KATHREIN

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SPECIFICATION

STB

VACUUM FLUORESCENT DISPLAY

HCS-12SS59T

	Date	Descriptions	Approved by
1	2009.04.22		
2			
3			
4			
5		Refer to REVISION RECORD	
6			
7			
8			
9			
10			

Designed by	Checked by	Approved by
Tony 04/22	04.22	04.22

Customer's Approval

1

Pin Description

| Pin Name	I/O	Description
F+,F-	-	Filament Voltage
V_{DD}		V_{DD}-GND are Power Supplies for Internal logic
GND	-	V_{EE}-GND are Power Supplies for driving CIG VFD.
V_{EE}		(Note: Apply V_{EE} after V_{DD} is applied)
OSC0	I/O	Oscillator
$\overline{RST}$	I	Reset Input : When RST is set to "LOW", all functions are initialized.
$\overline{CS}$	I	Chip Select Input : When CS is set to "HIGH", the serial data transfer is disabled.
CLK	I	Shift Clock Input : The serial data is shifted at the rising edge of CLK
DIN	I	Serial Data Input

Oscillation Circuit

An oscillation circuit may be constructed by connecting external Resistor (R1) and Capacitor (C1) between the oscillator pin -- OSC0. The RC time constant depends on the value of V_{DD} voltage used.

The target oscillation frequency is 2MHz. Please refer to the diagram below.
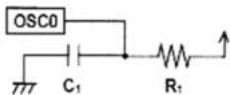
Application Circuit
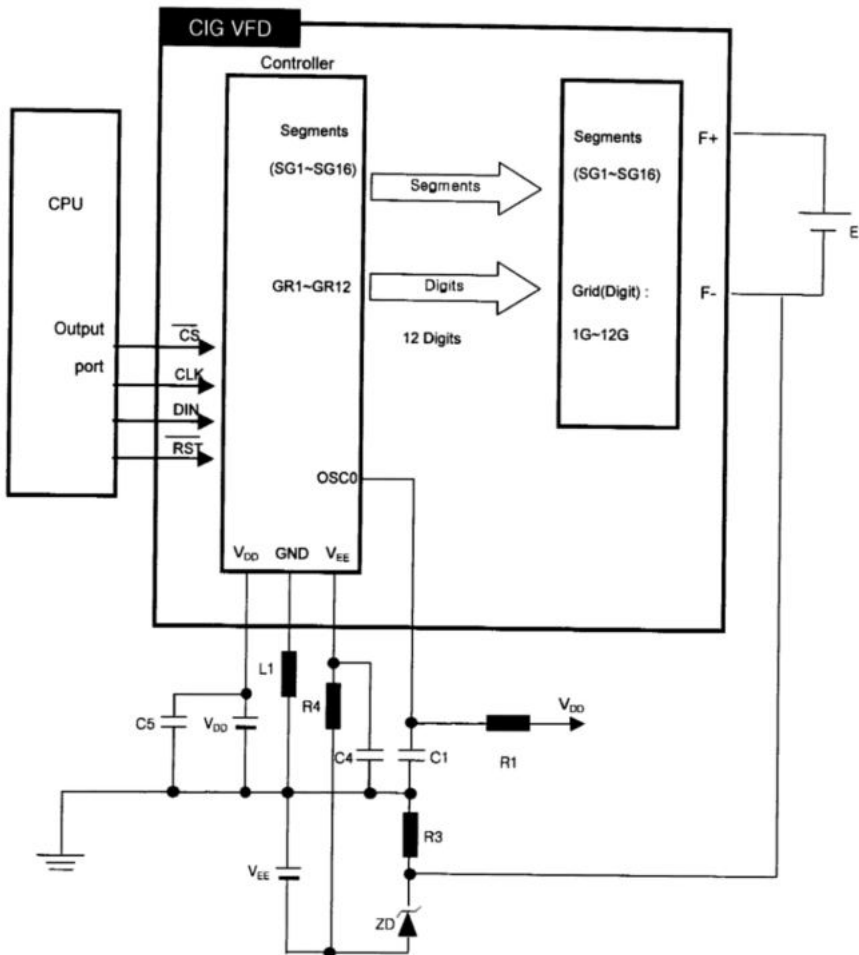
「Note」

Passive components relating oscillation and reset are required to be located as close as possible to VFD.

■ R4 : Current Limiting Resistor (470Ω)

■ L1 : Bead(Inductor) for improving ESD ... CIC21J601NE(Maker:SEM) equivalent

■ C4 : Bypass Capacitor for High Voltage (0.1uF, 60V)

■ C5 : Bypass Capacitor for Logic Voltage (0.1uF)

Absolute Maximum Ratings

Parameter	Symbol	Condition	Rating	Unit
Supply Voltage_1	V_{DD}	-	-0.3 to 6.5	V_{DC}
Supply Voltage_2	V_{EE}	-	-0.3~+45.0	V_{DC}
Input Voltage	V_{IN}	-	-0.3 to V_{DD}+0.3	V_{DC}
Storage Temperature	T_{STG}	-	-55 to +85	℃
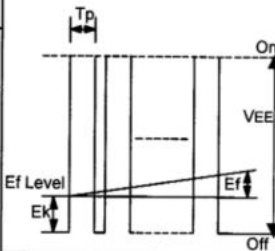
Recommended Operating Conditions

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Filament Voltage	Ef	-	3.24	3.6	3.96	V_{DC}
Supply Voltage_1	V_{DD}	-	4.5	5.0	5.5	V_{DC}
Supply Voltage_2	V_{EE}	-	30.6	34.0	37.4	V_{DC}
High Level Input Voltage	V_{IH}	All Input pins except OSC0	0.7 V_{DD}	-	-	V_{DC}
Low Level Input Voltage	V_{IL}	All Input pins except OSC0	-	-	0.3 V_{DD}	V_{DC}
Cut-off Voltage	Ek	-	2.0	-	-	V_{DC}
CLK Frequency	f_C	-	-	-	2.0	MHz
Oscillation Frequency	f_{OSC}	R1=8.2kΩ, C1=82pF	1.4	2.0	2.6	MHz
Frame Frequency	f_{FR}	R1=8.2kΩ, C1=82pF	170	244	318	Hz
Operating Temperature	T_{OPR}	-	-20	-	+70	℃

DC Electrical Characteristics

Parameter	Symbol	Applied Pin	Condition	Min.	Typ.	Max.	Unit
High Level Input Voltage	V_{IH}	CS, CLK, DIN, RST	-	0.7 V_{DD}	-	-	V_{DC}
Low Level Input Voltage	V_{IL}	CS, CLK, DIN, RST	-	-	-	0.3 V_{DD}	V_{DC}
High Level Input Current	I_{IH}	CS, CLK, DIN, RST	$V_{IH}=V_{DD}$	-1.0	-	1.0	μA
Low Level Input Current	I_{IL}	CS, CLK, DIN, RST	$V_{IL}=0.0V$	-1.0	-	1.0	μA
High Level Output Voltage	V_{OH1}	COM1~16	$I_{OH}=-30mA$	$V_{DISP}-1.5$	-	-	V_{DC}
	V_{OH2}	AD1~2	$I_{OH}=-15mA$	$V_{DISP}-1.5$	-	-	V_{DC}
	V_{OH3}	SEG1~16	$I_{OH}=-6mA$	$V_{DISP}-1.5$	-	-	V_{DC}
Low Level Output Voltage	V_{OL}	-	-	-	-	1.0	V_{DC}
Filament Current	If	F+ and F-	$V_{DD}=V_{EE}$=Open	113	125	138	mA
Current Consumption	I_{DD}(Peak)	-	-	-	|13|	|26|	mA
	I_{DD}(AVE)	-	-	-	|11|	|22|	mA

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Optical Characteristics

ITEMS	Test Conditions		Color	Min.	Typ.	Max.	Unit
Brightness	Ef = 3.60 Vdc V_{DD} = 5.0 Vdc V_{EE} = 34.0 Vdc EK = 2.0 Vdc fosc = 2.0 MHz Tp = 240 μs		GREEN	102	204	—	ft-L
Brightness Ratio Between Digits	Tb = 16 μs		$\frac{L(Max)}{L(Min)}$	-	-	2	-
Color Coordinate NOTE 1)			GREEN (G. :x=0.250,y=0.439)				

NOTE 1. All phosphor is Cd-free phosphor.

AC Electrical Characteristics

Parameter	Symbol	Condition	Min.	Max.	Unit
CLK Cycle Time	f_C	-	-	2.0	MHz
CLK Pulse Width	t_{CW}	-	250	-	ns
DIN Setup Time	t_{DS}	-	250	-	ns
DIN Hold Time	t_{DH}	-	250	-	ns
CS Setup Time	t_{CSS}	-	250	-	ns
CS Hold Time	t_{CSH}	R1=8.2kΩ, C1=82pF	16	-	μs
CS Wait Time	t_{CSW}	-	250	-	ns
Data Processing Time	t_{DOFF}	R1=8.2kΩ, C1=82pF	8	-	μs
RST Pulse Width	t_{WRST}	When RST Signal is input from microcontroller etc. externally	250	-	ns
RST Time	t_{RSON}	-	250	-	ns
D_{IN} Wait Time	t_{RSOFF}	-	250	-	ns
All Output Slew Rate	t_R	CI=100pF, tR=20% to 80%	-	2.0	μs
	t_F	CI=100pF, tF=80% to 20%	-	2.0	μs

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Data Transfer Method and Command Write Method

Display control command and data are written by an 8-bit serial transfer.
Write timing is shown in the figure below.

Setting the $\overline{CS}$ pin to "Low" level enables a data transfer.
Data is 8 bits and is sequentially input into the DA pin from LSB (LSB first).
As shown in the figure below, data is read by the shift register at the rising edge of the shift clock, which is input into the CP pin. If 8-bit data is input, internal load signals are automatically generated and data is written to each register and RAM.
Therefore it is not necessary to input load signals from the outside.

Setting the $\overline{CS}$ pin to "High" disables data transfer. Data input from the point when the $\overline{CS}$ pin changes from "High" to "Low" is recognized in 8-bit units.
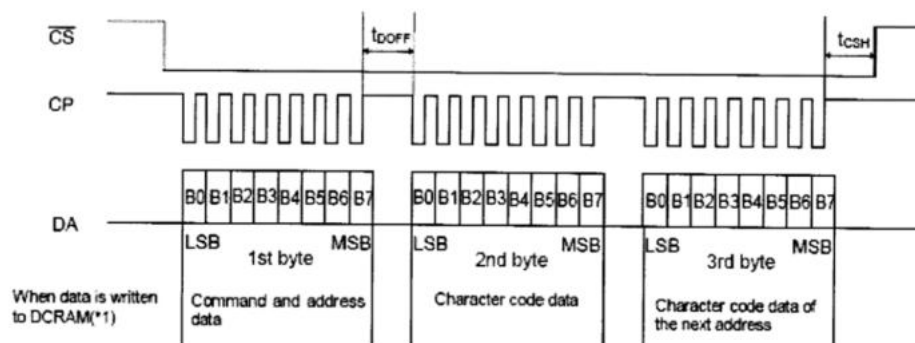
*1 When data is written to RAM (DCRAM, CGRAM, ADRAM) continuously, addresses are internally incremented automatically.   Therefore it is not necessary to specify the 1st byte to write RAM data for the 2nd and subsequent bytes.

Reset Function

Reset is executed when the $\overline{RESET}$ pin is set to "L", (when turning power on, for example) and initializes all functions.
Initial status is as follows.

• Address of each RAM .... Address 00H
• Data of each RAM .... All contents are undefined.
• Number of display digits .... 16 digits
• Brightness adjustment 0/16
• All display lights ON or OFF .... OFF mode
• Segment output .... All segment outputs go "Low."
• AD output .... All AD outputs go "Low."

Be sure to execute the reset operation when turning power on and set again according to "Setting Flowchart" after reset.

Timing Characteristics

Parameter	Symbol	V_{DD} = 5.0 ±10%
High Level Input Voltage	V_{IH}	0.7 V_{DD}
Low Level Input Voltage	V_{IL}	0.3 V_{DD}

- Data TIMING
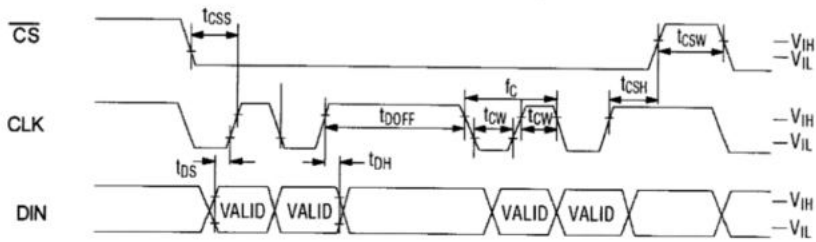
- Reset Timing

- Output Timing

Note: 14 SEG Mode was initially fixed,so SEG2 and SEG5 will not be connected.
For 16, 14, 7 SEG MODE,please find the detailed FONT-MAP in page 19.

Command List

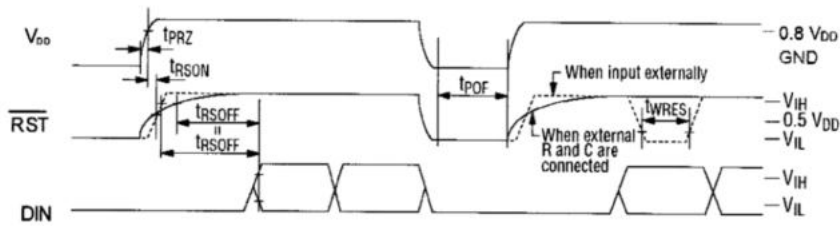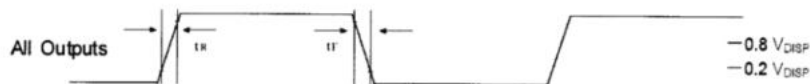|	Command	LSB		First byte					MSB	LSB		Second byte					MSB	
		B0	B1	B2	B3	B4	B5	B6	B7	B0	B1	B2	B3	B4	B5	B6	B7	
1	DCRAM data write	X0	X1	X2	X3	1	0	0	0	C0	C1	C2	C3	C4	C5	C6	C7	
2	CGRAM data write	X0	X1	X2	X3	0	1	0	0	C0	C1	C2	C3	C4	C5	C6	C7	2nd byte
										C8	C9	C10	C11	C12	C13	C14	C15	3rd byte
3	ADRAM data write	X0	X1	X2	X3	1	1	0	0	C0	C1	*	*	*	*	*	*	
4	Display duty set	D0	D1	D2	D3	1	0	1	0									
5	Number of digits set	K0	K1	K2	K3	0	1	1	0									
6	All display lights ON/OFF	L	H	*	*	1	1	1	0									
	Others (test mode)																	

* : Don't care
Xn : Address setting for each RAM
Cn : Character code setting for each RAM
Dn : Display duty setting
Kn : Setting of the number of display digits
H : All display lights ON setting
L : All display lights OFF setting

When data is written to RAM (DCRAM, CGRAM, and ADRAM) continuously, addresses are internally incremented automatically. Therefore it is not necessary to specify the 1st byte to write RAM data for the 2nd and subsequent bytes.

Note: The test mode is used for inspection before shipment. It is not a user function.

Positional Relationship Between SEGn and ADn (one digit)
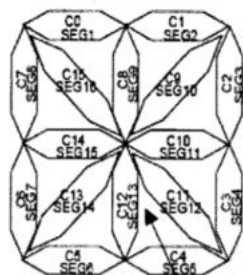
Note

C0–7: Corresponds to the 2nd byte of the CGRAM data write command.

C8–15: Corresponds to the 3rd byte of the CGRAM data write command.

SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8
C0	C1	C2	C3	C4	C5	C6	C7
SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15	SEG16
C8	C9	C10	C11	C12	C13	C14	C15

Note: SEG2 and SEG5 herein are suspended with no connection,
therefore both "0" or "1" level in bit C1 and C4 could be acceptable.

Description of Commands and Functions

1. "DCRAM data write" command
   (Specifies the address of DCRAM and writes the character code of CGROM and CGRAM.)

DCRAM (Data Control RAM) has a 4-bit address to store character codes of CGROM and CGRAM.
A character code specified by DCRAM is converted to an alphanumeric character pattern via CGROM or CGRAM.
The DCRAM can store 16 characters worth of character codes.

[Command format]

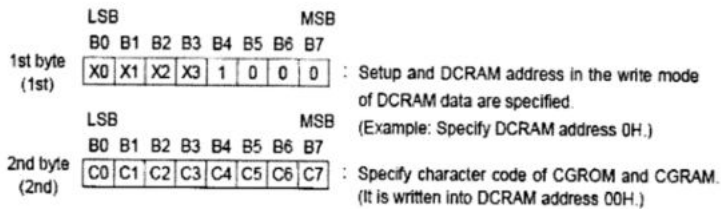|	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
1st byte (1st)	X0	X1	X2	X3	1	0	0	0	: Setup and DCRAM address in the write mode of DCRAM data are specified. (Example: Specify DCRAM address 0H.)

	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (2nd)	C0	C1	C2	C3	C4	C5	C6	C7	: Specify character code of CGROM and CGRAM. (It is written into DCRAM address 00H.)

To specify the character code of CGROM and CGRAM to the next address continuously, specify only character code as follows.
Since the address of DCRAM is automatically incremented, address specification is unnecessary.

	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (3rd)	C0	C1	C2	C3	C4	C5	C6	C7	: Specify character code of CGROM and CGRAM. (It is written into DCRAM address 1H.)

	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (4th)	C0	C1	C2	C3	C4	C5	C6	C7	: Specify character code of CGROM and CGRAM. (It is written into DCRAM address 2H.)

	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (17th)	C0	C1	C2	C3	C4	C5	C6	C7	: Specify character code of CGROM and CGRAM. (It is written into DCRAM address FH.)

	LSB							MSB	
	B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (18th)	C0	C1	C2	C3	C4	C5	C6	C7	: Specify character code of CGROM and CGRAM. (It is rewritten into DCRAM address 0H.)

X0 (LSB) to X3 (MSB): DCRAM address (4 bits: 16 characters worth)
C0 (LSB) to C7 (MSB): Character code of CGROM and CGRAM (8 bits: 256 characters worth)

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[Positional relationship between CGRAM addresses setup and CGROM addresses]

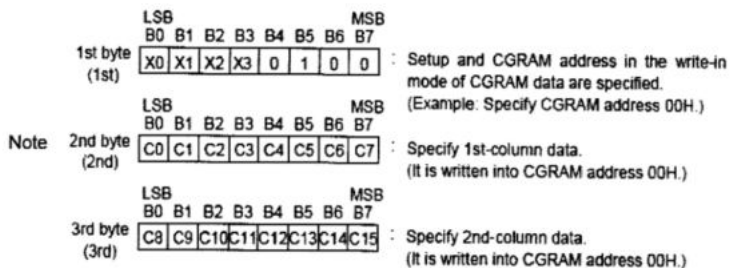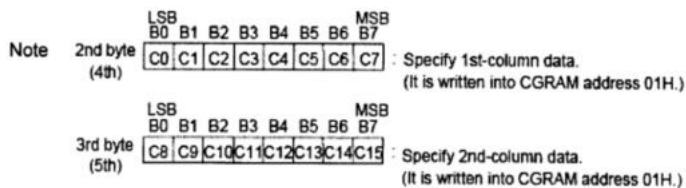| HEX	X0	X1	X2	X3	CGROM address	HEX	X0	X1	X2	X3	CGROM address
0	0	0	0	0	RAM00	8	0	0	0	1	RAM08
1	1	0	0	0	RAM01	9	1	0	0	1	RAM09
2	0	1	0	0	RAM02	A	0	1	0	1	RAM0A
3	1	1	0	0	RAM03	B	1	1	0	1	RAM0B
4	0	0	1	0	RAM04	C	0	0	1	1	RAM0C
5	1	0	1	0	RAM05	D	1	0	1	1	RAM0D
6	0	1	1	0	RAM06	E	0	1	1	1	RAM0E
7	1	1	1	0	RAM07	F	1	1	1	1	RAM0F

2. "CGRAM data write" command
(Specifies the address of CGRAM and writes character pattern data.)

CGRAM (Character Generator RAM) has a 4-bit address to store alphanumeric character patterns.
A character pattern stored in CGRAM can be displayed by specifying the character code (address) by DCRAM.
The addresses of CGRAM are assigned to 00H to 0FH (All the other addresses are the CGROM addresses).
The CGRAM can store 16 types of character patterns.

[Command format]

Note

1st byte (1st)

LSB B0 B1 B2 B3 B4 B5 B6 B7 MSB
| X0 | X1 | X2 | X3 | 0 | 1 | 0 | 0 |

: Setup and CGRAM address in the write-in mode of CGRAM data are specified.
(Example: Specify CGRAM address 00H.)

2nd byte (2nd)

LSB B0 B1 B2 B3 B4 B5 B6 B7 MSB
| C0 | C1 | C2 | C3 | C4 | C5 | C6 | C7 |

: Specify 1st-column data.
(It is written into CGRAM address 00H.)

3rd byte (3rd)

LSB B0 B1 B2 B3 B4 B5 B6 B7 MSB
| C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 |

: Specify 2nd-column data.
(It is written into CGRAM address 00H.)

To specify character pattern data continuously to the next address, specify only character pattern data as follows.
Since the address of CGRAM is automatically incremented, address specification is unnecessary.
Data from the 2nd to 6th byte (character pattern) is regarded as one data item taken together, so 8µs is sufficient for tDOFF time between bytes.

Note

2nd byte (4th)

LSB B0 B1 B2 B3 B4 B5 B6 B7 MSB
| C0 | C1 | C2 | C3 | C4 | C5 | C6 | C7 |

: Specify 1st-column data.
(It is written into CGRAM address 01H.)

3rd byte (5th)

LSB B0 B1 B2 B3 B4 B5 B6 B7 MSB
| C8 | C9 | C10 | C11 | C12 | C13 | C14 | C15 |

: Specify 2nd-column data.
(It is written into CGRAM address 01H.)

X0 (LSB) to X3 (MSB): CGRAM address (4 bits: 16 characters worth)
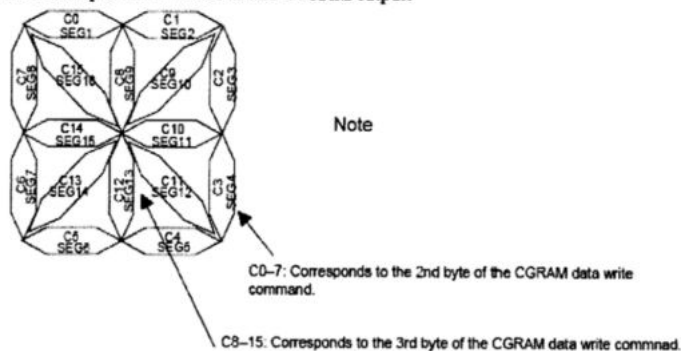C0 (LSB) to C15 (MSB): Character data of CGRAM (16 bits: 16 outputs per digit)

Note: Bit C1 and C4 in 2nd byte means suspended terminal SEG2 and SEG5.
Therefore both "0" or "1" level in bit C1 and C4 could be acceptable.

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[Positional relationship between CGRAM addresses setup and CGROM addresses]

HEX	X0	X1	X2	X3	CGROM address	HEX	X0	X1	X2	X3	CGROM address
0	0	0	0	0	RAM00	8	0	0	0	1	RAM08
1	1	0	0	0	RAM01	9	1	0	0	1	RAM09
2	0	1	0	0	RAM02	A	0	1	0	1	RAM0A
3	1	1	1	0	RAM03	B	1	1	0	1	RAM0B
4	0	0	1	0	RAM04	C	0	0	1	1	RAM0C
5	1	0	1	0	RAM05	D	1	0	1	1	RAM0D
6	0	1	1	0	RAM06	E	0	1	1	1	RAM0E
7	1	1	1	0	RAM07	F	1	1	1	1	RAM0F

Refer to the ROM Code Tables attached later in this document.

Positional Relationship Between CGROM and CGRAM outputs

Note

C0–7: Corresponds to the 2nd byte of the CGRAM data write command.

C8–15: Corresponds to the 3rd byte of the CGRAM data write commnad.

*On CGROM

A CGROM (Character Generator ROM) has an 8-bit address to generate alphanumeric type matrix character patterns.

It has a capacity of 240 x 16 bits and can store 240 types of character patterns.

SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8
C0	C1	C2	C3	C4	C5	C6	C7
SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15	SEG16
C8	C9	C10	C11	C12	C13	C14	C15

Note: Bit C1(SEG2) and C4(SEG5) would be required in data process even in fixed 14-Seg Mode. However, both "0" or "1" would be acceptalbe.

3. "ADRAM data write" command
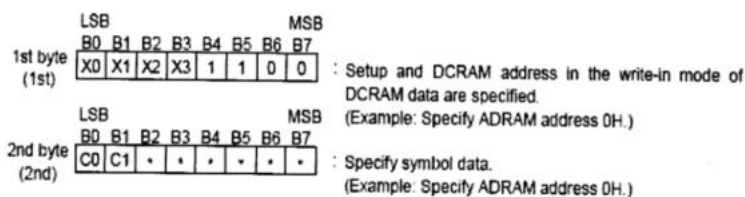(Specifies the address of ADRAM and writes symbol data)

ADRAM (Additional Data RAM) has a 2-bit address to store symbol data.
Symbol data specified by ADRAM is directly output without CGROM and CGRAM.
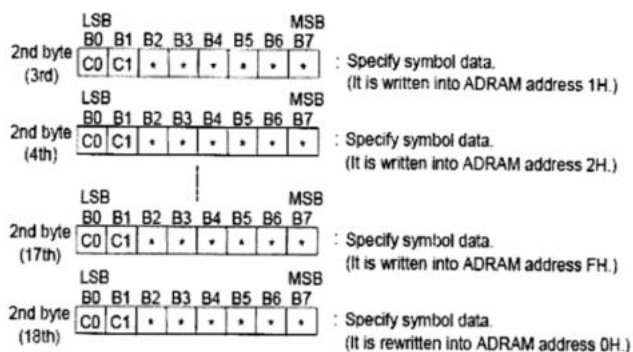(The ADRAM can store two types of symbol patterns for each digit.)
The terminal to which the contents of ADRAM are output can be used as a cursor.

[Command format]

		LSB							MSB	
		B0	B1	B2	B3	B4	B5	B6	B7	
1st byte (1st)		X0	X1	X2	X3	1	1	0	0	: Setup and DCRAM address in the write-in mode of DCRAM data are specified. (Example: Specify ADRAM address 0H.)
2nd byte (2nd)		C0	C1	•	•	•	•	•	•	: Specify symbol data. (Example: Specify ADRAM address 0H.)

To specify symbol data continuously to the next address. specify only symbol data as follows.
Since the address of ADRAM is automatically incremented, address specification is unnecessary.

		LSB							MSB	
		B0	B1	B2	B3	B4	B5	B6	B7	
2nd byte (3rd)		C0	C1	•	•	•	•	•	•	: Specify symbol data. (It is written into ADRAM address 1H.)
2nd byte (4th)		C0	C1	•	•	•	•	•	•	: Specify symbol data. (It is written into ADRAM address 2H.)
2nd byte (17th)		C0	C1	•	•	•	•	•	•	: Specify symbol data. (It is written into ADRAM address FH.)
2nd byte (18th)		C0	C1	•	•	•	•	•	•	: Specify symbol data. (It is rewritten into ADRAM address 0H.)

X0 (LSB) to X3 (MSB) : ADRAM address (4 bits: 16 characters worth)
C0 (LSB) to C1 (MSB) : Symbol data (2 bits: 2 symbols per digit)
    • : Don't care

[Relationship between ADRAM addresses setup and COM positions]

HEX	X0	X1	X2	X3	COM positions	HEX	X0	X1	X2	X3	COM positions
0	0	0	0	0	COM1	8	0	0	0	1	COM9
1	1	0	0	0	COM2	9	1	0	0	1	COM10
2	0	1	0	0	COM3	A	0	1	0	1	COM11
3	1	1	1	0	COM4	B	1	1	0	1	COM12
4	0	0	1	0	COM5	C	0	0	1	1	COM13
5	1	0	1	0	COM6	D	1	0	1	1	COM14
6	0	1	1	0	COM7	E	0	1	1	1	COM15
7	1	1	1	0	COM8	F	1	1	1	1	COM16

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4. "Display duty set" command
   (Writes display duty value into the duty cycle register.)

For display duty, brightness can be adjusted in 16 stages using 4-bit data.
When power is turned on or when the $\overline{\text{RESET}}$ signal is input, the duty cycle register value is "0". Always execute this command before turning the display on, then set a desired duty value.

[Command format]

```
              LSB                    MSB
              B0  B1  B2  B3  B4  B5  B6  B7
1st byte     | D0 | D1 | D2 | D3 | 1 | 0 | 1 | 0 |   : setup and duty value in display duty specification mode are
                                                        specified.
```

D0 (LSB) to D3 (MSB) :   Display duty data (4 bits: 16 stages worth)

[Relation between setup data and controlled COM duty]

HEX	D0	D1	D2	D3	COM duty	HEX	D0	D1	D2	D3	COM duty
0	0	0	0	0	0/16	8	0	0	0	1	8/16
1	1	0	0	0	1/16	9	1	0	0	1	9/16
2	0	1	0	0	2/16	A	0	1	0	1	10/16
3	1	1	0	0	3/16	B	1	1	0	1	11/16
4	0	0	1	0	4/16	C	0	0	1	1	12/16
5	1	0	1	0	5/16	D	1	0	1	1	13/16
6	0	1	1	0	6/16	E	0	1	1	1	14/16
7	1	1	1	0	7/16	F	1	1	1	1	15/16

* The state when power is turned on or when the RESET signal is input.

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5. "Number of display digits set" command
   (Writes the number of display digits into the number-of-display-digits register.)

For the number of display digits, 1 to 16 digits can be specified using 4-bit data.
When power is turned on or when a RESET signal is input, the number-of-display-digits register value is "0".
Always execute this command before turning the display on, then set a desired value.

[Command format]

```
        LSB                 MSB
        B0 B1 B2 B3 B4 B5 B6 B7
1st byte K0 K1 K2 K3  0  1  1  0   : Setup in display digits specification mode and digits value
                                     is specified.
```

K0 (LSB) to K3 (MSB) :   Data of the number of display digits (4 bits: 16 digits worth)

[Relation between data to be set and the number of digits of COM to be controlled]

HEX	K0	K1	K2	K3	No. of digits of COM	HEX	K0	K1	K2	K3	No. of digits of COM
0	0	0	0	0	COM1–16	8	0	0	0	1	COM1–8
1	1	0	0	0	COM1	9	1	0	0	1	COM1–9
2	0	1	0	0	COM1–2	A	0	1	0	1	COM1–10
3	1	1	0	0	COM1–3	B	1	1	0	1	COM1–11
4	0	0	1	0	COM1–4	C	0	0	1	1	COM1–12 ←
5	1	0	1	0	COM1–5	D	1	0	1	1	COM1–13
6	0	1	1	0	COM1–6	E	0	1	1	1	COM1–14
7	1	1	1	0	COM1–7	F	1	1	1	1	COM1–15

* The state when power is turned on or when the RESET signal is input.

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6 . "All display lights ON" and "All display lights OFF" commands
(Turns the entire display ON and OFF, respectively.)

All display lights ON is used primarily for display testing.
All display lights OFF is primarily used for display blink and to prevent false display upon power-on.

[Command format]

```
        LSB                    MSB
        B0  B1  B2  B3  B4  B5  B6  B7
1st byte  L   H   *   *   1   1   1   0   :  Select all display lights ON or OFF and specify
                                              their operation.
```

L: All display lights OFF
H: All display lights ON
* : Don't Care

[Data to be setup and display state of SEG and AD]

L	H	Display state of SEG and AD
0	0	Normal display
1	0	Sets all outputs to Low
0	1	Sets all outputs to High
1	1	Sets all outputs to High

* The state when power is turned on or when $\overline{RESET}$ signal is input

* Priority is given to the All display lights ON command.

Character Font Table

16 Segment design · 14 Segment design · 7 Segment design

16 Segment · 14 Segment · 7 Segment

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OUTER DIMENSIONS
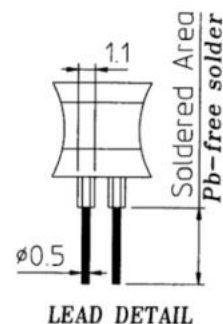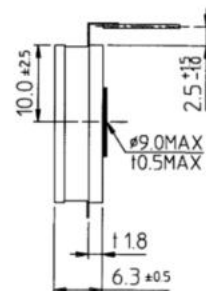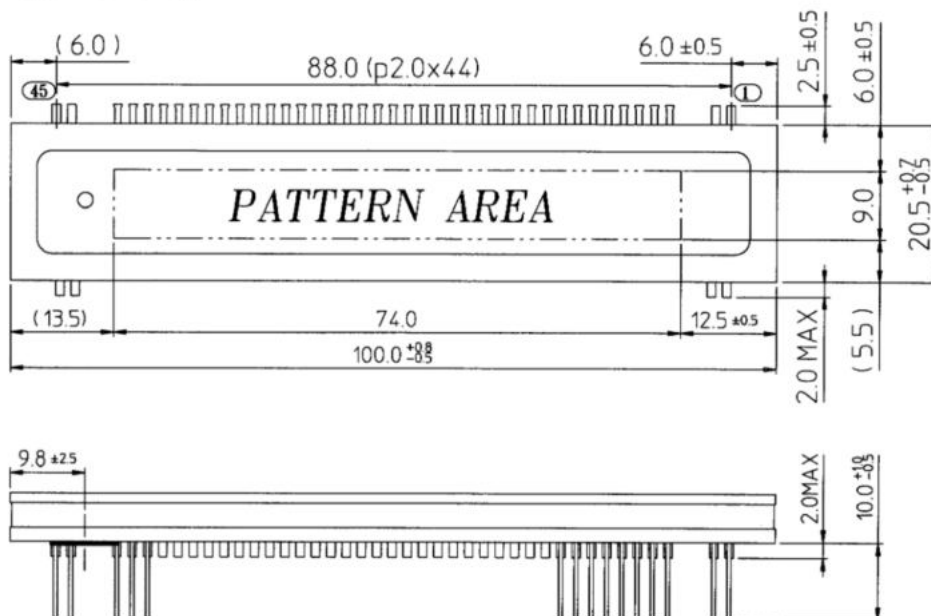
PIN CONNECTION

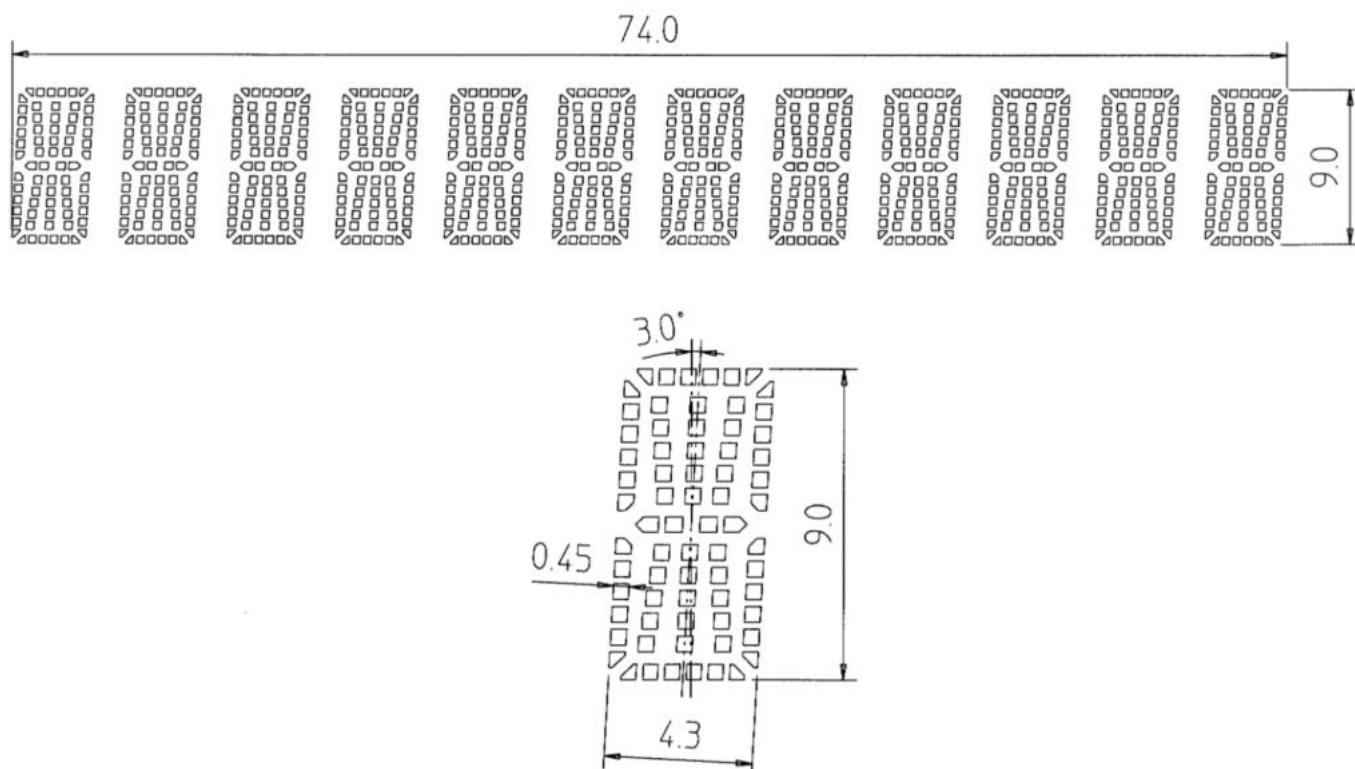| PIN NO.	45	44	43	42	41	40	39	38~13	12	11	10	9	8	7	6	5	4	3	2	1
CONNECTION	F+	F+	NP	NP	NC	NC	NC	NX	DIN	CLK	$\overline{CS}$	$\overline{RST}$	OSCO	GND	VDISP	VDD1	NP	NP	F-	F-

◉ Note ◉
1) F+,- : Filament pin
2) NX : No Extended pin
3) NC : No Connection pin
4) NP : No pin
5) TEST : Open if not use

LEAD DETAIL

MODEL : HCS-12SS59T
OUTER DIMENSIONS
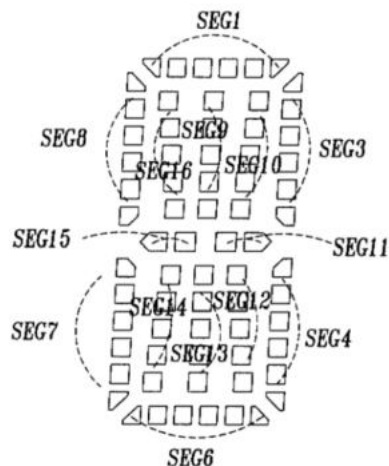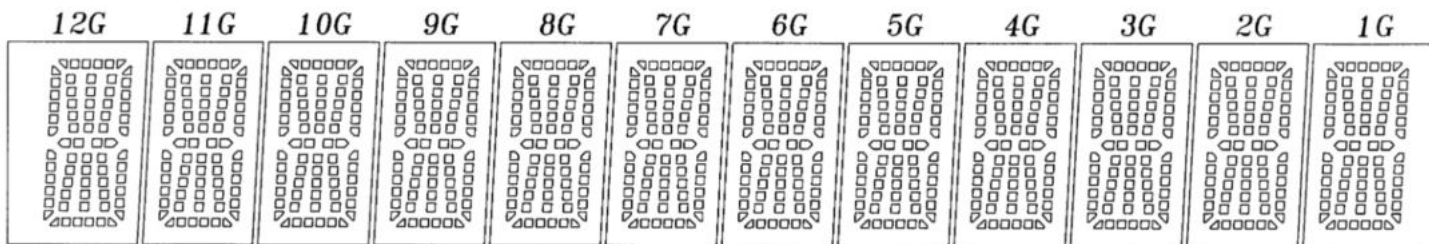Rev. ① 22-Apr-2009

PATTERN DETAILS

◎ Color of Illumination ◎

· Green (G. x=0.250, y=0.439) ----- All Patterns.

MODEL : HCS-12SS59T
PATTERN DETAILS
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SAMSUNG SSED

| 12G | 11G | 10G | 9G | 8G | 7G | 6G | 5G | 4G | 3G | 2G | 1G |

SEG1

SEG8

SEG9

SEG3

SEG16 SEG10

SEG15 ----- SEG11

SEG14 SEG12

SEG7 SEG4

SEG13

SEG6

(12G~1G)

MODEL : HCS-12SS59T
GRID ASSIGNMENT
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ANODE CONNECTION

SAMSUNG SSED

	COM12	COM11	COM10	COM9	COM8	COM7	COM6	COM5	COM4	COM3	COM2	COM1
	12G	11G	10G	9G	8G	7G	6G	5G	4G	3G	2G	1G
SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1	SEG1
SEG2												
SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3	SEG3
SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4	SEG4
SEG5												
SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6	SEG6
SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7	SEG7
SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8	SEG8
SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9	SEG9
SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10	SEG10
SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11	SEG11
SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12	SEG12
SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13	SEG13
SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14	SEG14
SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15	SEG15
SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16	SEG16

MODEL : HCS-12SS59T
ANODE CONNECTION
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