SPECIFICATION

PV09004Y0140E

DESIGNED	CHECKED	Approved
研发部 2018.12.07 Aleck	研发部 2018.12.07 Hones	研发部 2018.12.07 Mike

Approval by Customer:

Ok

NG, Problem survey

Approved By_____

Revision Record

REV NO.	REV DATE	CONTENTS	Note
V0	2018.12.07	NEW ISSUE	

Table of Contents

1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by Kingtech Group Co.,Ltd.
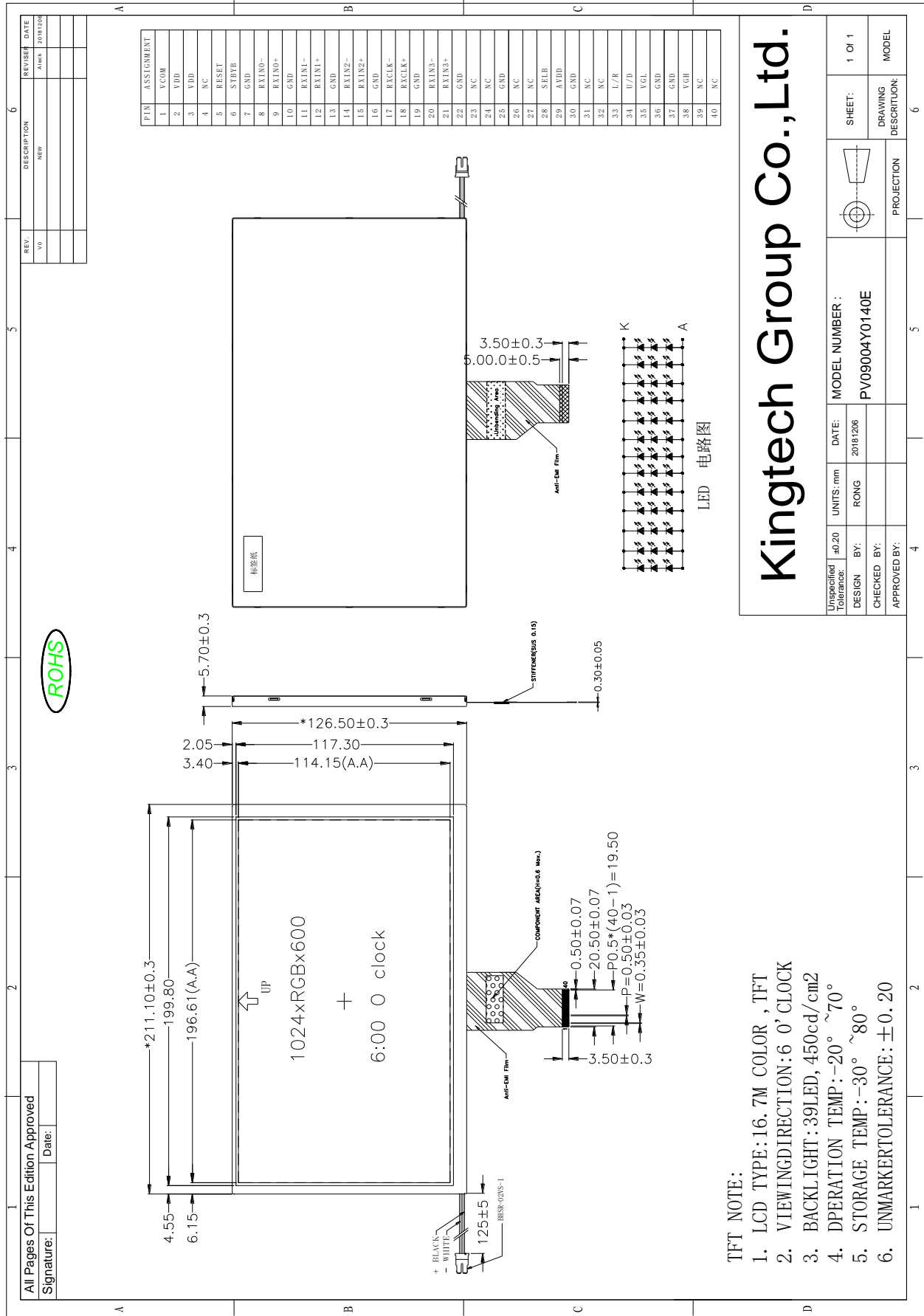
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	9.0"TFT	--
Dot arrangement	1024×3 (RGB)×600	dots
Color filter array	RGB vertical stripe	--
Display mode	Normally White	--
Viewing Direction	6 O'clock	--
Module size	211.1(W)×126.50(H)×5.7(T)	mm
Active area	196.61(W)×114.15(H)	mm
Dot pitch	0.1920(W)×0.19025(H)	mm
Interface	LVDS	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Module Weight	--	g

3. External Dimensions

Kingtech Group Co.,Ltd.

PIN	ASSIGNMENT
1	VCOM
2	VDD
3	VDD
4	NC
5	RESET
6	STBYB
7	GND
8	RXIN0−
9	RXIN0+
10	GND
11	RXIN1−
12	RXIN1+
13	GND
14	RXIN2−
15	RXIN2+
16	GND
17	RXCLK−
18	RXCLK+
19	GND
20	RXIN3−
21	RXIN3+
22	GND
23	NC
24	NC
25	GND
26	NC
27	NC
28	SELB
29	AVDD
30	GND
31	NC
32	NC
33	L/R
34	U/D
35	VGL
36	GND
37	GND
38	VGH
39	NC
40	NC

LED 电路图

MODEL NUMBER :	PV09004Y0140E
DATE:	20181206
UNITS: mm	RONG
DESIGN BY:	
CHECKED BY:	
APPROVED BY:	

Unspecified Tolerance: ±0.20

SHEET: 1 Of 1

PROJECTION

DRAWING DESCRITUON: MODEL

REV.: V0   DESCRIPTION: NEW   REVISER: Aleck   DATE: 20181206

3.50±0.3
5.00.0±0.5

K   A

Anti-EM Film
Unbonding Area

5.70±0.3
STIFFENER(SUS 0.15)
0.30±0.05

*126.50±0.3
2.05
117.30
3.40
114.15(A.A)

*211.10±0.3
199.80
196.61(A.A)

1024×RGB×600

6:00 O clock

UP

4.55
6.15

COMPONENT AREA(H=0.6 Max.)

0.50±0.07
20.50±0.07
P0.5*(40−1)=19.50
P=0.50±0.03
W=0.35±0.03

3.50±0.3

Anti-EM Film

125±5

BISR-02JS-1

+ BLACK
− WHITE

TFT NOTE:
1. LCD TYPE:16.7M COLOR , TFT
2. VIEWINGDIRECTION:6 O'CLOCK
3. BACKLIGHT:39LED, 450cd/cm2
4. DPERATION TEMP:−20° ~70°
5. STORAGE TEMP:−30° ~80°
6. UNMARKERTOLERANCE:±0.20

Viewing angle: −20° ~70° −30° ~80°

All Pages Of This Edition Approved
Signature: Date:

标签纸

ROHS

4. Interface Description

No.	Symbol	I/O	Function
1	VCOM	P	Common voltage
2,3	VDD	P	Digital power
4	NC	-	Not connect
5	RESET	I	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=100K_，C=1μF)
6	STBYB	I	Standby mode, normally pull high STBYB="1", normal operation STBYB="0",timing control, source driver will turn off, all output
7	GND	P	Ground
8	RXIN0-	I	Negative LVDS differential data inputs
9	RXIN0+	I	Positive LVDS differential data inputs
10	GND	P	Ground
11	RXIN1-	I	Negative LVDS differential data inputs
12	RXIN1+	I	Positive LVDS differential data inputs
13	GND	P	Ground
14	RXIN2-	I	Negative LVDS differential data inputs
15	RXIN2+	I	Positive LVDS differential data inputs
16	GND	P	Ground
17	RXCLK-	I	Negative LVDS differential clock inputs
18	RXCLK+	I	Positive LVDS differential clock inputs
19	GND	P	Ground
20	RXIN3-	I	Negative LVDS differential data inputs
21	RXIN3+	I	Positive LVDS differential data inputs
22	GND	P	Ground
23,24	NC	-	Not connect
25	GND	P	Ground
26,27	NC	-	Not connect
28	SELB	I	6bit/8bit mode select H : 6bit / L : 8bit
29	AVDD	P	Power for Analog Circuit
30	GND	P	Ground
31,32	LED-(NC)	P	Not connect
33	L/R	I	Horizontal inversion
34	U/D	I	Vertical inversion
35	VGL	P	Negative power for TFT
36	GND	P	Ground
37	GND	P	Ground
38	VGH	P	Positive power for TFT
39,40	LED+(NC)	P	Not connect

I：input , O：output , P：Power

【Note】

*1)：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

Item	Symbol	Min.	Max.	Unit
Digital Supply Voltage	DVDD	-0.3	5.0	V
Analog Supply Voltage	AVDD	6.5	13.5	V
Gate On Voltage	VGH	-0.3	40.0	V
Gate Off Voltage	VGL	-20.0	0.3	V
Gate On- Gate Off Voltage	VGH-VGL	-	40.0	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

Operating Conditions

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Digital Supply Voltage	DVDD	3.0	3.3	3.6	V	-
Analog Supply Voltage	AVDD	10.2	10.8	11	V	-
Gate On Voltage	VGH	15.3	18.0	20	V	-
Gate Off Voltage	VGL	-7.7	-7.0	-6.3	V	-
Common Voltage	VCOM	3.8	(4.25)	4.5	V	-
Logic Input Voltage	VIH	0.7DVDD	-	DVDD	V	-
	VIL	GND	-	0.3DVDD	V	-

NOTE1：VCOM 电压根据客户主板实际效果而定

7. Timing Characteristics

7.1 POWER ON/OFF SEQUENCE

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

Power on: VDD, GND _ AVDD, AGND _ V1 to V14

Power off: V1 to V14 _ AVDD, AGND_ VDD, GND

Power on/off control
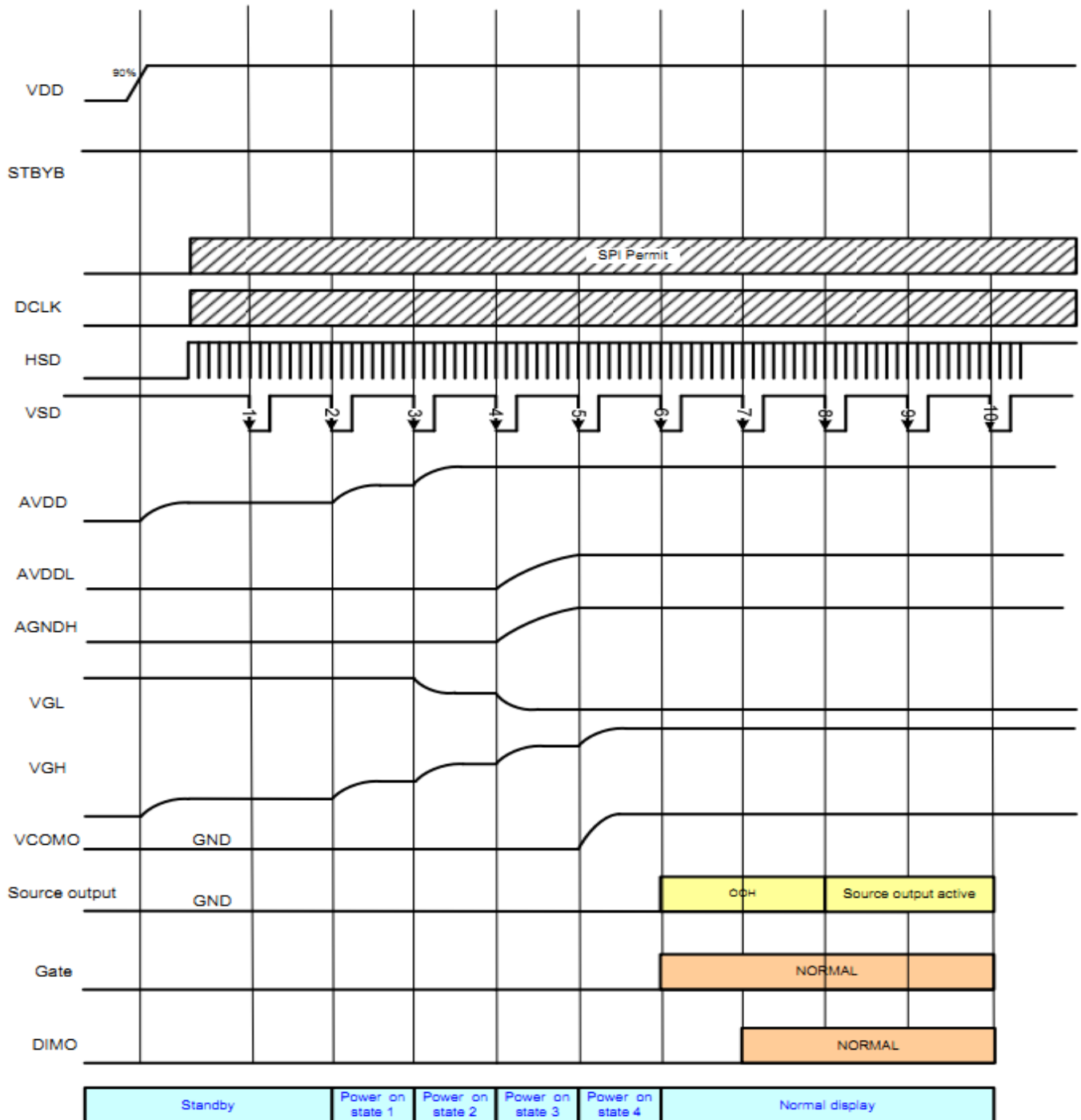
**Power on timing sequence**
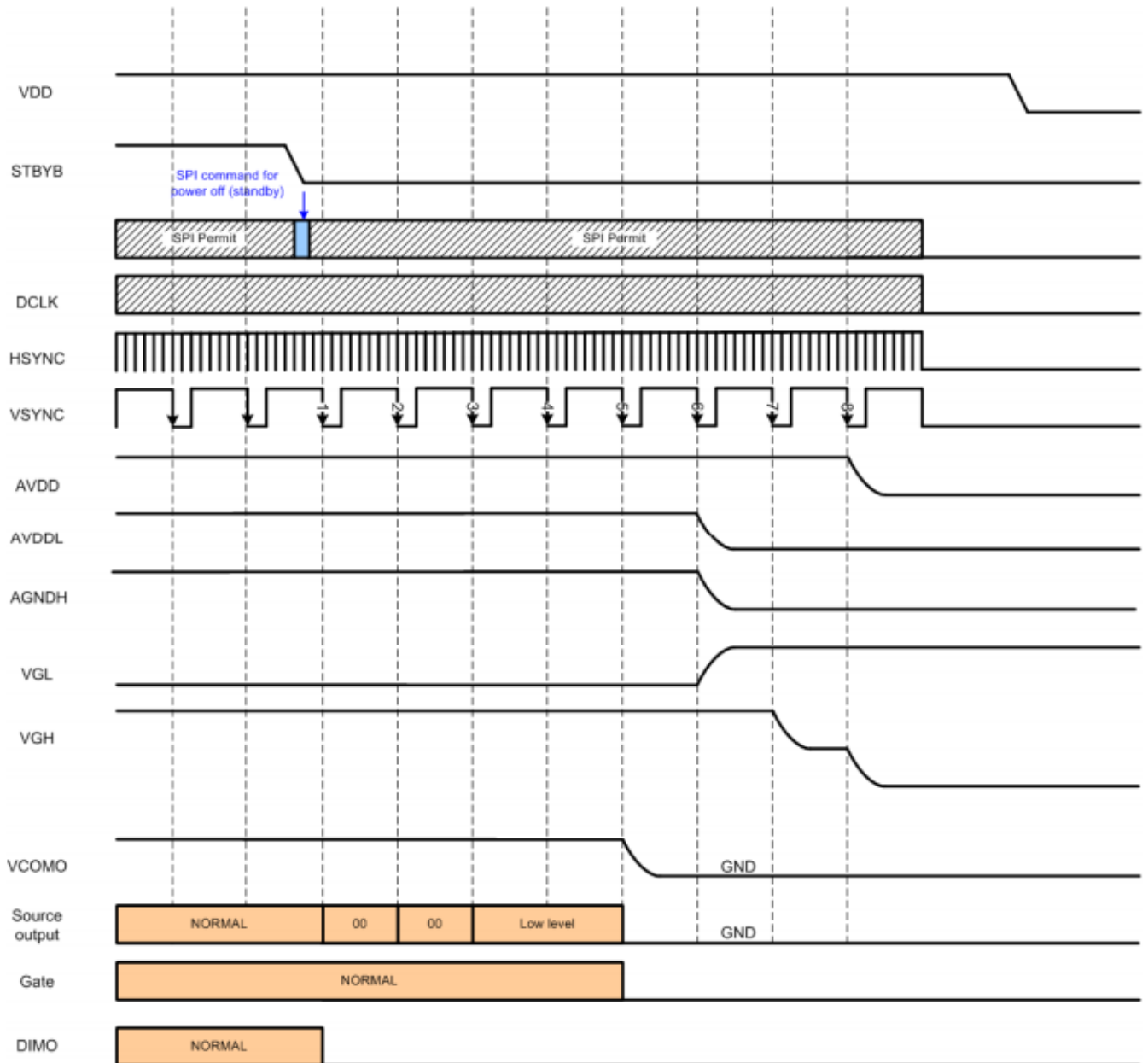
**Power off timing sequence**

7.2 INPUT SIGNAL TIMING

7.2.1 DC electrical characteristics

### LVDS mode DC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		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	-	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

Single-end signals
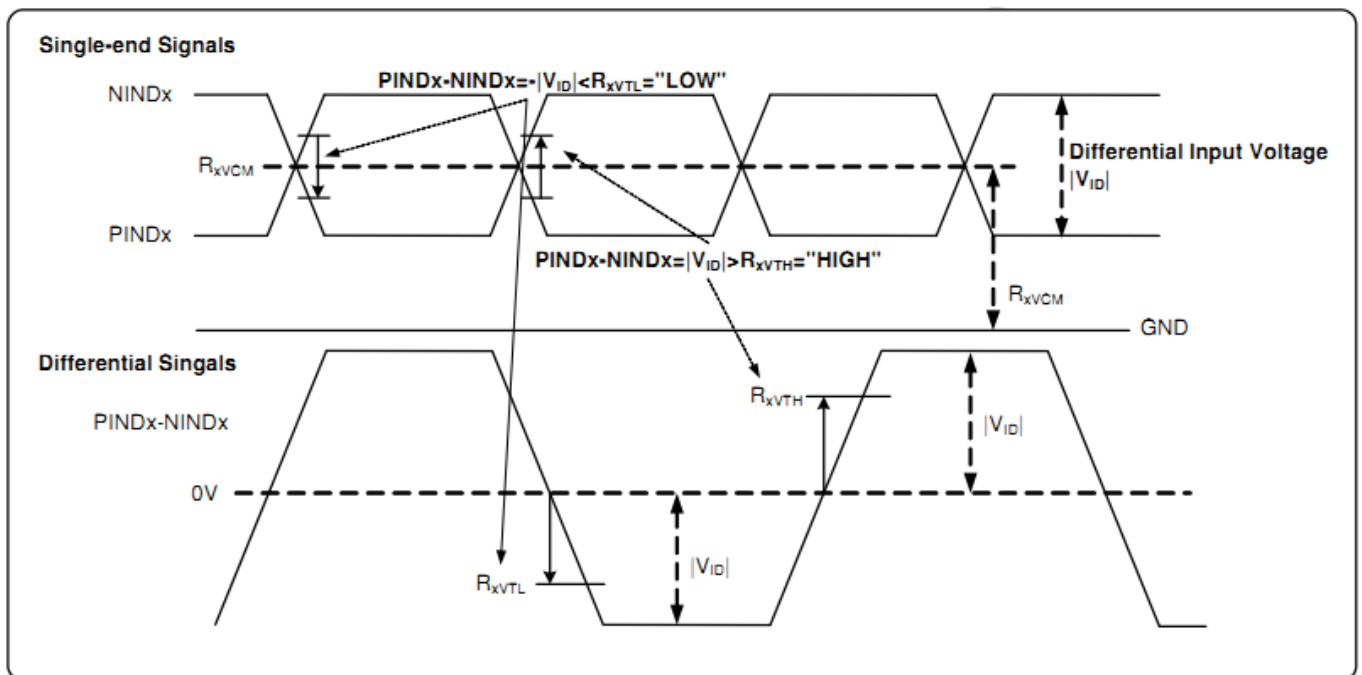
7.2.2AC ELECTRICAL CHARACTERISTICS

LVDS mode AC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
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	-
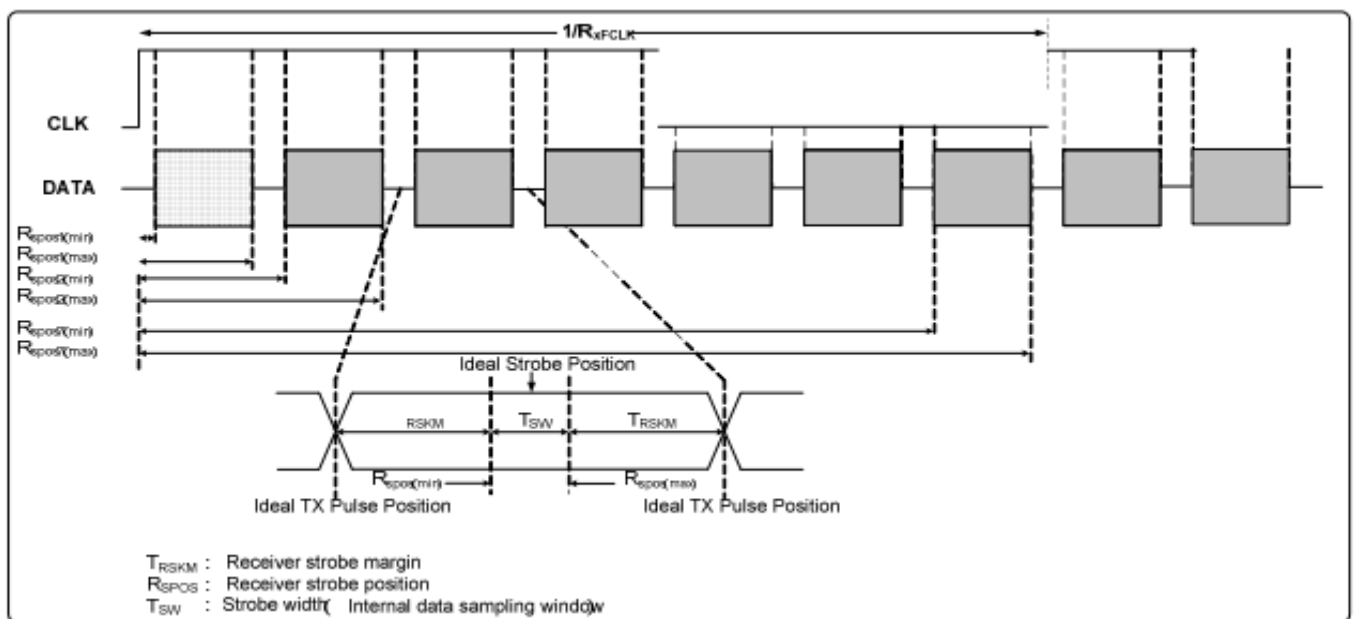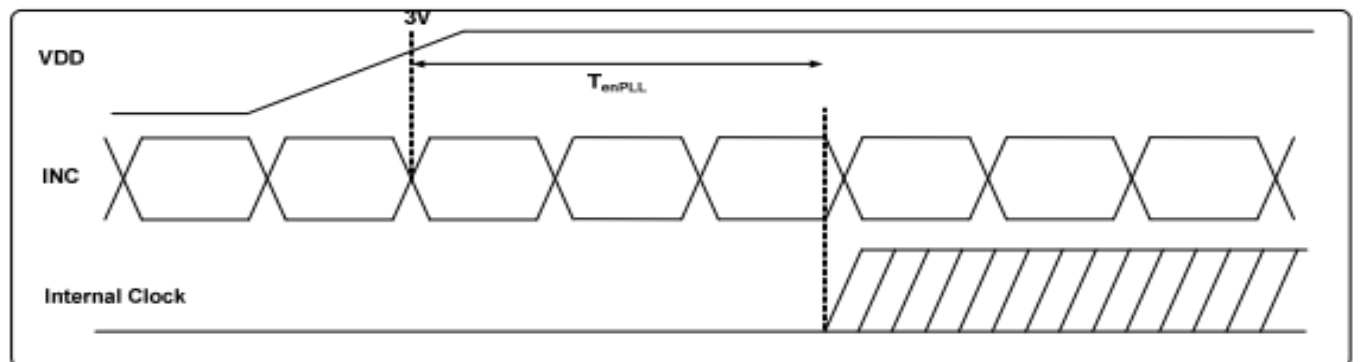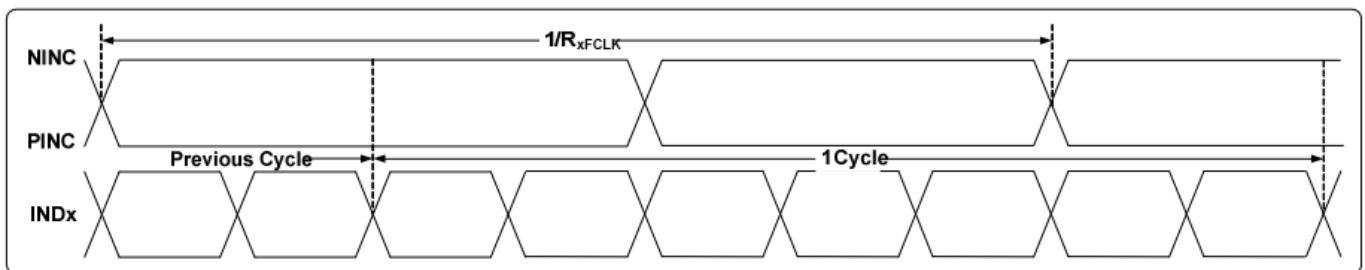
LVDS mode data input format

7.2.3LVDS mode data input format
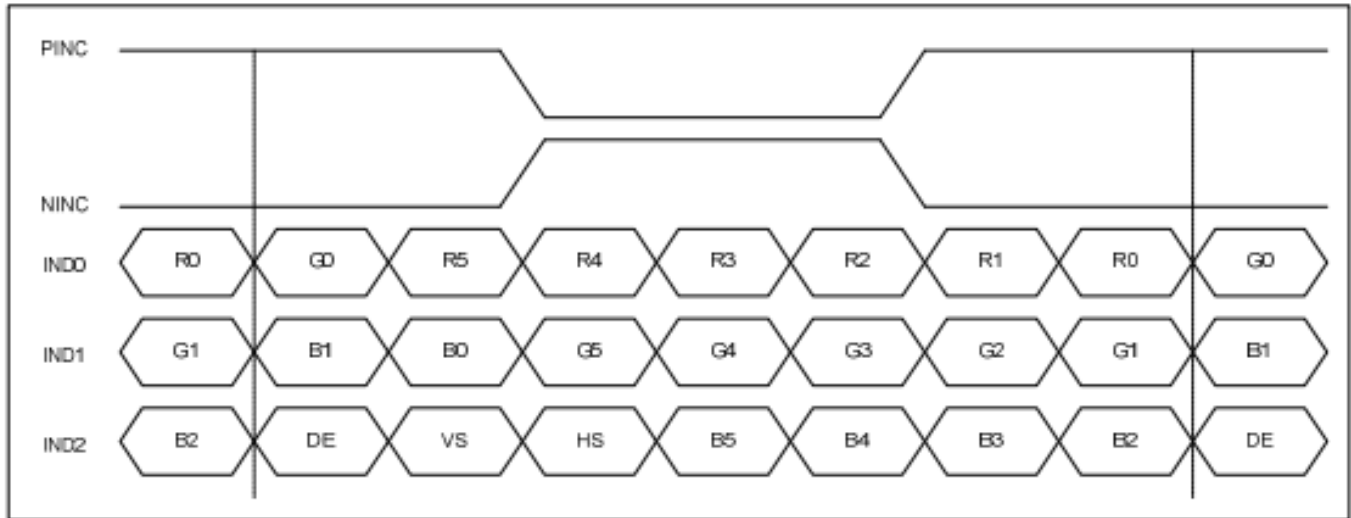
6-bit LVDS input
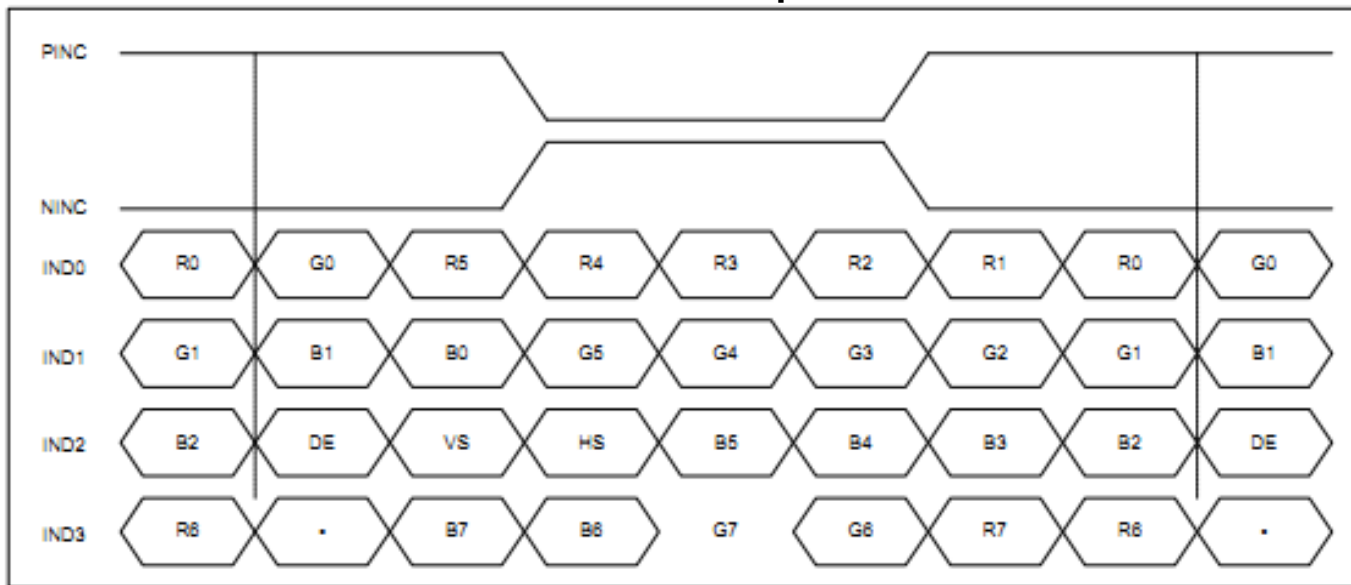
8-bit LVDS input

7.3 PARALLEL RGB INPUT TIMING TABLE
DE mode (1024x600)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd		1024		DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd		600		T_H
VSD Period	tv	610	635	800	T_H
VSD Blanking	tvbp+ tvfp	10	35	200	T_H

HV mode
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 back porch	tvb	23	23	23	H
VSYNC front porch	tvfp	1	12	127	H

7.4 TIMING DIAGRAM

Input Clock and Data Timing Diagram
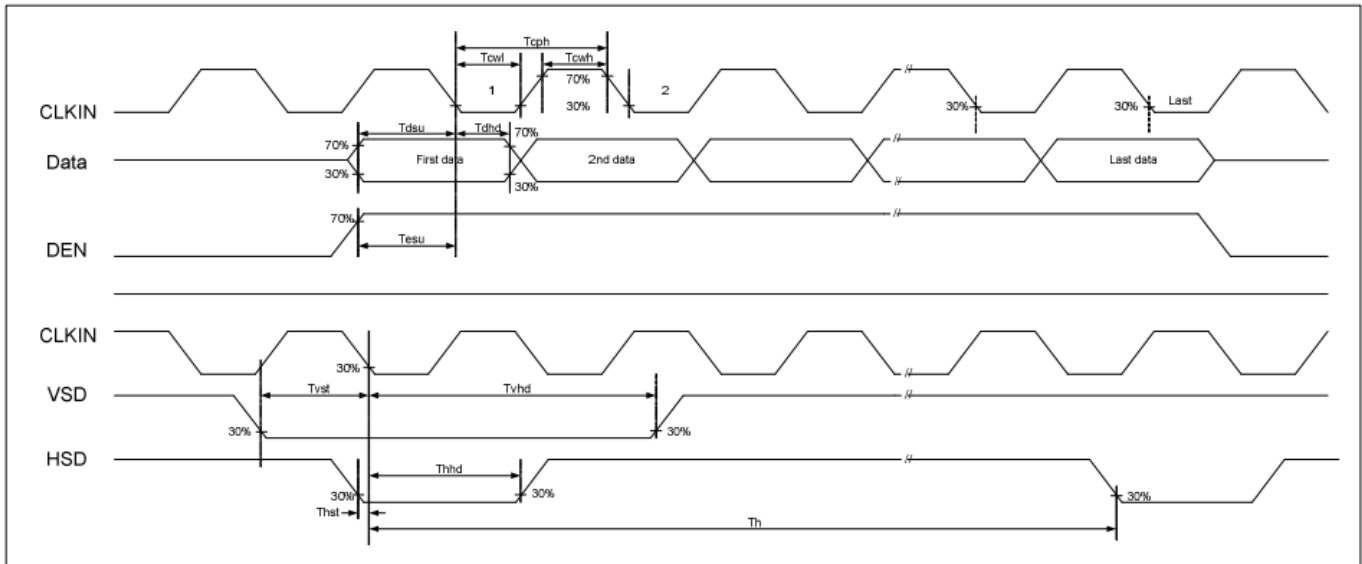
8. Backlight Characteristics
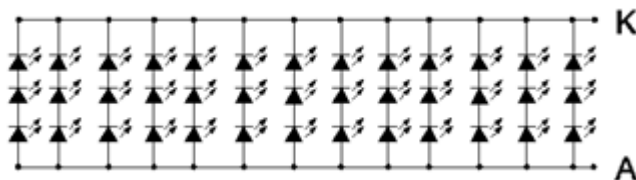
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	9	9.6	10.5	V	If=260mA
Supply Current	If	-	260	-	mA	If=260mA
Luminous Intensity for LCM	-	400	450	-	cd/m^2	If=260mA
Uniformity for LCM	-	70	-	-	％	If=260mA
Life Time	-	-	50000	-	Hr	If=260mA

9. Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Viewing Angle (CR>10)	Horizontal	θ_L	-	70	-	degree	(1),(2),(6)
		θ_R	-	70	-		
	Vertical	θ_T	-	50	-		
		θ_B	-	70	-		
Contrast Ratio	Center		-	500	-	-	(1),(3),(6)
Transmittance	Tr			5.18		%	Base on BLU Light Note (7))
Response Time	Rising + Falling		-	25	-	ms	(1),(4),(6)
CF Color Chromaticity (CIE1931)	Red x		Typ. -0.05	0.609	Typ. +0.05	-	(1), (6)
	Red y			0.339		-	
	Green x			0.321		-	
	Green y			0.599		-	
	Blue x			0.139		-	
	Blue y			0.123		-	
	White x			0.290		-	
	White y			0.325		-	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C 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
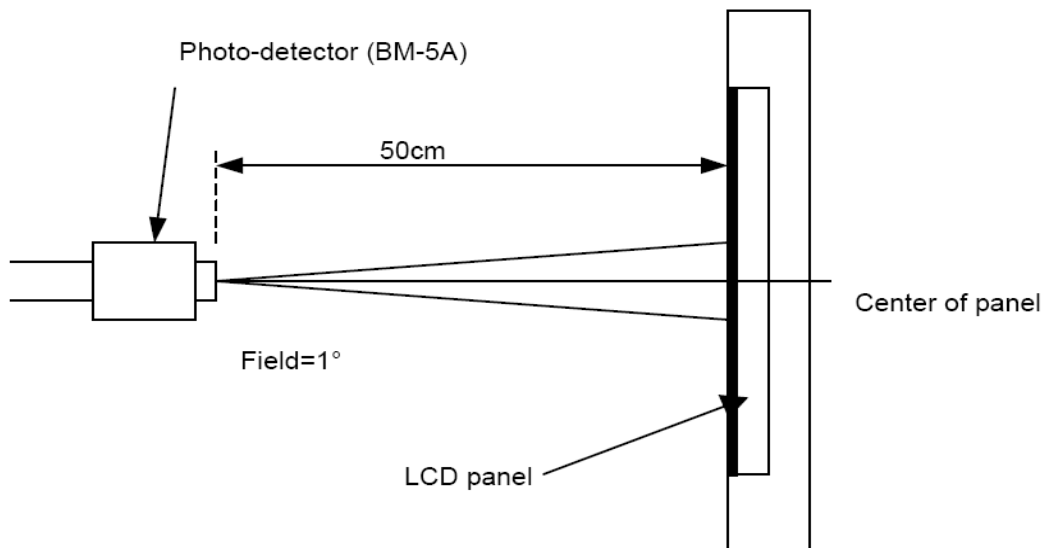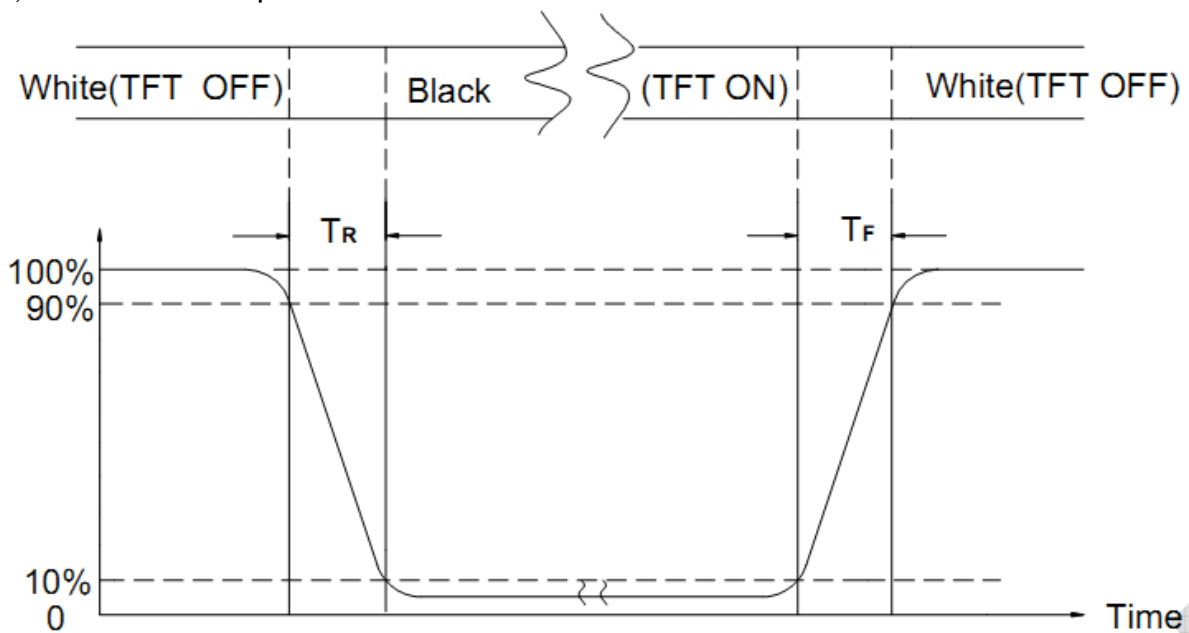
Note (2) Definition of Viewing Angle
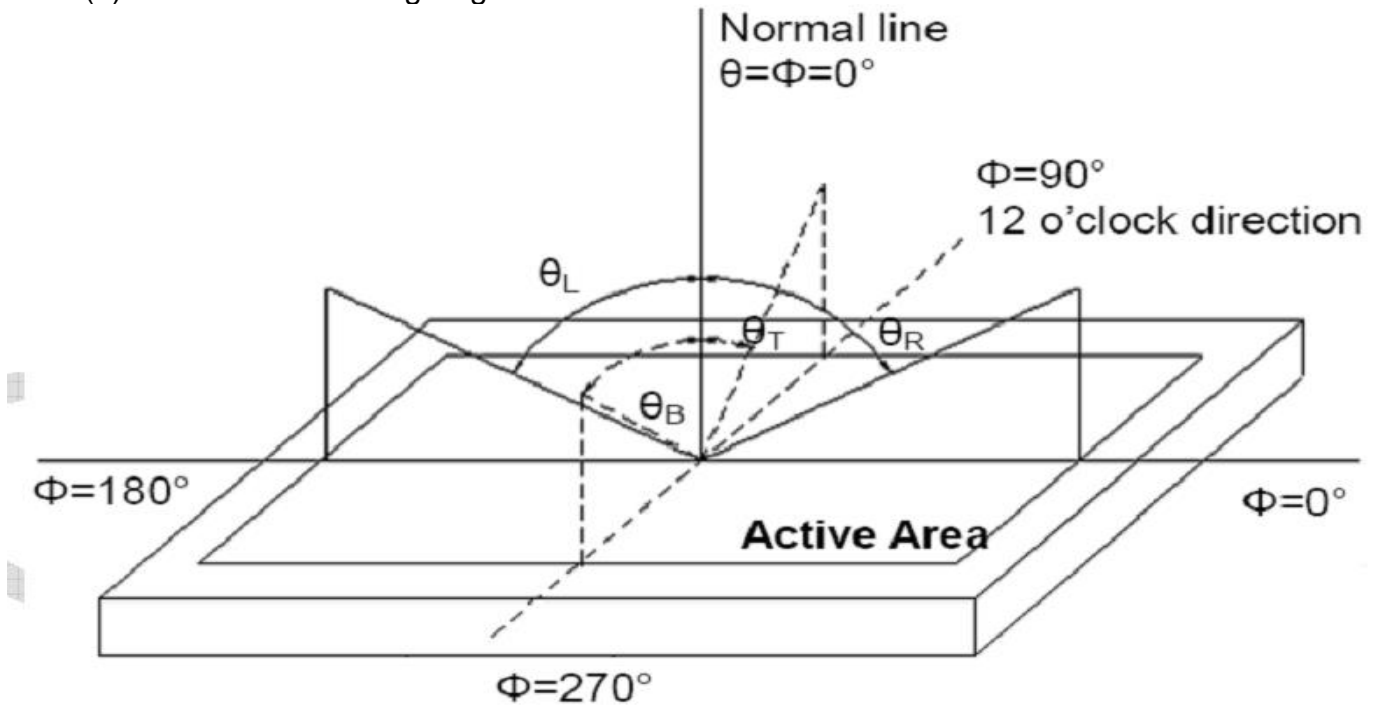
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time

Note (5) Definition of Transmittance (Module is without signal input)

Transmittance = Center Luminance of LCD / Center Luminance of Back Light x 100%

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	
①	High Temperature Storage	Keep in 80°C ±5℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs.	
②	Low Temperature Storage	Keep in -30°C ±5℃ 240 hrs Surrounding temperature, then storage at normal condition 4hrs.	
③	High Temperature / High Humidity Storage Test	Keep in 60 ℃ / 90% R.H duration for 240 hrs Surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer)	
④	Temperature Cycling Storage Test	-30°C → +25℃ → 80°C → +25℃ (30mins) (5mins) (30mins) (5mins) ◄─────────── 30 Cycle ───────────► Surrounding temperature, then storage at normal condition 4hrs.	
⑤	ESD Test	Air Discharge: Apply 2 KV with 5 times Discharge for each polarity +/-	Contact Discharge: Apply 250 V with 5 times discharge for each polarity +/-
		1. Temperature ambiance : 15℃～35℃ 2. Humidity relative : 30%～60% 3. Energy Storage Capacitance(Cs + Cd) : 150pF±10% 4. Discharge Resistance(Rd) : 330Ω±10% 5. Discharge, mode of operation : Single Discharge (time between successive discharges at least 1 sec) (Tolerance if the output voltage indication : ±5%)	
⑥	Vibration Test (Packaged)	1. Sine wave 10～55 Hz frequency (1 min/sweep) 2. The amplitude of vibration :1.5 mm 3. Each direction (X、Y、Z) duration for 2 Hrs	
⑦	Drop Test (Packaged)	<table><tr><td>Packing Weight (Kg)</td><td>Drop Height (cm)</td></tr><tr><td>0 ~ 45.4</td><td>122</td></tr><tr><td>45.4 ~ 90.8</td><td>76</td></tr><tr><td>90.8 ~ 454</td><td>61</td></tr><tr><td>Over 454</td><td>46</td></tr></table>Drop Direction :※1 corner / 3 edges / 6 sides each 1time	

11. Inspection Standard
11.1. QUALITY :
THE QUALITY OF GOODS SUPPLIED TO PURCHASER SHALL COME UP TO THE FOLLOWING STANDARD.
11.1.1. INSPECTIONTOOLS AND INSTRUMENTS
Vernier calipers, film scales, multimeter, magnifying eyepiece, ND5%, luminance meter and so on.
11.1.2. THE METHOD OF PRESERVING GOODS
AFTER DELIVERY OF GOODS FROM KINGTECH TO PURCHASER. PURCHASER SHALL CONTROL THE LCM   AT -10 TO 40 ,AND IT MIGHT BE DESIRABLE TO KEEP AT THE NORMAL ROOM TEMPERATURE AND HUMIDITY UNTIL INCOMING INSPECTION OR THROWING INTO PROCESS LINE.
11.1.3. INCOMING INSPECTION
(A) THE METHOD OF INSPECTION
IF PURCHASER MAKE AN INCOMING INSPECTION , A SAMPLING PLAN SHALL BE APPLIED ON THE CONDITION THAT QUALITY OF ONE DELIVERY SHALL BE REGARDED AS ONE LOT.
(B) THE STANDARD OF QUALITY
ISO-2859-1 (SAME AS MIL-STD-105E) ,LEVEL:II

CLASS	AQL(%)
CRITICAL	0.4 %
MAJOR	0.65 %
MINOR	1.5 %

EVERY ITEM SHALL BE INSPECTED ACCORDING TO THE CLASS.
(C) MEASURE
IF AS THE RESULT OF ABOVE RECEIVING INSPECTION , A LOT OUT IS DISCOVERED. PURCHASER SHALL BE INFORM SELLER OF IT WITHIN SEVEN DAYS. BUT FIRST SHIPMENT WITHIN FOURTEEN DAYS.
11.1.4. WARRANTY POLICY
KINGTECH WILL PROVIDE ONE-YEAR WARRANTY FOR THE PRODUCTS ONLY IF UNDER SPECIFICATION OPERATING CONDITIONS. KINGTECH WILL REPLACE NEW PRODUCTS FOR THESE DEFECT PRODUCTS WHICH UNDER WARRANTY PERIOD AND BELONG TO THE RESPONSIBILITY OF KINGTECH
11.2. CHECKING CONDITION
11.2.1. CHECKING DIRECTION SHALL BE IN THE 45 DEGREE AREA TO FACE THE SAMPLE.
11.2.2. CHECKER SHALL SEE OVER 300±25 mm. WITH BARE EYES FAR FROM SAMPLE
11.2.3. Ambient Illumination:
0 ~30 Lux for functional inspection
500 ~ 1200 Lux for external appearance inspection.
11.2.4. TEST AREA：

——→

END SEAL

可视区
显示区
边框
电极
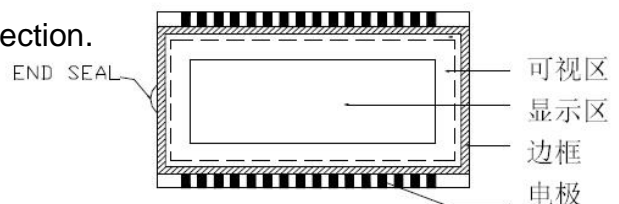
11.2.5. Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)

11.2.6.   The inspector may make a visual inspection or a comparative examination with a film

ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

11.2.7. Functional testing uses electrical testing fixtures or test fixtures required by customers.

11.2.8. the ion fan should be used when testing.

11.2.9. the principle of judgment

11.3.1   If the defect outside the visual area does
 not affect the assembly and display,
   it will be judged as a good product.

11.3.2   Poor definition
Pixel:
A combination of three sub-pixels
  (Red + Green + Blue).
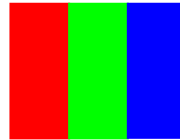
Dot:
Any of the sub-pixels
  (Red or Green or Blue).

Bright and dark dots:
   A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.
Highlights:
   Usually considered to be shown on a black screen.
Dark spots:
    They are generally considered to be shown on R, G, B solid colors or white images.
Neighborhood:
    Two or three adjacent point pixels (dot: sub-pixel) connected together (R, G or G, B or B, R or RGB).

11.3. INSPECTION PLAN :
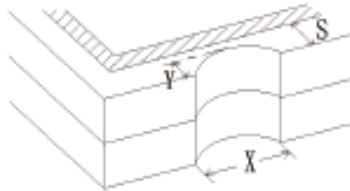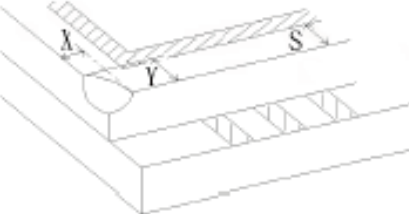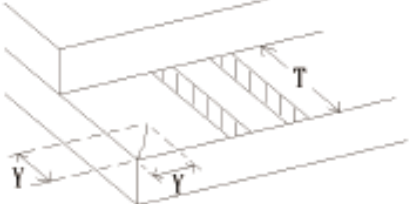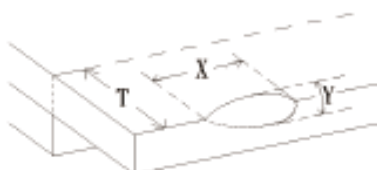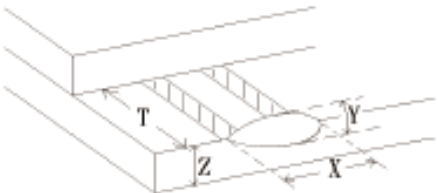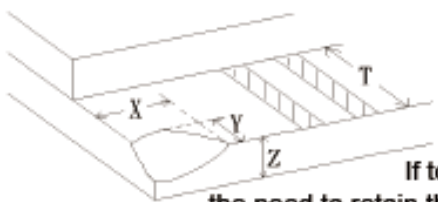
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO." , "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED...............REJECTED QUANTITY SHORT OR OVER......REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREA ….…..REJECTED	Minor
	6. BLEMISH、BLACK SPOT、 WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH、BLACK SPOT WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD......REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST、VOP、 CHROMATICITY … ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT、LINE、CHARACTER ....REJECTED	Critical
	12.SHORT CIRCUIT、 WRONG PATTERN DISPLAY	NO DISPLAY、WRONG PATTERN DISPLAY、CURRENT CONSUMPTION OUT OF SPECIFICATION...... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

11.4. STANDARD OF VISUAL INSPECTION

NO.	CLASS	ITEM	JUDGEMENT
11.4.1	MINOR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	(A) ROUND TYPE: unit : mm. **DIAMETER (mm.) / ACCEPTABLE Q'TY** $\Phi \leq 0.15$ — Distance≥1mm $0.15 < \Phi \leq 0.4$ — 3 (Distance>15mm) $0.4 < \Phi$ — 0 NOTE: Φ=(LENGTH+WIDTH)/2 (B) LINEAR TYPE: unit : mm. **LENGTH / WIDTH / ACCEPTABLE Q'TY** ------ / $W \leq 0.03$ / Distance≥1mm $L \leq 4.0$ / $0.03 < W \leq 0.05$ / 3 (Distance>15mm) ------ / $0.05 < W$ / FOLLOW ROUND TYPE
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	unit : mm. **DIAMETER / ACCEPTABLE Q'TY** $\Phi \leq 0.2$ — Distance≥1mm $0.2 < \Phi \leq 0.5$ — 3 (Distance>15mm) $0.5 < \Phi$ — 0
11.4.3	MINOR	Dot Defect	**Items / ACC. Q'TY** Bright dot — $N \leq 2$ (Distance≥15mm) Dark dot — $N \leq 3$ (Distance>15mm) Pixel Define : Note 1: The definition of dot: The size of a defective dot over 1/2 of whole dot is regarded as one defective dot. Definittion:<1/2dot and visible by 5% ND filter $N \leq 5$ Note 2: Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern. Note 3: Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green ,blue pattern.
11.4.4	MINOR	Mura	Not visible thriugh 5% ND filter in 50% gray or judge by limit sample if necessary

NO.	CLASS	ITEM	JUDGEMENT
11.4.5	MINOR	LCD GLASS CHIPPING	$X \geq 3mm$ $Y > S$ Reject
11.4.6	MINOR	LCD GLASS CHIPPING	X or $Y > S$ Reject
11.4.7	MAJOR	LCD GLASS GLASS CRACK	Continuous burst NG Reject
11.4.8	MAJOR	LCD GLASS SCRIBE DEFECT	ACCORDING TO DIMENSION
11.4.9	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	$Y < 1/2Z$ $Y \geq 0.5mm$ Reject $X \geq 3mm$
11.4.10	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	$Y < 1/2Z$ $Y \geq 0.5mm$ Reject $X \geq 3mm$
11.4.11	MINOR	LCD GLASS CHIPPING	$X \geq 3mm$ $Y \geq T$ Reject If touch the electrode lines, the need to retain the two-thirds electrode lines

12. Handling Precautions

12.1 Mounting method

The LCD panel of KINGTECH TFT 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.

12.2 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 happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

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

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

12.4 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

12.5 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.
- 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.

12.6 storing

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

12.7 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

13. Precaution for Use

13.1

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.

13.2

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 toKINGTECH TFT , 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.

14. Packing Method
TBD