Futaba®

VACUUM FLUORESCENT DISPLAY MODULE

ENGINEERING PROPOSAL

GP1095A01A

EVALUATION
☐ ACCEPTED WITHOUT ANY CHANGE
☐ THE FOLLOWING CHANGE IS REQUIRED

15 December, 2000

VFD MODULE GROUP

Futaba Corporation

ISSUED BY

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APPROVED BY

⚠ <u>Important Safety Notice</u>

Please read this note carefully before using the product.

Warning

- The module should be disconnected from the power supply before handling.

- The power supply should be switched off before connecting or disconnecting the power or interface cables.

- The module contains electronic components that generate high voltages (approx. 104V) which may cause an electrical shock when touched.

- Do not touch the electronic components of the module with any metal objects.

- The VFD used on the module is made of glass and should be handled with care. When handling the VFD, it is recommended that cotton gloves be used.

- The module is equipped with a circuit protection fuse.

- Under no circumstances should the module be modified or repaired. Any unauthorized modifications or repairs will invalidate the product warranty.

- The module should be abolished as the factory waste.

1. GENERAL SPECIFICATION

1-1.SCOPE

FUTABA GP1095A01A is a graphic display module using a FUTABA 204×48 dots VFD.
It consists of drivers, and a switch.

1-2. MECHANICAL DIMENSION

Please see the Fig.1

Table-1

Item	Specification	Unit
Outer Dimensions	(L) 127.8±0.7 (W) 79.8±0.7 (T) 20.4Max (except Connector)	mm
Weight	TBD	g

1-3. DISPLAY SPECIFICATION

Table-2

Item	Specification	Unit
Display Area(W×H)	90.65×25	mm
Number of Dots(W×H)	204×48	dots
Dot pitch(W×H)	0.445×0.524	mm
Dot size(W×H)	0.3×0.374	mm
Color of Illumination	Green (λp＝505nm)	－

1-4. ENVIRONMENT CONDITIONS

Table-3

Item	Symbol	Min.	Max.	Unit
Operating Temperature	Topr	-40	85	℃
Storage Temperature	Tstg	-40	85	℃
Operating Humidity	Hopr	20	85	%
Storage Humidity	Hstg	20	90	%
Vibration (10 to 55 Hz)	－	－	4	G
Shock	－	－	40	G

1-5. ABSOLUTE MAXIMUM RATING

Table-4

Item	Symbol	Min.	Max.	Unit
Supply Voltage	Vcc	-	7	Vdc
Filament Supply Voltage	Ef	3.33	4.07	Vac
Anode Supply Voltage	ebb	－	120	Vdc
Grid Supply Voltage	ecc	－	50	Vdc
Input Signal Voltage	V_{IS}	－	7	V

1-6. RECOMMENDED OPERATING CONDITIONS

Table-5

Item	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	Vcc	4.5	5	5.5	Vdc
Filament Supply Voltage	Ef	3.33	3.7	4.07	Vac
Anode Supply Voltage	ebb	—	104	114	Vdc
Grid Supply Voltage	ecc	—	45	47	Vdc
Cut-Off Bias *1	Ek	4.6	5	6	Vdc
H-Level Input Voltage	V_{IH}	2.7	—	—	V
L-Level Input Voltage	V_{IL}	—	—	0.4	V

Note *1) Ek is supplied to the center tap of the filament terminal .

1-7. ELECTRICAL CHARACTERISTICS

Table-6

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Supply Current	Icc	Vcc=5.0Vdc Ef=3.7Vac ebb=104V ecc=45V Ek=5Vdc	—	120	180	mA
Filament Current	If		466	518	570	mA
Anode Current	ibb		—	22	37	mA
Grid Current	icc		—	9.8	23	mA
Power Consumption	—		—	5.2	7.9	W
Luminance	L	—	550	1100	—	cd/m^2
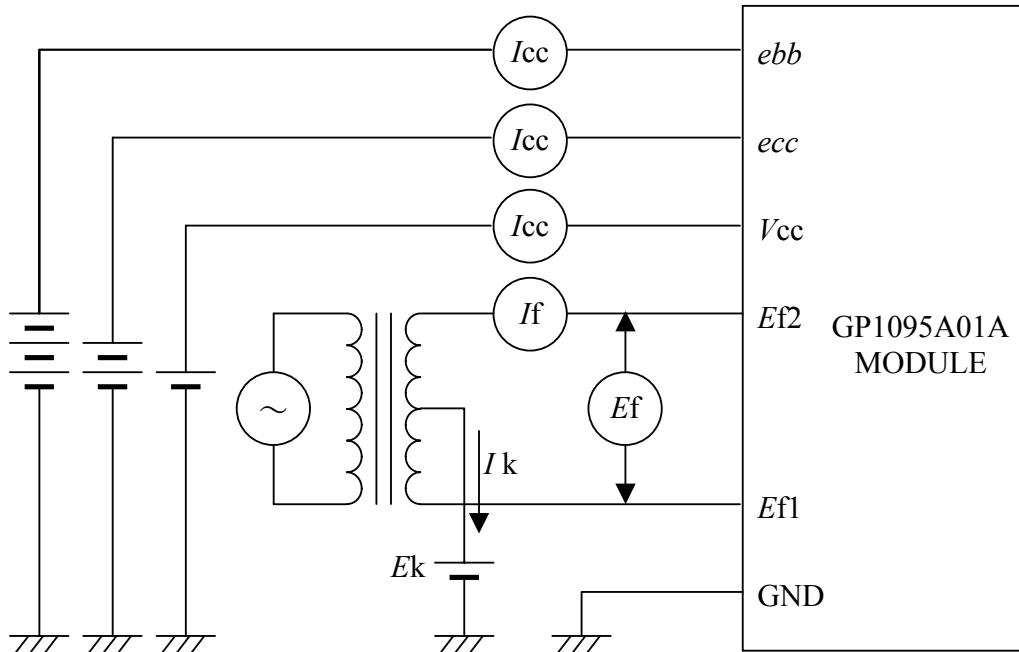
2. RELATIONSHIP OF THE DISPLAY SCREEN TO ADDRESS AND DATA
The following map is shown display address .

204 Dots → | 48 Dots

D7–D5								
D7 D6 D5	0006H	000CH	0012H	...	04B0H	04B6H	04BCH	04C2H
D4 D3 D2	0007H	000DH	0013H	...	04B1H	04B7H	04BDH	04C3H
D1 D0	0008H	000EH	0014H	...	04B2H	04B8H	04BEH	04C4H
	0009H	000FH	0015H	...	04B3H	04B9H	04BFH	04C5H
	000AH	0010H	0016H	...	04B4H	04BAH	04C0H	04C6H
	000BH	0011H	0017H	...	04B5H	04BBH	04C1H	04C7H

(left column first values: 0000H, 0001H, 0002H, 0003H, 0004H, 0005H)
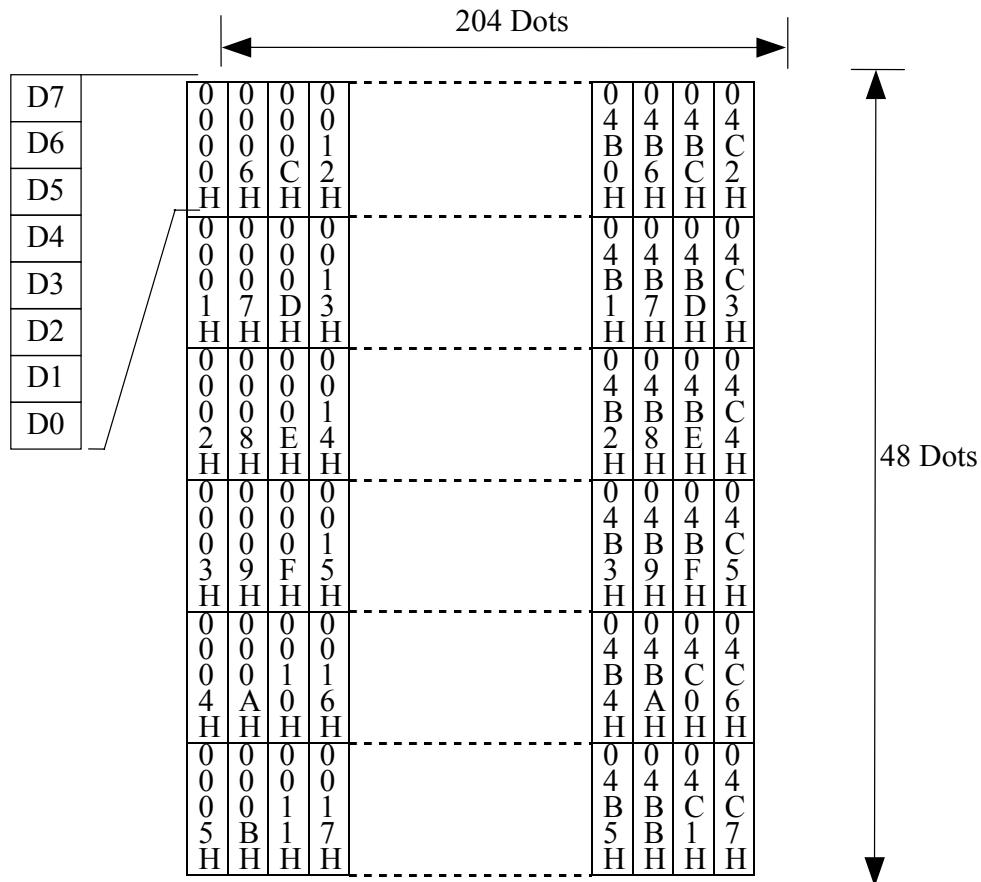
3. INTERFACE CONNECTION
Connector : A1-20PA-2.54DSA (HIROSE) or equivalent

CONNECTOR PIN ASSIGNMENT

Table-7

| PIN No.	Description	CONTENT	PIN No.	Description	CONTENT
1	Ef 1	FILAMENT VOLTAGE 1	2	Ef 1	FILAMENT VOLATGE 1
3	Ef 2	FILAMENT VOLTAGE 2	4	Ef 2	FILAMENT VOLATGE 2
5	GND	GND	6	GND	GND
7	GND	GND	8	GND	GND
9	ADATA	ANODE DATA	10	ACLK	ANODE CLOCK
11	ALAT	ANODE LATCH	12	ACLR	ANODE CLEAR
13	GCLK	GRID CLOCK	14	GDATA	GRID DATA
15	BLK	BLANK SIGNAL	16	PC	POLARITY CHANGE
17	Vcc	5V	18	Vcc	5V
19	ebb	ANODE VOLTAGE	20	ecc	GRID VOLATGE

4. POWER SUPPLY AND INPUT SIGNAL SEQUENCE

The module have to be supplied the voltages and the signals by the following sequence in order to avoid any damages of the module.

1. Supply the Vcc.
2. Send the grid scan signals, GCLK and GDATA, of a period with the condition of BLK signal="H", PC signal="L". While BLK signal="H", PC signal="L", all of the grid driver output becomes "L".
3. Supply the Filament voltage, Anode voltage, Grid voltage with the condition of BLK signal="L", PC signal="H".
   By the condition of BLK signal="L", PC signal="H", the input data is displayed

Vcc

BLK

PC

GCLK

103 CLOCK

GDATA

Other signal

Filament Voltage
GRID Voltage
ANODE Voltage

Vcc ON

Send the signals

Start grid scanning and refresh shift
resistors of the driver.

Supply high voltage
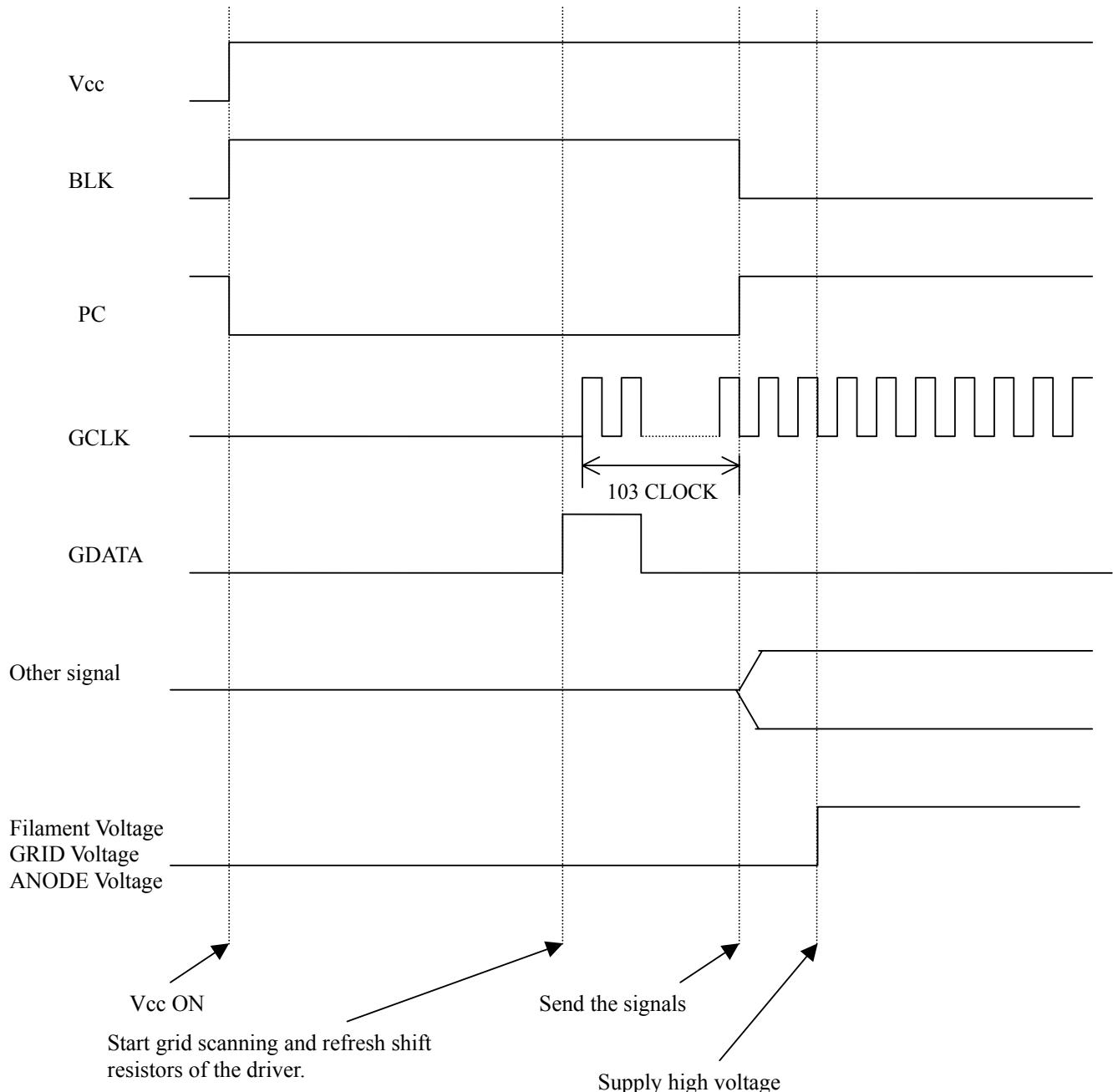
5. INTERFACE TIMING

Fig-1
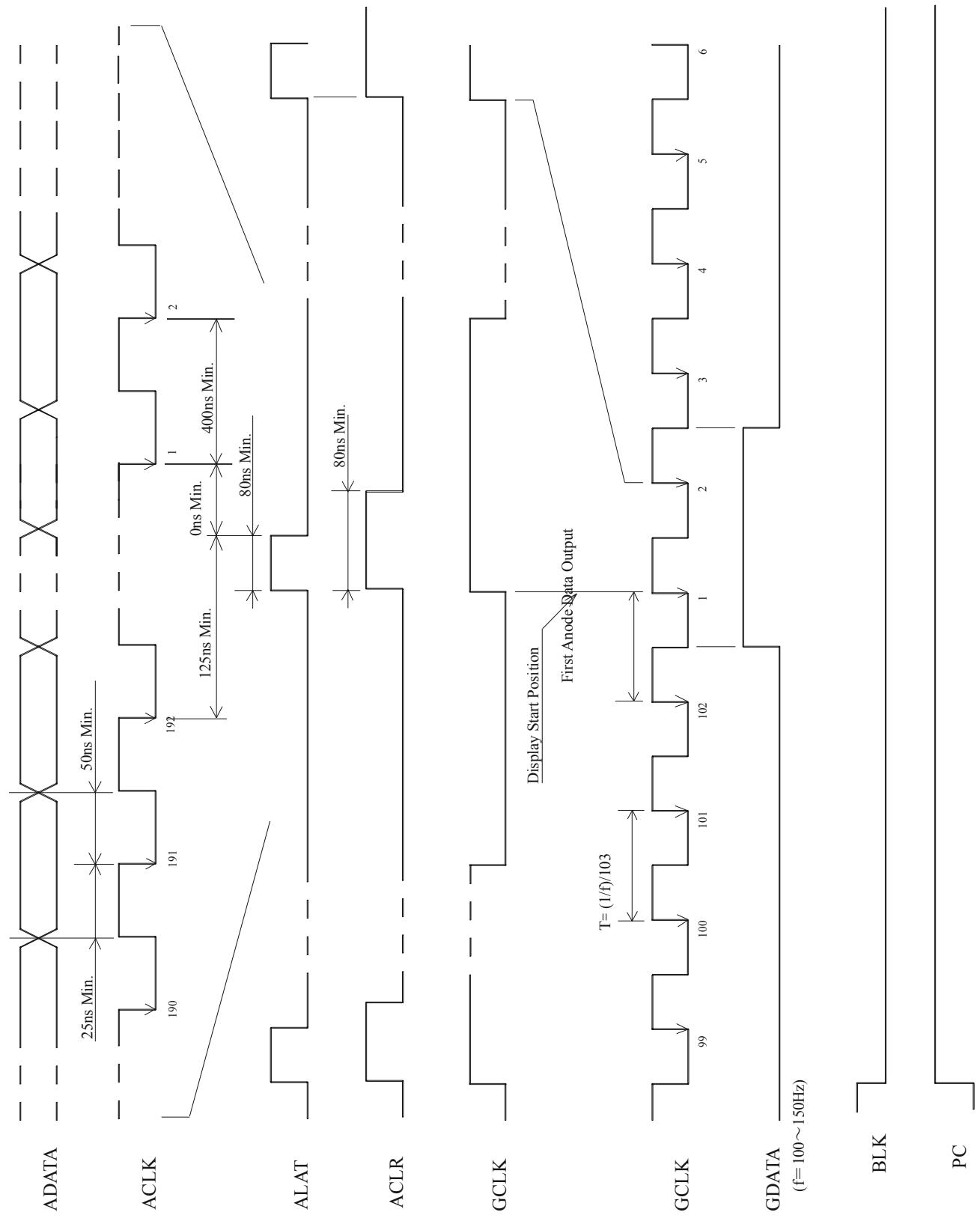
6. THE ORDER FOR THE ANODE DATA

Table-8

ORDER	ANODE DATA	103G,102G ADRESS	BIT	102G,101G ADRESS	BIT	101G,100G ADRESS	BIT	100G,99G ADRESS	BIT		3G,2G ADRESS	BIT	2G,1G ADRESS	BIT
1	1-1	0000H	D7		L	0018H	D7		L		04B0H	D7		L
2	1-2	0006H	D7		L	001EH	D7		L		04B6H	D7		L
3	1-3		L	000CH	D7		L	0024H	D7			L	04BCH	D7
4	1-4		L	0012H	D7		L	002AH	D7			L	04C2H	D7
5	2-1	0000H	D6		L	0018H	D6		L		04B0H	D6		L
6	2-2	0006H	D6		L	001EH	D6		L		04B6H	D6		L
7	2-3		L	000CH	D6		L	0024H	D6			L	04BCH	D6
8	2-4		L	0012H	D6		L	002AH	D6			L	04C2H	D6
9	3-1	0000H	D5		L	0018H	D5		L		04B0H	D5		L
10	3-2	0006H	D5		L	001EH	D5		L		04B6H	D5		L
11	3-3		L	000CH	D5		L	0024H	D5			L	04BCH	D5
12	3-4		L	0012H	D5		L	002AH	D5			L	04C2H	D5
13	4-1	0000H	D4		L	0018H	D4		L		04B0H	D4		L
14	4-2	0006H	D4		L	001EH	D4		L		04B6H	D4		L
15	4-3		L	000CH	D4		L	0024H	D4			L	04BCH	D4
16	4-4		L	0012H	D4		L	002AH	D4			L	04C2H	D4
17	5-1	0000H	D3		L	0018H	D3		L		04B0H	D3		L
18	5-2	0006H	D3		L	001EH	D3		L		04B6H	D3		L
19	5-3		L	000CH	D3		L	0024H	D3			L	04BCH	D3
20	5-4		L	0012H	D3		L	002AH	D3			L	04C2H	D3
21	6-1	0000H	D2		L	0018H	D2		L		04B0H	D2		L
22	6-2	0006H	D2		L	001EH	D2		L		04B6H	D2		L
23	6-3		L	000CH	D2		L	0024H	D2			L	04BCH	D2
24	6-4		L	0012H	D2		L	002AH	D2			L	04C2H	D2
25	7-1	0000H	D1		L	0018H	D1		L		04B0H	D1		L
26	7-2	0006H	D1		L	001EH	D1		L		04B6H	D1		L
27	7-3		L	000CH	D1		L	0024H	D1			L	04BCH	D1
28	7-4		L	0012H	D1		L	002AH	D1			L	04C2H	D1
29	8-1	0000H	D0		L	0018H	D0		L		04B0H	D0		L
30	8-2	0006H	D0		L	001EH	D0		L		04B6H	D0		L
31	8-3		L	000CH	D0		L	0024H	D0			L	04BCH	D0
32	8-4		L	0012H	D0		L	002AH	D0			L	04C2H	D0
⋮	⋮													
161	41-1	0005H	D7		L	001DH	D7		L		04B5H	D7		L
162	41-2	000BH	D7		L	0023H	D7		L		04BBH	D7		L
163	41-3		L	0011H	D7		L	0024H	D7			L	04C1H	D7
164	41-4		L	0017H	D7		L	002AH	D7			L	04C7H	D7
165	42-1	0005H	D6		L	001DH	D6		L		04B5H	D6		L
166	42-2	000BH	D6		L	0023H	D6		L		04BBH	D6		L
167	42-3		L	0011H	D6		L	0024H	D6			L	04C1H	D6
168	42-4		L	0017H	D6		L	002AH	D6			L	04C7H	D6
169	43-1	0005H	D5		L	001DH	D5		L		04B5H	D5		L
170	43-2	000BH	D5		L	0023H	D5		L		04BBH	D5		L
171	43-3		L	0011H	D5		L	0024H	D5			L	04C1H	D5
172	43-4		L	0017H	D5		L	002AH	D5			L	04C7H	D5
173	44-1	0005H	D4		L	001DH	D4		L		04B5H	D4		L
174	44-2	000BH	D4		L	0023H	D4		L		04BBH	D4		L
175	44-3		L	0011H	D4		L	0024H	D4			L	04C1H	D4
176	44-4		L	0017H	D4		L	002AH	D4			L	04C7H	D4
177	45-1	0005H	D3		L	001DH	D3		L		04B5H	D3		L
178	45-2	000BH	D3		L	0023H	D3		L		04BBH	D3		L
179	45-3		L	0011H	D3		L	0024H	D3			L	04C1H	D3
180	45-4		L	0017H	D3		L	002AH	D3			L	04C7H	D3
181	46-1	0005H	D2		L	001DH	D2		L		04B5H	D2		L
182	46-2	000BH	D2		L	0023H	D2		L		04BBH	D2		L
183	46-3		L	0011H	D2		L	0024H	D2			L	04C1H	D2
184	46-4		L	0017H	D2		L	002AH	D2			L	04C7H	D2
185	47-1	0005H	D1		L	001DH	D1		L		04B5H	D1		L
186	47-2	000BH	D1		L	0023H	D1		L		04BBH	D1		L
187	47-3		L	0011H	D1		L	0024H	D1			L	04C1H	D1
188	47-4		L	0017H	D1		L	002AH	D1			L	04C7H	D1
189	48-1	0005H	D0		L	001DH	D0		L		04B5H	D0		L
190	48-2	000BH	D0		L	0023H	D0		L		04BBH	D0		L
191	48-3		L	0011H	D0		L	0024H	D0			L	04C1H	D0
192	48-4		L	0017H	D0		L	002AH	D0			L	04C7H	D0

(NOTE)   Space : Don't Care

7. GRID, ANODE ASSIGNMENT

Fig-2
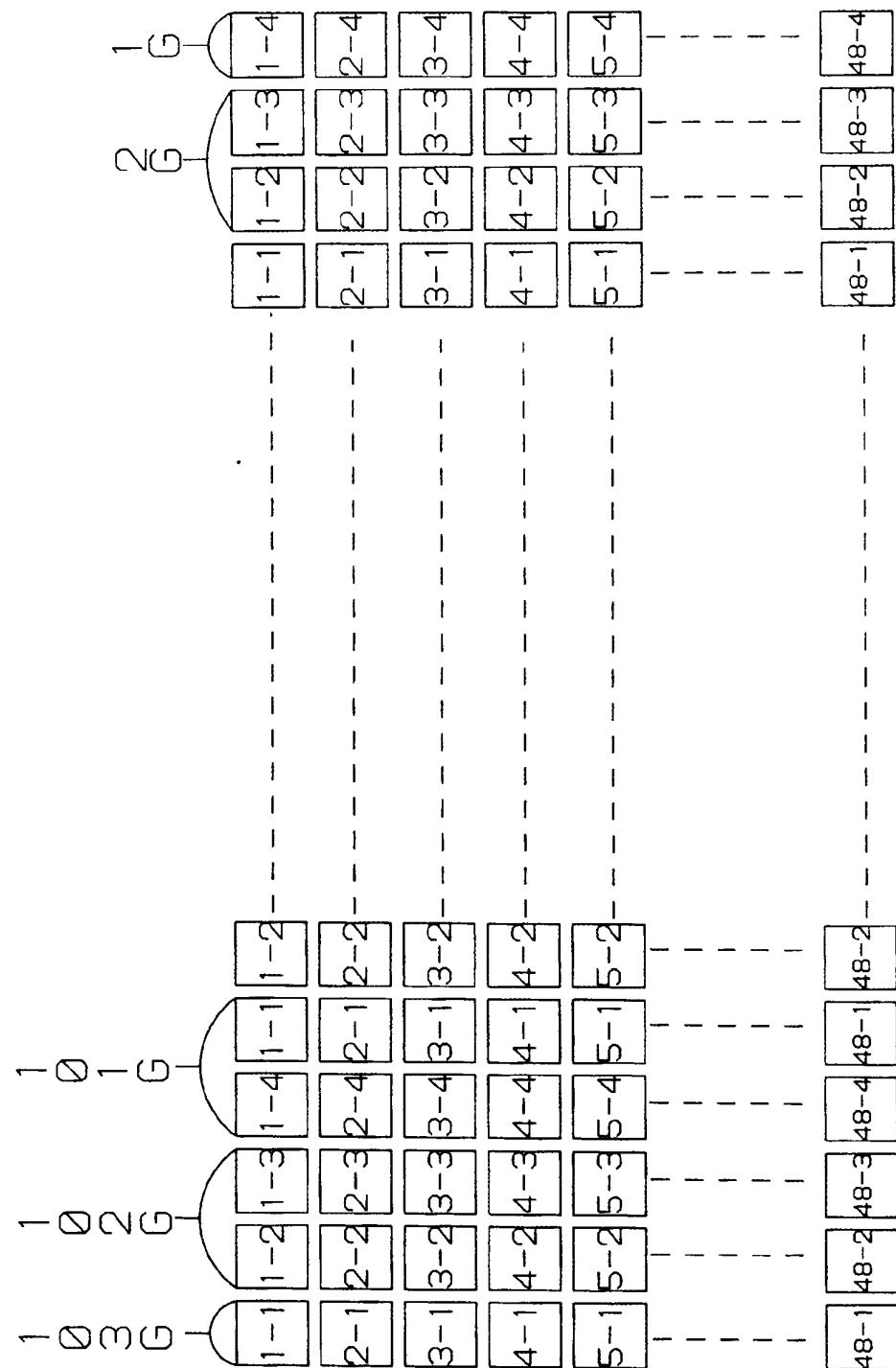
GP1095A01A   MECHANICAL DIMENSION

Fig-3
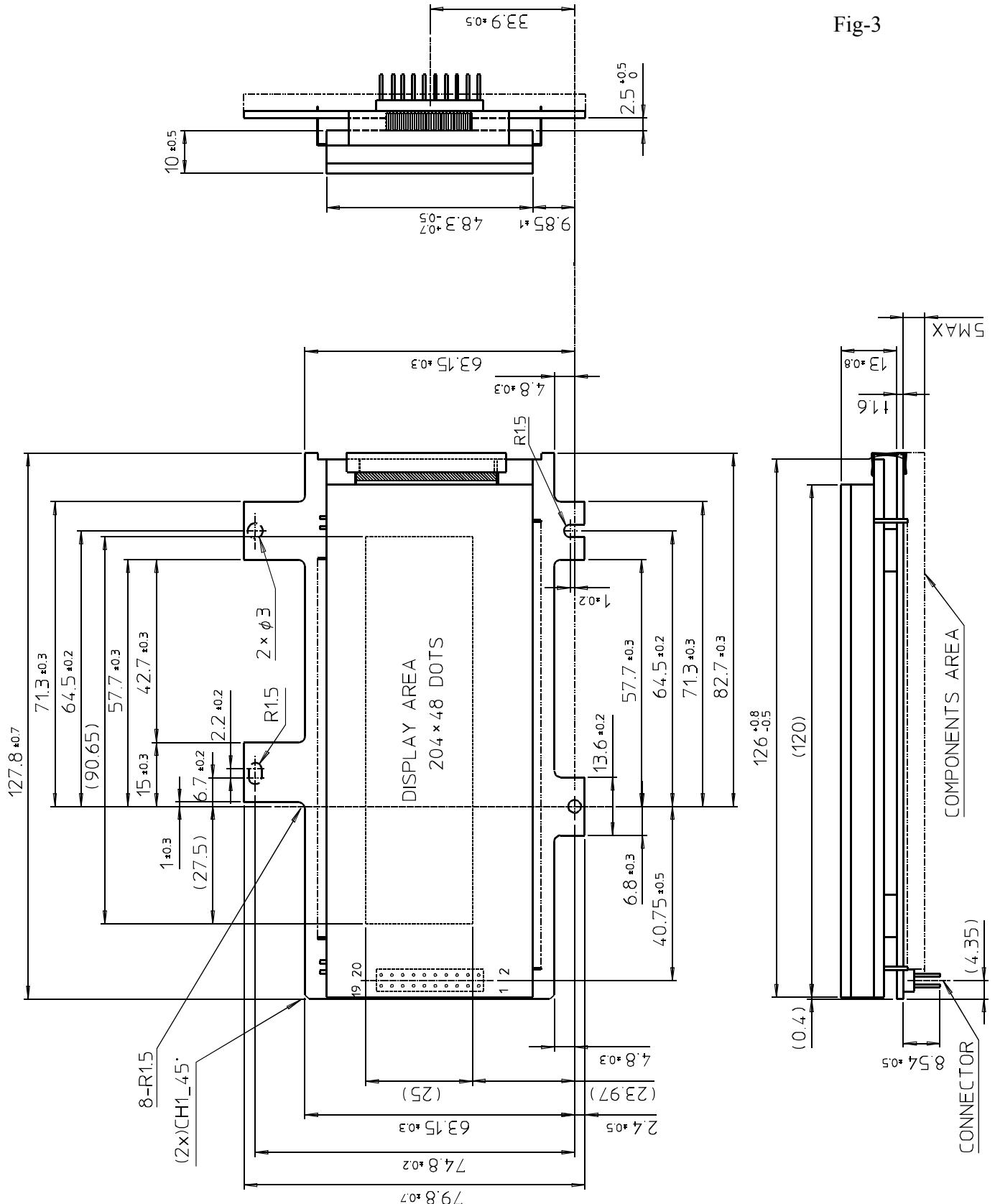
GP1095A01A   Block Diagram

Fig-4

CONNECTOR		VFD

ADATA → ANODE DRIVER IC (192bit)
ACLK →
ALAT →
ACLR →

192bit →

GCLK →
GDATA → GRID DRIVER IC (128 bit)
PC →
BLK →

103bit →

204×48 dots GRAPHIC DISPLAY

Vcc
ebb → LOGIC
ecc → ANODE DRIVER
Ef1 → GRID DRIVER
Ef2
GND

[9/9]