To: _______________________

### SPECIFICATION

**Application:** _______________________

**VACUUM FLUORESCENT DISPLAY MODULE**

* Model No.: 16L103DK1R

<table>
<thead>
<tr>
<th>Rev. No.</th>
<th>Issued Date</th>
<th>Descriptions</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rev. 2.0</td>
<td>May. 23, 2000</td>
<td>* Change of Miss Typing (Connector Pin Number: #1 ↔ #3)</td>
<td>Page – 5</td>
</tr>
<tr>
<td>Rev. 3.0</td>
<td>Nov. 07, 2005</td>
<td>* Second Edition (English Edition)</td>
<td>All Pages</td>
</tr>
<tr>
<td></td>
<td></td>
<td>* Change of Production Plant: SDI (Busan) → SSVD (Shanghai)</td>
<td>Page – 3</td>
</tr>
</tbody>
</table>

Issued by __________________________

Checked by __________________________

Approved by __________________________

Customer’s Approval

Page - 1 of 18
1. SCOPE

* This specification applies to VFD module (Model No: 16L103DK1R) manufactured by SSVD (Shanghai Samsung Vacuum Devices).

2. FEATURES

* Vacuum Fluorescent Display: Self Luminous, High Quality and Readable Display
* +5VDC Single Power Supply: Built in DC/DC Converter
* RS-232 Serial Interface: Baud-rate = 1,200 ~ 9,600 bps
* Built-in CG-ROM Font Table: ASCII and KSC-5601
* 10 Brightness Levels: 10% ~ 100%
* Character Format: 9 * 9 Dot Matrix

3. PRECAUTIONS and OPERATING RECOMMENDATIONS

* Fixed display for prolonged periods of time leads to deterioration of the quality of display. Mobile display or changing between regular and inverted display to avoid fixed display for prolonged periods of time are recommended.

* Avoid applying excessive shock or vibration beyond the specification for the VFD module.

* Since VFDs are made of glass material, careful handling is required. i.e. Direct impact with hard material to the glass surface (especially exhaust tip) may crack the glass.

* When mounting the VFD module to your system, leave a slight gap between the VFD glass and your front panel. The module should be mounted without stress to avoid flexing of the PCB.

* Avoid plugging or unplugging the interface connection with the power on, otherwise it may cause the severe damage to input circuitry.

* Slow starting power supply may cause non-operation because one-chip MCU won't be reset.

* Exceeding any of maximum ratings may cause the permanent damage.

* Since the VFD modules contain high voltage source, careful handling is required during powered on.

* When the power is turned off, the capacitor does not discharge immediately. The high voltage applied to the VFD must not contact to the ICs. And the short-circuitry of mounted components on PCB within 30 seconds after power-off may cause damage to those.

* The power supply must be capable of providing at least 10 times the rated current, because the surge current can be more than 5 times the specified current consumption when the power is turned on.

* Avoid using the module where excessive noise interference is expected. Noise may affects the interface signal and causes improper operation. And it is important to keep the length of the interface cable less than 15 meters (50 feet).

* Since all VFD modules contain C-MOS ICs, anti-static handling procedures are always required.
4. PRODUCT SPECIFICATIONS

4.1 Type

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Number (Model)</td>
<td>16L103DK1R</td>
<td></td>
</tr>
<tr>
<td>Character Format</td>
<td>9 * 9 Dot Matrix with Comma and Decimal Point</td>
<td></td>
</tr>
<tr>
<td>Number of Digits</td>
<td>16 (1 line * 16 characters)</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Outer Dimensions, Weight

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Specification</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Dimensions</td>
<td>W * H * t</td>
<td>mm</td>
</tr>
<tr>
<td>VFD Glass Size</td>
<td>W * H</td>
<td>mm</td>
</tr>
<tr>
<td>Display Area</td>
<td>W * H</td>
<td>mm</td>
</tr>
<tr>
<td>Character Size</td>
<td>C.W * C.H</td>
<td>mm</td>
</tr>
<tr>
<td>Character Pitch</td>
<td>Cpx</td>
<td>mm</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 150</td>
<td>g</td>
</tr>
</tbody>
</table>

4.3 Environment Conditions

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbols</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>T_OPR</td>
<td>-20</td>
<td>+70</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>T_STG</td>
<td>-40</td>
<td>+85</td>
<td>°C</td>
</tr>
<tr>
<td>Humidity (Operating)</td>
<td>H_OPR</td>
<td>30</td>
<td>85</td>
<td>%</td>
</tr>
<tr>
<td>Humidity (Non-operating)</td>
<td>H_STG</td>
<td>30</td>
<td>90</td>
<td>%</td>
</tr>
<tr>
<td>Vibration (10 ~ 55 Hz)</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>G</td>
</tr>
<tr>
<td>Shock</td>
<td>-</td>
<td>-</td>
<td>40</td>
<td>G</td>
</tr>
</tbody>
</table>

4.4 Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbols</th>
<th>Min.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VCC</td>
<td>-</td>
<td>+7.0</td>
<td>VDC</td>
</tr>
<tr>
<td>Input Signal Voltage</td>
<td>RXD</td>
<td>-25.0</td>
<td>+25.0</td>
<td>VDC</td>
</tr>
</tbody>
</table>

4.5 Recommended Operating Conditions

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Symbols</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>VCC</td>
<td>4.5</td>
<td>5.0</td>
<td>5.5</td>
<td>VDC</td>
</tr>
<tr>
<td>MARK Level Input Voltage</td>
<td>V_MARK</td>
<td>-25.0</td>
<td>-12.0</td>
<td>-3.0</td>
<td>VDC</td>
</tr>
<tr>
<td>SPACE Level Input Voltage</td>
<td>V_SPACE</td>
<td>+3.0</td>
<td>+12.0</td>
<td>+25.0</td>
<td>VDC</td>
</tr>
</tbody>
</table>

4.6 DC Characteristics (when Ta = +25°C, VCC = +5.0VDC)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Test Conditions</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Current (*)</td>
<td>VCC=+5.0VDC (All dots are lit.)</td>
<td>-</td>
<td>700</td>
<td>1,000</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>V_MARK = -12.0V</td>
<td>-</td>
<td>-</td>
<td>-8.3</td>
<td>mA</td>
</tr>
<tr>
<td></td>
<td>V_SPACE = +12.0V</td>
<td>-</td>
<td>-</td>
<td>+8.3</td>
<td>mA</td>
</tr>
<tr>
<td>Brightness</td>
<td>VCC=+5.0VDC (350)</td>
<td>102</td>
<td>204</td>
<td>-</td>
<td>ft-L (cd/m²)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(700)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Color</td>
<td></td>
<td>-</td>
<td>Blue-green (peak wave=505nm)</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

(* Note 1): The in-rush current can be approx. 5 times the specified supply current at power on. The peak in-rush current amplitude and duration are dependent on the characteristics of the host power supply.
4.7 Data Input Timing

Tw = 10^6/Baud-rate [us]

Fig.-1. Serial Input Timing Diagram

In this model, the MC1489AD (RS-232C Receiver) is mounted (refer to block diagram) for RS232C (EIA-232) level interfacing. If a user would like to use TTL level in this model, then the MC1489AD should be removed and "T0" have to be closed.

4.8 Signal Interfacing

* Connector (Male): 5046-03A (by MOLEX) - Single 3 Pins (Right Angled)
  → Mate socket (Female): 5051-03 (by MOLEX) or equivalent

Pin No: 1 2 3

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>VCC</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
</tr>
<tr>
<td>3</td>
<td>GND</td>
</tr>
</tbody>
</table>

4.9 System Block Diagram

Fig.-2 System Block Diagram
4.10 Outer Dimensions

![Outer Dimensions Diagram]

Unit: mm
Tolerance:
* Mounting Hole Size: +/- 0.3
* Length:
  Range < 10: +/- 0.5
  Range > 10: +/- 1.0

Fig.-3. Outer Dimensions

4.11 Pattern Details

![Pattern Details Diagram]

Details of "A"

Fig.-4. Pattern Details
5. FUNCTIONS

5.1 Character Data Write-in

5.1.1 ASCII Data Write-in (Refer to Appendix-#1 for ASCII Code Table)

When the character data code (20 Hex ~ 7F Hex) is transferred to the module, the character font of ASCII is
displayed on the screen. At this time, the cursor will be shifted one digit to the right automatically.

5.1.2 KSC-5601 Data Write-in (Refer to Appendix-#2 for KSC-5601 Code Table)

Korean and/or specialized character can be displayed by following 2 bytes code.

- Syntax: 1st byte (A1 Hex ~ C8 Hex) + 2nd byte (A0 Hex ~ FF Hex)

5.2 Control Code Write-in

The control commands are available as follows and details are will be explained.

1. NOP (No Operation).................................................................00 Hex
2. C1 (User Definable Font #1)......................................................01 Hex
3. C2 (User Definable Font #2)......................................................02 Hex
4. C3 (User Definable Font #3)......................................................03 Hex
5. C4 (User Definable Font #4)......................................................04 Hex
6. UDF (Save a User Definable Font).................................05 Hex
7. DEL (Delete).............................................................................06 Hex
8. SL (Shift Left)...........................................................................07 Hex
9. BS (Back Space)........................................................................08 Hex
10. HT (Horizontal Tab)...................................................09 Hex
11. LF (Line Feed)........................................................................0A Hex
12. CH (Cursor Home).............................................................0B Hex
13. INS (Insert Mode On/Off).................................................0C Hex
14. CR (Carriage Return).......................................................0D Hex
15. PD (Partial Dimming)......................................................0E Hex
16. DIM (Dimming)..............................................................0F Hex
17. DP (Display Position)....................................................10 Hex
18. DC1 (Normal Display Mode).......................................11 Hex
19. DC2 (Over Write Mode)................................................12 Hex
20. DC3 (Horizontal Scroll Mode)..................................13 Hex
21. DC4 (Auto Carriage Return Mode)...........................14 Hex
22. CON (Cursor on Mode)................................................15 Hex
23. COFF (Cursor off Mode)...............................................16 Hex
24. CBLK (Cursor Blinking Mode).................................17 Hex
25. NOP (No Operation)....................................................18 Hex
26. DPCM (Decimal Point or Comma Display On/Off)........19 Hex
27. CDB (Clear Digit Blinking Mode)...................................1A Hex
28. NOP (No Operation)....................................................1B Hex
29. DB (Digit Blinking Mode)...............................................1C Hex
30. DTR (Delete to Right)................................................1D Hex
31. DTL (Delete to Left)....................................................1E Hex
32. RST (Reset (Initialization)).................................1F Hex

5.2.1 NOP (00 Hex): No Operation

This code is not executed.

C1~C4 are the character codes defined by UDF command of 05 Hex. When these commands are transferred to the
module, the character font defined.

5.2.2 C1 (01 Hex): Print UDF #1

User defined character 1 is printed at the present cursor position.

5.2.3 C2 (02 Hex): Print UDF #2

User defined character 2 is printed at the present cursor position.
5.2.4 C3 (03 Hex): Print UDF #3
User defined character 3 is printed at the present cursor position.

5.2.5 C4 (04 Hex): Print UDF #4
User defined character 4 is printed at the present cursor position.

5.2.6 UDF (05 Hex): Save a User Definable Font
The characters can be designed by using this command. These font data are memorized into the RAM of the module.

- Syntax: UDF (05 Hex) + CHR (01~04 Hex) + PT1 + PT2 + PT3 + ...... + PT10 + PT11
- Any 9x9 dots pattern consisting of data form PT1 through PT11 (3rd–13th byte) can be stored in the character code location specified by CHR (2nd byte). And the maximum kinds of UDFs (User Definable Font) are 4 characters at once.
- 1st byte: UDF (05 Hex)………………………………………Specify UDF command.
- 2nd byte: CHR (00 Hex–04 Hex)…………………………Specify the character code address.
- 3th–13th byte (00 Hex–FF Hex)…………………………Specify ON or OFF of 81 dot positions (9*9dot).

Below left table shows the symbol definition of each dot, the right table shows the coding method. ("1"=dot turn on, "0"=dot turn off)

<table>
<thead>
<tr>
<th>9*9 Dot Matrix Location Symbols</th>
<th>D7 D6 D5 D4 D3 D2 D1 D0</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9</td>
<td>PT1 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8</td>
</tr>
<tr>
<td>2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9</td>
<td>PT2 1.9 2.1 2.2 2.3 2.4 2.5 2.6 2.7</td>
</tr>
<tr>
<td>3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8 3.9</td>
<td>PT3 2.8 2.9 3.1 3.2 3.3 3.4 3.5 3.6</td>
</tr>
<tr>
<td>4.1 4.2 4.3 4.4 4.5 4.6 4.7 4.8 4.9</td>
<td>PT4 3.7 3.8 3.9 4.1 4.2 4.3 4.4 4.5</td>
</tr>
<tr>
<td>5.1 5.2 5.3 5.4 5.5 5.6 5.7 5.8 5.9</td>
<td>PT5 4.6 4.7 4.8 4.9 5.1 5.2 5.3 5.4</td>
</tr>
<tr>
<td>6.1 6.2 6.3 6.4 6.5 6.6 6.7 6.8 6.9</td>
<td>PT6 5.5 5.6 5.7 5.8 5.9 6.1 6.2 6.3</td>
</tr>
<tr>
<td>7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8 7.9</td>
<td>PT7 6.4 6.5 6.6 6.7 6.8 6.9 7.1 7.2</td>
</tr>
<tr>
<td>8.1 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9</td>
<td>PT8 7.3 7.4 7.5 7.6 7.7 7.8 7.9 8.1</td>
</tr>
<tr>
<td>9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9</td>
<td>PT9 8.2 8.3 8.4 8.5 8.6 8.7 8.8 8.9</td>
</tr>
<tr>
<td>PT10 9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8</td>
<td>* PT11 9.9 ** ** ** ** ** ** **</td>
</tr>
</tbody>
</table>

*: Don’t care bit

<table>
<thead>
<tr>
<th>Euro Currency Symbol (€)</th>
<th>D7 D6 D5 D4 D3 D2 D1 D0</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 0 0 0 1 1 1 1 1 0 0 1</td>
<td>PT1 0 0 0 0 1 1 1 1 1 0</td>
</tr>
<tr>
<td>0 0 1 0 0 0 0 1 1 0 0 1</td>
<td>PT2 1 0 0 0 1 0 0 0 0 0</td>
</tr>
<tr>
<td>0 1 0 0 0 0 0 0 0 0 0 1</td>
<td>PT3 1 1 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>1 1 1 1 1 0 0 0 0 0 0 0</td>
<td>PT4 0 0 1 1 1 1 1 1 1 1</td>
</tr>
<tr>
<td>0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>PT5 0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>1 1 1 1 1 0 0 0 0 0 0 0</td>
<td>PT6 0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>1 1 1 1 1 0 0 0 0 0 0 0</td>
<td>PT7 1 1 1 1 1 0 0 0 0 0</td>
</tr>
<tr>
<td>0 0 0 0 0 0 0 0 0 0 0 0</td>
<td>PT8 0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>0 0 1 0 0 0 0 0 0 0 0 0</td>
<td>PT9 0 0 1 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>0 0 0 1 1 1 1 1 0 0 0 0</td>
<td>PT10 0 0 0 1 1 1 1 1 1 0</td>
</tr>
<tr>
<td>0 0 0 0 1 1 1 1 1 0 0 0</td>
<td>PT11 0 0 0 0 1 1 1 1 1 0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hexadecimal Data Coding</th>
<th>D7 D6 D5 D4 D3 D2 D1 D0</th>
</tr>
</thead>
<tbody>
<tr>
<td>* PT1 = 1E Hex</td>
<td>0 0 0 0 1 1 1 1 1 0</td>
</tr>
<tr>
<td>* PT2 = 90 Hex</td>
<td>1 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT3 = D0 Hex</td>
<td>1 1 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT4 = F3 Hex</td>
<td>0 0 1 1 1 1 1 1 1 1</td>
</tr>
<tr>
<td>* PT5 = 04 Hex</td>
<td>0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT6 = 07 Hex</td>
<td>1 1 1 1 1 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT7 = C1 Hex</td>
<td>0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT8 = 02 Hex</td>
<td>0 0 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT9 = 42 Hex</td>
<td>0 1 0 0 0 0 0 0 0 0</td>
</tr>
<tr>
<td>* PT10 = 1E Hex</td>
<td>0 0 0 1 1 1 1 1 1 0</td>
</tr>
<tr>
<td>* PT11 = 00 Hex</td>
<td>0 0 0 0 1 1 1 1 1 0</td>
</tr>
</tbody>
</table>

5.2.7 DEL (06 Hex): Delete
The character and symbol (Decimal Point, Comma) at current cursor position is deleted.
Also, all the characters and symbols on the right side of cursor position are shifted one digit to the left.

5.2.8 SL (07 Hex): Shift Left
The cursor position is shifted one digit to the left. If the cursor is located on the first(left-end) digit then the cursor motion depends upon display mode (DC1~DC4).
- DC1 Mode: The cursor moves to the last (right-end) digit.
- DC2–DC4 Mode: The cursor doesn't move.
5.2.9 BS (08 Hex): Back Space
The cursor position is shifted one digit to the left, also the character and symbol on the left digit of cursor position is deleted. At Insert-On mode (See Section 5.2.13), all the characters and symbols on the right side of cursor position (including cursor position) are shifted one digit to the left. When the cursor is located on the first digit, any operation is not executed.

5.2.10 HT (09 Hex): Horizontal Tab
The cursor position is shifted one digit to the right. If the cursor is located on the last digit then the cursor motion depends on display mode.
- DC1 Mode: The cursor moves to the first digit.
- DC2-DC4 Mode: The cursor doesn't move.

5.2.11 LF (0A Hex): Line Feed
All the characters displayed are cleared and the cursor doesn't move.

5.2.12 CH (0B Hex): Cursor Home
The cursor moves to the first digit.

5.2.13 INS (0C Hex): Insert Mode On/Off
Just after power-on or RST command, Insert-Off mode is selected. This command is toggled. Namely, if INS command is written-in at Insert-On state then Insert mode is dissolved. On the contrary, at the Insert-Off mode, the module will be Insert-On mode.
- Insert ON Mode: When the character data is written-in, all the characters and symbols on the right side of cursor position are shifted one digit to the right.
- Insert OFF Mode: When the character data is written-in, the character on the cursor position is over written to the new character.

5.2.14 CR (0D Hex): Carriage Return
All the characters and symbols are cleared and the cursor moves to the first digit.

5.2.15 PD (0E Hex): Partial Dimming
Brightness of specified digit can be controlled into 10 levels by using this function.
- Syntax: 1st byte + 2nd byte + 3rd byte + 4th byte
  - 1st byte: Partial Dimming Command ID
  - 2nd byte and 3rd byte: Digit Range (00 Hex ~ 0F Hex)
  - 4th byte: Dimming Level Data

<table>
<thead>
<tr>
<th>Brightness Level</th>
<th>Data</th>
<th>Brightness Level</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 %</td>
<td>FF Hex</td>
<td>50 %</td>
<td>50 Hex</td>
</tr>
<tr>
<td>90 %</td>
<td>90 Hex</td>
<td>40 %</td>
<td>40 Hex</td>
</tr>
<tr>
<td>80 %</td>
<td>80 Hex</td>
<td>30 %</td>
<td>30 Hex</td>
</tr>
<tr>
<td>70 %</td>
<td>70 Hex</td>
<td>20 %</td>
<td>20 Hex</td>
</tr>
<tr>
<td>60 %</td>
<td>60 Hex</td>
<td>10 %</td>
<td>10 Hex</td>
</tr>
</tbody>
</table>

5.2.16 DIM (0F Hex): Dimming
Brightness of all digits can be controlled by using this command.
- Syntax: DIM (0F Hex) + Dimming Level Data (refer to upper table in section 5.2.15.).

5.2.17 DP (10 Hex): Display Position
Instead of writing the character from the first digit, the write-in starting position can be pointed out by using this command. After writing a data 10 Hex, the successive byte is written-in to specify the desired position.
- Syntax: DP (10 Hex) + Position Data (00 Hex ~ 0F Hex)

When character data is written-in at the last digit, next operation is specified by DC1, DC2, DC3 and DC4. After power-on or RST command (Refer to Section 5.2.31), DC1 is selected.
5.2.18 DC1 (11 Hex): Normal Display Mode
The cursor moves to the first digit and all the characters displayed are left as they are.

5.2.19 DC2 (12 Hex): Over Write Mode
The newly entered character is displayed on the last digit. But the cursor position is not changed at the last digit.

5.2.20 DC3 (13 Hex): Horizontal Scroll Mode
All the characters displayed are shifted to the left one digit and a new character is written at the last digit. At this time, the character displayed at the first digit is disappeared. And the cursor stays at the last digit.

5.2.21 DC4 (14 Hex): Auto Carriage Return Mode
The cursor moves to the first digit and all the characters displayed are left as they are.
However, when the additional data is written-in at the first digit, all characters displayed except the additional character are erased and the cursor moves to next digit (2nd digit).

The cursor mode is selected by CON, COFF and CBLK. After the power on or RST command, COFF is selected.

5.2.22 CON (15 Hex): Cursor on Mode
The cursor is displayed as bottom line of each digit.

5.2.23 COFF (16 Hex): Cursor off Mode
The cursor won't be displayed.

5.2.24 CBLK (17 Hex): Cursor Blinking Mode
The cursor is blinked at current position. If a character is being displayed at cursor location, the cursor of bottom line and the character are alternatively displayed.

5.2.25 NOP (18 Hex): No Operation

5.2.26 DPCM (19 Hex): Decimal Point and Comma Display
After writing a data 19 Hex, successive data is written-in to specify the symbol of decimal point and the comma at current cursor position.
- Syntax: DPCM (19 Hex) + Symbol Data (01 Hex ~ 04 Hex)
  01 Hex: Decimal point is toggled.
  02 Hex: Comma is toggled.
  03 Hex: Decimal point and comma is toggled.
  04 Hex: Decimal points and commas of all digit are cleared

5.2.27 CPB (1A Hex): Clear Digit Blinking
The function of digit blinking (Refer to Section 5.2.29) is dissolved.

5.2.28 NOP (1B Hex): No Operation

5.2.29 DB (1C Hex): Digit Blinking
This command is used to blink the character. After writing a data 1C Hex, successive two bytes of position data is written-in to specify the desired position.
- Syntax: DB (1C Hex) + 2nd Byte + 3rd Byte (Position Data: 00 Hex ~ 0F Hex)
  00 Hex: First (Left End) Digit
  01 Hex: Second Digit
  0F Hex: Last (Right End) Digit

5.2.30 DTR (1D Hex): Delete to Right
The characters and symbols located in the right side of cursor position (including cursor position) are cleared and the cursor doesn't move.
5.2.31 DTL (1E Hex): Delete to Left
The characters and symbols located in the left side of cursor position are cleared and the characters and symbols located in the right side of cursor are moved and displayed from the first digit in that order. Also, the cursor moves to the first digit.

5.2.32 RST (1F Hex): Reset (Initialization)
This command is used to initialize the module.
All the characters and symbols are cleared. The cursor moves to first digit but the cursor isn't displayed. The brightness level is set by 100%, insert mode is turned off, digit blinking mode is dissolved and display mode is set by DC1 mode. And the baud-rate is selected by the combination of "B0" and "B1". (Refer to below table.)

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<th>B1</th>
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<td>Open</td>
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<td>4,800 bps</td>
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<tr>
<td>Short</td>
<td>Short</td>
<td>1,200 bps</td>
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* Factory Setting: B0=B1=Open for 9,600 bps

5.3 Power on Reset
When the module is turned on, the display and memory (RAM) are cleared and the module is initialized. The displaying status is the same as the status of RST command. (See section 5.2.31)
### [Appendix-#1] ASCII Code Table and Command Code

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*Note-1) 00 Hex ~ 1F Hex: Control Command (Refer to Section 5.3)*  
*Note-2) 20 Hex ~ 7F Hex: ASCII Character, SP (20 Hex)= Space, FD (7F Hex) = Full Dot*  
*Note-3) 80 Hex ~ A0 Hex, C9 Hex ~ FF Hex: Invalid Code Area (No Operation)*  
*Note-4) A1 Hex ~ C8 Hex: Korean Standard Code (KSC-5601)*
## [Appendix-#2] KSC-5601 Character Code Table

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