



SPECIFICATIONS

CUSTOMER : _____

MODEL NO. : **GFTO104GA1024768V**

VERSION : **A**

DATE : **2018.01.09**

CERTIFICATION : **ROHS**

CUSTOMER SIGN : _____

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Revision Record

Data(y/m/d)	Ver.	Description	Note	page
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1. SPECIFICATIONS

GFTO104GA1024768V is 10.4" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight.

The 10.4" screen produces a high resolution image that is composed of 1024×768 pixel elements in a stripe arrangement. Display 262K colors by 6 Bit R.G.B signal input.

General specification are summarized in the following table :

1.1 Features

ITEM	SPECIFICATION
Panel Size	10.4 inch(panel diagonal)
Display Area (mm)	211.2(H)×158.4(V) (10.4-inch diagonal)
Number of Pixels	1024(H) × 3(RGB) × 768(V)
Pixel Pitch (mm)	0.20625 x0. 20625
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of colors	262,144
Brightness(cd/m ²)	400(typ.)
Response Time (Tr+Tf)	25 ms
Module Size (mm)	236(W)×174.3(H)×7.4(D) (with PWB and Component)
Viewin Angle(BL on,CR ≥ 10)	150 degree(H) · 140 degree(V)
Power consumption (W)	4.0W(typ) / 4.3W(max)
BL unit	LED
Electrical Interface(data)	LVDS
Viewing Direction	6 o'clock (Max contrast ratio, Gray Level Inversion)
Weight(g)	385 (g)
Surface Treament	Anti-Glare · Hardness:3H

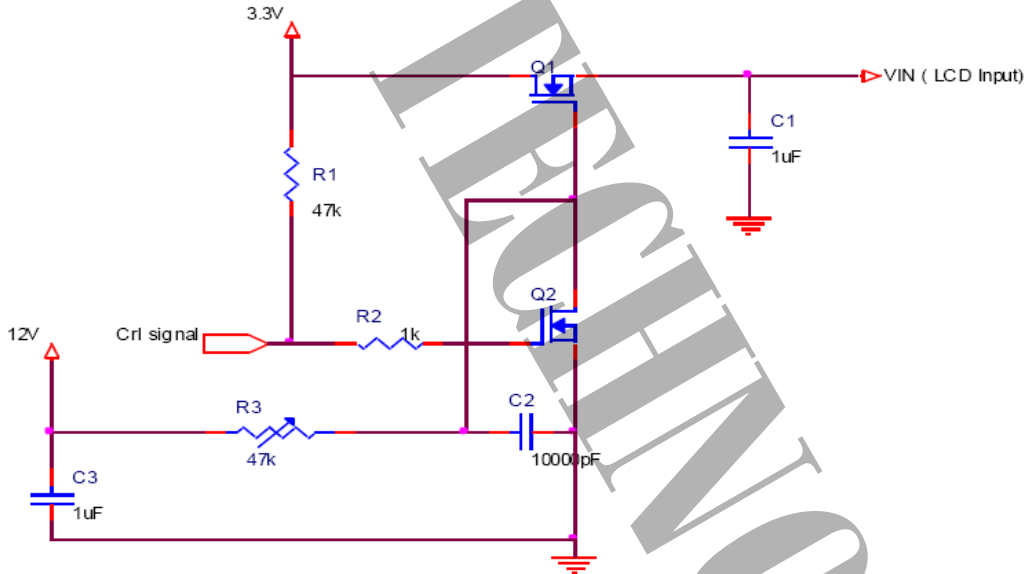


1.2 Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	V _{cc}	-0.3	4.0	V	
LED Supply Voltage	V _{LED}		10.65	V	
ICC Rush Current	IRUSH	-	1	A	【Note 2】
Operation Temperature	T _{op}	-20	70	°C	【Note 1】
Storage Temperature	T _{stg}	-30	80	°C	【Note 1】
Forward Current (per LED)	I _f		30	mA	
Reverse Voltage (per LED)	VR		5	V	
Pulse forward current (per LED)	I _{fp}		100	mA	【Note 3】

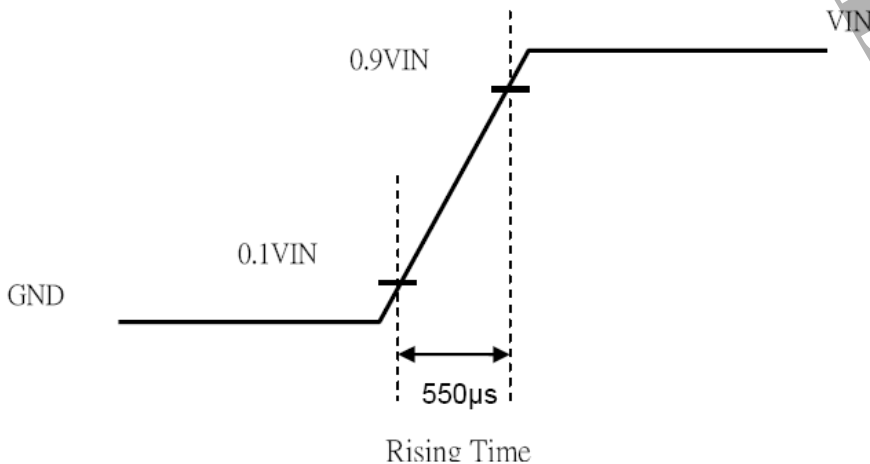
【Note1】 If users use the product out off the environment operation range (temperature and humidity,it will concern for visual quality.

【Note2】 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.

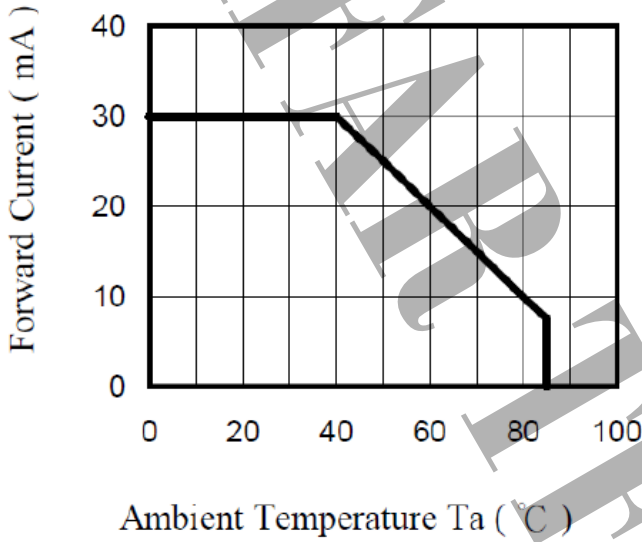




【Note3】 Ifp Conditions : Pulse Width $\leq 10\text{msec}$, Duty $\leq 1/10$.

【Note4】 Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.

Forward Current vs.
Ambient Temperature





1.3 Electrical Characteristics

TFT LCD Power Voltage

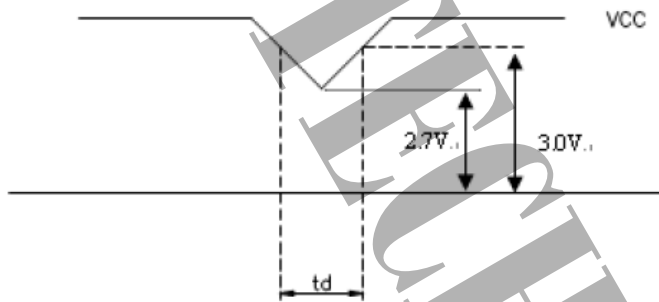
Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE	
Power Supply Voltage For LCD	V _{CC}	3.0	3.3	3.6	V	【Note 1】	
Logic Input Voltage (LVDS:IN+,IN-)	Common Mode Voltage	V _{CM}	1.08	1.2	1.32	V	【Note 2】
	Differential Input Voltage	V _{ID}	250	350	450	mV	【Note 2】
	Threshold Voltage(high)	V _{TH}	-	-	100	mV	【Note 2】
	Threshold Voltage(low)	V _{TL}	-100	-	-	mV	【Note 2】

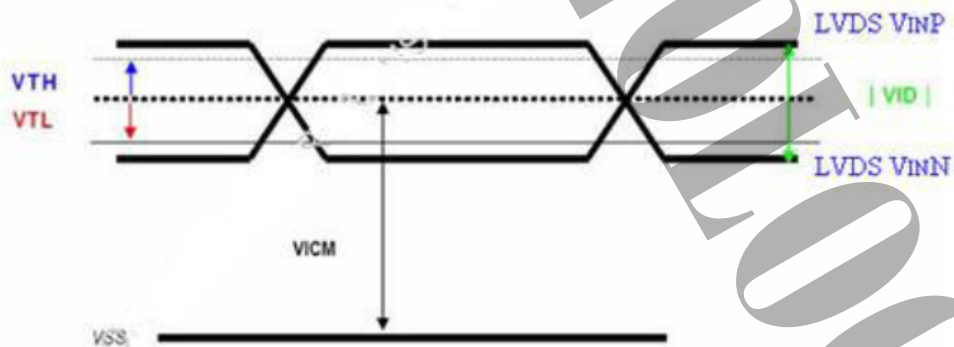
Remarks :

【Note1】 VCC –dip condition:

- 1) When $2.7\text{ V} \leq V_{CC} < 3.0\text{V}$, $t_d \leq 10\text{ms}$.
- 2) $V_{CC} > 3.0\text{V}$, VCC-dip condition should be same as VCC-turn-on condition.



【Note 2】 LVDS signal





TFT-LCD Current Consumption

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
LCD Power Current	I_{CC}	--	450	500	mA	【Note1】

【Note1】 (Frame rate = 60 Hz)

Typical: Under 64 gray pattern @ $V_{CC} = 3.3\text{ V}$

Maximum: Under black pattern @ $V_{CC} = 3.0\text{ V}$

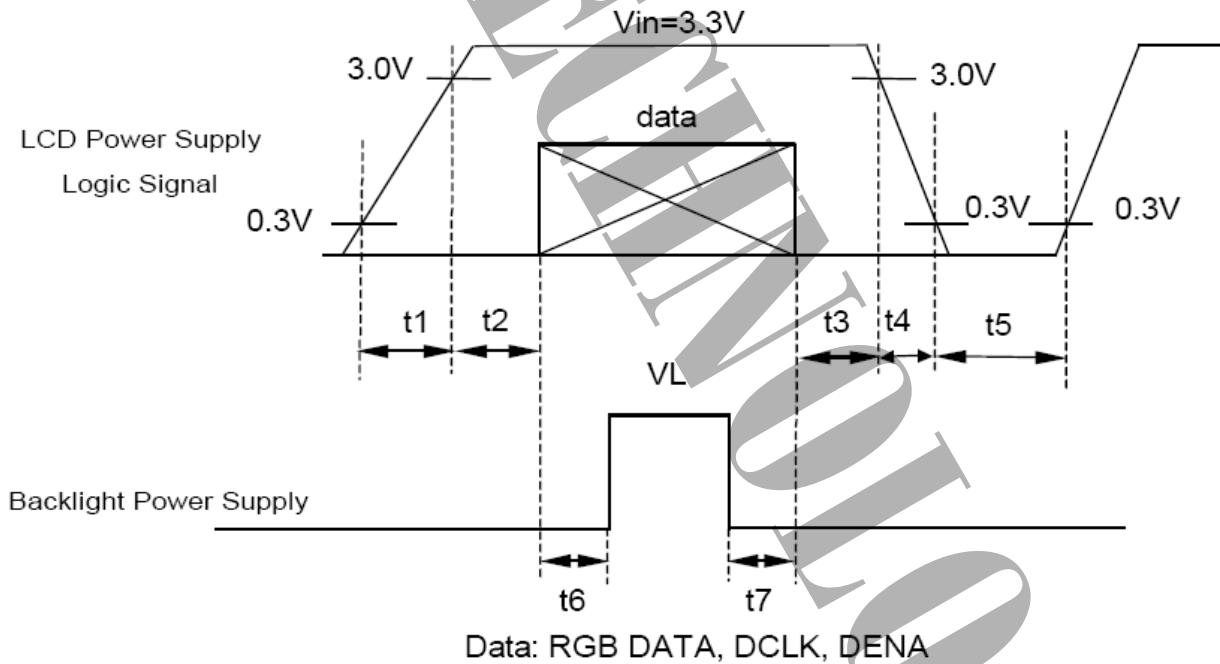


(a)64 Gray Pattern



(b)Black Pattern

Power 、 Signal Sequence



$0.5 < t_1 \leq 10\text{ms}$
 $0 < t_2 \leq 50\text{ms}$
 $0 < t_3 \leq 50\text{ms}$
 $0 < t_4 \leq 10\text{ms}$

$200\text{ms} \leq t_5$
 $200\text{ms} \leq t_6$
 $200\text{ms} \leq t_7$



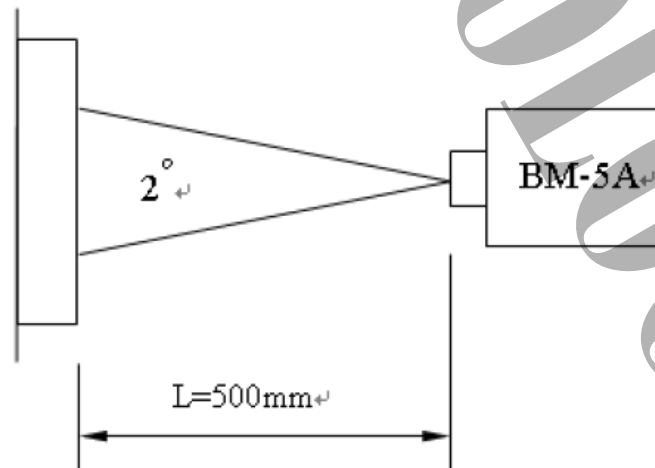
1.4 Optical Characteristics

Ta = 25°C, V_{CC} = 3.3V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Constrast Ratio	CR	Point-5	400	500	--	--	*1)*2)*3)
Luminance*)	Lw	Point-5	320	400	--	cd/m ²	*1)*3)
Luminance Uniformity	ΔL		70	80		%	*1)*3)
Response Time (White - Black)	Tr+ Tf	Point-5		25	30	ms	*1)*3)*5)
Viewing Angle	Left	Deg.	65	75			*1)*2)*4)
	Right	Deg.	65	75			*1)*2)*4)
	Upper	Deg.	50	60			*1)*2)*4)
	Lower	Deg.	70	80			*1)*2)*4)
NTSC			42	47	--	%	
Color Coordinate	White	Wx	0.273	0.313	0.353	--	*1)*3)
		Wy	0.289	0.329	0.369		
	Red	Rx	0.528	0.568	0.608		
		Ry	0.287	0.327	0.367		
	Green	Gx	0.308	0.348	0.388		
		Gy	0.533	0.573	0.613		
	Blue	Bx	0.120	0.160	0.200		
		By	0.064	0.104	0.144		

NOTE :

*1)Measure condition : 25°C±2°C , 60±10%RH , under10 Lux in the dark room.BM-5A (TOPCON) , viewing angle2° , IL=260mA , after 10 minutes operation.



*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 figure7-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure7-1

$$\Delta L = [L(\text{MIN})/L(\text{MAX})] \times 100$$

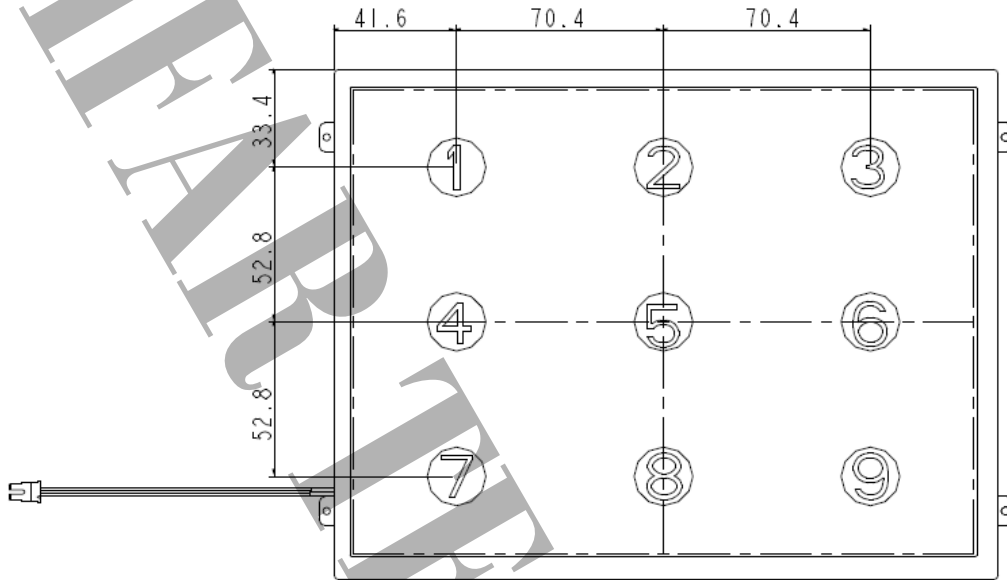


Fig7-1 Measuring point

- *4) Definition of Viewing Angle(θ, ψ), refer to Fig7-2 as below :
These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

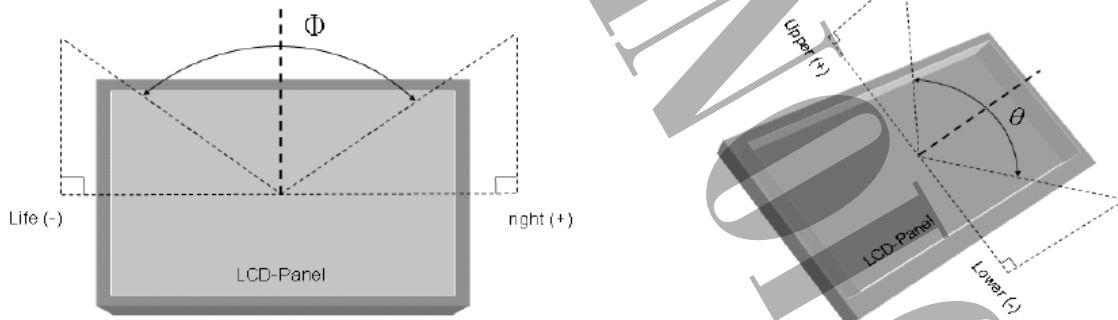


Fig8-2 Definition of Viewing Angle

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

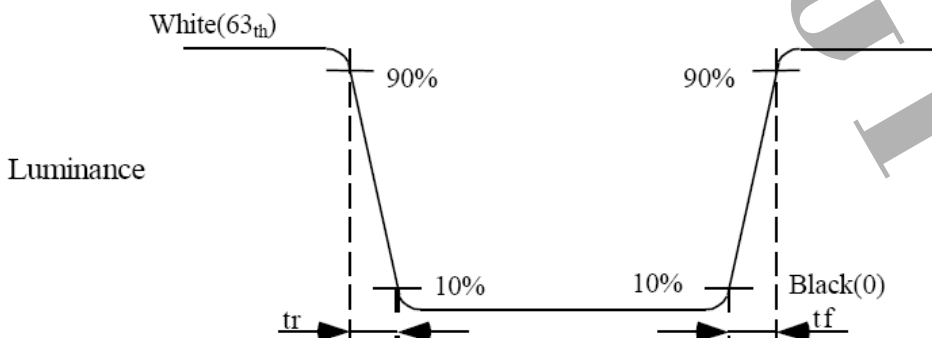


Fig8-3 Definition of Response Time(White-Black)

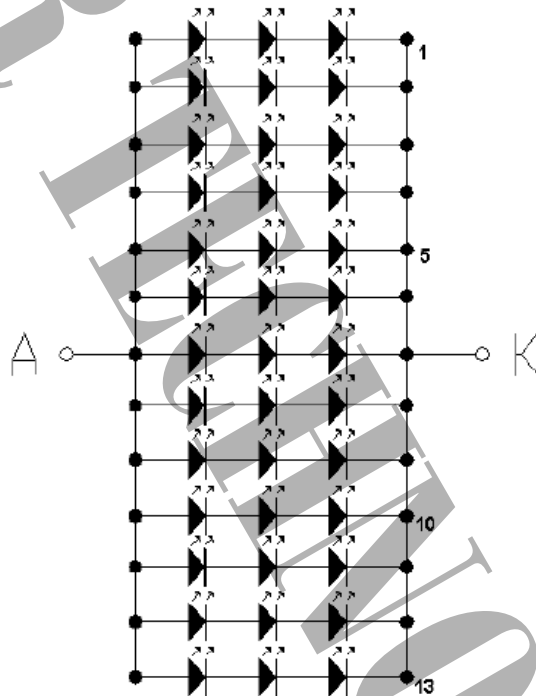


1.5 Backlight Characteristics

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARKS
LED Current	IL	Ta=25°C (20mA/serise)	--	260	--	mA	Note 1,2
LED Voltage	VL	Ta=25°C (20mA/serise)	8.55	9.6	10.65	V	Note 1,2
Power Consumption	WL	Ta=25°C (20mA/serise)	--	2.496	2.769	W	Note 1,2
LED Lifetime	-	Ta=25°C IF=20mA	30000	-	-	Hr	Note 3,4,5

Remarks :

*1)LED Circuit Diagram :



*2) A : Anode(+) , K : Cathode(-)

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) DEFINITION OF LED LIFETIME : LUMINANCE < INITIAL LUMINANCE 50%



2. MODULE STRUCTURE

2.1 Interface Pin Description

LCD connector (30pin) : STM · P/N : MSBK2407P30D or other of the same class

Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	V _{CC}	+3.3V Power
3	V _{CC}	+3.3V Power
4	NC	NC
5	NC	NC
6	NC	NC
7	GND	GND
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	NC	NC
21	NC	NC
22	GND	Ground
23	GND	Ground
24	NC	NC
25	NC	NC
26	NC	NC
27	NC	NC
28	NC	NC
29	NC	NC
30	NC	NC

【Note】

- 1) GND Pin must be connected to ground. Don't be floating.
- 2) NC Pin must be floating.

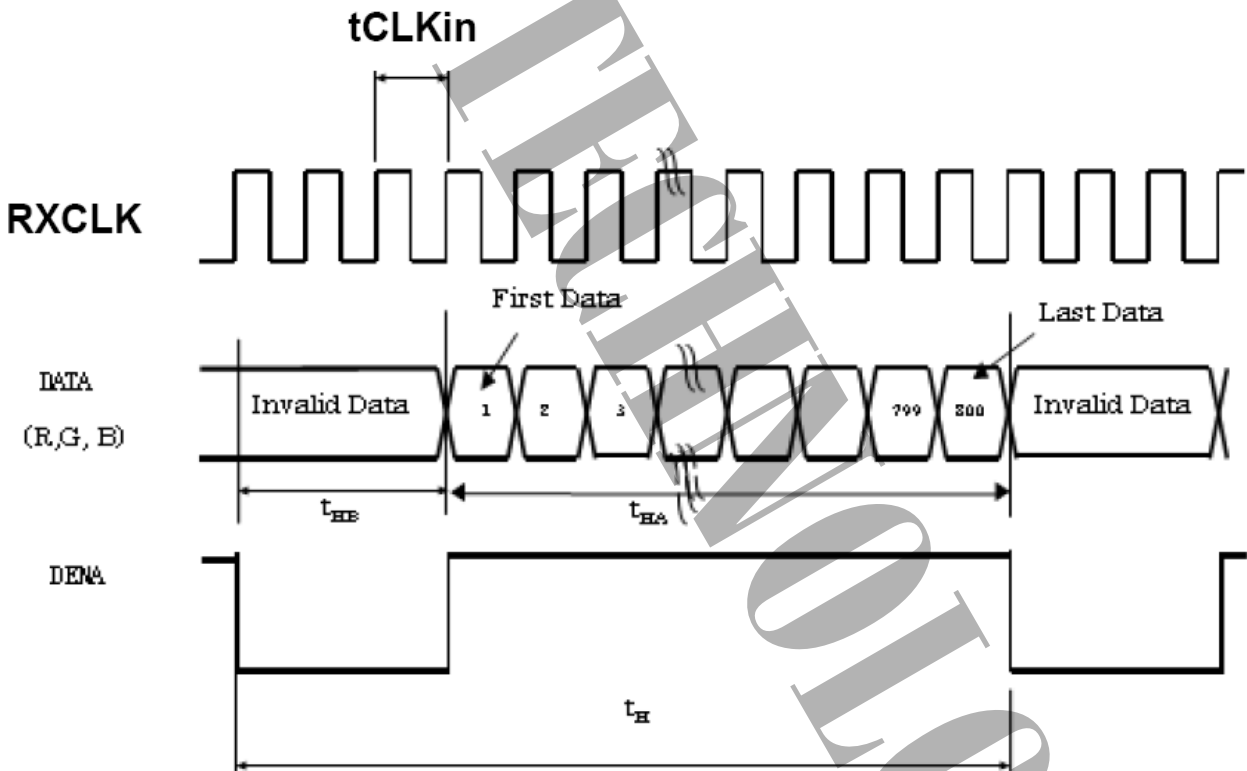


2.2. Timing Characteristics of Input Signals

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	
LVDS input signal sequence	CLK Frequency	fCLKin	51	65	71	MHz	
LCD input timing	Horizontal	Horizontal Period	t _H	1160	1344	1350	tCLK
		Horizontal Valid	t _{HA}	1024			tCLK
		Horizontal Blank	t _{HB}	136	320	326	tCLK
	Vertical	Frame	fV	55	60	65	Hz
		Vertical Period	t _V	790	806	810	t _H
		Vertical Valid	t _{VA}	768			t _H
		Vertical Blank	t _{VB}	22	38	42	t _H

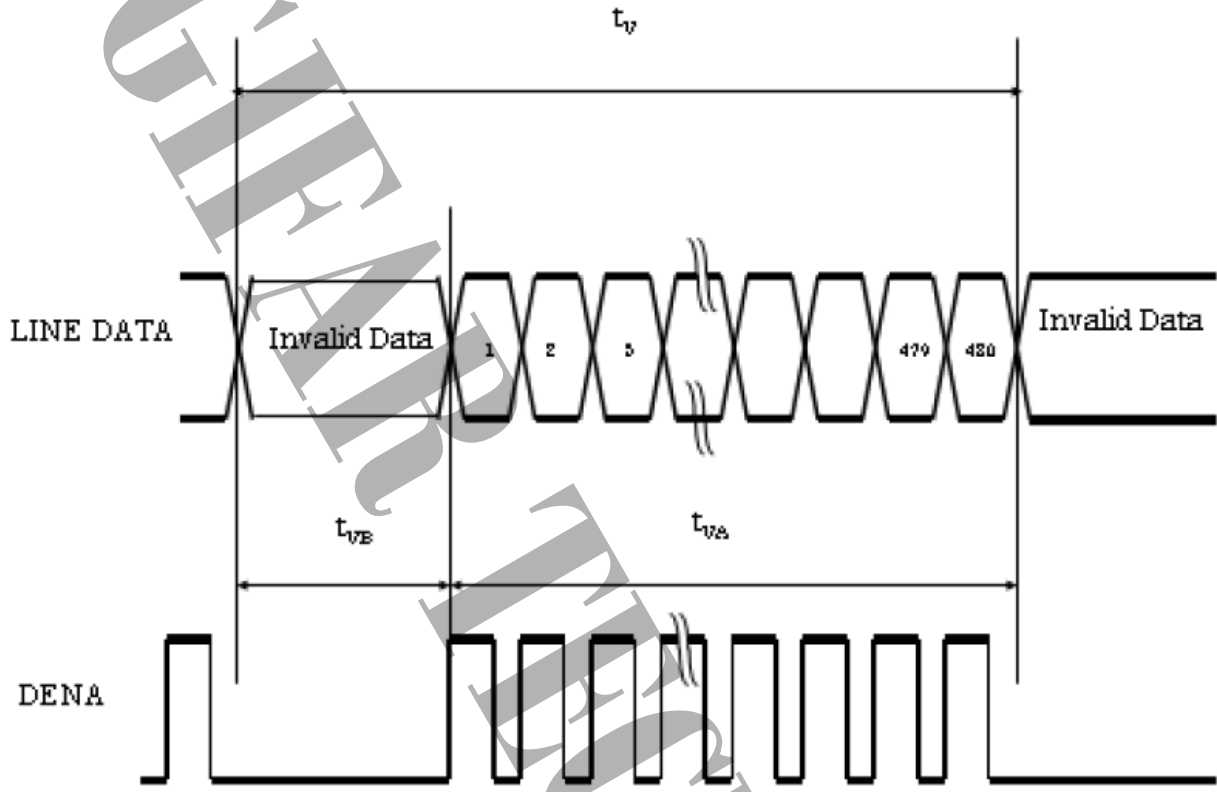
2.2.1 Timing Sequence (Timing Chart)

Horizontal Timing Sequence

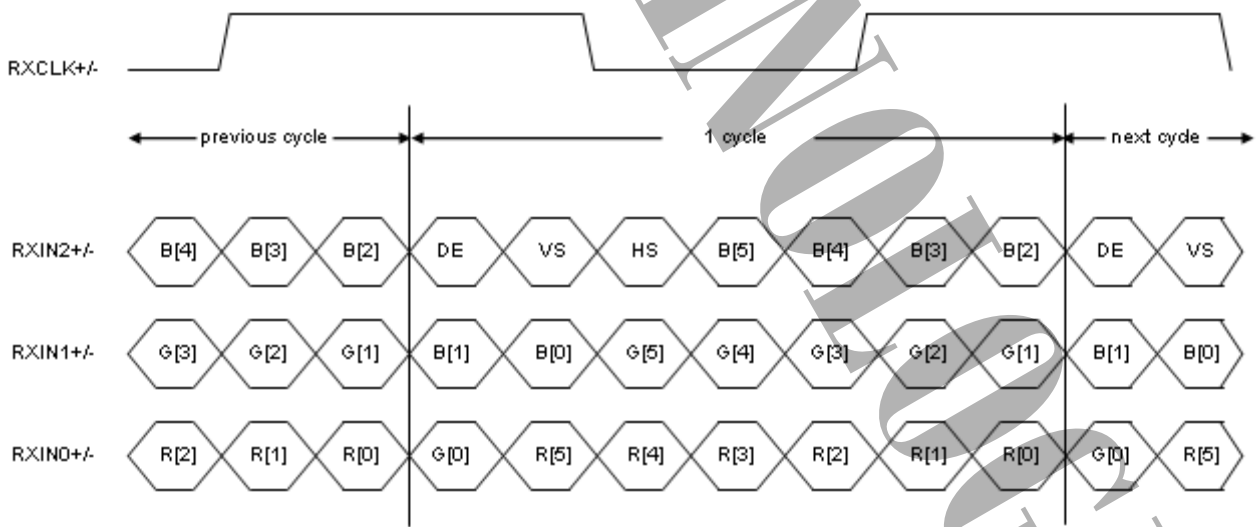




Vertical Timing Sequence



LVDS Input Data Mapping





2.3 Color Data Reference

COLOR	INPUT	R DATA						G DATA						B DATA					
	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	1	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	1	0	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) means the level of gray scale, the larger (n) means the brighter level.

【Note2】 Data:1-High,0-Low



3. RELIABILITY TEST

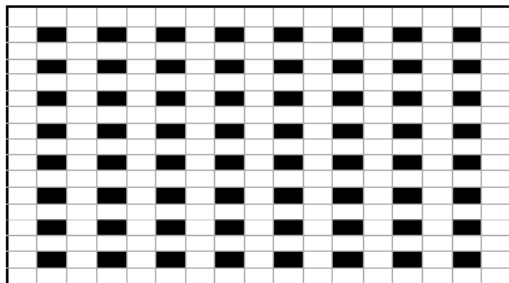
3.1 Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	70°C · 240Hrs	
High Temperature Storage	80°C · 240Hrs	
High Temperature High Humidity Operation	60°C · 90%RH · 240Hrs	No condensation
Low Temperature Operation	-20°C · 240Hrs	
Low Temperature Storage	-30°C · 240Hrs	
Thermal Shock	-30°C (0.5Hr) ~ 80°C(0.5Hr) 200 cycles	
Image Sticking	25°C ; 4hrs	
MTBF	20,000hrs	

[Note] :

Condition of Image Sticking test : 25 °C ± 2 °C

Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely .



(a) Test Pattern (chess board Pattern)



(b) Gray Pattern

3.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	<ul style="list-style-type: none"> ● Shock level:980m/s²(equeal to 100G) ● Waveform:half sinusoidal wave,6ms. ● Number of shocks:one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs.
Vibration (Non-operation)	<ul style="list-style-type: none"> ● Frequency range:8~33.3Hz ● Stroke:1.3mm ● Vibration:sinusoidal wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min



3.3 Electrostatic Discharge

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

Note: Measure

- 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 :

Pass : Normal display image and no line defect. Partial transformation of the module parts should be ignored.

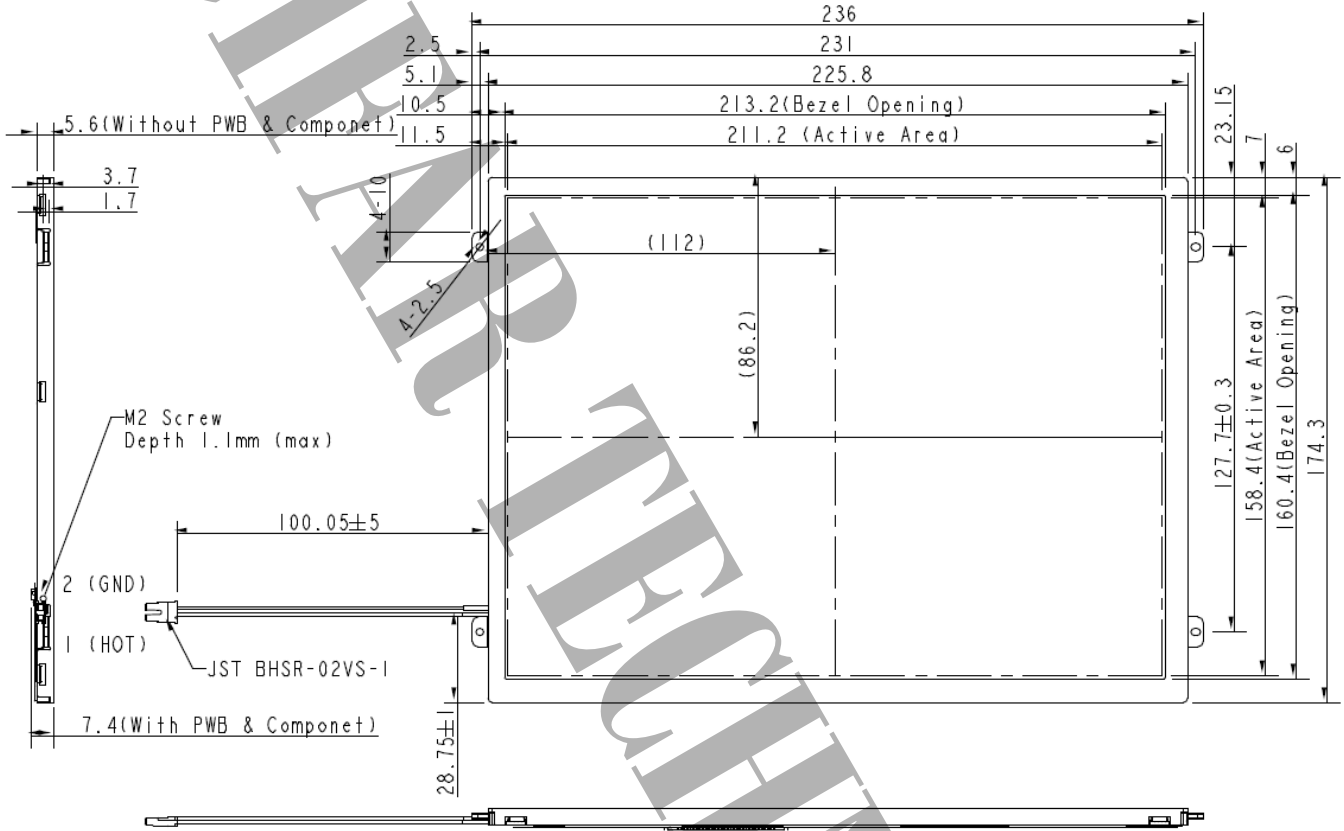
Fail : No display image, function NG, or line defects.



4. LCM Drawing

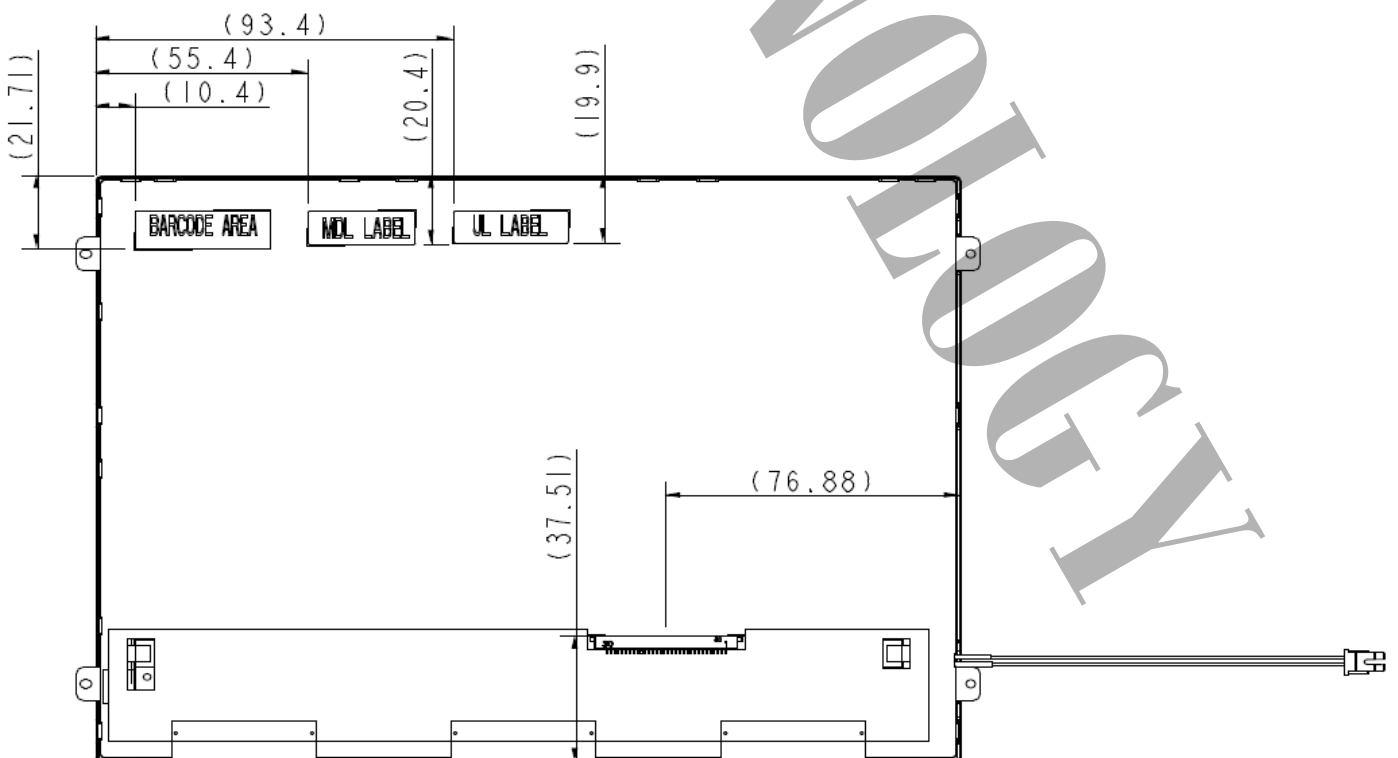
4.1 Front Side

[Unit : mm]



4.2 Rear Side

[Unit : mm]



[Note] : Tolerance is ±0.3mm unless noted



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.