



# Family



The **TX49** Family of RISC microprocessors for embedded use is an original Toshiba 64-bit processor family and is based on the RISC architecture designed by the MIPS Group in the U.S.A. The **TX49** Family processors can also be used as ASSPs or as the CPU core for gate arrays and cell-based ICs, allowing you to attain a higher level of integration in your system than has ever been possible before.

## 64-bit RISC architecture

- 64-bit operation
- Thirty-two 64-bit general-purpose registers
- Optimized 5-stage pipelining
- Upward-compatible instruction set including MIPS I, MIPS II and MIPS III instruction set architectures (ISAs)
  - Multiply/add instructions and debugging instructions added
- Built-in 48 double entry TLB

## Built-in high-capacity primary cache

- Instruction cache: 8/16/32 KB (selectable)
  - 4-way set-associative
  - Supports lock function.
- Data cache: 8/16/32 KB (selectable)
  - 4-way set-associative
  - Supports lock function.
  - Write-back/write-through (every page)
  - Supports snoop function.

## Useful as CPU core for gate arrays / cell-based ICs

- TX49/H: TC240C process technology
- TX49: TC220C process technology

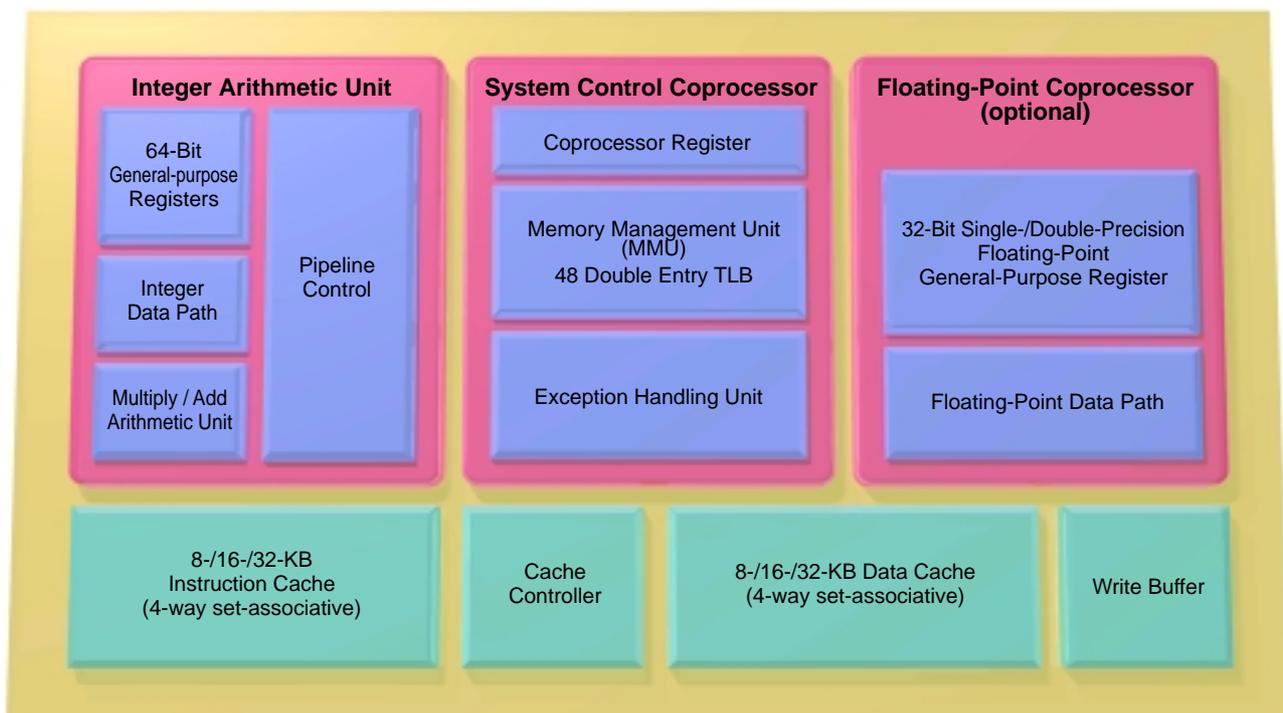
## Low power consumption design

- Low power consumption modes (Doze/Halt)
- Supply voltage: 3.3 V

## Numerous optional functions

- Debug support unit
  - Supports EJTAG.
- Single- or double-precision floating-point unit

## ■ TX49 processor block diagram



# NEW PRODUCTS

General-purpose MPU

**NEW**

## TMPR4901F-133\*

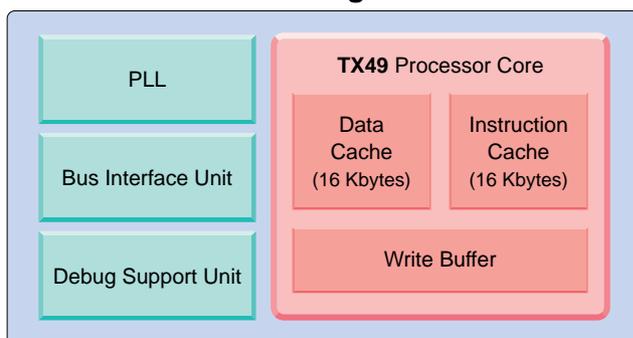
\* Under development

### ■ 64-bit general-purpose RISC microprocessor based on the TX49 processor core

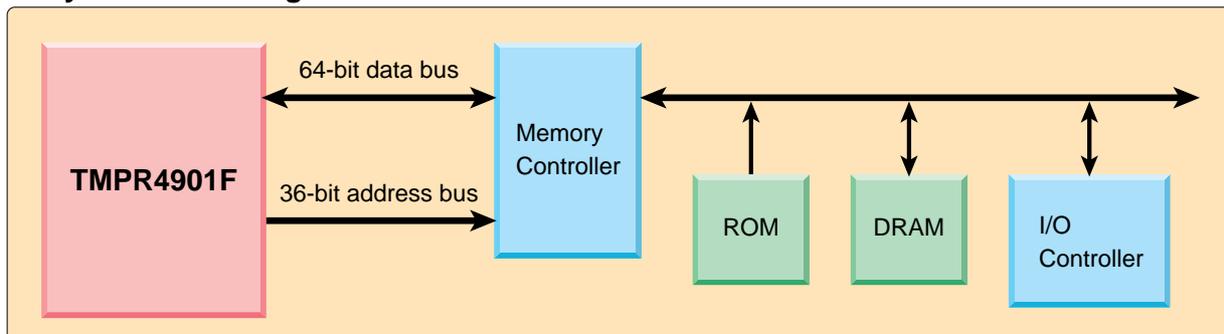
The **TMPR4901F** is the first product in the **TX49** Family. Built around the **TX49** processor core, it incorporates a clock generator and a debug support unit. This microprocessor is not just a general-purpose MPU; it can also be used to verify functions and evaluate device performance during the development of ASICs which feature the **TX49** processor core.

- TX49 processor core
- Instruction cache: 16 Kbytes built in
- Data cache: 16 Kbytes built in
- Separate 36-bit address bus and 64-bit data bus
- Clock generator with x16 PLL
- Low power consumption modes (Doze/Halt)
- Built-in debug support unit
- Maximum internal operating frequency: 133 MHz
- Maximum external operating frequency: 66 MHz
- Supply voltage: 3.3 V
- Package: 208-pin QFP

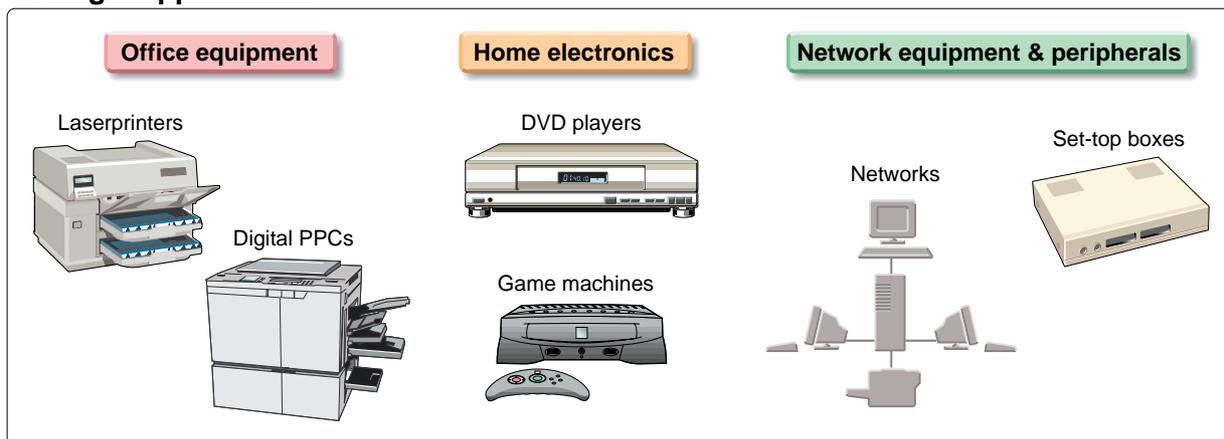
### ■ TMPR4901F block diagram



### ■ System block diagram



### ■ Target applications



# NEW PRODUCTS

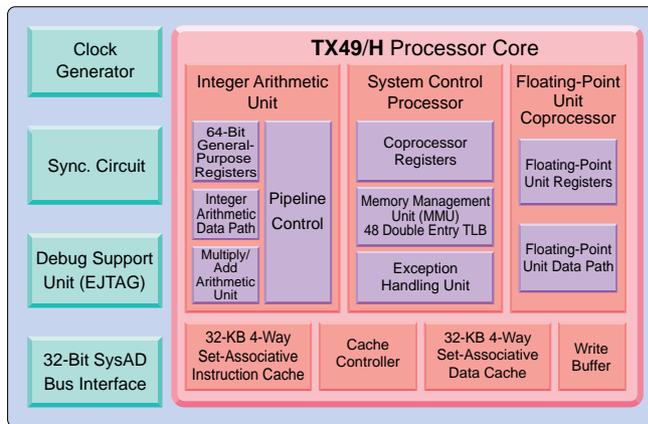
Floating-point unit built-in

**NEW**

## TMPR4955F-167\*/4955F-200\* \* Under development

### ■ 64-bit general-purpose RISC microcomputer with floating-point unit

The **TMPR4955F** is built around a **TX49/H** processor core with improved cache size and operating frequency. Incorporating a floating-point unit (FPU) and a 32-bit SysAD interface, the **TMPR4955F** is ideal for a wide range of applications, including laser beam printers (LBPs), network equipment and set-top boxes (STBs). In addition, a built-in debug support unit (DSU) allows smooth debugging.



- **TX49/H** 64-bit RISC core
- Five-stage pipeline
- On-chip caching
  - 4-way set-associative caches
  - Instruction cache: 32 KB built in
  - Data cache: 32 KB built in
  - Cache lock function
- Prefetch instruction
- 48 double entry TLB
- 32-bit system interface bus (SysAD bus)
- Single-/Double-precision FPU
- Low power consumption mode
- Supply voltage
  - Internal: 2.5 V
  - External: 3.3 V
- Built-in debug support unit (DSU)
- Maximum operating frequency: 167 MHz / 200 MHz
- Package: 160-pin QFP

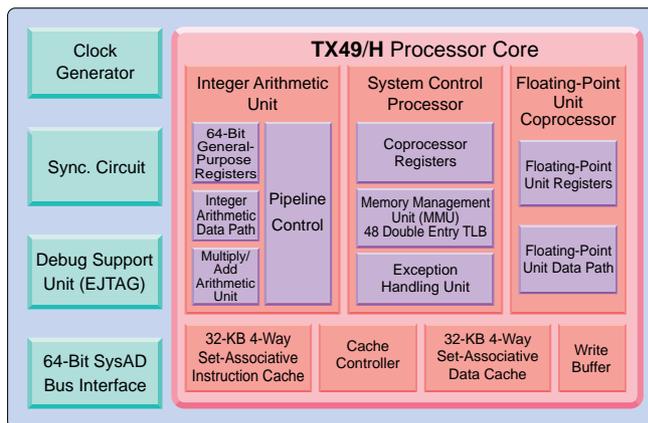
Floating-point unit built-in

**NEW**

## TMPR4956F-167\*/4956F-200\* \* Under development

### ■ SysAD bus-extended 64-bit RISC microcomputer with floating-point unit

The **TMPR4956F** 64-bit microcomputer is the SysAD bus-extended version of the **TMPR4955F**. The **TMPR4956F** incorporates a floating-point unit (FPU) as well as a **TX49/H** processor core, and is ideal for a wide range of applications including laser beam printers (LBPs), network equipment and set-top boxes (STBs). In addition, a built-in debug support unit (DSU) allows smooth debugging.



- **TX49/H** 64-bit RISC core
- Five-stage pipeline
- On-chip caching
  - 4-way set-associative caches
  - Instruction cache: 32 KB built in
  - Data cache: 32 KB built in
  - Cache lock function
- Prefetch instruction
- 48 double entry TLB
- 64-bit system interface bus (SysAD bus)
- Single-/Double-precision FPU
- Low power consumption mode
- Supply voltage
  - Internal: 2.5 V
  - External: 3.3 V
- Built-in debug support unit (DSU)
- Maximum operating frequency: 167 MHz / 200 MHz
- Package: 208-pin QFP

## 64-Bit TX System RISC

# TX100 Series



### 64-bit superscalar RISC processors for workstations and servers

- Compatible with the R10000 RISC processors available from MIPS Technologies, Inc.
- 64-bit superscalar architecture
- Capable of operating at 200 MHz
- Built-in 32-Kbyte instruction and data caches



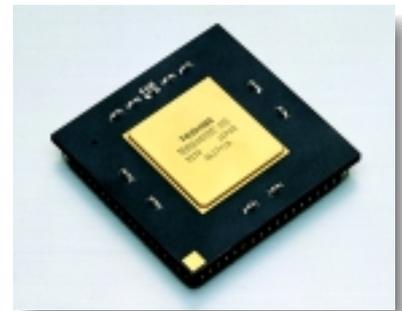
Product No.	Internal Frequency	Supply Voltage	Package	Features
<b>TC86R10000</b>	200 MHz	3.3 V	LGA 599	Superscalar architecture Built-in primary cache memory (64 KB) Built-in secondary cache memory controller

## 64-Bit TX System RISC

# TX44 Series



The **TX44** Series is comprised of 64-bit RISC microprocessors that are compatible with the R4000/R4400 microprocessors from MIPS Technologies, Inc. The microprocessors in this series are suited to a wide variety of applications, ranging from personal computers to high-end workstations. In addition to the internal operating frequency of 200 MHz, 8-stage super-pipeline and 32 Kbytes of primary cache memory, the microprocessors in this series contain an FPU based on the ANSI/IEEE-754-1985 standard, enhancing their integer and floating-point arithmetic capability.



- Integer arithmetic performance: 141 SPECint92 (at 200 MHz)
- Floating-point arithmetic performance: 143 SPECfp92 (at 200 MHz)
- 8-stage super-pipeline
- Built-in secondary cache memory controller
- Multiprocessing capability
- Package: 447-pin PGA

Product No.	Internal Frequency	Supply Voltage	Operating Temperature Range	Package
<b>TC86R4400-200(L)</b>	200 MHz	3.3 V	0° to 70°C	PGA447
<b>TC86R4400-200(SB)</b>	200 MHz	3.3 V	0° to 85°C	PGA447
<b>TC86R4400-150(S)</b>	150 MHz	3.3 V	0° to 85°C	PGA447

## 64-Bit TX System RISC

# TX43 Series



Product No.	Internal Frequency	Supply Voltage	Operating Temperature Range	Package
<b>TC86R4300F-100</b>	100 MHz	3.3 V	0° to 85°C	QFP120