POWERTIP TECH. CORP.

# SPECIFICATIONS

| | | |
|---|---|---|
| **CUSTOMER** | : | |
| **SAMPLE CODE (Ver.)** | : | |
| **MASS PRODUCTION CODE (Ver.)** | : | **PE12864LRF-004HC1Q (Ver.0)** |
| **DRAWING NO. (Ver.)** | | **PE-03007-008** |

## Customer Approved

**Date:**

| Approved | QC Confirmed | Designer |
|---|---|---|
| 技術部 2006-5-04 陳紀城 | | 5/4 06 |

■ Approval For Specifications Only.

* This specification is subject to change without notice.

Please contact Powertip or it's representative before designing your product based on this specification.

☐ Approval For Specifications and Sample.


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# RECORDS OF REVISION

| Date | Rev. | Description | Note | Page |
|---|---|---|---|---|
| 2005/12/11 | 0 | PE12864LRF-004HC1Qis the ROHS compliant part number based on Powertip's standard PE12864LRF-004-HC1 | | |
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**Note：For detailed information please refer to IC data sheet：SITRONIX---ST7565S**

# 1. SPECIFICATIONS

## 1.1 Features

| Item | Standard Value |
|---|---|
| Display Type | 128 * 64 Dots |
| LCD Type | FSTN, Positive, Transflective Extended Temp |
| Driver Condition | 1/65 Duty, 1/9 Bias |
| Viewing Direction | 6 O'clock |
| Backlight | LED YG B/L |
| Weight | 20 g |
| Interface | 8 Bit Parallel data input |
| Other(controller/driver IC) | Driver IC: ST7565S |

## 1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|---|---|---|
| Outline Dimension | 80.0 (L) * 54.0 (w) * 10.2 (H)(Max) | mm |
| Viewing Area | 70.7 (L) * 38.8 (w) | mm |
| Active Area | 66.52 (L) * 33.24 (w) | mm |
| Dot Size | 0.48 (L) * 0.48 (w) | mm |
| Dot Pitch | 0.52 (L) * 0.52 (w) | mm |

Note：For detailed information please refer to LCM drawing

## 1.3 Absolute Maximum Ratings

| Item | Symbol | Condition | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Power Supply Voltage | $V_{DD}$ | - | -0.3 | 5.0 | V |
| LCD Driver Supply Voltage | $V_{OUT,}V_5$ | - | -18.0 | 0.3 | V |
| Input Voltage | $V_{IN}$ | - | -0.3 | $V_{DD}$+0.3 | V |
| Operating Temperature | $T_{OP}$ | - | -20 | 70 | °C |
| Storage Temperature. | $T_{ST}$ | - | -30 | 80 | °C |
| Storage Humidity | $H_D$ | Ta < 40 °C | - | 90 | %RH |

## 1.4 DC Electrical Characteristics

$V_{DD}$ = 3.3 V ± 0.15V, $V_{SS}$ = 0V, Ta = 25°C

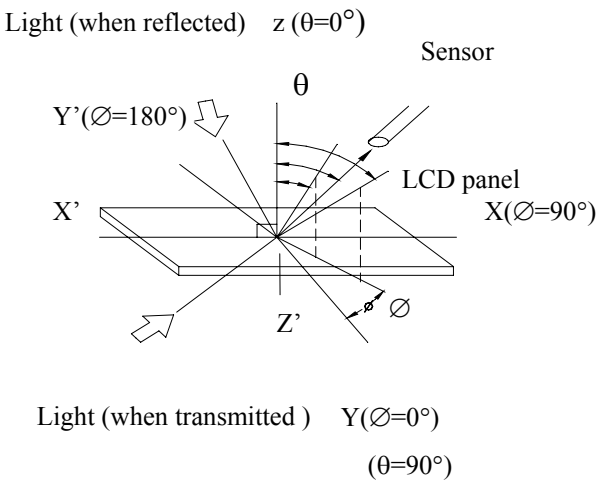
| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Logic Supply Voltage | $V_{DD}$ | - | 3.15 | 3.3 | 3.45 | V |
| "H" Input Voltage | $V_{IH}$ | - | 0.8 $V_{DD}$ | - | $V_{DD}$ | V |
| "L" Input Voltage | $V_{IL}$ | - | $V_{SS}$ | - | 0.2 $V_{DD}$ | V |
| "H" Output Voltage | $V_{OH}$ | - | 0.8 $V_{DD}$ | - | $V_{DD}$ | V |
| "L" Output Voltage | $V_{OL}$ | - | $V_{SS}$ | - | 0.2 $V_{DD}$ | V |
| Supply Current | $I_{DD}$ | $V_{DD}$ = 3.3 V | - | 0.6 | 1.0 | mA |
| LCM Driver Voltage | $V_{OP}$ | $V_{C5}$ (-20°C) | - | - | - | V |
| | | $V_{C5}$ (25°C) | 10.0 | 10.3 | 10.6 | |
| | | $V_{C5}$ (70°C) | - | - | - | |

## 1.5 Optical Characteristics

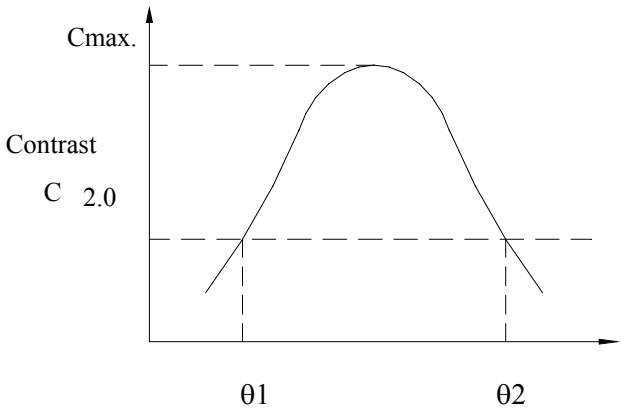
LCD Panel: 1/65 Duty, 1/9 Bias, $V_{LCD}$ = 10.0 V, Ta = 25°C

| Item | Symbol | Conditions | Min. | Typ. | Max. | Reference |
|---|---|---|---|---|---|---|
| View Angle | θ | C≥2.0,∅=0° | 0° | - | 40° | Notes 1 & 2 |
| Contrast Ratio | C | θ=5°, ∅=0° | 2 | 3 | - | Note 3 |
| Response Time(rise) | tr | θ=5°, ∅=0° | - | 200 ms | 300 ms | Note 4 |
| Response Time(fall) | tf | θ=5°, ∅=0° | - | 150 ms | 225 ms | Note 4 |

## Note 1: Definition of angles θ and ∅



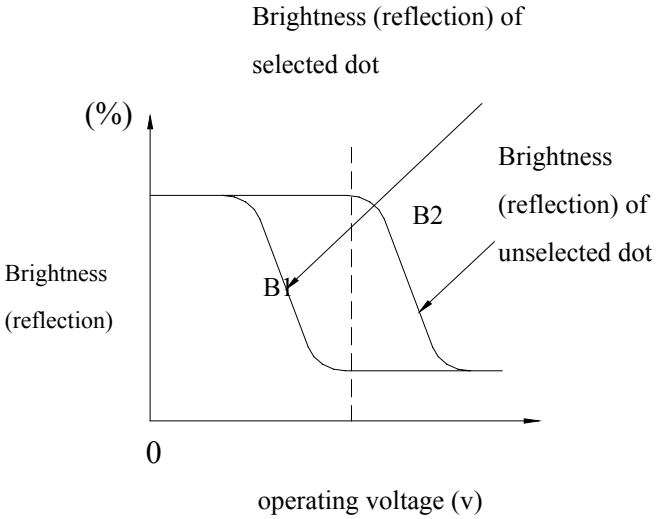

## Note 2: Definition of viewing angles θ1 and θ2



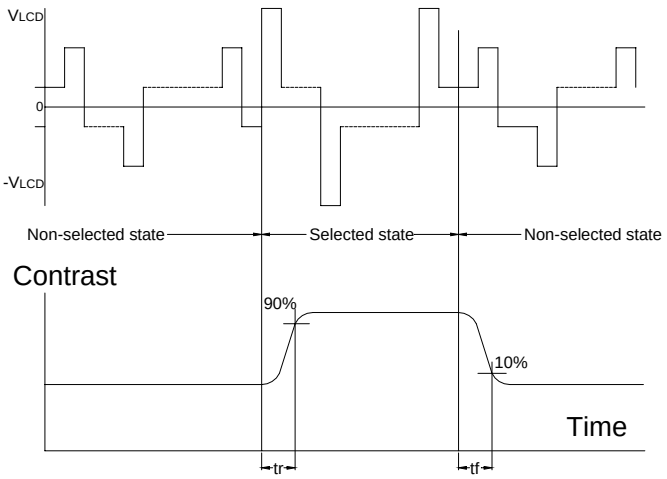

Note : Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same

## Note 3: Definition of contrast C

$$C = \frac{\text{Brightness (reflection) of unselected dot (B2)}}{\text{Brightness (reflection) of selected dot (B1)}}$$




## Note 4: Definition of response time




Note: Measured with a transmissive LCD panel which is displayed 1 $cm^2$

$V_{LCD}$ : Operating voltage $f_{FRM}$ : Frame frequency

$t_r$ : Response time (rise) $t_f$ : Response time (fall)

## 1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|---|---|---|---|---|---|
| Forward Current | IF | Ta =25°C | - | 200 | Ma |
| Reverse Voltage | VR | Ta =25°C | - | 8 | V |
| Power Dissipation | PO | Ta =25°C | - | 0.92 | W |

Electrical / Optical Characteristics

Ta =25°C

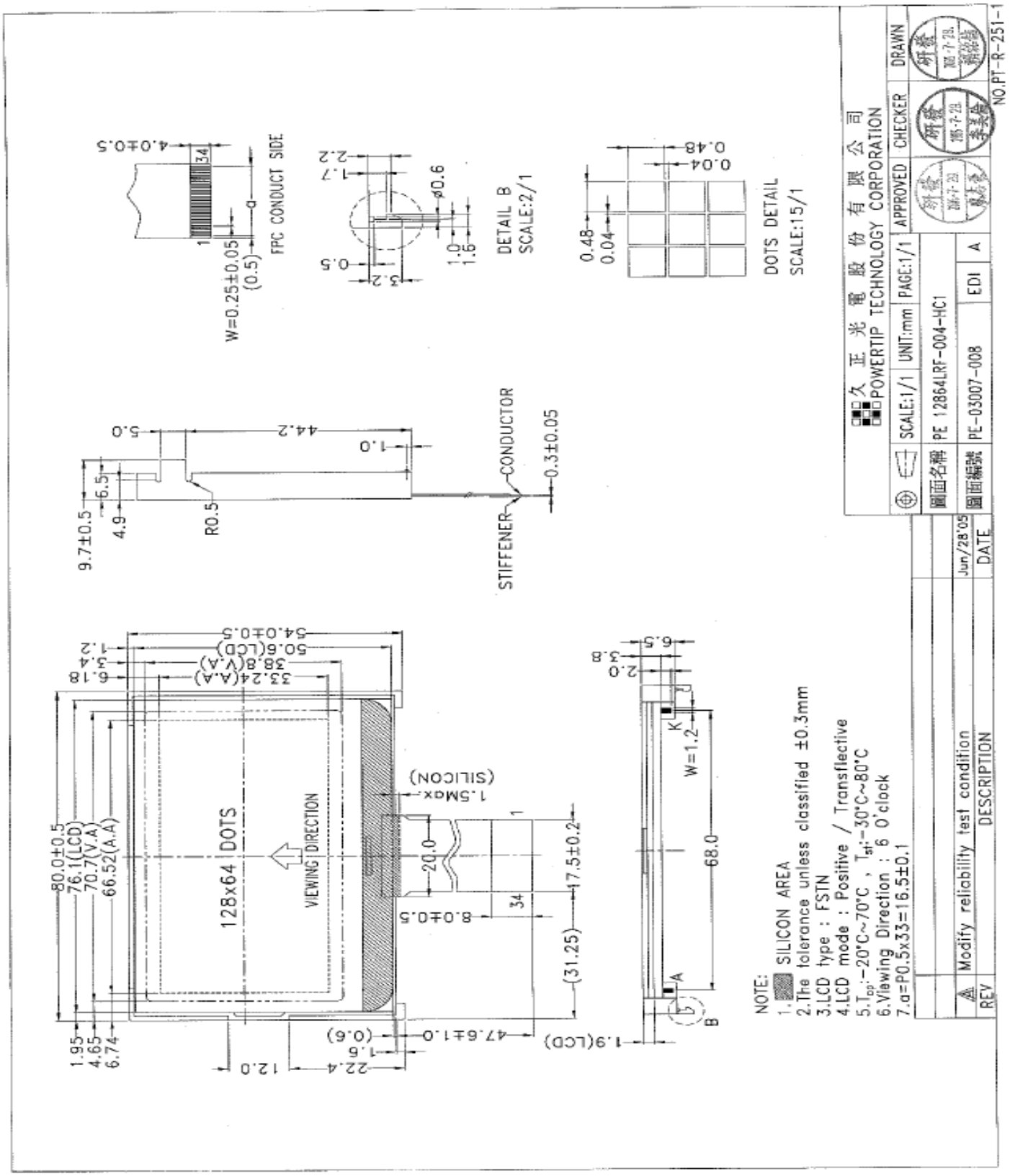
| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Forward Voltage | VF | IF=80 mA | - | 4.2 | 4.6 | V |
| Reverse Current | IR | VR=8V | - | - | 0.2 | mA |
| Average Brightness (Without LCD) | IV | IF=80 mA | 0.5 | 2.0 | - | $cd/m^2$ |
| Uniformity | △EH*1 | IF= 80 mA | 70 | - | - | % |
| Wavelength(With LCD) | Hue | IF= 80 mA | 574 | - | 580 | - |
| Color | Yellow-green | | | | | |

Note:△EH%＝B（MIN）÷ B（MAX）×100%

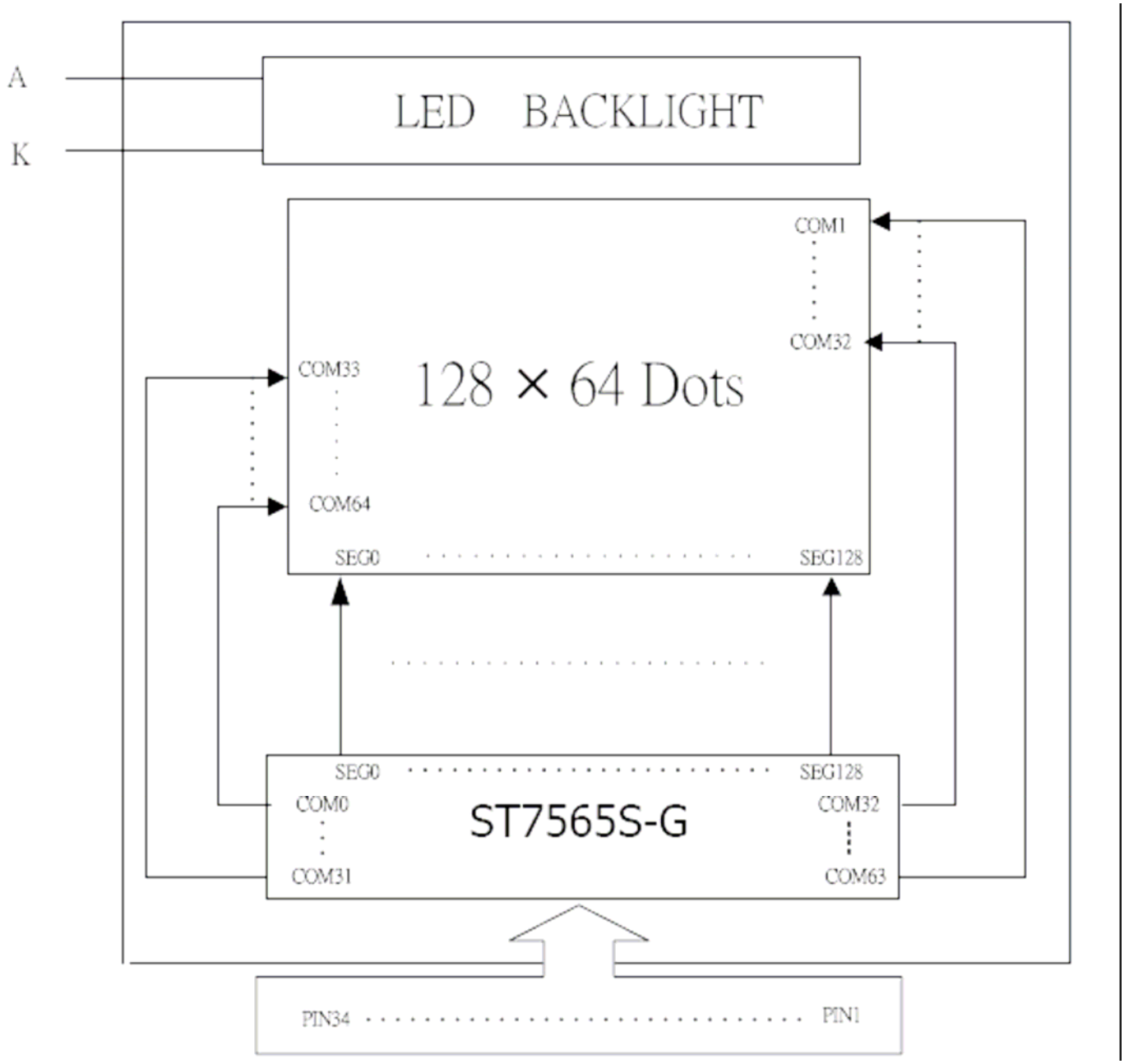
# 2. MODULE STRUCTURE

## 2.1 Counter Drawing

### 2.1.1 Mechanical Diagram



### 2.1.2 Block Diagram




Prese refer interface pin description for detail

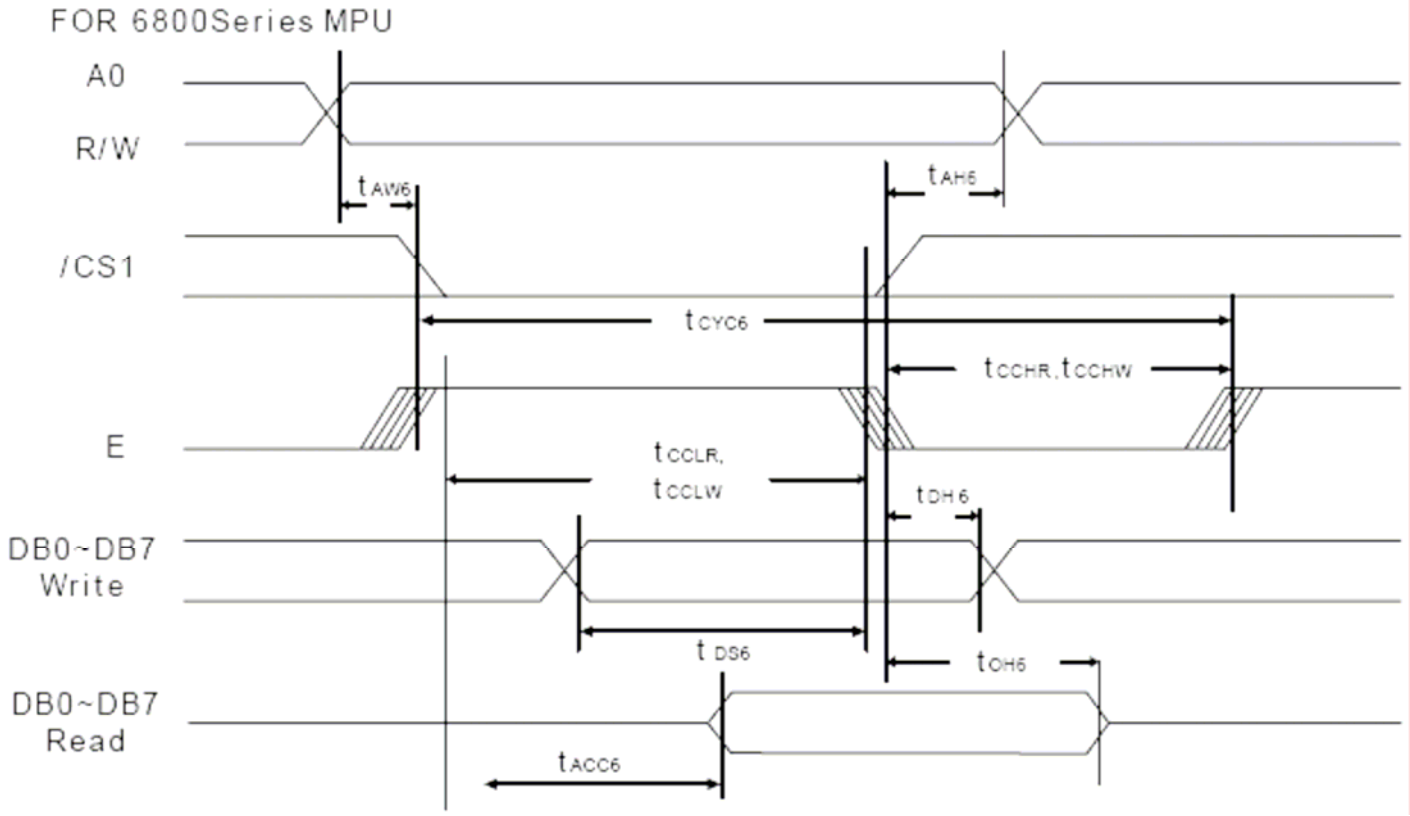
## 2.2 Interface Pin Description

| Pin No. | Symbol | Function |
|---|---|---|
| 1 | /CS1 | This is the chip select signal. When /CS1 = "L", then the chip select becomes active, and data/command I/O is enabled. |
| 2 | /RES | /RES is set to "L", the settings are initialized.<br>The /RES signal level performs the reset operation. |
| 3 | A0 | This is connect to the least significant bit of the normal MPU address bus,<br>and it determines whether the data bits are data or a command.<br>A0 = "H": Indicates that DB0 to DB7 are display data.<br>A0 = "L": Indicates that DB0 to DB7 are control data. |
| 4 | /WR<br>(R/$\overline{W}$) | When connected to an 8080 MPU, this is LOW active.<br>This terminal connects to the 8080 MPU /WR signal.<br>The signals on the data bus are latched at the rising edge of the /WR signal.<br>When connected to a 6800 Series MPU :<br>This is the read/write control signal input terminal.<br>When R/$\overline{W}$ = "H" : Read.<br>When R/$\overline{W}$ = "L" : Write. |
| 5 | /RD(E) | When connected to an 8080 MPU, this is LOW active.<br>This pin is connected to the /RD signal of the 8080 MPU, and the ST7565S series data bus is in an output status when this signal is "L".<br>When connected to a 6800 Series MPU , this is active HIGH.<br>This is the 6800 Serier MPU enable clock input terminal. |
| 6 | D0 | This is an 8-bit bi-directional data bus that connects to an 8-bit or 16-bit standard MPU data bus.<br>When the serial interface is selected (PS = "L"), DB7 serves as the serial data input terminal (SI) and DB6 serves as the serial clock input terminal (SCL). |
| 7 | D1 | |
| 8 | D2 | |
| 9 | D3 | |
| 10 | D4 | |
| 11 | D5 | |

| | | |
|---|---|---|
| 12 | D6 | At the same time, DB5 - 0 are set to high impedance.<br>When the chip select is inactive, DB0 to DB7 are set to high impedance. |
| 13 | D7 | |
| 14 | $V_{DD}$ | Power Supply ($V_{DD}$=3.3) |
| 15 | $V_{SS}$ | Power Supply ($V_{SS}$=0) |
| 16 | VOUT | DC/DC voltage converter. Connect a capacitor between this terminal and $V_{SS}$ |
| 17 | C5- | DC/DC voltage converter. Connect a capacitor between this terminal and C1+ |
| 18 | C3- | DC/DC voltage converter. Connect a capacitor between this terminal and C1+ |
| 19 | C1+ | DC/DC voltage converter. Connect a capacitor between this terminal and C1- |
| 20 | C1- | DC/DC voltage converter. Connect a capacitor between this terminal and C1+ |
| 21 | C2- | DC/DC voltage converter. Connect a capacitor between this terminal and C2+ |
| 22 | C2+ | DC/DC voltage converter. Connect a capacitor between this terminal and C2- |
| 23 | C4- | DC/DC voltage converter. Connect a capacitor between this terminal and C2+ |
| 24 | VRS | This is the internal-input VREG power supply for the LCD power supply |
| 25 | V1 | A multi-level power supply for the liquid crystal drive.<br>The voltage applied is determined by the liquid crystal cell, and is changed through the use of a resistive voltage divided or through changing the impedance using an op. amp.<br>Voltage levels are determined based on $V_{DD}$, and must maintain the relative magnitudes shown below.<br>$V_{DD}$ (= V0) $\geq$ V1 $\geq$ V2 $\geq$ V3 $\geq$ V4 $\geq$ V5 |
| 26 | V2 | |
| 27 | V3 | |
| 28 | V4 | |
| 29 | V5 | |

| | | |
|---|---|---|
| 30 | VR | Output voltage regulator terminal. Provides the voltage between $V_{DD}$ and V5 through a resistive voltage divider.<br>IRS = "H" :The V5 voltage regulator internal resistors are not used<br>IRS = "L" :The V5 voltage regulator internal resistors are used |
| 31 | C86 | This is the MPU interface switch terminal.<br>C86 = "H": 6800 Series MPU interface.<br>C86 = "L": 8080 MPU interface. |
| 32 | P/S | This is the parallel data input/serial data input switch terminal.<br>P/S = "H": Parallel data input.<br>P/S = "L": Serial data input. |
| 33 | /HPM | This is the power cpntrol terminal for the power supply circuit for liquid crystal drive.<br>/HPM="H":Normal made<br>/HPM="L":High power mode |
| 34 | IRS | This terminal selects the resistors for the V5 voltage level adjustment.<br>IRS = "H": Use the internal resistors.<br>IRS = "L": Do not use the internal resistors.<br>The V5 voltage level is regulated by an external resistive voltage divider attached to the VR terminal. |

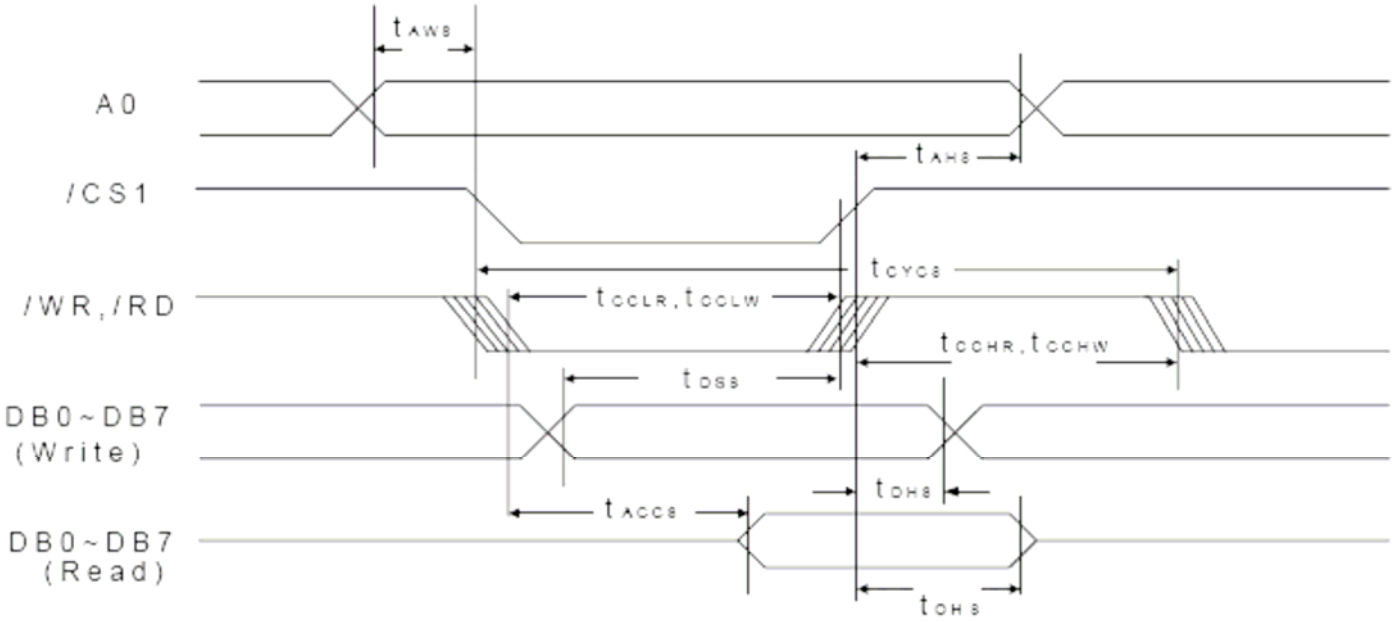
## 2.3 Timing Characteristics




( $V_{DD}$ = 3.3v , Ta = 25° )

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min | Max | |
| Address hold time | A0 | $t_{AH6}$ | - | 0 | - | ns |
| Address setup time | | $t_{AW6}$ | - | 0 | - | |
| System cycle time | | $t_{CYC6}$ | - | 240 | - | |
| Control L pulse width (Write) | WR | $t_{CCLW}$ | - | 80 | - | |
| Control H pulse width (Write) | | $t_{CCHW}$ | - | 80 | - | |
| Control L pulse width (Read) | RD | $t_{CCLR}$ | - | 80 | - | |
| Control H pulse width (Read) | | $t_{CCHR}$ | - | 140 | - | |
| WRITE Data setup time | DB0 to DB7 | $t_{DS6}$ | - | 40 | - | |
| WRITE Address hold time | | $t_{DH6}$ | - | 0 | - | |
| READ access time | | $t_{ACC6}$ | $C_L$=100pF | - | 70 | |
| READ Output disable time | | $t_{OH6}$ | $C_L$=100pF | 5 | 50 | |

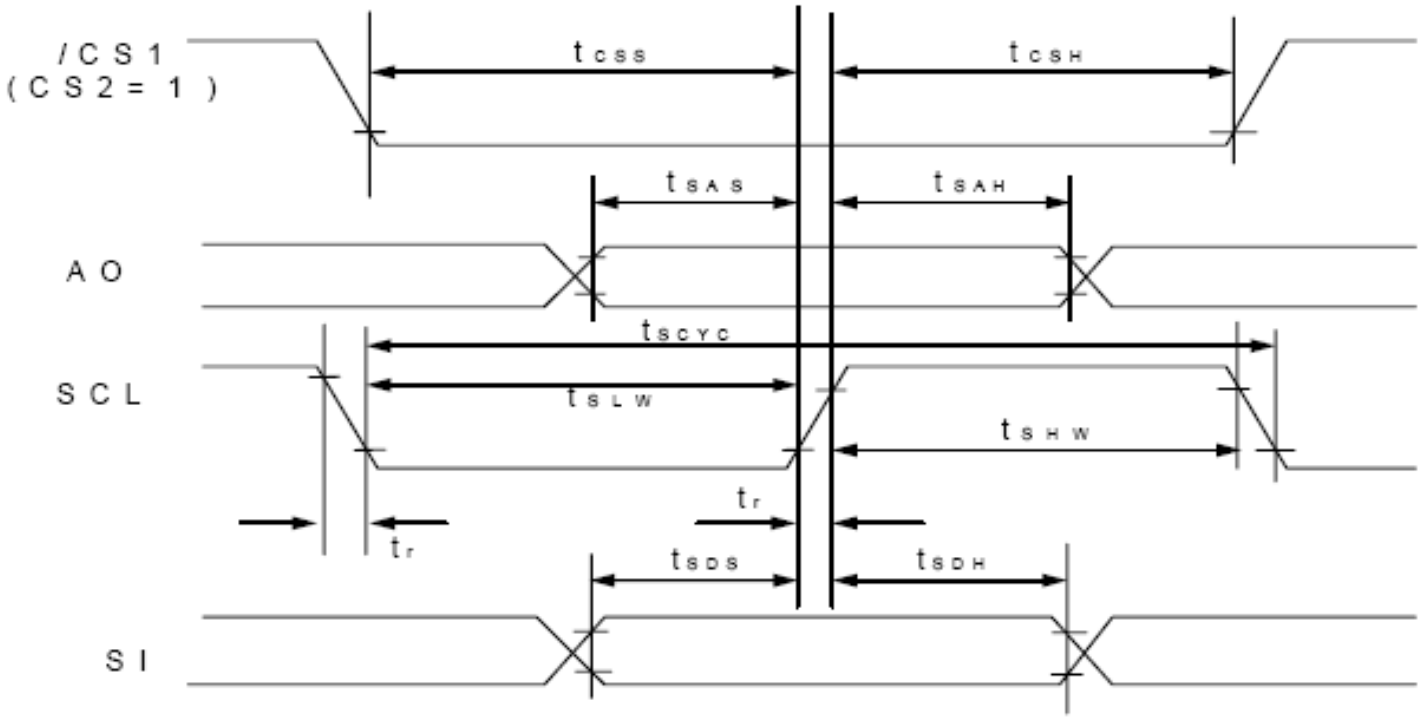
FOR 8080 Series MPU




( $V_{DD}$ = 3.3v , Ta = 25° )

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min | Max | |
| Address hold time | A0 | $t_{AH8}$ | - | 0 | - | ns |
| Address setup time | | $t_{AW8}$ | - | 0 | - | |
| System cycle time | | $t_{CYC8}$ | - | 240 | - | |
| Control L pulse width (Write) | WR | $t_{CCLW}$ | - | 80 | - | |
| Control H pulse width(Write) | | $t_{CCHW}$ | - | 80 | - | |
| Control L pulse width (Read) | RD | $t_{CCLR}$ | - | 140 | - | |
| Control H pulse width (Read) | | $t_{CCHR}$ | - | 80 | - | |
| WRITE Data setup time | DB0 to DB7 | $t_{DS8}$ | - | 40 | - | |
| WRITE Address hold time | | $t_{DH8}$ | - | 0 | - | |
| READ access time | | $t_{ACC8}$ | $C_L$=100pF | - | 70 | |
| READ Output disable time | | $t_{OH8}$ | $C_L$=100pF | 5 | 50 | |

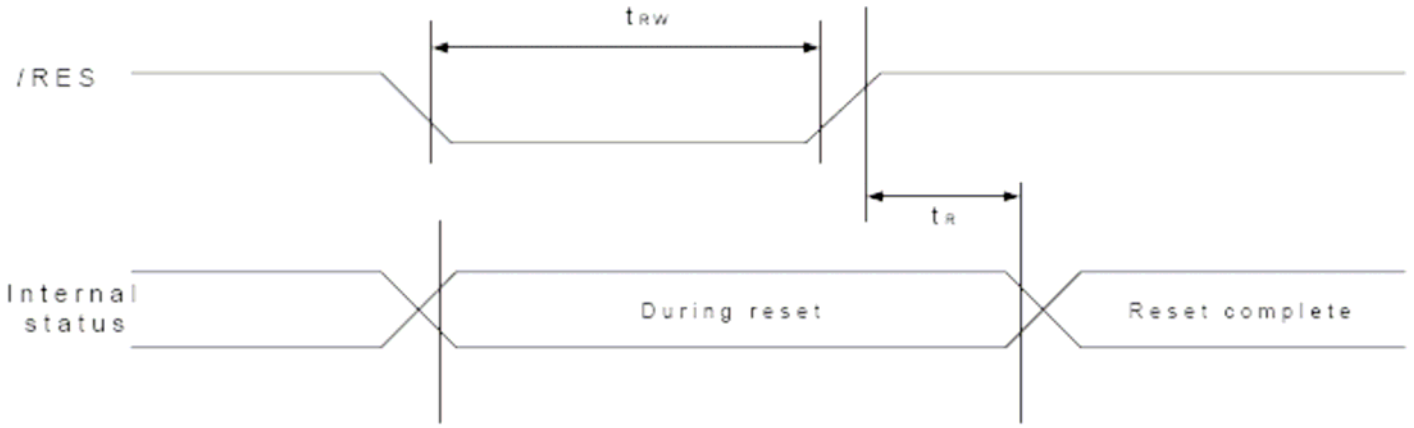
Serial Interface




( $V_{DD}$ = 3.3v , Ta = 25° )

| Item | Signal | Symbol | Condition | Rating | | Units |
|---|---|---|---|---|---|---|
| | | | | Min | Max | |
| Serial Clock Period | SCL | $t_{SCYC}$ | | 20 | - | ns |
| SCL "H" pulse width | | $t_{SHW}$ | | 75 | - | |
| SCL "L" pulse width | | $t_{SLW}$ | | 75 | - | |
| Address setup time | A0 | $t_{SAS}$ | | 50 | - | |
| Address hold time | | $t_{SAH}$ | | 50 | - | |
| Data setup time | SI | $t_{SDS}$ | | 50 | - | |
| Data hold time | | $t_{SDH}$ | | 50 | - | |
| CS-SCL time | /CS1 | tcss | | 50 | | |
| CS-SCL time | | tssh | | 150 | | |

**Reset Timing**




($V_{DD}$ = 3.3 V, Ta = - 20 to 70°C)

| Item | Signal | Symbol | Condition | Rating | | | Units |
|---|---|---|---|---|---|---|---|
| | | | | Min | Typ | Max | |
| Reset time | - | $t_R$ | | - | - | 0.5 | μs |
| Reset "L" pulse width | /RES | $t_{RW}$ | | 0.5 | - | - | μs |

## 2.4 Display Command

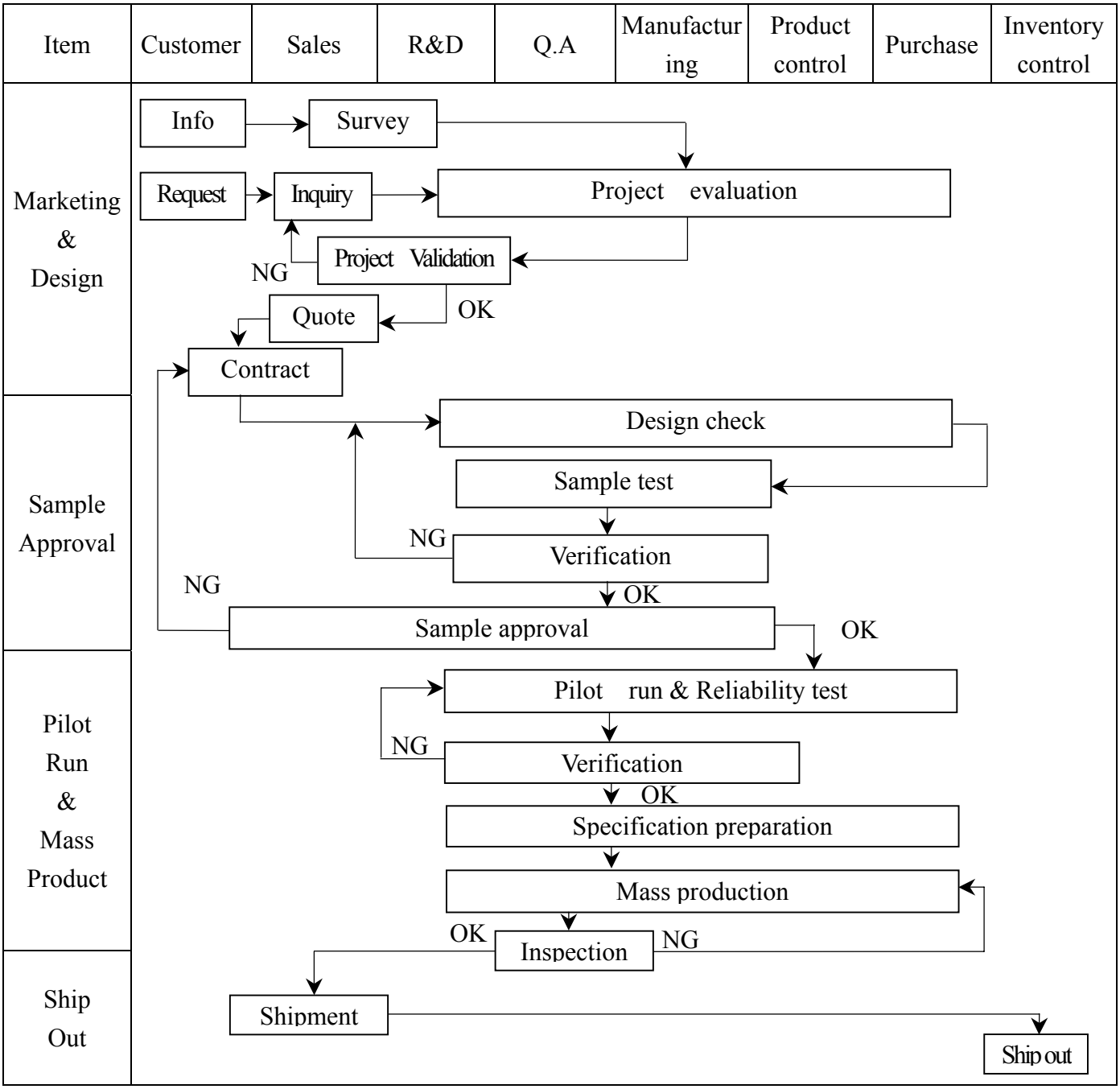
| Command | Command Code | | | | | | | | | | | Function |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A0 | $\overline{RD}$ | $\overline{WR}$ | D7 | D6 | D5 | D4 | D3 | D2 | D2 | D0 | |
| (1) Display ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0<br>1 | LCD display ON/OFF<br>0:OFF, 1:ON |
| (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 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | Most significant column address | | | | Sets the most significant 4 bits of the display RAM column address. |
| Column address set lower bit | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Least significant column address | | | | 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 RAM 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, 1:1/7 |
| (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 |

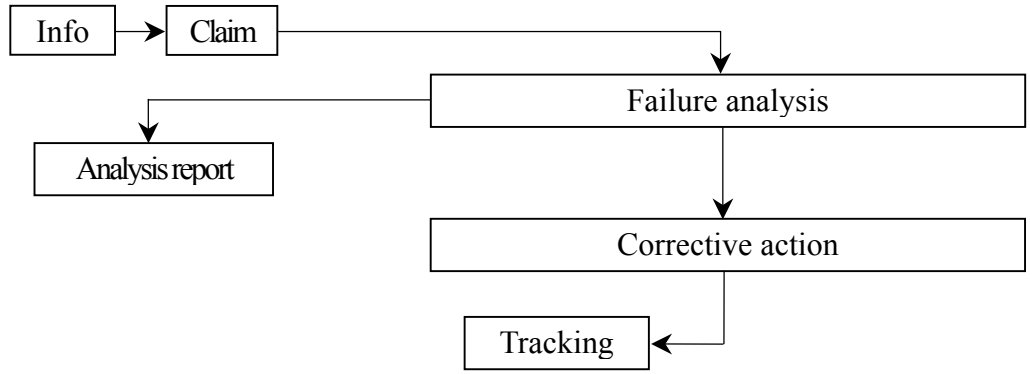
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (15) Common output mode select | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 0<br>1 | * | * | * | Select COM output scan direction<br>0: normal direction,<br>1: reverse direction |
| (16) Power control set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | Operating mode | | | Select internal power supply operating mode |
| (17) V5 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 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | |
| Electronic volume register set | 0 | 1 | 0 | * | * | Electronic volume value | | | | | | Set the V5 output voltage electronic volume register. |
| (19) Static indicator ON/OFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0<br>1 | 0: OFF<br>1: ON |
| Static indicator register set | 1 | 0 | 1 | * | * | * | * | * | * | Mode | | Set the flashing mode |
| (20) Power saver | | | | | | | | | | | | Display OFF and display all points ON compound command |
| (21) NOP | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | Command for non-operation |
| (22) Test | 0 | 1 | 0 | 1 | 1 | 1 | 1 | * | * | * | * | Command for IC test. Do not use this command |

(Note) *: disabled data

# 3. QUALITY ASSURANCE SYSTEM

## 3.1 Quality Assurance Flow Chart

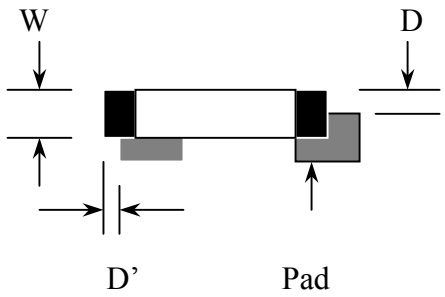


| Item | Customer | Sales | R&D | Q.A | Manufactu ring | Product control | Purchase | Inventory control |
|---|---|---|---|---|---|---|---|---|
| Sales Service |  | | | | | | | |
| Q.A Activity | 1. ISO 9001 Maintenance Activities<br>2. Process improvement proposal<br>3. Equipment calibration<br>4. Education And Training Activities<br>5. Standardization Management | | | | | | | |

## 3.2 Inspection Specification

Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II
Equipment : Gauge , MIL-STD , Powertip Tester , Sample
IQC Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5
FQC Defect Level : 100% Inspection
OUT Going Defect Level : Sampling
Specification :

| NO | Item | Specification | Judge | Level |
|---|---|---|---|---|
| 1 | Part Number | The part number is inconsistent with work order of production | N.G. | Major |
| 2 | Quantity | The quantity is inconsistent with work order of production | N.G. | Major |
| 3 | Electronic characteristics of LCM<br>A=( L + W )/2 | The display lacks of some patterns. | N.G. | Major |
| | | Missing line. | N.G. | Major |
| | | The size of missing dot, A is > 1/2 Dot size | N.G. | Major |
| | | There is no function. | N.G. | Major |
| | | Output data is error | N.G. | Major |
| 4 | Appearance of LCD<br>A=( L + W )/2<br><br>Dirty particle (Including scratch、bubble ) | Material is different with work order of production | N.G. | Major |
| | | LCD is assembled in inverse direction | N.G. | Major |
| | | Bezel is assembled in inverse direction | N.G. | Major |
| | | Shadow is within LCD viewing area + 0.5 mm | N.G. | Major |
| | | The diameter of dirty particle, A is > 0.4 mm | N.G. | Minor |
| | | Dirty particle length is > 3.0mm, and 0.01mm < width ≤ 0.05mm | N.G. | Minor |
| | | Display is without protective film | N.G. | Minor |
| | | Conductive rubber is over bezel 1mm | N.G. | Minor |
| | | Polarizer exceeds over viewing area of LCD | N.G. | Minor |
| | | Area of bubble in polarizer, A > 1.0mm, the number of bubble is > 1 piece. | N.G. | Minor |
| | | 0.4mm < Area of bubble in polarizer, A < 1.0mm, the number of bubble is > 4 pieces. | N.G. | Minor |
| 5 | Appearance of PCB<br>A=( L + W )/2 | Burned area or wrong part number is on PCB | N.G. | Major |
| | | The symbol, character, and mark of PCB are unidentifiable. | N.G | Minor |
| | | The stripped solder mask , A is > 1.0mm | N.G. | Minor |
| | | 0.3mm < stripped solder mask or visible circuit, A < 1.0mm, and the number is ≥ 4 pieces | N.G. | Minor |
| | | There is particle between the circuits in solder mask | N.G | Minor |
| | | The circuit is peeled off or cracked | N.G | Minor |
| | | There is any circuits risen or exposed. | N.G | Minor |
| | | 0.2mm < Area of solder ball, A is ≤ 0.4mm<br>The number of solder ball is ≥ 3 pieces | N.G | Minor |
| | | The magnitude of solder ball, A is > 0.4mm. | N.G | Minor |

| NO | Item | Specification | Judge | Level |
|---|---|---|---|---|
| 6 | Appearance of molding<br>A=( L + W )/2 | The shape of modeling is deformed by touching. | N.G. | Major |
| | | Insufficient epoxy: Circuit or pad of IC is visible | N.G. | Minor |
| | | Excessive epoxy: Diameter of modeling is > 20mm or height is > 2.5mm | N.G. | Minor |
| | | The diameter of pinhole in modeling, A is > 0.2mm. | N.G. | Minor |
| 7 | Appearance of frame<br>A=( L + W )/2 | The folding angle of frame must be > 45°+ 10° | N.G. | Minor |
| | | The area of stripped electroplate in top-view of frame, A is > 1.0mm. | N.G. | Minor |
| | | Rust or crack is (Top view only) | N.G. | Minor |
| | | The scratched width of frame is > 0.06mm. (Top view only) | N.G. | Minor |
| 8 | Electrical characteristic of backlight<br><br>A=( L + W )/2 | The color of backlight is nonconforming | N.G. | Major |
| | | Backlight can't work normally. | N.G. | Major |
| | | The LED lamp can't work normally | N.G. | Major |
| | | The unsoldering area of pin for backlight, A is > 1/2 solder joint area. | N.G. | Minor |
| | | The height of solder pin for backlight is > 2.0mm | N.G. | Minor |
| 10 | Assembly parts<br>A=( L + W )/2 | The mark or polarity of component is unidentifiable. | N.G. | Minor |
| | | The height between bottom of component and surface of the PCB is floating > 0.7mm | N.G. | Minor |
| | | D > 1/4W<br>  <br> | N.G. | Minor |
| | | End solder joint width, D' is > 50% width of component termination or width of pad | N.G. | Minor |
| | | Side overhang, D is > 25% width of component termination. | N.G. | Minor |
| | | Component is cracked, deformed, and burned, etc. | N.G. | Minor |
| | | The polarity of component is placed in inverse direction. | N.G. | Minor |
| | | Maximum fillet height of solder extends onto the component body or minimum fillet height is < 0.5mm. | N.G. | Minor |

# 4. RELIABILITY TEST

## 4.1 Reliability Test Condition

| NO | Item | Test Condition | |
|---|---|---|---|
| 1 | High Temperature Storage | Storage at 80 ± 2°C 96~100 hrs<br>Surrounding temperature, then storage at normal condition 4hrs | |
| 2 | Low Temperature Storage | Storage at -30 ± 2°C 96~100 hrs<br>Surrounding temperature, then storage at normal condition 4hrs | |
| 3 | High Temperature /Humidity Storage | 1.Storage 96~100 hrs 60 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer).<br>or<br>2.Storage 96~100 hrs 40 ± 2°C, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs. | |
| 4 | Temperature Cycling | -20°C → 25°C → 70°C → 25°C<br>(30mins) (5mins) (30mins) (5mins)<br>10 Cycle | |
| 5 | Vibration | 10~55Hz ( 1 minute ) 1.5mm<br>X,Y and Z direction * (each 2hrs) | |
| 6 | ESD Test | Air Discharge:<br>Apply 6 KV with 5 times discharge for each polarity +/- | Contact Discharge:<br>Apply 250V with 5 times discharge for each polarity +/- |
| | | Testing location:<br>Around the face of LCD | Testing location:<br>1.Apply to bezel.<br>2.Apply to Vdd, Vss. |
| 7 | Drop Test | Packing Weight (Kg) | Drop Height (cm) |
| | | 0 ~ 45.4 | 122 |
| | | 45.4 ~ 90.8 | 76 |
| | | 90.8 ~ 454 | 61 |
| | | Over 454 | 46 |

# 5. PRECAUTION RELATING PRODUCT HANDLING

## 5.1 SAFETY

5.1.1 If the LCD panel breaks , be careful not to get the liquid crystal to touch your skin.

5.1.2 If the liquid crystal touches your skin or clothes , please wash it off immediately by using soap and water.

## 5.2 HANDLING

5.2.1 Avoid any strong mechanical shock which can break the glass.

5.2.2 Avoid static electricity which can damage the CMOS LSI—When working with the module , be sure to ground your body and any electrical equipment you may be using.

5.2.3 Do not remove the panel or frame from the module.

5.2.4 The polarizing plate of the display is very fragile. So , please handle it very carefully, do not touch , push or rub the exposed polarizing with anything harder than an HB pencil lead (glass , tweezers , etc.)

5.2.5 Do not wipe the polarizing plate with a dry cloth , as it may easily scratch the surface of plate.

5.2.6 Do not touch the display area with bare hands , this will stain the display area.

5.2.7 Do not use ketonics solvent & aromatic solvent. Use with a soft cloth soaked with a cleaning naphtha solvent.

5.2.8 To control temperature and time of soldering is 320 ± 10°C and 3-5 sec.

5.2.9 To avoid liquid (include organic solvent) stained on LCM.

## 5.3 STORAGE

5.3.1 Store the panel or module in a dark place where the temperature is 25°C ± 5°C and the humidity is below 65% RH.

5.3.2 Do not place the module near organics solvents or corrosive gases.

5.3.3 Do not crush , shake , or jolt the module.

## 5.4 TERMS OF WARRANTY

5.4.1 Applicable warrant period

The period is within thirteen months since the date of shipping out under normal using and storage conditions.

5.4.2 Unaccepted responsibility

This product has been manufactured to your company’s specification as a part for use in your company’s general electronic products. It is guaranteed to perform according to delivery specifications. For any other use apart from general electronic equipment, we cannot take responsibility if the product is used in nuclear power control equipment, aerospace equipment , fire and security systems or any other applications in which there is a direct risk to human life and where extremely high levels of reliability are required.