HYeLCD

To : _____

REV A.0

Product Specification

(RoHS Compliant)

Customer :

Model No. : HD-240G320-24MT-12FA

Designed by	Checked by	Production DEPT.	Approved by

Final Approval by Customer

☐ **OK**

☐ **NG，Problem survey:**

Approved By _____

Hyundai LCD (HK) Co., Ltd.

* Records of Revision *

Version	Contents	Date	Note
A.0	New specification was released	2014.10.27	

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1. GENERAL DESCRIPTION

1.1 Description

The **HD-240G320-24MT-12FA** is a color active matrix Thin Film Transistor (TFT) Liquid Crystal Display (LCD) that uses amorphous silicon(a-Si) TFT as a switching device. This model is composed of a single 2.4 inches transmissive type main TFT-LCD panel. The resolution of the panel is 240x320 pixels and can display up to 262 K color.

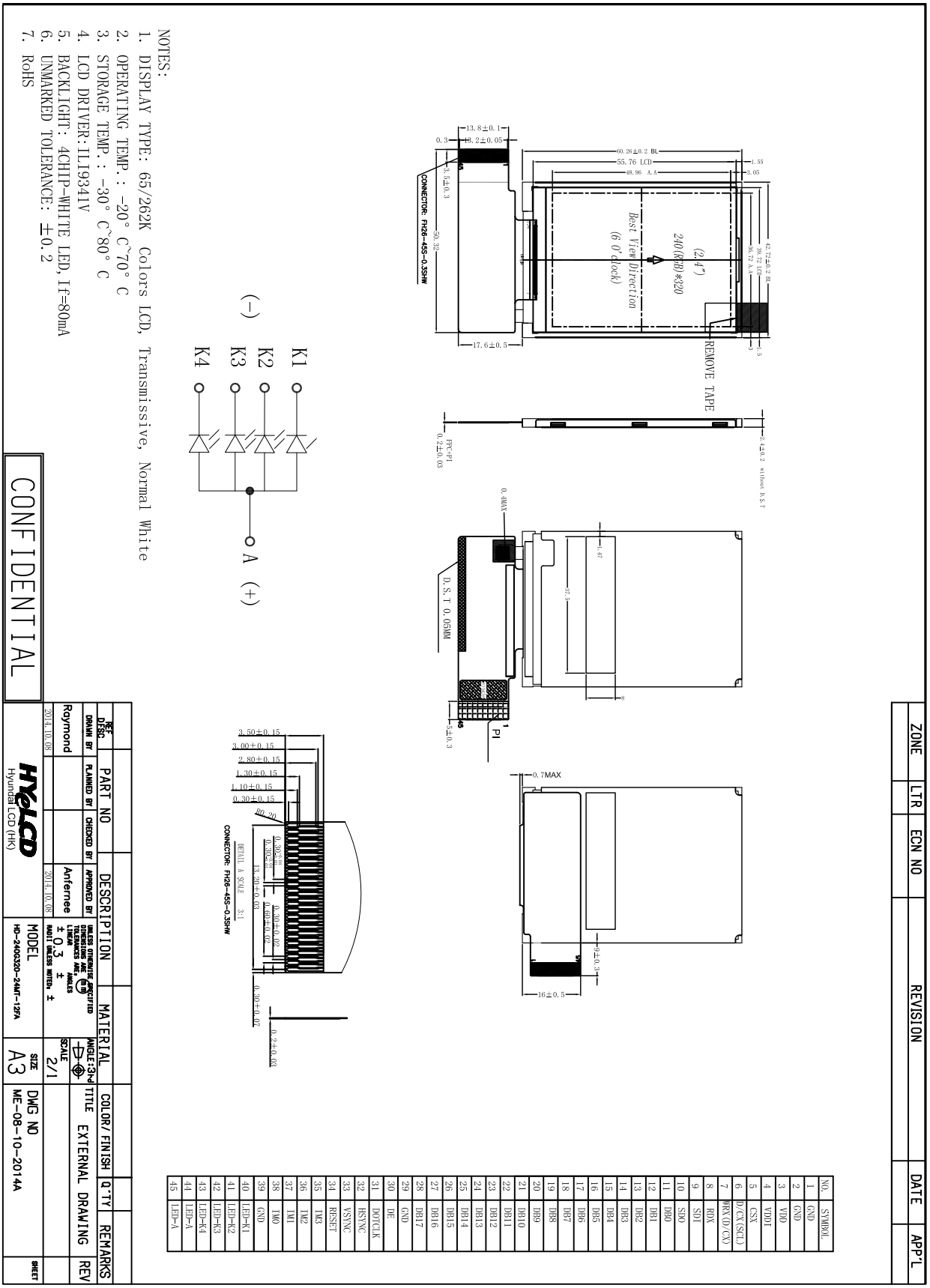
1.2 General Specification

No.	Item	Specification"	Unit	Remark
1	LCD Size	2.4	inch	-
2	Panel Type	a-Si TFT active matrix	-	-
3	Resolution	240 x (RGB) x 320	pixel	-
4	Display Mode	Normally white,Transmissive	-	-
5	Display Number of Colors	262K	-	-
6	Viewing Direction	12 o'clock(GSI) /6 o'clock(Human eyes)	-	Note
7	Contrast Ratio	500(TYP)	-	-
8	Luminance	250(TYP)	cd/m^2	-
9	Module Size	42.72(W) x 60.26(L) x 2.4(T)	mm	Note
10	Active Area	36.72(W) x 48.96(L)	mm	Note
11	Pixel Pitch	0.153(W)x0.153(L)	mm	-
12	Weight	TBD(TYP)	g	-
13	Driver IC	ILI9341V	-	-
14	Driver IC RAM Size	240x18x320	bit	-
15	Light Source	4 LEDs White	-	-
16	Interface	CPU18bit		
17	Operating Temperature	-20~70	℃	-
18	Storage Temperature	-30~80	℃	-

Note: Please refer to the mechanical drawing.

2. MECHANICAL SPECIFICATION

Genral tolerance: ±0.2



3. PIN DESCRIPTION

NO	SYMBOL	FUNCTION
1-2	GND	GROUND
3	VDD	Power supply
4	VDDI	Power supply
5	CSX	Chip Select
6	D/CX(SCL)	Serial Clock
7	WRX(D/CX)	Write signal (“L” □Active)
8	RDX	Read signal (“L” □Active)
9	SDI	Serial Data Input
10	SDO	Serial Data Output
11-28	DBO-DB17	DATA BUS
29	GND	GROUND
30	DE	Date Enable Signal
31	DOTCLK	Dot Data Clock
32	HSYNC	Line synchronization signal pin.
33	VSYNC	Frame synchronization signal pin.
34	RESET	Chip reset signal (“L” →Active)
35-38	IM3-IM0	Data bus Interface bit select
39	GND	GROUND
40	LED-K1	BACK LIGHT -
41	LED-K2	BACK LIGHT -
42	LED-K3	BACK LIGHT -
43	LED-K4	BACK LIGHT -
44	LED-A	BACK LIGHT +
45	LED-A	BACK LIGHT +

4. ELECTRICAL CHARACTERISTICS

4.1 Electrical Maximum Ratings – for IC Only

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Table 3

Items	Symbol	Condition	Min	Typ	Max	Unit	Note
Power Voltage	VCI	GND=0	2.4	2.8	3.3	V	
Operating Temperature	Top	-	-20	-	70	℃	Ambient temperature
Storage Temperature	Tst	-	-30	-	80	℃	Ambient temperature
Humidity	-	-	-	-	90	%RH	Note *

Note：

1) All the voltages listed above are with respective to GND=0V。
2) Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above。
3) * TA≦40℃ Without dewing。

4.2 Backlight Characteristics

Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Forward Current	IF	Ta =25℃	-	25	mA
Reverse Voltage	VR	Ta =25℃	-	5	V
Power Dissipation	PO	Ta =25℃	-	320	mW
Operating Temperature	T_{OP}	-	-20	70	℃
Storage Temperature	T_{ST}	-	-30	80	℃
Solder Temp. for 3 Seconds	-	-	-	260	℃

Electrical / Optical Characteristics VSS = 0V, Ta =25℃

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Forward Voltage	VF	IF= 20mA*4	-	3.2	-	V
Reverse Current	IR	VR= 5V	-	-	50	uA
Average Brightness (without LCD)	IV	IF= 20mA	-	-	-	cd/m^2
CIE Color Coordinate (without LCD)	X	IF= 20mA	-	-	-	—
	Y		-	-	-	
Color	WHITE					

5. INPUT SIGNAL TIMING

Reset Input Timing

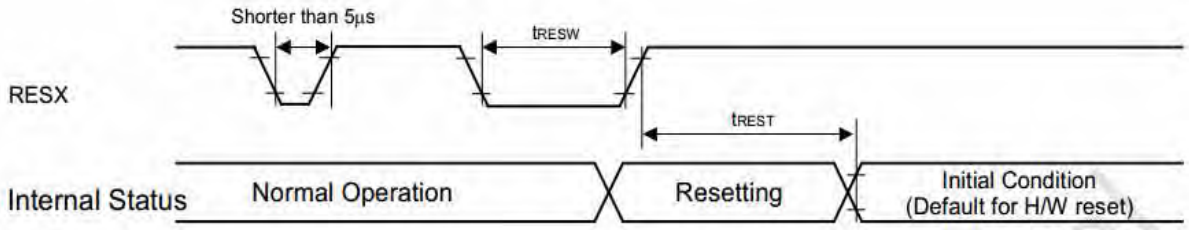


Table 7.3.2.1 Reset input timing VSS=0V, VDDIO=1.6V to 3.6V, VCI=2.5V to 5.5V,Ta = -30 to 70°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	10	-	-	-	μs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-		-	120	When reset applied during Sleep out mode	ms

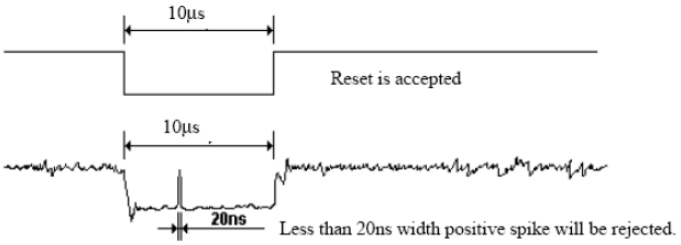
Figure 5 Reset Input Timing

Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width(1)	NRESET	10	-	-	-	μs
tREST	Reset complete time(2)	-	5	-		When reset applied during STB OUT mode	ms
		-	120	-		When reset applied during STB mode	ms
tPRES	Reset goes high level after Power on time	NRESET & IOVCC	1	-	-	Reset goes high level after Power on	ms

Note: (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the table below.

NRESET Pulse	Action
Shorter than 5 μs	Reset Rejected
Longer than 10 μs	Reset
Between 5 μs and 10 μs	Reset Start

(2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in STB Out –mode. The display remains the blank state in STB –mode) and then return to Default condition for H/W reset.
(3) During Reset Complete Time, VMF value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of NRESET.
(4) Spike Rejection also applies during a valid reset pulse as shown below:



(5) It is necessary to wait 5msec after releasing !RES before sending commands. Also STB Out

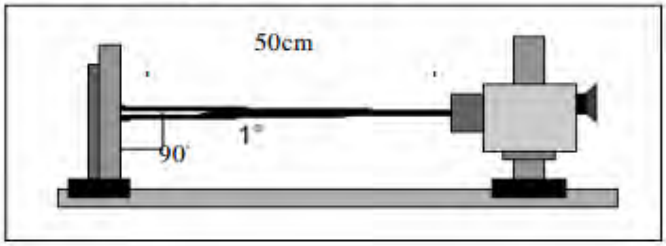
6. OPTICAL CHARACTERISTICS

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B	θ=0° Normal viewing angle At the center of panel Backlight On Equipment: BM7 Field=1°	200	250	--	cd/m^2	(1)
Contrast Ratio		C/R		400	500	--	--	(2)
Response Time		Tr + Tf		--	20	30	ms	(3)
Color chromaticity (CIE 1931)	White	Wx		0.23	0.28	0.33	--	
		Wy		0.25	0.30	0.35		
	Red	Rx		0.55	0.60	0.65		
		Ry		0.30	0.35	0.40		
	Green	Gx		0.27	0.32	0.37		
		Gy		0.57	0.62	0.67		
	Blue	Bx		0.09	0.14	0.19		
		By		0.07	0.12	0.17		
Viewing Angle	Top	θ_U	CR≧10 Backlight On Equipment: BM7 Field=1°	--	(70)	--	deg	(4)
	Bottom	θ_D		--	(60)	--		
	Left	θ_L		--	(70)	--		Gray Inversion Angle
	Right	θ_R		--	(70)	--		(4)
Uniformity		Un	θ=0° Normal viewing angle Backlight On Equipment: BM7 Field=1°	70	80	--	%	(5)

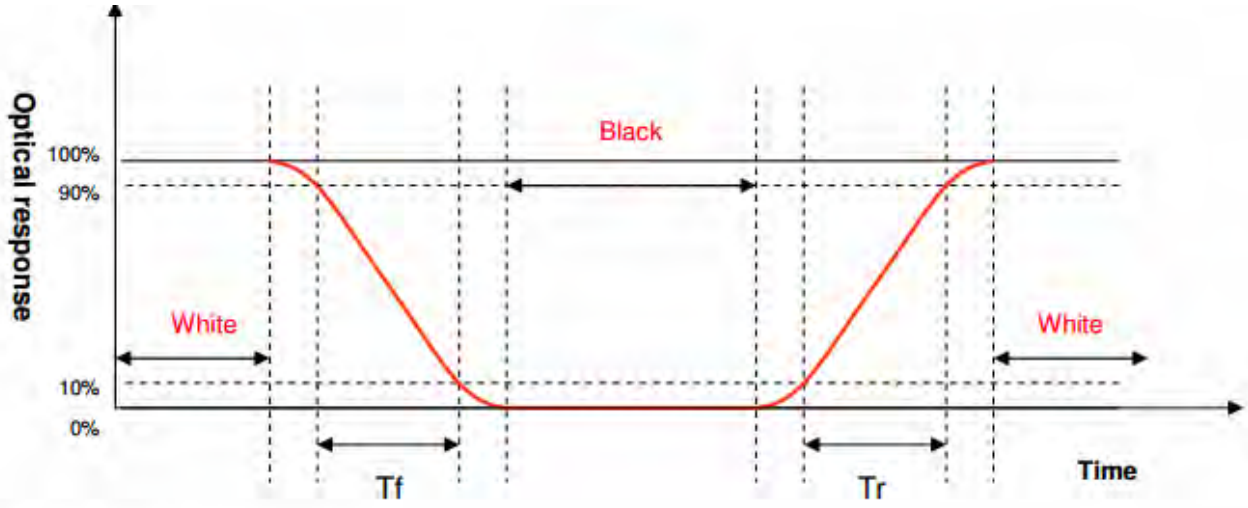
Note 1: Ambient temperature =25℃±2℃.

Note 2: To be measured in the dark room with backlight unit.

Note 3: To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 10 minutes operation (module).



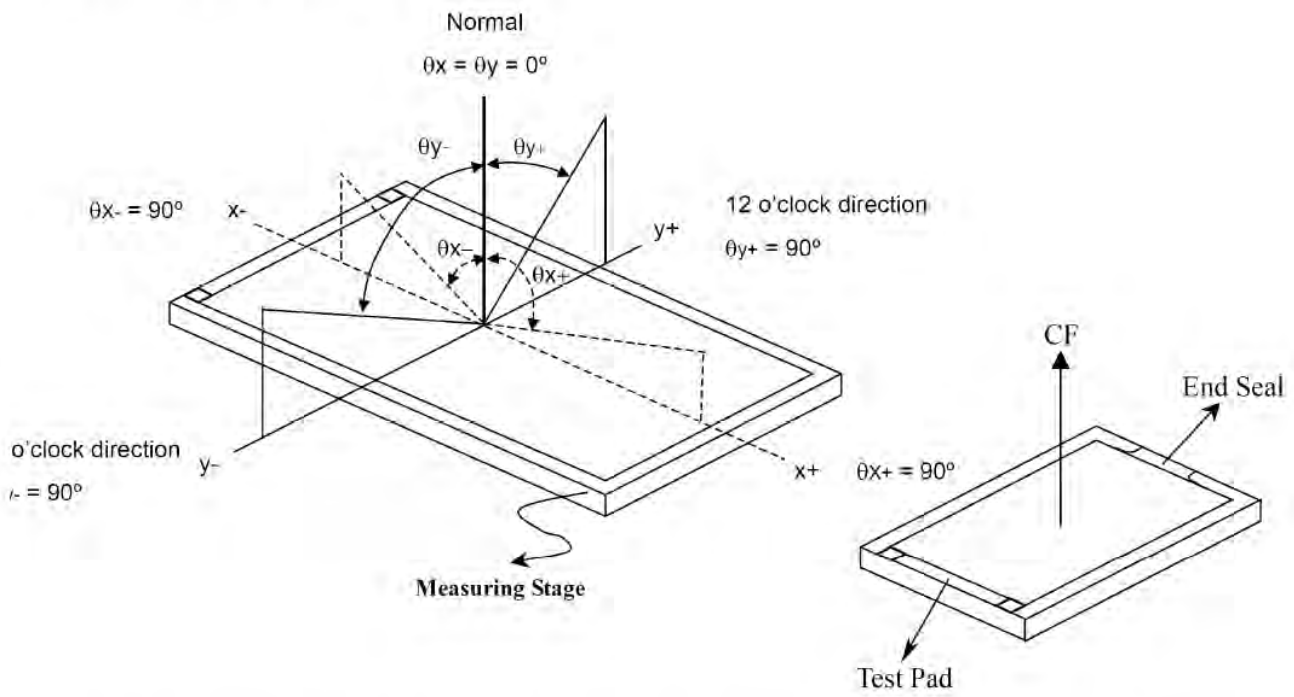
Note 4: Definition of response time:
The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below:



Note 5. Definition of contrast ratio:
Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

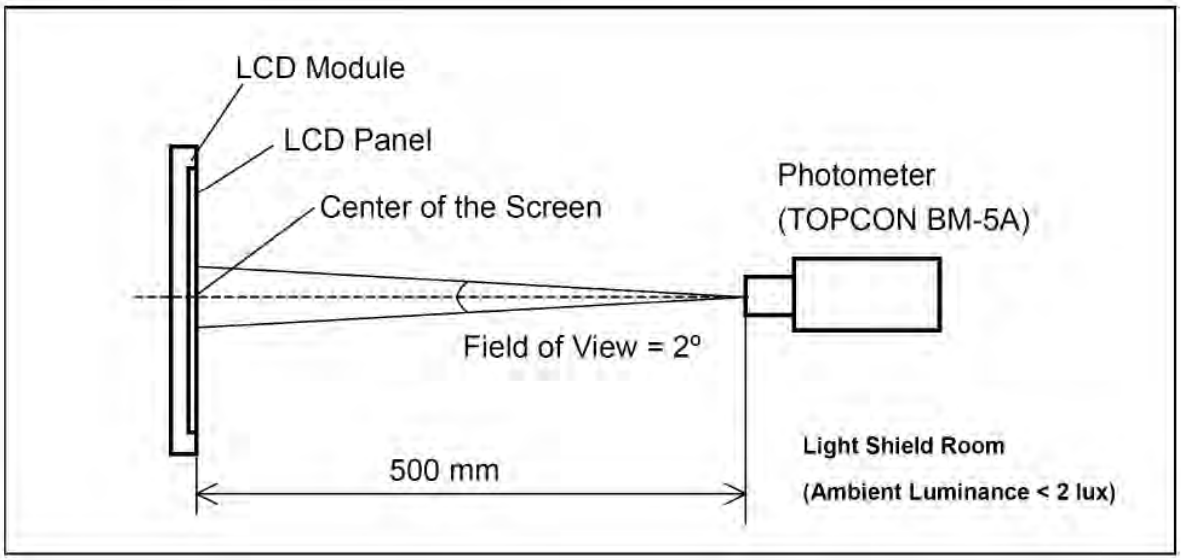
Note 6. Definition of viewing angle:
Refer to the figure as below.



*** The above "Viewing Angle" is the measuring position with Largest Contrast Ratio; not for good image quality. View Direction for good image quality is 6 O'clock. Module maker can increase the "Viewing Angle" by applying Wide View Film.

*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



7. QUALITY ASSURANCE SYSTEM

7.1 TEMPERATURE AND HUMIDITY

Test Item	Test Condition
High Temperature Storage	Ta=80℃; 72 hrs
Low Temperature Storage	Ta=-30℃; 72 hrs
High Temperature Operation	Ta=70℃，72 Hrs
Low Temperature Operation	Ta=-20℃; 72 hrs
High Temperature High Humidity Operation	Ta=60℃，90%RH，120Hrs(no condensation)
Thermal Shock	-10℃(0.5h) ~ 60℃(0.5h) / 1Hrs/cycles

7.2 VIBRATION & Drop

Test item	Conditions
Drop (with carton)	Height:60cm 1corner, 3edges, 6 surfaces
Vibaration (with carton)	Radom vibration: $0.015G^2$/Hz from 5 ~ 200Hz -6dB/octave from 200~500Hz

7.3 ESD

Test item	Conditions
Electro Static Discharge Test (non-operation)	±200v,200pF, 0Ω

8. PRECAUTION RELATING PRODUCT HANDLING

8.1 SAFETY

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

8.2 HANDLING

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

8.3 STATIC ELECTRICITY

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

8.4 STORAGE

1. Store the module in a dark room where must keep at 25±10℃ and 65%RH or less.
2. Do not store the module in surroundings containing organic solvent or corrosive gas.
3. Store the module in an anti-electrostatic container or bag.

8.5 CLEANING

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