

CMOS 8-Bit Microcontroller

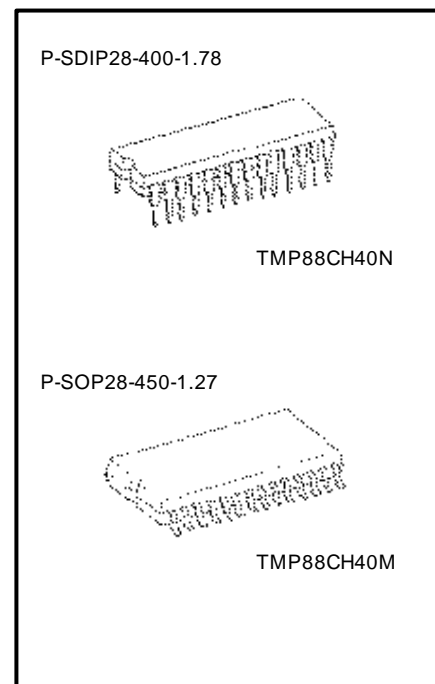
TMP88CH40N/M

The TMP88CH40N/M are the high-speed and high-function 8bit single-chip microcomputer which incorporates the TLCS-870/X Series CPU core, as well as a sine wave drive PMD (Programmable Motor Driver), a 10-bit AD converter, multi-function Timer/Counters, and synchronous/asynchronous serial interfaces.

Product Type Name	ROM	RAM	Package	OTP
TMP88CH40N	16 Kbytes	512 + 128 bytes	P-SDIP28-400-1.78	TMP88PH40N
TMP88CH40M			P-SOP28-450-1.27	TMP88PH40M

Features

- ◆ 8-bit single-chip microcomputer: TLCS-870/X Series
- ◆ Minimum instruction execution time: 0.20 μs (at 20.0 MHz operation)
- ◆ Fundamental machine instruction: 181 kinds, 842 instructions
- ◆ I/O port: 19 pins
 - Large-current output: 14 pins (typ. 20 mA), capable of LED direct drive
- ◆ Watchdog Timer (WDT)
- ◆ Time Base Timer (TBT)
- ◆ Programmable motor driver: 1 channel (PMD2)
 - Sine wave drive circuit (RAM for sine wave data is incorporated.)
 - Rotor position detection function
 - Timer and capture function for motor controlling
 - Overload protective function
 - Start functions for automatic commutation and automatic position detection



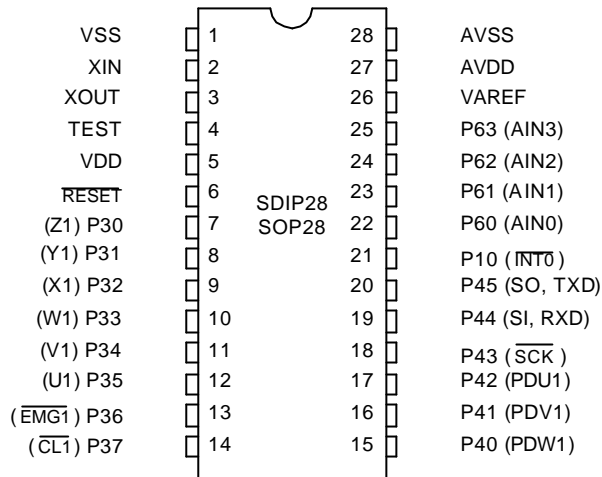
00070EBP1

- For a discussion of how the reliability of microcontrollers can be predicted, please refer to Section 1.3 of the chapter entitled Quality and Reliability Assurance / Handling Precautions.
- TOSHIBA is continually working to improve the quality and reliability of its products. Nevertheless, semiconductor devices in general can malfunction or fail due to their inherent electrical sensitivity and vulnerability to physical stress. It is the responsibility of the buyer, when utilizing TOSHIBA products, to comply with the standards of safety in making a safe design for the entire system, and to avoid situations in which a malfunction or failure of such TOSHIBA products could cause loss of human life, bodily injury or damage to property.
In developing your designs, please ensure that TOSHIBA products are used within specified operating ranges as set forth in the most recent TOSHIBA products specifications. Also, please keep in mind the precautions and conditions set forth in the "Handling Guide for Semiconductor Devices," or "TOSHIBA Semiconductor Reliability Handbook" etc..
- The TOSHIBA products listed in this document are intended for usage in general electronics applications (computer, personal equipment, office equipment, measuring equipment, industrial robotics, domestic appliances, etc.). These TOSHIBA products are neither intended nor warranted for usage in equipment that requires extraordinarily high quality and/or reliability or a malfunction or failure of which may cause loss of human life or bodily injury ("Unintended Usage"). Unintended Usage include atomic energy control instruments, airplane or spaceship instruments, transportation instruments, traffic signal instruments, combustion control instruments, medical instruments, all types of safety devices, etc.. Unintended Usage of TOSHIBA products listed in this document shall be made at the customer's own risk.
- The products described in this document are subject to the foreign exchange and foreign trade laws.
- The information contained herein is presented only as a guide for the applications of our products. No responsibility is assumed by TOSHIBA CORPORATION for any infringements of intellectual property or other rights of the third parties which may result from its use. No license is granted by implication or otherwise under any intellectual property or other rights of TOSHIBA CORPORATION or others.
- The information contained herein is subject to change without notice.

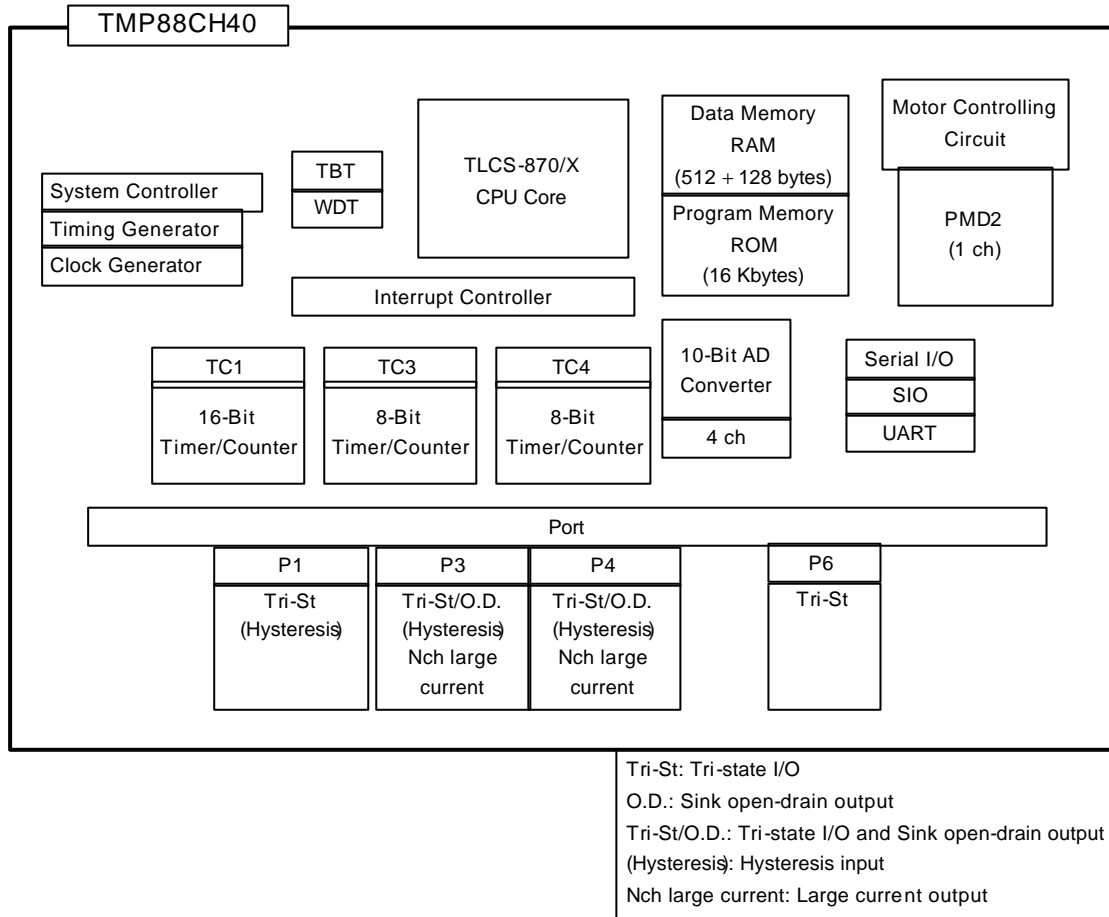
- ◆ 16-Bit Timer/Counter: 1 channel (TC1)
- ◆ 8-Bit Timer/Counter: 2 channels (TC3, TC4)
 - TC3: Timer
 - TC4: Timer, UART baud rate
- ◆ 10-bit successive approximation type AD converter (with sample-and-hold)
 - Analog input: 4 channels
- ◆ Serial interface: 2 channels (SIO and UART use the same I/O pins)
 - 8-bit SIO (synchronous): 1 channel
 - 8-bit UART (asynchronous): 1 channel
- ◆ Low power dissipation mode
 - IDLE mode: Halts CPU and operates only peripheral hardware. IDLE mode is reset by an interrupt. (CPU is restarted.)
 - Operating voltage: 4.5 to 5.5 V at 8 to 20 MHz

Pin Assignments

P-SDIP28-400-1.78, P-SOP28-450-1.27



Block Diagram



Specification List (compared to the TMP88CS43F) (: Incorporated, –: Not incorporated)

Function		Product	TMP88CS43F	TMP88CH40N/M
Package			P-QFP80-1420-0.80	P-SDIP28-400-1.78 P-SOP28-450-1.27
ROM (byte)			64 K	16 K
RAM (byte)			2 K + 128	512 + 128
CPU Core			TLCS-870/X	TLCS-870/X
Operating range (fc = 8 – 20 MHz)			4.5 to 5.5 V	4.5 to 5.5 V
Number of I/O ports			71	19
PMD (Sine wave control circuit)			2 ch	1 ch
16-bit TC	TC1 (TC1B)			(Note)
	CTC (CTC1)			–
8-bit TC	TC3 (TC3C)			(Note)
	TC4 (TC5B) (can be used as UART baud rate)			(Note)
	TC5 (TC6)	Suitable for cascade connection, and used as a 16-bit timer.		–
	TC6 (TC6)			–
High-speed PWM			2 ch	–
10-bit AD converter			16 ch	4 ch
Serial Communication	UART		1 ch (Pins are selectable)	1 ch (Uses the same I/O pins with SIO.)
	SIO		1 ch	1 ch (Uses the same I/O pins with UART.)
TBT				
WDT				
DVO				–
Standby				–
Port 0	Output: Tri-state/Programmable open-drain Input: Schmitt		P00 to P03	–
Port 1	Output: Tri-state Input: Schmitt		P10 to P17	P10
Port 2	Output: Open-drain Input: Schmitt		P20 to P22	–
Port 3	Output: Tri-state/Programmable open-drain Nch large current Input: Schmitt		P30 to P37	P30 to P37
Port 4	Output: Tri-state/Programmable open-drain Nch large current Input: Schmitt		P40 to P47	P40 to P45
Port 5	Output: Tri-state/Programmable open-drain Nch large current Input: Schmitt		P50 to P57	–
Port 6	Output: Tri-state Input: Normal		P60 to P67	P60 to P63
Port 7	Output: Tri-state Input: Normal		P70 to P77	–
Port 8	Output: Tri-state/Programmable open-drain Input: Normal		P80 to P87	–
Port 9	Output: Tri-state/Programmable open-drain Input: Normal		P90 to P97	–
OTP			TMP88PS43F	TMP88PH40N/M

Note: No timer I/O pin