

Product Specification

Model Name	S035HQ55NS
Description	TFT LCD Module 3.5" QVGA 320(RGB)x240 Dots
Date	2023/11/16
Version	2.0

Approved by/Date	Check by/Date	Prepared by/Date
HL 2023/11/16	HXY 2023/11/16	MHY 2023/11/16

Customer Approval	
Date	

Table of Contents

1. Record of Revision	3
2. General Specifications	4
3. Input/Output Terminals	5
4. Absolute Maximum Rating	5
5. Timing characteristics	6
6. Interface Timing	8
7. Optical Characteristics	12
8. Environmental / Reliability Tests	15
9. Mechanical Drawing	16
10. Packing	17
11. Precautions for Use of LCD modules	18

1. Record of Revision

Rev	Issued Date	Description	Editor
1.0	2019/7/20	First Release.	Yigui.Han
2.0	2021/7/15	Update the PIN interface definition	ZWF
	2023/11/16	Update reliability conditions	MHY

2. General Specifications

Feature		Spec
Characteristics	Size	3.5 inch
	Resolution	320(horizontal)*240(Vertical)
	Interface	24bit-RGB
	Connect type	Connector
	Color Depth	16.7M
	Technology type	a-Si
	Pixel pitch (mm)	0.219*0.219
	Pixel Configuration	R.G.B.Stripe
	Display Mode	Normally Black
	Driver IC	ST7272A
	Viewing Direction	Full view
Mechanical	LCM (W x H x D) (mm)	76.90*63.90*3.26
	Active Area(mm)	70.08*52.56
	Weight (g)	TBD
	LED Numbers	6 LEDs

Note 1: Requirements on Environmental Protection: RoHs

Note 2: LCM weight tolerance: +/- 5%

3. Input/Output Terminals

No.	Symbol	Description
1-2	VBL-	Backlight LED Cathode
3-4	VBL+	Backlight LED Anode.
5	Y1	Touch panel up side(NC)
6	X1	Touch panel right side(NC)
7	NC	-
8	RESET	Reset Signal pin ("Low" is enable)
9	SPENB(NC)	Chip select(NC)
10	SPCK(NC)	Serial Clock.(NC)
11	SPDA(NC)	Serial Data(NC)
12-19	B0~B7	Data bus
20-27	G0~G7	Data bus
28-35	R0~R7	Data bus
36	HSYNC	Line Synchronous Signal
37	VSYSNC	Frame Synchronous Signal
38	DOTCLK	Dot-clock signal and oscillator source
39-40	NC	-
41-42	VDD	Power supply for logic operation
43	Y2	Touch panel bottom side(NC)
44	X2	Touch panel left side(NC)
45-47	NC	-
48	IF2(NC)	Control the input data format(NC)
49	IF1(NC)	Control the input data format(NC)
50	IF0(NC)	Control the input data format(NC)
51	NC	-
52	DEN	Display enable signal
53-54	GND	System Ground

4. Absolute Maximum Rating

Item	Symbol	MIN	Typ	MAX	Unit	Remark
Supply Voltage	V _{DD}	-0.5	-	5.0	V	-
Operating Temperature	T _{OPR}	-20	-	70	°C	-
Storage Temperature	T _{STG}	-30	-	80	°C	

5. Timing characteristics

5.1 ELECTRICAL CHARACTERISTICS

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Supply Voltage		V_{cc}	3.0	3.3	3.6	V	
		IOVCC	1.65	3.0	3.3		
Input Signal Voltage	Low Leve	V_{IL}	GND	-	0.1x VDD	V	
	High Level	V_{IH}	0.8x VDD	-	VDD	V	
Output Signal Voltage	Low Leve	V_{OL}	0	-	0.2*VDD	V	
	High Level	V_{OH}	0.8*VDD	-	VDD	V	

5.2 LED Driving Conditions

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	-	mA	
Forward Voltage	V_F	18.6	19.2	19.8	V	
Backlight Power consumption	W_{BL}	-	0.384	-	W	
LED Lifetime		-	25000	-	Hrs	

Note 1: Each LED: $I_F = 20 \text{ mA}$, $V_F = 3.2 \pm 0.2 \text{ V}$.

Note 2: Optical performance should be evaluated at $T_a = 25^\circ \text{C}$ only.

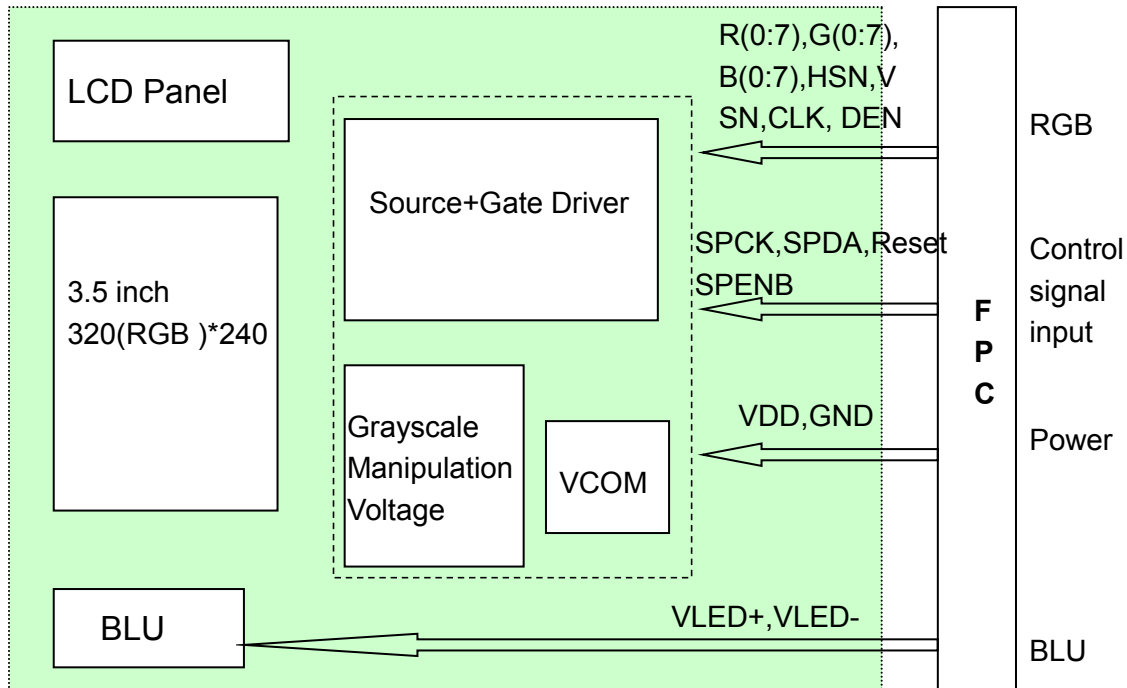
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life Time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.



CURRENT $I_F = 20 \text{ mA}$

Figure: LED connection of backlight(Constant Current)

5.3 Block Diagram



6 Interface Timing

6.1 AC Electrical Characteristics

Test Condition: (VDD=VDDP=3.3V, VDDA=5.0V, GND=GND A=GNDP=0V, TA= 25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
System Operation Timing						
VDD power source slew time	T _{POB}			1000	us	From 0V to 90% VDD
RSTB active pulse width	T _{RSTB}	40			us	VDD = 3.3V
Input Output Timing						
CLKIN clock time	T _{clk}	33.3/125	-	-	ns	Please refer to timing table(p.32)
HSD to CLKIN	T _{hc}	-	-	1	CLKIN	
HSD width	T _{hwh}	1	-	-	CLKIN	
VSD width	T _{vwh}	1	-	-	Th	
HSD period time	T _h	60	63.56	67	us	
VSD setup time	T _{vst}	8	-	-	ns	
VSD hold time	T _{vhd}	10	-	-	ns	
HSD setup time	T _{hst}	8	-	-	ns	
HSD hold time	T _{hhd}	10	-	-	ns	
Data set-up time	T _{dsu}	8	-	-	ns	DIN[23:0] to CLKIN
Data hold time	T _{dhd}	10	-	-	ns	DIN[23:0] to CLKIN
DEN setup time	T _{esd}	12	-	-	ns	DEN to CLKIN
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@CCIR601 / 8bit RGB HV mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs}	12	20	28	Th	@CCIR656 NTSC mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that CCIR_V to 1 st line data input	T _{vs} 17 25 33 Th					@CCIR656 PAL mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Time that VSD to 1 st line data input	T _{vs}	2	13	127	Th	@24bit RGB HV mode Control by HDLY[6:0] setting T _{vs} = HDLY[6:0]
Source output stable time 1	T _{st}	-	25	30	us	96% final, CL=30pF, RL=2K
Gate output stable time	T _{gst}	-	500	1000	ns	96% final, CL=40pF
VCOMOUT output stable time	T _{cst}	-	4	8	us	96% final, CL=33nF, RL=100ohm
3-wire serial communication AC timing						
Serial clock	T _{spck}	320	-	-	ns	
SPCK pulse duty		40	50	60	%	T _{ckh} / T _{spck}
Serial data setup time	T _{isu}	120	-	-	ns	
Serial data hold time	T _{ihd}	120	-	-	ns	
Serial clock high/low	T _{ckh/l}	120	-	-	ns	
Chip select distinguish	T _{cd}	1	-	-	us	
SPENB to VSD	T _{cv}	1	-	-	us	
SPENB input setup time	T _{eck}	150	-	-	ns	
SPENB input hold time	T _{cke}	150	-	-	ns	

6.2 DC Electrical Characteristics

Recommended Operating Range

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Supply Voltage	VDD	3.0	3.3	3.6	V	
IO Supply Voltage	VDDI	3.0	-	3.6	V	
Charge Pump Supply Voltage	PVDD	3.0	3.3	3.6	V	

DC Characteristics for Digital Circuit

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic-High Input Voltage	Vih	0.7VDDI	-	VDDI	V	
Logic-Low Input Voltage	Vil	DGND	-	0.3VDDI	V	
Logic-High Output Voltage	Voh	VDDI-0.4	-	VDDI	V	
Logic-Low Output Voltage	Vol	DGND	-	DGND+0.4	V	

DC Characteristics for Analog Circuit

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Positive High-Voltage Power	VGH	13	15	16.5	V	No Load@ FR=60Hz
Negative High-Voltage Power	VGL	-7	-10	-11	V	
Output Voltage Deviation	Vod	-	±35	±45	mV	
Standby Current	Isc	-		50	uA	
Operation Current	Ioc	-	20		mA	

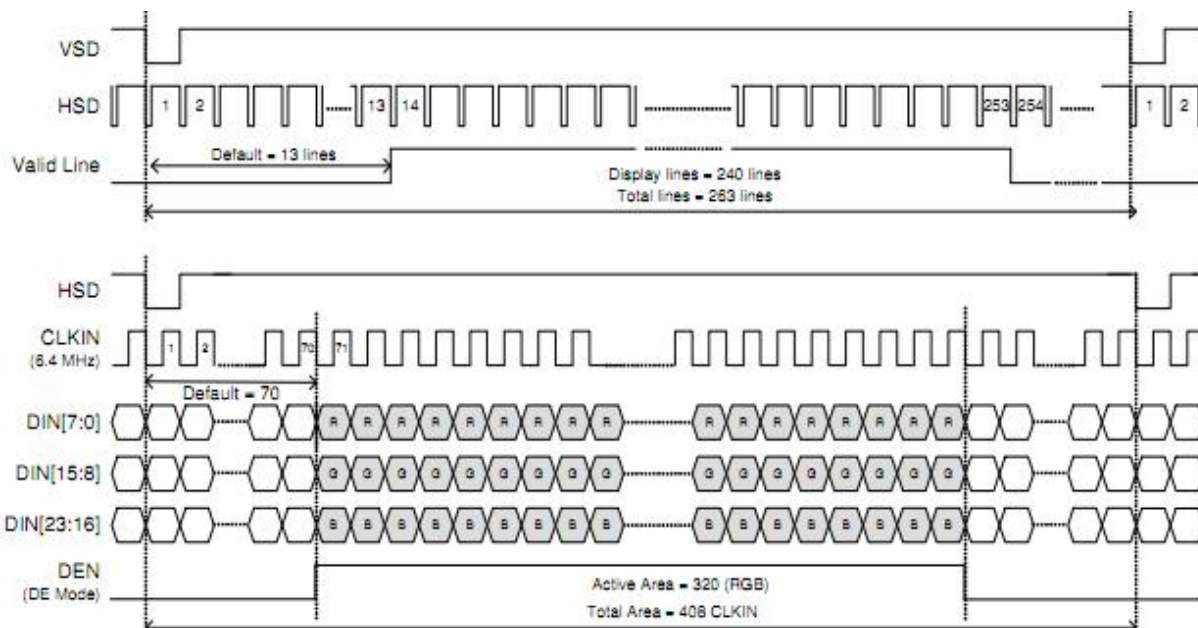
6.3 24 Bit RGB Mode

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

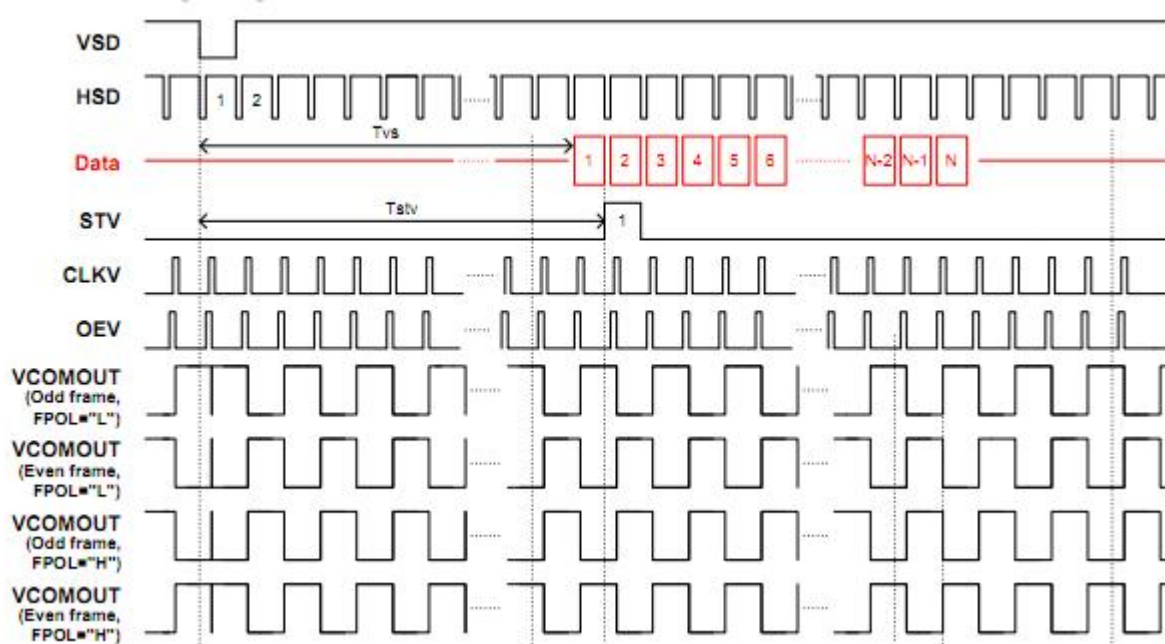
Parallel 24-bit RGB Input Timing Table						
Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK Frequency	Fclk	5	6	8	MHz	
DCLK Period	Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK
	Display Period	Thdisp		320		DCLK
	Back Porch	Thbp	3	43	43	DCLK SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK
	Pulse Width	Thw	2	4	43	DCLK
VSYNC	Period Time	Tv	244	260	289	HSYNC
	Display Period	Tvdisp		240		HSYNC
	Back Porch	Tvbp	2	12	12	HSYNC SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC
	Pulse Width	Tvw	2	4	12	HSYNC

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

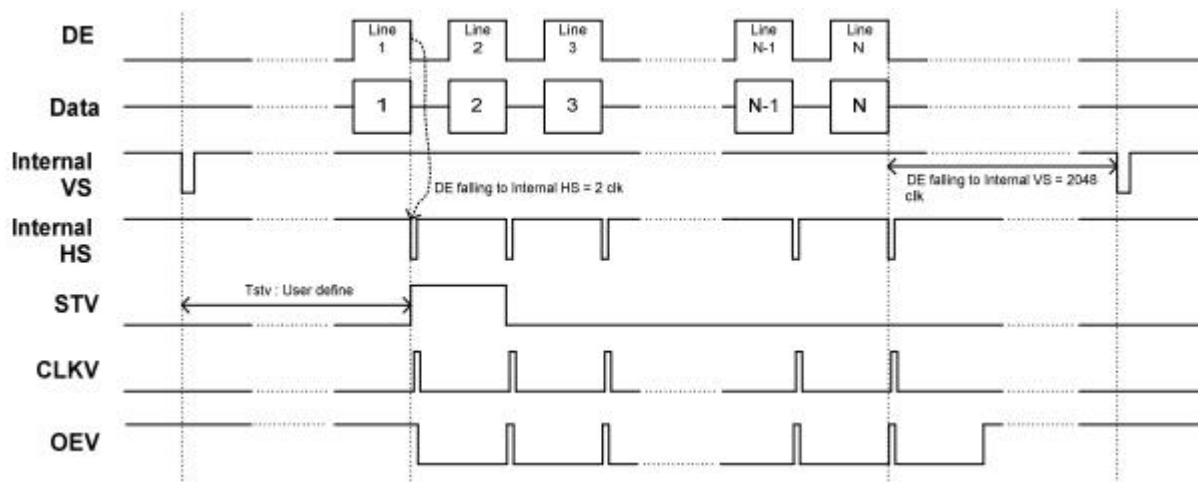
6.4 Input Data Timing



6.5 Vertical Timing Diagram (HV Mode)



6.6 Vertical Timing Diagram (DE Mode)



6.7 3-Wire Serial Port Interface

(TBD)

7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	Note
Response time		Tr+Tf	-	-	50	80	ms	FIG.1	Note4
Contrast Ratio		CR		-	700	-	-	FIG.2	Note1
Surface luminance		LV	$\theta = 0^\circ$	-	350	-	cd/m2	FIG.2	Note2
Luminance uniformity		Yu	$\theta = 0^\circ$	75	80	-	%	FIG.2	Note3
NTSC		-	$\theta = 0^\circ$	-	50	-	%	FIG.2	Note5
Viewing angle		θ Cr>10	θ_T	-	80	-	deg	FIG.3	Note6
			θ_B	-	80	-	deg	FIG.3	
			θ_L	-	80	-	deg	FIG.3	
			θ_R	-	80	-	deg	FIG.3	
Chromaticity	Red	R _X	$\theta = 0^\circ$ $\phi = 0^\circ$ Ta=25°	TBD	TBD	TBD	-	FIG.2 CIE1931	Note5
		R _Y		TBD	TBD	TBD	-		
	Green	G _X		TBD	TBD	TBD	-		
		G _Y		TBD	TBD	TBD	-		
	Blue	B _X		TBD	TBD	TBD	-		
		B _Y		TBD	TBD	TBD	-		
	White	W _X		TBD	TBD	TBD	-		
		W _Y		TBD	TBD	TBD	-		

Note1. Definition of contrast ratio

Contrast ratio(Cr) is defined mathematically by the following formula. For more information see FIG.2.

$$\text{Contrast ratio} = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

For contrast ratio, Surface Luminance, Luminance uniformity and CIE,the testing data is base on TOPCON' s BM-5 or BM-7 photo detector or compatible.

Note2. Definition of surface luminance.

Surface luminance is the luminance with all pixels displaying white. For more information see FIG.2.

Lv = Average Surface Luminance with all white pixels(P1,P2,P3,,Pn)

Note3. Definition of luminance uniformity

The luminance uniformity in surface luminance is determined by measuring luminance at each test position 1 through n, and then dividing the maximum luminance of n points luminance by minimum luminance of n points luminance.For more information see FIG.2.

$$YU = \frac{\text{Minimum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}{\text{Maximum surface luminance with all white pixels (P1,P2,P3,.....,Pn)}}$$

Note4. 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_r) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_f) is the time between photo detector output intensity changed from 10% to 90%.

For additional information see FIG1.

Note5. Definition of color chromaticity (CIE1931)

CIE (x,y) chromaticity, The x,y value is determined by screen active area center position P5. For more information see FIG.2.

Note6. Definition of viewing angle

Viewing angle is the angle at which the contrast ratio is greater than 10. Angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG.3.

For viewing angle and response time testing, the testing data is base on Autronic-Melchers' s ConoScope or DMS series Instruments or compatible.

FIG.1. The definition of response Time

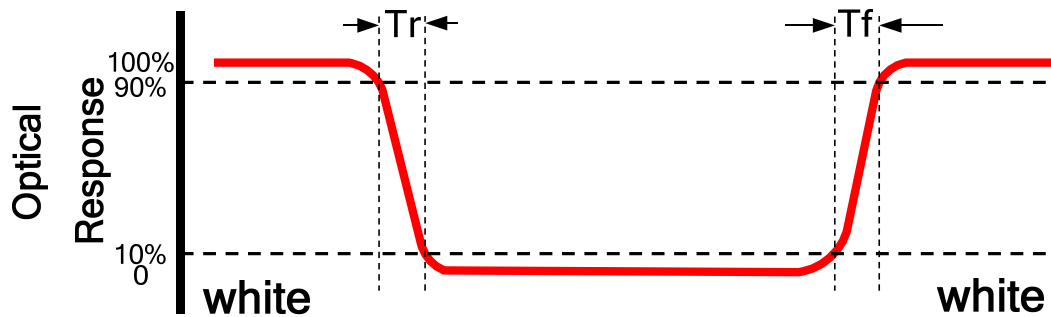


FIG.2. Measuring method for contrast ratio, surface luminance,

luminance uniformity, CIE (x,y) chromaticity

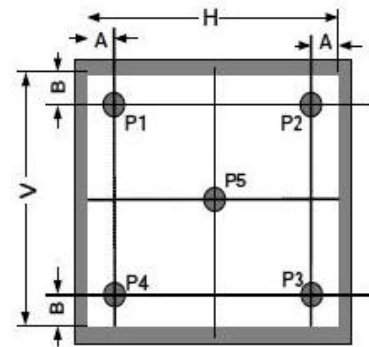
Size : $S \leq 5"$ (see Figure a) A : 5 mm B : 5 mm

H, V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure a.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).



Size : $5'' < S \leq 12.3''$ (see Figure b) H,V : Active area

Light spot size $\varnothing = 5\text{mm}$ (BM-5) or $\varnothing = 7.7\text{mm}$ (BM-7) 50cm distance or compatible distance from the LCD surface to detector lens.

test spot position : see Figure b.

measurement instrument : TOPCON's luminance meter BM-5 or BM-7 or compatible (see Figure c).

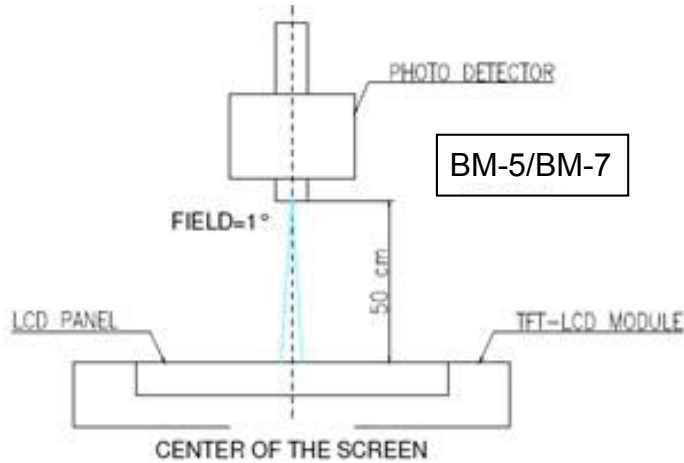


Figure c

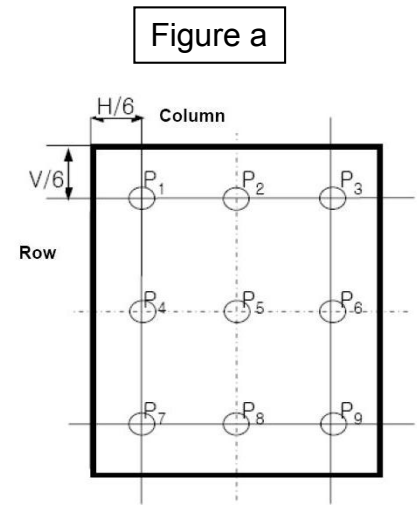
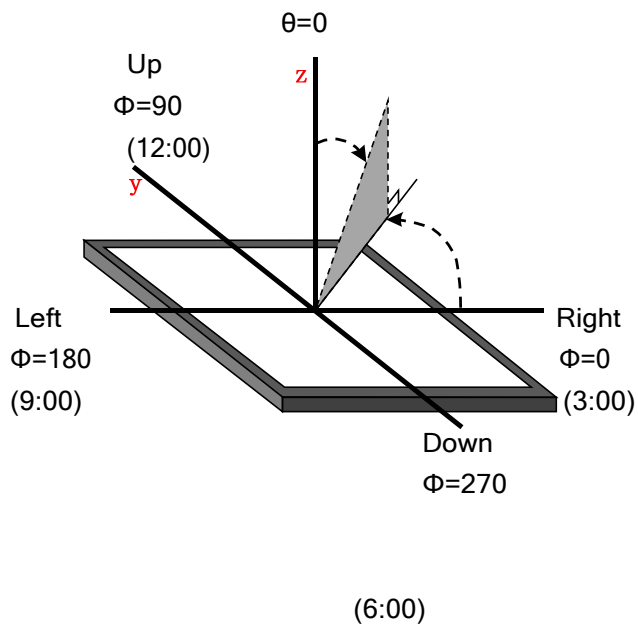


Figure b

FIG.3.The definition of viewing angle

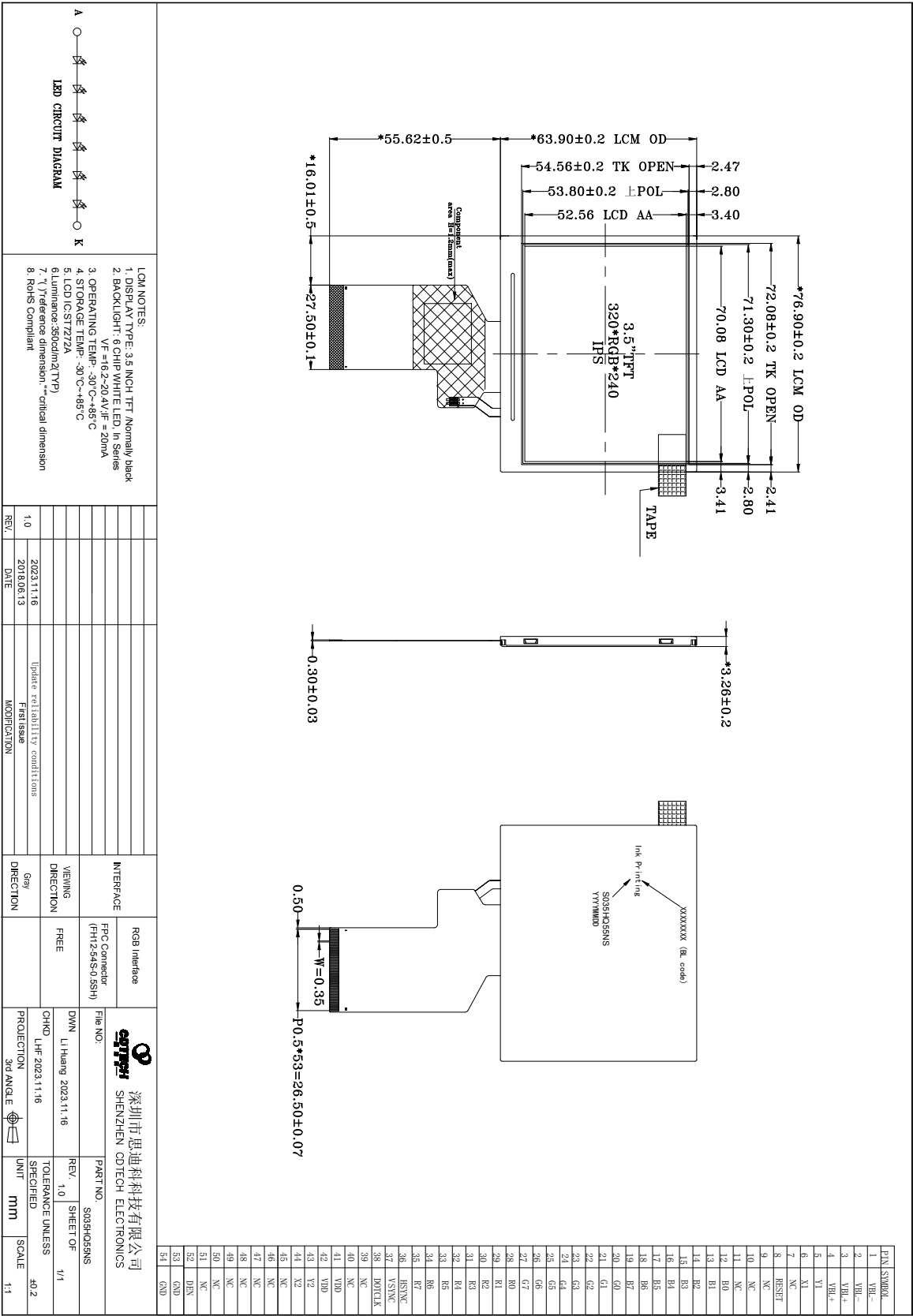


8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +85℃, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -30℃, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +85℃, 120hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃, 120hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max,120 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +85℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Discharge (Operation) Static	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15℃ ~ 35℃, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 80 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

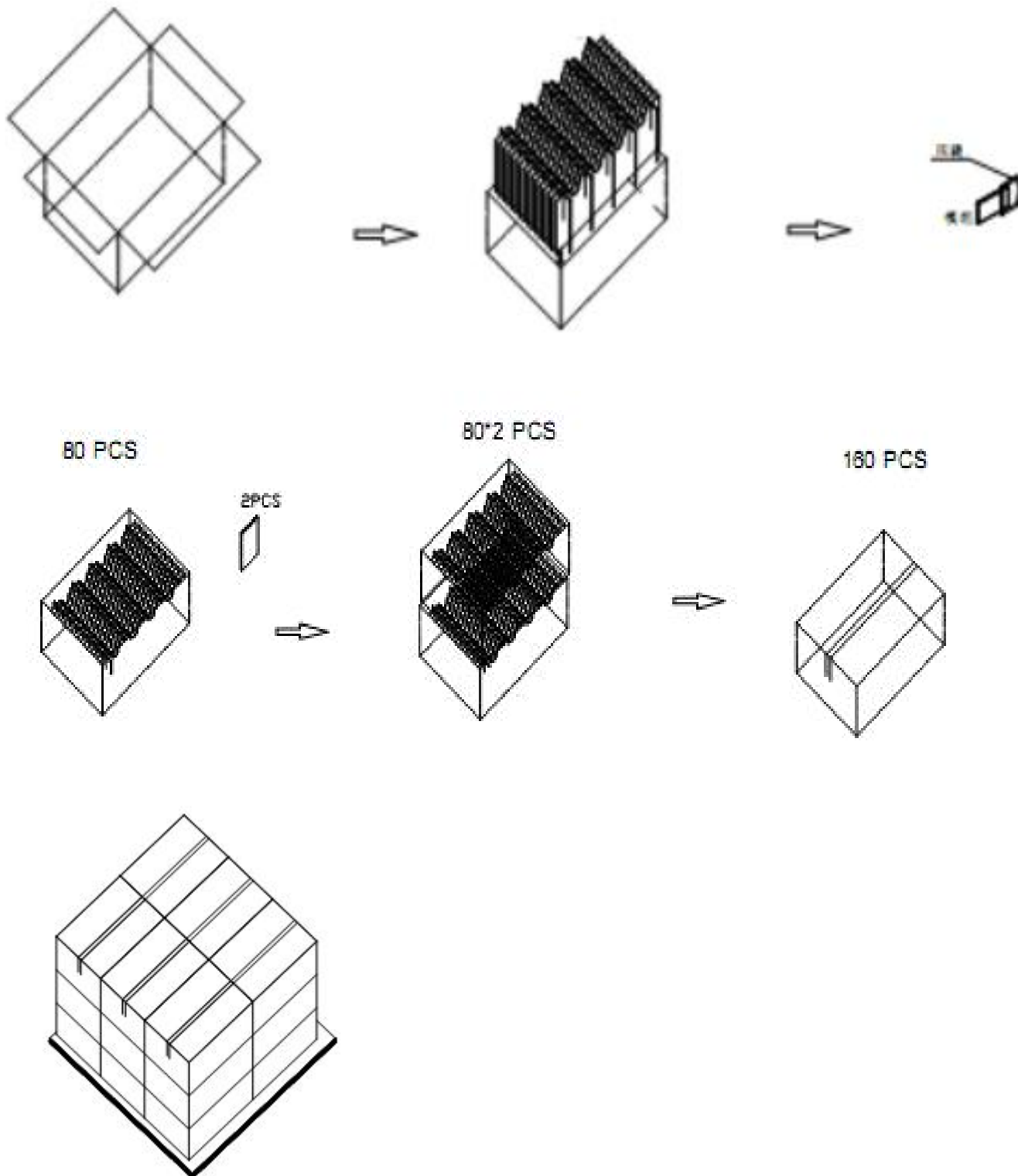
Note:1. Ts is the temperature of panel's surface.
2. Ta is the ambient temperature of sample.
3. The size of sample is 5pcs.

9 MechanicalDrawing



10 Packing

Packing Method



11 . Precautions for Use of LCD modules

11.1 Handling Precautions

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

11.1.2. 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.

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

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

11.1.5. 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
- Ketene
- Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

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

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

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

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

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

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

11.2 Storage Precautions

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

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

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

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

11.3 Transportation Precautions

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