

# **MN101C54A , MN101C54C**

|                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |           |
|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Type</b>                               | MN101C54A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | MN101C54C |
| <b>ROM (×8-bit)</b>                       | 32 K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 48 K      |
| <b>RAM (×8-bit)</b>                       | 2 K                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 2 K       |
| <b>Package</b>                            | QFP084-P-1818E *Lead-free, LQFP080-P-1414A *Lead-free, TQFP080-P-1212D *Lead-free (under planning)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |           |
| <b>Minimum Instruction Execution Time</b> | 0.1 μs (at 4.5 V to 5.5 V, 20 MHz)<br>0.25 μs (at 2.7 V to 5.5 V, 8 MHz)* <sup>1</sup><br>62.5 μs (at 2.0 V to 5.5 V, 32 kHz)* <sup>1,2</sup><br>* <sup>1</sup> The lower limit for operation guarantee for flash memory built-in type is 4.5 V.<br>* <sup>2</sup> The lower limit for operation guarantee for EPROM built-in type is 2.3 V.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |           |
| <b>Interrupts</b>                         | • RESET • Watchdog • External 0 • External 1 • External 2 • External 3* <sup>1</sup><br>• External 4 (key interrupt dedicated) • Timer 0 • Timer 1 • Timer 2 • Timer 3 • Timer 6 • Time base<br>• Timer 7 (2 systems) • Timer 8 (2 systems) • Serial 0 (2 systems) • Serial 2 • A/D conversion finish<br>* <sup>1</sup> LQFP080-P-1414A, TQFP080-P-1212D: Not mounted                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
| <b>Timer Counter</b>                      | <p>Timer counter 0 : 8-bit × 1<br/>           (square-wave/8-bit PWM output, event count, generation of remote control carrier, simple pulse width measurement) (square-wave/PWM output to large current terminal P50 possible)<br/>           Clock source ..... 1/2, 1/4 of system clock frequency; 1/1, 1/4, 1/16, 1/32, 1/64 of OSC oscillation clock frequency; 1/1 of XI oscillation clock frequency; external clock input<br/>           Interrupt source ..... coincidence with compare register 0</p> <p>Timer counter 1 : 8-bit × 1 (square-wave output, event count, synchronous output event)<br/>           Clock source ..... 1/2, 1/8 of system clock frequency; 1/1, 1/4, 1/16, 1/8192, 1/32768 of OSC oscillation clock frequency; 1/1 of XI oscillation clock frequency; external clock input<br/>           Interrupt source ..... coincidence with compare register 1</p> <p>Timer counter 0, 1 can be cascade-connected.</p> <p>Timer counter 2 : 8-bit × 1<br/>           (square-wave output, additional pulse type 10-bit PWM output, event count, synchronous output event, simple pulse width measurement) (square-wave/PWM output to large current terminal P52 possible)<br/>           Clock source ..... 1/2, 1/4 of system clock frequency; 1/1, 1/4, 1/16, 1/32, 1/64 of OSC oscillation clock frequency; 1/1 of XI oscillation clock frequency; external clock input<br/>           Interrupt source ..... coincidence with compare register 2</p> <p>Timer counter 3 : 8-bit × 1<br/>           (square-wave output, event count, generation of remote control carrier, serial 0 baud rate timer)<br/>           Clock source ..... 1/2, 1/8 of system clock frequency; 1/1, 1/4, 1/16, 1/64, 1/128 of OSC oscillation clock frequency; 1/1 of XI oscillation clock frequency; external clock input<br/>           Interrupt source ..... coincidence with compare register 3</p> <p>Timer counter 2, 3 can be cascade-connected.</p> <p>Timer counter 6 : 8-bit freerun timer<br/>           Clock source ..... 1/1 of system clock frequency; 1/1, 1/4096, 1/8192 of OSC oscillation clock frequency; 1/1, 1/4096, 1/8192 of XI oscillation clock frequency<br/>           Interrupt source ..... coincidence with compare register 6</p> <p>Timer counter 7 : 16-bit × 1<br/>           (square-wave output, IGBT/16-bit PWM output (cycle / duty continuous variable), event count, synchronous output event, pulse width measurement, input capture) (square-wave/PWM output to large current terminal P51 possible)<br/>           Clock source ..... 1/1, 1/2, 1/4, 1/16 of system clock frequency; 1/1, 1/2, 1/4, 1/16 of OSC oscillation clock frequency; 1/1, 1/2, 1/4, 1/16 of external clock input frequency<br/>           Interrupt source ..... coincidence with compare register 7 (2 lines)</p> |           |

## Timer Counter (Continue)

Timer counter 8: 16 bit × 1

(square-wave/16-bit PWM output [duty continuous variable], event count, pulse width measurement, input capture)

(square-wave/PWM output to large current terminal P53 possible)

Clock source ..... 1/1, 1/2, 1/4, 1/16, 1/128 of system clock frequency;

1/1, 1/2, 1/4, 1/16, 1/128 of OSC oscillation clock frequency;

1/1, 1/2, 1/4, 1/16 of external clock input frequency

Interrupt source ..... coincidence with compare register 8 (2 lines)

Timer counters 7, 8 can be cascade-connected.

(square-wave output, PWM, input capture, pulse width measurement is possible as a 32-bit timer.)

Time base timer (one-minute count setting)

Clock source ..... 1/1 of OSC oscillation clock frequency; 1/1 of XI oscillation clock frequency

Interrupt source ..... 1/128, 1/256, 1/512, 1/1024, 1/8192, 1/32768, of clock source frequency

Watchdog timer

Interrupt source ..... 1/65536, 1/262144, 1/1048576 of system clock frequency

## Serial Interface

Serial 0 : synchronous type/UART (full-duplex) × 1

Clock source ..... 1/2, 1/4 of system clock frequency; pulse output of timer counter 3;

1/2, 1/4, 1/16, 1/64 of OSC oscillation clock frequency

Serial 2 : synchronous type × 1

Clock source ..... 1/2, 1/4 of system clock frequency; pulse output of timer counter 3;

1/2, 1/4, 1/16, 1/32 of OSC oscillation clock frequency

## I/O Pins

### I/O

61  
(60)

• Common use • Specified pull-up resistor available • Input/output selectable (bit unit)

( ): LQFP080-P-1414A,TQFP080-P-1212D

### Input

4  
(3)

• Common use • Specified pull-up resistor available

( ): LQFP080-P-1414A,TQFP080-P-1212D

## A/D Inputs

10-bit × 8-ch. (with S/H)

## LCD

32 segments × 4 commons (static, 1/2, 1/3, or 1/4 duty)

LCD power supply separated from VDD (usable if  $VDD \leq V_{LCD} \leq 5.5\text{ V}$ )

LCD power step-up circuit contained (3/2, 2 and 3 times)

LCD power shunt resistance contained

## Special Ports

Buzzer output, remote control carrier signal output, high-current drive port

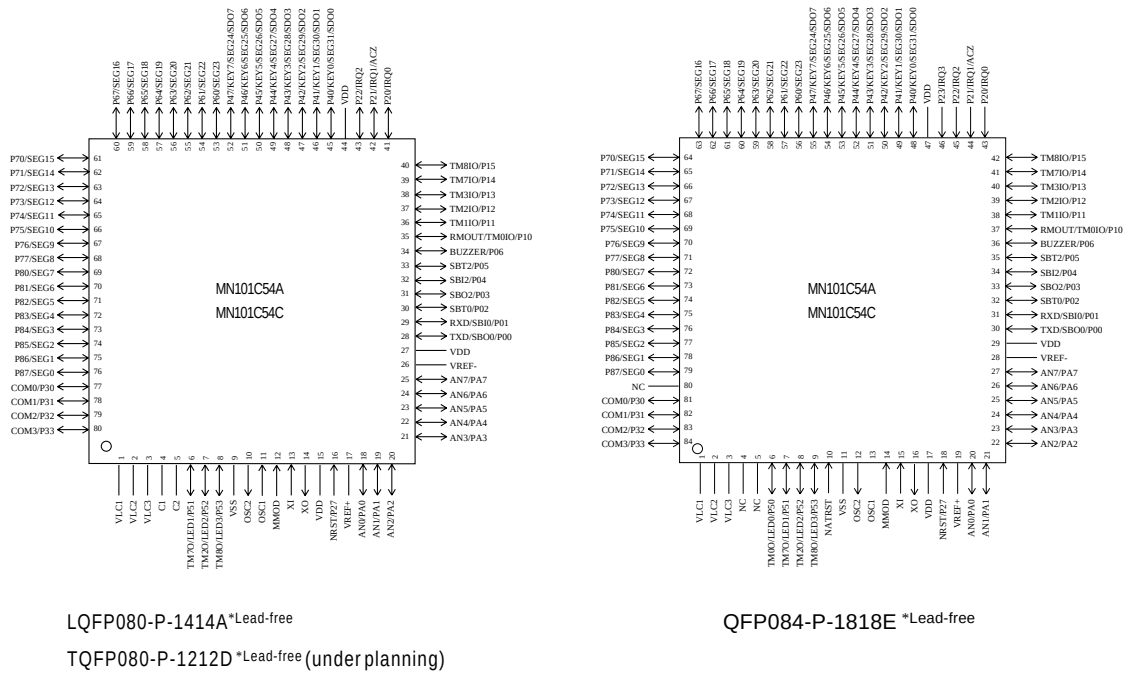
## Electrical Characteristics

### Supply current

| Parameter                | Symbol | Condition                                                                                     | Limit |     |     | Unit |
|--------------------------|--------|-----------------------------------------------------------------------------------------------|-------|-----|-----|------|
|                          |        |                                                                                               | min   | typ | max |      |
| Operating supply current | IDD1   | $f_{osc} = 20\text{ MHz}$ , $VDD = 5\text{ V}$                                                |       | 25  | 60  | mA   |
|                          | IDD2   | $f_{osc} = 8\text{ MHz}$ , $VDD = 5\text{ V}$                                                 |       | 10  | 25  | mA   |
|                          | IDD3   | $f_x = 32\text{ kHz}$ , $VDD = 3\text{ V}$                                                    |       | 30  | 100 | μA   |
| Supply current at HALT   | IDD4   | $f_x = 32\text{ kHz}$ , $VDD = 3\text{ V}$ , $T_a = 25^\circ\text{C}$                         |       | 4   | 8   | μA   |
|                          | IDD5   | $f_x = 32\text{ kHz}$ , $VDD = 3\text{ V}$ , $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$ |       |     | 30  | μA   |
| Supply current at STOP   | IDD6   | $VDD = 5\text{ V}$ , $T_a = 25^\circ\text{C}$                                                 |       |     | 2   | μA   |
|                          | IDD7   | $VDD = 5\text{ V}$ , $T_a = -40^\circ\text{C}$ to $+85^\circ\text{C}$                         |       |     | 50  | μA   |

See the next page for pin assignment and support tool.

## Pin Assignment



## Support Tool

### In-circuit Emulator

PX-ICE101C / D + PX-PRB101C54-TPFP080-P-1212D-M (under planning)  
 PX-ICE101C / D + PX-PRB101C54-QFP084-P-1818E-M  
 PX-ICE101C / D + PX-PRB101C54-LQFP080-P-1414A-M

### EPROM Built-in Type

|                                    |                                                                                                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Type                               | MN101CP54C                                                                                                      |
| ROM (× 8-bit)                      | 48 K                                                                                                            |
| RAM (× 8-bit)                      | 2 K                                                                                                             |
| Minimum instruction execution time | 0.1 μs (at 4.5 V to 5.5 V, 20 MHz)<br>0.25 μs (at 2.7 V to 5.5 V, 8 MHz)<br>62.5 μs (at 2.3 V to 5.5 V, 32 kHz) |
| Package                            | LQFP080-P-1414A *Lead-free, QFP084-P-1818E *Lead-free,<br>TQFP080-P-1212D *Lead-free (under planning)           |

### Flash Memory Built-in Type

|                                    |                                                                                                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Type                               | MN101CF54D [ES (Engineering Sample) available]                                                                  |
| ROM (× 8-bit)                      | 64 K                                                                                                            |
| RAM (× 8-bit)                      | 2 K                                                                                                             |
| Minimum instruction execution time | 0.1 μs (at 4.5 V to 5.5 V, 20 MHz)<br>0.25 μs (at 4.5 V to 5.5 V, 8 MHz)<br>62.5 μs (at 4.5 V to 5.5 V, 32 kHz) |
| Package                            | LQFP080-P-1414A *Lead-free, QFP084-P-1818E *Lead-free,<br>TQFP080-P-1212D *Lead-free (under planning)           |



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