SPECIFICATION

Model:IE-MX-1316CH07R24-C0-1

For Customer's Acceptance:

Approved By	Comment		
PREPARED	CHECKED	VERIFIED BY QA DEPT	VERIFIED BY R&D DEPT

2. Revision Record

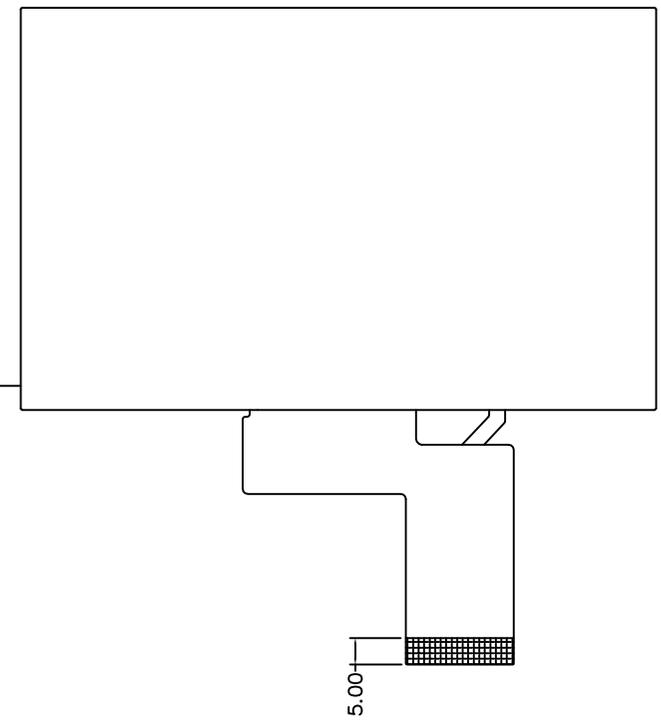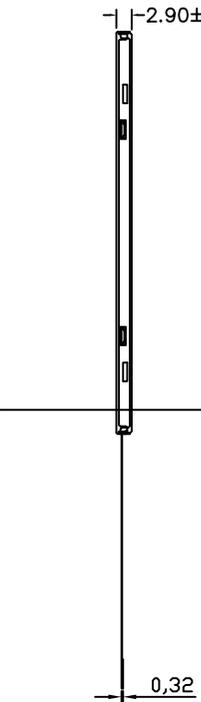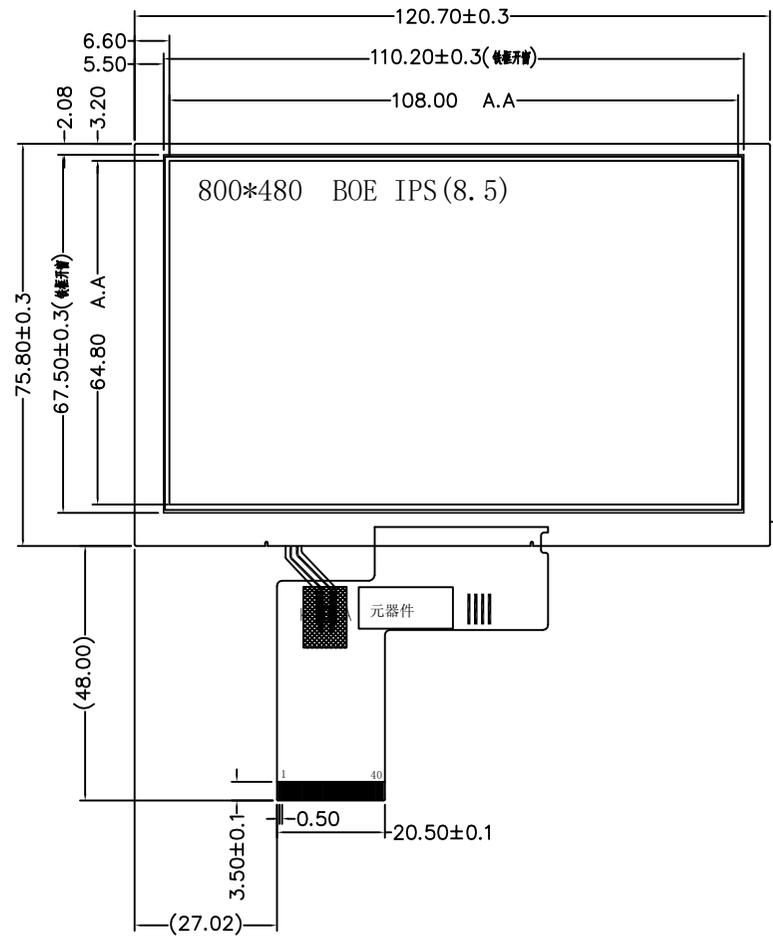| Date	Rev.No.	Page	Revision Items	Prepared
2023.02.28	A		Thefirstrelease	

3. General Specifications

IE-MX-1316CH07R24-C0-1 is a TFT-LCDmodule.It is composed of a TFT-LCD panel, driver IC, FPC, a backlight unit. The 5.0″ 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	-20~+70	℃	
Storage temperature	-30~+80	℃	
Module size	120.70(W)×75.90(H)×3.05(T)	mm	2
ActiveArea(W×H)	108.00(W)x64.80(H)	mm	
Number of Dots	800×RGB×480	dots	
Backlight	18-LEDs(white)	pcs	
Data Transfer	RGB interface	-	

Note 1:   Color tune is slightly changed by temperature and driving voltage.

Note 2:   Without FPC and Solder.

8	7	6	5	4	3	2	1

REV	DESCRIPTION	DATE
A	初版	

120.70±0.3

110.20±0.3(钣框开省)

108.00 A.A

6.60

5.50

2.08

3.20

800*480 BOE IPS(8.5)

75.80±0.3

67.50±0.3(钣框开省)

64.80 A.A

2.90±0.3

(48.00)

0.32

1   40

3.50±0.1

-0.50

20.50±0.1

(27.02)

5.00

LED 电路图

Vf 18.0/TYP

IF=20*3=60mA(定电流测试)

A

K

1   2   3

Specification:
1). Display mode: 16.7M, TFT/Transmissive
2). Operating temp.:
    Storage temp.:
3). Backlight: 18 hip White LED
4). Dimensions with mark "*" are important, with mark "()" are referenced

元器件
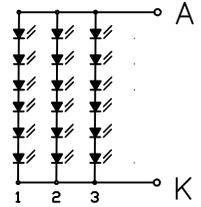
TITLE:	ASSEMBLY	DO NOT SCALE THIS DRAWING, GENERAL TOLERANCE:±0.2		
MODULE NO.:	IE-MX-1316CH07R24-C0-1		REV	A
DRAWN BY:		DATE:	PROJECTION:	
CHECKED BY:		DATE:	SCALE:N.T.S	UNIT: mm
APPROVED BY:		DATE:	SHEET: 1 OF 1	

						Rev	Nature of Modification	DATE
						01	初版	2017/09/01

FRONT VIEW

LENS OD 120,7±0.2
Sensor OD 119,6±0.2
VA 109±0.15
(0,72)
(0,55)
5,85±0.20
0,0
(800,480)
LENS OD 76,3±0.2
Sensor OD 74,3±0.2
SENSOR VA 65,8±0.15
3,04±0.20
35,5±0.50
23±0.50
元件区（表面覆高温胶纸）
10 1
0,35±0.03
0,5±0.03
4,5±0.10
5,5±0.10

SIDE VIEW

不含背胶
1,85
1.1mmLENS
0.2mmLOCA
0,55mm Glass
0,18mm 双面胶
1.40(Max,FPC+钢片补强+元件)
钢片补强（接地）
0.30±0.03

BACK VIEW

119.60±0.2
0.55
0.72
3M 9495LSE, T=0.175mm
74.30±0.2
1 10
PI补强
FPC+PI T=0.3±0.03
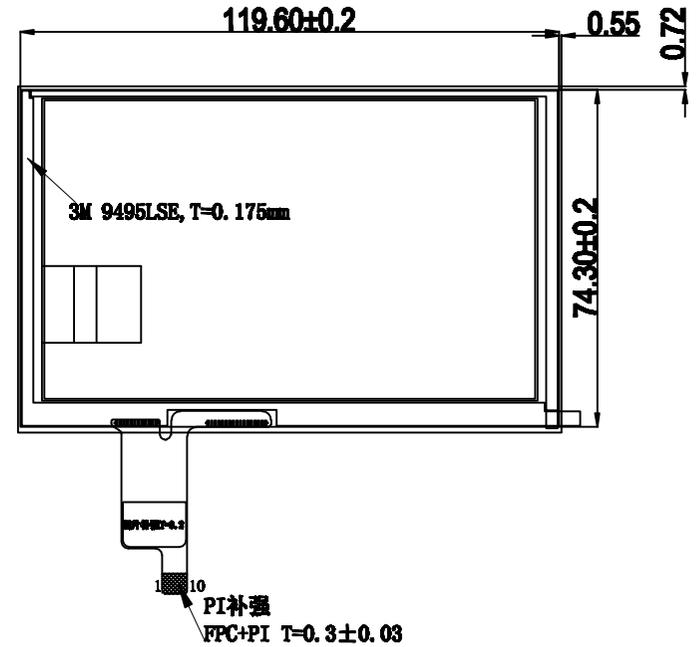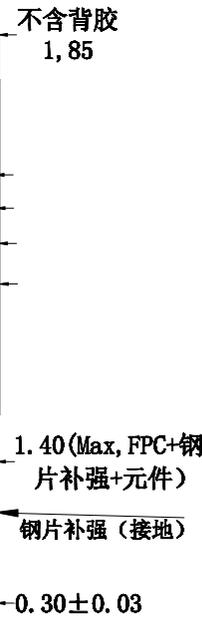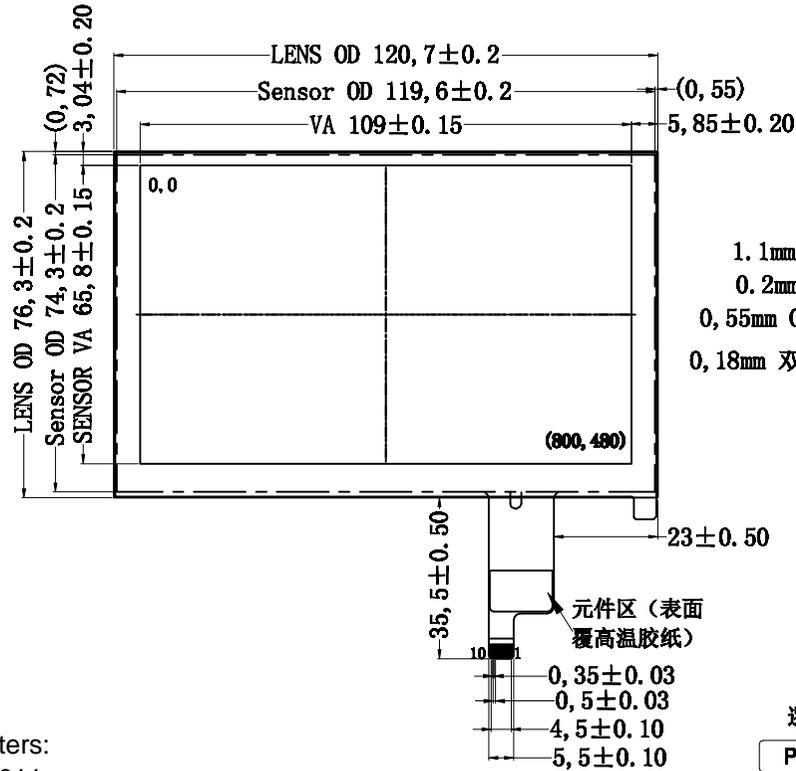
Parameters:
1.IC:GT911
2.Working volt.:2.8-3.3V
  I2C communication voltage:2.8V-3.3V
3.Transparency rate > 80%
4.Surface hardness: 6H
5.Working temp.:-10 to 60 degree,< 90%RH
6.Storage temp.:-20 to 70 degree,< 90%RH
7.Unmarked tolerance +/- 0.2mm
8.ROHS compliance

逻辑定义

PIN	定义
1	VSS
2	VDD
3	SCL
4	VSS
5	SDA
6	VSS
7	/RST
8	NC
9	INT
10	VSS

SCALE: 1 : 1
NOT TO SCALE

PAGE: 1 OF 1

GENERAL TOL. 0.50mm		UNITS MM	
APPROVALS		DATE	
APP:			MODEL NUMBER :
CHK:			
DWN:	YANHAI	2017-09-01	

CUSTOMER NO.:

DATE: 2017-09-01

5. Absolute Maximum Ratings(Ta=25℃)

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

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	3.6	V	
Input Voltage	V_{In}	-0.3	VDD+0.5	V	1，2
Current of LED	ILED	0	20	mA	

Notes:

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.

Parameter	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
TFT Gate ON Voltage 1	VGH	10	12	14	V	Note 3.1
TFT Gate OFF Voltage 2	VGL	-14	-11.5	-11.5	V	Note 3.2
TFT Common Electrode Voltage	VCOM	-1.0	TBD	1.0	V	

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
Supply voltage	-	-	16.8	18.6	20.4	V	1
Supply current	I_f	-	-	60	-	MA	
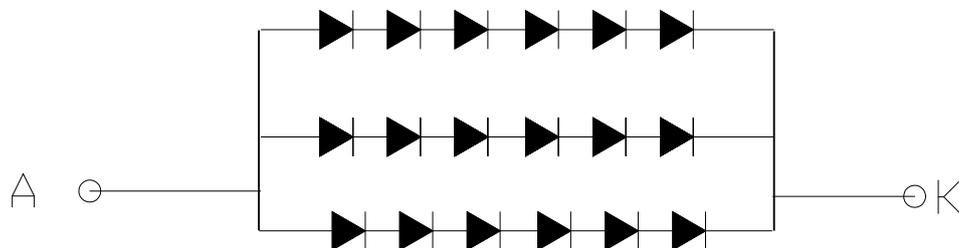
Note:

    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		$\theta=0°$		500		Cd/m^2	1
Uniformity	$\triangle$Bp		$\Phi=0°$	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		$\theta=0°$	1000	1200			
Response Time	T_r+T_f		$\Phi=0°$		30	40	ms	5
Color of CIE Coordinate	W	x	$\theta=0°$ $\Phi=0°$	0.27	0.32	0.37	-	1,6
		y		0.29	0.34	0.39	-	
		Y		-	-	-		
	R	x					-	
		y					-	
		Y		-	-	-		
	G	x					-	
		y					-	
		Y		-	-	-		
	B	x					-	
		y					-	
		Y		-	-	-		
NTSC Ratio	S			-	60	-	%	

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.
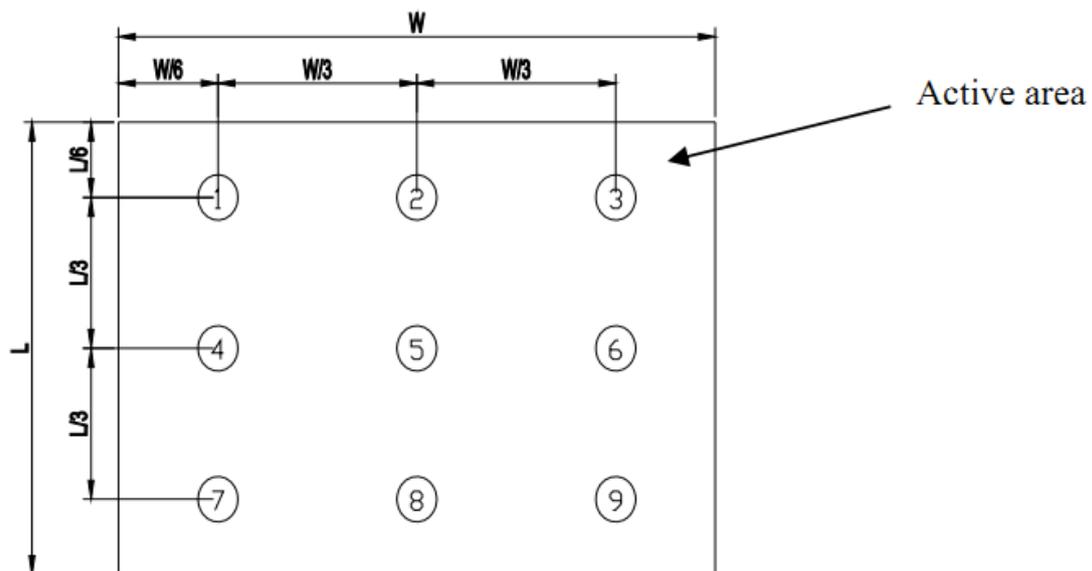
50cm

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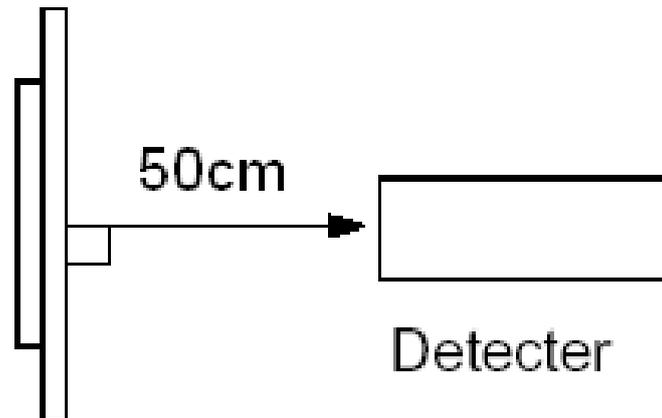
Note 2: The luminance uniformity is calculated by using following formula.

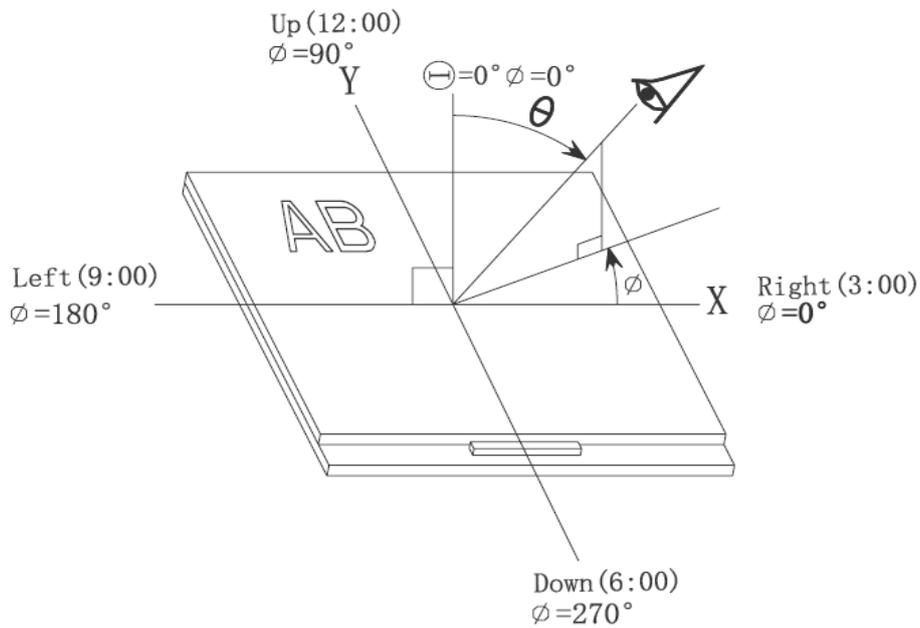$$\angle Bp = Bp\ (Min.)\ /\ Bp\ (Max.) \times 100\ (\%)$$

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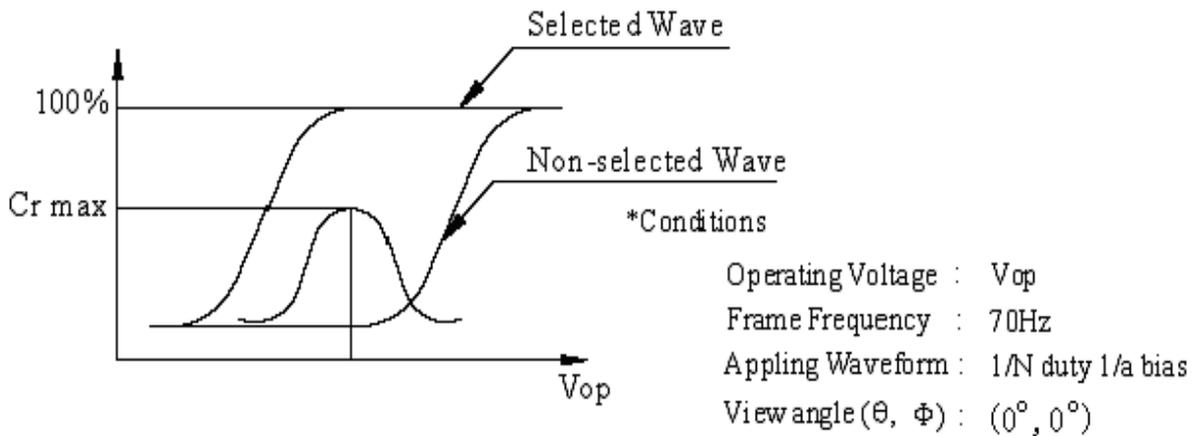
Bp (Min.) = Minimum brightness in 9 measured spots.

Active area

Note 3: The definition of viewing angle:

Refer to the graph below marked by θ and Φ

Up (12:00)
∅=90°

Left (9:00)
∅=180°

Right (3:00)
∅=0°

Down (6:00)
∅=270°

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

Selected Wave

Non-selected Wave

*Conditions

Operating Voltage :	Vop
Frame Frequency :	70Hz
Appling Waveform :	1/N duty 1/a bias
View angle (Θ, Φ) :	(0°, 0°)

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

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.
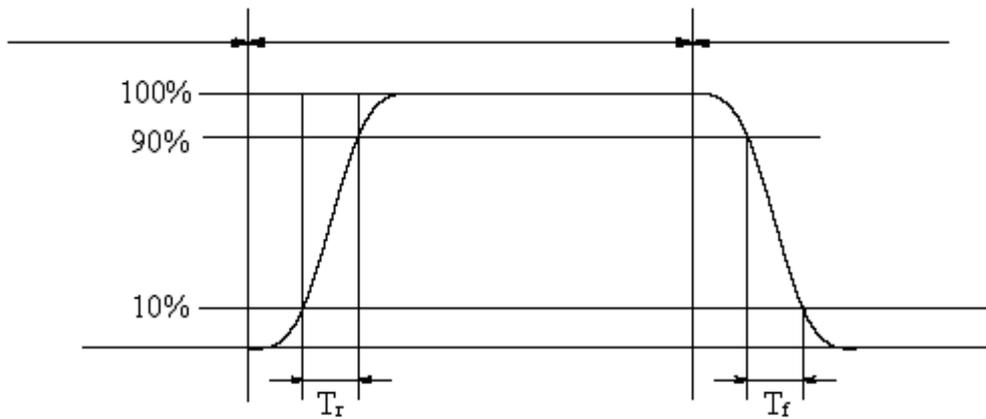
The definition of response time

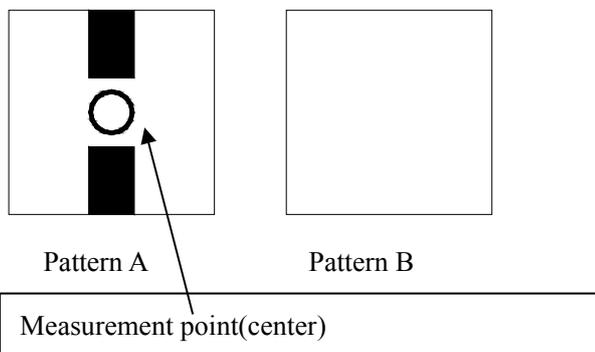Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

1931 CIE Chromaticity Diagram
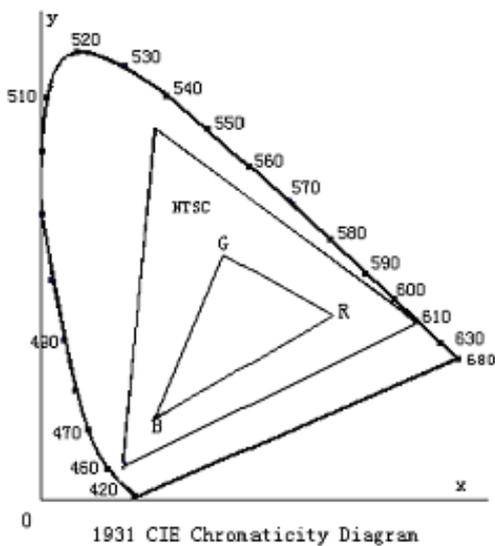
Color gamut:

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

Note 7: Definition of cross talk.

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

Pattern A   Pattern B

Measurement point(center)

Electric volume value=3F+/-3Hex

8. Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80℃±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	70℃±2℃ 96H Restore 2H at 25℃ Power on	
4	Low Temperature Operation	-20℃±2℃ 96H Restore 4H at 25℃ Power on	
5	High Temperature/Humidity Operation	60℃±2℃ 90%RH 96H Power on	
6	Temperature Cycle	–30℃ ←————→ 80℃ 30min 5min 30min after 5 cycle, Restore 2H at 25℃ Power off	
7	Vibration Test	10Hz~150Hz, 100m/s², 120min	Not allowed cosmetic and electrical defects.
8	Shock Test	Half- sine wave,300m/s²,11ms	
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

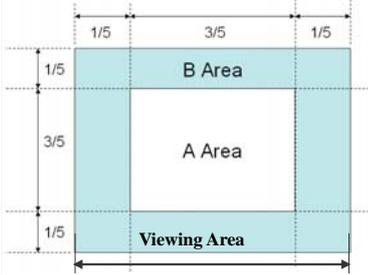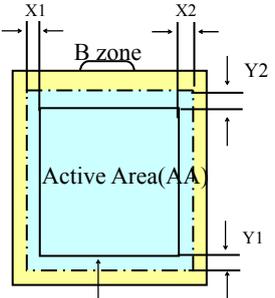| ITEM	Inspection
Contrast	CR>50%
IDD	IDD<200%
Brightness	Brightness>60%
Color Tone	Color Tone+/-0,05

9 Quality level

9.1 Classification of defects

Major defects (MA): A major defect refers to a defect that may substantially

REV:V1.0

degrade usability for product applications, including all functional defects(such as no display, abnormal display, open or missing segment, short circuit, missing component), outline dimension beyond the drawing, progressive defects and those affecting reliability.

Minor defects (MI): A minor defect refers to a defect which is not considered to be able to substantially degrade the product application or a defect that deviates from existing standards almost unrelated to the effective use of the product or its operation, such as black spot, white spot, bright spot, pinhole, black line, white line, contrast variation, glass defect, polarizer defect, etc.

9.2 Definition of inspection range

For dot defect of TFT LCD which is not smaller than 3 inches, dividing three areas to make a judgment (according to figure 1). A area : center of viewing area B area : periphery of viewing area C area : Outside viewing area For other defects, dividing two areas to make a judgment (according figure 2). A zone : Inside Viewing area B zone : Outside Viewing area X1(A.A~V.A): 2mm X2(A.A~V.A): 2mm Y1(A.A~V.A): 2mm Y2(A.A~V.A): 2mm	 Figure 1 Figure 2

9.3 Inspection items and general notes

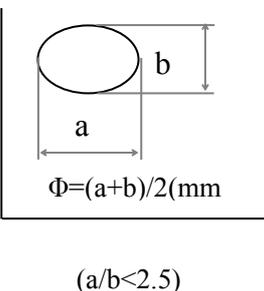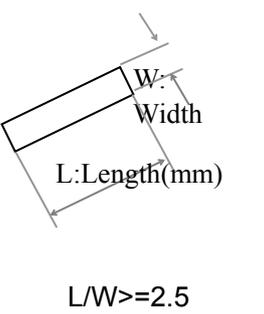|	
General notes	1.Should any defects which are not specified in this standard happen, additional standard shall be determined by mutual agreement between customer. 2.Viewing area should be the area 3.Limit sample should be prior to this Inspection standard. 4.Viewing judgment should be under static pattern. 5.Inspection conditions Inspection distance: 250 mm (from the sample) Temperature : 25±5 ℃ Inspection angle : 45 degrees in 6 o'clock direction (all defects in viewing area should be inspected from this direction)
Inspection items	Pinhole, Bright spot, Black spot, White spot, Black line, White Line, Foreign particle, Bubble — The color of a small area is different from the remainder. The phenomenon doesn't change with voltage
	Contrast variation — The color of a small area is different from the remainder. The phenomenon changes with voltage
	Polarizer defect — Scratch, Dirt, Particle, Bubble on polarizer or between polarizer and glass
	Dot defect (TFT LCD) — The pixel appears bright or dark abnormally when display
	Functional defect — No display, Abnormal display, Open or missing segment, Short circuit, False viewing direction

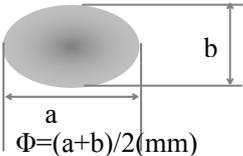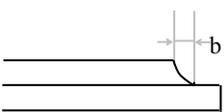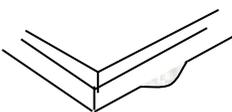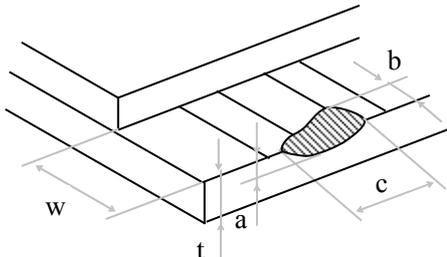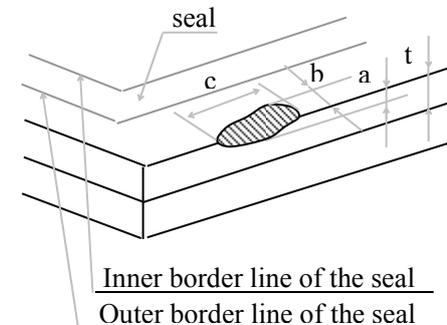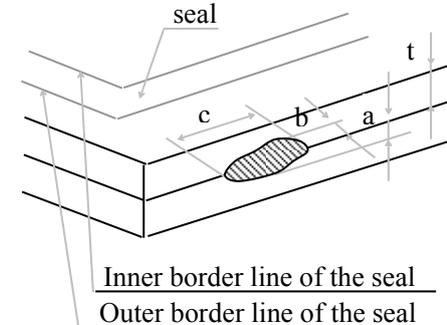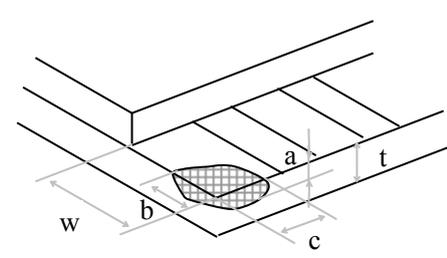|	
Glass defect	Glass crack, Shaved corner of glass, Surplus glass
PCB defect	Components assembly defect

9.4 Outgoing Inspection level

Outgoing Inspection standard	Inspection conditions	Inspection				
		Min.	Max.	Unit	IL	AQL
Major Defects	See 8.3 general notes	See 8.5			II	0.065
Minor Defects	See 8.3 general notes	See 8.5			II	0.065
Note：Sampling standard conforms to GB2828						

9.5 Inspection Items and Criteria

	Inspection items			Judgment standard			
				Category		Acceptable number	
						A zone	B zone
1	Black spot, White spot, Pinhole, Foreign Particle, Particle in or on glass, Scratch on glass	$\Phi=(a+b)/2$(mm (a/b<2.5)	A		$\Phi<=0.20$	Neglected	Neglected
			B		$0.20<\Phi<=0.25$	3	Neglected
			C		$0.25<\Phi<=0.3$	2	Neglected
			D		$0.3<\Phi<=0.4$	1	3
			E		$0.4<\Phi<=0.5$	0	2
			Total defective point(B,C)			1	-
2	Black line, White line, and Particle Between Polarizer and glass, Scratch on glass	W: Width L:Length(mm) L/W>=2.5	A		$W<=0.03$	Neglected	Neglected
			B		$0.03<W<=0.05$ $L<=3.0$	3	Neglected
			C		$0.05<W<=0.1$ $L<=3.0$	2	Neglected
			D		$0.05<W<=0.1$ $L<=4.0$	1	3
			E		$W>0.1$ $L>4.0$	0	2
			Total defective point(B,C)			1	-
3	Bright spot			any size		none	none
4	Contrast		A		$\Phi<0.2$	Neglected	Neglected

	variation	$\Phi=(a+b)/2$ (mm)	B	0.2<Φ<=0.3	2	
			C	0.3<Φ<=0.4	1	
			D	0.4<Φ	0	
			Total defective point(B,C)		3	
5	Bubble inside cell		any size		none	none
6	Polarizer defect (if Polarizer is used)	Scratch ,damage on polarizer, Particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	Φ<=0.1	Neglected	Neglected
			B	0.1 <Φ<=0.2	2	Neglected
			C	0.2 <Φ<=0.3	1	2
7	Surplus glass	Stage surplus glass	B<=0.3mm			
		Surrounding surplus glass	Should not influence outline dimension and assembling.			
8	Open segment or open common		Not permitted			
9	Short circuit		Not permitted			
10	False viewing direction		Not permitted			
11	Contrast ratio uneven		According to the limit specimen			
12	Crosstalk		According to the limit specimen			
13	Black /White spot(display)		Refer to item 1			
14	Black /White line(display)		Refer to item 2			

	Inspection items		Judgment standard		Acceptable number
			Category(application: B zone)		
15	Glass defect crack	ⅰ）The front of lead terminals 	A	a≤ t, b≤1/5W, c≤3mm	Max.3 defects allowed
			B	Crack at two sides of lead terminals should not cover patterns and alignment mark	
		ⅱ）Surrounding crack-non-contact side 	b < Inner borderline of the seal		
		ⅲ）Surrounding crack- contact side 	b < Outer borderline of the seal		
		ⅳ）Corner 	A	a <= t, b <= 3.0, c <= 3.0	
			B	Glass crack should not cover patterns u and alignment mark and patterns.	

Inspection items			Judgment standard
			Category(application: B zone)
16	PCB defect	Component soldering: No cold soldering、short、open circuit、burr、tin ball The flat encapsulation component position deviation must be less than 1/3 width of the pin (Pic.1); the sheet component deviation: Pin deviates from the pad and contact with the near components is not permitted（Pic.2）	Component $L \leq W/2$ W Soldering pad Lead Component L2>0 L1>0
		lead defect: The lead lack must be less than 1/3 of its width; The lead burr must be less than 1/3 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	head Base Board Soldering tin is not permit in this area Soldering tin is not permit in this area socket Base Board
		Glue on root of the speaker receiver and motor lead: The insulative coat of the lead must join into the PCB; the protected glue must envelop to the insulative coat.	Glue Lead PCB Insulative coat

REV:V1.0

10. Precautions for Use of LCD Modules

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 module 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 Module.

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.

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.

10.2 Storage precautions

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

10.2.2 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%

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

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

7. COMMUNICATION INTERFACE

7.1 3-wire Serial Interface

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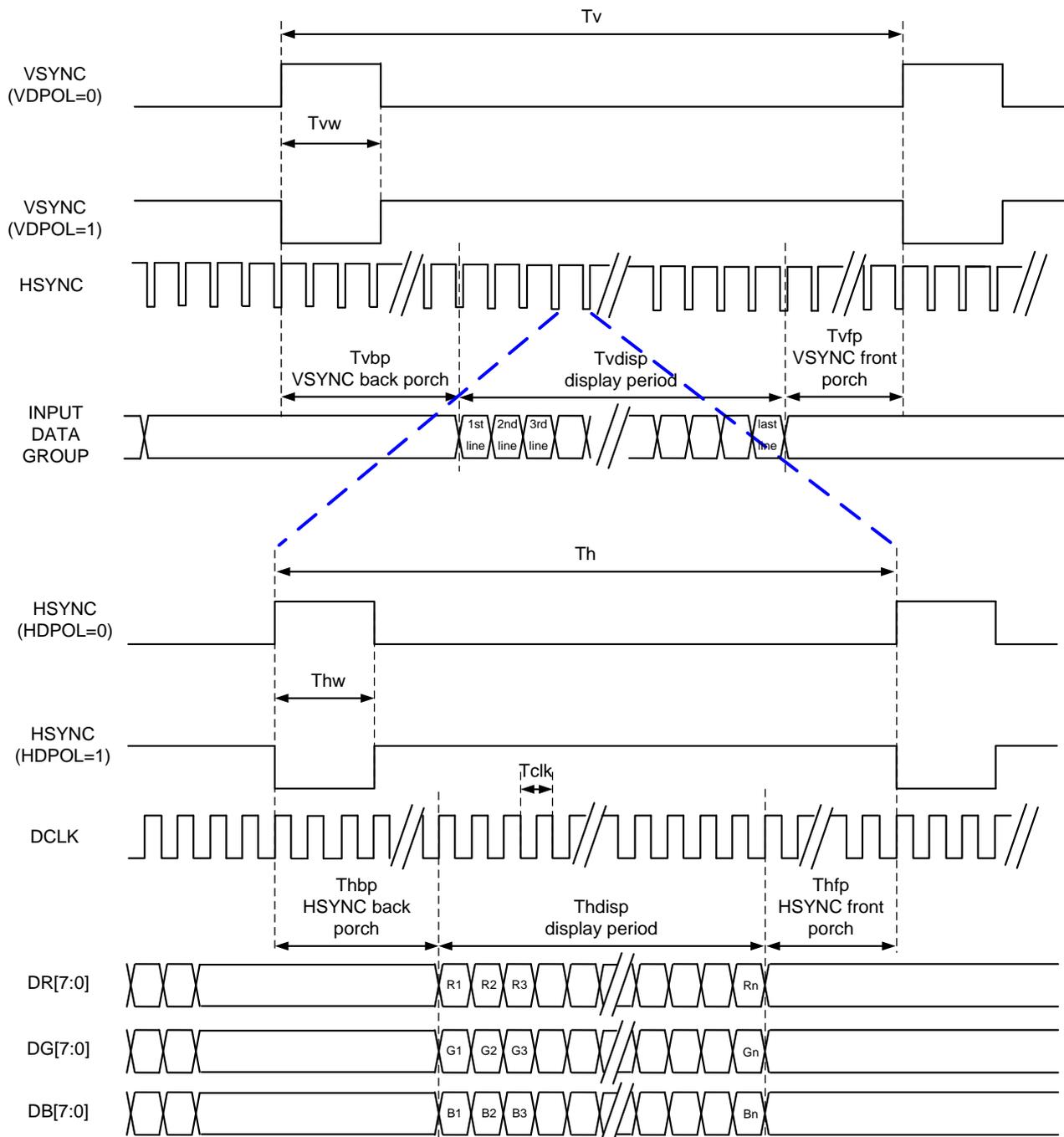R/W=0: Write mode

Read Mode

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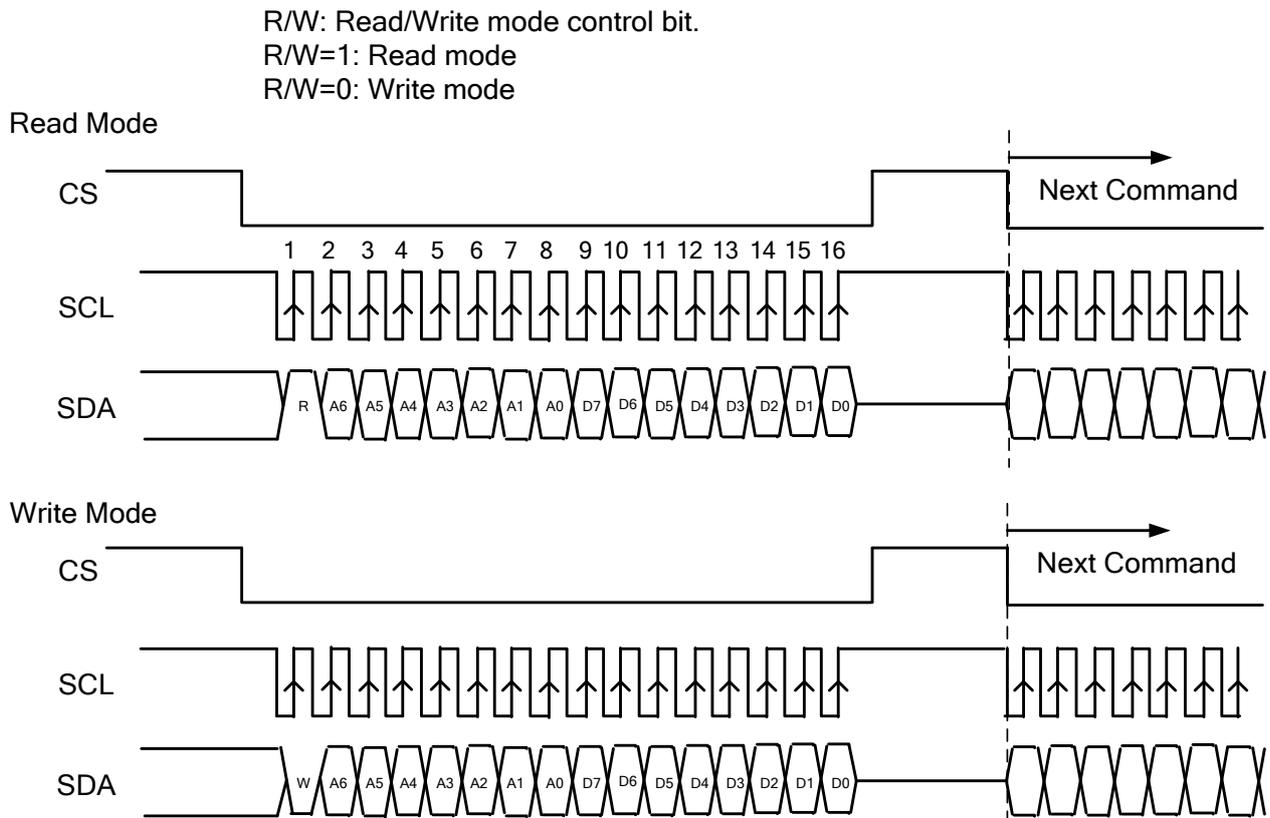
a. Each serial command consists of 16 bits of data which is loaded one bit a time at the rising edge of serial clock SCL.

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.

7.2 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

7.2.1 SYNC Mode

7.2.2 SYNC-DE Mode

7.2.3 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

HSYNC (VSS)

Th

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
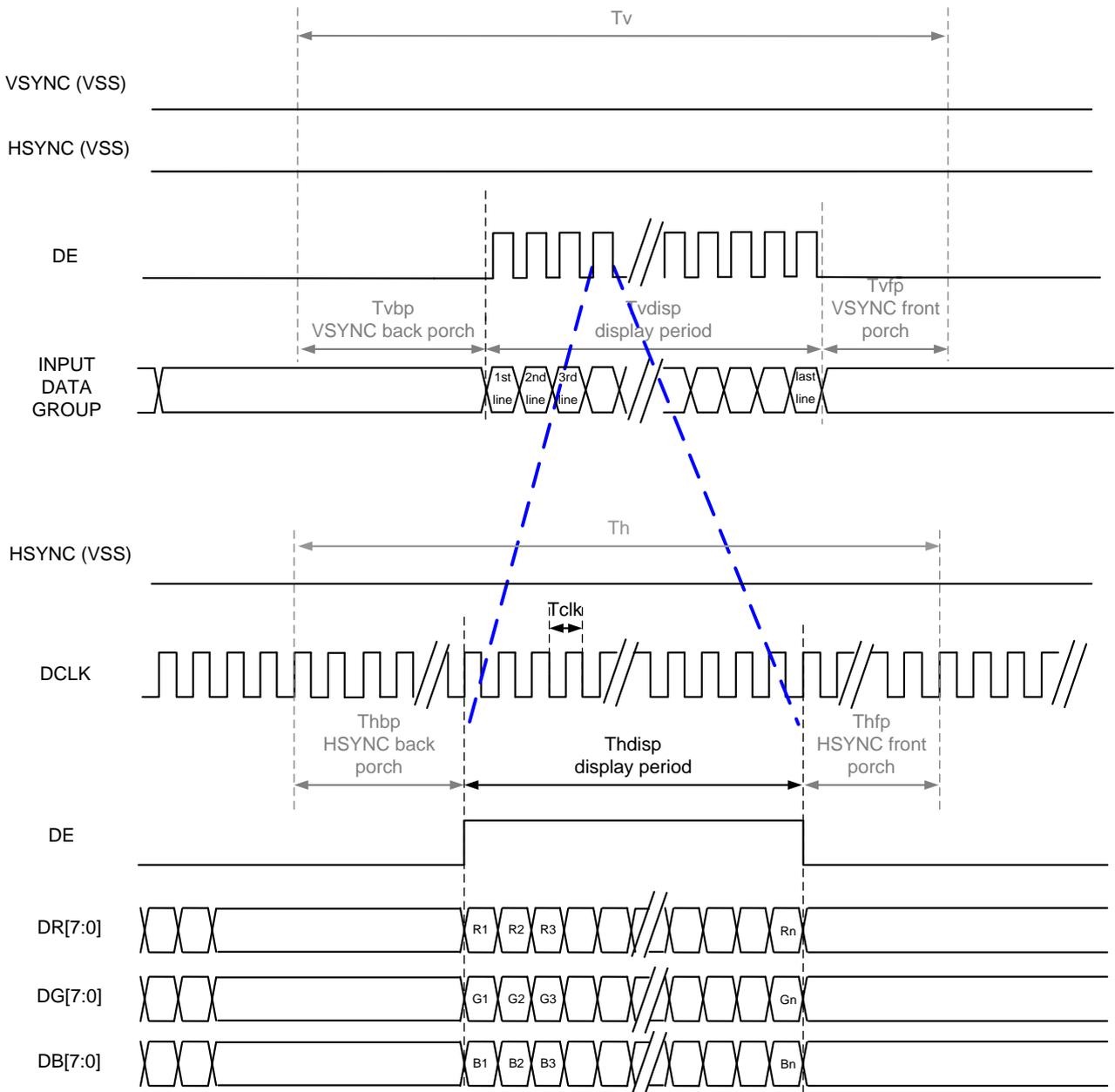
7.2.4 Parallel 24-bit RGB Input Timing Table

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

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Parallel 24-bit RGB Interface Timing Table							
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 =16 and Thbp =8 in sync mode. DE mode is unnecessary to keep it.