❑ MN101C28A , MN101C28C , MN101C28D , MN101C28F , MN101C28L

Type	MN101C28A	MN101C28C	MN101C28D	MN101C28F	MN101C28L
ROM (×8-bit) External memory can be expanded	32 K	48 K	64 K	96 K	96 K
RAM (×8-bit) External memory can be expanded	1.5 K	2 K	2 K	4 K	10 K
Package **(Conventional Package)**	[All lead-free] LQFP080-P-1414A, TQFP080-P-1212D, QFP084-P-1818E (TQFP080-P-1212C)			LQFP080-P-1414A *Lead-free	

Minimum Instruction Execution Time

0.10 µs (at 4.5 V to 5.5 V, 20 MHz)
0.238 µs (at 2.6 V to 5.5 V, 8.39 MHz)
0.333 µs (at 2.3 V to 5.5 V, 6 MHz)
1.00 µs (at 2.0 V to 5.5 V, 2 MHz)*
125 µs (at 2.0 V to 5.5 V, 32.768 kHz)*

* The lower limit for operation guarantee for EPROM built-in type is 2.3 V.

Interrupts

• RESET • Watchdog • External 0 • External 1 • External 2 • External 3 • External 4 • Timer 0
• Timer 1 • Timer 2 • Timer 3 • Timer 4 • Timer 5 • Time base • Serial 0 • Serial 1 • Serial 2
• Automatic transfer finish • A/D conversion finish

Timer Counter

Timer counter 0 : 8-bit × 1 (square-wave/8-bit PWM output, event count, generation of remote control carrier)
Clock source ····· 1/1, 1/4 of system clock frequency; 1/1 of OSC oscillation clock frequency; external clock input
Interrupt source ····· coincidence with compare register 0

Timer counter 1 : 8-bit × 1 (square-wave output, event count, synchronous output event)
Clock source ····· 1/16, 1/64 of system clock frequency; 1/1 of XI oscillation clock frequency; external clock input
Interrupt source ····· coincidence with compare register 1

Timer counter 0, 1 can be cascade-connected.

Timer counter 2 : 8-bit × 1 (square-wave/8-bit PWM output, event count, synchronous output event)
Clock source ····· 1/1, 1/4 of system clock frequency; 1/1 of XI oscillation clock frequency; external clock input
Interrupt source ····· coincidence with compare register 2

Timer counter 3 : 8-bit × 1
(square-wave output, event count, generation of remote control carrier, serial 0 baud rate timer)
Clock source ····· 1/4, 1/16 of system clock frequency; 1/1 of OSC oscillation clock frequency; external clock input
Interrupt source ····· coincidence with compare register 3

Timer counter 2, 3 can be cascade-connected.

Timer counter 4 : 16-bit × 1
(square-wave/16-bit PWM output, event count, synchronous output event, input capture)
Clock source ····· 1/4, 1/16 of system clock frequency; 1/1 of OSC oscillation clock frequency; external clock input
Interrupt source ····· coincidence with compare register 4

Time base timer (one-minute count setting, independently operable 8-bit timer counter 5)
Clock source ····· 1/4 of system clock frequency; 1/1, 1/8192 of OSC oscillation clock frequency; 1/1, 1/8192 of XI oscillation clock frequency
Interrupt source ····· coincidence with compare register 5; 1/8192 prescaler overflow

Watchdog timer
Interrupt source ····· 1/65536, 1/262144, 1/1048576 of system clock frequency (ROM option)

Serial Interface	Serial 0 : synchronous type/simple UART (half-duplex) × 1 Clock source ····· 1/2, 1/4, 1/16 of system clock frequency; output of timer counter 3 Serial 1 : synchronous type × 1 Clock source ····· 1/2, 1/8, 1/64 of system clock frequency; output of timer counter 3 Serial 2 : synchronous type/simple I^2C × 1 Clock source ····· 1/4, 1/8, 1/16, 1/32 of system clock frequency; 1/4 of timer counter 0 frequency

I/O Pins	**I/O**	57	• Common use • Specified pull-up resistor available • Input/output selectable (bit unit)
	Input	13	• Common use • Specified pull-up resistor available

A/D Inputs	10-Bit × 8-ch. (with S/H)
Special Ports	Buzzer output, remote control carrier signal output, high-current drive port

Electrical Characteristics

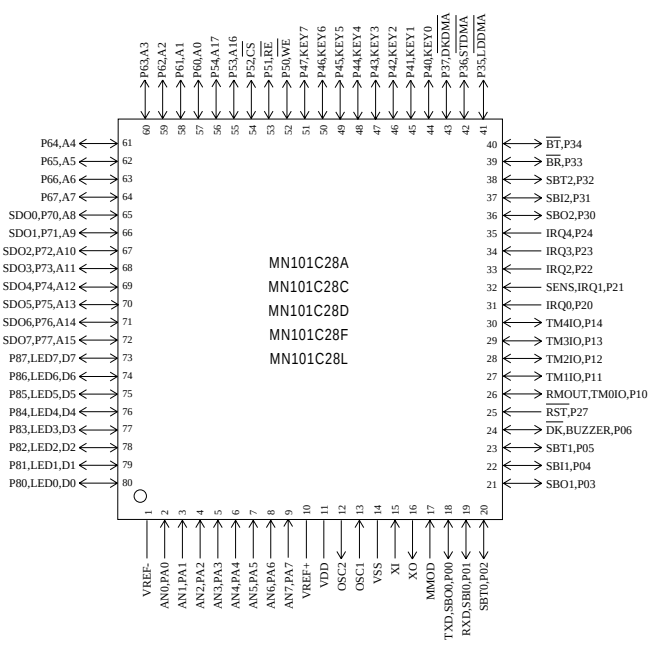
Supply current

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Operating supply current	IDD1	fosc = 20 MHz, VDD = 5 V		25	50	mA
	IDD2	fx = 32.768 kHz, VDD = 3 V		40	120	µA
Supply current at HALT	IDD3	fx = 32.768 kHz, VDD = 3 V, Ta = 25°C		4	8	µA
		fx = 32.768 kHz, VDD = 3 V, Ta = 85°C			20	µA
Supply current at STOP	IDD4	VDD = 5 V, Ta = 25°C			1	µA
		VDD = 5 V, Ta = –40°C to +85°C			30	µA

See the next page for pin assignment and support tool.

Pin Assignment

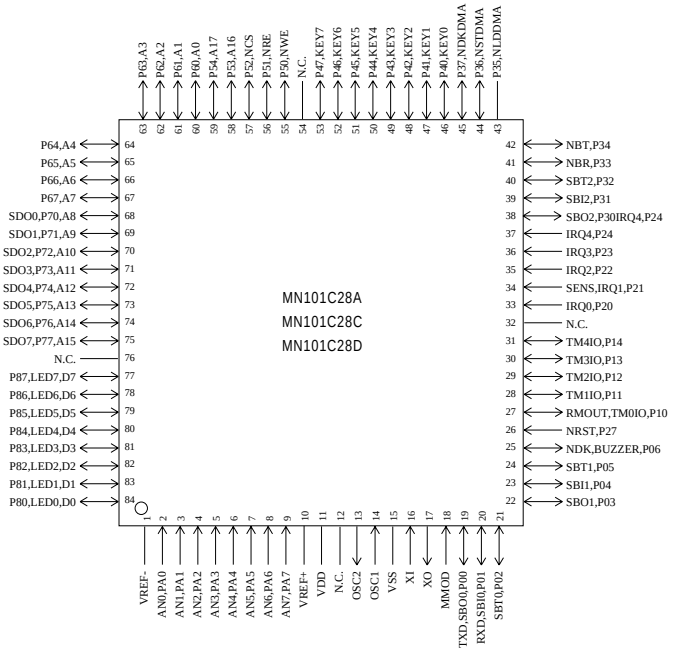
( ) : Conventional Package



LQFP080-P-1414A *Lead-free

TQFP080-P-1212D *Lead-free [MN101C28A/28C/28D]

(TQFP080-P-1212C)



QFP084-P-1818E *Lead-free

Support Tool

In-circuit Emulator	PX-ICE101C/D+PX-PRB101C28-TQFP080-P-1212 PX-ICE101C/D+PX-PRB101C28-QFP084-P-1818E PX-ICE101C/D+PX-PRB101C28-LQFP080-P-1414A	
EPROM Built-in Type	Type	MN101CP28DBF , MN101CP28DAL , MN101CP28DHT , MN101CP28LAL
	ROM (× 8-bit)	64 K / 64 K / 64 K / 96 K
	RAM (× 8-bit)	2 K / 2 K / 2 K / 10 K
	Minimum instruction execution time	0.10 µs (at 4.5 V to 5.5 V, 20 MHz) 0.238 µs (at 2.6 V to 5.5 V, 8.39 MHz) 0.333 µs (at 2.3 V to 5.5 V, 6 MHz)
	Package (Conventional Package)	[All lead-free] LQFP080-P-1414A, TQFP080-P-1212D, QFP084-P-1818E (TQFP080-P-1212C)

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

(1) An export permit needs to be obtained from the competent authorities of the Japanese Government if any of the products or technologies described in this material and controlled under the "Foreign Exchange and Foreign Trade Law" is to be exported or taken out of Japan.

(2) The technical information described in this material is limited to showing representative characteristics and applied circuits examples of the products. It neither warrants non-infringement of intellectual property right or any other rights owned by our company or a third party, nor grants any license.

(3) We are not liable for the infringement of rights owned by a third party arising out of the use of the product or technologies as described in this material.

(4) The products described in this material 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.

(5) The products and product specifications described in this material 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.

(6) When designing your equipment, comply with the guaranteed values, in particular those of maximum rating, the range of operating power supply voltage, and heat radiation characteristics. 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.

(7) When using products for which damp-proof packing is required, observe the conditions (including shelf life and amount of time let standing of unsealed items) agreed upon when specification sheets are individually exchanged.