INNOLUX DISPLAY CORPORATION

LCD MODULE

SPECIFICATION

Customer: _____

Model Name: AT102TN42

SPEC NO.: A102-42-TT-02

Date: 2008/09/22

Version: 02

☐ Preliminary Specification

■ Final Specification

For Customer's Acceptance

Approved by	Comment

Approved by	Reviewed by	Prepared by
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Record of Revision

Version	Revise Date	Page	Content
Pre-Spec.01	2008/04/28		Initial Release
02	2008/06/23	1	Modify Surface treatment from Anti-Glare to Clear Type
		2	Modify Pin3,4,5
		10~13	Add EDID DATA STRUCTURE
03	2008/07/16	5	Modify Current Consumption
		10	Modify EDID DATA STRUCTURE
Final-Spec.01	2008/08/26	1	Add Backlight & Panel power consumption
			Add LCM Weight
		3	Modify Note 4
		21	Add LCM Weight
Final-Spec.02	2008/09/22	6	Modify Power Sequence
		10~13	Modify EDID DATA STRUCTURE

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Contents

1 General Specifications

No.	Item	Specification	Remark
1	LCD size	10.2 inch(Diagonal)	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1024 × 3(RGB) × 600	
4	Display mode	Normally white, Transmissive	
5	Dot pitch	0.0722(W) × 0.2192(H) mm	
6	Active area	221.7984 (W) × 131.52 (H) mm	
7	Module size	235.0(W) ×145.8(H)×5.15(D) mm	Note 1
8	Surface treatment	Clear Type	
9	Color arrangement	RGB-stripe	
10	Interface	Digital (LVDS)	
11	Backlight power consumption	3.5W(Typ.)	Note 2
12	Panel power consumption	1.2W(Typ.)	Note 3
13	Weight	238g(Typ.)	

Note 1: Refer to Mechanical Drawing.
Note 2: Including LED Driver power consumption.
Note 3: Including T-con Board power consumption.

2 Pin Assignment

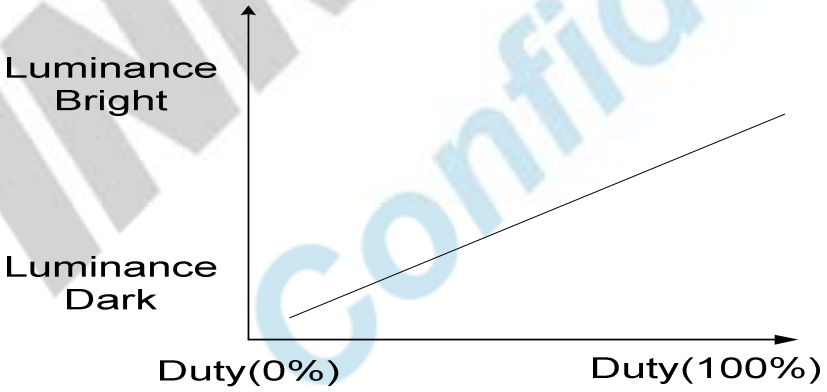
TFT LCD Panel Driving Section

LVDS Connector is used for the module electronics interface. The recommended model is MDF76KBW-30S-1H(58) manufactured by Hirose.

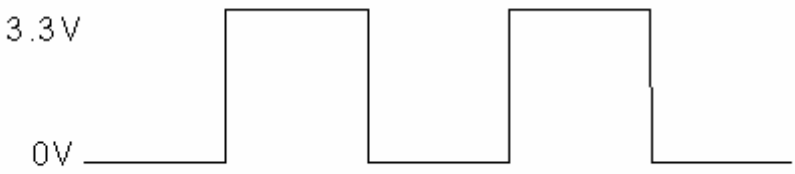
Pin No.	Symbol	I/O	Function	Remark
1	V_{CC}	P	Power Voltage for digital circuit	
2	V_{CC}	P	Power Voltage for digital circuit	
3	V_{EDID}	P	Power Voltage for EDID EEPROM(3.3V)	
4	SCL	I	EDID CLK Signal	
5	SDA	I	EDID DATA Signal	
6	VSS	P	Ground	
7	VSS	P	Ground	
8	Rin0-	I	- LVDS differential data input (R0-R5,G0)	
9	Rin0+	I	+ LVDS differential data input (R0-R5,G0)	
10	VSS	P	Ground	
11	Rin1-	I	- LVDS differential data input (G1-G5,B0-B1)	
12	Rin1+	I	+ LVDS differential data input (G1-G5,B0-B1)	
13	VSS	P	Ground	
14	Rin2-	I	- LVDS differential data input (B2-B5,HS,VS,DE)	
15	Rin2+	I	+ LVDS differential data input (B2-B5,HS,VS,DE)	
16	VSS	P	Ground	
17	ClkIN-	I	-LVDS differential clock input	
18	ClkIN+	I	+LVDS differential clock input	
19	VSS	P	Ground	
20	Rin3-	I	- LVDS differential data input (R6-R7,G6-G7,B6-B7)	Note1

21	Rin3+	I	+ LVDS differential data input (R6-R7,G6-G7,B6-B7)	Note1
22	VSS	P	Ground	
23	V_{LED}	P	Power Voltage for LED circuit	
24	V_{LED}	P	Power Voltage for LED circuit	
25	G_{LED}	P	Ground for LED circuit	
26	G_{LED}	P	Ground for LED circuit	
27	NC	—	No Connection	
28	NC	—	No Connection	
29	ADJ	P	Adjust the Back Light brightness	Note3,4
30	DTH	P	Dithering function	Note2

Note1:If Input data is 6 bit,Rin3-&Rin3+ can't be connected.
Note2:If Input data is 6 bit,DTH can`t be connected; If Input data is 8 bit, DTH must be connected to Ground.
Note3: Pin.29 is used to adjust brightness.



Note 4:ADJ signal=0~3.3V,Operation frequency:F=100~300Hz or 1K~20KHz



Operation Specifications

2.1 Absolute Maximum Ratings

(Note 1)

Item	Symbol	Values		Unit	Remark
		Min.	Max.		
Power Voltage	V_{CC}	-0.3	3.6	V	
	V_{LED}	-	5.5	V	
Input Signal Voltage	V_I	-0.3	6.3	V	Note 2
Operation Temperature	T_{OP}	0	50	℃	
Storage Temperature	T_{ST}	-20	60	℃	

Note 1: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

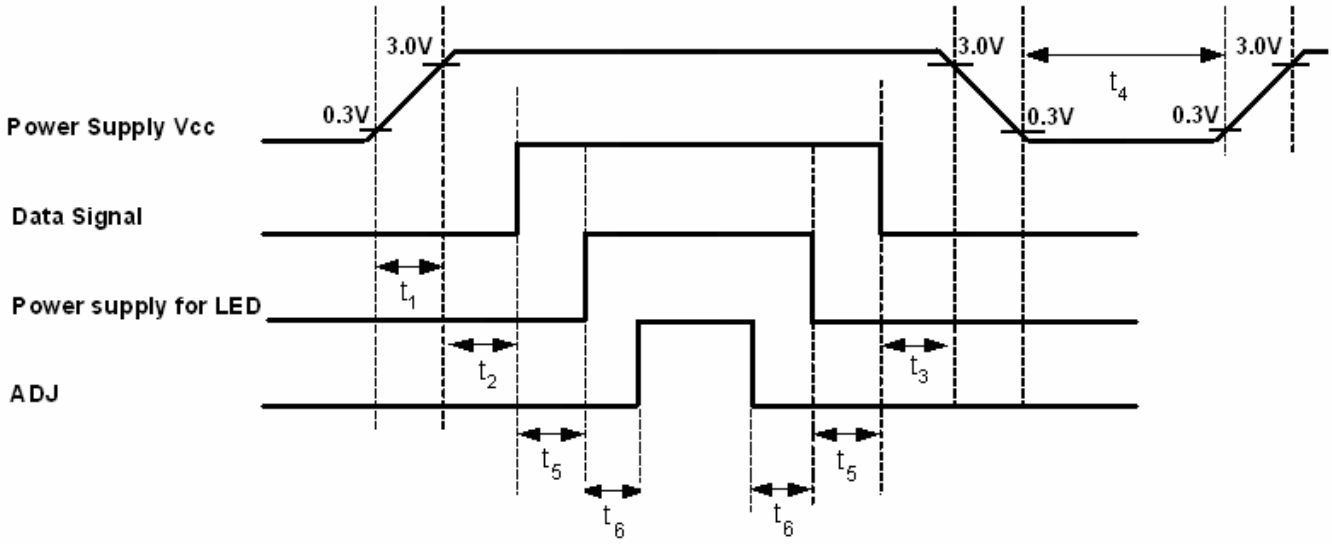
Note 2: The product is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

2.2 Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power Voltage	V_{CC}	3.1	3.3	3.5	V	Note 1
	V_{LED}	4.8	5.0	5.2	V	Note 2
Current Consumption	I_{CC}	-	370	420	mA	
	I_{LED}	-	700	850	mA	Note 3
Differential Input High Threshold	V_{THLVDS}	-	-	100.0	mV	V_{cm}=1.2V
Differential Input Low Threshold	V_{TLLVDS}	-100.0	-	-	mV	
LVDS Receiver Input Current	I_{IN}	-	-	±10.0	μA	V_{IN}=2.4V or 0V V_{CC} =3.6V
LVDS Receiver Input Common Voltage	V_{CM}	0.2	-	1.9	V	V_{CC} =3.3V T_a=+25 ℃
LED life time	-	10,000	-	-	Hr	Note 4

Note 1: V_{CC} setting should match the signals output voltage of customer's system board.
Note 2: LED driving voltage.
Note 3: LED driving current.
Note 4: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25□ and V_{LED} =5.0V. The LED lifetime could be decreased if operating V_{LED} is larger than 5.0V.

3.3. Power Sequence



Note1: Data Signal includes Rin0- ~ Rin3-,Rin0+ ~ Rin3+,CLKIN- , CLKIN+.
Note2: 10ms□ t_1 □ 0.5 ms; 50ms□ t_2 □ 0ms; 50ms□ t_3 □ 0ms;
t_4 □ 500ms; t_5 □ 200 ms; t_6 □50ms

3.4.Timing Characteristics

3.4.1 Timing Conditions

Switching Characteristics

(recommended operating condition unless otherwise noted)

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
RxCLKIN Period	t_{RCP}	11.76	T	50	ns	Note 1
RxCLKIN High Time	t_{RCH}	-	T/2	-	ns	
RxCLKIN Low Time	t_{RCL}	-	T/2	-	ns	
PAD0/1 to RxCLKIN Delay	t_{RCD}	-	3T/7	-	ns	
Data Setup to RxCLKIN	t_{RS}	1.9	-	-	ns	
Data Hold from RxCLKIN	t_{RH}	3.0	-	-	ns	
Input Data Position 0(T=11.76ns)	T_{RIP1}	-0.4	0	0.4	ns	Note 2
Input Data Position 1(T=11.76ns)	T_{RIP0}	T/7-0.4	T/7	T/7+0.4	ns	Note 2
Input Data Position 2(T=11.76ns)	T_{RIP6}	2T/7-0.4	2T/7	2T/7+0.4	ns	Note 2
Input Data Position 3(T=11.76ns)	T_{RIP5}	3T/7-0.4	3T/7	3T/7+0.4	ns	Note 2
Input Data Position 4(T=11.76ns)	T_{RIP4}	4T/7-0.4	4T/7	4T/7+0.4	ns	Note 2
Input Data Position 5(T=11.76ns)	T_{RIP3}	5T/7-0.4	5T/7	5T/7+0.4	ns	Note 2
Input Data Position 6(T=11.76ns)	T_{RIP2}	6T/7-0.4	6T/7	6T/7+0.4	ns	Note 2

Note 1: T= RxCLKIN Period

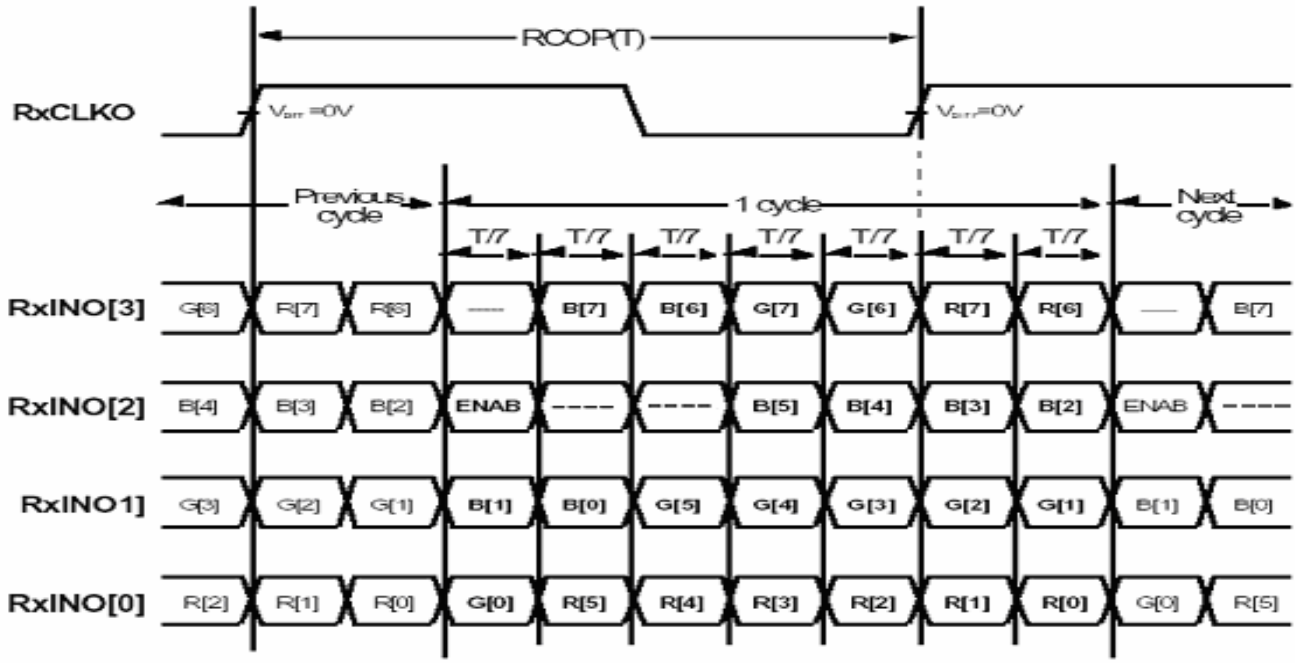
Note 2 : V_{CC} =3.3V , Ta=25□

Input Timming(only for DE Mode)

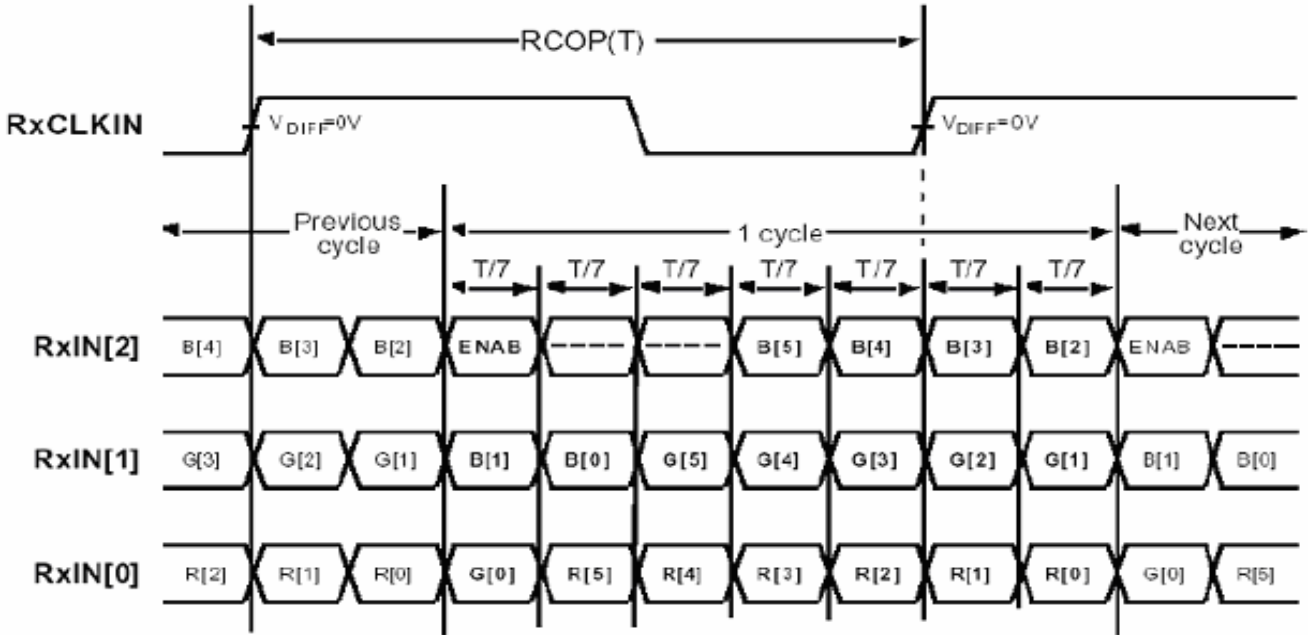
Parameter	Min	Typ	Max	Unit
H-Total	1185	1344	1800	CLK
H-Active	1024	1024	1024	CLK
H-Blanking	161	320	776	CLK
V-Total	628	635	650	LINE
V-Active	600	600	600	LINE
V-Blanking	28	35	50	LINE

3.4.2 Timing Diagram

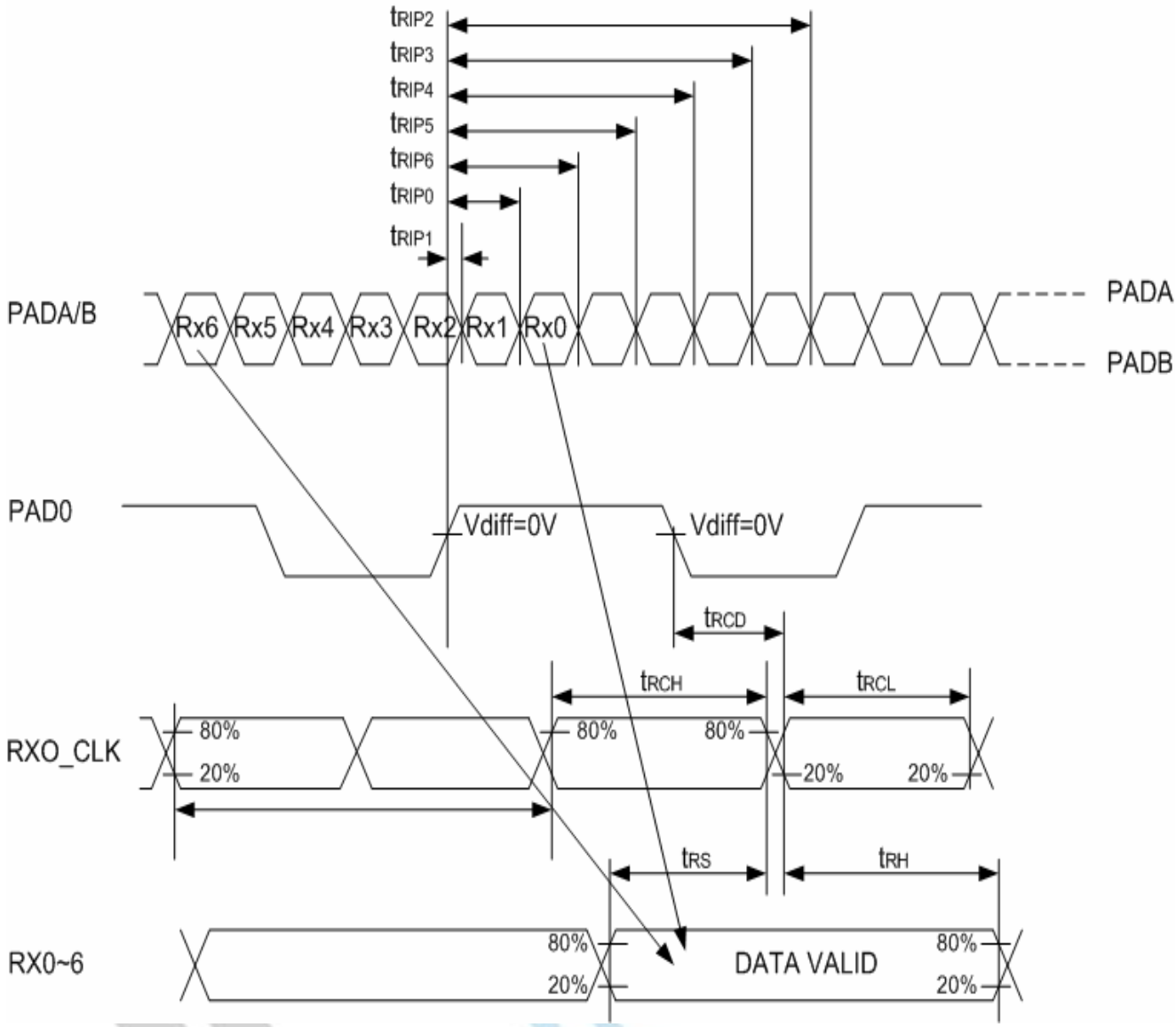
8 bit Mode:



6 bit Mode:



Note : R/G/B[7]s are MSBs and R/G/B[0]s are LSBs



LVDS AC Timing Diagrams

3.5 EDID DATA STRUCTURE

BYTE DE	BYTE HEX	Field Name and Comments	VALUE HEX	VALUE Binary
0	0	Header	00	00000000
1	1	Header	FF	11111111
2	2	Header	FF	11111111
3	3	Header	FF	11111111
4	4	Header	FF	11111111
5	5	Header	FF	11111111
6	6	Header	FF	11111111
7	7	Header	00	00000000
8	8	EISA ID manufacturer name('INL')	25	00100101
9	9	EISA ID manufacturer name('INL')	CC	11001100
10	A	ID Product code	00	00
11	B	ID Product code	00	00
12	C	ID S/N(fix"0")	00	00000000
13	D	ID S/N(fix"0")	00	00000000
14	E	ID S/N(fix"0")	00	00000000
15	F	ID S/N(fix"0")	00	00000000
16	10	week of manufacture	01	00000001
17	11	year of manufacture	12	00010010
18	12	EDID Structure Version	01	00000001
19	13	EDID Revision	03	00000011
20	14	Video Input Definition	80	10000000
21	15	Max.Horizontal Image Size(22.8CM)	16	00010110
22	16	Max. Vertical Image Size(13.152CM)	0D	00001101
23	17	Display Gamma(2.2)	78	01111000
24	18	Feature support	0A	00001010
25	19	Red/Green Low Bits(Rx1, Rx0, Ry1, Ry0, Gx1, Gx0, Gy1, Gy0)	58	01011000
26	1A	Blue/White Low Bits(Bx1, Bx0, By1, By0, Wx1, Wx0, Wy1, Wy0)	55	01010101
27	1B	Red-x(0.56)	8F	10001111
28	1C	Red-y(0.33)	54	01010100
29	1D	Green-x(0.35)	59	01011001
30	1E	Green-y(0.59)	97	10010111

31	1F	Blue-x(0.15)	26	00100110
32	20	Blue-y(0.08)	14	00010100
33	21	White-x(0.31)	4F	01001111
34	22	White-y(0.33)	54	01010100
35	23	Established timings 1	00	00000000
36	24	Established timings 2	00	00000000
37	25	Manufacturer's reserved timings	00	00000000
38	26	Standard timing ID #1	01	00000001
39	27	Standard timing ID #1	01	00000001
40	28	Standard timing ID #2	01	00000001
41	29	Standard timing ID #2	01	00000001
42	2A	Standard timing ID #3	01	00000001
43	2B	Standard timing ID #3	01	00000001
44	2C	Standard timing ID #4	01	00000001
45	2D	Standard timing ID #4	01	00000001
46	2E	Standard timing ID #5	01	00000001
47	2F	Standard timing ID #5	01	00000001
48	30	Standard timing ID #6	01	00000001
49	31	Standard timing ID #6	01	00000001
50	32	Standard timing ID #7	01	00000001
51	33	Standard timing ID #7	01	00000001
52	34	Standard timing ID #8	01	00000001
53	35	Standard timing ID #8	01	00000001
54	36	Detailed timing description#1 Pixel clock(51.2MHz)	00	00000000
55	37	#1Pixel clock(hex LSB first)	14	00010100
56	38	# 1 H active(1024)	00	00000000
57	39	# 1 H blank(320)	40	01000000
58	3A	# 1 H active : H blank(1024:320)	41	01000001
59	3B	# 1 V active(600)	58	01011000
60	3C	# 1 V blank(35)	23	00100011
61	3D	# 1 V active : V blank(600:35)	20	00100000
62	3E	# 1 H sync offset(24)	18	00011000
63	3F	# 1 H sync pulse width(136)	88	10001000
64	40	# 1 V sync offset : V sync pulse width(3:1)	31	00110001

65	41	# 1 H sync offset : H sync pulse width : V sync offset : V sync width	00	00000000
66	42	# 1 H image size(228mm)	E4	11100100
67	43	# 1 V image size(131.52mm)	83	10000011
68	44	# 1 H image size : V image size(22.8:13.152)	00	00000000
69	45	# 1 H boarder	00	00000000
70	46	# 1 V boarder	00	00000000
71	47	# 1 Non-interlaced, Normal, no stereo, Separate sync, H/V pol Negatives	18	00011000
72	48	Detailed timing description # 2	00	00000000
73	49	# 2 Flag	00	00000000
74	4A	# 2 Reserved	00	00000000
75	4B	# 2 FE (hex) defines ASCII string(Model Name"AT102TN42")	FE	11111110
76	4C	# 2 Flag	00	00000000
77	4D	# 2 1st character of name("A")	41	01000001
78	4E	# 2 2nd character of name("T")	54	01010100
79	4F	# 2 3rd character of name("1")	31	00110001
80	50	# 2 4th character of name("0")	30	00110000
81	51	# 2 5th character of name("2")	32	00110010
82	52	# 2 6th character of name("T")	54	01010100
83	53	# 2 7th character of name("N")	4E	01001110
84	54	# 2 8th character of name("4")	34	00110100
85	55	# 2 9th character of name("2")	32	00110010
86	56	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
87	57	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
88	58	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
89	59	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
90	5A	Detailed timing description # 3	00	00000000
91	5B	# 3 Flag	00	00000000
92	5C	# 3 Reserved	00	00000000
93	5D	# 3 FE (hex) defines ASCII string(Vendor"INNOLUX",ASCII)	FE	11111110
94	5E	# 3 Flag	00	00000000
95	5F	# 3 1st character of name("I")	49	01001001
96	60	# 3 2nd character of name("N")	4E	01001110

97	61	# 3 3rd character of name("N")	4E	01001110
98	62	# 3 4th character of name("O")	4F	01001111
99	63	# 3 5th character of name("L")	4C	01001100
100	64	# 3 6th character of name("U")	55	01010101
101	65	# 3 7th character of name("X")	58	01011000
102	66	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
103	67	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
104	68	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
105	69	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
106	6A	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
107	6B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
108	6C	Detailed timing description # 4	00	00000000
109	6D	# 4 Flag	00	00000000
110	6E	# 4 Reserved	00	00000000
111	6F	# 4 FE (hex) defines ASCII string(Model Name"AT102TN42")	FE	11111110
112	70	# 4 Flag	00	00000000
113	71	# 4 1st character of name("A")	41	01000001
114	72	# 4 2nd character of name("T")	54	01010100
115	73	# 4 3rd character of name("1")	31	00110001
116	74	# 4 4th character of name("0")	30	00110000
117	75	# 4 5th character of name("2")	32	00110010
118	76	# 4 6th character of name("T")	54	01010100
119	77	# 4 7th character of name("N")	4E	01001110
120	78	# 4 8th character of name("4")	34	00110100
121	79	# 4 9th character of name("2")	32	00110010
122	7A	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	0A	00001010
123	7B	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
124	7C	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
125	7D	(If <13 char, then terminate with ASCII code 0Ah, set remaining char = 20h)	20	00100000
126	7E	Extension Flag	00	00000000
127	7F	Checksum	E7	11100111

4. Optical Specifications

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Viewing angle (CR≥ 10)	θ_L	Φ=180°(9 o'clock)	70	80	-	degree	Note 1
	θ_R	Φ=0°(3 o'clock)	70	80	-		
	θ_T	Φ=90°(12 o'clock)	60	70	-		
	θ_B	Φ=270°(6 o'clock)	70	80	-		
Response time	T_{ON}	Normal θ=Φ=0°	-	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 Note 6
	W_Y		0.28	0.33	0.38	-	
Luminance	L		150	200	-	-	Note 6
Luminance uniformity	Y_U		70	75	-	%	Note 6,7

Test Conditions:

1. Viewing angle is tested when V_{black} =4.9V; V_{white} =0.6V
2. V_{CC}=3.3V, V_{LED}=5.0V, the ambient temperature is 25□.
3. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

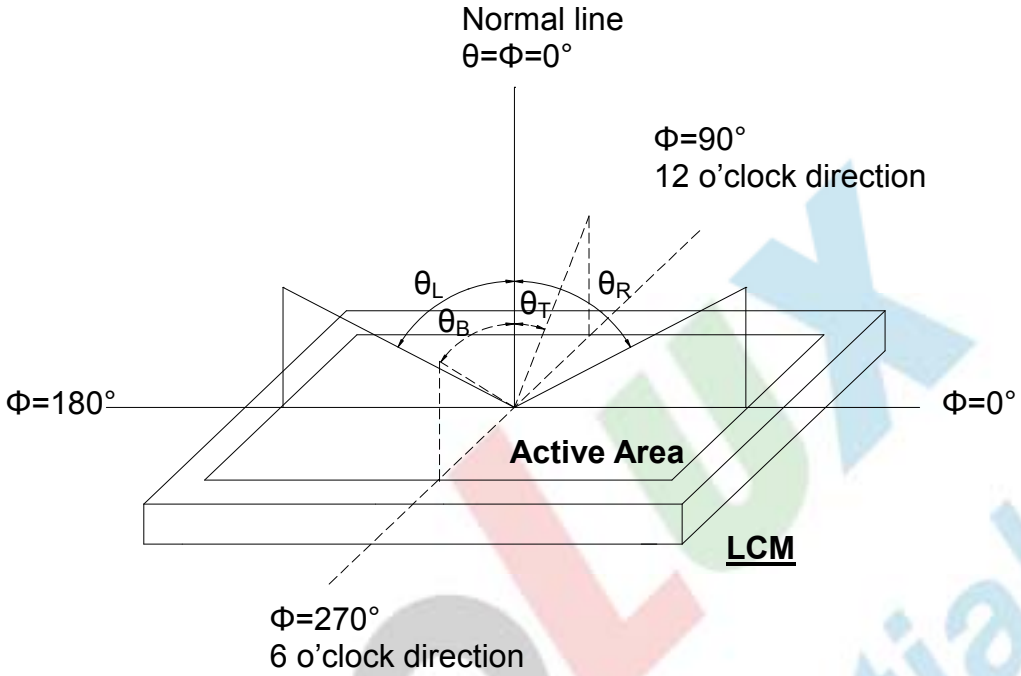


Fig. 4-1 Definition of viewing angle

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.)

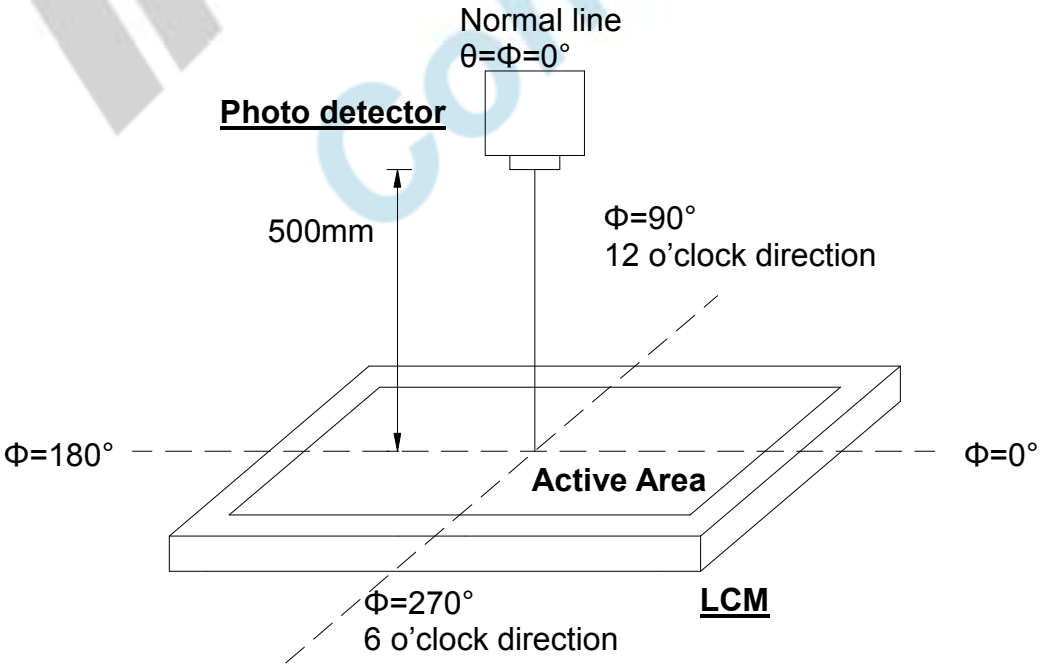


Fig. 4-2 Optical measurement system setup

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_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.

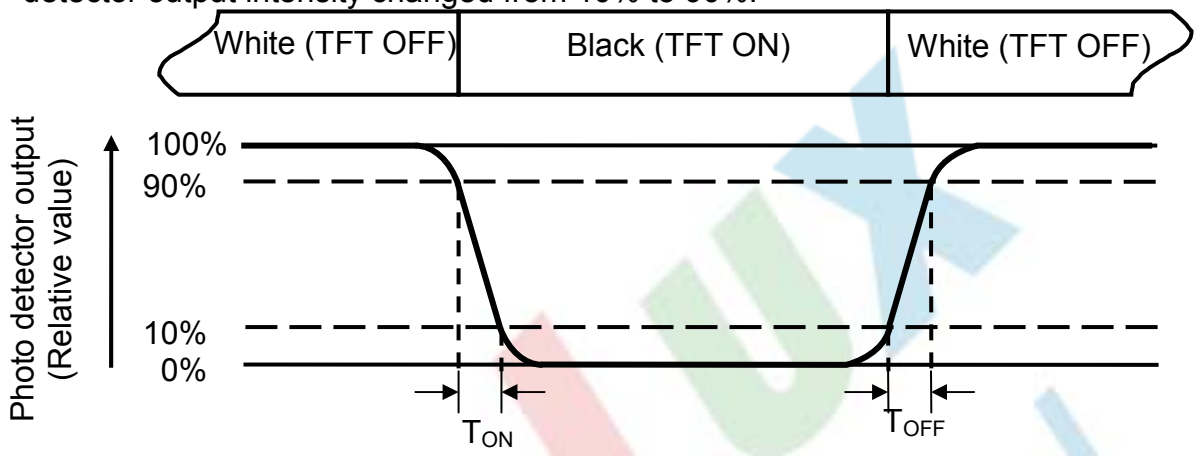


Fig. 4-3 Definition of response time

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: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is V_{LED}=5.0V.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer to Fig. 4-4).Every measuring point is placed at the center of each measuring area.

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

L-------Active area length W----- Active area width

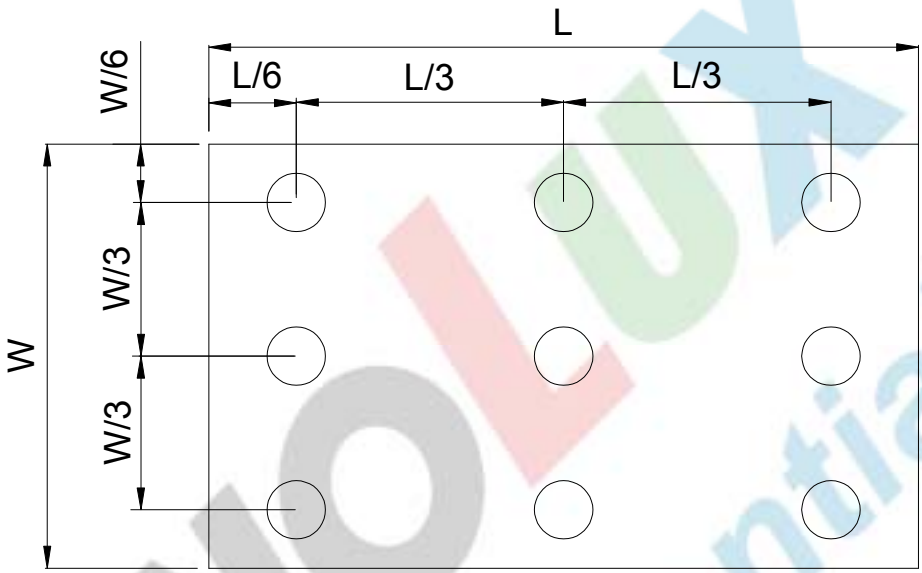


Fig. 4-4 Definition of measuring points

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

5. Reliability Test Items

(Note3)

Item	Test Conditions	Remark
High Temperature Storage	Ta = 60□ 240 hrs	Note 1, 4
Low Temperature Storage	Ta =-20□ 240hrs	Note 1, 4
High Temperature Operation	Ts =50□ 240hrs	Note 2, 4
Low Temperature Operation	Ta =0□ 240hrs	Note 1, 4
Operate at High Temperature and Humidity	+40□, 90%RH max. 240 hrs	Note 4
Thermal Shock	-20□/30 min ~ +60□/30 min for a total 100 cycles, Start with cold temperature and end with high temperature.	Note 4
Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	
Mechanical Shock	100G 6ms,±X, ±Y, ±Z 3 times for each direction	
Package Vibration Test	Random Vibration : 0.015G*G/Hz from 5-200HZ, -6dB/Octave from 200-500HZ 2 hours for each direction of X. Y. Z. (6 hours for total)	
Package Drop Test	Height:60 cm 1 corner, 3 edges, 6 surfaces	
Electro Static Discharge	± 2KV, Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.
Note 2: Ts is the temperature of panel's surface.
Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but doesn't guarantee all the cosmetic specification.
Note 4: Before cosmetic and function tests , the product must have enough recovery time, at least 2 hours at room temperature.

6. General Precautions

6.1. 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.

6.2. 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.

6.3. 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.

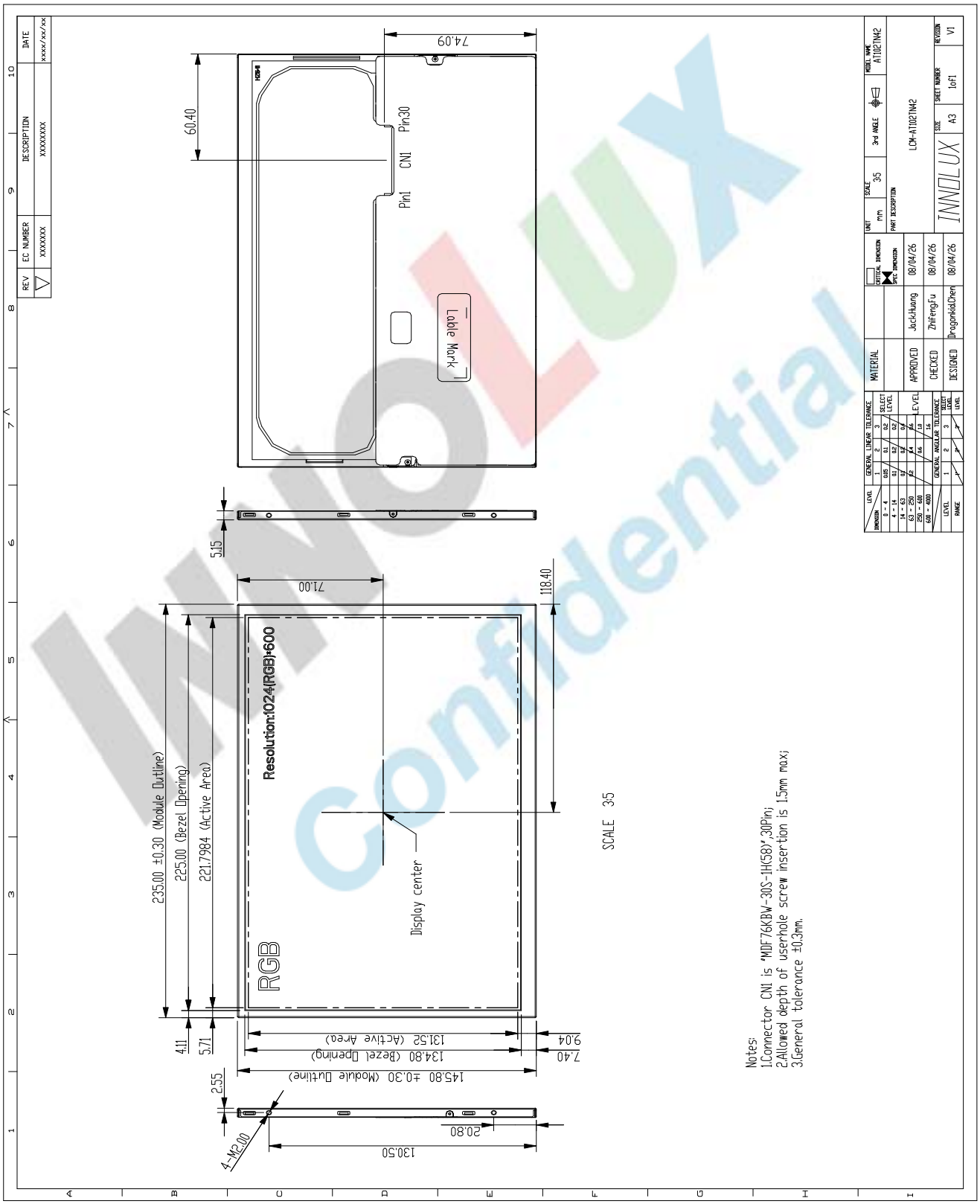
6.4. Storage

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.

6.5. 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.

7. Mechanical Drawing



8. Package Drawing

8.1 Packaging Material Table

No.	Item	Model (Material)	Dimensions(mm)	Unit Weight (kg)	Quantity	Remark
1	LCM Module	AT102TN42	235 x 145.8 x 5.15	0.238	25	
2	Partition	BC Corrugated paper	512 x 349 x 226	1.350	1	
3	Partition Paper	B Corrugated paper	510 x 350 x 7	0.148	2	
4	Corrugated Bar	B Corrugated paper	512 x 370x 7	0.110	2	
5	Dust-Proof Bag	PE	900 x 700 x 0.05	0.010	1	
6	A/S Bag	PE	280 x 200 x 0.05	0.001	25	10^{9}～ $10^{11}\Omega$/sq
7	Carton	Corrugated paper	530 x 355 x 255	1.100	1	
8	Total weight	8.951 kg ± 5%				

8.2 Packaging Quantity

Total LCM quantity in Carton: no. of Partition 1 Rows x quantity per Row 25 = 25

8.3 Packaging Drawing