



# OSD Displays

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Customer:	
Model Number:	OSD070T0538-04TS
Specification Number:	OSD070T0538-04TS
Date:	11/24/2009
Version:	A.1

For Customer's Acceptance

Approved by	Comments

Approved by	Reviewed by	Prepared by



## Record of Revision

[illegible]

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## 1.GENERAL DESCRIPTION

### 1.1 Features

No.	Item	Specification	Remark
1	LCD size	7 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	800X3(RGB)X480	
4	Display mode	Normally white, Transmissive	
5	Dot pitch	0.0635(W)X0.1905(H) mm	
6	Active area	152.4 (W)X91.44 (H) mm	
7	Module size	165(W)X104(H)X6.86(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Interface	Digital (LVDS 6Bits)	
11	Backlight power consumption	1.728W(Typ. )	
12	Panel power consumption	0.990W(Typ. )	Note2
13	Weight	TBD(Typ. )	

Note1: Refer to mechanical drawing

Note2: include T-con Board power consumption

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## 2.ABSOLUTE MAXIMUM RATINGS

### 2.1 Electrical absolute maximum ratings

Item	Symbol	Value	Unit	Note
Power Supply Voltage	VCC	-0.3 ~ 4.6	V	AVSS=0 GND=0
	VLED	5.5(Max)	V	
Input signal Voltage	Vi	-0.3 to VCC	V	Note1
Operation Temperature	Top	-20 to +70	°C	
Storage Temperature	Tst	-30 to +80	°C	

Note 1: DCLK, DE, HS, VS, R0~ R5, G0~ G5, B0~ B5.

Note 2: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

Note 3: Vr Conditions: Zener Diode 20mA.

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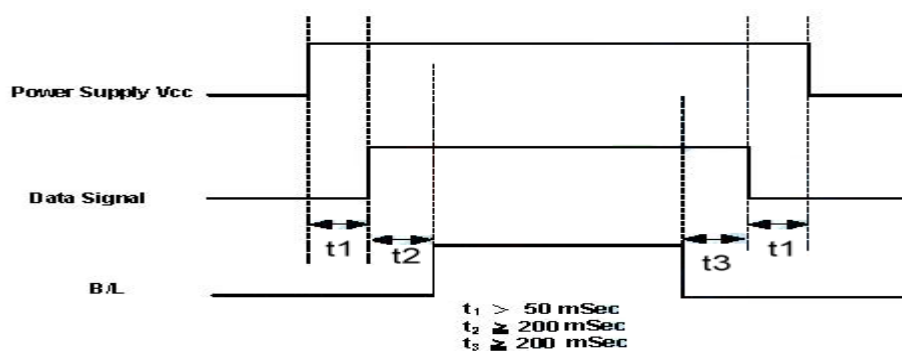
## 2.2 Typical Operation Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	$V_{CC}$	3.1	3.3	3.5	V	
LVDS_Board Current Consumption	$I_{CC}$	—	TBD	—	mA	Note 1
LED Driver Power Voltage	$V_{LED}$	4.6	5.0	5.4	VP-P	
LED Driver Current Consumption	$I_{LED}$	—	(230)	—	mA	
Differential Input High Threshold	$V_{THLVDS}$			100	mV	
Differential Input Low Threshold	$V_{TLLVDS}$	-100			mV	
Input current	$I_{IN}$			$\pm 10$	$\mu A$	

Note 1:  $V_{CC}$  setting should match the signals output voltage (refer to Note 2) of customer' s system board.

Note 2: DCLK, DE, HS, VS,  $R0 \sim R5$ ,  $G0 \sim G5$ ,  $B0 \sim B5$ .

## 2.3 Power Sequence



Note: Data Signal includes DCLK, DE, HS, VS,  $R0 \sim R5$ ,  $G0 \sim G5$ ,  $B0 \sim B5$ .

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### 3 Touch Screen panel specifications

#### Electronic characteristics

Item		Min.	Typ.	Max.	Unit	Note
Linearity		-	-	1.5	%	
Circuit Resistance	X-axis	140	-	370	Ω	
	Y-axis	580	-	1030	Ω	
Insulation Resistance		20	-	-	MΩ	
Operating Voltage		-	-	5	V	
Chattering		-	-	10	ms	
Transmittance		78	-	-	%	

#### Mechanical & Reliability Characteristics

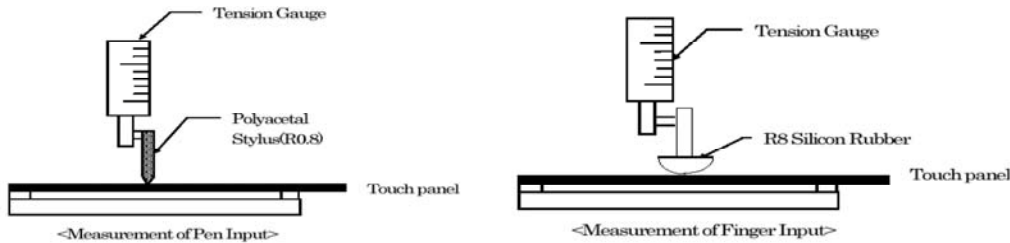
Item	Min.	Typ.	Max.	Unit	Note
Activation force	-	-	60	g	Note.1
Pen Writing Durability	100,000	-	-	characters	Note.2
Pitting Durability	1,000,000	-	-	touches	Note.3
Surface hardness	3	-	-	H	

Note.1 : Operation force with R0.8mm silicone finger.

Note.2 : With the silicon Rubbre R8mm on the same point of the touch panel with 250g force, frequency 240 times/min.

Note.3 : Writing with R0.8mm plastic stylus pen; writing force 150g in active area.  
Speed is 60mm/sec.

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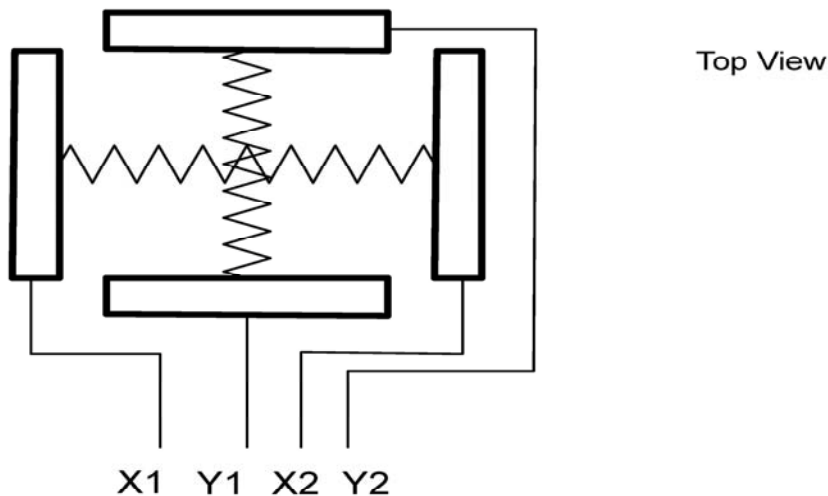
**Note 2: Measurement for surface area.**

- Scratch 100,000 times straight line on the film with a stylus change every 20,000 times.
- Force: 250gf.
- Speed: 60mm/sec.
- Stylus: R0.8 polyacetal tip.

**Note 3: Pit 1,000,000 times on the film with a R0.8 silicon rubber.**

- Force: 250gf.
- Speed: 2times/sec.

## Touch Screen Panel Block



## Touch Screen Panel Pin Definition

Pin No.	Symbol	I/O	Function	Remark
1	Y2	Top	Top electrode – differential analog	
2	X2	Right	Right electrode – differential analog	
3	Y1	Bottom	Bottom electrode – differential analog	
4	X1	Left	Left electrode – differential analog	



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## 4 AC CHARACTERISTICS

### 4.1 Timing conditions

Item	Symbol	Value			Unit	Note
		Min	Typ.	Max		
RxCLKIN Period	tRCP	11.76	T	50	ns	T= RxCLKIN Period
RxCLKIN High Time	tRCH	-	T/2	-	ns	
RxCLKIN Low Time	tRCL	-	T/2	-	ns	
PAD0/1 to RxCLKIN Delay	tRCD	-	3T/7	-		
Data Setup to RxCLKIN	tRS	1.9	-	-	ns	
Data Hold from RxCLKIN	tRH	3.0	-	-	ns	
Input Data Position 0(T=11.76ns)	TRIP1	-0.4	0	0.4	ns	
Input Data Position 1(T=11.76ns)	TRIP0	T/7-0.4	T/7	T/7+0.4	ns	
Input Data Position 2(T=11.76ns)	TRIP6	2T/7-0.4	2T/7	2T/7+0.4	ns	
Input Data Position 3(T=11.76ns)	TRIP5	3T/7-0.4	3T/7	3T/7+0.4	ns	
Input Data Position 4(T=11.76ns)	TRIP4	4T/7-0.4	4T/7	4T/7+0.4	ns	
Input Data Position 5(T=11.76ns)	TRIP3	5T/7-0.4	5T/7	5T/7+0.4	ns	
Input Data Position 6(T=11.76ns)	TRIP2	6T/7-0.4	6T/7	6T/7+0.4	ns	

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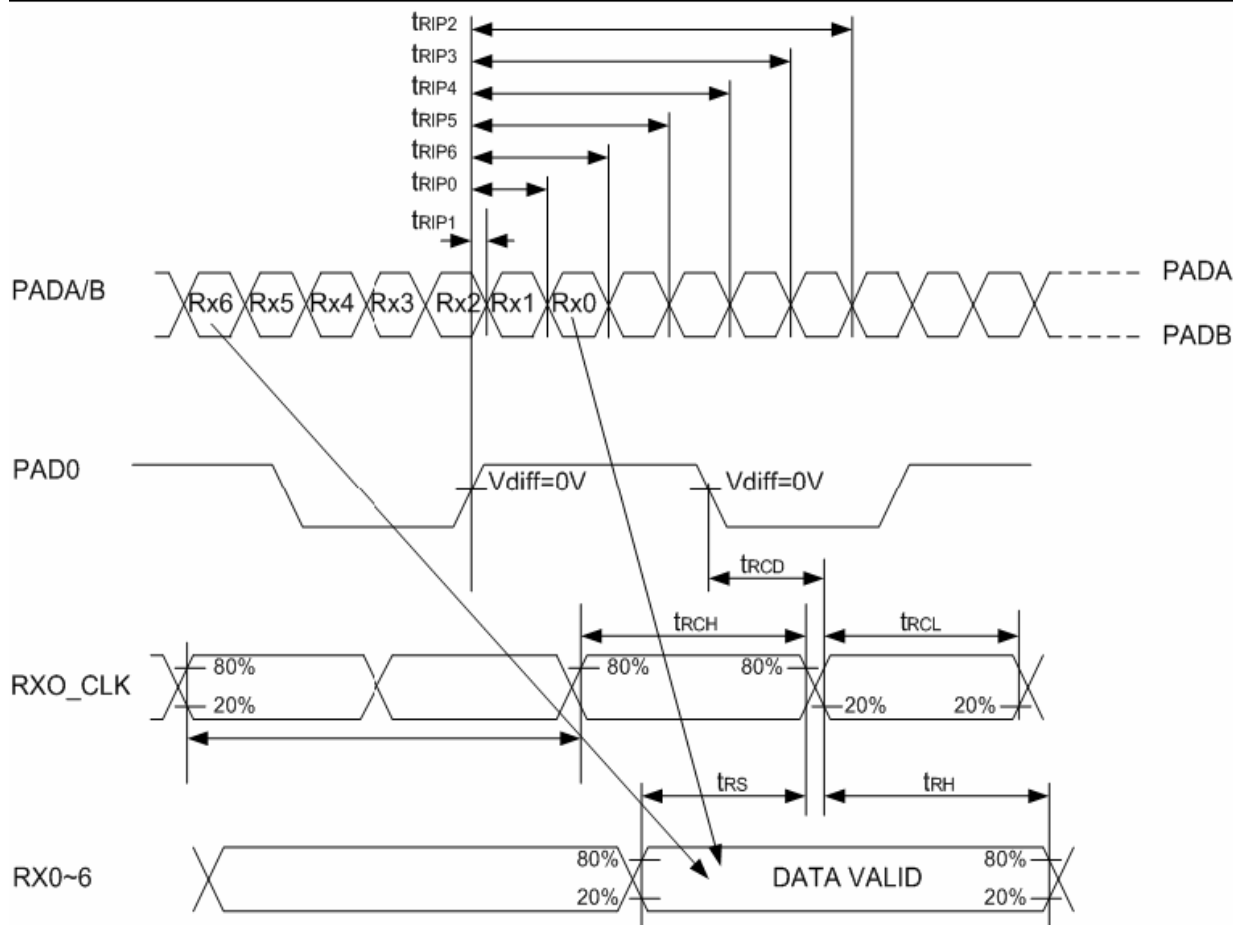
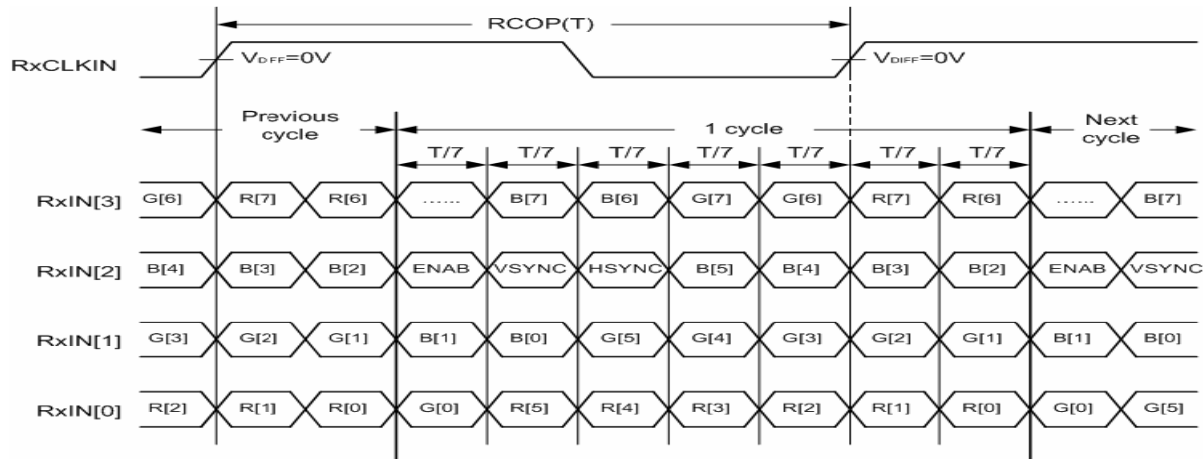
DE mode Input signal characteristics (800 x 480)

Item		Symbol	Value			Unit	Note
			Min	Typ.	Max		
DCLK	Period	t <sub>CLK</sub>		30.06		ns	Note1
	Frequency	f <sub>CLK</sub>		33.26		MHz	
	Duty		0.45	0.50	0.55		t <sub>CLKL</sub> / t <sub>CLK</sub>
DE	Setup Time	t <sub>DES</sub>	6			t <sub>CLK</sub>	
	Period	T <sub>DEH</sub> +T <sub>DE</sub>	1000	1056	1200	t <sub>CLK</sub>	
	Pulse width	T <sub>DEH</sub>		800		t <sub>CLK</sub>	
	Frame blanking	T <sub>DEB</sub>	10	45	110	T <sub>DEH</sub> +T <sub>D</sub>	
	Frame width	T <sub>DE</sub>	480			t <sub>HP</sub>	
DATA	Setup Time	t <sub>DS</sub>	6			ns	
	Hold Time	t <sub>DH</sub>	6			t <sub>CLK</sub>	

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## 4.2 Timing Diagram

R/G/B[7]s are MSBs and R/G/B[0]s are LSBs



LVDS AC Timing Diagrams

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## 5. OPTICAL CHARACTERISTICS

The following items are measured under stable conditions. The optical characteristics should be measured in a dark room or equivalent state with the methods shown in Note (1).

Measuring equipment: BM-5A, BM-7

(Ta = 25 +/- 2°C, Vcc = 3.3V, VLED=5.0V)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time    Rise Fall	Ton	25 °C	-	(10)	(20)	ms	Note 4
	Toff			(15)	(30)		
Contrast ratio	CR	At optimized viewing angle	250	400	-		Note 5,6
Viewing angle Top Bottom Left Right		CR ≥ 10	40 60 60 60	50 70 70 70	- - - -	deg.	Note 7
Brightness	B1	$\theta = 0^\circ$	280	320	-	Cd/m <sup>2</sup>	
Luminance Uniformity	Yu	$\theta = 0^\circ$	70	75		%	
White chromaticity	x	$\theta = 0^\circ$	0.26	(0.31)	0.36		
	y	$\theta = 0^\circ$	0.28	(0.33)	0.38		

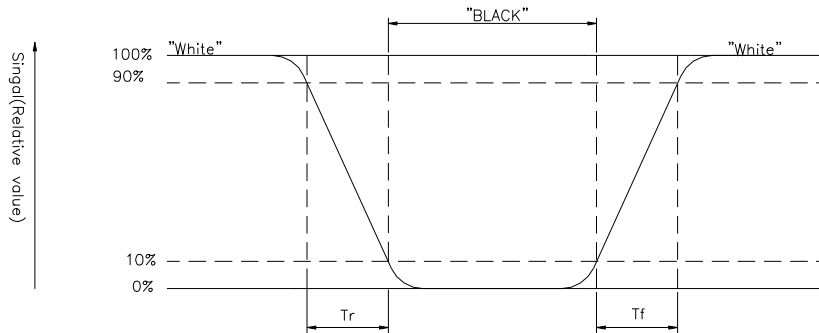
Note 1: Ambient temperature =25°C, And LED current IL=20mA.

Note 2: To be measured in the dark room.

Note 3: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 10 minutes operation.

Note 4: Definition of response time: The output signals of photo-detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black” (rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as shown below.

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Note 5: Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo-detector output when LCD is at "White" state}}{\text{Photo-detector output when LCD is at "Black" state}}$$

Note 6: White  $V_i = V_{i50} + 1.5V$

Black  $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

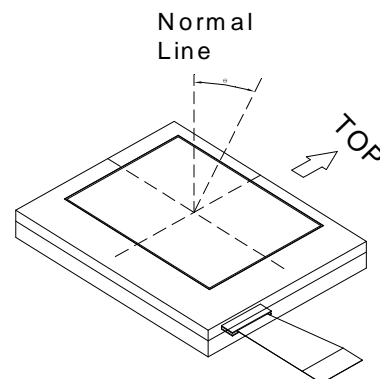
“+” means that the analog input signal swings out of phase with VCOM signal.

“Vi50” : The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 7: Definition of viewing angle:

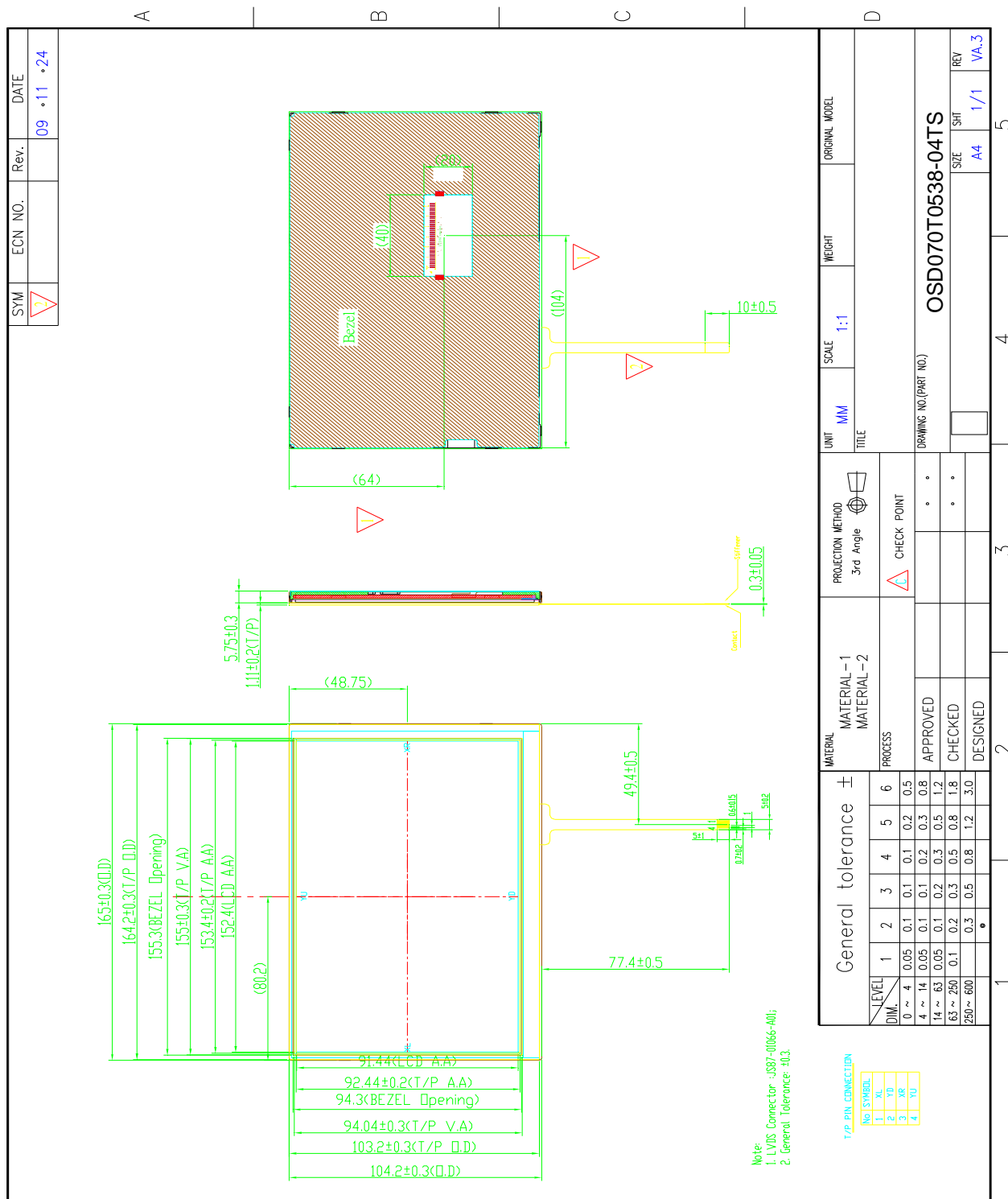
Refer to figure as below.



Note 8: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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## 6 OUTLINE DIMENSION



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## 7 INTERFACE PIN CONNECTION

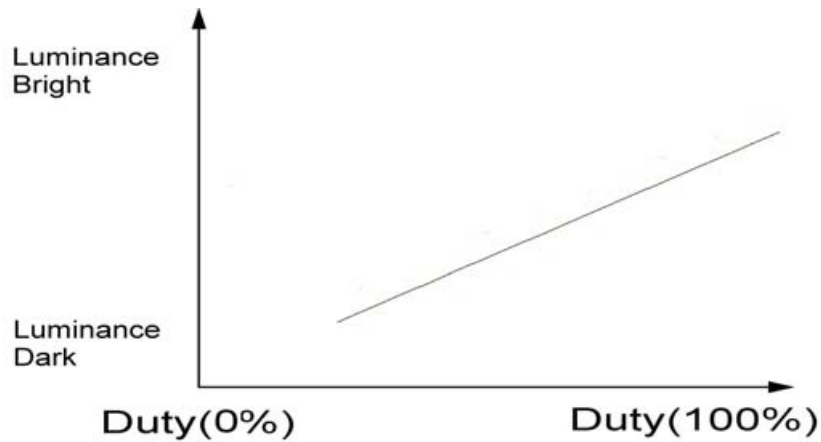
LVDS connector(JS87-01066-A01) is used for the module electronic interface.

Pin No.	Signal	I/O	Description	Note
1	V <sub>CC</sub>	P	Power supply for digital circuit	
2	V <sub>CC</sub>	P	Power supply for digital circuit	
3	V <sub>CC</sub>	P	Power supply for digital circuit	
4	GND	P	Power ground	
5	GND	P	Power ground	
6	GND	P	Power ground	
7	GND	P	Power ground	
8	RIN0-	I	- LVDS differential data input (R0-R5,G0)	
9	RIN0+	I	+ LVDS differential data input (R0-R5,G0)	
10	GND	P	Power ground	
11	RIN1-	I	- LVDS differential data input (G1-G5,B0-B1)	
12	RIN1+	I	+ LVDS differential data input (G1-G5,B0-B1)	
13	GND	P	Power ground	
14	RIN2-	I	- LVDS differential data input (B2-B5,HS,VS,DE)	
15	RIN2+	I	+ LVDS differential data input (B2-B5,HS,VS,DE)	
16	GND	P	Power ground	
17	CLKIN-	I	-LVDS differential clock input	
18	CLKIN+	I	+LVDS differential clock input	
19	GND	P	Power ground	
20	NC	-	NC	
21	NC	-	NC	
22	GND	P	Power ground	
23	VLED	P	Power supply for LED	
24	VLED	P	Power supply for LED	
25	GLED	P	GND for LED	
26	GLED	P	GND for LED	
27	NC		No Connect	
28	NC		No Connect	
29	ADJ	P	Adjust the Back Light brightness	Note 2,3
30	NC		No Connect	

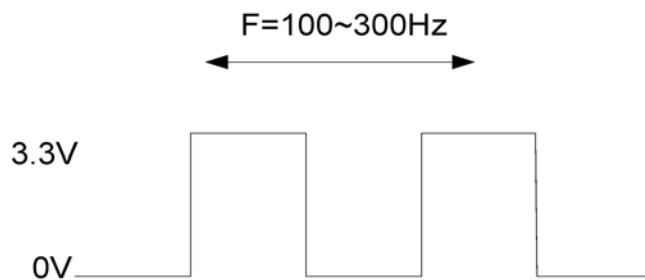
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Note1: If Input data is 6 bit, Rin3- & Rin3+ can't be connected.

Note2: ADJ adjust brightness to control Pin, Pulse duty the bigger brighter



Note3: ADJ signal = 0~3.3V, operation frequency: 100~300Hz



Note 4: DE Mode, Mode=" H" , HS floating and VS floating

HV Mode, Mode=" L" and DE floating

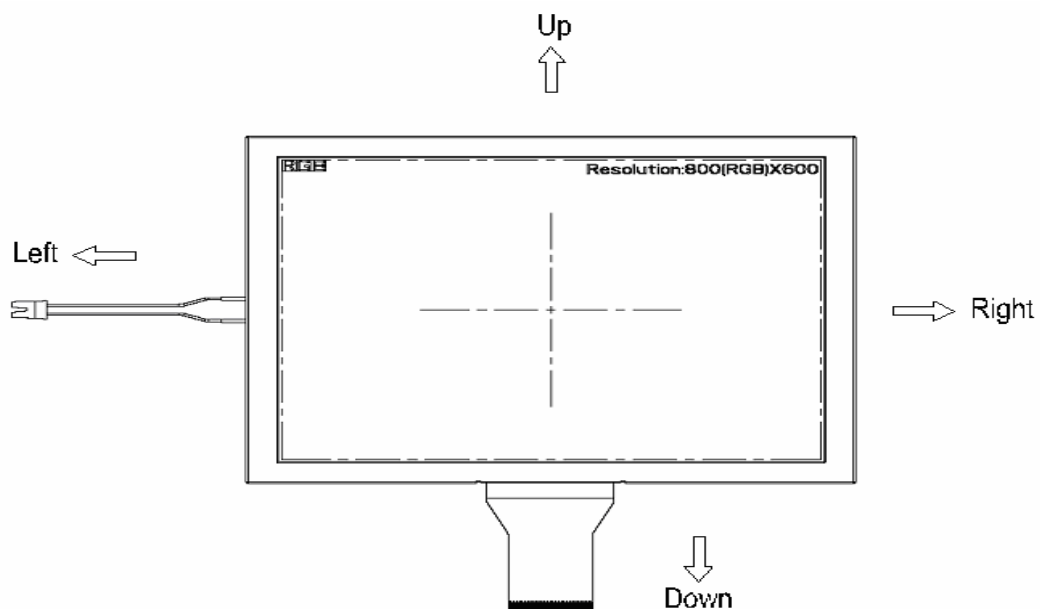
Note 5: Selection of scanning mode.

Setting of scan control input		Scanning direction
U/D	R/L	
GND	V <sub>cc</sub>	Up to down, left to right
V <sub>cc</sub>	GND	Down to up, right to left
GND	GND	Up to down, right to left
V <sub>cc</sub>	V <sub>cc</sub>	Down to up, left to right



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Note 6: Scanning direction refer to the figure below.



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## 8 RELIABILITY

No.	Test Items	Test Conditions
1	High Temperature Storage Test	Ta=80°C , 240 Hrs
2	Low Temperature Storage Test	Ta=-30°C , 240Hrs
3	High Temperature and High Humidity Operating Test	Ta=40°C , 90%RH, 240Hrs (No condensation of dew)
4	High Temperature Operating Test	Ta=70°C , 240Hrs
5	Low Temperature Operating Test	Ta=-20°C , 240Hrs
6	Thermal Shock Test	Ta=-30°C (0.5H) ~ 80°C (0.5H) / 50 cycles
7	Electro Static Discharge Test	+200V, 200pF (0Ω), 1 time for each terminal

Note: (1) Evaluation should be tested after storage at room temperature for 24 hours.

(2) There should be no change that might affect the practical display function when the display quality test is conducted under normal operating conditions.

(3) Judgment:

- a. In the standard condition, there shall be no practical problems that may affect the display function.
- b. No serious image quality degradation.

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## 9 RECAUTIONS

### 9.1 handling

- (1) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bend the module.
  - (2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
  - (3) Note that the polarizer is very fragile and could be easily damaged. Do not press or scratch the surface harder than a B pencil lead.
  - (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
  - (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
  - (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Don't use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
  - (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
  - (8) Protect the module from static; it may cause damage to the CMOS Gate Array IC.
  - (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
  - (10) Do not disassemble the module.
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- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.

## 9.2 Storage

- (13) Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35oC and relative humidity of less than 70%.
- (14) Do not store the TFT-LCD module in direct sunlight.
- (15) The module shall be stored in a dark place. It is prohibited to apply sunlight or fluorescent light during the store.

## 9.3 Operation

- (16) Do not connect; disconnect the module in the “Power on” condition.
- (17) Power supply should always be turned on/off by the chapter 8 TFT-LCD Driver IC Operation Algorithms.

## 9.4Precautions in use of touch panel

- (1) Do not give excessive strain to the product.
  - (2) To prevent giving distortion to the film of the product and peeling off of the film from the product, do not fix the film and a set case or a shock absorbing material adhered to a set case by adhesion.
  - (3) Operate it with a polyacetal pen (tip R0.8 or over) or a belly of a finger without applying excessive load. Never use any mechanical pencils, ball point pens and hard fingertips whose tip is hard for input, otherwise malfunctions may result.
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- (4) The input position may be fluctuated a little through long-time use. It is desirable to provide a zero-adjustment function by using a circuit and software.
- (5) Operation at the out of Active Area is out of our guarantee. It causes a serious damage of a transparent electrode. Do not operate at the out of Active Area.

## 9.5 Others

- (18) The Liquid crystal is deteriorated by ultra violet, do not leave it in direct sunlight and strong ultraviolet ray for many hours.
  - (19) Avoid condensation of water. It may result in improper operation or disconnection of electrode.
  - (20) Do not exceed the absolute maximum rating value. (the supply voltage variation, input voltage variation in part contents and environmental temperature and so on). Otherwise the panel may be damaged.
  - (21) If the panel displays the same pattern continuously for a long period of time, it can be the situation when the image" Sticks" to the screen.
  - (22) His panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.
-