

MODEL NO.: TM090RDH01-00ISSUED DATE: 2010-11-24VERSION: Ver. 1.0

- ☒ Preliminary Specification
☐ Final Product Specification

Customer : _____

Approved by	Notes

SHANGHAI AVIC Confirmed :

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This technical specification is subjected to change without notice.

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Record of Revision

[illegible]



1 General Specifications

1.1 General Specifications

Feature		Spec
Display Spec	Size	9 inch
	Resolution	800(RGB)×480
	Interface	TTL
	Color Depth	16.7M
	Technology Type	a-Si
	Pixel Pitch (mm)	0.2475(H) ×0.2327(V)
	Pixel Configuration	R.G.B. Stripe
	Display Mode	TM with Normally White
	Surface Treatment (Up Polarizer)	Anti Glare
	Viewing Direction (Note 1)	12 o'clock
	Gray Scale Inversion Direction	6 o'clock
Mechanical Characteristics	LCM (W x H x D)(mm)	211.10×126.50×5.60
	Active Area (W x H)(mm)	198.00 × 111.70
	With /Without TSP	Without TSP
	Weight (g)(Note 3)	TBD

Note 1: Viewing direction for best image quality is different from TFT definition. There is a 180 degree shift.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: Weight tolerance: +/- 5%



2 Input/Output Terminals

2.1 INPUT TERMINALS PIN ASSIGNMENT

Pin No.	Symbol	I/O (Note1)	Description	Comment
1	LED A	P	LED Anode	Note1
2	LED A	P	LED Anode	-
3	LED K	P	LED Cathode	-
4	LED K	P	LED Cathode	-
5	GND	P	Ground	-
6	VCOM	P	Common Voltage	-
7	DVDD	P	Digital power input,	-
8	MODE	I	DE/SYNC mode select. Normally pull high: 0 : SYNC mode 1 : DE mode DE Mode: Mode="H", Hsync and Vsync must pull high. SYNC Mode: Mode="L", DE must be connected to GND.	-
9	DE	I	DATA INPUT Enable	-
10	VSNC	I	Vertical Synchronization	-
11	HSNC	I	Horizontal Synchronization	-
12	B7	I	Blue data(MSB)	-
13	B6	I	Blue data	-
14	B5	I	Blue data	-
15	B4	I	Blue data	-
16	B3	I	Blue data	-
17	B2	I	Blue data	-
18	B1	I	Blue data	-
19	B0	I	Blue data(LSB)	-
20	G7	I	Green data(MSB)	-
21	G6	I	Green data	-
22	G5	I	Green data	-
23	G4	I	Green data	-
24	G3	I	Green data	-
25	G2	I	Green data	-
26	G1	I	Green data	-
27	G0	I	Green data(LSB)	-
28	R7	I	RED data(MSB)	-
29	R6	I	RED data	-
30	R5	I	RED data	-
31	R4	I	RED data	-
32	R3	I	RED data	-
33	R2	I	RED data	-
34	R1	I	RED data	-
35	R0	I	RED data(LSB)	-
36	GND	P	Ground	-



37	DCLK	I	Parallel RGB clock input	-
38	GND	P	Ground	-
39	L/R	I	Left / Right shift control, 0 : Shift left : S1200→S1199→...→S2→S1 1 : Shift right, S1→S2→S3→...→S1200	-
40	U/D	I	Up / Down rotate control 0:Up to down G960→G959→...→G2→G1 1:Down to up G1→G2→...→G959→G960	-
41	VGH	P	Power supply for Gate on output	
42	VGL	P	Power supply for Gate off output	
43	AVDD	P	Analog power input	
44	Reset	I	Global reset pin	
45	NC	-		
46	VCOM	P	common voltage	
47	Dither	I	Dithering function enable/disable, 0 :Enable;1: Disable	
48	GND	P	Ground	
49	NC	-		
50	NC	-		

Note1: I/O----definition, I----Input, O----Output, P----Power

2.2 U/D R/L Function Description

Scan Control Input		Scanning Direction
UPDN	SHLR	
GND	DVDD	Up to Down, Left to Right
DVDD	GND	Down to Up, Right to Left
GND	GND	Up to Down, Right to Left
DVDD	DVDD	Down to Up, Left to Right

3 Absolute Maximum Ratings

AGND=GND=0V, Ta = 25℃

Item	Symbol	Min	Max	Unit	Remark
Digital supply voltage	DVDD	-0.5	5.0	V	-
Analog supply voltage	AVDD	-0.5	15	V	-
Power supply voltage 1	VGH	-0.3	42	V	-
Power supply voltage 2	VGL	VGH-42	+0.3	V	-
Operating temperature	T _{OPR}	-20	70	℃	-
Storage temperature	T _{STG}	-30	80	℃	-

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4 Electrical Characteristics

4.1 Recommended Operating Condition

GND=0V, Ta = 25°C

Item	Symbol	Min	Typ.	Max	Unit	Remark
Digital Supply Voltage	DVDD	2.7	3.3	3.6	V	-
Analog Supply Voltage	AVDD	-	10.4	-	V	-
Gate On Voltage	VGH	-	17.0	-	V	-
Gate Off Voltage	VGL	-	-5.0	-	V	-
Common Electrode Driving Signal	VCOM	-	4.3	-	V	-

4.2 Power Consumption

AGND=GND=0V, Ta = 25°C

Item	Symbol	Condition	Min	Typ.	Max	Unit	Remark
Digital Supply Current	I _{VCC}	DVDD=3.3V	-	TBD		mA	-
Analog Supply Current	I _{AVDD}	AVDD=10.4V	-	TBD		mA	-
Gate On Current	I _{VGH}	VGH=17.0V	-	TBD		mA	-
Gate Off Current	I _{VGL}	VGL=-5.0V	-	TBD		mA	-
Power Consumption	Pane I& Gamma		-	TBD		mW	-

Note1: Checkered flag pattern for Typ.;

4.3 Recommended Driving Condition for Backlight

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Current	I _F	-	20		mA	33 LEDs (3 LED Serial, 11 LED Parallel)
Forward Voltage	V _F	9.0	9.9	10.5	V	
Backlight Power Consumption	W _{BL}	-	2.178		W	
Operating Life Time	-	20,000	-	-	Hrs	I _F =20mA

Note1: The LED driving condition is defined for each LED module (3 LED Serial, 11 LED Parallel). For each LED: I_F (1/11) =20mA, V_F (1/3) =3.3V.

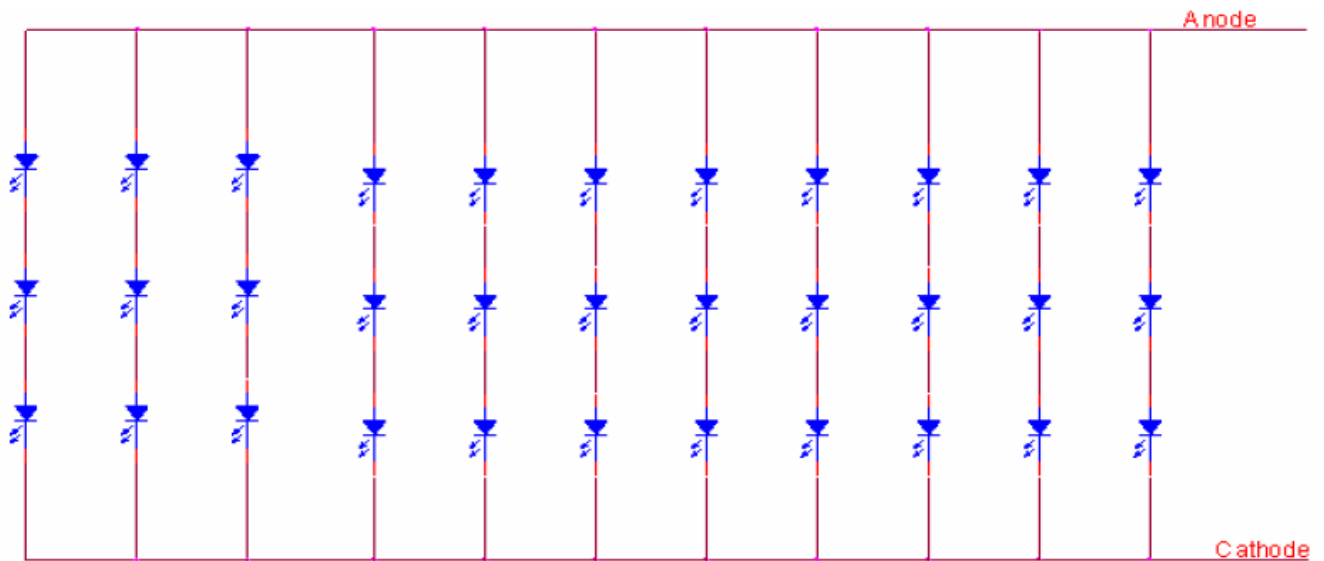
Note2: Under LCM operating, the stable forward current should be inputted. And forward voltage is for reference only.

Note3: I_F is defined for one channel LED. Optical performance should be evaluated at Ta=25°C only

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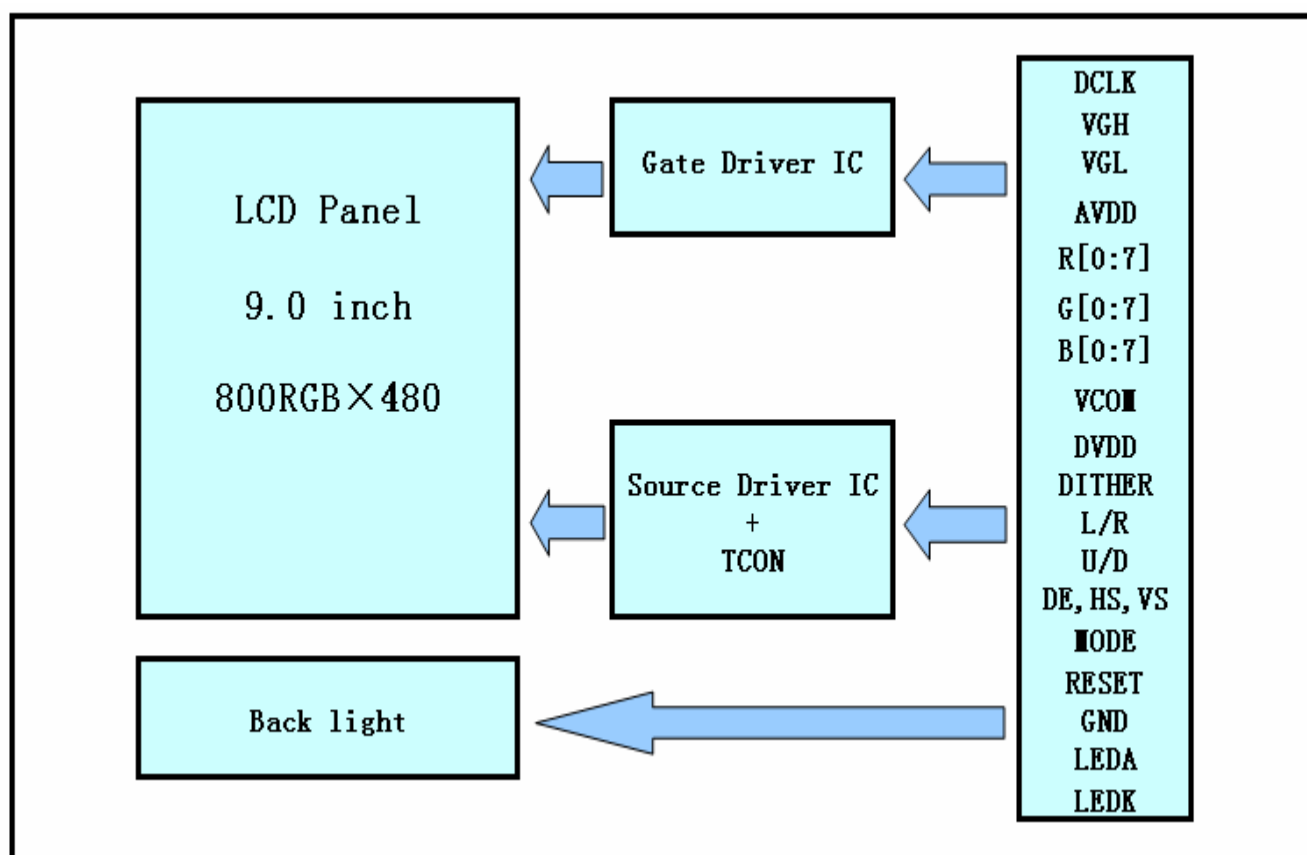
If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



Note4: The LED driving condition is defined for each LED module



4.4 Block Diagram





5 Interface Timing

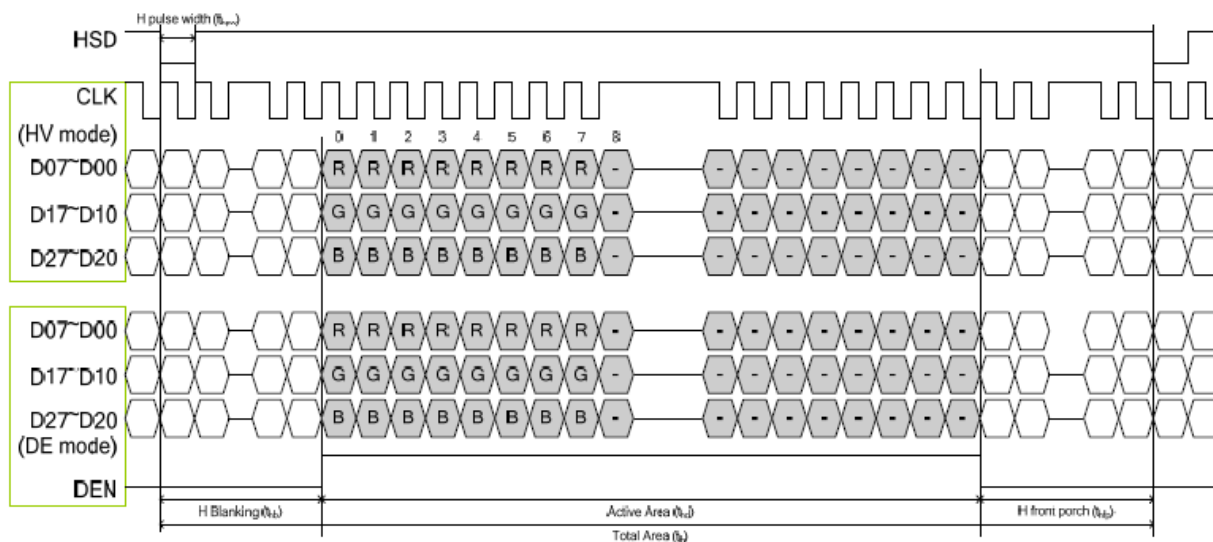
5.1 AC Electrical Characteristics (For TTL input mode)

DVDD=3.3V, Ta=25℃

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{cph}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

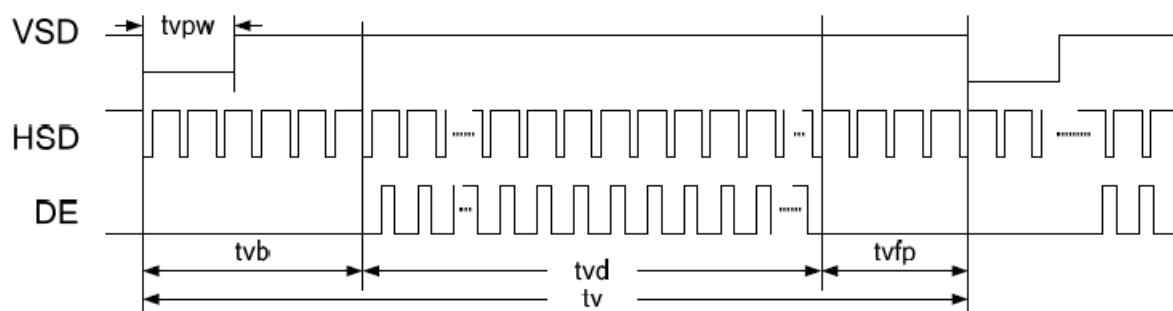
5.2 Data input format

● Horizontal timing





● Vertical timing



● Horizontal timing

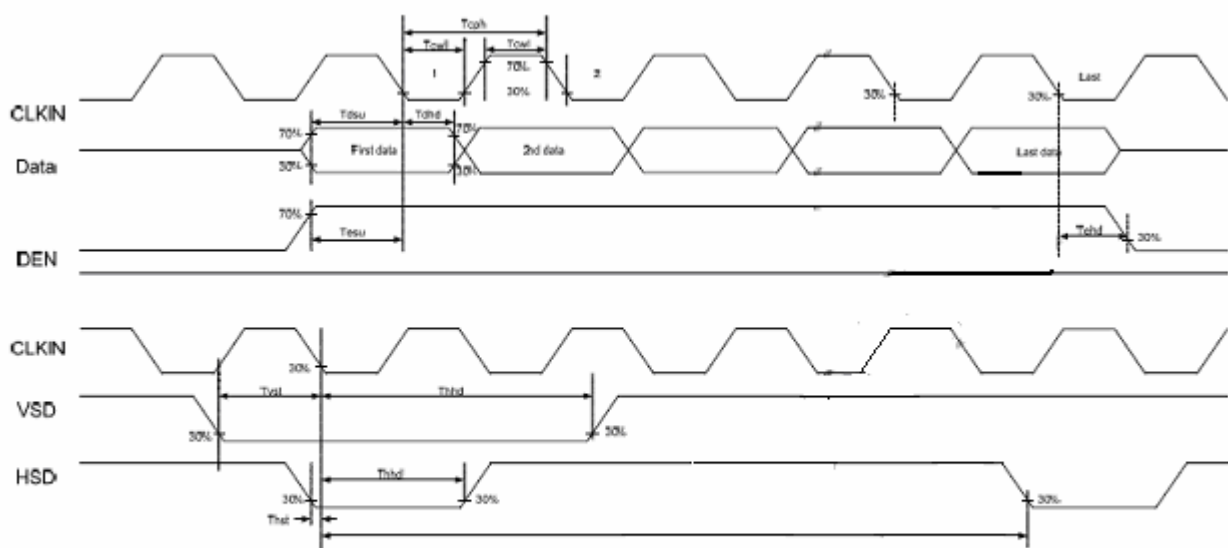
Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd	800			DCLK
DCLK frequency	fclk	-	30	50	MHz
One Horizontal Line	th	889	928	1143	DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb	88			DCLK
HS Front Porch	thfp	1	40	255	DCLK
DE mode Blanking	th-thd	85	128	512	DCLK

● Vertical timing

Parameter	Symbol	SPEC			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	480			th
VS period time	tv	513	525	767	th
VS pulse width	tvpw	3	3	255	th
VS Back Porch (Blanking)	tvb	32			th
VS Front Porch	tvfp	1	13	255	th
DE mode Blanking	tv-tvd	4	45	255	th



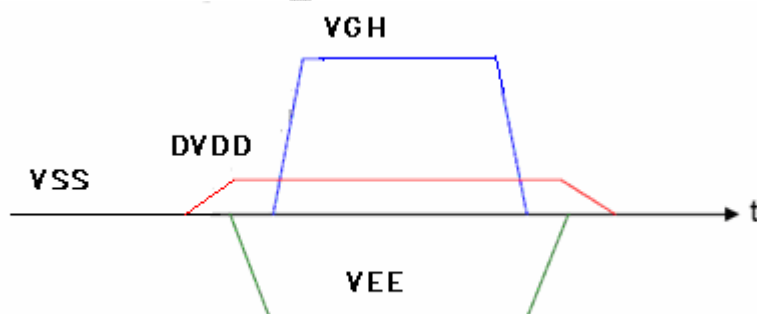
5.3 Input clock and data timing waveform



5.4 Power ON/OFF Sequence

When power on: DVDD→VEE→VGH

When power off: $V_{GH} \rightarrow V_{EE} \rightarrow DVDD$





6 Optical Characteristics

Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max	Unit	Remark
View Angles		θT	CR≥ 10	-	50	-	Degree	Note 2
		θB		-	70	-		
		θL		-	70	-		
		θR		-	70	-		
Contrast Ratio		CR	θ=0°	400	500	-	-	Note1 Note3
Response Time		T _{ON}	25℃	-	25	-	ms	Note1 Note4
		T _{OFF}						
Chromaticity	White	x	Backlight is on		0.31		-	Note5 Note1
		y			0.33			
	Red	x			TBD			
		y			TBD			
	Green	x			TBD			
		y			TBD			
	Blue	x			TBD			
		y			TBD			
NTSC		-	-	-	50	-	%	Note5
Luminance		L	-	-	250	-	cd/m ²	Note1 Note7
Uniformity		U		70	75	-	%	Note1 Note6

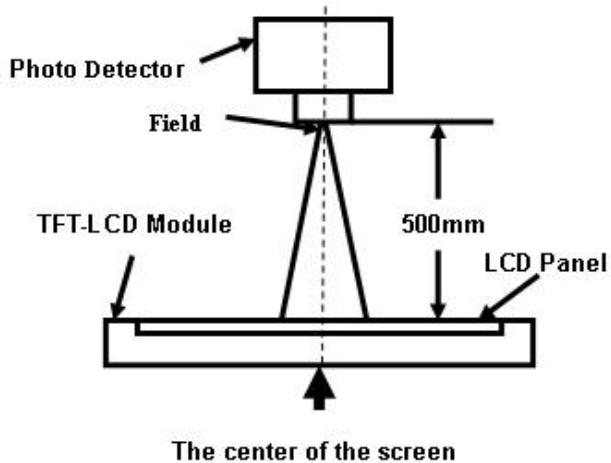
Test Conditions:

1. The ambient temperature is 25℃.
2. The test systems refer to Note 1 and Note2.



Note 1: Definition of optical measurement system

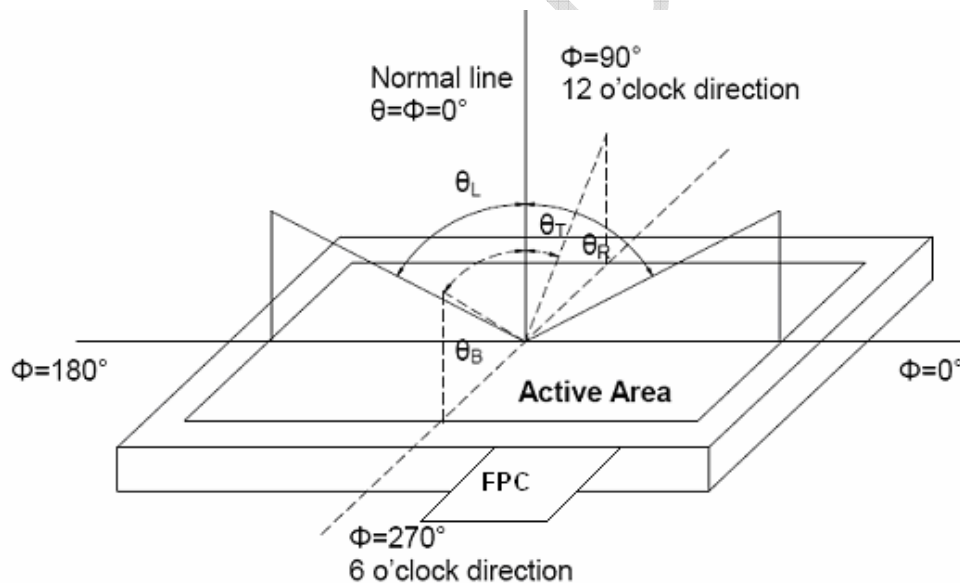
The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Item	Photo detector	Field
Contrast Ratio	BM-5A	1°
Luminance		
Lum Uniformity		
Chromaticity	SR-3A	-
Response Time	TRD100	

Note 2: Definition of viewing angle range and measurement system

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).



Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

"White state ": The state is that the LCD should drive by V_{white} .

"Black state": The state is that the LCD should drive by V_{black} .

V_{white} : To be determined V_{black} : To be determined.

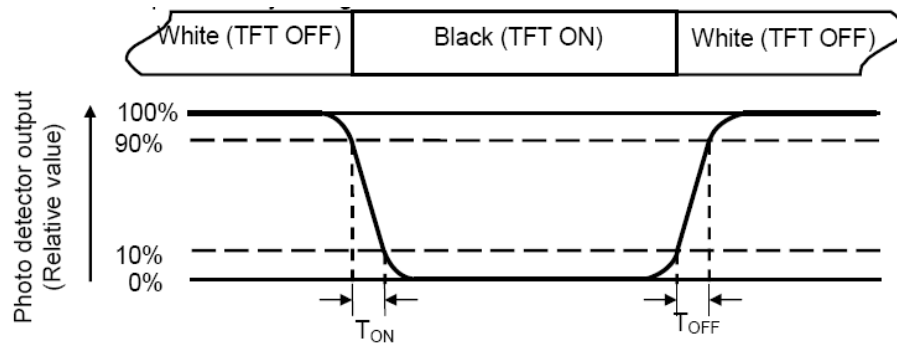
Note 4: Definition of response time

The response time is defined as the LCD optical switching time interval between "White" state and

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"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%.



Note 5: Definition of color chromaticity (CIE1931)

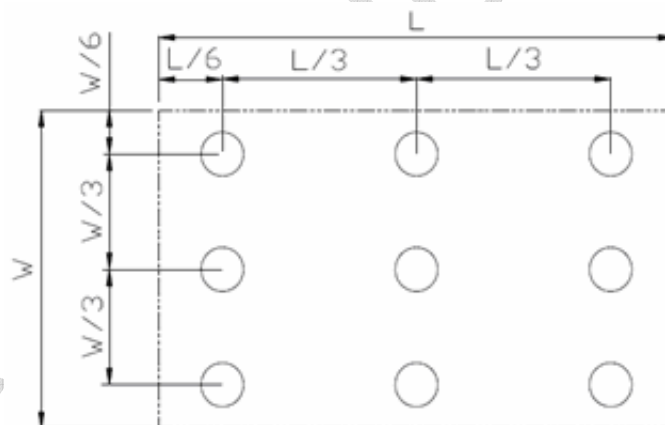
Color coordinates measured at center point of LCD.

Note 6: Definition of luminance uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (U)} = L_{\min} / L_{\max}$$

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



L_{\max} : The measured maximum luminance of all measurement position.

L_{\min} : The measured minimum luminance of all measurement position.

Note 7: Definition of luminance

Measure the luminance of white state at center point.



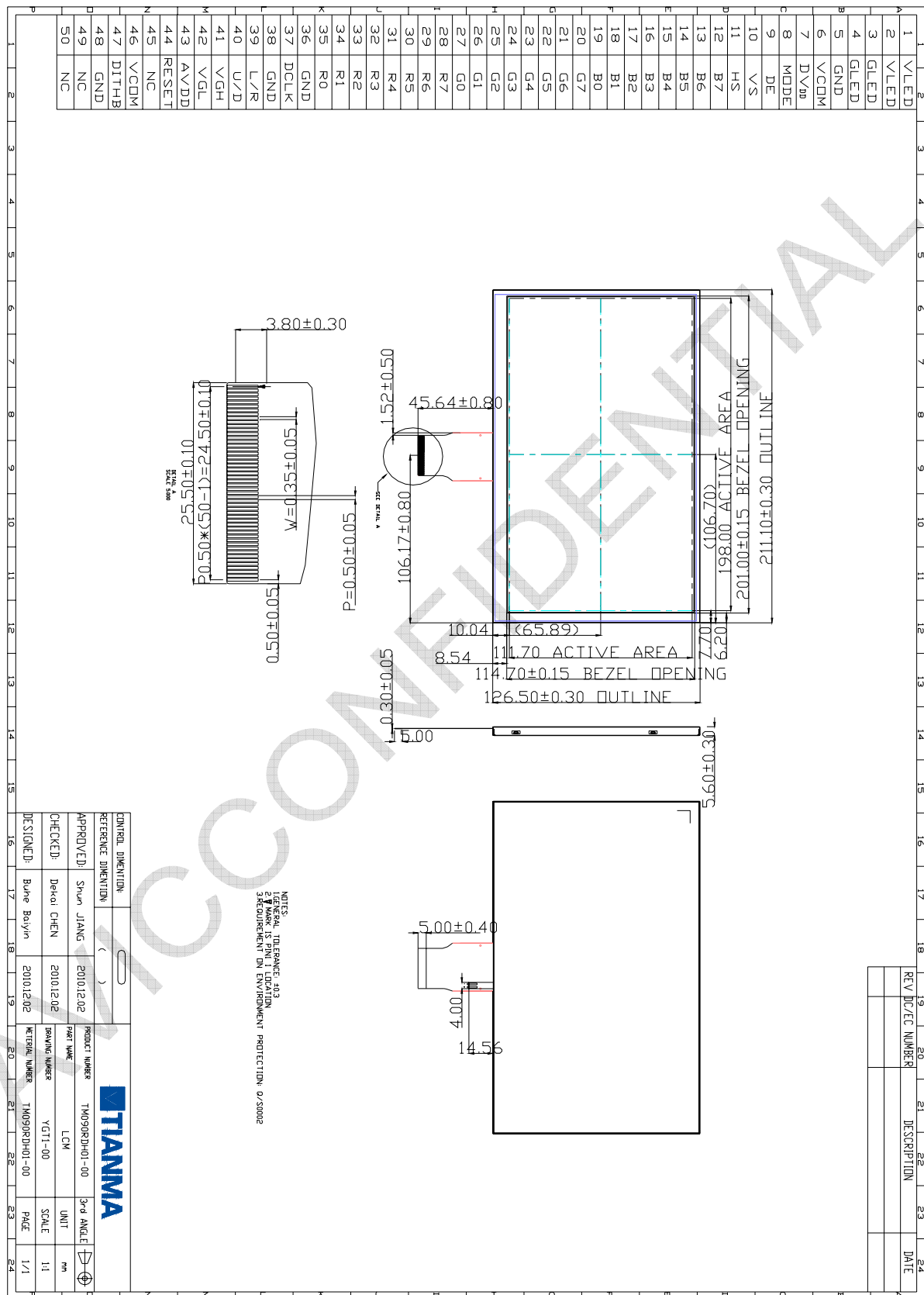
7 Environmental / Reliability Test

No.	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70℃, 240 hours (Note1)	IEC60068-2-1:2007 GB2423.2-2008
2	Low Temperature Operation	Ta = -20℃, 240 hours (Note2)	IEC60068-2-1:2007 GB2423.1-2008
3	High Temperature Storage	Ta = +80℃, 240 hours	IEC60068-2-1:2007 GB2423.2-2008
4	Low Temperature Storage	Ta = -30℃, 240 hours	IEC60068-2-1:2007 GB2423.1-2008
5	Storage at High Temperature and Humidity	Ta = +60℃, 90% RH max, 240hours	IEC60068-2-78 :2001 GB/T2423.3—2006
6	Thermal Shock (non-operation)	-30℃ 30 min ~ +80℃ 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984,G B2423.22-2002
7	ESD	C=150pF, R=330Ω, 5point/panel Air: ±8Kv, 5times; Contact: ±4Kv, 5times (Environment: 15℃~35℃, 30%~60%. 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626.2-2006
8	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)	IEC60068-2-6:1982 GB/T2423.10—1995
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423.5—1995
10	Package Drop Test	Height: 80cm, 1corner, 3edges, 6surfaces	IEC60068-2-32:1990 GB/T2423.8—1995

Note1: Ts is the temperature of panel's surface.

Note2: Ta is the ambient temperature of samples.

8 Mechanical Drawing





9 Packing Drawing

---TBD

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10 Precautions for Use of LCD Panels

10.1 Handling Precautions

10.1.1 The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

10.1.2 If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

10.1.3 Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

10.1.4 The polarizer covering the display surface of the LCD Panel is soft and easily scratched. Handle this polarizer carefully.

10.1.5 If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

- Water
- Ketone
- Aromatic solvents

10.1.6 Do not attempt to disassemble the LCD Panel.

10.1.7 If the logic circuit power is off, do not apply the input signals.

10.1.8 To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

10.1.8.1 Be sure to ground the body when handling the LCD Panels.

10.1.8.2 Tools required for assembly, such as soldering irons, must be properly ground.

10.1.8.3 To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

10.1.8.4 The LCD Panel is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

10.2 Storage precautions

10.2.1 When storing the LCD Panels, avoid exposure to direct sunlight or to the light of fluorescent lamps.

10.2.2 The LCD Panels should be stored under the storage temperature range. If the LCD Panels will be stored for a long time, the recommend condition is:

Temperature : 0℃ ~ 40℃, Relatively humidity: ≤80%

10.2.3 The LCD Panels should be stored in the room without acid, alkali and harmful gas.

10.3 Transportation Precautions

10.3.1 The LCD Panels should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.