

Microcontrollers
Toshiba Microcontrollers with LCD Controller
~ Product Guide ~

September 2008
Rev. 1.6

TOSHIBA CORPORATION
Semiconductor Company

TMP91C815FG



Standard 16-bit microcontroller with LCD controller, RTC, memory management unit (MMU), and melody alarm function

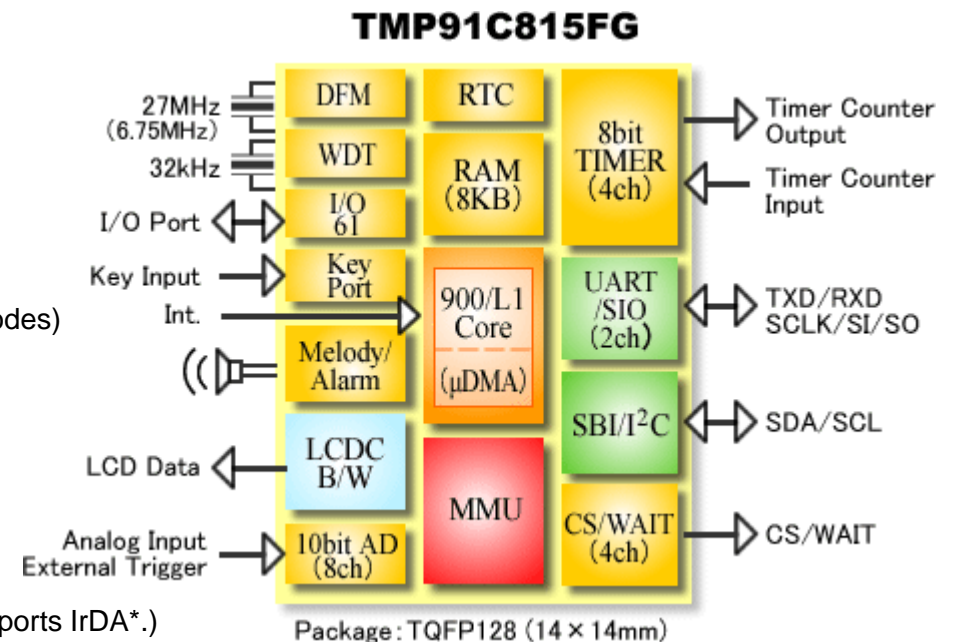
● TLCS-900/L1 CPU Core

- Operating voltage : 1.8 to 3.6 V
- Minimum instruction execution time : 148 ns (27 MHz/2.7 V)
400 ns (10 MHz/1.8 V)
- Power-saving features : Clock gear
Dual clocks
Standby modes
(IDLE2, IDLE1, STOP modes)

● Built-in Functions

- LCD controller : 1 channel (monochrome)
- 10-bit AD converter : 8 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- UART/SIO : 2 channels
(One of the channels supports IrDA*.)
- SBI/I²C : 1 channel
- Watchdog timer : 1 channel
- Memory management unit (MMU) : Up to 136 Mbytes

* IrDA: Infrared communication standards developed by the Infrared Data Association



Memory Size

Part Number	ROM	RAM
TMP91C815FG	None	8 Kbytes

TMP91C016FG



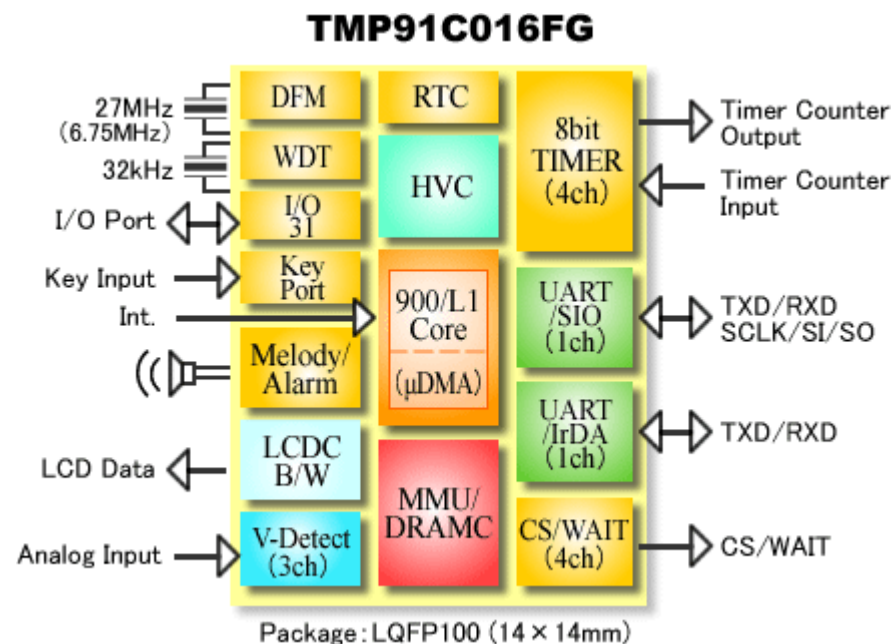
16-bit microcontroller with EDO DRAM controller and voltage detector

● TLCS-900/L1 CPU Core

- Operating voltage : 1.8 to 3.6 V
- Minimum instruction execution time : 148 ns (27 MHz/2.7 V)
400 ns (10 MHz/1.8 V)
- Power-saving features : Clock gear
Dual clocks
Standby modes
(IDLE2, IDLE1, STOP modes)

● Built-in Functions

- HVC (Horizontal Vertical Converter) : 1 channel
- LCD controller : 1 channel (monochrome)
- VLD (Voltage Level Detector) : 3 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- UART/SIO : 1 channel
- UART/IrDA1.0 : 1 channel (115.2 Kbps)
- EDO DRAM controller : 1 channel
- Watchdog timer : 1 channel
- Memory management unit (MMU) : Up to 105 Mbytes



Memory Size

Part Number	ROM	RAM
TMP91C016FG	None	None

TMP91C025FG



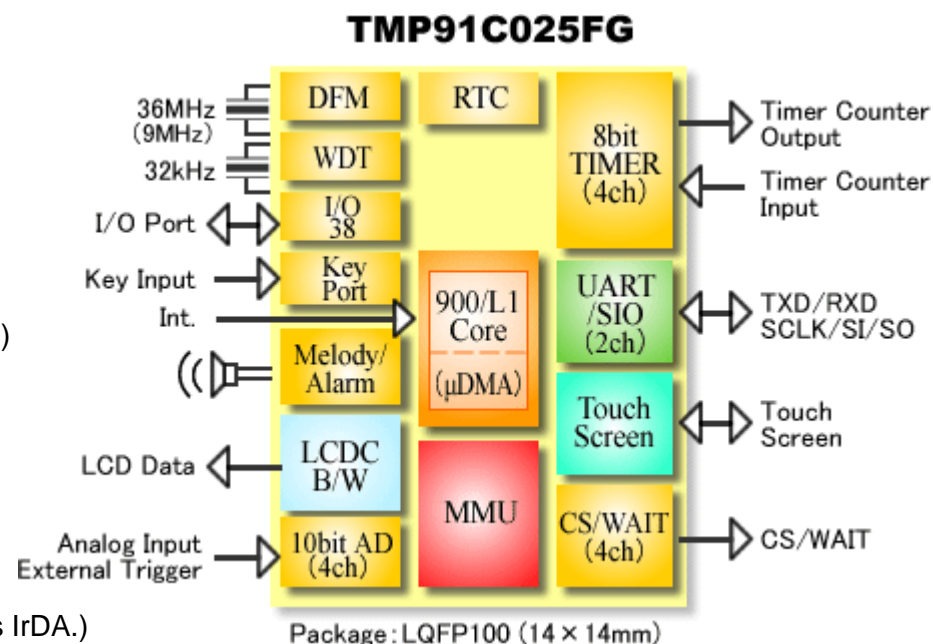
16-bit microcontroller supporting touch screen interface

● TLCS-900/L1 CPU Core

- Operating voltage : 2.7 to 3.6 V
- Minimum instruction execution time : 111 ns (36 MHz/3.0 V)
148 ns (27 MHz/2.7 V)
- Power-saving features : Clock gear
Dual clocks
Standby modes (IDLE2, IDLE1, STOP modes)

● Built-in Functions

- LCD controller : 1 channel (monochrome)
- 10-bit AD converter : 4 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- UART/SIO : 2 channels
(One of the channels supports IrDA.)
- Watchdog timer : 1 channel
- Memory management unit (MMU) : Up to 72 Mbytes
- Touch screen interface : 1 channel



Memory Size

Part Number	ROM	RAM
TMP91C025FG	None	None

TMP91C820AFG



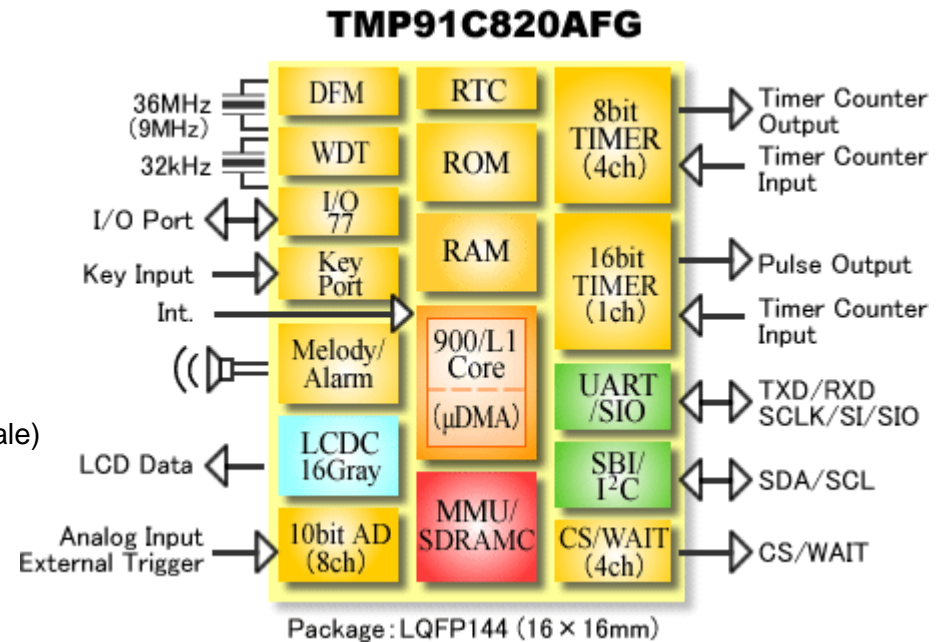
16-bit microcontroller with LCD controller and SDRAM controller supporting 16-level grayscale and 4096-color display

● TLCS-900/L1 CPU Core

- Operating voltage : 2.7 to 3.6 V
- Minimum instruction execution time : 111 ns (36 MHz/3.0 V)
148 ns (27 MHz/2.7 V)
- Power-saving features:
 - Clock gear
 - Dual clocks
 - Standby modes (IDLE2, IDLE1, STOP modes)

● Built-in Functions

- SDRAM controller : Up to 128 Mbits
- LCD controller : 1 channel (16-level grayscale)
- 10-bit AD converter : 8 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- 16-bit timer : 1 channel
- UART/SIO : 2 channels
- SIO/IrDA1.0 : 1 channel (115.2 Kbps)
- SBI/I²C : 1 channel
- Watchdog timer : 1 channel
- Memory management unit (MMU) : Up to 136 Mbytes



Memory Size

Part Number	ROM	RAM
TMP91C820AFG	8 Kbytes	8 Kbytes

TMP92C820FG



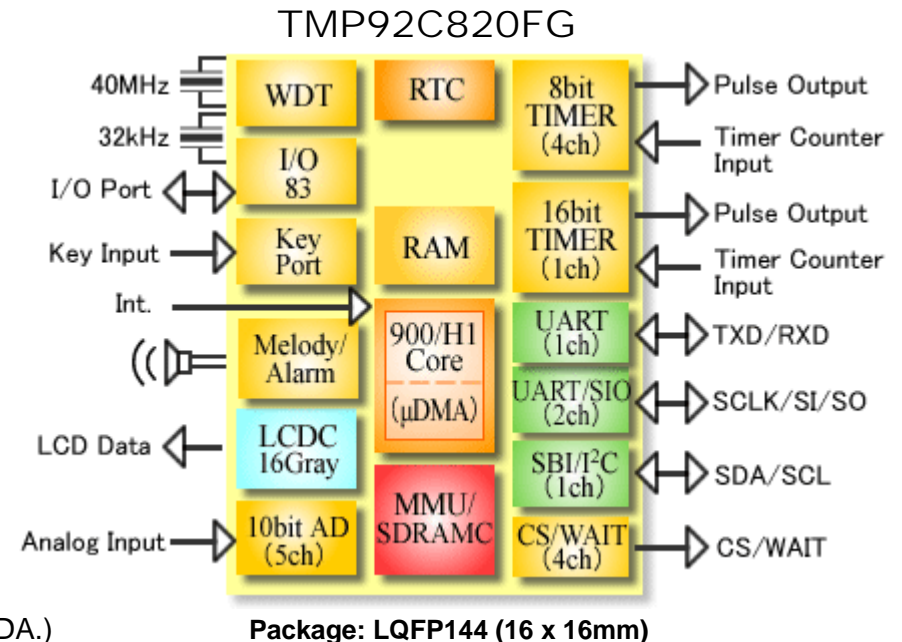
32-bit microcontroller based on high-performance 900/H1 core

● TLCS-900/H1 CPU Core

- Operating voltage : 3.0 to 3.6 V
- Minimum instruction execution time : 50 ns (internal 20 MHz)
- Power-saving features : Clock gear
Dual clocks
Standby modes (IDLE2, IDLE1, STOP modes)

● Built-in Functions

- SDRAM controller : Up to 128 Mbits
- LCD controller : 1 channel (16-level grayscale)
- 10-bit AD converter : 5 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- 16-bit timer : 1 channel
- UART : 1 channel
- UART/SIO : 2 channels
(One of the channels supports IrDA.)
- SBI/I²C : 1 channel
- Watchdog timer : 1 channel
- Memory management unit (MMU) : Up to 136 Mbytes



Memory Size

Part Number	ROM	RAM
TMP92C820FG	None	8 Kbytes

TMP92CH21FG



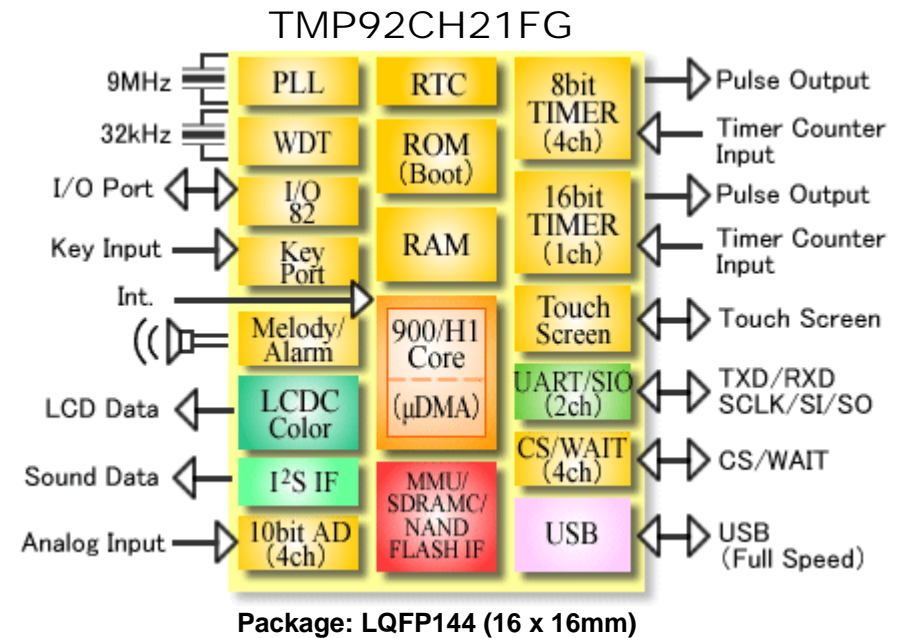
32-bit microcontroller with color LCD controller, USB control, and NAND Flash ROM interface

● TLCS-900/H1 CPU Core

- Operating voltage : 3.0 to 3.6 V
- Minimum instruction execution time : 50 ns (internal 20 MHz)
- Power-saving features : Clock gear
Dual clocks
Standby modes

● Built-in Functions

- USB device controller : 1 channel
- SDRAM controller : Up to 512 Mbits
- Color LCD controller (4096/TFT 4096/STN) : 1 channel
- NAND Flash ROM interface : 2 channels (128M x 2)
- I²S interface : 1 channel
- 10-bit AD converter : 4 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- 16-bit timer : 1 channel
- UART/SIO : 2 channels
(One of the channels supports IrDA.)
- Watchdog timer : 1 channel
- Touch screen interface : 1 channel
- Memory management unit (MMU) : Up to 512 Mbytes



Memory Size

Part Number	ROM	RAM
TMP92CH21FG	8 Kbytes (Boot)	16 Kbytes

TMP92CA25FG



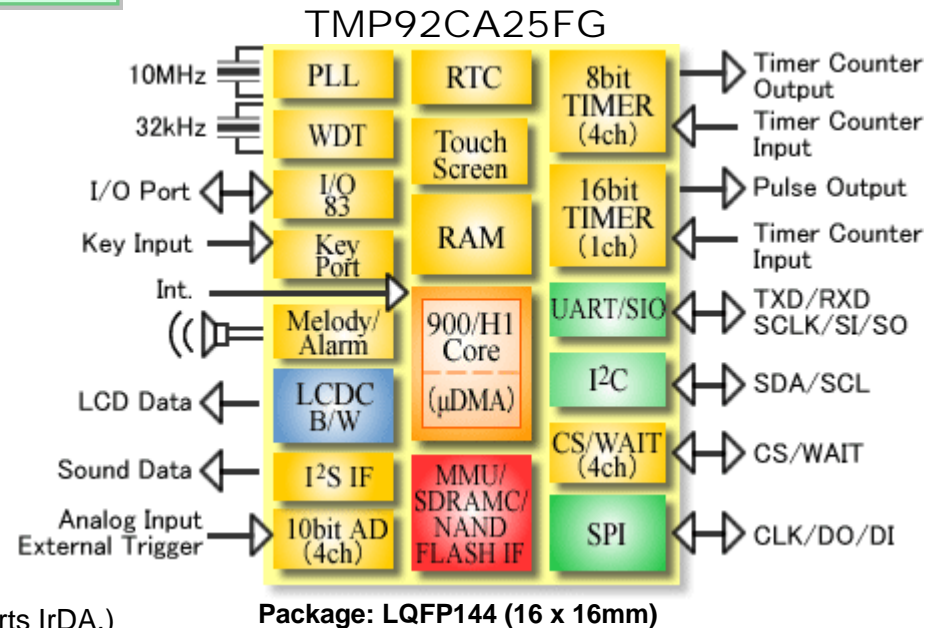
32-bit microcontroller with monochrome LCD controller and NAND Flash ROM interface

● TLCS-900/H1 CPU core

- Operating voltage : 3.0 to 3.6 V
- Minimum instruction execution time : 50 ns (internal 20 MHz)

● Built-in Functions

- SPI (Serial Peripheral Interface) : 1 channel
- SDRAM controller : Up to 512 Mbits (display & program execution)
- LCD controller : 1 channel (monochrome)
- NAND Flash ROM interface : 2 channels (128M x 2)
- I²S interface : 1 channel
- 10-bit AD converter : 4 channels
- RTC : 1 channel
- 8-bit timer : 4 channels
- 16-bit timer : 1 channel
- UART/SIO : 1 channel
- I²C : 1 channel
- Watchdog timer : 1 channel
- Touch screen interface : 1 channel
- Memory management unit (MMU) : Up to 512 Mbytes (One of the channels supports IrDA.)



Memory Size

Part Number	ROM	RAM
TMP92CA25FG	None	10 Kbytes

TMP92CZ26AXBG



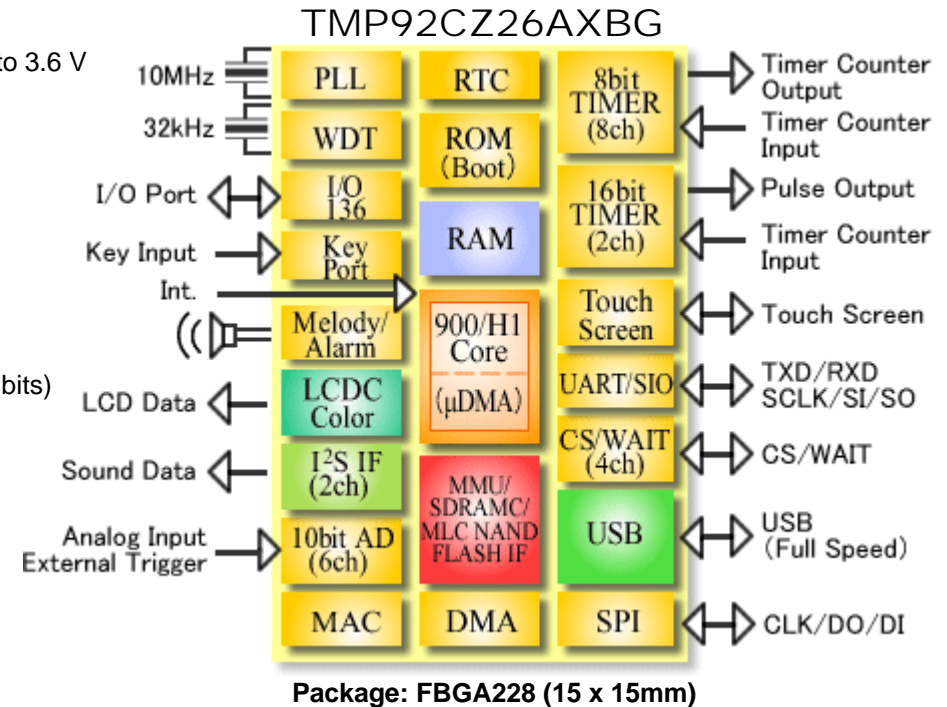
32-bit microcontroller with 0.18um process 900/H1 core and large-capacity RAM, capable of operating at 80 MHz (four times faster than existing 900/H1 products)

● **TLCS-900/H1 CPU Core (0.18 um)**

- Operating voltage : Internal 1.4 to 1.6 V, I/O 3.0 to 3.6 V
- Minimum instruction execution time : 12.5 ns (internal 80 MHz)
- Power-saving features : Clock gear
Dual clocks
Standby modes

● **Built-in Functions**

- Color LCD controller : 1 channel (16M/TFT 64K/STN)
- MLC/SLC NAND Flash ROM interface: 2 channels (128M x 2)
- MAC (multiply-accumulate unit) : 1 channel (32 x 32 + 64 = 64 bits)
- USB (full-speed) device controller : 1 channel
- SDRAM controller : Up to 512 Mbits
- I²S interface : 2 channels
- 10-bit AD converter : 6 channels
- DMA controller : 6 channels
- SPI (SD card) : 1 channel
- RTC : 1 channel
- 8-bit timer : 8 channels
- 16-bit timer : 2 channels
- UART/SIO : 1 channel
- Watchdog timer : 1 channel
- Touch screen interface : 1 channel
- Memory management unit (MMU) : Up to 3.1 Gbytes



Product Lineup

Part Number	ROM	RAM
TMP92CF26AXBG	8 Kbytes (Boot)	144 Kbytes
TMP92CZ26AXBG	8 Kbytes (Boot)	288 Kbytes

TMP92CF29AFG



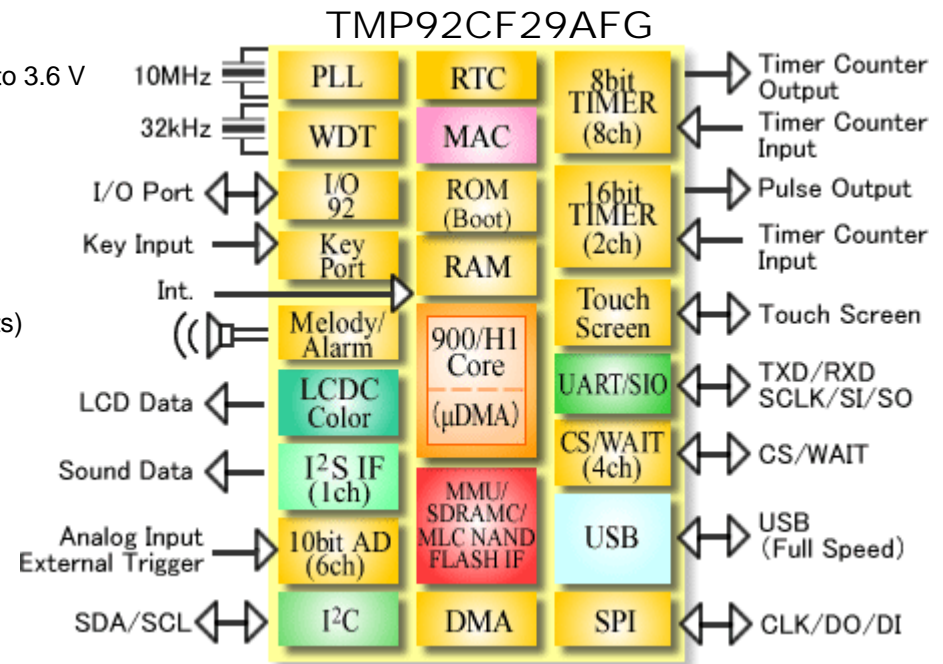
High-speed advanced 32-bit microcontroller with large capacity RAM and color LCD controller capable of operating at 80MHz

● **TLCS-900/H1 CPU Core (0.18 um)**

- Operating voltage : Internal 1.4 to 1.6 V, I/O 3.0 to 3.6 V
- Minimum instruction execution time : 12.5 ns (internal 80 MHz)

● **Built-in Functions**

- Color LCD controller : 1 channel (64K/TFT 64K/STN)
- MLC/SLC NAND Flash ROM interface: 2 channels (128M x 2)
- MAC (multiply-accumulate unit) : 1 channel (32 x 32 + 64 = 64 bits)
- USB (full-speed) device controller : 1 channel
- SDRAM controller : Up to 512 Mbits
- I²S interface : 1 channel
- 10-bit AD converter : 6 channels
- DMA controller : 6 channels
- SPI* (SD card) : 1 channel
- RTC : 1 channel
- 8-bit timer : 8 channels
- 16-bit timer : 2 channels
- UART/SIO : 2 channels
- Watchdog timer : 1 channel
- Touch screen interface : 1 channel
- Memory management unit (MMU) : Up to 2.1 Gbytes



Package: LQFP176 (20 x 20mm)

Memory Size

Part Number	ROM	RAM
TMP92CF29AFG	8 Kbytes (Boot)	144 Kbytes

* SPI : Serial Peripheral Interface

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