

# □ MN102H730F , MN102H73G , MN102H73K

|   |  |                                   |                               |
|---|--|-----------------------------------|-------------------------------|
| <b>Type</b>                               | MN102H730F   | MN102H73G (under development)     | MN102H73K (under development) |
| <b>ROM (x8-bit)</b>                       | External   | 128 K                             | 256 K                         |
| <b>RAM (x8-bit)</b>                       | 10 K   | 10 K                              | 12 K                          |
| <b>Package</b>                            | TQFP128-P-1414B *Lead-free   | TQFP128-P-1414A *Lead-free        |                               |
| <b>Minimum Instruction Execution Time</b> | With main clock operated   | 58 ns (at 3.0 V to 3.6 V, 34 MHz) |                               |
| <b>Interrupts</b>                         | <ul style="list-style-type: none"> <li>• RST pin • Watchdog • NMI pin • Timer counter 0 to 9 underflow • Timer counter 10 to 14 underflow</li> <li>• Timer counter 10 to 14 compare capture A • Timer counter 10 to 14 compare capture B</li> <li>• ATC ch.0 to 1 transfer finish • ETC ch.0 to 1 transfer finish</li> <li>• External 0 to 7 • Serial ch.0 to 4 transmission • Serial ch.0 to 4 reception • A/D conversion finish</li> </ul>   |                                   |                               |
| <b>Timer Counter</b>                      | <p>Timer counter 0 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM0IO pin; system clock (BOSC)</p> <p>Interrupt source ..... underflow of timer counter 0</p> <p>Timer counter 1 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM1IO pin; timer counter 0 output</p> <p>Interrupt source ..... underflow of timer counter 1</p> <p>Timer counter 2 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM2IO pin; timer counter 1 output</p> <p>Interrupt source ..... underflow of timer counter 2</p> <p>Timer counter 3 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM3IO pin; timer counter 2 output</p> <p>Interrupt source ..... underflow of timer counter 3</p> <p>Timer counter 4 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM4IO pin; system clock (BOSC)</p> <p>Interrupt source ..... underflow of timer counter 4</p> <p>Timer counter 5 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM5IO pin; timer counter 4 output</p> <p>Interrupt source ..... underflow of timer counter 5</p> <p>Timer counter 6 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM6IO pin; timer counter 5 output</p> <p>Interrupt source ..... underflow of timer counter 6</p> <p>Timer counter 7 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM7IO pin; timer counter 6 output</p> <p>Interrupt source ..... underflow of timer counter 7</p> <p>Timer counter 8 : 8-bit × 1</p> <p>Clock source ..... 1/2 of system clock (BOSC) frequency; system clock (BOSC); 1/4 of system clock (XI) frequency; TM8IO pin</p> <p>Interrupt source ..... underflow of timer counter 8</p> |                                   |                               |

|   |   |
|---|---|
| <b>Timer Counter (Continue)</b>   | Timer counter 9 : 8-bit × 1   |
|   | Clock source ..... 1/2 of system clock (BOSC) frequency; 1/64 of system clock (BOSC) frequency; TM9IO pin; timer counter 8 output                           |
|   | Interrupt source ..... underflow of timer counter 9   |
|   | Timer counter 10 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)   |
|   | Clock source ..... underflow of timer counter 8, 9; TM10IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM10IOA pin/TM10IOB pin (1 ×, 4 ×) |
|   | Interrupt source ..... underflow of timer counter 10; timer counter 10 compare capture A; timer counter 10 compare capture B                                |
|   | Timer counter 11 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)   |
|   | Clock source ..... underflow of timer counter 8, 9; TM11IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM11IOA pin/TM11IOB pin (1 ×, 4 ×) |
|   | Interrupt source ..... underflow of timer counter 11; timer counter 11 compare capture A; timer counter 11 compare capture B                                |
|   | Timer counter 12 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)   |
|   | Clock source ..... underflow of timer counter 8, 9; TM12IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM12IOA pin/TM12IOB pin (1 ×, 4 ×) |
|   | Interrupt source ..... underflow of timer counter 12; timer counter 12 compare capture A; timer counter 12 compare capture B                                |
|   | Timer counter 13 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)   |
|   | Clock source ..... underflow of timer counter 8, 9; TM13IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM13IOA pin/TM13IOB pin (1 ×, 4 ×) |
| Interrupt source ..... underflow of timer counter 13; timer counter 13 compare capture A; timer counter 13 compare capture B                                |   |
| Timer counter 14 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)   |   |
| Clock source ..... underflow of timer counter 8, 9; TM14IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM14IOA pin/TM14IOB pin (1 ×, 4 ×) |   |
| Interrupt source ..... underflow of timer counter 14; timer counter 14 compare capture A; timer counter 14 compare capture B                                |   |

|                         |  |
|-------------------------|--|
| <b>Serial Interface</b> | Serial 0, 1 : 8-bit × 1 (transfer direction of MSB / LSB selectable, transmission / reception of 7, 8-bit length)            |
|                         | Clock source ..... 1/8 of timer counter 6 underflow frequency; 1/8, 1/2 of timer counter 0 underflow frequency; external pin |
|                         | Serial 2, 3 : 8-bit × 1 (transfer direction of MSB / LSB selectable, transmission / reception of 7, 8-bit length)            |
|                         | Clock source ..... 1/8 of timer counter 2 underflow frequency; 1/8, 1/2 of timer counter 4 underflow frequency; external pin |
|                         | UART × 4 (common use with serial 0 to 3)   |
|                         | I <sup>2</sup> C × 2 (common use with serial 1,3; single master)   |

|                                |  |  |
|--------------------------------|--|--|
| <b>Multiply-and-Accumulate</b> | 16-bit sign × 16-bit sign + 40-bit sign  |  |
| <b>I/O Pins</b>                | I/O  | 104<br><ul style="list-style-type: none"> <li>• Common use : 59 (use of full address, address data separate 16-bit mode)</li> <li>• Common use : 76 (use of address 16-bit, address data separate 8-bit mode)</li> </ul> |
| <b>A/D Inputs</b>              | 10-bit × 12-ch. (with S/H)   |  |
| <b>D/A Outputs</b>             | 8-bit × 4-ch.  |  |
| <b>PWM</b>                     | 16-bit × 5-ch. (timer counter 10 to 14)  |  |
| <b>ICR</b>                     | 16-bit × 5-ch. (timer counter 10 to 14)  |  |
| <b>OCR</b>                     | 16-bit × 5-ch. (timer counter 10 to 14)  |  |
| <b>Notes</b>                   | Address / data separate bus interface; 8 / 16-bit bus width selectable; SRAM interface |  |

See the next page for electrical characteristics, pin assignment and support tool.

## Electrical Characteristics

### Supply current

| Parameter                | Symbol | Condition  | Limit |     |                  | Unit    |
|--------------------------|--------|--|-------|-----|------------------|---------|
|                          |        |  | min   | typ | max              |         |
| Operating supply current | IDDopr | VI = VDD or VSS, output open<br>f = 34 MHz, VDD = 3.3 V                                  |       |     | 60+10 $\alpha$ * | mA      |
| Supply current at STOP   | IDDS   | Pin with pull-up resistor is open<br>all other input pins and Hi-Z state input/output    |       |     | 70               | $\mu$ A |
| Supply current at HALT   | IDDH   | pins are simultaneously applied VDD or VSS level<br>f = 34 MHz, VDD = 3.3 V, output open |       |     | 30+10 $\alpha$ * | mA      |

(Ta = -40°C to +85°C, VDD = AVDD = 3.3 V, VSS = AVSS = 0 V)

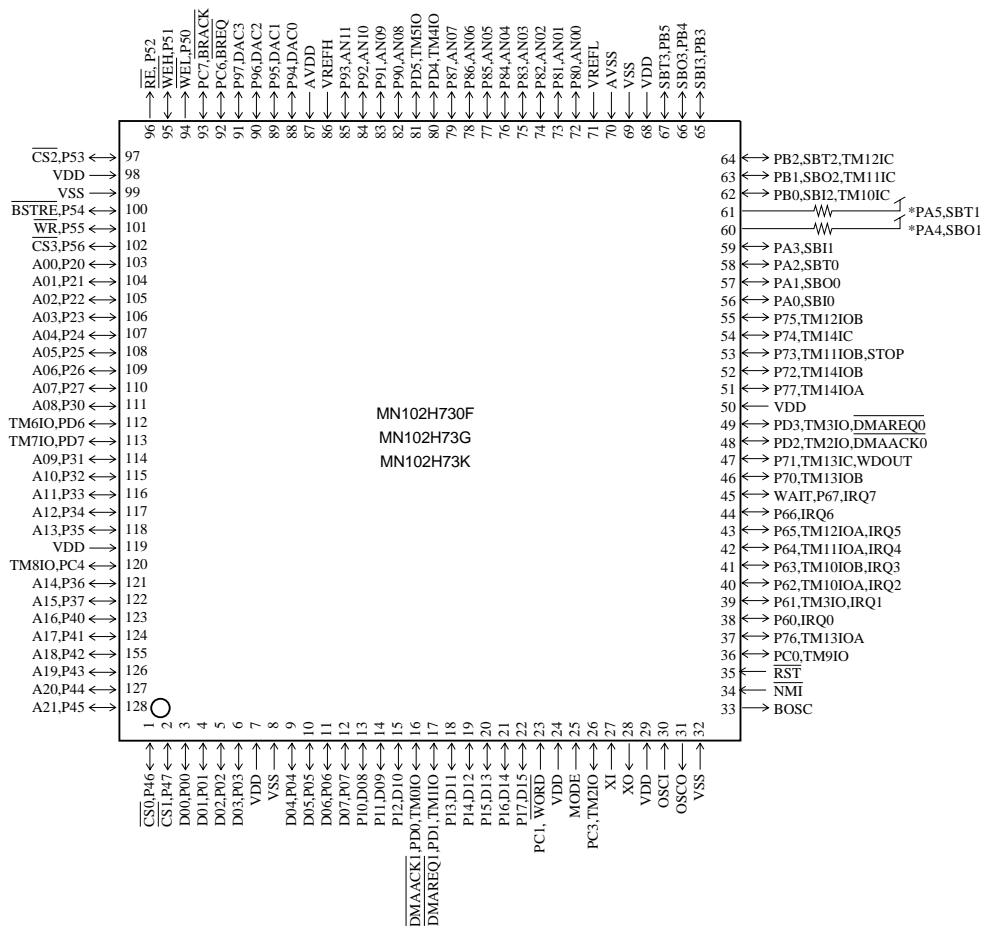
\* " $\alpha$ " depends on products .

MN102H73G/73K/730F  $\alpha = 0$

MN102HF73G  $\alpha = 1$

MN102HF73K  $\alpha = 2$

Pin Assignment



TQFP128-P-1414A \*Lead-free

TQFP128-P-1414B \*Lead-free

\* Use 4.7 kΩ to 10 kΩ.

Support Tool

|                            |                                    |                                   |
|----------------------------|------------------------------------|-----------------------------------|
| In-circuit Emulator        | PX-ICE102H73-128P1414              |                                   |
| Flash Memory Built-in Type | Type                               | MN102HF73G, MN102HF73K            |
|                            | ROM (× 8-bit)                      | 128 K / 256 K                     |
|                            | RAM (× 8-bit)                      | 10 K / 12 K                       |
|                            | Minimum instruction execution time | 58 ns (at 3.0 V to 3.6 V, 34 MHz) |
|                            | Package                            | TQFP128-P-1414B *Lead-free        |

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