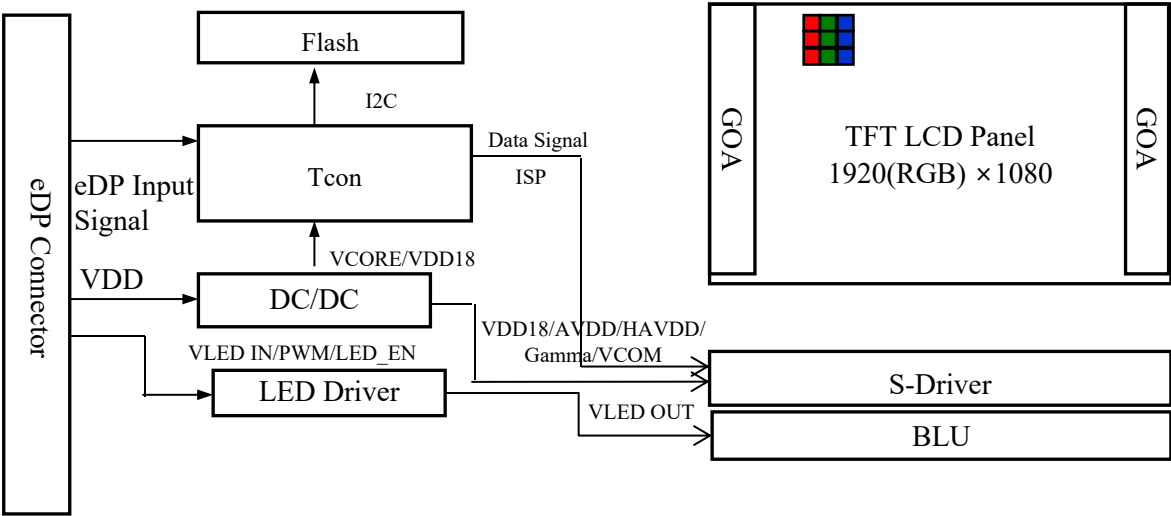


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1.0 GENERAL DESCRIPTION

1.1 Introduction

QV185FHB-N83 is a color active matrix TFT LCD Open Cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This Open Cell has a 18.5 inch diagonally measured active area with FHD resolutions (1920 horizontal by 1080 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 Open Cell panel is adapted for a low reflection and higher color type.



1.2 Features

- eDP 1.4 interface with 2 Lane
- High-speed response
- Low color shift image quality
- 8-bit color depth, display 16.7M colors
- Wide viewing angle
- iHADS technology is applied for high display quality
- RoHS compliant

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1.3 Application

- Commercial Digital Display
- Display Terminals for Control System
- Landscape Display

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	408.96(H) ×230.04(V)	mm	
Number of pixels	1920(H) ×1080(V)	pixels	
Pixel pitch	213(H) ×213(V)	um	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	16.7M	colors	Real 8bits
Display mode	Normally Black		
Open Cell Transmittance	3.7%	%	At center point With BOE YR粉 BLU
Dimensional outline	422.2(H) × 244.1(V)	mm	Detail refer to drawing
Weight	330 (typ.)	g	
Power Consumption	Typ.1.53 Max.2.9	Watt	Typ:Mosaic,Max:H1L
Surface Treatment	Haze 25% , 3H		

2.0 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.

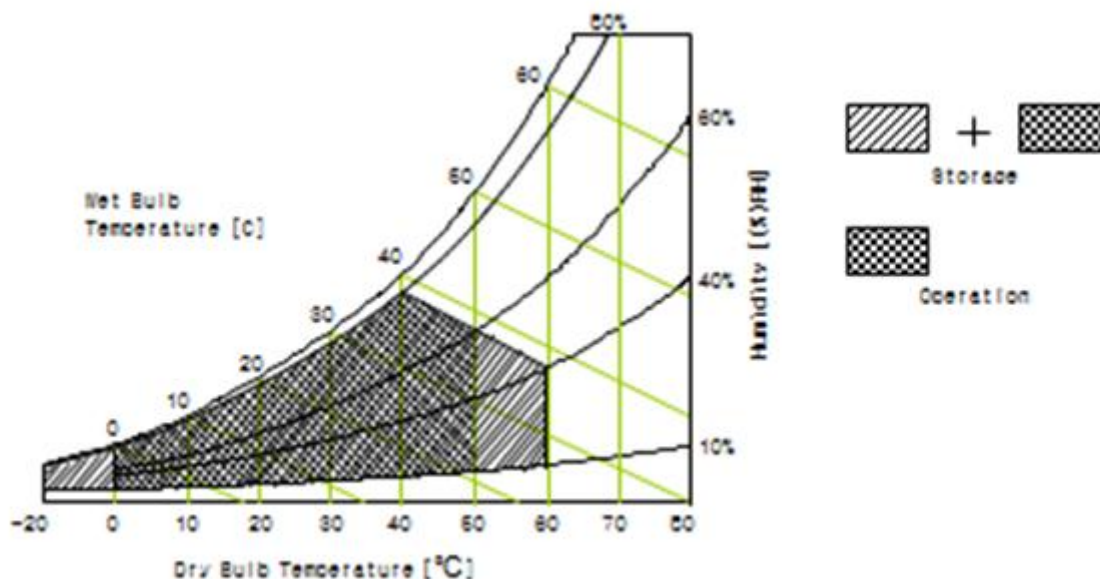
< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	2.6	5.5	V	Ta = 25 °C
Operating Temperature	T _{OP}	0	+50	°C	
Storage Temperature	T _{SUR}	-20	+60	°C	Note 1
	T _{ST}	-20	+60	°C	
Operating Ambient Humidity	H _{op}	10	80	%RH	
Storage Humidity	H _{st}	10	80	%RH	

Note 1 : Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39 °C max. and no condensation of water.



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3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Open Cell

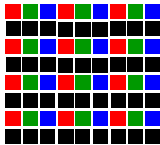
< Table 3. Open Cell Electrical Specifications > [Ta =25±2 °C]

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V _{DD}	3.0	3.3	3.6	V	Note 1
Power Supply Current	I _{DD}	-	464	900	mA	
Power Consumption	P _{DD}	-	1.53	2.9	W	
Rush current	I _{Rush}	-	-	2	A	Note 2
LED Driver Power Supply Voltage	H _{VDD}	10.8	12	13.2	V	
LED Driver Power Supply Current	I _{HVDD}	-	-	700	mA	
LED Power Consumption	P _{LED}	-	-	8.4	W	
Negative-going Input Threshold Voltage	V _{IT-}	-100		-	mV	
Differential input common mode voltage	V _{com}		3.9		V	V _{IH} =100mV, V _{IL} =-100mV

Notes : 1. The supply voltage is measured and specified at the interface connector of FOB.
The current draw and power consumption specified is for 3.3V at 25 °C
Max value at H 1 Line Pattern
a) Typ : Mosaic Pattern
b) Max : H1L Pattern
2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)



(a)



(b)

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3.2 Back-light Unit

< Table 4. LED Driving guideline specifications >

Ta=25+/-2°C

Parameter		Min.	Typ.	Max.	Unit	Remarks
Power supply voltage for B ack light		V _{LED}	-	-	20	V
Power supply Current for B ack light		I _{LED}	-	-	353	mA
Power supply for Back light		P _{LED}	-	-	6.94	W
EN Control Level	Backlight on	V _{ENH}	2	-	-	V
	Backlight off	V _{ENL}	0	-	0.8	V
PWM Cont rol Level	PWM High L evel	V _{PML}	-	-	0.8	V
	PWM Low Le vel	V _{PML}	2	-	-	V
PWM Control Frequency		F _{PWM}	0.2	-	10	KHz
Duty Ratio		-	1	-	100	%

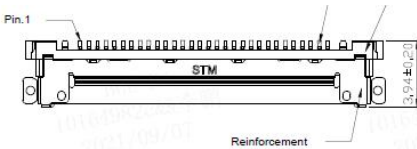
- Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} = P_{LED}$
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous under the condition of the ambient temperature of 25°C.

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4.0 INTERFACE CONNECTION

4.1 Open Cell Input Signal & Power

- eDP Connector : MSAK24025P30 or Equivalent.



< Table 4. Open Cell Input Connector Pin Configuration >

PIN #	Symbol	Description Remark	PIN #	Symbol	Description Remark
1	NC	NC	16	H_GND	Ground
2	H_GND	Ground	17	HPD	Hot Plug Detect Output
3	LANE1_N	eDP RX Channel 1 Negative	18	BL_GND	LED Ground
4	LANE1_P	eDP RX Channel 1 Positive	19	BL_GND	LED Ground
5	H_GND	Ground	20	BL_GND	LED Ground
6	LANE0_N	eDP RX Channel 0 Negative	21	BL_GND	LED Ground
7	LANE0_P	eDP RX Channel 0 Positive	22	BL_ENAB E	LED Enable Pin(+3.3V Input)
8	H_GND	Ground	23	BL_PWM	System PWM Signal Input
9	AUX_CH_P	eDP AUX CH Positive	24	NC	No Connection
10	AUX_CH_N	eDP AUX CH Negative	25	NC	No Connection
11	H_GND	Ground	26	BL_POWER	LED Power Supply 5V-21V
12	LCD_VCC	Power Supply, 3.3V (typ.)	27	BL_POWER	LED Power Supply 5V-21V
13	LCD_VCC	Power Supply, 3.3V (typ.)	28	BL_POWER	LED Power Supply 5V-21V
14	BIST	Panel Self Test Enable	29	BL_POWER	LED Power Supply 5V-21V
15	H_GND	Ground	30	NC	No Connection

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4.2 LED CONNECT

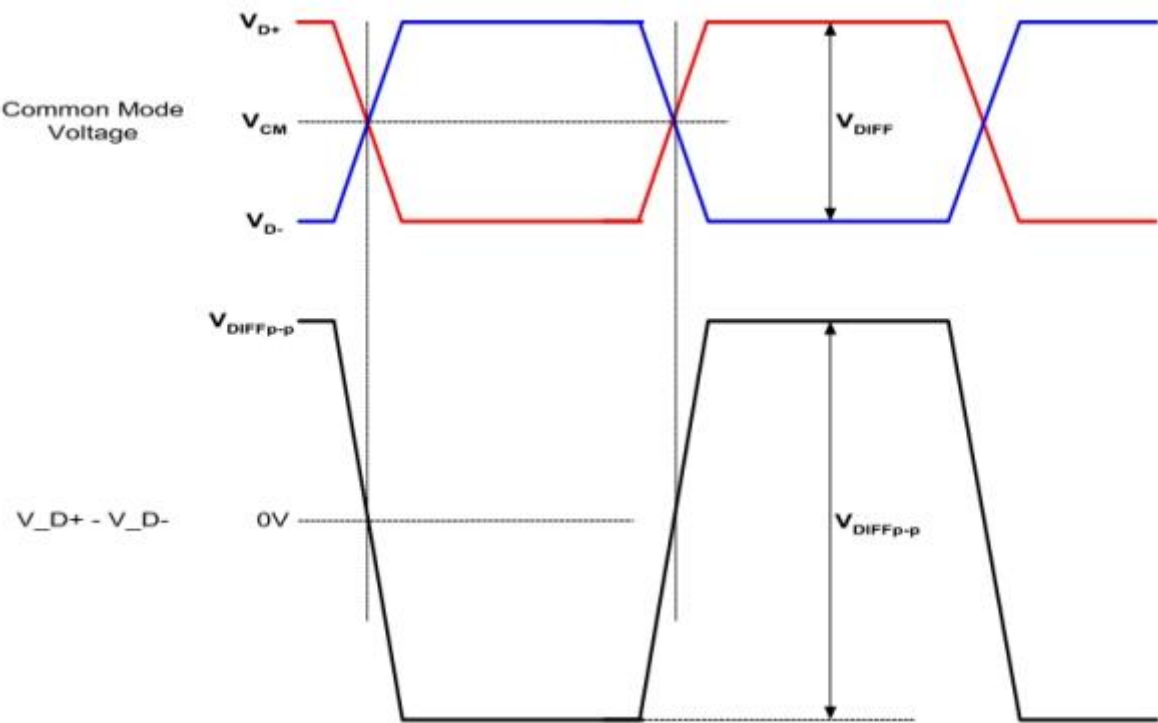
- eDP Connector : PF040-B09B-C09 or Equivalent.

PIN #	Symbol	Description Remark
1	LED1	LED-
2	LED2	
3	LED3	
4	LED4	
5	NC	NC
6	NC	
7	VLEDOUT	LED+
8	VLEDOUT	
9	VLEDOUT	

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4.5 eDP Interface

Item	Symbol	Min	Typ	Max	Unit	Remark
Spread spectrum clock	ssc			0.5	%	
Differential peak-to-peak input voltage at package pins	VRX-DIFFp-p	100	0	1320	mV	
Rx input DC common mode voltage	VRX_DC_CM	0	-	2	V	
Differential termination resistance	RRX-DIFF	80	-	120	Ω	
Single-ended termination resistance	RRX-SE	40	-	60	Ω	
Rx short circuit current limit	IRX_SHORT	-	-	50	mA	
Intra-pair skew at Rx package pins (HBR) RX intra-pair skew tolerance at HBR	LRX_SKEW_INTRA_PAIR	-	-	50	ps	



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5.0 SIGNAL TIMING SPECIFICATION

5.1 Timing Parameters

< Table 8. Timing Table >

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	fclk	138.5	148.5	169.7	MHz
Horizontal display area	thd	1920			pixel
HSYNC period time	th	2080	2200	2300	pixel
HSYNC blanking	thb+ thfp	160	280	380	pixel
Vertical display area	Tvd	1080			H
Frequency	fV	50	60	-	Hz
VSYNC period time	Tv	1110	1125	1200	H
VSYNC blanking	Tvb+ Tvfp	30	45	120	H

Note

1. Best operation clock frequency is 148.5Mhz.

2. Frequency] = [H Total] * [V Total] * [vertical Frame rate]
H Total, V Total and Frame rate]should operate within the range between Frequency_Min and Frequency_Max

3. Except Best operation clock frequency, FOS(Flicker & Brightness & Crosstalk, Etc.) are not guaranteed.

4. Main frequency Max is 60Hz

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5.3 Input Signals, Basic Display Colors and Gray Scale of Colors

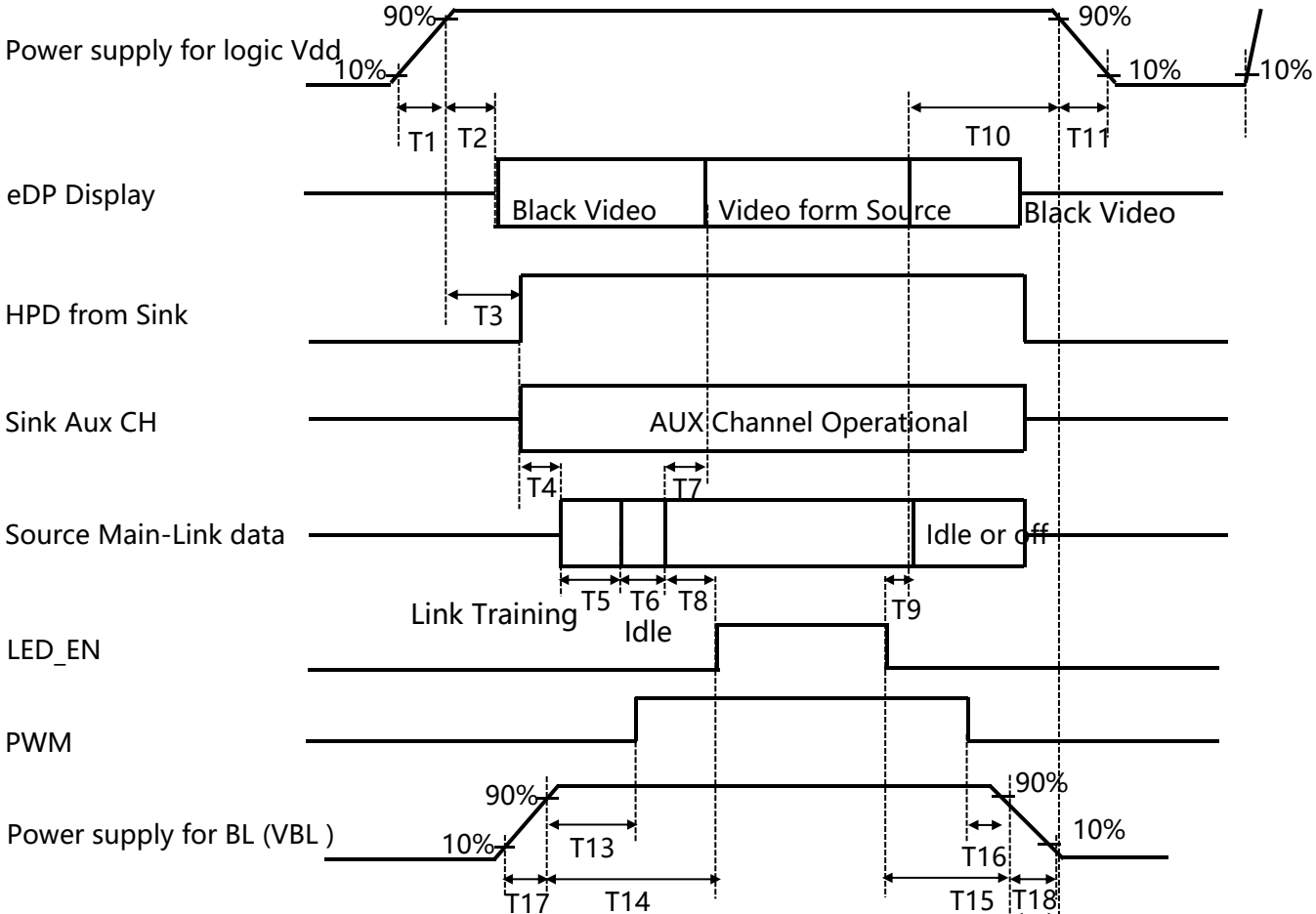
< Table 10. Input Signal and Display Color Table >

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue Data							
		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
	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
	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
	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
	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
	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	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	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	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	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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	0	0	0	0	0	0	0	0	1	1	1	1	1	1	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
Gray Scale of Blue	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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	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

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5.4 Power Sequence

To prevent a latch-up or DC operation of the Open Cell, the power on/off sequence shall be as shown in below



- 0.5ms ≤ T1 ≤ 10 ms
 - 0ms ≤ T2 ≤ 200 ms
 - 0ms ≤ T3 ≤ 200 ms
 - 0ms ≤ T13
 - 0ms ≤ T14
 - 0ms ≤ T17
 - 80ms ≤ T8
- 0ms ≤ T7 ≤ 50ms
 - 0ms ≤ T10 ≤ 500 ms
 - 0.5ms ≤ T11 ≤ 10 ms
 - 5ms ≤ T12
 - 0ms ≤ T15
 - 0ms ≤ T16
 - 0ms ≤ T18

Notes:

- When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
- 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.