CMOS 4-Bit Microcontroller

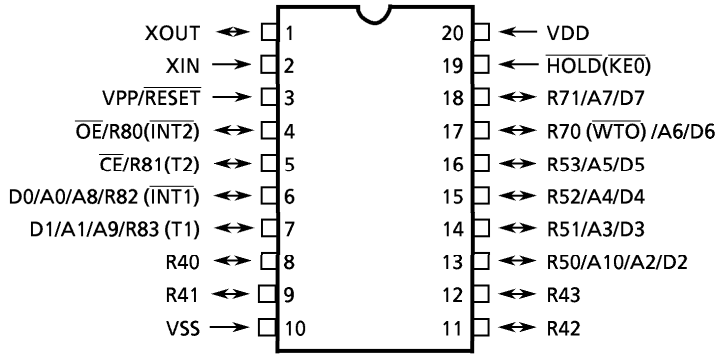
TMP47P202VP
TMP47P202VM

The TMP47P202V is the system evaluation LSI of TMP47C102/202 with a 16 Kbit one-time PROM. The TMP47P202V programs / verifies using an adapter socket to connect with PROM programmer, as it is in TMM27256AD.
In addition, the TMP47P202V and the TMP47C102/202 are pin compatible. The TMP47P202V operates as the same as the TMP47C102/202 by programming to the internal PROM.

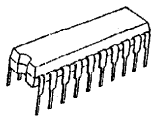
Part No.	ROM	RAM	Package	OTP
TMP47P202VP	OTP 2048 × 8-bit	128 × 4-bit	P-DIP20-300-2.54A	BM1187
TMP47P202VM			P-SOP20-300-1.27	BM11113

Pin Assignment (Top View)

P-DIP20-300-2.54A / P-SOP20-300-1.27

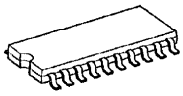


P-DIP20-300-2.54A



TMP47P202VP

P-SOP20-300-1.27



TMP47P202VM

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Pin Function

The TMP47P202V has MCU mode and PROM mode.

(1) MCU mode

The TMP47C102/202 and the TMP47P202V are pin compatible.

(2) PROM mode

Pin Name	Input / Output	Functions	Pin Name (MCU mode)
D0 / A0 / A8	I/O	Data inputs / outputs or Address inputs	R82
D1 / A1 / A9			R83
D2 / A2 / A10			R50
D3 / A3			R51
D4 / A4			R52
D5 / A5			R53
D6 / A6			R70
D7 / A7			R71
$\overline{OE}$	Input	Output Enable input	R80
$\overline{CE}$		Chip Enable input	R81
VPP	Power supply	+ 12.5 V / 5 V (Program supply voltage)	$\overline{RESET}$
VCC		+ 5 V	VDD
VSS		0 V	VSS
R43 to R40	I/O	Be fixed to low level.	
$\overline{HOLD}$	Input	PROM mode setting pin. Be fixed to low level.	
XIN	Input	Input the clock from the external oscillator.	
XOUT	Input	PROM control input	

Operational Description

The following is an explanation of hardware configuration and operation in relation to the TMP47P202V. The TMP47P202V is the same as the TMP47C102/202 except that an OTP is used instead of a built-in mask ROM.

1. Operation mode

The TMP47P202V has an MCU mode and a PROM mode.

1.1 MCU mode

The MCU mode is set by attaching a resonator between the XIN and XOUT pins. Operation in the MCU mode is the same as for the TMP47C102/202. In the TMP47P202V, RC oscillation is impossible.

1.1.1 Program Memory

The program storage area is the same as for the TMP47C202. Don't use the addresses 400 to $7FF_H$ when using the TMP47P102V to check TMP47C102 operation.

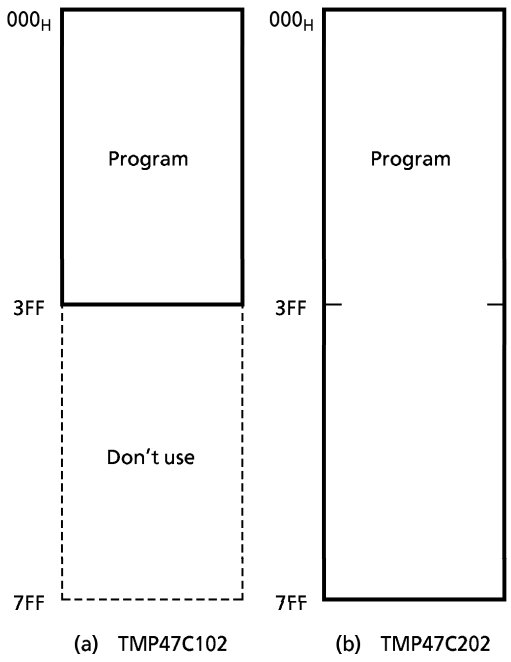


Figure 1-1. Program Area

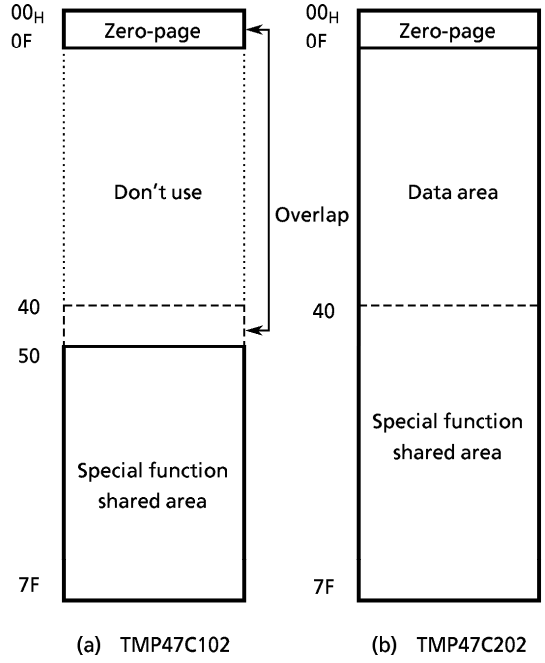


Figure 1-2. RAM Address Assignment

1.1.2 Data Memory

The TMP47P202V has 128 × 4-bit of data memory (RAM). When the TMP47P202V is used as the TMP47C102 evaluator, programming should be performed assuming that the RAM is assigned to address 00 to $0F_H$ and 50 to $7F_H$ as show in Figure 1-2. When the BM47C203 (emulator) is used as the TMP47C102 evaluator, it is same.

Further, zero-page (addresses 00 to $0F_H$) and special function shared area (stack location 0 to 3) are overlapped on the TMP47C102.

Electrical Characteristics

Absolute Maximum Ratings (V_{SS} = 0 V)

Parameter	Symbol	Pins	Ratings	Unit
Supply Voltage	V_{DD}		– 0.3 to 6.5	V
Program Voltage	V_{PP}	$\overline{RESET}$ / VPP	– 0.3 to 13.0	V
Input Voltage	V_{IN}		– 0.3 to V_{DD} + 0.3	V
Output Voltage	V_{OUT}		– 0.3 to V_{DD} + 0.3	V
Output Current (Per 1 pin)	I_{OUT1}	Port R4	30	mA
	I_{OUT2}	Port R5	15	
	I_{OUT3}	Port R7, R8	3.2	
Output Current (Total)	ΣI_{OUT}	Port R4, R5	60	mA
Power Dissipation [Topr = 70°C]	PD		300	mW
Soldering Temperature (time)	Tsld		260 (10 s)	°C
Storage Temperature	Tstg		– 55 to 125	°C
Operating Temperature	Topr		– 30 to 70	°C

Note: The absolute maximum ratings are rated values which must not be exceeded during operation, even for an instant. Any one of the ratings must not be exceeded. If any absolute maximum rating is exceeded, a device may break down or its performance may be degraded, causing it to catch fire or explode resulting in injury to the user. Thus, when designing products which include this device, ensure that no absolute maximum rating value will ever be exceeded.

Recommended Operating Conditions (V_{SS} = 0 V, Topr = – 30 to 70°C)

Parameter	Symbol	Pins	Conditions	Min	Max	Unit
Supply Voltage	V_{DD}		fc = 6.0 MHz	4.5	5.5	V
			fc = 4.2 MHz	2.7		
			HOLD mode	2.0		
Input High Voltage	V_{IH1}	Except Hysteresis Input	In the normal operating area	V_{DD} × 0.7	V_{DD}	V
	V_{IH2}	Hysteresis Input		V_{DD} × 0.75		
	V_{IH3}		In the HOLD mode	V_{DD} × 0.9		
Input Low Voltage	V_{IL1}	Except Hysteresis Input	In the normal operating area	0	V_{DD} × 0.3	V
	V_{IL2}	Hysteresis Input			V_{DD} × 0.25	
	V_{IL3}		In the HOLD mode		V_{DD} × 0.1	
Clock Frequency	fc	XIN, XOUT	V_{DD} = 4.5 to 5.5 V	0.4	6.0	MHz
			V_{DD} = 2.7 to 5.5 V		4.2	

Note: The recommended operating conditions for a device are operating conditions under which it can be guaranteed that the device will operate as specified. If the device is used under operating conditions other than the recommended operating conditions (supply voltage, operating temperature range, specified AC/DC values etc.), malfunction may occur. Thus, when designing products which include this device, ensure that the recommended operating conditions for the device are always adhered to.

DC Characteristics

(V_{SS} = 0 V, T_{opr} = − 30 to 70°C)

Parameter	Symbol	Pins	Conditions	Min	Typ.	Max	Unit
Hysteresis Voltage	V_{HS}	Hysteresis Input		–	0.7	–	V
Input Current	I_{IN1}	$\overline{RESET}$, $\overline{HOLD}$	V_{DD} = 5.5 V, V_{IN} = 5.5 V / 0 V	–	–	± 2	μA
	I_{IN2}	Open drain output ports					
Input Resistance	R_{IN}	$\overline{RESET}$		100	220	450	kΩ
Output Leakage Current	I_{LO}	Open drain output ports	V_{DD} = 5.5 V, V_{OUT} = 5.5 V	–	–	2	μA
Output Low Voltage	V_{OL}	Except XOUT and port R4	V_{DD} = 4.5 V, I_{OL} = 1.6 mA	–	–	0.4	V
Output Low Current	I_{OL1}	Port R4	V_{DD} = 4.5 V, V_{OL} = 1.0 V	–	20	–	mA
	I_{OL2}	Port R5		–	7	–	
Supply Current (in the Normal operating mode)	I_{DD}		V_{DD} = 5.5 V, fc = 4 MHz	–	2	4	mA
			V_{DD} = 3.0 V, fc = 4 MHz	–	1	2	
			V_{DD} = 3.0 V, fc = 400 kHz	–	0.5	1	
Supply Current (in the HOLD operating mode)	I_{DDH}		V_{DD} = 5.5 V	–	0.5	10	μA

Note 1: Typ. values show those at Topr = 25°C, V_{DD} = 5 V.

Note 2: Input Current I_{IN1}: The current through resistor is not included.

Note 3: Supply Current: V_{IN} = 5.3 V / 0.2 V (V_{DD} = 5.5 V) or 2.8 V / 0.2 V (V_{DD} = 3.0 V)

AC Characteristics

(V_{SS} = 0 V, Topr = – 30 to 70°C)

Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Instruction Cycle Time	t_{cy}		VDD = 4.5 to 5.5 V	1.3	–	20	μs
			VDD = 2.7 to 5.5 V	1.9			
High level Clock pulse Width	t_{WCH}	For external clock operation		80	–	–	ns
Low level Clock pulse Width	t_{WCL}						

Recommended Oscillating Conditions

(V_{SS} = 0 V, V_{DD} = 2.7 to 5.5 V, Topr = – 30 to 70°C)

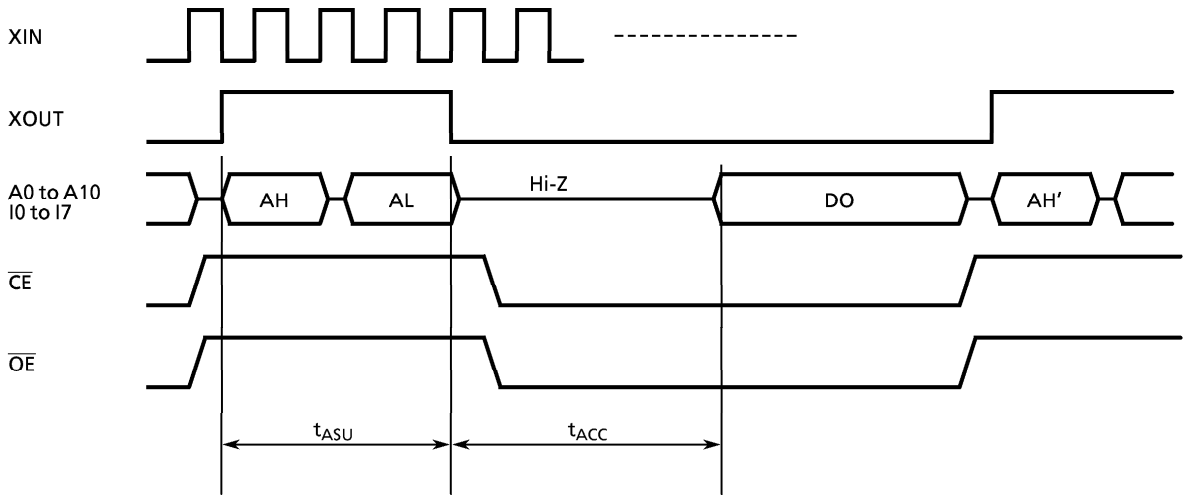
Recommended oscillating conditions of the TMP47P202V are equal to the TMP47C102/202's but RC oscillation is impossible.

DC/AC Characteristics

(V_{SS} = 0 V)

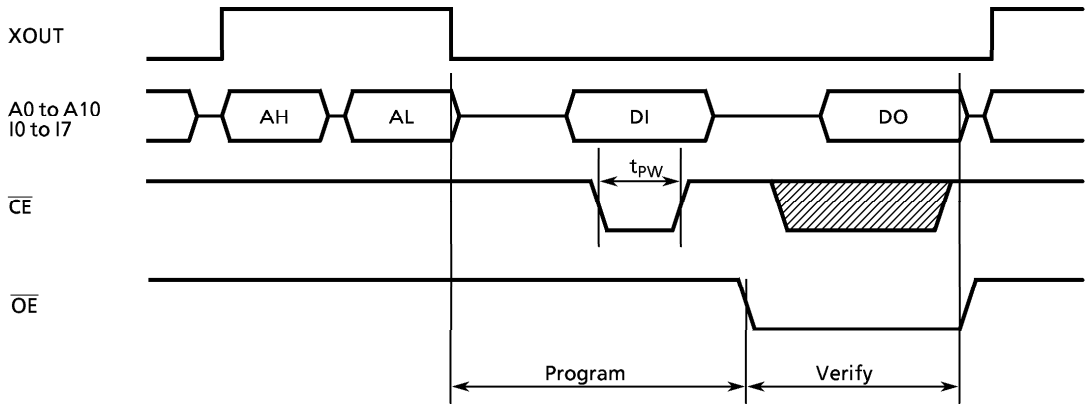
(1) Read Operation

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Output Level High Voltage	V_{IH4}		V_{CC} × 0.7	–	V_{CC}	V
Output Level Low Voltage	V_{IL4}		0	–	V_{CC} × 0.3	V
Supply Voltage	V_{CC}		4.75	–	6.0	V
Programming Voltage	V_{PP}					
Address Set-up Time	t_{ASU}		350	–	–	ns
Address Access Time	t_{ACC}	V_{CC} = 5.0 ± 0.25 V	–	–	300	ns



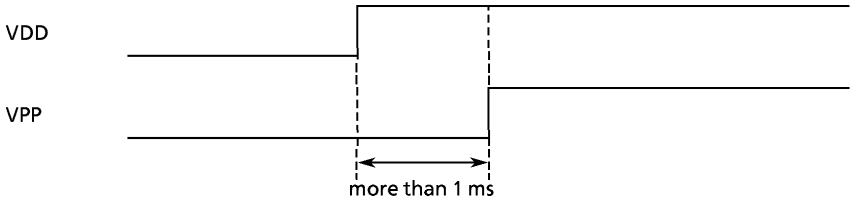
(2) High Speed Programming Operation

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Input High Voltage	V_{IH4}		$V_{CC} \times 0.7$	–	V_{CC}	V
Input Low Voltage	V_{IL4}		0	–	$V_{CC} \times 0.3$	V
Supply Voltage	V_{CC}		4.75	–	6.0	V
V_{PP} Power Supply Voltage	V_{PP}		12.0	12.50	13.00	V
Programming Pulse Width	t_{PW}	$V_{CC} = 6.0 \pm 0.25$ V	0.95	1.0	1.05	ms



Note: DO ; Data output (I0 to I7), AL ; Address input (A0 to A7)
DI ; Data input (I0 to I7), AH ; Address input (A8 to A10)

Note: There are some PROMprogrammer types which cannot program OTP.
In TMP47P202V, VPP pin is also used as RESET pin. To set a mode, REST/VPP pin must be set to "low" during 1 ms and more after the rising of power-on and the rising of VDD electrical power.



Recommende EPROM programmer

TYPE	
R4945	(ADVANTEST)
UNISITE	(DATA I/O)
AF – 9706	(ANDO)
PECKER – 11	(AVAL DATA)