

DISPLAYTRONIC

*XIAMEN ZETTLER ELECTRONICS CO.,
LTD.*

SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

AGM1264K SERIES GRAPHIC MODULE VER1.2

| CUSTOMER APPROVAL | | | |
|----------------------|--|-----------------|--|
| | | | |
| ※ PART NO. : _____ | | | |
| APPROVAL | | COMPANY CHOP | |
| CUSTOMER COMMENTS | | | |

| DISPLAYTRONIC ENGINEERING APPROVAL | | |
|------------------------------------|------------|-------------|
| DESIGN BY | CHECKED BY | APPROVED BY |
| | | |

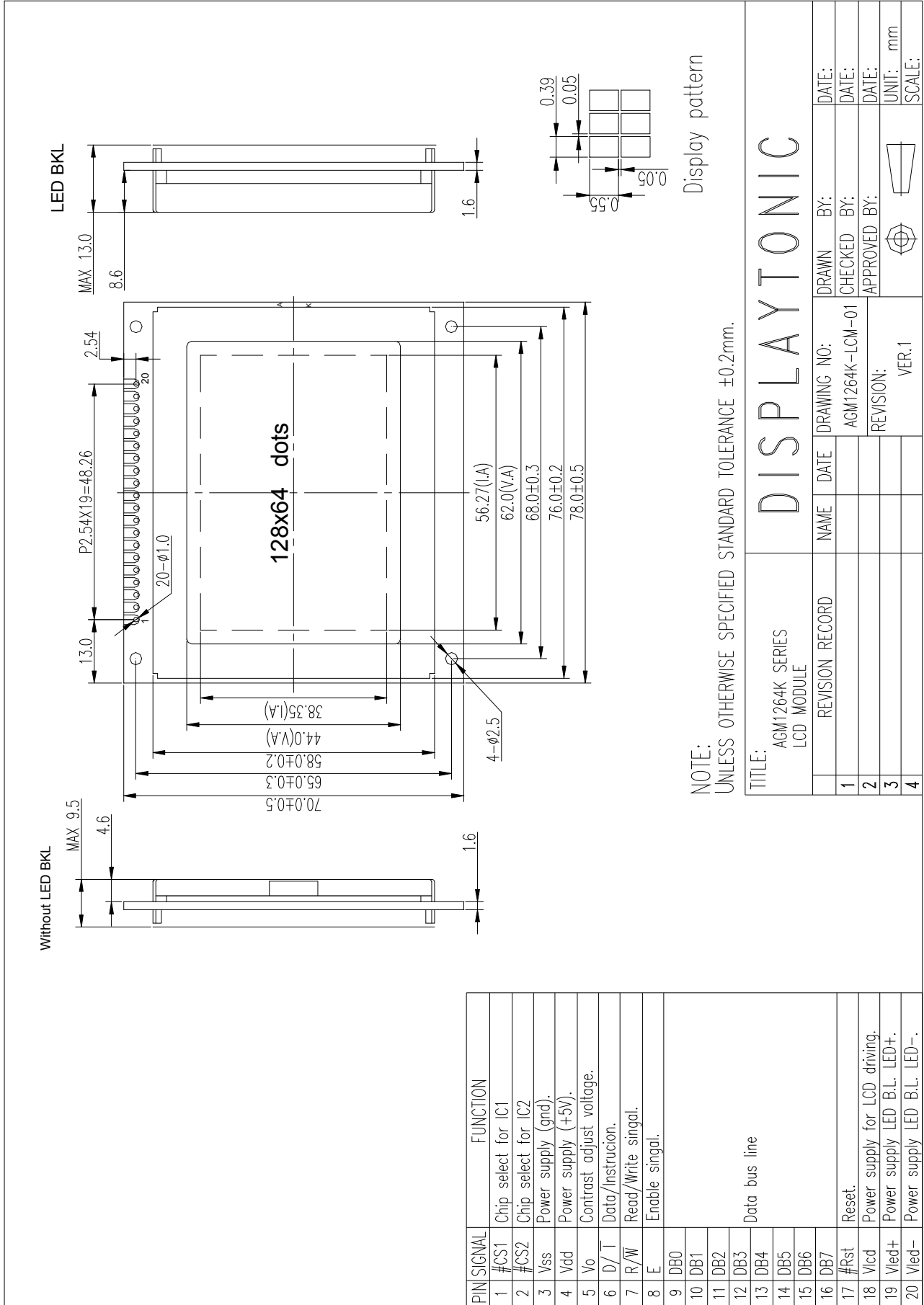
REVISION RECORD

| REVISION | REVISION DATE | PAGE | CONTENTS |
|----------|---------------|------|--|
| VER1.1 | 15/6-2006 | | MODIFY THE COVER,ADD CONTENT AND REVISION RECORD. |
| VER1.2 | 13/4-07 | | ADD PRECAUTION FOR USING LCM |

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1.0 MECHANICAL DIAGRAM



2.0 MECHANICAL SPECS

| | |
|-------------------------------|---|
| 1. Overall Module Size | 78.0mm(W) x 70.0mm(H) x max 13.0mm(D) for LED backlight version |
| 2. Dot Size | 0.39mm(W) x 0.55mm(H) |
| 3. Dot Pitch | 0.44mm(W) x 0.60mm(H) |
| 4. Duty | 1/64 |
| 5. Controller IC | S6B0108 or EQUI |
| 6. LC Fluid Options | STN |
| 7. Polarizer Options | Reflective,transflective,Transmissive |
| 8. Backlight Options | LED |
| 9. Temperature Range Options | -20°C ~ 70°C |
| 10. Temperature Range Storage | -30°C ~ 80°C |

3.0 ABSOLUTE MAXIMUM RATINGS

| Item | Symbol | Min | Typ | Max | Unit |
|--|----------|------|-----|------|------|
| Operating temperature (Standard) | Top | 0 | - | 50 | °C |
| Storage temperature (Standard) | Tst | -10 | - | 60 | °C |
| Operating temperature (Wide temperature) | Top | -20 | - | 70 | °C |
| Storage temperature (Wide temperature) | Tst | -30 | - | 80 | °C |
| Input voltage | Vin | Vss | | Vdd | V |
| Supply voltage for logic | Vdd- Vss | -0.3 | - | 6.0 | V |
| Supply voltage for LCD drive | Vdd- Vo | | - | 17.0 | V |

4.0 ELECTRICAL CHARACTERISTICS

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|--|-----------------|---------------|-----|-----|------|------|
| Input voltage (high) | Vih | H level | 3.5 | - | Vdd | V |
| Input voltage (low) | Vil | L level | 0 | - | 1.5 | V |
| Recommended LC Driving Voltage (Wide Temp) | Vdd -Vo | -20°C | - | | 12.0 | V |
| | | 25°C | - | 9.7 | - | |
| | | 70°C | 9.0 | | - | |
| Power Supply Current | Idd | Vdd=5.0V | - | - | 15.0 | mA |
| LED Power Supply Voltage | (VLED+)-(VLED-) | Ifled =440mA- | - | 5.0 | - | V |
| LED Power Supply Current | Ifled | - | - | 360 | 440 | mA |

5.0 OPTICAL CHARACTERISTICS

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| Item / Mode | | Cr (Contrast Ratio) | | θ (Viewing Angle) | | ϕ (Viewing Angle) | |
|-------------|---|---------------------|------|--------------------------|------|------------------------|------|
| | | 25 °C | | 25 °C | | 25 °C | |
| | | MIN. | TYP. | MIN | TYP. | MIN | TYP. |
| R | A | 2.80 | 3.05 | 80° | 85° | - | 35° |
| | B | 7.10 | 7.70 | 80° | 85° | - | 35° |
| | C | - | - | - | - | - | - |

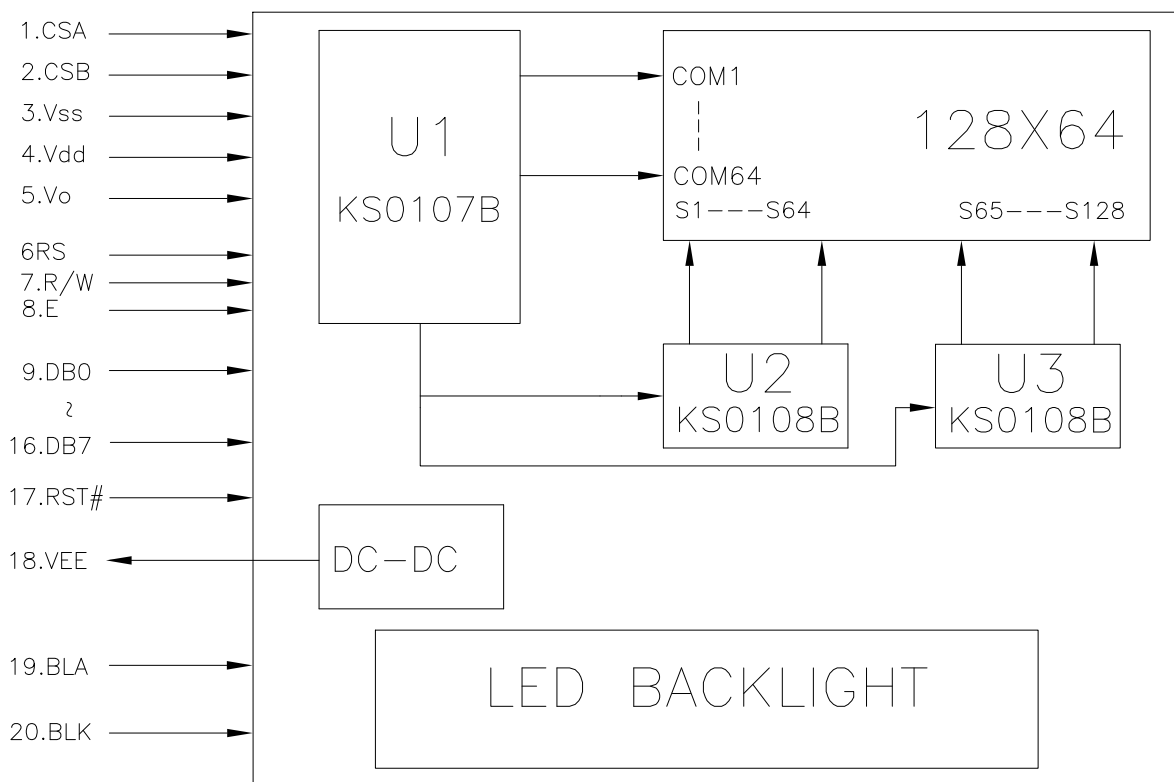
Note:

- R: Reflective
- S: Transflective
- A: STN Gray
- B: STN Yellow
- C: FSTN

At: $\phi=0^\circ$, $\theta=0^\circ$

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|----------------------|--------|-----------|-----|-----|-----|------|
| Response time (rise) | Tr | 25 °C | - | 140 | 280 | ms |
| Response time (fall) | Tf | 25 °C | - | 80 | 160 | ms |

6.0 BLOCK DIAGRAM

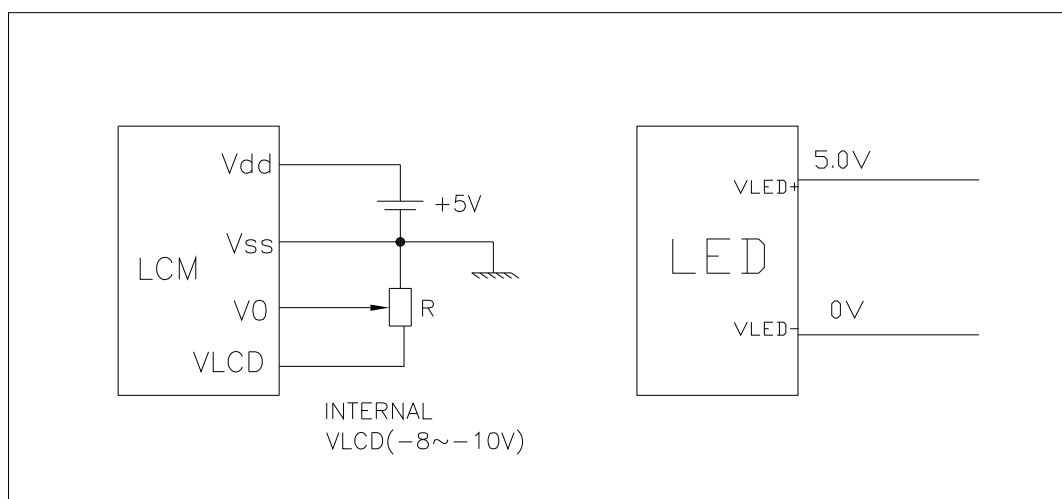


7.0 PIN ASSIGNMENT

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| Pin No. | Symbol | Function | Level |
|---------|--------|--|---------|
| 1 | CS1# | Chip selection for IC1 | L |
| 2 | CS2# | Chip selection for IC2 | L |
| 3 | Vss | Ground | - |
| 4 | Vdd | +5V | - |
| 5 | Vo | LCD contrast adjust voltage(VDD-V0=10.33V) | - |
| 6 | D/I | H: Data input L: Instruction code input | H/L |
| 7 | R/W | H: Data read L: Data write | H/L |
| 8 | E | Enable signal | H,H → L |
| 9 | DB0 | Data bit 0 | H/L |
| 10 | DB1 | Data bit 1 | H/L |
| 11 | DB2 | Data bit 2 | H/L |
| 12 | DB3 | Data bit 3 | H/L |
| 13 | DB4 | Data bit 4 | H/L |
| 14 | DB5 | Data bit 5 | H/L |
| 15 | DB6 | Data bit 6 | H/L |
| 16 | DB7 | Data bit 7 | H/L |
| 17 | RST# | Reset for LCM. When RST#=L, Reset. | |
| 18 | VLCD | LCD Driving Power supply (-8 ~ -10V) | |
| 19 | VLED+ | Power Supply for BL+(5.0V) | - |
| 20 | VLED- | Power Supply for BL- | - |

8.0 POWER SUPPLY



$$R=10K\sim 20K\Omega$$

9.0 TIMING CHARACTERISTICS

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| Item | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|------------------------|------------|----------------|------|------|------|------|
| Enable cycle time | t_{CYC} | Fig. a, Fig. b | 1000 | - | - | ns |
| E high level width | t_{WH} | Fig. a, Fig. b | 450 | - | - | ns |
| E low level width | t_{WL} | Fig. a, Fig. b | 450 | - | - | ns |
| Enable rise/fall time | T_r, t_f | Fig. a, Fig. b | - | - | 25 | ns |
| Address set up time | t_{AS} | Fig. a, Fig. b | 140 | - | - | ns |
| Address hold time | t_{AH} | Fig. a, Fig. b | 10 | - | - | ns |
| Data delay time | t_{DDR} | Fig. b | - | - | 320 | ns |
| Data set up time | t_{DSW} | Fig. a | 200 | - | - | ns |
| Data hold time (Write) | t_{DHW} | Fig. a | 10 | - | - | ns |
| Data hold time (Read) | t_{DHR} | Fig. b | 20 | - | - | ns |

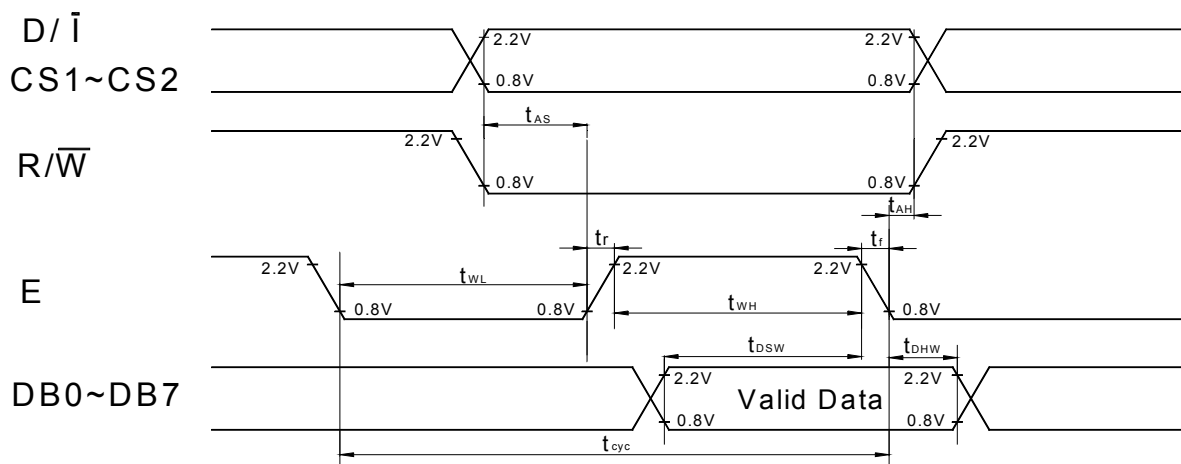


Fig. a Interface timing (data write)

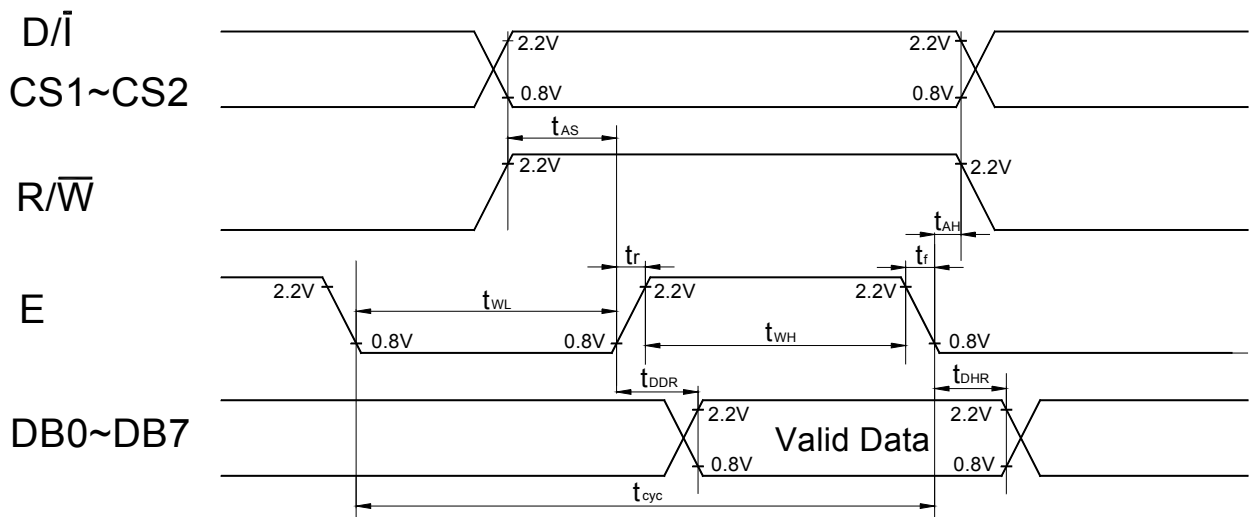


Fig. b Interface timing (data read)

10.0 RELIABILITY TEST

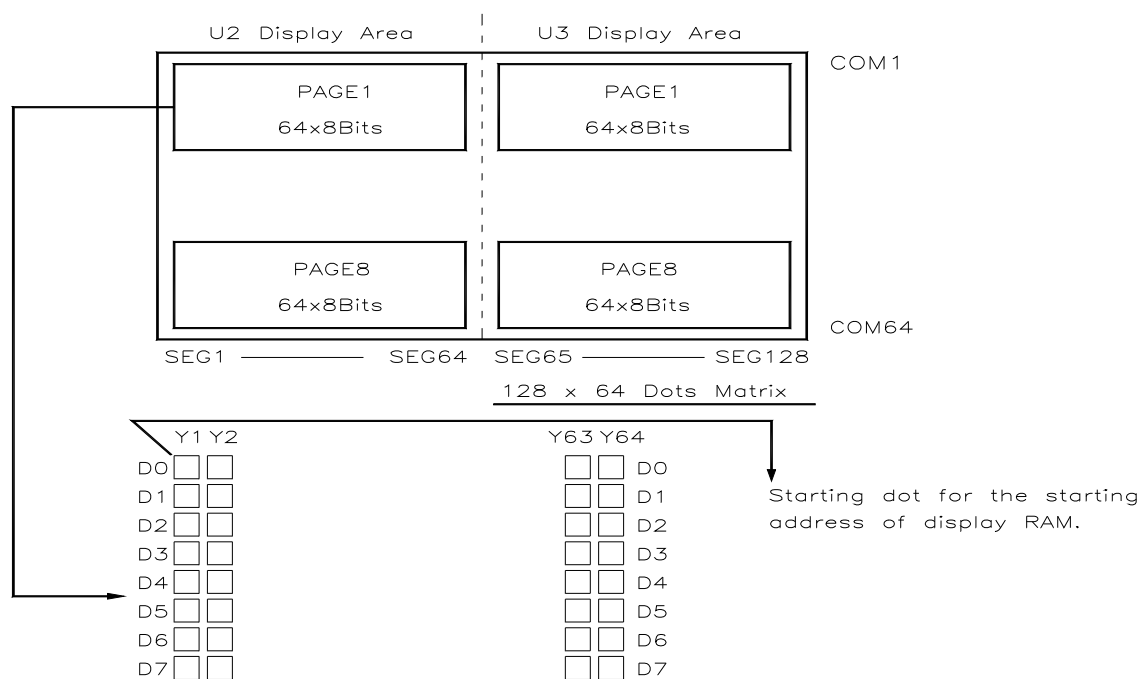
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| Storage Condition | Content | Evaluations and Assessment* | | | |
|--|--------------------|-----------------------------|--------|--------------------------------|-------------------|
| | | Current Consumption | Oozing | Contrast | Other Appearances |
| Operation at high temperature and humidity | 40°C,90% RH,240hrs | Twice initial value or less | none | More than 80% of initial value | No abnormality |
| High temperature storage | 60°C, 240hrs | Twice initial value or less | none | More than 80% of initial value | No abnormality |
| Low temperature storage | -20°C, 240hrs | Twice initial value or less | | More than 80% of initial value | No abnormality |

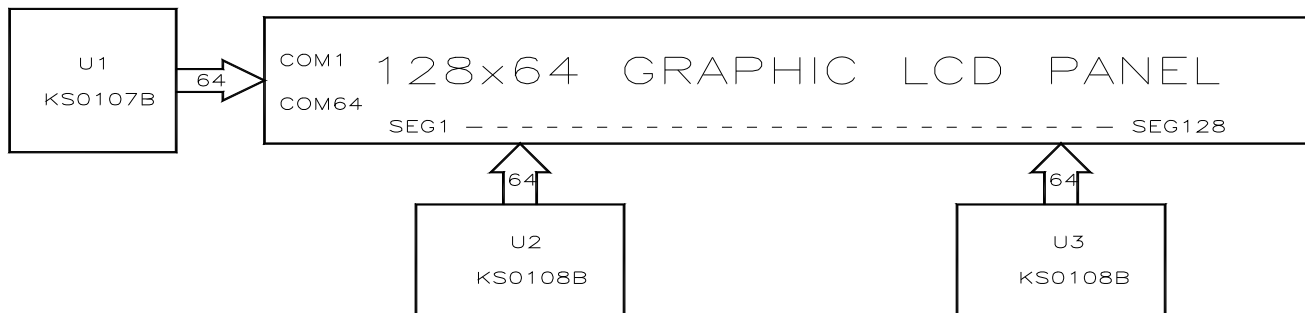
*Evaluations and assessment to be made two hours after returning to room temperature (25°C±5°C).

*The LCD|s subjected to the test must not have dew condensation.

11.0 RELATION BETWEEN DISPLAY PATTERN AND DRIVERS



Each segment driver has 8 pages RAM, and each page has 64x8 bits RAM. D0~D7 are 8 bits transmitted data, where D0 is LSB and D7 is MSB.



12.0 DISPLAY CONTROL INSTRUCTION

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The display control instructions control the internal state of the KS0108B. Instructions are received from MPU to KS0108B for the display control.

| INSTRUCTION | D/I | R/W | DB7 | DB6 | DB5 | DB4 | DB3 | DB2 | DB1 | DB0 | DESCRIPTION | |
|-------------------------------|-----|-----|------------|-----|---------------------------|-------|-----|------------|-----|-----|---|--|
| Display ON/OFF | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1/0 | Controls the display on or off. Display RAM data and internal status is not affected. 0: OFF. 1:ON | |
| Set Address (Y address) | 0 | 0 | 0 | 1 | Y address (0~63) | | | | | | Sets the Y address at the Y address counter. | |
| Set Page (X address) | 0 | 0 | 1 | 0 | 1 | 1 | 1 | Page (0~7) | | | Sets the X address at the X address register. | |
| Display Start Line (Zaddress) | 0 | 0 | 1 | 1 | Display start line (0~63) | | | | | | Indicates the display data RAM displayed at the top of the screen. | |
| Status Read | 0 | 1 | BUSY | 0 | ON/OFF | RESET | 0 | 0 | 0 | 0 | Read status: BUSY 0:Ready 1:In operation ON/OFF 0:Display ON 1:Display OFF RESET 0:Normal 1:Reset | |
| Write Display Data | 1 | 0 | Write Data | | | | | | | | | Writes data DB0~DB7 into display data RAM. After writing instruction, Y address is increased by 1 automatically. |
| Read Display Data | 1 | 1 | Read Data | | | | | | | | | Reads data DB0~DB7 from display data RAM to the data bus. |

13.0 RECAUTION FOR USING LCM

1. When design the product with this LCD Module, make sure the viewing angle matches to its purpose of usage.

2. As LCD panel is made of glass substrate, Dropping the LCD module or banging it against hard objects may cause cracking or fragmentation. Especially at corners and edges.
3. Although the polarizer of this LCD Module has the anti-glare coating, always be careful not to scratch its surface. Use of a plastic cover is recommended to protect the surface of polarizer.
4. If the LCD module is stored at below specified temperature, the LC material may freeze and be deteriorated. If it is stored at above specified temperature, the molecular orientation of the LC material may change to Liquid state and it may not revert to its original state. Excessive temperature and humidity could cause polarizer peel off or bubble. Therefore, the LCD module should always be stored within specified temperature range.
5. Saliva or water droplets must be wiped off immediately as those may leave stains or cause color changes if remained for a long time. Water vapor will cause corrosion of ITO electrodes.
6. If the surface of LCD panel needs to be cleaned, wipe it swiftly with cotton or other soft cloth. If it is not still clean enough, blow a breath on the surface and wipe again.
7. The module should be driven according to the specified ratings to avoid malfunction and permanent damage. Applying DC voltage cause a rapid deterioration of LC material. Make sure to apply alternating waveform by continuous application of the M signal. Especially the power ON/OFF sequence should be kept to avoid latch-up of driver LSIs and DC charge up to LCD panel.
8. Mechanical Considerations
 - a) LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.
 - b) Do not tamper in any way with the tabs on the metal frame.
 - c) Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.
 - d) Do not touch the elastomer connector; especially insert a backlight panel (for example, EL).
 - e) When mounting a LCM makes 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.
 - f) Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.
9. Static Electricity
 - a) Operator

Ware the electrostatics shielded clothes because human body may be statically charged if not ware shielded clothes. Never 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.

b) Equipment

There is a possibility that the static electricity is charged to the equipment, which has a function of peeling or friction action (ex: conveyer, soldering iron, working table). Earth the equipment through proper resistance (electrostatic earth: 1×10^8 ohm).

Only properly grounded soldering irons should be used.

If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.

The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended.

c) Floor

Floor is the important part to drain static electricity, which is generated by operators or equipment.

There is a possibility that charged static electricity is not properly drained in case of insulating floor. Set the electrostatic earth (electrostatic earth: 1×10^8 ohm).

d) Humidity

Proper humidity helps in reducing the chance of generating electrostatic charges. Humidity should be kept over 50%RH.

e) Transportation/storage

The storage materials also need to be anti-static treated because there is a possibility that the human body or storage materials such as containers may be statically charged by friction or peeling.

The modules should be kept in antistatic bags or other containers resistant to static for storage.

f) Soldering

Solder only to the I/O terminals. Use only soldering irons with proper grounding and no leakage.

Soldering temperature : $280^{\circ} \text{C} \pm 10^{\circ} \text{C}$

Soldering time: 3 to 4 sec.

Use eutectic solder with resin flux fill.

If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed afterwards.

g) Others

The laminator (protective film) is attached on the surface of LCD panel to prevent it from scratches or stains. It should be peeled off slowly using static eliminator.

Static eliminator should also be installed to the workbench to prevent LCD module from static charge.

10. Operation

- a) Driving voltage should be kept within specified range; excess voltage shortens display life.
 - b) Response time increases with decrease in temperature.
 - c) Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".
 - d) Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".
11. If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. The toxicity is extremely low but caution should be exercised at all the time.
 12. Disassembling the LCD module can cause permanent damage and it should be strictly avoided.
 13. LCD retains the display pattern when it is applied for long time (Image retention). To prevent image retention, do not apply the fixed pattern for a long time. Image retention is not a deterioration of LCD. It will be removed after display pattern is changed.
 14. Do not use any materials, which emit gas from epoxy resin (hardener for amine) and silicone adhesive agent (dealcohol or deoxym) to prevent discoloration of polarizer due to gas.
 15. Avoid the exposure of the module to the direct sunlight or strong ultraviolet light for a long time. The brightness of LCD module may be affected by the routing of CCFL cables due to leakage to the chassis through coupling effect. The inverter circuit needs to be designed taking the level of leakage current into consideration. Thorough evaluation is needed for LCD module and inverter built into its host equipment to