☐ MN102H74G

Type	MN102H74G (under development)
■ **ROM (×8-bit)**	128 K
■ **RAM (×8-bit)**	4 K
■ **Package**	LQFP100-P-1414 *Pb free
■ **Minimum Instruction Execution Time**	With Main Clock operated 83.3 ns (at 3.0 V to 3.6 V, 12 MHz)

■ **Interrupts**

• $\overline{\text{RST}}$ pin • Watchdog • $\overline{\text{NMI}}$ pin • Timer counter 0 to 9 underflow • Timer counter 10 to 13 under/overflow
• Timer counter 10 to 13 compare capture A • Timer counter 10 to 13 compare capture B
• ATC ch 0 to 3 transfer finish • External 0 to 5 • Serial ch 0 to 3 transmission • Serial ch 0 to 3 reception
• A/D conversion finish • USB general-purpose • USBSOF • USB end points 1 to 8

■ **USB Functions**

Conforms to USB1.1.
USB transceiver built-in
Full-speed (12 Mbps) supported.
9 end points (FIFO built-in independently)
FIFO size
  (EP0, 1, 2, 3, 4, 5, 6, 7, 8): 64, 128, 128, 128, 128, 128, 128, 128, 128 bytes
• EP0
  Control transfer
  IN/OUT (two ways)
• EP1 to EP8
  Interrupt/Bulk/Isochronous transfer supported.
  Settable to IN or OUT.
  Double Buffering function supported.
    When the MAXP size is set to a half or less of the MAXFIFO size for each EP, the Double Buffering function is
    made valid automatically.

■ **Timer Counter**

Timer counter 0: 8-bit × 1 (timer output, event count, timer interrupt)
        Clock source ···················· SYSCLK; XI; prescaler 0; TM0IO pin
        Interrupt source ··············· Timer counter 0 underflow

Timer counter 1: 8-bit × 1 (timer output, event count, timer interrupt)
        Clock source ···················· SYSCLK; prescaler 0; TM0IO pin
        Interrupt source ··············· Timer counter 1 underflow

(Connectable)   Timer counters 0 to 1

Timer counter 2: 8-bit × 1 (timer output, event count, timer interrupt, A/D conversion start)
        Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 3 underflow;
                                   timer counter 4 underflow; TM2IO pin
        Interrupt source ··············· Timer counter 2 underflow

Timer counter 3: 8-bit × 1 (timer output, event count, timer interrupt)
        Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 2 underflow;
                                   timer counter 4 underflow; TM3IO pin
        Interrupt source ··············· Timer counter 3 underflow

Timer counter 4: 8-bit × 1 (timer output, event count, timer interrupt)
        Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 2 underflow;
                                   timer counter 3 underflow; TM4IO pin
        Interrupt source ··············· Timer counter 4 underflow

■ **Timer Counter (Continue)**	Timer counter 5: 8-bit × 1 (timer output, event count, timer interrupt)

Timer counter 5: 8-bit × 1 (timer output, event count, timer interrupt)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 2 underflow;
                                          timer counter 3 underflow; timer counter 4 underflow; TM5IO pin
    Interrupt source ················ Timer counter 5 underflow

(Connectable)   Timer counters 2 to 5

Timer counter 6: 8-bit × 1 (timer output, event count, timer interrupt, serial clock generation)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 7 underflow;
                                          timer counter 8 underflow; TM6IO pin
    Interrupt source ················ Timer counter 6 underflow

Timer counter 7: 8-bit × 1 (timer output, event count, timer interrupt, serial clock generation)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 6 underflow;
                                          timer counter 8 underflow; TM7IO pin
    Interrupt source ················ Timer counter 7 underflow

Timer counter 8: 8-bit × 1 (timer output, event count, timer interrupt, serial clock generation)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 6 underflow;
                                          timer counter 7 underflow; TM8IO pin
    Interrupt source ················ Timer counter 8 underflow

Timer counter 9: 8-bit × 1 (timer output, event count, timer interrupt)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; 1/32 of SYSCLK; timer counter 6 underflow;
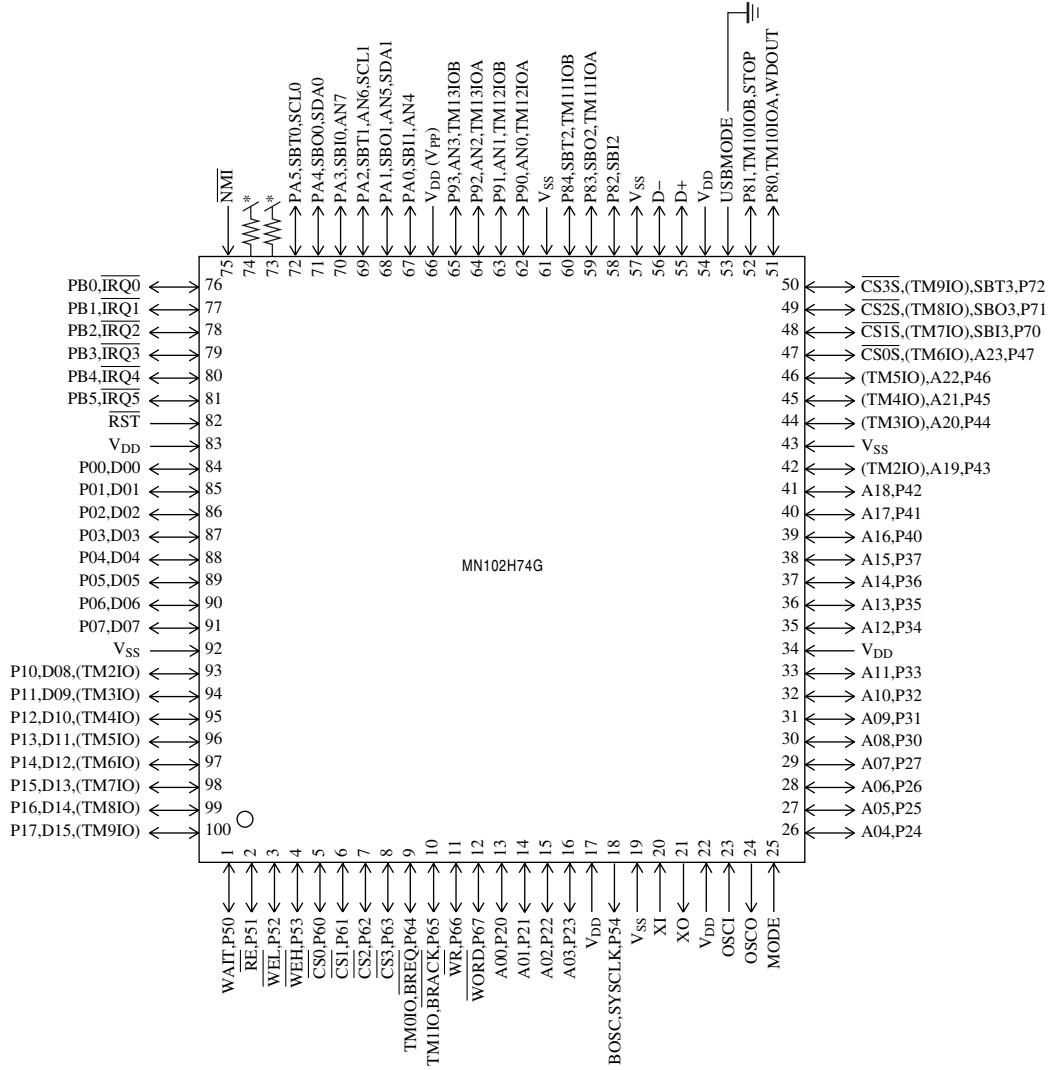   timer counter 7 underflow; timer counter 8 underflow; TM9IO pin
    Interrupt source ················ Timer counter 9 underflow

(Connectable)   Timer counters 6 to 9

Timer counter 10: 16-bit × 1 (timer output, event count, input capture, PWM output, 2-phase encoder input)
    Clock source ···················· SYSCLK; 1/8 of SYSCLK; timer counter 2 or 3 underflow; 2-phase encoding of
                                          TM10IOA/TM10IOB pin (1 or 4 multiply); TM10IOB pin
    Interrupt source ················ Timer counter 10 under/overflow; 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 ···················· SYSCLK; 1/8 of SYSCLK; timer counter 8 or 9 underflow; 2-phase encoding of
                                          TM11IOA/TM11IOB pin (1 or 4 multiply); TM11IOB pin
    Interrupt source ················ Timer counter 11 under/overflow; 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 ···················· SYSCLK; 1/8 of SYSCLK; timer counter 4 or 5 underflow; 2-phase encoding of
                                          TM12IOA/TM12IOB pin (1 or 4 multiply); TM12IOB pin
    Interrupt source ················ Timer counter 12 under/overflow; 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 ···················· SYSCLK; 1/8 of SYSCLK; timer counter 6 or 7 underflow; 2-phase encoding of
                                          TM13IOA/TM13IOB pin (1 or 4 multiply); TM13IOB pin
    Interrupt source ················ Timer counter 13 under/overflow; timer counter 13 compare capture A;
                                          timer counter 13 compare capture B

Serial Interface		Serial 0: 8-bit × 1 (transfer direction of MSB/LSB selectable; transmission/reception of 7, 8-bit length) Clock source ·················· 1/2 or 1/16 of timer counter 6 underflow; external pin
		Serial 1: 8-bit × 1 (transfer direction of MSB/LSB selectable; transmission/reception of 7, 8-bit length) Clock source ·················· 1/2 or 1/16 of timer counter 7 underflow; external pin
		Serial 2: 8-bit × 1 (transfer direction of MSB/LSB selectable; transmission/reception of 7, 8-bit length) Clock source ·················· 1/2 or 1/16 of timer counter 8 underflow; external pin
		Serial 3: 8-bit × 1 (transfer direction of MSB/LSB selectable; transmission/reception of 7, 8-bit length) Clock source ·················· 1/2 or 1/16 of timer counter 9 underflow; external pin
		UART × 2 (common use with serial 0 to 3)
		I²C × 2 (common use with serial 0, 1; single master)
ATC		4-ch DMA transfer enabled between memory and memory or memory and peripheral register by set interrupt factor and software activation setting Transfer unit: bytes/word Transfer mode: 1 word/burst (max. 128 K bytes) Transfer addressing: Source/destination pointer fix/increment High-speed transfer enabled between USB-FIFO and memory in single address mode
I/O Pins	**I/O**	77 • Common use : 77 (pull-up resistance specifiable)
A/D Inputs		10-bit × 8-ch. (with S/H)
Special Ports		USB ports (D+, D-)
Notes		4 multiply PLL built-in, generation of internal 48 MHz at external oscillation 12 MHz

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 external oscillation frequency 12 MHz	2			μs
Analog input voltage	VIA		VSS		VDD	V

(Ta = 25°C , VDD = 3.3 V , VSS = 0 V)

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Pin Assignment

Top side pins (left to right):
NMI, *, *, PA5.SBT0.SCL0, PA4.SBO0.SDA0, PA3.SBI0.AN7, PA2.SBT1.AN6.SCL1, PA1.SBO1.AN5.SDA1, PA0.SBI1.AN4, V_{DD} (V_{PP}), P93.AN3.TM13IOB, P92.AN2.TM13IOA, P91.AN1.TM12IOB, P90.AN0.TM12IOA, V_{SS}, P84.SBT2.TM11IOB, P83.SBO2.TM11IOA, P82.SBI2, V_{SS}, D−, D+, V_{DD}, USBMODE, P81.TM10IOB.STOP, P80.TM10IOA.WDOUT

Pin numbers top: 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51

Left side pins:
Pin	Signal
76	PB0,$\overline{IRQ0}$
77	PB1,$\overline{IRQ1}$
78	PB2,$\overline{IRQ2}$
79	PB3,$\overline{IRQ3}$
80	PB4,$\overline{IRQ4}$
81	PB5,$\overline{IRQ5}$
82	$\overline{RST}$
83	V_{DD}
84	P00,D00
85	P01,D01
86	P02,D02
87	P03,D03
88	P04,D04
89	P05,D05
90	P06,D06
91	P07,D07
92	V_{SS}
93	P10,D08,(TM2IO)
94	P11,D09,(TM3IO)
95	P12,D10,(TM4IO)
96	P13,D11,(TM5IO)
97	P14,D12,(TM6IO)
98	P15,D13,(TM7IO)
99	P16,D14,(TM8IO)
100	P17,D15,(TM9IO)

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Right side pins:
Pin	Signal
50	$\overline{CS3S}$,(TM9IO),SBT3,P72
49	$\overline{CS2S}$,(TM8IO),SBO3,P71
48	$\overline{CS1S}$,(TM7IO),SBI3,P70
47	$\overline{CS0S}$,(TM6IO),A23,P47
46	(TM5IO),A22,P46
45	(TM4IO),A21,P45
44	(TM3IO),A20,P44
43	V_{SS}
42	(TM2IO),A19,P43
41	A18,P42
40	A17,P41
39	A16,P40
38	A15,P37
37	A14,P36
36	A13,P35
35	A12,P34
34	V_{DD}
33	A11,P33
32	A10,P32
31	A09,P31
30	A08,P30
29	A07,P27
28	A06,P26
27	A05,P25
26	A04,P24

Pin numbers bottom: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Bottom side pins (left to right):
WAIT.P50, $\overline{RE}$.P51, $\overline{WEL}$.P52, $\overline{WEH}$.P53, $\overline{CS0}$.P60, $\overline{CS1}$.P61, $\overline{CS2}$.P62, $\overline{CS3}$.P63, TM0IO.$\overline{BREQ}$.P64, TM1IO.$\overline{BRACK}$.P65, $\overline{WR}$.P66, $\overline{WORD}$.P67, A00.P20, A01.P21, A02.P22, A03.P23, V_{DD}, BOSC.SYSCLK.P54, V_{SS}, X1, XO, V_{DD}, OSCI, OSCO, MODE

LQFP100-P-1414 *Pb free

* Use 4.7 kΩ to 10 kΩ.

Support Tool

■ In-circuit Emulator	PX-ICE102H74-LQFP100-P-1414

■ Flash Memory Built-in Type		
	Type	MN102HF74G (under development)
	ROM (× 8-bit)	128 K
	RAM (× 8-bit)	4 K
	Minimum instruction execution time	83.3 ns (at 3.0 V to 3.6 V, 12 MHz)
	Package	LQFP100-P-1414 *Pb free

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