HM170SX101I

17" Color TFT-LCD

FUNCTIONAL DRAFT SPECIFICATION

(This document is meant for customers' approval)

Release Date
14th Jun 2021

HIGHNESS MICROELECTRONICS PVT. LTD

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1. GENERAL DESCRIPTION

1.1 OVERVIEW

HM170SX101I is a 17" TFT Liquid Crystal Display module with WLED Backlight unit and 30 pins 2ch-LVDS interface. This module supports 1280 x 1024 SXGA mode and can display up to 16.7M colors.

1.2 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Screen Size	17" real diagonal	-	-
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1280 x R.G.B. x 1024	pixel	-
Pixel Pitch	0.264 (H) x 0.264 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Display Colors	16.7M	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	AG type, 3H hard coating, Haze 25	-	-
Luminance, White	400nits (Typ.)	Cd/m2	
Color Gamut	90% of NTSC(Typ.)	-	-
ROHS,Halogen Free &TCO 5.2	ROHS, Halogen Free, TCO 5.2 compliance		
Power Consumption	TBD		(1)

Note (1) The specified power consumption : Total= cell (reference 4.3.1)+BL (reference 4.3.3)

2. MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	358.0	358.5	359.0	mm	(1)
	Vertical (V)	296.0	296.5	297.0	mm	
	Thickness (T)	-	10.5	11.0	mm	
Bezel Area	Horizontal	341.7	341.9	342.1	mm	
	Vertical	274.2	274.4	274.6	mm	
Active Area	Horizontal	-	337.92	-	mm	
	Vertical	-	270.36	-	mm	
Weight		(1260)	(1400)	(1470)	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

3. ABSOLUTE MAXIMUM RATINGS

3.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-40	85	ºC	(1)
Operating Ambient Temperature	TOP	-30	80	ºC	(1), (2)

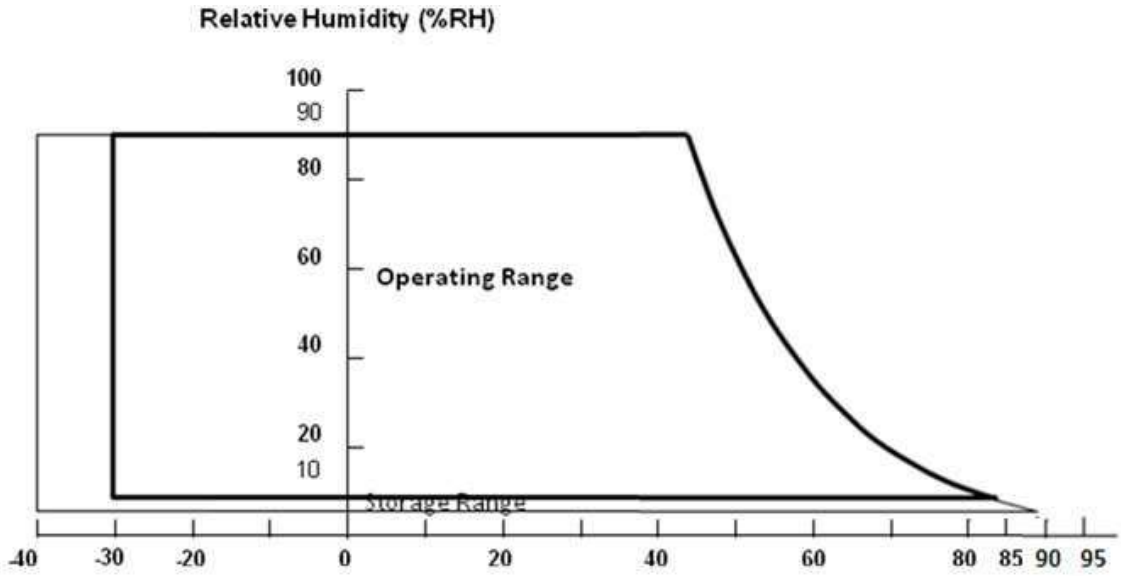
Note (1)

(a) 90 %RH Max. (Ta <= 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

(c) No condensation.

Note (2) Panel surface temperature should be -40℃ min. and 85℃ max under Vcc=5.0V, fr =60Hz, typical LED string current, 25℃ ambient temperature, and no humidity control . Any condition of ambient operating temperature ,the surface of active area should be keeping not higher than 85℃.



3.2 ELECTRICAL ABSOLUTE RATINGS

3.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCCS	-0.3	6.0	V	(1)
Logic Input Voltage	V_{IN}	-0.3	3.6	V	

3.2.2 BACKLIGHT UNIT

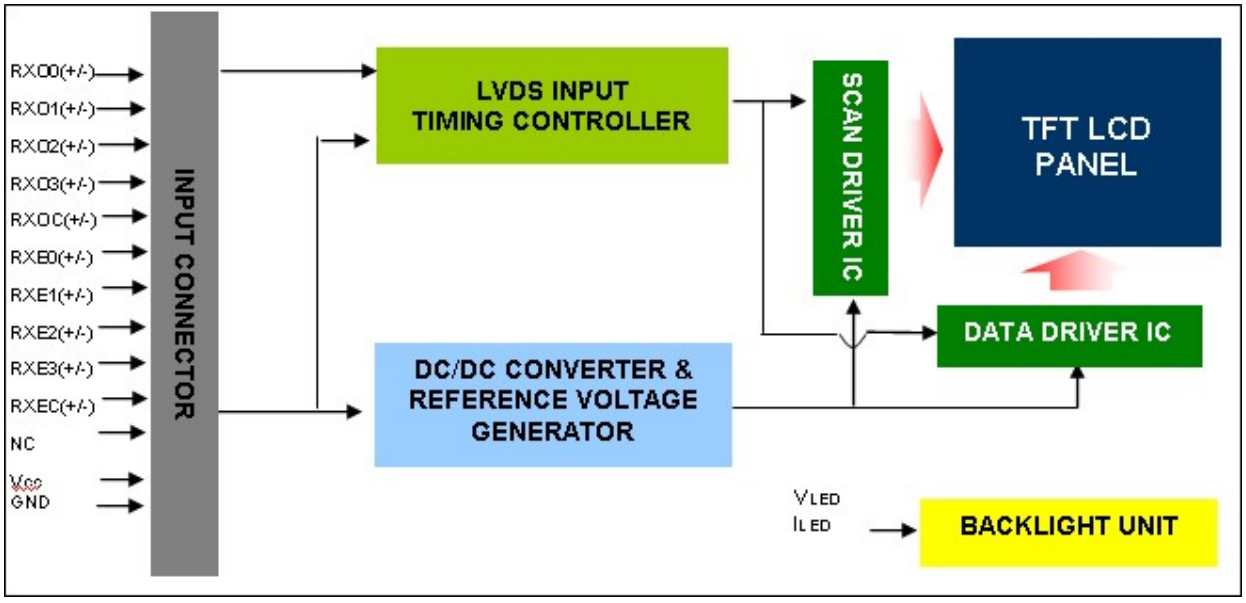
Item	Symbol	Value			Unit	Note
		Min.	Typ	Max.		
LED Forward Current Per Input Pin	I_F	0	40	44	mA	(1), (2) Duty=100%
LED Pulse Forward Current Per Input Pin	I_P	---	---	150	mA	(1), (2) Pulse Width≦10msec. and Duty≦30%

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 ℃ (Refer to 4.3.3 and 4.3.4 for further information).

4. ELECTRICAL SPECIFICATIONS

4.1 FUNCTION BLOCK DIAGRAM



4.2. INTERFACE CONNECTIONS

PIN ASSIGNMENT

Pin	Name	Description
1	RXO0-	Negative LVDS differential data input. Channel O0 (odd)
2	RXO0+	Positive LVDS differential data input. Channel O0 (odd)
3	RXO1-	Negative LVDS differential data input. Channel O1 (odd)
4	RXO1+	Positive LVDS differential data input. Channel O1 (odd)
5	RXO2-	Negative LVDS differential data input. Channel O2 (odd)
6	RXO2+	Positive LVDS differential data input. Channel O2 (odd)
7	GND	GND
8	RXOC-	Negative LVDS differential clock input. (odd)
9	RXOC+	Positive LVDS differential clock input. (odd)
10	RXO3-	Negative LVDS differential data input. Channel O3(odd)
11	RXO3+	Positive LVDS differential data input. Channel O3 (odd)
12	RXE0-	Negative LVDS differential data input. Channel E0 (even)
13	RXE0+	Positive LVDS differential data input. Channel E0 (even)
14	GND	GND
15	RXE1-	Negative LVDS differential data input. Channel E1 (even)
16	RXE1+	Positive LVDS differential data input. Channel E1 (even)
17	GND	GND
18	RXE2-	Negative LVDS differential data input. Channel E2 (even)
19	RXE2+	Positive LVDS differential data input. Channel E2 (even)
20	RXEC-	Negative LVDS differential clock input. (even)
21	RXEC+	Positive LVDS differential clock input. (even)
22	RXE3-	Negative LVDS differential data input. Channel E3(even)
23	RXE3+	Positive LVDS differential data input. Channel E3 (even)
24	GND	GND
25	NC	For LCD internal use only, Do not connect
26	NC	For LCD internal use only, Do not connect
27	NC	For LCD internal use only, Do not connect
28	Vcc	+5.0V power supply
29	Vcc	+5.0V power supply
30	Vcc	+5.0V power supply

Note (1)Connector Part No.: Foxconn:GS23301-0321R-7H or P-TWO:187098-30091 or FCN:WF13-422-3033

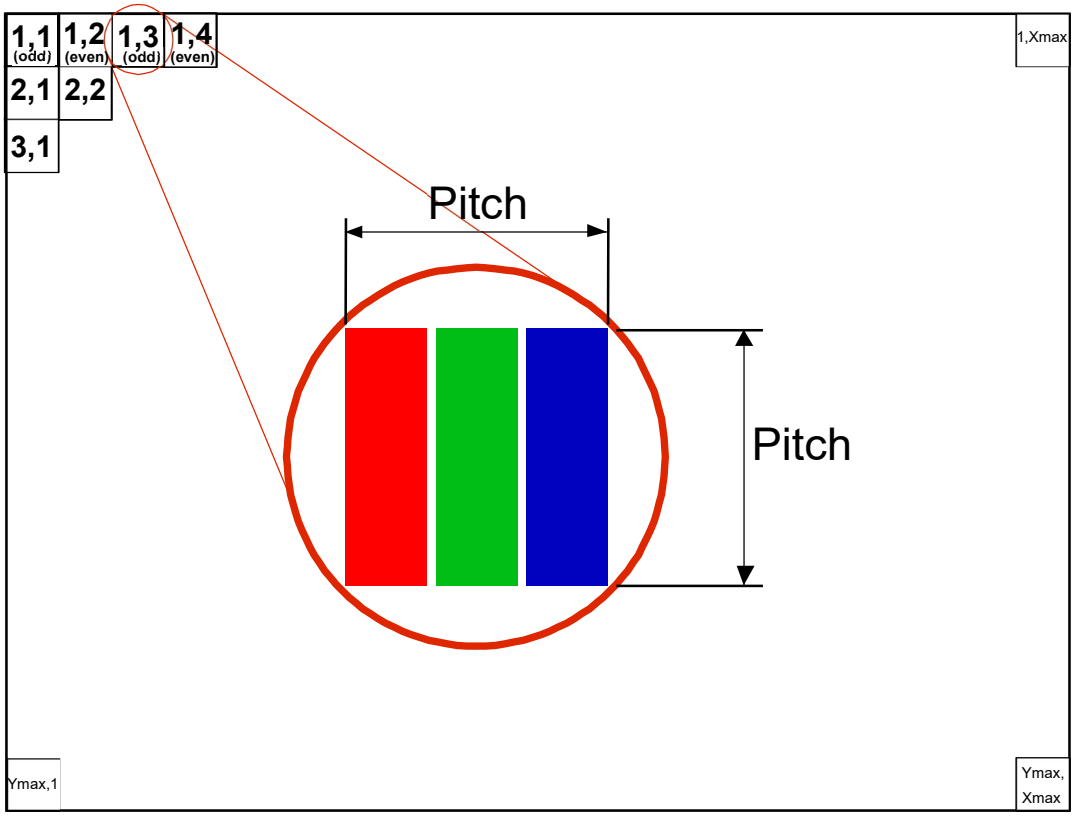
Note (2) User's connector Part No:

Mating Wire Cable Connector Part No.: FI-X30H(JAE) or FI-X30HL(JAE)

Mating FFC Cable Connector Part No.: 217007-013001 (P-TWO) or JF05X030-1 (JAE).

Note (3) The first pixel is odd.

Note (4) Input signal of even and odd clock should be the same timing.

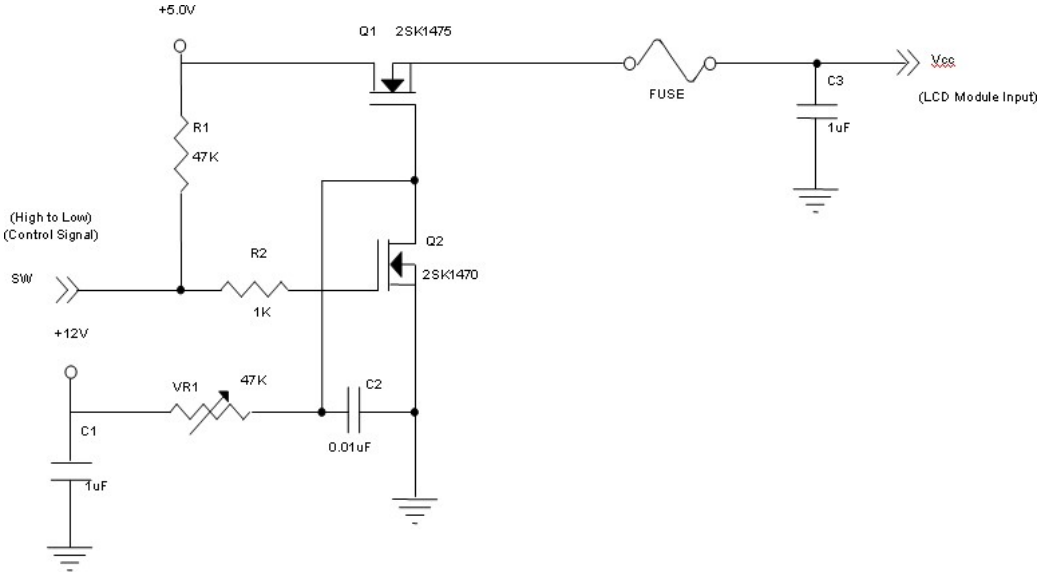


4.3 ELECTRICAL CHARACTERISTICS

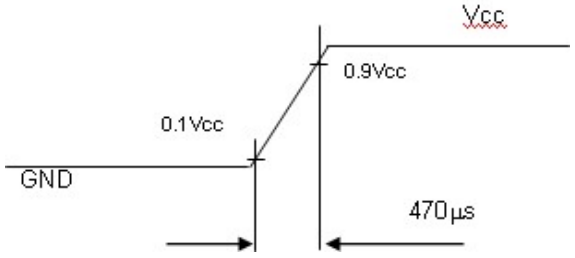
4.3.1 LCD ELETRONICS SPECIFICATION

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		Vcc	4.5	5	5.5	V	-
Ripple Voltage		V_{RP}			300	mV	-
Rush Current		I_{RUSH}			2	A	(2)
Power Supply Current	White			(335)	(390)	mA	(3)a
	Black			(490)	(580)	mA	(3)b
	Vertical Stripe			(420)	(490)	mA	(3)c
Power Consumption		PLCD		(2.45)	(2.90)	Watt	(4)
LVDS differential input voltage		Vid	100		600	mV	(5)
LVDS common input voltage		Vic	1.0	1.2	1.4	V	(5)
Logic High Input Voltage		VIH			100	mV	(5)
Logic Low Input Voltage		VIL	-100			mV	(5)

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.
Note (2) Measurement Conditions:21



Vcc rising time is 470µs



Note (3) The specified power supply current is under the conditions at Vcc = 5.0 V, Ta = 25 ± 2 ºC, Fr = 75Hz, whereas a power dissipation check pattern below is displayed.

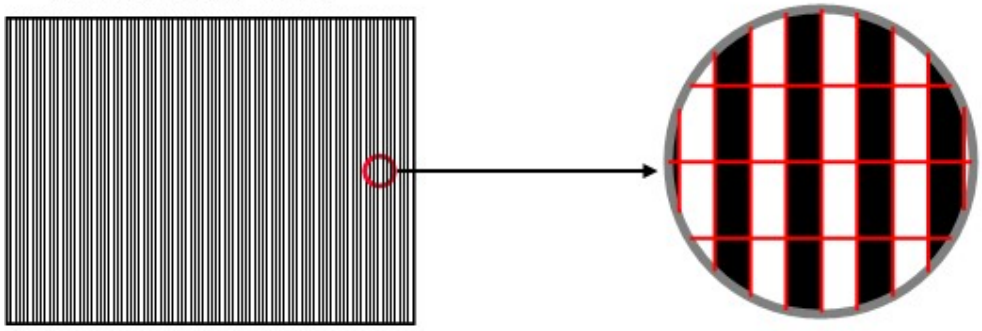
a. White Pattern

Active Area

b. Black Pattern

Active Area

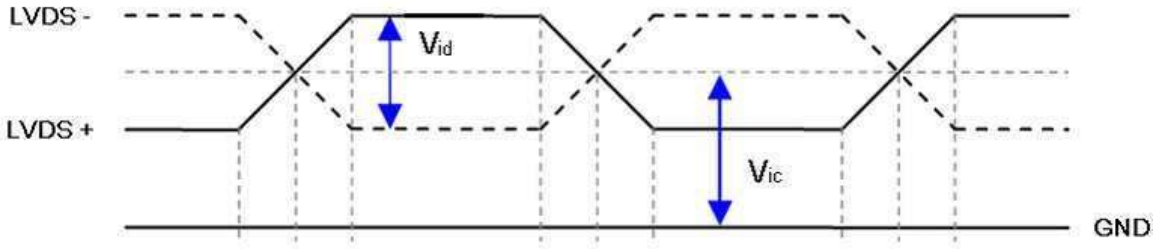
c. Vertical Stripe Pattern



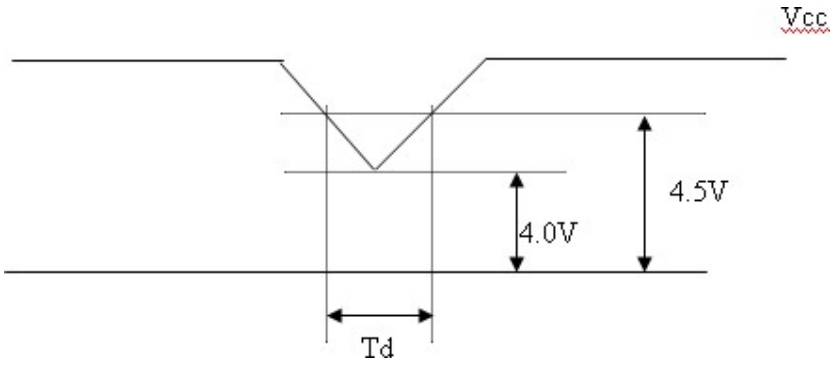
Active Area

Note (4) The power consumption is specified at the pattern with the maximum current.

Note (5) VID waveform condition



4.3.2 Vcc Power Dip Condition



Dip condition:4.0≦Vcc≦4.5, Td≦20ms

4.3.3 BACKLIGHT UNIT

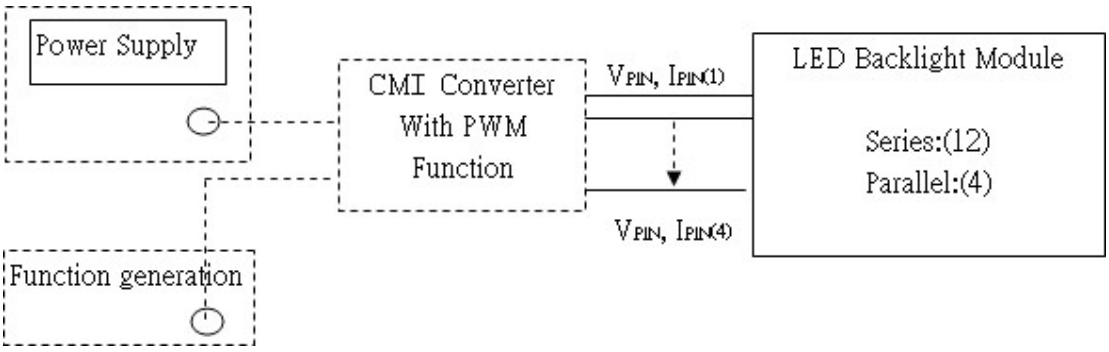
Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Light Bar Input Voltage Per Input Pin	VPIN	(34.2)	(36)	(37.8)	V	(1), Duty=100%,
LED Light Bar Current Per Input Pin	IPIN	(37.6)	(40)	(42.4)	mA	(1), (2) Duty=100%
LED Life Time	LLED	(40000)			Hrs	(3)
LED Light Bar Power Consumption	PBL	---	(5.76)	(6.05)	W	(1) Duty=100%,

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multimeter as shown below:

Note (2) PBL= IPIN× VPIN× (4) PBL.

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 ±2 ℃ and I= (65)mA (per chip) until the brightness becomes ≦ 50% of its original value.

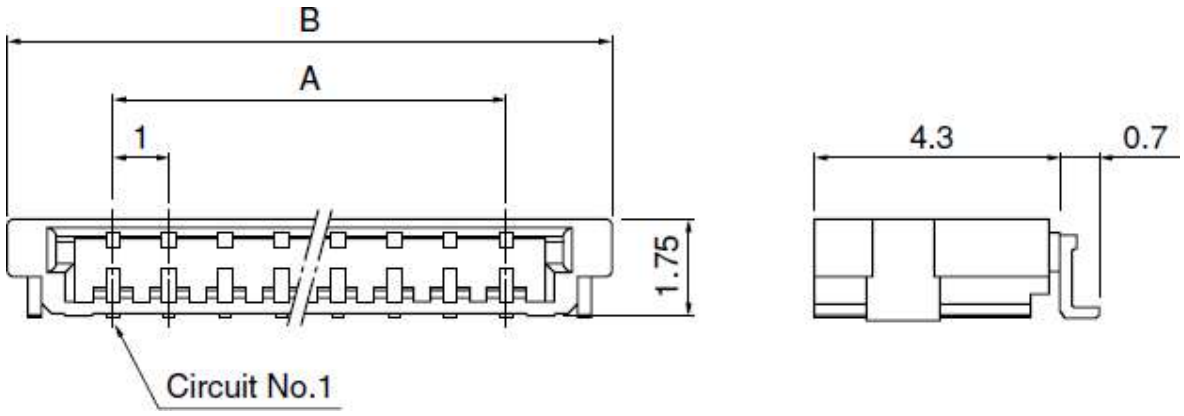
Note (4) The module must be operated with constant driving current.



4.3.4 LIGHTBAR Connector Pin Assignment

（1） Connector (wire type): J.S.T.(SM10B-SHLS-TF)

（2） L/B power input connector drawing. J.S.T.(SM10B-SHLS-TF)



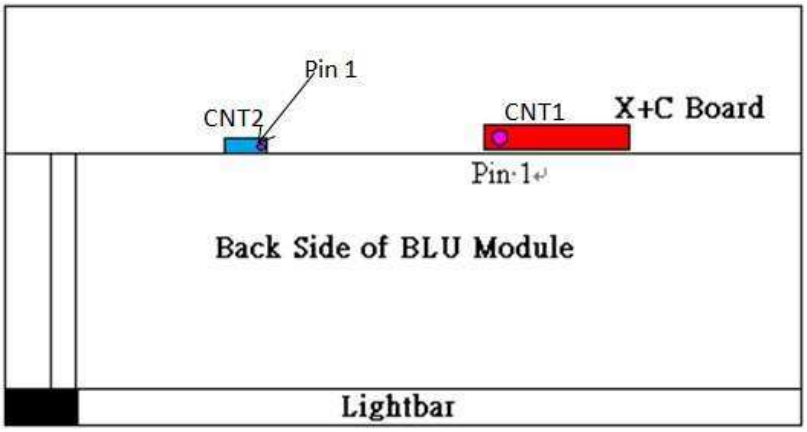
Circuits	Model No.		Insulation O.D. (mm)				Q'ty/ reel
	Normal type	Offset type	Normal type		Offset type		
			A	B	A	B	
2	SM02B-SHLS-TF	—	1.0	4.8	—	—	4,500
5	SM05B-SHLS-TF	—	4.0	7.8	—	—	4,500
6	SM06B-SHLS-TF	—	5.0	8.8	—	—	4,500
7	SM07B-SHLS-TF	—	6.0	9.8	—	—	4,500
8	SM08B-SHLS-TF	SM08B-SHLS-1-TF	7.0	10.8	7.0	12.0	4,500
10	SM10B-SHLS-TF	—	9.0	12.8	—	—	4,500
11	SM11B-SHLS-TF	—	10.0	13.8	—	—	4,500
12	SM12B-SHLS-TF	—	11.0	14.8	—	—	4,500
14	SM14B-SHLS-TF	SM14B-SHLS-1-TF	13.0	16.8	13.0	18.0	4,500
16	SM16B-SHLS-TF	—	15.0	18.8	—	—	4,500
20	SM20B-SHLS-TF	SM20B-SHLS-1-TF	19.0	22.8	19.0	24.0	4,500
22	SM22B-SHLS-TF	—	21.0	24.8	—	—	4,500
26	SM26B-SHLS-TF	—	25.0	28.8	—	—	4,500
30	SM30B-SHLS-TF	—	29.0	32.8	—	—	4,500

Other equivalents please refer to individual drawing

CN2

Pin	Symbol	Description
1	VIN	12V Input Power
2	VIN	12V Input Power
3	VIN	12V Input Power
4	VIN	12V Input Power
5	GND	Ground
6	VLED	Ground
7	VLED	Ground
8	VLED	Ground
9	LED EN	ENABLE 3.3V
10	LED PWM	PWM Dimming HI 3.3V ; LOW 0V

Note (1) User's Mating Connector Part No.:J.S.T(SHLP-10V-S-B)



4.4 LVDS INPUT SIGNAL SPECIFICATIONS

4.4.1 LVDS DATA MAPPING TABLE

LVDS Channel O0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	OG0	OR5	OR4	OR3	OR2	OR1	OR0
LVDS Channel O1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	OB1	OB0	OG5	OG4	OG3	OG2	OG1
LVDS Channel O2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	OB5	OB4	OB3	OB2
LVDS Channel O3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	OB7	OB6	OG7	OG6	OR7	OR6
LVDS Channel E0	LVDS output	D7	D6	D4	D3	D2	D1	D0
	Data order	EG0	ER5	ER4	ER3	ER2	ER1	ER0
LVDS Channel E1	LVDS output	D18	D15	D14	D13	D12	D9	D8
	Data order	EB1	EB0	EG5	EG4	EG3	EG2	EG1
LVDS Channel E2	LVDS output	D26	D25	D24	D22	D21	D20	D19
	Data order	DE	NA	NA	EB5	EB4	EB3	EB2
LVDS Channel E3	LVDS output	D23	D17	D16	D11	D10	D5	D27
	Data order	NA	EB7	EB6	EG7	EG6	ER7	ER6

4.4.2 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	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	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	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	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
Gray Scale Of Red	Red(0) / Dark	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
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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	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
Gray Scale Of Green	Green(0) / Dark	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
Gray Scale Of Blue	Blue(0) / Dark	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

Note (1) 0: Low Level Voltage, 1: High Level Voltage

4.5 DISPLAY TIMING SPECIFICATIONS

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Clock	Frequency	Fc	45	54	69.3	MHz	-
	Period	Tc	14.43	18.52	22.22	ns	
	Input cycle to cycle jitter	T_{rcl}	-0.02*TC	---	0.02*TC	ns	(4)
	Input Clock to data skew	TLVCCS	-0.02*TC	---	0.02*TC	ns	(5)
	Spread spectrum modulation range	Fclkin_mod	0.97*FC	---	1.03*FC	MHz	(6)
	Spread spectrum modulation frequency	F_{SSM}			100	KHz	
Vertical Display Term	Frame Rate	Fr	50	60	75	Hz	
	Total	Tv	1044	1066	1450	Th	Tv=Tvd+Tvb-
	Active Display	Tvd		1024		Th	-
	Blank	Tvb	20	42		Th	-
Horizontal Display Term	Total	Th	790	844	880	Tc	Th=Thd+Thb
	Active Display	Thd		640		Tc	-
	Blank	Thb	150	204		Tc	-

Note: (1) Because this module is operated by DE only mode, Hsync and Vsync input signals are ignored.

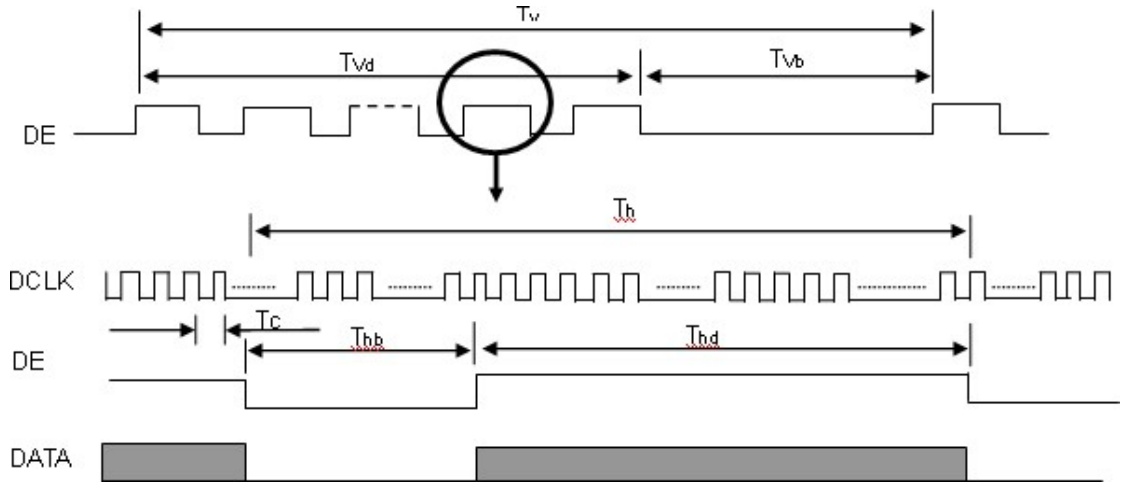
(2) Please make sure the range of pixel clock has follow below equation:

Fc(max)≧FrxTvxTh

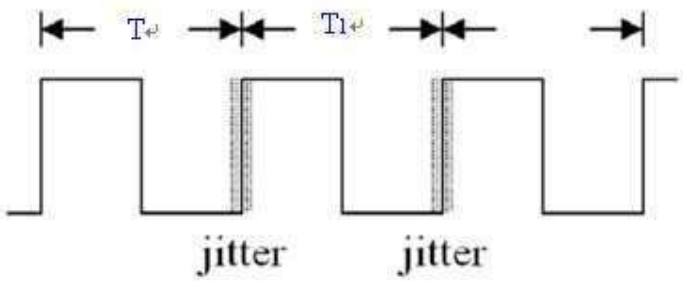
FrxTvxTh≧Fc(min)

(3) The Tv(Tvd+Tvb) must be integer, otherwise, this module would operate abnormally

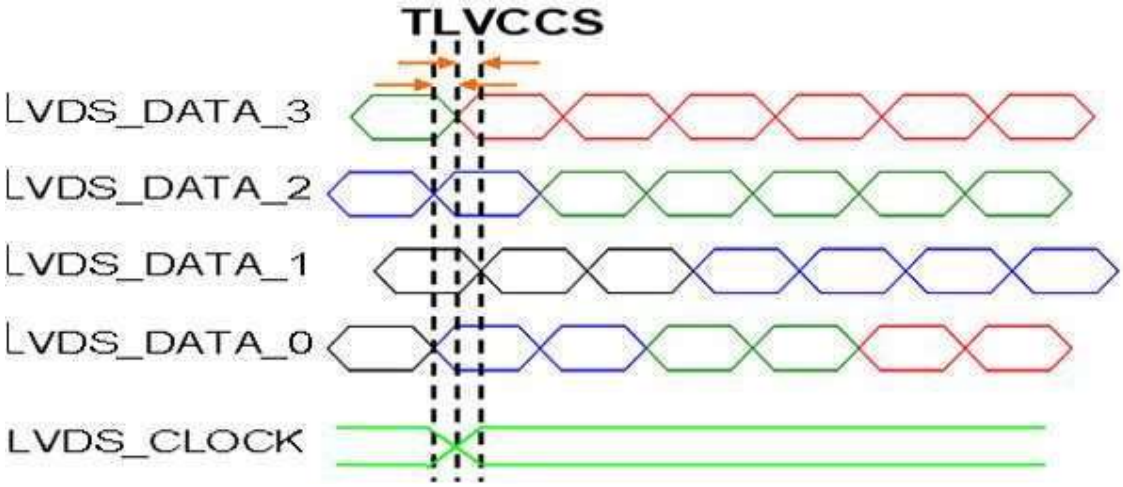
INPUT SIGNAL TIMING DIAGRAM



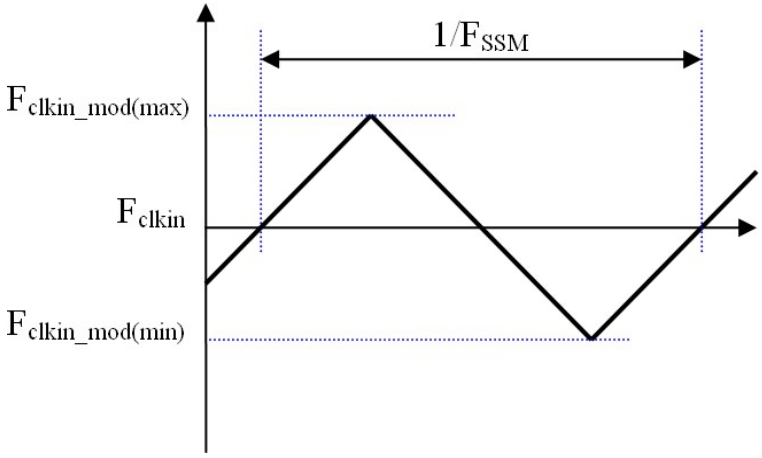
Note (4) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI



Note (5) Input Clock to data skew is defined as below figures.

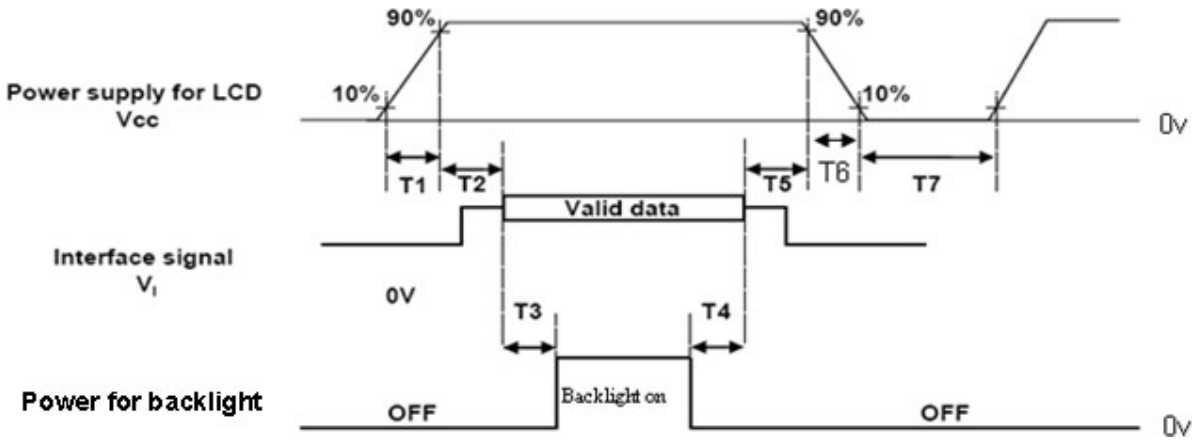


Note (6) The SSCG (Spread spectrum clock generator) is defined as below figures.



4.6 POWER ON/OFF SEQUENCE

The power sequence specifications are shown as the following table and diagram.



Timing Specifications:

Parameters	Values			Units
	Min	Typ.	Max	
T1	0.5	-	10	ms
T2	0	30	50	ms
T3	200	250	-	ms
T4	100	250	-	ms
T5	-	20	50	ms
T6	0.1	-	100	ms
T7	1000	-	-	ms

Note (1) The supply voltage of the external system for the module input should be the same as the definition of Vcc.

Note (2) When the backlight turns on before the LCD operation of the LCD turns off, the display may momentarily become abnormal screen.

Note (3) In case of VCC = off level, please keep the level of input signals on the low or keep a high impedance.

Note (4) T7 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Note (6) CMI won't take any responsibility for the products which are damaged by the customers not following the Power Sequence.

Note (7) There might be slight electronic noise when LCD is turned off (even backlight unit is also off). To avoid this symptom, we suggest "Vcc falling timing" to follow "t6 spec".

5. OPTICAL CHARACTERISTICS

5.1 TEST CONDITIONS

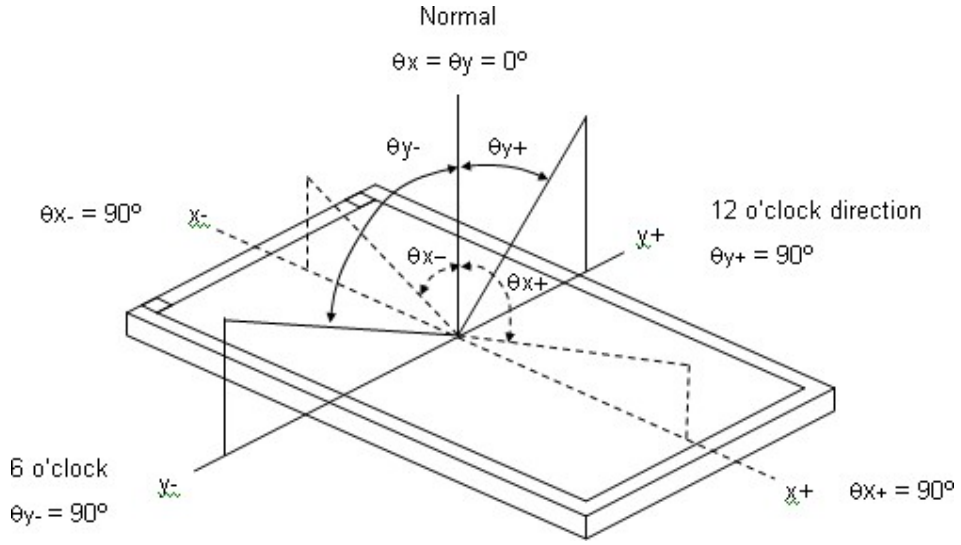
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	According to typical value in "ELECTRICAL CHARACTERISTICS"		
Input Signal			
LED Light Bar Input Current Per Input Pin			

5.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 5.2. The following items should be measured under the test conditions described in 5.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity (CIE 1931)	Red	Rx	θ_x=0°, θ_Y =0° CS-2000 R=G=B=255 Gray scale	Typ - 0.03	0.635	Typ + 0.03		(1), (5)
		Ry			0.340			
	Green	Gx			0.312			
		Gy			0.626			
	Blue	Bx			0.158			
		By			0.058			
	White	Wx			0.313			
		Wy			0.329			
Center Luminance of White (Center of Screen)		L_C		(350)	(400)	-	cd/m^2	(4), (5)
Contrast Ratio		CR		700	1000	-	-	(2), (5)
Response Time		T_R	θ_x=0°, θ_Y =0°	-	1	4	ms	(3)
		T_F		-	4	6		
White Variation		W	θ_x =0°, θ_Y =0°	75	80		%	(5), (6)
Viewing Angle	Horizontal	θx- + θx+	CR ≧ 10	150	170	-	Deg.	(1), (5)
	Vertical	θy- + θy+		140	160	-		
Viewing Angle	Horizontal	θx- + θx+	CR ≧ 5	160	178	---	Deg.	(1), (5)
	Vertical	θy- + θy+		150	170	---		

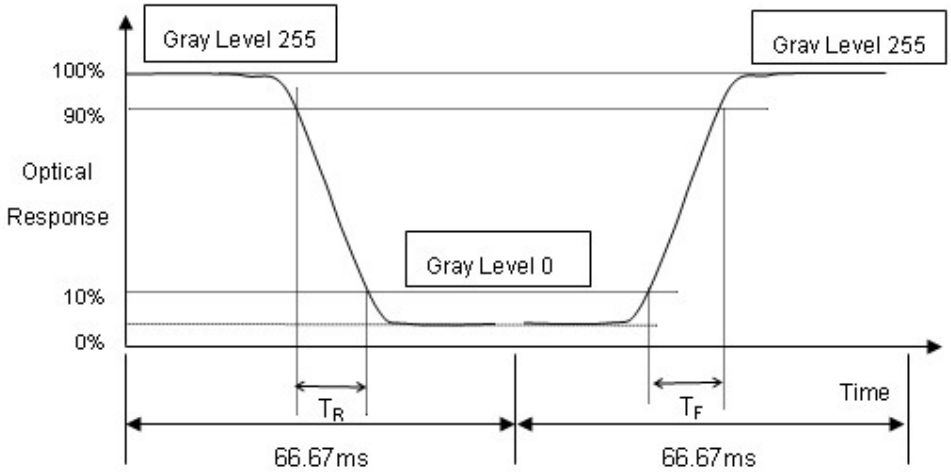
Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.
Contrast Ratio (CR) = L255 / L0
L255: Luminance of gray level 255
L 0: Luminance of gray level 0
CR = CR (5)
CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_C):

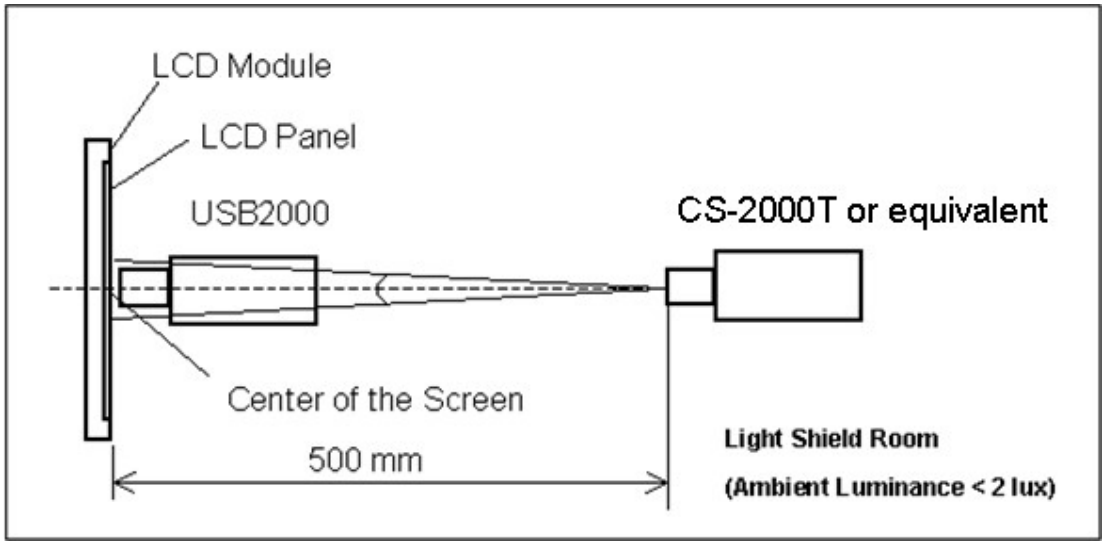
Measure the luminance of gray level 255 at center point

L_C = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5) Measurement Setup:

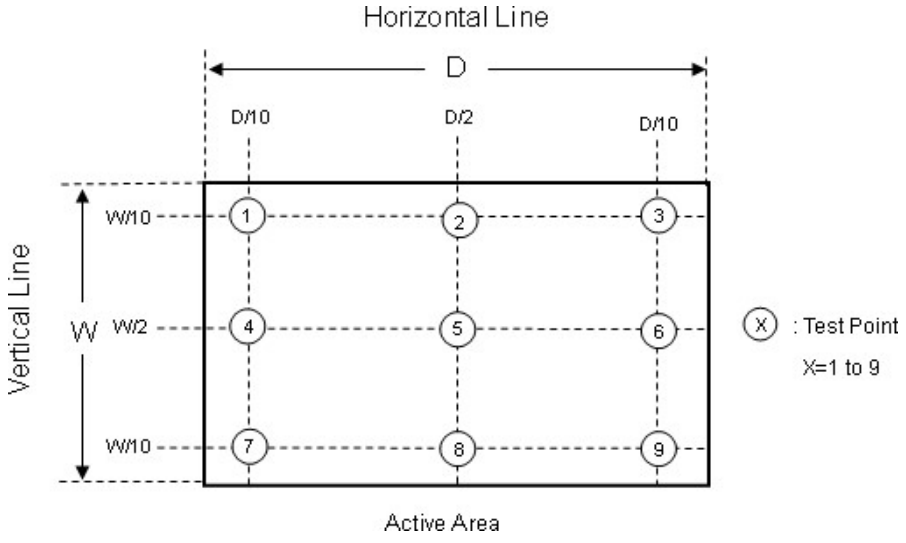
The LCD module should be stabilized at given temperature for 40 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement shouldbe executed after lighting Backlight for 40 minutes in a windless room.



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 9 points

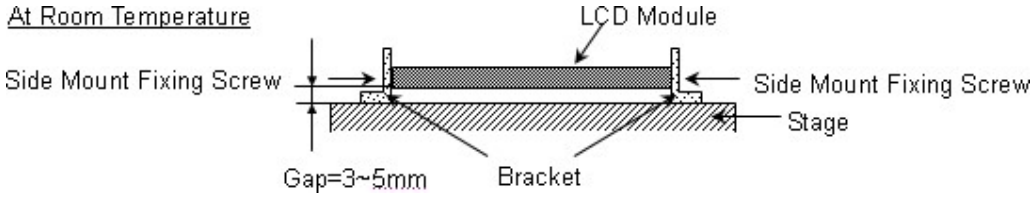
δW = (Minimum [L (1) ~ L (9)] / Maximum [L (1) ~ L (9)]) *100%



6. RELIABILITY TEST ITEM

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃ , 80%RH, 240hours	(1) (2)
High Temperature Operation (HTO)	Ta= 50℃ , 240hours	(1) (2)
Low Temperature Operation (LTO)	Ta= 0℃ , 240hours	(1) (2)
High Temperature Storage (HTS)	Ta= 60℃ , 240hours	(1) (2)
Low Temperature Storage (LTS)	Ta= -20℃ , 240hours	(1) (2)
Vibration Test (Non-operation)	Acceleration: 1.5 G Wave: Half-sine Frequency: 10 - 300 Hz Sweep: 30 Minutes each Axis (X, Y, Z)	(3)
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 11 ms Direction : ± X, ± Y, ± Z.(one time for each Axis)	(3)
Thermal Shock Test (TST)	-20℃/30min , 60℃ / 30min , 100 cycles	(1) (2)
On/Off Test	25℃ ,On/10sec , Off /10sec , 30,000 cycles	(1) (2)
ESD (Electro Static Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω)	(1)
	Air Discharge: ± 15KV, 150pF(330Ω)	(1)
Altitude Test	Operation:16,404 ft / 24hours Non-Operation:30,000 ft / 24hours	(1) (2)

Note (1) criteria : Normal display image with no obvious non-uniformity and no line defect.
Note (2) Evaluation should be tested after storage at room temperature for more than two hour
Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.
The fixing condition is shown as below:



7. Mechanical Strength Characteristics

7.1 Mechanical Strength Specifications

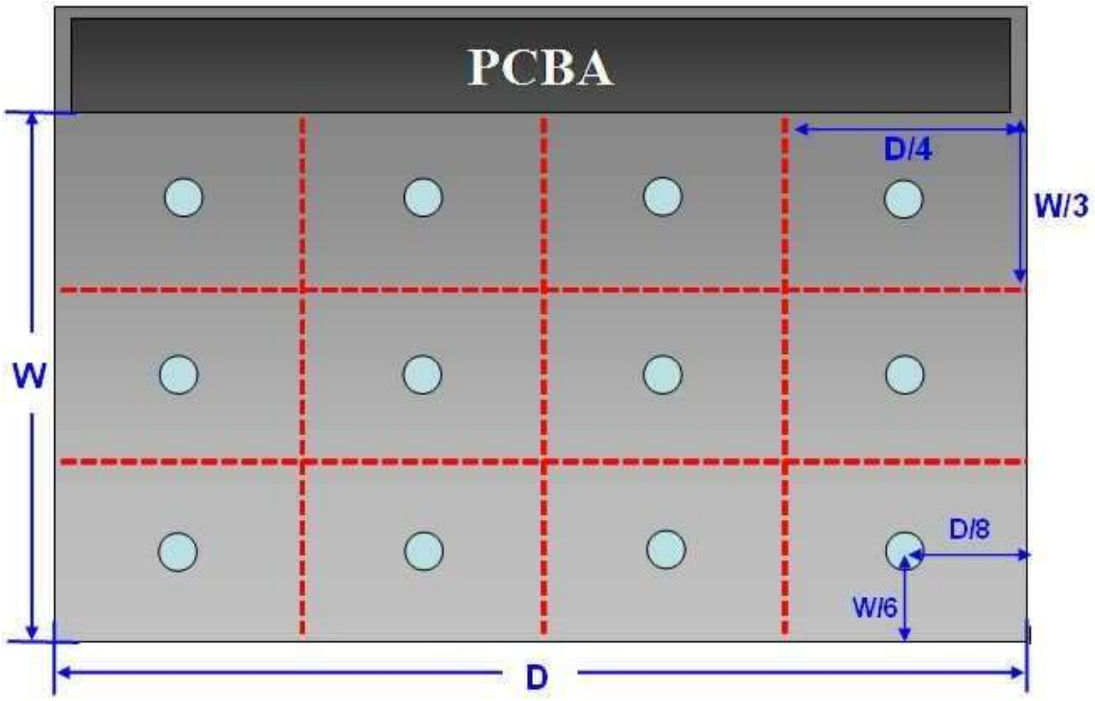
Item	Condition	Min	Unit	Note
Mechanical Strength	128th Gray Pattern	0.6	Kgf	

7.2 Test Conditions

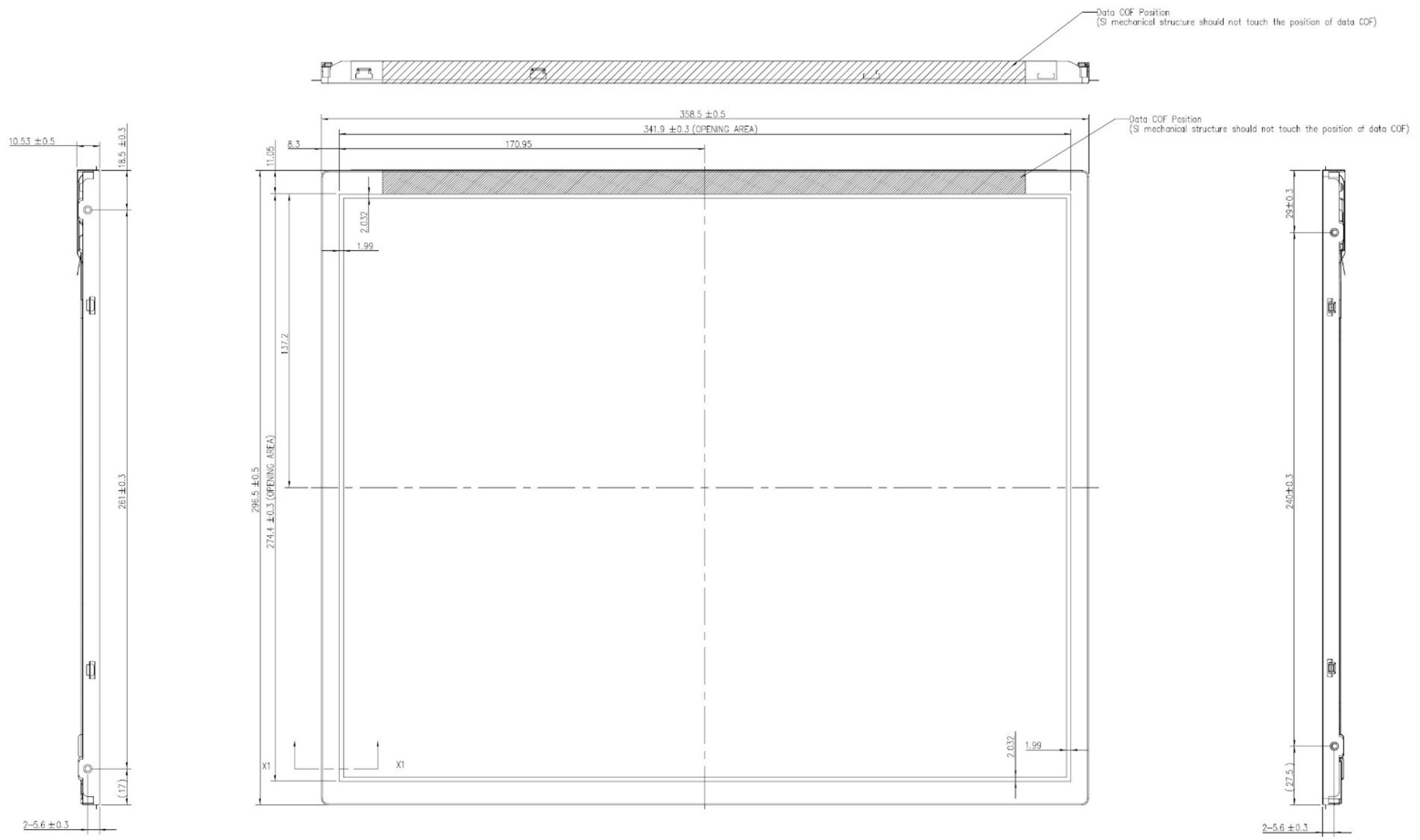
Items	Description
Test Condition	1. Ambient Illumination : 10~15 lux 2. Test Pattern : 128 Gray 3. Distance of the judgment : 30cm from the surface of module 4. Viewing angle of the judgment : Front
Gage Information	1. Push pull guage a. Model name : HF-50, maker : ALGOL b. Shape of gage tip - Diameter : 2mm - Thickness : 2mm
Definition of Minimum force	To measure minimum force when operator detects any white spot and light leakage that have occurred while operator presses on back side of module with push pull gage.

7.3 Definition of Test Points

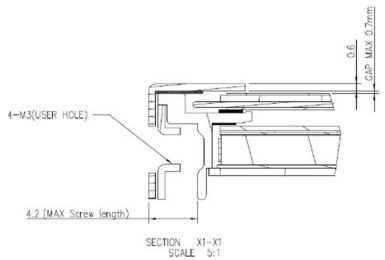
Measure the minimum force of test points at 128th Gray pattern. The test points at back side of module area is showing as below (except PCBA).



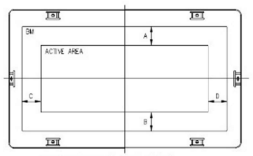
8. DISPLAY LABEL



NOTES:
1.UNSPECIFIED TOLERANCE: ±0.5mm
2.MODULE BACKSIDE CAN'T WITHSTAND ANYTHING EXCEPT USER HOLE.
3.DISPLAY AREA POSITION TOLERANCE: |A-B|<=1.0mm & |C-D|<=1.0mm(SEE FIG.1).
4.SIDE MOUNT HOLE TORQUE : 4Kgf-cm (MAX.).

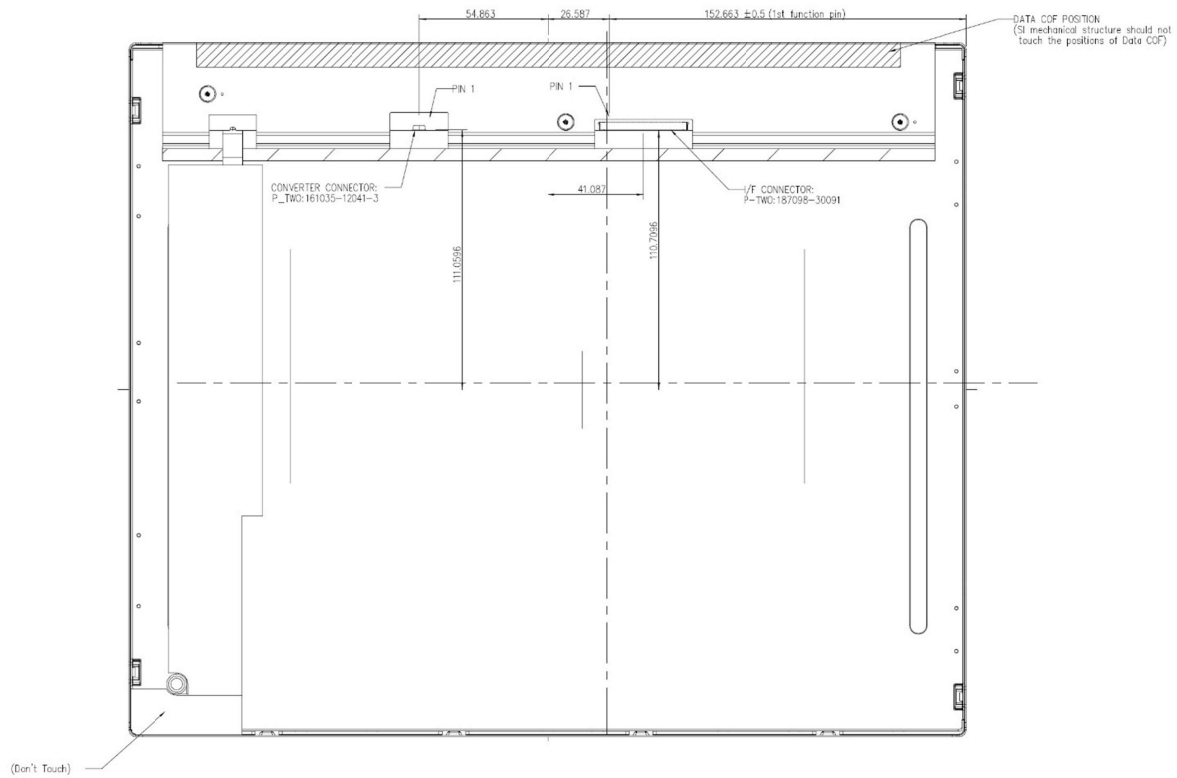


SECTION X1-X1
SCALE 5:1



EM WIDTH VARIATION : |A-B|,|C-D|<=1 (MAX.)
FIG.1

DESIGN OWNER	CONTROL OWNER	DATE 2015/6/8	SCALE 5:1	UNIT mm	
APPROVED	Amar S.	PART NAME 17" LCD DISPLAY			PART NO. A
CHECKED		PART DESCRIPTION HM170SX1011			REV NAME 1.2
DESIGNED	Akash S.	HIGHNESS			REV A1



NOTES:
1.UNSPECIFIED TOLERANCE: ±0.5mm
2.MODULE BACKSIDE CAN'T WITHSTAND ANYTHING EXCEPT USER HOLE.
3.DISPLAY AREA POSITION TOLERANCE: |A-B|<=1.0mm & |C-D|<=1.0mm(SEE FIG.1).
4.SIDE MOUNT HOLE TORQUE : 4Kgf-cm (MAX.).

UNSPECIFIED DIMENSION	CONTROL DIMENSION	DATE 2019/6/8	SCALE 1:1	UNIT mm	
APPROVED	Amar S.	PART NAME 3.5" LCD DISPLAY			DRAWING NO. A
CHECKED		PART DESCRIPTION HM1705X1011			REV NAME 2/2
DESIGNED	Akash S.	HIGHNESS			SIZE A3