BOE

DV350FBM-N10

Product Specification

Rev. P0

FUZHOU BOE OPTOELECTRONICS TECHNOLOGY Co.,LTD

SPEC. NUMBER	PRODUCT GROUP	Rev. P0	ISSUE DATE	PAGE
	TFT-LCD		2022.12.15	1 OF 35

REVISION HISTORY

(√)preliminary specification

(   )Final specification

Revision No.	Page	Description of changes	Date	Prepared
P0		Initial Release	2022/12/15	Sisi Zhang

Contents

1.0 GENERAL DESCRIPTION

1.1 Introduction

DV350FBM-N10 is a color active matrix TFT LCD MDL using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This MDL has a 35 inch diagonally measured active area with FHD resolutions (3840 horizontal by 200 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 MDL panel is adapted for a low reflection and higher color type.
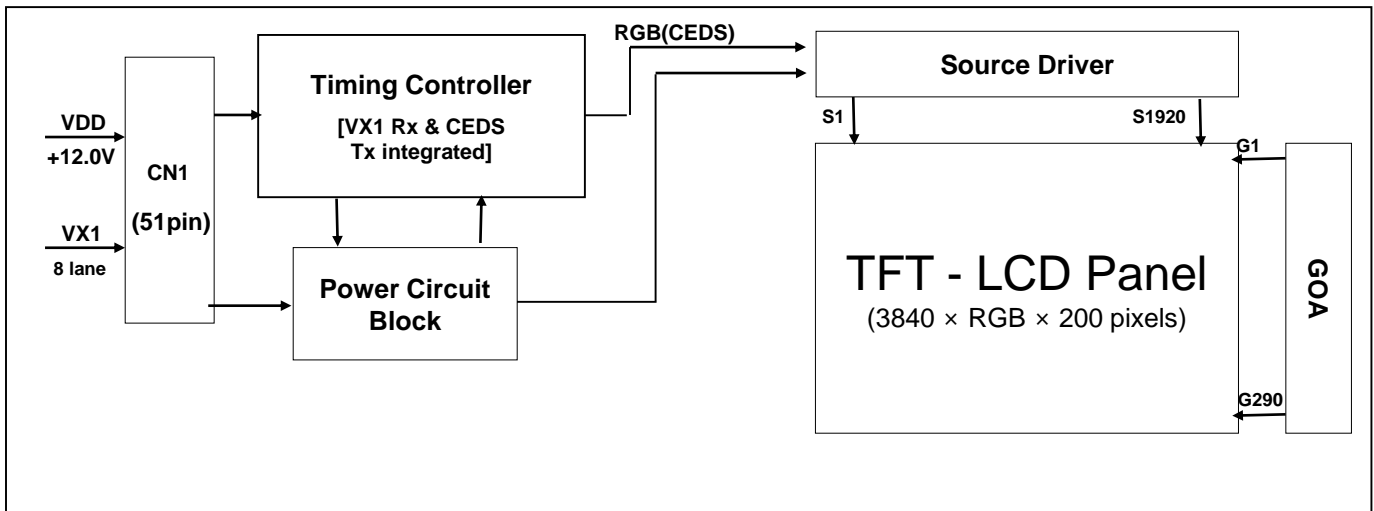
1.2 Features

- V by one interface with 8 lanes
- High-speed response
- Low color shift image quality
- 8-bit + FRC color depth, display 1.07G colors
- Wide viewing angle
- DE (Data Enable) only mode
- ADS technology is applied for high display quality
- RoHS compliant

1.3 Application

● Indoor Commercial Digital Display

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remarks
Active area	877.824(H)*45.72(V)	mm	
Number of pixels	3840(H) ×200(V)	pixels	
Pixel pitch	76.2(H)*228.6(V)	um	
Pixel arrangement	Pixels RGB Vertical stripe		
Display colors	1.07G	colors	8bits+FRC
Display mode	Normally Black		
Dimensional outline	891.6(H)*60.4(V)*10(B)	mm	Detail refer to drawing
Weight	TBD	g	
Power Consumption	TBD	Watt	Typ.
Bezel width (L/R/U/D)	5.7/5.7/7.8/4.5	mm	Typ.
Surface Treatment	Haze 1%		
Back-light	Down edge side, 2- LED Light bar		

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.
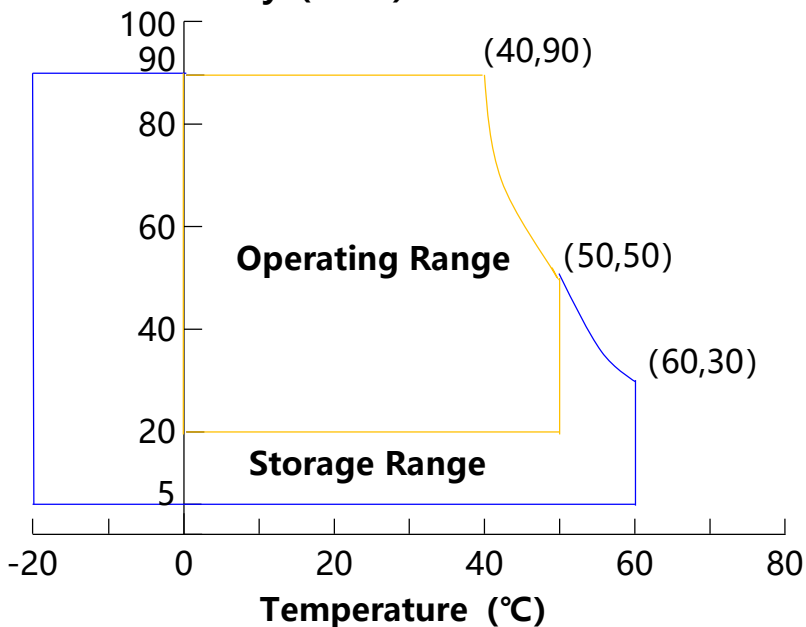
< Table 2. Module Electrical Specifications > [VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage	VDD	VSS-0.3	13.5	V	Ta = 25 ℃
	VLED	VSS-0.3	13.5	V	Ta = 25 ℃
Operating Temperature	T_{OP}	0	+50	℃	Note 1
	T_{SUR}	-	+65	℃	
Storage Temperature	T_{ST}	-20	+60	℃	
Operating Ambient Humidity	Hop	5	90	%RH	
Storage Humidity	Hst	5	90	%RH	

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.

Relative Humidity (%RH)

3.0 ELECTRICAL SPECIFICATIONS

3.1 TFT LCD Module

< Table 3. Module Electrical Specifications >

[Ta =25±2 ℃]

Parameter		Symbol	Values			Unit	Remark
			Min	Typ	Max		
Power Supply Input Voltage		VDD	10.8	12	13.2	Vdc	
Power Supply Ripple Voltage		VRP	-	-	300	mV	
Power Supply Current		IDD	-	TBD	TBD	mA	Note 1
Power Consumption		PDD	-	TBD	TBD	Watt	
Rush current		IRUSH	-	2	3	A	Note 2
LVDS Interface	Differential Input High Threshold Voltage	VLVTH	-	-	+50	mV	
	Differential Input Low Threshold Voltage	VLVTL	-50	-	-	mV	
	Input Differential Voltage	| VID |	-	0	-	mV	
	Common Input Voltage	VLVC	80	100	120	V	
CMOS Interface	Input High Threshold Voltage	VIH	2.7	-	3.3		
	Input Low Threshold Voltage	VIL	0	-	0.6	V	

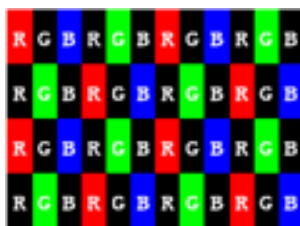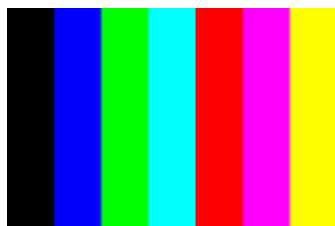Note 1 : The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDD=12.0V,

Frame rate f_V=60Hz and Clock frequency = 74.25MHz.

Test Pattern of power supply current

a) Typ : Color Bar pattern   b) Max : Skip subpixel pattern

Note 2 : The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

3.0 ELECTRICAL SPECIFICATIONS

3.2 Backlight Unit

< Table 3. Backlight Unit Electrical Specifications >

[Ta =25±2 ℃]

Parameter		Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage	V_F	-	2.7	2.9	V	-
LED Forward Current	I_F	-	28.5	-	mA	-
Backlight Supply Voltage	VBL	10.8	12	13.2	V	-
Backlight Supply current	IBL	-	TBD	TBD	mA	
VBL Inrush	IRUSH	-	TBD	TBD	A	
BLU Power Consumption	P_{BLU}		TBD	TBD	W	Note 1
LED Life-Time	N/A	50000			Hour	
PWM Control Level	PWM High Level	-	2.7	3.3	5	V	
	PWM Low Level	-	0	-	0.7	V	
LEDEN Control Level	LEDEN High Level	-	2.7	3.3	5	V	
	LEDEN Low Level	-	0	-	0.7	V	
PWM Control Frequency	F_{PWM}	200	-	2000	Hz	
Duty Ratio	-	5	-	100	%	

Notes :
1. Power supply voltage12V for LED Driver, Calculator Value for reference IBL × VBL = P_{BLU}
2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

4.0 INTERFACE CONNECTION

4.1 Module Input Signal & Power

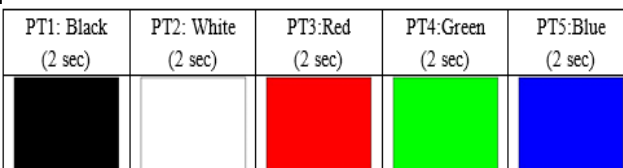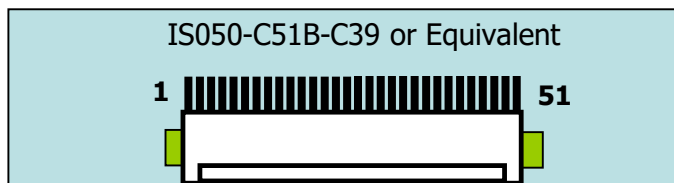- V by one Connector IS050-C51B-C39 or Equivalent.

-.　　　　　　　< Table 4-1. Module 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	LD_EN_IN	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 (BIST)	H : Enable (Default)　 L : Disable	47	Rx6p	V-by-One HS Data Lane 6
22	SEL_SECTION	H : 2 Section　 L or NC : 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

IS050-C51B-C39 or Equivalent

1 |||||||||||||||||||||||| 51

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

4.0 INTERFACE CONNECTION

4.2 V by one Setting.-1 Section

    a) System side have to put pull high resistor on LOCKN/HTPDN pins.

    b) V by one data mapping as follows.

< Table 7. V by one setting &data mapping Table >

	1 Section							
	Hactive = 3840							
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
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

4.0 INTERFACE CONNECTION

4.2 V by one Setting.-2 Section

a) System side have to put pull high resistor on LOCKN/HTPDN pins.

b) V by one data mapping as follows.

< Table 8. V by one setting &data mapping Table >

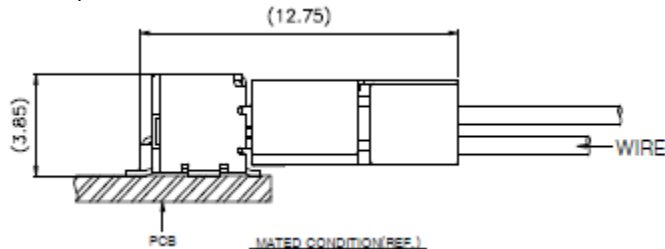|	2 Section							
	Hactive = 3840							
	Port0		Port1		Port2		Port3	
	Lane0	Lane1	Lane2	Lane3	Lane4	Lane5	Lane6	Lane7
V Blanking	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS	FSBS
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	…	…	…	…	…	…	…	…
	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP	FSBP
	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR	FSBE_SR
Line 1	Pixel 1	Pixel 2	Pixel 3	Pixel 4	Pixel 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	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 1921	Pixel 1922	Pixel 1923	Pixel 1924
	Pixel 5	Pixel 6	Pixel 7	Pixel 8	Pixel 1925	Pixel 1926	Pixel 1927	Pixel 1928
	…	…	…	…	…	…	…	…
	…	…	…	…	…	…	…	…
	Pixel 1917	Pixel 1918	Pixel 1919	Pixel 1920	Pixel 3837	Pixel 3838	Pixel 3839	Pixel 3840

4.0 INTERFACE CONNECTION

4.3 CNT Dimension

-51pin Connector：IS050-C51B-C39-S
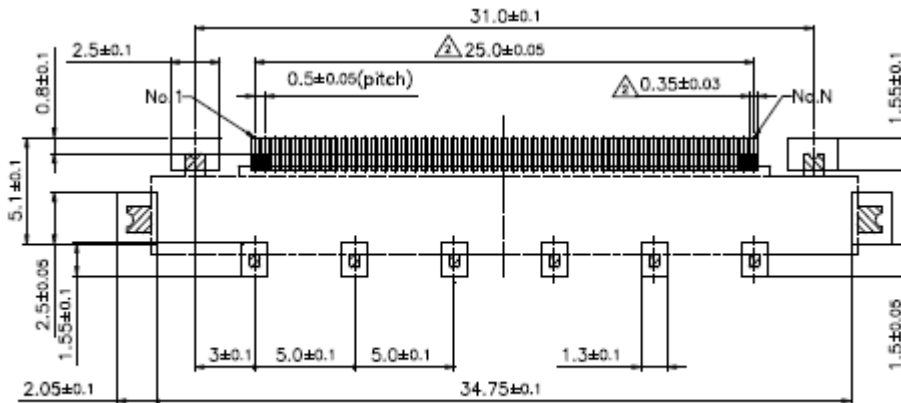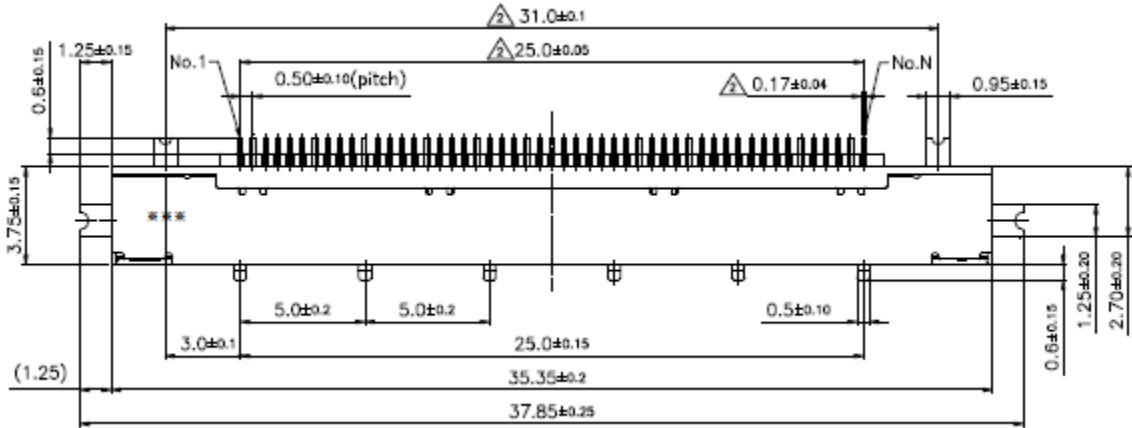
APPLICABLE P.C.B. DIMENSION
(Scale 4:1)

MATED CONDITION(REF.)
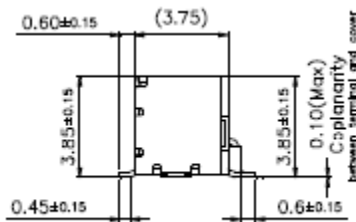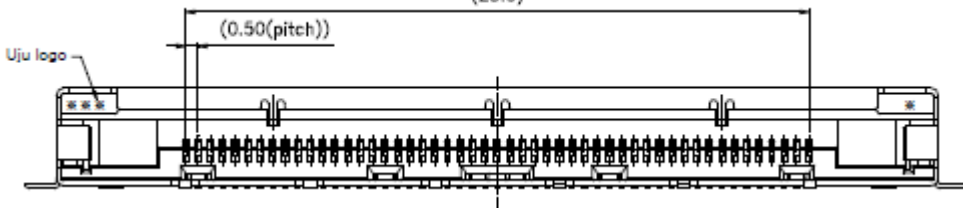
4.0 INTERFACE CONNECTION

4.4 Module VLED Input

- VLED Connector 12507WR-H10L or Equivalent.

No.	Symbol	Description
1	VIN	Power Supply, +12V
2	VIN	Power Supply, +12V
3	VIN	Power Supply, +12V
4	NC	No Connection
5	GND	Ground and Current Return
6	GND	Ground and Current Return
7	GND	Ground and Current Return
8	BLU_ON	Converter On-Off control
9	PWM	PWM Control Signal
10	NC	No Connection
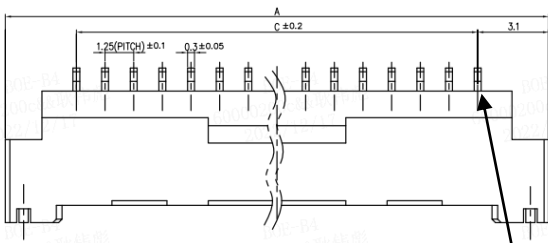
Pin1

PARTS NO.	A	B	C
12507WR-H02L	7.45	3.00	1.25
√12507WR-H03L	8.70	4.25	2.50
√12507WR-H04L	9.95	5.50	3.75
√12507WR-H05L	11.2	6.75	5.00
√12507WR-H06L	12.45	8.0	6.25
√12507WR-H07L	13.7	9.25	7.50
√12507WR-H08L	14.95	10.5	8.75
√12507WR-H09L	16.2	11.75	10.0
√12507WR-H10L	17.45	13.0	11.25

5.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL
5.1 Input data specification

- Table 9. 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

5.2 Vx1 Input Signal Waveforms

< Table 10. Signal Waveforms Table >

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Unit Interval(VBO Operation Bit Rate)	tRBIT	3-byte	266	tTCIP/30	1667	PS
		4-byte	266	tTCIP/40	1667	PS
		5-byte	266	tTCIP/50	1667	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
Effective Veye level	Veye	-	-	50	-	mv
Intra – pair Skew	TTOSK_intra	-	-0.3	-	0.3	UI
Inter – pair Skew	TTOSK_inter	-	-5	-	5	UI
SSCG	-	33KHz modulation	-0.5		0.5	%

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

tRBIT

B C
A D
F E

Y-0 mV

tREYE

X=0 UI   X=1 UI
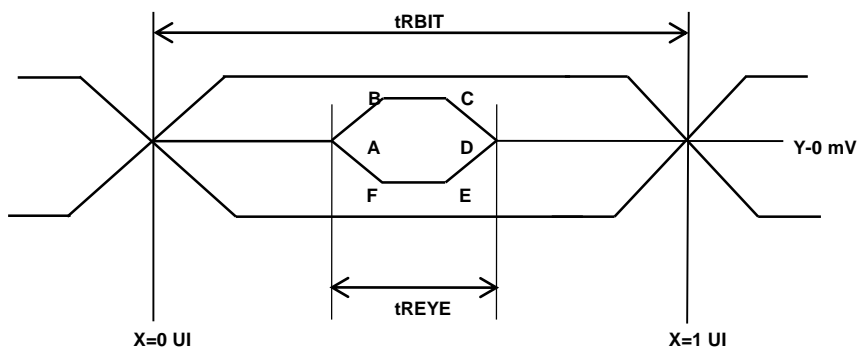
6.0 SIGNAL TIMING SPECIFICATION

6.1 Timing Parameters

< Table 11. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		$1/T_c$	69	74.25	78	MHz
Vertical	Frame Rate	F	57	60	61	Hz
	Total	T_V	2200	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}

Note

  1. DE Only Mode，While operation, DE signal should be have the same cycle. The input of HSYNC & VSYNC signal does not have an effect on normal operation.

  2. Best operation clock frequency is 74.25 MHz.

  3. Frequency] = [H Total] * [V Total] * [vertical Frame rate]

    H Total, V Total and Frame rate should operate within the range between Frequency_Min and Max

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

  5. Main frequency Max is 78Mhz MHz without spread spectrum

## 6.2 Input Signals, Basic Display Colors and Gray Scale of Colors

< Table 12. 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
	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
	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
	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
	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
	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
	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
	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
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
	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

	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
	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
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
	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

	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
	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
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
	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	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	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

6.3 Power Sequence
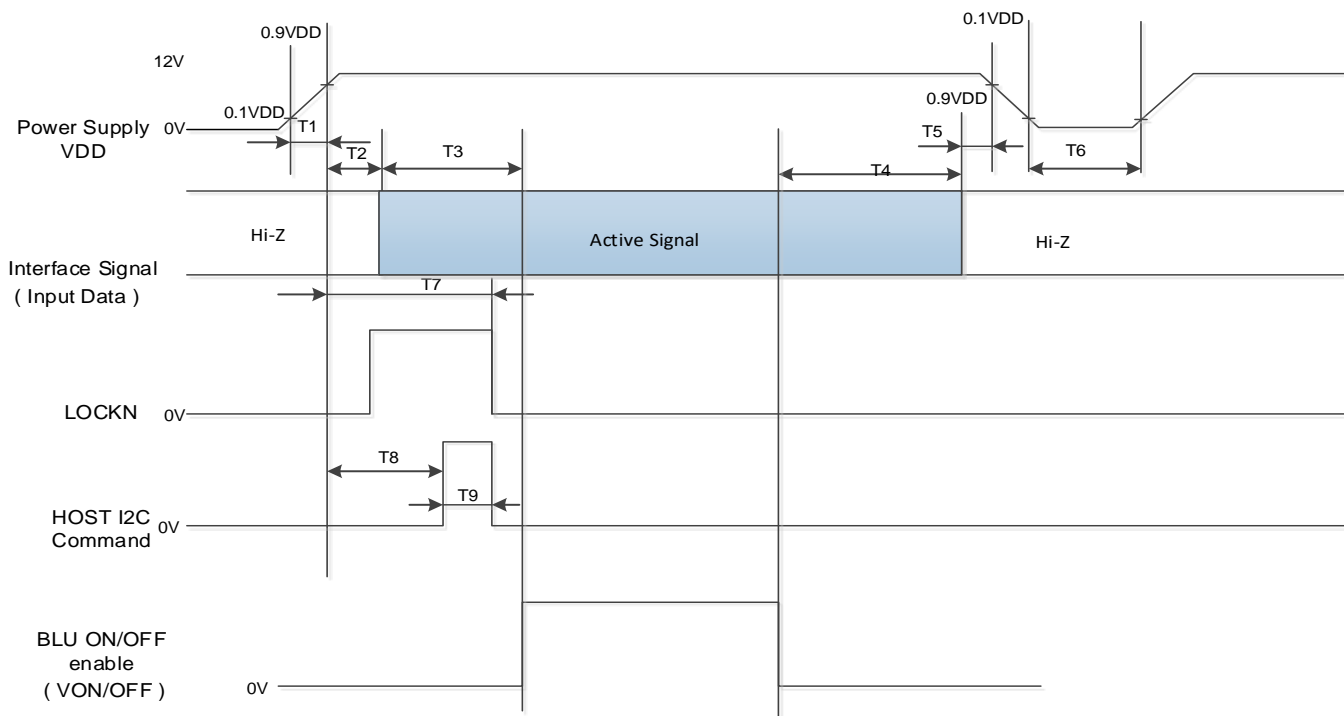
< Table 13. Sequence Table >

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

Notes:

1. Even though T1 is out of SPEC, it is still ok if the inrush current of VDD is below the limit.

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

    ※ Please avoid floating state of interface signal at invalid period.

    ※ When the power supply for LCD (VDD) is off, be sure to pull down the valid and invalid data to 0V.

3. Back Light must be turn on after power for logic and interface signal are valid; The T3 / T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.

4. T6 should be measured after the Module has been fully discharged between power off and on period

5. HOST I2C should operate after BLU enable. It 's used for flicker tuning. If customer does not need I2C, ignoring T8 & T9.

6. T11: VDD must decay smoothly after power-off , there should be none re-bounding voltage. (customer system decide this value)

7.0 OPTICAL SPECIFICATIONS

The test of optical specifications shall be measured in a dark room (ambient luminance$\leq$1 lux and temperature=25$\pm$2℃) 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 $\theta_{\varnothing=0}$ (=θ_3) as the 3 o'clock direction (the "right"), $\theta_{\varnothing=90}$ (= θ_{12}) as the 12 o'clock direction ("upward"), $\theta_{\varnothing=180}$ (= θ_9) as the 9 o'clock direction ("left") and $\theta_{\varnothing=270}$(= θ_6) as the 6 o'clock direction ("bottom"). While scanning θ and/or Ø, 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 12. Optical Table >

[VDD = 12.0V, Frame rate = 60Hz, Ta =25$\pm$2 ℃]

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remark
Viewing Angle	Horizontal	Θ_3	CR > 10	80	89	-	Deg.	Note 1
		Θ_9		80	89	-	Deg.	
	Vertical	Θ_{12}		80	89	-	Deg.	
		Θ_6		80	89	-	Deg.	
Brightness		Lv		400	500	-	nit	MDL
Contrast ratio		CR		700:1	1000:1	-		Note 2
White luminance uniformity		ΔY		75	-	-	%	Note 3
Reproduction of color	White	W_x	Θ = 0° (Center) Normal Viewing Angle	TYP. - 0.03	0.313	TYP. + 0.03		Note 4
		W_y			0.329			
	Red	R_x			TBD			
		R_y			TBD			
	Green	G_x			TBD			
		G_y			TBD			
	Blue	B_x			TBD			
		B_y			TBD			
Color Gamut				68	72	-	%	
Response Time	G to G	T_g		-	8	10	ms	Note 5

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 $\theta = 0°$ 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 White luminance uniformity on LCD surface is then expressed as :
   ΔY = (Minimum Luminance of 9 points / Maximum Luminance of 9 points) * 100
   (See Figure 5 shown in Appendix).

4. 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.

5. Response time Tg is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize.
   Each time in below table is defined as Figure 2 and shall be measured by switching the input signal for "any level of gray(bright)"and "any level of gray(dark)".

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

5. Definition of Transmittance (T%) :
   Module is with white(L255) signal input

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

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8.0 MECHANICAL CHARACTERISTICS

8.1 Dimensional Requirements

Figure 3(located in Appendix) shows mechanical outlines for the model DV366FBM-N10
. Other parameters are shown in Table 13.

< Table 13. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	891.6(H)*60.4(V)*10(B)	mm
Weight	TBD	gram
Active area	919.3(H)*138.85(V)	mm
Pixel pitch	159.6(H) ×478.8(V)	um
Number of pixels	1920(H) ×290(V)(1 pixel = R + G + B dots)	pixels
Back-light	Down edge side 2-LED Light bar Type	

8.2 Mounting

See FIGURE 5. (shown in Appendix)

8.3 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 14. Reliability Test Parameters >

No	Test Items	Conditions
1	High temperature storage test	Ta = 60 ℃, 240 hrs
2	Low temperature storage test	Ta = -20 ℃, 240 hrs
3	High temperature & high humidity operation test	Ta = 50 ℃, 80%RH, 240hrs
4	High temperature operation test	Ta = 50 ℃, 240hrs
5	Low temperature operation test	Ta = 0 ℃, 240hrs
6	Thermal shock	Ta = -20 ℃ ↔ 60 ℃ (0.5 hr), 100 cycle
7	Electro-static discharge test (non-operating)	Air : 150 pF, 330Ω, 15 KV Contact : 150 pF, 330Ω, 8 KV

This test condition is based on BOE module.

10.0 PRODCUT SERIAL NUMBER
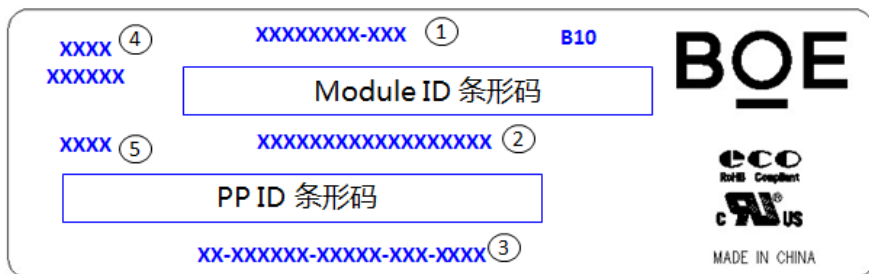
① FG-CODE
② Module ID，最后一位为Revision Code（扫描不显示），前17位编码规则如下
③ PPID（客户端ID）
④ D/PN码，规格待确定
⑤ 生产年份+生产周别（中间无空格）

MDL ID Naming Rule:

Digit	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Code	S	L	S	A	1	0	8	5	9	4	2	0	0	0	1	D	B
Description	Product Code/GBN→FG-CODE一一对应		Grade	line	Year		Month		Model Extension Code (Last 4 Digits of FG-CODE)				Serial No. Hex-Decimal 000000-FFFFFF				

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
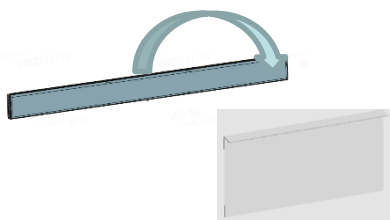
1. Put one MDL in the PE bag.
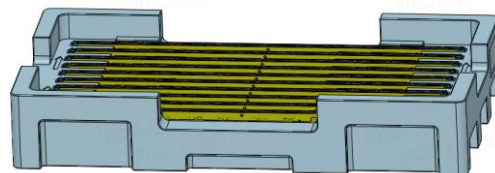
2. Put 10pcs MDL in the EPS Box, PCB faced upward.
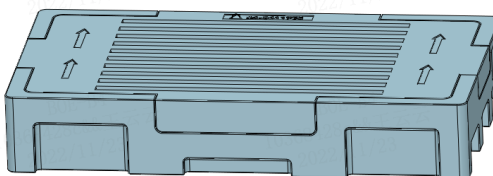
3. Put one EPS Cover.
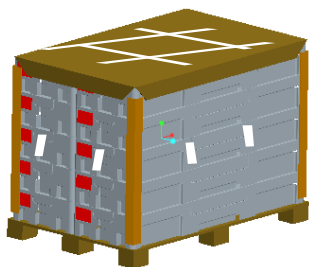
5. Put 4ea Paper Conner and one Top Cover on the EPS Boxs and Pack with 4 packing belts.
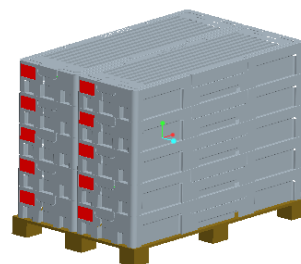
4. Put the boxes on the pallet (10ea boxes per pallet)

11.2 Packing Note

- Box Dimension : 1036mm(L)×477mm(W)×177mm(H)
- Package Quantity in one Box : 10pcs

11.3 Box Label

- Label Size : 100mm (L) × 50mm (W)
  - Contents
    Model : DV350FBM-N10
    Q`ty : Module  10 Q`ty in one box
    Serial No. : Box Serial No.
    Date : Packing Date

Digit Code	1	2	3	4	5	6	7	8	9	10	11	12	13
Code	X	X	X	X	1	6	3	D	0	0	1	A	1
Description	Products G BN		Gra de	Line	Year		Mon th	Revisi on Code	Serial No.				

12.0 PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD Module.

12.1 Mounting Precautions

- Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- You must mount a module using specified mounting holes (Details refer to the drawings)
- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress)is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
- Do not apply mechanical stress or static pressure on module; Abnormal display cause by pressing some parts of module during assembly process , do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on module , and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
- Protection film for polarizer on the module should be slowly peeled off before display.
- Be careful to prevent water & chemicals contact the module surface.
- You should adopt radiation structure to satisfy the temperature specification.
- Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment. Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
- When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane & alcohol is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene , because they cause chemical damage to the polarizer.
- Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading..

- This module has its circuitry PCB's on the rear side and Driver IC, should be handled carefully in order not to be stressed.
- Avoid impose stress on PCB and Driver IC during assembly process ,Do not drawing, bending, COF package & wire
- Do not disassemble the module.

12.2 Operating Precautions

- Do not connector or disconnect the cable to/from the Module at the "Power On" Condition.
- When the module is operating, do not lose CLK, ENAB signals. If any one of these signals is lost, the module would be damaged.
- Obey the supply voltage sequence. If wrong sequence is applied, the module would be damaged.
- Do not allow to adjust the adjustable resistance or switch
- The electrochemical reaction caused by DC voltage will lead to LCD module degradation, so DC drive should be avoided.
- The LCD modules use C-MOS LSI drivers, so customers are recommended that any unused input terminal would be connected to Vdd or Vss, do not input any signals before power is turn on, and ground you body, work/assembly area, assembly equipment to protect against static electricity.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.
- Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
- Design the length of cable to connect between the connector for back-light and the converter as shorter as possible and the shorter cable shall be connected directly , The long cable between back-light and Converter may cause the Luminance of LED to lower and need a higher startup voltage
- The cables should be as short as possible between System Board and PCB interface.
- Connectors are precision devices to transmit electrical signals, and operators should plug in parallel
- Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.

12.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.
- Do not touch interface pin directly.

12.4 Precautions for Strong Light Exposure

- Do not leave the module operation or storage in Strong light . Strong light exposure causes degradation of polarizer and color filter.

12.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	TYP	MAX
Storage Temperature	(°C)	5	25	40
Storage Humidity	(%rH)	40	50	75
Storage Life	6 months			
Storage Condition	• The storage room should be equipped with a dark and good ventilation facility. • Prevent products from being exposed to the direct sunlight, moisture and water. • The product need to keep away from organic solvent and corrosive gas. • Be careful for condensation at sudden temperature change. • Storage condition is guaranteed under packing conditions.			

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
- As the original protective film, do not use the adhesive protective film to avoid change of Pol color and characteristic.

12.6 Precautions for protection film

- Remove the protective film slowly, keeping the removing direction approximate 30-degree not vertical from panel surface, If possible, under ESD control device like ion blower, and the humidity of working room should be kept over 50%RH to reduce the risk of static charge.
- People who peeled off the protection film should wear anti-static strap and grounded well.

12.7 Appropriate Condition for Commercial Display

-Generally large-sized LCD modules are designed for consumer applications . Accordingly, long-term display like in Commercial Display application, can cause uneven display including image sticking. To optimize module's lifetime and function, several operating usages are required.

1. Normal operating condition

- Temperature: 20±15℃
- Operating Ambient Humidity : 55±20%
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up Commercial Display system

2. Special operating condition

a. Ambient condition

- Well-ventilated place is recommended to set up Commercial Display system.

b. Power and screen save

- Periodical power-off or screen save is needed after long-term display.

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD module may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD module will return to normal display.

d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD module may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD module 's surface which may affect the operation of the polarizer and LCD module

e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Module may be damaged.

f. Products exposed to low temperature environment for a long time, need to carry out necessary protection , low temperature environment is usually refrigerators , vending machine Etc…

g. Long time and large angle forword use or unconventional use , It is strongly recommended to contact BOE for filed application engineering advice

h. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.

　　a. Suitable operating time: under 20 hours a day.

　　b. Static information display recommended to use with moving image.

　　- Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.

　　c. Background and character (image) color change

　　- Use different colors for background and character, respectively.

　　- Change colors themselves periodically.

　　d. Avoid combination of background and character with large different luminance.

　　1) Abnormal condition just means conditions except normal condition.

　　2) Black image or moving image is strongly recommended as a screen save

4. Lifetime in this spec. is guaranteed only when Commercial Display is used according to operating usages.

12.8 Other Precautions

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.

- If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.

- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.
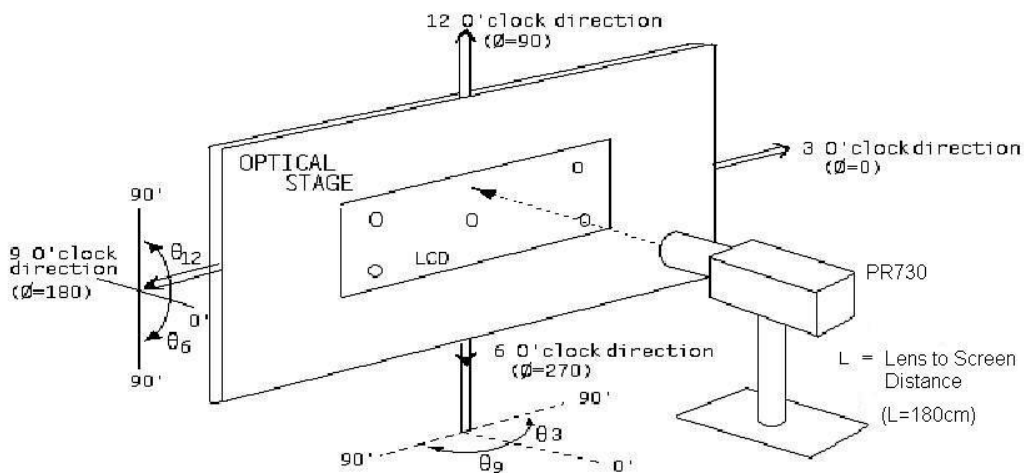
B. Rework

- When returning the module for repair or etc., Please pack the module not to be broken. We recommend to use the original shipping packages.

C. In order to prevent potential problems, flicker should be adjusted by optimizing the Vcom value in customer LCM Line through the I2C Interface. (Q/Single/OC出货时填写)
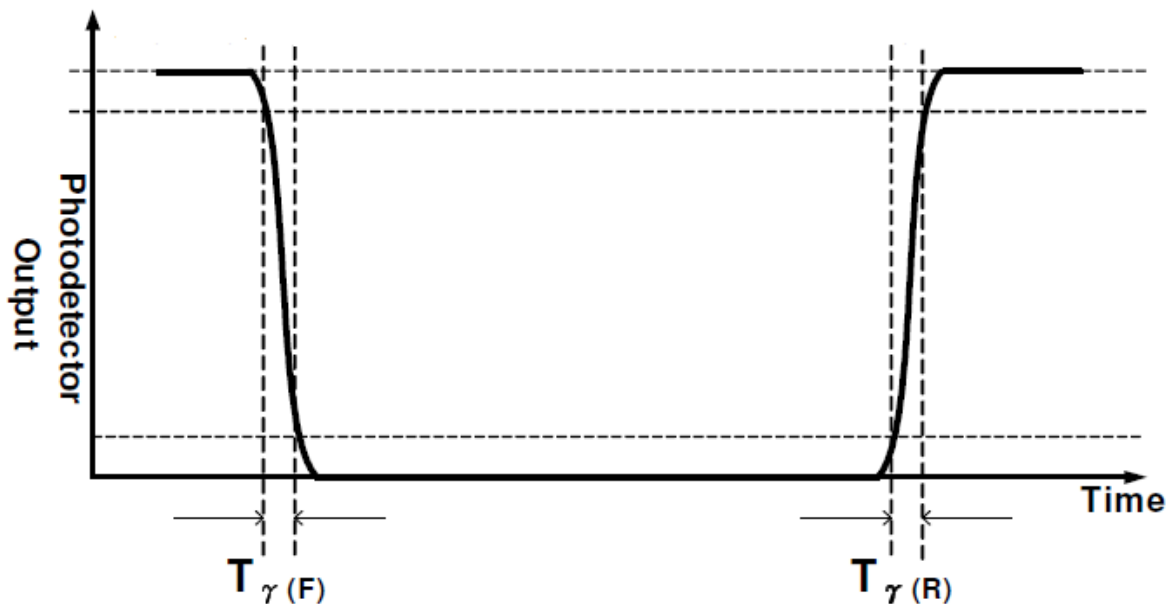
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13.0 APPENDIX

< Figure 1. Measurement Set Up >

< Figure 2. Response Time Testing >

< Figure 3.TFT-LCD Module Outline Dimensions (Front View) >
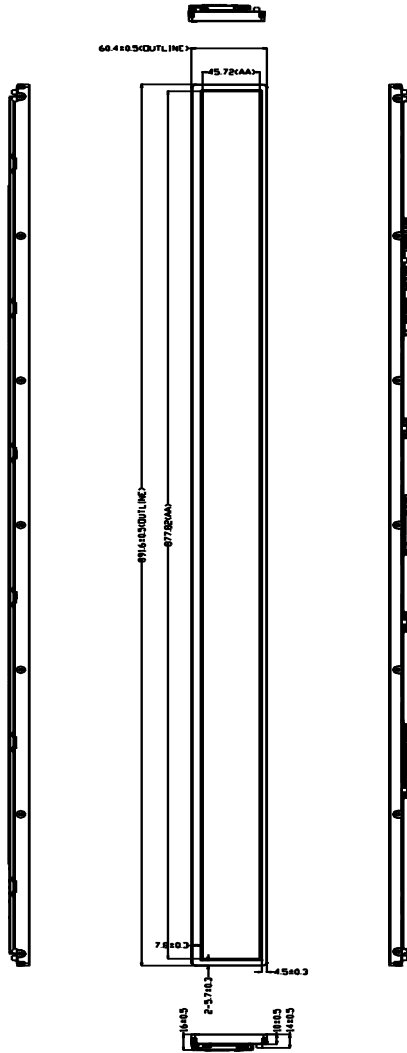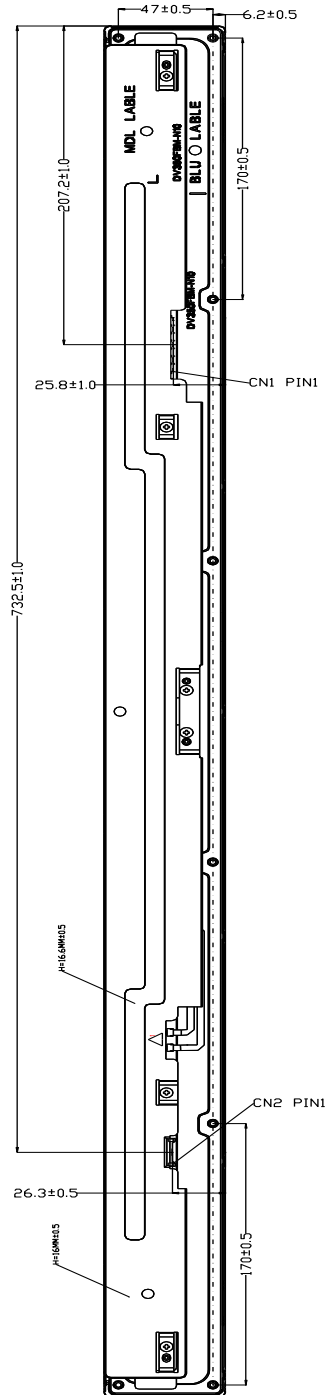
< Figure 4.TFT-LCD Module Outline Dimensions (Rear View) >

CN1: GT05S_51S

CN2: 12507WR-H10L

< Figure 5. White Luminance and Uniformity Measurement Locations >