

# TOSHIBA

The intelligent automotive  
display controller

## Capricorn Family



## Applications

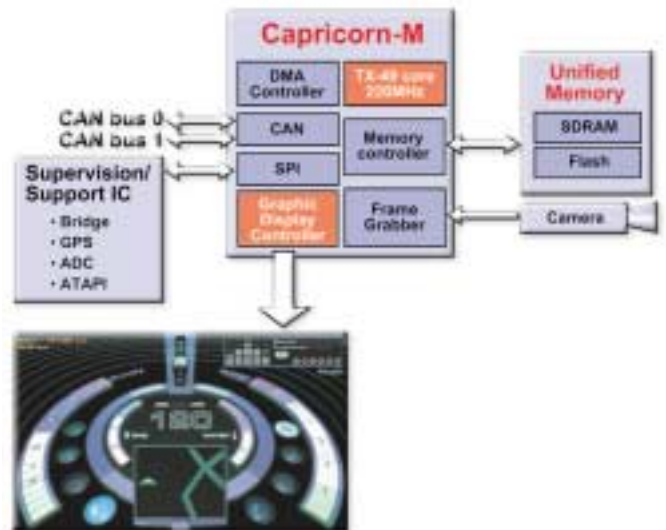
More and more cars are equipped with infotainment systems using a TFT display. Typical applications areas are  
 Car navigation systems  
 Driver information systems  
 Telematic systems  
 Rear seat entertainment systems

Such systems require a processor and a graphic display controller (GDC). Toshiba put both devices on one chip, minimizing the component count, utilising a unified memory architecture and therefore enabling a cost-effective and powerful implementation of infotainment applications.



## One-chip System Concept

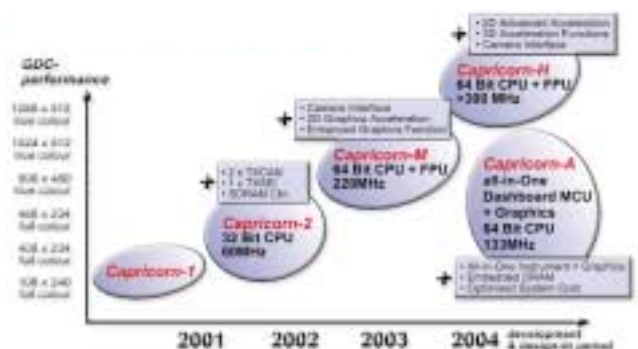
- Processor & display controller on a single chip
- Minimum component count
- Large bandwidth available for CPU and GDC due to separated internal buses
- Unified memory architecture  
 Direct CPU access to the frame buffer for fast direct graphics manipulations
- Integrated CAN controllers  
 • Bridge  
 • GPS  
 • ABC  
 • ATAPI
- Lower EMI  
 Fewer external bus connections
- Better reliability  
 Less components and fewer connections
- Reduced qualification effort required



## Capricorn Roadmap

Toshiba developed a series of Capricorn devices responding to the needs of different applications and is continuously enlarging this family to fulfil the demands of future infotainment systems with ever enhanced functionalities.

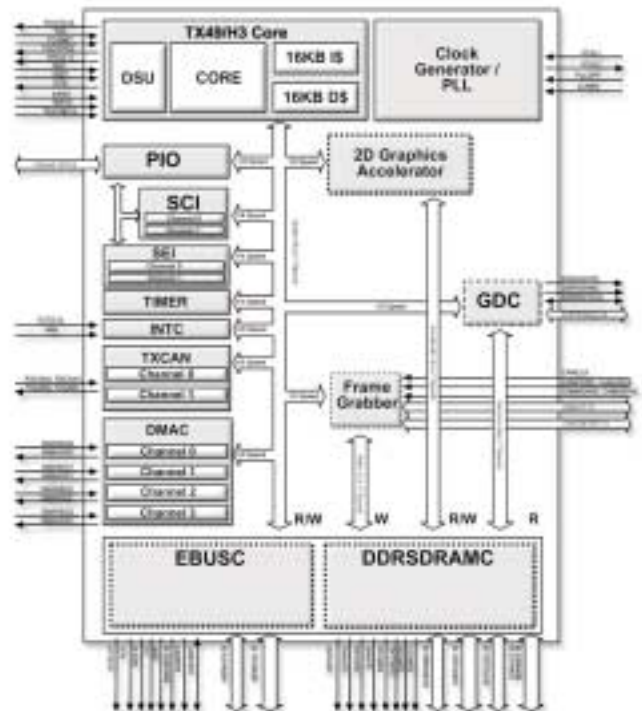
The Capricorn ASSPs are developed by Toshiba's European LSI Design and Engineering Centre (ELDEC). Evaluation boards are available for Capricorn-2 and Capricorn-M.





## Capricorn M Key Features

- 64-Bit TX49 Core, 220MHz, FPU
- Quad G-Bus DDR-SDRAM-Controller
- Graphics Display Controller
  - Display resolution up to 800 x 600 dots
  - 5 Layers ( 4 Main + Hardware-Cursor)
  - Smooth scrolling function for all layers
  - Video artefact handling
- Frame Grabber
  - Supports several input formats (RGB & YCbCr)
  - Capable of resolutions of up to 1024x512 dots
  - Picture-Cropping
  - Bilinear filtered pixel-by-pixel up and downscaling
- Graphics Accelerator
  - Drawing-Engine (high quality antialiasing)
  - Blitter-Engine
- Memory Controller
  - DDR-SDRAM: 2 channel
  - Flash, EBIF, async. SRAM: 4 channel
- Peripheral Blocks
  - Interrupt Controller
  - 4 x DMA Controller
  - 2 x CAN, 2 x SPI, 2 x UART
  - Timers, PWM Timer, General Purpose I/Os
- Capricorn M is currently developed in Europe



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