

Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 320240A FGH-CW

Product specification

Version : 1

15/03/2007

**SPECIFICATION FOR
LCM MODULE**

DEM 320240A FGH-CW

Customer Approval:

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	SIGNATURE	DATE
PREPARED BY (RD ENGINEER)	MH	09.03.2007
CHECKED BY	MHO	15.03.2007
APPROVED BY	MH	15.03.2007

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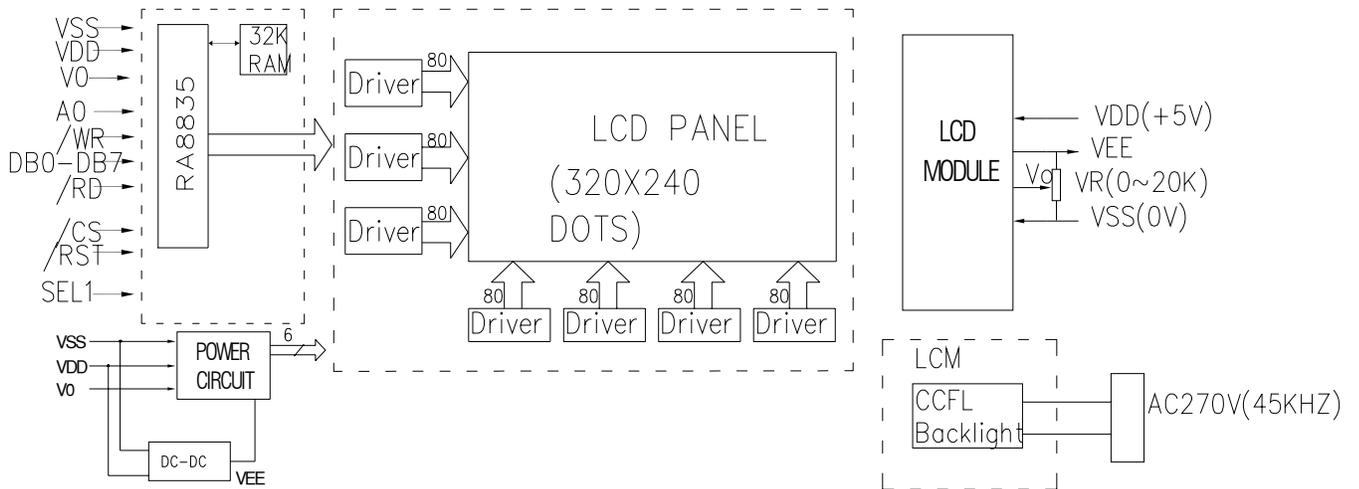
1. FUNCTIONS & FEATURES

Display Format	: 320 x 240 dots
LCD Mode	: FSTN transfective positive
Viewing Direction	: 6 o'clock
Driving Scheme	: 1/240 Duty cycle, 1/12 Bias
Power Supply Voltage(V _{DD})	: 5.0 Volt (typ.)
LCD Driving Voltage	: 23.8 Volt (typ. at 25°C)
Operation Temperature	: -20 ~ 70°C
Storage Temperature	: -30 ~ 80°C
Backlight	: CCFL, white

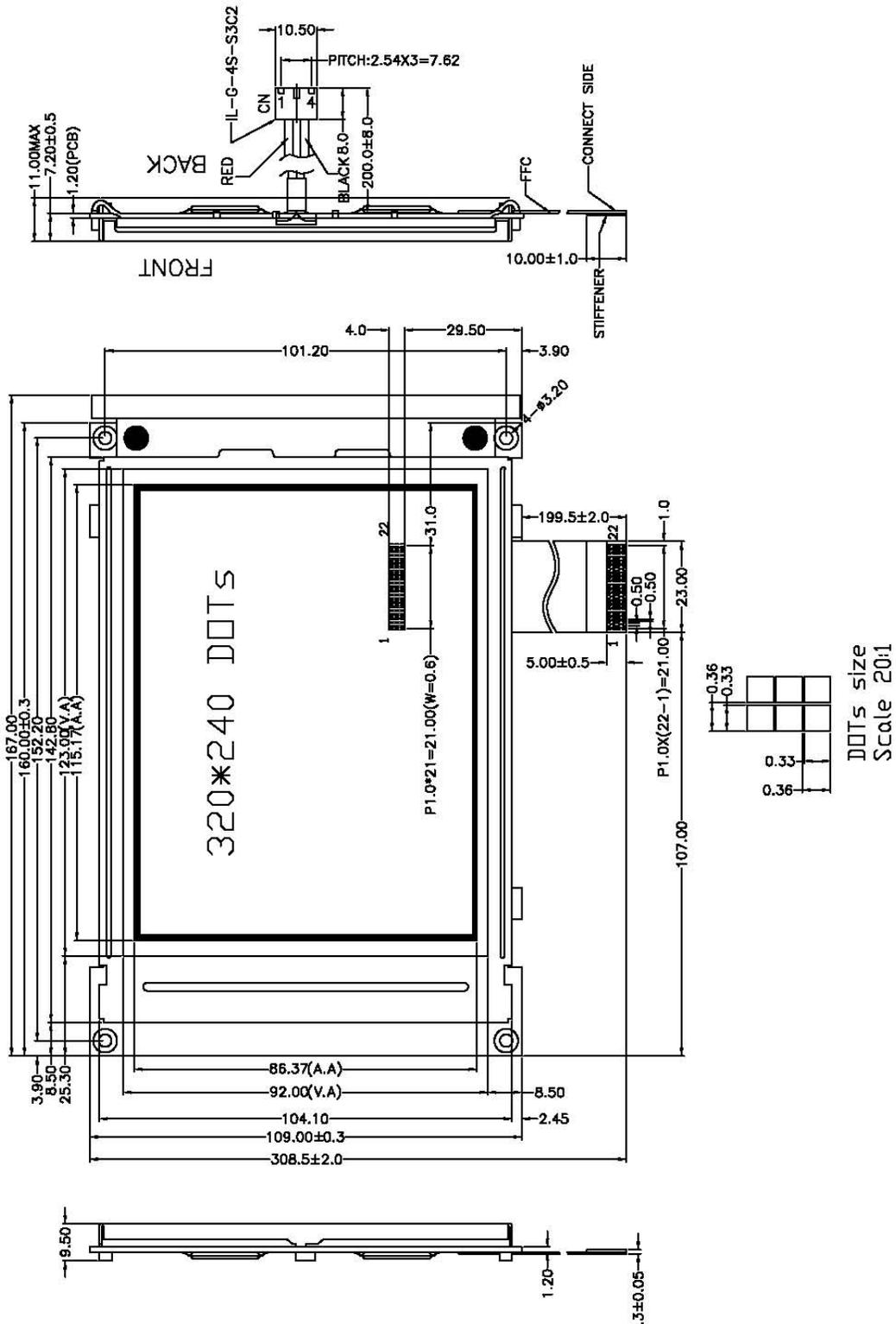
2. MECHANICAL SPECIFICATIONS

Module Size	: 167.0 x 109.0 x 11.0 mm (max.)
Viewing Area	: 123.0 x 92.0 mm
Dot Pitch	: 0.36 x 0.36 mm
Dot Size	: 0.33 x 0.33 mm

3. BLOCK DIAGRAM



4. DIMENSIONAL OUTLINE



5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND (0 Volt)
2	VDD	Power supply for the logic (+5 Volt)
3	V0	Power supply for the LCD drive
4	A0	Register selection (H:Data register, L:Instruction register)
5	/RD	8080 family: Read signal 6800 family: Enable clock (E)
6	/WR	8080 family: Write signal 6800 family: R/W signal
7-14	DB0~DB7	Data bus line
15	/CS	Chip enable signal
16	/RST	Reset signal
17	VEE	Negative voltage output
18	SLE1	8080 or 6800 family interface select
19~22	NC	No connection

6. MAXIMUM ABSOLUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V_{DD}	-0.3	7.0	V
Supply Voltage for LCD	V_0	$V_{DD}-19.0$	$V_{DD}+0.3$	V
Input Voltage	V_{in}	-0.3	$V_{DD}+0.3$	V
Supply Current for Backlight	$I_F(T_a = 25^\circ\text{C})$	---	$5+5*20\%$	mA (rms)
Reverse Voltage for Backlight	$V_R(T_a = 25^\circ\text{C})$	---	---	V
Operating Temperature	T_{op}	-20	70	$^\circ\text{C}$
Storage Temperature	T_{st}	-30	80	$^\circ\text{C}$

7. ELECTRICAL CHARACTERISTICS

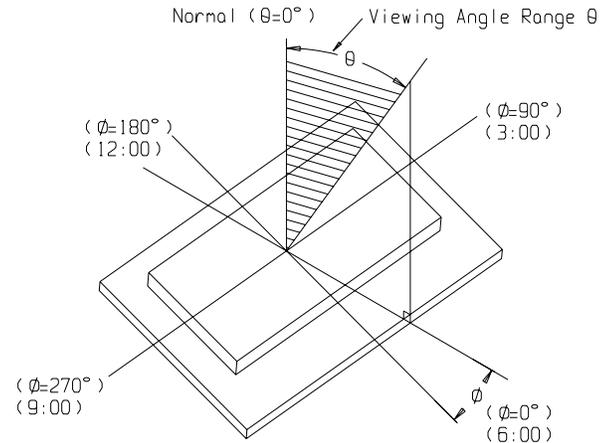
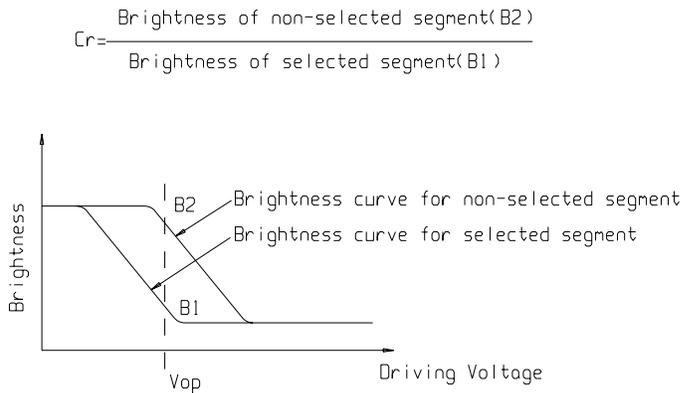
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V _{DD-VSS}	Ta = 25°C	4.75	5.0	5.25	V
Input High Voltage	V _{IH}	Ta = 25°C	0.7V _{DD}	---	V _{DD}	V
Input Low Voltage	V _{IL}	Ta = 25°C	0	---	0.3V _{DD}	V
Output High Voltage	V _{OH}	Ta = 25°C	2.4	---	---	V
Output Low Voltage	V _{OL}	Ta = 25°C	---	---	0.4	V
Supply Current	I _{DD}	Ta = 25°C	---		35	mA

8. BACKLIGHT CHARACTERISTICS (Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Tube Voltage	V	If= 5 mArms	---	270	---	V(AC)
Tube current	I		---	5	6	mA rms
Power dissipation	Pd	If= 5 mArms	---	1.35	---	W
Lighting Frequency	Fosc	If= 5 mArms	---	45	---	kHZ
Luminance	Lv	If= 5 mArms		400		cd/m ²

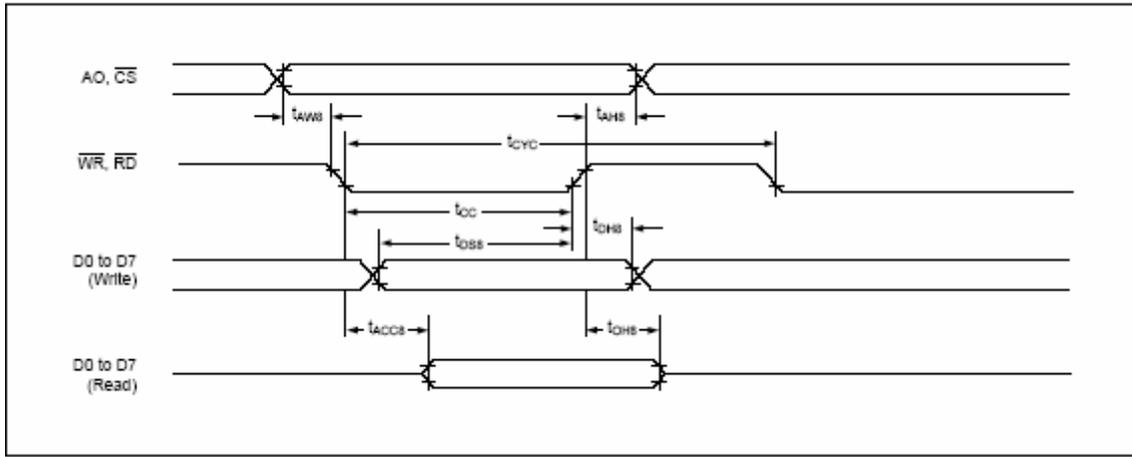
9. ELECTRO-OPTICAL CHARACTERISTICS (V_{DD}=5.0V, Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20°C	24.1	24.3	24.5	V
		Ta = 25°C	23.6	23.8	24.0	
		Ta = 70°C	23.1	23.3	23.5	
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



10. TIMING CHARACTERISTICS

8080 family Interface Timing



8080 family interface timing

($T_a = -20$ to 75°C)

Signal	Symbol	Parameter	VDD = 4.5 to 5.5V		VDD = 2.7 to 4.5V		Unit	Condition
			min	max	min	max		
A0, $\overline{\text{CS}}$	tAH8	Address hold time	10	—	10	—	ns	CL = 100 pF
	tAW8	Address setup time	0	—	0	—	ns	
$\overline{\text{WR}}, \overline{\text{RD}}$	tCYC	System cycle time	See note	—	See note	—	ns	
	tCC	Strobe pulsewidth	120	—	150	—	ns	
D0 to D7	tDS8	Data setup time	120	—	120	—	ns	
	tDH8	Data hold time	5	—	5	—	ns	
	tACC8	$\overline{\text{RD}}$ access time	—	50	—	80	ns	
	tOH8	Output disable time	10	50	10	55	ns	

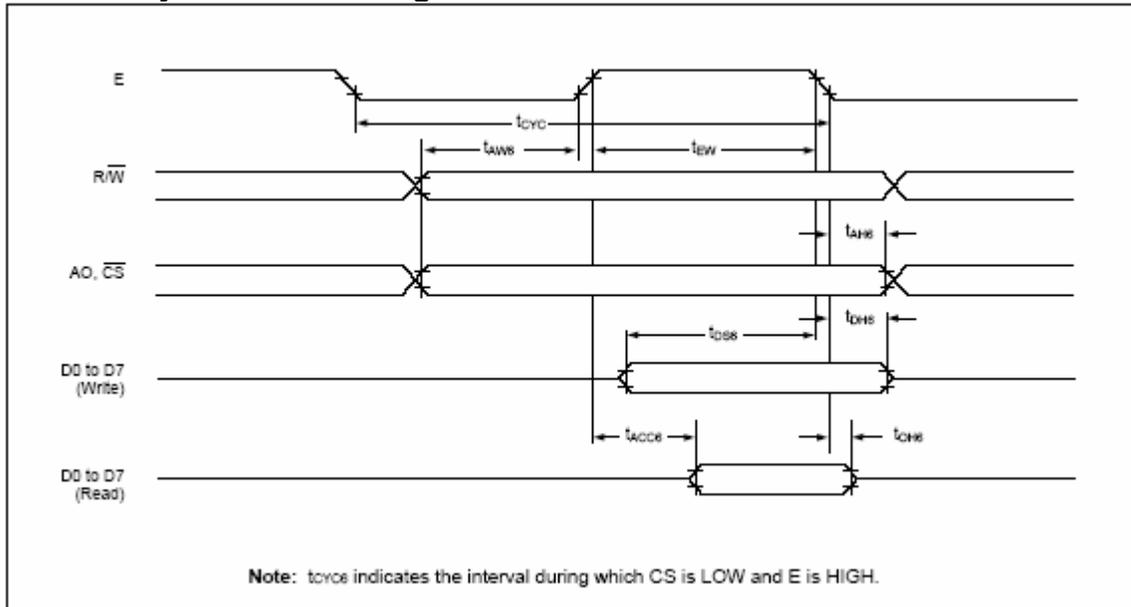
Note: For memory control and system control commands:

$$t_{CYC8} = 2t_C + t_{CC} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC8} = 4t_C + t_{CC} + 30$$

6800 family Interface Timing



6800 family interface timing

($T_a = -20$ to 75°C)

Signal	Symbol	Parameter	$V_{DD} = 4.5$ to $5.5V$		$V_{DD} = 2.7$ to $4.5V$		Unit	Condition
			min	max	min	max		
A0, CS, R/W	t_{CYC6}	System cycle time	See note	—	See note	—	ns	CL = 100 pF
	t_{AWs}	Address setup time	0	—	10	—	ns	
	t_{AHs}	Address hold time	0	—	0	—	ns	
D0 to D7	t_{DS}	Data setup time	100	—	120	—	ns	
	t_{DH}	Data hold time	0	—	0	—	ns	
	t_{OH}	Output disable time	10	50	10	75	ns	
	t_{ACC6}	Access time	—	85	—	130	ns	
E	t_{EW}	Enable pulsewidth	120	—	150	—	ns	

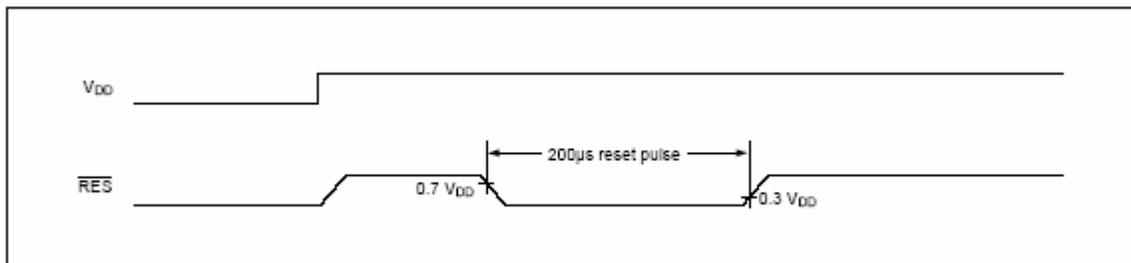
Note: For memory control and system control commands:

$$t_{CYC6} = 2t_c + t_{EW} + t_{CEA} + 75 > t_{ACV} + 245$$

For all other commands:

$$t_{CYC6} = 4t_c + t_{EW} + 30$$

11. The RESET (/RES) Terminal



12. CONTROL AND DISPLAY INSTRUCTION

Class	Command	Code											Hex	Command Description	Command Read Parameters	
		RD	WR	A0	D7	D6	D5	D4	D3	D2	D1	D0			No. of Bytes	
System control	SYSTEM SET	1	0	1	0	1	0	0	0	0	0	0	40	Initialize device and display	8	
	SLEEP IN	1	0	1	0	1	0	1	0	0	1	1	53	Enter standby mode	0	
Display control	DISP ON/OFF	1	0	1	0	1	0	1	1	0	0	D	58, 59	Enable and disable display and display flashing	1	
	SCROLL	1	0	1	0	1	0	0	0	1	0	0	44	Set display start address and display regions	10	
	CSRFORM	1	0	1	0	1	0	1	1	1	0	1	5D	Set cursor type	2	
	CGRAM ADR	1	0	1	0	1	0	1	1	1	0	0	5C	Set start address of character generator RAM	2	
	CSRDIR	1	0	1	0	1	0	0	1	1	CD 1	CD 0	4C to 4F	Set direction of cursor movement	0	
	HDOT SCR	1	0	1	0	1	0	1	1	0	1	0	5A	Set horizontal scroll position	1	
	OVLAY	1	0	1	0	1	0	1	1	0	1	1	5B	Set display overlay format	1	
Drawing control	CSRW	1	0	1	0	1	0	0	0	1	1	0	46	Set cursor address	2	
	CSRR	1	0	1	0	1	0	0	0	1	1	1	47	Read cursor address	2	
Memory control	MWRITE	1	0	1	0	1	0	0	0	0	1	0	42	Write to display memory	—	
	MREAD	1	0	1	0	1	0	0	0	0	1	1	43	Read from display memory	—	

Notes:

- In general, the internal registers of the SED1330F/1335F/1336F are modified as each command parameter is input. However, the microprocessor does not have to set all the parameters of a command and may send a new command before all parameters have been input. The internal registers for the parameters that have been input will have been changed but the remaining parameter registers are unchanged.
 - 2-byte parameters (where two bytes are treated as one data item) are handled as follows:
 - CSRW, CSRR: Each byte is processed individually. The microprocessor may read or write just the low byte of the cursor address.
 - SYSTEM SET, SCROLL, CGRAM ADR: Both parameter bytes are processed together. If the command is changed after half of the parameter has been input, the single byte is ignored.
- APL and APH are 2-byte parameters, but are treated as two 1-byte parameters.

13. 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°C is required, the relative humidity should be kept below 60%, and avoid direct sunlight.

Limited Warranty

Our 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 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.
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.