






# SPECIFICATIONS

**CUSTOMER** : \_\_\_\_\_  
**MODEL NO.** : **GFOC2002D-YG**  
**VERSION** : **B**  
**DATE** : **2023.02.23**  
**CERTIFICATION** : **ROHS**

Customer Sign	Approved By	Prepared By	Prepared By
			

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## Revision Record

Data(y/m/d)	Ver.	Description	page
2020.09.01	A	PCB 自製	
2023.02.23	B	更新公司抬頭認證圖示	



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## Functions and Features

- 2 lines x 20 characters
- Built-in controller
- Parallel or serial MPU interface (Default 6800 MPU parallel)
- +4V ~ +5.3V Power Supply (V1\_OPT="H")
- viewing angle "Free"
- Wide Temperature -40°C ~ +85°C (Operating)
- Sunlight Readable Technology
- RoHS compliant
- Built-in CGROM : ENGLISH\_JAPANESE CHARACTER FONT (Default)



## 1. Mechanical Specification

Item	Description	Unit
Active Area	73.52(W)×11.52(H)	mm
Module Size	116.0(W)×37.0(H)	mm
Display Format	20 characters (W)×2 lines (H)	
Controller	ST7066 or Equivalent	
Interface	6800 8Bit / 4Bit (STD) I2C (Option) · SPI (Option)	

### ※Precautions in use of OLED Modules

- ①. Don't disassemble , drop, bend or twist the OLED Module.
- ②. Don't operate it above the absolute maximum rating.
- ③. Don't modify its shape or change the components of OLED module.
- ④. Storage: please storage in anti-static electricity container and clean environment.
- ⑤. PITEK have the right to change the passive components and PCB Rev.



## 2. Pin Description

Parallel Interface (default):

Pin No.	Symbol	Level	Description
1	VSS	0V	Ground
2	VDD	5V	Supply Voltage for OLED and logic
3	NC	—	No Connect
4	RS	H/L	Register select signal. H: DATA, L: Command
5	R/W#	H/L	Read/Write select signal, R/W=1: Read(MPU←Module) R/W: =0: Write(MPU→Module)
6	E	H,H→L	Operation enable signal. Falling edge triggered.
7   14	DB0   DB7	H/L	Data bus lines
15-16	NC	—	No Connect



### 3. DC Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply for Logic	VDD	(Wide Voltage I/O Application)	4	5.0	5.3	Volt
Input Voltage for I/O Pins	V <sub>i</sub>	(Wide Voltage I/O Application)	4	5.0	5.3	Volt
Input Voltage	V <sub>IL</sub>	L level	0	-	0.3 VDD	Volt
Input Voltage	V <sub>IH</sub>	H level	0.7 VDD	-	VDD	Volt
Output Voltage	V <sub>OL</sub>	L level	0	-	0.3 VDD	
Output Voltage	V <sub>OH</sub>	H level	0.7 VDD	-	VDD	
Power Supply Current for OLED	IDD	Note		35		mA
Sleep Mode Current for VDD	IDD,SLEEP			10		μA

Note: VDD = 5.0V, 25% Display Area Turn on.100 cd/ m<sup>2</sup>

When random texts pattern is running, averagely, about 1/4 of pixels will be on.

### 4. Optical Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Viewing angle range			Free		Degree
Dark Room Contrast	Cr		>10,000:1		
Brightness	Lbr		100		cd/m <sup>2</sup>
C.I.E. (Yellow)	C.I.E 1931	X=0.43 Y=0.45	X=0.47 Y=0.49	X=0.51 Y=0.53	



## 5. Electrical Absolute Ratings

Item	Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply for Logic	VDD	-	5.0	5.5	Volt	1,2
Input Voltage for I/O Pins	VI	-	5.0	5.5	Volt	1,2
Life Time (100 cd/m <sup>2</sup> )			100,000		Hours	3

Note 1: All the above voltages are on the basis of "VSS = 0V".

Note 2: When this module is used beyond the above absolute maximum ratings, permanent breakage of the module may occur.

Note 3: VDD1= VDD2= 5.0V, VPP generated by internal DC/DC convertor. Ta = 25°C, 50% Checkerboard.

Software configuration follows Section 4.5.1 Initialization.

End of lifetime is specified as 50% of initial brightness reached. The average operating lifetime at room temperature is estimated by the accelerated operation at high temperature conditions.

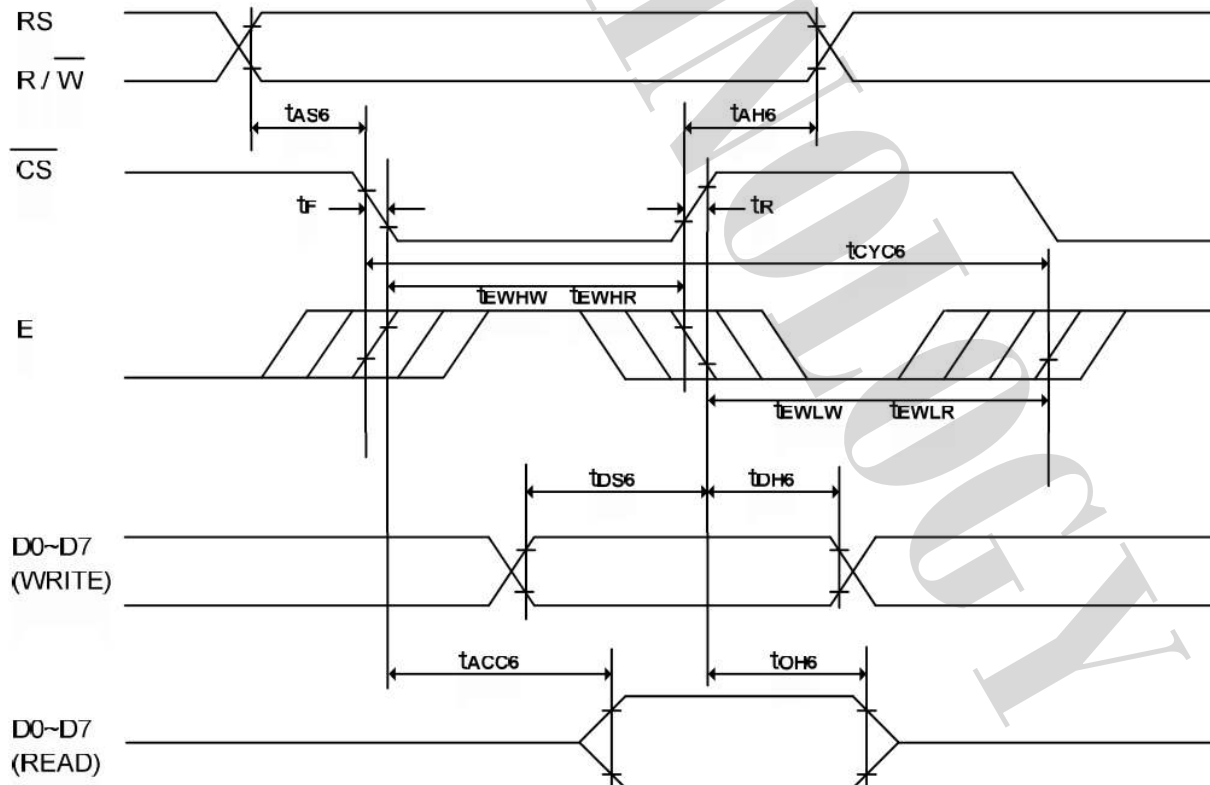


## 6. AC Characteristics

### 68XX-Series MPU Parallel Interface Timing Characteristics

Symbol	Description	Min	Max	Unit
$t_{CYC6}$	System cycle time	500	-	ns
$t_{AS6}$	Address setup time	0	-	ns
$t_{AH6}$	Address hold time	0	-	ns
$t_{DS6}$	Data setup time	66	-	ns
$t_{DH6}$	Data hold time	25	-	ns
$t_{OH6}$	Output disable time ( $C_L = 100pF$ )	16	140	ns
$t_{ACC6}$	Access time ( $C_L = 100pF$ )	-	280	ns
$t_{EWHW}$	Enable H pulse width (Write)	166	-	ns
$t_{EWHR}$	Enable H pulse width (Read)	200	-	ns
$t_{EWLW}$	Enable L pulse width (Write)	166	-	ns
$t_{EWLR}$	Enable L pulse width (Read)	166	-	ns
$t_R$	Rise time	-	25	ns
$t_F$	Fall time	-	25	ns

\* ( $V_{DD1} = 2.2 - 5.5V$ ,  $T_A = +25^\circ C$ )







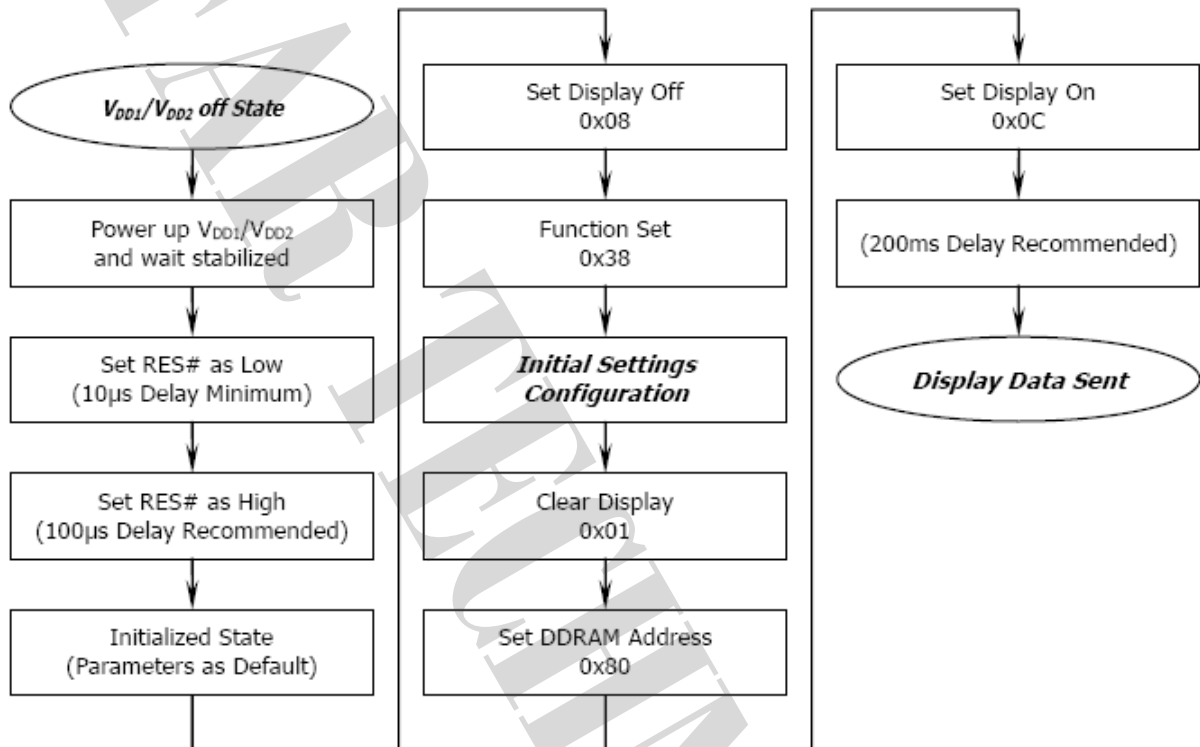
## 7. Initializing of OLED Module

### 7.1 Actual Application Example

Command usage and explanation of an actual example

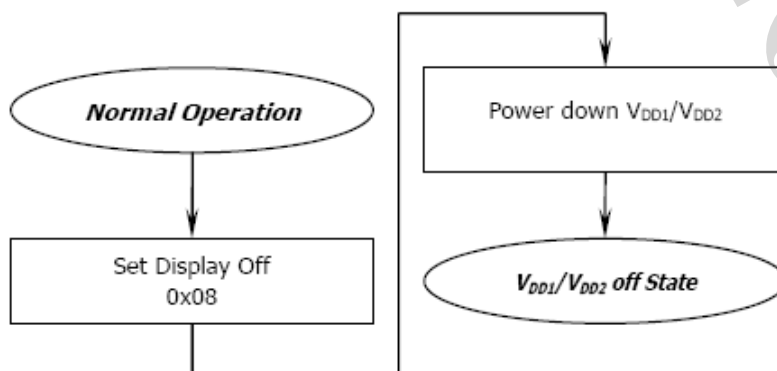
#### 7.1.1 VPP Generated by Internal DC/DC Circuit

<Power up Sequence>



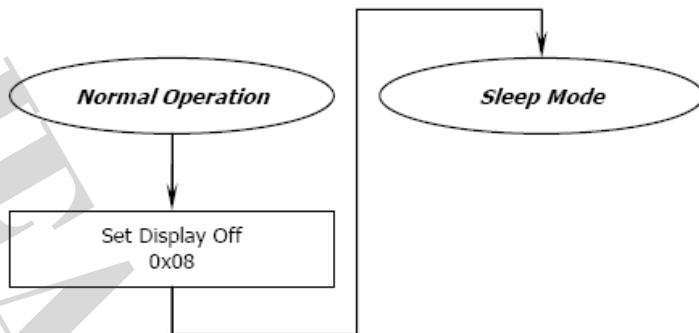
If the noise is accidentally occurred at the displaying window during the operation, please reset the display in order to recover the display function.

<Power down Sequence>

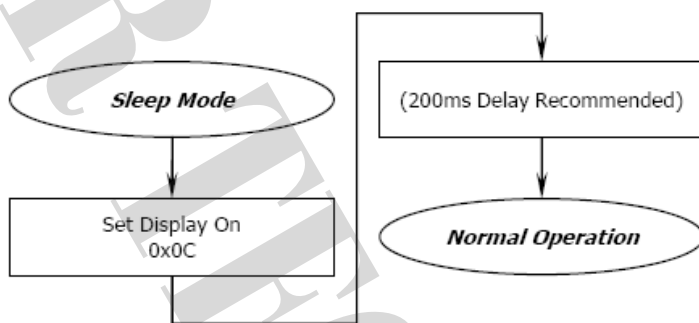




<Entering Sleep Mode>



<Exiting Sleep Mode>





## 8. Built-in CGROM (Character Generator ROM)

ENGLISH\_JAPANESE CHARACTER FONT TABLE (FT[1:0] = [0:0])

Upper 4bit \ Lower 4bit	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0001	CG RAM (2)	コ	ク	ケ	コ	カ	キ	ク	ケ	コ	カ	キ	ク	ケ	コ	カ
0010	CG RAM (3)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0011	CG RAM (4)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0100	CG RAM (5)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0101	CG RAM (6)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0110	CG RAM (7)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
0111	CG RAM (8)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1000	CG RAM (9)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1001	CG RAM (10)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1010	CG RAM (11)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1011	CG RAM (12)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1100	CG RAM (13)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1101	CG RAM (14)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1110	CG RAM (15)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五
1111	CG RAM (16)	ア	イ	ウ	エ	オ	カ	キ	ク	ケ	コ	一	二	三	四	五



WESTERN EUROPEAN CHARACTER FONT TABLE I (FT[1:0]=01)

Upper 4bit Lower 4bit	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)															
0001	CG RAM (2)															
0010	CG RAM (3)															
0011	CG RAM (4)															
0100	CG RAM (5)															
0101	CG RAM (6)															
0110	CG RAM (7)															
0111	CG RAM (8)															
1000	CG RAM (9)															
1001	CG RAM (2)															
1010	CG RAM (3)															
1011	CG RAM (4)															
1100	CG RAM (5)															
1101	CG RAM (6)															
1110	CG RAM (7)															
1111	CG RAM (8)															



ENGLISH\_RUSSIAN CHARACTER FONT TABLE(FT[1:0]=10)

Upper 4bit \ Lower 4bit	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (15)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
0001	CG RAM (21)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
0010	CG RAM (3)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
0011	CG RAM (41)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
0100	CG RAM (51)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
0101	CG RAM (61)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
0110	CG RAM (71)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
0111	CG RAM (81)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
1000	CG RAM (91)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
1001	CG RAM (2)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
1010	CG RAM (32)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
1011	CG RAM (42)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
1100	CG RAM (52)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
1101	CG RAM (62)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о
1110	CG RAM (72)	А	В	С	Д	Е	Ж	З	И	Й	К	Л	М	Н	О	П
1111	CG RAM (82)	а	б	в	г	д	е	ж	з	и	й	к	л	м	н	о



WESTERN EUROPEAN CHARACTER FONT TABLE II (FT[1:0]=11)

Upper 4bit Lower 4bit	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100	1101	1110	1111
0000	CG RAM (1)	士	田	田	P	P	P	P	田	田	田	田	田	田	田	田
0001	CG RAM (2)	三	!	1	田	田	田	田	田	田	田	田	J	田	田	田
0010	CG RAM (3)	田	"	田	田	田	田	田	田	田	田	田	田	田	田	田
0011	CG RAM (4)	田	#	田	田	田	田	田	田	田	田	田	P	田	田	田
0100	CG RAM (5)	田	田	田	D	T	田	田	田	田	田	田	田	田	田	田
0101	CG RAM (6)	田	田	田	E	U	田	田	田	田	田	田	田	田	田	田
0110	CG RAM (7)	田	田	田	F	V	田	田	田	田	田	田	田	田	田	田
0111	CG RAM (8)	田	田	田	G	W	田	田	田	田	田	田	田	田	田	田
1000	CG RAM (9)	田	田	田	H	田	田	田	田	田	田	田	田	田	田	田
1001	CG RAM (10)	田	田	田	I	Y	田	田	田	田	田	田	田	田	田	田
1010	CG RAM (11)	田	田	田	J	Z	田	田	田	田	田	田	田	田	田	田
1011	CG RAM (12)	田	田	田	K	田	田	田	田	田	田	田	田	田	田	田
1100	CG RAM (13)	田	田	田	L	田	田	田	田	田	田	田	田	田	田	田
1101	CG RAM (14)	田	田	田	田	田	田	田	田	田	田	田	田	田	田	田
1110	CG RAM (15)	田	田	田	田	田	田	田	田	田	田	田	田	田	田	田
1111	CG RAM (16)	田	田	田	田	田	田	田	田	田	田	田	田	田	田	田



## 9. Reliability

NO.	ITEM	CONDITION		STANDARD	NOTE
1	High Temp. Storage	40°C	120 hrs	Appearance Without defect	
2	Low Temp. Storage	-90°C	120 hrs	Appearance Without defect	
3	High Temp. & High Humi. Storage	40°C 90% RH	120 hrs	Appearance Without defect	
4	High Temp. Operating Display	85°C	120 hrs	Appearance Without defect	
5	Low Temp. Operating Display	-40°C	120 hrs	Appearance Without defect	
6	Thermal Shock	-40°C, 30min. → 85°C, 30min. ↑ (1cycle)		Appearance Without defect	10 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.



## 10. 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  $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$  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 acetone) or aromatic solvents (toluene and xylene), as they may damage the polarizing plate.

## 11. OPERATION PRECAUTIONS

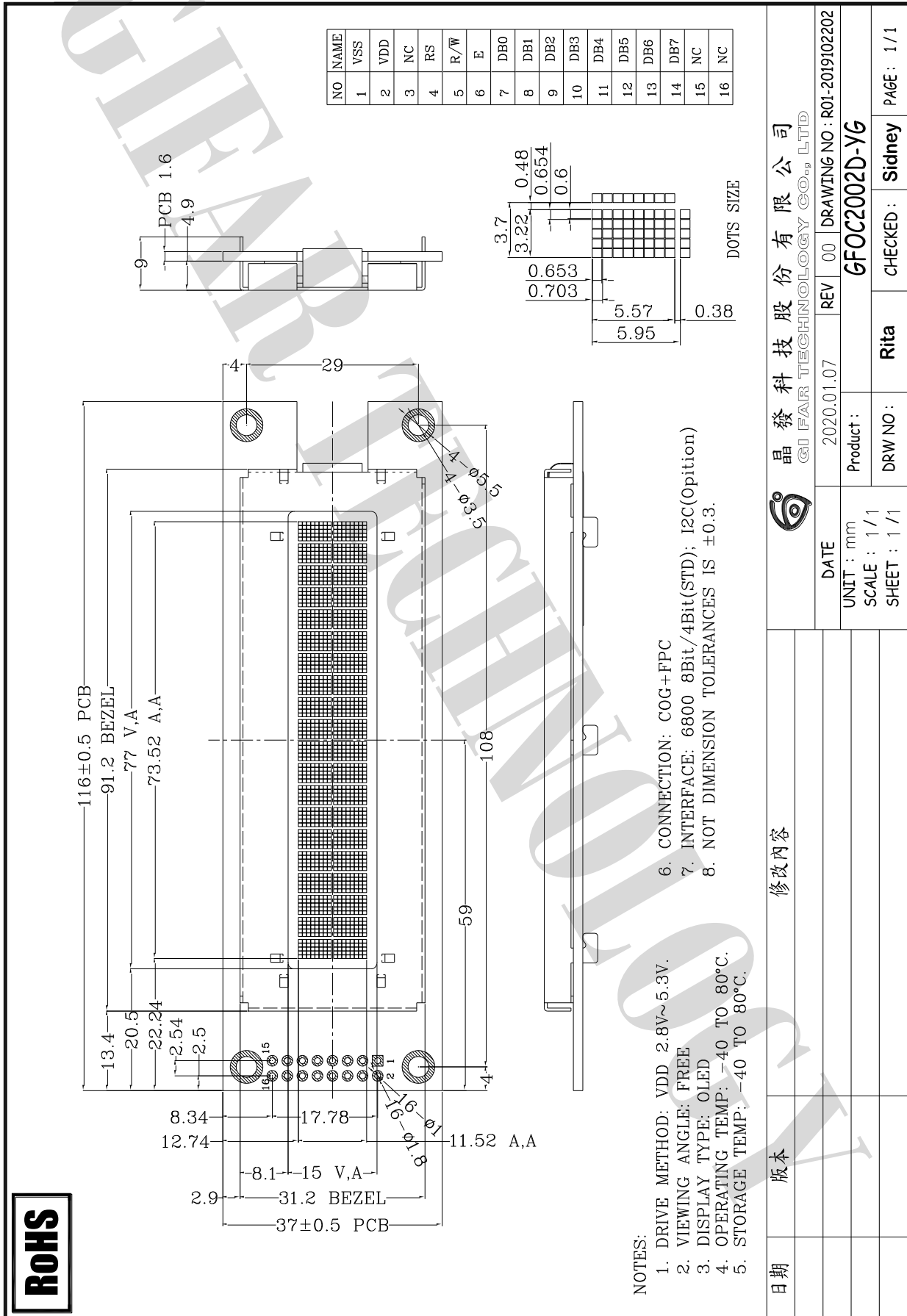
Any changes that need to be made in this specification or any problems arising from it will be dealt with quickly by discussion between both companies.

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





## 12. Mechanical Drawing





## 13. Outgoing Quality Control Specifications

### 13.1 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:	≥ 50 cm
Distance between the Panel & Eyes of the Inspector:	≥ 30 cm
Finger glove (or finger cover) must be worn by the inspector.	
Inspection table or jig must be anti-electrostatic.	

### 13.2 Sampling Plan

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

### 13.3 Criteria & Acceptable Quality Level

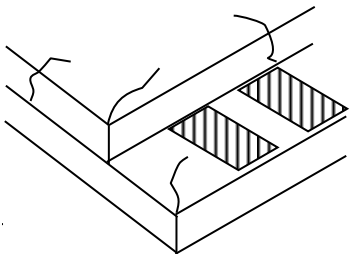

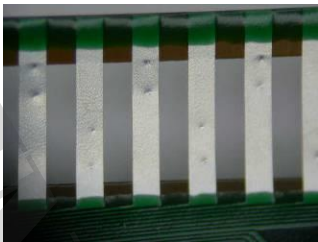
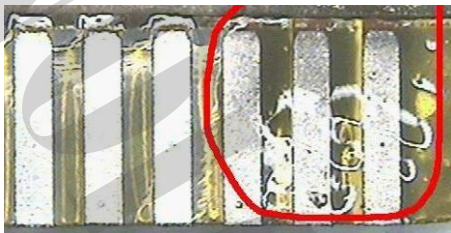
Partition	AQL	Definition
Major	0.65	Defects in Pattern Check (Display On)
Minor	1.0	Defects in Cosmetic Check (Display Off)

#### 13.3.1 Cosmetic Check (Display Off) in Non-Active Area

Check Item	Classification	Criteria
Panel General Chipping	Minor	<p>X &gt; 6 mm (Along with Edge) Y &gt; 1 mm (Perpendicular to edge)</p>

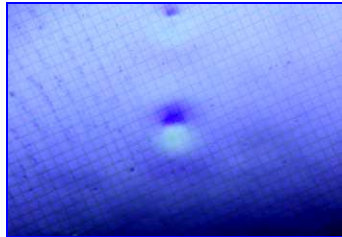


13.3.1 Cosmetic Check (Display Off) in Non-Active Area (Continued)

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

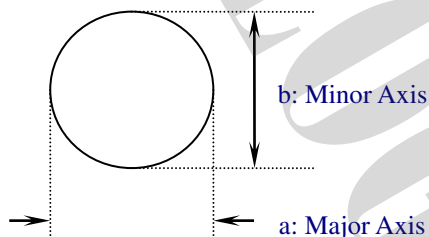
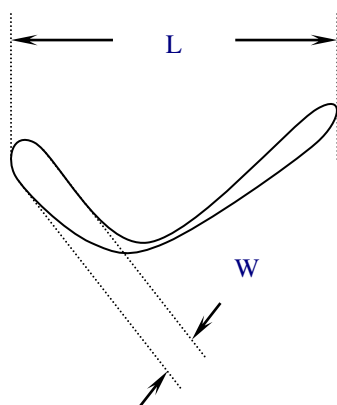


13.3.2 Cosmetic Check (Display Off) in Active Area

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	$W \leq 0.1$ Ignore $W > 0.1,$ $L \leq 2$ $n \leq 1$ $L > 2$ $n = 0$
Dirt, Black Spot, Foreign Material, (On Polarizer)	Minor	$\Phi \leq 0.1$ Ignore $0.1 < \Phi \leq 0.25$ $n \leq 1$ $0.25 < \Phi$ $n = 0$
Dent, Bubbles, White spot (Any Transparent Spot on Polarizer)	Minor	$\Phi \leq 0.5$ → Ignore if no Influence on Display $0.5 < \Phi$ $n = 0$ 
Fingerprint, Flow Mark (On Polarizer)	Minor	Not Allowable

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

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





13.3.3 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	