SPECIFICATION FOR LCD MODULE

Model No. GVLCM240320G-13705A（TFT）
(2.4"TFT)

Approved	Checked	Department

CONTENTS

1. General Specifications:

1.1. FEATURES

Display Mode	Transmissive and Negative type
	TFT
Display Format	Graphic 240 (RGB)* 320 Dot-matrix (262K Color)
Viewing Direction	12:00 O'clock
Multiplexing Ratio	1/320 Duty
Screen size(inch)	2.4(Diagonal)
Controller	UC8230S
Data Transfer	16 BITS 8080 PARALLEL INTERFACE
VDD	2.8~3.3V

1-2. MECHANICAL SPECIFICATION

Item	Specifcation	Unit
Viewing Area	37.72(W)x54.4(H)	mm
Active Area	36.72(W)x50.06(H)	mm
Dots pitch	0.153(H)X0. 153 (W)	mm
Outline Dimensional	40.7(W)x57.1(H)x2.75(D) Refer to outline drawing on next page	mm
Blacklight type	White LED*4	—
VLED	3.0V(typ.)	V

*Exclude FPC outline

2. Outline Drawing

APPROVED BY:

LCD TYPE	TFT		
POLARIZER TYPE	TRANSMISSIVE	FRAME TYPE	—
DISPLAY TYPE	NEGATIVE	DATA TRANSFER	16bit 8080
LCD COLOR		CONNECTOR TYPE	FPC
VIEWING ANGLE	12:00	TECHNOLOGY	COG
OPERATING TEMP	-20°C ~ +70°C	DC-DC IC	Without
STORAGE TEMP	-30°C ~ +80°C	LCD DUTY	1/320
BACKLIGHT TYPE	Edga LED	LCD BIAS	
CONTROLLER IC	UC8230S	BACKLIGHT COLOR	WHITE
			ROHS
REMARKS	VDD=2.8V, V_{LCD}=8.6V, V_{LED}=3.0V NOTE: GENERAL TOLERANCE: X±0.3.		

Dimensions: 59.26(BL), 57.1±0.2(LCD), 53.16(TP AA), 50.06(BL A.A), 48.96(LCD A.A), 2.26, 14.55, 42.72(BL), 41.1±0.2(LCD), 37.72(BL A.A), 36.72(LCD A.A)

240(H)*3(RGB)*320(V)
View Direction (12 0'clock)

P0.8*35=28±0.1, W=0.50, 36.00, 2.00

2.75±0.1, 2.00, 34.00, 1.50, 39.72, 2-Ø1.00

CONTACT SIDE / COMPONENT AREA / Double side tape / Y-

Ver	Date	Modify Contents

NO.	ITEM	NO.	ITEM
1	NC	19	DB9
2	NC	20	DB8
3	NC	21	DB7
4	IM3	22	DB6
5	NC	23	DB5
6	RESET	24	DB4
7	VSYNC	25	DB3
8	HSYNC	26	DB2
9	DOTCLK	27	DB1
10	DEN	28	DB0
11	DB17	29	RD
12	DB16	30	WR
13	DB15	31	DC
14	DB14	32	CS
15	DB13	33	GND
16	DB12	34	VCC
17	DB11	35	LED_K
18	DB10	36	LED_A

GOLDEN VIEW

PRODUCT NO.	GVLCM240320G-13705A		
DRAWN BY	ZCS	SCALE	1:1	REV.
CHECKED BY	lzy	PAGE	1/1	A01
DATE	2009-03-16	UNIT	mm	

3.Absolute Maximum Ratings(Ta=25℃)

Item	Symbol	Min	Max	Unit	Note
Supply voltage	Vdd	-0.3	4.6	V	
Supply voltage (Logic)	VDDI	-0.3	4.6	V	
Supply voltage (Digital)	VCC	-0.3	2.4	V	
Driver supply Voltage	VGH-VGL	-0.3	33	V	
Input Voltage	Vin	-0.3	VddI+0.3	V	1,2
Logic Output voltage range	VO	-0.3	VddI+0.3	V	
Operating temperature	Topr	-20	70	℃	
Storage temperature	Tstr	-30	80	℃	
Humidity	-	-	90	%RH	

Note:

1. If the module is above these absolute maximum ratings. It may become permanently damaged.
Using the module within the following electrical characteristic conditions are also exceeded,
the module will malfunction and cause poor reliability.
2. VDD >VSS must be maintained.

4. Electrical Characteristics(Ta=25℃)

Item		Symbol	Min	Typ	Max	Unit	Note
Input Voltage (VDD=2.8V)	'H'	Vih	0.8Vdd	-	Vdd	V	
	'L'	Vil	Vss	-	0.2Vdd		
Output Voltage (VDD=2.8V)	'H'	Vih	0.8Vdd	-	Vdd	V	
	'L'	Vil	Vss	-	0.2Vdd		
Current Consumption	Normal Mode		-	25.5	-	mA	1,3
	Partiall Mode		-	TBD	TBD	uA	2

Note:
1: Display full white. Backlight on state.
2: IC on standby mode.
3: the default voltage is 2.8V, for N lights in series, the power is that the current multiply N.

5. Module Function Description

5-1. Interface Signal

Pin No.	Symbol	Level	Description
1-3,5	NC	—	No connection
4	IM3	I	NC (Connected to GND interal)
6	RESET	I	Reset input pin
7	VSYNC	I	Frame synchronization signal
8	HSYNC		Line synchronization signal
9	DOTCLK		DOT clock
10	DEN		Enable signal in RGB mode
11-28	D17-D0		Data bus
29	RD	I	Read/write control pin
30	WR	I	Read/write execution control pin
31	DC	I	Register selection input pin
32	/CS	I	Chip select input pins
33	VSS	0V	Ground
34	VDD	3.3V	Power supply voltage for logic
35	LED_K	—	Back light-
36	LED_A	—	Back light+

5-2. Interface Timing Chart

Inter 80 system CPU interfac
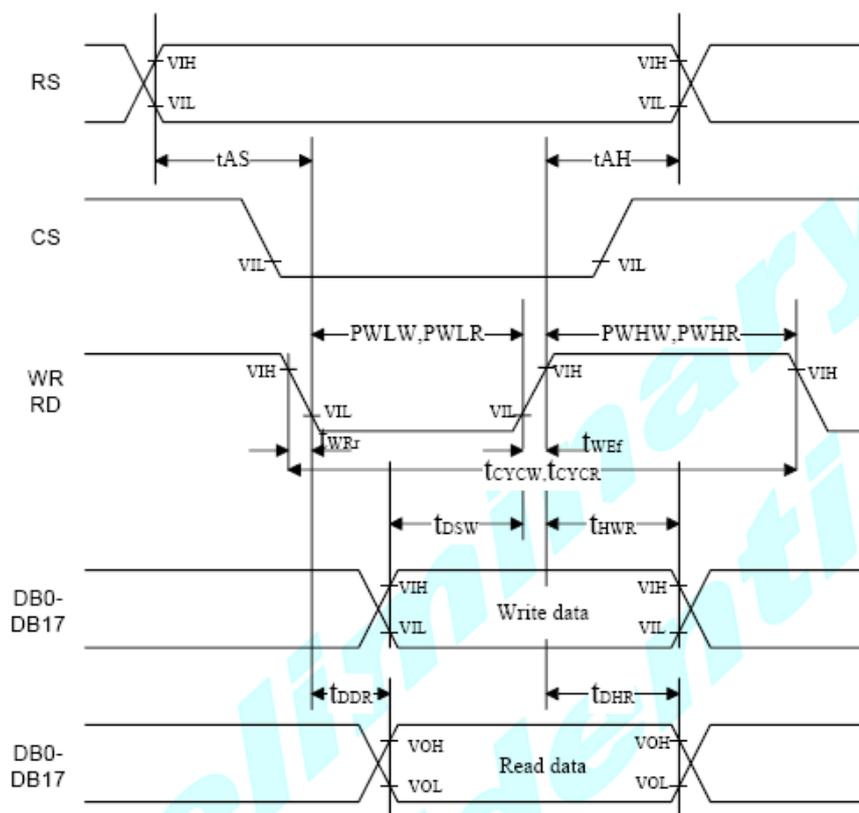
$(1.65V \leqslant V_{DD} < 2.5V, Ta = -30 \text{ to } +85^{\circ}C)$

Symbol	Signal	Description	Condition	Min.	Max.	Units
t_{CYCW}	WR	Bus cycle time Write		200	–	nS
t_{CYCR}	RD	Read		400		
PW_{LW}	WR	Write low-level pulse width		90	–	nS
PW_{LR}	RD	Read low-level pulse width		350	–	nS
PW_{HW}	WR	Write high-level pulse width		90	–	nS
PW_{HR}	RD	Read high-level pulse width		400	–	nS
t_{WRr}, t_{WRf}	WR,RD	Write/Read rise/fall time			25	nS
t_{AS}	RS to CS,WR,RD	Set up time		10	–	nS
t_{AH}	RS to CS,WR,RD	Address hold time		5		nS
t_{DSW}	WR	Write data set up time		5		nS
t_{HWR}	RD	Write data hold time		60		nS
t_{DDR}	WR	Read data delay time			200	nS
t_{DHR}	RD	Read data hold time		5		nS

5-3. Instruction Code

	Command	Reg.	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Default
1.	Index	IR	W	0	0	0	0	0	0	0	0	0					ID[7:0]				
2.	Status	SR	R	0	0	0	0	0	0	0	0	0	0	TE	MTPS	0	0	0	0	0	
3.	Set Display Enable	R00H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	AOF	MAN	OS	
4.	Device Code Read		R	1	1	0	0	0	0	0	1	0	0	0	1	1	0	0	0	0	
5.	Drive Output Control	R01H	W	1	0	0	0	0	0	SM	0	SS	0	0	0	0	0	0	0	0	0000H
6.	LCD Drive Waveform Control	R02H	W	1	0	0	0	0	0	1	BC0	EOR	0	0	0	0	0	0	0	0	0400H
7.	Entry Mode	R03H	W	1	TRI	DFM	0	BGR	0	0	0	0	ORG	0	ID1	ID0	AM	0	0	0	0030H
8.	Resize Control	R04H	W	1	0	0	0	0	0	0	RCV[1:0]		0	0	RCH[1:0]		0	0	RSZ[1:0]		0000H
9.	Display Control (1)	R07H	W	1	0	0	PTDE[1:0]		0	0	0	BASE	0	VON	GON	DTE	COL	0	D1	D0	
10.	Display Control (2)	R08H	W	1	0	0	0	0	FP[3:0]				0	0	0	0	BP[3:0]				0808H
11.	Display Control (3)	R09H	W	1	0	0	0	0	0	0	PTS[1:0]		0	0	PTG[1:0]		ISC[3:0]				0000H
12.	Display Control (4)	R0AH	W	1	0	0	0	0	0	0	0	0	0	0	0	0	FMAR KOE	FMI[2:0]			
13.	Ext. Display Interface Ctrl 1	R0CH	W	1	0	ENC[2:0]			0	0	0	RM	0	0	DM[1:0]		0	0	RIM[1:0]		0000H
14.	Frame Marker Control	R0DH	W	1	0	0	0	0	0	0	0		FMP[8:0]								0000H
15.	Ext. Display Interface Ctrl 2	R0FH	W	1	0	0	0	0	0	0	0	0	0	0	0	VSPL	HSPL	0	EPL	DPL	0000H
16.	Power Control (1)	R10H	W	1	0	0	0	SAP	0	BT[2:0]			APE	0	AP[1:0]		0	DSTB	SLP	0	0000H
	Power Control (2)	R11H	W	1	0	0	0	0	0	0	DC1[1:0]		0	0	DC0[1:0]		0	VC[2:0]			0000H
	Power Control (3)	R12H	W	1	P5V MD	0	0	0	0	PDC4	PDC2	PDC1	1	PON4	PON2	PON1	VRH[3:0]				00F0H
	Power Control (4)	R13H	W	1	0	0	VDV[5:0]						0	0	VCM[5:0]						
17.	Setting Disable	R17H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PSE	
18.	RAM Address Set - Horizontal	R20H	W	1	0	0	0	0	0	0	0	0	AD[7:0]								
19.	RAM Address Set - Vertical	R21H	W	1	0	0	0	0	0	0	0		AD[16:8]								
20.	RAM Data Write / Read	R22H	W	1	WR17-0																
			R	1	RD17-0																
21.	γ- Control (1)	R30H	W	1	0	0	0	0	0	PKP1[2:0]			0	0	0	0	0	PKP0[2:0]			00H
	γ- Control (2)	R31H	W	1	0	0	0	0	0	PKP3[2:0]			0	0	0	0	0	PKP2[2:0]			00H
	γ- Control (3)	R32H	W	1	0	0	0	0	0	PKP5[2:0]			0	0	0	0	0	PKP4[2:0]			00H
	γ- Control (4)	R33H	W	1	0	0	0	0	0	0	PFP1[1:0]		0	0	0	0	0	0	0	0	00H
	γ- Control (5)	R34H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PFP2[1:0]		00H
	γ- Control (6)	R35H	W	1	0	0	0	0	0	PRP1[2:0]			0	0	0	0	0	PRP0[2:0]			00H
	γ- Control (7)	R36H	W	1	0	0	0	VRP1[4:0]					0	0	0	VRP0[4:0]					00H
	γ- Control (8)	R37H	W	1	0	0	0	0	0	PKN1[2:0]			0	0	0	0	0	PKN0[2:0]			00H
	γ- Control (9)	R38H	W	1	0	0	0	0	0	PKN3[2:0]			0	0	0	0	0	PKN2[2:0]			00H
	γ- Control (10)	R39H	W	1	0	0	0	0	0	PKN5[2:0]			0	0	0	0	0	PKN4[2:0]			00H
	γ- Control (11)	R3AH	W	1	0	0	0	0	0	0	PFN1[1:0]		0	0	0	0	0	0	0	0	00H
	γ- Control (12)	R3BH	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	PFN2[1:0]		00H
	γ- Control (13)	R3CH	W	1	0	0	0	0	0	PRN1[2:0]			0	0	0	0	0	PRN0[2:0]			00H
	γ- Control (14)	R3DH	W	1	0	0	0	VRN1[4:0]					0	0	0	VRN0[4:0]					00H
22.	Checksum Control	R41H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	DAE	IRE	0000H
23.	IR Checksum	R42H	W	1	0	0	0	0	0	0	0	0	IRCK[7:0]								0000H
24.	DT Checksum	R43H	W	1	DACK[15:0]																0000H
25.	Windows Horizontal Start Addr.	R50H	W	1	0	0	0	0	0	0	0	0	HSA[7:0]								
26.	Windows Horizontal End Addr.	R51H	W	1	0	0	0	0	0	0	0	0	HEA[7:0]								
27.	Windows Vertical Start Addr.	R52H	W	1	0	0	0	0	0	0	0		VSA[8:0]								
28.	Windows Vertical End Addr.	R53H	W	1	0	0	0	0	0	0	0		VEA[8:0]								
29.	Driver Output Control	R60H	W	1	GS	0	NL[5:0]						0	0	SCN[5:0]						
30.	Base Image Display Control	R61H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	NDL	VLE	REV	
31.	Vertical Scroll Control	R6AH	W	1	0	0	0	0	0	0	0		VL[8:0]								
32.	Partial Image 1 Display Position	R80H	W	1	0	0	0	0	0	0	0		PTDP0[8:0]								
33.	Partial Image 1 Start RAM Addr.	R81H	W	1	0	0	0	0	0	0	0		PTSA0[8:0]								
34.	Partial Image 1 End RAM Addr.	R82H	W	1	0	0	0	0	0	0	0		PTEA0[8:0]								
35.	Partial Image 2 Display Position	R83H	W	1	0	0	0	0	0	0	0		PTDP1[8:0]								
36.	Partial Image 2 Start RAM Addr.	R84H	W	1	0	0	0	0	0	0	0		PTSA1[8:0]								
37.	Partial Image 2 End RAM Addr.	R85H	W	1	0	0	0	0	0	0	0		PTEA1[80]								
38.	Panel Interface Control 1	R90H	W	1	0	0	0	0	0	0	DIV[1:0]		0	0	0	RTNI[4:0]					
	Panel Interface Control 2	R92H	W	1	0	0	0	0	0	NOWI[2:0]			0	0	0	0	0	0	0	0	
	Panel Interface Control 3	R93H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	MCPI[2:0]			
	Panel Interface Control 4	R95H	W	1	0	0	0	0	0	0	DIVE[1:0]		0	0	RTNE[5:0]						
	Panel Interface Control 5	R97H	W	1	0	0	0	0	NOWE[3:0]				0	0	0	0	0	0	0	0	
	Panel Interface Control 6	R98H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	MCPE[2:0]			
39.	Calibration Control	RA4H	W	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	CALB	

	Command	Reg.	R/W	RS	D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	Default
40.	MTP Register	R46H	W	1	--	--	--	--	--	--	--	MATCH	--	--	MP1	MP0	--	--	MTPign	MTP_EN	
41.	MTP Timer	RC9H	W	1	WRTIMER								RDTIMER								
42.	MTP Cell	RCAH	W	1	MTPID[1:0]		MVDV[5:0]						--	--	--	MVCM[5:0]					

6. Electro-Optical Characteristics

Item	Symbol		Condition	Min.	Typ.	Max.	Unit	Note
Brightness	Bp		θ=0° Φ=0°	-	200	-	Cd/m^2	1
Uniformity	$\triangle$Bp			80%	-	-		1,2
Viewing Angle	θ1 (Φ=90° or270°)		Cr≥10		-27～+60		Deg	3
	θ2 (Φ=0° or 180°)				-50～+50			
Contrast Ratio	Cr		θ=0° Φ=0°		301.5		-	4
Response Time	t_{on}			-	15	30	ms	5
	t_{off}			-	35	50	ms	
Color of CIE Coordinate	W	x	θ=0° Φ=0°	-	-	-	-	1,6
		y		-	-	-	-	
	R	x		-	-	-	-	
		y		-	-	-	-	
	G	x		-	-	-	-	
		y		-	-	-	-	
	B	x		-	-	-	-	
		y		-	-	-	-	
NTSC Ratio	S			60.5%	-			

Note：The parameter is slightly changed by temperature, driving voltage and materiel.
Note 1: The data are measured after LEDs are turned on for 5 minutes. LCM displays full white.
The brightness is the average value of 9 measured spots. Measurement equipment PR-705 (Φ8mm)
Measuring condition:

- Measuring surroundings: Dark room.
- Measuring temperature: Ta=25℃.
- Adjust operating voltage to get optimum contrast at the center of the display.
Measured value at the center point of LCD panel after more than 5 minutes whilebacklight turning on.
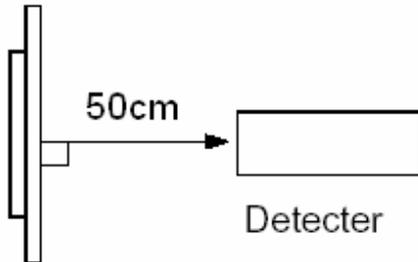
Note 2: The luminance uniformity is calculated by using following formula.
$\triangle$Bp = Bp (Min.) / Bp (Max.)×100 (%)
Bp (Max.) = Maximum brightness in 9 measured spots
Bp (Min.) = Minimum brightness in 9 measured spots.
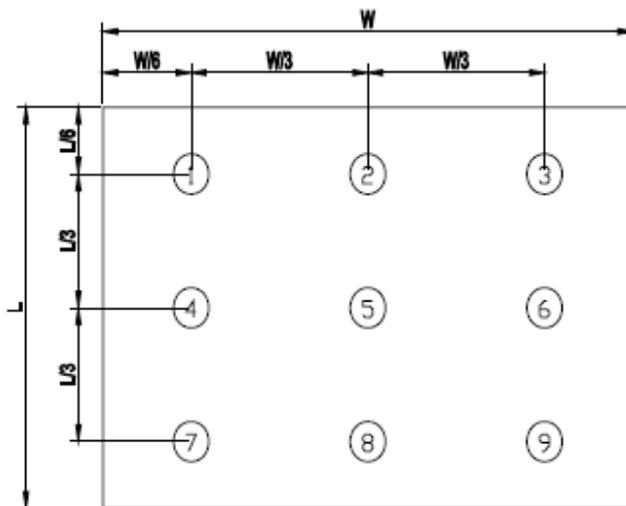
Measurement equipment PR-705 (Φ8mm)
Note 3: The definition of viewing angle:
Refer to the graph below marked by θ and Φ
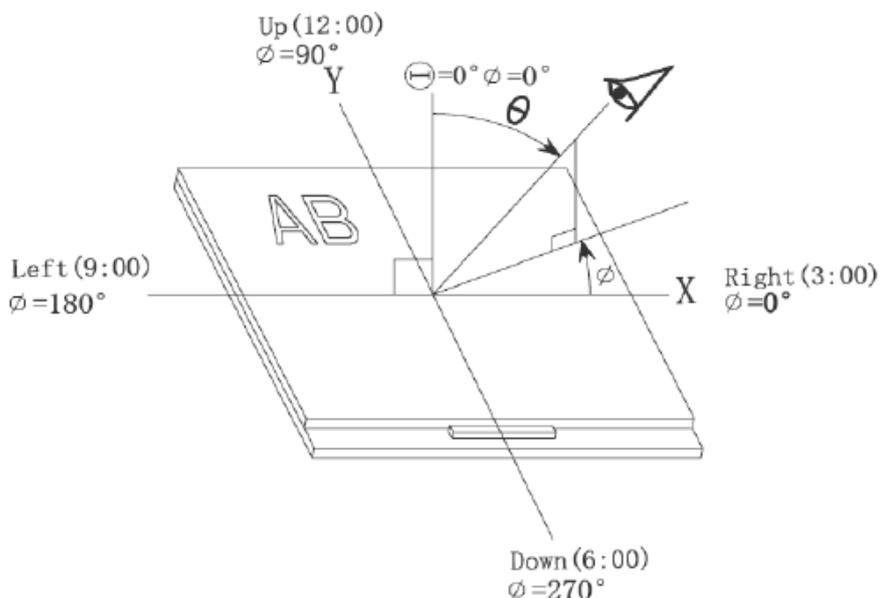
Note 4: The definition of contrast ratio (Test LCM using PR-705):

$$CR = \frac{\text{Luminance When LCD is at "White" state}}{\text{Luminance When LCD is at "Black" state}}$$

(Contrast Ratio is measured in optimum common electrode voltage)

Note 5: Definition of Response time. (Test LCD using DMS501):

The output signals of photo detector are measured when the input signals are changed
from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The
response time is defined as the time interval between the 10% and 90% of amplitudes.Refer to figure as below.
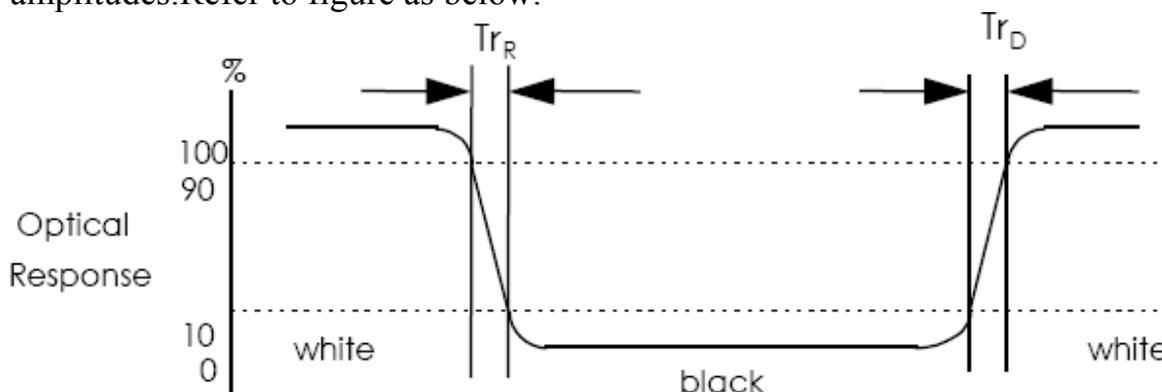

The definition of response time

Note 6: Definition of Color of CIE Coordinate and NTSC Ratio.

1931 CIE Chromaticity Diagram
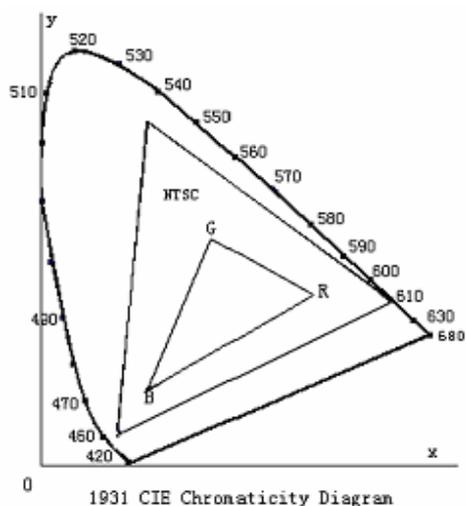
Color gamut:

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

7. Lightguide specification
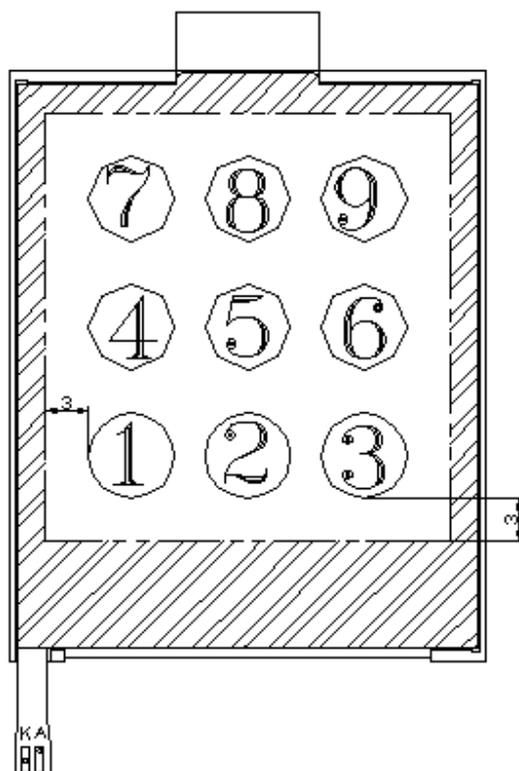
Item		Symbol	Min	Typ	Max	Unit	Condition
Forward voltage		Vf	-	3.3	3.4	V	If=60mA
Forward Current		If	-	60	-	mA	
Luminance	Master Screen	Lv	2000	2500	-	Cd/m²	If=30mA

Colour coordinate	X	0.260		0.315	If=30mA
	Y	0.260		0.315	

Note:
1. Average Luminous Intensity of P1⌒ P9
2. Luminous Uniformity =(MIN / MAX)*100%
3. Luminous Uniformity required ≧80%

8. Reliability

8-1.MTBF
The LCD module shall be designed to meet a minimum MTTF value of 50000 hours with normal. (25°C in the room without sunlight)

8-2. Content of Reliability Test

NO.	Test Item	Content of Test	Condition
1	High Temperature Storage	Endurance test applying the high temperature for a long time	+80℃, 96H
2	Low Temperature Storage	Endurance test applying the low temperature for a long time	-30℃, 96H
3	High Temperature/Humidity Storage	Endurance test applying the high temperature and high humidity for a long time	60℃, 90% RH, 96H
4	Heat Shock	Endurance test applying The low and high temperature cycles -20℃←→ 25℃←→ +70℃ (30min) ←→ (5min)←→（30min） 1 Cycle	-20℃/ +70℃ 5 cycle

Note: Test after 2 hours in room temperature.

9. Inspection Criteria

9-1. Environmental conditions
The environmental conditions for inspection shall be as follows
Room temperature: 20±3°C
Humidity: 65±20%RH

9-2.The external visual inspection
With a single 20-watt fluorescent lamp as the light source, the inspection was in the distance of 30cm or more from the LCD to the inspector's eyes.