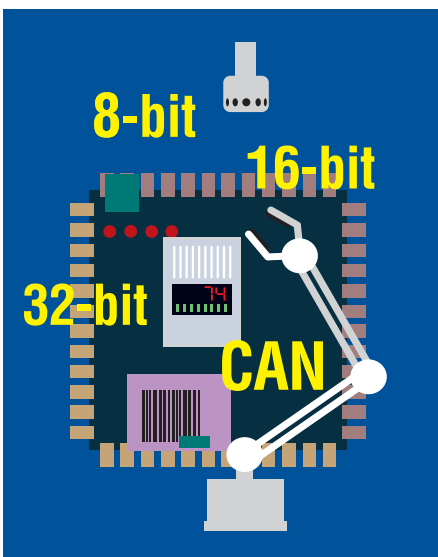


MCUs for the Latest Consumer and Industrial Applications and Designs



“Faster, Cooler, Smarter”

Microcontroller applications in consumer and industrial products continue to grow rapidly. Users demand faster, “cooler” and smarter performance from their audio-visual equipment and household appliances. Luxury vehicles now use as many as 80 MCUs, while mid-range models use 40 to 50. Fujitsu’s 8-bit, 16-bit and 32-bit MCU family is appropriate for all these applications.

Faster Controller with Sweet Features

Fujitsu’s new 32-bit FR60lite MCU family is designed to meet the requirements of the latest consumer product applications. The family is also suited for automotive equipment control systems that require safer, quieter, more customer-friendly performance.

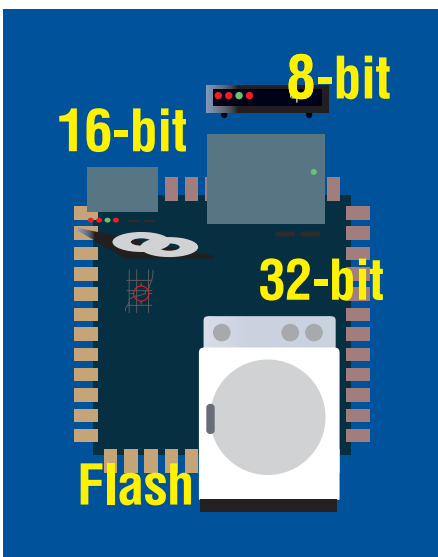
been integrated only with 8-bit or 16-bit microcontrollers. This MCU series is ideal for audio and video equipment that requires high-performance central-processing power, along with LCD user-interface displays in a single chip. The series also uses little power, an important feature in advanced A/V designs.

Fujitsu also offers a high-voltage vacuum fluorescence display controller/driver integrated device series. The MB90M405 series, with its high-performance 16-bit CPU that eliminates the need for an external driver circuit, meets the needs of audio/video equipment display controllers.

Small to Large: a Perfect Fit for Embedded Applications

Fujitsu’s best-in-class, small, 16-bit microcontroller has a 7 x 7 mm body, 0.5 mm pitch and 48 pins, making it appropriate for a wide range of applications. The three series, the MB90455, MB90385 and MB90890 (which is the world’s first dual-operation flash memory MCU) have pin-to-pin compatibility. Customers can choose from mask ROM or flash, with either Controller Area Network (CAN) interface support or simple MCU.

For complicated applications that require large memory, the 32-bit FR® RISC MCU family has 768KB embedded flash and the 16-bit CISC F²MC 16LX family has 384KB embedded flash. Pin count support is up to 100 pins for 8-bit, 144 pins for 16-bit, and 208 pins for 32-bit MCUs.



Smooth, Smart Motor Control

(http://www.fma.fujitsu.com/pdf/mcu_fr60.pdf/)

The MB91260 series is just one example of MCUs that integrate the industry’s fastest triple-channel A/D converter, with a dedicated waveform generator for smooth and smarter motor control. This series is ideal for intelligent air conditioners, smart dishwashers and other applications using motors.

Cool Audio Equipment

(http://www.fma.fujitsu.com/pdf/mcu_32risc.pdf/)

Fujitsu’s 32-bit MB91230 series integrates segment drive-base LCDs that, until now, have

The World's First Embedded Dual-Operation Flash MCU

(http://www.fma.fujitsu.com/pdf/doc_jp_mb90890.pdf)

Fujitsu has developed the world's first embedded dual-operation flash MCU. Dual operation means that a read operation can be executed on one bank while a write operation is executed on another. This is ideal for applications that require reprogramming in the field and could eliminate external memory requirements, such as EEPROM. Another benefit is that uninterrupted continuous operations can be performed on one bank, while the other bank is in programming mode using Embedded Algorithm™.

LIN Support

(http://www.fma.fujitsu.com/pdf/doc_jp_214.pdf)

The MB89210 series of F²MC controllers includes Universal Asynchronous Receiver/Transmitter (UART) capabilities that support the Local Interconnect Network (LIN). Fujitsu's MB89210 8-bit series is designed for applications where key requirements are an embedded LIN, a fail-proof internal oscillator for backup for an external resonator failure, a wide operation voltage range for power-supply

stability, and a small 30-pin SSOP package. This device is also suitable for simple household equipment.

CAN Support

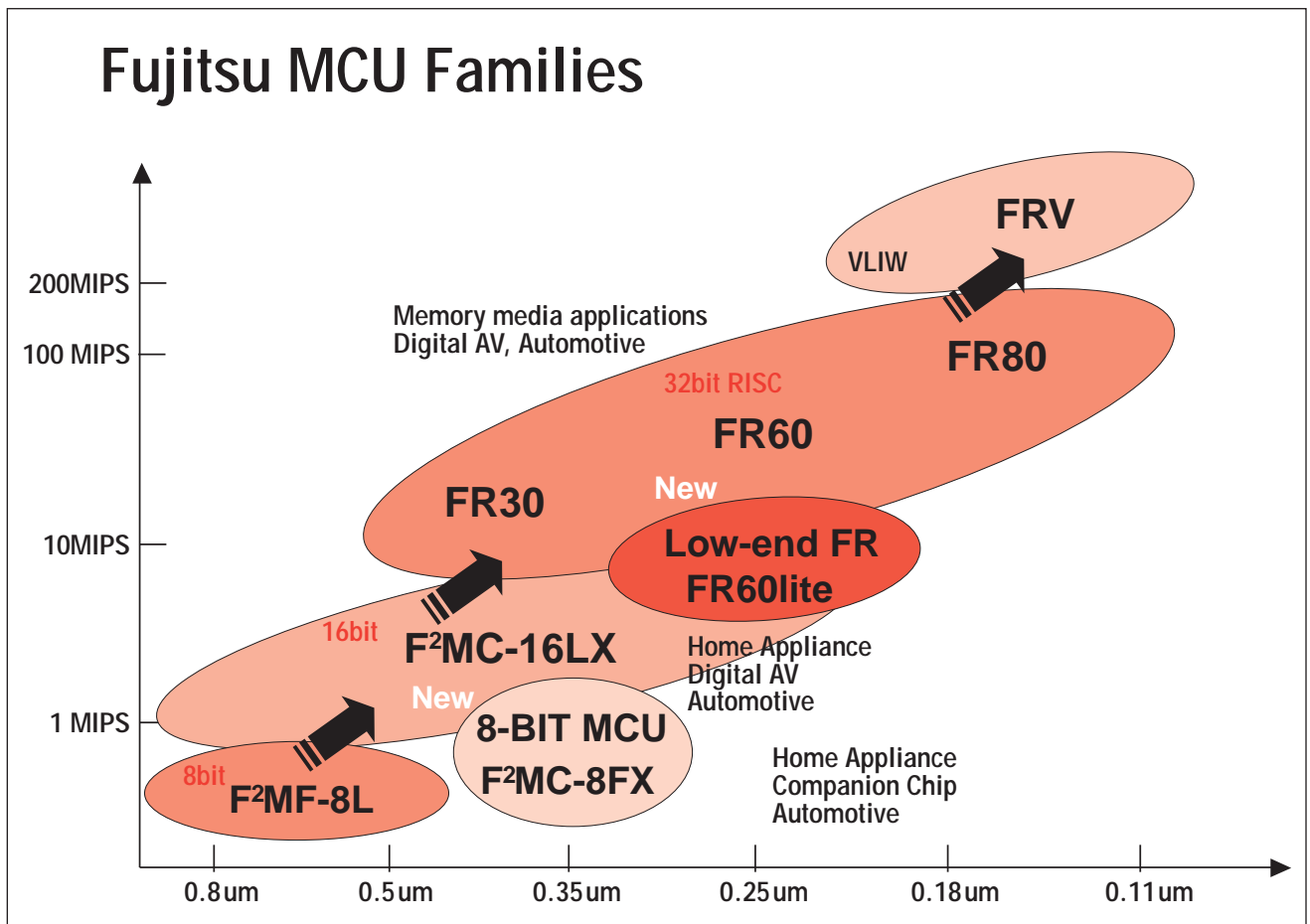
(<http://edevic.fujitsu.com/fj/MARCOM/find/20-4e/pdf/02.pdf>)

High-end CAN applications now require large amounts of program memory. With 768KB of embedded flash memory, the MB91F376 is perfectly suited for automotive instrumentation applications and for embedded industrial applications with CAN.

The MB90340/90345 series is a "best-in-class" series of 16-bit microcontrollers providing rich timing sets, multi-channel Programmable Pulse Generator, multiple UART, 12C and CAN interfaces.

For more information, or to order a free DVD visit

<http://www.fma.fujitsu.com/micro/>



Display Controller MCUs

Fujitsu has a variety of display controller MCUs ranging from small 48-pin configurations to 144-pin, and from basic 8-bit CPUs to high-performance 32-bit CPUs for a wide range of products.

LCD Controller/Driver Integrated MCUs

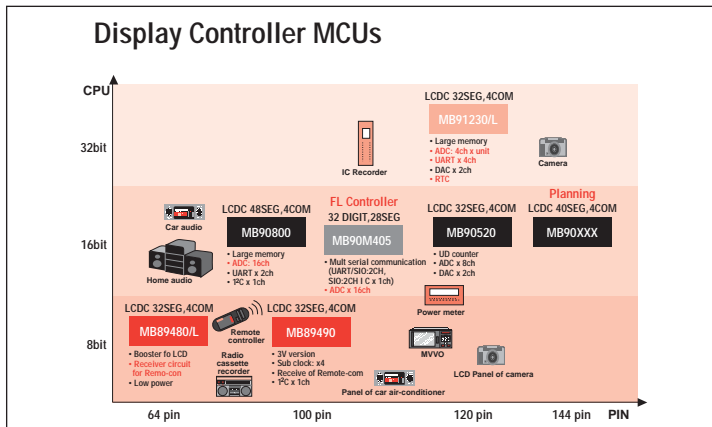
From small to large, Fujitsu's LCD controller MCUs are the choice for LCD display needs. Fujitsu has been supporting numeric LCD display applications for almost two decades. Fujitsu supports multiple LCD bias types and

duty types, and has dedicated memory for display that does not occupy the resource-conscious MCU's memory.

Recent trends require high-performance CPUs to be integrated with the LCD controller. Previously, separate MCUs were required for the CPU power and for the display operation. Fujitsu provides a 32-bit RISC MCU with an LCD controller-integration option. This single-chip solution minimizes BoM costs and reduces development time.

VFD Controller/Driver Integrated MCUs

Fujitsu also offers a Vacuum Florescence Display (VFD) controller/driver integrated MCU. Fujitsu's system-in-package technology supports the latest CPU performance with I/O ports that can withstand high voltages and can directly connect to the VFD. Fujitsu's 16-bit CPU-based MCU series can support up to 896 segments of VFD display nodes, more than most applications require. This large segment display capability meets the need for flexible and attractive A/V displays, while the MCU has enough power to support additional tasks.



| Series | CPU (Bit width) | ROM (KB) | Mask, OTP, Flash | RAM (Bytes) | Max. Int. CLK (MHz) | 32KHz Sub CLK | Ext. IRQ | ICU | OCU | ADC | DAC | Timer / Counter 16 bit | Up / Down Counter 16 bit | Prog. Pulse Gen: PPG 6 bit | PPG 8 bit | PPG 12 bit | PPG 16 bit | PWM 8 bit | PWC 8 bit | S/O | I ² C | UART | LCD/VFD seg. | V _{cc} Min | V _{cc} Max | Pin | |
|-----------|-----------------|----------|------------------|-------------|---------------------|---------------|----------|-----|-----|-----|-----|------------------------|--------------------------|----------------------------|-----------|------------|------------|-----------|-----------|-----|------------------|------|--------------|---------------------|---------------------|-----|-----|
| MB89150/A | 8 | 4-16 | M/O | 128-256 | 1.1 | Yes | 12 | | | | | 1 | | | | | | | | | | | 36 | 2 | 6 | 80 | |
| MB89160/L | 8 | 4-16 | M/O | 128-512 | 1.1 | Yes | 12 | | | 8 | | 1 | | | | | | 2 | | | | | 24 | 2 | 6 | 80 | |
| MB89180 | 8 | 4-16 | M/O | 128-256 | 1.1 | Yes | 12 | | | | | 1 | | | | | | | | | | | 32 | 2 | 6 | 64 | |
| MB89480 | 8 | 16 | M/O | 512 | 3.1 | Yes | 12 | | | 4 | | 1 | 1 | | | | 1 | 1 | 1 | | | 1 | 31 | 2 | 6 | 64 | |
| MB89490 | 8 | 32-60 | M/F | 1024-2048 | 3.1 | Yes | 8 | | | 8 | | 1 | | | | | 2 | 1 | 1 | 1 | 1 | 1 | 32 | 2 | 4 | 100 | |
| MB89560/H | 8 | 32-48 | M/O | 1024 | 3.1 | Yes | 12 | | | 8 | | 1 | 1 | 1 | 1 | | 2 | 1 | 1 | 1 | 1 | 2 | 24 | 2 | 6 | 80 | |
| MB89570 | 8 | 32-60 | M/O | 3072 | 2.5 | Yes | 4 | | | 12 | 2 | 1 | | | | | | | | 1 | 1 | 1 | 14 | 3 | 3 | 100 | |
| MB89650A | 8 | 8-32 | M/O | 256-1024 | 2.5 | Yes | 16 | | | 8 | | 2 | | | | | | 2 | | | | | 32 | 2 | 6 | 100 | |
| MB89800 | 8 | 8-48 | M/O | 256-2048 | 2.5 | No | 2 | | | | | | | | | | | 1 | 1 | 1 | | | 1 | 70 | 2 | 6 | 100 |
| MB89820 | 8 | 4-16 | M/O | 128-256 | 1.3 | No | 2 | | | | | | | | | | | 1 | 1 | 1 | | | 50 | 2 | 6 | 80 | |
| MB89870 | 8 | 16 | M/O | 512 | 10 | Yes | 8 | | | 8 | | 1 | | | | | | 1 | | 1 | 1 | 1 | 24 | 2 | 6 | 80 | |
| MB89940 | 8 | 8-16 | M/O | 512 | 2 | No | 3 | | | 2 | | 1 | | | | | | 2 | | | | | 17 | 4 | 6 | 48 | |
| MB89950 | 8 | 4-16 | M/O | 128-512 | 1.3 | No | 2 | | | | | | | | | | | 1 | 1 | 1 | | | 42 | 2 | 6 | 64 | |
| MB90370 | 16 | 64 | M/F | 6144 | 16 | No | 6 | 6 | 6 | 12 | 2 | 4 | | | | | 3 | | | | | | 9 | 3 | 4 | 144 | |
| MB90420G | 16 | 128 | M/F | 6144 | 16 | Yes | 8 | 4 | | 8 | | 2 | | | | | 3 | | | | | 2 | 24 | 5 | 6 | 100 | |
| MB90520 | 16 | 64-128 | M/F | 3072-4096 | 16 | Yes | 8 | 2 | 8 | 8 | 2 | 2 | 1 | | 2 | | 1 | | | | 2 | 1 | 32 | 3 | 6 | 120 | |
| MB90620A | 16 | 32-48 | M/O | 1664-2048 | 12 | Yes | 8 | | | 8 | | 2 | | | | | 2 | | | | 1 | | 32 | 4 | 6 | 100 | |
| MB91230 | 32 | 256 | M/F | 16384 | 34 | No | 16 | 2 | 4 | 8 | 2 | 4 | 2 | | | | 6 | | | 2 | | 4 | 32 | 3 | 4 | 120 | |
| MB89140/A | 8 | 8-32 | M/O | 256-1024 | 2 | Yes | 2 | | | 12 | | 1 | | | 1 | | | | | 1 | | | V 24 | 3 | 6 | 64 | |
| MB90M405 | 16 | 96-128 | M/F | 4096 | 17 | No | 4 | 2 | 1 | 16 | | 3 | | | | | | | | 2 | 1 | 2 | V 59 | 3 | 4 | 100 | |

Display Controller MCUs

Motor Controller MCUs

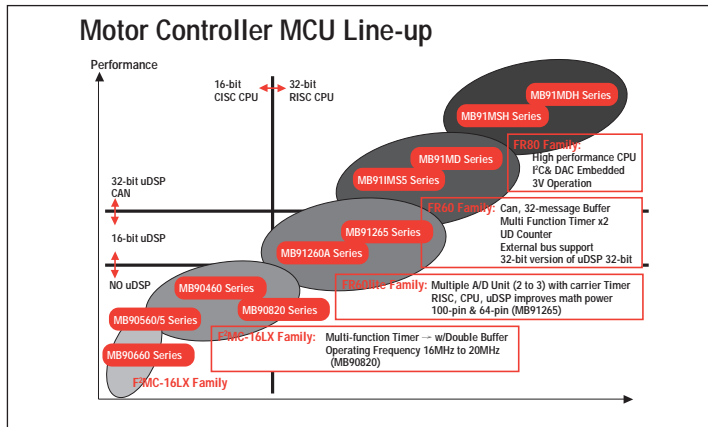
Fujitsu offers a variety of motor controller MCUs ranging from small 48-pin configurations to 208-pin, and from basic 8-bit CPUs to high-performance 32-bit CPUs for a wide range of applications.

AC Motor Controller MCUs

Fujitsu is a pioneer in designing MCUs for motor-controller applications. Previously, customers needed precise knowledge of the PWM timer control for the AC motor's dead-time generation.

Fujitsu's multi-function timer incorporates dead-time creation to simplify development. In addition, the latest model includes a DSP feature within the MCU, which can provide true sine-wave motor driving capability. This MCU also features one of the industry's fastest (one microsecond) ADC operations.

Precise control is very important for the quiet, smooth operation many applications require. Smooth motor operation not only provides the on/off capability, but the variable motor control enables customers to develop more feature-rich, flexible appliances.



Stepper Motor Controller MCUs

Fujitsu also offers strong stepper motor controller MCUs for industrial instruments and automotive meters. Fujitsu has integrated a controller and driver I/O, enabling a designer to reduce BoM costs. The MCUs are available with multiple choices of CPUs and from two to six motor controls. In addition, many of these stepper motor controller MCUs integrate support for CAN (Controller Area Network), the de-facto standard for automotive and industrial applications.

| Series | CPU (Bit width) | ROM (KB) | Mask, OTP, Flash | RAM (Bytes) | Max. Int. CLK (MHz) | 32KHz Sub CLK | MAC (uDSP) | Ext. IRQ | ICU | OCU | ADC | DAC | Timer / Counter 16 bit | Up / Down Counter 8 bit | Prog. Pulse Gen: PPG 8 bit | PPG 16 bit | PWM 8 bit | PWC 8 bit | SIO | I2C | UART | CAN 2.0B | AC Motor Control (Y/N)/ Stepper Motor Control (#) | Vcc Min | Vcc Max | Pin | |
|-----------|-----------------|----------|------------------|-------------|---------------------|---------------|------------|----------|-----|-----|-----|-----|------------------------|-------------------------|----------------------------|------------|-----------|-----------|-----|-----|------|----------|---|---------|---------|-----|-----|
| MB90460 | 16 | 64 | M/F | 2048 | 16 | No | 8 | 4 | 6 | 8 | | | 2 | | | | | | | | | 2 | Yes | 4.5 | 5.5 | 64 | |
| MB90560 | 16 | 32-64 | M/F | 1024-2048 | 16 | No | 8 | 4 | 6 | 8 | | | 2 | | 3 | 1 | | | | | | 2 | Yes | 3 | 5.5 | 64 | |
| MB90565 | 16 | 128 | M/F | 4096 | 8 | No | 8 | 4 | 6 | 8 | | | 2 | | 3 | 1 | | | | | | 2 | Yes | 2.7 | 3.6 | 64 | |
| MB90660A | 16 | 32-48 | M/O | 1664-2048 | 16 | No | 8 | | | 8 | | | 4 | | | | | | | | | 1 | Yes | 2.7 | 5.5 | 64 | |
| MB90820 | 16 | 64-128 | M/F | 4096 | 24 | No | 8 | 4 | 6 | 16 | 2 | | | | | 3 | | 2 | | | | 2 | Yes | 3.5 | 5.5 | 80 | |
| MB91260A | 32 | 128-256 | M/F | 8192 | 33 | No | Y | 10 | 4 | 6 | 12 | | 3 | 2 | | 8 | | 2 | | | | 3 | Yes | 4 | 5.5 | 100 | |
| MB89940 | 8 | 8-16 | M/O | 512 | 2 | No | 3 | | | | | 2 | 1 | | | | 2 | | | | | | | 2 | 3.5 | 5.5 | 48 |
| MB90390 | 16 | 384 | F | 10240 | 20 | No | 8 | 6 | 8 | 8 | | | 2 | | 6 | 6 | | | 1 | 1 | | 3 | 2 | 6 | 4.5 | 5.5 | 120 |
| MB90420G | 16 | 128 | M/F | 6144 | 16 | Y/N | 8 | 4 | | 8 | | | 2 | | | 3 | | | | | | 2 | 2 | 4 | 4.5 | 5.5 | 100 |
| MB90425G | 16 | 64-128 | M/F | 4096-6144 | 16 | Y/N | 8 | 4 | | 8 | | | 2 | | | 3 | | | | | | 2 | 1 | 4 | 4.5 | 5.5 | 100 |
| MB90590G | 16 | 256-384 | M/F | 6144-8192 | 16 | No | 8 | 6 | 6 | 8 | | | 2 | | 6 | 6 | | | 1 | | | 3 | 2 | 4 | 3 | 5.5 | 100 |
| MB90595G | 16 | 128 | M/F | 4096 | 16 | No | 8 | 4 | 4 | 8 | | | 2 | | 6 | 6 | | | 1 | | | 2 | 1 | 4 | 3 | 5.5 | 100 |
| MB91F362G | 32 | 512 | F | 20484 | 64 | No | 8 | 4 | 4 | 16 | 2 | 6 | | | | 8 | | | 2 | 1 | | 3 | 3 | 4 | 4.3 | 5.3 | 208 |
| MB91F365G | 32 | 512 | F | 36864 | 32 | No | 8 | 4 | 2 | 8 | 2 | 6 | | | | 8 | | | 2 | 1 | | 2 | 2 | 4 | 4.3 | 5.3 | 120 |
| MB91F366G | 32 | 512 | M/F | 36864 | 32 | Yes | 8 | 4 | 2 | 8 | | 6 | | | | 8 | | | 2 | 1 | | 2 | 2 | 4 | 4.3 | 5.3 | 120 |
| MB91F376G | 32 | 768 | F | 36864 | 64 | Yes | 8 | 4 | 2 | 8 | | 6 | | | | 8 | | | 2 | 1 | | 2 | 2 | 4 | 4.3 | 5.3 | 120 |

Motor Controller MCUs

FUJITSU MICROELECTRONICS AMERICA, INC.

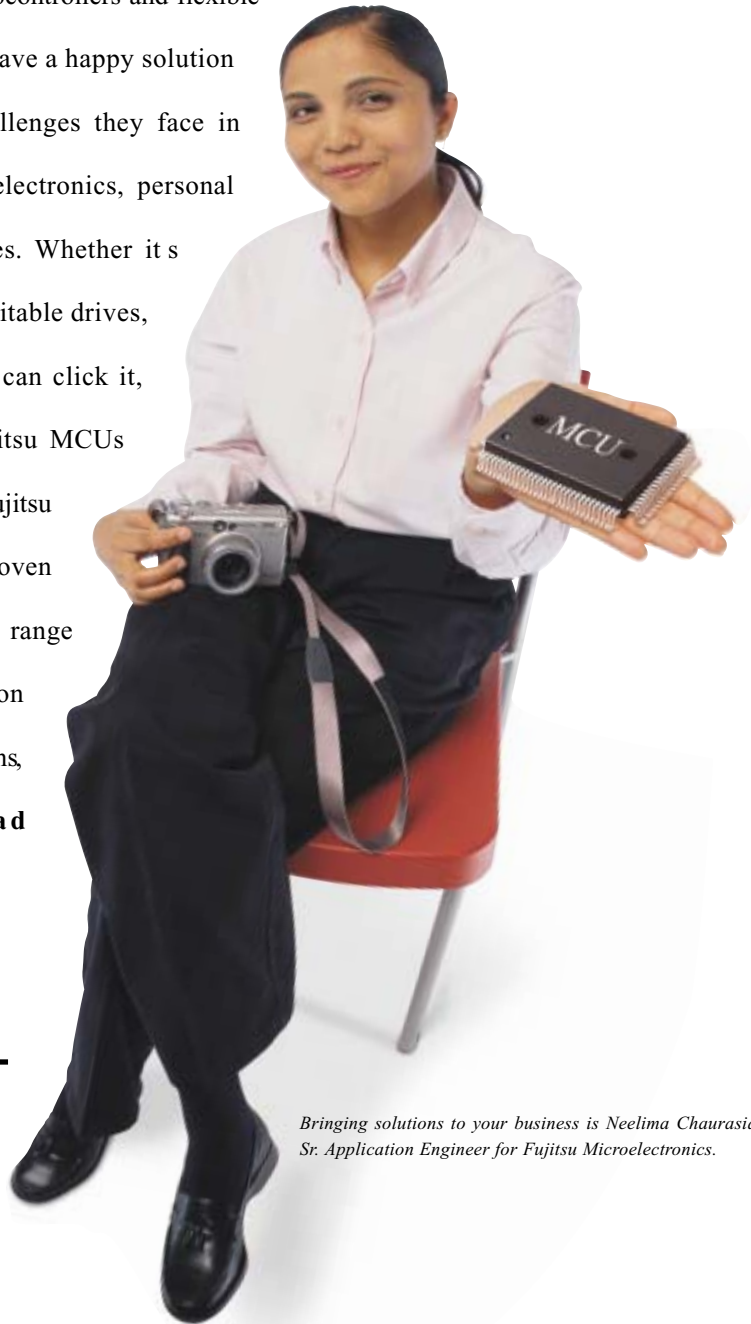
Corporate Headquarters
 1250 E. Arques Avenue, Sunnyvale, California 94088-3470
 Tel: (800) 866-8608 Fax: (408) 737-5999
 E-mail: inquiry@fma.fujitsu.com Web Site: http://www.fma.fujitsu.com

© 2004 Fujitsu Microelectronics America, Inc.
 All company and product names are trademarks or registered trademarks of their respective owners.
 Printed in the U.S.A. MCU-BR-21029-3/2004

Fujitsu MCUs.

They're how you make a cost-conscious, space-challenged, performance-driven engineer smile.

With Fujitsu's 8-bit, 16-bit and 32-bit microcontrollers and flexible design architecture, engineers everywhere have a happy solution to the price, space and performance challenges they face in developing the next wave of consumer electronics, personal computing devices and home technologies. Whether it's PDP flat screen TVs, camcorders, CD rewritable drives, or home climate control systems, if you can click it, snap it, record it, view it or play it, Fujitsu MCUs probably had a hand in it. Working with Fujitsu offers world-class manufacturing, a proven track record of reliability, and a wide range of product lines. For more information on our MCUs and engineer-pleasing solutions, visit www.fma.fujitsu.com/mcuad or call (800) 866-8608.



Bringing solutions to your business is Neelima Chaurasia, Sr. Application Engineer for Fujitsu Microelectronics.

MICROCONTROLLERS

- 8-bit, 16-bit, 32-bit MCUs
- Up to 768 KB embedded Flash memory
- Up to 5 channel UART
- Low-power modes
- DC/AC motor, inverter control modules
- Dedicated DSC application specific controllers
- LPC bus, PS2 interface, keyboard controller with multi Li-ion battery management
- A/D, D/A, LCD controllers/drivers and timers
- Full-featured ICE and integrated development environment available

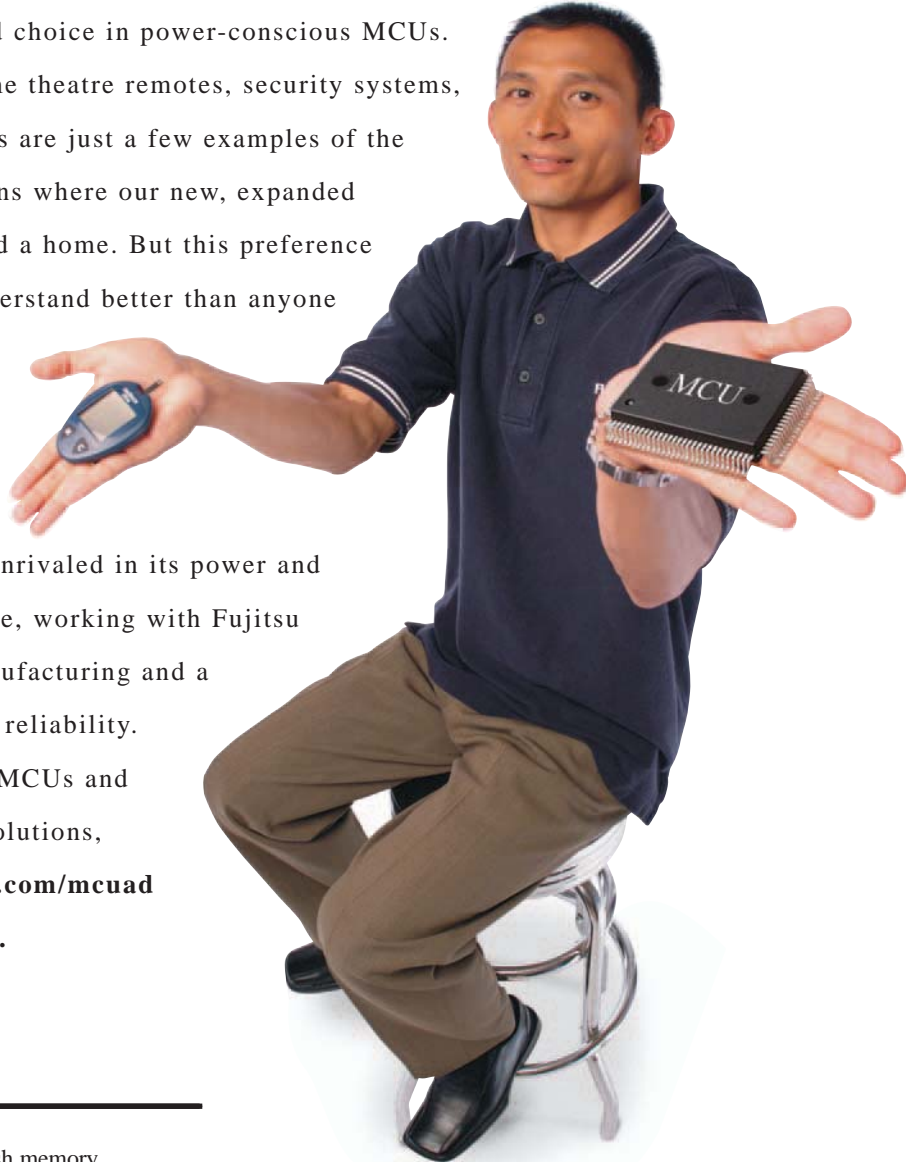
FUJITSU

THE POSSIBILITIES ARE INFINITE

www.fma.fujitsu.com

The real power behind Fujitsu's 8-bit MCUs is the fact they hardly use any.

Thanks to our low-voltage, low-leakage yet high-speed designs, Fujitsu is the preferred choice in power-conscious MCUs. Glucose monitors, home theatre remotes, security systems, and thermostat controls are just a few examples of the hundreds of applications where our new, expanded 8-bit MCUs have found a home. But this preference is no accident. We understand better than anyone the price, performance and space challenges faced by engineers, and the end result is a design architecture unrivaled in its power and flexibility. What's more, working with Fujitsu offers world-class manufacturing and a proven track record of reliability. For more on Fujitsu's MCUs and our industry-leading solutions, visit www.fma.fujitsu.com/mcuad or call (800) 866-8608.



MICROCONTROLLERS

- 8-bit, 16-bit, 32-bit MCUs
- Up to 768 KB embedded Flash memory
- Up to 5 channel UART
- Low-power modes
- DC/AC motor, inverter control modules
- Dedicated DSC application specific controllers
- LPC bus, PS2 interface, keyboard controller with multi Li-ion battery management
- A/D, D/A, LCD controllers/drivers and timers
- Full-featured ICE and integrated development environment available

*Bringing solutions to your business is Vu Lac,
Technical Sales Manager for Fujitsu Microelectronics.*

FUJITSU

THE POSSIBILITIES ARE INFINITE

www.fma.fujitsu.com