Product Presentation
ARM7TDMI-S 16-Bit/ 32Bit MCU
MultiMarket Semiconductors
BL Microcontrollers
April 2003
Microcontroller Business Line

• No 1 in 80C51-based Microcontrollers
  53% share in 2001   source: Gartner Dataquest

• Announced Industry-first 0.18 micron Flash
  16/32-bit ARM Microcontroller architecture

• Ambitious growth plans supported by
  commitment to leading technology innovation

• Partnerships, innovation, manufacturing and
  service strategies in place to achieve this
Microcontroller Core Roadmap

Throughput

100

10

1

Memory Size

1 KB
64 KB
1 MB
16 MB

16/32-bit
ARM9
ARM7TDMI-S

16-bit

LPC900
8-bit

2-Clock C51
6-Clock C51
12-Clock C51

1 KB
64 KB
1 MB
16 MB

16-bit XA

51MX

ARM7TDMI-S

Semiconductors
The ARM7TDMI-S is based on an ARM7 core

- **T** - Thumb architecture extension
  - ARM Instructions are all 32-bit
  - Thumb instructions are all 16-bit
  - Two execution states to select which instruction set to execute
- **D** - Core has debug extensions
- **M** - Core has enhanced multiplier (32*8) with instructions 64-bit results
- **I** - Core has EmbeddedICE Macrocell™
- **S** - Fully synthesizeable
LPC210x Flash MCU Family
16/32-bit ARM7TDMI-S Microcontroller

- Low-Power 0.18 µm process
  - 1.8V low-voltage operation
  - 128KBytes zero wait-state Flash
  - In-Application Programmable
  - 16/32/64KBytes SRAM

- Wide range of peripherals
  - UARTs, I2C, SPI, CAN, ADC, Timers, Ethernet, USB, 802.11b etc.
  - Philips, PrimeCell™, & 3rd party IP

- Full on-chip debug support
  - E-ICE RTM™ real-time debug
  - ETM™ embedded trace emulation

- Comprehensive development tools
  - IAR, Ashling, Hitex, Nohau
  - Keil, ARM … plus many others
ARM7-based microcontroller architecture

Shared System Architecture based on the ARM7TDMI-S Core, Real-Time debug Embedded Trace and Vectored Interrupt Controller Prime Cell®

All derivatives share:

• High-bandwidth 128-bit Flash and on-chip programming interface
• Memory map and interrupt structure
• ARM PrimeCell™ and Philips peripheral IP
• Easy to use debug, emulation and trace interfaces in low-cost production packages
LPC2100  Typical Applications

- Point of Sale (POS) Terminals
- Utility Metering
- Set Top Box (STB)
- Security Systems
- Serial Protocol Converters
- Vending Machines
- Remote Diagnostics
- Medical Systems
- Embedded Applications
LPC2100 Application + Soft Modem

- V21 through V32.bis capable
- V.42 and MNP4 Error correction
- TCP/IP
- Fast Connect
- DTMF generation and detection
- Tone generation and detection
- AT command set control
PHILIPS

16/32-bit ARM7TDMI-S Products
LPC2100 & 2200 Series

MultiMarket Semiconductors
BL Standard ICs - Microcontrollers
October 2003
ARM Microcontrollers

Philips has developed a family of ARM-based Microcontrollers

For
- Low-Cost High Volume Applications

With
- Embedded Flash and SRAM
- On-board AMBA-bus Peripherals (Adv. µC Bus Architecture)
- Real-Time Deterministic behavior (no Cache required)
- Full Debug, Real-time Monitoring and Trace facilities

To
- Continue on from our successful 8-bit 80C51 Family
- Enable new low-cost 16/32-bit Microcontroller-based applications
Philips approach for ARM microcontrollers

- Fast on-chip flash memory, code-execution from flash no loading into RAM needed
- “Real” microcontroller, no external memories
- General purpose microcontroller
- Very small packages provides high volume cost advantage
- Address customers using large memory 8 / 16-bit devices today and help them upgrade to a device open for the future
- Low cost 32-bit solutions
- Superior debugging features over most competitors
What is NOT our primary approach

- External (slow) program execution
- Applications that require Mbytes of memory
- ASIC-like solutions that require significant design resources to satisfy one customer's requirements
- High pincount packages
- Addressing customers who use XScale or ARM9 or other high-end architectures
- uCLinux
Philips 16/32-bit ARM7TDMI-S Family

- **On-Chip Memories**
  - Flash: 0 to 256KBytes (0.18u) ... up to 1MBytes (0.14u)
  - SRAM: 8 to 64KBytes (0.18u) ... up to 256KBytes (0.14u)

- **Wide range of 8/16-bit peripherals**
  - Timers, RTC, UARTs, I²C, SPI, 10-bit ADC, CAN2.0B, etc.

- **Planned for 2004: new 32/16-bit peripherals**
  - Ethernet MAC, USB 2.0

- **Packages:**
  - Quad Flat-Pack LQFP up to 144 pins
  - ‘Chip-Scale’ HVQFN up to 64 pins
  - L(T)FBGA 80,128,144 and up possible
**LPC2100/2200 overview**

<table>
<thead>
<tr>
<th>LPC210x</th>
<th>LPC211x</th>
<th>LPC22xx</th>
</tr>
</thead>
<tbody>
<tr>
<td>LPC2106 128K/64K</td>
<td>LPC2119 128K/16K CAN (2)</td>
<td>LPC2294 256K/16K CAN (6)</td>
</tr>
<tr>
<td>LPC2105 128K/32K</td>
<td>LPC2124 256K/16K 10-b ADC</td>
<td>LPC2224 256K/16K 10-b ADC</td>
</tr>
<tr>
<td>LPC2104 128K/16K</td>
<td>LPC2114 128K/16K 10-b ADC</td>
<td>LPC2214 128K/16K 10-b ADC</td>
</tr>
</tbody>
</table>

- **LPC210x** 48pins
- **LPC211x** 64pins
- **LPC22xx** 144pins

**Note:** Part No’s are subject to change

- released
- Q4/03
- Q1/04
LPC2106 Block Diagram

Semiconductors
**LPC2124 Block Diagram**

1. **AHB and Local Bus**
   - ARM 7TDMI-S
   - Vectored Interrupt Controller
   - AHB to VPB Bridge
   - Watchdog Timer
   - Real Time Clock

2. **VLSI Peripheral Bus (VPB)**
   - SPI Port
   - UART0
   - UART1
   - ADC
   - GPIO
   - Timer0
   - Timer1
   - PWM
   - I²C

3. **System Functions**
   - PLL
   - System Clock

**Components:**
- 16KB SRAM
- 256 KB FLASH
- SRAM Controller
- Memory Accelerator
- Test/Debug
- Trace
- AHB to VPB Bridge
- System Clock

**Interface Pins:**
- SCL, SDA, SCK, MOSI, MISO, SS
- TCK, TDI, TDO
- TRST, TMS
- X1, X2, X3
- RST
- Vdd, Vss
- USB, Ethernet
- UART0, UART1
- SPI Port
- ADC
- GPIO
- Timer0, Timer1
- PWM
- VCC, GND

**System Clock Generation:**
- PLL

**Microcontroller:**
- ARM 7TDMI-S

**GPIO Pins:**
- 2 pins
- 4 pins
- 8 pins
- 2 pins
- 6 pins

**Data Transfer Interfaces:**
- I²C
- SPI
- UART
- ADC
- GPIO
- Timer
- PWM
LPC2129 Block Diagram

16KB SRAM
- SRAM Controller
- Memory Accelerator

256 KB FLASH

Test/Debug | Trace
---|---
ARM 7TDMI-S

PLL
- System Functions

AHB and Local Bus
- Real Time Clock
- Watchdog Timer
- AHB to VPB Bridge
- Vectored Interrupt Controller

VLSI Peripheral Bus (VPB)
- I²C
- SPI Port
- UART0
- UART1
- 2xCAN
- ADC
- GPIO
- Timer0
- Timer1
- PWM

System Clock

SCL, SDA, SCK, MISO, MOSI, SSEL
- 2 pins
- 8 pins
- 4 pins
- GPIO
- CAP0, 0-2
- MAT0, 0-2
- CAP1, 0-3
- MAT1, 0-3
- PWM1, 0-6

Semiconductors
‘LPC229x-CAN’ Micro-Controller

- ARM7TDMI-S Processor Core
- 60 MHz @ 1.8V / 3.3V, -40 to 85°C
- Clock generator with PLL
- 256 kbyte Embedded Flash Memory
- 16 kbyte Data Memory
- 2 or 6 CAN Controller modules
- Fast Acceptance Filter
- Vectored Interrupt Controller
- 2 x 32-bit Multi-purpose timers with 6 capture and compare I/Os
- Watchdog Timer
- 2 x UART, 2 x SPI, I²C
- PWM with 6 channels
- 10-bit A/D Converter, 8channels
- I/O Ports
- External Bus Interface
- Embedded ICE & Trace
- LQFP 144
Microcontroller Web-site

http://www.semiconductors.philips.com/microcontrollers/