# SPECIFICATIONS

**CUSTOMER :** _____

**SAMPLE CODE :** GFOR1602AA-WG01

**VERSION :** A

**DATE :** 2022.07.01

**CERTIFICATION :** ROHS

| Customer Sign | Approved By | Prepared By | Prepared By |
|---|---|---|---|
| | GIFAR 2022.07.01 Sidney | GIFAR 2022.07.01 Roger | GIFAR 2022.07.01 Hazel |



晶 發 科 技 股 份 有 限 公 司
**GI FAR TECHNOLOGY CO., LTD.**

新北市樹林區東豐街 81 號
No. 81, Dongfeng St, Shulin District, 23874, New Taipei City, Taiwan, R.O.C.
TEL: +886-2-8684-1188 FAX: +886-2-8684-8532

# Revision Record

| Data(y/m/d) | Ver. | Description | page |
|---|---|---|---|
| 2022.07.01 | A | Specification released<br>依 GFOR1602AA-WG 改 Baud Rate: 115200 | |
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# 1. Basic Specifications

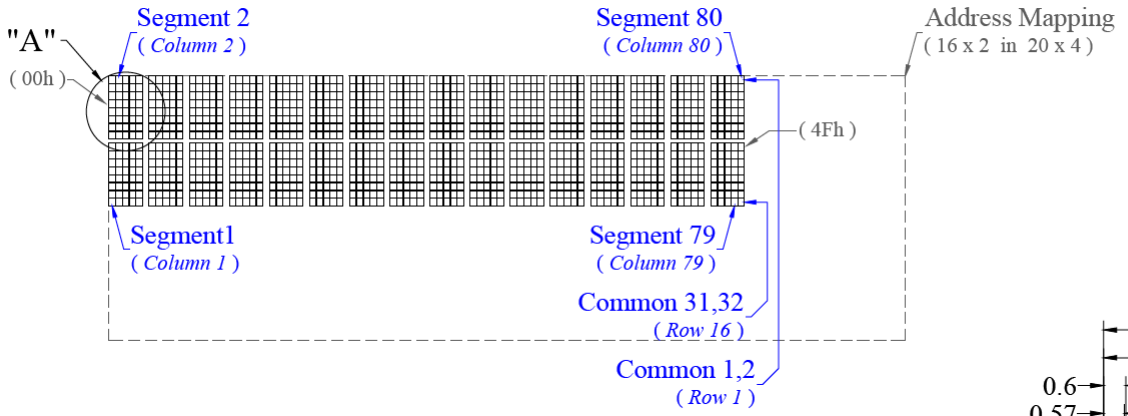
## 1.1 Display Specifications

1) Display Mode : Passive Matrix
2) Display Color : Monochrome (White)
3) Drive Duty : 1/16 Duty

## 1.2 Mechanical Specifications

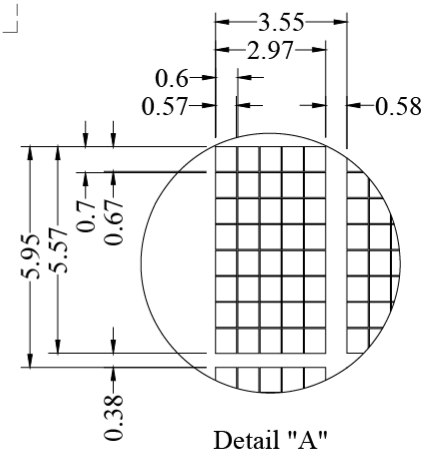
1) Outline Drawing : According to the annexed outline drawing
2) Number of Characters : 16 Characters ( 5 × 8 ) × 2 Lines
3) Module Size : 85.0 × 37.0 × 9.10 (mm)
5) Active Area: 56.22 × 11.52 (mm)
6) Character Pitch: 3.55 × 5.95 (mm)
7) Character Size: 2.97 × 5.57 (mm)
8) Pixel Pitch: 0.60 × 0.70 (mm)
9) Pixel Size: 0.57 × 0.67 (mm)
10) Weight: TBD (g)
11) Baud Rate: 115200
12) Startup Screen:

## 1.3 Active Area / Address Mapping & Character Construction




**Address Mapping**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line 1 | 00h | 01h | 02h | 03h | 04h | 05h | 06h | 07h | 08h | 09h | 0Ah | 0Bh | 0Ch | 0Dh | 0Eh | 0Fh |
| Line 2 | 40h | 41h | 42h | 43h | 44h | 45h | 46h | 47h | 48h | 49h | 4Ah | 4Bh | 4Ch | 4Dh | 4Eh | 4Fh |




## 1.4 Pin Definition

**Connector RS232**

| No | Signal | Direction | Function description |
|---|---|---|---|
| 1 | VDD | | VDD |
| 2 | GND | | Signal ground |
| 3 | RXD | LCM to PC | Transmit data |
| 4 | TXD | PC to LCM | Receiver data |

## 2. Absolute Maximum Ratings

| Parameter | Symbol | Min | Typ. | Max | Unit | Notes |
|---|---|---|---|---|---|---|
| Supply Voltage for Logic | VDD | - | 5 | 5.6 | V | 1 |
| Input Voltage | Rin | -15 | | 15 | V | |
| Output Voltage | Tout | -15 | | 15 | V | |
| Life Time (80 cd/m2) | | 50,000 | - | - | hour | 2 |
| Life Time (60 cd/m2) | | 70,000 | - | - | hour | |

Note 1: All the above voltages are on the basis of “GND = 0V”.

Note 2: VDD1= 5.0V, VPP generated by internal DC/DC convertor. Ta = 25°C, 50% Checkerboard. Software configuration follows Section 5 Command Summary.

# 3. Optics & Electrical Characteristics(OLED)

## 3.1 Optics Characteristics

| Characteristics | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Brightness | $L_{br}$ | Note 8 | - | 100 | - | cd/m$^2$ |
| C.I.E. (White) | (x)<br>(y) | C.I.E. 1931 | 0.25<br>0.27 | 0.29<br>0.31 | 0.33<br>0.35 | |
| Dark Room Contrast | CR | | - | >10,000:1 | - | |
| View Angle | | | - | Free | - | degree |

*Software configuration follows Section 5 Command Summary.

## 3.2 DC Characteristics

| Characteristics | Symbol | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Supply Voltage for Logic | $V_{DD1}$ | V1_OTP set “H” | 4.5 | - | 5.5 | V |
| Supply Voltage for Display | $V_{PP}$ | Note 5 | 11.2 | 12.0 | 12.5 | V |
| High Level Input | $V_{IH}$ | | 0.7×$V_{DD1}$ | - | $V_{DD1}$ | V |
| Low Level Input | $V_{IL}$ | | 0 | - | 0.3×$V_{DD1}$ | V |
| High Level Output | $V_{OH}$ | $I_{OH}$=-0.5mA | 0.7×$V_{DD1}$ | - | $V_{DD1}$ | V |
| Low Level Output | $V_{OL}$ | $I_{OL}$=0.5mA | 0 | - | 0.3×$V_{DD1}$ | V |
| Operating Current for $V_{DD1}$ | $I_{DD1}$ | | - | - | 200 | μA |
| Operating Current for $V_{DD2}$ | $I_{DD2}$ | Note 6 | - | 17.0 | 21.3 | mA |
| | | Note 7 | - | 26.2 | 32.8 | mA |
| | | Note 8 | - | 45.0 | 56.3 | mA |
| Sleep Mode Current for $V_{DD1}$ | $I_{DD1, SLEEP}$ | | - | - | 10 | μA |
| Sleep Mode Current for $V_{DD2}$ | $I_{DD2, SLEEP}$ | | - | - | 10 | μA |

Note 5: Brightness ($L_{br}$) and Supply Voltage for Display ($V_{PP}$) are subject to the change of the panel characteristics and the customer’s request.
Note 6: $V_{DD1}$= 5.0V, $V_{PP}$ generated by internal DC/DC convertor, 30% Display Area Turn on.
Note 7: $V_{DD1}$= 5.0V, $V_{PP}$ generated by internal DC/DC convertor, 50% Display Area Turn on.
Note 8: $V_{DD1}$= 5.0V, $V_{PP}$ generated by internal DC/DC convertor, 100% Display Area Turn on.
*Software configuration follows Section 5 Command Summary.

# 4. Reliability

| NO. | ITEM | CONDITION | | STANDARD | NOTE |
|---|---|---|---|---|---|
| 1 | High Temp. Storage | 90℃ | 240 hrs | Appearance<br>Without defect | |
| 2 | Low Temp. Storage | -40℃ | 240 hrs | Appearance<br>Without defect | |
| 3 | High Temp. & High Humi. Storage | 40℃<br>90% RH | 240 hrs | Appearance<br>Without defect | |
| 4 | High Temp.<br>Operating Display | 80℃ | 240 hrs | Appearance<br>Without defect | |
| 5 | Low Temp.<br>Operating Display | -30℃ | 240 hrs | Appearance<br>Without defect | |
| 6 | Thermal Shock | -30℃, 30min. → 80℃,30min.<br>↑ (1cycle) ← | | Appearance<br>Without defect | 200 cycles |

** Dissipation current, contrast and display functions
** Polarizing filter deterioration, other appearance defects
** The function test shall be conducted after 4hours storage at the normal temperature and humidity after remove from the test chamber.

# 5. Command Summary

**Introduction:**

1.Receive PC UART and transfer to LCM control signal. It also respond the external switch as UART to PC.

2.Baud Rate 115200

## Command Summary:

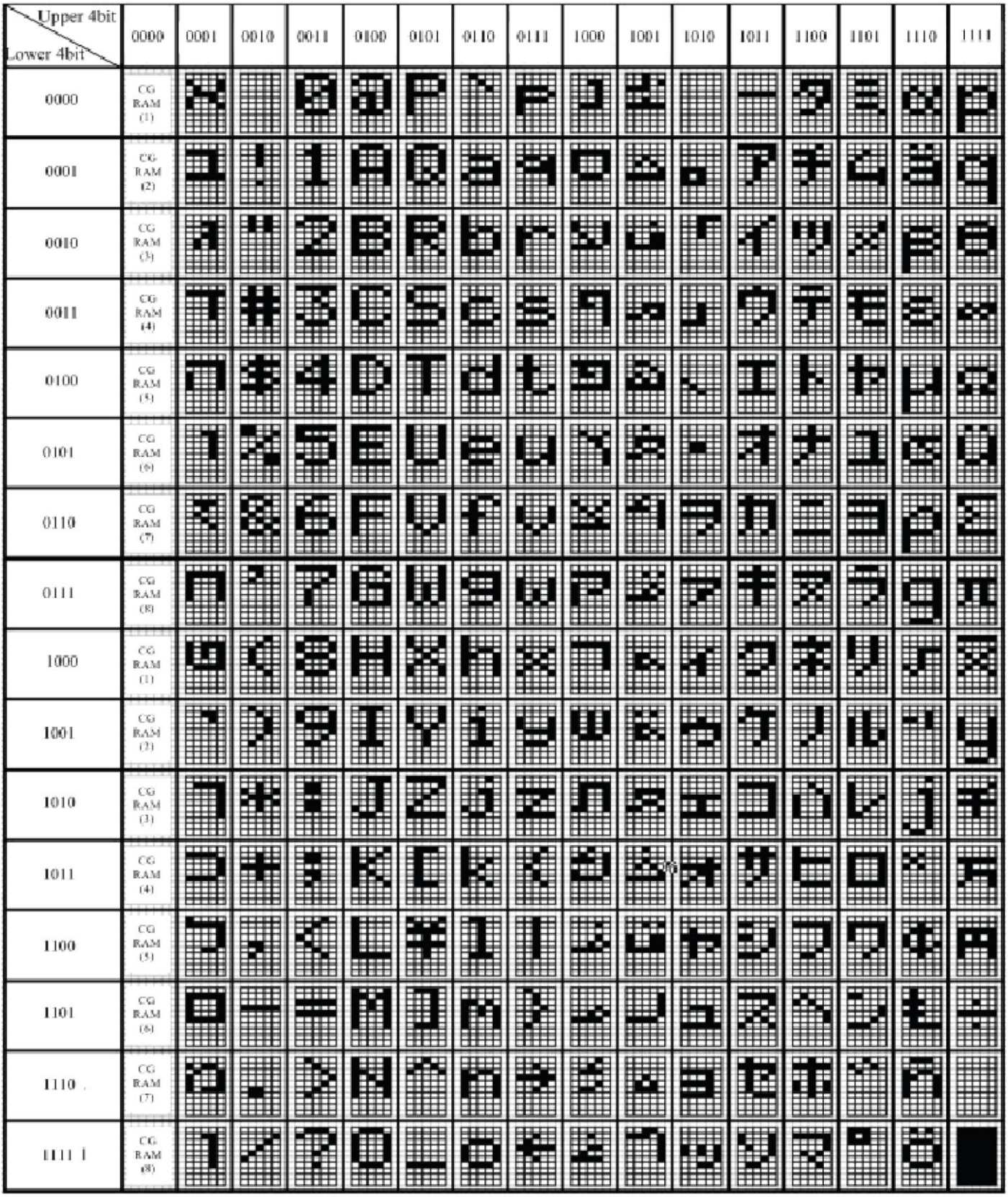
| Command | Syntax | Default | Description |
|---|---|---|---|
| Auto line wrap on | FE 43 FD | on | Enables line wrapping.<br>Character will wrap to first position of next line if it reaches the end of a line. |
| Auto line wrap off | FE 44 FD | N/A | Disables line wrapping.<br>Character will go to the first position of the original line if it reaches the end of a line. |
| Set text insertion point | FE 47 [col] [row] FD | N/A | Sets the text insertion point to [col] and [row].<br>[col] : 0x00 to 0x13<br>[row] : 0x00 to 0x03 |
| Set text insertion point home | FE 48 FD | N/A | Sets the text insertion point to [0] and [0]. |
| Underline cursor on | FE 4A [col] [row] FD | N/A | Turns on the underline cursor and sets it at location [col] and [row].<br>[col] : 0x00 to 0x13<br>[row] : 0x00 to 0x03 |
| Underline cursor off | FE 4B FD | N/A | Turns off the underline cursor. |
| Blinking Block cursor on | FE 59 [col] [row] FD | N/A | Turns on the blinking block cursor and sets it at Location [col] and [row].<br>[col] : 0x00 to 0x13<br>[row] : 0x00 to 0x03 |
| Blinking Block cursor off | FE 5A FD | N/A | Turn off the blinking block cursor. |
| Cursor left | FE 4C FD | N/A | Moves the underline cursor to left. It will move to the end of the same line if it reaches the beginning of a line |
| Cursor right | FE 4D FD | N/A | Moves the underline cursor to right. It will move to the beginning of the same line if it reaches the end of a line |
| Initial thick vertical bar graph | FE 76 FD | N/A | Initializes 5 pixels width as the vertical bar. |
| Initial thin vertical bar graph | FE 73 FD | N/A | Initializes 2 pixels width as the vertical bar. |

| | | | |
|---|---|---|---|
| Draw vertical bar graph | FE 3D [col] [height] FD | N/A | Draws vertical bar at position [col] of the last row with height [height].<br>[col] : 0x00 to 0x13<br>[height] : 0x00 to 0x10 |
| Erase vertical bar graph | FE 2D [col] FD | N/A | Erases vertical bar at position [col].<br>[col] : 0x00 to 0x13 |
| Initialize horizontal bar graph | FE 68 FD | N/A | Initialize horizontal bar graph. |
| Draw horizontal bar graph | FE 7C [col] [row] [len] FD | N/A | Draws horizontal bar at position [col] and [row] With length [length].<br>[length] ranges from [0x00] to [0x7A]. |
| Read Model Number | FE 30 FD | N/A | Reads 2 bytes back from LCD |
| Read Firmware Version | FE 31 FD | N/A | Reads 2 bytes back from LCD |
| Soft Reset | FE 56 FD | N/A | Resets |
| Clear display | FE 58 FD | N/A | Clears screen of LCD and places the text insertion point to top left. |
| Display on | FE 42 FD | on | Turns on the display |
| Display off | FE 46 FD | N/A | Turns off the display. |
| Set Contrast Control | FE 41 [Contrast] FD | 0x08 | Adjust LED Contrast.<br>[Contrast] : 0x01 to 0x08. |
| Auto key hold on | FE 32 FD | N/A | Auto key hold on. |
| Auto key hold off | FE 33 FD | N/A | Auto key hold off. |
| Set RS232 port speed | FE 39 [speed] FD | 115200 | Sets RS232 port speed.<br>[speed] : 0x00 to 0x06<br>0x00 = 115200<br>0x01 = 57600<br>0x02 = 38400<br>0x03 = 19200<br>0x04 = 9600<br>0x05 = 4800<br>0x06 = 2400 |
| Save user defined characters | FE 4F [cc] FD | N/A | Save user defined characters.<br>[cc] : 0x01 to 0x08.. |
| Define custom character | FE 4E [cc] [8 bytes] FD | N/A | Defines custom character.<br>[cc] : 0x01 to 0x08. |
| Load user defined characters | FE 50 [cc] FD | N/A | Load user defined characters.<br>[cc] : 0x01 to 0x08. |
| Save user settings | FE 53 [ud] [4 bytes] FD | N/A | Save user settings.<br>User is required to save 4 bytes at a time.<br>[ud] : 0x01 |

| | | | |
|---|---|---|---|
| Read user settings | FE 54 [ud] FD | N/A | Read user settings. 4 bytes are returned at each time<br>[ud] : 0x01 |
| Save custom startup screen | FE 40 [bb] [8bytes] FD | N/A | Save custom startup characters.<br>[bb] for LCM0802 : 0x00 to 0x01<br>[bb] for LCM1202 : 0x00 to 0x02<br>[bb] for LCM1602 : 0x00 to 0x03<br>[bb] for LCM2002 : 0x00 to 0x04 |
| Set LCM for 16x02 | FE 34 FD | 16x02 | Set LCM for 16x02 |
| Set LCM for 20x02 | FE 35 FD | N/A | Set LCM for 20x02 |
| Set LCM for 12x02 | FE 36 FD | N/A | Set LCM for 12x02 |
| Set LCM for 08x02 | FE 37 FD | N/A | Set LCM for 08x02 |
| Set LCM for 20x04 | FE 38 FD | N/A | Set LCM for 20x04 |

## Character Pattern

ENGLISH_JAPANESE CHARACTER FONT TABLE (FT[1:0] = [0:0])



# 6. NOTES

▪ Safety

- If the LCD panel breaks, be careful not to get the liquid crystal in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and plenty of water.

Handling

- Avoid static electricity as this can damage the CMOS LSI.
- The LCD panel is plate glass; do not hit or crush it.
- Do not remove the panel or frame from the module.
- The polarizing plate of the display is very fragile; handle it very carefully

Mounting and Design

- Mount the module by using the specified mounting part and holes.
- To protect the module from external pressure, leave a small gap by placing transparent plates (e.g. acrylic or glass ) on the display surface, frame, and polarizing plate
- Design the system so that no input signal is given unless the power-supply voltage is applied.
- Keep the module dry. Avoid condensation, otherwise the transparent electrodes may break.

Storage

- Store the module in a dark place where the temperature is 25 °C±10 °C and the humidity below 65% RH.
- Do not store the module near organic solvents or corrosive gases.
- Do not crush, shake, or jolt the module (including accessories).

Cleaning

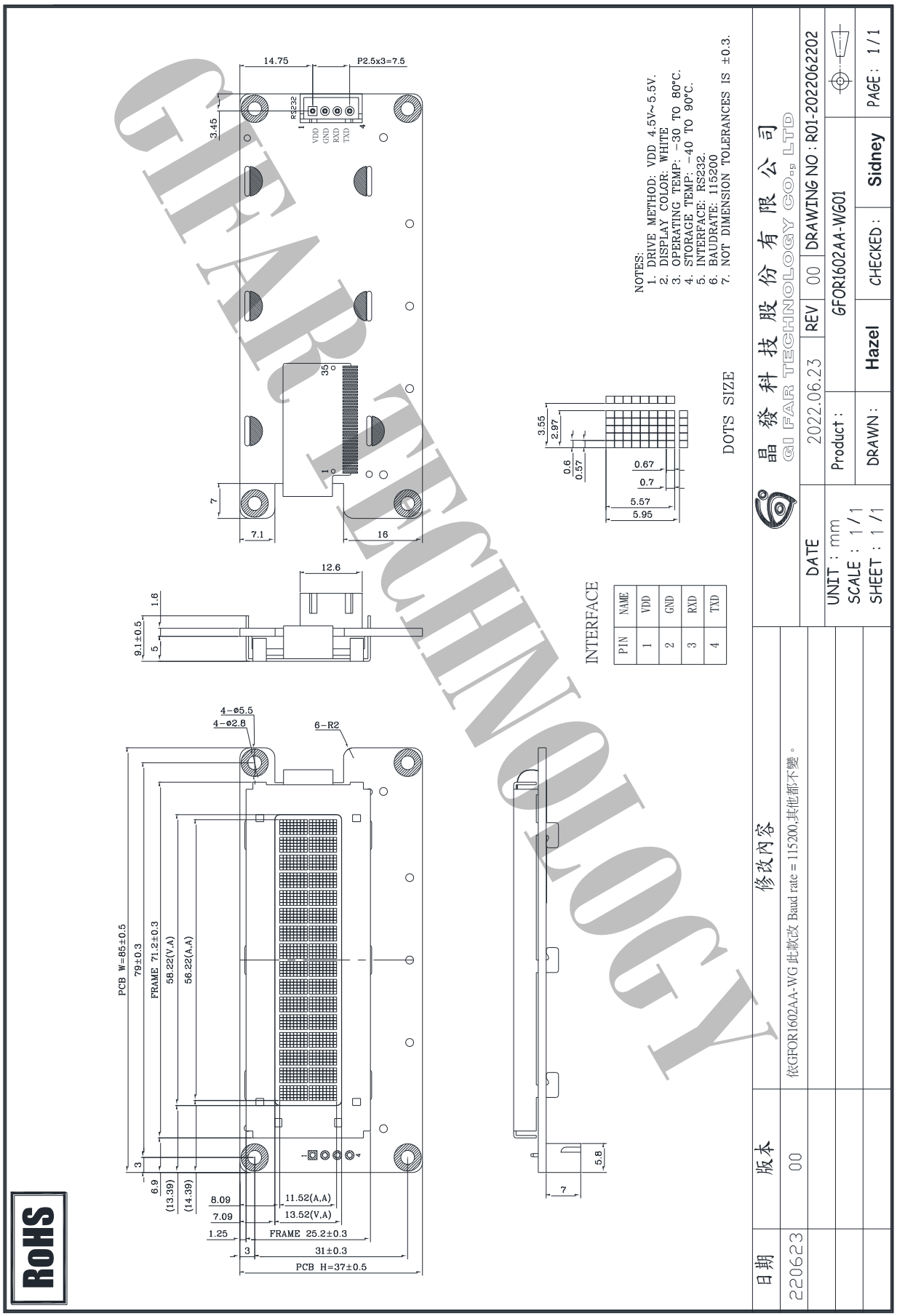
- Do not wipe the polarizing plate with a dry cloth, as it may scratch the surface.
- Wipe the module gently with soft cloth soaked with a petroleum benzine.
- Do not use ketonic solvents (ketone and acetoe) or aromatic solvents (toluene and xylene), as they may damage the polarizing plate.

# 7. OPERATION PRECAUTIONS

Any changes that need to be made in this specification or any problems arising from it will be dealt with quickly by discussion between both companies.

Quality warranty period: Within one year after shipment date (excluding abnormal usage way and abnormal environments.)

# 8. Mechanical Drawing



# 9. Inspection Standard

9.1 Environment Required

Customer's test & measurement are required to be conducted under the following conditions:

| | |
|---|---|
| Temperature | : 23 ± 5°C |
| Humidity | : 55 ± 15% RH |
| Fluorescent Lamp | : 30W |
| Distance between the Panel & Lamp | : ≧ 50cm |
| Distance between the Panel & Eyes of the Inspector | : ≧ 30cm |

Finger glove (or finger cover) must be worn by the inspector.

Inspection table or jig must be anti-electrostatic.

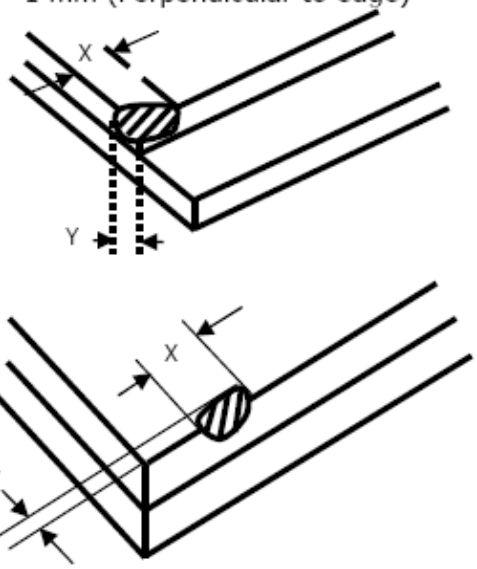
9.2 Sampling Plan

Level II, Normal Inspection, Single Sampling, MIL-STD-105E

9.3 Criteria & Acceptable Quality Level

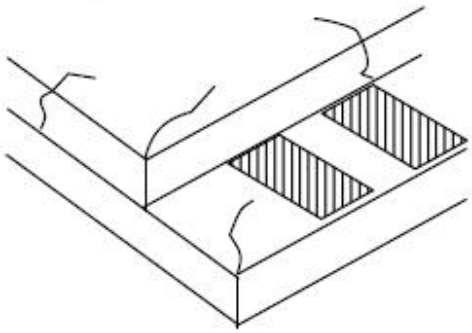
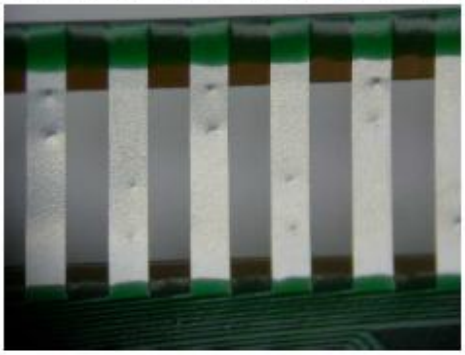
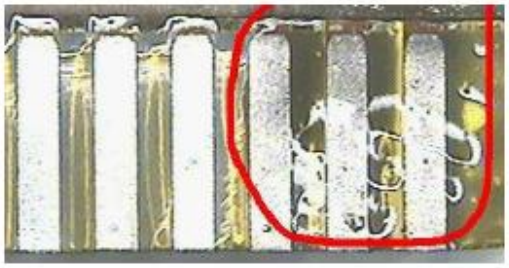
| Partition | AQL | Definition |
|---|---|---|
| Major | 0.65 | Defects in Pattern Check (Display On) |
| Minor | 1.0 | Defects in Cosmetic Check (Display Off) |

9.3.1 Cosmetic Check (Display Off) in Non-Active Area

| Check Item | Classification | Criteria |
|---|---|---|
| Panel General Chipping | Minor | X > 6 mm (Along with Edge)<br>Y > 1 mm (Perpendicular to edge)<br>  |

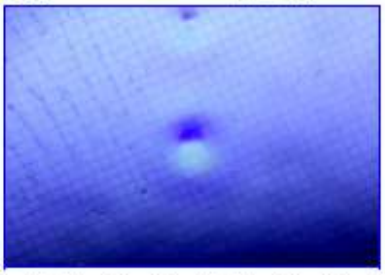


9.3.1 Cosmetic Check (Display Off) in Non-Active Area (Continued)

| Check Item | Classification | Criteria |
|---|---|---|
| Panel Crack | Minor | Any crack is not allowable.  |
| Copper Exposed (Even Pin or Film) | Minor | Not Allowable by Naked Eye Inspection |
| Film or Trace Damage | Minor |  |
| Terminal Lead Prober Mark | Acceptable |  |
| Glue or Contamination on Pin (Couldn't Be Removed by Alcohol) | Minor |  |
| Ink Marking on Back Side of panel (Exclude on Film) | Acceptable | Ignore for Any |

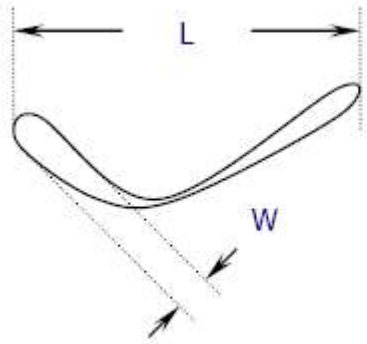
9.3.2 Cosmetic Check (Display Off) in Active Area

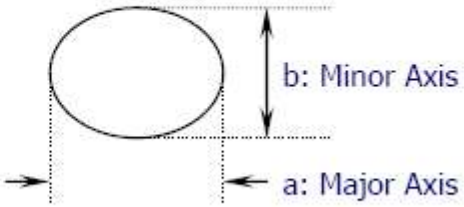
It is recommended to execute in clear room environment (class 10k) if actual in necessary.

| Check Item | Classification | Criteria |
|---|---|---|
| Any Dirt & Scratch on Polarizer's Protective Film | Acceptable | Ignore for not Affect the Polarizer |
| Scratches, Fiber, Line-Shape Defect (On Polarizer) | Minor | $W \le 0.1$ Ignore<br>$W > 0.1$<br>$L \le 2$ $n \le 1$<br>$L > 2$ $n = 0$ |
| Dirt, Black Spot, Foreign Material, (On Polarizer) | Minor | $\Phi \le 0.1$ Ignore<br>$0.1 < \Phi \le 0.25$ $n \le 1$<br>$0.25 < \Phi$ $n = 0$ |
| Dent, Bubbles, White spot (Any Transparent Spot on Polarizer) | Minor | $\Phi \le 0.5$<br>➔ Ignore if no Influence on Display<br>$0.5 < \Phi$ $n = 0$<br>  |
| Fingerprint, Flow Mark (On Polarizer) | Minor | Not Allowable |

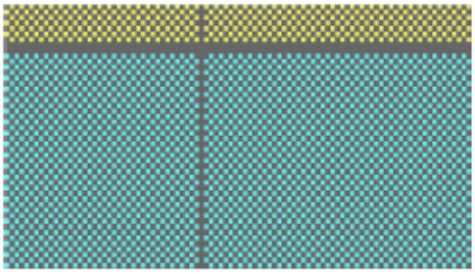
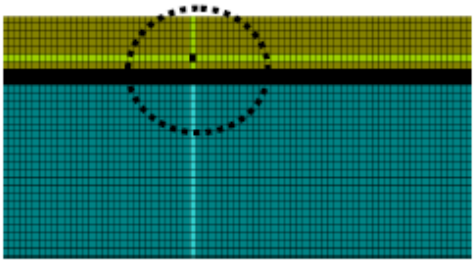
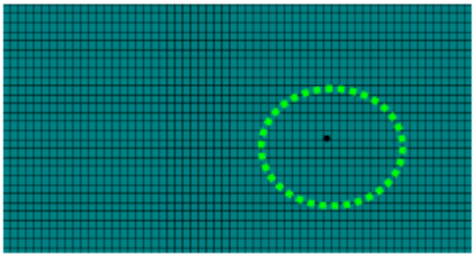
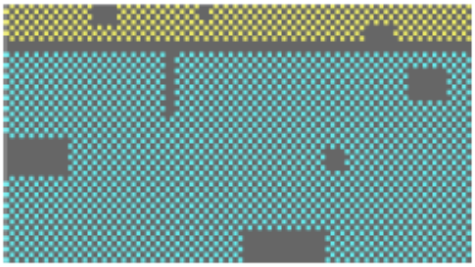
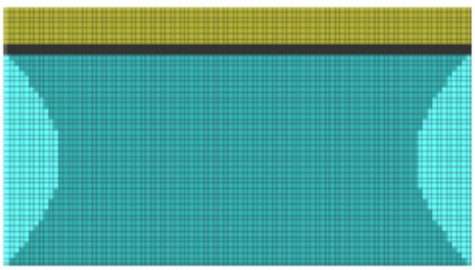
* Protective film should not be tear off when cosmetic check.

** Definition of W & L & Y (Unit: mm): Y = (a + b) / 2



9.3.3 Pattern Check (Display On) in Active Area

| Check Item | Classification | Criteria |
|---|---|---|
| No Display | Major |  |
| Missing Line | Major |  |
| Pixel Short | Major |  |
| Darker Pixel | Major |  |
| Wrong Display | Major |  |
| Un-uniform | Major |  |

# 10. PACKAGE INFORMATION

| | | | |
|---|---|---|---|
| 1 | 1 Tray | : | 20 pcs (modules) |
| 2 | 1 stack | : | 8 tray + 1 Cover tray |
| 3 | 1 Carton | : | ( 1 Cover tray + 8 tray )x 2 stack |
| 4 | Total pcs | : | 1 Carton ( 20 pcs* 8 tray * 2 stack) = 320 pcs |
| 5 | Carton size = NO. 17 | : | 495 * 315 * 435mm |
| 7 | Net weight | : | TBD KG |
| 8 | Gross weight | : | TBD KG |

** 包裝示意圖片

- 一個 tray 盤 可放 20PCS 模組
- 8 盤+1 空盤=1 疊，一箱可放入 2 疊，TRAY 盤上、下兩層需交叉堆疊放置

- 使用 17 號箱，可放入 2 疊，並使用防震材將旁邊空隙填滿