

PRODUCT SPECIFICATION **FOR LCD MODULE**

Revision: 1.0

Model No: LS101I20-L-V1

Module Type: COG+FPC+B/L

APPROVED SIGNATURE

- Approved Product Specification only
- Approved Product Specification and Samples

<u>Prepared By</u>	<u>Checked By</u>	<u>Approved By</u>

REVISION STATUS

Version	Revise Date	Page	Content	Modified by
V1.0	2022.04.30	-	First Issued.	

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1. GENERAL DESCRIPTION

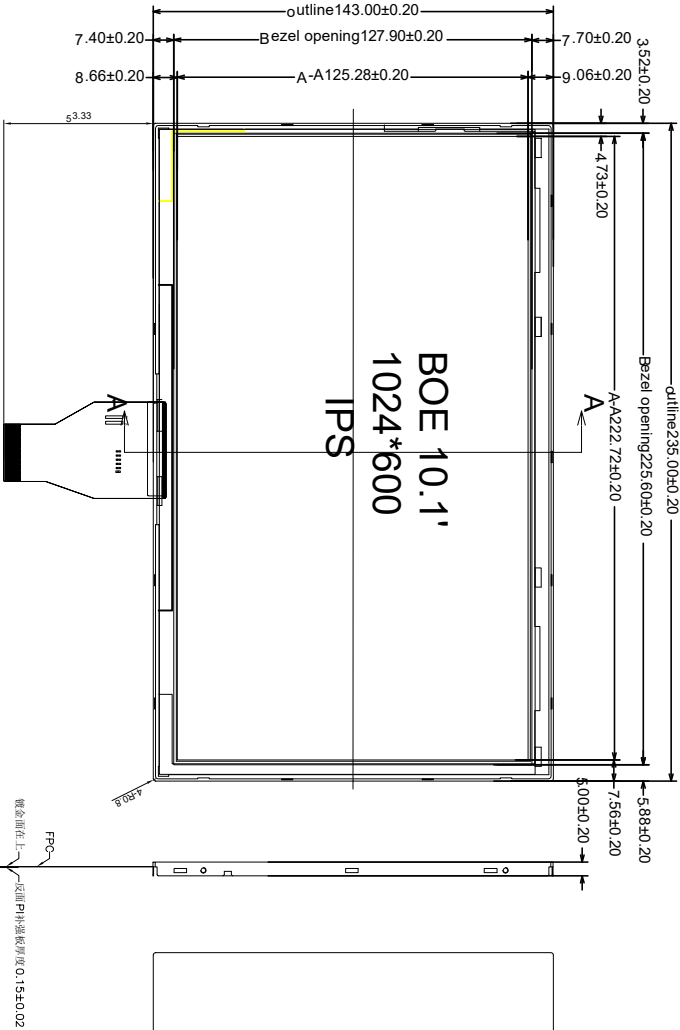
1.1 DESCRIPTION

LS101I20-L-V1 is a color active matrix thin film transistor (TFT) TN liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, Driver IC ,FPC and Backlight, This TFT LCD has a 10.1-inch diagonally measured active display area with WSVGA resolution (1,024vertical by 600 horizontal pixel array).

1.2 FEATURES:

No.	Item	Specification	Unit
1	Panel Size	10.1"	inch
2	Number of Pixels	1024×RGB (3) ×600	pixels
3	Active Area	222.72(H)× 125.28(V)	mm
4	Pixel Pitch	0.2175(H)×0.2088(V)	mm
5	Outline Dimension	(235W)×137(H)×5.0(D)	mm
6	Number of Colors	16.7M	-
7	Display Mode	Normally Black	-
8	Viewing Direction	80/80/80/80	-
9	Display Format	RGB vertical stripe	-
10	Luminance(cd/m ²)	400(TYP.)	nit
11	Surface Treatment	Anti-Glare	-
12	Interface	LVDS	-
13	Backlight	White LED	-
14	OperationTemperature	-20-70	°C
15	StorageTemperature	-30-80	°C
16	Driver IC	HX8282A11/HX8696	

2. MECHANICAL SPECIFICATION

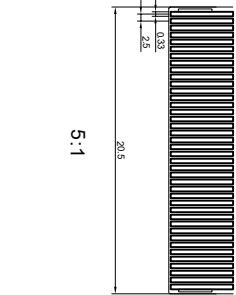


NOTES:

1. DISPLAY TYPE : TFT 262K
2. POLARIZER MODE : TRANSMISSIVE/POSITIVE
3. VIEWING DIRECTION: ALL
4. MAIN LCD BACKLIGHT : 6LED Serial 7 parallel
5. OPERATING TEMP : -20°C~70°C
6. STORAGE TEMP : -30°C~80°C
7. DRIVER IC :
8. LED OPERATING VOLTAGE : 19 V



PIN ASSIGNMENT	PIN	ASSIGNMENT
1	LED-	26 GND
2	LED-	27 NC
3	LED+	28 NC
4	LED+	29 GND
5	VCOM	30 NC
6	VDD	31 NC
7	VDD	32 SELB
8	NC	33 AVDD
9	RESET	34 GND
10	STBY	35 L/R
11	GND	36 U/D
12	D0-	37 VGL
13	D0+	38 NC
14	GND	39 NC
15	D1-	40 VGH
16	D1+	
17	GND	
18	D2-	
19	D2+	
20	GND	
21	CLOCK-	
22	CLOCK+	
23	GND	
24	D3-	
25	D3+	



BACKLIGHT CIRCUIT

TOOLERANCE	MATERIAL	FINISH
±0.2		
VERSION	SCALE	NO.
A	1:1	1/1
DATE	APPROVED	CHECKED
2020.11.19		
FILE NAME	L510120-L-V1	

立信（万安）智显科技有限公司

LCM

3. PIN DESCRIPTION

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

4. ELECTRICAL CHARACTERISTICS

4.1 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Power supply voltage 1	VDD	-0.5	-	+3.9	V
Power supply voltage 2	AVDD	-0.5	-	+14.85	V
Logic output voltage	V _{OUT}	-0.5	-	+5.0	V
Input voltage	V _{IN}	-0.5	-	AVDD+0.5	V

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

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

4.2 TFT LCD MODULE

4.2.1 Operating Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
TFT Gate on voltage	VGH	15	18	22	V	
TFT Gate off voltage	VGL	-9	-7	-5	V	
TFT Common electrode voltage	VCOM	4.0	4.4	4.7	V	
Analog power supply voltage	AVDD	9.4	9.6	10.6	V	

4.3 Current Consumption

Item	Symbol	Condition	Values			Unit	Remark
			Min.	Typ.	Max.		
Gate on Current	IVGH	VGH = 18 V	-	5.6	-	mA	
Gate off Current	IVGL	VGL = -6.5 V	-	8.1	-	mA	
Digital Current	IDVDD	DVDD = 3.3V	-	12.2	-	mA	
Analog Current	IAVDD	AVDD = 10.85V	-	29.7	-	mA	

4.4. Power On/Off Sequence

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

Power on: VDD, GND → AVDD, AGND → V1 to V14

Power off: V1 to V14 → AVDD, AGND → VDD, GND

4.4.1 Power on/off control

HX8282 has a power on/off sequence control function. In order to prevent IC from power on reset fail, the rising time (T_{POR}) of the digital power supply VDD should be maintained within the given specifications. Please refer to “AC Characteristics” for more detail on timing.

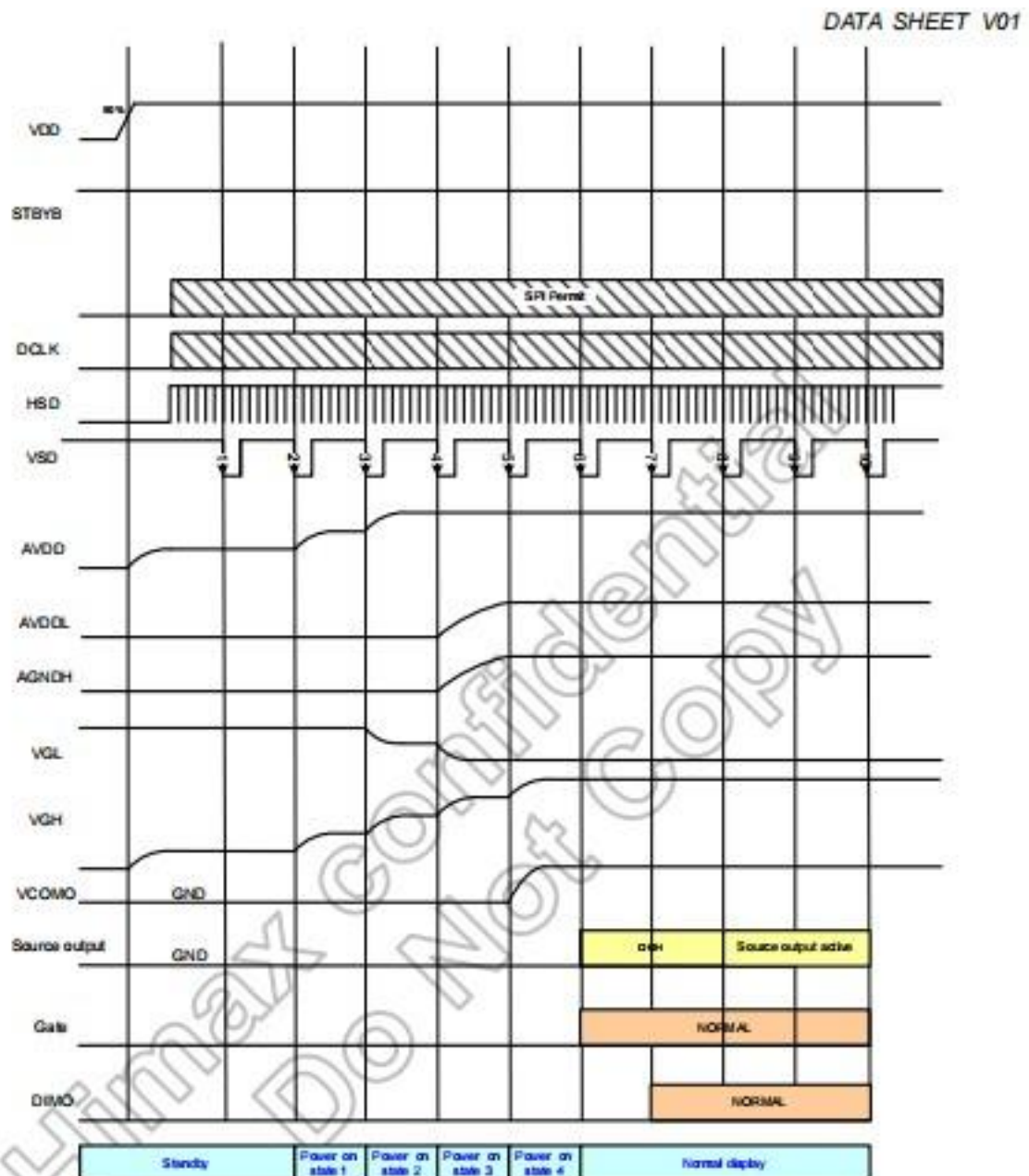
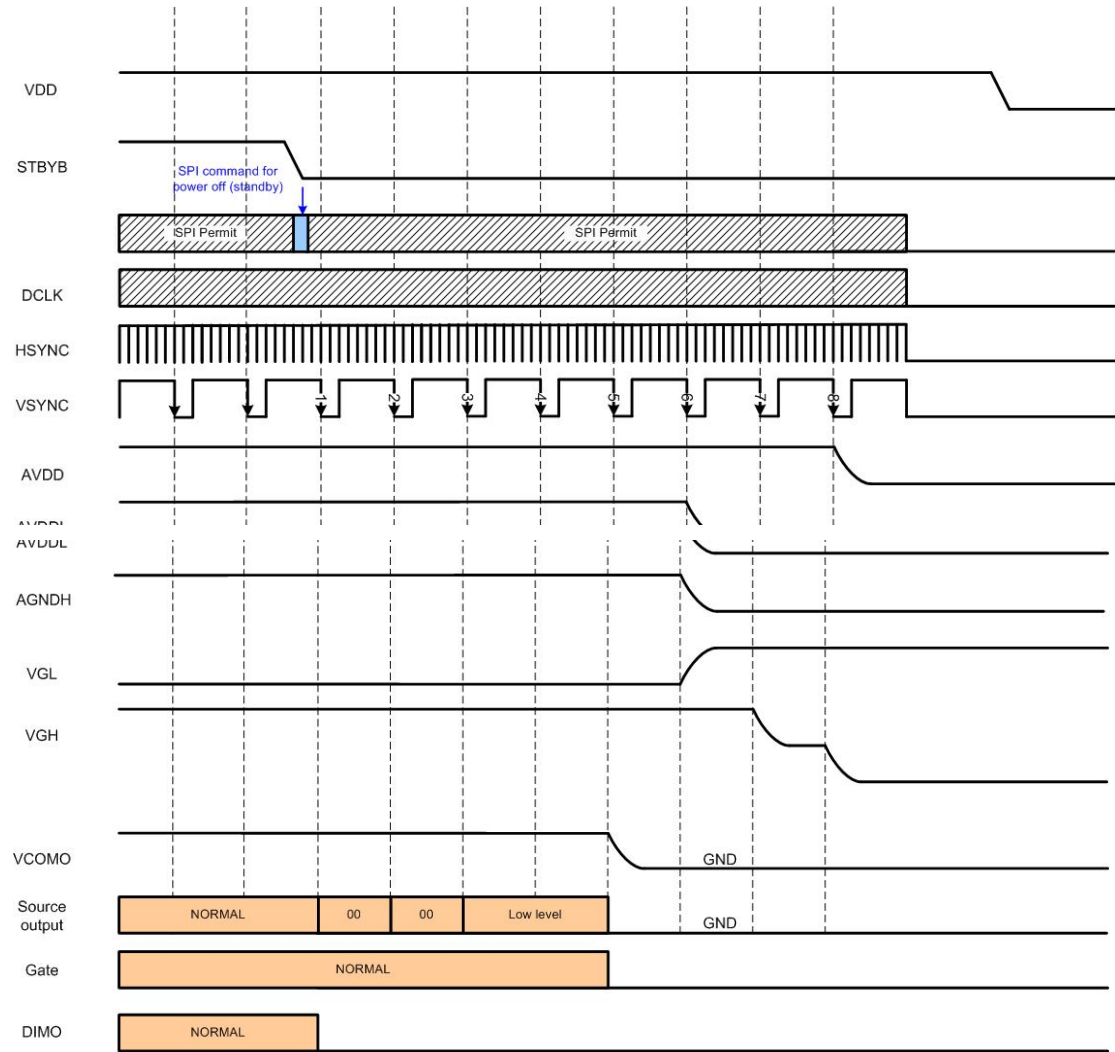


Figure 8.1: Power on timing sequence



Note: (1) Low level=3FH, when NBW=L. (Normally white)

(2) Low level=00H, when NBW=H. (Normally black)

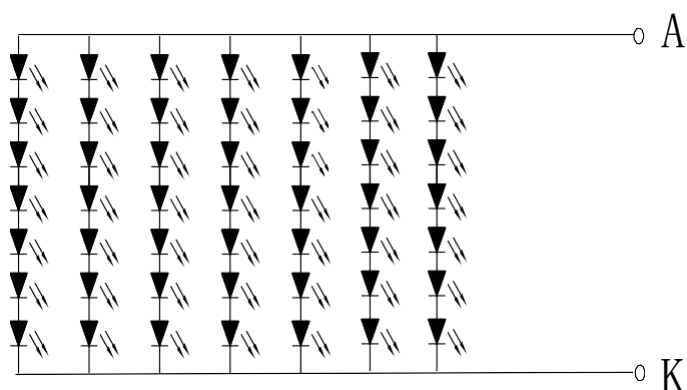
Figure 4.2: Power off timing sequence

4.5 BACK LIGHT UNIT

Ta=25°C

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LED Current	Iled	-	140	-	mA	42LEDS
Forward voltage	VF	18	19	19.8	V	IF=140mA,42LEDS
Reverse Current	IR			50	uA	VR=3V,1LED
Power dissipation	Pd	2660			mW	18LEDS
Peak forward current	IFP	20			mA	1LED
Reverse Voltage	VR	3.3			V	1LED

4.5.1 INTERNAL CIRCUIT DIAGRAM



6X7=42LED 19V 20mA X7=140mA

5 Electrical characteristics

5.1 LVDS mode DC electrical characteristics

Parameter	Symbol	Condition	Spec.			Unit
			Min.	Typ.	Max.	
Differential input high Threshold voltage	R_{XVTH}	$R_{XVCM}=1.2V$	-	-	+0.	V
Differential input low threshold voltage	R_{XVTL}		-0.		-	V
Input voltage range (Singed-end)	R_{XVIN}	-		-	$VDD-1.2+ V_{ID} /2$	V
Differential input common mode voltage	R_{XVCM}	-	$ I_D /2$	-	$VD-1.2$	V
Differential input voltage	$ V_{ID} $	-	0.2	-	0.6	V
Differential input leakage Current	$R_{V_{Xlilz}}$	-	-10	-	+	μA
LVDS digital operating Current	I_{ddlvds}	$k=65MHz, VDD=3.3V$	-	15	30	mA
LVDS digital stand-by Current	I_{stlvds}	Clock & all functions are stopped	-	1	50	μA

Table 9.3: LVDS mode DC electrical characteristics

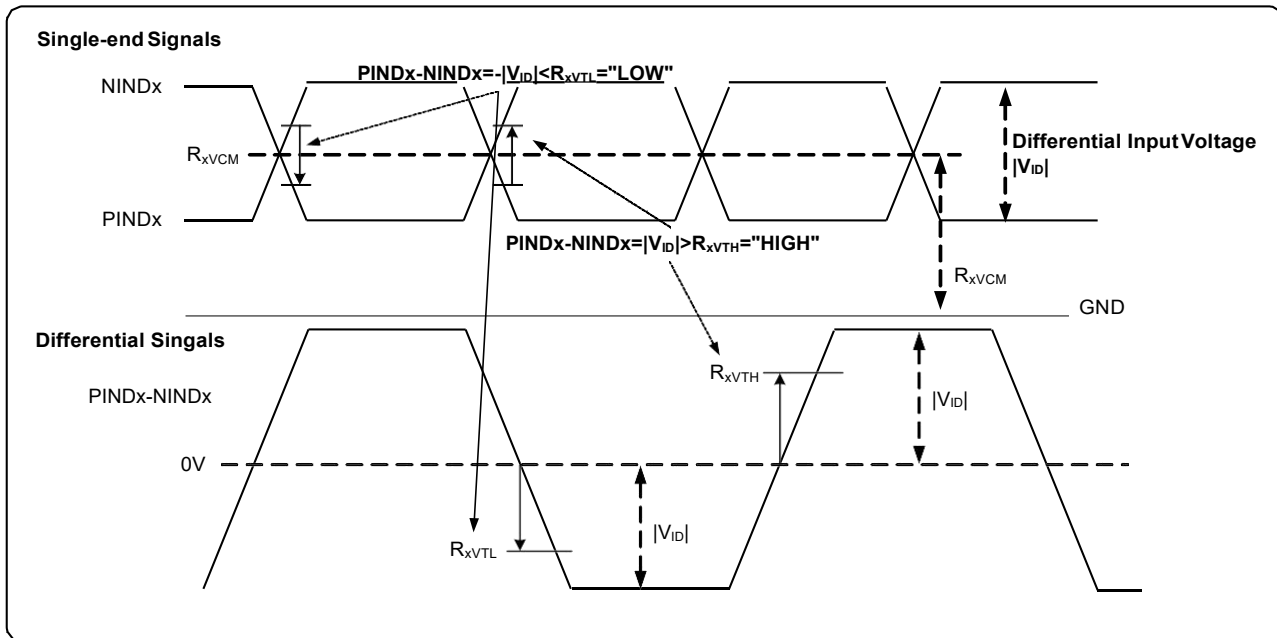


Figure 9.1: Single-end signals

5.2. AC Characteristics

5.2.1 LVDS mode AC electrical characteristics

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

Table 10.2: LVDS mode AC electrical characteristics

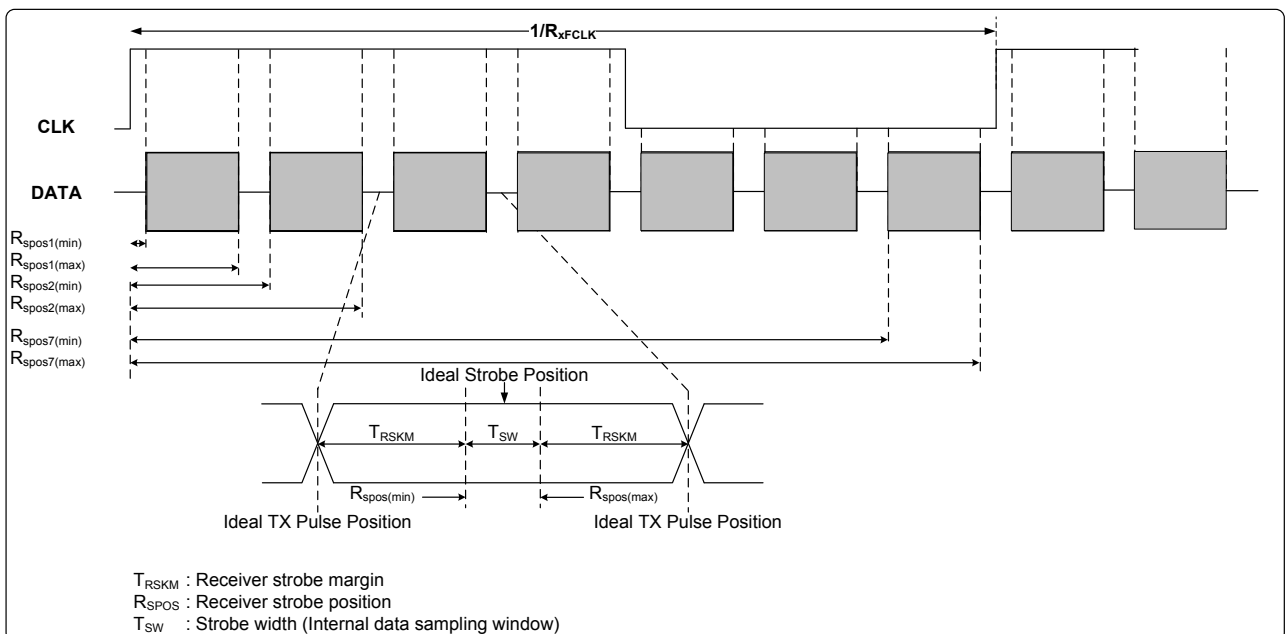
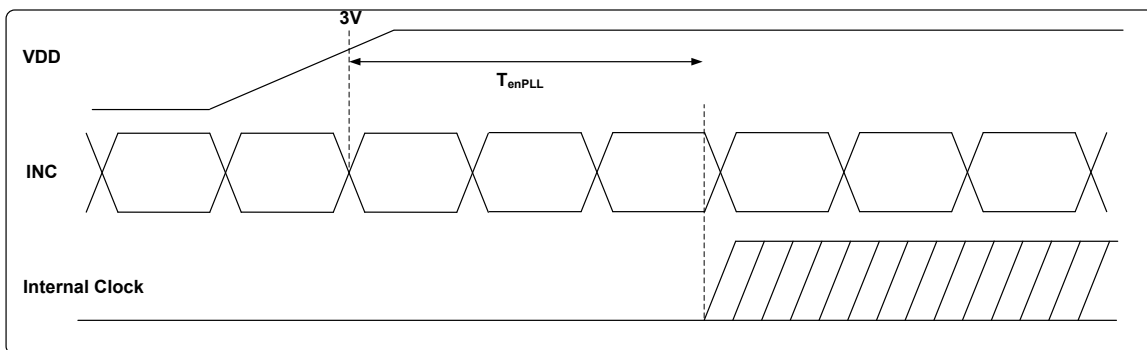
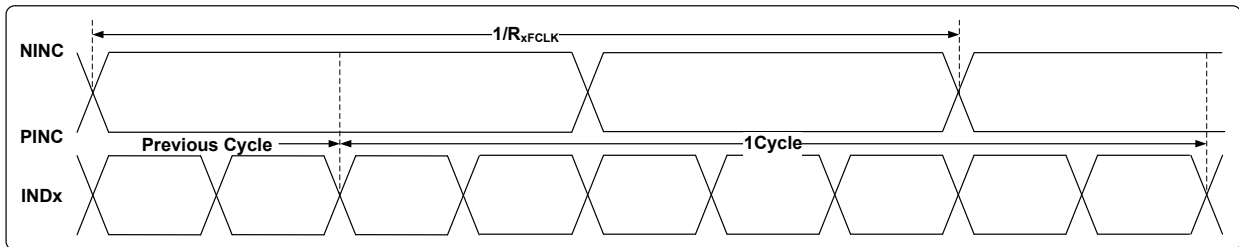


Figure 10.1: LVDS figure

5.2.2 LVDS mode data input format

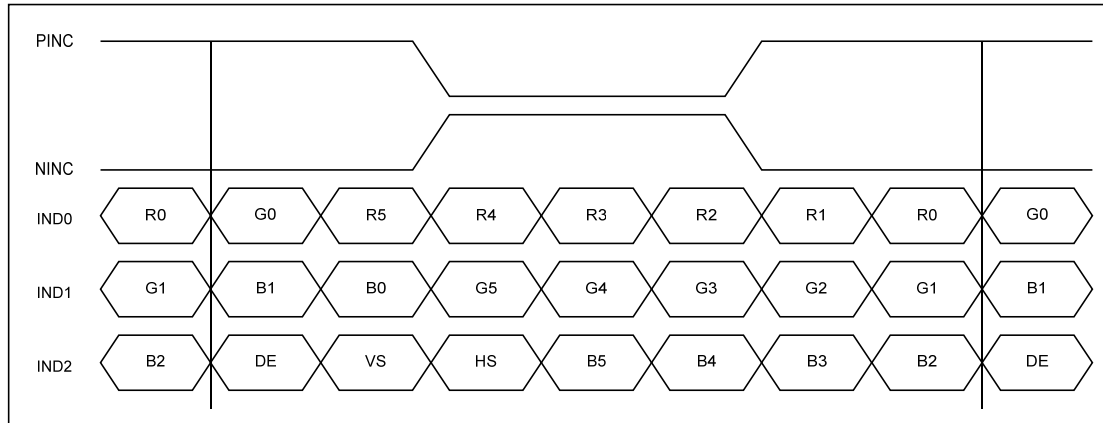


Figure 10.4: 6-bit LVDS input

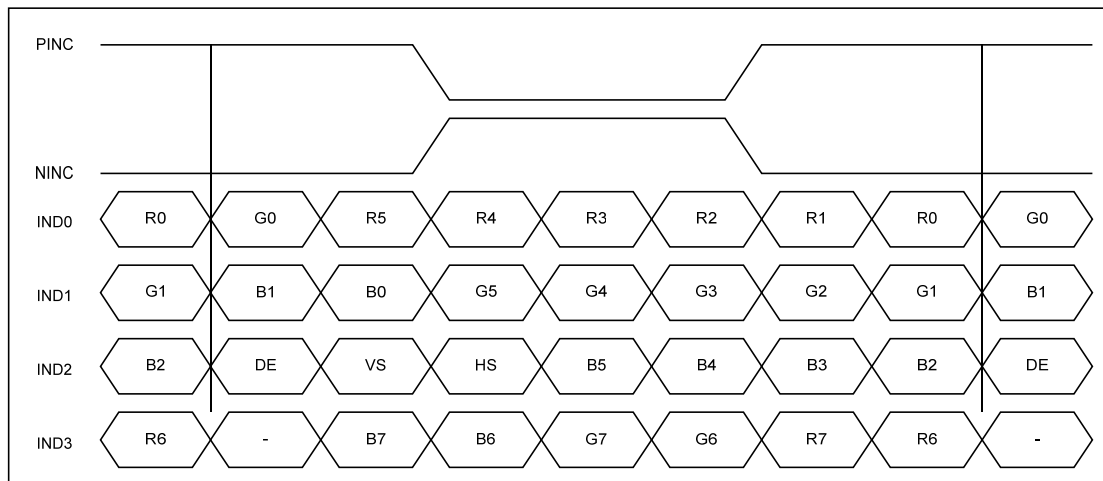


Figure 10.5: 8-bit LVDS input

53 input timing table

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	40.8	51.2	67.2	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1114	1344	1400	DCLK
HSD blanking	thb+thfp	90	320	376	DCLK
Vertical display area	tvd	600			T _H
VSD period	tv	610	635	800	T _H
VSD blanking	tvbp+tvfp	10	35	200	T _H

Table 10.4: DE mode (1024x600)

HV mode

• Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	44.9	51.2	63	MHz
Horizontal display area	thd	1024			DCLK
HSD period	th	1200	1344	1400	DCLK
HSD pulse Width	thpw	1	-	140	DCLK
HSD back porch	thbp	160			DCLK
HSD front porch	thfp	16	160	216	DCLK

Table 10.5: HV mode horizontal timing (1024x600)

• Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd	600			T _H
VSD period	tv	624	635	750	T _H
VSD pulse width	tvpw	1	-	20	T _H
VSD back porch	tvbp	23			T _H
VSD front porch	tvfp	1	12	127	T _H

Table 10.6: HV mode vertical timing (1024x600)

6. OPTICAL CHARACTERISTICS

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle range	Horizontal	Θ_3	CR > 10	-	85	-	Deg.	WV-Pol Note 1
		Θ_9		-	85	-	Deg.	
	Vertical	Θ_{12}		-	85	-	Deg.	
		Θ_6		-	85	-	Deg.	
Luminance Contrast ratio		CR	$\Theta = 0^\circ$	-	400	-		Note 2
Cell Transmittance		Tr		4.8	5.8	-	%	Base on C Light Note 3
White Chromaticity		x_w		TYP. - 0.03	0.307	TYP. + 0.03		Note 4 Base on C Light
		y_w			0.338			
Reproduction of color (C light)	Red	R_x			0.605			
		R_y			0.336			
	Green	G_x			0.297			
		G_y			0.552			
	Blue	B_x			0.139			
		B_y			0.132			
Color Gamut (C light)				-	50	-	%	
Response Time (Rising + Falling)		T _{RT}	Ta= 25° C $\Theta = 0^\circ$	-	30	40	ms	Note 5

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 5).
2. Contrast measurements shall be made at viewing angle of $\Theta = 0$ and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGURE 5) uminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. Transmittance is the Value with Polarizer.
4. The color chromaticity coordinates specified in Table 6 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Calculation is based on C light.
5. The electro-optical response time measurements shall be made as FIGURE 6 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

7.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

<Table 7. Reliability Test Parameters >

No	Test Items	Conditions	
1	High temperature storage test	Ta = 80 °C, 240 hrs	Note 1
2	Low temperature storage test	Ta = -30 °C, 240 hrs	
3	High temperature & high humidity (operation test)	Ta = 60 °C, 90%RH, 240hrs	
4	High temperature operation test	Ta = 70 °C, 24hrs	
5	Low temperature operation test	Ta = -20 °C, 24hrs	
6	Thermal shock	Ta = -30 °C ↔ 80 °C (0.5 hr), 100 cycle	
7	PCT	121°C 100% 2atm, 24hr	
8	Packing Vibration Test	f=5-200Hz/a=1.47G/Random/X,Y,±Z/ 各30min	Note 2
9	Drop Test	一角三棱六面，自由落体各跌落一次	

8. GENERAL PRECAUTION

8.1 SAFETY

1. Do not swallow any liquid crystal, even if there is no proof that liquid crystal is poisonous.
2. If the LCD panel breaks, be careful not to get liquid crystal to touch your skin.
3. If skin is exposed to liquid crystal, wash the area thoroughly with alcohol or soap.

8.2 STORAGE CONDITIONS

1. Store the panel or module in a dark place where the temperature is $23\pm5^{\circ}\text{C}$ and the humidity is below $50\pm20\%\text{RH}$.
2. Store in anti-static electricity container.
3. Store in clean environment, free from dust, active gas, and solvent.
4. Do not place the module near organics solvents or corrosive gases.
5. Do not crush, shake, or jolt the module.

8.3 HANDLING PRECAUTIONS

- (1) Avoid static electricity which can damage the CMOS LSI.
- (2) The polarizing plate of the display is very fragile. So, please handle it very carefully.
- (3) Do not give external shock.
- (4) Do not apply excessive force on the surface.
- (5) Do not wipe the polarizing plate with a dry cloth, as it may easily scratch the surface of plate.
- (6) Do not use ketonic solvent & Aromatic solvent, use with a soft cloth soaked with a cleaning naphtha solvent.
- (7) Do not operate it above the absolute maximum rating.
- (8) Do not remove the panel or frame from the module.
- (9) When the module is assembled, it should be attached to the system firmly, Be careful not to twist and bend the module.
- (10) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining and discoloration may occur.
- (11) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.

8.4 WARRANTY

- (1) The period is within twelve months since the date of shipping out under normal using and storage conditions.
- (2) Do not repaired or modified the LCM. It may cause function to lose efficacy, Starry does not warrant the LCM.
- (3) All process and material comply ROHS.

9. PACKAGE DRAWING

TBD