

# **SPECIFICATIONS**

CUSTOMER :	
SAMPLE CODE	: GFC0802B-YPOE- EP
DRAWING NO.	:
DATE :	2010.09.06
CERTIFICATIO	ON: ROHS

Customer Sign	Sales Sign	Approved By	Prepared By

## **Revision Record**

Data(y/m/d)	Ver.	Description	Note	page
2010.09.06	00	New		

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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  $5 \pm 0.5$  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	8X2	Character
Character Format	5 8 Dots	-
Character Pitch	3.55(W) 5. 94(H)	mm
Character Size	2.96(W) X5.56(H)	mm
Dot size	0.56(W) 0.66(H)	mm
Dot pitch	0.6(W) O. 7(H)	mm
Module dimension	58 (W) 32(H) 13. 5NAX(T)	mm
Active Area	27.81(W) 11. 5(H)	mm
Viewing Area	38(W) X 16(H)	mm
Lcd type	STN Yellow-Green Positive Transflective	
Controller	SPLC708D1-003A	
Duty	1/16	-
Bias	1/5	-
Viewing direction	6 O'clock	-
Backlight	Yellow Green	-
Module	No Connector	





### 3. Backlight Characteristic

### 3.1 Electrical / optical specifications

Ta = 25°C

	10 20 0					
Forward voltage	$V_{\mathrm{f}}$	If=60mA, Yellow Green	3.8	4.2	4.4	V
*Luminous Intensity	$I_{\rm v}$	If=60mA, Yellow Green	120	150		Cd/m2
Peak Emission Wavelength	λΡ	If=60mA, Yellow Green	567	572	577	nm
Spectrum Radiation Bandwidth	Δλ	If=60mA, Yellow Green		30		nm
Reverse Current	${f I}_{ m R}$	VR=5V, Yellow Green			0.7	mA

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

### 3.2 LED Maximum Operating Range

Power Dissipation	P <sub>AD</sub>	264	mW
Forward Current	$I_{\scriptscriptstyle F}$	60	mA
Reverse Voltage	V <sub>R</sub>	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	$V_{\scriptscriptstyle DD}$		4.5	5.0	5.5	V
Supply Current	${ m I}_{\scriptscriptstyle  m DD}$	Internal oscillation or external clock (V <sub>DD</sub> =5.0V,f <sub>OSC</sub> =270kHz)		1.5	2	mA
Input	$V_{{}_{\rm IH1}}$		$0.7~\mathrm{V}_{\mathrm{DD}}$		$V_{\scriptscriptstyle DD}$	V
Voltage(1) (except OSC1)	$V_{\scriptscriptstyle \rm IL1}$		-0.3		0.6	
Input	$V_{{ m IH}2}$		$V_{\rm DD}$ -1		$V_{\scriptscriptstyle DD}$	V
Voltage(2) (OSC1)	$V_{\text{IL}2}$				1.0	
Output	$V_{\text{OH1}}$	$I_{OH} = -0.1 \text{mA}$	3.9		$V_{\scriptscriptstyle DD}$	V
Voltage(1) (DB0 to DB7)	$V_{\scriptscriptstyle OL1}$	$I_{\rm OL}$ =0.1mA			0.4	
Output	$V_{\scriptscriptstyle OH2}$	$I_o=-40\mu A$	$0.9V_{\scriptscriptstyle DD}$		$V_{\scriptscriptstyle DD}$	V
Voltage(2) (DB0 to DB7)	$V_{\scriptscriptstyle OL2}$	$I_o$ =40 $\mu A$			0.1V <sub>DD</sub>	
Voltage Drop	$Vd_{COM}$	I <sub>o</sub> =0.1mA			1	V
	$Vd_{\text{SEG}}$				1	
Input Leakage Current	$ m I_{IKG}$	$V_{IN}$ =0V to $V_{DD}$	-1		1	μΑ
Input Low Current	${ m I}_{\scriptscriptstyle { m I\!L}}$	$V_{IN}=0V, V_{DD}=5V$ (Pull Up)	-50	-125	-250	
Internal Clock (external Rf)	$f_{ m OSC1}$	$Rf=91kO \pm 2\% (V_{DD}=5V)$	190	270	350	kHz
External	$f_{ m osc}$		125	270	410	kHz
Clock	duty		45	50	55	%
	$t_R, t_F$				0.2	μS

				1/2		
LCD Driving	$V_{\scriptscriptstyle LCD}$	$V_{DD}$ - $V_{5}$	3.0		100	
Voltage		(1/5,1/4 Bias)				

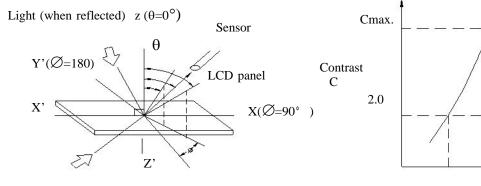
#### **6.Optical Characteristics**

1/16 duty, 1/5 bias, Vop=4.3V, Ta=25

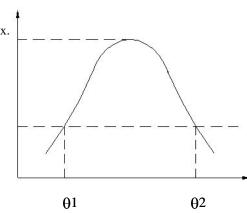
Item	Symbol	Conditions	Min.	Typ.	Max	Reference
Driving voltage	Vop=VDD-VO			4.3		
Viewing angle	θ	$C \ge 2.0, \emptyset = 0$ °C	30°	-	1	Notes 1 & 2
Contrast	С	θ=5°, Ø=0°	3.0	-	-	Note 3
Response time(rise)	ton	θ=5°, Ø=0°	-	-	185ms	Note 4
Response time(fall)	toff	θ=5°, Ø=0°	-	-	167ms	Note 4

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

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



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



viewing angle  $\theta$  ( fixed)

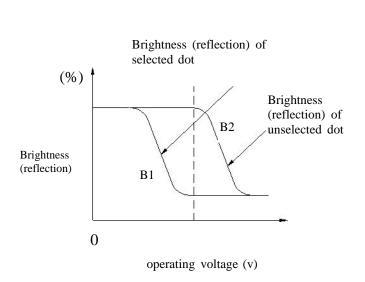
Note: Optimum viewing angle with the naked eye and viewing angle  $\theta$  at Cmax. Above are not always the same

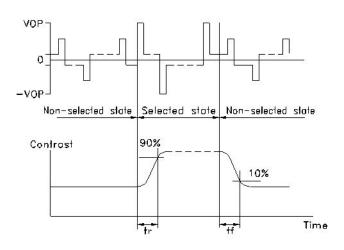
Note 3: Definition of contrast C

Brightness (reflection) of unselected dot (B2)

C =Brightness (reflection) of selected dot (B1)

#### Note 4: Definition of response time





Note: Measured with a transmissive LCD panel which is displayed 1 cm<sup>2</sup>



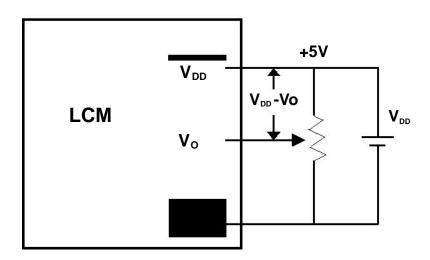
 $V_{\mbox{\tiny OPR}}$  : Operating voltage  $f_{\text{FRM}}$ : Frame frequency

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	Е	Enable signal
7-14	DB0-DB7	Data Bus line

### Voltage Generator Circuit



 $V_{\mbox{\tiny DD}}\mbox{-Vo}$  : LCD Driving Voltage  $V_{\mbox{\tiny R}}$  : 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	imi604i@±20°@rking 500 hemilysu	No abnormalities in to SPLC740401ctions* and appearance**	_
Heat shock	-20± ~ +60°°C Left for 1 hour at each temperature, transition time 5 min, repeated 10times tem	No abnormalities in functions* and appearance**	
Low temperature	-20±2°C for 500 hours	VIHI to abnormalities in functions* and thappearance**	
Vibration Read mode t	Sweep for 1 mm at 10 Hz, 55Hz, 10Hz, amplitude 1.5mm 2 hrs each in the diagram reading bata from SPL X, Y and Z directions	No abnormalities in functions* and c780D1 to appearance**	
Drop shock	a height of 10cm	No appormalities in functions* and appearance**	
* Dissipation current,	contrast and display functions	tr thoi	_
** Polarizing filter dete	rioration, other appearance d	efects VIL1	
.1 Liquid crystal paners	ervice life	Valid Data VIH1	
100,000 hours minin	num at 25 °C±10 °C	tc —	

### 8.2 Definition of wanted set White diffeta from MPU to SPLC780D1)

Contrast becomes 309	% of sinitia	al value	Limit Typ.	Max.	Unit	Test Condition
Current consumption	becomes		ies high		itial <sub>s</sub> val	ue <sub>in E</sub>
Remarkablevallignmer	nt deterior	atioffoc	curs in I	CD cell	layer	Pin E
E Rise/Fall Time	te, te			25	ns	Pin E
E Rise/Fall Time Unusual operation oc Address Setup Time oc	curs in di	splay fur	ctions	-107	ns	Pins: RS, R/W, E
Address Hold Time	t <sub>HD1</sub>	10	-		ns	Pins: RS, R/W, E
Data Setup Time	t <sub>SP2</sub>	40	7.4		ns	Pins: DB0 - DB7
Data Hold Time	t <sub>HD2</sub>	10	120	-	ns	Pins: DB0 - DB7

	Data Hold Time	t <sub>HD2</sub>	10	-	-	ns	Pins: DB0 - DB7
9. Timing Cha	racteristics			No.			
	Read mode (Reading	g Data from S	PLC780D	1 to MPU)			
	Characteristics	Unit	Test Condition				
	Characteristics	Symbol	Min.	in. Typ.		Unit	rest Condition
	E Cycle Time	tc	400	-2	-	ns	Pin E
	E Pulse Width	t <sub>w</sub>	150	(-)	-	ns	Pin E
	E Rise/Fall Time	t <sub>R</sub> , t <sub>F</sub>		1-6	25	ns	Pin E
	Address Setup Time	t <sub>SP1</sub>	30	-	4	ns	Pins: RS, R/W, E
	Address Hold Time	t <sub>HD1</sub>	10	-	S 3/4//	ns	Pins: RS, R/W, E
	Data Output Delay Time	to	121		100	ns	Pins: DB0 - DB7
	Data hold time	PAGE 29/14	5.0	- 1/10	197 -	ns	Pin DB0 - DB7



### 10.Display Command

Instructions					Instru	iction	Code			Description	Execution		
										Time			
	RS R/DB DB6 DB5 DI						DB3	DB2	DB1	DB0		(fosc=	
		W	7									270KHZ)	
Clear	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM. and set	1.52ms	
Display											DDRAM address to "00H" from		
											AC.		

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									100	jo		
Return	0	0			Set DDRAM address to "00H"	1.52118						
Home											from AC and return cursor to it's	
											original position if shifted.	
											The contents of DDRAM are not	
											changed.	
Entry Mode	0	0	0	0	0	0	0	1	I/D	SH	Assign cursor moving direction	38µs
Set											and make shift of entire display	
											enable.	
Display	0	0	0	0	0	0	1	D	С	В	Sets display (D), cursor(C), and	38µs
ON/OFF											blinking of cursor(B) on/off	
Control									10		control bit.	
Cursor or	0	0	0	0	0	1	S/C	R/L	×	×	Set cursor moving and display	38µs
Display Shift											shift control bit, and the direction,	
											without changing of DDRAM	
											data.	
Function Set	0	0	0	0	1	DL	N	F	×	×	Set interface data length (DL:4 -	38µs
											bit/8-bit), numbers of display line	
											(N: 1-line/2-line), display font	
											type(F:5*8 dots/5*11 dots)	
Set CGRAM	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address	38µs
Address								,	is.	e.	counter.	
Set DDRAM	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in address	38µs
Address											counter.	
Read Busy	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation	0µs
Flag and											or not can be known by reading	
Address											BF. The contents of address	
										i de	counter can also be read.	
Write Data to	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM	38µs
RAM	4		D=	D.	D.5		D2	- F.		D.C.	(DDRAM/CGRAM).	20
Read Data	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM	38µs
from RAM											(DDRAM/CGRAM).	

"x":don't care

 ${\bf 11.}\ Relationship\ between\ Character\ Code (DDRAM)\ and$ 

**Character Pattern(CGRAM)** 

Ch	arac	ter (	Code	(DE	DRA	M da	ita)	(	CGR	AM.	Add	res	5			CC	3RA				Qua	Pattern	Enviro
D7	D6	D5	D4	D3	D2	D1	D0	A5	A4	А3	A2	<b>A1</b>	A0	Р7	P6	P5	P4	Р3	P2	P1	ri <b>BiQ</b>	9001300nber	Enviror Licent
0	0	0	0	×	0	0	0	0	0	0	0	0	0	×	×	×	0				0	pattern 1	
											0	0	1					0	0	0			- 1
											0	1	0					0	0	0			- ['
								•			0	1	1										
				•							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	1	
•				•																			
				•							•							•					-
	···						_	4								····	1						_
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		•			0	0	0			
											1	1	0					0	0	0			
											1	1	1				Ö	0	0	0	Ö	]	1

### \* '×": dont care

### 12. Character Pattern





Upper			Π			Ι					- 6				
4 bit Lower 4 bit	LLLL	LLHL	LLHH	LHLL	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL , #	HLHH	HHLL	HHLH	нннс	нннн
LLLL															
LLLH															
LLHL															
LLHH															
LHLL															
LHLH															
LHHL															
гннн															
HLLL															
нтгн															
HLHL															
ньнн															
HHLL															
ннгн															
нннг															
нннн															

### 13. LCM Dimension





