

ARM-Based 32-bit RISC Microcontrollers



μPLAT™

OKI

*OkI, Network Solutions
for a Global Society*

Dear Reader,

As a leader in 32-bit microcontroller solutions, Oki Semiconductor offers a rich portfolio of ARM-based MCU products using Oki's award winning μ PLAT[®] System-on-Chip (SoC) design platform allowing a seamless migration to higher performance. ARM7 core-based family of microcontrollers, the new standard for low-cost MCU design much like the 8051, set the standard for the 8-bit architecture.

The ML674K series of MCU solutions and Oki's ML675K series with even higher performance, provide better alternatives to proprietary architecture in great part because of the higher performance, wider industry support, more ready-to-use software applications.

Now a new generation of General Purpose Microcontrollers based on the ARM946E™ core is added for applications which have particular high demands for data throughput and speed.

Oki's ARM-based MCU's are supported by a large array of third party hardware and software development tool suppliers.

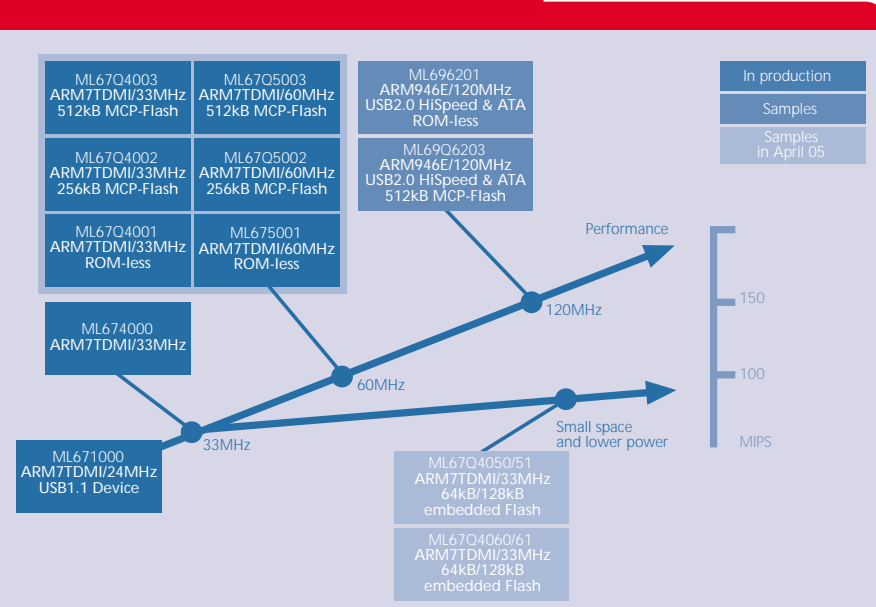
Features of OKI ARM-based MCUs:

- **Modular Design Concept μ PLAT[®] for smooth future upgrades at low costs**
- **AMBA-AHB/APB architecture**
- **PWM, ADC, USB, ATAPI, etc.**
- **Flash versions:**
 - MCU up to 512kByte
 - Embedded 128kByte
- **World's smallest ARM7 MCU in WCSP**

Contents

Embedded Secure Flash	
ML67Q4060/1	3
ML67Q4050/1	3
Multifunctional	
ML67(Q)400x/500x	4
High Performance	
ML696201/69Q6203	5
Tools	
ML674K/5K – CPU Board	6
RealView	6
Third Party Tools	6
Product Overview	
	7

General Purpose ARM-Core based MCU Family



ML67Q4060/1

The ML67Q4060/1 belongs to an extensive and growing family of 32-bit ARM-core based standard products for general-purpose applications that require 32-bit CPU performance and low cost. The wide range of on-chip functions makes the ML67Q4060/1 the ideal microcontroller for many handheld consumer and industrial applications.

- Advantages:**
- Ultra small package: 64-WCSP (5 x 5mm²) / 64-TQFP / 84-LFBGA
 - Embedded secure Flash
 - On-chip debug function/boundary scan support

- Features:**
- ARM7TDMI
 - 33MHz
 - 16kB RAM
 - 128kB Flash
 - Brownout detection
 - 7 16bit-Timers
 - 32kHz real-time clock
 - UART / I2C / I2S / SSIO
 - 10bit-ADC
 - DMA controller
 - 42 I/Os



ML67Q4050/1

The ML67Q4050/1 is similar to the ML67Q4060/1, but offers an external memory bus to easily connect additional Flash-ROM, SRAM, SDRAM or I/O devices.

- Advantages:**
- External data / address bus
 - Embedded secure Flash
 - On-chip debug function/boundary scan support

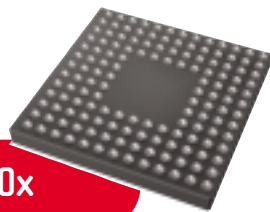
- Features:**
- ARM7TDMI
 - 33MHz
 - 16kB RAM
 - 128kB Flash
 - Brownout detection
 - 7 16bit-Timers
 - PWM
 - 32kHz real-time clock
 - UART / I2C / I2S / SSIO
 - 10bit-ADC
 - 2 ch. DMA controller
 - 42 I/Os



Features of PoS Reference Design Board

- Quick and easy development
- Complete card reader terminal reference design including μ CLinux kernel based on OKI ML675001
- IC card slot
- Magnetic strip reader
- Printer, keyboard, LCD
- 10/100Mbps Ethernet
- USB1.1 full speed device
- RS232C
- 56Kbps Modem
- Real-time clock
- Royalty and licence free
- Full software driver support

ML67(Q)400x/500x



This family of high-performance micro-controllers combines the 32-bit ARM7TDMI core with a DMA controller, serial ports, PWM generator, A/D-converter, 16-bit timers, and other peripheral functions on a single chip. In addition to 32-bit data processing, these MCUs include sufficient internal RAM and onboard peripherals that make it ideal for embedded control applications like PC peripherals and communication devices, but also consumer and industrial products. Finally, the built-in external memory controller offers direct connection of ROM, SRAM, SDRAM and other peripheral devices.

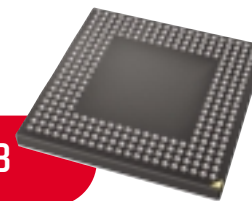
Advantages:

- Pin- and function-compatible product family
- Up to 512kB MCP-Flash
- External data / address bus
- On-chip debug function / boundary scan support

Features:

- ARM7TDMI
- 33MHz / 60MHz
- 32kB RAM
- ROM-less/256kB/512kB Flash-version
- 7 16bit-Timers
- PWM
- UART / I2C / SSIO
- 10bit-ADC
- 2 channel DMA controller
- 42 I/Os

ML696201/69Q6203



Another high-performance microcontroller family based on the 32-bit ARM946E-core is equipped with high speed USB port, HDD controller, DMA controller, PWM generator, A/D-converter and other peripheral functions on a single chip. In addition to 32-bit data processing, these MCUs include sufficient internal RAM and onboard peripherals that make it ideal for embedded control applications like PC peripherals and communication devices.

Finally, the built-in external memory controller offers direct connection of ROM, SRAM, SDRAM and other peripheral devices.

Advantages:

- High performance ARM946E core
- Direct connection of HDD through ATAPI/IDE interface
- High speed (480Mbps) USB device controller
- Up to 512kB MCP-Flash
- On-chip debug function / boundary scan support

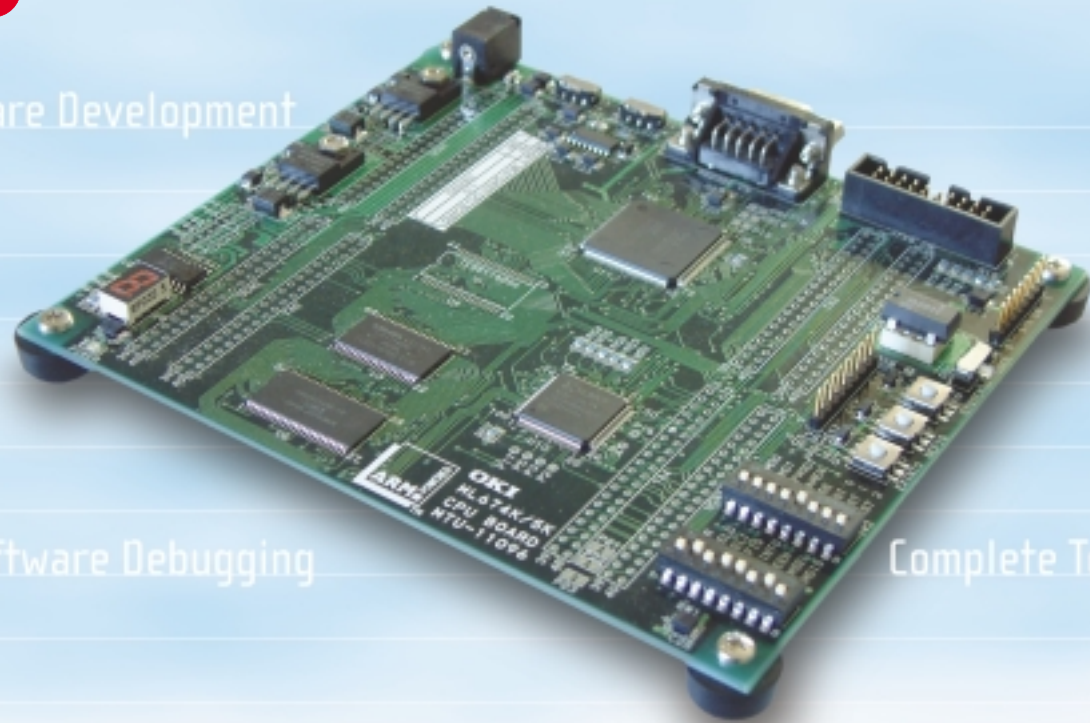
Features:

- ARM946E
- 120MHz
- 128kB RAM
- ROM-less/512 kB Flash-version
- 8kB instruction cache + 8kB data cache
- 4 16bit-Timers
- PWM
- UART / I2C / SSIO
- 10bit-ADC
- 4 ch. DMA controller
- 87 I/Os

Software Development

Software Debugging

Complete Tool Package



ML674K/5K – CPU Board



In combination with the ARM RealView®, this board will allow full development and debugging of software. Available software include C-compiler, assembler, linker and C-debugger.

Jointly developed by ARM and Oki Electric as a complete, low-cost solution for Oki's ML674K/ML675K series ARM core general-purpose microcontroller products, the RealView® Developer Kit for Oki is the leading edge tool suite for software

development. Being the most comprehensive tool package for writing, compiling, debugging and integrating systems, the kit is based on components of the ARM RealView development solution with functionality tailored to the specific requirements of Oki ARM7 MCU products. Comprised of the RealView targeted compiler and a powerful GUI-based RealView debugger, the complementary ARM RealView ICE Micro Edition module provides JTAG run control through a

standard 8 MHz JTAG TAP at data rates of 100 KB/second. The industry-leading optimisation facilities of the RealView Compiler help the developer to reduce system memory cost through smaller code size and increased system performance. A low price can be offered since the functionality is precisely tailored to Oki's ARM7 controllers. Moreover, a fully functional evaluation version restricted by the number of run cycles or by a 60 day time-out is available.

ARM-Based 32-bit RISC Microcontrollers

Part Number	Packages	Supply Voltage	Standard Temp. Range	Flash-ROM	RAM	Port Lines	Description
ML696201	272-LFBGA	+2.7~+3.6V	-30~+70°C	-	128KB	87	ARM946E, USB 2.0 High Speed ATAPI/IDE
ML69Q6203	272-LFBGA	+3.0~+3.6V	-30~+70°C	512KB (MCP)	128KB	87	ARM946E, USB 2.0 High Speed ATAPI/IDE
ML67Q4060	64-WCSP, 64-TQFP, 84-LFBGA	+3.0~+3.6V	-40~+85°C	64KB	16KB	42	General purpose μPLAT™-MCU with secure embedded Flash
ML67Q4061	64-WCSP, 64-TQFP, 84-LFBGA	+3.0~+3.6V	-40~+85°C	128KB	16KB	42	General purpose μPLAT™-MCU with secure embedded Flash
ML67Q4050	144-TQFP	+3.0~+3.6V	-40~+85°C	64KB	16KB	42	General purpose μPLAT™-MCU with secure embedded Flash, external bus
ML67Q4051	144-TQFP	+3.0~+3.6V	-40~+85°C	128KB	16KB	42	General purpose μPLAT™-MCU with secure embedded Flash, external bus
ML674000	128-TQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	-	8KB	32	General purpose μPLAT™-MCU with PWM, 10-bit-ADC, DMA controller
ML674001	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	-	32KB	42	General purpose μPLAT™-MCU with I ² C, PWM, 10-bit-ADC, DMA
ML67Q4002	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	256KB (MCP)	32KB	42	General purpose μPLAT™-MCU with I ² C, PWM, 10-bit-ADC, DMA
ML67Q4003	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	512KB (MCP)	32KB	42	General purpose μPLAT™-MCU with I ² C, PWM, 10-bit-ADC, DMA
ML675001	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	-	32KB	42	General purpose μPLAT™-MCU with 8KB unified cache, I ² C, PWM, 10-bit-ADC, DMA, max 60MHz
ML67Q5002	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	256KB (MCP)	32KB	42	General purpose μPLAT™-MCU with 8KB unified cache, I ² C, PWM, 10-bit-ADC, DMA, max 60MHz
ML67Q5003	144-LQFP, 144-LFBGA	+3.0~+3.6V	-40~+85°C	512KB (MCP)	32KB	42	General purpose μPLAT™-MCU with 8KB unified cache, I ² C, PWM, 10-bit-ADC, DMA, max 60MHz
ML671000	128-QFP	+3.0~+3.6V	-40~+85°C	-	4KB	64	ARM7 TDMI-MCU with full speed USB 1.1 device controller and DMA controller

Third Party Tools

	ARM	IAR	YOKOGAWA	MACRAIGOR	HITEX
Compiler	Realview Compiler	C/C++ Compiler	ARM-SDT/-ADS, ...	GNU Compiler	GNU Compiler
Debugger	Realview Debugger	Embedded Workbench for ARM (EWARM)	micro-View	OCD Commander	GNU Compile
JTAG Interface	ARM Realview ICE Ashling Opella	ARM Multi-ICE, OKI ADI-Board, Wiggler, Raven	advice PLUS	Wiggler, Raven	Tantino, Tanto
OKI MCU	all ARM7/ARM9	all ARM7/ARM9	all ARM7/ARM9	all ARM7	ML674000 ML67Q4003 ML67Q5003

● **Oki Electric Industry Co., Ltd.**

Silicon Solutions Company
10-3, Shibaura, 4-chome
Minato-ku, Tokyo 108
Japan
Tel.: +81-(0)3-54 45-63 27
Fax: +81-(0)3-54 45-63 28
<http://www.okisemi.com>

● **OKI Electric Europe GmbH**

Head Office Europe
Hellersbergstrasse 2
D-41460 Neuss
Germany
Tel.: +49-(0)2131-159 60
Fax: +49-(0)2131-1035 39
<http://www.okisemi.com/eu>

● **OKI Electric Europe GmbH**

Vertriebsbüro München
Aidenbachstr. 142
D-81479 München
Germany
Tel.: +49-(0)89-7488650
Fax: +49-(0)89-782913

● **OKI Semiconductor (UK) Ltd.**

3 Etongate
112 Windsor Road
Slough/Berkshire SL1 2JA
Great Britain
Tel.: +44-(0)1753-787700
Fax: +44-(0)1753-517195
E-Mail: oki-uk@oki.com

● **Oki (France) sarl**

148 Rue de Chevilly
F-94240 L'Hay Les Roses
France
Tel.: +33-(0)1-45 600328
Fax: +33-(0)1-49 780958
E-Mail: oki-france@oki.com

Copyright 2005 OKI
OKI Electric Europe GmbH
Ref.: 013-OEE-02/2005

Notice

1. The information contained herein can change without notice owing to product and/or technical improvements. We do not guarantee information contained herein. The exact product specifications may be obtained and confirmed before purchasing and using the product. Please make sure that the information contained herein is up-to-date.

2. The outline of action and examples of application circuits described herein have been chosen as a standard action and performance of the product. When planning to use the product, please ensure that the outside conditions are reflected in the actual circuit and assembly designs. The examples contained herein can give you no guarantee that the products will perform according to its specifications in your own environment. In any case you have to doublecheck the functionality before purchasing and using the products.

3. OKI assumes no responsibility or liability whatsoever for any failure or unusual or unexpected operation resulting from misuse, neglect, improper installation, repair, alteration or accident, improper handling, or unusual physical or electrical stress including, but not limited to, exposure to parameters outside the specified maximum ratings or operation the specified operating range.

4. Neither indemnity against nor license of a third party's industrial and intellectual property right etc. is granted by us in connection with the use of product and/or the information and drawings contained herein. No responsibility is assumed by

us to any infringement of a third party's right which may result from the use thereof.

5. When designing your product, please use our product below the specified maximum ratings and within the specified operating ranges, including but not limited to operating voltage, power dissipation, and operating temperature.

6. The products listed in this document are intended for use in general electronics equipment for commercial applications, (e.g. office automation, communication equipment, measurement equipment, consumer electronics, etc.). These products are not authorized for use in any system or application that requires special or enhanced quality and reliability characteristics nor in any system or application where the failure of such system or application may result in the loss or damage of property or death or injury to persons. Such applications include, but are not limited to: traffic control, automotive, safety, aerospace, nuclear power control, and medical, including life support and maintenance.

7. Certain products in this document may need governmental approval before they can be exported to particular countries. The purchaser assumes the responsibility of determining the legality of export of these products and will take appropriate and necessary steps at their own expense for these.

8. No part of the contents contained herein may be reprinted or reproduced without our prior permission.

