

NXP 32-bit microcontrollers

February 2012

Broaden your options

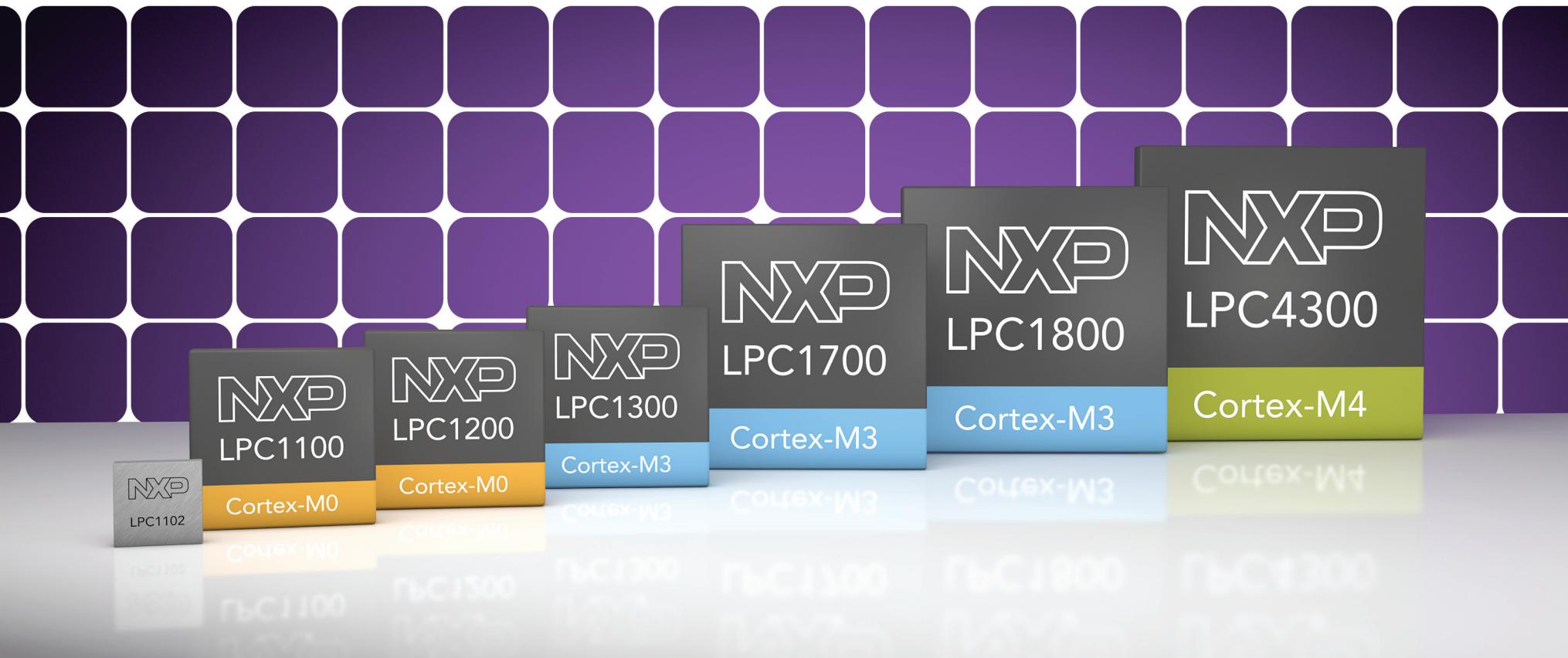


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1.

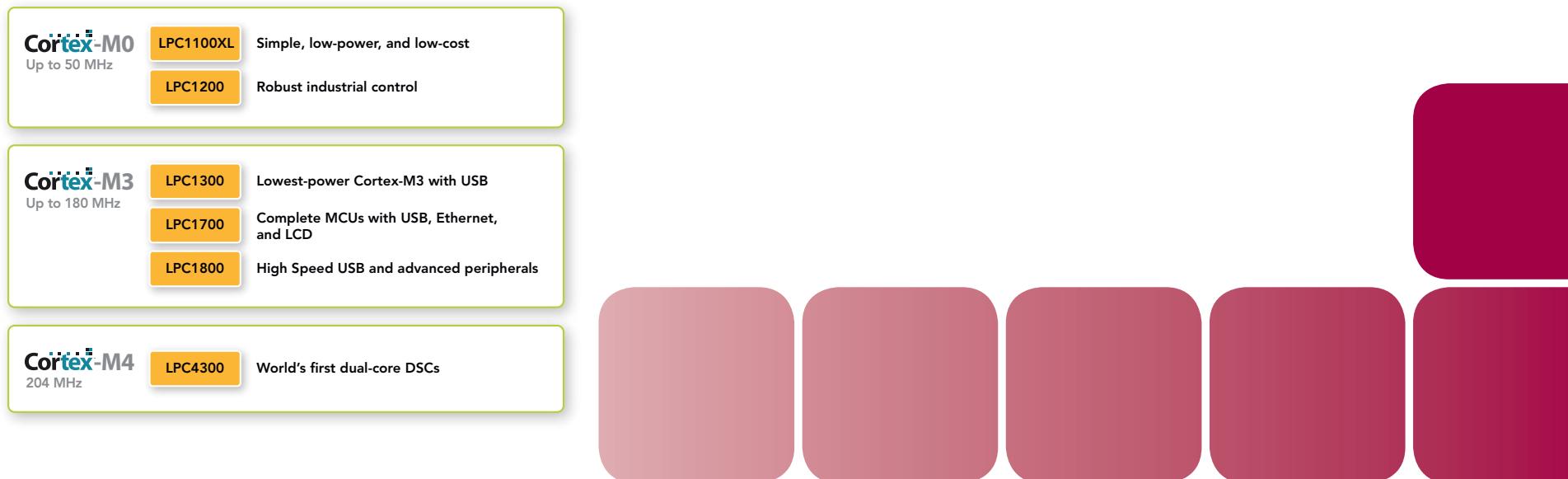
Changing the landscape for embedded

Simply put, nobody gives you more options for ARM Cortex-M than NXP.

Our ARM® Cortex™-M portfolio – one of the largest in the industry – covers the entire spectrum of embedded applications. Our Cortex-M0 devices use a low-power core that's ready to replace traditional 8/16-bit architectures. Our Cortex-M3 devices offer best-in-class bandwidth and connectivity, and our new Cortex-M4 devices bring high-performance signal processing capabilities within reach of the typical MCU programmer. All our Cortex-M devices build on an optimized ARM core to deliver higher performance, consume less power, and offer more peripherals. Designers can choose from the many tools available in the ARM ecosystem, or use a single, comprehensive toolchain to support all Cortex-M devices. Plus, our long-term strategic relationship with ARM gives us early access to next-generation IP, so you can be sure you're working with the latest technologies.

Best-in-class performance, power, and connectivity

Cortex-M0 Up to 50 MHz	LPC1100XL	Simple, low-power, and low-cost
Cortex-M3 Up to 180 MHz	LPC1300	Lowest-power Cortex-M3 with USB
Cortex-M4 204 MHz	LPC4300	World's first dual-core DSCs



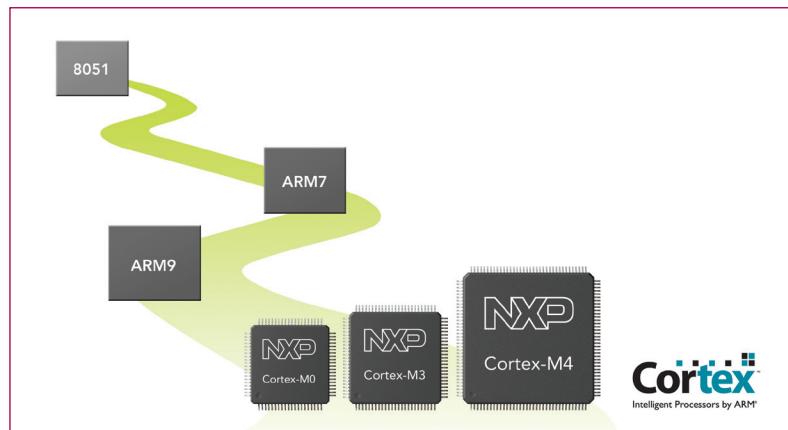
1.

Changing the landscape for embedded

More experience

Every NXP Cortex-M device builds on our history of innovation with ARM. We have continually set the standard for performance, integration, and price. We've been first to introduce low-cost versions of high-performance products, and first with integrated features like Flash/EEPROM memory, real-time debug, and embedded trace. We were first to add independent bus systems and local bus I/O, and we've had several firsts with smaller geometries that deliver higher speed, more advanced functionality, and lower power consumption.

Building on a legacy of innovation



More compatibility

When you choose NXP for Cortex-M, you get more than just a 32-bit architecture loaded with features. You get a flexible way to support your entire product line – now and in future. We use the same building blocks in many of our MCUs, and offer pin- and software-compatible options across product families and across Cortex-M cores. That means you have the freedom to add or subtract features, without having to migrate to a new architecture. With NXP Cortex-M, it's easy to re-use designs, whether you're upgrading or downgrading functionality.



1.

Changing the landscape for embedded

CMSIS support

We support ARM's Cortex Microcontroller Software Interface Standard (CMSIS), the vendor-independent hardware abstraction layer that enables consistent and simple software interfaces for your peripherals, RTOSs, and middleware. The standard is fully scalable across Cortex-M cores and requires very little memory (less than 10 Bytes of RAM) for the Core Peripheral Access Layer.

Award-winning solutions

NXP has won awards across its entire range of ARM microcontrollers.

2003	2005	2007	2008	2009	2010	2011								
 EDN HOT 100 Products LPC213x	 EDN HOT 100 Products LPC210x	 Elektronik Produkt des Jahres 2005	 i-mnovation 2007 WINNER	 EEPW China Innovation Award LPC24xx	 21ic.com EDN China Innovation Award LPC1700	 EEPW China Best Series LPC1100	 EDN China Innovation Award LPC1102	 EEPW China Best 32-bit Microcontroller LPC1759/69	 best electronic design 2010	 China ACE Award Digital Product of the Year LPC4000	 21ic China Product of the Year LPC4000	 EDN Innovation Award EM773	 CEN Best MCU Solution for Industrial Design LPC11U00	 EDN HOT 100 Products LPC1800

2.

ARM Cortex-M0: True 8/16-bit replacements

Upgrading 8/16-bit designs to faster, more efficient performance

As the smallest, most energy-efficient Cortex-M core, the ARM Cortex-M0 is the new, low-cost alternative for 8/16-bit designs. The LPC1100XL series offers industry-leading low-cost and low-power consumption, and includes the LPC1102, the world's smallest 32-bit ARM MCU. The LPC1100XL also features the world's first Cortex-M0 microcontroller in low-pin-count packages, SO20, TSSOP20, TSSOP28, and DIP 28. The LPC11C00 series is the first CAN microcontroller and transceiver with CANopen drivers, and the LPC11U00 delivers robust USB performance with on-chip USB drivers at a low price point. The LPC11E00 is a feature rich solution with up to 4K EEPROM. The LPC1200 series, NXP's latest generation of Cortex-M0, delivers high energy efficiency and includes specific features for industrial control. Several of NXP's Cortex-M0 devices are pin-compatible with Cortex-M3 LPC1300 devices.



2.

LPC1100XL: Simple, low-power, and low-cost

LPC1100XL series



The LPC1100XL series is the lowest-priced 32-bit MCU solution on the market. It is a high-value, easy-to-use upgrade for existing 8/16-bit designs, delivering unprecedented performance, simplicity, and power. The optimized Thumb instruction set also enables dramatic reductions in code size for most 8/16-bit applications. The LPC1100XL is a seamless entry point for 8/16-bit designers looking to start using the scalable ARM architecture. The LPC11E00 brings in feature rich EEPROM solution to the Cortex-M0 family and includes up to 32 kB of flash memory, up to 10 kB of SRAM data memory and 4 kB EEPROM. The peripheral mix includes one Fast-mode Plus I²C-bus interface, one RS-485/EIA-485 USART with support for synchronous mode and smart card interface, two SSP interfaces, four general-purpose counter/timers, a 10-bit ADC, and up to 42 general-purpose I/O pins.

Features

- ▶ 50 MHz ARM Cortex-M0 core
- ▶ Up to 64 KB Flash (small sector size of 256 bytes)
- ▶ Up to 8 KB SRAM
- ▶ Serial peripherals: I²C Fast-mode Plus, two SPI, UART
- ▶ 8-channel, 10-bit ADC
- ▶ Lowest active power consumption
- ▶ Up to 42 high-speed GPIO
- ▶ Superior code density compared to traditional 8/16-bit MCUs
- ▶ Supported by NXP's low-cost LPCXpresso toolchain

LPC1100XL selection guide

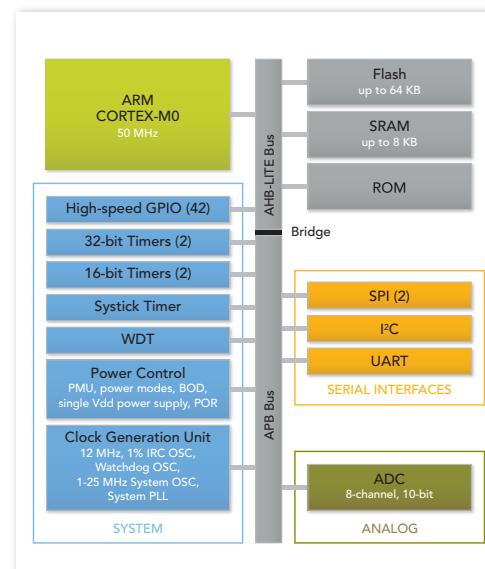
Type	Memory		Timers*	PWM channels	UART	I ² C	SSP/SPI	ADC channels/ resolution	I/O pins	Package
	Flash (KB)	SRAM (KB)								
LPC1115	64	8	5	11**	1	1	1 to 2	8ch 10b	28 to 42	LQFP48
LPC1114	32	4 to 8	5	11**	1	1	1 to 2	8ch 10b	28 to 42	HVQFN33, LQFP48, TSSOP28, DIP28
LPC1113	24	4 to 8	5	11**	1	1	1 to 2	8ch 10b	28 to 42	HVQFN33, LQFP48
LPC1112	16	2 to 4	5	11**	1	1	1	8ch 10b	28	HVQFN33, TSSOP28
LPC1111	8	2 to 4	5	11**	1	1	1	8ch 10b	28	HVQFN33, TSSOP28
LPC1110	4	1	5	11**	1	1	1 to 2	5ch 10b	16	S020
LPC11D00	32	8	5	11**	1	1	1 to 2	8ch 10b	42	LQFP100
LPC11E11	8	4	5	11**	1	1	1 to 2	8ch 10b	28	HVQFN33
LPC11E12	16	6	5	11**	1	1	1 to 2	8ch 10b	40	LQFP48
LPC11E13	24	8	5	11**	1	1	1 to 2	8ch 10b	40	LQFP48
LPC11E14	32	10	5	11**	1	1	1 to 2	8ch 10b	54	LQFP64, LQFP48, HVQFN33

* Includes Watchdog timer and real-time clock

** Using timers

Note: The "L" in LPC1100XL indicates lower power consumption and easy-to-use power profiles. Please refer to the datasheet and user manual for detailed information.

LPC1100XL block diagram



2.

LPC11C00: Complete CAN solutions

LPC11C00 series

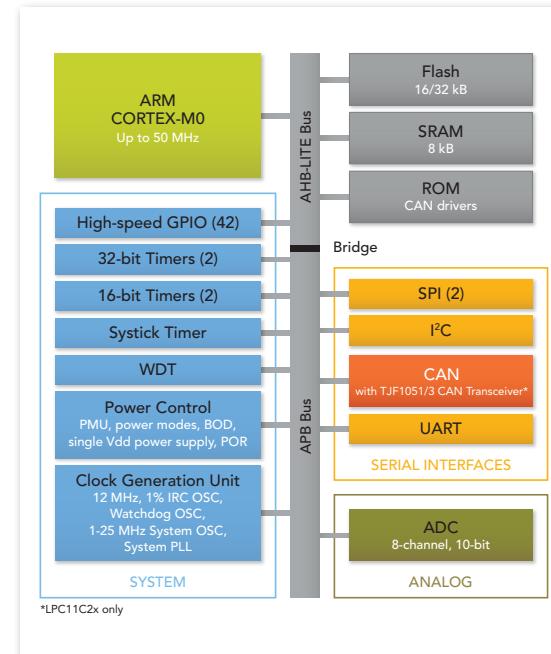


The LPC11C00 series is the first to integrate CAN, the preferred communication channel for rugged environments. In many applications, the CAN transceiver often costs as much as or more than the microcontroller itself. Integrating the CAN transceiver increases system reliability and quality, minimizes the issues related to electrical interconnect and compatibility, and reduces board space by over 50% while adding under 20% to the MCU cost. As a result, the LPC11C00 enables low-cost development for a wide range of industrial networking applications.

Features

- ▶ 50 MHz ARM Cortex-M0 core
- ▶ Up to 32 KB Flash
- ▶ 8 KB SRAM
- ▶ Complete CAN node
 - On-chip CAN 2.0B C_CAN controller and CANopen drivers
 - Integrated CAN transceiver (LPC11C22/C24)
 - Close coupling of CAN transceiver, 32-bit MCU, and CANopen protocol
 - Direct on-chip support extends plug-and-play system approach for CAN
- ▶ 8-channel, 10-bit ADC with up to 400,000 samples per second at ± 1 LSB DNL
- ▶ Three reduced-power modes: sleep, deep-sleep, and deep power-down
- ▶ Up to 42 high-speed GPIO
- ▶ Superior code density compared to traditional 8/16-bit MCUs
- ▶ Supported by NXP's low-cost LPCXpresso toolchain

LPC11C00 block diagram



LPC11C00 selection guide

Type	Memory		Timers	Serial interfaces	Analog	On-chip CAN transceiver	I/O pins	Package
	Flash (kB)	SRAM (kB)						
LPC11C24	32	8	5	11**	1	1	2	8ch 10b
LPC11C22	16	8	5	11**	1	1	1	2
LPC11C14	32	8	5	11**	1	1	1	2
LPC11C12	16	8	5	11**	1	1	1	2

* Includes Watchdog timer and real-time clock

** Using timers

2.

LPC11U00: Complete USB solutions

LPC11U00 series



Delivering robust USB performance at a low price point, LPC11U00 devices are compelling replacements for 8/16-bit USB microcontrollers.

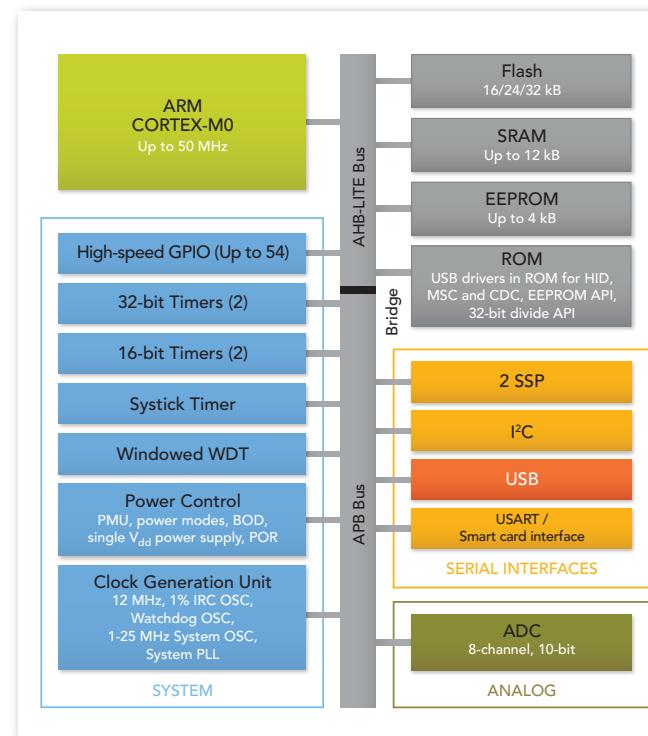
The highly flexible USB architecture is, quite simply, a better approach to USB, and the tiny (4.5 x 4.5 mm) TFBGA48 package is especially well suited for mobile and consumer applications. Like NXP's other ARM-based USB solutions, the LPC11U00 series is supported by easy-to-use software and integrated development platforms that make NXP a one-stop shop for USB. The series is pin-compatible with Cortex-M3 LPC134x devices.

Features

- ▶ 50 MHz ARM Cortex-M0
- ▶ Up to 32 KB Flash
- ▶ API-driven power profiles
- ▶ Up to 10K SRAM up to 4K EEPROM
- ▶ On-chip USB drivers for HID, MSD and CDC, 32-bit divide routines
- ▶ USB 2.0 full-speed device controller
- ▶ USART with fractional baud generation
- ▶ Smart Card interface (ISO 7816-3)
- ▶ Two SSP interfaces, one I²C interface supporting Fast-mode Plus
- ▶ 8-channel, 10-bit ADC with input multiplexing among eight pins
- ▶ Four general-purpose counter/timers, plus a programmable windowed Watchdog timer
- ▶ Four reduced power modes: sleep, deep-sleep, power-down, deep power-down
- ▶ Up to 54 GPIO (configurable in groups)
- ▶ Available in TFBGA48 package (4.5 x 4.5 mm)

- ▶ Superior code density compared to traditional 8/16-bit MCUs
- ▶ Supported by NXP's low-cost LPCXpresso toolchain
- ▶ Pin-compatible with Cortex-M3 LPC134x devices

LPC11U00 block diagram



LPC11U00: Complete USB solutions

LPC11U00 selection guide

Type	Memory		Timers	Serial interfaces				Analog	I/O pins	Package	
	Flash (KB)	SRAM (KB)	No. of timers*	PWM channels	USB	UART	I ² C	SSP/SPI	ADC channels/ resolution		
LPC11U23	24	8 KB	5	11**		1	1	2	8ch 10b	40	LQFP48
LPC11U24	32	8 KB	5	11**		1	1	2	8ch 10b	26/40	HVQFN33 (5x5), TFBGA48
LPC11U24	32	10 KB	5	11**		1	1	2	8ch 10b	26/40/54	LQFP64, LQFP48, HVQFN33
LPC11U14	32	6	5	11**	1	1	1	2	8ch 10b	Up to 40	HVQFN33, LQFP48, TFBGA48
LPC11U13	24	6	5	11**	1	1	1	2	8ch 10b	Up to 40	LQFP48
LPC11U12	16	6	5	11**	1	1	1	2	8ch 10b	Up to 40	HVQFN33, LQFP48

* Includes Watchdog timer and real-time clock

** Using timers

2.

LPC1200: Robust industrial control

LPC1200 series

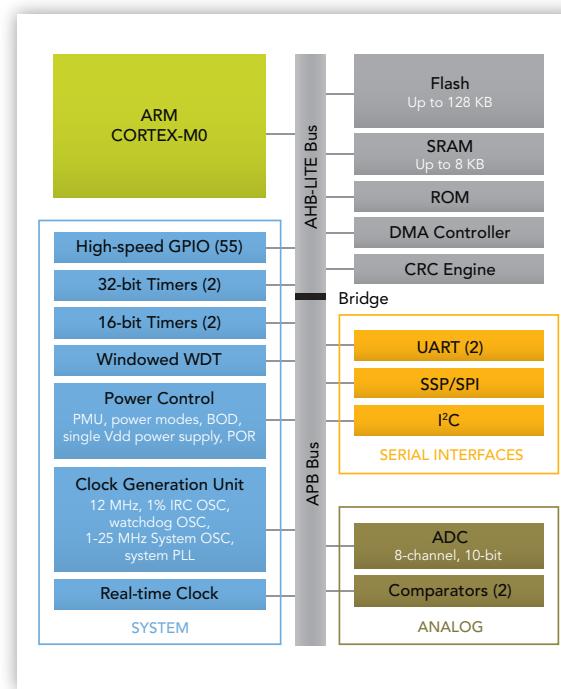


The LPC1200 series targets traditional 8/16-bit industrial control applications with an extensive list of memory options and high-performance peripherals. On-chip features include a 1% accuracy oscillator, up to 128 KB of Flash (512-byte erase sector), DMA, CRC, Fast-mode Plus I²C, a windowed WDT, four timers, an RTC, an 8-channel/10-bit ADC, and two comparators.

Features

- ▶ Up to 30 MHz ARM Cortex-M0 core
- ▶ Up to 128 KB Flash, up to 8 KB SRAM
- ▶ On-chip ROM with industry's first divide library for ARM Cortex-M0
- ▶ Two UARTs with fractional baud-rate generation and internal FIFO (supports RS-485/IrDA)
- ▶ SSP/SPI with FIFO and multi-protocol capabilities
- ▶ I²C with Fast-mode Plus for longer distances
- ▶ 8-channel/10-bit ADC, two comparators (each with six selectable external sources)
- ▶ Four timers, IEC-60730 Class-B compliant windowed WDT
- ▶ 21-channel DMA, CRC, 1% accuracy oscillator, 32-bit RTC
- ▶ Two comparators each with six selectable external sources
- ▶ High reliability for industrial applications
 - High immunity rating EFT test
 - 8 kV ESD protection
 - Industrial temp range: -40 to +85 °C
- ▶ Up to 55 high-speed GPIO, all with programmable digital filters
- ▶ Supported by NXP's low-cost LPCXpresso toolchain

LPC1200 block diagram



LPC1200 selection guide

Type	Memory		No. of timers*	PWM channels	UART	I ² C	SSP/SPI	ADC channels/ resolution	I/O pins	Package
	Flash (KB)	SRAM (KB)								
LPC12D00	128	8	6	13**	2	1	1	8ch 10b	39	LQFP100
LPC1227	128	8	6	13**	2	1	1	8ch 10b	39 to 55	LQFP48, LQFP64
LPC1226	96	8	6	13**	2	1	1	8ch 10b	39 to 55	LQFP48, LQFP64
LPC1225	64 to 80	8	6	13**	2	1	1	8ch 10b	39 to 55	LQFP48, LQFP64
LPC1224	32 to 48	4	6	13**	2	1	1	8ch 10b	39 to 55	LQFP48, LQFP64

* Includes Watchdog timer and real-time clock

** Using timers

2.

Miniature packages: World's smallest 32-bit MCUs

LPC1102: 5 mm² footprint

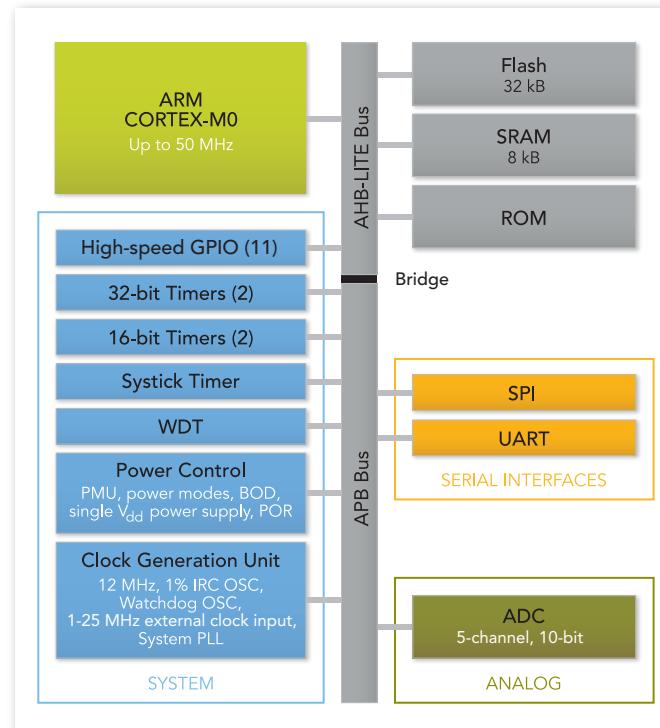


The LPC1102, the first in a series of devices housed in Wafer Level Chip Scale Packages (WL-CSPs), offers unprecedented computing power in just 5 mm² of PCB area. Designed for applications requiring an ultra-miniature board layout, it offers true 32-bit performance (50 MHz) and offers a far higher memory configuration (32 kB Flash) than typical 8/16-bit solutions.

Features

- ▶ 50 MHz ARM Cortex-M0 core
- ▶ 32 kB Flash
- ▶ 8 kB SRAM
- ▶ Serial peripherals: SPI, UART
- ▶ 5-channel, 10-bit ADC
- ▶ Two 32-bit timers, two 16-bit timers, Systick timer, WDT
- ▶ Lower dynamic power, leading to overall reduced power consumption
- ▶ 11 high-speed GPIO
- ▶ WL-CSP package (2.17 x 2.32 mm, 0.5 mm pitch)
- ▶ Superior code density compared to traditional 8/16-bit MCUs
- ▶ Supported by NXP's low-cost LPCXpresso toolchain
- ▶ Best Product for Embedded Systems & ICs (2010 EDN China Innovation)

LPC1102 block diagram



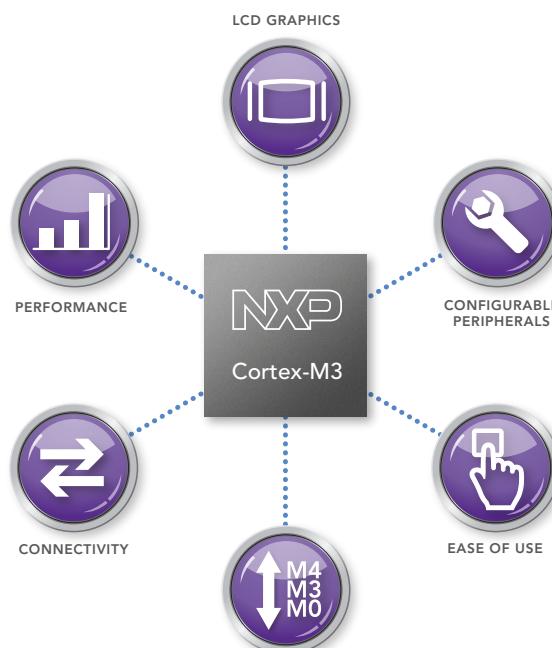
LPC1102 selection guide

Type number	Flash (KB)	SRAM (KB)	UART RS-485	I ² C	SPI	ADC channels	Package
LPC1102	32	8	1	1	-	5ch 10b	WLCSP16

ARM Cortex-M3: High-performance MCUs for communications and control

Industry-leading performance with low power

NXP's ARM Cortex-M3, the first of our Cortex-M cores to offer a seamless continuum of performance, has rapidly become a mainstream choice for a very large range of applications. The LPC1300, a low-power, low-cost implementation, performs USB device functions. The LPC1700 integrates advanced peripherals, such as Ethernet, USB 2.0, and CAN 2.0B. The LPC1800, the highest-performing Cortex-M3 available on the market, operates at up to 180 MHz and offers up to 1 MB of Flash and up to 200 KB of SRAM. For added design freedom, and the flexibility to quickly upgrade or downgrade system performance, members of our Cortex-M3 portfolio are pin-compatible with devices in our Cortex-M0, Cortex-M4, and ARM7 portfolios.



3.

LPC1300: Lowest-power ARM Cortex-M3 with USB

LPC1300 series

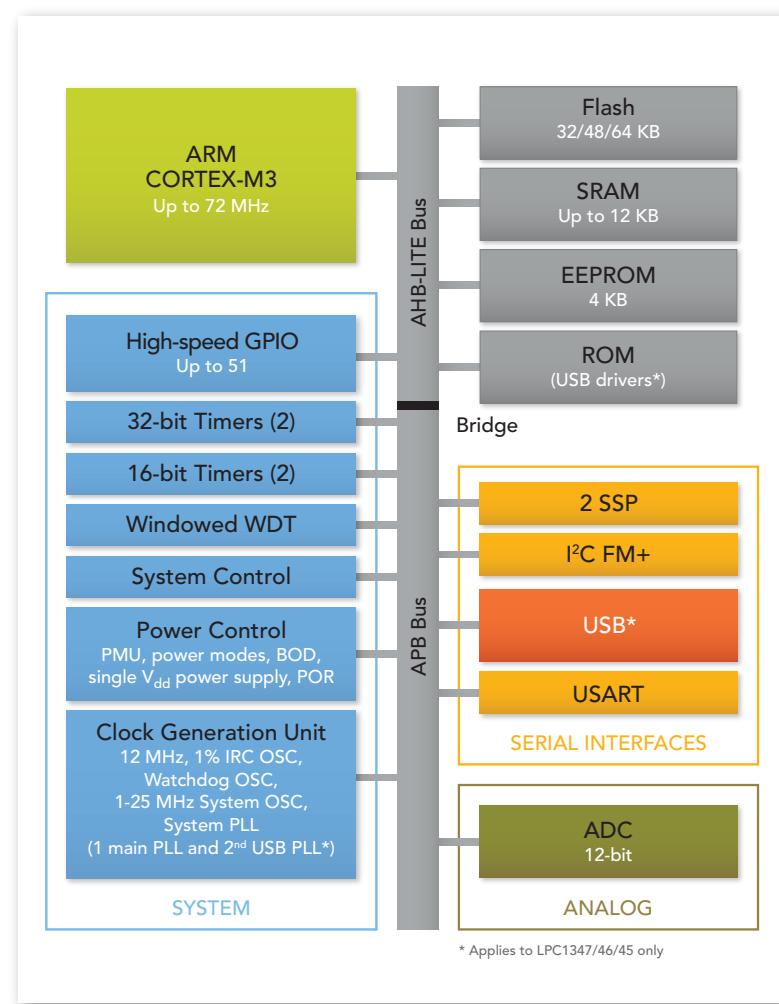


This power-efficient series saves energy in a range of applications. To simplify the design of USB-enabled systems, the LPC1340 includes on-chip USB drivers for Mass Storage Class and Human Interface Device. The drivers are incorporated in ROM, so they save roughly 5 to 6 KB of user code. For added design flexibility, the LPC134x devices are pin-compatible with the Cortex-M0 LPC11U00 series.

Features

- ▶ Up to 72 MHz ARM Cortex-M3 core
- ▶ Up to 64 KB Flash
- ▶ Up to 12 KB SRAM
- ▶ Up to 4 KB EEPROM
- ▶ Power Profiles and EEPROM drivers in ROM
- ▶ USB 2.0 FS device controller with on-chip PHY
 - ROM-based drivers save up to 6 KB of Flash
 - Tested and validated USB-certified code for reduced development risk
 - Supported device classes: Mass Storage, Human Interface Device
 - Host driverless USB bootloader also on-chip
- ▶ Binary ROM driver circumvents potential tool vendor porting issues
- ▶ Serial peripherals: I²C Fast-mode Plus, SSP/SPI, USART
- ▶ 8-channel, 12-bit ADC
- ▶ Low power consumption: ~ 200 µA/MHz
- ▶ Up to 51 GPIO
- ▶ Flash programming
- ▶ Supported by NXP's low-cost LPCXpresso toolchain
- ▶ LPC134x devices are pin-compatible with Cortex-M0 LPC11U00 series

LPC1300 block diagram



* Applies to LPC1347/46/45 only

3.

LPC1300: Lowest-power ARM Cortex-M3 with USB

LPC1300 selection guide

Type	Memory			Timers		Analog						I/O pins	Package
	Flash (kB)	SRAM (kB)	EEPROM	No. of timers*	PWM channels	USB	UART	I ² C	SSP/SPI	USB Dev	ADC channel/s/ resolution		
LPC1347	64	12	4	5	11**	1	1 (USART)	1	2	Yes	12-/ 8	28 to 51	LQFP64, LQFP48, HVQFN33
LPC1346	48	8	4	5	11**	1	1 (USART)	1	2	Yes	12-/ 8	28 to 42	LQFP48, HVQFN33
LPC1345	32	8	2	5	11**	1	1 (USART)	1	2	Yes	12-/ 8	28 to 42	LQFP48, HVQFN33
LPC1343	32	8		5	11**	1	1	1	1	Yes	8ch 10b	28 to 42	LQFP48, HVQFN33
LPC1342	16	4		5	11**	1	1	1	1	Yes	8ch 10b	28	HVQFN33
LPC1317	64	12	4	5	11**		1 (USART)	1	2	No	12-/ 8	28 to 51	LQFP64, LQFP48, HVQFN33
LPC1316	48	8	4	5	11**		1 (USART)	1	2	No	12-/ 8	28 to 42	LQFP48, HVQFN33
LPC1315	32	8	2	5	11**		1 (USART)	1	2	No	12-/ 8	28 to 42	LQFP48, HVQFN33
LPC1313/01	32	8		5	11**		1	1	2	No	10-/ 8	28 to 42	LQFP48, HVQFN33
LPC1311/01	8	2		5	11**		1	1	2	No	10-/ 8	28	HVQFN33

* Includes Watchdog timer and real-time clock ** Using timers

LPC1700: Complete MCUs with USB, Ethernet, and LCD

LPC1700 series

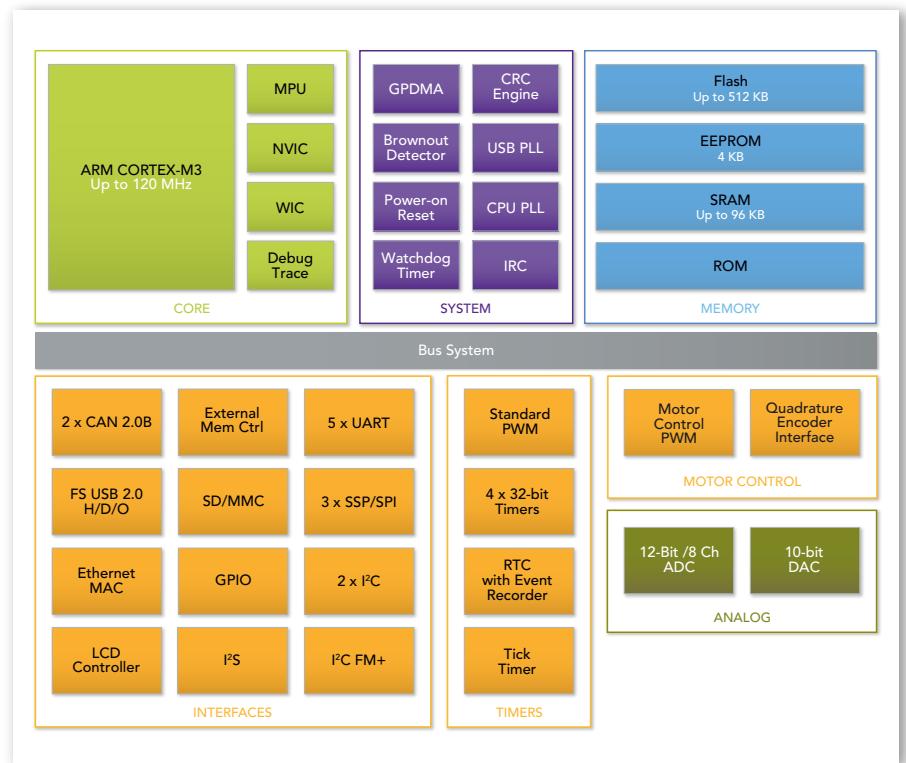


The LPC1700 series operates at speeds up to 120 MHz. Each device is equipped with up to 512 KB of Flash memory, up to 96 KB of SRAM, up to 4 KB of EEPROM, 12-bit A/D and 10-bit D/A converters, and an internal oscillator. The series also features advanced peripherals, such as Ethernet, USB 2.0 Host/OTG/Device, LCD control, and CAN 2.0B.

Features

- ▶ Up to 120 MHz ARM Cortex-M3 core
- ▶ Up to 512 KB Flash
- ▶ Up to 96 KB SRAM
- ▶ Up to 4 KB EEPROM
- ▶ Advanced multi-layer bus enables high performance without bottlenecks
- ▶ LCD controller with display resolution of up to 1024 x 768 pixels
- ▶ 10/100T Ethernet MAC with MII and RMII interfaces
- ▶ USB 2.0 FS Host/Device/OTG controller
- ▶ Motor-control PWM with Quadrature Encoder Interface
- ▶ Two CAN 2.0B controllers
- ▶ Serial peripherals: up to three I²C, up to three SSP/SPI, up to five UARTs, and I²S
- ▶ Analog peripherals: 12-bit ADC, 10-bit DAC
- ▶ Other peripherals: low-power RTC, precise internal RC oscillator
- ▶ Up to 165 GPIO
- ▶ Supported by NXP's low-cost LPCXpresso toolchain

LPC1700 block diagram



LPC1700: Complete MCUs with USB, Ethernet, and LCD

LPC1700 selection guide

Type	Memory		Timers		Serial interfaces								Analog		I/O pins	LCD controller	Package
	Flash (KB)	SRAM (KB)	No. of timers*	PWM channels	Ethernet	USB	UART	I ² C	CAN	SPI	SSP/SPI	I ² S	ADC channels/ resolution	DAC channels/ resolution			
LPC1788	512	96	5	6	1	1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165	1	LQFP208/144, TFBGA208/180
LPC1787	512	96	5	6		1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165	1	LQFP208
LPC1786	256	80	5	6	1	1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165	1	LQFP208
LPC1785	256	80	5	6		1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165	1	LQFP208
LPC1778	512	96	5	6	1	1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165		LQFP208/144, TFBGA208/180
LPC1777	512	96	5	6		1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165		LQFP208
LPC1776	256	80	5	6	1	1	5	3	2		3	1	8ch 12b	1ch 10b	Up to 165		LQFP208, TFBGA180
LPC1774	128	40	5	6		1	4	3	2		3	1	8ch 12b	1ch 10b	Up to 165		LQFP208, LQFP144
LPC1769	512	64	6	6	1	1	4	3	2	1	2	1	8ch 12b	1ch 10b	70		LQFP100
LPC1768	512	64	6	6	1	1	4	3	2	1	2	1	8ch 12b	1ch 10b	70		LQFP100, TFBGA100
LPC1767	512	64	6	6	1		4	3		1	2	1	8ch 12b	1ch 10b	70		LQFP100
LPC1766	256	64	6	6	1	1	4	3	2	1	2	1	8ch 12b	1ch 10b	70		LQFP100
LPC1765	256	64	6	6		1	4	3	2	1	2	1	8ch 12b	1ch 10b	70		LQFP100
LPC1764	128	32	6	6	1	1	4	3	2	1	2		8ch 12b	1ch 10b	70		LQFP100
LPC1763	256	64	6	6			4	3		1	2	1	8ch 12b	1ch 10b	70		LQFP100
LPC1759	512	64	6	6		1	4	2	2	1	2	1	6ch 12b	1ch 10b	52		LQFP80
LPC1758	512	64	6	6	1	1	4	2	2	1	2	1	6ch 12b	1ch 10b	52		LQFP80
LPC1756	256	32	6	6		1	4	2	2	1	2	1	6ch 12b	1ch 10b	52		LQFP80
LPC1754	128	32	6	6		1	4	2	1	1	2		6ch 12b	1ch 10b	52		LQFP80
LPC1752	64	16	6	6		1	4	2	1	1	2		6ch 12b	1ch 10b	52		LQFP80
LPC1751	32	8	6	6		1	4	2	1	1	2		6ch 12b	1ch 10b	52		LQFP80

* Includes Watchdog timer and real-time clock

3.

LPC1800: High Speed USB and advanced peripherals

LPC1800 series

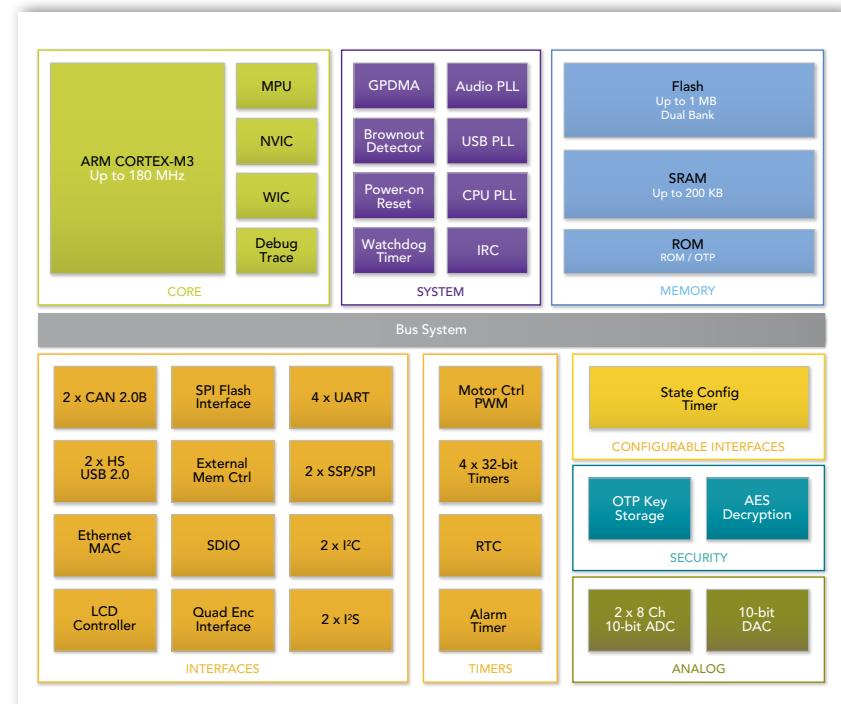


Operating at speeds up to 180 MHz, the LPC1800 series is the fastest ARM Cortex-M3 on the market. These high-performance devices feature advanced peripherals, such as Ethernet, High Speed USB 2.0 Host/OTG/Device, LCD controller, and CAN 2.0B, plus two unique NXP peripherals – a state-configurable timer for flexible waveform generation and a Quad SPI Flash interface (SPIFI) for memory-mapped serial Flash. The 256-bit-wide Flash memory architecture reduces power consumption, by minimizing memory fetches, and maximizes the performance of the core processor. The LPC1800 series is pin-for-pin compatible with the Cortex-M4 LPC4300 series.

Features

- ▶ Up to 180 MHz ARM Cortex-M3 core
- ▶ Up to 1 MB dual-bank Flash
- ▶ Up to 200 KB SRAM
- ▶ Up to 4 KB EEPROM
- ▶ LCD controller with display resolution of up to 1024 x 768 pixels
- ▶ 10/100T Ethernet MAC with MII and RMII interfaces
- ▶ Two HS USB 2.0 interfaces, with on-chip HS PHY
- ▶ Two CAN 2.0B controllers
- ▶ External memory controller
- ▶ Innovative Quad SPI Flash interface (SPIFI)
- ▶ State-configurable timer (SCT) subsystem
- ▶ AES decryption with 128-bit secure OTP memories for key storage
- ▶ Four reduced-power modes: sleep, deep-sleep, power-down, deep power-down
- ▶ Up to 164 GPIO
- ▶ Ultra-low-leakage 90 nm process
- ▶ Pin-compatibility with Cortex-M4 LPC4300 series

LPC1800 block diagram



3.

LPC1800: High Speed USB and advanced peripherals

LPC1800 selection guide

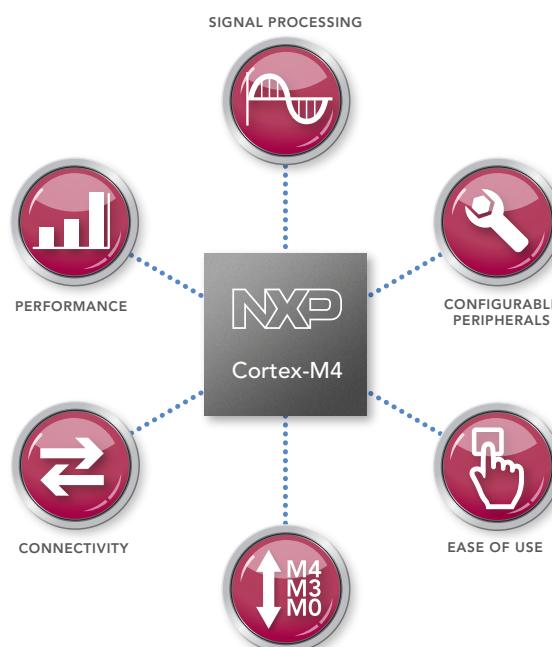
Type	Memory		Configurable peripherals	Timers		Serial interfaces							Analog	LCD	SD/MMC	I/O pins	External bus interface	Package		
	Flash (KB)	SRAM (KB)		State-configurable timer (SCT)		No. of timers*	PWM channels	Ethernet	USB	UART	I ² C	CAN	SSP/SPI	Quad SPI Flash interface (SPIFI)	I ² S	ADC channels/resolution				
LPC1857	1024 (2x512)	136	•	5	6	1	2	4	2	2	2	2	•	2	2x 8ch 10b	•	•	80	16 to 32	BGA256/180, LQFP208
LPC1853	512 (2x256)	136	•	5	6	1	2	4	2	2	2	2	•	2	2x 8ch 10b	•	•	80	16 to 32	BGA256/180, LQFP208
LPC1850	200	•	5	6	1	2	4	2	2	2	2	2	•	2	2x 8ch 10b	•	•	80	16 to 32	BGA256/180, LQFP208
LPC1837	1024 (2x512)	136	•	5	6	1	2	4	2	2	2	2	•	2	2x 8ch 10b	•	80	16 to 32	BGA256/180/100, LQFP208/144	
LPC1833	512 (2x256)	136	•	5	6	1	2	4	2	2	2	2	•	2	2x 8ch 10b	•	80	16 to 32	BGA256/180/100, LQFP208/144	
LPC1830	200	•	5	6	1	2	4	2	2	2	2	2	•	2	2x 8ch 10b	•	80	16 to 32	BGA256/180/100, LQFP208/144	
LPC1827	1024 (2x512)	136	•	5	6		1	4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1825	768 (2x384)	136	•	5	6		1	4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1823	512 (2x256)	104	•	5	6		1	4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1822	512 (1x512)	104	•	5	6		1	4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1820	168	•	5	6		1	4	2	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1817	1024 (2x512)	136	•	5	6			4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1815	7768 (2x384)	136	•	5	6			4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1813	512 (2x256)	104	•	5	6			4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1812	512 (1x512)	104	•	5	6			4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	
LPC1810	136	•	5	6				4	2	2	2	2	•	2	2x 4-6ch 10b		50 to 64	8 to 16	BGA100, LQFP144	

* Includes Watchdog timer and real-time clock

ARM Cortex-M4: Extending ARM MCUs with DSP capability

World's first dual-core DSCs

The LPC4300 series, the world's first family of asymmetrical, dual-core digital signal controllers (DSCs), combine high-performance, low-power ARM Cortex-M4 and ARM Cortex-M0 cores with a unique set of configurable peripherals. They let you develop sophisticated DSP and MCU applications quickly, using one architecture and one development environment. For added design flexibility, the LPC4300 series is pin-compatible with the Cortex-M3 LPC1800 series.



4.

LPC4300: World's first dual-core DSCs

LPC4300 series



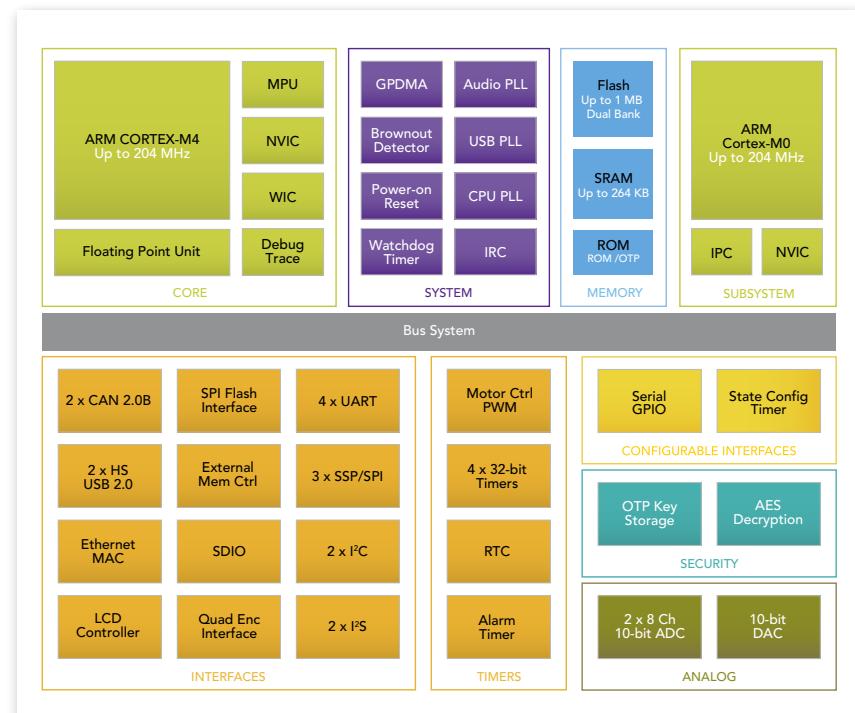
In the LPC4300 series, the Cortex-M4 processor combines the benefits of a microcontroller with high-performance digital signal processing features such as single-cycle MAC, Single Instruction

Multiple Data (SIMD) techniques, saturating arithmetic, and a floating point unit. The Cortex-M0 coprocessor off-loads many of the data movement and I/O handling duties that can drain the bandwidth of the Cortex-M4 core. The 256-bit-wide Flash memory architecture reduces power consumption, by minimizing fetches, and maximizes the performance of the core processor. The LPC4300 series is pin-for-pin compatible with the LPC1800 Cortex-M3 series.

Features

- ▶ 204 MHz dual-core architecture
 - ARM Cortex-M4 core with hardware floating-point unit
 - ARM Cortex-M0 asymmetrical coprocessor
- ▶ Up to 1 MB dual-bank Flash, up to 264 KB SRAM, up to 4 KB EEPROM
- ▶ LCD controller with display resolution up to 1024 x 768 pixels
- ▶ 10/100T Ethernet MAC with MII and RMII interfaces
- ▶ Two HS USB 2.0 interfaces, with on-chip HS PHY
- ▶ External memory controller
- ▶ Memory protection unit
- ▶ Innovative Quad SPI Flash interface (SPIFI)
- ▶ State-configurable timer (SCT) subsystem
- ▶ AES decryption with 128-bit secure OTP memories for key storage
- ▶ Four reduced-power modes: sleep, deep-sleep, power-down, deep power-down
- ▶ Up to 164 GPIO, with configurable serial GPIO (SGPIO)
- ▶ Pin compatibility with Cortex-M3 LPC1800 series

LPC4300 block diagram



4.

LPC4300: World's first dual-core DSCs

LPC4300 selection guide

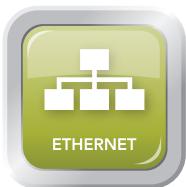
Type	Memory		Configurable peripherals		Timers		Serial interfaces						Analog		I/O pins	External bus interface	Package		
	Flash (KB)	SRAM (KB)	State-configurable timer (SCT)	Serial GPIO (SGPIO)	No. of timers	PWM channels	Ethernet:	USB	UART	I ² C	CAN	SPI	SSP/SPI	Quad SPI Flash interface (SPIFI)	I ² S	ADC channels/resolution	LCD	SD/MMC	
LPC4357	1024 (2x512)	136	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4353	512 (2x256)	136	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4350		264	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4337	1024 (2x512)	136	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4333	512 (2x256)	136	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4330		264	•	•	5	6	1	2	4	2	2	1	2	•	2	2x 8ch 10b	•	•	146
LPC4327	1024 (2x512)	136	•	•	5	6		1	4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4325	768 (2x384)	136	•	•	5	6		1	4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4323	512 (2x256)	104	•	•	5	6		1	4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4322	512 (1x512)	104	•	•	5	6		1	4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4320		200	•	•	5	6		1	4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4317	1024 (2x512)	136	•	•	5	6			4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4315	768 (2x384)	136	•	•	5	6			4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4313	512 (2x256)	104	•	•	5	6			4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4312	512 (1x512)	104	•	•	5	6			4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16
LPC4310		168	•	•	5	6			4	2	2	1	2	•	2	2x 4-6ch 10b		up to 64	8 to 16

5.

Unique NXP peripherals

More configurability + more options = better designs

Our Cortex-M solutions are packed with features you won't find anywhere else. We offer a unique set of configurable peripherals – including a state-configurable timer, a Quad SPI Flash interface, and a serial GPIO interface – so engineers can experience unprecedented levels of design flexibility. We've also optimized the basic ARM architecture, adding special functions and peripheral interfaces that simplify design, improve performance, and save power. This section gives a summary of these options. For specific details, please refer to the product datasheets.



5.

State-configurable timer

State-configurable timer (SCT)

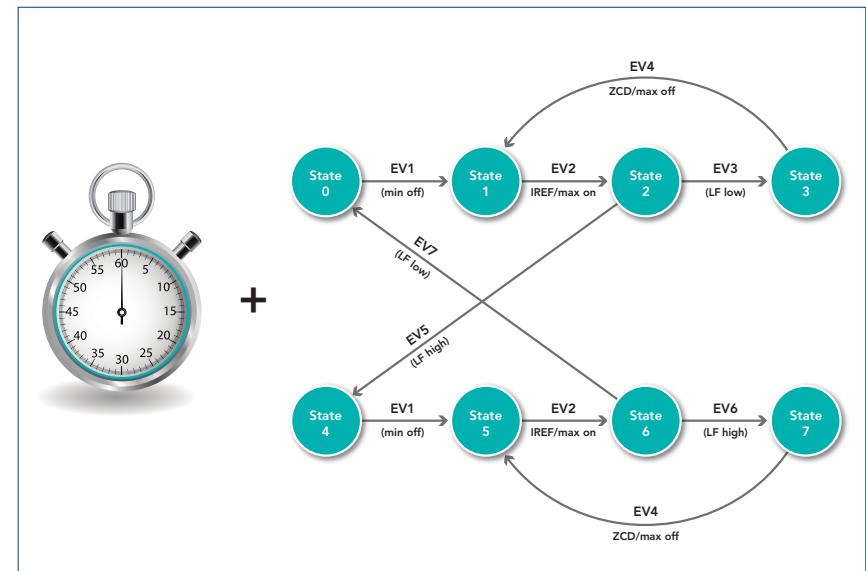


The state-configurable timer (SCT), a new patent-pending peripheral developed by NXP, is a sophisticated yet easy-to-configure timing function that delivers unprecedented flexibility. The SCT lets designers configure advanced timing operations – including those required for complex motor-control functions – while meeting tight development schedules. Initially available on the Cortex-M3 LPC1800 and Cortex-M4 LPC4300 series, the SCT is a timer-capture unit coupled with a highly flexible, event-driven state machine. It brings two familiar concepts – event and state – to the area of timing, and thus enables a wide variety of operations for timing, counting, output modulation, and input capture.

Features

- ▶ Two 16-bit counters or one 32-bit counter
- ▶ Counter(s) clocked by bus clock or selected input
- ▶ Up counter(s) or up-down counter(s)
- ▶ State variable allows sequencing across multiple counter cycles
- ▶ Event combines input or output condition and/or counter match in a specified state
- ▶ Events control outputs and interrupts
- ▶ Selected event(s) can limit, halt, start, or stop a counter
- ▶ Supports:
 - up to 8 inputs (one input connected internally)
 - up to 16 outputs
 - 16 match/capture registers
 - 16 events
 - 32 states
- ▶ Available with Cortex-M3 LPC1800 and Cortex-M4 LPC4300 series

The SCT combines a timer with a state machine



SCT selection guide

Series	ARM core	Memory		SCT subsystem
		Flash (KB)	SRAM (KB)	
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	Yes
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	Yes

5.

Quad SPIFI & GPIO

Quad SPI Flash interface (SPIFI)



This patent-pending feature allows external serial memory to appear in the microcontroller's memory map and to be read like other on-chip memory. SPIFI is the first interface to let designers take full advantage of small, inexpensive serial Flash, including Quad SPI Flash. Designers can use a standard microcontroller and cost-effective serial Flash to produce high speeds, save board space, and lower the design's bill of materials.

Features

- ▶ Standard SPI Flash uses four lines: CLK, CS, MISO, MOSI
- ▶ Quad SPI Flash uses six lines: CLK, CS, IO0, IO1, IO2, IO3
- ▶ Compatible with standard and Quad devices from a majority of suppliers: Atmel, Gigadevice, Macronix, Micron (Numonyx), Microchip (SST), Winbond
- ▶ Available with Cortex-M3 LPC1800 and Cortex-M4 LPC4300 series

SPIFI selection guide

Series	ARM core	Memory		Quad SPIFI
		Flash (KB)	SRAM (KB)	
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	Yes
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	Yes

Serial GPIO (GPIO)



NXP's GPIO combine general-purpose I/O with a timer/shift register and can be used to create or capture multiple real-time serial data streams. This eliminates the need for code loops that manipulate GPIO in real time, and provides an easy-to-use alternative to CPU-intensive "bit banging". GPIO can also be configured to provide designers an extra standard serial interface (UART, I²S, I²C, etc.).

Features

- ▶ Up to 16 I/O, each with their own timer/shift register unit
- ▶ Counter for controlling the rate at which data is clocked in/out
- ▶ Counter for controlling the number of bits clocked in/out
- ▶ Output has three states: high, low, or high impedance
- ▶ Available with Cortex-M4 LPC4300 series

GPIO selection guide

Series	ARM core	Memory		GPIO
		Flash (KB)	SRAM (KB)	
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	Yes

5.

LCD display & Ethernet interfaces

LCD display interface



NXP's optimized LCD display interface drives a wide range of displays without loading the CPU. It provides all the necessary control signals to interface directly with a variety of color and monochrome LCD panels with up to 1024 x 768 pixels.

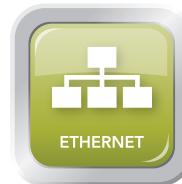
Features

- ▶ Supports color TFT display panels, as well as single and dual-panel monochrome and color (STN) displays
- ▶ Programmable display resolution including, but not limited to: 320 x 200, 320 x 240, 640 x 200, 640 x 240, 640 x 480, 800 x 600, and 1024 x 768
- ▶ Supports hardware cursor for single-panel displays
- ▶ Programmable timing for different display panels
- ▶ Frame, line, and pixel clock signals. AC bias signal for STN panels, data enable signal for TFT panels
- ▶ Data formats: little and big-endian, Windows CE
- ▶ Integrated DMA controller for operation independent of the CPU and other system functions

LCD display interface selection guide

Series	ARM core	Memory		LCD display interface
		Flash (KB)	SRAM (KB)	
LPC1700	Cortex-M3	Up to 512	Up to 96	STN, TFT, up to 24 bits true-color XGA
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	STN, TFT, up to 24 bits true-color XGA
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	STN, TFT, up to 24 bits true-color XGA

Ethernet interface



This full-featured 10/100 Ethernet MAC supports hardware checksum verification and uses DMA hardware acceleration to improve throughput. It includes RMII and MII interfaces to an external transceiver.

Features

- ▶ Supports 10/100 Mbit/s
- ▶ TCP/IP hardware checksum
- ▶ DMA support enables high throughput at low CPU load
- ▶ Power management with remote wake-up frame and magic packet detection
- ▶ Supports half-duplex operation, including CSMA/CD protocol
- ▶ Supports full-duplex operation, including IEEE 802.3x flow control
- ▶ VLAN frame support
- ▶ Supports JUMBO frames up to 9018 bytes (LPC18xx, LPC43xx)
- ▶ Supports IEEE 1588-2008 v2 advanced time stamp (LPC18xx, LPC43xx)

Ethernet interface selection guide

Series	ARM core	Memory		Ethernet interface
		Flash (KB)	SRAM (KB)	
LPC1700	Cortex-M3	Up to 512	Up to 96	10/100 EMAC, MII, RMII, DMA support
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	10/100 EMAC, MII, RMII, DMA support
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	10/100 EMAC, MII, RMII, DMA support

5.

USB interface

USB interface



NXP offers the widest choice of fully certified USB options. Our USB 2.0 host/device/OTG interface includes DMA support and an on-chip high-speed PHY. Options are available with the USB device stack and certain class drivers in ROM.

Features

- ▶ Complies with Universal Serial Bus Specification 2.0
- ▶ Complies with USB On-The-Go Supplement
- ▶ Supports up to 32 physical (16 logical) endpoints with up to 4 KB of endpoint buffer RAM
- ▶ Supports all four transfer types: control, interrupt, bulk, isochronous
- ▶ On-chip high-speed UTMI+ compliant transceiver (PHY)
- ▶ OHCI and EHCI compliant USB blocks
- ▶ Supports direct connection of all full- and high-speed USB-compliant peripherals
- ▶ Comprehensive software support
- ▶ More than 50 options

USB interface selection guide

Series	ARM core	On-chip controller			No. of ports	On-chip PHY	ROM USB driver
		Device	Host	OTG			
LPC11U00	Cortex-M0	FS	-	-	1	Device	Yes
LPC1300	Cortex-M3	FS	-	-	1	Device	Yes
LPC1700	Cortex-M3	FS	FS	FS	1	Device, Host	-
LPC1800	Cortex-M3	HS	HS	HS	Up to 2	Device, Host	Yes
LPC4300	Cortex-M4	HS	HS	HS	Up to 2	Device, Host	Yes



CAN & motor-control interfaces

CAN 2.0B interface



NXP is first to offer a low-cost entry point for a total Controller Area Network (CAN) solution. The CAN and CANopen drivers are embedded in ROM, so there's more Flash memory for product firmware. This high-performance interface supports multi-drop and serial communications.

Features

- ▶ Conforms to CAN Protocol Version 2.0, parts A and B
- ▶ Bit rates up to 1 Mbit/s
- ▶ Up to 32 message objects
- ▶ Each message object has its own identifier mask (11 or 29 bits)
- ▶ Programmable FIFO mode (concatenation of message objects)
- ▶ Maskable interrupts
- ▶ Supports Disabled Automatic Retransmission (DAR) mode for time-triggered CAN applications
- ▶ Programmable loop-back mode for self-test operation

CAN 2.0B interface selection guide

Series	ARM core	Memory		No. of ports	On-chip CAN_Open drivers	On-chip CAN transceiver
		Flash (KB)	SRAM (KB)			
LPC11C00	Cortex-M0	Up to 32	8	1	Yes	Yes
LPC1700	Cortex-M3	Up to 512	Up to 96	Up to 2	-	-
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	1	Yes	-
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	2	Yes	-

Motor-control interface



NXP's integrated features for motor control let you take advantage of today's smaller, more efficient motors. On-chip options provide basic control of universal, brushed DC, and other single-phase motors, and dedicated options for more complex requirements are also available. The control functions require very little CPU interaction, so the system can do more with less power.

Features

- ▶ Dedicated motor-control PWMs
- ▶ Quadrature Encoder Interface (QEI) for highest precision
- ▶ Simple single-phase to complex three-phase motors
- ▶ Lower power consumption and EMI
- ▶ Richer feature set with extended MCU capacity

Motor-control interface selection guide

Series	ARM core	Memory		Motor-control PWM (# channels)	Quadrature encoder interface (QEI)	State-configurable timer (SCT)
		Flash (KB)	SRAM (KB)			
LPC1700	Cortex-M3	Up to 512	Up to 96	6	Yes	-
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	9	Yes	Yes
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	9	Yes	Yes

5.

I²C Fm+ & smart-card / USART interfaces

I²C Fast-mode Plus (Fm+) interface

The simple, two-wire format of the Inter-Integrated Circuit (I²C) bus gives designers a quick, easy way to extend core functionality and add new features while saving power and minimizing the PCB footprint. Invented by Philips (the founder of NXP) more than 30 years ago, the I²C bus is now a de facto worldwide standard. The Fast-mode Plus version supports speeds up to 1 Mbit/s, and offers a sink capability that can be used to support higher currents or longer distances.

Features

- ▶ Supports 400 kbit/s Fast-mode (Fm) and 1 Mbit/s Fast-mode Plus (Fm+)
- ▶ Easy to configure as master, slave, or master/slave
- ▶ Programmable clocks enable versatile rate control
- ▶ Bidirectional data transfer between masters and slaves
- ▶ Multi-master bus (no central master)
- ▶ Arbitration between simultaneously transmitting masters without corruption of serial data on the bus
- ▶ Serial clock synchronization lets devices with different bit rates communicate via one serial bus
- ▶ Serial clock synchronization enables handshake mechanism to suspend/resume serial transfer
- ▶ Supports multiple address recognition and a bus monitor mode
- ▶ Provides open-drain I/O pins conforming to the full specification

I²C interface selection guide

Series	ARM core	Memory		I ² C controller	
		Flash (KB)	SRAM (KB)	Fm	Fm+
LPC1300	Cortex-M3	Up to 32	8	-	Up to 1
LPC1700	Cortex-M3	Up to 512	Up to 96	Up to 2	Up to 1
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	Up to 1	Up to 1
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	Up to 1	Up to 1

Smart-card interface (USART)

To support a wide range of communication interfaces, NXP integrates a full-featured Universal Synchronous/Asynchronous Receiver/Transmitter (USART). The USART can operate as a standard asynchronous-only UART, or interface with a smart-card or infrared (IrDA) device. By including a fractional baud-rate generator, the USART supports standard baud rates with any clock frequency above 2 MHz, and thus eliminates the need for value-specific crystals.

Features

- ▶ Smart-card mode conforms to ISO7816 specification
- ▶ Auto-baud capabilities and FIFO control mechanism enable software flow control implementation
- ▶ IrDA mode supports infrared communication
- ▶ Supports RS-485/9-bit/EIA-485 mode
- ▶ Built-in fractional baud-rate generator eliminates need for external crystals of particular values
- ▶ Supports synchronous mode
- ▶ 16-byte receive and transmit FIFOs
- ▶ Register locations conform to 16C550 standard
- ▶ Receiver FIFO trigger points at 1, 4, 8, and 14 bytes
- ▶ Full modem interface

Smart-card (USART) interface selection guide

Series	ARM core	Memory		Smart-card interface	USART
		Flash (KB)	SRAM (KB)		
LPC1700	Cortex-M3	Up to 512	Up to 96	1	1
LPC1800	Cortex-M3	Up to 1024 (2 x 512)	Up to 200	Up to 1	Up to 3
LPC4300	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	Up to 1	Up to 3

5.

Special functions in ROM

Special functions in ROM

NXP enhances the ARM Cortex-M architecture by integrating special features into ROM. These features include programming algorithms, peripheral drivers and stacks, power profiles, and optimized libraries. The result is increased design flexibility, reduced code, and a simpler development cycle.

Peripheral drivers

Certain Cortex-M devices have peripheral application programming interfaces (APIs) embedded in ROM. Depending on the product family, these peripheral APIs can be drivers or complete stacks. For example, the Cortex-M3 LPC1300 and LPC1800, as well as the Cortex-M4 LPC4300 series, implement USB drivers as well as USB-compliant stacks that include Human Interface Device (HID), Mass Storage, Communication Device Class (CDC), and Device Firmware Upgrade (DFU) class. The Cortex-M devices equipped with CAN have ROM-based peripheral APIs that include extensible code and CANopen drivers.



Divide libraries

In the Cortex-M0 LPC1200 series, a ROM-based divide library reduces Flash code size and produces a deterministic CPU cycle. There are four functions in the library: unsigned division, signed division, unsigned division with remainder, and signed division with remainder. The library supports any width, up to 32 bits, in the numerator or the denominator.

CPU cycles for LPC1200 divide library

Function	CPU cycles
Unsigned	82
Signed (both positive)	85
Signed (one or both negative)	97

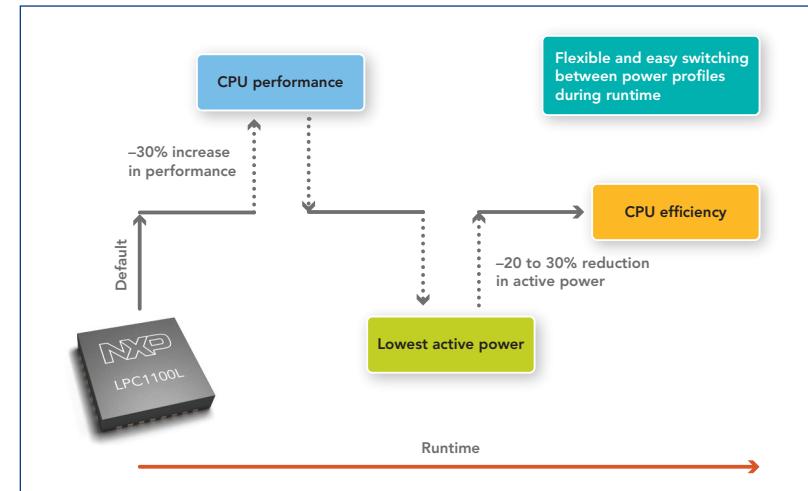
5.

Special functions in ROM

Power profiles

On the Cortex-M0 LPC1100XL series, the ROM includes API-driven power profiles that let designers work with ready-to-use power management templates. The power profiles can be customized for any low-power application, so designers can reach ideal power levels with minimal application intervention. The power profiles serve as an excellent alternative to non-configurable low-power modes, since they can conduct dynamic power management and optimize CPU operation for various application states. This minimizes overall energy consumption while maintaining the lowest operating current at low supply voltages. Optimized for CPU performance, CPU efficiency, and lowest active current, the power profiles enable maximum operating frequency through the entire voltage range from 1.8 to 3.6 V without compromising speed or functionality. The designer can also change the system clock frequency dynamically, without the overhead required to configure any system PLLs.

Typical flow of power profiles



5.

LPC4300 Dual-Core: Cortex-M0 coprocessor

ARM Cortex-M0 coprocessor

Having two cores on one chip makes it possible to separate the processing and real-time control functions while minimizing PCB space. The small gate count of the Cortex-M0 core makes it an ideal coprocessor to the high-performance Cortex-M4 core, because it provides increased system flexibility and performance at a nominal cost. The M0 can handle the I/O processing and all the communication interfaces, including USB and Ethernet. That way, the Cortex-M4 is free to focus on executing high-performance algorithms.

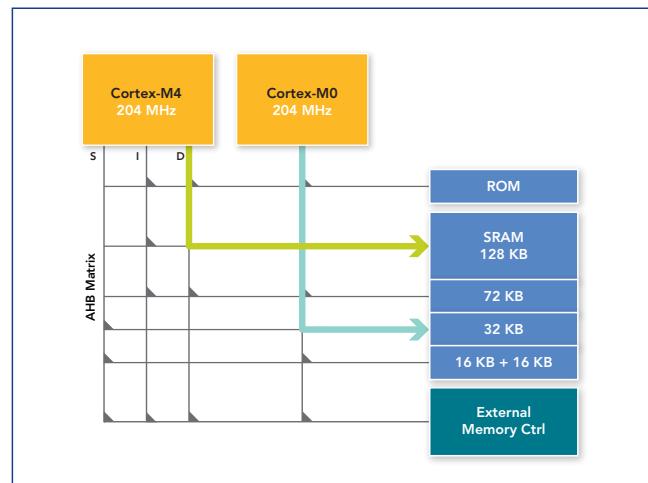
Features

- Runs at the same rate as the ARM Cortex-M4 (204 MHz)
- Provides access to all peripherals, via connection to internal bus matrix
- Nested Vector Interrupt Controller (NVIC) for dedicated interrupt support
- Shared debug interface lets designers use a single JTAG unit on both cores
- Inter-Processing Communication (IPC) supported through shared memory
- Processor code can be stored in separate memories for maximum performance
 - ARM Cortex-M4: 1.25 DMIPS/MHz
 - ARM Cortex-M0: 0.9 DMIPS/MHz

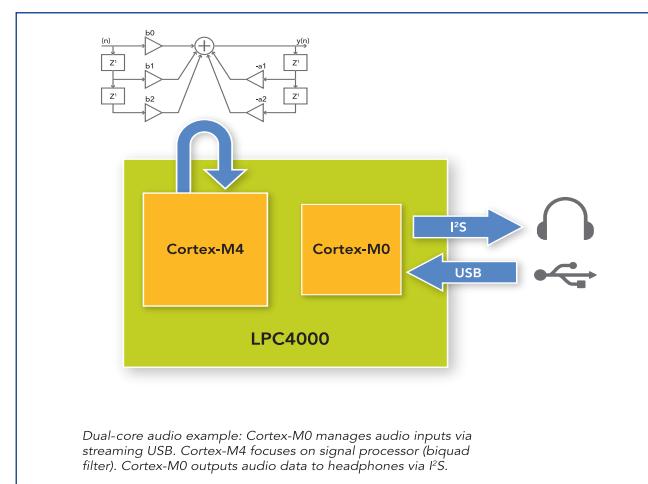
ARM Cortex-M0 coprocessor selection guide

Product	ARM core	Memory		M4 core	M0 core
		Flash (KB)	SRAM (KB)		
LPC4350	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	1	1
LPC4330	Cortex-M4	Up to 1024 (2 x 512)	Up to 264	1	1
LPC4320	Cortex-M4	Up to 1024 (2 x 512)	Up to 200	1	1
LPC4310	Cortex-M4	Up to 1024 (2 x 512)	Up to 168	1	1

Sample memory partitioning



Example system: audio signal processing



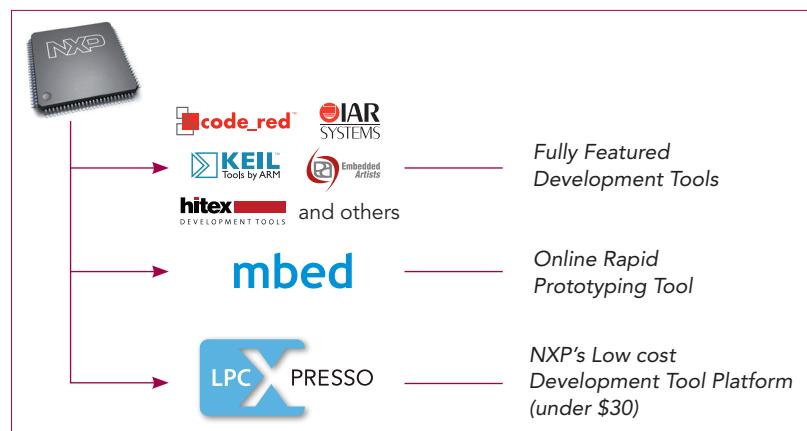
6.

Development tools

Better tools make better designs

Our entire ARM portfolio works with a single MCU toolchain. That means you get to use a familiar set of tools no matter what product or architecture you choose. Plus, because we have such an extensive range of options to choose from, you can be certain you'll be working with the best. Whether you opt for one of our custom-developed tools or software from a third-party partner, you'll be able to explore new ideas and get to market faster than ever. The third-party tools listed here are available for purchase through NXP-authorized dealers. This is just a partial list; for a complete list, go to www.nxp.com and enter "ARM Development Tools" in the search field.

NXP ARM tool solutions



6.

LPCXpresso toolchain

NXP's unique, low-cost toolchain



This groundbreaking development platform, created by NXP exclusively for its Cortex-M microcontrollers, takes you from evaluation all the way through to product development for less than \$30. Designed for simplicity and ease of use, it features a powerful Eclipse-based IDE with a special, NXP-designed user interface. Also included are an optimized Cortex-M0 compiler with libraries, an LPC-Link JTAG/SWD debug probe, and target boards. A Linux version is also available.

LPCXpresso users can evaluate, explore, and develop within a single, easy-to-use interface while retaining all the advanced features associated with powerful and expensive tools. More than 15,000 LPCXpresso boards have already shipped, and there are more than 1,000 community members on the LPCXpresso forum.

For more information, please visit:

www.nxp.com/lpcxpresso

www.nxp.com/lpcxpresso-support

www.nxp.com/lpcxpresso-forum

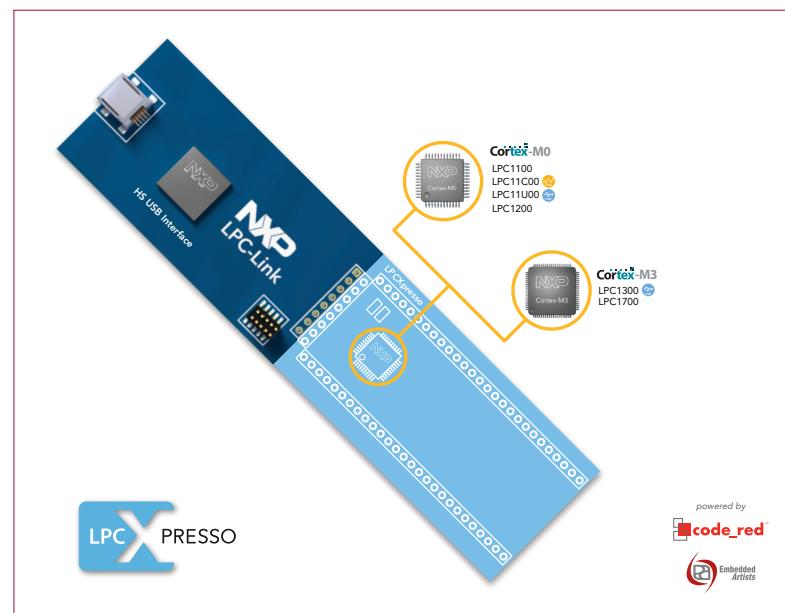
LPCXpresso selection guide

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1769	OM13000	\$ 29	€ 20	LPCXpresso board for LPC1769
LPC1343	OM11048	\$ 29	€ 20	LPCXpresso board for LPC1343
LPC11C24	OM13012	\$ 29	€ 20	LPCXpresso board for LPC11C24
LPC1114	OM11049	\$ 29	€ 20	LPCXpresso board for LPC1114
LPC11U14	OM13014	\$ 29	€ 20	LPCXpresso board for LPC11U14
LPC1115	OM13035	\$ 29	€ 20	LPCXpresso board for LPC1115

Evaluate, explore, develop

- An end-to-end tool for less than \$30
- Eclipse-based IDE
- Intuitive, NXP-designed user interface
- Optimized libraries
- LPC-Link JTAG/SWD debug probe
- Target boards
- Linux version now available
- Supports all Cortex-M devices

LPCXpresso supports all Cortex-M devices



6. mbed prototyping tool

Rapid prototyping

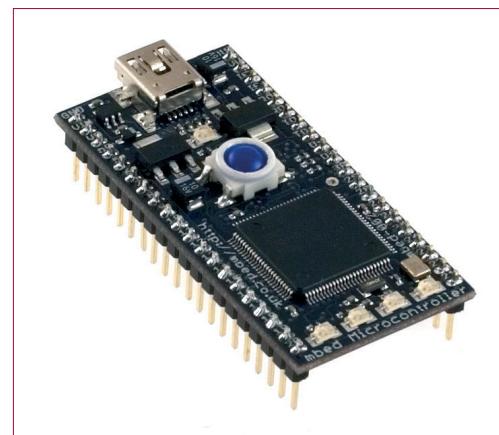
mbed

This remarkable online tool, co-developed by NXP and ARM, is the only rapid prototyping tool for ARM products. It provides a tightly coupled combination of hardware and software, so it's easy to explore design ideas quickly. New users can get started in just minutes, and compiling the first program can take as little as 60 seconds. The Cortex version of mbed uses an LPC1768 Cortex-M3 and LPC11U24 Cortex-M0 device. For more information, please visit <http://mbed.org>.

Features

- ▶ Convenient form-factor: 40-pin DIP, 0.1-inch pitch
- ▶ Drag-and-drop programming, with the board represented as a USB drive
- ▶ Best-in-class Cortex-M0 hardware LPC11U24
 - 50 MHz ARM (10 KB SRAM, 32 KB Flash, up to 4 K EEPROM)
 - FS USB Device
 - 2SPI, I²C, UART
 - GPIO, PWM, ADC
- ▶ Best-in-class Cortex-M3 hardware LPC1768
 - 100 MHz ARM with 64 KB of SRAM, 512 KB of Flash
 - Ethernet, USB OTG
 - SPI, I²C, UART, CAN
 - GPIO, PWM, ADC, DAC
- ▶ Easy-to-use online tools
 - Web-based C/C++ programming environment
 - Uses the ARM RealView compile engine
 - API-driven development using libraries with intuitive interfaces
 - Comprehensive help resources and online community

The mbed rapid prototyping tool



Benefits

- ▶ Get started right away, with nothing to install
- ▶ Get working fast, using high-level APIs
- ▶ Explore, test, and demonstrate ideas more effectively
- ▶ Write clean, compact code that's easy to modify
- ▶ Log in from anywhere, on Windows, Mac, or Linux

mbed selection guide

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1768	OM11043	\$ 60	€ 41	mbed LPC1768 Board
LPC11U24	OM13033	\$ 45	€ 35	mbed LPC11U24

6.

Code Red Technologies

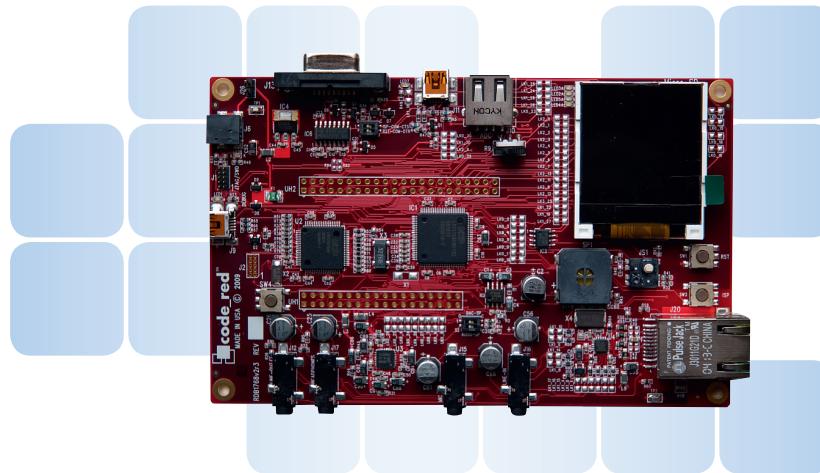


Code Red Technologies

Code Red Technologies produces innovative and powerful development tools for ARM-based 32-bit microcontrollers, enabling embedded systems designers to get up and running with their applications in just minutes instead of weeks. We have developed our own unique technology to provide unprecedented levels of visibility into target systems, enabling the rapid development and debugging of fully featured embedded applications. Our Red Suite family includes the Red Probe+ debug probe, which provides high levels of visibility into target systems so developers can quickly debug their embedded applications.

Code Red Technologies
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USA

Phone (Europe): +44 1223 515768
Phone (US): +1 415 420 2467
Email: information@code-red-tech.com
<http://www.code-red-tech.com>



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1768	OM11048	\$ 280	€ 200	Code Red LPC1769 eval board
N/A	N/A	\$ 256	€ 176	Red Suite 3 IDE upgrade (256K)
N/A	N/A	\$ 512	€ 353	Red Suite 3 IDE upgrade (512K)

6.

Embedded Artists

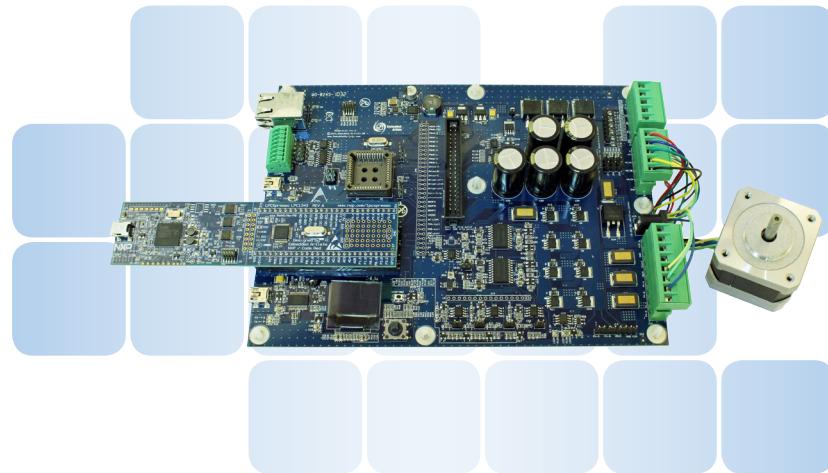


Embedded Artists

EA ensures simpler and shorter design & development cycles when using NXP processors, by providing reliable products, services and knowledge to our customers. EA designs, produces, and distributes evaluation and OEM platforms based on NXP processors to companies globally. We work in close co-operation with NXP, ensuring superior knowledge, high quality, and availability of new products, as well as providing superior customer support. We help companies with customization services to meet specific demands and to ensure cost-efficient solutions.

Embedded Artists AB
Södra Promenaden 51
SE-211 38 Malmö
SWEDEN

Phone: +46 (0)40-611 00 93
Fax: +46 (0)40-611 00 93
<http://www.EmbeddedArtists.com>



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1769	OM13000	\$ 29	€ 20	LPCXpresso board for LPC1769
LPC1343	OM11048	\$ 29	€ 20	LPCXpresso board for LPC1343
LPC11C24	OM13012	\$ 29	€ 20	LPCXpresso board for LPC11C24
LPC1114	OM11049	\$ 29	€ 20	LPCXpresso board for LPC1114
N/A	OM11083	\$ 125	€ 89	EA base board for LPCXpresso/mbed
N/A	OM13009	\$ 415	€ 299	EA motor-control kit for LPCXpresso
LPC1788	OM13001	\$ 249	€ 169	LPC177x/8x Eval Board
LPC11U14	OM13014	\$ 29	€ 20	LPCXpresso board for LPC11U14
LPC11D14	OM13023	\$ 61	€ 45	LPC11D14 QuickStart Board
LPC12D27	OM13024	\$ 61	€ 45	LPC12D27 QuickStart Board
LPC1115	OM13035	\$ 29	€ 20	LPCXpresso board for LPC1115
N/A	OM13036	\$ 80	€ 61	Android Eval board

6.

Hitex Development Tools

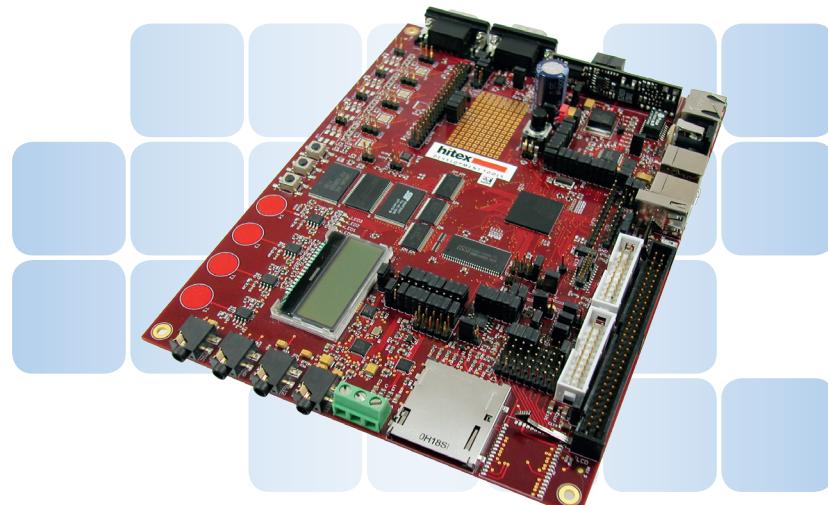


Hitex Development Tools

Hitex can look back on 35 years of company history and enjoys a leading position as a supplier of innovative and reliable tools for embedded engineers. The portfolio comprises sophisticated solutions and complete product-oriented training programs to support users in getting high-quality applications to market faster. This includes in-circuit emulators, debuggers, evaluation boards, software tools for automated test, compilers, bus and protocol analyzers, and programmers, as well as energy profiling solutions. In addition, Hitex supports customers on a consulting basis in all phases of their development projects, from concept to system realization, with a special focus and a wealth of experience in safety critical applications.

Hitex Development Tools GmbH
Greschbachstr. 12
76229 Karlsruhe
GERMANY

tel +49 721 9628 0
fax +49 721 9628 149
www.hitex.com



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1850	OM13030	\$ 299	€ 214	LPC1850 Eval board
LPC4350	OM13031	\$ 299	€ 214	LPC4350 Eval board

6.

IAR Systems

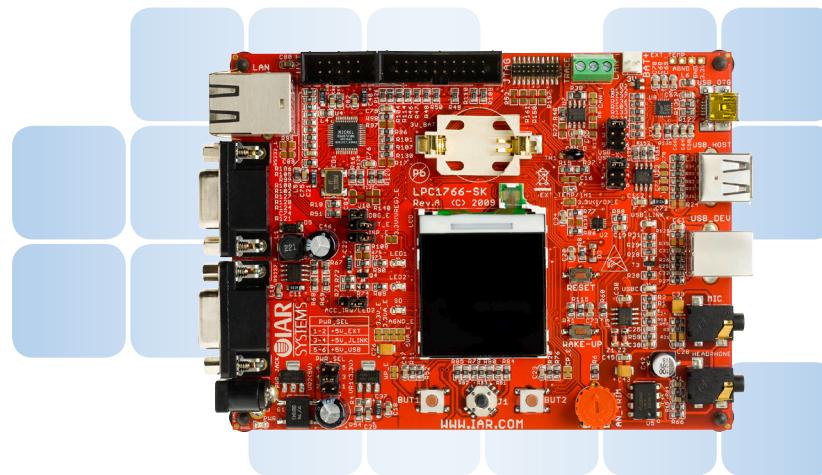


IAR Systems

IAR Systems is the world's leading supplier of software tools for embedded systems that enable large and small companies, mainly in the areas of industrial automation, medical devices, consumer electronics, and automotive products, to develop premium products. IAR Systems have a long co-operation with NXP Semiconductors and extensive support of their ARM and Cortex devices. For software engineers who need professional yet easy-to-use development tools for embedded systems, IAR Embedded Workbench is an integrated development environment that generates very efficient code. IAR Embedded Workbench is the world-leading C/C++ compiler and debugger tool suite for applications that use ARM-based microcontrollers.

IAR Systems AB
P.O. Box 23051
SE-750 23 Uppsala
SWEDEN

Phone: +46 18 16 78 00
Fax: +46 18 16 78 38
www.iar.com



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1768	OM11034	\$ 199	€ 140	IAR LPC1768 KS board
LPC1343	OM11040	\$ 139	€ 100	IAR LPC1343 KS board
LPC1227	OM13013	\$ 183	€ 129	IAR LPC1227 KSK with j-link lite
LPC11C14	OM13003	\$ 139	€ 120	IAR LPC11C14 eval board
LPC1114	OM11085	\$ 139	€ 100	IAR LPC1114 KS board
LPC11U14	OM13016	\$ 179	€ 129	IAR LPC11U14 KSK
LPC11U24	OM13022	\$ 179	€ 129	IAR LPC11U24 KSK

6.

Keil - An ARM Company

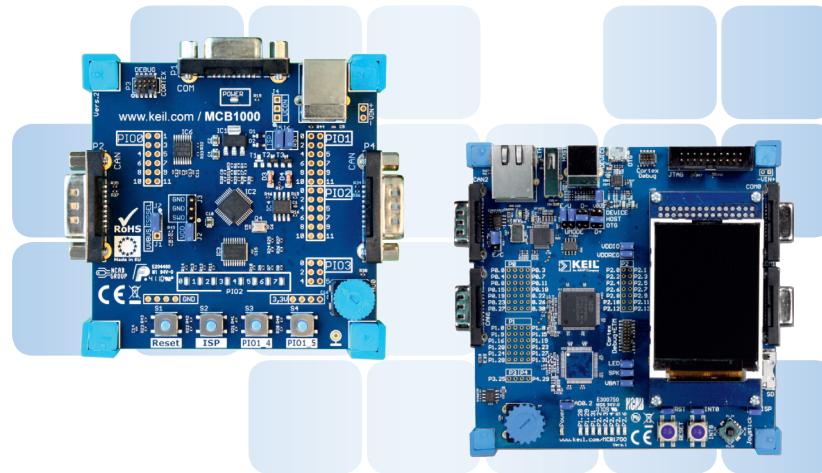


Keil - An ARM Company

Keil develops, manufactures, and distributes embedded software development tools for the 8051, 251, ARM, and XC16x/C16x/ST10 microcontroller families. Keil provides ANSI-C compilers, Macro Assemblers, real-time executives, debuggers and simulators, integrated environments, and evaluation boards. Since its beginning, Keil has driven the industry to new heights with advanced software technology. Our constant, hard-driving research has paid off time and again as we continue to develop innovative products that make product development easier. In October 2005, Keil (Keil Elektronik GmbH in Munich, Germany, and Keil Software, Inc. in Plano, Texas) was acquired by ARM.

Keil - An ARM Company
Bretonischer Ring 16
D-85630 Grasbrunn
GERMANY

Phone (Europe): +49 89/456040-20
Phone (US): +1 972 312 1107
www.keil.com



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC1769	OM11084	\$ 320	€ 250	Keil MCB LPC1769 eval board
LPC1768	OM11032	\$ 320	€ 250	Keil MCB LPC1768 eval board
LPC1758	OM11036	\$ 320	€ 250	Keil MCB LPC1758 eval board
LPC1343	OM11039	\$ 150	€ 106	Keil MCB LPC1343 eval board
LPC1227	OM13011	\$ 150	€ 106	Keil MCB LPC1227 eval board
LPC11C14	OM13004	\$ 150	€ 106	Keil MCB LPC11C14 eval board
LPC1114	OM11086	\$ 150	€ 106	Keil MCB LPC1114 eval board
LPC11U14	OM13018	\$ 150	€ 106	Keil MCB LPC11U14 eval board

6.

NGX Technologies

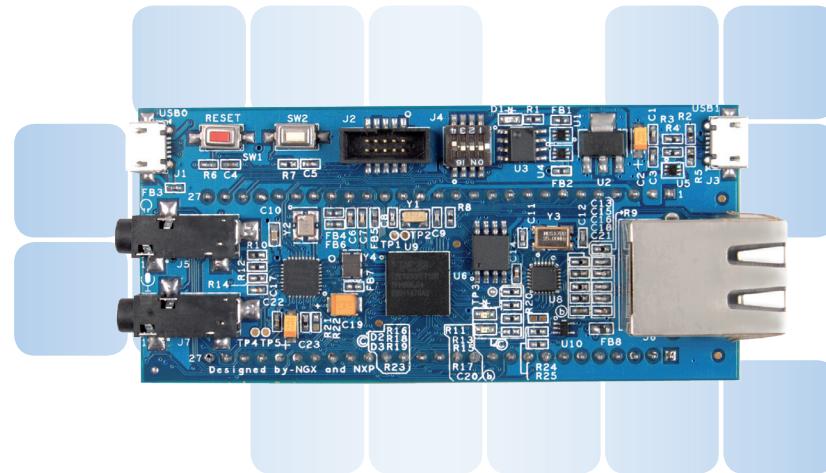


NGX Technologies

NGX Technologies is a premier supplier of development tools for the ARM7, ARM Cortex M0, M3 and M4 series of microcontrollers. NGX provides innovative and cost effective design solutions for embedded systems. We specialize in NXP's ARM portfolio, which includes ARM7, Cortex-M3, M0 & M4 microcontrollers. Our experience with developing evaluation platforms for NXP controller enables us to provide solutions with shortened development time thereby ensuring reduced time to market and lower development costs for our customers. Our cost effective and feature rich development tool offering, serves as a testimony to our expertise, cost effectiveness and quality.

NGX Technologies Pvt. Ltd.
No.216, 5th main Road, R.P.C. Layout,
Vijayanagar 2nd Stage,
Bangalore – 560 104
INDIA

Phone: +91-80-40925507
www.ngxtechnologies.com



Highlighted products

Device	Order number	Price (USD)	Price (EURO)	Description
LPC4330	OM13027	\$ 49	€ 39	Low cost evaluation tool for LPC4330
LPC1830	OM13028	\$ 49	€ 39	Low cost evaluation tool for LPC1830
LPC11U14	OM13021	\$ 34	€ 25	Low cost evaluation tool for LPC11U14
LPC11U24	OM13033	\$ 70	€ 54	Low cost evaluation tool for LPC11U24
N/A	OM13016	\$ 45	€ 32	BaseBoard to evaluate LPCXpresso boards
LPC1114	OM13026	\$ 42	€ 30	DALI evaluation tool
LPC1343	N/A	\$ 20	€ 14	Low cost evaluation tool for LPC1343
LPC1768	N/A	\$ 49	€ 39	Low cost evaluation tool for LPC1768

6.

Software support partners

Software support partners

NXP's microcontrollers are supported by a large number of software development tools. Integrated Development Environments (IDEs) give you a graphical interface for managing every step of application development, including editing, compiling, and debugging application code. Many IDEs work with a variety of JTAG debuggers, emulators, and compilers for additional flexibility. The vendors listed here provide a range of software tools and support services, and are part of the NXP Partner Program.

	<p>Blue Water Embedded's engineering team has decades of experience in working on the most challenging embedded software projects. They understand the requirements of building safety critical medical devices and industrial controls. They can be a valuable asset to assist your team in getting your project done on time and within budget. In addition to their technical expertise with graphical user interface software, their engineering capabilities include custom widget development, custom LCD and touch-screen drivers, and application development.</p>	<p>Blue Water Embedded 3847 Pine Grove Ave, Suite A Fort Gratiot, MI 48059 - USA Phone: +1 810 987 3002 Fax: +1 810 987 3151 www.bwembedded.com</p>
	<p>CMX Systems develops and supports real-time, multi-tasking operating systems (RTOSes), TCP/IP stacks, Flash File Systems and USB stacks. CMX supports NXP ARM7/9, Cortex-M3 and 8051 processor families. Available software includes CMX-RTX and CMX-TINY+ RTOSes; CMX-MicroNet, which is a unique TCP/IP stack targeted at processors with limited Flash and/or RAM; and CMX-TCP/IP, a full-featured TCP/IP stack. CMX also offers five different Flash File Systems and CMX-USB Host/Device/OTG software for designers wishing to add USB connectivity to their products.</p>	<p>CMX Systems 12276 San Jose Blvd , Suite 511 Jacksonville, FL 32223 - USA Phone: +1 904 880 1840 Fax: +1 904 880 1632 www.cmx.com</p>
 EMBEDDED SYSTEMS ACADEMY	<p>Embedded Systems Academy's expertise covers several microcontroller architectures and their development tool chains. In addition ESA focuses on topics such as time-to-market, quality improvement and embedded networking applications using Controller Area Network (CAN, CANbus), CANopen, and Embedded Internetworking. ESA's training and consulting services include prototyping and customized software or hardware development.</p>	<p>Embedded Systems Academy 50 Airport Parkway San Jose, CA 95110 - USA Phone: +1 877 812 6393 Fax +1 877 812 6382 www.esacademy.com</p>
	<p>Express Logic's mission is to provide the absolute best quality software solutions for deeply embedded applications. In addition to providing the very best software products, we philosophically believe in licensing our products in a non-royalty fashion along with providing complete source code. This combination of having superior products and a practical business model is paying huge dividends. The name recognition and popularity of ThreadX is growing tremendously from year to year.</p>	<p>Express Logic 11423 West Bernardo Court San Diego, CA 92127 Phone: +1 858 613 6640 Fax: +1 858 613 6646 info@expresslogic.com</p>
	<p>FreeRTOS™, a product of Real Time Engineers, includes official ports to 26 architectures and receives more than 77,500 downloads a year. It is a popular, portable, open-source, royalty-free, mini Real Time Kernel. It is free to download and free to deploy and can be used in commercial applications without the need to expose any proprietary source code. Each official port includes a pre-configured example application demonstrating the kernel features, expediting learning, and permitting out-of-the-box development. Support is provided by an active user community.</p>	<p>Real Time Engineers PO Box 1421 Bristol BS41 9WR - UK Fax: +44 117 205 0179 www.freertos.org</p>

6.

Software support partners

	<p>HCC-Embedded is a foremost vendor of storage and communication solutions for embedded applications. Products include an extensive family of file systems, as well as USB software for host and device; flash translation layers; Windows embedded connectivity; specialized IP; and development boards. HCC products run in most environments, with most OSs, or without an OS, and with most processors and peripherals. They are used in great variety of embedded applications, including aerospace, automotive, communications, consumer, industrial control, instrumentation, medical, security, and more. All HCC products are licensed on a royalty-free basis and distributed in full-source form. Support is included for one year after purchase of a license.</p>	<p>HCC-Embedded 444 East 82nd Street New York , NY 10028 - USA Phone: +1 212 734 1345 www.hcc-embedded.com</p>
	<p>InterNiche is a specialist provider of Internet Protocol software stacks and networking expertise specifically targeted at connected device implementations. InterNiche offers a broad range of royalty-free TCP/IP protocol suites, delivered as C source code. The suites are optimized for maximum performance and minimum memory footprint on the highly integrated VLSI at the heart of today's device designs.</p>	<p>InterNiche Technologies 51 E Campbell Avenue, Suite 160 Campbell, CA 95008 - USA Phone: +1 408 540 1160 Fax: +1 408 540 1161 www.iniche.com</p>
	<p>IS2T is a software editor specializing in products for making embedded devices in a very cost-effective way. The focus is on combining state-of-the-art technologies, with a specific concentration on object-oriented/Java technologies for embedded systems. Involved in public and industrial research labs, IS2T spends more than 30m per year to develop and refine its technologies. Our solutions address issues of any company involved in software design for embedded systems, whatever the embedded microprocessor architectures, including 8-bit, 16-bit and 32-bit+ computation units.</p>	<p>IS2T 1 rue de la Noë 44321 Nantes - FRANCE Phone : +33 0 240 180 496 www.is2t.com</p>
 Micrium For the Way Engineers Work	<p>Micrium's vision is to provide the highest-quality embedded software components in the industry. Micrium delivers a full portfolio of embedded software components that complement their well-known uC/OS-II operating system. A TCP/IP stack, USB stack, CAN stack, File System (FS), Graphical User Interface (GUI), as well as many other high-quality embedded components are also available.</p>	<p>Micrium 949 Crestview Circle Weston, FL 33327 - USA Phone: +1 954 217 2036 Fax: +1 954 217 2037 www.micrium.com</p>
	<p>Micro Digital Inc, founded in 1975, was one of the first embedded-systems software companies in the market. Over the years, Micro Digital has been dedicated to providing excellent engineering services and developing high-quality software products for the embedded OEM marketplace. Micro Digital provides out-of-the-box solutions for NXP ARM7/9 and Cortex-M3. Micro Digital's large portfolio includes the real-time, multi-tasking Operating System (SMX), USB Host/Device/OTG Stacks, TCP/IP stacks, and File Systems.</p>	<p>Micro Digital 2900 Bristol Street #G204 Costa Mesa, CA 92626 - USA Phone: +1 714 437 7333 Fax: +1 714 432 0490 www.smxrtos.com/nxp</p>
 SEGGER www.segger.com	<p>SEGGER Microcontroller Systeme GmbH develops and distributes software development tools and ANSI "C" software components (middleware) for embedded systems in telecom, medical technology, consumer electronics, automotive, industrial automation, and more. Key products are emWin, a universal graphic software for embedded applications, and embOS, a small and efficient real-time kernel.</p>	<p>SEGGER In den Weiden 11 40721 Hilden - GERMANY Phone: +49 0 2103 28780 Fax: +49 0 2103 287828 www.segger.com</p>

7.

Online communities

When you choose NXP as your design partner, you become part of an international community of developers ready to share their experiences and expertise whenever you need it.



LPCZone

This online community, dedicated to developers of LPC MCUs, is design central for all things LPC. Here is where engineers will find the latest product information, news, events, and videos.

Access: <http://www.nxp.com/lpczone>



LPCXpresso forum

This forum, with over 1,000 active members, has hundreds of useful threads, all dedicated to tips, tricks, and insider expertise on the LPCXpresso development platform.

Access: <http://knowledgebase.nxp.com/>



YouTube

An extension of the LPCZone, this YouTube site is an extensive resource for technical tutorials, news items, interviews, design challenges, and more.

Access: <http://www.youtube.com/user/LPCZone>



Yahoo! forum

With roughly 10,000 registered members, NXP's LPC forum is the #1 active microcontroller user forum on Yahoo!

Access: <http://tech.groups.yahoo.com/group/lpc2000/>



Twitter

Follow the LPCZone for the most up-to-date information on all of NXP's LPC product families.

Access: <http://twitter.com/LPCZone>



LPCware

At LPCware.com, you can communicate with other developers that have similar interests using NXP LPC devices. There are also many other resources for getting you up and running with your new hardware, such as tutorials, software or driver packages, tools, FAQs, design tips, and much more. Please visit www.lpcware.com

Other useful links

Other useful links

NXP's dedicated web pages make it easy to find whatever you need. Use the links below to review product data, get help with a design, sign up for a training seminar, find your nearest distributor, and more.

Application notes

www.nxp.com/all_appnotes

Datasheets (all released products and product families)

www.nxp.com/all_datasheets

Microcontroller microsite

www.nxp.com/microcontrollers

Sales literature (product leaflets, brochures)

www.nxp.com/all_literature

Sales offices & distributors

www.nxp.com/profile/sales

Technical support

www.nxp.com/technical_support

Microcontroller community website

www.microcontrollercentral.com

