Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 122032B – SYH-LY

Product specification   **Version : 1**

23/April/2007

DOCUMENT REVISION HISTORY

Version	DATE	DESCRIPTION	CHANGED BY
00	Sep-5-2006	First issue	
01	Sep-5-2006	Change print	

CONTENTS

1. FUNCTIONS & FEATURES

1.1. Format : 122x32dots
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_{DD}) : 5.0 Volt (typ.)
1.6. LCD driving voltage : 4.8 Volt (typ.)
1.7. Operation temp : -20 ~ 70°C
1.8. Storage temp : -30 ~ 80°C
1.9. Backlight : LED, Yellow-green, Lightbox

2. MECHANICAL SPECIFICATIONS

2.1. Module size : 84.0 x 44.0 x 13.5 mm(max.)
2.2. Viewing area : 61.0 x 19.5 mm
2.3. Dot pitch : 0.44 x 0.49 mm
2.4. Dot size : 0.40 x 0.45 mm

3. BLOCK DIAGRAM
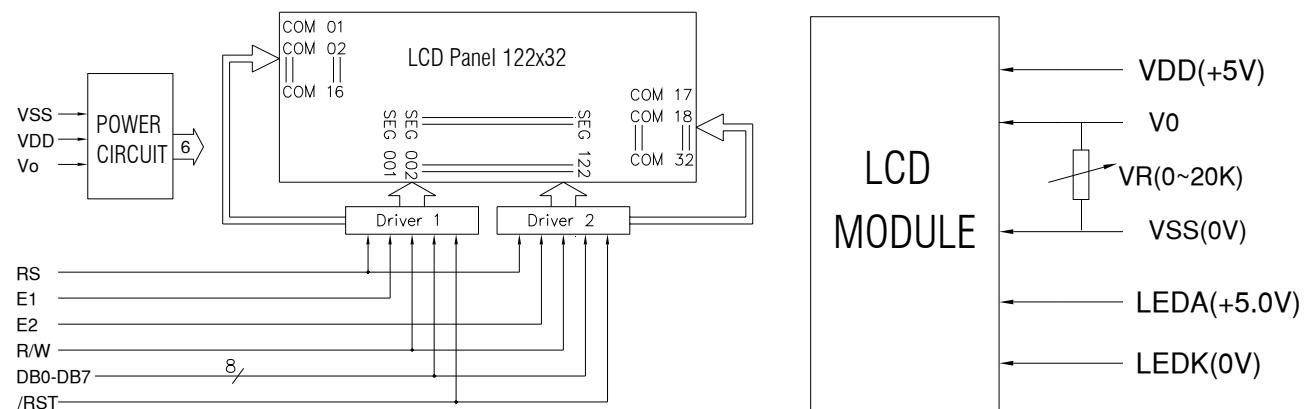
Figure 1. Block diagram

4. DIMENSIONAL OUTLINE
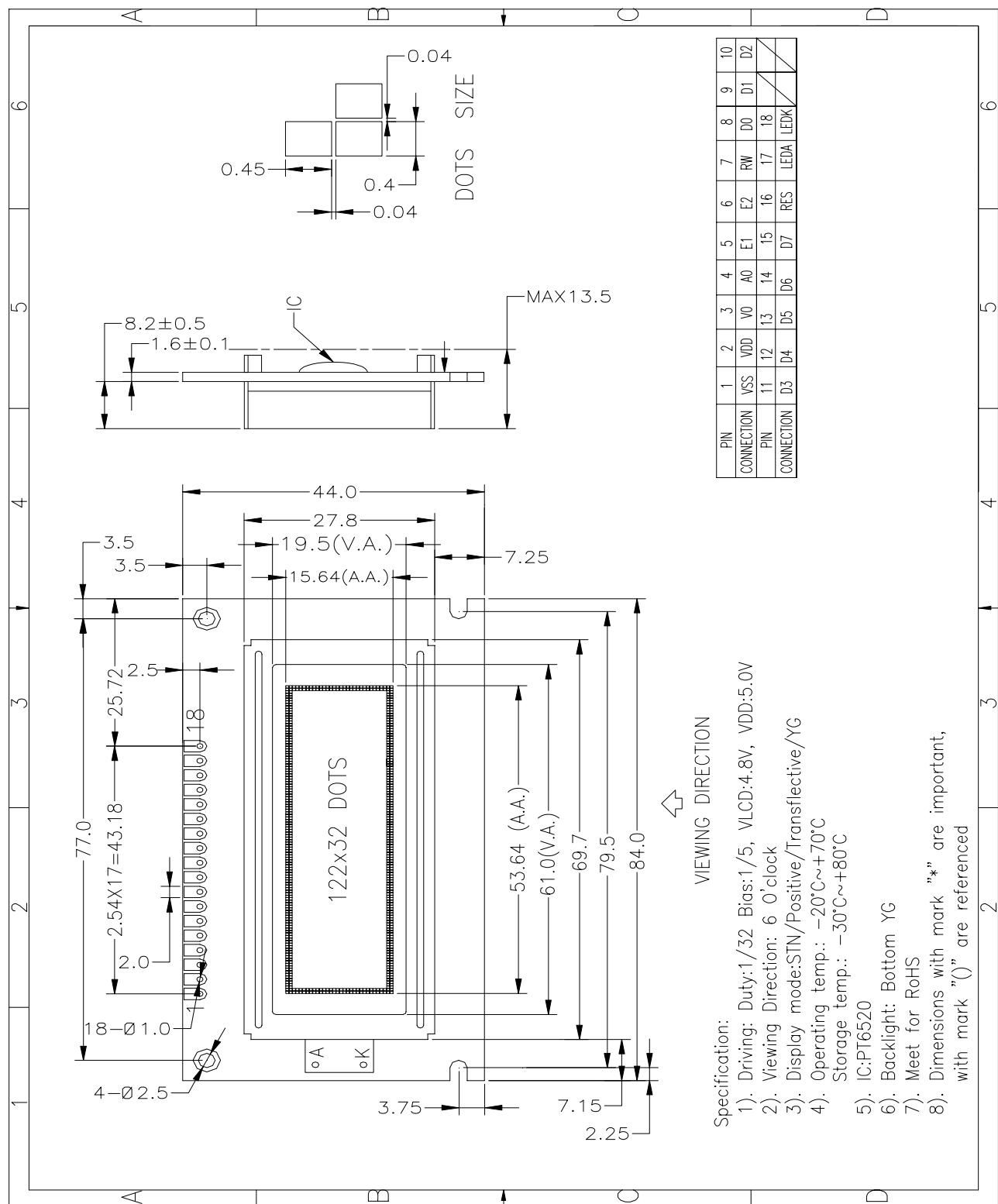
Figure 2. Dimensional outline

5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND(0V)
2	VDD	Power supply (+5V)
3	VO	Supply voltage for LCD drive
4	RS	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 RET='h')
17	LED+ (A)	Power supply for backlight(+5V)
18	LED- (K)	Power supply for backlight(0V)

6. MAXIMUM ABSOUTE LIMIT
 (For IC)

Absolute Maximum Ratings

Parameter	Symbol	Rating	Unit
Supply voltage (1)	Vss	-8.0 to +0.3	V
Supply voltage (2)	V5	-16.5 to +0.3	V
Supply voltage (3)	V1, V4, V2, V3	V5 to +0.3	V
Input voltage	VIN	Vss -0.3 to +0.3	V
Output voltage	VO	Vss -0.3 to +0.3	V
Power dissipation	PD	250	mW
Operating temperature	Topr	-30 to +85	deg. C
Storage temperature	Tstg	-65 to +150	deg. C
Soldering temperature time at lead	Tsol	260, 10	deg. C, s

Notes :
1. All voltages are specified relative to VDD= 0 V.
2. The following relation must be always hold
   VDD$\geq$V2$\geq$V3$\geq$V4$\geq$V5
3. Execeding the absolute maximum ratings may cause permanent damage to the device. Functional
   operation under these conditions is not implied.
4. Moisture resistance of flat packages can be reduced by the soldering process, so care should be
   taken to avoid thermally stressing the package during board assembly.

7. ELECTRICAL CHARACTERISTICS

(VDD=0V, VSS=-5V)

Parameter		Symbol	Condition		Min	Typ	Max	Unit	Applicable Pin
Operating voltage (1)*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+2.0	-	VDD	V	*2, *3
		VIHC			0.2xVSS	-	VDD		
		VIHT	VSS=-3v		0.2xVSS	-	VDD		*2, *3
		VIHC	VSS=-3v		0.2xVSS	-	VDD		
Low input voltage		VILT			VSS	-	VSS+0.8	V	*2, *3
		VILC			VSS	-	0.8xVSS		
		VILT	VSS=-3v		VSS	-	0.85xVSS		*2, *3
		VILC	VSS=-3v		VSS	-	0.8xVSS		
High output voltage		VOHT	IOH=-3.0mA		VSS+2.4	-	-	V	OSC2 *4, *5
		VOHC1	IOH=-2.0mA		VSS+2.4	-	-		
		VOHC2	IOH=-120Ma		0.2xVSS	-	-		
		VOHT	VSS=-3v	IOH=-2mA	0.2xVSS			V	*4, *5 OSC2
		VOHC1	VSS=-3v	IOH=-2mA	0.2xVSS				
		VOHC2	VSS=-3v	IOH=-50µA	0.2xVSS				
Low output voltage		VOLT	IOL=3.0mA		-	-	VSS+0.4	V	OSC2 *4, *5
		VOLT1	IOL=2.0mA		-	-	VSS+0.4		
		VOLT2	IOL=120µA		-	-	0.8xVSS		
		VOLT	VSS=-3v	IOL=2mA			0.8xVSS	V	*4, *5 OSC2
		VOLC1	VSS=-3v	IOL=2mA			0.8xVSS		
		VOLC2	VSS=-3v	IOL=50µA			0.8xVSS		
Input leak current		ILI			-1	-	1	µA	*6
Output leak current		ILO			-3	-	3	µA	*7
LCD driver ON resistance		RON	Ta=25°C	V5=-5.0V	-	5	7.5	KΩ	SEG0~60 COM0~15
				V5=-3.5V	-	10	50		
Static current consumption		IDDQ	CS=CL=VDD		-	0.05	1	µA	VDD
Dynamic current dissipation	External CLK	During IDD (1)	During display Vs=-5.0V	Rf=1MΩ	-	9.5	15	µA	VDD
	Oscillator		During display V5=-5V VSS =-3V	Rf=1 MΩ	-	6.0	12	µA	
		IDD (2)	During access Tcyc = 200kHz		-	300	500	µA	VDD
			VSS=-3V, During access Tcyc = 200 kHz			150	300		
Input terminal capacity		CIN	Ta=25°C, f=1MHz		-	5.0	8	pF	All input terminals
Oscillation frequency		Fosc	Rf=1MΩ+2%	VSS=-5.0V	15	18	21	kHz	*4, *5 OSC2
			Rf=1MΩ +2%	VSS=-3.0V	11	16	21		
Reset time		tR			1.0	-		µs	RES
Hysteresis		VH			0.05VSS	0.1VSS	-	V	

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 and CS pins
3. CL, FR, M/S and RES pins
4. A0, E, R/W, CS, CL, RES, M/S pins

8. TIMING CHARACTERISTICS

. **MPU Bus Read/Write II (68-family MPU)**
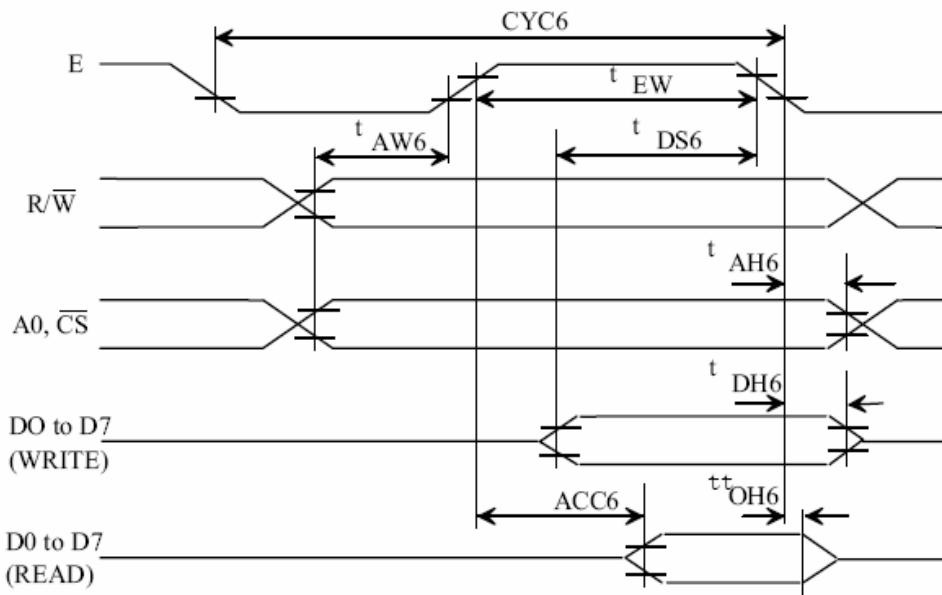
Ta= -20 to 75 deg. C. Vss= -5V ± 10 unless stated otherwise

Parameter		Symbol	Condition	Rating		Unit	Signal
				min	max		
System cycle time		tCYC6		1,000	--	ns	A0, $\overline{CS}$, R/$\overline{W}$
Address setup time		tAW6		20	--	ns	
Address hold time		tAH6		10	--	ns	
Data setup time		tDS6		80	--	ns	D0 to D7
Data hold time		tDH6		10	--	ns	
Output disable time		tOH6		10	60	ns	
Access time		tACC6	CL= 100pF	--	90	ns	
Enable pulsewidth	Read	tEW		100	--	ns	E
	Write			8	--	ns	

Notes : 1. tCYC6 is the cycle time of $\overline{CS}$. E=H. not the cycle time of E.
       2. Increase parameter values by 200% when Vss= -3.0V.
       3. all inputs must have a rise and fall time of less than 15 ns.

9. CONTROL AND DISPLAY INSTRUCTION

Command	A0	RD	WR	D7	D6	D5	D4	D3	D2	D1	D0	Function
Display On/Off	0	1	0	1	0	1	0	1	1	1	0/1	Turns display on or off. 1 : ON, 0 : OFF
Display start line	0	1	0	1	1	0	Display start address (0 to 31)					Specifies RAM line corresponding to top line of display.
Set page address	0	1	0	1	0	1	1	1	0	Page (0 to 3)		Sets display RAM page in page address register.
Set column (segment) address	0	1	0	0	Column address (0 to 79)							Sets display RAM column address in column address registser.
Read status	0	0	1	Busy	ADC	ON/OFF	Reset	0	0	0	0	Reads the following status : BUSY 1 : Busy 0 : Ready ADC 1 : CW output 0 : CCW output ON/OFF 1 : Display off 0 : Display on RESET 1 : Being reset 0 : Normal
Write display data	1	1	0	Write data								Writes data from data bus into display RAM.
Read display data	1	0	1	Read data								Reads data from display RAM onto data bus.
Select ADC	0	1	0	1	0	1	0	0	0	0	0/1	0 : CW output, 1 : CCW output
Statis drive ON/OFF	0	1	0	1	0	1	0	0	1	0	0/1	Selects static driving operation. 1 : Static drive, 0 : Normal driving
Select duty	0	1	0	1	0	1	0	1	0	0	0/1	Selects LCD duty cycle 1 : 1/32, 0 : 1/16
Read-Modify -Write	0	1	0	1	1	1	0	0	0	0	0	Read-modify-write ON
End	0	1	0	1	1	1	0	1	1	1	0	Read-modify-write OFF
Reset	0	1	0	1	1	1	0	0	0	1	0	Software reset

10. BACK LIGHT CHARACTERISTICS

LCD Module with bottom Backlight
ELECTRICAL   RATINGS

Ta = 25°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=100mA	3.85	4.05	4.25	V
Reverse Current	IR	VR=8V	---	---	1	mA
Luminous Intensity (With LCD dots off)	IV	IF=100mA	125	179	---	Cd/m^2
Wave length	λρ	IF=100mA		568		nm
Color	Yellow-green					
External use at pin 17/18	5 Volt with approx. 140mA (typ.)					

11. ELECTRO-OPTICAL CHARACTERISTICS

(V_{OP} =4.8V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20°C	5.0	5.2	5.4	V
		Ta = 25°C	4.6	4.8	5.0	
		Ta = 70°C	4.2	4.4	4.6	
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

$$Cr = \frac{\text{Brightness of non-selected segment(B2)}}{\text{Brightness of selected segment(B1)}}$$
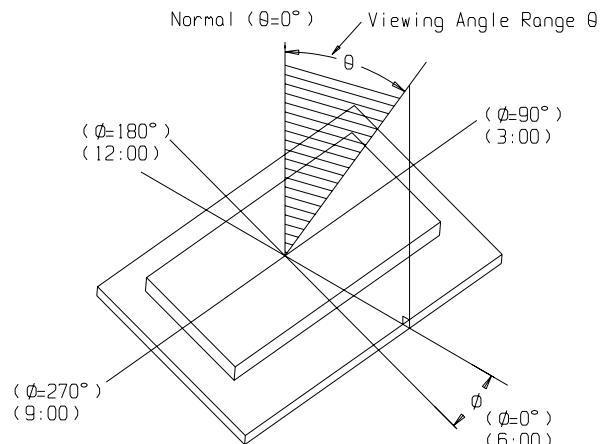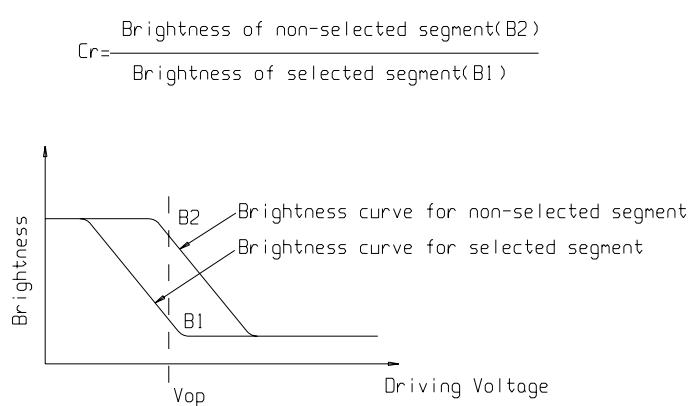
12. PRECAUTION FOR USING LCD/LCM

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 isoproply alcohol, ethyl alcohol or trichlorotriflorothane, 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 when ever 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 enches.
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: $280°C \pm 10°C$
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 Vo.
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°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 ailures or defect.