

481-646

itron VACUUM FLUORESCENT DISPLAY MODULE

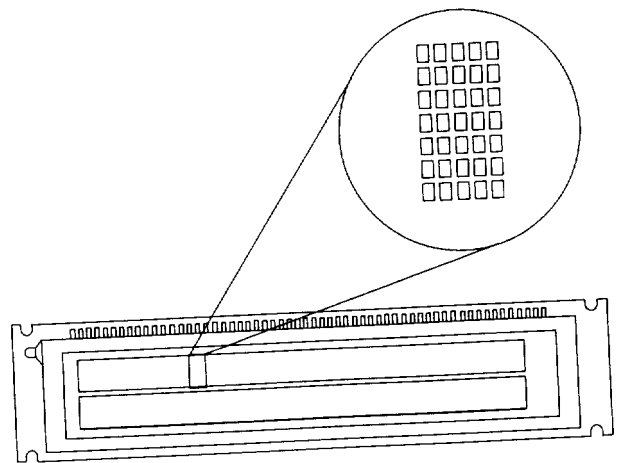
CU20029SCP-B-T20A

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2 LINE x 20 CHARACTERS
9 mm HIGH
5 x 7 DOT MATRIX

FEATURES

2 x 20 Character Display
Single 5v Supply
Bright Blue Green Display
ASCII Character Set
Serial and Parallel Interface
Compact Construction
Extensive Command Set



APPLICATION

Readout for computer systems, communications terminals, and instruments.

CONSTRUCTION

Single board display module consisting of 40 character VFD, refresh memory, character generator, DC/DC converter and the necessary control logic.
The parallel interface level is 5v TTL compatible and can be connected directly to the data bus of the host CPU. The serial interface can be converted to RS232 using an in-line adapter

OPTICAL SPECIFICATIONS

No of Characters	40 in 2 lines
Matrix Format	5 x 7 dots
Display Area	162.2 x 23.6 mm (XxY)
Character Size	6.2 x 9.5 mm (XxY)
Character Pitch	7.7 x 14.1 mm (XxY)
Dot Size	1.0 x 1.1 mm (XxY)
Dot Pitch	1.3 x 1.4 (XxY)
Luminance	350 cd/m ² (100 fL) Min
Colour of Illumination	Blue-Green

ENVIRONMENTAL SPECIFICATIONS

Operating Temperature	-10 to +65°C
Storage Temperature	-40 to +85°C
Operating Humidity	20 to 80% RH
Vibration	10 to 55Hz (10G max. in 3 directions for 30 minutes each)
Shock	100g , 9 ms

ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Details
Logic Input Voltage	VI	0 VDC to 5.5 VDC and not more than the Power Supply Voltage
Power Supply Voltage	VCC	0 VDC to 7.0 VDC

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max.	Unit	Condition
Logic High Input Voltage	VIH	2.0	---	---	VDC	
Logic Low Input Voltage	VIL	---	---	0.8	VDC	
Logic High Output Voltage	VOH	2.4	---	---	VDC	IOH= -2mA
Logic Low Output Voltage	VOL	---	---	0.5	VDC	IOL= 2mA
Power Supply Voltage	VCC	4.75	5.0	5.25	VDC	
Power Supply Current	ICC	---	700	TBD	mADC	VCC= 5V

Note: Power On rise time for VCC should be less than 100ms
The In Rush current ICC may be twice the steady state current at Power On
Optical filters can be used to give blue, green, yellow, white, purple and red output.

DEFAULT SETTINGS

Display Attributes (Power On Reset)	Display Clear, Cursor Off, Cursor Position Left End, Brightness 100%, Auto Carriage Return Mode, Quick Write Mode.
Factory Jumper Settings	Baud: 19200 Parity: Even Font: International

SOFTWARE COMMANDS

Data should be sent to the display only when the busy line is low. Alternatively a delay can be introduced between sending each character. Refer to the BUSY table when using 'Quick Write' mode.

The 'Cursor' is the position where the next sent character will appear.

The 'ESCAPE' command byte allows multiple byte and extended commands to be implemented.

ASCII Commands

Nmon	Hex	Function	Description
CW	20 - FF	Character Write	The character sent is illuminated at the cursor position and the cursor position increments according to the display mode selected (DC1 or 2).
BS	08	Back Space	The cursor moves one position left except when on the top line at the left end.
HT	09	Horizontal Tab	The cursor increments one position according to the display mode (DC1 or 2).
LF	0A	Line Feed	The cursor moves down one line. On the bottom line the cursor moves to the top line in DC mode, or scroll + line clear + carriage return occurs in DC2 mode.
FF	0C	Form Feed	The cursor moves to the top left end.
CR	0D	Carriage Return	The cursor moves to the left end on the same line.
CLR	0E	Clear	All displayed characters are cleared. The cursor does not move.
DC1	11	Overwrite Mode	Characters overwrite existing entries, then the cursor increments one position. At the right end of a line, line feed + carriage return occurs.
DC2	12	Scroll Mode	All characters scroll up one line after write, HT or CR at the bottom right end.
DC4	14	Cursor Off	The cursor is not visible.
DC5	15	Cursor On	The cursor is depicted as a blinking block alternating with the character.
DC6	16	Cursor Off	The cursor is not visible.
DC7	17	Cursor Off	The cursor is not visible.
CT0	18	Character Font 0	The ASCII and International character font is active
CT1	19	Character Font 1	The ASCII and Japanese Katakana font is active.
ESC	1B	Escape Sequence	Extended commands are implemented. See Escape Sequence Table.

Escape Commands

All commands are preceded by ESC.

Nmon	Hex	Function	Description
DMCP	48 + 00H to 27H	Dot Matrix Cursor Position	The cursor is moved to the hex equivalent position.
LUM	4C + 00H to C0H	Brightness Set	where the hex address alters luminance : 00H = 25% 40H = 50% 80H = 75% C0H = 100%
SPW	53	Screen Priority Write	Refreshing the display has priority over data receive which provides a flickerless display. BUSY time is extended.
CBS	54 + 01H to FFH	Cursor Blink Speed	The period of the blink speed is given by the hex value x 14.5ms.
SR	49	Software Reset	All characters are cleared and modes are set to Power On default.
UDC	43 + chr + PT1 + PT2 + PT3 + PT4 + PT5	UDC Dot Matrix	8 user defined characters (UDC) can be active at any one time. The 'chr' represents the character to be substituted by a user defined character from 00H to FFH. Control characters can be replaced. PT1-PT5 specify the dot pattern where a bit set high is a dot 'ON' and a bit set low is a dot 'OFF'.

If an invalid data byte is received, the ESCAPE sequence will terminate and process further bytes as ASCII.

UDC Dot Assignment Table

	D7	D6	D5	D4	D3	D2	D1	D0
PT1	8	7	6	5	4	3	2	1
PT2	16	15	14	13	12	11	10	9
PT3	24	23	22	21	20	19	18	17
PT4	32	31	30	29	28	27	26	25
PT5	---	---	---	---	---	35	34	33

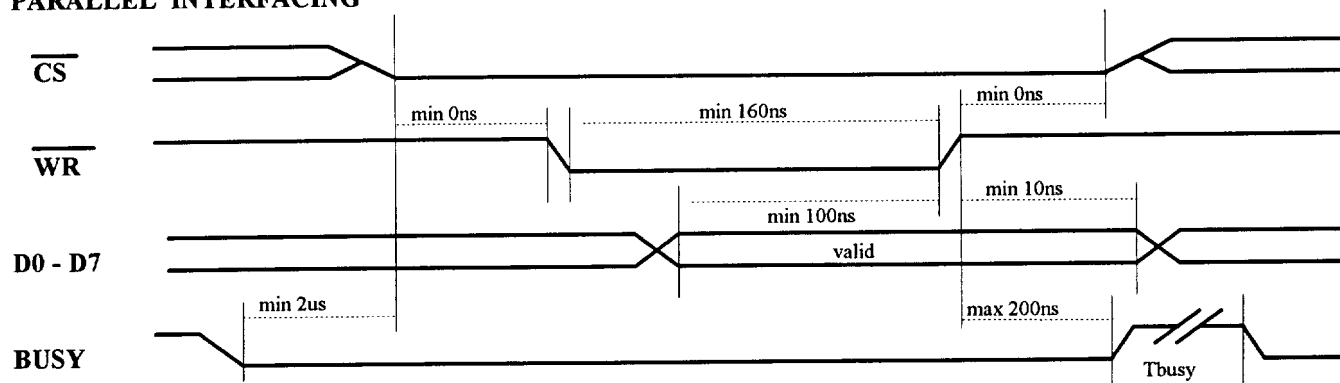
A bit set to '1' will appear illuminated on the display.

Dot Position Number

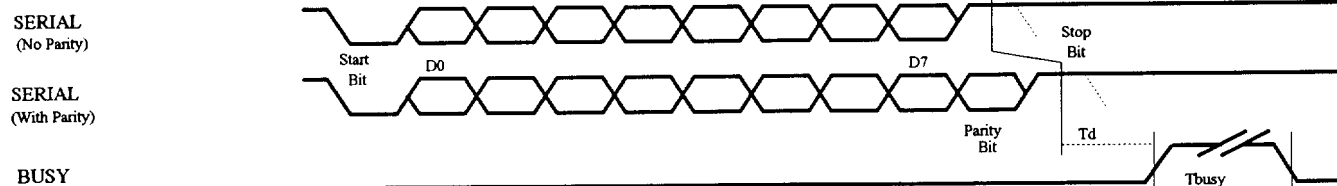
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

5 x 7 Dot Character Font

PARALLEL INTERFACING



SERIAL INTERFACING



SCREEN PRIORITY vs. QUICK WRITE MODE

When display screen scanning has priority over the processing of received data, the busy time can extend from 2 to 15 times the values shown for quick write mode to ensure a flickerless display. Monitoring the BUSY output is therefore preferred in this mode.

QUICK WRITE BUSY TIMING

Data Byte Sent	Busy
Character, HT (DC1 or 2 mode)	200us
Character, HT (DC3 mode)	700us
BS,FF,CR,CT0,CT1,DC1,DC2,DC3	200us
DC4,DC5,DC6,DC7	200us
LF,CLR	700us

Escape Byte Sent	Busy
ESC (1st Byte)	200us
ESC (2nd Byte = 'C')	200us
ESC (2nd Byte = 'I')	1200us
ESC (2nd Byte other than 'C' or 'I')	200us
ESC (3rd ~ 7th Bytes)	200us

JUMPERS

Baud Rate	J0	J1	J2
19200	1	1	1
9600	0	1	1
4800	1	0	1
2400	0	0	1
1200	1	1	0
600	0	1	0
300	1	0	0

Parity	J3	J4
Even	1	1
Odd	0	1
None	0	0

Character Font	JA
International	1
Japanese	0

Where '0' is Short and '1' is Open.

SIGNAL CONNECTOR

Function	Pin No	Function	Pin No	Function	Pin No	Function	Pin No
D7	1	D3	5	$\overline{WR}$	9	GND	13
D6	2	D2	6	$\overline{CS}$	10	GND	14
D5	3	D1	7	SIN/Test	11	VCC	15
D4	4	D0	8	BUSY	12	VCC	16

POWER

Function	Pin No
VCC	1
SIN/Test	2
GND	3

CHARACTER SET

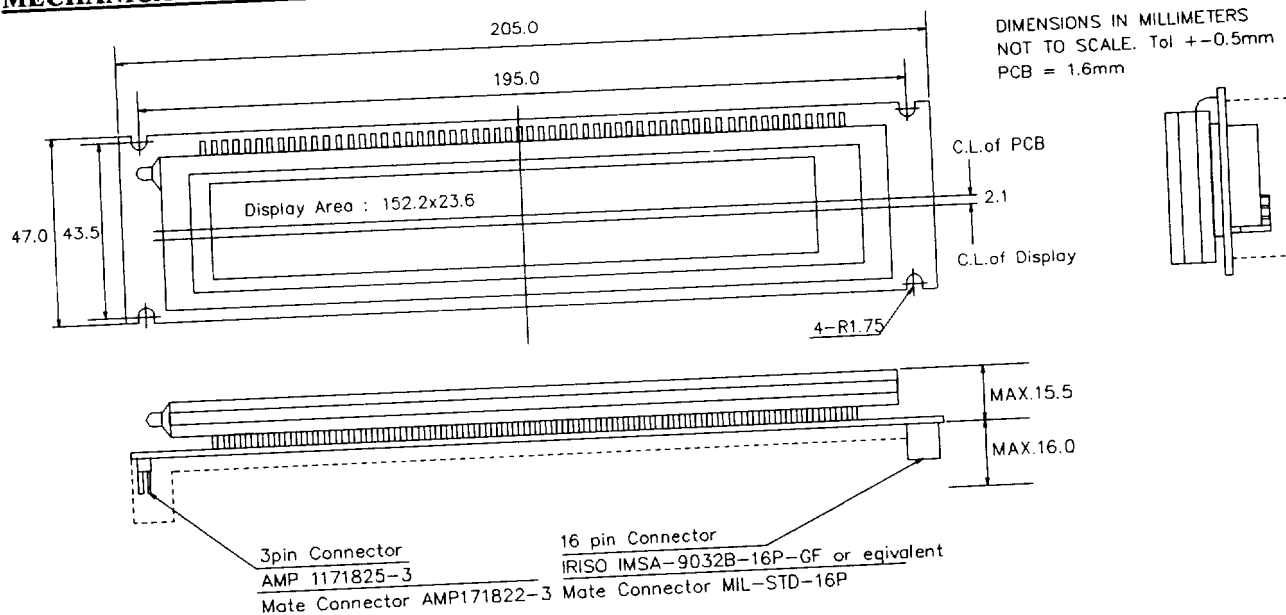
INTERNATIONAL FONT

L	H	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
00																	
01																	
02																	
03																	
04																	
05																	
06																	
07																	
08																	
09																	
0A																	
0B																	
0C																	
0D																	
0E																	
0F																	

JAPANESE KATAKANA FONT

L	H	00	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
00																	
01																	
02																	
03																	
04																	
05																	
06																	
07																	
08																	
09																	
0A																	
0B																	
0C																	
0D																	
0E																	
0F																	

MECHANICAL DRAWINGS



PRECAUTIONS

- Anti-static handling procedures are always required.
- Heavy mechanical or thermal shock may crack the glass.
- Ensure module is mounted without stress to the PCB.
- Power must be OFF when changing connectors.