

LCD MODULE SPECIFICATION

Model:	IE-D-1028CS04R18-INCB-2
Version:	V1.0
Date:	2025.07.24

Customer Confirmation

Approved by	Notes

Please return one of the copies of the specification with your signature to us within two weeks after you receive this document. If it is not returned, we will assume that you agree to the entire contents of this specification document.

VIEWE Confirmation

Prepared by	Reviewed by	Approved by

TABLE of CONTENTS

1. GENERAL INFORMATION	4
1.1 Features	4
1.2 Mechanical Specification	4
2. ABSOLUTE MAXIMUM RATINGS	5
3. MECHANICAL DRAWING	6
4. I/O CONNECTION	7
5. ELECTRICAL CHARACTERISTICS	8
5.1 TFT-LCD Panel Driving Section	8
5.2 Back Light Driving Section	8
5.3 Power On/Off Sequence	9
5.4 Timing Characteristics	10
5.4.1 AC CHARACTERISTICS	10
5.4.2 DC CHARACTERISTICS	11
6. OPTICAL CHARACTERISTICS	13
7. RELIABILITY	15

1.GENERAL INFORMATION

1.1 Features

- 1) Pixel Arrangement: RGB Vertical Stripe
- 2) Interface Mode: 3SPI+ RGB 18bits
- 3) Driver IC: ST7102-G5(RGB)
- 4) Operation Temperature: -10~60°C
- 5) Storage Temperature: -20~70°C
- 6) Backlight Type: White LED
- 7) Display mode: Normally black
- 8) LED life time: 30,000 Hours

1.2 Mechanical Specification

Item	Specification	Unit	Remark
Pixel Driving element	TFT	-	-
Screen Size	4.0	Inch	Diagonal
Resolution	480(W)*3(RGB)*480(H)	Dots	-
Active Area	71.86(W)*70.18(H)	mm	-
Pixel pitch (W*H)	0.1497(H)*0.1462(V)	mm	-
Module Size (W*H*D)	84(W)*84(H)*2.96(D)	mm	-
Interface Mode	3SPI+ RGB 18bits	-	-
Luminance	400	cd/m ²	Typ.
Viewing Direction	ALL	O'clock	-
Display Color	16.7M	Colors	24bits

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	VCC	-0.3	4.6	V	Note1
LED forward current	I _F	-0.001	30	mA	For each led,Note1
LED Reverse Voltage	V _R	-	5	V	For each led,Note1
Operating temperature	T _{op}	-10	60	°C	Note1,2
Storage temperature	T _{st}	-20	70	°C	Note1,2
Humidity	H _{st}	10	90	%RH	Note1,3

(T_a=+25°C,GND=0V)

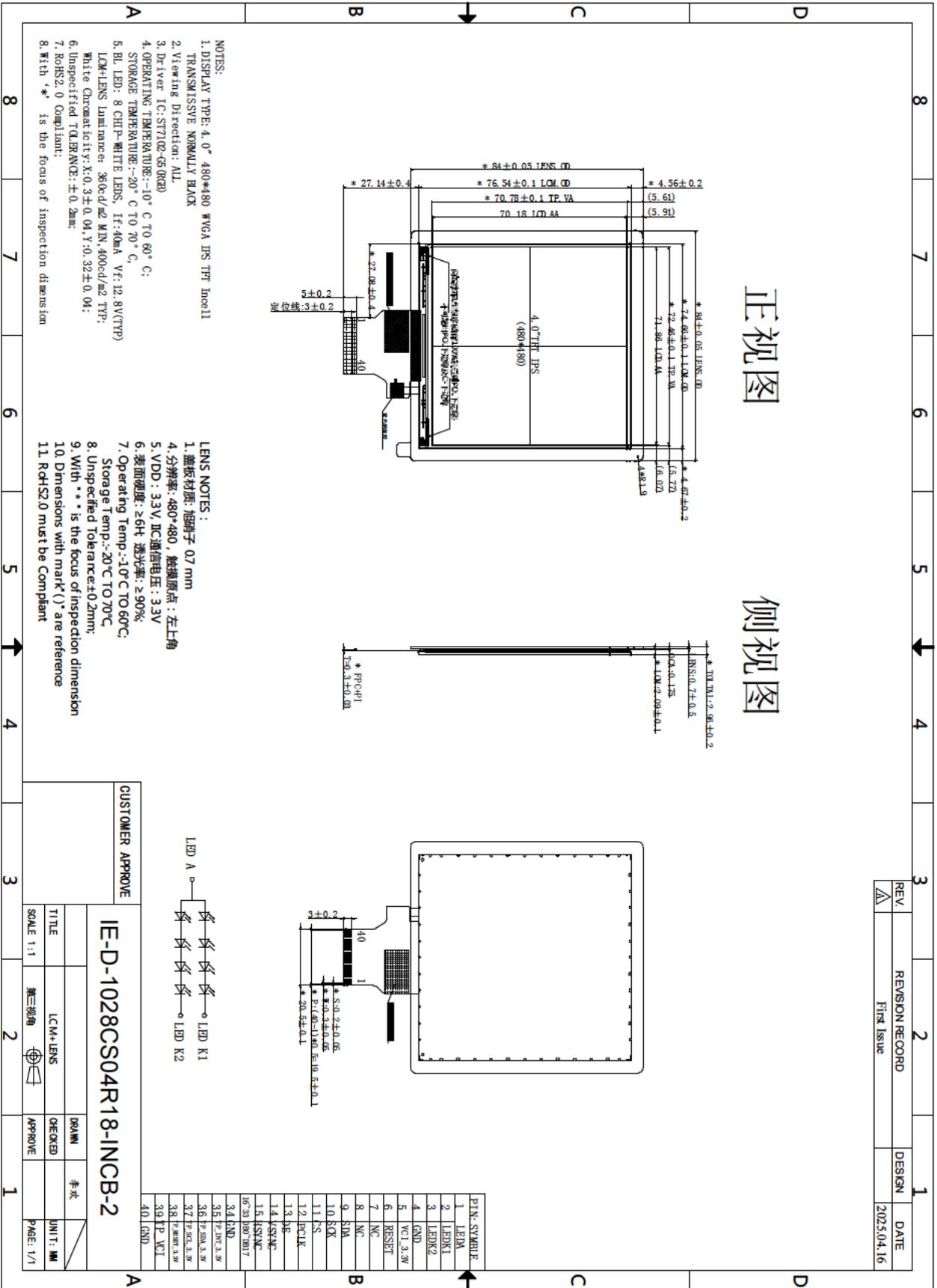
Note1:If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also if the module operates with the absolute maximum ratings for a long time, the reliability may drop.

Note2: In case of temperature below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel darker than normal one.

Note3: Temp. ≤ 60°C , 90% RH MAX.

Temp. > 60°C , Absolute humidity shall be less than 90% RH.

3. MECHANICAL DRAWING



4. I/O CONNECTION

Pin No.	Symbol	I/O	Description
1	LEDA	P	Power supply for backlight anode
2	LEDK	P	Power supply for backlight cathode
3	LEDK	P	Power supply for backlight cathode
4	GND	P	Power Ground
5	VCI_3.3V	P	Power supply to the internal logic power regulator(3.3V)
6	RESET	I	The signal will reset the LCM,Signal is active low.
7	NC	/	-
8	NC	/	-
9	SDA	I	RGB/MIPI SPI9, RGB/MIPI SPI8, RGB/MIPI SP16 input data Pin.
10	SCK	I	RGB/MIPI SPI9, RGB/MIPI SPI8, RGB/MIPI SP16 Chip select pin.
11	CS	P	RGB/MIPI SPI9, RGB/MIPI SPI8, RGB/MIPI SP16 Chip select pin.
12	PCLK	I	Pixel clock input pin, Negative polarity
13	DE	I	Data input enable. Display access is enabled when DE is “H”
14	VSYNC	I	Vertical sync signal, Negative polarity
15	HSYNC	I	Horizontal sync signal, Negative polarity
16-33	DB0-DB17	I	Pixel data in 16-bit,18-bit and 24-bit format
34	GND	-	Power Ground
35	TP_INT_3.3V	I/O	Interrupt signals for TP
36	TP_SDA_3.3V	I/O	I2C data signal for TP
37	TP_SCL_3.3V	I	I2C clock signals for TP
38	TP_RESET_3.3V	I	The signal will reset the TP,Signal is active low
39	TP_VCI	P	IPower supply for TP(3.3V)
40	GND	P	Power Ground

I: Input; O: Output; P: Power

5. ELECTRICAL CHARACTERISTICS

5.1 TFT-LCD Panel Driving Section

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply Voltage	VCC	2.5	2.8	3.3	V	-
Power Supply Current	I _{VCC}	-	26	-	mA	Note1
Logic Input High Voltage	V _{IH}	0.7VCC	-	VCC	V	-
Logic Input Low Voltage	V _{IL}	0	-	0.3VCC	V	-
Panel Power Consumption	P _{VDD}	-	0.0728	-	Watt	Note1
Module Power Consumption	P _{LCM}	-	0.5848	-	Watt	Note1,2

(Ta=+25°C,GND=0V)

Note1:Measurement Conditions (Video Mode): Full Screen Red Pattern,VDD=3.3V,60Hz Refresh.

Note2: P_{LCM}= P_{VDD}+ P_{BL}, About P_{BL} information, inference to 5.2 Back Light Driving Section.

5.2 Back Light Driving Section

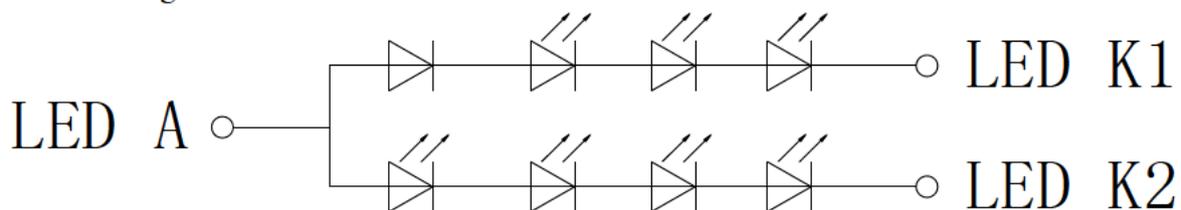
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Voltage	V _F	-	12.8	-	V	Note1
Forward Current	I _F	-	40	-	mA	Note1
Backlight Power consumption	P _{BL}	-	0.512	-	Watt	Note1
LED Quantity		8			PCS	

(Ta=+25°C,GND=0V)

Note1: The LED driving condition is defined for each LED module.

For each LED : I_F=20mA,V_F=3V(Typ.)/3.3V(Max.),Ta=25°C。

Note2:The “LED life time” is defined as the module brightness decrease to 50% of original brightness at I_{LED}=20mA(Per Led). The LED life time could be decreased if operating I_{LED} is larger than 20mA.



5.3 Power On/Off Sequence

The power On/Off timing diagram is illustrated below.

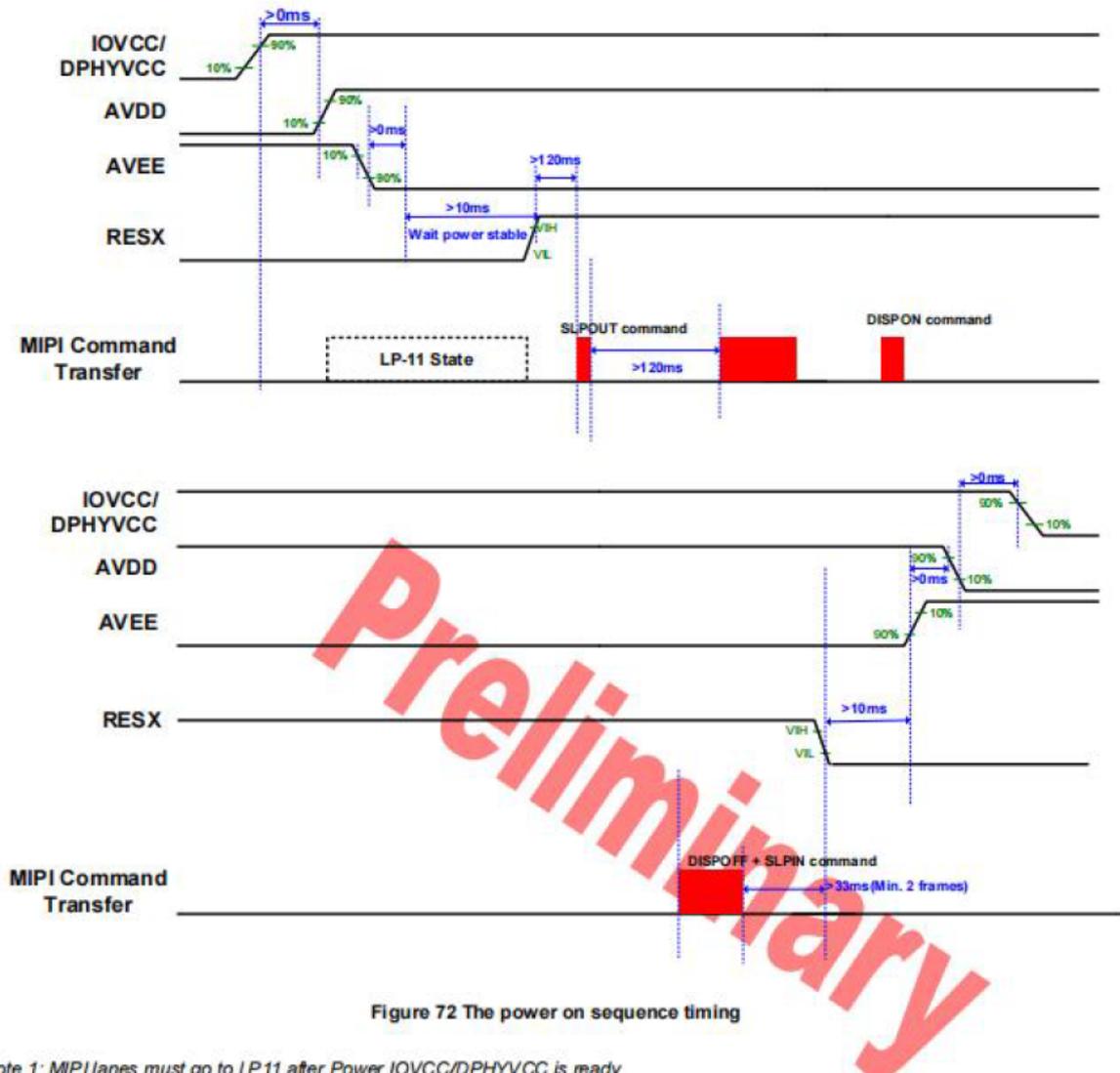


Figure 72 The power on sequence timing

Note 1: MIPI lanes must go to LP11 after Power IOVCC/DPHYVCC is ready

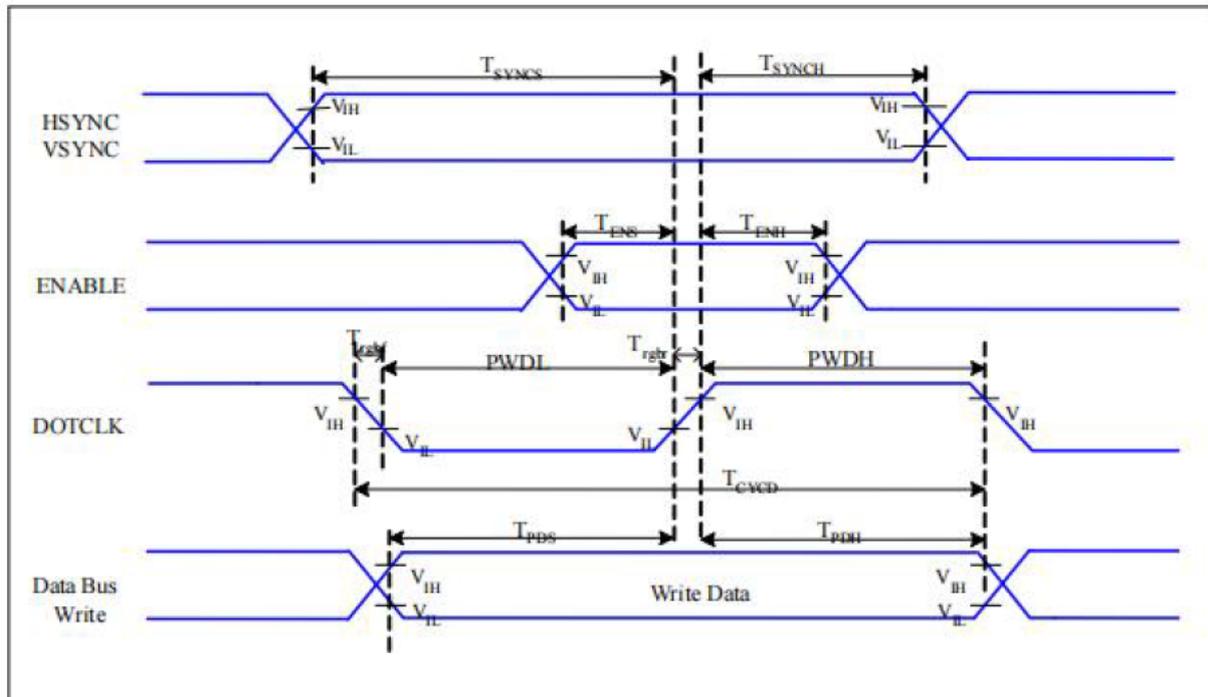
Note 2: After SLPOUT command, driver IC will start internal power on action. Any other settings should be set after SLPOUT command with a minimum of 120ms.

Note 3: DISPOFF and SLPIN command should be set after SLPOUT command with a minimum delay time of 120ms.

Note 4: RESX tied low into deep standby mode with a minimum time of 10ms.

5.4 Timing Characteristics

5.4.1 AC CHARACTERISTICS



RGB Interface Timing Characteristics

IOVCC=1.8V, Ta=25 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T _{SYNCS}	VSYNC, HSYNC Setup Time	TBD	-	ns	
ENABLE	T _{ENS}	Enable Setup Time	TBD	-	ns	
	T _{ENH}	Enable Hold Time	TBD	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	TBD	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	TBD	-	ns	
	T _{CycD}	DOTCLK Cycle Time	TBD	-	ns	
DB	T _{PDs}	PD Data Setup Time	TBD	-	ns	
	T _{PDH}	PD Data Hold Time	TBD	-	ns	

5.4.2 DC CHARACTERISTICS

Parameter	Symbol	Condition	Specification			Unit	Note
			MIN.	TYP.	MAX.		
Power & Operation Voltage							
Power supply Voltage	IOVCC		1.65	1.8	3.6	V	
	DPHYVCC		1.65	1.8	3.6	V	
	AVDD		4.5	5.5	6.6	V	
	AVEE		-4.5	-5.5	-6.6	V	
Gate Driver High Voltage	VGH		7		18	V	Note 2
Gate Driver Low Voltage	VGL		-7		-18	V	
Input / Output							
Logic-High Input Voltage	VIH		0.7 IOVCC		IOVCC	V	Note 1
Logic-Low Input Voltage	VIL		VSS		0.3IOVCC	V	Note 1
Logic-High Output Voltage	VOH	IOH = -1.0mA	0.8 IOVCC		IOVCC	V	Note 1
Logic-Low Output Voltage	VOL	IOL = +1.0mA	VSS		0.2 IOVCC	V	Note 1
Input Leakage Current	IIL	VIN=IOVCC/VS	-1		+1	uA	Note 1
VCOM Voltage							
VCOM amplitude	VCOM		-2.75		-0.2	V	
Source Driver							
Gamma Amplitude (Positive)	VGPAMP		3		6	V	
Gamma Amplitude (Negative)	VGNAMP		-6		-3	V	

Notes:

1. TA= -30 to 70°C (to +85°C no damage).
2. When evaluating the maximum and minimum of VGH/VGL. IOVCC/AVDD/AVEE is typical value.

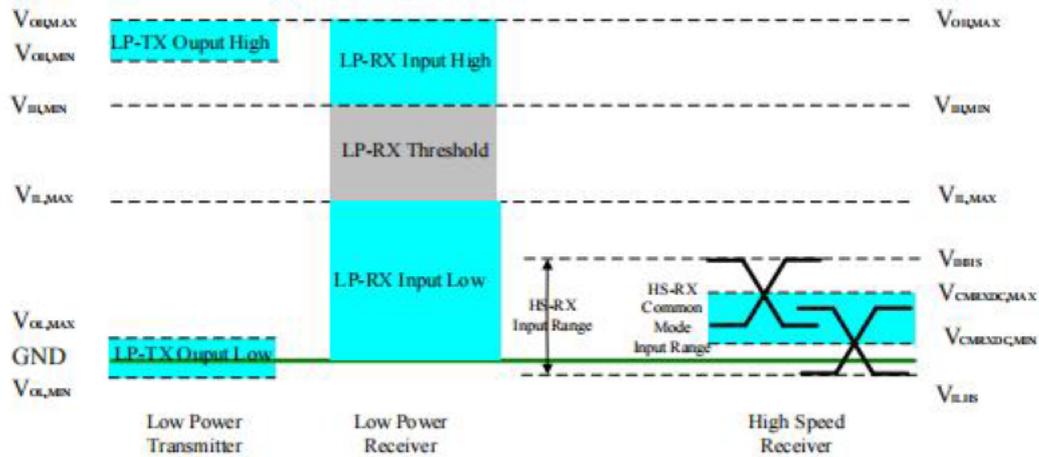


Figure 76 MIPI Signaling Voltage Levels

Parameter	Symbol	Specification			Unit
		MIN	TYP	MAX	
Operation Voltage for MIPI Receiver					
Low power mode operating voltage	V_LPH	-	TBD	-	V
MIPI Characteristics for High Speed Receiver					
Single-ended input low voltage	V_ILHS	TBD	-	-	mV
Single-ended input high voltage	V_IHHS	-	-	TBD	mV
Common-mode voltage	V_CMRXDC	TBD	-	TBD	mV
Differential input impedance	Z_ID	TBD	TBD	TBD	ohm
MIPI Characteristics for Low Power Mode					
Pad signal voltage range	V_I	TBD	-	TBD	mV
Logic 0 input threshold	V_IL	TBD	-	TBD	mV
Logic 1 input threshold	V_IH	TBD	-	-	mV
Output low level	V_OL	TBD	-	TBD	mV
Output high level	V_OH	TBD	TBD	TBD	V

6. OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Contrast Ratio	C/R	$\theta = 0^\circ$	900	1200	-	-	Note(4)
NTSC Ratio	CIE1931	$\theta = 0^\circ$	65	70	-	%	Note(7)
Luminance uniformity	U _w	$\theta = 0^\circ$	900	1200	-	%	Note(3)
Response Time	T _r + T _F	25 °C	-	25	35	ms	Note(2)
Color Coordination	W _x	$\theta = 0^\circ$ (Center) Normal viewing angle B/L On	0.26	0.3	0.34	NTSC (x,y)	Note(6)
	W _y		0.28	0.32	0.36		
	R _x		-0.03	0.656	+0.03		
	R _y			0.339			
	G _x			0.286			
	G _y			0.611			
	B _x		0.138				
	B _y		0.098				
Viewing Angle	θ_L	C/R>10	80	85	-	Degree	Note(1)
	θ_R		80	85	-		
	θ_U		80	85	-		
	θ_D		80	85	-		

Test Conditions:

1. VDD=3.3V, I_F=20mA (Backlight current), the ambient temperature is +25°C.

2. The test systems refer to Note 8.

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 $\Theta = 0$ 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 FIGURE1) Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3. 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.

4. The electro-optical response time measurements shall be made as FIGURE 2 by switching the "data" input signal ON and OFF. The times needed for the luminance to change from 10% to 90% is T_r , and 90% to 10% is T_d .

7.RELIABILITY

Item 项目	Test Condition 测试条件	Remark 备注
High Temperature Storage	Ta =+70°C / 96Hours	Note1,2,3
Low Temperature Storage	Ta =-20°C / 96Hours	Note1,2,3
High Temperature Operating	Ta =+60°C / 96Hours	Note1,2,3
Low Temperature Operating	Ta =-10°C / 96Hours	Note1,2,3
Temperature Cycle storage Test	-20°C/30min Δ+70°C /30min for 30cycles,Transfer time less than 5min	Note2,3
Thermal humidity storage Test	60°C x 90%RH / 96Hours	Note2,3
Package Vibration Test	Frequency: 10Hz~55Hz,Amplitude:1.5mm, 1 hrs for each direction of X, Y, Z	Note2
Packing shock test	Drop to the ground from 60cm height, 1 corner, 3 edges, 6 surfaces.	Note2

Inspection after Test :

Note1:Ta is the ambient temperature of samples.

Note 2: 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 doesn't guarantee all the cosmetic specification.

Note 3: Before cosmetic and function tests , the product must have enough recovery time, at least 2 hours at room temperature.

Note 4: In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.