






SPECIFICATIONS

CUSTOMER : _____
MODEL NO. : GFTO050GA800480L
VERSION : A
DATE : 2018.01.04
CERTIFICATION : ROHS
CUSTOMER SIGN : _____

QA Approved By	Approved By	Prepared By	Prepared By
			

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Revision Record

Data(y/m/d)	Ver.	Description	Note	page
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1. OVERVIEW

GFTO050GA800480L is 5" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs and backlight. The 5" screen produces a high resolution image that is composed of 384,000 (800×480) pixel elements and 16.2M-color images are displayed on the 5" diagonal screen. General specifications are summarized in the following table

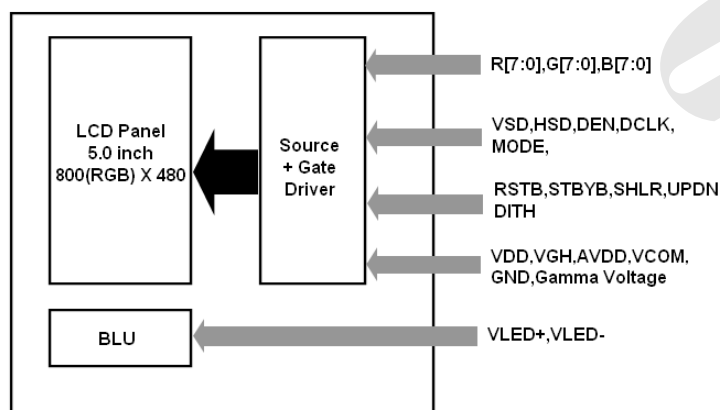
General specifications are summarized in the following table:

Item	Specification
Panel Size	5" inch
Display Area (mm)	108.0(H) x 64.8(V)
Number of Pixels (dot)	800(H) x 3(RGB) x 480(V)
Pixel Pitch(mm)	0.135(H) x 0.135(V)
Color Pixel Arrangement	RGB island
Display Mode	Normally white TN
Number of color	16.2M
Luminance (cd/m ²)	500(Typ)
Contrast Ratio	500:1 (Typ.) 350:1 (Min.)
Optimum Viewing Angle	6' o'clock
Electrical Interface	RGB 24Bits
Power Consumption(W)	1.42 (Typical)
Surface Treatment	HC
Outline Dimension (mm)	118.5(W)× 77.55(H)× 2.8(D)
Weight (g)	65g(MAX)

Note 1. Outline Dimension define without FPC.

The LCD Products listed on this document are not suitable for use of aerospace equipments, submarine cables, nuclear reactor control systems and life support systems. If customers intend to use these LCD products for above applications or not listed in "Standard" as follows, please contact our sales people in advance.

1.1 Block Diagram





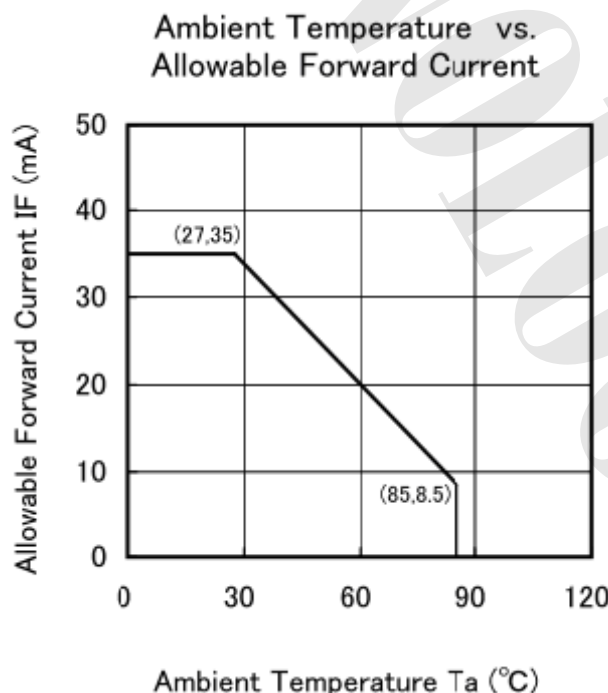
2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Power voltage	VDD	-0.3	+3.96	V	
Analog Power Supply Voltage	AVDD	-0.5	+14.85	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Singnal Input Voltage	R0 ~ R7 G0 ~ G7 B0~B7	-0.3	+3.96	V	
GAMMA Voltage	Vr1~Vr10	-0.5	+14.85	V	
Forward Current (per LED)	If		35	mA	
Reverse Voltage (per LED)	VR		5	V	
Pulse forward current (per LED)	I _{fp}		100	mA	Note1
Operation Temperature	Topa	-20	70	°C	Note3
Storage Temperature	Tstg	-30	80	°C	Note3

Note 1. Absolute maximum rating is the limit value. When the panel is exposed operating environment beyond this range, the Panel can not assure operations and may be damaged permanently, not be able to be recovered

Note 2. condition: 1 pcs LED 、 1/10 duty 、 10ms width

Note 3. Ambient temperature and the maximum input are fulfilling the following operating conditions



Note 4. While the panel is used in normal temperature, the temperature in the center of panel's surface must be low than 40°C



3. ELECTRICAL CHARACTERISTICS

3.1 Typical operation conditions

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Power Supply Voltage For LCD	VDD	3	3	3.6	V	
Logic Input Voltage	VIL	0	-	0.3xVDD	V	
	VIH	0.7xVDD	-	VDD	V	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM	3.6	3.8	4.0	V	Note1

Note1. Please adjust VCOM to make the flicker level be minimum.

3.2 TFT-LCD current consumption

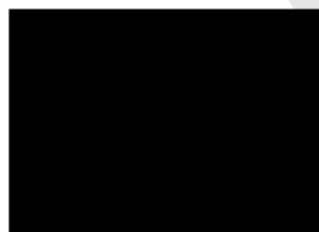
Item	Symbol	Conditions	Min.	Min.	Max.	Unit	Note
Gate on power current	IVGH	VGH =18V	-	2	3	mA	Note1
Gate off power current	IVGL	VGL= -6V	-	2	3	mA	Note1
Digital power current	IVDD	VDD = 3.3V	-	15	25	mA	Note1
Analog power current	IAVDD	AVDD = Vr1+0.8	-	25	40	mA	Note1
Total Power Consumption	PC		-	338	539	mW	Note1

Note 1. Typ. specification : Gray-256 test Pattern

Max. specification : Black test Pattern



(a)Gray-256 Pattern



(b)Black Pattern



3.3 Gamma Voltage Setting

Symbol	Value	Symbol	Value	Unit
Vr1	9.0	Vr6	3.9	V
Vr2	7.3	Vr7	2.7	
Vr3	6.8	Vr8	2.4	
Vr4	6.5	Vr9	1.9	
Vr5	5.4	Vr10	0.1	

3.4 Backlight system

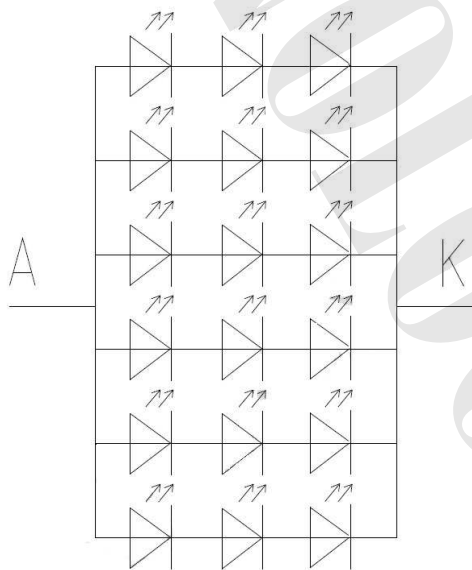
Ta=25°C

Item	Symbol	Conditions	Min.	Min.	Max.	Unit	NOTE
LED Voltage	VL	Ta=25°C Each serial=20mA	-	9	10.5	V	
LED Current	IL	Ta=25°C Each serial=20mA	-	120	210	mA	
Power consumption	WL	V Ta=25°C Each serial=20mA	-	1080	1206	mW	Note1
LED Lifetime	-	Ta=60°C Each serial=20mA	10000			Hr	Note2

Note 1. $W = VL \times IL$, $IL=120mA$

Note 2. Brightness to be decreased to 50% of the initial value.

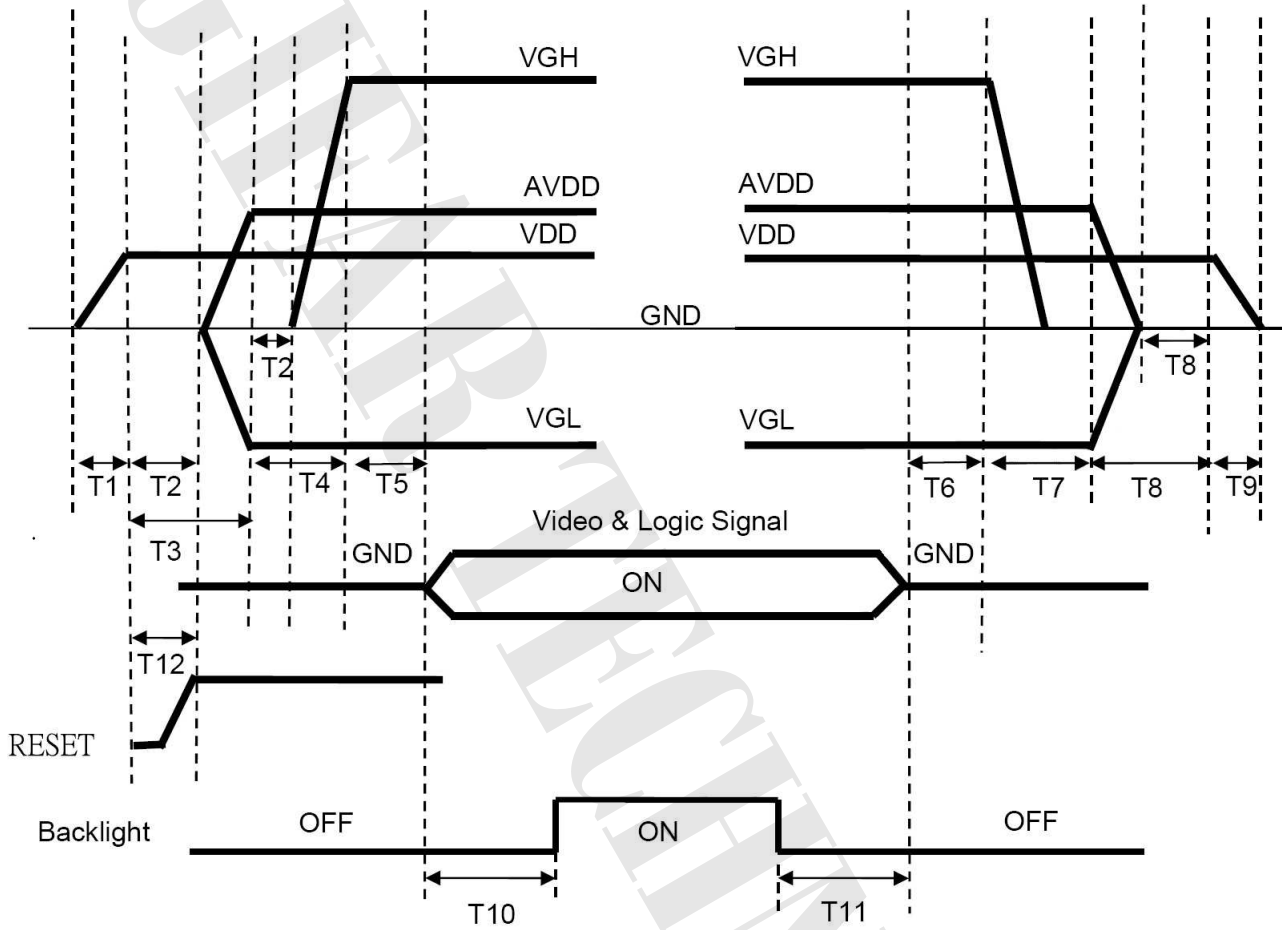
Note 3. LED Circuit Diagram(A : Anode(+), Cathode(-))



The frame of the LEDs is 3 series-6 parallel connection.



3.5 Power on/off sequence



$0 < T1 \leq 10\text{ms}$

$T2 > 0\text{ms}$

$T3 > 20\text{ms}$

$T4 > 10\text{ms}$

$T5 > 0\text{ms}$

$T10 \geq 200\text{ms}$

$T12 > 1\text{ ms}(\text{Note})$

$T6 > 0\text{ms}$

$T7 > 0\text{ms}$

$T8 > 0\text{ms}$

$0 < T9 \leq 10\text{ms}$

$T11 \geq 200\text{ms}$

Note: If reset pin without RC, please follow T12 timing to power on reset panel function.



4. INPUT SIGNAL TIMING

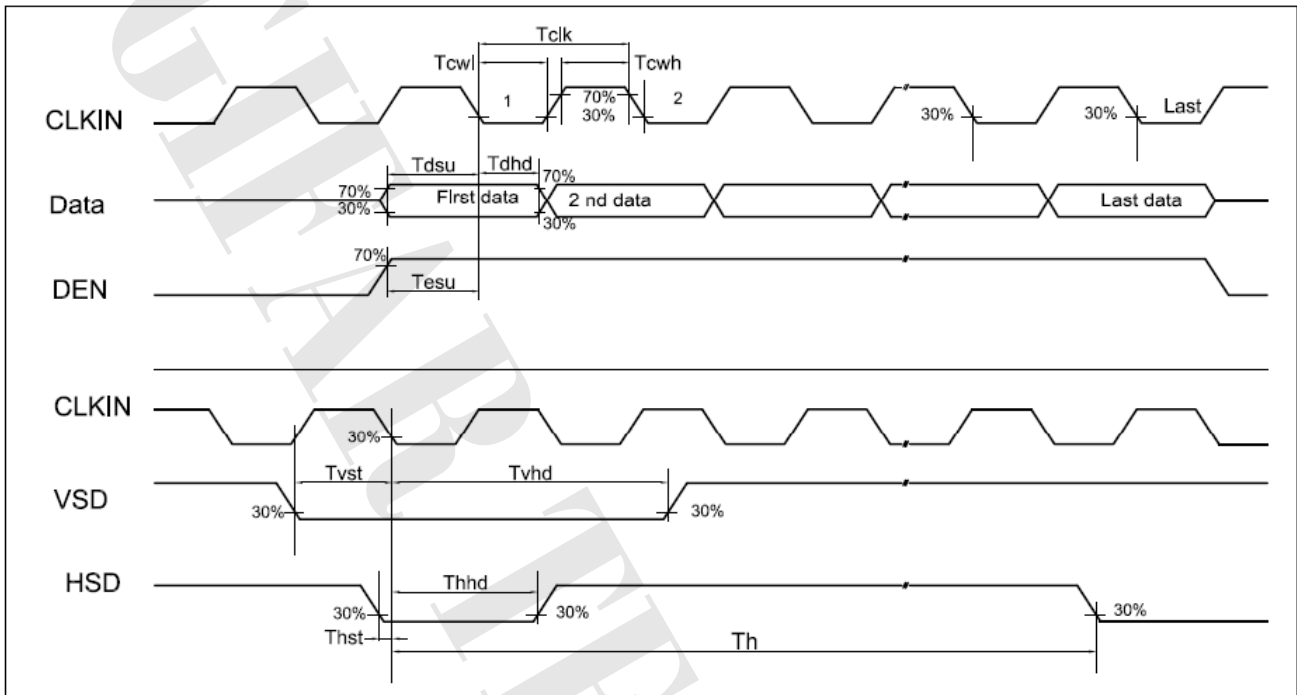
4.1 TTL Timing

4.1.1 Timing Specification

	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	Note
DCLK	Dot Clock	1/Tclk	28.5	30	38	MHz	
	DCLK pulse duty	Tcwh	40	50	60	%	
DE	Setup Time	Tesu	8	-	-	ns	
	Hold time	Tehd	8	-	-	ns	
	Horizontal Period	t _H	908	928	1000	t _{CLK}	
	Horizontal Valid	t _{HA}	800			t _{CLK}	
	Horizontal Blank	t _{HB}	108	128	200	t _{CLK}	
	Vertical Period	t _V	523	538	633	t _H	
	Vertical Valid	t _{VA}	480			t _H	
	Vertical Blank	t _{VB}	43	58	153	t _H	
SYNC	HSYNC Setup Time	T _{hst}	8	-	-	ns	
	HSYNC Hold Time	T _{hhd}	8	-	-	ns	
	VSYNC Setup Time	T _{vst}	8	-	-	ns	
	VSYNC Hold Time	T _{vhd}	8	-	-	ns	
	Horizontal Period	t _H	908	928	1000	t _{CLK}	
	Horizontal Pulse Width	t _{HPW}	4	48	60	t _{CLK}	t _{HB} + t _{HPW} = 88DCLK is fixed
	Horizontal Back Porch	t _{HB}	28	40	84	t _{CLK}	
	Horizontal Front Porch	t _{HFP}	20	40	112	t _{CLK}	
	Horizontal Valid	t _{HD}	800			t _{CLK}	
	Vertical Period	t _V	523	538	633	t _H	
	Vertical Pulse Width	t _{VPW}	3	3	3	t _H	t _{VPW} + t _{VB} = 32t _H is fixed
	Vertical Back Porch	t _{VB}	29	29	29	t _H	
	Vertical Front Porch	t _{VFP}	11	26	121	t _H	
Vertical Valid	t _{VD}	480			t _H		
DATA	Setup Time	T _{dsu}	8	-	-	ns	
	Hold Time	T _{dhd}	8	-	-	ns	



4.1.2 Timing Diagram

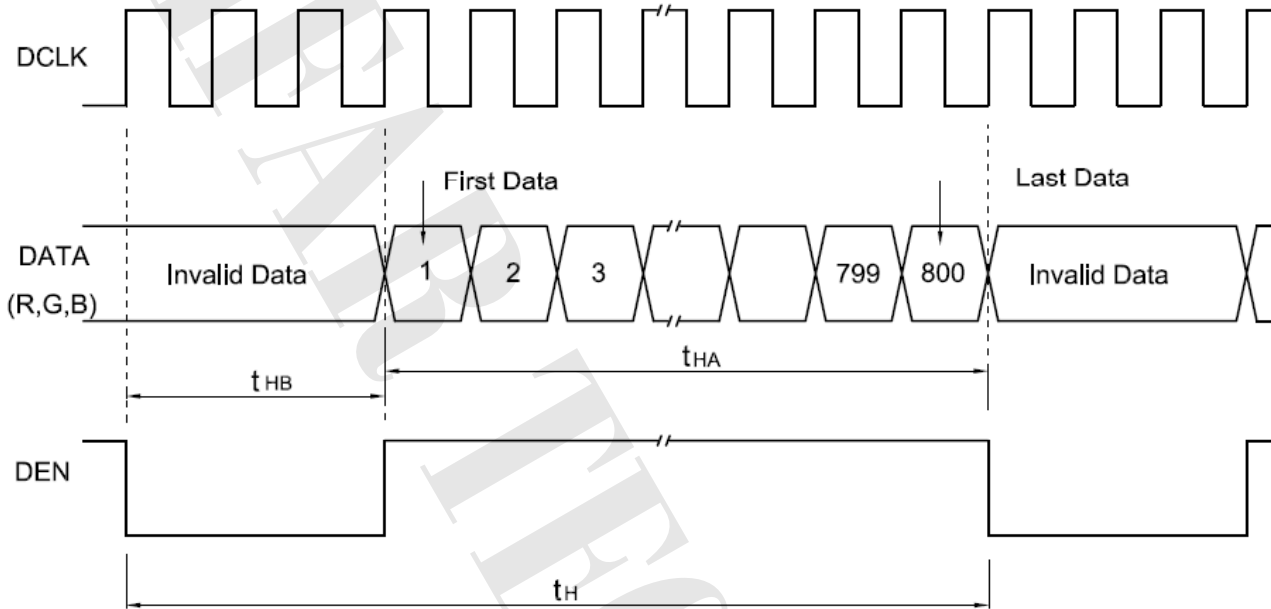




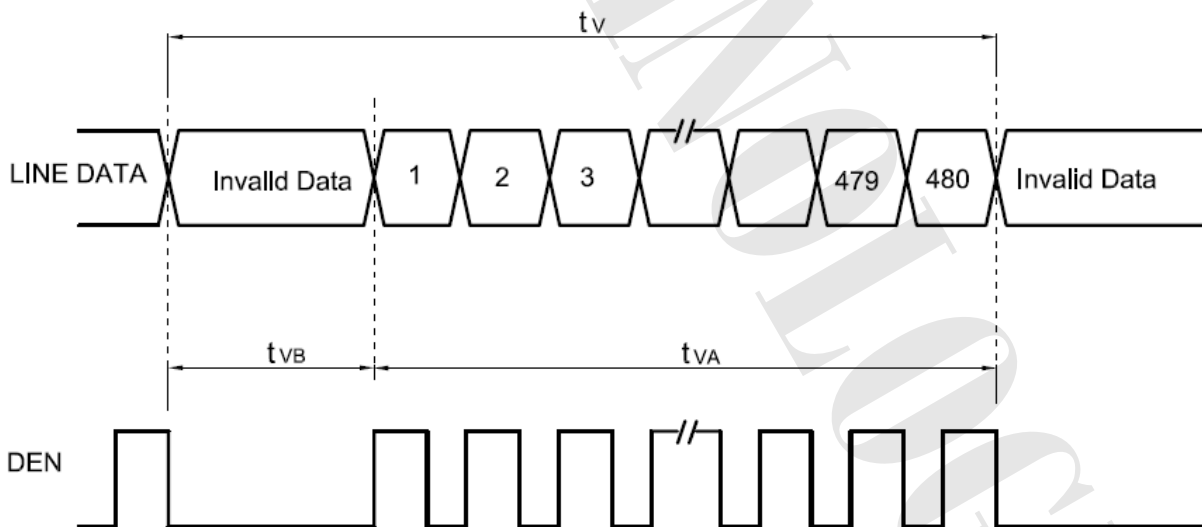
4.2 Timing Sequence(Timing Chart)

4.2.1 DE mode :

Horizontal timing :



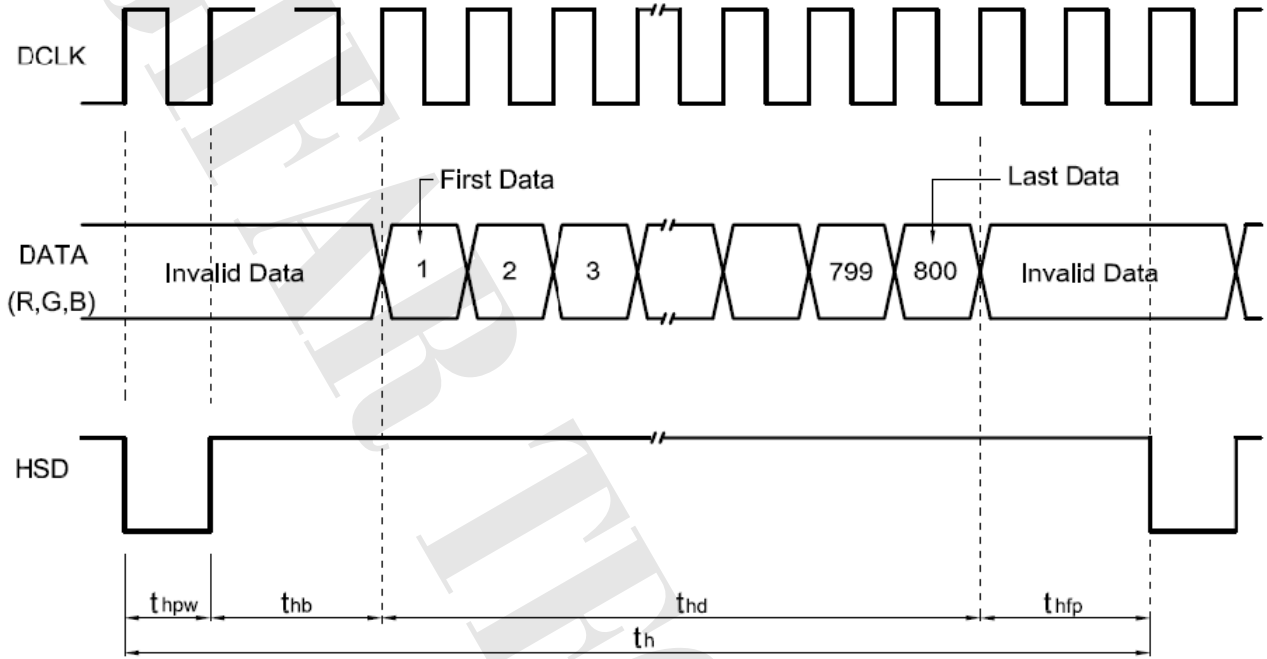
Vertical timing :



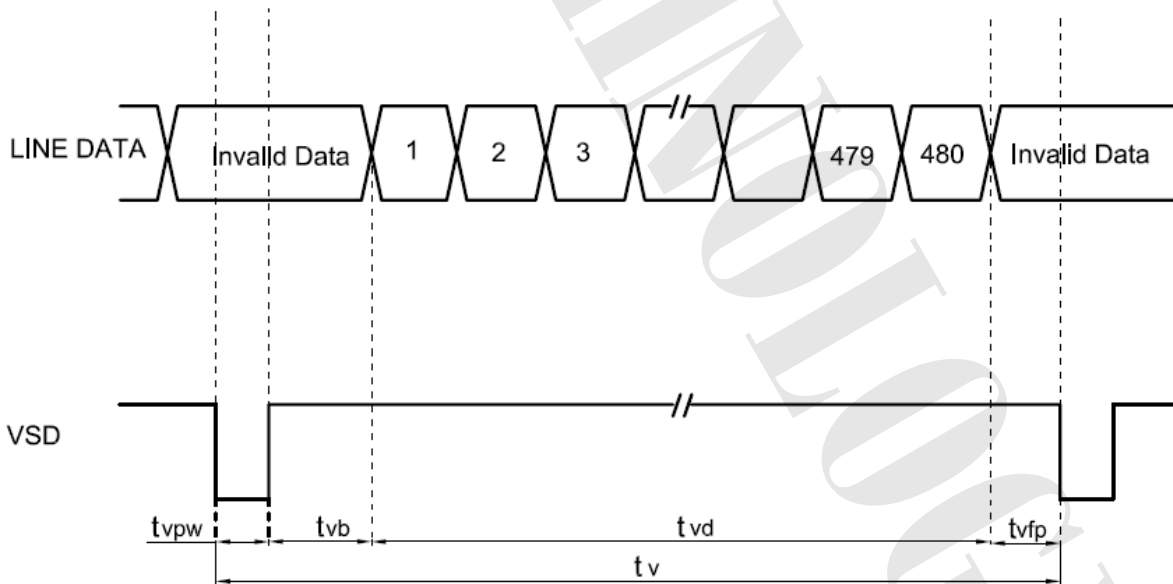


4.2.2 SYNC mode

Horizontal timing :



Vertical timing :





4.3 Color data definition

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
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
RED	RED(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(1)	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(2)	0	0	0	0	0	0	1	0	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
GREEN	GREEN(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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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
BLUE	BLUE(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(1)	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(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	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

Note 1. Definition of gray scale :

Color (n): n means level of gray scale. Larger n means brighter level.

Note 2. Data : 1= High, 0 = Low



5. INTERFACE CONNECTION

Pin NO.	SYMBOL	DESCRIPTION
1	GND	GND
2	VDDA	Analog Power
3	VDD	Digital Power
4	R0	Red data Input (LSB)
5	R1	Red data Input
6	R2	Red data Input
7	R3	Red data Input
8	R4	Red data Input
9	R5	Red data Input
10	R6	Red data Input
11	R7	Red data Input (MSB)
12	G0	Green data Input (LSB)
13	G1	Green data Input
14	G2	Green data Input
15	G3	Green data Input
16	G4	Green data Input
17	G5	Green data Input
18	G6	Green data Input
19	G7	Green data Input (MSB)
20	B0	Blue data Input (LSB)
21	B1	Blue data Input
22	B2	Blue data Input
23	B3	Blue data Input
24	B4	Blue data Input
25	B5	Blue data Input
26	B6	Blue data Input
27	B7	Blue data Input (MSB)
28	DCLK	Pixel clock
29	DE	Data Enable. When MODE="0", this pin is OPEN
30	HSD	Horizontal Sync Signal
31	VSD	Vertical Sync Signal
32	MODE	DE/SYNC mode selec , Normal pull high MODE="1" DE mode MODE="0" SYNC mode



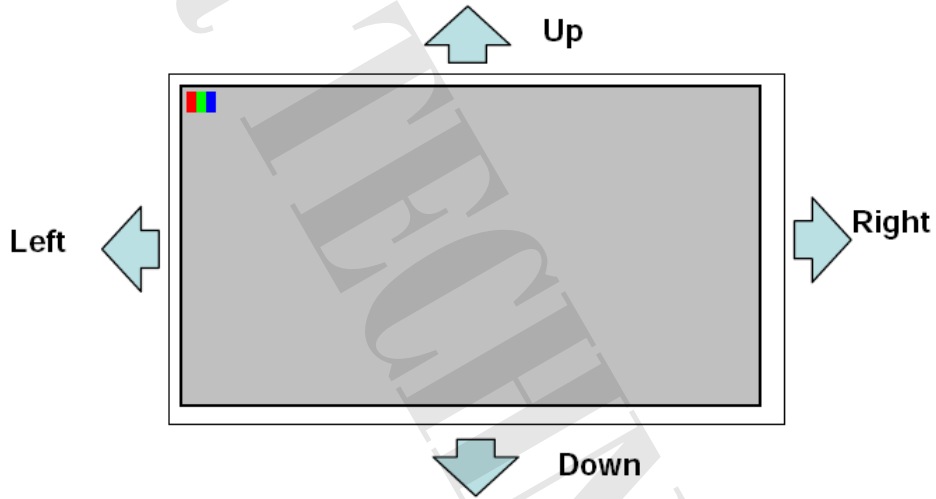
33	RSTB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ · C=1μF)
34	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are high-Z
35	SHLR	Shift left or right control
36	VDD	Digital Power
37	UPDN	Shift up or down control
38	GND	GND
39	GND	GND
40	VDDA	Analog Power
41	VCOM	VCOM DC input
42	DITH	Dithering function enable control. DITHB = "0", Enable internal dithering function , LSB0 and LSB1 connect to ground. DITHB = "1", Disable internal dithering function
43	VR10	Gamma Voltage input
44	VR9	Gamma Voltage input
45	VR8	Gamma Voltage input
46	VR7	Gamma Voltage input
47	VR6	Gamma Voltage input
48	VR5	Gamma Voltage input
49	VR4	Gamma Voltage input
50	VR3	Gamma Voltage input
51	VR2	Gamma Voltage input
52	VR1	Gamma Voltage input
53	VGH	Get on Voltage
54	VDD	Digital Power
55	VGL	Get off Voltage
56	GND	GND
57	VLED+	Power Supply for LED (Anode)
58	VLED+	Power Supply for LED (Anode)
59	VLED-	LED GND (Cathode)
60	VLED-	LED GND (Cathode)



【Note1】 SHLR : left or right setting

UPDN : up or down setting

SHLR	UPDN	Data shifting
DVDD	GND	Left→Right · Up→Down(default)
GND	GND	Right→Left · Up→Down
DVDD	DVDD	Left→Right · Down→Up
GND	DVDD	Right→Left · Down→Up

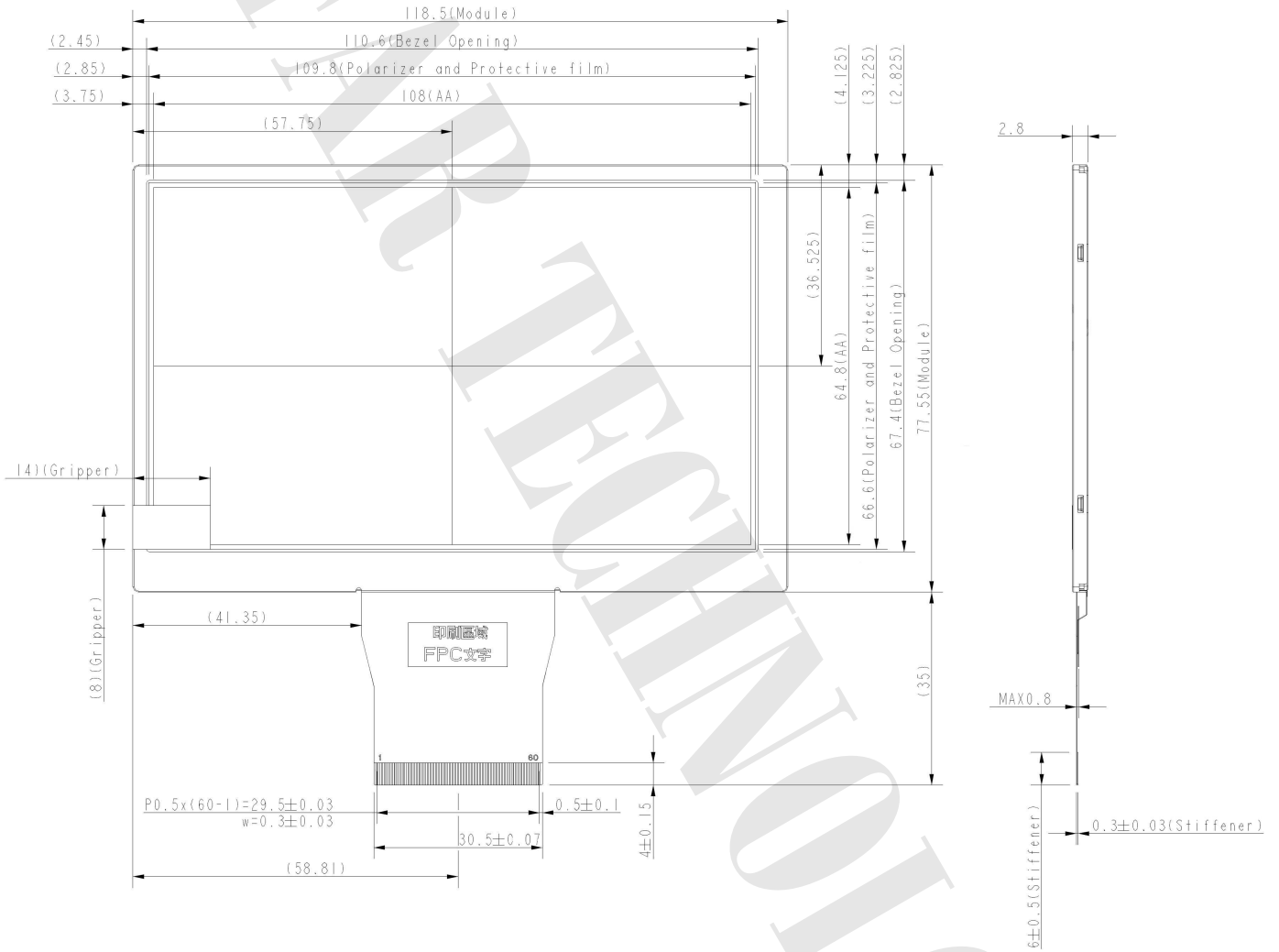




6. MECHANICAL SPECIFICATION

(Front View)

Unit:mm



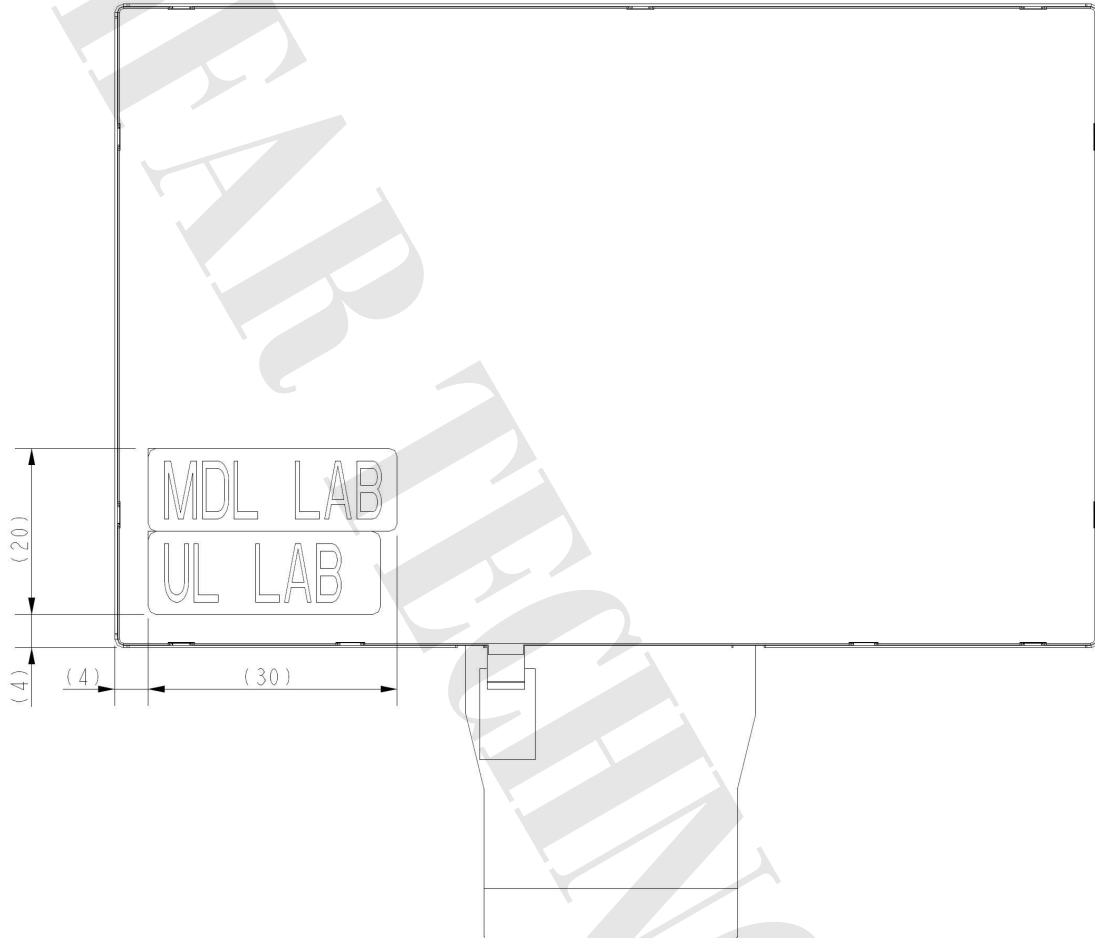
Note : General tolerance = ±0.3mm

Gripper size : 14mm x 8mm x 0.08mm

Protective film size : 109.8 mm (H)X66.6 mm (V)



(Rear View)



Note General tolerance = ± 0.3 mm



7. OPTICAL SPECIFICATION

Item	Symbol	Condition	Min	Typ	Max	Unit	Remark	
Contrast Ratio	CR	$\theta=\Phi-0^\circ$ Point-5	350	500	-	-	Note 3	
Luminance	L	$\theta=\Phi-0^\circ$ Point-5	400	500	-	cd/m ²		
Luminance Uniformity	ΔL	$\theta=\Phi-0^\circ$	70	80	-	%	Note 4	
Response Time	Tr+Tf	$\theta=\Phi-0^\circ$		20	35	ms	Note 5	
NTSC			45	50		%		
Viewing Angle	Horizontal	Φ	CR \geq 10 Point-5	60(Right)	70(Right)	-	°	Note 6
				60(Left)	70(Left)			
	Vertical	θ		45(Up)	55(Up)	-	°	
				65(Down)	75(Down)			
Color Coordinate	R	x	$\theta=\Phi-0^\circ$ Point-5	0.588	0.625	0.665		
		y		0.313	0.353	0.393		
	G	x		0.313	0.353	0.393		
		y		0.554	0.594	0.634		
	B	x		0.122	0.162	0.202		
		y		0.066	0.106	0.146		
	W	x		0.273	0.313	0.353		
		y		0.289	0.329	0.369		

Note 1.Ambient condition : 25°C \pm 2°C , 60 \pm 10%RH under 10 Lux in the darkroom
Lighting the LCM and measuring after 10 minutes.

Note 2.Measure device : BM-5A (TOPCON) , viewing cone=1° , I_L=80mA

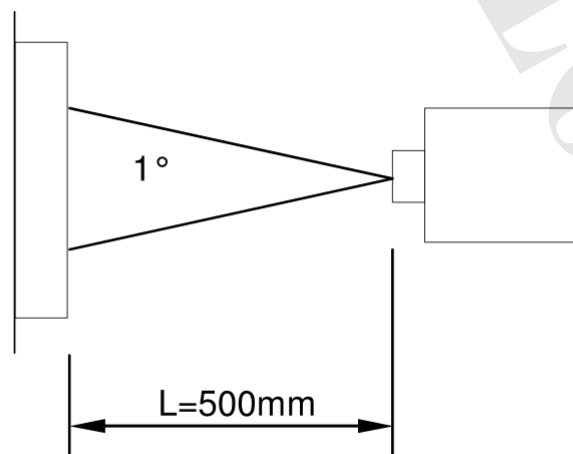


Fig.8-1 viewing cone=1°



Note 3. Definition of Contrast Ratio :

$$CR = \text{White Luminance (ON)} / \text{Black Luminance (OFF)}$$

Note 4. Definition of Luminance Uniformity : $\Delta L = L(\text{MIN}) / L(\text{MAX}) \times 100\%$

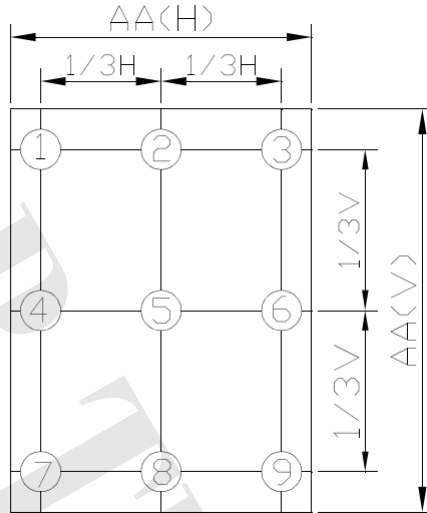


Fig.8-2 Measuring point

Note 5. Definition of response time : The response time is defined as the time interval between the 10% and 90% amplitudes.

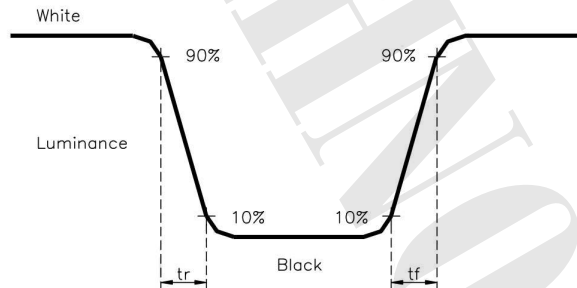


Fig.8-3 Definition of Response Time (White - Black)

Note 6. Definition of view angle(θ , Φ)

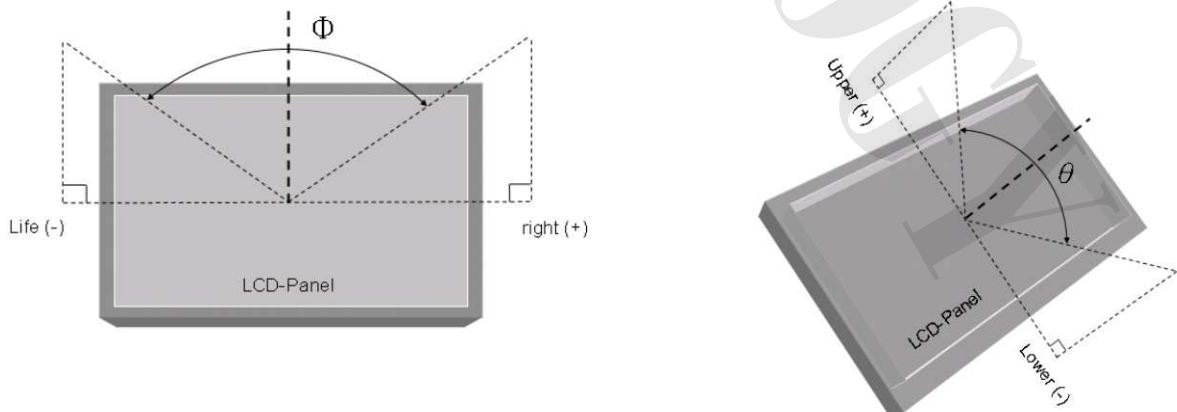


Fig.8-4 Definition of Viewing Angle



8. RELIABILITY TEST

8.1 Temperature and Humidity

TEST ITEMS	CONDITIONS
HIGH TEMPERATURE OPERATION	70° C : 240Hrs
HIGH TEMPERATURE STORAGE	80° C : 240Hrs
HIGH TEMPERATURE AND HIGH HUMIDITY OPERATION	60° C : 90% RH : 240Hrs
LOW TEMPERATURE OPERATION	-20° C : 240Hrs
LOW TEMPERATURE STORAGE	-30° C : 240Hrs

8.2 Shock & Vibration

TEST ITEM	CONDITIONS
SHOCK (Non operation)	<ul style="list-style-type: none"> ● shock level: 980m/s² (equal to 100G). ● aveform: half sinusoidal wave,6ms ● Number of shocks: one shock input in each direction of three mutually perpendicular axes(±X, ±Y, ±Z)for a total of 6 shock inputs.
VIBRATION (Non operation)	<ul style="list-style-type: none"> ● Frequency range:8~33.3Hz ● Stroke:1.3 mm ● Vibration:sinusoidal wave, perpendicular axis Each direction on X, Z axes: 2hrs, Y axes: 4hrs. ● Sweep:2.9G,33.3 Hz ~ 400 Hz ● Cycle:15 min

8.3. ESD

TEST ITEM	CONDITIONS	NOTE
ESD (Non operation)	150 pF、330Ω、±8KV,±15KV	Air mode
	150 pF、330Ω、±8KV,±15KV	Contact mode
	200 pF、0Ω、±200V	Contact mode

8.4. Judgment standard

The judgment of the above test should be made as follow

Pass : Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail : No display image, line defects. Transformation of the carton which occurs at

Shock and VIBRATION test should be ignored.



9. WARRANTY

- 9.1. The period is within 12 months since the date of shipping out under normal using and storage conditions.
- 9.2. The warranty will be avoided in case of defect induced by customer.