Noritake itron

VACUUM FLUORESCENT DISPLAY

MODULE

SPECIFICATION

MODEL : CU20026SCPB-T30A

SPECIFICATION NO.: DS-756-0000-00

DATE OF ISSUE : Sep. 07 , 1999
REVISION :
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PUBLISHED BY
ISE ELECTRONICS CORP. / JAPAN

1. General Description

1.1 Application : Readout of computer, micro-computer, communication terminal and automatic instruments.

1.2 Construction : Single board display module consists of 40 characters(2 x 20) VFD, refresh memory, character generator, control circuit, DC/DC converter and all necessary control logics. Interface level is TTL compatible and the module can be connected to the CPU bus of host directly.

1. 3 Drawing : See attached 11. Outline dimension

2. Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Logic Input Voltage	VI	0	–	5.5	VDC	VI<Vcc+0.2
Power Supply Voltage	Vcc	0	–	7.0	VDC	–

3. Electrical Ratings

Parameter		Symbol	Min.	Typ.	Max	Unit	Condition
Logic Input Voltage	"H"	VIH	2.0	–	VCC	VDC	VCC=5.0V TA=25℃
	"L"	VIL	0	–	0.8		
Power Supply Voltage		VCC	4.75	5.0	5.25	VDC	–

4. Electrical Characteristics
Measuring Conditions : TA (Ambient temperature)=25℃, Vcc=5.0V

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition
Logic Output Voltage	"H"	VOH	3.5	–	–	VDC	IOH=-1.0mA
	"L"	VOL	–	–	0.4		IOL=1.6mA
Power Supply Voltage		ICC	–	0.4	0.6	ADC	–

Note :Icc shows the current at all dots in the screen are lighted.
Slow start power supply may cause erroneous operation.
Icc might be anticipated twice as usual at power on rush.

5. Optical Specifications

Number of characters	: 40(2 lines × 20 chrs)
Matrix format	: 5 × 7 dot with Underline
Display area	: 96.6 × 14.0 mm (X × Y)
Character size	: 3.5 × 5.0 mm (X × Y)
Character pitch	: 4.9 × 8.0 mm (X × Y)
Dot size	: 0.5 × 0.5 mm (X × Y)
Dot pitch	: 0.75 × 0.75 mm (X × Y)
Luminance	: 500 cd/m^2 (145fL) Min.
	1000 cd/m^2 (291fL) Typ.
Color of illumination	: Blue-green.

6. Environmental Specifications

Operating temperature	: -20 to +70 ℃
Storage temperature	: -40 to +85 ℃
Operating humidity	: 0 to 85 % RH (No condensation)
Storage humidity	: 0 to 95 % RH (No condensation)
Vibration	: 10 to 55 Hz, all amplitude 1.0mm, 3 directions, 30 min. each
Shock	: 392mS^2(40G),10 mS.

7. Functional Descriptions

This module provides the functions of 8 bit parallel and serial data write.
Each control data and character fonts are shown in Character Table 0 and Character Table 1.
All data write should be done during BUSY line is low.

$\overline{CS}$	$\overline{WR}$	A0	$\overline{BL}$	T0	Function	BUS direction
0	↑	0	×	×	Character Data Write	Module ← Host
0	↑	↑	×	×	Command Data Write	Module ← Host
×	×	×	0	×	Blanking	—
×	×	×	×	0	Test Mode	—

↑ : Rising edge of pulse X : don't care

7.1 Character data write

When $\overline{WR}$ change from "0" to "1" at the setting of CS =A0="0",data write becomes possible. All data and character codes are shown in Table 1 and 2.

7.2 Control data write

Detail of control data are shown in this clause . The term "Cursor" is the same meaning of " Writing Position".

7.2.1 BS : Back Space (08 Hex)

DC1 Mode: The cursor moves one character to the left.
At the left end, it moves to the upper right end.
At the top left end, the cursor doesn't move.

DC2 Mode: The same as above.

7.2.2 HT : Horizontal Tab (09 Hex)

DC1 Mode: The cursor moves one character to the right.
At the right end, the cursor moves to the lower left end.
At the bottom right end, it can't shift any more.

DC2 Mode: The same as above.

7.2.3 LF : Line Feed (0A Hex)

DC1 Mode : All characters are cleared while the cursor position remains at the same position.
DC2 Mode : The same as above.

7.2.4 CLR : Clear (0C Hex)

DC1 Mode :The data clears display and memory.
The cursor shifts to the left end of the upper line.

DC2 Mode :The same as above.

7.2.5 CR : Carriage Return (0D Hex)

DC1 Mode :The cursor moves to the left end on the upper line.

DC2 Mode : The same as above.

7.2.6 ESC : Escape

The cursor position may be defined by 1byte data after the ESC data.

Upper Line	Lower Line
0000 0000 (1st Column)	0001 0100 (1st Column)
0001 0011 (20th Column)	0010 0111 (20th Column)

7.2.7 Display Mode

DC1 Mode: Ordinary Mode
The cursor moves one character to the right automatically when a character data is written. If the cursor is at right end of the upper line. It moves to the left end of the lower line.

DC2 Mode : Horizontal Scroll mode
All characters are shifted one character to the left and the character written newly is displayed at the right end of the lower line when the writing position reaches to the right end of the lower line.

7.2.8 Cursor Mode

The modules have three selectable cursor modes(DC3,DC4,DC5).
A cursor mode is kept until the other modes are selected.

DC3 Mode : The cursor turns ON.
DC4 Mode : The cursor turns OFF.
DC5 Mode : The cursor turns on and blinks.

This module has three kinds of cursor as follows.

CM1: Underline cursor is selected when the power supply is switched on.
CM2: All segments located at the cursor position are lit.
CM3: The character located at the cursor position are lit in reverse.

7.2.9 Luminance Levels

The module has four selectable luminance levels(DIM1,DIM2,DIM3 and DIM4).

DATA	Relative Luminance(%)
DIM1(01Hex)	100
DIM2(02Hex)	75
DIM3(03Hex)	50
DIM4(04Hex)	25

Default of Luminance level is 100%.

7.2.10 SB: Sub Sequence

One user character can be registered by 8 byte after the SB data as follows.

1st byte: Enter the character code (20Hex~FFHex) where can be registered.
2nd byte: Enter the data (active high) as shown in below.
↓ : At this time, D5 ~D7 are invalid.
8th byte :

	D0	D1	D2	D3	D4	Example of "S"
2nd byte	0	1	1	1	1	1EHex
3rd byte	1	0	0	0	0	01Hex
4th byte	1	0	0	0	0	01Hex
5th byte	0	1	1	1	0	0EHex
6th byte	0	0	0	0	1	10Hex
7th byte	0	0	0	0	1	10Hex
8th byte	1	1	1	1	0	0FHex

7.3 Character and control code table

Following 2 character tables can be selected. (see para. 9. Jumper wires)

7.3.1 Table 1 (G57181)

D3 D2 D1 D0	D7 D6 D5 D4	0 0 0 0	0 0 0 1	0 0 1 0	0 0 1 1	0 1 0 0	0 1 0 1	0 1 1 0	0 1 1 1	1 0 0 0	1 0 0 1	1 0 1 0	1 0 1 1	1 1 0 0	1 1 0 1	1 1 1 0	1 1 1 1
		0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0 0 0 0	0	NUL		SP	0	@	P	`	p								
0 0 0 1	1	MD1		!	1	A	Q	a	q								
0 0 1 0	2	MD2		"	2	B	R	b	r								
0 0 1 1	3	MD3		#	3	C	S	c	s								
0 1 0 0	4			$	4	D	T	d	t								
0 1 0 1	5			%	5	E	U	e	u								
0 1 1 0	6			&	6	F	V	f	v								
0 1 1 1	7			'	7	G	W	g	w								
1 0 0 0	8	BS	CAN	(	8	H	X	h	x								
1 0 0 1	9	HT		)	9	I	Y	i	y								
1 0 1 0	A	LF		*	:	J	Z	j	z								
1 0 1 1	B	HOM	ESC	+	;	K	[	k	{								
1 1 0 0	C	CLR		,	<	L	\	l	|								
1 1 0 1	D	CR		-	=	M	]	m	}								
1 1 1 0	E			.	>	N	^	n	~								
1 1 1 1	F		US	/	?	O	_	o									

7.3.2 Table 2 (G57180)

7.4 Command Write

At the setting of CS="0",A0="1",when WR changes from "0" to "1",the following command is written. This is possible, however, only when the Busy signal is at logic "0".

0000 0000 (00Hex) ↓ 0010 0111 (27Hex)	Set the cursor position. 0000 0000(00Hex) Home position Left end Right end Upper Line 00Hex 13Hex Lower Line 14Hex 27Hex
1111 0011 (F3Hex)	Character Insertion This shifts the character at the cursor position and subsequent characters one character to the right. The character at the right end of the lower line overflows. The cursor remains at its former position, while space is written in, which prepares for the next character to be written.
1111 0100 (F4Hex)	Character deletion This deletes the character at the cursor position. The characters next to this in the line shifts one character to the left.
1111 1111 (FFHex)	Reset This clear display and memory. Set up power ON condition.

7.5 Test Mode

Test Mode is set by keeping T0 is low at power on or initialize. During Test Mode, all character fonts are displayed automatically, and no any data are acceptable.

7.6 Blanking

The displays are blanked by turning BL="0".Quick blanking response is possible due to direct ON,OFF operation of the driver. Since the content of memory is not affected, restoring of BL="1" displays the previous characters.

Use of this line facilitates blinking of the displays.

7.7 Module Initialize

(1)All character data becomes "space".

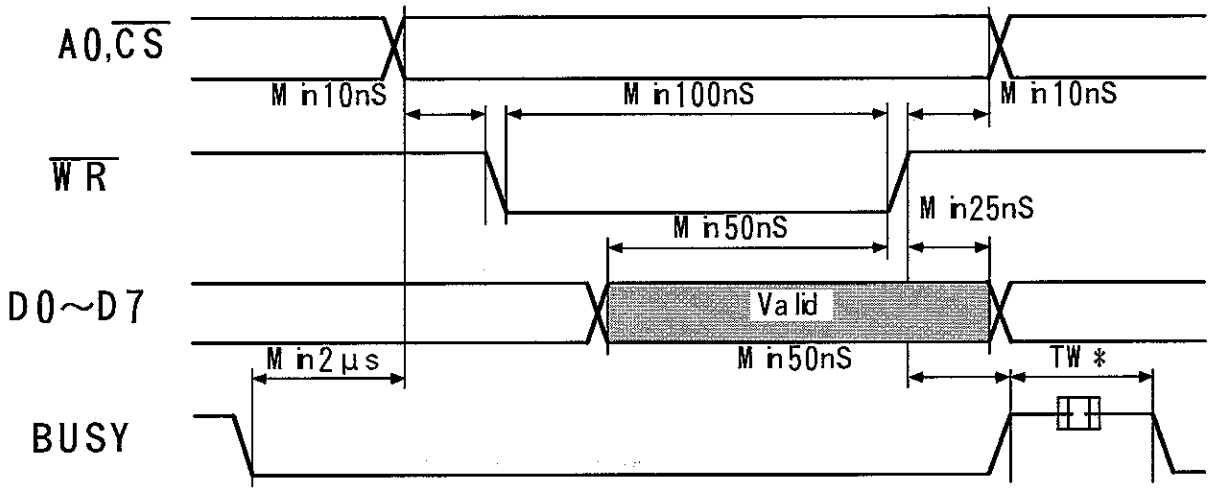
(2)Cursor position is set to the left end of upper line.

(3)The luminance level is set to DIM1.

(4)Display Mode is set to DC1.

8. Timing

8.1 Parallel interface Timing

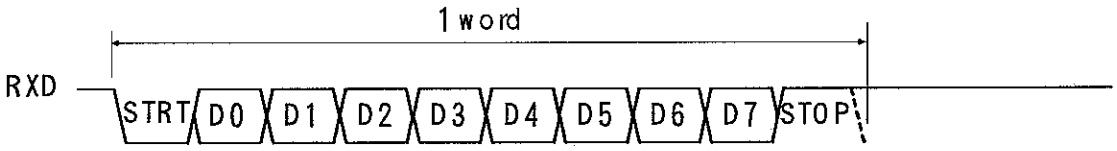


TW * :see para BUSY TIME

8.2 Serial Interface Timing

It is possible to input serial data from the terminal "RXD".
Serial data write, asynchronous-8bit TTL level is also acceptable.
Following baud rates can be selected by combination of the Jumper wires.
(see para. 9. Jumper wires)

300, 600, 1200, 2400, 4800, 9600BPS



STRT : Start Bit STOP : Stop Bit D0(LSB)~D7(MSB)

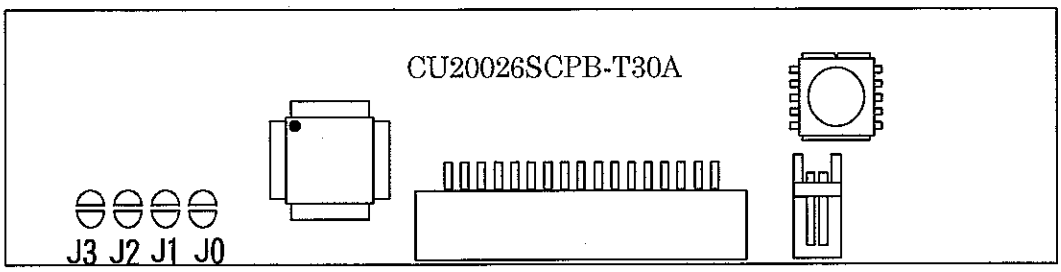
Busy Time

Input data execution time (TW*) at Quick Write Mode are shown as follows.

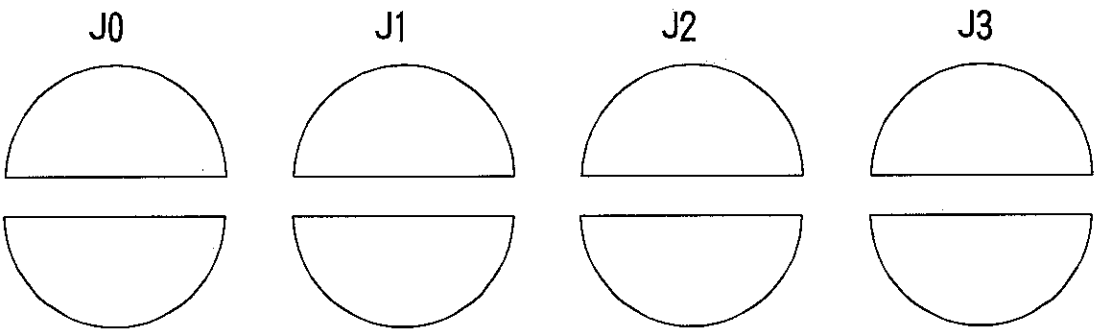
Data	Execution time(TW)		Data Writing Mode
	DC1 Mode	DC2 Mode	
Character Data,HT,LF	200 μS (Max)	345 μS (Max) at scrolling	Quick write mode
BS,CR,DC1,DC2,DC3 ,DC4,DC5	200 μS (Max)		
CLR	345 μS		

9. Jumper wires

Position of jumper wire



Jumper form



Jumper Function Table

J3	J2	J1	J0	Baud Rate Selection
0	0	0	X	300 BPS
0	0	1	X	300 BPS
0	1	0	X	300 BPS
0	1	1	X	600 BPS
1	0	0	X	1200 BPS
1	0	1	X	2400 BPS
1	1	0	X	4800 BPS
1	1	1	X	9600 BPS
Character Table Selection				
X	X	X	1	Table1(G57181)
X	X	X	0	Table2(G57180)
1	1	1	1	Setting at Factory

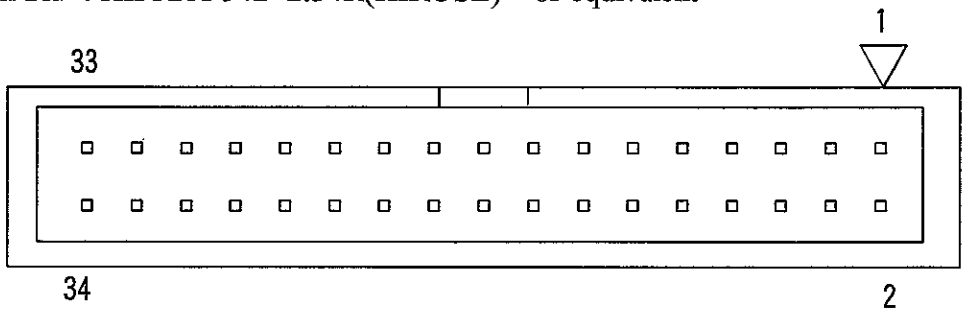
0:short 1:open X:Don't care

10. Connector Pin assignment

10.1 Interface Connector(30pin)

Module Side: HIF3FB-34PA-2.54DS(HIROSE) or equivalent

System Sid : HIF3BA-34D-2.54R(HIROSE) or equivalent



No.	Terminal	No.	Terminal
1	D7	2	GND
3	D6	4	GND
5	D5	6	GND
7	D4	8	GND
9	D3	10	GND
11	D2	12	GND
13	D1	14	GND
15	D0	16	GND
17	$\overline{WR}$	18	GND
19	A0	20	GND
21	N. C	22	GND
23	$\overline{CS}$	24	GND
25	T0	26	GND
27	BUSY	28	GND
29	$\overline{BL}$	30	GND
31	N. C	32	GND
33	RXD	34	GND

N.C:No Connection

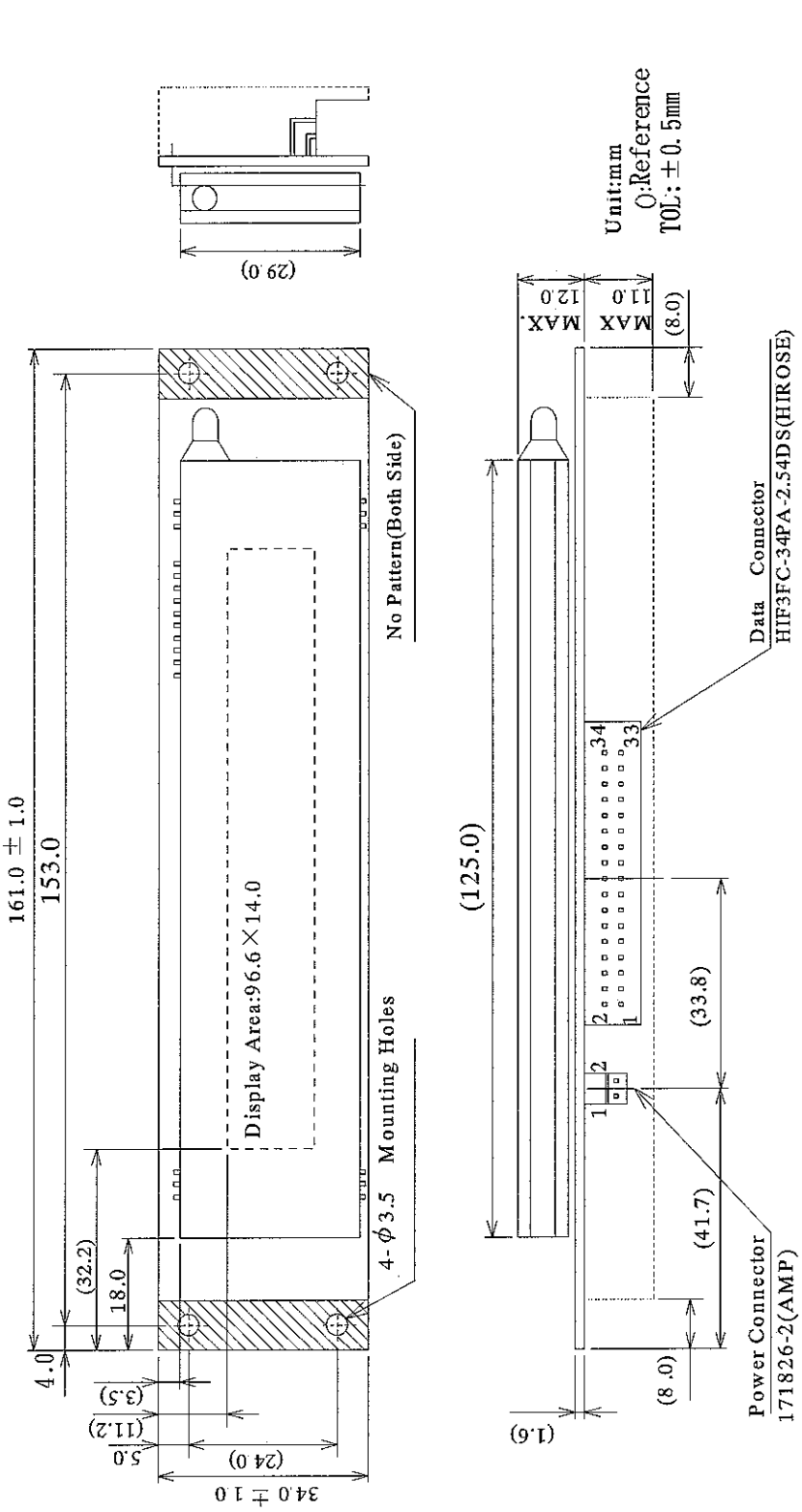
10.2 Power Supply Connector(2pin)

Module Side : 171826-2(AMP)

System Side : Housing 171822-2(AMP),Pin 170204-1(AMP) or 170204-2(AMP)

No.	Terminal
1	Vcc(+5V)
2	GND

11. Outline dimension



IMPORTANT PRECAUTIONS

* All VFD Modules contain MOS LSIs or ICs. Anti-Static handling procedures are always required.

* VF Display consists of Soda-lime glass. Heavy shock more than 100G, thermal shock greater than 10℃/minute, direct hit with hard material to the glass surface --especially to the EXHAUST PIPE -- may CRACK the glass.

* Do not PUSH the display strongly. At mounting to the system frame, slight gap between display glass face and front panel is necessary to avoid a contact failure of lead pins of display. Twist or warp mounting will make a glass CRACK around the lead pin of display.

* Neither DATA CONNECTOR or POWER CONNECTOR should be connected or disconnected while power is applied. As is often the case with most subsystems, caution should be exercised in selectively disconnecting power within a computer based system. The modules receive high logic on strobe lines as random signals on all data ports.
  Removal of primary power with logic signals applied may damage input circuitry.

* Stress more than specification listed under the Absolute Maximum Ratings may cause PERMANENT DAMAGE of the modules.

* +5 volts power line must be regulated completely since all control logics depend on this line. Do not apply slow-start power. Provide sufficient output current power source to avoid trouble of RUSH CURRENT at power on. (At least output current of double figure of Icc, listed on the specification of each module, is required.)

* Data cable length between module and host system is recommended within 500 mm to be free from a miss-operation caused by noise.

* Do not place the module on the conductive plate just after the power off. Due to big capacitors on the module, more than 1 min. of discharging time is required to avoid the failure caused by shorting of power line.

* 2 hours pre-running with the test mode operation may help the stability of the brightness of the VFD when power was not applied more than 2 months.

* Steady repeating of a fixed (static) message displaying, longer than 5 hours in a day may cause the phosphor burn-out problem. An automatic shut down programming, scrolling message using DC2 mode or 2 hours test mode operation during the idling of the host is recommended.