

Shenzhen K&D Technology Co. Ltd

☒ Preliminary Specification
☐ Approval Specification

SPECIFICATION FOR LCD MODULE

Customer : _____
Product Model: **KD070D64-31NA-A002**
Sample code: _____

Designed by	Checked by	Approved by
Xi Yang	Zha Xiaolong	Zhang Xiyang

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.

Contents

No.	Item	Page
1	Features	4
2	General Specifications	4
3	Outline Dimension	5
4	Electrical Specifications	6
5	Optical Specifications	15
6	Reliability Test	18
7	Handling Precautions	19
8	Precaution for use	20
9	Package Drawing	21
10	Label Drawing	22
11	HSF Requirements	22
12	Scope	22
13	Numbering System	23

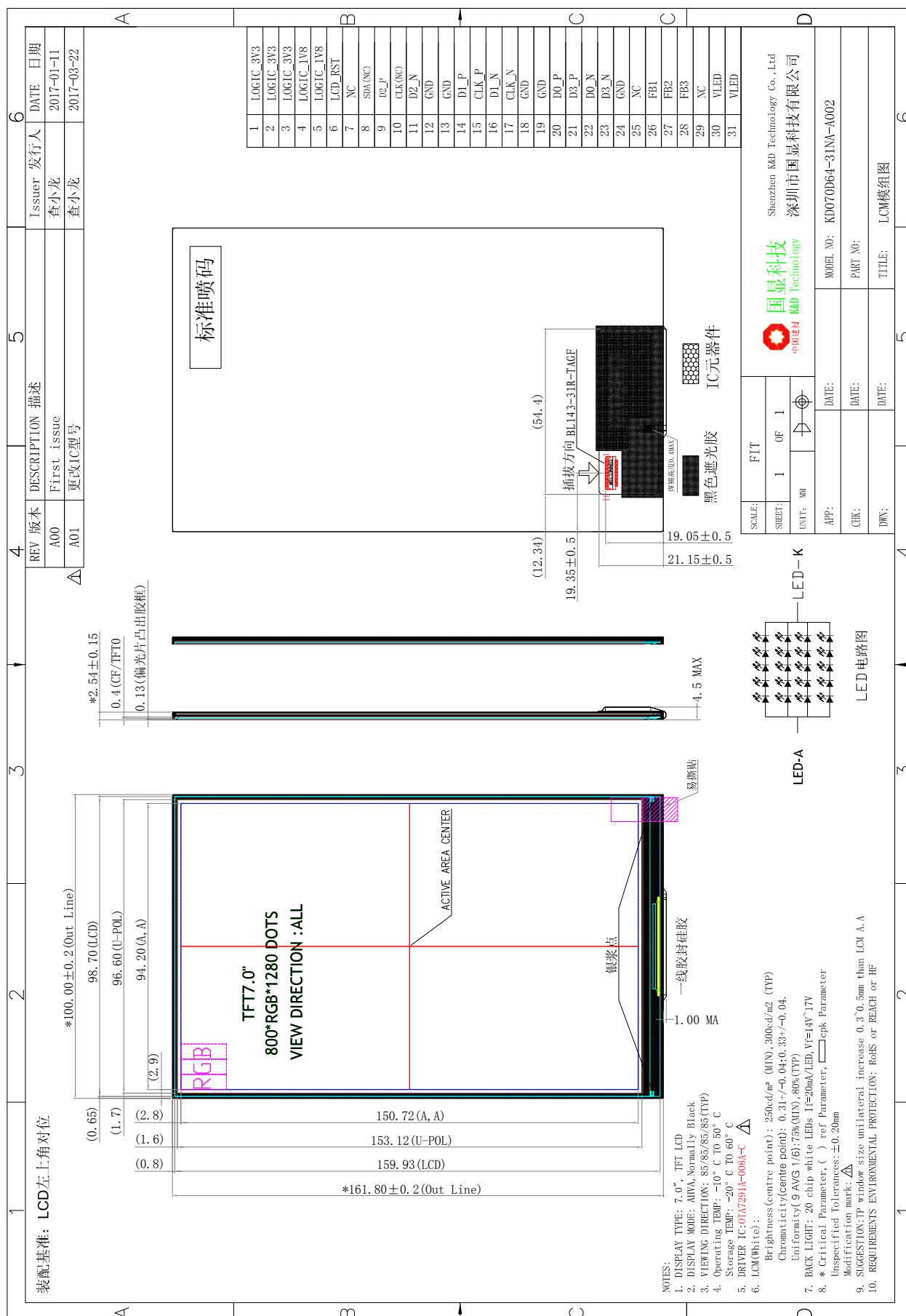
1. Features

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

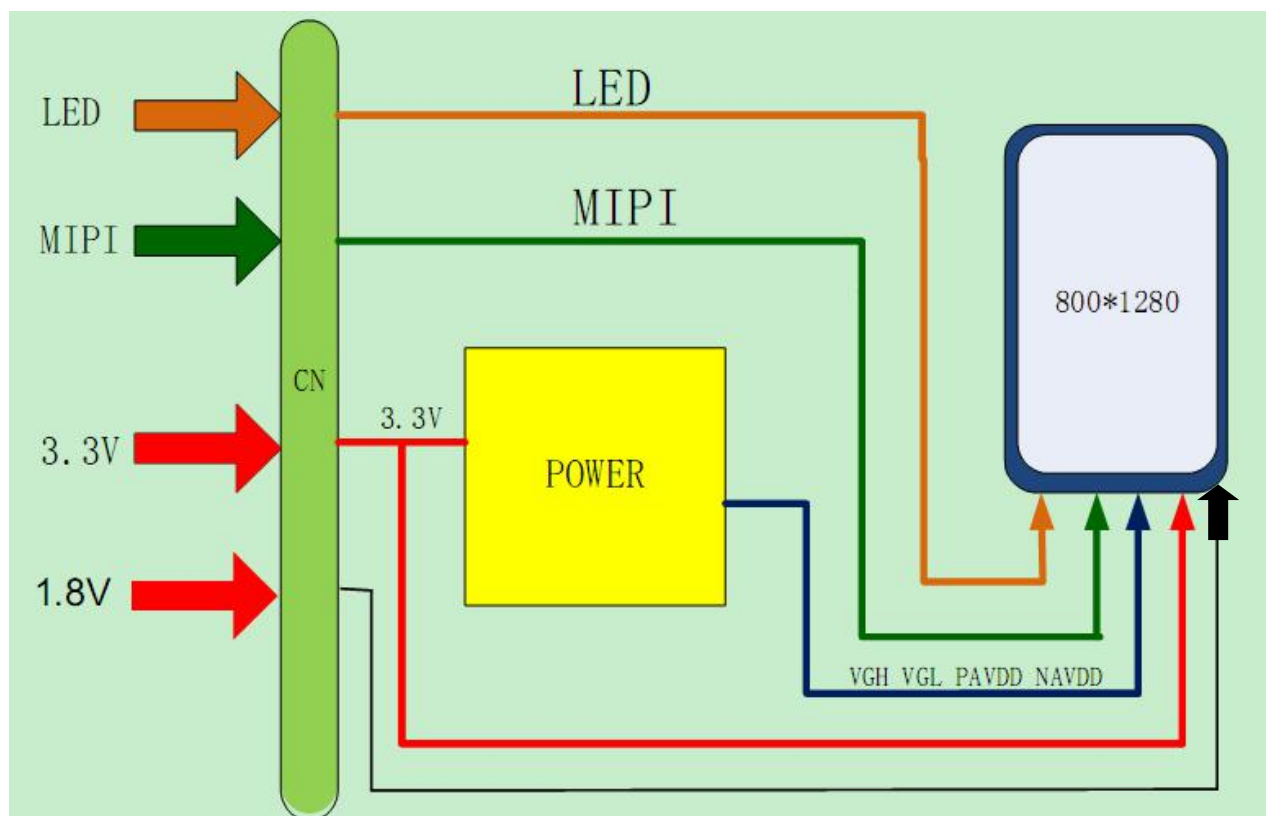
No.	Item	Specification
1	LCD size	7.0 inch
2	Resolution	800(RGB)X1280
3	Display mode	Normally Black
4	Pixel pitch	0.11775 (W) X 0.11775 (H) mm
5	Active area	94.2(W)X150.72(H) mm
6	Module size	100(W)X161.8(H)X2.54(D)mm
7	Pixel arrangement	RGB Vertical stripe
8	Interface	MIPI 4 lane (video mode)
9	Backlight power consumption	1.24W (typ.)
10	Panel power consumption	0.27W (typ.)
11	Weight	82g (typ.)
12	Luminance for LCM	300 cd/m ² (typ.)

3.Outline Dimension



4. Electrical specifications

4.1 Block Diagram



4.2 Interface Definition

Pin No.	Symbol	Function
1-3	LOGIC_3V3	Power supply for panel power(3.3V)
4-5	LOGIC_1V8	Logic and interface power supply(1.8V)
6	LCD_RST	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied(1.8V)
7	NC	No connection
8	SDA(NC)	No connection
9	D2_P	MIPI-DSI Data positive signal input pins
10	CLK(NC)	No connection
11	D2_N	MIPI-DSI Data negative signal input pins
12	GND	Power Ground
13	GND	Power Ground
14	D1_P	MIPI-DSI Data positive signal input pins
15	CLK_P	MIPI-DSI CLOCK positive signal input pins
16	D1_N	MIPI-DSI Data negative signal input pins
17	CLK_N	MIPI-DSI CLOCK negative signal input pins
18	GND	Power Ground
19	GND	Power Ground
20	D0_P	MIPI-DSI Data positive signal input pins
21	D3_P	MIPI-DSI Data positive signal input pins
22	D0_N	MIPI-DSI Data negative signal input pins
23	D3_N	MIPI-DSI Data negative signal input pins
24	GND	Power Ground
25	NC	No connection
26	FB1	LED Cathode(Negative)
27	FB2	LED Cathode(Negative)
28	FB3	LED Cathode(Negative)
29	NC	No connection
30-31	VLED	LED Anode(positive)

4.3 Absolute Max. Rating

Item	Symbol	Values		Unit
		Min.	Max.	
Power Voltage	LOGIC_3V3	-0.3	6.6	V
	LOGIC_1V8	-0.3	3.6	V
Backlight forward current	I _{LED}	0	20	mA(For each LED)
Input Signal Voltage	V _I	-0.3	LOGIC_1V8+0.3	V
Operation Temperature	T _{OP}	-10	50	°C
Storage Temperature	T _{ST}	-20	60	°C

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.

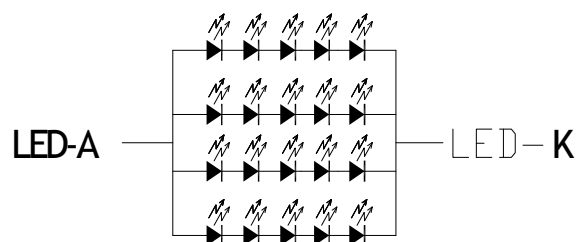
4.4 Typical Operation Conditions

Item	Symbol	Values			Unit	Note
		Min.	Typ.	Max.		
Power Voltage	LOGIC_3V3	3.0	3.3	3.6	V	
	LOGIC_1V8	1.7	1.8	1.9	V	
	V _{IH}	0.7LOGIC_1V8	-	LOGIC_1V8	V	
	V _{IL}	GND	-	0.3LOGIC_1V8	V	
Power consumption	I _{LOGIC_3V3}	-	60	-	mA	
	I _{LOGIC_1V8}	-	21	-	mA	

4.5 LED Backlight Specification

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V _f	I _f =80mA	14	-	17	V

LED circuit:

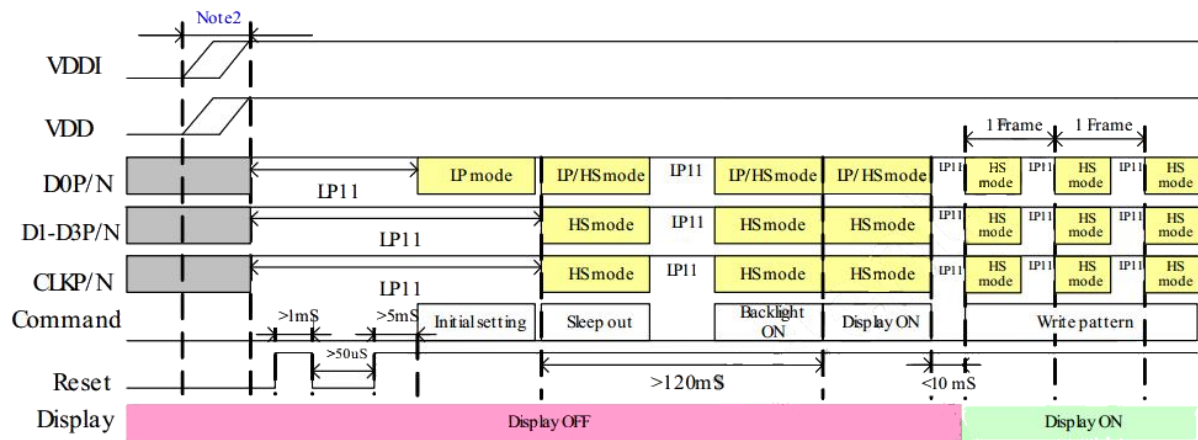


LED电路图

4.6 Power On/Off Sequence

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

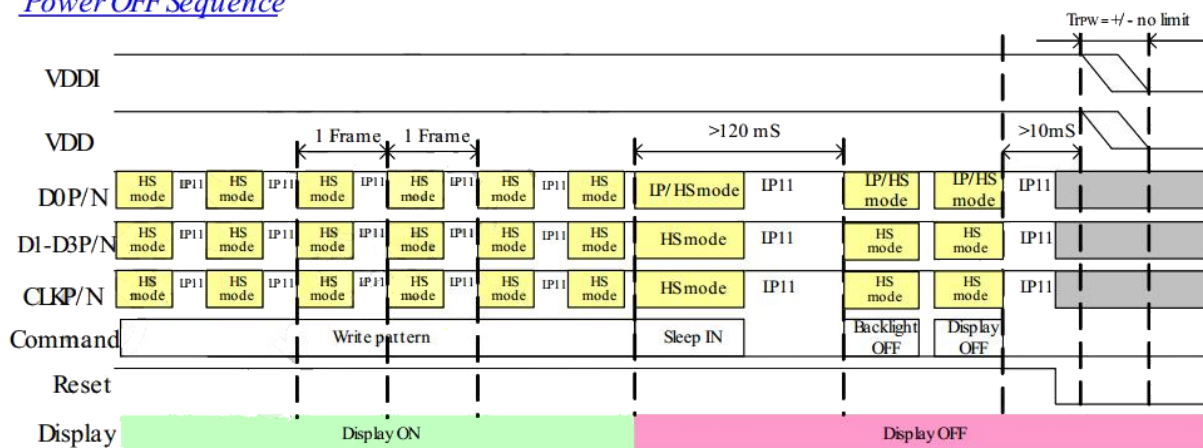
Power ON Sequence



Note :

1. Propose using non-continuous CLK with Burst mode
2. For VDDI/VDD power, propose applying them separately and having 10 ms timing gap

Power OFF Sequence



Note :

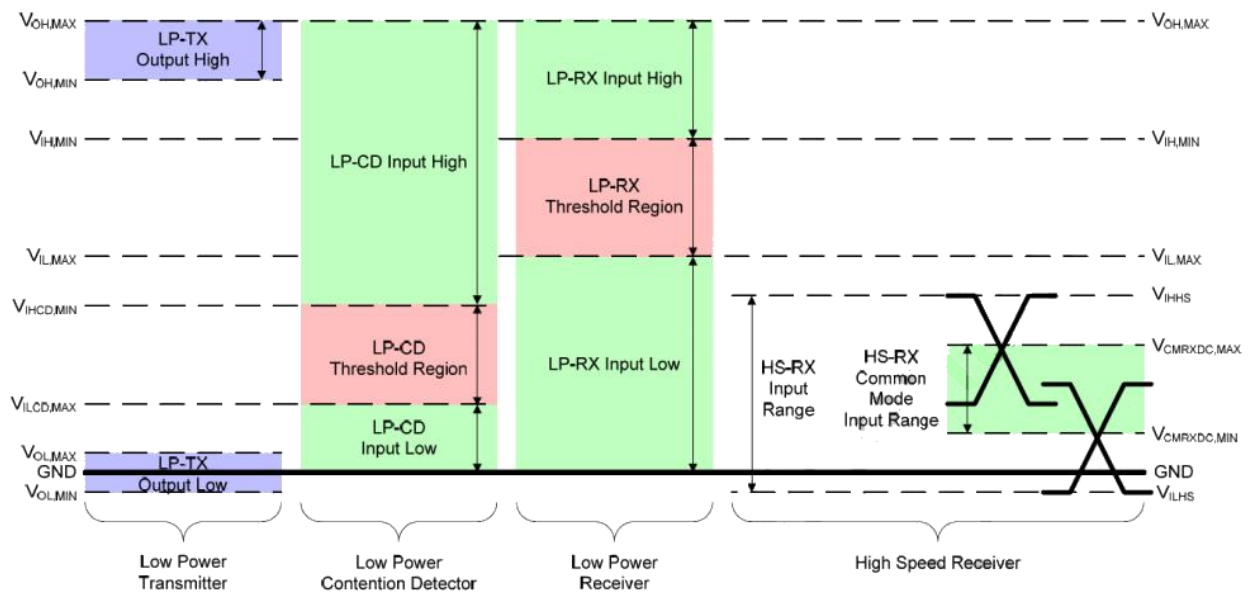
1. Propose using non-continuous CLK with Burst mode

Note: VDDI=LOGIC_1V8 VDD=LOGIC_3V3

4.7 Electrical Characteristics

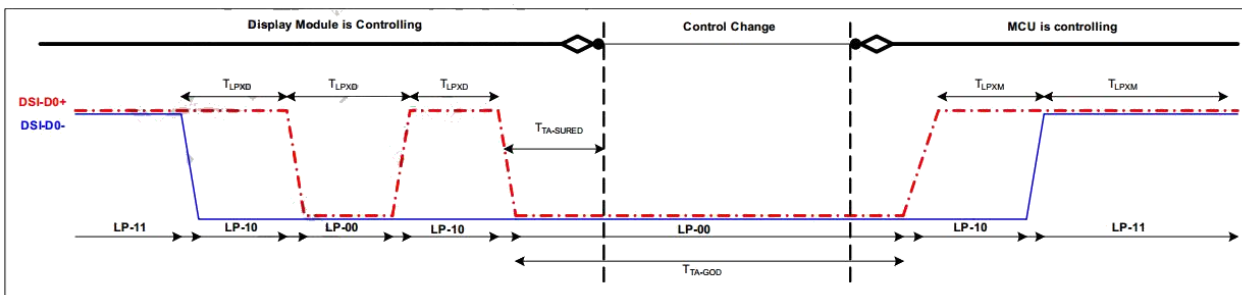
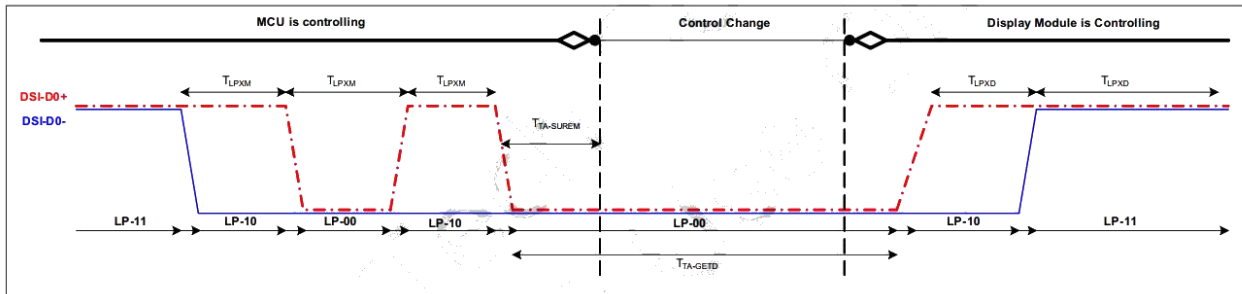
4.7.1 DC characteristics for MIPI-DSI

Parameter	Symbol	Conditions	Specification			Unit
			MIN	TYP	MAX	
Power supply voltage for MIPI Interface						
Power supply voltage for MIPI interface	VDD_IF	-	2.5	3.3	5	V
	VDD18_IF	-	1.7	1.8	1.9	V
LPDT Input Characteristics						
Pad signal voltage range	VI	-	-50	-	1350	mV
Ground Shift	VGND SH	-	-50	-	50	mV
Logic 0 input threshold	VIL	-	0	-	550	mV
Logic 1 input threshold	VIH	-	880	-	VDD18_IF	mV
Input hysteresis	VHYST	-	25	-	-	mV
LPDT Output Characteristics						
Output low level	VOL	-	-50	-	50	mV
Output high level	VOH	-	1.1	1.2	1.3	V
Logic 1 contention threshold	VILCD,MIN	-	450	-	VDD18_IF	mV
Logic 0 contention threshold	VIHCD,MAX	-	0	-	200	mV
Output impedance of LPDT	ZOLP	-	80	100	125	ohm
Hi-speed Input/Output Characteristics						
Single-end input low voltage	VILHS	-	-40	-	-	mV
Single-end input high voltage	VIHHS	-	-	-	460	mV
Common mode voltage	VCMRXDC	-	70	-	330	mV
Hi-speed transmit voltage	VOD	-	140	200	250	mV
Differential input impedance	ZID	-	80	100	125	ohm



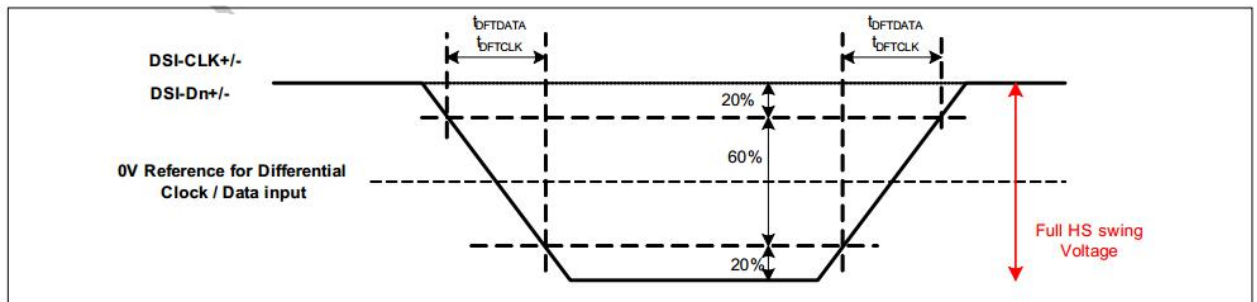
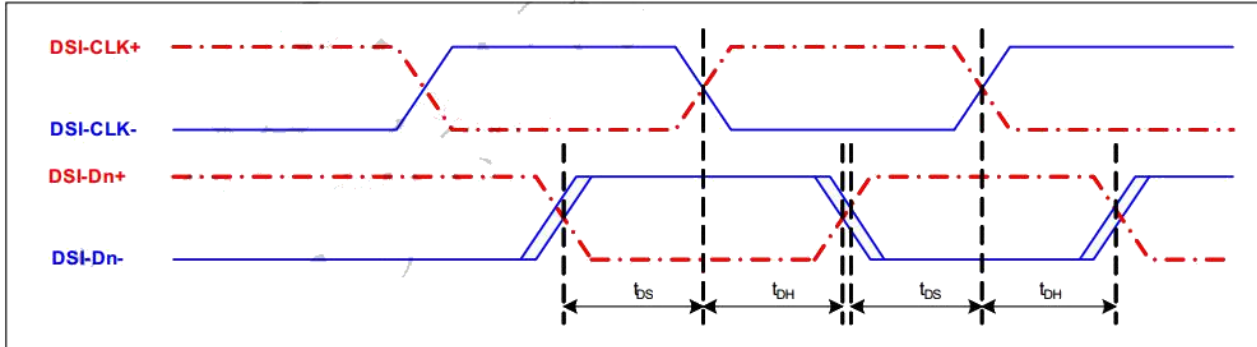
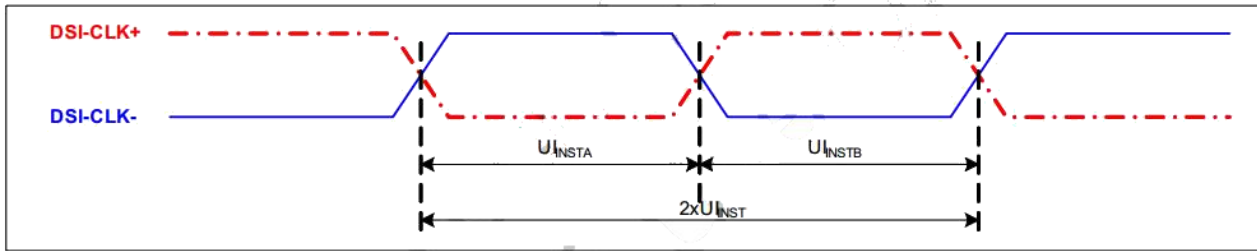
4.7.2 Low power mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Low Power mode						
DSI-D0+/-	T _{LPXM}	Length of LP-00, LP-01, LP-10 or LP-11 periods MPU Display Module	50	-	-	ns
DSI-D0+/-	T _{LPXD}	Length of LP-00, LP-01, LP-10 or LP-11 periods Display Module MPU	58	-	-	ns
DSI-D0+/-	T _{TA-SURED}	Time-out before the MPU start driving	T _{LPXD}	-	2XT _{LPXD}	ns
DSI-D0+/-	T _{TA-GETD}	Time to drive LP-00 by display module	5XT _{LPXD}	-	-	ns
DSI-D0+/-	T _{TA-GOD}	Time to drive LP-00 after turnaround request - MPU	4XT _{LPXD}	-	-	ns
DSI-D0+/-	Ratio T _{LPX}	Ratio of T _{LPXM} / T _{LPXD} between MCU and display module	2/3	-	3/2	



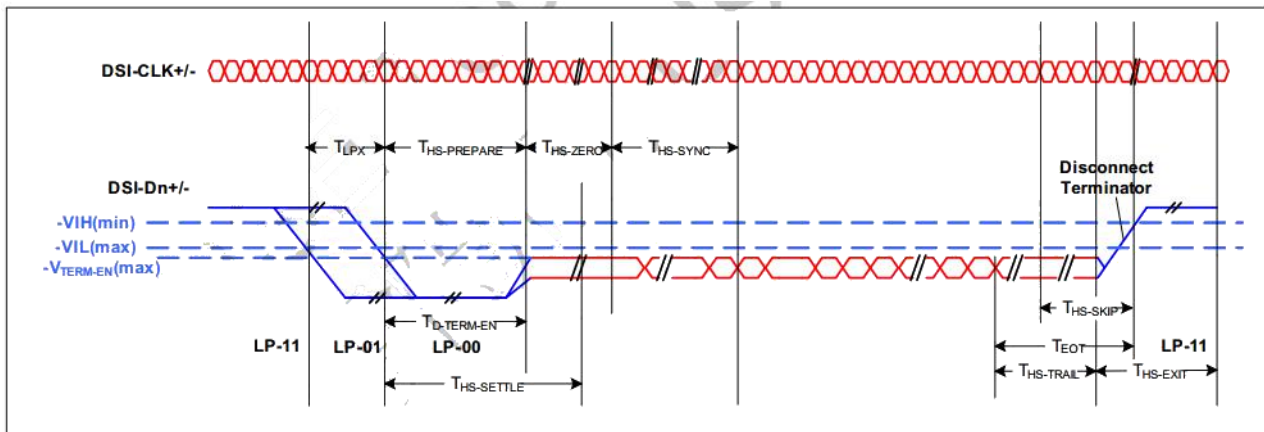
4.7.3 High-Speed mode

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Mode						
DSI-CLK+/-	2xUI _{INST}	Double UI instantaneous	2.22	-	25	ns
DSI-CLK+/-	UI _{INSTA} , UI _{INSTB}	UI instantaneous Halfs	1.11	-	12.5	ns
DSI-Dn+/-	t _{DS}	Data to clock setup time	0.15	-	-	UI
DSI-Dn+/-	t _{DH}	Data to clock hold time	0.15	-	-	UI
DSI-CLK+/-	t _{DRTCLK}	Differential rise time for clock	150	-	0.3UI	ps
DSI-Dn+/-	t _{DRTDATA}	Differential rise time for data	150	-	0.3UI	ps
DSI-CLK+/-	t _{DFTCLK}	Differential fall time for clock	150	-	0.3UI	ps
DSI-Dn+/-	t _{DFTDATA}	Differential fall time for data	150	-	0.3UI	ps



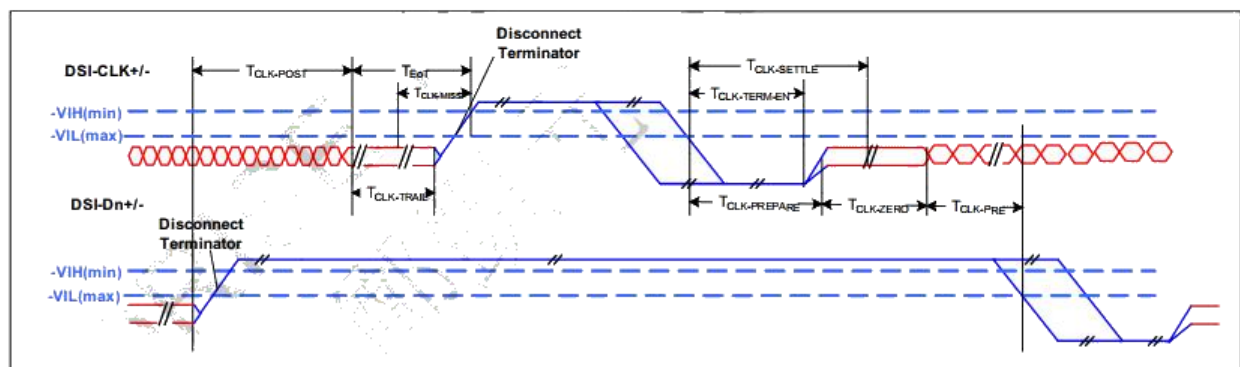
4.7.4 Bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
High Speed Data Transmission Bursts						
DSI-Dn+/-	T _{LPX}	Length of any low-power state period	50	-	-	ns
DSI-Dn+/-	T _{HS-PREPARE}	Time to drive LP-00 to prepare for HS transmission	40ns + 4UI	-	85ns + 6UI	ns
DSI-Dn+/-	T _{HS-PREPARE} + T _{HS-ZERO}	T _{HS-PREPARE} + time to drive HS-0 before the sync sequence	145ns + 10UI	-	-	ns
DSI-Dn+/-	T _{D-TERM-EN}	Time to enable Data Lane receiver line termination measured from when Dn crosses V _{IL(max)}	Time for Dn to reach V _{TERM-EN}	-	35ns + 4UI	ns
DSI-Dn+/-	T _{HS-SKIP}	Time-out at RX to ignore transition period of EoT	40	-	55ns + 4UI	ns
DSI-Dn+/-	T _{HS-TRAIL}	Time to drive flipped differential state after last payload data bit of a HS transmission burst	max (8UI, 60ns+4UI)	-	-	ns
DSI-Dn+/-	T _{HS-EXIT}	Time to drive LP-11 after HS burst	100	-	-	ns
DSI-Dn+/-	T _{EoT}	Time from start of T _{HS-TRAIL} period to start of LP-11 state	-	-	105ns + 12UI	ns



High speed data transmission bursts

Parameter	Symbol	Parameter	Specification			Unit
			MIN	TYP	MAX	
Switching the clock Lane between clock Transmission and Low Power Mode						
DSI-CLK+/-	T _{CLK-POST}	Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	60ns + 52UI	-	-	ns
DSI-CLK+/-	T _{CLK-PRE}	Time that the HS clock shall be driven prior to any associated Data Lane beginning the transition from LP to HS mode	8	-	-	UI
DSI-CLK+/-	T _{CLK-PREPARE}	Time to drive LP-00 to prepare for HS clock transmission	38	-	95	ns
DSI-CLK+/-	T _{CLK-TERM-EN}	Time to enable Clock Lane receiver line termination measured from when Dn crosses V _{IL(max)}	Time for Dn to reach V _{TERM-EN}	-	38	ns
DSI-CLK+/-	T _{CLK-PREPARE} + T _{CLK-ZERO}	T _{CLK-PREPARE} + time for lead HS-0 drive period before starting Clock	300	-	-	ns
DSI-CLK+/-	T _{CLK-TRAIL}	Time to drive HS differential state after last payload clock bit of a HS transmission burst	60	-	-	ns
DSI-CLK+/-	T _{EoT}	Time from start of T _{CLK-TRAIL} period to start of LP-11 state	-	-	105ns + 12UI	ns



Switching the clock lane between clock transmission low power mode

4.8 Timing

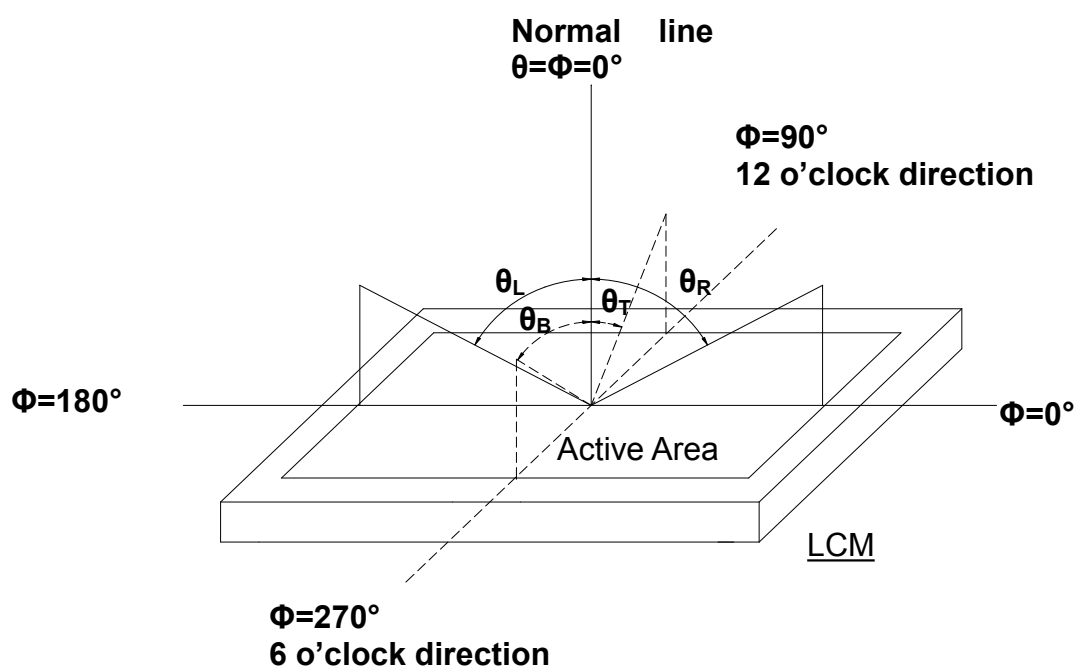
Parameters	Symbols	Min.	Typ	Max.	Unit
MIPI Vedio data-rate (4 lane)	-	-	419	-	Mbps
PCLK Frequency	FPCLK	-	70	-	MHz
Horizontal Synchronization	Hsync	2	2	-	PCLK
Horizontal Back Porch	HBP	4	42	-	PCLK
Horizontal Front Porch	HFP	4	44	-	PCLK
Hsync+ HBP+ HFP	-	58 ^{Note1}	88 ^{Note1}	-	PCLK
Horizontal Address (Display area)	HAdr	-	800	-	PCLK
Horizontal cycle	-	778	888	-	PCLK
Vertical Synchronization	Vsync	1	2	-	Line
Vertical Back Porch	VBP	4	14	-	Line
Vertical Front Porch	VFP	4	16	-	Line
Vsync+ VBP+ VFP	-	-	32	-	Line
Vertical Address (Display area)	VAdr	-	1280	-	Line
Vertical cycle	-	-	1312	-	Line
Frame-Rate	60	Hz			

5 . Optical Specifications

Item		Symbol	Condition	Values			Unit	Remark
				Min.	Typ.	Max.		
Viewing angle	Horizontal	θ_L	CR > 10	80	85	-	degree	Note 1
		θ_R		80	85	-		
	Vertical	θ_T		80	85	-		
		θ_B		80	85	-		
Response time Rise+Fall		T_{RT}	Ta=25°C ; $\theta=0^\circ$	-	30	-	ms	Note 2 Note 3
Contrast ratio		CR	Normal $\theta=\Phi=0^\circ$	-	700	-	-	Note 2 Note 4
Color chromaticity		W_X		0.27	0.31	0.35	-	Note 2
		W_Y		0.29	0.33	0.37	-	Note 5
Color gamut		NTSC		-	45	-	%	-
Luminance		L		250	300	-	cd/m ²	Note 2
Luminance uniformity		Y_U		75	-	-	%	Note 2 Note 6

Note 1: Definition of viewing angle range

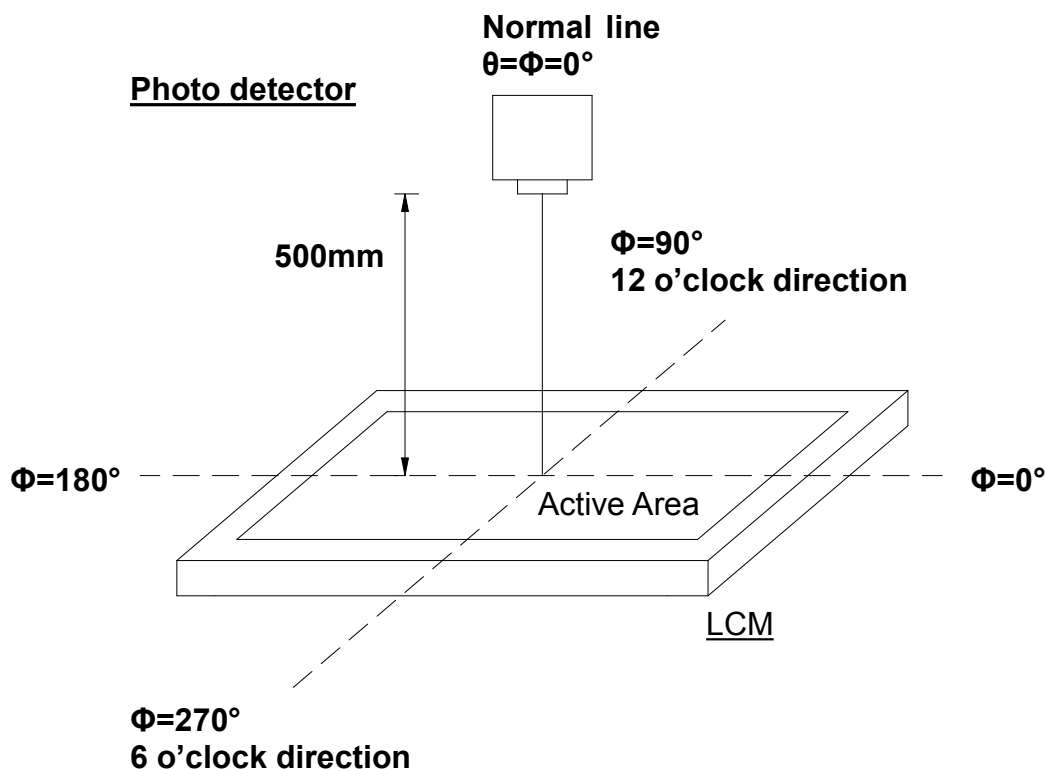
Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface



Definition of viewing angle

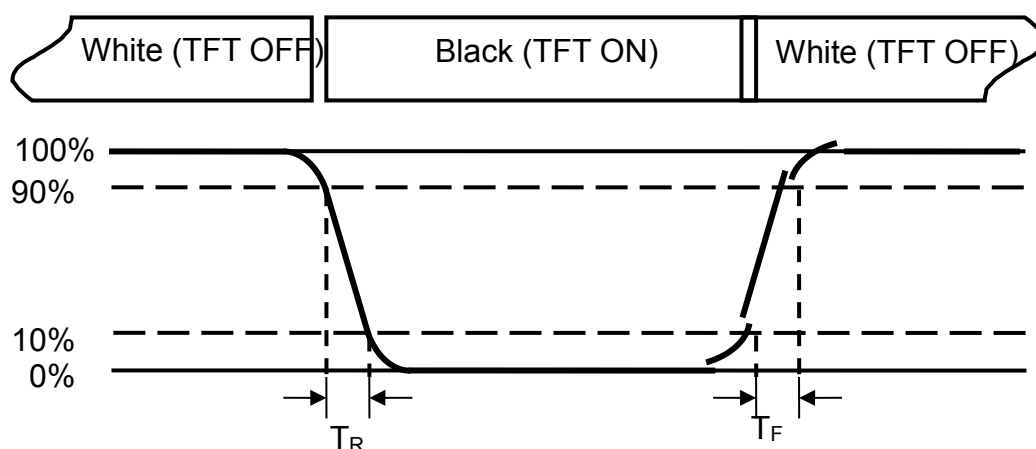
Note 2: Definition of optical measurement system.

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

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

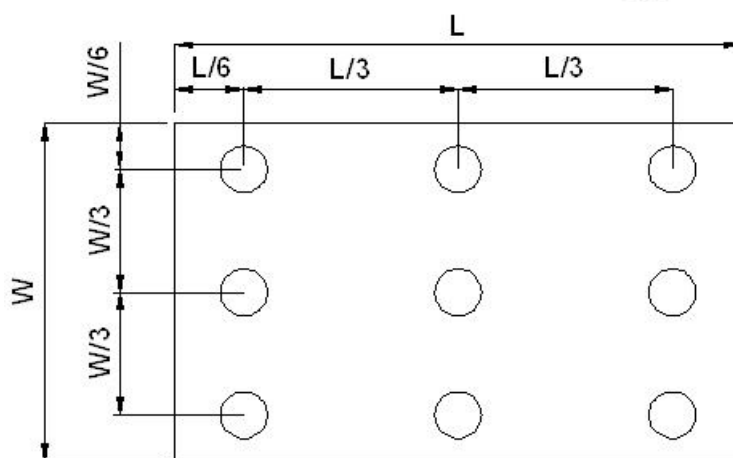
Note 5: Definition of color chromaticity (CIE1931)

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.

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



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	$T_a = 60^{\circ}\text{C}$	96hrs	
Low Temperature Storage	$T_a = -20^{\circ}\text{C}$	96hrs	
High Temperature Operation	$T_s = 50^{\circ}\text{C}$	96hrs	
Low Temperature Operation	$T_a = -10^{\circ}\text{C}$	96hrs	
High Temperature and Humidity (No condensation)	50°C , 90%RH max.	96hrs	Non-operation
Thermal Shock	-30/5min~25/5min~70°C/30min Change time:5min, 8cycle		Non-operation
Electrostatic Discharge	Contact: $\pm 4\text{KV}$ Air: $\pm 8\text{KV}$ 150PF/330 Ω ,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 polarizers which easily be damaged. And since the module is 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) , Sulfur (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 happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

7.3 Caution Against Static Charge

The LCD module uses C-MOS LSI drivers, so we recommend 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 employs 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 than the limit causes the shorter LCD life.
- An electro-chemical 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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

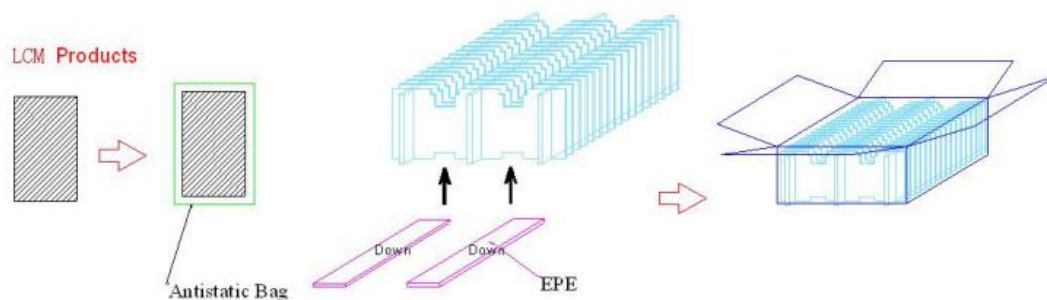
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

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



First step

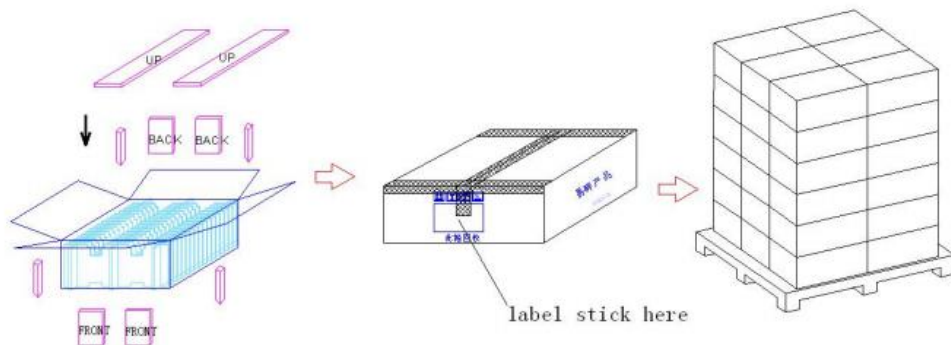
Putting every piece of LCM into anti-static bag.

Second step

Assemble a carton matrix with the right white EPE down below ,then place them into the carton.

Third step

Put a pink EPE between 2 pcs products(face to face) while insert all of them into the carton matrix.



Fourth step

Insert all other white EPE into the right place of the carton matrix .

Fifth step

seal the carton with cellulose tape ;
Stick on a carton label,

sixth step

Place the boxes together on a pallet (6 layers at most),

10. Label Drawing

Bar code label and packing chest label
TBD

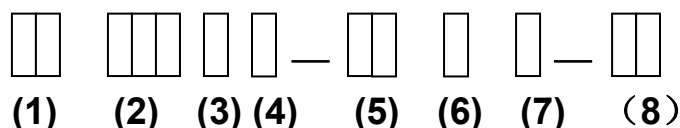
11. HSF Requirements

- 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.

13. Numbering System



No	Definition	Specifications
(1)	TFT LCM Product No.	KD ---- Kingdisplay technology Co.,Ltd
(2)	Display monitor opposite angle line size	Unit :mm (takes three integers)
(3)	Product Types	D ---- PMP / Tablet PC G ----GPS M ----MP P ----Mobile-Phone N ----Net Book A----Automotive I----Industry
(4)	Product Development Series No.	By two figures characters expression from 1 to 99
(5)	Interface PIN Number	By two figures characters expression from 1 to 99
(6)	With Touch Panel Or Not	T----With T/P ; N----Without T/P
(7)	LCD Type	A----AUO ; M----CMI ; C----CPT; B----BOE; L----LG; W----Wintek; H----HSD; S----Century T----Tianma; Y----Hydis; I----INNOLUX; U---Samsung; V---- IVO; P---- Panasonic
(8)	Product Development edition No.	By The English letters : A1~ Z999