

TOSHIBA

Leading Innovation >>>

Microcontrollers

Toshiba Microcontrollers for Automotive Applications

~ Product Guide ~

April 2008

Rev. 1.7

**TOSHIBA CORPORATION
Semiconductor Company**

Operating Temperatures and Part Numbers

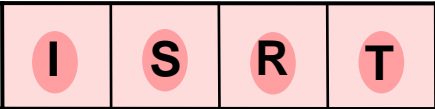
Operating Temperatures and Corresponding Part Numbers

Grade	Operating Temperatures (°C)	Example Part Number
A	-40 to 125	TMP91CMxx T
	-40 to 85	TMP91CMxx R
B	-40 to 125	TMP91CMxx S
	-40 to 85	TMP91CMxx I

In part numbers, the suffix “T” or “R” indicates Grade A products and “S” or “I” indicates Grade B products.



Quality Grade



Grade A: Recommended for automotive powertrain and safety systems.

Grade B: Recommended for automotive accessories.

Toshiba offers quality grade products for automotive applications. Note)

Note) For details about the automotive grade products, please contact your local Toshiba sales representative.

TMP91CY22IFG



16-bit microcontroller with 16-Kbyte RAM and various serial interfaces

Quality Grade
(Flash = Standard quality)

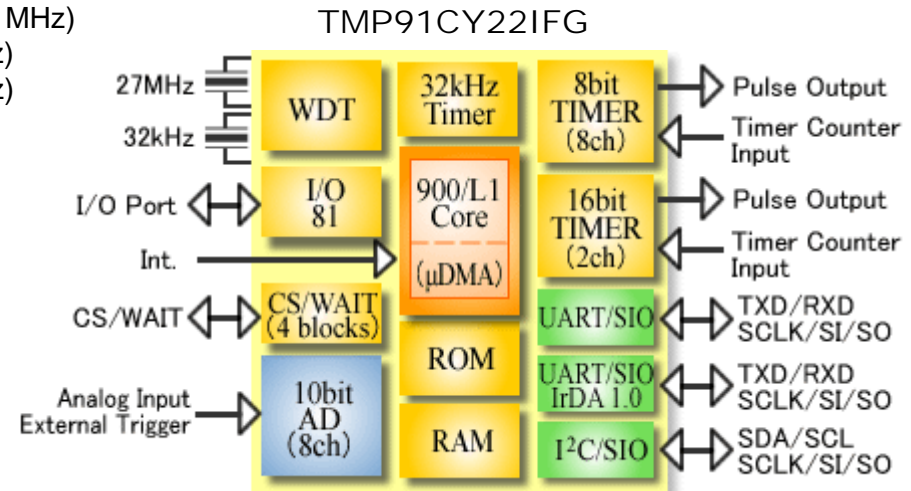
I	S	R	T
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● **TLCS-900/L1 CPU Core**

- Operating voltage : 2.7 to 3.6 V (27 MHz)
1.8 to 3.6 V (10 MHz)
- Minimum instruction execution time : 148 ns (27 MHz)
400 ns (10 MHz)

● **Built-in Functions**

- 10-bit AD converter : 8 channels
- UART/SIO : 1 channel
- UART/SIO/IrDA ver1.0 (115.2 kbps) : 1 channel
- I²C/SIO : 1 channel
- 8-bit timer : 8 channels
- 16-bit timer : 2 channels



Package: LQFP100 (14 x 14mm) MASK
QFP100 (14 x 14mm) FLASH

Product Lineup

Part Number	ROM	RAM
TMP91CY22IFG	256 Kbytes	16 Kbytes
TMP91FY42FG	256 Kbytes (Flash)	16 Kbytes

● This product uses the SuperFlash® technology under license of Silicon Storage Technology, Inc. Super Flash® is a registered trademark of Silicon Storage Technology, Inc.

TMP91CU27RUG

Under development



16-bit microcontroller with various serial interfaces in compact package

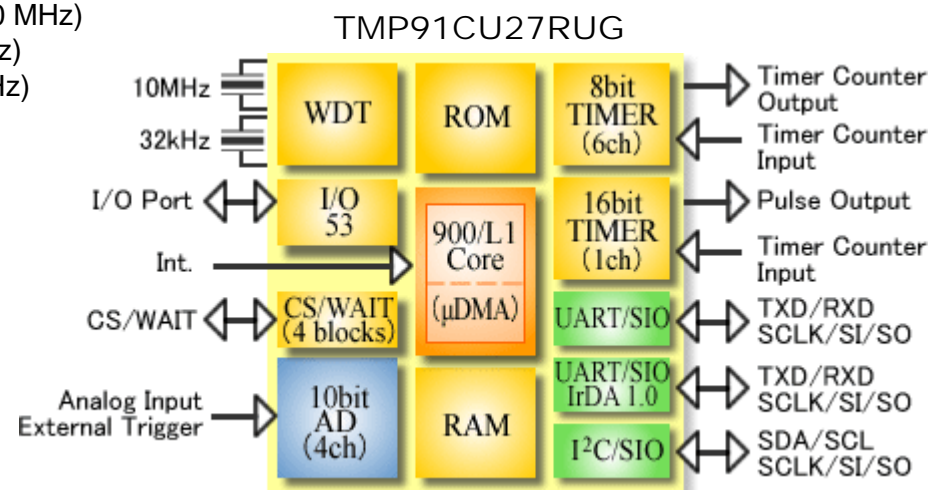
Quality Grade

(Flash = Standard quality)

I	S	R	T
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- **TLCS-900/L1 CPU Core**
 - Operating voltage : 2.7 to 3.6 V (27 MHz)
1.8 to 3.6V (10 MHz)
 - Minimum instruction execution time : 148 ns (27MHz)
400 ns (10 MHz)

- **Built-in Functions**
 - 10-bit AD converter : 4 channels
 - UART/SIO : 1 channel
 - UART/SIO/IrDA ver1.0 (115.2 kbps) : 1 channel
 - I²C/SIO : 1 channel
 - 8-bit timer : 6 channels
 - 16-bit timer : 1 channel



Package: LQFP64 (10 x 10mm)

Product Lineup

** : Under development

Part Number	ROM	RAM
TMP91CU27RUG**	96 Kbytes	10 Kbytes
TMP91FY27UG	256 Kbytes (Flash)	16 Kbytes

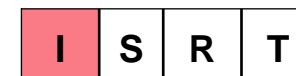
TMP92CD54IFG TMP92FD54AIFG

Under development



32-bit CAN microcontroller with 512-Kbyte ROM capable of 5V single-supply operation through use of voltage regulator and suitable for large-scale applications

Quality Grade



● **TLCS- 900/H1 CPU Core**

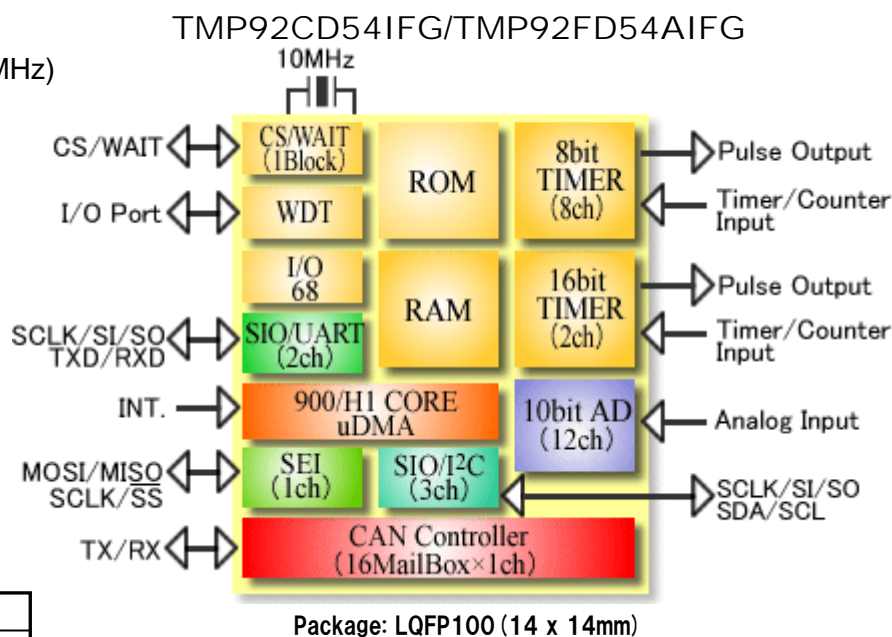
- Operating voltage : 4.5 to 5.25 V (10 MHz)
- Minimum instruction execution time : 50 ns (10 MHz)

● **Built-in Functions**

- 10-bit AD converter : 12 channels
- SIO/UART : 2 channels
- I²C/SIO : 3 channels
- SEI : 1 channel
- 8-bit timer : 8 channels
- 16-bit timer : 2 channels
- CAN controller : 1 channel
Full CAN 2.0B / 16 mailboxes

Product Lineup

Part Number	ROM	RAM
TMP92CD54IFG**	512 Kbytes	32 Kbytes
TMP92FD54AIFG**	512 Kbytes (Flash)	32 Kbytes



TMP86Cx08xDMG



8-bit microcontroller with two serial interfaces in compact package suitable for limited-space applications

Quality Grade

(OTP/Flash = Standard quality)

I	S	R	T
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● TLCS- 870/C CPU Core

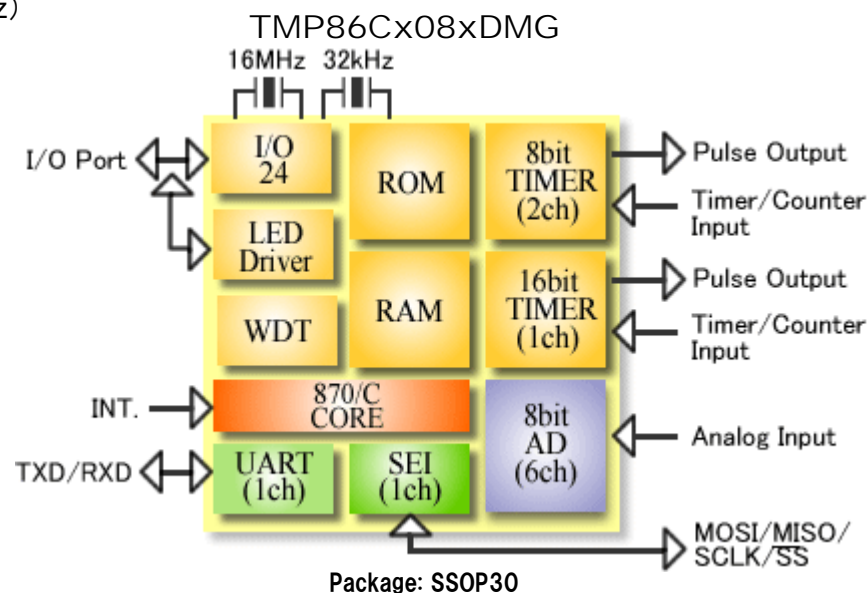
- Operating voltage : 4.5 to 5.5 V (16 MHz)
2.7 to 5.5 V (8 MHz)
- Minimum instruction execution time : 250 ns (16 MHz)

● Built-in Functions

- 8-bit AD converter : 6 channels
- UART : 1 channel
- SEI : 1 channel
- 8-bit timer : 2 channels
- 16-bit timer : 1 channel
- Key-on wake-up : 4 channels

Product Lineup

Part Number	ROM	RAM
TMP86C408IDMG	4 Kbytes	256 bytes
TMP86C408SDMG	4 Kbytes	256 bytes
TMP86C808IDMG	8 Kbytes	256 bytes
TMP86C808SDMG	8 Kbytes	256 bytes
TMP86P808DMG	8 Kbytes (OTP)	256 bytes
TMP86F808DMG	8 Kbytes (Flash)	256 bytes



TMP86Cx47xUG



8-bit microcontroller with 10-bit AD converter and two serial interfaces in 44-pin package

Quality Grade

(OTP/Flash = Standard quality)

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● TLCS- 870/C CPU Core

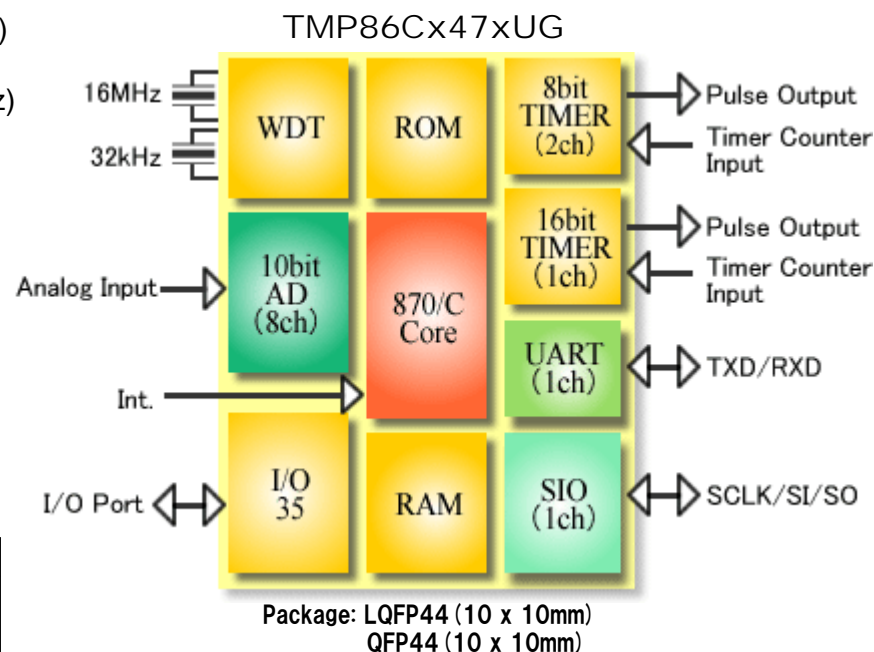
- Operating voltage : 4.5 to 5.5 V (16 MHz)
2.7 to 5.5 V (8 MHz)
1.8 to 5.5 V (4.2 MHz)
- Minimum instruction execution time : 250 ns (16 MHz)

● Built-in Functions

- 10-bit AD converter : 8 channels
- UART : 1 channel
- SIO : 1 channel
- 8-bit timer : 2 channels
- 16-bit timer : 1 channel
- Key-on wake-up : 4 channels

Product Lineup

Part Number	ROM	RAM
TMP86C847IUG/SUG	8 Kbytes	512 bytes
TMP86CH47IUG/SUG	16 Kbytes	512 bytes
TMP86PM47AUG	32 Kbytes (OTP)	1 Kbyte
TMP86FH47UG	16 Kbytes (Flash)	512 bytes



TMP86FS49AIUG TMP86FS49AIFG



8-bit microcontroller with various serial interfaces and enhanced 10-bit AD converter in 64-pin package

Quality Grade
(OTP = Standard quality)

I	S	R	T
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● **TLCS- 870/C CPU Core**

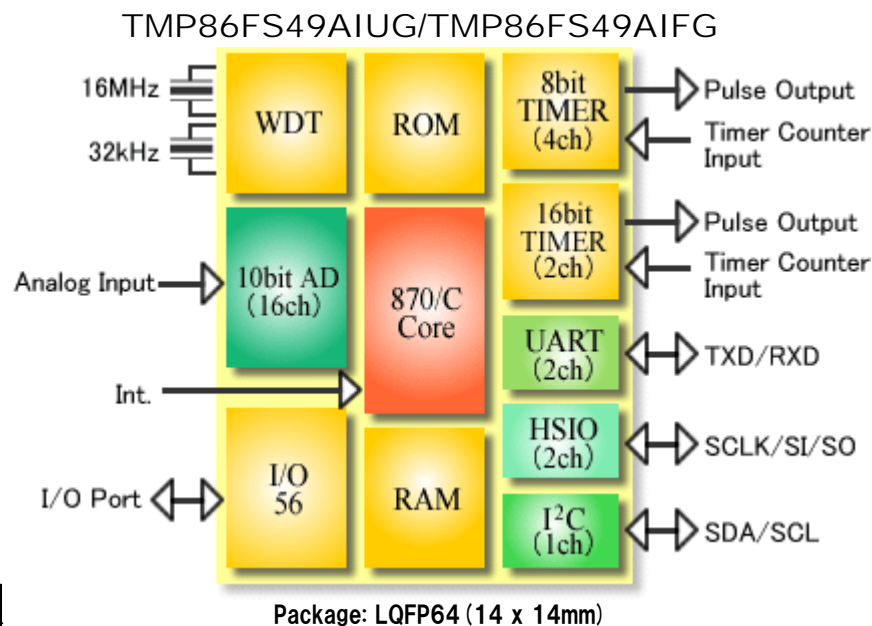
- Operating voltage : 1.8 to 5.5 V (Mask/OTP)
3.0 to 5.5 V (Flash)
- Minimum instruction execution time:
 - 250 ns at 16 MHz/4.5 to 5.5 V (Mask/OTP/Flash)
 - 500 ns at 8 MHz/2.7 to 5.5 V (Mask/OTP)
3.0 to 5.5 V (Flash)
 - 950 ns at 4.2 MHz/1.8 to 5.5 V (Mask/OTP)

● **Built-in Functions**

- 10-bit AD converter : 16 channels
- UART : 2 channels
- High-speed SIO : 2 channels
- I²C : 1 channel
- 8-bit timer : 4 channels
- 16-bit timer : 2 channels
- Key-on wake-up : 4 channels

Product Lineup

Part Number	ROM	RAM
TMP86PM49UG/FG	32 Kbytes (OTP)	1 Kbyte
TMP86FS49AIUG/IFG	60 Kbytes (Flash)	2 Kbytes



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TMP86xx87RUG



Compact 8-bit CAN microcontroller containing Full CAN 2.0B with 4 mailboxes and 14 channels of 10-bit AD converter in LQFP44 package

Quality Grade

I	S	R	T
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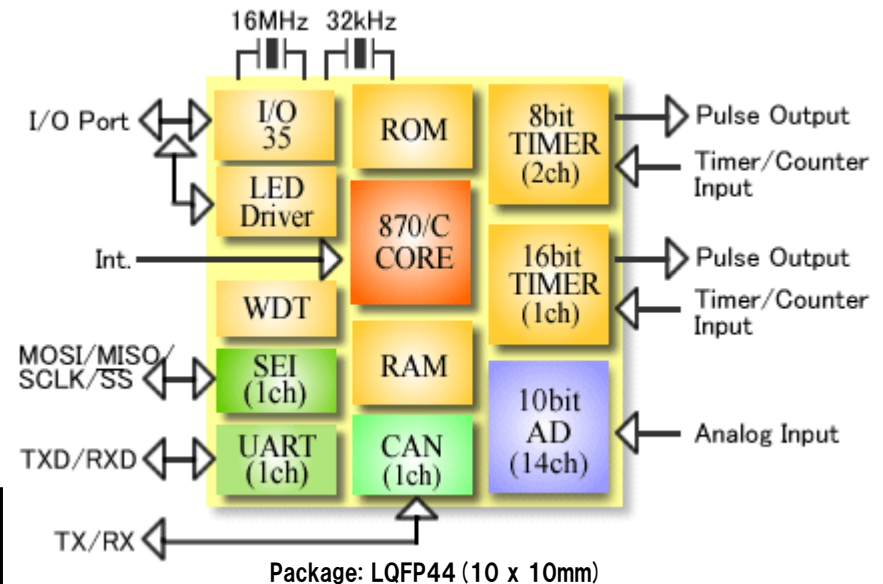
● **TLCS- 870/C CPU Core**

- Operating voltage : 4.5 to 5.5 V (16 MHz)
- Minimum instruction execution time : 250 ns (16 MHz)

TMP86CH87RUG/TMP86CM87RUG
TMP86PM87RUG

● **Built-in Functions**

- 10-bit AD converter : 14 channels
- UART : 1 channel
- SEI : 1 channel
- 8-bit timer : 2 channels
- 16-bit timer : 1 channel
- CAN controller : 1 channel
Full CAN 2.0B / 4 mailboxes
- Key-on wake-up : 4 channels



Memory Variations

Part Number	ROM	RAM
TMP86CH87RUG	16 Kbytes	1 Kbyte
TMP86CM87RUG	32 Kbytes	1 Kbyte
TMP86PM87RUG	32 Kbytes (OTP)	1 Kbyte

TMP86CH92IDMG TMP86FH92IDMG



8-bit microcontroller incorporating 10-bit AD converter, voltage detection circuit, and power-on reset circuit in compact 30-pin package

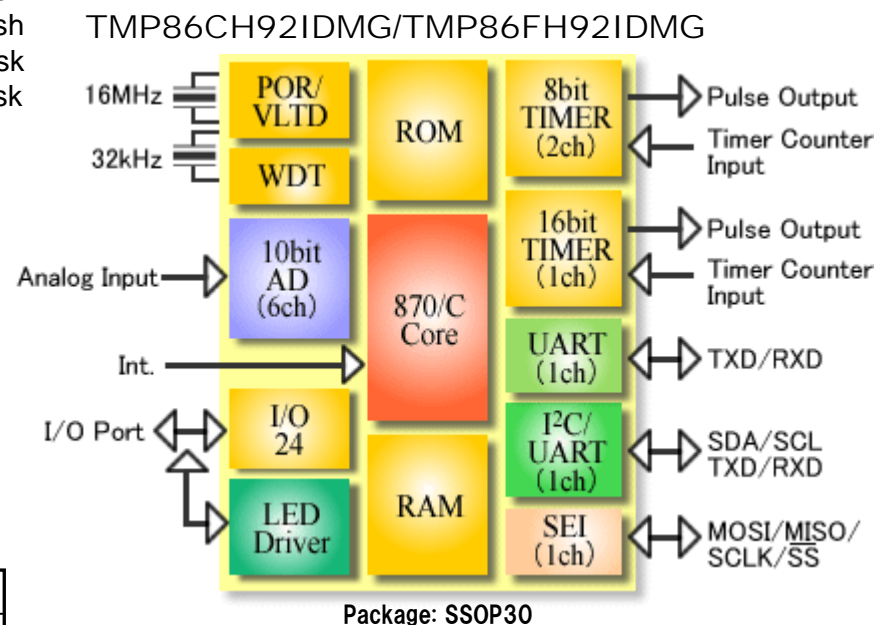
Quality Grade
(OTP = Standard quality)

I	S	R	T
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- **TLCS- 870/C CPU Core**
 - Operating voltage : 4.0 to 5.5 V (16 MHz) Flash
3.0 to 5.5 V (10 MHz) Flash
4.0 to 5.5 V (16 MHz) Mask
2.7 to 5.5 V (10 MHz) Mask
 - Minimum instruction execution time : 250 ns (16 MHz)
- **Built-in Functions**
 - 10-bit AD converter : 6 channels
 - UART : 1 channel
 - SEI : 1 channel
 - I²C/UART : 1 channel
 - 8-bit timer : 2 channels
 - 16-bit timer : 1 channel
 - Key-on wake-up : 4 channels

Product Lineup

Part Number	ROM	RAM
TMP86CH92IDMG	16 Kbytes	512 bytes
TMP86FH92IDMG	16 Kbytes (Flash)	512 bytes



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TMP88CH40IMG



8-bit microcontroller containing 1 channel of PMD2 in 28-pin package ideal for low-noise, low-vibration motor control

Quality Grade
(OTP = Standard quality)

I	S	R	T
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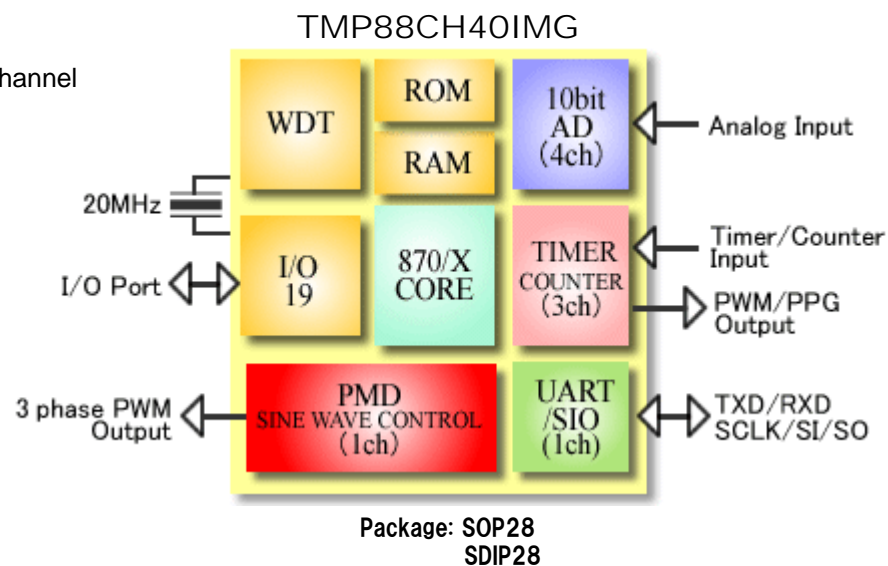
● **TLCS- 870/X CPU Core**

- 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 control
- DC motor control (sensorless, sensor-equipped)
- AC motor control (inverter control)
- Automatic commutation, automatic position detection
- Overload protection function

- 10-bit AD Converter : 4 channels
- 8-bit timer : 2 channels
- 16-bit timer : 1 channel
- SIO/UART : 1 channel



Memory Variations

Part Number	ROM	RAM
TMP88CH40IMG	16 Kbytes	512 bytes
TMP88PH40NG/MG	16 Kbytes (OTP)	512 bytes

TMP89FM82TDUG

Under development



8-bit microcontroller with improved PMD2 circuit, various communications functions, and power-on-reset circuit suitable for automotive motor control

Quality Grade

I	S	R	T
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ISO/TS16949

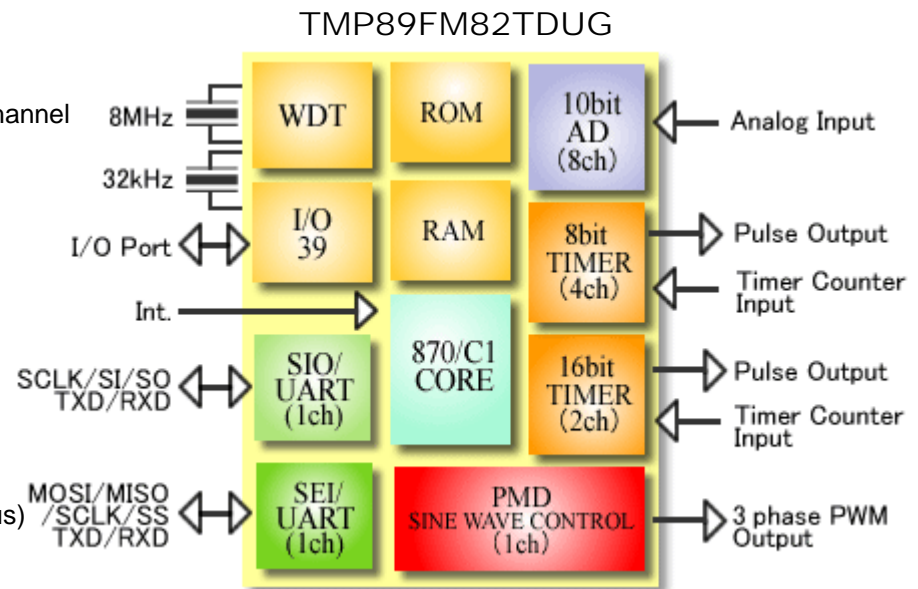
- **TLCS- 870/C1 CPU Core**
 - Operating voltage : 4.5 to 5.5 V (8 MHz)
 - Minimum instruction execution time: 125 ns (8 MHz)
- **Motor Control Circuit (PMD: Programmable Motor Driver) : 1 channel**
 - Enhanced PWM counter resolution (24 MHz)
 - Enhanced dead-time counter resolution
 - Supports 100% commutation
 - Supports multiple maps using sine wave data registers
 - Sine wave drive circuit

DC motor control (sensorless, sensed)
 AC motor control (Inverter control)
 Overload protective function
 Auto commutation, auto position detection start

- 10-bit AD Converter : 8 channels (conversion time 10μs)
- 8-bit Timer : 4 channels
- 16-bit Timer : 2 channels
- Serial Interface : SIO/UART: 1 channel
SEI/UART: 1 channel

- On-chip debug function
- Power-on reset circuit
- Voltage detecting circuit

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Package: LQFP48 (7 x 7mm /0.5mm pitch)

Memory Size

**Under development

Part Number	ROM	RAM
TMP89FM82TDUG**	32 Kbytes (Flash)	2 Kbytes

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