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Product Specification

1.6″ COLOR TFT-LCD

(◆) Preliminary Specification
( ) Final Specification

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content

Contents:

Appendix:

A. General Specification

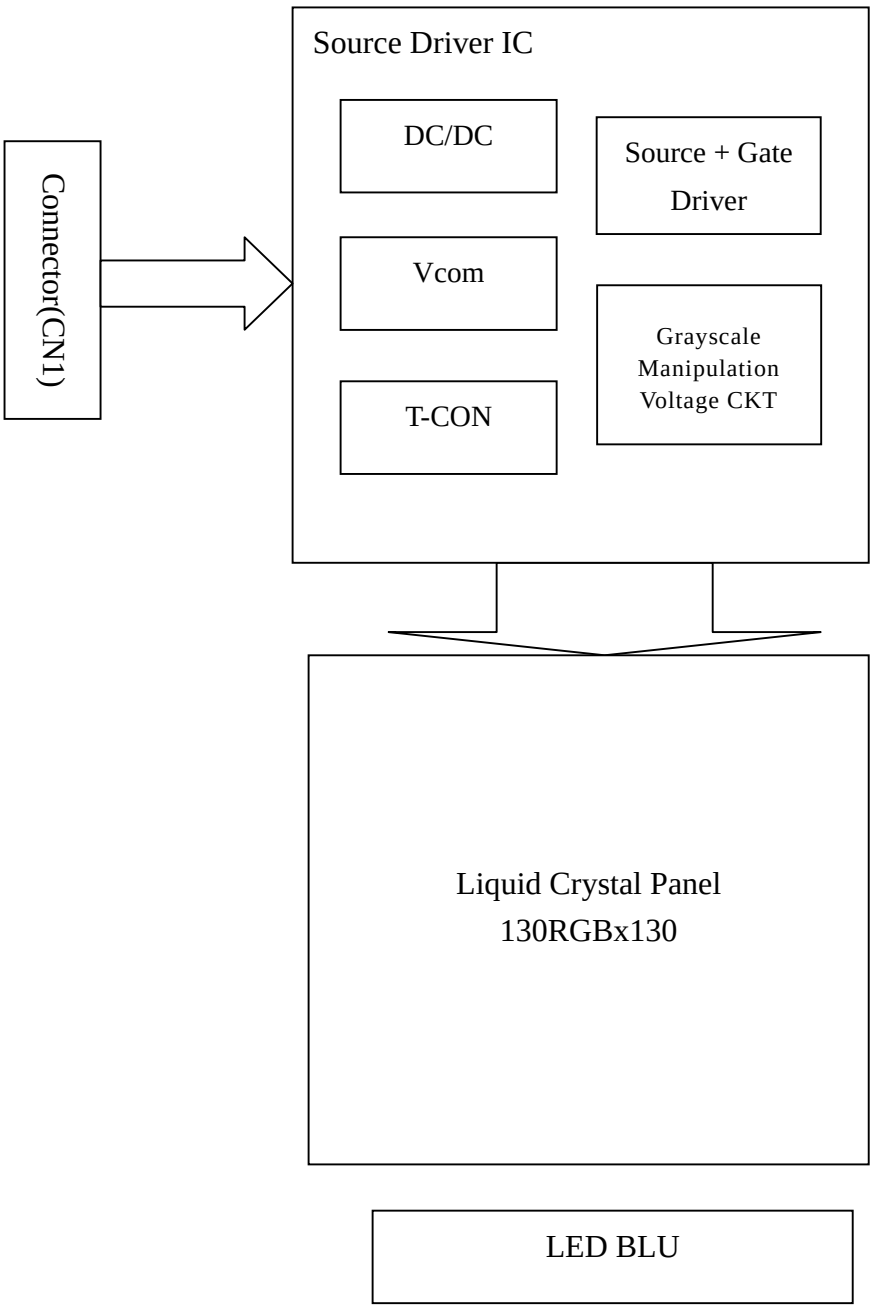
1.Physical specifications

NO.	Item	Specification	Remark
1	Display method	Active matrix TFT	
2	Display mode	MTN transflective type, normally white	
3	Display resolution (dot)	130X3 (V) X 130(H)	
4	Active area (mm)	28.86(V) X 28.86(H)	
5	Screen size (inch)	1.6 (Diagonal)	
6	Pixel pitch (mm)	0.222(V)X0.222(H)	
7	Color configuration	R. G. B. strip	
8	Display color	65K/262K colors	
9	Surface treatment	Hard Coating + AR	
10	Light technology	3 pcs LED	
11	Overall dimension (mm)	35.4(W)X39.8(H)X2.86(D)	
12	View Direction	6 o'clock	
13	Weight (g)	12g	
14	Driver IC	Solomon SSD1283	

Key features

a. Low power consumption solution.
b. Low current sleep mode, partial display mode, and 8-colors text mode for power saving.
c. Driver embeds DC-DC converter, Oscillator and voltage generator to provide all necessary voltage required by the driver with minimum external components.
d. Non-Volatile Memory (OTP) for VCOM calibration.
e. Display moving pictures up to 30 FPS, and support area scrolling and partial display.
f. Single chip driver solution including source and gate scan direction control.

2.Block diagram



B. Electrical specifications

1. Pin assignment (Pin1-20):

Pin number	Pin name	Description
1	/CS	Chip select
2	/Reset	Reset
3	D/C	Data/Command (DC=0: command; DC=1: data)
4	PS	Parallel/Serial (PS=0: 4SPI, PS=1: 8 bit 6800 Parallel)
5	D0	Data 0
6	D1	Data 1
7	D2	Data 2
8	D3	Data 3
9	D4	Data 4
10	D5	Data 5
11	D6 / SCLK	Data 6 (parallel) / Serial clock (serial)
12	D7 SDATA	Data 7 (parallel) / Serial data (serial)
13	VSS	Ground
14	VCI	Power supply voltage (2.775V)
15	VDDIO	Logic supply voltage (1.8V/2.775V)
16	VSS	Ground
17	LED1	LED1
18	LED2	LED2
19	LED3	LED3
20	LEDGND	LED ground

2. Absolute maximum ratings (VSS=0V) (Note 1)

Item	Symbol	Condition	Min.	Max.	Unit	Remark
System power supply pins of logic block	VDD		-0.3	2.7	V	
Supply voltage for step-up circuit	VCI		-0.3	5.0	V	
Power supply pin of IO pins	VDDIO		-0.3	4.0	V	Note 2
Operating temperature (Ambient)	Topa		-20	70	℃	
Storage temperature	Tstg		-30	80	℃	

Note 1: If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

Note 2: Including D0~D7, /CS, D/C, PS

3. Electrical characteristics

a. Typical operating conditions

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Logic voltage		VDDIO	1.16	-	3.6	V	Note 1
Supply voltage for set-up circuit		VCI	2.5	-	3.6	V	
Input Signal Voltage	H Level	V_{IH}	0.8 x VDD	-	VDD	V	Note 2
	L Level	V_{IL}	0	-	0.2 x VDD	V	
Output signal voltage	H Level	V_{OH}	0.9 x VDD	-	VDD	V	
	L Level	V_{OL}	0	-	0.1 x VDD	V	

Note 1: The operations are guaranteed under the recommended operating conditions only. These operations are not guaranteed if a quick voltage change occurs during operation. To prevent noise, a bypass capacitor must be inserted into the line close to power pin.

Note 2: Including D0~D7, /CS, D/C, PS

b. Power consumption (Note 1)

Mode	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Normal	P_S	VDD = 1.875V VCI = 2.775V	-	6.4	10.4	mW	Note 2
Partial	P_P		-	1.14	2.22	mW	Note 3
Sleep	P_g		-	0.1	0.85	mW	Note 4

Note 1: No backlight is driven

Note 2: 65536 colors, full screen at 66Hz frame frequency, line inversion mode.

Note 3: 65536 colors, 130x32 at 66Hz frame frequency, frame inversion mode.

Note 4: Display off, oscillator off and power control off.

c. Backlight driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Units	Remark
LED voltage	V_L	-	3.7	-	V	
LED current	I_L	-	15	-	mA	
Power consumption	W_L	-	167	-	mW	Note 1
LED life time	L_L	5000	10000	-	hr	Note 2

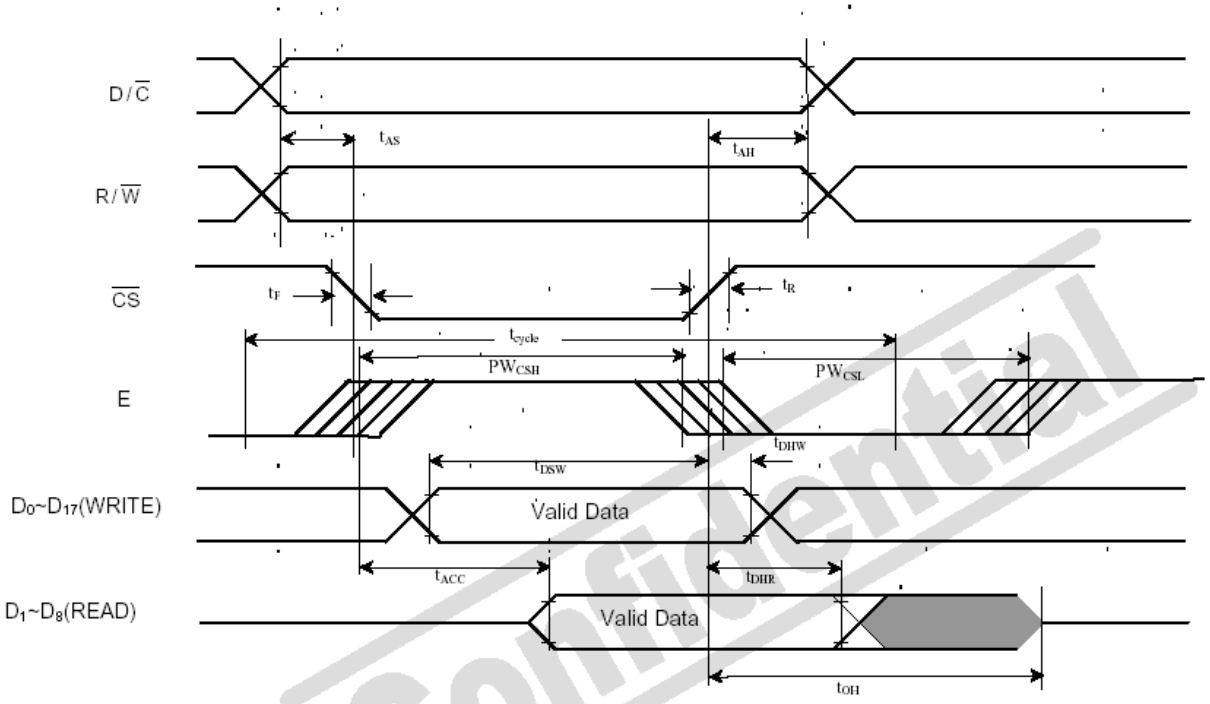
Note 1: T= 25℃, I_L =15mA, with parallel LED circuit (3 LED)

Note 2: Brightness (I_L=15mA) to be decreased to 50% of the initial value.

4. AC Characteristics

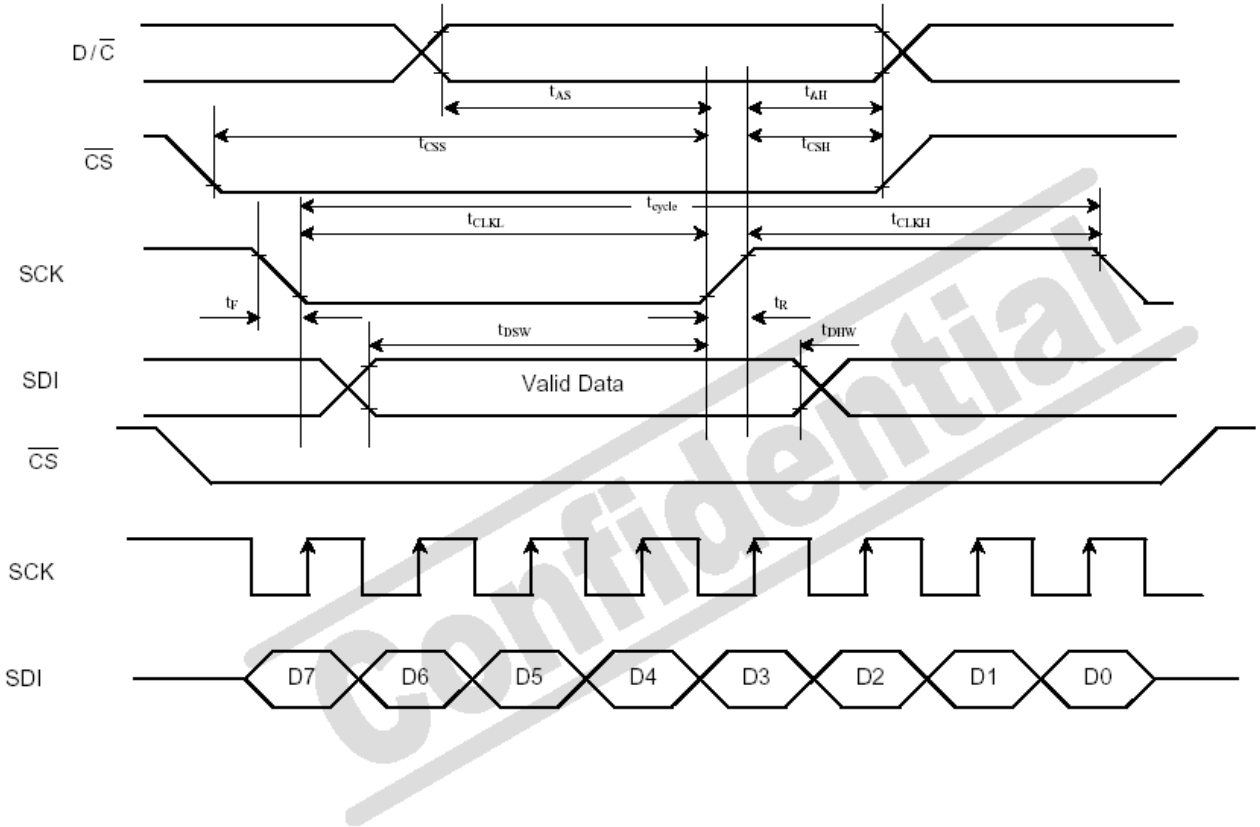
Parallel Timing Characteristics (T_A = -40 to 85°C, V_{DD} = 2.6V to 3.3V)

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time (write cycle)	66	TBD	-	ns
t_{AS}	Address Setup Time	0	TBD	-	ns
t_{AH}	Address Hold Time	0	TBD	-	ns
t_{DSW}	Data Setup Time	5	TBD	-	ns
t_{DHW}	Data Hold Time	3	TBD	-	ns
t_{ACC}	Data Access Time	210	TBD	-	ns
t_{OH}	Output Hold time	90	TBD	-	ns



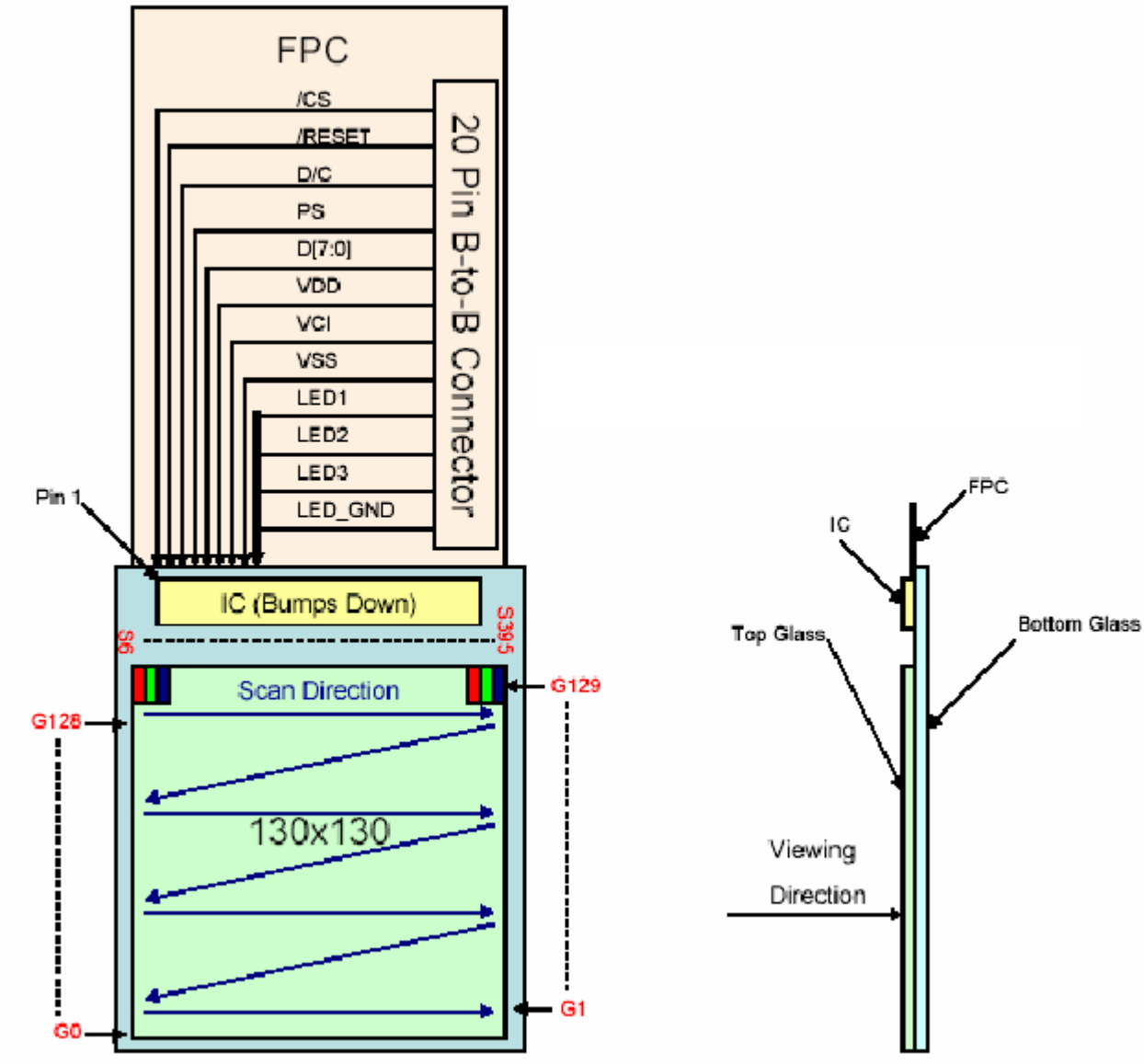
Parallel 6800-series Interface Timing Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
t_{cycle}	Clock Cycle Time	-	50	-	ns
f_{CLK}	Serial Clock Cycle Time SPI Clock tolerance = +/- 2 ppm	-	TBD	-	MHz
t_{AS}	Register select Setup Time	2	TBD	-	ns
t_{AH}	Register select Hold Time	0	TBD	-	ns
t_{CSS}	Chip Select Setup Time	2	TBD	-	ns
t_{CSH}	Chip Select Hold Time	0	TBD	-	ns
t_{DSW}	Write Data Setup Time	2.5	TBD	-	ns
t_{DHW}	Write Data Hold Time	0	TBD	-	ns
t_{CLKL}	Clock Low Time	4	TBD	-	ns
t_{CLKH}	Clock High Time	-	46	-	ns



4 wire Serial Timing Characteristics

5. Gate driver scan mode



C. Optical specification (Note 1,Note 2, Note 3)

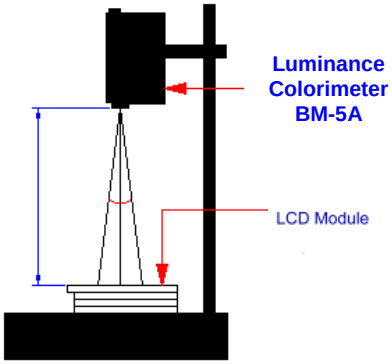
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	Tr	θ =0°	-	15	20	ms	Note 3-1,4
	Fall	Tf		-	25	30	ms	
Contrast ratio	B/L On	C/R_{on}	θ =0°	70	100	-	-	Note 3-1,5
	B/L Off	C/R_{off}		7	10		-	Note 3-2,5
Viewing angle	Top	-	CR≧5	25	35	-	deg.	Note 3-1, 6
	Bottom			25	35	-		
	Left			35	45	-		
	Right			35	45	-		
Brightness uniformity		-	θ =0°	80	85	-	%	Note 3-1, 7
Reflectance		Rfp	B/L Off θ =30°	--	--	-	%	Note 3-2
		Rfd	B/L Off θ = 8° (Diffused)	4.2	5	-		Note 3-3
Brightness		Y_L	θ =0°	60	75	-	cd/m^2	Note 3-1
Color Tone	White	x	θ =0°	-	0.305	-	-	Note 3-1
		y		-	0.315	-		
	Red	x		-	0.560	-		
		y		-	0.330	-		
	Green	x		-	0.330	-		
		y		-	0.510	-		
	Blue	x		-	0.140	-		
		y		-	0.085	-		

Note 1: Ambient temperature =25℃±2℃.

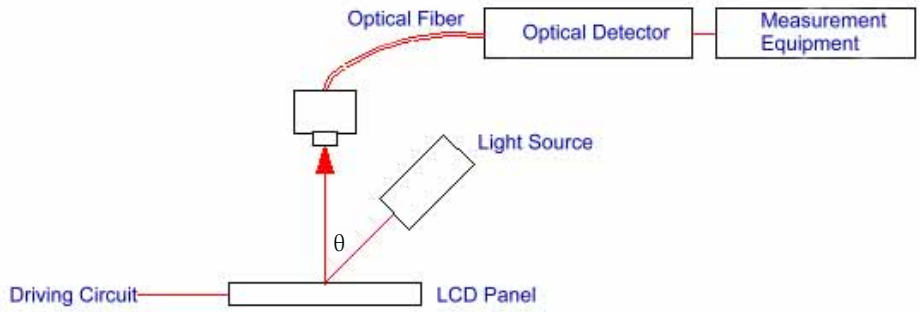
Note 2: To be measured in the dark room.

Note 3: To be measured at the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A and LCD-7000, after 10 minutes module operation.

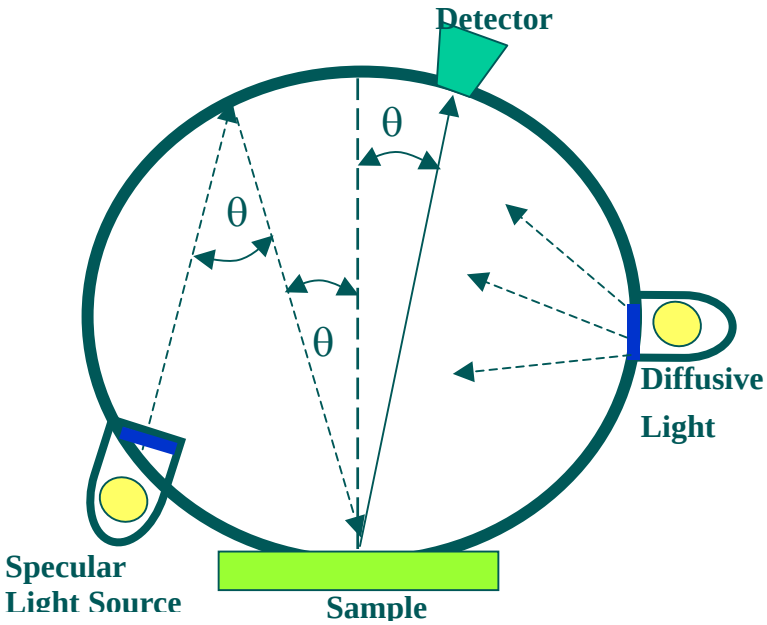
3-1. Measurement system 1: BM-5A



3-2. Measurement system 2: LCD-7000



3-3 Measurement system 3: Minolta CM2500D (specular component exclude value)

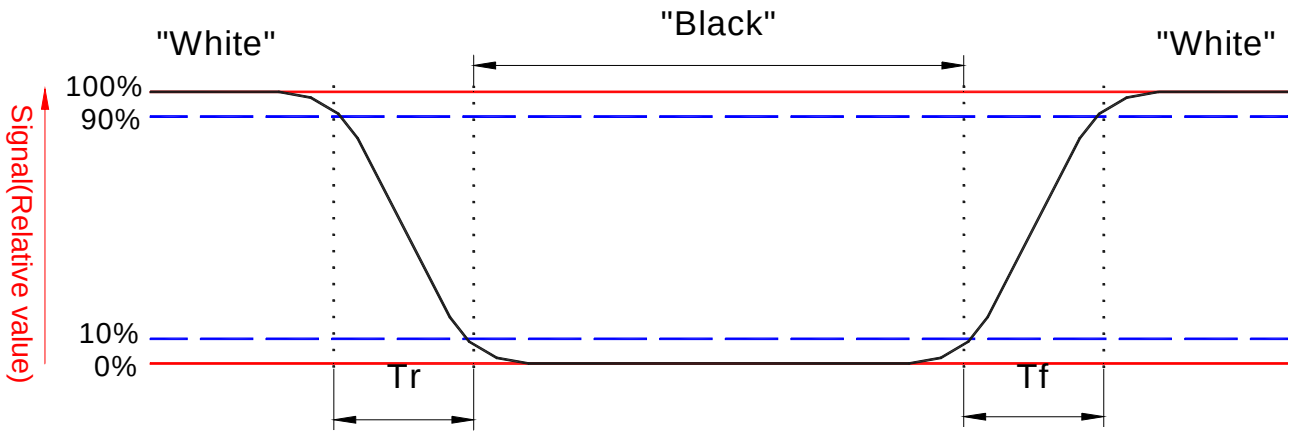


Note 4: Definition of response time:

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:



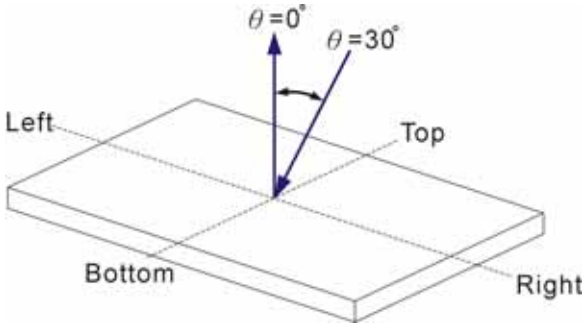
Note 5. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

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

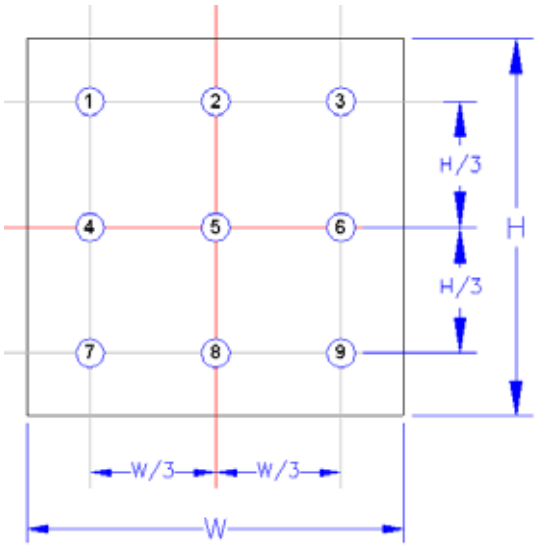
Note 6. Definition of viewing angle:

Refer to the figure as below.



Note 7. Definition of the brightness uniformity

$$= \frac{\text{The minimum brightness of 9 points}}{\text{The maximum brightness of 9 points}} \times 100\%$$

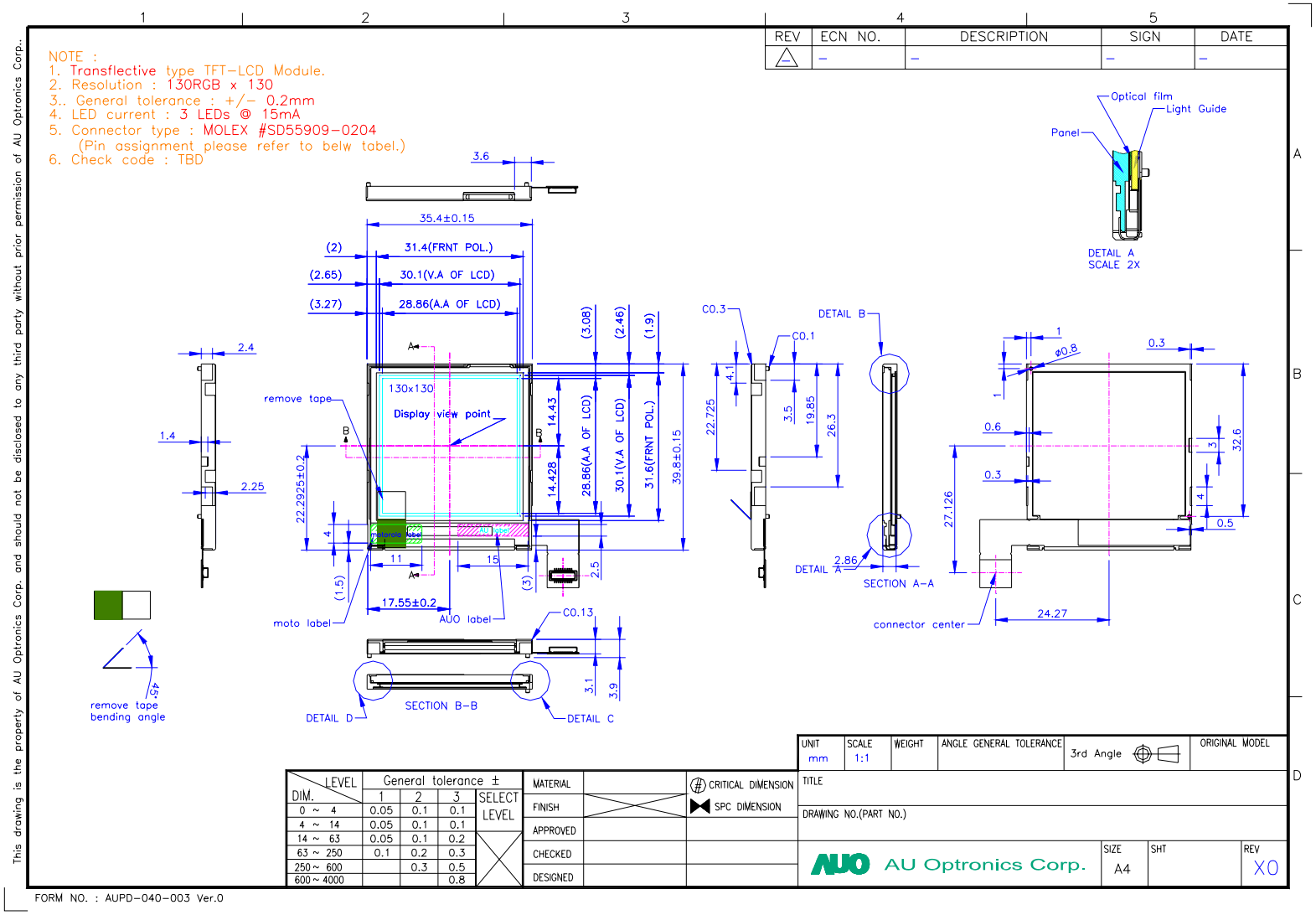


D. Reliability test items:

No.	Test items	Conditions	Remark
1	High temperature storage	Ta= 80℃ 240H	
2	Low temperature storage	Ta= -30℃ 240H	
3	High temperature operation	Ta= 70℃ 240H	
4	Low temperature operation	Ta= -20℃ 240H	
5	High temperature and high humidity	Ta= 60℃. 90% RH 240H	Operation
6	Heat shock	-30℃~80℃/50 cycles 2H/cycle	Non-operation
7	Electrostatic discharge	±200V,200pF(0Ω), once for each terminal	Non-operation
8	Drop (with carton)	Height: 80cm 1 corner, 3 edges, 6 surfaces	

Note: Ta: Ambient temperature.

Appendix: Outline dimension of TFT LCD drawing



DIM. \ LEVEL	General tolerance ± 1	2	3	SELECT LEVEL
0 ~ 4	0.05	0.1	0.1	
4 ~ 14	0.05	0.1	0.1	
14 ~ 63	0.05	0.1	0.2	
63 ~ 250	0.1	0.2	0.3	
250 ~ 600		0.3	0.5	
600 ~ 4000			0.8	