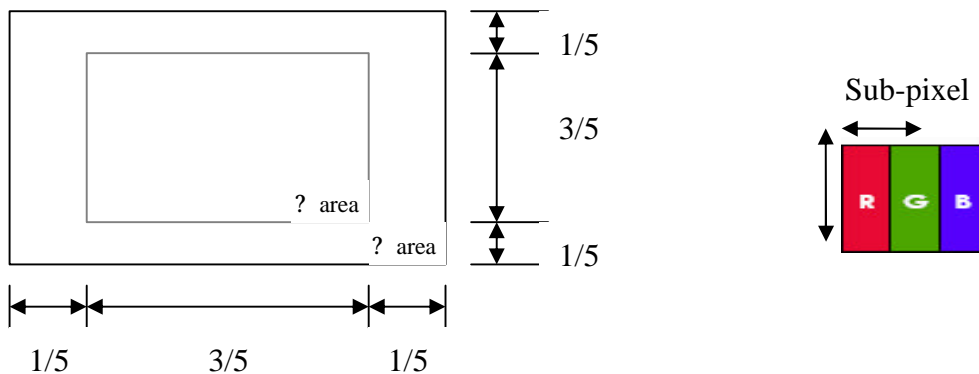
Note: 1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area . And the bright dot defect must be visible through 5% ND filter.

2. Except for the allowed numbers of adjacent dots, the distance between dot defects should be more than 3mm apart.
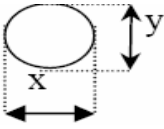
11.3.2.1.3 The definitions of the inner display area and outer display area.

**11.4 Inspection standards table:**

11.4.1 Major defect

| Item No. | Items to be | Inspection Standard | Classification of defects |
|----------|-------------|---------------------|---------------------------|
| 11.4.1.1 | All functional defects | 1) No display<br>2) Display abnormally<br>3) Missing vertical/horizontal segment<br>4) Short circuit<br>5) Back-light no lighting, flickering and abnormal lighting. | Major |
| 11.4.1.2 | Missing | Missing component | |
| 11.4.1.3 | Outline dimension | Overall outline dimension beyond the drawing is not allowed. | |
| 11.4.1.4 | linearity | No more than 1.5% | |

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11.4.2 Cosmetic Defect (spot defect)
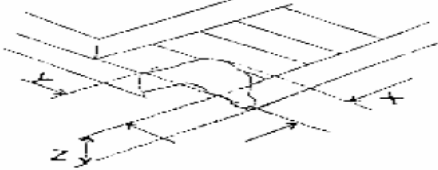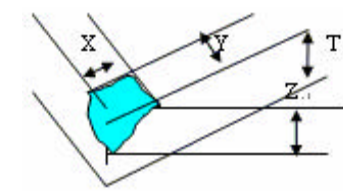
| Item No | Items to be | Inspection Standard | | | | Classification of defects |
|---------|-------------|---------------------|---|---|---|---------------------------|
| 11.4.2.1 | **Clear Spots** Black and white Spot defect Pinhole, Foreign Particle, polarizer Dirt | For dark/white spot, sizeF is defined as $F =( x +y )/2$  | | | | Minor |

For item 11.4.2.1:

| Zone Size(mm) | Acceptable Qty | | | Classification |
|---|---|---|---|---|
| | A | B | C | |
| F =0.1 | Ignore | | | |
| 0.10< F =0.15 | 2 | | Ignore | Minor |
| 0.15< F =0.20 | 1 | | | |
| F > 0.20 | 0 | | | |

| Item No | Items to be | Zone Size(mm) | Acceptable Qty | | | Classification |
|---------|-------------|---------------|---|---|---|---------------------------|
| | | | A | B | C | |
| 11.4.2.2 | **Clear Spots** TP Dirt | F =0.1 | Ignore | | | Minor |
| | | 0.10< F =0.15 | 2 | | Ignore | |
| | | 0.15< F =0.25 | 1 | | | |
| | | F > 0.25 | 0 | | | |

| Item No | Items to be | Zone Size(mm) | Acceptable Qty | | | Classification |
|---------|-------------|---------------|---|---|---|---------------------------|
| | | | A | B | C | |
| 11.4.2.3 | **Dim Spots** Circle shaped and dim edged defects | F =0.2 | Ignore | | | Minor |
| | | 0.20< F =0.4 | 2 | | Ignore | |
| | | 0.4< F =0.6 | 1 | | | |
| | | F > 0.6 | 0 | | | |

| Item No | Items to be | dot =sub-pixel | | | Classification |
|---------|-------------|----------------|---|---|----------------|
| | | | Acceptable Qty | | |
| | | | I | II | |
| 11.4.2.4 | **Dot defect** | Bright dot | 0 | 2 | Minor |
| | | Dark dot | 1 | 2 | |

The distance of two point >5mm

11.4.3 Cosmetic Defect (linear defect)

| Item No | Items to be | Inspection Standard | | | | Classification of defects |
|---------|-------------|---------------------|---|---|---|---------------------------|

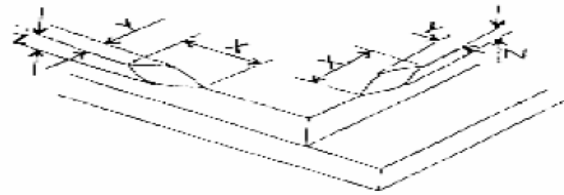| | | Size(mm) | | Acceptable Qty | | | |
|---------|-------------|----------|----------|---|---|---|---|
| | **Line defect** Black line, White line, Foreign material on polarizer | L(Length) | W(Width) | zone | | | |
| | | | | A | B | C | |
| 11.4.3.1 | | Ignore | W=0.02 | Ignore | | | Minor |
| | | L=3.0 | 0.02< W=0.03 | 2 | | Ignore | |
| | | L=2.0 | 0.03< W=0.05 | 1 | | | |
| | | | W> 0.05 | Define as spot defect | | | |

| | | | | | |
|---|---|---|---|---|---|
| 11.4.3.2 | **Dim line defect** Polarizer &BL scratch TP film scratch | If the scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 11.4.3.1. If the scratch can be seen only in non-operating condition or some special angle, judge by the following. | | | Minor |

Table for 11.4.3.2:

| Size(mm) | | Acceptable Qty | | |
|---|---|---|---|---|
| | | zone | | |
| L(Length) | W(Width) | A | B | C |
| Ignore | W=0.02 | Ignore | | Ignore |
| L=3.0 | 0.02< W=0.03 | 2 | | |
| L=2.0 | 0.03< W=0.05 | 1 | | |
| | W> 0.05 | Define as spot defect | | |

| | | | | |
|---|---|---|---|---|
| 11.4.3.3 | Polarize Air bubble | Air bubbles between glass & polarizer | | Minor |

Table for 11.4.3.3:

| | Acceptable Qty | | |
|---|---|---|---|
| | A | B | C |
| F =0.2 | Ignore | | Ignore |
| 0.20< F =0.3 | 2 | | |
| 0.3< F =0.5 | 1 | | |
| F > 0.5 | 0 | | |

11.4.4 Chipping Defect

| Item No | Items to be | Inspection Standard | Classification of defects |
|---|---|---|---|
| 11.4.4.1 | Glass defect | Chips on corner **A:LCD Glass defect**  Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. **B:TP Glass defect**  | Minor |

Table A (LCD Glass defect):

| X | Y | Z |
|---|---|---|
| =0.2 | =S | Disregard |

Table B (TP Glass defect):

| X | Y | Z |
|---|---|---|
| =3.0 | =3.0 | Disregard |

Usual surface cracks
**A:LCD Glass defect**



| X | Y | Z |
|------|-----------------------------|-----------|
| =3.0 | <Inner border line of the seal | Disregard |

**B:TP Glass defect**
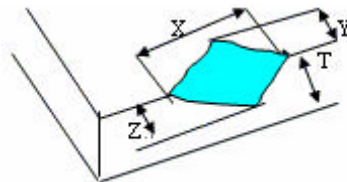


| X | Y | Z |
|------|------|-----------|
| =6.0 | =2.0 | Disregard |

Crack: Cracks tend to break are not allowed.
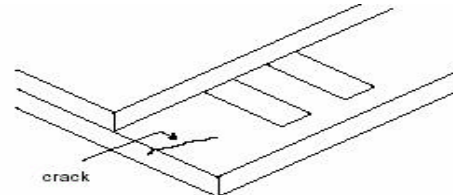


11.4.5 Parts Defect

| Item No | Items to be | Inspection Standard | Classification of defects |
|---------|-------------|---------------------|---------------------------|
| 11.4.5.1 | Parts contra position | 1   Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern.<br>2   Not allow chip or solder component is off center more than 50% of the pad outline. | Major |
| 11.4.5.2 | SMT | According to the <Acceptability of electronic assemblies>IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect. | Major |
| 11.4.5.3 | Backlight elements | 1 Illumination source flickers when lit.<br>2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards.<br>3 Backlight doesn't light or color is wrong | Major |
| 11.4.5.4 | Soldering | 1 No unmelted solder paste may be present on the FPC<br>2 No cold solder joints, missing solder connections, oxidation or icicle.<br>3 No short circuits in components on FPC | Major |

# 11. Packing
   **T.B.D.**

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