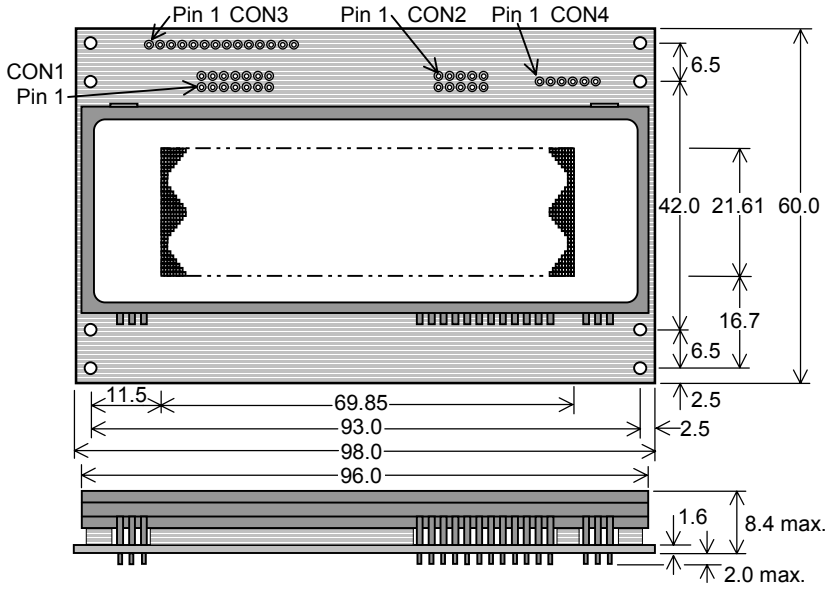
Dot Graphic VFD Module — GU140x32F-7806

- **140x32 Dot Graphic (4x20 characters)**
- **Single 5V Supply**
- **High Brightness Blue Green Display**
- **Operating Temp -40°C to +85°C**
- **3 Multi Sized Fonts**
- **4/8 Bit Parallel LCD & Serial Interfaces**

The module includes the Vacuum Fluorescent Display glass, VF drivers and micro-controller ICs with refresh RAM, character generator and interface logic. The 4/8 bit parallel & serial bi-directional interfaces are 5V TTL/CMOS compatible. The command set is LCD compatible with extended graphic functions.



Dimensions in mm & subject to tolerances.
Mounting holes 3.2mm dia.

CON4 is not used on this version.

SERIAL INTERFACES–CON2

Pin	Async	SPI
1	5V	5V
2	NC	SCK
3	RXD	/SS
4	NC	SIN
5	0V	0V
6	NC	SOUT
7	TXD	NC
8	/RES	/RES
9	MB	MB
10	HB	HB

NC = Do Not Connect

PARALLEL INTERFACE - CON1 & 3

Pin	Sig	Pin	Sig
1	GND	2	VCC
3	NC*	4	RS
5	R/W (/WR)	6	E (/RD)
7	D0	8	D1
9	D2	10	D3
11	D4	12	D5
13	D6	14	D7

*/RESET = Jumper J6.1 & J6.2
BUSY = Jumper J6.2 & J6.3

ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Condition
Power Supply Voltage	VCC	5.0VDC +/- 5%	GND=0V
Power Supply Current	ICC	450mADC typ.	VCC=5V
Logic High Input	VIH	0.8VDC min. Vcc max.	VCC=5V
Logic Low Input	VIL	0VDC min 0.6VDC max.	VCC=5V
Logic High Output	VOH	3.5VDC min. Vcc max.	IOH=-10uA
Logic Low Output	VOL	0VDC min 0.6VDC max.	IOL =4mA

OPTICAL and ENVIRONMENTAL SPECIFICATIONS

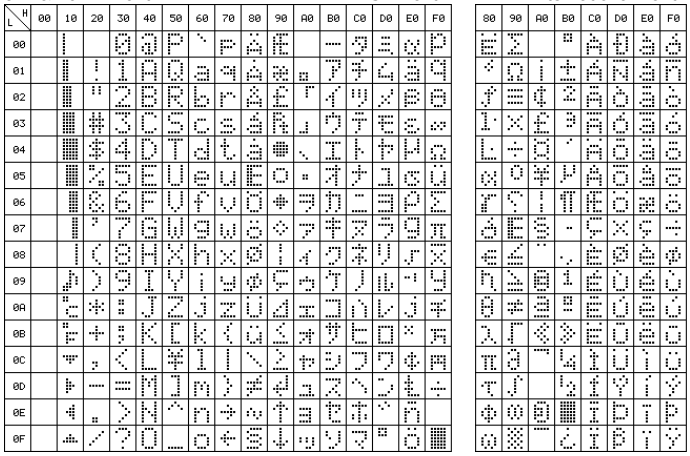
Parameter	Value
Display Area (XxY mm)	69.85 x 21.61
Dot Size/Pitch (XxY mm)	0.35 x 0.53 / 0.5 x 0.68
Luminance	700 cd/m^2 Typ.
Colour of Illumination	Blue-Green (Filter for colours)
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +85°C
Operating Humidity (non condensing)	20 to 80% RH @ 25°C

SOFTWARE COMMANDS

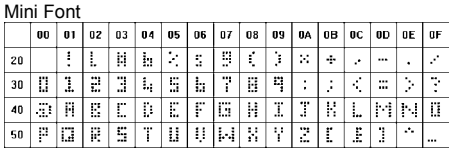
Instruction	R/W	RS	D0-D7
Clear Display	L	L	01H
Cursor Return Home	L	L	02H
Entry Mode Set	L	L	04H-07H
Display ON/OFF	L	L	08H-0FH
Cursor Shift Left	L	L	10H
Cursor Shift Right	L	L	14H
Display Shift Left	L	L	18H
Display Shift Right	L	L	1CH
Select 4 bit interface	L	L	20H + *optional luminance data*
Select 8 bit interface	L	L	30H + *optional luminance data*
Set CG RAM Addr.	L	L	40H-7FH
Set DD RAM Addr.	L	L	80H-E7H
Read BUSY/Addr.	H	L	00H-FFH D7 Busy = High
Read Data from RAM	H	H	00H-FFH
Set Graphic Cursor	L	L	F0H + *xpos* + *ypos*
Set Area Commands	L	L	F1H + x1 + y1 + x2 + y2 + *cmd*
	L	H	where *cmd* 49H = Invert Area
	L	H	46H = Fill Area
	L	H	43H = Clear Area
	L	H	4FH = Set Outline Box
	L	H	6FH = Clear Outline Box
	L	H	+ others for graphic data write
Set Font / Spacing	L	L	F2H + *font style*
Set RS Low			0FH Serial Comms. only
Read Data			FEH Serial Comms. only
Read Cursor Position			FFH Serial Comms. only

CHARACTER SET

5x7 & 10x14 Font — LCD Font — International Font



Mini Font



The default font can be changed by J3. Other fonts can then be selected by software command.

FONT SELECTION

J3	Font
Open	LCD (default)
Link	International

M68 / i80 SELECTION

J5 / J7	Bus
1 & 2	M68 E, R/W (default)
2 & 3	I80 /WR, /RD

SERIAL/PARALLEL SELECTION

J8	Interface
Open	Parallel (default)
Link	Serial

SERIAL MODE

J9	J10	Configuration
O	O	SPI / Clock Serial (def)
L	O	Async 9600,N,8,1
O	L	Async 19200,N,8,1
L	L	Async 38400,N,8,1

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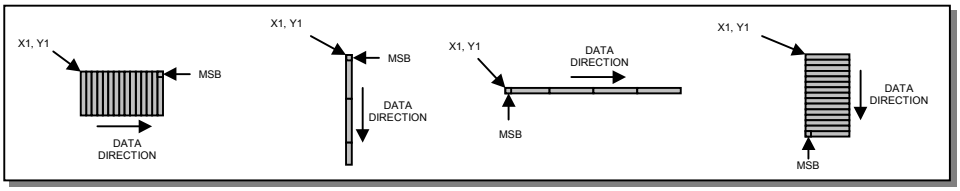
SOFTWARE COMMANDS

Instruction	Data Format (RS = 1)	Description
UDF Write	00H – 0FH	Write user defined character 0-7 to the current cursor location on the display.
Data Write (40us – LCD compatible mode) (400us – Graphic mode)	00H – FFH	Write data to the display. In normal (LCD compatible) mode of operation, data is written to the display data (DD RAM) or character generator (CG RAM). When using the graphical data commands (F0H, F1H & F2H), data is written direct to the display and is not stored in DD RAM. Data write busy times will increase when using the graphic functions.
Instruction	**Data Format (RS = 0)**	**Description**
Display Clear (300μs)	01H	Fills all locations in the display data (DD) RAM with 20H (blank character). The address counter is set to 0 in the DD RAM. The address counter is set to increment on each data read/write. Any display offset (using the display shift command) is removed.
Cursor Home (1ms)	02H	The address counter is set to 0 in the DD RAM. Any display offset (using the display shift command) is removed.
Entry Mode *Note1 (40μs)	04H – 07H	Bit 1 is used to select the direction of the address counter on each data read or write. If set to '1', the address counter is incremented. If set to '0', the address counter is decremented. Bit 0 enables the display to shift on each data read/write. If this bit is set to '1', the display is shifted with the cursor. The display shift direction depends upon the address counter direction (bit1). If this is set to increment, the display is shifted left, if the address counter is set to decrement, the display is shifted right.
Display Control *Note2 (50us)	08H-0FH	Bit 2 is used to enable or disable the display. If this bit is set to '0' the VFD's power supply is turned off to reduce power consumption. Bit 0 enables the flashing block cursor.
Cursor Shift Left (40us)	10H	Shift the cursor position (address counter) one position to the left.
Cursor Shift Right (40us)	14H	Shift the cursor position (address counter) one position to the right.
Display Shift Left (250us)	18H	Shift the display left, one character position.
Display Shift Right (250us)	1CH	Shift the display right, one character position.
Select 4 bit interface (40μs)	20H + *lum*	Enables 4-bit communications. Data is received on DB4-DB7 only. Two writes are required to send one data byte. The most significant nibble should be sent first. The *lum* value sets the displays brightness, 00H = full brightness, 01H = 75%, 02H = 50% & 03H = 25%.
Select 8 bit interface (40μs)	30H + *lum*	Enables 8-bit communications. Data is received on DB0-DB7. The *lum* value sets the displays brightness, 00H = full brightness, 01H = 75%, 02H = 50% & 03H = 25%.
Set CG Address (40us)	40H – 7FH	Set the character generator address (CG RAM). All written data is placed within the user definable character area.
Set DD Address (40us)	80H – E7H	Set the display data address (DD RAM). 80H - 8FH = top line. C0H - CFH = bottom line.
Set Graphic Cursor *Note3 (40us)	F0H + *xpos* + *ypos*	Set the absolute cursor position. *xpos* = 0 – 111, *ypos* = 0 – 15. Co-ordinates should be written with RS line set high.
Set Area *Note3 (40us + 500us[cmd byte])	F1H + x1 + y1 + x2 + y2 + *cmd*	Area Commands: - 'I' - invert area. 'F' – fill area. 'C' = clear area. 'O' – set outline. 'o' – clear outline. 'H' – write horizontal graphical data with horizontal cursor movement. 'V' – write vertical graphical data with horizontal cursor movement. 'h' – write horizontal graphical data with vertical cursor movement. 'v' – write vertical graphical data with vertical cursor movement. All area commands should be proceeded with the area co-ordinates. X1 Y1 left top X2 Y2 bottom right. Graphical data should immediately follow the 'H','h','V' and 'v' commands. Co-ordinates, command and graphical data should be written with RS line set high.
Set Font *Note3 (40us)	F2H + *font*	Select font type, font size and font spacing. Font commands: - 'A' or 'a' = proportional 64 character mini-font. 'B' = 5x7 LCD compatible font with Katakana characters. 'C' = 10x14 LCD compatible font with Katakana characters. 'b' = 5x7 international font with European characters. 'c' = 10x14 international font with European characters. '1' = set the inter-character pixel spacing to 1 pixel. '2' = set the inter-character pixel spacing to 2 pixels. Font command should be written with RS line set high.
Instruction	**Data Format**	**Additional Serial Data Commands**
Set RS Low	0FH	Set the RS line low for the following byte only. Used in serial communications only.
Read Data	FEH	Read data at current cursor position. This command is used with serial communications only.
Read Cursor Position	FFH	Read current cursor position. This command is used with serial communications only.

Notes: -
1. When display shift is enabled, the data write busy time can increase by 200us.
2. If the cursor is enabled, busy times can increase by 20us.
3. After these commands are executed, the cursor will be disabled and any character data will be written to the display only, and not the DD RAM. Any subsequent LCD compatible command will re-enable the cursor and allow for DD RAM writing.

GRAPHICAL DATA WRITES



Vertical Data & Horizontal Movement | Vertical Data & Vertical Movement | Horizontal Data & Horizontal Movement | Horizontal Data & Vertical Movement

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