



Model No: MTD0500JDR

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1. Scope

This data sheet is to introduce the specification of **MTD0500JDR** active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 5.0" display area contains 800(RGB) x 480 pixels.

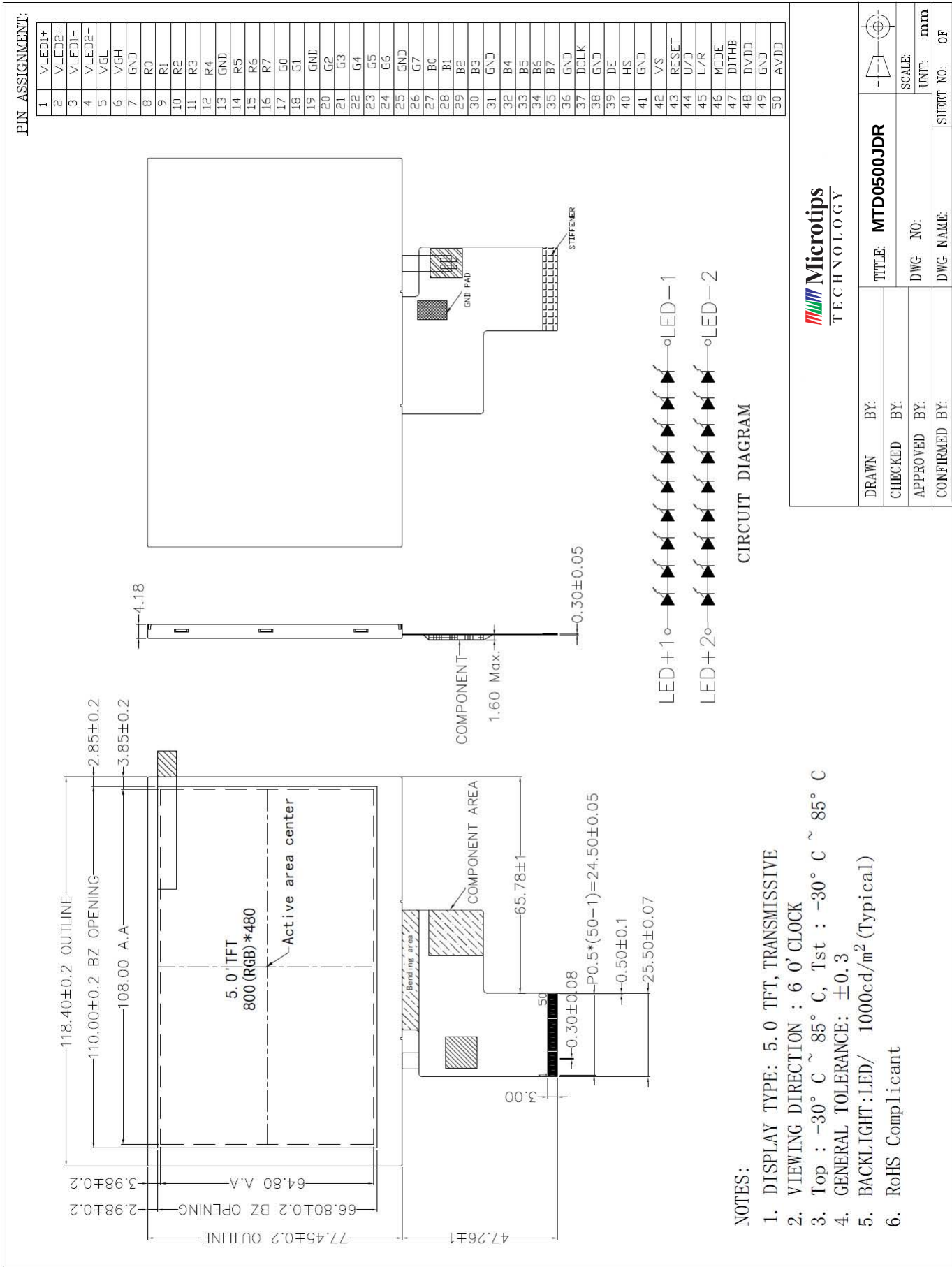
2. Application

Digital equipments which need color display, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	5.0	inch
Resolution	800 (RGB) x 480	/
Interface	RGB 24 bits	/
Technology type	a-Si TFT	/
Pixel pitch	0.135 x 0.135	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Polarizer Surface Treatment	Anti-Glare	
Outline Dimension (W x H x D)	118.40 x 77.45 x 4.18	mm
Active Area	108.00 x 64.80	mm
Display Mode	Transmissive Normally white	/
View Direction(Gray inversion)	6 O'clock	
Backlight Type	LED	/
Weight	76	g

4. Outline Drawing



5. Interface signals

Recommend connector: Molex 54104-5031 or equivalent

No.	Symbol	Description	Note
1	VLED 1+	Power for LED backlight (Anode)	
2	VLED 2+	Power for LED backlight (Anode)	
3	VLED 1-	Power for LED backlight (Cathode)	
4	VLED 2-	Power for LED backlight (Cathode)	
5	VGL	Gate OFF Voltage	
6	VGH	Gate ON Voltage	
7	GND	Power ground	
8	R0	Red data (LSB)	2
9	R1	Red data	2
10	R2	Red data	
11	R3	Red data	
12	R4	Red data	
13	GND	Power ground	
14	R5	Red data	
15	R6	Red data	
16	R7	Red data (MSB)	
17	G0	Green data (LSB)	2
18	G1	Green data	2
19	GND	Power ground	
20	G2	Green data	
21	G3	Green data	
22	G4	Green data	
23	G5	Green data	
24	G6	Green data	
25	GND	Power ground	
26	G7	Green data(MSB)	
27	B0	Blue data (LSB)	2
28	B1	Blue data	2
29	B2	Blue data	
30	B3	Blue data	
31	GND	Power ground	
32	B4	Blue data	
33	B5	Blue data	
34	B6	Blue data	
35	B7	Blue data(MSB)	
36	GND	Power ground	
37	DCLK	Sample clock	3
38	GND	Power ground	

39	DE	Data Input Enable	
40	HS	Horizontal Sync Input	
41	GND	Power ground	
42	VS	Vertical Sync Input	
43	RESET	Global reset pin	6
44	U/D	Up/Down selection	4,5
45	L/R	Left/right selection	4,5
46	MODE	DE/SYNC mode select	1
47	DITHB	Dithering function	7
48	DVDD	Power for Digital circuit	
49	GND	Power ground	
50	AVDD	Power for Analog Circuit	

Note 1: DE/SYNC mode select. Normally pull high. When select DE mode, MODE="1", VS and HS must pull high. When select SYNC mode, MODE="0", DE must be grounded.

Note 2: When input 18 bits RGB data, the two low bits of R,G and B data must be grounded.

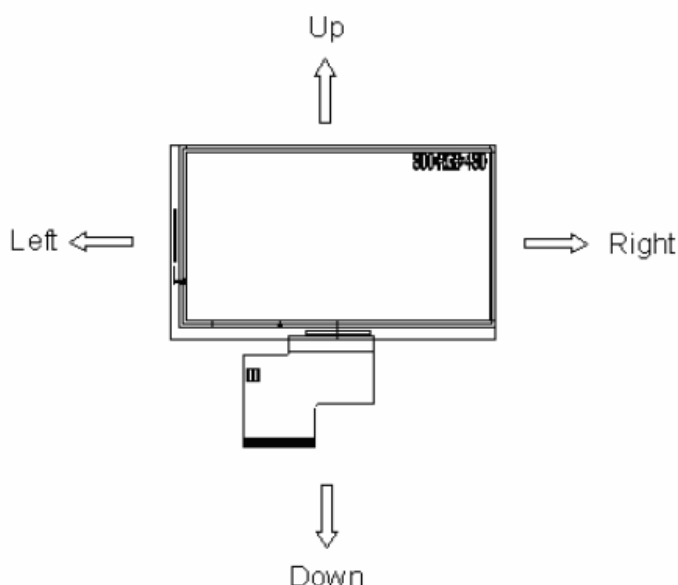
Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Setting of scan control input		Scanning direction
U/D	L/R	
DVDD	DVDD	Up to down, left to right
GND	GND	Down to up, right to left
DVDD	GND	Up to down, right to left
GND	DVDD	Down to up, left to right

Note 5: Definition of scanning direction.

Refer to the figure as below:



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC reset circuit for stability. Normally pull high.

Note 7: Dithering function enable control, normally pull high.
When DITHB="1", Disable internal dithering function,
When DITHB="0", Enable internal dithering function,

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Voltage	DVDD	-0.3	5.0	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	42.0	V	
	VGL	-20.0	0.3	V	
	VGH-VGL	-	40.0	V	

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. If a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered..

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	85	°C	-40°C on temperature cycling test
Storage Temperature	TSTG	-30	85	°C	

6.3. LED Backlight Absolute max. ratings

Item	Symbol	MIN	MAX	Unit	Remark
LED Forward Current	ILED	--	25	mA	For each LED

7. Electrical Characteristics

7.1 Electrical characteristics

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Voltage	DVDD	3.0	3.3	3.6	V	Note2
	AVDD	10.2	10.4	10.6	V	
	VGH	15.8	16.0	16.2	V	
	VGL	-6.2	-6.0	-5.8	V	
Input logic high voltage	VIH	0.7*DVDD	-	DVDD	V	Note3
Input logic low voltage	VIL	0	-	0.3*DVDD	V	

Note 1: Be sure to apply DVDD and VGL to the LCD first, and then apply VGH.

Note 2: DVDD setting should match the signals output voltage (refer to Note 3) of customer's system board.

Note 3: DCLK,HS,VS,RESET, U/D, L/R, DE, R0~R7, B0~B7, MODE, DITHB.

7.2 Current Consumption

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Current for Driver	IGH	-	0.50	1	mA	VGH=16.0V
	IGL	-	0.54	1	mA	VGL=-6.0V
	IDVDD	-	4.2	10	mA	DVDD=3.3V
	IAVDD	-	19	50	mA	AVDD=10.4V

7.3 LED Backlight

The backlight system is an edge-lighting type with 18 LED.

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	V _L	25	--	31.5	V	
LED current	I _L	--	40	--	mA	
LED Life Time		15,000	30,000	--	Hour	Note 1

Note 1: The "LED life time" is defined as the module brightness decrease to 50% original brightness at Ta=25°C and IL=40mA. The LED lifetime could be decreased if operating IL is larger than 40mA. The constant current driving method is suggested.

LED- 1  LED+ 1

LED- 2  LED+ 2

IF=20X2=40mA, VF= 25~31.5 V

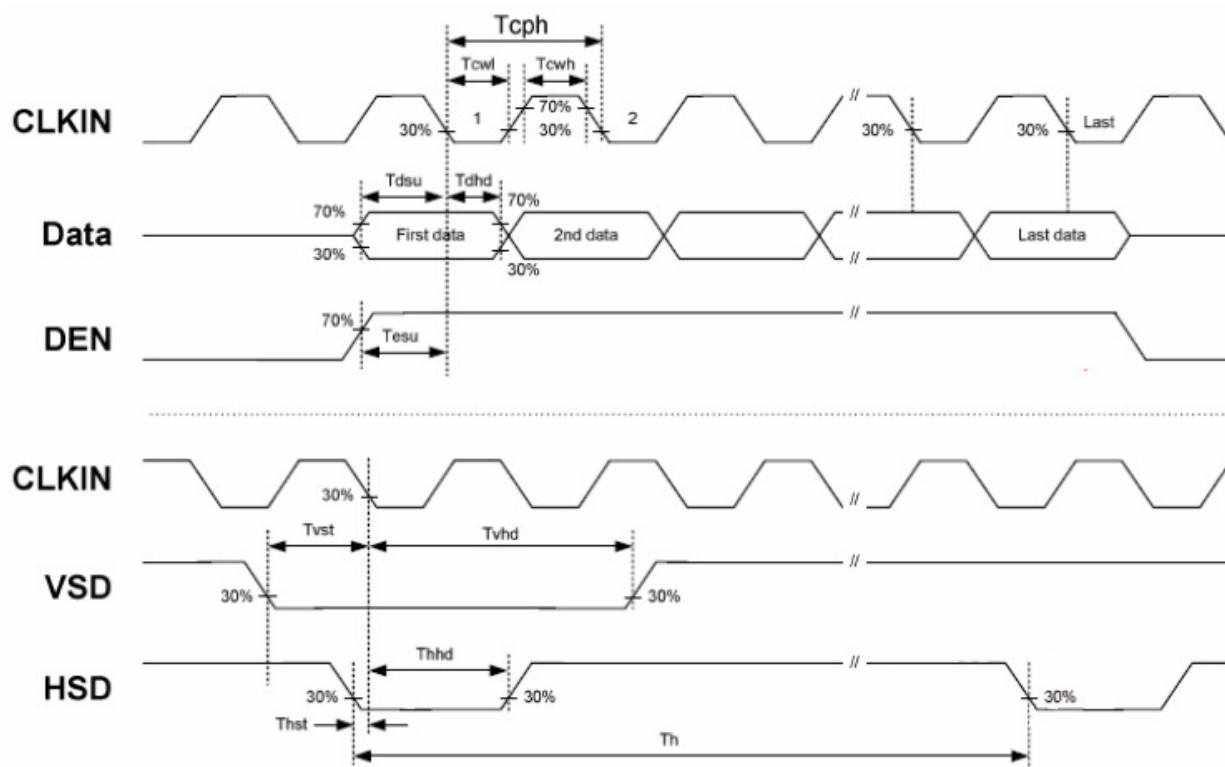
backlight circuit

8. Command/AC Timing

8.1 AC Electrical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
HS setup time	T_{hst}	8	-	-	ns	
HS hold time	T_{hhd}	8	-	-	ns	
VS setup time	T_{vst}	8	-	-	ns	
VS hold time	T_{vhd}	8	-	-	ns	
Data setup time	T_{dsu}	8	-	-	ns	
Data hole time	T_{dhd}	8	-	-	ns	
DE setup time	T_{esu}	8	-	-	ns	
DE hole time	T_{ehd}	8	-	-	ns	
DVDD Power On Slew rate	T_{POR}	-	-	20	ms	From 0 to 90% DVDD
RESET pulse width	T_{Rst}	1	-	-	ms	
DCLK cycle time	T_{coh}	20	-	-	ns	
DCLK pulse duty	T_{cwh}	40	50	60	%	

8.2 Input Clock and Data Timing Diagram

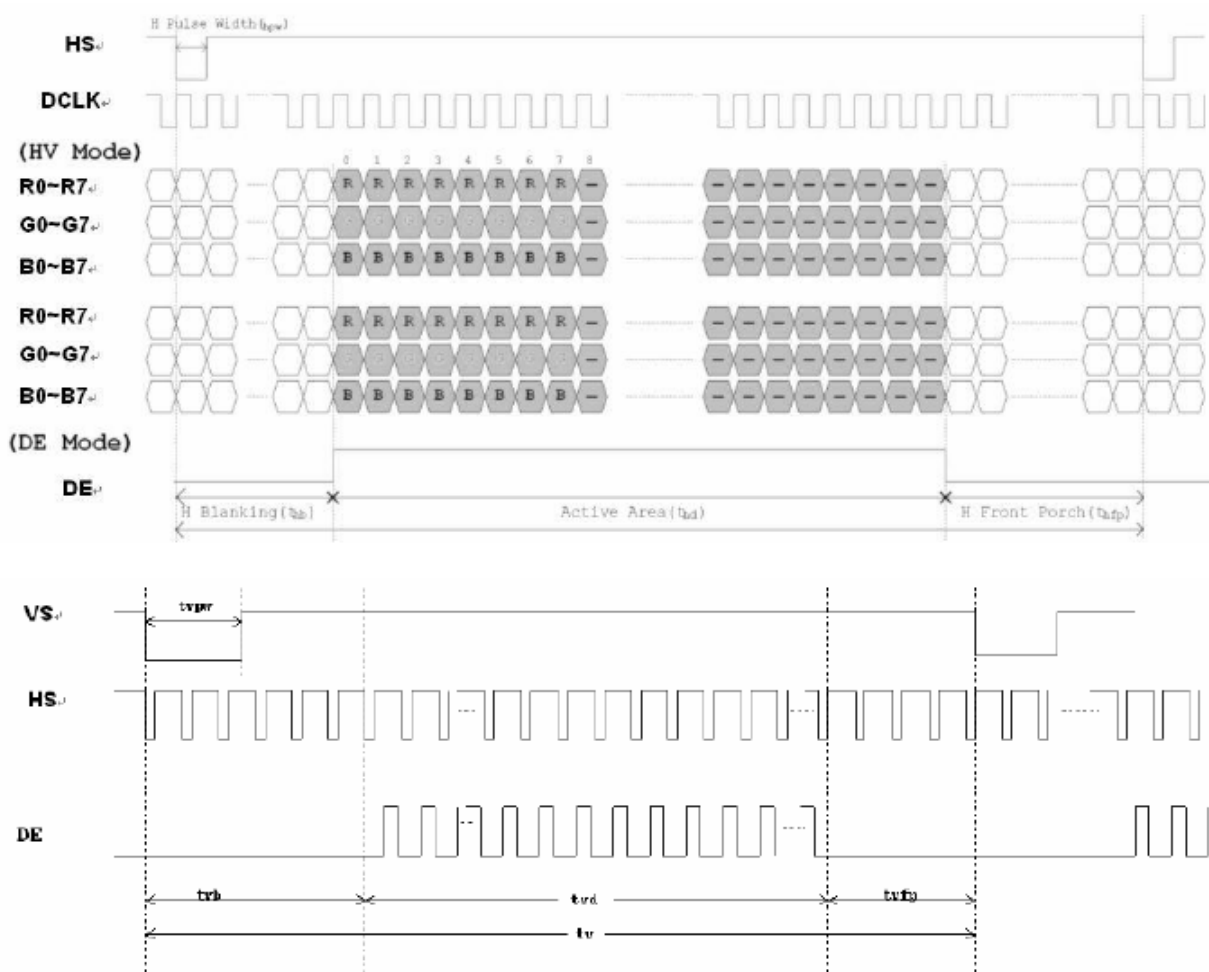


8.3 Timing

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	46.8	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	40	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

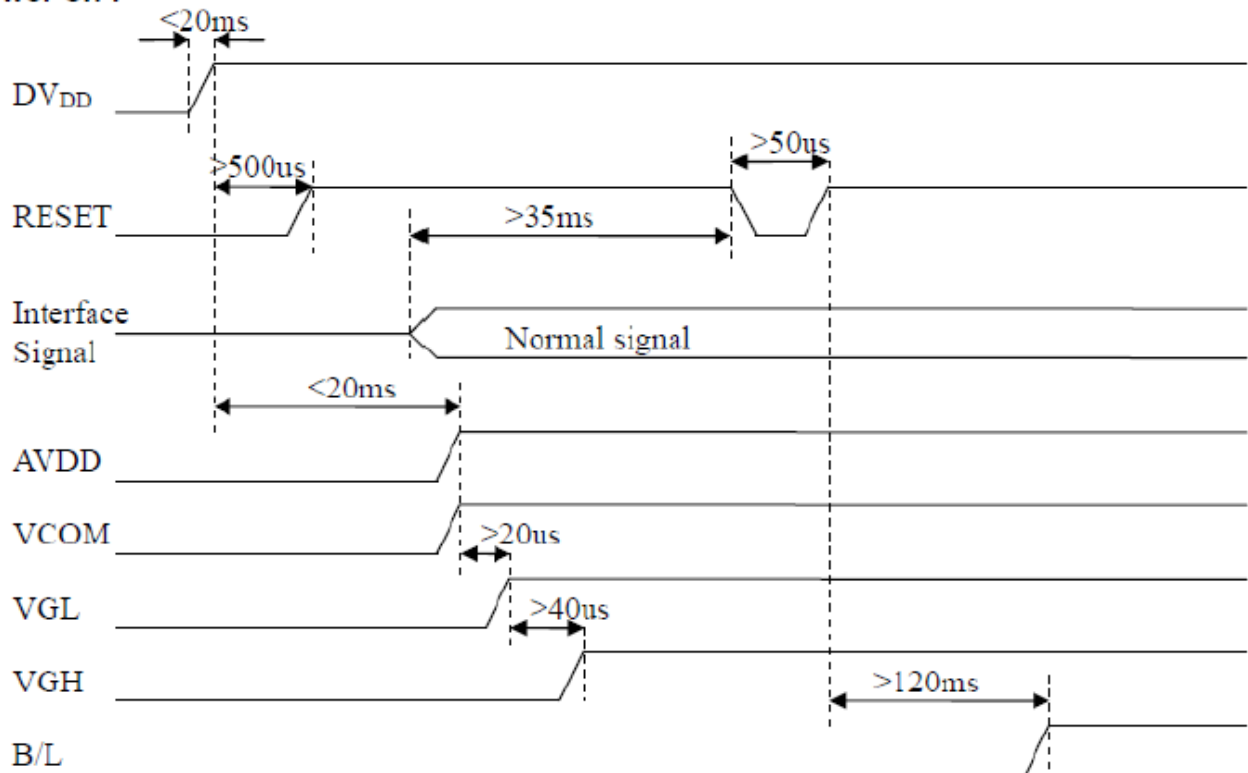
8.4 Data Input Format



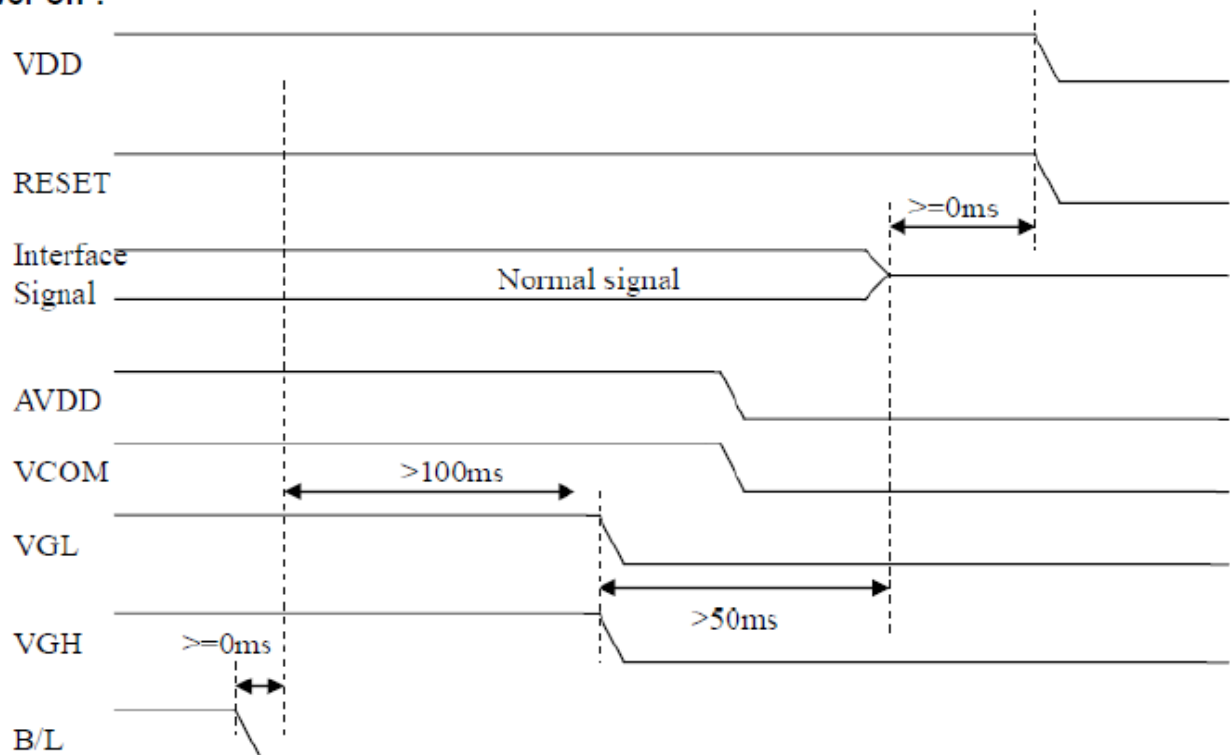
9. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on / off sequence should be as the diagram below.

Power on :



Power off :



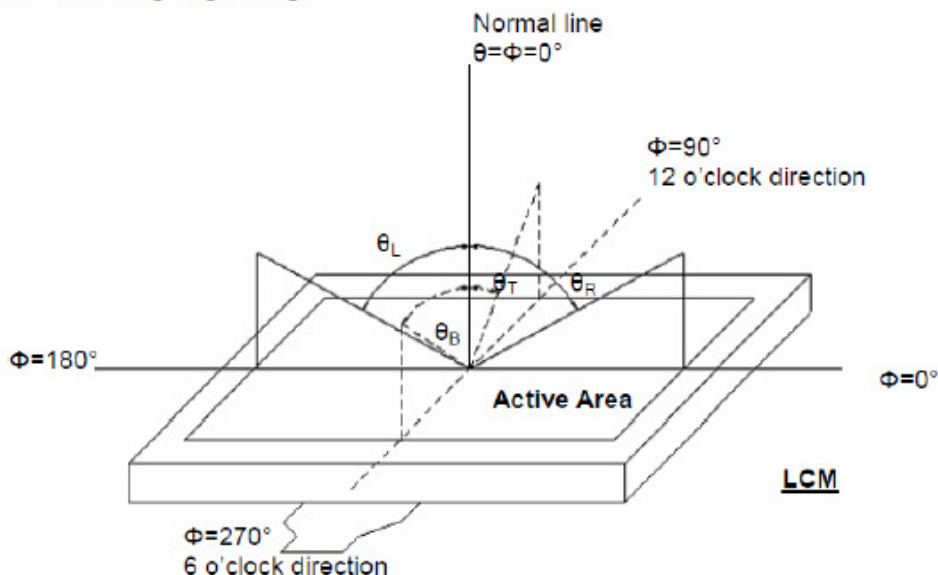
10. Optical Specification

Item		Symbol		Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	TON		Normal $\theta=\Phi=0^{\circ}$	-	10	20	ms	Note 3
	Fall	TOFF			-	15	30	ms	
Contrast ratio		CR			500	700			Note 4
Viewing angle	θ L	$\Phi=180^{\circ}$ (9 o' clock)			60	70	-	Deg.	Note 1
	θ R	$\Phi=0^{\circ}$ (3 o' clock)			60	70	-		
	θ U	$\Phi=90^{\circ}$ (12 o' clock)			60	70	-		
	θ D	$\Phi=270^{\circ}$ (6 o' clock)			60	70	-		
Brightness (Center)				Normal $\theta=\Phi=0^{\circ}$	800	1000	--	cd/m ²	Note 5
Color chromaticity (CIE1931)		White	X		0.26	0.31	0.34		Note 5
			y		0.28	0.33	0.36		
Uniformity		B-uni		$\theta=\Phi=0^{\circ}$	70	-	-	%	Note 2,6

Test Conditions:

1. DVDD=3.3V, the ambient temperature is 25°C.
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range

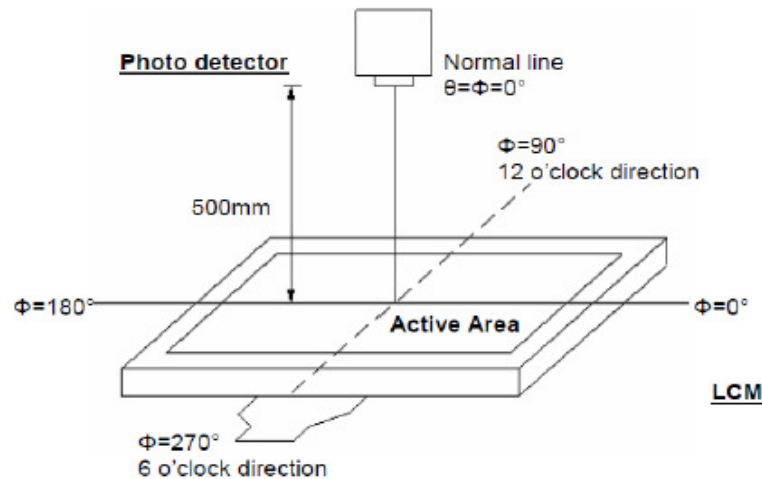


Note 2: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical properties are measured at the center point of the LCD screen.

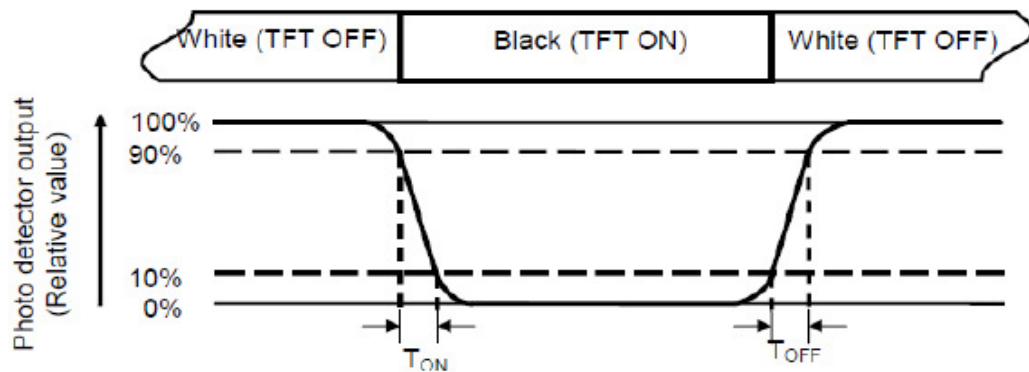
(Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/

Field of view: 1° /Height: 500mm.)



Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%.



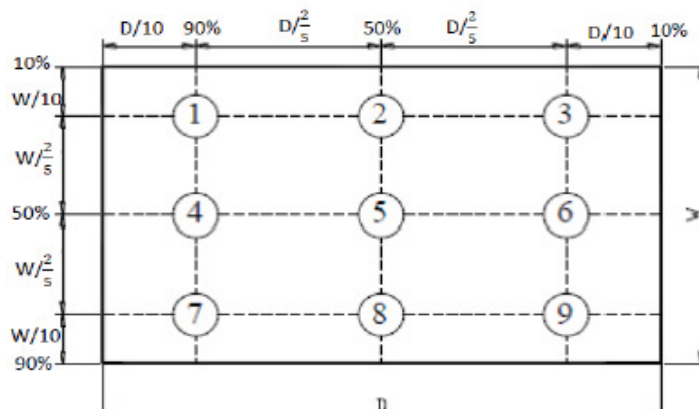
Note 4: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Measured at the center area of the panel when all terminals of LCD panel are electrically open. And backlight unit at typical backlight current.

Note 6: Definition of brightness uniformity (B-uni)

$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9 points}} \quad (\text{Note 6}).$$



11. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+85℃, 120hrs	Per table in below
2	Low Temp Operation	Ta=-30℃, 120hrs	Per table in below
3	High Temp Storage	Ta=+85℃, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30℃, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60℃, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z.	Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	Per table in below
10	Package Drop Test	Height:80 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

12. Precautions for Use of LCD Modules

12.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

12.2 Handling

- A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability
- C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.
- D. Provide a space so that the panel does not come into contact with other components.
- E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.
- F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.
- G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.
- H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

12.3 Static Electricity

- A. Ground soldering iron tips, tools and testers when they are in operation.
- B. Ground your body when handling the products.
- C. Power on the LCD module before applying the voltage to the input terminals.
- D. Do not apply voltage which exceeds the absolute maximum rating.
- E. Store the products in an anti-electrostatic bag or container.

12.4 Storage

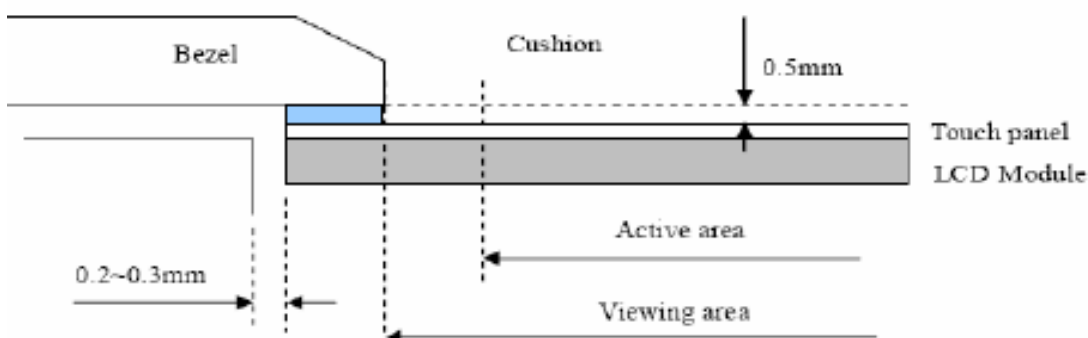
- A. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.
- B. Storage in a clean environment, free from dust, active gas, and solvent.

12.5 Cleaning

- A. Do not wipe the touch panel with dry cloth, as it may cause scratch.
- B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

12.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.



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