Tailorpixels

A Professional Manufacturer of Display

Manufacturer Certificated

9001 CERT. No.: 282Q19070712006

14001 CERT. No.: 282E19070712007

Product Specification

Model: TTX035MHH-02

3.5″TFT Display Module (320*240)

This module uses RoHS material

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Contents

1 Record of Revision

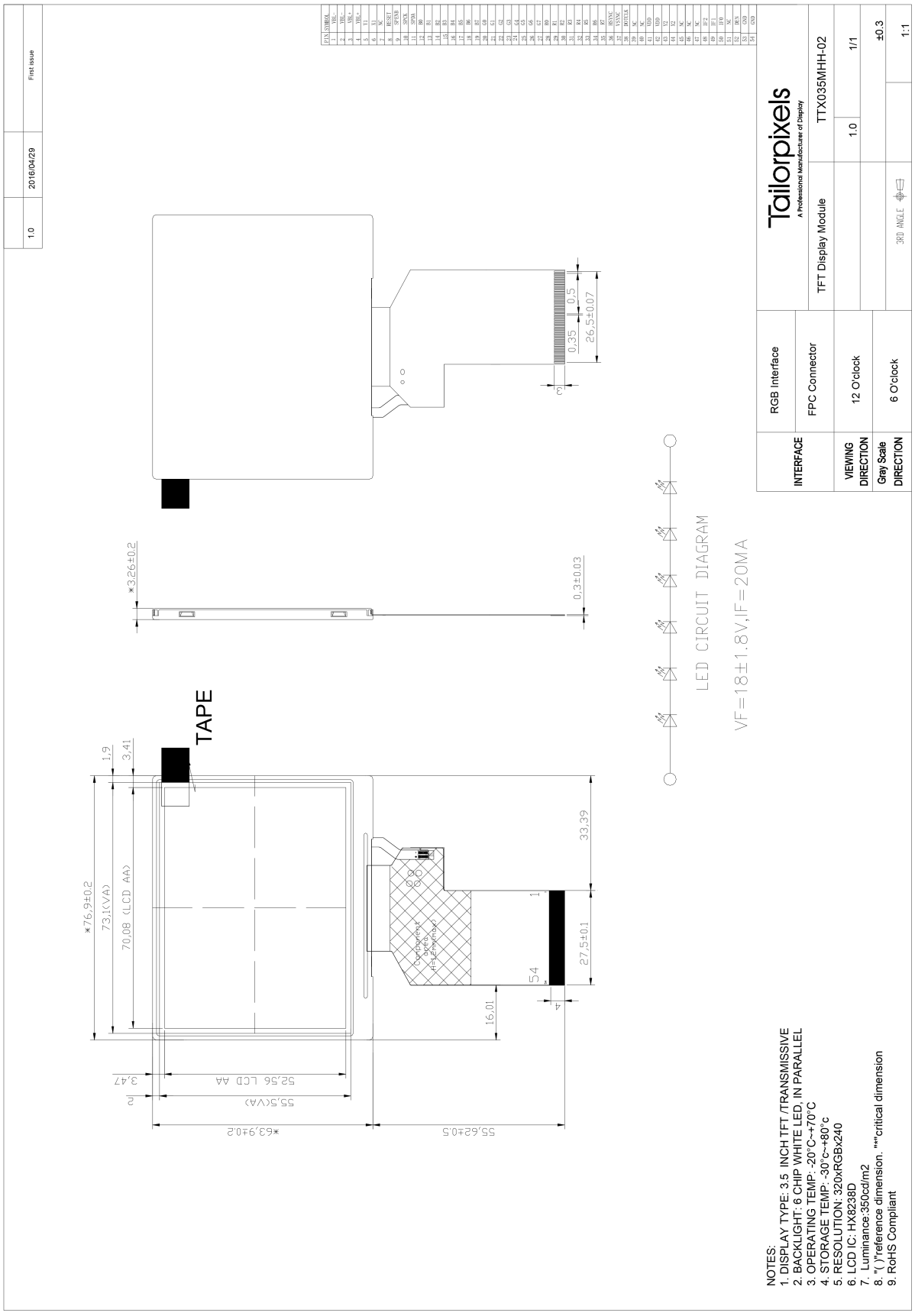
Version	Revise Date	Content	Remark
1.0	2021/01/16	First Release.	

2 General Specifications

Characteristics	LCD Size	3.5inch
	Display Format	320 (RGB) × 240
	Interface	24-bit RGB/SERIAL RGB/CCIR656/CCIR601
	Color Depth	16.7M
	Technology type	a-Si
	Display Spec.	0.073 x 0.219
	Display Mode	Normally White
	Driver IC	HX8238D
	Surface Treatment	Haze 20%
	Viewing Direction	12 O'clock
	Gray Viewing Direction	6 O'clock
Mechanical	LCM (W x H x D) (mm)	76.90*63.9*3.26
	Active Area(mm)	70.08 x 52.56
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	6 LEDs

Note 1: Viewing direction is following the data which measured by optics equipment.
Note 2: Requirements on Environmental Protection: RoHS
Note 3: LCM weight tolerance: +/- 5%

3 Mechanical Drawing



4 Interface

No.	Symbol	Description
1,2	VBL-	Backlight LED Cathode
3,4	VBL+	Backlight LED Anode.
5	YU	Touch panel up side
6	XR	Touch panel right side
7	NC	NC
8	RESET	Reset Signal pin (“Low” is enable)
9	SPENB	Chip select
10	SPCK	Serial Clock.
11	SPDA	Serial Data
12-19	B0~B7	Data bus
20-27	G0~G7	Data bus
28-35	R0~R7	Data bus
36	HSYNC	Line Synchronous Signal
37	VSYNC	Frame Synchronous Signal
38	DOTCLK	Dot-clock signal and oscillator source
39-40	NC	NC
41-42	VDD	Power supply for logic operation
43	YD	Touch panel bottom side
44	XL	Touch panel left side
45-47	NC	
48	SEL2	Control the input data format/floating
49	SEL1	Control the input data format
50	SEL0	Control the input data format
51	NC	NC
52	DEN	Display enable signal
53-54	GND	System Ground

SEL2-0: Define the input interface mode.

SEL2	SEL1	SEL0	Format	Operating Frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHz
0	0	1	Serial-RGB data format	19.5MHz
0	1	0	CCIR 656 data format (640RGB)	24.54MHz
0	1	1	CCIR 656 data format (720RGB)	27MHz
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)	24.54MHz
1	0	1	YUV mode A data format (Cr-Y-Cb-Y)	27MHz
1	1	0	YUV mode B data format (Cb-Y-Cr-Y)	27MHz
1	1	1	YUV mode B data format (Cb-Y-Cr-Y)	24.54MHz

5 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	VDD	-0.3	4.6	V	
Operating Temperature	T_{OPR}	-20	70	℃	
Storage Temperature	T_{STG}	-30	80	℃	

6 Electrical Characteristics

6.1 Driving TFT LCD Panel

Ta 25 °C

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Analog Supply Voltage		VDD	3.0	3.3	3.6	V	
Input Signal Voltage	Low Level	V_{IL}	VSS	-	0.3x VDD	V	
	High Level	V_{IH}	0.7x VDD	-	VDD	V	

6.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I_F	-	20	-	mA	
Forward Voltage	V_F	16.2	18.0	19.8	V	

Note 1: Each LED: IF =20 mA/LED
Note 2: Optical performance should be evaluated at Ta=25℃ only.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The lifetime of LED will be reduced. Operating life means brightness goes down to 50% initial brightness.
Typical operating lifetime is estimated data.

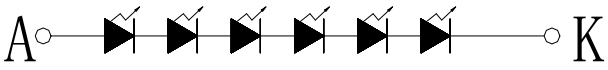


Figure: LED connection of backlight

6.3 AC Electrical Characteristics

AC Characteristics
(Unless otherwise specified, Voltage Referenced to Vss, V_{DDIO}= 2.2V, T_A= 25℃)

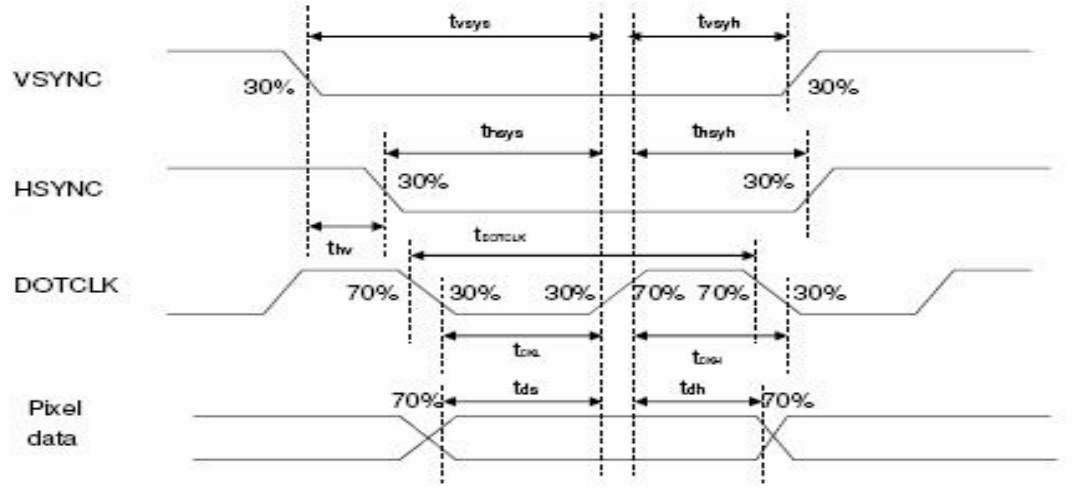
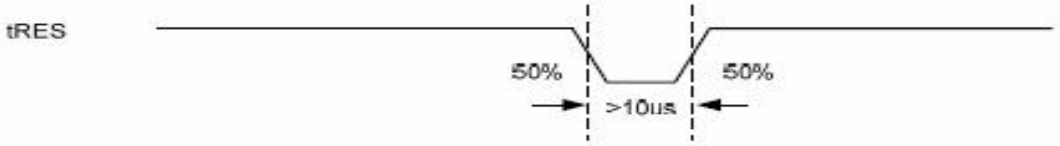


Figure 13. 1 Pixel Timing



Characteristics	Symbol	Min.		Typ.		Max.		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-		6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Vertical Sync Setup Time	tvsys	20	10	-	-	-	-	ns
Vertical Sync Hold Time	tvsyh	20	10	-	-	-	-	ns
Horizontal Sync Setup Time	thsys	20	10	-	-	-	-	ns
Horizontal Sync Hold Time	thsyh	20	10	-	-	-	-	ns
Phase difference of Sync Signal Falling Edge	thv	-4		-		+4		tDOTCLK
DOTCLK Low Period	tCKL	50	15	-	-	-	-	ns
DOTCLK High Period	tCKH	50	15	-	-	-	-	ns
Data Setup Time	tds	12	8	-	-	-	-	ns
Data hold Time	tdh	12	8	-	-	-	-	ns
Reset pulse width	tRES	10		-		-		us

Note: External clock source must be provided to DOTCLK pin of HX8238-A01. The driver will not operate if absent of the clocking signal.

Table 13. 1 Pixel & tRES Timing

Digital Parallal RGB interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	156	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	408	-	Tosc
	Pulse Width	THS	5	30	-	Tosc
	Back-Porch	Thb		38		Tosc
	Display Period	TEP	-	320	-	Tosc
	Hsync-den time	THE	36	68	88	Tsoc
	Front-Porch	Thf	-	20	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: 1. Thp + Thb = 68, the user is make up by yourself.
2. Tv = Tvs + Tvb + Tvd + Tvf , the user is make up by yourself.
3.When SYNC mode is used,1st data start from 68th Dclk after Hsync falling

Digital Serial RGB interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	52	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns
Hsync	Period	TH	-	1224	-	Tosc
	Pulse Width	THS	5	90	-	Tosc
	Back-Porch	Thb		114		Tosc
	Display Period	TEP	-	960	-	Tosc
	Hsync-den time	THE	108	204	264	
	Front-Porch	Thf	-	60	-	Tosc
Vsync	Period	Tv	-	262	-	TH
	Pulse Width	Tvs	1	3	5	TH
	Back-Porch	Tvb	-	15	-	TH
	Display Period	Tvd	-	240	-	TH
	Front-Porch	Tvf	2	4	-	TH

Note: 1. Thp + Thb = 204, the user is make up by yourself.
2. Tv = Tvs + Tvb + Tvd + Tvf , the user is make up by yourself.
3. When SYNC mode is used,1st data start from 204th Dclk after Hsync falling

CCIR601/656 Interface

Signal	Item	Symbol	Min	Typ	Max	Unit
Dclk	Frequency	Tosc	-	37	-	ns
	High Time	Tch	-	78	-	ns
	Low Time	Tcl	-	78	-	ns
Data	Setup Time	Tsu	12	-	-	ns
	Hold Time	Thd	12	-	-	ns

6.4 Waveform

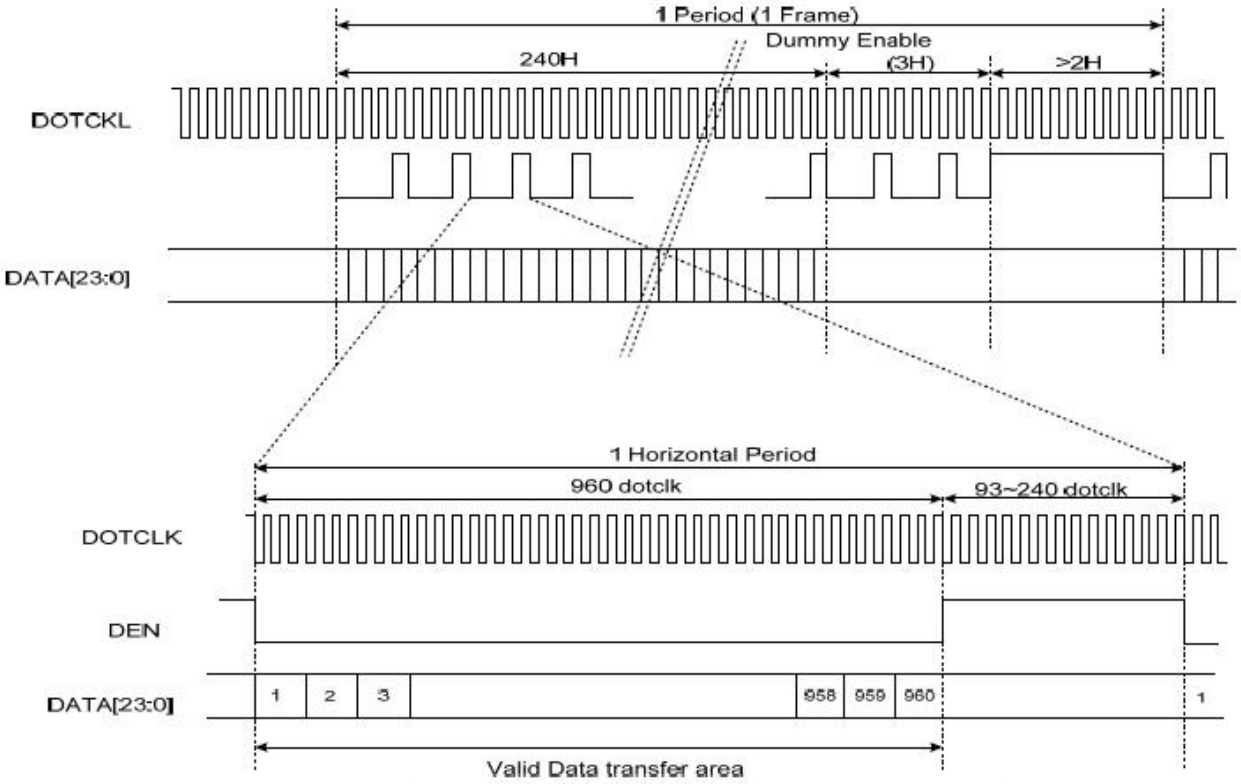


Figure 3 Data Transaction Timing in Serial RGB (8 bit) Interface (DE Mode)

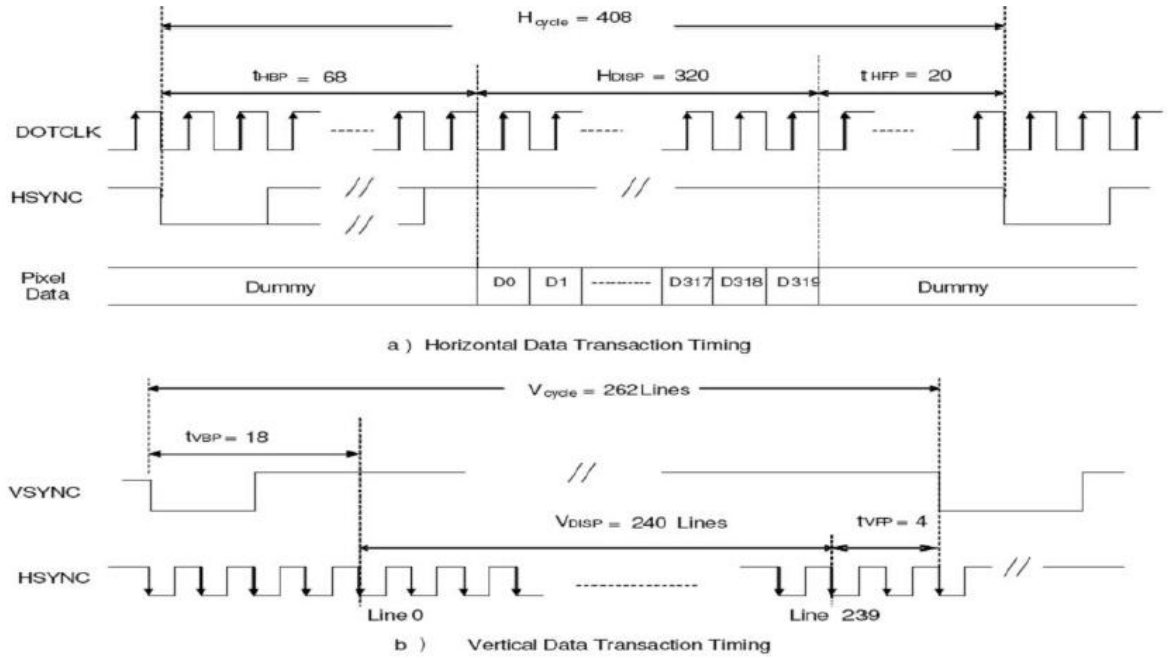


Figure 3 Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)

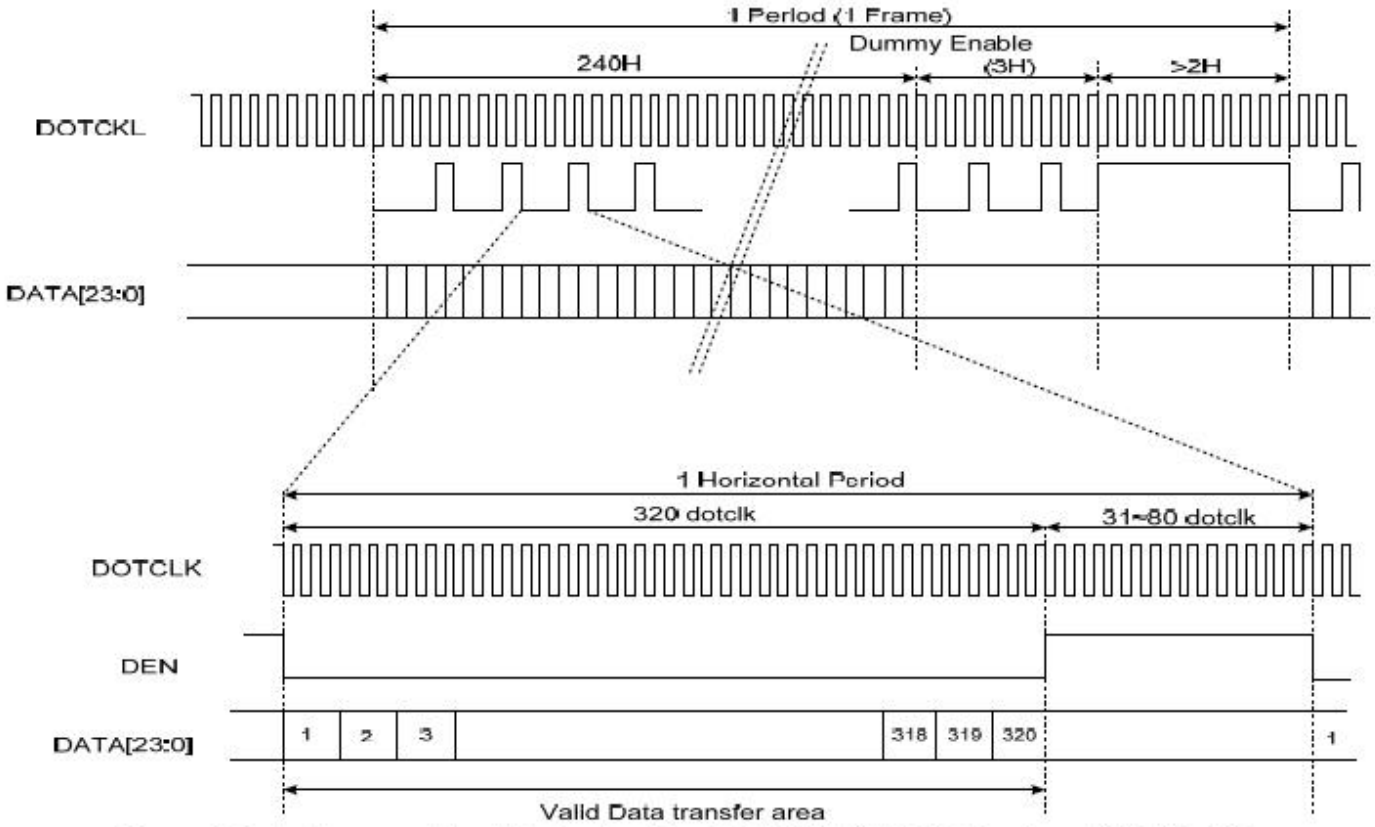


Figure 4 Data Transaction Timing in Parallel RGB (24 bit) Interface (DE Mode)

6.5 Clock and Sync waveforms

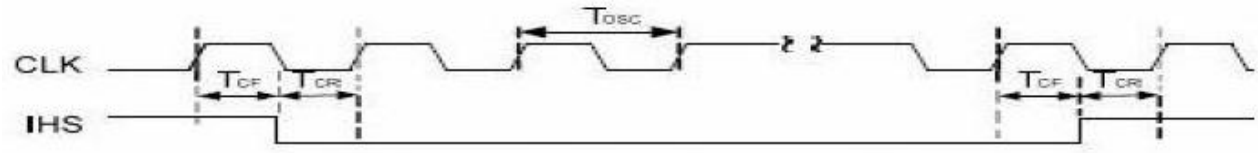


Figure 6 CLK and IHS timing waveform

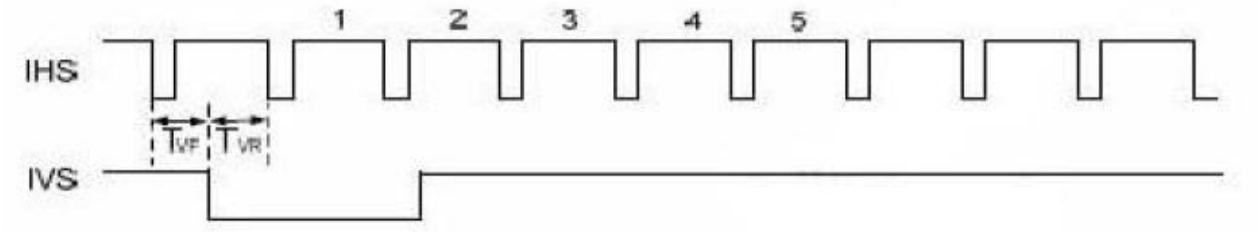
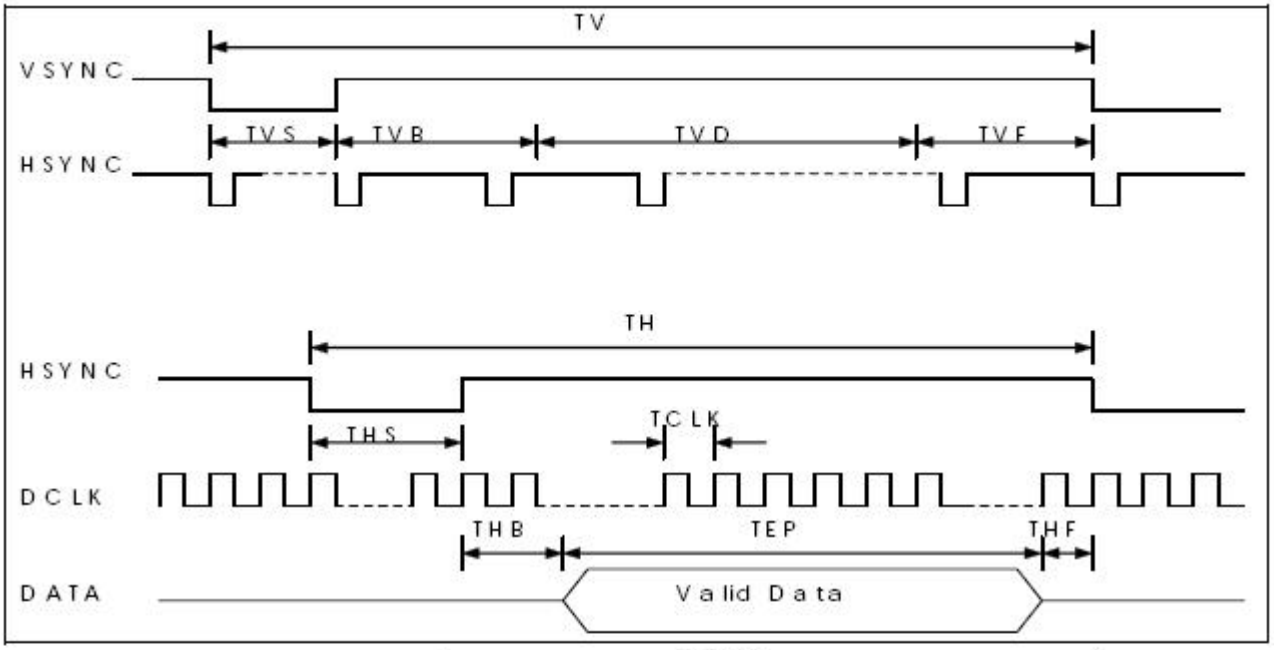
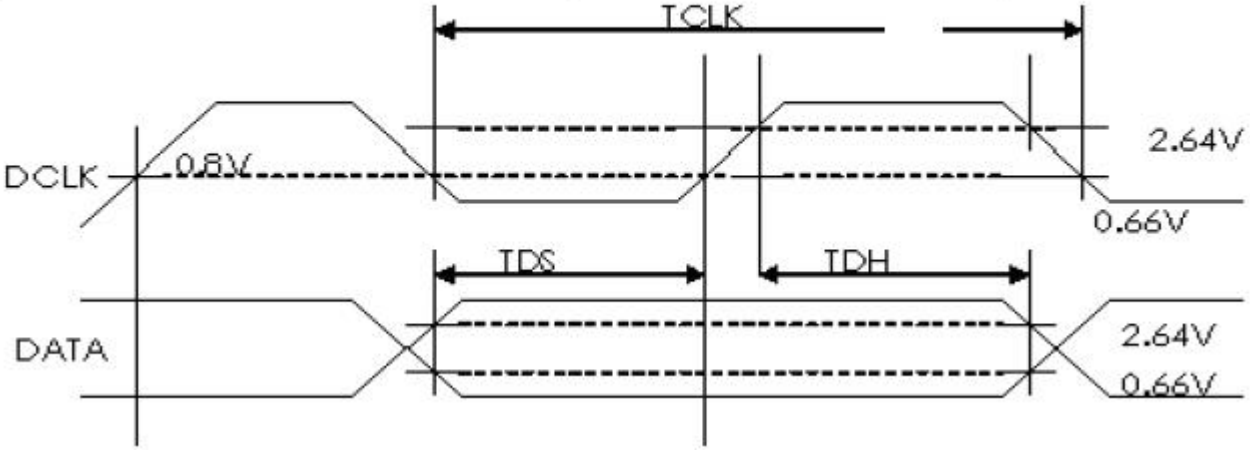
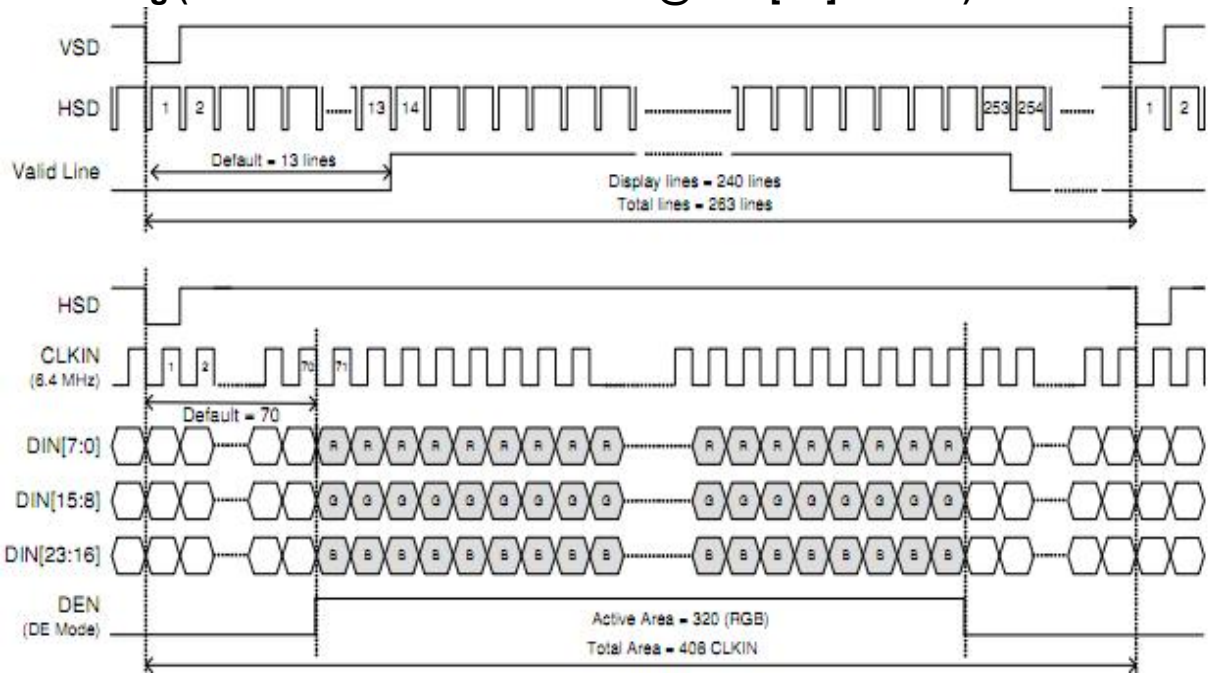


Figure 7 IHS and IVS timing waveforms

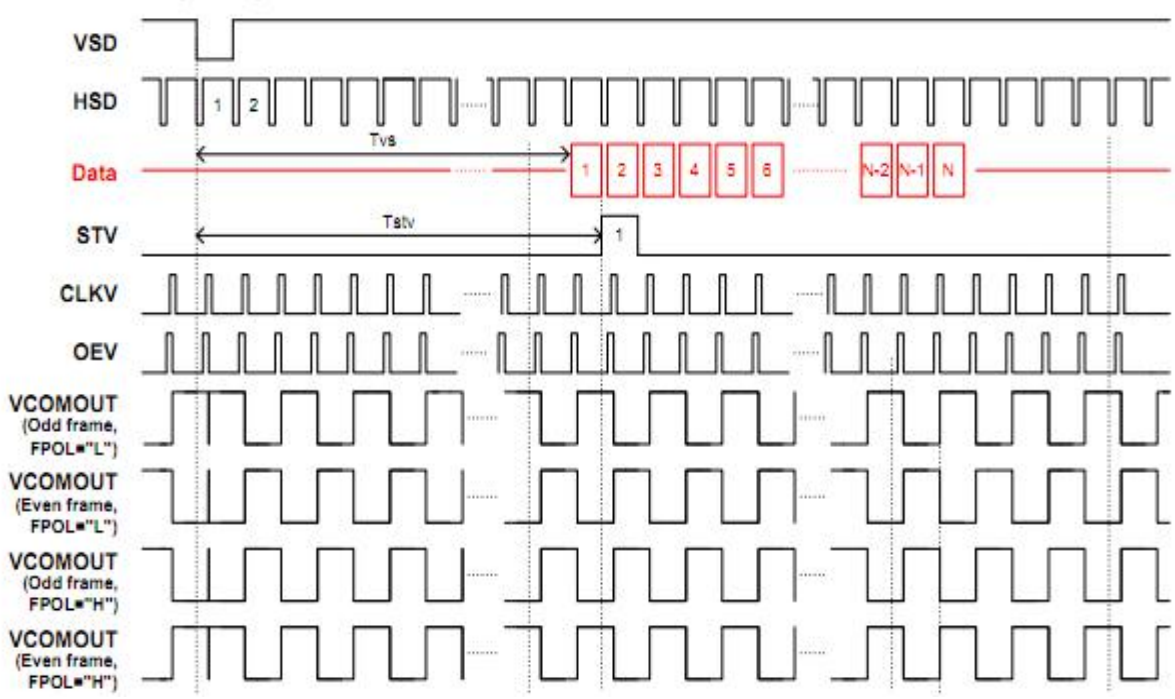




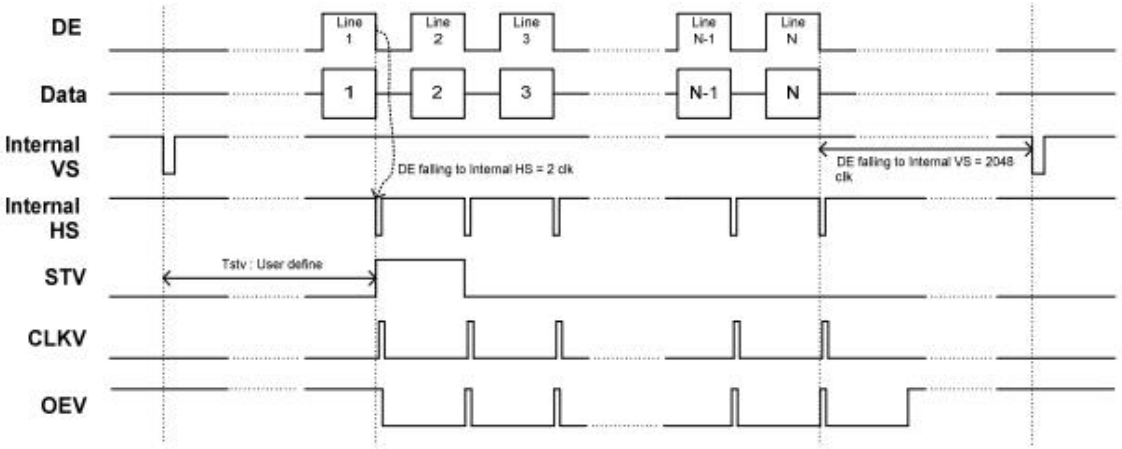
6.6 Input Data Timing (24 bit RGB mode for 960 x 240 @ SEL\[3:0] = 1100b)



6.7 Vertical Timing Diagram (HV Mode)

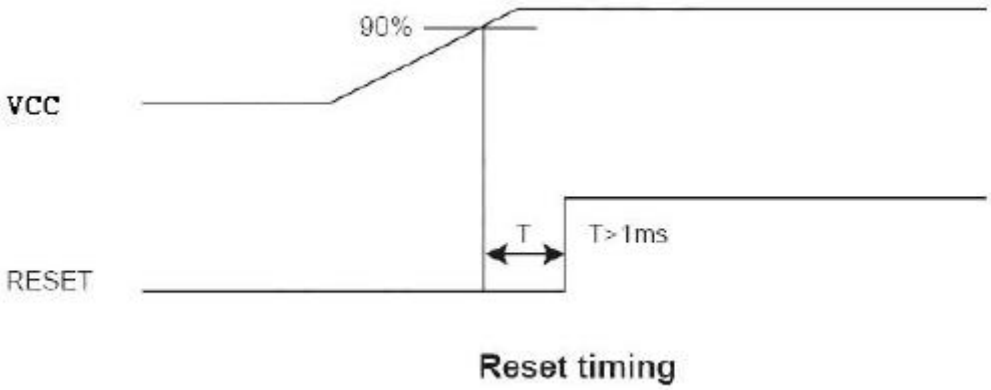


6.8 Vertical Timing Diagram (DE Mode)



6.9Reset Timing Chart

The RESET input must be held at least 1ms after power is stable



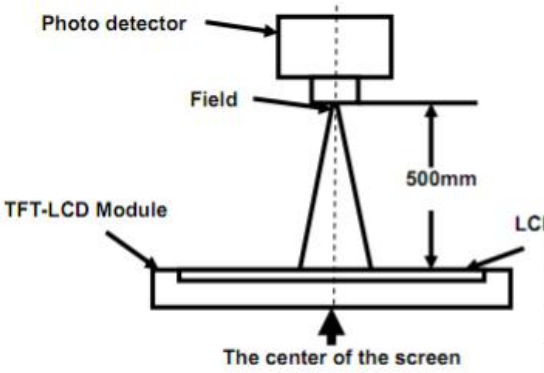
Reset timing

7 Optical Characteristics

Items		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angles		θ_T	Center CR≥10		55	-	Degree.	Note2
		θ_B			65	-		
		θ_L			65	-		
		θ_R			65	-		
Contrast Ratio		CR	Θ =0	-	350	-	-	Note1, Note3
Response Time		T_{ON}	25°C	-	20	35	ms	Note1, Note4
		T_{OFF}		-	25	40		
Chromaticity	White	X_W	Backlight is on	0.282	0.312	0.342	-	Note1, Note5
		Y_W		0.319	0.349	0.379	-	
	Red	X_R		0.609	0.639	0.669	-	
		Y_R		0.314	0.344	0.374	-	
	Green	X_G		0.264	0.294	0.324	-	
		Y_G		0.557	0.587	0.617	-	
	Blue	X_B		0.102	0.132	0.162	-	
		Y_B		0.106	0.136	0.166	-	
Uniformity		U		80	-	-	%	Note1, Note6
NTSC					50		%	Note5
Luminance		L		300	350			Note1, Note7

Test Conditions:
1. IF= 20mA(one channel),the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

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-7A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	SR-3A	2°

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).

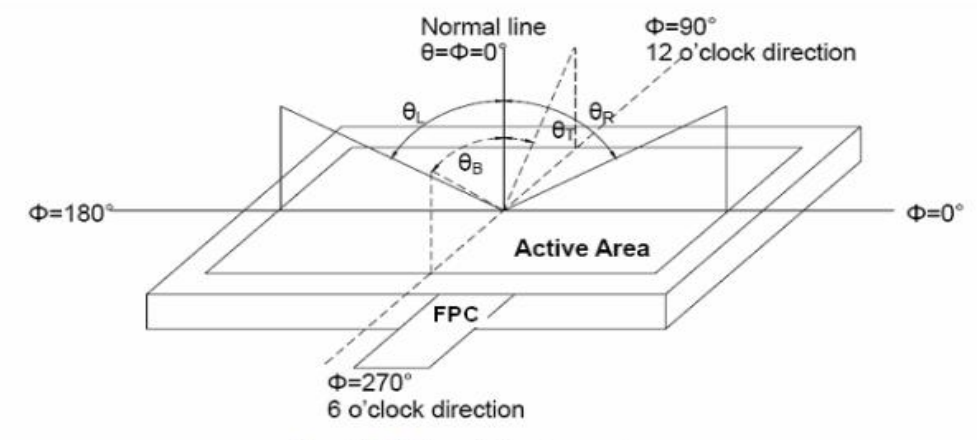


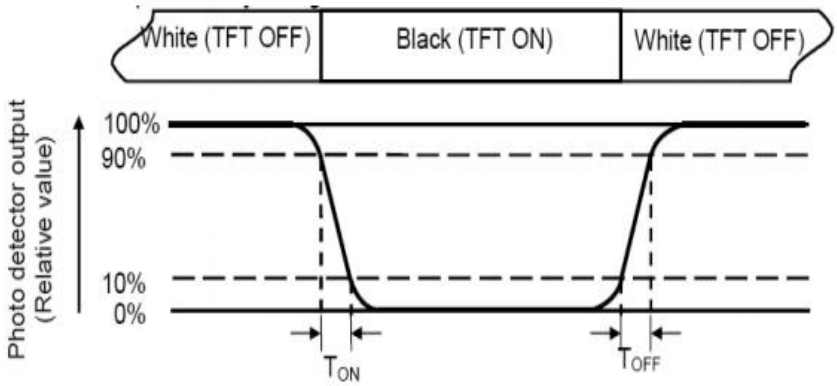
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

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

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval Between “White” state and “Black” state. Rise time (TON) is the time between Photo detector output intensity changed from 90% to 10%. And fall time (TOFF) 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

Luminance Uniformity (U) = Lmin/ Lmax X100%

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

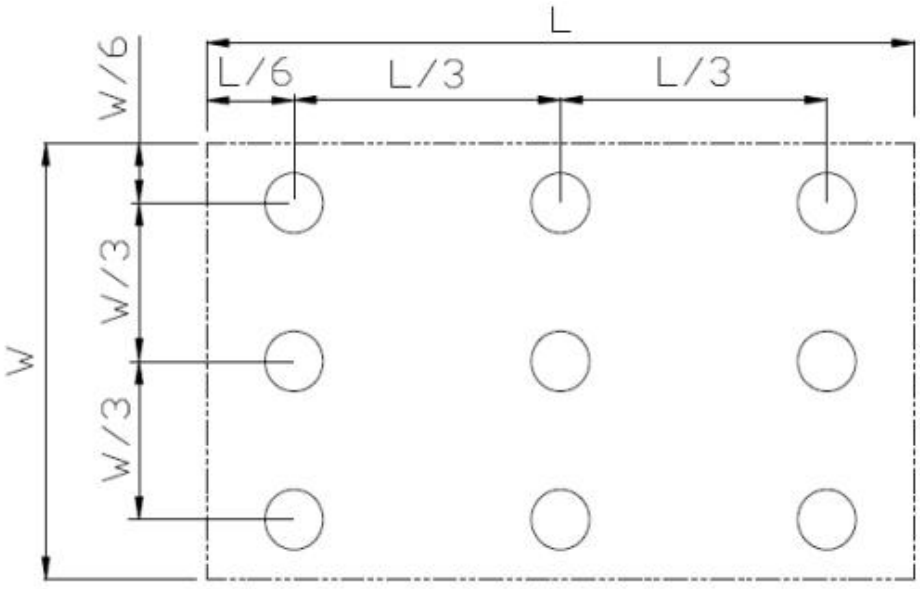


Fig. 2 Definition of uniformity

Lmax: The measured maximum luminance of all measurement position.

Lmin: The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts= +70℃, 240hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	Ta= -20℃, 240hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	Ta= +80℃, 240hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	Ta= -30℃, 240hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	Ta= +60℃, 90% RH max, 160 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30℃ 30 min ~ +80℃ 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±6KV, 5 times; Contact: ±2KV, 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: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. T_S is the temperature of panel's surface.
2. Ta is the ambient temperature of sample.

9.Precautions For Use of LCD modules

9.1 Handling Precautions

9.1.1The 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 the 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

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

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

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

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

9.1.8.4The LCD Module is coated with a film to protect the display surface. Be careful 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 recommended 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.

9.3Transportation Precautions

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