晶采光電科技股份有限公司
AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AM-800480AYTZQW-00H
APPROVED BY	
DATE	

☐Approved For Specifications
☐Approved For Specifications & Sample

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2016/04/20	--	New Release	Alan

1.0 General Descriptions

1.1 Features

- 7 inch (16:9 diagonal) configuration
- 16.7M colors (R , G , B, 8bit digital each)
- RoHS

1.2 Product Summary

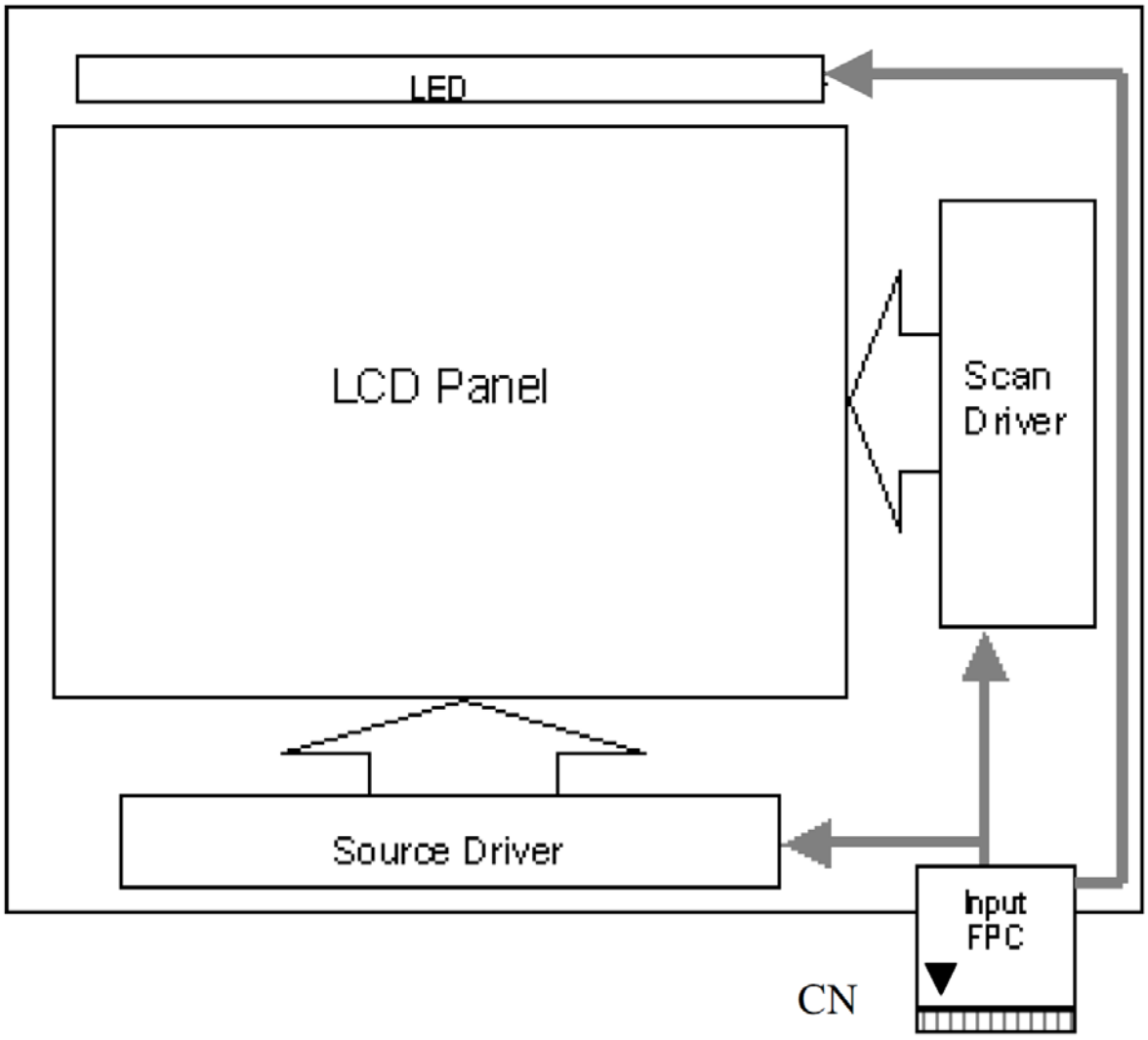
NO	Item	Specification	Remark
1	LCD Size	7.0 inch (Diagonal)	
3	Resolution	800 x 3 (RGB) x 480	
4	Display Mode	Normally Black.	
5	Pixel pitch	0.1926 (W) x 0.179(H) mm	
6	Active area	154.08(W) x 85.92(H) mm	
7	Module Size	164.9(W) x 100.0(H) x 5.7(T) mm	Note 1
8	LCD Surface treatment	Anti-Glare	
9	Color arrangement	RGB-stripe	
10	Luminance	555 Cd/m^2	Cd/m^2
11	Viewing Direction	All direction	

(Note1) Refer to the mechanical drawing.

1.3 Functional Block Diagram

Shows the functional block diagram of the LCD module.

Figure 1 Block Diagram



2.0 Absolute Maximum Ratings

GND=0V

Item	Symbol	MIN	MAX	Unit	Remark
Power Voltage1	VCC	-0.5	3.96	V	Note1
Power Voltage2	AVDD	-0.5	14.85	V	
Logic output voltage	V_{OUT}	-0.5	5	V	
Input voltage	V_{IN}	-0.5	AVDD+0.5	V	
Relative Humidity Note2	RH	--	≤95	%	Ta≤40℃
		--	≤85	%	40℃<Ta≤50℃
		--	≤55	%	50℃<Ta≤60℃
		--	≤36	%	60℃<Ta≤70℃
		--	≤24	%	70℃<Ta≤80℃
Absolute Humidity	AH	--	≤70	g/m^3	Ta>70℃

Table 3 Absolute Maximum Ratings

Note1 Ta means the ambient temperature.
It is necessary to limit the relative humidity to the specified temperature range.
Condensation on the module is not allowed.

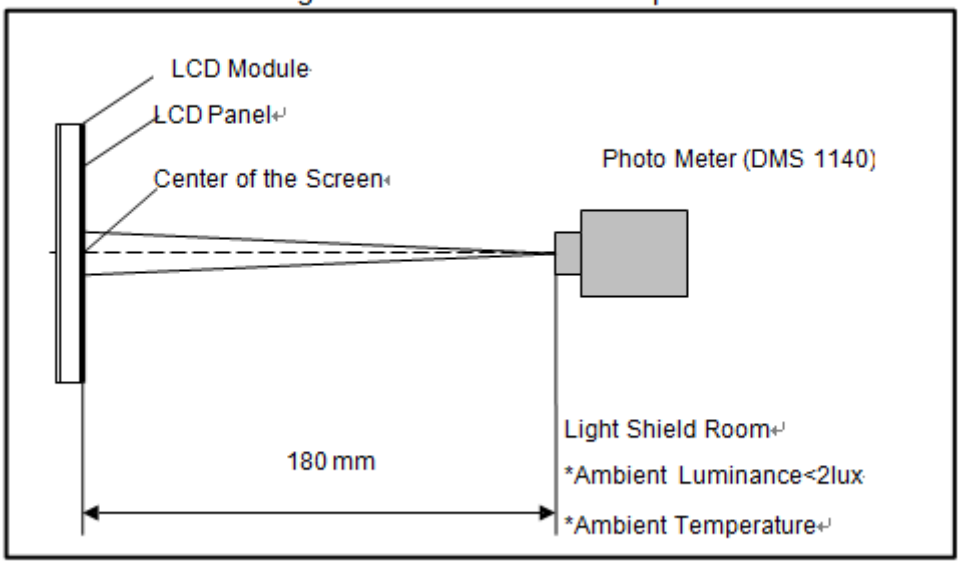
3.0 Optical Specifications

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	(80)	(88)	-	degree	(1),(2),(3)
		θ_R	(80)	(88)	-		
	Vertical	θ_U	(80)	(88)	-		
		θ_D	(80)	(88)	-		
Contrast Ratio	Center		(700)	(900)	-	-	(1),(2),(4) θx=θy=0°
Response Time	Rising + Falling		-	(30)	(40)	ms	(1),(2),(5) θx=θy=0°
Color Chromaticity (CIE1931)	Red x		Typ (+0.05)	(0.633)	Typ (+0.05)	-	(1),(2),(3) θx=θy=0°
	Red y			(0.329)		-	
	Green x			(0.320)		-	
	Green y			(0.613)		-	
	Blue x			(0.150)		-	
	Blue y			(0.053)		-	
	White x		Typ. (-0.05)	(0.308)	Typ. (+0.05)	-	
	White y			(0.332)		-	
NTSC	-		--	(70)	-	%	(1),(2),(3) θx=θy=0°
White Luminance	Center Point		(450)	(555)	-	cd/m^2	(1),(2),(6) θx=θy=0°

Note (1) Measurement Setup:

The LCD module should be stabilized at given temperature(25℃) for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

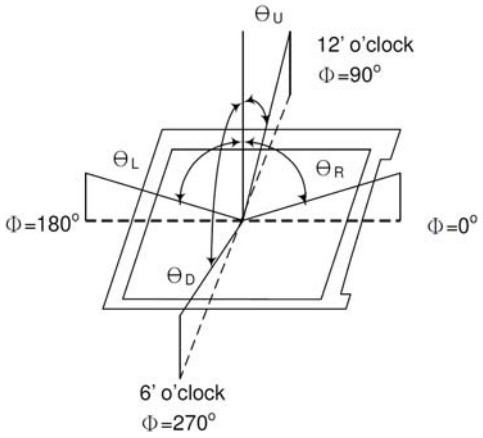
Figure 3 Measurement Setup



Note (2) The LED input parameter setting as:

I_LED: 180mA

Note (3) Definition of Viewing Angle



Note (4) Definition Of Contrast Ratio (CR)

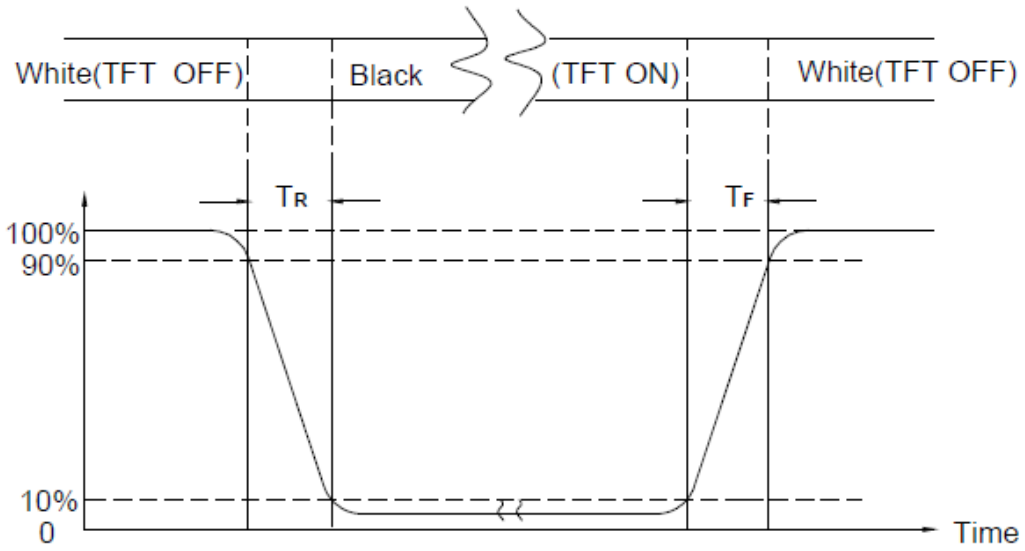
The contrast ratio can be calculated by the following

expression: Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Note (5) Definition Of Response Time (T_R, T_F)

Figure 5 Definition of Response Time



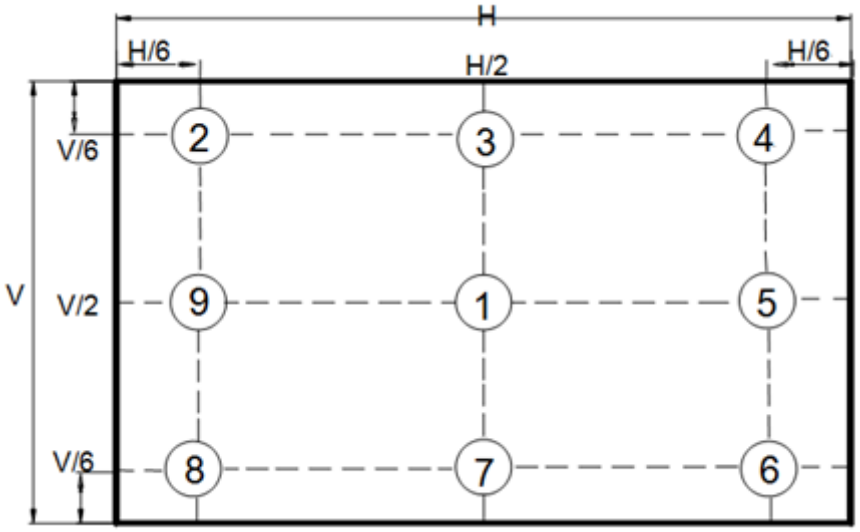
Note (6) Definition of Luminance Uniformity (Ref.: Active Area)

Measure the luminance of gray level 255 at 9 points.

Luminance Uniformity= Min.(L1, L2, ... L9) / Max.(L1, L2, ... L9)

H—Active Area Width, V—Active Area Height, L—Luminance

Figure 6 Measurement Locations of 9 Points



4.0 Interface Connections

Matching Connection Type : HIROSE FH12A-50S-0.5H

Pin No.	Symbol	I/O	Function	Remark
1	VLED+	P	Led anode	
2	VLED+	P	Led anode	
3	VLED-	P	Led cathode	
4	VLED-	P	Led cathode	
5	GND	P	Ground	
6	NC	NC		
7	VCC	P	Digital power supply	
8	MODE	I	DE/SYNC mode select. H:DE mode, L:SYNC mode	
9	DE	I	Data enable signal, active high to enable data,	
10	VSYNC	I	Vertical sync input,	
11	HSYNC	I	Horizontal sync input,	
12	B7	I	Blue data（MSB）	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	
19	B0	I	Blue data（LSB）	
20	G7	I	Green data（MSB）	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	
27	G0	I	Green data（LSB）	
28	R7	I	Red data（MSB）	
29	R6	I	Red data	
30	R5	I	Red data	

31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	
35	R0	I	Red data（LSB）	
36	GND	P	Ground	
37	DCLK	I	Clock for input data	
38	GND	P	Ground	
39	LR	I	Source left or right sequence control	
40	UD	I	Gate up or down scan control	
41	VGH	P	Positive power of TFT	
42	VGL	P	Negative power of TFT	
43	AVDD	P	Analog power supply	
44	RESET	I	Global reset pin	
45	NC	NC		
46	NC	NC		
47	DITHB	I	Dithering setting.H: 6bit resolution, L: 8bit resolution	
48	GND	P	Ground	
49	NC	NC		
50	NC	NC		

I---Input, O---Output, P---Power/Ground

Table 2.1 terminal pin assignment

5. Backlight Unit

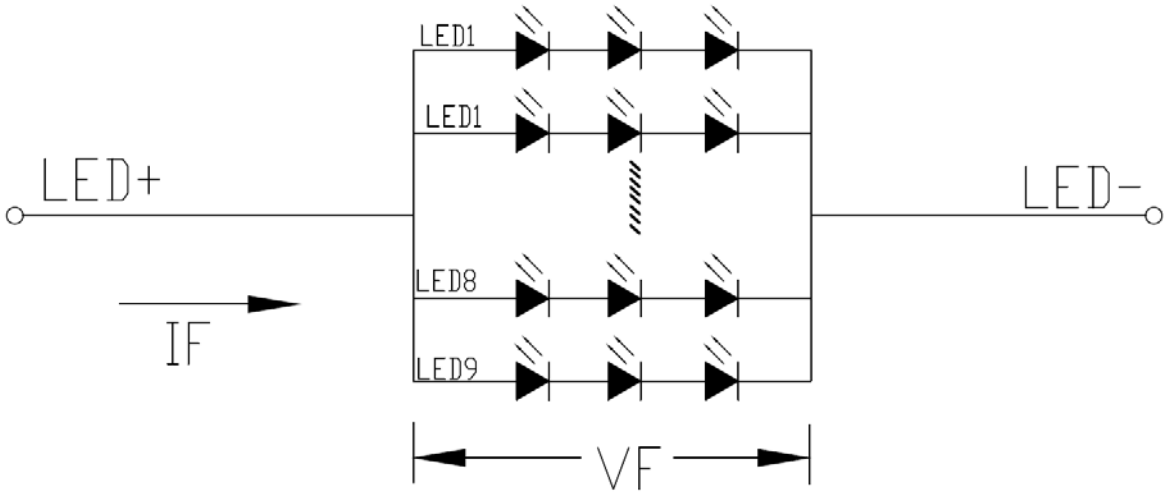
Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	180	-	mA	27 LEDs (3 LED Serial,9 LED Parallel)
Forward Current Voltage	V_F	9.0	9.3	9.6	V	
Backlight Power Consumption	W_{BL}	1620	1674	1728	mW	
LED Life Time	--	10000	20000	--	hrs	Note 2, Note 3

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 9LED Parallel).

Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: Optical performance should be evaluated at Ta=25℃ only If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

Note4: The LED driving condition is defined for each LED module.



6.ELECTRICAL CHARACTERISTICS

TTL mode DC electrical characteristics

(VDD=2.3~3.6V,AVDD=6.5~13.5V,GND=AGND=0V,T_A=-30℃~+85℃)

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Power supple voltage	VDD		2.3	-	3.6	V
Power supple voltage	AVDD		6.5	-	13.5	V
Low level input voltage	V_{IL}	For digital circuit	0	-	0.3VDD	V
High level input voltage	V_{IH}	For digital circuit	0.7VDD	-	VDD	V
Output low voltage	V_{OL}	IOL=400μA	-	-	GND+0.4	V
Output high voltage	V_{OH}	IOH=-400μA	VDD-0.4	-		V
Gate high voltage	VGH		18	20	22	V
Gate low voltage	VGL		-6.3	-7	-7.7	V
Pull low/high resistance	R_I	For the digital input pin @VDD=3.3V	200	250	300	KΩ
Input leakage current	I_I	For digital circuit	-	-	±1	uA
Digital operation current	Idd	Fclk=50MHz,LD=48KHz, VDD=3.3V, No load	-	12	20	mA
Digital stand-by current	Ist1	Clock & all functions are stopped	-	10	50	uA
Analog operating current	Idda	No load, Fclk=50MHz,LD=48KHz @ AVDD=10V, V1=8V, V14=0.4V	-	8	10	mA
Analog stand-by current	Ist2	No load, clock & all functions are stopped	-	10	50	uA
Input level of V1-V7	Vref1	Gamma correction voltage input	0.4AVDD	-	AVDD-0.1	V
Input level of V8-V14	Vref2	Gamma correction voltage input	0.1	-	0.6AVDD	V
Output voltage deviation	Vod1	Vo=AGND+0.1V~AGND+0.5V & Vo=AVDD-0.5V~AVDD-0.1V	-	±20	±35	mA
Output voltage deviation	Vod2	Vo=AGND+0.5V~AVDD-0.5V	-	±15	±20	mA
Output voltage offset between chips	Voc	Vo=AGND+0.5V~AVDD-0.5V	-	-	±20	mA
Dynamic range of output	Vdr	SO1~SO1200	0.1	-	VADD-0.1	V
Sinking current of outputs	IOLy	SO1~SO1200; Vo=0.1V vs. 1.0V, AVDD=13.5V	80	-	-	uA
Driving current of output	IOHy	SO1~SO1200 ;Vo=0.1V vs. 12.5V, AVDD=13.5V	80	-	-	uA
Resistance of gamma table	Rg	Rn: Internal gamma resistor	0.7xRn	1.0xRn	1.3xRn	Ω

TTL mode AC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
VDD Power on alew rate	TPOR	From 0V to 90% VDD	-	-	20	ms
GRB pulse width	TGRB	DCLK=65MHz	50	-	-	μs
DCLK cycle time	Tcph	-	14	-	-	ns
DCLK pulse duty	Tcwh	-	40	50	60	%
VSD setup time	Tvst	-	5	-	-	ns
VSD hold time	Tvhd	-	5	-	-	ns
HSD setup time	Thst	-	5	-	-	ns
HSD hold time	Thhd	-	5	-	-	ns
Data setup time	Tdsu	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
Data hold time	Tdhd	D0[7:0], D1[7:0], D2[7:0] to DCLK	5	-	-	ns
DE setup time	Tesu	-	5	-	-	ns
DE hold time	Tehd	-	5	-	-	ns
Output stable time	Tsst	10% to 90% target voltage. CL=90pF, R=10K. **(Cascade)**	-	-	6	μs
		Dual gate			3	

Table 4.2 AC electrical characteristics

7. Timing Chart

7.1

TTL mode data input format
Vertical timing

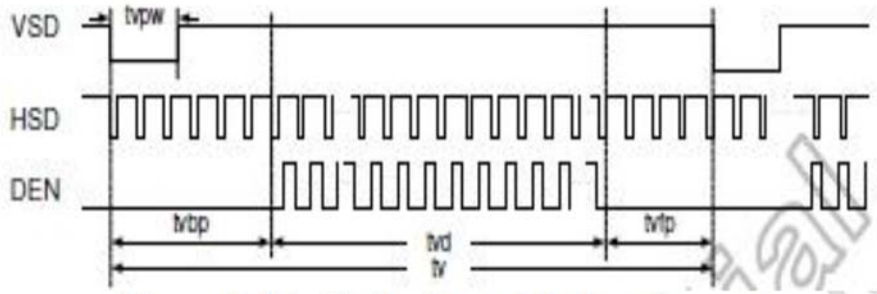


Figure 5.1.1: Vertical input timing diagram

Horizontal timing

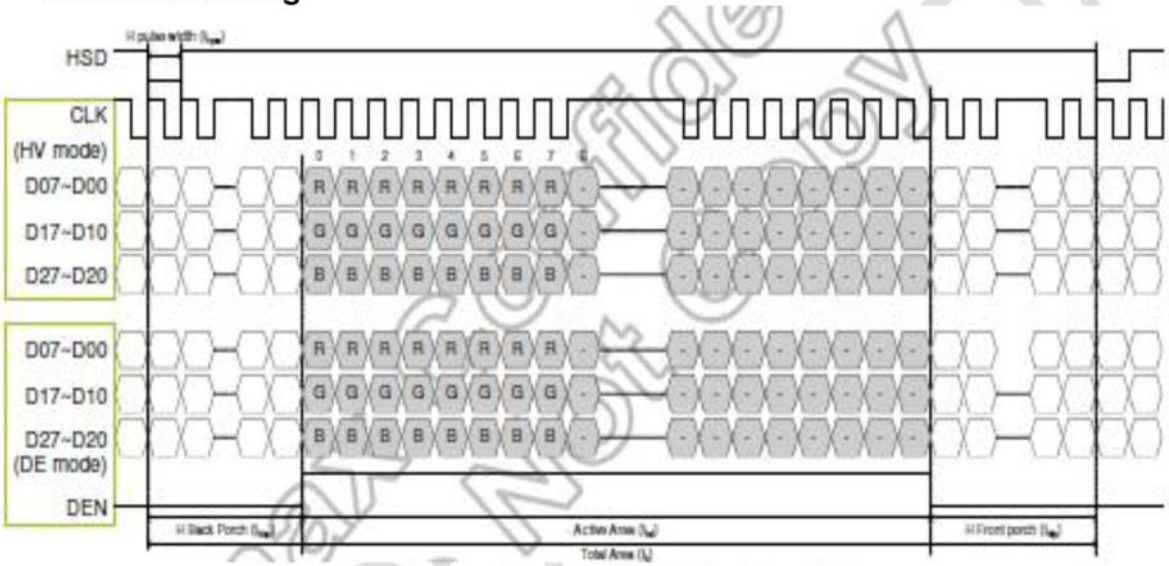


Figure 5.1.2: Horizontal input timing diagram

7.2 Parallel RGB input timing table

DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	26.2	29.2	54.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	890	928	1300	DCLK
HSD blanking	thb+ thfp	90	128	500	DCLK
Vertical display area	tvd		480		T_H
VSD period	tv	490	525	700	T_H
VSD blanking	tvbp+ tvfp	10	45	220	T_H

HV mode

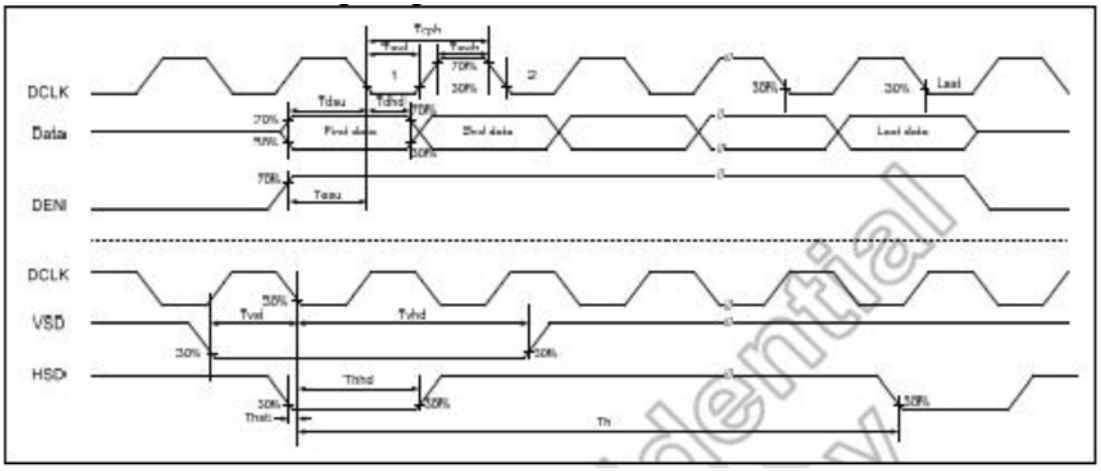
Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	27.7	29.2	39.6	MHz
Horizontal display area	thd		800		DCLK
HSD period	th	900	928	1100	DCLK
HSD pulse width	thpw	1	-	40	DCLK
HSD back porch	thbp		88		DCLK
HSD front porch	thfp	12	40	212	DCLK

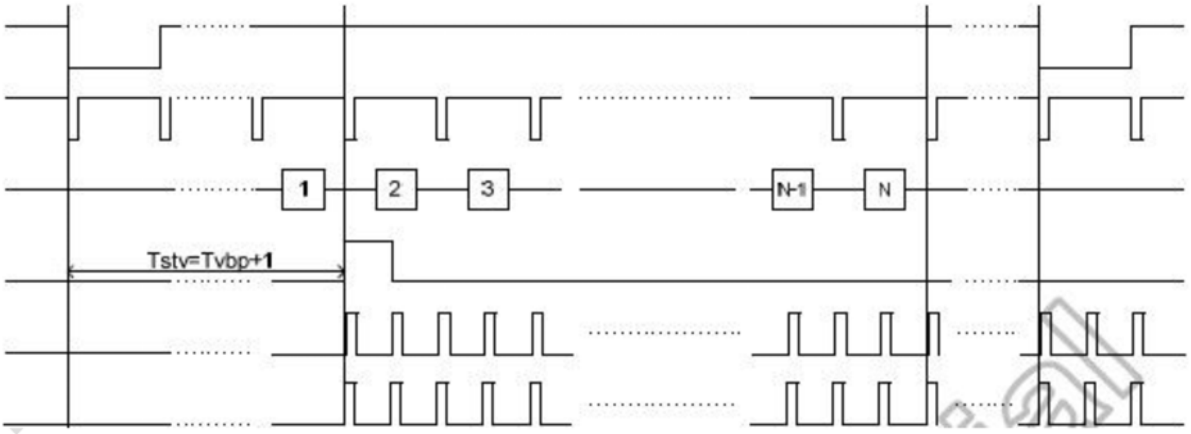
Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd		480		T_H
VSD period	tv	513	525	600	T_H
VSD pulse width	tvpw	1	-	3	T_H
VSD back porch	tvbp		32		T_H
VSD front porch	tvfp	1	13	88	T_H

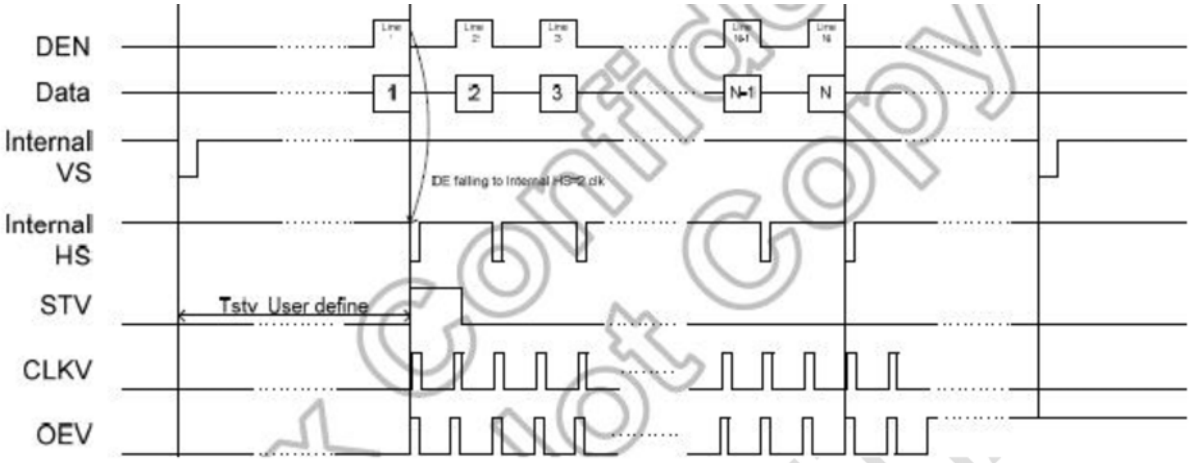
7.3 Input clock and data timing diagram



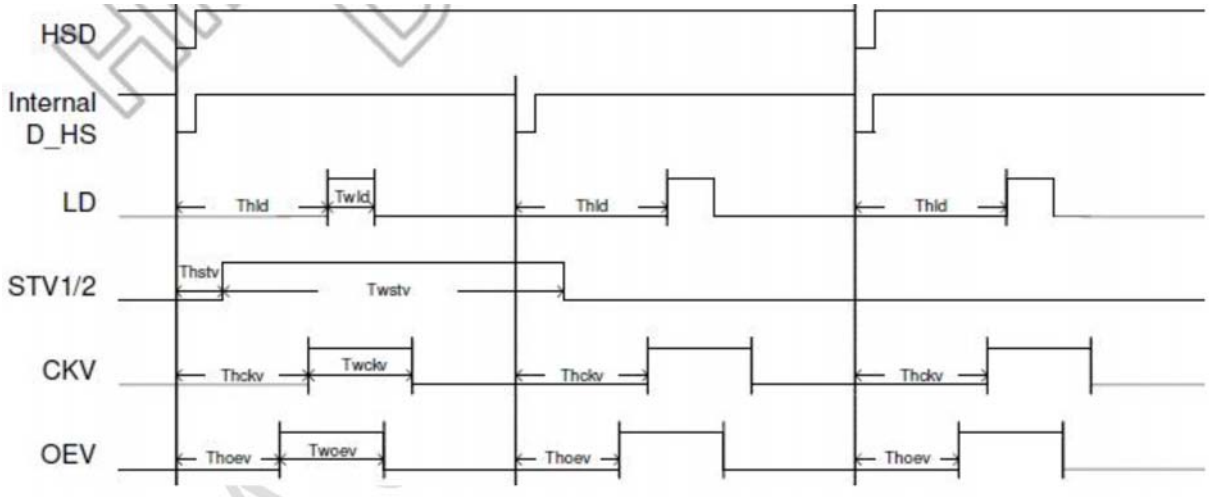
7.4 Vertical timing diagram HV(dual gate)



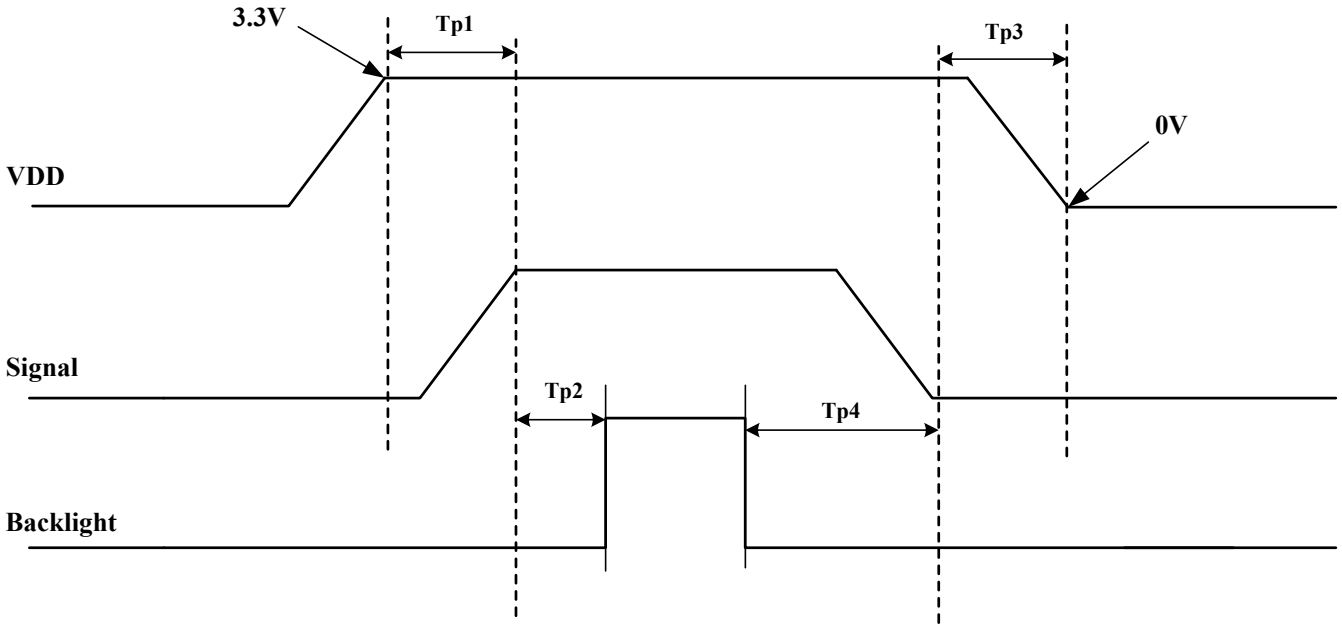
7.5 Vertical timing diagram DE(dual gate)



7.6 Gate output timing diagram(dual gate)



7.7 Power On / Off Sequence



Item	Symbol	Value			Units	Remark
		Min.	Typ.	Max.		
VDD on to signal starting	Tp1	5	-	50	ms	
Signal starting to backlight on	Tp2	150	-	-	ms	
Signal off to VDD off	Tp3	5	-	50	ms	
Backlight off to signal off	Tp4	150	-	-	ms	

8 .Reliability Test Items

Test Item	Test Conditions	Note
High Temperature Operation	70±3°C , t=240 hrs	
Low Temperature Operation	-20±3°C , t=240 hrs	
High Temperature Storage	80±3°C , t=240 hrs	1,2
Low Temperature Storage	-30±3°C , t=240 hrs	1,2
Storage at High Temperature and Humidity	60°C, 90% RH , 240 hrs	1,2
Thermal Shock Test	-30°C (30min) ~ 80°C (30min) 100 cycles	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions (15-35°C , 45-65%RH).

9.0 General Precaution

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

9.2 Handling Precaution

(1) Please mount LCD module by using mounting holes arranged in four corners tightly.
(2) Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. IVO does not warrant the module, if customers disassemble or modify the module.
(3) If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin. If liquid crystal contacts mouth or eyes, rinse out with water immediately. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.
(4) Disconnect power supply before handling LCD module.
(5) Refrain from strong mechanical shock and /or any force to the module.
(6) Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts parameters, environmental temperature; etc otherwise LCD module may be damaged. It’s recommended employing protection circuit for power supply.
(7) Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.
(8) When the surface is dusty, please wipe gently with absorbent cotton or other soft material. When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzene or other adequate solvent.
(9) Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.
(10) Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.
(11) Because LCD module uses CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge, please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.
(12) Do not adjust the variable resistor located on the module.

9.3 Storage Precaution

(1) Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

(2) The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.

(3) The module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storage.

9.4 Operation Precaution

(1) Do not connect or disconnect the module in the "Power On" condition.

(2) Power supply should always be turned on/off by "Power On/Off Sequence".

(3) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(4) After installation of the TFT module into an enclosure, do not twist nor bend the TFT module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT module from outside. Otherwise the TFT module may be damaged.

9.5 Others

(1) Ultra-violet ray filter is necessary for outdoor operation.

(2) Avoid condensation of water which may result in improper operation or disconnection of electrode.

(3) If the module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.

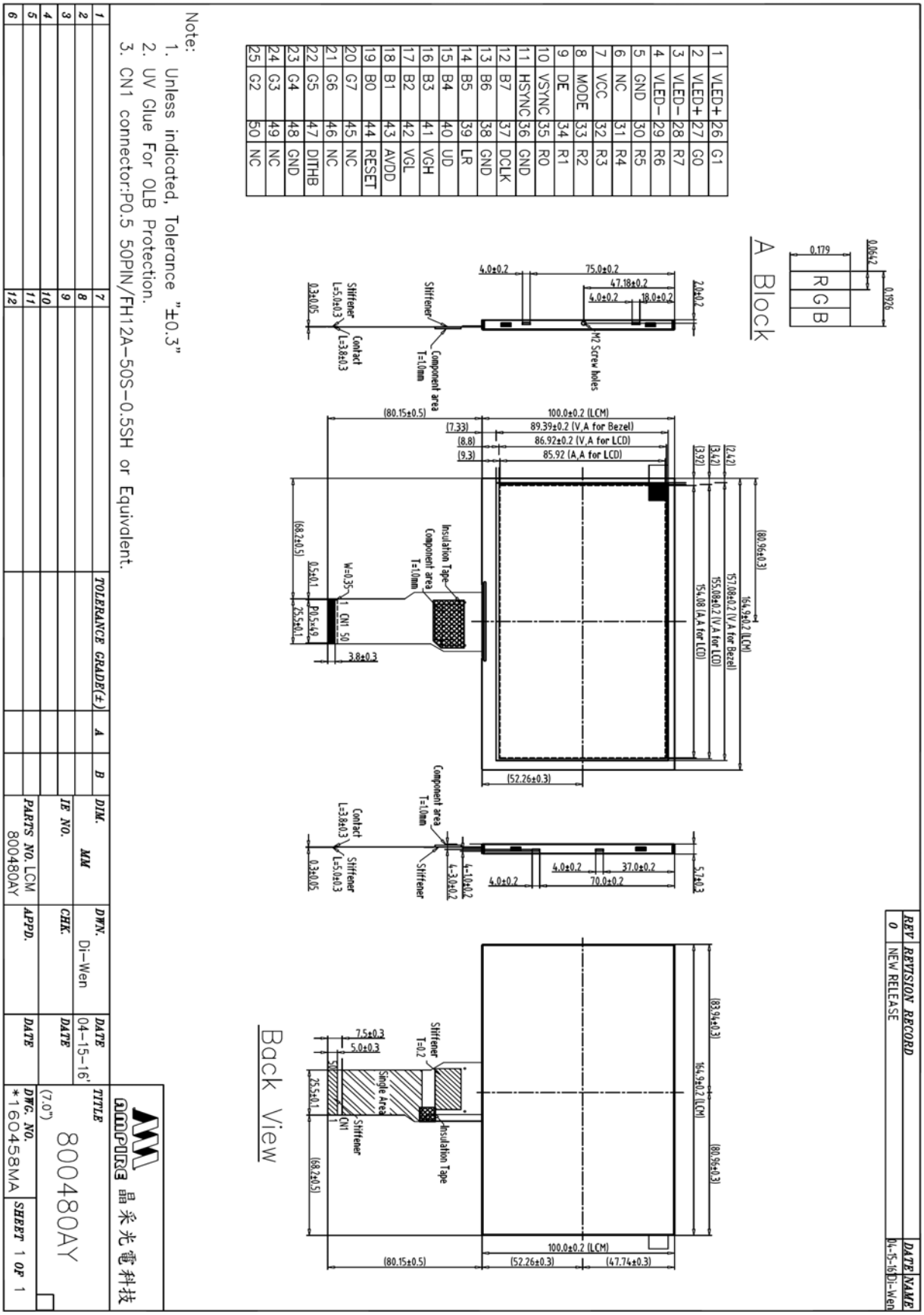
(4) This module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

(5) Do not keep the LCD at the same display pattern continually. The residual image will happen and it will damage the LCD. Please use screen saver.

9.6 Disposal

When disposing LCD module, obey the local environmental regulations.

10.0 Outline Dimension



1	VLED+	26	G1
2	VLED+	27	G0
3	VLED-	28	R7
4	VLED-	29	R6
5	GND	30	R5
6	NC	31	R4
7	VCC	32	R3
8	MODE	33	R2
9	DE	34	R1
10	VSYNC	35	R0
11	HSYNC	36	GND
12	B7	37	DCLK
13	B6	38	GND
14	B5	39	LR
15	B4	40	UD
16	B3	41	VGH
17	B2	42	VGL
18	B1	43	AVDD
19	B0	44	RESET
20	G7	45	NC
21	G6	46	NC
22	G5	47	DITHB
23	G4	48	GND
24	G3	49	NC
25	G2	50	NC