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Document No.	DC110-001001	Revision	1.0

TO :晶凌達科技

Date :Jan 17, 2012

HannStar Product Specification **(Formal)**

Model: HSD070PFW3
-B

Note:

1. The information contained herein is preliminary and may be changed without prior notices.
2. Please contact HannStar Display Corp. before designing your product based on this module specification.
3. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by HannStar for any intellectual property claims or other problems that may result from application based on the module described herein.

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1.0 GENERAL DESCRIPTION

1.1 Introduction

HannStar Display model HSD070PFW3-B01 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 (17:10) inch diagonally measured active display area with WSVGA (1024 horizontal by 600 vertical pixel) resolution.

1.2 Features

- 7 inch (17:10 diagonal) configuration
- 16.7M color by 6 bit+HiFRC R.G.B signal input
- RoHS/ Halogen Free Compliance

1.3 Applications

- Mobile NB
- Digital Photo frame
- Display terminal for AV application

1.4 TFT LCD General information

Item		Specification	Unit
Outline Dimension		165.75 x 105.39 (typ)	mm
Display area		153.6(H) x 90(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		Hard coating with EWV Flim	
Weight		(95g) (Typ.)	g
Back-light		White LED	
Power Consumption	Logic	0.45 (typ) @ Black pattern w/o LED driver Frame rate:60Hz Vdd:3.3v	W
	BL System	1.2 (typ)	W

1.5 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Remark
Module Size	Horizontal (H)	165.45	165.75	166.05	mm	
	Vertical (V)	105.09	105.39	105.69	mm	
	Depth (D)	—	3.4	3.7	mm	
Weight		—	(95)	—	g	

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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	--	120	mA	(1) (2)(3)
LED voltage	V_L	9.6	10.2	V	(1) (2)(3)
LED reverse voltage	V_R	--	5	V	
LED forward current	I_F		20	mA	

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) $T_a = 25 \pm 2^\circ\text{C}$
- (3) Test Condition: LED current 120 mA. The LED lifetime could be decreased if operating I_L is larger than 120mA.

2.1.3 Environment Absolute Rating

Item	Symbol	Min.	Max.	Unit	Note
Operating Temperature	T_{opa}	-20	60	$^\circ\text{C}$	
Storage Temperature	T_{stg}	-30	70	$^\circ\text{C}$	

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3.0 OPTICAL CHARACTERISTICS

3.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast		CR	$\Theta = 0$ Normal viewing angle	600	800	—		(1)(2)(4)
Response time		Tr		—	4	8	msec	(1)(3)
		Tf		—	12	24		
White luminance (Center)		Y _L		350	400	—	cd/m ²	(1)(4)
Color chromaticity (CIE1931)	Red	R _x		(0.542)	(0.592)	(0.642)		
		R _y		(0.302)	(0.352)	(0.402)		
	Green	G _x		(0.273)	(0.323)	(0.373)		
		G _y		(0.520)	(0.570)	(0.620)		
	Blue	B _x		(0.107)	(0.157)	(0.207)		
		B _y		(0.049)	(0.099)	(0.149)		
	White	W _x		(0.260)	(0.310)	(0.360)		
		W _y		(0.280)	(0.330)	(0.380)		
Viewing angle	Hor.	Θ_L	CR>10	70	80	—		(1)(4)
		Θ_R		70	80	—		
	Ver.	Θ_U		60	70	—		
		Θ_D		70	80	—		
Brightness uniformity		B _{UNI}	$\Theta = 0$ (9point)	70	75	—		(5)
View Direction		6 O' clock						(6)

3.2 Measuring Condition

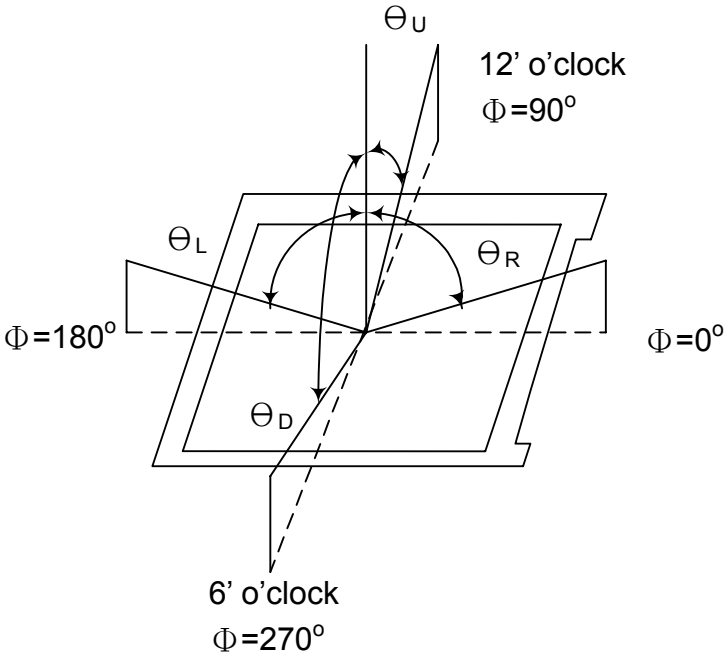
- Measuring surrounding : dark room
- LED current I_L : 120mA
- Ambient temperature : 25±2°C
- 15min. warm-up time.

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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 ~ 21 mm

Note (1) Definition of Viewing Angle:

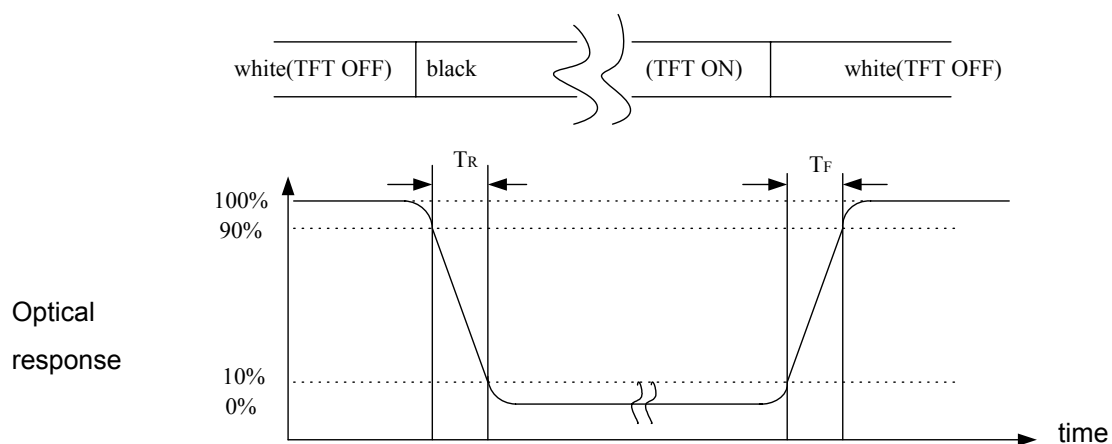


Note (2) Definition of Contrast Ratio (CR) :
measured at the center point of panel

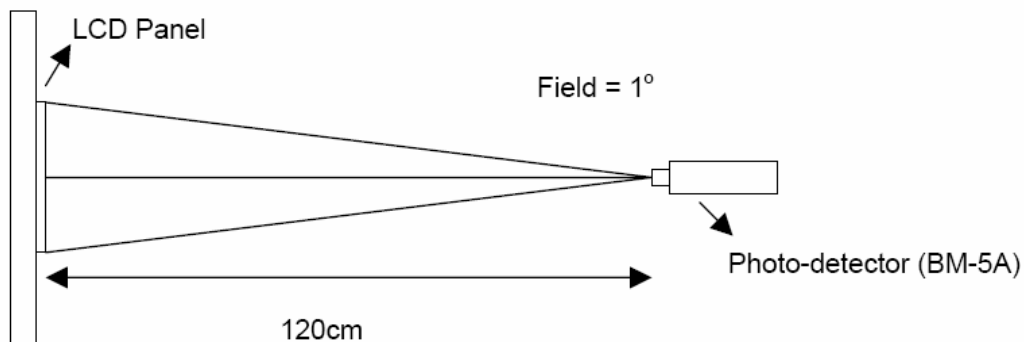
$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

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

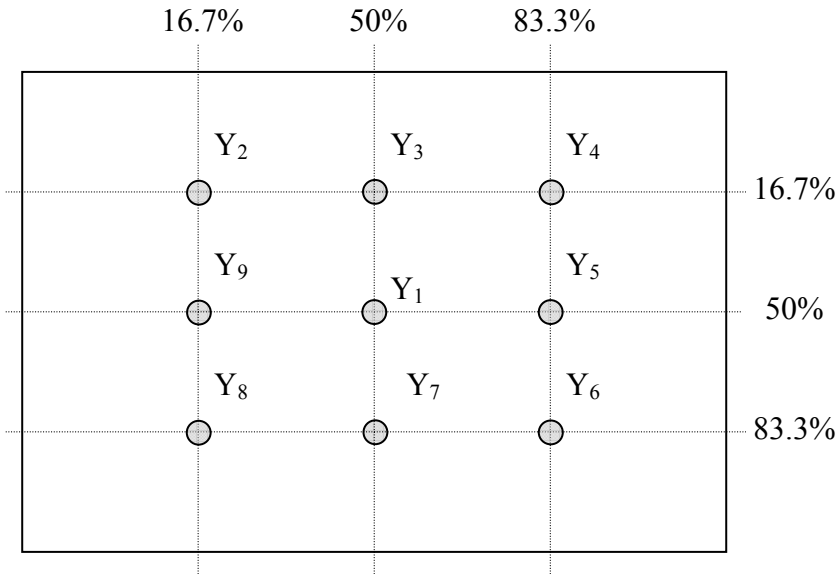


Note (4) Definition of optical measurement setup



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



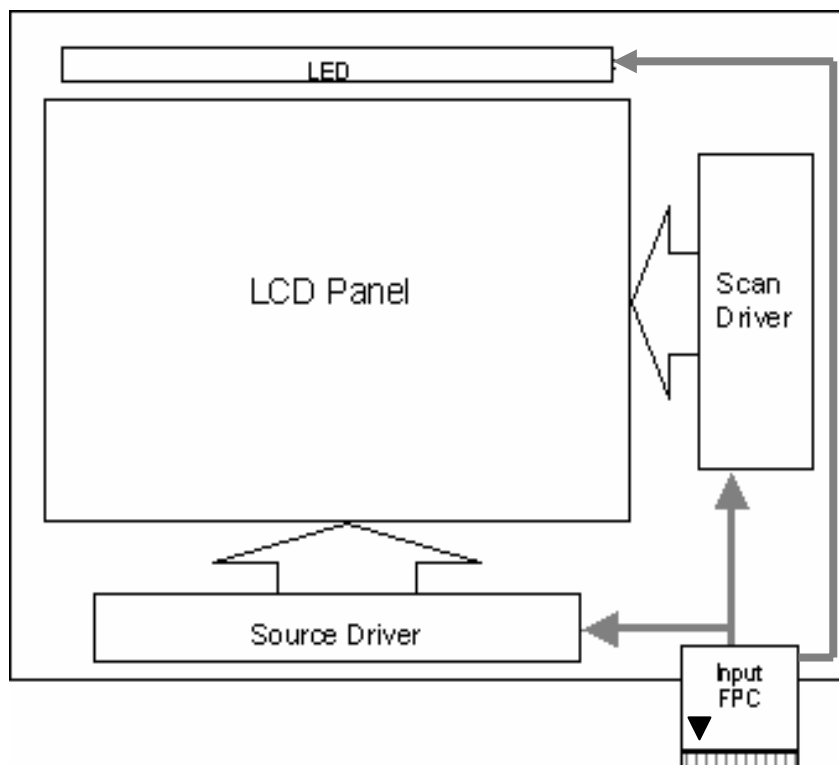
$$\text{Luminance uniformity} = \frac{(\text{Min Luminance of 9 points})}{(\text{Max Luminance of 9 points})} \times 100\%$$

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

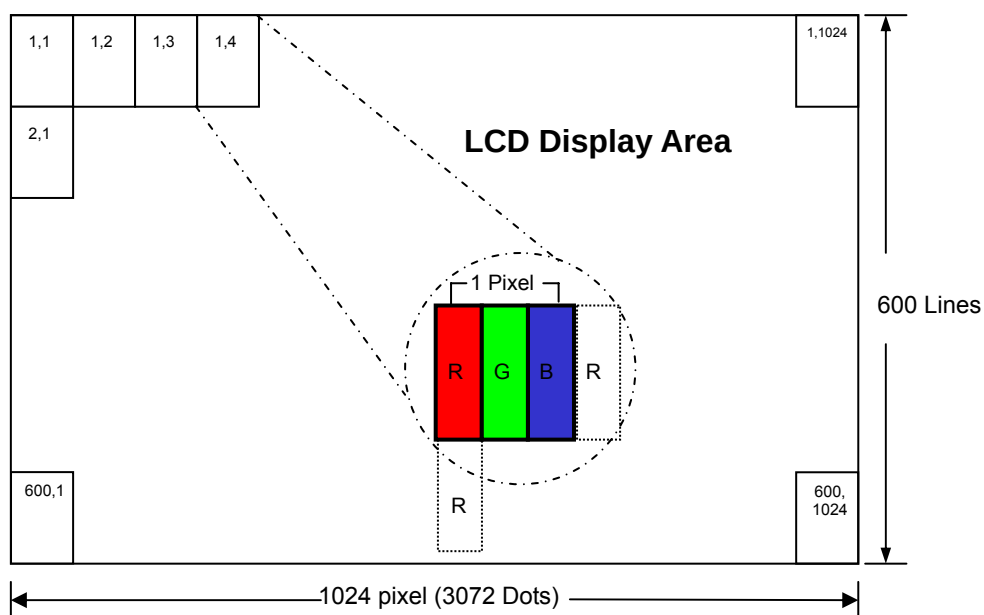
4.0 BLOCK DIAGRAM

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4.1 TFT LCD Module



4.2 Pixel Format



Relationship Between Displayed Color and Input

4.2.1 6bit

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	Display	MSB LSB R5 R4 R3 R2 R1 R0	M L G5 G4 G3 G2G1 G0	S S G5 G4 G3 G2G1 G0	B B B5 B4 B3 B2 B1 B0	Gray scale level
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	H H H H H H	H H H H H H	-
	Green	L L L L L L	H H H H H H	L L L L L L	L L L L L L	-
	Light Blue	L L L L L L	H H H H H H	H H H H H H	H H H H H H	-
	Red	H H H H H H	L L L L L L	L L L L L L	L L L L L L	-
	Purple	H H H H H H	L L L L L L	H H H H H H	H H H H H H	-
	Yellow	H H H H H H	H H H H H H	L L L L 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 ↑ ↓ Light	L L L L L H	L L L L L L	L L L L L L	L L L L L L	L1
		L L L L H L	L L L L L L	L L L L L L	L L L L L L	L2
		:	:	:	:	L3...L60
		H H H H L H	L L L L L L	L L L L L L	L L L L L L	L61
		H H H H H L	L L L L L L	L L L L L L	L L L L L L	L62
	Red	H H H H H H	L L L L L L	L L L L L L	L L L L L L	Red L63
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 ↑ ↓ Light	L L L L L L	L L L L L L	L L L L L L	H L L L L L	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	L2
		:	:	:	:	L3...L60
		L L L L L L	H H H H L H	L L L L L L	L L L L L L	L61
		L L L L L L	H H H H H L	L L L L L L	L L L L L L	L62
	Green	L L L L L L	H H H H H H	L L L L L L	L L L L L L	Green L63
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 ↑ ↓ Light	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 H L	L2
		:	:	:	:	L3...L60
		L L L L L L	L L L L L L	H H H H L H	L L L L L L	L61
		L L L L L L	L L L L L L	H H H H H L	L L L L L L	L62
	Blue	L L L L L L	L L L L L L	H H H H H H	H H H H H H	Blue L63
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 ↑ ↓ Light	L L L L L H	L L L L L L	L L L L L L	L L L L L H	L1
		L L L L H L	L L L L L L	L L L L L L	L L L L H L	L2
		:	:	:	:	L3...L60
		H H H H L H	H H H H L H	H H H H L H	H H H H L H	L61
		H H H H H L	H H H H H L	H H H H H L	H H H H H L	L62
	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 L63

4.2.2 8bit

	MSB	LSB	MSB	LSB	MSB	LSB	Gray scale
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	Display	R7 R6 R5 R4 R3 R2 R1 R0	G7 G6 G5 G4 G3 G2 G1 G0	B7 B6 B5 B4 B3 B2 B1 B0	Level
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 ↑ ↓ Light	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 H L	L L L L L L L L	L L L L L L L L	L2
		:	:	:	L3...L251
		H H H H H H L L	L L L L L L L L	L L L L L L L L	L252
		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 L	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 ↑ ↓ Light	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 L L L L L H L	L L L L L L L L	L2
		:	:	:	L3...L251
		L L L L L L L L	H H H H H H L L	L L L L L L L L	L252
		L L L L L L L L	H H H H H H L H	L L L L L L L L	L253
		L L L L L L L L	H H H H H H H L	L L L L L L L L	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 ↑ ↓ Light	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 H L	L2
		:	:	:	L3...L251
		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	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	H H H H H H 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 ↑ ↓ Light	L L L L L L L H	L L L L L L L H	L L L L L L L H	L1
		L L L L L L H L	L L L L L L H L	L L L L L L H L	L2
		:	:	:	L3...L251
		H H H H H H L L	H H H H H H L L	H H H H H H L L	L252
		H H H H H H L H	H H H H H H L H	H H H H H H L H	L253
		H H H H H H H L	H H H H H H H L	H H H H H H 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

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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	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	
7	GND	P	Ground	
8	RXIN0-	I	- LVDS differential data input	
9	RXIN0+	I	+ LVDS differential data input	
10	GND	P	Ground	
11	RXIN1-	I	- LVDS differential data input	
12	RXIN1+	I	+ LVDS differential data input	
13	GND	P	Ground	
14	RXIN2-	I	- LVDS differential data input	
15	RXIN2+	I	+ LVDS differential data input	
16	GND	P	Ground	
17	RXCLKIN-	I	- LVDS differential clock input	
18	RXCLKIN+	I	+ LVDS differential clock input	
19	GND	P	Ground	
20	RXIN3-	I	- LVDS differential data input	
21	RXIN3+	I	+ LVDS differential data input	
22	GND	P	Ground	
23	NC	---	No connection	
24	NC	---	No connection	
25	GND	P	Ground	
26	NC	---	No connection	
27	NC	---	No connection	
28	SELB	I	6bit/8bit mode selection	Note2
29	AVDD	P	Power for Analog Circuit	
30	GND	P	Ground	

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Pin No.	Symbol	I/O	Function	Note
31	LED-	P	LED Cathode	
32	LED-	P	LED Cathode	
33	L/R	I	Horizontal inversion	Note3
34	U/D	I	Vertical inversion	Note3
35	VGL	P	Gate off Voltage	
36	NC	---	No connection	
37	NC	---	No connection	
38	VGH	P	Gate ON Voltage	
39	LED+	P	LED Anode	
40	LED+	P	LED Anode	

I: 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=10K Ω , C=0.1 μ F)

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

Note2 : 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.

Note3 : 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.

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6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Supply Voltage	V _{DD}	3.0	3.3	3.6	V	
	V _{GH}	19.7	20	20.3	V	
	V _{GL}	-6.5	-6.8	-7.1	V	
	AV _{DD}	10.8	11	11.2	V	
VCOM	VCOMin	3.46	3.66	3.86	V	
Input signal voltage	V _{iH}	0.7 V _{DD}	-	V _{DD}	V	Note (1)
	V _{iL}	0	-	0.3 V _{DD}	V	
Current of power supply	I _{DD}	-	20.8	-	mA	V _{DD} =3.3V
	I _{ADD}	-	33.3	-	mA	AV _{DD} =11V
	I _{GH}	-	0.4	-	mA	V _{GH} =20V
	I _{GL}	-	0.9	-	mA	V _{GL} =-6.8V

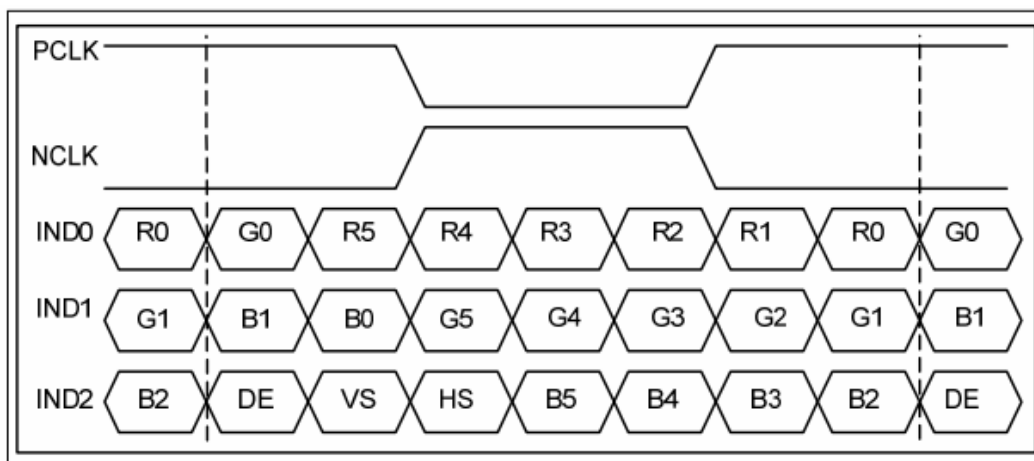
6.2 Switching Characteristics for LVDS Receiver

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	V _{th}	—	—	100	mV	V _{CM} =1.2V
Differential Input Low Threshold	V _{tl}	-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	

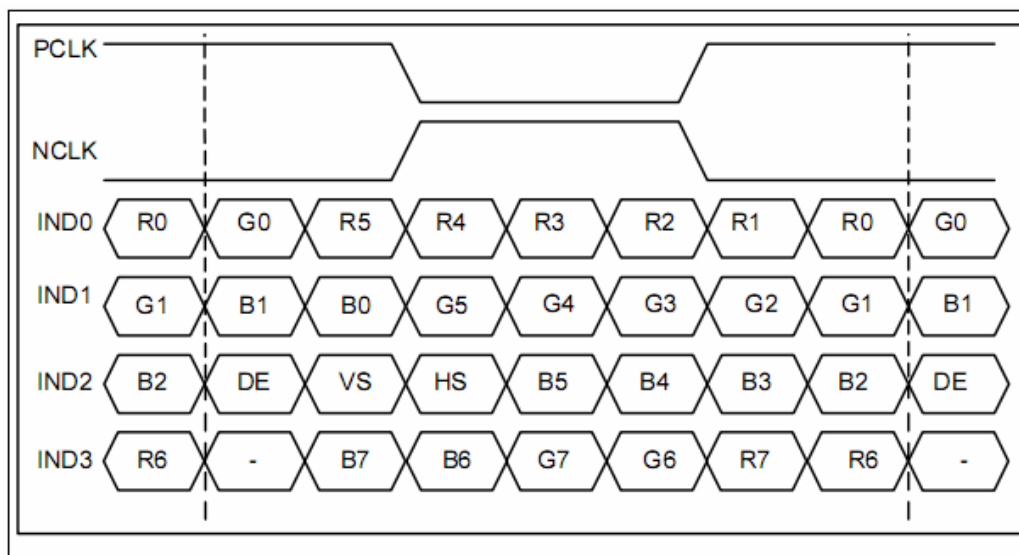
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6.3 Bit LVDS input

6.3.1 6bit LVDS input



6.3.2 8Bit LVDS input

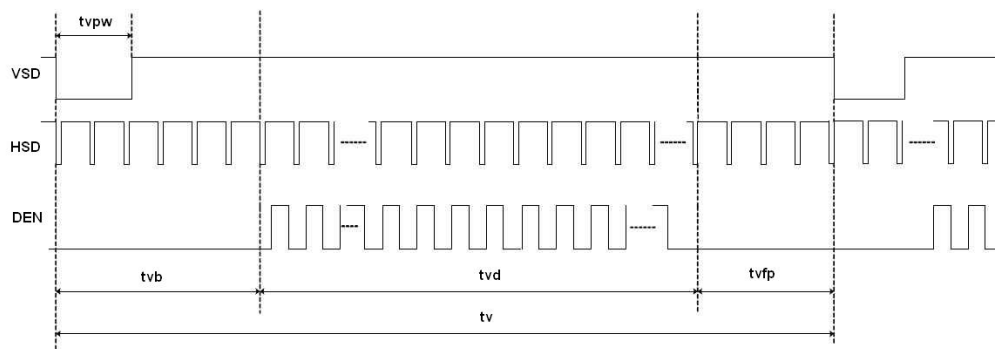


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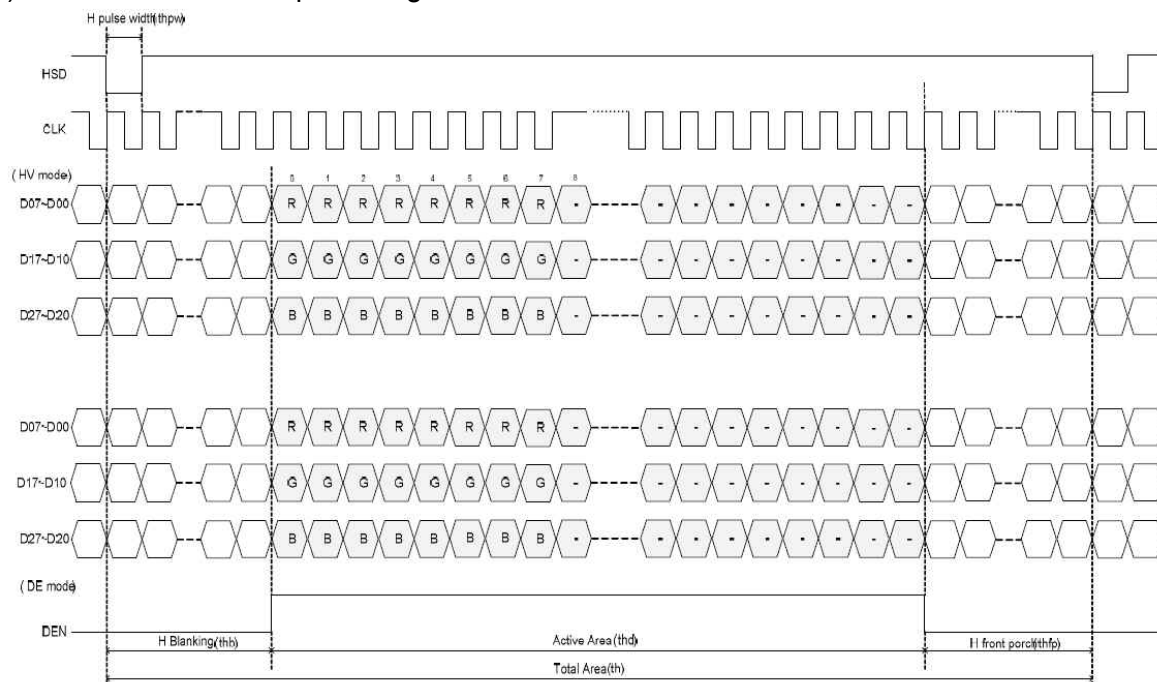
6.4 Interface Timing (DE mode)

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

(1) Vertical input timing

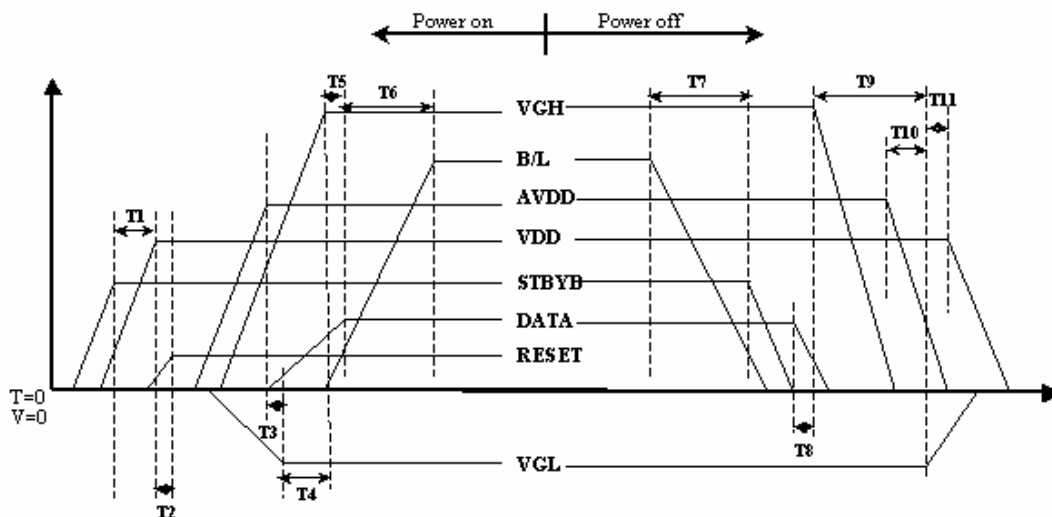


(2) Horizontal Vertical input timing



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6.5 Power On / Off Sequence



Item	Min.	Typ.	Max.	Unit
T1	0	--	--	ms
T2	50	--	--	ms
T3	5	--	--	ms
T4	10	--	--	ms
T5	20	--	--	ms
T6	50	--	--	ms
T7	20	--	--	ms
T8	10	--	--	ms
T9	20	--	--	ms
T10	10	--	--	ms
T11	20	--	--	ms

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6.6 Backlight Unit

Parameter	Symbol	Min	Typ	Max	Units	Condition
LED Current	I_F	--	--	180	mA	Ta=25°C
LED Voltage	V_F	--	9.6	10.2	Volt	Ta=25°C
LED Life-Time	N/A	20,000	--	--	Hour	Ta=25°C $I_F=20\text{mA}$ Note (2)

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition: Ta=25±3 °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 Ta=25°C and IL=120mA. The LED lifetime could be decreased if operating IL is larger than 120mA. The constant current driving method is suggested.

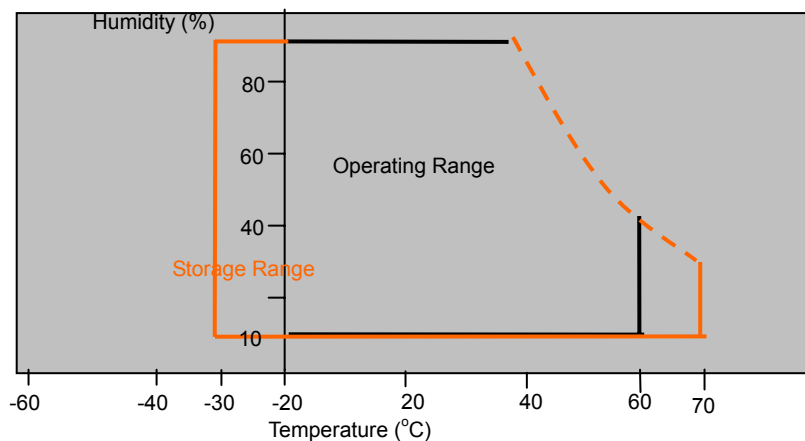
Note(3) LED Light Bar Circuit

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7.0 Reliability test items

No.	Item	Conditions	Remark
1	High Temperature Storage	Ta=+70°C, 240hrs	
2	Low Temperature Storage	Ta=-30°C, 240hrs	
3	High Temperature Operation	Ta=+60°C, 240hrs	
4	Low Temperature Operation	Ta=-20°C, 240hrs	
5	Thermal Cycling Test (non operation)	-20°C(30min)→+60°C(30min),100 cycles	
6	Vibration	Sine Wave 1.5G, 5~500Hz, XYZ 30min/each direction	
7	Shock	Half-Sine, 200G, 2ms, ±XYZ, 1time	

Storage / Operating temperature



Note .Max wet bulb temp.=39°C

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8.0 OUTLINE DIMENSION (HSD070PFW3-B01 Rev2)

8.0 Front View Outline Dimension

