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Microcontrollers

Introduction to Toshiba PMD Microcontrollers

~ Product Guide ~

August 2008

Rev.1.1

TOSHIBA CORPORATION
Semiconductor Company

TMP19A71



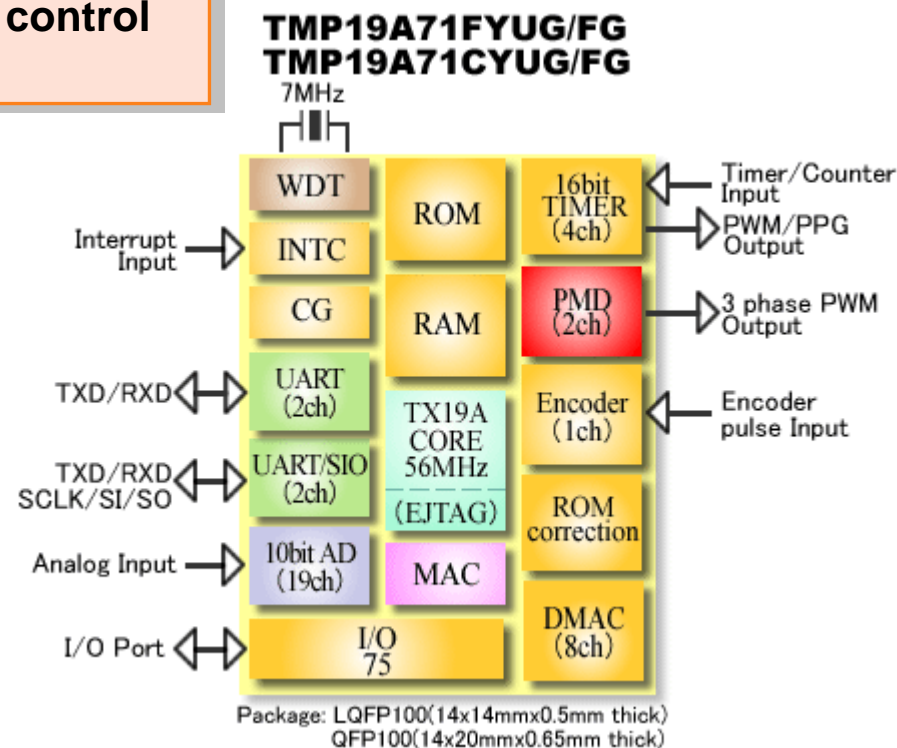
32-bit RISC microcontroller based on TX19A core supporting high-speed vector control suitable for home appliances

● TX19A CPU Core

- Operating voltage : Internal = 2.5 V, peripheral I/O = 3.3 V
- Maximum operating frequency: 56 MHz (7 MHz × 8 by PLL)
- Internal memory : ROM: 256 KB RAM: 10 KB
- DSP function : 32-bit multiply-accumulate (MAC) operations take only one clock cycle to execute.
- Built-in debug function (EJTAG)

● Built-in Functions

- Third-generation PMD (motor control timer): 2 channels
- 10-bit AD converter: Conversion time: 2.36 μs
2 units (8 channels + 11 channels)
(Can be started simultaneously.)
- ABZ encoder input : 1 channel
- 16-bit timer : 4 channels
- UART : 2 channels
- UART/SIO : 2 channels
- DMA controller : 8 channels (memory-to-memory, memory-to-I/O, I/O-to-memory transfers)
- ROM correction : 8 words x 8 blocks



Product Lineup

Part Number	ROM	RAM
TMP19A71FYUG	256 Kbytes (Flash)	10 Kbytes
TMP19A71FYFG	256 Kbytes (Flash)	10 Kbytes
TMP19A71CYUG	256 Kbytes (Mask)	10 Kbytes
TMP19A71CYFG	256 Kbytes (Mask)	10 Kbytes

TMP88F846UG



Low-pin-count Flash microcontroller containing a dedicated inverter motor control circuit (PMD)

● **TLCS-870/X CPU core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **On-chip oscillator (20 MHz)**

*An external resonator cannot be used.

● **Motor control circuit**

(PMD: Programmable Motor Driver) (1 channel)

- Sine wave drive circuit (built-in sine wave data-table RAM)
- Rotor position detect function
- Motor control timer and capture function
- Overload protective function
- Auto commutation and auto position detection start function

● **AD converter: 10-bit x 8 channels**

Synchronous start with INTPWM

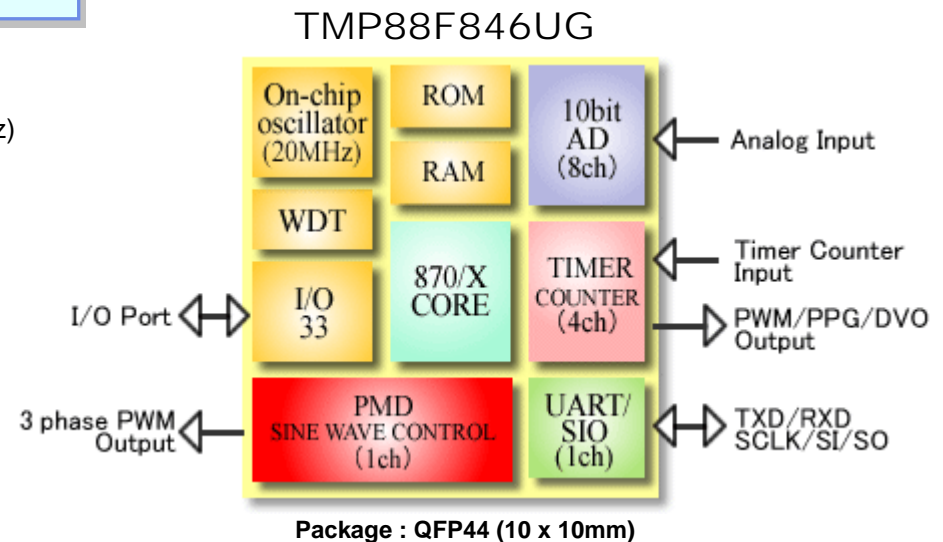
● **16-bit timer: 2 channels**

● **8-bit timer: 2 channels**

● **Serial interface: SIO/UART 1 channel**

● **Power-on reset circuit**

● **Voltage detecting circuit (VLTD)**



Memory Size

Part Number	ROM	RAM
TMP88F846UG	8 Kbytes (Flash)	512 bytes

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TMP88FW45FG



8-bit microcontroller containing two channels of PMD 2 and 120-Kbyte ROM in 80-pin package (pin-compatible with TMP88CW43) and suitable for home appliances requiring low motor vibration and high performance.

● **TLCS-870/X CPU Core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor Control Circuit**

- (PMD: Programmable Motor Driver) (2 channels)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

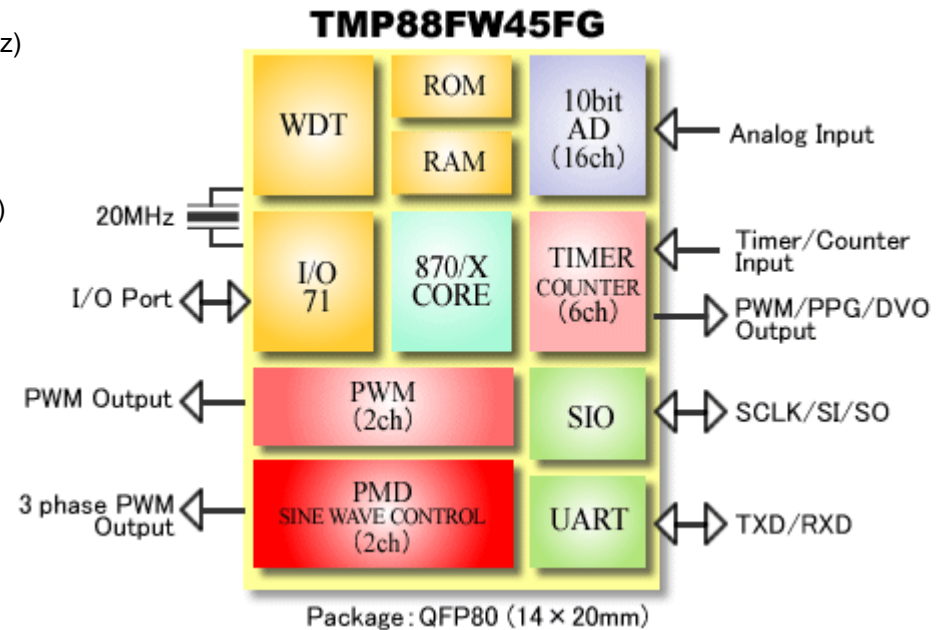
● **AD converter: 10-bit x 16 channels**

● **PWM output: 2 channels**

● **16-bit timer: 2 channels**

● **8-bit timer: 4 channels**

● **Serial Interface: SIO 1 channel, UART 2 channels**



Memory Size

Part Number	ROM	RAM
TMP88FW45FG	120 Kbytes (Flash)	4 Kbytes

TMP88FW44FG



8-bit microcontroller containing two channels of PMD 2 and 120-Kbyte ROM in 100-pin package and suitable for home appliances requiring low motor vibration and high performance.

● **TLCS-870/X CPU Core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor Control Circuit**

- (PMD: Programmable Motor Driver) (2 channels)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

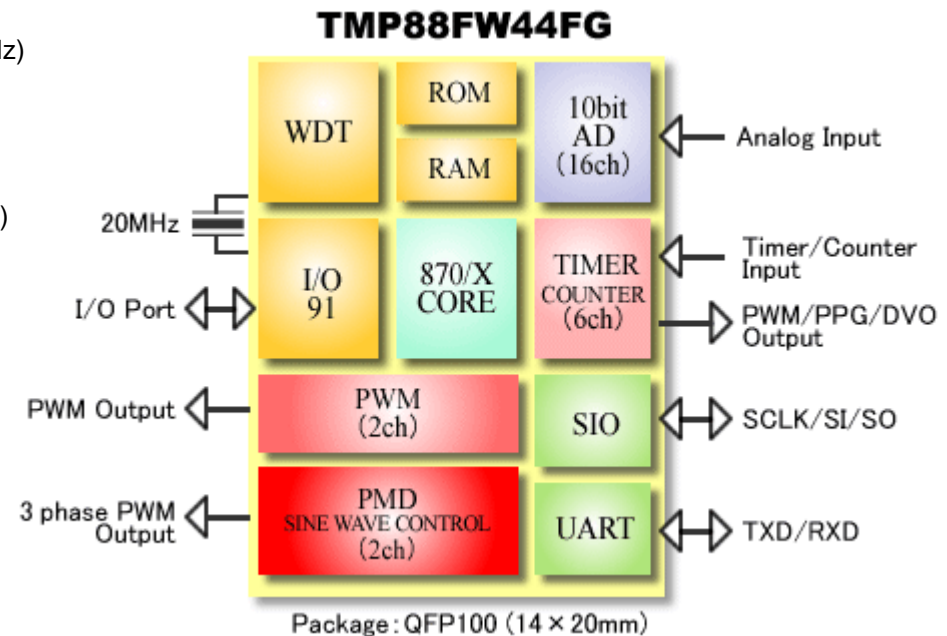
● **AD converter: 10-bit x 16 channels**

● **PWM output: 2 channels**

● **16-bit timer: 2 channels**

● **8-bit timer: 4 channels**

● **Serial Interface: SIO 1 channel, UART 2 channels**



Memory Size

Part Number	ROM	RAM
TMP88FW44FG	120 Kbytes (Flash)	4 Kbytes

TMP88CS43FG



8-bit microcontroller containing two channels of PMD 2 and suitable for home appliances requiring low motor vibration and high performance

● **TLCS-870/X CPU Core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor Control Circuit**

- (PMD: Programmable Motor Driver) (2 channels)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

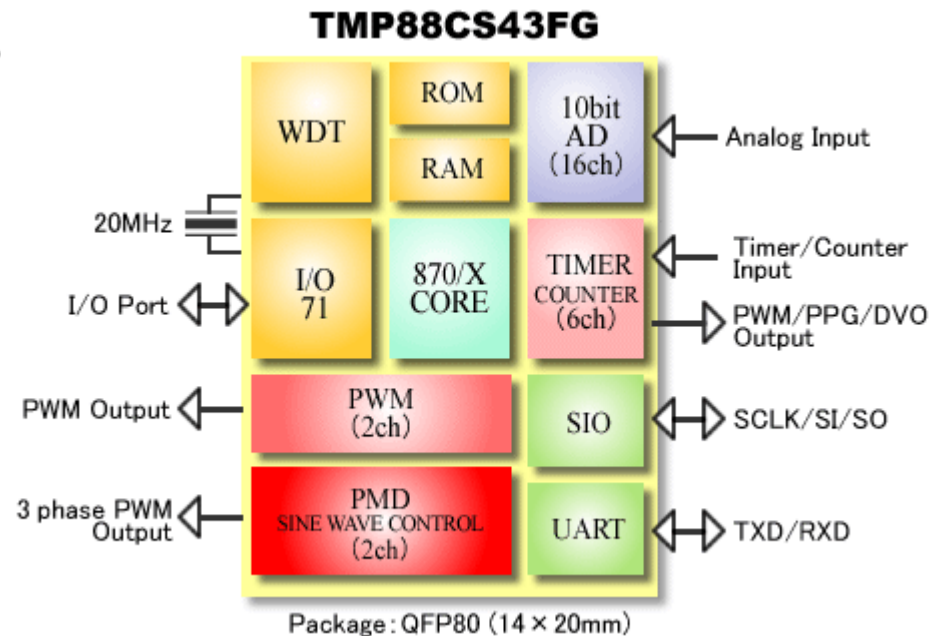
● **AD converter: 10-bit x 16 channels**

● **PWM output: 2 channels**

● **16-bit timer: 2 channels**

● **8-bit timer: 4 channels**

● **Serial Interface: SIO 1 channel, UART 1 channel**



Memory Variations

Part Number	ROM	RAM
TMP88CS43FG	64 Kbytes	2 Kbytes
TMP88PS43FG	64 Kbytes (OTP)	4 Kbytes

TMP88CS42NG/FG



8-bit microcontroller containing two channels of PMD 2 and suitable for home appliances requiring low motor vibration and high performance

● **TLCS-870/X CPU core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor control circuit**

- (PMD: Programmable Motor Driver) (2 channels)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

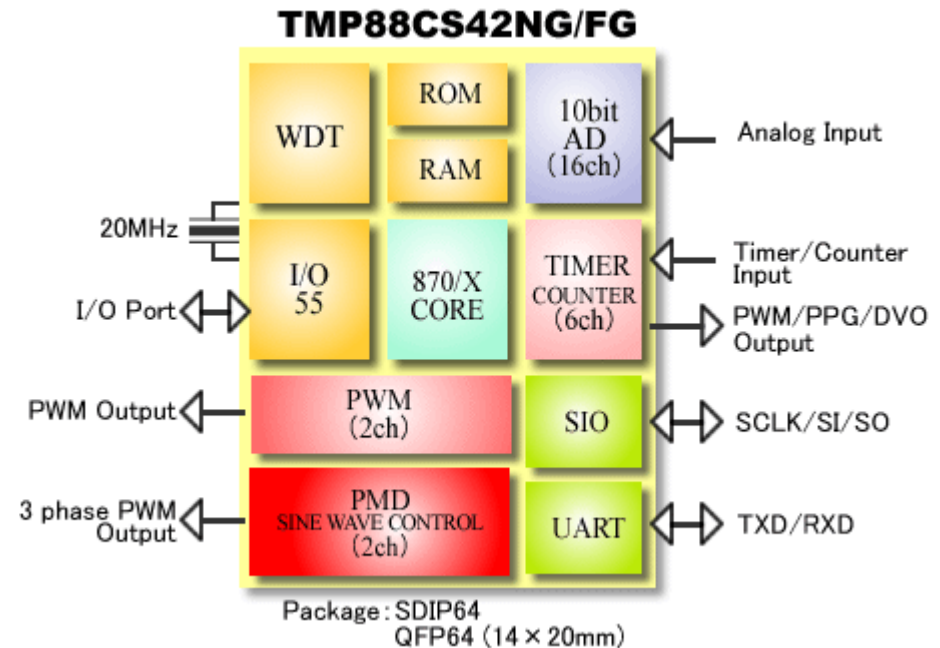
● **AD converter: 10-bit x 16 channels**

● **PWM output: 2 channels**

● **16-bit timer: 2 channels**

● **8-bit timer: 4 channels**

● **Serial Interface: SIO 1 channel, UART 1 channel**



Memory Variations

Part Number	ROM	RAM
TMP88CS42NG/FG	64 Kbytes	2 Kbytes
TMP88PS42NG/FG	64 Kbytes (OTP)	2 Kbytes

TMP88FH41UG



Low-pin-count Flash microcontroller containing a dedicated inverter motor control circuit (PMD)

● **TLCS-870/X CPU core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor control circuit**

- (PMD: Programmable Motor Driver) (1 channel)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

● **AD converter: 10-bit x 8 channels**
Synchronous start with INTPWM

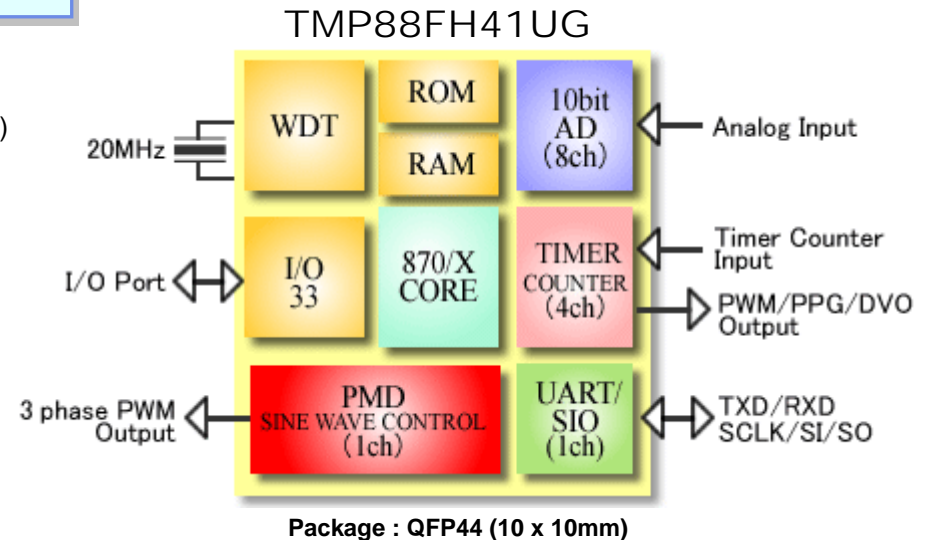
● **16-bit timer: 2 channels**

● **8-bit timer: 2 channels**

● **Serial interface: SIO/UART 1 channel**

● **Power-on reset circuit**

● **Voltage detecting circuit (VLTD)**



Product Lineup

Part Number	ROM	RAM
TMP88FH41UG	16 Kbytes (Flash)	512 bytes
TMP88CH41UG	16 Kbytes (Mask)	512 bytes
TMP88PH41UG	16 Kbytes (OTP)	512 bytes

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TMP88CH41NG/UG



8-bit microcontroller containing one channel of PMD 2 in 44-/42-pin package and suitable for simple home appliances requiring motor control

● **TLCS-870/X CPU core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor control circuit**

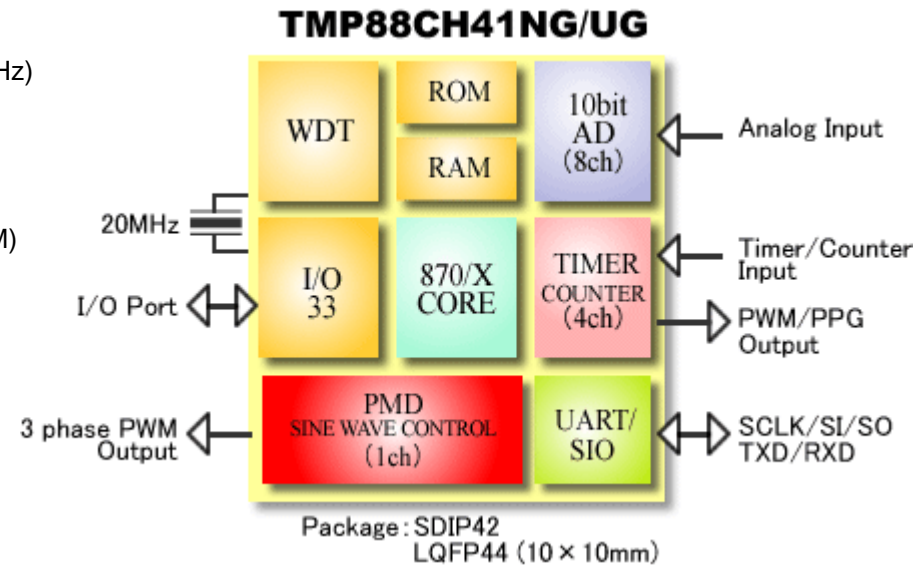
- (PMD: Programmable Motor Driver) (1 channel)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

● **AD converter: 10-bit x 8 channels**

● **16-bit timer: 2 channels**

● **8-bit timer: 2 channels**

● **Serial interface: SIO/UART 1 channel**



Memory Variations

Part Number	ROM	RAM
TMP88CH41NG/UG	16 Kbytes	512 bytes
TMP88PH41NG/UG	16 Kbytes (OTP)	512 bytes

TMP88CH40NG/MG



8-bit microcontroller containing one channel of PMD 2 in small 28-pin package and suitable for applications requiring electrical insulation or motor-only control for a large system

● **TLCS-870/X CPU core**

- Operating voltage : 4.5 to 5.5 V (20 MHz)
- Minimum instruction execution time : 200 ns (20 MHz)

● **Motor control circuit**

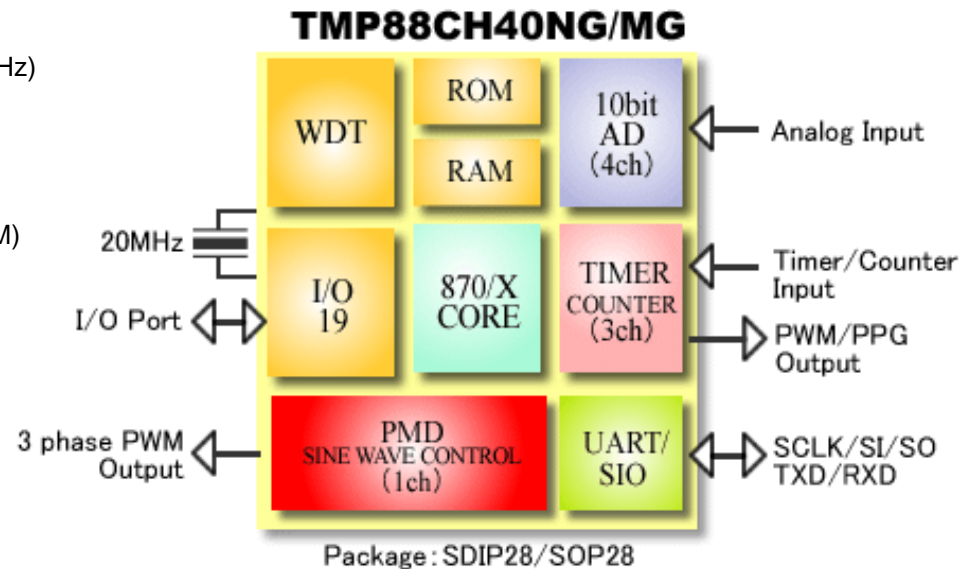
- (PMD: Programmable Motor Driver) (1 channel)
- Sine wave drive circuit (built-in sine wave data-table RAM)
 - Rotor position detect function
 - Motor control timer and capture function
 - Overload protective function
 - Auto commutation and auto position detection start function

● **AD converter: 10-bit x 4 channels**

● **16-bit timer: 1 channel**

● **8-bit timer: 2 channels**

● **Serial interface: SIO/UART 1 channel**



Memory Variations

Part Number	ROM	RAM
TMP88CH40NG/MG	16 Kbytes	512 bytes
TMP88PH40NG/MG	16 Kbytes (OTP)	512 bytes

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