

COG MODULE

Products & Designing

Ver. 3.1

7, Jun, 2001

Features:

- * Display formats can be customized according to your request.
- * Shorter lead time.
- * With a small & slim chip COG, we have realized compact, thinner and lighter design.
- * Various types of interfaces (Pin, Heat-seal, FPC, etc.) are available, according to your requirements.
- * LCD controller included.
- * Low power consumption.
- * Any manufacturer's LCD driver (Epson, Fuji Electric, Hitachi, JRC, NEC, Oki, Phillips, SII, etc.) is available.

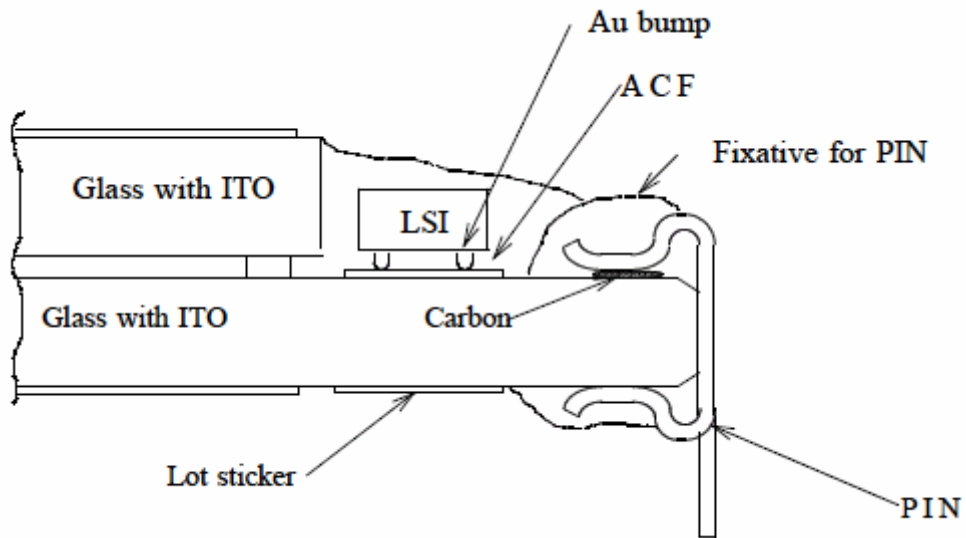


NANOX CORPORATION

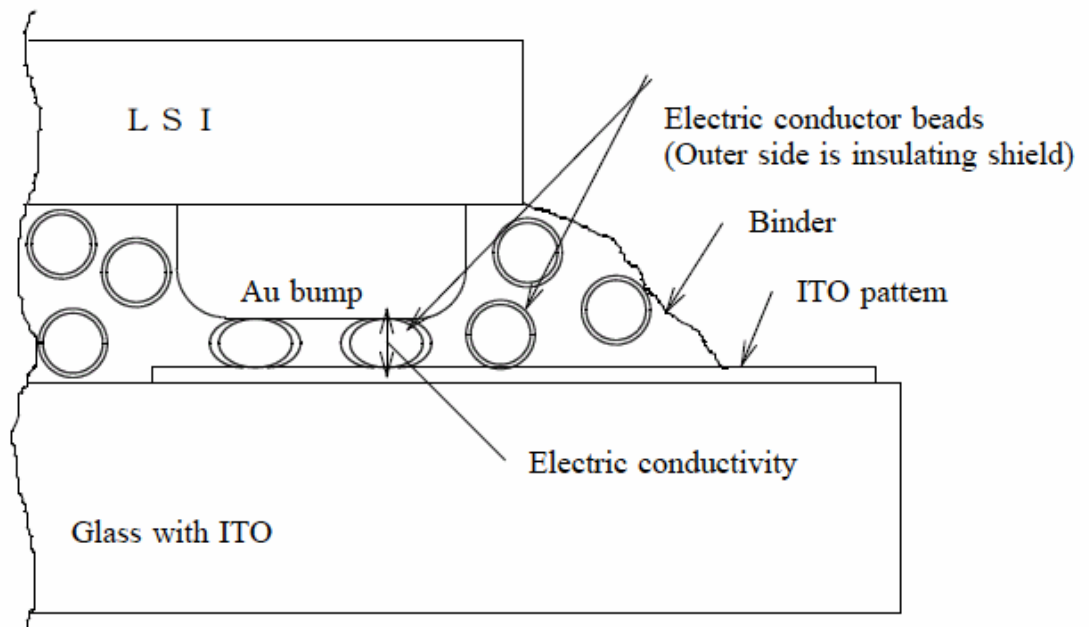
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1 , Structure of COG Module



2 , Principle of connection to LSI and LCD



A C F (Anisotropy Conductive Film)

ACF is a film that contains binder and electric conductor beads. When electric conductor beads are compressed, there will be electric conductivity between LSI and LCD.

For the ACF system, we can use most IC chips in the market if the IC chip already has Au Bump.

Most of IC companies line up those IC chips as standard.

We as well as most manufacturers of COG products use ACF system.

3, Types of COG I/F

(1)PIN type

Solder plated pin can be soldered directly to PCB.

The pin pitch is compatible with glass thickness such as 1.1mm, 0.7mm, 1.5mm and 1.8mm.

The maximum pin length is 30mm. With bending the pin, it can be easily soldered to PCB by SMT.

Since there is no need for connectors, it is a good solution for cost reduction.

(2)Heat seal type

Heat seal is a flexible cable. (polyester sheet)

Wiring is already applied on the cable.

(The connector area is coated with silver on carbon.)

With the reinforcement plate, it can be connected to the connector. (We recommend using ZIF type connectors.) We can customize for terminal pitch and cable length. (We have some NANOX standard for pitch and length.)

(3)FPC type

FPC is a flexible cable which is made with polyimide film and copper wires.

For reinforcement plate type, it can connect to the connector. (We recommend using ZIF type connectors.)

For open cut type, it can be soldered directly to the PCB.

We can offer the customized pitch of terminals and cabling length for our customers.

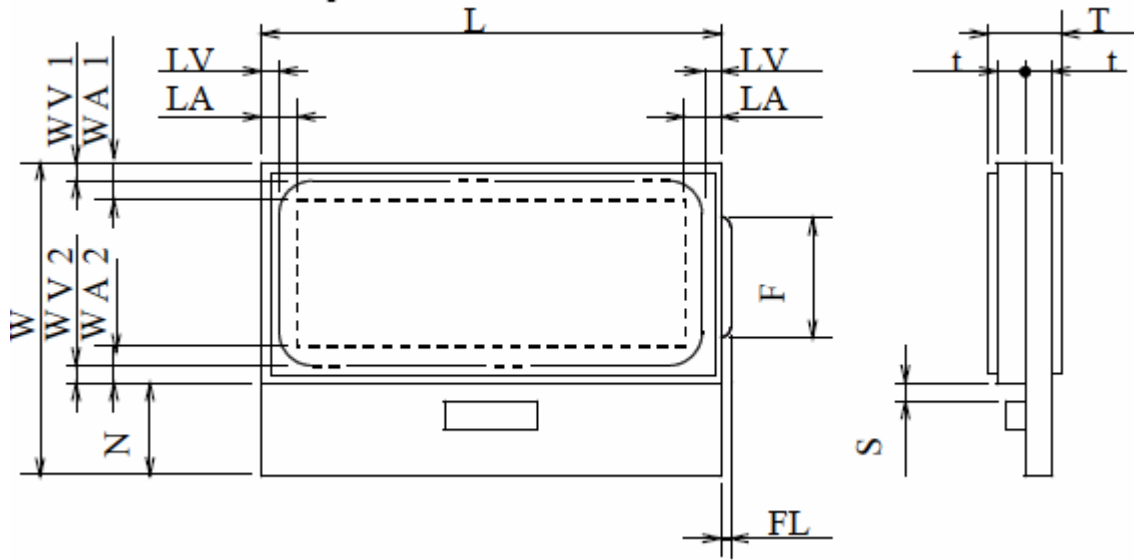
If the product needs fine pitch (ex, for graphic use, etc.), we recommend Heat seal type or FPC type. (The pitch of Heat seal and FPC is usually 1.0mm or 0.5mm.)

Otherwise we recommend pin type. (low cost)

4 , Example for application

Display Contents	LCD Type	Application
Mobile telephones	Graphic type	1 3 2 × 3 3 dots 1 3 2 × 4 9 dots 1 3 2 × 5 3 dots 1 3 2 × 5 5 dots 1 3 2 × 6 5 dots
Cordless telephone	Character type Semi-Graphic type Full-Graphic type	1 6 Characters × 2 line + I C O N 1 6 Characters × 3 line + I C O N 9 7 × 3 3 dots 1 0 2 × 6 5 dots 1 2 0 × 5 2 dots(With Kanji ROM) 1 3 2 × 4 9 dots
Regular telephone	Character type Graphic type	1 6 Characters × 2 line 1 6 Characters × 3 line + I C O N 1 6 Characters × 4 line 2 0 Characters × 2 line 1 2 0 × 5 2 dots(With Kanji ROM) 1 3 2 × 6 5 dots
FAX Printer	Character type Graphic type	1 6 Characters × 1 line 1 6 Characters × 2 line 2 0 Characters × 2 line 1 3 2 × 6 5 dots 1 6 8 × 6 5 dots 2 6 4 × 6 5 dots (2 Chip)
POS terminal	Graphic type	1 3 2 × 3 3 dots 1 3 2 × 4 9 dots 1 3 2 × 5 3 dots 1 3 2 × 6 5 dots
Audio Stereo MP3	Character type Graphic type	1 2 Characters × 2 line + I C O N 1 6 Characters × 2 line + I C O N 1 3 2 × 3 3 dots 1 3 2 × 6 5 dots
Educational equipment	Graphic type	1 3 2 × 3 3 dots 1 3 2 × 6 5 dots 2 6 4 × 6 5 dots (2 Chip)
Computer relations	Character type Graphic type	1 6 Characters × 2 line + I C O N 120 × 5 2 dots (With Kanji ROM) 1 3 2 × 6 5 dots
Games	Graphic type	1 3 2 × 6 5 dots

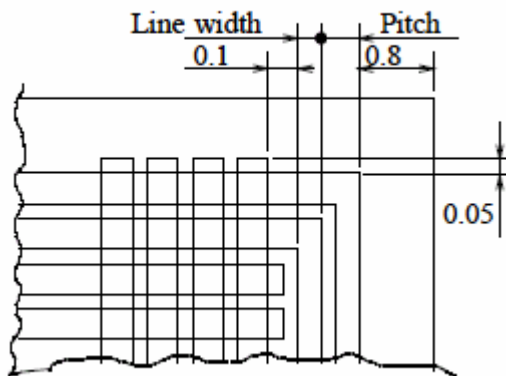
5, Design limitation
 (1) LCD panel



Notice) Outer dimension: MIN. 30(L)× 20(W)×0.5(t)mm
 MAX. 120(L)×100(W)×1.1(t)mm

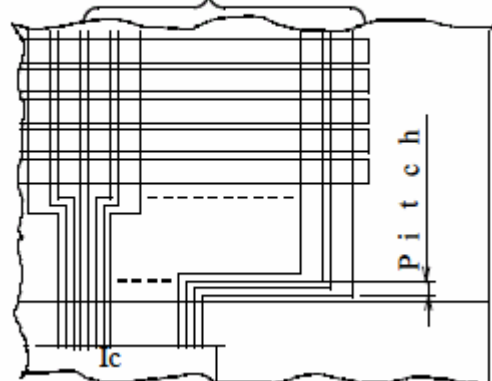
L×W	less than 45.0×30.0 mm	More than 45.0×30.0mm
LV	M I N. 1. 5	M I N. 2. 0
LA *1	$\text{Pitch} \times 0.13 \times (n-1) + 0.1(\text{Line Width}) + 0.1 + 0.8$ n = Wiring Qty of COM	$\text{Pitch} \times 0.18 \times (n-1) + 0.15(\text{Line Width}) + 0.1 + 0.8$ n = Wiring Qty of COM
WV1	M I N. 1. 5	M I N. 2. 0
WV2	M I N. 2. 0	M I N. 2. 0
WA1	M I N. 3. 0	M I N. 3. 0
WA2 *2	Pitch $0.13 \times (\text{SEG Wiring Qty} \div 2) - 0.03 + 0.1$	
N	Character type: 6.5~8.0mm Graphic type: 6.5~10.0mm	
S	M I N. 1. 0	
t	0. 5, 0. 55, 0. 7, 1. 1	

* 1



*2

(SEG Wiring Qty ÷ 2) line



(2) Total thickness, Size of sealing, Tolerance of outer dimension

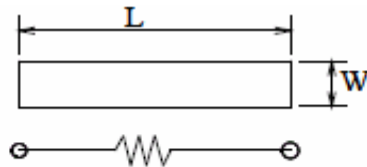
Glass thickness		1.1mm	0.7mm	0.55mm	0.5mm	0.4mm
Total thickness #3	Transmissive	2.6±0.3	1.8±0.2	1.5±0.15	1.4±0.15	1.2±0.15
	Transflective	2.7±0.3	1.9±0.2	1.6±0.15	1.5±0.15	1.3±0.15
	Reflective	2.7±0.3	1.9±0.2	1.6±0.15	1.5±0.15	1.3±0.15
F		10.0mm	8.0mm	8.0mm	8.0mm	8.0mm
FL		MAX.1.0	MAX.0.8	MAX.0.5	MAX.0.5	MAX.0.5
Tolerance of outer dimension		±0.3	±0.2	±0.15	±0.15	±0.15

*3,FSTN (Black and White) mode will require 0.05mm additionally for the above thickness.

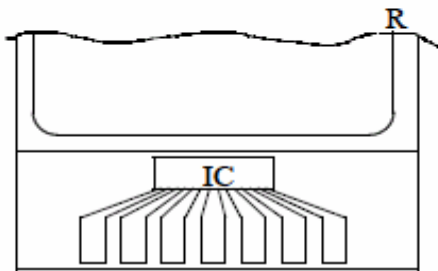
(3)Wiring resistance

We use ITO for COG module wiring. On the other hand, for PCB and TAB types, we use copper wiring. While the wiring resistance of the copper wiring can be ignored, the wiring resistance of ITO wiring will be several hundred to several thousand Ω. When wiring resistance is too much, it may reduce the responsiveness of COG. Therefore, it is important to design so as to reduce the wiring resistance. As graphic type especially needs more input terminals, we recommend using Heat seal type or FPC.

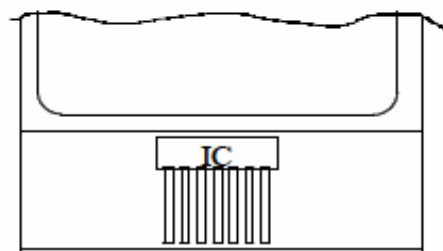
The way of calculation for wiring resistance is as follows.



$R = \rho \times \text{wiring resistance} (L \div W)$
 wiring resistance = 100Ω or 30Ω



Example for PIN type wiring
 *Mainly used for character type



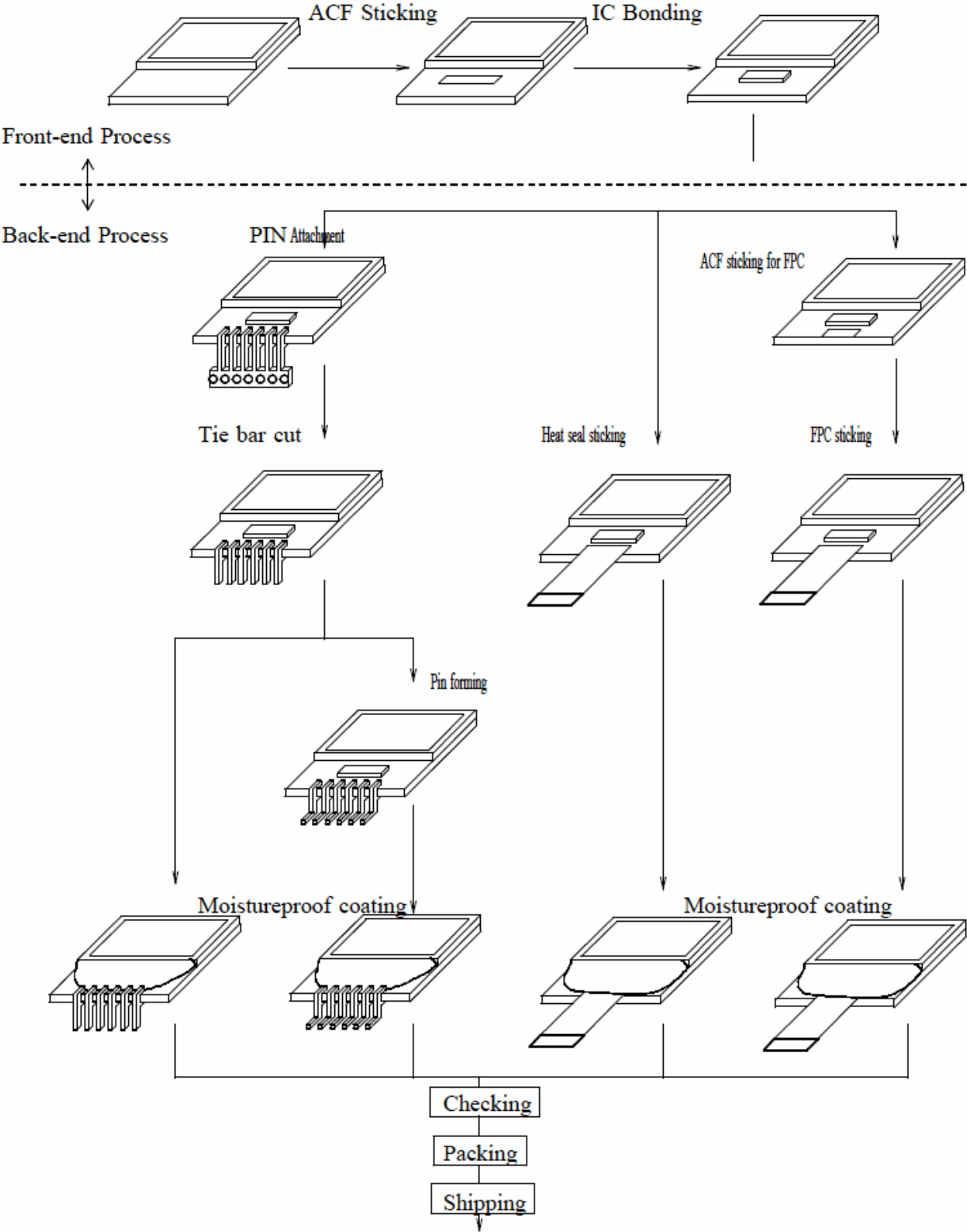
Example for Heat seal and FPC type
 *Character and graphic type

6, COG LSI line up

Display Contents	ICON	Power supply voltage	LCD voltage	Pump up circulation	duty	I/O	IC code	Other
12 Characters×3 line	120+10	1.7-3.6	3.0-6.0	4 times	1/18,26	1/4/8bit	SED1225	Low voltage drive
14 Characters×2 line	84	2.4-5.5	3.0-11	2/3 times	1/9,18	1 bit	NJU6520	Scroll
16 Characters×2 line	32	2.4-5.5	2.7-7.2	2 times	1/18	1/4bit	FCS2332K	
	32	2.4-5.5	3.0-5.5	None	1/18	1/4bit	FCS2336K	
	160+10	1.8-3.6	5.0-11	2/3times	1/18	1/4/8bit	SED1242	Low voltage drive
	None	2.5-5.5	3.0-5.5	None	1/16	4/8bit	NJU6635	32x1
16 Characters×3 line	160+10	1.8-3.6	5.0-11	2/3times	1/26	1/4/8bit	SED1241	Low voltage drive
16 Characters×4 line	96	2.4-5.5	2.7-11	2/3times	1/10,18 1/26,34	1/4/8bit	FCS2338AK	
	160+10	1.8-3.6	5.0-11	2/3times	1/34	1/4/8bit	SED1240	Low voltage drive
20 Characters×2 line	None	4.5-5.5	3.0-5.5	None	1/8,16	4/8bit	FCS2314AK	
97x33dots	90	2.4-5.5	3.0-11	2/3	1/34	1/4/8bit	FCS2350K	'00.3Q
102x64dots	102	1.9-5.5	4.5-9.0	4times	1/65	I2C	PCF8548	
	102	2.5-5.5	4.5-9.0	4times	1/65	1bit	PCF8812	
120x52dots	200	2.2-5.5	3.0-13	2/3/4times	1/15,28 1/41,54	1/4/8bit	HD66732	Japanese Rom on board
132x32dots	132	1.8-5.5	4.5-16	2/3/4times	1/33	1/8bit	SED1567	
132x48dots	132	1.8-5.5	4.5-16	2/3/4times	1/49	1/8bit	SED1566	
132x52dots	132	1.8-5.5	4.5-16	2/3/4times	1/53	1/8bit	SED1569	
132x54dots	132	1.8-5.5	4.5-16	2/3/4times	1/55	1/8bit	SED1568	
132x64dots	132	1.8-5.5	4.5-16	2/3/4times	1/65	1/8bit	SED1565	
132x64dots	132	2.2-5.5	6.0-18	2/3/4times	1/65	1/8bit	NJU6676	
168x96dots	528	1.8-3.6	3.2-10	2/3times	1/100	1/8bit	SED15E0	
168x64dots	168	2.4-5.5	4.5-18	2/3/4times	1/65	1/8bit	SED1575	
200x32dots	200	2.4-5.5	4.5-16	2/3/4time	1/33	1/8bit	SED1577	
224x64dots	224	1.8-5.5	4.5-18	2/3/4time	1/65	1/8bit	SED157A	

Notice) For IC code FCS**** is made by Fuji Electric
 SED**** is made by Seiko Epson Co. LTD
 HD***** is made by Hitachi Manufacturing Co. LTD
 PCF***** is made by Philips
 NJU***** is made by NJRC

7, COG manufacturing Flow



8, Manufacturing location

Fukushima Main Factory: From LCD to final products of COG.
(COG MP starting from Apr.1995)

China Plant : Back-end process of COG.
(COG MP starting from Sep.1997)

Philippines Plant : From LSI bonding to final products of COG
(Established: Apr.2000)