CMOS 8-Bit Microcontroller

TMPA8700PSN, TMPA8700PSF

The A8700PS is a One-Time PROM microcontroller with low-power 498 Kbits (a 60 Kbytes program memory and a 256 characters OSD font memory) electrically programmable read only memory for the A8700CH / CK / CM / CP / CS and A8701CH / CK / CM system evaluation. The A8700PS is pin compatible with the A8700CH / CK / CM / CP / CS and A8701CH / CK / CM. The operations possible with the A8700CH / CK / CM / CP / CS and A8701CH / CK / CM can be performed by writing programs and OSD font data to PROM. The A8700PS can write and verify in the same way as the TC571000 using an adaptor socket BMA1101 / BMA1102 and an EPROM programmer.

Part No.	OTP	RAM	Package	Adaptor Socket
TMPA8700PSN	60 Kbytes + 8 × 9 × 256 bits	2 Kbytes	SDIP42-P-600-1.78	BMA1101
TMPA8700PSF			QFP44-P-1414-0.80D	BMA1102

980910EBP1

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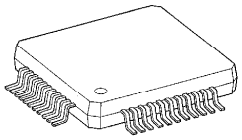
Package

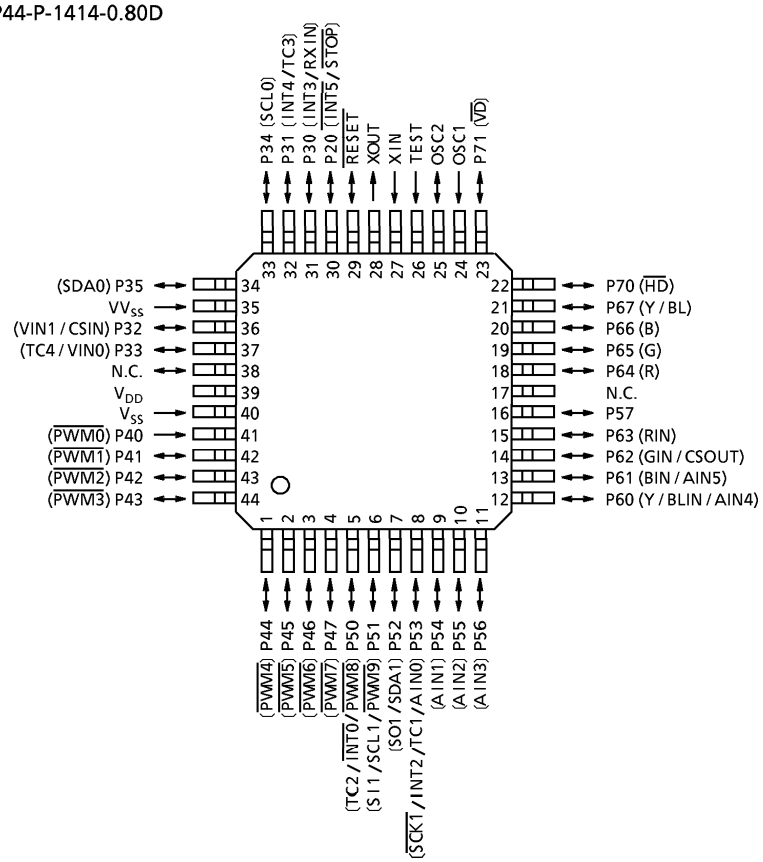
QFP44-P-1414-0.80D



TMPA8700PSF

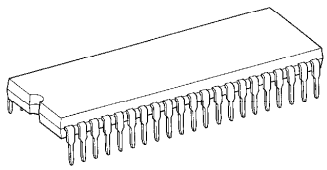
Pin Assignments (Top View)

QFP44-P-1414-0.80D



Package

SDIP42-P-600-1.78



TMPA8700PSN

Pin Assignments (Top View)

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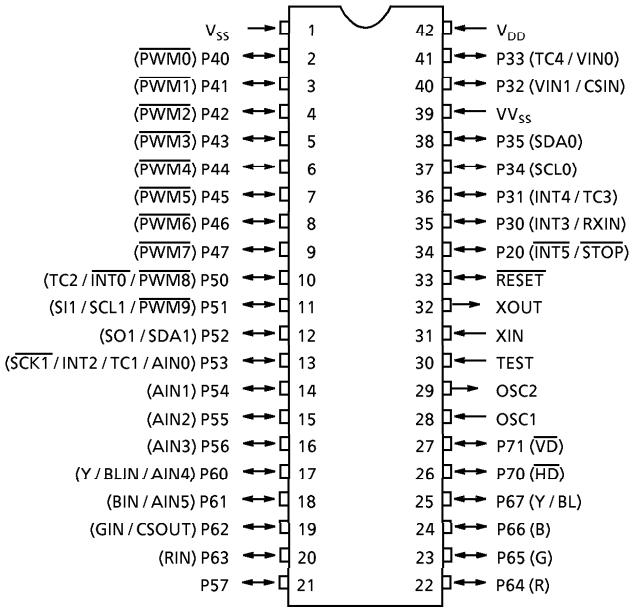


Pin Function

The A8700PS has two modes : MCU and PROM.

(1) MCU mode

In this mode, the A8700PS is pin compatible with the A8700CH / CK / CM / CP / CS and A8701CH / CK / CM (fix the TEST pin at low level).

(2) PROM mode

Pin Name (PROM Mode)	Input / Output	Functions	Pin Name (MCU Mode)
A_{16}	Input	PROM address inputs	OSC1
A_{15} to A_{12}			P35, P34, P31, P30
A_{11} to A_8			P67 to P64
A_7 to A_0			P57 to P50
D_7 to D_0	I / O	PROM data input / outputs	P47 to P40
$\overline{CE}$	Input	Chip enable signal input (active low)	P33
$\overline{OE}$		Output enable signal input (active low)	P32
$\overline{PGM}$	Input	Program mode signal input (active low)	OSC2
V_{PP}	Power supply	+ 12.75 V / 5 V (Program supply voltage)	TEST
V_{CC}		+ 6.25 V / 5 V	V_{DD}
GND		0 V	V_{SS}, VVSS
P61	Input	PROM mode setting pin. Be fixed at high level.	
P70			
P20		PROM mode setting pin. Be fixed at low level.	
P63, P62, P60			
P71			
$\overline{RESET}$			
XIN	Input	Connect an 8 MHz oscillator to stabilize the internal state.	
XOUT	Output		

Operational Description

The following explains the A8700PS hardware configuration and operation. The configuration and functions of the A8700PS are the same as those of the A8700CS, except in that a one-time PROM is used instead of an on-chip mask ROM.

1. Operating Mode

The A8700PS has two modes : MCU and PROM.

1.1 MCU Mode

The MCU mode is activated by fixing the TEST / V_{PP} pin at low level.

In the MCU mode, operation is the same as with the A8700CH / CK / CM / CP / CS (the TEST / V_{PP} pin cannot be used open because it has no built-in pull-down resistance).

Also, without the program corrective function, D / A converted (pulse width modulation) output, remote control signal processor, and RAM addresses 340_H to $83F_H$, the chip operates in the same way as the A8701CH / CK / CM.

Moreover, when using the chip to evaluate the A8701CH / CK / CM, do not set the registers used for these functions.

1.1.1 Program Memory and OSD Character Font Memory

The A8700PS has a 60 Kbytes (addresses 1100_H to $FFFF_H$ in the MCU mode, address 11100_H to $1FFFF_H$ in the PROM mode) of program memory and a $8 \times 9 \times 256$ bits (addresses 4000_H to $4FFF_H$ in the PROM mode) of OSD character font memory.

Electrical Characteristics

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

Characteristic	Symbol	Pins	Rating	Unit
Supply Voltage	V_{DD}	—	– 0.3 to 6.5	V
Programmable Voltage	V_{PP}	TEST / V_{PP} pin	– 0.3 to 13.0	V
Input Voltage	V_{IN}	—	– 0.3 to V_{DD} + 0.3	V
Output Voltage	V_{OUT1}	—	– 0.3 to V_{DD} + 0.3	V
Output Current (Per 1pin)	I_{OUT1}	Ports P2, P3, P4, P5, P64 to P67, P7	3.2	mA
	I_{OUT2}	Ports P60 to P63	30	
Output Current (Total)	ΣI_{OUT1}	Ports P2, P3, P4, P5, P64 to P67, P7	120	mA
	ΣI_{OUT2}	Ports P60 to P63	120	
Power Dissipation	P_D	—	600	mW
Soldering Temperature (time)	T_{sld}	—	260 (10 s)	°C
Storage Temperature	T_{stg}	—	– 55 to 125	°C
Operating Temperature	T_{opr}	—	– 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, T_{opr} = − 30 to 70°C)

Characteristic	Symbol	Pins	Test Condition	Min	Max	Unit
Supply Voltage	V_{DD}	—	NORMAL mode	4.5	5.5	V
			IDLE mode			
			STOP mode	2.0		
Input High Voltage	V_{IH1}	Except hysteresis input	—	V_{DD} × 0.70	V_{DD}	V
	V_{IH2}	Hysteresis input		V_{DD} × 0.75		
Input Low Voltage	V_{IL1}	Except hysteresis input	—	0	V_{DD} × 0.30	V
	V_{IL2}	Hysteresis input			V_{DD} × 0.25	
Clock Frequency	fc (Note)	XIN, XOUT	—	1	8.0	MHz
	f_{OSC}	OSC1, OSC2	Normal freguency mode (FORS = 0)	2	12	
			Double frequency mode (FORS = 1)	2	6	

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: Clock frequency fc : Supply voltage range is specified in NORMAL1 / 2 mode and IDLE1 / 2 mode.
Furthermore, since the CPU clock serves dual purposes as a clock for the CCD slicer, always be sure to use an 8 MHz oscillator.

D.C. Characteristics

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

Characteristic	Symbol	Pins	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Hysteresis Voltage	V_{HS}	Hysteresis inputs	—	—	—	0.9	—	V
Input Current	I_{IN1}	TEST	—	V_{DD} = 5.5 V, V_{IN} = 5.5 V / 0V	—	—	± 2	μA
	I_{IN2}	Open drain ports, Tri-state ports	—					
	I_{IN3}	$\overline{RESET}$, $\overline{STOP}$	—					
Input Resistance	R_{IN2}	$\overline{RESET}$	—	—	100	220	450	kΩ
Output Leakage Current	I_{LO1}	Sink open drain ports	—	V_{DD} = 5.5 V, V_{OUT} = 5.5 V / 0 V	—	—	± 2	μA
	I_{LO2}	Tri-state ports	—	V_{DD} = 5.5 V, V_{OUT} = 5.5 V / 0 V				
Output High Voltage	V_{OH2}	Tri-state ports	—	V_{DD} = 4.5 V, I_{OH} = − 0.7 mA	4.1	—	—	V
Output Low Voltage	V_{OL}	Except XOUT, OSC2 and P63 to 60	—	V_{DD} = 4.5 V, I_{OL} = 1.6 mA	—	—	0.4	V
Output Low Current	I_{OL3}	P63 to P60	—	V_{DD} = 4.5 V, V_{OL} = 1.0 V	—	20	—	mA
Supply Current in NORMAL Mode	I_{DD}	—	—	V_{DD} = 5.5 V fc = 8 MHz (Note 3) V_{IN} = 5.3 V / 0.2 V	—	15	25	mA
Supply Current in IDLE Mode					—	10	18	
Supply Current in STOP Mode				V_{DD} = 5.5 V V_{IN} = 5.3 V / 0.2 V	—	0.5	10	μA

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

Note 2: Input Current I_{IN3} ; The current through resistor is not included.

Note 3: Supply Current I_{DD} ; The current (Typ. 0.5 mA) through ladder resistors of ADC is included in NORMAL mode and IDLE mode.

A/D Conversion Characteristics

(T_{opr} = − 30 to 70°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Analog Reference Voltage	V_{AREF}	—	Supplied from V_{DD} pin	—	V_{DD}	—	V
Analog Reference Voltage Range	V_{ASS}	—	0 V, supplied from V_{SS} pin	—	0	—	
	ΔV_{AREF}	—	= V_{DD} − V_{SS}	—	V_{DD}	—	
Analog Input Voltage	V_{AIN}	—	—	V_{SS}	—	V_{DD}	
Nonlinearity Error	—	—	V_{DD} = 4.5 to 5.5 V	—	—	± 1	LSB
Zero Point Error	—			—	—	± 2	
Full Scale Error	—			—	—	± 2	
Total Error	—			—	—	± 3	

A.C. Chracteristics

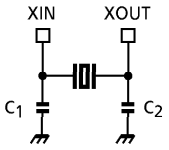
(V_{SS} = 0 V, V_{DD} = 4.5 to 5.5 V, T_{opr} = – 30 to 70°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Machine Cycle Time	tcy	—	In NORMAL mode	0.5	—	4	μs
			In IDLE mode				
High Level Clock Pulse Width	t_{WCH}	—	For external clock operation (XIN input), fc = 8 MHz	62.5	—	—	ns
Low Level Clock Pulse Width	t_{WCL}						

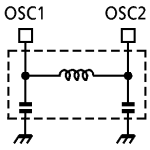
Recommended Oscillating Conditions

(V_{SS} = 0 V, V_{DD} = 4.5 to 5.5 V, T_{opr} = – 30 to 70°C)

Parameter	Oscillator	Frequency	Recommended Oscillator		Recommended Constant	
					C_1	C_2
High-Frequency Oscillation	Ceramic Resonator	8 MHz	KYOCERA	KBR8.0M	30 pF	30 pF
	Crystal Oscillator	8 MHz	TOYOCOM	210B 8.0000	20 pF	20 pF
OSD	LC Resonator	6 MHz	TOKO	A285HCIS-13319	—	—
		12 MHz	TOKO	TBEHCIS-13306		



(1) High-frequency Oscillation



(2) LC Resonator for OSD

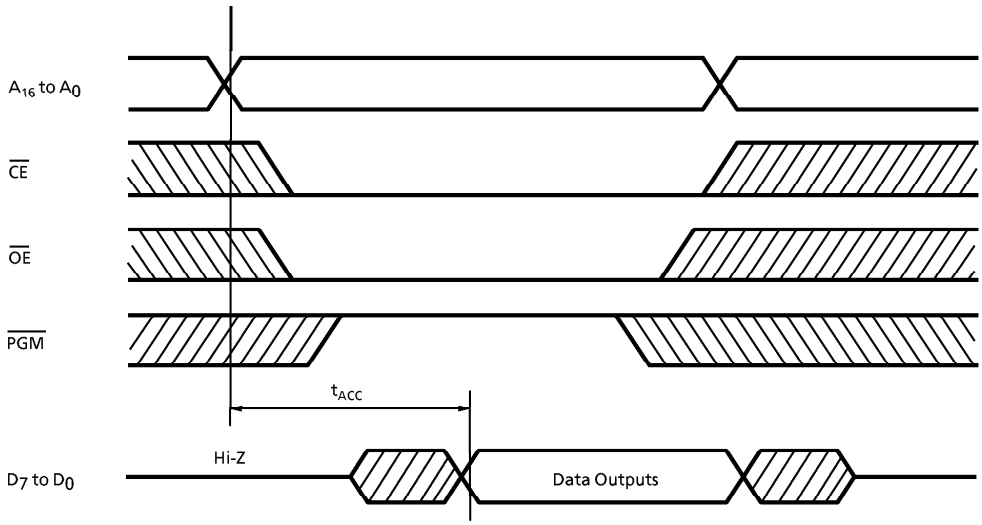
Note: To keep reliable operation, shield the device electrically with the metal plate on its package mold surface against the high electric field, for example, by CRT (Cathode Ray Tube).

DC / AC Characteristics (PROM Mode) (V_{SS} = 0 V, T_{opr} = − 30 to 70°C)

(1) Read operation

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input High Voltage	V_{IH4}	—	—	V_{CC} × 0.7	—	V_{CC}	V
Input Low Voltage	V_{IL4}	—	—	0	—	V_{CC} × 0.12	V
Power Supply Voltage	V_{CC}	—	—	4.75	5.0	5.25	V
Program Power Supply Voltage	V_{PP}	—					
Address Access Time	t_{ACC}	—	V_{CC} = 5.0 ± 0.25 V	—	1.5 tcyc + 300	—	ns

Note: tcyc = 500 ns at 8 MHz



(2) High-speed programming operation (T_{opr} = 25 ± 5°C)

Characteristic	Symbol	Test Circuit	Test Condition	Min	Typ.	Max	Unit
Input High Voltage	V_{IH4}	—	—	V_{CC} × 0.7	—	V_{CC}	V
Input Low Voltage	V_{IL4}	—	—	0	—	V_{CC} × 0.12	V
Power Supply Voltage	V_{CC}	—	—	6.0	6.25	6.5	V
Program Power Supply Voltage	V_{PP}	—	—	12.5	12.75	13.0	V
Initial Program Pulse Width	t_{PW}	—	V_{CC} = 6.0 V	0.095	0.1	0.105	ms