



7 inch TFT Display Series

GDTL070JL-S01

Dalian Good Display Co., Ltd.

- Tentative Specification
- Preliminary Specification
- Approval Specification

MODEL NAME: GDTL070JL-S01

Version:1.2

Customer: Common	
APPROVED BY	SIGNATURE
<u>Name / Title</u> _____	_____
Note	
Please return 1 copy for your confirmation with your signature and comments.	

Approved By	Checked By	Prepared By

Record of Revisions

Rev.	Date	Name	Description of change
1.0	2019.12.06	ZCW	First release
1.1	2020/12/24		Update Power on/off sequence
			Update ESD
1.2	2021/5/8		Update the brightness

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1.0 GENERAL DESCRIPTION

1.1 Introduction

TFT LCD Display model GDTL070JL-S01 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT LCD panel, a driving circuit and a back light system. This TFT LCD has a 7.0 (16:9) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

1.2 Features

- 7 inch (16:9 diagonal) configuration
- 16.7M color by 6 bit+HiFRC R.G.B signal input
- RoHS/ Halogen Free Compliance

1.3 Applications

- Automotive

1.4 TFT LCD General information

Item	Specification	Unit
Outline Dimension	166.60(H) x 105.80(V) x 6.5(D)	mm
Active area	153.60(H) x 90.00(V)	mm
Number of Pixel	1024 RGB (H) x 600(V)	pixels
Pixel pitch	0.15(H) x 0.15(V)	mm
Pixel arrangement	RGB Vertical stripe	
Display mode	Normally white	
NTSC	50 (typ.)	%
Surface treatment	AG,with EWV Flim	
Weight	174	g
Back-light	White LED	

2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item	Symbol	Min.	Max.	Unit	Note
Power supply voltage	V_{DD}	-0.3	5.0	V	
	V_{GH}	0.3	40.0	V	
	V_{GL}	-20.0	0.3	V	
	AV_{DD}	6.5	13.5	V	
	V_I	-0.3	$V_{DD} + 0.3$	V	
Logic Signal Input Level	V_{DD}	-0.3	5.0	V	

2.1.2 Backlight unit

Item	Symbol	Typ.	Max.	Unit	Note
LED current	I _L	247	-	mA	(1) (2)(3)
LED voltage	V _L	9.6	10.2	V	(1) (2)(3)
LED reverse voltage	V _R	--	5	V	

Note:

- (1) Permanent damage may occur to the LCD module if beyond this specification. Functional operation should be restricted to the conditions described under normal operating conditions.
- (2) Ta =25±2°C
- (3) Test Condition: LED current 297 mA. The LED lifetime could be decreased if operating IL is larger than 297 mA.

2.1.3 Environment Absolute Rating

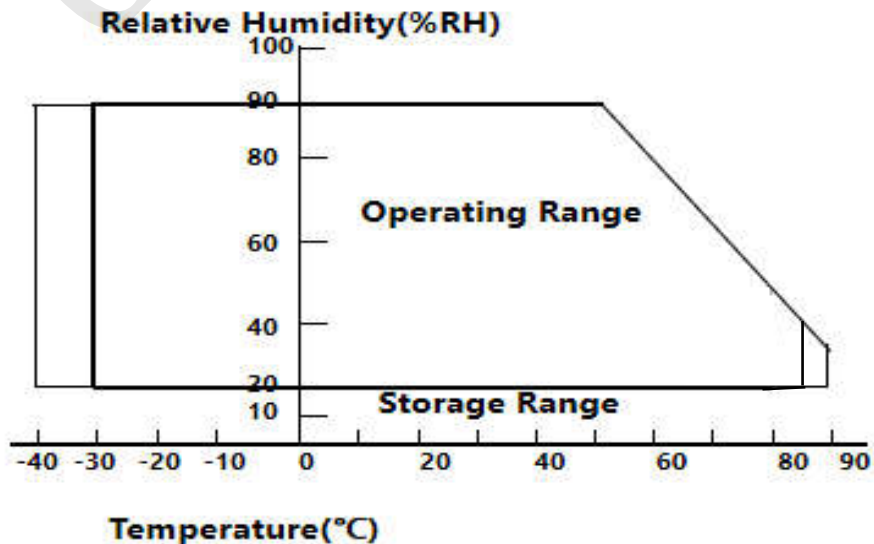
Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T _{opa}	-30	85	°C	
Storage Temperature	T _{stg}	-40	90	°C	

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

90 %RH Max. (Ta ≤40°C); (b) Wet-bulb temperature should be 39 °C Max. (Ta > 40°C);

(c) No condensation.

Note(2) The absolute maximum rating values of this product are not allowed to be exceeded at any times. The module should not be used over the absolute maximum rating value. It will cause permanently unrecoverable function fail in such an condition



3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

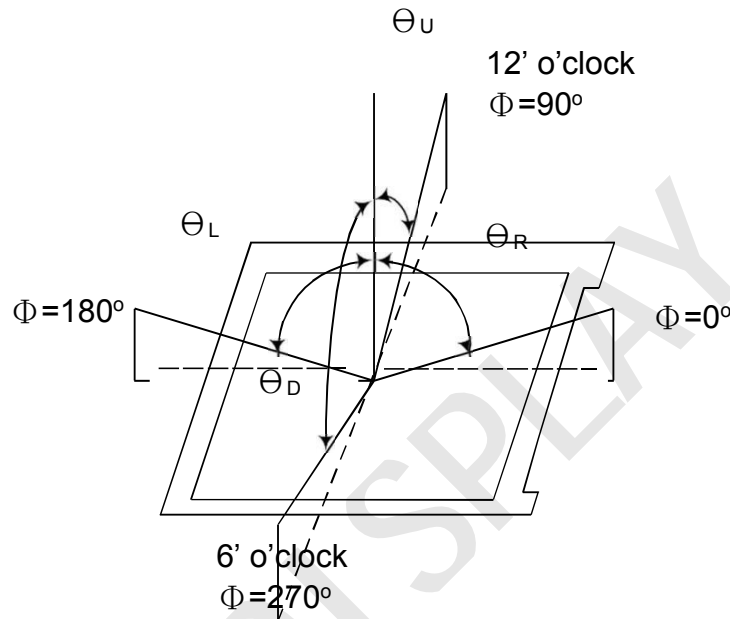
Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta=0$ Normal viewing angle	500	700	—		(1)(2)(4)
Response time		Tr		—	10	20	msec	(1)(3)
		Tf		—	15	30		
White luminance (Center)		Y_L		450	500	—	cd/m ²	(1)(4) ($I_L=297mA$)
Color chromaticity (CIE1931)	Red	R_x		-0.05	+0.05	(0.617)		
		R_y				(0.353)		
	Green	G_x				(0.365)		
		G_y				(0.580)		
	Blue	B_x				(0.148)		
		B_y				(0.098)		
	White	W_x	(0.31)					
		W_y	(0.33)					
Viewing angle	Ver.	Θ_U	65	75	—		(1)(4)	
		Θ_D	40	50	—			
	Hor.	Θ_L	65	75	—			
		Θ_R	65	75	—			
Luminance Uniformity		Y_U		75			%	

3.2 Measuring Condition

- Measuring surrounding : dark room
- LED current I_L : 297 mA
- Ambient temperature : $25\pm 2^\circ C$
- 15min. warm-up time.

3.3 Measuring Equipment

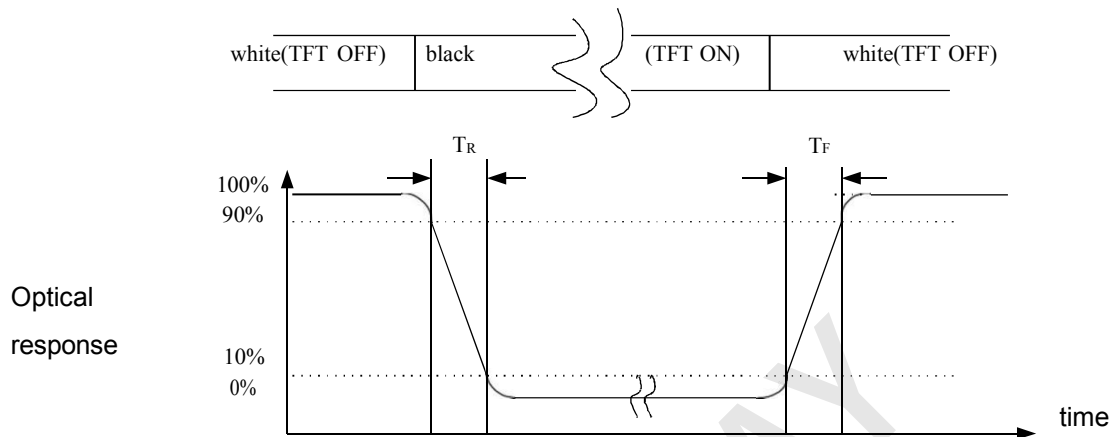
- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-7 for other optical characteristics.
 - Measuring spot size : 20 ~ 21 mm
- Note (1)** Definition of Viewing Angle:



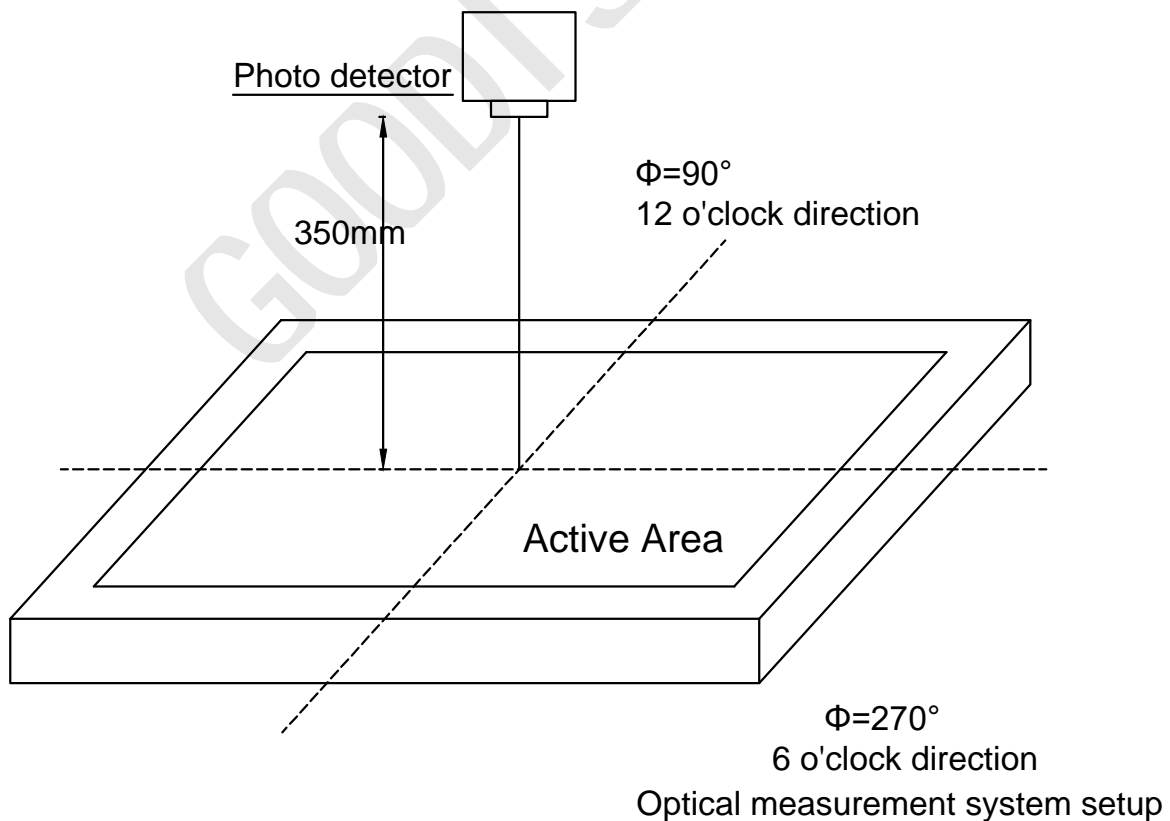
Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

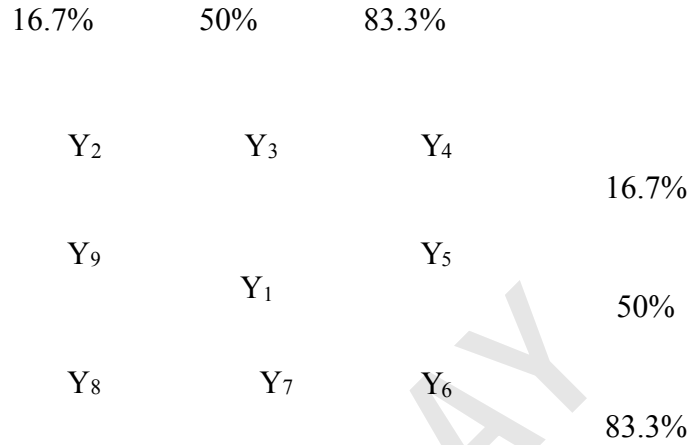
Note (3) Definition of Response Time : Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of Average Luminance Uniformity of White (Center)
 Definition of brightness uniformity

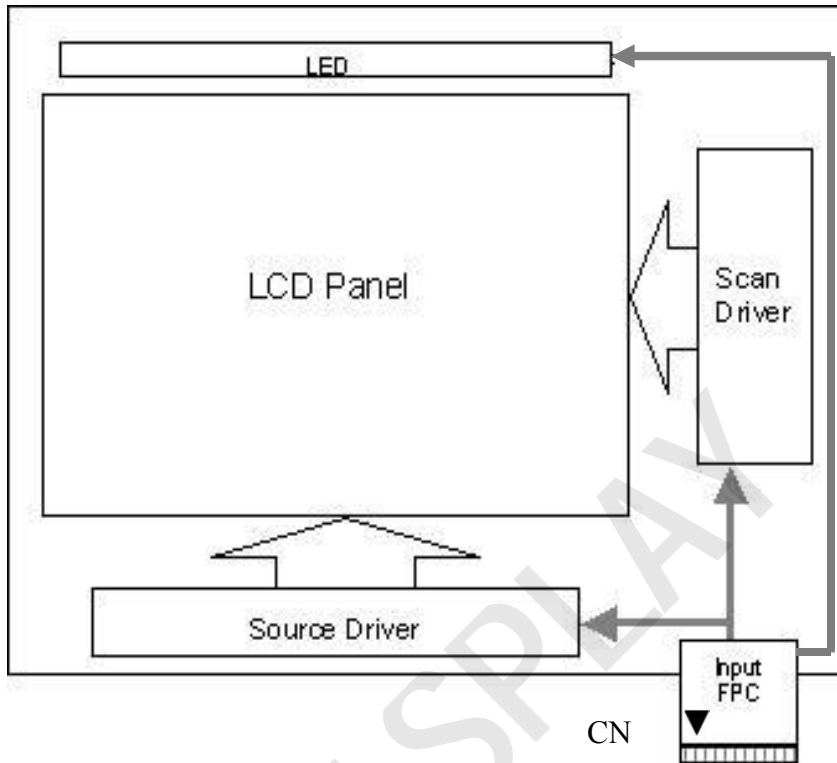


$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

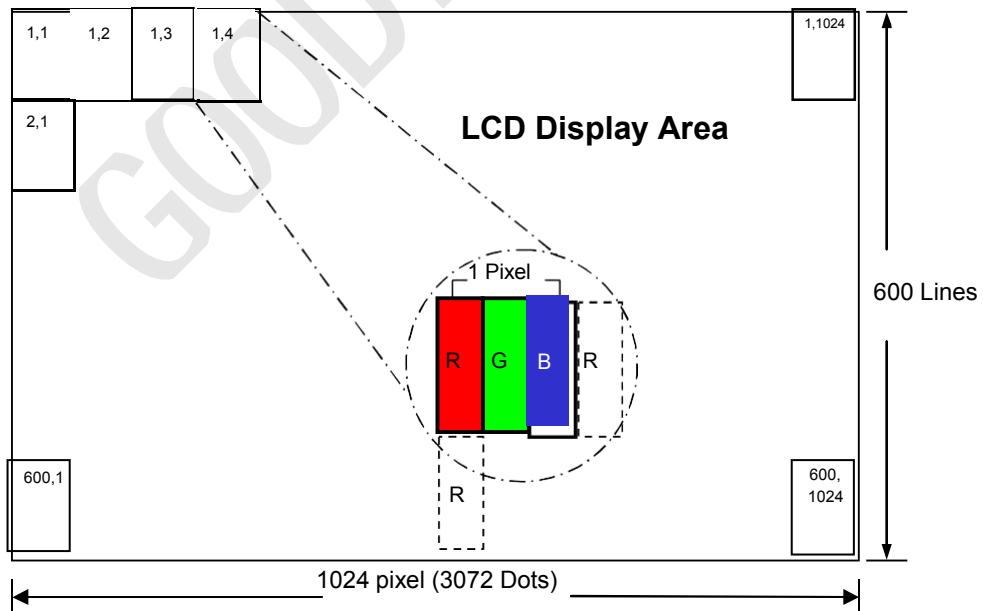
Note (6) Rubbing Direction (The different Rubbing Direction will cause the different optimal view direction.)

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



4.3 Relationship Between Displayed Color and Input

4.3.1 6bit

	Display	MSB LSB R5R4R3R2R1R0	M L S S G5 G4 G3 G2G1 G0	B M L S B5B4B3	S S B2 B1 B0	Gray scale level
Basic color	Black	LLLLLL	LLLLLL	LLLLLL	LLLLLL	-
	Blue	LLLLLL	LLLLLL	HHHHHH	LLLLLL	-
	Green	LLLLLL	HHHHHH	LLLLLL	LLLLLL	-
	Light Blue	LLLLLL	HHHHHH	HHHHHH	LLLLLL	-
	Red	HHHHHH	LLLLLL	LLLLLL	LLLLLL	-
	Purple	HHHHHH	LLLLLL	HHHHHH	LLLLLL	-
	Yellow	HHHHHH	HHHHHH	LLLLLL	LLLLLL	-
	White	HHHHHH	HHHHHH	HHHHHH	HHHHHH	-
Gray scale of Red	Black	LLLLLL	LLLLLL	LLLLLL	LLLLLL	L0
	Dark ↑ ↓ Light	LLLLLH	LLLLLL	LLLLLL	LLLLLL	L1
		LLLLHL	LLLLLL	LLLLLL	LLLLLL	L2
		:	:	:	:	L3...L60
		HHHHLH	LLLLLL	LLLLLL	LLLLLL	L61
		HHHHHL	LLLLLL	LLLLLL	LLLLLL	L62
	Red	HHHHHH	LLLLLL	LLLLLL	LLLLLL	Red L63
Gray scale of Green	Black	LLLLLL	LLLLLL	LLLLLL	LLLLLL	L0
	Dark ↑ ↓ Light	LLLLLL	LLLLLH	LLLLLL	LLLLLL	L1
		LLLLLL	LLLLHL	LLLLLL	LLLLLL	L2
		:	:	:	:	L3...L60
		LLLLLL	HHHHLH	LLLLLL	LLLLLL	L61
		LLLLLL	HHHHHL	LLLLLL	LLLLLL	L62
	Green	LLLLLL	HHHHHH	LLLLLL	LLLLLL	Green L63
Gray scale of Blue	Black	LLLLLL	LLLLLL	LLLLLL	LLLLLL	L0
	Dark ↑ ↓ Light	LLLLLL	LLLLLL	LLLLLH	LLLLLL	L1
		LLLLLL	LLLLLL	LLLLHL	LLLLLL	L2
		:	:	:	:	L3...L60
		LLLLLL	LLLLLL	HHHHLH	LLLLLL	L61
		LLLLLL	LLLLLL	HHHHHL	LLLLLL	L62
	Blue	LLLLLL	LLLLLL	HHHHHH	LLLLLL	Blue L63
Gray scale of White & Black	Black	LLLLLL	LLLLLL	LLLLLL	LLLLLL	L0
	Dark ↑ ↓ Light	LLLLLH	LLLLLH	LLLLLH	LLLLLH	L1
		LLLLHL	LLLLHL	LLLLHL	LLLLHL	L2
		:	:	:	:	L3...L60
		HHHHLH	HHHHLH	HHHHLH	HHHHLH	L61
		HHHHHL	HHHHHL	HHHHHL	HHHHHL	L62
	White	HHHHHH	HHHHHH	HHHHHH	HHHHHH	White L63

4.3.2 8bit

	Display	M B LSB								M B LSB								M B LSB								Gray scale Level			
		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 color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-			
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-			
	Light Blue	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-			
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-			
	Purple	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	-			
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	-			
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-			
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0			
	Dark	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1		
		L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252		
		H	H	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253	
		H	H	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254	
	Red	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Red L255			
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0			
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L1	
		L	L	L	L	L	L	L	L	L	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251	
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	L	L252		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L253		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	H	L254		
	Green	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	Green L255			
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0			
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2		
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251		
	Light	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	L	L	L252		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L254		
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	H	H	H	H	H	H	H	Blue L255			
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0			
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L1		
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	H	L	L2	
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251		
	Light	H	H	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	H	H	H	H	H	L	L	L	L252		
		H	H	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L253		
		H	H	H	H	H	H	H	H	L	H	L	L	L	L	L	L	L	H	H	H	H	H	L	H	L	L254		
	White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255			

5.0 INTERFACE PIN CONNECTION

FPC connector is used for electronics interface. The recommended model is FH12A-40S-0.5SH manufactured by Hirose.

Pin No.	Symbol	I/O	Function	Note
1	VCOM	P	Common Voltage	
2	VDD	P	Power Voltage for digital circuit	
3	VDD	P	Power Voltage for digital circuit	
4	NC	---	No connection	
5	Reset	I	Global reset pin	Note1
6	U/D	I	Vertical inversion	Note2
7	L/R	I	Horizontal inversion	Note2
8	STBYB	I	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z	
9	GND	P	Ground	
10	NINC	I	- LVDS differential clock input	
11	PINC	I	+ LVDS differential clock input	
12	GND	P	Ground	
13	NIND0	I	- LVDS differential data input	
14	PIND0	I	+ LVDS differential data input	
15	GND	P	Ground	
16	NIND1	I	- LVDS differential data input	
17	PIND1	I	+ LVDS differential data input	
18	GND	P	Ground	
19	NIND2	I	- LVDS differential data input	
20	PIND2	I	+ LVDS differential data input	
21	GND	P	Ground	
22	NIND3	I	- LVDS differential data input	
23	PIND3	I	+ LVDS differential data input	
24	GND	P	Ground	
25	SELB	I	6bit/8bit mode selection	Note3
26	GND	P	Ground	
27	AVDD	P	Power for Analog Circuit	
28	GND	P	Ground	
29	VGH	P	Gate ON Voltage	
30	NC	---	No connection	
31	NC	---	No connection	
32	VGL	P	Gate off Voltage	
33	GND	P	Ground	
34	NC	---	No connection	

Pin No.	Symbol	I/O	Function	Note
35	VLEDK	P	LED Cathode	
36	VLEDK	P	LED Cathode	
37	NC	---	No connection	
38	VLEDA	P	LED Anode	
39	VLEDA	P	LED Anode	
40	NC	---	No connection	

: input O: Output P: Power

Note1 : Global reset pin: Active low to enter reset mode. Suggest connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ, C=0.1μF)

Note: If RC is not added, users must follow the rule, T2 > 50ms on page 18 item 6.5 power on/off sequence.

Note2 : When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.

Note3 : If LVDS input data is 6 bits, SELB must be set to High;

If LVDS input data is 8 bits, SELB must be set to Low.

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

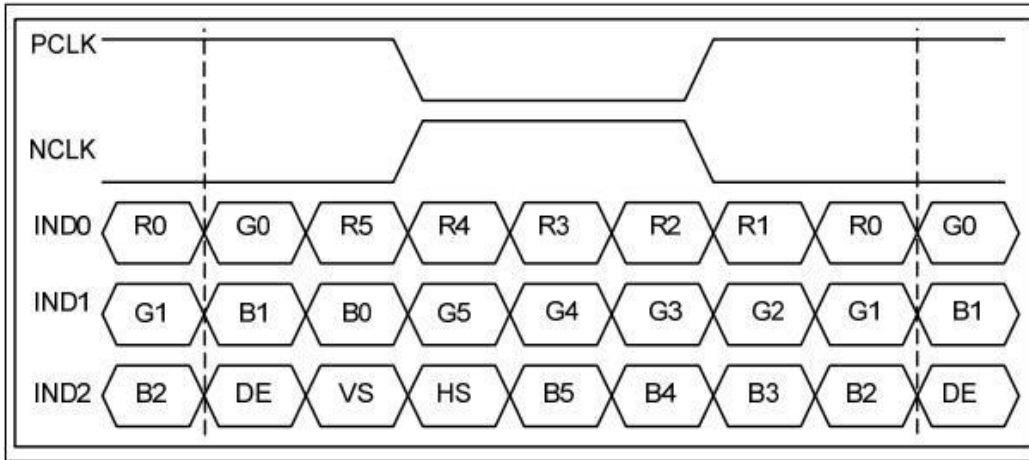
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	VDD	3.0	3.3	3.6	V	
	VGH	16	20	24	V	
	VGL	-10	-7	-3	V	
	AVDD	9.3	9.6	9.9	V	
VCOM	VCOMin	2.9	3.1	3.4	V	
Input signal voltage	ViH	0.7 VDD	-	VDD	V	Note (1)
	ViL	0	-	0.3 VDD	V	
Current of power supply	IDD	-	33	-	mA	VDD =3.3V
	IADD	-	18	-	mA	AVDD=9.6V
	IGH	-	0.31	-	mA	VGH=18V
	IGL	-	1.0	-	mA	VGL=-6V

6.2 Switching Characteristics for LVDS Receiver

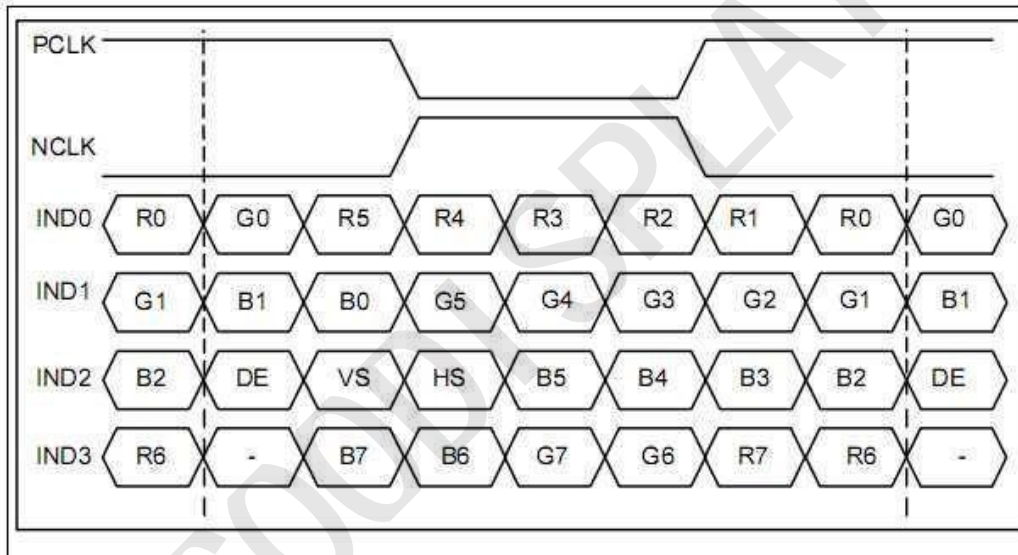
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	—	—	100	mV	
Differential Input Low Threshold	Vtl	-100	—	—	mV	
Input Current	I _{IN}	-10	—	+10	uA	
Differential input Voltage	V _{ID}	0.1	—	0.6	V	
Common Mode Voltage Offset	V _{CM}	0.7	1.2	1.6	V	

6.3 Bit LVDS input

6.3.1 6bit LVDS input



6.3.2 8Bit LVDS input



6.4 Interface Timing (DE mode)

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency @Frame rate=60hz	fclk	40.8	51.2	67.2	Mhz
Horizontal display area	thd	1024			DCLK
HSYNC period time	th	1114	1344	1400	DCLK
HSYNC blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			H
VSYNC period time	tv	610	635	800	H
VSYNC blanking	tvb+tvfp	10	35	200	H

6.5 Power On / Off Sequence

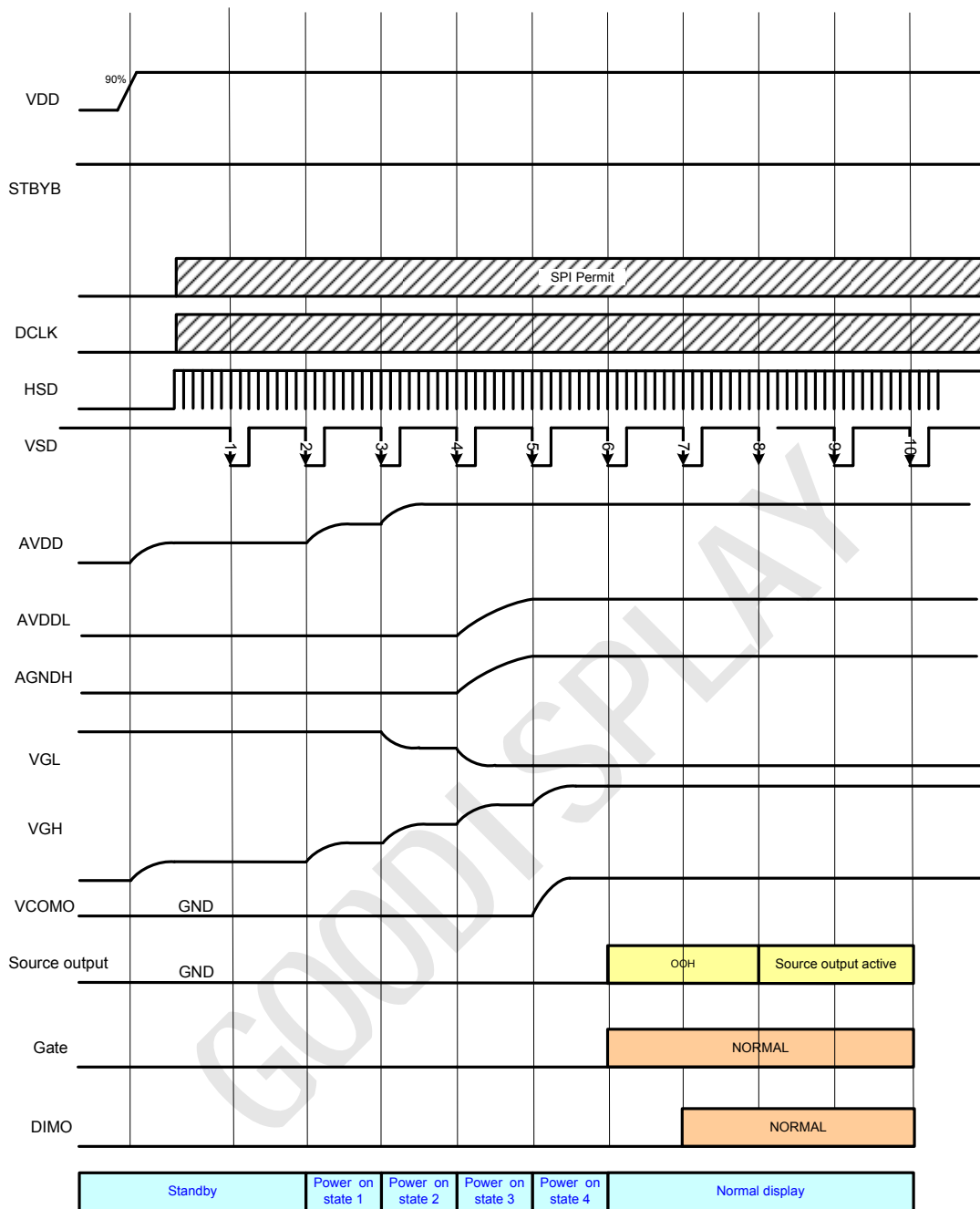


Figure 6.5.1: Power on timing sequence

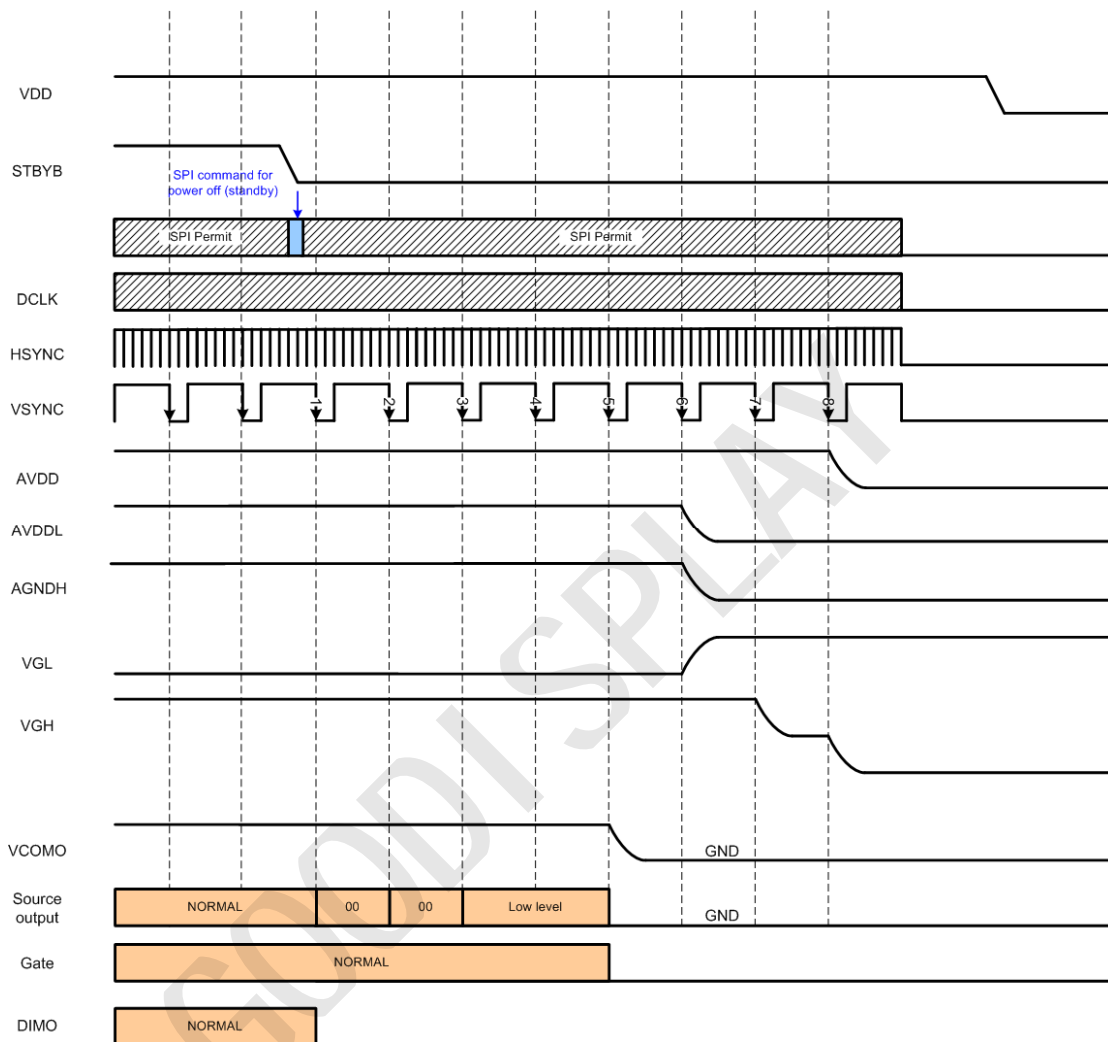


Figure 6.5.2: Power off timing sequence

Note: Low level=3FH, when NBW=L (Normally white)
 Low level=00H, when NBW=H (Normally black)

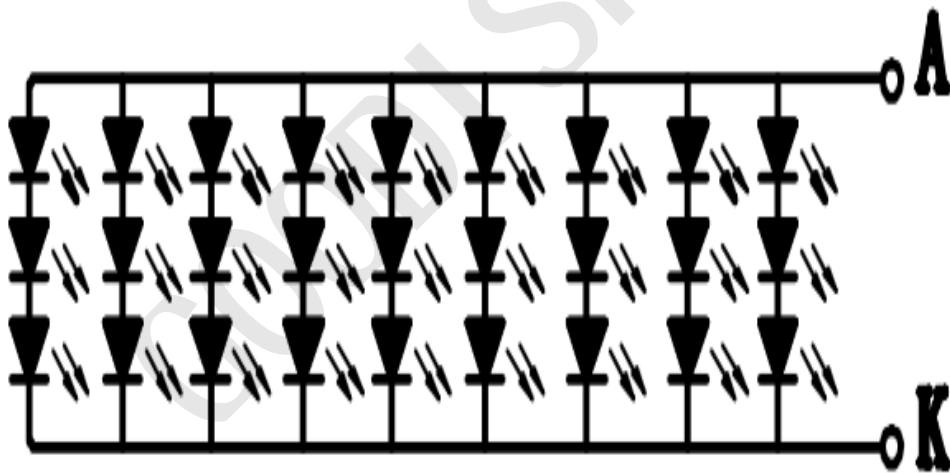
6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	297	--	mA	$T_a=25^{\circ}\text{C}$
LED Voltage	V_F	--	9.6	10.2	Volt	$T_a=25^{\circ}\text{C}$
LED Life-Time	LL	30,000	100,000	--	Hour	$T_a=25^{\circ}\text{C}$ $I_F=297\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm 3^{\circ}\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at $T_a=25^{\circ}\text{C}$ and $I_L=297\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 297mA. The constant current driving method is suggested.

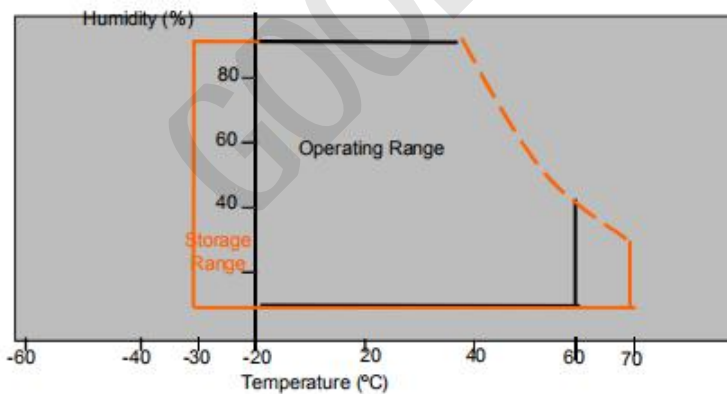
Note (3) LED Light Bar Circuit



7.0 Reliability test items

No.	Item	Condit ions	Remark
1	High Temperature Storage	Ta=+90°C, 500hrs	
2	Low Temperature Storage	Ta=-40°C, 500hrs	
3	High Temperature Operation	Ta=+85°C, 500hrs	
4	Low Temperature Operation	Ta=-30°C, 500hrs	
5	Thermal Cycling Test (non operation)	-40°C(30min)→+90°C(30min), 300 cycles	
6	Vibration	Sine Wave 1.5G, 5~500Hz, XYZ 30min/each direction	
7	Shock	Half-Sine, 200G, 2ms, ±XYZ, 1time	
8	ESD	C=150pF , R=330 5point/panel Air : ±15KV , 5times Contact:±8KV,5times (Environment:15 ~35 , 30%~ 60% , 86Kpa~106Kpa)	Class B

Storage / Operating temperature

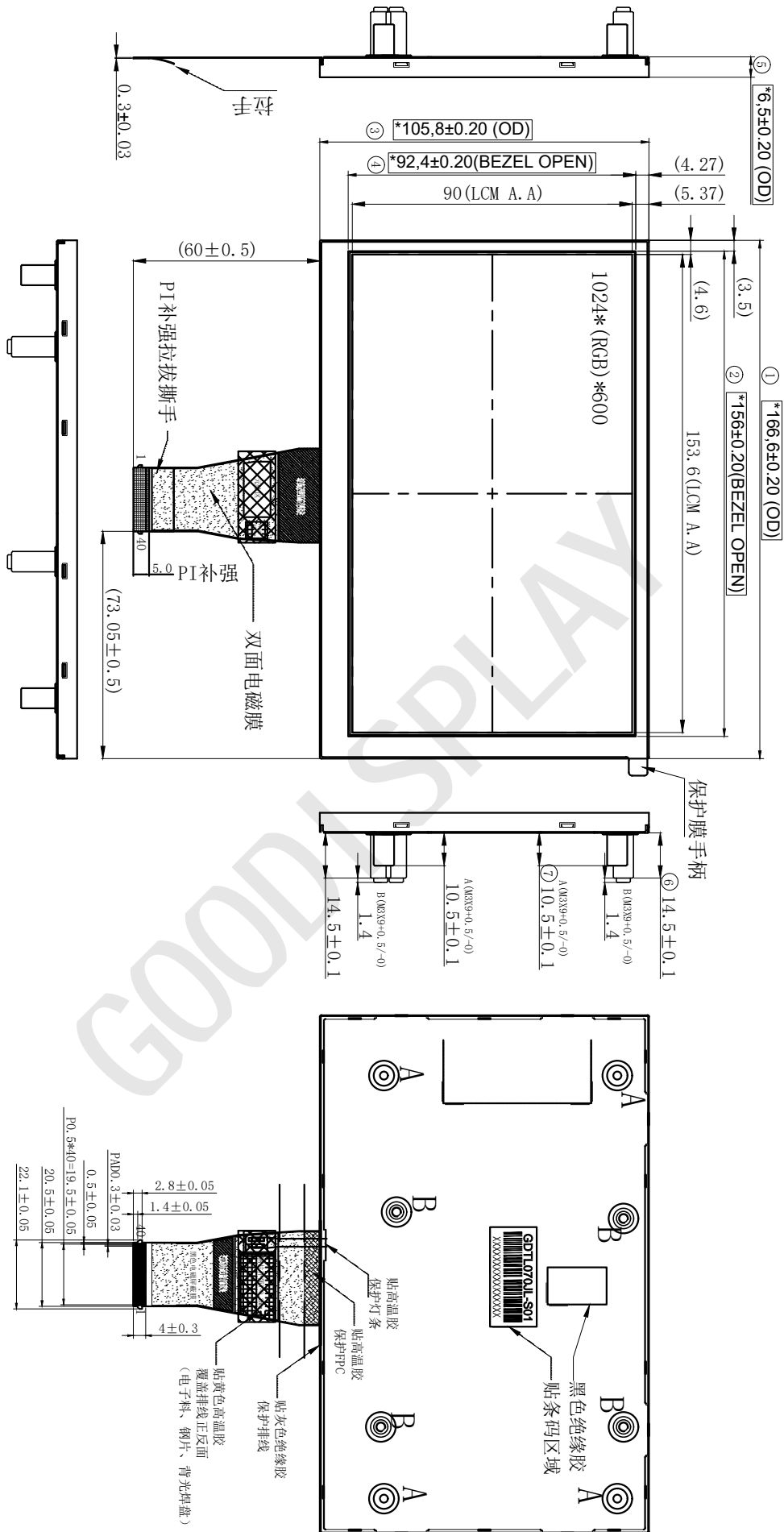


Note .Max wet bulb temp.=39°C

8.0 OUTLINE DIMENSION

8.1 Front View Outline Dimension

Unit : mm



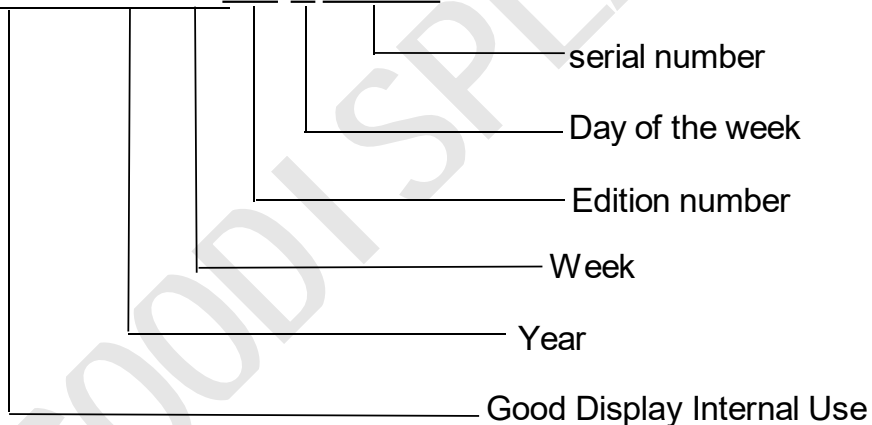
9.0 GOOD DISPLAY MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Model Name: GDTL070JL-S01

(b) Serial ID: X X X X X XX XX X X X X X X X



Serial ID includes the information as below:

(a) Manufactured Date:

Year: 00~99, ... 2019=19, 2020=20, 2021=21..., 2028=28.

Week: 01~56, first week of the year=01; second week of the year=02; ...

Day of the week: A~G=Monday~Sunday

(b) Edition number: cover all the change; A1, A2... Sample order;

C for mass production, C1, C2... change of order

(c) Serial No.: Manufacturing sequence of product