

POWERTIP TECH. CORP.

SPECIFICATIONS

CUSTOMER : CUS007


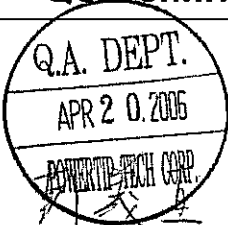


SAMPLE CODE (Ver.) : PS240128WRF-001H01 (VER.0)

MASS PRODUCTION CODE (Ver.) : PE240128WRF-001-HQ (VER.0)

DRAWING NO. (Ver.) : PE-05008-002 (VER.0)

Customer Approved

Date:

| Approved | QC Confirmed | Designer |
|---|---|---|
|  |  |   |

- 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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Contents

1. SPECIFICATIONS

- 1.1 Features
- 1.2 Mechanical Specifications
- 1.3 Absolute Maximum Ratings
- 1.4 DC Electrical Characteristics
- 1.5 Optical Characteristics
- 1.6 Backlight Characteristics

2. MODULE STRUCTURE

- 2.1 Counter Drawing
- 2.2 Interface Pin Description
- 2.3 Timing Characteristics
- 2.4 Display Command

3. QUALITY ASSURANCE SYSTEM

- 3.1 Quality Assurance Flow Chart
- 3.2 Inspection Specification

4. RELIABILITY TEST

- 4.1 Reliability Test Condition

5. PRECAUTION RELATING PRODUCT HANDLING

- 5.1 Safety
- 5.2 Handling
- 5.3 Storage
- 5.4 Terms of Warranty

Appendix A : LCM Drawing

Appendix B : Package

Note : For detailed information please refer to IC data sheet : Sitronix --- ST7529-G

1. SPECIFICATIONS

1.1 Features

| Item | Standard Value |
|-------------------|---|
| Display Type | 240 * 128 Dots |
| LCD Type | FSTN , Positive , Transflective |
| Driver Condition | LCD Module : 1/160 Duty , 1/10 Bias |
| Viewing Direction | 6 O'clock |
| Backlight Type | LED B/L |
| Weight | 50 g |
| Interface | Support 8 Bit Parallel interface with 8080 or 6800 series MPU & IIC serial interface |
| Driver IC | SITRONIX - ST7529-G |

1.2 Mechanical Specifications

| Item | Standard Value | Unit |
|-------------------|--------------------------------------|------|
| Outline Dimension | 99.2 (L) * 64.2 (w) * 18.04 (H)(Max) | mm |
| Viewing Area | 93.0 (L) * 49.0 (w) | mm |
| Active Area | 82.775 (L) * 44.135 (w) | mm |
| Dot Size | 0.32 (L) * 0.32 (w) | mm |
| Dot Pitch | 0.345 (L) * 0.345 (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} | - | -0.5 | 5.0 | V |
| LCD Driver Supply Voltage | $V_{LCD} - V_{SS}$ | - | -0.5 | +22 | V |
| Input Voltage | V_{IN} | - | -0.5 | $V_{DD} + 0.5$ | V |
| Operating Temperature | T_{OP} | - | -20 | 70 | °C |
| Storage Temperature | T_{ST} | - | -30 | 80 | °C |
| Storage Humidity | H_D | $T_a < 40\text{ °C}$ | 20 | 90 | %RH |

1.4 DC Electrical Characteristics

$V_{DD} = 3.3 \text{ V} \pm 0.3$, $V_{SS} = 0 \text{ V}$, $T_a = 25^\circ\text{C}$

| Item | Symbol | Condition | Min. | Typ. | Max. | Unit |
|---------------------------|----------|--------------------------------------|-------------|-------|-------------|------|
| Logic Supply Voltage | V_{DD} | - | 3.0 | 3.3 | 3.6 | V |
| High-level Input Voltage | V_{IH} | - | $0.7V_{DD}$ | - | V_{DD} | V |
| Low-level Input Voltage | V_{IL} | - | V_{SS} | - | $0.3V_{DD}$ | V |
| High-level Output Voltage | V_{OH} | - | - | - | - | V |
| Low-level Output Voltage | V_{OL} | - | - | - | - | V |
| Supply Current | I_{DD} | $V_{DD} = 3.3 \text{ V}$ | - | 1.2 | 6.2 | mA |
| LCM Driver Voltage | V_{OP} | $V_o - V_{SS} (-20^\circ\text{C})$ | 14.0 | 14.1 | 14.2 | V |
| | V_{OP} | $V_o - V_{SS} (25^\circ\text{C}) *1$ | 12.8 | 12.95 | 13.1 | V |
| | V_{OP} | $V_o - V_{SS} (70^\circ\text{C})$ | 11.7 | 11.8 | 11.9 | V |

NOTE:*1 The VOP test point is $V_o - V_{SS}$.

NOTE:2 :Recommended Power Supply Combinations.

| User setup | Power control (VB VR VF) | V/B circuits | V/R circuits | V/F circuits | VLCD | V0 | V1 to V4 |
|--|-----------------------------|-----------------|-----------------|-----------------|----------------|----------------|----------------|
| Only the internal power supply circuits are used | 1 1 1 | ON | ON | ON | Open | Open | Open |
| Only the voltage regulator circuits and voltage follower circuits are used | 0 1 1 | OFF | ON | ON | External input | Open | Open |
| Only the voltage follower circuits are used | 0 0 1 | OFF | OFF | ON | Open | External input | Open |
| Only the external power supply circuits are used | 0 0 0 | OFF | OFF | OFF | Open | External input | External input |

1.5 Optical Characteristics

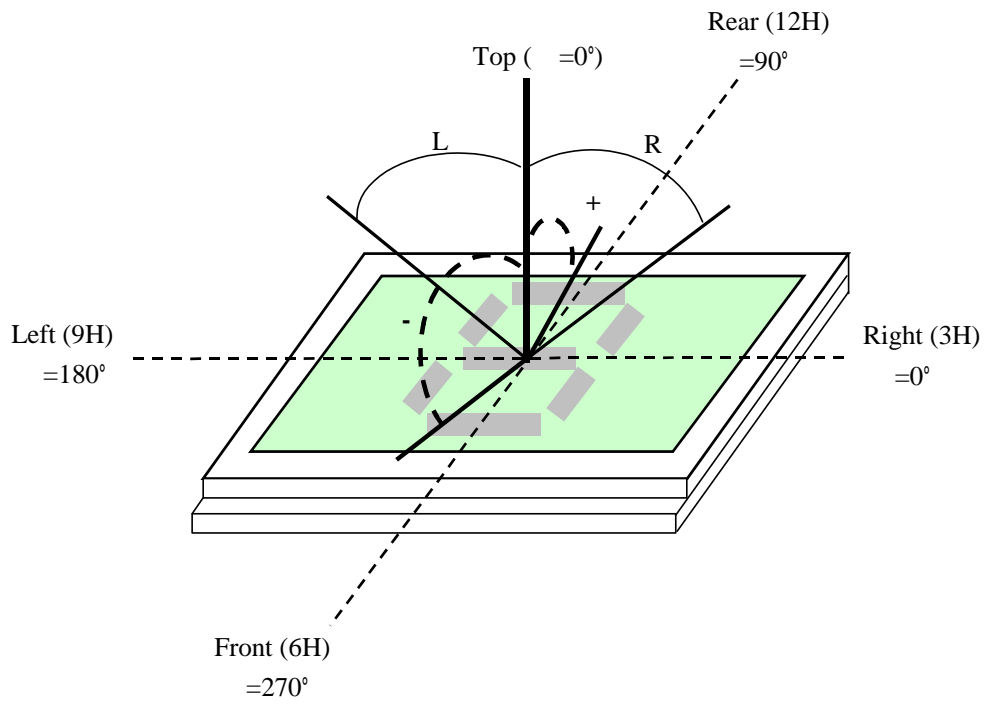
LCD Panel: 1/160 Duty, 1/13 Bias, $V_{LCD} = 15.06 \text{ V}$ $T_a = 25^\circ\text{C}$

| Item | Symbol | Conditions | Min. | Typ. | Max. | Reference |
|---------------------|----------|---|-------------|--------|-------------|-----------|
| View Angle | θ | $C \geq 2.0$, $\varnothing = 270^\circ$ | -40° | - | $+40^\circ$ | Note 1 |
| Contrast Ratio | CR | $\theta = -5^\circ$, $\varnothing = 270^\circ$ | 2 | 2.8 | - | Note 3 |
| Response Time(rise) | T_r | $\theta = -5^\circ$, $\varnothing = 270^\circ$ | - | 135 ms | 205 ms | Note 2 |
| Response Time(fall) | T_f | $\theta = -5^\circ$, $\varnothing = 270^\circ$ | - | 300 ms | 450 ms | |

Note 1.

Optical characteristics-2

Viewing angle

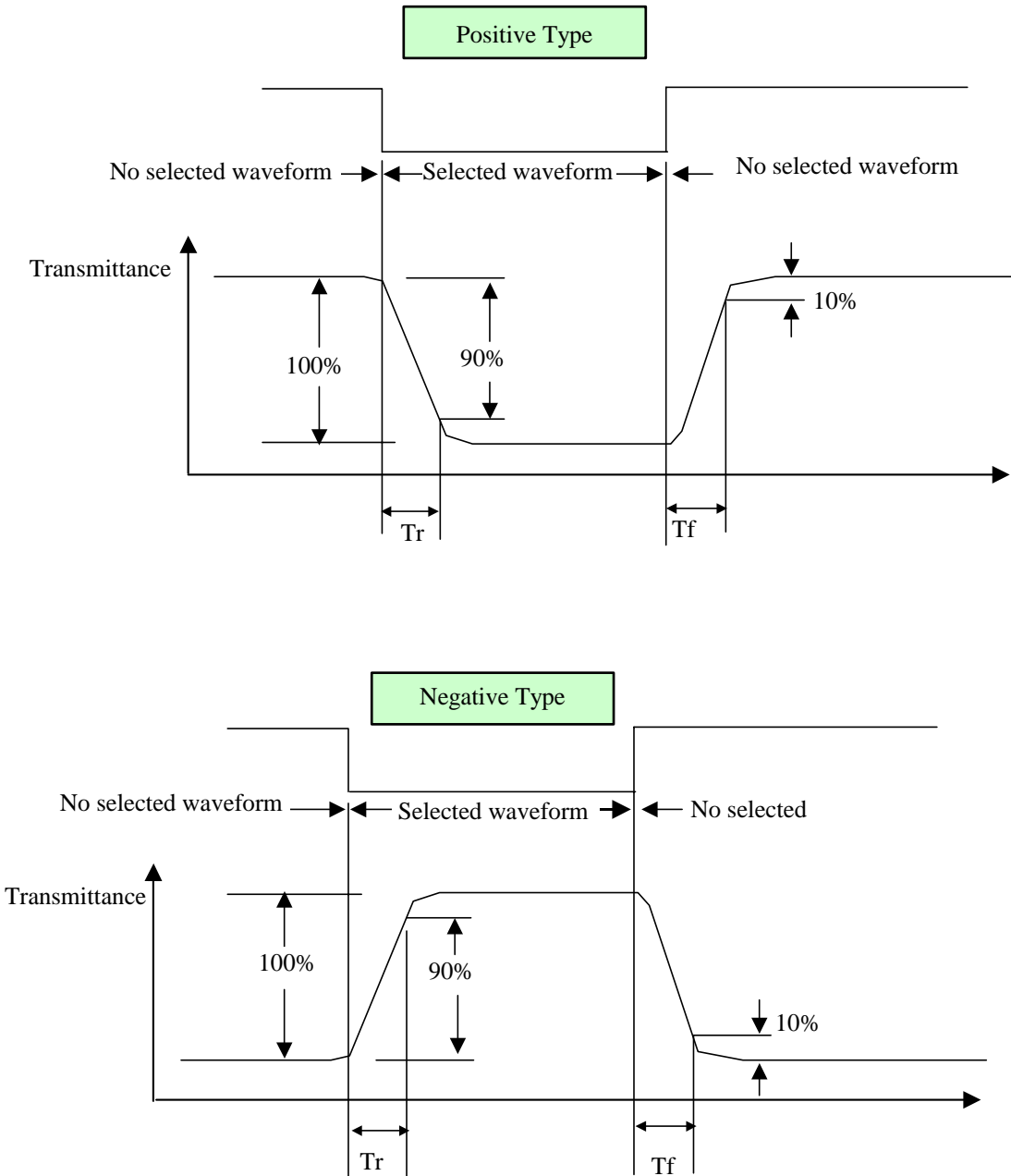


Viewing angle

Note 2.

Optical characteristics-3

Fig.2 Definition of response time

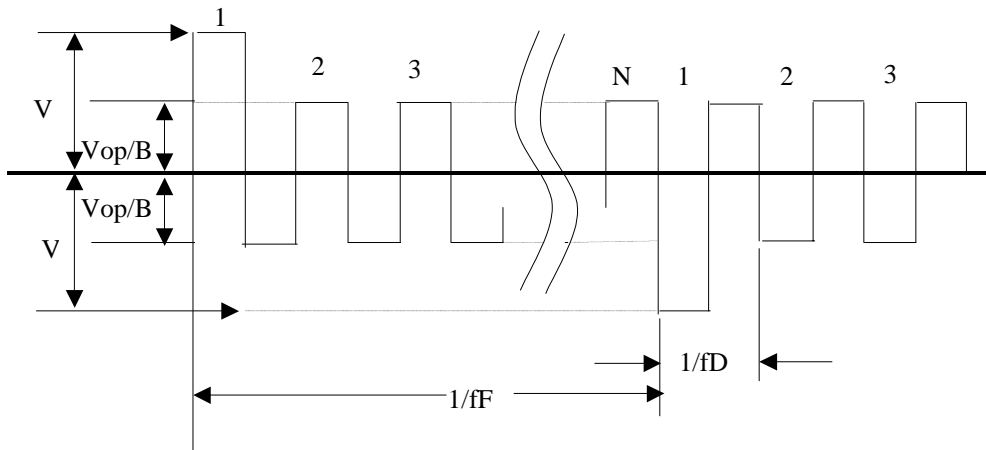


Electrical characteristics-2

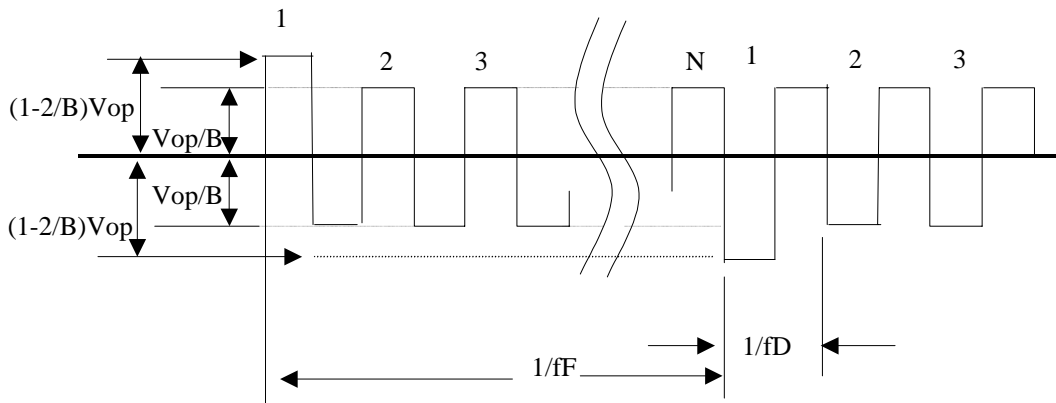
2 Drive waveform

V_{op} : Drive voltage f_F : Frame frequency
 $1/B$: Bias f_D : Drive frequency
 N : Duty

(1) Selected waveform



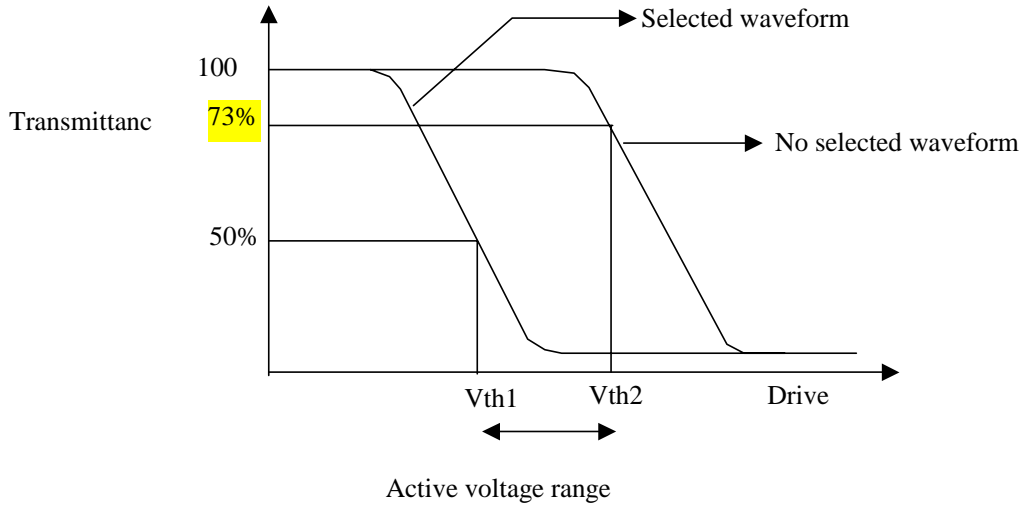
(2) Non- Selected waveform



Note:

Frame frequency is defined as follows: Common side supply voltage peak - to - peak / 2 = 1 period

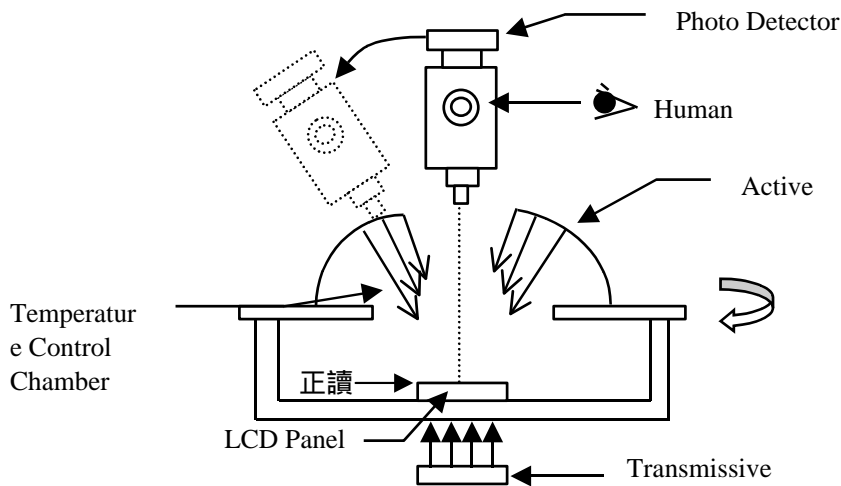
Note 3. : Definition of Vth



| | Vth1 | Vth2 |
|----------------|---------------------|------------------------|
| View direction | 10° | 40° |
| Drive waveform | (Selected waveform) | (No selected waveform) |
| Transmittance | 50% | 73% |

1 Contrast ratio
 = (Brightness in OFF state) / (Brightness in ON state)

Outline of Electro-Optical Characteristics Measuring System



Measuring System: Autronic DMS-803

1.6 Backlight Characteristics

LCD Module with LED Backlight

Maximum Ratings

| Item | Symbol | Conditions | Min. | Max. | Unit |
|-------------------|--------|------------|------|------|------|
| Forward Current | IF | Ta =25 | - | 180 | mA |
| Reverse Voltage | VR | Ta =25 | - | 5 | V |
| Power Dissipation | PO | Ta =25 | - | 0.61 | W |

Electrical / Optical Characteristics

Ta =25

| Item | Symbol | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--------|------------|------|------|------|-------------------|
| Forward Voltage | VF | IF= 80 mA | - | 3.3 | 3.4 | V |
| Reverse Current | IR | VR= 5V | - | - | 60 | uA |
| CIE Color Coordinate (With LCD) | X | IF= 80 mA | 0.29 | 0.32 | 0.35 | - |
| | Y | | 0.35 | 0.38 | 0.41 | |
| Average Brightness (with LCD) *1 | IV | IF= 80 mA | 30 | 50 | - | cd/m ² |
| Uniformity (With LCD)*2 | B | IF= 80 mA | 70 | - | - | % |
| Color | White | | | | | |

*1 This value will be changed while mass production.

*2 : $B=B(\min) / B(\max)$

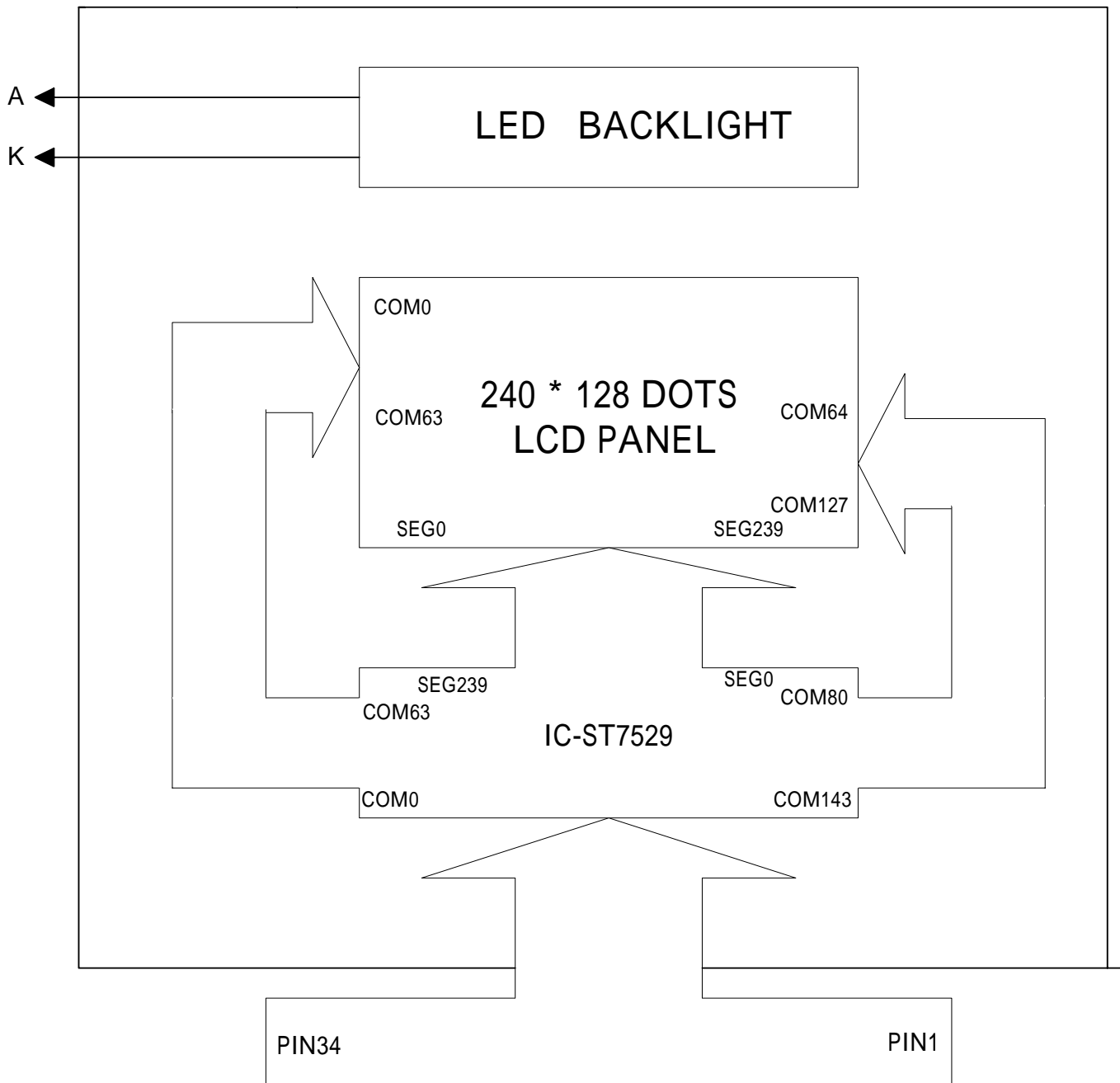
2. MODULE STRUCTURE

2.1 Counter Drawing

2.1.1 LCM Mechanical Diagram

* See Appendix

2.1.2 Block Diagram



Please refer interface pin description for detail

2.2 Interface Pin Description

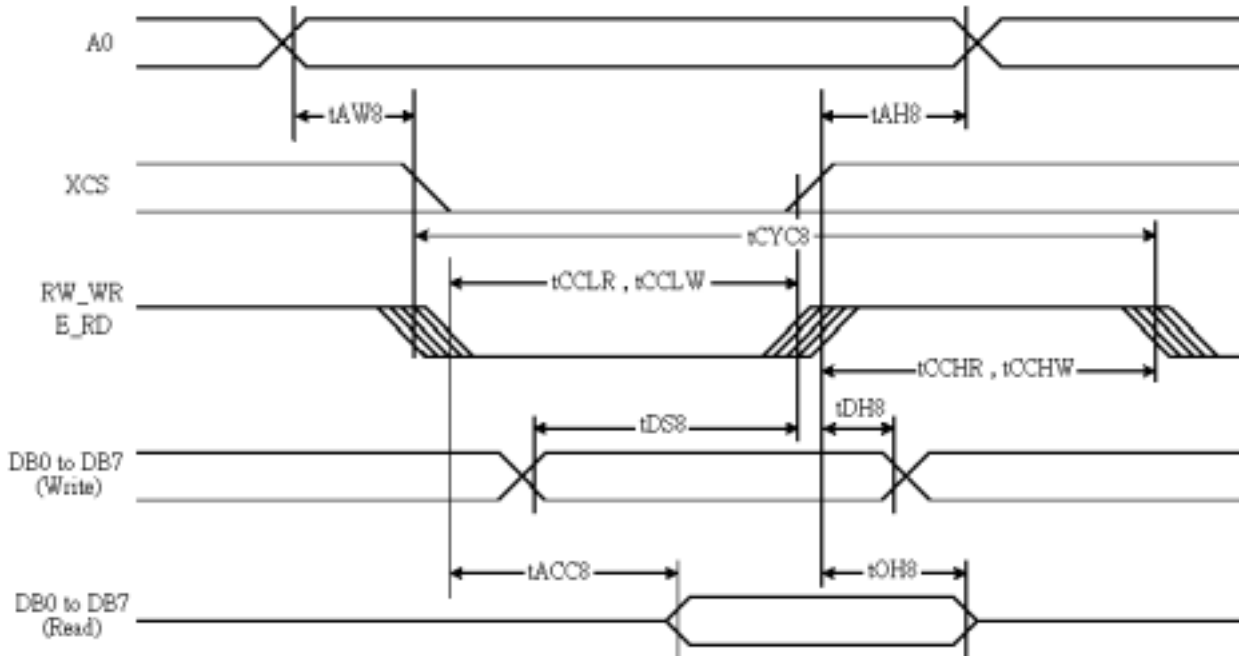
| Pin No. | Symbol | Function | | | | | | | | | |
|---------|--------|---|----------|-------------|-------------|------|----|---|------|-----|--|
| 1 | A0 | Register select input pin – A0 = "H": DB0 to DB8 or SI are display data – A0 = "L": DB0 to DB8 or SI are control data | | | | | | | | | |
| 2 | RW_WR | Read / Write execution control pin | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>MPU Type</th> <th>RW_WR</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>6800</td> <td>RW</td> <td>Read / Write control input pin RW = "H" : read RW = "L" : write</td> </tr> <tr> <td>8080</td> <td>/WR</td> <td>Write enable clock input pin The data on DB0 to DB8 are latched at the rising edge of the /WR signal.</td> </tr> </tbody> </table> | MPU Type | RW_WR | Description | 6800 | RW | Read / Write control input pin RW = "H" : read RW = "L" : write | 8080 | /WR | Write enable clock input pin The data on DB0 to DB8 are latched at the rising edge of the /WR signal. |
| | | MPU Type | RW_WR | Description | | | | | | | |
| 6800 | RW | Read / Write control input pin RW = "H" : read RW = "L" : write | | | | | | | | | |
| 8080 | /WR | Write enable clock input pin The data on DB0 to DB8 are latched at the rising edge of the /WR signal. | | | | | | | | | |
| | | | | | | | | | | | |
| 3 | DB0 | They connect to the standard 8-bit MPU bus via the 8 bit bi-directional bus. When the following interface is selected and the XCS pin is high, the following pins become high impedance, which should be fixed to VDD or VSS. | | | | | | | | | |
| 4 | DB1 | | | | | | | | | | |
| 5 | DB2 | | | | | | | | | | |
| 6 | DB3 | | | | | | | | | | |
| 7 | DB4 | In IIC Interface | | | | | | | | | |
| 8 | DB5 | D7: SCL; D6: SI ; D0, D1: SA1, SA0 | | | | | | | | | |
| 9 | DB6 | D3, D2: Acknowledgement | | | | | | | | | |
| 10 | DB7 | D4, D5, D8 should be fixed to VDD or VSS. | | | | | | | | | |
| 11 | E_RD | Read / Write execution control pin | | | | | | | | | |
| | | <table border="1"> <thead> <tr> <th>MPU Type</th> <th>RW_WR</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>6800</td> <td>E</td> <td>Read / Write control input pin -RW = "H": When E is "H", DB0 to DB8 are in an output status. -RW = "L": The data on DB0 to DB8 are latched at the falling edge of the E signal.</td> </tr> <tr> <td>8080</td> <td>/RD</td> <td>Read enable clock input pin When /RD is "L", DB0 to DB8 are in an output status.</td> </tr> </tbody> </table> | MPU Type | RW_WR | Description | 6800 | E | Read / Write control input pin -RW = "H": When E is "H", DB0 to DB8 are in an output status. -RW = "L": The data on DB0 to DB8 are latched at the falling edge of the E signal. | 8080 | /RD | Read enable clock input pin When /RD is "L", DB0 to DB8 are in an output status. |
| | | MPU Type | RW_WR | Description | | | | | | | |
| 6800 | E | Read / Write control input pin -RW = "H": When E is "H", DB0 to DB8 are in an output status. -RW = "L": The data on DB0 to DB8 are latched at the falling edge of the E signal. | | | | | | | | | |
| 8080 | /RD | Read enable clock input pin When /RD is "L", DB0 to DB8 are in an output status. | | | | | | | | | |
| | | | | | | | | | | | |
| 12 | RST | Reset input pin. When RST is "L", initialization is executed. | | | | | | | | | |

| Pin No. | Symbol | Function | | |
|---------|--------|---|-----|--------------------------|
| 13 | IF1 | IF1 | IF3 | MPU interface type |
| | | H | L | 80 series 8-bit parallel |
| 14 | IF3 | L | H | 68 series 8-bit parallel |
| | | L | L | IIC |
| 15 | XCS | Chip select input pins Data/instruction I/O is enabled only when XCS is "L". When chip select is non-active, DB0 to DB8 may be high impedance. | | |
| 16 | VSS | Power supply (VSS=0) | | |
| 17 | VDD | Power supply (VDD=3.3V) | | |
| 18 | CAP7P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP7P terminal. | | |
| 19 | CAP1N | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal. | | |
| 20 | CAP5P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP5P terminal. | | |
| 21 | CAP3P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP3P terminal. | | |
| 22 | CAP1N | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP1N terminal. | | |
| 23 | CAP1P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP1P terminal. | | |
| 24 | CAP2P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP2P terminal. | | |
| 25 | CAP2N | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal. | | |
| 26 | CAP4P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP4P terminal. | | |
| 27 | CAP2N | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP2N terminal. | | |
| 28 | CAP6P | DC / DC voltage converter. Connect a capacitor between this terminal and the CAP6P terminal. | | |
| 29 | VLCD | LCD supply voltage | | |

| Pin No. | Symbol | Function | | | | | | | | | | |
|-------------------|-----------------------|---|-------------------|-------------------|----|----|----|----------|-----------------------|-----------------------|-------------------|-------------------|
| 30 | V4 | LCD driver supply voltages V0In & V0out should be connected together in FPC area. | | | | | | | | | | |
| 31 | V3 | Voltages should have the following relationship: V0 V1 V2 V3 V4 VSS | | | | | | | | | | |
| 32 | V2 | When the internal power circuit is active, these voltages are generated as the following table according to the state of LCD bias. | | | | | | | | | | |
| 33 | V1 | <table border="1"> <thead> <tr> <th>LCD Bias</th> <th>V1</th> <th>V2</th> <th>V3</th> <th>V4</th> </tr> </thead> <tbody> <tr> <td>1/N Bias</td> <td>$(N-1) / N \times V0$</td> <td>$(N-2) / N \times V0$</td> <td>$(2/N) \times V0$</td> <td>$(1/N) \times V0$</td> </tr> </tbody> </table> | LCD Bias | V1 | V2 | V3 | V4 | 1/N Bias | $(N-1) / N \times V0$ | $(N-2) / N \times V0$ | $(2/N) \times V0$ | $(1/N) \times V0$ |
| | | LCD Bias | V1 | V2 | V3 | V4 | | | | | | |
| 1/N Bias | $(N-1) / N \times V0$ | $(N-2) / N \times V0$ | $(2/N) \times V0$ | $(1/N) \times V0$ | | | | | | | | |
| NOTE: N = 5 to 14 | | | | | | | | | | | | |
| 34 | V0 | | | | | | | | | | | |

2.3 Timing Characteristics

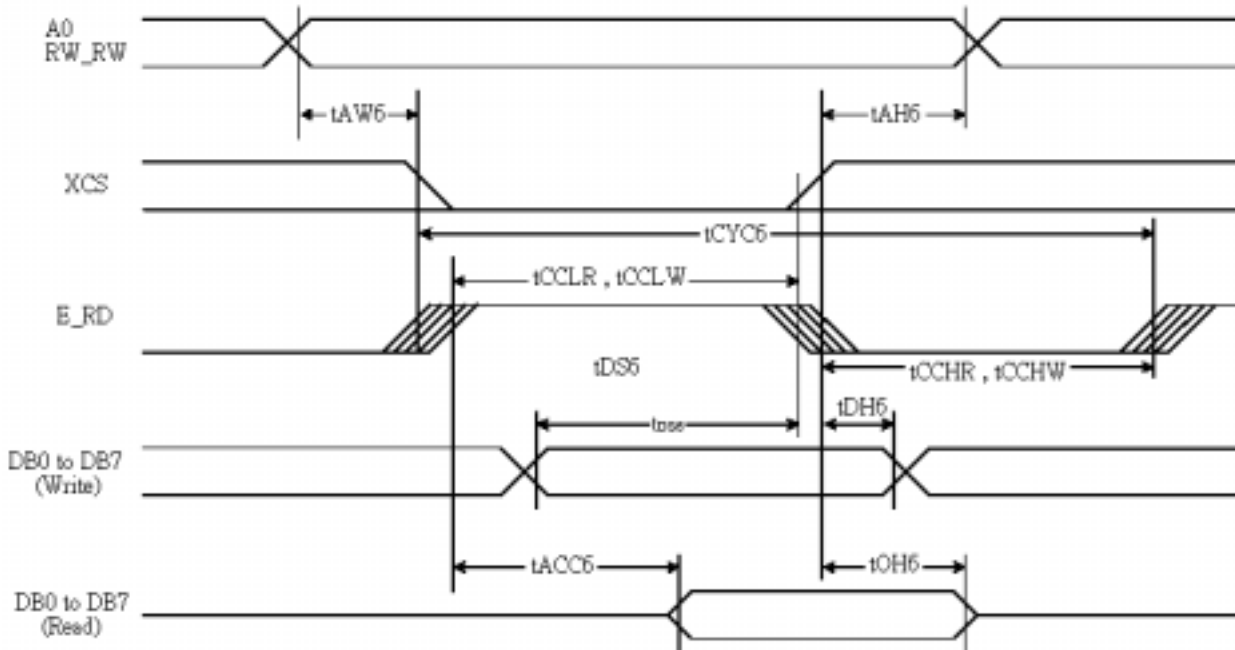
For the 8080 Series MPU



$V_{DD} = 3.3V$, $T_a = 25^\circ C$

| Item | Signal | Symbol | Condition | Rating | | Units |
|------------------------------|------------|------------|---------------|--------|-----|-------|
| | | | | Min | Max | |
| Address hold time | A0 | t_{AH8} | - | 20 | - | ns |
| Address setup time | | t_{AW8} | - | 20 | - | |
| System cycle time | | t_{CYC8} | - | 200 | - | |
| Enable L pulse width (Write) | RW_WR | t_{CCLW} | - | 100 | - | |
| Enable H pulse width (Write) | | t_{CCHW} | - | 100 | - | |
| Enable L pulse width (Read) | E_RD | t_{CCLR} | - | 100 | - | |
| Enable H pulse width (Read) | | t_{CCHR} | - | 100 | - | |
| WRITE Data setup time | DB0 to DB7 | t_{DS8} | - | 150 | - | |
| WRITE Address hold time | | t_{DH8} | - | 20 | - | |
| READ access time | | t_{ACC8} | $C_L = 100pF$ | - | 40 | |
| READ Output disable time | | t_{OH8} | $C_L = 100pF$ | - | 30 | |

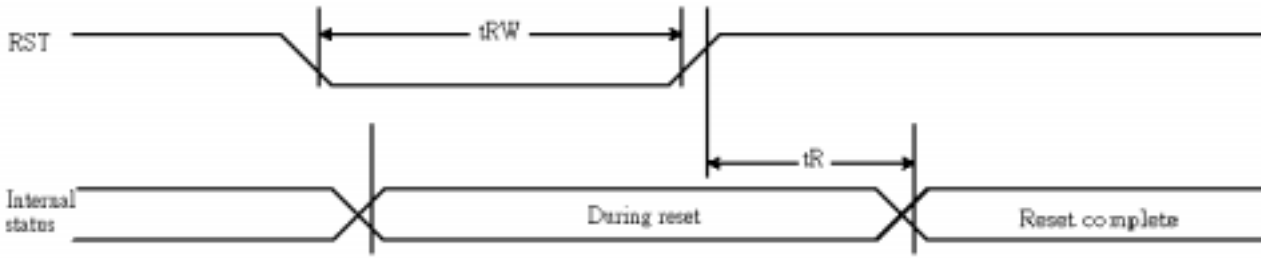
For the 6800 Series MPU



$V_{DD} = 3.3V, T_a = 25^{\circ}C$

| Item | Signal | Symbol | Condition | Rating | | Units |
|------------------------------|------------|------------|---------------|--------|-----|-------|
| | | | | Min | Max | |
| Address hold time | A0 | t_{AH6} | - | 20 | - | ns |
| Address setup time | | t_{AW6} | - | 20 | - | |
| System cycle time | | t_{CYC6} | - | 200 | - | |
| Enable L pulse width (Write) | RW_WR | t_{EWLW} | - | 100 | - | |
| Enable H pulse width (Write) | | t_{EWHW} | - | 100 | - | |
| Enable L pulse width (Read) | E_RD | t_{EWLR} | - | 100 | - | |
| Enable H pulse width (Read) | | t_{EWHR} | - | 100 | - | |
| WRITE Data setup time | DB0 to DB7 | t_{DS6} | - | 150 | - | |
| WRITE Address hold time | | t_{DH6} | - | 20 | - | |
| READ access time | | t_{ACC6} | $C_L = 100pF$ | - | 40 | |
| READ Output disable time | | t_{OH6} | $C_L = 100pF$ | - | 30 | |

Reset Timing



$V_{DD} = 3.3V$, $T_a = 25^{\circ}C$

| Item | Signal | Symbol | Condition | Rating | | | Units |
|-----------------------|--------|----------|-----------|--------|-----|-----|---------|
| | | | | Min | Typ | Max | |
| Reset time | - | t_R | - | - | - | 1 | μs |
| Reset "L" pulse width | RES | t_{RW} | - | 1 | - | - | μs |

2.4 Display Command

Ext=0 or Ext=1

| Index | Command | A0 | RD | WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function |
|-------|---------|----|----|----|----|----|----|----|----|----|----|----|-----------|
| 1 | Ext In | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | Ext=0 Set |
| 2 | Ext Out | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | Ext=1 Set |

Ext=0

| Index | Command | A0 | RD | WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function |
|-------|---------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|
| 1 | DISON | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | Display On |
| 2 | DISOFF | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | Display Off |
| 3 | DISNOR | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | Normal Display |
| 4 | DISINV | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | Inverse Display |
| 5 | COMSCN | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | COM Scan Direction |
| 6 | DISCTRL | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | Display Control |
| 7 | SLPIN | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | Sleep In |
| 8 | SLPOUT | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | Sleep Out |
| 9 | LASET | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 1 | Line Address Set |
| 10 | CASET | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | Column Address Set |
| 11 | DATSDR | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | Data Scan Direction |
| 12 | RAMWR | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | Writing to Memory |
| 13 | RAMRD | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | Reading from Memory |
| 14 | PTLIN | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | Partial display in |
| 15 | PTLOUT | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | Partial display out |
| 16 | RMWIN | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | Read and Modify Write |
| 17 | RMWOUT | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 0 | RMW end |
| 18 | ASCSET | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | Area Scroll Set |
| 19 | SCSTART | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 1 | Scroll Start Set |

| | | | | | | | | | | | | | |
|----|----------|---|---|---|---|---|---|---|---|---|---|---|------------------|
| 20 | OSCON | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 1 | Internal OSC on |
| 21 | OSCOFF | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | Internal OSC off |
| 22 | PWRCTRL | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | Power Control |
| 23 | VOLCTRL | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | EC control |
| 24 | VOLUP | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | EC increase 1 |
| 25 | VOLDOWN | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | EC decrease 1 |
| 26 | RESERVED | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | Not Use |
| 27 | EPSRRD1 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | READ Register1 |

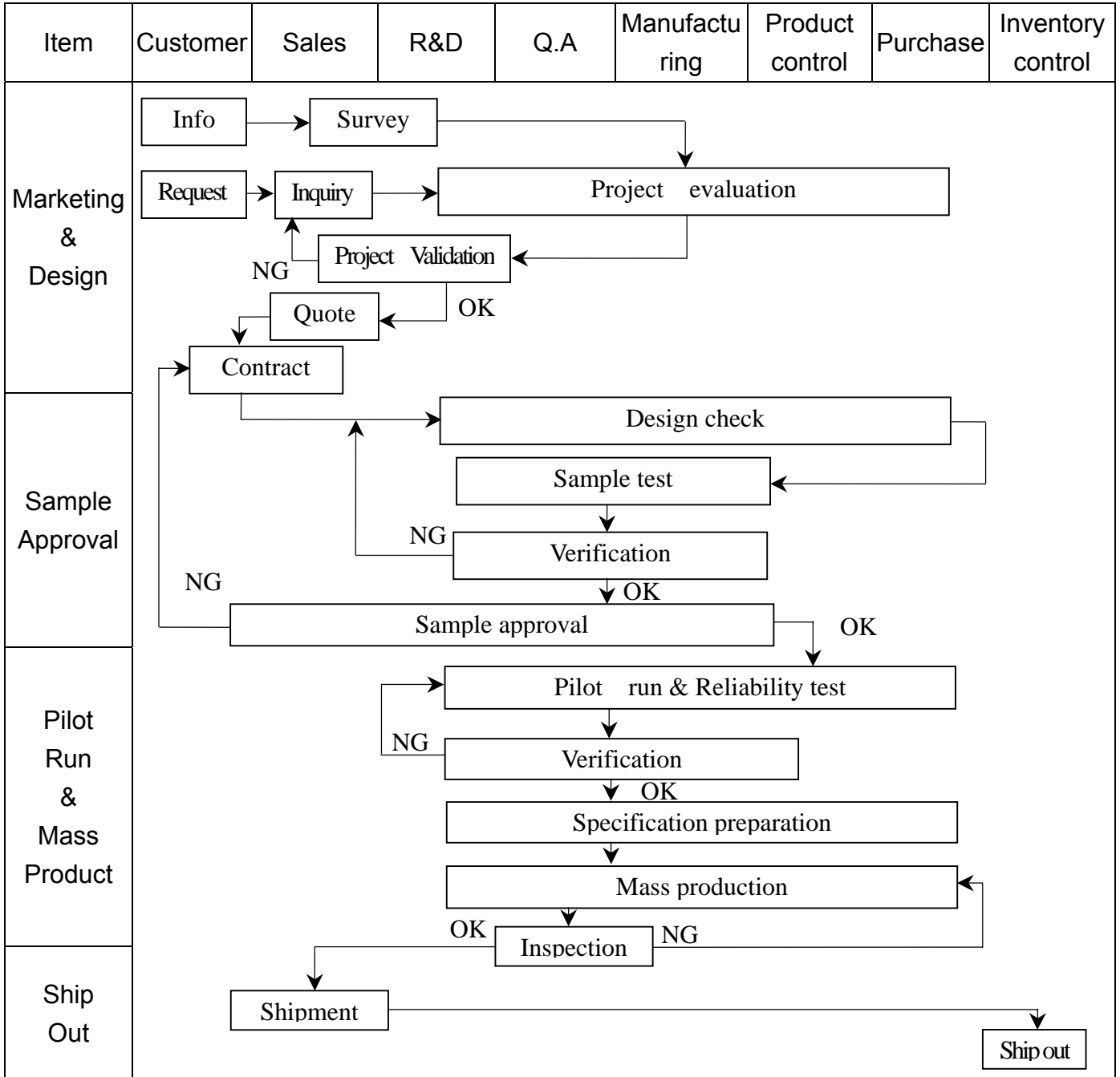
| | | | | | | | | | | | | | |
|----|---------|---|---|---|-----------|---|---|---|---|---|---|-------------|-----------------|
| 28 | EPSRRD2 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | READ Register2 |
| 29 | NOP | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | NOP Instruction |
| 30 | STREAD | 0 | 0 | 1 | Read Data | | | | | | | Status Read | |
| 31 | EPINT | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | Initial code(1) |

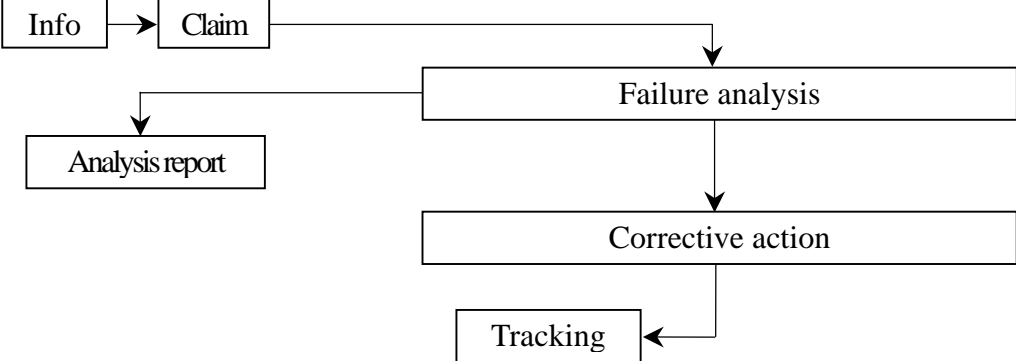
Ext=1

| Index | Command | A0 | RD | WR | D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 | Function |
|-------|------------|----|----|----|----|----|----|----|----|----|----|----|-----------------------|
| 1 | Gray 1 Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | FRAME 1 Gray PWM Set |
| 2 | Gray 2 Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | FRAME 2 Gray PWM Set |
| 3 | Wt. Set | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | Weight Set |
| 4 | ANASET | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | Analog Circuit Set |
| 5 | DITHOFF | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 0 | Dithering Circuit Off |
| 6 | DITHON | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | Dithering Circuit On |
| 7 | EPCTIN | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | Control EEPROM |
| 8 | EPCOUT | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | Cancel EEPROM |
| 9 | EPMWR | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | Write to EEPROM |
| 10 | EPMRD | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | Read from EEPROM |

3. QUALITY ASSURANCE SYSTEM

3.1 Quality Assurance Flow Chart



| Item | Customer | Sales | R&D | Q.A | Manufacturing | Product control | Purchase | Inventory control |
|---------------|---|-------|-----|-----|---|-----------------|----------|-------------------|
| Sales Service |  <pre> graph TD Info[Info] --> Claim[Claim] Claim --> Failure[Failure analysis] Failure --> Report[Analysis report] Failure --> Action[Corrective action] Action --> Tracking[Tracking] </pre> | | | | | | | |
| Q.A Activity | 1. ISO 9001 Maintenance Activities 3. Equipment calibration 5. Standardization Management | | | | 2. Process improvement proposal 4. Education And Training Activities | | | |

3.2 Inspection Specification

Inspection Standard : MIL-STD-105E Table Normal Inspection Single Sampling Level II

Equipment : Gauge , MIL-STD , Powertip Tester , Sample

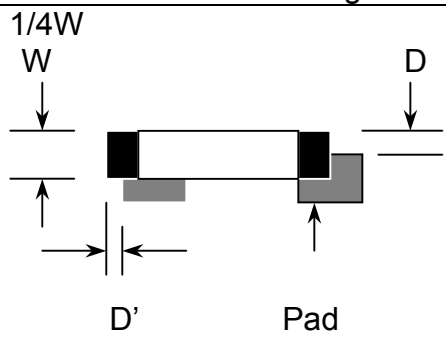
IQC Defect Level : Major Defect AQL 0.4; Minor Defect AQL 1.5

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 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 A=(L + W) 2 | 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 (Including scratch、bubble) | 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 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 | N.G. | Minor |
| | | 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 $A=(L+W)$ 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 $> 20\text{mm}$ or height is $> 2.5\text{mm}$ | N.G. | Minor |
| | | The diameter of pinhole in modeling, A is $> 0.2\text{mm}$. | N.G. | Minor |
| 7 | Appearance of frame $A=(L+W)$ 2 | The folding angle of frame must be $> 45^\circ + 10^\circ$ | N.G. | Minor |
| | | The area of stripped electroplate in top-view of frame, A is $> 1.0\text{mm}$. | N.G. | Minor |
| | | Rust or crack is (Top view only) | N.G. | Minor |
| | | The scratched width of frame is $> 0.06\text{mm}$. (Top view only) | N.G. | Minor |
| 8 | Electrical characteristic of backlight $A=(L+W)$ 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 $> 2.0\text{mm}$ | N.G. | Minor |
| 10 | Assembly parts $A=(L+W)$ 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 $> 0.7\text{mm}$ | N.G. | Minor |
| | | $D > 1/4W$  <p>The diagram illustrates a component on a PCB pad. W is the component width, D is the side overhang, and D' is the end solder joint width. The pad is labeled 'Pad'.</p> | 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 $< 0.5\text{mm}$. | N.G. | Minor |

4. RELIABILITY TEST

4.1 Reliability Test Condition

| NO | Item | Test Condition | |
|----|------------------------------------|---|---|
| 1 | High Temperature Storage | Storage at $80 \pm 2^{\circ}\text{C}$ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs | |
| 2 | Low Temperature Storage | Storage at $-30 \pm 2^{\circ}\text{C}$ 96~100 hrs Surrounding temperature, then storage at normal condition 4hrs | |
| 3 | High Temperature /Humidity Storage | 1.Storage 96~100 hrs $60 \pm 2^{\circ}\text{C}$, 90~95%RH surrounding temperature, then storage at normal condition 4hrs. (Excluding the polarizer).or 2.Storage 96~100 hrs $40 \pm 2^{\circ}\text{C}$, 90~95%RH surrounding temperature, then storage at normal condition 4 hrs. | |
| 4 | Temperature Cycling | $-20^{\circ}\text{C} \rightarrow 25^{\circ}\text{C} \rightarrow 70^{\circ}\text{C} \rightarrow 25^{\circ}\text{C}$ $\leftarrow (30\text{mins}) (5\text{mins}) (30\text{mins}) (5\text{mins}) \rightarrow$ <p style="text-align: center;">10 Cycle</p> | |
| 5 | Vibration | 10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs) | |
| 6 | ESD Test | Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/- | Contact Discharge: Apply 250V with 5 times discharge for each polarity +/- |
| | | Testing location: Around the face of LCD | Testing location: 1.Apply to bezel. 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 $280 \pm 10^{\circ}\text{C}$ 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 $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 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.

LCM Model PE240128WRF-001-HQ
 版次Ver.0

LCM包裝規格書

LCM Packaging Specifications

(For Tray)

| | | |
|---------------------------------|--------------------------------|----------------------------------|
| Approve 研發 95.4.27 張慶源 | Check 研發 95.4.13. 郭政玲 | Contact 研發 95.4.11. 賴銘信 |
|---------------------------------|--------------------------------|----------------------------------|

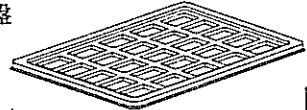
1. 包裝材料規格表 (Packaging Material) : (per carton)

| No. | Item | Model | Dimensions (mm) | Quantity |
|-----|----------------------|--------------------|------------------|----------|
| 1 | 成品 (LCM) | PE240128WRF-001-HQ | 99.2 X 62.8 | 96 |
| 2 | 多層薄膜(1)POF | OTFILM0BA03ABA | 19"X350X0.015 | 6 |
| 3 | TRAY 盤 (2) | TYPE24012801BA | 352 X 260 X 24.8 | 18 |
| 4 | 內盒(3)Product Box | BX36627063ABBA | 393 X 274 X 68 | 6 |
| 5 | 保力龍板(4)Pollyon board | OTPLB00PL08ABA | 550 X 393 X 20 | 2 |
| 6 | 外紙箱(5)Carton | BX57041027CCBA | 570 X 410 X 265 | 1 |
| 7 | | | | |
| 8 | | | | |
| 9 | | | | |

2. 單箱數量規格表 (Packaging Specifications and Quantity) :

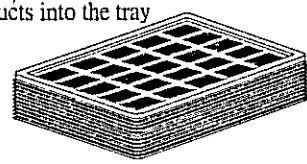
| | | | | | |
|---|----|---------------|---|---|----|
| (1) LCM quantity per box : no per tray | 8 | x no per tray | 2 | = | 16 |
| (2) Total LCM quantity in carton : quantity per box | 16 | x no of boxes | 6 | = | 96 |

Use empty tray
空盤



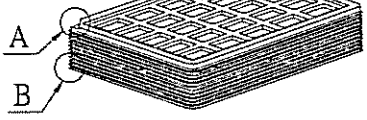
+

Put products into the tray

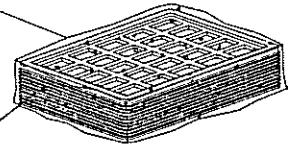


⇓

Tray stacking



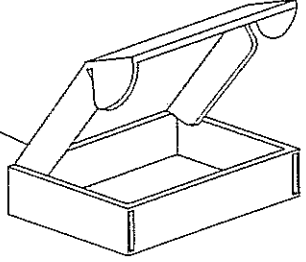
(1) POF



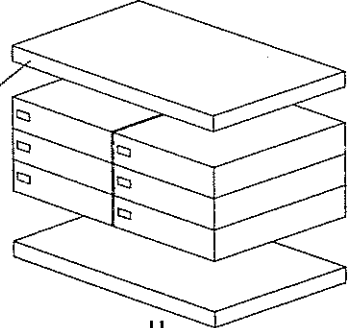
(2) Tray

⇓

(3) Product Box

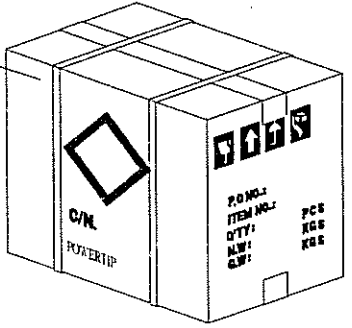


(4) Pollyon board



⇓

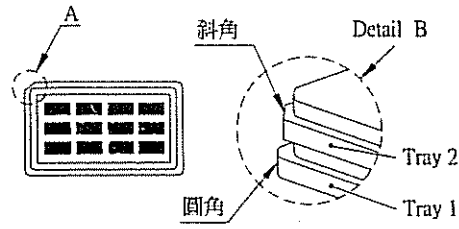
(5) Carton



特 記 事 項 (REMARK)

1. Label Specifications :

MODEL:
 LOT NO:
 QUANTITY:
 CHECK:



Rotate tray 180 degrees and place on top of stack.
 Check the tray stack using Fig. B.
 TRAY盤相疊時,需旋轉180度,請詳見B視圖

3.It's also suitable to Panel
 (可適用於單品包裝)
 4. TRAY Number PE240128-001



Стандарт Электрон Связь

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