# DATA MODUL
## DISPLAY AND SYSTEM SOLUTIONS

# Specification

## CLAA070LCOECT
## 7.0" / 800x480 / LVDS / LED / TOUCH

**Version September 2007**

# CONTENTS

# 1. OVERVIEW

 CLAA070LC0ECT is 7″ color TFT-LCD(Thin Film Transistor Liquid Crystal Display)module which integrates Touch–Screen.Composed of LCD panel,driver ICs,control circuit,and LED backlight.

 The 7.0″screen produces a high resolution image that is composed of 800×480 pixel elements in a stripe arrangement.Display 262K colors by 6 Bit R.G.B signal input.

General specifications are summarized in the following table：

| ITEM | SPECIFICATION |
|---|---|
| Display Area (mm) | 152.4(W)×91.44(H) |
| Number of Pixels | 800(H)×3(RGB)×480(V) |
| Pixel Pitch (mm) | 0.1905(H)×0.1905(V) |
| Color Pixel Arrangement | RGB vertical stripe |
| Display Mode | Normally white |
| Number of colors | 262,144 |
| Viewing Direction | 6 o´clock |
| Response Time (Tr+Tf) | 20ms |
| Brightness(cd/m$^2$) | 250nit(typ) |
| Viewing Angle(BL on,CR≧10) | 140 degree(H)，110degree(V) |
| Electrical Interface(data) | LVDS |
| Power consumption | 2.5W(Typ) |
| Outline Dimension(in mm) | 165(W)×104(H)×6(D) |
| Weight(g) | TBD |
| BL unit | LED |
| Surface Treament | Anti-Glare，Hardness:3H |
| Touch Panel Type | 4 wire resistive |

## 2. ABSOLUTE MAXIMUM RATINGS

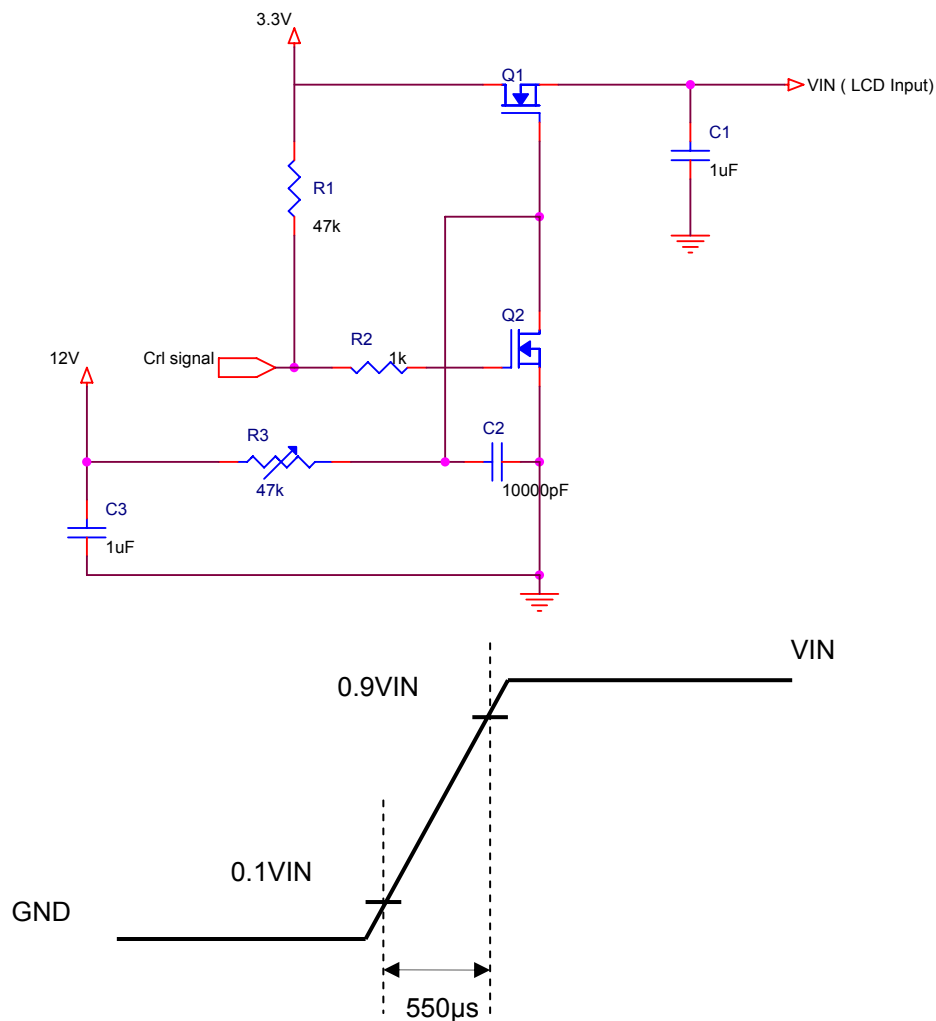| Item | Symbol | Min. | Max. | Unit | Note |
|---|---|---|---|---|---|
| Input Voltage | Vcc | -0.3 | 4.0 | V | |
| Signal Input Voltage | RxIN0+ ~ RxIN2+<br>RxIN0- ~ RxIN2-<br>Rx CLK IN +/- | -0.3 | Vcc+0.3 | V | |
| Static Electricity | VESDc | -200 | +200 | V | 【Note1】 |
| | VESDm | -15K | +15K | V | |
| ICC Rush Current | IRUSH | - | 1 | A | 【Note2】 |
| Operation Temperature | $T_{op}$ | -30 | 85 | ℃ | |
| Storage Temperature | $T_{stg}$ | -40 | 95 | ℃ | |

【Note1】
Test Condition: IEC 61000-4-2 ,
VESDc ：Contact discharge to input connector
VESDm ：Discontact discharge to module

【Note2】
Control signal:High(+3.3V)→Low(GND)
Supply Voltage of rising time should be from R3 and C2 tune to 550 us.



Rising Time

# 3. ELECTRICAL CHARACTERISTICS

## 3.1 TFT LCD

Ta=25℃

| Item | | Symbol | Min. | Typ | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Power Supply Voltage For LCD | | VCC | 3.0 | 3.3 | 3.6 | V | 【Note1】 |
| Power Supply Voltage For LED | | VDD | 4.5 | 5 | 5.5 | V | |
| Logic Input Voltage (LVDS:IN+,IN-) | Input Voltage | VIN | 0 | - | VCC | V | 【Note2】 |
| | Common Mode Voltage | VCM | 1.08 | 1.2 | 1.32 | V | 【Note2】 |
| | Differential Input Voltage | ｜VID｜ | 250 | 350 | 450 | mV | 【Note2】 |
| | Threshold Voltage(high) | VTH | - | - | 100 | mV | 【Note2】 When VCM=+1.2V |
| | Threshold Voltage(low) | VTL | -100 | - | - | mV | 【Note2】 |
| ADJ Input Voltage | Threshold Voltage(high) | VIH | 3.0 | | 3.3 | V | |
| | Threshold Voltage(low) | VIL | GND | | 0.3 | V | |

Remarks：

【Note1】

VCC –dip codition:

1) When 2.7 V≦VCC＜3.0V，td≦10ms.
2) VCC＞3.0V，VCC-dip condition should be same as VCC-turn-on condition.
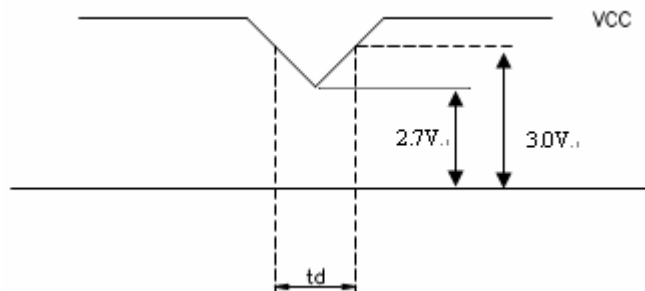


【Note2】LVDS signal
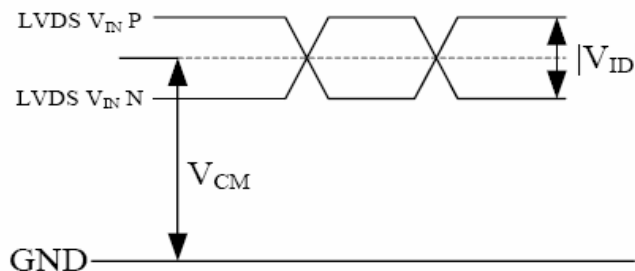


$|VID| = |VTH – VTL|$,
$VCM =( VTH + VTL)/2$

## 3.2 TFT-LCD Current Consumption

| Item | Symbol | Min | Type | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| LCD power current | ICC | -- | 150 | 200 | mA | 【Note1】 |
| LED power current | ILED | | 400 | 450 | mA | 【Note2】 |

【Note1】
Typical: Under 64 gray pattern
Maximum: Under black pattern
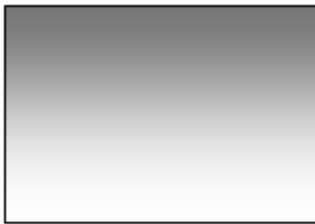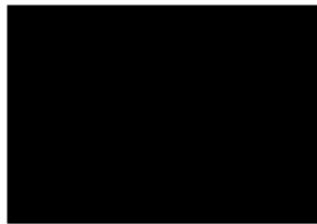


(a)64 Gray Pattern        (b)Black Pattern

【Note2】
Typical: When VDD is 5V
Maximum: When VDD is 4.5V

## 3.3 Power、Signal sequence

t1≦10ms          1 sec≦t5
50ms≦t2          200ms≦t6
0＜t3≦50ms      200ms≦t7
0＜t4≦10ms



Data: RGB DATA, DCLK, DENA

## 4. INTERFACE CONNECTION

4.1 CN1：Connector type：STARCONN 093F30-B0B01A

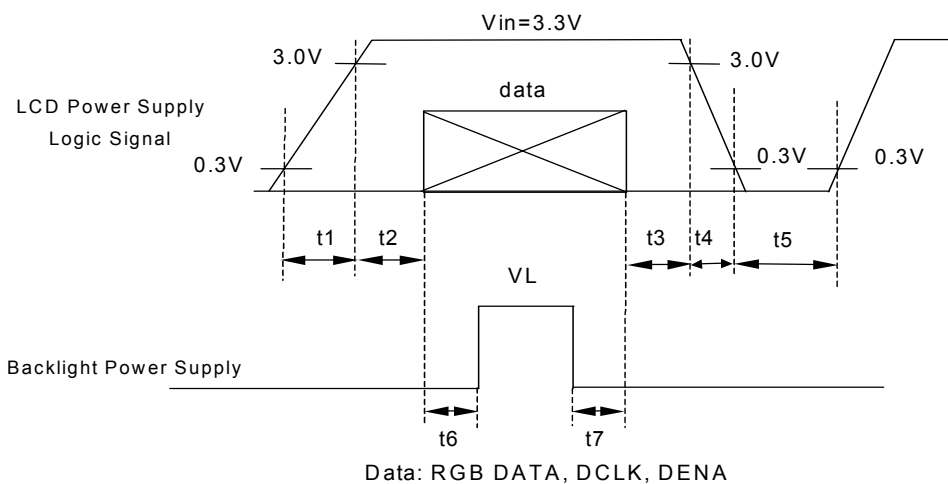| Pin NO. | SYMBOL | DESCRIPTION |
|---------|--------|-------------|
| 1 | AVSS | Power Ground |
| 2 | VCC | Power Supply for Digital circuit |
| 3 | VCC | Power Supply for Digital circuit |
| 4 | NC | NC |
| 5 | ADJ | Brightness control for LED B/L |
| 6 | NC | NC |
| 7 | AVSS | Power Ground |
| 8 | RXIN0- | Negative LVDS differential data inputs |
| 9 | RXIN0+ | Positive LVDS differential data inputs |
| 10 | AVSS | Power Ground |
| 11 | RXIN1- | Negative LVDS differential data inputs |
| 12 | RXIN1+ | Positive LVDS differential data inputs |
| 13 | AVSS | Power Ground |
| 14 | RXIN2- | Negative LVDS differential data inputs |
| 15 | RXIN2+ | Positive LVDS differential data inputs |
| 16 | AVSS | Power Ground |
| 17 | RXCLK- | Negative LVDS differential clock inputs |
| 18 | RXCLK+ | Positive LVDS differential clock inputs |
| 19 | AVSS | Power Ground |
| 20 | NC | NC |
| 21 | NC | NC |
| 22 | AVSS | Power Ground |
| 23 | NC | NC |
| 24 | VLED | Power Supply for LED Driver circuit |
| 25 | VLED | Power Supply for LED Driver circuit |
| 26 | VLED | Power Supply for LED Driver circuit |
| 27 | NC | NC |
| 28 | AVSS | Power Ground |
| 29 | NC | NC |
| 30 | NC | NC |

## 4.2 CN2（Touch Panel）

| Pin No. | Symbol | function |
|---------|--------|----------|
| 1 | XL | X  axis resistance |
| 2 | YD | Y axis resistance |
| 3 | XR | X axis resistance |
| 4 | YU | Y axis resistance |

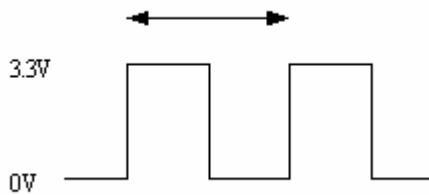Remarks:

1).ADJ adjust brightness to control Pin，Pulse duty the more big the more bright
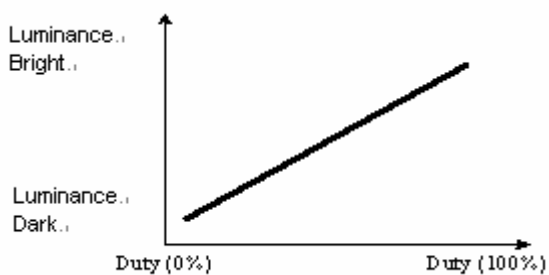


2) ADJ signal=0~3.3V，operation frequency：20±5KHz



3) AVSS Pin must ground contact，can not be floating.

4) TP_FPC suggested connector(CN2)： molex 52207-0490 (or compatible connectors)

# 5. INPUT SIGNAL(DE ONLY MODE)

## 5.1 Timing Specification

| Item | | | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|---|
| LVDS input signal sequence | CLK Frequency | | | $f_{CLKin}$ | 25 | 27 | 32 | MHz |
| LCD input signal sequence （Input LVDS Transmitter） | DENA | Horizontal | Horizontal total Time | $t_H$ | 850 | 900 | 950 | tCLK |
| | | | Horizontal effective Time | $t_{HA}$ | 800 | 800 | 800 | tCLK |
| | | | Horizontal Blank Time | $t_{HB}$ | 50 | 100 | 150 | tCLK |
| | | Vertical | Frame | fV | 55 | 60 | 65 | Hz |
| | | | Vertical total Time | $t_V$ | 490 | 500 | 520 | $t_H$ |
| | | | Vertical effectiveTime | $t_{VA}$ | 480 | 480 | 480 | $t_H$ |
| | | | Vertical Blank Time | $t_{VB}$ | 10 | 20 | 40 | $t_H$ |

## 5.2 Timing sequence(Timing chart）
## 5.2.1 Horizontal Timing Sequence
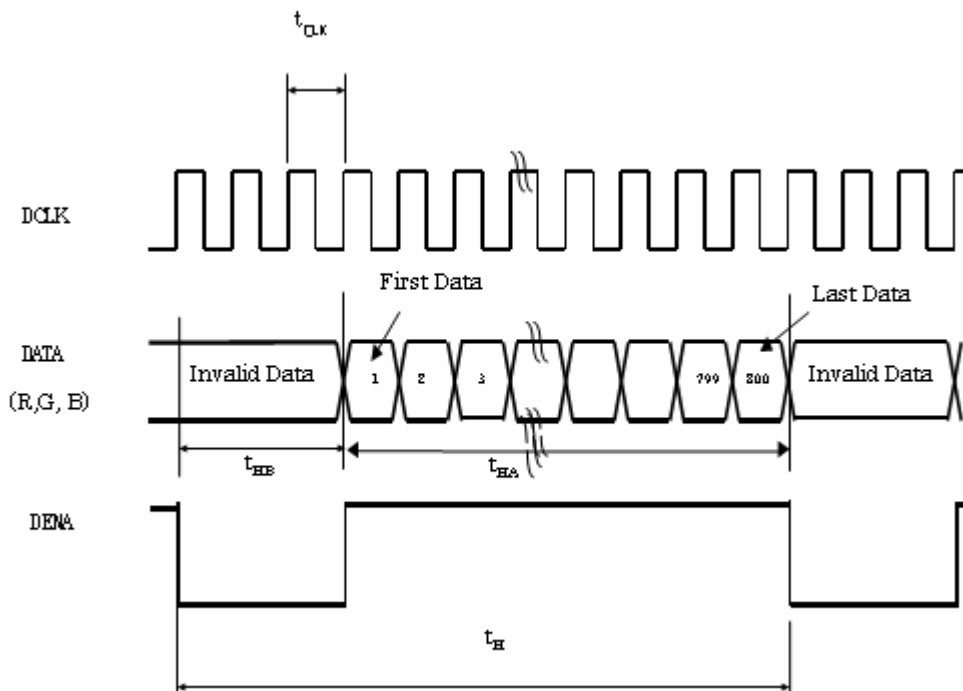
## 5.2.2 Vertical Timing Sequence
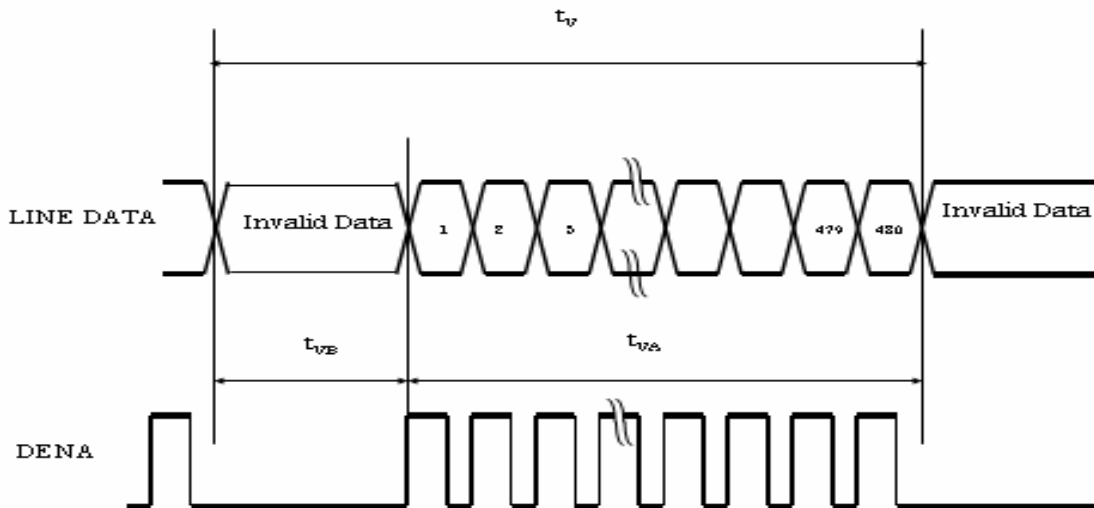


## 5.3 LVDS Input Data mapping

## 5.4 Color Data Assignment

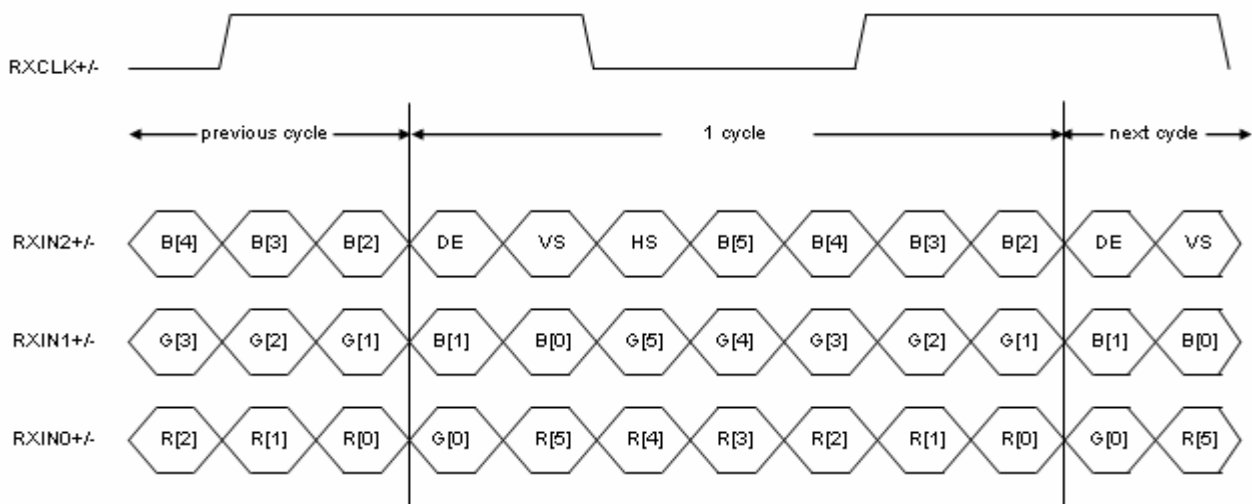| COLOR | INPUT DATA | R DATA | | | | | | G DATA | | | | | | B DATA | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | R5 | R4 | R3 | R2 | R1 | R0 | G5 | G4 | G3 | G2 | G1 | G0 | B5 | B4 | B3 | B2 | B1 | B0 |
| | | MSB | | | | | LSB | MSB | | | | | LSB | MSB | | | | | LSB |
| BASIC COLOR | BLACK | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | BLUE(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | CYAN | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| | MAGENTA | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| | YELLOW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 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 |
| RED | RED(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(1) | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(2) | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | RED(62) | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | RED(63) | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| GREEN | GREEN(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | GREEN(62) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | GREEN(63) | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| BLUE | BLUE(0) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | BLUE(1) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | BLUE(2) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | | | | | | | | | | | | | | | | | | |
| | BLUE(62) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |
| | BLUE(63) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

Remarks:
(1)Definition of Gray Scale
   color(n)：n is series of Gray Scale
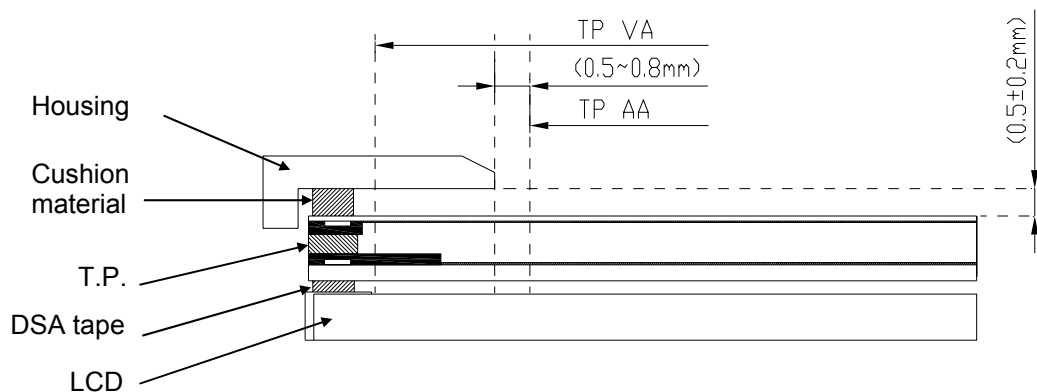   The more n value is, the bright Gray Scale.
(2)Data:1-High,0-Low

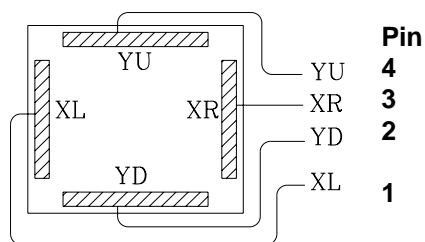# 6. CHARACTERISTIC OF TOUCH PANEL

## 6.1 Basis characteristic

| Item | Standard | Note |
|---|---|---|
| Operating Voltage | 3V(Min)/5V(Typ)/7V(Max) | DC |
| Surface Treatment | Anti-Glare，Hardness：3H | |
| Activation Force | 20gf ± 10gf | Less than 80gf(Typical 20gf) individual with stylus pen (R 0.8mm) or finger (R 8.0mm) |
| Linearity Force | 130 gf | Input with stylus pen (R0.8mm) |
| Interface Type | 4 Wire Resistive | |
| Resistance Between Terminals | X(Glass side)：360~1140Ω | At the connector |
| | Y(Film side)：120~640Ω | |
| Linearity | X(Glass side)：$\leq 1.5\%$ | Testing interval is 2mm with load 100g |
| | Y(Film side)：$\leq 1.5\%$ | |
| Insulation Resistance | Min. 20MΩ | At DC 25V |

## 6.2 Design guideline for Touch-Panel

(a) The Housing Cushion on touch-panel must be set at outside of T.P's view-area .
(b) The Cushion material must be elastic material.
(c) The housing must avoid to touch the T.P
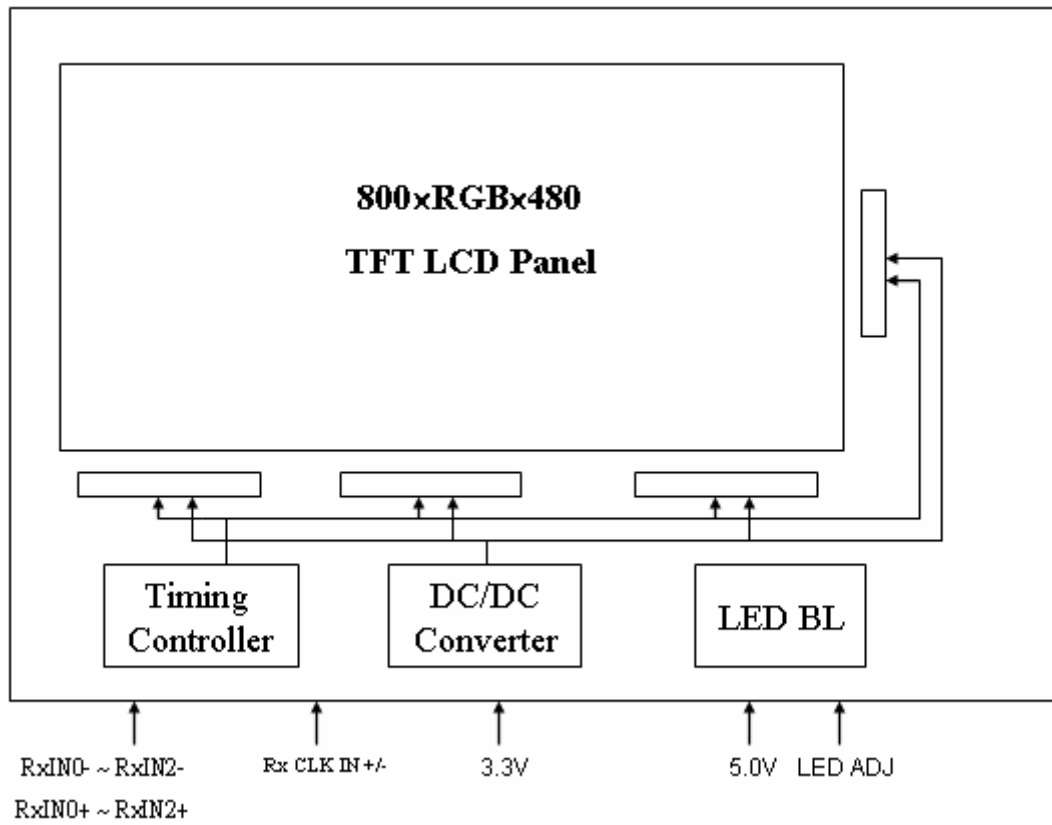(d) To combine, the housing should not be stuck on T.P.
(e) Example of housing design：
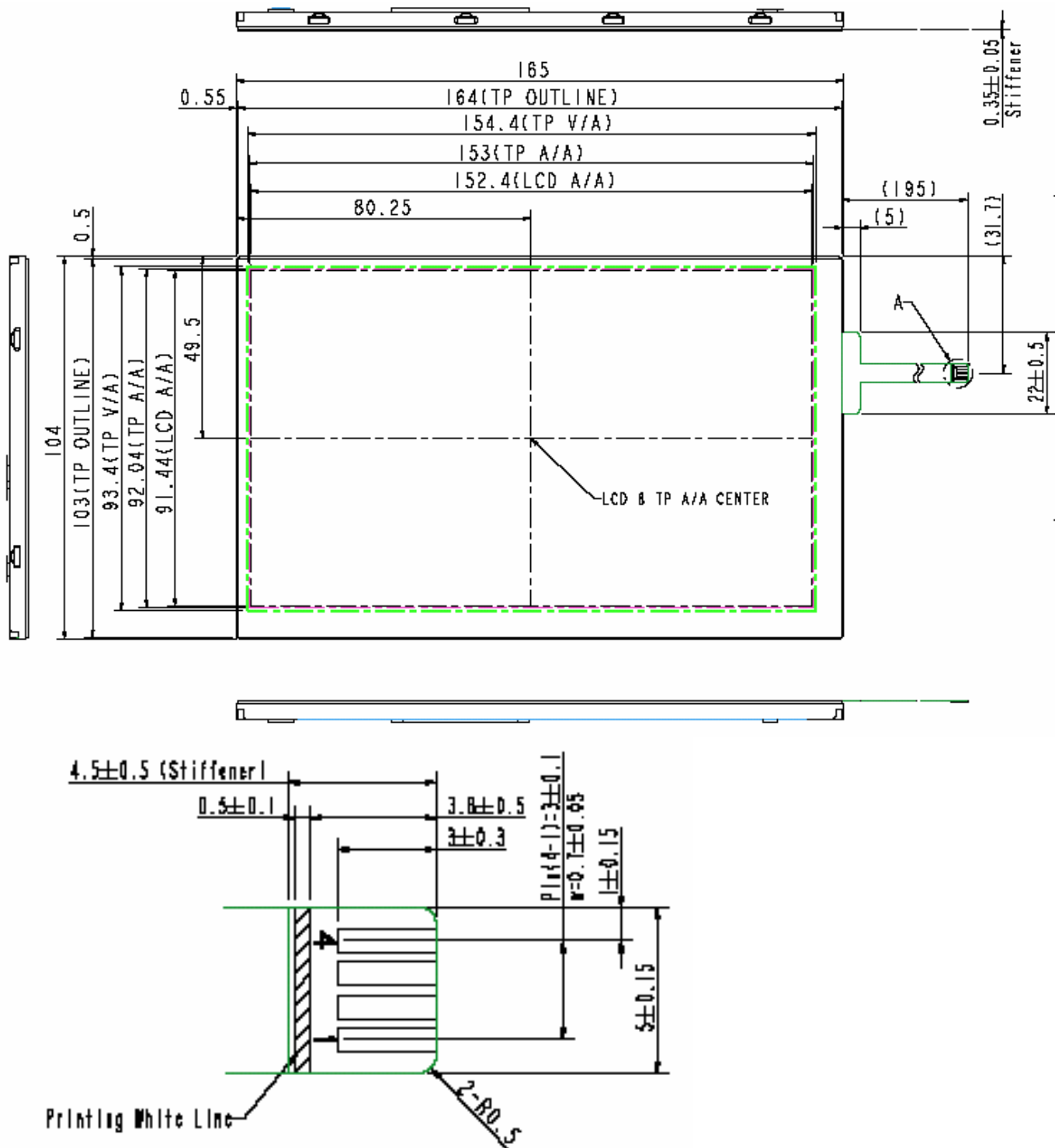


## 6.3 Circuit Diagram



Circuit Diagram

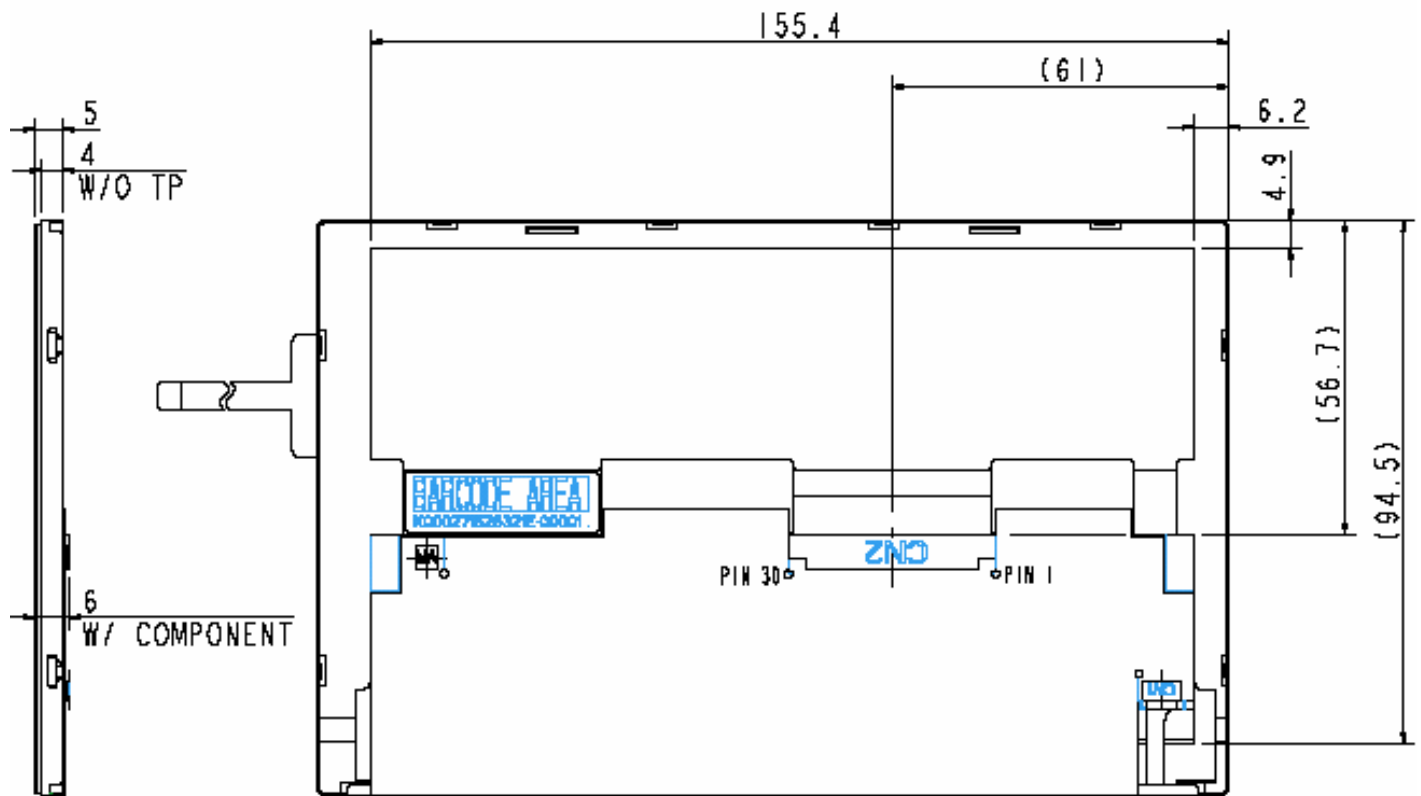# 7. BLOCK DIAGRAM



800×RGB×480
TFT LCD Panel

Timing Controller

DC/DC Converter

LED BL

RxIN0- ~ RxIN2-
RxIN0+ ~ RxIN2+

Rx CLK IN +/-

3.3V

5.0V   LED ADJ

# 8. MECHANICAL DIMENSION

## 8.1 Front Side                                                                                                [Unit：mm]

## 8.2 Rear Side

[Unit：mm]



Remark：Un-indication tolerance is ±0.3mm

## 9. OPTICAL CHARACTERISTICS

| ITEM | | SYMBOL | CONDITION | MIN. | TYP. | MAX. | UNIT | Remarks |
|---|---|---|---|---|---|---|---|---|
| Constrast Ratio | | CR | Point-5 | 300 | 400 | -- | -- | *1)*2)*3) |
| Luminance*) | | Lw | Point-5 | 200 | 250 | -- | cd/m² | *1)*3) |
| Luminance Uniformity | | ∆L | | 70 | 80 | -- | % | *1)*3) |
| Response Time (White - Black) | | Tr+ Tf | Point-5 | -- | - | 20 | ms | *1)*3)*5) |
| Viewing Angle | Horizontal | $\phi$ | CR≧10 Point-5 | 120 | 140 | -- | ° | *1)*2)*4) |
| | Vertical | $\theta$ | | 90 | 110 | -- | ° | *1)*2)*4) |
| Color Coordinate | White | Wx Wy | Point-5 | 0.273 0.289 | 0.313 0.329 | 0.353 0.369 | -- | *1)*3) |
| | Red | Rx Ry | | (0.535 0.292) | (0.575 0.332) | (0.615 0.372) | | |
| | Green | Gx Gy | | (0.290 0.525) | (0.330 0.565) | (0.370 0.605) | | |
| | Blue | Bx By | | (0.110 0.080) | (0.150 0.120) | (0.190 0.160) | | |

Remarks：

*1)Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，VCC=3.3V，VDD=5V.
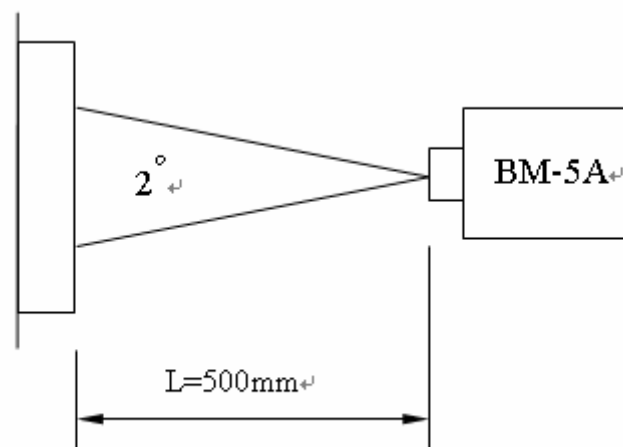


*2）Definition of contrast ratio：
Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

*3) Definition of luminance：

Measure white luminance on the  point 5 as figure9-1
Definition of Luminance Uniformity:
Measure white luminance on the  point1~9 as figure9-1

$$\triangle L = [L(MIN)/L(MAX)]\times 100$$
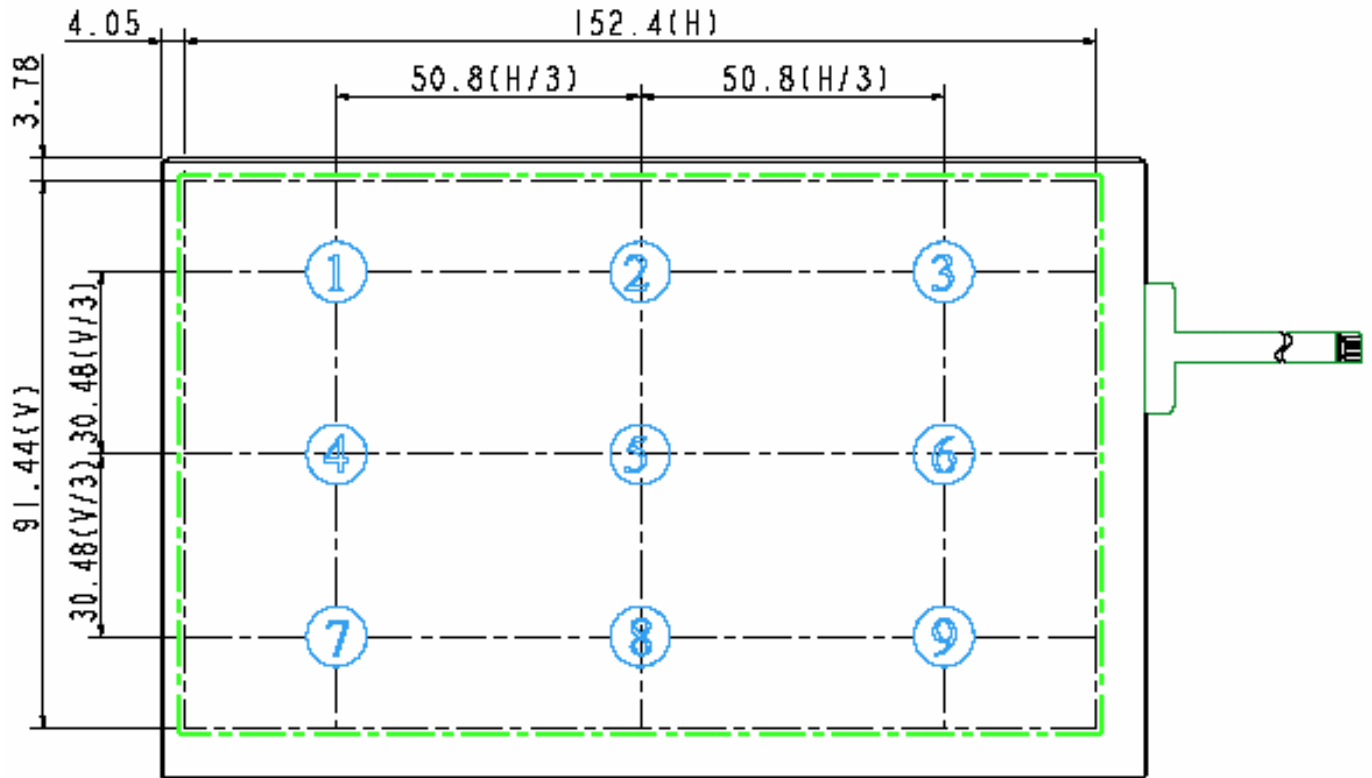


Fig9-1   Measuring point

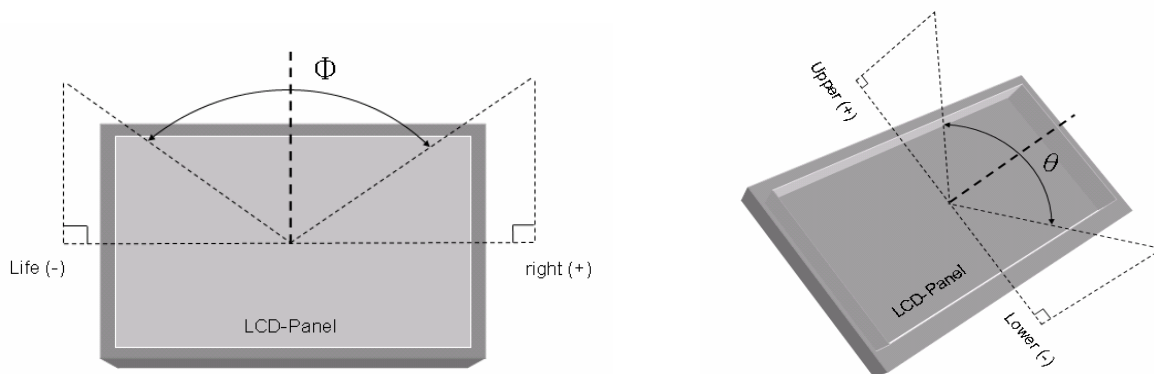*4) Definition of Viewing Angle(θ,ψ),refer to Fig9-2 as below：



Fig9-2 Definition of Viewing Angle
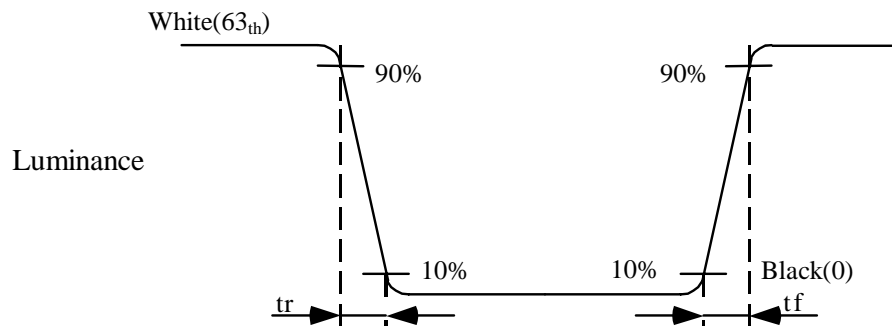
*5) Definition of Response Time.(White-Black)



Fig9-3 Definition of Response Time(White-Black)

## 10. RELIABILITY TEST

### 10.1. Temperature and humidity

| TEST ITEMS | CONDITIONS | REMARK |
|---|---|---|
| High Temperature Operation | 85℃，240Hrs | |
| High Temperature Storage | 95℃，240Hrs | |
| High Temperature High Humidity Operation | 60℃，90%RH，240Hrs | No condensation |
| Low Temperature Operation | -30℃，240Hrs | |
| Low Temperature Storage | -40℃，240Hrs | |
| Thermal Shock | -30℃（0.5Hr）~ 85℃(0.5Hr) 200 cycles | |

### 10.2. Shock and Vibration

| TEST ITEMS | CONDITIONS |
|---|---|
| Shock (Non-operation) | • Shock level:980m/s$^2$(equel to 100G) <br> • Waveform:half sinusoidal wave,6ms. <br> • Number of shocks:one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs. |
| Vibration (Non-operation) | • Frequency range:8~33.3Hz <br> • Stoke:1.3mm <br> • Vibration:sinusodial wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). <br> • Sweep:2.9G,33.3Hz-400Hz <br> • Cycle:15min |

### 10.3. ESD Test

| ITEM | CONDITION | REMARK |
|---|---|---|
| ESD | 150pF，330Ω，±8KV&±15KV air & contact test | *1) |
| | 200pF，0Ω，±250V contact test | *2) |

Remarks：
*1) LCD glass and metal bezel
*2) IF connector pins

### 10.4 Judgment standard

The Judgment of the above test should be made as follow:
Pass:Normal display image with no obvious non-uniformity and no line defect.Partial
trasformation of the module parts should be ignored.
Fail:No display image,obvious non-uniformity,or line defect.

# DATA MODUL
## DISPLAY AND SYSTEM SOLUTIONS

Data Modul Headquarters Munich
Landsberger-Str. 322
D-80687 Munich - Germany
Tel.: +49-89-56017-0

Sales Office Duesseldorf
Fritz-Vomfelde-Str. 8
D-40547 Duesseldorf - Germany
Tel.: +49-211-52709-0

Sales Office Hamburg
Borsteler Chaussee 51
D-22453  Hamburg - Germany
Tel.: +49-40-42947377 - 0

Sales Office Stuttgart
Friedrich-List-Str. 42
D-70771 Leinfelden-Echterdingen
Germany
Tel.: +49-711-782385-0

Data Modul France, S.A.R.L.
Bat B - Hall 204
1-3 Rue des Campanules
77185 Lognes - France
Tel.: +33-1-60378100

Data Modul Italia, S.r.l.
Regus Center Senigallia
Via Senigallia 18/2
20161 Milano - Italy
Tel.: +39-02-64672-509

Data Modul Iberia, S.L.
c/ Adolfo Pérez Esquivel 3
Edificio Las Americas III Oficiana 40
28230 Parque Empresarial
Madrid Las Rozas - Spain
Tel.: +34-916 366 458

Data Modul Ltd. / UK
3 Brindley Place
Birmingham B 12JB
United Kingdom
Tel.: +44-121-698-8641

Data Modul Inc. / USA
1767-46 Veterans Memorial Highway
Islandia NY 11749
USA
Tel.: +1-877-951-0800

## www.data-modul.com
## display@data-modul.com