



PRODUCT SPECIFICATIONS

Module No.: NTD-3.5T320240R100C

TFT(Thin-Film-Transistor) Color Liquid Crystal Display Module

General Specification

- 3.5inch Diagonal
- 320xRGBx240 resolution
- 24bit RGB interface
- LED Backlight (400cd/m²)
- 16.7 M colors Normally White
- 12:00 O'clock Optimal View
- **RoHS Compliant**

For Customer's Acceptance:

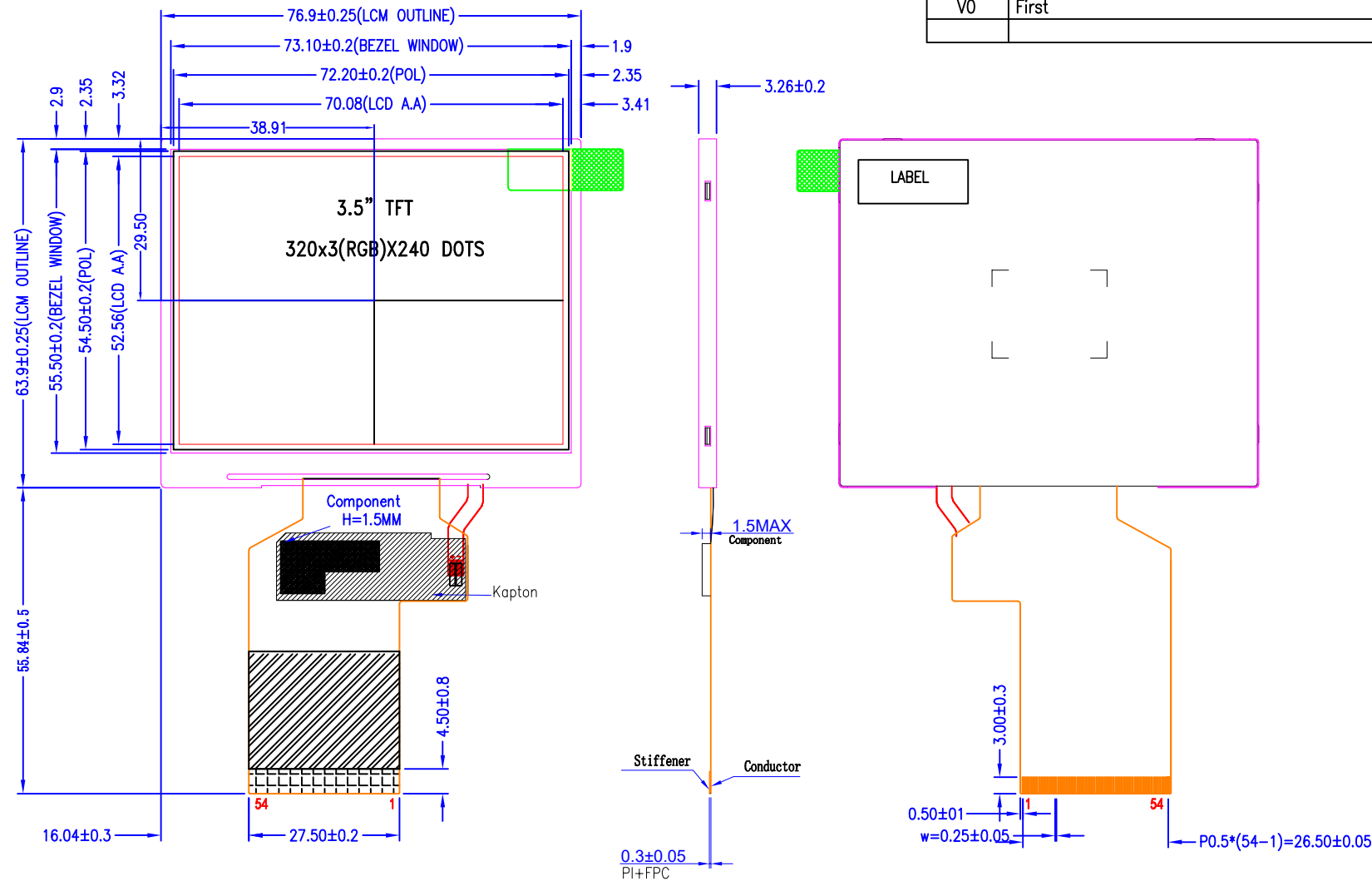
Approved By	Comment

From: NewTrend Display Technology Co., Ltd.

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Outline Drawing

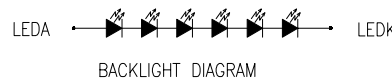
SYMBOL	REVISION		DATE
VO	First		



PIN NO.	SYMBOL
1	LEDK
2	LEDK
3	LEDA
4	LEDA
5	YU
6	XR
7	NC
8	RESET
9	CS
10	SCK
11	SDA
12~19	BO-B7
20~27	GO-G7
28~35	RO-R7
36	HSYNC
37	VSYNC
38	DCLK
39	NC
40	NC
41	VCC
42	VCC
43	YD
44	XL
45	NC
46	NC
47	NC
48	SEL2
49	SEL1
50	SELO
51	NC
52	DE
53	GND
54	GND

NOTES:

1. DISPLAY TYPE: 3.5" TFT, Transmissive, Normally White
2. OPTIMUM VIEWING : 12:00
3. Top: -20°C~+70°C, Tst: -30°C~+80°C
4. Driver IC: HX8238D
5. TFT Interface :24-bit RGB Interace, VCC=3.3V
6. LCM Luminance:LED/400cd/m² (TYP) IF=20mA,VF=18V(TYP)
7. RoHS



UNLESS OTHERWISE SPECIFIED Unit:mm THIRD ANGLE PROJECTION:		NewTrend Display Technology	
UNLESS OTHERWISE NOTED TOLERANCES :±0.2mm		DRAWING_NO. NTD-3.5T320240R100C	
SCALE	SHEET	DRAWN BY:	APPROVED BY:
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Pin Description:

Pin No.	Symbol	Function Description	Remark
1~2	LEDK	LED backlight (Cathode).	
3~4	LEDA	LED backlight (Anode).	
5	YU	RTP (No connection)	
6	XR	RTP (No connection)	
7	NC	No connection	
8	RESET	Reset signal input terminal, active at 'L'	
9	CS	Chip select signal input terminal, Active at 'L'	
10	SCK	Write signal input terminal, Active at 'L'. Synchronizing clock signal in SPI mode.	
11	SDA	SPI interface input pin.	
12~19	B0~B7	Blue Data bus	
20~27	G0~G7	Green Data bus	
28~35	R0~R7	Red Data bus	
36	HSYNC	Line synchronizing signal for RGB interface operation.	
37	VSYNC	Frame synchronizing signal for RGB interface operation.	
38	DCLK	Dot clock signal for RGB interface operation.	
39~40	NC	No connection	
41~42	VCC	Power supply for voltage	
43	YD	RTP (No connection)	
44	XL	RTP (No connection)	
45~47	NC	No connection	
48	SEL2	Define the input interface	Note1
49	SEL1	Define the input interface	Note1
50	SEL0	Define the input interface	Note1
51	NC	No connection	
52	DE	Data ENEABLE signal for RGB interface operation.	
53~54	GND	Power ground	

Note1:

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

DC Electrical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Temperature Range	Top	Absolute Max	-20	-	+70	°C
Storage Temperature Range	T _{ST}	Absolute Max	-30	-	+80	°C
Digital Supply Voltage	V _{CC}	-	3.0	3.3	3.6	V
Input logic high voltage	V _{IH}	-	0.8*V _{CC}	-	V _{CC}	V
Input logic low voltage	V _{IL}	-	GND	-	0.2*V _{CC}	V
Output logic High Voltage	V _{OH}	-	0.8*V _{CC}	-	V _{CC}	V
Output logic Low Voltage	V _{OL}	-	GND	-	0.2*V _{CC}	V

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Backlight Supply Voltage	V _f	Top=25°C I _f =20mA	16.8	18.0	21.0	V
Backlight Supply Current	I _f		-	20		mA
Backlight Lifetime	-	Top=25°C I _f =20mA	-	50000		Hrs

*Backlight lifetime is rated as Hours until half-brightness, under normal operating conditions. The LED of the backlight is driven by current drain, drive voltage is for reference only. Drive voltage must be selected to ensure backlight current drain is below MAX level stated.

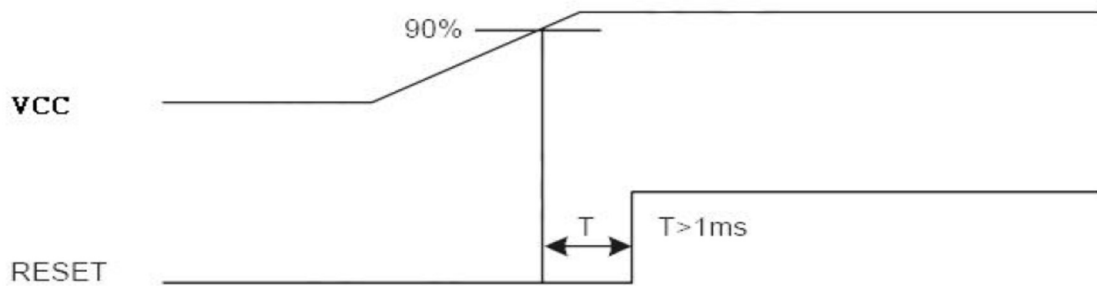
Optical Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	
Operating Viewing Angles	Top	-	CR≥10	50	-	Deg	
	Bottom	-		70	-		
	Left	-		70	-		
	Right	-		70	-		
Contrast Ratio	CR	Center	300	400	-	-	
Luminance	L _v		300	400		cd/m ²	
Response Time	T _r +T _f			50		ms	
Chromaticity	Red	X _R	-	TYP-0.05	0.633	TYP+0.05	-
		Y _R			0.326		-
	Green	X _G			0.297		-
		Y _G			0.577		-
	Blue	X _B			0.133		-
		Y _B			0.129		-
	White	X _w			0.294		-
		Y _w			0.334		-

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.

AC Electrical Characteristics
Reset Timing Characteristics

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



Reset timing

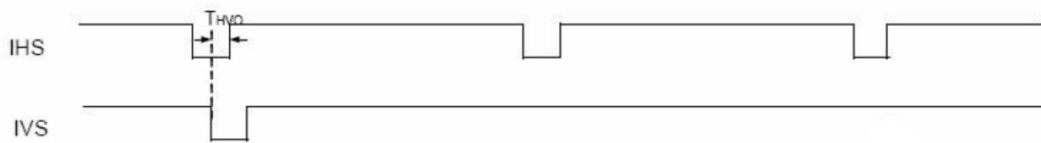
Parallel RGB Interface Timing Characteristics

Hsync and Vsync timing

CCIR601 timing waveform VS_POL=H, HS_POL=L in Register R2)

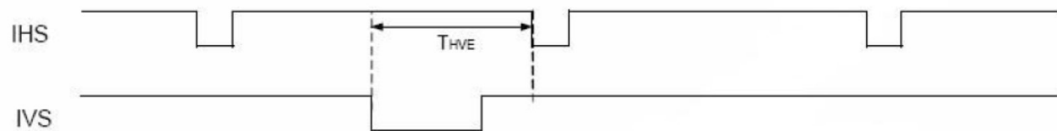
IHS and IVS timing

- Odd field



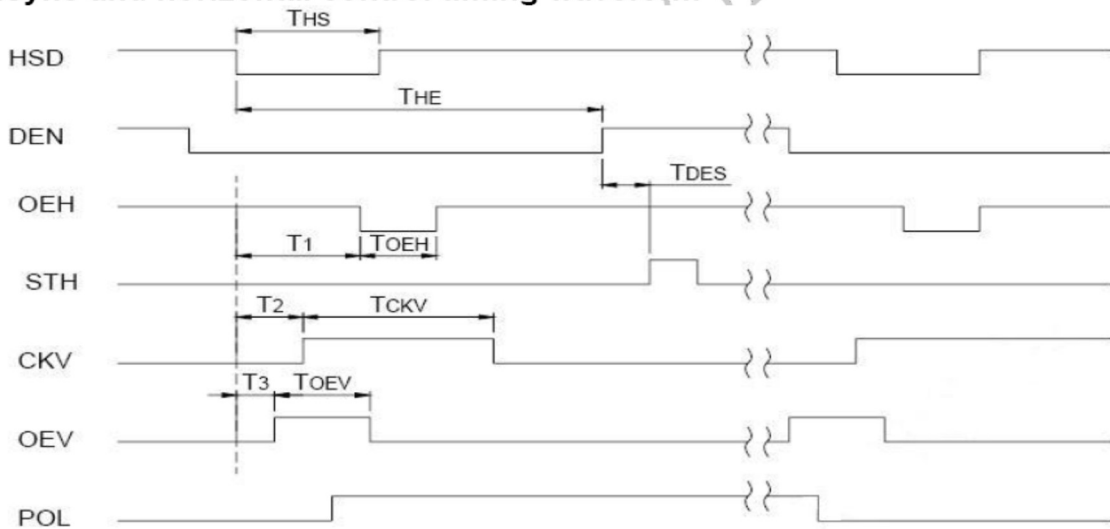
IHS and IVS waveforms in odd field

- Even field

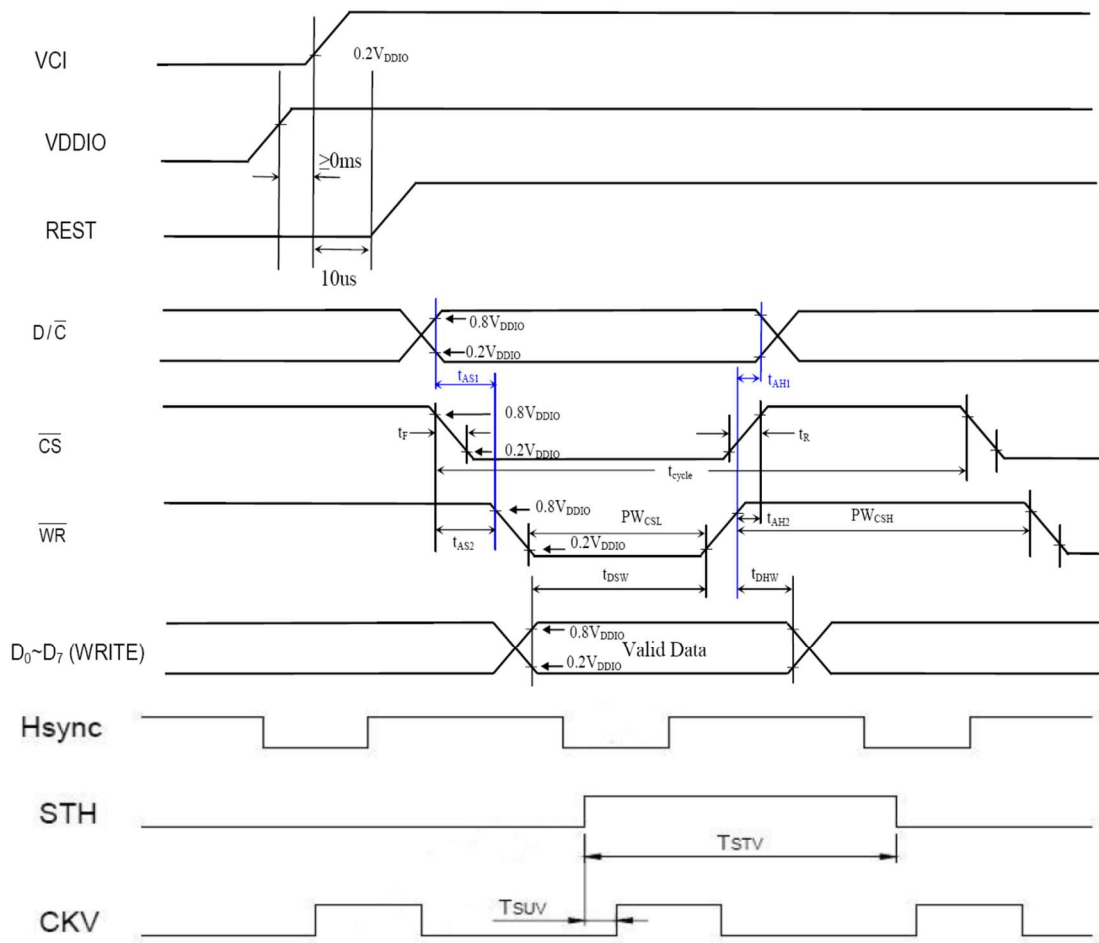


IHS and IVS waveforms in even field

Hsync and horizontal control timing waveform



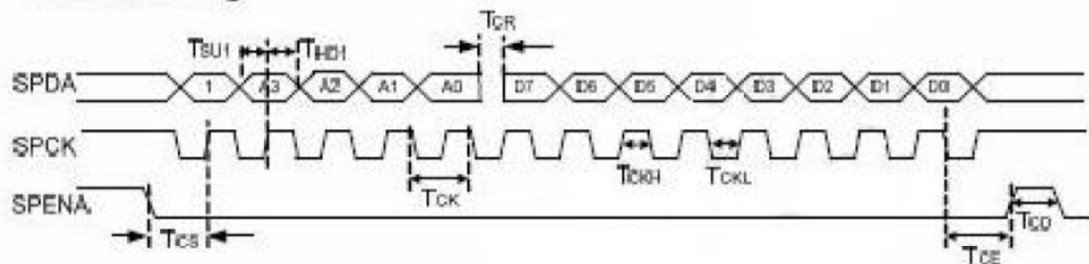
Hsync and vertical shift clock timing waveform



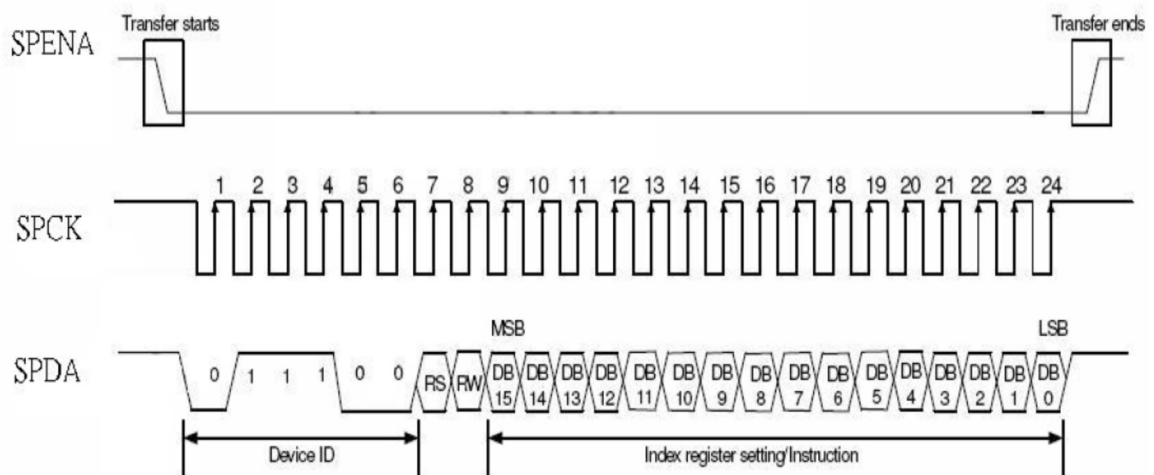
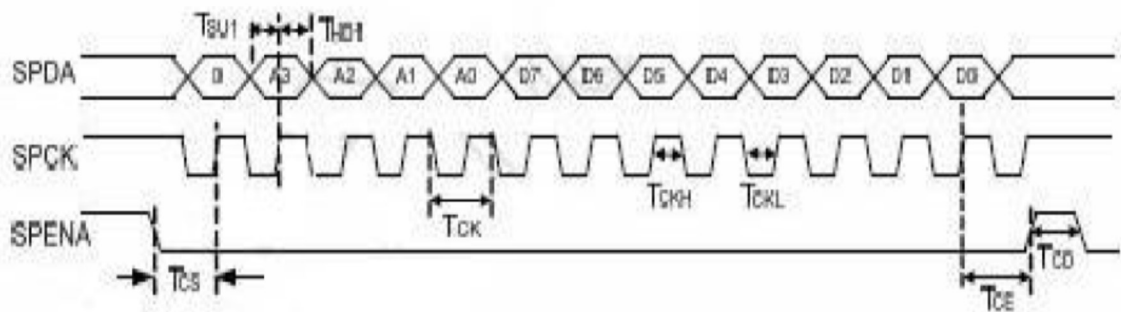
SPI Timing Characteristics

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
SPCK period	T_{CK}	60	-	-	ns
SPCK high width	T_{CKH}	30	-	-	ns
SPCK low width	T_{CKL}	30	-	-	ns
Data setup time	T_{SU1}	12	-	-	ns
Data hold time	T_{HD1}	12	-	-	ns
SPENA to SPCK setup time	T_{CS}	20	-	-	ns
SPENA to SPDA hold time	T_{CE}	20	-	-	ns
SPENA high pulse width	T_{CO}	50	-	-	ns
SPDA output latency	T_{CB}	-	1/2	-	T_{CK}

● SPI read timing

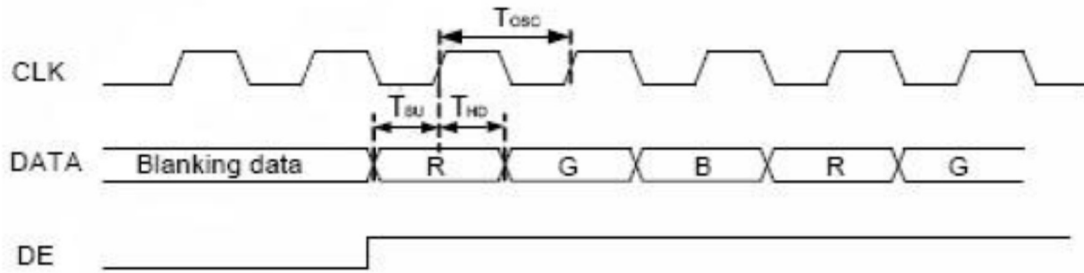


● SPI write timing

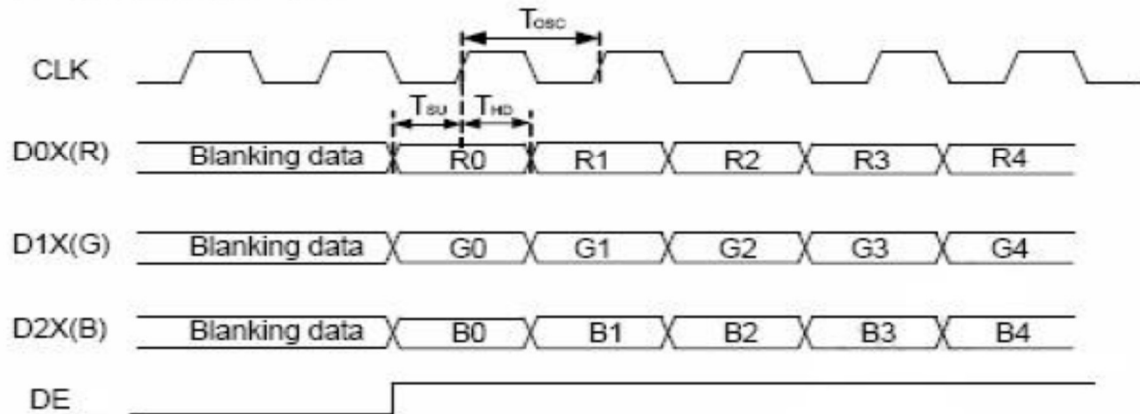


RGB Timing Characteristics

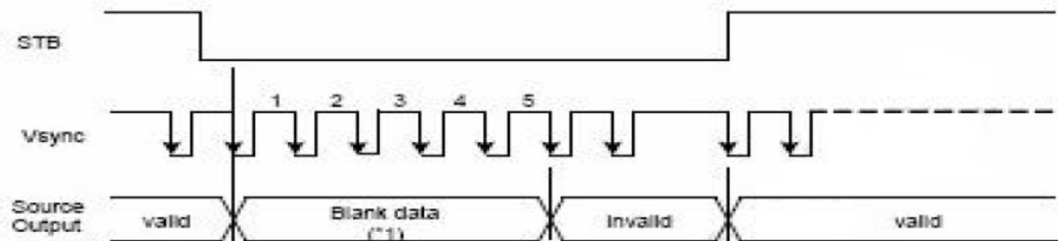
● Digital Serial RGB



● Digital Parallel RGB



Power Up Sequence for RGB mode



Reliability Test Items and Criteria

No	Test Item	Test condition	Criterion
1	High Temperature Storage	80°C±2°C 96H Restore 4H at 25°C, 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°C±2°C 96H Restore 4H at 25°C, Power off	
3	High Temperature Operation	70°C±2°C 96H Restore 4H at 25°C, Power on	
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C, Power on	
5	High Temperature/Humidity Storage	50°C±2°C 90%RH 96H Power off	
6	Temperature Cycle	-30°C → +25°C → 80°C → +25°C (30mins) (5mins) (30mins) (5mins) ← 5 Cycle → Restore 4H at 25°C, Power off	

Precautions for Use of LCD Modules

1. Handling Precautions

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.

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.

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

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

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

1.6 Do not attempt to disassemble the LCD Module.

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

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.

2. Storage precautions

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

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 : 10°C ~ 40°C

Relatively humidity: ≤60%

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

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