

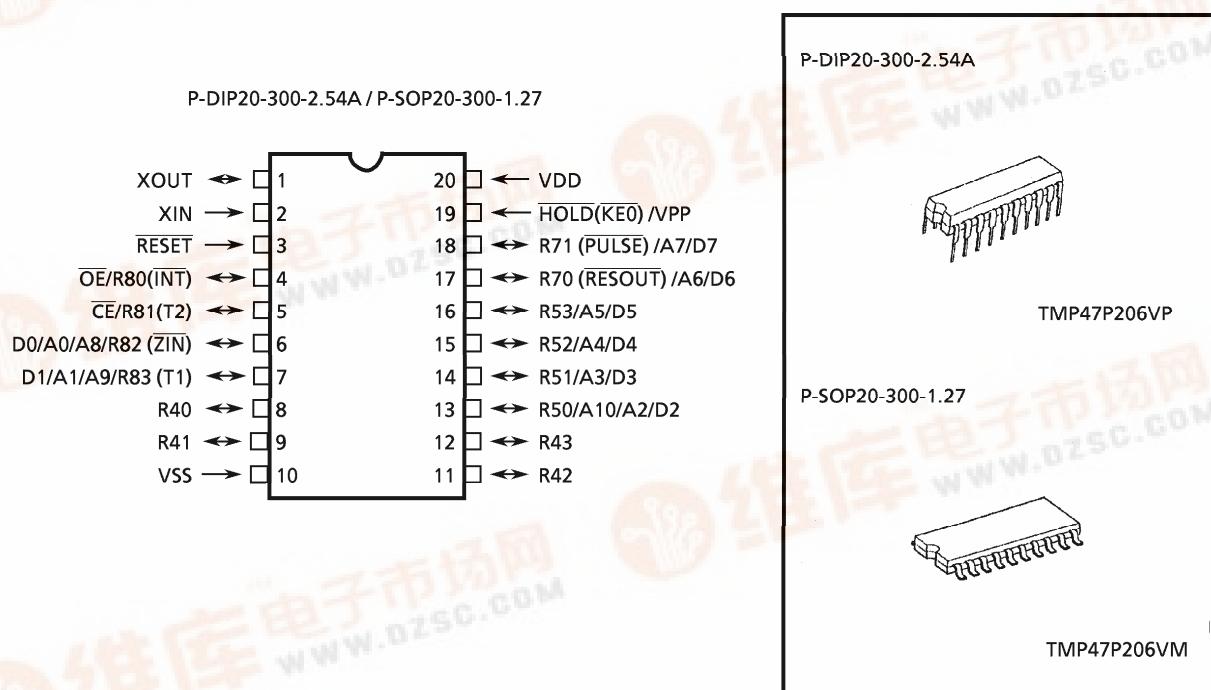
TOSHIBA**TMP47P206V**

CMOS 4-Bit Microcontroller

TMP47P206VM/P

The TMP47P206V is the OTP microcontroller with 16 Kbit PROM. For program operation, the programming is achieved by using with EPROM programmer (TC57256AD type) and adapter socket. The function of this device is exactly same as the TMP47C206.

Part No.	ROM	RAM	Package	OTP
TMP47P206VP	OTP		P-DIP20-300-2.54A	BM11125
TMP47P206VM	2048 × 8-bit	128 × 4-bit	P-SOP20-300-1.27	BM11126

Pin Assignment (Top View)

000707EBA1

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Pin Function

The TMP47P206V has MCU mode and PROM mode.

(1) MCU mode

The TMP47C206 and the TMP47P206V are pin compatible.

(2) PROM mode

Pin Name	Input / Output	Functions	Pin Name (MCU mode)
D0 / A0 / A8			R82
D1 / A1 / A9			R83
D2 / A2 / A10			R50
D3 / A3			R51
D4 / A4	I/O	Data inputs / outputs or Address inputs	R52
D5 / A5			R53
D6 / A6			R70
D7 / A7			R71
OE		Output Enable input	R80
CE	Input	Chip Enable input	R81
VPP		+ 12.5 V / 5 V (Program supply voltage)	HOLD
VCC	Power supply	+ 5 V	VDD
VSS		0 V	VSS
R43 to R40	I/O	Be fixed to low level.	
RESET	Input	Be fixed to non connection.	
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 TMP47P206V. The TMP47P206V is the same as the TMP47C206 except that an OTP is used instead of a built-in mask ROM.

1. Operation mode

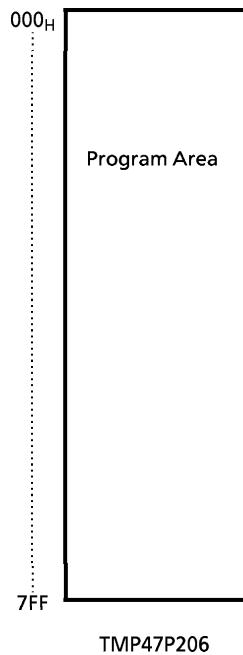
The TMP47P206V has a MCU mode and a PROM mode.

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 TMP47C206. In the TMP47P206V, RC oscillation is impossible.

1.1.1 Program Memory

The program storage area is the same as for the TMP47C206.



TMP47P206

Figure 1-1. Program Area

1.1.2 Data Memory

The TMP47P206V has 128×4 -bit of data memory (RAM).

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}	HOLD / V_{PP}	- 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, R50	30	mA
	I_{OUT2}	Port R51 to 53, R8, R70, R71	3.2	
Output Current (Total)	ΣI_{OUT1}	Port R4, R50	100	mA
	ΣI_{OUT2}	Port R51 to 53, R8, R70, R71	28.8	
Power Dissipation [Topr = 85°C]	PD	SOP	150	mW
		DIP	250	
Soldering Temperature (time)	Tsld		260 (10 s)	°C
Storage Temperature	Tstg		- 55 to 125	°C
Operating Temperature	Topr		- 40 to 85	°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 = -40 to 85°C)

Parameter	Symbol	Pins		Conditions		Min	Max	Unit		
Supply Voltage	V_{DD}	Normal mode		Crystar or ceramic	$f_c = 8$ MHz	4.0 (2.7) *2	5.7	V		
					$f_c = 4.2$ MHz	4.0 (2.2) *2				
				RC	$f_c = 2.5$ MHz	4.0 (2.2) *2				
		HOLD mode		-	-	4.0 (2.0) *2				
Input High Voltage	V_{IH1}	Except Hysteresis Input		In the normal operating area	$V_{DD} \times 0.7$		V_{DD}	V		
		V_{IH2} Hysteresis Input			$V_{DD} \times 0.75$					
		V_{IH3}		In the HOLD mode	$V_{DD} \times 0.9$					
Input Low Voltage	V_{IL1}	Except Hysteresis Input		In the normal operating area	0	$V_{DD} \times 0.3$	V			
		V_{IL2} Hysteresis Input				$V_{DD} \times 0.25$				
	V_{IL3}			In the HOLD mode		$V_{DD} \times 0.1$				
Clock Frequency	f_c	X_{IN}, X_{OUT}		$V_{DD} = 2.7$ to 5.7 V	1	8	MHz			
				$V_{DD} = 2.2$ to 5.7 V		4.2				

Note 1: 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.

Note 2: LVD is initially enable and initial Min. V_{DD} is 4.0 V. After LVD is disabled above 4.0 V. Min. V_{DD} will be 2.7 or 2.2 to 2.0 V.

DC Characteristics		$(V_{SS} = 0 \text{ V}, \text{Topr} = -40 \text{ to } 85^\circ\text{C})$					
Parameter	Symbol	Pins	Conditions	Min	Typ.	Max	Unit
Hysteresis Voltage	V_{HS}	Hysteresis Input		–	0.7	–	V
Input Current	I_{IN1} (Note 1)	RESET, HOLD	$V_{DD} = 5.7 \text{ V}, V_{IN} = 5.7 \text{ V} / 0 \text{ V}$	–	–	± 2	μA
	I_{IN2}	Open drain output ports					
Input Resistance	R_{IN}	RESET		100	220	450	$\text{k}\Omega$
Pull down Resistance	R_{PD}	R82		22	70	160	
Input Low Current	I_{IL}	Push-pull output ports	$V_{DD} = 5.7 \text{ V}, V_{IN} = 0.4 \text{ V}$	–	–	–2	mA
Output Leakage Current	I_{LO}	Open drain output ports	$V_{DD} = 5.7 \text{ V}, V_{OUT} = 5.7 \text{ V}$	–	–	2	μA
Output High Voltage	V_{OH}	Push-pull output ports	$V_{DD} = 5 \text{ V}, I_{OH} = -100 \mu\text{A}$	4.8	–	–	V
			$V_{DD} = 4.5 \text{ V}, I_{OH} = -200 \mu\text{A}$	2.4	–	–	
			$V_{DD} = 2.2 \text{ V}, I_{OH} = -5 \mu\text{A}$	2.0	–	–	
Output Low Voltage	V_{OL1}	Port R8, R7, R51 to 53	$V_{DD} = 4.5 \text{ V}, I_{OL} = 3.3 \text{ mA}$	–	–	1.0	V
			$V_{DD} = 4.5 \text{ V}, I_{OL} = 1.6 \text{ mA}$	–	–	0.4	
			$V_{DD} = 2.2 \text{ V}, I_{OL} = 20 \mu\text{A}$	–	–	0.1	
	V_{OL2}	Port R4, R50	$V_{DD} = 4.5 \text{ V}, I_{OL} = 15 \text{ mA}$	–	–	1.0	
			$V_{DD} = 4.5 \text{ V}, I_{OL} = 7 \text{ mA}$	–	–	0.4	
			$V_{DD} = 2.2 \text{ V}, I_{OL} = 50 \mu\text{A}$	–	–	0.1	
Output Low Current	I_{OL1}	Port R8, R7, R51 to 53	$V_{DD} = 4.5 \text{ V}, V_{OL} = 0.4 \text{ V}$	1.6	–	–	mA
	I_{OL2}	Port R4, R50	$V_{DD} = 4.5 \text{ V}, V_{OL} = 1.0 \text{ V}$	15	–	–	
			$V_{DD} = 4.5 \text{ V}, V_{OL} = 0.4 \text{ V}$	7	17	–	
Supply Current (in the Normal operating mode) (Note 2)	I_{DD}		$V_{DD} = 5.7 \text{ V}, f_c = 8 \text{ MHz}$	–	3	6	mA
			$V_{DD} = 5.7 \text{ V}, f_c = 4 \text{ MHz}$	–	2	4	
			$V_{DD} = 3.0 \text{ V}, f_c = 4 \text{ MHz}$	–	1	2	
			$V_{DD} = 3.0 \text{ V}, f_c = 1 \text{ MHz}$	–	0.6	1.2	
Supply Current (in the HOLD operating mode) (Note 2)	I_{DDH}	LVD always Enable	$V_{DD} = 5.7 \text{ V}$	–	50	200	μA
		LVD On and Off	$V_{DD} = 5.7 \text{ V}$	–	2.5	20	
Injection Current	I_{ZC}	R82		–	–	1	mA

<General Conditions>

Typ. values show those at $\text{Topr} = 25^\circ\text{C}, V_{DD} = 5 \text{ V}$.Note 1: Input Current I_{IN1} : The current through resistor is not included.Note 2: Supply Current: $V_{IN} = 5.5 \text{ V} / 0.2 \text{ V} (V_{DD} = 5.7 \text{ V})$ or $2.8 \text{ V} / 0.2 \text{ V} (V_{DD} = 3.0 \text{ V})$

AC Characteristics

(V_{SS} = 0 V, Topr = -40 to 85°C)

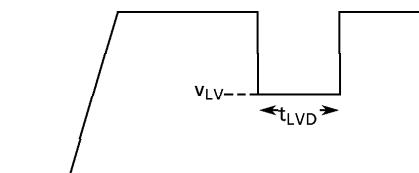
Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
Instruction Cycle Time	t _{cyc}		V _{DD} = 2.7 to 5.7 V	1.0	-	8	μs
			V _{DD} = 2.2 to 5.7 V	1.9			
High level Clock pulse Width	t _{WCH}	For external clock operation	V _{DD} ≥ 2.7 V	60	-	-	ns
			V _{DD} < 2.7 V	120			
Low level Clock pulse Width	t _{WCL}		V _{DD} ≥ 2.7 V	60	-	-	ns
			V _{DD} < 2.7 V	120			
Delay Reset Output Signal	t _{rd}	f _C = 1 MHz		-	-	16	μs

Low Voltage Detector Characteristics

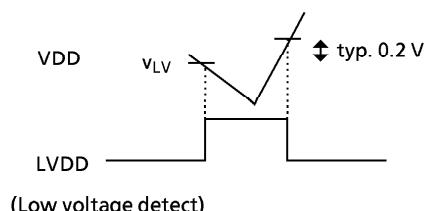
(V_{SS} = 0 V, Topr = -40 to 85°C)

Parameter	Symbol	Conditions		Min	Typ.	Max	Unit
LVD interval time (Note 1)	t _{int}			8.5	-	128	ms
LVD Enable time (Note 1)	t _{en}			100	-	-	μs
LVD pulse width (Note 1, 2)	t _{LVD}			50	-	-	μs
Detection Voltage (Note 3)	V _{LV}	LVDDTY = 0	LVDD = 0	2.7	3.3	3.8	V
		LVDDTY = 1	LVDD = 0	2.2	2.7	3.3	
LVD Operating Voltage (Note 1)	V _{LVD}			2.0	-	-	V

Note 1: These parameters are characterized but not tested.

Note 2: Less than Min. t_{LVD}, CPU will not be reset.

Note 3: Detection voltage has typ. 0.2 V hysteresis.

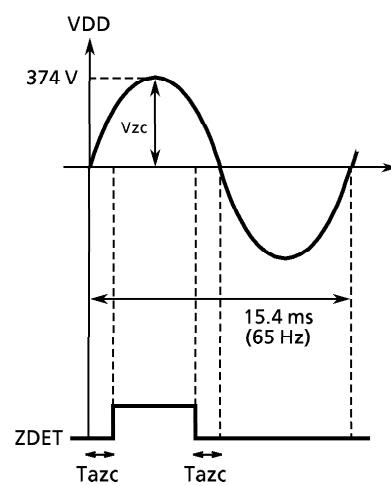
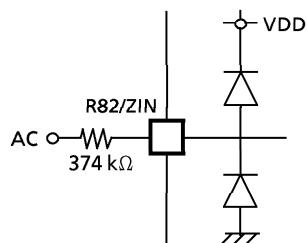


Zero-Cross Detection Characteristics

(V_{SS} = 0 V, Topr = -40 to 85°C)

Parameter	Symbol	Conditions	Min	Typ.	Max	Unit
Zero-cross Accuracy	T _{azc}	f _{zc} = 45 to 65 Hz (*)			90	μs
Injection Current	I _{zc}				1	mA
Pull-down resistance	R _{PD}		22	70	160	kΩ

(*) Measurement conditions



Recommended Oscillating Conditions

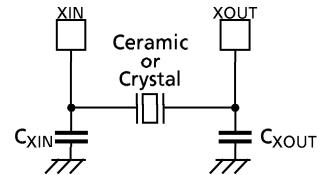
(V_{SS} = 0 V, V_{DD} = 2.2 to 5.7 V, T_{opr} = -40 to 85°C)

Recommended oscillating conditions of the TMP47P206V are equal to the TMP47C206's but RC oscillation is impossible.

(1) 8 MHz

Ceramic Resonator

CSA8.00MGU	(MURATA)	C _{XIN} = C _{XOUT} = 30pF
KBR-8.00MS	(KYOCERA)	C _{XIN} = C _{XOUT} = 30pF
EFOEC8004A4	(NATIONAL)	C _{XIN} = C _{XOUT} = 30pF



(2) 6 MHz

Ceramic Resonator

CSA6.00MGU	(MURATA)	C _{XIN} = C _{XOUT} = 30pF
KBR-6.00MS	(KYOCERA)	C _{XIN} = C _{XOUT} = 30pF
EFOEC6004A4	(NATIONAL)	C _{XIN} = C _{XOUT} = 30pF

(3) 4 MHz

Ceramic Resonator

CSA4.00MGU	(MURATA)	C _{XIN} = C _{XOUT} = 30pF
KBR-4.00MS	(KYOCERA)	C _{XIN} = C _{XOUT} = 30pF
EFOEC4004A4	(NATIONAL)	C _{XIN} = C _{XOUT} = 30pF

Crystal Oscillator

204B-6F 4.0000 (TOYOCOM) C_{XIN} = C_{XOUT} = 20pF

(4) 1 MHz

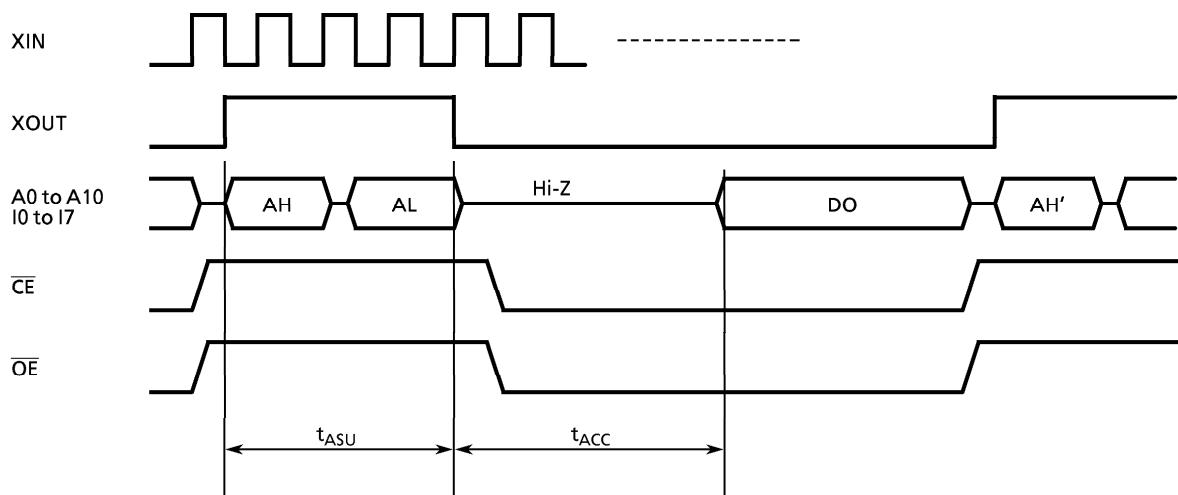
Ceramic Resonator

CSA1.00MGU	(MURATA)	C _{XIN} = C _{XOUT} = 30pF
KBR-1.00MS	(KYOCERA)	C _{XIN} = C _{XOUT} = 30pF
EFOEC1004A4	(NATIONAL)	C _{XIN} = C _{XOUT} = 30pF

DC/AC Characteristics ($V_{SS} = 0 \text{ V}$)

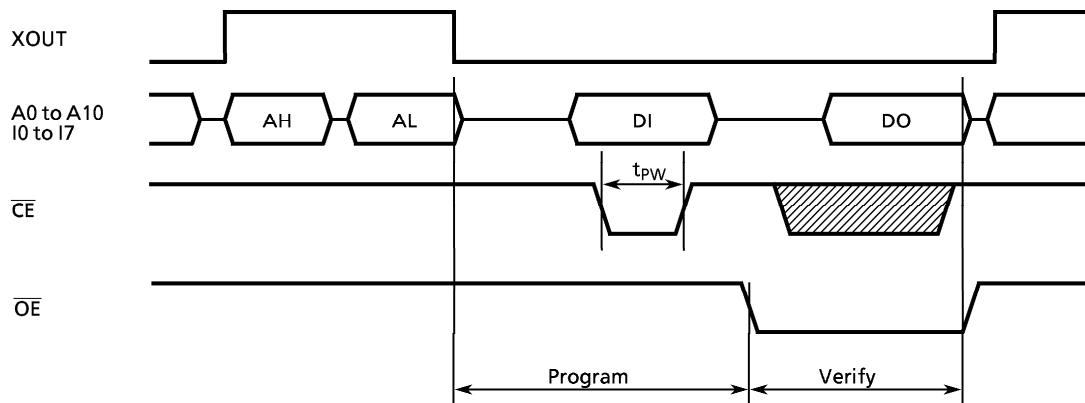
(1) Read Operation

Parameter	Symbol	Condition	Min	Typ.	Max	Unit
Output Level High Voltage	V_{IH4}		$V_{CC} \times 0.7$	-	V_{CC}	V
Output Level Low Voltage	V_{IL4}		0	-	$V_{CC} \times 0.3$	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}	$V_{CC} = 5.0 \pm 0.25 \text{ V}$	-	-	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}		12.25	12.50	12.75	V
Programming Pulse Width	t_{PW}	$V_{CC} = 6.0 \pm 0.25$ V	0.095	0.1	0.105	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)