LCD Module Specification

Module P/N: IE-A-2229CH04-00-1

Version: 2.0

Description : 10.1 inch TFT 1200*1920 Pixels with LED backlight, wide viewing angle

Revision History

Date	Rev.	Page	Description
2019-06-07	1.0	All	First issue
2019-07-10	2.0	Page7&14	Update Luminance to 350cd/m^2

CONTENTS

1. General Features

Item	Spec	Remark
Display Mode	Normally Black transmissive	
Viewing Direction	ALL o'clock	ALL
Input Signals	MIPI VIDEO MODE	
Outside Dimensions	143 (W) x228.55(H) x2.7(D)	mm
Active Area	135.36(W)×216.58(H)	mm
Number of Pixels	1200×RGB×1920Pixels	
Dot Pitch	0.1128(H) ×0.1128(V)	mm
Pixel Arrangement	RGB Vertical stripes	

2. Absolute Maximum Ratings

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

Item	Symbol	Min.	Typ.	Max	Unit	Note
Power Supply Voltage	V_{DD}	-0.3	3.3	3.6	V	1，2
	AVDD				V	
	VGH				V	
	VGL				V	
	VCOM				V	
Logic Signal Input	V_{IO}	-0.3	3.3	3.6	V	
Current of LED	ILED	0	90	100	mA	

Notes:

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. $V_{CC} > V_{SS}$ must be maintained.

3. Electrical Specification

3.1 Driving TFT LCD Panel

Item		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		VDD	-0.3	3.3	3.6	V	
Power For Circuit Logic		VDDIO	-0.3	3.3	3.6	V	
Logic Input Voltage	Low Voltage	V_{IL}	0.0	-	0.2 IOVCC	V	
	High Voltage	V_{IH}	0.8 IOVCC	-	IOVCC	V	
Logic Output Voltage	Low Voltage	V_{OL}	0.0	-	0.2 IOVCC	V	
	High Voltage	V_{OH}	0.8 IOVCC	-	IOVCC	V	
Power Consumption	Black Mode	P_b	--	--	--	mW	
	Standby Mode	P_w	--	--	--	mW	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V_F	--	24.8	--	V	
Backlight driving current	I_F	--	90	--	mA	
Backlight Power Consumption	W_{BL}	-	-	-	mW	
Life Time	-	-	10,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25℃)
Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
Note 3: 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.

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 ℃. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1)Contrast Ratio	C/R	700	900	-		FIG.1
2)Luminance	L	-	350	-	cd/m^2	FIG.1
3)Response time	Tr+Tf	-	35		ms	FIG.2
4)Viewing Angle	Θ_L	75	80	-	Degree	FIG.3
	Θ_R	75	80	-		
	Θ_U	75	80	-		
	Θ_D	75	80	-		
5)Chromaticity	Wx	0.260	0.310	0.360		
	Wy	0.280	0.330	0.380		
	Rx	--	TBD	--		
	Ry	--	TBD	--		
	Gx	--	TBD	--		
	Gy	--	TBD	--		
	Bx	--	TBD	--		
	By	--	TBD	--		

Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

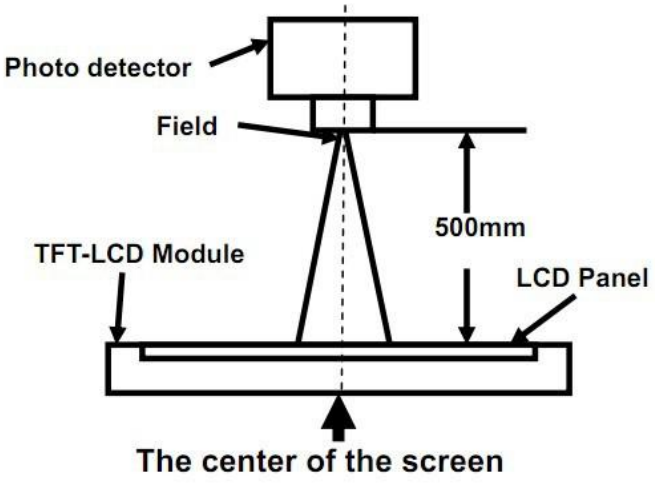
$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

FIG. 1 Optical Characteristic Measurement Equipment and Method



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% ☾ Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% ☾ Full White 90% Transmittance.

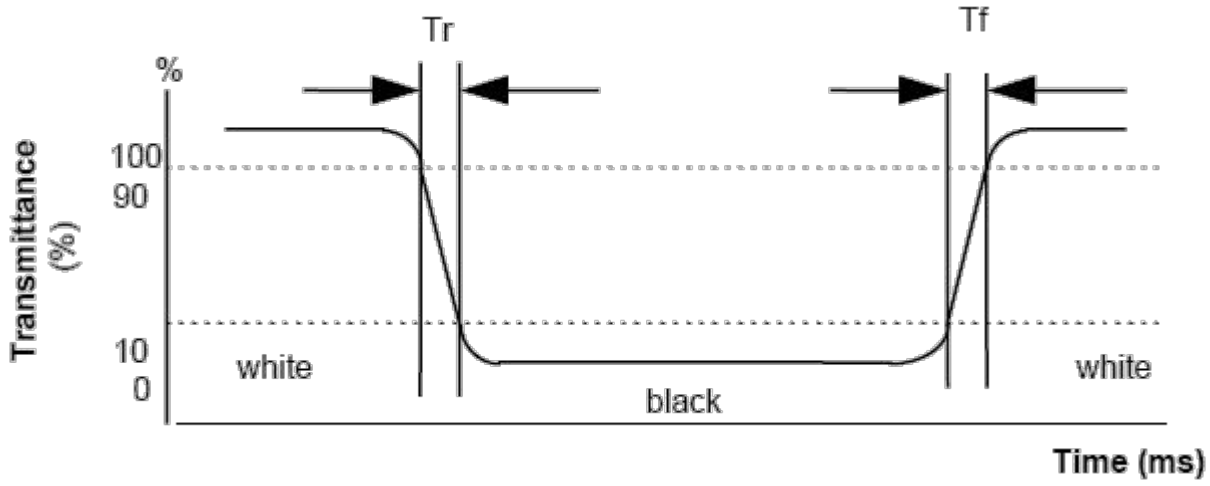
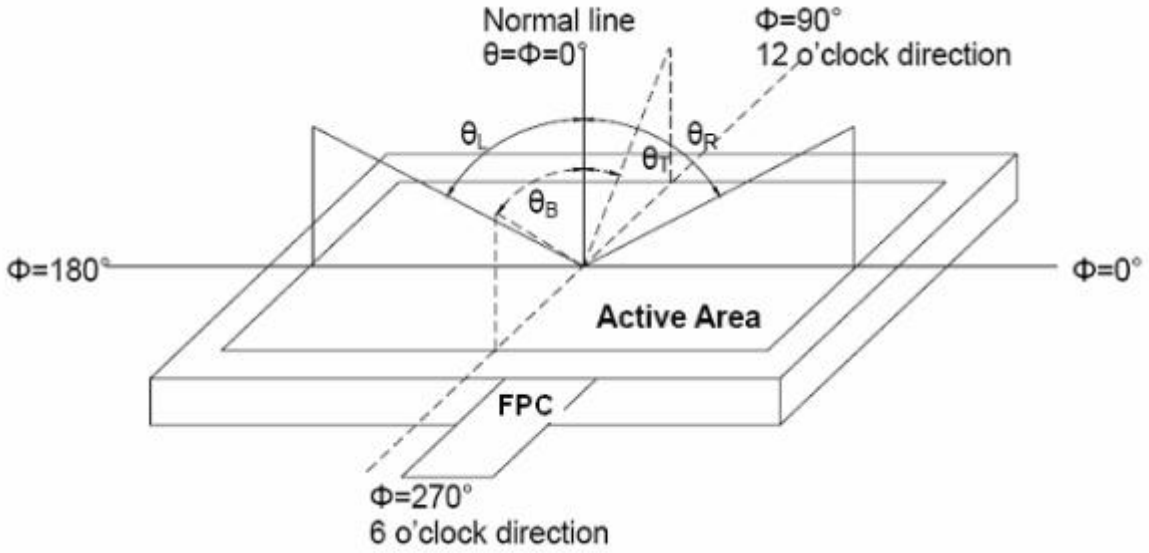
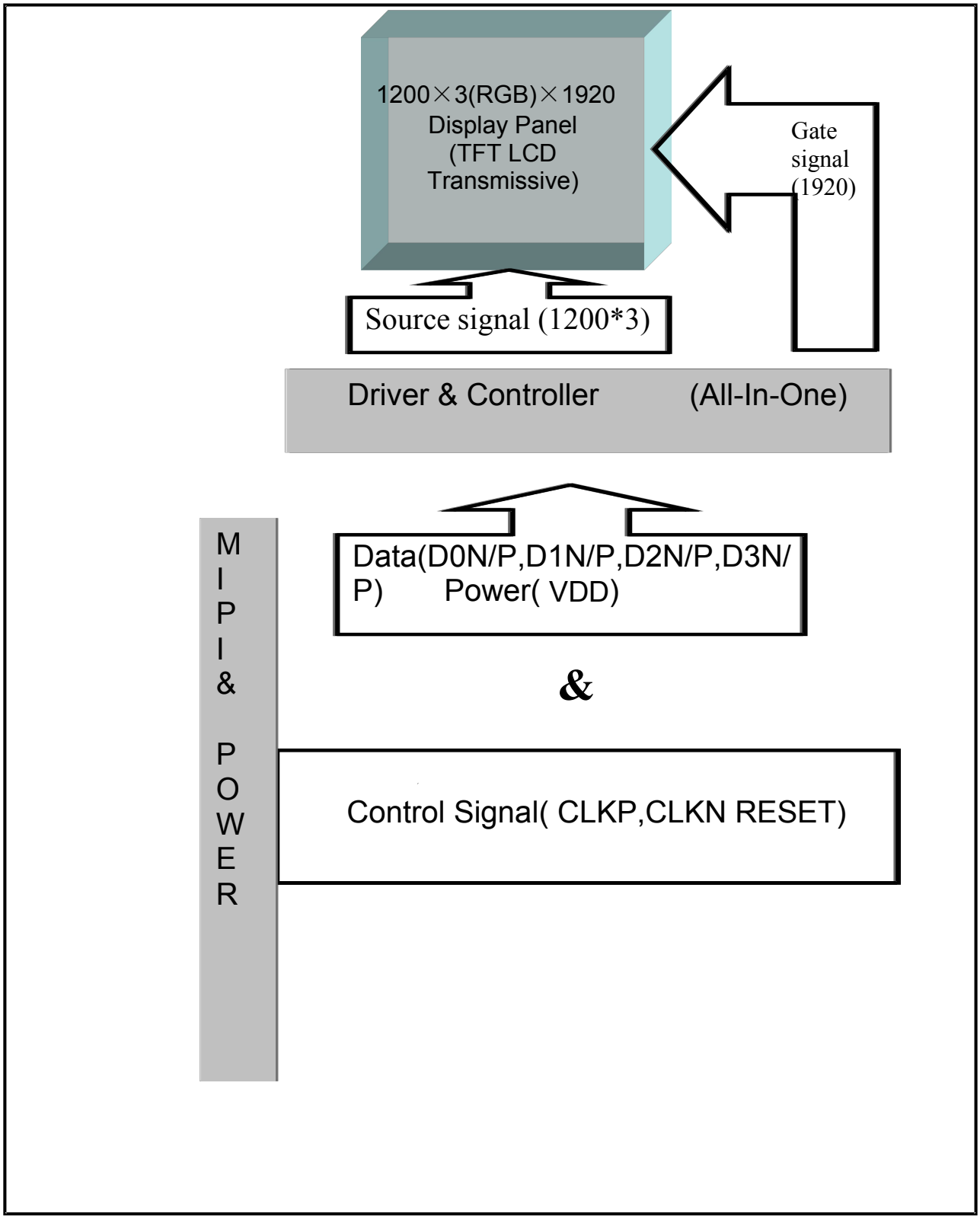


FIG. 3 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



5.Block Diagram

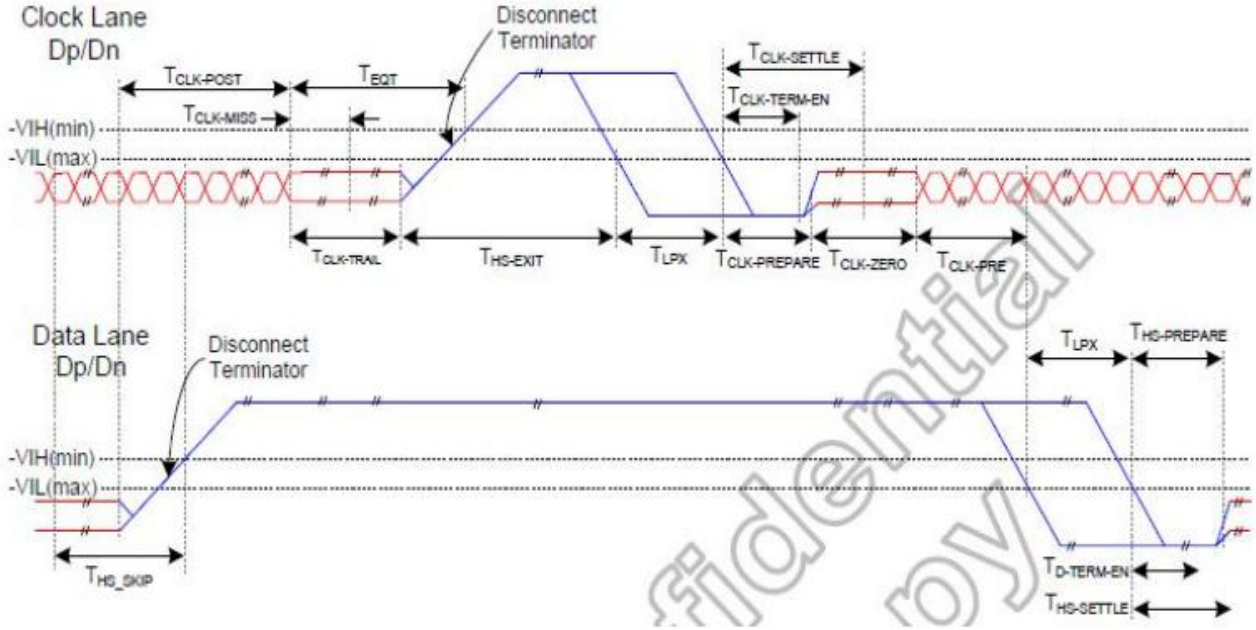


6.Pin Description

SYMBOL	PIN	I/O	DISCRIPTION
NC	1	-	-
VDD	2	P	Power supply for digital block (+3.3V)
VDD	3	P	Power supply for digital block (+3.3V)
GND	4	I	Ground
RESET	5	I	**Global reset pin. Active Low to enter Reset State**.(3.3v)
NC	6	-	-
GND	7	P	Ground
D0N	8	I	Negative MIPI differential Data Input 0
D0P	9	I	Positive MIPI differential Data Input 0
GND	10	P	Ground
D1N	11	I	Negative MIPI differential Data Input 1
D1P	12	I	Positive MIPI differential Data Input 1
GND	13	P	Ground
DCLKN	14	I	Negative MIPI differential Clock Input
DCLKP	15	I	Positive MIPI differential Clock Input
GND	16	P	Ground
D2N	17	I	Negative MIPI differential Data Input 2
D2P	18	I	Positive MIPI differential Data Input 2
GND	19	P	Ground
D3N	20	I	Negative MIPI differential Data Input 3
D3P	21	I	Positive MIPI differential Data Input 3
GND	22	P	Ground
NC	23	-	No Connection
NC	24	-	No Connection
GND	25	P	Ground
NC	26	I	No Connection
PWM	27	O	
NC	28	I	No Connection
NC	29	I	No Connection
GND	30	P	Ground
LED-	31	P	Backlight LED Cathode input pin (-)
LED-	32	P	
NC	33	I	No Connection
NC	34	I	No Connection
NC	35	P	No Connection
NC	36	I	No Connection
NC	37	I	No Connection
NC	38	P	No Connection
LED+	39	P	Backlight LED Anode input pin (+)
LED+	40	P	

7.Timing Characteristics

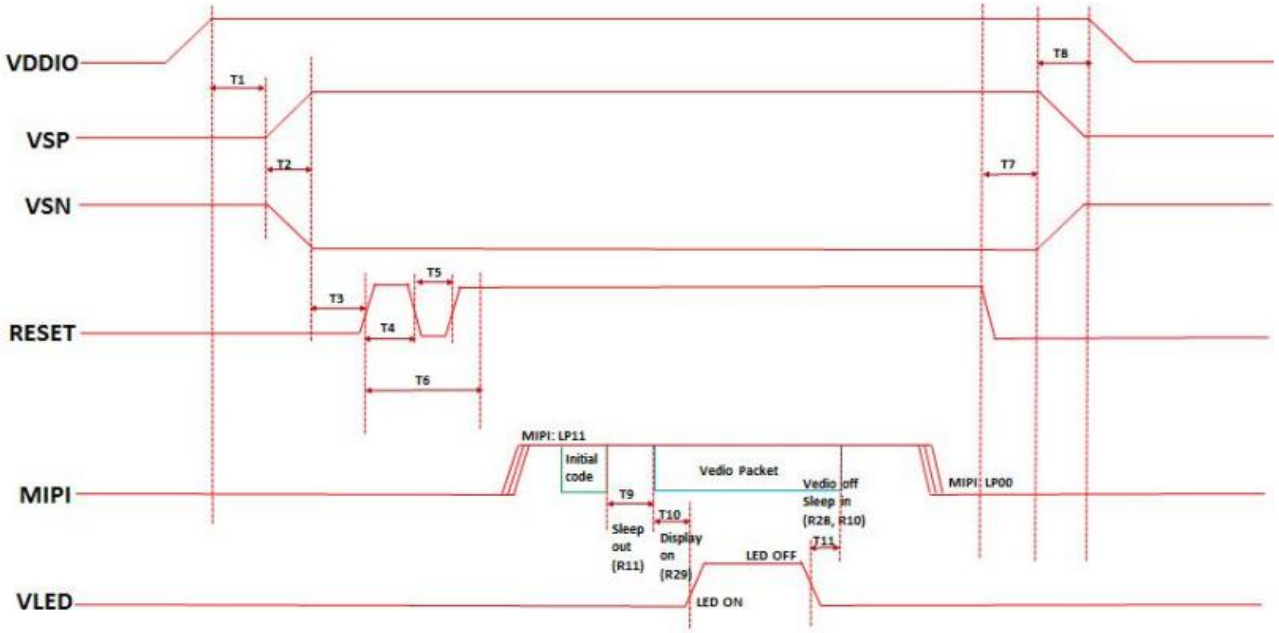
7.1. Low Power Mode Data Transmission



< Switching the clock lane between clock transmission and low-power mode >

Item			Symbol	min	typ	max	UNIT
LCD	Frame Rate		-	-	60	-	Hz
	Pixels Rate		-	-	156	-	MHz
Timing	DCLK	Frequency	fCLK	-	468	-	MHz
		Period	Tclk	-	2.14	-	ns
	Horizontal	Horizontal total time	tHP	-	1340	2047	t_{CLK}
		Horizontal Active time	tHadr		1200		t_{CLK}
		Horizontal Pulse Width	tHsync	-	24	-	t_{CLK}
		Horizontal Back Porch	tHBP	-	80	-	t_{CLK}
		Horizontal Front Porch	tHFP	-	60	-	t_{CLK}
	Vertical	Vertical total time	tvp	-	1944	2047	t_H
		Vertical Active time	tVadr		1920		t_H
		Vertical Pulse Width	tVsync	-	2	-	t_H
		Vertical Back Porch	tVBP	-	10	-	t_H
		Vertical Front Porch	tVFP	-	14	-	t_H
Bit Rate			TX SPD (Mbps)	980	980	995	Mbps
Lane				-	4	-	Lane

7.2 Power Sequence



< Table15. Sequence Table >

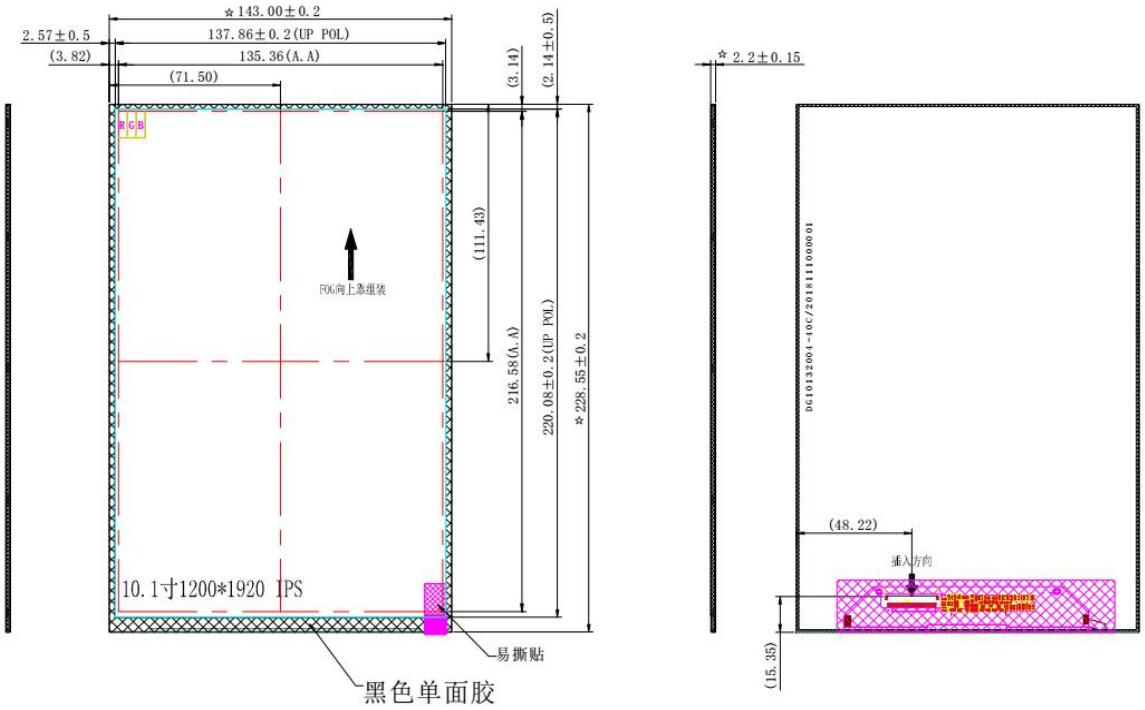
Item	Time	Unit	Remark
T1	>0	ms	
T2	1	ms	
T3	>5	ms	
T4	>=0	ms	
T5	>=0	ms	
T6	>6	ms	
T7	>0	ms	
T8	>0	ms	
T9			
T10			
T11			
T12			
T13			
T14			

8.Outline Dimension

模 组 图

IE-A-2229CH04-00-1

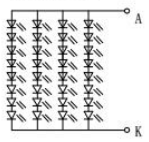
DIMENSIONAL TOLERANCE(±) 尺寸范围(±)						
公差等级	0 ≤ 5	5 ≤ 15	15 ≤ 60	60 ≤ 150	150 ≤ 300	300 ≤ 630
☐ A	0.05	0.10	0.15	0.20	0.25	0.30
☑ B	0.10	0.15	0.20	0.25	0.30	0.35
UNLESS OTHERWISE SPECIFIED 没指定尺寸						



亮度计A测试

参数	SYMBOL	MIN	TYP	MAX	单位	备注
中心点亮度	Iv ■ LCM	330	350		cd/m2	
	Iv ■ LCM	180	190		LUX	
背光色坐标范围	X					IF=90mA
	Y					
模组色坐标范围	X	0.260	0.310	0.360		
	Y	0.280	0.330	0.380		
驱动电压	VF	23.2	24.8	26.4	V	
反向电流	IR			50	uA	VR=10V, ※1
均匀性	Iv-m	75	80		%	(min/max)*100
最大额定功率				1260	mW	

电路原理图:



8*4=32PCS

驱动电流：90mA

9. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	60℃, 96Hr	Note
		Operation	50℃, 96Hr	Note
2	Low Temperature	Storage	-20℃, 96Hr	Note
		Operation	0℃, 96Hr	
3	High Temperature and High Humidity		40℃, 90%RH, 96Hr	Note

Note:

1) The test samples should be applied to only one test item.
2) Sample size for each test item is 5~10pcs.

10.PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol
Do not scrub hard to avoid damaging the display surface.
(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents
Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
(9) Do not attempt to disassemble or process the LCD module.
(10) NC terminal should be open. Do not connect anything.
(11) If the logic circuit power is off, do not apply the input signals.
(12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.

(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.

(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.

(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
-Terminal electrode sections.