MAXEN ELECTRONICS LIMITED

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SPECIFICATION

MX-043WR40BFM-N44

For Customer's Acceptance:

Approved By	Comment

PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

1. Table of Contents

2. Revision Record

Date	Rev.No.	Page	Revision Items	Prepared
2024.01.03	A		Thefirstrelease	DH

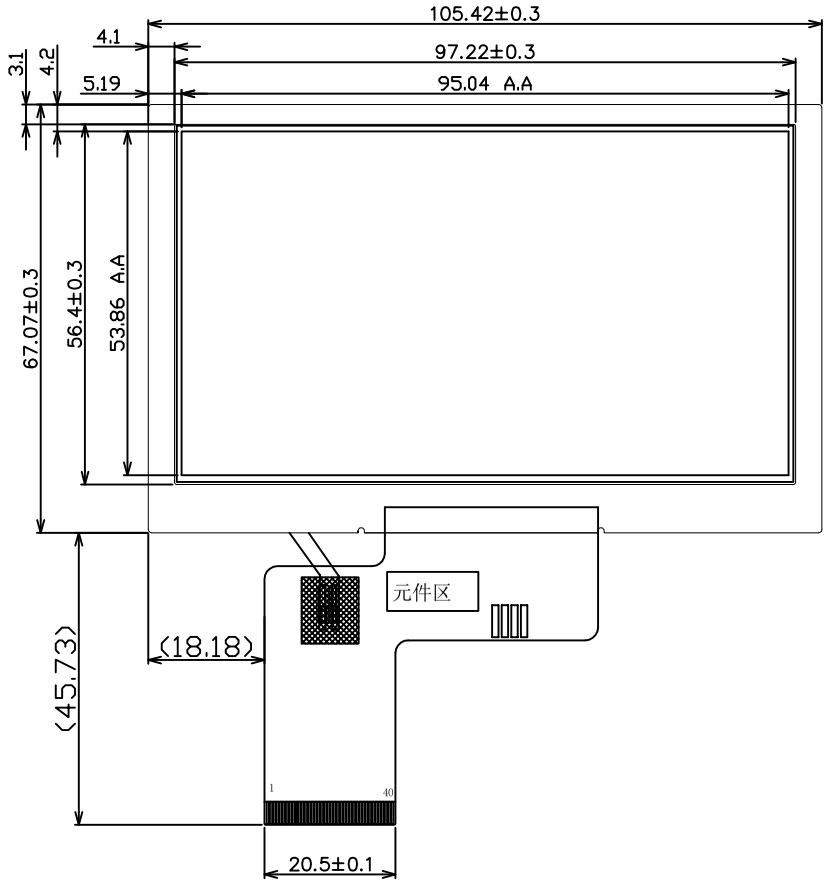
3. General Specifications

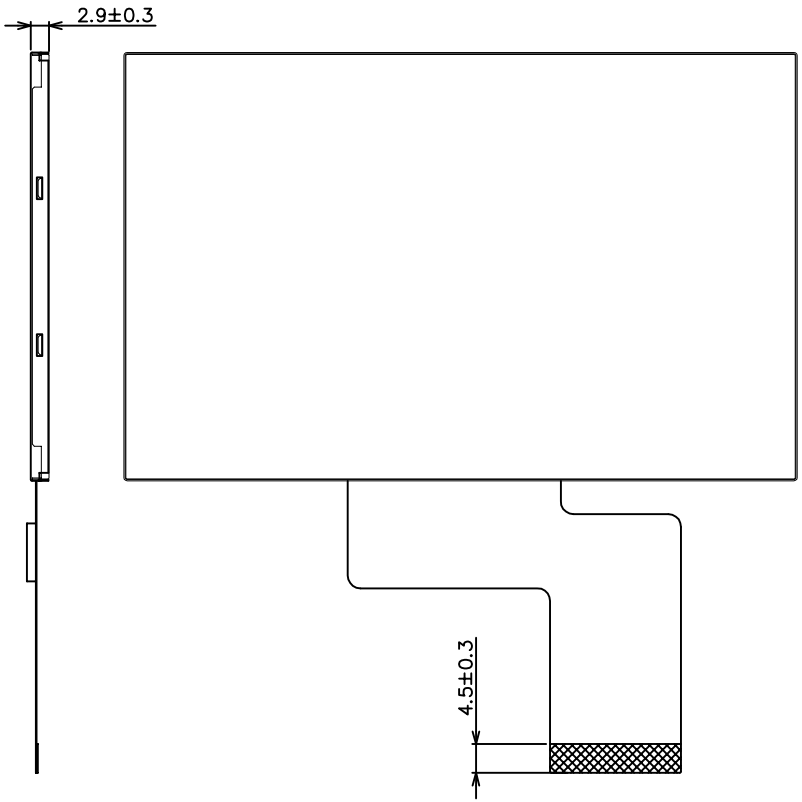
MX-043WR40BFM-N44 is a TFT-LCD module.It is composed of aTFT-LCD panel,driverIC, FPC, a back light unit. The 4.3′′ display area contains 800 x 480 pixels and can display up to 16.7M colors. This product accords with RoHS environmental criterion.

Item	Contents	Unit	Note
LCD Type	Normally Black,Transmissive	-	
Display color	16.7M		1
Viewing Direction	ALL	O’ Clock	
Operating temperature	-30~+85	℃	
Storagetemperature□	-30~+85	℃	
Modulesize	105.50(W)×67.20(H)×3.00(T)	mm	
ActiveArea□	95.04(W)×53.858(H)	mm	
Number of Dots	800×RGB×480	dots	
Backlight	10-LED		
Data Transfer	RGB interface	-	

Note 1: Color tune is slightly changed by temperature and driving voltage.
Note 2: Without FPC and Solder.

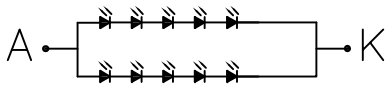
REV	DESCRIPTION	DATE
A	初版	2019.08.23





Specification:

1). Display mode: 16.7M, TFT/Transmissive
2). Operating temp.:
Storage temp.:
3). Backlight: 10hip White LED
4). Dimensions with mark "*" are important, with mark "()" are referenced



LED 电路图
Vf 15.0/TYP
IF=20*2=40mA(定电流测试)

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TITLE:	ASSEMBLY	DO NOT SCALE THIS DRAWING, GENERAL TOLERANCE:±0.2			
MODULE NO.:	MX-043WR40BFM-N44			REV	A
DRAWN BY:		DATE:		PROJECTION:	
CHECKED BY:		DATE:		SCALE:N.T.S	UNIT: mm
APPROVED BY:		DATE:		SHEET: 1 OF 1	

5. Absolute Maximum Ratings(Ta=25℃)

5.1 Electrical Absolute Maximum Ratings.(Vss=0V ,Ta=25℃)

Parameter	Symbol	Min	Typ	Max	Unit	Note
Power supply	VDD	-0.3	-	3.96	V	
	AVDD	-0.5	-	14.85	V	
	VGL	-	-10.5	-	V	
	VGH	-	13	-	V	
Operating Temperature	TOP	-30	-	85	°C	
Storage Temperature	TST	-30	-	85	°C	

1. If the module is above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.
2. VDD>V_{SS} must be maintained.
3. Please be sure users are grounded when handing LCD Module.

5.2 Environmental Absolute Maximum Ratings.

Item	Storage		Operating		Note
	MIN.	MAX.	MIN.	MAX.	
Ambient Temperature	-30℃	85℃	-30℃	85℃	1,2
Humidity	-	-	-	-	3

1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
   The phenomenon is reversible.
3. Ta<=40℃:85%RH MAX.
   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

6. Electrical Specifications and Timing Characteristics

6.1 Electrical characteristics(Vss=0V ,Ta=25℃)

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Note
Power supply		VDD	Ta=25℃	2.8	3.3	3.6	V	
Input voltage	'H'	V_{IH}	VDD=3.3V	0.7VDD	-	VDD	V	
	'L'	V_{IL}	VDD=3.3V	0	-	0.3VDD	V	
Current Consumption		I_{CC1}	Normal mode	-	-	-	mA	2
		I_{CC2}	Sleep mode	-	0.03	0.09	mA	2

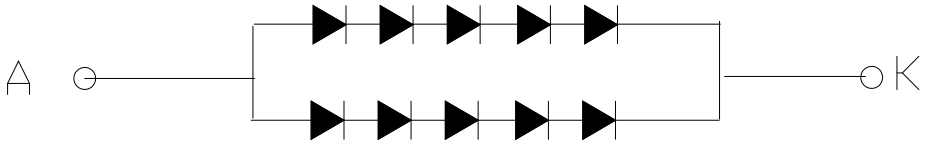
Note:

1:When an optimum contrast is obtained in transmissive mode.

2: Tested in 1×1 chessboard pattern.

6.2 LED backlight specification(VSS=0V ,Ta=25℃)

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
Supplyvoltage			-	15	-	V	
Supply current	I_f	-	-	40	-	MA	
LED life time	-	-	30000	-	-	Hrs	



Note:

1: $V_{LED}=V_{LED}(+)-V_{LED}(-)$.

2:The current of LED is 20mA.
A LED drive in constant current mode is recommended.

6.3 Interface signals

Pin	Symbol	Description.
1	LED_K	Backlight LED Ground
2	LED_A	Backlight LED Power
3	GND	GND
4	VDD	Power supply
5~12	R0-R7	Red data bus
13~20	G0-G7	Green data bus
21~28	B0-B7	Blue data bus
29	GND	GND
30	PCLK	Data clock
31	DISP	Standby mode select pin
32	HSYNC	Line SYNC signal
33	VSYNC	Frame SYNC signal
34	DE	Data Enable Input
35	NC	NC
36	GND	GND
37	X1	Touch Panel Control Pin
38	Y1	Touch Panel Control Pin
39	X2	Touch Panel Control Pin
40	Y2	Touch Panel Control Pin

7. Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	-	500	-	Cd/m²	1
Uniformity	⊿Bp			75	80	-	%	1,2
Viewing Angle	3:00		Cr≥10	70	80	-	Deg	3
	6:00			70	80	-		
	9:00			70	80	-		
	12:00			70	80	-		
Contrast Ratio	Cr		θ=0° Φ=0°		1200			
Response Time	T_r+T_f				30	40	ms	5
Color of CIE Coordinate	W	x	θ=0° Φ=0°	-	0.311	-	-	1,6
		y		-	0.338	-	-	
		Y		-	-	-	-	
	R	x		-	-	-	-	
		y		-	-	-	-	
		Y		-	-	-	-	
	G	x		-	-	-	-	
		y		-	-		-	
		Y		-	-	-	-	
	B	x		-	-	-	-	
		y		-	-	-	-	
		Y		-	-	-	-	
NTSC Ratio					50		%	

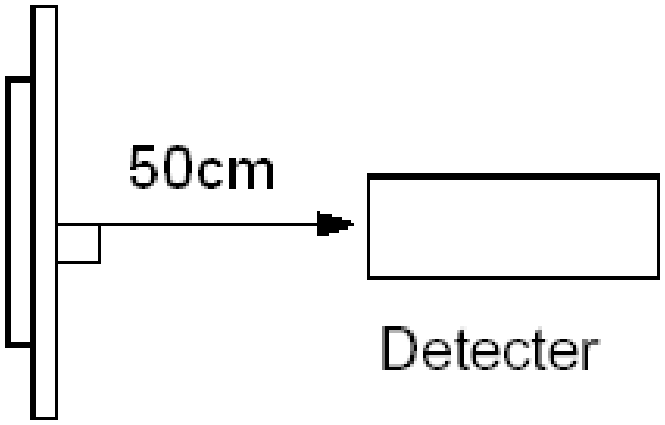
Note：The parameter is slightly changed by temperature, driving voltage and materiel

Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white. The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)

Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.

Measured value at the center point of LCD panel after more than 5 minutes while backlight turning on.

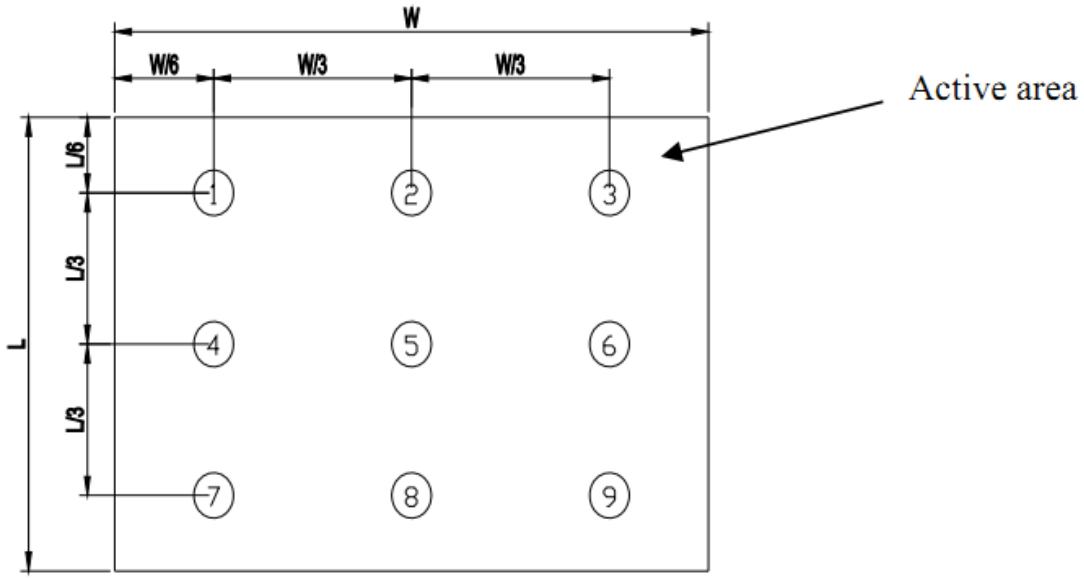


Note 2: The luminance uniformity is calculated by using following formula.

⊿Bp = Bp (Min.) / Bp (Max.)×100 (%)

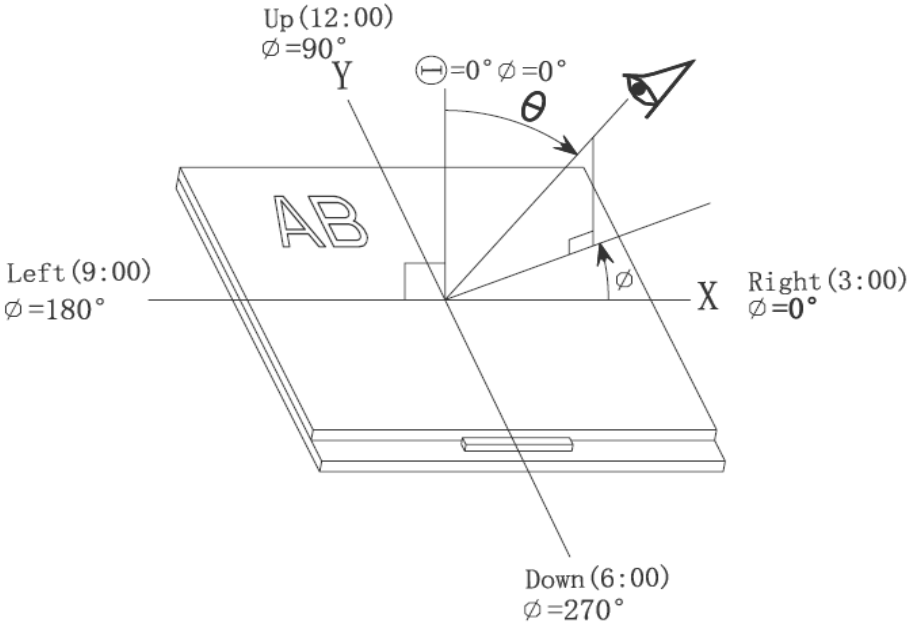
Bp (Max.) = Maximum brightness in 9 measured spots

Bp (Min.) = Minimum brightness in 9 measured spots.

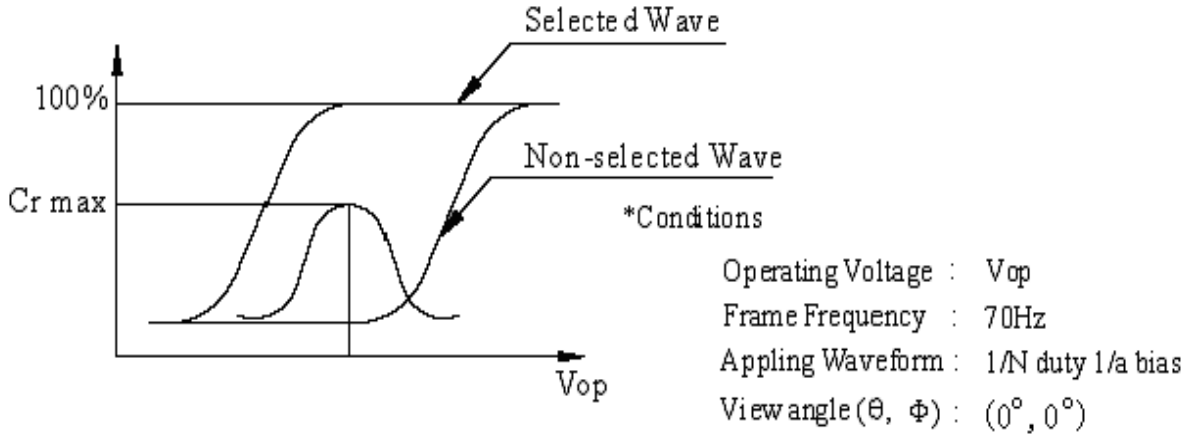


Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ



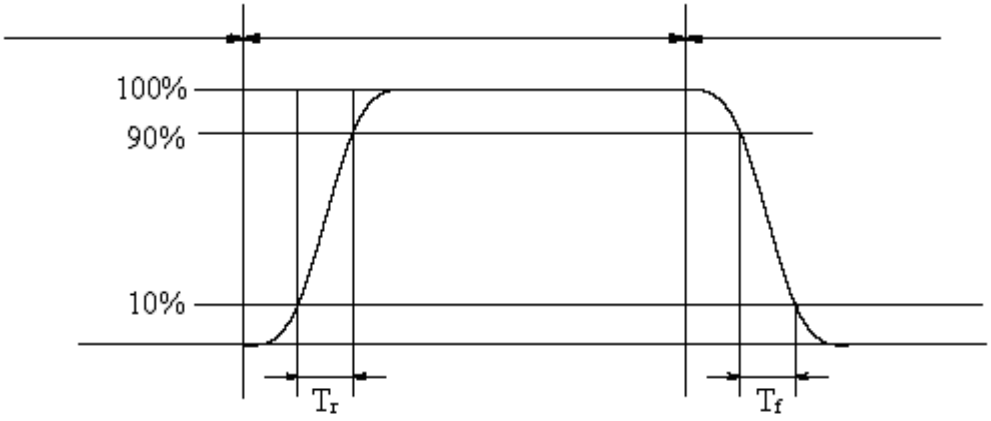
Note 4: Definition of contrast ratio.(Test LCD using DMS501)



$$Contrast\ ratio(Cr) = \frac{Brightness\ of\ selected\ dots}{Brightness\ of\ non-selected\ dots}$$

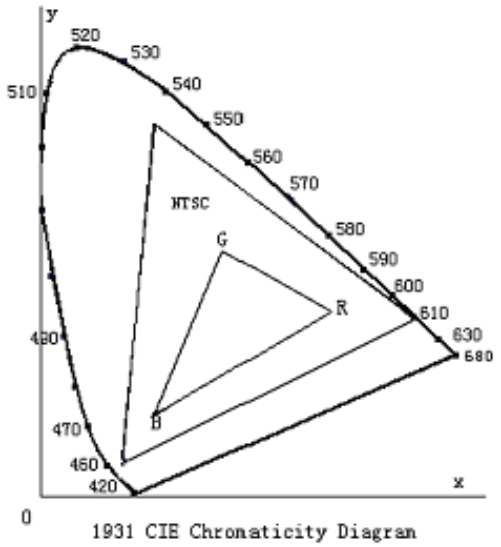
Note 5: Definition of Response time. (Test LCD using DMS501):

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.



The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

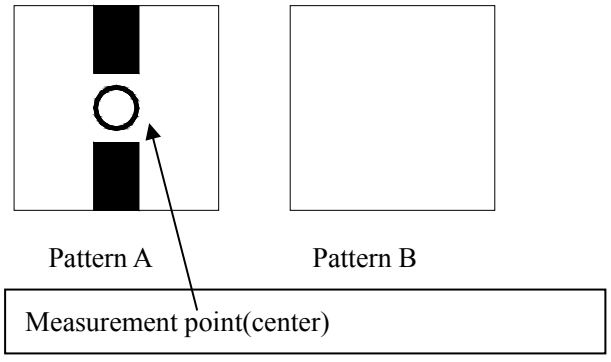


Color gamut:

$$S = \frac{\textbf{area of RGB triangle}}{\textbf{area of NTSC triangle}} \times 100\%$$

Note 7: Definition of cross talk.

Cross talk ratio(%)=|pattern A Brightness-pattern B Brightness|/pattern A Brightness*100



Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	85℃±2℃ 96H Restore 2H at 25℃ Power off	1. After testing, cosmetic and electrical defects should not happen. 2. Total current consumption should not be more than twice of initial value.
2	Low Temperature Storage	-30℃±2℃ 96H Restore 2H at 25℃ Power off	
3	High Temperature Operation	85℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-30℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	-30℃←——→85℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s^2, 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s^2,11ms	
9	ESD Test	Air discharge:±8KV, Contact discharge:±4KV	

Note: Operation: Supply 3.3V for logic system.

The inspection terms after reliability test, as below

ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

Finished product inspection standards

Newly formulated 2022.9.8

1. Purpose

Provide a basis for judging the appearance quality and functional inspection of Touch Display products, as well as the standards for product acceptance. Define product CR, MA, MI, to ensure that the appearance, structure, identification, packaging, and general performance of the entire product and its components meet the specification requirements.

2. Scope of Application

2.1 This inspection standard is applicable to the inspection of full fit products.

3. Rights and Responsibilities

3.1 Quality Control Department: Responsible for the execution and judgment of finished product inspection, feed back of abnormal information and verification of the effectiveness of improvement measures.

3.2 Technical Project Department: Assist the Quality Control Department in analyzing and handling anomalies found during inspections, and improve normative documents.

3.3 Manufacturing Department: Responsible for the full testing of product functions and self inspection of appearance, as well as the discovery and feed back of finished product quality issues.

4. Definition

Nothing

5. Inspection method

5.1 Inspection plan

5.1.1 Ifthe customer has inspection plan requirements and standards. the inspection shall be carried out according to the customer's requirements. If the customer does not provide inspection standards. the inspection shall be carried out according to our company's standards

5.1.2 Before the product is shipped. personnel from the Quality Control Department shall conduct a random inspection according to the GB/T2828.1-2012 normal inspection sampling plan, with Level II of general inspection level. AQL:CR=0;MA=0.4;MI=0.65. Vehicle Mounted products are randomly inspected by personnel from the quality control department according to C=0 and AQL=0.4.

5.1.3 Defect categories

CR: The product has defects that pose a threat to the personal and property safety of users.

MA: Functional defects that affect normal use, performance parameters that do not meet design specifications and national standards, incorrect materials, missing components, accessories and main markings, excessive irrelevant markings, and other unrelated items that may affect product performance, packaging defects that may affect product image, and serious defects in structure and appearance that are difficult for customers to accept.

MI: Any defect other than a fatal or serious defect that does not affect the use of the product.

Acceptable defects: Acceptable defects for reference during factory inspection.

5.2 Sample disposal

5.2.1 If the sampled products are Qualified, they should be placed together with the batch of products to handle the ware housing procedures

5.2.2 If the sampled samples are unqualified products in the qualified batch, they shall be processed according to the unqualified product processing process.

5.3 Appearance inspection conditions

5.3.1 Basic conditions for examiners: Normal naked eye (or corrected vision), single eye vision not less than 1.0 (no color blindness).

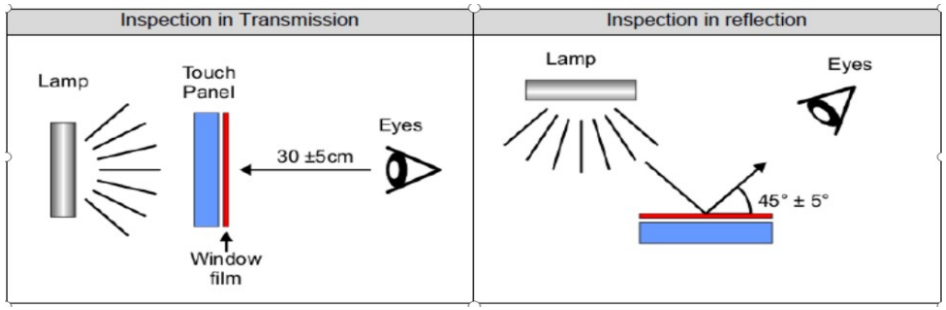
5.3.2 Temperature: 24 ± 3, Humidity: 45% RH-75% RH.

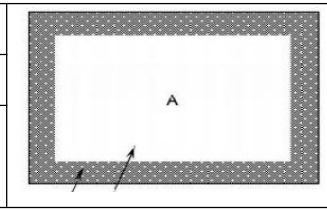
5.3.3 Time: Within 5-10 seconds, (i.e. when inspecting a certain area, the visual retention time should not exceed 3-5 seconds): Among them, the product window area should not be less than 5 seconds.

5.3.4 Angle: Rotate vertically by 45 ± 5 ° and inspect in order from top to bottom and from left to right.

5.3.5 Display area: Area A: Generally refers to the display area that can be seen by customers during installation. Zone B: Generally refers to the ink zone.

5.3.6 Lighting: Appearance inspection: The bottom of the product is set off with black and white as the background, and the distance between the person and the object being tested is 30 ± 5CM. Illumination level 1800 ± 200LUX (light source above inspector) illuminated: 100 ± 20LUX.



Area	Spec	
A	Work area	
B	Margin	

5.4 Inspection precautions

5.4.1 Inspectors must wear fingertips and electrostatic bracelets.

5.4.2 Place the inspected product in front of the inspector and carefully hold the edge of the product with both hands, avoiding bending.

5.4.3.W=Width、L=Length、H=High、T=Thickness、D=diameter、DS=distance

5.5 Sampling Plan

5.5.1 Normal Single General Type II Sampling Plan

Sample size code

Lot size	8	15	25	50	90	150	280	500	1200	3200	10000	35000	150000	500000	以上 More than
General Type II	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q

Normal Single Sampling Plan

size code	Sample size	0.010 AcRe	0.015 AcRe	0.025 AcRe	0.040 AcRe	0.065 AcRe	0.10 AcRe	0.15 AcRe	0.25 AcRe	0.4 AcRe	0.65 AcRe	1.0 AcRe	1.5 AcRe	2.5 AcRe	4.0 AcRe	6.5 AcRe	10 AcRe	15 AcRe	25 AcRe	40 AcRe	65 AcRe	100 AcRe	150 AcRe	250 AcRe	400 AcRe	650 AcRe	1000 AcRe
A	2	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↓	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	3031
B	3	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	3031	4445
C	5	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	3031	4445	↑
D	8	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	3031	4445	↑	↑
E	13	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	3031	4445	↑	↑	↑
F	20	↓	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑
G	32	↓	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑
H	50	↓	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑
J	80	↓	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑
K	125	↓	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
L	200	↓	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
M	315	↓	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
N	500	↓	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
P	800	↓	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Q	1250	0 1	↑	↓	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
R	2000	↑	↑	1 2	2 3	3 4	5 6	7 8	1011	1415	2122	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑

↓ Use the sampling plan below the arrow, and if the sample size is equal to or exceeds the batch size, perform a 100% inspection. ↑ Use the sampling plan above the arrow.

5.5.2 C=0 Sampling Plan

Lot size	.010	.015	.025	.040	.065	.10	.15	.25	.40	.65	1.0	1.5	2.5	4.0	6.5	10.0
8	*	*	*	*	*	*	*	*	*	*	*	*	5	3	2	2
15	*	*	*	*	*	*	*	*	*	*	13	8	5	3	2	2
25	*	*	*	*	*	*	*	*	*	20	13	8	5	3	3	2
50	*	*	*	*	*	*	*	*	32	20	13	8	5	5	5	3
90	*	*	*	*	*	*	80	50	32	20	13	8	7	6	5	4
150	*	*	*	*	*	125	80	50	32	20	13	12	11	7	6	5
280	*	*	*	*	200	125	80	50	32	20	20	19	13	10	7	6
500	*	*	*	315	200	125	80	50	48	47	29	21	16	11	9	7
1200	*	800	500	315	200	125	80	75	73	47	34	27	19	15	11	8
3200	1250	800	500	315	200	125	120	116	73	53	42	35	23	18	13	9
10，000	1250	800	500	315	200	192	189	116	86	68	50	38	29	22	15	9
35，000	1250	800	500	315	300	294	189	135	108	77	60	46	35	29	15	9
150，000	1250	800	500	490	476	294	218	170	123	96	74	56	40	29	15	9
500，000	1250	800	750	715	476	345	270	200	156	119	90	64	40	29	15	9
and over	1250	1200	1112	715	556	435	303	244	189	143	102	64	40	29	15	9
Notes	1．“*”Indicates entire lot must be inspected															

6. Inspection standards

6.1 Appearance

NO	Inspection content		S≤7 Inch	7 Inch＜S≤15.6 Inch	15.6 Inch＜S≤32 Inch	Inspection tools	Defect categories
1	Foreign objects	A	D≤0.15，（Do not allow	D≤0.2，（Do not allow	D≤0.25，（Do not allow	visual /Film card	MI

	(white spots, foreign objects)		density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）		
		B	D≤0.25，（Do not allow density） 0.25 ＜ D≤0.35，N≤2，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3，（Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35，（Do not allow density） 0.35 ＜ D≤0.45，N≤2，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
2	Internal contamination	A	D≤0.15，（Do not allow density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	D≤0.2，（Do not allow density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25，（Do not allow density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）	visual /Film card	MI
		B	D≤0.25，（Do not allow density） 0.25 ＜ D≤0.35，N≤2，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3，（Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35，（Do not allow density） 0.35 ＜ D≤0.45，N≤2，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
3	Bubbles (upper bubble, attached	A	D≤0.1，（Do not allow density） 0.1＜D≤0.2，N≤1 0.2＜D，（Unqualified）	D≤0.15，（Do not allow density）0.15＜D≤0.25，N≤2 0.25＜D，（Unqualified）	D≤0.2，（Do not allow density） 0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	visual /Film card	MI

	bubble)						
		B	D≤0.2 ， （ Do not allow density） 0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25 ， （ Do not allow density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3 ， （ Do not allow density） 0.3＜D≤0.3，N≤2，DS≥15mm 0.3＜D，（Unqualified）	visual /Film card	MI
4	Black spots	A	D≤0.15 ， （ Do not allow density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	D≤0.2 ， （ Do not allow density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25 ， （ Do not allow density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）	visual /Film card	MI
		B	D≤0.25 ， （ Do not allow density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3 ， （ Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35 ， （ Do not allow density） 0.35 ＜ D≤0.45 ， N≤2 ，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
5	Scratches (scratches, stabs)	A	W≤0.02 ， （ Do not allow density） 0.02＜W≤0.03，L≤3，N≤2，DS≥15mm 0.03＜W≤0.05，L≤3，N≤1 0.05 ＜ W ， 3 ＜ L ，	W≤0.03 ， （ Do not allow density） 0.03＜W≤0.05，L≤5，N≤2，DS≥15mm 0.05＜W≤0.08，L≤5，N≤1 0.08 ＜ W ， 5 ＜ L ，	W≤0.03 ， （ Do not allow density） 0.03＜W≤0.05，L≤5，N≤2，DS≥15mm 0.05＜W≤0.08，L≤5，N≤1 0.08 ＜ W ， 5 ＜ L ，	visual /Film card	MI

			（Unqualified）	（Unqualified）	（Unqualified）		
		B	W≤0.03，（Do not allow density） 0.03＜W≤0.05，L≤5，N≤2，DS≥15mm 0.05＜W≤0.08，L≤5，N≤1 0.08 ＜ W ， 5 ＜ L ，（Unqualified）	W≤0.03，（Do not allow density） 0.03＜W≤0.05，L≤5，N≤3，DS≥15mm 0.05＜W≤0.08，L≤5，N≤2，DS≥15mm 0.08＜W≤0.1，L≤5，N≤1 0.1＜W，5＜L，（Unqualified）	W≤0.03，（Do not allow density） 0.03＜W≤0.05，L≤5，N≤3，DS≥15mm 0.05＜W≤0.08，L≤5，N≤2，DS≥15mm 0.08＜W≤0.1，L≤5，N≤1 0.1＜W，5＜L，（Unqualified）	visual /Film card	MI
6	Wool	A	Nothing	Straight lines following A standard, curve is not allowed,AA area is not allowed.	W≤0.05mm,L≤5mm，N≤1 or invisible after applying film	visual /Film card	MI
		B	Straight lines following A standard, curve is not allowed,AA area is not allowed.	W≤0.05mm,L≤5mm， N≤1or invisible after applying film	W≤0.08mm,L≤5mm， N≤1or invisible after applying film	visual /Film card	MI
7	Damage (damage, screen breakage, cracking, missing, liquid leakage)		Nothing	0.10mm ＜ W≤0.3mm ，L≤3.0mm；allow 1pc	0.2mm ＜ W≤0.4mm ，L≤3.0mm；allow 1pc	visua	MI
8	Function (function,					目	MA

	broken cable, buckle, broken cable, FPC, terminal)	Nothing	Nothing	Nothing	visual	
9	Printing (printing, sanding, highlights, transparency, hollowing, watermarks, uneven ink, AG, bumps)	D≤0.15，N≤1，DS≥15mm	D≤0.25，N≤2，DS≥15mm	D≤0.35，N≤3，DS≥15mm	visual /Film card	MI
10	Deviation (deviation, edge leakage)	Nothing	Nothing	Nothing	visual /Film card	MI
11	On upside down	Nothing	Nothing	Nothing	visual /Film card	MA
12	AG	Nothing	Nothing	Nothing	visual /Film card	MI

6.2 Electrical measurement function

NO	Inspection content		S≤7 Inch	7 Inch＜S≤15.6 Inch	15.6 Inch＜S≤32 Inch	Inspection tools	Defect categories
1	Foreign objects	A	D≤0.15，（Do not allow density）	D≤0.2，（Do not allow density）0.2＜D≤0.3，N≤2	D≤0.25，（Do not allow density）	visual /Film card	MI

			0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	0.3＜D，（Unqualified）	0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）		
		B	D≤0.25，（Do not allow density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3 ，（Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35 ，（Do not allow density） 0.35 ＜ D≤0.45 ， N≤2 ，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
2	Internal contamination	A	D≤0.15 ，（Do not allow density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	D≤0.2 ，（Do not allow density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25 ，（Do not allow density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）	visual /Film card	MI
		B	D≤0.25 ，（Do not allow density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3 ，（Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35 ，（Do not allow density） 0.35 ＜ D≤0.45 ， N≤2 ，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
3	white spots	A	D≤0.15 ，（Do not allow density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	D≤0.2 ，（Do not allow density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25 ，（Do not allow density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）	visual /Film card	MI
		B	D≤0.25 ，（Do not allow	D≤0.3 ，（Do not allow	D≤0.35 ，（Do not allow	visual /Film	MI

			density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	density） 0.35 ＜ D≤0.45 ， N≤2 ，DS≥15mm 0.45＜D，（Unqualified）	card	
4	Color spots(Color spots 、 red spots、 black spots、 lights spots)	A	D≤0.15 ，（Do not allow density） 0.15＜D≤0.25，N≤1 0.25＜D，（Unqualified）	D≤0.2 ，（Do not allow density）0.2＜D≤0.3，N≤2 0.3＜D，（Unqualified）	D≤0.25 ，（Do not allow density） 0.25＜D≤0.35，N≤2 0.35＜D，（Unqualified）	visual /Film card	MI
		B	D≤0.25 ，（Do not allow density） 0.25 ＜ D≤0.35 ， N≤2 ，DS≥15mm 0.35＜D，（Unqualified）	D≤0.3 ，（Do not allow density） 0.3＜D≤0.4，N≤2，DS≥15mm 0.4＜D，（Unqualified）	D≤0.35 ，（Do not allow density） 0.35 ＜ D≤0.45 ， N≤2 ，DS≥15mm 0.45＜D，（Unqualified）	visual /Film card	MI
5	Wool	A	Nothing	Straight line according to A area scratches standard, bending is not allowed	W≤0.05mm,L≤5mm，N≤1（Or normal light is not visible after lamination）	visual /Film card	MI
		B	Straight line according to A area scratches standard, bending is not allowed	W≤0.05mm,L≤5mm，N≤1（Or normal light is not visible after lamination）	W≤0.08mm,L≤5mm，N≤1（Or normal light is not visible after lamination）	visual /Film card	MI

6	Abnormal display (abnormal display, black screen, flashing screen, grid, faulty circuit, flashing lines, spots)	Limit sample	Limit sample	Limit sample	visual /Film card	MA
7	Spot printing (white printing, red printing, blue printing, black printing)	Limit sample	Limit sample	Limit sample	visual /Film card	MI
8	Yellowing	Limit sample	Limit sample	Limit sample	visual /Film card	MI
9	lines	Limit sample	Limit sample	Limit sample	visual /Film card	MI
10	Stripe	Limit sample	Limit sample	Limit sample	visual /Film card	MI
11	Mura	ND filter 2% test	ND filter 5% test	ND filter 5% test	visual /Film card	MI
12	Lcm arch	Limit sample	Limit sample	Limit sample	visual /Film card	MI
13	Lamp eye (lamp eye, shadow, dim)	Limit sample	Limit sample	Limit sample	visual /Film card	MI

14	Light leakage	Limit sample	Limit sample	Limit sample	visual /Film card	MI
15	electrostatic	Limit sample	Limit sample	Limit sample	visual /Film card	MI
16	TP Function	Nothing	Nothing	Nothing	visual /Film card	MI
17	liquid leakage	Nothing	Nothing	Nothing	visual /Film card	MI

6.3 Dimensions

No	Inspection content	standards	Inspection tools
1	Long	±0.2MM	Vernier caliper
2	wide	±0.2MM	Vernier caliper
3	thick	±0.2MM	thickness gauge

6.4 General specifications

NO	Inspection area	Inspection content	Inspection methods	standards	Inspection tools	Defect categories
1	Key hole	Deformation、size	Vernier caliper	Drawing	visual	MI
2	Camera hole	Dirt,foreign materials ,stains	Perspective	Dirt, foreign objects, stains, and discolored spots are not allowed (or refer to the Limit sample)	visual	MI

3	Printing area	Printing	look at the front horizontally	There should be no blurry handwriting, broken lines, or misty ink areas	visual	MA
4	Electrical measurement	Electrical measurement	Electrical measurement function	No response, poor touch, disconnected	Test fixture	MA
5	Dimensions	Drawing Dimensions	Vernier caliper	Drawing	Vernier caliper	CR

6.5 Packaging

Inspection content	Inspection content	standards	Inspection tools	Defect categories
Packaging	Label, product name, specification, quantity	According to customer requirements and specifications	visual	MA
	Label location	Paste specified location	visual	MI
	The packaging box is deformed, damaged, or incomplete	Unqualified	visual	MI
	Product placement and packaging methods	Consistent with the requirements of the work instructions and product recognition documents	visual	MI
	Packaging box printing and filling content	Consistent with the requirements of the work instructions and product recognition documents	visual	MI

9. Precautions for Use of LCD Modules

9.1 Handling Precautions

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

9.1.2 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.

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

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

9.1.5 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

9.1.6 Do not attempt to disassemble the LCD Module.

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

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

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

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

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

d. 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.

9.2 Storage precautions

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

9.2.2 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℃

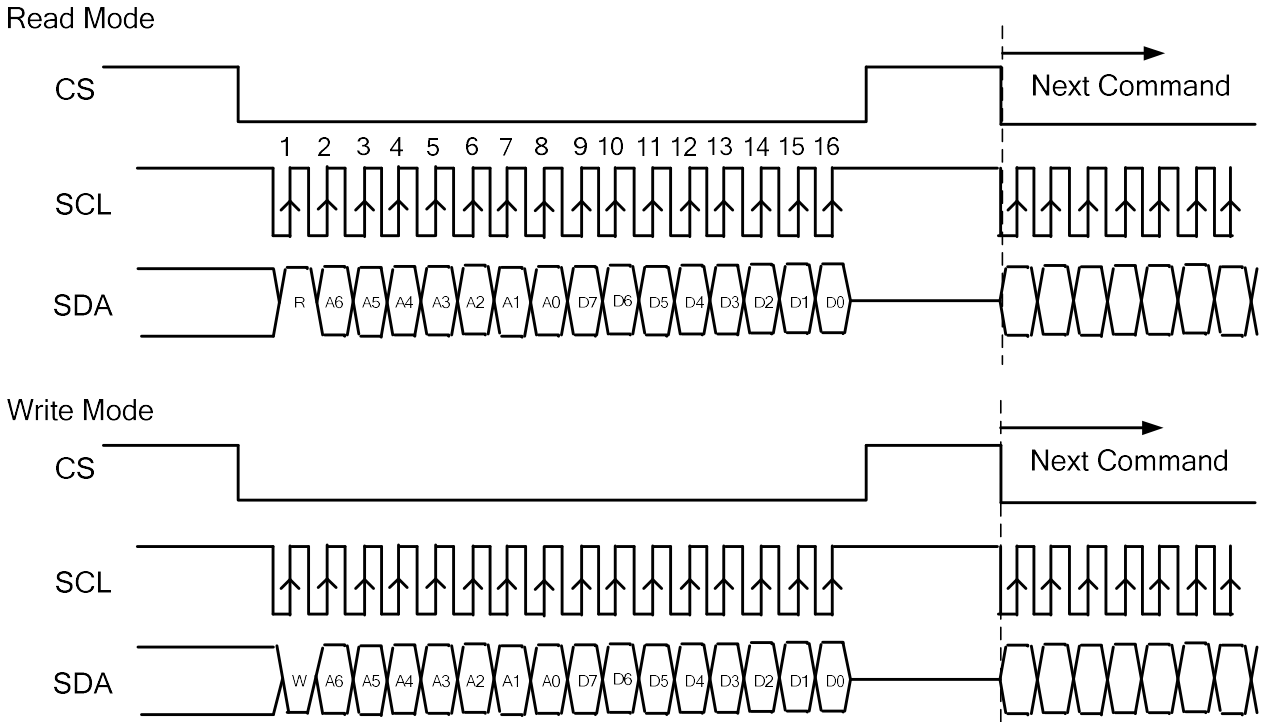
Relatively humidity: ≤80%

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

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

10 wire Serial Interface

R/W: Read/Write mode control bit.
R/W=1: Read mode
R/W=0: Write mode



a. Each serial command consists of 16 bits of data which is loaded one bit a time at the rising edge of serial clock SCL.

b. Command loading operation starts from the falling edge of CS and is completed at the next rising edge of CS.

c. The serial control block is operational after power on reset, but commands are established by the VSYNC signal. If command is transferred multiple times for the same register, the last command before the VSYNC signal is valid.

d. If less than 16 bits of SCL are input while CS is low, the transferred data is ignored.

e. If 16 bits or more of SCL are input while CS is low, the previous 16 bits of transferred data before then rising edge of CS pulse are valid data.

f. Serial block operates with the SCL clock

g. Serial data can be accepted in the power save mode.

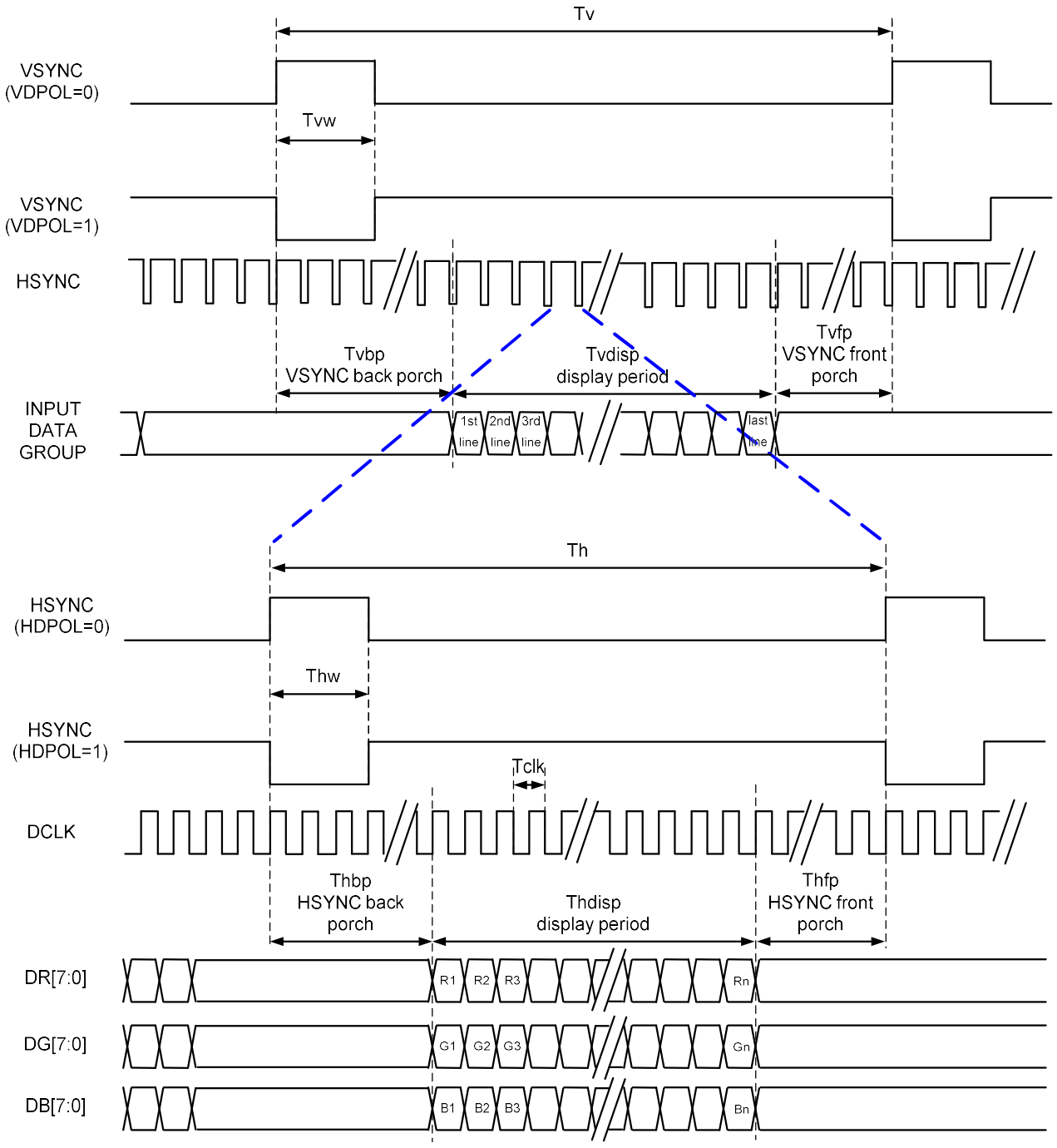
h. After power on reset or GRB reset, it is required 100ms delay to begin SPI communication.

10.1 RGB Interface

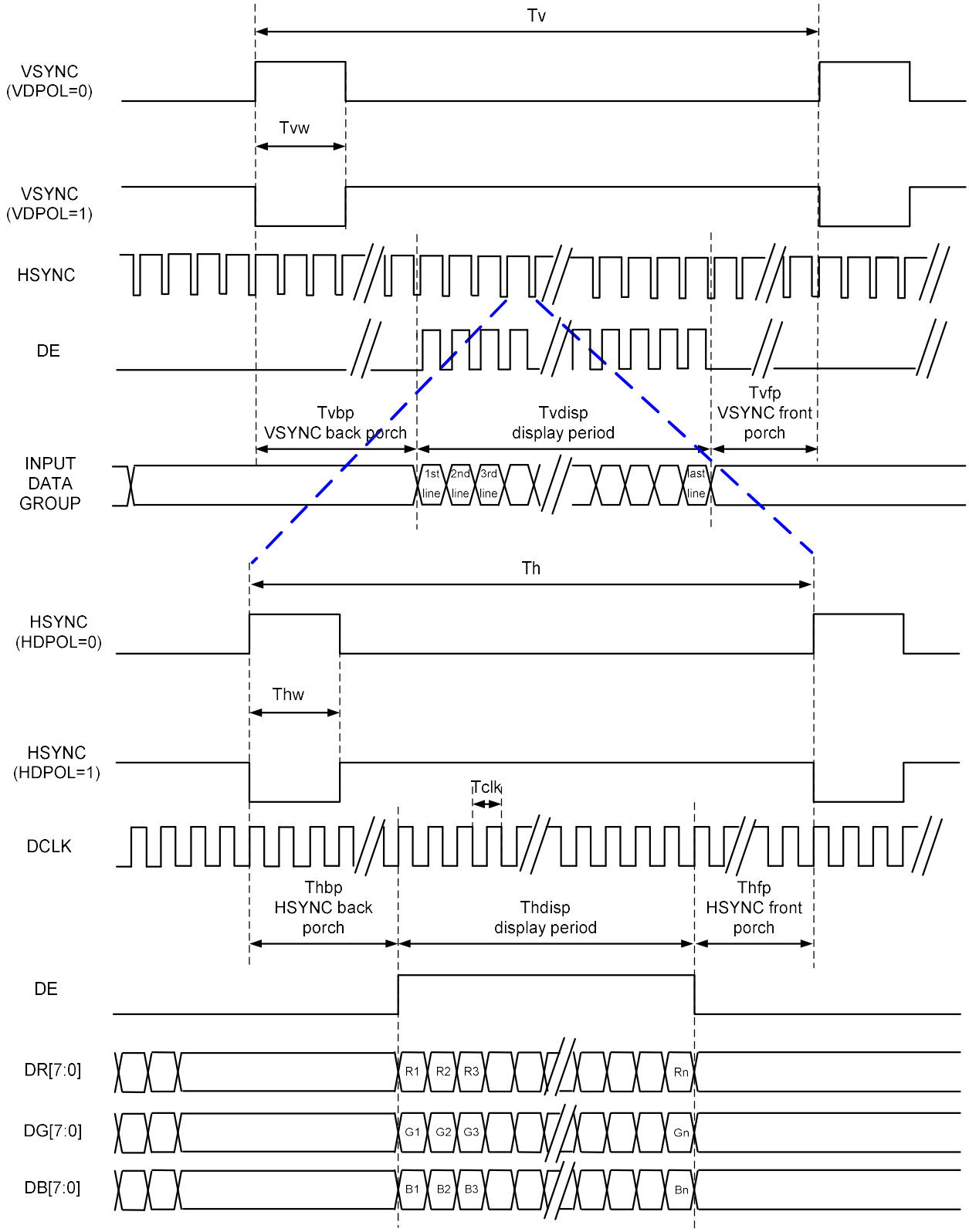
RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

Note: "Input" means these signals are driven by host side

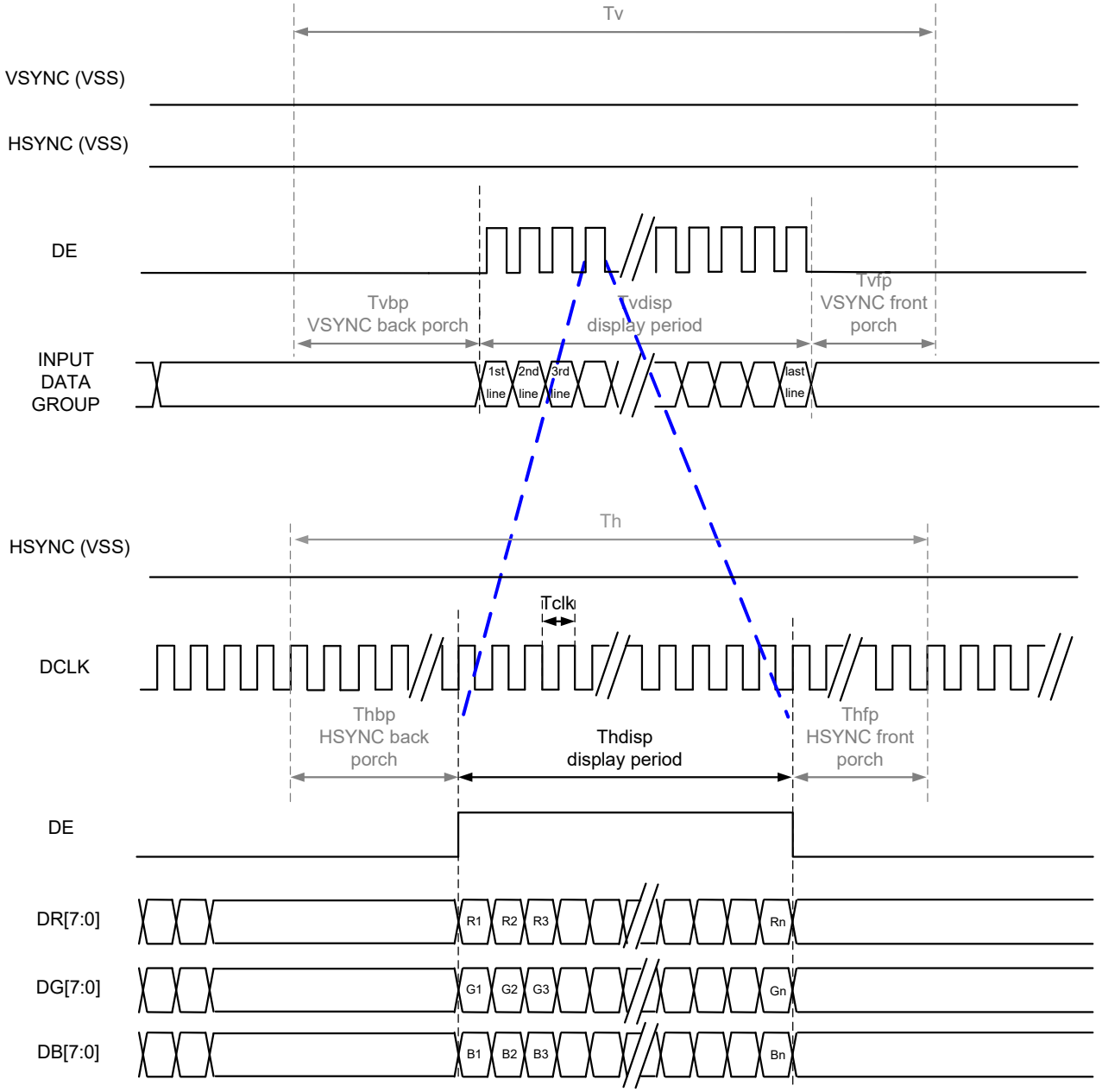
10.2.1 SYNC Mode



10.2.2 SYNC-DE Mode



10.2.3 DE Mode


Tv
VSYNC (VSS)
HSYNC (VSS)
DE
Tvbp
VSYNC back porch
Tvdisp
display period
Tvfp
VSYNC front
porch
INPUT
DATA
GROUP
1st
line
2nd
line
3rd
line
last
line
Th
HSYNC (VSS)
Tclk
DCLK
Thbp
HSYNC back
porch
Thdisp
display period
Thfp
HSYNC front
porch
DE
DR[7:0]
R1
R2
R3
Rn
DG[7:0]
G1
G2
G3
Gn
DB[7:0]
B1
B2
B3
Bn

10.2.4 Parallel 24-bit RGB Input Timing Table

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

Parallel 24-bit RGB Interface Timing Table							
Item		Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK Frequency		Fclk	23	25	27	MHz	.
HSYNC	Period Time	Th	808	816	848	DCLK	
	Display Period	Thdisp		800		DCLK	
	Back Porch	Thbp	4	8	24	DCLK	
	Front Porch	Thfp	4	8	24	DCLK	
	Pulse Width	Thw	2	4	8	DCLK	
VSYNC	Period Time	Tv	496	512	528	HSYNC	
	Display Period	Tvdisp		480		HSYNC	
	Back Porch	Tvbp	8	16	24	HSYNC	
	Front Porch	Tvfp	8	16	24	HSYNC	
	Pulse Width	Tvw	2	4	8	HSYNC	

Note: 1. The minimum blanking time depends on the GIP timing of the panel specification

2. To ensure the compatibility of different panels, it is recommended to use the typical setting.

3. It is necessary to keep Tvbp =8 and Thbp =8 in sync mode. DE mode is unnecessary to keep it.

4. The maximum DCLK Frequency is 27MHz. If the case needs faster DCLK, please contact Sitronix .