CMOS 8-BIT MICROCONTROLLER

TMP87PS39N

The 87PS39 is a One-Time PROM microcontroller with low-power 543K bits (a 60K bytes program memory and a 256 characters OSD font memory) electrically programmable read only memory for the 87CS39 system evaluation. The 87PS39 is pin compatible with the 87CS39. The operations possible with the 87CS39 can be performed by writing programs and OSD character data to PROM. The 87PS39 can write and verify in the same way as the TC571000 using an adaptor socket BM11118 and an EPROM programmer.

PART No.	OTP	RAM	PACKAGE	ADAPTOR SOCKET
TMP87PS39N	60Kbytes + 14 × 18 × 256 bits	2K bytes	SDIP64-P-750-1.78	BM11118

PIN ASSIGNMENTS (TOP VIEW)

SDIP64-P-750-1.78

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GND / VSS  ──►[ 1        64 ]◄── VDD / VCC
D6 / P06  ◄─►[ 2         63 ]◄─► P05 / D5
D7 / P07  ◄─►[ 3         62 ]◄─► P04 / D4
(INT0) P10  ◄─►[ 4       61 ]◄─► P03 / D3
(INT1) P11  ◄─►[ 5       60 ]◄─► P02 / D2
(INT2 / TC1) P12  ◄─►[ 6 59 ]◄─► P01 / D1
CE / (DVO) P13  ◄─►[ 7   58 ]◄─► P00 / D0
OE / (PPG) P14  ◄─►[ 8   57 ]◄─► P36 (SCK0)
PGM / (TC2) P15  ◄─►[ 9  56 ]◄─► P35 (SDA0 / SO0)
P16  ◄─►[ 10            55 ]◄─► P34 (SCL0 / SI0)
P17  ◄─►[ 11            54 ]◄─► P33 (TC4)
(PWM0) P40  ◄─►[ 12     53 ]◄─► P32 (INT4)
(PWM1) P41  ◄─►[ 13     52 ]◄─► P31 (TC3)
(PWM2) P42  ◄─►[ 14     51 ]◄─► P30 (INT3 / RXIN) / A16
(PWM3) P43  ◄─►[ 15     50 ]◄─► P22 (XTOUT)
(PWM4) P44  ◄─►[ 16     49 ]◄─► P21 (XTIN)
(PWM5) P45  ◄─►[ 17     48 ]◄─► P20 (INT5 / STOP)
(PWM6) P46  ◄─►[ 18     47 ]◄─► RESET
(PWM7) P47  ◄─►[ 19     46 ]──► XOUT
A0/ (PWM8) P50  ◄─►[ 20 45 ]◄── XIN
A1/ (PWM9) P51  ◄─►[ 21 44 ]◄── TEST / VPP
A2 / (AIN0) P52  ◄─►[ 22 43 ]──► OSC2
A3 / (AIN1) P53  ◄─►[ 23 42 ]◄── OSC1
A4 / (AIN2) P54  ◄─►[ 24 41 ]◄─► P74 (SCK1)
A5 / (AIN3) P55  ◄─►[ 25 40 ]◄─► P73 (SDA1 / SO1)
A6 / (AIN4) P56  ◄─►[ 26 39 ]◄─► P72 (SCL1 / SI1)
A7 / (AIN5) P57  ◄─►[ 27 38 ]◄─► P71 (VD)
A8 / (AIN6) P60  ◄─►[ 28 37 ]◄─► P70 (HD)
A9 / (AIN7) P61  ◄─►[ 29 36 ]◄─► P67 (Y / BL) / A15
A10 / P62  ◄─►[ 30     35 ]◄─► P66 (B) / A14
A11 / P63  ◄─►[ 31     34 ]◄─► P65 (G) / A13
GND / VSS  ──►[ 32     33 ]◄─► P64 (R) / A12
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SDIP64-P-750-1.78
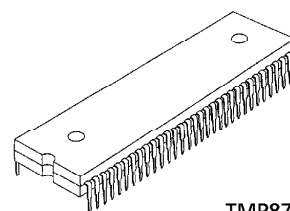
TMP87PS39N

PIN FUNCTION

The 87PS39 has two modes: MCU and PROM.

(1) MCU mode
In this mode, the 87PS39 is pin compatible with the 87CS39 (fix the TEST pin at low level).

(2) PROM mode

PIN NAME (PROM mode)	INPUT/OUTPUT	FUNCTIONS	PIN NAME (MCU mode)
A16	Input	PROM address inputs	P30
A15 to A8			P67 to P60
A7 to A0			P57 to P50
D7 to D0	I/O	PROM data input/outputs	P07 to P00
$\overline{CE}$	Input	Chip enable signal input (active low)	P13
$\overline{OE}$		Output enable signal input (active low)	P14
$\overline{PGM}$	Input	Program mode signal input (active low)	P15
VPP	Power supply	+ 12.5V / 5V (Program supply voltage)	TEST
VCC		+ 5V	VDD
GND		0V	VSS
P47 to P40	Input	Pull-up with resistance for input processing	
P12			
P74 to P70			
P36 to P32			
P11		PROM mode setting pin. Be fixed at high level.	
P21			
P31			
P17, P16, P10		PROM mode setting pin. Be fixed at low level.	
P22, P20			
$\overline{RESET}$			
XIN	Input	Connect an 8 MHz oscillator to stabilize the internal state.	
XOUT	Output		
OSC1	Input	Non connection	
OSC2	Output		

OPERATIONAL DESCRIPTION

The following explains the 87PS39 hardware configuration and operation. The configuration and functions of the 87PS39 are the same as those of the 87CS39, except in that a one-time PROM is used instead of an on-chip mask ROM.

The 87PS39 is placed in the *single-clock* mode during reset. To use the dual-clock mode, the low-frequency oscillator should be turned on by executing [SET (SYSCR2). XTEN] instruction at the beginning of the program.

1. OPERATING MODE

The 87PS39 has two modes: MCU and PROM.

1.1 MCU Mode

The MCU mode is activated by fixing the TEST / VPP pin at low level.

In the MCU mode, operation is the same as with the 87CS39 (the TEST / VPP pin cannot be used open because it has no built-in pull-down resistance).

1.1.1 Program Memory and OSD Character Font memory

The 87PS39 has a 60K × 8-bit (addresses 1100_H to $FFFF_H$ in the MCU mode, addresses 11100_H to $1FFFF_H$ in the PROM mode) of program memory and a 14 × 18 × 256 bits (addresses 04000_H to $07FFF_H$ in the PROM mode) of OSD character font memory.
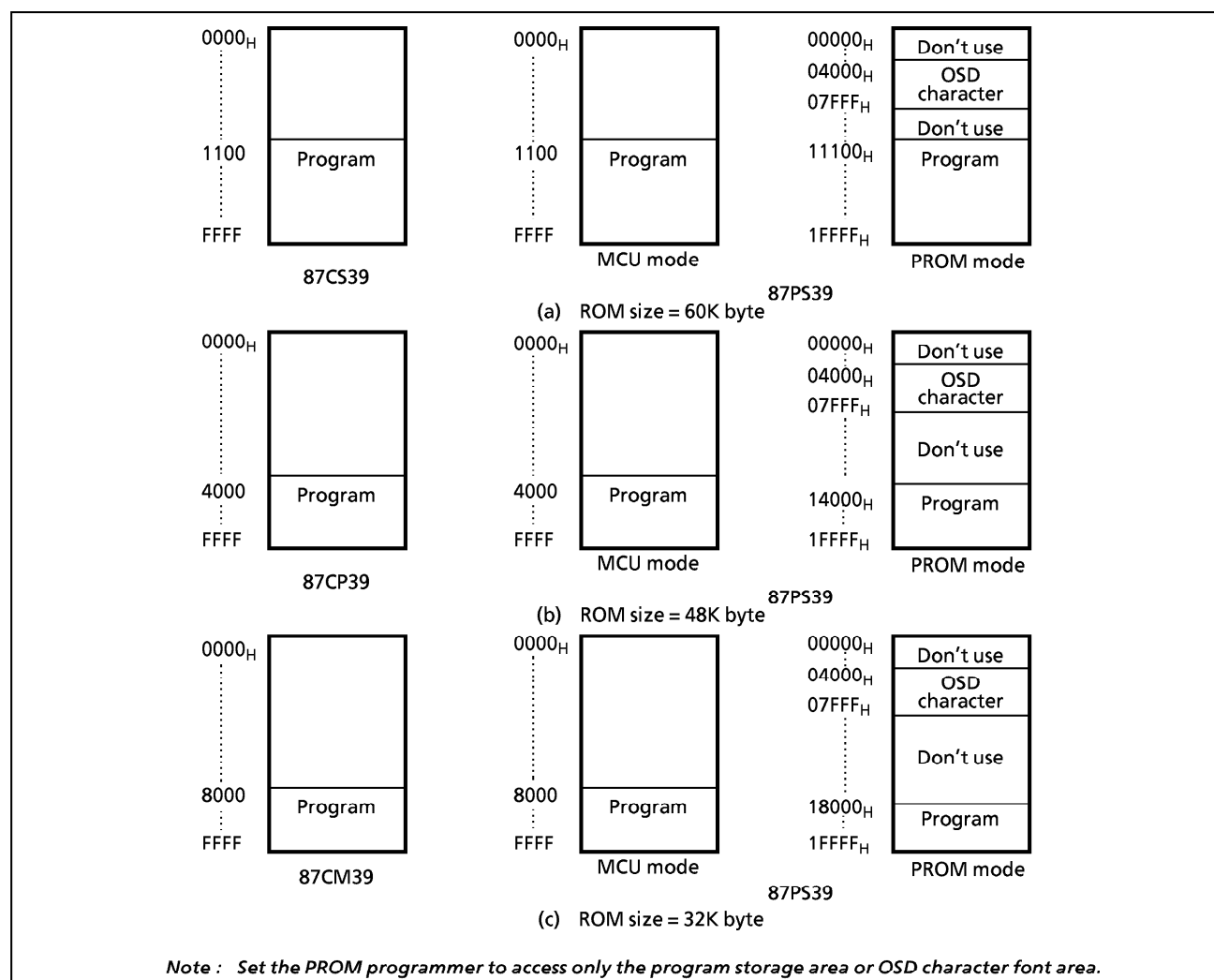

Note : Set the PROM programmer to access only the program storage area or OSD character font area.

Figure 1-1.   Program Memory Area

1.1.2   Data Memory

The 87PS39 has an on-chip 2K bytes data memory (static RAM).

1.1.3   Input/Output Circuitry

(1)   Control pins

The control pins of the 87PS39 are the same as those of the 87CS39 except that the TEST pin has no built-in pull-down resistance.
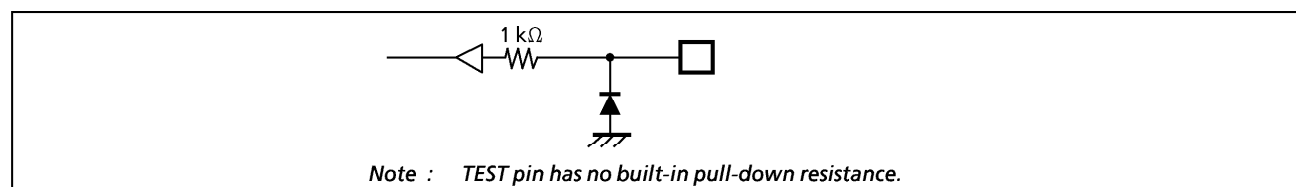

Note :   TEST pin has no built-in pull-down resistance.

Figure 1-2.   TEST Pin

(2)   I/O ports

The I/O circuitries of 87PS39 I/O ports the are the same as those of the 87CS39.

1.2   PROM Mode

The PROM mode is activated by setting the TEST, $\overline{\text{RESET}}$ pin and the ports P22 to P20, P17 to P16, P11 to P10 and P31 as shown in Figure 1-2. The PROM mode is used to write and verify programs with a general-purpose PROM programmer. The high-speed programming mode can be used for program operation. The 87PS39 is not supported an electric signature mode, so the ROM type must be set to TC571000.
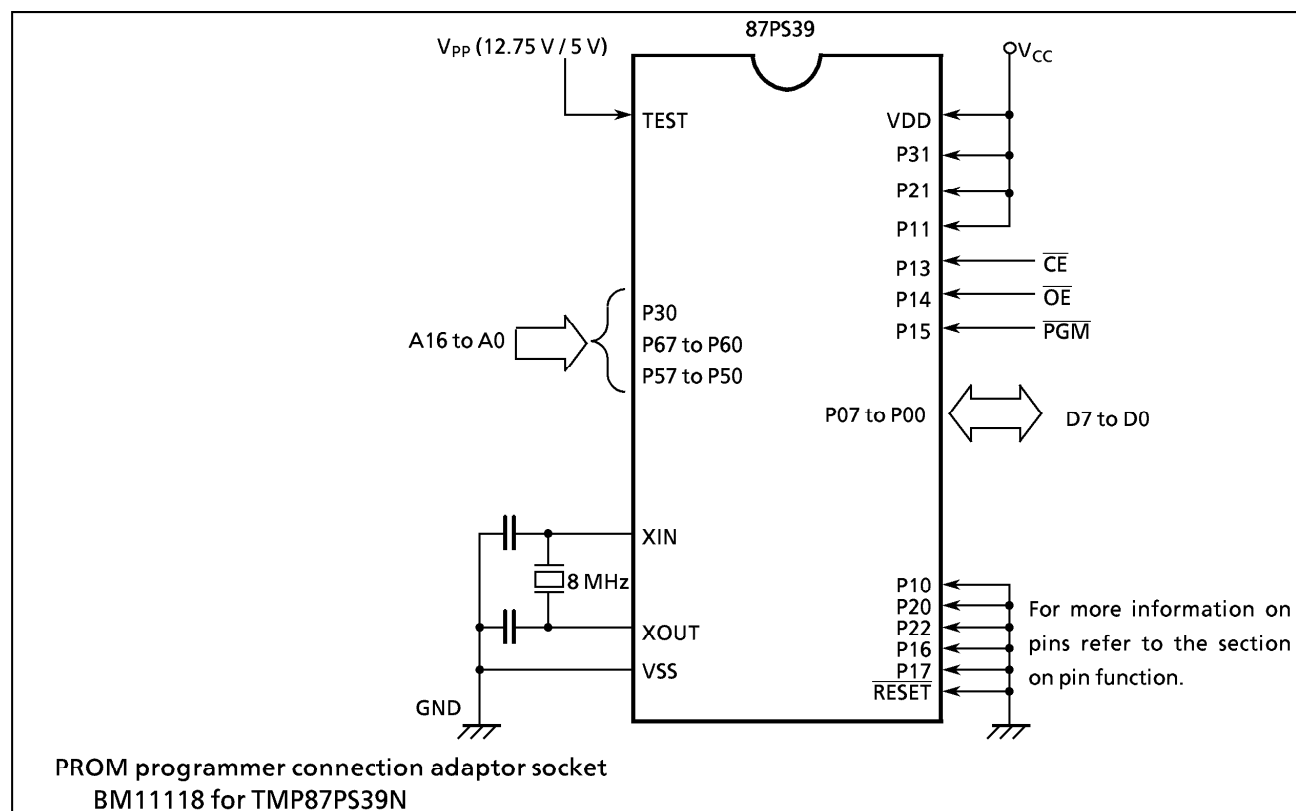Set the adaptor socket switch to "N".

Figure 1-3. Setting for PROM Mode

1.2.1 Programming Flowchart (High-speed Programming Mode)

The high-speed programming mode is achieved by applying the program voltage (+ 12.75 V) to the VPP pin when Vcc = 6.25 V. After the address and input data are stable, the data is programmed by applying a single 0.1 ms program pulse to the $\overline{PGM}$ input. The programmed data is verified. If incorrect, another 0.1 ms program pulse is applied. This process should be repeated (up to 25 times) until the program operates correctly. After that, change the address and input data, and program as before. When programming has been completed, the data in all addresses should be verified with Vcc = Vpp = 5 V.
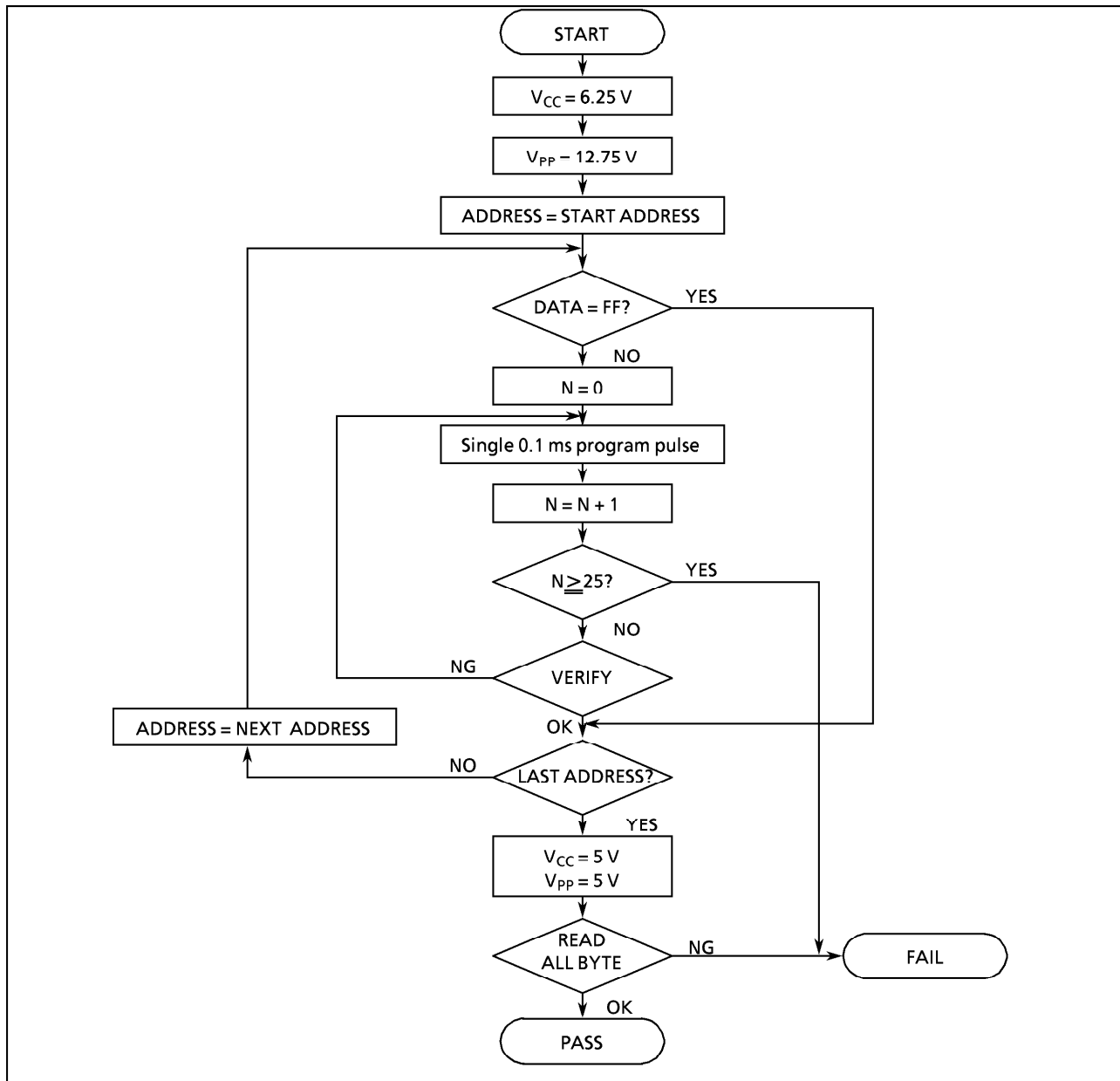

Figure 1-4. Flow Chart of High-Speed Programming

1.2.2   Writing method for general-purpose PROM program

(1)   Adapters
        BM11118 : TMP87PS39N

(2)   Adapter setting
        Switch (SW1) is set to side N.

(3)   PROM programmer specifying
    i)   PROM type is specified to TC571000D.
            Writing voltage：   12.75 V (high-speed program mode)

    ii)   Data transfer (copy) (note 1)
            In the TMP87PS39, EPROM is within the addresses 04000_H to $07FFF_H$, and 11100_H to $1FFFF_H$. Data
            is required to be transferred (copied) to the addresses where it is possible to write. The program
            area in MCU mode and PROM mode is referred to "Program memory area" in figure 1-1.

    iii) Writing address is specified. (note 1)
            Start address : 04000_H
            End address : $1FFFF_H$

(4)   Writing
        Writing/Verifying is required to be executed in accordance with PROM programmer operating
        procedure.

> Note 1 :   *The specifying method is referred to the PROM programmer description. Either write the
>   data FF_H to the unused area or set the PROM programmer to access only the program
>   storage area.*
> Note 2 :   *When MCU is set to an adapter or the adapter is set to PROM programmer, a position of pin
>   1 must be adjusted. If the setting is reversed, MCU, the adapter and PROM program is
>   damaged.*
> Note 3 :   *The TMP87PS39 does not support the electric signature mode (hereinafter referred to as
>   "signature"). If the signature is used in PROM program, a device is damaged due to applying
>   12V ± 0.5V to the address pin 9 (A9). The signature must not be used.*