

TOSHIBA

PRODUCT GUIDE

8-Bit Microcontroller

TLCS-870/C1 Series

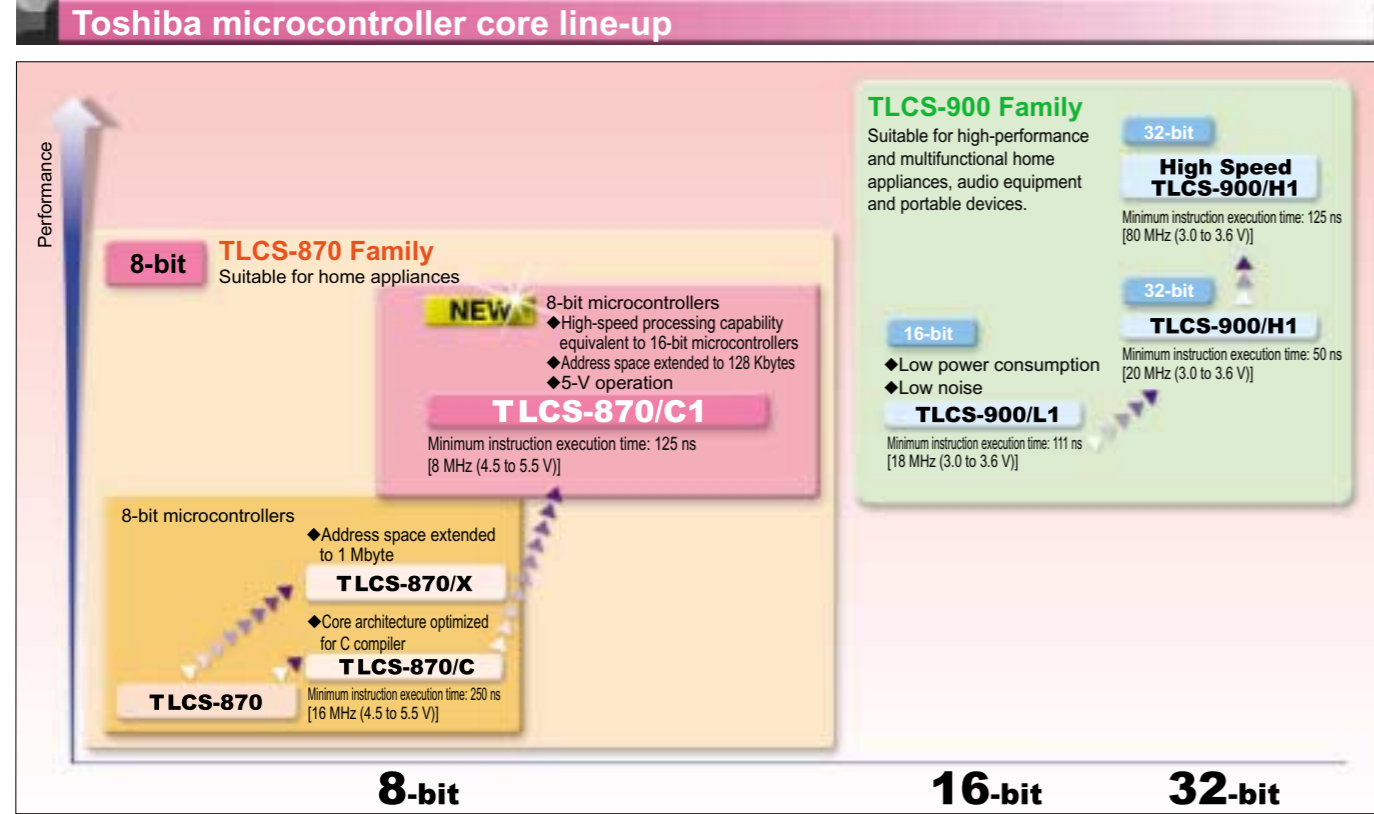
*TLCS-870/C1
SERIES*

8-Bit Microcontrollers

Toshiba Microcontrollers TLCS-870/C1 Series NEW

Realizing processing capability equivalent to 16-bit microcontrollers and memory address space extendable up to 128 Kbytes

Toshiba has newly developed TLCS-870/C1 Series of 8-bit microcontrollers that deliver high-speed processing capability equivalent to 16-bit microcontrollers. The TLCS-870/C1 Series achieves high-speed processing capability at low internal clock frequencies by operating one instruction cycle in a single clock cycle. Toshiba's proprietary memory segment method allows addressing up to 128 Kbytes of memory address space.

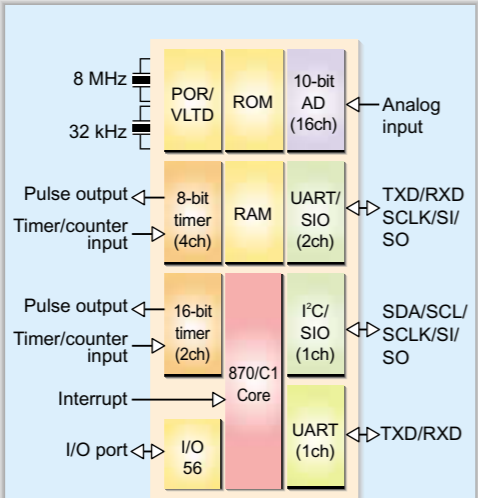


Product line-up NEW

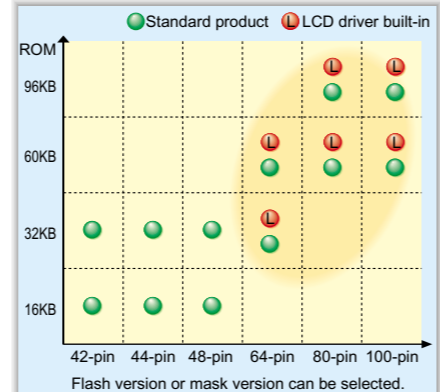
8-bit Flash microcontrollers based on TLCS-870/C1 core

TMP89FS60UG/FG**
General-purpose 64-pin product providing various interfaces for serial communications and a timer system

- TLCS-870/C1 Core**
 - Operating voltage: 4.5 to 5.5 V at 8 MHz, 2.7 to 5.5 V at 4.2 MHz
 - Clock gear:** 1/4, 1/2, 1/1
- Built-In Functions**
 - Voltage detecting circuit**
(Two voltage levels detectable, reset or interrupt selectable)
 - Power-on reset circuit**
(Threshold voltage: 2.4 V ±0.2 V)
 - 8-bit timer/counter: 4 channels (Resolution: 125 ns at 8 MHz)
 - 16-bit timer/counter: 2 channels (Resolution: 250 ns at 8 MHz)
 - UART/SIO*: 2 channels (UART: 128 Kbps, SIO: 4 Mbps at 8 MHz)
 - UART: 1 channel (UART: 128 Kbps at 8 MHz)
 - I²C/SIO*: 1 channel (I²C: 400 Kbps, SIO: 4 Mbps at 8 MHz)
* Two SIO channels can be used simultaneously.
 - 10-bit AD converter: 16 channels
 - Built-in pull-up resistors
 - On-chip debug function (Flash version only)



870/C1 Series road map (planned)



Packages:
UG: 64-pin LQFP (10 mm X 10 mm/0.50-mm pitch)
FG: 64-pin QFP (14 mm X 14 mm/0.80-mm pitch)

Part Number	ROM	RAM
TMP89CM60UG/FG**	32 KB	3.0 KB
TMP89CS60UG/FG**	60 KB	3.0 KB
TMP89FS60UG/FG**	60 KB	3.0 KB

** : Under development **: Under planning

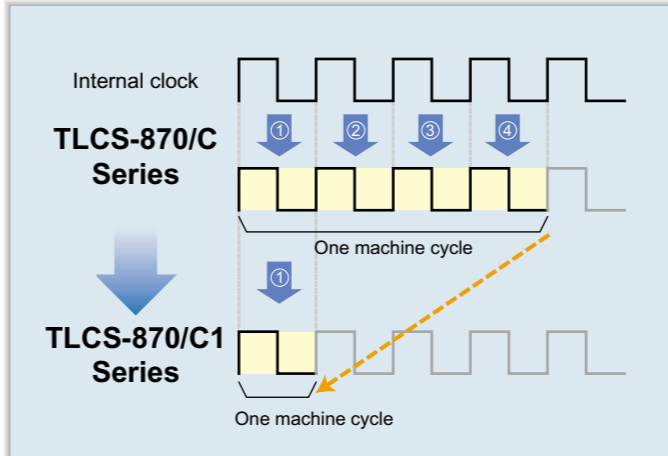
Features of TLCS-870/C1 Series

The new 8-bit CPU core delivering high-speed processing capability and memory address space extension, while offering instruction code compatibility with TLCS-870/C

High-speed processing at a low clock frequency

One instruction cycle operated in a single clock cycle

The core architecture is configured to reduce the number of clock cycles required to complete one machine cycle to a single clock cycle. This achieves processing performance four times that of TLCS-870/C Series at the same internal clock frequency.



TLCS-870/C1 Series: Minimum instruction execution time of 125 ns
TLCS-870/C Series: Minimum instruction execution time of 250 ns

Advantages of low-frequency operation

- Compared to the TLCS-870/C, power consumption can be reduced at the same performance level.
- Noise generation can be reduced.

Address space extendable to 128 Kbytes

Toshiba's proprietary memory segment method manages instruction codes and data independently in separate memory address spaces. This new method enables memory address space extension without affecting processing speed or code efficiency for small- to large-sized programs exceeding 64 Kbytes.

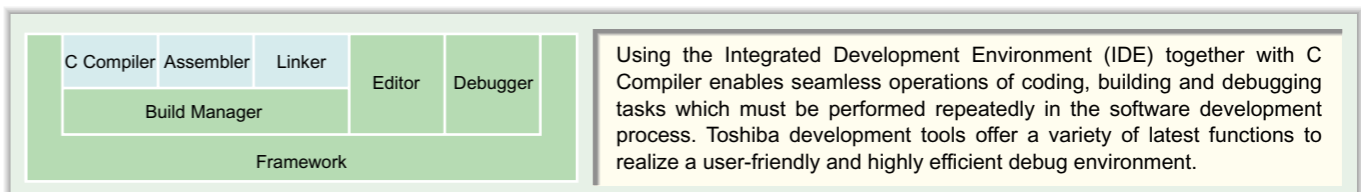
Segment method

Compact core and object sizes
Compared to the address bus extension method, core and code sizes are reduced. The instruction set is compatible with TLCS-870/C.

Software design facilitated
Unlike the bank switching method, small- to large-sized programs need not be modified. Processing speed and code efficiency are unaffected even if the code size exceeds 64 Kbytes.

Development System

Toshiba Integrated Development Environment (TIDE)



Emulators

On-chip debug emulator

- Business-card-sized compact emulator
- No need for power supply (using USB bus power)
- Target connection via a narrow-pitched cable
- Extensive on-chip debug functions
- Break/event: 8 breakpoints/1 event
- Trace: The last two branches can be stored in real time.
- Memory access: Display/Rewrite during program execution in 1-byte units (with a wait of 1 clock cycle)
- Debug pin: Two I/O pins
- Flash programming function
- IDE included (downloadable from website)

In-circuit emulator

- Compact, low-cost, yet highly functional in-circuit emulator (compared to RTE870/C model 15)
- Various 870/C1 Series devices supported by replacing the probe
- Common probe with RTE870/C Light* (* Compact emulator for 870/C Series)
- Connected with the host system via USB
- IDE included (downloadable from website)

*The target system requires a separate power supply.

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