

**Display Elektronik GmbH**

# DATA SHEET

**LCD MODULE**

## **DEM 122032A – SYH-LY**

**Product Specification**

**Version : 2**

**18/03/2008**

## **DOCUMENT REVISION HISTORY**

<b>Version</b>	<b>DATE</b>	<b>DESCRIPTION</b>	<b>CHANGED BY</b>
0	29.05.2006	First issue	-
1	05.09.2006	Change Print	MH
2	18.03.2008	Change LCD-driver	MH

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### 1. FUNCTIONS & FEATURES

- 1.1. Format : 122 x 32dots
- 1.2. LCD mode : STN / Positive Transflective Mode / Yellow-Green
- 1.3. Viewing direction : 6 o'clock
- 1.4. Driving scheme : 1/32 Duty cycle, 1/5 Bias
- 1.5. Power supply voltage (V<sub>DD</sub>) : 5.0 Volt (typ.)
- 1.6. LCD driving voltage : 4.5 Volt (typ. at 25°C)
- 1.7. Operation temp : -20°C ~ 70°C
- 1.8. Storage temp : -30°C ~ 80°C
- 1.9. Backlight color : Lightbox, Yellow-Green
- 1.10. Control IC : PT6520 (PTC)
- 1.11. ROHS standard

### 2. MECHANICAL SPECIFICATIONS

- 2.1. Module size : 80.00 x 36.00 x 13.5 mm
- 2.2. Viewing area : 60.50 x 18.50 mm
- 2.3. Dot pitch : 0.44 x 0.49 mm
- 2.4. Dot size : 0.40 x 0.45 mm

### 3. BLOCK DIAGRAM

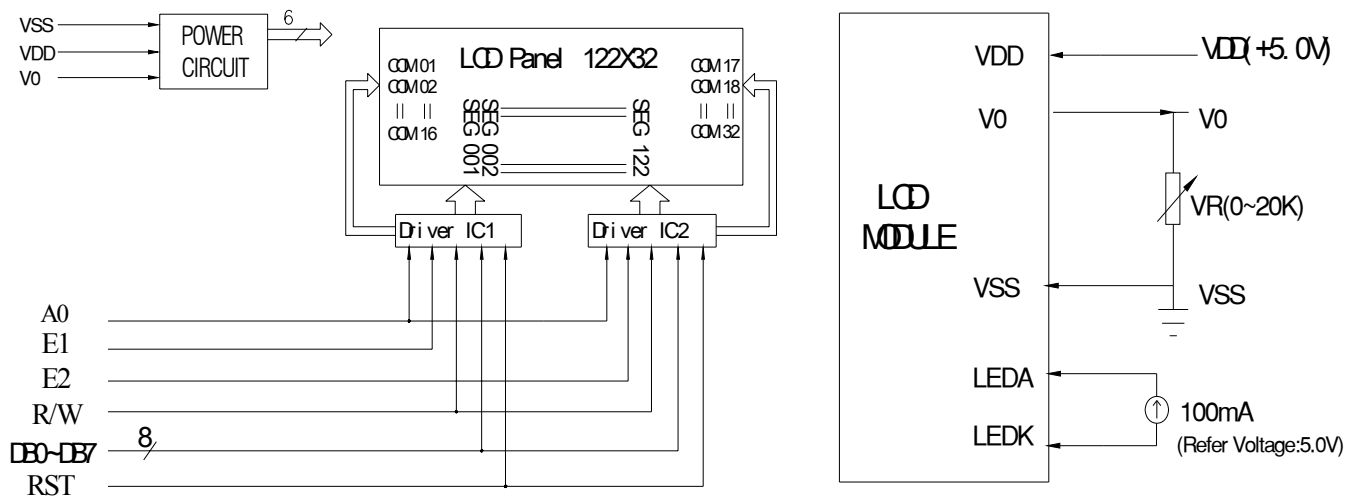


Figure 1. Block diagram

**4. DIMENSIONAL OUTLINE**

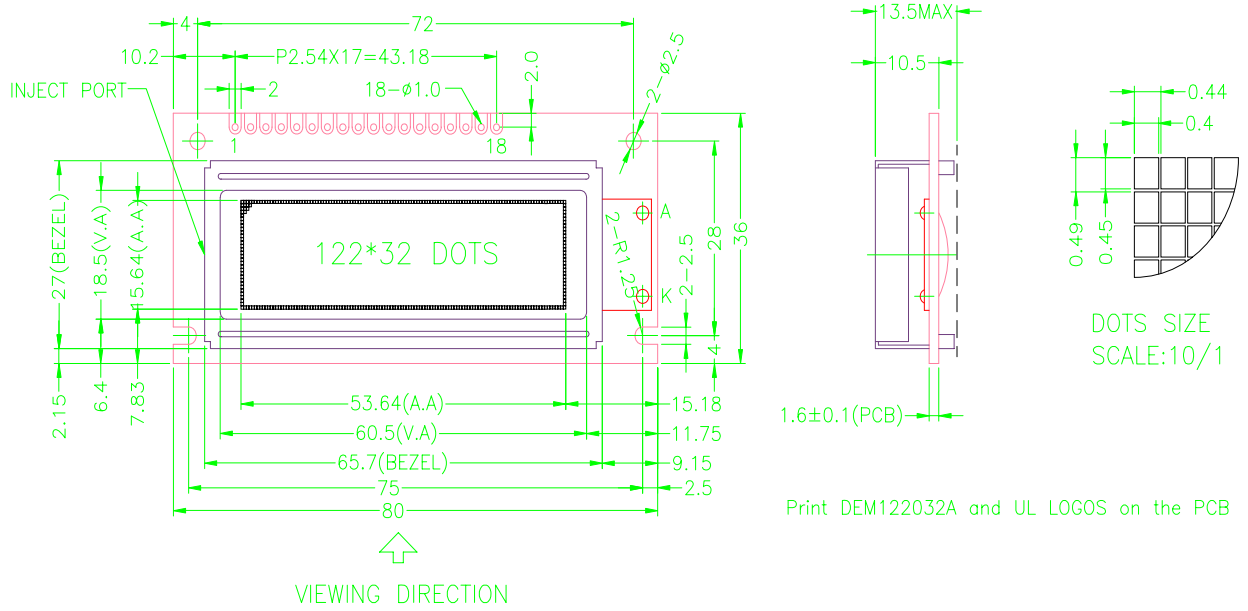


Figure 2. Dimensional outline

## 5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND
2	VDD	Power supply
3	VO	Supply voltage for LCD drive
4	A0	Register selection. (H: Data register L: Instruction register)
5	E1	Enable signal for IC1(left half of the panel)
6	E2	Enable signal for IC2(right half of the panel)
7	R/W	Read /write selection. (H: Read L: write)
8~15	DB0~DB7	Data bus lines
16	RST	Reset signal(The rise of the signal is for active and keep RST='h')
17	LED+(A)	Power supply for backlight (Current:100mA, Reference voltage:5.0V)
18	LED-(K)	Power supply for backlight(-)

## 6. MAXIMUM ABSOLUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V <sub>DD</sub>	-0.3	8.0	V
Supply Voltage for LCD	V <sub>0</sub>	-0.3	16.5	V
Input Voltage	V <sub>in</sub>	-0.3	V <sub>DD</sub> +0.3	V
Supply Current for Backlight	I <sub>F</sub> (Ta = 25°C)	---	100+100*20%	mA
Reverse Voltage for Backlight	V <sub>R</sub> (Ta = 25°C)	---	10	V
Operating Temperature	T <sub>op</sub>	-20	70	°C
Storage Temperature	T <sub>st</sub>	-30	80	°C

## 7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V <sub>DD</sub> -V <sub>SS</sub>	Ta = 25°C	4.5	5.0	5.5	V
Input High Voltage	V <sub>IH</sub>	Ta = 25°C	V <sub>DD</sub> -3.0	---	V <sub>DD</sub>	V
Input Low Voltage	V <sub>IL</sub>	Ta = 25°C	V <sub>SS</sub>	---	V <sub>SS</sub> +0.8	V
Output High Voltage	V <sub>OH</sub>	Ta = 25°C	2.4	---	---	V
Output Low Voltage	V <sub>OL</sub>	Ta = 25°C	---	---	0.4	V
Supply Current	I <sub>DD</sub>	Ta = 25°C	---	3	5	mA

### 8. TIMING CHARACTERISTICS

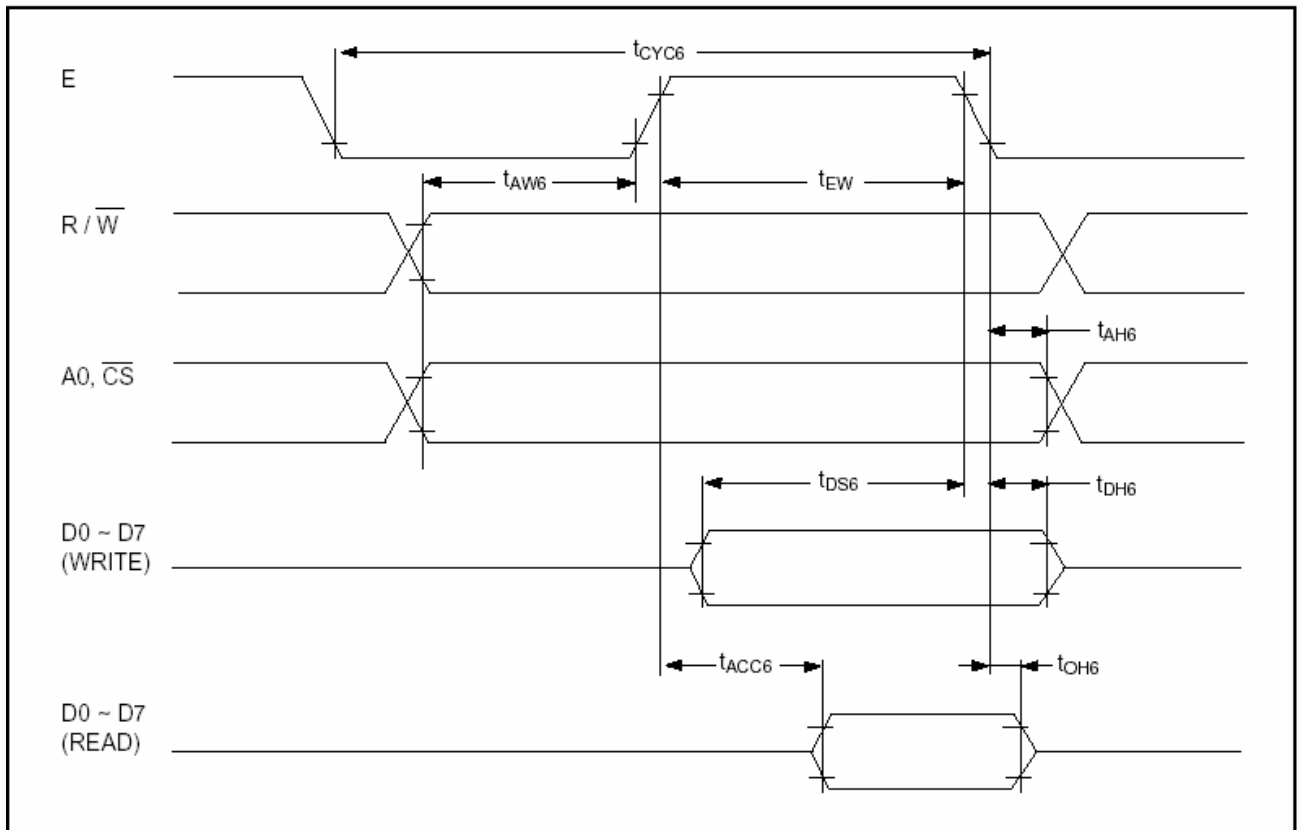
Ta=25°C, V<sub>DD</sub>=0V, V<sub>SS</sub>=-5V)

Parameter	Symbol	Signal	Condition	Min	Typ	Max	Unit
System cycle time	t <sub>CYC6</sub> *1	A0, $\overline{CS}$	CL = 100 pF	1000	—	—	ns
Address setup time	t <sub>AW6</sub>	R/ $\overline{W}$		20	—	—	ns
Address hold time	t <sub>AH6</sub>			10	—	—	ns
Data setup time	t <sub>DS6</sub>	D0 – D7		80	—	—	ns
Data hold time	t <sub>DH6</sub>			10	—	—	ns
Output disable time	t <sub>OH6</sub>			10	—	60	ns
Access time	t <sub>ACC6</sub>				—	—	90
Enable pulse width: Read	t <sub>EW</sub>	E		100	—	—	ns
Enable pulse width: Write				80	—	—	ns

\*1 t<sub>CYC6</sub> indicates the cycle time during which  $\overline{CS} \cdot E = "H"$ . It does not mean the cycle time of signal E.

\*2 Each of the values where V<sub>SS</sub> = -3.0V is about 200% of that where V<sub>SS</sub> = -5.0V (i.e., the listed value).

\*3 The rise or fall time of input signals should be less than 15 ns.



System bus read/write II (68-family MPU)

## 9. CONTROL AND DISPLAY INSTRUCTION

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	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								Reads data from the Display RAM onto the data bus.	
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	
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.	



**10. BACKLIGHT CHARACTERISTICS**

LCD Module with bottom LED Backlight  
**ELECTRICAL RATINGS**

Ta = 25°C

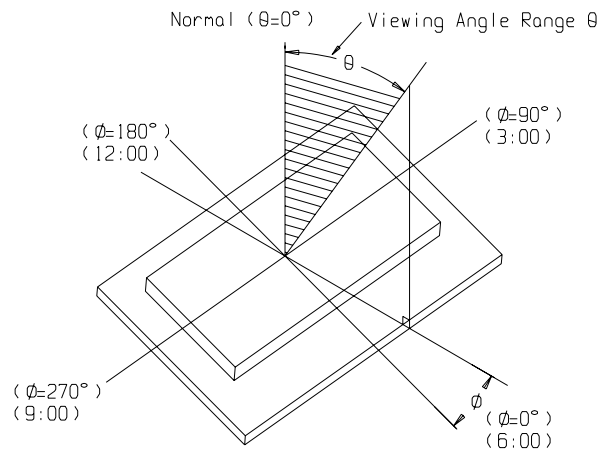
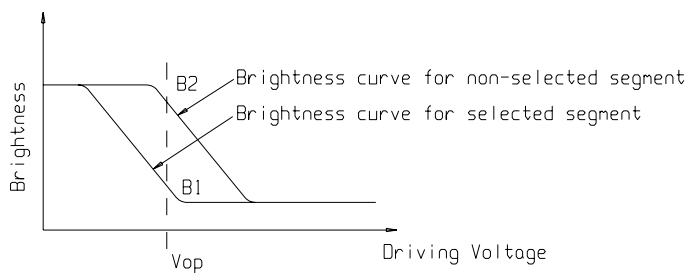
Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=100mA	4.0	4.2	4.4	V
Reverse Current	IR	VR=10V	---	100	500	uA
Luminous Intensity (Without LCD)	IV	IF=100mA	150	200	---	Cd/m <sup>2</sup>
Wave length(Without LCD)	λρ	IF=100mA	569	572	575	nm
Color	Bottom Yellow-Green					

**11. ELECTRO-OPTICAL CHARACTERISTICS**

( V<sub>DD</sub>=5.0V, Ta = 25°C )

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20C	4.6	5.0	5.4	V
		Ta = 25°C	4.1	4.5	4.9	
		Ta = 70C	3.6	4.0	4.4	
Response time	Tr	Ta = 25°C	---	185	---	ms
	Tf		---	200	---	ms
Contrast	Cr	Ta = 25°C	---	4	---	---
Viewing angle range	θ	Cr≥2	-40	---	+40	deg
	Φ		-40	---	+40	deg

$$Cr = \frac{\text{Brightness of non-selected segment}(B2)}{\text{Brightness of selected segment}(B1)}$$



## 12. Precaution for using LCD/LCM

LCD/LCM is assembled and adjusted with a high degree of precision. Do not attempt to make any alteration or modification. The followings should be noted.

### General Precautions:

1. LCD panel is made of glass. Avoid excessive mechanical shock or applying strong pressure onto the surface of display area.
2. The polarizer used on the display surface is easily scratched and damaged. Extreme care should be taken when handling. To clean dust or dirt off the display surface, wipe gently with cotton, or other soft material soaked with isopropyl alcohol, ethyl alcohol or trichlorotrifluoroethane, do not use water, ketone or aromatics and never scrub hard.
3. Do not tamper in any way with the tabs on the metal frame.
4. Do not make any modification on the PCB without consulting DISPLAY.
5. When mounting a LCM, make sure that the PCB is not under any stress such as bending or twisting. Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.
6. Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels and also cause rainbow on the display.
7. Be careful not to touch or swallow liquid crystal that might leak from a damaged cell. Any liquid crystal adheres to skin or clothes, wash it off immediately with soap and water.

### Static Electricity Precautions:

1. CMOS-LSI is used for the module circuit; therefore operators should be grounded whenever he/she comes into contact with the module.
2. Do not touch any of the conductive parts such as the LSI pads; the copper leads on the PCB and the interface terminals with any parts of the human body.
3. Do not touch the connection terminals of the display with bare hand; it will cause disconnection or defective insulation of terminals.
4. The modules should be kept in anti-static bags or other containers resistant to static for storage.
5. Only properly grounded soldering irons should be used.
6. If an electric screwdriver is used, it should be grounded and shielded to prevent sparks.
7. The normal static prevention measures should be observed for work clothes and working benches.
8. Since dry air is inductive to static, a relative humidity of 50-60% is recommended.

**Soldering Precautions:**

1. Soldering should be performed only on the I/O terminals.
2. Use soldering irons with proper grounding and no leakage.
3. Soldering temperature:  $280^{\circ}\text{C}\pm 10^{\circ}\text{C}$
4. Soldering time: 3 to 4 second.
5. Use eutectic solder with resin flux filling.
6. If flux is used, the LCD surface should be protected to avoid spattering flux.
7. Flux residue should be removed.

**Operation Precautions:**

1. The viewing angle can be adjusted by varying the LCD driving voltage  $V_o$ .
2. Since applied DC voltage causes electro-chemical reactions, which deteriorate the display, the applied pulse waveform should be a symmetric waveform such that no DC component remains. Be sure to use the specified operating voltage.
3. Driving voltage should be kept within specified range; excess voltage will shorten display life.
4. Response time increases with decrease in temperature.
5. Display color may be affected at temperatures above its operational range.
6. Keep the temperature within the specified range usage and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel-off or generate bubbles.
7. For long-term storage over  $40^{\circ}\text{C}$  is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

**Limited Warranty**

DISPLAY LCDs and modules are not consumer products, but may be incorporated by DISPLAY's customers into consumer products or components thereof, DISPLAY does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of DISPLAY is limited to repair or replacement on the terms set forth below. DISPLAY will not be responsible for any subsequent or consequential events or injury or damage to any personnel or user including third party personnel and/or user. Unless otherwise agreed in writing between DISPLAY and the customer, DISPLAY will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with DISPLAY general LCD inspection standard . (Copies available on request)
2. No warranty can be granted if any of the precautions state in handling liquid crystal display above has been disregarded. Broken glass, scratches on polarizer mechanical damages as well as defects that are caused accelerated environment tests are excluded from warranty.
3. In returning the LCD/LCM, they must be properly packaged; there should be detailed description of the failures or defect.

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