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---

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April 1\(^{st}\), 2010
Renesas Electronics Corporation

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SH7086 CPU Board
M3A-HS86
User’s Manual

Renesas 32-Bit RISC Microcomputers
SuperH™ RISCengine Family / SH7080 Group
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<thead>
<tr>
<th>Rev.</th>
<th>Date of Issue</th>
<th>Content of Revision</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Feb. 6, 2007</td>
<td>1st edition issued.</td>
</tr>
</tbody>
</table>

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M3A-HS86 SCHEMATICS

Rev. 1.0 Feb. 6, 2007
REJ10J0916-0100
1.1 Overview

The M3A-HS86 is the CPU board designed for users to evaluate the functionality and performance of the SH7086 group of Renesas Technology original microcomputers, as well as develop and evaluate the application software for this group of microcomputers. The SH7086's data bus, address bus and various internal peripheral circuit function pins are connected to the extension connector of the M3A-HS86, allowing users to evaluate the timing relationship with peripheral devices using measurement instruments or develop extension boards tailored to suit development purposes. Furthermore, the E10A-USB or the on-chip emulator made by Renesas Technology can also be connected to the M3A-HS86.

1.2 Configuration

Figure 1.2.1 shows an example of system configuration using the M3A-HS86.

*: It is necessary to buy separately for software development.

Figure 1.2.1 System Configuration Example of M3A-HS86
1.3 External Specifications

Table 1.3.1 lists external specifications of M3A-HS86.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CPU</td>
<td>SH7086</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Input(XIN) clock : 10MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bus clock : 40MHz, max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CPU clock : 80MHz, max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• On-chip memory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flash memory : 512KB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RAM : 32KB</td>
</tr>
<tr>
<td>2</td>
<td>Memory</td>
<td>*M3A-HS86(3.3V version) only</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SDRAM : 16 Mbytes.(16-bit bus width) 1pc</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External flash memory enabled to mount</td>
</tr>
<tr>
<td>3</td>
<td>Connectors</td>
<td>Extension connector (Bus, I/O, VCC, GND)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>User I/O connector (SH7086's MTU2 and A/D function pins)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serial port connector (D-sub 9pins)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H-UDI connector (36pins)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H-UDI connector (14pins)</td>
</tr>
<tr>
<td>4</td>
<td>LED</td>
<td>POWER LED (1pc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LED for interrupt switch (1pc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>User LED (7pcs.)</td>
</tr>
<tr>
<td>5</td>
<td>Switches</td>
<td>Reset switch (1pc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>NMI switch (1pc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IRQ1 switch (1pc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIP switch for system setting (1pc., 4 poles)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIP switch for users (1pc., 4 poles)</td>
</tr>
<tr>
<td>6</td>
<td>Package Dimensions</td>
<td>Dimensions : 100mm x 100mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mounting form : 6-layer, double-side mounted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Board configuration : 1 board</td>
</tr>
</tbody>
</table>
1.4 External View

Figure 1.4.1 shows the external view of M3A-HS86.

Figure 1.4.1  External View of M3A-HS86 (IC socket mounted version)
1.5 M3A-HS86 Block Diagram

Figure 1.5.1 shows the system block diagram of M3A-HS86.

![Block Diagram of M3A-HS86](image)

Figure 1.5.1  System Block Diagram of M3A-HS86
1.6 M3A-HS86 Board Overview

Figure 1.6.1 shows the M3A-HS86 board overview.

**< Top View of the Component Side >**

- **J3** Serial Port Connector
- **J5** Power Supply Connector
- **U1** SH7086
- **SW1** Power Switch
- **SW4** DIP Switch for System Setting
- **J1** H-UDI Connector (36-pin)
- **J2** H-UDI Connector (14-pin)
- **U2** Clock Buffer
- **U5** RS232C Driver
- **JP2** FWE Pin Select Jumper
- **JP1** Power Supply Select Jumper
- **SW5** NMI Switch
- **SW6** IRQ1 Switch
- **SW7** MRES Switch
- **SW2** RESET Switch
- **SW3** DIP Switch for Users
- **U6** Reset IC
- **LED2-5** User LED
- **LED8** User LED
- **LED9** LED for Interrupt Confirmation
- **LED1** Power LED
- **U8** 3.3V Voltage Regulator
- **U4** SDRAM
- **U3** Flash Memory
- **J13** Extension Connector
- **J12** Extension Connector
- **J11** Extension Connector
- **J9** Extension Connector
- **J10** Extension Connector
- **J7, J8** User I/O Connector
- **J14** Extension Connector
- **J1, J3, J5, J13, J12, J11, J9, J10** User I/O Connectors

**< Top View of the Solder Side >**

- **J10** Extension Connector
- **J6** User I/O Connector
- **J14** Extension Connector
- **J12** Extension Connector
- **J11** Extension Connector
- **J9** Extension Connector
- **U8** 3.3V Voltage Regulator
- **U4** SDRAM
- **U3** Flash Memory

**Notes:** *1: Not mounted  *2: 3.3V version only  *3: Can be mounted only for 3.3V version
Table 1.6.1 lists main components mounted in the M3A-HS86.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parts Name</th>
<th>Remarks</th>
<th>Recommended parts number for not-mounted components</th>
</tr>
</thead>
<tbody>
<tr>
<td>U1</td>
<td>CPU</td>
<td>SH7086 (Renesas)</td>
<td></td>
</tr>
<tr>
<td>U1</td>
<td>CPU socket</td>
<td>NQPACK176SD</td>
<td></td>
</tr>
<tr>
<td>U2</td>
<td>Clock buffer</td>
<td>Not mounted</td>
<td>CY2305SC-1 (Cypress)</td>
</tr>
<tr>
<td>U3</td>
<td>Flash memory</td>
<td>Not mounted (Can be mounted only for 3.3V version)</td>
<td></td>
</tr>
<tr>
<td>U4</td>
<td>SDRAM</td>
<td>3.3V version only</td>
<td></td>
</tr>
<tr>
<td>U5</td>
<td>RS-232C driver</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U6</td>
<td>Reset IC</td>
<td>M51957BFP (Renesas)</td>
<td></td>
</tr>
<tr>
<td>U7</td>
<td>Logic IC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U8</td>
<td>3.3V voltage regulator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X1</td>
<td>Oscillator</td>
<td>10.00MHz</td>
<td></td>
</tr>
<tr>
<td>J1</td>
<td>H-UDI connector</td>
<td>36-pin type</td>
<td></td>
</tr>
<tr>
<td>J2</td>
<td>H-UDI connector</td>
<td>14-pin type</td>
<td></td>
</tr>
<tr>
<td>J3</td>
<td>Serial port connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J4</td>
<td>External power supply connector</td>
<td>Not mounted</td>
<td>A2-2PA-2.54DSA (Hirose)</td>
</tr>
<tr>
<td>J5</td>
<td>Power supply connector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>J6</td>
<td>User I/O connector</td>
<td>Not mounted</td>
<td>XG4C-2634 (Omron)</td>
</tr>
<tr>
<td>J7,J8</td>
<td>User I/O connector</td>
<td>Not mounted</td>
<td>A2-3PA-2.54DSA (Hirose)</td>
</tr>
<tr>
<td>J9,J11,J12</td>
<td>Extension connector</td>
<td>Not mounted</td>
<td>XG4C-2031 (Omron)</td>
</tr>
<tr>
<td>J10,J13</td>
<td>Extension connector</td>
<td>Not mounted</td>
<td>XG4C-4031 (Omron)</td>
</tr>
<tr>
<td>J14</td>
<td>Extension connector</td>
<td>Not mounted</td>
<td>3428-6002LCSC (Sumitomo 3M)</td>
</tr>
<tr>
<td>LED1</td>
<td>Power LED</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>LED2-8</td>
<td>User LED</td>
<td>Green</td>
<td></td>
</tr>
<tr>
<td>LED9</td>
<td>LED for interrupt confirmation</td>
<td>Red/Yellow green (Two colors)</td>
<td></td>
</tr>
<tr>
<td>SW1</td>
<td>Power switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW2</td>
<td>Reset switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW3</td>
<td>DIP switch for users</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW4</td>
<td>DIP switch for system setting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW5</td>
<td>NMI switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW6</td>
<td>IRQ1 switch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW7</td>
<td>MRES switch</td>
<td>Not mounted</td>
<td>B3SN-3012 (Omron)</td>
</tr>
</tbody>
</table>
1.7 M3A-HS86 Memory Mapping

Figure 1.7.1, Figure 1.7.2 and Figure 1.7.3 show a memory mapping example of SH7086 in the M3A-HS86.

### Logical space of the SH7086
**MCU mode 3** (Single Chip mode)

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H'0000 0000</td>
<td>On-chip ROM (512KB)</td>
<td>H'FFFF 0000</td>
<td>On-chip ROM (512KB)</td>
</tr>
<tr>
<td>H'0007 FFFF</td>
<td>Reserved</td>
<td>H'FFFF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'0008 0000</td>
<td></td>
<td>H'FFFF 3FFF</td>
<td></td>
</tr>
<tr>
<td>H'FFFF 3FFF</td>
<td>On-chip RAM (32KB)</td>
<td>H'FFFF 4000</td>
<td>On-chip RAM (32KB)</td>
</tr>
<tr>
<td>H'FFFF 4000</td>
<td></td>
<td>H'FFFF BFFF</td>
<td>On-chip peripheral Module</td>
</tr>
<tr>
<td>H'FFFF BFFF</td>
<td></td>
<td>H'FFFF C000</td>
<td></td>
</tr>
<tr>
<td>H'FFFF C000</td>
<td>On-chip peripheral Module</td>
<td>H'FFFF FFFF</td>
<td>On-chip peripheral Module</td>
</tr>
<tr>
<td>H'FFFF FFFF</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Memory Mapping of the M3A-HS86

Figure 1.7.1 Memory Mapping Example of SH7086 (MCU mode 3)
Overview

1.7 M3A-HS86 Memory Mapping

1-9

Logical space of the SH7086
MCU mode 0,1
(On-chip ROM disabled mode)

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H’0000 0000</td>
<td>CS0 space: 64MB</td>
</tr>
<tr>
<td>H’03FF FFFF</td>
<td>SDRAM Mode setting</td>
</tr>
<tr>
<td>H’0400 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’07FF FFFF</td>
<td>CS1 space: 64MB</td>
</tr>
<tr>
<td>H’0800 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’0BFF FFFF</td>
<td>CS2 space: 64MB</td>
</tr>
<tr>
<td>H’0C00 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’0FF FFFF</td>
<td>CS3 space: 64MB</td>
</tr>
<tr>
<td>H’1000 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’13FF FFFF</td>
<td>CS4 space: 64MB</td>
</tr>
<tr>
<td>H’1400 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’17FF FFFF</td>
<td>CS5 space: 64MB</td>
</tr>
<tr>
<td>H’1800 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’1BFF FFFF</td>
<td>CS6 space: 64MB</td>
</tr>
<tr>
<td>H’1C00 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’1FFF FFFF</td>
<td>CS7 space: 64MB</td>
</tr>
<tr>
<td>H’2000 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’3FF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’4000 0000</td>
<td>CS8 space: 1GB</td>
</tr>
<tr>
<td>H’7FF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’8000 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FF7 FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FF8 0000</td>
<td>SDRAM Mode setting</td>
</tr>
<tr>
<td>H’FF9 FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FFFF 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FFFF 3FFF</td>
<td>On-chip RAM (32KB)</td>
</tr>
<tr>
<td>H’FFFF 4000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FFFF BFFF</td>
<td>On-chip peripheral Module</td>
</tr>
<tr>
<td>H’FFFF C000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H’FFFF FFFF</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

Memory Mapping of the M3A-HS86

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H’0000 0000</td>
<td>Flash Memory (8MB)</td>
</tr>
<tr>
<td>H’0007 FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’0400 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’07FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’0800 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’0BFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’0C00 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’0FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’13FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1400 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’17FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1800 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1BFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1C00 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’1FFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’2000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’3FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’4000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’7FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’8000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FF7 FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FF8 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FF9 FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF 3FFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF 4000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF BFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF C000</td>
<td>User Area</td>
</tr>
<tr>
<td>H’FFFF FFFF</td>
<td>User Area</td>
</tr>
</tbody>
</table>

Notes
*1: For the case that 8MB flash memory is mounted (M3A-HS86(3.3V version) only)
*2: M3A-HS86(3.3V version) only

Figure 1.7.2 Memory Mapping Example of SH7086 (MCU mode 0,1)
## Logical space of the SH7086

**MCU mode 2**

(On-chip ROM enabled mode)

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H'0000 0000</td>
<td>On-chip ROM (512KB)</td>
</tr>
<tr>
<td>H'0007 FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'0008 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'01FF FFFF</td>
<td>CS0 space: 32MB</td>
</tr>
<tr>
<td>H'0200 0000</td>
<td>H'0200 0000</td>
</tr>
<tr>
<td>H'027F FFFF</td>
<td>H'027F FFFF</td>
</tr>
<tr>
<td>H'03FF FFFF</td>
<td>CS1 space: 64MB</td>
</tr>
<tr>
<td>H'0400 0000</td>
<td>H'0400 0000</td>
</tr>
<tr>
<td>H'07FF FFFF</td>
<td>CS2 space: 64MB</td>
</tr>
<tr>
<td>H'07FF FFFF</td>
<td>H'07FF FFFF</td>
</tr>
<tr>
<td>H'0BFF FFFF</td>
<td>CS3 space: 64MB</td>
</tr>
<tr>
<td>H'0800 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'0C00 0000</td>
<td>CS4 space: 64MB</td>
</tr>
<tr>
<td>H'0C00 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'1000 0000</td>
<td>CS5 space: 64MB</td>
</tr>
<tr>
<td>H'1000 0000</td>
<td>H'1000 0000</td>
</tr>
<tr>
<td>H'1400 0000</td>
<td>CS6 space: 64MB</td>
</tr>
<tr>
<td>H'1400 0000</td>
<td>H'1400 0000</td>
</tr>
<tr>
<td>H'17FF FFFF</td>
<td>CS7 space: 64MB</td>
</tr>
<tr>
<td>H'1800 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'1BFF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'1C00 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'1FFF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'2000 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'3FFF FFFF</td>
<td>CS8 space: 1GB</td>
</tr>
<tr>
<td>H'4000 0000</td>
<td>H'4000 0000</td>
</tr>
<tr>
<td>H'7FFF FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'8000 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'FFF7 FFFF</td>
<td>SDRAM Mode setting</td>
</tr>
<tr>
<td>H'FFF8 0000</td>
<td>H'FFF8 0000</td>
</tr>
<tr>
<td>H'FFF9 FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'FFFFA 0000</td>
<td>H'FFFFA 0000</td>
</tr>
<tr>
<td>H'FFFF 3FFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'FFFF 4000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'FFFF BFFF</td>
<td>On-chip RAM (32KB)</td>
</tr>
<tr>
<td>H'FFFF C000</td>
<td>H'FFFF C000</td>
</tr>
<tr>
<td>H'FFFF FFFF</td>
<td>On-chip peripheral Module</td>
</tr>
</tbody>
</table>

### Memory Mapping of the M3A-HS86

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H'0000 0000</td>
<td>On-chip ROM (512KB)</td>
</tr>
<tr>
<td>H'0007 FFFF</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'0008 0000</td>
<td>Reserved</td>
</tr>
<tr>
<td>H'01FF FFFF</td>
<td>Flash Memory (8MB)</td>
</tr>
<tr>
<td>H'0200 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'027F FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'03FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'0400 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'07FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'0800 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'0BFF FFFF</td>
<td>SDRAM (16MB) *2</td>
</tr>
<tr>
<td>H'0C00 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'0CFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'0FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'13FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1400 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'17FF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1800 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1BFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1C00 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'1FFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'2000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'3FFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'4000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'7FFF FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'8000 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFF7 FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFF8 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFF9 FFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFFA 0000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFF 3FFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFF 4000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFF BFFF</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFF C000</td>
<td>User Area</td>
</tr>
<tr>
<td>H'FFFF FFFF</td>
<td>User Area</td>
</tr>
</tbody>
</table>

### Notes

*1: For the case that 8MB flash memory is mounted (M3A-HS86(3.3V version) only)
*2: M3A-HS86(3.3V version) only

**Figure 1.7.3 Memory Mapping Example of SH7086 (MCU mode 2)**
### 1.8 Absolute Maximum Ratings

Table 1.8.1 lists the absolute maximum ratings of M3A-HS86.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rated Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5VCC</td>
<td>5V system power supply voltage</td>
<td>-0.3V to 6.0V</td>
<td>Relative to VSS</td>
</tr>
<tr>
<td>3VCC</td>
<td>3.3V system power supply voltage</td>
<td>-0.3V to 4.6V</td>
<td>Relative to VSS</td>
</tr>
<tr>
<td>Topr</td>
<td>Operating ambient temperature</td>
<td>-0°C to 50°C</td>
<td>No dewdrops allowed. Use in corrosive gas environment prohibited.</td>
</tr>
<tr>
<td>Tstr</td>
<td>Storage ambient temperature</td>
<td>-10°C to 60°C</td>
<td>No dewdrops allowed. Use in corrosive gas environment prohibited.</td>
</tr>
</tbody>
</table>

Note: The ambient temperature refers to the air temperature in places closest possible to the board.

### 1.9 Recommended Operating Conditions

Table 1.9.1 lists the recommended operating conditions of M3A-HS86.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rated Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>5VCC</td>
<td>5V system power supply voltage</td>
<td>4.75V to 5.25V</td>
<td>Relative to VSS</td>
</tr>
<tr>
<td>3VCC</td>
<td>3.3V system power supply voltage</td>
<td>3.0V to 3.6V</td>
<td>Relative to VSS</td>
</tr>
<tr>
<td></td>
<td>Maximum current consumption in the board</td>
<td>Within 1A</td>
<td></td>
</tr>
<tr>
<td>Topr</td>
<td>Operating ambient temperature</td>
<td>0°C to 50°C</td>
<td>No dewdrops allowed. Use in corrosive gas environment prohibited.</td>
</tr>
</tbody>
</table>
* This is a blank page *
Chapter 2
Functional Overview
2.1 Functional Overview

The M3A-HS86 is the SH7086 CPU board that has the functions listed in Table 2.1.1. Table 2.1.1 lists the functional modules of M3A-HS86.

Table 2.1.1 Functional Modules of M3A-HS86

<table>
<thead>
<tr>
<th>Sections</th>
<th>Functions</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.2</td>
<td>CPU</td>
<td>SH7086</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Input(XIN) clock : 10MHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Bus clock : 40MHz, max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• CPU clock : 80MHz, max</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• On-chip memory</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Flash memory : 512KB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- RAM : 32KB</td>
</tr>
<tr>
<td>2.3</td>
<td>Memory</td>
<td>SDRAM : 16 Mbytes(16-bit bus width) 1pc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• External flash memory enabled to mount</td>
</tr>
<tr>
<td></td>
<td>*M3A-HS86(3.3V version) only</td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>Serial Port Interface</td>
<td>Connects SCI1 of the SH7086 to the Serial Port connector</td>
</tr>
<tr>
<td>2.5</td>
<td>I/O Ports</td>
<td>Connects to the input/output ports of the SH7086</td>
</tr>
<tr>
<td>2.6</td>
<td>Power Supply Circuit</td>
<td>Controls the system power supply of the M3A-HS86</td>
</tr>
<tr>
<td>2.7</td>
<td>Clock Module</td>
<td>Controls the system clock</td>
</tr>
<tr>
<td>2.8</td>
<td>Reset Module</td>
<td>Controls device reset mounted on the M3A-HS86</td>
</tr>
<tr>
<td>2.9</td>
<td>Interrupt Switches</td>
<td>Connect to the NMI and IRQ1 pins</td>
</tr>
<tr>
<td>2.10</td>
<td>E10A-USB Interface</td>
<td>SH7086 H-UDI/AUD interface</td>
</tr>
<tr>
<td></td>
<td>- Operational specifications</td>
<td>Connectors, switches and LEDs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• SH7086 extension connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Switches and LEDs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• H-UDI connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Detailed in Chapter 3.</td>
</tr>
</tbody>
</table>
The M3A-HS86 contains the 32-bit RISC microcomputer SH7086 that operates with a maximum 80MHz of CPU clock frequency. The SH7086 includes 512-Kbyte flash memory, and 32-Kbyte SRAM, making it useful in a wide range of applications from data processing to equipment control.

The M3A-HS86 can be operated with a maximum 80MHz of CPU clock frequency (external bus 40MHz, max) using a 10MHz input clock.

Figure 2.2.1 shows the SH7086 block diagram in the M3A-HS86.
2.3 Memory

2.3.1 SH7086 On-chip Memory

The SH7086 includes 512-Kbyte flash memory and 32-Kbyte SRAM.

2.3.2 SDRAM

The M3A-HS86 (3.3V version) mounts 16MB SDRAM as standard equipment. SDRAM is controlled by the bus state controller built into SH7086. Table 2.3.1 lists SDRAM specifications used in M3A-HS86. Figure 2.3.1 shows the block diagram of SDRAM connection.

Table 2.3.1 SDRAM Specifications

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>16 Mbytes (16-bit bus) x 1pc.</td>
</tr>
<tr>
<td>Capacity</td>
<td>16 Mbytes</td>
</tr>
<tr>
<td>Access Time</td>
<td>5.4ns</td>
</tr>
<tr>
<td>CAS Latency</td>
<td>2 (at 40MHz bus clock)</td>
</tr>
<tr>
<td>Refresh Interval</td>
<td>4,096 refresh cycles every 64ms</td>
</tr>
<tr>
<td>Row Address</td>
<td>A11-A0</td>
</tr>
<tr>
<td>Column Address</td>
<td>A8-A0</td>
</tr>
<tr>
<td>Number of Banks</td>
<td>4-bank operation controlled by BA0 and BA1</td>
</tr>
</tbody>
</table>

![Figure 2.3.1 Block Diagram of SDRAM Connection](image-url)
Table 2.3.2 lists an example of bus state controller settings for operation with the SH7086 Bus clock at 40MHz.

<table>
<thead>
<tr>
<th>User Area</th>
<th>SDRAM Controller Settings</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS3 Space Bus Control Register (CS3BCR)</td>
<td></td>
</tr>
<tr>
<td>Initial value : H’36DB 0600</td>
<td></td>
</tr>
<tr>
<td>Recommended set value : H’1000 4400</td>
<td></td>
</tr>
<tr>
<td>- Specify idle cycles between write-read cycles and write-write cycles</td>
<td></td>
</tr>
<tr>
<td>IWW[2:0] = 001 ; 1 idle cycle inserted</td>
<td></td>
</tr>
<tr>
<td>- Specify memory type : TYPE[2:0] = 100 ; SDRAM</td>
<td></td>
</tr>
<tr>
<td>- Data bus size : BSZ[1:0] = B’10 ; 16-bit size</td>
<td></td>
</tr>
<tr>
<td>CS3 Space Wait Control Register (CS3WCR)</td>
<td></td>
</tr>
<tr>
<td>Initial value : H’0000 0500</td>
<td></td>
</tr>
<tr>
<td>Recommended set value : H’0000 4891</td>
<td></td>
</tr>
<tr>
<td>- Number of Auto-Precharge Completion Wait Cycles</td>
<td></td>
</tr>
<tr>
<td>TRP[1:0] = 10 ; 3 cycles</td>
<td></td>
</tr>
<tr>
<td>- Wait Cycles between ACTV Command and READ(A)/WRIT(A) Command</td>
<td></td>
</tr>
<tr>
<td>TRCD[1:0] = 10 ; 3 cycles</td>
<td></td>
</tr>
<tr>
<td>- Area 3 CAS latency</td>
<td></td>
</tr>
<tr>
<td>A3CL[1:0] = 01 ; 2 cycles</td>
<td></td>
</tr>
<tr>
<td>- WRIT(A) command → Number of Auto-Precharge/PRE Command cycles</td>
<td></td>
</tr>
<tr>
<td>TRWL[1:0] = 10 ; 2 cycles</td>
<td></td>
</tr>
<tr>
<td>TRC[1:0] = 01 ; 4 cycles</td>
<td></td>
</tr>
<tr>
<td>SDRAM Control Register (SDCR)</td>
<td></td>
</tr>
<tr>
<td>Initial value : H’0000 0000</td>
<td></td>
</tr>
<tr>
<td>Recommended set value : H’0000 0809</td>
<td></td>
</tr>
<tr>
<td>- Refresh control</td>
<td></td>
</tr>
<tr>
<td>RFNSH = 1 ; Refresh enabled</td>
<td></td>
</tr>
<tr>
<td>- Refresh control</td>
<td></td>
</tr>
<tr>
<td>RMODE = 0 ; Auto refresh</td>
<td></td>
</tr>
<tr>
<td>- Bank active mode</td>
<td></td>
</tr>
<tr>
<td>BACTV = 0 ; Auto precharge mode</td>
<td></td>
</tr>
<tr>
<td>- Number of area3 row address bits</td>
<td></td>
</tr>
<tr>
<td>A3ROW[1:0] = 01 ; 12 bits</td>
<td></td>
</tr>
<tr>
<td>- Number of area3 column address bits</td>
<td></td>
</tr>
<tr>
<td>A3COL[1:0] = 01 ; 9 bits</td>
<td></td>
</tr>
<tr>
<td>Refresh Timer Control/Status Register (RTCSR)</td>
<td></td>
</tr>
<tr>
<td>Initial value : H’0000 0000</td>
<td></td>
</tr>
<tr>
<td>Recommended set value : H’A55A 0010</td>
<td></td>
</tr>
<tr>
<td>- Clock select</td>
<td></td>
</tr>
<tr>
<td>CKS[2:0] = 010 ; Bφ/16</td>
<td></td>
</tr>
<tr>
<td>- Refresh times</td>
<td></td>
</tr>
<tr>
<td>RRC[2:0] = 000 ; 1 time</td>
<td></td>
</tr>
<tr>
<td>Refresh Time Constant Register (RTCOR)</td>
<td></td>
</tr>
<tr>
<td>Initial value : H’0000 0000</td>
<td></td>
</tr>
<tr>
<td>Recommended set value : H’A55A 0027</td>
<td></td>
</tr>
<tr>
<td>*The following shows refresh request intervals in cases when clock select is set to Bφ/16.</td>
<td></td>
</tr>
<tr>
<td>1 cycle : 400nsec (40MHz/16 = 2.5MHz)</td>
<td></td>
</tr>
<tr>
<td>Refresh request intervals for the SDRAM : every 15.625μsec</td>
<td></td>
</tr>
<tr>
<td>15.625μsec / 400nsec = 39 (0x27) cycles / refresh</td>
<td></td>
</tr>
</tbody>
</table>
Figure 2.3.2 shows an example of SDRAM single read/write timing for operation with the SH7086 Bus clock at 40MHz.

![Figure 2.3.2  Example of SDRAM Single Read/Write Timing]
2.3.3 Expand of Flash Memory

M3A-HS86 has installed the mounting space to which the flash memory can be expanded externally. The mountable flash memory is 32M bit or 64M bit flash memory with 3.3V power-supply voltage, 16-bit bus width, and TSOP-48 pin (20 x 12mm). By a DIP switch (SW4-4), the validity or invalidity of write protect for flash memory can be switched. Figure 2.3.3 shows an example of 32-Mbit Flash Memory connection.

---

Note: Only the M3A-HS86 (3.3V version) can connect the flash memory to outside.
2.4 Serial Port Interface

The SH7086 included in the M3A-HS86 contains a UART module. In the M3A-HS86, SCI channel 1 is connected to Serial Port connector J3.

Figure 2.4.1 shows the block diagram of serial port interface in the M3A-HS86.

![Block Diagram of Serial Port Interface](image-url)
2.5 I/O Ports

In the M3A-HS86, all of the SH7086's I/O ports are connected to the extension bus connector. Some I/O ports are connected to DIP switches and LEDs of the M3A-HS86 board. Users are free to use these ports. Figure 2.5.1 shows the Block Diagram of DIP Switch and LEDs in the M3A-HS86. Table 2.5.1 to Table 2.5.3 list a function of the SH7086 I/O ports in the M3A-HS86.

![Block Diagram of DIP Switch and LEDs in M3A-HS86](image-url)
### Table 2.5.1 Functions of SH7086 I/O Ports

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Connection Destinations on M3A-HS86</th>
<th>Extension Connector</th>
<th>Other Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PE12/TIOC4A/TXD3/SCS/TCK</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>2</td>
<td>PE13/TIOC4B/MRES/ASEBRKAK/ASEBRK</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>H-UDI connector (J1, J2) MRES SW (Not mounted)</td>
</tr>
<tr>
<td>4</td>
<td>PE14/WRH/HICIOWR/AH/DQMUI/U/DACK0/TIOC4C</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>LED5</td>
</tr>
<tr>
<td>5</td>
<td>PA22/WRHL/HICIORD/DQMUL/TIC5V</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>LED5</td>
</tr>
<tr>
<td>6</td>
<td>PA21/CS5/CE1A/CASU/TIC5U</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>LED5</td>
</tr>
<tr>
<td>7</td>
<td>PE15/CHE/DACK1/I/TIOC4D/IRQOUT</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>LED5</td>
</tr>
<tr>
<td>8</td>
<td>PE16/CS8/TIOC3BS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED6)</td>
</tr>
<tr>
<td>9</td>
<td>PE17/TIOC3DS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED7)</td>
</tr>
<tr>
<td>10</td>
<td>PE18/TIOC4AS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED8)</td>
</tr>
<tr>
<td>11</td>
<td>PE19/TIOC4BS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED9)</td>
</tr>
<tr>
<td>12</td>
<td>PE20/TIOC4CS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED10)</td>
</tr>
<tr>
<td>13</td>
<td>PE21/TIOC4DS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (LED11)</td>
</tr>
<tr>
<td>14</td>
<td>PC0/A0</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
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<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>15</td>
<td>PC1/A1</td>
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<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>16</td>
<td>PC2/A2</td>
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<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>17</td>
<td>PC3/A3</td>
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<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>18</td>
<td>PC4/A4</td>
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<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>19</td>
<td>PC5/A5</td>
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<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>20</td>
<td>PC6/A6</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>21</td>
<td>PC7/A7</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>22</td>
<td>PC8/A8</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>23</td>
<td>PC9/A9</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>24</td>
<td>PC10/A10</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>25</td>
<td>PC11/A11</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>26</td>
<td>PC12/A12</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>27</td>
<td>PC13/A13</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>28</td>
<td>PC14/A14</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>29</td>
<td>PC15/A15</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>30</td>
<td>PC16/A16/TIC5WS</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>31</td>
<td>PB0/A17/TIC5W</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>32</td>
<td>PB1/A17/TIC5W</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>33</td>
<td>PA20/CS4/RASU</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>34</td>
<td>PA19/BACK/TEND1</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>35</td>
<td>PB2/IROQ/POE0/SC1</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>36</td>
<td>PB3/IROQ/POE1/SDA</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>37</td>
<td>PA18/BREQ/TEND0</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>38</td>
<td>PB4/RASL/IROQ2/POE2</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
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<tr>
<td>39</td>
<td>PB5/CASL/IROQ3/POE3</td>
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<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>40</td>
<td>PB6/BACK/IROQ4/RXD0</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (Dip SW)</td>
</tr>
<tr>
<td>41</td>
<td>PB7/BACK/IROQ5/TXD0</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (Dip SW)</td>
</tr>
<tr>
<td>42</td>
<td>PB8/A20/WAIT/IROQ6/SCK0</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (Dip SW)</td>
</tr>
<tr>
<td>43</td>
<td>PB9/A21/IROQ7/ADTRG/POE8</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>User Port (Dip SW)</td>
</tr>
<tr>
<td>44</td>
<td>PA14/RD</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
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<tr>
<td>45</td>
<td>PC18/A18</td>
<td>J6 J7 J8 J9 J10 J11 J12 J13 J14</td>
<td>●</td>
<td>Flash, SDRAM *1</td>
</tr>
</tbody>
</table>

*Note *1: Only for 3.3V version
## Table 2.5.2 Functions of SH7086 I/O Ports

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Extension Connector</th>
<th>Other Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>PC19/A19</td>
<td>J6 ●</td>
<td>Flash *1</td>
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<tr>
<td>56</td>
<td>PC20/A20</td>
<td>J6 ●</td>
<td>Flash *1</td>
</tr>
<tr>
<td>58</td>
<td>PC21/A21</td>
<td>J6 ●</td>
<td>Flash *1</td>
</tr>
<tr>
<td>59</td>
<td>PC22/A22</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>PC23/A23</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>PC24/A24</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>PC25/A25</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>PA26/A26/IRQ0</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>PA27/A27/IRQ1</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>PA28/A28/IRQ2</td>
<td>J6 ●</td>
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</tr>
<tr>
<td>68</td>
<td>PA29/A29/IRQ3</td>
<td>J6 ●</td>
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<tr>
<td>69</td>
<td>PD31/D31/TIOC3AS/ADTRG</td>
<td>J6 ●</td>
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<td>70</td>
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<td>PA11/CS1/POE5</td>
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<td>PA10/CS0/POE4</td>
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<td>SDRAM *1</td>
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<td>PA8/RDWR/IRQ2/TCLKC</td>
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<td>SDRAM *1</td>
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<td>PA7/CS3/TCLKB</td>
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</tr>
<tr>
<td>81</td>
<td>PD29/D29/CS3/TIOC3BS</td>
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<tr>
<td>82</td>
<td>PD28/D28/CS2/TIOC3DS</td>
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<td>PD20/D20/IRQ4/TIC5WS/AUDRST</td>
<td>J6 ●</td>
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<td>PD19/D19/IRQ3/POE7/AUDATA3</td>
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<td>PD18/D18/IRQ2/POE6/AUDATA2</td>
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<td>97</td>
<td>PD16/D16/IRQ0/POE4/AUDATA0</td>
<td>J6 ●</td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>PD15/D15/TIOC4DS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>99</td>
<td>PD14/D14/TIOC4CS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
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<tr>
<td>100</td>
<td>PD13/D13/TIOC4BS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
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<td>PD12/D12/TIOC4AS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>103</td>
<td>PD11/D11/TIOC3DS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>105</td>
<td>PD10/D10/TIOC3CS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>106</td>
<td>PD9/D9/TIOC3BS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>107</td>
<td>PD8/D8/TIOC3AS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>108</td>
<td>PD7/D7/TIC5WS</td>
<td>J6 ●</td>
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</tr>
<tr>
<td>110</td>
<td>PD6/D6/TIC5VS</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>111</td>
<td>PD5/D5/TIC5US</td>
<td>J6 ●</td>
<td>Flash, SDRAM *1</td>
</tr>
</tbody>
</table>

Note *1: Only for 3.3V version
Table 2.5.3 Functions of SH7086 I/O Ports

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<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Extension Connector</th>
<th>Other Connections</th>
</tr>
</thead>
<tbody>
<tr>
<td>112</td>
<td>PD4/D4/TICSW</td>
<td>J7</td>
<td>Flash, SDRAM *1</td>
</tr>
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<td>113</td>
<td>PD3/D3/TIC5V</td>
<td>J8</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>114</td>
<td>PD2/D2/TIC5U</td>
<td>J9</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>115</td>
<td>PD1/D1</td>
<td>J10</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>116</td>
<td>PD0/D0</td>
<td>J11</td>
<td>Flash, SDRAM *1</td>
</tr>
<tr>
<td>117</td>
<td>PA16/WRHH/</td>
<td>J12</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td></td>
<td>/IC/OWR/AH/DQMUU/</td>
<td>J13</td>
<td></td>
</tr>
<tr>
<td></td>
<td>/C/KE/DREQ2/AUDSYNC/</td>
<td>J14</td>
<td></td>
</tr>
<tr>
<td>125</td>
<td>PA17/WAIT/DACK2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>126</td>
<td>PA24/CE2A/DREQ3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>127</td>
<td>PA25/CE2B/DACK3/POE6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>131</td>
<td>PA15/CK</td>
<td>J6</td>
<td>SDRAM *1</td>
</tr>
<tr>
<td>132</td>
<td>PE0/DREQ0/TIOC0A/AUDCK</td>
<td>J7</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>134</td>
<td>PE1/TEND0/TIOC0B/AUDMD</td>
<td>J8</td>
<td>LED2</td>
</tr>
<tr>
<td>135</td>
<td>PE2/DREQ1/TIOC0C/AUDRST</td>
<td>J9</td>
<td>LED3</td>
</tr>
<tr>
<td>137</td>
<td>PE3/TEND1/TIOC0D/AUDATA3</td>
<td>J10</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>138</td>
<td>PE4/IOS16/TIOC1A/RXD3/AUDATA2</td>
<td>J11</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>139</td>
<td>PE5/CS6/CE1B/TIOC1B/TXD3/AUDATA1</td>
<td>J12</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>140</td>
<td>PE6/CS7/TIOC2A/SCK3/AUDATA0</td>
<td>J13</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>143</td>
<td>PF0/AN0</td>
<td>J14</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>PF1/AN1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>145</td>
<td>PF8/AN8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>146</td>
<td>PF9/AN9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>147</td>
<td>PF2/AN2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>148</td>
<td>PF3/AN3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>149</td>
<td>PF10/AN10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>PF11/AN11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>152</td>
<td>PF4/AN4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>153</td>
<td>PF5/AN5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>154</td>
<td>PF12/AN12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>155</td>
<td>PF13/AN13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>157</td>
<td>PF6/AN6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>158</td>
<td>PF7/AN7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>159</td>
<td>PF14/AN14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>160</td>
<td>PF15/AN15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>164</td>
<td>PA0/CS4/RXD0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td>PA1/CS5/CE1A/TXD0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>166</td>
<td>PA2/A25/DREQ0/IRQ0/SCK0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>167</td>
<td>PA3/A24/RXD1</td>
<td></td>
<td>Serial port (J3)</td>
</tr>
<tr>
<td>169</td>
<td>PA4/A23/TXD1</td>
<td></td>
<td>Serial port (J3)</td>
</tr>
<tr>
<td>170</td>
<td>PA5/A22/DREQ1/IRQ1/SCK1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>171</td>
<td>PE7/BS/TIOC2B/UBCTRGR/RXD2/SSI</td>
<td>J6</td>
<td>LED4</td>
</tr>
<tr>
<td>172</td>
<td>PE8/TIOC3A/SCK2/SSCK/TMS</td>
<td>J7</td>
<td>H-UDI connector (J1,J2)</td>
</tr>
<tr>
<td>174</td>
<td>PE9/TIOC3B/SCK3/RTS3/TRST</td>
<td>J8</td>
<td>H-UDI connector (J1,J2)</td>
</tr>
<tr>
<td>175</td>
<td>PE10/TIOC3C/TXD2/SSO/TDI</td>
<td>J9</td>
<td>H-UDI connector (J1,J2)</td>
</tr>
<tr>
<td>176</td>
<td>PE11/TIOC3D/RXD3/CTS3/TDO</td>
<td>J10</td>
<td>H-UDI connector (J1,J2)</td>
</tr>
</tbody>
</table>

Note *1: Only for 3.3V version

*2: Connected only when the 0Ω resistance is mounted. It is not mounted Initially.
2.6 Power Supply Circuit

The M3A-HS86 accepts a 5V power supply as its input and generates 3.3V from it by using a regulator. The M3A-HS86 (3.3V version) and M3A-HS86 (5V version) are different according to whether R37 and R38 are mounted.
- M3A-HS86 (3.3V version) : R37 is not mounted, R38 is mounted
- M3A-HS86 (5V version) : R37 is mounted, R38 is not mounted

Figure 2.6.1 shows the block diagram of power supply circuit in the M3A-HS86.
2.7 Clock Module

The clock module in the M3A-HS86 consists of the following two blocks:

- Output from an oscillator connected to EXTAL of the SH7086
- Ceramic resonator connected to EXTAL and XTAL

The M3A-HS86 has a 10MHz oscillator connected to it as standard specification.

The system clock output (PA15/CK) of SH7086 is connected to an extension connector through the damping resistor. To connect an extension board to an extension connector, we recommend including a clock buffer that contains a PLL to ensure that the board will be supplied with a stable clock signal.

Figure 2.7.1 shows the block diagram of clock module.

*1: To mount the ceramic oscillator, remove R3.
*2: To mount the clock buffer, remove R7.

Figure 2.7.1 Block Diagram of Clock Module
2.8 Reset Module

Reset module controls the reset signal connected to the SH7086, which mounted on the M3A-HS86. Moreover, when the flash memory is mounted, it is used as a reset signal of the flash memory.

Figure 2.8.1 shows the block diagram of reset module in the M3A-HS86.

Reset IC output delay time, \( t_d = 0.34 \times C_d (\text{pF}) \times \text{usec} = 34 \text{ms} \)

Reset IC output detection voltage, \( V_s \)
- M3A-HS86 (3.3V Version)
  \( R_a = 10K \Omega \), \( R_b = 10K \Omega \)
  \( V_s = 1.25 \times (R_a+R_b)/R_b = 2.50V \)
- M3A-HS60 (5V Version)
  \( R_a = 20K \Omega \), \( R_b = 10K \Omega \)
  \( V_s = 1.25 \times (R_a+R_b)/R_b = 3.75V \)

![Block Diagram of Reset Module](image-url)
2.9 Interrupt Switches

In the M3A-HS86, the switch is connected with the PA5/IRQ1 pin and NMI pin of the SH7086. LED to confirm that the switch has been pushed is connected. In addition, MRES switch can be mounted on PE13/MRES pin. However, it cannot be mounted when E10A-USB is used because MRES pin is multiplexed with the signal ASEBRKAK/ASEBRK.

Figure 2.9.1 shows the interrupt block diagram in the M3A-HS86.
2.10 E10A-USB Interface

The M3A-HS86 has a 36-pin H-UDI connector and 14-pin H-UDI connector included in it for connection to the E10A-USB.

Because the SH7086's H-UDI pins and AUD pins are being output to the extension connector, do not use the applicable pins of the extension connector when debugging with the H-UDI connector.

Figure 2.10.1 shows the block diagram of E10A-USB interface.

Note: 36-pin type and 14 pin type of the H-UDI connector cannot be used at the same time.
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Chapter 3
Operational Specifications
Figure 3.1.1 shows M3A-HS86 connector assignments.

Figure 3.1.1  M3A-HS86 Connector Assignments
3.1.1 H-UDI Connector (J1,J2)

M3A-HS86 has the 36-pin H-UDI (J1) connector and 14-pin H-UDI (J2) connector included in it for connection to the E10A-USB emulator.

Figure 3.1.2 shows a pin assignment of H-UDI (J1) connector.

Table 3.1.1 lists pin assignments of H-UDI connector.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AUDCK</td>
<td>19</td>
<td>TMS</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>20</td>
<td>GND</td>
</tr>
<tr>
<td>3</td>
<td>AUDATA0</td>
<td>21</td>
<td>TRST</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>22</td>
<td>(GND)</td>
</tr>
<tr>
<td>5</td>
<td>AUDATA1</td>
<td>23</td>
<td>TDI</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>24</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>AUDATA2</td>
<td>25</td>
<td>TDO</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>26</td>
<td>GND</td>
</tr>
<tr>
<td>9</td>
<td>AUDATA3</td>
<td>27</td>
<td>ASEBRKAK/ASEBRK</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>28</td>
<td>GND</td>
</tr>
<tr>
<td>11</td>
<td>AUDSYNC</td>
<td>29</td>
<td>UVCC</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>30</td>
<td>GND</td>
</tr>
<tr>
<td>13</td>
<td>NC</td>
<td>31</td>
<td>RES</td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>32</td>
<td>GND</td>
</tr>
<tr>
<td>15</td>
<td>NC</td>
<td>33</td>
<td>GND</td>
</tr>
<tr>
<td>16</td>
<td>GND</td>
<td>34</td>
<td>GND</td>
</tr>
<tr>
<td>17</td>
<td>TCK</td>
<td>35</td>
<td>NC</td>
</tr>
<tr>
<td>18</td>
<td>GND</td>
<td>36</td>
<td>GND</td>
</tr>
</tbody>
</table>
Figure 3.1.3 shows a pin assignment of H-UDI (J2) connector.

Table 3.1.2 lists pin assignments of H-UDI (J2) connector.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TCK</td>
<td>8</td>
<td>NC</td>
</tr>
<tr>
<td>2</td>
<td>TRST</td>
<td>9</td>
<td>(GND)</td>
</tr>
<tr>
<td>3</td>
<td>TDO</td>
<td>10</td>
<td>GND</td>
</tr>
<tr>
<td>4</td>
<td>ASEBRKAK/ASEBRK</td>
<td>11</td>
<td>UVCC</td>
</tr>
<tr>
<td>5</td>
<td>TMS</td>
<td>12</td>
<td>GND</td>
</tr>
<tr>
<td>6</td>
<td>TDI</td>
<td>13</td>
<td>GND</td>
</tr>
<tr>
<td>7</td>
<td>RES</td>
<td>14</td>
<td>GND</td>
</tr>
</tbody>
</table>
3.1.2 Serial Port Connector (J3)

The M3A-HS86 includes a serial port connector (J3) for serial communication.

Figure 3.1.4 shows a pin assignment of serial port connector.

Table 3.1.3 lists pin assignments of serial port connector.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>6</td>
<td>DSR</td>
</tr>
<tr>
<td>2</td>
<td>RXD</td>
<td>7</td>
<td>RTS</td>
</tr>
<tr>
<td>3</td>
<td>TXD</td>
<td>8</td>
<td>CTS</td>
</tr>
<tr>
<td>4</td>
<td>DTR</td>
<td>9</td>
<td>NC</td>
</tr>
<tr>
<td>5</td>
<td>GND</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Pins 4-6 are loop back-connected. Pins 7-8 are loop back-connected.
3.1.3 External Power Supply Connectors for the SH7086 (J4)

The M3A-HS86 includes the external power supply connector pin for the SH7086. Figure 3.1.5 shows a pin assignment of power supply connector.

Table 3.1.4 lists a pin assignment of power supply connector for the SH7086.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+3.3V or +5.0V</td>
<td>2</td>
<td>GND</td>
</tr>
</tbody>
</table>
3.1.4 Power Supply Connector (J5)

The M3A-HS86 includes a power supply connector for the board itself. Figure 3.1.6 shows a pin assignment of power supply connector.

Table 3.1.5 lists a pin assignment of power supply connector for the M3A-HS86.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5V</td>
<td>2</td>
<td>GND</td>
</tr>
</tbody>
</table>
3.1.5 User I/O Connector (J6-J8)

The M3A-HS86 includes user I/O connectors to which the internal peripheral function pins of the SH7086 applicable for motor control (e.g., MTU2 and AD functions) are connected. Figure 3.1.7 shows a pin assignment of each user I/O connector. Table 3.1.6 lists pin assignments of user I/O connectors (J6).

![Figure 3.1.7 Pin Assignment of User I/O Connectors (J6-J8)]

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+5V</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>PF8/AN8</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>PA21/CS5/CE1A/CASU/TIC5U</td>
<td>Extension connector (J10)</td>
</tr>
<tr>
<td>5</td>
<td>PA22/WRHL/CIORD/DQMUL/TIC5V</td>
<td>Extension connector (J11)</td>
</tr>
<tr>
<td>6</td>
<td>PA23/WRHH/CIWR/AH/DQMUL/TIC5W</td>
<td>Extension connector (J11)</td>
</tr>
<tr>
<td>7</td>
<td>PE16/CS8/TIOC3BS</td>
<td>Extension connector (J11), LED6</td>
</tr>
<tr>
<td>8</td>
<td>PE18/TIOC4AS</td>
<td>LED8</td>
</tr>
<tr>
<td>9</td>
<td>PE19/TIOC4BS</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>PE17/TIOC3DS</td>
<td>LED7</td>
</tr>
<tr>
<td>11</td>
<td>PE20/TIOC4CS</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>PE21/TIOC4DS</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>PA26/A26/IRQ0</td>
<td>Extension connector (J9)</td>
</tr>
<tr>
<td>14</td>
<td>PA27/A27/IRQ1</td>
<td>Extension connector (J9)</td>
</tr>
<tr>
<td>15</td>
<td>PA28/A28/IRQ2</td>
<td>Extension connector (J9)</td>
</tr>
<tr>
<td>16</td>
<td>PA29/A29/IRQ3</td>
<td>Extension connector (J9)</td>
</tr>
<tr>
<td>17</td>
<td>PF2/AN2</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>PF3/AN3</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>PF4/AN4</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>PF9/AN9</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>PB6/A18/BACK/IRQ4/RXD0</td>
<td>DIP switch (SW3)</td>
</tr>
<tr>
<td>22</td>
<td>PB7/A19/BREQ/IRQ5/TXD0</td>
<td>DIP switch (SW3)</td>
</tr>
<tr>
<td>23</td>
<td>PB8/A20/WAIT/IRQ6/SCK0</td>
<td>DIP switch (SW3)</td>
</tr>
<tr>
<td>24</td>
<td>PB9/A21/IRQ7/ADTRG/POE8</td>
<td>DIP switch (SW3)</td>
</tr>
<tr>
<td>25</td>
<td>PF1/AN1</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>PF7/AN7</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 3.1.7 lists pin assignments of user I/O connector (J7).

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PD20/D20/IRQ4/TIC5WS</td>
<td>Extension connector (J13)</td>
</tr>
<tr>
<td>2</td>
<td>PD21/D21/IRQ5/TIC5VS</td>
<td>Extension connector (J13)</td>
</tr>
<tr>
<td>3</td>
<td>PD22/D22/IRQ6/TIC5US</td>
<td>Extension connector (J13)</td>
</tr>
</tbody>
</table>

Table 3.1.8 lists pin assignments of user I/O connector (J8).

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PF0/AN0</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>PF6/AN6</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>PF5/AN5</td>
<td>-</td>
</tr>
</tbody>
</table>
3.1.6 Extension Connectors (J9-J13)

The M3A-HS86 includes extension connectors to which the I/O pins of the SH7086 are connected. MIL standard connectors can be connected to J9-J13, allowing the user to create extension board or monitor the SH7086 bus signals.

Figure 3.1.8 shows a pin assignment of extension connector.

[Note]: The pin numbers on CPU board are defined based on that extension connectors are mounted on the component side. Thus, the pin assignments on the extension connector side and the CPU board side are different when mounting extension connectors on the solder side.

Figure 3.1.8 Pin Assignment of Extension Connectors (J9-J13)
Table 3.1.9 lists pin assignments of extension connector (J9).

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>PA0/RXD0/CS4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PA1/TXD0/CS5/CE1A</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>PA2/A25/DREQ0/IRQ0/SCK0</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>PA5/A22/DREQ1/IRQ1/SCK1</td>
<td>IRQ switch (SW6)</td>
</tr>
<tr>
<td>9</td>
<td>PA6/CS2/TCLKA</td>
<td>Extension connector (J10)</td>
</tr>
<tr>
<td>10</td>
<td>PA26/A26/IRQ0</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>11</td>
<td>PA27/A27/IRQ1</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>12</td>
<td>PA28/A28/IRQ2</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>13</td>
<td>PA29/A29/IRQ3</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>14</td>
<td>PF10/AN10</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>PF11/AN11</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>PF12/AN12</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>PF13/AN13</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>PF14/AN14</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>PF15/AN15</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>
Table 3.1.10 lists pin assignments of extension connectors.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3.3V</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>3.3V</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>WDTOVF</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>PC25/A25</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>PC24/A24</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>PC23/A23</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>PC22/A22</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>PC21/A21</td>
<td>Flash memory</td>
</tr>
<tr>
<td>9</td>
<td>PC20/A20</td>
<td>Flash memory</td>
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<tr>
<td>10</td>
<td>PC19/A19</td>
<td>Flash memory</td>
</tr>
<tr>
<td>11</td>
<td>PC18/A18</td>
<td>Flash memory</td>
</tr>
<tr>
<td>12</td>
<td>PB1/A17</td>
<td>Flash memory</td>
</tr>
<tr>
<td>13</td>
<td>PB0/A16</td>
<td>Flash memory</td>
</tr>
<tr>
<td>14</td>
<td>PC15/A15</td>
<td>Flash memory</td>
</tr>
<tr>
<td>15</td>
<td>PC14/A14</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>16</td>
<td>PC13/A13</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>17</td>
<td>PC12/A12</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>18</td>
<td>PC11/A11</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>19</td>
<td>PC10/A10</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>22</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>23</td>
<td>PA15/CK (EXCLK)</td>
<td>Extension connector (J12),</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SDRAM¹, Clock buffer</td>
</tr>
<tr>
<td>24</td>
<td>PC9/A9</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>25</td>
<td>PC8/A8</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>26</td>
<td>PC7/A7</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>27</td>
<td>PC6/A6</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>28</td>
<td>PC5/A5</td>
<td>SDRAM¹, Flash memory</td>
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<td>29</td>
<td>PC4/A4</td>
<td>SDRAM¹, Flash memory</td>
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<tr>
<td>30</td>
<td>PC3/A3</td>
<td>SDRAM¹, Flash memory</td>
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<td>31</td>
<td>PC2/A2</td>
<td>SDRAM¹, Flash memory</td>
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<tr>
<td>32</td>
<td>PC1/A1</td>
<td>SDRAM¹, Flash memory</td>
</tr>
<tr>
<td>33</td>
<td>PC0/A0</td>
<td>-</td>
</tr>
<tr>
<td>34</td>
<td>PA10/CS0/POE4</td>
<td>Flash memory</td>
</tr>
<tr>
<td>35</td>
<td>PA11/CS1/POE5</td>
<td>-</td>
</tr>
<tr>
<td>36</td>
<td>PA6/CS2/TCLKA</td>
<td>Extension connector (J9)</td>
</tr>
<tr>
<td>37</td>
<td>PA20/CS4/RASU</td>
<td>-</td>
</tr>
<tr>
<td>38</td>
<td>PA21/CS5/CASU/CE1A/TIC5U</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>39</td>
<td>RES</td>
<td>Reset module, Flash memory</td>
</tr>
<tr>
<td>40</td>
<td>GND</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes *1: M3A-HS86 (3.3V version) only.
*2: Not mounted.
Table 3.1.11 lists pin assignments of extension connectors.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PB2/IRQ0/POE0/SCL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PB3/IRQ1/POE1/SDA</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PA7/CS3/TCLKB</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>PA8/RDWR/IRQ2/TCLKC</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>5</td>
<td>PA12/WRL/DQMLL/POE6</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;, Flash memory&lt;sup&gt;2&lt;/sup&gt;</td>
</tr>
<tr>
<td>6</td>
<td>PA13/WRH/DQMLU/W/E/POE7</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>7</td>
<td>PA22/WRHL/ICIO/ORD/DQML/TIC5V</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>8</td>
<td>PA23/WRHH/ICIOWR/AH/DQMU/TIC5W</td>
<td>User I/O connector (J6)</td>
</tr>
<tr>
<td>9</td>
<td>PA9/FRAME/CKE/IRQ3/TCLKD</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>10</td>
<td>PB4/RASL/IRQ2/POE2</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>11</td>
<td>PB5/CASL/IRQ3/POE3</td>
<td>SDRAM&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>12</td>
<td>PE16/CS8/TIOC3BS</td>
<td>User I/O connector (J6), LED6</td>
</tr>
<tr>
<td>13</td>
<td>PE8/SCK2/TIOC3A/SSCK/TMS</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>14</td>
<td>PE10/TXD2/TIOC3C/SSO/TDI</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>15</td>
<td>PE7/RXD2/B S/TIOC2B/UBCTR/G/SSI</td>
<td>Extension connector (J12), LED4</td>
</tr>
<tr>
<td>16</td>
<td>PA24/CE2A/DREQ3</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>PA25/CE2B/DACK3/POE8</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>PA18/REQ/TEND0</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>PA19/BACK/TEND1</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td></td>
</tr>
</tbody>
</table>

Notes

*1: M3A-HS86 (3.3V version) only.

*2: Not mounted.
Table 3.1.12 lists pin assignments of extension connectors.

### Table 3.1.12 Pin Assignments of Extension Connectors (J12)

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>PE0/DREQ0/TIOC0A/AUDCK</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>7</td>
<td>NC (PE3/TEND1/TIOC0D/AUDATA3 when R68 mounted)</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>8</td>
<td>NC (PE4/IOIS16/TIOC1A/RXD3/AUDATA2 when R69 mounted)</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>9</td>
<td>NC (PE5/CS6/CE1B/TIOC1B/TXD3/AUDATA1 when R70 mounted)</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>10</td>
<td>NC (PE6/CS7/TIOC2A/SCK3/AUDATA0 when R71 mounted)</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>11</td>
<td>PE7/RXD2/BS/TIOC2B/UBCTRGL/SSI</td>
<td>Extension connector (J11), LED4</td>
</tr>
<tr>
<td>12</td>
<td>PE9/TIOC3B/SCK3/RTS3/TRST</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>13</td>
<td>PE11/TIOC3D/RXD3/CTS3/TDO</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>14</td>
<td>PE12/TIOC4A/TXD3/SCS/TCK</td>
<td>H-UDI connector (J1, J2)</td>
</tr>
<tr>
<td>15</td>
<td>PE13/TIOC4B/MRES/AEBR/K/AEBR/K</td>
<td>H-UDI connector (J1, J2), MRES switch²</td>
</tr>
<tr>
<td>16</td>
<td>PE14/WRHH/IC/OWR/AA/DQM/UC/DACK0/TIOC4C</td>
<td>LED5</td>
</tr>
<tr>
<td>17</td>
<td>PE15/CKE/DACK1/TIOC4D/IRQOUT</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>PA15/CK</td>
<td>Extension connector (J12), SDRAM¹, Clock buffer²</td>
</tr>
<tr>
<td>19</td>
<td>PA16/WRHH/IC/OWR/AA/DQM/UC/CKE/DREQ2/AUDSYNC</td>
<td>H-UDI connector (J1)</td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td>-</td>
</tr>
</tbody>
</table>

**Notes**

*¹: M3A-HS86 (3.3V version) only.

*²: Not mounted.
Table 3.1.13 lists pin assignments of the extension connectors.

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5V</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>5V</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>PA17/WAIT/DACK2</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>PD31/D31/TIOC3AS/ADTRG</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>PD30/D30/TIOC3CS/IRQOUT</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>PD29/D29/CS3/TIOC3BS</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>PD28/D28/CS2/TIOC3DS</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>PD27/D27/DACK1/TIOC4AS</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>PD26/D26/DACK0/TIOC4BS</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>PD25/D25/DREQ1/TIOC4CS</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>PD24/D24/DREQ0/TIOC4DS</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>PD23/D23/IRQ7/AUDSYNC</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>PD22/D22/IRQ6/TIC5US/AUDCK</td>
<td>Extension connector (J7)</td>
</tr>
<tr>
<td>14</td>
<td>PD21/D21/IRQ5/TIC5VS</td>
<td>Extension connector (J7)</td>
</tr>
<tr>
<td>15</td>
<td>PD20/D20/IRQ4/TIC5WS</td>
<td>Extension connector (J7)</td>
</tr>
<tr>
<td>16</td>
<td>PD19/D19/IRQ3/POE7/AUDATA3</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>PD18/D18/IRQ2/POE6/AUDATA2</td>
<td>-</td>
</tr>
<tr>
<td>18</td>
<td>PD17/D17/IRQ1/POE5/AUDATA1</td>
<td>-</td>
</tr>
<tr>
<td>19</td>
<td>PD16/D16/IRQ0/POE4/AUDATA0</td>
<td>-</td>
</tr>
<tr>
<td>20</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>21</td>
<td>PE2/DREQ1/TIOC0C</td>
<td>LED3</td>
</tr>
<tr>
<td>22</td>
<td>PE1/TEND0/TIOC0B</td>
<td>LED2</td>
</tr>
<tr>
<td>23</td>
<td>PA14/RD</td>
<td>Flash memory(^2)</td>
</tr>
<tr>
<td>24</td>
<td>PD15/D15/TIOC4DS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>25</td>
<td>PD14/D14/TIOC4CS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>26</td>
<td>PD13/D13/TIOC4BS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>27</td>
<td>PD12/D12/TIOC4AS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>28</td>
<td>PD11/D11/TIOC3DS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>29</td>
<td>PD10/D10/TIOC3CS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>30</td>
<td>PD9/D9/TIOC3BS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>31</td>
<td>PD8/D8/TIOC3AS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>32</td>
<td>PD7/D7/TIC5WS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>33</td>
<td>PD6/D6/TIC5VS</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>34</td>
<td>PD5/D5/TIC5US</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>35</td>
<td>PD4/D4/TIC5W</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>36</td>
<td>PD3/D3/TIC5V</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>37</td>
<td>PD2/D2/TIC5U</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>38</td>
<td>PD1/D1</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>39</td>
<td>PD0/D0</td>
<td>SDRAM(^1), Flash memory(^2)</td>
</tr>
<tr>
<td>40</td>
<td>GND</td>
<td>-</td>
</tr>
</tbody>
</table>

Notes

*1: M3A-HS86 (3.3V Version) only.
*2: Not mounted.
3.1.7 Extension Connector (J14)

Extension connector (J14) connects the pins necessary for writing a on-chip flash memory of SH7086. Figure 3.1.9 lists pin assignments of the extension connectors.

![Top View of the Component Side](image)

Figure 3.1.9 Pin Assignments of the Extension Connector (J14)

Table 3.1.14 lists pin assignments of the extension connector (J14).

<table>
<thead>
<tr>
<th>Pin</th>
<th>Signal Name</th>
<th>Other Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RES</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>FWE</td>
<td>FWE pin select jumper (JP2)</td>
</tr>
<tr>
<td>4</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>MD0</td>
<td>DIP switch for system setting (SW4-3)</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>7</td>
<td>MD1</td>
<td>DIP switch for system setting (SW4-2)</td>
</tr>
<tr>
<td>8</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>NC</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>PA4/A23/TXD1</td>
<td>Serial port connector (J3)</td>
</tr>
<tr>
<td>16</td>
<td>GND</td>
<td>-</td>
</tr>
<tr>
<td>17</td>
<td>PA3/A24/RXD1</td>
<td>Serial port connector (J3)*</td>
</tr>
<tr>
<td>18</td>
<td>VCC</td>
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<tr>
<td>19</td>
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</tr>
<tr>
<td>20</td>
<td>VCC</td>
<td>-</td>
</tr>
</tbody>
</table>

Note *: It is connected to the output pin of RS-232C driver.
The M3A-HS86 includes switches and LEDs as its operational components.

Figure 3.2.1 shows the M3A-HS86 operational component assignment.

Note: * Not mounted

Figure 3.2.1 M3A-HS86 Operational Component Assignment
3.2.1 SH7086 Power Supply Select Jumpers (JP1)

The JP1 allow the sources for the SH7086 power supply voltages to be selected. Figure 3.2.2 shows the SH7086 power supply voltage select jumper assignment (JP1). Table 3.2.1 lists the jumper setting for selecting SH7086 Power Supply Voltage (JP1).

![Top View of the Component Side](image)

Figure 3.2.2 SH7086 Power Supply Voltage Select Jumpers Assignment (JP1)

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Setting</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>1 - 2</td>
<td>5V fixed power supply voltage (supplied from J5)</td>
</tr>
<tr>
<td>PWRSEL</td>
<td>2 - 3</td>
<td>External power supply voltage (supplied from J4)</td>
</tr>
</tbody>
</table>

[Initial Setting]

Note: Do not change jumper settings during the operation of M3A-HS86. Ensure to turn off the power for the M3A-HS86 before changing jumper settings.
3.2.2 FWE Pin Select Jumper (JP2)

The JP2 allows the connection for the FWE pin to be selected. Figure 3.2.3 shows FWE pin select jumper (JP2) assignment. Table 3.2.2 lists jumper setting for selecting FWE pin (JP2).

![JP2 Diagram](image)

Table 3.2.2 Jumper Setting FWE Pin (JP2)

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Setting</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP2</td>
<td>1 - 2</td>
<td>The FWE pin of SH7086 is connected with SW4-1.</td>
</tr>
<tr>
<td>FDMSEL</td>
<td>2 - 3</td>
<td>The FWE pin of SH7086 is connected with J14 connector.</td>
</tr>
</tbody>
</table>

Note: Do not change jumper settings during the operation of M3A-HS86. Ensure to turn off the power for the M3A-HS86 before changing jumper settings.
3.2.3 Switch and LED Functions

The M3A-HS86 includes six switches and nine LEDs. The MRES switch can be mounted as the option. However, MRES pin is multiplexed with ASEBRK/ASEBRK pin, so do not mount the switch MRES when H-UDI connectors (J1, J2) are used. Figure3.2.4 shows the switch and LED pin layout on M3A-HS86 board. Table3.2.3 lists switches mounted on M3A-HS86.

![Top View of the Component Side >](image)

**Figure3.2.4** Switch and LED Pin Assignment on M3A-HS86 Board

**Table3.2.3** Switches Mounted on M3A-HS86

<table>
<thead>
<tr>
<th>No.</th>
<th>Function</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW1</td>
<td>System power on/off switch</td>
<td>-</td>
</tr>
<tr>
<td>SW2</td>
<td>System reset input switch</td>
<td>See section 2.8 for details.</td>
</tr>
<tr>
<td>SW3</td>
<td>DIP switch open to the user (4-pole)</td>
<td>PB6, PB7, PB8 and PB9 are pulled up. See section 2.5 on chapter 2 for details.</td>
</tr>
<tr>
<td></td>
<td>SW3-1 OFF : PB6=H, ON : PB6=L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SW3-2 OFF : PB7=H, ON : PB7=L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SW3-3 OFF : PB8=H, ON : PB8=L</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SW3-4 OFF : PB9=H, ON : PB9=L</td>
<td></td>
</tr>
<tr>
<td>SW4</td>
<td>System setup DIP switch (4-pole)</td>
<td>See Table3.2.4 for the functions</td>
</tr>
<tr>
<td>SW5</td>
<td>NMI input switch</td>
<td>See section 2.9 of chapter 2 for details.</td>
</tr>
<tr>
<td>SW6</td>
<td>IRQ1 input switch</td>
<td>See section 2.9 of chapter 2 for details.</td>
</tr>
<tr>
<td>SW7</td>
<td>MRES input switch</td>
<td>Not mounted.</td>
</tr>
</tbody>
</table>

*: By MRES (manual reset), each register of the on-chip peripheral module is not initialized though an internal state of CPU is initialized.
Table 3.2.4 lists functions of switch SW4. SH7086 operating mode is determined by the combination of the MD0, MD1 and FWE pins. Table 3.2.5 lists the selection of SH7086 operating modes.

### Table 3.2.4 Functions of Switch SW4

<table>
<thead>
<tr>
<th>No.</th>
<th>Setting</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW4-1 FWE</td>
<td>OFF</td>
<td>FWE=H (Releasing the writing/erasing protects of on-chip flash memory)</td>
</tr>
<tr>
<td>ON</td>
<td>FWE=L (Setting the writing erasing protects of on-chip flash memory)</td>
<td></td>
</tr>
<tr>
<td>SW4-2 MD1</td>
<td>OFF</td>
<td>MD1 pin state &quot;H&quot;</td>
</tr>
<tr>
<td>ON</td>
<td>MD1 pin state &quot;L&quot;</td>
<td></td>
</tr>
<tr>
<td>SW4-3 MD0</td>
<td>OFF</td>
<td>MD0 pin state &quot;H&quot;</td>
</tr>
<tr>
<td>ON</td>
<td>MD0 pin state &quot;L&quot;</td>
<td></td>
</tr>
<tr>
<td>SW4-4 FLASH Lock</td>
<td>OFF</td>
<td>Releasing the write protect in the on-chip flash memory (WP#pin is &quot;H&quot;)</td>
</tr>
<tr>
<td>ON</td>
<td>Setting the write protect in the on-chip flash memory (WP#pin is &quot;L&quot;)</td>
<td></td>
</tr>
</tbody>
</table>

**MCU operating mode setting** *(See Table 3.2.5)*

**Initial Setting**

### Table 3.2.5 Selection of SH7086 Operating Mode

<table>
<thead>
<tr>
<th>SW4-1 (FWE)</th>
<th>SW4-2 (MD1)</th>
<th>SW4-3 (MD0)</th>
<th>SH7086 Operating Mode</th>
<th>Mode Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON</td>
<td>ON</td>
<td>ON</td>
<td>Mode0</td>
<td>MCU extension mode0 (On-chip ROM not active, CSO space:16bit bus)</td>
</tr>
<tr>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
<td>Mode1</td>
<td>MCU extension mode1 (On-chip ROM not active, CSO space:32bit bus)</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
<td>Mode2</td>
<td>MCU extension mode2 (On-chip ROM active)</td>
</tr>
<tr>
<td>ON</td>
<td>OFF</td>
<td>OFF</td>
<td>Mode3</td>
<td>Single chip mode (On-chip ROM active)</td>
</tr>
<tr>
<td>OFF</td>
<td>ON</td>
<td>OFF</td>
<td>Mode4</td>
<td>Boot mode (On-chip ROM active)</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
<td>Mode5</td>
<td>User boot mode (On-chip ROM active)</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>Mode6</td>
<td>User programming mode (On-chip ROM active)</td>
</tr>
<tr>
<td>OFF</td>
<td>OFF</td>
<td>OFF</td>
<td>Mode7</td>
<td>User programming mode (On-chip ROM active)</td>
</tr>
</tbody>
</table>

**Initial Setting**

Table 3.2.6 lists functions of LEDs mounted in M3A-HS86.

### Table 3.2.6 Functions of LEDs mounted in M3A-HS86

<table>
<thead>
<tr>
<th>No.</th>
<th>Color</th>
<th>Functions/Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>LED1</td>
<td>Blue</td>
<td>Power-on LED (LED1 lights when power is supplied)</td>
</tr>
<tr>
<td>LED2</td>
<td>Green</td>
<td>Open to user (LED2 lights when PE1 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED3</td>
<td>Green</td>
<td>Open to user (LED3 lights when PE2 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED4</td>
<td>Green</td>
<td>Open to user (LED4 lights when PE7 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED5</td>
<td>Green</td>
<td>Open to user (LED5 lights when PE14 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED6</td>
<td>Green</td>
<td>Open to user (LED6 lights when PE16 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED7</td>
<td>Green</td>
<td>Open to user (LED7 lights when PE17 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED8</td>
<td>Green</td>
<td>Open to user (LED8 lights when PE18 outputs &quot;L&quot;)</td>
</tr>
<tr>
<td>LED9</td>
<td>Red</td>
<td>Interrupt confirmation (LED9 lights red when pushing NMI switch (SW5)).</td>
</tr>
<tr>
<td></td>
<td>Yellow green</td>
<td>Interrupt confirmation (LED9 lights yellow green when pushing IRQ1 switch (SW6)).</td>
</tr>
</tbody>
</table>
3.3 Board Dimensions of M3A-HS86

Figure 3.3.1 shows board dimensions of M3A-HS86.
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SH7086 CPU BOARD M3A-HS86 SCHEMATICS

Note:
5VCC = 5V
3VCC = 3.3V
VCC = 3.3V(M3A-HS86G50,M3A-HS86G51)
5V(M3A-HS86G55,M3A-HS86G56)
R = Fixed Resistors
RA = Resistor Array
C = Ceramic Caps
CE = Tantalum Electrolytic Caps
CP = Decoupling Caps

[Note]: not mounted
Flash CSC channel 0
16bit access = 4MB

Decoupling Caps

[Note]
M3A-HS86G50,M3A-HS86G51 (3.3V Version): U3,R12,R13 not mounted
M3A-HS86G55,M3A-HS86G56 (5V Version): U3,R11,R12,R13,CP18 not mounted
M3A-HS86G56, M3A-HS86G56 (5V Version): U4, R14-R22, RA7, RA8, CP19-CP22 not mounted
TEST PIN

AGND-GND

R77 0Ω
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SH7086 CPU Board
M3A-HS86
User’s Manual