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TFT-LCD PRODUCT

Ver.P0

2021-05-14

APPROVAL SHEET 承认书

客户名称
Customer产品型号
Part NO.

DCE116FHM-N86-400

产品内容
Product type

Mode: TFT LCD Module

备注栏
Remarks

- ☐ APPROVAL FOR SEPCIFICATIONS ONLY
- ☒ APPROVAL FOR SEPCIFICATIONSAND SAMPLE

客户确认签章

Signature by Customer:

备注/ Notes:

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1. Application

This specification applies to a color TFT-LCD Module,

2. Overview

This Open-cell is a color active matrix LCD open-cell incorporating Oxide TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, a control circuit and power supply circuit. Graphics and texts can be displayed on a 1920×3×1080 dots panel with 16,777,216 colors by using eDP (Embedded Display Port) Ver1.2 interface and supplying +3.3V DC supply voltage for TFT-LCD panel driving.

In this TFT-LCD panel, color filters for excellent color performance is incorporated to realize brighter and clearer pictures, making this open-cell optimum for use in multi-media applications.

Optimum viewings are in all directions.

Without Backlight-driving LED controller.

eDP transfer rate specification: 2.7Gbps/2 lane.

3. Mechanical specifications.

Parameter	Specification	Unit	Note
Display size	11.6" (Diagonal)	inch	
Active area	256.32(H) × 144.18(V)	mm	
Pixel Format	1920(H) × 1080(V) (1pixel = R + G + B dot)	pixel	
Pixel pitch	0.1335(H) × 0.1335 (V)	mm	
Pixel configuration	R, G, B vertical stripe		
Display mode	Normally black		
Surface treatment of front polarizer	Anti-glare coating: (3H)		

Outline dimensions

Parameter		Min	Typ	Max	Unit	Remark
Unit outline dimensions	Width	263.3	263.5	263.7	mm	
	Height	157.12	157.32	157.52	mm	
	Depth	2.45	2.55	2.75	mm	w/o PWB.[Note3-2]
Mass		-	-	-	g	

[Note 3-1] Outline dimensions is shown in page 18

[Note 3-2] Without war page and deflection.



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4. Input Terminals

4-1 Driving interface of PWB

CN1 (eDP signals, +3.3V DC power supply and B/L power supply)

1	CABC_EN / NC	-	Reserved for CD	[Note4-1-1]
2	H_GND	P	High Speed round	[Note4-1-2]
3	Lane1_N	I	Complement Signal Link Lane 1	
4	Lane1_P	I	True Signal Link Lane 1	
5	H_GND	P	High Speed round	[Note4-1-2]
6	Lane0_N	I	Complement Signal Link Lane 0	
7	Lane0_P	I	True Signal Link Lane 0	
8	H_GND	P	High Speed round	[Note4-1-2]
9	AUX_CH_P	I	True Signal Auxiliary Channel	
10	AUX_CH_N	I	Complement Signal Auxiliary Channel	
11	H_GND	P	High Speed round	[Note4-1-2]
12	LCD_VDD	P	LCD logic and driver power(3.3V)	
13	LCD_VDD	P	LCD logic and driver power(3.3V)	
14	NC	I	Reserved for LCD manufacturer's use	[Note4-1-1]
15	LCD_GND	P	LCD logic and driver ground	
16	LCD_GND	P	LCD logic and driver ground	
17	HPD	O	HPD signal pin	[Note4-1-3]
18	LED-1	P	Backlight ground	
19	LED-2	P	Backlight ground	
20	LED-3	P	Backlight ground	
21	LED-4	P	Backlight ground	
22	BL_ENABLE	I	Backlight on/off	[Note4-1-4]
23	BL_PWM_DIM	I	System PWM	[Note4-1-5]
24	SCL/NC	-	Reserved for LCD manufacturer's use	[Note4-1-1]
25	SDA/NC	-	Reserved for LCD manufacturer's use	[Note4-1-1]
26	BL_PWR	P	Backlight power	
27	BL_PWR	P	Backlight power	
28	BL_PWR	P	Backlight power	
29	BL_PWR	P	Backlight power	
30	NC	-	Reserved for LCD manufacturer's use	[Note4-1-1]

*1 P: POWER I: Input O: Output



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[Note 4-1-1] Don't input any signals or any powers into a NC pin. Keep the NC pin open.

[Note 4-1-2] The shielding case is connected with signal GND.

• Connector used :20455-030E-76(I-PEX)

• Corresponding connector : 20453-030T (I-PEX)

(Panda is not responsible to its product quality, if the user applies a connector not corresponding to the above model.)

The equivalent circuit figure of the terminal.

[Note 4-1-3]

[Note 4-1-4]

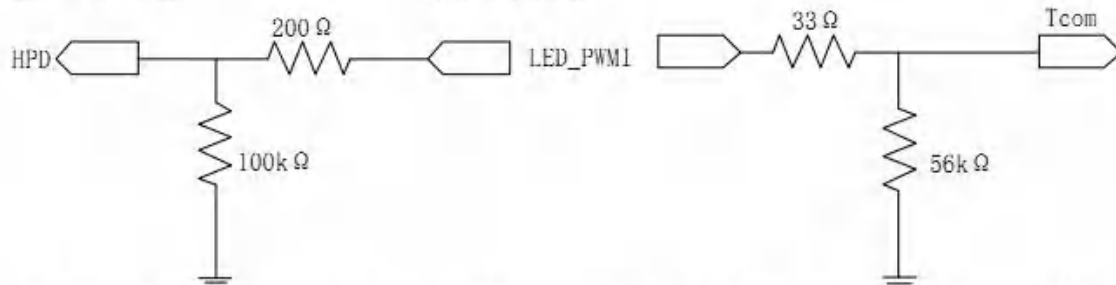


Fig.4-1-1 Equivalent circuit (Pin No.17)

Fig.4-1-2 Equivalent circuit (Pin No.23)

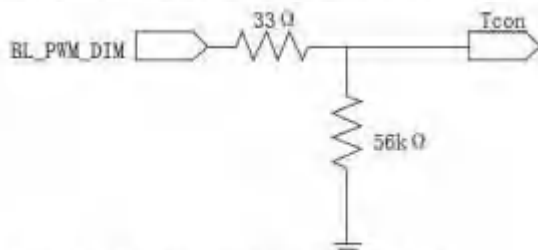


Fig.4-1-3 Equivalent circuit (Pin No.23)

4-2 eDP interface

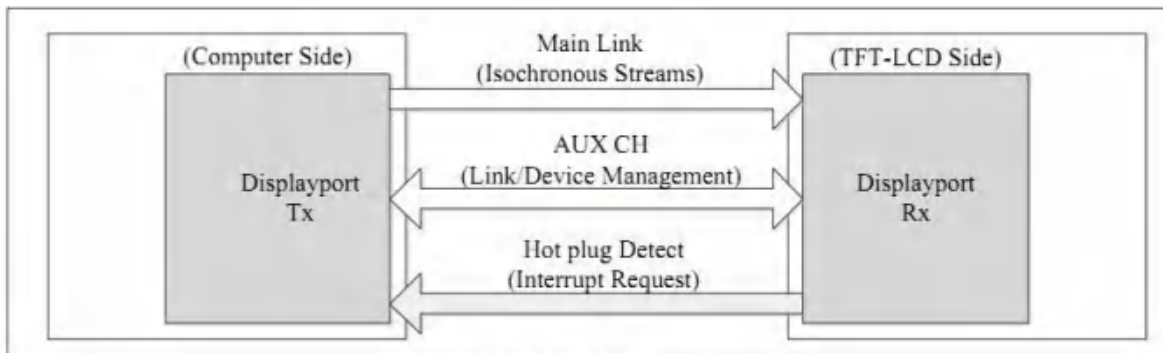


Fig.4-2-1 DP architecture

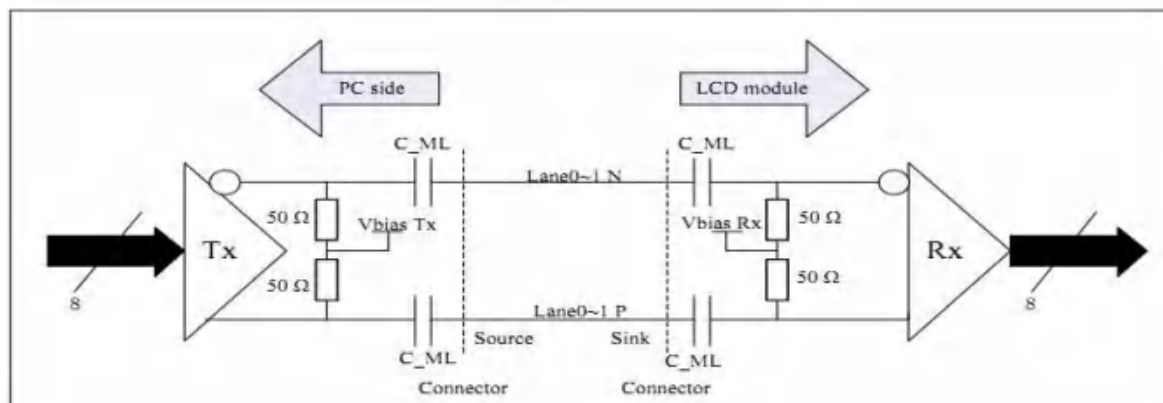


Fig.4-2-2 Main Link differential pair

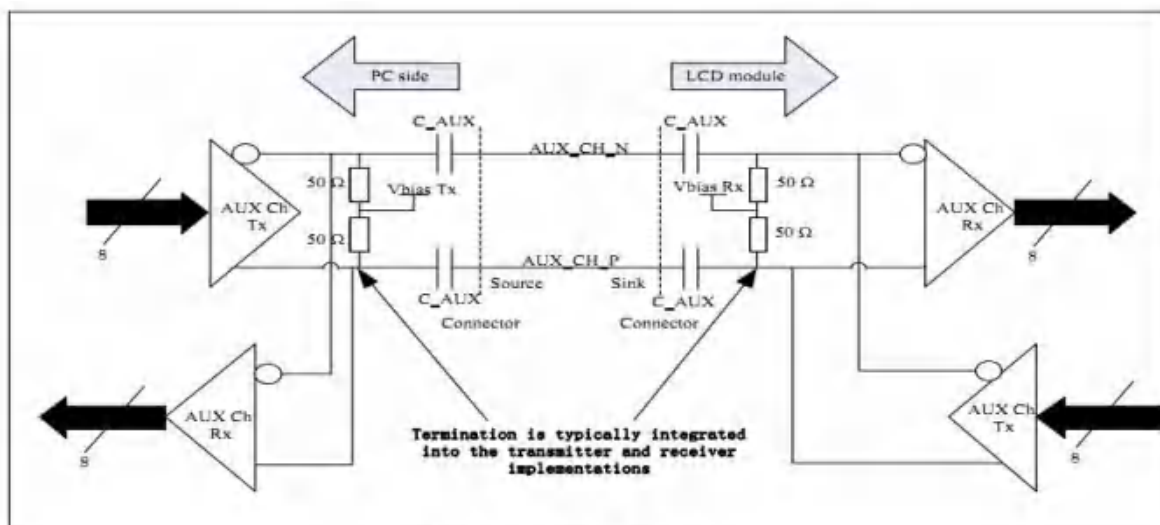


Fig.4-2-3 AUX Link differential pair

Lane0	Lane1
R0-7:0	R1-7:0
G0-7:0	G1-7:0
B0-7:0	B1-7:0
R2-7:0	R3-7:0
G2-7:0	G3-7:0
B2-7:0	B3-7:0
R4-7:0	R5-7:0
G4-7:0	G5-7:0
B4-7:0	B5-7:0

Fig.4-2-4 eDP 2lane 8bit input data mapping

5. Electrical Characteristics 5-1 Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings		Unit	Remark
			MIN	MAX		
supply voltage	VDD	Ta=25℃	-0.3	+5.5	V	
Backlight supply voltage	VBL	Ta=25℃	-0.3	+16	V	
Input voltage(eDP)	VI	Ta=25℃	-0.3	+1.5	V	[Note 5-1]
Input voltage(BL)	VBL_I	Ta=25℃	-0.3	VDD+0.3	V	[Note 5-2]
Storage temperature	Tstg		-10	+60	℃	[Note 5-3]
Operation temperature	Topa		0	+50	℃	



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(*) "Absolute Maximum Ratings" is regulations that do not exceed it even momentarily.

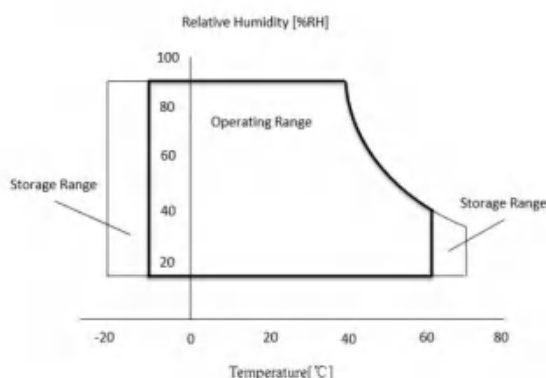
(*) Stress beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device.

[Note 5-1] eDP signals

[Note 5-2] Backlight control signals (BL_ENABLE, BL_PWM_DIM)

[Note 5-3] Humidity: 90%RH Max. at $T_a \leq +40^{\circ}\text{C}$.

Maximum wet-bulb temperature at $+39^{\circ}\text{C}$ or less at $T_a > +40^{\circ}\text{C}$, No condensation.



5. DC Characteristics

5-2-1. TFT-LCD panel driving

DC Electrical Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	VDD	+2.8	+5.0	+5.3	V	[Note 5-2-1]
Power Supply Inrush Current	Inrush			1.8	A	
Power Supply Current	IDD		220	508	mA	
Permissible input ripple voltage	VRP	-	-	100	mVp-p	
eDP HPD Signal Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
HPD High level output voltage	VOH _{HPD}		VDD-0.1			
HPD Low level output voltage	VOL _{HPD}					
eDP AUX Channel Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Unit Interval for AUX channel	UIAUX	0.4	0.5	0.6	μS	
Peak-to-peak voltage at TP1	V _{AUX-DIFF-pp}	0.32	-	1.36	V	
AUX DC Common mode Voltage	V _{AUX-DC-CM}	0	-	2.0	V	
AUX Short current limit	I _{AUX_SHORT}	-	-	90	mA	
AUX CH termination DC resistor	R _{AUX_TERM}	-	100	-	Ω	Differential input
AUX AC coupling capacitor	C _{AUX}	75	-	200	nF	



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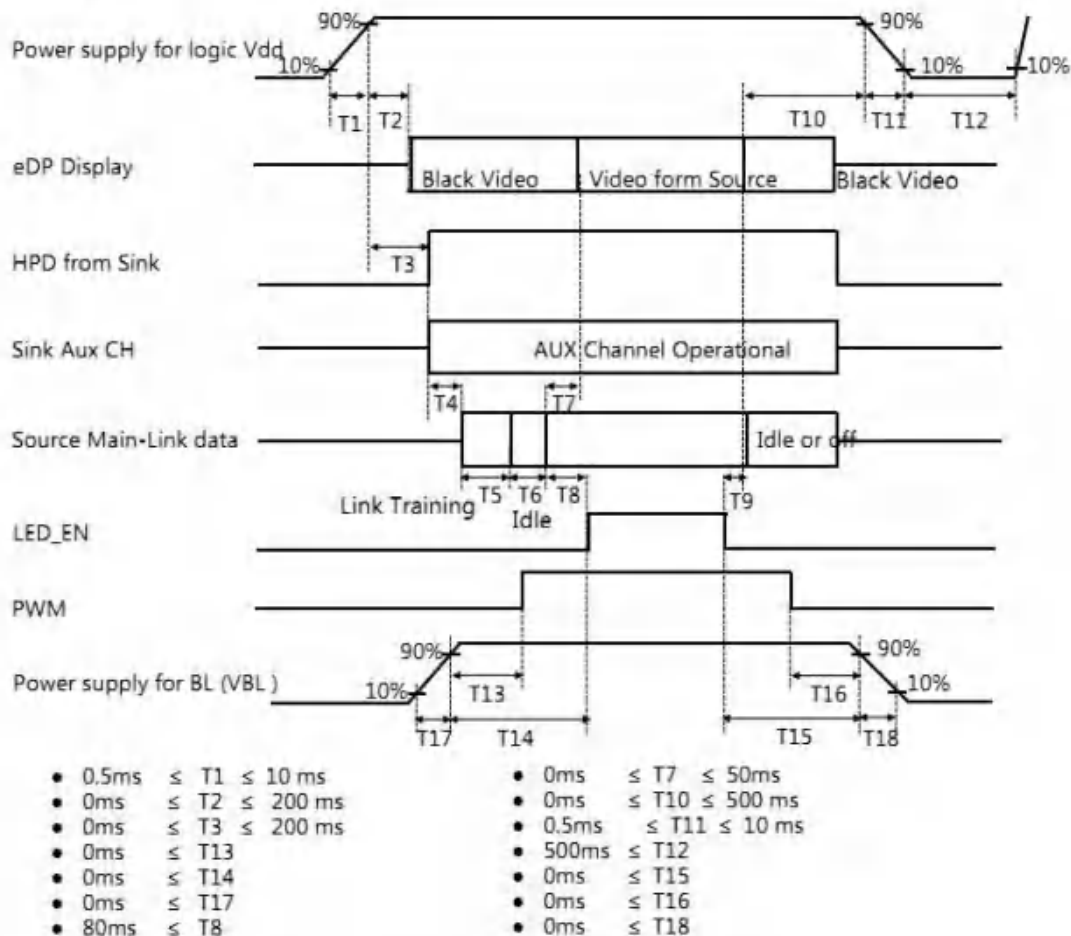
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Number of pre-charge pulses	Pre-charge pulses	10	-	16	-	
eDP AUX Channel Characteristics						
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Link clock down spreading	Down_Spread_Amplitude	0		0.5	%	
Differential Peak-to-peak Input Voltage at Rx package pins	$V_{RX-DIFFp-p}$	90		1200	mV	
Differential Return Loss at 1.35GHz at Rx package pins	$RL_{RX-DIFF}$	9	-	-	dB	
Differential termination resistance	$R_{RX-TERM}$	-	100	-	Ω	
RX short circuit Current Limit	$I_{RX-SHORT}$		-	50	mA	
Lane Intra-pair Skew at RX package pins	$T_{RX-SKEW-NTRA-PAIR-High-Bit-Rate}$	-	-	TBD	ps	

[Note 5-2-1] ON-OFF conditions for supply voltage



Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.



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6 . Backlight driving

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

(It is usually required to measure under the following condition: Ta=25℃±2℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	V _{BL}	7.0	12.0	16.0	V	
Current dissipation	I _{BL}	-	(227)	(251)	mA	V _{BL} =12V Duty Ratio=100%
			(135)	(135)	mA	V _{BL} =7.9V Duty Ratio=40%
Modulated light signal voltage	V _{PWM H}	1.85	-	VDD	V	
	V _{PWM L}	0	-	0.7	V	
Brightness Control Duty Ratio	Duty	1	-	100	%	[Note6-3-1]
Brightness Control pulse width	T _{PWM}	5	-	-	μs	Note6-3-2]
Brightness Control frequency	f _{PWM}	200	-	2,000	Hz	
LED-BL ON/OFF High voltage	V _{CNTH}	1.8	3.3	3.6	V	[Note6-3-3]
LED-BL ON/OFF low voltage	V _{CNTL}	0	-	0.5	V	
Input signal pin current	I _{IN}	-	V _{in} /51kΩ		μA	BL_ENABLE BL_PWM_DIM
LED lifetime	-	-	30,000	-	h	LED

[Note6-3-1] V_{pwm} Input : 100%= Max luminance 1%= Min luminance

[Note6-3-2]The minimum value of the dimming signal pulse width is assumed regulations of the width of high and the width of low.

[Note6-3-3] V_{CNT} Input : High = BL turn on, Low or OPEN =BL turn off V_{BL}-ip conditions



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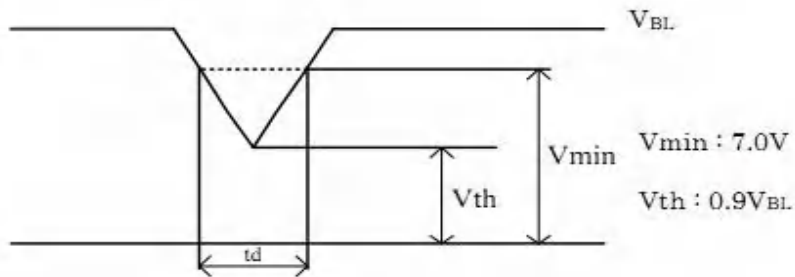
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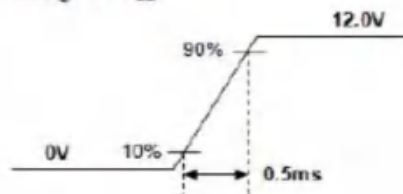
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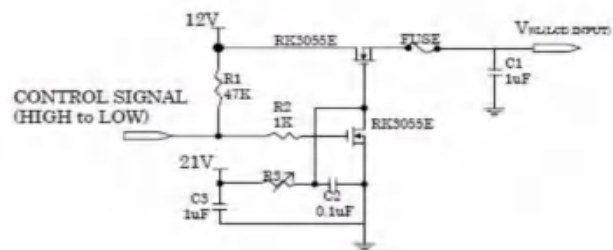
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Rising time V_{BL} :



Measurement condition :



7. Timing characteristics of input signals

7-1.Timing Characteristics

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	100	141.4	160	MHz
Horizontal display area	thd	1920			pixel
HSYNC period time	th	2080	2142	2400	pixel
HSYNC blanking	thb+ thfp	-	222	-	pixel
Vertical display area	Tvd	1080			H
Frequency	fV	40	60	66	Hz
VSYNC period time	Tv	1090	1100	1238	H
VSYNC blanking	Tvb+ Tvfp	-	20	-	H

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7-2. Input data signals and display position on the screen





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7-3 Input signal, basic display colors and gray scale of each color

Colors & Gray Scale		Gray Scale	Data signal																							
			R								G								B							
			R7 R6 R5 R4 R3 R2 R1 R0								G7 G6 G5 G4 G3 G2 G1 G0								B7 B6 B5 B4 B3 B2 B1 B0							
			MSB								LSB								MSB							
Basic Color	Black	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue	—	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	
	Green	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Cyan	—	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Red	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Magenta	—	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Yellow	—	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	
Gray Scale of Red	Black	G80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1	G81	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	G82	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	2	↓	↓								↓								↓							
	3	↓	↓								↓								↓							
	Brighter	G8253	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	4	G8254	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red	G8255	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	Black	G80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1	G81	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Darker	G82	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	2	↓	↓								↓								↓							
	3	↓	↓								↓								↓							
	Brighter	G8253	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	4	G8254	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Green	G8255	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	Black	G80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1	G81	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Darker	G82	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
	2	↓	↓								↓								↓							
	3	↓	↓								↓								↓							
	Brighter	G8253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	
	4	G8254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Blue	G8255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

0: Low level voltage, 1: High level voltage.

Each basic color can be displayed in 256 gray scales from 8 bit data signals.

According to the combination of 24 bit data signals, the 16.7M color display can be achieved on the screen.

8. EDID Specifications (TBD)