HIGHNESS™

One of a kind

HM057VG101I

5.7" Color TFT-LCD

Release Date
03rd July 2020

THIS DOCUMENT CONTAINS PROPRIETORY INFORMATION WHICH IS SOLELY OWENED BY 'HIGHNESS MICROELECTRONICS LTD." ANY UNAUTHORISED COPY OR PRINTING OR PUBLISHING OF INFORMATION IN THIS DOCUMENT IN PART OR IN COMPLETE IS RESTRICTED.

1. GENERAL DESCRIPTION

1.1 OVERVIEW

The HM057VG101I model is a 5.7” TFT-LCD module with a white LED Backlight Unit and a 33-pin 1ch-TTL interface. This module supports 640 x 480 VGA mode and displays 262K/16.2M colors. The converter for the Backlight Unit is built in.

1.2 FEATURES

- Wide viewing angle
- High contrast ratio
- Fast response time
- VGA (640 x 480 pixels) resolution
- Wide operating temperature
- DE (Data Enable) mode and DE+SYNC mode
- TTL interface
- Reversible scan direction
- RoHS Compliance

1.3 APPLICATION

- TFT LCD Monitor
- Industrial Application

1.4 GENERAL SPECIFICATI0NS

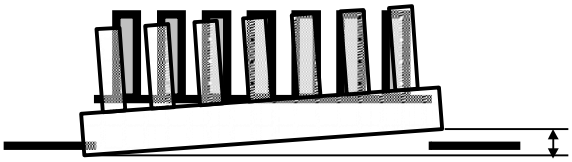
Item	Specification	Unit	Note
Diagonal Size	5.7	inch	
Active Area	115.2(H) x 86.4(V)	mm	
Bezel Opening Area	118.2(H) x 89.4(V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	640 x R.G.B. x 480	pixel	-
Pixel Pitch	0.18(H) x 0.18(V)	mm	-
Pixel Arrangement	RGB stripe	-	-
Display Colors	262K	color	-
Transmissive Mode	Normally white	-	-
Surface Treatment	Anti-Glare coating (Haze 25)	-	-
Module Power Consumption	3.5	W	Typ.

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	143.5	144	144.5	mm	(1)
	Vertical (V)	104.1	104.6	105.1	mm	
	Depth (D)	-	12.3	12.8	mm	
Weight			155	170	g	-
I/F connector mounting position		The mounting inclination of the connector makes the screen center within ±0.5mm as the horizontal.			-	(2)

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

(2) Connector mounting position



2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

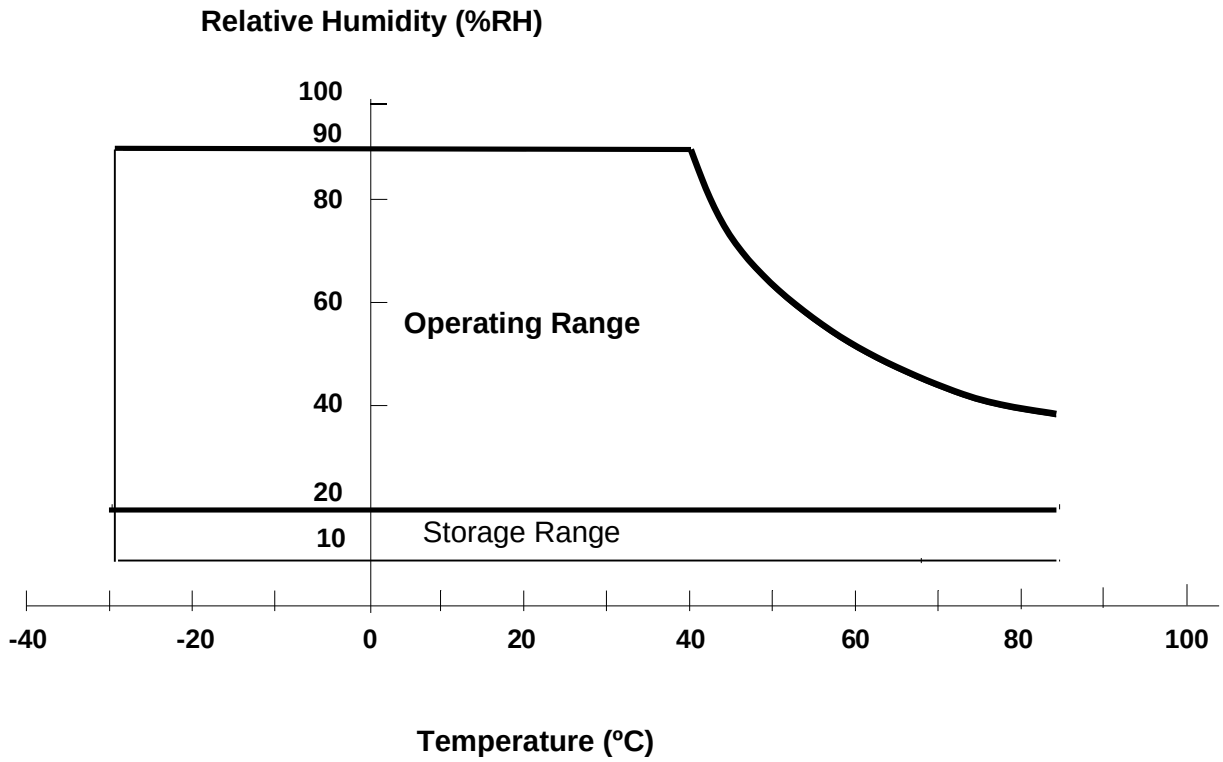
Item	Symbol	Value		Unit	Note
		Min.	Max.		
Operating Ambient Temperature	T_{OP}	-30	85	ºC	
Storage Temperature	T_{ST}	-30	85	ºC	

Note (1) Temperature and relative humidity range is shown in the figure below.

(2) 90 %RH Max. (Ta ≦ 40 ºC).

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

(3) No condensation.



2.2 ELECTRICAL ABSOLUTE RATINGS

2.2.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	3.6	V	(1)

2.2.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5.5	V	
Backlight Adjust	ADJ	---	5.5	V	

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 lamp (Refer to 3.2 for further information).

3. ELECTRICAL CHARACTERISTICS

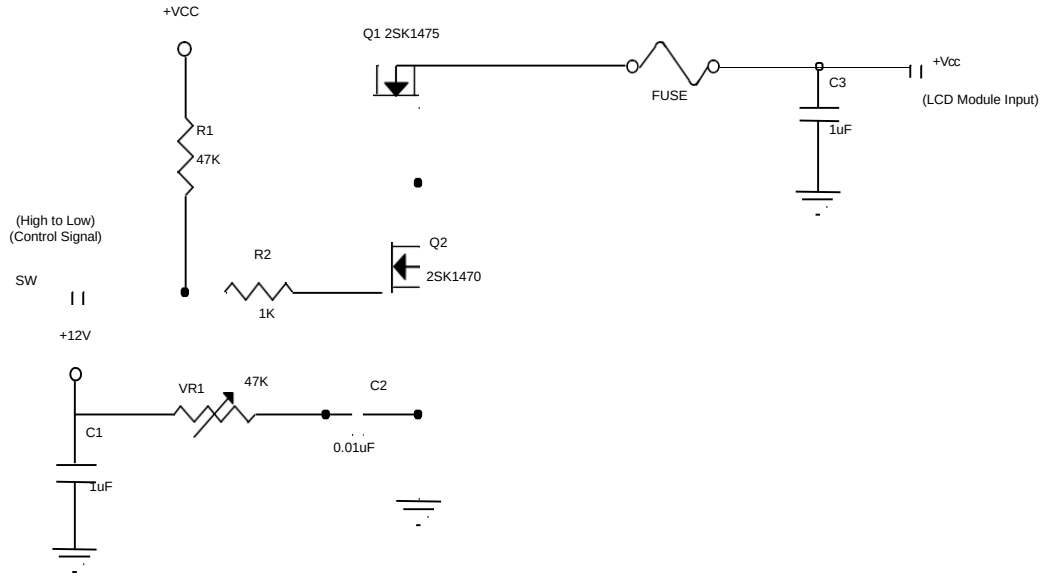
3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

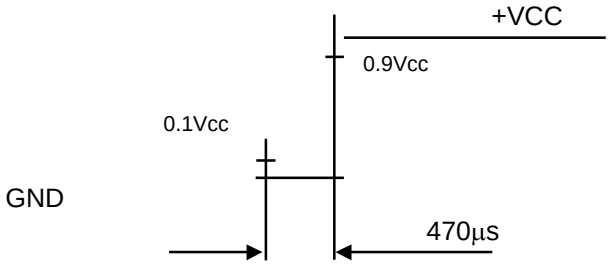
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	3.0	3.3	3.6	V	(1) at Vcc=3.3V
Rush Current		I_{RUSH}	-	-	1.5	A	(2)
Power Supply Current	White	-	-	140	190	mA	(3)a, at Vcc=3.3V
	Black		-	160	210	mA	(3)b, at Vcc=3.3V
Power Consumption		P_L	-	0.53	-	W	

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:



Vcc rising time is 470□s



Note (3) The specified power supply current is under the conditions at Vcc = 3.3V, Ta = 25 ± 2 ºC, f_v = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

3.2 BACKLIGHT UNIT Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12	13.2	V	
Converter Power Supply Current		I_i	0.28	0.26	0.23	A	@ Vi = 12V (Duty 100%)
LED Power Consumption		P_{LED}		2.45		W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on		2.0	---	3.3	V	
	Backlight off		0.8	---	0.8	V	
PWM Control Level	PWM High Level		3.3	---	3.3	V	
	PWM Low Level		0.15	---	0.15	V	
PWM Control Duty Ratio		-	Note(3)		100	%	Note(3)
PWM Control Frequency		f_{PWM}	200		30K	Hz	Note(3)
LED Life Time		L_L	50000			Hrs	(2)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and Duty 100% until the brightness becomes ≦ 50% of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.

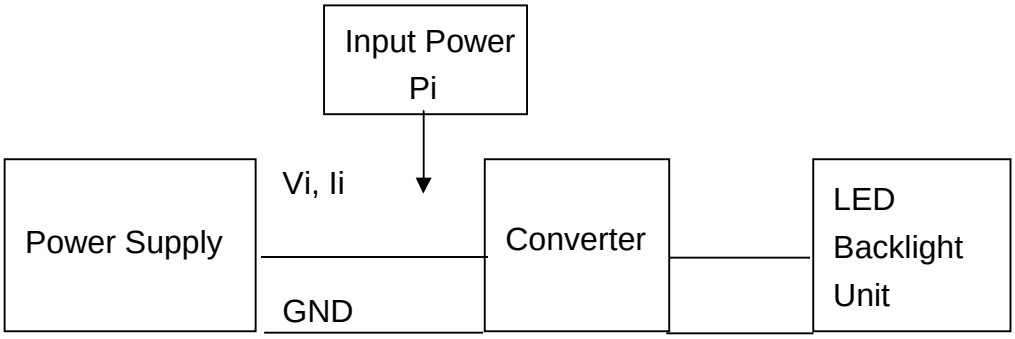
Note (3) At 1K ~30KHz PWM control frequency, duty ratio range is restricted as below:

1K Hz ===> 2 %

10KHz ===> 20 %

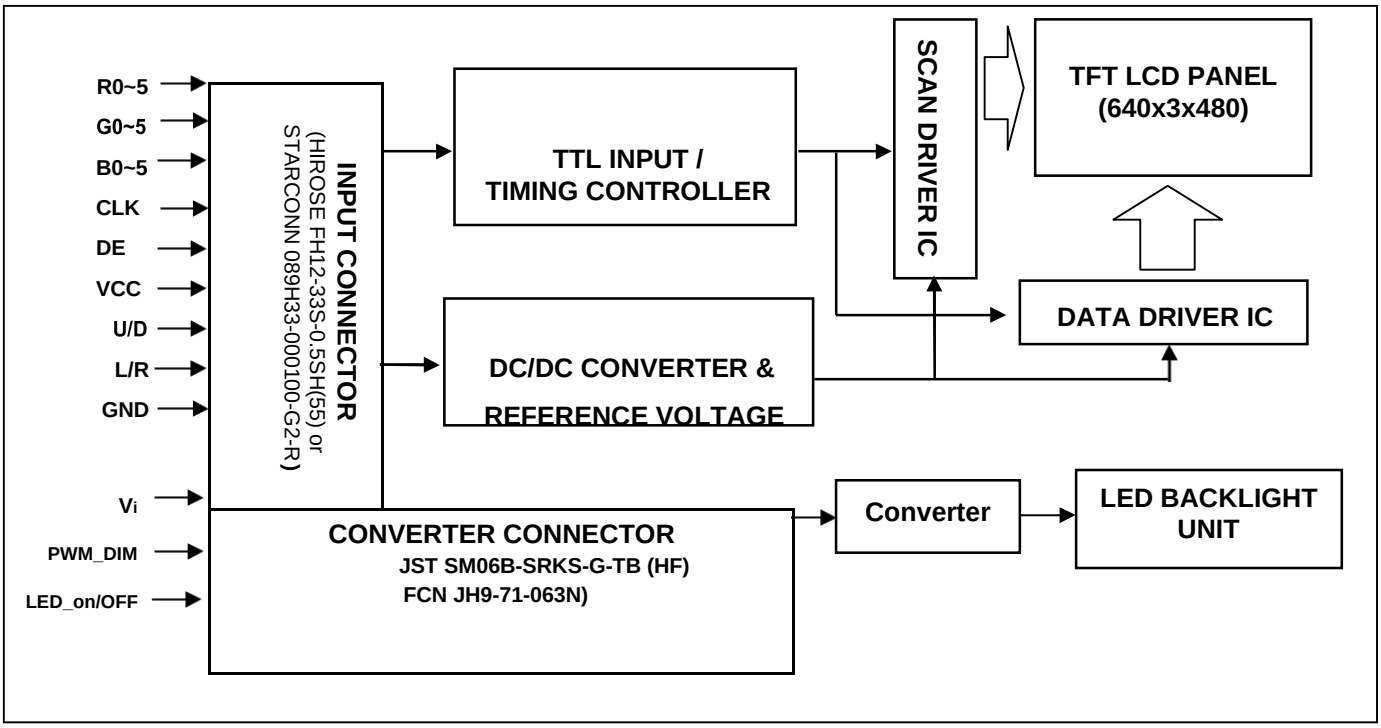
20KHz ===> 40 %

30KHz ===> 60 %



4. BLOCK DIAGRAM

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD MODULE

Pin	Name	Description	Remark
1	GND	Ground	
2	CLK	Dot Clock	
3	IHS	Horizontal synchronous signal	Note(4)
4	IVS	Vertical synchronous signal	Note(4)
5	GND	Ground	
6	R0	Red data (LSB)	
7	R1	Red data	
8	R2	Red data	
9	R3	Red data	
10	R4	Red data	
11	R5	Red data (MSB)	
12	GND	Ground	
13	G0	Green data (LSB)	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data (MSB)	
19	GND	Ground	
20	B0	Blue data (LSB)	
21	B1	Blue data	
22	B2	Blue data	
23	B3	Blue data	
24	B4	Blue data	
25	B5	Blue data (MSB)	
26	GND	Ground	
27	DE	Data Enable Signal	
28	VDD	Power Supply (3.3V)	
29	VDD	Power Supply (3.3V)	
30	R/L	Horizontal reverse scan	Note (5)
31	U/D	Vertical reverse scan	Note (5)
32	NC	Not Connect	Note (3)
33	GND	Ground	

Note (1) Connector Part No.: HIROSE FH12-33S-0.5SH (55), STARCONN 089H33-000100-G2-R or equivalent.

Note (2)User's connector Part No.: HIROSE FH12-33S-0.5SH (55), STARCONN 089H33-000100-G2-R or equivalent.

Note (3) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected".

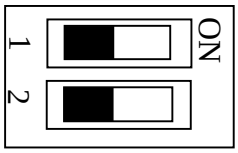
Note (4) DIP Switch for DE Only Mode or DE + Sync Mode Option

Note (5) DIP Switch for Two types or four types reverse scan Option

5.2 BACKLIGHT UNIT (Converter connector pin) JST SM06B-SRKS-G-TB (HF) or FCN JH9-71-063N

Pin	Symbol	Description	Remark
1	V_i	Converter input voltage	12V
2	V_i	Converter input voltage	12V
3	V_{GND}	Converter ground	Ground
4	V_{GND}	Converter ground	Ground
5	ADJ	Backlight Adjust	PWM Dimming
6	EN	Backlight Enable	LED On/Off

5.3 DIP Switch for Reverse scan function option



(1) Switch 1

ON：NA

OFF：NA

(2) Switch 2

ON：2 types reverse scan as the Fig.5 & Fig.6 (U/D must be “OPEN”)

OFF：4 types reverse scan as the Fig.1~4

5.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 6-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					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	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
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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
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
	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(61)	1	1	1	1	0	1	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
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
	Green(1)	0	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	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(61)	0	0	0	0	0	0	1	1	1	1	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	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	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
	Blue(1)	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	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	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	0	1	1	1	1	1	1

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

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

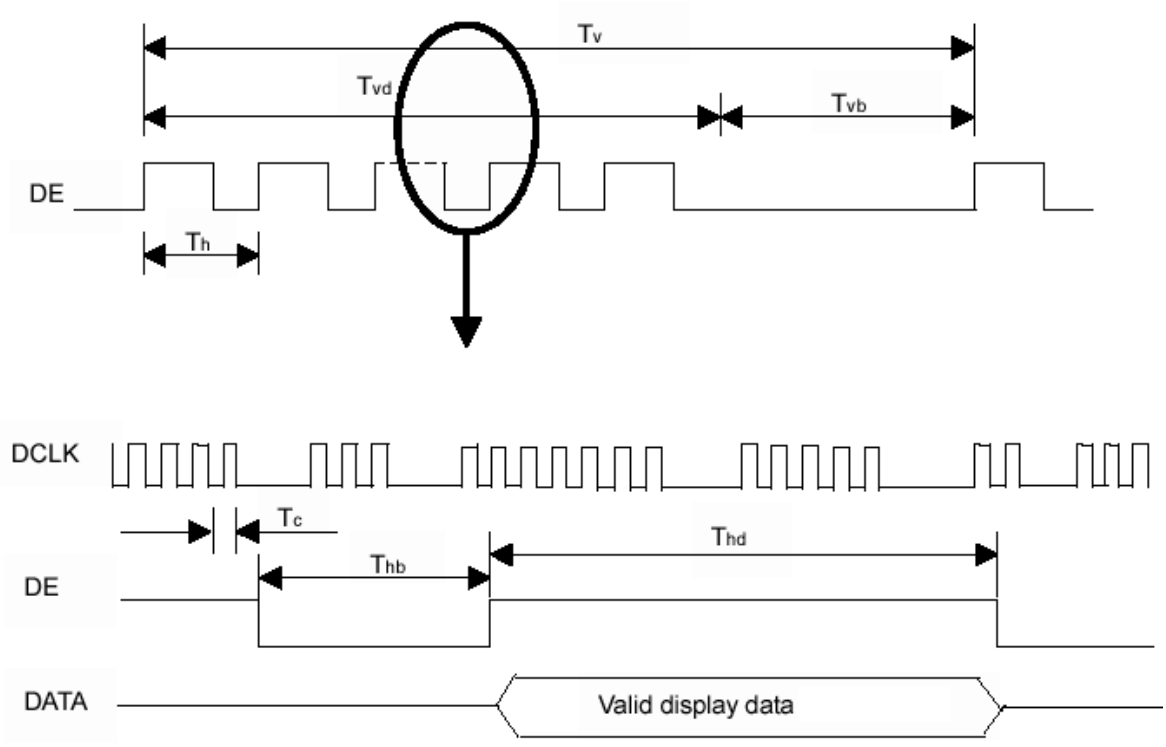
The input signal timing specifications are shown as the following table and timing diagram**.**

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	Fc	22.66	25.175	27.69	MHz	
Vertical Active Display Term	Total	Tv	515	525	535	Th	Tv=Tvd+Tvb
	Display	Tvd	-	480	-	Th	-
	Blank	Tvb	35	45	55	Th	-
Horizontal Active Display Term	Total	Th	750	800	850	Tc	Th=Thd+Thb
	Display	Thd	-	640	-	Tc	-
	Blank	Thb	110	160	210	Tc	-

Note (1) Since this assembly is operated in DE only mode. Otherwise, this assembly would operate abnormally.

(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM



6.2 **DE +Sync Mode** INPUT SIGNAL TIMING SPECIFICATIONS

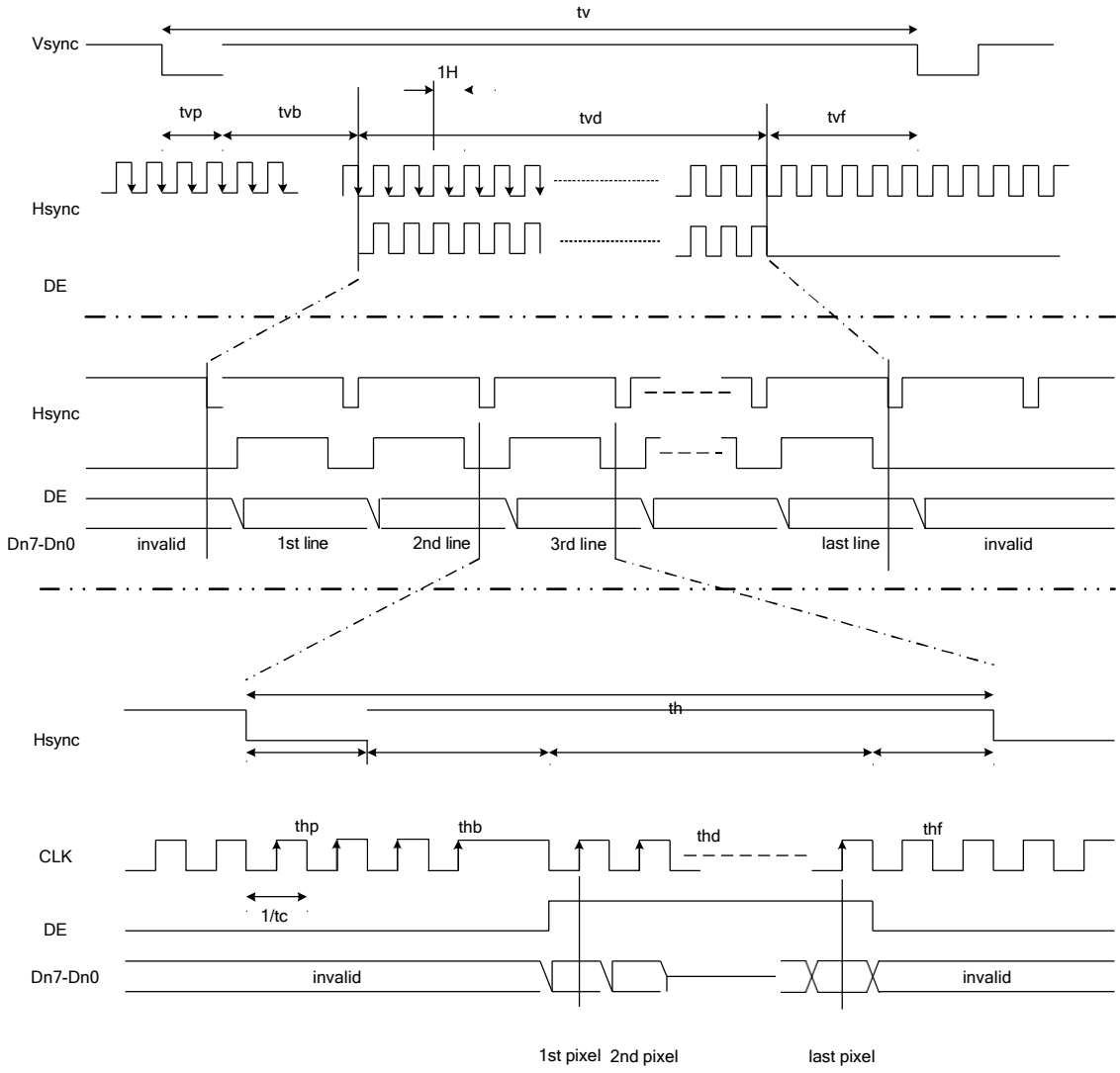
The input signal timing specifications are shown as the following table and timing diagram**.**

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
DCLK	Frequency	Tc	22.66	25.175	27.69	MHz	
Vertical Active Display Term	Total	Tv	515	525	535	Th	
	Display	Tvd	-	480	-	Th	
	Front Porch	Tvf	-	7	-	Th	
	Back Porch	Tvb	-	35	-	Th	
	VS Pluse width	Tvp	1	3	5	Th	
Horizontal Active Display Term	Total	Th	750	800	850	Tc	
	Display	Thd	-	640	-	Tc	
	Front Porch	Thf	-	16	-	Tc	
	Back Porch	Thb	107	114	125	Tc	
	HS Pluse width	Thp	5	30	50	Tc	

Note (1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

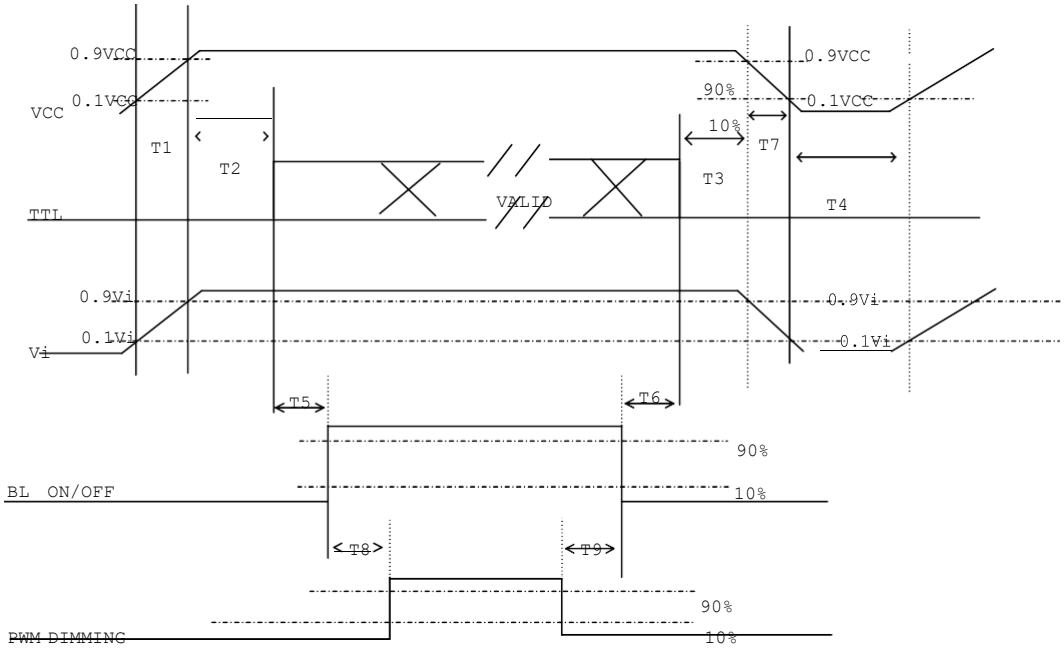
(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM



6.3 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms

6.4 Scanning Direction

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

Fig. 1 Normal scan (R/L=Low or NC, U/D = High or NC)

Fig. 2 Reverse scan (R/L=High, U/D = High or NC)

Fig. 3 Reverse scan (R/L=Low or NC, U/D = Low)

Fig. 2 Reverse scan (R/L=High, U/D = Low)

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

Fig.5 Normal Scan

Fig.6 Reverse Scan

Fig. 1 Normal scan (RL=Low or NC)

Fig. 2 Reverse scan (RL=High,)

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

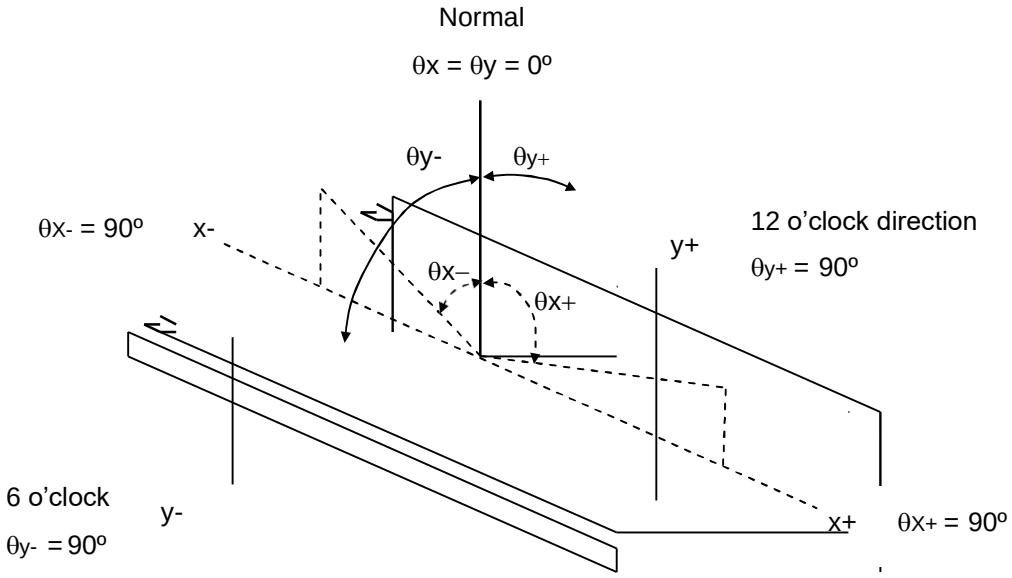
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	3.3	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Converter Voltage	V_{in}	12	V
Converter Duty		100%	

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (5).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° CS-1000	Typ - 0.05	(0.588)	Typ + 0.05	-	(1), (5)
		Ry			(0.339)		-	
	Green	Gx			(0.332)		-	
		Gy			(0.587)		-	
	Blue	Bx			(0.146)		-	
		By			(0.097)		-	
	White	Wx			(0.313)		-	
		Wy			(0.329)		-	
Center Luminance of White		L_C		350	450		-	-
Contrast Ratio		CR		600	800			-
Response Time		T_R	θ_x=0°, θ_Y =0°	-	(15)			ms
		T_F		-	(35)			ms
White Variation		δW	θ_x=0°, θ_Y =0°	-	(1.25)	(1.4)		-
Viewing Angle	Horizontal	θ_x+	CR≥10	70	80	-	Deg.	(1), (5)
		θ_x-		70	80	-		
	Vertical	θ_Y+		60	70	-		
		θ_Y-		60	70	-		

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) = L63 / L0

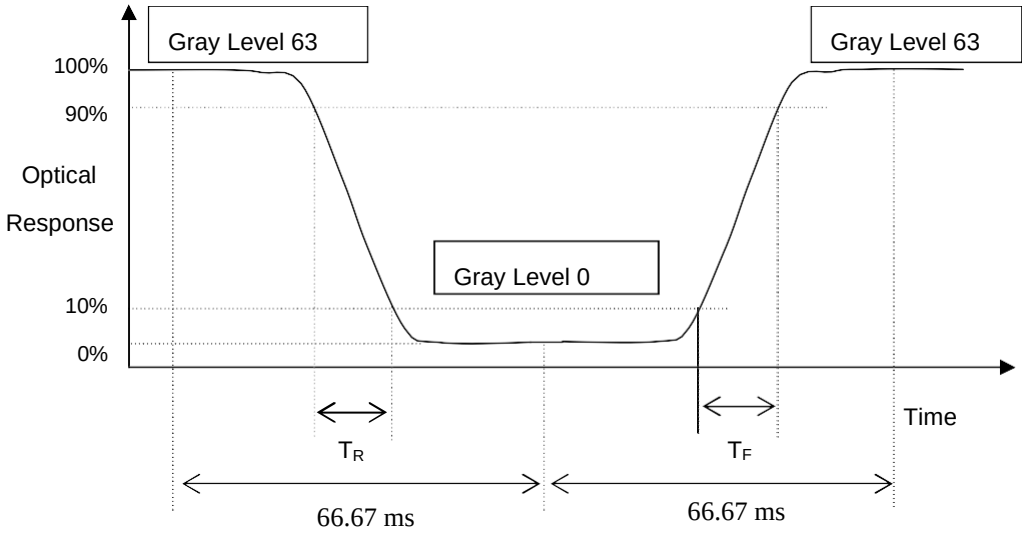
L63: Luminance of gray level 63

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) and measurement method:



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

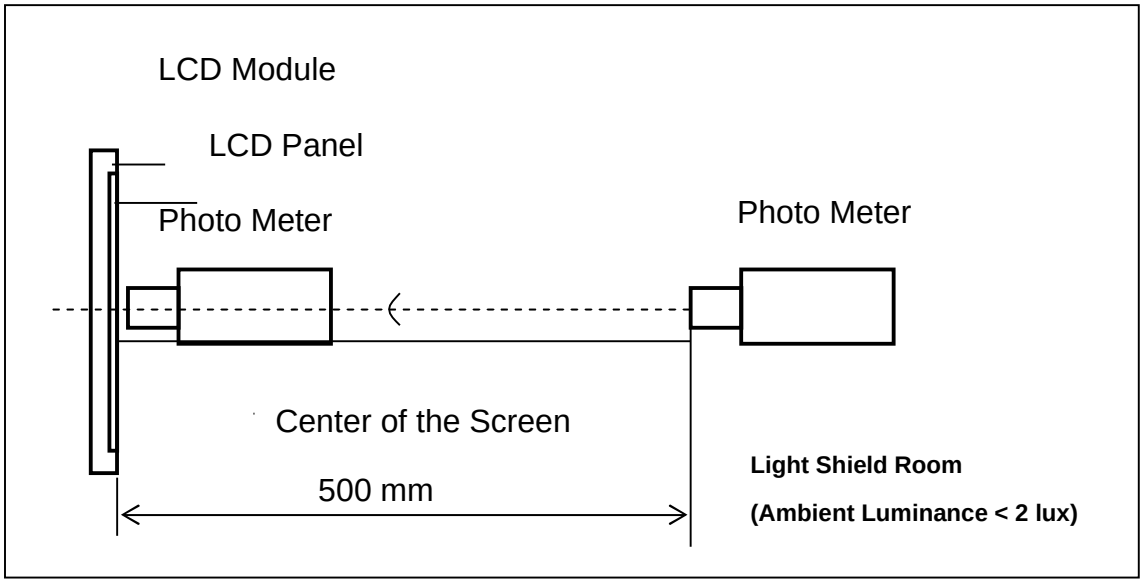
Measure the luminance of gray level 63 at center point

L_C = L (5)

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

Note (5) Measurement Setup:

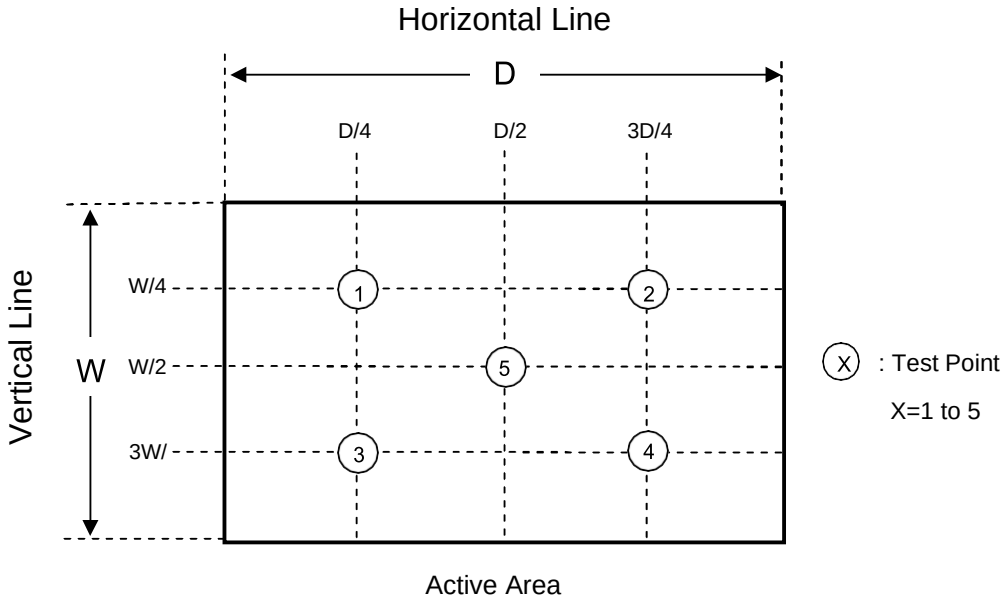
The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



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

Measure the luminance of gray level 63 at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



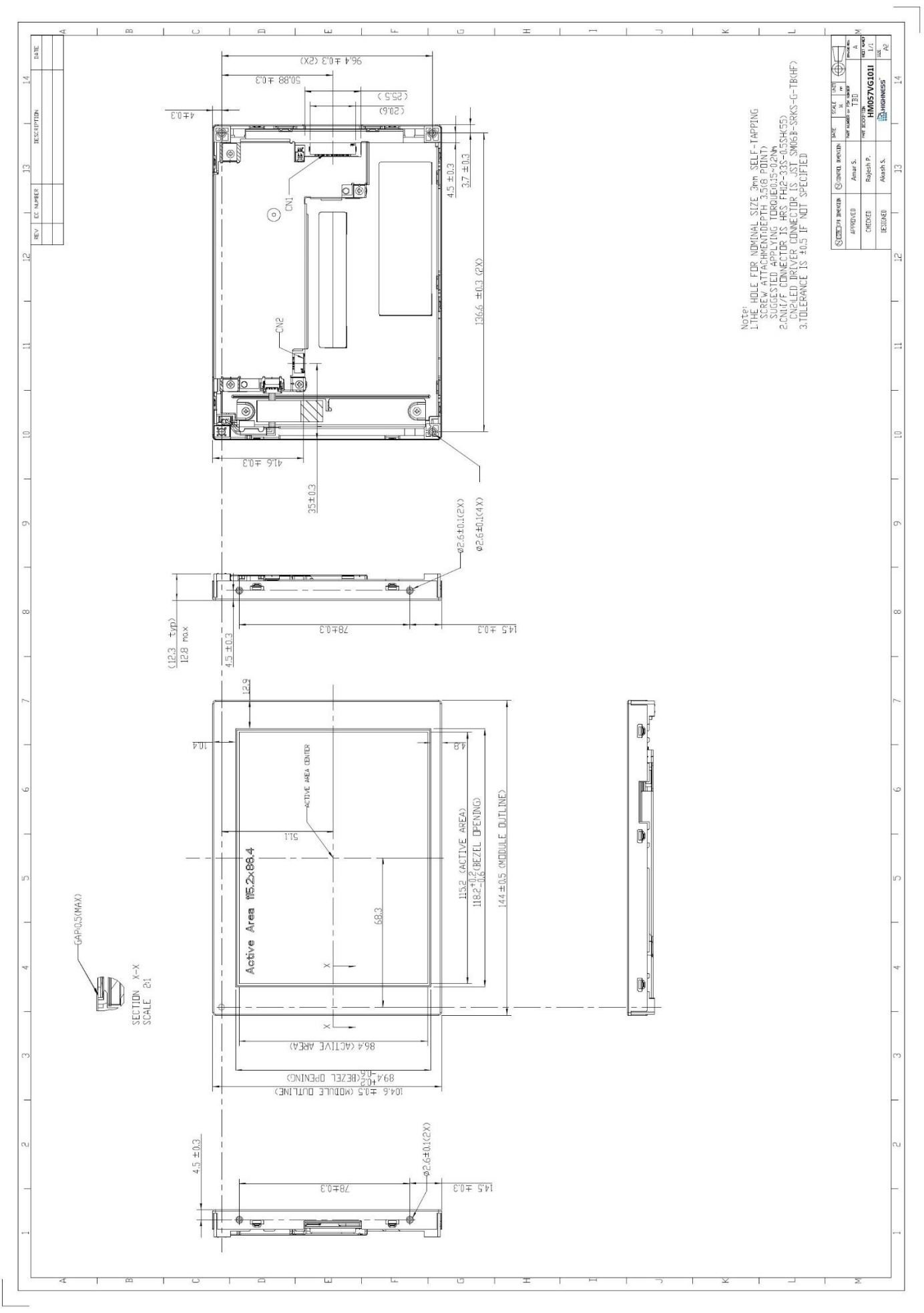
8. RELIABILITY TEST CRITERIA

Test Item	Test Condition	Note
High Temperature Storage Test	85ºC, 240 hours	(1)(2)
Low Temperature Storage Test	-30ºC, 240 hours	
Thermal Shock Storage Test	-30ºC, 0.5hour←→85ºC, 0.5hour; 1hour/cycle,100cycles	
High Temperature Operation Test	85ºC, 240 hours	
Low Temperature Operation Test	-30ºC, 240 hours	
High Temperature & High Humidity Operation Test	60ºC, 90%RH, 240hours	
Shock (Non-Operating)	50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z direction	(3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 80 ºC Max.

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.

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specifications are judged before reliability test.

10. MECHANICAL CHARACTERISTICS