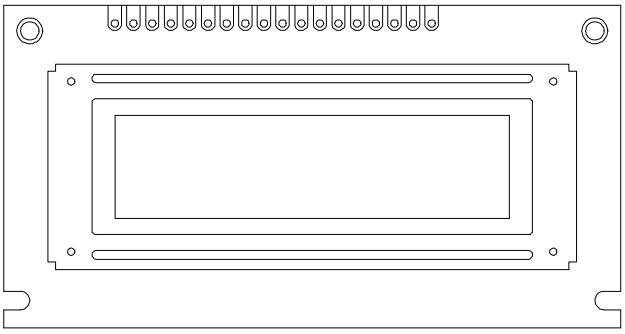
HANTRONIX

PRODUCT SPECIFICATION

HDM32GS12-B

122x32 GRAPHICS
LCD DISPLAY MODULE



HANTRONIX, INC. 10080 BUBB RD. CUPERTINO, CA 95014	**Q.A.:** JK	**REV.:** 1.0	HDM32GS12-B	SHEET 1 OF 14 **DATE:** 9/4/03

1.General specifications

1-1.General

The HDM32GS12-B dot matrix graphic LCD module consist of the liquid crystal display CMOS driver, a yellow or gray STN LCD.

1-2.Features

A. Drive Method:1/32 Duty, 1/5 Bias.

B. The Module Operating Voltage: 5.0V

C. Viewing Direction: 6:00h or 12:00h

D. Operating Temperature: 0℃~50℃ (Normal), -20℃~70℃ (Extended)

E. Storage Temperature: -20℃~70℃(Normal), -30℃~80℃ (Extended)

F. The Connect Method Between LCD and PCB: Zebra

G. The LED Backlight Operating Voltage: 4.1v

H. The LED Backlight Color: Yellow-Green or None

1-3.Mechanical Data:

(1) Module Size ---------- 84.0 w * 44.0 h mm

(2) Viewing Area ---------- 60.0 w * 18.5 h mm

(3) Dot Size ---------- 0.40 w * 0.40 h mm

(4) Dot Quality---------- 122 * 32

1-4. Absolute maximum ratings

Item		Symbol	Min.	Max.	Unit	Note
Supply Voltage	Logic	Vdd	-0.3	7.0	V	1),2)
	LCD drive	Vdd – V0	Vdd-13.5	Vdd+0.3	V	1),2)
Input voltage		Vi	-0.3	Vdd+0.3	V	1),2)
Operating Temperature		Top	0	50	℃	
Storage Temperature		Tstg	-20	70	℃	
Humidity		—	—	90	%RH	

Note

1) The modules may be destroyed if they are used beyond absolute maximum ratings. In ordinary operation, it is desirable to use them within recommended operation conditions. Using the modules beyond these conditions may cause malfunction and poor reliability.
2) All voltage values are referenced to GND=0V.

1-5.Electrical characteristics

Electrical characteristics

Item		Symbol	*Conditions*	Min.	Typ.	Max.	Unit
Supply Voltage	*Logic*	Vdd		4.5	5.0	5.5	V
	LCD drive	Vdd–V0		—	5.0	—	
Input Voltage	"H" Level	Vih	A0,D0-D7,E,R/W	2.0	—	Vdd	
	"L" Level	Vil	TERMINALS	0	—	0.8	
	"H" Level	Vih	$\overline{RES}$	0.8xVdd		Vdd	
	"L" Level	Vil	TERMINALS	0		0.2xVdd	
Frame Frequency		Fflm	Vdd=5V	60	65	70	Hz
Current Consumption	Logic	Idd	Vdd=5V Vdd–V0=5.0V Fflm=70Hz	—	0.5	—	mA
	LCD drive	I0		—	0.5	—	
LCD Driving Voltage (Recommended Voltage)		Vdd–V0	Ta= 0℃ φ=0° , θ=0°	—	—	—	V
			Ta= 25℃ φ=0° , θ=0°	—	5.0	—	
			Ta= 50℃ φ=0° , θ=0°	—	—	—	

Note: **<1>** Duty =1/32 **<2>** All dots on static state

1-6.Pin Connections:

<table>
<tr><th>Pin No.</th><th>Symbol</th><th>Level</th><th>Function</th></tr>
<tr><td>1</td><td>Vss</td><td>---</td><td>0V(GND)</td></tr>
<tr><td>2</td><td>Vdd</td><td>---</td><td>Power supply for logical circuit (5V).</td></tr>
<tr><td>3</td><td>Vo</td><td>---</td><td>Power Supply For LCD Driving.</td></tr>
<tr><td>4</td><td>A0</td><td>H/L</td><td>MPU control signal input.
MPU inputs transfer data/instruction selection signal.
➢ D/I="H": data at the data bus <DB0:DB7> is display data.
➢ D/I="L": data at the data bus <DB0:DB7> is instruction data.</td></tr>
<tr><td>5</td><td>E1</td><td>H/L</td><td>Master chip enable colock</td></tr>
<tr><td>6</td><td>E2</td><td>H/L</td><td>Slave chip enable colock</td></tr>
<tr><td>7</td><td>R/W</td><td>H/L</td><td>➢ When connect to the 68 type MPU.
Connect to Read/Write control signal input terminal of 68 type MPU.
<table>
<tr><td>R/W</td><td>H</td><td>L</td></tr>
<tr><td>Status</td><td>Read</td><td>Write</td></tr>
</table>
➢ When connect to the 80 type MPU.
Connect to /WR signal input terminal of 80 type MPU. Active "L".
The data on the data bus is fetch at the rising edge of this signal.</td></tr>
<tr><td>8~15</td><td>DB0~DB7</td><td>H/L</td><td>Tri-state bilateral Data Bus.
Transfers the data between MPU and module.</td></tr>
<tr><td>16</td><td>/RES</td><td>H/L</td><td>Reset signal and interface type select terminal.
The reset operation is performed by rise or fall edge of this signal.
The input level after initialization selects the interface type of 68 or 80 type of MPU.
<table>
<tr><td>MPU</td><td>Edge</td><td>Input level after initialization</td></tr>
<tr><td>68 Type</td><td>Rise</td><td>H</td></tr>
<tr><td>80 Type</td><td>Fall</td><td>L</td></tr>
</table></td></tr>
<tr><td>17~18</td><td>LED+,LED-</td><td></td><td>LED Backlight power supply</td></tr>
</table>

1-7.Timing Characteristics:

1-7-1 Read / Write operation sequence

Timing parameters VDD=5V±10%, VSS=0V, TA=0℃~+50℃

(68 Type MPU)

ITEM			SYMBOL	MIN	MAX	CONDITION	UNIT
Address Set Up time		A0, R/W	T_{AW6}	20	–	–	ns
Address Hold Time			T_{AH6}	10	–		
System Cycle Time			T_{CYC6}	1000	–		
Enable Pulse Width	Read	E	T_{EW}	100	–		
	Write			80	–		
Data Set Up Time		D0-D7	T_{DS6}	80	–		
Data Hold Time			T_{DH6}	10	–		
Access Time			T_{ACC6}	–	90	C_L=100pF	
Output Disable Time			T_{CH6}	10	60		

Note: Input signal rise time(tr)and fall time(tf) are less than 15ns.

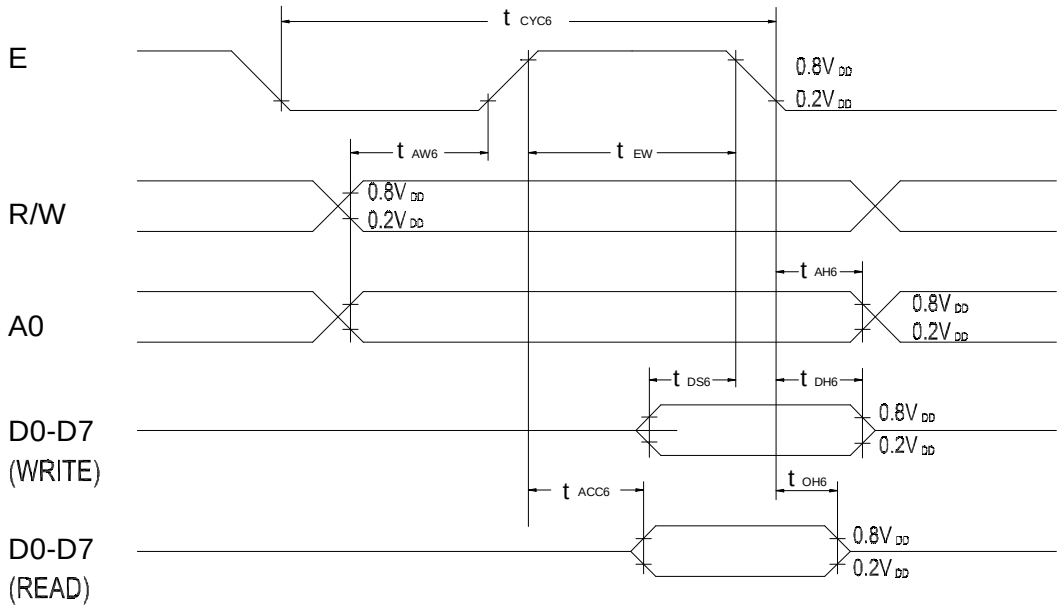
(80 Type MPU)

ITEM		SYMBOL	MIN	MAX	CONDITION	UNIT
Address Set Up time	A0	T_{AW8}	20	–	–	ns
Address Hold Time		T_{AH8}	10	–		
System Cycle Time	/RD,/WR	T_{CYC8}	1000	–		
Control Pulse Width		T_{CC}	200	–		
Data Set Up Time	D0-D7	T_{DS8}	80	–		
Data Hold Time		T_{DH8}	10	–		
Access Time		T_{ACC8}	–	90	C_L=100pF	
Output Disable Time		T_{CH8}	10	60		

Note: Input signal rise time(tr)and fall time(tf) are less than 15ns.

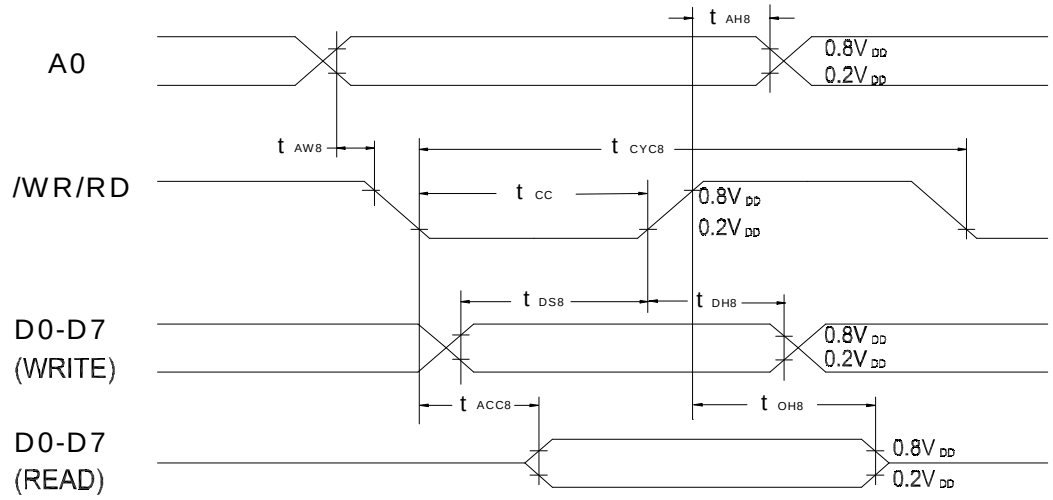
1-7-2 Timing Diagram

Bus Read/Write operation sequence(68 type MPU)



Bus Read / Write operation sequence

Bus Read/Write operation sequence(80 type MPU)



Bus Read / Write operation sequence

2.The characteristics and the reliability test

2-1.Electro-Optic Characteristics(LCM unit):

Condition:TEMP=(21±3)℃ HUM=(70±5)%RH

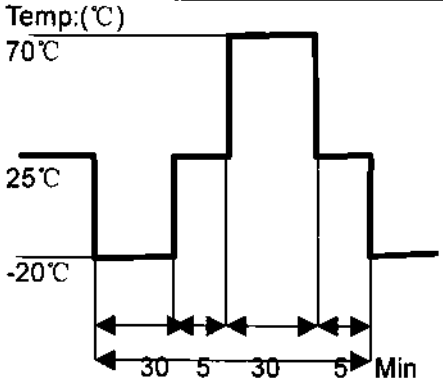
V_{DD}: 5.0V

NO	Item		Symbol	Min.	Typ.	Max.	Unit	Remarks
1	Operating Voltage		Vop		5.0		V	
2	Current Consumption		Is		1.08		mA	
3	Response Time		Ton		252		ms	
			Toff		63		ms	
4	Contrast		CR	3				
5	Viewing Angel (CR≥3.0)	12H	θ1		4		Deg.	
		6H	θ2		41			
		3H	θ3		45			
		9H	θ4		45			
6	Threshold Voltage		Vth		4.17		V	

2-2. Electro-Optic Characteristics(LED unit):

Ltem	Symbol	Min	Typ	Max	Unit
Forward Voltage	VF	3.95	4.1		V
Power Dissipation	PD		369		mW
Forward current	IF		90		mA
Color		Yellow-green			

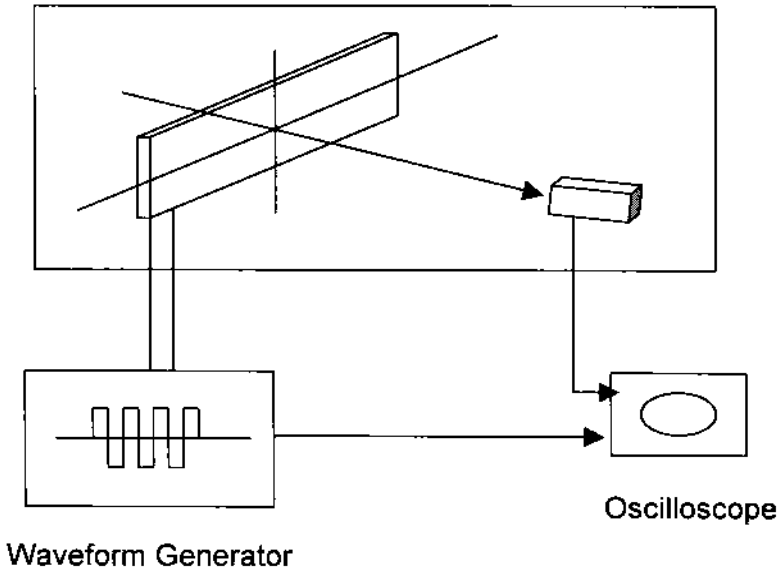
2-3.Reliability Test

No	Items	Test Condition	Equipmet	Test Result
1	High Temp Storage	Temp:70±2℃ Time:96h Restore:24h	Tenny	Passed
2	Low Temp Storage	Temp:-20±3℃ Time:96h Restore:24h	Tenny	Passed
3	High Temp Static drive	Temp:50±2℃ VOP: 5V Time:24h Restore:24h	Tenny	Passed
4	Low Temp Static drive	Temp:0±3℃ VOP: 5V Time:24h Restore:24h	Tenny	Passed
5	High Temp High Hum Storage	Temp:40±2℃ Hum:95%Rh Time:96h Restore:24h	Tenny	Passed
6	Thermal Shock	Temp:(℃)  5 Cycles Restore:24h	Tenny	Passed

3.The LCD measuring method and equipment

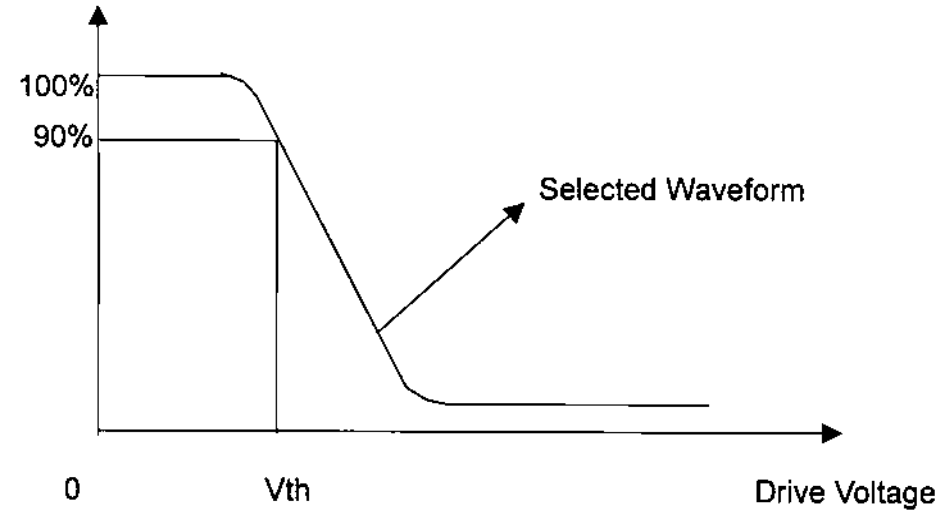
3-1.Threshold Voltage And Response Time Measuring

(1) Equipment

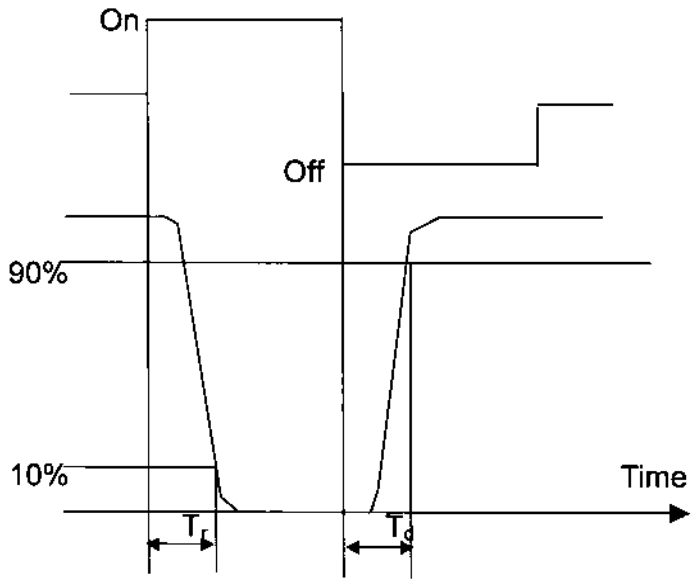


(2) Definition

A. Threshold Voltage (Vth)

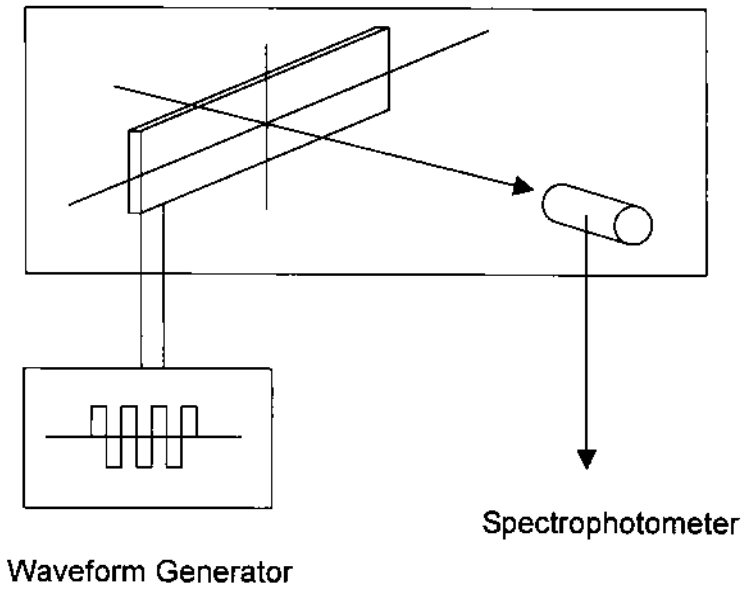


B. Response Time



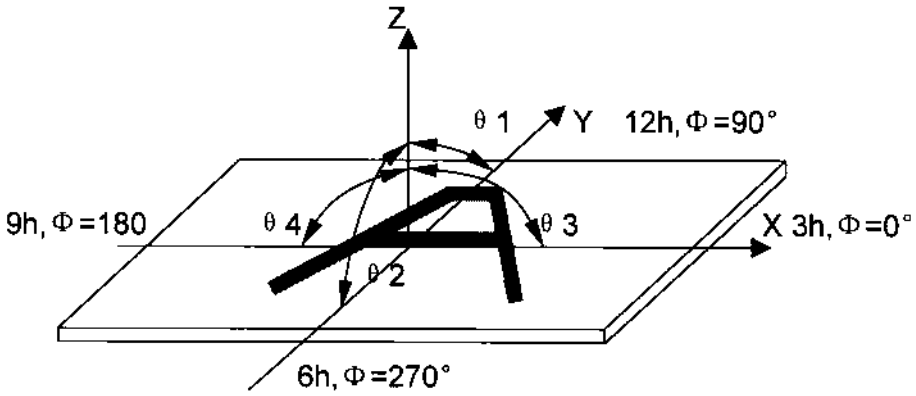
3-2. Contrast Measuring

(1) Equipment



(2)Definition:

A.Viewing Angle:



B. Contrast Ratio (Positive)

$$CR = \frac{\text{Brightness of non-selected wave-form}}{\text{Brightness of selected wave-form}}$$

3-3.Reliability Test:

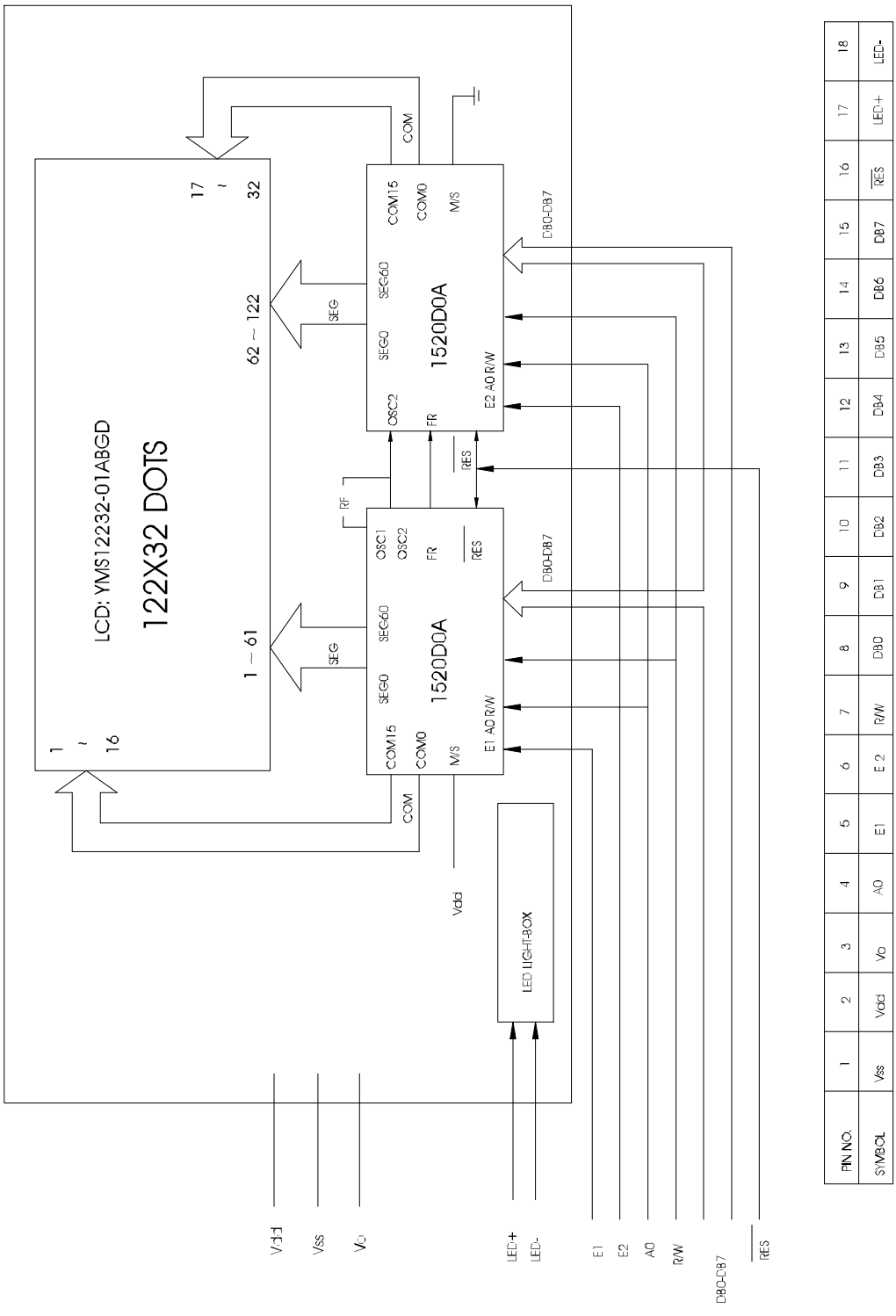
Equipment : TENNY

4. Control Instruction

The following table is the instruction codes of the module.

Instruction	Code											Description
	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	
Display On/Off	0	1	0	1	0	1	0	1	1	1	0/1	Whole Display On/Off. ➢ 1:On ➢ 0:Off
Display Start Line	0	1	0	1	1	0	Display Start Address (1~31)					Determine the Display Line correspond to the COM0.
Page Address Set	0	1	0	1	0	1	1	1	0	Page (0~3)		Set the Page of DDRAM to the Page Register.
Column Address Set	0	1	0	0	Column Address (0~79)							Set the Column Address of Display Data RAM to the Column Register.
Status Read	0	0	1	BUSY	ADC	ON / OFF	RESET	0	0	0	0	Read the status.
Write Display Data	1	1	0	Write Data								Write the data to the Display Data RAM.
Read Display Data	1	0	1	Read Data								Read the data from the Display Data RAM.
ADC Select	0	1	0	1	0	1	0	0	0	0	0/1	Determine output direction of segment signal
Static Drive On / Off	0	1	0	1	0	1	0	0	1	0	0/1	Select the Dynamic or Static Driving.
Duty Ratio Select	0	1	0	1	0	1	0	1	0	0	0/1	Select the duty ratio.
Read Modify Write	0	1	0	1	1	1	0	0	0	0	0	Increment the Column Address register when writing but no-change when reading.
End	0	1	0	1	1	1	0	1	1	1	0	Release from the Read Modify Write Mode.
Reset	0	1	0	1	1	1	0	0	0	1	0	Execute instruction reset
Power Save (Dual Command)	0 0	1 1	0 0	1 1	0 0	1 1	0 0	1 0	1 1	1 0	0 1	Set the power save mode by selecting. Display Off and Static Driving On.

5. Block Diagram



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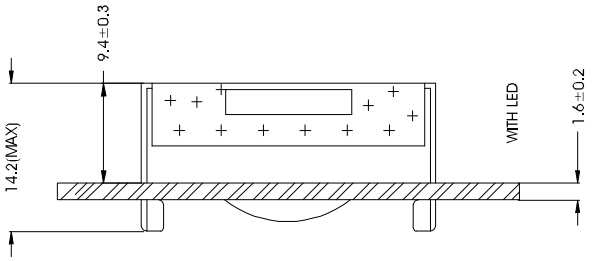
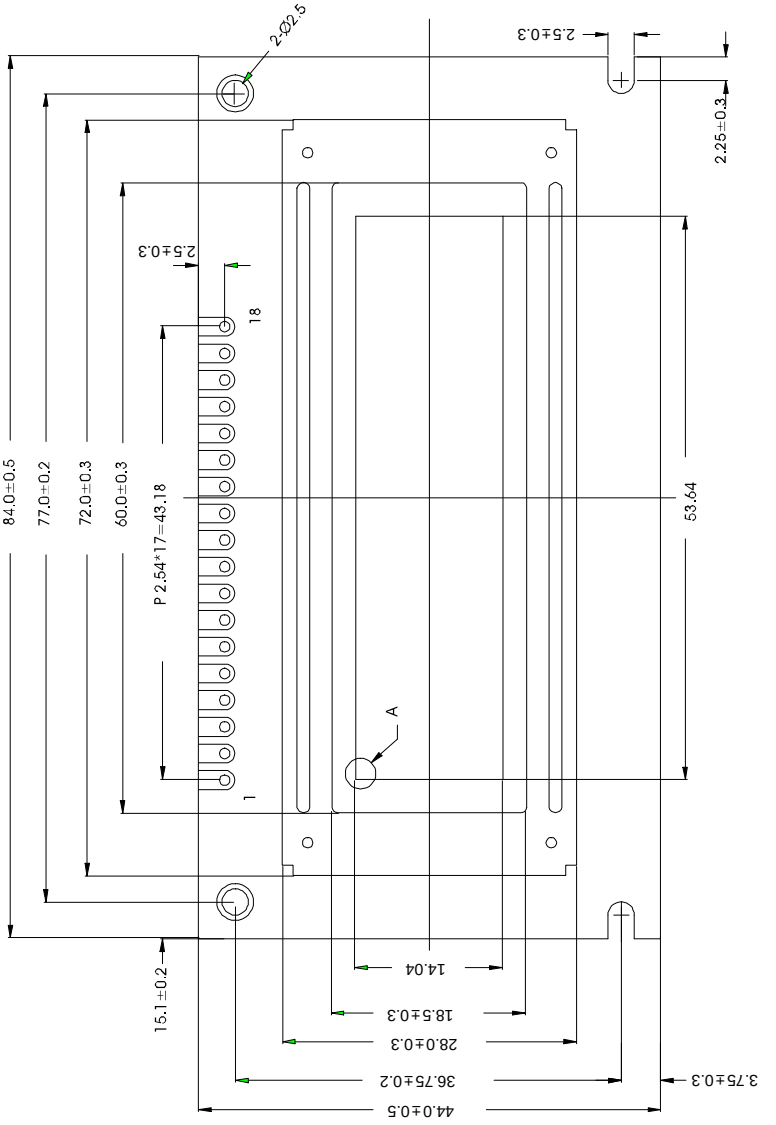
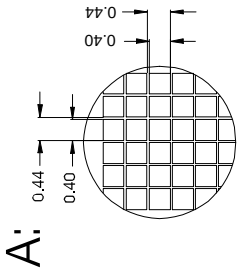
6. Drawing







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