

KOE

JDI Group

TENTATIVE

Kaohsiung Opto-Electronics Inc.

FOR MESSRS : _____

DATE : Jul. 29th ,2020

TECHNICAL DATA

TX26D211VM0BAA

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ACCEPTED BY: _____

PROPOSED BY: John Chou

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 10.4" XGA of 4:3 format of 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, COG (chip on glass) technology and LED backlight are applied on this display.

Part Name	TX26D211VM0BAA
Module Dimensions	230 (W) mm x 180.2(H) mm x 9.5 (D) mm
LCD Active Area	211.2(W) mm x 158.4(H)
Pixel Pitch	0.20625(W) mm x 0.20625 (H)
Resolution	1024 x 3(RGB)(W) x 768(H) dots
Color Pixel Arrangement	R, G, B Vertical Stripe
LCD Type	Transmissive Color TFT; Normally Black
Display Type	Active Matrix
Number of Colors	16.7M Colors(8 bit RGB)
Backlight	Light Emitting Diode (LED)
Weight	(TBD)g
Interface	1ch-LVDS ; 20 pins
Power Supply Voltage	3.3V for LCD; 12V for Backlight
Power Consumption	LCD (TBD)W ; BL (TBD)W
Viewing Direction	Super Wide Version (In-Plane Switching)

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	V _{DD1}	-0.3	3.9	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}	-40	80	°C	Note 2
Backlight Input Voltage	V _{LED}	-0.3	14	V	-
Backlight Voltage for PWM	V _{PWM}	-0.3	14	V	-
Backlight Voltage for EN	V _{EN}	-0.3	14	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 glass surface 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 DC CHARACTERISTICS OF GENERAL

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

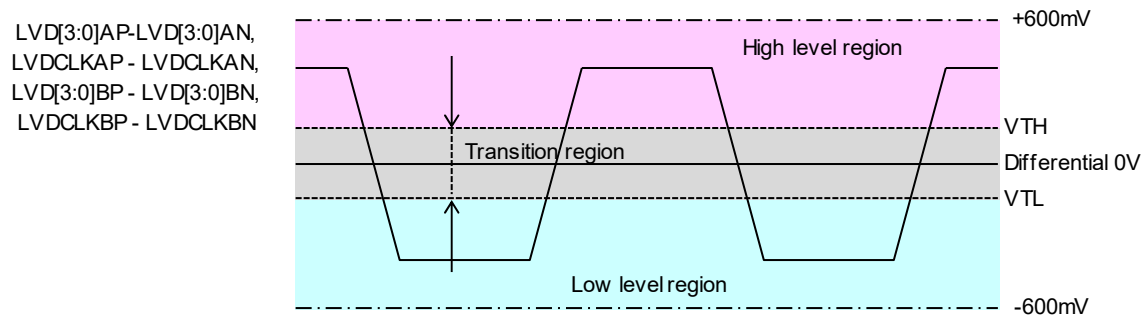
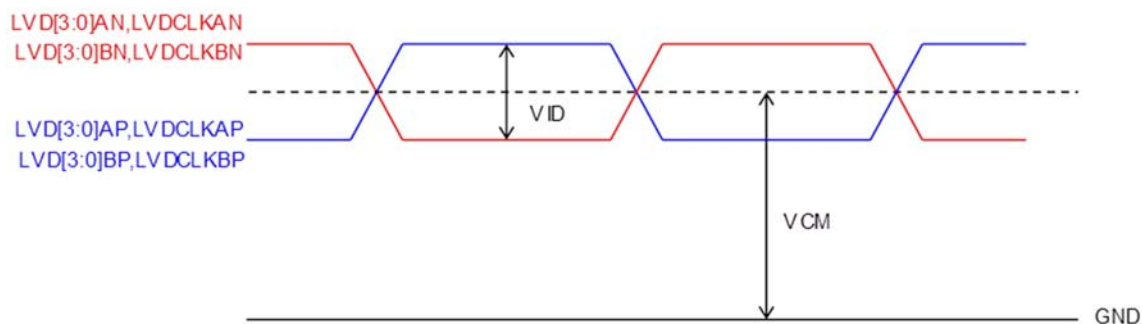
Item	Symbol	Condition	Standard Value			Unit	Remarks
			Min.	Typ.	Max.		
Power supply voltage	V_{DD1}	-	3.0	3.3	3.6	V	-
Power supply current	I_{DD1}	Note 1	-	300	400	mA	Note 1,5
Input signal voltage	V_{IH1}	-	$0.8V_{DD}$	-	V_{DD}	V	Note 2
	V_{IL1}	-	V_{SS}	-	$0.3V_{DD}$	V	
Allowable Ripple Voltage	VRP1	-	-	-	100	mV (p-p)	Note 3
Differential Input High Threshold	V_{TH}	$V_{ICM}=1.25V$	-	-	100	mV	Note 4
Differential Input Low Threshold	V_{TL}	$V_{ICM}=1.25V$	-100	-	-	mV	
Input Differential Voltage	$ V_{ID} $	-	200		600	mV	
Differential Input Common Mode Voltage	VCM	$ V_{ID} /2$	-	1.2	$V_{CC}-1.2$	V	

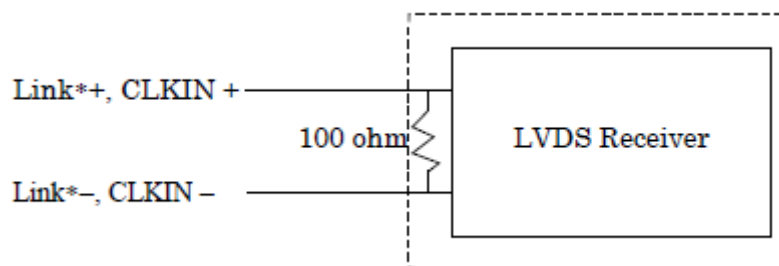
Note 1: An all white check pattern is used when measuring I_{DD} frame rate is set to 60Hz with Typ voltage.

Note 2: Applied pin is {SC}.

Note 3: Applied pin is $\{V_{DD}\}$

Note 4: For LVDS input signal.





Note 5: (TBD) fuse is applied in the module for I_{DD} . For display activation and protection purpose, power supply is recommended larger than (TBD)A to start the display and break fuse once any short circuit occurred.

5.2 BACKLIGHT CHARACTERISTICS

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

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
LED Input Voltage	V_{LED}	$I_{LED}=(TBD)\text{mA}$	10.8	12	13.2	V	Note 1
LED Forward Current	I_{LED}	100% duty	-	TBD	-	mA	Note 2
		0% duty	-	-	-		
PWM Signal Voltage	-	High	2.5	-	V_{LED}	V	-
		Low	-	-	0.4		-
EN Voltage	V_{EN}	-	2.5	-	5.5	V	-
LED Lifetime	-	$I_{LED}=(TBD)\text{mA}$	-	100K	-	hrs	Note 3

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

Note 2: Dimming function can be obtained by applying PWM signal from the display interface CN2. The recommended PWM signal is 100Hz ~ 5KHz with 3.3 V amplitude.

Note 3: The estimated lifetime is specified as the time to reduce 50% brightness by applying (TBD)mA at 25°C .

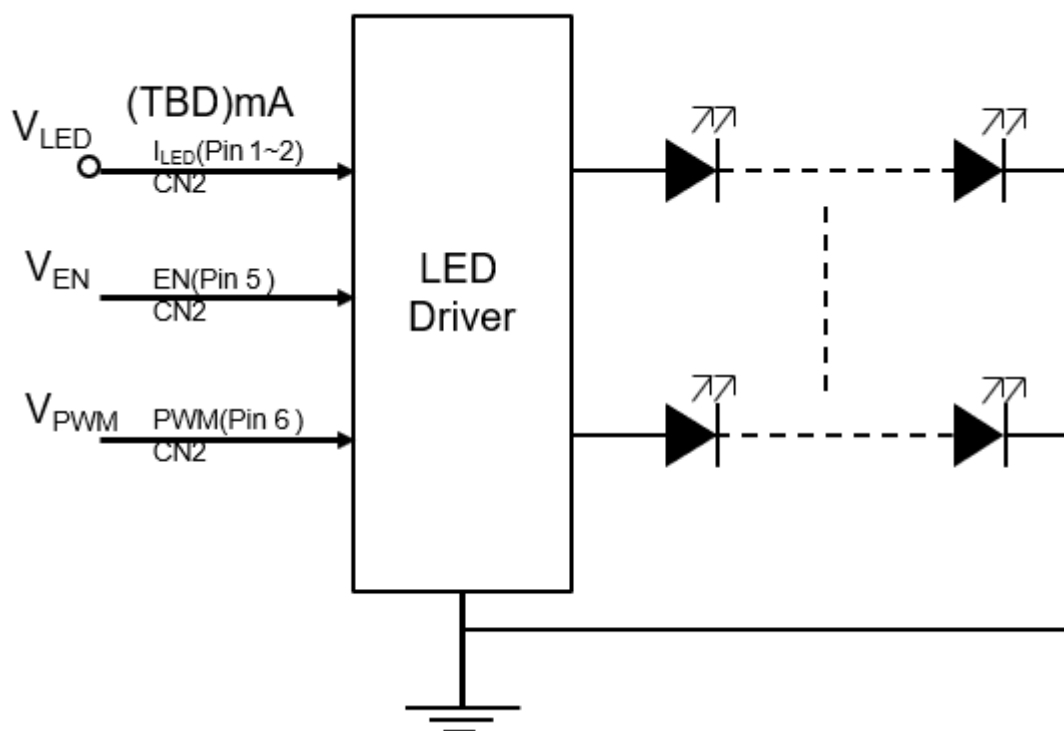


Fig 5.1

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	-	$\phi = 0^{\circ}, \theta = 0^{\circ},$ $I_{LED} = (\text{TBD})\text{ mA}$	-	1300	-	cd/m ²	Note 1
Brightness Uniformity	-		-	80	-	%	Note 2
Contrast Ratio	CR		-	1000	-	-	Note 3
Response Time	$T_r + T_f$	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	30	-	ms	Note 4
NTSC Ratio	-	$\phi = 0^{\circ}, \theta = 0^{\circ}$	-	70	-	%	-
Viewing Angle	θ_x	$\phi = 0^{\circ}, CR \geq 10$	-	88	-	Degree	Note 5
	$\theta_{x'}$	$\phi = 180^{\circ}, CR \geq 10$	-	88	-		
	θ_y	$\phi = 90^{\circ}, CR \geq 10$	-	88	-		
	$\theta_{y'}$	$\phi = 270^{\circ}, CR \geq 10$	-	88	-		
Color Chromaticity	Red	X	-	(TBD)	-	-	Note 6
		Y	-	(TBD)	-		
	Green	X	-	(TBD)	-		
		Y	-	(TBD)	-		
	Blue	X	-	(TBD)	-		
		Y	-	(TBD)	-		
	White	X	-	(TBD)	-		
		Y	-	(TBD)	-		

Note 1: The brightness is measured from the center point of the panel, 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.

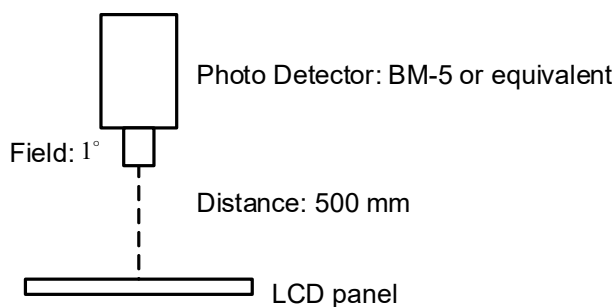


Fig 6.1

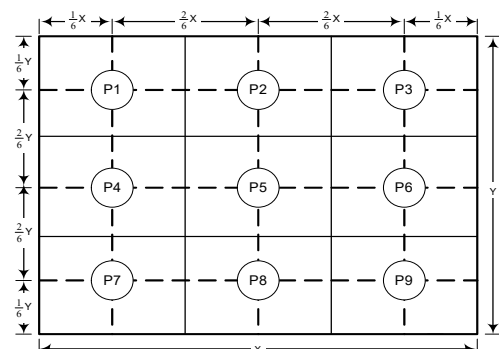


Fig 6.2

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.

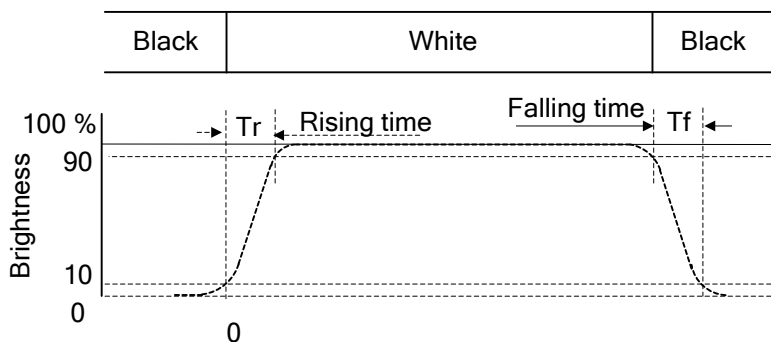


Fig 6.3

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.

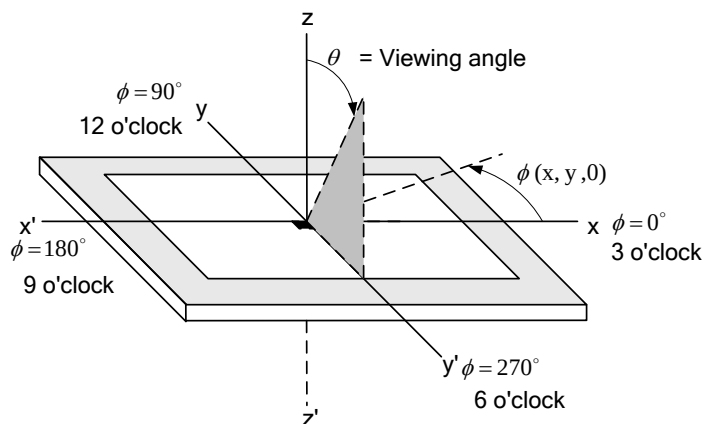
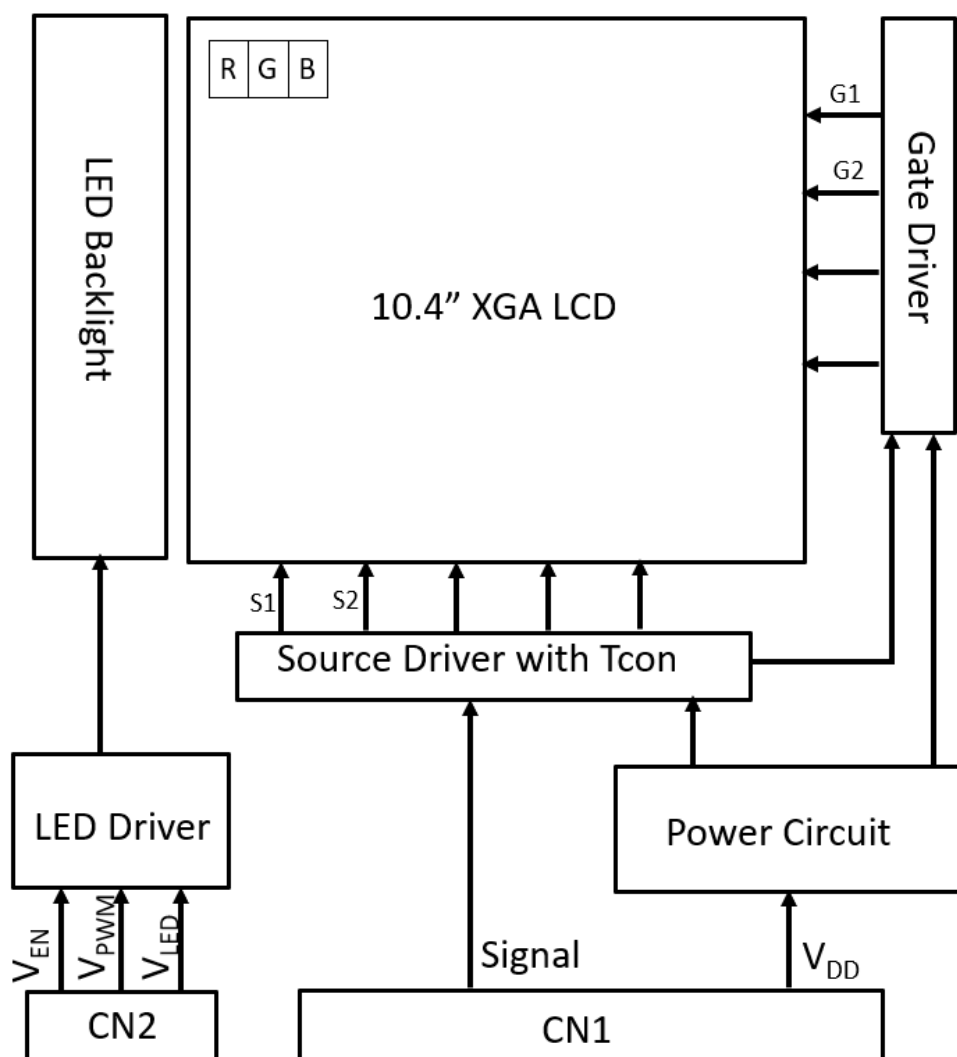


Fig 6.4

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 1: Signals are CLK and pixel data pairs.

8. LCD INTERFACE

8.1 INTERFACE PIN CONNECTIONS

The display interface connector CN1 is 20186-020E-11F (I-PEX), and Pin assignment is as below:

No.	Signal	Signal	I/O/P	Note
1	V _{DD}	Power supply for LCD	I	
2	V _{DD}	Power supply for LCD	I	
3	GND	GND	P	
4	GND	GND	P	
5	IN0-	R0~R5, G0	I	
6	IN0+	R0~R5, G0	I	
7	GND	GND	P	
8	IN1-	G1~G5, B0~B1	I	
9	IN1+	G1~G5, B0~B1	I	
10	GND	GND	P	
11	IN2-	B2~B5, DE	I	
12	IN2+	B2~B5, DE	I	
13	GND	GND	P	
14	CLK IN-	Pixel Clock	I	
15	CLK IN+	Pixel Clock	I	
16	GND	GND	P	
17	IN3-	R6~R7, G6~G7, B6~B7	I	
18	IN3+	R6~R7, G6~G7, B6~B7	I	
19	NC	No Connection	-	
20	SC	Scan direction control (Low : Normal . High : Reverse)	I	Note 1

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



SC : Low

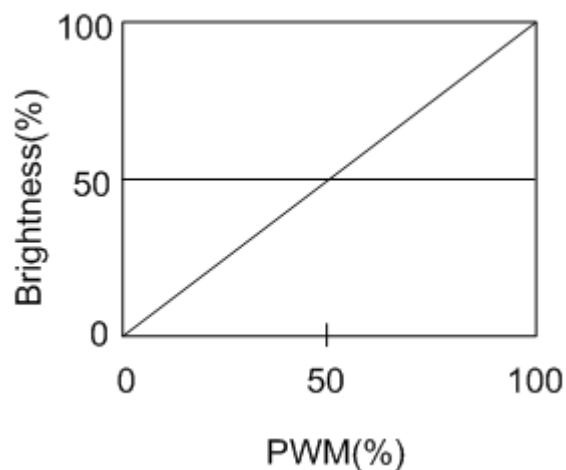


SC : High

The interface CN2 is (3800K-F06N-03L) made by E&T and pin assignment is as below:

Connector Name	Pin No.	Symbol	Function
3800K-F06N-03L	1	V _{LED} (+)	Power Supply for LED
	2	V _{LED} (+)	Power Supply for LED
	3	V _{LED} (-)	GND
	4	V _{LED} (-)	GND
	5	V _{EN}	Backlight Enable
	6	V _{PWM}	Brightness dimming

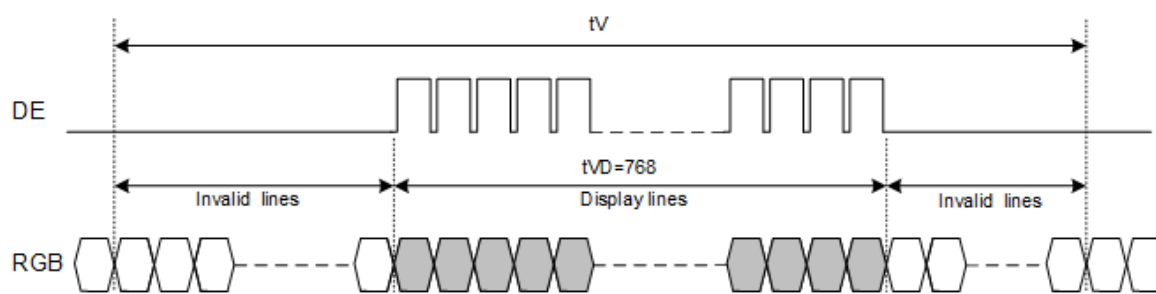
Note 1: The relationship of brightness and Dim control are shown as below.



Note 2: Normal brightness : 100% PWM duty ; Brightness control : 0% to 100% PWM duty. If no using , please keep it high(100%).

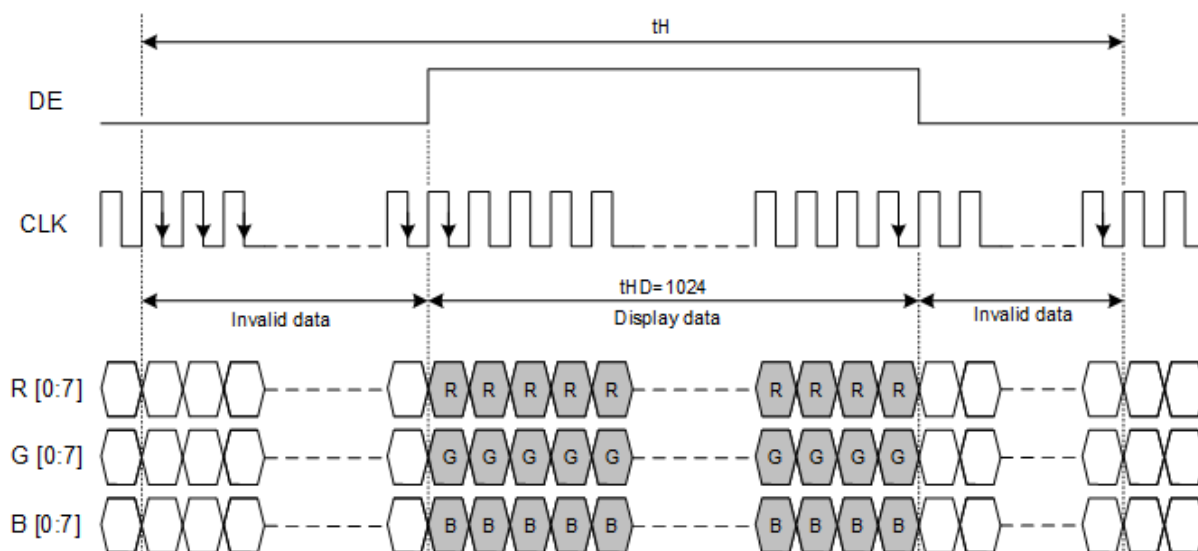
8.2 Data Input Timing

Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock	Frequency	fCLK	-	65	-	MHz
	Frequency	fVD	-	60	--	Hz
Vertical timing	Cycle	tV	-	806	-	Line
	Display period	tVD	-	768	-	Line
Horizontal timing	Cycle	tH	-	1344	-	CLK
	Display period	tHD	-	1024	-	CLK



Vertical timing

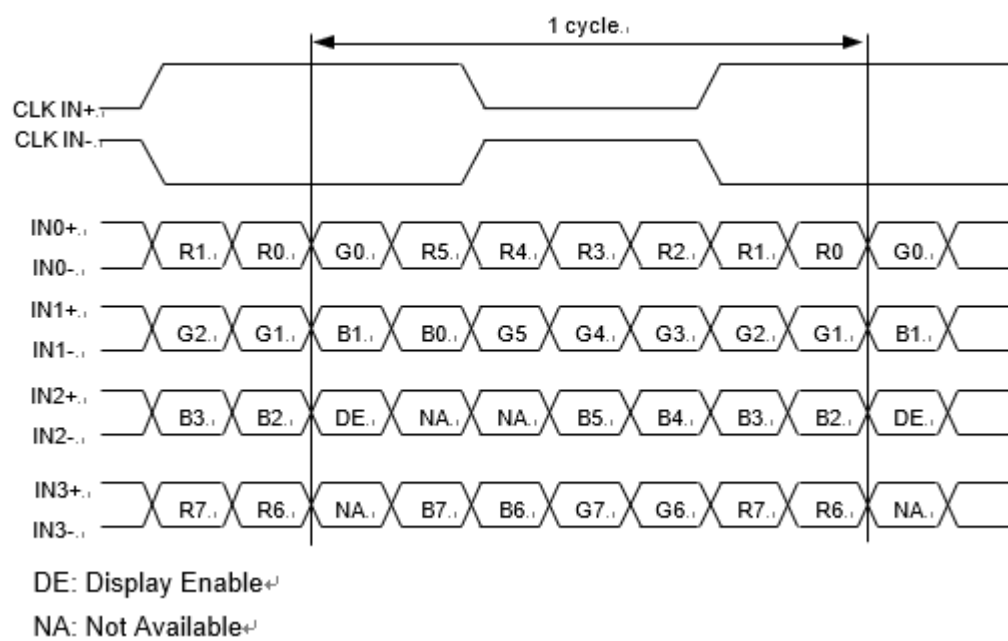
Note : In case of changing the vertical and horizontal timing, the display should be turned off.



Horizontal timing

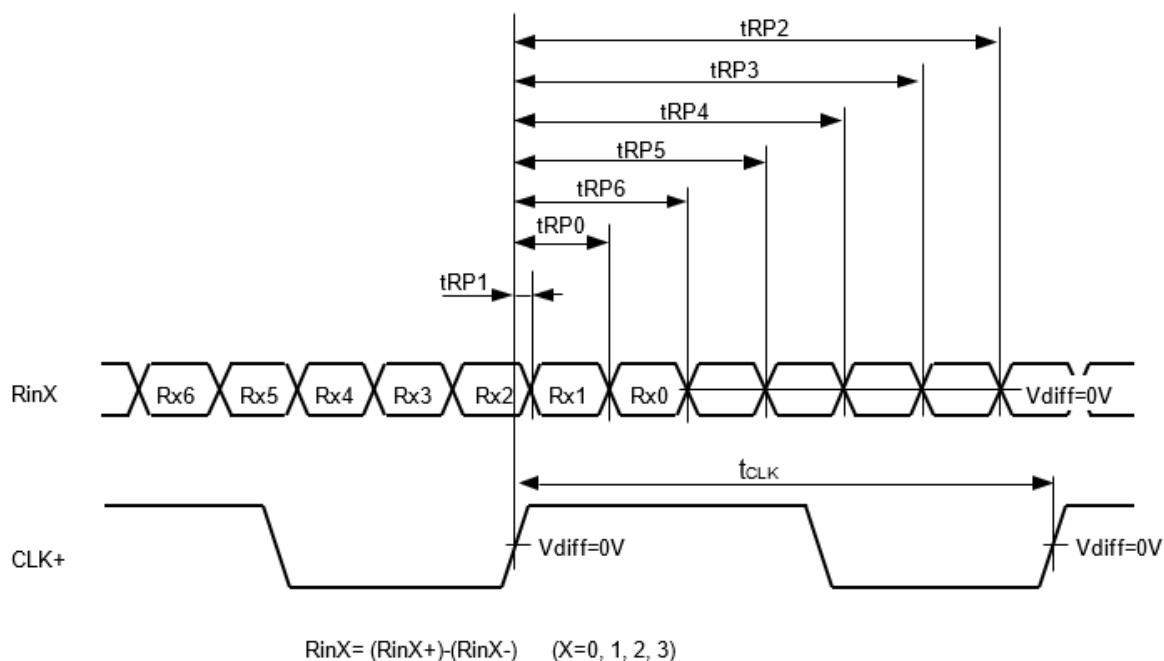
Note : In case of changing the vertical and horizontal timing, the display should be turned off.

8.3 LVDS DATA FORMAT



8bit LVDS input

8.4 LVDS RECEIVER TIMING



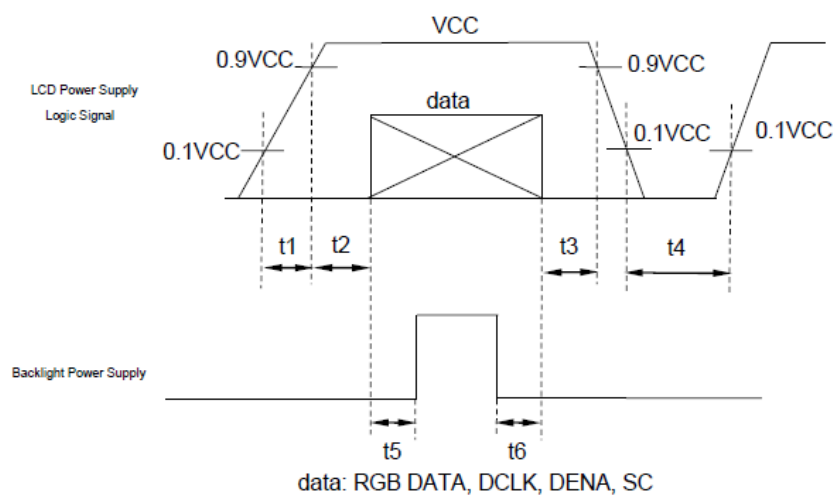
	Item	Symbol	Min.	Typ.	Max.	Unit
CLK	Cycle frequency	$1/t_{CLK}$	-	65	-	MHz
R_{inX} ($X=0,1,2,3$)	0 data position	t_{RP0}	-	$1/7 * t_{CLK}$	-	ns
	1st data position	t_{RP1}	-	0	-	
	2nd data position	t_{RP2}	-	$6/7 * t_{CLK}$	-	
	3rd data position	t_{RP3}	-	$5/7 * t_{CLK}$	-	
	4th data position	t_{RP4}	-	$4/7 * t_{CLK}$	-	
	5th data position	t_{RP5}	-	$3/7 * t_{CLK}$	-	
	6th data position	t_{RP6}	-	$2/7 * t_{CLK}$	-	

8.5 DATA INPUT for DISPLAYCOLOR

8bit mode

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							
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	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(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(253)	1	1	1	1	1	1	0	1	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	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
	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
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	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	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
	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
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	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	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

8.6 POWER ON / OFF SEQUENCE

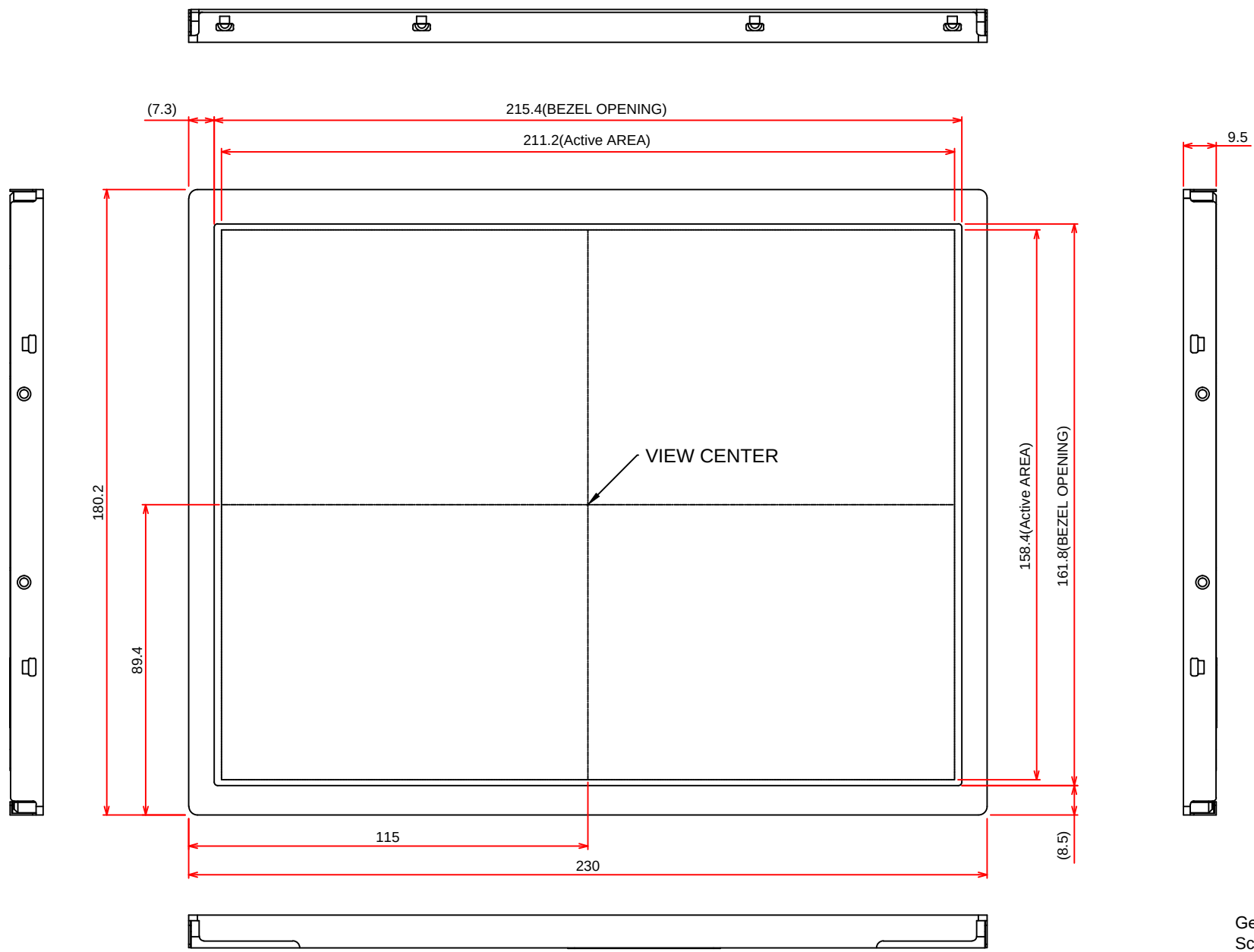


Please design the circuit which is able to adjust the interval of following table.

	t1	t2	t3	t4	t5	t6
Min.	$0.5\text{ ms} \leq$	$0 <$	$0 <$	$500\text{ms} \leq$	$200\text{ms} \leq$	$0 \leq$
Max.	$\leq 10\text{ ms}$	$\leq 50\text{ ms}$	$\leq 50\text{ms}$	-	-	-

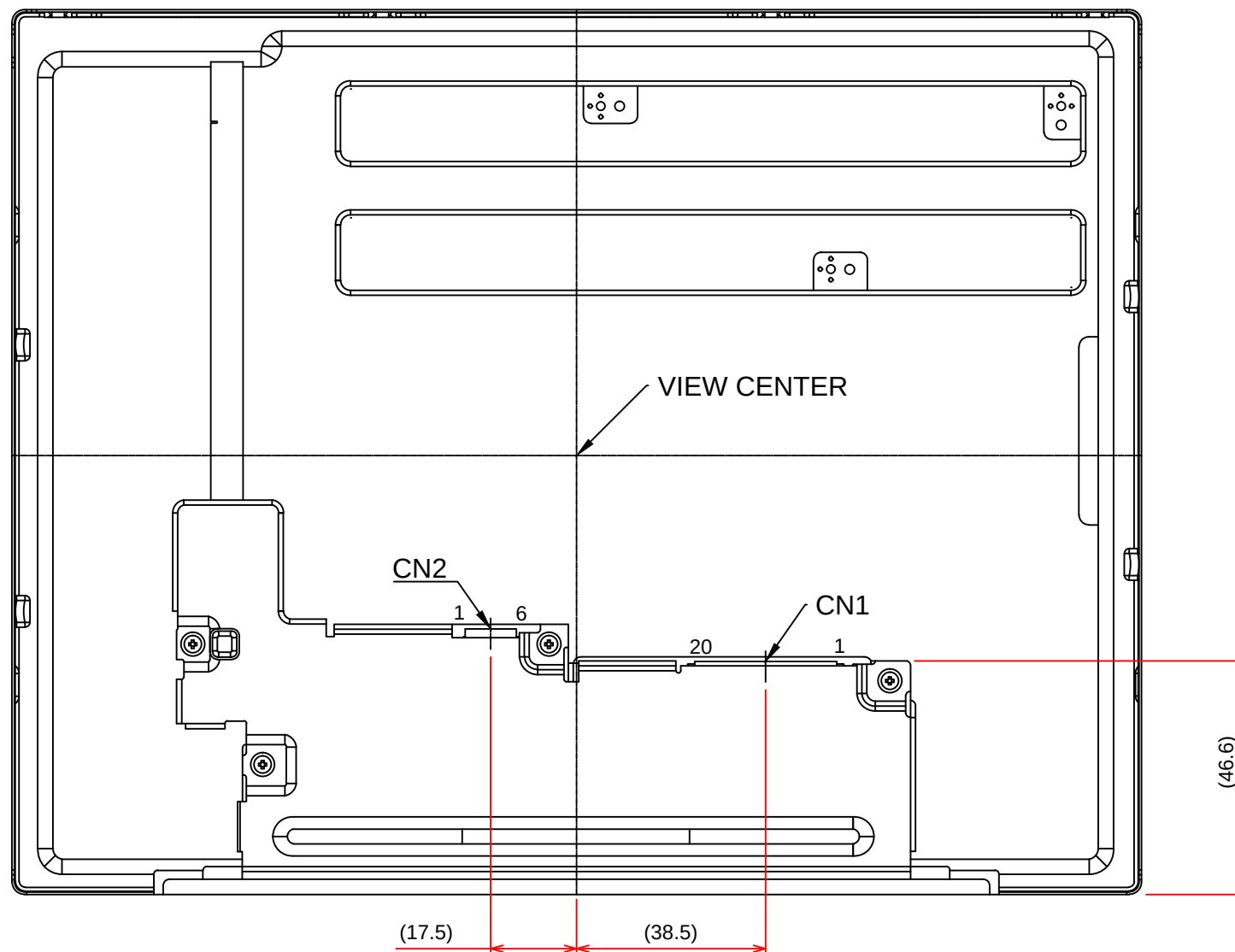
9. OUTLINE DIMENSIONS

9.1 FRONT VIEW



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

9.2 RAER VIEW



General Tolerance: $\pm 0.5\text{mm}$
Scale : NTS
Unit : mm