❑ MN101D07H

VTR Servo

Type	MN101D07H	
ROM (×8-bit)	160 K	
RAM (×8-bit)	5 K	
Package	LQFP112-P-2020 *Lead-free	
Minimum Instruction Execution Time	With main clock operated	0.1397 µs (at 4.0 V to 5.5 V, 14.32 MHz)
	When sub-clock operated	71.5 µs (at 3.0 V to 5.5 V fixed to 14.32 MHz internal frequency division) 61 µs (at 2.2 V to 5.5 V, 32.768 kHz)
Interrupts	• RESET • Runaway • External 0, 1, 2, 3, 4/key input (P50 to 54) • Timer 0 • Timer 1 • Timer 2 • Timer 3 • Timer 4 • Timer 6 • Capstan FG • Control • HSW • Cylinder FG • Servo VSYNC • Synchronous output • OSD • XDS • Serial 0 • Serial 1 • Serial 2 • A/D (common with PWM 4 reference frequency) • OSDVSYNC	
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, 1/12, 1/16, 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 (2^{18} 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 (timer function, event count [P53 input]) Clock source ····· 1/4, 1/8, 1/16, 1/32 of system clock frequency; external clock input Interrupt source ····· overflow of timer counter 7	
Serial Interface	Serial 0: 8-bit × 1 (synchronous type/start-stop synchronous type) (transfer direction of MSB/LSB selectable) Synchronous type clock source · 1/4, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256 of system clock frequency; 2-division timer 4 output; $\overline{\text{SBT0}}$ pin input Clock for UART ····· 8-division of above clock; 2-division timer 4 output; $\overline{\text{SBT0}}$ pin input	

Serial Interface (Continue)

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; $\overline{\text{SBT1}}$ pin input
- Remote control clock ····· 2-division timer 4 output

Serial 2: 8-bit × 1 (I^2C) (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 or super impose 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
Screen background color	: 8-hue settable (at output of composite video signal)
Character color	: white
Character intensity	: 8 gradations settable in the row unit
Frame function	: 1-dot frame in 4 or 8 directions
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	: 32 characters × 16 rows
Character type	: max. 128 character types (variable)
Character size	: 12 × 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
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
Input	: composite video signal input (output level: 1 V[p-p] / 2 V[p-p])
Clamp method	: sync chip 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)

See the next page for electrical characteristics, pin assignment and support tool.

XDS		Built-in U.S. closed caption data slicer (optional 2 line data can be extracted.)	
ROM Correction		Correcting address designation: up to 3 addresses possible Correction method: correction program being saved in internal RAM	
I/O Pins	**I/O**	85	• Common use: 85 ports 0, 1, 2, 4, 5, 6, 7, A, B (by bit)
	Input	2	• Common use: 2
A/D Inputs		8-bit × 13-ch. (without S/H)	
PWM		13-bit × 2-ch. (at repetition cycle 572 µs, 14.32 MHz), 10-bit × 2-ch. (at repetition cycle 71.5 µs, 14.32 MHz), 8-bit × 1-ch. (at repetition cycle 35.7 µs, 14.32 MHz)	
ICR		18-bit × 6-ch.	
OCR		16-bit × 7-ch. , 8-bit × 1-ch.	
Special Ports		Buzzer output; 3-state output (PTO) VLP pin; synchronous output: 7; 3-state synchronous output: 4; remote control receive; CTL amp; built-in FG amp; output of 1/2 OSC oscillation clock (2 V[p-p]); output of 1/4 OSC oscillation clock (1 V[p-p])	
Notes		VISS/VASS detection function	

Electrical Characteristics

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			20	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

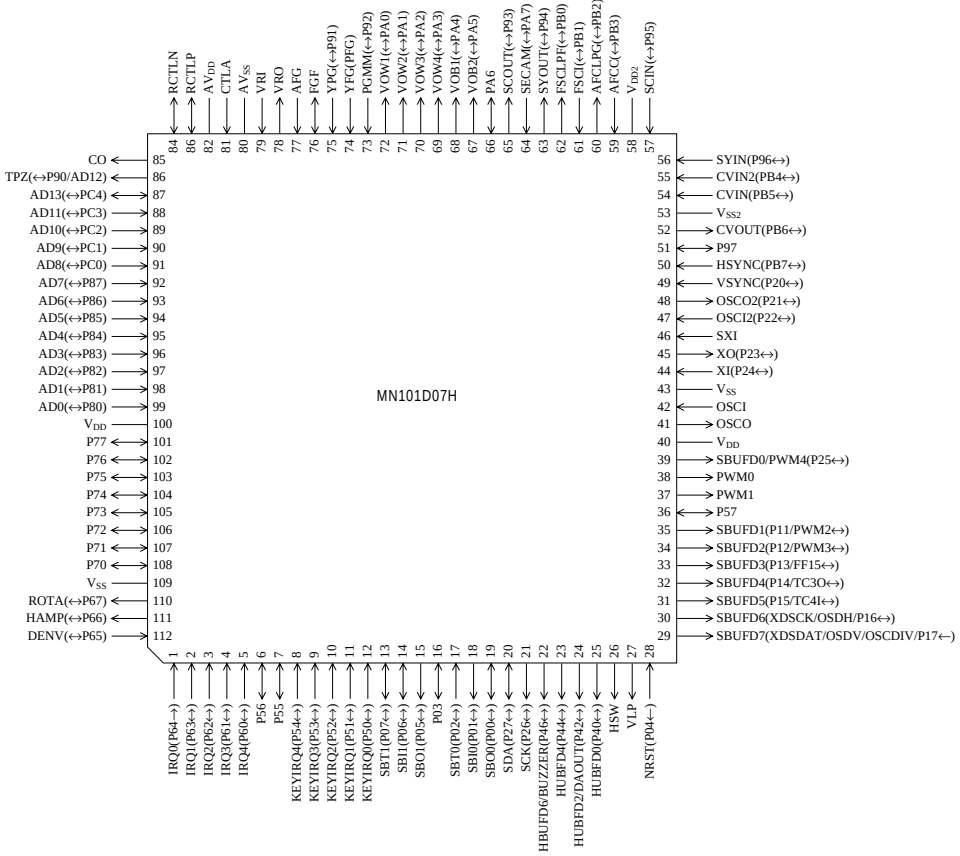
(Ta = 25°C ± 2°C , VSS = 0 V)

A/D Converter Performance

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

(Ta = 25°C ± 2°C ,VSS = 0 V)

Pin Assignment



LQFP112-P-2020 *Lead-free

Support Tool

In-circuit Emulator	PX-ICE101C / D + PX-PRB101D07-LQFP112-P-2020-M	
Flash Memory Built-in Type	Type	MN101DF07K [ES (Engineering Sample) available]
	ROM (× 8-bit)	224 K
	RAM (× 8-bit)	6 K
	Minimum instruction execution time	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, fixed to 14.32 MHz internal division)
	Package	LQFP112-P-2020 *Lead-free

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