❑ MN102H60G , MN102H60K , MN102H60M , MN102H60R

Type	MN102H60G	MN102H60K	MN102H60M [ES (Engineering Sample) available]	MN102H60R (under development)
ROM (×8-bit)	128 K	256 K	384 K	1024 K
RAM (×8-bit)	4 K	10 K	10 K	4 K
Package	LQFP100-P-1414 *Pb free			
Minimum Instruction Execution Time	With main clock operated	58 ns (at 3.0 V to 3.6 V, 34 MHz)		
Interrupts	• $\overline{\text{RST}}$ pin • Watchdog • $\overline{\text{NMI}}$ pin • Timer counter 0 to 7 underflow • Timer counter 8 to 12 underflow • Timer counter 8 to 12 compare capture A • Timer counter 8 to 12 compare capture B • ATC ch.0 to 3 transfer finish • ETC ch.0 to 1 transfer finish • External 0 to 4 • Serial ch.0 to 4 transmission • Serial ch.0 to 4 reception • $\overline{\text{KI}}$ pin (OR) • A/D conversion finish			

Timer Counter

Timer counter 0 : 8-bit × 1 (prescaler, timer output, event count, clock supply for 16-bit timer, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; 1/4 of system clock (XI) frequency; system clock (BOSC); TM0IO pin
- Interrupt source ····· underflow of timer counter 0

Timer counter 1 : 8-bit × 1 (serial clock generator, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0, 4
- Interrupt source ····· underflow of timer counter 1

Timer counter 2 : 8-bit × 1 (serial clock generator, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0, 4
- Interrupt source ····· underflow of timer counter 2

Timer counter 3 : 8-bit × 1 (A/D conversion start up, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0, 4
- Interrupt source ····· underflow of timer counter 3

Timer counter 4 : 8-bit × 1
(prescaler, serial clock generator, timer output, event count, clock supply for 16-bit timer, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0; TM4IO pin
- Interrupt source ····· underflow of timer counter 4

Timer counter 5 : 8-bit × 1 (serial clock generator, timer interrupts)
- Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0; system clock (BOSC)
- Interrupt source ····· underflow of timer counter 5

Timer counter 6 : 8-bit × 1 (timer interrupts)
- Clock source ····· 1/4 of system clock (XI) frequency; underflow of timer counter 0, 4
- Interrupt source ····· underflow of timer counter 6

Timer counter 7 : 8-bit × 1 (timer output, event count, timer interrupts)
- Clock source ····· 1/4 of system clock (XI) frequency; underflow of timer counter 0; TM7IO pin
- Interrupt source ····· underflow of timer counter 7

(Connectable) timer counter 0 to 7

Timer counter 8 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)
- Clock source ····· underflow of timer counter 0, 4; TM8IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM8IOA pin/TM8IOB pin (1 ×, 4 ×); TM8IC pin
- Interrupt source ····· underflow of timer counter 8; timer counter 8 compare capture A; timer counter 8 compare capture B

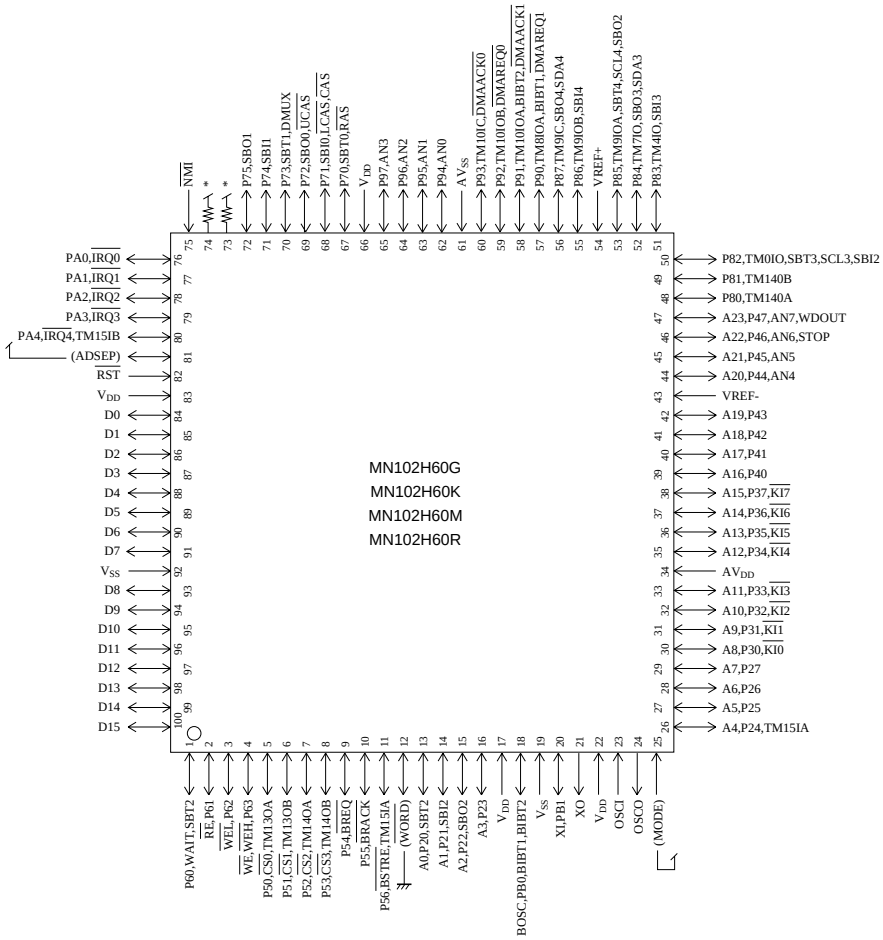
Timer Counter (Continue)	Timer counter 9 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input) Clock source ····· underflow of timer counter 0, 4; TM9IOB pin; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM9IOA pin/TM9IOB pin (1 ×, 4 ×) Interrupt source ····· underflow of timer counter 9; timer counter 9 compare capture A; timer counter 9 compare capture B Timer counter 10 : 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input) Clock source ····· underflow of timer counter 0, 4; 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 0, 4; 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 0, 4; 1/2 of system clock (BOSC) frequency; 2-phase encode of TM12IOA pin/TM12IOB pin (1 ×, 4 ×), TM12IOB pin Interrupt source ····· underflow of timer counter 12; timer counter 12 compare capture A; timer counter 12 compare capture B Timer counter 13, 14 : 8-bit × 1 (simple PWM output) Clock source ····· 1/2 of system clock (BOSC) frequency; underflow of timer counter 0 Timer counter 15 : 16-bit × 1 (pulse width measurement) Clock source ····· system clock (BOSC); 1/2 of system clock (BOSC) frequency; underflow of timer counter 0; TM15IB pin (Connectable) timer counter 13, 14
Serial Interface	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 1 underflow frequency; 1/8, 1/2 of timer counter 2 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 4 underflow frequency; 1/8, 1/2 of timer counter 5 underflow frequency; external pin Serial 4 : 8-bit × 1 (transfer direction of MSB / LSB selectable, transmission / reception of 7, 8-bit length) Clock source ····· 1/8 of timer counter 1 underflow frequency; 1/8, 1/2 of timer counter 5 underflow frequency; external pin UART × 2 (common use with serial 3, 4) I^2C × 2 (common use with serial 3,4; single master)

I/O Pins	**I/O**	82	• Common use : 46 (address data separate 8-bit mode) • Common use : 53 (address data multiplex 8-bit mode)

A/D Inputs	10-bit × 8-ch. (with S/H)
PWM	16-bit × 5-ch. (timer counter 8 to 12)
ICR	16-bit × 5-ch. (timer counter 8 to 12)
OCR	16-bit × 5-ch. (timer counter 8 to 12)
Notes	Address / data multiplex bus interface, address / data separate bus interface, 8-bit / 16-bit bus width selectable

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

Pin Assignment



LQFP100-P-1414 *Pb free

* Use 33 kΩ to 50 kΩ.

* Pin position in 16-bit bus width address data split memory extension mode.

Support Tool

In-circuit Emulator	PX-ICE102H60-LQFP100-P-1414	Not applicable to MN102H60R. Use in the same way as mentioned in Note) of a flash memory built-in version.
Flash Memory Built-in Type	Type	MN102HF60G, MN102HF60K, MN102HF60M (under development)
	ROM (× 8-bit)	128 K / 256 K / 384 K
	RAM (× 8-bit)	4 K / 10 K / 10 K
	Minimum instruction execution time	58 ns (at 3.0 V to 3.6 V, 34 MHz)
	Package	LQFP100-P-1414 *Pb free

Note: This system does not support the MN102H60R flash memory built-in type; instead, use the MN102HF60G + external flash.

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	3.29			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 open f = 34 MHz , VDD = 3.3 V			60+10α*	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 f = 34 MHz , VDD = 3.3 V, output open			70	µA
Supply current at HALT	IDDH				30+10α*	mA

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

* "α" depends on products.

MN102H60G, MN102H60K, MN102H60M, MN102H60R : α = 0

MN102HF60G : α = 1

MN102HF60K : α = 2

MN102HF60M : α = 3

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