# P-TEC

# PRODUCT SPECIFICATION

*Part Number*

## PG24064A-O Series

| CUSTOMER | |
| --- | --- |
| CUSTOMER PART NUMBER | |
| DESCRIPTION | |
| APPROVED BY | |
| DATE | |

**Table of Contents**

## Record of Revisions

| Rev. | Comments | Page | Date |
|---|---|---|---|
| 1 | Preliminary Specification was first issued. | All | 8/8'14 |
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# 1. Part number breakdown

P_ __ - _ _ _ _ - _ _ _
1　2　　3　4　5　6　　7　8　9

*Replace each Space (_) with the following letters and or numbers*

| 1. P-tec LCD Type | C = Character<br>G = Graphic<br>COG = Chip On Glass | COF = Chip On Flex<br>TAB = Tape Automated Bonding<br>TFT = Thin-film Transistor |
|---|---|---|
| 2. LCD Model | Example for Character: **2002A** = 20 Characters x 2 Lines w/ Pins on Left side and 116mm x 37 x 12.7mm overall size<br>Example for Graphic: **12864B** = 128 Dots per row x 64 Dots per Column w/ Pins on lower side and 93mm x 70 x 8.8mm overall size | |
| 3. Fluid Type | **T** = TN/Grey<br>**Y** = STN/Yellow Green<br>**G** = STN/ Grey | **B** = STN/ Blue<br>**F** = FSTN/ White<br>**N** = FSTN/ Black |
| 4. Backlight/polorizer | **NF** = None/Transflective<br>**NM** = None/Transmissive<br>**NR** = None/Reflective<br>**EF** = EL/Transflective<br>**EM** = EL/Transmissive | **LF** = LED/Transflective<br>**LM** = LED/Transmissive<br>**CF** = CCFL/Transflective<br>**CM** = CCFL=Transmissive |
| 5. Backlight Color | (If no backlight provided move on to viewing angle [6.])<br>**B** = Blue/Green<br>**Y** = Yellow<br>**G** = Green | **S** = Yellow/Green<br>**O** = Orange<br>**W** = White |
| 6. Viewing Angle | **D** = 6:00<br>**U** = 12:00 | **R** = 3:00<br>**L** = 9:00 |
| 7. Internal Number | Single Letter for internal purposes | |
| 8. Extended Temperature | This space is blank if operating temperature is standard 0°C to 50°C<br>An X will be visible if the LCD is Extended operating temperature | |
| 9. Customer Specials or List of Value-added items | Usually blank unless customer requests some modifications.<br>Can be several Letters long. | |

# 2. Precautions in use of LCD Modules

(1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.

(3) Don't disassemble the LCM.

(4) Don't operate it above the absolute maximum rating.

(5) Don't drop, bend or twist LCM.

(6) Soldering: only to the I/O terminals.

(7) Storage: please storage in anti-static electricity container and clean environment.

# 3. General Specification

| Item | Dimension | Unit |
|---|---|---|
| Number of Dots | 240 x 64 | — |
| Module dimension(None Backlight ) | 180.0 x 65.0 x 11.0（MAX） | mm |
| Module dimension(With Backlight ) | 180.0 x 65.0 x 16.0（MAX） | mm |
| View area | 132.2 x 39.2 | mm |
| Active area | 127.16 x 33.88 | mm |
| Dot size | 0.49 x 0.49 | mm |
| Dot pitch | 0.53x 0.53 | mm |
| LCD type | STN | |
| Duty | 1/64 | |
| View direction | 6 o'clock or 12 o'clock | |
| Backlight Type | None, YELLOW-GREEN backlight, WHITE backlight | |

# 4. Absolute Maximum Ratings

| Item | | Symbol | Min | Max | Unit |
|---|---|---|---|---|---|
| Input Voltage | | $V_I$ | -0.3 | VDD+0.3 | V |
| Supply Voltage For Logic | | VDD-$V_{SS}$ | -0.3 | 7.0 | V |
| Supply Voltage For LCD | | $V_{DD}$-$V_0$ | 0 | 16 | V |
| Standard Temperature LCM | Operating Temp. | Top | 0 | 50 | ℃ |
| | Storage Temp. | Tstr | -10 | 60 | ℃ |
| Wide Temperature LCM | Operating Temp. | Top | -20 | 70 | ℃ |
| | Storage Temp. | Tstr | -30 | 80 | ℃ |

# 5. Electrical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage For Logic | $V_{DD}$-$V_{SS}$ | — | 4.5 | 5.0 | 5.5 | V |
| Supply Voltage For LCD | $V_{DD}$-$V_0$ | Ta=25℃ | 12.0 | 12.5 | 13.2 | V |
| Input High Volt. | $V_{IH}$ | — | 0.7 $V_{DD}$ | — | $V_{DD}$ | V |
| Input Low Volt. | $V_{IL}$ | — | $V_{SS}$ | — | 0.3 $V_{DD}$ | V |
| Supply Current | $I_{DD}$ | $V_{DD}$=5V | 9.0 | 9.9 | 12.0 | mA |
| Supply Voltage of Yellow-green backlight | $V_{LED}$ | Forward current =630 mA  Number of LED die 2x63= 126 | 3.8 | 4.2 | 4.3 | V |
| Supply Voltage of White backlight | $V_{LED}$ | Forward current =60 mA  Number of LED die 4 | 2.8 | 3.1 | 3.3 | V |

# 6. Optical Characteristics

| Item | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| View Angle | (V)θ | CR ≧ 2 | -20 | — | 35 | deg |
| | (H)φ | CR ≧ 2 | -30 | — | 30 | deg |
| Contrast Ratio | CR | — | — | 3 | — | — |
| Response Time | T rise | — | — | — | 250 | ms |
| | T fall | — | — | — | 250 | ms |

**Definition of Operation Voltage (Vop)**        **Definition of Response Time ( Tr , Tf )**
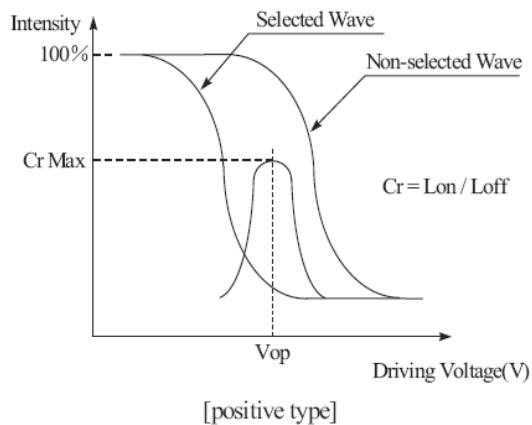


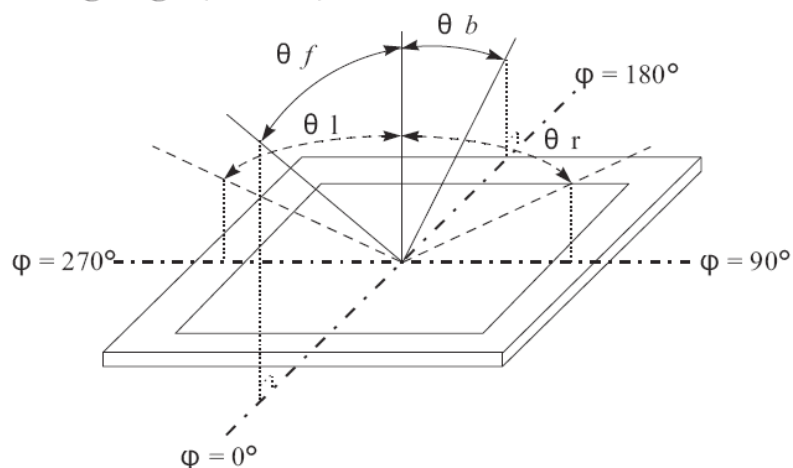[positive type]        [positive type]
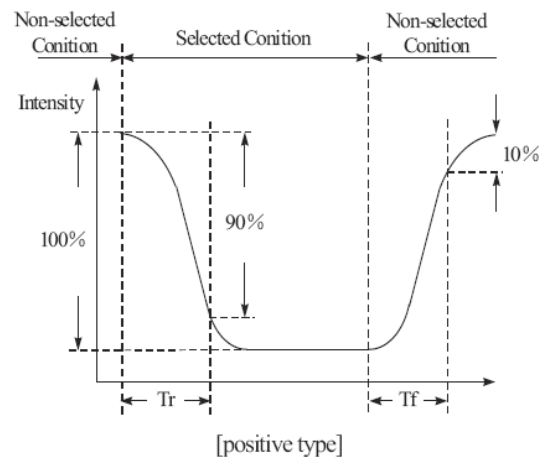
**Conditions :**

Operating Voltage : Vop        Viewing Angle($\theta$ ， $\varphi$) : 0° ， 0°

Frame Frequency : 64 HZ        Driving Waveform : 1/N duty , 1/a bias

**Definition of viewing angle(CR ≧ 2)**

# 7. Interface Pin Function

| Pin No. | Symbol | Level | Description |
|---|---|---|---|
| 1 | $V_{SS}$ | 0V | Ground |
| 2 | $V_{DD}$ | 5.0V | Supply Voltage for logic |
| 3 | V0 | | Supply voltage for LCD |
| 4 | RS | H/L | Command/Data select |
| 5 | RW | H/L | Data Read/Write |
| 6 | E | H/L | Chip Enable |
| 7 | DB0 | H/L | Data bit 0 |
| 8 | DB1 | H/L | Data bit 1 |
| 9 | DB2 | H/L | Data bit 2 |
| 10 | DB3 | H/L | Data bit 3 |
| 11 | DB4 | H/L | Data bit 4 |
| 12 | DB5 | H/L | Data bit 5 |
| 13 | DB6 | H/L | Data bit 6 |
| 14 | DB7 | H/L | Data bit 7 |
| 15 | /CS | H/L | Chip enable for T6963C |
| 16 | /RST | H/L | Reset signal |
| 17 | Vee | | Negative Voltage Output/input |
| 18 | NC | | NC |
| 19 | LED(+) | | Anode of LED Backlight |
| 20 | LED(-) | | Cathode of LED Backlight |

# 8. POWER SUPPLY

**Without Negative Power on PCB**



VDD(+5V)

LCD Bias Circuit

VO — negative voltage in put

LCD Module

Vee — NC
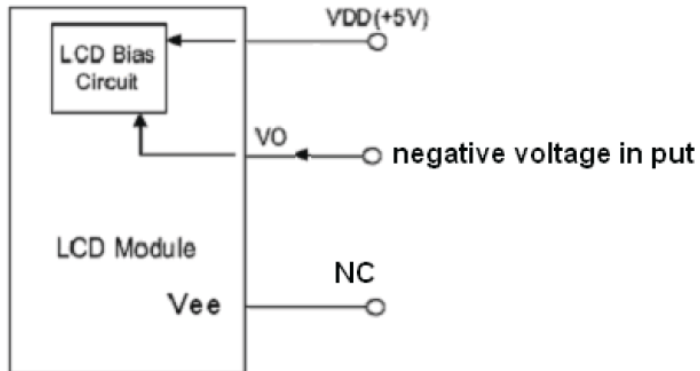
without DC-DC converter

**With Negative Power on PCB**



VDD(+5V)

LCD Bias Circuit

VO

R1

VR

R2

LCD Module

Vee
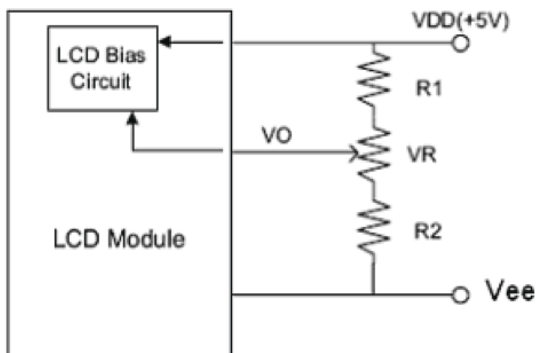
with DC-DC converter
VR:10K-20K

# 9. Contour Drawing &Block Diagram
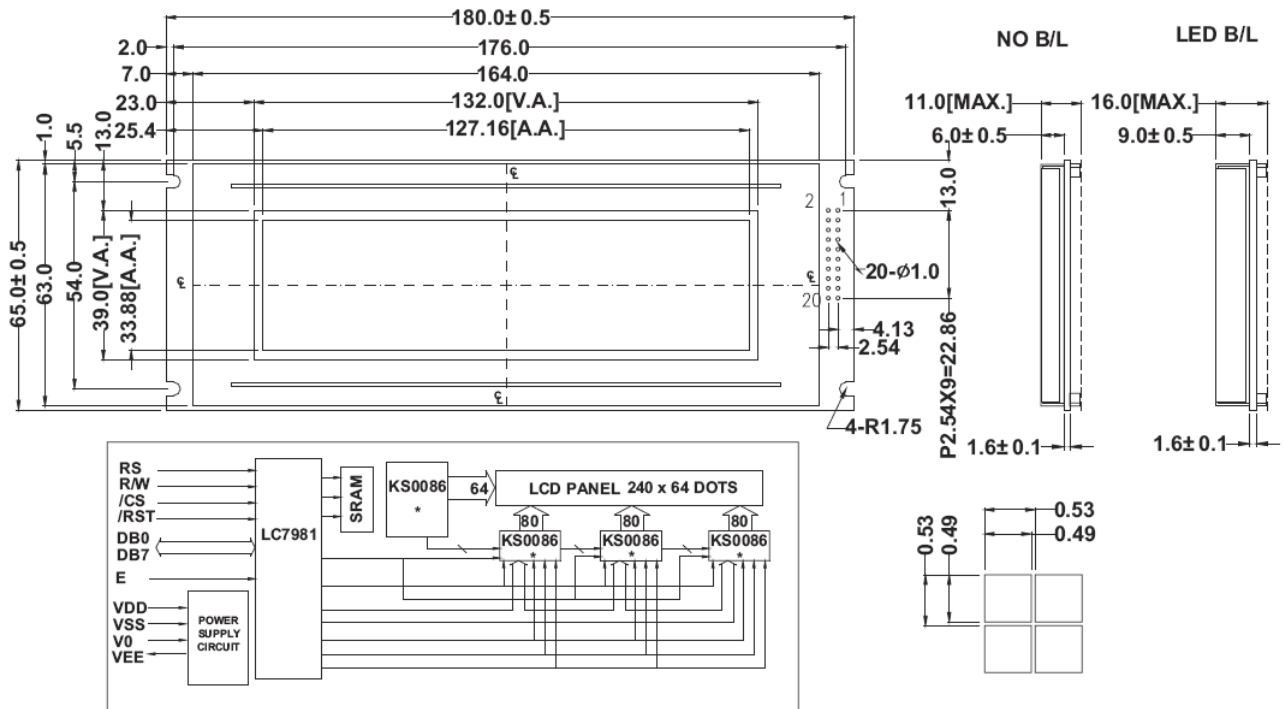
# 10.Timing Characteristics (equivalent to HD61830)

HD61830 MPU Interface ($V_{CC}$ = 5 V ±10%, GND = 0 V, $T_a$ = −20 to +75°C)

| Item | | Symbol | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Enable cycle time | | $t_{CYC}$ | 1.0 | — | — | μs |
| Enable pulse width | High level | $t_{WEH}$ | 0.45 | — | — | μs |
| | Low level | $t_{WEL}$ | 0.45 | — | — | μs |
| Enable rise time | | $t_{Er}$ | — | — | 25 | ns |
| Enable fall time | | $t_{Ef}$ | — | — | 25 | ns |
| Setup time | | $t_{AS}$ | 140 | — | — | ns |
| Data setup time | | $t_{DSW}$ | 225 | — | — | ns |
| Data delay time | | $t_{DDR}$ | — | — | 225 | ns * |
| Data hold time | | $t_{DHW}$ | 10 | — | — | ns |
| Address hold time | | $t_{AH}$ | 10 | — | — | ns |
| Output data hold time | | $t_{DH}$ | 20 | — | — | ns |

Note: * The following load circuit is connected for specification:

$R_L$ = 2.4 kΩ
R = 11 kΩ
C = 130 pF (C includes jig capacitance)
Diodes D1 to D4 : 1S2074Ⓗ
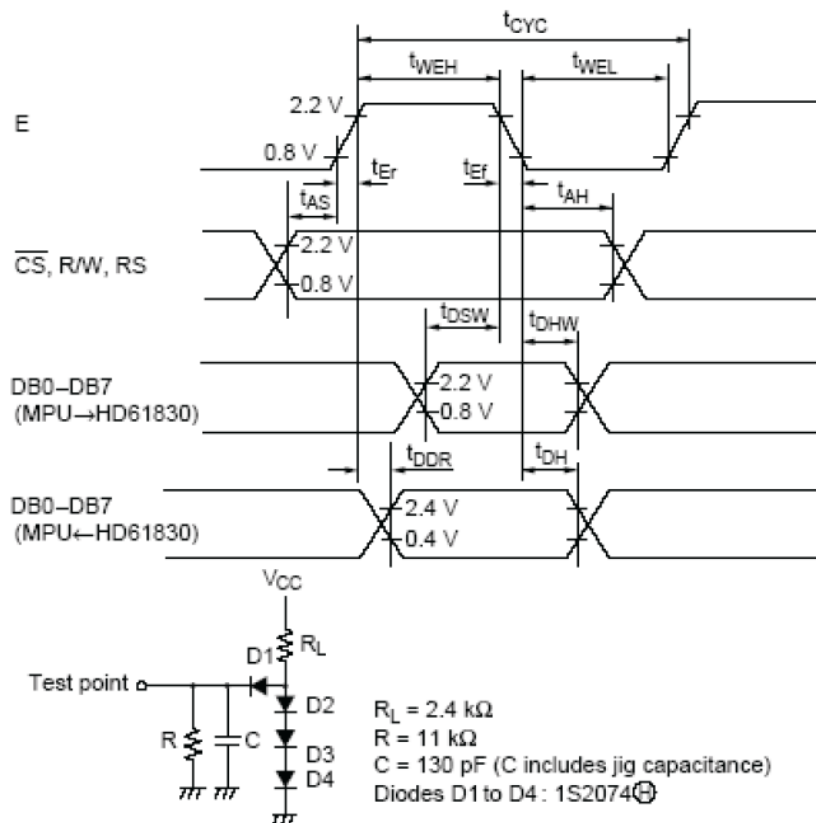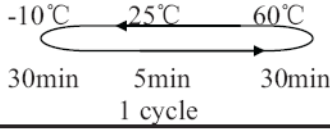
# 11.Quality Assurance

**Screen Cosmetic Criteria**

| Item | Defect | Judgment Criterion | Partition |
|---|---|---|---|
| 1 | Spots | A)Clear<br> Size: d mm    Acceptable Qty in active area<br> $d \leqq 0.1$     Disregard<br> $0.1 < d \leqq 0.2$     6<br> $0.2 < d \leqq 0.3$     2<br> $0.3 < d$     0<br>Note: Including pin holes and defective dots which must be within one pixel size.<br>B)Unclear<br> Size: d mm    Acceptable Qty in active area<br> $d \leqq 0.2$     Disregard<br> $0.2 < d \leqq 0.5$     6<br> $0.5 < d \leqq 0.7$     2<br> $0.7 < d$     0 | Minor |
| 2 | Bubbles in Polarizer | Size: d mm    Acceptable Qty in active area<br> $d \leqq 0.3$     Disregard<br> $0.3 < d \leqq 1.0$     3<br> $1.0 < d \leqq 1.5$     1<br> $1.5 < d$     0 | Minor |
| 3 | Scratch | In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable. | Minor |
| 4 | Allowable Density | Above defects should be separated more than 30mm each other. | Minor |
| 5 | Coloration | Not to be noticeable coloration in the viewing area of the LCD panels.<br>Back-light type should be judged with back-light on state only. | Minor |

# 12.Reliability

## Content of Reliability Test

| Environmental Test | | | |
|---|---|---|---|
| **Test Item** | **Content of Test** | **Test Condition** | **Applicable Standard** |
| High Temperature storage | Endurance test applying the high storage temperature for a long time. | 60℃ 96hrs | ____ |
| Low Temperature storage | Endurance test applying the high storage temperature for a long time. | -10℃ 96hrs | ____ |
| High Temperature Operation | Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time. | 50℃ 96hrs | ____ |
| Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | 0℃ 96hrs | ____ |
| High Temperature/ Humidity Storage | Endurance test applying the high temperature and high humidity storage for a long time. | 60℃,90%RH 96hrs | ____ |
| High Temperature/ Humidity Operation | Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time. | 50℃,90%RH 96hrs | ____ |
| Temperature Cycle | Endurance test applying the low and high temperature cycle. -10℃　25℃　60℃ 30min　5min　30min 1 cycle | -10℃/60℃ 10 cycles | ____ |
| Mechanical Test | | | |
| Vibration test | Endurance test applying the vibration during transportation and using. | 10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs | ____ |
| Shock test | Constructional and mechanical endurance test applying the shock during transportation. | 50G Half sign wave 11 msedc 3 times of each direction | ____ |

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃