LCD TFT Module Specification

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RVT3.5A320240CFWN36

LCD TFT Datasheet

Rev.1.2
2015-08-05

ITEM	CONTENTS	UNIT
LCD Type	TFT/Transmissive/Normally white	/
Size	3.5	Inch
Viewing Direction	12:00 (without image inversion)	O' Clock
Gray Scale Inversion Direction	6:00	O' Clock
LCM (W × H × D)	77.70 x 64.70 x 7.15	mm^3
Active Area (W × H)	70.08 × 52.56	mm^2
Dot Pitch (W × H)	0.73 × 0.219	mm^2
Number Of Dots	320 (RGB) × 240	/
Controller IC	SSD1963	/
Backlight Type	6 LEDs	/
Surface Luminance	540	cd/m^2
Interface Type	Parallel 8/16b (i80 by default)	/
Color Depth	262k	/
Pixel Arrangement	RGB Vertical Stripe	/
Input Voltage	3.3	V
With/Without TSP	Without touch panel	/
Weight	59	g

Note 1: RoHS compliant

Note 2: LCM weight tolerance: ± 5%.

REVISION RECORD

REVNO.	REVDATE	CONTENTS	REMARKS
1.0	2014-05-16	Initial Release	
1.1	2015-01-30	Update surface luminance, update LED livetime, update response time	
1.2	2015-08-05	Add pin numbering in the mechanical drawing	

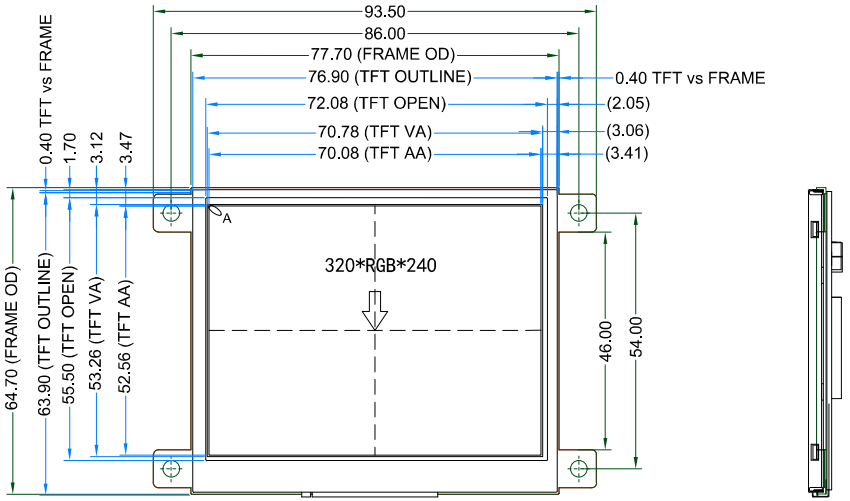
CONTENTS

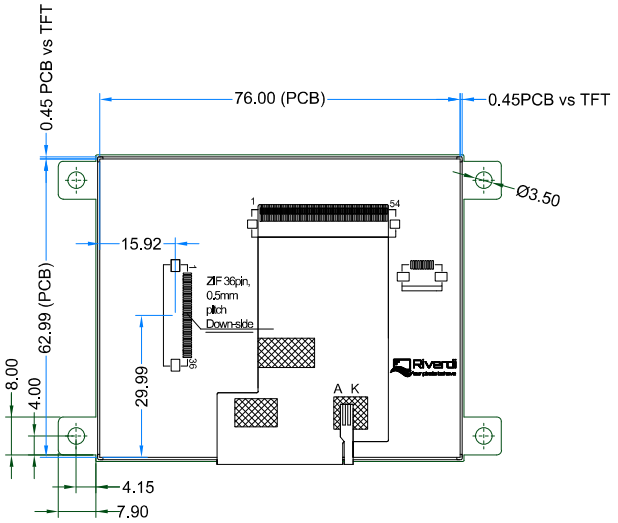
1. MODULE CLASSIFICATION INFORMATION

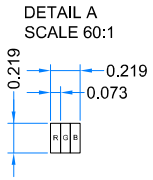
RV	T	3.5	A	320240	C	F	W	N	36
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.

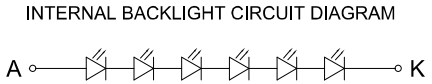
1.	**BRAND**	**RV** – Riverdi
2.	**PRODUCT TYPE**	**T – TFT Standard** **F** – TFT Custom
3.	**DISPLAY SIZE**	**3.5 – 3.5”** **4.3** – 4.3” **5.7** – 5.7” **7.0** – 7.0”
4.	**MODEL SERIAL NO.**	**A (A-Z)**
5.	**RESOLUTION**	**320240 – 320x240 px** **480272** – 480x272 px **800480** – 800x480 px
6.	**INTERFACE**	T – TFT LCD, RGB **L** – TFT LCD, LVDS **C – TFT + Controller**
7.	**FRAME**	**N** – No Frame **F – Mounting Frame**
8.	**BACKLIGHT TYPE**	**W – LED White**
9.	**TOUCH PANEL**	**N – No Touch Panel** **R** – Resistive Touch Panel **C** – Capacitive Touch Panel
10.	**VERSION**	**36** (00-99)

PIN	20
1	GND
2	VDD
3	BL_E
4	D/C
5	WR
6	RD
7	D0
8	D1
9	D2
10	D3
11	D4
12	D5
13	D6
14	D7
15	D8
16	D9
17	D10
18	D11
19	D12
20	D13
21	D14
22	D15
23	NC
24	NC
25	CS
26	RESET
27	DISP_ON
28	NC
29	NC
30	NC
31	NC
32	NC
33	BLGND
34	BLGND
35	BLVDD
36	BLVDD









NOTES:

1. DISPLAY TYPE:	TFT, TRANSMISSIVE, NORMALLY WHITE
2. OPERATION VOLTAGE:	VDD=3.3V
3. VIEWING DIRECTION:	12 O'CLOCK
4. IC CONTROLLER:	SSD1963
5. OPERATING TEMP.:	-20°C ~ 70°C
6. STORAGE TEMP.:	-30°C ~ 80°C
7. LED BACKLIGHT:	6-LED WHITE, BUILT-IN INVERTER
8. SURFACE LUMINANCE:	540 cd/m^2
9. GENERAL TOLERANCE:	±0.2
10. RoHS COMPLIANT	

Rev.	DESCRIPTION	DATE
1.1	Adding Pin information	2015.08.05
1.0	Initial case	2015.05.30

CUSTOMER APVL		DATE	2015-08-05
DRAWN	SCALE 1:1	TITLE	RVT3.5A320240CFWN36
DFTG CHK	UNIT mm		
ENGR CHK		MODEL	
APPROVAL	Riverdi our pixels behave	DWG NO	Rev.1.1
		PAGE	1/1

3. ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage For Logic	VDD	-0.3	4.6	V
Input Voltage For Logic	VIN	-0.3	VDD	V
Input Voltage For LED Inverter	BLVDD	-0.3	7.0	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

4. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	NOTES
Supply Voltage For Module	VDD	3.0	3.3	3.6	V	
Input Voltage for LED Inverter	BLVDD	2.8	3.3	5.5	V	
Input Voltage 'H' level for BL_E pin	BL_E_H	1.5	-	5.5	V	
Input Voltage 'L' level for BL_E pin	BL_E_L	0	-	0.7		
Input Current (Exclude LED Backlight)	IDD	-	25	32	mA	VDD = 3.3V
LED Backlight Current	$IDD_{backlight}$		150	187	mA	BLVDD=3.3V
LED Backlight Current	$IDD_{backlight}$		95	119	mA	BLVDD=5V
Total Input Current (Include LED Backlight 100%)	IDD_{total}	-	175	219	mA	BLVDD=3.3V
Input Voltage ' H ' level	V_{IH}	0.7VDD	-	VDD	V	
Input Voltage ' L ' level	V_{IL}	0	-	0.2VDD	V	
LED Life Time	-	40000	50000	-	Hrs	Note 1

Note 1: The LED life time is defined as the module brightness decrease to 50% original brightness at Ta=25°C.

5. ELECTRO-OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	REMARK	NOTE
Response Time		Tr+Tf	θ=0° Ø=0° Ta=25°C	-	25	30	ms	Figure 1	4
Contrast Ratio		Cr		-	350	-	---	Figure 2	1
Luminance Uniformity		δ WHITE		75	80	-	%	Figure 2	3
Surface Luminance		Lv		-	540	-	cd/m^2	Figure 2	2
Viewing Angle Range		θ	Ø = 90°	30	40	-	deg	Figure 3	6
			Ø = 270°	50	60	-	deg	Figure 3	
			Ø = 0°	50	60	-	deg	Figure 3	
			Ø = 180°	50	60	-	deg	Figure 3	
CIE (x, y) Chromaticity	Red	x	θ=0° Ø=0° Ta=25°C	0.574	0.624	0.674	Figure 2		5
		y		0.318	0.368	0.418			
	Green	x		0.300	0.350	0.400			
		y		0.500	0.550	0.600			
	Blue	x		0.093	0.143	0.193			
		y		0.069	0.119	0.169			
	White	x		0.260	0.310	0.360			
		y		0.283	0.333	0.383			
NTSC	-	-	-	-	50	-	%		-

Note 1. Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

Note 2. Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information see Figure 2.

Lv = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

Note 3. The uniformity in surface luminance δ WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

Note 4. Response time is the time required for the display to transition from white to black (Rise Time, Tr) and from black to white (Decay Time, Tf). For additional information see Figure 1. The test equipment is Autronic-Melchers's ConoScope series.

Note 5. CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

Note 6. Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see Figure 3.

Note 7. For viewing angle and response time testing, the testing data is based on Autronic-Melchers's ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCON's BM-5 photo detector.

Note 8. For TFT module, gray scale reverse occurs in the direction of panel viewing angle.

Figure 1. The definition of response time

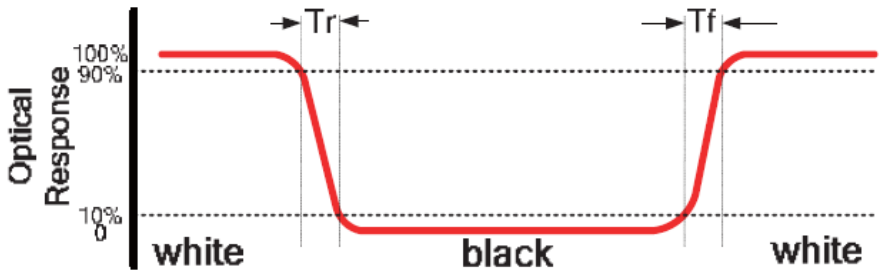


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm
B : 5 mm
H,V : Active Area
Light spot size ∅=5mm, 500mm distance from the LCD surface to detector lens
measurement instrument is TOPCON's luminance meter BM-5

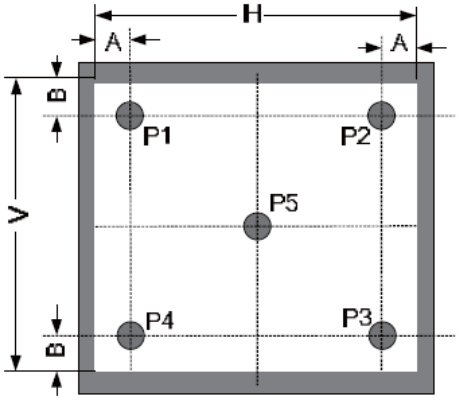
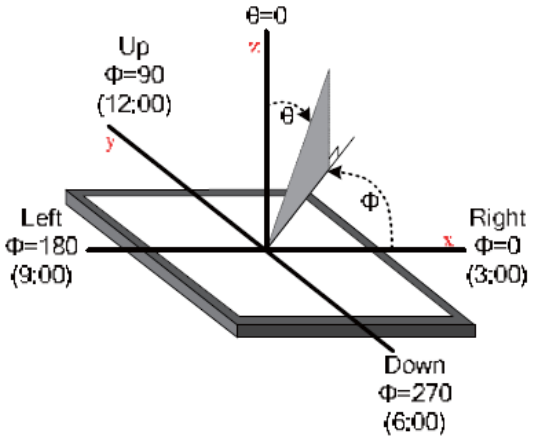


Figure 3. The definition of viewing angle



6. INTERFACE DESCRIPTION

PIN NO.	SYMBOL	I/O	DESCRIPTION
1	GND	P	Power Ground
2	VDD	P	Power Supply: +3.3V
3	BL_E	I	Backlight Control Signal, H: On/L: Off (internally pulled-up to BLVDD)
4	D/C	I	Data/Command Select
5	WR	I	Write Strobe Signal
6	RD	I	Read Strobe Signal
7-22	D0-D15	I	Data Bus. Pins not used should be floating.
23	NC	-	No Connection
24	NC	-	No Connection
25	CS	I	Chip Select
26	RESET	I	Hardware reset
27	DISP ON	I	Display Control H: On/L: Off (internally pulled-up)
28	NC	-	No Connection
29	NC	-	No Connection
30	NC	-	No Connection
31	NC	-	No Connection
32	NC	-	No Connection
33	BLGND	-	Backlight ground, can be connected to GND
34	BLGND	-	Backlight ground, can be connected to GND
35	BLVDD	-	Backlight power supply, can be connected to VDD
36	BLVDD	-	Backlight power supply, can be connected to VDD

7. INTERFACE TIMING CHARACTERISTICS

7.1. 8080 Mode

The 8080 mode MCU interface consist of CS#, D/C#, RD#, WR#, D[15:0]. This interface use WR# to define a write cycle and RD# for read cycle. If the WR# goes low when the CS# signal is low, the data or command will be latched into the system at the rising edge of WR#. Similarly, the read cycle will start when RD# goes low and end at the rising edge of RD#.

7.2. Pixel Data Format

Interface	Cycle	D[17]	D[16]	D[15]	D[14]	D[13]	D[12]	D[11]	D[10]	D[9]	D[8]	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]
16 bits (565 format)	1st			R5	R4	R3	R2	R1	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1
16 bits	1st			R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0
	2nd			B7	B6	B5	B4	B3	B2	B1	B0	R7	R6	R5	R4	R3	R2	R1	R0
	3rd			G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
12 bits	1st							R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4
	2nd							G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
9 bits	1st										R5	R4	R3	R2	R1	R0	G5	G4	G3
	2nd										G2	G1	G0	B5	B4	B3	B2	B1	B0
8 bits	1st											R7	R6	R5	R4	R3	R2	R1	R0
	2nd											G7	G6	G5	G4	G3	G2	G1	G0
	3rd											B7	B6	B5	B4	B3	B2	B1	B0

7.3. Parallel8080-series Interface Timing

Figure 4. Parallel 8080-series Interface Timing Diagram (Write Cycle)

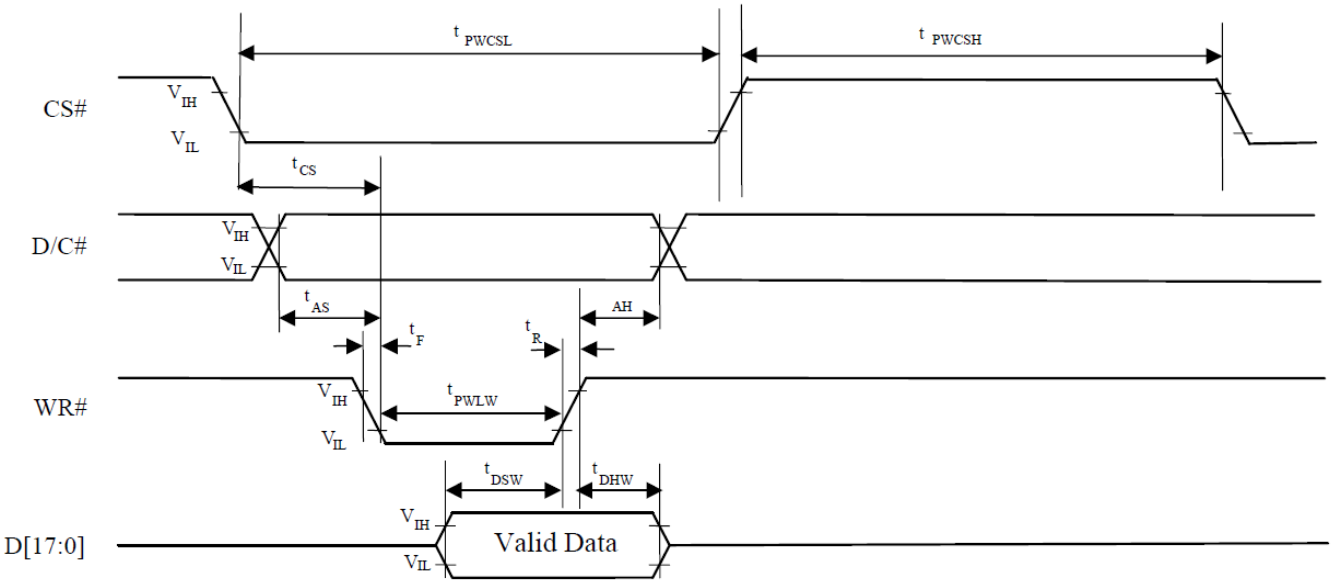
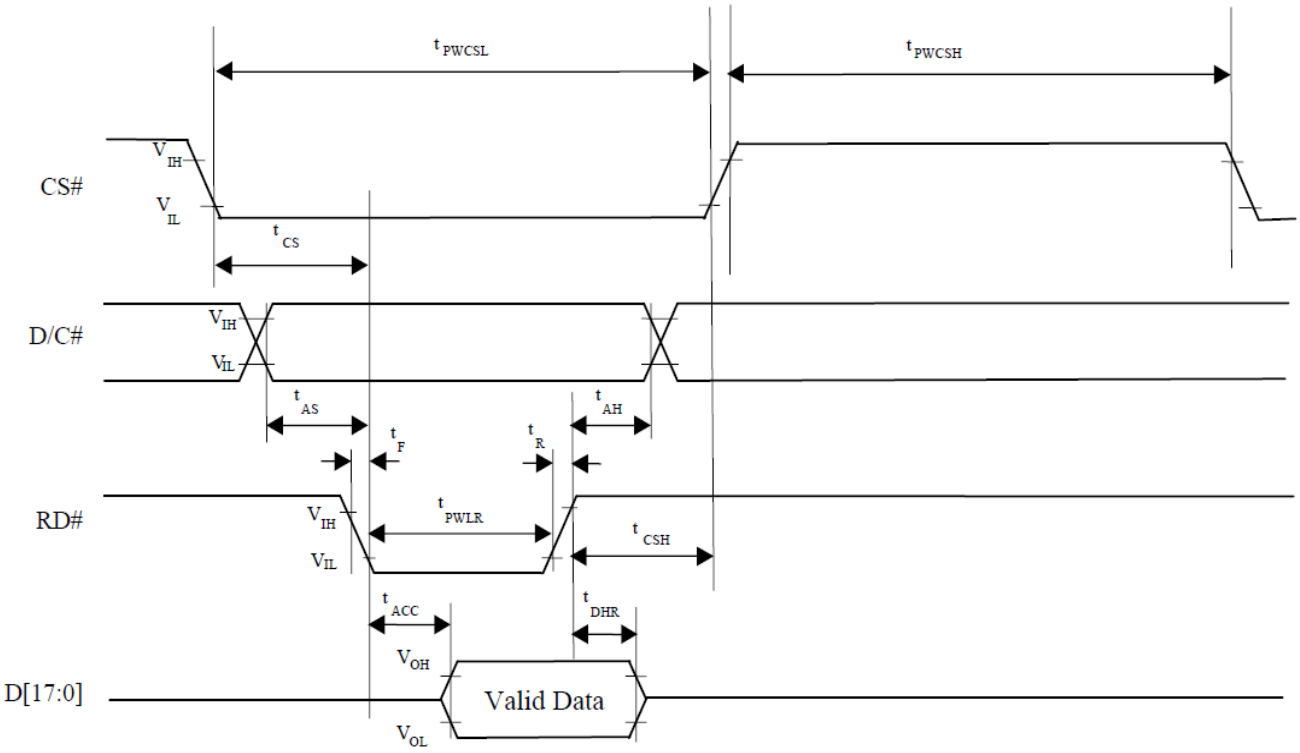


Figure 5.Parallel 8080-series Interface Timing Diagram (Read Cycle)



8. LCD TIMIG CHARACTERISTICS

8.1. Timing Chart

Timing parameter (VDD=3.3V, GND=0V, Ta=25˚C)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
CLK Clock Time	T_{clk}	1/Max(F_{CLK})	-	1/Min(F_{CLK})	ns	-
CLK Pulse Duty	T_{chw}	40	50	60	%	T_{CLK}
HSYNC to CLK	T_{hc}	-	-	1	CLK	-
HSYNC Width	T_{hwh}	1	-	-	CLK	-
VSYNC Width	T_{vwh}	1	-	-	ns	-
HSYNC Period Time	T_{h}	60	63.56	67	ns	-
VSYNC Set-up Time	T_{vst}	12	-	-	ns	-
VSYNC Hold Time	T_{vhd}	12	-	-	ns	-
HSYNC Setup Time	T_{hst}	12	-	-	ns	-
HSYNC Hold Time	T_{hhd}	12	-	-	ns	-
Data Set-up Time	T_{dsu}	12	-	-	ns	D00~D23 to CLK
Data Hold Time	T_{dhd}	12	-	-	ns	D00~D23 to CLK
DEN Set-up Time	T_{esu}	12	-	-	ns	DEN to CLK

Figure 6. DE mode timing diagram

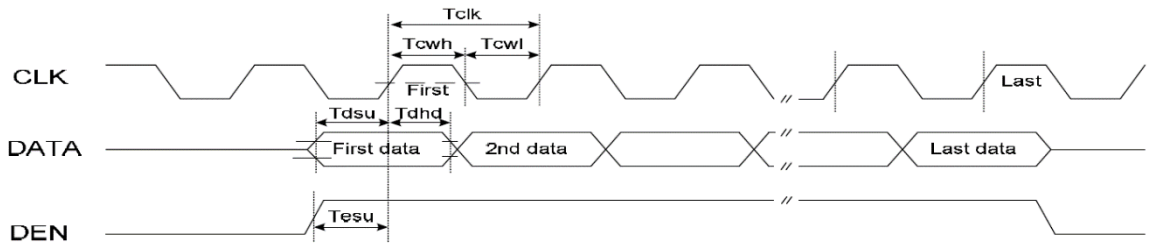


Figure 7. SYNC mode timing diagram

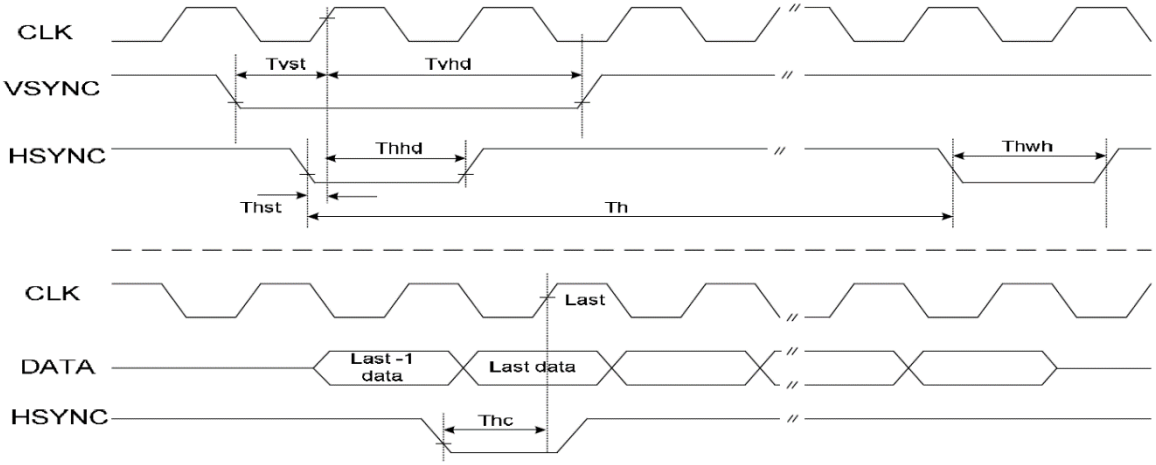
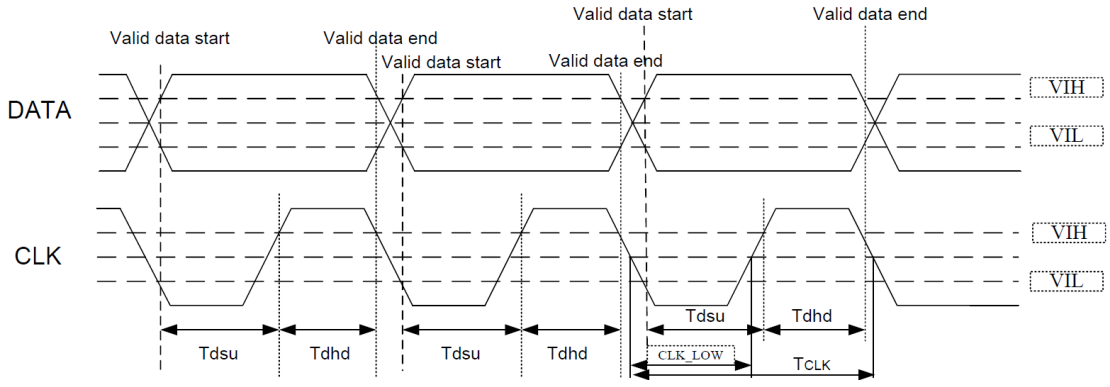


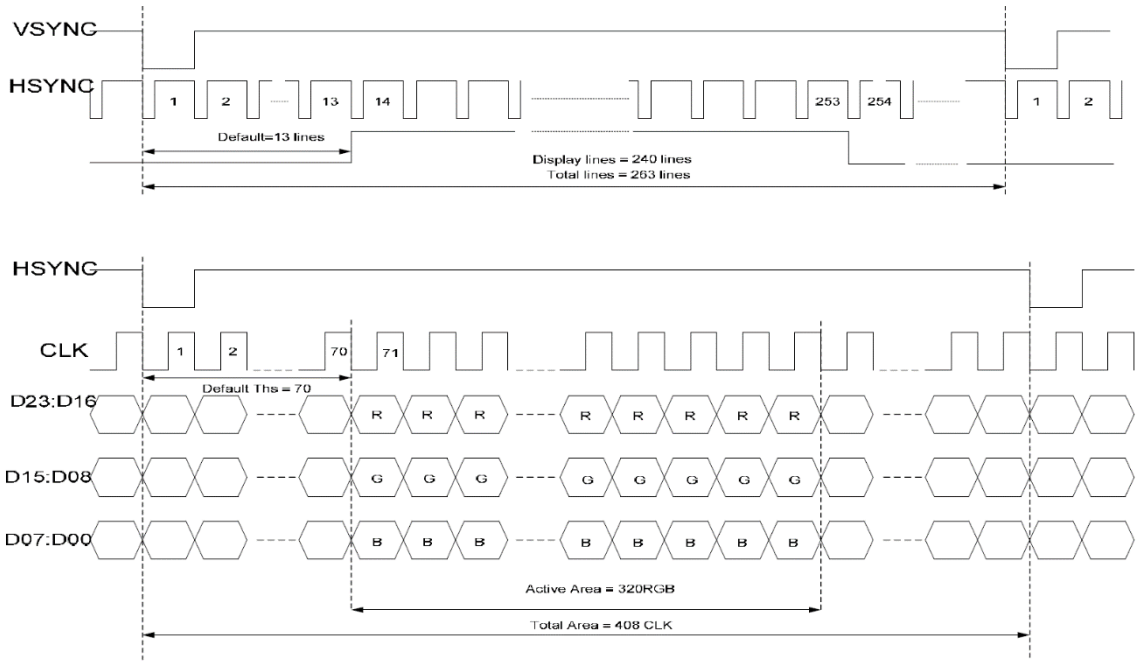
Figure 8. Timing diagram



8.2. 24 Bit RGBMode for 320 x RGB x 240

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
CLK Frequency	F_{clk}	7.0	8.0	9.0	MHz	VDD=3.0V~3.6V
CLK Cycle Time	T_{clk}	143	125	111	ns	-
CLK Pulse Duty	T_{cwh}	40	50	60	%	-
Time that HSYNC to 1st Data Input (NTSC)	T_{hs}	40	70	255	CLK	DDLY=70 Offset=0(fixed)

Figure 9. 24 bit RGB SYNC mode timing



9. RELIABILITY TEST

NO.	TEST ITEM	TEST CONDITION	INSPECTION AFTER TEST
1	High Temperature Storage	80±2°C/240 hours	Inspection after 2~4 hours storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD 2. Seal leak 3. Non-display 4. Missing segments 5. Glass crack 6. Current I_{dd} is twice higher than initial value 7. The surface shall be free from damage 8. Linearity must be no more than 1.5% by the linearity tester 9. The Electric characteristics requirements shall be satisfied
2	Low Temperature Storage	-30±2°C/240 hours	
3	High Temperature Operating	70±2°C/240 hours	
4	Low Temperature Operating	-20±2°C/240 hours	
5	Temperature Cycle	-30±2°C~25~70±2°C × 30 cycles	
6	Damp Proof Test	60°C ±5°C × 90%RH/160 hours	
7	Vibration Test	Frequency 10Hz~55Hz Stroke: 1.5mm Sweep: 10Hz~55Hz~10Hz 2 hours For each direction of X, Y, Z (6 hours for total)	
8	Mechanical Shock	60G 6ms, ± X, ± Y, ± Z 3 times for each direction	
9	Packing Drop Test	Height: 80 cm 1 corner, 3 edges, 6 surfaces	
10	Package Vibration Test	Random vibration: $0.015G^2$/Hz from 5-200Hz -6dB/Octave from 200-500Hz 2 hours for each direction of X, Y, Z (6 hours for total)	
11	Electrostatic Discharge	Air: ±8KV 150pF/330Ω 5 times Contact: ±4KV 150pF/330Ω 5 times	
12	Hitting Test	1,000,000 times in the same point Hitting pad: tip R3.75mm, Silicone rubber, Hardness: 40deg. Load: 2.45N Hitting speed: Twice/sec Electric load: none Test area should be at 1.8mm inside of insulation.	
13	Pen Sliding Durability Test	100,000 times minimum Hitting pad: tip R0.8mm plastic pen Load: 1.47N Sliding speed: 60 mm/sec Electric load: none Test area should be at 1.8mm inside of insulation.	

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 judge as a good part.
5. EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6. Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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