# DISPLAYTRONIC

*DISPLAYTRONIC CO., LTD.*

# SPECIFICATIONS FOR LIQUID CRYSTAL DISPLAY

**AQM1264D-MLG-YBS GRAPHIC MODULE VER1.0**

| CUSTOMER APPROVAL | | | |
|---|---|---|---|
| 1.POLARIZER OPTIONS: ☐R=REFLECTIVE ☐F=TRANSFLECTIVE<br>☐N=TRANSMISSIVE NEGATIVE<br>■M=TRANSMISSIVE POSITIVE<br>2.BACKLIGHT OPTIONS:☐N=NONE ☐E=EL ■L=LED ☐C=CCFL<br>3. BACKLIGHT COLOR: ☐A= AMBER ☐B= BLUE ■G= GREEN ☐W=WHITE<br>☐R= RED ☐RGB= RED+GREEN+BLUE<br>4.FLUID OPTIONS: ☐T=TN ☐F=FSTN<br>■Y=STN-YELLOW GREEN ☐G=STN-GRAY ☐B=STN-BLUE<br>5. VIEWING DIRECTION: ■B=BOTTOM VIEW(6 O'CLOCK)<br>☐T=TOP VIEW(12 O'CLOCK)<br>6.TEMPERATURE RANGE: ■ S=STANDARD TEMPERATURE RANGE<br>☐H=DUAL POWER,WIDE TEMPERATURE RANGE<br>☐W=SINGLE POWER,WIDE TEMPERATURE RANGE2<br>7.OTHERS REQUIREMENT:<br><br>※ CUSTOMER PART NO. : AQM1264D-MLG-YBS | | | |
| APPROVAL | | COMPANY CHOP | |
| CUSTOMER COMMENTS | | | |

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

## REVISION RECORD

| REVISION | REVISION DATE | CONTENTS |
|---|---|---|
| **VER1.0** | **21/11-2007** | **FIRST ISSUED** |

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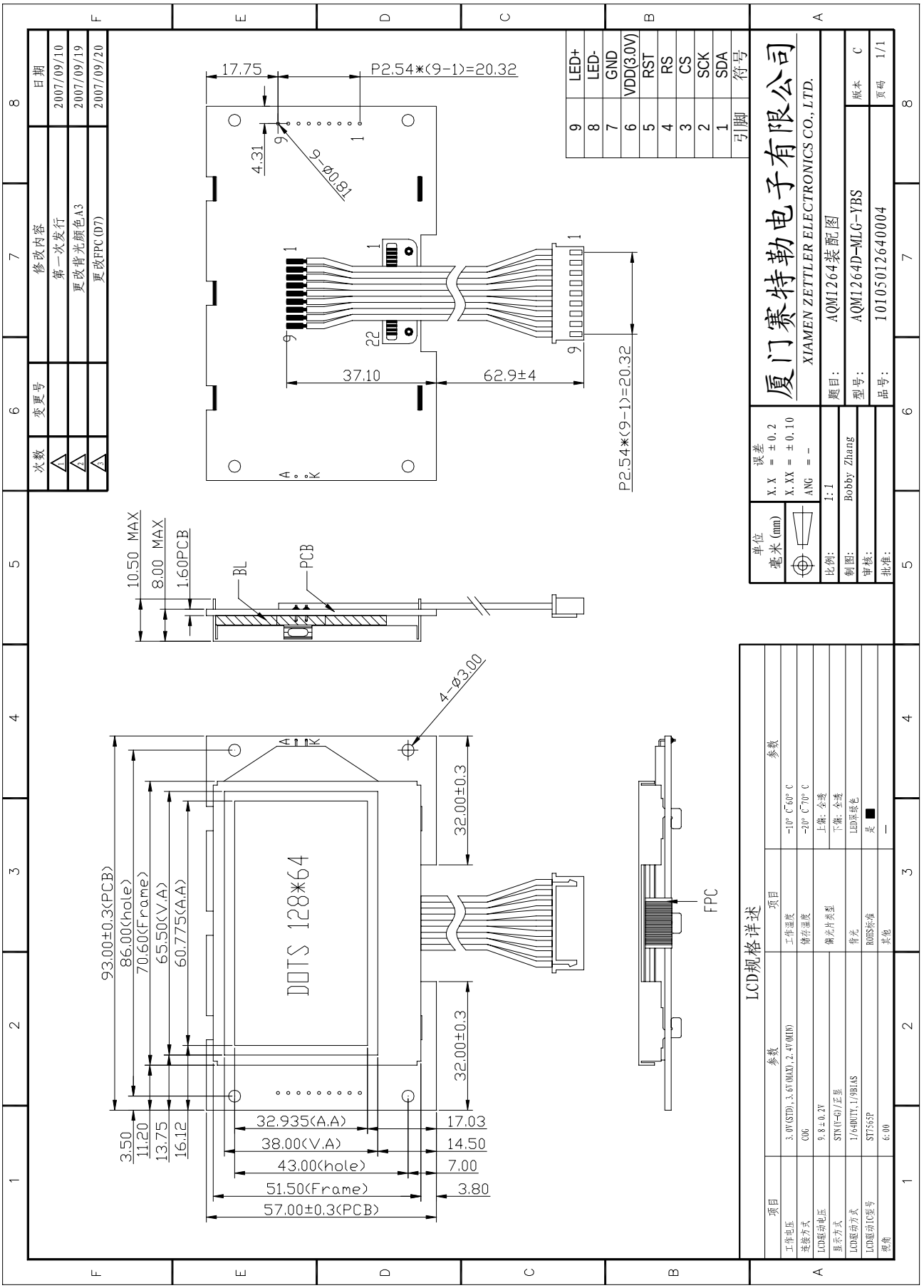
# 1.0 MECHANICAL DRAWING



NOTE1: ULESS OTHERWISE SPECIFIED STANDARD TOLERANCE ±0.2MM

## 2.0 MECHANICAL SPECIFICATION

| | |
|---|---|
| 1. Number of dots | 128x64 |
| 2. Module dimension | 93.0mm(L) x 57.0mm(W) x 10.5mm(T) |
| 3. Bezel dimension | 70.6mm(L) x 51.5mm(W) x 10.5mm(T) |
| 4. Active display area (A/A) | 60.775mm(L)x32.935mm(W) |
| 5. View area (V/A) | 65.5mm(L)x38.0mm(W) |
| 6. Dot Size | 0.45mm(W) x 0.49mm(H) |
| 7. Dot Pitch | 0.475mm(W) x 0.515mm(H) |
| 8. Driver method | 1/65 duty,1/9 bias, Vop=9.8V |
| 9. Display mode | Positive STN Transmissive Yellow-Green |
| 10. LCD type | STN/ YELLOW-GREEN |
| 11. Driver IC | ST7565P COG |
| 12. Backlight Options | LED-SIDE Green |

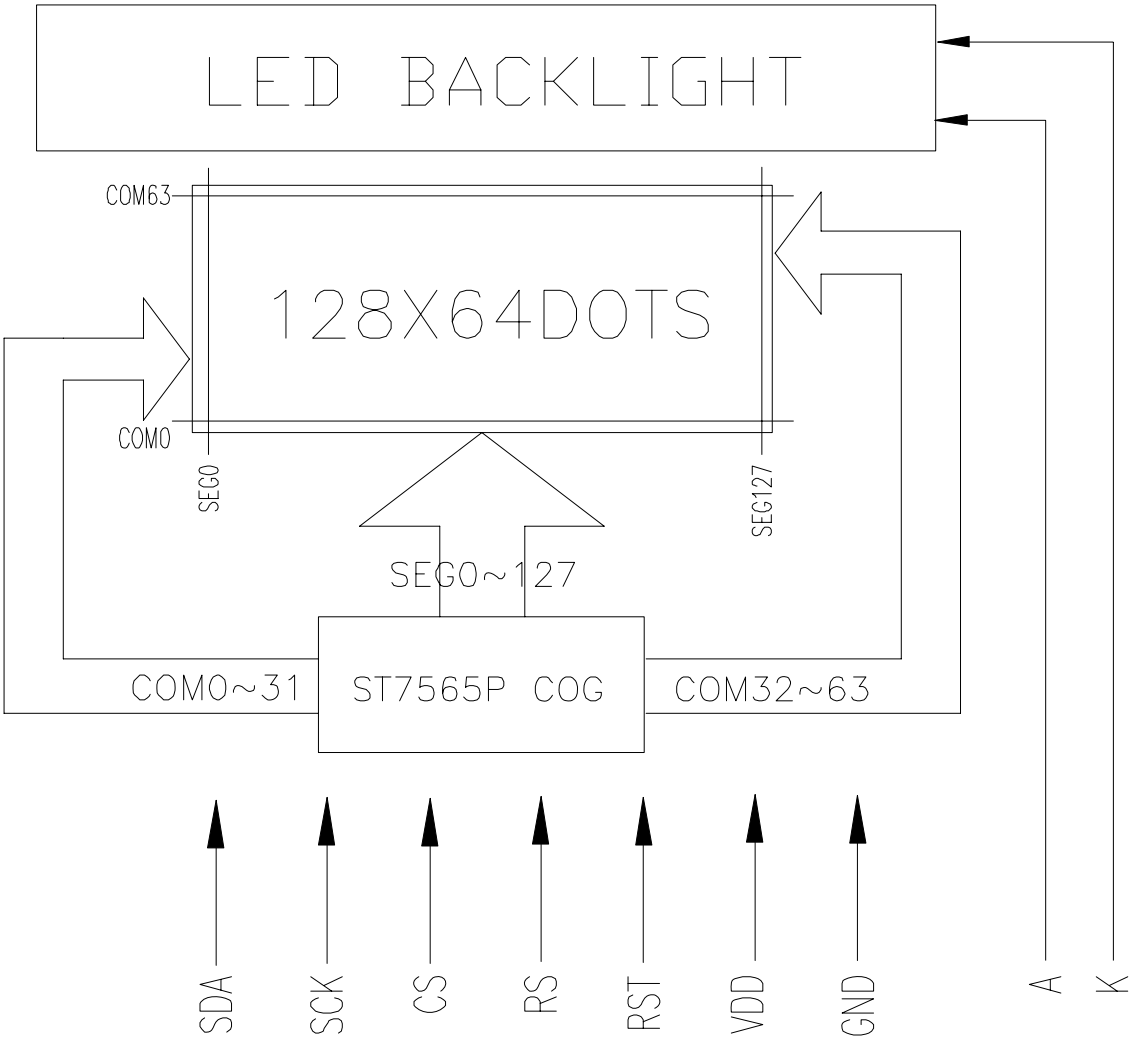
## 3.0 ABSOLUTE MAXIMUM RATINGS

| Item | Min | Typ | Max | Unit |
|---|---|---|---|---|
| DC Supply Voltage(VDD) | 0.3 | | 5.0 | V |
| DC Supply Voltage(Vout) | 0.3 | | 18.0 | V |
| DC Supply Voltage(V0) | 0.3 | | 18.0 | V |
| Input Voltage | 0.3 | | VDD+0.3 | V |
| Operating Temperature | -10 | | 60 | ºC |
| Storage Temperature | -20 | | 70 | ºC |

## 4.0 ELECTRICAL CHARACTERISTICS

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Power Supply | $V_{DD}$-$V_{SS}$ | - | 1.8 | 3.0 | 3.3 | V |
| Input voltage (high) | Vih | H level | 0.8 $V_{DD}$ | - | $V_{DD}$ | V |
| Input voltage (low) | Vil | L level | Vss | - | 0.2 $V_{DD}$ | V |
| Output voltage (high) | Voh | $I_{OH}$=-0.5mA | 0.8 $V_{DD}$ | | $V_{DD}$ | V |
| Output voltage (low) | Vol | $I_{OL}$=0.5mA | Vss | | 0.2 $V_{DD}$ | V |
| Power Supply Current | Idd | Vdd=3.0V | - | - | 0.8mA | mA |
| LED Power Supply Voltage | A-K | - | 3.0 | 3.15 | 3.3 | V |
| LED Power Supply Current | $I_{BL}$ | - | - | 15 | - | mA |
| Luminance evenness | - | Same part(Min/Max) | 70% | - | - | - |

## 5.0 BLOCK DIAGRAM



## 6.0 PIN ASSIGNMENT

| Pin No | I/O | Name | Description |
|---|---|---|---|
| 1 | I | SDA | Serial data input |
| 2 | I | SCK | Serial clock input |
| 3 | I | /CS | Chip select signal. Active:L |
| 4 | I | RS | Display data or control data select signal |
| 5 | I | RST | Reset signal |
| 6 | I | VDD | Power supply(3.0V) |
| 7 | I | GND | Power supply(0V) |
| 8 | I | LED-(K) | Power supply for backlight(+) |
| 9 | I | LED+(A) | Power supply for backlight(-) |

## 7.0 LCD OPTICAL CHARACTERISTICS

| Item | Symbol | Test condition | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|---|
| Viewing angle | Φ1-Φ2 | T=25℃,CR=2 | - | 65 | - | Degree | Note2 |
| | Φ1 | | 35 | 45 | - | | |
| | Φ2 | | -25 | -20 | - | | |
| | θ | | - | ±35 | - | | |
| Contrast ratio | K1 | Φ=0°,θ=0° | 6 | - | - | - | Note3 |
| Rise time | tr1 | Φ=0°,θ=0° Transflective mode | - | 150 | 250 | ms | Note4 |
| Fall time | td1 | | - | 150 | 250 | ms | Note4 |

Note 2: Definition of angle θ and φ.

φ: Angle measured from normal to direction of observation.

θ: Azimuth angle measured counter-clockwise from X-axis.

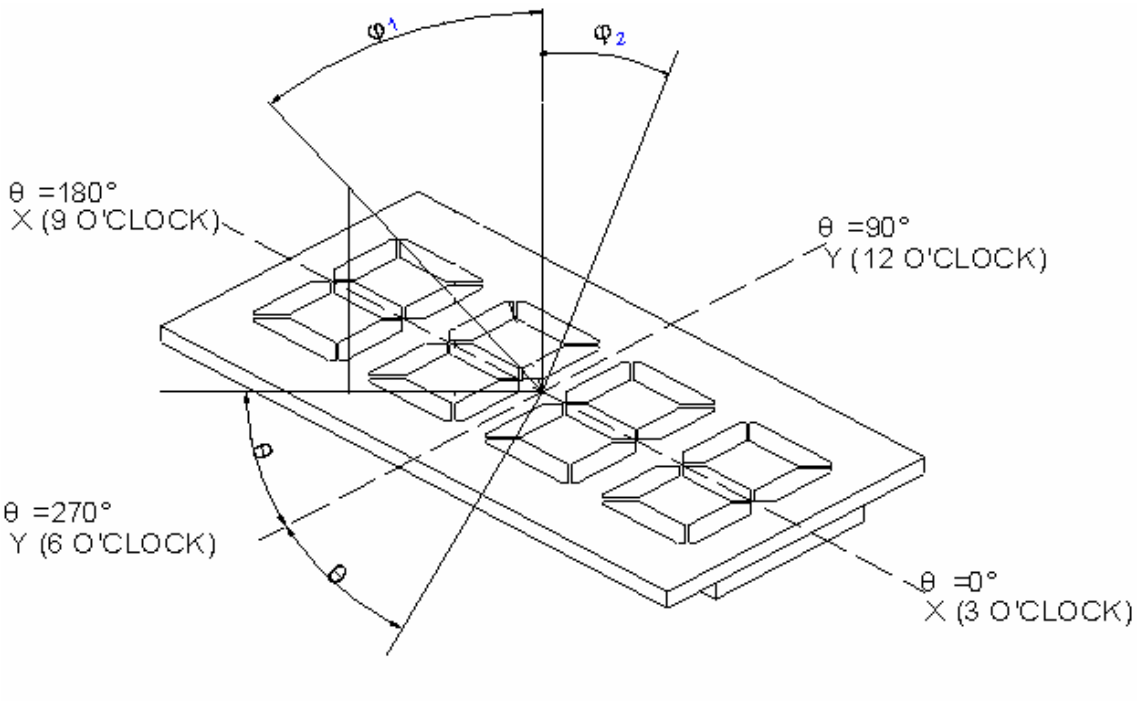
Note 3 : Definition of Contrast ratio

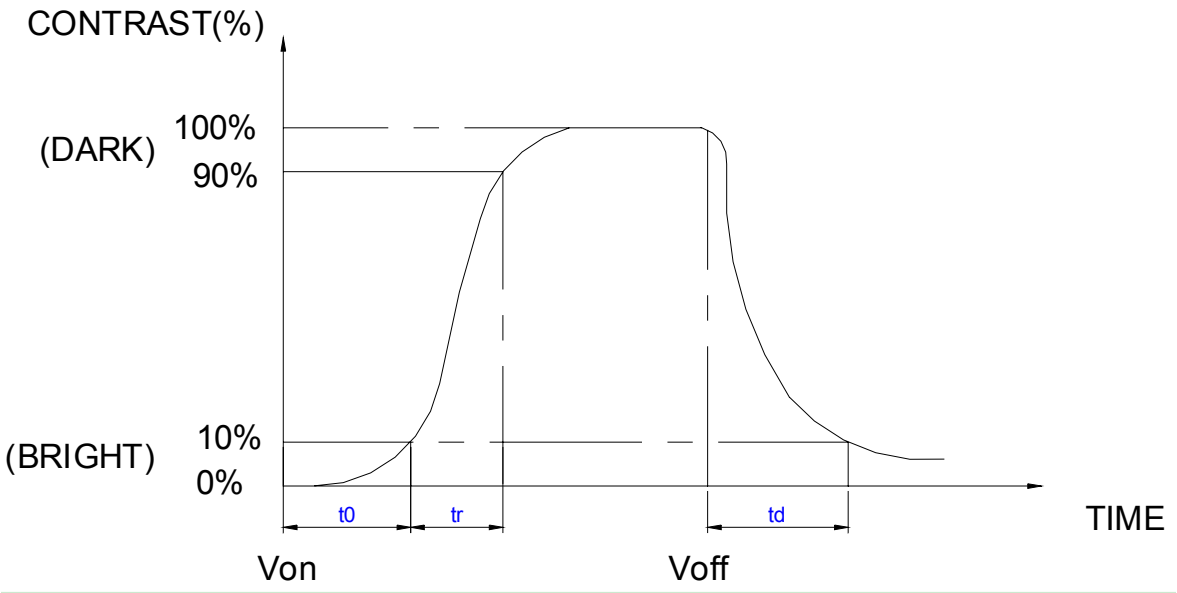
The contrast ratio is defined to be the ratio of transmission or reflection of a symbol at its "on" and "off" state.

$$\text{Contrast ratio(K)} = \frac{\text{Transmission/Reflectance at "OFF" state}}{\text{Transmission/Reflectance at "ON" state}}$$

Note 4 : Definition of response time

At specific operating voltage and temperature, the times measured by observing contrast or transmission ratio.



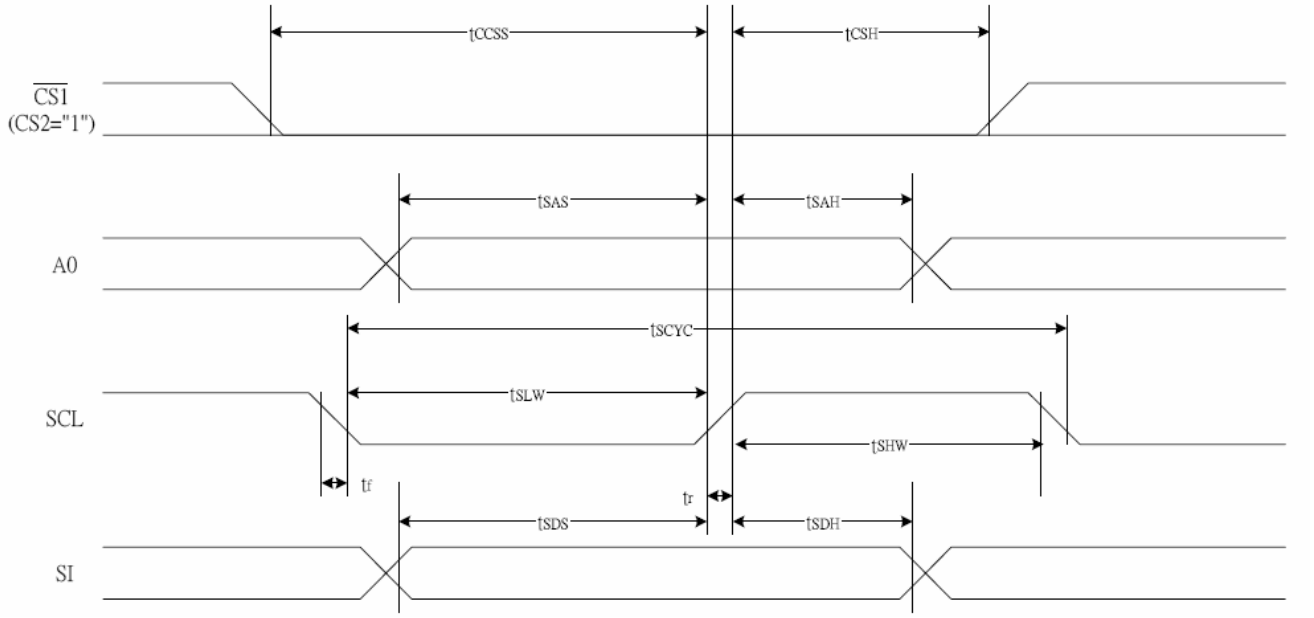

Delay time to : Measured between zero and 10% with Von.
Rise time tr : Measured between 10% and 90% of LCD segment maximum response with Von
Decay time td : With voltage switches to zero and the instant LCD segment reaches 10% of its maximum response
Ton : Time measured between the instant operating voltage is applied to display and the distant the display reaches 90% of its maximum response.
Toff : Time measured between the instant operating voltage switches to zero and the instant the display reaches 10% of its maximum response.

LIQUID CRYSTAL PANEL LIFE TIME

50000 hours minimum at 25℃±10℃ and 65% RH maximum.
Note: Definition of life time : the time up to occurrence of any of the following:
Contrast reduces to 30% of the initial value.
Current consumption becomes three times the initial value.

Orientation deteriorates significantly.

## 8.0 TIMING CHARACTERISTICS




(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 | — | |

# 9.0 COMMAND SETTING DESCRIPTION

| 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 |

# 10.0 RELIABILITY SPECIFICATION

| ITEM | CONDCONDITIONS |
|---|---|
| High temperature operation | 60℃ for 96 hours |
| Low temperature operation | -10℃ for 96 hours |
| High humidity, High temperature operation | 40℃,90%RH for 96 hours |
| High temperature storage | 70℃ for 96 hours |
| Low temperature storage | -20℃ for 96 hours |
| Temperature cycling(storage) | 70℃ (30 min)<br>↓ ↑<br>25℃ ( 5 min)<br>↓ ↑<br>-20℃ ( 30 min)<br>CYCLES: 5 |
| ESD (Electrostatic Discharge) | +/-8KV air discharge to LCD module. +/-2KV discharge is applied to VDD&VSS of LCD module. Test for functionality and No missing line after discharge. |