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To :
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OSD040JB1CW

ACCEPTED BY :
Tentative V0.0

APPROVED BY	CHECKED BY	PREPARED BY

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1. OVERVIEW

OSD040JB01CW is 10.16cm(4") color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and LED backlight. By applying 480×272 images are displayed on the 10.16cm(4") diagonal screen.

General specification are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	87.84(H) ×49.776(V) (4-inch diagonal)
Number of Pixels	480(H) X 3(RGB) X 272(V)
Pixel Pitch (mm)	0.061(H) × 0.183(V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white, TN
Number of Colors	16.7M
Optimum Viewing Angle	6 o'clock
Brightness (cd/m ²)	200nit(typ)
Viewing Angle	(130 Horizontal)/(110 Vertical) (Typ.)
Power Consumption(with B/L)	0.8W(Typ.)
Module Size (mm)	98.3 (W)x 62.6(H) x 5.0(D) (Typ)
Module Weight (g)	TBD(typ)
Backlight Unit	LED
Surface Treatment	Anti-Glare, Hardness:3H

2. ABSOLUTE MAXIMUM RATINGS

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Items	Symbol	Product Specification			Unit
		Min	Typ	Max	
Power Voltage	VCC	-0.3	-	6	V
	AVDD	-0.3	-	6	V
	VGG	-0.3	-	42	V
	VEE	VGH-42	-	0.3	V
Input Signal Voltage	V _i	-0.3	-	VCC+0.3	V
Operating Temperature	T _{opa}	-30	-	85	°C
Storage Temperature	T _{stg}	-55	-	125	°C
Single LED Forward Current	I _F	-	-	30	mA
Single LED Pulse Forward Current	I _{FP}	-	-	100	mA
Single LED Reverse Voltage	V _R	-	-	5	V

3. ELECTRICAL CHARACTERISTICS

(A) Typical operation conditions (GND = Avss = 0V)

Items	Symbol	Product Specification			Unit
		Min	Typ	Max	
Power Voltage	VCC	3.0	3.3	3.6	V
	AVDD	4.8	5.0	5.2	V
	VGG	-	15	-	V
	VEE	-	-5.0	-	V
	VCOM		2.0		V
Gamma Voltage	VR0~VR13	0.2	-	AVDD-0.2	V
Input H/L Level Voltage	VIH	0.7VCC	-	VCC	°C
	VIL	0	-	0.3VCC	°C

(B) current consumption

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Current For Driver	I _{VGG}	VGG = 15V	-	-	-	uA
	I _{VEE}	VEE = -5V	-	-	-	uA
	I _{VCC}	VCC = 3.3V	-	-	-	mA
	I _{AVDD}	AVDD = 5V	-	-	-	mA

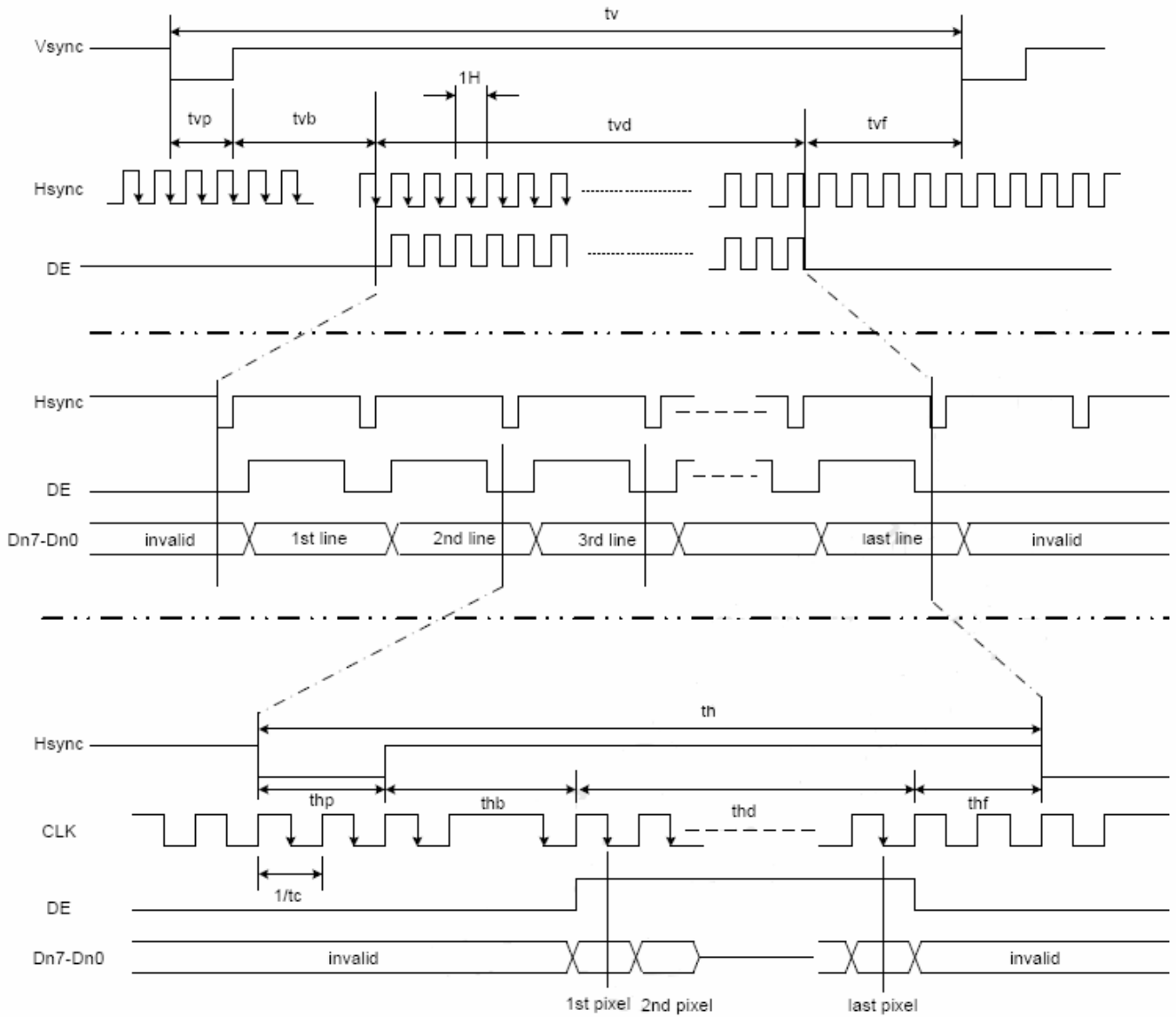
(C) Timing conditions

(480RGBx272, T_A=25°C, DVDD=2.25V to 3.6V, DVSS= 0V)

PARAMETER	Symbol	Min.	Typ.	Max.	Unit
Clock cycle	f _{CLK}	-	9	15	MHz
Hsync cycle	1/th	-	17.14	-	KHz
Vsync cycle	1/tv	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th ^{*2}	-	525	-	CLK
Horizontal display period	thd	-	480	-	CLK
Horizontal front porch	thf	2	-	-	CLK
Horizontal pulse width	thp	2	41	-	CLK
Horizontal back porch	thb	2	2	-	CLK
Vertical Signal					
Vertical cycle	tv	-	286	-	H
Vertical display period	tvd	-	272	-	H
Vertical front porch	tvf	1	2	-	H
Vertical pulse width	tvp	1	10	-	H
Vertical back porch	tvb	1	2	-	H

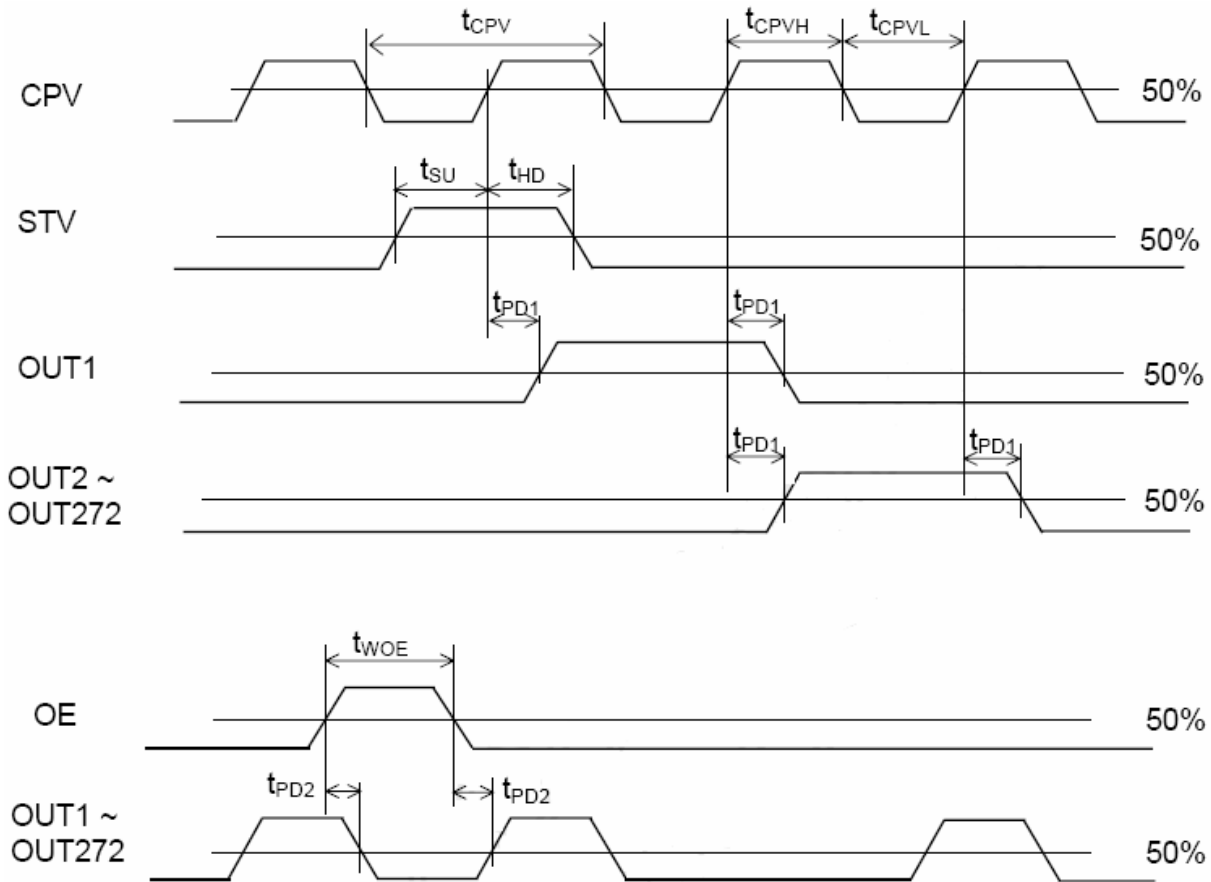
(d) timing characteristic

Horizontal Waveforms



Vertical Waveforms

Parameter	Symbol	Condition	Spec			Unit
			Min.	Typ.	Max.	
CPV period	t_{CPV}	-	5	-	-	μs
CPV pulse width	t_{CPVH}, t_{CPVL}	50% duty cycle	2.5	-	-	
OE pulse width	t_{WOE}	-	1	-	-	
Data setup time	t_{SU}	-	0.2	-	-	
Data hold time	t_{HD}	-	0.3	-	-	
CPV to output delay time	t_{PD1}	CL=220pF	-	-	0.9	
OE to output delay time	t_{PD2}	CL=220pF	-	-	0.8	



(e) LED Backlight

e.1. Electrical Characteristics

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Voltage (IL=20 mA)	VL	--	23.1	25.2	V	
Power consumption	WL	--	462	--	mW	Note 1

Note 1. T=25°C , IL=20mA , serial LED circuit.

4. INTERFACE PIN CONNECTION

(a.)CN1

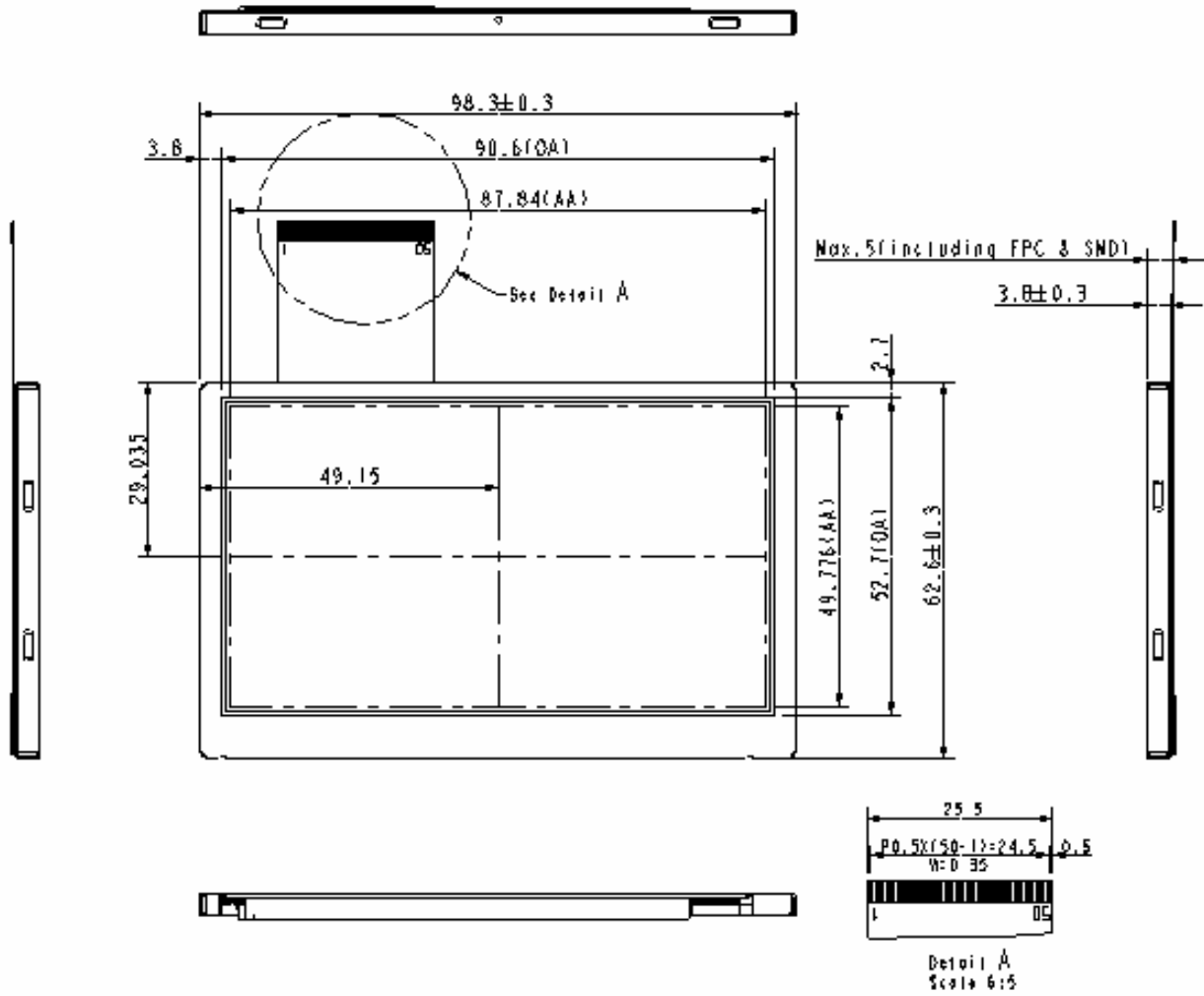
1	VSS	GND
2	VSS	GND
3	VCC	Power
4	VCC	Power
5	R0	Red Data
6	R1	Red Data
7	R2	Red Data
8	R3	Red Data
9	R4	Red Data
10	R5	Red Data
11	R6	Red Data
12	R7	Red Data
13	G0	Green Data
14	G1	Green Data
15	G2	Green Data
16	G3	Green Data
17	G4	Green Data
18	G5	Green Data
19	G6	Green Data
20	G7	Green Data
21	B0	Blue Data
22	B1	Blue Data
23	B2	Blue Data
24	B3	Blue Data
25	B4	Blue Data
26	B5	Blue Data
27	B6	Blue Data
28	B7	Blue Data
29	VSS	GND
30	DCLK	Dot clock
31	DISP	Display on/off
32	HSYNC	Hsync signal
33	VSYNC	Vsync signal
34	DE	DE signal
35	UD	Up/Down

36	NC	NC
37	VSS	GND
38	VSS	GND
39	X1	TSP control
40	Y1	TSP control
41	X2	TSP control
42	Y2	TSP control
43	VSS	GND
44	VSS	GND
45	VSS	GND
46	VLED-	LED Power+
47	VLED+	LED Power-
48	VSS	GND
49	VSS	GND
50	VSS	GND

5. MECHANICAL SPECIFICATION

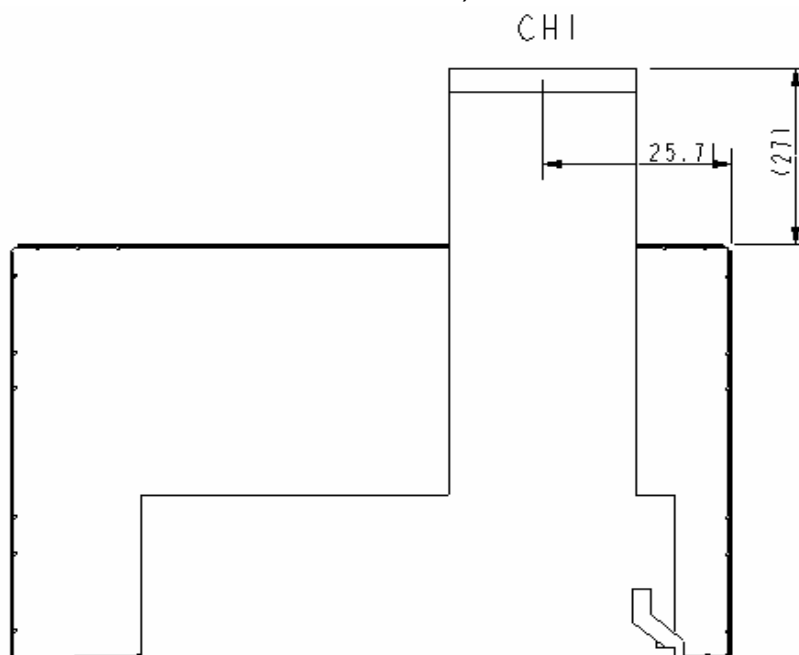
(a)Front side (Tolerance is $\pm 0.3\text{mm}$ unless noted)

[Unit: mm]



(b)Rear side (Tolerance is $\pm 0.3\text{mm}$ unless noted)

[Unit: mm]



6. OPTICAL CHARACTERISTICS

Ta = 25°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Contrast	CR	*1)	(280)	(350)	--	--
Luminance (CEN)	L	I _L = 20 mA	(160)	(200)	--	cd/m ²
Luminance Uniformity	ΔL	*3)	(70)	(80)	--	%
Color saturation			(45)	(50)		%
Response Time	Tr	*4)	--	(10)	(15)	ms
	Tf		--	(15)	(20)	ms
View angle	φ ^{*2)}		(120)	(130)		
	θ ^{*2)}	θ ^{*2)}	(100)	(110)		
Color Coordinate	Wx	θ=φ= 0°		(0.313)		
	Wy	θ=φ= 0°		(0.329)		

[Note]

Measured by BM-5A (TOPCON) under the dark room condition (no ambient light).

Measurement Condition: IL=20mA

Measures points: figure (1)

Measures Viewing Angle : figure(2) θ=ψ=0°

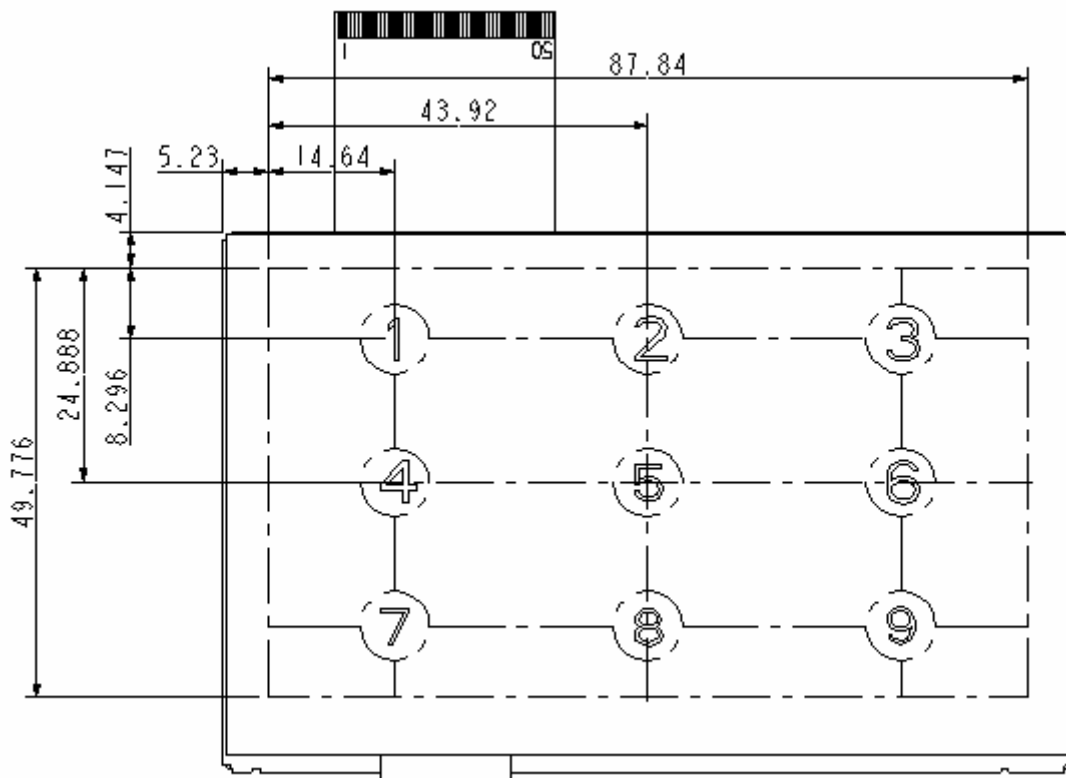


Figure (1)

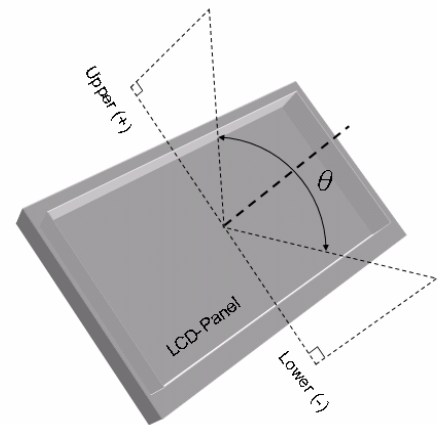
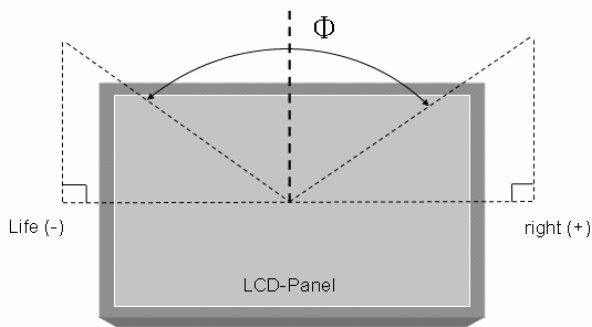


Figure (2)

***1) Definition of Contrast Ratio**

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

***2) Definition of Viewing Angle(θ,ψ)**

***3) Definition of Luminance Uniformity:**

Measure maximum luminance(L(MAX))and minimum luminance (L(MIN))on the 9 points as figure 1.Luminance Uniformity is calculated with the following formula :

$$\Delta L = [L(MIN)/L(MAX)] \times 100\%$$

***4) Definition of Response Time**

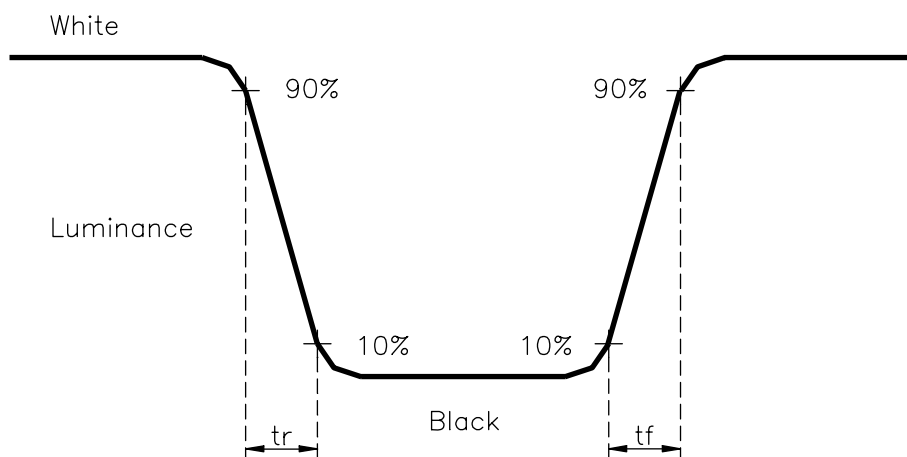


Fig.3 Definition of Response Time

7.RELIABILITY TEST CONDITIONS

(a) Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temperature Operation	85°C; 240hrs
High Temperature High Humidity Operation	60°C; 90%RH; 240hrs (No condensation)
High Temperature Storage	95°C; 240hrs
Low Temperature Operation	-30°C; 240hrs (Backlight unit always turn on)
Low Temperature Storage	-40°C; 240hrs
Thermal Shock (No operation)	Between -30°C (0.5hr) and 85°C (0.5hr); 200 Cycles

(b) Shock & Vibration

ITEMS	CONDITIONS
Shock (Non-Operation)	Shock level: 980m/s ² (100G) Waveform: half sinusoidal wave, 6ms Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of six shock inputs
Vibration (Non-Operation)	Frequency range:8~33.3Hz Stoke : 1.3 mm Vibration: sinusoidal wave, perpendicular axis(both x,z axis: 2Hrs , y axis: 4Hrs). Sweep: 2.9G, 33.3~400Hz Cycle: 15 min

(c) Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD	150pF , 330Ω , ±8kV&±15kV air & contact test	(1)
	200pF , 0Ω , ±200V contact test	(2)

[NOTE]Measure point :(1)LCD glass and metal bezel

(2)IF connector pins

(d) 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, obvious non-uniformity, or line defects.