

THE POSSIBILITIES ARE INFINITE

FUJITSU

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# FUJITSU AUTOMOTIVE SYSTEM SOLUTIONS

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Shimpei Hirata  
President  
Fujitsu Microelectronics Europe

Fujitsu Microelectronics Europe (FME) has operated in Europe for over 25 years, and is actively involved in many of the key markets, particularly the automotive industry.

Europe leads the world in automotive electronic systems, with European vehicles incorporating more and more advanced electronics – delivering benefits on a global scale.

Fujitsu helps reinforce this lead, through substantial investment in state-of-the-art technologies, and by close collaboration with strategic partners to further strengthen our automotive capability with specialist technologies and products.

Underpinning this success is a world-beating combination of local Design Centres and global engineering support, helping us develop innovative system solutions in partnership with our European customers.



Dr Gerhard Roos  
Director of Automotive & Industrial  
Business Unit  
Fujitsu Microelectronics Europe

FME is at the forefront of the most significant automotive electronics developments, combining strong engineering design and cutting-edge technologies. Applications engineers and product designers contribute auto-industry expertise to technologies as diverse as microcontroller architectures, graphic controllers, sensors and GPS/AGPS.

Our Frankfurt-based Centres for Microcontroller Design and Multimedia Development work directly with strategic partners and European customers to develop enhanced solutions for systems applications.

Our membership of the FlexRay™ consortium and the AUTOSAR consortium helps us develop next-generation automotive by-wire applications, enabling significantly increased functionality and performance to be embedded into future Fujitsu MCUs.

FME's goal is to help customers develop the most competitive platform solutions for future automotive electronic systems, by defining and supporting solutions based on its core technologies.

In close co-operation with customers, vehicle manufacturers and strategic partners, we focus on adding value by delivering excellence in local design and support, in-depth market knowledge, reliable supply and high product quality.

# Fujitsu's Commitment to the Automotive Solutions of Tomorrow

Development Cycle

Body and Comfort Electronics

Chassis and Safety

Infotainment and Navigation

Driver Information

In-car Networks

Design Centres

Quality, Environment and  
Corporate Social Responsibility

Website and Literature Support



# Fujitsu's Commitment to the Automotive Solutions of Tomorrow

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## Performance

Our automotive products range from 32-bit RISC core MCUs to Advanced GPS devices and sensor systems. We constantly push performance boundaries with a watchful eye on quality and reliability.

## Competitive

We deliver high performance, and by developing the most advanced, cost-efficient manufacturing techniques, and optimising logistics, we achieve competitiveness right up and across the value chain.

## Partnerships

By delivering end-to-end systems through a comprehensive network of partners, Tier 1 suppliers and third-party specialists we create advanced automotive platforms, enabling highly innovative solutions.

## Co-operation

The best way to achieve optimum results is to form close bonds between teams working together; between our own global and local Design Centres; with customers; with strategic partners. The closer the better.

## Functionality

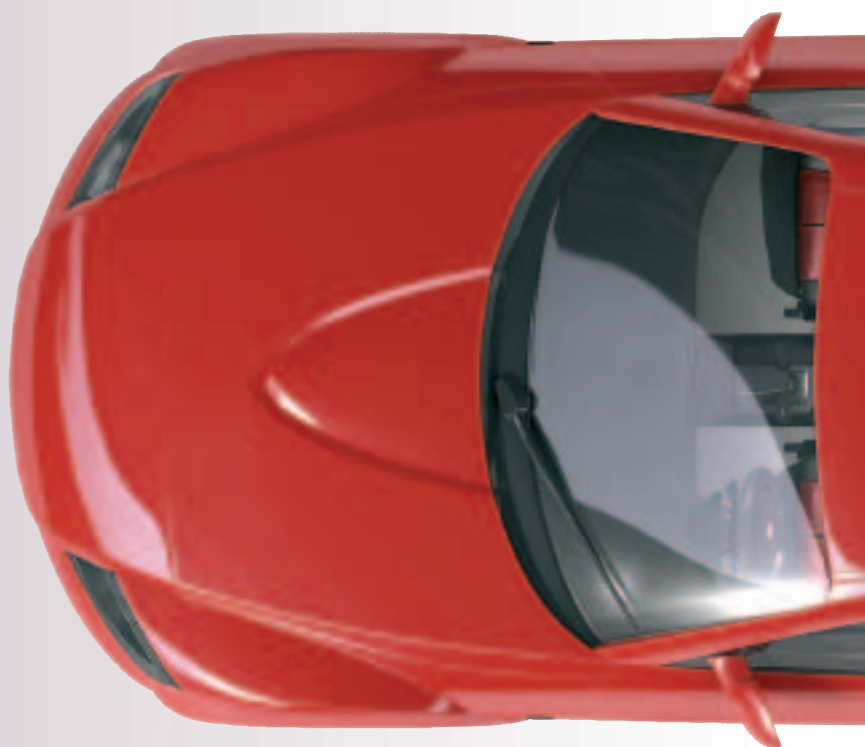
We are actively involved in a variety of automotive platforms. Devices such as our MCUs and pioneering GDCs use the same peripheral block and a choice of CPU cores to suit application functionalities.

## Service/Logistics

As a world-class, first-choice, automotive electronics partner through the design-to-production cycles, we provide full technical and applications engineering advice and fully-flexible logistical support – globally.

## Design

Our local R&D and engineering design teams utilise the latest Fujitsu automotive technologies. These teams have developed over 100 products now being used in automotive mass production.



### Environment

Over and above our statutory obligations Fujitsu is committed to finding ways of continuously reducing any adverse effects its operations may have on global or local communities and eco-systems.

### Experience

Working to meet requirements right through the automotive supplier chain, our European application teams and Design Centres have years of experience developing new products and adapting existing ones.

### Focus

We are committed to continued development of automotive devices and support tools, and actively participate in automotive industry standards like FlexRay™ and AUTOSAR – driving electronic systems.



### Skill

Our automotive solutions team harnesses many years' experience across the variety of automotive disciplines. With technology expertise and life-cycle support we make a positive impact, today and tomorrow.

### Innovation

Fujitsu's European Design Centres are consistently at the forefront of automotive solutions. Working with the industry's leaders and innovators, they develop a wide range of sophisticated devices.

### Quality

Our procedures are clearly defined, from design through production to logistics, with continuous quality improvement at the core. QMS certification is to ISO 9001:2000 while automotive products meet ISO/TS 16949.

### Knowledge

Fujitsu's automotive knowledge and impressive systems know-how are the result of a proven track record in designing, integrating and supporting new technologies – both independently and with strategic partners.

# Development



## **Pre-project**

Early engagement with customers. Sharing product roadmaps and applying industry experience to support right-first-time designs. Brain storming. Consulting.

## **Definition**

Working with customers through discussions and meetings to define solution specifications at the earliest opportunity. Definition of complete system covering both technical and commercial issues. Ensuring clarity by defining roles of Fujitsu, and roles of the customer.

## **First Development**

Development of prototyping platform to demonstrate proof of concept and identify problem areas.

## **Evaluation**

Leasing of development tools and utilisation of Fujitsu's free-of-charge development software.

## **Start**

Project goals, milestones and time-scales fixed and agreed. Design phase commences.



**Support**

On-going logistic support to ensure successful completion of project (shipment analysis, consignment stock, etc).

**Samples**

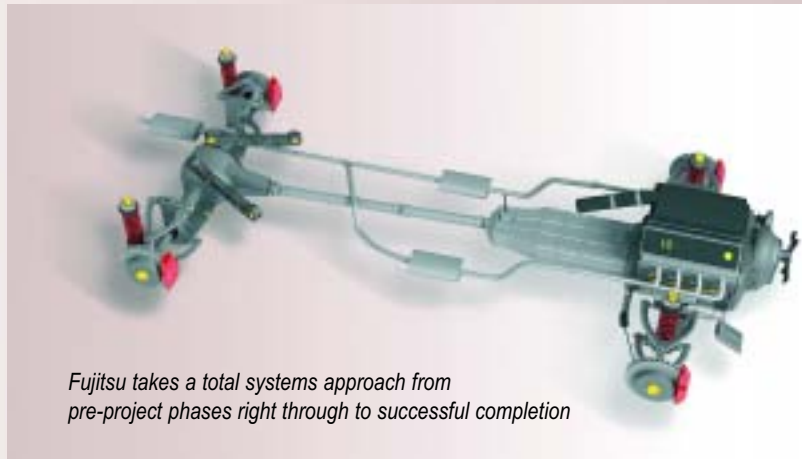
Project starts with handover of engineering samples and support.

**Application Support**

Close liaison between customer and FME at all levels, especially system integrators and tooling.

**Design**

EMC design consultancy for complete system by FME experts to ensure dependable operation in automotive environment.



*Fujitsu takes a total systems approach from pre-project phases right through to successful completion*

# Body and Comfort Electronics

Body and comfort modules are no longer stand-alone systems. Solutions from FME enable the modern vehicle's comfort and body electronics to communicate not only with each other, but also with higher-level systems. Adaptive headlights are a prime example: to adapt in the correct manner they need to communicate with steering-wheel angle sensors, and to know the vehicle's speed.

Fujitsu technology used on modern networked body/comfort systems ranges from 8-bit LIN slave MCUs, through 16-bit body controllers with up to three CAN or LIN channels, up to 32-bit controllers and gateways featuring 6 CAN-bus channels and many channels of LIN. FlexRay solutions are being developed to meet future needs.

## Related Products

- 8-bit LIN MCUs  
e.g. MB95F108
- 16-bit CAN-LIN-MCUs  
e.g. MB90340/350/360 series
- 32-bit CAN-LIN-MCUs  
e.g. MB91F272, MB91F364, MB91460 series
- 32-bit FlexRay-CAN-Gateway MCUs
- FlexRay MB88121
- Linear Products
- e.g. MB3793, MB3773





#### Related documents

- <http://www.fujitsu.com/emea/services/microelectronics/micros/>
- Fingerprint sensors MBF200/300 datasheets
- 8/16-bit microcontroller brochure
- 32-bit microcontroller brochure

Door modules typically use a single CAN microcontroller networked with the central body controller of the vehicle. Communication within the doors uses LIN to connect the module controller with switches, mirror, locking, power windows and door lights.

Similarly, HVAC modules use LIN internally to connect flap actuators and temperature sensors via Fujitsu LIN microcontrollers.

Fujitsu fingerprint sensor systems can be used for personalisation, allowing each driver to restore their seat & mirror positions, suspension & gear settings, infotainment, etc., each time they identify themselves as 'the driver'.

Body control gateways incorporating Fujitsu MCUs and fingerprint sensor systems will be connected by FlexRay communications interfaces to the vehicle backbone, providing the additional benefits of fast diagnostics and automatic software updates for all microcontrollers throughout the network.



# Chassis and Safety

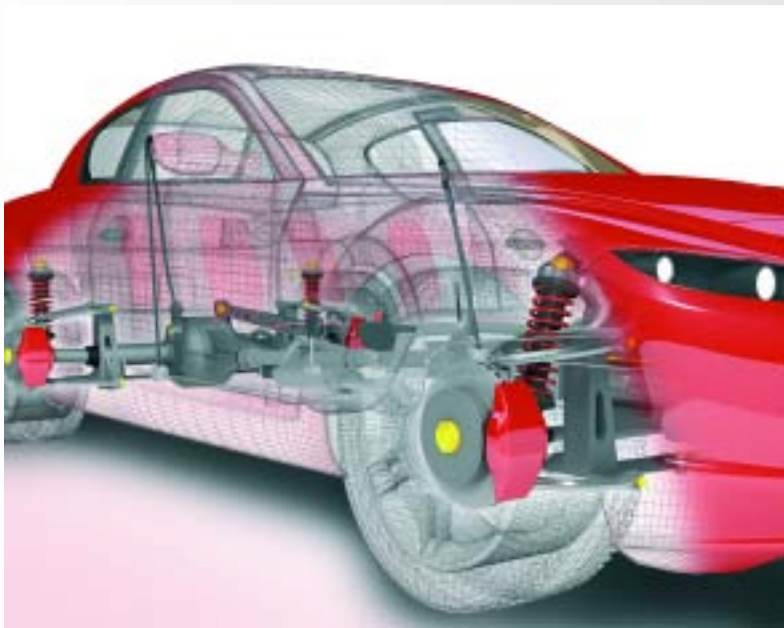
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Fujitsu electronic systems address three key areas of vehicle chassis dynamics: braking systems, steering control and suspension. They contribute to innovations such as electronic stability control (ESC) and the Electronic Stability Program (ESP). By improving upon established technologies such as anti-lock braking and traction control, they ensure safe driving conditions by correcting over-steer and reducing engine torque where required: even taking control themselves when conditions are critical.

ESP systems utilising Fujitsu solutions compare driver inputs from

the steering wheel with feedback from sensors in the wheel hub and underside of the vehicle. Steering wheel angles measure the driver input, while accelerometers and gyro sensors measure the vehicle response. Also, by connecting the





*Fujitsu wheel hub sensors are a critical ingredient in electronic stability control.*

**Related Products**

- 16-bit Sensor MCUs  
e.g. MB90350/360
- 32-bit FlexRay-CAN-MCUs  
e.g. MB91460 series
- FlexRay MB88121
- Gyro sensor FAR series
- 3-axis accelerometer  
FAR-S2AB series

ESP controller to the power train ECU, the element of traction control can be implemented.

FME not only manufactures microcontrollers for main chassis control and sensor subsystems, but also offers a range of gyro sensors



and accelerometers for use in these safety-critical systems.

The Fujitsu 8, 16 and 32-bit microcontroller families embody a range of peripherals such as PWM inputs and on-chip analogue-digital converters, together with automotive interfaces for communicating with CAN and LIN in-vehicle networks. Next-generation devices for FlexRay and other high-performance applications are under development.



*Traction control is simplified by linking the ESP microcontroller to powertrain ECUs.*

# Infotainment

In-vehicle information and entertainment systems are one of the fastest-growing areas of automotive electronics driven not only by consumer demand but also by national and international initiatives such as the Intelligent Transportation System.

Whether for rear-seat entertainment or driver information, Fujitsu systems are playing a pivotal role. Our solutions build on substantial experience not only in conventional automotive microcontrollers and networking but right across the spectrum of mobile communications, multimedia and graphic display technologies.

Harnessing these capabilities, Fujitsu has created the core of some of the most sophisticated and comprehensive in-car multimedia systems on the market, including MPEG transmission over MOST (Media Oriented Systems Transport) with the goal of exploiting MOST technology not only for audio and control but also for video transmission.



Rear-seat entertainment systems for the OEM and after-market sectors, feature a MOST network for distributing multimedia content, enabling multiple screens to be provided in the car.

## Related Products

- Graphic display controllers (Coral, Lime, etc.)
- MPEG Encoder/Decoder MB86391, SmartMPEG™ (MB86H22A)
- Automotive SoC – ASIC
- 32-bit MCUs e.g. MB91460 series
- Automotive IDB 1394.b e.g. MB88387

# Navigation

*MOST networks featuring Fujitsu multimedia devices distribute video and audio content to screens throughout the vehicle.*



## Related Products

- Graphic display controllers (Coral, Lime, etc.)
- Automotive ASICs
- Gyro sensor FAR-S1BG series
- 3-axis accelerometer FAR-S2AB series
- GPS/AGPS e.g. MB97Q2040, MB15H156

Today's car navigation systems do much more than tell you where you are and how to get to your destination. Increasingly, they work alongside other information systems, for example recalculating routes dynamically when there is a traffic jam ahead, or integrating with mobile communications and digital broadcasting.

This demands first-class technology at the front-end: such as assisted GPS, high-sensitivity accelerometers and gyro sensors. Fujitsu's GPS/AGPS chips offer unparalleled sensitivity, ensuring dependable signal capture in urban canyons and even indoors.

Navigation systems also demand graphic display controllers for all price-performance levels, each specifically designed with the features needed by navigation system screens.

Fujitsu graphic display controllers have numerous functions, which represent the state-of-the-art in graphic controllers today, and have been specially optimised for the area of embedded systems. This means that, in addition to video input and many 2D and 3D rendering functions, there is a flexible layer concept, support for screen resolution of up to XGA (1024 x 768) and further features that are of particular interest in the area of navigation, such as alpha-blending and anti-aliasing.

All models have a CPU interface to enable direct connection of embedded CPUs and microcontrollers.

Whether for navigation-only systems or total infotainment networks, time-to-market is dramatically improved thanks to Fujitsu's comprehensive set of development tools, starter kits, third-party evaluation boards and complete reference platforms backed by software drivers.



# Driver Information

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Fujitsu's microcontrollers, graphic display controllers and multimedia devices are helping automotive instrumentation systems deliver the right information more ergonomically than ever before.

Single-chip MCUs with stepper motor and LCD drivers can drive a complete standard cluster with two to four instruments, whilst our higher-performance controller chipsets enable today's mid- and high-range clusters: dashboards with six or more instruments, dot-matrix displays or even full-colour graphics.



Beyond the cluster itself, FME offers solutions for head-up displays, capable of providing a huge range of information options. CAN-bus-enabled MCUs integrate the instrument cluster with other vehicle networks, allowing information to be gathered from anywhere in the car. And with CAN microcontrollers on the dashboard, sensors, etc., can be directly connected to the cluster where required. Results are available to controllers throughout the vehicle.



To fulfil such requirements, the Fujitsu instrumentation microcontroller family ranges from eight-bit MCUs, through 16-bit dashboard controllers with three CAN or LIN channels, up to 32-bit controllers and gateways featuring 6 CAN-bus channels and many channels of LIN. In fact, it's the largest range of CAN-bus MCUs on the market today. And FlexRay solutions are being developed for the complexities of future driver information needs.

#### Related Products

- 16-bit Instrumentation MCUs  
e.g. MB90390 series
- 32-bit Instrumentation MCUs  
e.g. MB91360 series,  
MB91460 series
- Graphic display controllers  
e.g. Jasmine, Coral, Lime
- ASP (Adaptive Stream Processing) and Image processing SoC



*Fujitsu helps to deliver driver information more effectively, efficiently and ergonomically than ever before.*

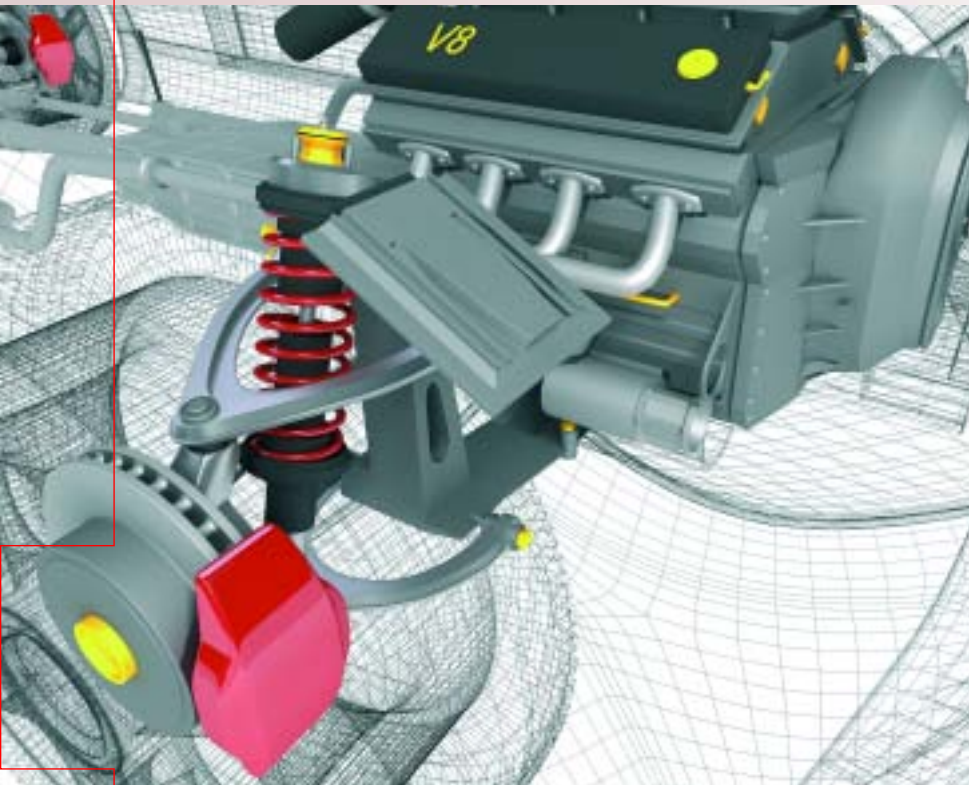
# In-car Networks

From highly complicated point-to-point wiring looms, in-car interconnection is evolving through a sequence of increasingly complex networking standards. Fujitsu automotive solutions provide a range

With 20kbit bandwidth and a master-slave topology, Fujitsu LIN microcontrollers provide the ideal solution for replacing CAN-bus in low-speed cost-reduced designs and in applications such as seat & mirror control, and in roof & window systems.

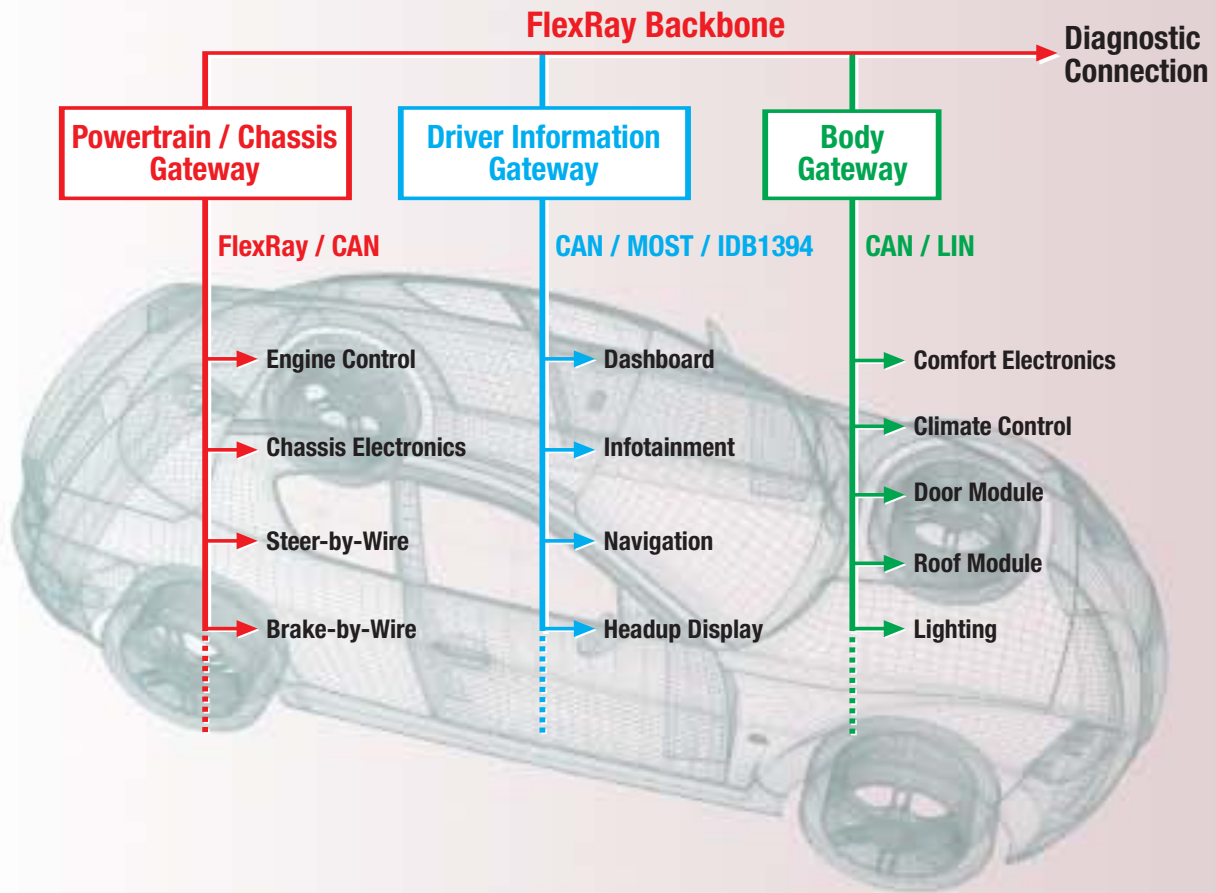
Where higher bandwidth up to 1Mbit/s is required, FME offers the widest range of CAN-bus MCUs on the market – the heart of automotive systems demand the performance of 8, 16 or 32-bit CPU cores. Fujitsu is the world's largest manufacturer of 16-bit Flash CAN microcontrollers (source: Marketing Eye, 2004).

Tomorrow's in-car networks will be even faster (10 Mbit/s), more fault-tolerant and more reliable, thanks to technologies like FlexRay. Fujitsu is designing microcontrollers with FlexRay communications to meet the needs of safety-critical designs and control systems, such as chassis/safety control units, that require short, predictable latencies and time-triggered performance. New standalone FlexRay protocol chips will bridge the gap until single-chip MCUs with embedded communications are available. Already, designers are charting the FlexRay future with FME's FPGA-based evaluation kits, featuring a ready-to-use COMMSTACK driver for prototyping.



*Backbone architecture with Fujitsu FlexRay solutions.*

of options scaled to meet today's variety of application requirements – and tomorrow's. From cost-reduced master-slave communications with local interconnect network (LIN), through well-established CAN-bus systems, to safety-critical and high-speed control networks using FlexRay, Fujitsu microcontrollers are leading the way. And FME is meeting consumer-led demand for in-vehicle entertainment with solutions for the leading multimedia network contenders: MOST and IDB1394.



### Multimedia networking

Fujitsu automotive networking solutions are also enhancing tomorrow's road journeys with world-beating options in vehicle entertainment. In particular, we offer MPEG-2 decoders and encoders for applications including streaming DVDs and entertainment over MOST (Media-Oriented System Transport) using plastic optical fibre serial links.

Building on our expertise with IEEE1394 (Firewire), Fujitsu is introducing solutions for the emerging IDB1394.b standard, enabling not only multimedia for entertainment, but also for real-time transmission of video camera data.

### Related Products

- LIN-MCUs
  - 8/16/32-bit for modules and gateways
- CAN-MCUs
  - 16/32-bit for modules and gateways
- FlexRay MCUs
  - 16/32-bit MCUs
- FlexRay ASSP
- MOST multimedia systems
- IDB1394.b ASSP (with PHY)

# Design Centres

## Automotive Design in Europe

Fujitsu's global engineering capability is supported throughout Europe by Design and Development Centres. Each Centre has a specialist discipline for which it designs products and provides support, and collectively helps provide advanced systems solutions for the European automotive industry.



*The Microcontroller Design Centre offers a complete range of application support services.*

## Microcontroller Design, Frankfurt

FME's European Microcontroller Design Centre, established July 1997, undertakes both front-end logic and back-end physical design. It utilises the latest design-flow technology and handles design projects and development support involving both standard microcontrollers and customised products for European customers.

Fujitsu provides the basis for automotive system solutions to numerous applications from its wide portfolio of 8, 16 and 32 bit microcontroller devices. CAN, LIN and FlexRay protocol controllers form the focus for the Centre with a full range of application support services.

## Multimedia Development, Frankfurt

Fujitsu's Multimedia Development Centre designs some of the most complex, highly integrated, MPEG-2 ICs available, including the SmartMPEG integrated MPEG-2 set-top box decoder. Fujitsu also offers an extensive range of Graphic Display Controllers to optimise solutions for embedded graphic applications. Established in 1997, the Centre's functions include design, application and support for multimedia semiconductor solutions with focus on the European automotive market. Amongst its most recent achievements is the first complete solution for a MOST Multimedia Car Infotainment system.

*Our Multimedia Development Centre provides design, application and lifetime support for our semiconductor solutions.*





### **Mixed Signal Design, Maidenhead**

The Mixed Signal Design Centre leads the world in integrating analogue and digital technologies as right-first-time systems on chip. Adding analogue functionality on chip delivers substantial benefits to bill-of-materials, inventory, testing and reliability wherever real-world data is needed for automotive measurements and control.

As well as custom solutions, the Design Centre creates high performance mixed signal ASSPs such as DACs, ADCs, OpAmps, comparators and PLLs/clock multipliers.

### **ASIC Design Centres**

Fujitsu has a 20 year track-record of successful ASIC projects in Europe. Automotive ASICs are supported through local design centres in Frankfurt & Munich, with mixed-signal support & design in Maidenhead, UK. We can handle complete designs from front-end support, through layout & implementation to physical verification and test.

Leading-edge silicon and the latest design methodology ensure first-pass success, even at extreme complexity, integration and performance.

*As well as custom solutions, the Mixed Signal Design Centre creates high-performance ASSPs such as DACs, ADCs, OpAmps, comparators and PLLs.*

### **RF Design, Frankfurt**

The RF Design Centre is dedicated to providing design solutions for automotive communications, control and positioning, on the move. For example, the team here developed state-of-the-art RF chips for the world's most sensitive GPS/AGPS front-end.

Today it is working on future wireless solutions for control, which could become as important in automotive applications as they are to the IT industry today.



*ASICs are supported through local Design Centres in Frankfurt and Munich.*



*From the world's most sensitive GPS/AGPS front-ends, to future wireless control solutions, the RF Design Centre leads Europe – and the world.*

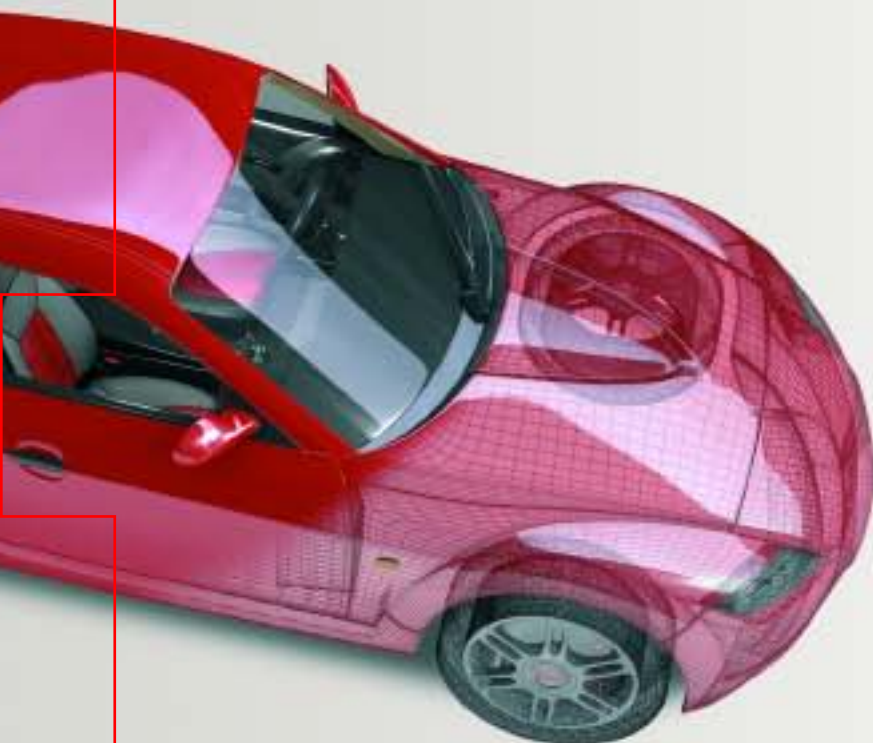
# Quality

From FME's earliest days, Quality has extended well beyond product specifications to encompass organisation-wide policies and objectives. Each process and procedure is clearly defined, from design through production and logistics to business planning & back-up and capacity options. Customer expectations and continuous improvement are the core drivers of its objectives.

Established quality management systems continuously monitor, improve and audit quality to maintain and exceed the high standards customers expect. Since 1994, these quality management systems have been recognised according to ISO 9001 with current certification to ISO 9001 : 2000.

The high reliability of FME products, together with the skills of our solutions-focussed teams, means that we can fulfil even the most stringent customer requirements. Products for automotive systems are certified to ISO/TS 16949 quality standards and are subjected to Fujitsu's strict regime of rigorous quality and reliability testing.

The quality programme in FME is on-going and continues to strive for even higher levels of customer satisfaction.



Since 1994, our quality has been recognised by ISO9001 certification.

# Environment

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Fujitsu's approach to environmental challenges is embodied in 'Green Policy 21' – broad-reaching, high-impact initiatives constantly reappraised at every level of the organisation. Programmes include: creating super green products; developing eco-efficient solutions; abolishing hazardous substances in Fujitsu-branded products; implementing the recycling programme throughout the world; reinforcing environmental management based on EMS, and improving environmental efficiency throughout product life-cycles.

Fujitsu practices a 3R (recycle, reuse, reduce) approach to

conserving energy and creating environmentally-friendly products. Its 'Green' successes include collection and re-use of packaging and empty trays; recycling of cardboard and polystyrene materials; and, wherever possible, using multi-use containers and making outer boxes & filling materials obsolete. A specially developed scheme is already successfully operating in the automotive industry.

FME is also fully compliant and ahead of the time-plan for implementing RoHS (Restriction of Hazardous Substances) and WEEE (Waste Electrical & Electronic Equipment) programmes.



*Fujitsu's 'Green Policy 21' encompasses initiatives at every level of the organisation.*

# Corporate Social Responsibilities

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Fujitsu is fully committed to Corporate Social Responsibility through a worldwide policy, which is encouraged and implemented at a local level within all the countries

where we operate. We are dedicated to developing close relationships with local communities, and are involved in such activities as sponsoring educational, social and

environmental programmes. Our goal: to help improve all the communities in which Fujitsu operates, to the long-term benefit of all.



*Ethics and social responsibility underpin a global policy, implemented wherever Fujitsu operates in the world.*

# Website

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Visit <http://www.fujitsu.com/emea/services/industries/automotive/> for a comprehensive presentation of Fujitsu's automotive solutions, including vehicle body control and comfort systems; chassis control and instrumentation clusters; driver information and passenger entertainment systems.

The site also details Fujitsu's system solutions for the automotive industry with a wide range of state-of-the-art products, software and hardware

development tools, software drivers, real-time operating systems and connectivity, as well as complete reference designs with application software.

Fujitsu's automotive innovations are running at a rapid pace, so bookmark the Website and check it regularly for the latest information. While you're on site, why not register to receive the latest updates on specific automotive component groups, support tools and services.

# Literature Support

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FME has developed the following range of literature to support its increasing presence in the automotive industry. Please contact one of our local sales offices or Distributors:

<http://www.fujitsu.com/emea/contact/microelectronics/salesoffices/>

or visit our website for your copies:

<http://www.fujitsu.com/emea/support/microelectronics/datasheets/>

- 8/16-bit Microcontrollers Product Overview
- 32-bit Microcontrollers Product Overview
- Microcontrollers CD
- DVB/MPEG-2 & Graphic Controller (Multimedia) Product Overview
- LIN-MCU Factsheet
- 8FX Microcontroller Factsheet
- FlexRay Factsheet
- GPS/AGPS Telematics Navigation Factsheet
- MMP Multimedia Mobile Processor Factsheet
- MBFP200 Embedded Fingerprint Development Kit Factsheet
- Piezoelectric Gyro Sensor Factsheet
- Accelerometer Factsheet





Fujitsu – Committed to the  
Automotive Solutions of Tomorrow

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