



**SPECIFICATION
FOR
LCD MODULE**

MODULE NO: AFK1024600A0-7.0INTM

REVISION NO: V01

Customer's Approval:

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	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)		
CHECKED BY		
APPROVED BY		

Records of Revision

DATE	REF.PAGE PARAGRAPH DRAWING No.	REVISED No.	SUMMARY	REMARK
2015-11-25		V01	First Issue	

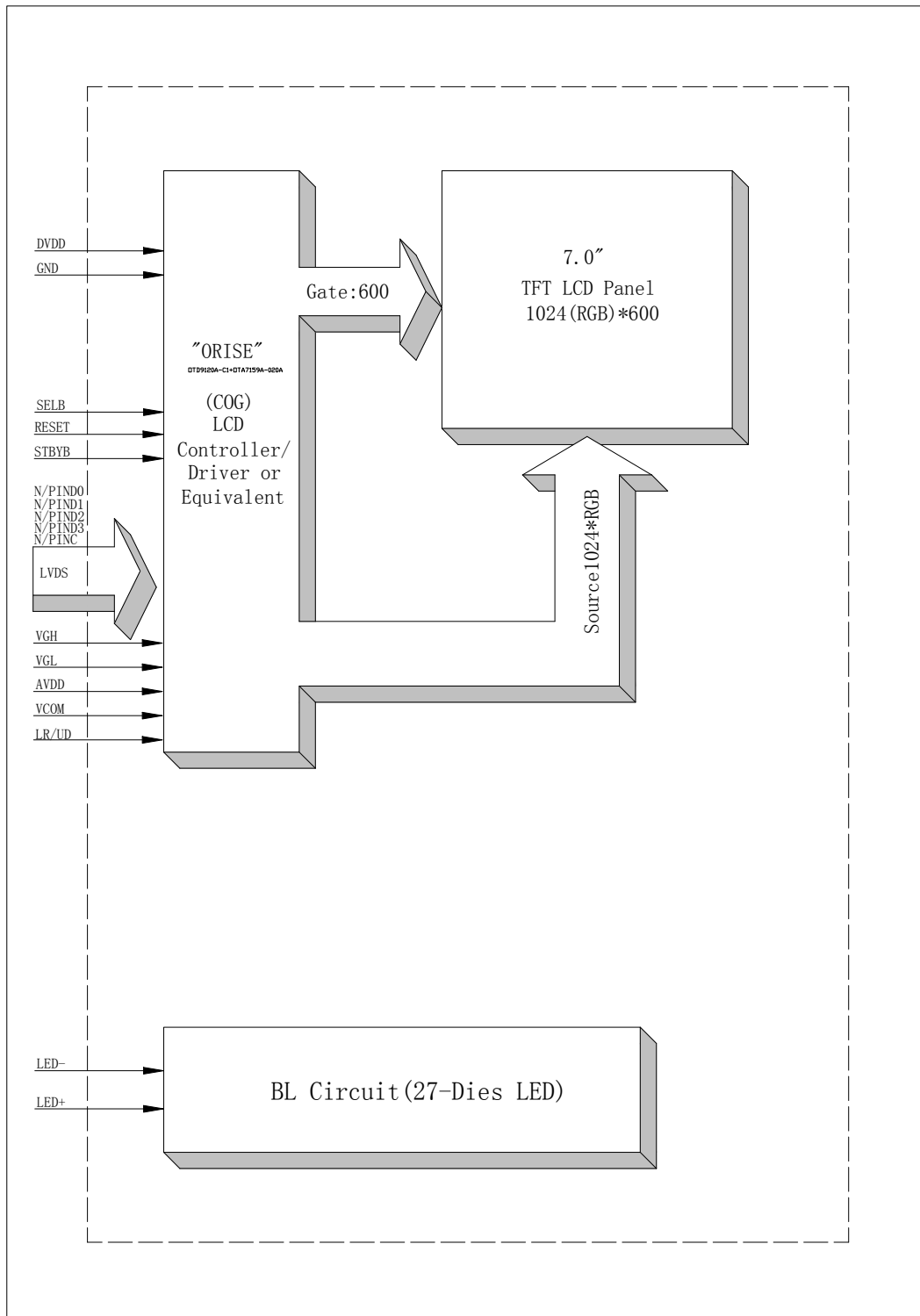
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1. General Specification

Item	Contents	Unit
LCD TYPE	TFT/TRANSMISSIVE	
MODULE SIZE (W*H*T)	164.80*99.80*5.50	MM
ACTIVE SIZE (W*H)	154.21*85.92	MM
PIXEL PITCH (W*H)	0.1506*0.1432	MM
NUMBER OF DOTS	1024*600	
DIVER IC	OTD9120A-C1+OTA7159A-020A	
INTERFACE TYPE	LVDS	
TOP POLARIZER TYPE	ANTI-GLARE	
RECOMMEND VIEWING DIRECTION	ALL VIEW	O'CLOCK
GRAY SCALE INVERSION DIRECTION	-	O'CLOCK
COLORS	16.7M	
BACKLIGHT TYPE	27-CHIP WHITE LED	
TOUCH PANEL TYPE	WITHOUT	

3. Block Diagram



4. Interface Pin Function

Pin No.	Symbol	Description
1	VCOM	Common Voltage
2	DVDD	Power Voltage for digital circuit
3	DVDD	Power Voltage for digital circuit
4	NC	No connection
5	Reset	Global reset pin
6	STBYB	Standby mode, Normally pulled high STBYB = "1", normal operation STBYB = "0", timing controller, source driver will turn off, all output are High-Z
7	GND	Power ground
8	NIND0	-LVDS differential data input
9	PIND0	+ LVDS differential data input
10	GND	Power ground
11	NIND1	-LVDS differential data input
12	PIND1	+ LVDS differential data input
13	GND	Power ground
14	NIND2	-LVDS differential data input
15	PIND2	+ LVDS differential data input
16	GND	Power ground
17	NINC	-LVDS differential data input
18	PINC	+ LVDS differential data input
19	GND	Power ground
20	NIND3	-LVDS differential data input
21	NIND3	+ LVDS differential data input
22	GND	Power ground
23	NC	No connection
24	NC	No connection
25	GND	Power ground
26	NC	No connection
27	NC	No connection
28	SELB	6bit/8bit mode select
29	AVDD	Power for Analog Circuit
30	GND	Power ground
31	LED-	LED Cathode
32	LED-	LED Cathode
33	SHLR	Horizontal inversion
34	UPDN	Vertical inversion
35	VGL	Gate OFF Voltage
36	NC	No connection
37	NC	No connection

38	VGH	Gate ON Voltage
39	LED+	LED Anode
40	LED+	LED Anode

Note1: If LVDS input data is 6 bits, SELB must be set to High;

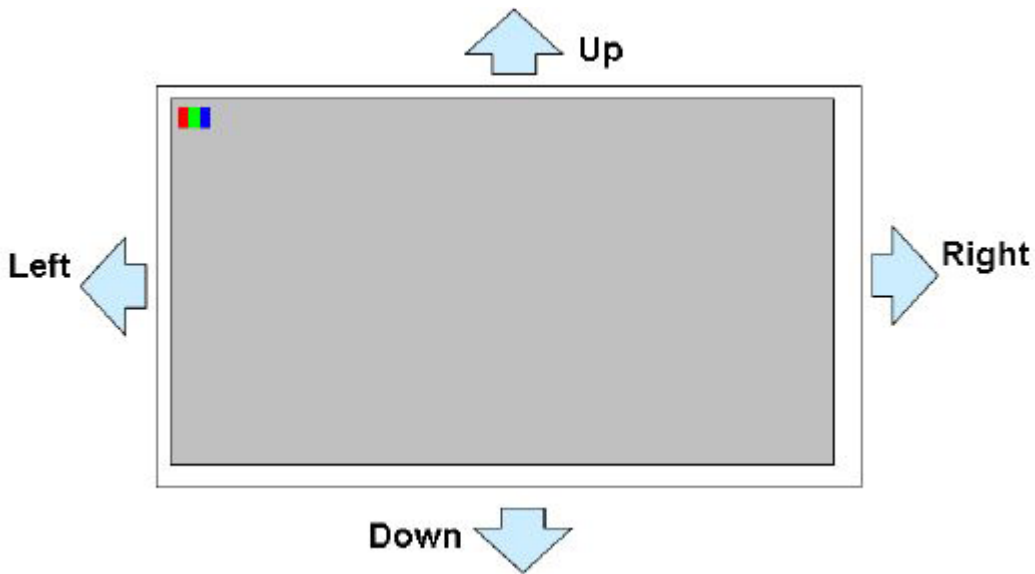
If LVDS input data is 8 bits, SELB must be set to Low.

Note2: When L/R="0", set right to left scan direction.

When L/R="1", set left to right scan direction.

When U/D="0", set top to bottom scan direction.

When U/D="1", set bottom to top scan direction.



5. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply voltage for logic	DVDD	-0.3	5	V
Supply voltage for analog	AVDD	-0.5	13.5	V
Power supply	VGH	-0.3	40	V
Power supply	VGL	-20	0.3	V
Power supply	VGH-VGL	-	40	V
Supply current (One LED)	I _{LED}		30	mA
Operating temperature	T _{OP}	-20	+70	°C
Storage temperature	T _{ST}	-30	+80	°C

Note: The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

6. Electrical Characteristics

6.1 Input Power

Item	Symbol	Min	Typ.	Max	Unit	Applicable terminal
Supply Voltage for Analog	DVDD	3.0	3.3	3.6	V	
Supply Voltage for Logic	AVDD	10.8	11	11.2	V	
Power supply	VGH	19.7	20	20.3		
Power supply	VGL	-6.5	-6.8	-7.1		
Power supply	VCOM	3.56	3.76	3.96		
Input Voltage	V _{IL}	0	-	0.3DVDD	V	
	V _{IH}	0.7 DVDD	-	DVDD		
Input leakage Current	I _{LKG}	-		-	μA	

6.2 Backlight Driving Conditions

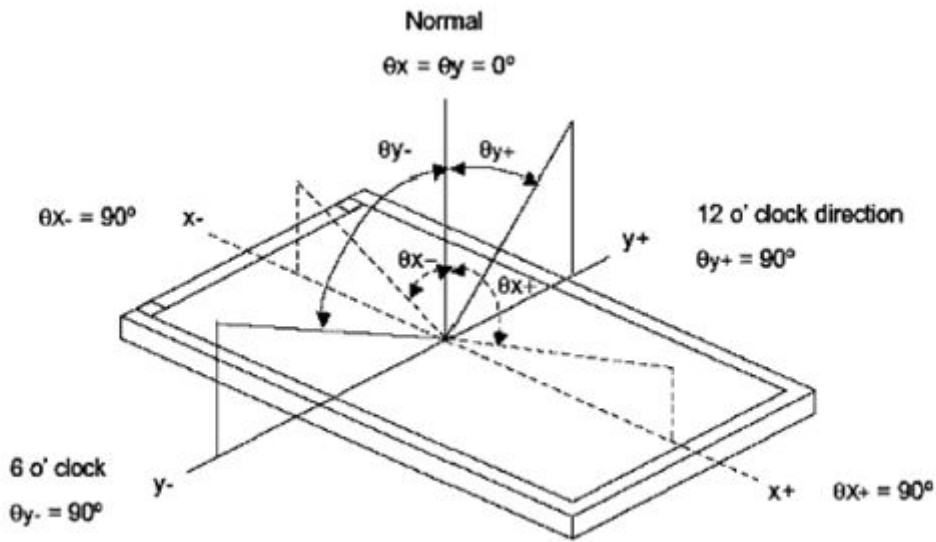
Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Voltage for LED Backlight	V _F	-	9.6	10.8	V	I _L =225mA
Current for LED Backlight	I _L		225		mA	
Power Consumption	P		2.16		W	
LED Life Time		30,000			Hr	Note

Note: Brightness to be decreased to 50% of the initial value at ambient temperature TA=25°C

7. Optical Characteristics

ITEM	SYMBOL	CONDITIONS	SPECIFICATIONS			UNIT	NOTE
			MIN	TYP.	MAX		
Luminance	L	$I_L = 225\text{mA}$	-	450	-	Cd/m^2	
Contrast Ratio	CR	$\theta = 0^\circ$	600	800			
Response Time	T_{ON}	25°C		25	40	ms	
	T_{OFF}						
CIE Color Coordinate	Red	X_R	Viewing normal angle				
		Y_R					
	Green	X_G					
		Y_G					
	Blue	X_B					
		Y_B					
	White	X_W			0.270		
		Y_W			0.290		
Viewing Angle	Hor.	θ_{X+}	$\text{CR} \geq 10$	80	85	Degree	
		θ_{X-}		80	85		
	Ver.	θ_{Y+}		80	85		
		θ_{Y-}		80	85		
Uniformity	Un			70	75	%	

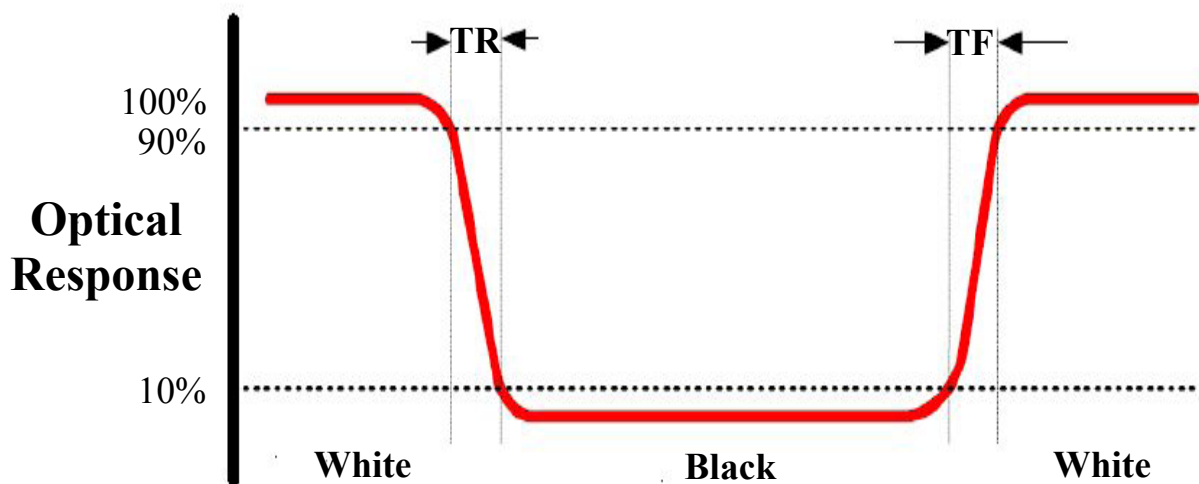
Note 1: Definition of Viewing Angle θ_x and θ_y :



Note 2: Definition of contrast ratio CR:

$$CR = \frac{\text{Luminance of white state}}{\text{Luminance of black state}}$$

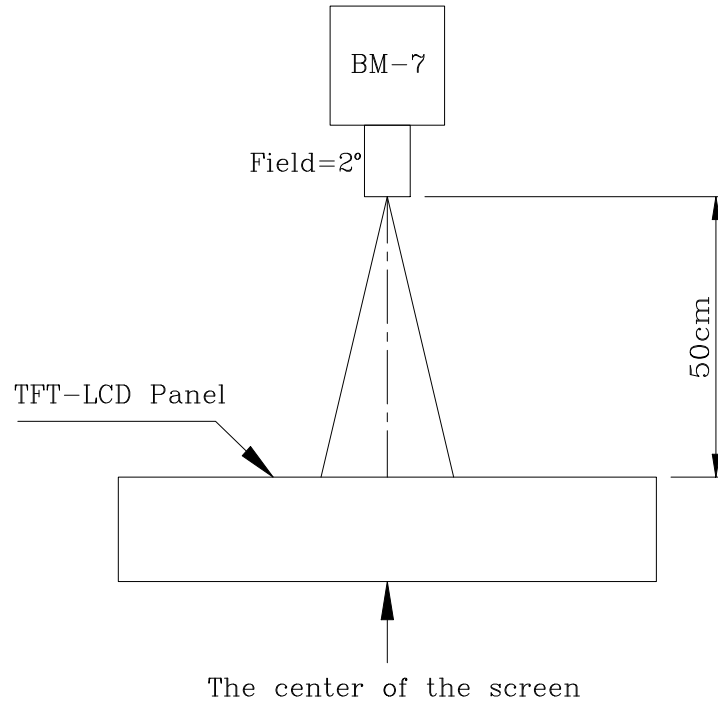
Note 3: Definition of Response Time (T_r, T_f)



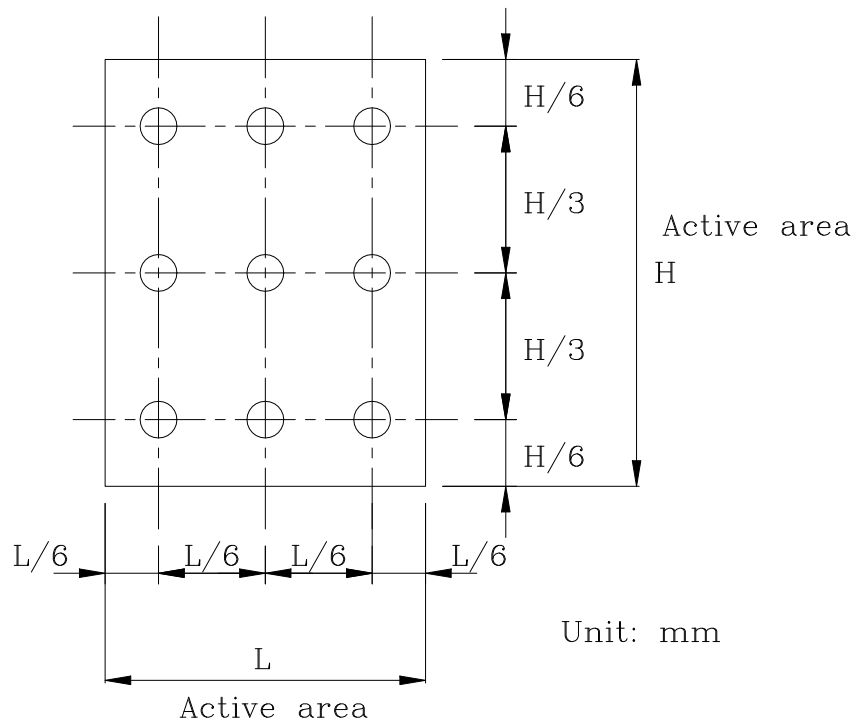
Note 4: Definition of Luminance

①The Brightness Test Equipment Setup

Field=2° (As measuring “black” image, field=2° is the best testing condition)



②The Brightness Test Point Setup

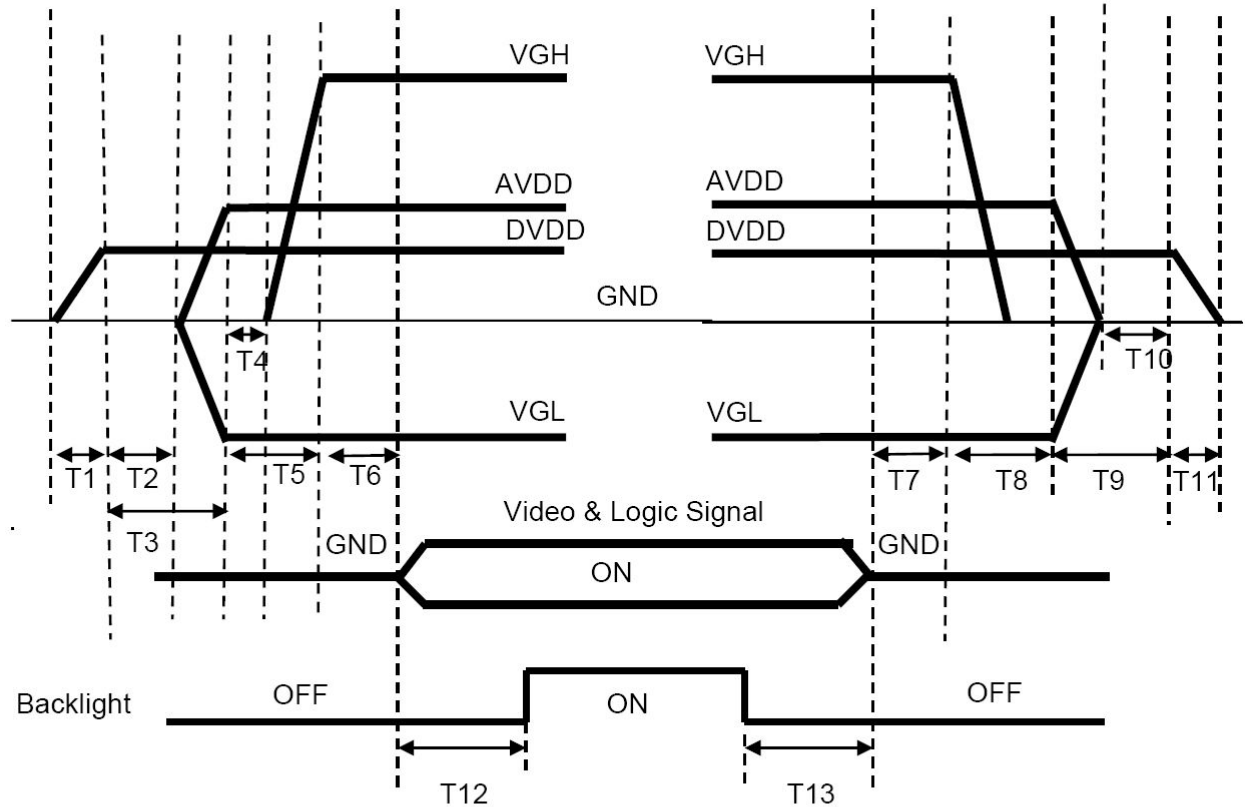


8. Timing Characteristics

8.1 Power Sequence

Power On : DVDD→AVDD/VGL →VGH →Video & Logic Signal→Backlight

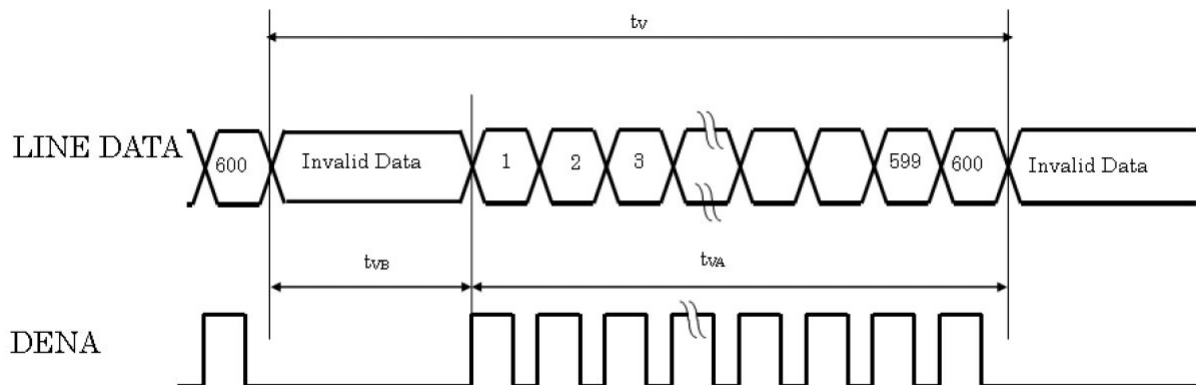
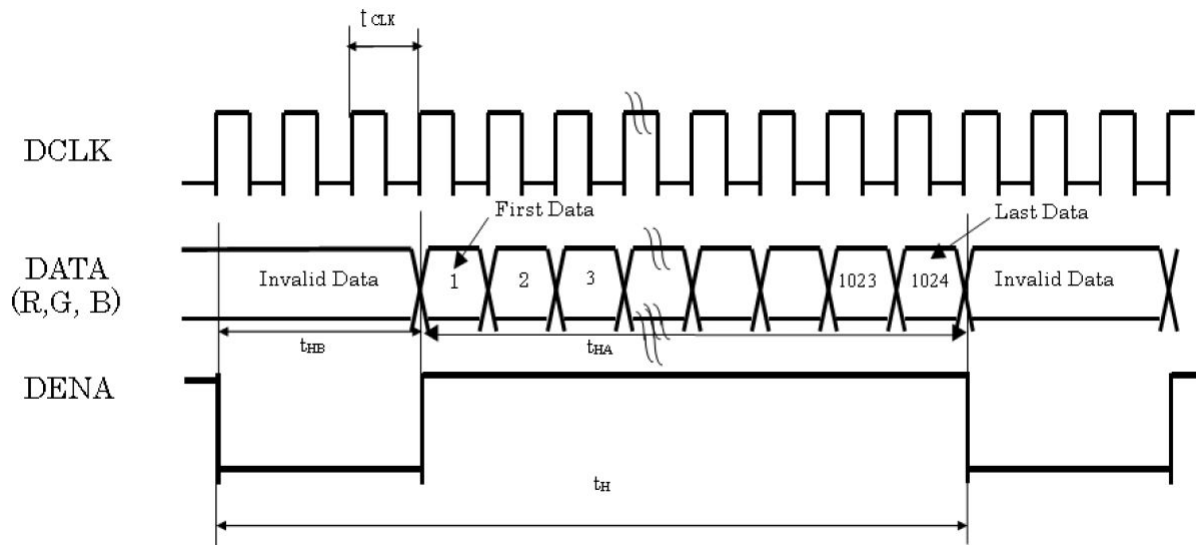
Power Off : Backlight→Video & Logic Signal→ VGH→AVDD/VGL→DVDD



$0 < T1 \leq 10\text{ms}$
 $T2 > 0\text{ms}$
 $T3 > 20\text{ms}$
 $T4 > 0\text{ms}$
 $T5 > 10\text{ms}$
 $0 < T6 \leq 10\text{ms}$
 $T12 \geq 200\text{ms}$

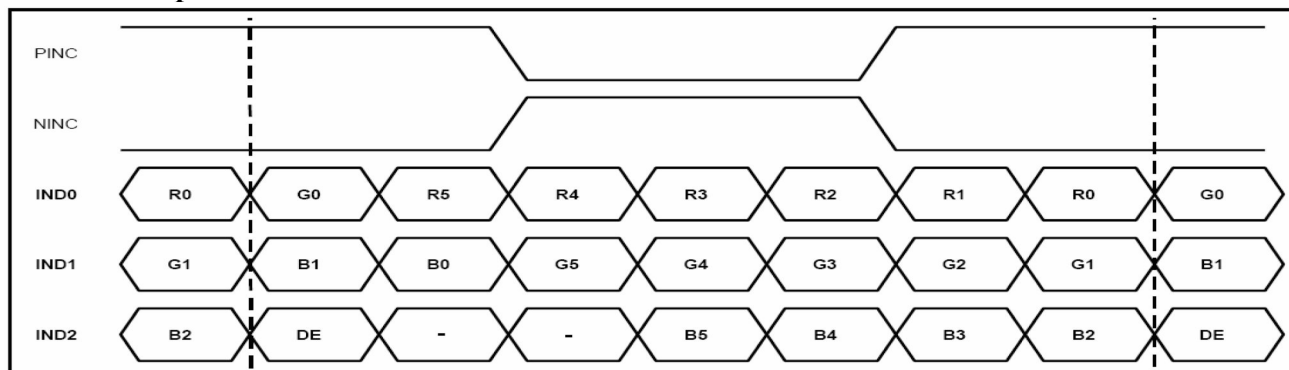
$T7 > 0\text{ms}$
 $T8 > 0\text{ms}$
 $T9 > 0\text{ms}$
 $T10 > 0\text{ms}$
 $0 < T11 \leq 10\text{ms}$
 $T13 \geq 200\text{ms}$

8.2 Input data format

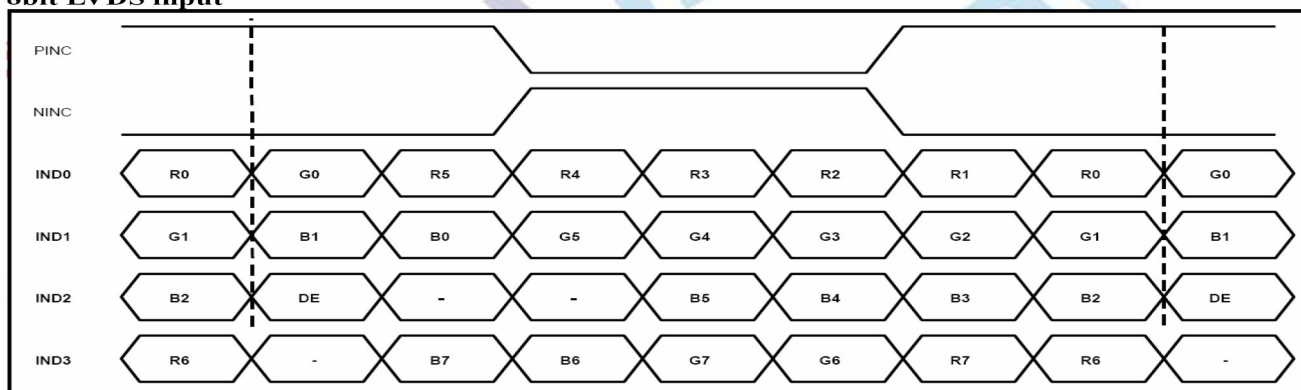


8.3 Data input format

6bit LVDS input



8bit LVDS input



Note: Support DE timing mode only, SYNC mode not supported.

8.4 TIMING

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	
LVDS Input Signal Sequence	CLK Frequency	tclk	45	51.2	57	MHz	
LCD Input Signal Sequence (Input LVDS Transmitter)	Horizontal	Horizontal Total Time	t_H	1324	1344	1364	tCLK
		Horizontal Effective Time	t_{HA}	1024			tCLK
		Horizontal Blank Time	t_{HB}	300	320	340	tCLK
	Vertical	Vertical Total Time	t_V	625	635	645	t_H
		Vertical Effective Time	t_{VA}	600			t_H
		Vertical Blank Time	t_{VB}	25	35	45	t_H

9. Standard Specification for Reliability

9.1 Standard Specification for Reliability of LCD Module

Item	Test Conditions	Remark
High temperature storage	Ta=80°C 240hrs	NOTE1 , NOTE4
Low temperature storage	Ta=-30°C 240hrs	NOTE1 , NOTE4
High temperature operation	Ta=70°C 240hrs	NOTE2 , NOTE4
Low temperature operation	Ta=-20°C 240hrs	NOTE2 , NOTE4
Operate at high temperature and humidity	+60°C, 90%RH 240hrs	NOTE4
Thermal Shock	-30°C/30min~+80°C/30min for a total 100 cycles, start with cold temperature and end with high temperature.	NOTE4
Vibration Test	Frequency range:10~55HZ Stroke:1.5mm Swap:10HZ~55HZ~10HZ 2 hours of each direction of X.Y. Z (6 hours for total)	
Mechanical shock	100G 6ms, ±X, ±Y, ±Z 3 times for each direction	
Package vibration test	Random vibration :0.15G*G/HZ from 5-200 HZ,-6dB/Octave from 200-500HZ of each direction of X.Y. Z (6 hours for total)	
Low temperature storage	Height:60cm 1 corner ,3 edges ,6 surfaces	
Low temperature storage	±2KV ,Human Body Mode, 100pF/1500Ω	

Note 1: Ta is the ambient temperature of samples.

Note 2: Ts is the temperature of panel's surface.

Note 3: In the standard condition, there shall be no practical problem that may affect the display function. After the reliability test, the product only guarantees operation, but don't guarantee all of the cosmetic specification.

Note 4: Before cosmetic and function test, the product must have enough recovery time, at least 2 hours at room temperature.

10. General Precautions

10.1. Safety

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

10.2. Handling

- The LCD panel is plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.
- The polarizer attached to the display is easily damaged. Please handle it carefully to avoid scratch or other damages.
- To avoid contamination on the display surface, do not touch the module surface with bare hands.
- Keep a space so that the LCD panels do not touch other components.
- Put cover board such as acrylic board on the surface of LCD panel to protect panel from damages.
- Transparent electrodes may be disconnected if you use the LCD panel under environmental conditions where the condensation of dew occurs.
- Do not leave module in direct sunlight to avoid malfunction of the ICs.

10.3. Static Electricity

- Be sure to ground module before turning on power or operating module.
- Do not apply voltage which exceeds the absolute maximum rating value.

10.4. Storage

- Store the module in a dark room where must keep at $25\pm 10^{\circ}\text{C}$ and 65%RH or less.
- Do not store the module in surroundings containing organic solvent or corrosive gas.
- Store the module in an anti-electrostatic container or bag.

10.5. Cleaning

- Do not wipe the polarizer with dry cloth. It might cause scratch.
- Only use a soft sloth with IPA to wipe the polarizer, other chemicals might permanent damage to the polarizer.

11. Packing Method

----TBD