Specification

Product ： TH101MB31IG002-28A

ED DATE ： 2022-09-18

VERSION ： Ver1.0

CUSTOMER APPROVED	PREPARE BY	CHECK BY	APPROVED BY
SUPPLIER APPROVED	PREPARE BY	CHECK BY	APPROVED BY

Contents

Revision Record

Date	Version	Revision Items	Page	Design by
2012/09/18	01	New	All	CC

1. General Description

1.1 Description

THE LCM is a color active matrix TFT LCD module using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 10.1 inch diagonally measured active are a with WXGA resolutions (800 horizontal by 1280 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.

1.2 Features

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Panel Size	10.1 inch		
Active Area	135.36(H) X 216.576(V)	mm	
Number of Pixels	800(H) X 1280(V)	pixels	
Pixel Pitch	0.1692(H)X0.1692(V)XRGB	mm	
Pixel Arrangement	RGB Vertical stripe		
Interface	MIPI		
Display Colors	16.7M (6bits+Hi FRC)	colors	
Display Mode	Normally Black, Transmissive		
Outline Dimension	143(H) X 228.6(V) X 2.8(D) (typ.)	mm	
View Direction (Gray Inversion)	Free		
Surface Treatment	Hard coating		
Back-light	Bottom edge side , 1-LED lighting bar type		30*LED array

■4 Lane MIPI Interface
■ Thin and light weight
■ Display 16.7M colors
■ High luminance and contrast ratio, low reflection and wide viewing angle
■ 3.3V for Logic Power
■ RoHS Compliant& Halogen free

2.Electrical Characteristics

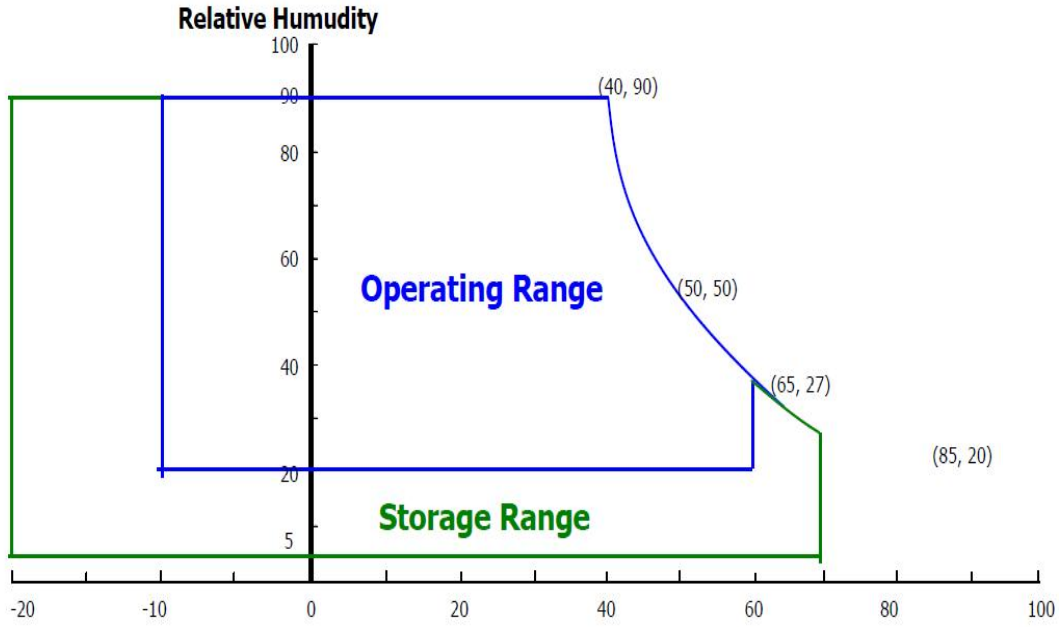
2.1 Absolute Maximum Ratings

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

< Table 2. LCD Module Electrical Specifications > [Ta =25±2 ℃]

Item	Symbol	Min.	Max.	Unit	Remark
Power Voltage	VCI	2.5	5.6	V	
	IOVCC	1.65	3.6		
Operating Ambient Temperature	TOP	-20	+60	℃	Note 1
Storage Temperature	TSTG	-25	+65	℃	Note 1

Note : 1) Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



2.2 TFT LCD Module

〈 Table 3. LCD Module Electrical Specifications 〉 [Ta =25±2 ℃]

Item	Symbol	Condition	Min	Typ	Max	Unit	Pins
Power Supply Voltage *1)	VCI		3.0	3.3	3.6	V	
I/O and interface power supply	IOVCC		1.7	1.8	1.9	V	
Low-level input voltage	VIL		0	-	0.3 x IOVCC	V	
High-level input voltage	VIH		0.7xIOVCC	-	IOVCC	V	
Low-level output voltage	VOL	IOL=+1mA	0	-	0.2 x IOVCC	V	
High-level output voltage	VOH	IOH=-1mA	0.8xIOVCC	-	IOVCC	V	
Input high level leakage current	I_{IH}	VIN=IVDDI	-	-	1	μA	
Input low level leakage current	I_{IL}	VIN=GND	-1	-	-	μA	
Power supply current	I_{VCI}		-	80	96	mA	**VCI**
	I_{IOVCC}		-	35	55	mA	**IOVCC**
Sleep Current	I_{VCI}		-	-	35	μA	**VCC**
	I_{IOVCC}		-	-	100	μA	**IOVCC**

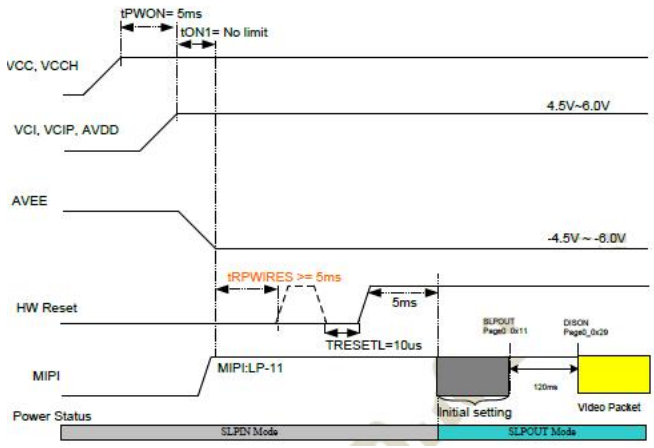
Notes :

1. *a: Rated values indicate operating range of electrical functions.
   *b: When it is the power supply voltage Typ., and the temperature of 25 °C.
   *c: Display image is “White raster”.

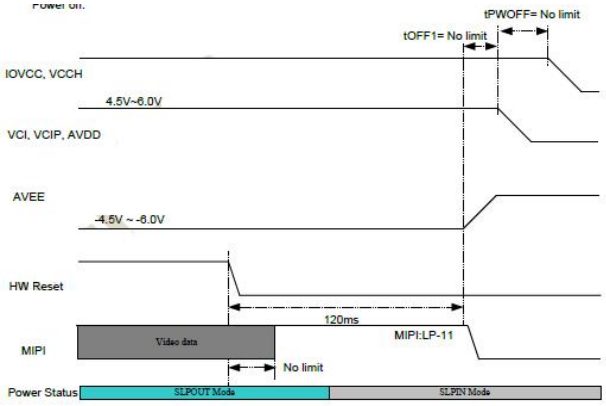
2.3 Power On/Off Sequence

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

Power On:



Power Off:



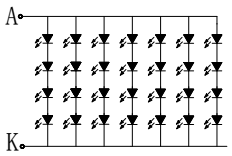
2.4 Back light Electrical Characteristics

< Table 4. LED Driving guideline specifications > Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V_F	3.0	3.3	3.5	V	
LED Forward Current	I_F	-	20	25	mA	
LED Light Bar Power Supply Voltage	V_L	-	13	13.2	V	
LED Light Bar Power Supply Current	I_L	-	140	-	mA	
Power Consumption	P_L	-	1.82	-	W	Note 1
LED Life-Time	N/A	20000			hour	I_F=20mA Note 2

Notes ：

1. Calculator Value for reference IL × VL = PL
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.



LED 4*7=28 13V/140MA

20mA*7=140mA

3. Optical Specifications

3.1Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤1lux and temperature = 25±2℃) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance50cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. While scanning θ and/or Ø, the center of the measuring spot on the Display surface shall stay fixed. The backlight should be operating for 30 minutes prior to measurement. VCI shall be 33+/-0.3V at 25° C.Optimum viewing angle direction is 6 'clock.

3.2 Optical Specifications

<Table 5. Optical Specifications>

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remarks
View Angles		θT	CR=10	75	80	-	Degree	Note1
		θB		75	80	-		
		θL		75	80	-		
		θR		75	80	-		
Color Gamut		CG		55	60	-	%	
Contrast Ratio		CR	θ=0°	800	1000	-		Note2
Luminance of White	Center	Y_W	θ=0°	280	300	-	cd/m^2	Note3
Luminance Uniformity	13 Points	ΔY13		75	80	-		Note4
White Chromaticity		Wx	θ=0°	TYP - 0.03	0.304	TYP +0.03		Note5
		Wy			0.320			
Response time (Rising+Falling)		Trt	Ta=25℃	-	30	40	ms	Note6
NTSC				45	60	-	%	
Transmittance				5.2	6.1		%	BLU:C light

Notes ：

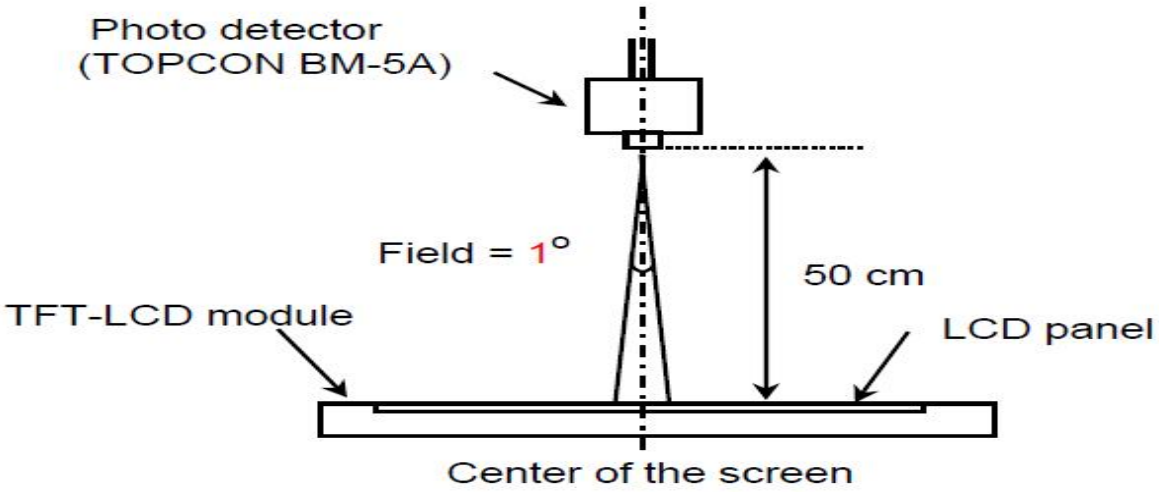
1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o'clock direction and the vertical or 6, 12 o'clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).
2. Contrast measurements shall be made at viewing angle of Θ= 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 1) Luminance Contrast Ratio (CR) is defined mathematically.

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

3. Center Luminance of white is defined as luminance values of 9point average across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. the LED current is setting at 18mA.
4. The White luminance uniformity on LCD surface is then expressed as :
ΔY =Minimum Luminance of 13 points / Maximum Luminance of 13points (see FIGURE 2).
5. The color chromaticity coordinates specified in Table 5 shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.
6. The electro-optical response time measurements shall be made as FIGURE 3by switching the “data” input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is Tr, and 90% to 10% is Td.

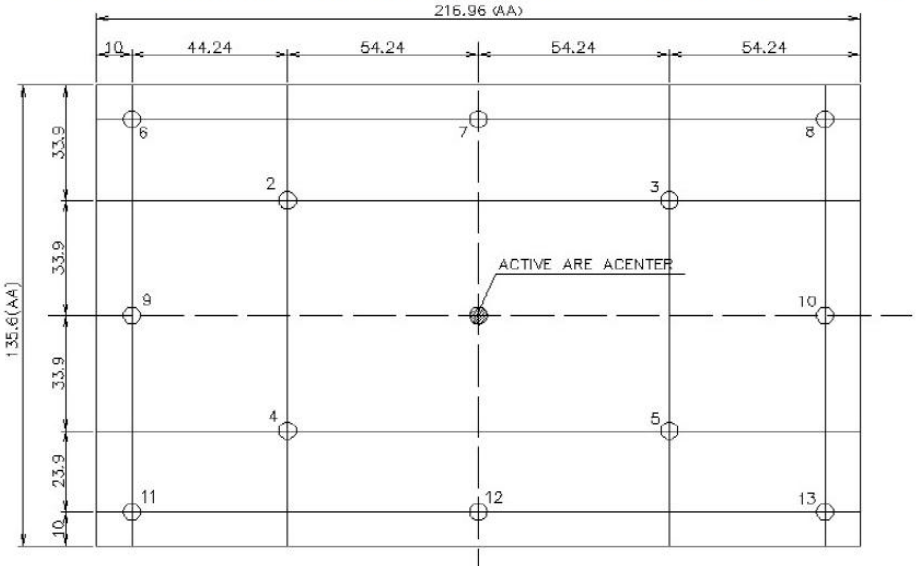
3.3 Optical measurements

Figure 1. Measurement Set Up



Optical characteristics measurement setup

Figure 2. White Luminance and Uniformity Measurement Locations (13 points)



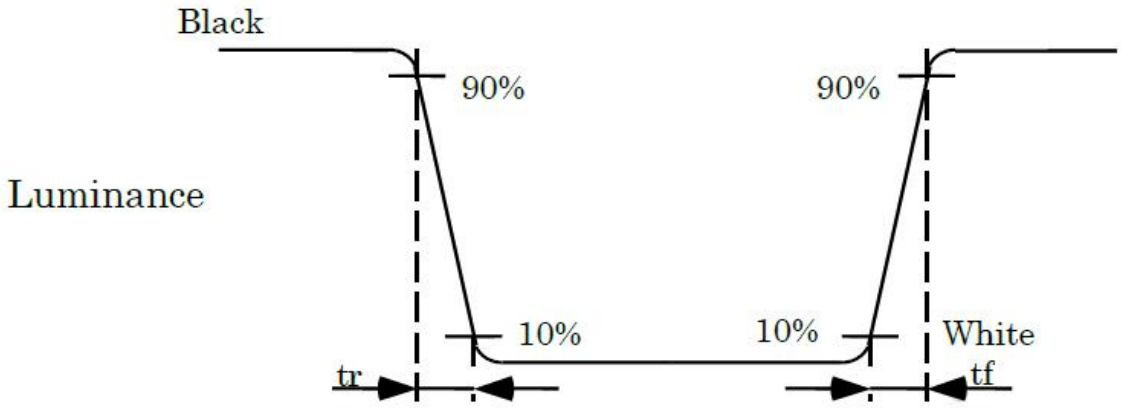
Center Luminance of white is defined as luminance values of center 13points across the LCD surface. Luminance shall be measured with all pixels in the view field set first to white. This measurement shall be taken at the locations shown in FIGURE 2 for a total of the measurements per display. The White luminance uniformity on LCD surface is then expressed as :

△Y13= Minimum Luminance of five points / Maximum Luminance of nine points (see FIGURE 2).

The White luminance uniformity on LCD surface is then expressed as :

ΔY5 =Minimum Luminance of 5 points / Maximum Luminance of 5points (see FIGURE 2).

Figure 3. Response Time Testing



Definition of response time：The response time is defined as the time interval between the 10% and 90% of amplitudes. The response time interval between the 10% and 90% of amplitudes (Refer to FIGURE 3).

4. Interface Connection

4.1 Electrical Interface Connection

The electronics interface connector is HRC：FH26-31S-0.3SHW(0.5).

The connector interface pin assignments are listed in Table 6.

<Table 6 Pin Assignments for the Interface Connector>

NO.	Symbol	I/O	Function
1-3	LEDA	P	LED Anode
4	NC	-	No connection
5-8	LEDK	P	LED Cathode
9-10	GND	P	GND
11	D2P	I	Positive MIPI Differential Data Pair 2
12	D2N	I	Negative MIPI Differential Data Pair 2
13	GND	P	GND
14	D1P	I	Positive MIPI Differential Data Pair 1
15	D1N	I	Negative MIPI Differential Data Pair 1
16	GND	P	GND
17	CKLP	I	Positive MIPI Differential Clock input
18	CKLN	I	Negative MIPI Differential Clock input
19	GND	P	GND
20	D0P	I	Positive MIPI Differential Data Pair 0
21	D0N	I	Negative MIPI Differential Data Pair 0
22	GND	P	GND
23	D3P	I	Positive MIPI Differential Data Pair 3
24	D3N	I	Negative MIPI Differential Data Pair 3
25	GND	P	GND
26	IOVCC	P	Logic power supply Voltage【1.8V】
27	RESET	I	System reset control【1.7V~1.9V】
28	GND	P	GND
29	IOVCC	P	Logic power supply Voltage【1.8V】
30	VCI	P	Analog power supply Voltage【3.3V】
31	VCI	P	Analog power supply Voltage【3.3V】】

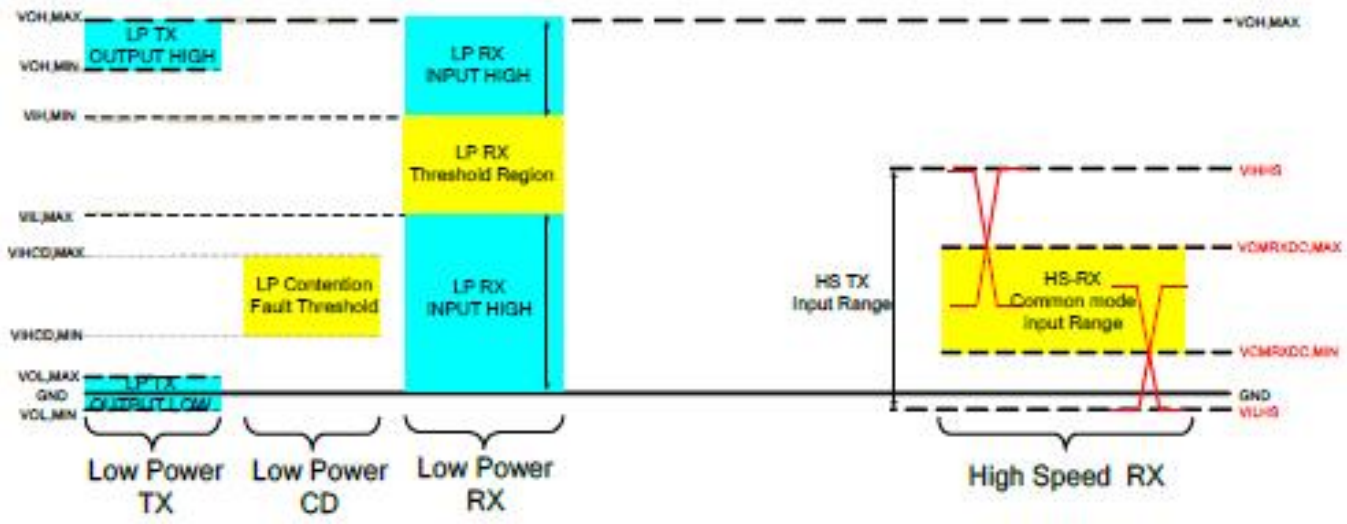
Note： P：Power Supply I：Input O：output N：No connection.

Note1: Global reset pin. Active Low to enter Reset State. Normally pull high. suggest to connecting with an RC reset circuit for stability.

5. Signal Timing

5.1 MIPI mode DC electrical characteristics:

Symbol	Description	Min.	Typ.	Max.	Unit	Condition
VCMRX	Common-mode voltage (HS Rx mode)	70	-	330	mV	
VIDTH	Differential input high threshold (HS Rx mode)	-	-	70	mV	
VIDTL	Differential input low threshold (HS Rx mode)	-70	-	-	mV	
VIHHS	Single-end input high voltage (HS Rx mode)	-	-	460	mV	
VILHS	Single-end input low voltage (HS Rx mode)	-40	-	-	mV	
ZID	Differential input impedance	80	100	125	ohm	
| VOD |	HS transmit differential voltage(VDP-VDN)	140	200	270	mV	
VIH	Logic 1 input voltage (LP Rx mode)	880	-	-	mV	
VIL	Logic 0 input voltage (LP Rx mode)	-	-	550	mV	
VIL-ULPS	Logic 0 input voltage，ULP State	-	-	300	mV	
VOH	Logic 1 output voltage (LP Tx mode)	1.1	1.2	1.3	V	
VOL	Logic 0 output voltage (LP Tx mode)	-50	-	50	mV	



5.2 MIPI mode AC electrical characteristics:

Symbol	Description	Min.	Typ.	Max.	Unit	Condition
TEOT	Time from start of THS-TRAIL or TCLK-TRAIL period to start of LP-11 state	-	-	105ns+4 8*UI	-	
THS-EXIT(1)	time to drive LP-11 after HS burst	100	-	-	ns	
THS-PREPARE	Time to drive LP-00 to prepare for HS transmission	40ns + 4*UI	-	85ns+6* UI	ns	
THS-PREPARE+ T HS-ZERO	THS-PREPARE + Time to drive HS-0 before the Sync sequence	145ns +10*UI	-	-	ns	
THS-SKIP	Time-out at RX to ignore transition period of EoT	40	-	55ns+4* UI	ns	
THS-TRAIL	Time to drive flipped differential state after last payload data bit of a HS transmission burst	60	-	-	ns	
TLPX	Length of any Low-Power state period	50	-	-	ns	
Ratio TLPX	Ratio of TLPX(MASTER)/TLPS(SLAVE) between Master and Slave side	2/3	-	3/2	-	
TTA-GET	Time to drive LP-00 by new TX	5*TLPX			ns	
TTA-GO	Time to drive LP-00 after Turnaround Request	4*TLPX			ns	
TTA-SURE	Time-out before new TX side starts driving	TLPX	-	2*TLPX	ns	

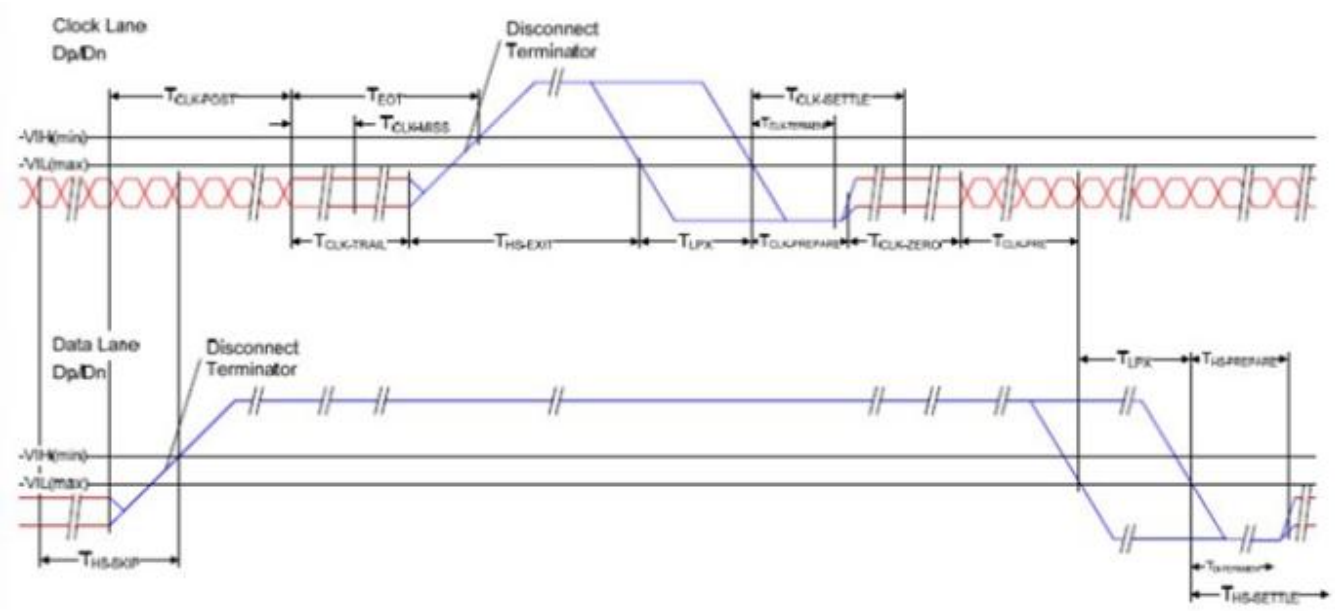


Figure : Switching the clock lane between clock transmission and low-power mode

5.3 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
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	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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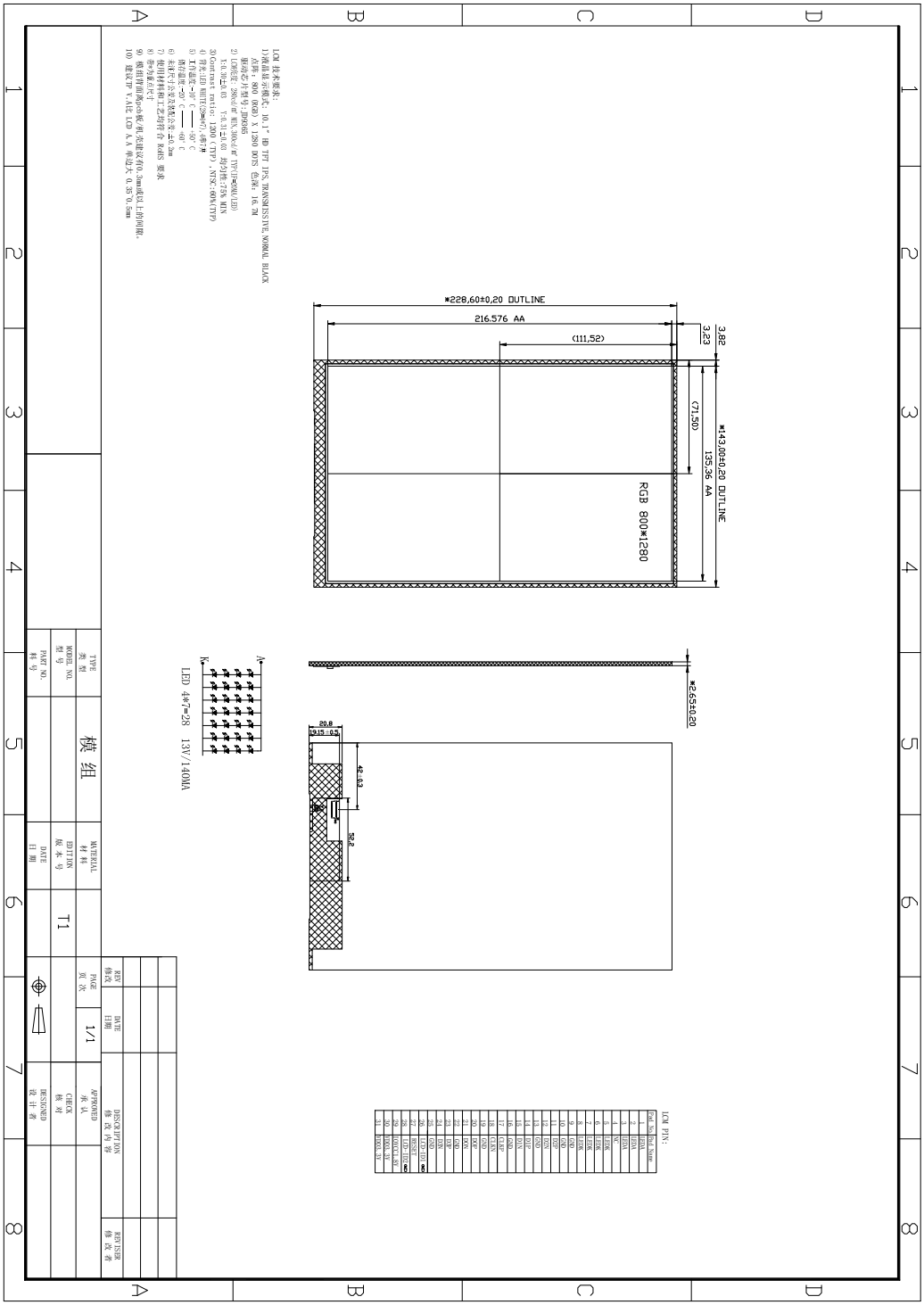
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

6. Outline Dimension

6.1Mechanical Outline Dimension

TFT LCD Module Outline Dimension



7. Handling Precautions

(1) Safety

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

(2)Handling

A. The LCD is made of plate glass. Don't subject the panel to mechanical shock or to excessive force on its surface.

B. Don't handle the product by holding the flexible pattern portion on 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 doesn't 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're exposed to light, possibly resulting in IC malfunctions.

(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. Don't apply voltage which exceeds the absolute maximum rating

E. Store the products in an anti-electrostatic bag or container.

(4) Storage

A. Store the products in a dark place at 25℃+ 10℃ 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.

(5) Cleaning

A. Don't wipe the panel with dry cloth, as it may cause scratch.

B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Don't allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Don't use any organic solvent or detergent other than ethanol.