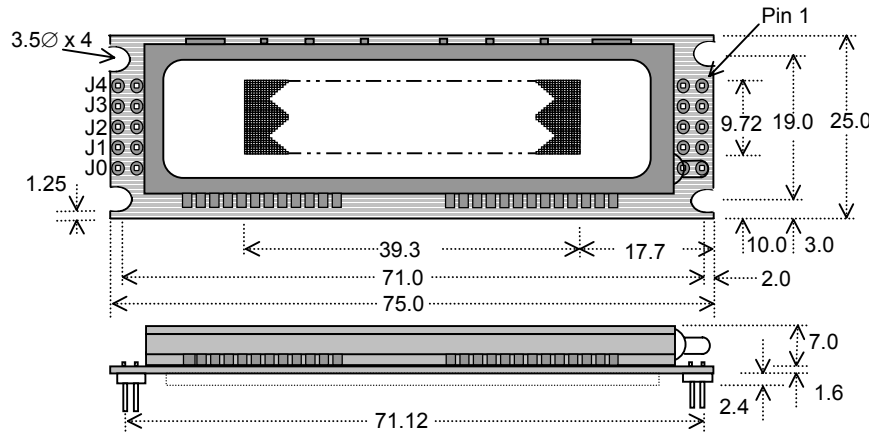


# Active Matrix Graphic VFD Module

# GW128x32C-K610A

- 128 x 32 Fine Dot Matrix
- Single 5V DC Supply
- Ultra High Brightness Display
- Wide Operating Temperature
- Async and SPI interfaces

This compact high brightness active matrix VF display module provides a compact solution for miniature information systems.  
 The single 5V input power supply utilizes a unique patent applied technique without any inductive components or electrolytic capacitors.  
 Please ask about custom commands and character fonts.



### PIN OUT

Pin	Sig	Pin	Sig
1	V <sub>cc</sub>	2	SCK
3	RX	4	SI
5	GND	6	SO
7	TX	8	/RES
9	MBusy	10	HBusy

Dimensions in mm. tolerances.

Uses patent applied PSU which has no inductive components.  
 Brown out detector active when RES is not connected.

### ELECTRICAL SPECIFICATION

Parameter	Sym	Min	Typ	Max	Unit	Condition
Supply Voltage	V <sub>cc</sub>	4.5	5.0	5.5	V	V <sub>ss</sub> =0V
Supply Current	I <sub>cc</sub>	-	150	250	mA	V <sub>cc</sub> =5V All dots
Logic High Input	V <sub>IH</sub>	3.7	-	V <sub>cc</sub>	V	V <sub>ss</sub> =0V
Logic Low Input	V <sub>IL</sub>	0	-	0.3	V	V <sub>ss</sub> =0V

### ENVIRONMENTAL and OPTICAL SPECIFICATION

Parameter	Value
Display Area (XxY mm)	39.29 x 9.72
Dot Size/Pitch (XxY mm)	0.17 x 0.17/0.30 x 0.30
Luminance	3500 cd/m <sup>2</sup> Typ
Colour of Illumination	Blue-Green (Filter for colours)
Operating Temperature	-30°C to +80°C
Storage Temperature	-40°C to +85°C
Operating Humidity (non condensing)	10 to 90% @ 25°C

### SOFTWARE COMMANDS

Hex	Command
00-0F	Write user defined 8x8 icon in EEPROM to cursor
10+	Position Cursor where top left = 0,0 (10,x,y)
11	Set Pixel On at Cursor
12	Clear Pixel at Cursor
13+	Fill Area, co-ordinates inclusive (13,tx,ty,bx,by)
14+	Clear Area, co-ordinates inclusive (14,tx,ty,bx,by)
15+	Invert Area, co-ordinates inclusive (15,tx,ty,bx,by)
16+	Draw boxed outline, co-ordinates inclusive (16,tx,ty,bx,by)
17+	Draw line, diagonal allowed (17,tx,ty,bx,by)
18+	Send vertical graphic bytes (18, h/v inc, num, n1..n255 max)
19+	Send horiz. graphic bytes (19, h/v inc, num, n1..n255 max)
1A+	Download 8x8 icon to EEPROM. 1A,00-0F, n1,...n8
1B+	Extended Functions (Power Control and Semi-custom)
1C	Select Mini Font
1D	Select 5x7 Font
1E	Select 10x14 Font
1F	Select 20x28 Font
20-7F	Write ASCII Characters

The module defaults to a 4 x 21 character display using the 5x7 font with single pixel spacing. The cursor position auto increments after each character write. The bottom left of a character is placed at the cursor x,y. Data can be sent via the synchronous SPI or asynchronous RX input. Transmitted data is 'E' for error or 'R' at power on or module reset. The M(odule) Busy line indicates the module is busy when high. Connect the H(ost) Busy input to the MBusy to disable handshaking, which is mandatory for SPI communication.

### CHARACTER SETS

#### MINI FONT (PROPORTIONAL)

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
20		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_

#### 5x7 FONT (FIXED SPACING)

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
20		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	P	q	r	s	t	u	v	w	x	y	z	{	}	~	▀	■

#### 10x14 FONT (FIXED SPACING)

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
20		!	"	#	\$	%	&	'	(	)	*	+	,	-	.	/
30	0	1	2	3	4	5	6	7	8	9	:	;	<	=	>	?
40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
70	P	q	r	s	t	u	v	w	x	y	z	{	}	~	▀	■

#### 20x28 FONT (FIXED SPACING)

	00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
20																
30	0	1	2	3	4	5	6	7	8	9	;	:	<	=	>	?

Baud	J0	J1
19200	Open	Open
9600	Open	Short
4800	Short	Open
2400	Short	Short

Parity	J2	J3
None	Open	Open
Even	Open	Short
Odd	Short	Open

### CONTACT

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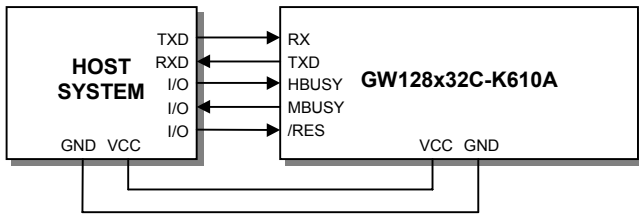
Subject to change without notice.  
 Doc Ref: 03149 Iss7 24 January 2003



## INTERFACING TO THE GW128x32C-K610A

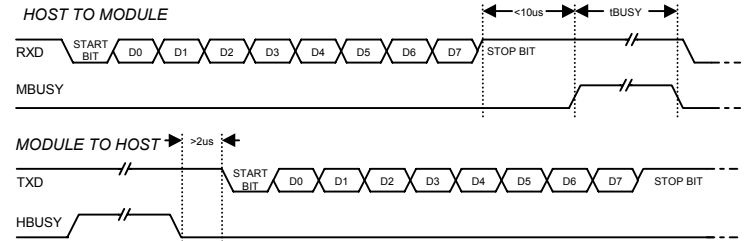
The VFD module contains two serial ports for synchronous and asynchronous communication, both at TTL. The busy line should be monitored to ensure data is interpreted correctly.

### ASYNCHRONOUS SERIAL COMMUNICATION

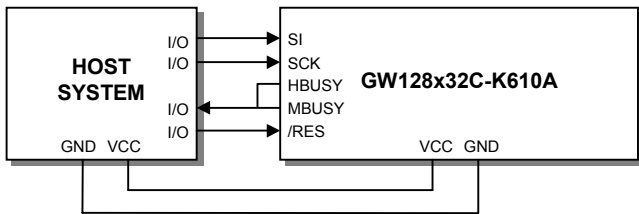


The communication speed and parity can be changed with the jumper links J0-J4. These settings will be applied at power-up and with hardware reset. The default settings are 19200 baud, with no parity.

Hardware handshaking is available using the module busy 'MBUSY' and host busy 'HBUSY' control lines. The module contains a receive buffer of 32 bytes.

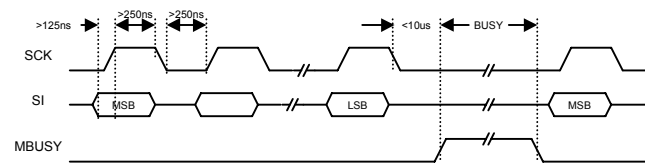


### SYNCHRONOUS SERIAL COMMUNICATION

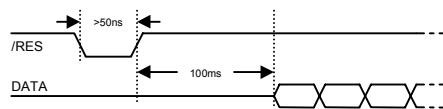


If the busy line is not being monitored, the host must provide adequate delays for the module to process the data. These data/command busy times are specified in the software command section.

When using synchronous communications, the user must ensure that the module busy 'MBUSY' and host busy 'HBUSY' lines are tied together at power up. The host system can still monitor the MBUSY line. Data is clocked in on the rising edge of SCK. The most significant bit of the data byte should be sent first.



### RESET TIMING



The module is reset when a low level signal is applied to the /RES line. This will cause the module to recheck the jumper links, clear the display and set all defaults. All icon data is retained. During this initialisation period, the user must delay any transmission to the module.

### DISPLAYING TEXT

The module contains 4 font sizes, a proportional mini-font, 5x7 pixel, 10x14 pixel and a 20x28-pixel font. Characters of any size can be written to any part of the display. All data sent to the module from 20H to 7FH is treated as character data. Characters are positioned above the current cursor position, see Fig1. Each character written has will include a space to the right and below, this space size is dependant upon the selected font. The mini-font & 5x7 pixel font have a one pixel space, the 10x14 font has a 2 pixel space, and the 20x28 pixel font has a 4 pixel space. This space should be taken into consideration when positioning the character. After each character is written to the display, the cursor position is automatically advanced by the width of the selected character font plus it's space. If the cursor position advances off the display, it will automatically be moved to the left side of the display ( $x = 0$ ).

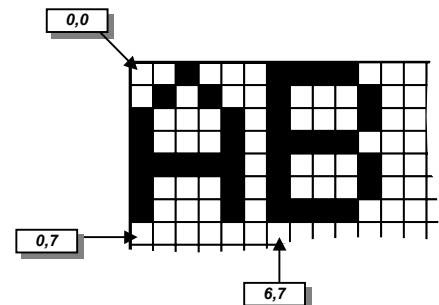
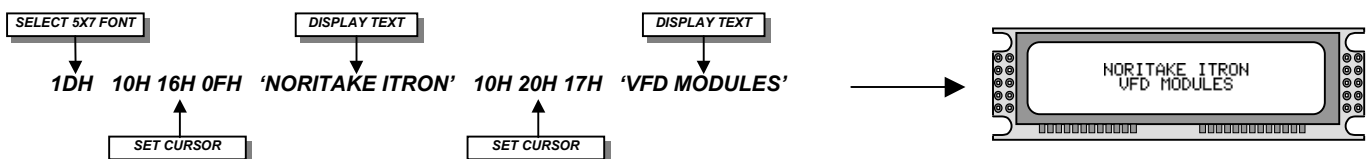


Fig1: Cursor Positioning, example of writing 2 characters from cursor position 0,7.

The following example displays two text messages in the center of the display.



## DISPLAYING GRAPHICS

Graphical images can be displayed on the VFD module in either a horizontal or vertical byte orientation. The cursor is automatically advanced in a downward direction, or a forward (left-right) direction. The most significant bit is positioned to the top (vertical data) or to the left (horizontal data).

The following example displays a simple graphic image. The vertical graphics command is used to send the top 20 bytes, then the bottom 20 bytes of graphical data.

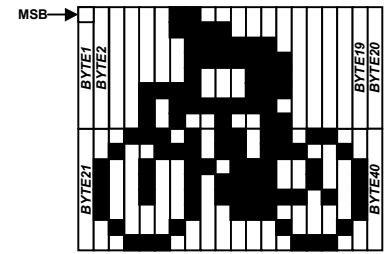
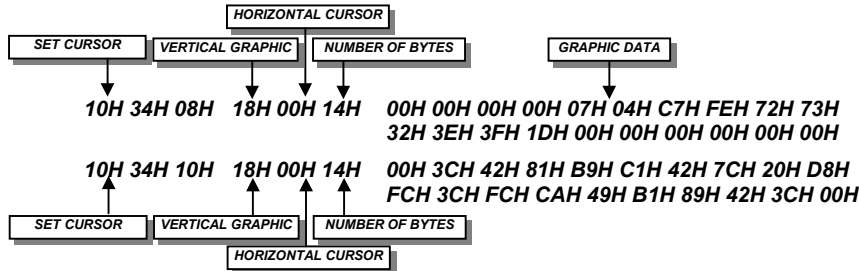
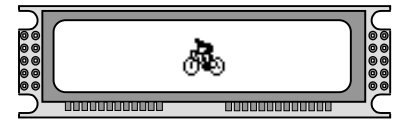


Fig2: Example Graphic Image



## USING USER DEFINED CHARACTERS/ICONS

16 User defined icons/characters can be stored in the VFD module's EEPROM, these are retained when the power is removed. All icons have an 8x8-pixel format. The icon data should be in a vertical format, with the MSB uppermost. Displaying an icon is much the same procedure for displaying any standard character. A user character/icon is displayed with 00H-0FH.

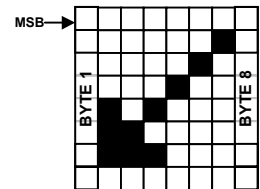
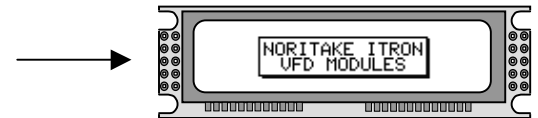
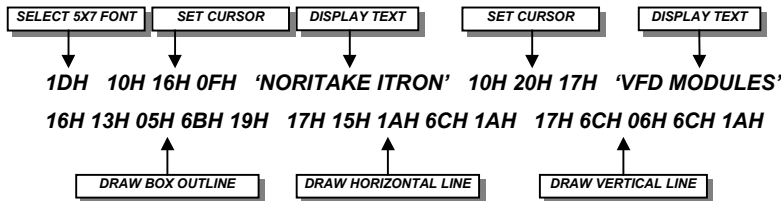


Fig3: Example Icon

## DRAWING COMMANDS

The box, line and pixel commands allow the creation of complex displays without the need for the transferring a complete image. The line command can draw a single pixel width line from any point of the display, in any direction. The following example draws a box with a drop shadow around some text.



## DISPLAY UPDATE

If the display is visually slow in updating, the user can issue a command to buffer all display changes. The user can then latch this data with one command, and the display will change instantaneously. The manual latch command (1BH + 4DH) should be issued before data transfer (to disable automatic update), and after data transfer. To revert back to an immediate display update, use the automatic latch command (1BH + 41H).

