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SPEC. NUMBER

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TITLE :

DV860QUD-N50 Product Specification

Fuzhou BOE Optoelectronics Technology Co.,Ltd

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REVISION HISTORY

REV.	ECN No.	DESCRIPTION OF CHANGES	DATE	PREPARED
P0	-	Initial Release	2018.03.22	Wang Peng

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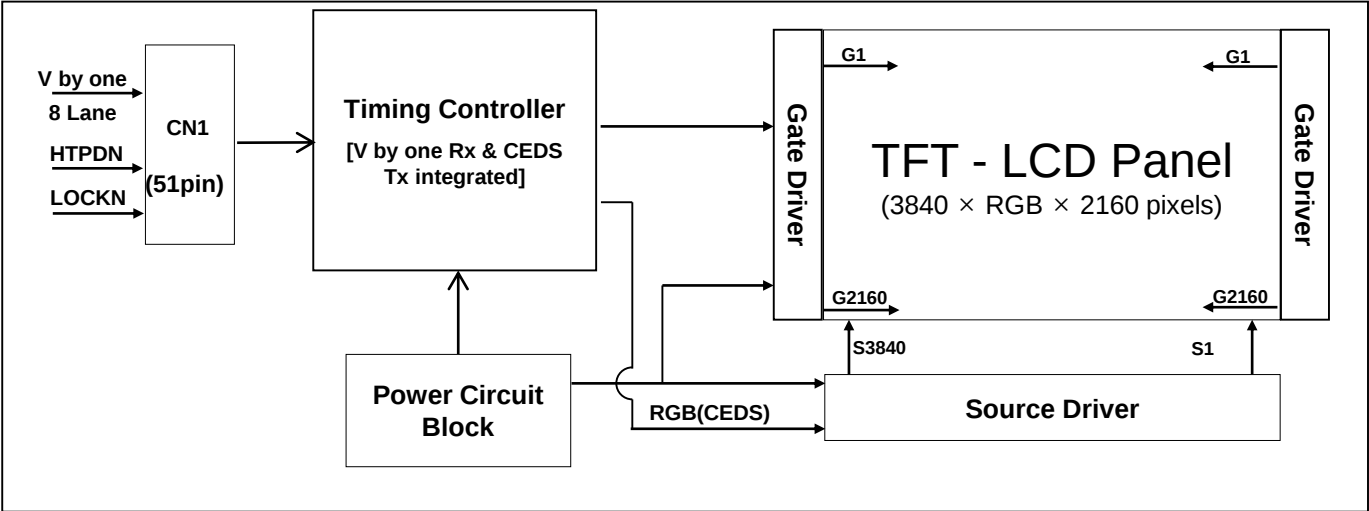
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1.0 GENERAL DESCRIPTION

1.1 Introduction

DV860QUD-N50 is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This OC has a 86 inch diagonally measured active area with resolutions (3840 horizontal by 2160 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this OC can display 1.07G colors. The TFT-LCD panel used for this OC is adapted for a low reflection and higher color type.



1.2 Features

- V by one interface with 8 lanes
- High-speed response
- Low color shift image quality
- 8-bit + FRC color depth, display 1.07G colors
- High luminance and contrast ratio, low reflection and wide viewing angle
- Gate driver use COF 8+8 mode
- ADS technology is applied for high display quality
- RoHS compliant

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1.3 Application

- Home Alone Multimedia TFT-LCD TV
- Display Terminals for Control System
- Ultra High Definition TV(3840*2160)
- AV application Products

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	1895.04(H) × 1065.96(V)	mm	
Number of pixels	3840(H) × 2160(V)	pixels	
Pixel pitch	493.5(H) × 493.5(V)	um	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	1.07G (8bits+FRC)	colors	
Display mode	Normally Black		
Open Cell Transmittance	5.1(Typ.)	%	At center point with BOE BLU
Dimensional outline	1913.1(H) × 1084(V) × 1.35 (B) .	mm	Dimensional outline
Weight	5400(Typ.)	g	预估
Power Consumption	14(Typ.)	Watt	预估
BM Size (L/R/U/D)	9.03/9.03/9.9/8.14	mm	
Surface Treatment	AG1/AG1(CF /TFT POL)		

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.

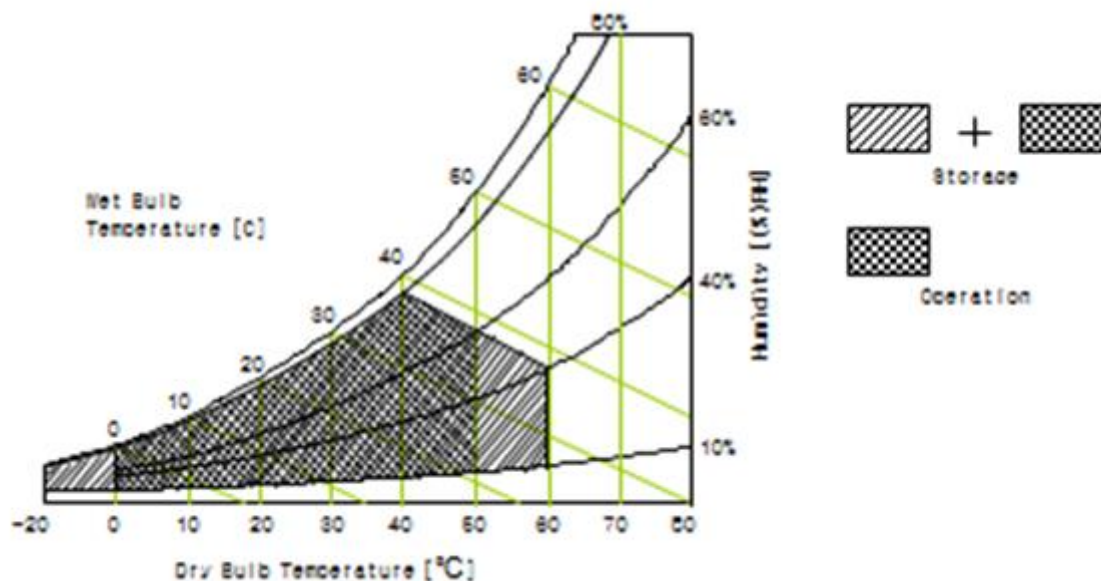
< Table 2. Open Cell Electrical Specifications >

[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.5	V	Ta = 25 °C
Operating Temperature	T _{OP}	0	+50	°C	Note 1
Storage Temperature	T _{SUR}	-20	+60	°C	
	T _{ST}	-20	+60	°C	
Operating Ambient Humidity	Hop	10	80	%RH	
Storage Humidity	Hst	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

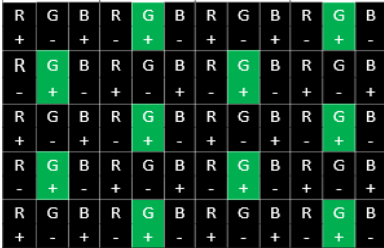
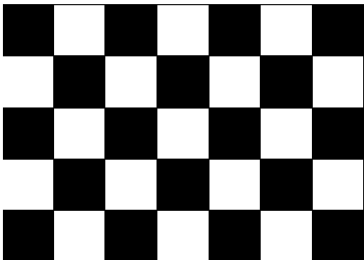
3.1 TFT LCD Open Cell

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

Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP	-	-	600	mV	
Power Supply Current		IDD	-	1165	2590	mA	Note 1 (评估值)
Power Consumption		PDD	-	14.0	31.1	Watt	
Rush current		IRUSH	-	-	4	A	Note 2
V by One Interface	Differential Input High Threshold Voltage	VLVTH	-	-	+50	mV	-
	Differential Input Low Threshold Voltage	VLVTL	-50	-	-	mV	-
	Common Input Voltage	VLVC	-	-	-	V	-
	Terminating Resistor	Rt	90	100	110	ohm	-
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3	V	
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

Note 1 : The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for VDD=12.0V,
Frame rate f_v=60Hz and Clock frequency = 37.125MHz.
Test Pattern of power supply current
a) Typ : Mosaic 7X5 (L0/L255) b) Max : Horizontal 1 Line (L0/L255) c) Flicker Test Pattern

Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 0.5ms(min)



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4.0 INTERFACE CONNECTION

4.1 Open Cell Input Signal & Power

- V by one Connector : F05035-51P-H(Changtong) or Equivalent.

< Table 4. Open Cell Input Connector Pin Configuration >

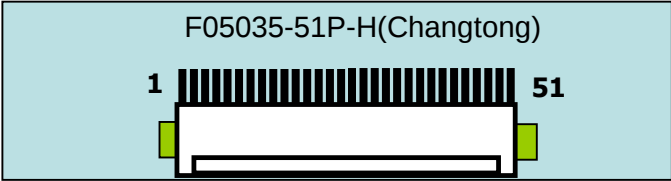
Pin No	Symbol	Description	Pin No	Symbol	Description
1	VDD	Power Supply +12.0V	27	GND	Ground
2	VDD	Power Supply +12.0V	28	Rx0n	V-by-One HS Data Lane 0
3	VDD	Power Supply +12.0V	29	Rx0p	V-by-One HS Data Lane 0
4	VDD	Power Supply +12.0V	30	GND	Ground
5	VDD	Power Supply +12.0V	31	Rx1n	V-by-One HS Data Lane 1
6	VDD	Power Supply +12.0V	32	Rx1p	V-by-One HS Data Lane 1
7	VDD	Power Supply +12.0V	33	GND	Ground
8	VDD	Power Supply +12.0V	34	Rx2n	V-by-One HS Data Lane 2
9	NC	No Connection	35	Rx2p	V-by-One HS Data Lane 2
10	GND	Ground	36	GND	Ground
11	GND	Ground	37	Rx3n	V-by-One HS Data Lane 3
12	GND	Ground	38	Rx3p	V-by-One HS Data Lane 3
13	GND	Ground	39	GND	Ground
14	GND	Ground	40	Rx4n	V-by-One HS Data Lane 4
15	NC	No Connection	41	Rx4p	V-by-One HS Data Lane 4
16	NC	No Connection	42	GND	Ground
17	NC	No Connection	43	Rx5n	V-by-One HS Data Lane 5
18	SDA	SDA(For I2C)	44	Rx5p	V-by-One HS Data Lane 5
19	SCL	SCL(For I2C)	45	GND	Ground
20	NC	No Connection	46	Rx6n	V-by-One HS Data Lane 6
21	Aging	H : Enable (Default) L : Disable	47	Rx6p	V-by-One HS Data Lane 6
22	SEL_SECTION	H : 2 Section L : 1 Section (Default)	48	GND	Ground
23	NC	No Connection	49	Rx7n	V-by-One HS Data Lane 7
24	GND	Ground	50	Rx7p	V-by-One HS Data Lane 7
25	HTPDN	Hot Plug Detect	51	GND	Ground
26	LOCKN	Lock Detect			

Notes : 1. NC (Not Connected) : This pins are only used for BOE internal operations.

2.BIST : This pin is used for selecting display pattern mode when input DE or input CLOCK quits toggling.

Rear view of LCM

BIST Pattern



PT1: Black (2 sec)	PT2: White (2 sec)	PT3: Red (2 sec)	PT4: Green (2 sec)	PT5: Blue (2 sec)

4.2 V by one Misc. Setting.-1 Section

- System side have to put pull high resistor on LOCKN/HTPDN pins.
- V by one data mapping as follows.

< Table 5. V by one setting &data mapping Table >

1 Section								
Hactive= 3840								
	port 0		port 1		port 2		port 3	
	Lane 0	Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6	Lane 7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	...	...	...	...	...	...	...	...
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8
	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...
	Pixel 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840
H Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	...	...	...	...	...	...	...	...
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE	FSBE
Line 2	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 5	Pixel 6	Pixel 7	Pixel 8
	Pixel 9	Pixel 10	Pixel 11	Pixel 12	Pixel 13	Pixel 14	Pixel 15	Pixel 16
	...	...	...	...	...	...	...	...
	...	...	...	...	...	...	...	...
	Pixel 3833	Pixel 3834	Pixel 3835	Pixel 3836	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

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5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

5.1 Input data specification CN1

- Table 6 Vx1 Byte length and Color mapping

Byte	Packer input	Color data mapping
		30 bpp RGB
0	Bit-0	R2
	Bit-1	R3
	Bit-2	R4
	Bit-3	R5
	Bit-4	R6
	Bit-5	R7
	Bit-6	R8
	Bit-7	R9
1	Bit-8	G2
	Bit-9	G3
	Bit-10	G4
	Bit-11	G5
	Bit-12	G6
	Bit-13	G7
	Bit-14	G8
	Bit-15	G9
2	Bit-16	B2
	Bit-17	B3
	Bit-18	B4
	Bit-19	B5
	Bit-20	B6
	Bit-21	B7
	Bit-22	B8
	Bit-23	B9
3	Bit-24	-
	Bit-25	-
	Bit-26	B0
	Bit-27	B1
	Bit-28	G0
	Bit-29	G1
	Bit-30	R0
	Bit-31	R1

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6.0 SIGNAL TIMING SPECIFICATION

6.1 Timing Parameters

< Table 7. Timing Table >

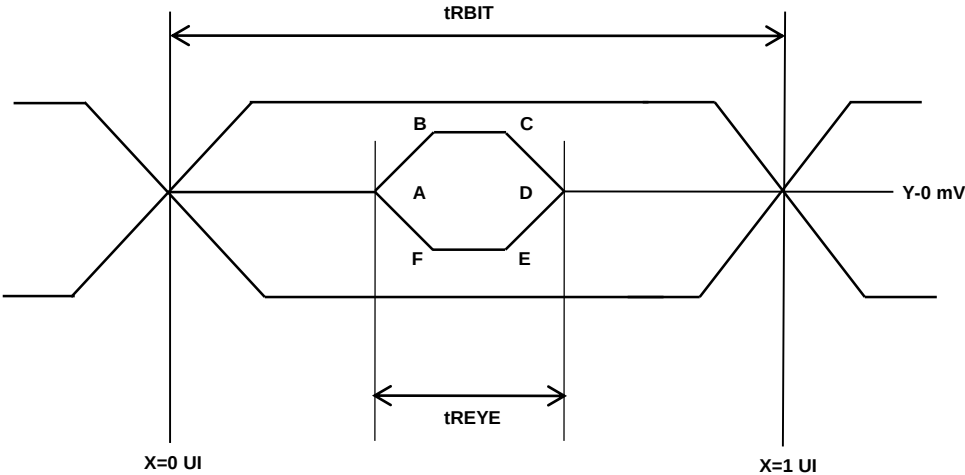
Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	70.54	74.25	76.73	MHz
Vertical	Frame Rate	F	57	60	62	Hz
	Total	T _V	2180	2250	2450	T _H
	Display	T _{VD}	2160			T _H
	Blank	T _{VB}	20	90	290	T _H
Horizontal	Total	T _H	530	550	570	T _{CLK}
	Display	T _{HD}	-	480	-	T _{CLK}
	Blank	T _{HB}	50	70	90	T _{CLK}

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6.2 Signal Timing Waveform

< Table 8. Signal Timing Table >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	380	tTCIP/30	1667	PS
		4-byte	285	tTCIP/40	1250	PS
		5-byte	266	tTCIP/50	1000	PS
Eye Width at Package Pin	tREYE	-	-	0.5	-	UI
Eye Width Position A at Package Pin	tA	-	-	0.25	-	UI
Eye Width Position B at Package Pin	tB	-	-	0.3	-	UI
Eye Width Position Cat Package Pin	tC	-	-	0.7	-	UI
Eye Width Position D at Package Pin	tD	-	-	0.75	-	UI
Eye Width Position E at Package Pin	tE	-	-	0.7	-	UI
Eye Width Position F at Package Pin	tF	-	-	0.3	-	UI
Intra – pair Skew	TTOSK_intra	-	-	-	0.3	UI
Inter – pair Skew	TTOSK_inter	-	-	-	40	UI
SSCG	-	30KHz modulation	-0.5		0.5	%



	Y[mV]
A	0
B	50
C	50
D	0
E	-50
F	-50

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

< Table 9. Input Signal and Display Color Table >

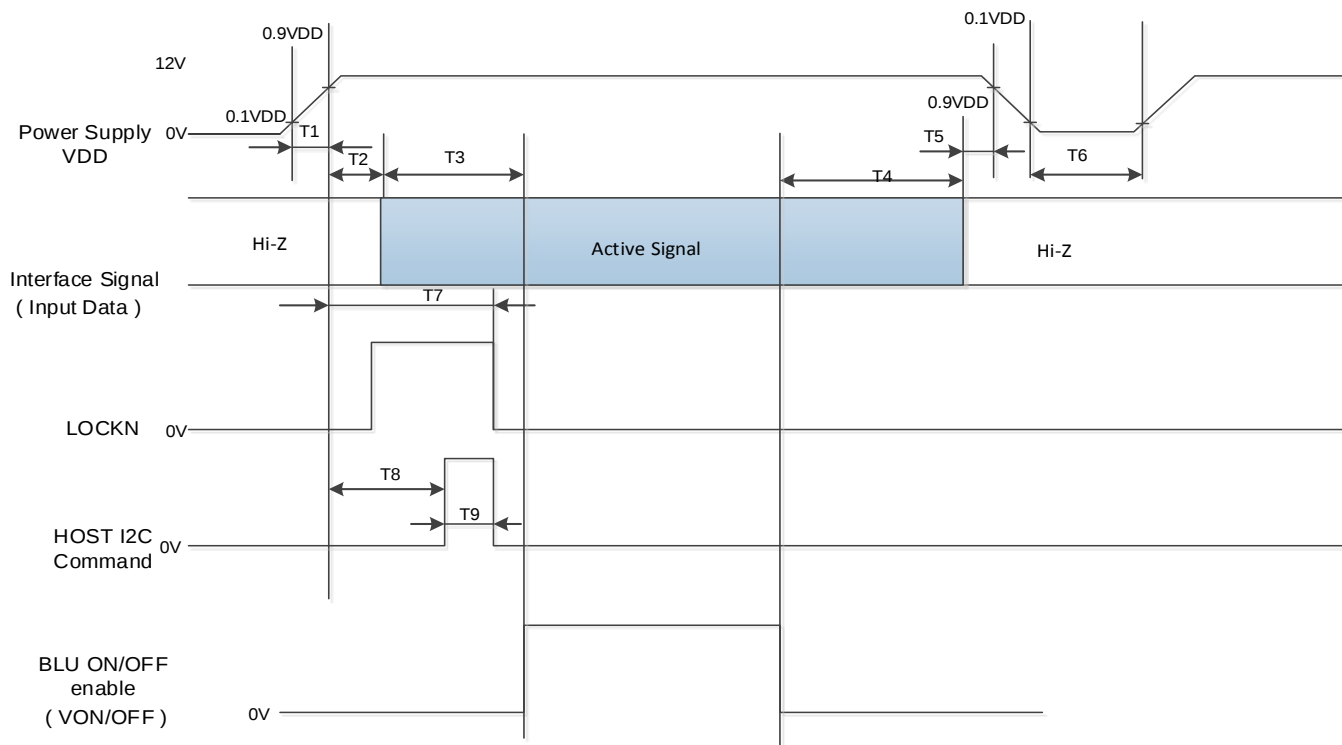
Color		Input Color Data																																			
		MSB RED LSB										MSB GREEN LSB										MSB BLUE LSB															
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0						
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(1023)	1	1	1	1	1	1	1	1	1	1	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	
	Green(1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	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	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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	1	1	1	1	0	0	0	0	0	0	0	0	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	1	1	1	1	1	1	1	1	1	1	1	1
R	RED(000)	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	
	RED(001)	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	0	0	0	0	0	0	0	0	0	

	RED(1022)	1	1	1	1	1	1	1	1	1	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	
	RED(1023)	1	1	1	1	1	1	1	1	1	1	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
G	Green (000)	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
	Green (000)	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	

	Green (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
B	Blue(000)	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
	Blue(000)	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	

	Blue(1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	0		
	Blue(1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	

6.4 Power Sequence



< Table 10. Sequence Table >

Parameter	Values			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	-	ms
T3	200	-	-	ms
T4	100	-	-	ms
T5	0	-	50	ms
T6	1	-	-	s
T7	200	-	-	ms
T8	0	-	1200	ms
T9	Depends on I2C command			ms

Notes: 1. Even though T1 is over the specified value, there is no problem if I2T spec of fuse is satisfied.

2. Back Light must be turn on after power for logic and interface signal are valid.

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7.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance≤1 lux and temperature=25±2°C) with the equipment of Luminance meter system (Goniometer system and PR730) and test unit shall be located at an approximate distance 180cm from the LCD surface at a viewing angle of θ and Φ equal to 0°. We refer to θ_{∅=0} (=θ₃) as the 3 o'clock direction (the “right”), θ_{∅=90} (= θ₁₂) as the 12 o'clock direction (“upward”), θ_{∅=180} (= θ₉) as the 9 o'clock direction (“left”) and θ_{∅=270}(= θ₆) as the 6 o'clock direction (“bottom”). While scanning θ and/or ∅, the center of the measuring spot on the Display surface shall stay fixed. The measurement shall be executed after 30 minutes warm-up period. VDD shall be 12.0V at 25°C. Optimum viewing angle direction is 6 ’clock.

< Table 11. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25±2 °C]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10		89		Deg.	Note 1
		Θ_9			89		Deg.	
	Vertical	Θ_{12}			89		Deg.	
		Θ_6			89		Deg.	
Cell Transmittance			$\Theta = 0^\circ$ (Center) Normal Viewing Angle	4.6	5.1		%	
Contrast ratio		CR		1000:1	1200:1	-		Note 2
Reproduction of color	White	W_x		TYP. - 0.03	TBD	TYP. + 0.03		Note 3
		W_y			TBD			
	Red	R_x			TBD			
		R_y			TBD			
	Green	G_x			TBD			
		G_y			TBD			
	Blue	B_x			TBD			
		B_y			TBD			
Color Gamut				-	TBD	-	%	
Response Time	G to G	T_g		-	8	10	ms	Note 4
Gamma Scale				2.0	2.2	2.4		

Note :

1. Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing 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.
2. Contrast measurements shall be made at viewing angle of $\theta = 0^\circ$ 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 shown in Appendix) 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 9. 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. The BLU is used by BOE.
4. Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate $f_V = 60\text{Hz}$ to optimize.
Each time in below table is defined as Figure 2 and shall be measured by switching the

Measured Response Time	Target															
	0	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239
Start	0															
	15															
	31															
	47															
	63															
	79															
	95															
	111															
	127															
	143															
	159															
	175															
	191															
	207															
	223															
	239															
	255															

5. Definition of Transmittance (T%) :

OC is with white(L255) signal input

$$\text{Transmittance} = \frac{\text{Luminance of LCD OC}}{\text{Luminance of BLU}} \times 100 \%$$

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8.0 MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

Figure 3(located in Appendix) shows mechanical outlines for the model DV430FBD-N50. Other parameters are shown in Table 12.

< Table 12. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	1913.1(H) × 1084(V) × 1.35 (B) .	mm
Weight	5400 (typ.)(预估)	gram
Active area	1895.04(H) × 1065.96 (V)	mm
Pixel pitch	493.5 (H) × 493.5(V)	um
Number of pixels	3840(H) × (2160V) (1 pixel = R + G + B dots)	pixels

8.2 Anti-Glare and Polarizer Hardness.

The surface of the LCD has an anti-glare coating to minimize reflection and a coating to reduce scratching.

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9.0 RELIABILITY TEST

The Reliability test items and its conditions are shown in below.

< Table 13. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °C, 240 hrs
2	Low temperature storage test	Ta = -20 °C, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 °C, 80%RH, 240hrs
4	High temperature operation test	Ta = 50 °C, 240hrs
5	Low temperature operation test	Ta = -5 °C, 240hrs
6	Thermal shock	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle

This test condition is based on BOE OC.

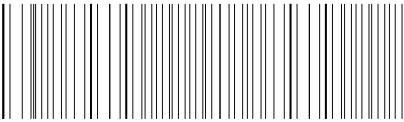
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10.0 PRODCUT SERIAL NUMBER

XXXX

XXXXXXXX-XXX

BA



XXXXXXXXXXXXXXXXXXXX

FG-Code

MDL ID

BOE

eco

RoHS Compliant

MADE IN CHINA

MDL ID Naming Rule:

Digit Code	1	2	3	4	5	6	7	8	9	10	11
Description	Model Code GBN		Grade	Line	Year		Month	Model Extension Code			
Digit Code	12	13	14	15	16	17	18				
Description	Serial No						扫码不显示，BOE厂内用				

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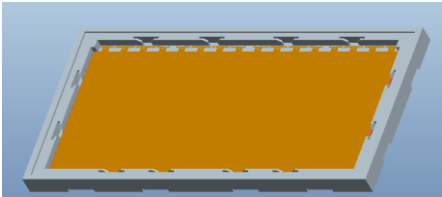
11.0 PACKING INFORMATION

BOE provides the standard shipping container for customers, unless customer specifies their packing information. The standard packing method and Barcode information are shown in below.

11.1 Packing Order



Put 1Pcs 3t EPE pad in the box ,



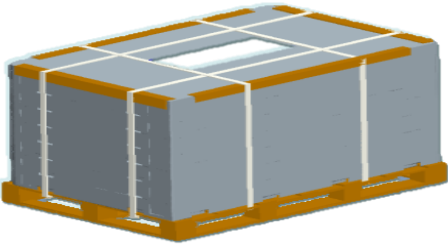
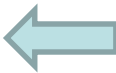
Put one open cell on EPE pad.



Put 1Pcs 4t EPE pad , ... , totally 8 pcs open cell and 9pcs EPE pad in one box,



Put one paper pad on the pallet,
Put totally 5 boxes and 1 cover,
(5ea boxes per pallet)



Place Top-Cover and wrap film
around the boxes.
Pack with 4 packing belts.

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11.2 Packing Note

- Box Dimension : 2129mm(L)×360mm(W)×158mm(H)
- Package Quantity in one Box : 8pcs

11.3 Box Label

- Label Size : 100 mm (L) × 50 mm (W)
 - Contents
- OC: DV860QUD-N50
- Q`ty : OC 8 Q`ty in one box
- Serial No. : Box Serial No.
- Date : Packing Date

BOE

FUZHOU BOE OPTOELECTRONICS
TECHNOLOGY Co.,LTD

MODEL: XXXXXXXX-XXX

Q'TY: XXX

SERIAL NO: XXXXXXXXXXXXX

DATE: XXXX.XX.XX



XXXXXXXXXXXXXXXX

RoHS Compliant

XXXX

RoHS Mark

Internal CODE

Digit	1		2	3	4		5	6	7				
Code	x	x	x	x	x	x	x	x	x	x	x	x	x
Des.	1. Model Code GBN 2. Grade 3. Line 4. Year(2016:16, 2017:17, ...) 5. Month(1, 2, 3, ..., 9, X, Y, Z) 6. Revision Code 7. Serial Number												

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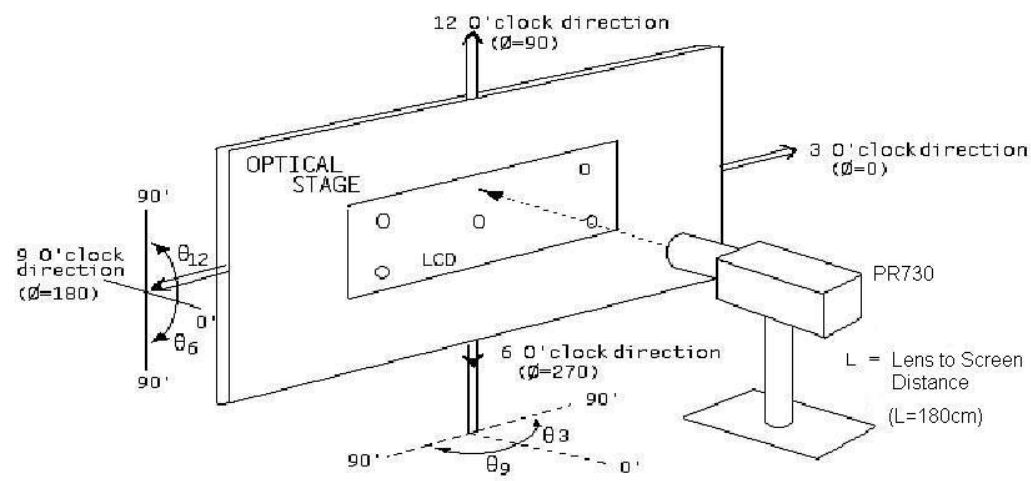
12.0 HANDLING & CAUTIONS

- (1) Cautions when taking out the OC
 - Pick the pouch only, when taking out OC from a shipping package.
- (2) Cautions for handling the OC
 - As the electrostatic discharges may break the LCD OC, handle the LCD OC with care. Peel a protection sheet off from the LCD panel surface as slowly as possible.
 - As the LCD panel and back - light element are made from fragile glass material, impulse and pressure to the LCD OC should be avoided.
 - As the surface of the polarizer is very soft and easily scratched, use a soft dry cloth without chemicals for cleaning.
 - Do not pull the interface connector in or out while the LCD OC is operating.
 - Put the OC display side down on a flat horizontal plane.
 - Handle connectors and cables with care.
- (3) Cautions for the operation
 - When the OC is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the LCD panel would be damaged.
 - Obey the supply voltage sequence. If wrong sequence is applied, the OC would be damaged.
- (4) Cautions for the atmosphere
 - Dew drop atmosphere should be avoided.
 - Do not store and/or operate the LCD OC in a high temperature and/or humidity atmosphere. Storage in an electro-conductive polymer packing pouch and under relatively low temperature atmosphere is recommended.
- (5) Cautions for the OC characteristics
 - Do not apply fixed pattern data signal to the LCD OC at product aging.
 - Applying fixed pattern for a long time may cause image sticking.
- (6) Other cautions
 - Do not disassemble and/or re-assemble LCD OC.
 - Do not re-adjust variable resistor or switch etc.
 - When returning the OC for repair or etc., Please pack the OC not to be broken. We recommend to use the original shipping packages.

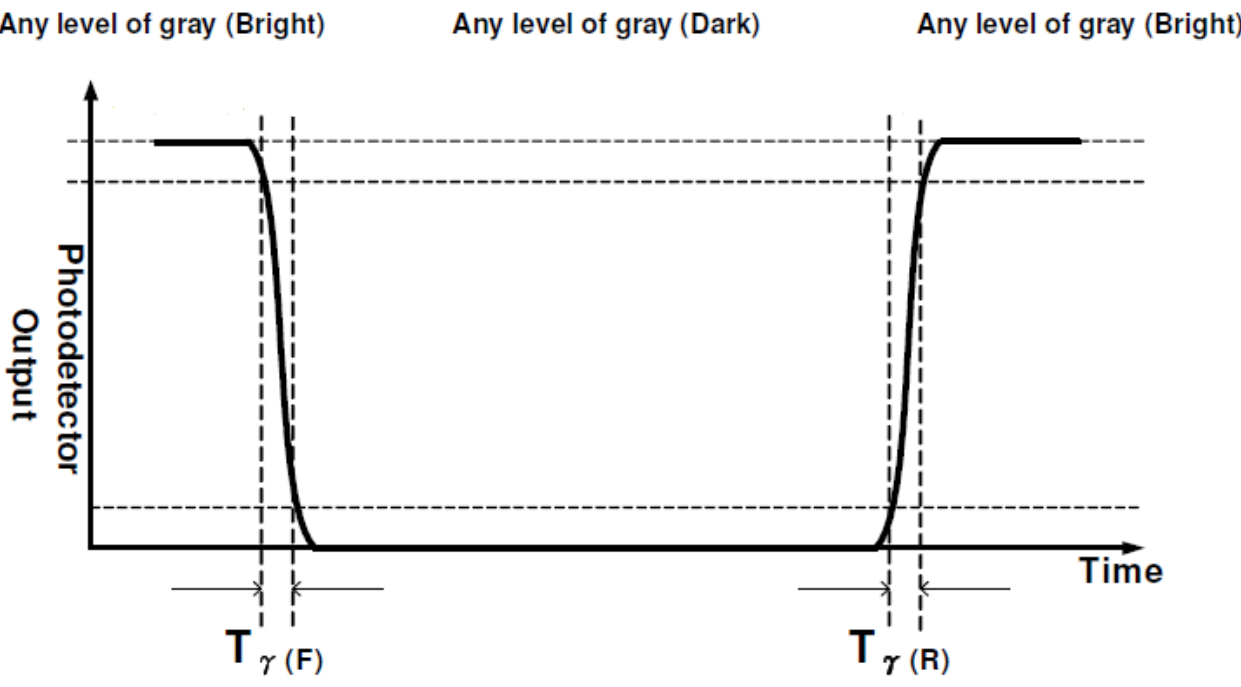
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13.0 APPENDIX

< Figure 1. Measurement Set Up >



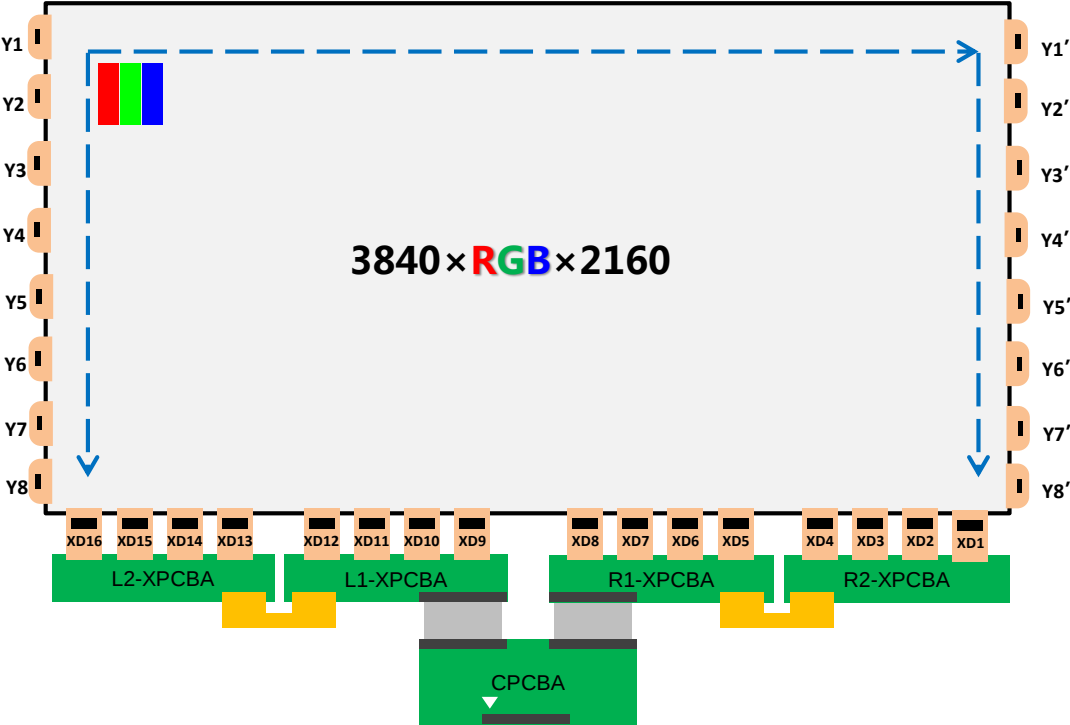
< Figure 2. Response Time Testing >



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< Figure 4. Display Mode>

(a)This Product is Reverse type display



Notes : NC(Not Connected) : This pins are only used for BOE internal operations.