

# □ MN102H950F

Type	MN102H950F
Internal ROM type	External
ROM (byte)	—
RAM (byte)	10K
Package (Lead-free)	LQFP100-P-1414
Minimum Instruction Execution Time	[With main clock operated] 58 ns (at 3.0 V to 3.6 V, 34 MHz)

## ■ Interrupts

/RST pin, Watchdog, /NMI pin, Timer counter 0 to 9 underflow, Timer counter 10 to 14 underflow, Timer counter 10 to 14 compare capture A, Timer counter 10 to 14 compare capture B, ATC ch.0 to ch.3 transfer finish, External 0 to 4, Serial ch.0 to ch.4 transmission, Serial ch.0 to ch.4 reception, A/D conversion finish

## ■ Timer Counter

Timer counter 0 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM0IO pin; system clock (BOSC)  
Interrupt source ..... underflow of timer counter 0

Timer counter 1 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8, 9; timer counter 0 output  
Interrupt source ..... underflow of timer counter 1

Timer counter 2 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM2IO pin; timer counter 1 output  
Interrupt source ..... underflow of timer counter 2

Timer counter 3 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; TM3IO pin; timer counter 2 output  
Interrupt source ..... underflow of timer counter 3

Timer counter 4 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM4IO pin; system clock (BOSC)  
Interrupt source ..... underflow of timer counter 4

Timer counter 5 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8, 9; timer counter 4 output  
Interrupt source ..... underflow of timer counter 5

Timer counter 6 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM6IO pin; timer counter 5 output  
Interrupt source ..... underflow of timer counter 6

Timer counter 7 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 9; TM7IO pin; timer counter 6 output  
Interrupt source ..... underflow of timer counter 7

Timer counter 8 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; system clock (BOSC); 1/4 of system clock (XI) frequency;  
TM8IO pin  
Interrupt source ..... underflow of timer counter 8

Timer counter 9 : 8-bit × 1

Clock source..... 1/2 of system clock (BOSC) frequency; underflow of timer counter 8; 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

■ 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 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)

■ I/O Pins

I/O	63	Common use : 43 (use of full address, address data separate 16-bit mode) Common use : 57 (use of address 16-bit, address data separate 8-bit mode) Common use : 56 (use of full address, address data multiplex 16-bit mode) Common use : 63 (use of address 16-bit, address data multiplex 8-bit mode)
-----	----	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

■ A/D converter

10-bit × 12-ch. (with S/H)

■ D/A converter

8-bit × 4-ch.

■ PWM

16-bit × 5-ch. (timer counter 10 to 14)

■ ICR

16-bit × 5-ch. (timer counter 10 to 14)

■ OCR

16-bit × 5-ch. (timer counter 10 to 14)

■ Notes

Address / data separate bus interface; 8 / 16-bit bus width selectable; SRAM interface

Address / data multiplex bus interface support

## Electrical Characteristics (Supply current)

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Operating supply current	IDDopr	V <sub>I</sub> = VDD or VSS, output open f = 34 MHz, VDD = 3.3 V			60	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			70	μA
Supply current at HALT0	IDDH	VDD or VSS level f = 34 MHz, VDD = 3.3 V, output open			30	mA

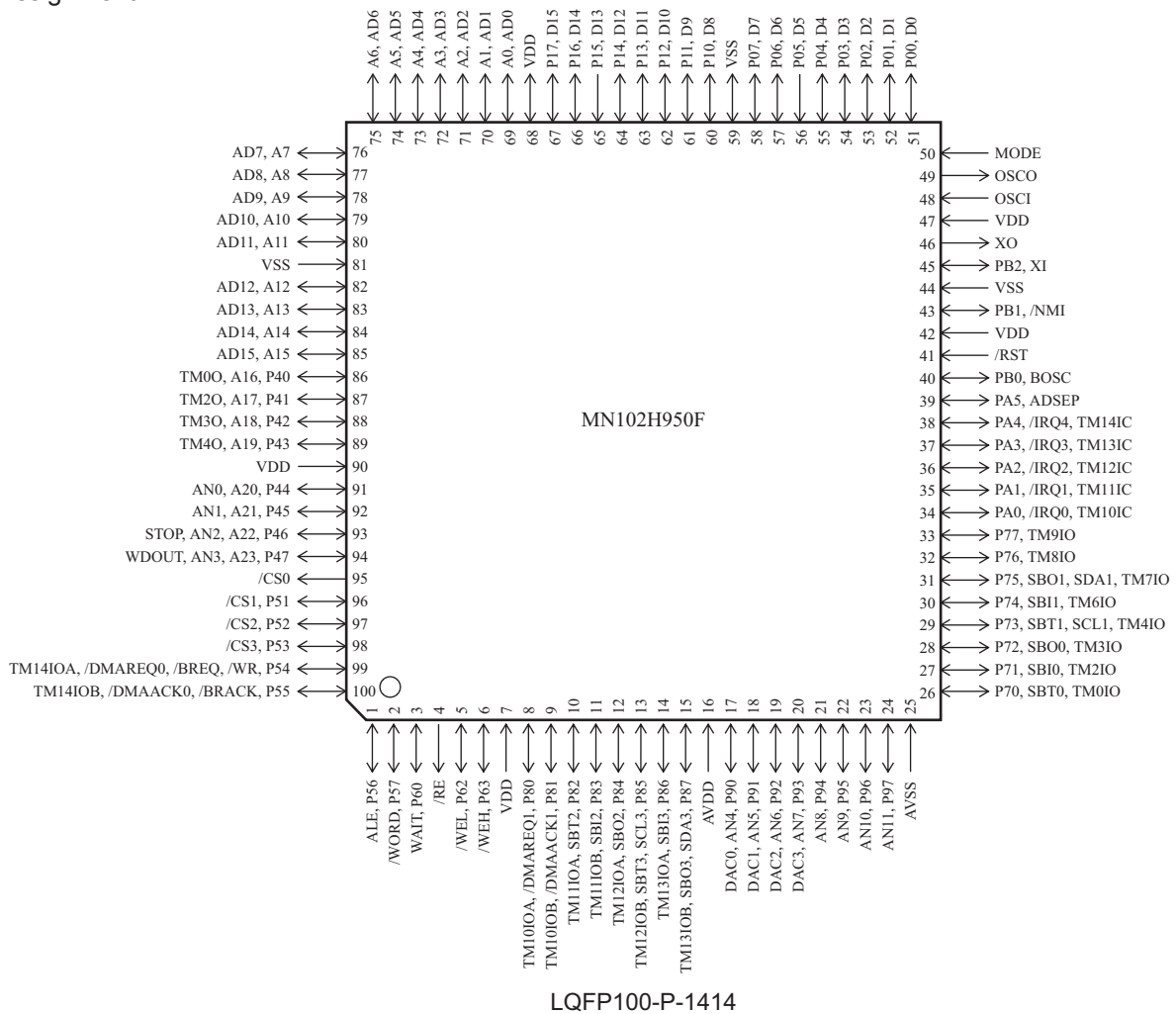
(Ta = -40°C to +85°C, VDD = AVDD = 3.3 V, VSS = AVSS = 0 V)

## Development tools

In-circuit Emulator

PX-ICE102H930F-LQFP100-P-1414

## Pin Assignment



## Request for your special attention and precautions in using the technical information and semiconductors described in this book

- (1) If any of the products or technical information described in this book is to be exported or provided to non-residents, the laws and regulations of the exporting country, especially, those with regard to security export control, must be observed.
- (2) The technical information described in this book is intended only to show the main characteristics and application circuit examples of the products, and no license is granted under any intellectual property right or other right owned by our company or any other company. Therefore, no responsibility is assumed by our company as to the infringement upon any such right owned by any other company which may arise as a result of the use of technical information described in this book.
- (3) The products described in this book are intended to be used for standard applications or general electronic equipment (such as office equipment, communications equipment, measuring instruments and household appliances).  
Consult our sales staff in advance for information on the following applications:
  - Special applications (such as for airplanes, aerospace, automobiles, traffic control equipment, combustion equipment, life support systems and safety devices) in which exceptional quality and reliability are required, or if the failure or malfunction of the products may directly jeopardize life or harm the human body.
  - Any applications other than the standard applications intended.
- (4) The products and product specifications described in this book are subject to change without notice for modification and/or improvement. At the final stage of your design, purchasing, or use of the products, therefore, ask for the most up-to-date Product Standards in advance to make sure that the latest specifications satisfy your requirements.
- (5) When designing your equipment, comply with the range of absolute maximum rating and the guaranteed operating conditions (operating power supply voltage and operating environment etc.). Especially, please be careful not to exceed the range of absolute maximum rating on the transient state, such as power-on, power-off and mode-switching. Otherwise, we will not be liable for any defect which may arise later in your equipment.
  - Even when the products are used within the guaranteed values, take into the consideration of incidence of break down and failure mode, possible to occur to semiconductor products. Measures on the systems such as redundant design, arresting the spread of fire or preventing glitch are recommended in order to prevent physical injury, fire, social damages, for example, by using the products.
- (6) Comply with the instructions for use in order to prevent breakdown and characteristics change due to external factors (ESD, EOS, thermal stress and mechanical stress) at the time of handling, mounting or at customer's process. When using products for which damp-proof packing is required, satisfy the conditions, such as shelf life and the elapsed time since first opening the packages.
- (7) This book may be not reprinted or reproduced whether wholly or partially, without the prior written permission of Matsushita Electric Industrial Co., Ltd. Industrial Co., Ltd.