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TFT | OLED | CHARACTER | GRAPHIC | UWVD | SEGMENT | CUSTOM

TFT Display Module

Part Number

E35GF-I-RW1000-C

Overview:

- 3.5-Inch TFT (76.8x63.9mm)
- 320x240 Pixels
- 16/18/24-Bit RGB Interface
- Operating Temp: -20°C to +70°C
- All Viewing Angle
- Transmissive/Normally Black
- Capacitive Touch Panel
- 1000 Nits
- TFT IC: ST7272A
- RoHS Compliant

Description

This is a color active matrix TFT (Thin Film Transistor) LCD (Liquid Crystal Display) that uses amorphous silicon TFT as a switching device. This model is composed of a transmissive type TFT LCD Panel, driver circuit, capacitive touch panel, and a backlight unit. The resolution of this 3.5" TFT LCD contains 320(RGB)x240 pixels and can display up to 16.7M colors.

TFT Features

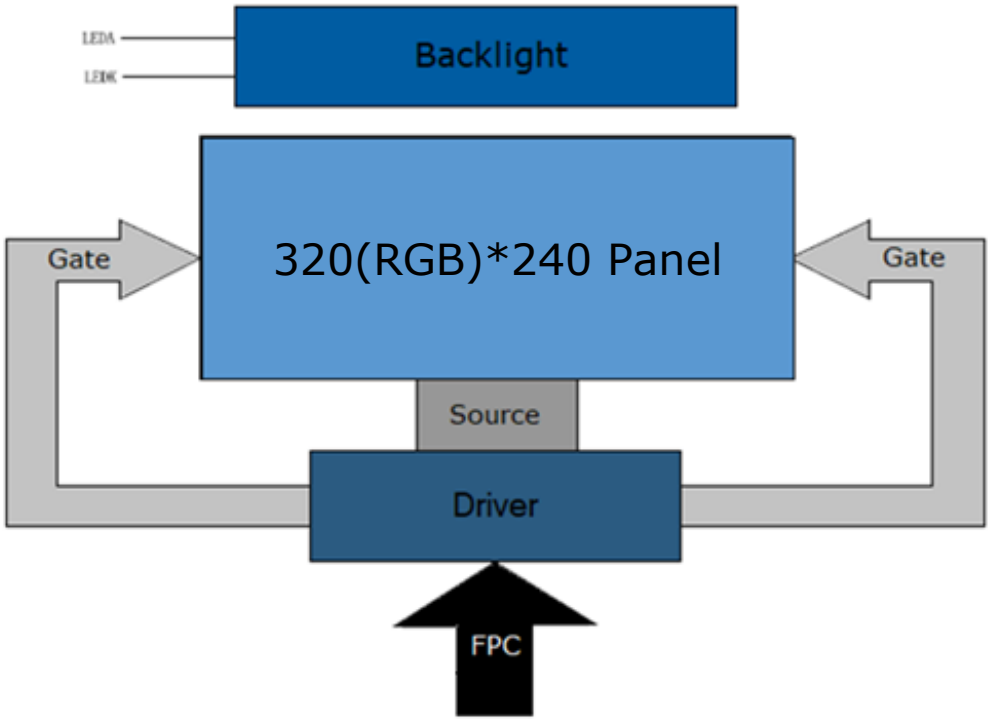
Low Input Voltage: 3.3V
Display Colors: 16.7M

General Information Items	Specification	Unit	Note
	Main Panel		
TFT Active area (AA)	70.08(H) x 52.56(V) (3.5 inch)	mm	-
Driver Element	TFT active matrix	-	-
Display Colors	16.7M	colors	-
Number of pixels	320(RGB)x240	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel Pitch	0.219(H) x 0.219 (V)	mm	-
Viewing angle	All	o'clock	-
TFT Controller IC	ST7272A	-	-
TFT Interface	16/18/24bit RGB	-	-
Display mode	Transmissive/ Normally Black	-	-
Operating temperature	-20-+70	℃	-
Storage temperature	-30-+80	℃	-

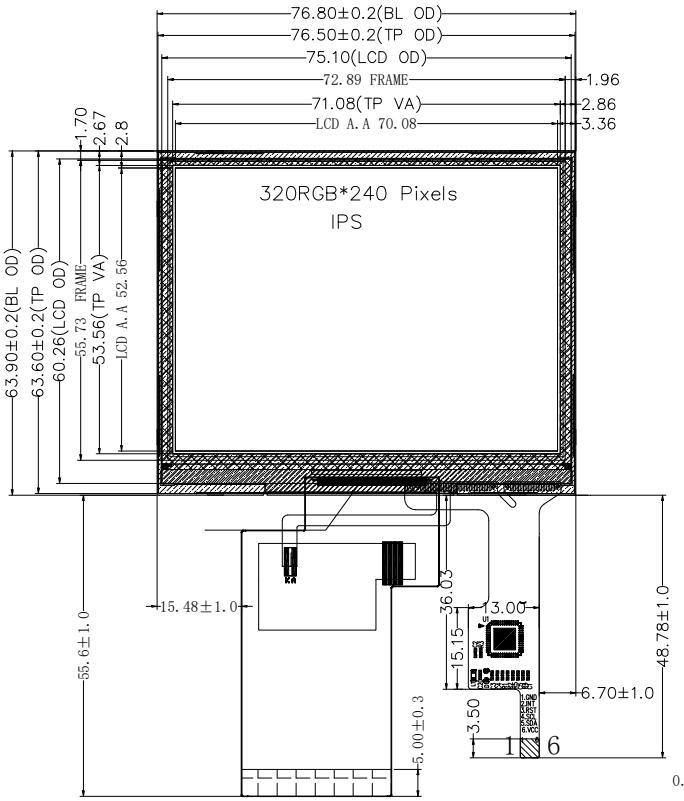
Mechanical Information

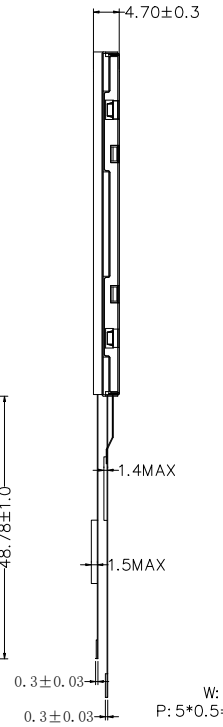
Item		Min	Typ.	Max	Unit	Note
Module Size	Horizontal (H)	76.50	76.80	77.10	mm	-
	Vertical (V)	63.60	63.90	64.20	mm	-
	Depth (D)	4.40	4.70	5.00	mm	-
	Weight		tbd		g	

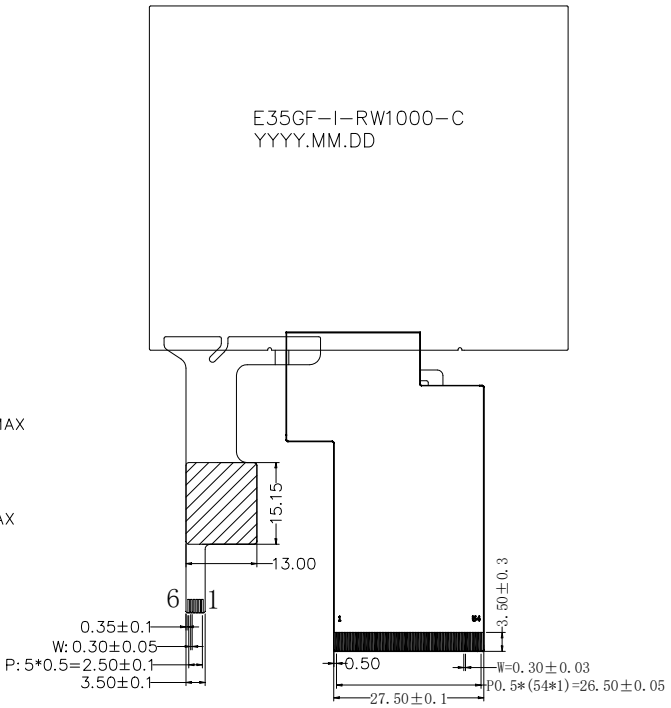
1. Block Diagram



Rev.	Description	Date
1.0	First	5-9-2022





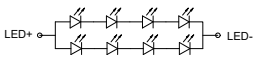


CTP Pin Characteristics

Pin #	Symbol
1	VDD
2	GND
3	SCL
4	SDA
5	INT
6	RESET

NO.	PIN
1.	LED-
2.	LED-
3.	LED+
4.	LED+
5.	GND
6.	RESET
7.	NC
8.	NC
9.	NC
10.	NC
11.	NC
12.	D0
13.	D1
14.	D2
15.	D3
16.	D4
17.	D5
18.	D6
19.	D7
20.	D8
21.	D9
22.	D10
23.	D11
24.	D12
25.	D13
26.	D14
27.	D15
28.	D16
29.	D17
30.	D18
31.	D19
32.	D20
33.	D21
34.	D22
35.	D23
36.	HSYNC
37.	VSYNC
38.	DCLK
39.	NC
40.	NC
41.	VDD
42.	VDD
43.	SPENA
44.	GND
45.	NC
46.	GND
47.	NC
48.	NC
49.	SPCK
50.	SPDA
51.	NC
52.	DE
53.	GND
54.	GND

Vf= 24 ~27.2V If=40mA
1000cd/m2



NOTES:

1. DISPLAY TYPE: 16.7M TFT, TRANSMISSIVE, ALL, /Normally Black
2. OPERATING TEMP: -20° C~70° C
3. STORAGE TEMP: -30° C~80° C
4. LCD DRIVER: ST7272A-G4-1-E
   CTP DRIVER: GT911
5. BACKLIGHT:8CHIP-WHITE LED, Parallel connection
6. ROHS COMPLIANCY
7. GENERAL TOLERANCE : ±0.2

Model Name: E35GF-I-RW1000-C		
General Tol: ±0.2		
Approvals	Date	
DWN:		
CHK:		
APP:		

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Drawing No.:		Scale:	
Size:		Unit: mm	Page: 1/1

2. Input TFT Terminal Pin Assignment

Recommended Connector: 512965494

NO.	Symbol	Description	Notes
1-2	LED-	BACKLIGHT LED CATHODE INPUT PIN	
3~4	LED+	BACKLIGHT LED ANODE INPUT PIN	
5	GND	GROUND	
6	RESET	SYSTEM RESET PIN	
7-11	NC	NO CONNECT	
12~35	D00-D23	DATA BUS	
36	HSYNC	HORIZONTAL SYNCHRONOUS SIGNAL	
37	VSYNC	VERTICAL SYNCHRONOUS SIGNAL	
38	DCLK	PIXEL CLOCK INPUT PIN	
39~40	NC	NO CONNECT	
41~42	VDD	POWER SUPPLY	
43	SPENA	CHIP SELECT FOR SERIAL PORT USE	
44	GND	GROUND	
45	NC	NO CONNECT	
46	GND	GROUND	
47-48	NC	No connect	
49	SPCK	Serial port Clock	
50	SPDA	Serial port Data input/output	
51	NC	No connect	
52	DEN	Data enable signal	
53~54	GND	Ground	

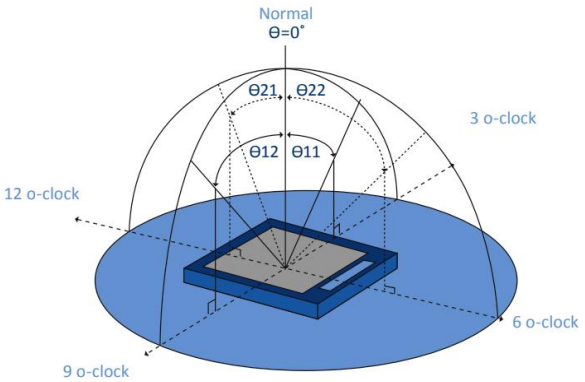
3. LCD Optical Characteristics

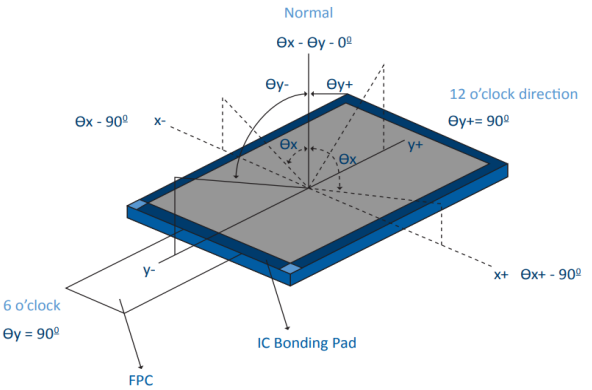
3.1 Optical Specifications

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Contrast Ratio		Cr		900	1200	--		(1)(2)
Response Time	Rising	Tr	Θ= 25	--	10	15	msec	(1)(3)
	Falling	Tf		--	20	25	msec	(1)(3)
Uniformity		ΔL		75	80	--	%	
Color Filter Cromacicity	White	Wx	Θ=0 Normal viewing angle	0.2615	0.3115	0.3615	--	(1)(4) CF Glass C-light
		Wy		0.2808	0.3308	0.3808		
	Red	Rx		--	--	--		
		Ry		--	--	--		
	Green	Gx		--	--	--		
		Gy		--	--	--		
	Blue	Bx		--	--	--		
		By		--	--	--		
Viewing Angle	Horizontal	ΘL	CR>10	70	80	--	--	(1)(4)
		ΘR		70	80	--	--	
	Vertical	ΘU		70	80	--	--	
		ΘD		70	80	--	--	
Option View Direction		Free						

Optical Specification Reference Notes:

(1) Definition of Viewing Angle: The viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3,9 o'clock direction and the vertical or 6,12 o'clock direction with respect to the optical axis which is normal to the LCD surface.



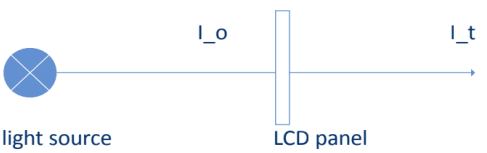


(2) Definition of Contrast Ratio (Cr): measured at the center point of panel. The contrast ratio (Cr) measured on a module, is the ratio between the luminance (Lw) in a full white area (R=G=B=1) and the luminance (Ld) in a dark area (R=G=B=0).

$$Cr = \frac{Lw}{Ld}$$

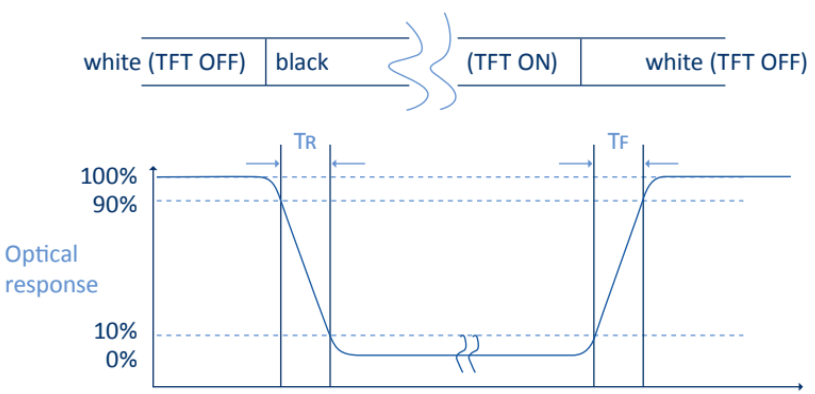
(3) Definition of transmittance (T%): The transmittance of the panel including the polarizers is measured with electrical driving. The equation for transmittance Tr is:

$$Tr = \frac{It}{Io} x\ 100\%$$



Io = the brightness of the light source.
It = the brightness after panel transmission

(4) Definition of Response Time (Tr, Tf): The rise time 'Tr' is defined as the time for luminance to change from 90%to 10% as a result of a change of the electrical condition. The fall time 'Tf' is defined as the time for luminance to change from 10% to 90% as a result of a change of the electrical condition.



(5) Definition of Color Gamut:
Measuring machine CFT-01. NTSC's Primaries: R(x,y,Y),G(x,y,Y), B(x,y,Y). FPM520 of Westar Display Technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.The color chromaticity shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

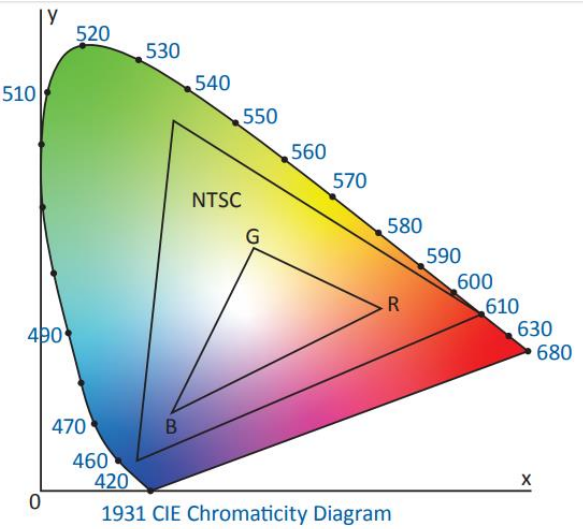
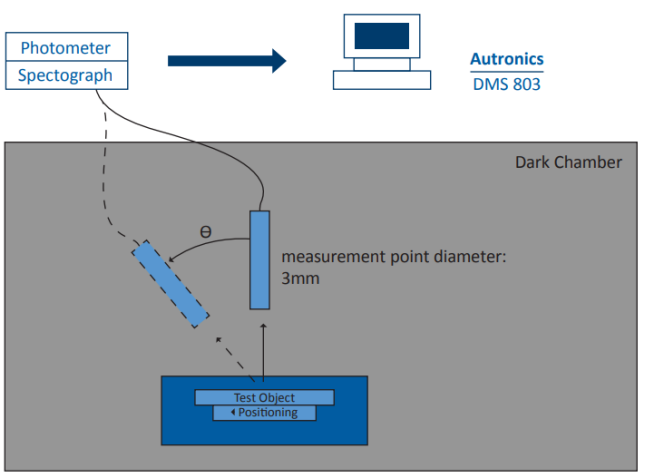


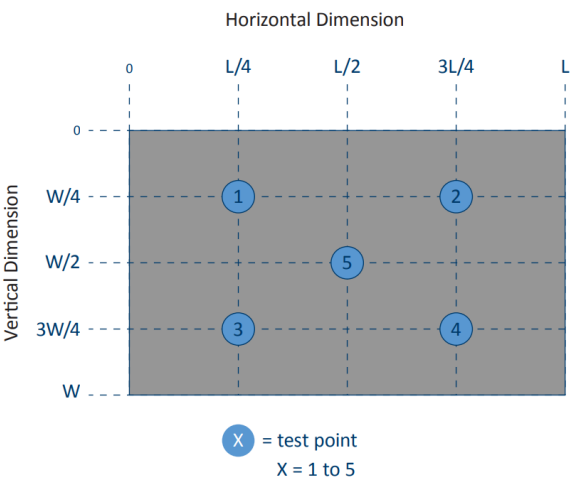
Fig. 1931 CIE chromacity diagram

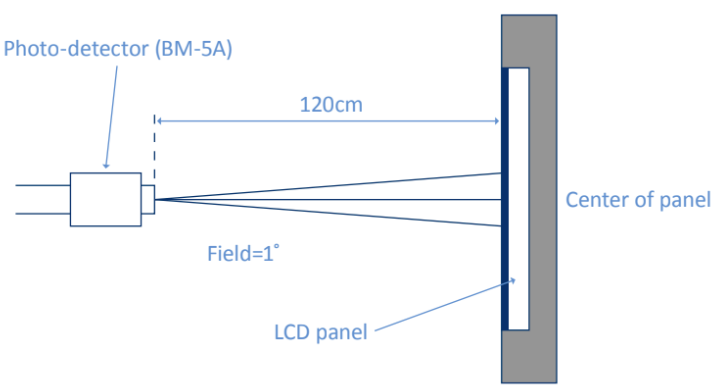
Color gamut: $S = \frac{\text{Area of RGB triangle}}{\text{Area of NTSC triangle}} \times 100\%$

(6) Definition of Optical Measurement Setup:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 20 minutes.







4. TFT Electrical Characteristics

4.1 Absolute Maximum Rating (Ta=25 ˚C, VSS=0V)

Characteristics	Symbol	Min	Max	Unit
Digital Supply Voltage	VDD	VSS-0.3	4.0	V
Operating Temperature	TOP	-20	+70	℃
Storage Temperature	TST	-30	+80	℃

NOTE: If the absolute maximum rating of the above parameters is exceeded, even momentarily, the quality of the product may be degraded. Absolute maximum ratings specify the values which the product may be physically damaged if exceeded. Be sure to use the product within the range of the absolute maximum ratings.

4.2 DC Electrical Characteristics

Characteristics	Symbol	Min	Typ.	Max	Unit	Note
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
Normal Mode Current	IDD	--	22.89	34.34	mA	
Level Input Voltage	VIH	0.7VDD	--	VDD	V	
	VIL	GND	--	0.3VDD	V	
Gate driver high voltage	VGH	----	----	-----	----	
Gate driver low voltage	VGL	----	----	-----	----	
Input signal voltage	VCOM	----	----	-----	----	

4.3 LED Backlight Characteristics

Item	Symbol	Min	Typ.	Max	Unit	Note
LED Voltage	VF	24	25	27.2	V	
LED Current	IF	--	40	--	V	
LCM Luminance	LV		1000	--	cd/m2	Note 3
LED lifetime	Hr	--	50000	--	hour	Note1 & 2
Uniformity	AVg	80	--	--	%	Note 3

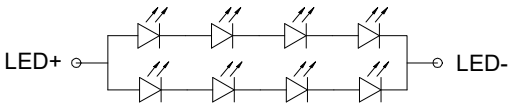
The back-light system is edge-lighting type with 8 white LEDs.

Note 1: LED lifetime (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °C, typical IL value indicated in the above table until the brightness becomes less than 50%.

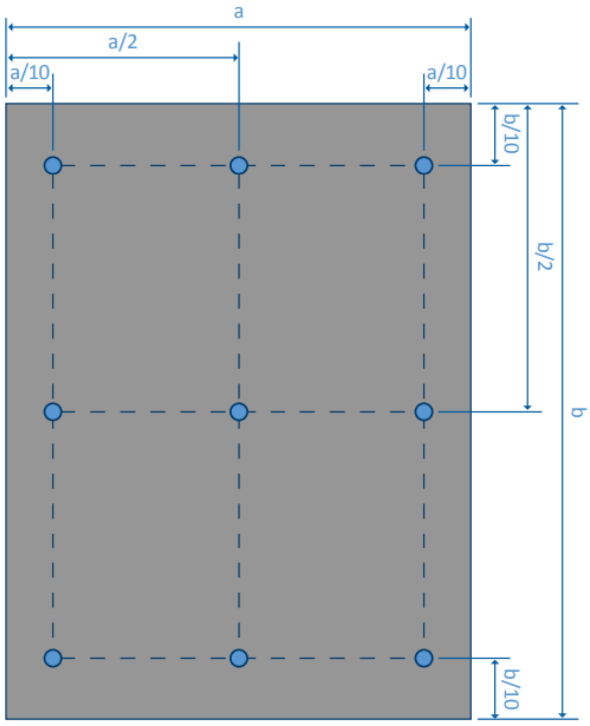
Note 2: The "LED lifetime" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=8=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.

Vf= 24 ~ 27.2 V If=40mA

1000 cd/m2



Note 3: Luminance Uniformity of these 9 points is defined as below:

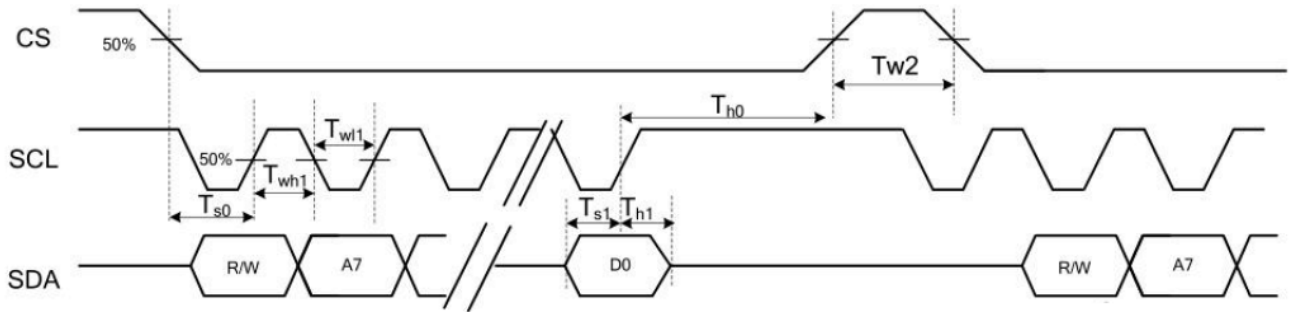


$$\text{Luminance} = \frac{\text{(Total Luminance of 9 points)}}{9}$$

$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points(1-9)}}{\text{maximum luminance in 9 points(1-9)}}$$

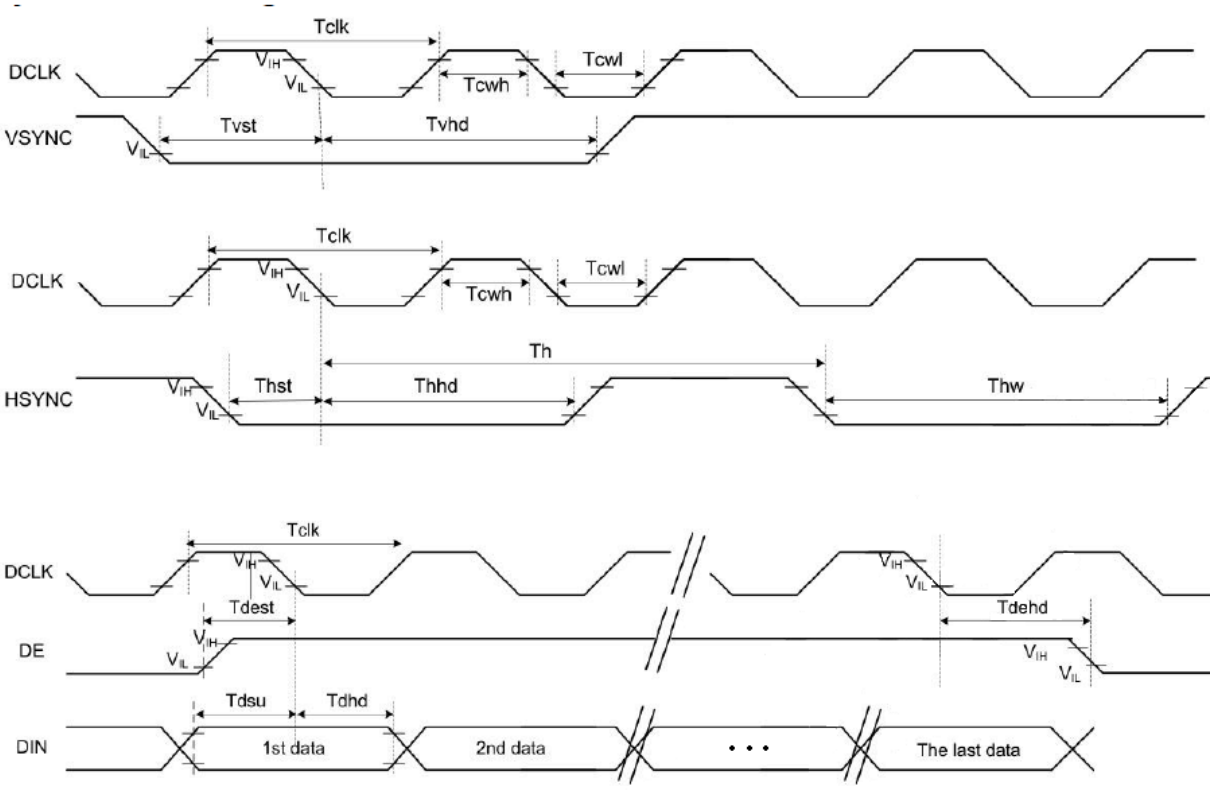
5. AC Characteristics

5.1. 3-wire Serial Interface (3SPI



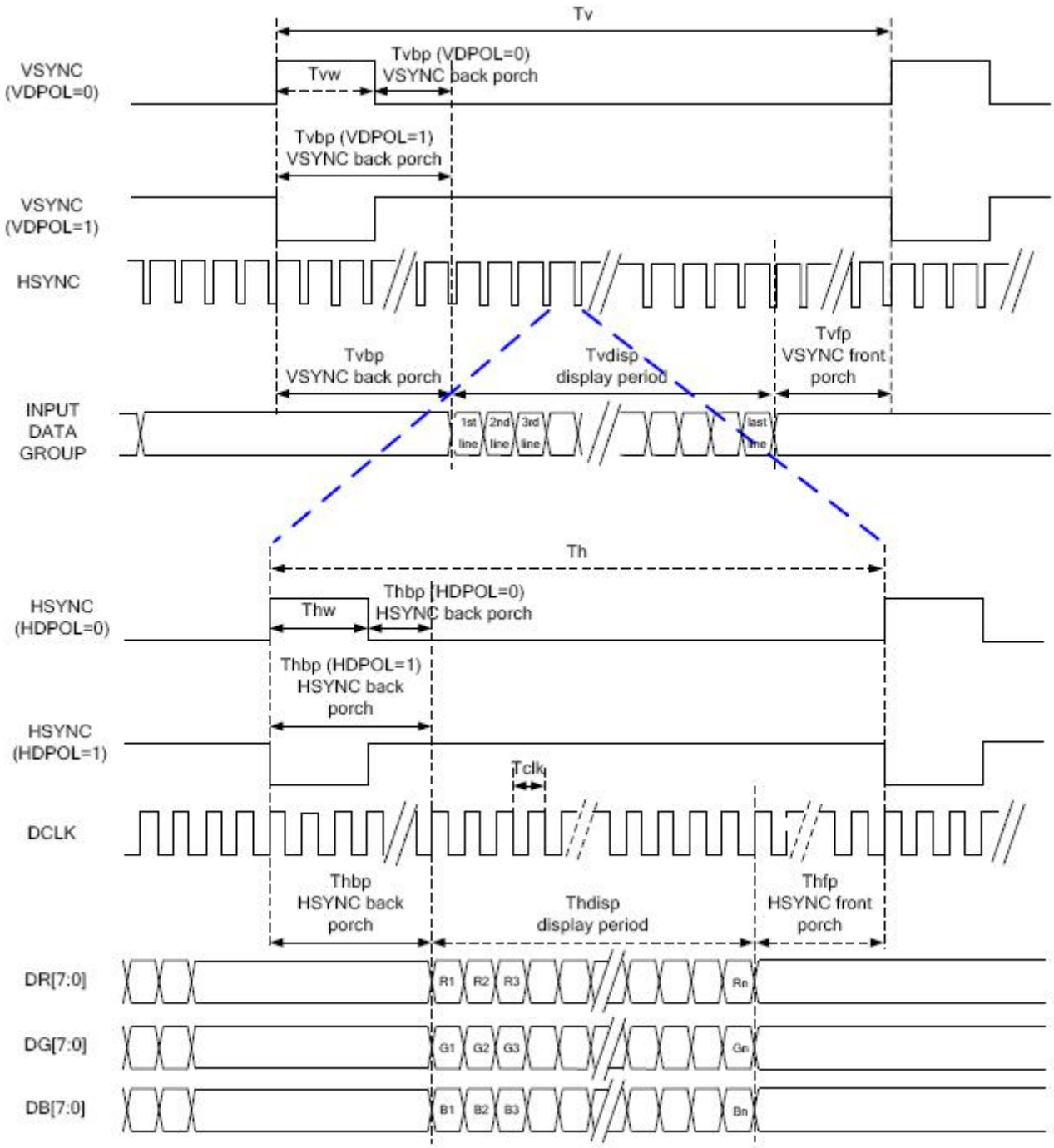
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CS Input Setup Time	T_{s0}	50	-	-	ns	
Serial Data Input Setup Time	T_{s1}	50	-	-	ns	
CS Input Hold Time	T_{h0}	50	-	-	ns	
Serial Data Input Hold Time	T_{h1}	50	-	-	ns	
SCL Write Pulse High Width	T_{wh1}	50	-	-	ns	
SCL Write Pulse Low Width	T_{wl1}	50	-	-	ns	
SCL Read Pulse High Width	T_{rh1}	300	-	-	ns	
SCL Read Pulse Low Width	T_{rl1}	300	-	-	ns	
CS Pulse High Width	T_{w2}	400	-	-	ns	

5.2. RGB Data Bus Timing Signals

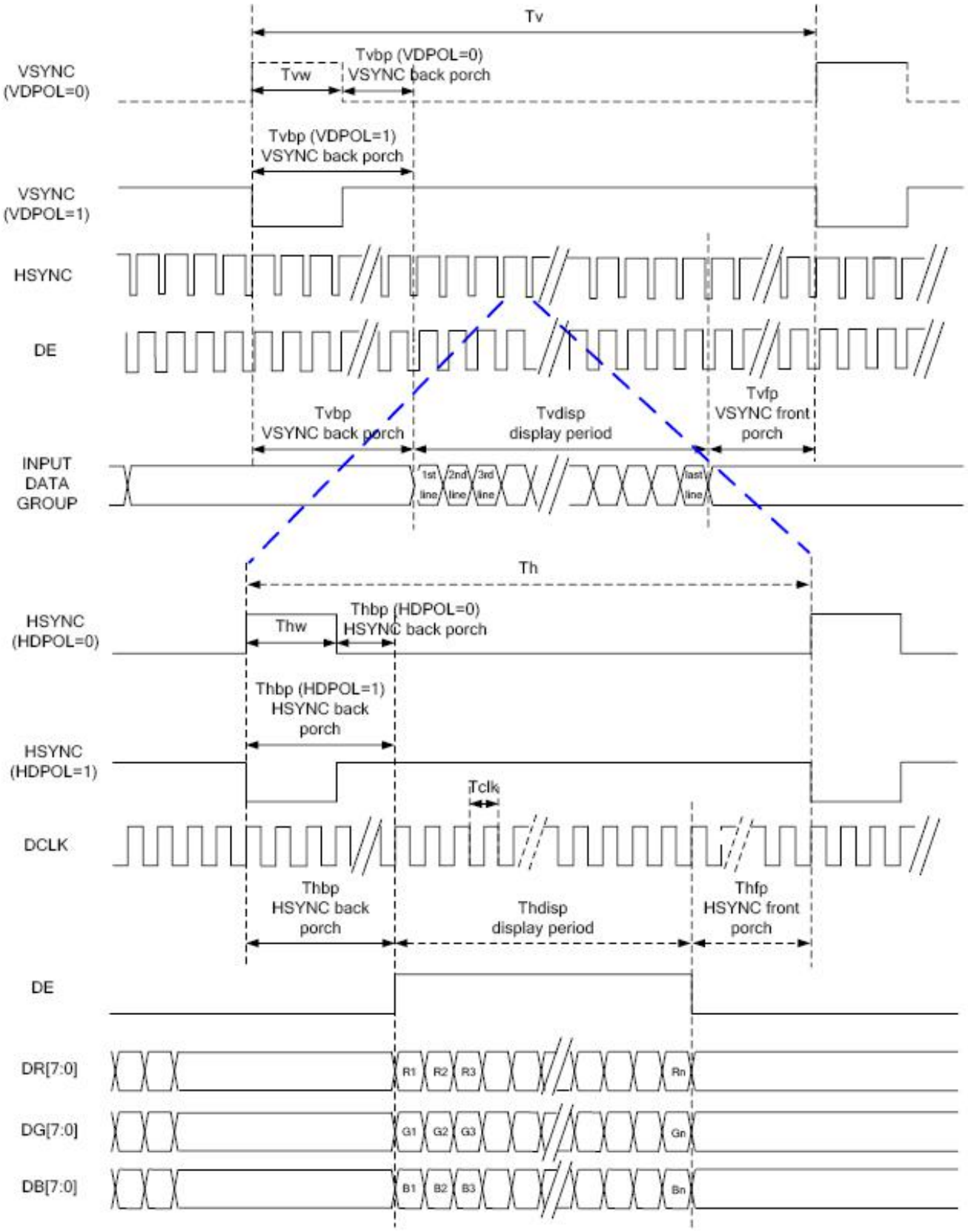


Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tclk	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
HSYNC Period	Th	55	60	65	us	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	That	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	
DE Setup Time	Tdest	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

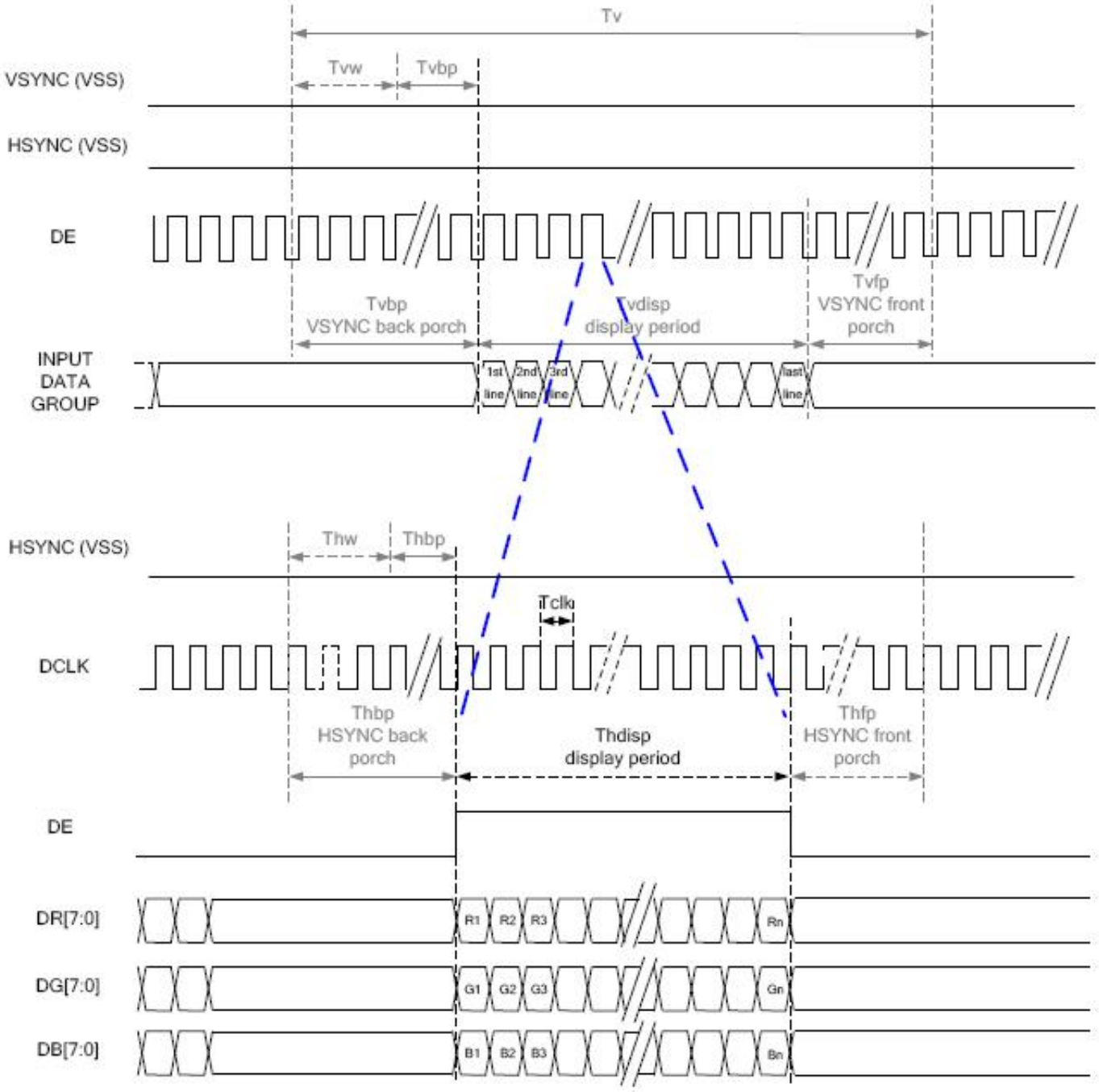
5.3. RGB SYNC Mode



5.4. RGB SYNC-DE Mode

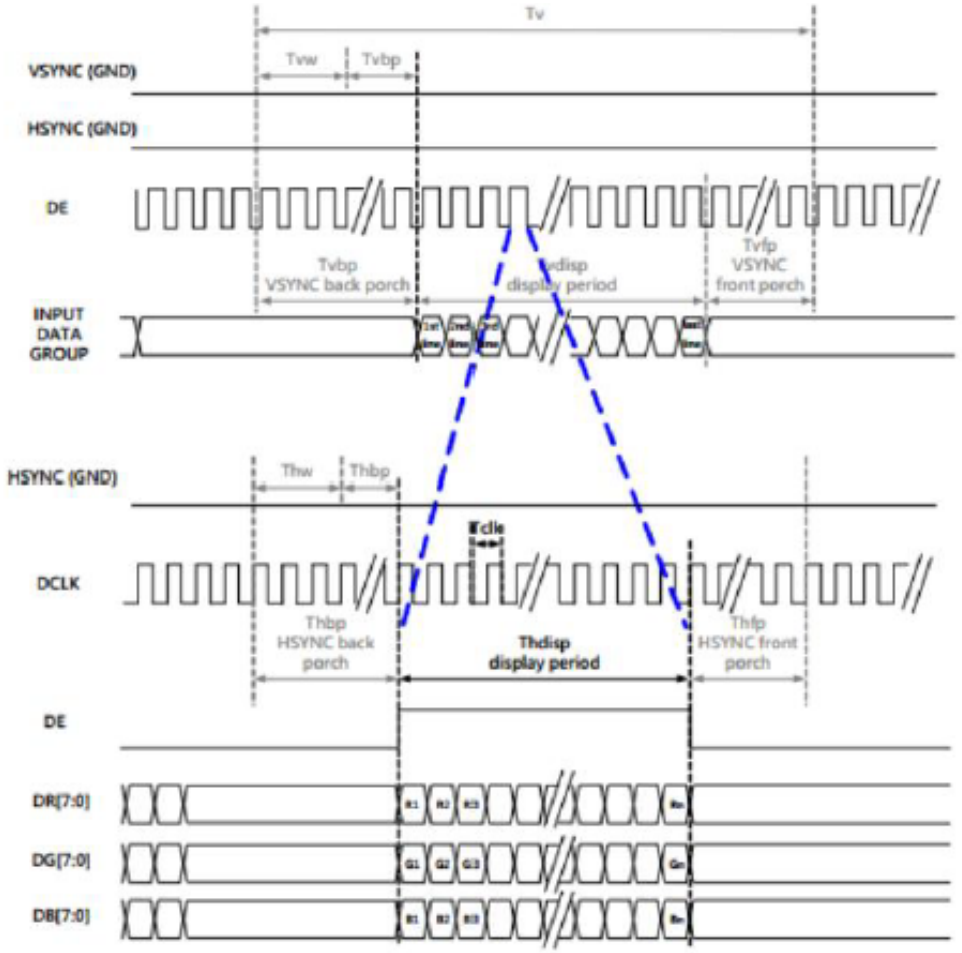


5.5. DE Mode



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

5.6. 24-bit RGB Timing Table

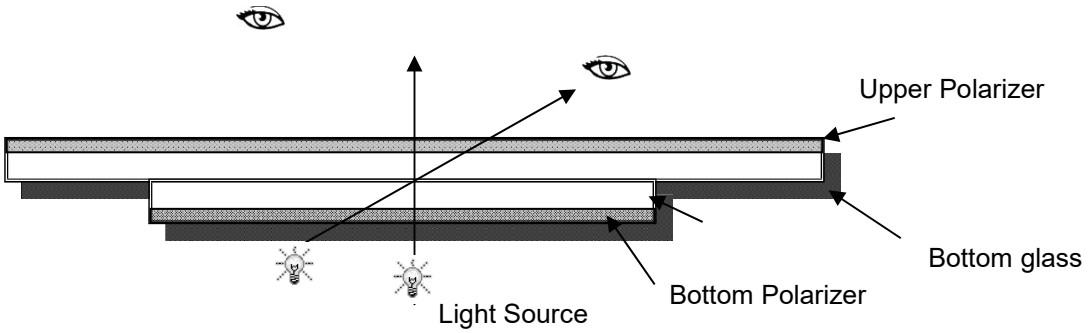


Item		Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK Frequency		Fclk	5	6	8	MHz	
DCLK Period		Tclk	125	167	200	ns	
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp	-	320	-	DCLK	
	Back Porch	Thbp	3	43	43	DCLK	H blanking setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp	-	240	-	HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	V blanking setting
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

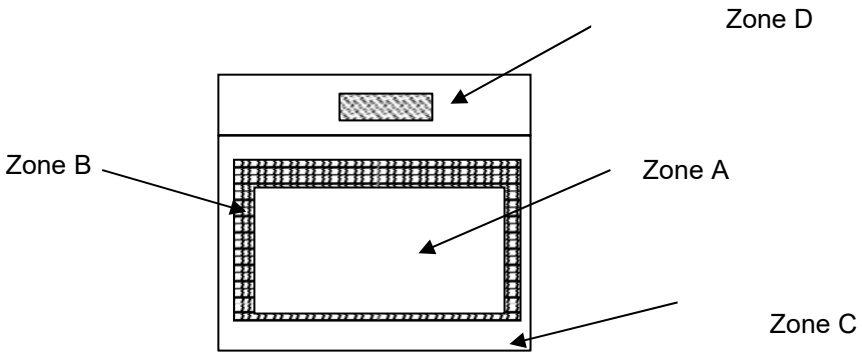
6.0 Visual & Function Inspection Standards

Inspection conditions

Inspection performed under the following conditions is
recommended: Temperature: 25±5℃
Humidity 65%±10%RH
Viewing Angle: Normal viewing angle.
Illumination: Single fluorescent lamp (300 to 700Lux)
Viewing distance: 30-50cm



Definition



Zone A: Effective Viewing Area(Character or Digit can be seen)
Zone B: Viewing Area except Zone A
Zone C: Outside (Zone A+Zone B) which cannot be seen after assembly by customer.)
Zone D: IC Bonding Area

Note: As a general rule, visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

6.1 Sampling Plan

According to GB/T 2828-2003; normal inspection, Class Ⅱ

AQL:

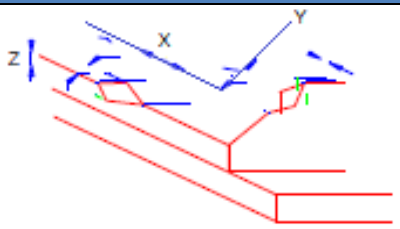
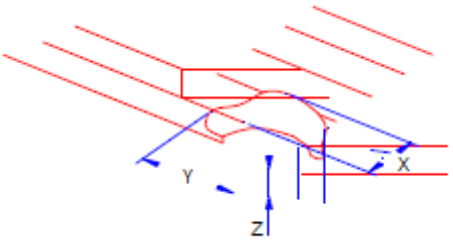
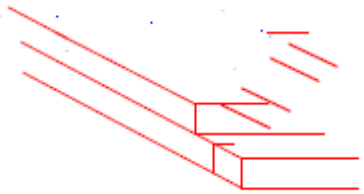
Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display, TP: Touch Panel, LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight not lighting, abnormal lighting 4) TP not functioning	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot, Dim spot, Polarizer Bubble; Polarizer accidented spot.	
6	Soldering appearance	Good soldering, peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	

6.2 Criteria For Visual Inspection

6.2.1 LCD Broken/Crack

No.	Description	Criteria	Visual
1	Edge of LCD Broken	X ≤ 3mm Y < border line seal Z ≤ T	
2	LCD Corner Broken	X ≤ 3mm Y < L Z ≤ T	
3	LCD Crack	Not allowed	

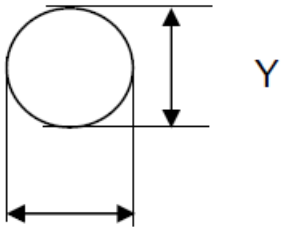
Note: X=Length, Y=Width, Z=Height, L=Length of ITO, T=Height of LCD

Number	Items	Criteria
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight not lighting	Not allowed
5	TP not functioning	Not allowed

6.2.2 Spot Defect

No	Description	Acceptable Quality			
1	Light Dot: LCD/TP/Polarizer black/white spot, light dot, pinhole, dent, stain	Size (mm)	Zone		
		φ	A	B	C
		$\varphi \leq 0.10$	Ignore		Ignore
		$0.10 \leq \varphi \leq 0.20$	3 (distance≥10mm)		
		$0.20 \leq \varphi \leq 0.25$	2		
		$\varphi > 0.3$	0		
2	Dim Spot: LCD/TP/Polarizer dim dot, light leakage, dark spot	$\varphi \leq 0.1$	Ignore		Ignore
		$0.10 \leq \varphi \leq 0.20$	3 (distance≥10mm)		
		$0.20 \leq \varphi \leq 0.25$	2		
		$\varphi > 0.30$	0		
3	Polarizer Accident Spot	$\varphi \leq 0.2$	Ignore		Ignore
		$0.3 \leq \varphi \leq 0.5$	2(distance≥10mm)		
		$\varphi > 0.5$	0		
4	Polarizer Bubble	$\varphi \leq 0.2$	Ignore		Ignore
		$0.2 \leq \varphi \leq 0.4$	3(distance≥10mm)		
		$0.4 \leq \varphi \leq 0.6$	2		
		$\varphi > 0.6$	0		

Visual:



$\Phi=(X+Y)/2$

6.2.3 Line Defect

No.	Description	Width(mm)	Length(mm)	Acceptable Quality		
1	Line Defect: LCD/TP/Polarizer backlight black/white line, scratch, stain.	W	L	A	B	C
		$W \leq 0.03$	Ignore	Ignore		Ignore
		$0.03 \leq W \leq 0.04$	$L \leq 3.0$	$N \leq 2$		
		$0.04 \leq W \leq 0.05$	$L \leq 2.0$	$N \leq 1$		
		$W > 0.05$	Define as spot defect			

Electronic Components SMT

According to IPC-A-610C class Ⅱ standard. Function defect and missing part are major defects, the others are minor defects.

6.3 Reliability Test Results

Item	Condition
High Temperature Operating	70℃,96H
Low Temperature Operating	-20℃, 96HR
High Temperature Storage	80℃, 96HR
Low Temperature Storage	-30℃, 96HR
High Temperature & High Humidity Storage	+60℃, 90% RH, 96 hours.
Thermal Shock (Non-operation)	30℃,30 min ↔ 80℃,30 min Change time:5min 20CYC.
ESD test	C=150pF, R=330, 5points/panel Air±8KV, 5times; Contact±6KV, 5 times; (Environment: 15℃~35℃, 30%~60%).
Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).
Box Drop Test	1 Corner 3 Edges 6 faces,80cm (medium box)

Inspection After Test: Inspection after 2-4 hours storage at room temperature, the sample shall be free from defects:

1. Air bubble in LCD
2. Non-display
3. Missing segments/line;
4. Glass crack
5. Current IDD is twice higher than initial value

Remark:

1. The test samples should be applied to only one test item.
2. Sample size for each test item is 5~10pcs.
3. For Damp Proof Test, Pure water (Resistance＞10MΩ) should be used.
4. In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
5. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

7. Cautions and Handling Precautions

7.1 Handling and Operating the Module

1. When the module is assembled, it should be attached to the system firmly. Do not warp or twist the module during assembly work.
2. Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
3. Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
4. Do not allow drops of water or chemicals to remain on the display surface. If you have the droplets for a long time, staining and discoloration may occur.
5. If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
6. The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane. Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
7. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
8. Protect the module from static; it may cause damage to the CMOS ICs.
9. Use fingerstalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
10. Do not disassemble the module.
11. Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
12. Pins of I/F connector shall not be touched directly with bare hands.
13. Do not connect, disconnect the module in the “Power ON” condition.
14. Power supply should always be turned on/off by the item Power On Sequence & Power Off Sequence.

7.2 Storage and Transportation

1. Do not leave the panel in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
2. Do not store the TFT-LCD module in direct sunlight.
3. The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
4. It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module. In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
5. This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.