Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 20233 SYH-LY

Product Specification   **Version : 2**

21.04.2010

GENERAL SPECIFICATION

MODULE NO. :
DEM 20233 SYH-LY

CUSTOMER P/N

VERSION NO.	CHANGE DESCRIPTION	DATE
0	ORIGINAL VERSION	25.07.2006
1	UPDATE IC	16.01.2008
2	CORRECT OPERATING VOLTAGE	21.04.2010

PREPARED BY: KD   DATE: 21.04.2010
APPROVED BY: MH   DATE: 21.04.2010

DEM 20233 SYH-LY   *Product Specification*

CONTENTS

1. FUNCTIONS & FEATURES

Display Format : 20x2 Characters
LCD Mode : STN / Positive / Transflective / Yellow-Green
Viewing Direction : 6 o'clock
Driving scheme : 1/16 Duty , 1/5 Bias
Power supply voltage (V_{DD}) : 5.0 Volt (typ.)
LCD driving voltage(Vop) : 3.8 Volt (typ. at 25°C)
Operation Temperature : -20°C ~ 70°C
Storage Temperature : -30°C ~ 80°C
Backlight : LED, Yellow-Green, Lightbox

2. MECHANICAL SPECIFICATIONS

Module Size : 180.00 x 40.00 x 13.9 mm
Viewing Area : 149.00 x 23.00 mm
Character Pitch : 7.20 x 10.98 mm
Character Size : 6.00 x 9.66 mm
Dot Pitch : 1.22 x 1.22 mm
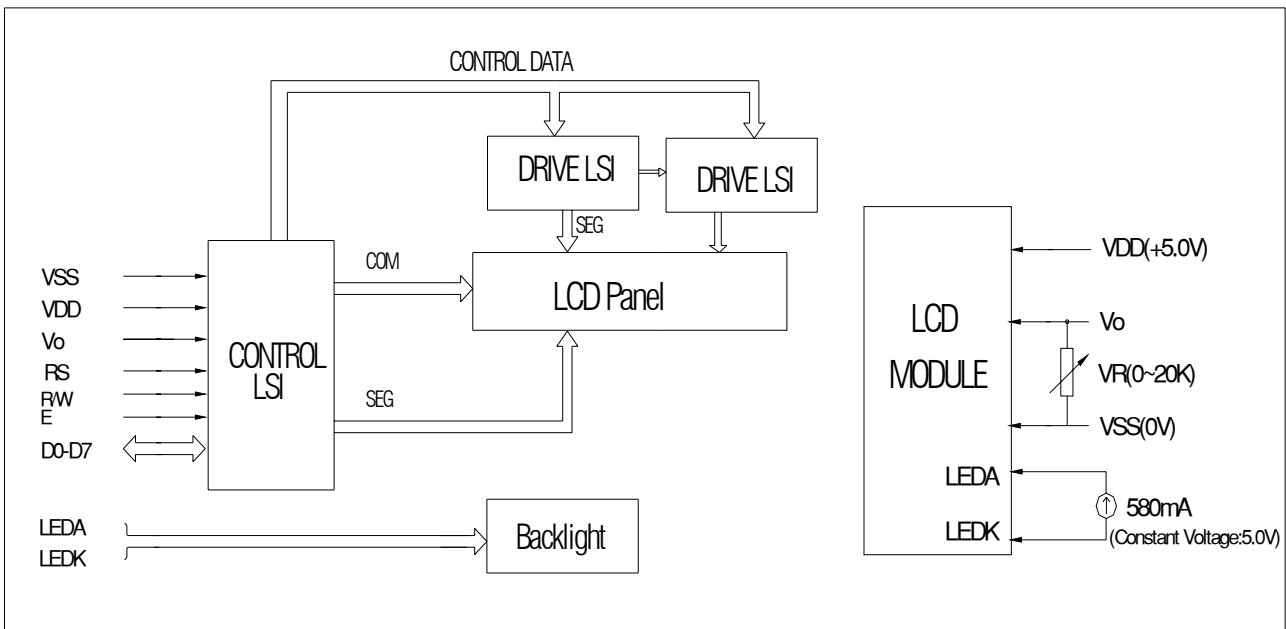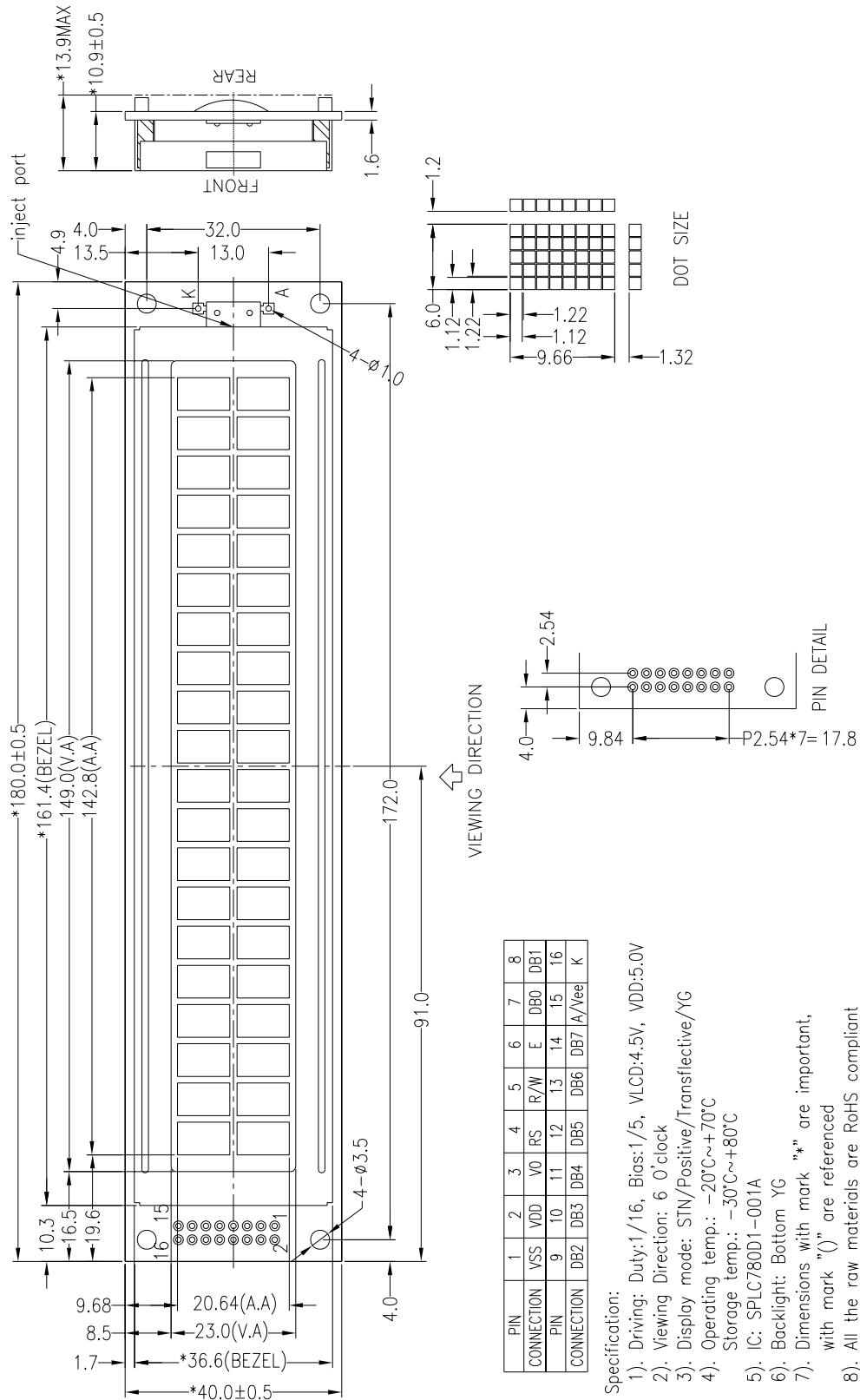Dot Size : 1.12 x 1.12 mm

3. BLOCK DIAGRAM

Figure1. Block diagram

4. DIMENSIONAL OUTLINE

Specification:
1). Driving: Duty:1/16, Bias:1/5, VLCD:4.5V, VDD:5.0V
2). Viewing Direction: 6 O'clock
3). Display mode: STN/Positive/Transflective/YG
4). Operating temp.: −20°C~+70°C
   Storage temp.: −30°C~+80°C
5). IC: SPLC780D1−001A
6). Backlight: Bottom YG
7). Dimensions with mark "*" are important,
   with mark "()" are referenced
8). All the raw materials are RoHS compliant

PIN	1	2	3	4	5	6	7	8
CONNECTION	VSS	VDD	V0	RS	R/W	E	DB0	DB1
PIN	9	10	11	12	13	14	15	16
CONNECTION	DB2	DB3	DB4	DB5	DB6	DB7	A/Vee	K

5. PIN DESCRIPTION

No.	Symbol	Function
1	VSS	GND(0V)
2	VDD	Power supply for Logic(+5.0V)
3	V0	Power supply for LCD drive
4	RS	Register selection (H: Data register , L :Instruction register)
5	R/W	Read/write selection (H: Read , L: Write)
6	E	Enable signal for LCM
7-14	DB0~DB7	Data Bus lines
15	LEDA	Power supply for Backlight(Current:580mA,Reference Voltage:5.0V)
16	LEDK	Power supply for Backlight(0V)

6. MAXIMUM ABSOUTE LIMIT

Item	Symbol	MIN	MAX	Unit
Supply Voltage for Logic	V_{DD}	-0.3	7.0	V
Supply Voltage for LCD	V0	V_{DD}-10.0	V_{DD}+0.3	V
Input Voltage	Vin	-0.3	V_{DD}+0.3	V
Supply Current for Backlight	Ifm(Ta = 25°C)	---	750	mA
Reverse Voltage for Backlight	V_R(Ta = 25°C)	---	3	V
Operating Temperature	Top	-20	70	°C
Storage Temperature	Tst	-30	80	°C

7. ELECTRICAL CHARACTERISTICS

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for Logic	V_{DD}-V_{SS}	Ta = 25°C	4.75	5.0	5.25	V
Input High Voltage	V_{IH}	Ta = 25°C	2.5	---	V_{DD}	V
Input Low Voltage	V_{IL}	Ta = 25°C	-0.3	---	0.6	V
Output High Voltage(TTL)	V_{OH}	Ta = 25°C	2.4	---	V_{DD}	V
Output Low Voltage(TTL)	V_{OL}	Ta = 25°C	---	---	0.4	V
Supply Current	I_{DD}	Ta = 25°C	---	---	3.0	mA

NOTE: Voltage greater than above may damage the circuit.

8. BACKLIGHT CHARACTERISTICS

(Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	VF	IF=580mA	3.8	4.0	4.2	V
Reverse Current	IR	VR=3V	---	---	10	uA
Luminous Intensity (Without LCD)	LV	IF=580mA	165	220	---	Cd/m^2
Wave length(Without LCD)	λρ	IF=580mA	569	572	575	nm
Color	Bottom YG					

Note:

when the temperature exceed 25°C, the approved current decrease rate for Backlight change as the temperature increase is: -0.36x116mA/°C(below 25°C, the current refer to constant, which would not change with temperature).

9. ELECTRO-OPTICAL CHARACTERISTICS

(Ta = 25°C)

Item	Symbol	Condition	Min	Typ	Max	Unit
Operating Voltage	Vop	Ta = -20°C	3.8	4.0	4.2	V
		Ta = 25°C	3.6	3.8	4.0	
		Ta = 70°C	3.3	3.5	3.7	
Response time	Tr	Ta = 25°C	---	---	250	ms
	Tf		---	---	250	ms
Contrast	Cr	Ta = 25°C	---	3	---	---
Viewing angle range	θ	Cr≥2	-20	---	+35	deg
	Φ		-30	---	+30	deg

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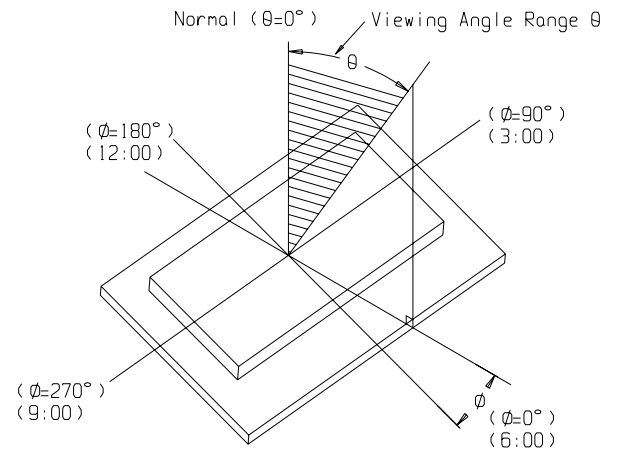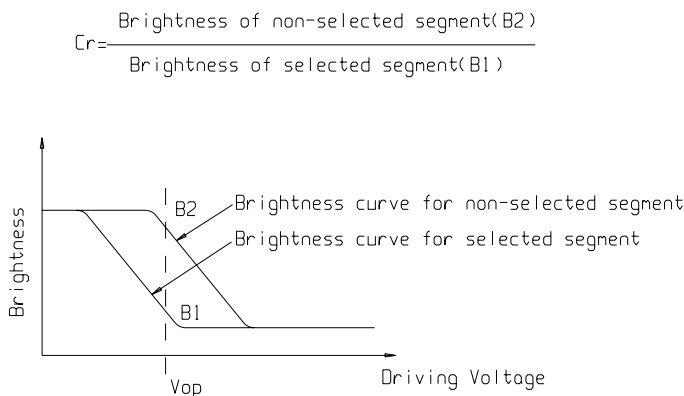
10. TIMING CHARACTERISTICS

■ Write Mode (Writing data from MPU to SPLC780A)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min	Typ	Max		
E Cycle Time	t_C	400	-	-	ns	Pin E
E Pulse Width	t_{PW}	150	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	30	-	-	ns	Pins: RS, R/W,E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W,E
Data Setup Time	t_{SP2}	40	-	-	ns	Pins: DB0 ~ DB7
Data Hold Time	t_{HD2}	10	-	-	ns	Pins: DB0 ~ DB7

■ Read Mode (Reading data from SPLC780A to MPU)

Characteristics	Symbol	Limit			Unit	Test Condition
		Min	Typ	Max		
E Cycle Time	t_C	400	-	-	ns	Pin E
E Pulse Width	t_W	150	-	-	ns	Pin E
E Rise/Fall Time	t_R, t_F	-	-	25	ns	Pin E
Address Setup Time	t_{SP1}	30	-	-	ns	Pins: RS, R/W,E
Address Hold Time	t_{HD1}	10	-	-	ns	Pins: RS, R/W,E
Data Output Delay Time	t_D	-	-	100	ns	Pins: DB0 ~ DB7
Data hold time	t_{HD2}	20	-	-	ns	Pin DB0 ~ DB7
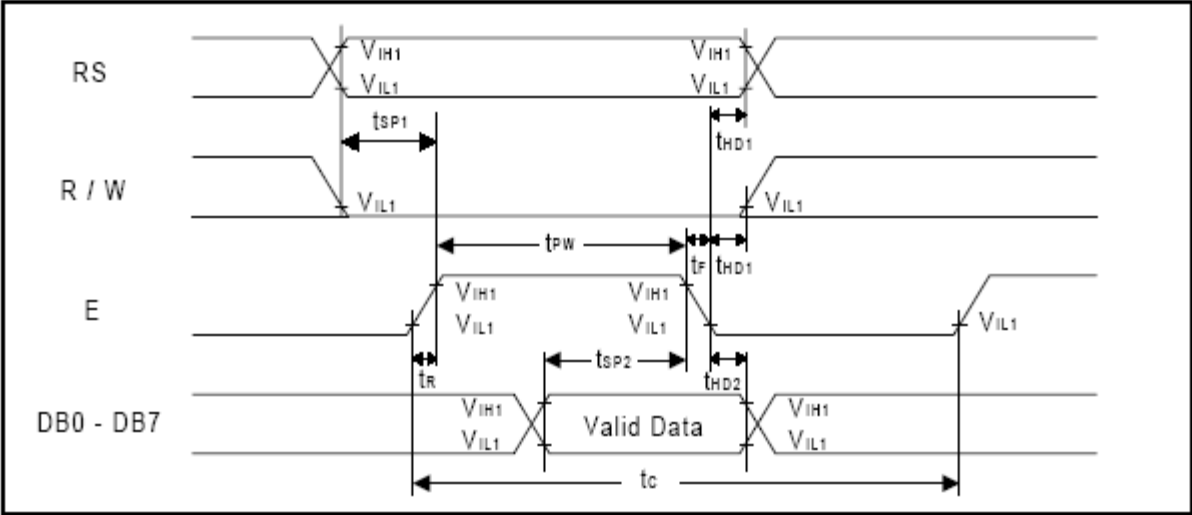
Write Mode Timing Diagram
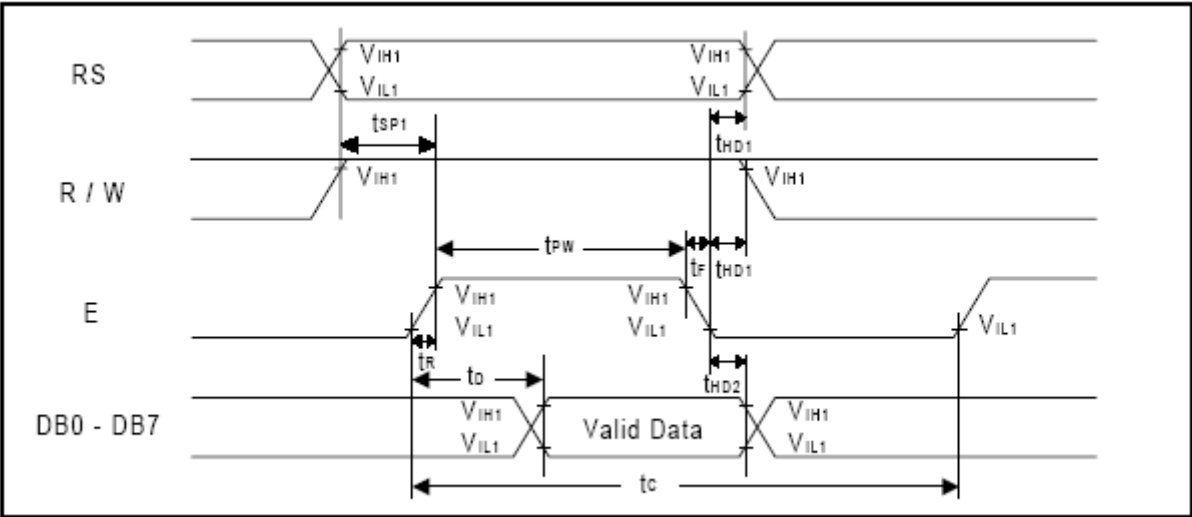
Read Mode Timing Diagram

11. CONTROL AND DISPLAY COMMAND

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description	Execution time (fosc=270KHz)
Clear Display	0	0	0	0	0	0	0	0	0	1	Write "20H" to DDRAM and set DDRAM address to "00H" from AC	1.52ms
Return Home	0	0	0	0	0	0	0	0	1	-	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.	1.52ms
Entry Mode Set	0	0	0	0	0	0	0	1	I/D	S	Assign cursor moving direction and enable the shift of entire display	38μs
Display ON/ OFF Control	0	0	0	0	0	0	1	D	C	B	Set display(D), cursor(C), and blinking of cursor(B) on/off control bit.	38μs
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	-	-	Set cursor moving and display shift control bit, and the direction, without changing of DDRAM data.	38μs
Function Set	0	0	0	0	1	DL	N	F	-	-	Set interface data length (DL: 8-bit/4-bit), numbers of display line (N: 2-line/1-line) and, display font type (F:5x10 dots/5x8 dots)	38μs
Set CGRAM Address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	Set CGRAM address in address counter.	38μs
Set DDRAM Address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Set DDRAM address in counter	38μs
Read Busy Flag and Address Counter	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	Whether during internal operation or not can be known by reading BF. The contents of address counter can also be read.	
Write Data to RAM	1	0	D7	D6	D5	D4	D3	D2	D1	D0	Write data into internal RAM (DDRAM/CGRAM).	38μs
Read Data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	Read data from internal RAM (DDRAM/CGRAM).	38μs

Note: "-": don't care

12.CHARACTER ROM

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 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 Elektronik GmbH.
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°C ± 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 ELEKTRONIK GMBH LCDs and modules are not consumer products, but may be incorporated by customers into consumer products or components thereof, DISPLAY ELEKTRONIK GMBH does not warrant that its LCDs and components are fit for any such particular purpose.

1. The liability of DISPLAY ELEKTRONIK GMBH is limited to repair or replacement on the terms set forth below. DISPLAY ELEKTRONIK GMBH 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 ELEKTRONIK GMBH and the customer, DISPLAY ELEKTRONIK GMBH will only replace or repair any of its LCD which is found defective electrically or visually when inspected in accordance with DISPLAY ELEKTRONIK GMBH 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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