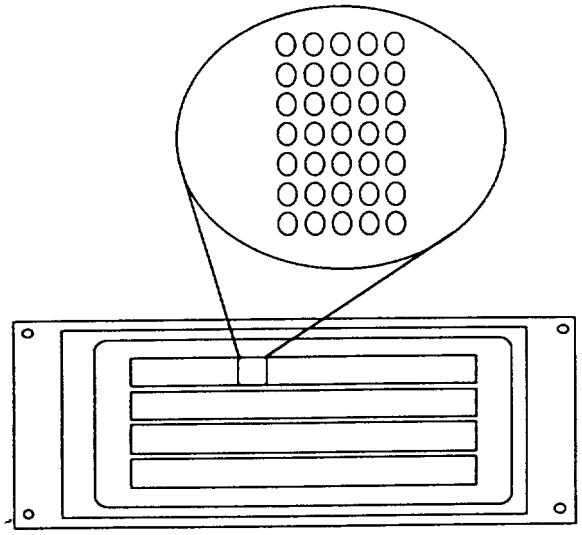
232-488

CU20045SCPB-T23A

4 LINE x 20 CHARACTERS
5 mm HIGH
5 x 7 DOT MATRIX



FEATURES

Single 5V Supply
Bright Blue Green Display
Serial & Parallel Interface
ASCII Character Set
Extensive Command Set
Compact Construction

APPLICATION Readout for computer systems, communication terminals, and automatic instrument

CONSTRUCTION Single board display module consisting of 80 character VFD, refresh memory, character generator, control circuit 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 adaptor

OPTICAL SPECIFICATIONS

No of Characters	20 x 4 lines
Matrix Format	5 x 7 dots
Display Area	90.4 x 26.0 mm (XxY)
Character Size	3.0 x 5.0 mm (XxY)
Character Pitch	4.6 x 7.0 mm (XxY)
Dot Size	0.4 x 0.5 mm (XxY)
Dot Pitch	0.65 x 0.75 mm (XxY)
Luminance	350 cd/m² (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

Logic Input Voltage	0 VDC to 5.5 VDC and not more than the Power Supply Voltage
Power Supply Voltage	0 VDC to 7.0 VDC

ELECTRICAL CHARACTERISTICS

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Logic High Input	VIH	2.0	---	---	VDC	
Logic Low Input	VIL	---	---	0.8	VDC	
Logic High Output	VOH	2.4	---	---	VDC	IOH= -2mA
Logic Low Output	VOL	---	---	0.5	VDC	IOL= 2mA
Power Supply Voltage	VCC	4.75	5.0	5.25	VDC	
Power Supply Current	ICC		400	500	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.

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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
	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 or wraps one position left except the top line 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 DC1 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 bottom right end.
DC4	14	Cursor Underline	The cursor is a solid underline.
DC5	15	Cursor Blink Char	The cursor is depicted as a blinking block alternating with the character.
DC6	16	Cursor Off	The cursor is not visible.
DC7	17	Cursor Blink Under	The cursor is shown as a blinking underline.
CT0	18	Character Font 0	The ASCII + International character font is active.
CT1	19	Character Font 1	The ASCII + Japanese Katakana font is active.
ESC	1B	Escape Sequence	Extended commands are implemented. See Escape Sequence Table.

Escape Commands

Command	Sequence	Description
Move Cursor Position	ESC + 'H' + 00H to 4FH	The cursor is moved to the hex equivalent position.
Brightness Control	ESC + 'L' + 00H to C0H	00H = 25% 40H = 50% 80H = 75% C0H = 100% luminance.
Screen Priority Write	ESC + 'S'	Refreshing the display has priority over data receive which provides a flickerless display. BUSY time is extended.
Cursor Blink Speed	ESC + 'T' + 01H to FFH	The period of the blink speed is given by the hex value x 14.5ms.
Software Reset	ESC + 'I'	All characters are cleared and modes are set to Power On default.
8 User Defineable Characters (UDC)	ESC + 'C' + chr + PT1 + PT2 + PT3 + PT4 + PT5	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	NC	NC	NC	NC	NC	35	34	33

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

DOT POSITION NUMBER

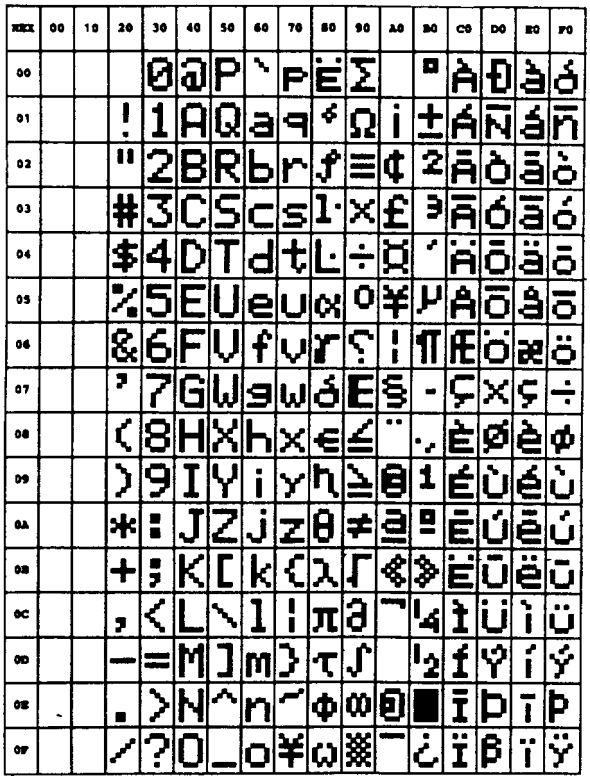
1	2	3	4	5
6	7	8	9	10
11	12	13	14	15
16	17	18	19	20
21	22	23	24	25
26	27	28	29	30
31	32	33	34	35

5x7 Dot Character Font

DEFAULT SETTINGS

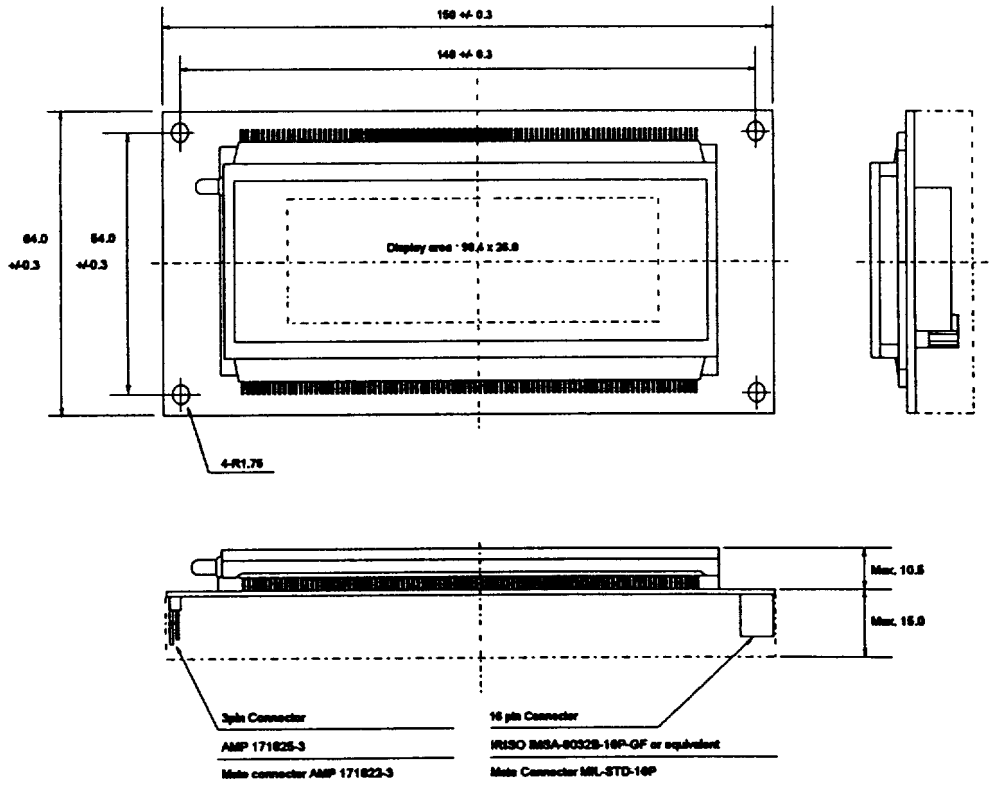
Display Attributes (Power On Reset)	Display Clear, Cursor Off, Cursor Position Left End, Brightness 100%, Auto Carriage Return Mode, Quick Write Mode.
Factory Jumper Settings	Baud: 19200, Parity: Even, Font: International

INTERNATIONAL FONT



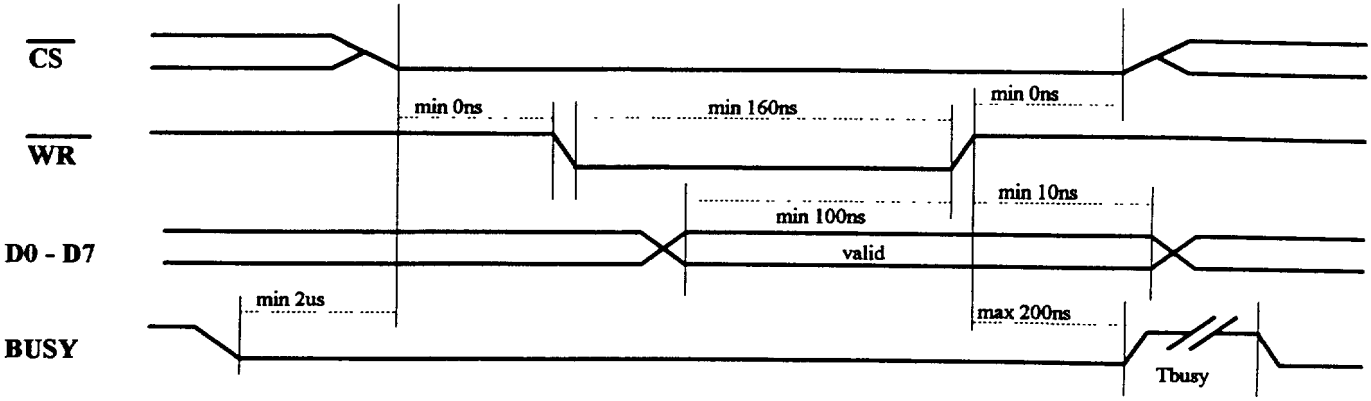
JAPANESE KATAKANA FONT

MECHANICAL DRAWINGS

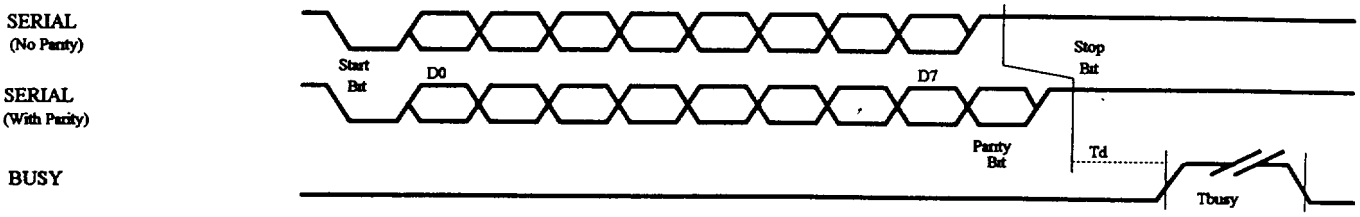


DIMENSIONS IN MILLIMETERS
NOT TO SCALE, Tol +-0.5mm
PCB = 1.6mm

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 prefered in this mode.

QUICK WRITE BUSY TIMING

Data Byte Sent	Busy
Character, HT (DC1or 2 mode)	200us
Character, HT (DC3 mode)	1000us
BS,FF,CR,CT0,CT1,DC1,DC2,DC3	200us
DC4,DC5,DC6,DC7	200us
LF,CLR	900us
ESC (1st Byte)	200us
ESC (2nd Byte = 'C')	200us
ESC (2nd Byte = 'I')	1400us
ESC (2nd Byte other than 'C' or 'I')	200us
ESC (3rd ~ 7th Bytes)	200us

BAUD RATE JUMPERS

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

0 = SHORT
1 = OPEN

PARITY JUMPERS

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

FONT JUMPERS

JA	Character Font
1	International
0	Japanese

SIGNAL CONNECTOR

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

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POWER

Pin No	Function
1	VCC
2	SIN\Test
3	GND

PRECAUTIONS

This module should be handled with care against static discharge and glass breakage.
Data subject to change without notice.

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