

SPECIFICATIONS

COSTOMER	-	
MODEL NO.	:_	GFC1202B-YPFE-JPD
VEDSION	•	C

DATE : <u>2012.10.18</u>

CERTIFICATION: ROHS

Customer Sign	Approved By	Prepared By	Prepared By

Revision Record

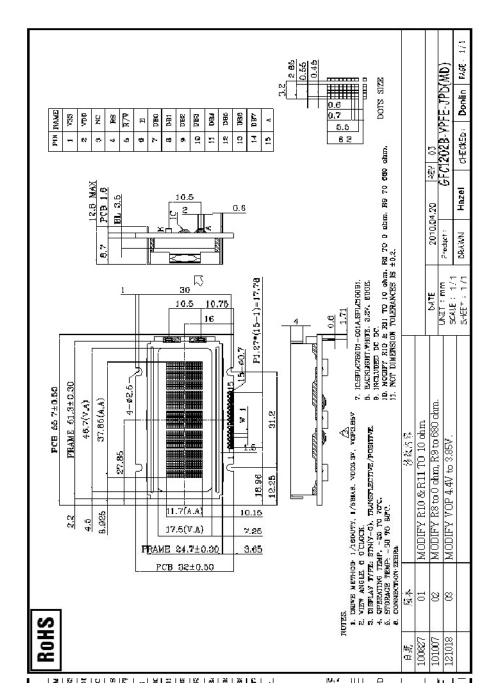
Data(y/m/d)	Ver.	Description	Note	page
2010.08.30	A	Specification released		
2010.10.07	В	Modify R8 to 0 O,R9 to 680O		
2012.10.18	С	Modify VOP 4.4 to 3.85V		

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LCM Dimension







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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 it 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. Storaging temperature:-30~+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) O. 6(H)	mm
Dot pitch	0.55(W) O. 7(H)	mm
Module dimension	55.7 (W) 32(H) 12 8NAX(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	-
Built-in	DC - DC	-
Module	R10 & R11 to 10O	
	R8 to 0O, R9 to 680O	



3. Backlight Characteristic

3.1 Electrical / optical specifications

 $Ta = 25^{\circ}C$

			1a – 25			
Item	Symbol	Condition	Min.	Typ.	Max.	Unito
Forward voltage	$ m V_{ m f}$	V _f If=40mA, White		3.2	3.6	V
LED *Luminous Intensity	$I_{\rm v}$	If=40mA, White		150		Cd/m2
Chromaticity Coordinate	X	x If=40mA, White		0.31	0.36	
	У		0.25	0.32	0.37	
Reverse Current	$\mathbf{I}_{ ext{R}}$	VR=5V, White			0.1	mA

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

3.2 LED Maximum Operating Range

Item	Symbol	White	Unit
Power Dissipation	$P_{\scriptscriptstyle{AD}}$	144	mW
Forward Current	$I_{\scriptscriptstyle F}$	40	mA
Reverse Voltage	$V_{\scriptscriptstyle R}$	5	V

4. Absolute Maximum Ratings

Item	Symbol	Conditions	Min.	Max.	Unit
Power supply Voltage	Vdd	-	-0.3	7.0	V
Input voltage Range	Vin	-	-0.3	VDD+0.3	V
Operating temperature	TOPR	-	-20	70	
Storage temperature	Tstg	-	-30	80	
Static electricity	Be sure that you are grounded when handing 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.	Тур.	Max.	Unit
Operating Voltage	$V_{\scriptscriptstyle DD}$		2.7	3.3	4.5	V
Supply Current	$I_{\scriptscriptstyle DD}$	Internal oscillation or external clock (V _{DD} =5.0V,f _{OSC} =270kHz)		0.2	0.4	mA
Input Voltage(1)	$V_{\text{IH}1}$ $V_{\text{IL}1}$		0.7 V _{DD} -0.3		0.55	V
(except OSC1)	▼ ILI				0.55	
Input	$V_{{ m IH}2}$		$0.7V_{DD}$		V _{DD}	V
Voltage(2) (OSC1)	$V_{\scriptscriptstyle \rm IL2}$	-1	-0.2		0.2 V _{DD}	
Output	$V_{\scriptscriptstyle OH1}$	I_{OH} =-0.1mA	0.75V _{DD}			_ V
Voltage(1) (DB0 to DB7)	$\mathbf{V}_{\text{OL}1}$	$I_{\text{OL}}\!=\!0.1\text{mA}$			0.2 V _{DD}	
Output	$V_{{ m OH2}}$	I _o =-40μA	$0.8V_{\scriptscriptstyle m DD}$			V
Voltage(2) (DB0 to DB7)	$ m V_{OL2}$	I_o =40 μA			0.2V _{DD}	
Voltage Drop	Vd_{COM}	I _o =0.1mA			1	V
	Vd_{SEG}				1	
Input Leakage Current	${ m I}_{ m IKG}$	V_{IN} =0V to V_{DD}	-1		1	μА

Input Low	$I_{\scriptscriptstyle \rm IL}$	$V_{IN}=0V, V_{DD}=5V$	-10	-50	120	7.0
Current		(Pull Up)				
Internal	$f_{ m OSC1}$	$Rf=91kO \pm 2\% \ (V_{DD}=5V)$	190	270	350	kHz
Clock						
(external Rf)						
External	$f_{ m osc}$		125	250	350	kHz
Clock	duty		45	50	55	%
	$t_{\scriptscriptstyle R}, t_{\scriptscriptstyle F}$				0.2	μS
LCD Driving	V_{LCD}	$V_{DD}-V_{5}$	3.0		8.0	V
Voltage		(1/5,1/4 Bias)				

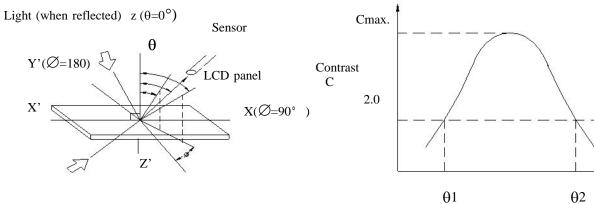
6. Optical Characteristics

1/16 duty, 1/5 bias, Vop=3.85V, Ta=25

				•	-	
Item	Symbol	Conditions	Min.	Тур.	Max	Reference
Driving voltage	Vop=VDD-VO			3.85		
Viewing angle	θ	$C \ge 2.0, \emptyset = 0$ °C	30°	-	-	Notes 1 & 2
Contrast	С	θ=5°, Ø=0°	3.0	_	_	Note 3
Response time(rise)	ton	θ=5°, Ø=0°	-	-	256ms	Note 4
Response time(fall)	toff	θ=5°, Ø=0°	-	-	242ms	Note 4

Note 1: Definition of angles θ and \emptyset

Note 2: Definition of viewing angles $\theta 1$ and $\emptyset 2$



 $\label{eq:continuity} \mbox{viewing angle } \theta \; (\quad \mbox{fixed})$ Note : Optimum viewing angle with t

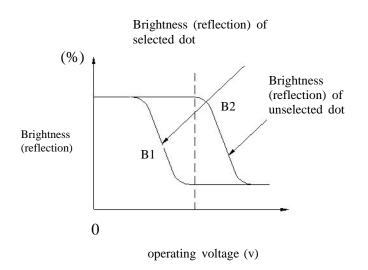
Note: Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

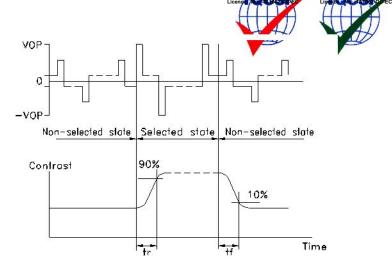
Note 3: Definition of contrast C

Brightness (reflection) of unselected dot (B2)

Brightness (reflection) of selected dot (B1)

Note 4: Definition of response time





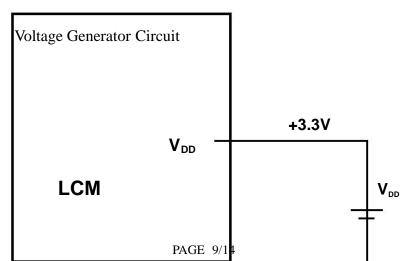
Note: Measured with a transmissive LCD panel which is displayed 1 cm²

 V_{OPR} : Operating voltage f_{FRM} : Frame frequency

 $t_{\ \scriptscriptstyle ON}\ :$ Response time (rise) $\quad t_{\ \scriptscriptstyle OFF}\ :$ Response time (fall)

7. Interface Pin Description

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







 V_{ss}

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

- 8.1 Liquid crystal panel service life 100,000 hours minimum at 25 °C±10 °C
- 8.2 Definition of panel service life

^{**} Polarizing filter deterioration, other appearance defects

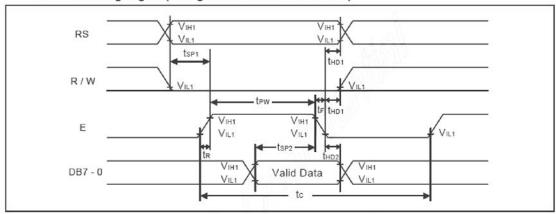




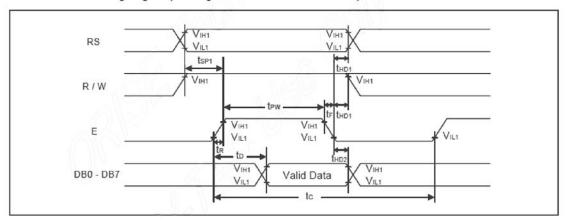
- Contrast becomes 30% of initial value
- Current consumption becomes three times higher than initial value
- Remarkable alignment deterioration occurs in LCD cell layer
- Unusual operation occurs in display functions

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			
Characteristics	Symbol	Min.	Тур.	Max.	Unit	lest Condition			
E Cycle Time	tc	400	370	-	ns	Pin E			
E Pulse Width	t _{PW}	150	-	-	ns	Pin E			
E Rise/Fall Time	t _R , t _F	14	(2)	25	ns	Pin E			
Address Setup Time	t _{SP1}	30	121		ns	Pins: RS, R/W, E			
Address Hold Time	t _{HD1}	10	-		ns	Pins: RS, R/W, E			
Data Setup Time	t _{SP2}	40	1.5	10014	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	T4 C 1141		
Characteristics	Symbol	Min.	Тур.	Max.	Unit	Test Condition		
E Cycle Time	tc	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	-	4	ns	Pins: RS, R/W, E		
Address Hold Time	t _{HD1}	10			ns	Pins: RS, R/W, E		
Data Output Delay Time	t _o	-		100	ns	Pins: DB0 - DB7		
Data hold time	t _{HO2}	5.0	-1/10	19/-	ns	Pin DB0 - DB7		

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10. Display Command

Instructions					Instru	iction	Code			Description	Execution Time	
	RS	R/ W	DB 7	DB6	DB5	DB4	DB3	DB2	DB1	DB0		(fosc= 270KHZ)
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	×	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	С	В	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	×	×	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	×	×	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).	38µs



11. Relationship between Character Code(DDRAM) and Character

Pattern(CGRAM)

Figure 1

Ch	агас	ter (Code	e (DE	PRA	M da	ıta)	(CGR	AM .	Add	res	\$	CGRAM Data							Pattern	
D7	D6	D5	D4	D3	D2	D1	D0	A5	A4	A3	A2	A1	A0	P7	P6	P5	P4	Р3	P2	P1	P0	number
0	0	0	0	×	0	0	0	0	0	0	0	0	0	×	×	×	0				0	pattern 1
											0	0	1					0	0	0		
											0	1	0					0	0	0		
								[0	1	1									
									•		1	0	0		٠			0	0	0		
				•					•		1	0	1		•			0	0	0		
								İ			1	1	0					0	0	0		•
											1	1	1				0	0	0	0	0	
				•																		
			•	•							•							•				
0	0	0	0	×	1	1	1	1	1	1	0	0	0	×	×	×		0	0	0		pattern 8
											0	0	1					0	0	0		
											0	1	0					0	0	0		
											0	1	1		•							
											1	0	0					0	0	0		
				•					•		1	0	1		٠			0	0	0		
											1	1	0					0	0	0		
											1	1	1				0	0	0	0	0	

* "×" dont care



12. Character Pattern

	_		-				_					- 1				
Upper 4 bit Lower 4 bit	LLLL	LLLH	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHE	нгнн	ннгг	ннін	HHHL	нннн
LLLL																
LLLH																
LLHL																
LLHH																
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LHLH																
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