HM070WV201A

7" Color TFT-LCD

With Resistive Touch Screen

Release Date
12th Mar 2021

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2. General Description

This specification applies to the 7.0 inch color TFT LCD module G070VW01 V0.

G070VW01 V0 designed with wide viewing angle; wide operating temperature and long life LEDs backlight is well suited to be the display units for Industrial Applications.

LED driving board for backlight unit is included in this panel and the structure of the LED units is replaceable.

G070VW01 V0 is built in timing controller and LVDS interface.

The screen format is intended to support the WVGA (800(H) x 480(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits).

G070VW01 V0 is a RoHS product.

2.1 Display Characteristics

The following items are characteristics summary on the table under 25 condition:

Items	Unit	Specifications
Screen Diagonal	[inch]	7.0 (177.8mm)
Active Area	[mm]	152.40(H) x 91.44(V)
Pixels H x V		800x3(RGB) x 480
Pixel Pitch	[mm]	0.1905x 0.1905
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 typ.
Typical Power Consumption	[Watt]	3.7 typ.
Weight	[Grams]	165 ± 10
Physical Size	[mm]	170.0(W) x 111.0(H) x 7.5(D) (typ.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		262K(6-bit) / 16.2M(8-bit)
Temperature Range Operating Storage (Non-Operating)	 [°C] [°C]	 -30 to +85 (panel surface temperature) -30 to +85
RoHS Compliance		RoHS Compliance

2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25□ (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m2]	I_F= 80mA (center point)	300	400	-	1
Uniformity		5 Points		-	1.3	1.2.3
Contrast Ratio			750	1000	-	4
Response Time	[msec]	Rising	-	20	30	5
	[msec]	Falling	-	10	20	
	[msec]	Rising + Falling	-	30	50	
Viewing Angle	[degree] [degree]	Horizontal (Right) CR 10 (Left)	70 70	80 80	- -	6
	[degree] [degree]	Vertical (Upper) CR 10 (Lower)	70 70	80 80	- -	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.55	0.60	0.65	1
		Red y	0.30	0.35	0.40	
		Green x	0.27	0.32	0.37	
		Green y	0.55	0.60	0.65	
		Blue x	0.10	0.15	0.20	
		Blue y	0.03	0.08	0.13	
		White x	0.26	0.31	0.36	
		White y	0.28	0.33	0.38	
Color Gamut	%		-	60	-	1

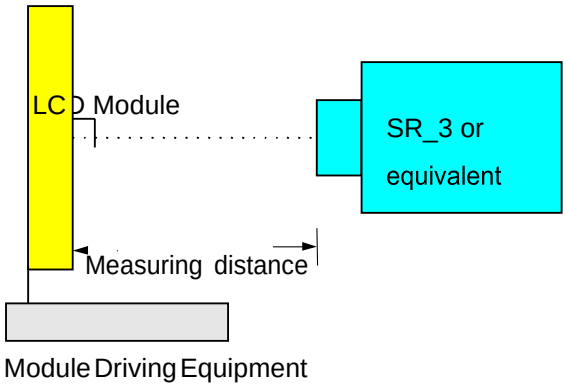
Note 1: Measurement method

Equipment : Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

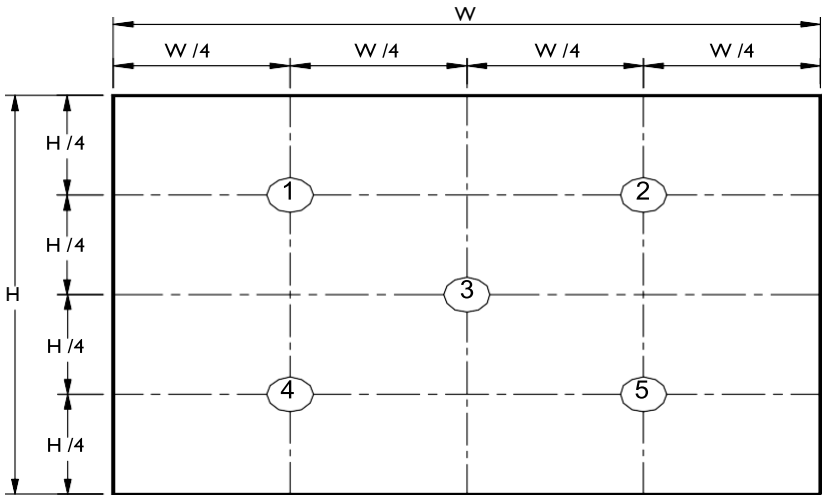
Aperture

Test Point Center

Environment < 1 lux



Note 2: Definition of 5 points position (Display active area: 152.40(H) x 91.44(V))



Note 3:
The luminance uniformity of 5 points is defined by dividing the maximum luminance value by the minimum luminance value at full white condition.

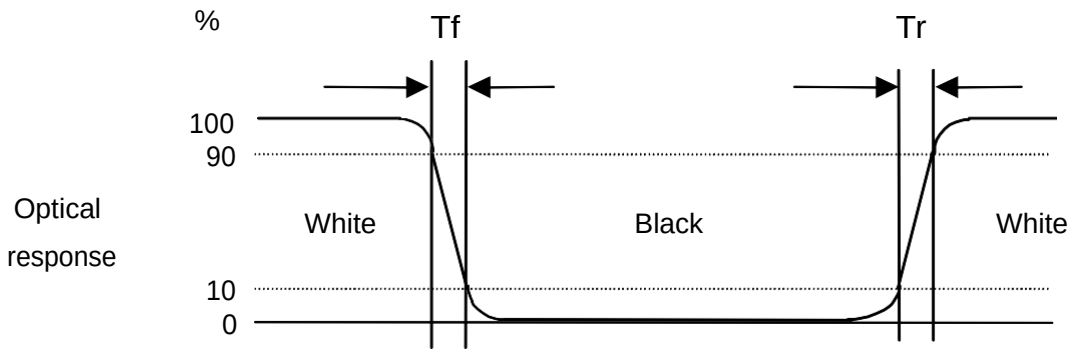
$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

Note 4： Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the “White” state}}{\text{Brightness on the “Black” state}}$$

Note 5: Definition of response time:

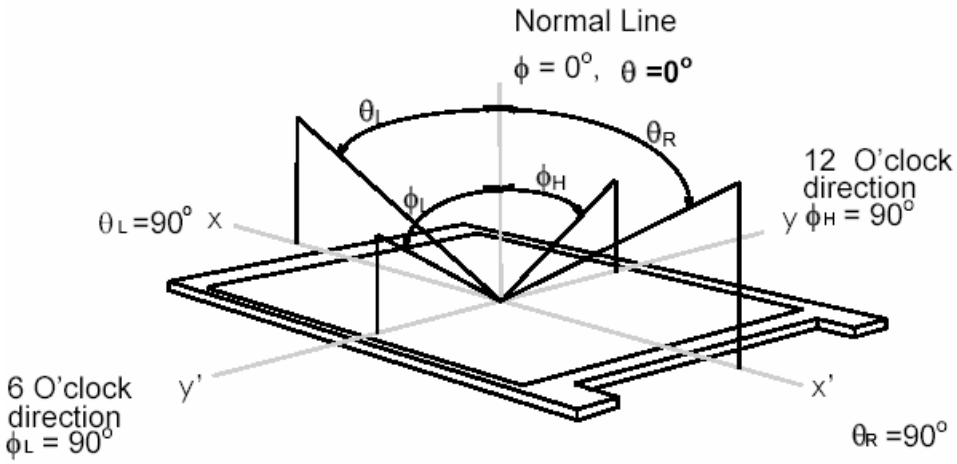
The output signals of photo detector are measured when the input signals are changed from “White” to “Black” (falling time) and from “Black” to “White” (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



Note 6: Definition of viewing angle

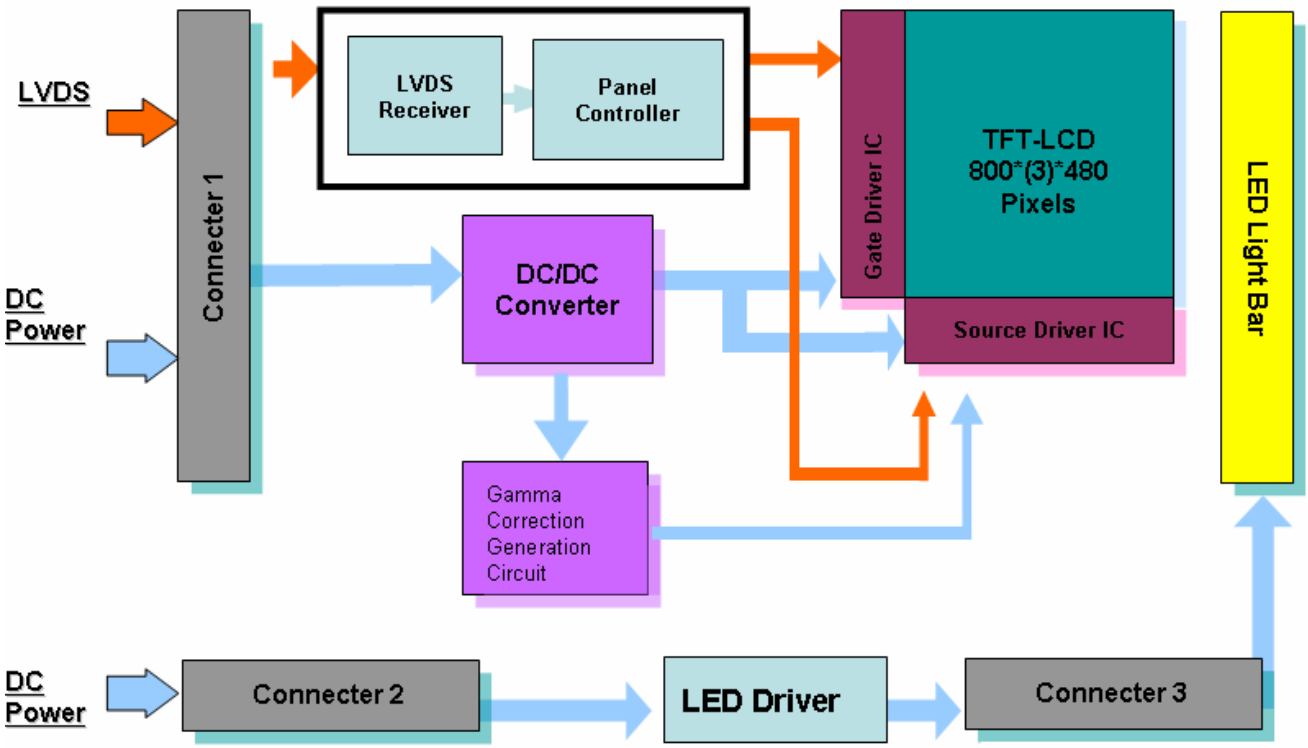
0°

vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as below: 90° (θ) horizontal left and right, and 90° (Φ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



3. Functional Block Diagram

The following diagram shows the functional block of the 7.0 inch color TFT/LCD module:



4. Absolute Maximum Ratings

4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	-0.3	+3.6	[Volt]	

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage Temperature	TST	-30	+85	[°C]
Storage Humidity	HST	5	90	[%RH]

Note: Maximum Wet-

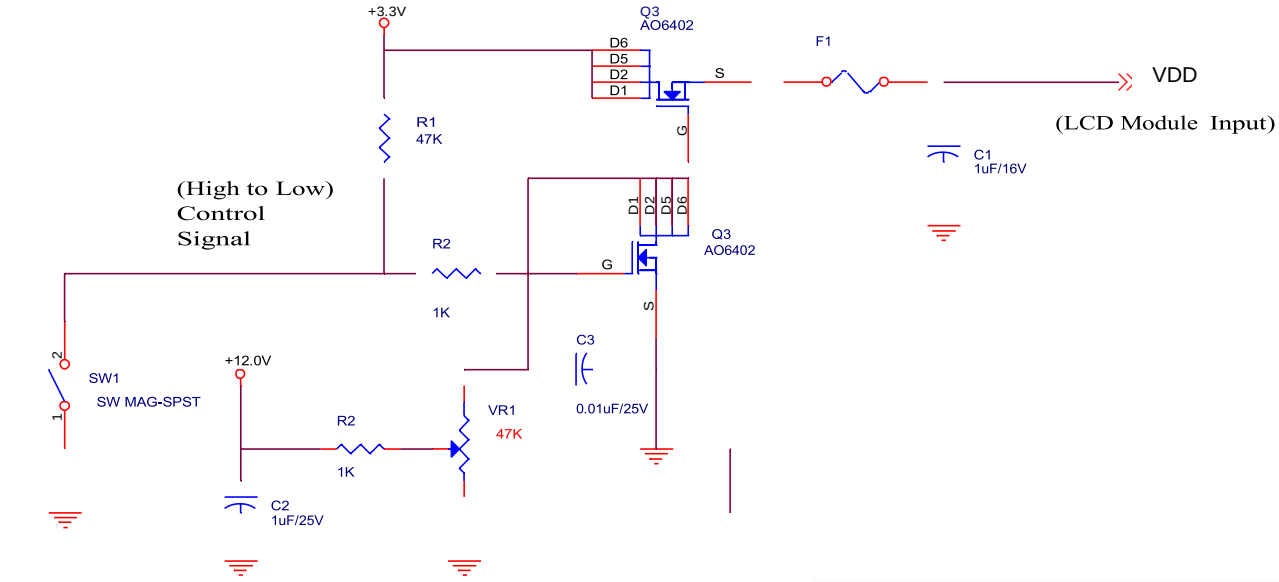
5. Electrical Characteristics

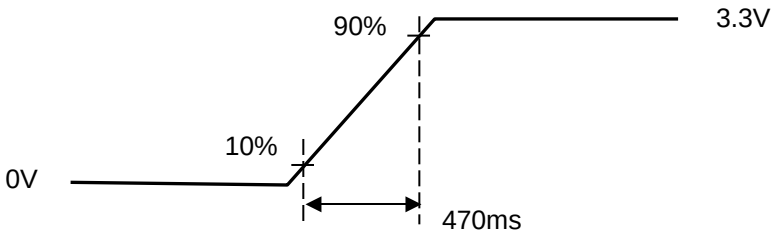
5.1 TFT LCD Module

5.1.1 Power Specification

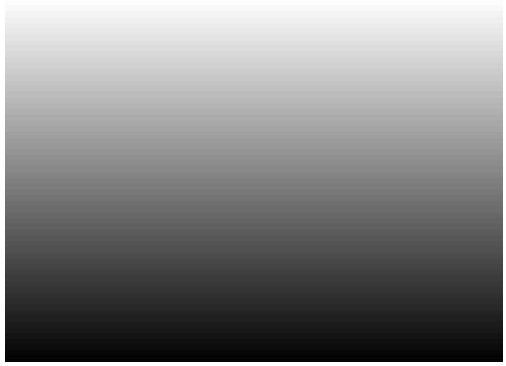
Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
I_{VDD}	VDD Current	-	240	260	[mA]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
P_{VDD}	VDD Power	-	0.8	0.96	[Watt]	64 Gray Bar Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:





VDD rising time



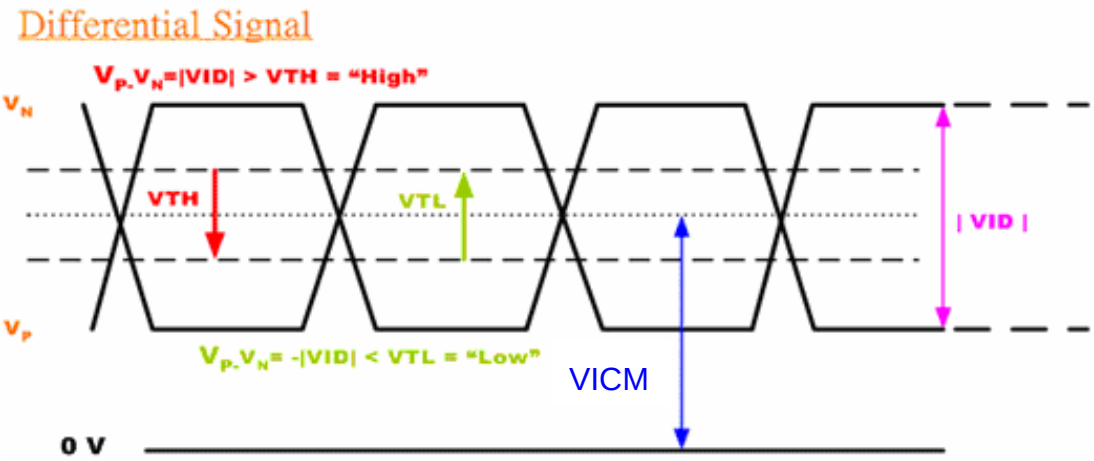
64 Gray pattern

5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	100	[mV]	VICM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VICM=1.2V
| VID |	Input Differential Voltage	100	400	600	[mV]	
VICM	Differential Input Common Mode Voltage	1.1		1.6	[V]	VTH/VTL=±100mV

Note: LVDS Signal Waveform.



5.2 Backlight Unit

5.2.1 Parameter guideline for LED

Following characteristics are measured under a stable condition using an inverter at 25

Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
VCC	Input Voltage	10.8	12	12.6	[Volt]	
Ivcc	Input Current	-	0.24	-	[A]	100% analog dimming
P_{VCC}	Power Consumption	-	2.88	3.6	[Watt]	100% analog dimming
Irush $_{LED}$	Inrush Current	-	-	3.0	[A]	at rising time=470us
Dimming	Swing Voltage	0.3		5.0	V	Analog Dimming
	Brightness percentage	25		100	%	
I_F	LED Forward Current	-	80	84	mA	Ta = 25°C
V_F	LED Forward Voltage	-	35	-	Volt	I_F = 80mA, Ta = -30°C
		-	32	36.5	Volt	I_F = 80mA, Ta = 25°C
		-	30.5	-		I_F = 80mA, Ta = 85°C
P_{LED}	LED Power Consumption	-	2.56	-	Watt	I_F = 80mA, Ta = 25°C
Operation Lifetime		50,000			Hrs	I_F=80mA, Ta= 25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: VCC, Ivcc, P_{VCC} ,Irush $_{LED}$ are defined for LED B/L.(100% analog dimming)

Note 3: I_F, V_F , P_{LED} are defined for LED Light Bar. There is one LED channel (AN1-CA1) in back light unit.

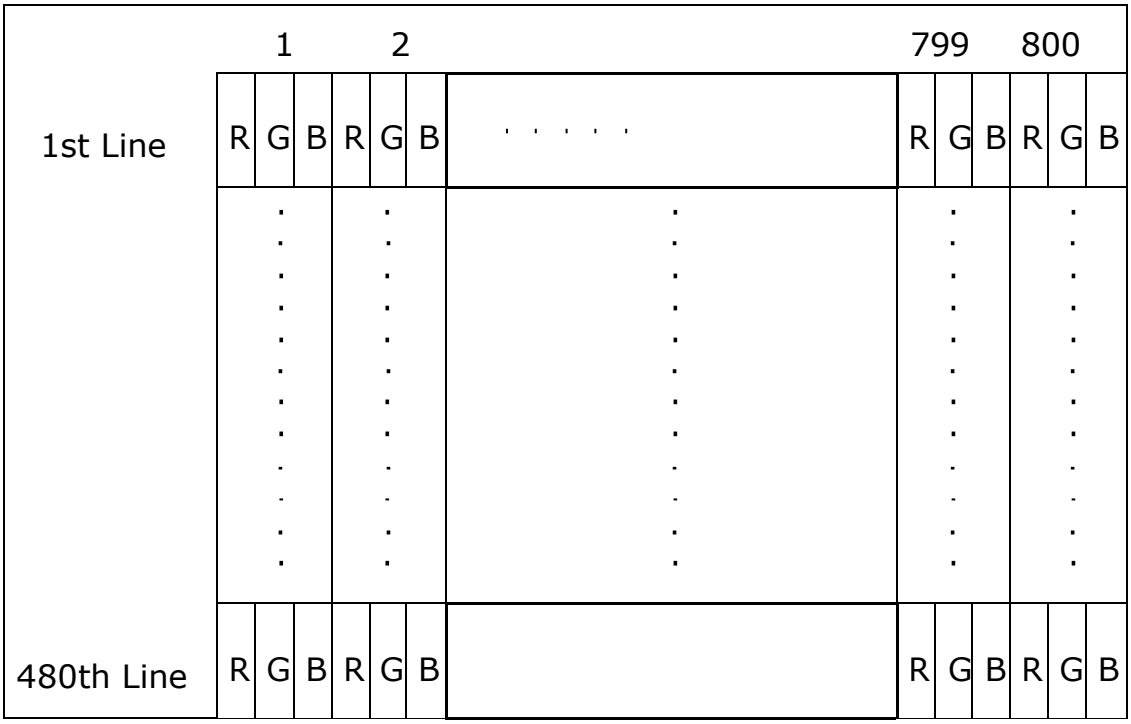
Note 4: If G070VW01 V0 module is driven by high current or at high ambient temperature & humidity condition. The operating life will be reduced.

Note 5: Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



6.2 Signal Description

LVDS is a differential signal technology for LCD interface and high speed data transfer device. The connector pin definition is as below.

Pin No.	Symbol	Description
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	UD	Vertical Reverse Scan Control, When UD=High or NC → Normal Mode. When UD=Low → Vertical Reverse Scan. Note
4	LR	Horizontal Reverse Scan Control, When LR=High or NC → Normal Mode. When LR=Low → Horizontal Reverse Scan. Note
5	RxIN1-	LVDS differential data input Pair 0
6	RxIN1+	
7	GND	Ground
8	RxIN2-	LVDS differential data input Pair 1
9	RxIN2+	
10	GND	Ground
11	RxIN3-	LVDS differential data input Pair 2
12	RxIN3+	
13	GND	Ground
14	RxCLKIN-	LVDS differential Clock input Pair
15	RxCLKIN+	
16	GND	Ground
17	SEL 68	LVDS 6/8 bit select function control, Low or NC → 6 Bit Input Mode. High → 8 Bit Input Mode. Note
18	NC	NC
19	RxIN4-	LVDS differential data input Pair 3. Must be tied to Ground in 6 bit input mode.
20	RxIN4+	

Note : “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for “No Connected.”

6.3 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

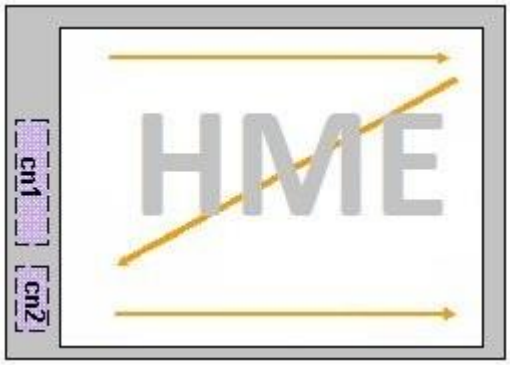


Fig. 1

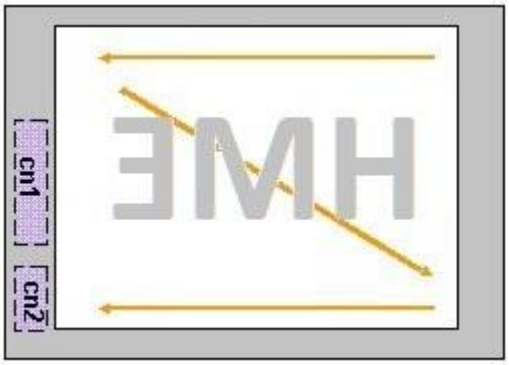


Fig. 2

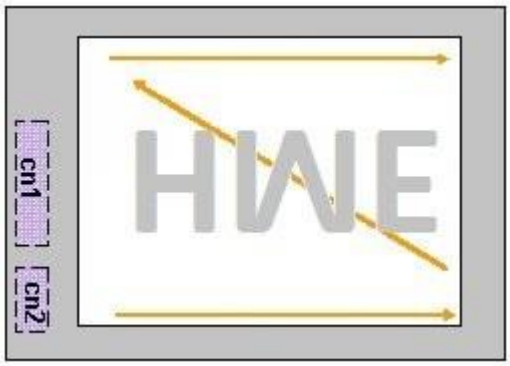


Fig. 3

Fig. 4

Fig. 1 Normal scan (Pin3, UD = High or NC ; Pin4, RL = High or NC)

Fig. 2 Reverse scan (Pin3, UD = High or NC ; Pin4, RL = Low)

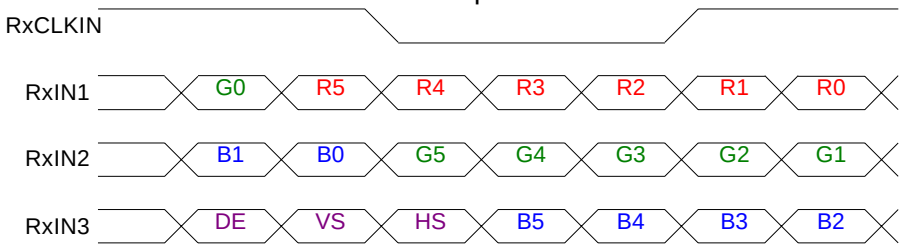
Fig. 3 Reverse scan (Pin3, UD = Low ; Pin4, RL = High or NC)

Fig. 4 Reverse scan (Pin3, UD = Low ; Pin4, RL = Low)

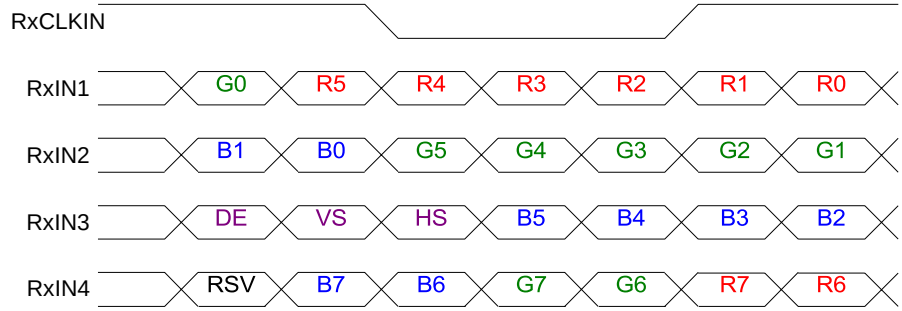
6.4 The Input Data Format

6.4.1 SEL68

SEL68 = ”Low” or “NC” for 6 bits LVDS Input



SEL68 = “High” for 8 bits LVDS Input



Note1: Please follow PSWG.

Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	Remark
R7 R6 R5 R4 R3 R2 R1 R0	Red Data 7 (MSB) Red Data 6 Red Data 5 Red Data 4 Red Data 3 Red Data 2 Red Data 1 Red Data 0 (LSB)	Red-pixel Data Each red pixel’s brightness data consists of these 8 bits pixel data.
G7 G6 G5 G4 G3 G2 G1 G0	Green Data 7 (MSB) GreenData 6 GreenData 5 GreenData 4 GreenData 3 GreenData 2 GreenData 1 GreenData 0 (LSB)	Green-pixel Data Each green pixel’s brightness data consists of these 8 bits pixel data.
B7 B6 B5 B4 B3 B2 B1 B0	Blue Data 7 (MSB) Blue Data 6 Blue Data 5 Blue Data 4 Blue Data 3 Blue Data 2 Blue Data 1 Blue Data 0 (LSB)	Blue-pixel Data Each blue pixel’s brightness data consists of these 8 bits pixel data.
RxCLKIN+ RxCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.5 Interface Timing

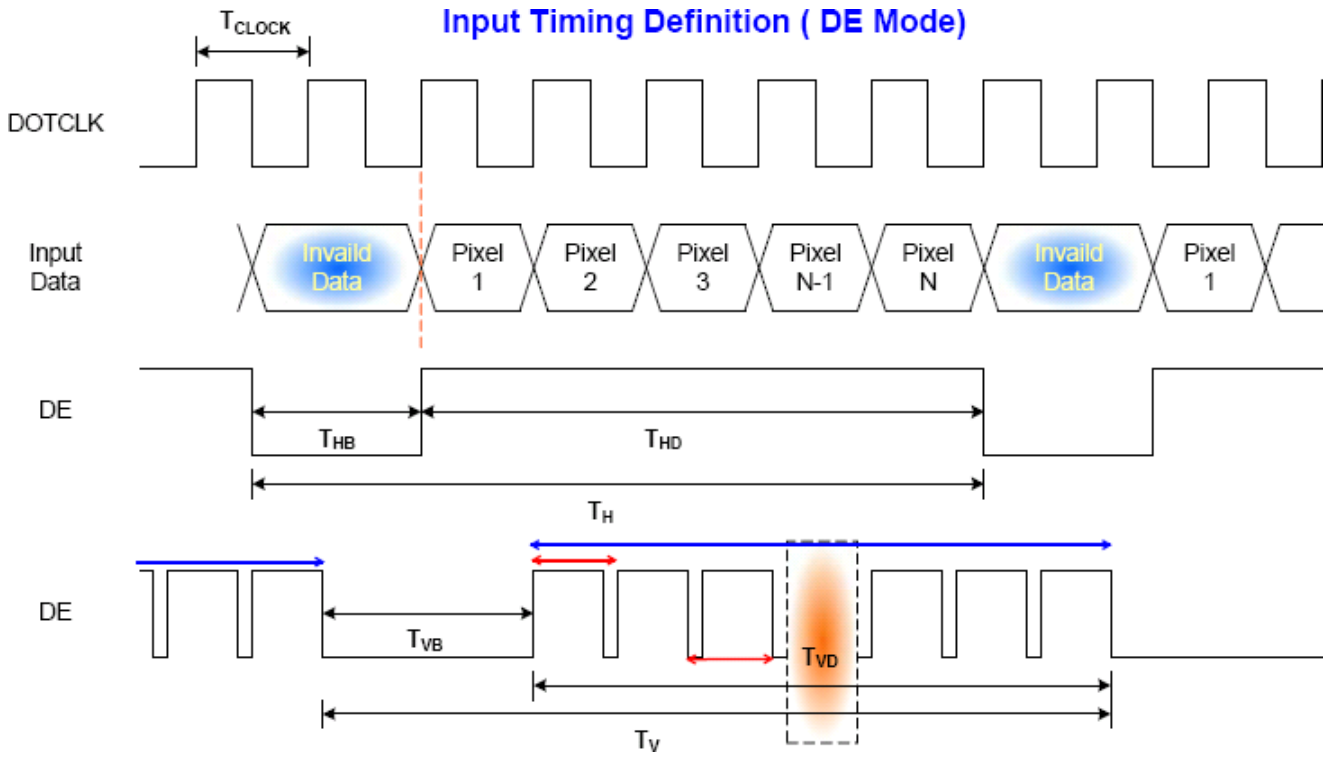
6.5.1 Timing Characteristics

DE mode only

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Clock frequency		1/ T_{Clock}	27	33.3	39.4	MHz	
Vertical Section	Period	T_V	490	508	530	T_H	
	Active	T_{VD}	480	480	480		
	Blanking	T_{VB}	8	28	50		
Horizontal Section	Period	T_H	920	1056	1240	T_{Clock}	
	Active	T_{HD}	800	800	800		
	Blanking	T_{HB}	120	256	440		

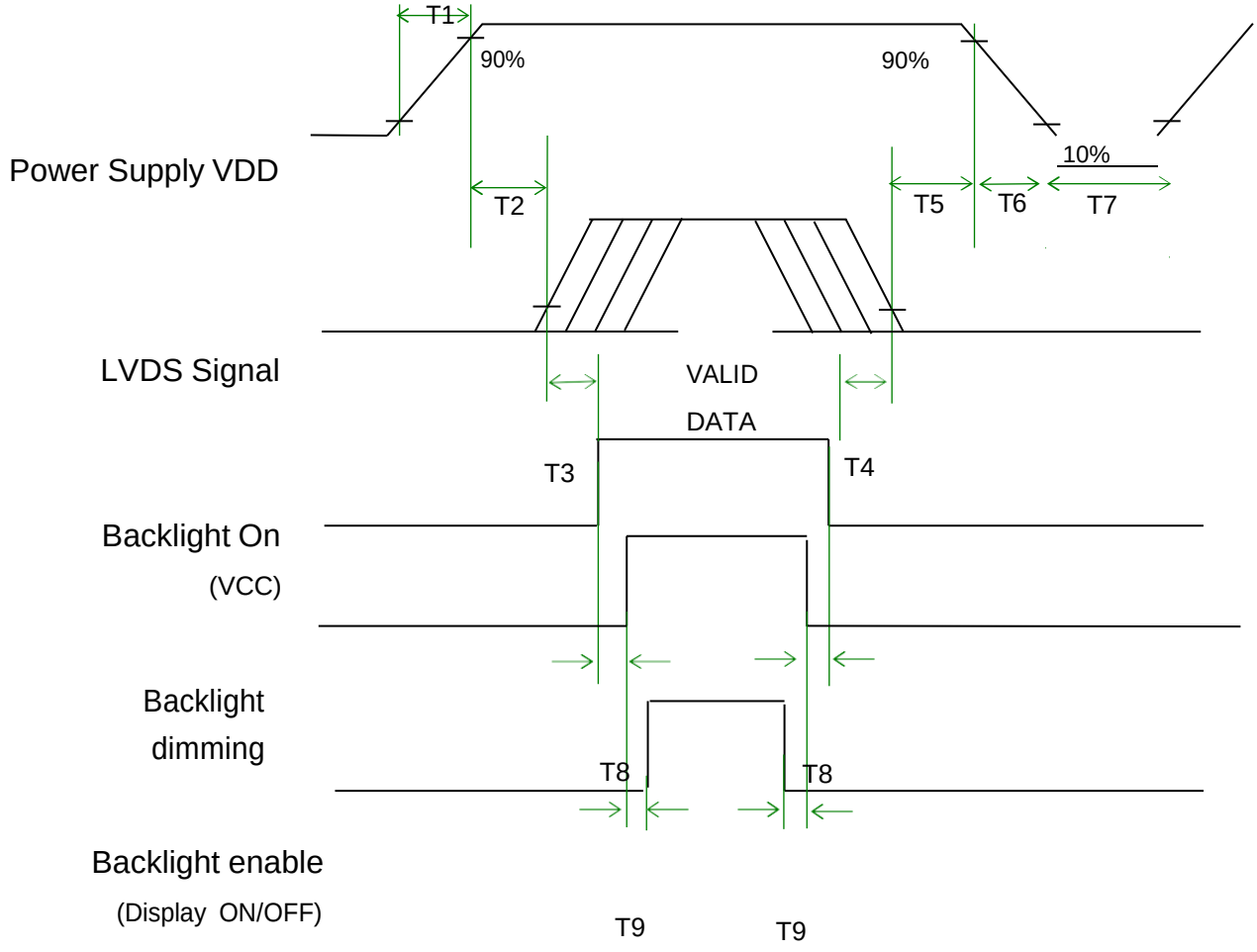
Note: Frame rate is 60 Hz.
Note: DE mode.

6.5.2 Input Timing Diagram



6.6 Power ON/OFF Sequence

VDD power and backlight on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.



Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	40	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	16	50	ms
T6	0	-	10	ms
T7	1000	-	-	ms
T8	10	-	-	ms
T9	10	-	-	ms

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7. Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Signal (CN1): LVDS Connector

Connector Name / Designation	Signal Connector
Manufacturer	STM, Hirose or compatible
Connector Model Number	STM -MSB24013P20HA, Hirose- DF19LA-20P-1H or compatible
Mating Model Number	STM-P24013P20, Hirose-DF19-20S-1C or compatible

Pin No.	Signal Name	Pin No.	Signal Name
1	VDD	2	VDD
3	UD	4	LR
5	RxIN1-	6	RxIN1+
7	GND	8	RxIN2-
9	RxIN2+	10	GND
11	RxIN3-	12	RxIN3+
13	GND	14	RxCKIN-
15	RxCKIN+	16	GND
17	SEL 68	18	NC
19	RxIN4-	20	RxIN4+

7.2 LED Backlight Unit (CN2): LED Driver Connector

Connector Name / Designation	LED Driver Connector
Manufacturer	Entery
Connector Model Number	3808K-F04N-02R or compatible
Mating Model Number	H208K-P04N-02B or compatible

Pin #	Symbol	Pin Description
1	GND	GND
2	Display_ON/OFF	+3.3V:ON, 0V:OFF
3	Dimming	Analog Dimming
4	VCC12V	12V Power Input

7.3 LED Light Bar Input Connector (CN4):

Manufacturer	Entery or compatible
Connector Model Number	H208K-P02N-02B or compatible
Mating Connecter Model Number	3808K-F02N-02R or compatible

Pin #	Symbol	Pin Description
1	AN1	LED anode
2	CA1	LED cathode

Pin #	Symbol	Cable color
1	AN1	Red
2	CA1	Black

8. Reliability Test Criteria

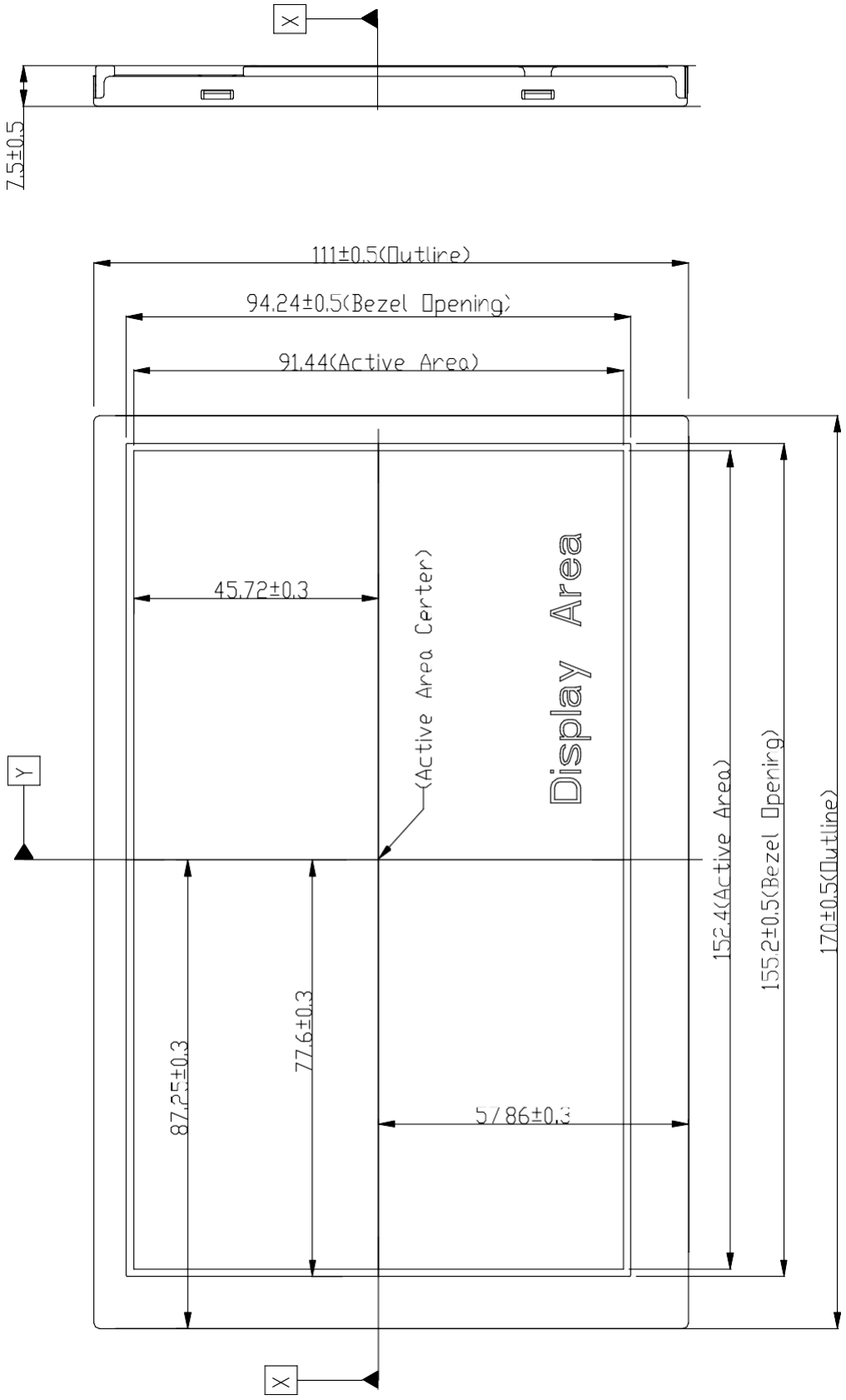
Items	Required Condition	Note
Temperature Humidity Bias	4 90%,300 hours	
High Temperature Operation	85 ,300 hours	
Low Temperature Operation	-30 ,300 hours	
Hot Storage	85	
Cold Storage	-3	
Thermal Shock Test	- 100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,(±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point	Note 1

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

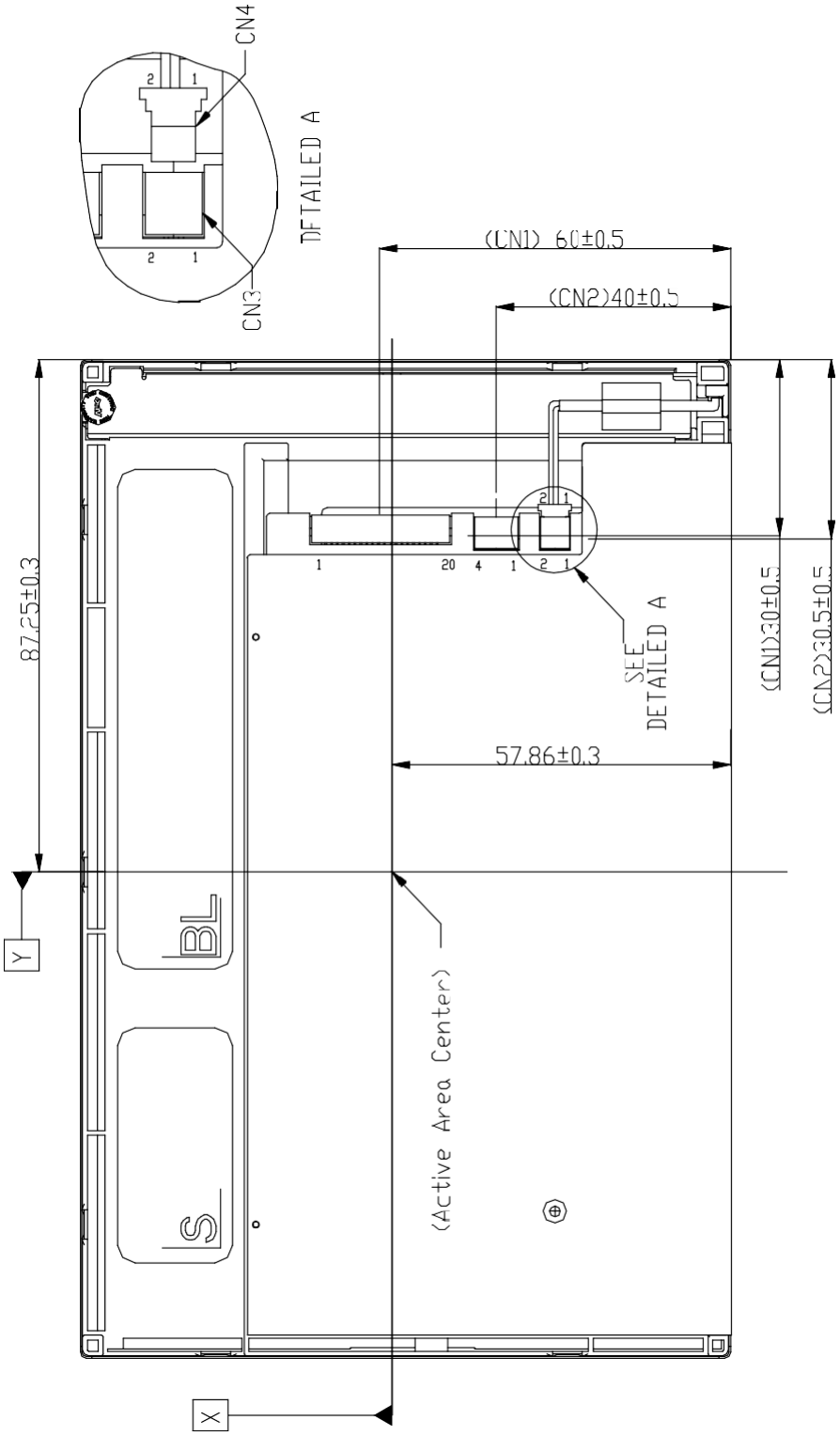
. Self-recoverable. No hardware failures.

9. Mechanical Characteristics

9.1 LCM Front View



9.2 LCM Rear View



NOTE:
1.CN1: I/F CONNCTOR IS MSB24013P20HA (STM) OR AU APPROVED EQUIVALENT
CN2: LED BLU CONNECTOR IS 3808K-F04N-02R (ENTERY) OR AU APPROVED EQUIVALENT
CN3: LED LIGHT BAR OUTPUT CONNECTOR IS 3808K-F02N-02R (ENTERY) OR AU APPROVED EQUIVALENT
CN4: LED LIGHT BAR INPUT CONNECTOR IS H208-P02N-02B (ENTERY) OR AU APPROVED EQUIVALENT

10. Safety

10.1 Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

10.2 Materials

10.1.1 Toxity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible toxicologist.

10.1.2 Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The pRxINted circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be pRxINted on the pRxINted circuit board.

10.3 Capacitors

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

10.4 National Test Lab Requirement

The display module will satisfy all requirements for compliance