

Display Elektronik GmbH

DATA SHEET

LCD MODULE

DEM 128048A FGH-PW

Product Specification

Version: 3

22.10.2019

GENERAL SPECIFICATION

MODULE NO. :

DEM 128048A SBH-PW-N

CUSTOMER P/N:

| Version No. | Change Description | Date |
|-------------|--|------------|
| 0 | Original Version | 12.07.2019 |
| 1 | Correct the EXTERNAL DIMENSIONS & BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATION | 22.07.2019 |
| 2 | Correct the EXTERNAL DIMENSIONS on page 4 and page 5(AK Pinlayout)& Correct the BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATION on page 7(AK Pinlayout) | 25.07.2019 |
| 3 | Add the UL No. and correct the P/N No. on the FPC in the drawing | 22.10.2019 |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

PREPARED BY: ZJ

DATE: 22.10.2019

APPROVED BY: MHI

DATE: 22.10.2019

CONTENTS

1. FUNCTIONS & FEATURES4

2. MECHANICAL SPECIFICATIONS.....4

3 . BLOCK DIAGRAM.....5

4. EXTERNAL DIMENSIONS6

5.PIN DESCRIPTION7

6.BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATION8

7. ABSOLUTE MAXIMUM RATINGS9

8. DC CHARACTERISTICS9

9. AC ELECTRICAL CHARACTERISTICS.....9

10. INSTRUCTION TABLE10

11. LCD ARTWORK.....11

12. SEG & COM LAYOUT11

13. IC LAYOUT12

14. MODULE ACCEPT QUALITY LEVEL (AQL)12

15. RELIABILITY TEST12

16. QUALITY DESCRIPTION.....13

17. LCD MODULES HANDLING PRECAUTIONS14

18. OTHERS14

1. FUNCTIONS & FEATURES

I DEM 128048A FGH-PW Series LCD Type :

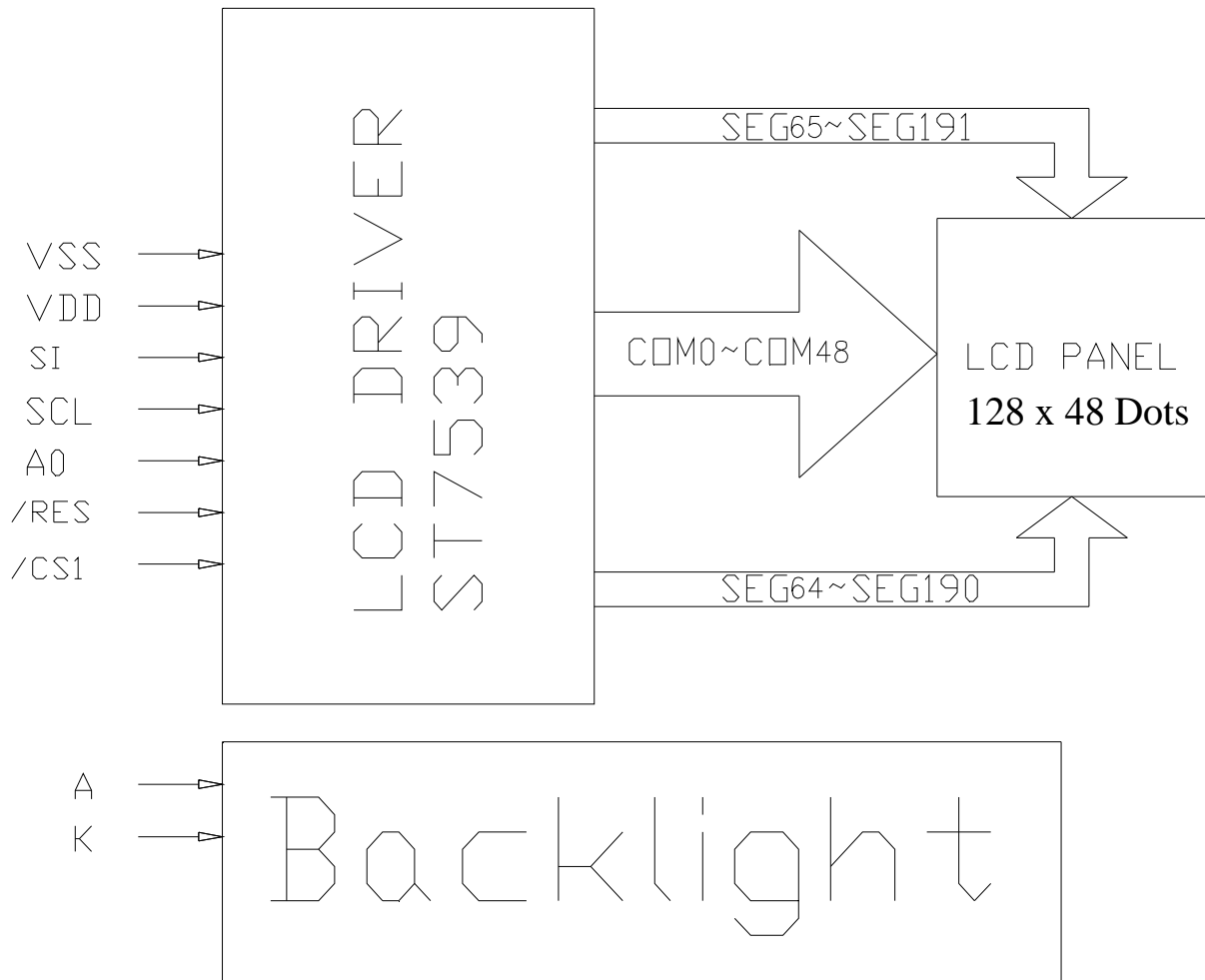
| Module | LCD Type | Remark |
|-----------------------|----------------------------------|---------------|
| DEM 128048A FGH-PW | FSTN Transflective Positive Mode | --- |

- I Viewing Direction : 6 O'clock
- I Driving Scheme : 1/49 Duty Cycle, 1/8 Bias
- I Power Supply Voltage : 3.3 Volt
- I LCD Driving Voltage : 9.0 Volt
- I Driver IC : ST7539
- I Display Contents : 128 x 48 Dots

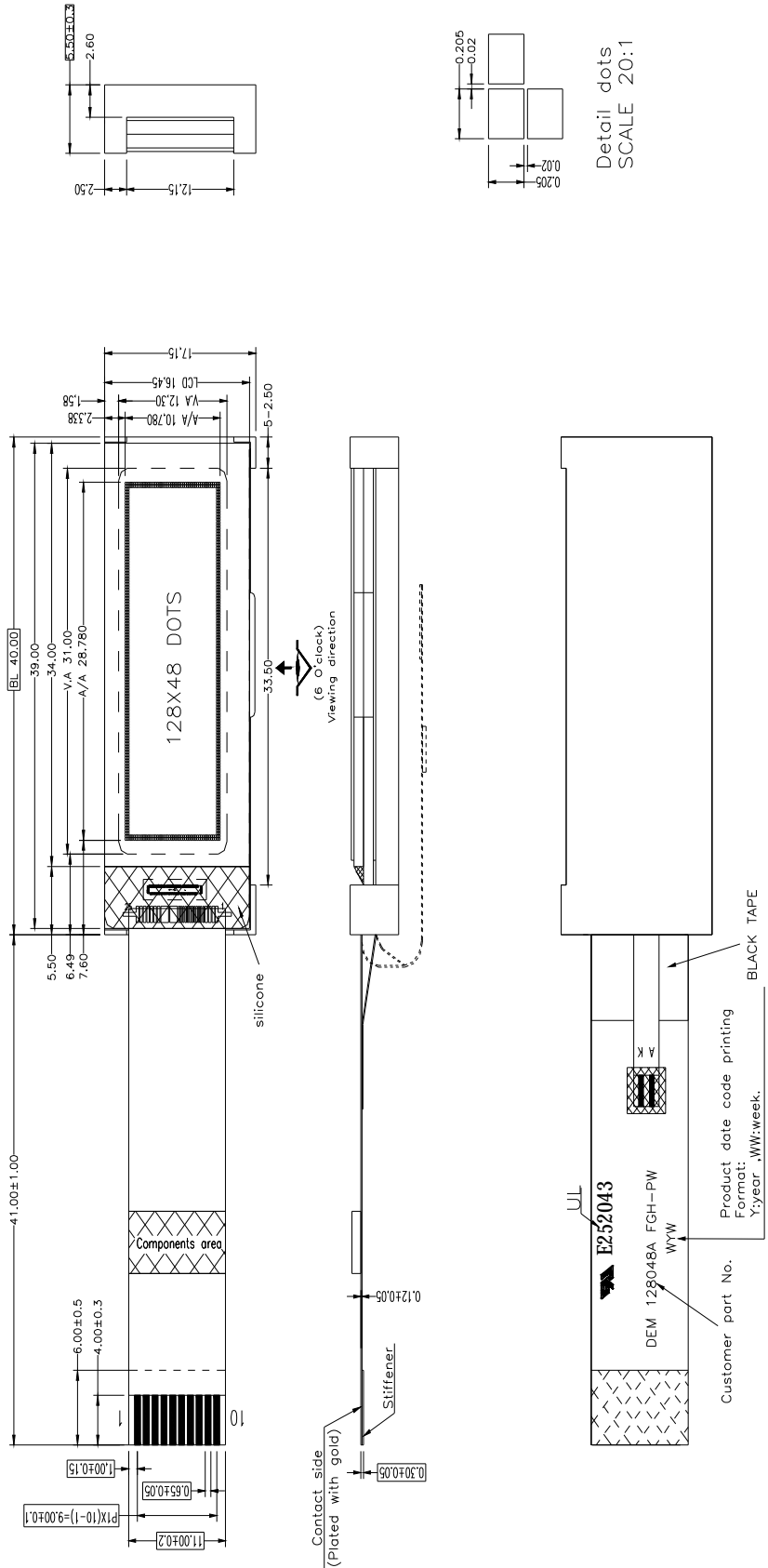
2. MECHANICAL SPECIFICATIONS

- I Module Size : 40.00 x 17.15 x 5.50 mm (excl.FPC)
- I View Area Size : 31.00 x 12.30 mm
- I Active Area Size : 28.78 x 10.78 mm
- I Dot Size : 0.205 x 0.205 mm
- I Dot Gap : 0.02mm

3. BLOCK DIAGRAM



4. EXTERNAL DIMENSIONS



Remarks:
 1. Unmarked tolerance is ±0.3
 2. All materials comply with RoHS
 3. [] : critical dimension.

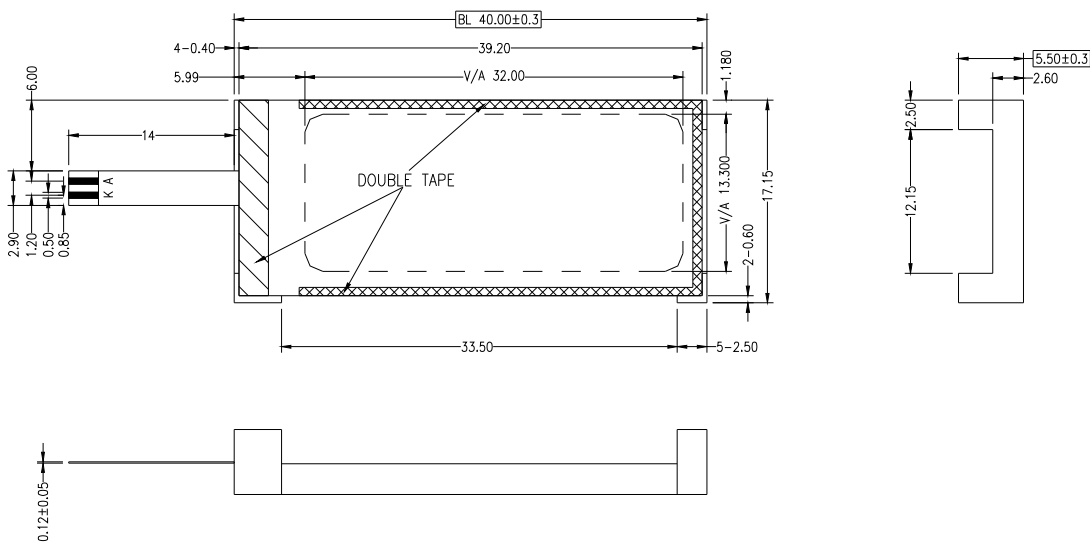
5. PIN DESCRIPTION

| Pin No. | Name | Description |
|----------------|-------------|---|
| 1 | /CS1 | Chip select input pins |
| 2 | /RES | Reset input pin. When RST is “L”, internal initialization is executed. |
| 3 | A0 | It determines whether the access is related to data or command. A0=“H” : Indicates that D[7:0] are display data. A0=“L” : Indicates that D[7:0] are control data. |
| 4 | SCL(D6) | Serial clock input. |
| 5 | SI(D7) | Serial input data. |
| 6 | NC | No Connection |
| 7 | VDD | Power Supply |
| 8 | VSS | Ground. |
| 9 | A | Power supply for backlight |
| 10 | K | Power ground For backlight |

6.BACKLIGHT ELECTRICAL/OPTICAL SPECIFICATION

Electrical-Optical Characteristics (Ta=25°C)

| Item | Symbol | MIN. | TYP. | MAX. | Unit | Condition |
|--|-------------|------|------|------|-------------------|-----------|
| Forward Voltage | Vf | 2.7 | 3 | 3.3 | V | If= 15 mA |
| Colour Coordinate (Tolerances is ±0.01) | x | 0.23 | 0.27 | 0.33 | | |
| | y | 0.23 | 0.27 | 0.33 | | |
| Uniformity | Avg | 70 | | | % | |
| Luminance | Lv | 1000 | 1300 | | cd/m ² | |
| lifetime | 50000 HOURS | | | | | |



Curcuit Diagram



COLOR: WHITE

Remarks:

- 1.Unmarked tolerance is ±0.3
- 2.All materials comply with RoHs
- 3.□...:critical dimension.

7. ABSOLUTE MAXIMUM RATINGS

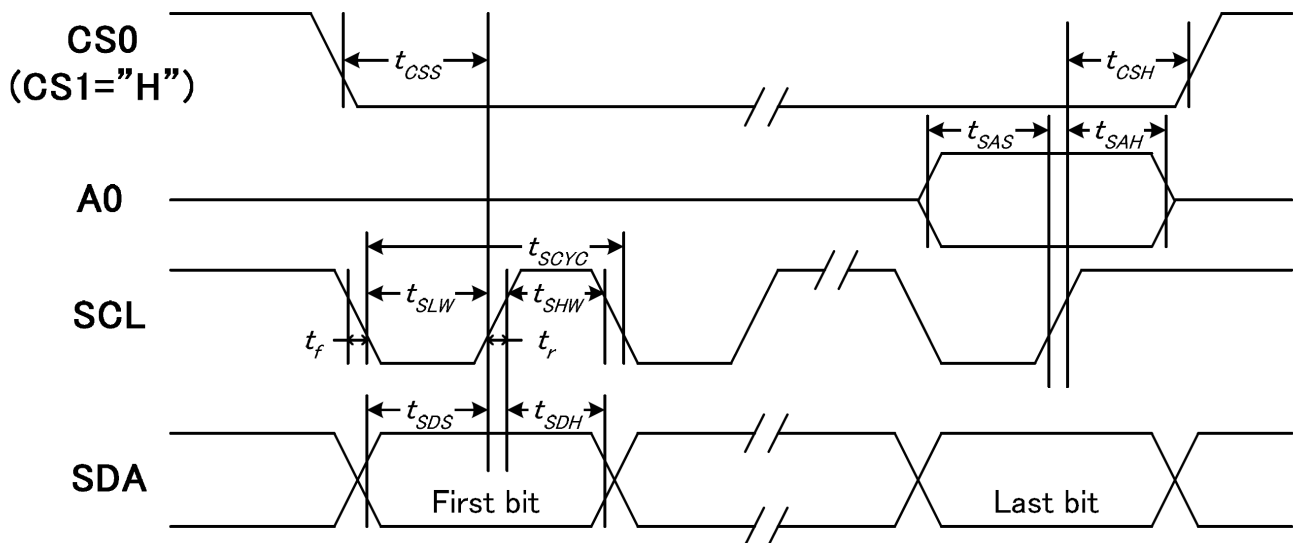
| Parameter | Symbol | Conditions | Unit |
|-----------------------|--------------------------|-------------|------|
| Power Supply Voltage | V _{DD} | -0.3 ~ 4.0 | V |
| LCD Supply Voltage | V _{OP} (V0-XV0) | -0.3 ~ 13.0 | V |
| LCD Supply Voltage | VG | -0.3 ~ 4.0 | V |
| LCD Supply Voltage | VM | -0.3 ~ 4.0 | V |
| Operating Temperature | T _{OPR} | -20 ~ +70 | °C |
| Storage Temperature | T _{STR} | -30 ~ +80 | °C |

8. DC CHARACTERISTICS

| Item | Symbol | Condition | Rating | | | Unit |
|--------------------|-----------------|-----------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Supply Voltage | V _{DD} | | 3.0 | 3.3 | 3.6 | V |
| LCD Supply Voltage | V _{OP} | | 8.7 | 9.0 | 9.3 | V |
| Supply Current | I _{DD} | | --- | TBD | --- | uA |

9. AC ELECTRICAL CHARACTERISTICS

SERIAL INTERFACE (4-Line Interface)



| Item | Signal | Symbol | Condition | Min. | Max. | Unit |
|---------------------|--------|-------------------|-----------|------|------|------|
| Serial clock period | SCL | t _{SCYC} | | 60 | - | ns |
| SCL "H" pulse width | | t _{SHW} | | 15 | - | |
| SCL "L" pulse width | | t _{SLW} | | 15 | - | |
| Address setup time | A0 | t _{SAS} | | 10 | - | |
| Address hold time | | t _{SAH} | | 10 | - | |
| Data setup time | SDA | t _{SDS} | | 10 | - | |
| Data hold time | | t _{SDH} | | 10 | - | |
| CS0 setup time | CS0 | t _{CSS} | | 15 | - | |
| CS0 hold time | | t _{CSH} | | 10 | - | |

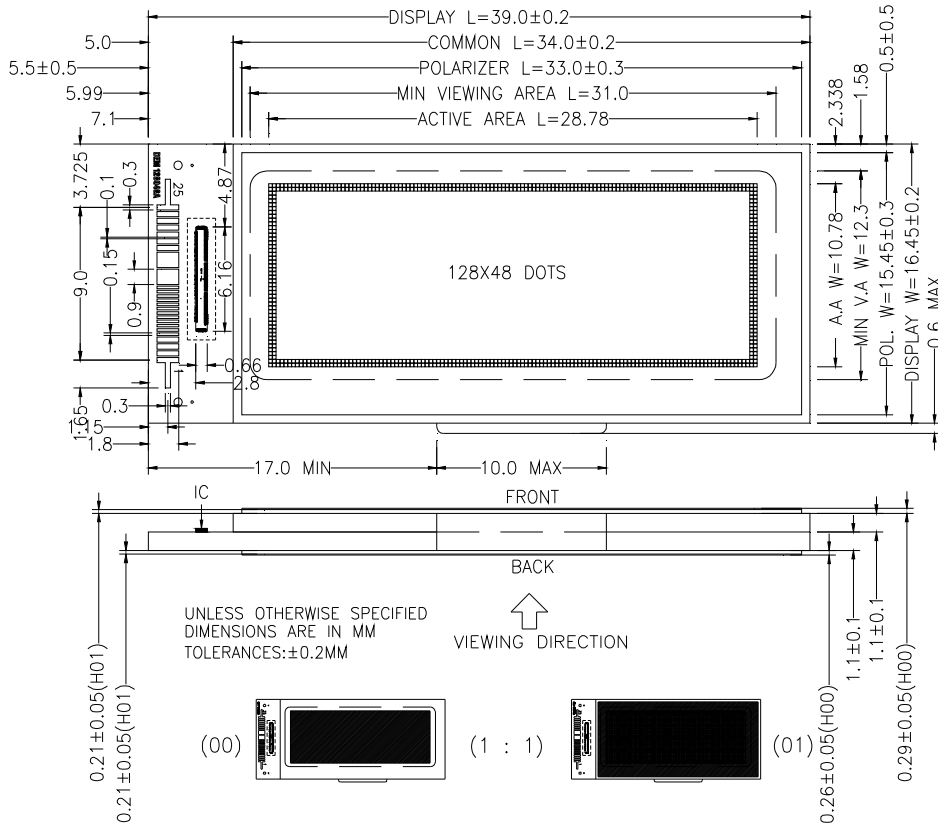
10. INSTRUCTION TABLE

| COMMAND TABLE | | | | | | | | | | | |
|--|----|--------------|--------------|-----|------|------|------|------|------|------|---|
| INSTRUCTION | A0 | R/W (RWR) | COMMAND BYTE | | | | | | | | DESCRIPTION |
| | | | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| Write Data | 1 | 0 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Write data to DDRAM |
| Read Data | 1 | 1 | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Read data from DDRAM Only for parallel interface and I ² C |
| Read Status Byte (parallel interface) | 0 | 1 | ID0 | MX | MY | WA | DE | 0 | 0 | 0 | Read status byte Only for parallel interface |
| | | | 0 | POR | 0 | 0 | 0 | ID3 | ID2 | ID1 | |
| Read Status Byte (4-SPI) | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | Read status byte Only for 4 line SPI |
| | | | 0 | POR | 0 | 0 | 0 | ID3 | ID2 | ID1 | |
| Set Column Address LSB | 0 | 0 | 0 | 0 | 0 | 0 | CA3 | CA2 | CA1 | CA0 | Set column address of RAM |
| Set Column Address MSB | 0 | 0 | 0 | 0 | 0 | 1 | CA7 | CA6 | CA5 | CA4 | |
| Set Scroll Line | 0 | 0 | 0 | 1 | SL5 | SL4 | SL3 | SL2 | SL1 | SL0 | Specify line address for the 1 st display line of DDRAM (vertical scrolling) |
| Set Page Address | 0 | 0 | 1 | 0 | 1 | 1 | PA3 | PA2 | PA1 | PA0 | Set page address of RAM |
| Set Contrast | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2-byte instruction. Set Vop voltage |
| | | | EV7 | EV6 | EV5 | EV4 | EV3 | EV2 | EV1 | EV0 | |
| Set Partial Screen Mode | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | PS | PS=1: Enable partial mode |
| Set RAM Address Control | 0 | 0 | 1 | 0 | 0 | 0 | 1 | AC2 | AC1 | AC0 | Set column and page address behavior |
| Set Frame Rate | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | FR1 | FR0 | Set frame frequency |
| Set All Pixel ON | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | AP | Set all display segments on |
| Set Inverse Display | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | INV | Set inverse display |
| Set Display Enable | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | PD | PD=0: Chip is in power down mode |
| Scan Direction | 0 | 0 | 1 | 1 | 0 | 0 | 0 | MY | MX | 0 | Set COM and SEG scan direction |
| Software Reset | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | Set software reset |
| NOP | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | No operation |
| Set Bias | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | BR1 | BR0 | Set internal bias circuit |
| Set COM End | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 2-byte instruction. Set display duty |
| | | | -- | -- | CEN5 | CEN4 | CEN3 | CEN2 | CEN1 | CEN0 | |
| Partial Start Address | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | Set partial start for partial display screen |
| | | | -- | -- | DST5 | DST4 | DST3 | DST2 | DST1 | DST0 | |
| Partial End Address | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | Set partial end for partial display screen |
| | | | -- | -- | DEN5 | DEN4 | DEN3 | DEN2 | DEN1 | DEN0 | |
| Test Control | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | Set test command table |
| | | | -- | -- | -- | -- | -- | -- | H1 | H0 | |

Note: 1. Do not use instructions not listed in these tables (Command Table).

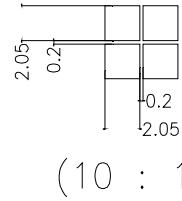
2. "--" = Disabled bit. It can be either logic 0 or 1.

11. LCD ARTWORK

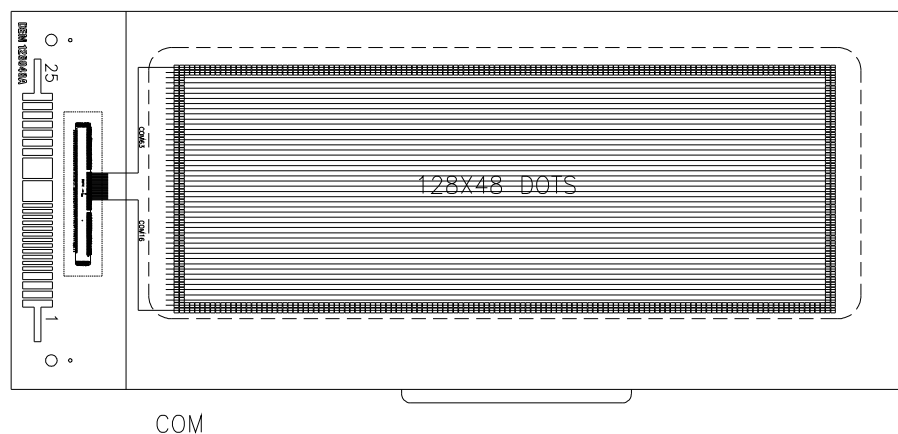
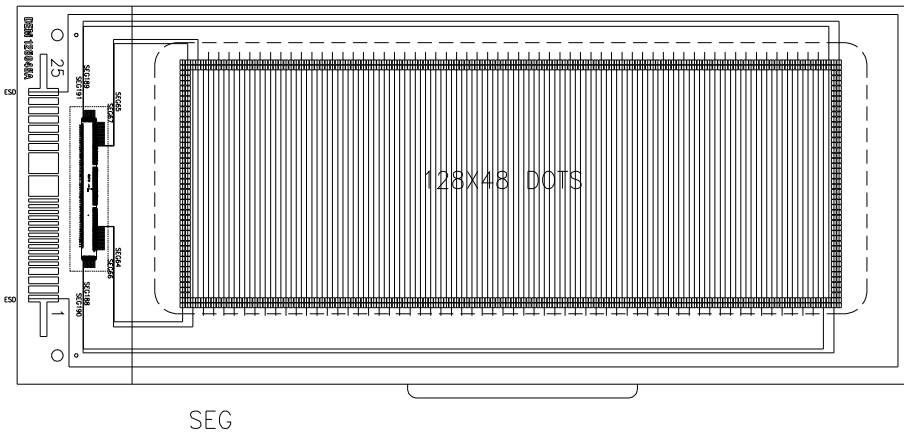


PIN Interface(LCD)

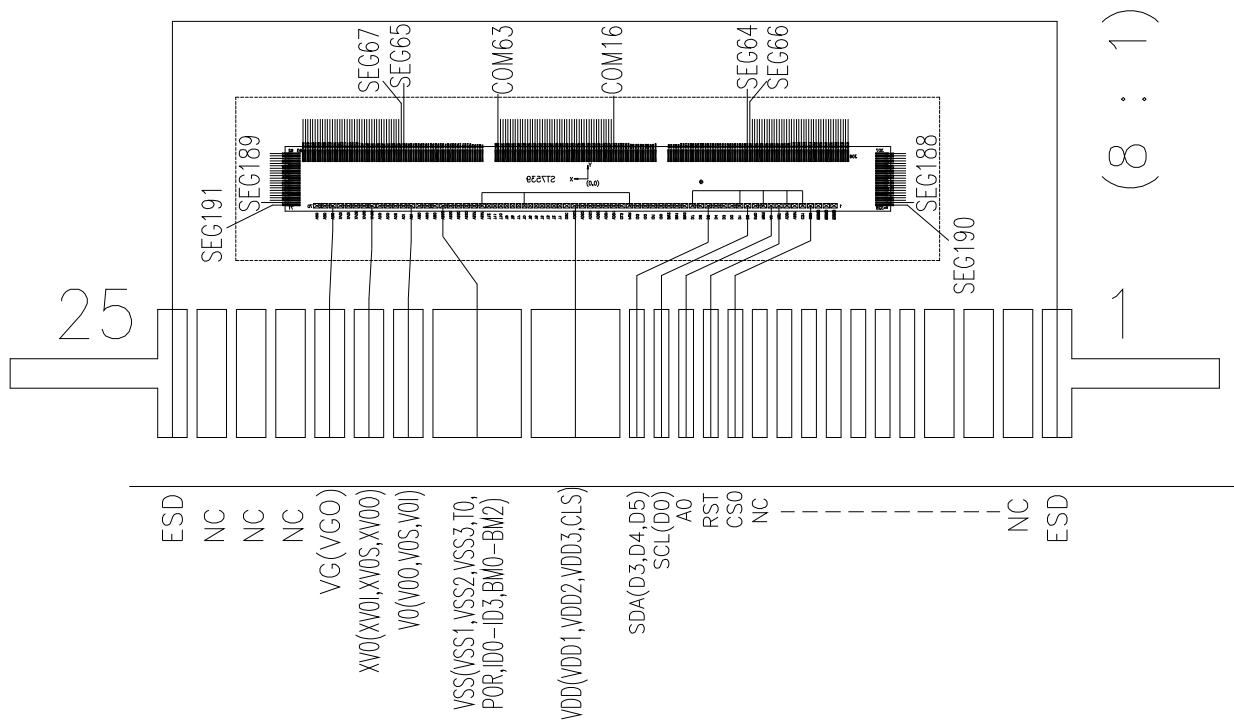
| PIN | NAME |
|-------|------|
| 25 | ESD |
| 22~24 | NC |
| 21 | VG |
| 20 | XVO |
| 19 | VO |
| 18 | VSS |
| 17 | VDD |
| 16 | SDA |
| 15 | SCL |
| 14 | A0 |
| 13 | RST |
| 12 | CS0 |
| 2~11 | NC |
| 1 | ESD |



12. SEG & COM LAYOUT



13. IC LAYOUT



14. MODULE ACCEPT QUALITY LEVEL (AQL)

Inspection Standard: ANSI Z-1.4 Table Normal Inspection Single Sampling Level II .

15. RELIABILITY TEST

Operating life time: 5 0000H (at room temperature without direct irradiation of sunlight)
 Reliability characteristics shall meet following requirements.

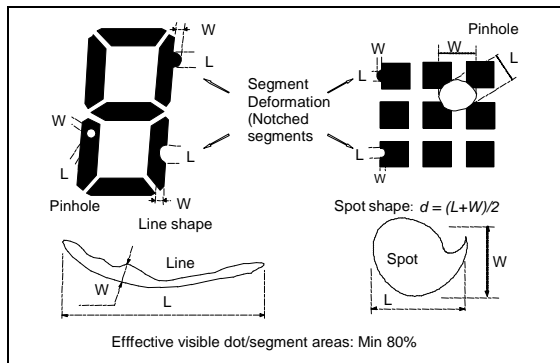
| Tests Item | Condition |
|---------------------------------|--|
| High Temperature Storage | +80°C x 96 hrs |
| Low Temperature Storage | -30°C x 96 hrs |
| High Temperature Operation | +70°C x 96 hrs |
| Low Temperature Operation | -20°C x 96 hrs |
| High Temperature, High humidity | +60°C x 90%RH x 96 hrs |
| Thermal Shock | -20°C x 30min à 25°C x 10s à +70°C x 30 min x 5 cycles |
| Vibration Test | Frequency x Swing x Time 40Hz x 4mm x 4hrs |
| Drop Test | Height x no. of drop 1.0m x 6 drops |

16. QUALITY DESCRIPTION

DEFECT SPECIFICATION:

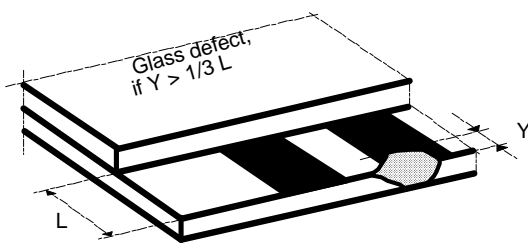
Specific type-related items are covered in this sheet.

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



Examples/Shapes

- 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.

| Defect Type | Max. defect size [μm] d or L | W | Max. Quantity. |
|--------------------------|--|--------------|----------------|
| Black or White Spots | $d \leq 100$ | | nc |
| | $100 < d \leq 200$ | | 5 |
| Black or White Lines | -- | $W \leq 10$ | nc |
| | $L \leq 5000$ | $W \leq 30$ | 3 |
| | $L \leq 2000$ | $W \leq 50$ | 2 |
| Pinhole | $d \leq 100$ | | nc |
| | $100 < d \leq 200$ | | 1/segment |
| (Total defects) | | | (5) |
| Segment Deformation | | $W \leq 100$ | nc |
| Bubble (e.g. under pola) | $d \leq 150$ | | nc |
| | $200 < d \leq 400$ | | 3 |
| | $400 < d \leq 600$ | | 1 |

17. LCD MODULES HANDLING PRECAUTIONS

- n** Please remove the protection foil of polarizer before using.
- n** The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.
- n** 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.
- n** Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.
- n** The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarize carefully.
- n** 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.
- n** 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□). Whenever possible, the LCD modules should be stored in the same conditions in which they were shipped from our company.

18. OTHERS

- n** 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.
- n** 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.
- n** 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