



Specification
For
LCD Module
TS12232L

MODULE: TS12232L
CUSTOMER: _____

REV	DESCRIPTION	DATE
1	FIRST ISSUE	2008.05.17

IDW	INITIAL	DATE
APREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 FEATURE

3.0 DIMENSION DIAGRAM

4.0 PIN ASSIGNMENT

5.0 BLOCK DIAGRAM

6.0 POWER SUPPLY BLOCK DIAGRAM

7.0 ABSOLUTE MAXIMUM RATING

8.0 DC ELECTRICAL CHARACTERISTICS

9.0 BACK LIGHT ELECTRICAL CHARACTERISTICS

10.0 AC ELECTRICAL CHARACTERISTIC

11.0 CONTROL AND DISPLAY COMMAND



1.0 INTRODUCTION

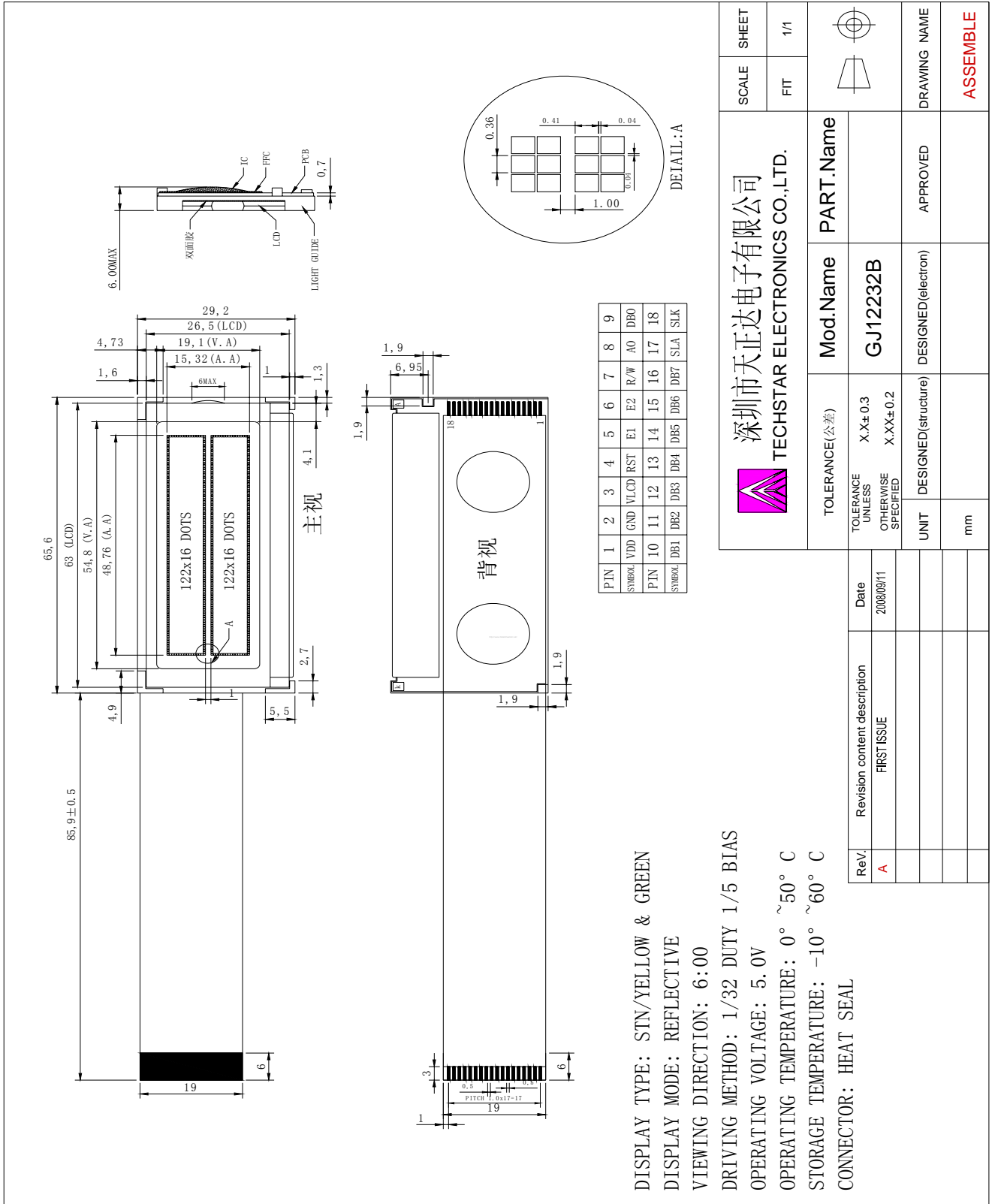
This USER'S MANUAL is introduced the outside dimensions, optical characteristics, electrical characteristics, interface, controller commands, etc. of the custom design LCD module.

2.0 FEATURE

- (1) Display mode: STN ,YELLOWGREEN, TRANSMISSIVE,POSITIVE.
- (2) Display format: 122*32 Dots
- (3) Driving method: 1/32 Duty, 1/5 Bias
- (4)VLCD Voltage: 4.7V
- (5)Viewing Direction: 6 o'clock
- (6)Control IC: PT6520
- (7) Input Voltage : +5.0V
- (8)Interface Input Data : 8-Bit
- (9)Back light: LED (YELLOWGREEN)
- (10)Operating Temperature: -20°C - 70°C
- (11) Storage Temperature:-30°C - 80°C
- (12)Module Outline:65.6mmX29.2mm
- (13)Viewing Area: 54.8mmX26.5mm
- (14)Active Area:48.76mmX15.32mm



3.0 DIMENSION DIAGRAM



深圳市天正达电子有限公司 TECHSTAR ELECTRONICS CO.,LTD.		Mod.Name GJ12232B	PART.Name
TOLERANCE(公差) TOLERANCE UNLESS OTHERWISE SPECIFIED X.X±0.3 X.XX±0.2		DESIGNED(structure) DESIGNED(electron)	APPROVED
Rev/ A	Revision content description FIRST ISSUE	Date 2008/09/11	SCALE FIT
			SHEET 1/1
			DRAWING NAME ASSEMBLE

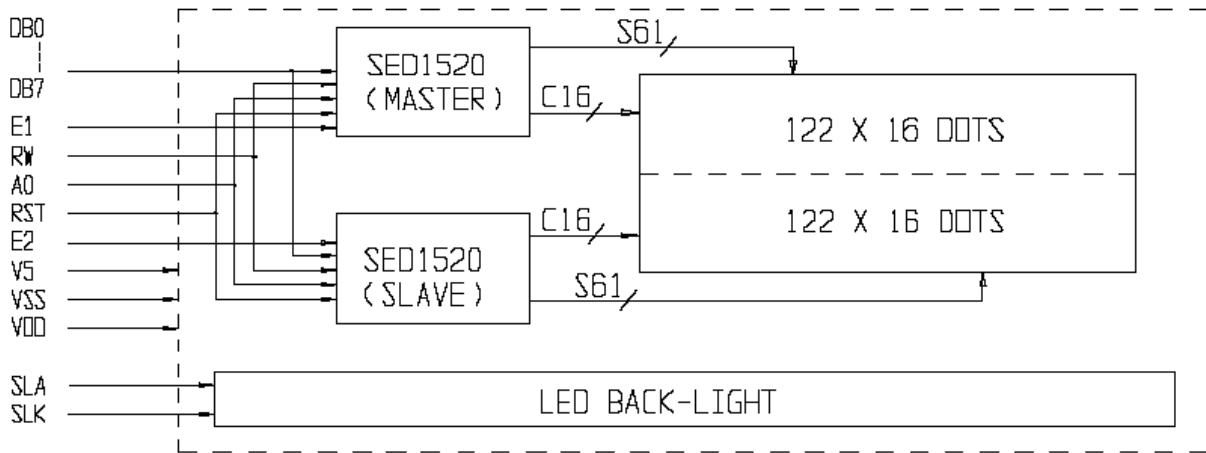


4.0 PIN ASSIGNMENT

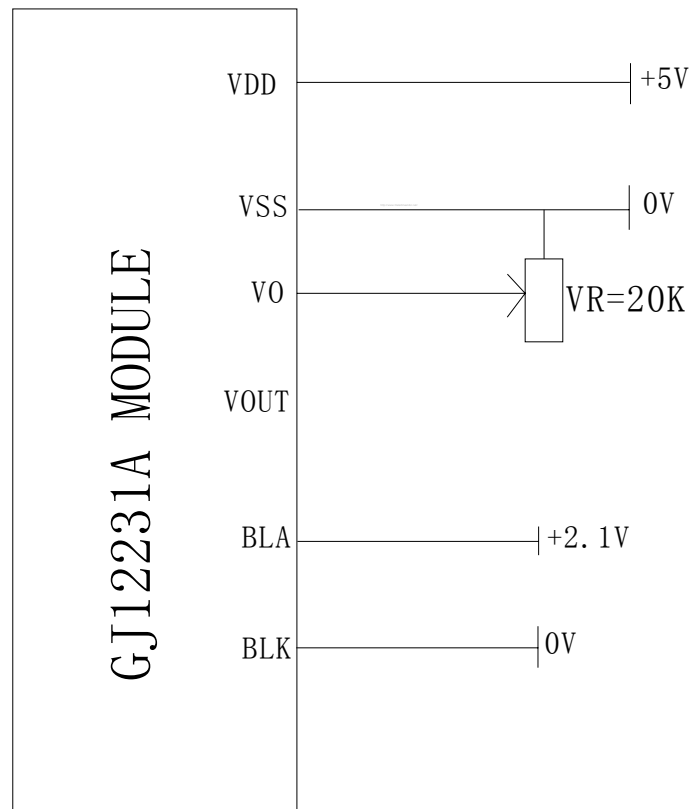
Pin NO.	Symbol	Function
1	VDD	Power supply.
2	GND	Power Ground.
3	VO	For LCD drive voltage.
4	RESET	Reset the system and selects the interface type for a 68 port/80 port MPU. High: 68 port MPU interface. Low: 80 port MPU interface. (edge trigger)
5	E1	U1 Enable Signal. Read/Write Enable signal when a 68 port MPU is connected. (Active-Low read enable signal when an 80 port MPU is connected)
6	E2	U2 Enable Signal. Read/Write Enable signal when a 68 port MPU is connected. (Active-Low read enable signal when an 80 port MPU is connected)
7	R/W	Read/Write select signal when a 68 port MPU is connected. High: read select. Low: write select. (Active-Low write enable input when an 80 port MPU is connected. Rising edge sensing)
8	A0	Selection display data or instructions. High: Display data. Low: Instruction.
9-16	DB0-DB7	Data input
17	LEDA	Power for LED Backlight(+2.1V).
18	LEDK	Power for LED Backlight (0V).



5.0 BLOCK DIAGRAM



6.0 POWER SUPPLY BLOCK DIAGRAM





7.0 ABSOLUTE MAXIMUM RATING(VSS=0V)

Characteristics	Symbol	Value	Unit	Note
Supply voltage(1)	VSS	-8 to+0.3	V	
Supply voltage(2)	V5	-16.5 to 0.3	V	
Supply voltage(3)	V1, V2, V3, V4	V5 to 0.3	V	
Input voltage	VI	VSS -0.3 to 0.3	V	
Output voltage	VO	VSS -0.3 to 0.3		
Operating temperature	T _{OP}	-20 to +70	°C	--
Storage temperature	T _{ST}	-30 to +80	°C	--



8.0 DC ELECTRICAL CHARACTERISTICS

(Unless otherwise stated, VDD=0V, VSS=-5/-3V, Ta=25°)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable Pin
Operating voltage (1) (Note 1)	Recommended	VSS		-5.5	-5.0	-4.5	V	VSS
	Potential			-7.0	-	-2.4	V	
Operating voltage (2)	Recommended	V5		-13	-	-3.5	V	V5
	Potential			-13	-	-	V	
	Potential	V1, V2		0.6xV5	-	VDD	V	V1, V2
	Potential	V3, V4		V5	-	0.4xV5	V	V3, V4
High input voltage	VIHT	VSS=-5V		VSS+2.0	-	VDD	V	(Notes 2, 3)
	VIHC			0.2xVSS	-	VDD		
	VIHT	VSS=-3V		0.2xVSS	-	VDD		(Notes 2, 3)
	VIHC			0.2xVSS	-	VDD		
Low input voltage	VILT	VSS=-5V		VSS	-	VSS+0.8	V	(Notes 2, 3)
	VILC			VSS	-	0.8xVSS		
	VILT	VSS=-3V		VSS	-	0.85xVSS		(Notes 2, 3)
	VILC			VSS	-	0.8xVSS		
High output voltage	VOHT	VSS=-5V	IOH=-3.0mA	VSS+2.4	-	-	V	OSC2 (Notes 4, 5)
	VOHC1		IOH=-2.0mA	VSS+2.4	-	-		
	VOHC2		IOH=-120μA	0.2xVSS	-	-		
	VOHT	VSS=-3V	IOH=-2mA	0.2xVSS			V	OSC2 (Notes 4, 5)
	VOHC1		IOH=-2mA	0.2xVSS				
	VOHC2		IOH=-50μA	0.2xVSS				
Low output voltage	VOLT	VSS=-5V	IOL=3.0mA	-	-	VSS+0.4	V	OSC2 (Notes 4, 5)
	VOLT1		IOL=2.0mA	-	-	VSS+0.4		
	VOLT2		IOL=120μA	-	-	0.8xVSS		
	VOLT	VSS=-3V	IOL=2mA			0.8xVSS	V	OSC2 (Notes 4, 5)
	VOLC1		IOL=2mA			0.8xVSS		
	VOLC2		IOL=50μA			0.8xVSS		
Input leak current	ILI			-1	-	1	μA	(Note 6)
Output leak current	ILO			-3	-	3	μA	(Note 7)
LCD driver ON resistance	RON	Ta=25°C	V5=-5.0V VSS=-5V	-	5	7.5	KΩ	SEG0~60 COM0~15 (Note 9)
			V5=-3.5V VSS=-5V	-	10	50		
Static current consumption	IDDQ	CS=CL=VDD		-	0.05	1	μA	VDD
Dynamic current dissipation	During IDD (1)	During display V5=-5.0V VSS=-5V	fCL=2KHz	-	2.0	5.0	μA	VDD (Note 10)
			Rf=1MΩ	-	9.5	15		
		During display V5=-5V VSS=-3V	fCL=2KHz	-	1.5	4.5	μA	
			Rf=1MΩ	-	6.0	12		
IDD (2)	During access Tcyc=200kHz, V5=-5V		-	300	500	μA		
		VSS=-3V, During access Tcyc=200kHz, VSS=-3V		150	300			
Input terminal capacity	CIN	Ta=25°C, f=1MHz		-	5.0	8	pF	All input terminals



Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Applicable Pin
Oscillation frequency	Fosc	Rf=1.2MΩ ±5% VSS=-5.0V	12	17	25	KHz	OSC2 (Notes 5, 6)
		Rf=1.2MΩ ±5% VSS=-3.0V	11	16	27		
Hysteresis	VH		0.05VSS	0.1VSS	-	V	(Notes 2, 3, 4, 5)

Notes:

1. A wide range of operating voltages is guaranteed, except in case of abrupt voltage fluctuations during MPU access.
2. A0, D0~D7, E, R/W pins
3. CL, FR, M/S and RES pins
4. D0~D7
5. FR
6. A0, E (or RD), R/W (or WR), M/S and RES.
7. When D0 to D7 and FR are high impedance.
8. During continual writer access at a frequency of tcyc. Current consumption during access is effectively proportional to the access frequency.
9. For a voltage differential of 0.1V between input (V1, ..., V4) and output (COM, SEG) pins. All voltages within specified operating voltage range.
10. PT6520 only. Does not include transient currents due to stray and panel capacitances.

9.0 BACK LIGHT ELECTRICAL CHARACTERISTICS

The back-light system is edge-lighting type with 10 chips Yellow Green LED in parallel

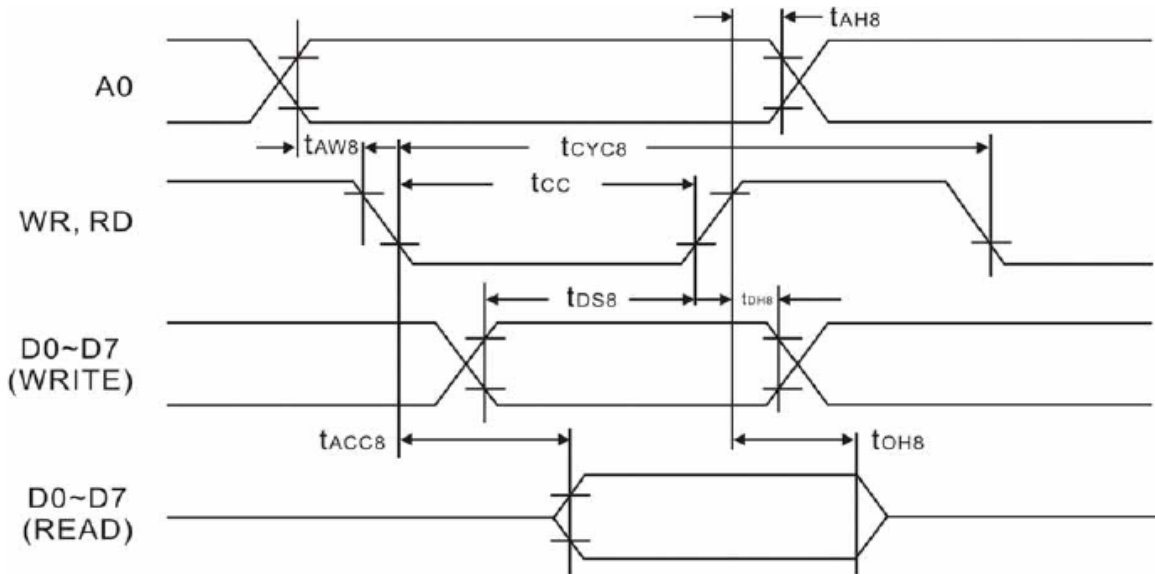
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I _F	--	150	--	mA	--
Forward Voltage	V _F	1.8	2.1	2.3	V	--
Luminance	L _V	--	60	--	cd/m ²	I _F =150mA
Uniformity	A _{Vg}	75	--	--	%	--



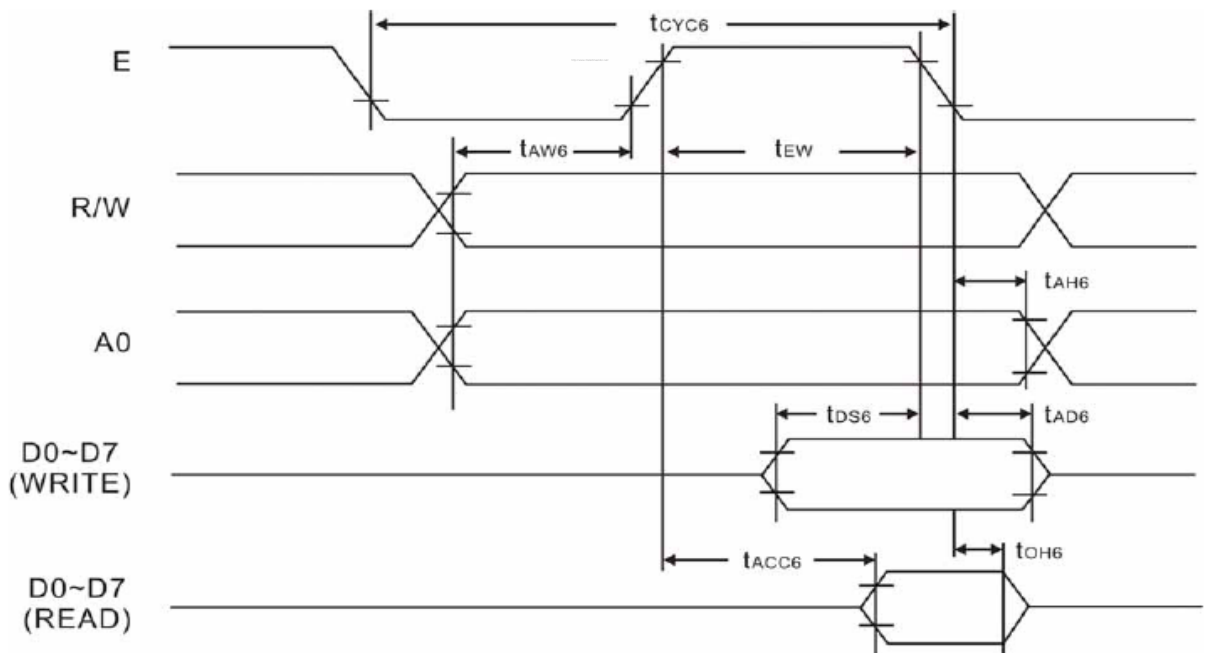
10.0 AC ELECTRICAL CHARACTERISTIC

- MPU Interface

READ/WRITE TIMING FOR THE 80-PORT MPU



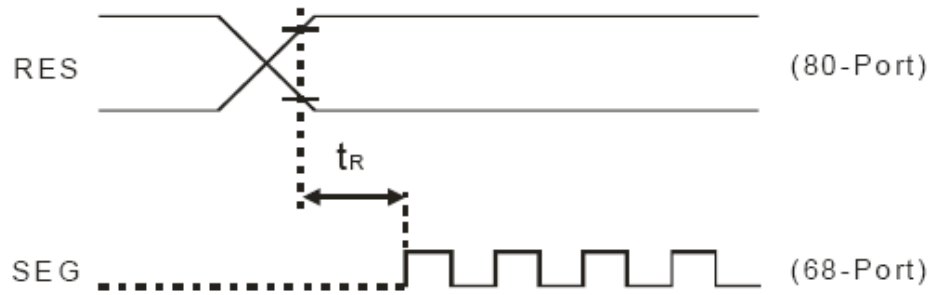
READ/WRITE TIMING FOR THE 68-PORT MPU





- RESET

RESET TIMING FOR 80-PORT/68-PORT DISPLAY





11.0 CONTROL AND DISPLAY COMMAND

DISPLAY COMMANDS

(Based on the 80 port MPU; the RD and WR commands differ for the 68 port MPU)

Command	RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0	Function	
1	Display ON/OFF	1	0	0	1	0	1	0	1	1	1	0/1	Switches the entire display ON or OFF, regardless of the Display RAM's data or the internal status. *
2	Display START Line	1	0	0	1	1	0	Display START address (0-31)				Determines the line of RAM data to be displayed at the display's top line (COM0)	
3	Page Address Set	1	0	0	1	0	1	1	1	0	Page (0-3)		Sets the page of the Display RAM in the page address register.
4	Column (segment) Address Set	1	0	0	0	Column address (0-79)							Sets the column address of the Display RAM in the column address register.
5	Status Read	0	1	0	BUSY	ACC	ON/OFF	RESET	0	0	0	0	Read the status. Busy 1: Busy (internal processing) 0: Ready status ADC 1: Rightward (forward) output 0: Leftward (reverse) output ON/OFF 1: Display OFF 0: Display ON RESET 1: Resetting. 0: Normal
6	Write Display Data	1	0	1	Write Data								Writes the data on the data bus to RAM Reads data from the Display RAM onto the data bus. These commands access a previously-specified address of the Display RAM, after which the column address is incremented by one.
7	Read Display Data	0	1	1	Read Data								
8	ADC Select	1	0	0	1	0	1	0	0	0	0	0/1	Used to reverse the correspondence between the Display RAM's column address and segment driver output ports 0: Rightward (forward)output 1: Leftward (reverse) output
9	Static Drive ON/OFF	1	0	0	1	0	1	0	0	1	0	0/1	Selects normal display operation or static all-lit drive display operation. 1: Static drive (power save)* 0: Normal display operation



Command		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0	Function
10	Duty Select	1	0	0	1	0	1	0	1	0	0	0/1	Selects the duty factor for driving LCD cells. 1: 1/32 duty, 0: 1/16 duty
11	Read Modify Write	1	0	0	1	1	1	0	0	0	0	0	Increments column address counter by 1 when display is written. (This is not done when data is read)
12	End	1	0	0	1	1	1	0	1	1	1	0	Cancels the Ready Modify Write mode.
13	Reset	1	0	0	1	1	1	0	0	0	1	0	Resets the display START line to the 1st line in the register. Resets the column address counter to 0 and page address to 0.



液晶显示屏使用注意事项:

亲爱的客户，在您使用液晶显示屏前，请先阅读以下注意事项：

一、处理保护膜：在模块成品表面贴有一层保护膜，是为了避免客户在装配时沾污了显示表面，故请您在整机装配结束前不要揭去，以免弄脏或损坏显示面。

二、加装衬垫：在模块与前面板之间最好加装一块约 0.1 毫米左右的衬垫。面板还应保持平整，以免在装配后产生扭曲，并可提高其抗振性能。

三、严防静电：模块中的控制、驱动电路是低压、低功耗的 CMOS 电路，极易被静电击穿，静电击穿是一种不可修复的损坏，而人体有时会产生高达几十伏或上百伏的高压静电，所以，在操作、装配以及使用中都应极其小心，严防静电。为此： 1. 不要用手随意去摸外引线、电路板上的电路及金属框； 2. 如必须直接接触时，应使人体与模块保持在同一电位，或将人体良好接地； 3. 焊接使用的烙铁和操作的电动工具必须良好接地，没有漏电； 4. 不得使用真空吸尘器进行清洁处理，因为它会产生很强的静电； 5. 空气干燥，也会产生静电，因此，工作间湿度应在 RH60%以上； 6. 取出或放回包装袋或移动位置时，也需小心，防止产生静电。不要随意更换包装或舍弃原包装。

四、装配操作时的注意事项： 1. 模块是经过精心设计组装而成的，请勿随意自行加工、修整； 2. 金属框爪不得随意扭动、拆卸； 3. 不要随意修改加工 PCB 板外形、装配孔、线路极其部件； 4. 不得修改导电胶条； 5. 不得修改任何内部支架； 6. 不要碰、摔、折曲、扭动模块。

五、焊接：在焊接模块外引线、接口电路时，应按如下规程进行操作。 1. 烙铁头温度小于 280°C； 2. 焊接时间小于 3-4s； 3. 焊接材料：共晶型、低熔点； 4. 不要使用酸性助焊剂； 5. 重复焊接不要超过 3 次，且每次重复需间隔 5 分钟。

六、模块的使用与保养： 1. 模块的外引线决不允许接错，在您想调试液晶模块时，请注意正确接线，尤其是正、负电源的接线不能有错，否则可能造成过流、过压、烧毁电路上的芯片等对液晶模块元器件有损的现象； 2. 模块在使用时，接入电源及断开电源，必须在正电源稳定接入以后，才能输入信号电平。如在电源稳定前或断开后输入信号电平，有可能损坏模块中的 IC 及电路； 3. 模块使用时，



接入逻辑电源和驱动电源的顺序应是先逻辑电源，后驱动电源；断电时，应先驱动电源，后逻辑电源。这样做有助于保持屏的良好显示效果和避免在上电、断电时的电压冲击损坏。所以推荐使用带控制的 DC-DC 电源做为模块的驱动电源。

4. 点阵液晶模块显示时的对比度、视角与温度、驱动电压关系很大，所以，如果 VEE 调整过高，不仅会影响显示，还会缩短模块的使用寿命；

5. 因为液晶材料的物理特性，液晶的对比度会随着温度的变化而相应变化，所以，您加的负电压值应该随温度作相应的调整，大致是温度变化 10℃，电压变化 1 伏。为满足这一要求，您可做一个温度补偿电路，或者安排一个电位器，随温度调整负电压值；

6. 不应在规定工作温度范围以外使用，并且不应在超过存储极限温度的范围外存储，如果温度低于结晶温度，液晶就会结晶，如果温度过高，液晶将变成各向同性的液体，破坏分子取向，使器件报废；

7. 用力按压显示部分，会产生异常显示。这时切断电源，稍待片刻，重新上电，即恢复正常；

8. 液晶显示器件或模块表面结雾时，不要通电工作，因为这将引起电极化学反应，产生断线；

9. 长期用于阳光及强光下时，被遮部分会产生残留影像。

七、模块的存储：若长期（如几年以上）存储，我们推荐以下方式：

1. 装入聚乙烯口袋（最好有防静电涂层）并将口封住；

2. 在 -10℃~ +35℃ 之间存储；

3. 放暗处，避强光；

4. 决不能在表面压放任何物品；

5. 严格避免在极限温/湿度条件下存放。