

CMOS 4-Bit Microcontroller

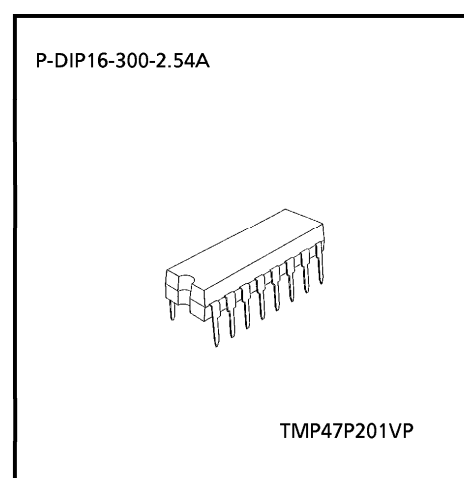
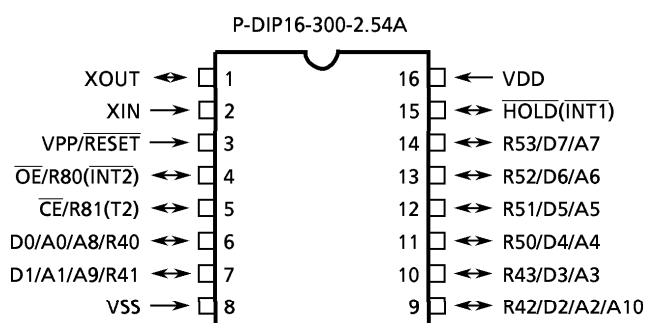
TMP47P201VP

The TMP47P201V is the system evaluation LSI of TMP47C101/201 with a 16 Kbit one-time PROM. The TMP47P201V programs / verifies using an adapter socket to connect with PROM programmer, as it is in TMM27256AD.

In addition, the TMP47P201V and the TMP47C101/201 are pin compatible. The TMP47P201V operates as the same as the TMP47C101/201 by programming to the internal PROM.

Part No.	ROM	RAM	Package	Adapter Socket
TMP47P201VP	OTP 2048 x 8-bit	128 x 4-bit	P-DIP16-300-2.54A	BM1187

Pin Assignment (Top View)



000707EBA1

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Pin Function

The TMP47P201V has MCU mode and PROM mode.

(1) MCU mode

The TMP47C101/201 and the TMP47P201V 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	R40
D1 / A1 / A9			R41
D2 / A2 / A10			R42
D3 / A3			R43
D4 / A4			R50
D5 / A5			R51
D6 / A6			R52
D7 / A7			R53
\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
\overline{HOLD}	Input	PROM mode setting pin. Be fixed to low level.	\overline{HOLD}
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 TMP47P201V. The TMP47P201V is the same as the TMP47C101/201 except that an OTP is used instead of a built-in mask ROM.

1. Operation mode

The TMP47P201V 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 TMP47C101/201. In the TMP47P201V, RC oscillation is impossible.

1.1.1 Program Memory

The program storage area is the same as for the TMP47C201. Don't use the addresses 400 to 7FF_H when using the TMP47P101V to check TMP47C101 operation.

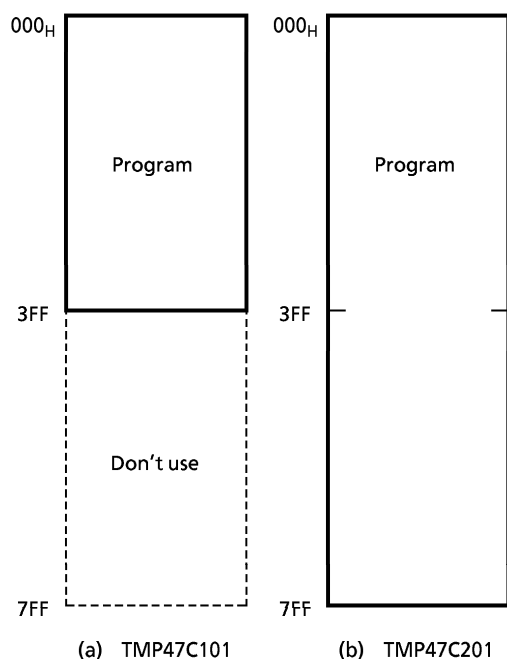


Figure 1-1. Program Area

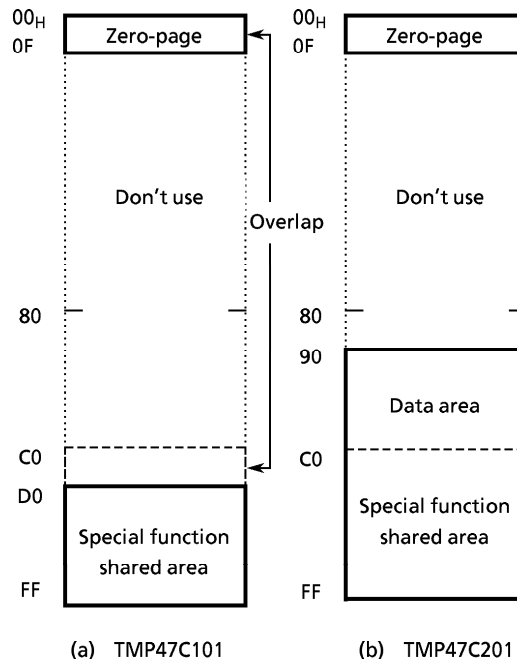


Figure 1-2. RAM Address Assignment

1.1.2 Data Memory

The TMP47P201V has 128×4-bit of data memory (RAM). When the TMP47P201V is used as the TMP47C101/201 evaluator, programming should be performed assuming that the RAM is assigned to address 00 to 0F_H and D0 to FF_H for TMP47C101, and 00 to 0F_H and 90 to FF_H for TMP47C201 as show in Figure 1-2. When the BM4721A (emulator) is used as the TMP47C101/201 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 TMP47C101.

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}	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}	Ports R5, R8, HOLD	3.2	
Output Current (Total)	Σ I _{OUT}	Port R4	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, Topr = – 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}	RESET, 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}	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
Supply Current (in the Normal operating mode)	I _{DD}		V _{DD} = 5.5 V, f _c = 4 MHz	–	2	4	mA
			V _{DD} = 3.0 V, f _c = 4 MHz	–	1	2	
			V _{DD} = 3.0 V, f _c = 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, T_{opr} = -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, T_{opr} = -30 to 70°C)

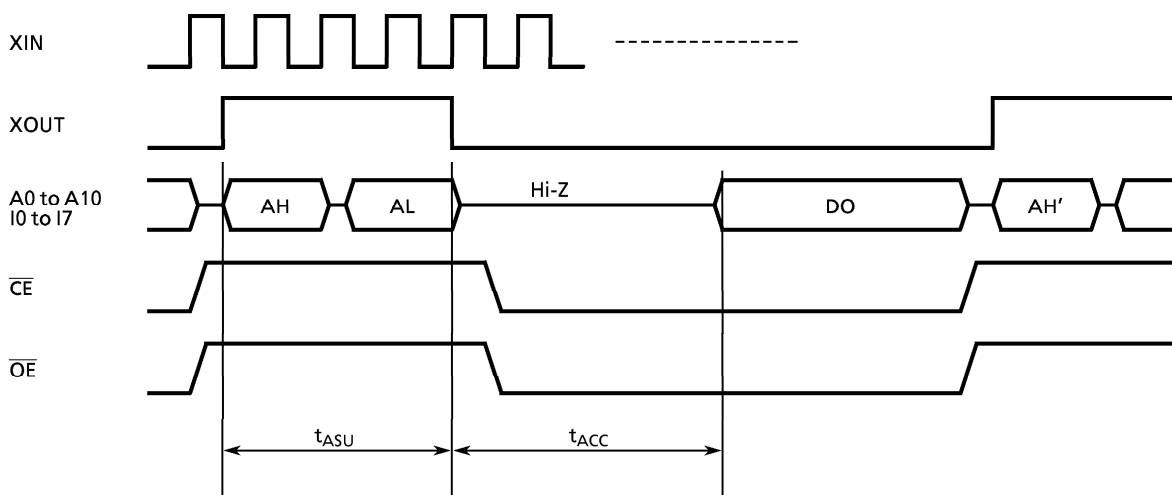
Recommended oscillating conditions of the TMP47P201V are equal to the TMP47C101/201's but RC oscillation is impossible.

DC/AC Characteristics

(V_{SS} = 0 V)

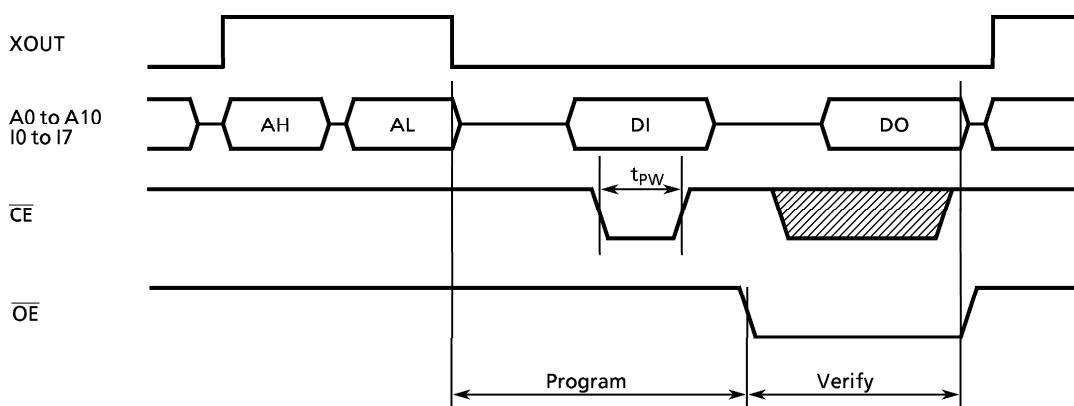
(1) Read Operation

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



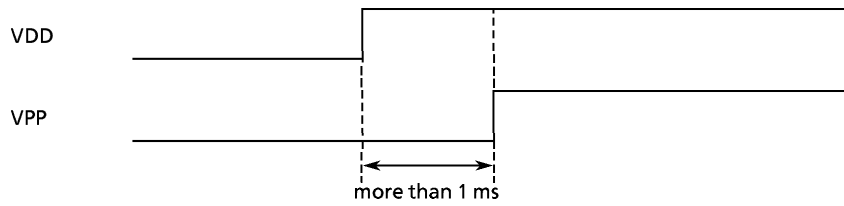
(2) High Speed Programming Operation

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}		12.00	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 PROM programmer types which cannot program OTP.
In TMP47P201V, 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)