DISPLAY Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 20485 SYH-LY

Product Specification ***Version: 3***

08.01.2018

GENERAL SPECIFICATION

MODULE NO. :

DEM 20485 SYH-LY

CUSTOMER P/N

Version No.	Change Description	Date
0	Original Version	29.10.2001
1.1.0	Change IC	14.11.2007
1.1.1	Change PCB Description	14.11.2008
2	Add Version	05.05.2009
3	Change Maximum Parameters	08.01.2018

PREPARED BY: PS DATE: 08.01.2018

APPROVED BY: MH DATE: 08.01.2018

CONTENTS

1.FUNCTIONS & FEATURES

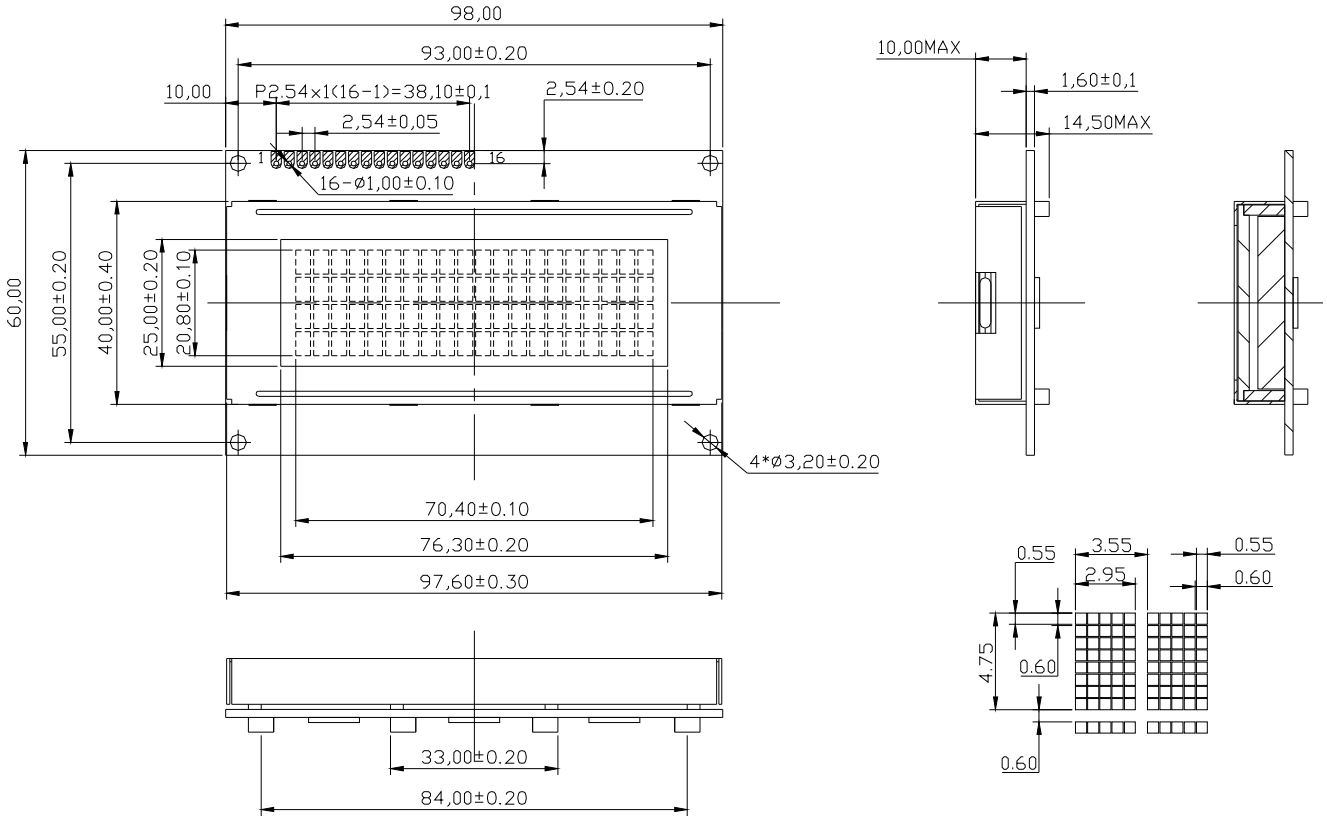
MODULE NAME	LCD Type	Remark
DEM 20485 SYH-LY	STN Yellow Green Transflective Positive Mode	---

- Viewing Direction : 6 O'clock
- Driving Scheme : 1/16 Duty Cycle, 1/5 Bias
- Power Supply Voltage : 5 Volt (typ.)
- V_{LCD} (V_{DD}-V_0) : 4.5 Volt (typ.)
- Backlight Color : LED, Lightbox, Yellow Green
- Display contents : 20 x 4 Characters (5 x 8 dots)
- Internal Memory : CGROM (10,080 Bits)
  : CGRAM (64 x 8 Bits)
  : DDRAM (80 x 8 Bits for Digits)
- CGROM : CGROM of the ST7066U-0A-B
- Interface : Easy Interface with a 4-bit or 8-bit MPU

2. MECHANICAL SPECIFICATIONS

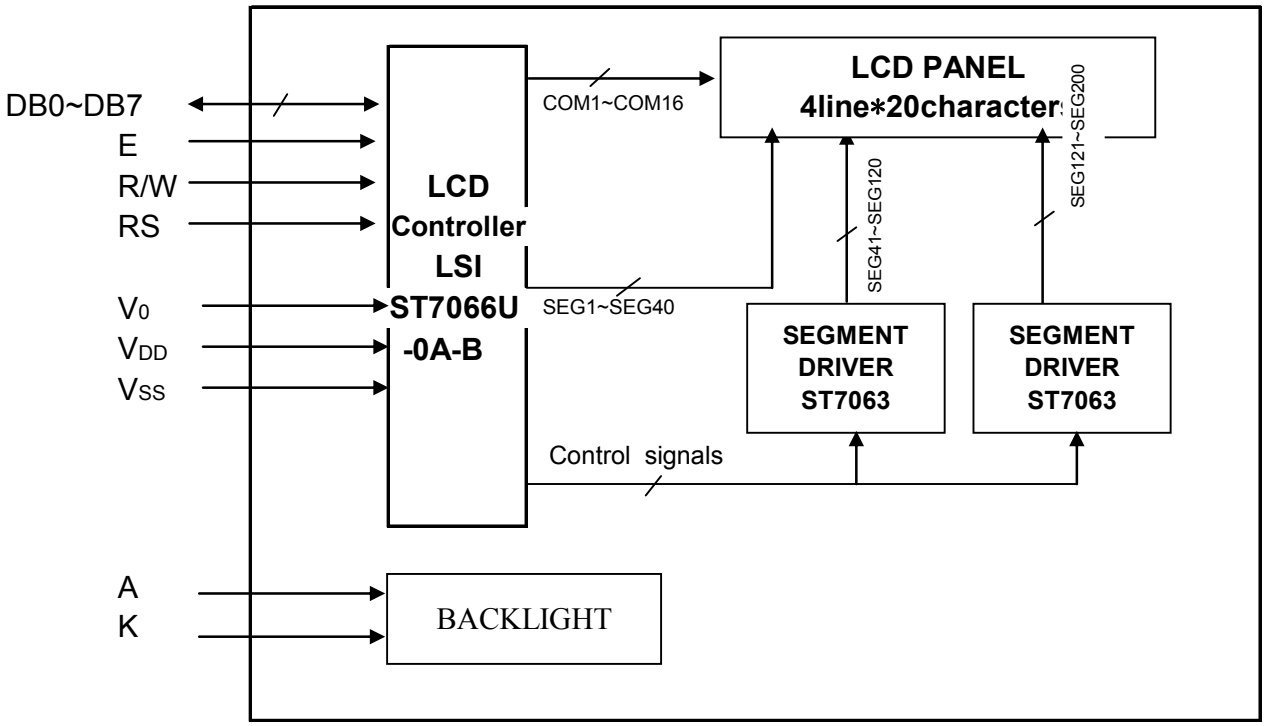
- Module Size : 98.00 x 60.00 x 14.50 mm
- Character Font : 5 x 8 dots
- Character Size : 4.75 x 2.95 mm
- Character Pitch : 5.35 x 3.55 mm
- Dot Size : 0.55 x 0.55 mm
- Dot Pitch : 0.60 x 0.60 mm
- Dot Gap : 0.05 mm

3. EXTERNAL DIMENSIONS (unit: mm)



NOTES:
UNTOLERANCE IS ±0.5mm.

4. BLOCK DIAGRAM

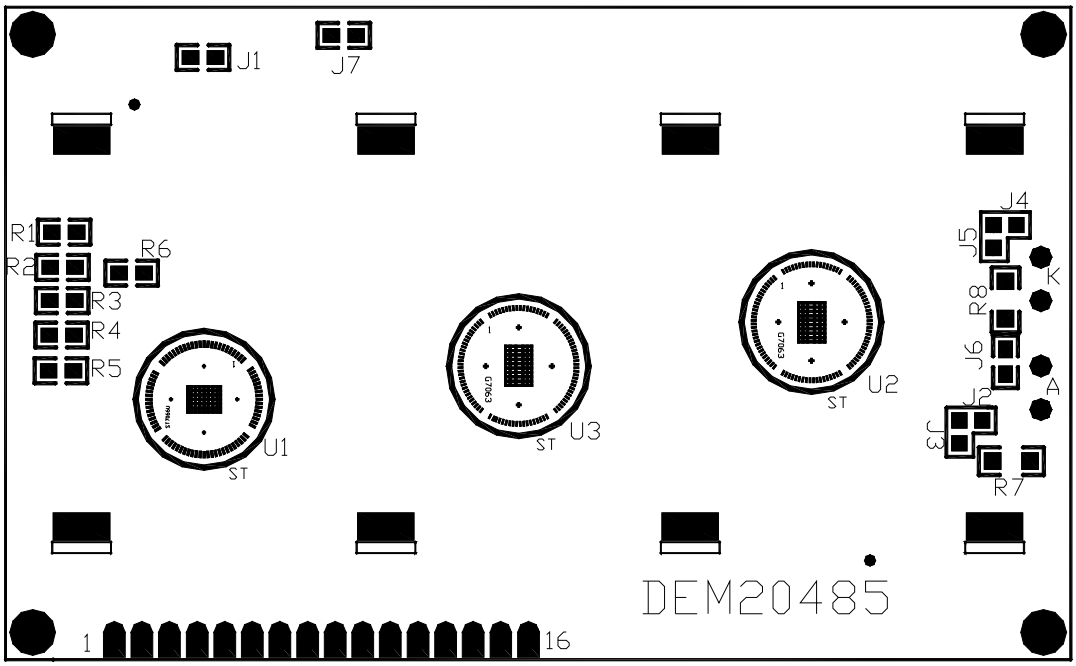


5. PIN ASSIGNMENT

Pin No.	Symbol		Function
1	VSS		Ground terminal of module
2	VDD		Supply terminal of module +5 V
3	V0		Power Supply for Liquid crystal Drive
4	RS		Register Select, RS = 0 (Instruction Register), RS = 1 (Data Register)
5	R/W		Read / Write, R/W = 1 (Read), R/W = 0 (Write)
6	E		Enable
7	DB0		Bi-directional Data Bus, Data Transfer is performed once , thru DB0~DB7 , in the case of interface data . Length is 8-bits; and twice , thru DB4~DB7 in the case of interface data length is 4-bits. Upper four bits first then lower four bits .
8	DB1		
9	DB2		
10	DB3		
11	DB4		
12	DB5		
13	DB6		
14	DB7		
15	K	B00	Please also refer to 6.1 PCB drawing and description.
16	A		
15	A	B01	
16	K		

6. PCB DRAWING AND APPLICATION

6. PCB Drawing and Description



Note: on application module, R1~R5=820Ω, R6=91KΩ

Description :

6-1. The polarity of the pin 15 and the pin 16

J3,J5	J2, J4	LED Polarity	
		15 Pin	16 Pin
Each open	Each closed	Anode	Cathode
Each closed	Each open	Cathode	Anode

Note: on application module B00: J3=J5= closed, J2=J4=open
B01: J3=J5= open, J2=J4=closed

6-2. The metal-bezel is set on ground when the J1 is closed.

Note: on application module, J1=closed

6-3. The LED resistor should can be bridged when the J6 is open.

Note: on application module, J6=open

6-4. The R7 and the R8 are the LED resistor.

Note: on application module, R7= R8=10Ω.

6-5. The mounting holes are set on ground when J7 is closed.

Note: on application module, J7=closed

7. BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATIONS

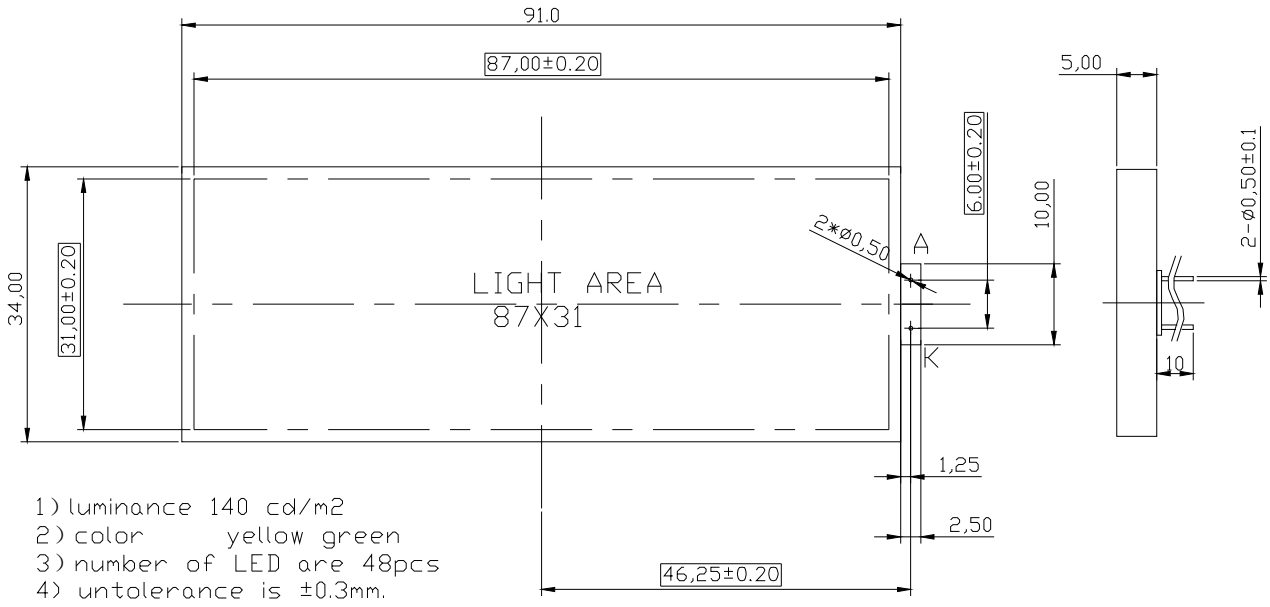
7.1 Absolute Maximum Ratings (Ta=25°C)

Item	Symbol	Conditions	Rating	Unit
Absolute Maximum Forward Current	Ifm		480	mA
Peak Forward Current	Ifp	1 msec plus 10% guty cycle	1152	mA
Reverse Voltage	Vr		5	V
Power Dissipation	Pd		2400	mW

7.2 Electrical-Optical Characteristics (Ta=25°C)

Item	Symbol	Min.	Typ.	Max.	Unit	Condition
Forward Voltage	Vf	3.8	4.0	4.3	V	If=240mA
Reverse Current	Ir			100	uA	Vr=4.0V
Dominant Wavelength	λ D	569	572	575	nm	If=240mA
Spectral Line Half Width	Δ λ		25		nm	If=240mA
Luminance	Lv		(140)		cd/m^2	If=240mA

7.3 Backlight Drawing (unit: mm)



8. DISPLAY DATA RAM (DDRAM)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	← Display position
FIRST LINE	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F	10	11	12	13	← DDRAM Address
SECOND LINE	40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F	50	51	52	53	
THIRD LINE	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F	20	21	22	23	24	25	26	27	
FOURTH LINE	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F	60	61	62	63	64	65	66	67	

9. MAXIMUM ABSOLUTE POWER LIMIT

Item	Symbol	Standard value	Unit
Power Supply Voltage (1)	V_{DD}	-0.3 ~ +6.0	V
Power Supply Voltage (2)	V_{LCD}	V_{DD}-10.0 ~ V_{DD}+0.3	V
Input Voltage	V_{IN}	-0.3 ~ V_{DD}+0.3	V
Voltage for Backlight	VLED1	4 ~ 4.5	V
Operating Temperature	Topr	-20 ~ +70	℃
Storage Temperature	Tstg	-30 ~ +80	℃

*Voltage greater than above may damage to the Circuit.

VDD＞V1＞V2＞V3＞V4＞V5

10. CONTROL AND DISPLAY COMMAND

Command	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Execution time (fosc=270KHz)	Remark
Clear Display	0	0	0	0	0	0	0	0	0	1	1.52ms	Write"20H" to DDRAM. And set DDRAM address to "00H" from AC
Return home	0	0	0	0	0	0	0	0	1	x	1.52ms	Set DDRAM address to "00H" from AC and return cursor to its original position if shifted. The contents of DDRAM are not changed.
Entry mode Set	0	0	0	0	0	0	0	1	I/D	S	37us	Sets cursor move direction and specifies display shift. These operations are performed during data write and read.
Display on/off control	0	0	0	0	0	0	1	D	C	B	37us	D=1: entire display on C=1: cursor on B=1: cursor position on
Cursor or Display Shift	0	0	0	0	0	1	S/C	R/L	x	x	37us	Set cursor moving and display shift control bit, and the direction, without changing DDRAM data.
function Set	0	0	0	0	1	DL	N	F	x	x	37us	DL: interface data is 8/4 bits N: number of line is 2/1 F: font size is 5x11/5x8
Set CGRAM address	0	0	0	1	AC5	AC4	AC3	AC2	AC1	AC0	37us	Set CGRAM address in address counter
Set DDRAM address	0	0	1	AC6	AC5	AC4	AC3	AC2	AC1	AC0	37us	Set DDRAM address in address counter
Read busy flag& address	0	1	BF	AC6	AC5	AC4	AC3	AC2	AC1	AC0	0us	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	37us	Write data into internal RAM (DDRAM/CGRAM)
Read data from RAM	1	1	D7	D6	D5	D4	D3	D2	D1	D0	37us	Read data from internal RAM (DDRAM / CGRAM)

Note:

Be sure the ST7066U is not is not in the busy state (BF=00 before sending an instruction from the MPU to the ST7066U. If an instruction is sent without checking the busy flag, the time between the first instruction and next instruction will take much longer than the instruction time itself. Refer to instruction table for the list of each instruction execution time.

11. STANDARD CHARACTER PATTERN (ST7066U-0A-B)

Upper(4bit) / Lower(4bit)	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	10010	1011	1100	1101	1110	1111
0000	CG RAM (1)															
0001	(2)															
0010	(3)															
0011	(4)															
0100	(5)															
0101	(6)															
0110	(7)															
0111	(8)															
1000	(1)															
1001	(2)															
1010	(3)															
1011	(4)															
1100	(5)															
1101	(6)															
1110	(7)															
1111	(8)															

12. ELECTRICAL CHARACTERISTICS

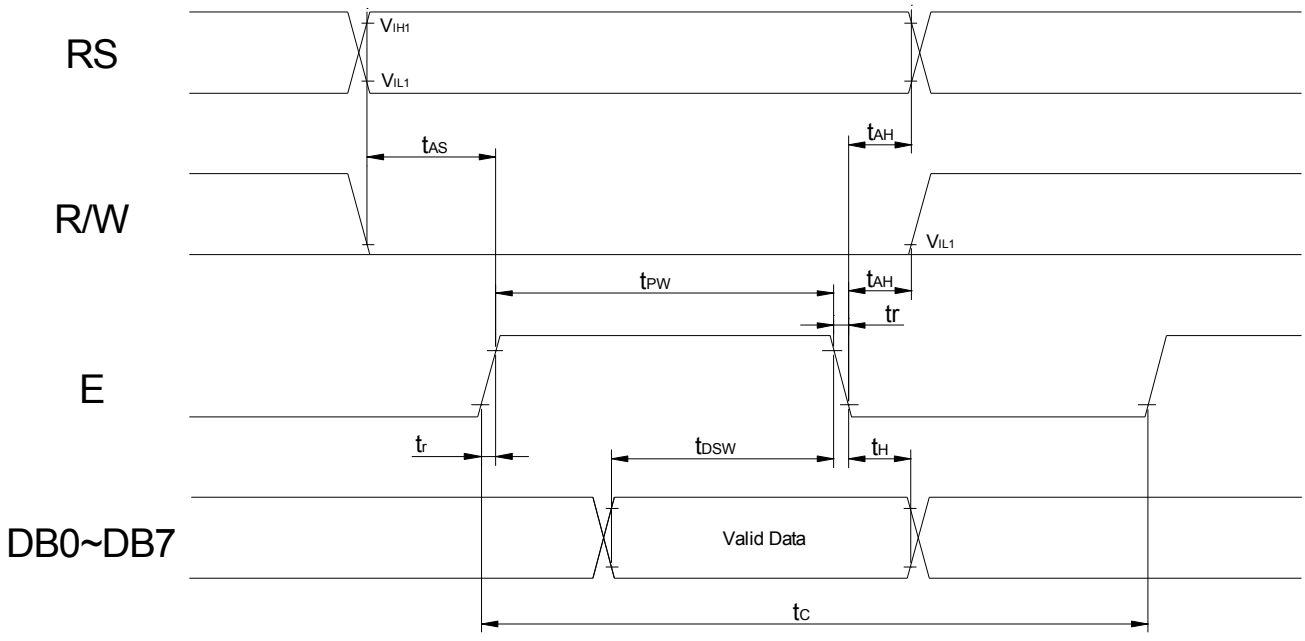
12-1-1 DC Characteristics (V_{DD}=4.5V~5.5V, Ta=25°C)

Item	Symbol	Standard Value			Test Condition	Unit
		Min	Typ	Max		
Operating Voltage	V_{DD}	4.5	5	5.5	-------	V
Supply Current	I_{DD}	----	0.35	0.6	V_{DD}=5V,fosc=270kHz	mA
LCD Driving Voltage	V_{LCD}	3.0	4.5	7.0	V_{DD}-V_0(5, 1/4 Bias)	V

12-2 AC Characteristics (VDD=4.5V~5.5V, Ta=25°C)

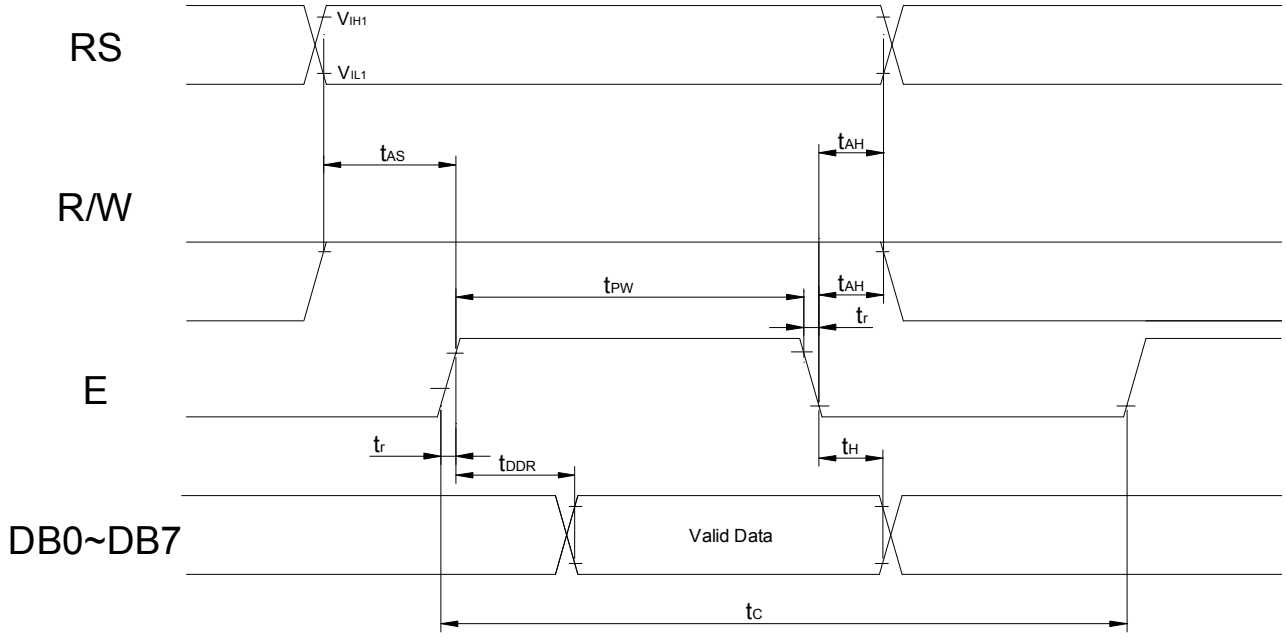
12-2-1 Write Mode (Writing Data from MPU to Module)

Characteristic	Symbol	Min	Type	Max	Unit	Test PIN
E Cycle Time	t_C	1200	---	---	ns	E
E Rise Time	t_R	---	---	25	ns	E
E Fall Time	t_F	---	---	25	ns	E
E Pulse width	t_W	140	---	---	ns	E
Address Setup Time	t_{SU1}	0	---	---	ns	R/W,RS,E
Address Hold Time	t_{H1}	10	---	---	ns	R/W,RS,E
Data Set-up Time	t_{SU2}	40	---	---	ns	DB0~DB7
Data Hold Time	t_{H2}	10	---	---	ns	DB0~DB7



12-2-2 Read Mode (Reading Data from Module to MPU)

Characteristic	Symbol	Min	Type	Max	Unit	Test PIN
E Cycle Time	t_C	1200	---	---	ns	E
E Rise Time	t_R	---	---	25	ns	E
E Fall Time	t_F	---	---	25	ns	E
E Pulse width	tp_W	140	---	---	ns	E
Address Setup Time	t_{AS}	0	---	---	ns	R/W,RS,E
Address Hold Time	t_{AH}	10	---	---	ns	R/W,RS,E
Data Setup Time	t_{DDR}	---	---	100	ns	DB0~DB7
Data Hold Time	t_H	10	---	---	ns	DB0~DB7

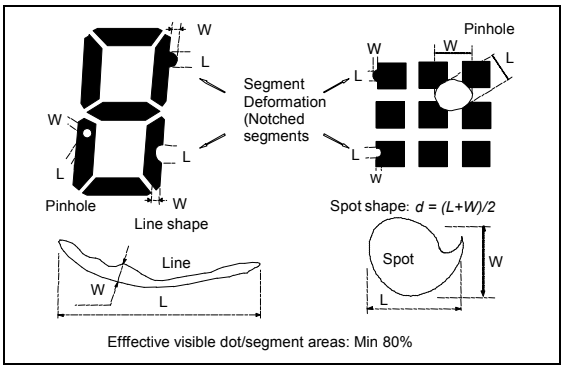


13. QUALITY DESCRIPTION

DEFECT SPECIFICATION:

Specific type-related items are covered in this sheet.

a: Table for Cosmetic defects
(Note: nc = not counted).
Sizes and number of defects
(Max. Qty)



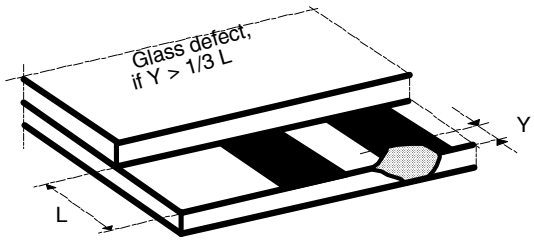
Examples/

Shapes

Defect Type	Max. defect size [µm] d or L W	Max. Quantity.
Black or White Spots	d ≤ 150	nc
	150 < d ≤ 300	3
Black or White Lines	-- W ≤ 10	nc
	L ≤ 3000 W ≤ 30	3
	L ≤ 2000 W ≤ 50	2
Pinhole	d ≤ 150 150 < d ≤ 300	nc 1/segment
(Total defects)		(5)
Segment Deformation	W ≤ 100	nc
Bubble (e.g. under pola)	d ≤ 150	nc
	200 < d ≤ 400	3
	400 < d ≤ 600	1

b: Glass defects

b1:Glass defects at contact ledge



b2:Glass chipping in other areas shall not be in conflict with the product's function.

14. MODULE ACCEPT QUALITY LEVEL (AQL).

14.1 AQL Standard Value: Critical Defect =0.1, Major Defect=0.65; Minor Defect =2.5.
14.2 Inspection Plan: MIL-STD-105E, Normal Inspection Level II, Single Sampling Plan

15. RELIABILITY TEST

Operating life time: Longer than 50000 hours (at room temperature without direct irradiation of sunlight)
Reliability characteristics shall meet following requirements.

Temperature Tests	Normal Grade
High Temperature Storage	+80°C x 96hrs
Low Temperature Storage	-30°C x 4hrs
High Temperature Operation	+70°C x 96hrs
Low Temperature Operation	-20°C x 96hrs
High Temperature, High Humidity	+70°C 95%RH 96hrs
Thermal Shock	-20°C x 30 min 10s ↓ 5Cycles +70°C x 30 min ↑
Vibration Test	Frequency x Swing x Time 40Hz x 4mm x 4hrs
Drop Test	Drop Height x Times 1.0m x 6 times

16. LCD MODULES HANDLING PRECAUTIONS

- Please remove the protection foil of polarizer before using.

- The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

- If the display panel is damaged and the liquid crystal substance inside it leaks out, do not get any in your mouth. If the substance come into contact with your skin or clothes promptly wash it off using soap and water.

- Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

- The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.

- To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.
  -Be sure to ground the body when handling the LCD module.
  -Tools required for assembly, such as soldering irons, must be properly grounded.
  -To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.
  -The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

- Storage precautions
  When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps. Keep the modules in bags designed to prevent static electricity charging under low temperature / normal humidity conditions (avoid high temperature / high humidity and low temperatures below 0°C). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

17. OTHERS

- Liquid crystals solidify at low temperature (below the storage temperature range) leading to defective orientation of liquid crystal or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subjected to a strong shock at a low temperature.

- If the LCD modules have been operating for a long time showing the same display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. Abnormal operating status can be resumed to be normal condition by suspending use for some time. It should be noted that this phenomena does not adversely affect performance reliability.

- To minimize the performance degradation of the LCD modules resulting from caused by static electricity, etc. exercise care to avoid holding the following sections when handling the modules:
  - Exposed area of the printed circuit board
  - Terminal electrode sections