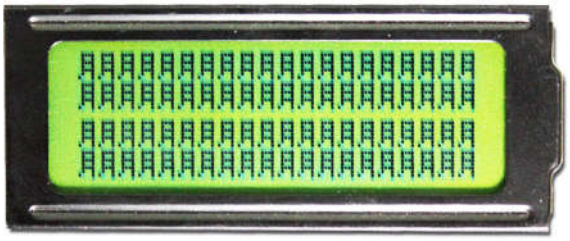
图形点阵液晶模块使用手册

FM12232A



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目　　录

一． 基本特征

1.概述

FM12232A 是一种图形点阵液晶显示器,它主要由行驱动器/列驱动器及 122×32 全点阵液晶显示器组成。可完成图形显示，也可以显示七个半(16×16 点阵)汉字。

主要技术参数和性能：

1.电源：VDD=+2.7V～+5V；LCD 外接驱动电压 VDD-V0=5.0V。

2.显示内容：122(列)×32(行)点

3.显示颜色：绿底蓝字

4.显示角度：6 点钟直视

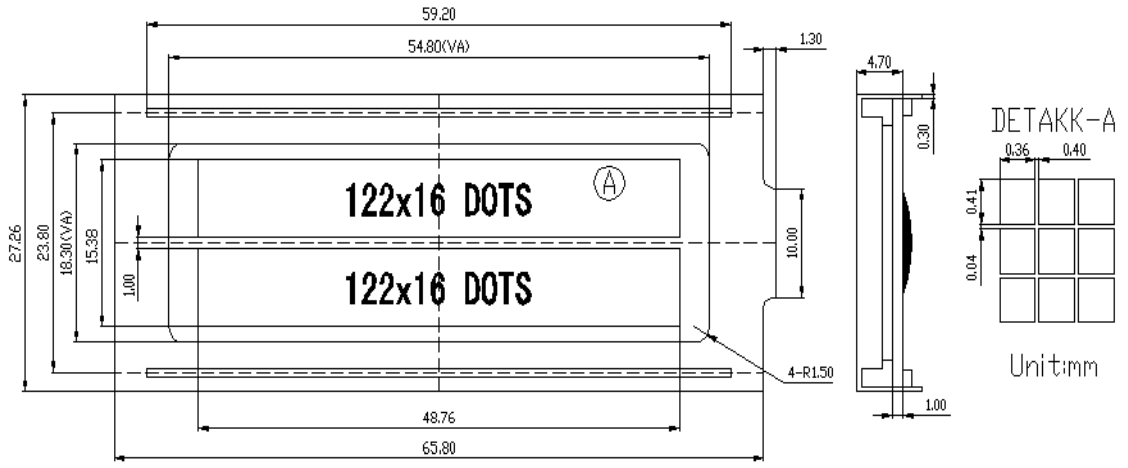
5.STN 正视反射模式

6.驱动方式：1/32 Duty，1/6 Bias

7.工作温度：-20℃~+60℃，存储温度：-30℃~+70℃

8.连接方式：外部接口由带缆连接

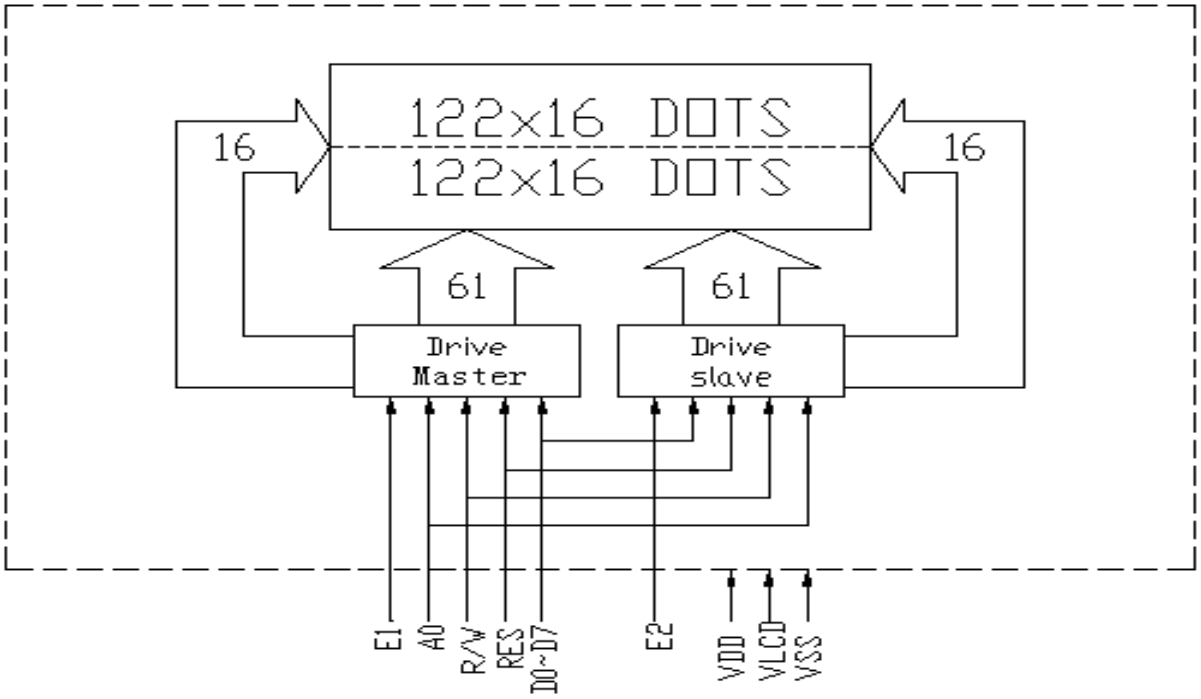
2.外形尺寸图



3.机械尺寸一览：

项目	标准尺寸	单位
模块体积	67.1×27.2×8.4	mm
视域	54.8×18.3	mm
行列点阵数	122×32	dots
点距离	0.40×0.45	mm
点大小	0.36×0.41	mm

二． 原理图：



三． 限定参数

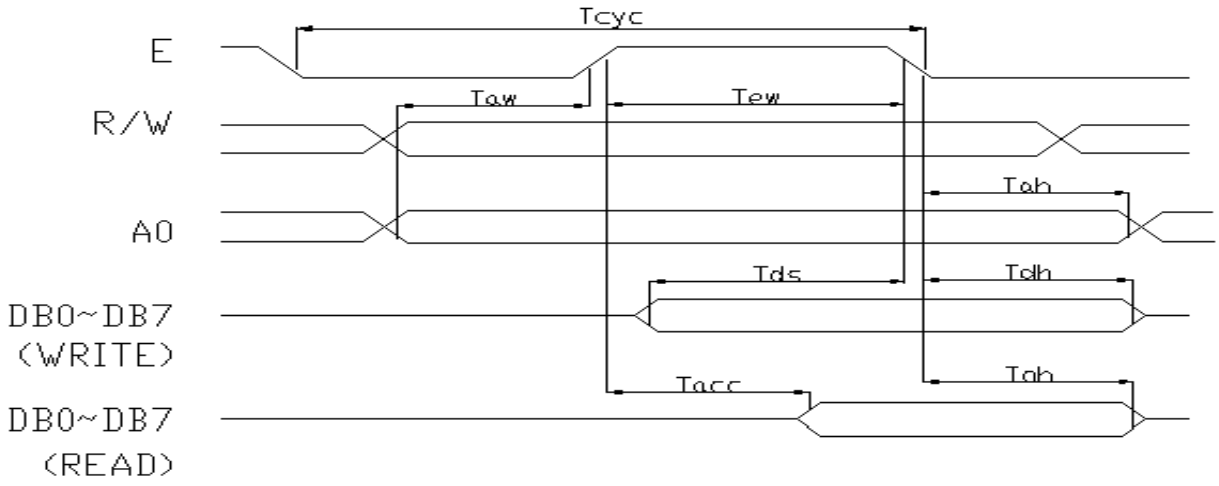
Item	Symbol	Standard Value	Unit	Condition
Power supply voltage	V_{DD}	0~+7.0	V	
LCD driving voltage	V_{DD}~V_{LCD}	+3.5~+12.0		
Input voltage	V_{IN}	GND≤V_{IN}≤V_{DD}		
Operating temperature range	Top	-20~+60	℃	No condition
Storage temperature range	Tst	-30~+70		

四． 直流特性： （Ta=0~40℃，VDD=2.7~6.0V）

Item	Symbol	Standard Value	Unit
Power Supply	VDD	+2.4～+6.0	V
LCD Driving Voltage	VLCD	----------	V
Input High Voltage	VIN	0.8VDD≤VIN≤VDD	V
Output High Voltage	VOH	0.5VDDmin	V
Input Low Voltage	VIL	0≤VIL≤0.2VDD	V
Output Low Voltage	VOL	0.1VDDmax	V
Power Supply Current	IDD	2max	mA
LCD Power Supply Current	ILCD	220max	uA

五． 交流特性

Signal	Parameter	Symbol	MIN	MAX	Unit	Condition
A0，/RW	System cycle time	zTcyc	2000	--	ns	
	Address setup time	Taw	40	--	ns	
	Address hold time	Tah	20	--	ns	
D0~D7	Data setup time	Tds	160	--		CL=100p F
	Data hold time	Tdh	20	--	ns	
	Output disable time	Tch	20	120	ns	
	Access time	Tacc	--	180	ns	
E	Enable pulse width(Read)	Tew	200	--		
	Enable pulse width(Write)		160	--	ns	
Input wave width rise time		Tr	--	15	ns	



六． 引脚特性

管脚号	管脚名称	LEVER	管脚功能描述
1	VDD	+5.0V	电源电压
2	VSS	0	电源地
3	VLCD	0~+5V	LCD 外接驱动负电压
4	/RET	H/L	复位信号。在系统需要硬件复位时，在/RES 端产生一个上升沿信号。当内部电路复位后，/RES 端保持高电平。
5	E1	H/L	读写使能信号(MASTER)
6	E2	H/L	读写使能信号(SLAVE)
7	R/W	H/L	读写选择信号
8	D/I	H/L	D/I=“H”，表示 DB7∽DB0 为显示数据 D/I=“L”，表示 DB7∽DB0 为显示指令数据
9	DB0	H/L	数据线
10	DB1	H/L	数据线
11	DB2	H/L	数据线
12	DB3	H/L	数据线
13	DB4	H/L	数据线
14	DB5	H/L	数据线
15	DB6	H/L	数据线
16	DB7	H/L	数据线
17	NC	--	悬空
18	NC	--	悬空

注:）当 VDD=+3V 时，VLCD=0~-5V

七． 指令表

INSTRCTION	CODE										FUNCTION
	R/W	D/I	D7	D6	D5	D4	D3	D2	D1	D0	
DISPLAY ON/OFF	0	0	1	0	1	0	1	1	1	1/0	Switch the entire display ON or OFF，regardless of the display RAM’s Data or the internal status. 1: ON 0: OFF
Display Start Line	0	0	1	1	0	Display start Line (0 •••• 31)					Determines the line of RAM data to be displayed at the display’s top line (COM0)
Page Address set	0	0	1	0	1	1	1	0	PAGE: (0~3)		Sets the page of the Display in the Address register(X address)
Column (seg) Address set	0	0	0	Column address(0~79)							Sets the column of the Display in the column address register(Y address)
Status Read	1	0	Bu	AD	ON/	RS	0	0	0	0	Read status Busy 1:insternal

			s y	C	OFF	T					operation 0:Ready ADC 1:Rightward output 0:Leftward RST 1:Reseting 0:Normal ON/OFF 1:Display on 0:Display off
Write Display Data	0	1	Write data								Writes the data on the Data bus to RAM
Read Display Data	1	1	Read data								Reads data from the Display RAM onto the Data BUS
ADC Select	0	0	1	0	1	0	0	0	0	0/1	Determine the clockwise or Counterclockwise reading of the display Data RAM 0: Clockwise 1: Counterclockwise
Static Drive ON/OFF	0	0	1	0	1	0	0	1	0	0/1	Select the dynamic or static Driving. 1:Static driving 0: Dynamic driving
Duty Ratio Select	0	0	1	0	1	0	1	0	0	0/1	Select the duty ratio 1:1/32 duty 0:1/16 duty
Read Modify Write	0	0	1	1	1	0	0	0	0	0	Increment the column Address register when writing. But no-change when reading.
End	0	0	1	1	1	0	1	1	1	0	Release from the Read Modify Write Mode.
Reset	0	0	1	1	1	0	0	0	1	1	Set the Display Start Line Register to 1st line, column Address count to 0 and Page Add. Resister to 0.
Power Save(dualcommand)	0 0	0 0	0 0	1 1	0 0	1 1	0 0	1 1	1 0	0 1	Set the power save mode by selecting display off and static driving on

八． DDRAM 地址表

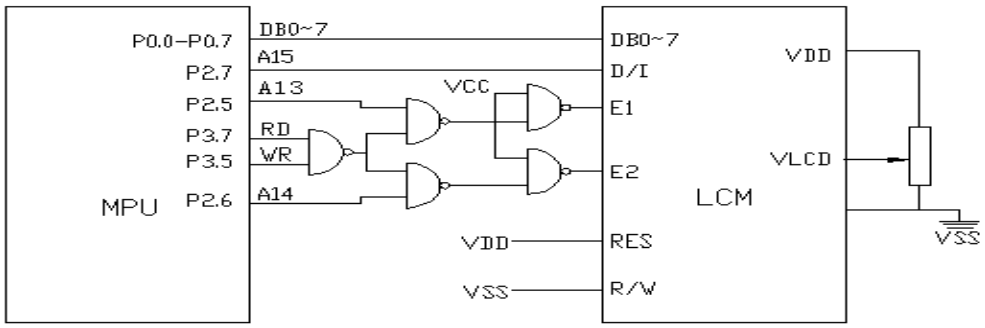
Page	Data		Com No	Drive
2	D0 ： D7	： ： 122 X 16 PLXELS	1 ： 16	Slave
3	D0 ： D7	： ： 122 X 16 PLXELS		
0	D0 ： D7	： ： 122 X 16 PLXELS	17 ： 32	Master
1	D0 ： D7	： ： 122 X 16 PLXELS		

Column Addr	ADC=0	00H •••• 3C	00H •••• 3C
	Seg No	0 •••• 60	0 •••• 60
	Drive	Slave	Master

九．应用举例

FM12232A 有(1)直接访问方式和(2)间接控制方式两种
FM12232A 与单片机 8031 的直接访问接口如图 5 所示：（VDD=+5V）

FM12232A 与单片机 8031 的直接访问接口如图 6 所示：（VDD=+5V）



利用图 5 举例介绍编程实例

```
        ORG   0100H
INITM：MOV   A，#0E2H          ；RESET
       LCALL   OUTMI
       LCALL   OUTSI
       MOV   A，#0AEH          ；OFF DISPLAY
       LCALL   OUTMI
       LCALL   OUTSI
       MOV   A，#0A4H          ；OFF STATIC DRIVE
       LCALL   OUTMI
       LCALL  OUTSI
```

```
        MOV   A，#0A9H          ；SELECT 1/32 DUTY
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#0A0H          ；ADC SELECT RIGHTWARS OUTPUT
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#0EEH          ；READ MODIFY WRITE OFF
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#00H           ；COLUMN ADDRESS SET
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#0C0H          ；SET DISPLAY START LINE
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#0AFH          ；ON DISPLAY
        LCALL    OUTMI
        LCALL    OUTSI
；DISPLAY “*”
        MOV   R2，#0B8H
  DIS2：MOV   A，R2
        LCALL   OUTMI
        LCALL   OUTSI
        MOV A，#00H
        LCALL   OUTMI
        LCALL   OUTSI
        MOV   R1，#1FH
  DIS1：MOV   A，#55H
        LCALL    OUTMI
        LCALL    OUTSI
        MOV   A，#0AAH
        LCALL    OUTMI
        LCALL    OUTSI
        DJNZ   R1，DIS1
        INC   R2
        CJNE   R2，#0BCH，DIS2
        LCALL    MS40
        LCALL    MS40
        LCALL    MS40
        LCALL    MS40
        MOV   A，#0AFH
；DISPLAY“横条”
        MOV   R2，#0B8H
  DIS3：MOV   A，R2
```

```
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  A，#00H
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  R1，#3DH
  DIS4：MOV  A，#55H
        LCALL   OUTMD
        LCALL   OUTSD
        DJNZ  R1 ，DIS4
        INC  R2
        CJIE  R2，#0BCH，DIS3
        LCALL   MS40
        LCALL   MS40
        LCALL   MS40
        LCALL   MS40
        MOV  A，#0AFH
        LCALL   OUTMI
        LCALL   OUTSI

；DISPLAY“竖条”
        MOV  R2，#0B8H
  DIS5：MOV  A，R2
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  A，#00H
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  R1，#1EH
  DIS6：MOV  A，#00H
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  A，#0FFH
        LCALL   OUTMI
        LCALL   OUTSI
        DJNZ  R1，DIS6
        MOV  A，#3CH
        LCALL   OUTMI
        LCALL   OUTSI
        MOV  A，#00H
        LCALL   OUTMI
        LCALL   OUTSI
        INC  R2
        CJNE  R2，#0BCH，DIS5
```

```
        LCALL    MS40
        LCALL    MS40
        LCALL    MS40
        LCALL    MS40
        MOV   A，#0AFH

；DISPLAY 汉字“两只黄鹂鸣翠柳 一行白鹭上青天”
INITMC：MOV   DPTR，#CHINESE
         MOV   R1   #00H
         MOV   B，#B8H
DISPWORDM：PUSH   B
        MOV    A，B
        LCALL   OUTMI
        LCALL   OUTST
        MOV   A，#00H
        LCALL   OUTMI
        MOV   R2   #7AH
DISPWORD1：MOV   A，R1
        MOVC   A，@A+DPTR
        LCALL   OUTMD
        INC   DPTR
        DEC   R2
        CJNE   R2，#3DH，DISPWORD1
        MOV   A，#00H
        LCALL   OUTST
DISPWORD2：MOV   A，R1
        MOVC   A，@A+DPTR
        LCALL   OUTSD
        INC   DPTR
        DJNZ   R2，DISPWORD2

        MOV   R1，#00H
        POP   B
        INC   B
        MOV   A，B
        CINZ   A，#0BCH，DISPWORDM
        LCALL   MS40
        LCALL   MS40
        LCALL   MS40
        LCALL   MS40

        AJMP   INITM

MS40：   MOV   R7，#0E8H
```

```
MS2:    MOV   R6，#0FFH
MS1:    DJNA   R6，MS1
        DJNZ   R7，MS2
        RET

；OUT   INSTRCTION   TO   MASTER 6450
OUTMI：PUSH   DPH
        PUSH   DPL
        MOV   DPTR，#6000H
        MOVX   @DPTR，A
        POP   DPL
        POP   DPH
        RET

；OUT   INSRCTION   TO SLAVE 6450
OUTSI：PUSH   DPH
       PUSH   DPL
       MOV   DPTR，#5000H
       MOVX   @DPTR，A
       POP   DPL
       POP   DPH
       RET

；OUT   DATA TO   MASTER 6450
OUTMD：PUSH   DPH
       PUSH   DPL
       MOV   DPTR，#0E000H
       MOVX   @DPTR，A
       POP   DPL
       POP   DPH
       RET

；OUT   DATA TO   SLAVE 6450
OUTSD：PUSH   DPH
       PUSH   DPL
       MOV   DPTR，#0D000H
       MOVX   @DPTR，A
       POP   DPL
       POP   DPH
       RET

CHINESE:；（PAGE0）
DB 00H,00H
DB 00H,80H,80H,80H,80H,80H,80H,80H,80H,80H,80H,80H,80H,0C0H,80H,00
```

```
DB 00,00,10H,88H,0C4H,23H,40H,42H,42H,42H,42H,42H,0C2H,43H,62H,40H,00
DB 00,00,00,0F8H,08H,0CH,0AH,09H,08H,08H,08H,08H,08H,0FCH,08H,00,00
DB 00,80H,0EEH,8AH,0FAH,0AAH,0AEH,80H,24H,0E3H,0B6H,0AAH,0B6H,0E2H,20H,20H,00
DB 00,00,00,00,00,00,00,00,0FFH,20H,20H,20H,30H,20H,00,00,00
DB 00,40H,44H,54H,54H,54H,54H,54H,7FH,54H,54H,54H,54H,56H,44H,40H,00
DB 00,40H,42H,42H,42H,42H,42H,42H,0FEH,42H,42H,42H,42H,43H,62H,40H,00
0B 00
;（PAGE1）
DB 00,00
0B 00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00,00
DB 00,02H,01H,00,0FFH,00,00,00,00,00,40H,80H,7FH,00,00,00,00
DB 00,00,00,7FH,21H,21H,21H,21H,21H,21H,21H,21H,21H,7FH,00,00,00
DB 00,00,40H,40H,5H,52H,53H,56H,5AH,52H,5AH,56H,90H,90H,78H,10H,00
DB 00,40H,40H,40H,40H,40H,40H,40H,7FH,40H,40H,40H,40H,40H,60H,40H,00
DB 00,00,00,00,0FFH,15H,15H,15H,15H,15H,55H,95H,7FH,00,00,00,00
DB 00,80H,80H,40H,20H,10H.0CH,03H,00,03H,0CH,10H,20H,40H,0C0H,40H,00
DB 00

;（PAGE2）
DB 00,00
DB 00,02H,02H,0F2H,12H,12H,0FEH,12H,12H,12H,0FEH,12H,12H,0F2H,03H,02H,00
DB 00,00,00,00,0FCH,04H,04H,04H,04H,04H,04H,04H,0FEH,04H,00,00,00
DB 00,20H,20H,24H,24H,24H,3FH,24H,0E4H,24H,3FH,24H,24H,24H,30H,20H,00
DB 00,04H,0E4H,24H,0E4H,04H,0E4H,26H,0E4H,00,0FCH,06H,55H,84H,7CH,00,00
DB 00,00,0FCH,04H,04H,0FCH,04H,00,0FCH,06H,15H,44H,84H,7EH,04H,00,00
DB 00,00,40H,41H,55H,0C9H,41H,5FH,60H,41H,55H,0C9H,41H,5FH,40H,00,00
DB 00,10H,0D0H,0FFH,90H,10H,0FEH,02H,02H,0F9H,00,0FEH,02H,02H,0FFH,02H,00
DB 00

;（PAGE3）
DB 00,00
DB 00,00,00,0FFH,08H,04H,03H,14H,08H,04H,03H,44H,98H,7FH,00,00,00
DB 00,00,80H,40H,23H,11H,19H,01H,01H,01H,09H,11H,23H,60H,0C0H,00,00
DB 00,00,80H,80H,5FH,55H,35H,15H,1FH,15H,35H,35H,5FH,40H,80H,00,00
DB 00,00,7FH,02H,7FH,00,7FH,02H,7FH,10H,13H,12H,1AH,52H,82H,7EH,00
DB 00,00,0FH,04H,04H,0FH,10H,10H,13H,12H,12H,1AH,52H,82,7FH,02H,00
DB 00,08H,08H,0AH,09H,08H,09H,0AH,0FCH,0AH,09H,08H,09H,0AH,08H,08H,00
DB 00,01H,00,0FFH,00,01H,8FH,44H,22H,1FH,00,0FFH,08H,10H,0FH,00,00
DB 00
```