

SPECIFICATIONS

CUSTOMER : _____

MODEL NO. : **GFC1202B-YPFE-JP**

VERSION : **B**

DATE : **2012.10.18**

CERTIFICATION : **ROHS**

Customer Sign	Approved By	Prepared By	Prepared By

Revision Record

Data(y/m/d)	Ver.	Description	Note	page
2010.06.02	A	Specification released		
2012.10.18	B	Modify VOP 4.4 to 3.85V		

LCM Dimension

CONTENTS

- 1. Precautions in use of LCM
- 2. Mechanical Specifications
- 3. Backlight Characteristic
- 4. Absolute Maximum Ratings
- 5. DC Electrical Characteristics
- 6. Optical Characteristics
- 7. Interface Pin Description



8. Reliability
9. Timing Characteristics
10. Display Command
11. Relationship Between Character Code (DDRAM) and Character Pattern (CGRAM)
12. Character Pattern

1. Precautions in use of LCM

1.1 Use Modules

1. When modules switch on or off, after accessing positive supply power with 5 ± 0.5 voltage, then input signal levels, if signal levels input before supply power becomes stable or switches off, IC circuits off, modules will be damaged, as a result, modules will be damaged.
2. Dot matrix modules are high path-number LCDs, they are largely related to the contrast, view angle, driving voltage when displaying, so you should adjust it to get best contrast and view angle, if it is too high, not only displays are effected, but also let life shorted.
3. When using under regulated working temperature below, the display responsiveness is too slow, when using under regulated temperature above, whole display surface turns dark, this is not damaged, when the temperature returns normal, all displays become normal

1.2 Module storage

1. Storing temperature: $-30 \sim +80$
2. Place in dark sites to avoid strong lights
3. Don't place other thing on their surfaces
4. Packaged in polyer materials (with anti-static electricity layers) and sealed

1.3 Soldering

1. Iron head temperature: 280 ± 10
2. Soldering time: $< 3-4S$
3. Soldering material: eutectic nature, low melting point
4. Don't use acid solder
5. Soldering don't repeat above 3 times

2. Mechanical Specifications

Item	Value	Unit
Number of Characters	12X2	Character
Character Format	5 8 Dots	-
Character Pitch	3.2(W) 6.2(H)	mm
Character Size	2.65(W) X5.5(H)	mm
Dot size	0.45(W) 0.6(H)	mm
Dot pitch	0.55(W) 0.7(H)	mm
Module dimension	55.7 (W) 32(H) 12.8MAX(T)	mm
Active Area	37.85(W) 11.7(H)	mm
Viewing Area	46.7(W) X 17.5(H)	mm
Lcd type	STN Yellow-Green Positive Transflective	
Controller	SPLC708D1-001A	
Duty	1/16	-
Bias	1/5	-
Viewing direction	6 O'clock	-
Backlight	WHITE	-
Module	No Connector	

3. Backlight Characteristic

3.1 Electrical / optical specifications

Ta = 25°C

Forward voltage	V_f	If=40mA, White	2.9	3.2	3.6	V
LED *Luminous Intensity	I_v	If=40mA, White	--	150	--	Cd/m2
Chromaticity Coordinate	x	If=40mA, White	0.26	0.31	0.36	
	y		0.25	0.32	0.37	
Reverse Current	I_R	VR=5V, White	--	--	0.1	mA

Note: * Measured at the bare LED back-light unit.

3.2 LED Maximum Operating Range





Power Dissipation	P_{AD}	144	mW
Forward Current	I_F	40	mA
Reverse Voltage	V_R	5	V

4. Absolute Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply Voltage	V_{DD}	-	-0.3	7.0	V
Input voltage Range	V_{IN}	-	-0.3	$V_{DD}+0.3$	V
Operating temperature	$TOPR$	-	-20	70	
Storage temperature	$TSTG$	-	-30	80	
Static electricity	Be sure that you are grounded when handling LCM				

Notes: 1. Exceeding the absolute maximum ratings may cause permanent damage to the device.
Functional operation under these conditions is not implied.

5. DC Electrical Characteristics (Without LED back-light)

Characteristic	Symbol	Condition	Min.	Typ.	Max.	Unit
Operating Voltage	V_{DD}	--	4.5	5.0	5.5	V
Supply Current	I_{DD}	Internal oscillation or external clock ($V_{DD}=5.0V, f_{OSC}=270kHz$)	--	1.5	2	mA
Input Voltage(1) (except OSC1)	V_{IH1}	--	$0.7 V_{DD}$	--	V_{DD}	V
	V_{IL1}	--	-0.3	--	0.6	
Input Voltage(2) (OSC1)	V_{IH2}	--	$V_{DD}-1$	--	V_{DD}	V
	V_{IL2}	--	--	--	1.0	
Output Voltage(1) (DB0 to DB7)	V_{OH1}	$I_{OH}=-0.1mA$	3.9	--	V_{DD}	V
	V_{OL1}	$I_{OL}=0.1mA$	--	--	0.4	
Output Voltage(2) (DB0 to DB7)	V_{OH2}	$I_o=-40\mu A$	$0.9V_{DD}$	--	V_{DD}	V
	V_{OL2}	$I_o=40\mu A$	--	--	$0.1V_{DD}$	
Voltage Drop	V_{dCOM}	$I_o=0.1mA$	--	--	1	V
	V_{dSEG}		--	--	1	
Input Leakage Current	I_{IKG}	$V_{IN}=0V$ to V_{DD}	-1	--	1	μA

Input Low Current	I_{IL}	$V_{IN}=0V, V_{DD}=5V$ (Pull Up)	-50	-125	250	
Internal Clock (external Rf)	f_{OSC1}	$Rf=91k\Omega \pm 2\%$ ($V_{DD}=5V$)	190	270	350	kHz
External Clock	f_{OSC}	--	125	270	410	kHz
	duty		45	50	55	%
	t_R, t_F		--	--	0.2	μS
LCD Driving Voltage	V_{LCD}	$V_{DD}-V_s$ (1/5, 1/4 Bias)	3.0	--	10.0	V

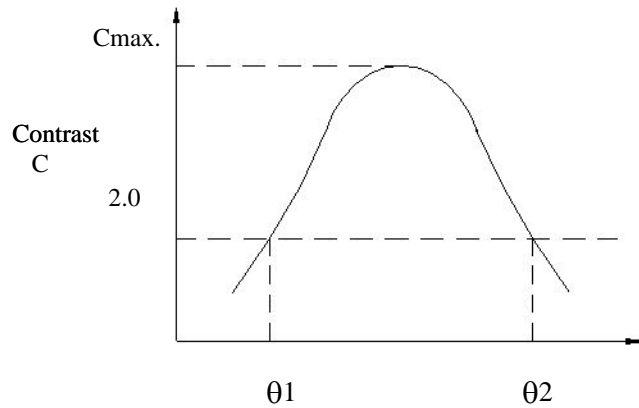
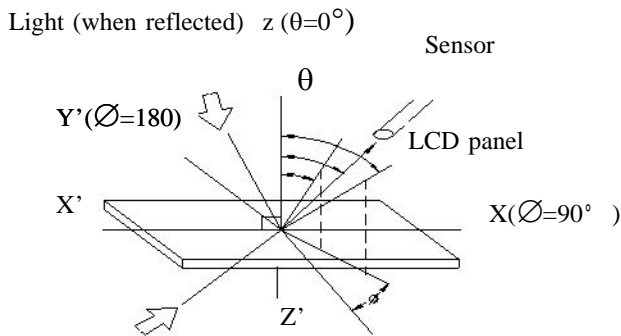
6. Optical Characteristics

1/16 duty, 1/5 bias, $V_{op}=3.85V$, $T_a=25$

Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Driving voltage	$V_{op}=V_{DD}-V_O$		--	3.85	--	
Viewing angle	θ	$C>2.0, \varnothing=0^\circ C$	30°	-	-	Notes 1 & 2
Contrast	C	$\theta=5^\circ, \varnothing=0^\circ$	3.0	-	-	Note 3
Response time(rise)	t_{on}	$\theta=5^\circ, \varnothing=0^\circ$	-	-	256ms	Note 4
Response time(fall)	t_{off}	$\theta=5^\circ, \varnothing=0^\circ$	-	-	242ms	Note 4

Note 1: Definition of angles θ and \varnothing

Note 2: Definition of viewing angles θ_1 and \varnothing_2



Light (when transmitted) $Y(\varnothing=0^\circ)$
 $(\theta=90^\circ)$

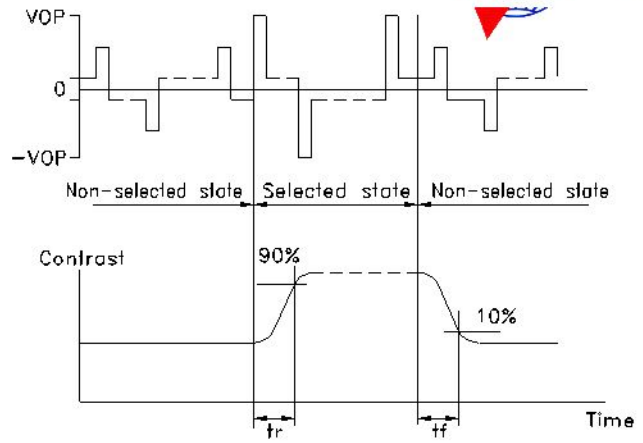
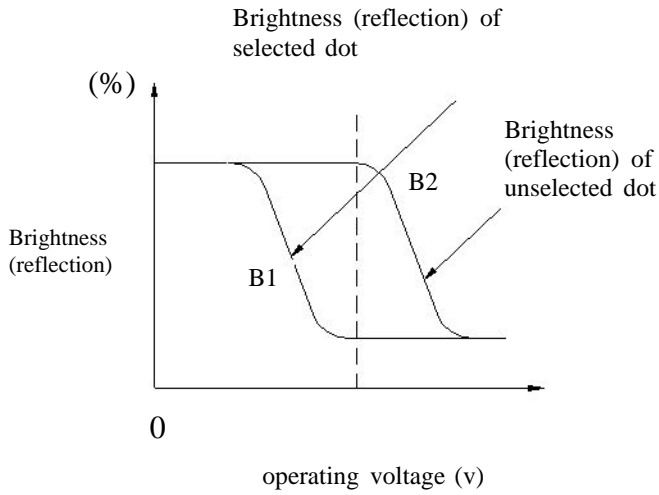
viewing angle θ (fixed)

Note : Optimum viewing angle with the naked eye and viewing angle θ at C_{max} . Above are not always the same

Note 3: Definition of contrast C

Note 4: Definition of response time

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$



Note: Measured with a transmissive LCD panel which is displayed 1 cm²

V_{OPR} : Operating voltage

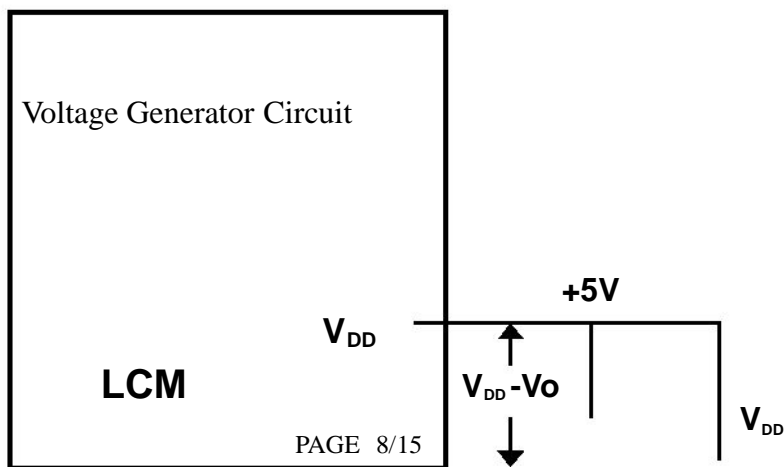
f_{FRM} : Frame frequency

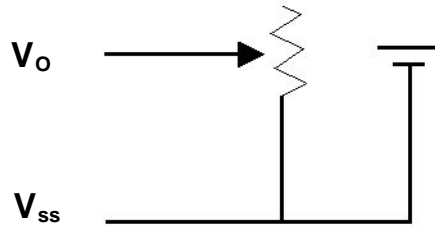
t_{ON} : Response time (rise)

t_{OFF} : Response time (fall)

7. Interface Pin Description

NO.	Symbol	Function
1	VSS	Ground (0V)
2	VDD	Power supply for Logic circuit
3	VO	Power Supply for Driving the LCD
4	RS	Data / Instruction select
5	R/W	Read / Write select
6	E	Enable signal
7-14	DB0-DB7	Data Bus line
15	LED A	Power supply for LED





$V_{DD} - V_o$: LCD Driving Voltage
 V_R : 10K~20K

8. RELIABILITY

Test item	Test condition	Evaluation and assessment
Operation at high temperature and humidity	40°C±2°C 90%RH for 500hours	No abnormalities in functions* and appearance**
Operation at high temperature	60°C±2°C for 500 hours	No abnormalities in functions* and appearance**
Heat shock	-20± ~ +60°C Left for 1 hour at each temperature, transition time 5 min, repeated 10times	No abnormalities in functions* and appearance**
Low temperature	-20±2°C for 500 hours	No abnormalities in functions* and appearance**
Vibration	Sweep for 1 min at 10 Hz, 55Hz, 10Hz, amplitude 1.5mm 2 hrs each in the X,Y and Z directions	No abnormalities in functions* and appearance**
Drop shock	Dropped onto a board from a height of 10cm	No abnormalities in functions* and appearance**

* Dissipation current, contrast and display functions

** Polarizing filter deterioration, other appearance defects

8.1 Liquid crystal panel service life

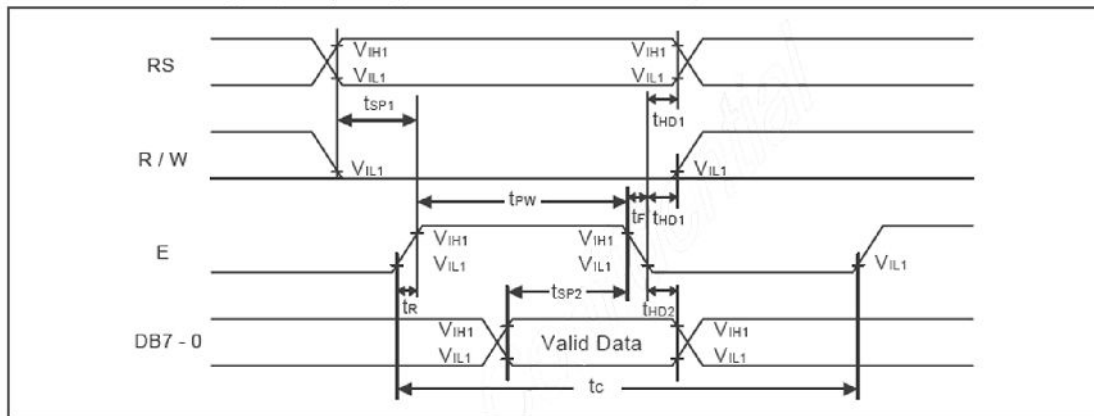
100,000 hours minimum at 25°C±10°C

8.2 Definition of panel service life

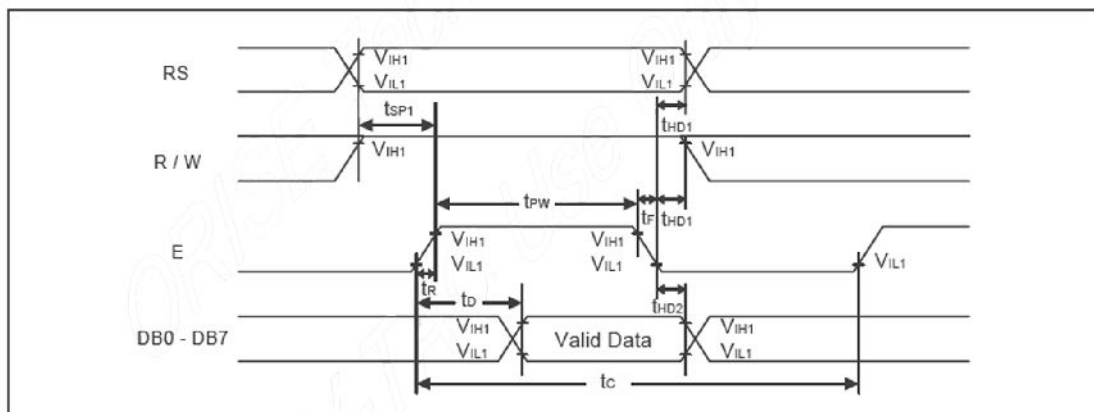
- Contrast becomes 30% of initial value
- Current consumption becomes three times higher than initial value
- Remarkable alignment deterioration occurs in LCD cell layer
- Unusual operation occurs in display functions

9. Timing Characteristics

Write mode timing diagram (Writing Data from MPU to SPLC780D1)



Read mode timing diagram (Reading Data from SPLC780D1 to MPU)



Write mode (Writing Data from MPU to SPLC780D1)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_c	400	-	-	ns	Pin E
E Pulse Width	t_{PW}	150	-	-	ns	Pin E
E Rise/Fall Time	t_r, t_f	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	30	-	-	ns	Pins: RS, R/W, E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W, E
Data Setup Time	t_{SP2}	40	-	-	ns	Pins: DB0 - DB7
Data Hold Time	t_{HD2}	10	-	-	ns	Pins: DB0 - DB7

Read mode (Reading Data from SPLC780D1 to MPU)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min.	Typ.	Max.		
E Cycle Time	t_c	400	-	-	ns	Pin E
E Pulse Width	t_w	150	-	-	ns	Pin E
E Rise/Fall Time	t_r, t_f	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	30	-	-	ns	Pins: RS, R/W, E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W, E
Data Output Delay Time	t_D	-	-	100	ns	Pins: DB0 - DB7
Data hold time	t_{HD2}	5.0	-	-	ns	Pin DB0 - DB7

10. Display Command

Instructions	Instruction Code										Description	Execution Time (fosc= 270KHZ)
	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set DDRAM address to "00H" from AC.	1.52ms
Return Home	0	0	0	0	0	0	0	0	1	x	Set DDRAM address to "00H" from AC and return cursor to it's original position if shifted. The contents of DDRAM are not changed.	1.52ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction and make shift of entire display enable.	38µs
Display ON/OFF Control	0	0	0	0	0	0	1	D	C	B	Sets display (D), cursor(C), and blinking of cursor(B) on/off control bit.	38µs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	38µs
Function Set	0	0	0	0	1	DL	N	F	x	x	Set interface data length (DL:4 - bit/8-bit), numbers of display line (N: 1-line/2-line), display font type(F:5*8 dots/5*11 dots)	38µs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	38µs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address counter.	38µs
Read Busy Flag and Address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	0µs
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	38µs

Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	3
--------------------	---	---	----	----	----	----	----	----	----	----	--	---

"x":don't care

11. Relationship between Character Code(DDRAM) and Character Pattern(CGRAM)

Figure 1

Character Code (DDRAM data)								CGRAM Address						CGRAM Data								Pattern number
D7	D6	D5	D4	D3	D2	D1	D0	A5	A4	A3	A2	A1	A0	P7	P6	P5	P4	P3	P2	P1	P0	
0	0	0	0	x	0	0	0	0	0	0	0	0	0	x	x	x	0				0	pattern 1
											0	0	1					0	0	0		
											0	1	0					0	0	0		
											0	1	1					0	0	0		
											1	0	0					0	0	0		
											1	0	1					0	0	0		
											1	1	0					0	0	0		
											1	1	1				0	0	0	0	0	
0	0	0	0	x	1	1	1	1	1	1	0	0	0	x	x	x		0	0	0		pattern 8
											0	0	1					0	0	0		
											0	1	0					0	0	0		
											0	1	1					0	0	0		
											1	0	0					0	0	0		
											1	0	1					0	0	0		
											1	1	0					0	0	0		
											1	1	1				0	0	0	0	0	

* 'x': dont care

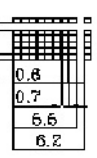
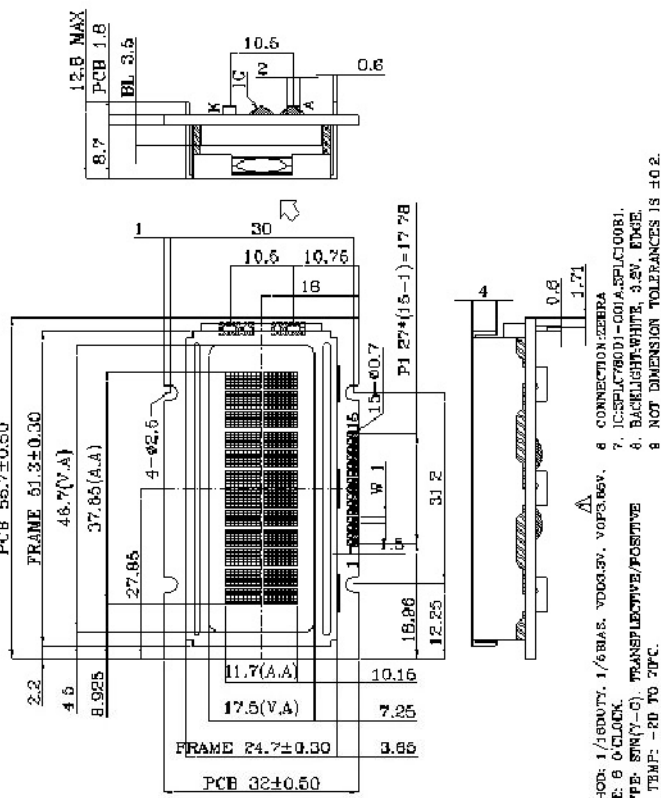


12. Character Pattern

Upper 4 bit Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLL	HHLH	HHHL	HHHH
LLLL				0	1	2	3	4	5	6	7	8	9	A	B	C
LLLH			!	1	A	Q	a	g			。	ア	キ	ウ	当	白
LLHL			"	2	B	R	b	r			「	イ	ウ	×	月	日
LLHH			#	3	C	S	c	s			」	ウ	テ	毛	三	※
LHLL			\$	4	D	T	d	t			レ	エ	ト	巾	内	分
LHLH			%	5	E	U	e	u			。	オ	大	工	区	国
LHHL			&	6	F	V	f	v			ヲ	力	二	目	白	区
LHHH			'	7	G	W	g	w			ヲ	キ	又	又	又	又
HLLL			(8	H	X	h	x			イ	ウ	幸	リ	丁	又
HLLH)	9	I	Y	i	y			ウ	丁	ル	丁	丁	丁
HLHL			*	0	J	Z	j	z			エ	コ	ウ	レ	丁	丁
HLHH			+	1	K	0	k	0			オ	オ	日	日	※	又
HHLL			,	<	L	1	l	1			カ	ウ	ウ	ウ	ウ	又
HHLH			=	=	M	2	m	2			ユ	又	<	ウ	又	又
HHHL			.	>	N	3	n	3			ヨ	又	ウ	ウ	又	又
HHHH			/	?	O	4	o	4			ウ	ウ	又	又	又	又

ROHS

PIN NAME	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
VSS	VDD	VO	RS	R7#	E	DB0	DB1	DB2	DB3	DB4	DB5	DB6	DB7	A	



NOTES:
 1. DRIVE METHOD: 1/16DUTY, 1/6BIAS, VDD4.5V, VDD3.85V. 6 CONNECTION ZERRA
 2. VIEW ANGLE: 60 DEGREE
 3. DISPLAY TYPE: SPM(Y-C), TRANSPARENT/POSITIVE
 4. OPERATING TEMP: -20 TO 30°C
 5. STORAGE TEMP: -30 TO 80°C
 6. NOT DIMENSION TOLERANCES IS ±0.2

日期	版本	修改内容		
121018	01	原VOP4 4V, 改為3.85V		
			DATE	2010.04.20
			REV	01
		UNIT - mm	Product: GFC1202B-YPF6-JP(MD)	
		SCALE: 1/1	DRAWN	Hazel
		SHEET: 1/1	CHECKED:	Domlin
				Page: 1/1