

FOR MESSRS : _____

DATE : Mar. 08th ,2023

TECHNICAL DATA
TX40D201VM0BAB

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ACCEPTED BY : _____

PROPOSED BY : Alex Lee

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 15.8" format amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially. This display is RoHS compliant, and COG (chip on glass) technology and LED backlight are applied on this display

Part Name	TX40D201VM0BAB
Module Dimensions	409.8(W) mm x 109.5(H) mm x 14.5(D) mm
LCD Active Area	389.76(W) mm x 91.35(H) mm
Pixel Pitch	0.15225(W) mm x 0.15225(H) mm
Resolution	2560 x 3(RGB)(W) x 600(H) dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	IPS, Normally Black, Transmissive Type
Display Type	Active Matrix
Number of Colors	16.7M Colors (8-bit RGB)
Backlight	Light Emitting Diode (LED)
Weight	658g
Interface	LVDS; 20 pins
Power Supply Voltage	3.3V for LCD ; 46.5V for Backlight
Viewing Direction	Super Wide Version (In Plane Switching)

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	V _{DD}	-0.3	4.0	V	-
Input Voltage of Logic	V _I	-0.3	V _{DD} +0.3	V	Note 1
Operating Temperature	T _{op}	-30	80	°C	Note 2
Storage Temperature	T _{st}	-30	80	°C	Note 2
Backlight Input Voltage	V _{LED}	0	49.5	V	-

Note 1: The rating is defined for the signal voltages of the interface such as CLK and pixel data pairs.

Note 2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25°C.
- Operating under high temperature will shorten LED lifetime.

5. ELECTRICAL CHARACTERISTICS

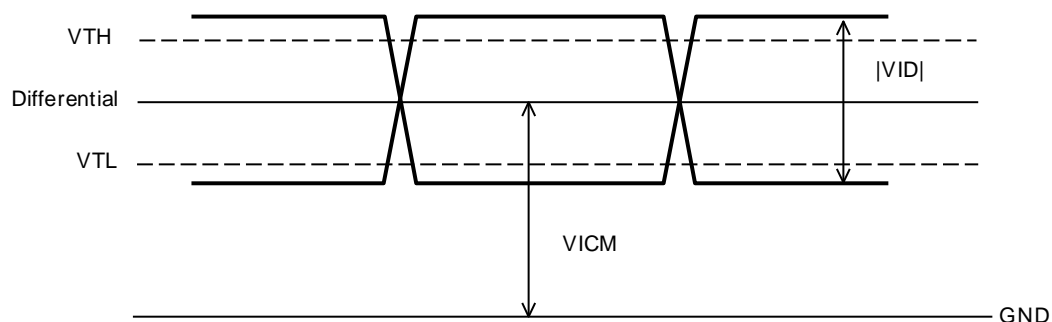
5.1 OPERATING CONDITIONS

$T_a = 25\text{ }^\circ\text{C}$, $V_{SS} = 0\text{V}$

Item	Symbol	Condition	Standard Value			Unit	Remarks
			Min.	Typ.	Max.		
Power supply voltage	V_{DD}	-	3.0	3.3	3.6	V	-
Power supply current	I_{DD}	$V_{DD} = 3.3\text{V}$	-	310	360	mA	Note 1
Input signal voltage	V_{IH1}	-	$0.8V_{DD}$	-	V_{DD}	V	-
	V_{IL1}	-	V_{SS}	-	$0.2V_{DD}$	V	-
Allowable Ripple Voltage	VRP	-	-	-	100	mV (p-p)	-
Differential Input High Threshold	V_{TH}	$V_{ICM} = 1.2\text{V}$	-	-	100	mV	Note 2
Differential Input Low Threshold	V_{TL}	$V_{ICM} = 1.2\text{V}$	-100	-	-	mV	Note 2
Input Differential Voltage	$ V_{ID} $	-	100	-	600	mV	Note 2
Differential Input Common Mode Voltage	V_{ICM}	-	1	1.2	1.4	V	Note 2

Note 1: Measurement picture: Maximum load condition.

Note 2:



5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25^\circ\text{C}$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	V_{LED}	-	40.5	46.5	49.5	V	Note 1
LED Forward Current	I_{LA}	$V_{LA} = (46.5V)$	-	70	-	mA	Note 2
LED Lifetime	-	$I_{LED} = 280mA$	-	50K	-	hrs	Note 2

Note 1: Fig. 5.1 shows the LED backlight circuit.

Note 2: The estimated lifetime is specified as the time to reduce 50% brightness by applying $I_{LA}=70mA$ at 25°C .

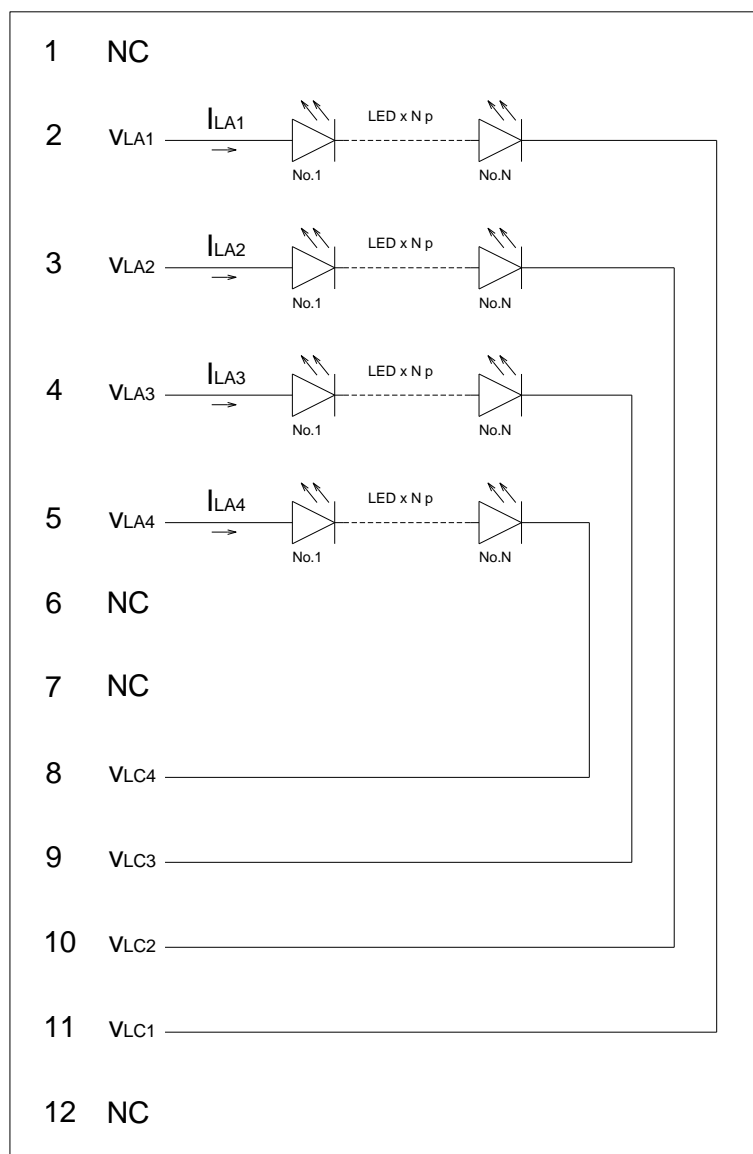


Fig 5.1

6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.
- The backlight unit needs to be turned on for 30 minutes.
- The ambient temperature is 25 °C .
- In the dark room less than 100 lx, the equipment has been set for the measurements as shown in Fig 6.1.

$$T_a = 25 \text{ }^\circ\text{C}, f_{Frame} = 60 \text{ Hz}, V_{DD} = 3.3\text{V}$$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White	-	$\phi = 0^\circ, \theta = 0^\circ,$ $I_{LED} = 1000\text{mA}$	800	1000	-	cd/m ²	Note 1
Brightness Uniformity	-		75	-	-	%	Note 2
Contrast Ratio	CR		800	1300	-	-	Note 3
Response Time	-	$\phi = 0^\circ, \theta = 0^\circ$	-	-	25	ms	-
NTSC Ratio	-	$\phi = 0^\circ, \theta = 0^\circ$	-	70	-	%	-
Viewing Angle	θ_x	$\phi = 0^\circ, CR \geq 10$	-	85	-	Degree	Note 5
	$\theta_{x'}$	$\phi = 180^\circ, CR \geq 10$	-	85	-		
	θ_y	$\phi = 90^\circ, CR \geq 10$	-	85	-		
	$\theta_{y'}$	$\phi = 270^\circ, CR \geq 10$	-	85	-		
Color Chromaticity	Red	X	-	0.63	-	-	Note 6
		Y	-	0.33	-		
	Green	X	-	0.33	-		
		Y	-	0.63	-		
	Blue	X	-	0.15	-		
		Y	-	0.10	-		
	White	X	-	0.32	-		
		Y	-	0.32	-		

Note 1: The brightness is measured from the panel center point, P5 in Fig. 6.2, for the typical value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

which is based on the brightness values of the 9 points in active area measured by BM-5 as shown in Fig. 6.2.

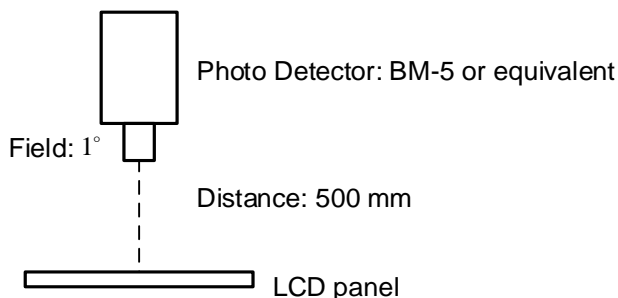


Fig 6.1

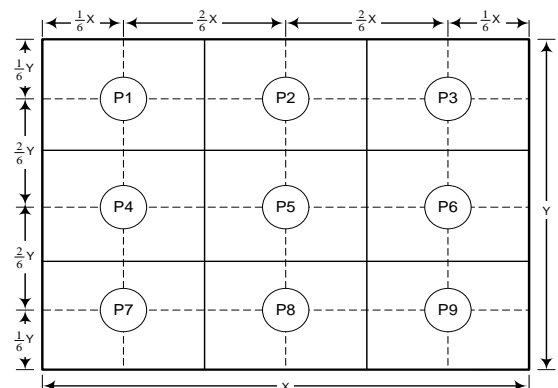


Fig 6.2

Note 3: The Contrast Ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 10% brightness to 90% brightness when the data is from black to white. Oppositely, Falling time is the period from 90% brightness falling to 10% brightness.

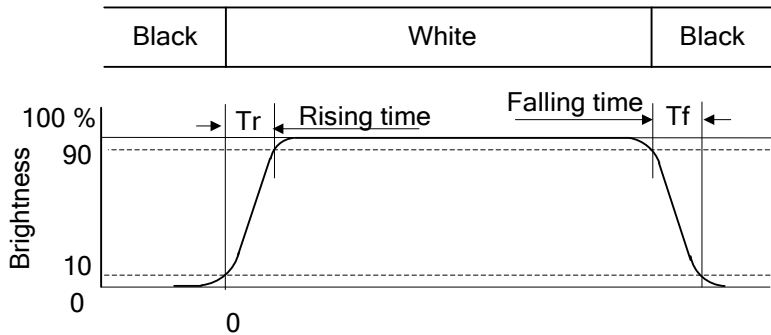


Fig 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle ϕ is used to represent viewing directions, for instance, $\phi = 270^\circ$ means 6 o'clock, and $\phi = 0^\circ$ means 3 o'clock. Moreover, angle θ is used to represent viewing angles from axis Z toward plane XY.

The display is super wide viewing angle version; 85° viewing angle can be obtained from each viewing direction.

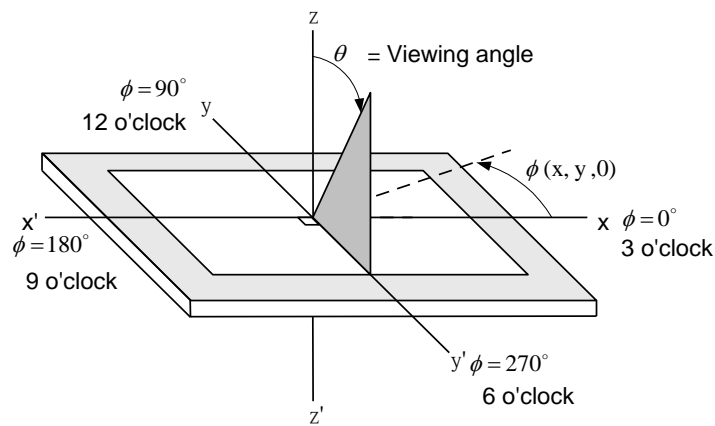
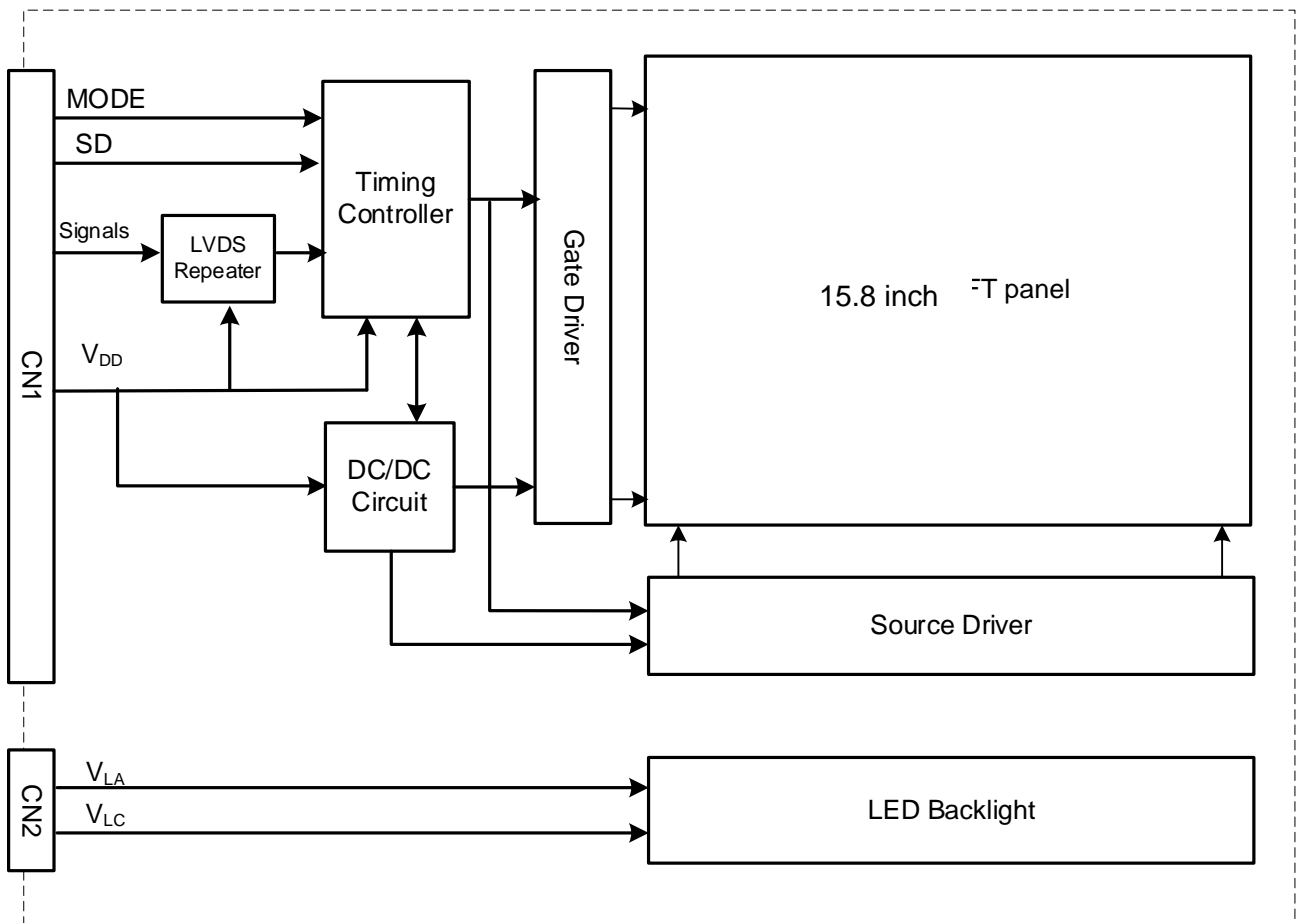


Fig 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

7. BLOCK DIAGRAM



Note : Signals are CLK and pixel data pairs.

8. LCD INTERFACE

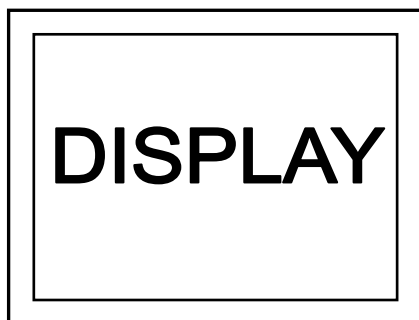
8.1 INTERFACE PIN CONNECTIONS

The display interface (CN1) is FI-SEB20P-HF13E made by JAE.

Pin assignment is as below:

Pin No.	Symbol	Signal	Pin No.	Symbol	Signal
1	V _{DD}	Power Supply for Logic	11	IN2-	B4~B7, DE
2	V _{DD}	Power Supply for Logic	12	IN2+	
3	V _{SS}	GND	13	V _{SS}	GND
4	V _{SS}	GND	14	CLK IN-	Pixel Clock
5	IN0-	R2~R7, G2	15	CLK IN+	
6	IN0+		16	V _{SS}	GND
7	V _{SS}	GND	17	IN3-	R0~R1, G0~G1, B0~B1
8	IN1-	G3~G7, B2~B3	18	IN3+	
9	IN1+		19	MODE	Low= JEIDA, High= VESA
10	V _{SS}	GND	20	SD	Scan Direction Control (Note 1)

Note 1: Scan direction is available to be switched as below.



SD : Low or Open (Default)



SD : High

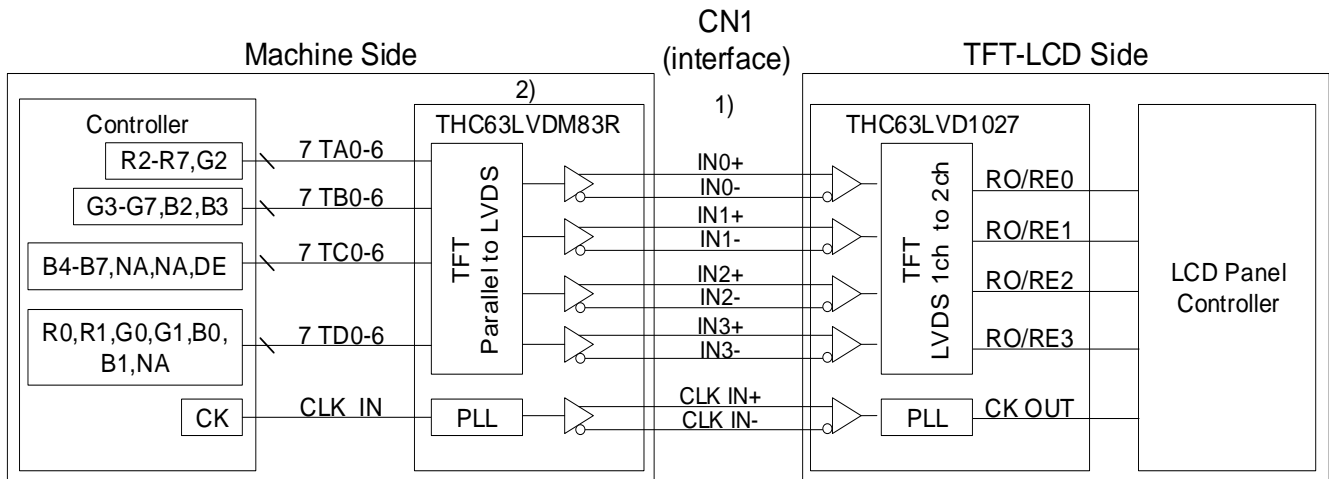
Note 2: IN_n- and IN_n+ (n=0,1,2,3), CLK IN- and CLK IN+ should be wired by twist-pairs or side-by-side FPC patterns, respectively.

The backlight interface (CN2) is SM10B-SRSS-TB(LF)(SN) made by JST.

Pin assignment is as below:

Pin No.	Symbol	Signal	Pin No.	Symbol	Signal
1	VLA1	LED Anode Terminal1	6	VLC1	LED Cathode Terminal1
2	VLA2	LED Anode Terminal2	7	VLC2	LED Cathode Terminal2
3	VLA3	LED Anode Terminal3	8	VLC3	LED Cathode Terminal3
4	VLA4	LED Anode Terminal4	9	VLC4	LED Cathode Terminal4
5	NC	Non-Connection	10	NC	Non-Connection

8.2 LVDS INTERFACE

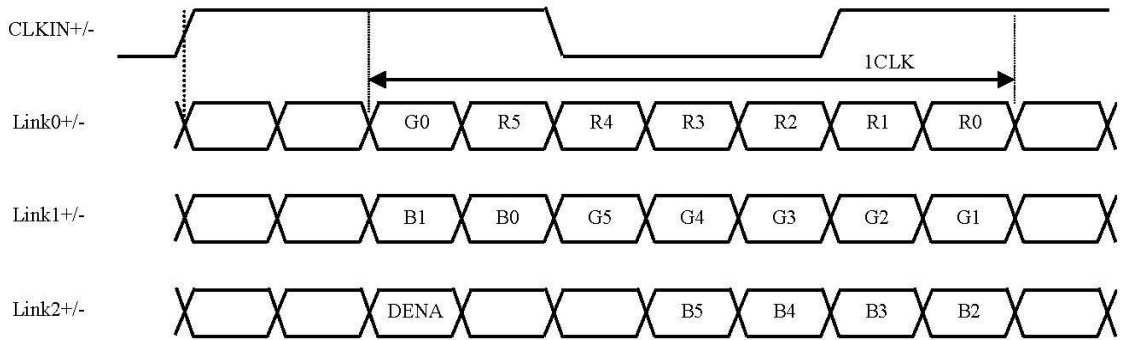


Note 1: LVDS cable impedance should be 100 ohms per signal line when each 2-lines (+, -) is used in differential mode.

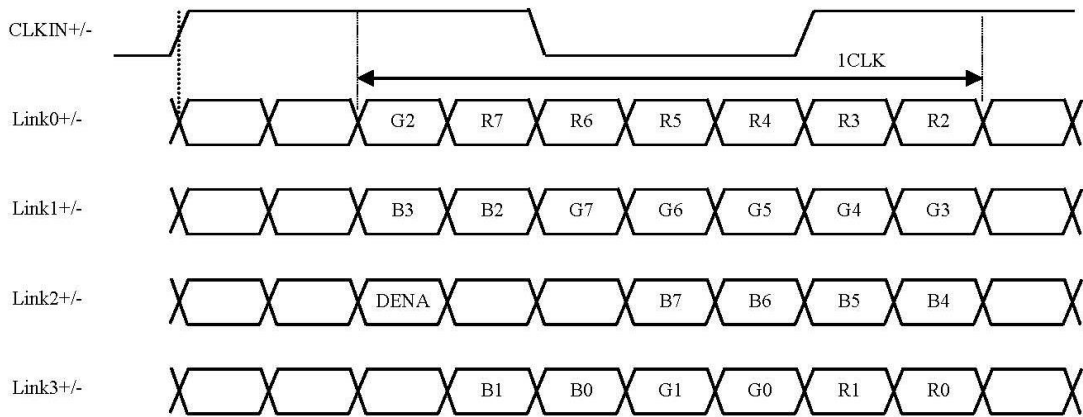
Note 2: The recommended transmitter, THC63LVDM83R, is made by Thine or equivalent, which is not contained in the module.

8.3 LVDS DATA FORMAT

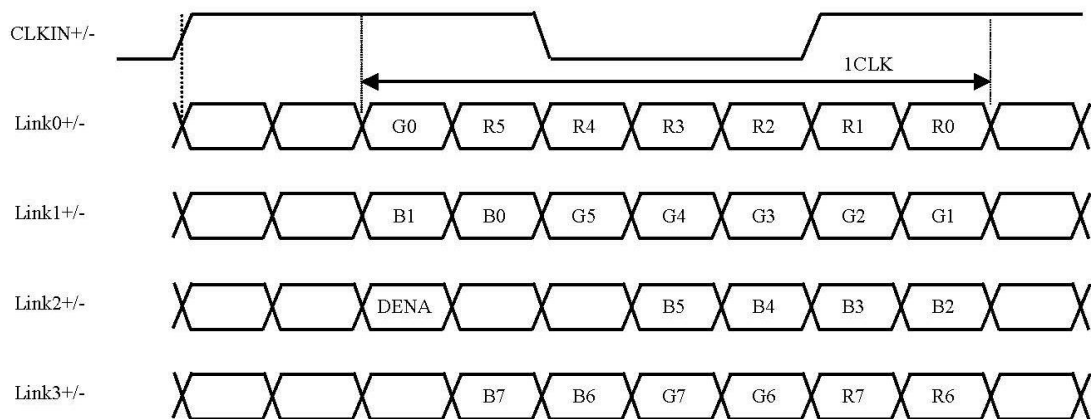
8.3.1 MODE = Low (6 bit input)



8.3.2 MODE = Low (8 bit input)



8.3.3 MODE = High (8 bit input)



DE: Display Enable

NA: Not Available

8.4 TIMING CHART

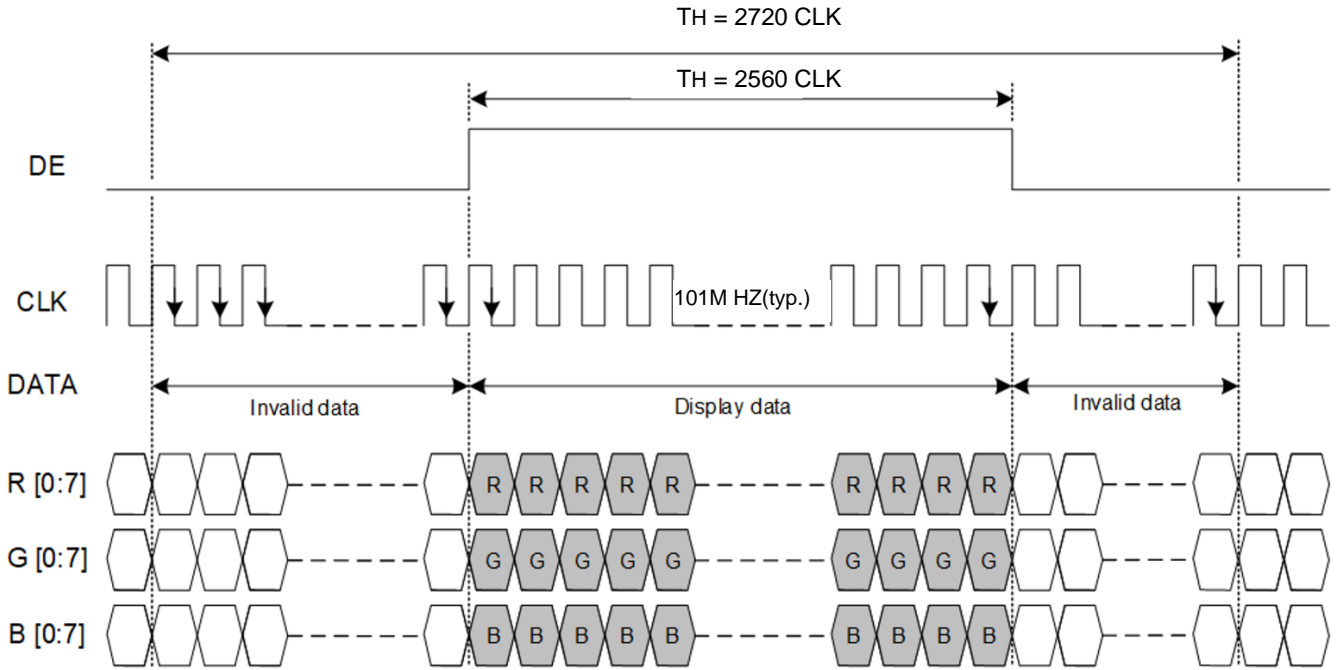


Fig. 8.1 Horizontal Timing

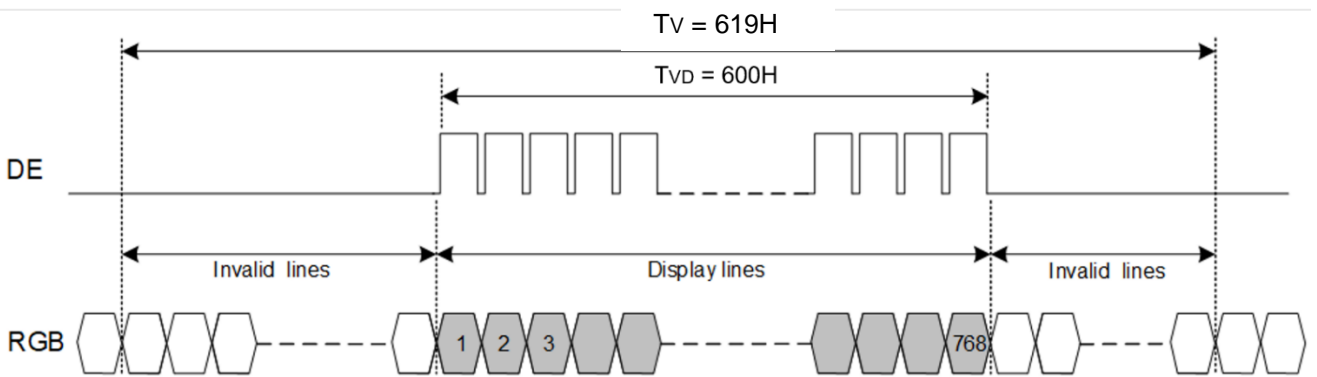


Fig. 8.2 Vertical Timing

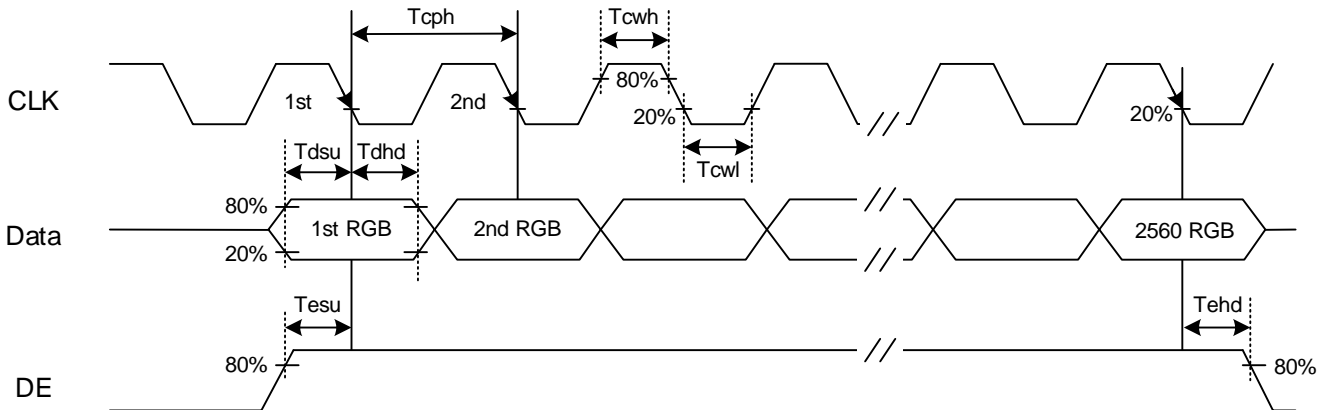


Fig. 8.3 Setup & Hold Time

8.5 TIME TABLE

The column of timing sets including minimum, typical, and maximum as below are based on the best optical performance, frame frequency (f_{Frame}) = 60 Hz to define.

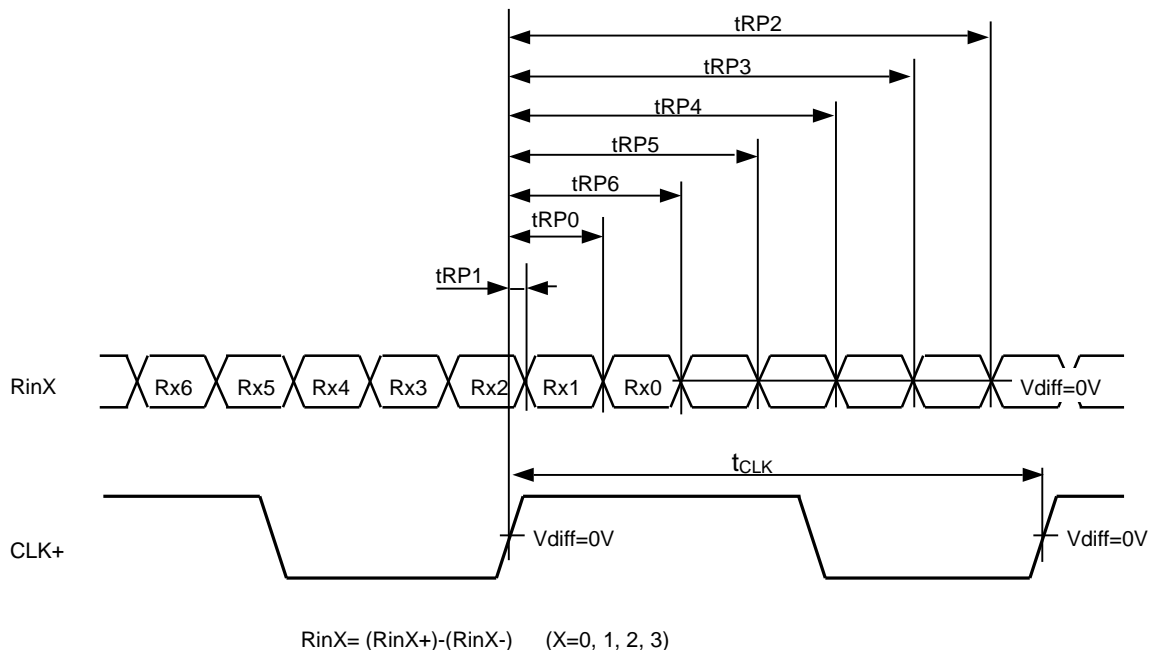
A. Horizontal and Vertical Timing

Item		Symbol	Min.	Typ.	Max.	Unit
Horizontal	CLK Frequency	fclk	96	69.8	135.6	M Hz
	Display Data	thd	2560			CLK
	Cycle Time	th	2650	2720	3082	
Vertical	Display Data	tvd	600			H
	Cycle Time	tv	604	619	733	

B. Setup and Hold Time

Item		Symbol	Min.	Typ.	Max.	Unit
CLK	Duty	Tcwh	40	50	60	%
	Cycle Time	Tcph	-	13.89	-	ns
Data	Setup Time	Tdsu	6	-	-	
	Hold Time	Tdhd	6	-	-	
DE	Setup Time	Tesu	6	-	-	
	Hold Time	Tehd	6	-	-	

8.6 LVDS RECEIVER TIMING



	Item	Symbol	Min.	Typ.	Max.	Unit
CLK	Cycle frequency	$1/t_{CLK}$	-	69.8	-	MHz
RinX (X=0,1,2,3)	0 data position	tRP0	-	$1/7 * t_{CLK}$	-	ns
	1st data position	tRP1	-	0	-	
	2nd data position	tRP2	-	$6/7 * t_{CLK}$	-	
	3rd data position	tRP3	-	$5/7 * t_{CLK}$	-	
	4th data position	tRP4	-	$4/7 * t_{CLK}$	-	
	5th data position	tRP5	-	$3/7 * t_{CLK}$	-	
	6th data position	tRP6	-	$2/7 * t_{CLK}$	-	

8.7 DATA INPUT for DISPLAY COLOR

8.7.1 MODE = Low

Input color		Red Data						Green Data						Blue Data					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red(255)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Red(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Green(1)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	
Blue	Blue(1)	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	1	0	
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	

Note 1: Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2: Data Signal : 1 : High, 0 : Low

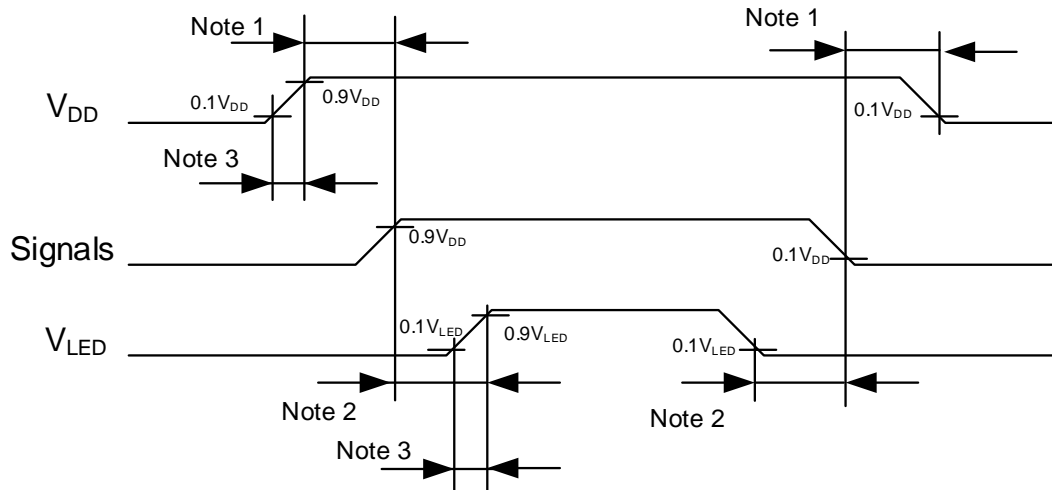
8.7.2 MODE = High

Input color		Red Data								Green Data								Blue 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					
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							
	Green(255)	0	0	0	0	0	0	0	0	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	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							
	Magenta	1	1	1	1	1	1	1	1	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	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							
Red	Black	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								
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:								
	Red(253)	1	1	1	1	1	1	0	1	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								
Red(255)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
Green	Black	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	1	0	0	0	0	0	0	0	0								
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0								
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:								
	Green(253)	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0								
	Green(254)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0								
Green(255)	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0									
Blue	Black	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	1								
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0								
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:								
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1								
	Blue(254)	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	1	1	1	1	1	1	1	1									

Note 1: Definition of gray scale : Color(n) Number in parenthesis indicates gray scale level. Larger number corresponds to brighter level.

Note 2: Data Signal : 1 : High, 0 : Low

8.8 POWER SEQUENCE

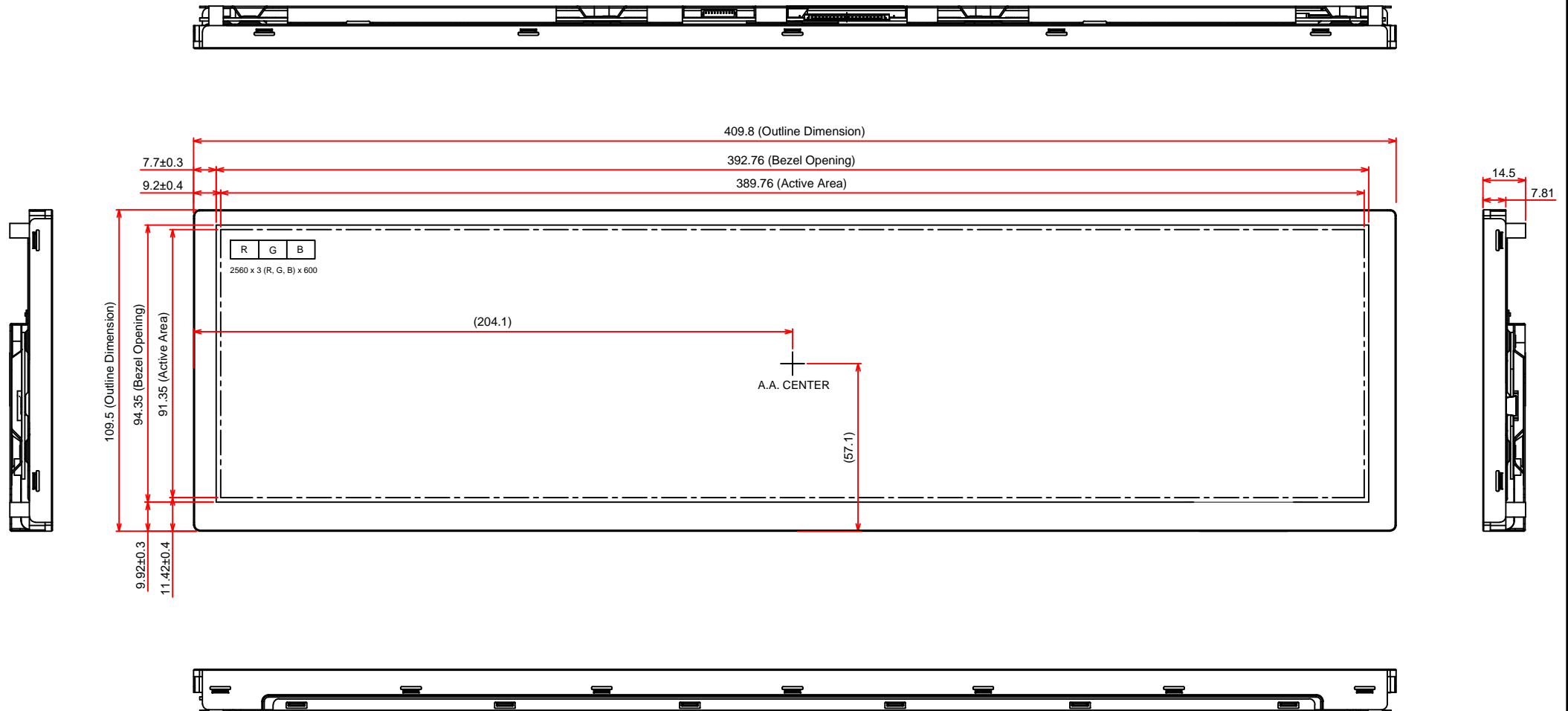


Note 1: In order to avoid any damages, V_{DD} has to be applied before all other signals. The opposite is true for power off where V_{DD} has to be remained on until all other signals have been switch off. The recommended time period is within 1 second. Hot plugging might cause display damage due to incorrect power sequence, please pay attention on interface connecting before power on.

Note 2: In order to avoid showing uncompleted patterns in transient state. It is recommended that switching the backlight on is delayed for 1 second after the signals have been applied. The opposite is true for power off where the backlight has to be switched off 1 second before the signals are removed.

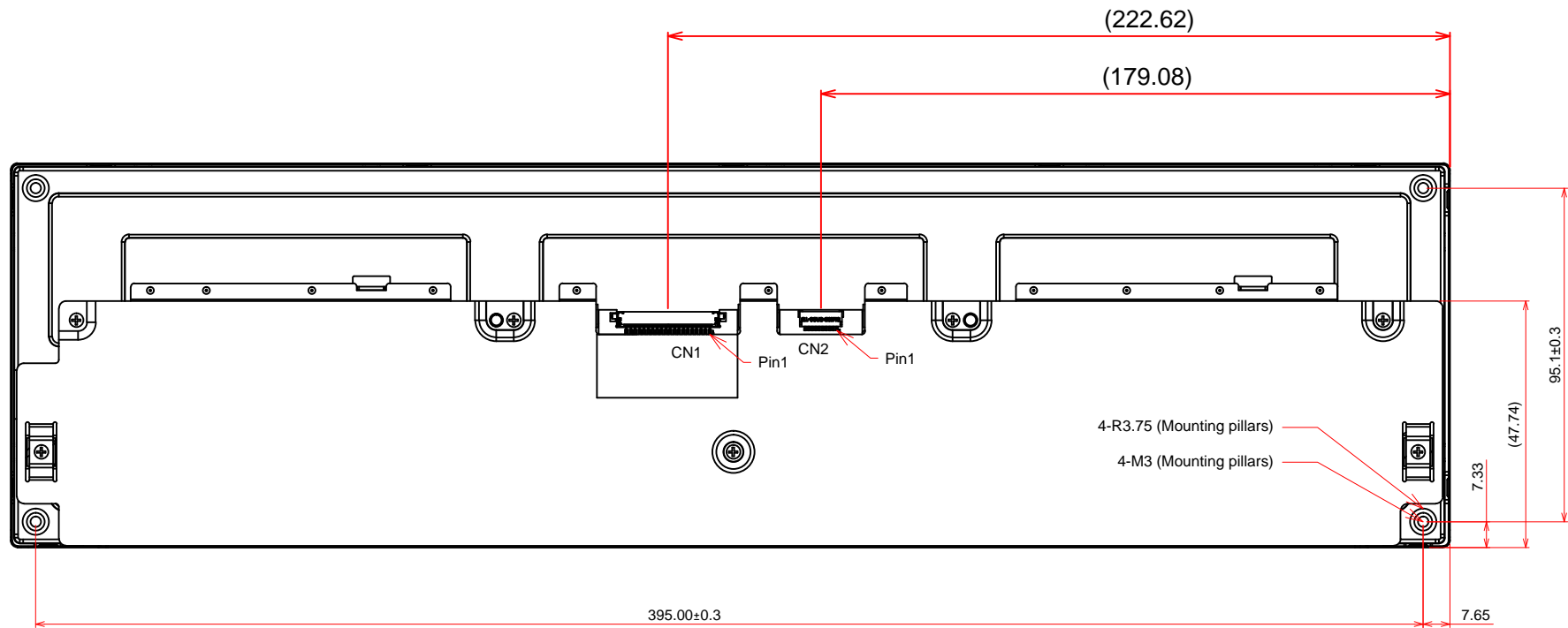
9. OUTLINE DIMENSIONS

9.1 FRONT VIEW



General Tolerance:±0.5mm
 Scale : NTS
 Unit : mm

9.2 REAR VIEW



General Tolerance: ± 0.5 mm
 Scale : NTS
 Unit : mm