Display Elektronik GmbH

DATA SHEET

TFT MODULE

DEM 1920720B VMX-PW-N

12,3" TFT
(Wide-Screen)

Product Specification   Ver.: 0

16.08.2017

Revise Records

Rev.	Date	Contents	Written	Approved
0	16.08.2017	Preliminary Specification	R	MHO

Special Notes

Note1.	
Note2.	
Note3.	
Note4.	
Note5.	

Contents

1. General Description

The module is 12.3" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and LED Backlight. The 12.3" screen produces 1920×RGB×720 resolution image. By applying R.G.B input signal, full color images are displayed.

1.1 Features

- 1920 x 720 pixels resolution.
- Display in 16.7M colors.
- LED Backlight with 800 cd/m^2
- Extreme Temperature Range
- LVDS Interface
- RoHS Compliance

1.2 LCD Module

Item	Specification	Unit
Screen Size	12.3 Inches	Diagonal
Display Resolution	1920 x RGB x 720	Dot
Active Area	292.03 x 109.51	mm
Outline Dimension	307.90 x 130.27 x 15.35 mm	mm
Display Mode	Normally Black (IPS)	--
Pixel Pitch	0.1521 x 0.1521	mm
Pixel Arrangement	RGB-Vertical Stripe	--
Display Color	16.7 Million	--
Surface Treatment	Anti-Glare	--
Viewing Direction	Full	--
Input Interface	LVDS	--

2. Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	--	307.90	--	mm	
	Vertical (V)	--	130.27	--	mm	
	Thickness (T)	--	15.35	--	mm	
Weight		--	TBD	--	g	

3. Absolute Max. Ratings

3.1 Absolute Ratings of Environment

If the operating condition exceeds the following absolute maximum ratings, the TFT LCD module may be damaged permanently.

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{OPR}	-30	+85	°C	(1)
Storage Temperature	T_{STG}	-40	+90	°C	(1)

Note (1) If users use the product out of the environmental operation range (temperature and humidity), it will have visual quality concerns.

### 3.2 Absolute Ratings of Electrical

The following are maxim values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
LCD Supply Voltage	VCC	-0.3	4.0	V	
Signal Input Voltage	RxIN0+~RxIN3+ RxIN0-~RxIN3- RxCLK IN +/-	-0.3	Vcc	V	
ICC Rush Current	IRUSH	-	2	A	Note 1

Note (1) The input pulse-current measurement system is as below:

Control signal: High (+3.3V) Low (GND)

Supply Voltage of rising time should be from R3 and C2 tune to 550 µs.
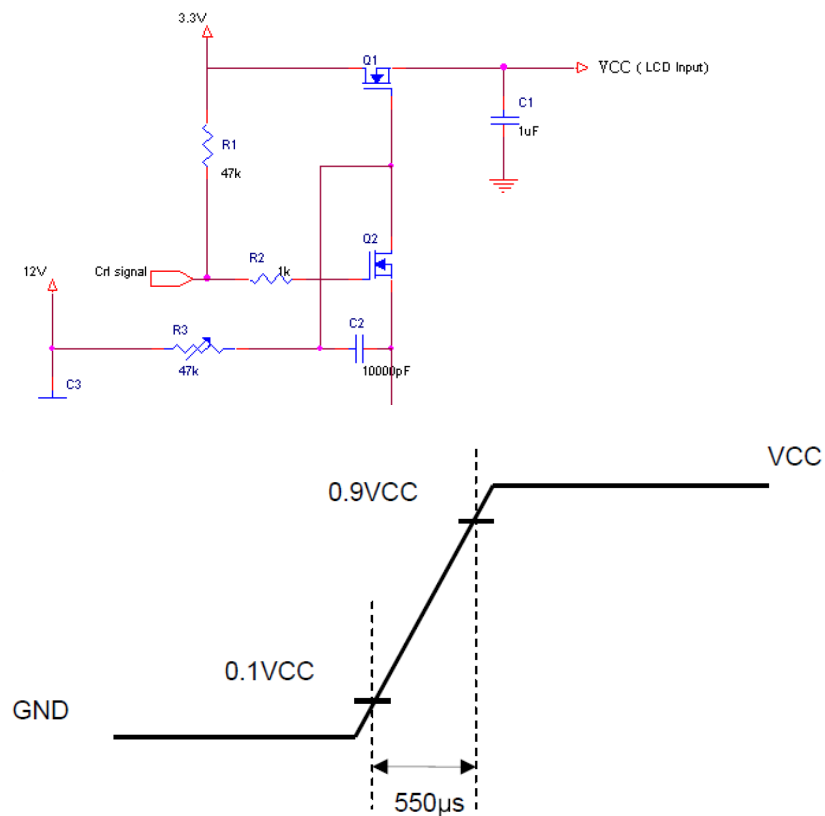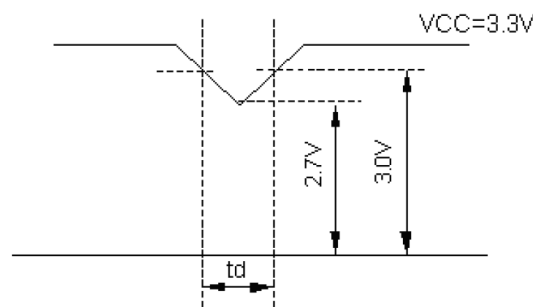
4. Electrical Characteristics
4.1 TFT-LCD Module

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Supply Voltage	VCC	3.0	3.3	3.6	V	*1)
Logic Input Voltage (LVDS: IN+,IN-)	VCM	1	1.2	1.7-VID/2	V	*2)
	VID	200	-	600	mV	*2)
	VTH	-	-	100	mV	*2)
	VTL	-100	-	-	mV	*2)

*1) VCC-dip state

   (1) when 3.0V>VCC≥2.7V, td≤10ms.

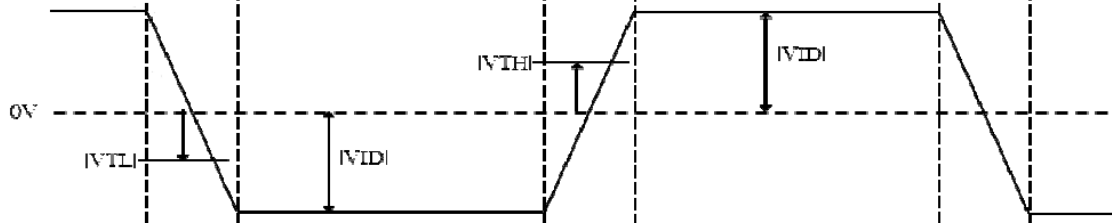   (2) when VCC<2.7v, VCC-dip condition should as the VCC-turn-off condition.

*2) LVDS DC electrical characteristics
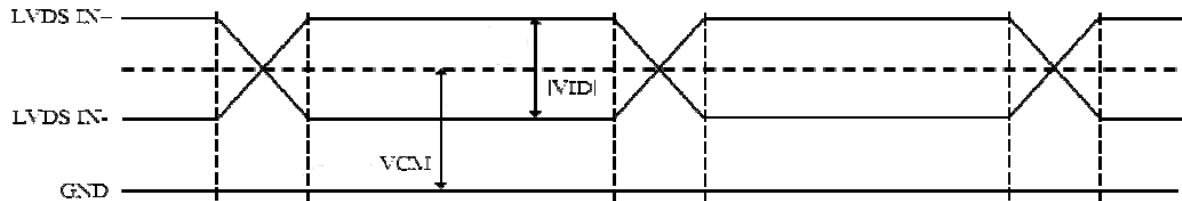
4.2   TFT-LCD Current Consumption

Item	Symbol	Min.	Typ.	Max.	Unit.	Note.
LCD Supply Current	ICC	-	600	825	mA	1

Remarks:

*1) Typical: Under 256 gray pattern
    Maximum: Under White pattern
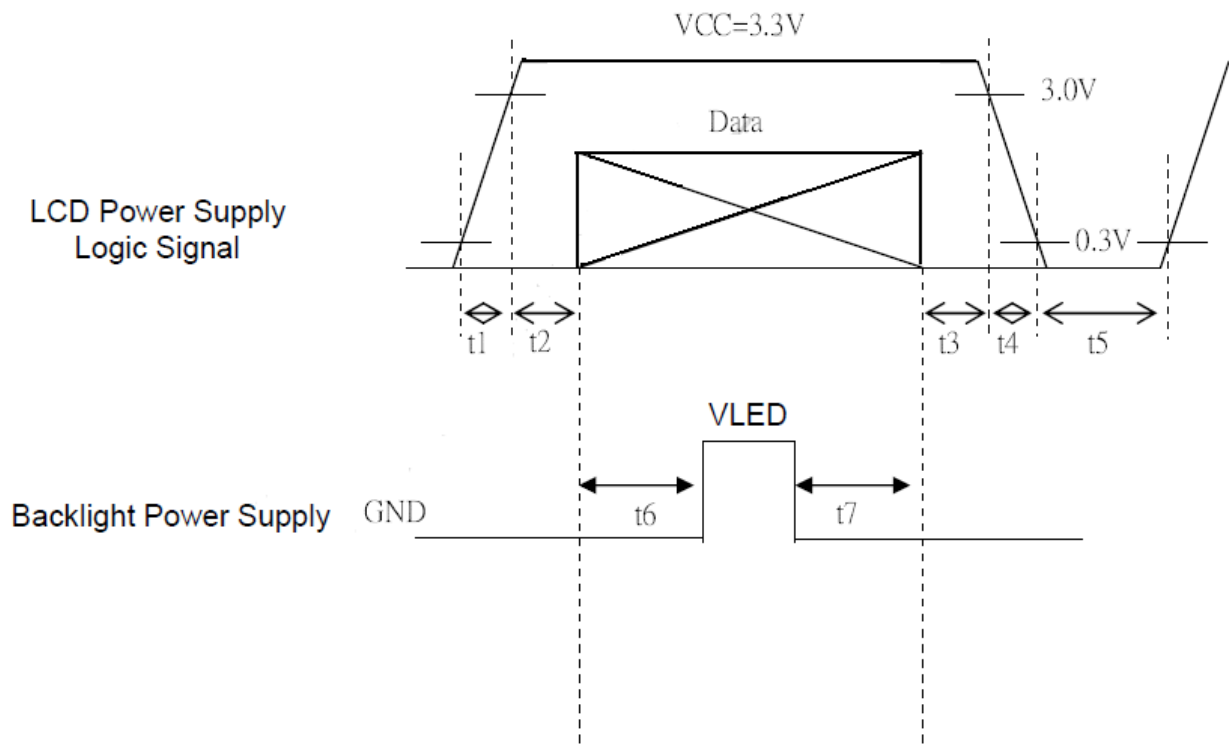   The current is root mean square value (RMS)

256 gray pattern   White pattern

4.3   Power、Signal sequence
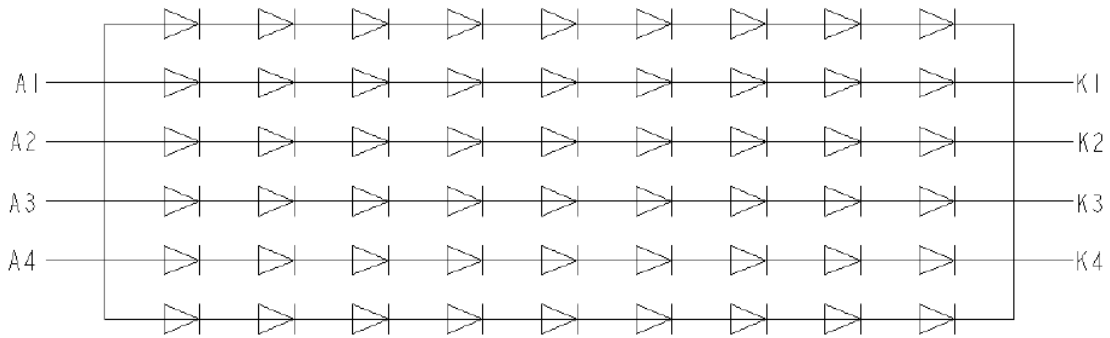
Logical signal：RGB data, DCLK, DENA
Power ：VCC,VLED

$0.5 < t1 \leq 10ms$ $200ms \leq t6$
$0 < t2 \leq 50ms$ $200ms \leq t7$
$0 < t3 \leq 50ms$
$0 < t4 \leq 10ms$
$200ms \leq t5$

4.4　Backlight

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED Current	IL	Ta=25℃(IF=60mA)	--	360	--	mA	
LED Voltage	VL	Ta=25℃(IF=60mA)	25.2	--	30.6	V	
Power Consumption	WL	Ta=25℃(IF=60mA)	--	--	11.02	W	
LED Lifetime	-	Ta=25℃(IF=60mA）	50000	--	--	Hr	

Remarks：

*1) LED Circuit Diagram

*2) A: Anode （＋） K: Cathode （－）

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) Definition of Led lifetime: Luminance < Initial luminance 50%.

5. Input Terminal Pin Assignment

5.1 Used connector: FI-RE41S-HF (JAE) or equivalent

Pin No.	Symbol	Function	Remark
1	GND	Power ground	
2	ORXIN0-	Odd pixel negative LVDS differential data inputs	
3	ORXIN0+	Odd pixel positive LVDS differential data inputs	
4	GND	Power ground	
5	ORXIN1-	Odd pixel negative LVDS differential data inputs	
6	ORXIN1+	Odd pixel positive LVDS differential data inputs	
7	GND	Power ground	
8	ORXIN2-	Odd pixel negative LVDS differential data inputs	
9	ORXIN2+	Odd pixel positive LVDS differential data inputs	
10	GND	Power ground	
11	ORXCLKIN-	Odd pixel negative LVDS differential clock inputs	
12	ORXCLKIN+	Odd pixel positive LVDS differential clock inputs	
13	GND	Power ground	
14	ORXIN3-	Odd pixel negative LVDS differential data inputs	
15	ORXIN3+	Odd pixel positive LVDS differential data inputs	
16	GND	Power ground	
17	ERXIN0-	Even pixel negative LVDS differential data inputs	
18	ERXIN0+	Even pixel positive LVDS differential data inputs	
19	GND	Power ground	
20	ERXIN1-	Even pixel negative LVDS differential data inputs	
21	ERXIN1+	Even pixel positive LVDS differential data inputs	
22	GND	Power ground	
23	ERXIN2-	Even pixel negative LVDS differential data inputs	
24	ERXIN2+	Even pixel positive LVDS differential data inputs	
25	GND	Power ground	
26	ERXCLKIN-	Even pixel negative LVDS differential clock inputs	
27	ERXCLKIN+	Even pixel positive LVDS differential clock inputs	
28	GND	Power ground	
29	ERXIN3-	Even pixel negative LVDS differential data inputs	
30	ERXIN3+	Even pixel positive LVDS differential data inputs	
31	GND	Power ground	
32	VCC	Digital power(3.3V)	
33	VCC	Digital power(3.3V)	
34	GND	Power ground	
35	RESET	Global reset pin.	
36	GND	Power ground	
37	LEDK	LED Cathode -	
38	LEDK	LED Cathode -	
39	LEDA	LED Anode +	
40	LEDA	LED Anode +	
41	GND	Power ground	

6. Optical Characteristics

Item		Symbol	Condition	Min	Typ	Max	Unit	Note
Brightness (Center)		L	--	600	800	--	cd/m²	a
Response Time (White - Black)		Tr +Tf	θ=0°	--	25	35	ms	b
Contrast Ratio		CR	At optimized viewing angle	800	1000	--	--	c
Luminance Uniformity		△L	--	75	80	--	%	--
Color Chromaticity	White	Wx	θ=0° Normal Viewing Angle	(0.267)	(0.307)	(0.347)	--	BM-7A
		Wy		(0.298)	(0.338)	(0.378)		
Viewing Angle	Ver.	θU	CR≥10	75	85	--	Degree	--
		θD		75	85	--		
	Hor.	θL		75	85	--		
		θR		75	85	--		
NTSC				60	70	--	%	--

a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

b. Definition of response time: Tr and Tf

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".
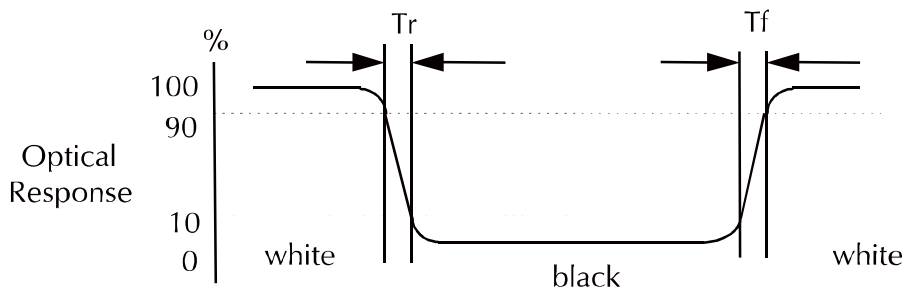
c. Definition of contrast ratio:

$$Contrast\ Ratio\ (CR) = \frac{Brightness\ measured\ when\ LCD\ is\ at\ ``white\ state"}{Brightness\ measured\ when\ LCD\ is\ at\ ``black\ state"}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle

Θ_U

12' o'clock
$\Phi = 90°$

Θ_L Θ_R

$\Phi = 180°$ $\Phi = 0°$

Θ_D

6' o'clock
$\Phi = 270°$
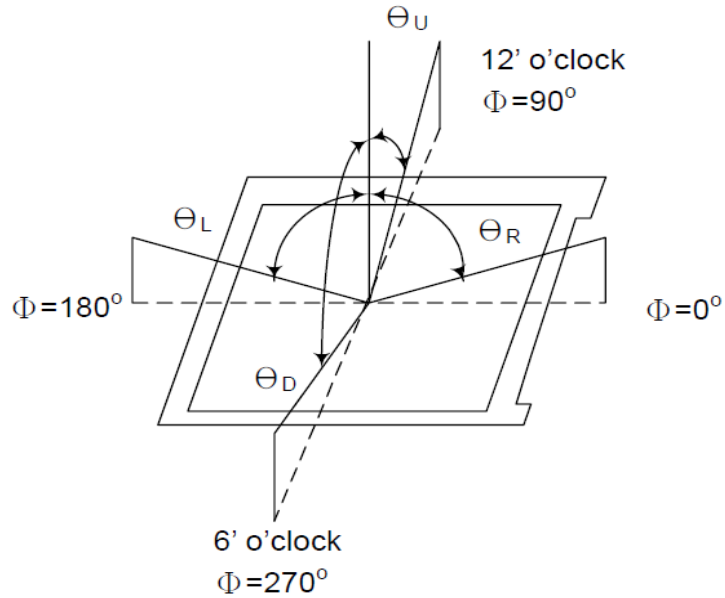
f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type

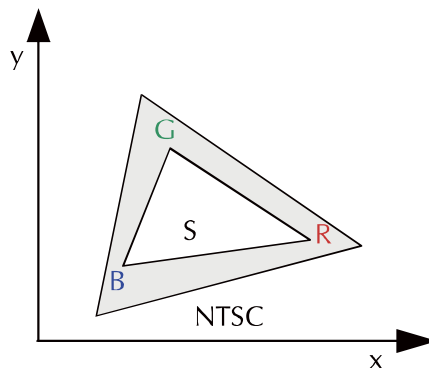g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931
Color coordinate of white & red, green, blue at center point.
Color Gamut: NTSC (%) = (RGB Triangle Area / NTSC Triangle Area) x 100

y

G

S   R

B

NTSC

x

7. Interface Timing

7.1 Timing specification

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	Note
DCLK	Dot Clock	$1/t_{CLK}$	43.74	44.1	47.75	MHz	
	DCLK pulse duty	Tcwh	40	50	60	%	
SYNC	HSYNC Setup Time	Thst	5	-	-	ns	
	HSYNC Hold Time	Thhd	5	-	-	ns	
	VSYNC Setup Time	Tvst	5	-	-	ns	
	VSYNC Hold Time	Tvhd	5	-	-	ns	
	Horizontal Period	Th	992	992	1005	t_{CLK}	
	Horizontal Pulse Width	thpw	-	8	-	t_{CLK}	thb + thpw=16 DCLK is fixed
	Horizontal Back Porch	thb	-	8	-	t_{CLK}	
	Horizontal Front Porch	thfp	16	16	29	t_{CLK}	
	Horizontal Valid	thd		960		t_{CLK}	
	Vertical Period	tv	735	741	792	th	
	Vertical Pulse Width	tvpw	-	2	-	th	tvpw + tvb = 5 th is fixed
	Vertical Back Porch	tvb	-	3	-	th	
	Vertical Front Porch	tvfp	10	16	67	th	
	Vertical Valid	tvd		720		th	
DATA	Setup Time	Tdsu	5	-	-	ns	
	Hold Time	Tdhd	5	-	-	ns	

7.2 Timing sequence(Timing chart)

SYNC mode

Horizontal timing
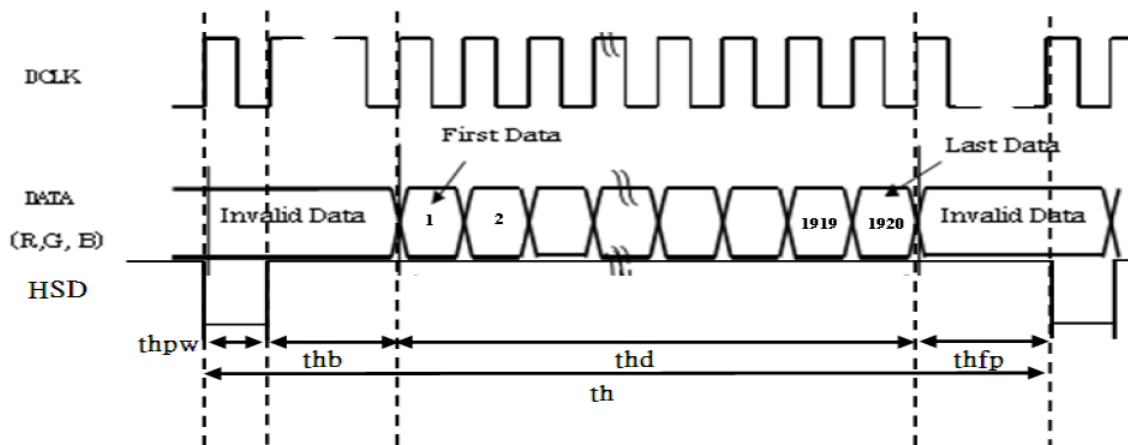
Vertical timing

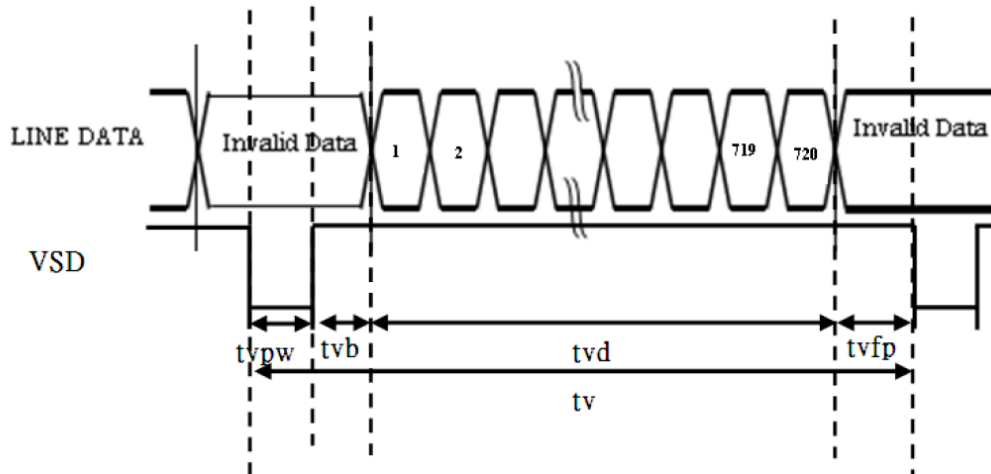

LVDS Input Data mapping

LVDS DATA (VESA): Timing Chart
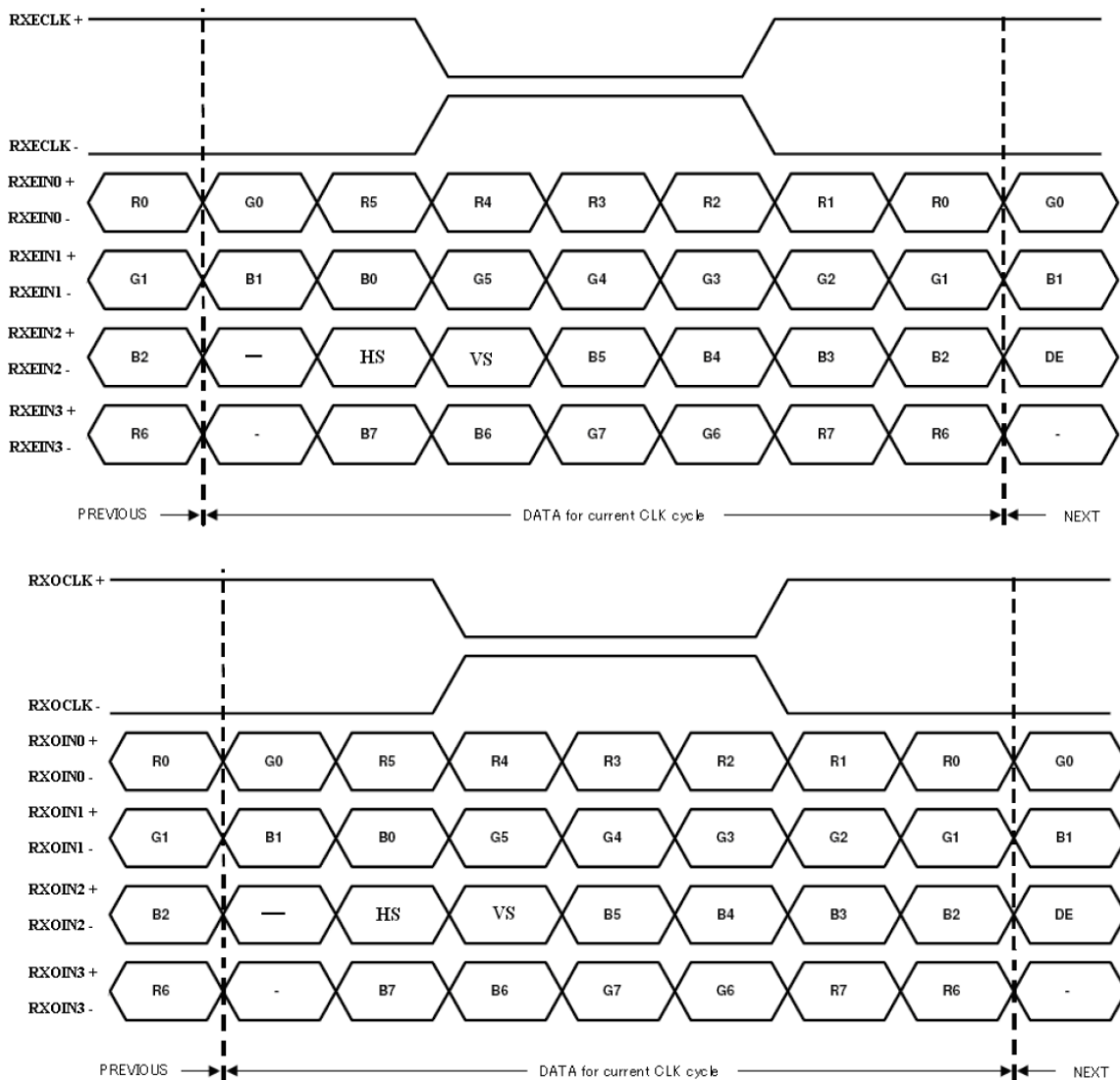
DATA mapping

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

[Note]

1) Definition of gray scale:

   Color (n): n indicates gray scale level; higher n means brighter level.

2) Data: 1-High, 0-Low.

3) This assignment is applied to both odd and even data.

8.   Reliability Condition

8.1 Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temp. Operation	85℃, 1000 hrs
High Temp. and Humidity Operation	60℃, 90%RH, 1000 hrs
Low Temp. Operation	-30℃, 1000 hrs
High Temp. Storage	90℃, 1000 hrs
Low Temp. Storage	-40℃, 1000 hrs
Thermal Shock (No operation)	-40℃ <-> 85℃(各 0.5hr), 500 cycles
Temperature /humidity cyclic test	-10~65℃, 90~95%RH, 10 cycles

8.2 Shock and Vibration

ITEMS	CONDITIONS
Shock (Non-Operation)	● 980m/s2 (100G)6msec±XYZ 3Times each
Vibration (Non-Operation)	● 10~500Hz 49m/s2 (5G)8h × 3(±X、±Y,±Z), 1.3mm

8.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	NOTE
ESD (power off)	150pF, 150Ω, ±15kV air& contact test	1
	- (MM Mode) C = 200pF R = 0Ω min 200V 3Times - (HBM Mode) C = 100pF R = 1.5kΩ min 2000V 3Times	1

Note: Measure point

1. LCD glass and metal bezel

8.4 Judgment Standard

The judgment of the above test should be made as follow:

Pass**:** Normal display image with no line defect.

Fail**:** No display image, or line defects.

9. Dimensional Outline

49.09±0.5

13.39

121.24

159.61

88.08±0.5

41

1

29.01

41.05±0.5