



Chunghwa Picture Tubes, Ltd.

Product Specification

To :
Date :

TFT LCD

CLAA028GB01AW(ILI9320)

ACCEPTED BY : Ver. 1.0

APPROVED BY	CHECKED BY	PREPARED BY

Prepared by :

Product Planning Management Division
Small & Medium TFT Product Business Unit

CHUNGHWA PICTURE TUBES, LTD.

1127 Hopin Rd., Padeh, Taoyuan, Taiwan 334, R.O.C.
TEL: +886-3-3675151 FAX: +886-3-377--3858

Doc.No:	SPEC_CLAA028GB01AW_V1.0_CPT_070329	Issue Date:	2007/03/29
---------	------------------------------------	-------------	------------

Contents

1. OVERVIEW	4
2. ABSOLUTE MAXIMUM RATINGS	5
3. ELECTRICAL CHARACTERISTICS.....	6
3.1 Typical operating conditions	6
3.2 Power consumption by TFT panel	6
3.3 Backlight.....	6
4. INTERFACE PIN CONNECTION.....	7
4.1.Pin Assignment.....	7
4.1.1 Pin Assignment for ILITEK IC : ILI9320.....	7
4.2 Description of function	8
5. AC CHARACTERISTICS	9
5.1 AC CHARACTERISTICS of ILITEK.....	9
5.1.1 80-system Bus Interface Timing Characteristics.....	9
5.2 Reset Timing Characteristics.....	10
6. BLOCK DIAGRAM	11
7. MECHANICAL SPECIFICATION.....	12
8. OPTICAL SPECIFICATION.....	13
9. RELIABILITY TEST	15
9.1 Temperature and humidity	15
9.2 ESD.....	15
9.3 Shock (package state).....	15

1. OVERVIEW

CPT **CLAA028GB01AW** is 2.8" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel , driver ICs, control circuit, Utilizes a panel with a 3:4 aspect ratio.

The 2.8" screen produces a high resolution image that is composed of 76,800 (240x320) pixel elements in a stripe arrangement.

General specifications are summarized in the following table:

ITEM	SPECIFICATION
Panel Size	2.8" inch
Display Area (mm)	43.2(W) x57.6(H)
Number of Pixels (dot)	240(H) x 3(RGB) x 320(V)
Pixel Pitch(mm)	0.18(W) x0.18(H)
Color Pixel Arrangement	RGB vertical strip
Display Mode	Normally white TN
Number of Colors	18bits , 262144 (colors)
Luminance (cd/m ²)	200nit(typ)
Contrast Ratio	300
Optimum Viewing Angle	12 o'clock
Video Signal Interface	CPU I/F
Surface Treatment	Glare Type
Outline Dimension (mm)	50(W)X69.2(H)x3.2(D)(mm)
Weight (g)	22g

Note 1. Outline Dimension :
69.2(H) without FPC, 3.0(D) without component

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.

2. ABSOLUTE MAXIMUM RATINGS

(GND=0V) (Note 1)

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
Power supply for Logic	V _{CC}	-0.3	4.6	V	
Forward current (per LED)	I _F	0	30	mA	
Pulse forward current (per LED)	I _{FP}	0	100	mA	
Reverse voltage (per LED)	V _R	0	5	V	
Power supply for Analog	V _{ci}	-0.3	4.6	V	
TFT-LCD supply voltage	V _{GH-GND}	-0.3	18.5	V	
	GND-V _{GL}	-0.3	18.5	V	
Logic input voltage range	V _i	-0.3	V _{CC} +0.3	V	Note 2
Operating temperature	T _{opa}	-20	70	°C	Note 3
Storage temperature	T _{stg}	-30	80	°C	Note 3

Note 1. If the module exceeds the absolute maximum ratings, it may be damaged permanently. Also, if the module operated with the absolute maximum ratings for a long time, its reliability may drop.

Note 2. DBN(N=0 ~17), /CS , /RS , /WR , /RD,/RESET.

Note 3. The display function wise is no problem.

Note 4. Ifp Conditions : Pulse Width ≤ 10msec and Duty ≤ 1/10 ◦

3. ELECTRICAL CHARACTERISTICS

3.1 Typical operating conditions

ITEM		SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
Power supply		V _{CC}	2.4	2.8	3.3	V	Note 1
		V _{CI}	2.5	2.8	3.3	V	
Input Signal Voltage	H Level	V _{IH}	0.8×V _{CC}	---	V _{CC}	V	Note 2
	L Level	V _{IL}	-0.3	---	0.2×V _{CC}	V	
Output Signal Voltage	H Level	V _{OH}	0.8×V _{CC}	---	---	V	Note 3
	L Level	V _{OL}	---	---	0.2×V _{CC}	V	

Note1 : The operations are guaranteed under the recommended operating conditions only. These operations are not guaranteed if a quick voltage change occurs during operation. To prevent noise, a bypass capacitor must be inserted into the line close to power pin.

Note2 : CS , RS , DB0 to DB17, /WR , /RD /RESET.

Note3 : DB0~DB17.

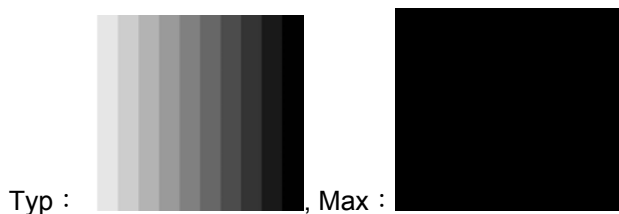
3.2 Power consumption by TFT panel

MODE	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Stand-by	P _S	V _{CC} =2.8V	---	---	0.04	mW	Note 1
Partial display	P _P		---	---	9.2	mW	Note 2
Still	P _G		---	---	22	mW	Note 3

Note1 : Display off

Note2 : 20 black display lines

Note3 : Full screen with 262144 colors (Line inversion) ,



3.3 Backlight

3.3.1 Backlight

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
LED current	IL	20			mA	
LED voltage	VL	11.2	14.4	16	V	Note 1
Power consumption	WL	224	288	320	mW	Note 1

Note1 : T=25°C , IL=20mA , serial LED circuit.

4. INTERFACE PIN CONNECTION

4.1. Pin Assignment

4.1.1 Pin Assignment for ILITEK IC : ILI9320

NO	SYMBOL	FUNCTION	REMARK
1	Vcc	Power Supply for digital circuit(2.8V)	
2	Vci	Power Supply for analog circuit(2.8V)	
3	nCS	Chip select pin	
4	RS	Display data/command selection	
5	nWR	Write enable pin when active Low	
6	nRD	Read enable pin when active Low	
7	RESET	Reset pin	
8	DB0	Data bus pin	
9	DB1		
10	DB2		
11	DB2		
12	DB4		
13	DB5		
14	DB6		
15	DB7		
16	DB8		
17	DB9		
18	DB10		
19	DB11		
20	DB12		
21	DB13		
22	DB14		
23	DB15		
24	DB16		
25	DB17		
26	NC	Floating , no connect.	
27	NC		
28	NC		
29	NC		
30	NC		
31	NC		
32	GND	Ground pin	
33	VSYNC	Frame synchronizing signal for RGB I/F Fix to the Vcc level when not in use	
34	HSYNC	Line synchronizing signal for RGB I/F Fix to the Vcc level when not in use	
35	DOTCLK	Dot clock signal for RGB I/F Fix to the Vcc level when not in use	
36	ENABLE	Data Enable signal for RGB I/F Fix to the Vcc or GND level when not in use	
37	SDO	Serial bus interface data output pin Let SDO as floating when not used	
38	SDI	Serial bus interface data input pin Fix to the Vcc level when not in use	
39	LED+	Power Supply for LED+	
40	LED-	Power Supply for LED-	

4.2 Description of function

4.2.1 The input/output data from data pins (DB17-0) and signal operation of the I80 series parallel bus interface .

Common	I80 series CPU		Description
	nWR	nRD	
0	0	1	Write command to register
0	1	0	Read command from register
1	0	1	Write display data to RAM
1	1	0	Read display data from RAM

Note : Please refer to specifical of Chip- ILITEK _ 9320 to gain More detail

5. AC CHARACTERISTICS

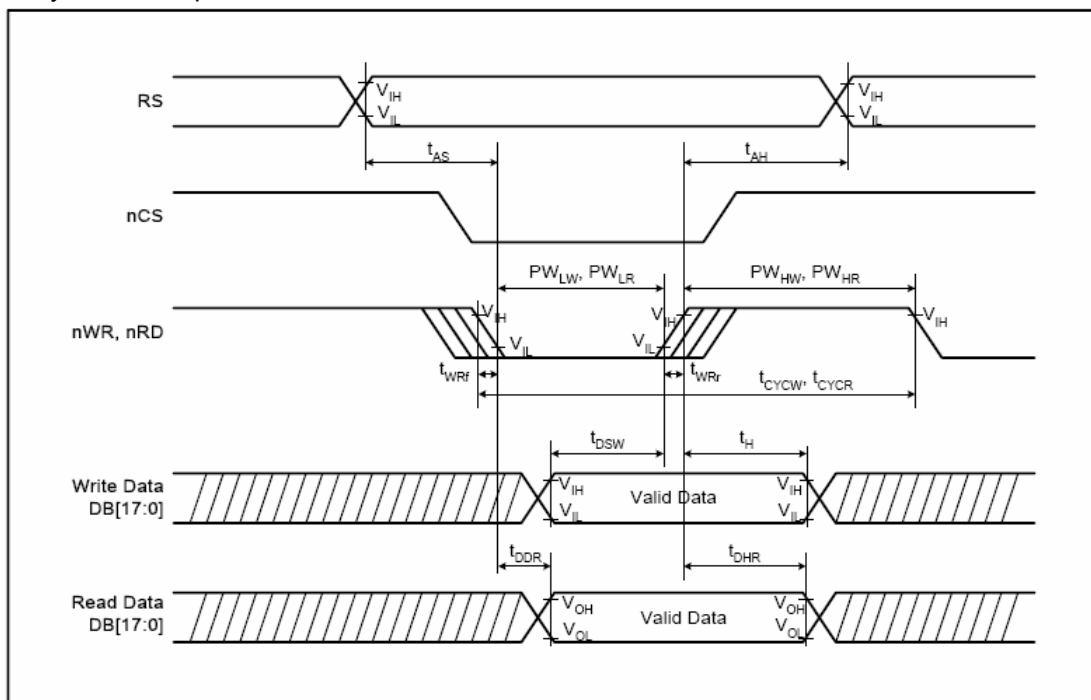
5.1 AC CHARACTERISTICS of ILITEK

5.1.1 80-system Bus Interface Timing Characteristics

Normal Write Mode (IOVCC = 1.65~3.3V, VCC=2.4~3.3V)

Item	Symbol	Unit	Min.	Typ.	Max.	Test Condition
Bus cycle time	Write	t_{CYCW}	ns	100	-	-
	Read	t_{CYCR}	ns	300	-	-
Write low-level pulse width	PW_{LW}	ns	50	-	500	-
Write high-level pulse width	PW_{HW}	ns	50	-	-	-
Read low-level pulse width	PW_{LR}	ns	150	-	-	-
Read high-level pulse width	PW_{HR}	ns	150	-	-	-
Write / Read rise / fall time	t_{WRr}/t_{WRf}	ns	-	-	25	-
Setup time	Write (RS to nCS, E/nWR)	t_{AS}	ns	10	-	-
	Read (RS to nCS, RW/nRD)			5	-	-
Address hold time	t_{AH}	ns	5	-	-	-
Write data set up time	t_{DSW}	ns	10	-	-	-
Write data hold time	t_H	ns	15	-	-	-
Read data delay time	t_{DDR}	ns	-	-	100	-
Read data hold time	t_{DHR}	ns	5	-	-	-

80 system bus operation



5.2 Reset Timing Characteristics

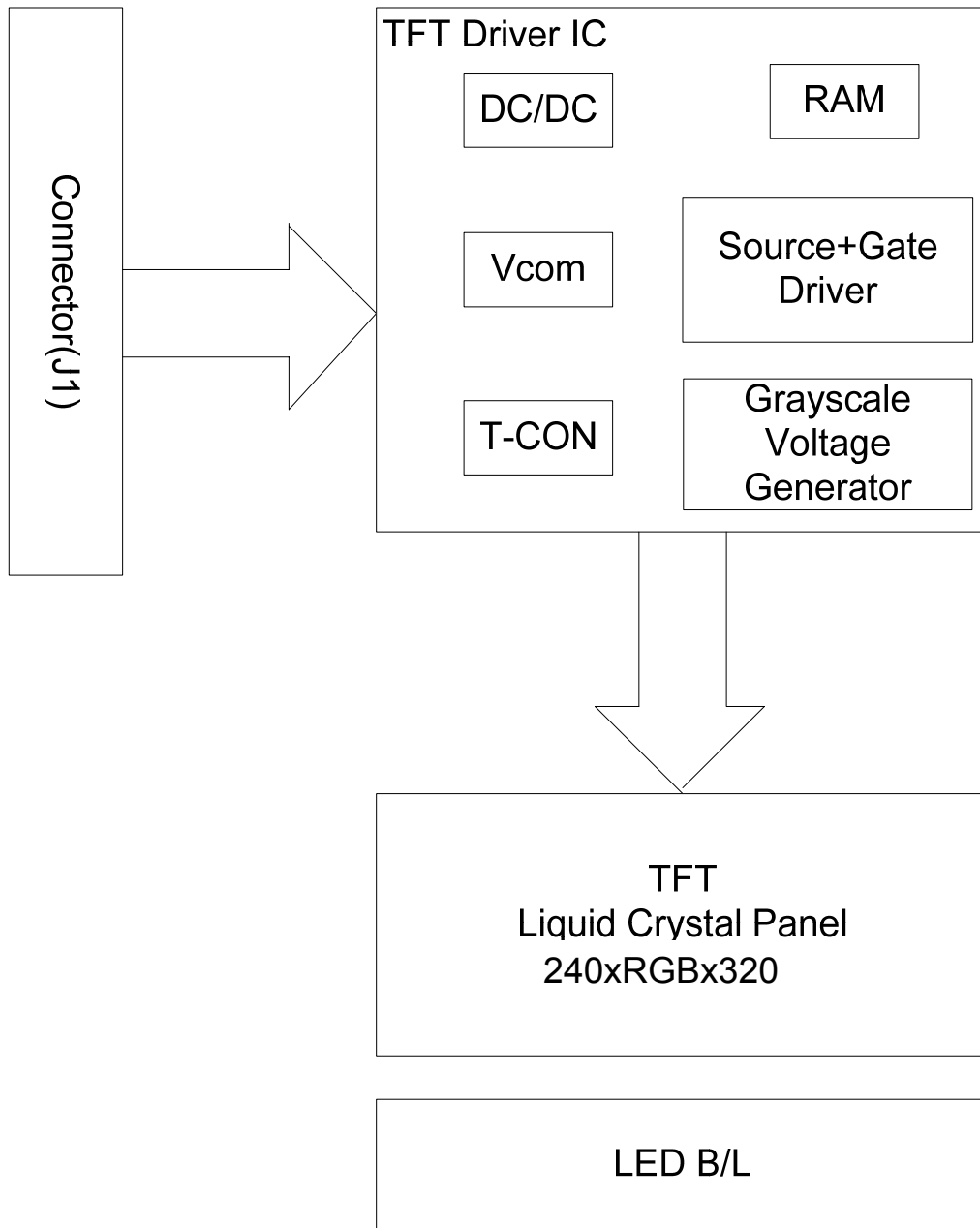
(IOVCC=1.65~3.3V) / (VCC = 1.8V~3.3V)

ITEM	SYMBOL	UNIT	MIN.	MAX.
Reset low level width	t_{RES}	ms	1	---
Reset rise time	tr_{RES}	ns	---	10

Reset Operation

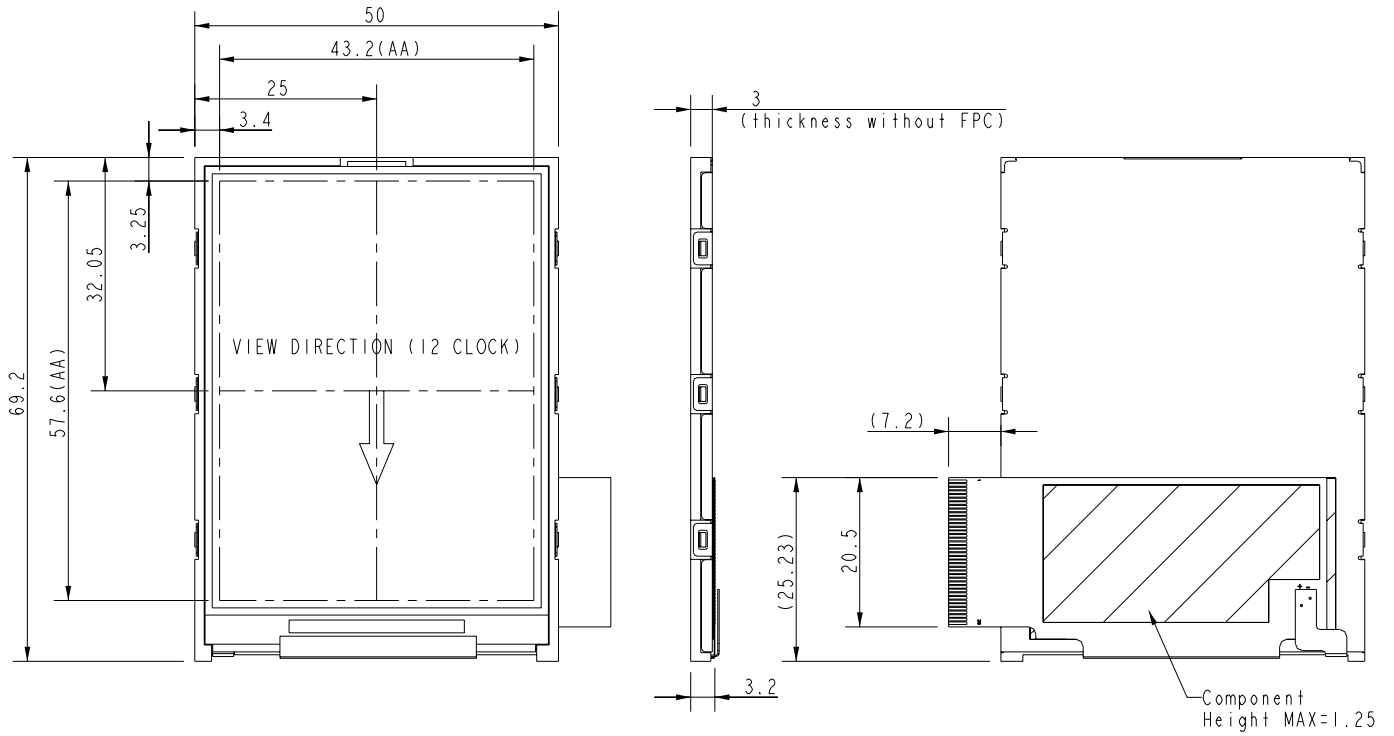


6. BLOCK DIAGRAM



7. MECHANICAL SPECIFICATION

Unit : mm



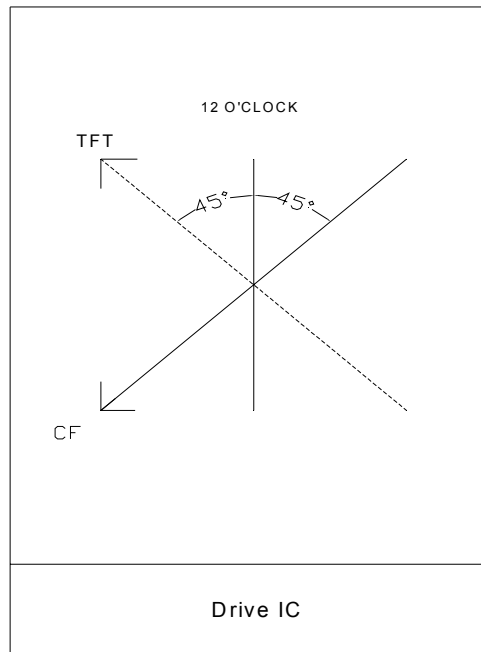
Note1 : General tolerance =±0.3mm

Note2 : Recommend connector :FH19SC-40S-0.5SH(05) or compatible

Note3 : Viewing direction define

TFT Rubbing Direction

CF Rubbing Direction



Viewing direction 12 O'Clock



Best Contrast but with Gray Level Inversion

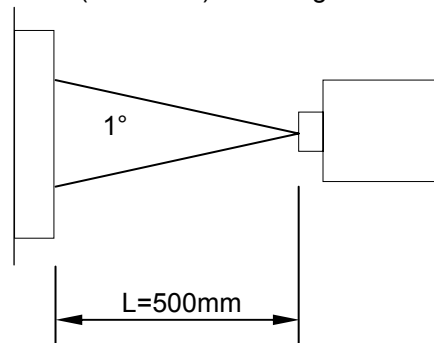
8. OPTICAL SPECIFICATION

(Note1 , Note2)

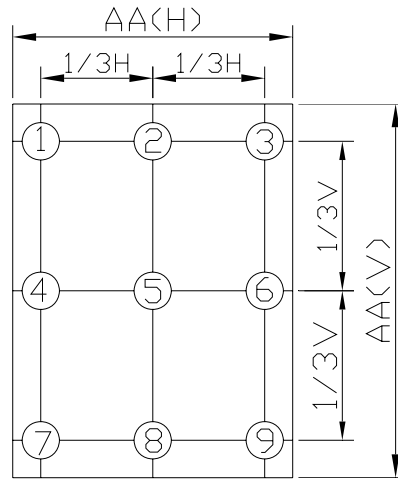
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
Luminance	L		180	200	—	cd/m ²		
Luminance Uniformity	ΔL		80	—	—	%	Note 3	
Contrast Ratio	CR		—	300	—		Note 4	
NTSC Ratio	---			58%				
Response Time	Tr	$\theta = \psi = 0^\circ$	—	10		ms	Note 5	
	Tf		—	15		ms		
View angle	Upper	ϕ	$CR \geq 10$	50	60	—	°	Note 6
	Lower			45	55	—	°	
	Left			40	50	—	°	
	Right			40	50	—	°	
Color Coordinate	W	x	$\theta = \psi = 0^\circ$	0.273	0.313	0.353		
		y		0.289	0.329	0.369		
	R	x		0.603	0.643	0.683		
		y		0.296	0.336	0.376		
	G	x		0.293	0.333	0.373		
		y		0.557	0.597	0.637		
	B	x		0.106	0.146	0.186		
		Y		0.045	0.085	0.125		

Note 1. Ambient condition : $25^\circ\text{C} \pm 2^\circ\text{C}$, $60 \pm 10\% \text{RH}$, under 10 Lux in the darkroom .

Note 2. Measure device : BM-5A (TOPCON) , viewing cone= 1° , $I_L=20\text{mA}$, after 10 minutes operation.



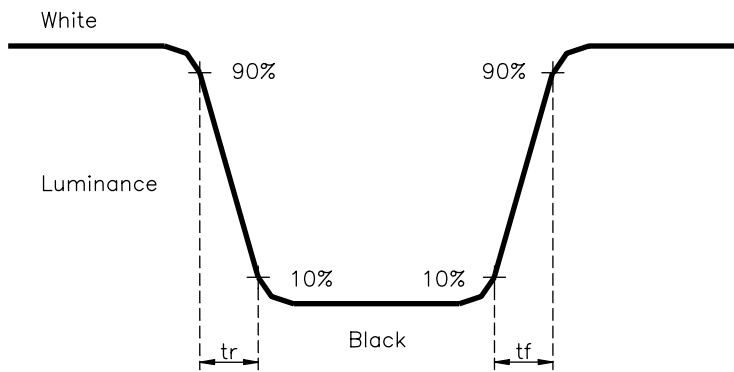
Note 3. Definition of Luminance Uniformity : $\Delta L = L(\text{MIN}) / L(\text{MAX}) \times 100\%$



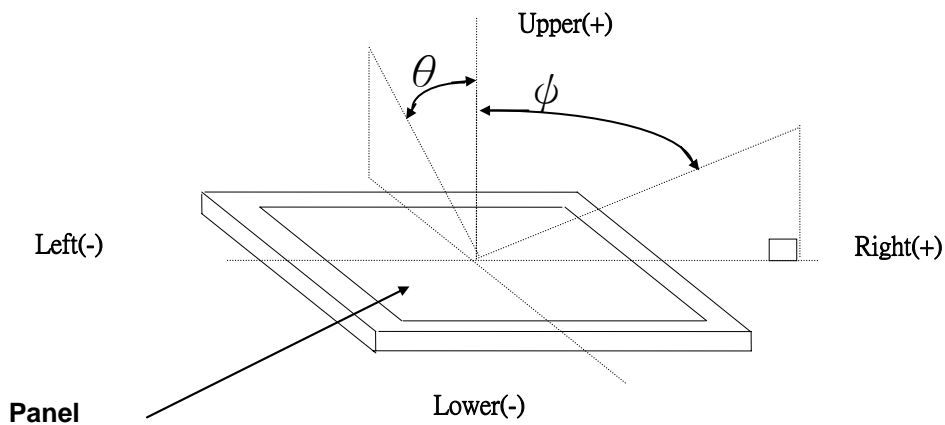
Note 4. Definition of Contrast Ratio :

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

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



Note 6. Definition of view angle(θ , ψ) :



9. RELIABILITY TEST

9.1 Temperature and humidity

TEST ITEMS	CONDITIONS	REMARK
High Temperature Storage	80°C , 240H	
Low Temperature Storage	-30°C , 240H	
High Temperature Operation	70°C , 240H	
Low Temperature Operation	-20°C , 240H	
High Temperature High Humidity Operation	60°C , 90%RH , 240H	
Thermal Shock	-30°C (1H)~80°C (1H) / 50 cycles	Non operation

9.2 ESD

ITEM	CONDITIONS	REMARK
ESD	150 pF , 330 Ω , ±8 kV , 5 times , air discharge 150 pF , 330 Ω , ±4 kV , 5 times , contact discharge 200 pF , 0 Ω , ±200 V , once for each terminal	Non operation

9.3 Shock (package state)

TEST ITEMS	CONDITIONS	REMARK
Shock (package state)	Height : 120cm , 0~45Kg , 1 corner , 3 edges , 6 surfaces	Each direction 1 time