

## NMOS 4-BIT MICROCONTROLLER

## TMP4250N, TMP4270N

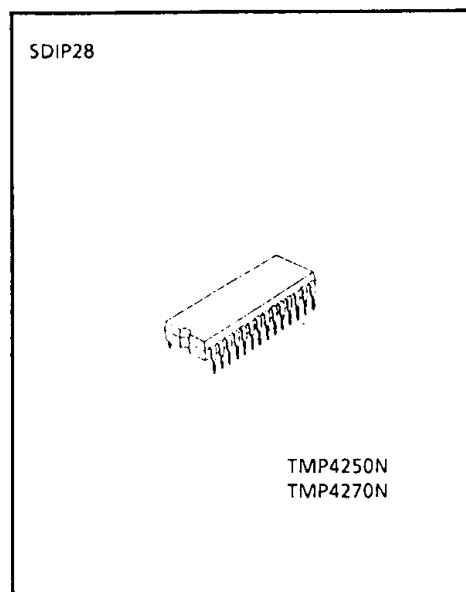
The 4250 / 70 are high speed, 4-bit single chip microcomputers with additional input/output ports and based on the TLCS-42 NMOS series.

The 4250 / 70 are suitable for control of home appliances (such as fans, air-conditioners, refrigerators), audio equipments, games, and toys.

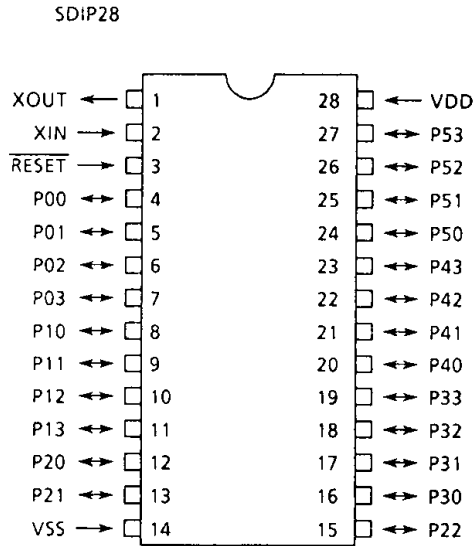
PART No.	ROM	RAM	PACKAGE	PIGGYBACK BOARD
TMP4250N	512 × 8-bit	32 × 4-bit	SDIP28	BM4211B
TMP4270N	1024 × 8-bit			

## FEATURES

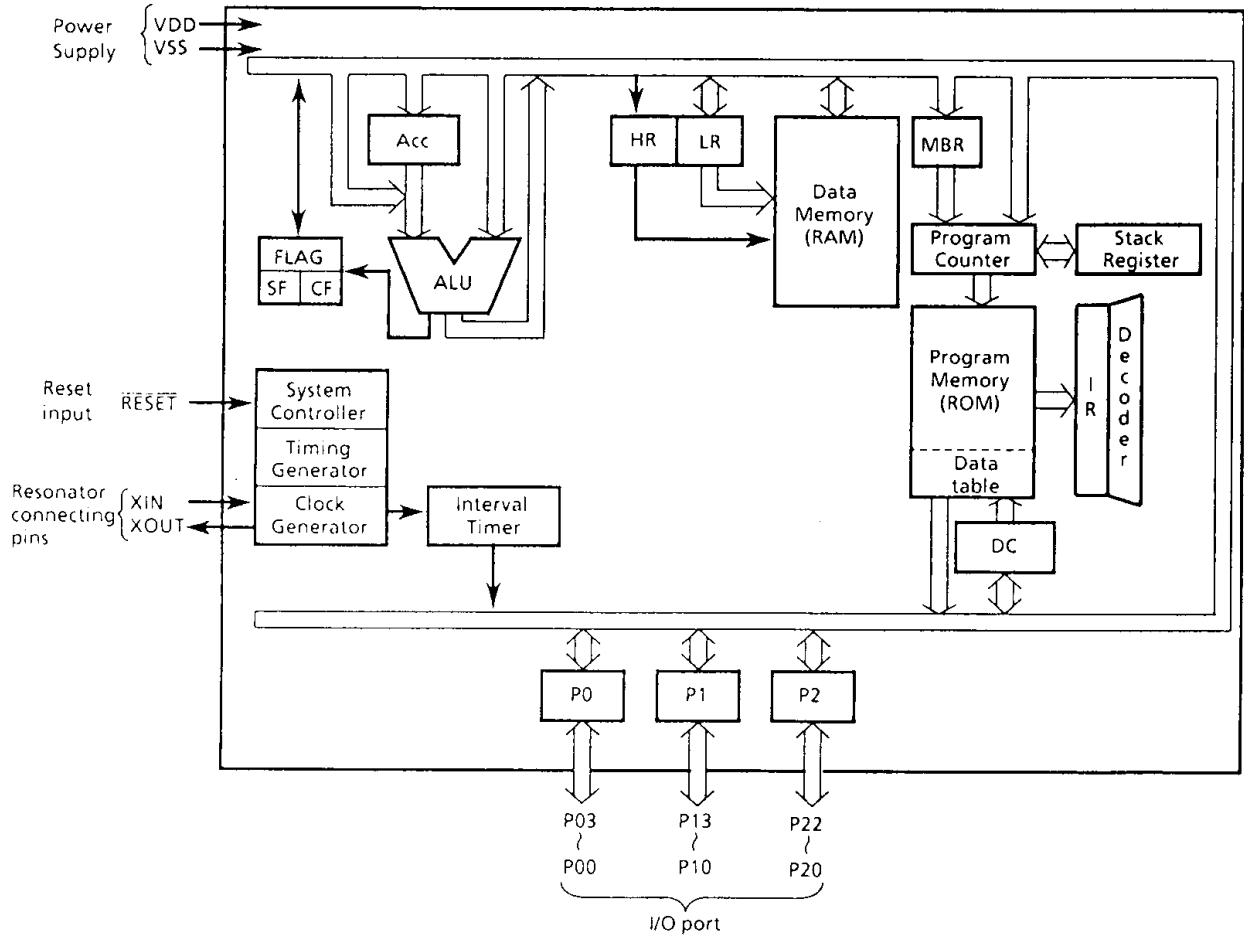
- ◆ 4-bit single chip microcomputer
- ◆ Instruction execution time : 2.5 $\mu$ s (at 2MHz)
- ◆ 42 basic instructions
  - All instructions are one byte object code
  - Table look-up instructions
- ◆ Stack for subroutine call : 1 level
- ◆ I/O port (11 pins)
  - I/O 3ports 11pins
- ◆ Interval Timer (11 stages)
- ◆ High current outputs
  - LED direct drive is available.
- ◆ Real Time Emulator : BM4221A



PIN ASSIGNMENT (TOP VIEW)



BLOCK DIAGRAM



## PIN FUNCTION

PIN NAME	INPUT/OUTPUT	FUNCTION
P03 - P00	I/O	4-bit programmable I/O ports with latch. When used as input port, the latch must be set to "1".
P13 - P10		
P22 - P20		3-bit programmable I/O port with latch. When used as input port, the latch must be set to "1".
P33 - P30		
P43 - P40		4-bit programmable I/O ports with latch. When used as input port, the latch must be set to "1".
P53 - P50		
XIN	INPUT	Resonator connecting pins.
XOUT	OUTPUT	For inputting external clock, XIN is used and XOUT is opened.
RESET	INPUT	Reset signal input
VDD	Power Supply	+5V
VSS		0V (GND)

OPERATIONAL DESCRIPTION

The 4250/70 are similar to the 4240/60, except for the addition of 3 input/output ports (12 pins). All other operations and functions are exactly the same as those of the 4240/60 (Naturally, the 4250/70 have interval timers). Consequently, except for the input/output ports, all operations are the same as those of the 42C40/60 which are standard LSI's in the TLC5-42 CMOS series (However, the 4250/70 do not have hold functions and port registers). Refer to the 42C40/60 technical data sheets for details.

1. PERIPHERAL HARDWARE FUNCTION

1.1 I/O Ports

The 4250/70 have 3 I/O ports (11 pins) each as follows :

- ① P0, P1 ; 4-bit input/output
- ② P2 ; 3-bit input/output
- ③ P3, P4, P5 ; 4-bit input/output

The following explanation covers only port (3) added to the 4240/60. All of the ports have output latches, so output data are held by the latches. There is no input latch, so external input data are either held externally until read, or are read several times before processing, when necessary.

- (1) Ports P3 (P33-P30), P4 (P43-P40), P5 (P53-P50)

These are input/output ports with latch. Ports P0 and P1 have 4 bits each, and P2 has 3 bits. When used as input ports, latch should be set to "1".

Pull-up resistor can be specified for each bit by mask options.

In addition, the 4240 does not have as interval timer ; therefore, interval timer output (ITS) is permanently set to "1".

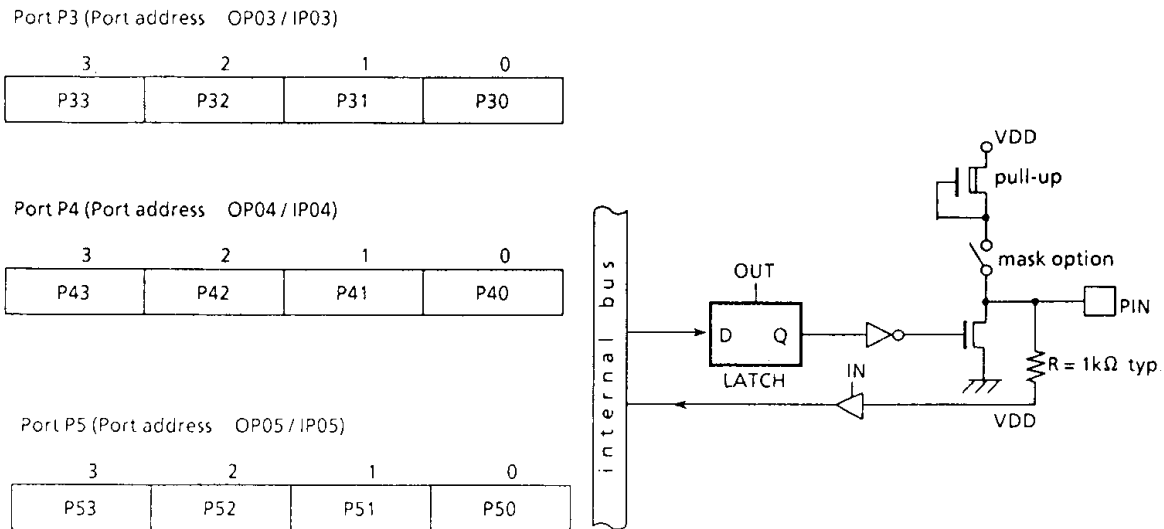


Figure 1-1 Ports P3, P4 and P5

## ELECTRICAL CHARACTERISTICS

ABSOLUTE MAXIMUM RATINGS (V<sub>SS</sub> = 0V)

PARAMETER	SYMBOL	PINS	RATINGS	UNIT
Supply Voltage	V <sub>DD</sub>		- 0.5 to 7	V
Input Voltage	V <sub>IN</sub>		- 0.5 to 7	V
Output Voltage	V <sub>OUT1</sub>	Except sink open drain pin	- 0.5 to 7	V
	V <sub>OUT2</sub>	Sink open drain pin	- 0.5 to 15	
Output Current (total)	ΣI <sub>OUT</sub>		90	mA
Power Dissipation [T <sub>opr</sub> = 85°C]	PD		300	mW
Soldering Temperature (time)	T <sub>sld</sub>		260 (10sec)	°C
Storage Temperature	T <sub>stg</sub>		- 55 to 125	°C
Operating Temperature	T <sub>opr</sub>		- 40 to 85	°C

RECOMMENDED OPERATING CONDITIONS (V<sub>SS</sub> = 0V, T<sub>opr</sub> = - 40 to 85°C)

PARAMETER	SYMBOL	PINS	CONDITIONS	Min.	Max.	UNIT
Supply Voltage	V <sub>DD</sub>			4.5	5.5	V
Input High Voltage	V <sub>IH1</sub>	Except $\overline{\text{RESET}}$		2.2	V <sub>DD</sub>	V
	V <sub>IH2</sub>	$\overline{\text{RESET}}$ pin		3.0		
Input Low Voltage	V <sub>IL1</sub>	Except $\overline{\text{RESET}}$ pin		0	0.8	V
	V <sub>IL2</sub>	$\overline{\text{RESET}}$ pin			0.6	
Clock Frequency	f <sub>c</sub>			0.2	2.0	MHz

D.C. CHARACTERISTICS

( $V_{SS} = 0V$ ,  $T_{opr} = -40$  to  $85^{\circ}C$ )

PARAMETER	SYMBOL	PIN	CONDITIONS	Min.	Typ.	Max.	UNIT
Hysteresis Voltage	$V_{HS}$	RESET		—	0.3	—	V
Input Current	$I_{IN}$	Open drain pin	$V_{DD} = 5.5V$ , $V_{IN} = 0.4V$	—	$-10^{-5}$	-2.0	$\mu A$
Low Level Input Current	$I_{IL1}$	RESET	$V_{DD} = 5.5V$ , $V_{IN} = 0.6V$	—	-50	-100	$\mu A$
	$I_{IN2}$	Pin with pull-up resistor		—	—	-360	
Output Leakage Current	$I_{LO}$	Open drain pin	$V_{DD} = 5.5V$ , $V_{OUT} = 5.5V$	—	$10^{-5}$	2.0	$\mu A$
Output Level High Voltage	$V_{OH}$	Pin with pull-up resistor	$V_{DD} = 5V$ , $I_{OH} = -5\mu A$	4.7	4.9	—	V
Output Level High Current	$I_{OH}$		$V_{DD} = 4.5V$ , $V_{OH} = 2.4V$	-50	—	—	$\mu A$
Low Level output Current	$I_{OL1}$	Port P0, P1, P2	$V_{DD} = 4.5V$ , $V_{OL} = 0.4V$	1.6	10.0	—	mA
	$I_{OL2}$		$V_{DD} = 4.5V$ , $V_{OL} = 1.2V$	10	25	—	
Supply Current	$I_{DD}$		$V_{DD} = 5.5V$	—	19	40	mA

Note1. Typ. values shows those at  $V_{DD} = 5V$ ,  $T_{opr} = 25^{\circ}C$

Note2. Supply Current : RESET pin is 0V, and XOUT pin and ports are opened in the external clock operation.

A.C. CHARACTERISTICS

( $V_{SS} = 0V$ ,  $V_{DD} = 4.5$  to  $5.5V$ ,  $T_{opr} = -40$  to  $85^{\circ}C$ )

PARAMETER	SYMBOL	CONDITIONS		Min.	Typ.	Max.	UNIT
Instruction Cycle Time	$t_{cy}$			2.5	—	25	$\mu s$
High level Clock pulse Width	$t_{WCH}$	$V_{IN} = V_{IH}$	For external clock operation	100	—	—	ns
Low level Clock pulse Width	$t_{WCL}$	$V_{IN} = V_{IL}$					

RECOMMENDED OSCILLATING CONDITIONS

( $V_{SS} = 0V$ ,  $V_{DD} = 4.5$  to  $5.5V$ ,  $T_{opr} = -40$  to  $85^{\circ}C$ )

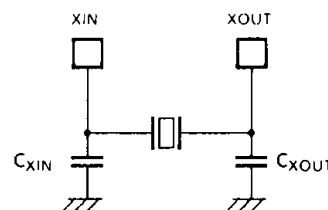
(1) Ceramic Rrsonator

2MHz

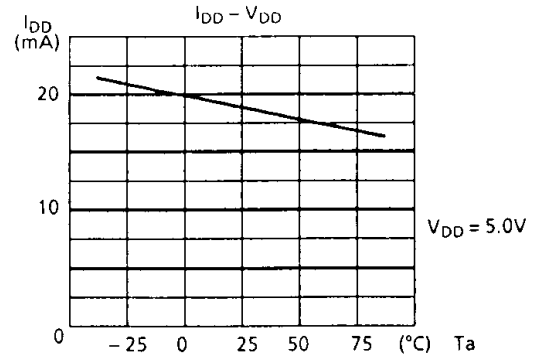
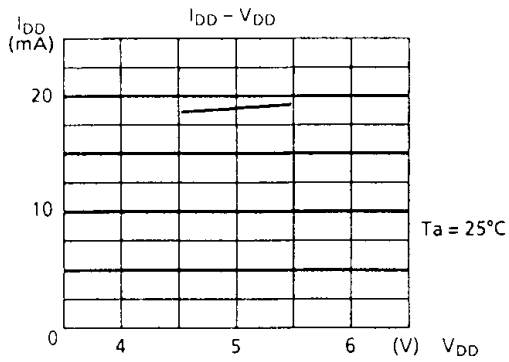
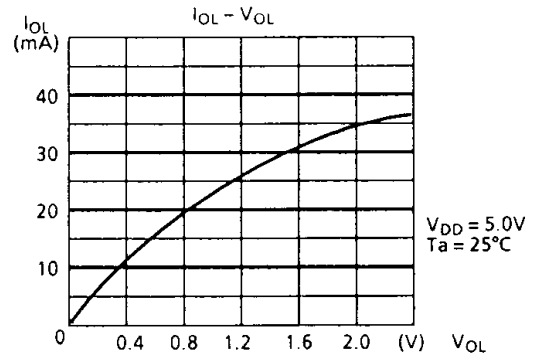
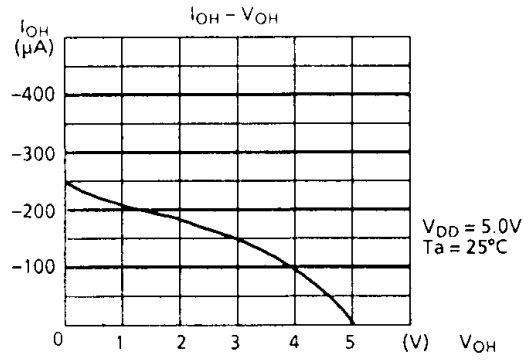
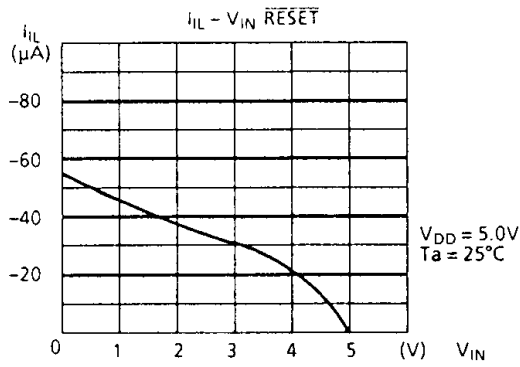
CSA2.00MG (MURATA)  $C_{XIN} = C_{XOUT} = 50pF$

400KHz

CSB400B (MURATA)  $C_{XIN} = C_{XOUT} = 220pF$



TYPICAL CHARACTERISTICS



INPUT/OUTPUT CIRCUITRY

(1) Control pins

Input/Output circuitries of the 42C50/70 control pins are shown below.

CONTROL PIN	I/O	CIRCUITRY	REMARKS
XIN XOUT	INPUT OUTPUT		Resonator connecting pins $R = 1K\Omega$ (typ.) $R_f = 1M\Omega$ (typ.) $R_O = 0.5K\Omega$ (typ.)
RESET	INPUT		Hysteresis input Pull-up resistor $R_{IN} = 90K\Omega$ (typ.) $R = 1K\Omega$ (typ.)

(2) I/O ports

Input/Output circuitries of the 42C50/70 I/O ports are shown below. Pull-up resistor can be specified for each bit by mask option.

PORT	I/O	CIRCUITRY	INITIAL STATE	REMARKS
P0 P1 P2 P3 P4 P5	I/O	Option : open drain output 	Hi-Z (INPUT)	Sink open drain output $R = 1K\Omega$ (typ.)
		Option : open drain output with pull-up 	High (INPUT)	Pull-up resistor $R_L = 20K\Omega$ (typ.) $R = 1K\Omega$ (typ.)