

## IP and reusable components

### Autosar IP

#### Microcontroller abstraction layer

Microcontroller drivers: GPT, Watch Dog

Memory drivers: Internal EEPROM, RAM test

Communication drivers: CAN, SPI, SCI

I/O drivers - DIO, Port, PWM, ICU - developed for ECUs based on V850ES\_FJ2, V850ES\_FJ3, N78K, S12X, PIC 18

#### ECU abstraction layer

I/O hardware abstraction: SPI Handler

Memory hardware abstraction: EEPROM interface

Communication hardware abstraction: CAN driver interface, CAN interface

#### Services layer

Communication services: Diagnostic communication manager

Memory services: NVRAM manager

### FlexRay IP

#### Microcontroller abstraction layer

Communication drivers: FlexRay driver

#### ECU abstraction layer

Communication hardware abstraction: FlexRay interface

### OSEK compliant basic scheduler

#### ABOUT TATA ELXSI

Tata Elxsi is the technology arm of the Tata Group, one of India's largest and most respected business conglomerates with US\$ 65.3 billion in market capitalization. The company's core practice areas cover embedded product design services, industrial design & engineering, animation & VFX services, and systems integration services.

With high quality, cost effective, time-to-market solutions across the product design lifecycle, Bangalore-headquartered Tata Elxsi serves verticals such as networking & communication, automotive, consumer electronics, media & entertainment, semiconductors, and scientific instrumentation. The company's strong and multi-faceted team provides expertise in VLSI design, embedded software, networking, telecom, multimedia, storage, visual & high performance computing, mechanical product design and digital content creation services.

Tata Elxsi draws on its knowledge base of over fifteen years in delivering product designs, and a large talent pool of over 3500 technologists. The company's passion for excellence is backed by SEI CMMi Level 5, ISO 9001: 2000 and BS 7799 certified processes. Tata Elxsi is the world's first company to be certified at SEI CMMi Level 5 for product design workflows – a testimony to its quality focus, which translates into higher reliability, lowered design risks and improved time-to-market.

Tata Elxsi has 13 sales and support offices in India and 20 international offices. This is supported by India development centers in Bangalore, Chennai, Coimbatore, Hyderabad, Pune and Thiruvananthapuram, and a near-shore center in Japan.

[www.tataelxsi.com](http://www.tataelxsi.com)

# Automotive Electronics

10+ years of know-how and know-why



Leveraging 10+ years' expertise and strong ties with automotive OEMs and Tier-1s, Tata Elxsi provides custom electronic controls and product design services that can address your entire product lifecycle. These include new product design and prototyping, end-to-end development, feature enhancements of existing products and maintenance support.

## Systems modeling and embedded electronics services

Backed by SEI CMMi Level 5, ISO 9001: 2000 and BS 7799 certified processes, Tata Elxsi offers a range of systems modeling and embedded electronics services accelerating your time-to-market.

## Partnerships

### Powering next-generation automotive electronics

Tata Elxsi brings contemporary technologies to customers through partnerships with global leaders such as ARM, TI, SuperH, Intel, Microsoft, Tensilica and Xilinx; and alliances with standards bodies such as Autosar, FlexRay, SNIA and UPnP Forum.



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#### APPLICATIONS

Body & chassis electronics  
Safety & security systems  
Powertrain  
Telematics  
Application & tool development  
Test bench

#### SERVICES

Product design services  
Embedded hardware & software design & development  
Modeling & simulation  
HILS  
Verification & validation  
Protocol system development  
Autosar compliant development

## Automotive expertise

Whether you are an OEM or a Tier-1, Tata Elxsi can be your trusted service provider – thanks to its vast expertise in areas such of silicon, systems & software and key technology elements such as hardware, board, firmware, RTOS, processors, drivers, tools & processes, and communication protocols.

### HARDWARE

IC design and verification, RTL design, chip layout, FPGA synthesis, behavioral modeling (VHDL, Verilog, C, C++), system/board designs

### FIRMWARE

BSP/Boot, POST & diagnostics, Glue Logic, device drivers

### RTOS

OSEK, iTRON, PSOS, VxWorks, iRMX, QNX, Nucleus, Windows CE, pSOS, proprietary micro-kernels, Embedded Linux

### BOARD

Board design, logic development & synthesis, PCB layout, signal integrity tests, prototyping, testing & certification

### PROCESSORS

Motorola, NEC, Hitachi, Microchip, Infineon, Renesas, ARM, Mitsubishi, TI, Fujitsu, ST, Freescale

### TOOLS & PROCESSES

Matlab, Simulink, Stateflow, Target Link, Mtest, Doors, ASCET Tool, Rational Rose, Visio, Innovator, Green Hills, Enterprise Architect, Jude, Vector CAN, Cadence Tools, Mentor Graphics, Tessy, QAC, Rational Test Real Time, LabWindows, LabVIEW, processes/guidelines (MISRA, MAAB)

### DRIVERS

I/O (PCI, cPCI, VME, SBUS, ISA, CT BUS), network devices, storage devices (SCSI/ RAID), media device drivers, on-board devices (USB, I2C), Autosar drivers

### COMMUNICATION PROTOCOLS

CAN, LIN, FlexRay, Keyword 2000, SAE J1850, RS 232-C, RS 422, HDLC/SDLC, IEEE 1394, IEEE-488, IEEE 802.3/802.4

## Work samples

### Body & chassis electronics

- Design, implementation and integration of body electronics module
- Adaptive front lighting system
- LIN FAN system
- Auto coding of HVAC
- Unit testing of BC module using RTRT under DO 178 Level B
- Verification and validation of memory seat and mirror control
- Verification and Validation of roof top control
- Modeling for virtual integration platform

### Safety & security systems

- Passive entry/passive start system
- Central locking/anti-theft system
- Airbag control unit
- Verification and validation of occupant classification system
- Automatic collision notification

### Application & tool development

- Design tool for model application
- Diagnostics tool
- Airbag calibration tool
- Airbag algorithm simulation tool
- Tool enhancement

### Telematics

- Remote vehicle diagnostic and control application
- Bluetooth-CAN- MOST gateway
- Bluetooth hands-free car kit
- Driver assist system
- Wireless GPS navigation
- HMI development

### Test bench

- Tester tool for adaptive front lighting system
- ECU test automation

### Powertrain

- Design and development of turbo charger actuator device
- Engine management system (ECU)
- Design and development of CPU board system for electric hybrid vehicle
- Components for ECU
- Instant Ignition Start System: C to modeling
- Reverse Engineering: C to model for a transmission system
- In-cylinder pressure data generation model
- Model verification engine intake system
- Motor bench system

In the past, Tata Elxsi's electronics design specialists have helped automotive OEMs and Tier-1s in body & chassis electronics, safety & security systems, Powertrain, telematics, application & tool development and test bench setup.

