

# MN102H60G / HF60G

<b>Type</b>	<b>MN102H60G (under development) / HF60G (under development)</b>	
<b>ROM (×8-Bit)</b>	128 K / 128 K (Flash)	
<b>RAM (×8-Bit)</b>	4 K / 4 K	
<b>Minimum Instruction Execution Time</b>	With Main Clock operated	<b>58 ns (at 3.0 V to 3.6 V, 34 MHz)</b>
<b>Interrupts</b>	<ul style="list-style-type: none"> <li>• <math>\overline{\text{RST}}</math> Pin • Watchdog • NMI Pin • Timer Counter 0 to 7 Underflow • Timer Counter 8 to 12 Underflow</li> <li>• Timer Counter 8 to 12 Compare Capture A • Timer Counter 8 to 12 Compare Capture B</li> <li>• ATC ch 0 to 3 Transfer finish • ETC ch 0 to 1 Transfer finish</li> <li>• External 0 to 4 • Serial ch 0 to 4 Transmission • Serial ch 0 to 4 Reception • <math>\overline{\text{KI}}</math> Pin (OR)</li> <li>• A/D Conversion finish</li> </ul>	
<b>Timer Counter</b>	<p><b>Timer Counter 0 : 8-Bit × 1</b> (Prescaler, Timer Output, Event Count, Clock Supply for 16-Bit Timer, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), 1/4 of System Clock (XI), System Clock (BOSC), TM0IO Pin  Interrupt Source                Underflow of Timer Counter 0</p> <p><b>Timer Counter 1 : 8-Bit × 1</b> (Serial Clock Generator, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), Underflow of Timer Counter 0, 4  Interrupt Source                Underflow of Timer Counter 1</p> <p><b>Timer Counter 2 : 8-Bit × 1</b> (Serial Clock Generator, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), Underflow of Timer Counter 0, 4  Interrupt Source                Underflow of Timer Counter 2</p> <p><b>Timer Counter 3 : 8-Bit × 1</b> (A/D Conversion Start up, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), Underflow of Timer Counter 0, 4  Interrupt Source                Underflow of Timer Counter 3</p> <p><b>Timer Counter 4 : 8-Bit × 1</b> (Serial Clock Generator, Timer Output, Event Count, Clock Supply for 16-Bit Timer, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), Underflow of Timer Counter 0, TM4IO Pin  Interrupt Source                Underflow of Timer Counter 4</p> <p><b>Timer Counter 5 : 8-Bit × 1</b> (Serial Clock Generator, Timer Interrupts)  Clock Source                    1/2 of System Clock (BOSC), Underflow of Timer Counter 0, System Clock (BOSC)  Interrupt Source                Underflow of Timer Counter 5</p> <p><b>Timer Counter 6 : 8-Bit × 1</b> (Timer Interrupts)  Clock Source                    1/4 of System Clock (XI), Underflow of Timer Counter 0, 4  Interrupt Source                Underflow of Timer Counter 6</p> <p><b>Timer Counter 7 : 8-Bit × 1</b> (Timer Output, Event Count, Timer Interrupts)  Clock Source                    1/4 of System Clock (XI), Underflow of Timer Counter 0, TM7IO Pin  Interrupt Source                Underflow of Timer Counter 7</p> <p style="text-align: center;"><span style="border: 1px solid black; border-radius: 5px; padding: 2px;">Connectable</span>      Timer Counter 0 to 7</p> <p><b>Timer Counter 8 : 16-Bit × 1</b> (Timer Output, Event Count, Input Capture, PWM Output, 2-Phase Encoder Input)  Clock Source                    Underflow of Timer Counter 0, 4, TM8IB Pin, 1/2 of System Clock (BOSC), TM8IA Pin, 2-Phase Encode of TM8IB Pin (1×, 4×)  Interrupt Source                Underflow of Timer Counter 8, Timer Counter 8 Compare Capture A, Timer Counter 8 Compare Capture B</p> <p><b>Timer Counter 9 : 16-Bit × 1</b> (Timer Output, Event Count, Input Capture, PWM Output, 2-Phase Encoder Input)  Clock Source                    Underflow of Timer Counter 0, 4, TM9IB Pin, 1/2 of System Clock (BOSC), TM9IA Pin, 2-Phase Encode of TM9IB Pin (1×, 4×), TM9IC Pin  Interrupt Source                Underflow of Timer Counter 9, Timer Counter 9 Compare Capture A, Timer Counter 9 Compare Capture B</p> <p><b>Timer Counter 10 : 16-Bit × 1</b> (Timer Output, Event Count, Input Capture, PWM Output, 2-Phase Encoder Input)  Clock Source                    Underflow of Timer Counter 0, 4, TM10IB Pin, 1/2 of System Clock (BOSC), TM10IA Pin, 2-Phase Encode of TM10IB Pin (1×, 4×)  Interrupt Source                Underflow of Timer Counter 10, Timer Counter 10 Compare Capture A, Timer Counter 10 Compare Capture B</p>	

<b>Timer Counter (Continue)</b>	<b>Timer Counter 11 : 16-Bit × 1</b> (Timer Output, Event Count, Input Capture, PWM Output, 2-Phase Encoder Input)
	Clock Source . . . . . Underflow of Timer Counter 0, 4, TM111B Pin, 1/2 of System Clock (BOSC), TM111A Pin, 2-Phase Encode of TM111B Pin (1×, 4×)
	Interrupt Source . . . . . Underflow of Timer Counter 11, Timer Counter 11 Compare Capture A, Timer Counter 11 Compare Capture B
	<b>Timer Counter 12 : 16-Bit × 1</b> (Timer Output, Event Count, Input Capture, PWM Output, 2-Phase Encoder Input)
Clock Source . . . . . Underflow of Timer Counter 0, 4, 1/2 of System Clock (BOSC), TM121A Pin, 2-Phase Encode of TM121B Pin (1×, 4×), TM121C Pin	
Interrupt Source . . . . . Underflow of Timer Counter 12, Timer Counter 12 Compare Capture A, Timer Counter 12 Compare Capture B	
<b>Timer Counter 13, 14 : 8-Bit × 2</b> (Simple PWM Output)	
Clock Source . . . . . 1/2 of System Clock (BOSC), Underflow of Timer Counter 0	
<b>Timer Counter 15 : 16-Bit × 1</b> (Pulse Width Measurement)	
Clock Source . . . . . System Clock (BOSC), 1/2 of System Clock (BOSC), Underflow of Timer Counter 0, TM151B Pin	
<span style="border: 1px solid black; border-radius: 5px; padding: 2px;">Connectable</span> . . . . . Timer Counter 13, 14	

<b>Serial Interface</b>	<b>Serial 0, 1 : 8-Bit × 1</b> (Transfer direction of MSB / LSB selectable, Transmission / Reception of 7, 8-Bit length)
	Clock Source . . . . . 1/8 of Timer Counter 1 Underflow, 1/8, 1/2 of Timer Counter 2 Underflow, External Pin
	<b>Serial 2, 3 : 8-Bit × 1</b> (Transfer direction of MSB / LSB selectable, Transmission / Reception of 7, 8-Bit length)
	Clock Source . . . . . 1/8 of Timer Counter 4 Underflow, 1/8, 1/2 of Timer Counter 5 Underflow, External Pin
<b>Serial 4 : 8-Bit × 1</b> (Transfer direction of MSB / LSB selectable, Transmission / Reception of 7, 8-Bit length)	
Clock Source . . . . . 1/8 of Timer Counter 1 Underflow, 1/8, 1/2 of Timer Counter 5 Underflow, External Pin	
<b>UART × 2</b> (Common use with Serial 3, 4)	
<b>I<sup>2</sup>C × 2</b> (Common use with Serial 3,4, Single Master)	

<b>I/O Pins</b>	<b>I/O</b>	<b>82</b>	• Common use : 46 (Address Data Separate 8-Bit Mode) • Common use : 53 (Address Data Multiplex 8-Bit Mode)
<b>A/D</b>			10-Bit × 8ch (with S/H)
<b>PWM</b>			16-Bit × 5ch (Timer Counter 8 to 12)
<b>ICR</b>			16-Bit × 5ch (Timer Counter 8 to 12)
<b>OCR</b>			16-Bit × 5ch (Timer Counter 8 to 12)
<b>Notes</b>			Address / Data Multiplex Bus Interface, Address / Data Separate Bus Interface, 8-Bit / 16-Bit Bus Width selectable, DRAM Refresh Controller built-in
<b>Package</b>			LQFP100-P-1414

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

## Electrical Characteristics

### A/D Characteristics

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Non-linear Error		10-Bit			±4	LSB
A/D Conversion Time		at 34 MHz	3.73			μs
Analog Input Voltage	VIA		VSS		VDD	V

(Ta = 25 °C, VDD = AVDD = 3.3 V, VSS = AVSS = 0 V)

### Supply Current

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Operating Supply Current	IDDOpr	VI = VDD or VSS, Output release f = 34 MHz, VDD = 3.3 V			50	mA
Supply Current at STOP	IDDS	Pin with pull-up resistor is open All other input pins and Hi-Z state input/output pins are simultaneously applied VDD or VSS level			70	μA
Supply Current at HALT	IDDH	f = 34 MHz, VDD = 3.3 V Output release			25	mA

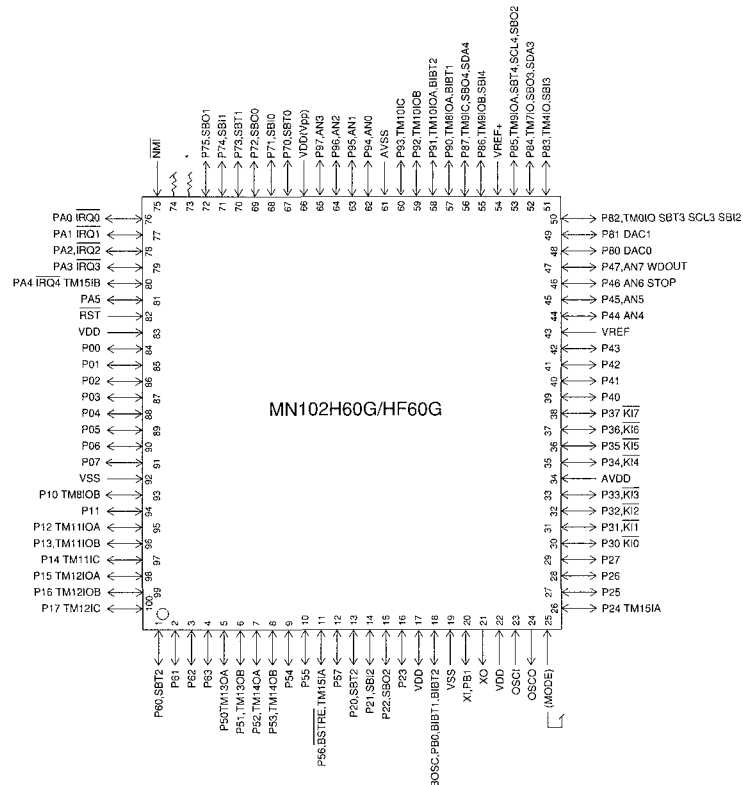
(Ta = -40 °C to + 85 °C, VDD = AVDD = 3.3 V, VSS = AVSS = 0 V)

## Support Tool

### In Circuit Emulator

PX-ICE102H60G

### Pin Assignment



LQFP100-P-1414

\* Use 33 kΩ to 50 kΩ.