



SPECIFICATION FOR TFT LCD MODULE

CUSTOMER : _____

CUSTOMER MODULE : _____

HL MODEL : _____HG101WS042_____

☐ Preliminary Specification

☒ Final Specification

Customer Confirmation column:

Approved by : _____ Dept. : _____ Date : _____

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

Designed by	Checked by	Approved by



REVISION RECORD

<u>REV NO</u>	<u>REV DATE</u>	<u>CONTENTS</u>	<u>REMARKS</u>
V.0	2020-01-25	First Release	



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1.0 General description

1.1 Introduction

HG101WS042 is model 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 array)** resolution. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.

1.2 Features

- 4 lanes LVDS Interface
- Data enable signal mode
- 6/8-bit color depth, display 16.7M colors
- Low driving voltage and low power consumption
- ROHS Compliant

1.3 General information

Item		Specification	Unit	Remarks
Outline Dimension		235(H) x 143(V) x 2.8(body)	mm	Tolerance: ± 0.2 mm
Display area		222.72(W) x 125.28(H)	mm	
Number of Pixel		1024(H) x 600(V)	pixels	
Pixel pitch		0.2175(H) x 0.2088(V)	mm	
Pixel arrangement		Pixels RGB stripe arrangement		
Display mode		Normally White		
Surface treatment		TV Film		
Weight		TBD (Typ.)	gram	
Back-light		Single LED (Side-Light type)		
Power Consumption	B/L System	1.52(Max.)	watt	

1.4 Mechanical Information

Item		Min.	Typ.	Max.	Unit
Module Size	Horizontal(H)	234.9	235	235.2	mm
	Vertical(V)	142.9	143	143.2	mm
	Depth(D)	2.6	2.8	3.0	mm



2.0 ABSOLUTE MAXIMUM RATINGS

2.1 Electrical Absolute Rating

2.1.1 TFT LCD Module

Item		Specification	Unit
Outline Dimension		235(H) x 143(V) x 2.8(body)	mm
Display area		222.72(W) x 125.28(H)	mm
Number of Pixel		1024(H) x 600(V)	pixels
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Display mode		Normally White	
Surface treatment		TV Film	
Weight		TBD (Typ.)	gram
Back-light		Single LED (Side-Light type)	
Power Consumption	B/L System	1.52(Max.)	watt

2.1.2 Back-Light Unit

Item	Symbol	Typ	MIN.	TYP.	MAX.	Unit	Note
Forward voltage	Vf	9.3	9.0	9.3	9.5	V	(1)(2)
Forward current	If	160	--	--	--	mA	(1)(2) (3)
Power Consumption	PBL	--	--	--	--	mW	

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 160 mA

3.0 OPTICAL CHARACTERISTICS

3.1 Optical Specifications

Item	Symbol	Temp	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle range	Horizontal	θ	CR > 10	60	70	--	Deg	Note 1
	Vertical	θ		40	50	--	Deg	
Luminance Contrast ratio	CR	θ = 0°		500	600	--	--	Note 2
Brightness	YL			160	180	--	Cd/cm2	
Transmittance	T(%)	θ = 0°		--	6.6	--	%	Note 3
Color Gamut (C light)				--	50	--	%	
White chromaticity		Xw	Θ=0°	TYP. -0.04	0.298	TYP. +0.04		
		Yw			0.334			
Reproduction of color (C-light)	Red	Rx			0.605			
		Ry			0.372			
	Green	Gx			0.297			
		Gy			0.563			
	Blue	Bx			0.144			
		By			0.169			
Response Time (Rising + Falling)	Trt	Ta= 25°C θ = 0°						
				--	25	40	ms	Note 5



3.2 Measuring Condition

Measuring surrounding: dark room ,LED current IL : 160mA

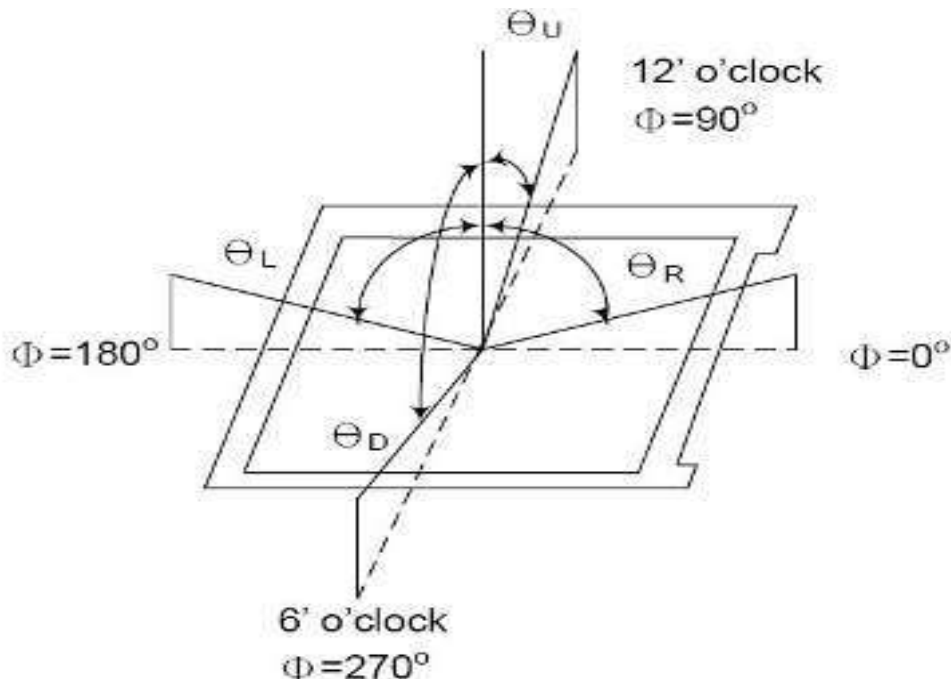
Ambient temperature: 25±2oC

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 ~ 21 mm

Note (1) Definition of Viewing Angle :

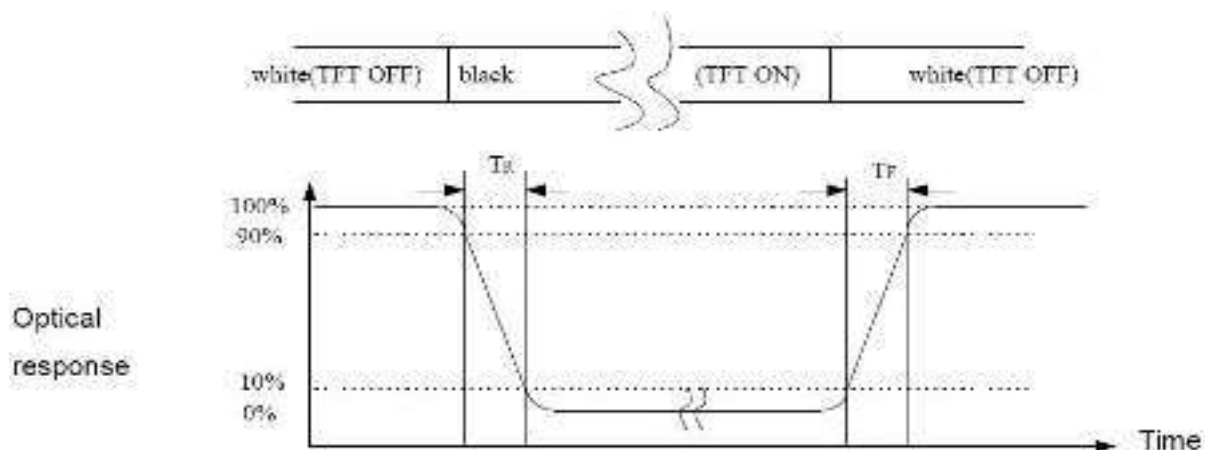


Note (2) Definition of Contrast Ratio (CR):

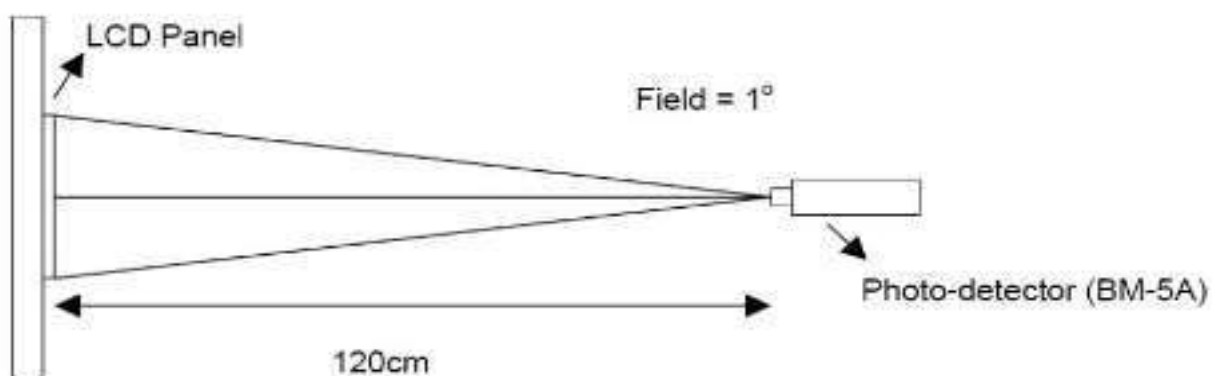
Measured at the center point of panel

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

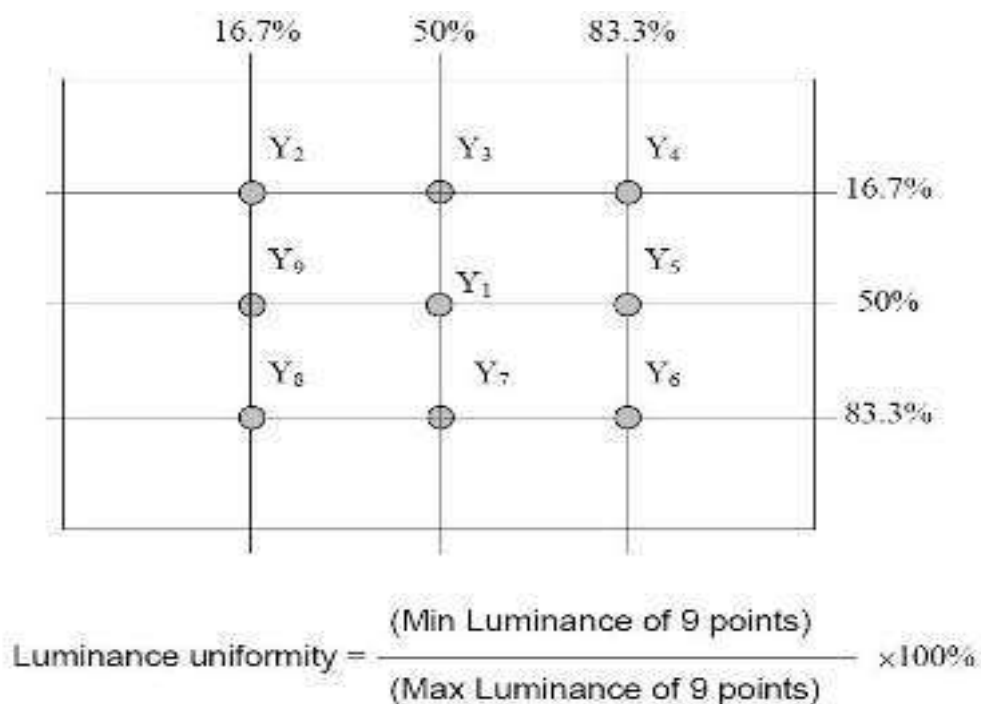
Note (3) Definition of Response Time: Sum of TR and TF



Note (4) Definition of optical measurement setup



Note (5) Definition of brightness uniformity





4.0 INTERFACE PIN CONNECTION

4.1 Signal of interface

Terminal No.	Symbol	I/O	Functions
1	VCOM	P	Common voltage
2	DVDD	P	Power for Digital Circuit
3	DVDD	P	Power for Digital Circuit
4	NC	N	No connection
5	RESET	I	Global reset pin.
6	STBYB	I	Standby mode,normally pull high STBYB="1", normally opration STBYB="0", timing control,source driver will turn off
7	GND	P	Ground
8	RXIN0-	I	Negative LVDS differential data inputs
9	RXIN0+	I	Positive LVDS differential data inputs
10	GND	P	Ground
11	RXIN1-	I	Negative LVDS differential data inputs-
12	RXIN1+	I	Positive LVDS differential data inputs+
13	GND	P	Ground
14	RXIN2-	I	Negative LVDS differential data inputs-
15	RXIN2+	I	Positive LVDS differential data inputs+
16	GND	P	Ground
17	RXCLKIN-	I	Negative LVDS differential clock inputs-
18	RXCLKIN+	I	Positive LVDS differential clock inputs+
19	GND	P	Ground
20	RXIN3-	I	Negative LVDS differential data inputs-
21	RXIN3+	I	Positive LVDS differential data inputs+
22	GND	P	Ground
23	NC	N	No connection
24	NC	N	No connection
25	GND	P	Ground
26	NC	N	No connection
27	NC	N	No connection
28	SELB	P	6bit/8bit mode select SELB="1", input data is 6bit, SELB="0", input data is 8bit
29	AVDD	P	Power for Analog Circuit
30	GND	P	Ground
31	LED-	P	Power for LED backlight input (cathode)
32	LED-	P	Power for LED backlight input (cathode)
33	L/R	I	Left / right selection
34	U/D	I	Up/down selection
35	VGL	P	Gate OFF Voltage
36~37	NC	N	No connection
38	VGH	P	Gate ON Voltage
39	LED+	P	Power for LED backlight (Anode)
40	LED+	P	Power for LED backlight (Anode)



5.0 Power On/Off Sequence

To prevent the device damage from latch up, the power on/off sequence shown Below must be followed.



power on/off timing sequence

6.0 ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Module

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	VDD	3.0	3.3	3.6	V
	VGH	17.7	18	18.3	V
	VGL	-8.3	-8.0	-7.8	V
	AVDD	10.5	10.8	11.1	V
VCOM	VCOM	3.95	(4.25)	4.55	V

Note:

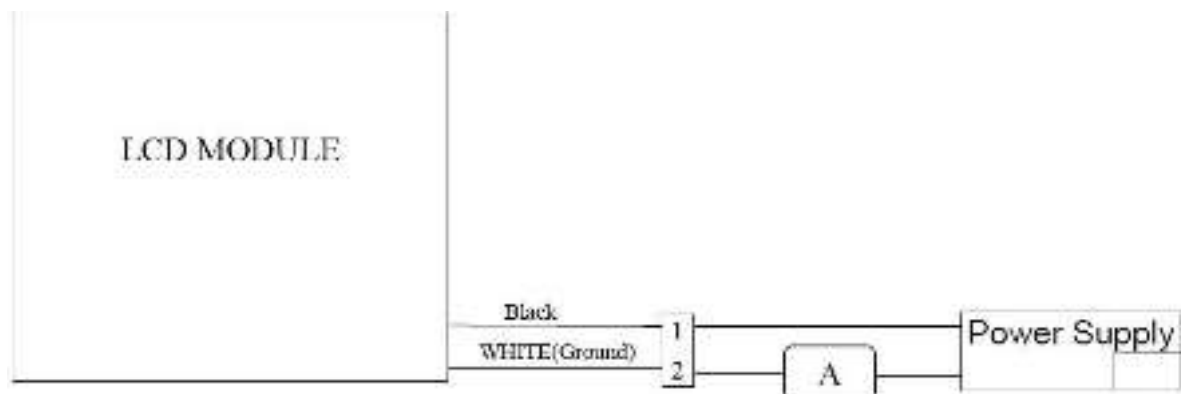
- (1) VGH is TFT Gate operating voltage.
- (2) VGL is TFT Gate operating voltage. The low voltage level of VGH signal must be fluctuates with same phase As Vcom.

6.2 Back-Light Unit

The backlight system is an edge-lighting type with **24 LED**.

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

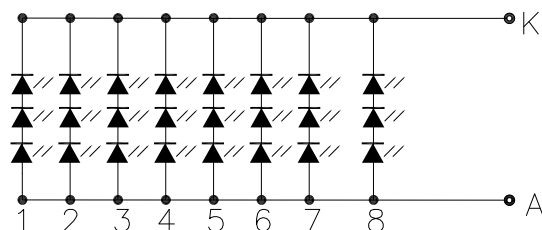
Item	Symbol	Min.	Typ.	Max.	Unit	Note
LED current	IL	-	160	-	mA	(2)
LED Voltage	VL	-	9.3	-	V	
Operating LED life time	Hr	20000	-	-	Hour	(1)(2)



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 $I_L=160\text{mA}$. The LED lifetime could be decreased if operating I_L is larger than 160mA. The constant current driving method is suggested.

LED CIRCUIT DIAGRAM: **3 x 8 = 24LED**



6.3 DC Characteristics

6.3.1 Absolute Maximum Rating (GND=AGND=0V)

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Power supply voltage 1	Vdd	-0.5	-	+3.96	V
Power supply voltage 2	Avdd	-0.5	-	+13.5	V
Logic Output voltage	Vout	-0.5	-	+5.0	V
Input voltage	Vin	-0.5	-	AVDD+0.5	V
Operation temperature	T _{OPR}	-20	-	+70	°C
Storage temperature	T _{STG}	-30	-	+80	°C

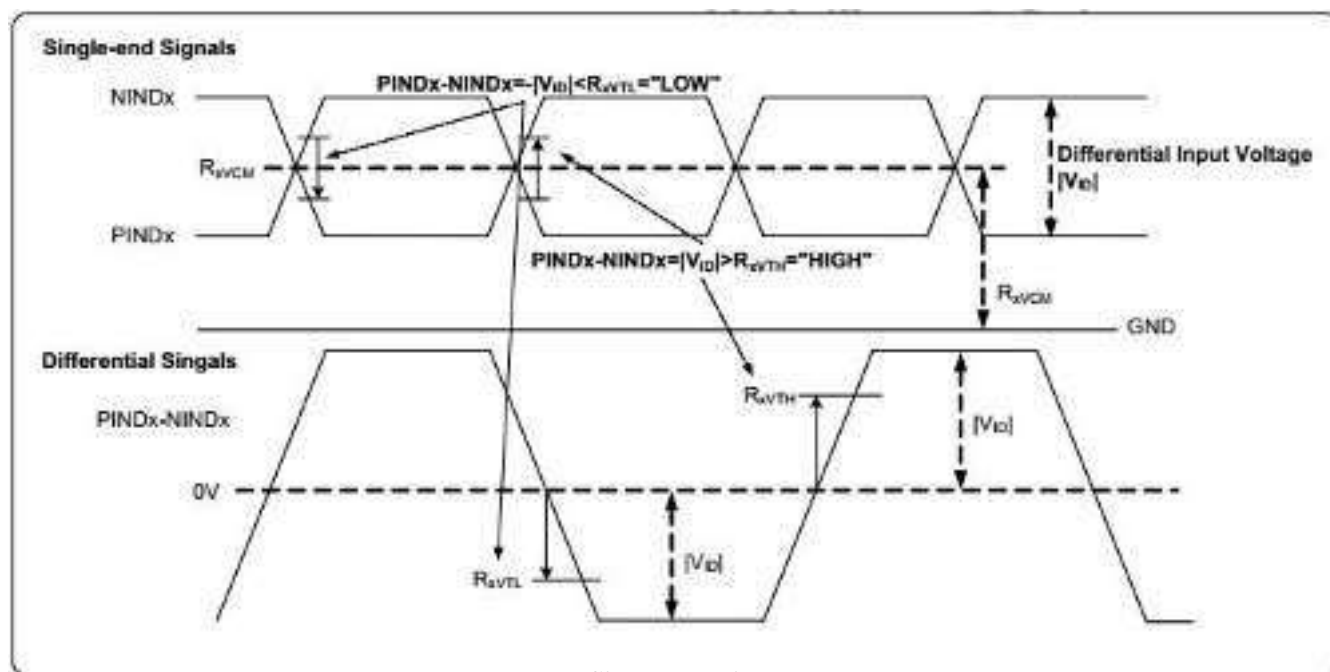
Note: (1) All of the Voltages listed above are with respect to GND=0V.

(2) Device is subject to be damaged permanently if stresses belong to those absolute maximum ratings listed above.

6.3.2 LVDS mode DC electrical characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Differential input high Threshold voltage	R_{XVTH}	-	-	+0.1	V	$R_{XVCM}=1.2V$
Differential input low threshold voltage	R_{XVTL}	-0.1	-	-	V	
Input voltage range (singled-end)	R_{XVIN}	0	-	$VDD-1.2+ V_{IO} /2$	V	-
Differential input common Mode voltage	R_{XVCM}	$ V_{IO} /2$	-	$VDD-1.2$	V	-
Differential input voltage	$ V_{IO} $	0.2	-	0.6	V	-
Differential input leakage Current	RV_{XIT}	-10	-	+10	μA	-
LVDS Digital Operating Current	I_{ddlvds}	-	15	30	mA	Fclk=65MHz, VDD=3.3V
LVDS Digital Stand-by Current	I_{stlvds}	-	10	50	μA	Clock & all Functions are stopped

LYDS mode DC electrical characteristics



Single-end signals

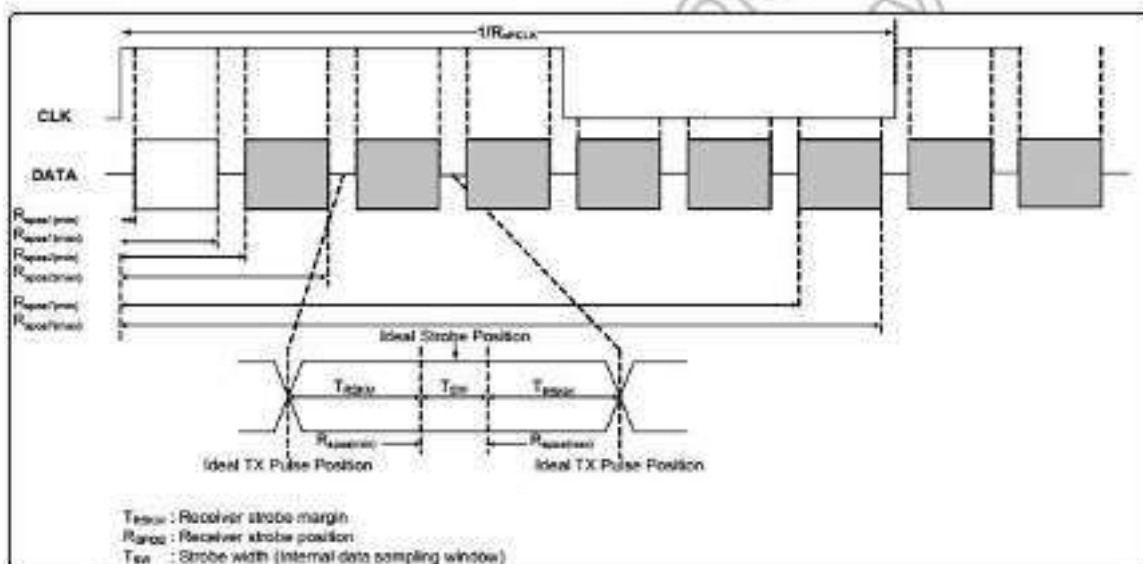
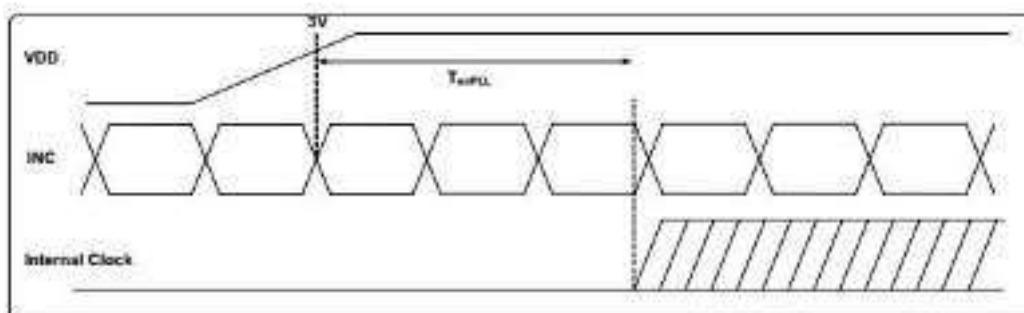
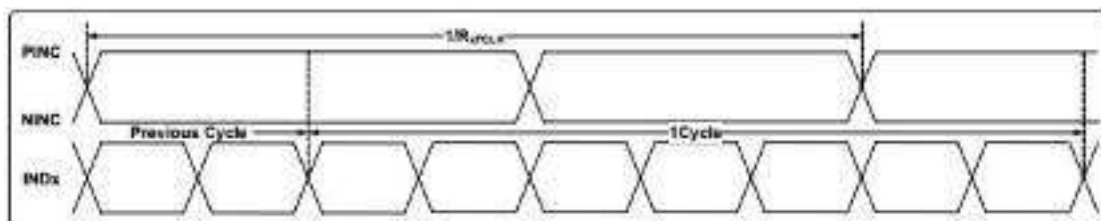


6.4 AC Characteristics

6.4.1 LVDS mode AC electrical characteristics

Parameter	Symbol	Min.	Spec. Typ.	Max.	Unit	Condition
Clock frequency	R_{XFCCLK}	20	-	71	MHz	-
Input data skew margin	T_{RSDM}	500	-	-	pS	$ V_{IO} =400mV$ $R_{XVCM}=1.2V$ $R_{XFCCLK}=71MHz$
Clock high time	T_{LVCH}	-	$4/(7 \cdot R_{XFCCLK})$	-	ns	-
Clock low time	T_{LVCL}	-	$3/(7 \cdot R_{XFCCLK})$	-	ns	-
PLL wake-up time	T_{enPLL}	-	-	150	μs	-

LVDS mode AC electrical characteristics



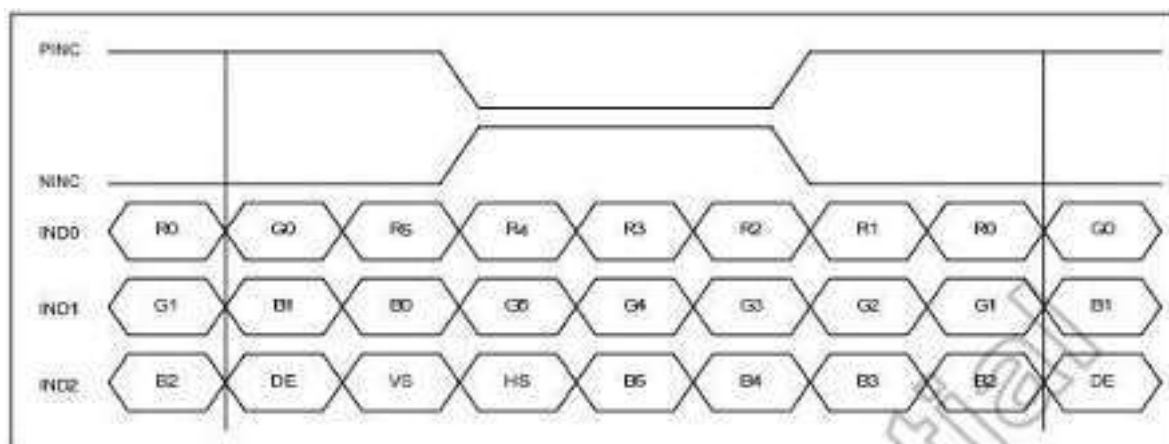
LVDS figure



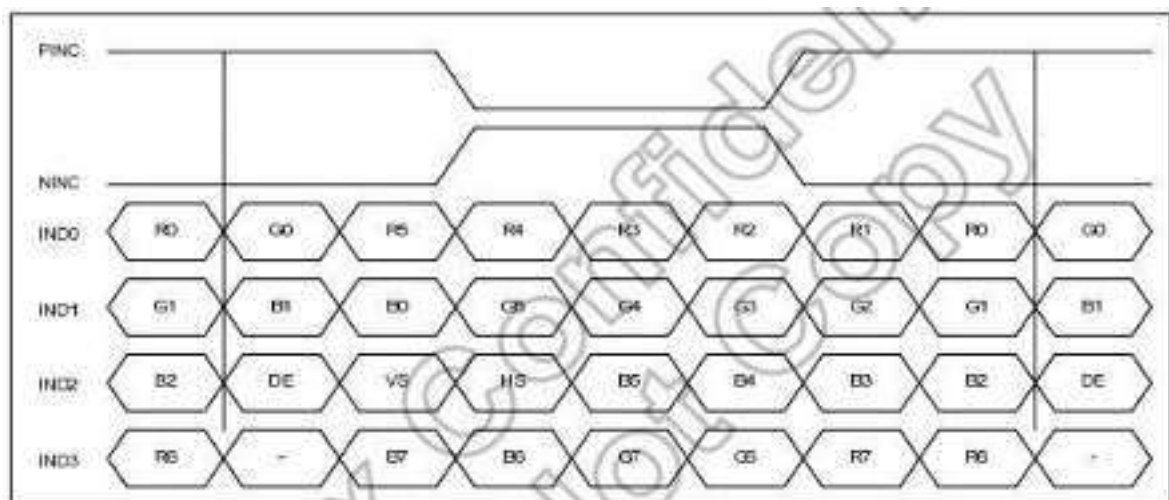
Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
Modulation Frequency	SSC _{MF}	23	-	93	KHz	-
Modulation Rate	SSC _{MR}	-	-	±3	%	LVDS clock =71MHz center spread

SSC table

6.4.2 LVDS mode data input format



6-bit LVDS input



8-bit LVDS input



6.4.3 Input timing table

➤ DE mode

Parameter	Symbol	Min.	Typ.	Max	Unit	Note
Horizontal Display Area	thd	-	1024	-	DCLK	
DCLK frequency	fclk	40.8	51.2	67.2	MHz	
HSD Period	th	1114	1344	1400	DCLK	
HSD Blanking	Thb+thfp	90	320	376	DCLK	
Vertical Display Area	tv	600			T _H	
VSD Period	tv	610	635	800	T _H	
VSD Blanking	Thb+thfp	10	35	200	T _H	

➤ HV mode

Horizontal timing

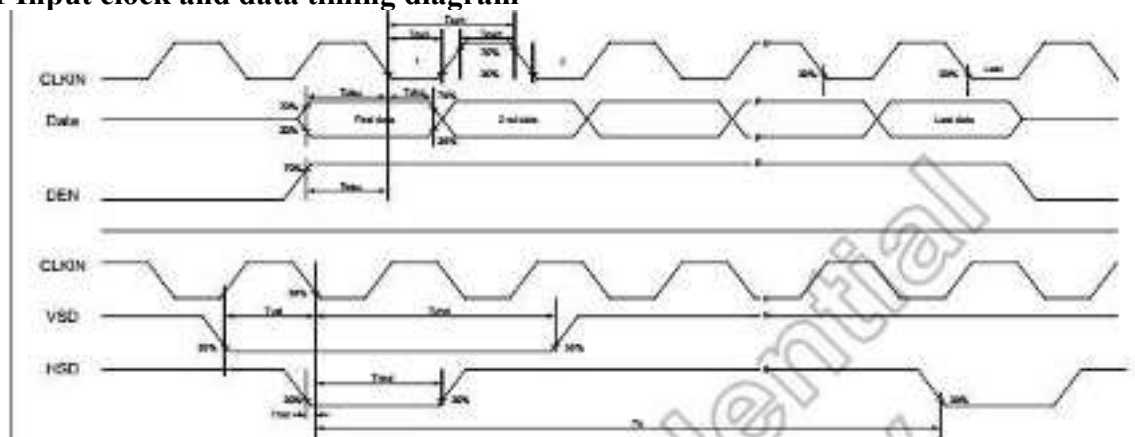
Parameter	Symbol	Min.	Typ.	Max	Unit	Note
Horizontal Display Area	thd	1024			DCLK	
DCLK frequency	fclk	40.9	51.2	63	MHz	
HSD Period	th	1200	1344	1400	DCLK	
HS pulse width	thpw	1	-	140	DCLK	
HS Back Porch(Blanking)	thbp	160			DCLK	
HS Front Porch	thfp	16	160	216	DCLK	

Vertical timing

Parameter	Symbol	Min.	Typ.	Max	Unit	Note
Vertical Display Area	tv	600			T _H	
VS period time	tv	624	635	750	T _H	
VS pulse width	tvpw	1	-	20	T _H	
VS Back Porch(Blanking)	tvbp	23			T _H	
VS Front Porch	tvfp	1	12	127	T _H	

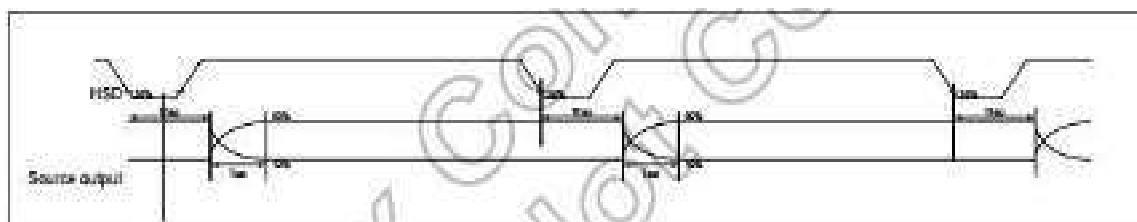
6.5 Timing Diagram of Interface Signal

6.5.1 Input clock and data timing diagram

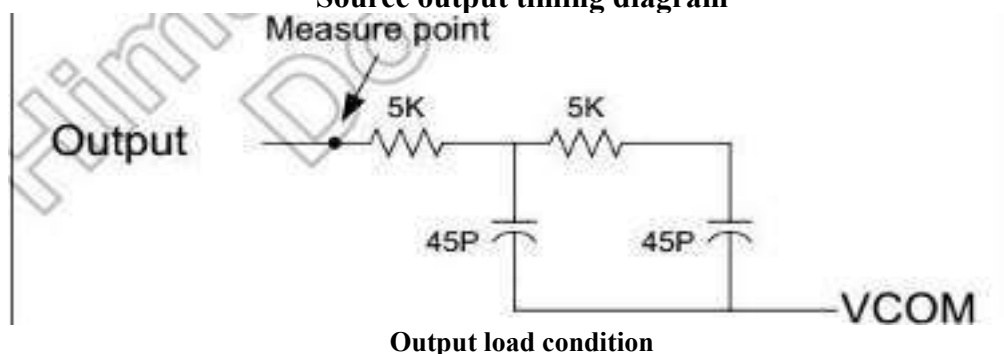


Input clock and data timing diagram

6.5.2 Source output timing diagram (cascade)



Source output timing diagram



Output load condition

7.0 Reliability test items

Test Item	Test Conditions	Notes
High temperature Operation	Ta= +70℃ , 120hrs	
Low temperature Operation	Ta= -20℃ , 120hrs	
High Temperature Storage	Ta= +80℃ , 120hrs	
Low Temperature Storage	Ta= -30℃ , 120hrs	
Humidity Test	60℃ ,Humidity 80% ,96hrs	
Thermal Shock Test	-20℃ ,30min~+70℃ ,30min (30 cycle)	
Vibration Test(Packing)	Sine Wave 1.04G, 5~500Hz, XYZ 30min/each direction	
Static Electricity	Half-Sine, 100G, 6ms, ±XYZ, 3 cycle	

8.0 OUTLINE DIMENSION

[illegible]



9.0 General precaution

9.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application where performance failure could be life threatening or otherwise catastrophic.

9.2 Disassembling or Modification

Do not disassemble or modify the module. It may damage sensitive parts inside LCD module, and may cause scratches or dust on the display. HG does not warrant the module, if customers disassemble or modify the module.

9.3 Breakage of LCD Panel

9.3.1. If LCD panel is broken and liquid crystal spills out, do not ingest or inhale liquid crystal, and do not contact liquid crystal with skin.

9.3.2. If liquid crystal contacts mouth or eyes, rinse out with water immediately.

9.3.3. If liquid crystal contacts skin or cloths, wash it off immediately with alcohol and rinse thoroughly with water.

9.3.4. Handle carefully with chips of glass that may cause injury, when the glass is broken.

9.4 Electric Shock

9.4.1. Disconnect power supply before handling LCD module.

9.4.2. Do not pull or fold the LED cable.

9.4.3. Do not touch the parts inside LCD modules and the fluorescent LED's connector or cables in order to prevent electric shock.

9.5 Absolute Maximum Ratings and Power Protection Circuit

9.5.1. Do not exceed the absolute maximum rating values, such as the supply voltage variation, input voltage variation, variation in parts' parameters, environmental temperature, etc., otherwise LCD module may be damaged.

9.5.2. Please do not leave LCD module in the environment of high humidity and high temperature for a long time.

9.5.3. It's recommended to employ protection circuit for power supply.

9.6 Operation

9.6.1 Do not touch, push or rub the polarizer with anything harder than HB pencil lead.

9.6.2 Use finger stalls of soft gloves in order to keep clean display quality, when persons handle the LCD module for incoming inspection or assembly.

9.6.3 When the surface is dusty, please wipe gently with absorbent cotton or other soft material.

9.6.4 Wipe off saliva or water drops as soon as possible. If saliva or water drops contact with polarizer for a long time, they may cause deformation or color fading.

9.6.5 When cleaning the adhesives, please use absorbent cotton wetted with a little petroleum benzine or other adequate solvent.

9.7 Mechanism

Please mount LCD module by using mounting holes arranged in four corners tightly.

9.8 Static Electricity

9.8.1 Protection film must remove very slowly from the surface of LCD module to prevent from electrostatic occurrence.

9.8.2. Because LCD module use CMOS-IC on circuit board and TFT-LCD panel, it is very weak to electrostatic discharge. Please be careful with electrostatic discharge. Persons who handle the module should be grounded through adequate methods.

9.9 Strong Light Exposure

The module shall not be exposed under strong light such as direct sunlight. Otherwise, display characteristics may be changed.