SPECIFICATIONS

CUSTOMER :

MODEL NO. : GFTO102AA1024600V

VERSION : A

DATE : 2018.01.09

CERTIFICATION : ROHS

CUSTOMER SIGN :

QA Approved By	Approved By	Prepared By	Prepared By
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Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2018.01.09	A	New		

CONTENTS

1. SPECIFICATIONS

GFTO102AA1024600V is 10.2” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight.

The 10.2" screen produces a high resolution image that is composed of 1024x600 pixel elements in a stripe arrangement. Display 16.2M colors by 8Bit R.G.B signal input. Use 3.3 voltage to drive the power of LCD system, and 12.0 Voltage to drive the LED back light.

General specification are summarized in the following table:

1.1 Features

ITEM	SPECIFICATION			
Panel Size	10.2 inch(panel diagonal)			
Display Area (mm)	222.72(H) x 130.5(V) (10.2-inch diagonal)			
Number of Pixels	1024(H) × 3(RGB) × 600(V)			
Pixel Pitch (mm)	0.2175 (H) × 0.2175 (V)			
Color Pixel Arrangement	RGB vertical stripe			
Display Mode	Normally white			
Number of Colors	16.2M (6Bit+FRC)			
Brightness(cd/m^2)	400(typ.)			
NTSC	70(typ.)；60(min.)			
Contrast Ratio	700(typ.)；500(min.)			
Response Time (Tr+Tf)	25ms(typ.)；30(max.)			
Outline Dimension(mm)		min.	typ.	max.
	Horizontal (H)	234.7	235	235.3
	Vertical (V)	145.5	145.8	146.1
	Depth (D)	5.0	5.3	5.6
Viewing Angle (BL on，CR≧10)	Horizontal：70(typ.);60(min.) Left / 70(ty.p);60(min.) Right			
	Vertical：55(typ.);45(min.) Up / 65(typ.);55(min.) down			
Power Consumption（W）	4.8			
BL unit	LED			
Electrical Interface(data)	LVDS			
Viewing Direction	6 o´clock (Max. contrast ratio, Gray level inversion)			
Weight(g)	250			
Surface Treament	Anti-Glare，Hardness:3H			

1.2 Absolute Maximum Ratings

The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

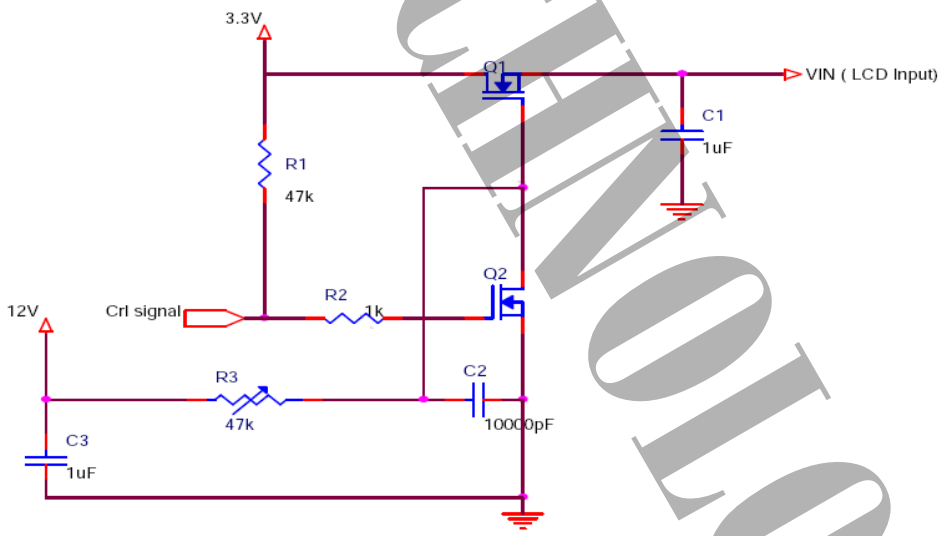
ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	Vcc	-0.3	4.0	V	
LED Supply Voltage	VLED	-0.3	13.0	V	
Static Electricity	VESDc	-200	200	V	【Note2】
	VESDm	-15K	15K	V	
ICC Rush Current	IRUSH	-	1	A	【Note 3】
Operation Temperature	T_{op}	-20	70	℃	【Note 1】
Storage Temperature	T_{stg}	-30	80	℃	【Note 1】

【Note】

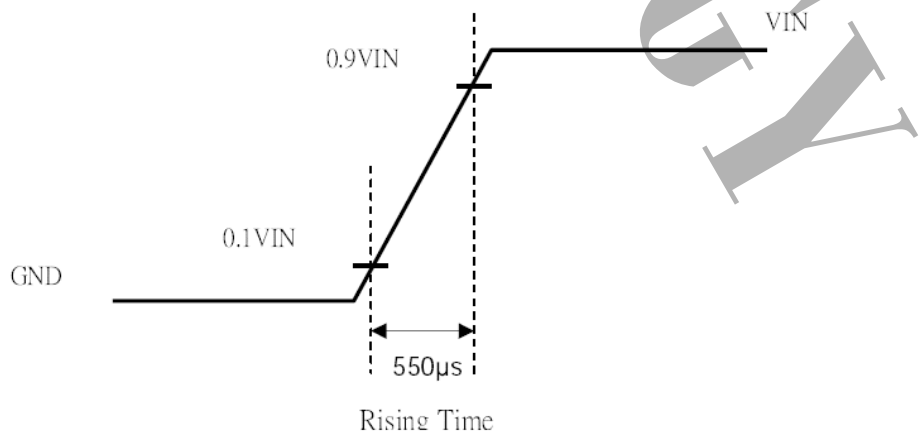
【Note1】If users use the product out off the environmemt operation range（temperature and humidity）,it will concern for visual quality.

【Note2】Test Condition: IEC 61000-4-2 ,
VESDc ：Contact discharge to input connector
VESDm：Discontact discharge to module

【Note3】The input pulse-current measurement system as below：



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



1.3 Electrical Characteristics

TFT LCD Power Voltage

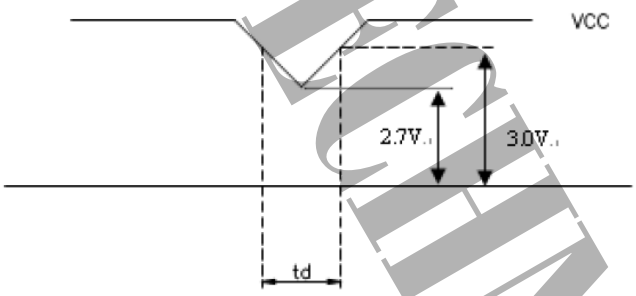
Ta=25℃

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
Power Supply Voltage For LCD		V_{CC}	3.0	3.3	3.6	V	【Note 1】
Power Supply Voltage For LED		V_{LED}	11.5	12	12.5	V	
Logic Input Voltage (LVDS:IN+,IN-)	Input Voltage	VIN	0	-	V_{CC}	V	【Note 2】
	Common Mode Voltage	VCM	1.08	1.2	1.32	V	【Note 2】
	Differential Input Voltage	| VID |	250	350	450	mV	【Note 2】
	Threshold Voltage(high)	VTH	-	-	100	mV	【Note 2】
	Threshold Voltage(low)	VTL	-100	-	-	mV	【Note 2】
ADJ Input Voltage	Input Voltage(high)	VIH	3.0		3.3	V	
	Input Voltage(low)	VIL	GND		0.3	V	

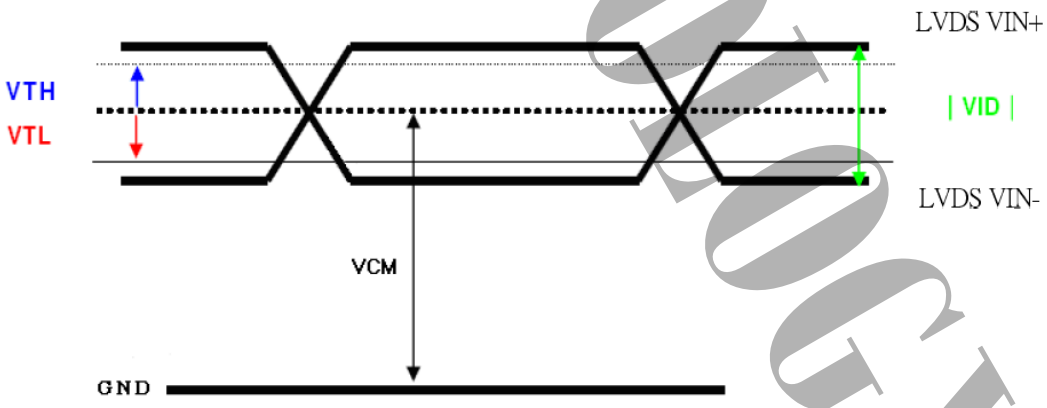
Remarks :

【Note1】 VCC –dip condition:

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.



【Note 2】 LVDS signal



Backlight

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED Lifetime	-	Ta=25℃ IF=20mA	15,000			Hr	

NOTE:

*1) Life time means that estimated time to 50% degradation of initial luminous intensity.

TFT-LCD Current Consumption

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	I_{CC}	--	250	350	mA	【Note1】
LED Power Current	I_{LED}	--	300	450	mA	【Note2】

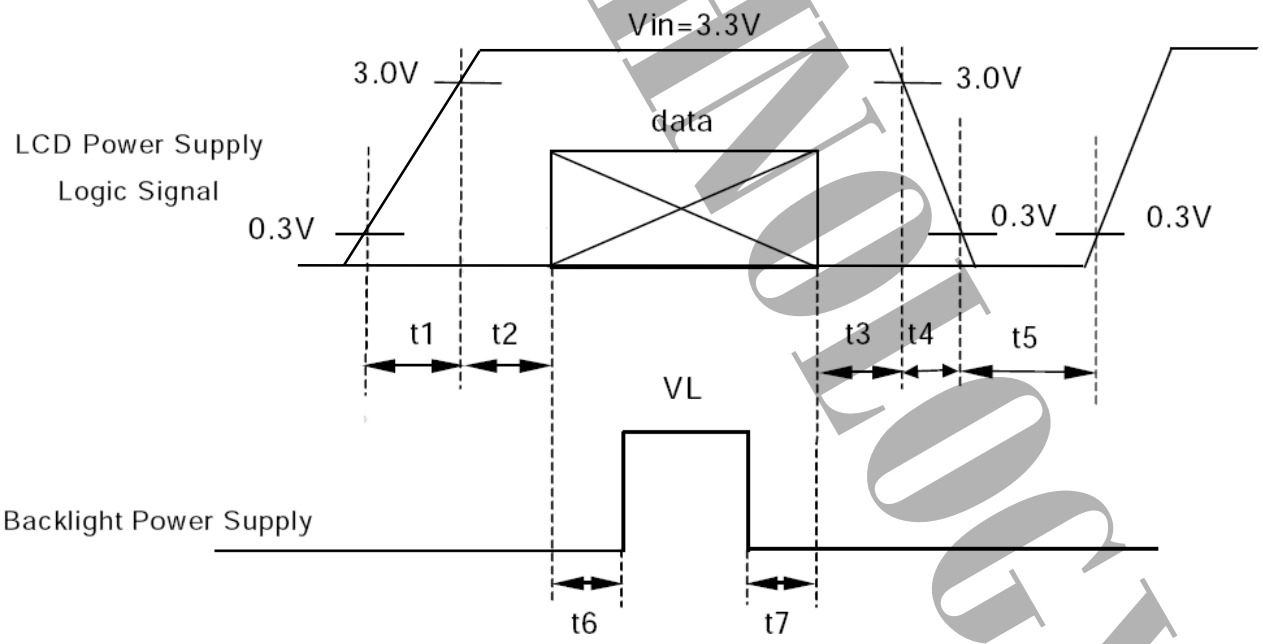
【Note1】 (Frame rate = 60 Hz)
Typical: Under 64 gray pattern @ Vcc = 3.3 V
Maximum: Under black pattern @ Vcc = 3.0 V


(a)64 Gray Pattern


(b)Black Pattern

【Note2】 Typical: When V_{LED} is 12.0V
Maximum: When V_{LED} is 11.5V

Power 、Signal Sequence



Data: RGB DATA, DCLK, DENA

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

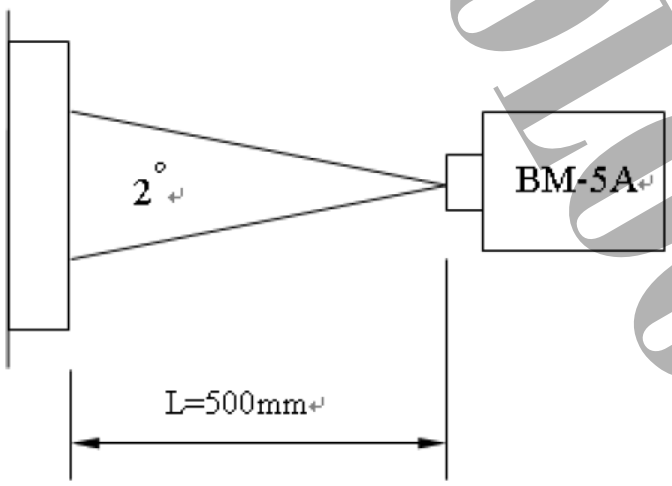
1.4 Optical Characteristics

Ta = 25°C, V_{CC} =3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Constrast Ratio		CR	Point-5	500	700	–	--	*1)*2)*3)
Luminance*)		Lw	Point-5	360	400	--	cd/m^2	*1)*3)
NTSC		NTSC		60	70	--	%	*1)*3)
Luminance Uniformity		☒		70	80		%	*1)*3)
ResponseTime(White-Black)		Tr+Tf	Point-5	--	25	30	ms	*1)*3)*5)
Viewing Angle	Horizontal	Left (ψ)	CR≧10 Point-5	60	70	–	°	*1)*2)*4)
		Right (ψ)		60	70	–	°	*1)*2)*4)
	Vertical	Up (θ)		45	55	--	°	*1)*2)*4)
		Down (θ)		55	65	–	°	*1)*2)*4)
Color Coordinate	White	Wx Wy	θ= φ= 0° Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	*1)*3)
	Red	Rx Ry		0.613 0.304	0.653 0.344	0.693 0.384		
	Green	Gx Gy		0.309 0.565	0.349 0.605	0.389 0.645		
	Blue	Bx By		0.107 0.019	0.147 0.059	0.187 0.099		

NOTE :

*1)Measure condition : 25℃ ±2℃ , 60±10%RH , under **1** Lux in the dark room.BM-5A (TOPCON), viewing angle2°, V_{CC}=3.3V ,V_{LED}=12V.



*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 figure8-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure8-1
ΔL = [L(MIN)/L(MAX)]×100

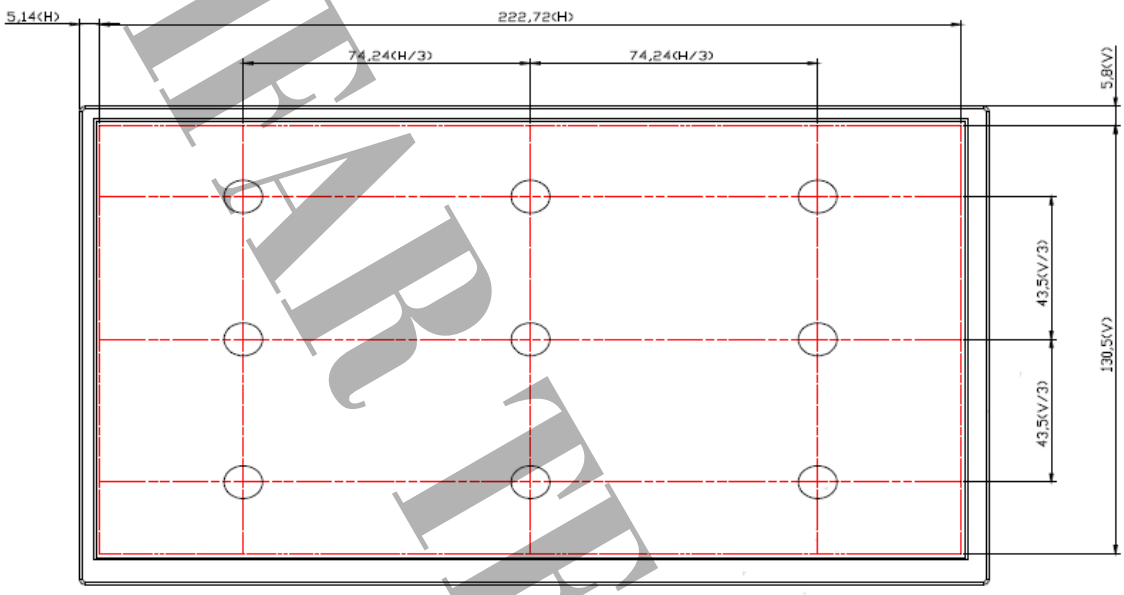


Fig8-1 Measuring point

*4) Definition of Viewing Angle(θ,ψ),refer to Fig8-2 as below：
These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

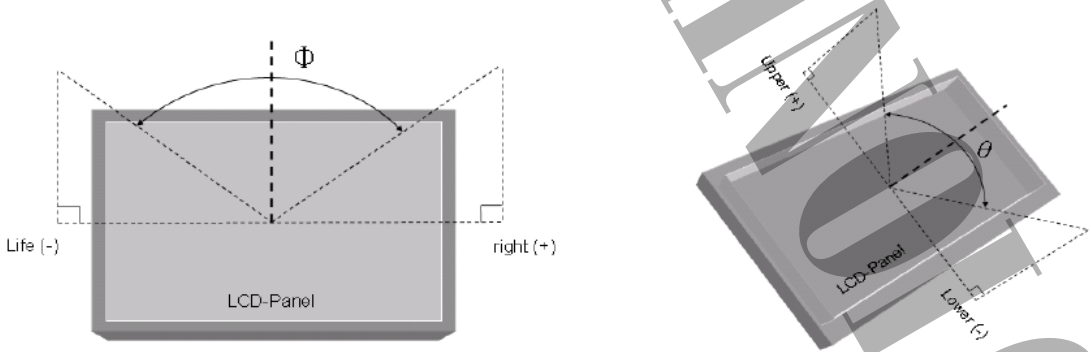


Fig8-2 Definition of Viewing Angle

*5) Definition of Response Time.(White-Black)

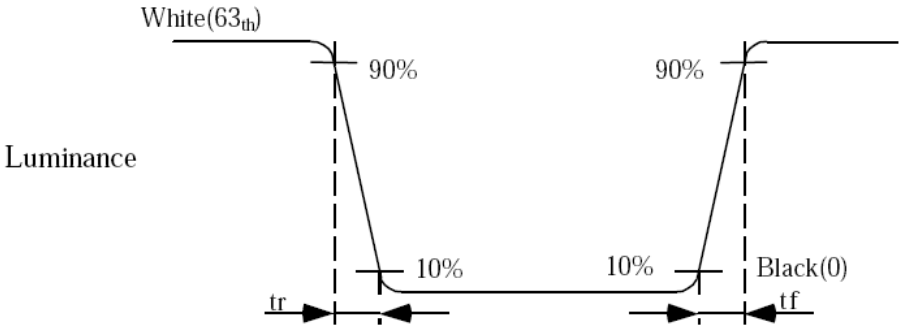


Fig8-3 Definition of Response Time(White-Black)

2. MODULE STRUCTURE

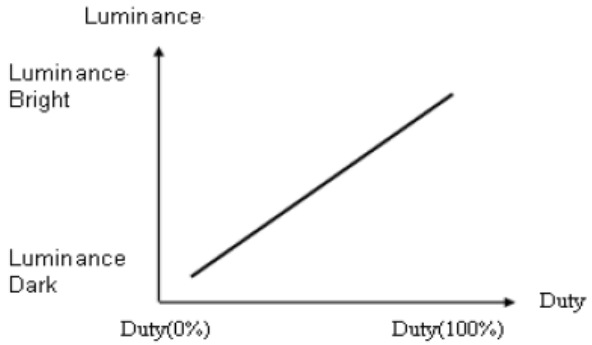
2.1 Interface Pin Description

CN1：Connector type：MSBK2407P30D (STM) or compatible.

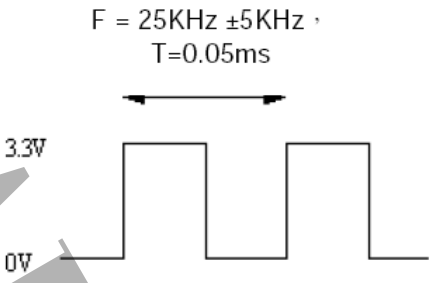
Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	V_{CC}	+3.3V Power
3	V_{CC}	+3.3V Power
4	NC	NC
5	ADJ	Adjust for LED brightness
6	SELB	6bit/8bit mode select
7	NC	NC
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	RXIN3-	LVDS Signal(-)—channel 3
21	RXIN3+	LVDS Signal(+)—channel 3
22	GND	Ground
23	GND	Ground
24	V_{LED}	Power Supply for LED(V_{LED} =12.0±0.5)
25	V_{LED}	Power Supply for LED(V_{LED} =12.0±0.5)
26	V_{LED}	Power Supply for LED(V_{LED} =12.0±0.5)
27	NC	NC
28	NC	NC
29	NC	NC
30	NC	NC

【Note】

1) ADJ adjust brightness to control Pin，Pulse duty the bigger the brighter.



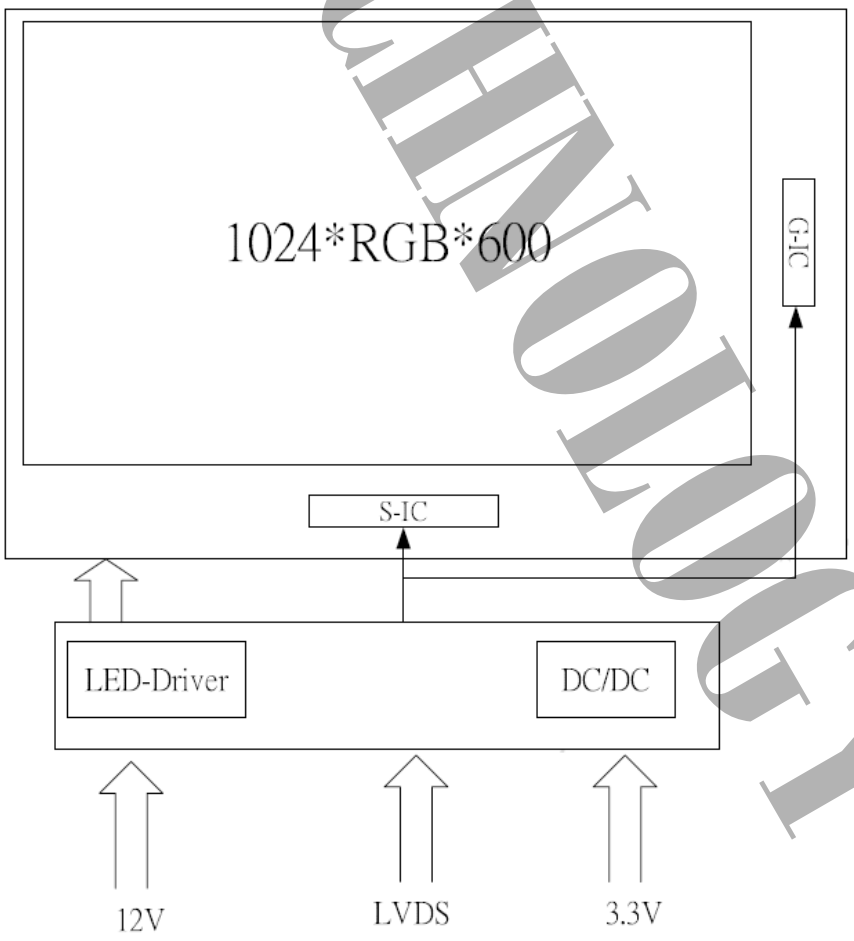
2) ADJ signal=0~3.3V，operation frequency：25KHZ±5KHz, ADJ pin shound not connect to GND, it shound pull-high if not adjust brightness.



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

4) if LVDS input data is 6bits, SELB must be set to High
if LVDS input data is 8bits, SELB must be set to Low

2.2. BLOCK DIAGRAM

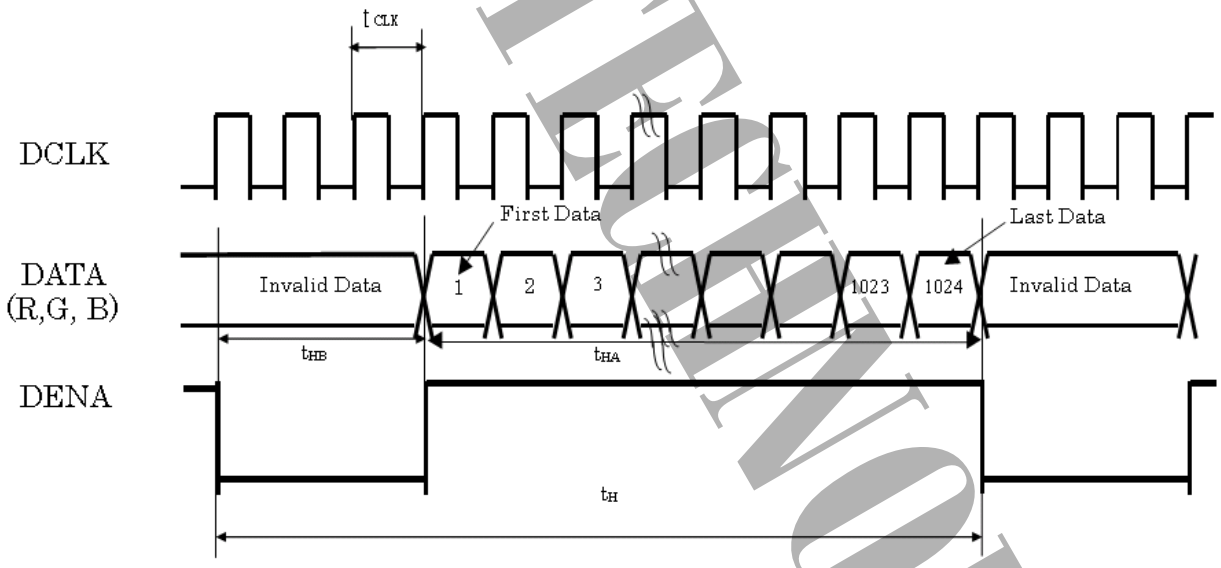


2.3. Timing Characteristics of Input Signals

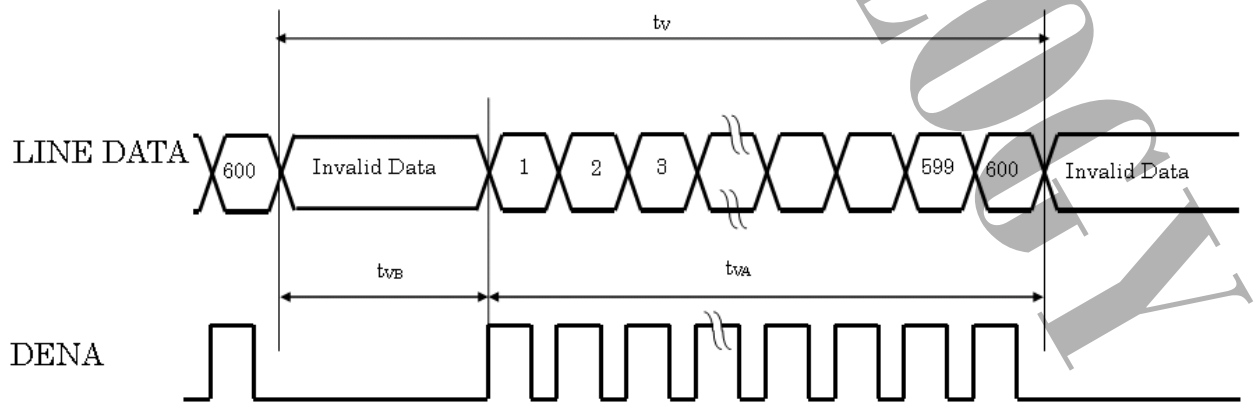
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LVDS input signal sequence	CLK Frequency			tCLK	41	45	50	MHz
	CLK Period			tCLK	24.39	22.22	20.00	ns
LCD input timing	DENA	Horizontal	Horizontal Period	t_H	1194	1200	1240	tCLK
			Horizontal Valid	t_{HA}	1024	1024	1024	tCLK
			Horizontal Blank	t_{HB}	170	176	216	tCLK
		Vertical	Frame	fV	55	60	65	Hz
			Vertical Period	t_V	624	625	638	t_H
			Vertical Valid	t_{VA}	600	600	600	t_H
			Vertical Blank	t_{VB}	24	25	38	t_H

2.3.1 Timing Sequence(Timing Chart)

Horizontal Timing Sequence

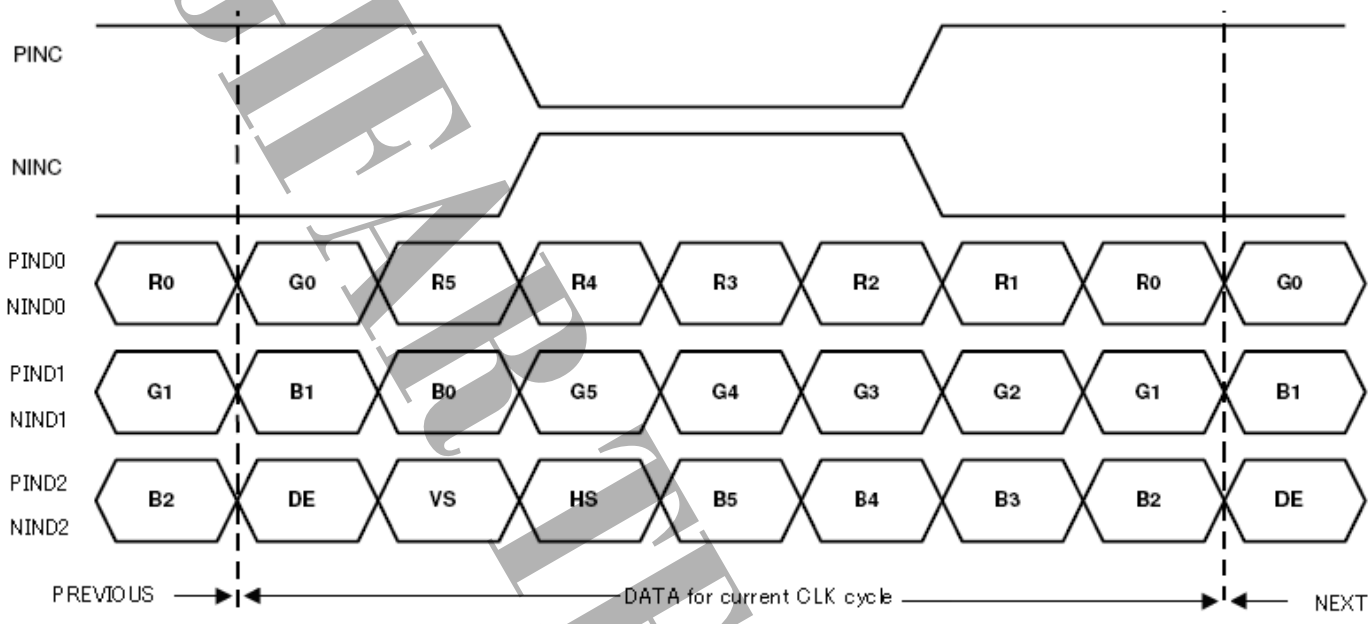


Vertical Timing Sequence

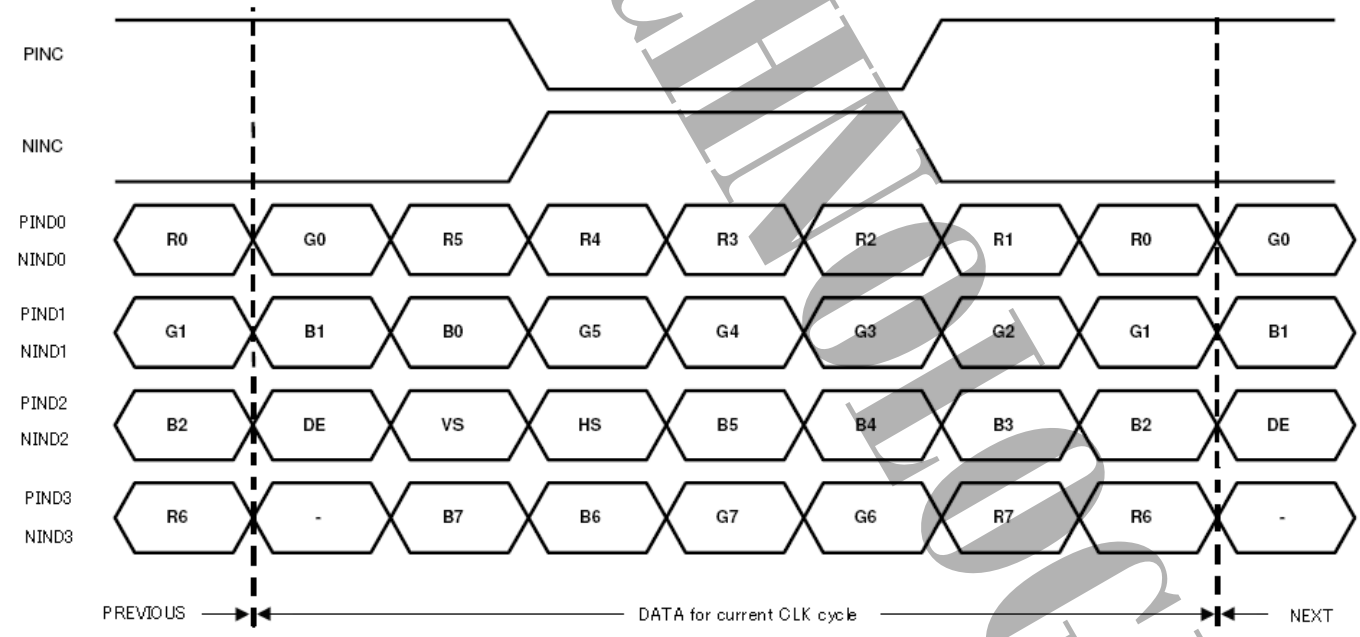


2.3.2 LVDS Input Data Mapping

6 Bit LVDS input



8 Bit LVDS input



2.4 Color Data Reference

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

【Note1】Definition of Gray Scale
color(n)：n is series of Gray Scale. The more n value is, the bright Gray Scale.
【Note2】Data:1-High,0-Low

3. RELIABILITY TEST

3.1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70℃ , 240Hrs	
High Temperature Storage	80℃ , 240Hrs	
High Temperature High Humidity Operation	60℃ , 90%RH , 240Hrs	No condensation
Low Temperature Operation	-20℃ , 240Hrs	
Low Temperature Storage	-30℃ , 240Hrs	
Thermal Shock	-30℃(1Hr) ~ 80℃(1Hr) , 100 cycles	
Image Sticking	25 ℃± 2 ℃ ; 4hrs	Note

【Note】
Condition of Image Sticking test：25 ℃± 2 ℃
Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .

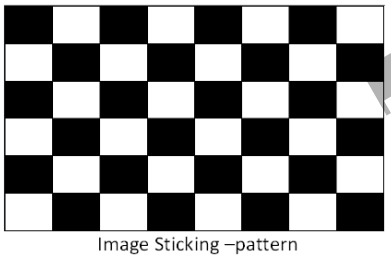


Image Sticking –pattern


Mid-Gray pattern

3.2 Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level:980m/s^2(equel to 100G) ● Waveform:half sinusoidal wave,6ms. ● Number of shocks: ±X , ±Y , ±Z , each axis 1times, total 6 times
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stroke:1.3mm ● Vibration:sinusodial wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min

3.3 ESD Test

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

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

3.4 Judgment Standard

The Judgment of the above test should be made as follow:

The specimen shall then remain under standard atmospheric conditions for recovery for a period adequate for the attainment of temperature stability

The specimen must be in the room temperature with a minimum of 4 hrs.

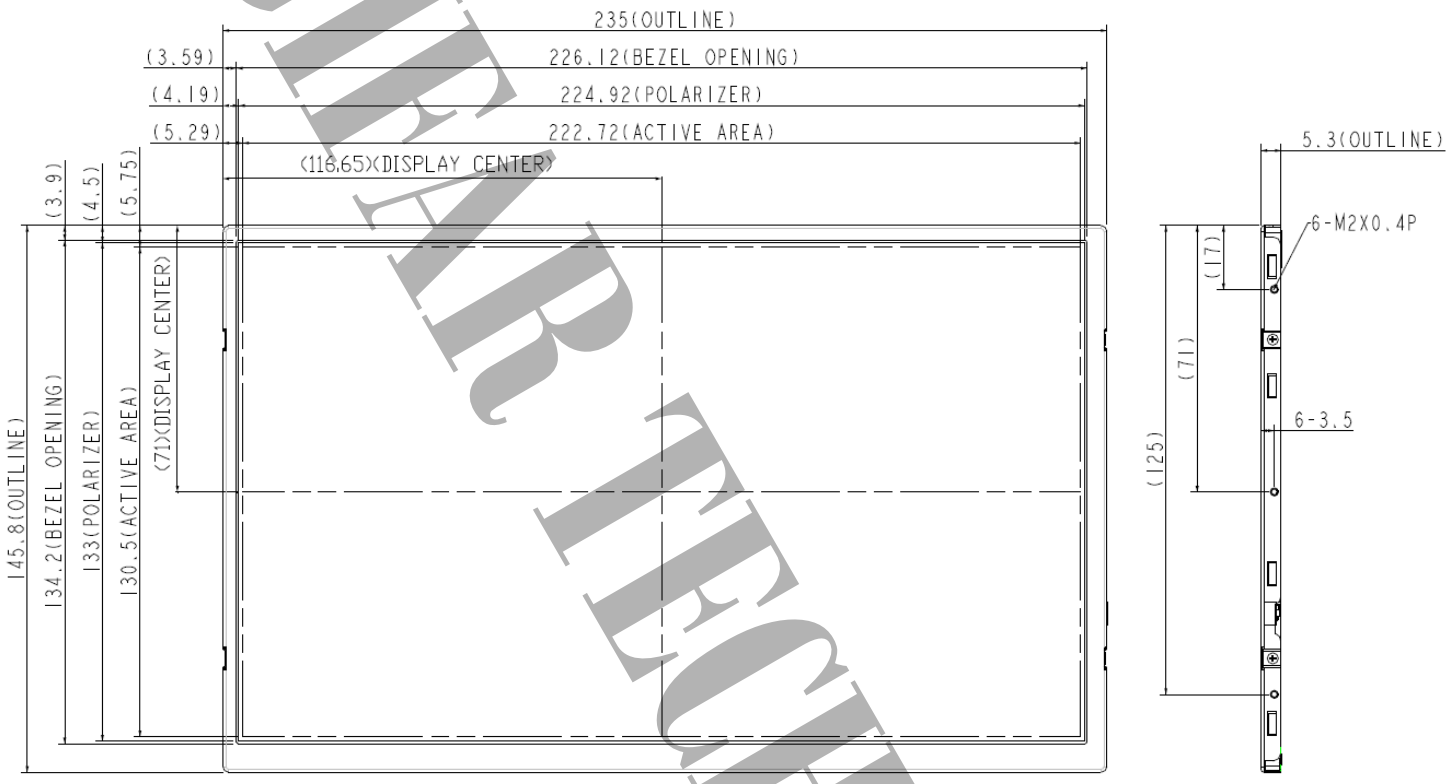
Pass: Normal display image with no line defect.

Fail: No display image, function NG or line defects.

4. LCM Drawing

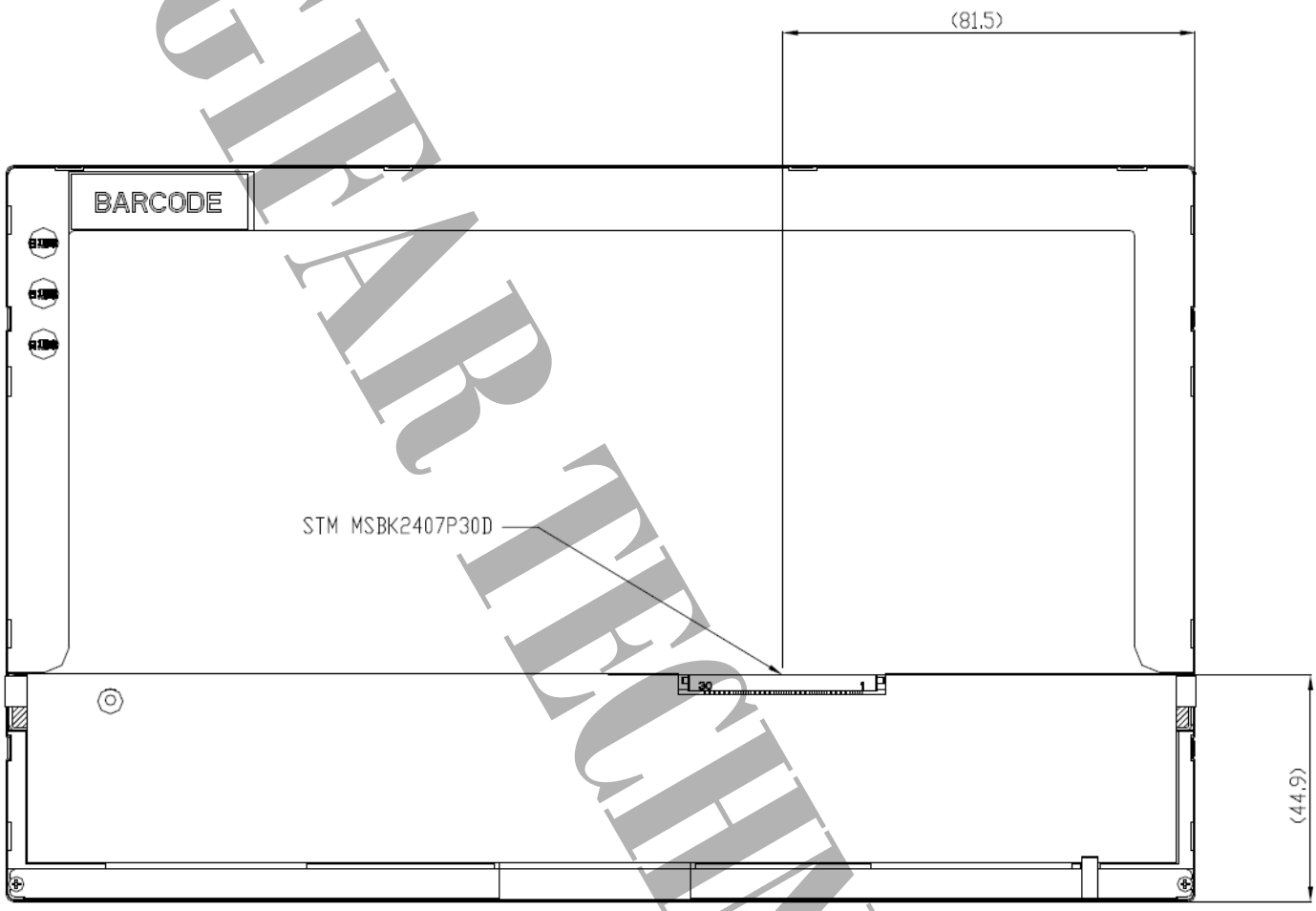
4.1 Front Side

[Unit：mm]



NOTES:
1. GENERAL TOLERANCE:±0.3mm.
2. ALLOW ED DEPTH OF USERHOLE SCREW INSERTION IS 1.5mm MAX.
3. USERHOLE SCREW OF TORQUE=2.5 kgf/cm MAX.

4.2 Rear Side **[Unit：mm]**



[Note]：Tolerance is ±0.3mm

5. WARRANTY

5.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

5.2 The warranty will be avoided in case of defect induced by customer.