



晶采光電科技股份有限公司  
AMPIRE CO., LTD.

## SPECIFICATIONS FOR LCD MODULE

<b>CUSTOMER</b>	
<b>CUSTOMER PART NO.</b>	
<b>AMPIRE PART NO.</b>	<b>AM-1024600R1TNQW-T00H</b>
<b>APPROVED BY</b>	
<b>DATE</b>	

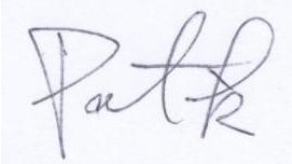
- Approved For Specifications
- Approved For Specifications & Sample

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## RECORD OF REVISION

Revision Date	Page	Contents	Editor
2013/12/25	-	New Release	Rober
2014/3/6	-	Correct the Operating Temperature	Rober

## 1. FEATURES

The TFT is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 10.1 (17:10) inch diagonally measured active display area with WSVGA(1024 x 600 pixel) resolution.

- (1) 10.1 (17:10 diagonal) inch configuration
- (2) One channel LVDS interface
- (3) 262K color by 6 bit or 8bit R.G.B signal input
- (4) RoHS Compliance
- (5) Projected Capacitive Touch Screen . USB Interface.

## 2. PHYSICAL SPECIFICATIONS

Item	Specifications	Unit	Note
LCD size	10.1" (Diagonal)	inch	
Active area	222.72 (H) × 125.28 (V)	mm	
Number of pixels	1024(H) × 600(V)	pixels	
Pixel pitch	0.2715(H) × 0.2088(V)	mm	
Pixel arrangement	RGB Vertical stripe		
Display colors	262,144	colors	
Display mode	Normally white		
Dimensional outline	244.0 (Typ) × 143.0 (Typ) × 13.844(D)	mm	
Back-light	Single LED (Side-Light type)		
Weight	TBD	g	

### 3. ABSOLUTE MAX. RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit.

Item	Symbol	Values		UNIT	Note
		Min.	Max.		
LED Power Supply Voltage	Vin	-0.3	3.6	V	Logic power supply voltage
		-0.3	24	V	LED Driver Vin
Power Supply Fuse Current Setting	I <sub>FUSE</sub>	-	1.5	A	Vin from 10% ~ 90% , rise time 500us
Input Singal	Vs	-	3.6	V	LVDS signals
PWM Voltage	V <sub>pwm</sub>	0.8	5.0	V	PWM Dimming Voltage
Operating Temperature	T <sub>OPA</sub>	-30	80	°C	
Storage Temperature	T <sub>STG</sub>	-30	85	°C	

## 4. ELECTRICAL CHARACTERISTICS

### 4.1 TFT LCD Module

Item	Symbol	Values			UNIT	Note
		Min.	Typ.	Max.		
Input Power Supply Voltage	V <sub>IN</sub>	3.0	3.3	3.6	V	Note1
Input Power Supply Current	I <sub>VIN</sub>	-	-	191	mA	Black pattern , 60Hz
Input Inrush Current	I <sub>RUSH</sub>	-	-	1.5	A	0.5ms rise time (10%~90%)
Input Power Voltage Ripple	V <sub>RPL</sub>	-	-	200	mV	V <sub>p-p</sub>
REV	V <sub>H</sub>	2.0	3.3	5.0	V	
	V <sub>L</sub>	-	-	0.8	V	
Input Power Supply Voltage	V <sub>LED-IN</sub>	8	12	16	V	
Input Power Supply Current	I <sub>LED-IN</sub>	-	-	543	mA	V <sub>LED</sub> =12V ADJ=100%
EN/PWM	V <sub>H</sub>	2.0	3.3	5.0	V	
	V <sub>L</sub>	-	-	0.8	V	

**Note: A. Input signals shall be low or Hi-Z state when V<sub>IN</sub> is off.**

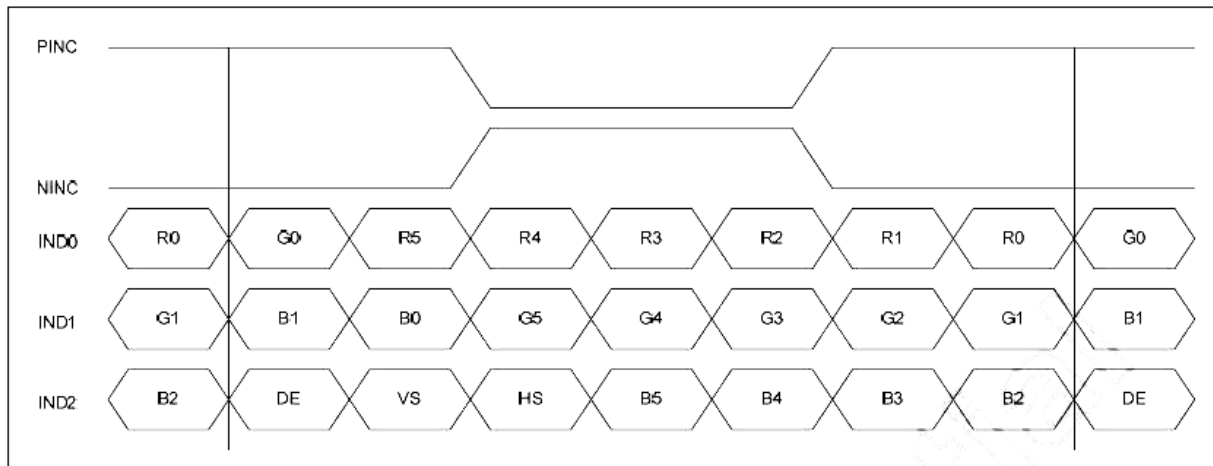
**B. All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.**

**C. White Pattern at 3.3V driving voltage.**

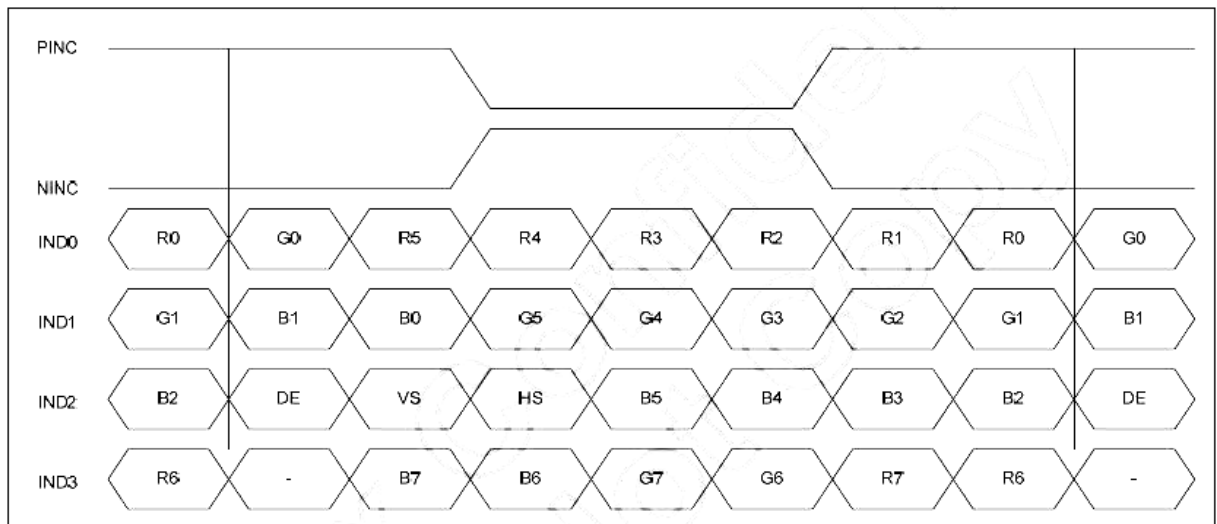
### 4.2 Switching Characteristics of LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Differential Input High Threshold	V <sub>TH</sub>	--	--	100	mV	V <sub>CM</sub> =1.2V
Differential Input Low Threshold	V <sub>TL</sub>	-100	--	--	mV	V <sub>CM</sub> =1.2V
Magnitude Differential Input Voltage	V <sub>id</sub>	200	--	600	uA	
Common Mode Voltage	V <sub>cm</sub>	1.0	1.2	1.4	mV	V <sub>th</sub> - V <sub>tl</sub> = 200mV
Common Mode Voltage Offset	V <sub>CM</sub>	-50	-	+50	mV	V <sub>th</sub> - V <sub>tl</sub> = 200mV

### 4.3 6-bit LVDS Input Data Mapping



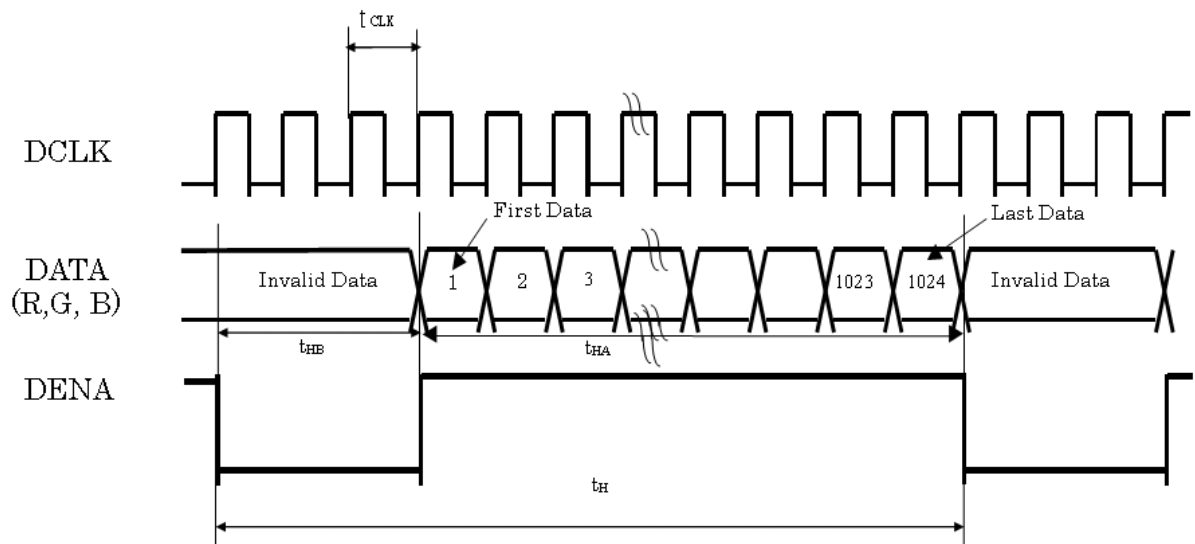
### 4.4 8-bit LVDS Input Data Mapping



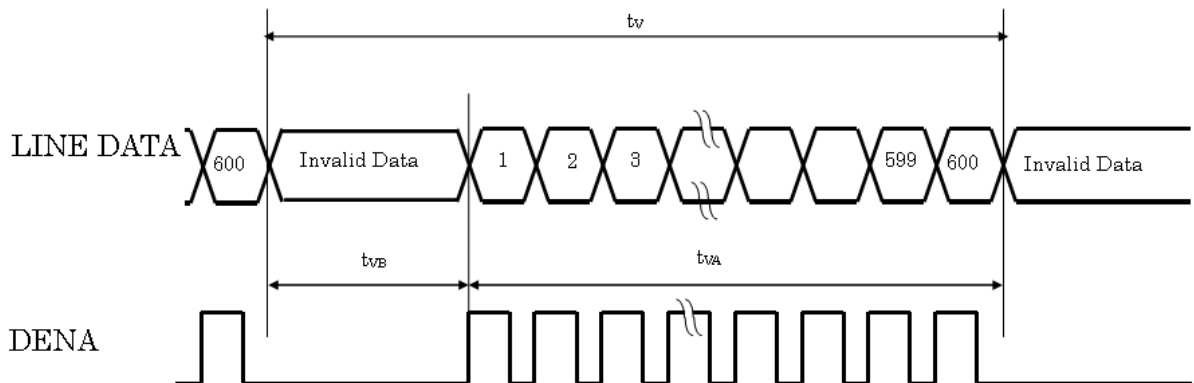
#### 4.4 Timing characteristics of input signals

Item			Symbol	Min.	Typ.	Max.	Unit	
LVDS input signal sequence	Frame Rate		tclk	41	51.2	57	MHz	
LCD input signal sequence (input LVDS Transmitter)	DENA	Horizontal	Horizontal total Timing	t <sub>H</sub>	1214	1344	1364	tCLK
			Horizontal effective Timing	t <sub>HA</sub>	1024			tCLK
		Horizontal Blank Time	t <sub>HB</sub>	300	320	340	tCLK	
	Vertical	Vertical total Time	t <sub>V</sub>	625	365	645	t <sub>H</sub>	
		Vertical effective Time	t <sub>VA</sub>	600			t <sub>H</sub>	
		Vertical Blank Time	t <sub>VB</sub>	25	35	45	t <sub>H</sub>	

Horizontal timing sequence



Vertical timing sequence



#### 4.5 Backlight Driving Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
VIN_LED	V	8	12	16	V	
IVIN_LED	I <sub>LED</sub>	-	600	-	mA	V <sub>LED</sub> =12V PWM=3.3V (duty 100%)
F <sub>DIM</sub>	HZ	100	-	1K	HZ	
PWM	-	-	3.3	5	V	duty=100%
LED voltage	V <sub>AK</sub>	--	22.4	--	V	I <sub>L</sub> =160mA Ta=25°C
LED current	I <sub>L</sub>	--	160	--	mA	Ta=25°C
LED Life Time	-	50K		--	Hour	Ta=25°C

Note : The LED life time define as the estimated time to 50% degradation of initial luminous.

Item	Description
Signal Connector	STM MSB240420HD
LED Connector	STM MSB24038P5A



## 5. OPTICAL SPECIFICATION

### 5.1 Optical specification

Item	Symbol	Condition	Values			Unit	Note
			Min.	Typ.	Max.		
Viewing angle	$\theta L$	$(CR \geq 10)$	70	80	--	degree	Note1 Note2
	$\theta R$		70	80	--		
	$\theta U$		70	80	--		
	$\theta D$		70	80	--		
Response time	TR	Normal $\theta = \Phi = 0^\circ$	--	11	--	msec	Note3
	TF		--	5	--	msec	
Contrast ratio	CR		400	500	--	--	Note2
Color chromaticity	WX		0.26	0.31	0.36	--	Note1 Note4
	WY		0.28	0.33	0.38	--	
	RX		0.53	0.58	0.63	--	
	RY		0.29	0.34	0.39	--	
	GX		0.28	0.33	0.38	--	
	GY		0.54	0.59	0.64	--	
	BX		0.11	0.16	0.21	--	
	BY	0.08	0.13	0.18	--		
Luminance	L	320	400	--	cd/m <sup>2</sup>	Note4	
Luminance uniformity	YU	70	80	--	%	Note5	

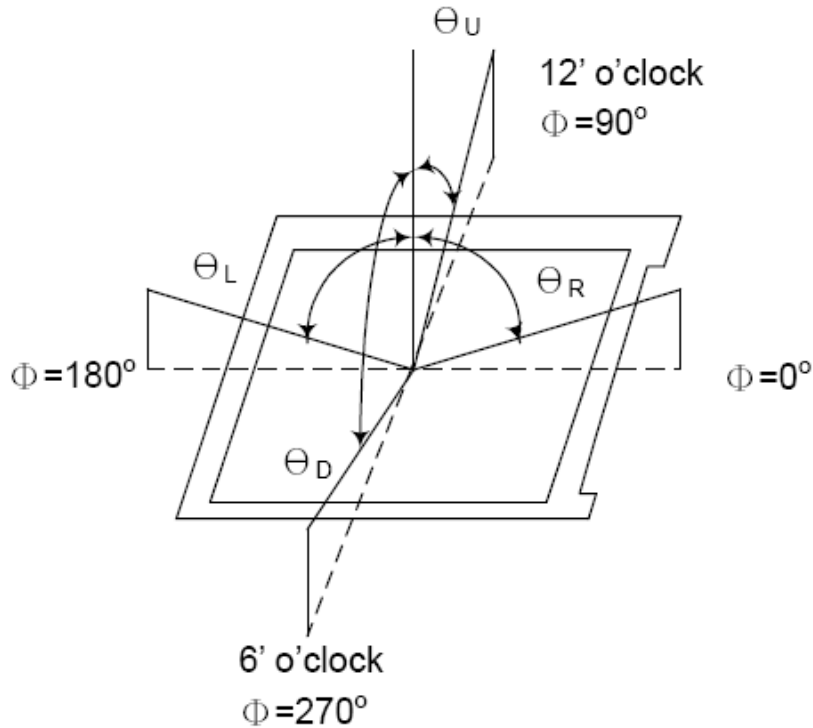
### 5.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature :  $25 \pm 2^\circ\text{C}$
- 15min. warm-up time

## 5.2 Measuring Equipment

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Response time is measured by Photo detector TOPCON BM-7 of view : 1° / Height : 120mm.)

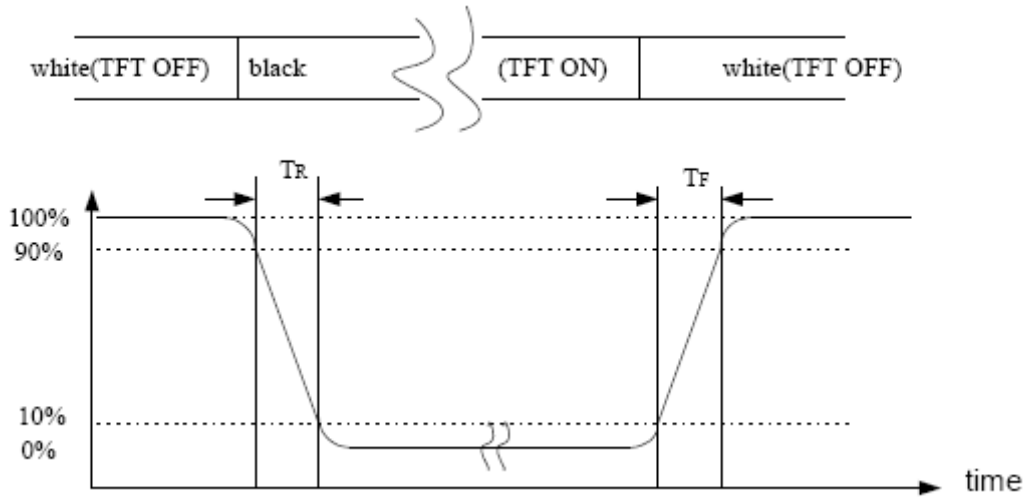
Note 1 : Definition of viewing angle range



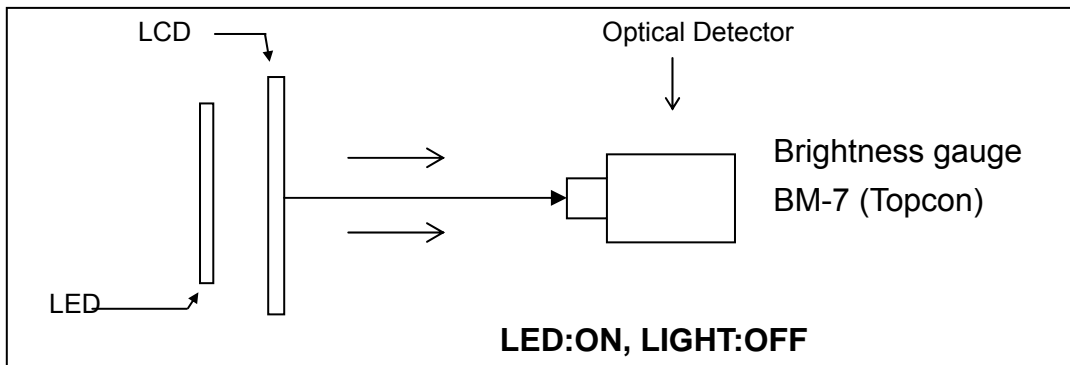
Note 2 : Definition of Contrast Ratio (CR) :  
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

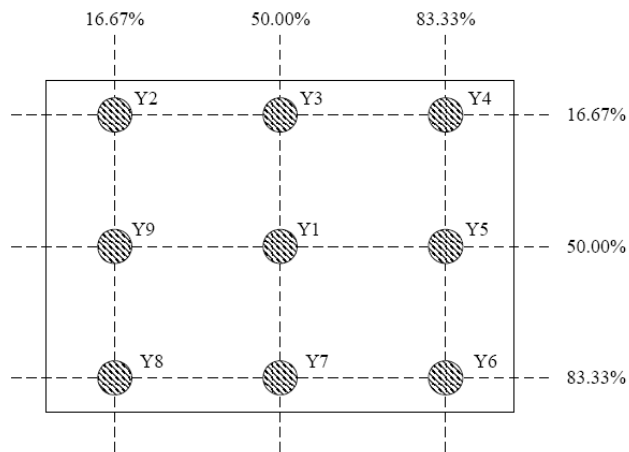
Note 3 : Definition of Response time : Sum of Tr and T



Note 4 : Definition of optical measurement setup



Note 5 : Definition of brightness uniformity



(Min Luminance of 9 points)

$$\text{Luminance uniformity} = \frac{\text{Min Luminance of 9 points}}{\text{Max Luminance of 9 points}} \times 100\%$$

Note 6 : Rubbing Direction (The different Rubbing Direction will cause the different optima view direction)

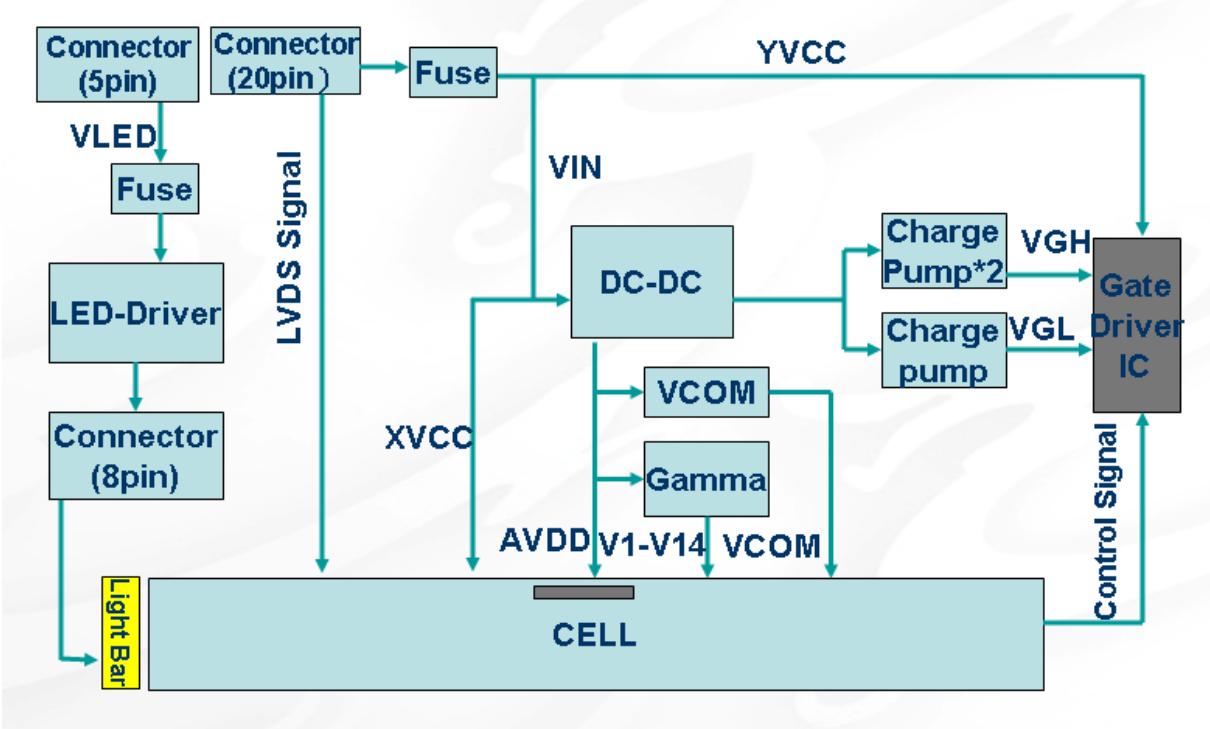
Note 7 : Condition:  $T_a=25^{\circ}\text{C}$ , Life time is estimated data.

Definitions of failure:

- i. LCM brightness becomes half of the minimum value.
- ii. LED doesn't light normally.

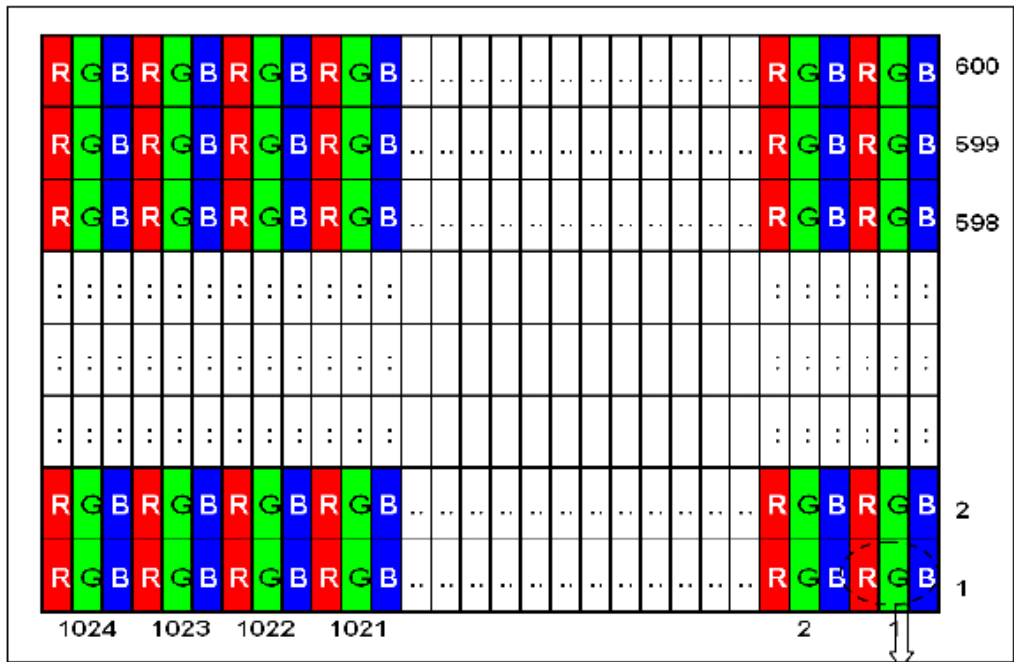
6. BLOCK DIAGRAM

6.1 TFTLCD Module



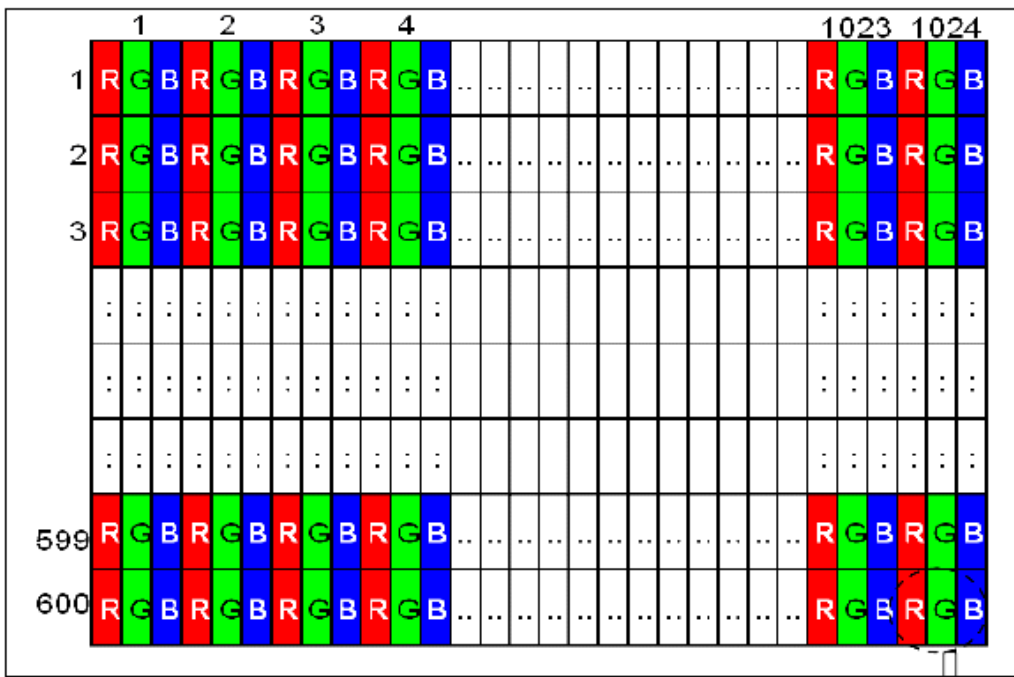
## 6.2 Pixel format

REV=H



R+G+B dots = 1 Pixel

REV=L/NC



R+G+B dots = 1 Pixel

## 7.INTERFACE

### 7.1 Electrical Interface Connection

Pin #	Signal Name	Description	Remarks
1	VDD	Power Supply, 3.3V (typical)	
2	VDD	Power Supply, 3.3V (typical)	
3	VSS	Ground	
4	REV	Reverse Scan selection	
5	Rin1-	-LVDS differential data input	
6	Rin1+	+LVDS differential data input	
7	VSS	Ground	
8	Rin2-	-LVDS differential data input	
9	Rin2+	+LVDS differential data input	
10	VSS	Ground	
11	Rin3-	-LVDS differential data input	
12	Rin3+	+LVDS differential data input	
13	VSS	Ground	
14	ClkIN-	-LVDS differential clock input	
15	ClkIN+	+LVDS differential clock input	
16	GND	Ground	
17	Rin4-	-LVDS differential data input	
18	Rin4+	+VDS differential data input	
19	SEL68	6/8 bits LVDS data input selection(H:8bit ;L/Floating:6bit)	Table 7
20	NC	Not connection	High Active

Signal Name	SYMBOL	MIN.	TYP.	MAX.	UNIT
SEL68	VH	2.0	3.3	5.0	V
	VL	-	-	0.8	V

Pin #	Signal Name	Description	Remarks
1	VCC	Power Supply, 12V (typical)	
2	GND	Ground	
3	EN	3.3V (typical)	
4	PWM	3.3V (typical)	
5	NC	Not Connection	



## 8. Projected capacitive-type Touch panel specification

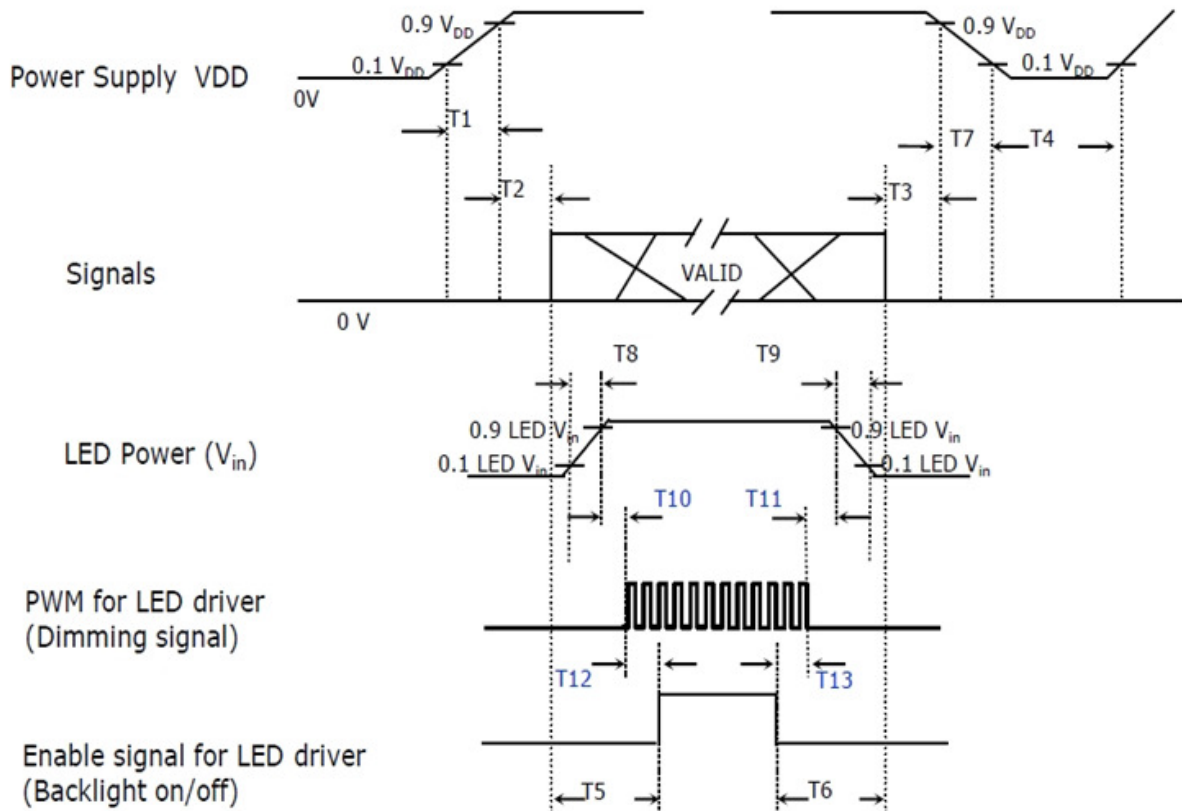
### 8.1 Basic Characteristic

ITEM	SPECIFICATION
Type	Projective Capacitive Touch Panel
Activation	Two-fingers or Signal-finger
X/Y Position Reporting	Absolute Position
Touch Force	No contact pressure required
Calibration	No need for calibration
Report Rate	Approx 25 points/sec
Control IC	<a href="#">EETI EXC7200 +EX5404</a>

### 8.2 Interface

CN6		
Pin No.	Symbol	Function
1	VCC	USB POWER 5V
2	D+	USB Data+
3	D-	USB Data-
4	NC	No connect
5	DGND	USB POWER GND
6	DGND	USB POWER GND

## 9. Power On/Off Sequence



Parameter	Symbol	Unit	min	typ	max
VDD rising Time from 10% to 90%	T1	ms	0.5	--	10
Delay from VDD to valid data at power ON	T2	ms	0	--	50
Delay from valid data OFF to VDD OFF at power OFF	T3	ms	0	--	50
VDD OFF time for Windows restart	T4	ms	500	--	--
Delay from valid data to B/L enable at power ON	T5	ms	200	--	--
Delay from valid data off to B/L disable at power OFF	T6	ms	200	--	--
VDD falling time from 90% to 10%	T7	ms	0	--	10
LED Vin rising time from 10% to 90%	T8	ms	0.5	--	10
LED Vin falling time from 90% to 10%	T9	ms	0.5	--	10
Delay from LED driver Vin rising time 90% to PWM ON	T10	ms	0	--	10
Delay from PWM Off to LED Driver Vin falling time 10%.Must Keep rule	T11	ms	0	--	--
Delay from PWM ON to B/L Enable ON, Must Keep rule	T12	ms	0	--	--
Delay from B/L Enable Off to PWM Off	T13	ms	0	--	--

## 10. RELIABILITY TEST CONDITIONS

Item	Test Conditions	Note
High Temperature Storage	Ta = 85°C 240 hrs	
Low Temperature Storage	Ta = -30°C 240 hrs	
High Temperature Operation	Ts =80°C 240 hrs	
Low Temperature Operation	Ta = -30°C 240 hrs	
Thermal Shock	-20°C /30 min ~ +60°C /30 min 100 cycles	

## **11. HANDLING & CAUTIONS**

### **11.1 Cautions when taking out the module**

Pick the pouch only, when taking out module from a shipping package.

### **11.2 Cautions for handling the module**

11.2.1 As the electrostatic discharges may break the LCD module, handle the LCD module with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.

11.2.2 As the LCD panel and backlight element are made from fragile glass material, impulse and pressure to the LCD module should be avoided.

11.2.3 As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.

11.2.4 Do not pull the interface connector in or out while the LCD module is operating.

11.2.5 Put the module display side down on a flat horizontal plane.

11.2.6 Handle connectors and cables with care.

### **11.3 Cautions for the operation**

11.3.1 When the module is operating, do not lose MCLK, DE signals. If any one of these signals were lost, the LCD panel would be damaged.

11.3.2 Obey the supply voltage sequence. If wrong sequence were applied, the module would be damaged.

### **11.4 Cautions for the atmosphere**

11.4.1 Dewdrop atmosphere should be avoided.

11.4.2 Do not store and/or operate the LCD module in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer-packing pouch and under relatively low temperature atmosphere is recommended.

### **11.5 Cautions for the module characteristics**

11.5.1 Do not apply fixed pattern data signal to the LCD module at product aging.

11.5.2 Applying fixed pattern for a long time may cause image sticking.

### **11.6 Other cautions**

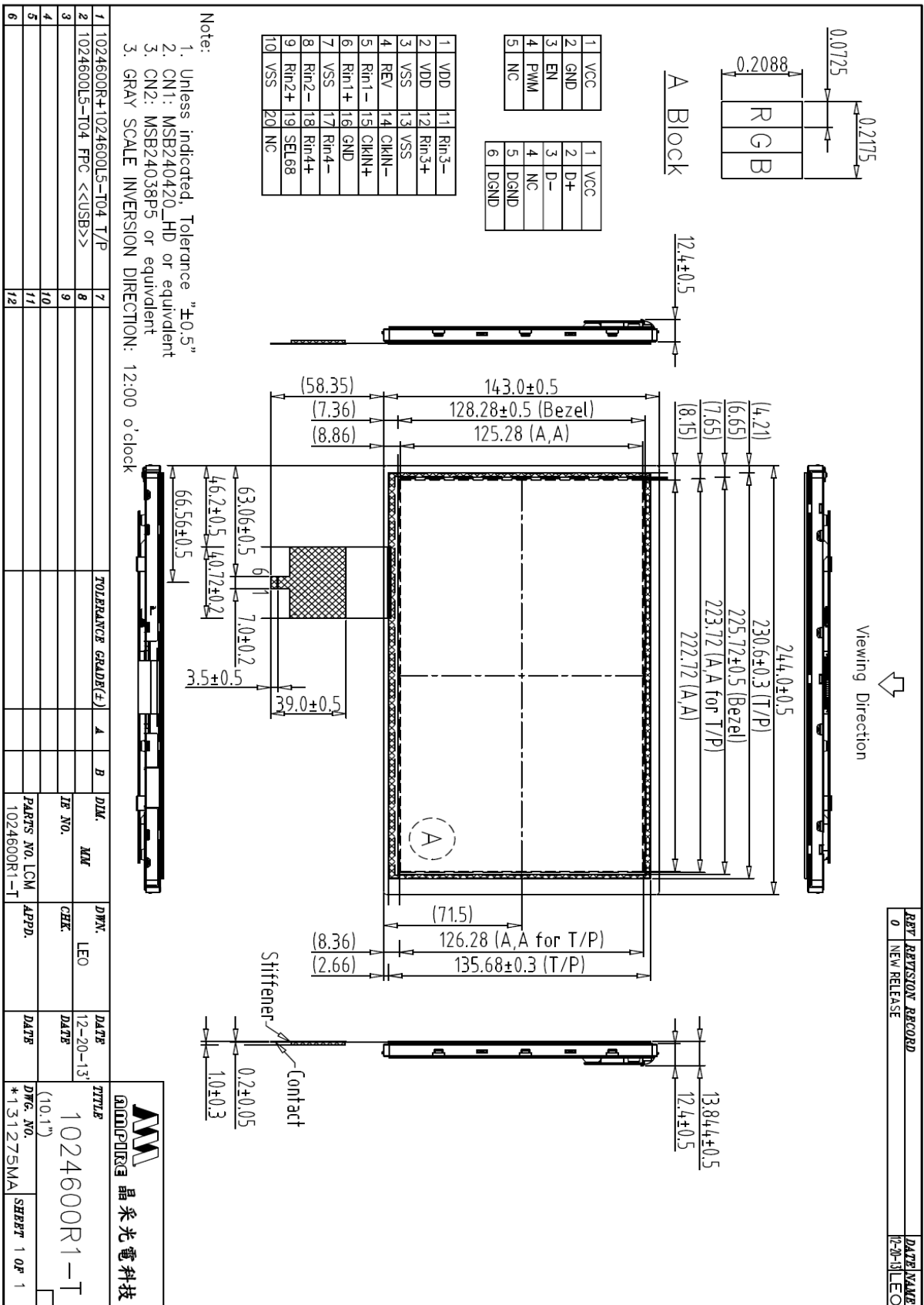
11.6.1 Do not disassemble and/or re-assemble LCD module.

11.6.2 Do not re-adjust variable resistor or switch etc.

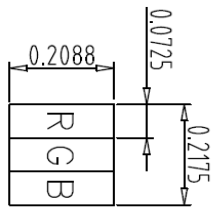
11.6.3 When returning the module for repair or etc, please pack the module not to be broken. We recommend using the original shipping packages.

11.6.4 AMIPRE will provide one year warrantee for all products and three months warrantee for all repairing products.

# 12. OUTLINE DIMENSION



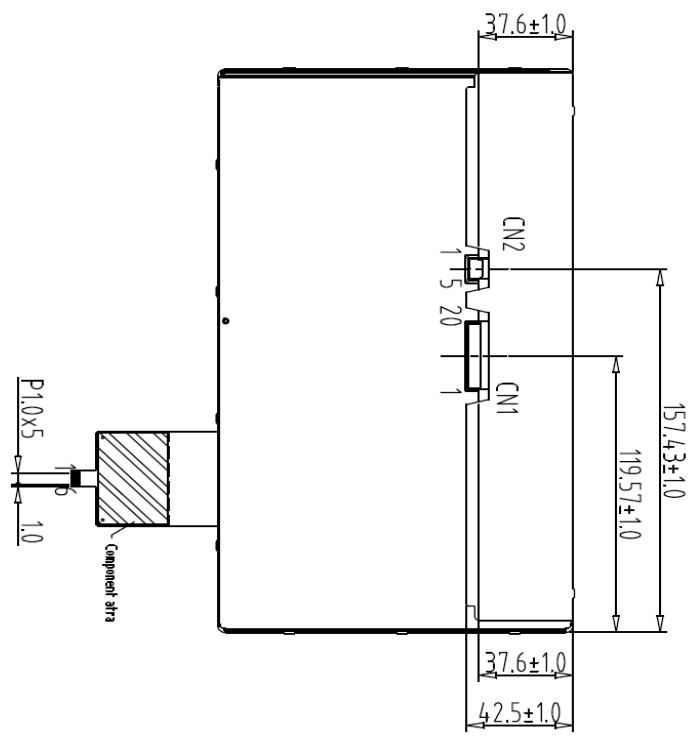
REV	REVISION RECORD	DATE	NAME
0	NEW RELEASE	12-20-13	LEO



A Block

1	VCC	1	VCC
2	GND	2	D+
3	EN	3	D-
4	PWM	4	NC
5	NC	5	DGND
		6	DGND

1	VDD	11	Rin3-
2	VDD	12	Rin3+
3	VSS	13	VSS
4	REV	14	CKIN-
5	Rin1-	15	CKIN+
6	Rin1+	16	GND
7	VSS	17	Rin4-
8	Rin2-	18	Rin4+
9	Rin2+	19	SEL68
10	VSS	20	NC



Back view

- Note:
1. Unless indicated, Tolerance "±0.5"
  2. CN1: MSB240420\_HD or equivalent
  3. CN2: MSB24038P5 or equivalent
  3. GRAY SCALE INVERSION DIRECTION: 12:00 o'clock

1	1024600R+1024600L5-104 T/P	7		TOLERANCE GRADER(+)	A	B	DM.	MM	DVN.	LEO	DATE	TITLE
2	1024600L5-104 FPC <<USB>>	8									12-20-13	1024600R1-T
3		9					IE NO.		CEK		DATE	(10.1")
4		10					PARTS NO/CM-1		APPD.		DATE	*131276MA
5		11					1024600R1-T					SHEET 1 OF 1
6		12										

