

10.1 寸 LED 模组规格书

SPECIFICATION

承 认 印 Approved by	
审核:	确认:
客户确认结果:	

Customer

客 户: _____

Product

品 名: _____ 10.1 寸 LED 模组 _____

Part NO.

产品料号: _____ 1 01ML285HS18A _____

DATE

日 期: _____ 2012/01/20 _____

Approved 核 准	Checked 审 核	Prepared 制 作

:

1.0 General Description

1.1 Introduction

HSD Display model WY101ML285HS18A is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel and a driving circuit. This TFT LCD has a 10.1 (16:9) inch diagonally measured active display area with (1024 horizontal by 600 vertical pixels) resolution.

1.2. Features

10.1 (16:9 diagonal) inch configuration
 Compatible with NTSC & PAL system
 Image Reversion: UP/DOWN and LEFT/RIGHT
 ROHS design

1.3. General information

Item	Specification	Unit
Outline Dimension	234.9 (H) x 142.8 (V) x 5.0 (D)	mm
Display area	222.72 (H) x 125.28 (V)	mm
Number of Pixel	1024 RGB (H) x 600 (V)	pixels
Pixel pitch	0.2178 (H) x 0.2088 (V)s	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
Color Filter Array	RGB vertical stripes	
Backlight	White LED	
Weight	TBD	g

2.0 Absolute Maximum Ratings

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	DV _{DD}	-0.3	5.0	V	GND=0
	AV _{DD}	6.5	13.5	V	AGND=0
	V _{COM}	3.44	3.62	V	
Analog Signal Input Level	V _R , V _G , V _B	-0.2	AV _{DD} +0.2	V	
Logic Signal Input Level	V _I	-0.3	5.0	V	

Note (1) Stresses above those listed under "Absolute Maximum Rating" may cause permanent damage to the device. These are stress ratings only. Functional operation of this device at indicated in the operational sections(6.1) of this specification.

2.2 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T _{opa}	-10	60	°C	
Storage Temperature	T _{stg}	-20	70	°C	

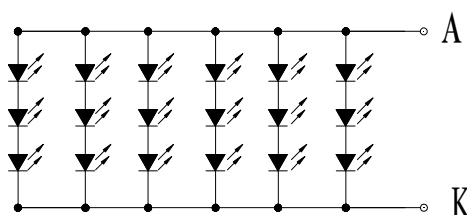
2.3 Back-light Unit:

PARAMETER	Sym.	Min.	Typ.	Max.	Unit	Test Condition	Note
LED Current	I _F	–	120	–	mA	–	–
LED Voltage	V _F	9	9.9	10.5	V	–	–
Life Time		–	25000	–	Hr.	I ≦ 120mA	–
Color	White						

Note (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.

(2) T_a=25±2°C

(3) Test condition: LED Current 120mA



LED电路图

3.0 Optical Characteristics

3.1 Optical specification

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR \geq 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	40	45	-	degree	Note 1
	θ_R	$\Phi=0^\circ$ (3 o'clock)	40	45	-		
	θ_T	$\Phi=90^\circ$ (12 o'clock)	10	15	-		
	θ_B	$\Phi=270^\circ$ (6 o'clock)	30	35	-		
Response time	T_{ON}	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	T_{OFF}		-	15	30	msec	Note 3
Contrast ratio	CR		400	500	-	-	Note 4
Color chromaticity	W_x		0.26	0.31	0.36	-	Note 2 Note 5
	W_y		0.28	0.33	0.38	-	Note 6
Luminance	L		120	170	-	cd/m ²	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 7

Test Conditions:

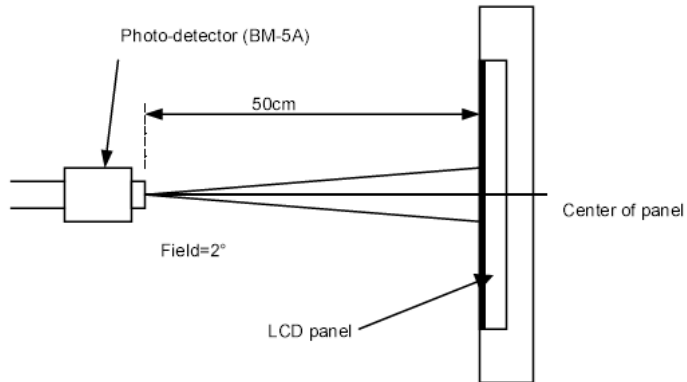
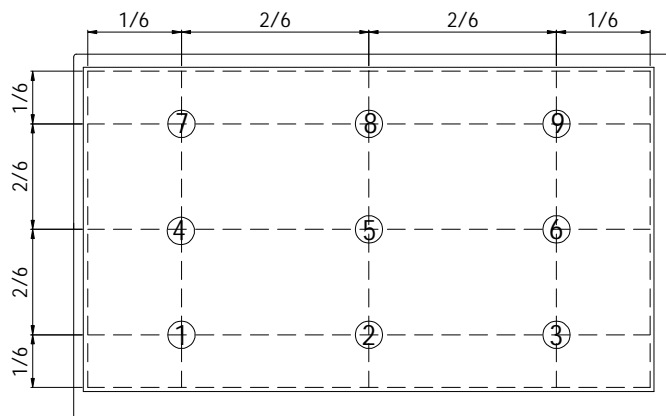
1. $V_{CC}=3.3V$, $I_L=220mA$ (Backlight current), the ambient temperature is $25^\circ C$.
2. The test systems refer to Note 2.

3.2 Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : $25\pm 2^\circ C$
- 30min. warm-up time.

3.3 Measuring Equipment

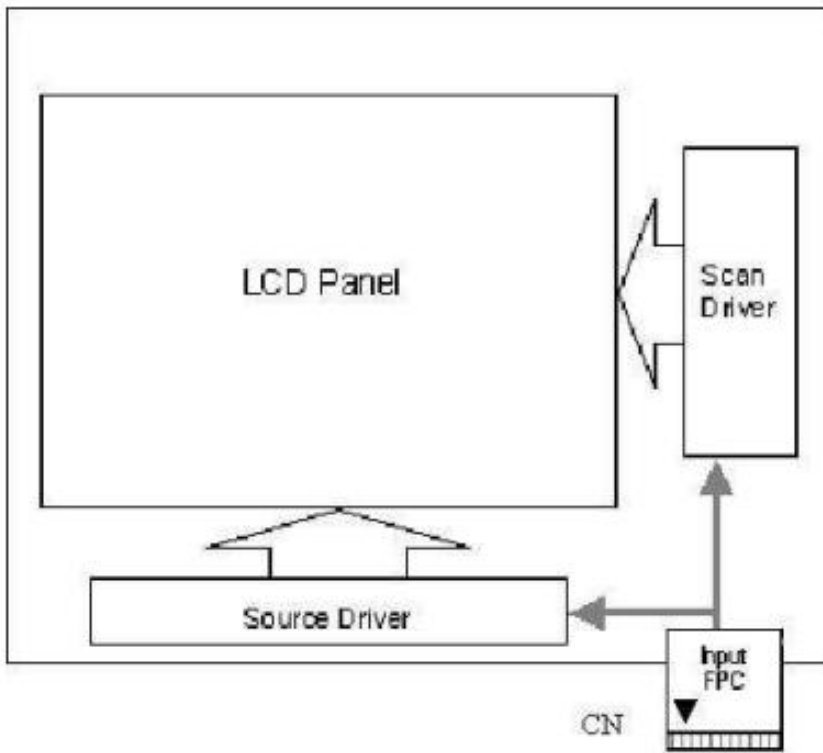
- TOPCON BM-7
- Measuring spot size : field 2°

Note (5) Definition of optical measurement setup**Note (6)** Definition of brightness uniformity

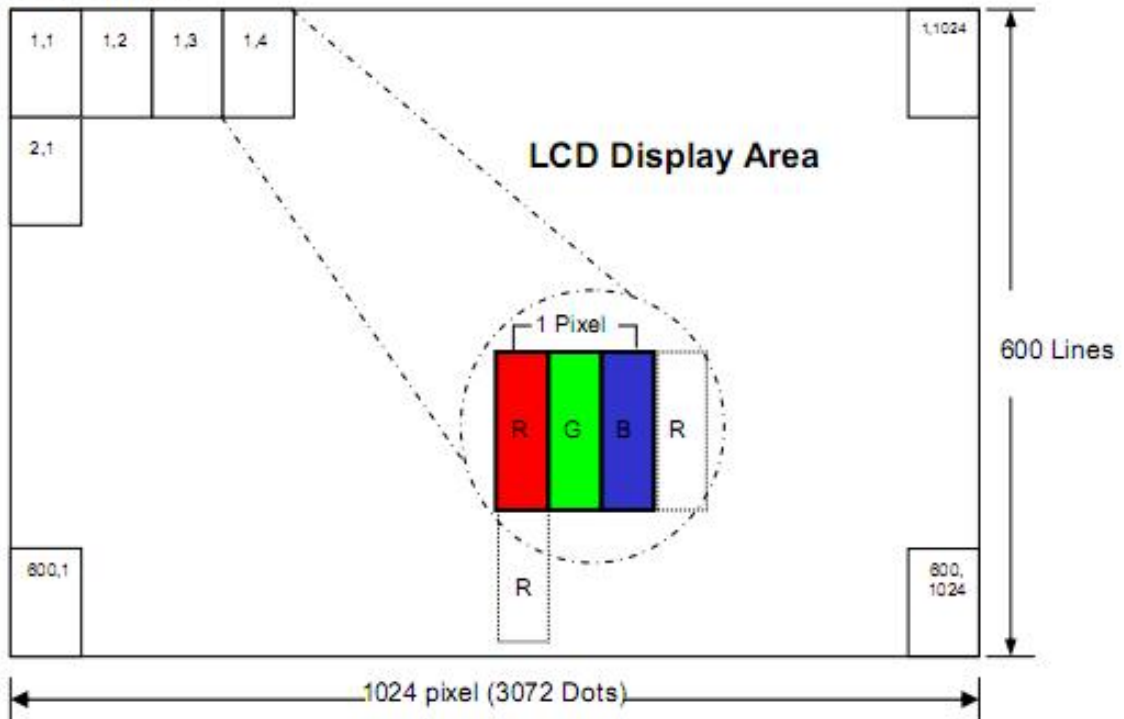
Note (7) Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)

4.0 Block Diagram

4.1 TFT LCD Module



4.2 Pixel Format



4.3 Relationship Between Displayed Color and Input

4.3.1 6bit

Display	MSB						M						S						B						Gray scale level
	LSB						L						S						B						
	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0							
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-					
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-					
	Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-					
	Light Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	-					
	Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	-					
	Purple	H	H	H	H	H	H	L	L	L	L	L	L	L	H	H	H	H	H	-					
	Yellow	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	-					
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-						
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0					
	Dark	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L1					
		L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L2					
	↑	:						:						:						L3...L60					
		↓	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L61				
	H		H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L62				
Red	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	Red L63						
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0					
	Dark	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L1					
		L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L2					
	↑	:						:						:						L3...L60					
		↓	L	L	L	L	L	L	H	H	H	H	L	H	L	L	L	L	L	L	L61				
	L		L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L62				
Green	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L	L	L	L	Green L63						
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0					
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L1					
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L2					
	↑	:						:						:						L3...L60					
		↓	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	L	H	L	L61				
	L		L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L62					
Blue	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	Blue L63						
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0					
	Dark	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	H	L1					
		L	L	L	L	H	L	L	L	L	H	L	L	L	L	H	L	L	L	L2					
	↑	:						:						:						L3...L60					
		↓	H	H	H	H	L	H	H	H	H	L	H	H	H	H	L	H	L	L	L61				
	H		H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	L	L62				
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L63						

4.3.2 8bit

	Display	MSB				LSB				MSB				LSB				MSB				LSB				Gray scale Level	
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0		
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-	
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-	
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-	
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-	
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-		
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252	
		H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253	
		H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254	
Red	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255			
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L252		
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L253		
		L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L254		
Green	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255				
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L252	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253	
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L254	
Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255			
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L	L	L	L	L	L	H	L1		
		L	L	L	L	L	L	L	H	L	L	L	L	L	H	L	L	L	L	L	L	H	L	L2			
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251		
	Light	H	H	H	H	H	L	L	H	H	H	H	L	L	H	H	H	H	L	L	H	H	H	H	L	L	L252
		H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	H	H	H	H	L	H	L253
		H	H	H	H	H	L	L	H	H	H	H	H	L	H	H	H	H	L	H	H	H	H	L	L	L254	
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255	

5.0 Interface Pin Connection

5.1 FPC pin assignment for netbook application (This is for customers who will use LED pad to connect to the light bar of backlight.)

FPC connector is used for electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Signal	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 clock 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	NC	No connection
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	NC	No connection

37	NC	No connection
38	VGH	Gate ON Voltage
39	LED+	LED Anode
40	LED+	LED Anode

I: input O: Output P: Power

Note 1 : 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 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.

5.2 FPC pin assignment for portable DVD application (This is for customers who do not use LED pad to connect to the light bar of backlight.)

FPC connector is used for electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Signal	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 clock 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	NC	No connection
28	SELB	6bit/8bit mode select
29	AVDD	Power for Analog Circuit
30	GND	Ground
31	NC	NC
32	NC	NC
33	L/R	Horizontal inversion
34	U/D	Vertical inversion
35	VGL	Gate OFF Voltage
36	NC	No connection
37	NC	No connection
38	VGH	Gate ON Voltage
39	NC	NC
40	NC	NC

: input O: Output P: Power

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

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

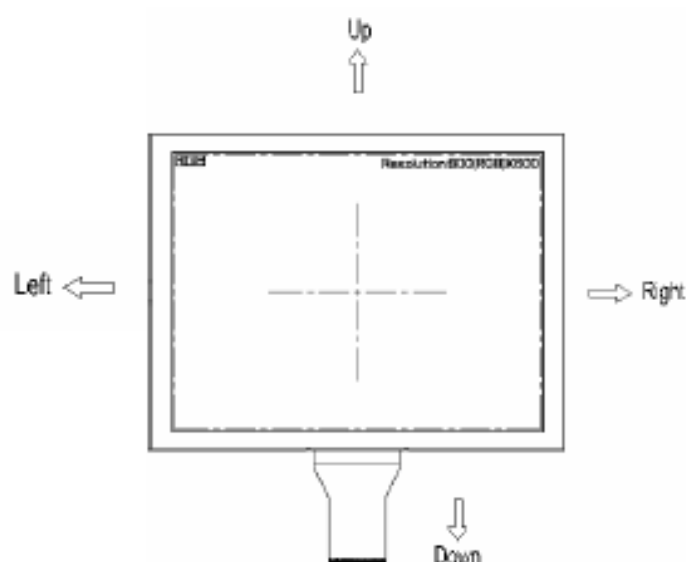
When U/D="0", set top to bottom scan direction.

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

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
GND	DV _{DD}	Up to down, left to right
DV _{DD}	GND	Down to up, right to left
GND	GND	Up to down, right to left
DV _{DD}	DV _{DD}	Down to up, left to right

Note 5: Definition of scanning direction.
Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

Note(1) Selection of scanning mode (please refer to the following table)

Setting of scan control input		IN/OUT state for start pulse				Scanning direction
U/D	L/R	STVD	STVU	STHR	STHL	
GND	DV _{DD}	Output	input	output	input	up to down, and from left to right
DV _{DD}	GND	input	output	input	output	down to up, and from right to left
GND	GND	output	input	input	output	up to down, and from right to left
DV _{DD}	DV _{DD}	input	output	output	input	down to up, and from left to right

Note(2) MOD=H: Simultaneous sampling.(Please check CPH2 and CPH3 to GND when MOD=H)
 MOD=L: Sequential sampling.

6. Electrical Characteristics

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	DV _{DD}	3.0	3.3	3.6	V	
	V _{GH}	14.55	15	15.45	V	
	V _{GL}	-7.25	-6.9	-6.25	V	
	AV _{DD}	8.722	8.9	9.08	V	
Video signal amplitude (V _R ,V _G ,V _B)	V _{IA}	-	-	AV _{DD} -0.4	V	
	V _{IAC}	-	-	-	V	AC component,
	V _{IDC}	-	AV _{DD} /2	-	V	DC component
VCOM	V _{CAC}		-	-	VP-P	AC component
	V _{CDC}	-	-	-	V	DC component, (1)
Input signal voltage	V _{IH}	0.7DV _{DD}	-	DV _{DD}	V	(2)
	V _{IL}	0	-	0.3DV _{DD}	V	(2)
Current of power supply	I _{DD}	-	-		mA	DV _{DD} =3.3V
	I _{ADD}	-	-		mA	AV _{DD} =5V
	I _{GH}	-	-		uA	V _{GH} =15V
	I _{GL}	-	-		mA	V _{GL} =-10V

Note (1): The brightness of LCD panel could be changed by adjusting the AC component of VCOM.

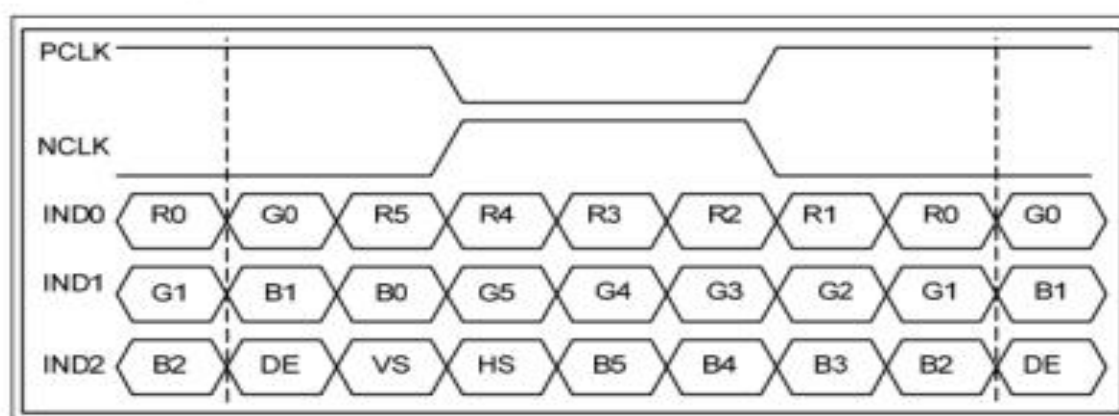
Note (2): STHL, STHR, OEH, L/R, CPH1~CPH3, STVD, STVU, OEV, CKV, U/D

6.2 Switching Characteristics for LVDS Receiver

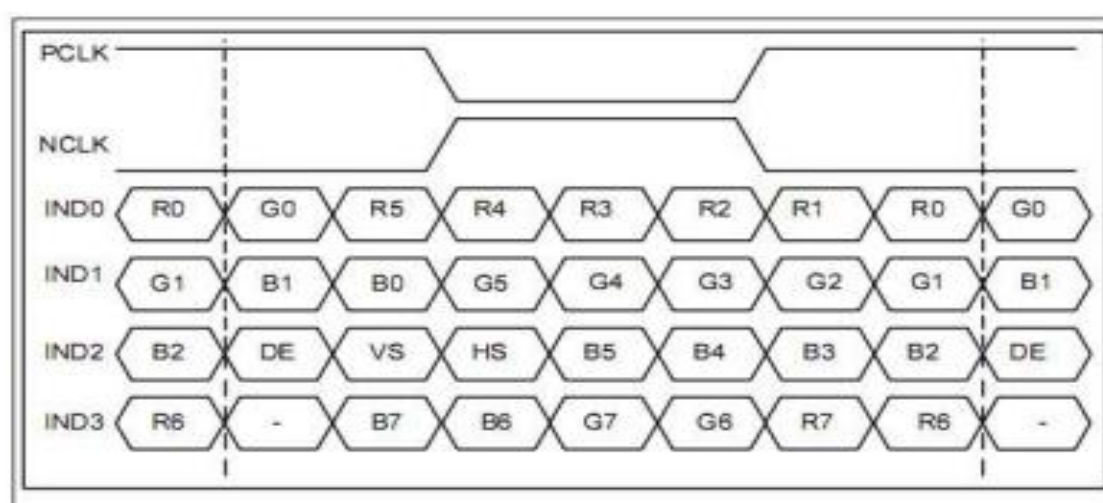
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V_{th}	—	—	100	mV	$V_{CM}=1.2V$
Differential Input Low Threshold	V_{tl}	-100	—	—	mV	
Input Current	I_{IN}	-10	—	+10	μA	
Differential input Voltage	$ V_{ID} $	0.1	—	0.6	V	
Common Mode Voltage Offset	V_{CM}	0.7	1.2	1.6	V	

6.3 Bit LVDS input

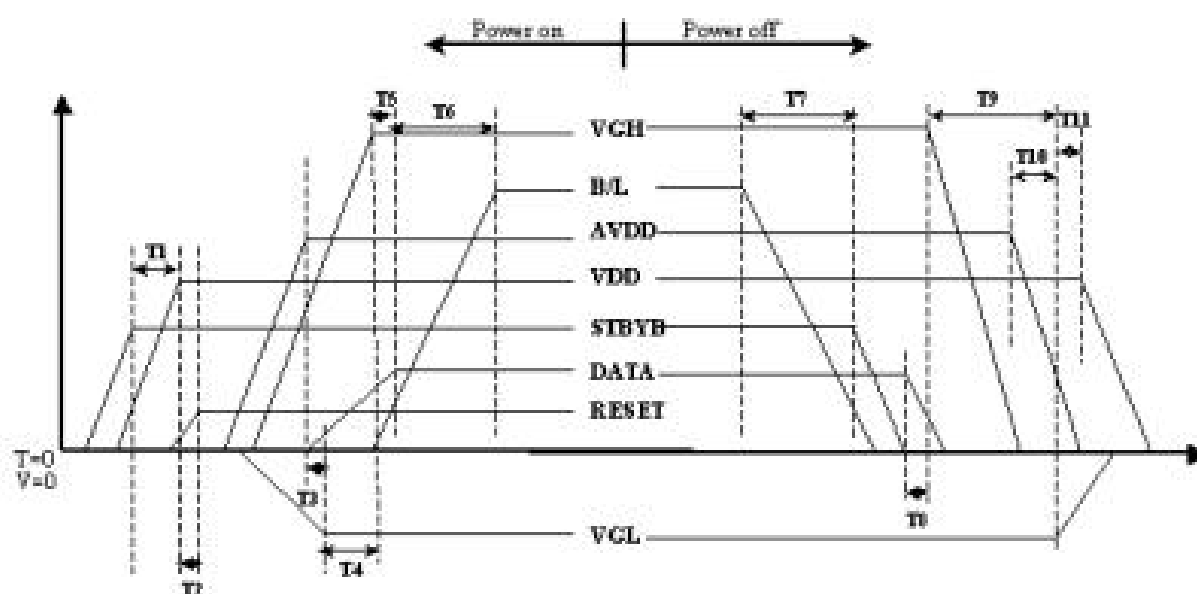
6.3.1 6bit LVDS input



6.3.2 8Bit LVDS input



6.4 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3\text{ }^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

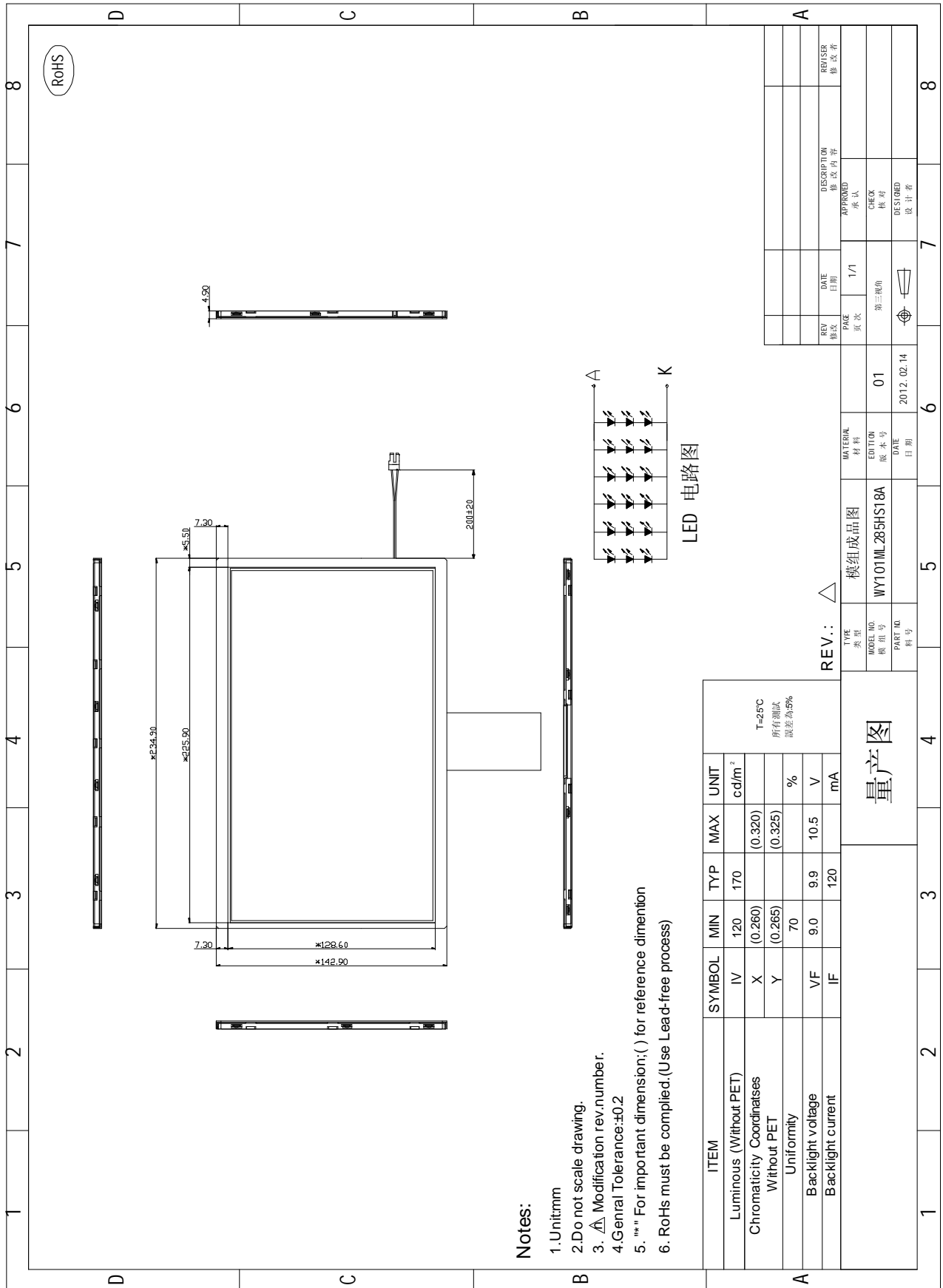
7.0 Reliability test items

NO	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70°C,240hrs	
2	Low Temperature Storage	Ta=-20°C,240hrs	
3	High Temperature Operation	Ta=+60°C,240hrs	
4	Low Temperature Operation	Ta=-10°C,240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60°C,90%RH,240hrs	
6	Thermal Cycling Test (non operation)	-20°C(0.5hr)→+70°C(0.5hr),200cycles	
7	Vibration	1.Random:1.04G,10-500HZ,X,Y,Zdirection 30min/each direction 2.Sweep sine:1.5G, 5~500Hz, X/Y/Z,30min/each direction	
8	Shock	100G,6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
9	Vibration (with carton)	Random:1.04Grms, 10~500Hz, X/Y/Z 45min/each direction Fixed:5Hz, 1.5Grms, X/Y/Z 45min/each direction	
10	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202
11	Electrostatic Discharge	±200V,200PF,0Q1 time/each terminal	

Note: All tests above are practiced at module type.

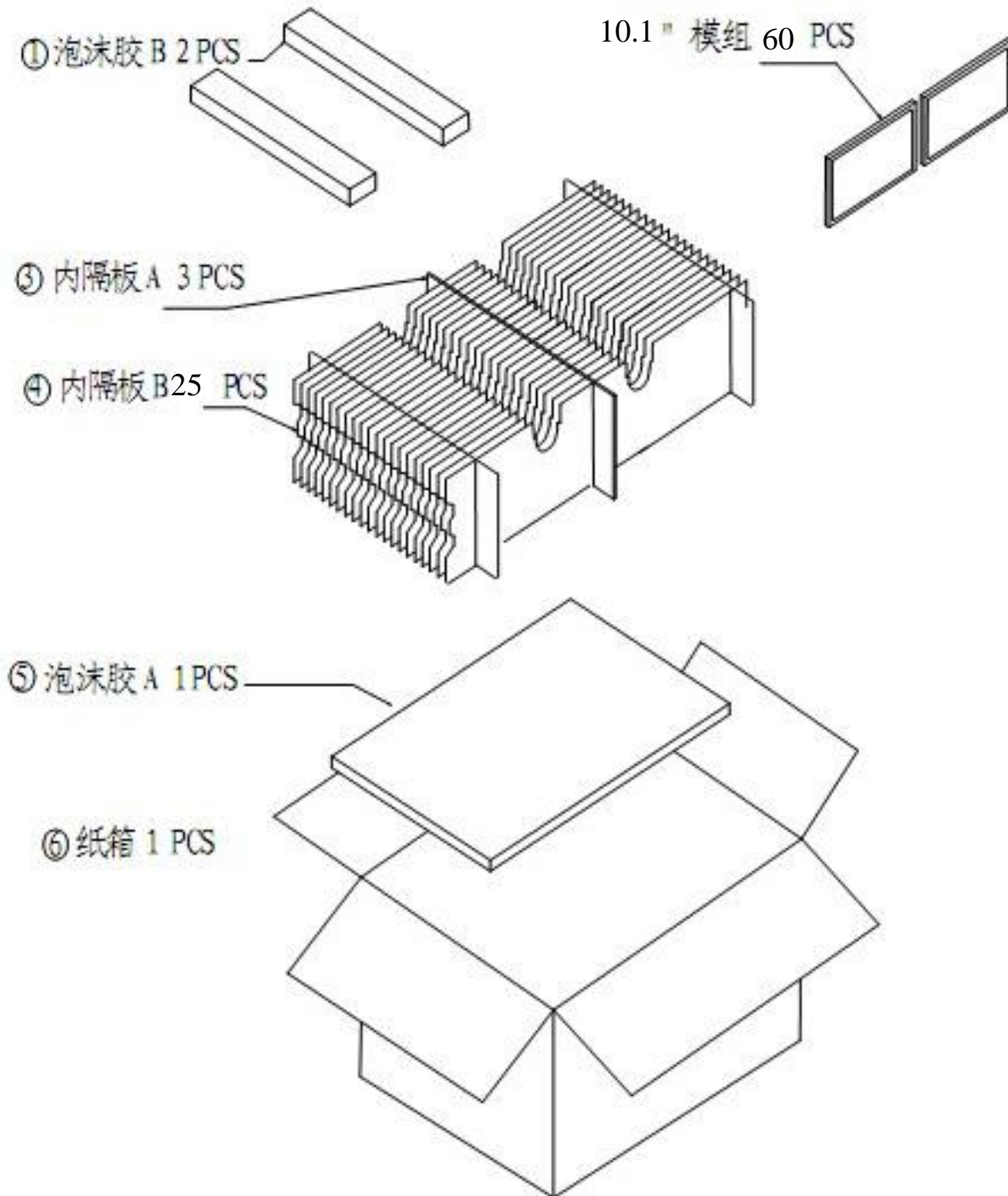
There is no display function NG issue occurred, All the cosmetic specification is judged before the reliability stress.

8.0 Outline dimension



9.0 Packing form

9.1 Packing form 1



10.0 General Precaution

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life-threatening or otherwise catastrophic.

10.2 Assembly Precaution

10.2.1 Please use the mounting hole on the module side in installing and do not bending or wrenching LCD in assembling. And please do not drop, bend or twist LCD module in handling.

10.2.2 Please design display housing in accordance with the following guide lines.

10.2.2.1 Housing case must be destined carefully so as not to put stresses on LCD all sides and not to wrench module. The stresses may cause non-uniformity even if there is no non-uniformity statically.

10.2.2.2 Keep sufficient clearance between LCD module back surface and housing when the LCD module is mounted. The clearance in the design is recommended taking into account the tolerance of LCD module thickness and mounting structure height on the housing.

10.2.3 Please do not push or scratch LCD panel surface with any-thing hard. And do not soil LCD panel surface by touching with bare hands. (Polarizer film, surface of LCD panel is easy to be flawed.)

10.2.4 Please do not press any parts on the rear side such as source IC, gate IC, and FPC during handling LCD module. If pressing rear part is unavoidable, handle the LCD module with care not to damage them.

10.2.5 Please wipe out LCD panel surface with absorbent cotton or soft cloth in case of it being soiled.

10.2.6 Please wipe out drops of adhesives like saliva and water on LCD panel surface immediately. They might damage to cause panel surface variation and color change.

10.2.7 Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.

10.3 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HannStar does not warrant the module, if customers disassemble or modify the module.

10.4 Breakage of LCD Panel

10.4.1 If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

10.4.2 If liquid crystal contacts mouth or eyes, rinse out with water immediately.

10.4.3 If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

10.4.4 Handle carefully with chips of glass that may cause injury, when the glass is broken.

10.5 Absolute Maximum Ratings and Power Protection Circuit

10.5.1 Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

10.5.2 Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

10.5.3 It's recommended employing protection circuit for power supply.

10.6 Operation

10.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead. Use fingerstalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

10.6.2 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

10.6.3 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may causes deformation or color fading.

10.6.4 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

10.7 Static Electricity

10.7.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

10.7.2 Because LCD module uses CMOS-IC on TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge.

10.7.3 Persons who handle the module should be grounded through adequate methods.

10.8 Disposal

When disposing LCD module, obey the local environmental regulations.

10.9 OTHERS

10.9.1 A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior.

Please do not expose LCD module direct sunlight land strong UV rays.

10.9.2 Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.

10.9.3 For the packaging box, please pay attention to the followings:

10.9.3.1 Packaging box and inner case for LCD are designed to protect the LCDs from the damage or scratching during transportation. Please do not open except picking LCDs up from the box.

10.9.3.2 Please do not pile them up more than 6 boxes. (They are not designed so.) And please do not turn over.

10.9.3.3 Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.

10.9.3.4 Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)