■ Preliminary Specification
□ Approval Specification

SPECIFICATION FOR LCD MODULE

Customer : _____

Product Model: 101-001-A

Sample code: _____

Designed by	Checked by	Approved by
zhoupeng	zenglingling	tanyunzhi

Final Approval by Customer

Approved by	Comment

※The specification of "TBD" should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

Revision History

Version	Contents	Date
A0	Original	2020.01.08

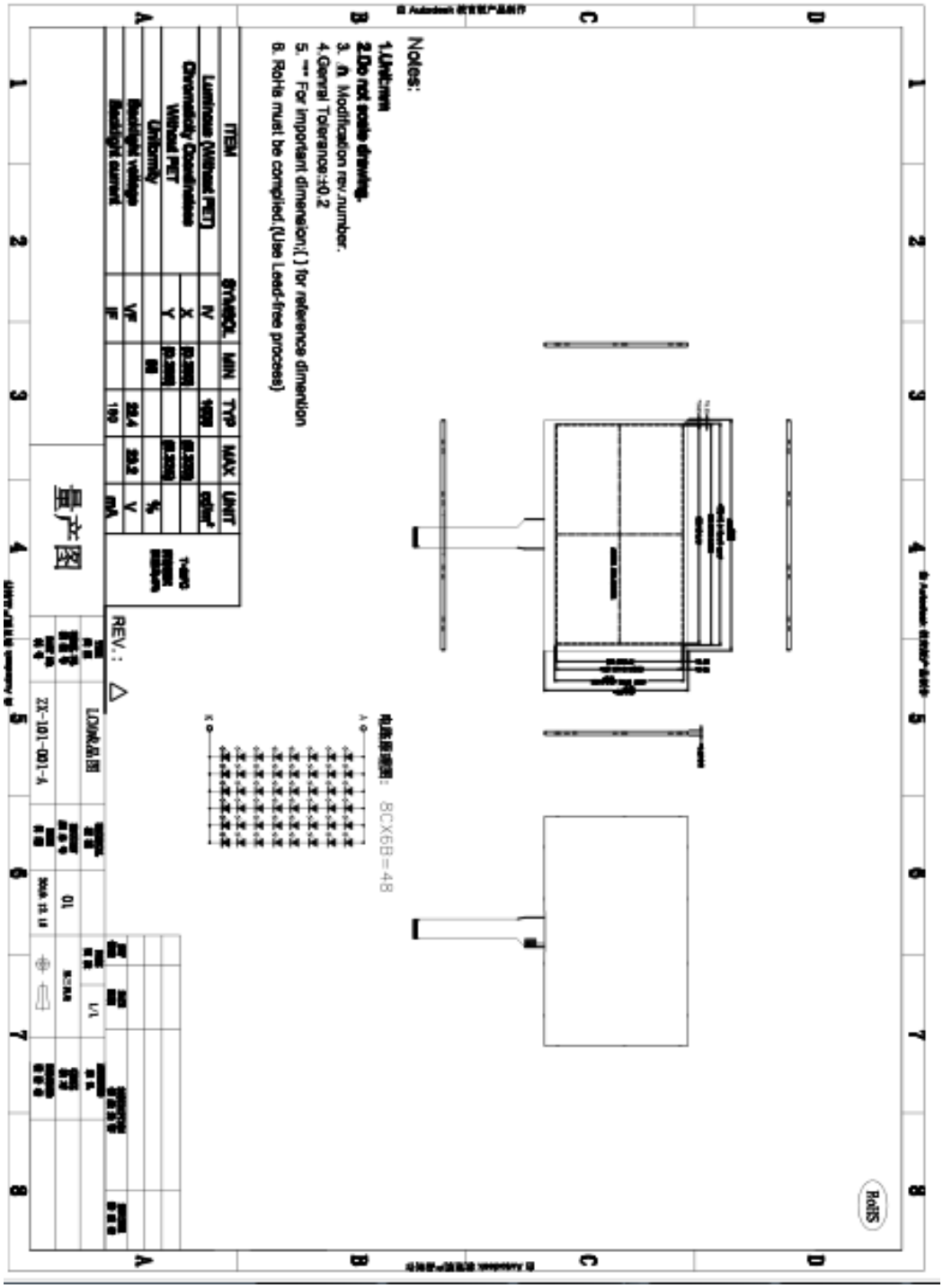
Contents

1. Features

This module is a color active matrix TFT-LCD (Thin Film Transistor Liquid Crystal Display) module that uses amorphous silicon TFT as a switching device. This module is composed of LCD panel, driver IC, and LED backlight.

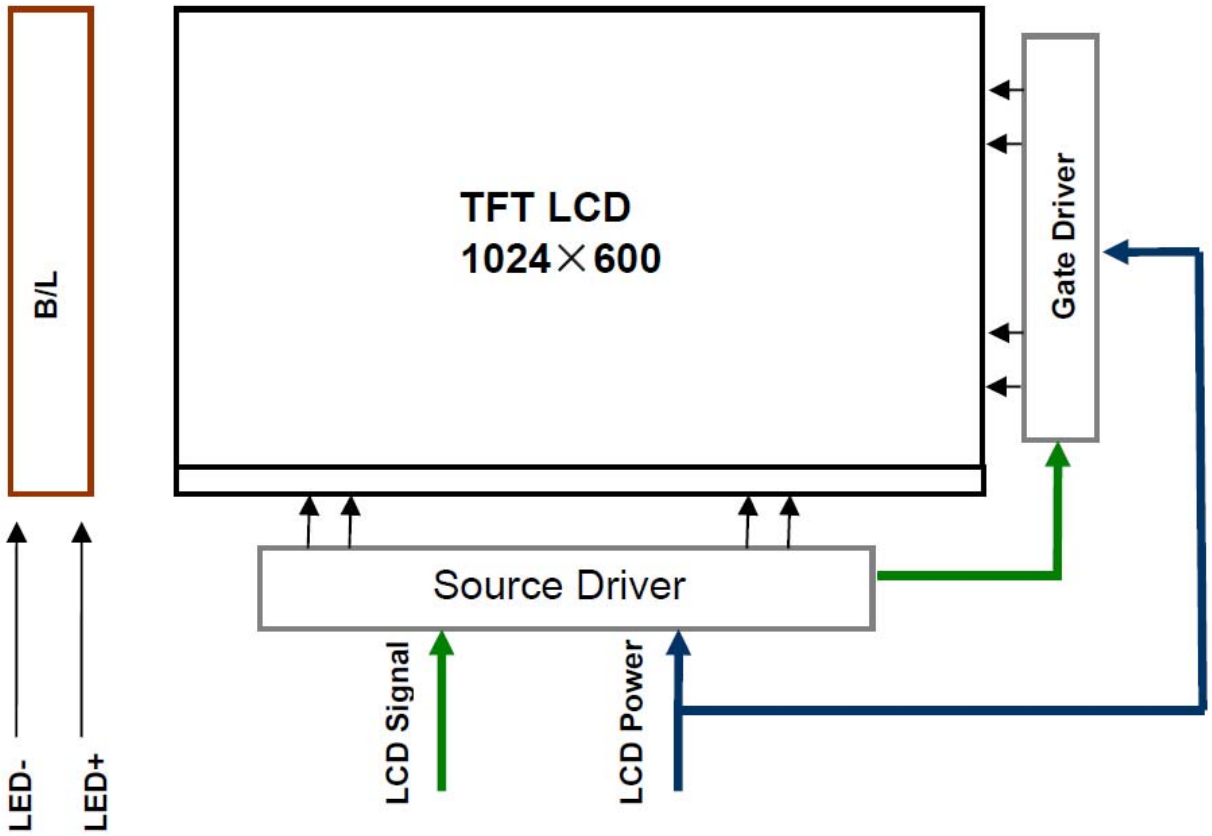
2. General Specifications

No.	Item	Specification
1	LCD size	10.1 inch
2	Resolution	1024 (RGB)X600
3	Display mode	Normally Black
4	Pixel pitch	0.2175(H)X0.2088(V)
5	Active area	222.72(W)X125.28(H) mm
6	Module size	235(W)X143(H)X4.5(D)mm
7	Pixel arrangement	RGB stripe
8	Surface Treatment	AG
9	Support Color	16.7M
10	Interface	LVDS
11	Backlight power consumption	4.2W (typ)
12	Panel power consumption	0.4W (typ.)
13	Weight	TBD
14	Luminance for LCM	1000cd/m^2 (typ.)


Notes:
1.Unit:mm
2.Do not scale drawing.
3. ※ Modification rev.number.
4.Genral Tolerance:±0.2
5. *** For Important dimension,( ) for reference dimention
6. RoHs must be compliled.(Use Lead-free process)
ITEM
SYMBOL
MIN
TYP
MAX
UNIT
Luminous (Without PET)
Iv
1600
cd/m²
Chromaticity Coordinates
Without PET
X
(0.280)
(0.330)
Y
(0.280)
(0.330)
Uniformity
80
Backlight voltage
VF
22.4
23.0
V
Backlight current
IF
190
mA
量产图
REV.: △
ZX-101-001-A
01
RoHS

4. Electrical specifications

4.1 Block Diagram



4.2 Interface Definition

Pin No.	Symbol	Function	Remark
1	VCOM	Common voltage	
2	VDD	Power supply(typ3.3V)	
3	VDD	Power supply(typ3.3V)	
4	NC	No Connection	
5	RESET	Global reset pin. Active Low to enter Reset State. Normally pull high. Suggest to connecting with an RC reset circuit for stability.	
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	Power ground	
8	RXIN0-	Negative LVDS differential data input	
9	RXIN0+	Positive LVDS differential data input	
10	GND	Power ground	
11	RXIN1-	Negative LVDS differential data input	
12	RXIN1+	Positive LVDS differential data input	
13	GND	Power ground	
14	RXIN2-	Negative LVDS differential data input	
15	RXIN2+	Positive LVDS differential data input	
16	GND	Power ground	
17	RXCLKIN-	Negative LVDS differential clock input	
18	RXCLKIN+	Positive LVDS differential clock input	
19	GND	Power ground	
20	RXIN3-	Negative LVDS differential data input	
21	RXIN3+	Positive LVDS differential data input	
22	GND	Power ground	
23	NC	No Connection	
24	NC	No Connection	
25	GND	Power ground	
26	NC	No Connection	
27	NC	No Connection	
28	SELB	LVDS 8Bit/6Bit select pin, SELB="0" 8Bit, SELB="1" 6Bit	
29	AVDD	Power supply for analog circuits	
30	GND	Power ground	

31	LED-	LED Cathode	
32	LED-	LED Cathode	
33	L/R	L/R=”1”: Shift left to right L/R=”0”: Shift right to left	
34	U/D	U/D=”1”: Shift bottom to top U/D=”0”: Shift top to bottom	
35	VGL	Gate off Voltage	
36	GND	Power ground	
37	GND	Power ground	
38	VGH	Gate on Voltage	
39	LED+	LED Anode	
40	LED+	LED Anode	

4.3 Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	VDD	-0.5	5	V
	AVDD	-0.5	15	V
	VGH	-0.3	40	V
	VGL	-20	0.3	V
Backlight forward current	I_{LED}	0	30	mA(For each LED)
sInput Signal Voltage	V_I	-0.3	VDD+0.3	V
Operation Temperature	T_{OP}	-20	70	℃
Storage Temperature	T_{ST}	-30	80	℃

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

4.4 Typical Operation Conditions

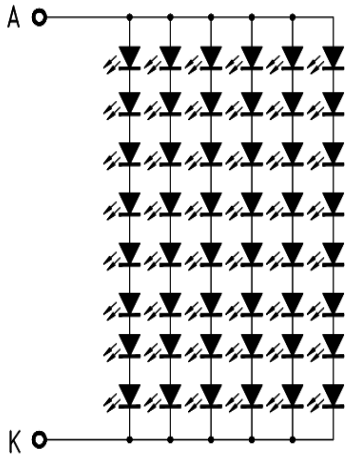
Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Power Voltage	DVDD	3.0	3.3	3.6	V	
	VGH	19.4	20	20.6	V	
	VGL	-10.3	-10	-9.7	V	
	AVDD	9.9	10.2	10.5	V	
Input signal Volage	VCOM	4.0	4.3	4.6	V	
Input logic high voltage	ViH	0.7DVDD	-	DVDD	V	
Input logic low voltage	ViL	0	-	0.3DVDD	V	

4.5 LED Backlight Specification

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	Vf	If=180mA	---	23.2	26.4	V

LED circuit:

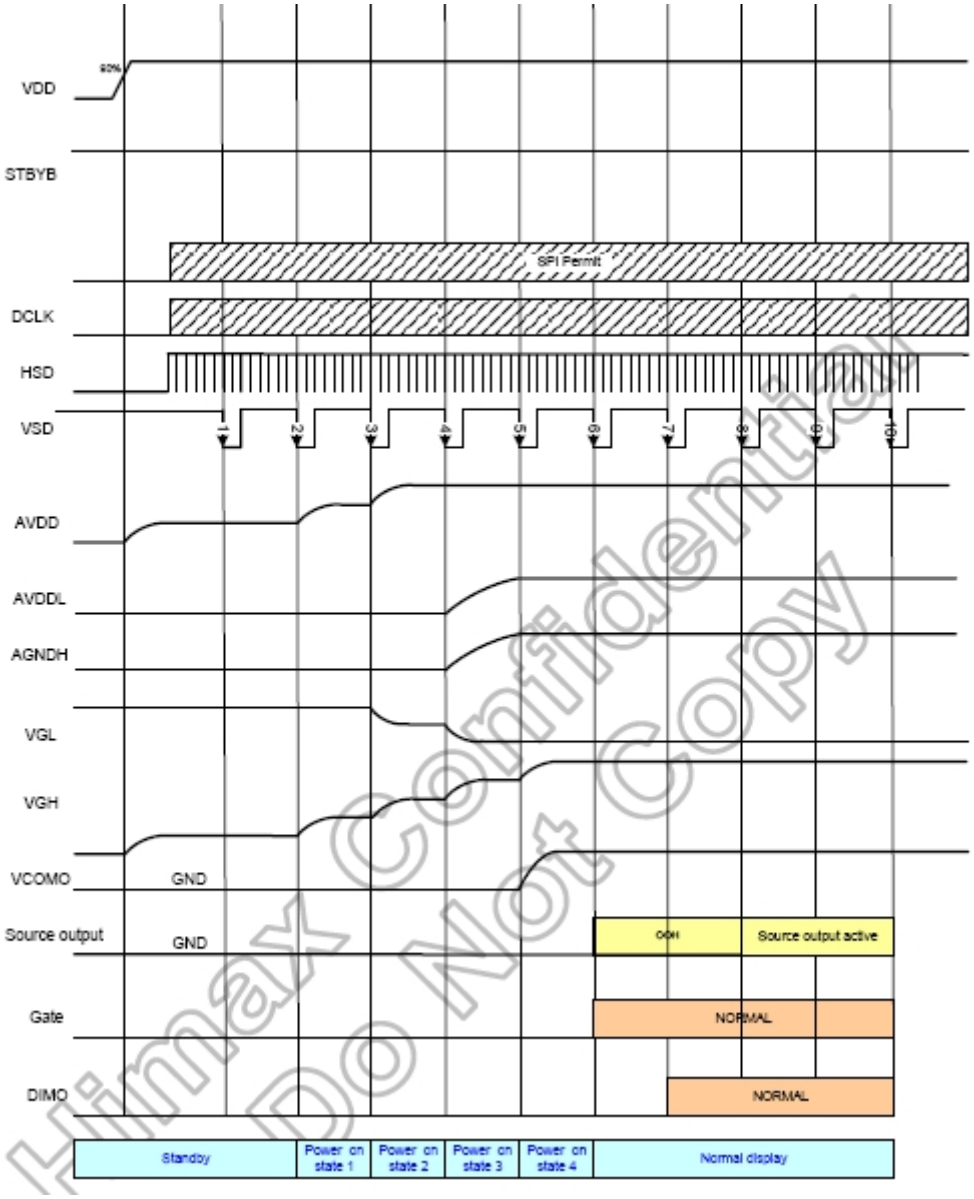
电路原理图: 8CX6B=48



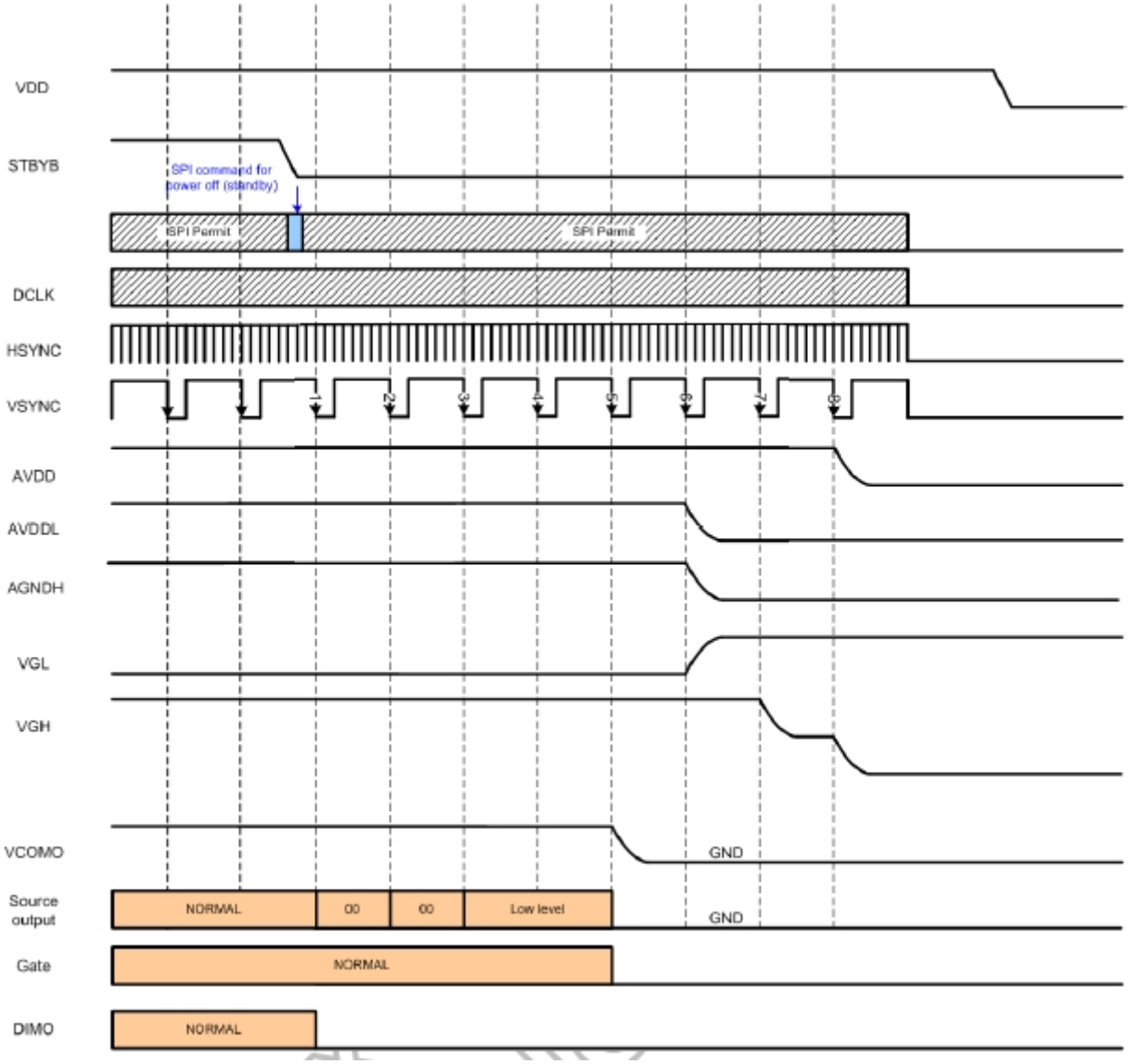
4.5 Power On/Off Sequence

To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

4.5.1 Power On control



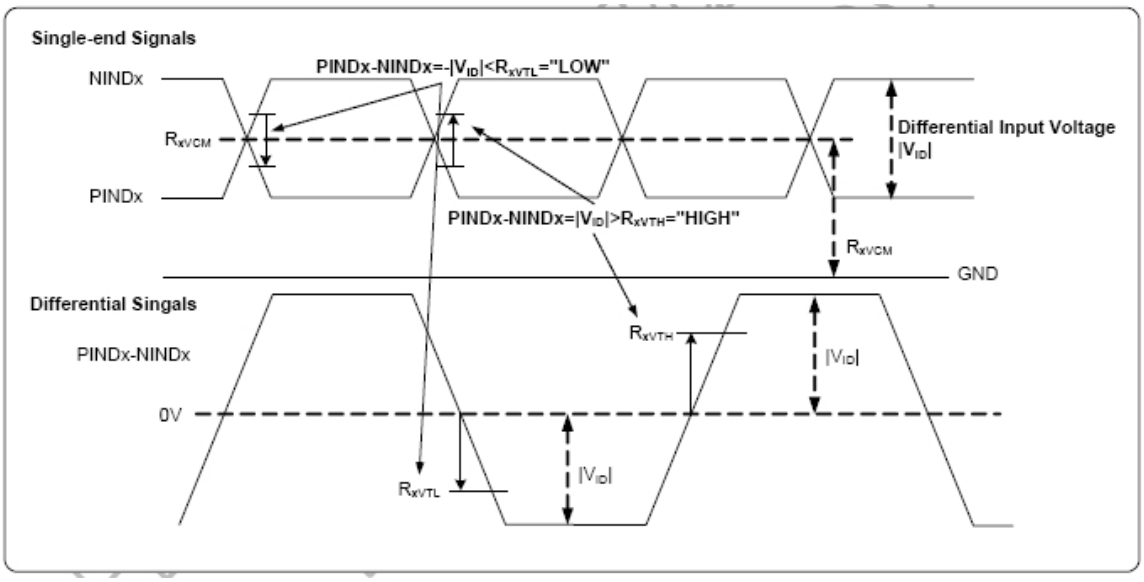
4.5.2 Power off timing sequence



4.6 DC Characteristics

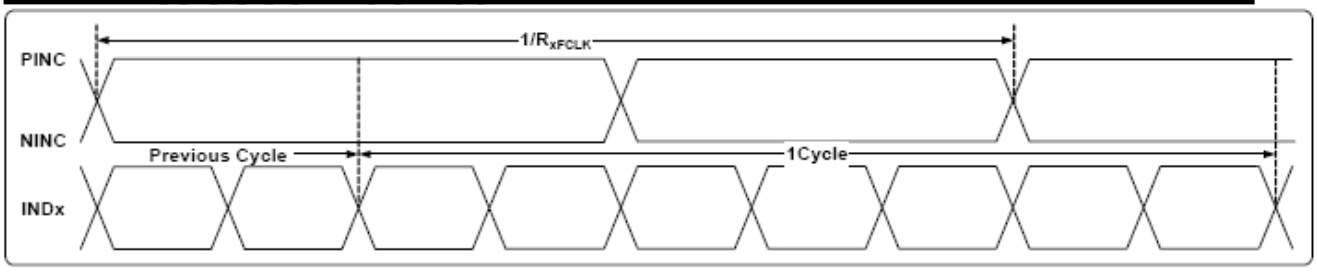
4.6.1 DC electrical Characteristics

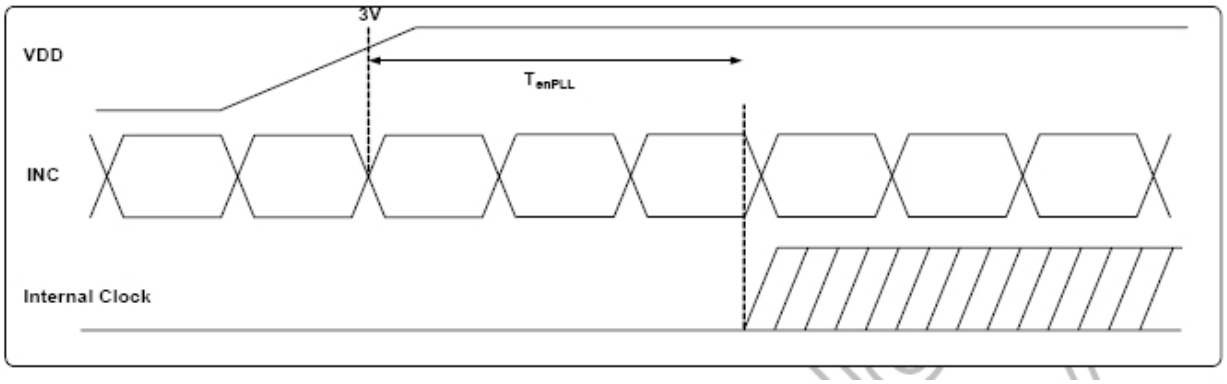
Parameter	Symbol	Spec. Min.	Spec. Typ.	Spec. Max.	Unit	Condition
Differential input high Threshold voltage	R_{XVTH}	-	-	+0.1	V	R_{XVCM}=1.2V
Differential input low threshold voltage	R_{XVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{XVIN}	0	-	VDD-1.2+ $\|V_{ID}\|/2$	V	-
Differential input common Mode voltage	R_{XVCM}	$\|V_{ID}\|/2$	-	VDD-1.2	V	-
Differential input voltage	$\| V_{ID} \|$	0.2	-	0.6	V	-
Differential input leakage Current	RV_{Xliz}	-10	-	+10	µA	-
LVDS Digital Operating Current	Iddlvds	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	Istlvds	-	10	50	µA	Clock & all Functions are stopped

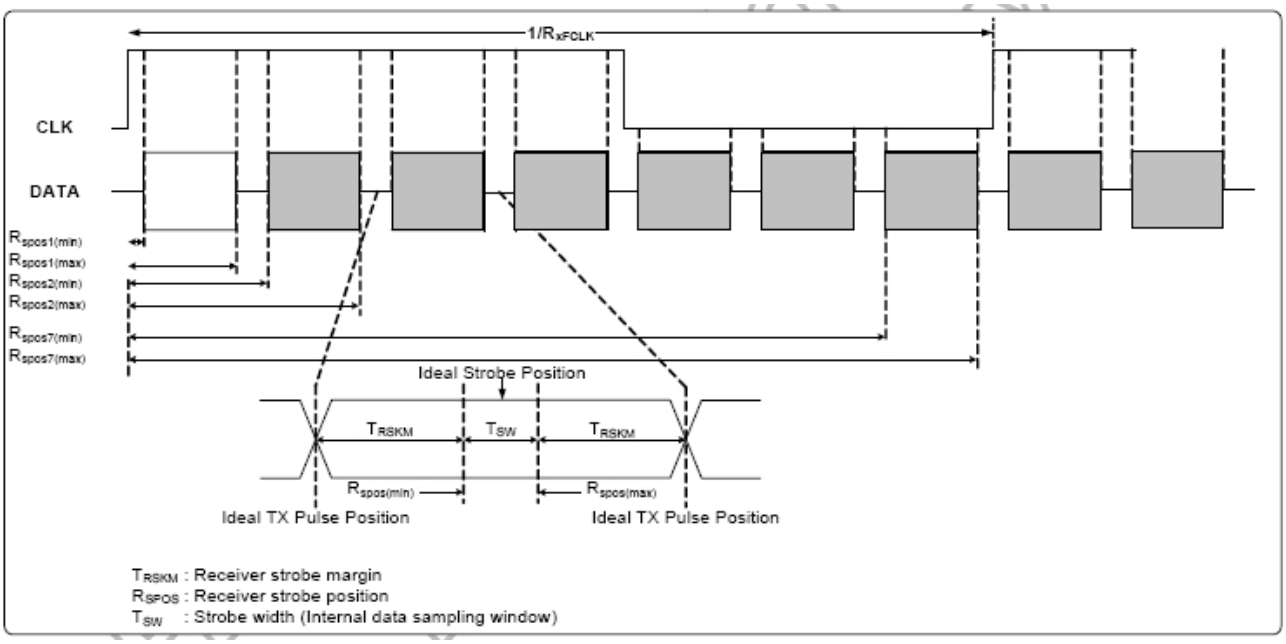


4.6.2LVDS AC electrical characteristics

Parameter	Symbol	Spec. Min.	Spec. Typ.	Spec. Max.	Unit	Condition
Clock frequency	R_{XFCLK}	20	-	71	MHz	-
Input data skew margin	T_{RSKM}	500	-	-	pS	$\|V_{ID}\|$=400mV R_{XVCM}=1.2V R_{XFCLK}=71MHz
Clock high time	T_{LVCH}	-	4/(7* R_{XFCLK})	-	ns	-
Clock low time	T_{LVCL}	-	3/(7* R_{XFCLK})	-	ns	-
PLL wake-up time	T_{enPLL}	-	-	150	µs	-

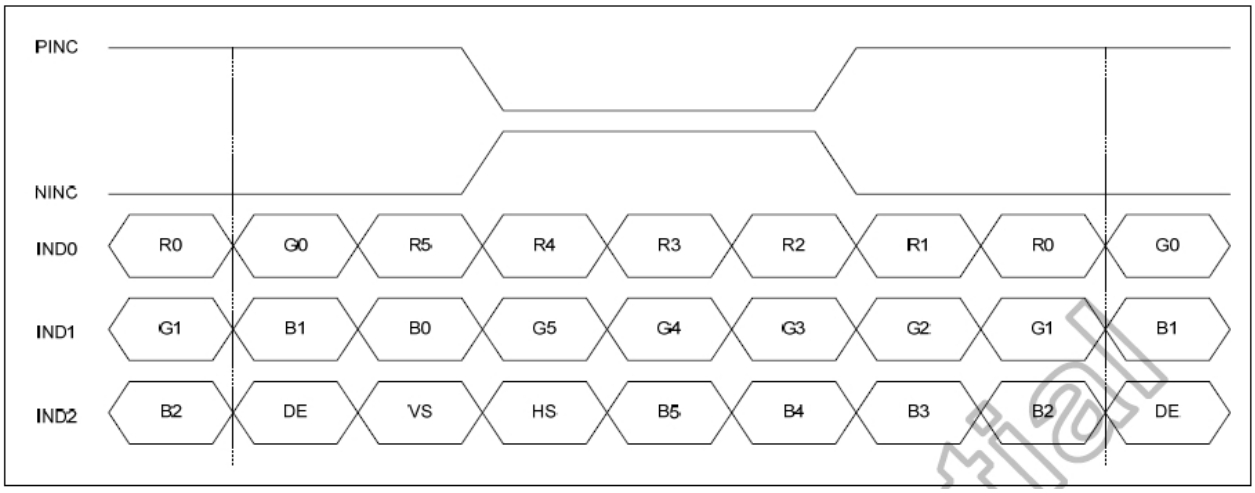




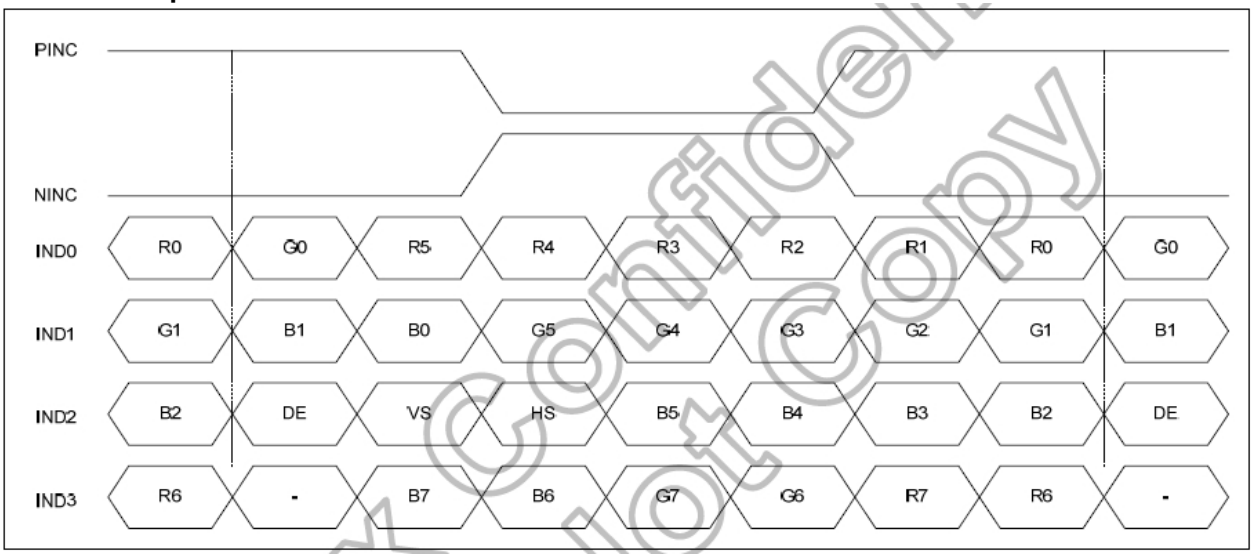


4.7 Data Input format for LVDS

6 bit LVDS input



8 bit LVDS input



4.8 Parallel RGB input Interface timing

DE Mode

Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
DCLK frequency Frame rate = 60Hz	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd		1024		DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd		600		H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

HV Mode

a. Horizontal input timing

Parameter		Symbol	Value			Unit
Horizontal display area		thd	1024			DCLK
DCLK frequency Frame rate = 60Hz		fclk	Min	Typ.	Max	
			44.9	51.2	63	MHz
1 Horizontal Line		th	1200	1344	1400	DCLK
HSYNC pulse width	Min	thpw	1			DCLK
	Typ.		-			
	Max		140			
HSYNC blanking		thb	160	160	160	
HSYNC front porch		thfp	16	160	216	

b. Vertical input timing

Parameter	Symbol	Value			Unit
		Min	Typ.	Max	
Vertical display area	tvd		600		H
VSYNC period time	tv	624	635	750	H
VSYNC pulse width	tvpw	1	-	20	H
VSYNC blanking	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

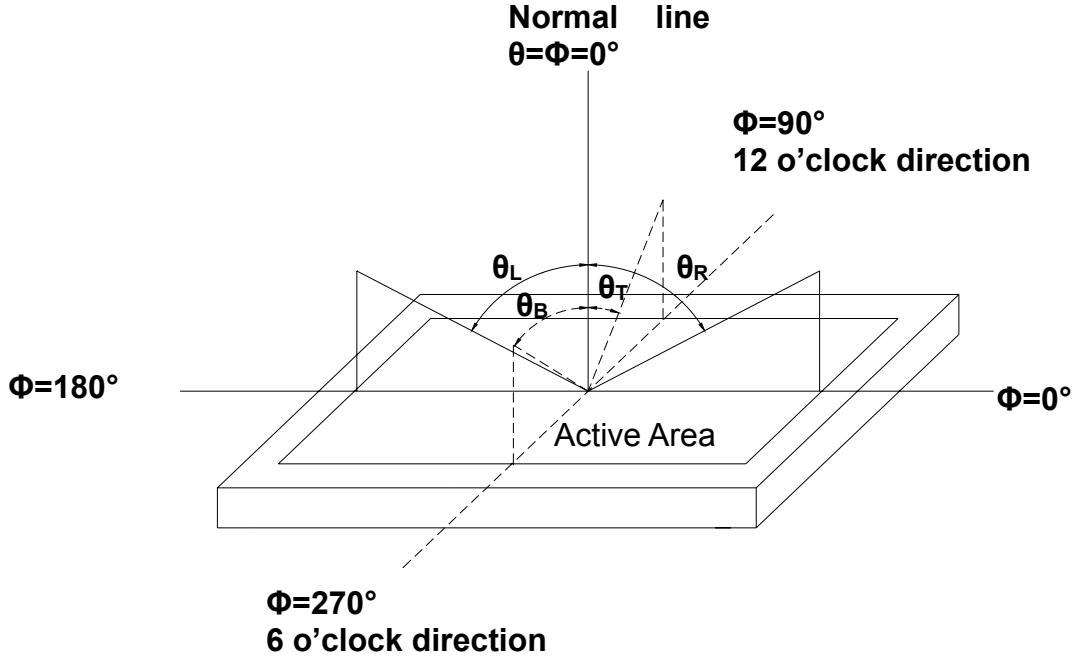
Note: 1.frame rate : 60Hz for typ value

2. DE Mode(Design by DE mode)

5 . Optical Specifications

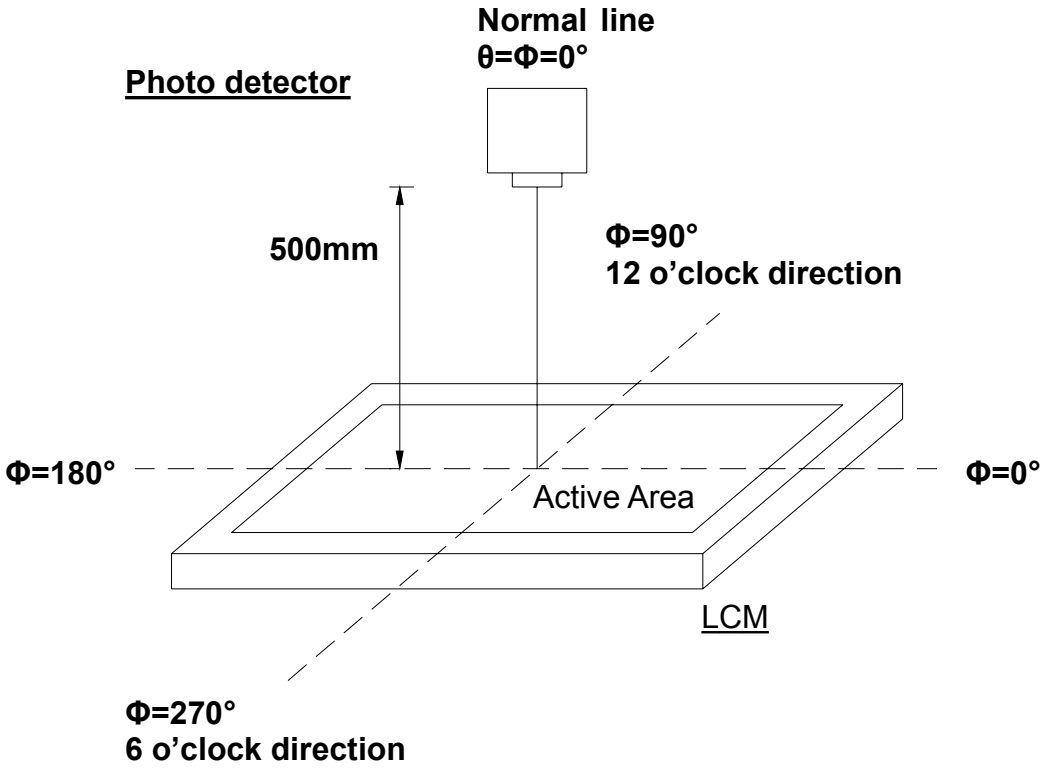
Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing angle	Horizontal	θ_L	CR > 10	-	85	-	degree	Note 1
		θ_R		-	85	-		
	Vertical	θ_T		-	85	-		
		θ_B		-	85	-		
Response time Rise+Fall		T_{RT}	Ta=25℃ ; θ=0°	-	30	55	ms	Note 2 Note 3
Contrast ratio		CR	Normal θ=Φ=0°	600	-	-	-	Note 2 Note 4
Color chromaticity		W_X		0.27	0.32	0.37	-	Note 2 Note 5
		W_Y		0.31	0.36	0.41	-	
Color gamut		NTSC		-	45	-	%	-
Luminance		L		900	1000	-	cd/m^2	Note 2
Luminance uniformity		Y_U		70	-	-	%	Note 2 Note 6

Note 1: Definition of viewing angle range
Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface.

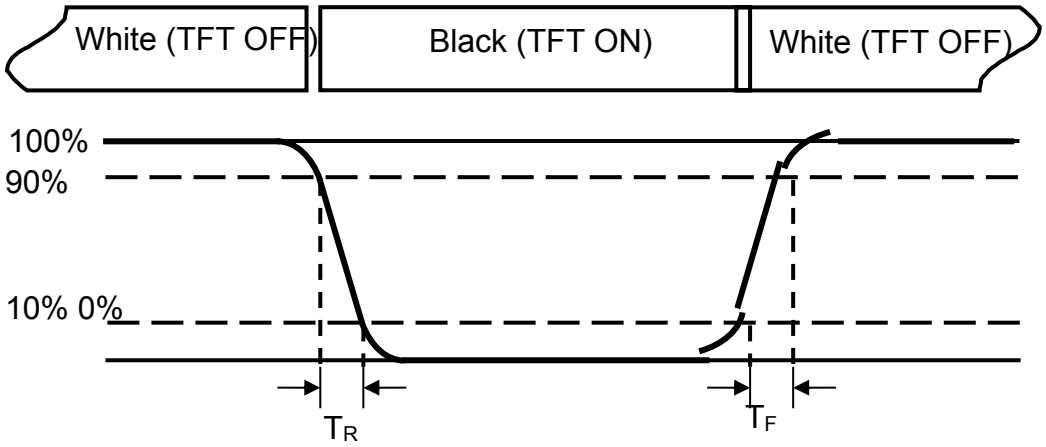


Definition of viewing angle

Note 2: Definition of optical measurement system.
The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ
contrast/Height :1.2mm ,Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/
Field of view: 1° /Height: 500mm.)



Note 3: Definition of Response time
The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_R) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_F) is the time between photo detector output intensity changed from 10% to 90%.



Definition of response time

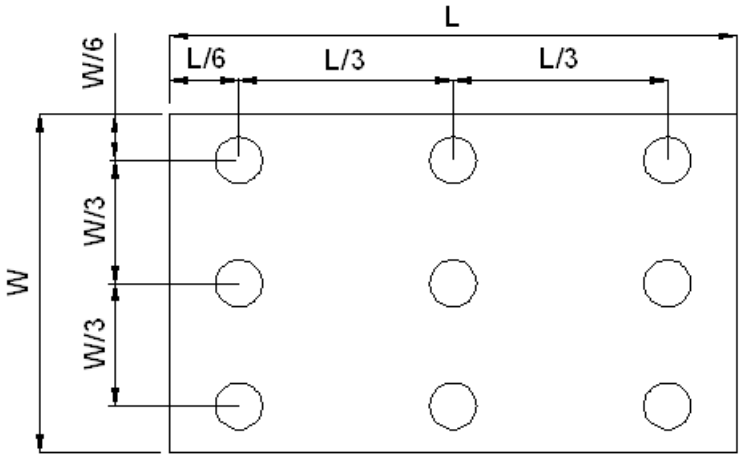
Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)
Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity (“White” state)
Active area is divided into 9 measuring areas.Every measuring point is placed at the center of each measuring area.

$$\textit{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$



Definition of measuring points

B_{max}: The measured maximum luminance of all measurement position.
B_{min}: The measured minimum luminance of all measurement position.

6. Reliability Test

Item	Test Conditions	Remark
High Temperature Storage	T_a = 80℃ 240hrs	
Low Temperature Storage	T_a= -30℃ 240hrs	
High Temperature Operation	T_s =70℃ 240hrs	
Low Temperature Operation	T_a = -20℃ 240hrs	
High Temperature and Humidity (No condensation)	+50℃, 80%RH max. 120 hrs	Non-operation
Thermal Shock	-30/30min～80℃/30min Change time:5min, 100cycle	Non-operation
Electrostatic Discharge	Contact: ±4KV Air: ±8KV 150PF/330Ω,5Points/panel,5times	Class B,Note1

Note1

Class	Performance
A	All functions perform as designed during and after exposure to interference
B	Temporary degradation or less of performance which is self-recoverable
C	Degradation or less of performance which requires operator intervention or system reset to recover
D	Degradation or less of function which is not recoverable

7. Handling Precautions

7.1 Mounting Method

The LCD panel of K&D LCD module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

7.2 Caution Of LCD Handling And Cleaning

When cleaning the display surface, Use soft cloth with solvent [recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Salfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Salfur (S) from customer, Responsibility is on customer.

7.3 Caution Against Static Charge

The LCD module use C-MOS LSI drivers, so we recommended that you:

Connect any unused input terminal to Vdd or Vss, do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

7.4 Packing

- Module employ LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

7.5 Caution For Operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally

displayed but it resumes normal condition after turning off once.

- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.
  Usage under the maximum operating temperature, 50%Rh or less is required.

7.6 Storage

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it . And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us

7.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

8. Precaution For Use

8.1

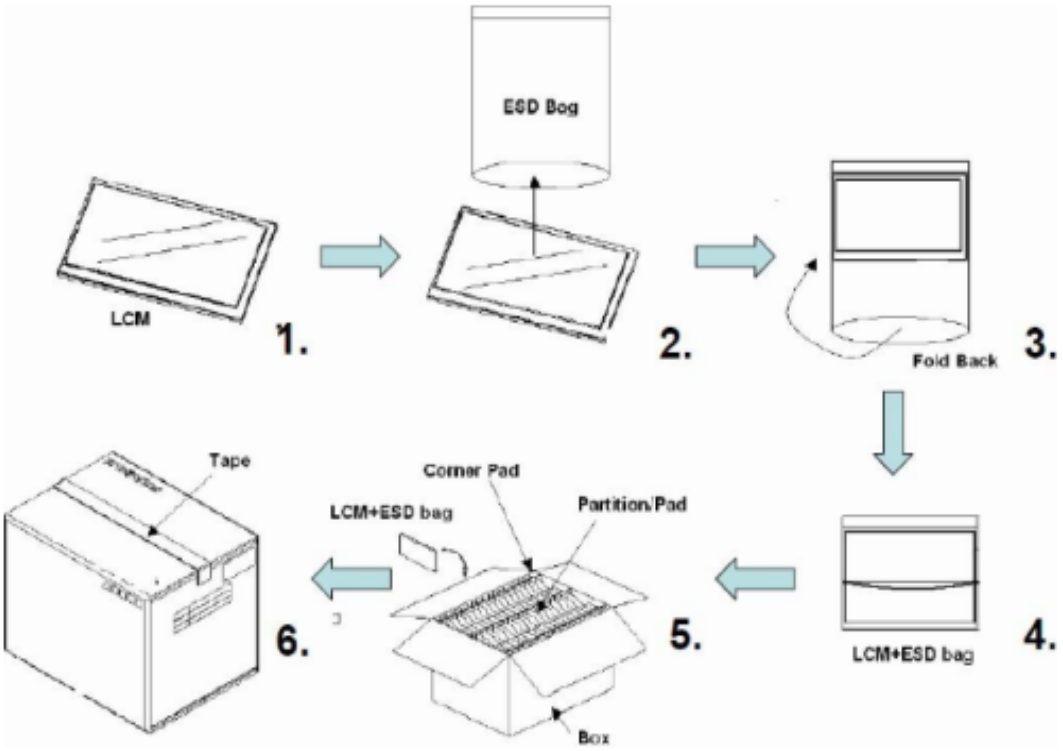
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

8.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specifications
- When an inspection specifications change or operating condition change in customer is reported to K&D , and some problem is arisen in this specification due to the change
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

9.Package Drawing



Items	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	B Flute
Corner Pad	Corrugated Paper Board	AB Flute
ESD bag	PE	

10. Label Drawing

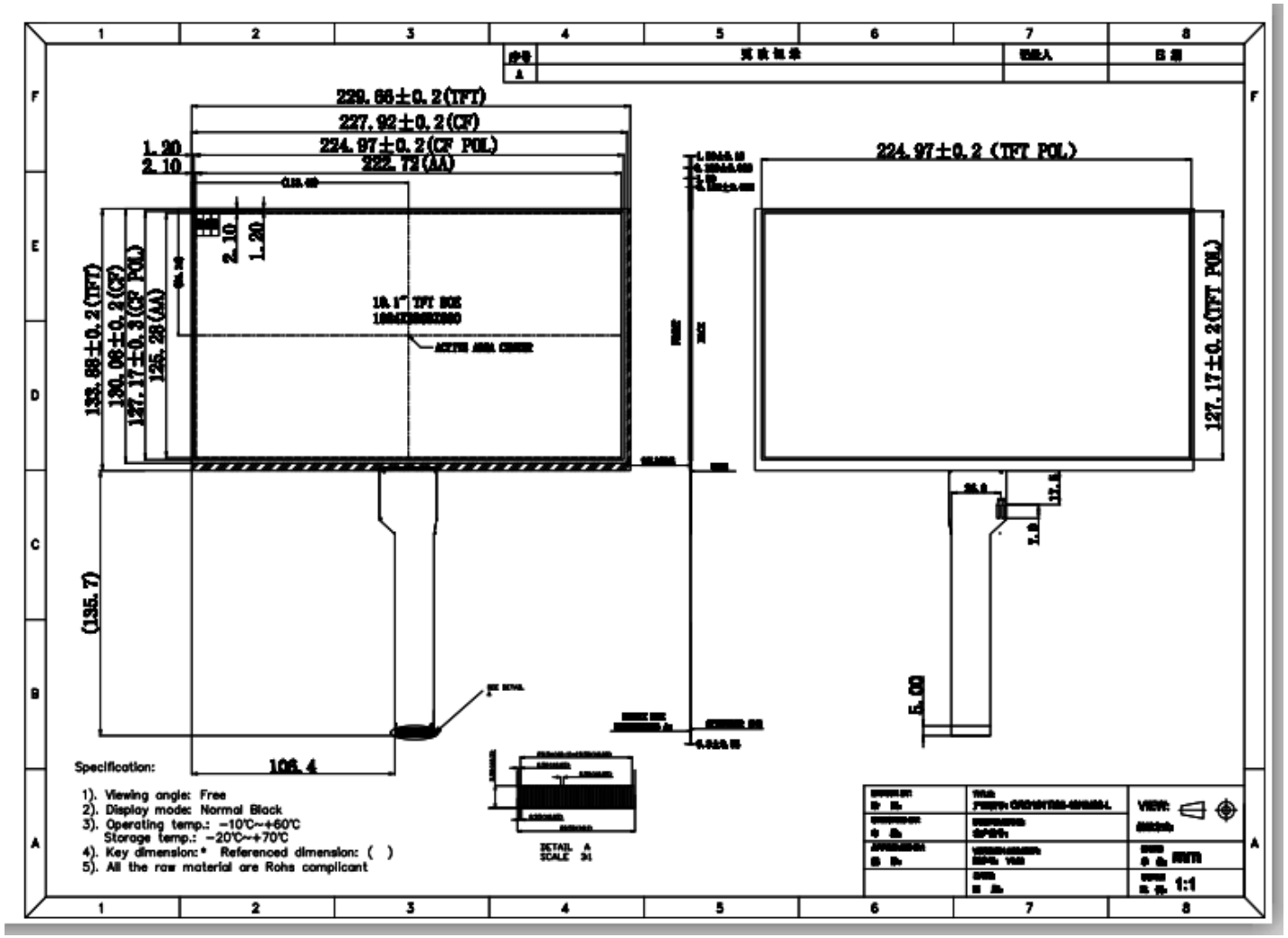
Bar code label and packing chest label
TBD

11. HSF Requirements

■ RoHS（Restriction of the use of certain Hazardous Substances）
■ HF（Halogen Free）
■ REACH（Regulation concerning the Registration, Evaluation，Authorization and Restriction of Chemicals）
□ Other regulations

12. Scope

This specification applies to the TFT LCD module which is designed and manufactured by LCM Factory of Shenzhen K&D Technology Co. Ltd.


229.66±0.2(TFT)
227.92±0.2(CF)
224.97±0.2(CF POL)
222.72(AA)
1.20
2.10
224.97±0.2 (TFT POL)
127.17±0.2(TFT POL)
133.68±0.2(TFT)
130.06±0.2(CF)
127.17±0.3(CF POL)
125.28(AA)
10.1" TFT SIZE
ACTIVE AREA CENTER
(135.7)
106.4
5.00
DETAIL A
SCALE 3:1
Specification:
1). Viewing angle: Free
2). Display mode: Normal Black
3). Operating temp.: -10℃~+60℃
Storage temp.: -20℃~+70℃
4). Key dimension: * Referenced dimension: ( )
5). All the raw material are Rohs complicant
VIEW:
1:1