❑ MN101D07G, MN101D07H

Type	MN101D07G	MN101D07H	MN101DF07Z
Internal ROM type	Mask ROM		FLASH
ROM (byte)	128K	160K	224K
RAM (byte)	4K	5K	6K
Package (Lead-free)	LQFP112-P-2020		
Minimum Instruction Execution Time	[With main clock operated] 0.1397 µs (at 4.0 V to 5.5 V, 14.32 MHz) 71.5 µs (at 3.0 V to 5.5 V, 14.32 MHz internal frequency di Vision) [When sub-clock operated] 61 µs (at 2.2 V to 5.5 V, 32.768 kHz)		0.1397 µs (at 4.0 V to 5.5 V, 14.32 MHz) 71.5 µs (at 3.0 V to 5.5 V, 14.32 MHz internal frequency di Vision) 61 µs (at 2.5 V to 5.5 V, 32.768 kHz)

■ Interrupts

RESET, Runaway, External 0 to 4, key input (P50 to P54), Timer 0 to 4, Timer 6, Timer 7, Capstan FG, Control, HSW, Cylinder(Drum) FG, Servo V-sync, Synchronous output, OSD, XDS, Serial 0 to 2, A/D (common with PWM 4 reference frequency), OSD V-sync

■ Timer Counter

Timer counter 0 : 16-bit × 1
(timer function, clock function [max. 2 s or max. 36 h at cascade-connecting with timer 6])
Clock source..... 1/2, (1/4,) 1/8, (1/16) of system clock frequency; overflow of timer counter 6; 1/512 of XI oscillation clock or OSC oscillation clock frequency
Interrupt source ..... overflow of timer counter 0

Timer counter 1 : 16-bit × 1 (timer function, linear timer counter function)
Clock source..... 1/2, (1/4,) 1/8, (1/16) of system clock frequency; CTL signal
Interrupt source ..... overflow of timer counter 1

Timer counter 2 : 16-bit × 1
(timer function, input capture
(DCTL specified edge), duty judgment of DCTL signal)
Clock source..... 1/2, (1/4,) 1/8, (1/16,) 1/12, (1/24) of system clock frequency
Interrupt source ..... overflow of timer counter 2; input of DCTL specified edge; underflow of timer 2 shift register 4-bit counter; coincidence of timer 2 shift register with timer 2 shift register compare register

Timer counter 3 : 16-bit × 1
(timer function, detection of serial indexing, generation of remote control output carrier frequency)
Clock source..... 1/2, (1/4,) 1/8, (1/16) of system clock frequency; XI oscillation clock
Interrupt source ..... overflow of timer counter 3

Timer counter 4 : 16-bit × 1 (timer function, event count [P15 input], generation of serial transmission clock)
Clock source..... 1/8, (1/16) of system clock frequency; external clock input
Interrupt source ..... overflow of timer counter 4; coincidence of timer counter 4 with OCR4

Timer counter 5 : 19-bit × 1 (watchdog, stable oscillation waiting function)
Clock source..... system clock
Watchdog interrupt source... $1/2^{16}$, $1/2^{19}$ of timer counter 5 frequency
Clear by stable oscillation ... after 256 counts by timer counter 5 (218 counts of OSC oscillation clock)

Timer counter 6 : 16-bit × 1 (clock function [max. 2 s])
Clock source..... 1/512 of OSC oscillation clock frequency; XI oscillation clock; 1/4, (1/8,) 1/64, (1/128) of system clock frequency
Interrupt source ..... $1/2^{13}$, $1/2^{14}$, $1/2^{15}$ overflow of timer counter 6

Timer counter 7 : 8-bit × 1 or 4-bit × 2 (timer function, event count)
Clock source..... 1/4, (1/8,) 1/16, (1/32) of system clock frequency; external clock input
Interrupt source ..... overflow of timer counter 7 (although when 4-bit × 2, there is one interrupt vector.)

■ Serial interface

Serial 0 : 8-bit × 1 (synchronous type/start-stop synchronous type) (transfer direction of MSB/LSB selectable)

- Synchronous type clock source .... 1/8, 1/16, 1/32, 1/64, 1/128, 1/256 of system clock frequency; 2-division timer 4 output; NSBT0 pin input
- Clock for UART..... 8-division of above clock; 2-division timer 4 output; NSBT0 pin input

Serial 1 : 8-bit × 1 (synchronous type/remote control transmission/simple remote control receive)
(transfer direction of MSB/LSB selectable, start condition function)

- Clock source..... 1/8, 1/16, 1/32, 1/64, 1/128, 1/256 of system clock frequency; 2-division timer 4 output; NSBT1 pin input
- Remote control clock..... 2-division timer 4 output

Serial 2 : 8-bit × 1 (I²C)
(master transmission/reception, slave transmission/reception)

- Clock source..... 1/144 to 1/252 of system clock, SCK pin input

■ OSD

OSD mode : Accommodation with menu(internal synchronous) or super impose(external synchronous) display

- Applicable broadcasting system....NTSC, PAL, PAL-M, PAL-N
- Screen configuration .....24 characters × 2n rows (n = 1 to 6)
- Character type .....max. 512 character types (variable)
- Character size.....12 × 18 dots
- Enlarged characters.....each × 2, × 3 or × 4 settings in horizontal and vertical
- Character interpolation.....none
- Line background color .....8-hue settable (settable in the row unit at menu display)
- Line background intensity.....8 gradations settable in the row unit(at output of composite video signal)
- Screen background color.....8-hue settable (at output of composite video signal)
- Character color.....white (at output of composite video signal)
- Character intensity .....8 gradations settable in the row unit
- Frame function .....1-dot frame in 4 or 8 directions (at output of composite video signal)
- Frame intensity.....4 gradations settable in the row unit
- Box shade function .....settable in the character unit (at output of composite video signal with 129 or more characters (character types))
- Blinking.....none (covered by software)
- Inverted character.....settable in the character unit
- Halftone.....settable in the row unit in 2 intensity gradations (at output of external synchronous composite video signal)

CCD mode : Supports Closed Caption in the U.S.A.

- Screen configuration .....2 characters × 16 rows
- Character type .....max. 128 character types (variable)
- Character size.....2 × 26 dots (including 8 dots in the underlined area)
- Enlarged characters.....none
- Character interpolation.....none
- Line background color .....8-hue settable
- Line background intensity.....8 gradations settable in the screen unit (at output of composite video signal)
- Screen background color.....8-hue settable (at output of composite video signal)
- Character color.....8 colors (at RGB output), White (at output of composite video signal)
- Character intensity .....8 gradations settable in the screen unit(at output of composite video signal)
- Frame function .....none
- Box shade function .....none
- Inverted character.....none
- Halftone.....settable in the row unit in 2 intensity gradations (at output of external synchronous composite video signal)
- Others.....Underline, italic, blinking function and scroll

Common

- Input .....composite video signal input (output level : 1 V[p-p] / 2 V[p-p])
- Clamp method.....sync tip clamp, clamp level in 4 levels
- Output .....composite video output, output of Y/C split video signal, digital output (6 pins)
- Measure against image fluctuation.....built-in AFC circuit
- Dot clock.....1/2 of OSC oscillation clock (automatic phase adjustment)

■ XDS

Built-in U.S. closed caption data slicer (optional 2 line data can be extracted.)

■ I/O Pins

I/O	85	Common use : 71
Input	2	Common use : 2

■ A/D converter

8-bit × 14-ch. (without S/H)

■ PWM

13-bit × 2-ch. (at repetition cycle 572 ms at 14.32 MHz),
10-bit × 2-ch. (at repetition cycle 71.5 ms at 14.32 MHz),
8-bit × 1-ch. (at repetition cycle 71.5 ms, 0.572 ms, 1.14 ms, 2.29 ms at 14.32 MHz)

■ ICR

18-bit × 6-ch.

■ OCR

16-bit × 2 (8-bit synchronous output; 4-bit 3-state synchronous output),
16-bit × 1 (weak electric field V-sync backup), 16-bit × 1 (Rec CTL)

■ Special Ports

Buzzer output; 3-state output VLP pin; remote control receive;
CTL signal input terminal; Capstan FG inputterminal; Sylinder(Durm) PG/FG input terminals;
HSW output terminal; Head Amp/Rortary control output terminals;
output of 1/2 OSC oscillation clock (2 V[p-p]); output of 1/4 OSC oscillation clock (1 V[p-p])

■ ROM Correction

Correcting address designation : up to 3 addresses possible
Correction method : correction program being saved in internal RAM

■ Electrical Charactreistics (Supply current)

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Operating supply current	IDD1	14.32 MHz operation without load, VDD = 5 V		60	100	mA
	IDD2	1/1024 of 14.32 MHz operation without load VDD = 3.0 V		2	5	mA
	IDD3	Stop of 14.32 MHz oscillation, VDD = 2.7 V 32 kHz oscillation operation without load		50	100	µA
Supply current at STOP	IDSP	Stop of oscillation without load, VDD = 5 V, Ta = 55°C			10	µA
Supply current at HALT	IDHT0	14.32 MHz oscillation without load, VDD = 5 V		5	15	mA
	IDHT1	Stop of 14.32 MHz oscillation, VDD = 2.7 V 32 kHz oscillation operation without load		5	20	µA

(Ta = 25°C±2°C , VSS = 0 V)

■ Electrical Charactreistics (A/D converter characteristics)

Parameter	Symbol	Condition	Limit			Unit
			min	typ	max	
Conversion relative error	ΔNLAD				±3	LSB
A/D Conversion Time	tAD	fosc = 14.32 MHz		8		µ s
Analog Input Voltage					5	V

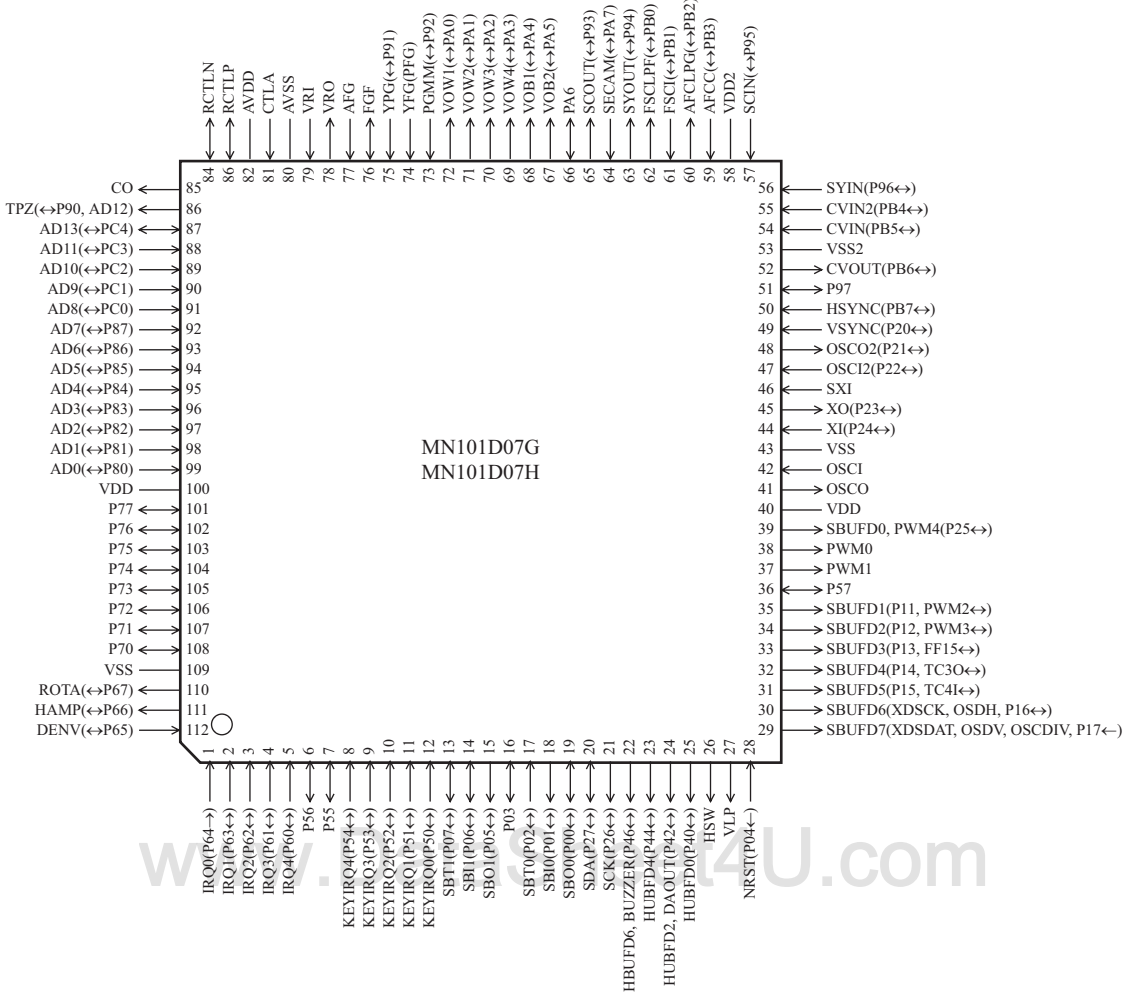
(Ta = 25°C±2°C , VDD = 5.0 V , VSS = 0 V)

■ Development tools

In-circuit Emulator

PX-ICE101C/D + PX-PRB101D07-LQFP112-P-2020-M

■ Pin Assignment



LQFP112-P-2020

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.