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1. GENERAL DESCRIPTION

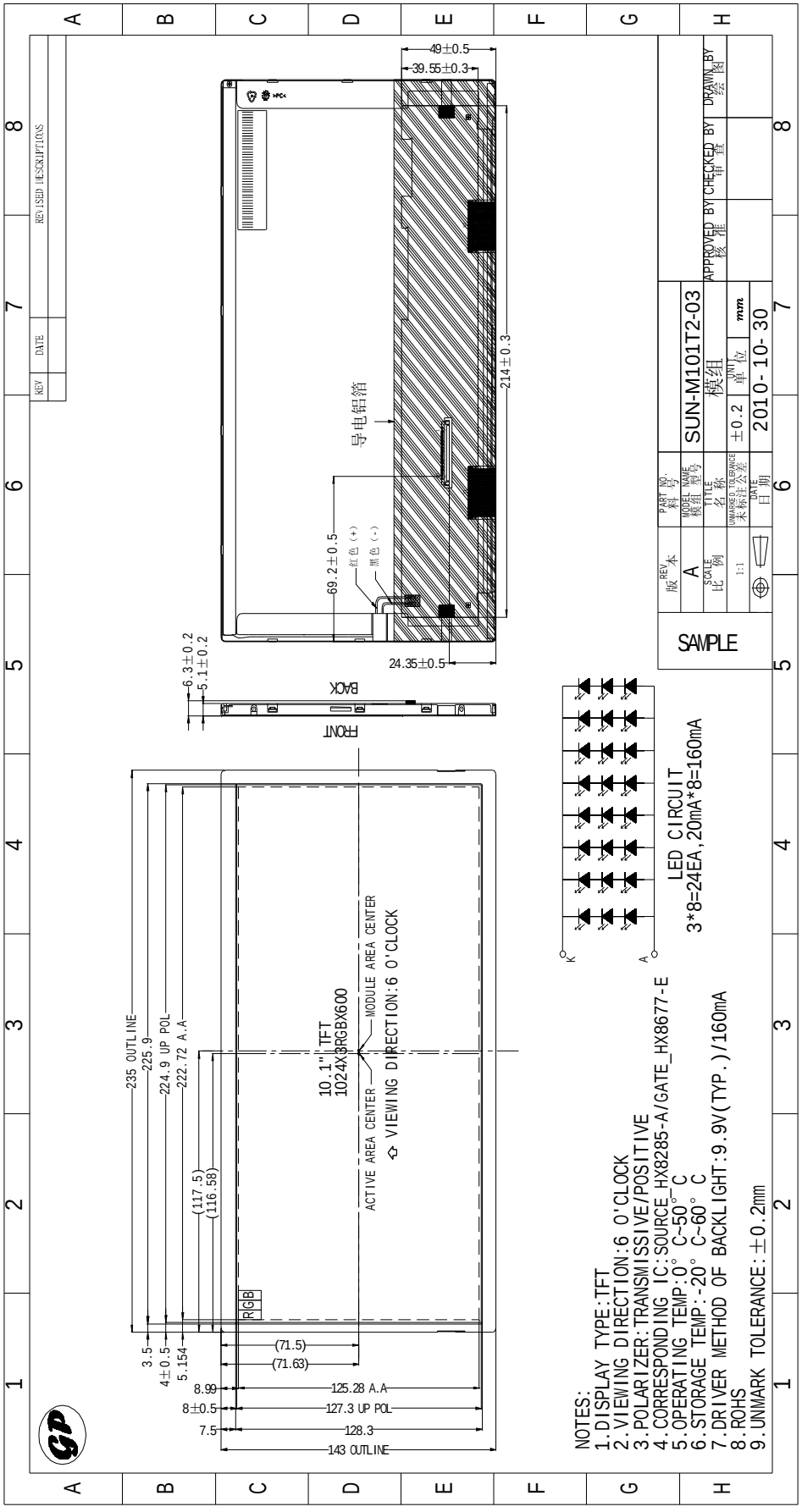
1.1 DESCRIPTION

SUN-M101T2-03 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, a timing controller, voltage reference, common voltage, column driver, and row driver circuit. 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)x 125.28(V)	mm
4	Pixel Pitch	0.2175 (H)×0.2088(V)	mm
5	Outline Dimension	235(W)×143(H)×5.1(D)	mm
6	Number of Colors	262K	-
7	Display Mode	TN Mode, Normally White	-
8	Viewing Direction	6 o’clock	-
9	Display Format	RGB vertical stripe	-
10	Luminance (cd/m^2)	200(min)	nit
11	Contrast Ratio	500(typ)	
12	Surface Treatment	Anti-Glare and Hard-coating 3H	-
13	Interface	LVDS	-
14	Backlight	White LED	-
15	Operation Temperature	0~50	℃
16	Storage Temperature	-20~60	℃
17	Weight	190 (max)	g

2. MECHANICAL SPECIFICATION



3. PIN DESCRIPTION

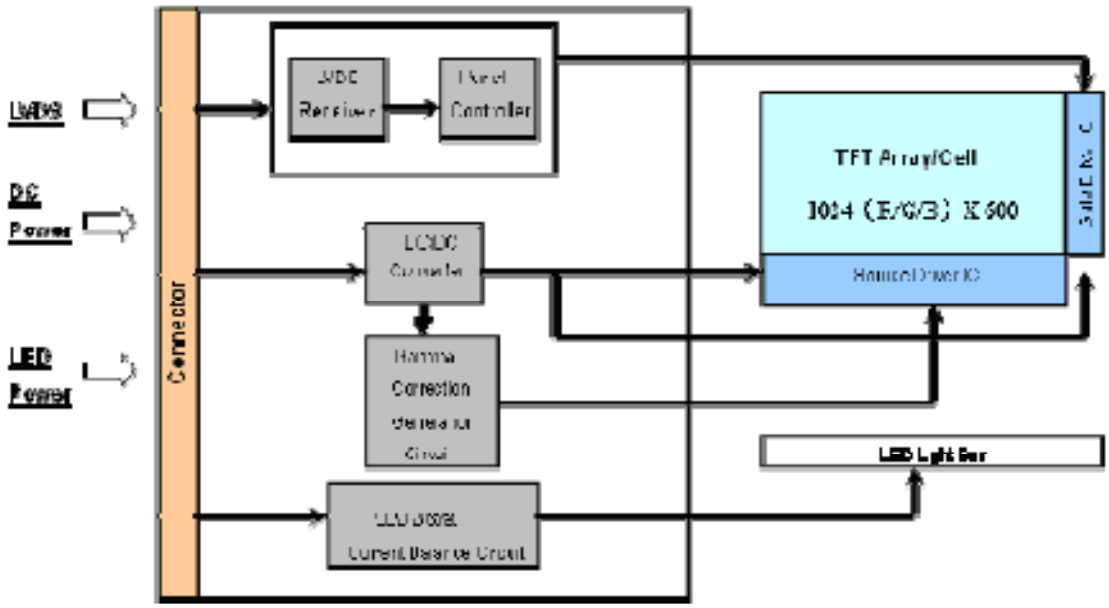
No.	Symbol	Function	Remark
1	NC	No Connection	
2	AVDD	PowerSupply,3.3V(typical)	
3	AVDD	PowerSupply,3.3V(typical)	
4	DVDD	DDC 3.3Vpower	
5	NC	NC	
6	NC	NC	
7	NC	NC	
8	Rin0-	-LVDS differential data input(R0-R5,G0)	
9	Rin0+	+LVDS differential data input(R0-R5,G0)	
10	GND	Ground	
11	Rin1-	-LVDS differential data input(G1-G5,B0-B1)	
12	Rin1+	+LVDS differential data input(G1-G5,B0-B1)	
13	GND	Ground	
14	Rin2-	-LVDS differential data input(B2-B5,HS,VS,DE)	
15	Rin2+	+LVDS differential data input(B2-B5,HS,VS,DE)	
16	GND	Ground	
17	ClkIN-	-LVDS differential clock input	
18	ClkIN+	+LVDS differential clock input	
19	GND	Ground	
20	NC	NC	
21	NC	NC	
22	GND	Ground	
23	NC	NC	
24	NC	NC	
25	GND	Ground – Shield	
26	NC	NC	
27	NC	NC	
28	GND	Ground – Shield	

29	NC	NC	
30	NC	NC	
31	VLED_GND	LED Ground	
32	VLED_GND	LED Ground	
33	VLED_GND	LED Ground	
34	NC	NC	
35	ADJ	Adjust for LED brightness	Note1
36	LED_EN	LED enable pin(+3.3V Input)	
37	NC	NC	
38	VLED	LED Power Supply +5V	
39	VLED	LED Power Supply +5V	
40	VLED	LED Power Supply +5V	

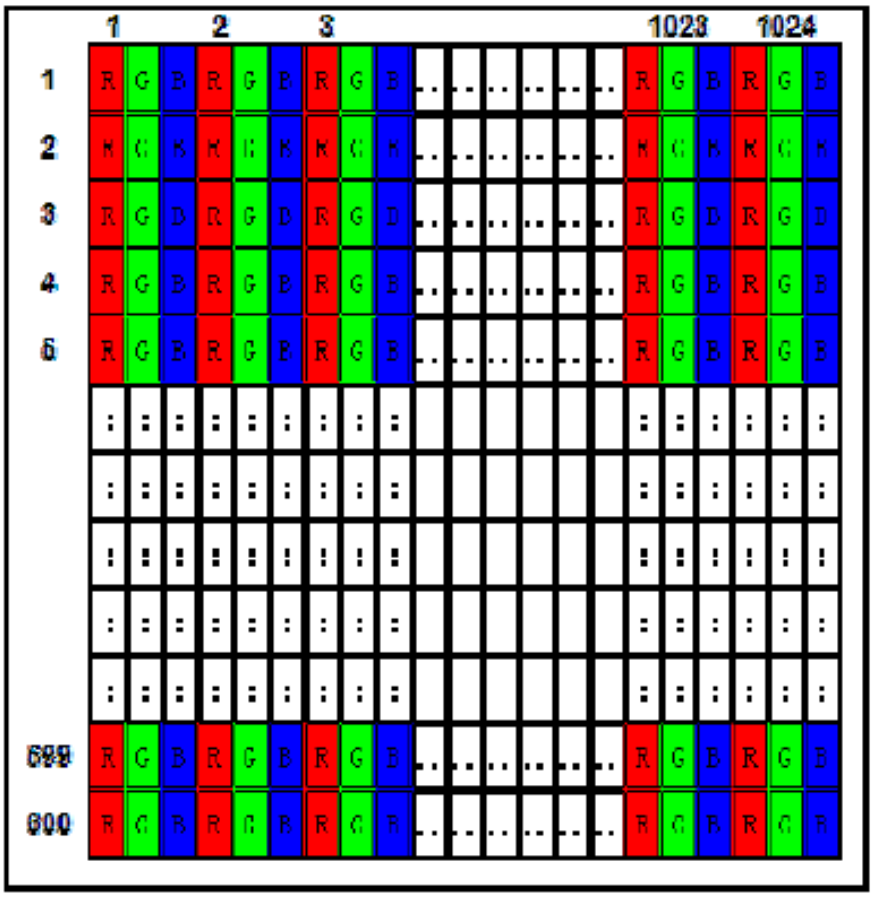
Note1:ADJ can adjust brightness to control Pin. Pulse duty the bigger the brighter.

4. BLOCK DIAGRAM

4.1 FUNCTIONAL BLOCK DIAGRAM



4.2 PIXEL FORMAT IMAGE



5. ELECTRICAL CHARACTERISTICS

5.1 ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Conditions
Supply Voltage	VDD	-0.3	4.0	V	Typ.=3.3V
Supply V_LED voltage	V_LED	4.5	5.5	V	Typ.=5V
Input Signal		-0.3	2.7	V	LVDS signals

5.2 LVDS RECEIVER

5.2.1Signal Electrical Characteristics for LVDS Receiver

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	-	-	+100	mV	Vcm=+1.2V
Differential Input Low Threshold	Vtl	-100	-	-	mV	Vcm=+1.2V
Magnitude Differential Input Voltage	|Vid|	100	-	600	mV	
Common Mode Voltage	Vcm	1.0	1.2	1.4	V	
Common Mode Voltage Offset	△Vcm	-	-	50	mV	Vcm=+1.2V

Note1: (1) Input signals shall be low or Hi-Z state when VDD is off.
(2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

Note2: All values are at VDD=3.3V, Ta=25 degree C.

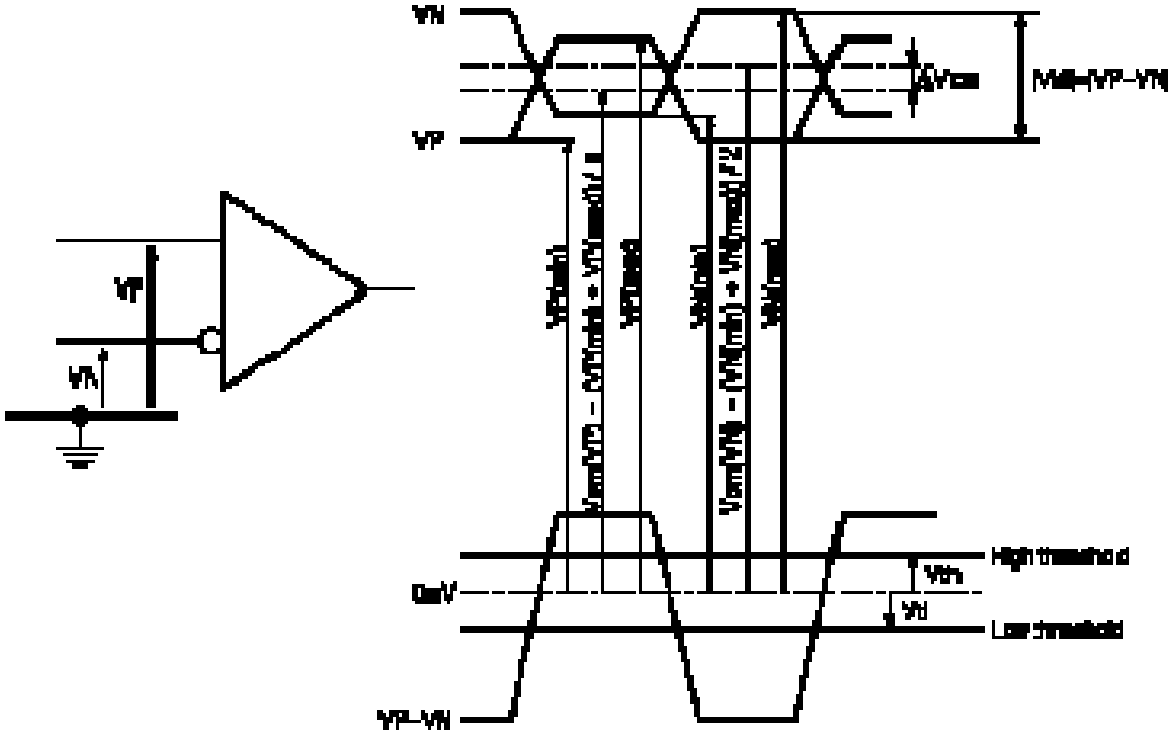


Figure5-1 Voltage Definitions

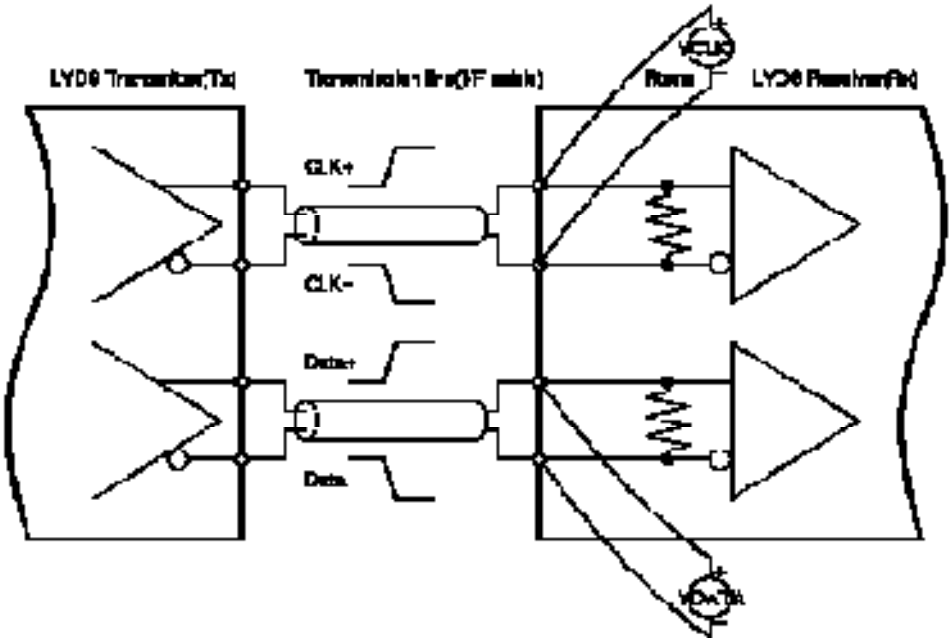


Figure5-2 Measurement System

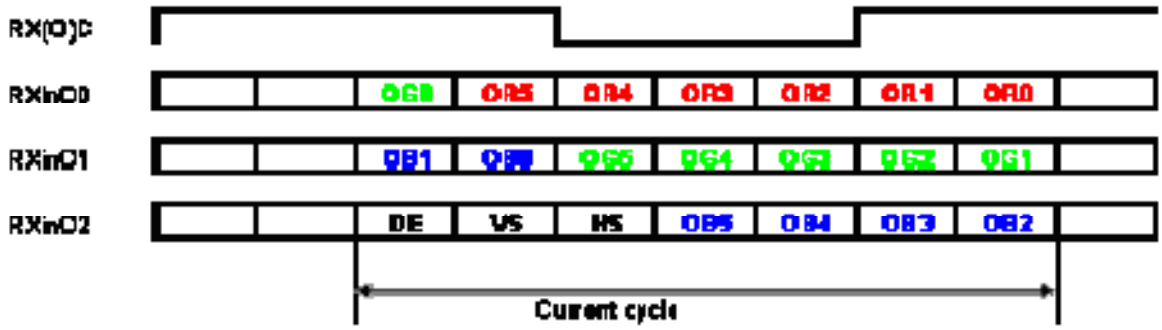


Figure5-3 Data mapping

5.2.2 LVDS Receiver Internal Circuit

Figure 5-4 LVDS Receiver Internal Circuit shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.

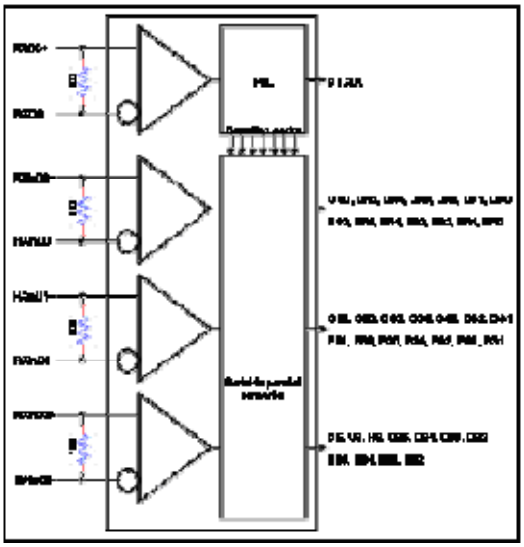


Figure5-4 LVDS Receiver Internal Circuit

5.3 POWER CONSUMPTION

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Logic/LCD Drive Voltage	VDD	3.0	3.3	3.6	V	
VDD Current	IDD	-	160	-	mA	
VDD Power	PDD	-	-	0.53	W	Black pattern, 60Hz
Rush Current	Irush	-	-	2	A	Note1
Allowable Logic/LCD Drive Ripple Voltage	VDDrp	-	-	300	mVp-p	

Note1: Measure Condition

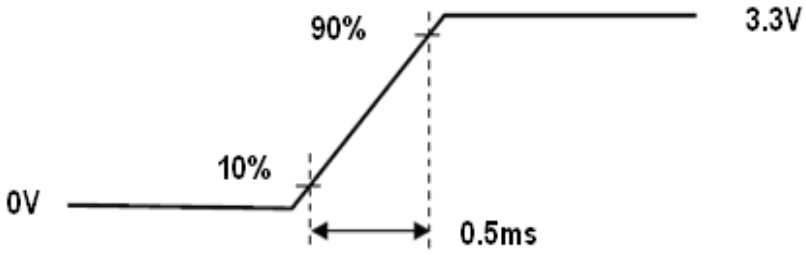


Figure5-5 VDD rising time

Note2.VDD Power Dip Condition

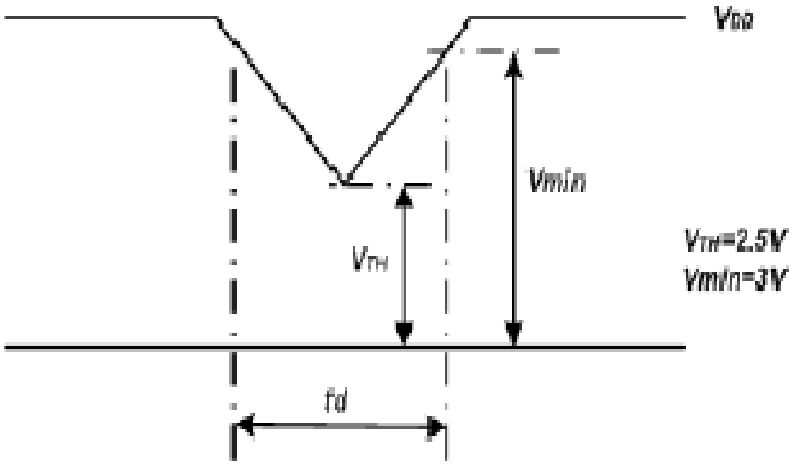


Figure5-6 VDD Power Dip

If VTH < VDD≤Vmin. then td≤10ms: when the voltage return to normal our panel must revive automatically.

5.4 POWER ON/OFF SEQUENCE

VDD power, interface signals, and lamp on/off sequence are shown in Figure 5-7 Signals shall be Hi-Z state or low level when VDD is off.

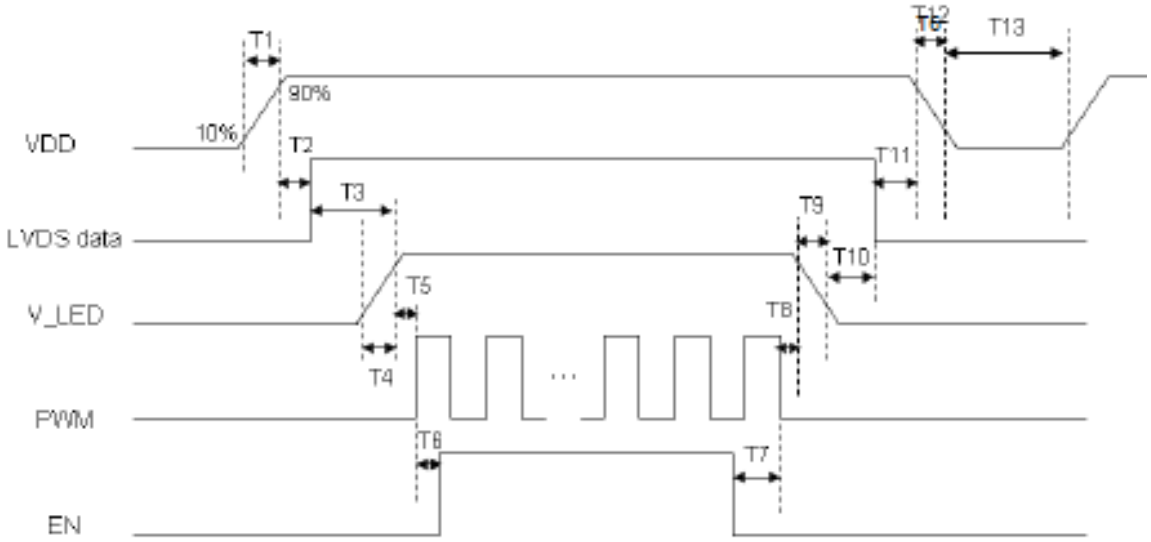


Figure5-7 Power Sequence

5.4.1 Power Sequencing Requirements

Parameter	Symbol	Min.	Typ.	Max.	Unit
VDD Rise Time	T1	0.5	-	10	ms
VDD Good to Signal Valid	T2	30	-	90	ms
Signal Valid to Backlight On	T3	200	-	-	ms
Backlight Power On Time	T4	0.5	-	-	ms
Backlight VDD Good to System PWM On	T5	10	-	-	ms
System PWM ON to Backlight Enable ON	T6	10	-	-	ms
Backlight Enable Off to System PWM Off	T7	0	-	-	ms
System PWM Off to B/L Power Disable	T8	10	-	-	ms
Backlight Power Off Time	T9	-	10	30	ms
Backlight Off to Signal Disable	T10	200	-	-	ms
Signal Disable to Power Down	T11	0	-	50	ms
VDD Fall Time	T12	-	10	30	ms
Power Off	T13	500	-	-	ms

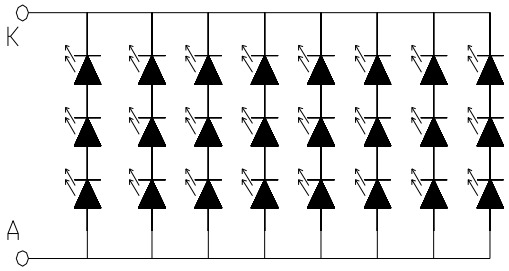
5.5 BACK LIGHT UNIT

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Center luminous Intensity	Iv	180	200		cd/m2	IF=160mA 24LEDS
LED current	ILED		160		mA	24LEDS
Chromaticity coordinates	X	0.270	0.300	0.330		IF=20mA/SMD
	Y	0.300	0.330	0.360		
Forward voltage	VF		9.9	10.8	v	IF=160mA 24LEDS
Reverse current	IR			400	μA	VR=15V
Luminous tolerance	IV-M point5	80			%	(Min/Max)×100
Luminous tolerance	IV-M point13	70			%	(Min/Max)×100
Power dissipation	Pd	1584			mW	24LEDS
Peak forward current	IFP	400			mA	
Reverse Voltage	VR	15			V	

Note: Only Backlight without LED Driver Circuit

5.5.1 Internal Circuit Diagram

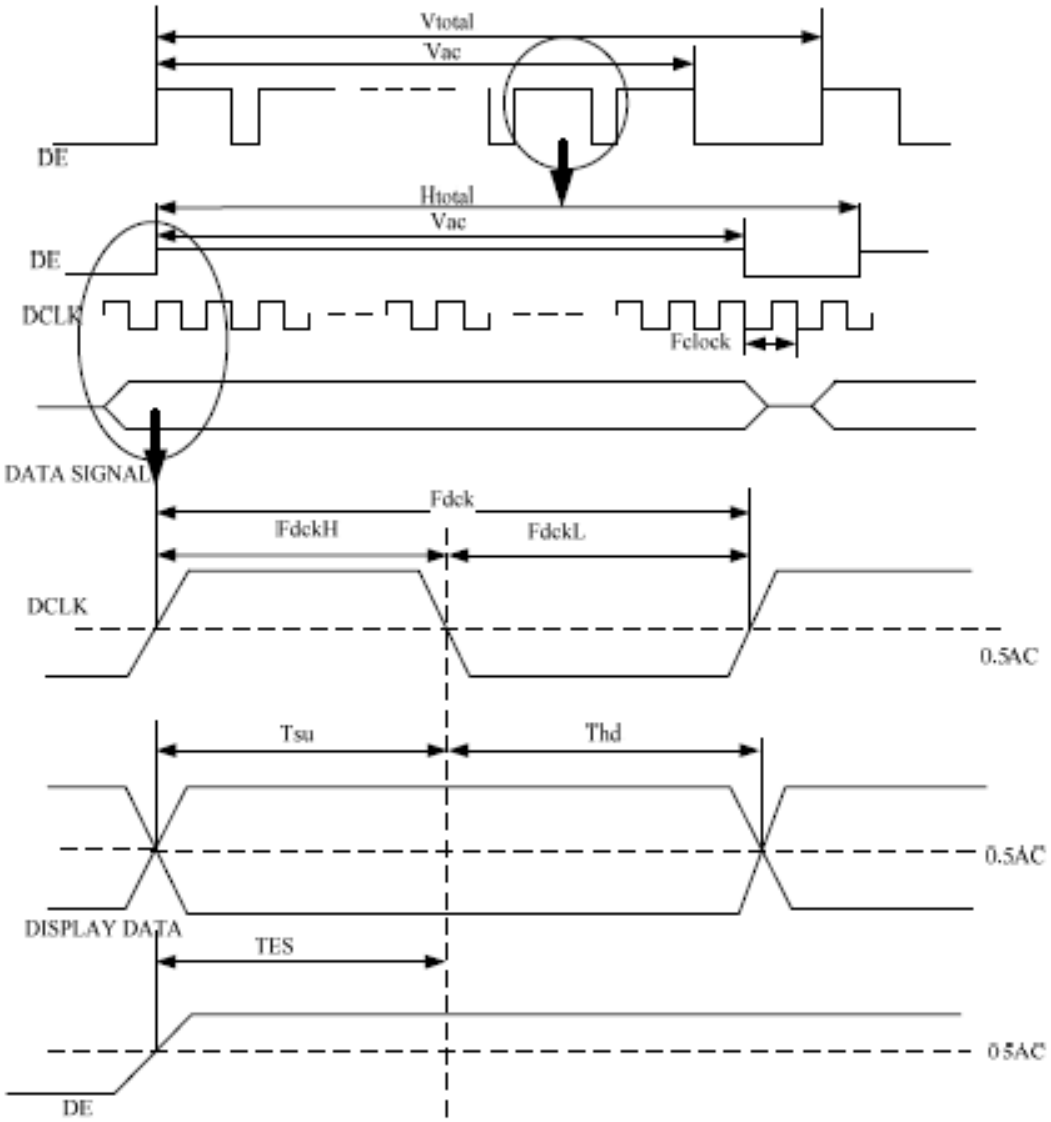


LED CIRCUIT
3*8=24EA,20mA*8=160mA

6. INPUT SIGNAL TIMING

6.1 TIMING CHARACTERISTICS

Parameter	Symbol	Min.	Typ.	Max.	Unit
LVDS Clock Frequency(single)	Fdck	44.4	50.4	65.2	MHz
H Total Time	Htotal	1320	1344	1362	clocks
H Active Time	Hac	1024	1024	1024	clocks
V Total Time	Vtotal	612	625	638	lines
V Active Time	Vac	600	600	600	lines
Frame Rate	Vsync	55	60	65	Hz



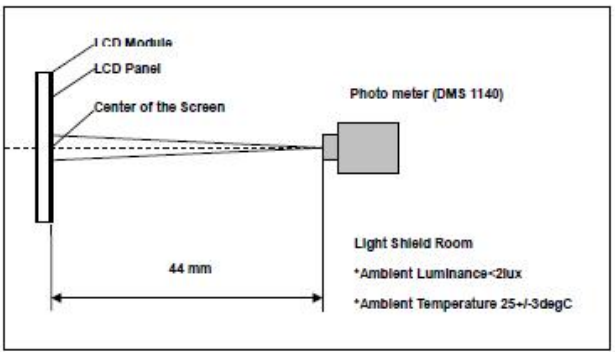
Note: TES is data enable signal setup time.

7. OPTICAL CHARACTERISTICS

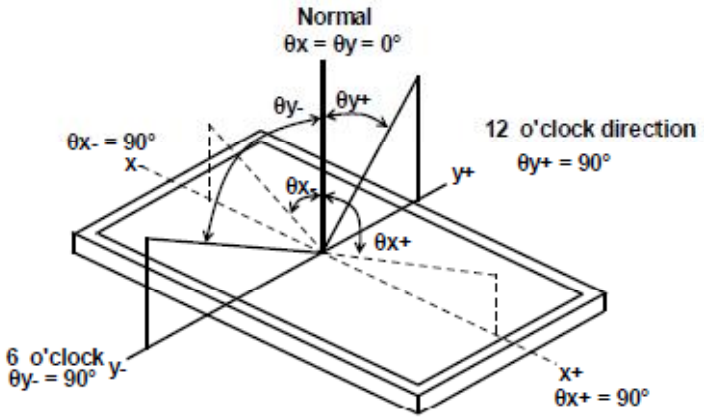
Item		Symbol	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	350	500	-		Note1 Note3
luminance		YL	180	200	-	cd/m2	Note1 Note5
Luminance Uniformity		13points	70			%	Note1 Note6
		5points	80				
Response Time		Rising + Falling	-	3+5	16	ms	Note1 Note4
Viewing Angle K=Contrast Ratio>10	Hor.	ΘL	40	70	-	degree	Note1 Note2
		ΘR	40	70	-		
	Ver.	ΘU	10	40	-		
		ΘD	30	50	-		
Color Chromaticity (CIE1931)	Red	x	TYP.-0.03	TBD	TYP.+0.03		Note1
	Red	y					
	Green	x		TBD			
	Green	y					
	Blue	x		TBD			
	Blue	y					
	White	x		0.313			
	White	y		0.329			

Note1: Measurement Setup

The LCD module should be stabilized at given temperature for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note2: Definition of Viewing Angle



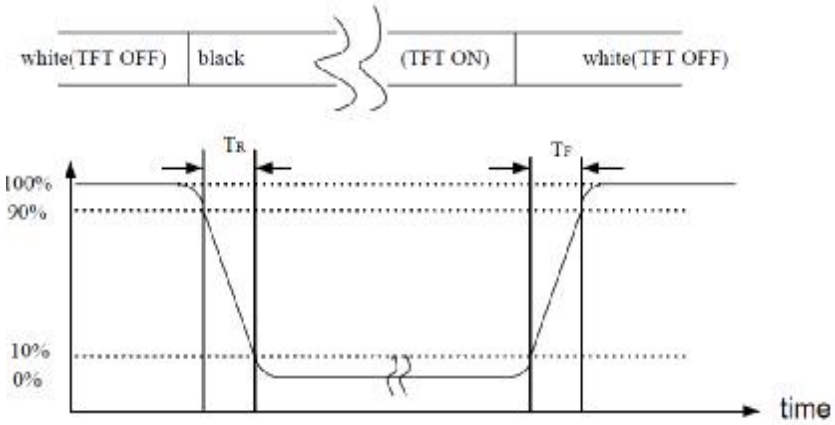
Note3: Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

Contrast Ratio (CR) = L63 / L0

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note4: Definition of Response Time (TR, TF)



Note5: Definition of Luminance White

Measure the luminance of gray level 63 at center point and 5 points.

Center of Luminance = Y1

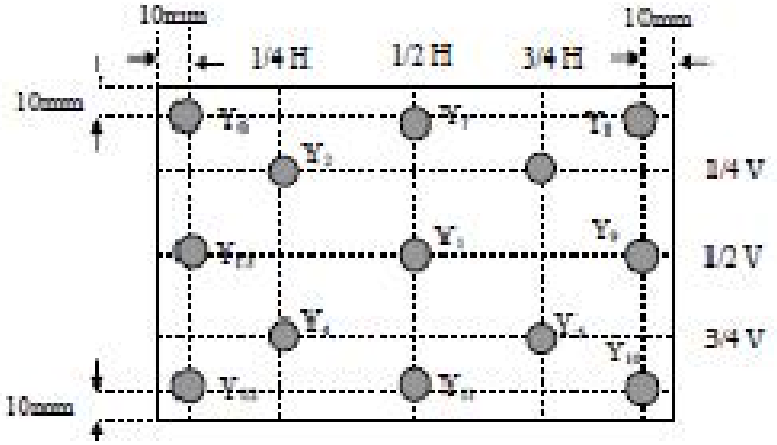
$$\text{Average Luminance of 5 points} = \frac{Y_1 + Y_2 + Y_3 + Y_4 + Y_5}{5}$$

Note6: Definition of Luminance Uniformity(Variation)

Measure the luminance of gray level 63 at 13 points.

$$\text{Uniformity of 13 points} = \frac{\text{Min Luminance of Y1~Y13}}{\text{Max Luminance of Y1~Y13}} \times 100\%$$

$$\text{Uniformity of 5 points} = \frac{\text{Min Luminance of Y1~Y5}}{\text{Max Luminance of Y1~Y5}} \times 100\%$$


10mm
10mm
1/4 H
1/2 H
3/4 H
10mm
10mm
1/4 V
1/2 V
3/4 V

8. RELIABILITY TEST ITEMS

8.1 TEMPERATURE AND HUMIDITY

Test items	Conditions
High temperature storage	Ta=60°C,240Hrs
Low temperature storage	Ta=-20°C,240Hrs
High temperature operation	Ta=50°C,240Hrs
Low temperature operation	Ta=0°C,240Hrs
High temperature and High humidity operation	Ta=50°C,90% RH, 240Hrs(no condensation)
Thermal shock	0°C(30Mins)～50°C(30Mins)，100 Cycle

8.2 VIBRATION & SHOCK

Test item	Conditions
Packing Shock (non-operation)	980m/s2,6ms, ±x,y,x 3times for direction
Packing Vibration (non-operation)	Frequency range:10 HZ~55HZ Stroke:1.5mm,sweep:10 HZ ~55 HZ x,y,x 2 hours for each direction

8.3 ESD

Test item	Conditions
Electro Static Discharge Test (non-operation)	±200v,200pF, 0Ω

9. GENERAL PRECAUTION

9.1 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.

9.2 STORAGE CONDITIONS

1. Store the panel or module in a dark place where the temperature is 23±5°C and The humidity is below 50±20%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.

9.3 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 ketonics 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.

9.4 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.

10. PACKAGE DRAWING

TBD