

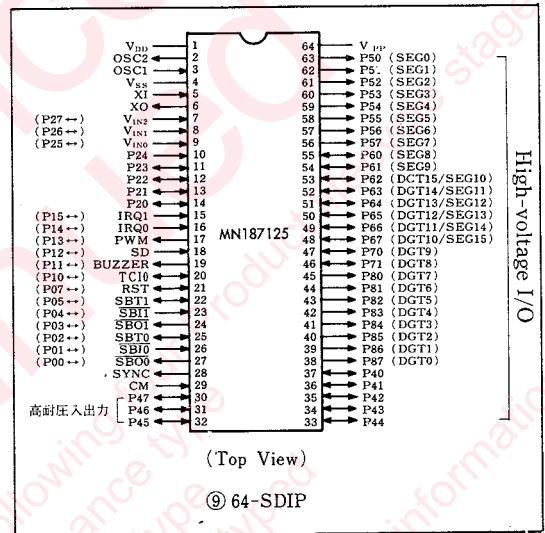
MN187125

■ Features

- ROM capacity:12,288 x 8 bits
- RAM capacity:320 X 8 bits(data area and stack area)
- Machine cycle:0.475 μ s(at 8.38 MHz),122 μ s(at 32 kHz)
Soft programmable
- Interrupt:External interrupt 2 levels
(one of them with noise filter)
Timer interrupt 4 levels
Serial interrupt 2 levels
FLT(key scan)interrupt 1 level
ADT(RAM automatic transfer)interrupt 1 level
- Timer counter:
8-bit programmable timer x 3 with prescaler
Pulse width measuring function
Event count function
Timer output function
Time base counter x 1
For time base,watch
Watchdog timer x 1
- Serial interface:
8-bit synchronous type x 2
Upper compatible with MN1500 series
1-to 8-bit send/receive
Arbitrary bits send by the swap mode(applied to remote control send)
Whether MSB/LSB is to be the first,and clock polarity soft programmable
MNOS interface function
Start condition function
- Fluorescent display tube drive function:
Max.16 segments x 16 digits(max.26 in total)
Comonly available for key scan
Dimmer 16 steps
- PWM output:14-bit resolution(7-bit basic cycle + 7-bit additional pulse)
Repeat cycle 15.6 ms(basic cycle 122 μ s)
- Analog input:4-bit simple A/D converter 3 channels

- Sync.signal detecting counter:Counts an input signal every constant cycle(measures a horizontal sync.signal)
- Buzzer output:2 kHx/4 kHz

■ Pin Configuration



- Remote control receive function:Reception by external interrupt input with noise filter
- ADT function:Capable of transferring up to 255-byte data in the RAM space. Transfer enabled among 3 addresses.
- Standby mode:STOP/HALT mode
Totally 9 modes available in combination with clock selection(NORMAL/IDEL/SLOW mode)
- Operating voltage range:
4.5 to 5.5 V(at 8.38 MHz)
2.7 to 5.5 V(at 32 kHz,STOP)
- I/O pins: 5 for general purpose I/O
18 for high-voltage I/O (fluorescent display tube output)
16 for high-voltage output (fluorescent display tube output)
16 for combined I/O(commonly used for interrupt input,serial interface)
- Package:64-SDIP
- Piggyback:EP187324
- Process:Silicon gate CMOS

■ Pin Descriptions

Symbol	Pin Name	I/O	Description
V _{DD} V _{SS}	Power supply	I	Connect +5V±10% to +3V±10% to V _{DD} , and 0 V to V _{SS}
V _{PP}	High-voltage output pull-down voltage input	I	Connect a voltage supplied to the pull-down resistors of the Ports 5-8
OSC1 OSC2	Clock input Clock output	I O	Oscillation pins to connect f _{osc} ceramic oscillator or crystal oscillator. When inputting a clock from the external, input to OSC1 and open the OSC2 pin. They are not available in the external clock mode when the STOP or SLOW mode is used.
XI XO	Clock input Clock output	I O	Oscillation pins to connect f _x ceramic oscillator or crystal oscillator. When inputting a clock from the external, input to XI and open the XO pin. They are not available in the external clock mode when the STOP mode is used.
SYNC	Timing output	O	Output a clock of f _{osc} /32768. Available for watch setting standard clock.
CM	Chip mode selector	I	Connect to V _{SS} .
RST	Reset input (Port 07) (Schmidt)	I/O	Pin to reset at power-on time. It is assigned to the port 07 and incorporated a pull-up resistor (typ. 50 kΩ). When reset is cancelled, there automatically occurs a hardware wait for system clock oscillation to be stabilized. The low level is outputted by writing "0" to the Port 07, when reset is applied by software as well. An output type is N-channel open drain. When inserting a capacitor between RST and V _{DD} , it is recommended to connect a discharge diode between them.
P00~P05 P07	Special port P0	I/O	7-bit I/O/input ports with special functions. Input/output can be set for each bit by the I/O direction register P0DIR. For details of each pin, see RST, SBO0, SBO1, SBI0, SBI1, SBT0 and SBT1. All the pins are placed in the input mode at reset time.
P10~P15	Special port P1	I/O I	6-bit I/O/input ports with special functions. For P10 through P13, input/output can be set for each bit by the I/O direction register P1DIR. P14 and P15 are input only ports. For details of each pin, see TCI0, BUZZER, RMOUT, PWM, IRQ0, IRQ1, respectively. P10 through P13 are placed in the input mode at reset time.
P20~P23	I/O port P2	I/O	4-bit CMOS 3-state I/O ports. Input/output can be set for each bit by the I/O direction register P3DIR. They are placed in the input mode at reset time. P20 is also available as a serial clock.
P24~P27	Special port P2	I/O	4-bit CMOS 3-state I/O ports with special functions. Input/output can be set for each bit by the I/O direction register P3DIR. For details of each pin, see V _{REF} , VINO, SD and V _{INI} . All the pins are placed in the input mode at reset time.

■ Pin Descriptions(Continued)

Symbol	Pin Name	I/O	Description
P40~P47	High-voltage input port P4	I	4-bit high-voltage I/O ports. P40-P43 are input only, and P44-P47 are I/O pins.
P50~P57 P80~P87	High voltage output port P5,P8	O	The ports P5 and P8 are high voltage output ports. An output type is P-channel open drain. Pull-down resistors are incorporated between these ports and the Vpp pin. They are set to the Low level at reset time.
P60~P67 P70~P71	High voltage I/O port P6, P7	I/O	The port P6 is an 8-bit high voltage I/O port, and P7 is a 2-bit one. An output type is P-channel open drain, pull-down resistors are incorporated between these ports and the Vpp pin. They are set to the Low level at reset time. The pull-down resistor of P6 is detachable by a mask option.(bit by bit)
$\overline{\text{SBO0}}$ $\overline{\text{SBO1}}$	(Port 00) (Port 03) Serial interface data output	I/O	Serial interface send data output pin. An output type is CMOS push-pull or N-channel open drain. Which type is to be used is software programmable. $\overline{\text{SBO0}}$ and $\overline{\text{SBO1}}$ are assigned to the port 00 and Port 03, respectively, and available as I/O pins when the serial interface is not used.
$\overline{\text{SBI0}}$ $\overline{\text{SBI1}}$	(Port 01) (Port 04) Serial interface data input	I/O	Serial interface receive data input pins. An output type is CMOS 3-state. $\overline{\text{SBI0}}$ and $\overline{\text{SBI1}}$ are assigned to the Port 01 and Port 04, respectively and available as I/O pins when the serial interface is not used.
SBT0 SBT1	(Port 02) (Port 05) Serial interface clock I/O (Schmidt)	I/O	Serial interface send/receive clock I/O pins. An output type is CMOS 3-state. $\overline{\text{SBI0}}$ and $\overline{\text{SBI1}}$ are assigned to the Port 01 and Port 04, and available as I/O pins when the serial interface is not used.
TCIO	Timer I/O (Port 10)	I/O	Clock output pin for the timer 1 and clock input pin for the timer 0. It serves as an output pin when the timer 1 is in the timer mode, and as an input pin when it is in the event count mode. An output type is CMOS 3-state. It is assigned to the Port 10 and available as an I/O pin when the timer 1 is not used.
BUZZER	Buzzer output (Port 11)	I/O	CMOS 3-state Output pin for $f_{osc}/2^{10}$ or $f_{osc}/2^{11}$ buzzer. Since it is assigned to the Port 11, it is available as a normal I/O pin when the buzzer is not used.
RMOUT	Pulse signal output (Port 12)	I/O	Pulse signal output pin. Since it is assigned to the Port 12, it is available as a normal I/O pin when pulse output is not used.
PWM	PWM output (Port 13)	I/O	14-bit PWM CMOS 3-state output pin. Since it is assigned to the Port 13, it is available as a normal input pin when PWM is not used.

■ Pin Descriptions (Continued)

Symbol	Pin Name	I/O	Description
IRQ0	External interrupt input (port 14) (Schmidt) (Port 15) (Schmidt)	I	External interrupt pin which receives an interrupt at a negative or positive edge. Which edge is to be made valid can be specified by the IRQM register. It is assigned to the Ports 14 and 15 and available as a normal input pin by masking an interrupt. IRQ1 incorporates a noise filter for receiving remote control.
V _{INO}	(PORT24)	I/O	Reference voltage input pin for the comparator 0. Commonly used as the Port 24.
V _{REF}	(PORT25)	I/O	Comparison voltage input pin for the comparator 0. Commonly used as the Port 25.
SD	(PORT26)	I/O	Horizontal sync. signal input pin. Input from this pin is directly given to a 9-bit counter. Commonly used as the Port 26.
V _{INI}	(PORT27)	I/O	Comparison voltage input pin for the comparator 1. Commonly used as the Port 27.

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