

Product Specification

- () Product Information
- () Preliminary Specification
- () Approval Specification

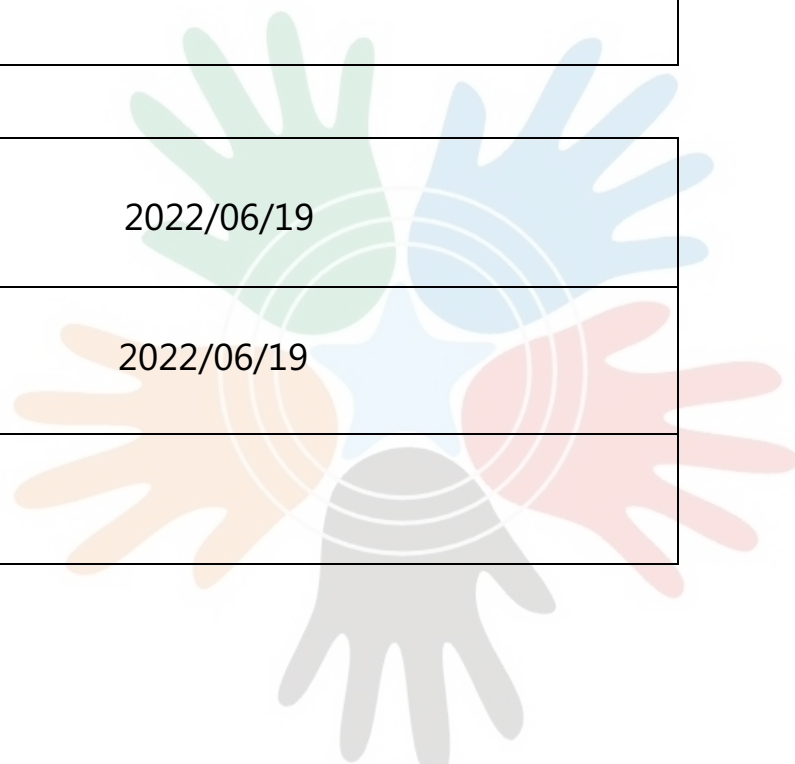
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CUSTOMER	R/A Customer
DATE OF ISSUE	2022/06/19

MODEL NO.	DV550QUB-R11-BL2K
EXTENSION CODE	-V(0)

Customer Approval & Feedback

Approved by	2022/06/19
Prepared by	2022/06/19





PROPRIETARY NOTE

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DV550QUB-R11
Product Specification
Rev. 0

Customer : _____

APPROVED BY	
DATE	

CONFIRMED BY TV SBU	CONFIRMED BY QA	CONFIRMED BY R&D

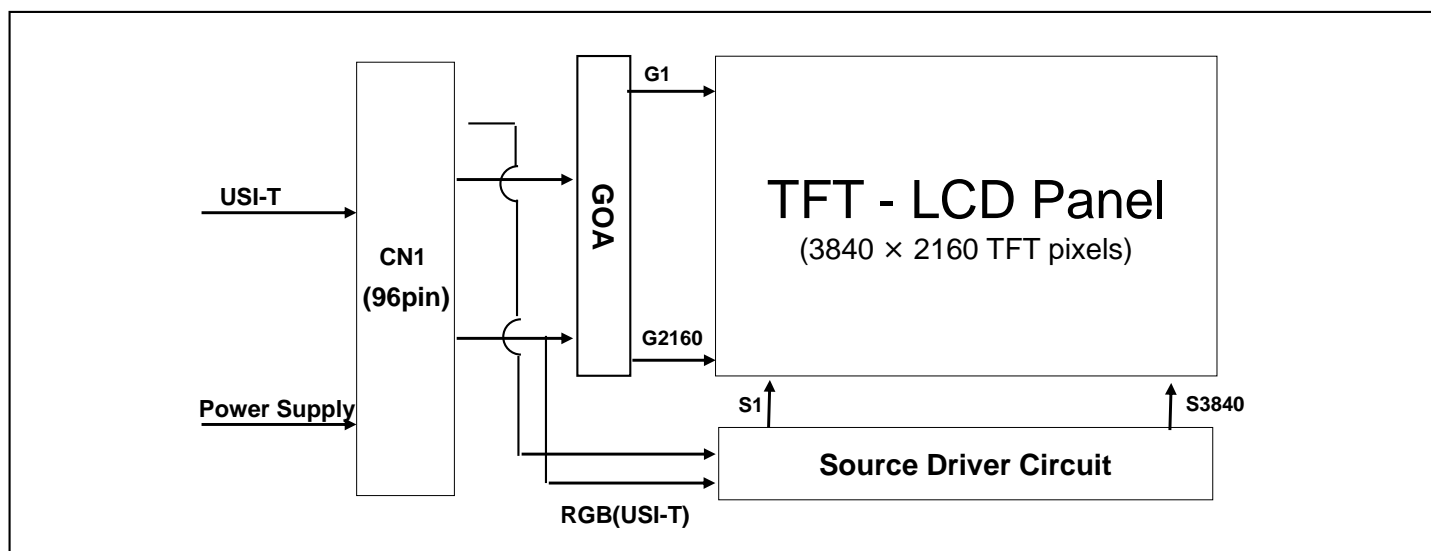
FuZhou BOE Optoelectronics Technology Co., Ltd

SPEC. NUMBER S8-64-8D-064	PRODUCT GROUP TFT-LCD	Rev. 0	ISSUE DATE 2022.1.12	PAGE 1 OF 50
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1.0 GENERAL DESCRIPTION

1.1 Introduction

DV550QUB-R11 is a color active matrix TFT LCD open cell using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 55 inch diagonally measured active area with UHD 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 module can display 1.07G colors. The TFT-LCD panel used for this module is adapted for a low reflection and higher color type.



1.2 Features

- USIT interface with 12 pairs
- 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 GOA mode
- ADS technology is applied for high display quality
- RoHS compliant

1.3 Application

- Commercial Digital Display
- Display Terminals for Control System
- Electronic Signage(Outdoor , Compatibility of direction H/V)
- High TNI 105°C

1.4 General Specification

< Table 1. General Specifications >

Parameter	Specification	Unit	Remark
Active area	1209.6(H) × 680.4(V)	mm	Array
Number of pixels	3840(H) × 2160(V)	pixels	
Pixel pitch	315(H) × RGB × 315(V)	μm	Array
Pixel arrangement	Pixels RGB Vertical stripe		Array
Display colors	16.7M(8bits-true)	colors	
Display mode	Transmission mode, Normally Black		
Outline Dimension	1247.8(H)x716.8V) × 58.5(B)	mm	Mech.
Weight	15.28 (Typ.)	Kg	Mech.
Power Consumption	360.5W(Typ.)	Watt	
Surface Treatment	Haze 25%,3H (Front Polarizer)		
Temperature	Operating	-30~70	°C High TNI 105°C
	Storage	-30~70	

Note 1 : Transmittance is measured by BOE BLU and By-pass mode T-con Board;
Light Source : Normal ;

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 Absolute Maximum Ratings >

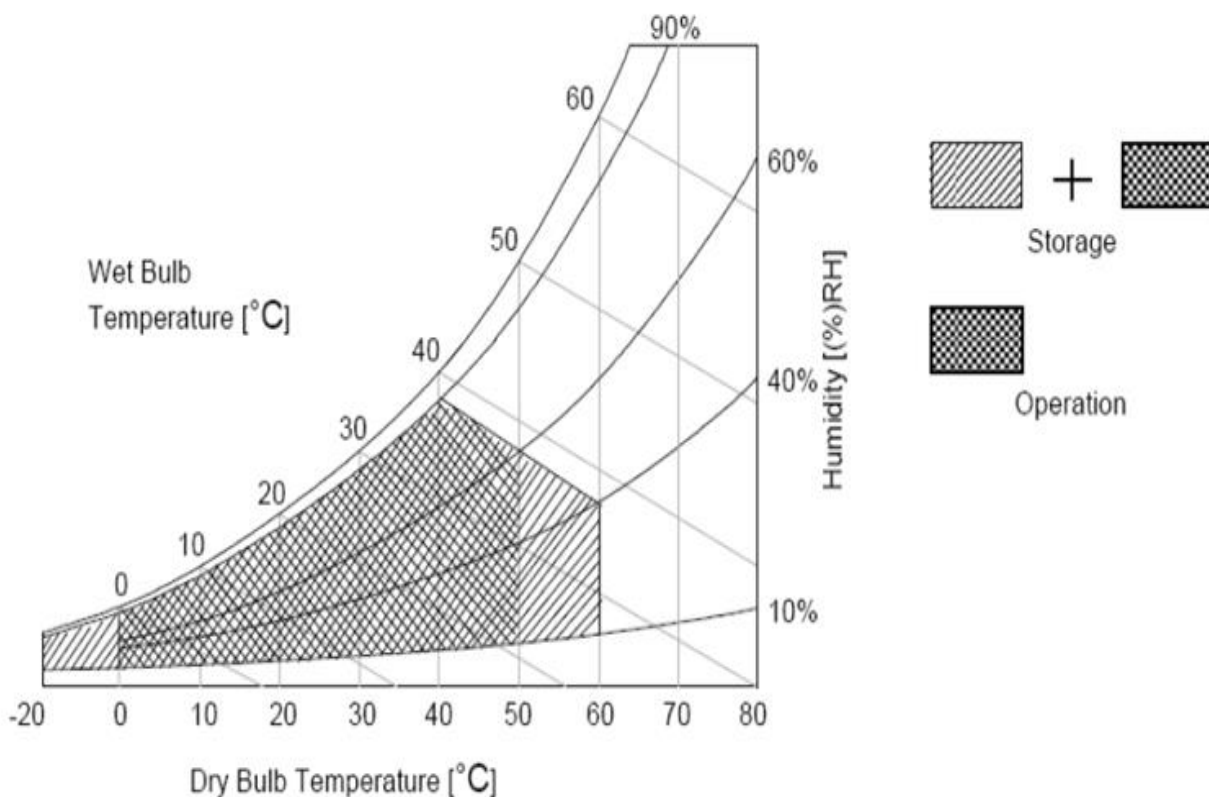
[VSS=GND=0V]

Parameter	Symbol	Min.	Max.	Unit	Remark
Operating Temperature	T _{OP}	-20	+50	°C	Note
	T _{SUR}	-20	+70	°C	
Storage Temperature	T _{ST}	-30	+60	°C	
Operating Ambient Humidity	Hop	10	90	%RH	
Storage Humidity	Hst	10	90	%RH	

Note 1 : The operating test condition is based on BOE backlight.

Note 2 : Temperature and relative humidity range are shown in the figure below.

Note 3 : Wet bulb temperature should be 39 °C max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 Open Cell Electrical Specifications

< Table 3. Open Cell Electrical Specifications >

[Ta =25±2 °C]

Characteristics	Symbol	Min	Typ	Max	Unit
DC Supply Voltage	VGL	-4.0	-4.2	-4.4	V
DC Supply Voltage	VGH	34.6	35.8	37	V
DC Supply Voltage	DVDD1V8	1.75	1.9	1.95	V
DC Supply Voltage	DVDD1V9	1.75	1.9	1.95	V
DC Supply Voltage	DVDD3V3	3.2	3.3	3.4	V
DC Supply Voltage	VCOM	7.2	7.3	7.4	V
DC Supply Voltage	HAVDD	7.5	7.6	7.7	V
DC Supply Voltage	AVDD	17.1	17.3	17.5	V
DC Supply Voltage	VGMA_UH	15.2	15.3	15.4	V
DC Supply Voltage	VGMA_UL	7.9	8.0	8.1	V
DC Supply Voltage	VGMA_LH	7.1	7.2	7.3	V
DC Supply Voltage	VGMA_LL	0.2	0.3	0.4	V

Notes:

1. VGH should be tested on SOC board. High voltage of STV/CLK/VDDODD/VDDEVEN is as same as VGH voltage.
2. Other test points are on source board. Use typical pattern to test.

3.1 Open Cell Electrical Specifications

< Table 4. Open Cell Current Setting Specifications >

[Ta =25±2 °C]

Characteristics	Symbol	Min	Typ	Max	Unit
DC Supply Current	VGL	-	-	128	mA
DC Supply Current	LVGL	-	-	185	mA
DC Supply Current	VGH	-	-	440	mA
DC Supply Current	DVDD1V8	-	-	500	mA
DC Supply Current	DVDD1V9	-	-	840	mA
DC Supply Current	DVDD3V3	-	-	840	mA
DC Supply Current	VCOM	-	-	50	mA
DC Supply Current	HAVDD	-	-	350	mA
DC Supply Current	AVDD	-	-	2670	mA
DC Supply Current	VGMA_UH	-	-	20	mA
DC Supply Current	VGMA_UL	-	-	20	mA
DC Supply Current	VGMA_LH	-	-	20	mA
DC Supply Current	VGMA_LL	-	-	20	mA

Notes:

1. Current is RMS value test with TCON board; The input current drive capability must more than the Max value.
2. VCOM short-circuit current is 400mA.
3. VGH should be tested on SOC board.
4. Other test points are on SOC board. Use maximum pattern to test.

3.1 Open Cell Electrical Specifications

< Table 5. Open Cell Voltage Ripple Specifications >

[Ta =25±2 °C]

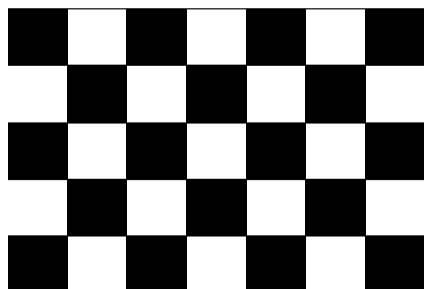
Characteristics	Symbol	Max	Unit
DC Supply Ripple	VGL	±5%	mV
DC Supply Ripple	LVGL	±5%	mV
DC Supply Ripple	VGH	±5%	mV
DC Supply Ripple	DVDD1V8	±5%	mV
DC Supply Ripple	DVDD3V3	±5%	mV
DC Supply Ripple	VCOM	±5%	mV
DC Supply Ripple	HAVDD	±5%	mV
DC Supply Ripple	AVDD	±5%	mV
DC Supply Ripple	VGMA_UH	400	mV
DC Supply Ripple	VGMA_UL	300	mV
DC Supply Ripple	VGMA_LH	300	mV
DC Supply Ripple	VGMA_LL	50	mV

Notes:

1. Voltage ripple is Vpeak to Vpeak value. The ripple does not include V-blanking area ripple.
2. VGH should be tested on SOC board.
3. Other test points are on source board. Use maximum pattern to test.

3.2 Power Consumption and Flicker Pattern

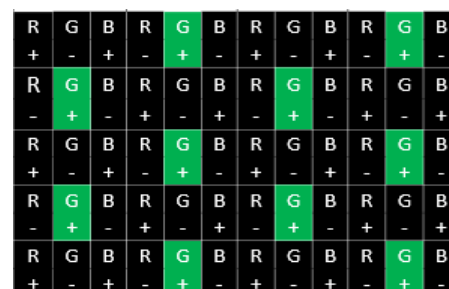
a) Typ : Mosaic 7X5 (L0/L255)



b) Max : Horizontal 1 Line(L0/L255)



c) Flicker Test Pattern



< Table 6. Power consumption >

Parameter	Symbol	Min	Typ	Max	Unit
Power Consumption	PDD	-	17	60	W
Power Supply Current	IDD	-	1416	5000	mA

3.3 Driver Characteristics

< Table 7. Driver Characteristics >

Parameter	Symbol	Values			Unit	Remark
		Min	Typ	Max		
Driver Surface Temperature	T _{DS}	-	-	125	°C	Note

Note 1: Any point on the driver surface must be less than 125 °C under any conditions.

2: This test condition is based on BOE module.

4.0 OPTICAL SPECIFICATION

The test of optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature $= 25 \pm 2^\circ\text{C}$) 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 $\theta_{\phi=0}$ ($=\theta_3$) as the 3 o'clock direction (the "right"), $\theta_{\phi=90}$ ($=\theta_{12}$) as the 12 o'clock direction ("upward"), $\theta_{\phi=180}$ ($=\theta_9$) as the 9 o'clock direction ("left") and $\theta_{\phi=270}$ ($=\theta_6$) as the 6 o'clock direction ("bottom"). While scanning θ and/or ϕ , 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 $\pm 10\%$ at 25°C . Optimum viewing angle direction is 6 'clock.

< Table 5. Optical Table >

[VDD = 12.0V, Frame rate = 120Hz, Ta = $25 \pm 2^\circ\text{C}$]

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.	
Color Temperature				9000	10,000	11500	K	
Color Gamut				70	72	-	%	
Contrast ratio		CR	$\theta = 0^\circ$ (Center) Normal Viewing Angle	1000:1	1200:1	-		Note 2
Luminance of White		Y_w		2000	2500	-	cd/m^2	Note 3
White luminance uniformity		ΔY		70	75		%	Note 4
Reproduction of color	White	W_x		TYP. - 0.03	TYP. + 0.03	0.280	Note 5	
		W_y	0.290					
	Red	R_x	-					
		R_y	-					
	Green	G_x	-					
		G_y	-					
Blue	B_x	-						
	B_y	-						
Response Time	G to G	T_g	-	8	10	ms	Note 6	
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 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. The BLU is used by BOE.
4. 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 =120Hz to optimize. Each time in below table 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
Start																	
0																	
15																	
31																	
47																	
63																	
79																	
95																	
111																	
127																	
143																	
159																	
175																	
191																	
207																	
223																	
239																	
255																	

5. Definition of Transmittance (T%) :

Module is with white(L255) signal input

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

5.0 INTERFACE CONNECTION

5.1 Connector Pin Configuration

< Table 9. Open Cell Input Connector Pin Configuration >

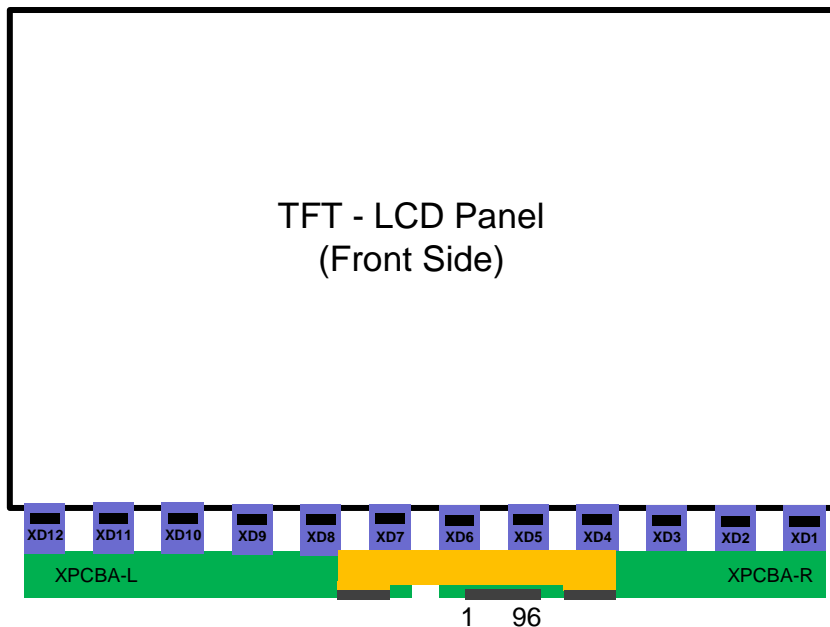
P/N	Name
1	AVDD
2	AVDD
3	AVDD
4	AVDD
5	AVDD
6	AVDD
7	AVDD
8	AVDD
9	GMA1
10	GMA9
11	HAVDD
12	HAVDD
13	GMA10
14	GMA18
15	FB_2
16	GND
17	SFC1
18	GND
19	USIT11N
20	USIT11P
21	GND
22	USIT10N
23	USIT10P
24	GND
25	USIT9N
26	USIT9P
27	GND
28	USIT8N
29	USIT8P
30	GND
31	USIT7N
32	USIT7P
33	GND
34	USIT6N
35	USIT6P
36	GND
37	USIT5N
38	USIT5P
39	GND
40	USIT4N

P/N	Name
41	USIT4P
42	GND
43	USIT3N
44	USIT3P
45	GND
46	USIT2N
47	USIT2P
48	GND
49	USIT2N
50	USIT2P
51	GND
52	USIT1N
53	USIT1P
54	GND
55	SRF
56	SEL_EQ
57	1.9V
58	1.9V
59	1.9V
60	1.9V
61	HOLD
62	SCK
63	CS
64	DI
65	DO
66	WP
67	3.3V
68	NC
69	VGL
70	VGLT
71	VGLT
72	VDDEVEN
73	VDDODD
74	NC
75	NC
76	NC
77	NC
78	NC
79	CLK6
80	CLK5

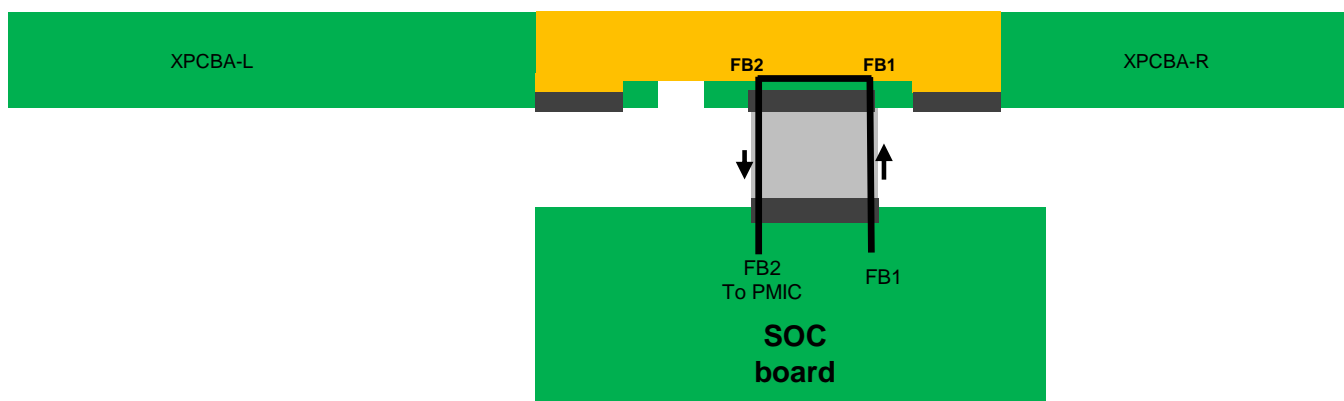
P/N	Name
81	CLK4
82	NC
83	CLK3
84	CLK2
85	CLK1
86	STV
87	STV_TRST
88	NC
89	VCOM2(NC)
90	VCOM2(NC)
91	VCOM0
92	VCOM0
93	FB_VCOMFBR(NC)
94	FB_VCOMFBL(NC)
95	GND
96	FB1

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

- Notes :
1. NC (Not Connected) : These pins show status of T/con board and are only used for BOE internal operations.
 2. XPCBL and XPCBR Input pins assignments refer to the below diagram.



3. FB1/FB2 are used for FB function. Aim to avoid electrical damage when FFC skew plug happens. When using FB function, it requires customers to design circuit and power supply sequence which depends on power IC on SOC board. Otherwise, ignore FB function and keep these pins NC.



6.0 INTERFACE SIGNAL TIMING SPECIFICATION

6.1 Signal Timing Parameters

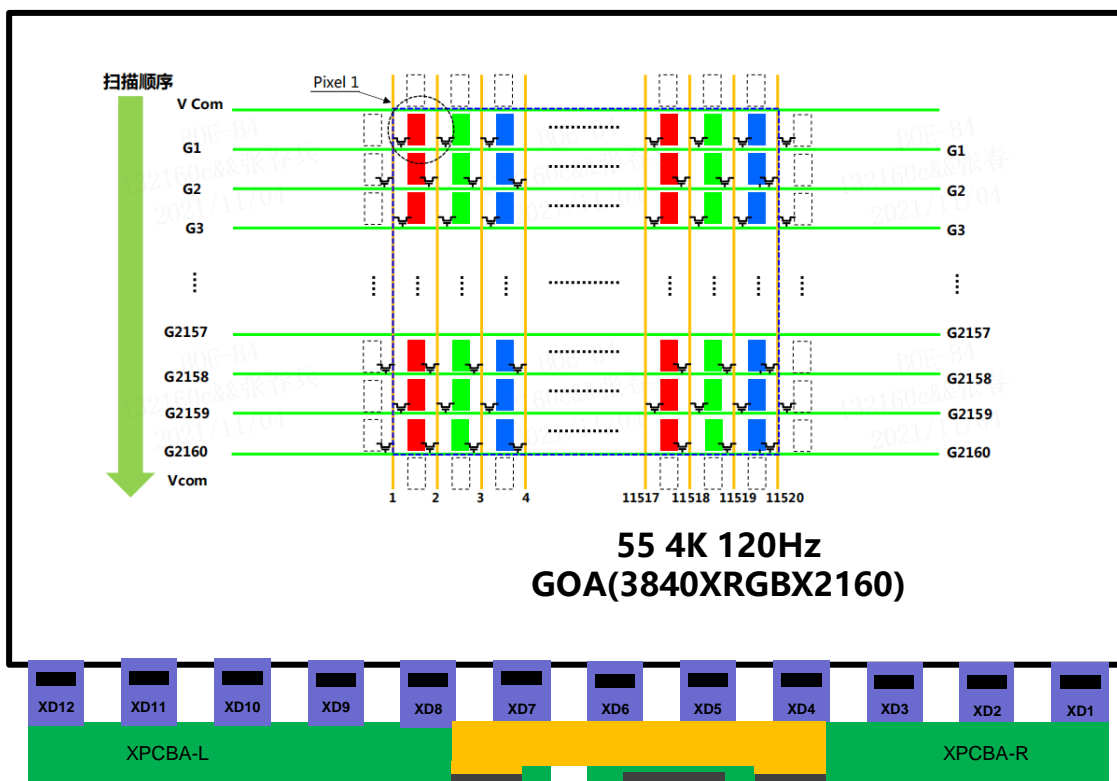
< Table 11. Timing Table >

Item		Symbols	Min	Typ	Max	Unit
Frequency		1/Tc	69	74.5	77	MHz
Vertical	Frame Rate	F	114	120	126	Hz
	Total	T _V	2200	2250	2450	T _H
	Display	T _{VD}	2160			T _H
	Blank	T _{VB}	40	90	290	T _H
Horizontal	Total	T _H	270	275	280	T _{CLK}
	Display	T _{HD}	-	240	-	T _{CLK}
	Blank	T _{HB}	30	35	40	T _{CLK}

Notes:

1. This product is DE only mode. The input of Hsync & Vsync signal does not have an effect on normal operation.
2. This product should keep data frequency and Horizontal value fixed when adjusting frame rate.
3. This product supports frequency 120Hz and Vertical & Horizontal values must follow the table.

6.2 Pixel Structure



Notes:

1. Panel is progressive scan from top to bottom.
2. Source driver data latch direction is from right to left.

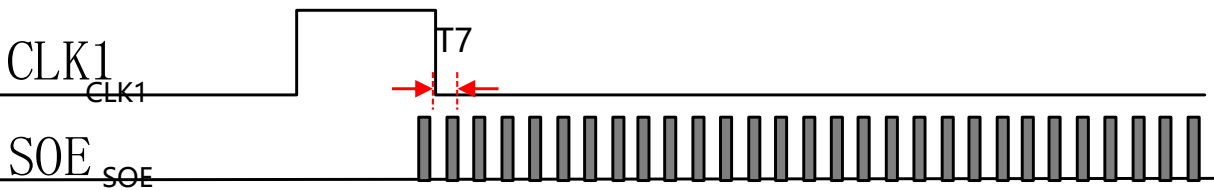
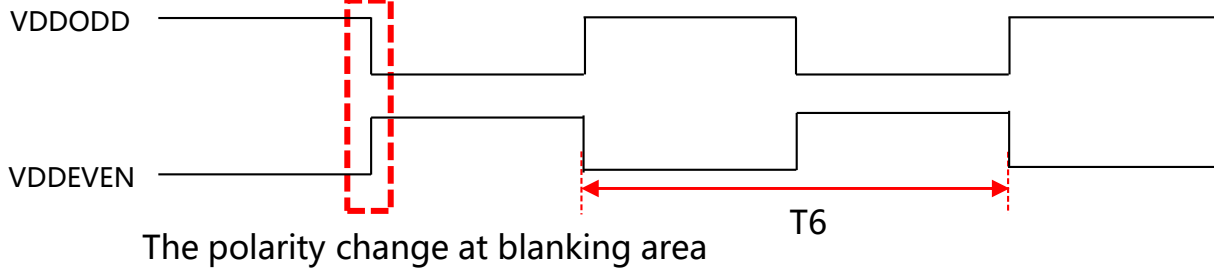
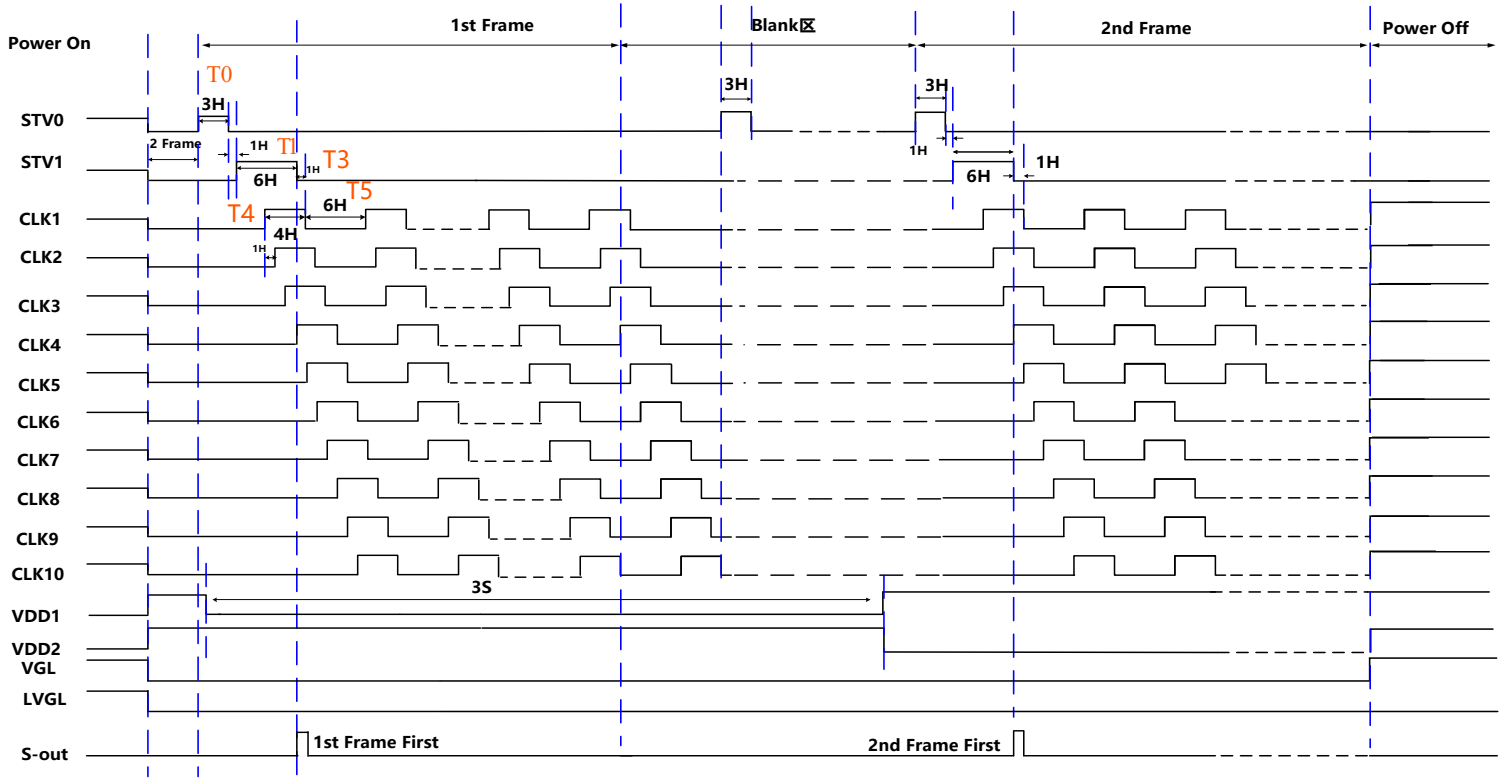
6.0 SIGNAL TIMING SPECIFICATION

H total :4400

6.1 Signal Timing Waveform

V total :2250

Frame Rate:120Hz



6.3 Signal Timing Waveform

H total :4400

V total :2250

Frame Rate:120Hz

6.3.2 Signal Timing Waveform Remark

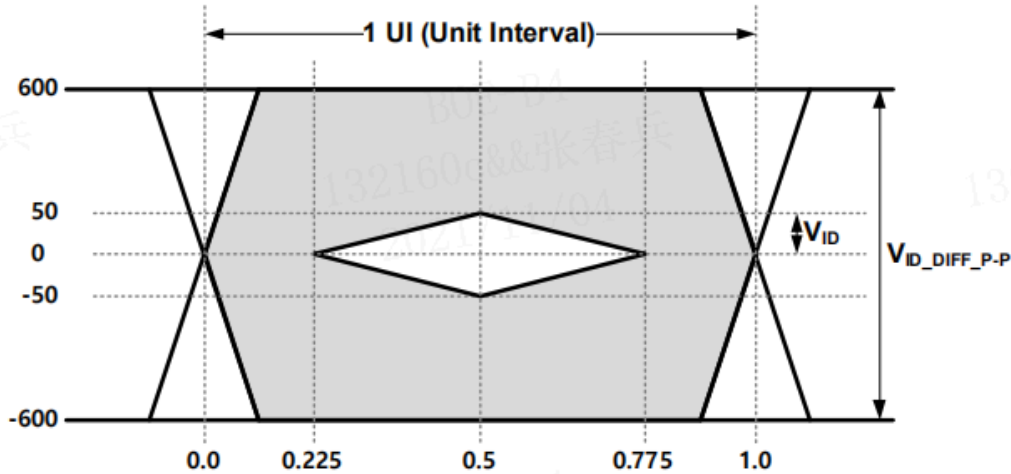
	Min.	Typ.	Max.		
T0	-	7.4us	-	STV0 Width	
T1	-	22.2us	-	STV1 Width(6H)	
T2	-	3.7us	-	CLK1 Falling to STV Falling (1H)	
T3	-	3.7us	-	CLK1 Falling to CLK2 Falling(1H)	
T4	-	14.8us	-	CLK High Width(4H)	
T5	-	22.2us	-	CLK Low Width(6H)	
T6	3s	4s	5s	VDDODD/VDDEVEN Period	Changed in blanking area
T7	-	1.9us	-	GOE	

Notes :

- 1H=1/ (Frame Rate*V total).
- 2.When power on, STV and CLK1~CLK6 should keep low before the first STV.
- 3.VDDODD and VDDEVEN must reverse in vertical blanking time.

6.4 Signal Eye Diagram

< Table 12. USIT Eye Diagram >



(a) Eye Diagram with a Driver IC @ TP3

< Table 13. Eye Diagram information >

(VSS1 = VSS2 = 0V)

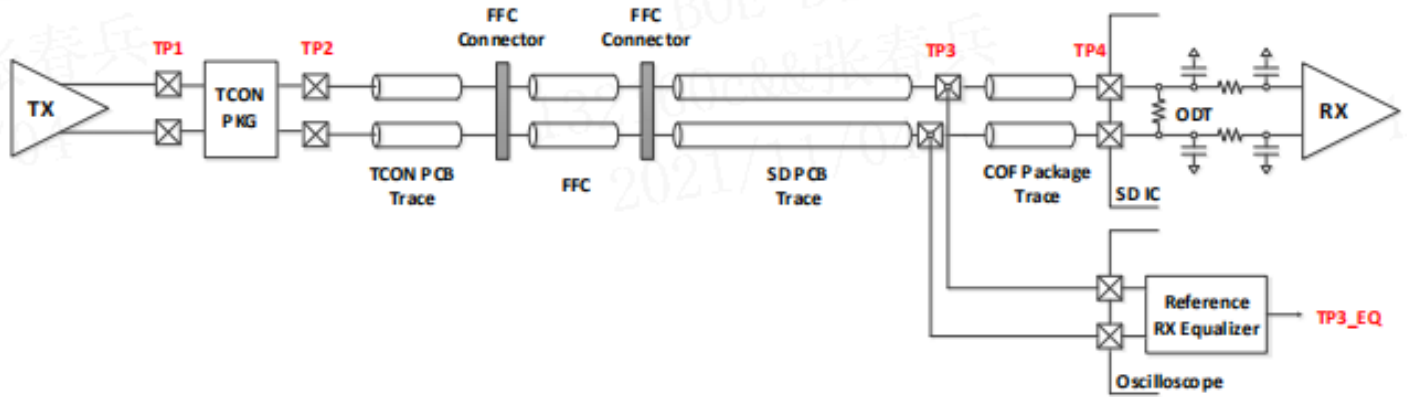
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input offset voltage	$V_{ICM}^{(1)}$	$V_{DD1A} = 1.62V \text{ to } 1.98V$	0.3	0.45	0.6	V
Differential input data voltage	$V_{ID}^{(2) (3)}$		50	–	600	mV
Differential input data peak-to-peak voltage	$V_{ID_DIFF_P-P}^{(2) (3)}$		100	–	1200	
Differential input data voltage with EQ	$V_{ID_EQ}^{(4) (5)}$		50	–	600	
Differential input data peak-to-peak voltage with EQ	$V_{ID_DIFF_P-P_EQ}^{(4) (5)}$		100	–	1200	
Internal termination resistor	$R_T^{(6)}$	$T_C^{(6)}$	Typ-20%	100	Typ+20%	Ω

NOTE:

- V_{ICM} voltage is the common mode voltage of the differential input data.
- The min/max level of V_{ID} includes all the AC fluctuation upon DC level. Differential input voltage is measured at TP3 in case of low-lossy channel so that satisfied eye diagram can be obtained at TP3 without any receiver equalizer options.
- The condition of measurement for eye diagram with bonding a Driver IC on the source PCB is illustrated [Figure 3\(a\)](#).
- The min level of V_{ID_EQ} means internal min value of USI-T data and the max level of V_{ID_EQ} means external max value of the USI-T data in eye diagram at TP3_EQ when RX equalizer is enabled, respectively. The condition of measurement for eye diagram is to bond a Driver IC on the source PCB ([Figure 3\(b\)](#)) and measured at TP3_EQ.
- The differential input data voltage with EQ includes all the AC fluctuation upon DC level. Differential input voltage is measured at TP3_EQ, the reference EQ output. Allowable channel characteristics including TCON board, FFC, Source PCB, and FPCB are defined by eye mask specification at TP3_EQ after application of corresponding reference equalizer, with a response curve as defined in [5.1 TP3_EQ Reference Equalizers](#). Configurable reference EQ with 7 steps is provided for TP3_EQ eye measurement. As described in [5.1 TP3_EQ Reference Equalizers](#), because the reference receiver equalizer does not define the downstream device receiver equalizer implementation, the implemented equalizer characteristics will be provided as a supplement.

Notes:

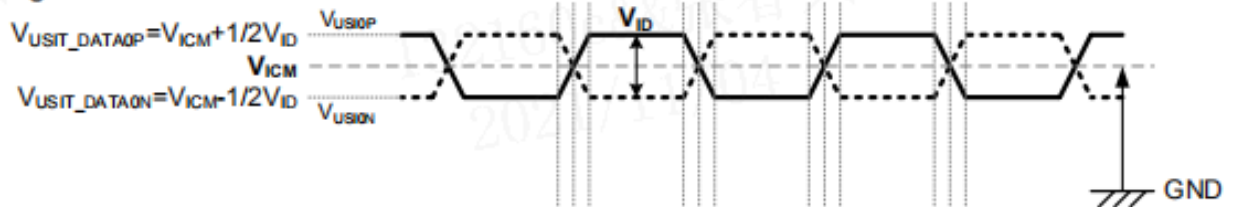
- Please use the measurement results just for your reference.
- Eye measurement results using the Oscilloscope PLL are inaccurate because EPI uses the DLL..



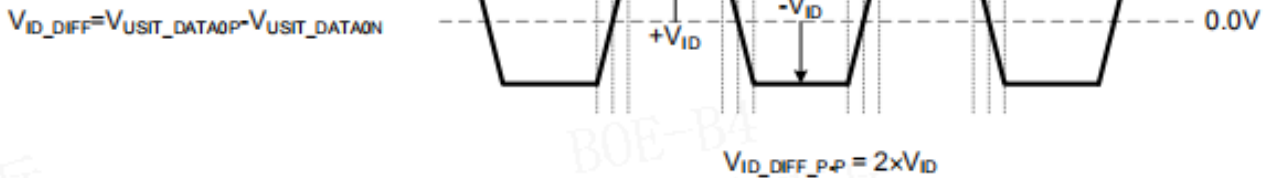
6. R_T is an internal termination resistor (On-Die Termination). Condition is $T_{C,typ}$ (52.5°C).

7. Signal parameter

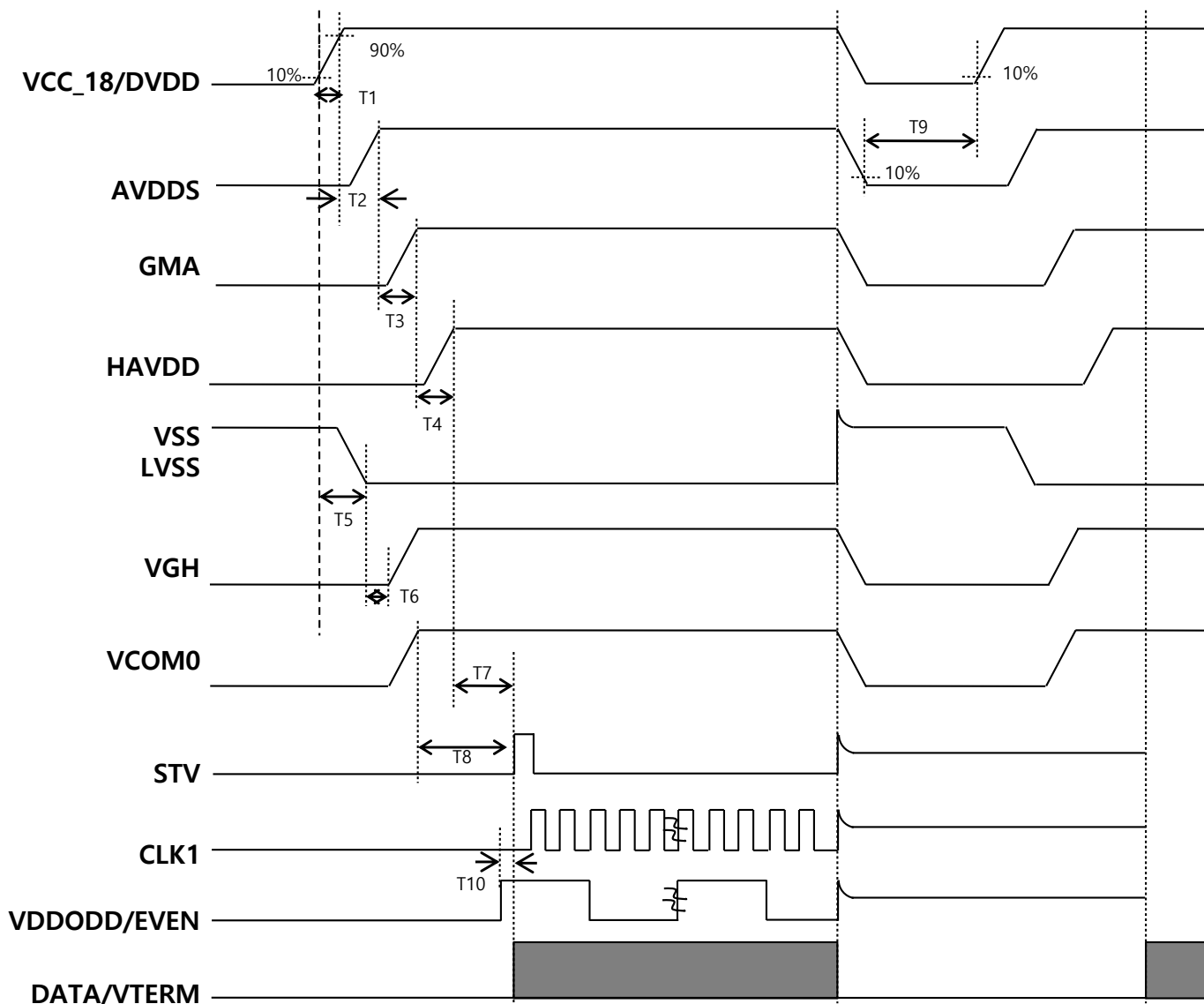
*** Single-ended**



*** Differential**



7.0 POWER SEQUENCE



Notes :

1. When power off, VGL(VSS),STV,CLK,VDDODD/VDDEVEN timing should follow VGH falling.
2. VGH is on SOC board only, so T6 time is tested on SOC board.

7.0 POWER SEQUENCE

T	Min	Type	Max	Unit	Note
T1	0	-	10	ms	
T2	0	-	-	ms	
T3	0	-	-	ms	AVDDS must be higher than HAVDD and GMA all the time
T4	-200	-	1000	ms	AVDDS must be higher than HAVDD and GMA all the time
T5	0	-	-	ms	
T6	0	-	-	ms	
T7	0	-	-	ms	
T8	0	-	-	ms	
T9	1	-	-	s	
T10	2	-	-	Frame	VDD should pull high before 1 st STV rising

8.0 SIGNAL TIMING WAVEFORMS OF INTERFACE SIGNAL

< Table 10. Input Signal and Display Color Table >

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB	MSB	LSB		
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 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
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	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
	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
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
	RED(001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	RED(254)	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(255)	1	1	1	1	1	1	1	1	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
	Green (0001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0

	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	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
	Blue(0001)	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(254)	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(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

9.0 MECHANICAL CHARACTERISTICS

9.1 Dimensional Requirements

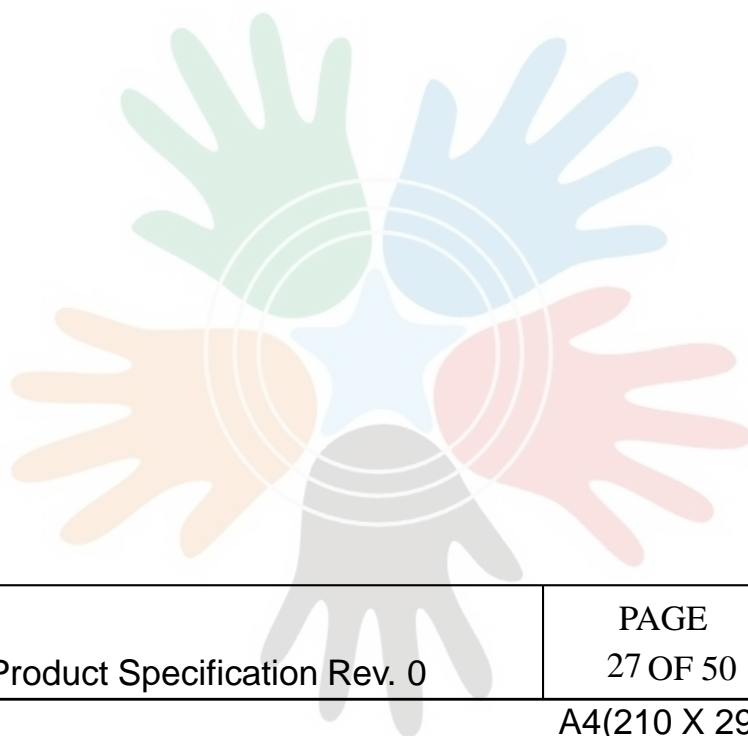
Figure 3(located in Appendix) shows mechanical outlines for the model DV550QUB-R11. Other parameters are shown in Table 12.

< Table 12. Dimensional Parameters >

Parameter	Specification	Unit
Dimensional outline	1247.8(H)x716.8V) × 58.5(B)	mm
Weight	15.28	Kg
Active area	1209.6(H) × 680.4(V)	mm
Pixel pitch	315(H) × 315(V)	μm
Number of pixels	3840(H) × 2160(V)	pixels
Back-light	D-LED Backlight	

9.2 Surface Treatment and Polarizer Hardness

The surface of the LCD has a Low haze coating and a coating to Reduce scratching. The front and bottom polarizer hardness is 3H(Min 2H).



10.0 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

Note 1: This test condition is based on BOE module.

Under 24 hours a day is available for black fog mura (In ordinary temperature) .
Life time 45,000 hours is available for black fog mura (In ordinary temperature)

11.0 PRECAUTIONS

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

11.1 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.
- Long side LED Bar design is recommended when using E-LED type Back Light
- 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..

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- 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.

11.2 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.

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11.3 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.

11.4 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.

11.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	MAX
Storage Temperature	(°C)	5	40
Storage Humidity	(%rH)	40	75
Storage Life	6 months		
Storage Condition	<ul style="list-style-type: none"> • 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.

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11.6 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.

11.7 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°C
- 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 should be protected from high and low temperature, water vapor and ultraviolet radiation,in order to avoid direct exposure to the extreme environment for a long time.

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

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3. Operating usages to protect against image sticking due to long-term static display.
- Suitable operating time: under 20 hours a day.
 - Static information display recommended to use with moving image.
 - Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.
 - Background and character (image) color change
 - Use different colors for background and character, respectively.
 - Change colors themselves periodically.
 - 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.

11.8 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.

12.0 PRODUCT SERIAL NUMBER



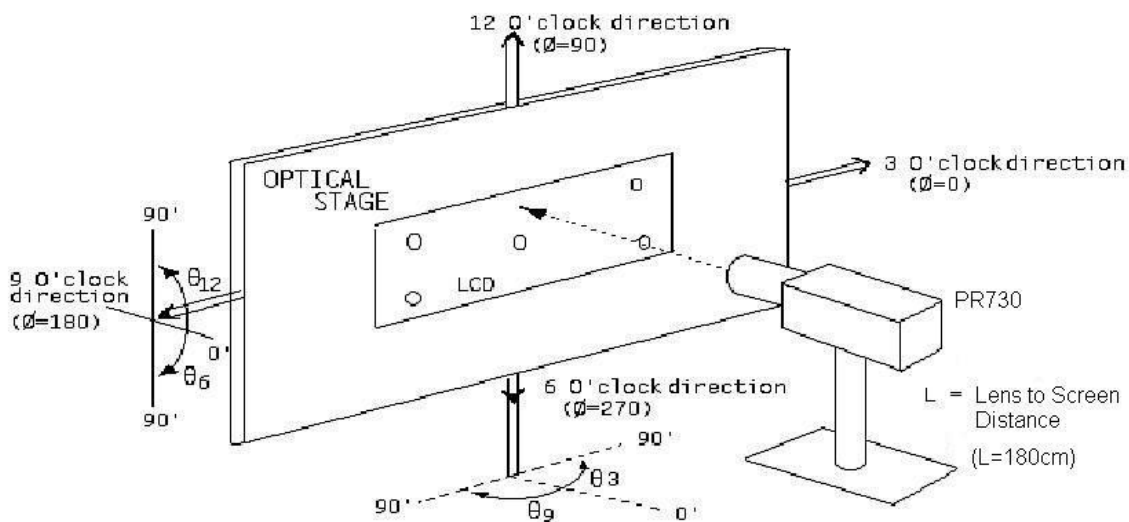
- ① QR Code
- ② MDL ID
- ③ FG Code
- ④ P/N
- ⑤ Bar Code

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				

14.0 APPENDIX 1

< Figure 6. Measurement Set Up >

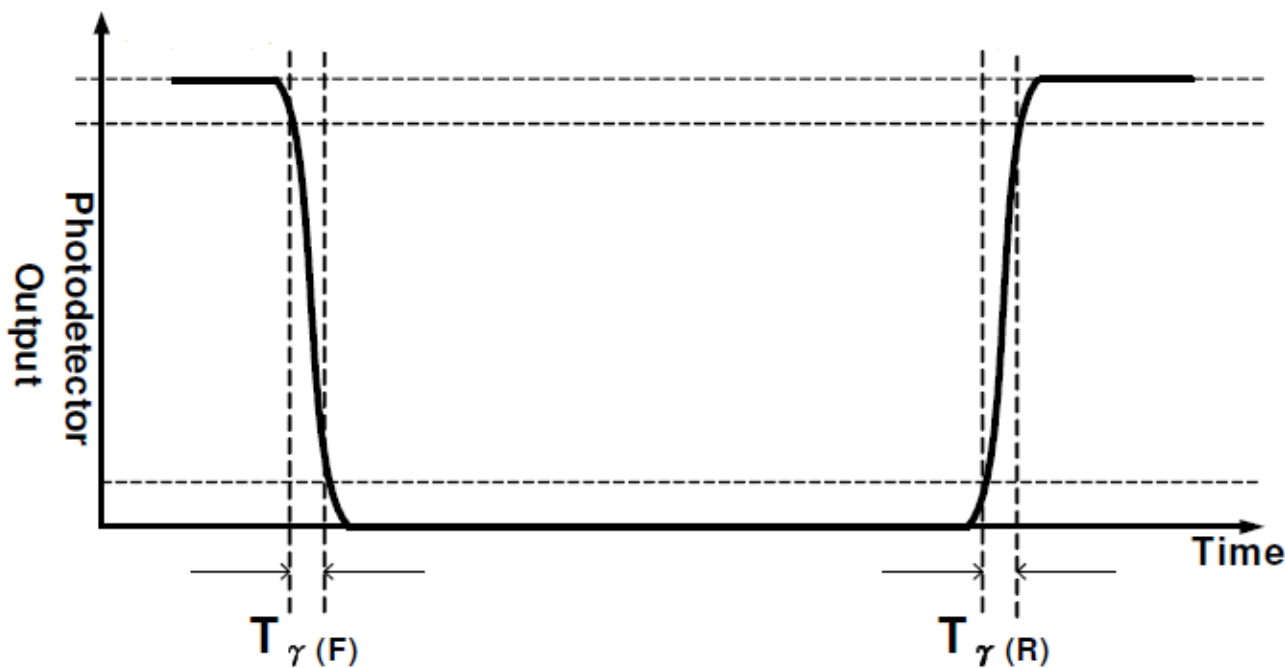


< Figure 7. Response Time Testing >

Any level of gray (Bright)

Any level of gray (Dark)

Any level of gray (Bright)



14.0 APPENDIX 2

