

TFT-LCD MODULE SPECIFITION FOR APPROVAL

CUSTOMER MODEL NO.: _____
FX MODEL NO : RXK070HSD-16MZ
(HSD070IDW1-A20)

ALL MATERIAL AGREE WITH RoHS

FOR CUSTOMER APPROVAL	SUPPLIER SIGNATURE
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APPROVAL DATE:	MAKE DATE:
	2010. 11.24

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model SOL070D18-D 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 WVGA (800 horizontal by 480 vertical pixel) resolution.

1.2 Features

- 7 (16:9 diagonal) inch configuration.
- 6 bits + FRC driver with 1channel TTL interface
- LED Backlight
- Up/Down, Left/Right reversion selection

1.3 Applications

- Mobile NB
- Digital Photo frame
- Multimedia applications and Others AV system

1.4 General information

Item	Specification	Unit
Screen Size	7.0 inches	Diagonal
Number of Pixel	800 RGB (H) x 480(V)	Pixels
Display area	153.6(H) x 86.64(V)	mm
Outline Dimension	164.9 x 100.0 x 5.7 (Typ.)	mm
Display mode	Normally white	--
Pixel arrangement	RGB Vertical stripe	--
Pixel pitch	0.192(H) x 0.1805(V)	mm
Back-light	Single LED (Side-Light type)	--
Surface treatment	Antiglare, Hard-Coating (3H) with EWV film	--

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal (H)	164.6	164.9	165.2	mm
	Vertical (V)	99.7	100.0	100.3	mm
	Depth (D)	5.3	5.7	6.0	mm
Weight		--	170	--	g

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

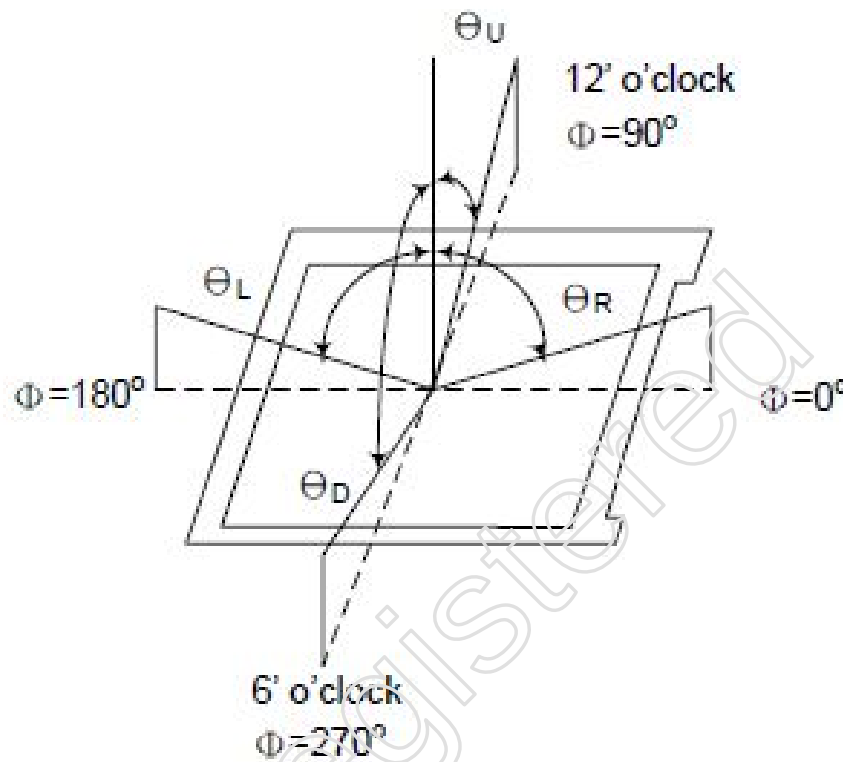
Item		Symbol	Condition	Min	Type	Max	Unit	Note
White luminance (Center)		YL	$\theta=0$ Normal Viewing Angle	150	200		cd/m ²	(1)(4) (IL= mA)
Response time		T _r		-	5	7	msec	(1)(3)
		T _f		--	20	28		
Contrast ratio		CR		400	500	--	--	(1)(2)
Color Chromaticity (CIE 1931)	white	W _x		0.260	0.310	0.360		
		W _y		0.280	0.330	0.380		
Viewing Angle	Hor.	Θ _L	CR≥10	60	75	--		(1)(4)
		Θ _R		60	75	--		
	Ver.	Θ _U		40	60	--		
		Θ _D		50	70	--		
Brightness uniformity		B _{UNI}	Θ=0	70	--	--	%	(5)(7)
Optima View Direction		6 O' clock						(6)

3.2 Measuring Condition

- Measuring surrounding: dark room
- LED current IL: 100 mA
- Ambient temperature: 25±2oC
- 15min. warm-up time

3.3 Measuring Equipment

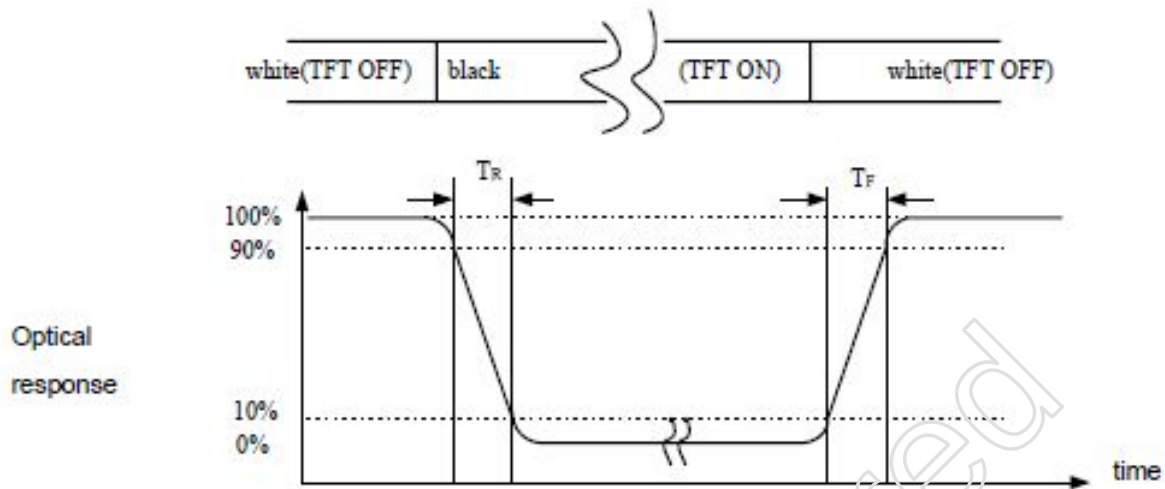
- FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.
- Measuring spot size: 20 ~ 21mm

Note (1) Definition of Viewing Angle**Note (2) Definition of Contrast Ratio (CR):**

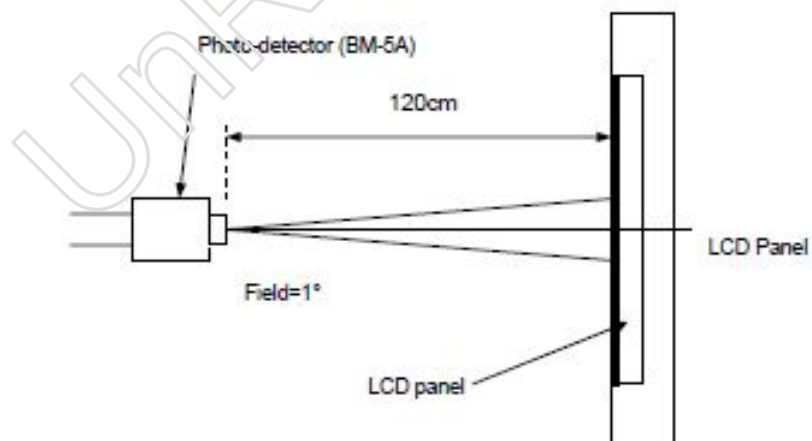
Measured at the center point of panel

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

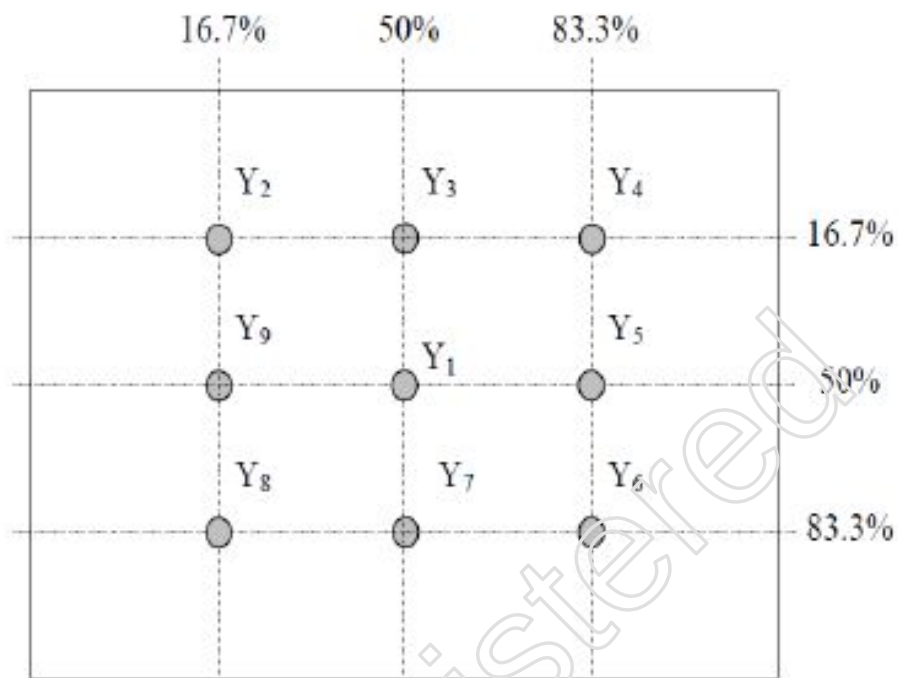
Note (3) Definition of Response Time: Sum of T_R and T_F



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity



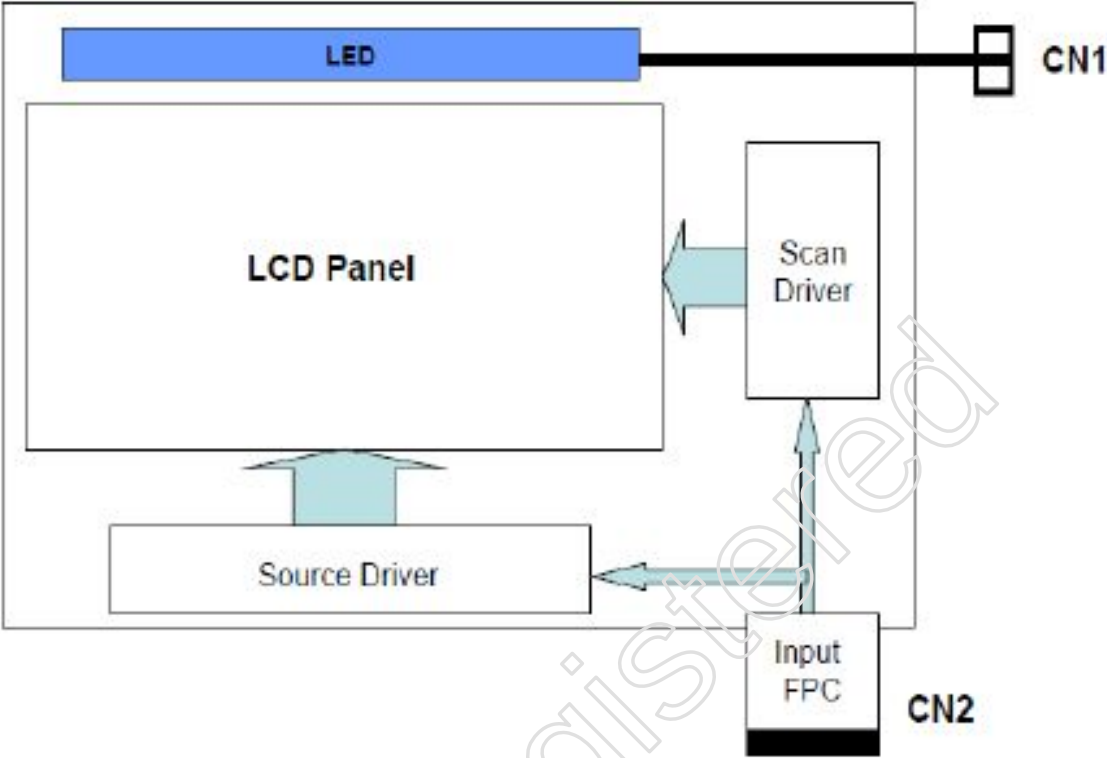
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

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

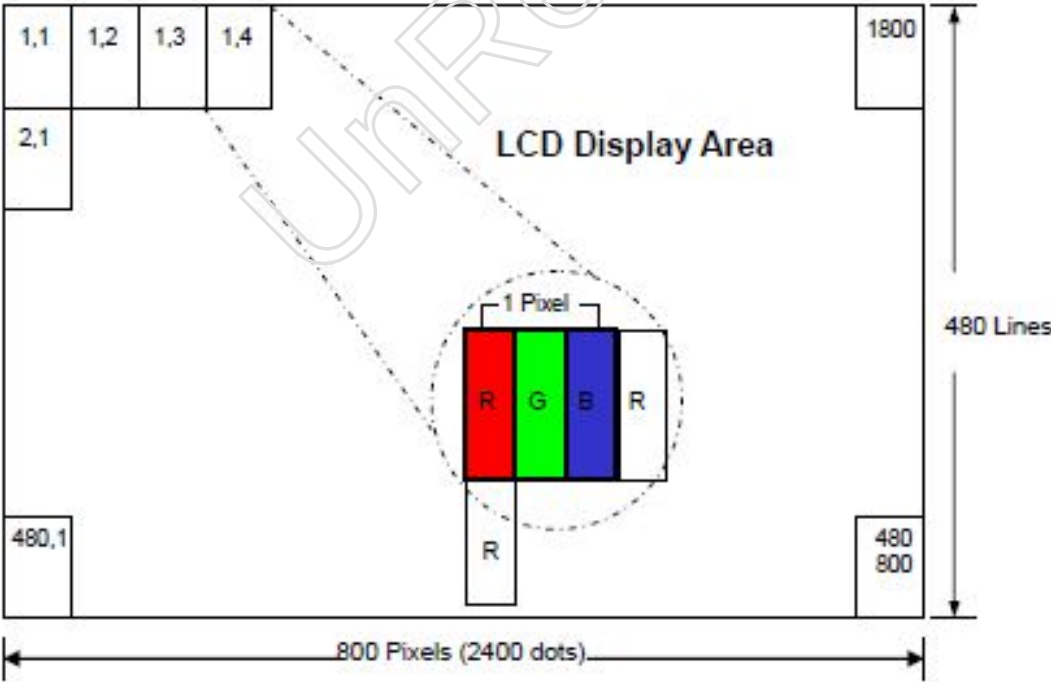
Note (7) Measured at the brightness of the panel when all terminals of LCD panel are electrically open.

4.0 BLOCK DIAGRAM

4.1 TFT LCD Module



4.2 Pixel Format



5.0 INPUT INTERFACE PIN ASSIGNMENT

5.1 TFT LCD Module

CN2 (Input signal): FPC Down Connector, (FH28-60S-0.5SH (HIROSE), 60pin,pitch = 0.5mm)

Pin No.	Symbol	I/O	Function
1	AGND	P	Analog Ground
2	AVDD	P	Analog Power
3	VCC	P	Digital Power
4	R0	I	Data Input(LSB)
5	R1	I	Data Input
6	R2	I	Data Input
7	R3	I	Data Input
8	R4	I	Data Input
9	R5	I	Data Input
10	R6	I	Data Input
11	R7	I	Data Input(MSB)
12	G0	I	Data Input(LSB)
13	G1	I	Data Input
14	G2	I	Data Input
15	G3	I	Data Input
16	G4	I	Data Input
17	G5	I	Data Input
18	G6	I	Data Input
19	G7	I	Data Input(MSB)
20	B0	I	Data Input(LSB)
21	B1	I	Data Input
22	B2	I	Data Input
23	B3	I	Data Input
24	B4	I	Data Input
25	B5	I	Data Input
26	B6	I	Data Input
27	B7	I	Data Input(MSB)
28	DCLK	I	Clock input
29	DE	I	Data Enable signal
30	HSD	I	Horizontal sync input.Negative polarity
31	VSD	I	Vertical sync input.Negative polarity
32	MODE3	I	DE/SYNC mode select .normally pull high H:DE mode.L:HSD/VSD mode

33	RSTB	I	global reset pin.Active low to enter reset state.suggest to connecting with an RC reset circuit for stability .normally pull high.
34	STBYB	I	standby mode,normally pull high STBYB="1",normal operation STBYB="0",timming control ,sorce driver will turn off,all output are high-Z
35	SHLR	I	Source right or left sequence control.SHLR="L",shift left:last data=S1<-S2...S1200=first data SHLR="H",shift right:first data=S1->SS2...S1200=last data
36	VCC	P	Digital Power
37	UPDN	I	gate up or down scan control. UPDN="L" , DOWN shift : G1->G2...->G480 ; UPDN="H", up shift: G1<-G2...<-G480
38	GND	P	Digital Ground
39	AGND	P	Analog Ground
40	AVDD	P	Analog Power
41	VCOMin	I	For external VCOM DC input(Optional)
42	DITH	I	Dithering setting: DITH="H" 6bit resolution (last 2 bits of input data truncated) (default setting) DITH="L" 8bit resolution
43	NC	-	Not connect
44	NC	-	Not connect
45	V10	P	Gamma correction voltage reference
46	V9	P	Gamma correction voltage reference
47	V8	P	Gamma correction voltage reference
48	V7	P	Gamma correction voltage reference
49	V6	P	Gamma correction voltage reference
50	V5	P	Gamma correction voltage reference
51	V4	P	Gamma correction voltage reference
52	V3	P	Gamma correction voltage reference
53	V2	P	Gamma correction voltage reference
54	V1	P	Gamma correction voltage reference
55	NC	-	Not connect
56	VGH	P	Positive Power for TFT
57	VCC	P	Digital Power
58	VGL	P	Negative Power for TFT
59	GND	P	Digital Ground
60	NC	-	Not connect

5.2 Back-Light Unit

CN1 LED Power Source (BHSR-02VS-1) or equivalent

Mating Connector: (SBHT-002T-P0.5) or equivalent

Terminal no.	Symbol	Function
1	VL	LED power supply (high voltage)
2	GL	LED power supply (high voltage)

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage	Vcc	2.7	3.0	3.5	V	
	VGH	14.5	15	20	V	
	VGL	-10	-7	-6.5	V	
	AVDD	9.85	10	10.15	V	
VCOM	VCOMin	--	3.9	--	V	
Input signal Voltage	ViH	0.7 Vcc	-	Vcc	V	Note (1)
	ViL	0	-	0.3 Vcc	V	
Current of Power Supply	IDD	--	5.426	--	mA	Vcc =3.3V
	IADD	--	24.1	--	mA	AVDD=10V(Black)
	IGH	--	0.128	--	mA	VGH=15V
	IGL	--	0.344	--	mA	VGL= -7V
Input level of V1~V5	Vx	AVDD/2-		AVDD-0.1-	V	
Input level of V6~V10	Vx	0.1-		AVDD/2-	V	

Note (1): HSYNC, VSYNC, DE, R/G/B Data

Note (2): Be sure to apply the power voltage as the power sequence spec.

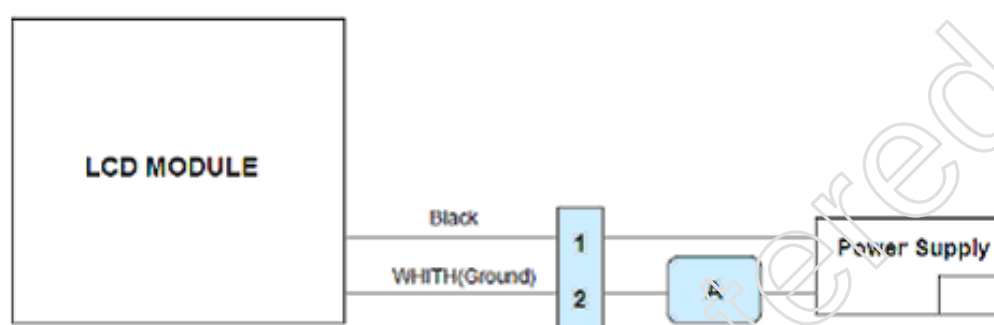
Note (3): DGND=AGND=0V

6.2 Back-Light Unit

The backlight system is an edge-lighting type with 12 LED.

The characteristics of the LED are shown in the following tables.

Item	Symbol	Min	Typ	Max	Unit	Note
LED current	IL	-	100	-	mA	(2)
LED voltage	VL	-	9.6	10.2	V	
Operating LED life time	Hr	20000	-	-	Hour	(1)(2)



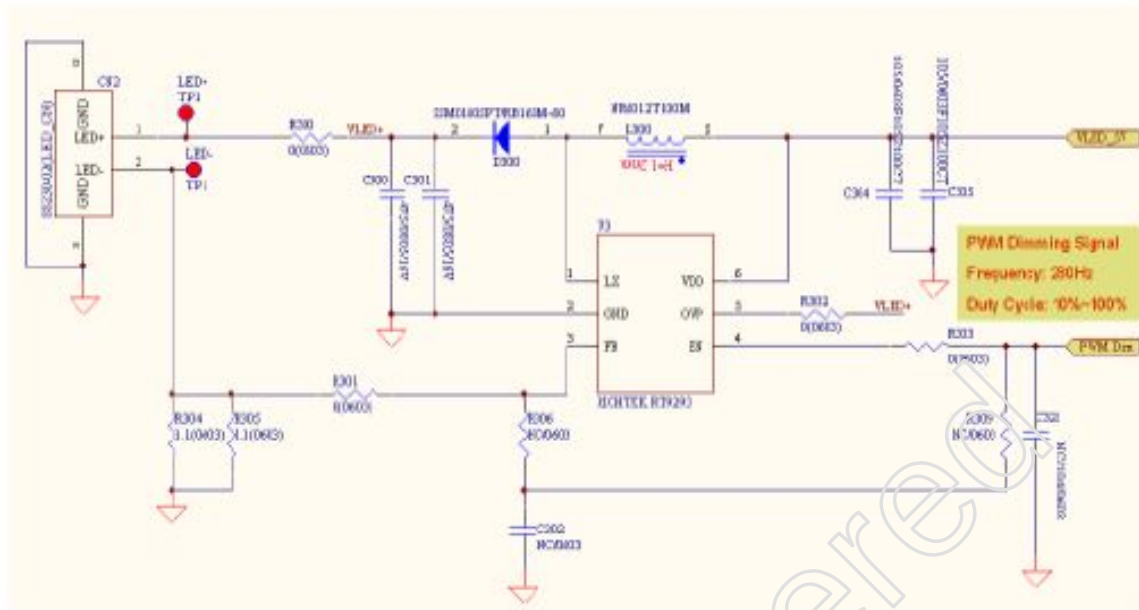
Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: $T_a=25\pm3^\circ\text{C}$, typical IL value indicated in the above table until the brightness becomes less than 50%.

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 $IL=100\text{mA}$. The LED lifetime could be decreased if operating IL is larger than 100mA. The constant current driving method is suggested.



LED Light Bar Circuit

Note (3) Suggested Schematic of LED Back-Light Driver

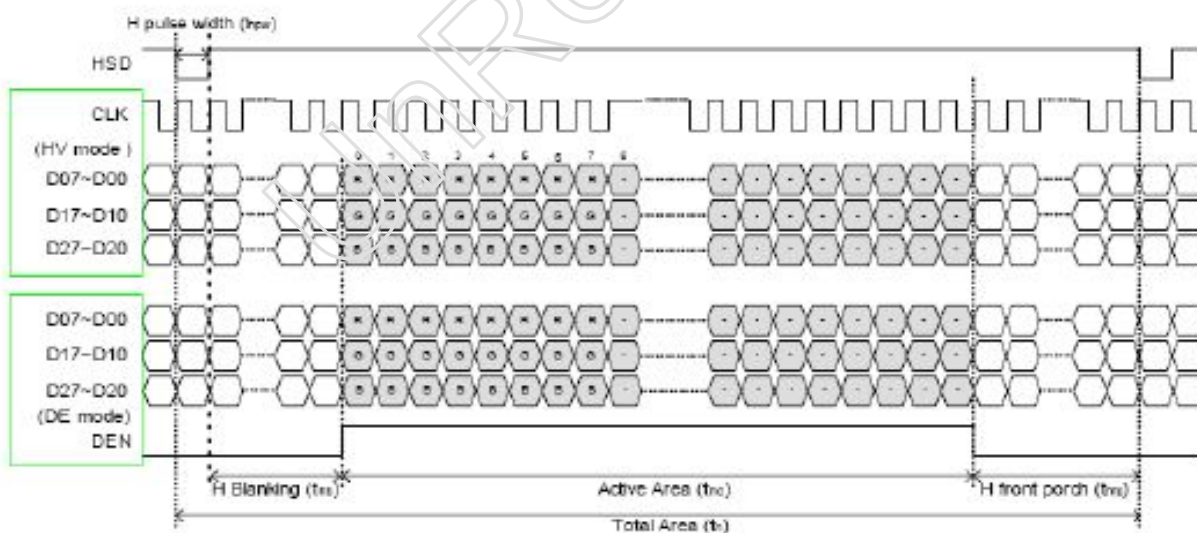
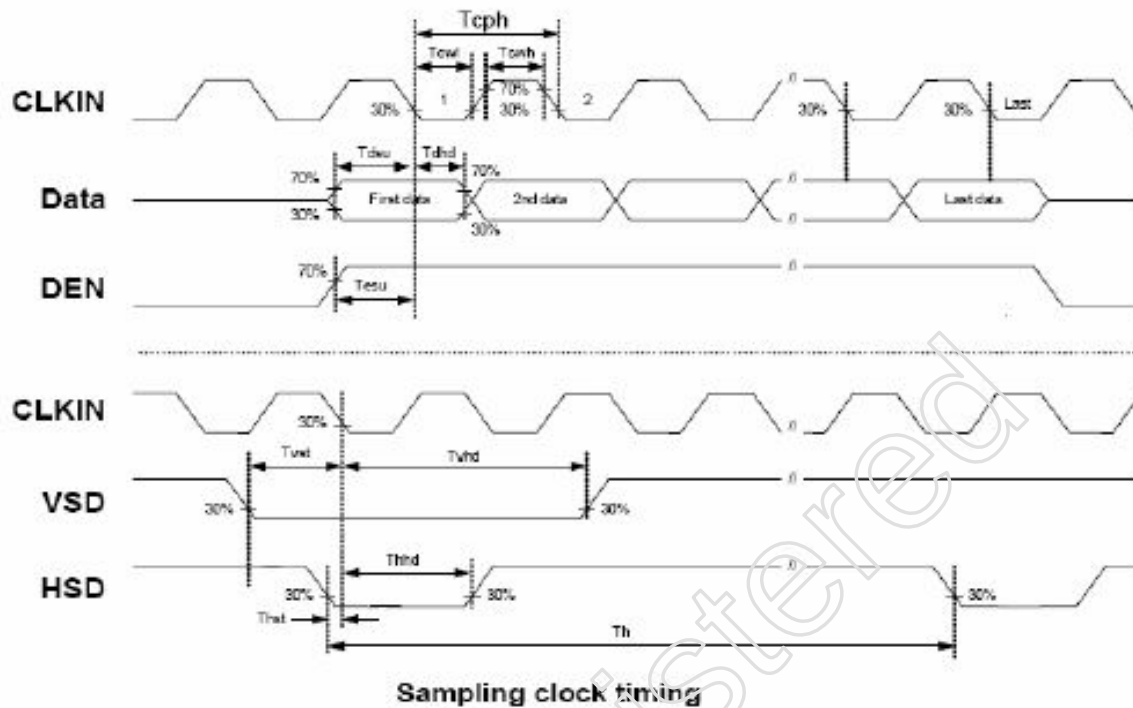


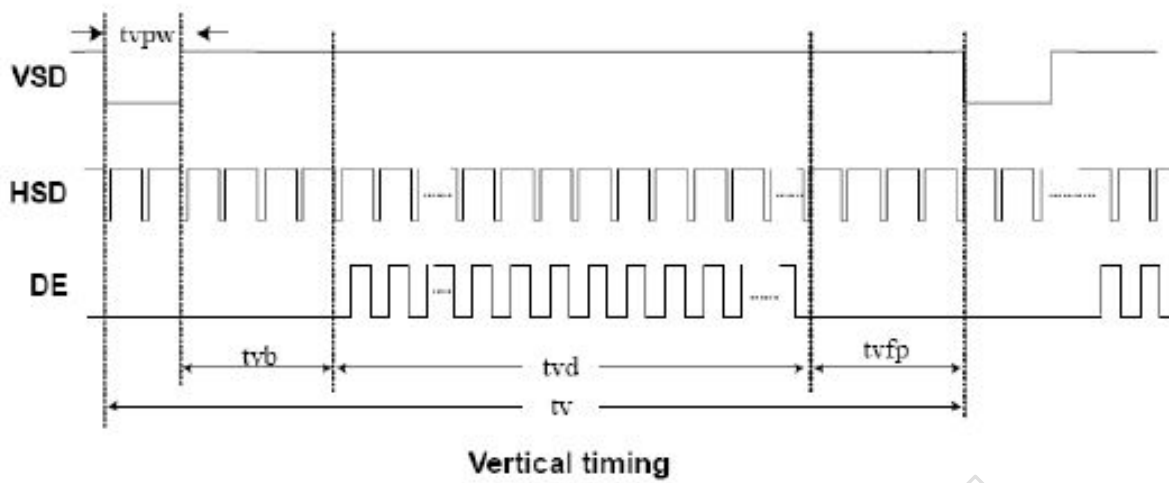
Suggested Schematic of LED Back-Light Driver

6.3 AC Characteristics

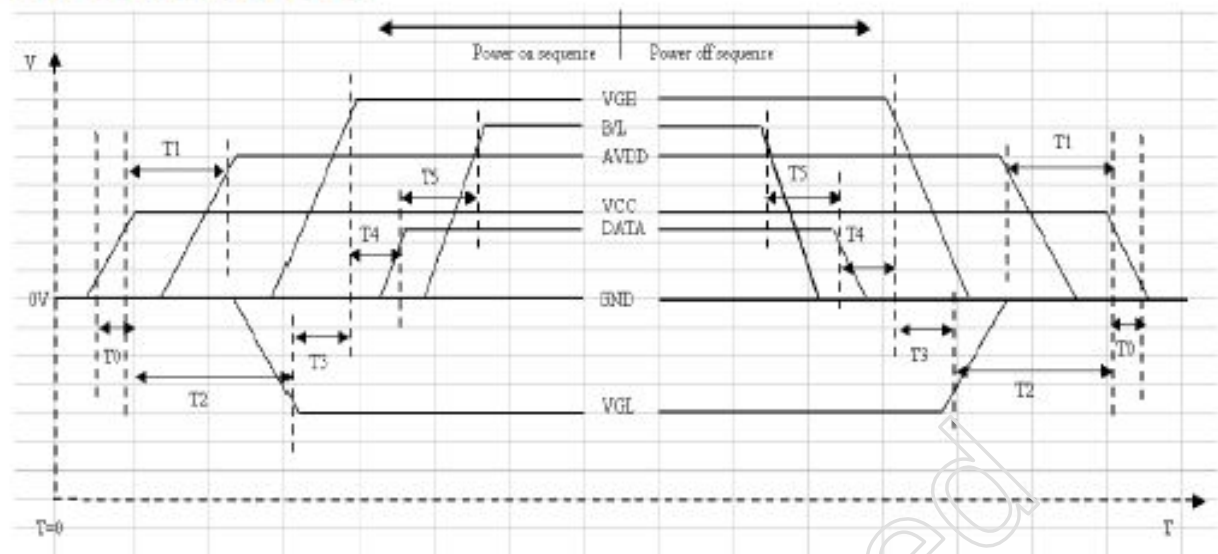
Item	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK cycle time	Tcph	25	-	-	ns	
DCLK frequency	Fclk	-	30	40	MHz	
DCLK pulse duty	Tcwh	40	50	60	%	
VSD setup time	Tvst	8			ns	
VSD hold time	Tvhd	8			ns	
HSD setup time	Thst	8			ns	
HSD hold time	Thhd	8			ns	
Data setup time	Tdasu	8		-	ns	
Data hold time	Tdhd	8		-	ns	
DE setup time	Tesu	8		-	ns	
DE hold time	Tehd	8		-	ns	
Horizontal display area	Thd		800	-	Tcph	
HSD period time	Th		928	-	Tcph	
HSD pulse width	Thpw	1	48	-	Tcph	
HSD back porch	Thb		40	-	Tcph	
HSD front porch	Thfp		40	-	Tcph	
Vertical display area	Tvd		480	-	th	
VSD period time	Tv		525	-	th	
VSD width	Tvpw		3	-	th	
VSD back porch	Tvb		29	-	th	
VSD front porch	Tvfp		13	-	th	

6.4 Timing Diagram of Interface Signal

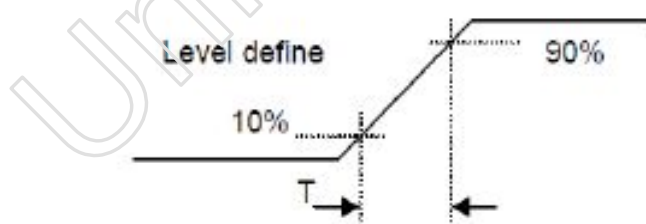




6.5 Power Sequence



Item	Min.	Typ.	Max.	Unit
T0	0.5	—	20	msec
T1	16			msec
T2	20			msec
T3	10			msec
T4	10		50	msec
T5	50			msec

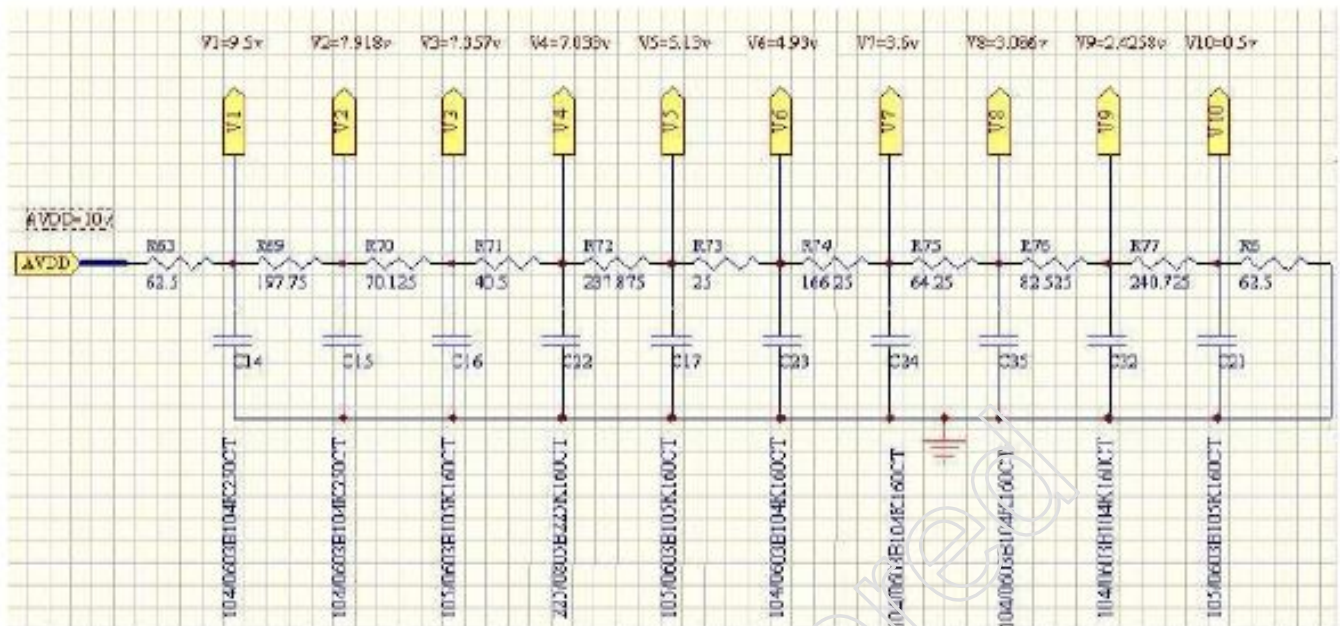


Power On Sequence: VCC → AVDD → VGL → VGH → Data → B/L

Power Off Sequence: B/L → Data → VGH → VGL → AVDD → VCC

Notes : Data include R0~R7, G0~G7, B0~B7, HSD, VSD, DCLK, SHLR, UPDN, DE
MODE, RSTB, STBYB, SHLR, UPDN, DITH

6.6 Gamma circuit



** Suggested Gamma Circuit.

**

7.0 RELIABILITY TEST ITEMS

No.	Item	Conditions	Notes
1	High Temperature Storage	Ta=+80 °C, 240hrs	
2	Low Temperature Storage	Ta=-30 °C, 240hrs	
3	High Temperature Operation	Ta=+70 °C, 240hrs	
4	Low Temperature Operation	Ta=-20 °C, 240hrs	
5	High Temperature and High Humidity (operation)	Ta=+60 °C, 90%RH, 240hrs	
6	Thermal Cycling Test (non operation)	-30 °C (30min) → +80 °C (30min), 200cycles	
7	Electrostatic Discharge	±200V, 200pF(0Ω) 1 time/each terminal	
8	Vibration	1.Random: 1.04Grms, 5~500Hz, X/Y/Z, 30min/each direction 2. Sine: Freq. Range: 8~33.3Hz Stoke: 1.3mm Sweep: 2.9G, 33.3~400Hz X/Z: 2hr, Y: 4hr, cyc: 15min	
9	Shock	100G, 6ms, ±X, ±Y, ±Z 3 time for each direction	JIS C7021, A-10 (Condition A)
10	Vibration (with carton)	Random: 0.015G ² /Hz, 5~200Hz -6dB/Octave, 200~400Hz XYZ each direction: 2hr	
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	JIS Z0202

Note: There is no display function NG issue occurred, all the cosmetic specification is judged before the reliability stress.

8.0 Precautions

8.1 Operation

Burn-in sometimes happens when the same character was displayed at along time. Therefore, to prevent Burn-in, it is recommended to set up a Screen-saver function.

8.2 Safety

The liquid crystal in the LCD is poisonous, DO NOT put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

8.3 Handling

	a. The LCD module shall be installed flat, without twisting or bending. b. COF or FPC has narrow pattern width, so easily become open circuit by external force. DO NOT apply pressure to COF or FPC especially in bending area.
	c. To avoid damage in appearance or malfunction, DO NOT subject the module to mechanical shock or to excessive force on its surface.
	d. The polarizer attached to the display is very easy to damage, handle it with care to avoid scratching.
	e. To avoid contamination on the display surface, DO NOT touch the display surface with bare hands. f. Provide a space so that the LCD module does not come into contact with other components.

	g. To protect the LCD panel from external pressure, put covering glass (acrylic board or similar board) to keep appropriate space between them.
	h. Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
	i. Property of semiconductor devices may be affected when they are exposed to light possibly resulting in malfunctioning of the ICs. To prevent such malfunctioning of the ICs, your design and mounting layout done are so that the IC is not exposed to light in actual use.
	j. Strong light exposure causes degradation of color filter. It may not recover
	k. DO NOT contact with water to avoid Metal corrosion. l. When it is not in use, the screen must be turned off or the pattern must be frequently changed by a screen saver. If it displays the same pattern for a long period of time, brightness down/image sticking may develop due to the LCD structure.
	m. Never disassemble LCD product under any circumstances. If unqualified operators or users assemble the product after disassembling it, it may not function or its operation may be seriously affected.

8.4 Static Electricity

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge.



- The LCD module shall be installed flat, without twisting or bending. Ground soldering iron tips, tools and testers when they operate.
- Ground your body when handling the products.
- DO NOT apply voltage to the input terminal without applying power supply.
- DO NOT apply voltage that exceeds the absolute maximum rating.
- Store the products in an anti-electrostatic container.
- Peel off protect tape, attached to polarizer, slowly to minimize ESD damage.

8.5 Storage



Store the products in a dark place at $+5 \sim +25$ degree C, low humidity (50%RH or less).

DO NOT store the products in an atmosphere containing organic solvents or corrosive gases.

8.6 Cleaning



- DO NOT wipe the polarizer with dry cloth, as it might cause scratch.
- Wipe the polarizer with a soft cloth soaked with petroleum IPA, other chemical might damage.

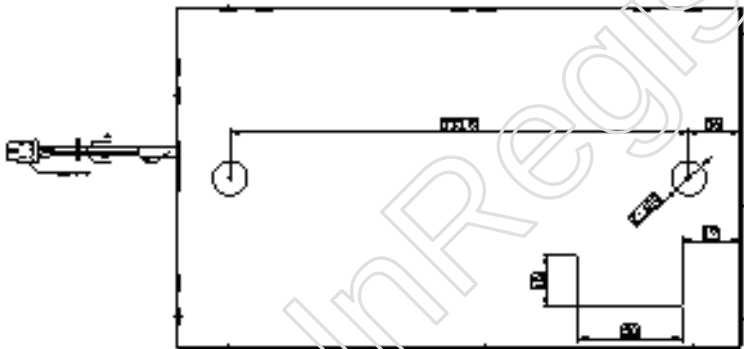
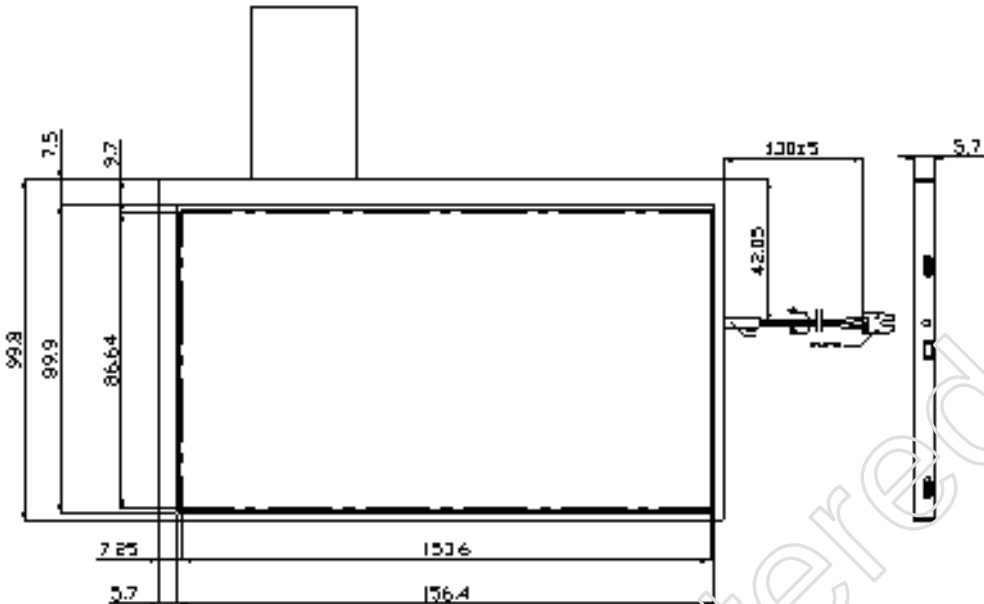
8.7 Waste



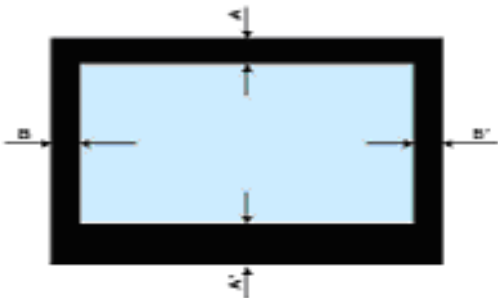
When dispose of LCD module, manage it at the production waste according to the relevant laws and regulations.

9.0 OUTLINE DIMENSION

Unit: mm



BM Assembly Tolerance



BM Assembly Tolerance

$|A - A'| \leq 2 \text{ (mm)}$
 $|B - B'| \leq 1 \text{ (mm)}$

10.0 LOT MARK

10.1 Lot Mark

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----

code 1,2,3,4,5,: SOLA internal flow control code.

code 6: production location.

code 7,8: production year.

code 9,10: production month.

code 11,12,13,14,15,16: serial number.

Note (1) Production Year: Code 7,8 is defined by the last number of the year, for example

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mark	09	10	11	12	13	14	15	16	17

Note (2) Production Month

Month	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Mark	08	09	10	11	12	01	02	03	04

10.2 Location of Lot Mark

(1) Location: The label is attached to the backside of the LCD module.

(2) Detail of the Mark: as attached below.

(3) This is subject to change without prior notice.

11. Packaging Drawing

