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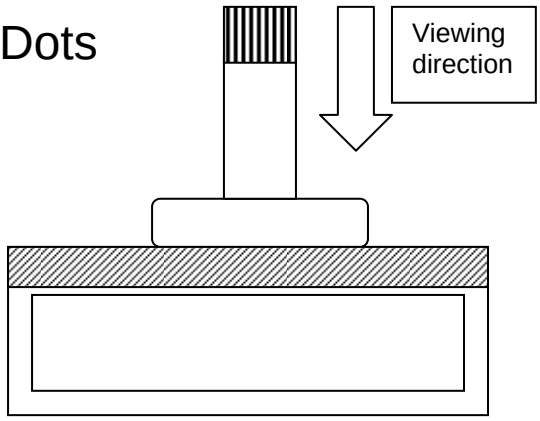
lead-free

# SPECIFICATIONS

## SD1023-V00

Swissdis 108293

LCD Module Graphic 240x64 Dots
With LED Backlight white




Viewing direction
12 o'clock

Version November 2012

**REVISION RECORD (MODEL NO.: SD1023-V00)**

| Revision | Revision Date | Page | Contents |
|---|---|---|---|
| A | 2012/05/21 | | Initial Release and Issue Full Specification. |
| B | 2012/06/29 | | Improve the display effect. |
| C | 2012/09/18 | | Improve the backlight. |
| D | 2012/11/21 | | Improve the backlight. |

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※ ANNEX : 1. SAMPLES OUTGOING INSPECTION REPORT
2. REVISION RECORD

## 1. FEATURES

The features of LCD are as follows

* Display mode : FSTN, Positive, Transflective
* Color : Display dot : Black
  Background: White
* Display Format : 240 × 64 Dots graphic
* IC : SITRONIX ST7565P-G *2 Chip
* Interface Input Data : Series MPU
* Driving Method : 1/65 Duty, 1/7 Bias
* Viewing Direction : 12 O'clock
* Backlight : LED(**White**)
* LCM technological conditions: **RoHS**

## 2. MECHANICAL SPECIFICATIONS

| Item | Specification | Unit |
|---|---|---|
| Module Size | 109.6 (W) X 134.82(H) X 5.5(T) | mm |
| Viewing Area | 102.4(W) X 30.22(H) | mm |
| Effective Display Area | 98.38(W) X 26.22(H) | mm |
| Number of Dots | 240 X 64Dots | - |
| Dot Size | 0.39(W) X 0.39(H) | mm |
| Dot Pitch | 0.41(W) X 0.41(H) | mm |

## 3. ELECTRICAL SPECIFICATIONS

3-1. Absolute Maximum Ratings (Vss=0V)

| Item | Symbol | Standard Value | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Supply Voltage For Logic | $V_{DD}$ | 0.3 | _ | 3.6 | V |
| Supply Voltage For LCD Drive | $V_{0\ .\ Vout}$ | 0.3 | _ | 14.5 | V |
| Operating Temp. | $T_{OP}$ | -20 | - | +70 | °C |
| Storage Temp. | $T_{ST}$ | -30 | - | +80 | °C |
| Static Electricity | Be sure that you are ground when handing LCM | | | | |

## 3. ELECTRICAL SPECIFICATIONS (Continued)

3-2-1.Electrical Characteristics

| Item | | Symbol | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Supply Voltage For Logic | | $V_{DD} - V_{SS}$ | Ta=25℃ | 2.7 | 3.0 | 3.3 | V |
| Supply Voltage For LCD | | $V_{DD} - V_{ss}$ | Ta=25℃ | 7.8 | 8.0 | 8.3 | V |
| Input Voltage | "H" Level | $V_{IH}$ | Ta=25℃ | 0.8$V_{DD}$ | - | $V_{DD}$ | V |
| | "L" Level | $V_{IL}$ | | $V_{SS}$ | - | 0.2$V_{DD}$ | V |
| Output Voltage | "H" Level | $V_{OH}$ | $I_{OUT}$= -0.5mA | 0.8$V_{DD}$ | - | $V_{DD}$ | V |
| | "L" Level | $V_{OL}$ | $I_{OL}$ = 0.5mA | $V_{SS}$ | - | 0.2$V_{DD}$ | V |
| Current Consumption | | $I_{DD}$ | - | - | 1.5 | 3.0 | mA |

NOTE: 1) Duty ratio=1/65, Bias=1/7

2) Measured in Dots ON-state

## 3-3. Backlight

3-3-1. Absolute Maximum Ratings at Ta=25℃

| Item | Symbol | Rating | Unit |
|---|---|---|---|
| Absolute maximum forward current | If | 200 | mA |
| Reverse Voltage | Vr | 4 | V |
| Power Dissipation | $P_d$ | 840 | mW |
| Storage Temperature Range | Tstg | -30~+80 | ℃ |
| Hand Soldering Temperature | / | | - |

3-3-2. Electronic Optical Characteristics (If=120mA)

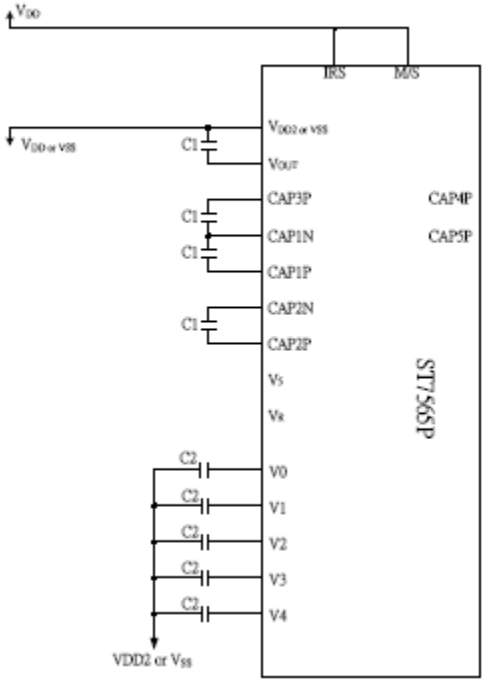
| Item | Symbol | Min. | Typ. | Max | Unit |
|---|---|---|---|---|---|
| Forward Voltage | VF | 3.8 | 4.0 | 4.2 | V |
| Luminous Intensity | Iv | 500 | 670 | - | $cd/m^2$ |
| Uniformity | U | 70 | - | - | % |
| Colour Coordinate | X | 0.28 | 0.31 | 0.34 | |
| | Y | 0.28 | 0.31 | 0.34 | nm |

* The brightness is measured without LCD panel

## 4. POWER SUPPLY and BLOCK DIAGRMA

4-1 Power supply

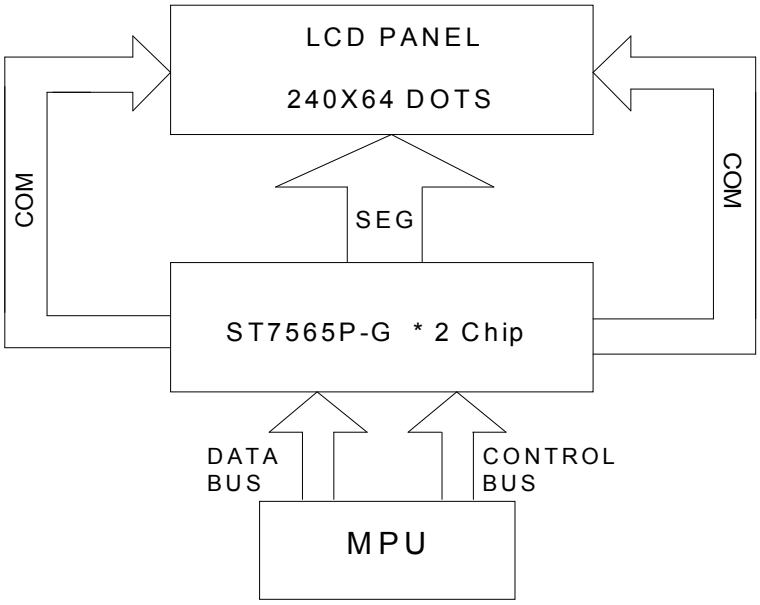
(1) When the voltage regulator internal resistor is used.
(Example where VDD2 = VDD, with 4x step-up)




Note: 1. C1: 1.0 to 4.7 $\mu$F

2. C2: 0.1 to 4.7 $\mu$F

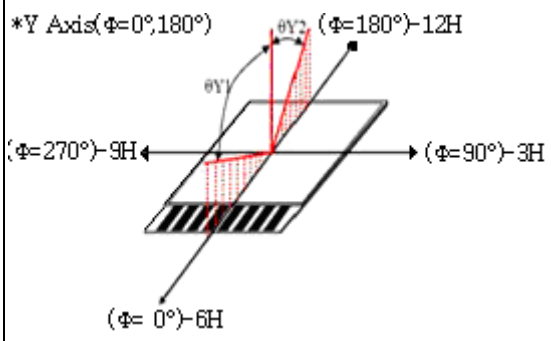
4-2 Block diagram



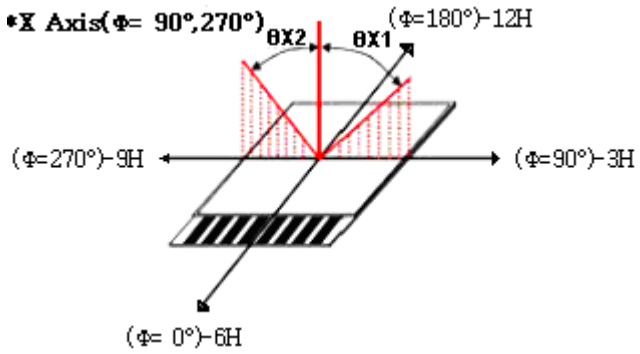
## 5. ELECTRO – OPTICAL CHARACTERISTICS

| Item | | Symbol | Temp. | Min. | Typ. | Max. | Unit | Conditions | Note |
|---|---|---|---|---|---|---|---|---|---|
| Viewing Angle Cr≥2 | Φ=0° | Θ1 | 25℃ | -- | 28 | -- | Deg. | - | 1,2 |
| | Φ=180° | Θ2 | | -- | 30 | -- | | | |
| | Φ=90° | Θ3 | | -- | 25 | -- | | | |
| | Φ=270° | Θ4 | | -- | 28 | -- | | | |
| Viewing Direction | | | 12 O'clock | | | | | | |
| Contrast Ratio | | Cr | 25℃ | 2.0 | 3.08 | 3.18 | - | Θ= 0° Φ= 0° | 3 |
| Response Time(rise) | | Tr | 25℃ | - | 208 | 350 | ms | Θ= 0° Φ= 0° | 4 |
| | | | 0℃ | - | 950 | 1150 | | | |
| Response Time(fall) | | Tf | 25℃ | - | 268 | 350 | ms | Θ= 0° Φ= 0° | 4 |
| | | | 0℃ | - | 950 | 1150 | | | |

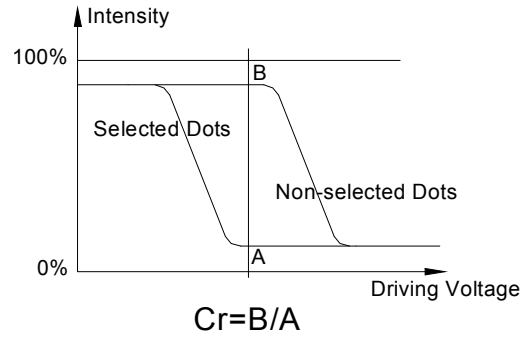
Note1. Definition of Angle ΘY1&ΘY2




Note2. Definition of Viewing Angle ΘX1&ΘX2

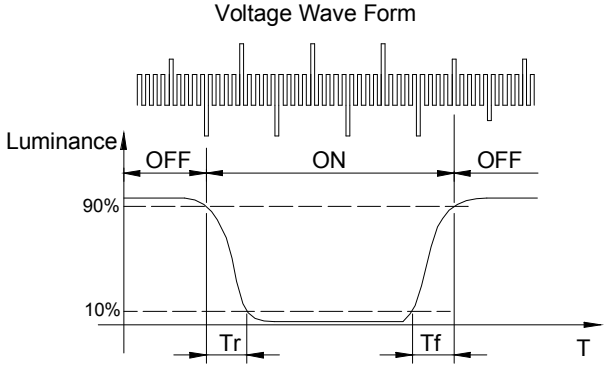



Note3. Definition of Contrast Cr




Cr=B/A

Note4. Definition of Optical Response



## 6. INTERFACE PIN FUNCTION

| Pin NO. | Symbol | I / O | Functions |
|---|---|---|---|
| 1 | /RES | I | When /RES is set to “L”, the settings ate initialized. |
| 2 | /CSA | I | This is the chip select signal. When /CSA = “L” master(A) chip select becomes active. |
| 3 | /CSB | I | This is the chip select signal. When /CSB = “L” Slave(B) chip select becomes active. |
| 4 | A0 | I | This is connected to the least significant bit of the normal MPU address bus, and it determines whether the data bits ate data or a command. |
| 5 | SCL | I | Serial clock input. |
| 6 | SI | I | Serial data input. |
| 7 | $V_{DD}$ | Power Supply | Power Supply. |
| 8 | $V_{SS}$ | Power Supply | Ground. |
| 9 | $V_{OUT}$ | O | DC/DC voltage converter. Connect a capacitor between this terminal and VSS or VDD. |
| 10 | CAP3P | O | DC/DC Voltage converter. Connect a capacitor between this terminal and the CAP1N terminal. |
| 11 | CAP1N | O | DC/DC Voltage converter. Connect a capacitor between this terminal and the CAP1P terminal. |
| 12 | CAP1P | O | DC/DC Voltage converter. Connect a capacitor between this terminal and the CAP1N terminal. |
| 13 | CAP2P | O | DC/DC Voltage converter. Connect a capacitor between this terminal and the CAP2N terminal. |
| 14 | CAP2N | O | DC/DC Voltage converter. Connect a capacitor between this terminal and the CAP2P terminal. |
| 15~19 | V4~V0 | Power Supply | This is a multi-level power supply for the liquid crystal drive. Voltage levels are determined based on VSS, and must maintain the relative magnitudes shown below. $V0 \geq V1 \geq V2 \geq V3 \geq V4 \geq V_{SS}$. |
| 20 | VR | I | Output voltage regulator terminal. Provides the voltage between VSS and V0 through a resistive voltage divider. |
| 21 | IRS | I | This terminal selects the resistors for the V0 voltage level adjustment. |
| 22 | NC | / | No Connect. |

## 7. COMMAND LIST

| Command | Command Code | | | | | | | | | | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | A0 | /RD | /WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | |
| (1) Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0<br>1 | LCD display ON/OFF<br>0: OFF, 1: ON |
| (2) Display start line set | 0 | 1 | 0 | 0 | 1 | Display start address | | | | | | Sets the display RAM display start line address |
| (3) Page address set | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Page address | | | | Sets the display RAM page address |
| (4) Column address set upper bit<br>Column address set lower bit | 0<br>0 | 1<br>1 | 0<br>0 | 0<br>0 | 0<br>0 | 0<br>0 | 1<br>0 | Most significant column address<br>Least significant column address | | | | Sets the most significant 4 bits of the display RAM column address.<br>Sets the least significant 4 bits of the display RAM column address. |
| (5) Status read | 0 | 0 | 1 | Status | | | | 0 | 0 | 0 | 0 | Reads the status data |
| (6) Display data write | 1 | 1 | 0 | Write data | | | | | | | | Writes to the display RAM |
| (7) Display data read | 1 | 0 | 1 | Read data | | | | | | | | Reads from the display RAM |
| (8) ADC select | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0<br>1 | Sets the display RAM address SEG output correspondence<br>0: normal, 1: reverse |
| (9) Display normal/ reverse | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0<br>1 | Sets the LCD display normal/ reverse<br>0: normal, 1: reverse |
| (10) Display all points ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0<br>1 | Display all points<br>0: normal display<br>1: all points ON |
| (11) LCD bias set | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | 0<br>1 | Sets the LCD drive voltage bias ratio<br>0: 1/9 bias, 1: 1/7 bias (ST7565P) |
| (12) Read/modify/write | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Column address increment<br>At write: +1<br>At read: 0 |
| (13) End | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | Clear read/modify/write |
| (14) Reset | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | Internal reset |
| (15) Common output mode select | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0<br>1 | * | * | * | Select COM output scan direction<br>0: normal direction<br>1: reverse direction |
| (16) Power control set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Operating mode | | | Select internal power supply operating mode |
| (17) $V_0$ voltage regulator internal resistor ratio set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | Resistor ratio | | | Select internal resistor ratio(Rb/Ra) mode |
| (18) Electronic volume mode set<br>Electronic volume register set | 0 | 1 | 0 | 1<br>0 | 0<br>0 | 0<br>Electronic volume value | 0 | 0 | 0 | 0 | 1 | Set the $V_0$ output voltage electronic volume register |
| (19) Static indicator ON/OFF<br>Static indicator register set | 0 | 1 | 0 | 1<br>0 | 0<br>0 | 1<br>0 | 0<br>0 | 1<br>0 | 1<br>0 | 0<br>0 | 0<br>1<br>Mode | 0: OFF, 1: ON<br>Set the flashing mode |
| (20) Booster ratio set | 0 | 1 | 0 | 1<br>0 | 1<br>0 | 1<br>0 | 1<br>0 | 1<br>0 | 0<br>0 | 0<br>step-up value | 0 | select booster ratio<br>00: 2x,3x,4x<br>01: 5x<br>11: 6x |
| (21) Power saver | | | | | | | | | | | | Display OFF and display all points ON compound command |
| (22) NOP | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | Command for non-operation |
| (23) Test | 0 | 1 | 0 | 1 | 1 | 1 | 1 | * | * | * | * | Command for IC test. Do not use this command |

## 8.TIMING CHARACTERISTICS (Continued)

### 8-3.The Serial Interface

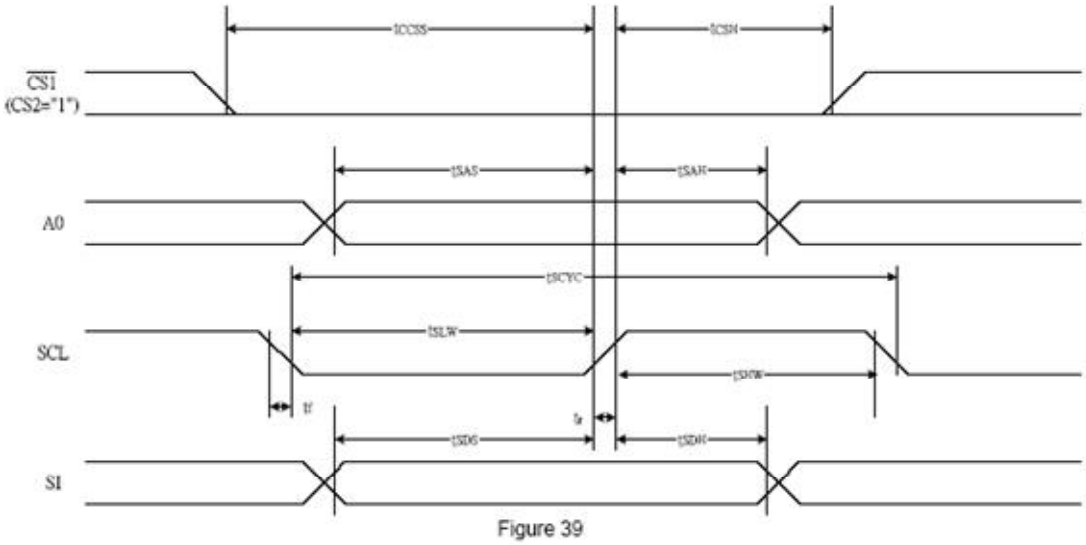



Figure 39

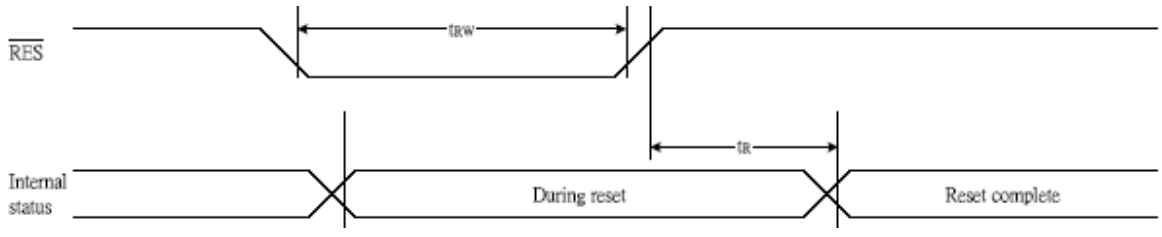
**Table 30**

(VDD = 3.3V, Ta =25°C )

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min. | Max. | |
| Serial Clock Period | SCL | Tscyc | | 50 | — | ns |
| SCL "H" pulse width | | Tshw | | 25 | — | |
| SCL "L" pulse width | | TSLW | | 25 | — | |
| Address setup time | A0 | TSAS | | 20 | — | |
| Address hold time | | Tsah | | 10 | — | |
| Data setup time | SI | Tsds | | 20 | — | |
| Data hold time | | TSDH | | 10 | — | |
| CS-SCL time | CS | Tcss | | 20 | — | |
| CS-SCL time | | Tcsh | | 40 | — | |

*1 The input signal rise and fall time (tr, tf) are specified at 15 ns or less.
*2 All timing is specified using 20% and 80% of VDD as the standard.

### 8-4. Reset Timing



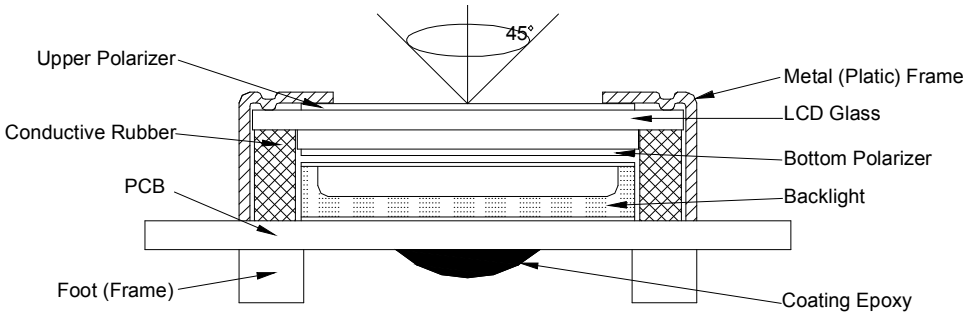

(VDD = 3.3V , Ta = –40 to 85°C )

| Item | Signal | Symbol | Condition | Rating | | | Units |
|---|---|---|---|---|---|---|---|
| | | | | Min. | Typ. | Max. | |
| Reset time | | tR | | — | — | 1.0 | us |
| Reset "L" pulse width | /RES | tRW | | 1.0 | — | — | us |

## 9. QUALITY SPECIFICATION

9 - 1. LCM Appearance and Electric inspection Condition

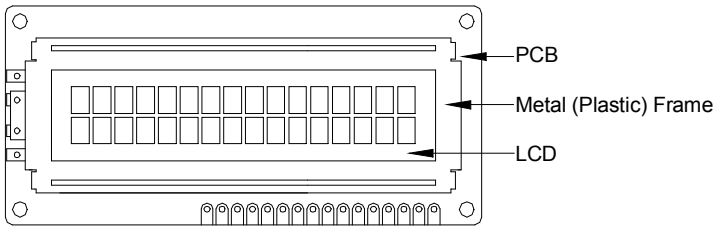
1. Inspection will be done by placing LCM 30cm away from inspector's eyeballs under normal illumination.



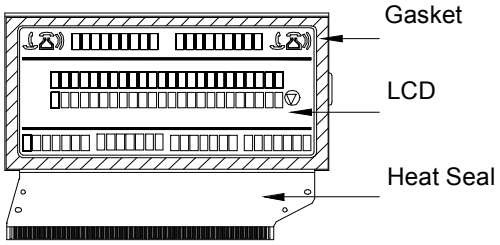

2. View Angle: with in 45°around perpendicular line.

9 - 2. Definition

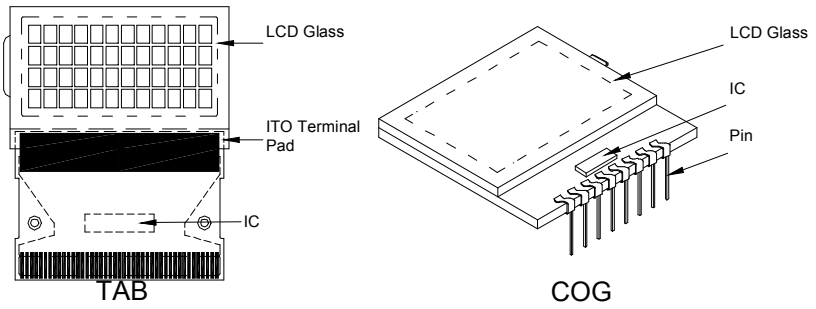
1. COB




2. Heat Seal




3. TAB and COG



## 9. QUALITY SPECIFICATION (Continued)

9-3. Sampling Plan and Acceptance

1. Sampling Plan

MIL - STD - 105E ( || ) ordinary single inspection is used.

2. Acceptance

Major defect: AQL = 0.25

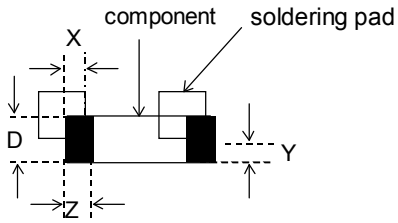
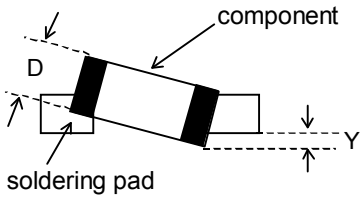
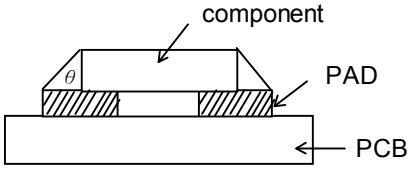
Minor defect: AQL = 0.65

9-4. Criteria

1. COB

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | PCB copper flakes peeling off | Any copper flake in viewing Area should be greater than 1.0mm$^2$ | Reject |
| Major | Height of coating epoxy | Exceed the dimension of drawing | Reject |
| Major | Void or hole of coating epoxy | Expose bonding wire or IC | Reject |
| Major | PCB cutting defect | Exceed the dimension of drawing | Reject |

2. SMT

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Minor | Component marking not readable | | Reject |
| Minor | Component height | Exceed the dimension Of drawing | Reject |
| Major | Component solder defect (missing , extra, wrong component or wrong orientation | | Reject |
| Minor | Component position shift   | X < 3/4Z<br>Y > 1/3D | Reject<br>Reject |
| Minor | Component tilt   | Y > 1/3D | Reject |
| Minor | Insufficient solder   | $\theta \leq 20^{\circ}$ | Reject |

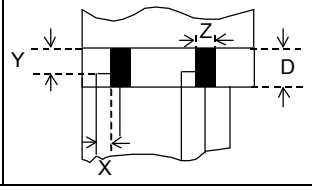
## 9. QUALITY SECIFICATION (Continued)

9-4. Criteria (Continued)

3. Metal (Plastic) Frame

| Defect | Inspection Item | Inspection Standards | | |
|---|---|---|---|---|
| Major | Crack / breakage | Anywhere | | Reject |
| Minor | Frame Scratch | W | L | Acceptable of Scratch |
| | | w<0.1mm | Any | Ignore |
| | | 0.1≤w<0.2mm | L≤5.0mm | 2 |
| | | 0.2≤w<0.3mm | L≤3.0mm | 1 |
| | | w≥0.3mm | Any | 0 |
| | | Note : 1. Above criteria applicable to scratch lines with distance greater than 5mm.<br>2. Scratch on the back side of frame (not visible) can be ignored . | | |
| Minor | Frame Dent , Prick<br>$\Phi = \frac{L + W}{2}$ | | | Acceptable of Dents / Pricks |
| | | $\Phi \leq 1.0$mm | | 2 |
| | | $1.0 < \Phi \leq 1.5$mm | | 1 |
| | | $1.5\text{mm} < \Phi$ | | 0 |
| | | Note : 1. Above criteria applicable to any two dents / pricks with distance greater than 5mm<br>2. Dent / prick on the back side of frame (not visible) can be ignored | | |
| Minor | Frame Deformation | Exceed the dimension of drawing | | |
| Minor | Metal Frame Oxidation | Any rust | | |

4. Flexible Film Connector (FFC)

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Minor | Tilted soldering | Within the angle +5° | Acceptable |
| Minor | Uneven solder joint /bump | | Reject |
| Minor | Hole $\Phi = \frac{L + W}{2}$ | Expose the conductive line | Reject |
| | | $\Phi$ > 1.0mm | Reject |
| Minor | Position shift<br>  <br> | Y > 1/3D | Reject |
| | | X > 1/2Z | Reject |

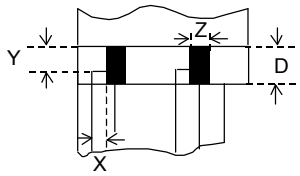
## 9. QUALITY SPECIFICATION (Continued)

9-4. Criteria (Continued)

5. Screw

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | Screw missing/loosen | | Reject |
| Minor | Screw oxidation | Any rust | Reject |
| Minor | Screw deformation | Difficult to accept screw driver | Reject |

6. Heatseal 、TCP 、FPC

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | Scratch expose conductive layer | | Reject |
| Minor | HS Hole $\Phi = \frac{L + W}{2}$ | $\Phi$> 0.5mm | Reject |
| Major | Adhesion strength | Less than the specification | Reject |
| Minor | Position shift   | Y > 1/3D | Reject |
| | | X > 1/2Z | Reject |
| Major | Conductive line break | | Reject |

7. LED Backing Protective Film and Others

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Minor | LED dirty, prick | Acceptable number of units | |
| | | $\Phi \leq$0.10mm | Ignore |
| | | 0.10< $\Phi \leq$0.15mm | 2 |
| | | 0.15< $\Phi \leq$0.2mm | 1 |
| | | $\Phi$>0.2mm | 0 |
| | | The distance between any two spots should be $\geq$5mm<br>Any spot/dot/void outside of viewing area is acceptable | |
| Minor | Protective film tilt | Not fully cover LCD | Reject |
| Major | COG coating | Not fully cover ITO circuit | Reject |

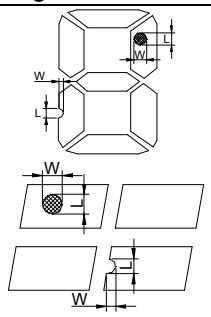
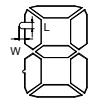
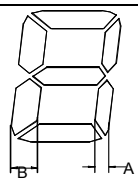
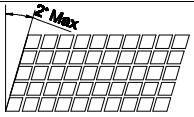
8. Electric Inspection

| Defect | Inspection Item | Inspection Standards | |
|---|---|---|---|
| Major | Short | | Reject |
| Major | Open | | Reject |

## 9. QUALITY SPECIFICATION (Continued)

9-4. Criteria (Continued)

9. Inspection Specification of LCD

| Defect | Inspect Item | | Inspection Standards | | | | |
|---|---|---|---|---|---|---|---|
| Minor | Linear Defect | ∗ Glass Scratch<br>∗ Polarizer Scratch<br>∗ Fiber and Linear material | W | W≤0.03 | | 0.03<W≤0.05 | W>0.05 |
| | | | L | L<5 | | L<3 | Any |
| | | | ACC. NO. | 1 | | 1 | Reject |
| | | | Note | L is the length and W is the width of the defect | | | |
| Minor | Black Spot and Polarizer Pricked | ∗ Foreign material between glass and polarizer or glass and glass<br>∗ Polarizer hole or protuberance by external force | Φ | Φ≤0.1 | 0.1<Φ≤0.15 | 0.15<Φ≤0.2 | Φ>0.2 |
| | | | ACC. NO. | 3EA / 100mm$^2$ | 2 | 1 | 0 |
| | | | Note | Φ is the average diameter of the defect.<br>Distance between two defects > 10mm. | | | |
| Minor | White Spot and Bubble in polarizer | ∗ Unobvious transparant foreign material between glass and glass or glass and polarizer<br>∗ Air protuberance between polarizer and glass | Φ | Φ≤0.3 | | 0.3<Φ≤0.5 | 0.5<Φ |
| | | | ACC. NO. | 3EA / 100mm$^2$ | | 1 | 0 |
| | | | Note | Φ is the average diameter of the defect.<br>Distance between two defects > 10mm. | | | |
| Minor | Segment Defect |  | Φ | Φ≤0.10 | 0.10<Φ≤0.20 | 0.20<Φ≤0.25 | Φ>0.25 |
| | | | ACC. NO. | 3EA / 100mm$^2$ | 2 | 1 | 0 |
| | | | Note | W is more than 1/2 segment width | | | Reject |
| | | | | $\Phi = \frac{L + W}{2}$<br>Distance between two defect is 10mm | | | |
| Minor | Protuberant Segment |  <br>Φ = ( L + W ) / 2 | Φ | Φ≤0.10 | 0.10<Φ≤0.20 | 0.20<Φ≤0.25 | Φ>0.25 |
| | | | W | Glue | W≤1/2 Seg W≤0.2 | W≤1/2 Seg W≤0.2 | Ignore |
| | | | ACC. NO. | 3EA / 100mm$^2$ | 2 | 1 | 0 |
| Minor | Assembly Mis-alignment |  | 1. Segment | | | | |
| | | | B | B≤0.4mm | | 0.4<B≤1.0mm | B>1.0mm |
| | | | B-A | B-A<1/2B | | B-A<0.2 | B-A<0.25 |
| | | | Judge | Acceptable | | Acceptable | Acceptable |
| | |  | 2. Dot Matrix | | | | |
| | | | Deformation>2° | | | | Reject |
| Minor | Stain on LCD Panel Surface | | Accept when stains can be wiped lightly with a soft cloth or a similar one. Otherwise, judged according to the above items: “Black spot” and “White Spot” | | | | |

## 10. RELIABILITY

| NO. | Item | Condition | Criterion |
|---|---|---|---|
| 1 | High Temperature Operating | -20℃, 96Hrs | No defect in cosmetic and operational function allowable.<br>Total current Consumption should be below double of initial value. |
| 2 | Low Temperature Operating | 70℃, 96Hrs | |
| 3 | High Humidity | 60℃, 90%RH, 96Hrs | |
| 4 | High Temperature Storage | 80℃, 96Hrs | |
| 5 | Low Temperature Storage | -30℃, 96Hrs | |
| 6 | Vibration | Random wave<br>10 ~ 100Hz<br>Acceleration: 2G<br>60 Minute | |
| 7 | Thermal Shock | -10℃ to 25℃ to 60℃<br>(60Min) (15Min) (60Min)<br>10Cycles | |
| 8 | ESD Testing | Contract Discharge Voltage:<br>+1 ~ 5kV and –1 ~ –5kV | There will be discharged ten times at every discharging voltage cycle. The voltage gap is 1kV. |
| | | Air Discharge Voltage:<br>+1 ~ 8kV and –1 ~ -8kV | |

Note: 1) Above conditions are suitable for Swissdis standard products.

2) For restrict products, the test conditions listed as above must be revised.

## 11. HANDLING PRECAUTION

(1) Mounting Method

The panel of the LCD Module consists of two thin glass plates with polarizers which easily get damaged since the Module is fixed by utilizing fitting holes in the printed circuit board. Extreme care should be taken when handling the LCD Modules.

(2) Caution of LCD handling & cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- Isopropyl alcohol
- Ethyl alcohol
- Trichlorotrifloroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Ketone
- Aromatics

(3) Caution against static charge

The LCD Module use C-MOS LSI drivers, so we recommend that you connect any unused input terminal to VDD or VSS, do not input any signals before power is turned on. And ground your body, Work/assembly table. And assembly equipment to protect against static electricity.

(4) Packaging

- Modules use LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation. Do not operate or store them exposed directly to sunshine or high temperature/humidity.

(5) Caution for operation

- It is indispensable to drive LCD's within the specified voltage limit since the higher voltage than the limit shorten LCD life. An electrochemical reaction due to direct current causes LCD deterioration, Avoid the use of direct current drive.

**11. HANDLING PRECAUTION (Continued)**

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.

However those phenomena do not mean malfunction or out of order with LCD's. Which will come back in the specified operating temperature range.

- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the relative condition of 40°C, 80%RH or less is required.

(6) Storage

In the case of storing for a long period of time (for instance ,for years) for the purpose or replacement use, The following ways are recommended.

- Storage in a polyethylene bag with sealed so as not to enter fresh air outside in it, And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping temperature in the specified storage temperature range.
- Storing with no touch on polarizer surface by the anything else. (It is recommended to store them as they have been contained in the inner container at the time of delivery)

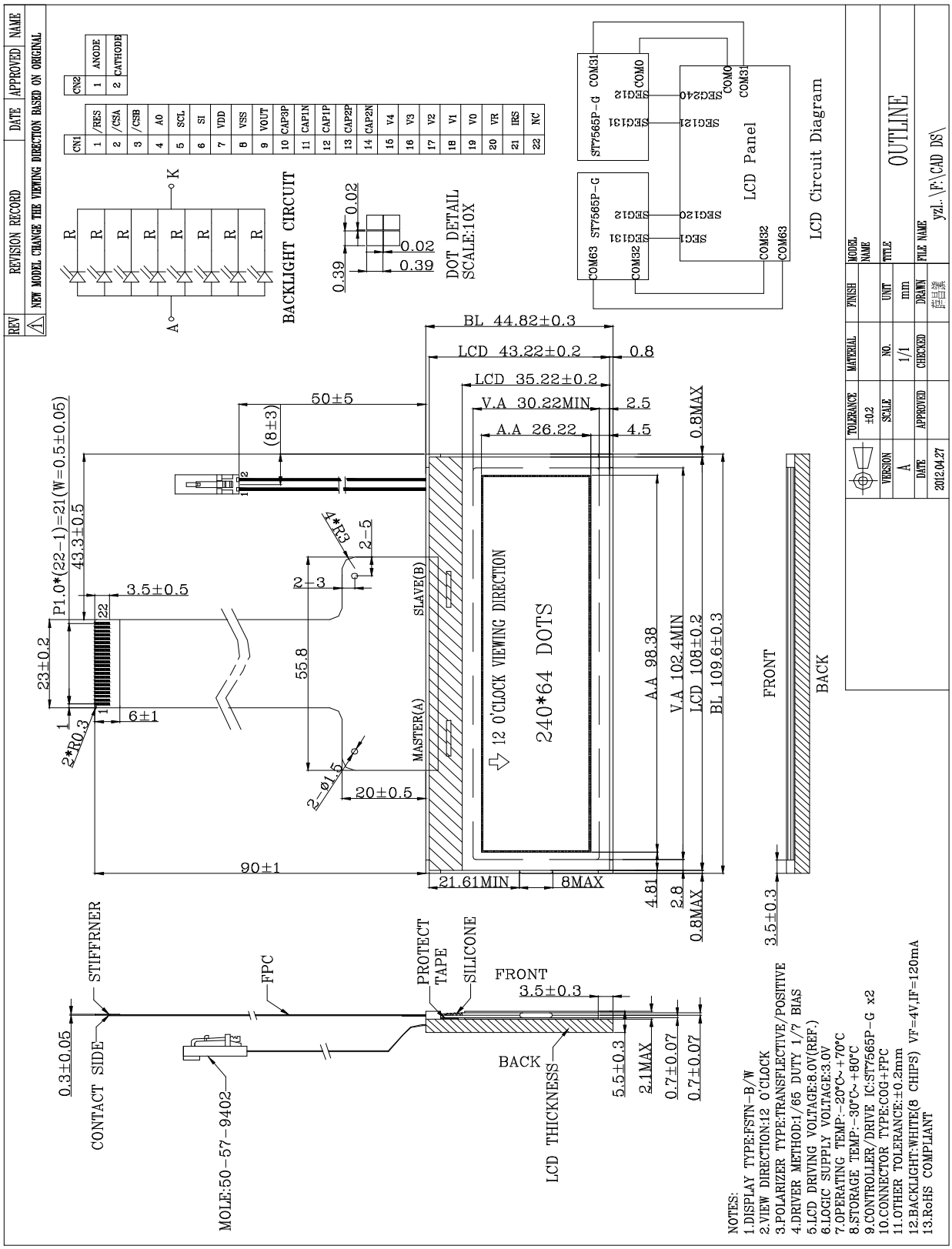
(7) Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and wash off liquid crystal by using solvents such as acetone and ethanol.

Which should be burned up later.

- When any liquid crystal leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

## 12. OUTLINE DIMENTION



# SAMPLE OUTGOING INSPECTION REPORT (LCM)

Data: 2012/11/21 NO. : QAC11003

| Customer | Product NO. | Driving Voltage | Testing Condition | Quantity |
|---|---|---|---|---|
| Swissdis AG | SD1023-V00 | $V_{OP}$: 8.0V | 25℃ | 5Pcs |

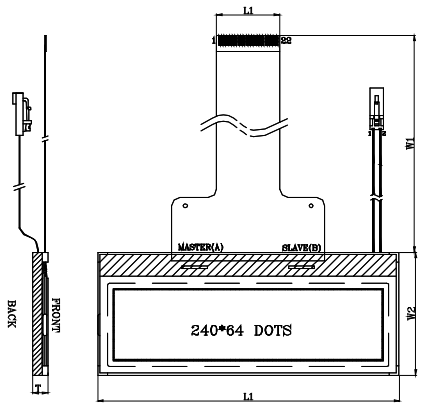
**Inspection Result**

| Items | Specification |
|---|---|
| Display Mode | ● W / B Mode ○ B / W Mode ○ Yellow Mode ○ Blue Mode ○ Gray Mode |
| Polarizer Type | ○ Reflective ● Transflective ○ Transmissive |
| Viewing direction | ○ 3 O'clock ○ 6 O'clock ○ 9 O'clock ● 12 O'clock |

**Electrical / Appearance**

| Item | Inspection Method | Specification | Inspection Result | |
|---|---|---|---|---|
| Appearance | Spot Gauge Caliper | Final Inspection Criteria | ● OK | ○ NG |
| Electrical | LCM Tester | Product Specification | ● OK | ○ NG |
| Pattern | LCM Tester | Drawing | ● OK | ○ NG |

**Dimension / Supply Current**

| Item | Spec.(mm) | NO.1 | NO.2 | NO.3 | NO.4 | NO.5 | Result | | Fig. |
|---|---|---|---|---|---|---|---|---|---|
| L1 | 109.6±0.3 | 109.8 | 109.7 | 109.6 | 109.6 | 109.7 | ● OK | ○ NG |  |
| L2 | 23.0±0.2 | 22.98 | 22.99 | 22.99 | 22.95 | 22.98 | ● OK | ○ NG | |
| W1 | 90.0±1.0 | 89.95 | 90.26 | 89.90 | 89.97 | 89.95 | ● OK | ○ NG | |
| W2 | 44.82±0.3 | 44.86 | 44.83 | 44.86 | 44.80 | 44.85 | ● OK | ○ NG | |
| T | 5.5±0.3 | 5.55 | 5.53 | 5.51 | 5.52 | 5.50 | ● OK | ○ NG | |
| $I_{DD}$ | 3.0mA max | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | ● OK | ○ NG | |



| Designed | ELIN | Checked | / | Approved | Wallace |
|---|---|---|---|---|---|

Doc. NO.: F10018A .