## $\square$ MN101E59 Series

| Type | MN101E59R | MN101EF59R |
| :---: | :---: | :---: |
| Internal ROM type | Mask ROM | FLASH |
| ROM (byte) | 928K |  |
| RAM (byte) | 8K |  |
| Package (Lead-free) | QFP100-P-1818B |  |
| Minimum Instruction Execution Time | $\begin{gathered} 50 \mathrm{~ns} \text { (at } 2.2 \mathrm{~V} \text { to } 5.5 \mathrm{~V}, 20 \mathrm{MHz} \text { ) } \\ \text { *: at internal } 2,3,4,5,6,8,10 \text { times oscillation used } \end{gathered}$ |  |

## ■ Interrupts

6 external interrupts. 30 internal interrupts
RESET. NMI. External 0 to 4 . Timer 0 to 4 . Timer 6. Timer 7 (2 systems). Timer 8 ( 2 systems). Timer 9 ( 2 systems). Time base. Serial 0 (2 systems). Serial 1 (2 systems). Serial 2 ( 2 systems). Serial 3 (2 systems). Serial 4. Serial 5. A/D conversion. Automatic transfer (2 systems). Key interrupt. End of single tone. End of phrase

## Timer Counter

8 -bit timer $\times 7$
Timer 0 ..................Timer pulse output. Event count. Added pulse (2-bit) type PWM output. Remote control carrier output. Simple pulse width measurement. Real time output control
Timer 1 $\qquad$ .Timer pulse output. Event count. 16-bit cascade connected (timer 0, 1). Timer synchronous output
Timer 2 .................Timer pulse output. Event count. Added pulse (2-bit) type PWM output. Simple pulse width measurement. 24-bit cascade connected (timer 0, 1, 2). Timer synchronous output. Real time output control
Timer 3 $\qquad$ .Timer pulse output. Event count. Remote control carrier output. 16-bit cascade connected (timer 2, 3). 32-bit cascade connected (timer 0, 1, 2, 3)
Timer 4 .Timer pulse output. Added pulse (2-bit) type PWM output. Event count. Serial transfer clock output. Simple pulse width measurement
Timer 6 $\qquad$ .8 -bit freerun timer. Time base timer
Timer A. .Event count. Baud rate timer. Clock output for peripheral function
16 -bit timer $\times 3$
Timer 7 $\qquad$ Timer pulse output. Event count. High accuracy PWM. High performance IGBT output (cycle/duty continuous variable). Timer synchronous output. Input capture (both edge available). Real time output control. Double buffer compare register
Timer 8 $\qquad$ Timer pulse output. Event count. High accuracy PWM output (cycle/duty continuous variable). Pulse width measurement. Input capture (both edge available). 32-bit cascade connected (timer 7, 8). 32-bit PWM output. Synchronous output event. Double buffer compare register
Timer 9 $\qquad$ .Timer pulse output. Event count. High accuracy PWM output (cycle/duty continuous variable). Pulse width measurement. Input capture (both edge available). Real time output control. Double buffer compare register
Watchdog timer $\times 1$
$\square$ Serial interface
Synchronous type/UART (full-duplex) $\times 4$ : Serial 0 to 3
Synchronous type/Multi-master $\mathrm{I}^{2} \mathrm{C} \times 1$ : Serial 4
$I^{2} \mathrm{C}$ slave $\times 1$ : Serial 5

## ■ DMA controller

2 systems. Maximum transfer cycles are 255
Starting factor: External request. Internal event. Software
I/O Pins
I/O
85: Common use. Specified pull-up/pull-down resistor available. Input/output selectable (bit unit)
■ A/D converter
10-bit $\times 12$ channels

- D/A converter

8 -bit $\times 4$ channels. 20 -bit $\times 2$ channels. (Sound reproduction:digital output, analog output)

## - Display control function

LCD: 55 segments $\times 4$ commons (Static, $1 / 2,1 / 3$, or $1 / 4$ duty) $1 / 3$ bias
Usable if VLC1 $\leq$ VDD

## - Special Ports

Buzzer output. Inverted buzzer output. Remote control carrier output. High-current drive port

## ROM Correction

Correcting address designation: Up to 7 addresses possible
Pin Assignment
QFP100-P-1818B


Note) ( ): Flash memory built-in type

## 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. No license is granted in and to any intellectual property right or other right owned by Panasonic Corporation 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 our company.

