晶 發 科 技 股 份 有 限 公 司
GI FAR TECHNOLOGY CO., LTD.
No. 81, Dongfeng St, Shulin District, 23874, New Taipei City, Taiwan, R.O.C.

SPECIFICATIONS

CUSTOMER :

MODEL NO. : GFTO121DA1024768V

VERSION : A

DATE : 2018.01.10

CERTIFICATION : ROHS

CUSTOMER SIGN :

QA Approved By	Approved By	Prepared By	Prepared By
	GIFAR 2018.01.11 Sidney	GIFAR 2018.01.11 Hazel	GIFAR 2018.01.11 Rita

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Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2018.01.10	A	New		

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1. SPECIFICATIONS

GFTO121DA1024768V is 12.1” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and backlight. By applying 8 bit digital data (6Bit+HFRC),1024×768, 16.7M-color images are displayed on the 12.1” diagonal screen.

General specifications are summarized in the following table:

1.1 Features

ITEM	SPECIFICATION
Display Area(mm)	245.76 (W) ×184.32 (H) (12.1-inch diagonal)
Number of Pixels	1024x RGB (H) × 768(V)
Pixel Pitch(mm)	0.24(W) × 0.24(H)
Color Pixel Arrangement	RGB vertical strip
Display Mode	Normally white, TN
Number of Colors	16.7M(6bit+Hi-FRC)
Brightness(cd/m^2)	600 (typ.) (Center point)
Viewing Angle	160 /140(Typ.)
Surface Treatment	Anti-Glare, 3H
Optimum Viewing Direction	6 O'clock(Max. contrast ratio, Gray level inversion)
Power consumption(W)	8.67W (typ.)
Interface Connection	LVDS
Module Size(mm)	260.5 ×204 ×8.4 (typ.)
Module Weight(g)	497(typ.)
Backlight Unit	LED

1.2 Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power Supply Voltage for LCD	VCC	0	5	V	
Logic Input Voltage	VI	0	5	V	
Backlight Power Supply Voltage	VLED	0	20	V	
Backlight ON-OFF Voltage	LED_EN	0	20	V	
Backlight Dimming Control Input Voltage	LED_PWM	0	20	V	4)
Operation Temperature	Top	-20	70	℃	1). 2). 3).
Storage Temperature	Tstg	-20	70	℃	1). 2). 3).

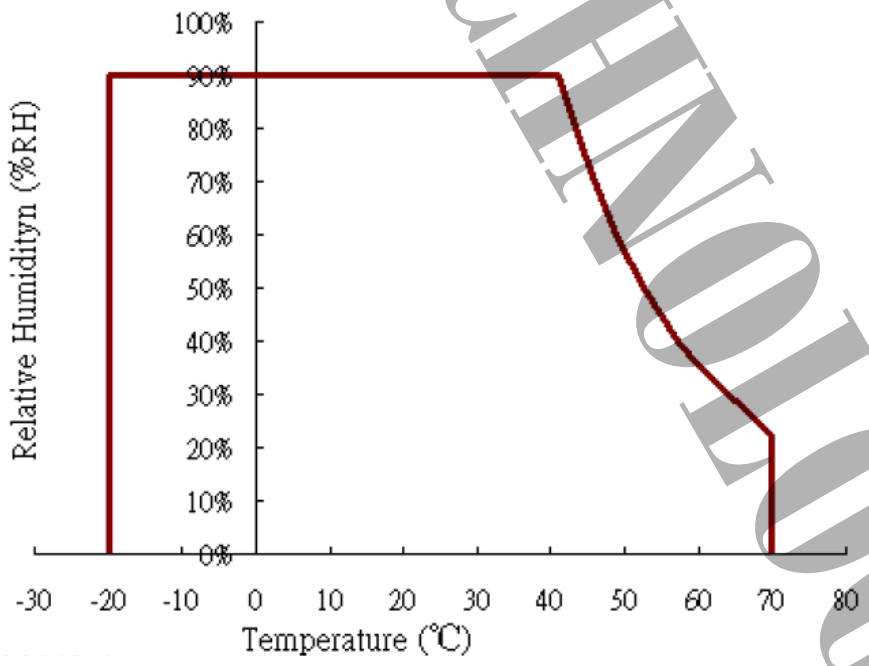
[Note]

1). The relative humidity and temperature range are as below sketch,90%RH Max.

2). The maximum wet bulb temperature ≤39℃ and without dewing.

3). If you use the product in an environment which over the definition of temperature and humidity too long to effect the result of eye-etching.

4). LED_EN, LED_PWM voltage must be smaller than VLED or equal to VLED.



1.3 Electrical Characteristics

TFT LCD

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage		VCC	3.0	3.3	3.6	V	
LCD Power Current		ICC	-	263	306	mA	*1)
LCD Rush Current		VCC_Irush			2	A	*3)
Logic Input Voltage (LVDS: IN+,IN-)	Common Voltage	VCM	$\frac{\lvert VID \rvert}{2}$	-	$2.4-\frac{\lvert VID \rvert}{2}$	V	Logic Input Voltage (LVDS: IN+,IN-)
	Differential Input Voltage	| VID |	200	-	600	mV	
	Threshold Voltage (HIGH)	VTH	-	-	100	mV	
	Threshold Voltage (LOW)	VTL	-100	-	-	mV	
Logic Input Voltage	VIH	0.7*DVDD	-	DVDD	V		Logic Input Voltage
	VIL	GND	-	0.3*DVDD	V		
Power consumption		P		0.87	1.01	W	(1)
1 Data time		UI	-	1/7	-	tclk	(4)
LVDS clock to data skew		tskew	-		0.2	UI	
input data eye width		teyew	0.6			UI	

【Note】

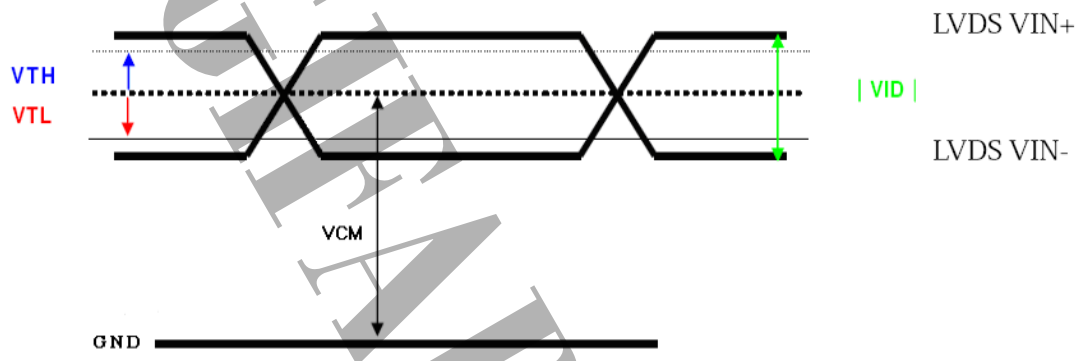
*1)TYP. specification：Gray-level test Pattern (TYP Freq. @3.3V)

MAX. specification：Black test Pattern (TYP Freq. @3.3V)

Gray-level Pattern

Black Pattern

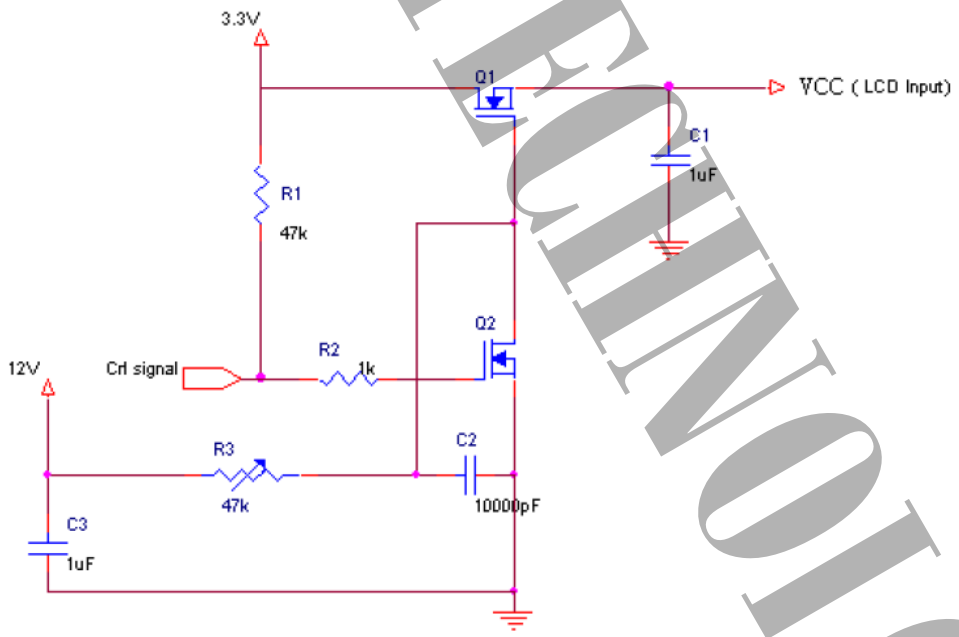
*2) LVDS Signal Definite：

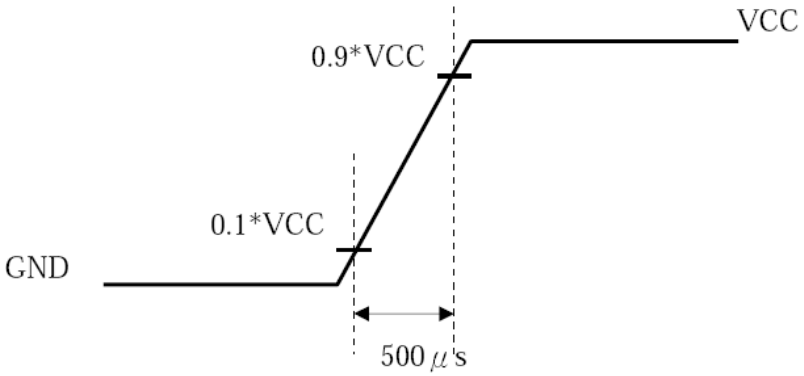


VIN+：Positive differential DATA & CLK Input

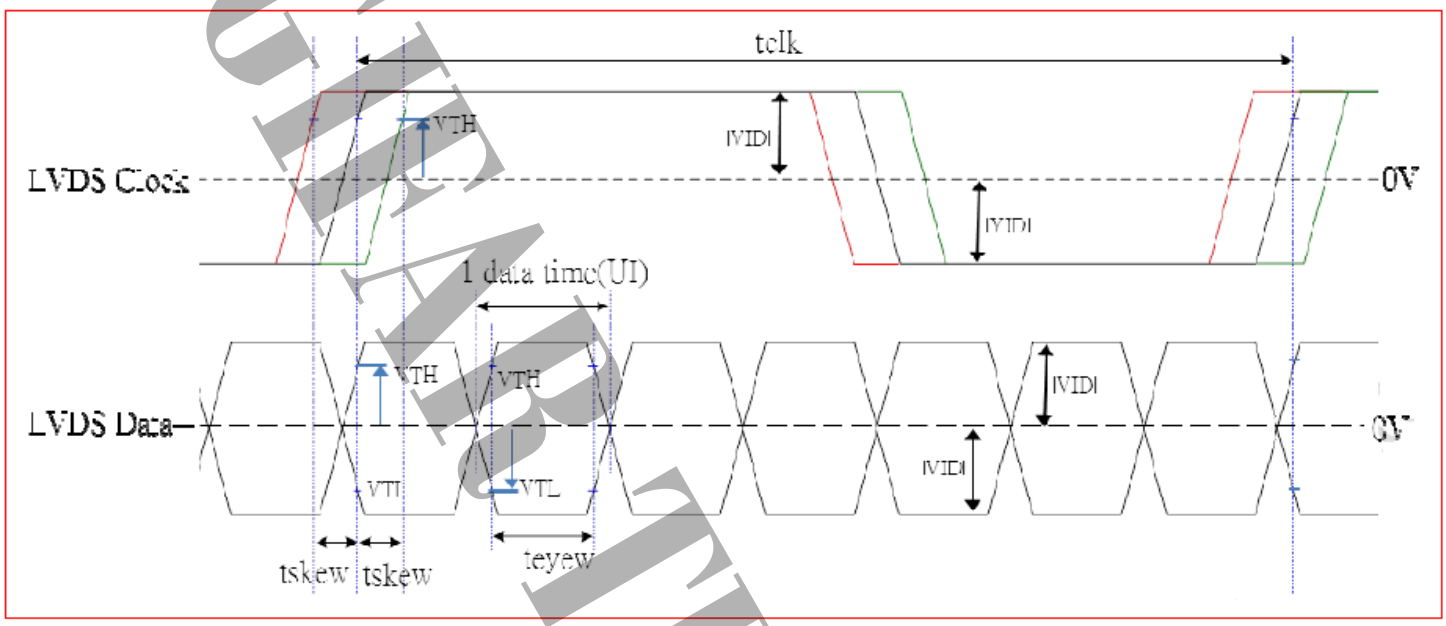
VIN-：Negative differential DATA & CLK Input

*3) Irush measure condition





*4) LVDS signal electric characteristics



1.4 Optical Characteristics

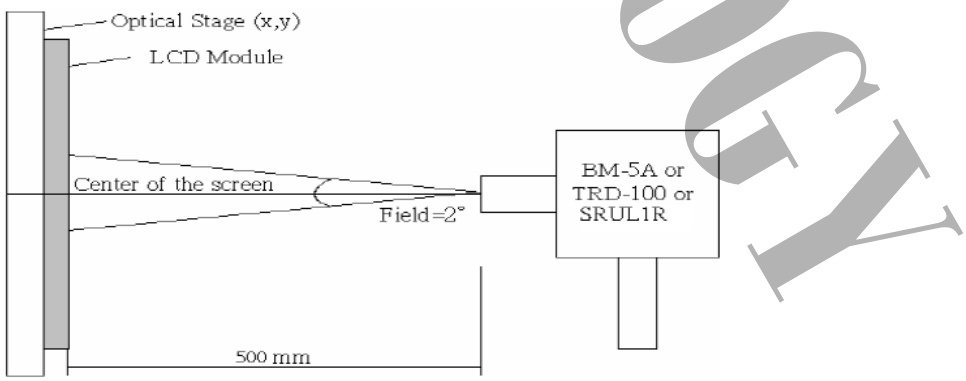
ITEM		SYMBOL	CONDITION	min	typ	max	UNIT	REMARK
Contrast Ratio		CR	θ = ψ = 0°	500	700	--	--	*1) 2)
Luminance(CEN)		L	θ = ψ = 0°	500	600	--	cd/m^2	*1) 3)
9P Uniformity		ΔL	θ = ψ = 0°	75	80	--	%	*1) 3)
Response Time		Tr+Tf	θ = ψ = 0°		16	--	ms	*5)
Crosstalk		CT	θ = ψ = 0°	--	--	2	%	*6)
Viewing Angle	Horizontal	Left(ψ)	CR≧10	70	(80)	--	Deg.	*4)
		Right(ψ)		70	(80)			
	Vertical	Upper(θ)		60	(70)	--		
		Down(θ)		60	(70)			
Color Coordinates	White	X	θ = ψ = 0°	(0.263)	(0.313)	(0.363)		*3)
		Y		(0.279)	(0.329)	(0.379)		
	Red	X		(0.587)	(0.637)	(0.687)		
		Y		(0.294)	(0.344)	(0.394)		
	Green	X		(0.249)	(0.299)	(0.349)		
		Y		(0.576)	(0.626)	(0.676)		
	Blue	X		(0.096)	(0.146)	(0.196)		
		Y		(0.024)	(0.074)	(0.124)		
Gamut		CG	θ = ψ = 0°	65	70	--	--	--
Gamma		γ	VESA	2	2.2	2.4	--	*6)

[Note]

Definition of these measurement items is as follows:

*1) Setup of Measurement Equipment

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 10 minutes and in a dark room.



*2).Definition of Contrast Ratio:

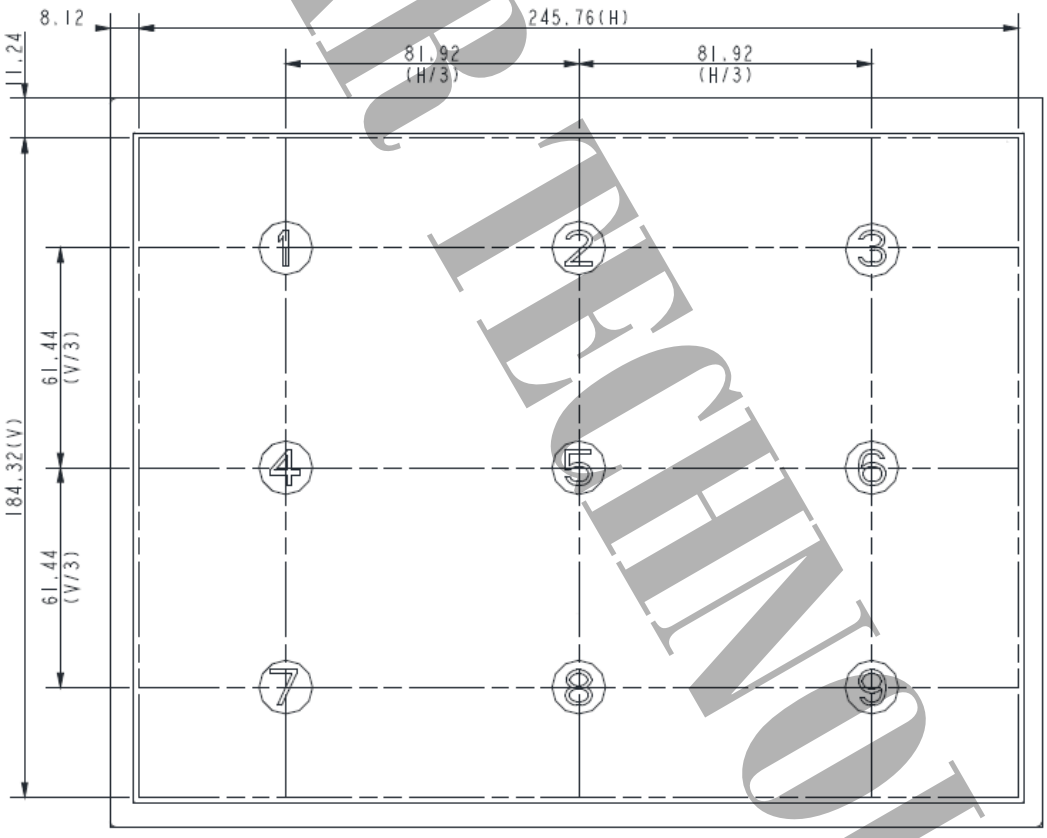
CR=ON (White) Luminance/OFF (Black) Luminance

*3).Definition of Luminance and Luminance uniformity:

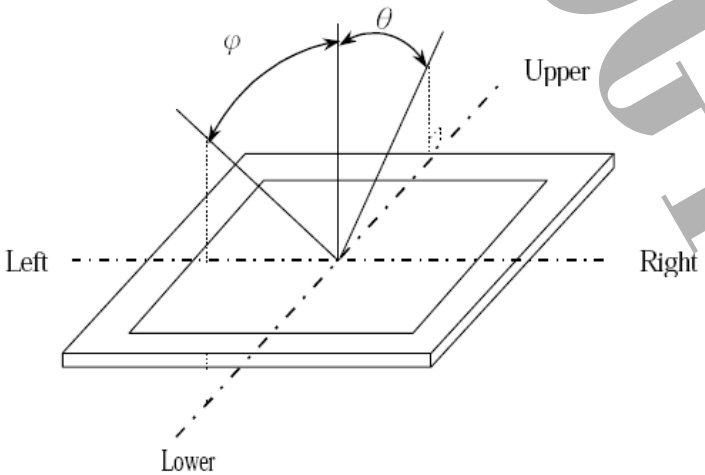
Center Luminance, &Color coordinate: measuring the luminance of the point no. 5

Average Luminance: measuring average luminance of points no.1-no.9

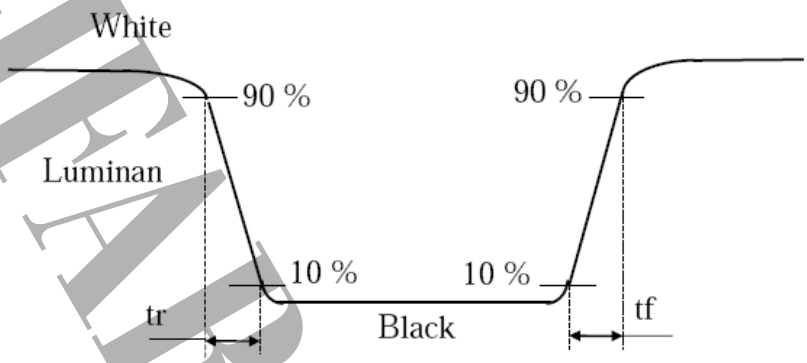
Uniformity: ΔL= [L (Min)/L (Max)] ×100 %



*4).Definition of Viewing Angle (θ,ψ):



*5) Definition of Response Time:

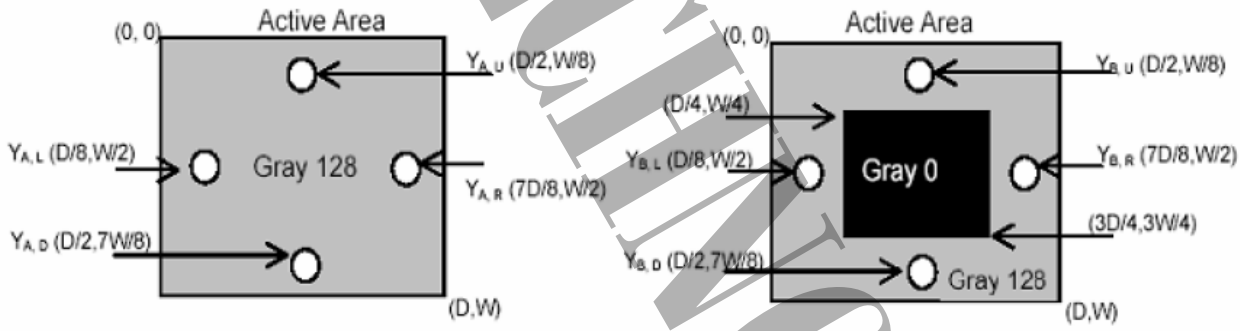


*6) Definition of crosstalk:

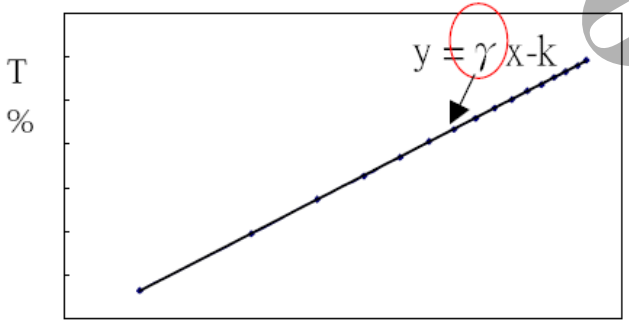
$CT = | Y_B - Y_A | / Y_A \times 100\ (\%)$

Y_A : The luminance of measured position at pattern A

Y_B : The luminance of measured position at pattern B with Gray level 0



*7) Definition of Gamma (γ), follow VESA standard sampling every 16 gray level (0,16,32,.....224,240,255)



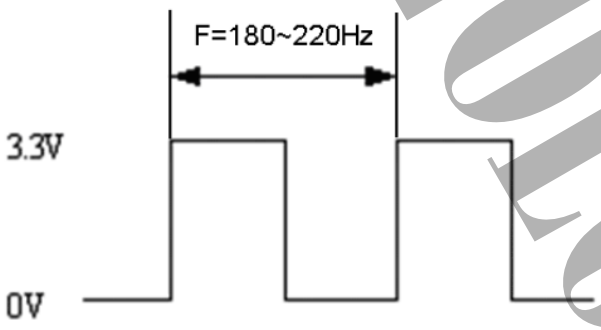
1.5.Converter Specification for Backlight

Ta = 25°C

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage		VLED	7	12	13.2	V	
LED Driver Input Current		IVLED	-	660	1200	mA	*1)
					2	A	*3)
Dimming Control	High	LED_PWM	2.4	--	5	V	Dimming Control
	Low		0		0.8		
Duty Ratio			2	-	100	%	
ON/OFF Control	High	LED_EN	1.8		5	V	ON/OFF Control
	Low		0		0.8		
Power Consumption (Backlight)		BLW	--	7.8	8.3	W	
LED Forward voltage (single LED)		VF	2.8	--	3.4	V	IF=75mA Ta=25℃
LED Forward current (single LED)		IF	--	75	--	mA	Ta=25℃
LIFE TIME(Backlight)			50000	70000		hr	*4)

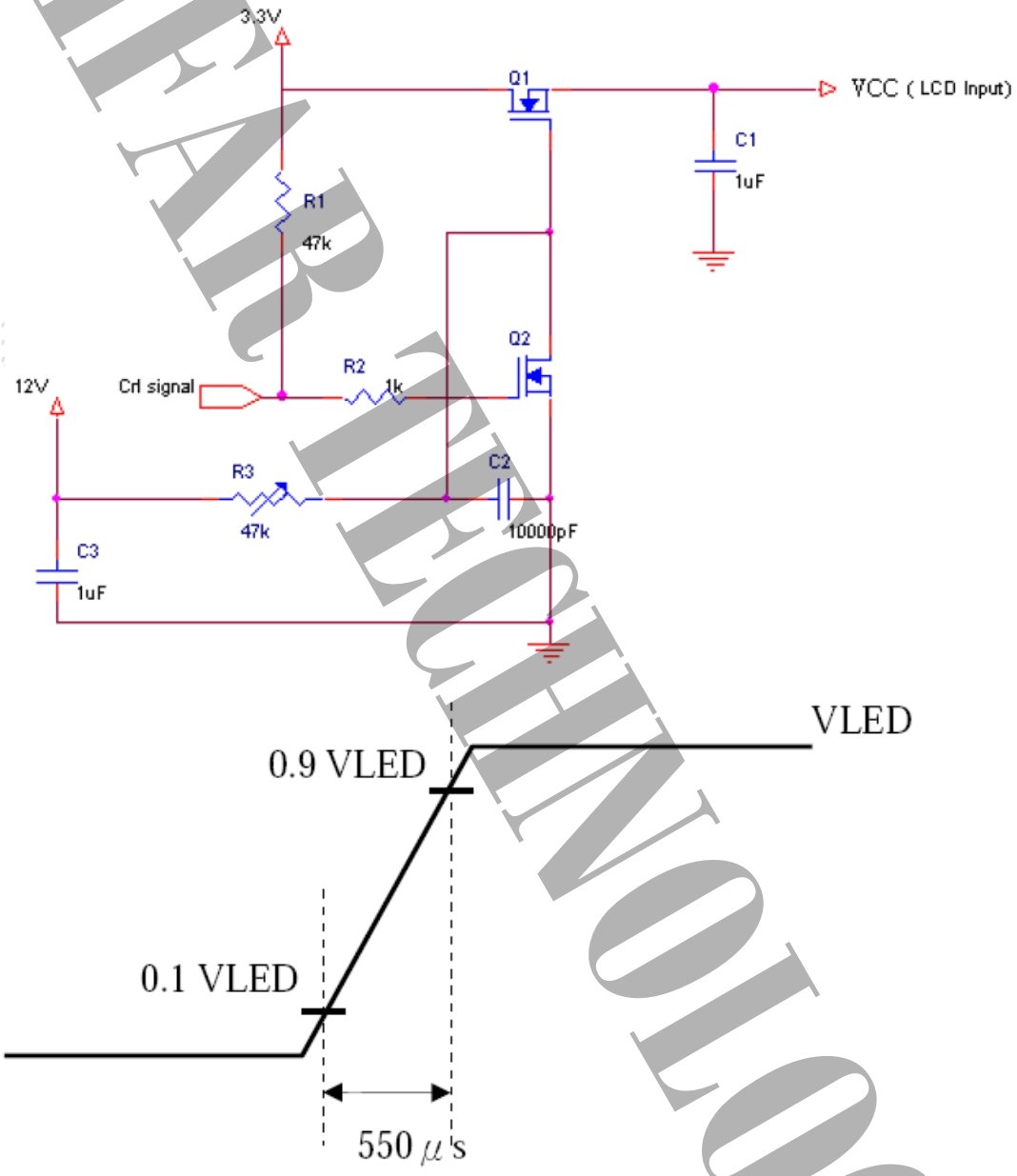
*1) Maximum LED Driver Input Current at 10.8V Input Voltage/PWM Duty 100%.

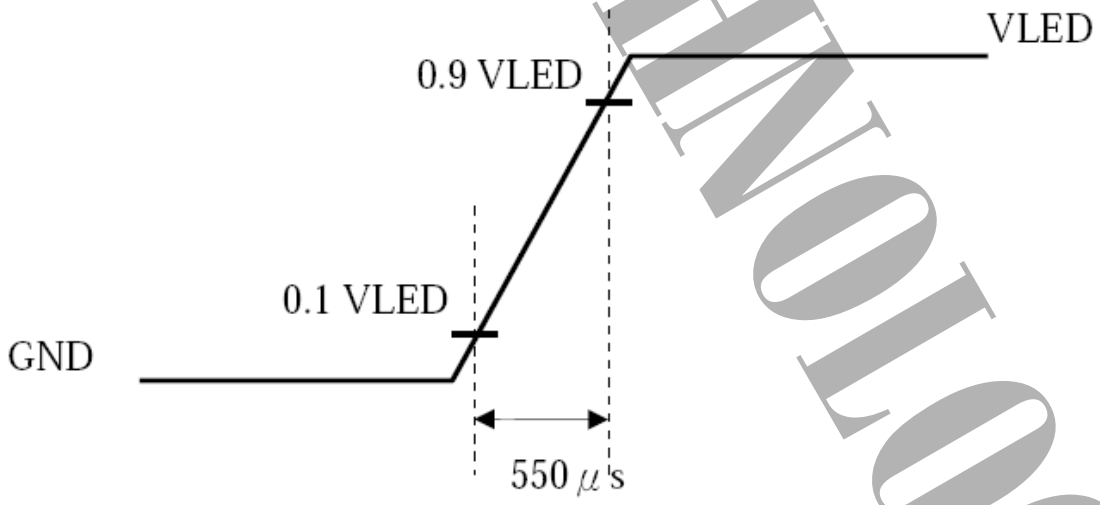
*2) The ADJ adjust signal level is 0~3.3V，operation frequency:180Hz~220Hz。



The ADJ can adjust LED BL brightness , where Duty and Luminance are in direct radio.

*3) Irush measure condition



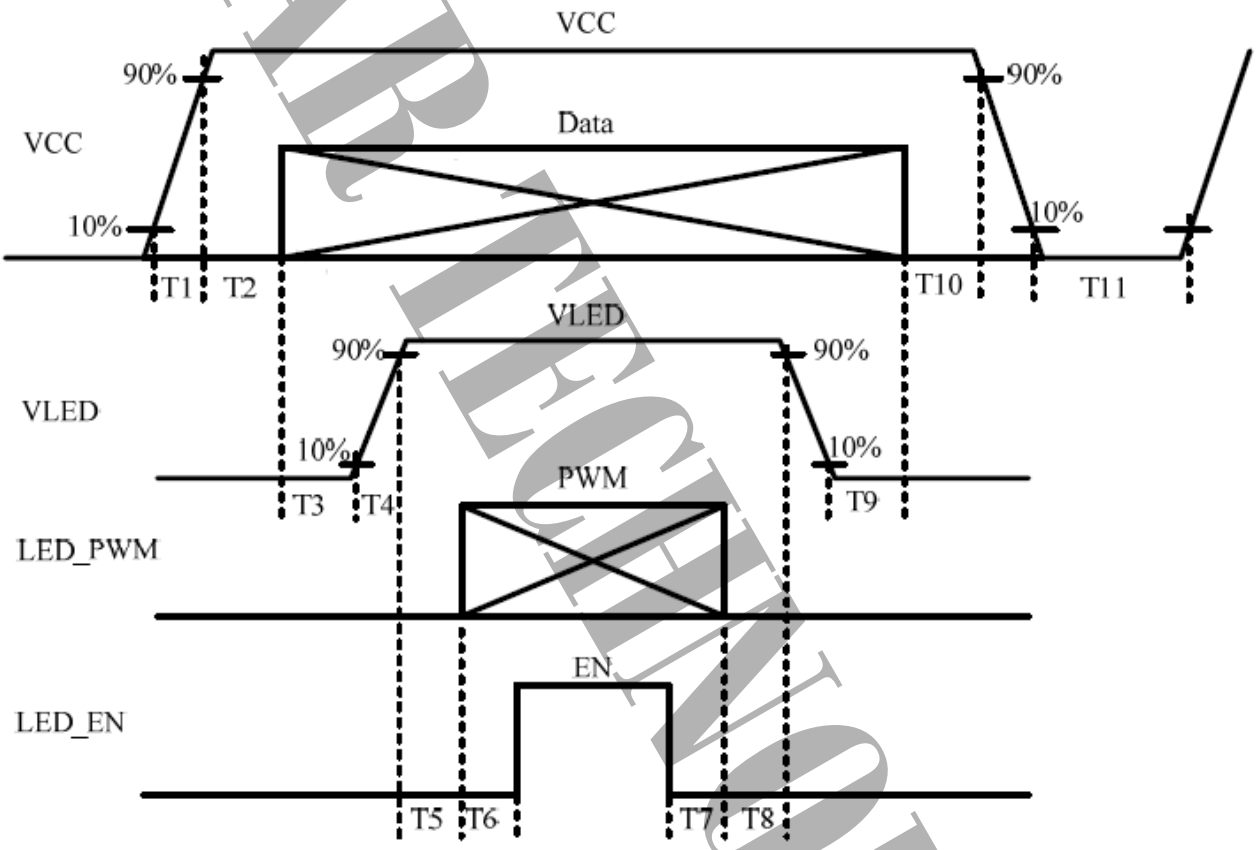


*4). Definition of the LED life time: Luminance (L) under 50% of the initial value. LED life time is restricted under normal condition, ambient temperature=25℃ and LED operation forward current=75mA.

1.6 Power and Signal sequence

Power Sequence：

0.50 ms≦T1 ≦20 ms	50 ms≦T3<100ms	1 ms ≦ T8
16 ms＜T2 ≦50 ms	1 ms ≦ T5	20 ms≦T9
0.50 ms ≦T4 ≦ 10 ms	1 ms ≦ T6	1s≦T11
0.01 ms＜T10 ≦100 ms	1 ms ≦ T7	



2. MODULE STRUCTURE

2.1 Interface Pin Description

(1) CN1 (Data Signal and Power Supply)
Outlet connector: 076B20-0048RA-G4 (STARCONN) or FI-SEB20P-HFE(JAE)
User's connector: JAE FI-SE20ME or compatible

PIN #	SYMBOL	FUNCTION	Note
1	RXIN3+	Differential Data Input , CH3 (Positive)	
2	RXIN3-	Differential Data Input , CH3 (Negative)	
3	NC	Don't connect	1
4	SEL68	LVDS 6/8 bit select function control, Low or NC=> 6 bit Input Mode High=> 8bit Input Mode	1
5	GND	Gound	2
6	RXC+	Differential Clock Input (Positive)	
7	RXC-	Differential Clock Input (Negative)	
8	GND	Gound	2
9	RX2+	Differential Data Input , CH2 (Positive)	
10	RX2-	Differential Data Input , CH2 (Negative)	
11	GND	Gound	2
12	RX1+	Differential Data Input , CH1 (Positive)	
13	RX1-	Differential Data Input, CH1 (Negative)	
14	GND	Gound	2
15	RX0+	Differential Data Input, CH0 (Positive)	
16	RX0-	Differential Data Input, CH0 (Negative)	
17	reLR	Horizontal Reverse Scan Control, Low or NC Normal Mode. High Horizontal Reverse Scan	1
18	reUD	Vertical Reverse Scan Control, Low or NC Normal Mode, High Vertical Reverse Scan	1
19	VCC	Power supply	3.0~3.6V
20	VCC	Power supply	3.0~3.6V

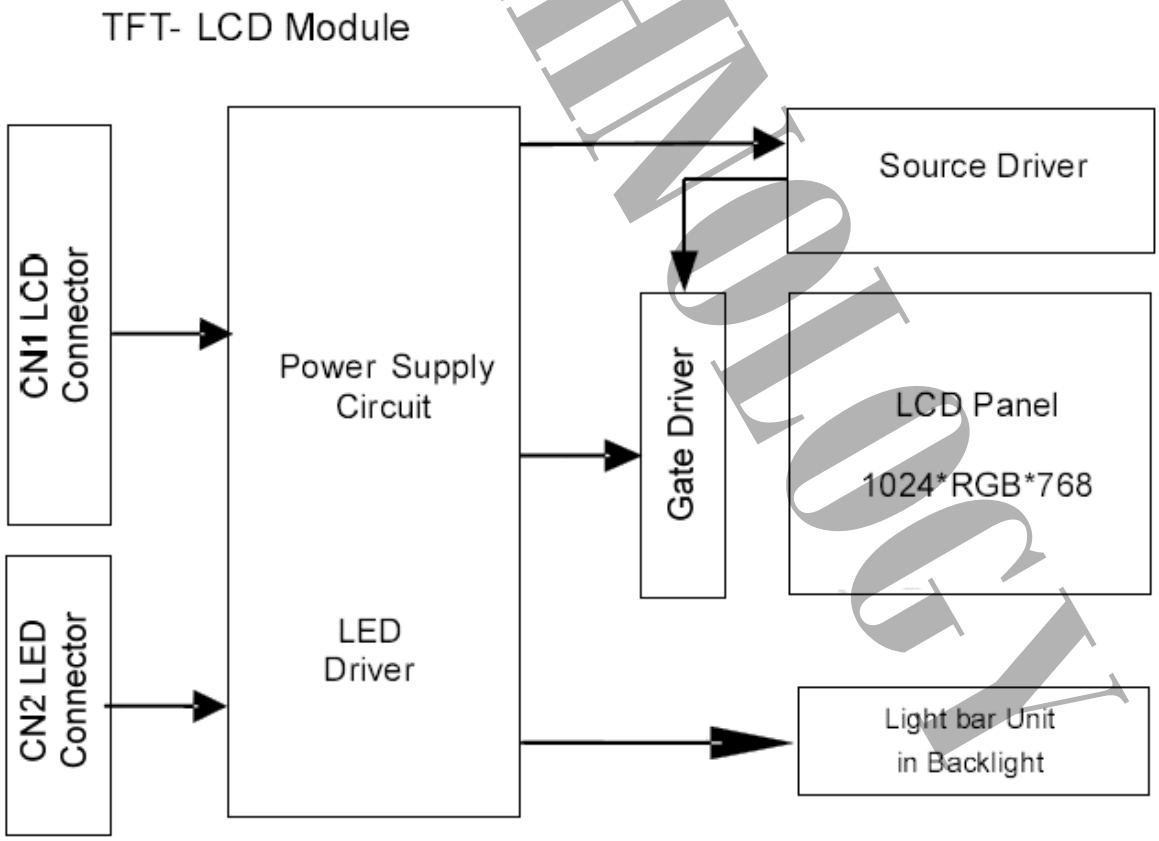
1) NC: Please don't connect it to GND or other signals.
High: Please connect it to 3.3V
Low: Please connect it to GND
2) GND Pin must connect to the ground, don't let it be a vacant pin.

(2) CN2 (Backlight)
Outlet connector: 91208-01001-H01 (ACES) or compatible
User's connector: 91209-01011 (ACES) or compatible

Pin	Symbol	Description	Remark
1	VLED	Converter input voltage	12V
2	VLED	Converter input voltage	12V
3	VLED	Converter input voltage	12V
4	NC	Don't connect	
5	GND	Gound	
6	GND	Gound	
7	GND	Gound	
8	GND	Gound	
9	EN	Enable pin	3.3V
10	ADJ	Backlight Adjust	Diming(180-220Hz, Hi: 3.3V ,Lo: 0V)

*1) Enable High=2.4 to 5V, Low=0 to 0.8V or Open.

2.2 BLOCK DIAGRAM



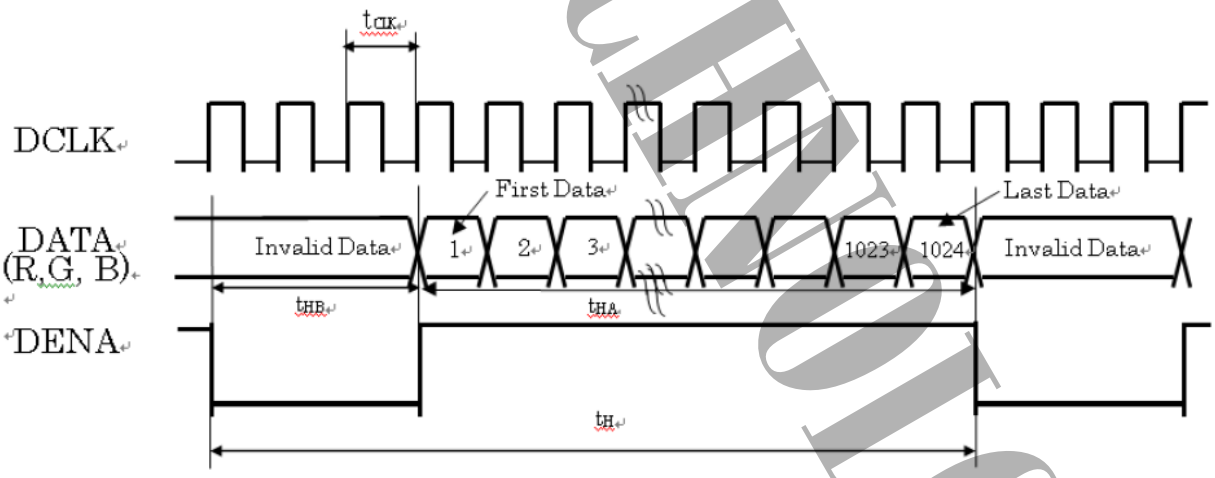
2.3. Timing Characteristics of Input Signals

(1) Timing Specifications

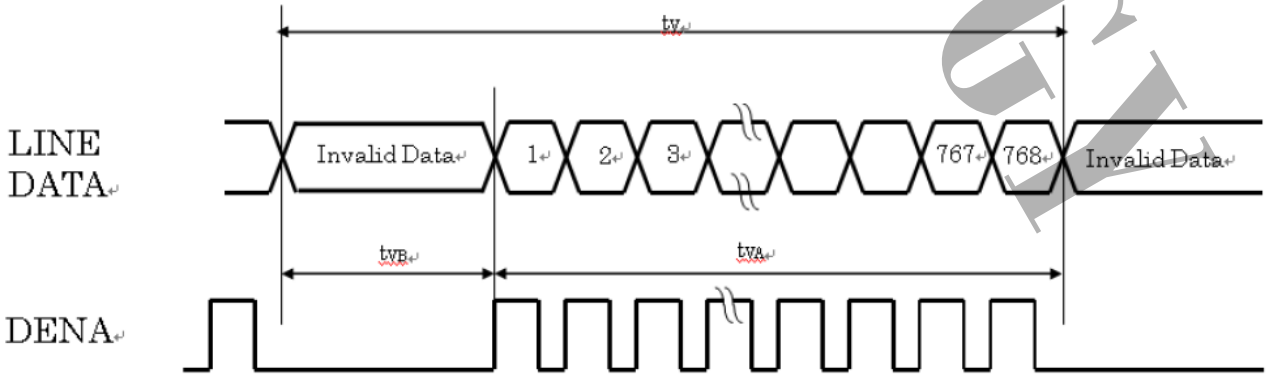
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LCD Timing	DCLK		Frequency	f_{CLK}	57.5	64.9	74.4	MHz
				T_{CLK}	13.44	15.41	17.4	ns
	DENA	Horizontal	Horizontal total time	t_H	1240	1344	1464	t_{CLK}
			Horiaontal effective time	t_{HA}		1024		t_{CLK}
			Horizontal blank time	t_{HB}	216	320	440	t_{CLK}
		Vertical	Vertical total time	t_V	778	806	848	t_H
			Vertical effective time	t_{VA}		768		t_H
			Vertical blank time	t_{VB}	10	38	80	t_H
	Frame rate			Fv	50	60	65	Hz

(2) Timing Chart

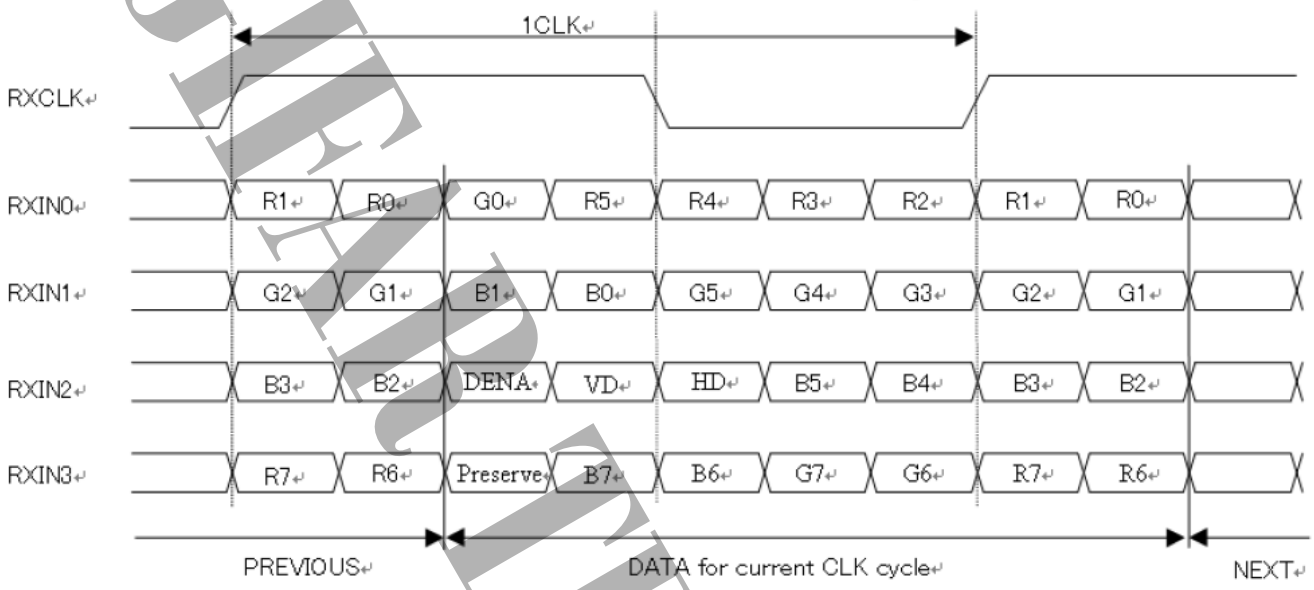
a. Horizontal Timing



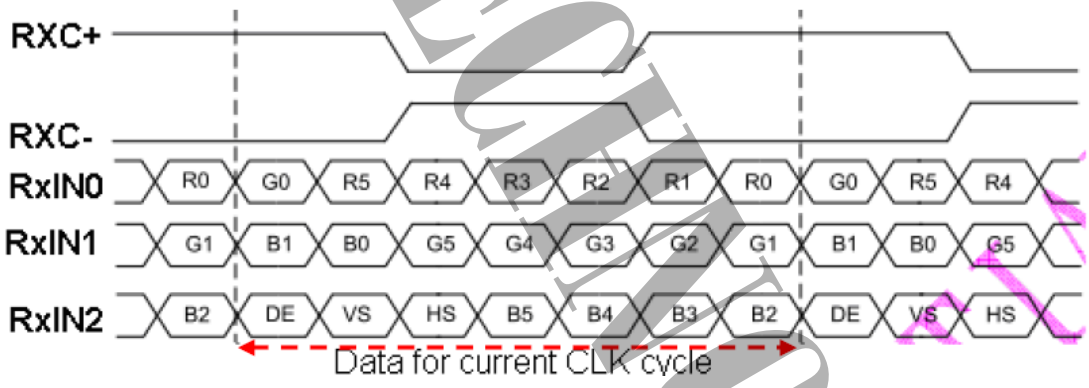
b. Vertical Timing



(3) 8-bits LVDS DATA Timing Chart (VESA)：



(4) 6-bits LVDS DATA Timing Chart (VESA)：



2.4 Color Data Reference

8-bits in Color Data Assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7 (MSB)	R6	R5	R4	R3	R2	R1	R0 (LSB)	G7 (MSB)	G6	G5	G4	G3	G2	G1	G0 (LSB)	B7 (MSB)	B6	B5	B4	B3	B2	B1	B0 (LSB)
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	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	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	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	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note]

1) Definition of gray scale:
   Color (n): n indicates gray scale level; higher n means brighter level.
2) Data: 1-High, 0-Low.
3) This assignment is applied to both odd and even data.

6-bits in Color Data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		R5 (MSB)	R4	R3	R2	R1	R0 (LSB)	G5 (MSB)	G4	G3	G2	G1	G0 (LSB)	B5 (MSB)	B4	B3	B2	B1	B0 (LSB)
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(255)	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(254)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	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(254)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(255)	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(254)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

[Note]

4) Definition of gray scale:

Color (n): n indicates gray scale level; higher n means brighter level.

5) Data: 1-High, 0-Low.

6) This assignment is applied to both odd and even data.

3. RELIABILITY TEST

(1) Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature High Humidity Operation	60℃; 90%RH; 240hrs	No condensation
High Temperature Operation	70℃; 240hrs	
High Temperature Storage	70℃; 240hrs	
Low Temperature Operation	-20℃; 240hrs	
Low Temperature Storage	-20℃; 240hrs	
Thermal Shock	-20℃(0.5hr) ~ 70℃(0.5hr); 200 Cycles	
Image Sticking	25℃,4hrs	*1)

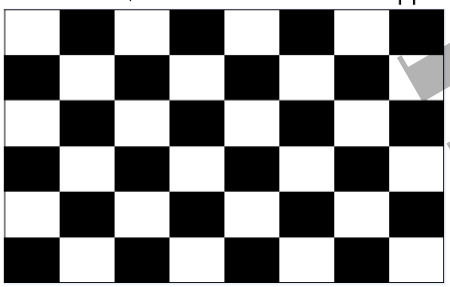
[Note]

*1) Image Sticking :

Condition of image sticking test: 25℃

Operation with test pattern sustained for 4hrs, then change to gray pattern immediately.

After 5 min, the Mura must be disappeared completely.



(a) Test Pattern(Chess Board Pattern)

(b) judgment Pattern(128 Gray Pattern)

(2) Shock & Vibration

ITEMS	CONDITIONS
SHOCK (NON-OPERATION)	Shock level: 1470 m/s2 (150 G) Waveform: half sinusoidal wave, 2 ms Number of shocks: one shock of each direction
VIBRATION (NON-OPERATION)	Vibration level: (1.0G) zero to peak Waveform: sinusoidal Frequency range: 10 to 300 Hz Frequency sweep rate: 0.5 octave/min Duration: one sweep from 10 to 300Hz in each of three mutually,each x,y,z axis: 30 min.

(3) ESD

POSITION	CONDITION(MDL turn off)
ESD (power off)	【MM Connector】200pF, 0 , ±250V ，contact mode for each pin 1. 150 pF，330 Ω，±8K V/±15K V (Air mode)，±8K V (Contact mode) 2. Air mode, test 25 times for each test point 3. Contact mode, 25 times for each test point

(4) Judgment standard

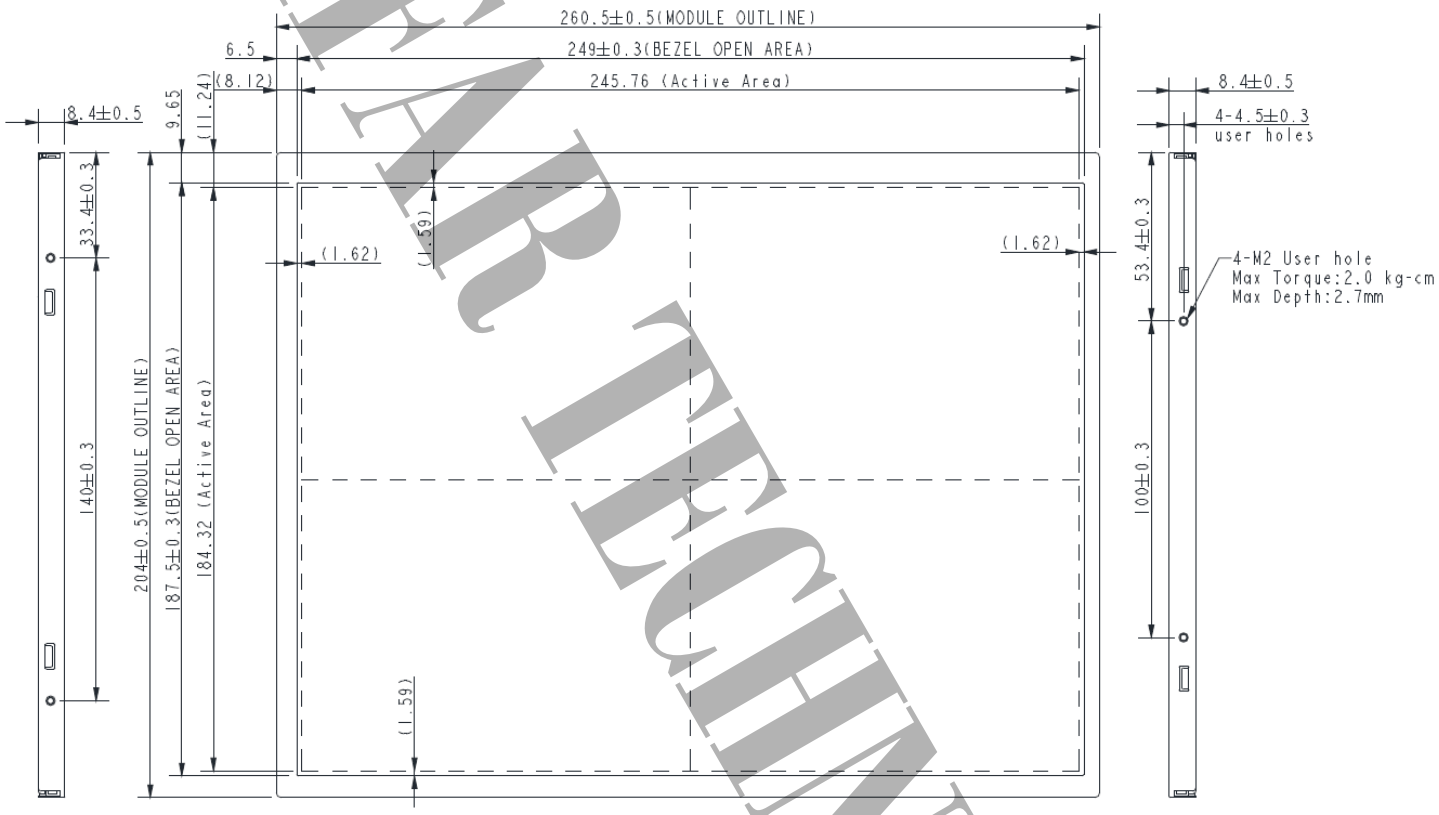
The judgment of the above test should be made as follow:

Pass: Normal display image with no line defect.

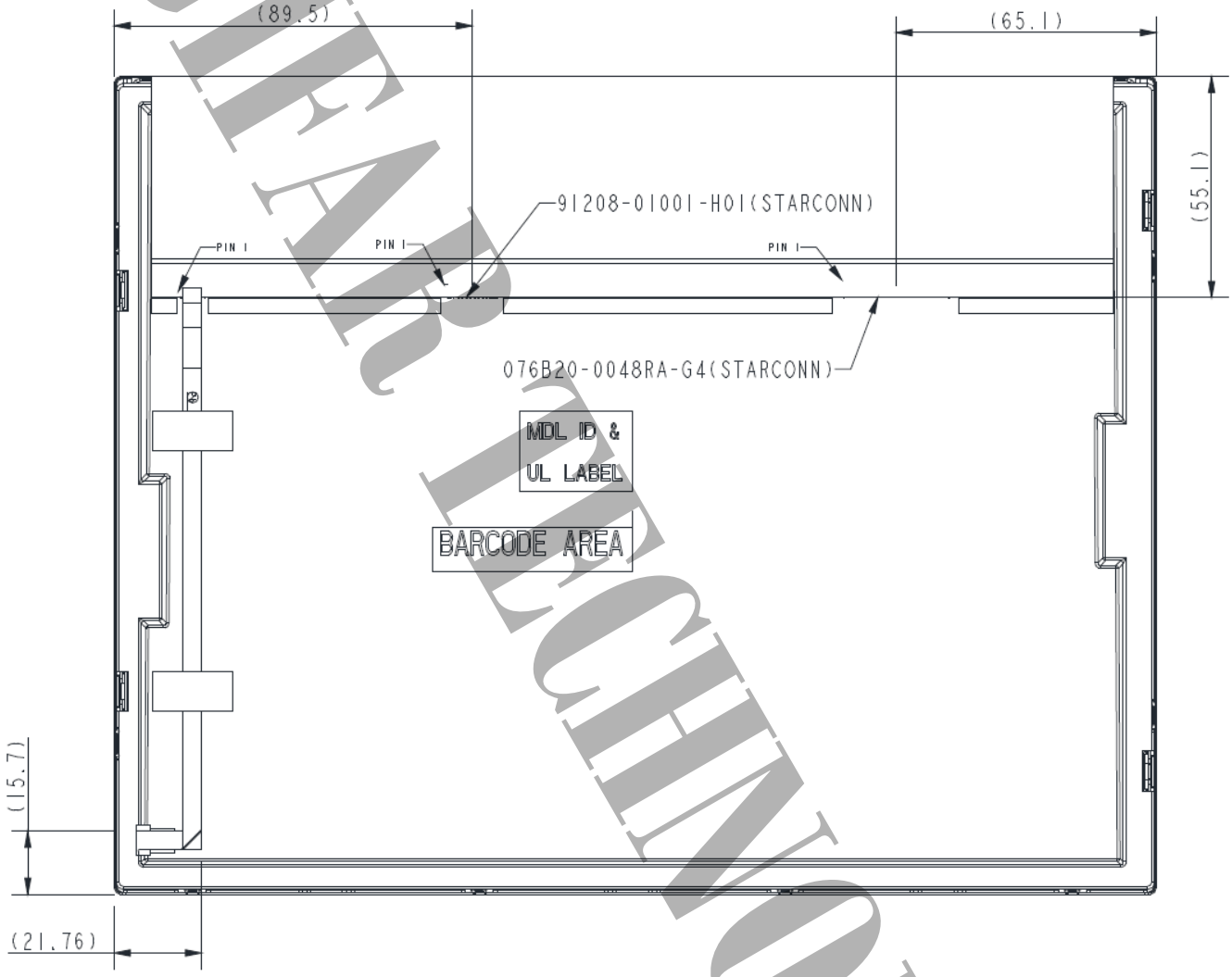
Fail: No display image or line defects

4. LCM Drawing

4.1 Front side (Tolerance is ±0.5mm unless noted) Unit: mm



4.2 Rear Side(Tolerance is ±0.5mm unless noted) **[Unit：mm]**



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.