



**SPECIFICATION
FOR
LCD MODULE**

**MODULE NO: AFK1024600A0-8.0N12NTM
REVISION NO: V01**

Customer's Approval:

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	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
CHECKED BY		
APPROVED BY		

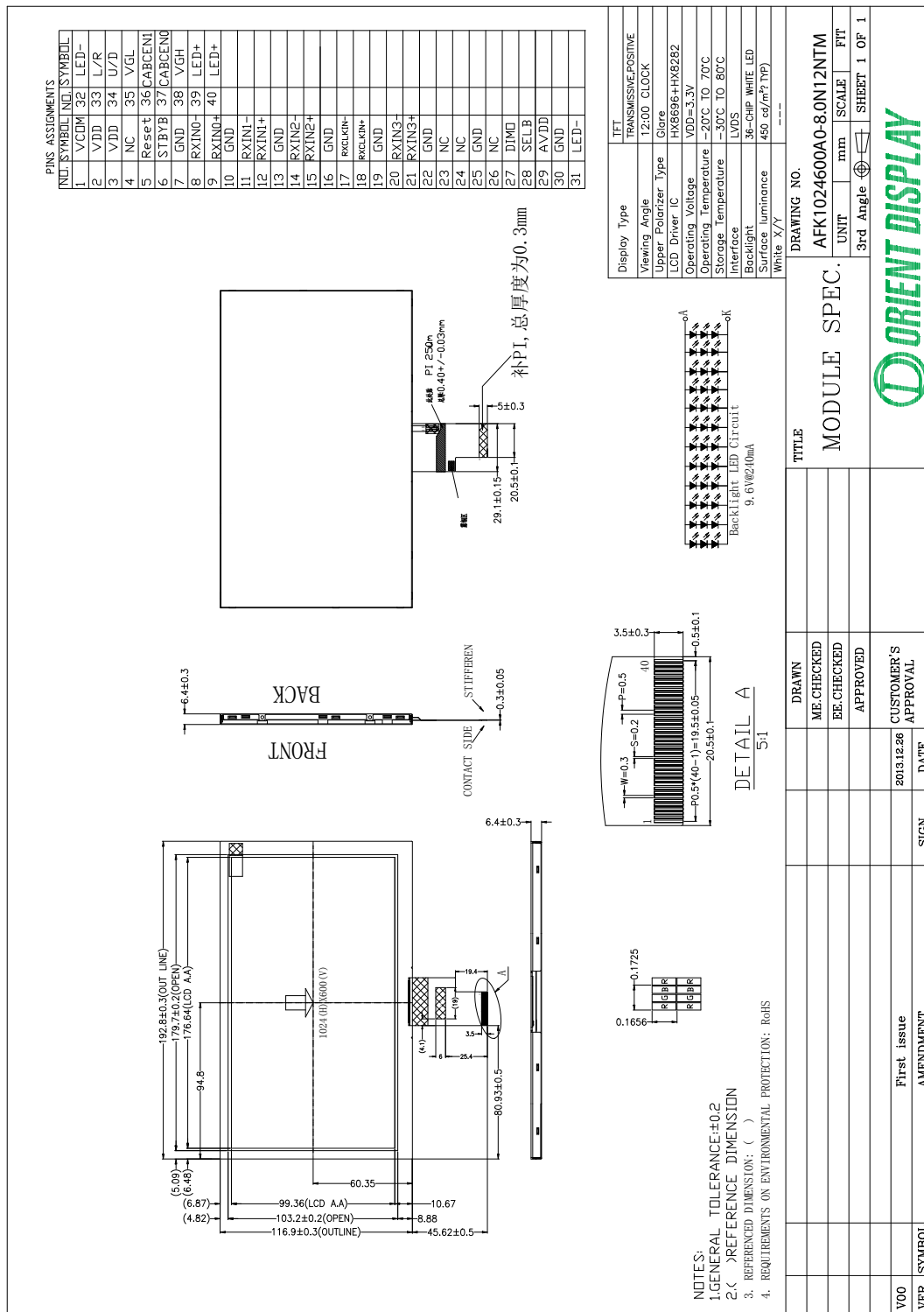
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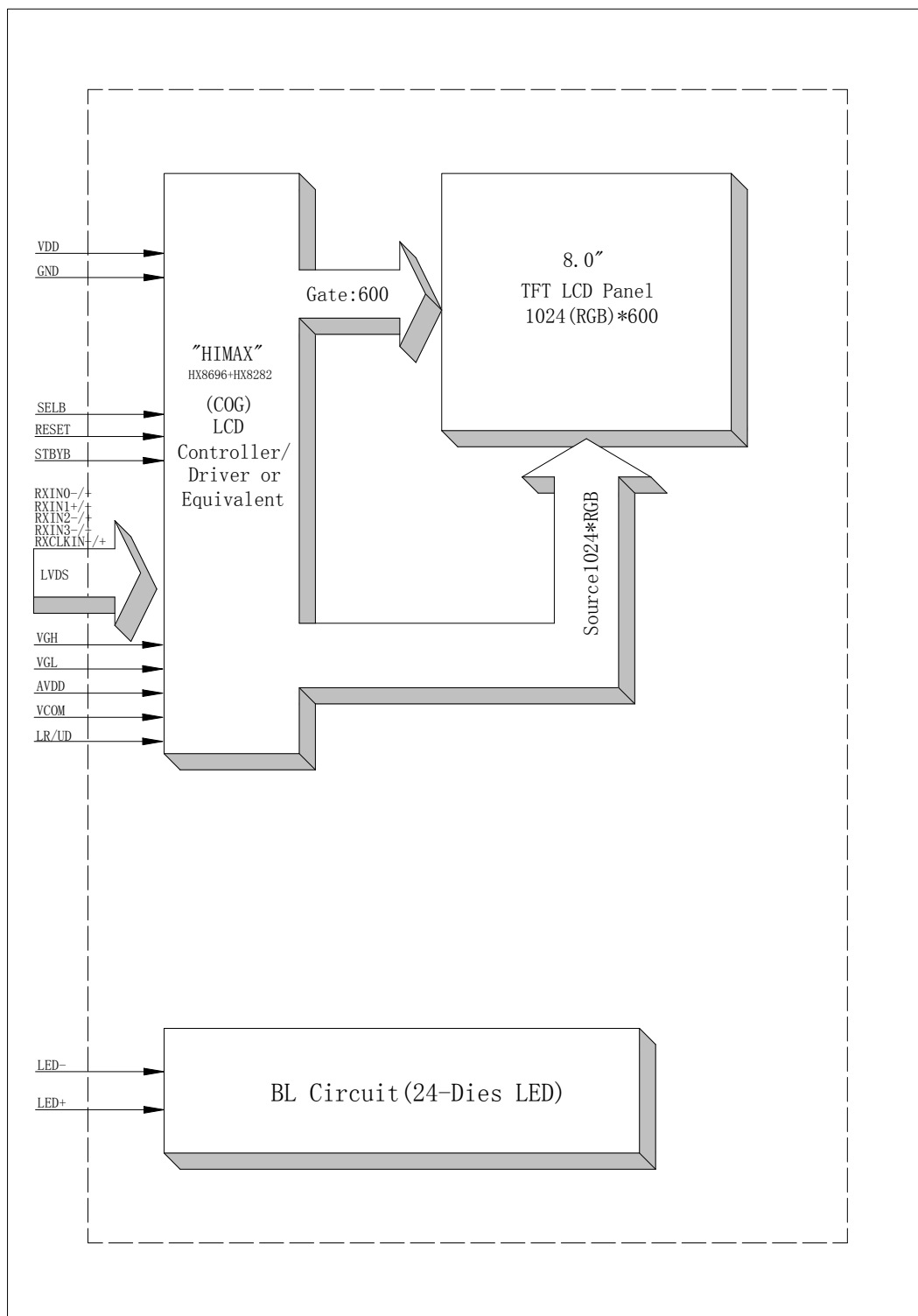
1. General Specification

Item	Contents	Unit
LCD TYPE	TFT/TRANSMISSIVE	
MODULE SIZE (W*H*T)	192.8*116.9*6.4	MM
ACTIVE SIZE (W*H)	176.64*99.36	MM
PIXEL PITCH (W*H)	0.1656*0.1725	MM
NUMBER OF DOTS	1024*600	
DIVER IC	HX8696+HX8282	
INTERFACE TYPE	LVDS	
TOP POLARIZER TYPE	GLARE	
RECOMMEND VIEWING DIRECTION	12	O'CLOCK
GRAY SCALE INVERSION DIRECTION	6	O'CLOCK
COLORS	16.7M	
BACKLIGHT TYPE	36-CHIP WHITE LED	
TOUCH PANEL TYPE	WITHOUT	

2. Mechanical Drawing



3. Block Diagram



4. Interface Pin Function

Pin No.	Symbol	Description
1	VCOM	Common voltage
2	VDD	Power Voltage for digital circuit
3	VDD	Power Voltage for digital circuit
4	NC	No connection
5	Reset	Global reset pin
6	STBYB	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z
7	GND	Ground
8	RXIN0-	-LVDS differential data input
9	RXIN0+	+ LVDS differential data input
10	GND	Ground
11	RXIN1-	-LVDS differential data input
12	RXIN1+	+ LVDS differential data input
13	GND	Ground
14	RXIN2-	-LVDS differential data input
15	RXIN2+	+ LVDS differential data input
16	GND	Ground
17	RXCLKIN-	-LVDS differential clock input
18	RXCLKIN+	+ LVDS differential data input
19	GND	Ground
20	RXIN3-	-LVDS differential data input
21	RXIN3+	+ LVDS differential data input
22	GND	Ground
23	NC	No connection
24	NC	No connection
25	GND	Ground
26	NC	No connection
27	DIMO	Backlight CABC controller signal output
28	SELB	6bit/8bit mode select
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	LED-	LED Cathode
32	LED-	LED Cathode
33	L/R	Horizontal inversion
34	U/D	Vertical inversion
35	VGL	Gate OFF Voltage
36	CABCEN1	CABC H/W enable
37	CABCEN0	CABC H/W enable
38	VGH	Gate ON Voltage

39	LED+	Anode of LED
40	LED+	Anode of LED

Note1: If LVDS input data is 6 bits, SELB must be set to High;

If LVDS input data is 8 bits, SELB must be set to Low.

Note2: When CABC_EN="00", CABC OFF.

When CABC_EN="01", user interface image.

When CABC_EN="10", still picture.

When CABC_EN="11", moving image.

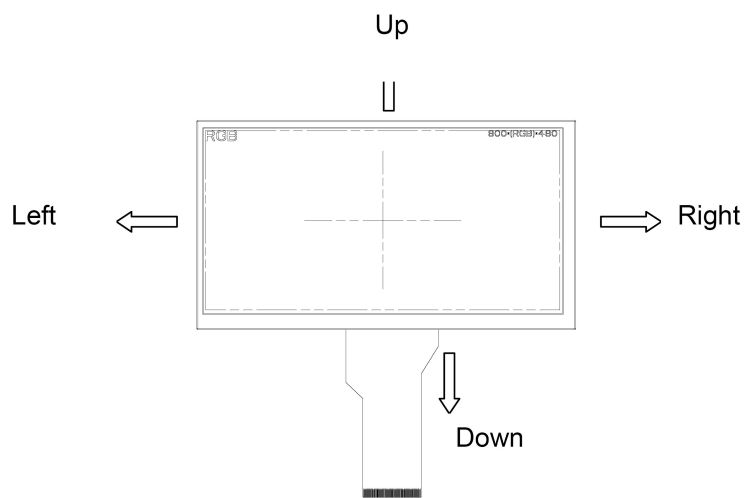
When CABC off, don't connect DIMO, else connect it to backlight.

Note3: When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.



5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	VDD	-0.3	5	V
Supply voltage for analog	AVDD	6.5	13.5	V
Power supply	VGH	-0.3	40	V
Power supply	VGL	-20	0.3	V
Power supply	VGH-VGL	-	40	V
Supply current (One LED)	I _{LED}		30	mA
Operating temperature	T _{OP}	-20	+80	°C
Storage temperature	T _{ST}	-30	+80	°C

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

6. Electrical Characteristics

6.1 Input Power

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply Voltage for Analog	VDD	3.0	3.3	3.6	V	
Supply Voltage for Logic	AVDD	10.8	11	11.2	V	
Power supply	VGH	16	20	24		
Power supply	VGL	-9.8	-6.8	-3.8		
Power supply	VCOM	3.4	3.7	4.0		
Input Voltage	V _{IL}	0	-	0.3VDD	V	
	V _{IH}	0.7 VDD	-	VDD		
Input leakage Current	I _{LKG}	-		-	μA	

6.2 Backlight Driving Conditions

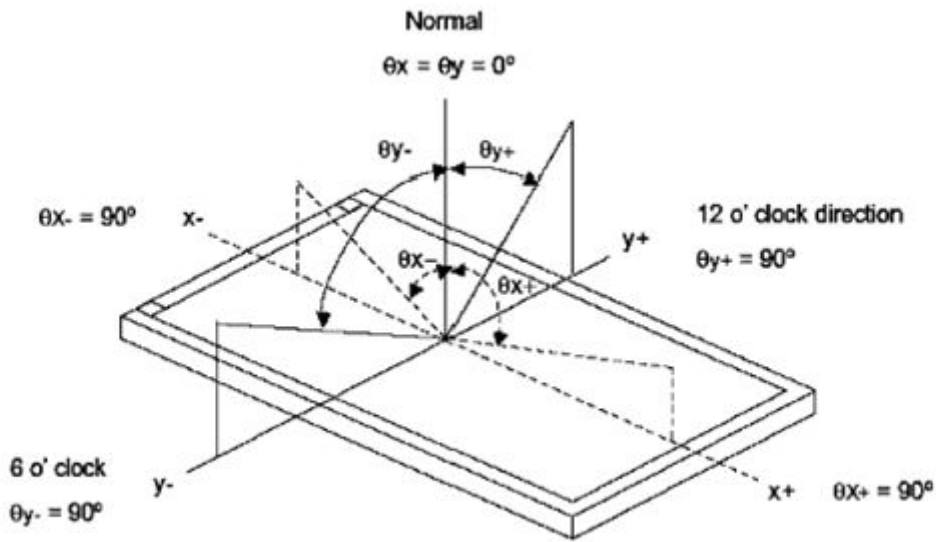
Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V _F	-	9.6	10.8	V	I _L =240mA
Current for LED Backlight	I _L		240		mA	
Power Consumption	P		2.304		W	
LED Life Time		30,000			Hr	Note

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25°C

7. Optical Characteristics

ITEM	SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
			MIN	TYP.	MAX		
Luminance	L	$I_L = 240\text{mA}$	-	450	-	Cd/m^2	
Contrast Ratio	CR	$\theta = 0^\circ$	500	700			
Response Time	T_{ON}	25°C		10	20	ms	
	T_{OFF}			20	30		
CIE Color Coordinate	Red	X_R	Viewing normal angle				
		Y_R					
	Green	X_G					
		Y_G					
	Blue	X_B					
		Y_B					
	White	X_W			-		
		Y_W			-		
Viewing Angle	Hor.	θ_{X+}	$\text{CR} \geq 10$	70	70	Degree	
		θ_{X-}		70	70		
	Ver.	θ_{Y+}		60	65		
		θ_{Y-}		70	70		
Uniformity	Un			70	75	%	

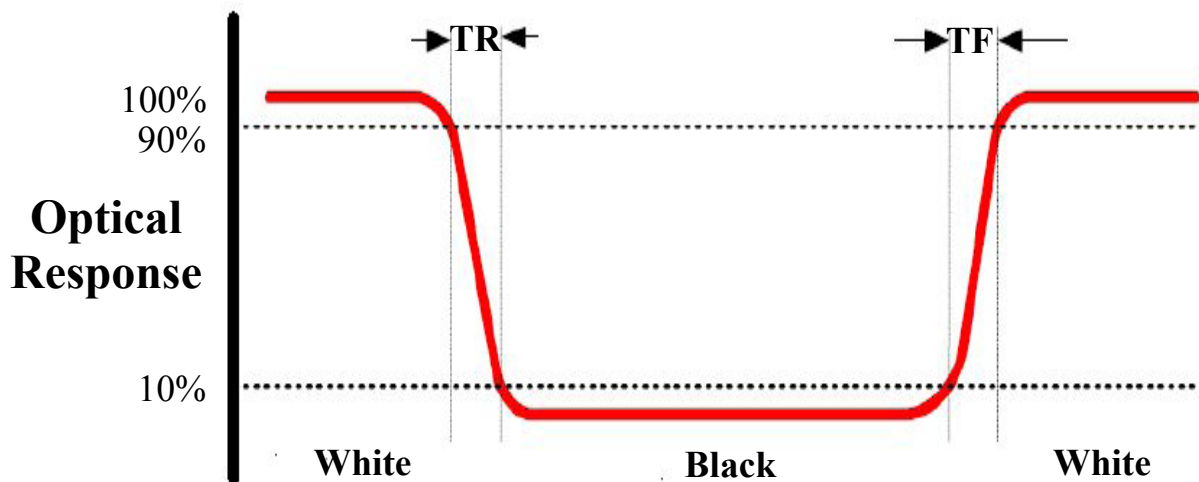
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

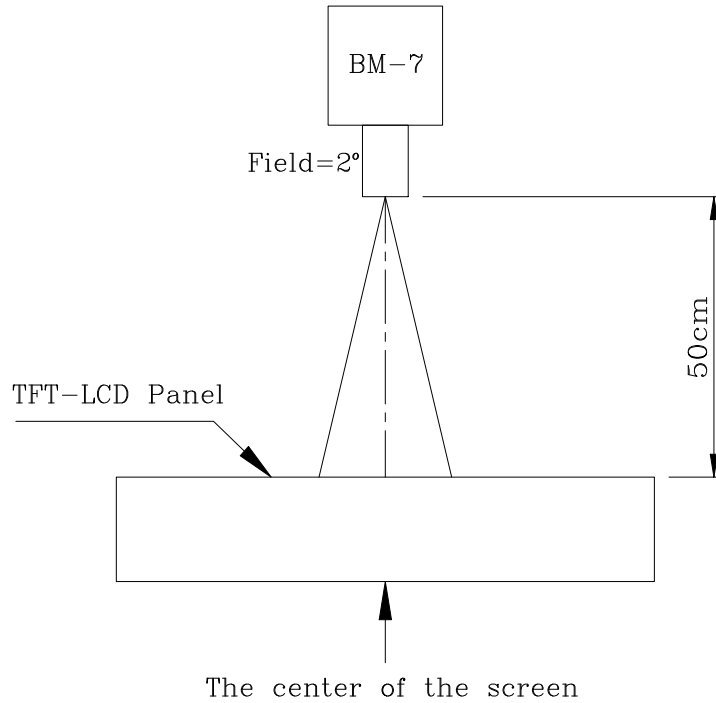
Note 3: Definition of Response Time (T_r, T_f)



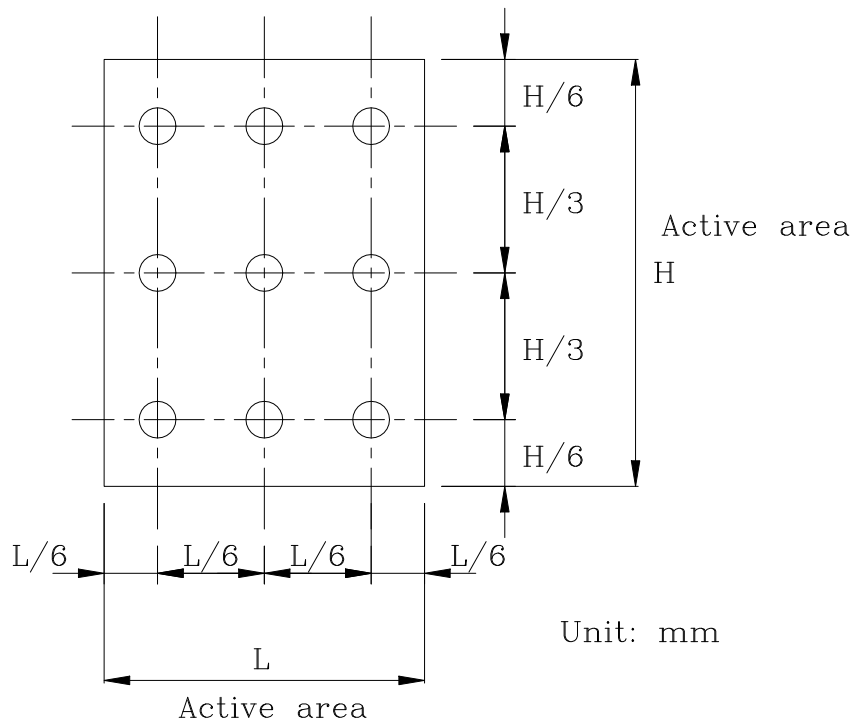
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



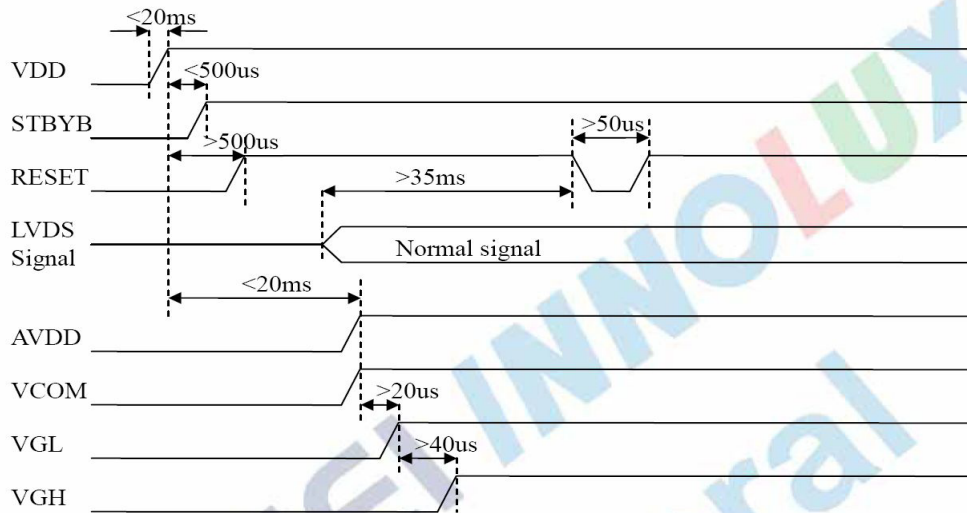
②The Brightness Test Point Setup



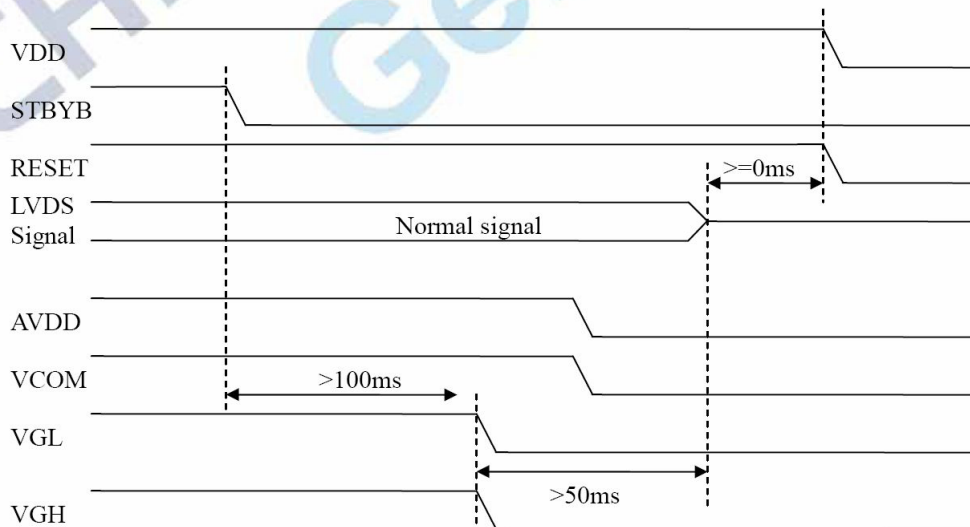
8. Timing Characteristics

8.1 Power Sequence

Power on



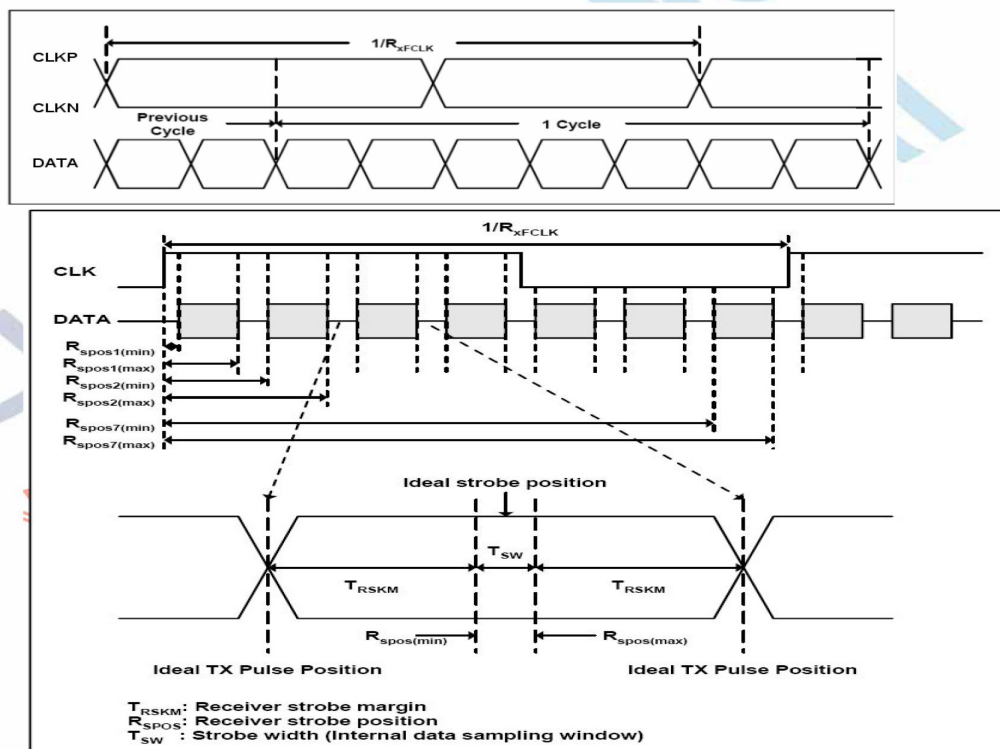
Power off



8.2 AC electrical characteristics

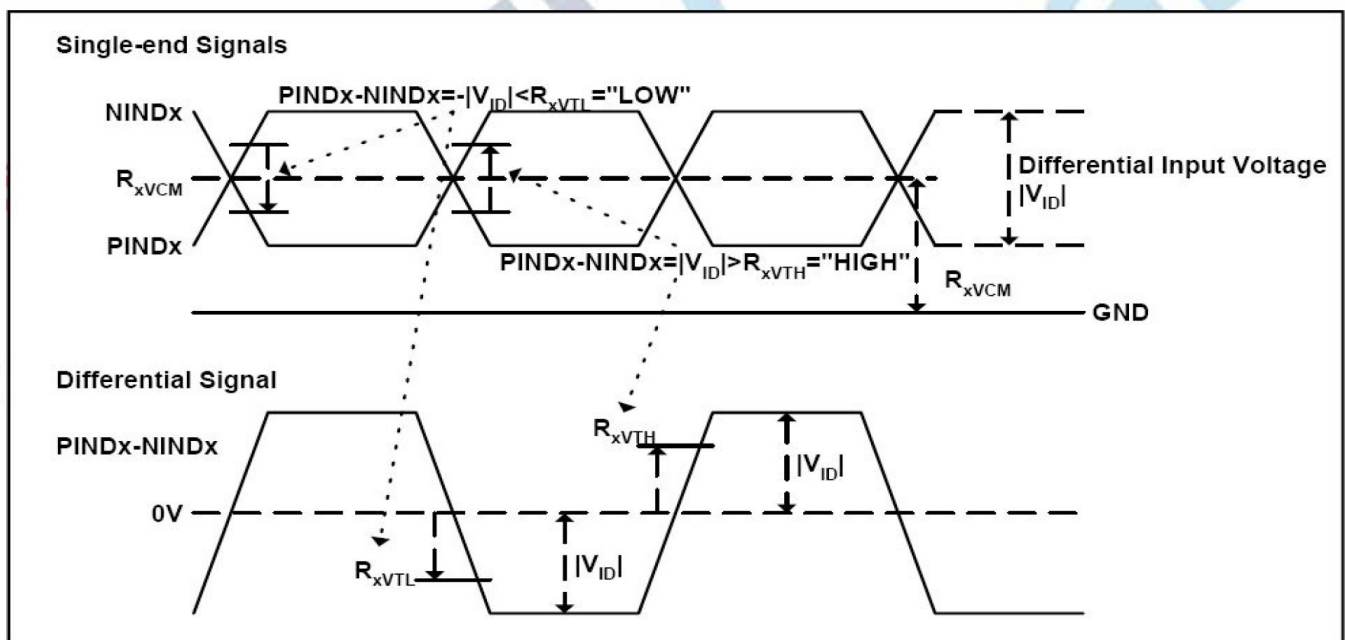
Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock frequency	RXFCLK	20	-	71	MHZ	
Input data skew margin	TRSKM	500	-	-	Ps	
Clock high time	TLVCH	-	$4/(7 \cdot r)$	-	ns	
Clock low time	TLVCL	-	$3/(7 \cdot r)$	-	ns	

8.3 Input data format

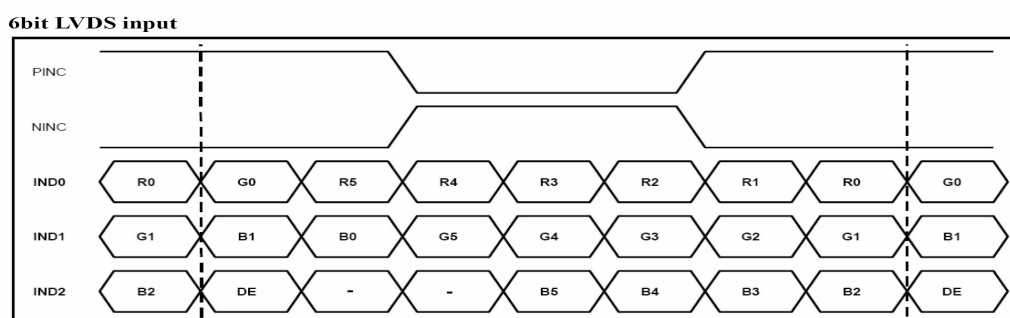


8.4 DC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Differential input high Threshold voltage	R_{xVTH}	-	-	+0.1	V	$R_{xVCM}=1.2V$
Differential input low Threshold voltage	R_{xVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{xVIN}	0	-	2.4	V	
Differential input common mode voltage	R_{xVCM}	$ V_{ID} /2$	-	$2.4- V_{ID} /2$	V	
Differential voltage	$ V_{ID} $	0.2	-	0.6	V	
Differential input leakage current	$R_{V_{xliz}}$	-10	-	+10	μA	



8.5 Data input format



Note: Support DE timing mode only, SYNC mode not supported.

8.6 Data input format

Item	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Clock frequency	Fclk	40.8	51.2	67.2	MHz	Frame rate=60Hz
Horizontal display area	Thd	1024			DCLK	
HS period time	Th	1114	1344	1400	DCLK	
HS Blanking	Thb	90	320	376	DCLK	
Vertical display area	Tvd	600			H	
VS period time	Tv	610	635	800	H	
VS blanking	Thb	10	35	200	H	

9. Standard Specification for Reliability

9.1 Standard Specification for Reliability of LCD Module

Item	Test Conditions	Remark
High temperature storage	Ta=80°C 240hrs	NOTE1 , NOTE4
Low temperature storage	Ta=-30°C 240hrs	NOTE1 , NOTE4
High temperature operation	Ta=80°C 240hrs	NOTE2 , NOTE4
Low temperature operation	Ta=-20°C 240hrs	NOTE2 , NOTE4
Operate at high temperature and humidity	+60°C , 90%RH 240hrs	NOTE4
Thermal Shock	-30°C/30min~+80°C/30min for a total 100 cycles, start with cold temperature and end with high temperature.	NOTE4
Vibration Test	Frequency range:10~55HZ Stroke:1.5mm Swap:10HZ~55HZ~10HZ 2 hours of each direction of X.Y. Z (6 hours for total)	
Mechanical shock	100G 6ms, ±X, ±Y, ±Z 3 times for each direction	
Package vibration test	Random vibration :0.15G*G/HZ from 5-200 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)	
Low temperature storage	Height:60cm 1 corner ,3 edges ,6 surfaces	
Low temperature storage	±2KV ,Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

10. General Precautions

10.1. Safety

- Liquid crystal is poisonous. Do not put it in your mouth. If liquid crystal touches your skin or clothes, wash it off immediately by using soap and water.

10.2. Handling

- The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- To avoid contamination on the display surface, do not touch the module surface with bare hands.
- Keep a space so that the LCD panels do not touch other components.
- Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
- Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
- Do not leave module in direct sunlight to avoid malfunction of the ICs.

10.3. Static Electricity

- Be sure to ground module before turning on power or operating module.
- Do not apply voltage which exceeds the absolute maximum rating value.

10.4. Storage

- Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas.
- Store the module in an anti-electrostatic container or bag.

10.5. Cleaning

- Do not wipe the polarizer with dry cloth. It might cause scratch.
- Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

11. Packing Method

----TBD