液 晶 模 组 说 明 书

LCD Module Instructions

Module P/N: TFT-H103W01ZMINV5N30

Version: 0.0

Description : 10.24 inch TFT 1440*540 Pixels with LED backlight, wide viewing angle

☑初定规格 Preliminary specification

☐正式规格 Official specifications

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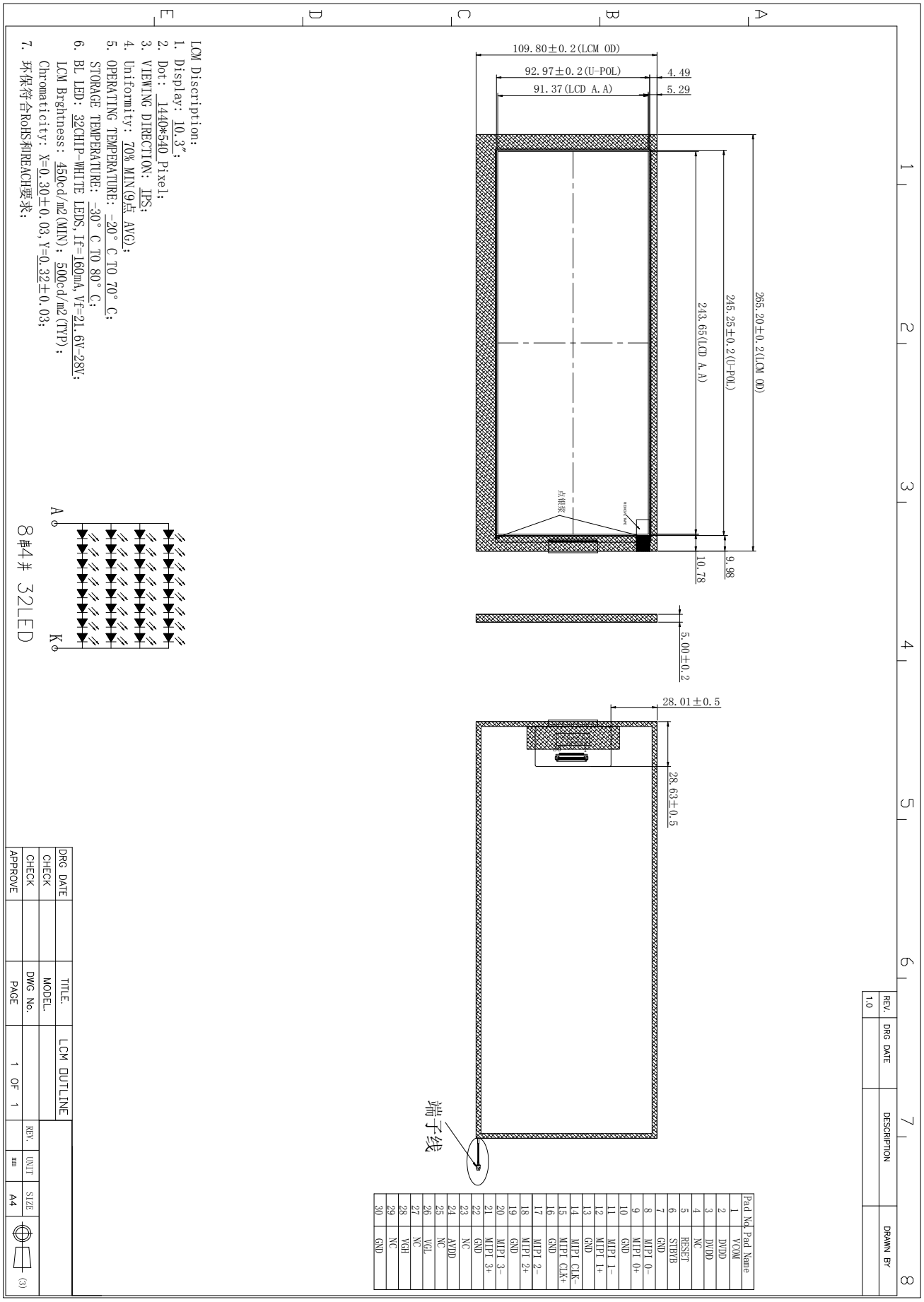
Revision History

Date	Rev.	Page	Description
2023-9-14	0.0	All	First issue

1.General Features

Item	Spec	Remark
Display Mode	Normally Black ,transmissive	
Viewing Direction	ALL Viewing	
Input Signals	***MIPI***	
Outline Dimensions	265.2(W)×109.8(H)×5.0(D) .	mm/With
Active Area	243.65(W)×91.37(H)	mm
Number of Pixels	1440×RGB×540 Pixels	
Dot Pitch	0.1692(H)×0.1692 (V)	mm
Pixel Arrangement	RGB Vertical stripes	
Display Color	16.7M	
Drive IC	NV3051F	

2.Outline Dimension



3. Reliability and Inspection Standard

No.	Test Item		Test Conditions	INSPECTION AFTER TEST
1	High Temperature	Storage	80℃, 120Hrs	Inspection after 2-4hours storage at room temperature,the samples should be free from defects: 1,Air bubble in the LCD. 2,Seal leak. 3,Non-display. 4,Missing segments. 5,Glass crack. 6,Current IDD is twice higher than initial value. 7,The surface shall be free from damage.
		Operation	70℃, 120Hrs	
2	Low Temperature	Storage	-30℃, 120Hrs	
		Operation	-20℃, 120Hrs	
3	High Temperature and High Humidity		70℃,80%RH, 48Hrs	
4	Temperature Cycle(storage)		-20 ~ 70℃, 30 Mins/cycle , Total 10 Cycles,	
5	Vibration Test		10Hz~150Hz, 100m/s2, 30min	
6	ESD Test		Voltage:±4KV R: 330Ω C: 150pF Air discharge, 10time	
7	Drop Test(package state)		300mm, concrete floor, 1corner, 3edges, 6 sides	1.After testing, cosmetic and electrical defects should not happen. 2.the product should remain at initial place 3.Product uncovered or package broken is not permitted.

REMARK:
1,The Test samples should be applied to only one test item.
2,Sample for each test item is 3pcs.
3,For Damp Proof Test, Pure water(Resistance＞10MΩ)should be used.
4,Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

4.Absolute Maximum Ratings

(VCI=2.5V~6.0V, IOVCC = 1.65V~3.6V, Ta = -30℃ ~ 85℃)

Parameter	Symbol	Rating	Unit	Note
Power Supply Voltage 1	IOVCC-VSS	-0.3 ~ +4.5	V	
Power Supply Voltage 2	VDDAM-VSS	-0.3 ~ +6.6	V	
Power Supply Voltage 3	VCI-VSS	-0.3 ~ +6.6	V	
Power Supply Voltage 4	VPP-VSS	-0.3 ~ +7.8	V	
Power Supply Voltage 5	DVDD-VSS	-0.3 ~ +1.8	V	
Power Supply Voltage 6	VSP-VSS	-0.3 ~ +6.6	V	
Power Supply Voltage 7	VSS-VSN	-0.3 ~ +6.6	V	
Power Supply Voltage 8	VGH-VGL	-0.3 ~ +32	V	
Input Voltage	Vt	-0.3 ~ IOVCC +0.3	V	

Note: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

5.Electrical Specification

Item		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		AVDD	9	10	13	V	
		DVDD	-	1.8	-		
Logic Input Voltage	Low Voltage	VIL	0.0	-	0.2 IOVCC	V	
	High Voltage	VIH	0.8 IOVCC	-	IOVCC	V	
Logic Output Voltage	Low Voltage	VOL	0.0	-	0.2 IOVCC	V	
	High Voltage	VOH	0.8 IOVCC	-	IOVCC	V	

6.Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	VBL	21.6	-	28	V	
Backlight driving current	IBL	-	160	-	mA	
Life Time	-	-	20,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25℃)
Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.
Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

7.Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 ℃. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1)Contrast Ratio	C/R	1000	1200	-		FIG.1
2)Luminance Uniformity	δ WHITE	70	75	-	%	Note5
3)Luminance	L	450	500	-	cd/m^2	
4)Response time	Tr	-	30	35	ms	FIG.2
	Tf					
5)Viewing Angle	θ_T	80	85	-	Degree	FIG.3
	θ_B	80	85	-		
	θ_L	80	85	-		
	θ_R	80	85	-		
6)Chromaticity	Wx	Typ -0.03	0.30	Typ +0.03		
	Wy		0.32			
	Rx		-			
	Ry		-			
	Gx		-			
	Gy		-			
	Bx		-			
	By		-			
NTSC	75%					TYP

◆ Measurement System

Notes:

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.

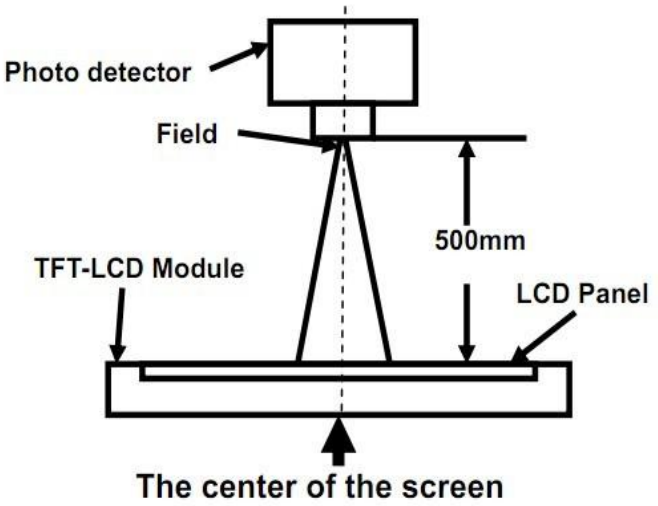
3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.

4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3..

5. The uniformity in surface luminance（δ WHITE）is determined by measuring luminance at each test position 1 through 9, and then dividing the maximum luminance of 9 points luminance by minimum luminance of 9 points luminance.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels}}{\text{Maxi mum Surface Luminance with all white pixels}}$$

FIG. 1 Optical Characteristic Measurement Equipment and Method



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(Tr) + Falling Time(Tf)

- Rising Time(Tr) : Full White 90% → Full White 10% Transmittance.
- Falling Time(Tf) : Full White 10% → Full White 90% Transmittance.

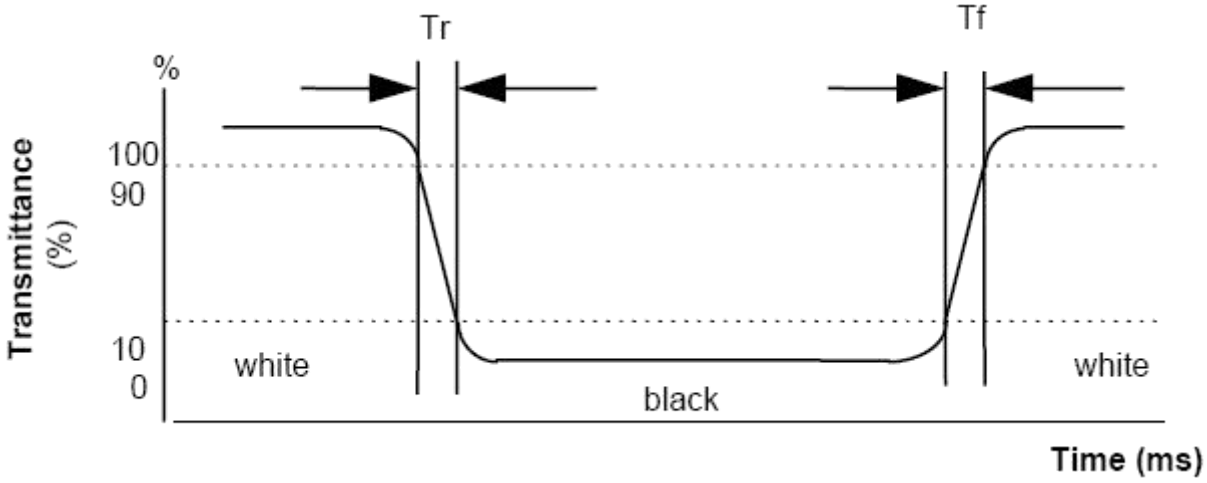
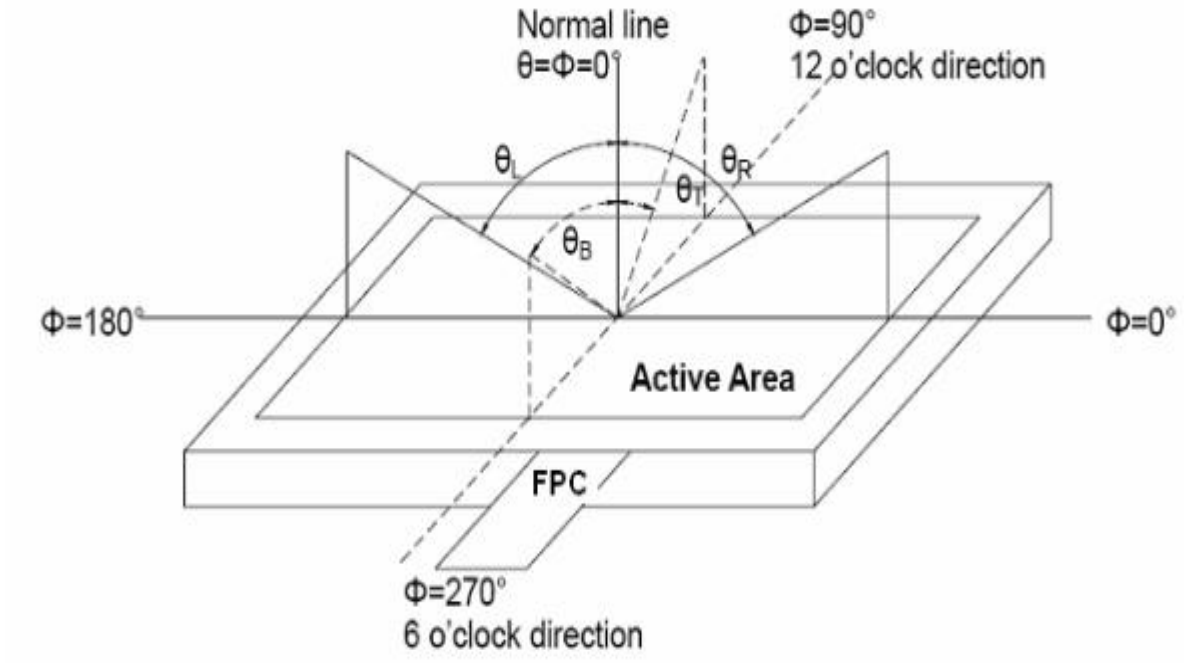
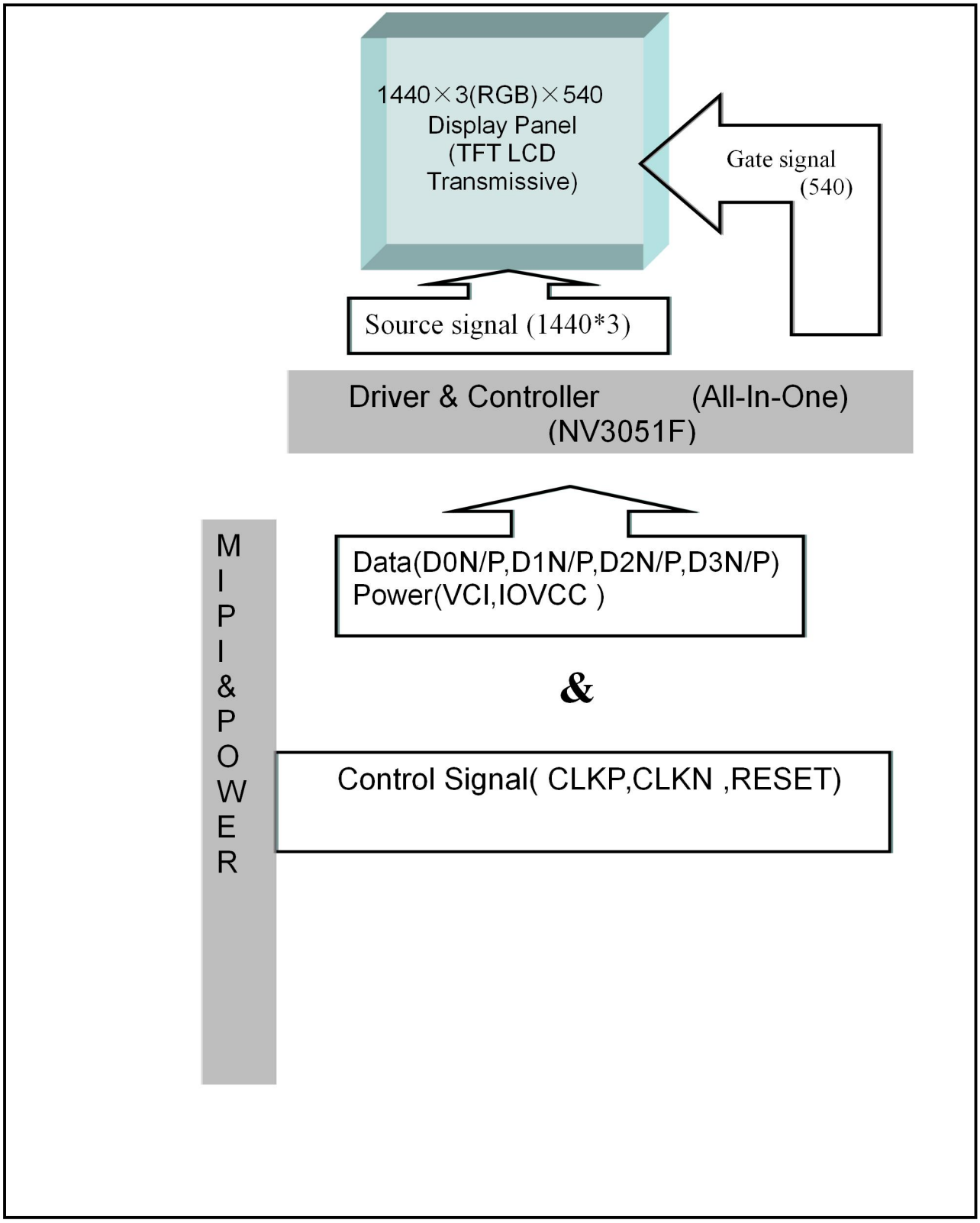


FIG. 3 The definition of Viewing Angle

Use Fig. 1(Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



8.Block Diagram



9.Pin Description

Item	Terminal	Functions
1	VCOM	Common voltage（NC）
2	DVDD	Power for Digital Circuit（1.8V）
3	DVDD	Power for Digital Circuit（1.8V）
4	GND	NC
5	RESET	Global reset pin. Active Low to enter Reset State. Normally pull high. Connecting with an RC reset circuit for stability（1.8V）
6	STBYB	NC
7	GND	Ground
8	D0-	Negative MIPI differential data inputs0-
9	D0+	Positive MIPI differential data inputs0+
10	GND	Ground
11	D1-	Negative MIPI differential data inputs1-
12	D1+	Positive MIPI differential data inputs1+
13	GND	Ground
14	CLK-	Negative MIPI differential clock inputs
15	CLK+	Positive MIPI differential clock inputs
16	GND	Ground
17	D2-	Negative MIPI differential data inputs2-
18	D2+	Positive MIPI differential data inputs2+
19	GND	Ground
20	D3-	Negative MIPI differential data inputs3-
21	D3+	Positive MIPI differential data inputs3+
22	GND	Ground
23	NC	NC
24	AVDD	Power for Analog Circuit（9-13V）
25	NC	NC
26	VGL	Gate OFF Voltage（NC）
27	NC	NC
28	VGH	Gate ON Voltage（NC）
29	NC	NC
30	GND	Ground

10.Timing Characteristics

10.1. LVDS interface Timing

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Differential input high threshold voltage	$V_{Rx,TH}$	V_{RxVCM}=1.2V	-	0.2	-	V
Differential input low threshold voltage	$V_{Rx,TL}$		-	-0.2	-	V
Input voltage range(single-end)	V_{RxIN}		0	-	1.8	V
Differential input common mode voltage	V_{RxVCM}		|VID|/2	1.2	1.8 - |VID|/2	V
Differential input voltage	| VID|		0.2	0.4	0.6	V
Differential input leakage current	I_{LCLVDS}		-10	-	10	uA
Differential input impedance	ZID		80	100	140	Ω

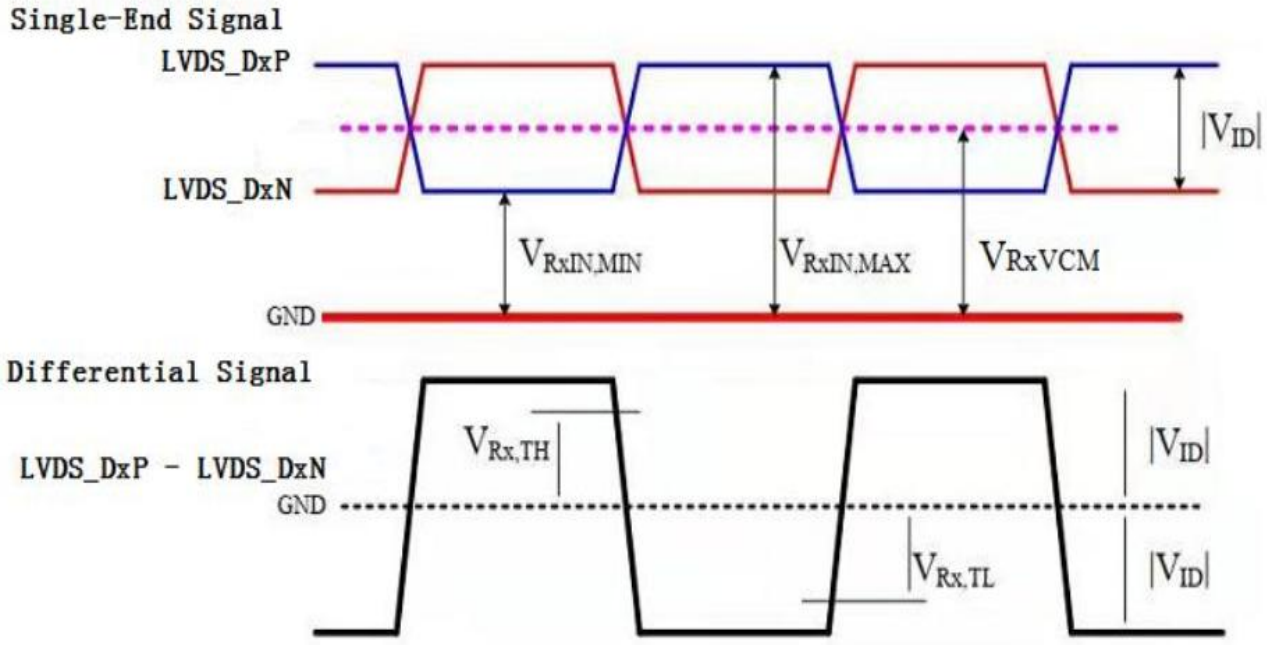
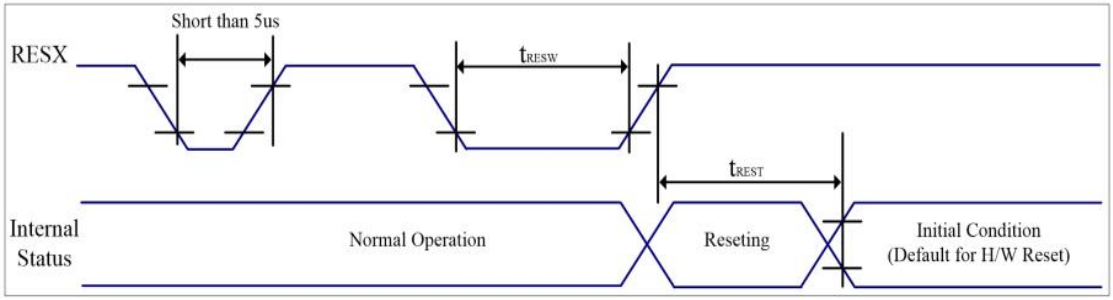


Figure: LVDS Receiver Differential Definition

10.2. Reset Operation



VSS=0V, IOVCC=1.65V to 3.6V, VCI=2.5V to 6.0V,Ta = -30℃ to 85℃

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
T_{resw}	*1) Reset low pulse width	RESX	10	-	-	-	us
T_{rest}	*2) Reset complete time	-	-	-	5	When reset applied during Sleep in mode	ms
		-	-	-	120	When reset applied during Sleep out mode	ms

Table: Reset input timing

Note 1: Due to an electrostatic discharge on RESX line,spike does not cause irregular system reset according to the table below.

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts (It depends on voltage and temperature condition.)

Note 2: During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120ms, when Reset Starts in Sleep Out mode. The display remains the blank state in Sleep In mode) , then return to default condition for H/W reset.

Note 3: During Reset Complete Time, ID1/ID2/ID3 and VCOM value in OTP will be latched to internal register. After a rising edge of RESX, there is a H/W reset complete time (Trest) which lasted 5ms.The loading operation will be done every time during this reset.

11.PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.
(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.
(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol
Do not scrub hard to avoid damaging the display surface.
(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents
Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.
(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.
(9) Do not attempt to disassemble or process the LCD module.
(10) NC terminal should be open. Do not connect anything.
(11) If the logic circuit power is off, do not apply the input signals.
(12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
- Do not alter, modify or change the shape of the tab on the metal frame.
- Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
- Do not damage or modify the pattern writing on the printed circuit board.
- Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.

- Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
- Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.
(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.
If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.
To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
- Exposed area of the printed circuit board.
-Terminal electrode sections.