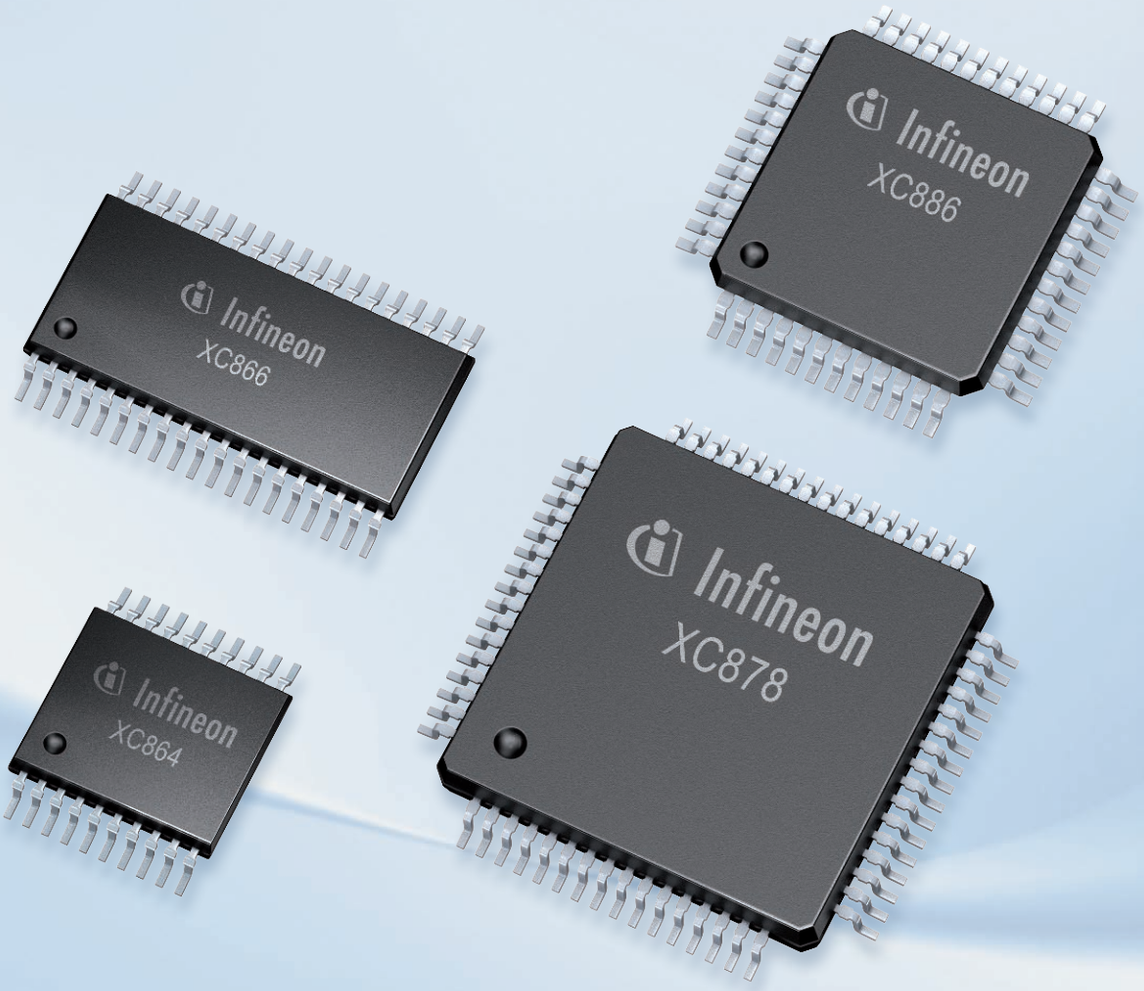
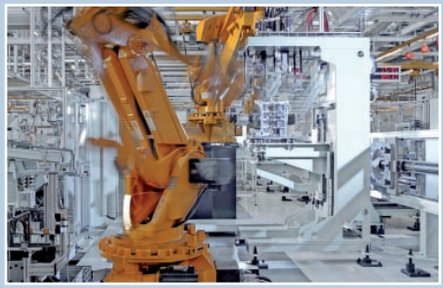


XC800 Family

Highly-Integrated and Cost-Effective 8-bit Flash Microcontrollers



www.infineon.com/XC800

Contents

XC800 Family Overview 04

Peripheral Highlights 06

XC800 Safety Solutions 10

XC800 A-Family 12

- Body & Convenience 14
- Safety 20
- Powertrain 23
- XC800 150°C-Series 25

XC800 I-Family 26

Motor Control and Automation Solutions 33

Solutions for Advanced Touch Control 40

Solutions for Intelligent Industrial Lighting 44

Tools 46

XC800 Family Overview

Infineon's high-performance XC800 family of 8-bit MCUs combines a dual-cycle 8051 core with embedded Flash memory and powerful on-chip peripherals. XC800 features innovative enhancements like extended temperature ranges up to 150°C, capacitive touch control and a 16-bit performance with the embedded vector computer. Flash sizes from 2kB to 64kB with up to 3kB RAM and pin counts from 16-pin to 64-pin will make it easy to select the right product and optimized fit for your purpose. The high-quality MCUs are well-suited for a wide range of 5V as well as 3V applications.

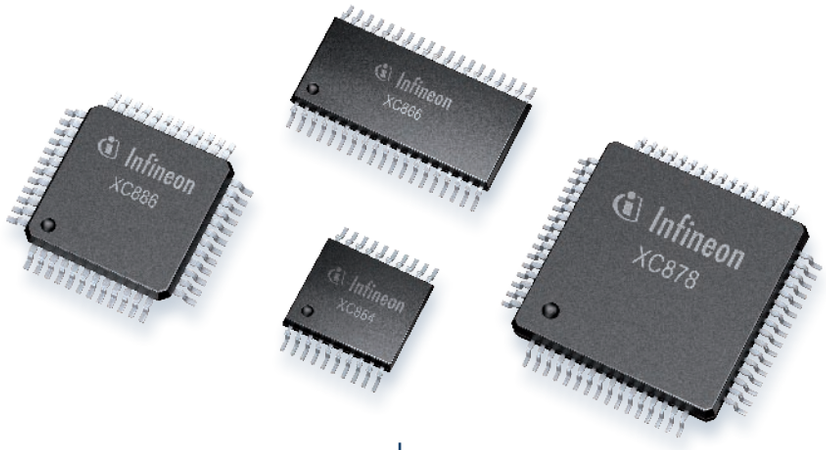
Energy efficiency in many applications is a matter of intelligent control. With Infineon's 8-bit MCUs, designers can optimize energy efficiency in their systems by using advanced control algorithms for electric drives or power converters, and communication interfaces for automation or lighting network applications.

Nowadays, time-to-market is crucial to economic success. Infineon‘s free tools, simple evaluation boards and comprehensive range of application kits enable easy and fast design in all 8-bit MCUs from Infineon.

Cost is still one of the most important factors when choosing an 8-bit MCU. We have reduced system level costs by integrating features such as oscillator, voltage regulator, EEPROM and supervisory circuitry.

XC800 Benefits

High Level of Integration	Peripheral Highlights	Enhanced Communication
System Cost Savings ■ Embedded voltage regulator ■ EEPROM support ■ On-chip oscillator **Safety Features** ■ Brownout detection ■ Power-on reset ■ Clock recovery system ■ Window watchdog timer ■ I/O protection circuitry **On-Chip Debug Support (OCDS)** ■ JTAG-based non-intrusive debugging	**CapCom6 Unit** ■ High-speed PWM ■ Direct HW link with ADC **Enhanced ADC** ■ 5V and 3.3V supply capability ■ 10-bit resolution ■ Up to 8 channels ■ Conversion time <1µs **Capacitive Touch Control** ■ ROM library ■ Integrated LED-display control **16-bit Vector Computer** ■ Nested execution of CORDIC and MDU ■ Vector rotation and transformations	**Flexible Serial Interfaces** ■ Full duplex UART ■ High-speed SSC (SPI compatible) ■ I^2C **Application-Specific Protocol Stacks** ■ LIN master and slave support ■ DALI slave support for lighting ■ IO-Link slave for sensor/ actuator networks



Automotive

XC800 A-Family

Body Applications
- Motorcycle BCM
- Low-end BCM/HVAC
- Lighting
- Window lift
- Switch sensors
- Power operating systems
- Touch control

Safety Applications
- Low-end airbag
- EHPS
- Steering angle sensor
- Failsafe controller

Powertrain Applications
- Pumps
- Valve/throttle control
- Motorcycle engine management
- Shift-by-wire
- Cooling fan

Industrial & Multi-Market

XC800 I-Family

Low-Cost Motor Control and Automation
- Motor control
- Power supply control
- Network connectivity

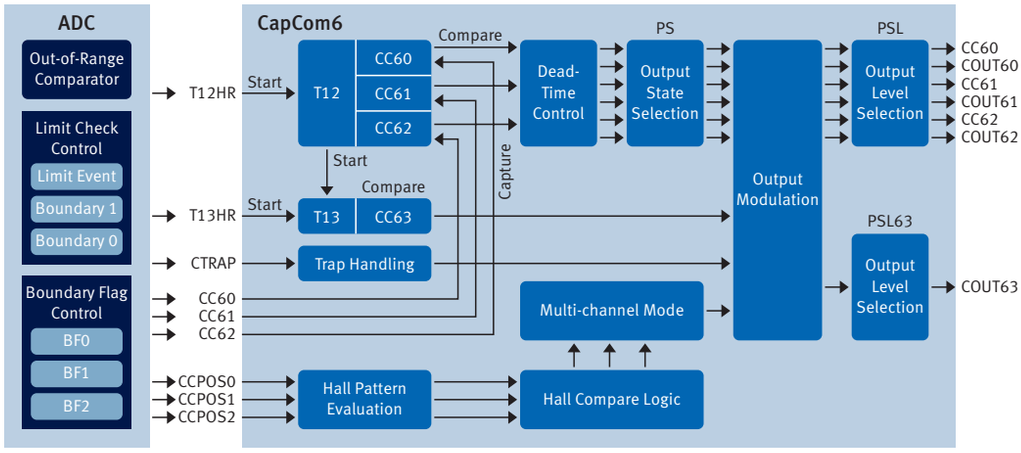
Advanced Touch Control
- Capacitive touch control
- Display control

Intelligent Lighting
- LED light control
- Power supply control
- Network connectivity

Peripheral Highlights

Direct hardware link between Analog-Digital Converter (ADC) and Capture/Compare Unit (CCU6)

The Infineon CCU6 units consist of a T12 timer block with three capture/compare channels and a T13 timer block with one compare channel. The T12 channels can generate up to six PWM signals or accept up to six capture triggers. The T12 channels can be used to control up to three half-bridges with automatic dead-time generation. They can jointly generate control signal patterns to drive AC motors or inverters. Sinusoidal or space vector modulation can be easily implemented. Special operating modes support the control of brushless DC motors using hall sensors or back-EMF detection. Furthermore, block commutation and control mechanisms for multiphase machines are also supported. A direct hardware link between ADC and CapCom6 provides powerful PWM control.



CCU6 Features

- Capture for time measurement
- Compare for PWM generation
- Burst for additional modulation
- Single-shot for flexible signal generation
- Multi-channel for unipolar machines
- Block commutation for brushless DC drives
- Programmable dead-time control

ADC Features

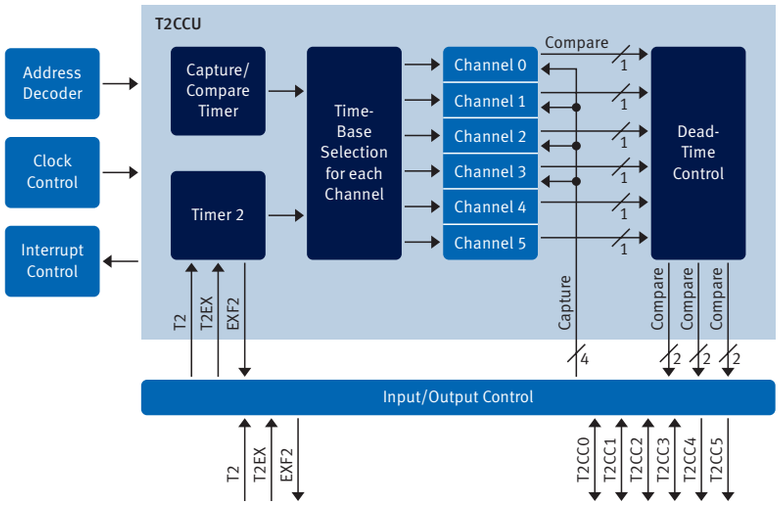
- 10-bit resolution, ±2 LSB
- Conversion time of ‹1.5µs
- Hardware synchronization with PWM enables noise-free sampling
- Auto scan, injection and comparator modes to reduce CPU load

T2CCU Capture/Compare Unit

The T2CCU (Timer 2 Capture/Compare Unit) is an add-on block to the standard timer two unit. Control is available in the T2CCU to individually select either the timer 2 or its own Capture/Compare Timer (CCT) as the time base for each of its 16-bit capture/compare channels. The T2CCU can be used for various digital signal generation and event capturing operations such as pulse generation, pulse width modulation, pulse width measurement etc. Target applications include various automotive control as well as industrial applications like frequency generation, digital-to-analog conversion and process control.

T2CCU Features

- Four capture channels and six compare channels
- Flexible time-base option
- 16-bit resolution able to work at twice the peripheral clock frequency
- Can be used for digital signal generation and event capturing like pulse generation, pulse width modulation

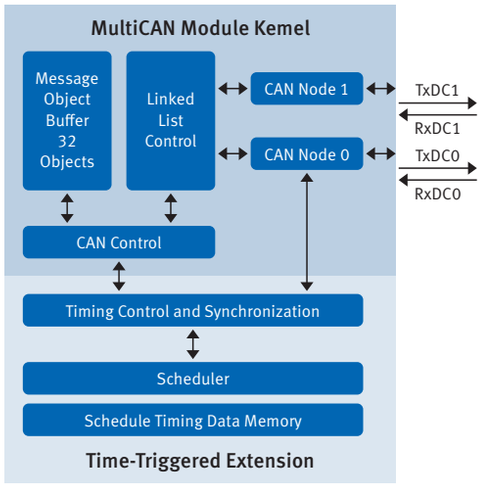


MultiCAN

Complex applications increasingly require intelligent communication over the CAN network. A CAN gateway and a FIFO are only two examples of what can easily be implemented with an enhanced MultiCAN module.

MultiCAN Features

- Full-CAN with CAN 2.0B active
- Up to two independent CAN nodes
- Up to 32 message objects
- Programmable acceptance filtering
- Powerful analysis capability
- FIFO data handling support
- Automatic gateway support
- Flexible interrupt handling



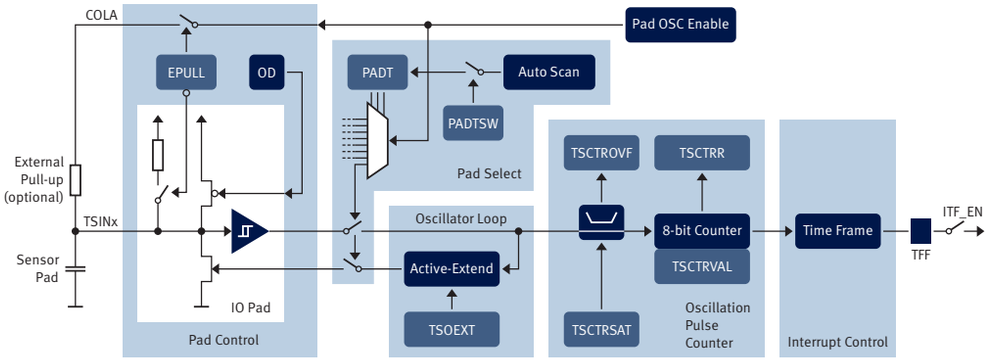
Peripheral Highlights

LED Touch Sense Unit

The LED Touch Sense Unit is featured with the Xc82x and XC83x series. This unit integrates capacitive touch control and the operation of an LED matrix used for displays in low pin-count devices via time-multiplexed operation. It encompasses a combination of features often demanded – e.g. by home appliance, automotive or consumer HMI designs.

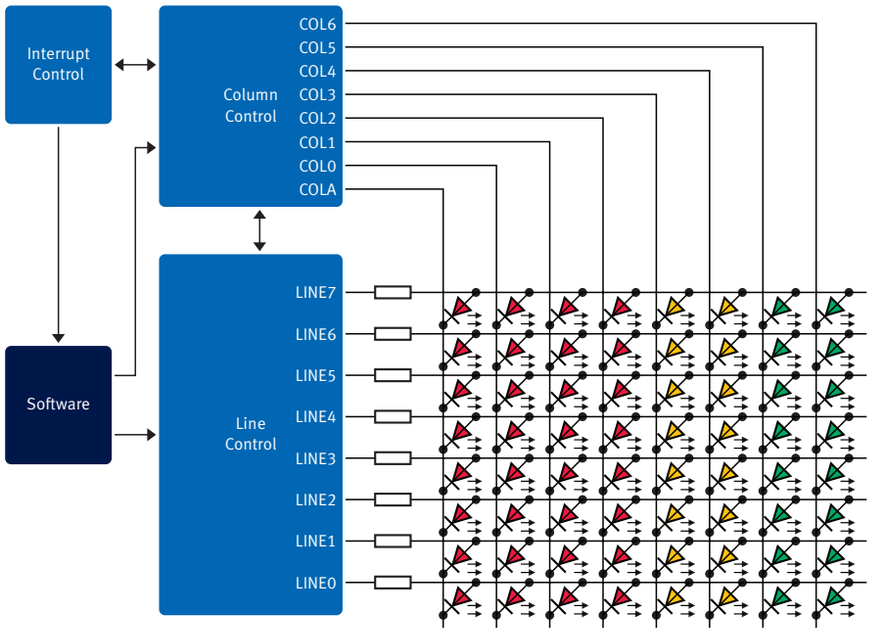
Touch Control Unit

- External or internal pull-up resistor
- Automatic pad selection logic for auto-scan function
- Adjustable discharge time
- Adjustable saturation/overflow behavior of oscillation pulse counter
- Counter value evaluation in interrupt service routine
- ROM library for Adjustable Accumulation, Glitch Filter, Adaptive Average Control, Pad-Down and Pad-Up Handling, Result and Error Handling



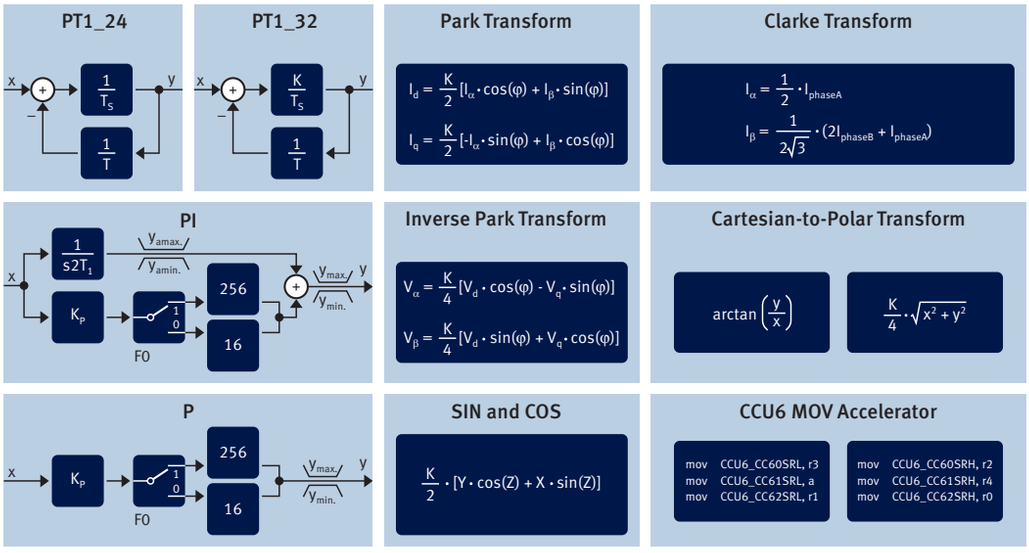
LED Matrix Unit

- Supports up to 8x8 LEDs arranged in lines and columns
- A resistor in the line path limits the current
- The columns are activated one after the other (multiplexing)
- The line signals must be synchronized to the column activation
- The LEDs can be arranged in various layouts



Math and Control ROM-Library

The math and control code ROM library featured with the XC82x and XC83x series offers various DSP functionalities, such as the PI-controller, SIN and COS or Cartesian-to-polar transformation. It contains all algorithms required to perform one of the most ambitious control schemes – field-oriented motor control – with an 8-bit microcontroller.



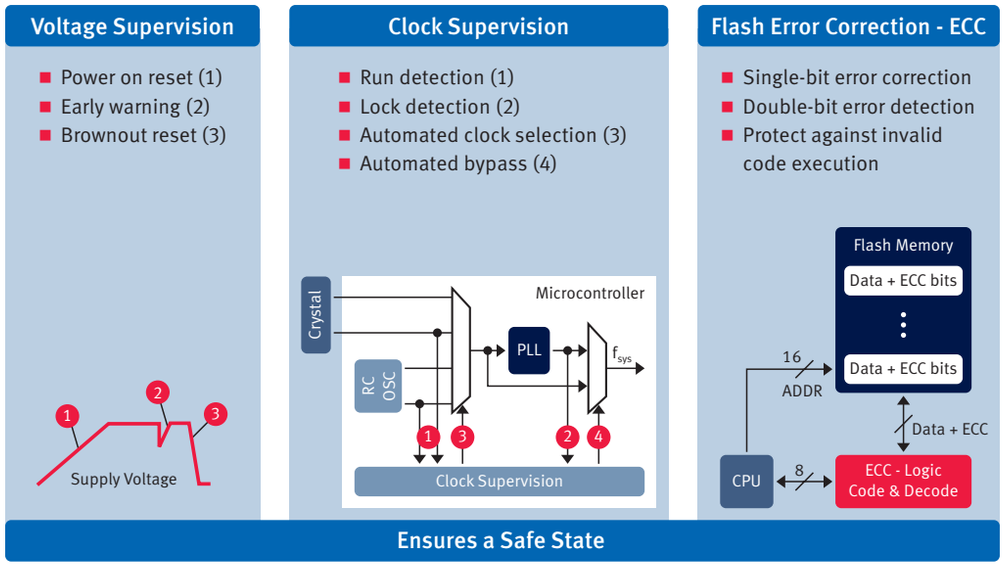
XC800 Safety Solutions

IEC 60730/Class B Certification

Infineon offers SafeDrive, a flexible and cost-sensitive approach to class B compliance using single-channel architecture with a periodic self-test.

SafeDrive consists of a VDE-certified free software library containing self-test routines that covers six of the ten components required by class B. The remaining four are application-specific and have to be implemented in the application code.

Thanks to the safety features of XC800, compliance is possible with minimal CPU/ memory overhead. Class B compliance is mandatory in Europe.

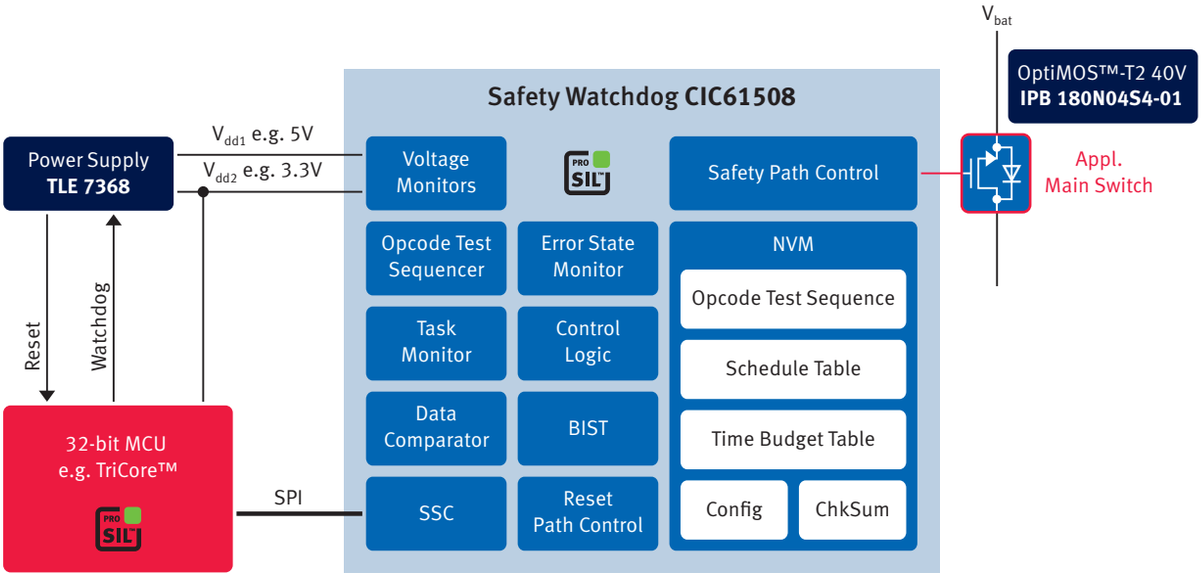


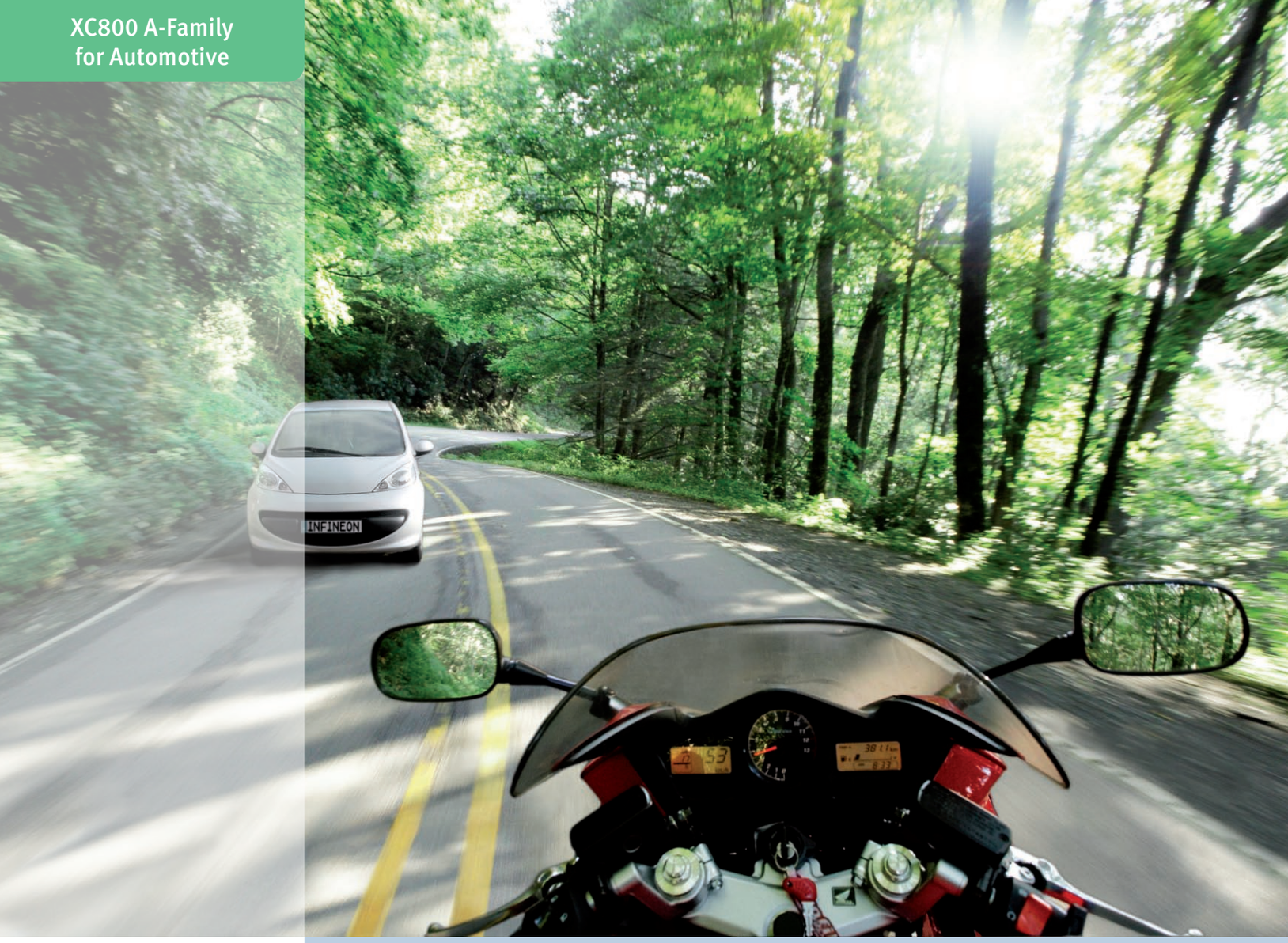
Safety Watchdog CIC61508

Safety Systems require an independent watchdog which implements a robust monitoring channel for main MCU supervision in ISO26262 and IEC61508 compliant safety applications.
With its small footprint the CIC61508 is a space/cost effective choice to support applications like airbag, steering, braking, etc.

SIL Supporting Key Features

- Internal Test Scheduler / Sequencer
  - Generates a sequence of test requests with specific data and checks the response against a static table
- Supply Voltage Monitor
  - Capable of detecting under- and overvoltage of the supply to the monitored microcontroller and trigger RESET if required
- Data Verification Unit
  - Compares two data variables delivered within a determined time period to check for equality
- Task Monitor
  - Monitor system using a defined schedule table to check the dispatch of critical tasks with predefined execution budgets
- System Shutdown
  - Three level of temporal system shutdown, providing flexible sequences





XC800 A-Family – Dedicated to Automotive Applications

The XC800 A-Family is Infineon's automotive 8-bit family that addresses low-end body, safety and powertrain applications for 2-/3-/4-wheelers.

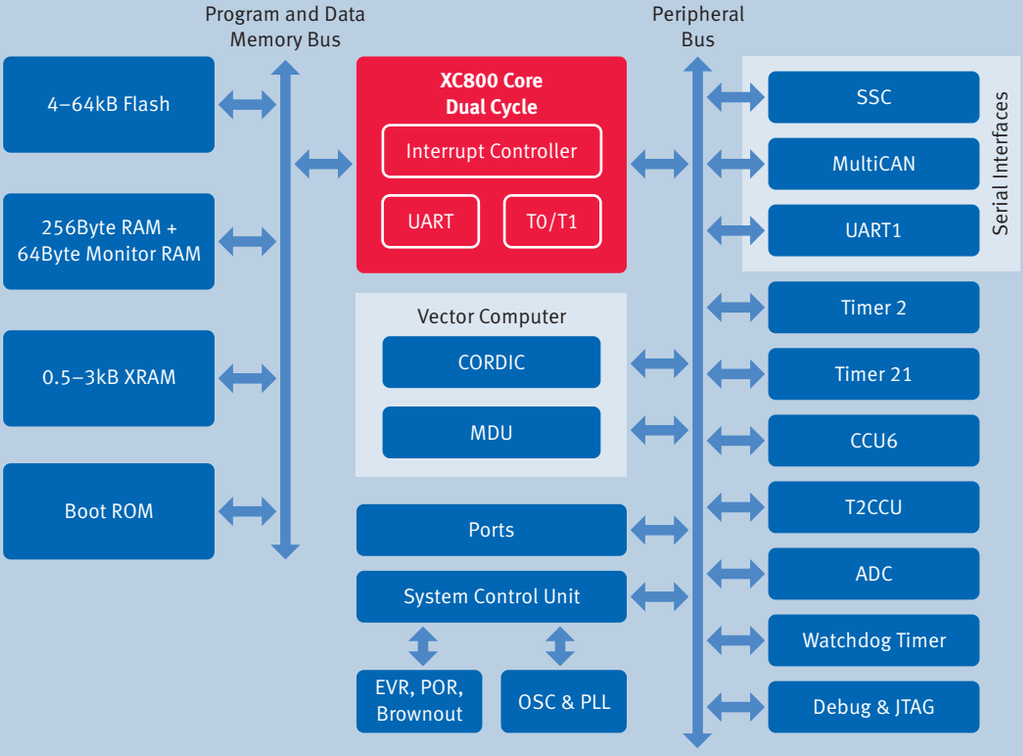
A set of strong peripheral features along with high quality standards has already positioned the 8-bit microcontroller ahead of the competition in demanding applications such as automotive motor control. This high standard of performance and quality is now further enhanced with the introduction of the 150°C Series; the same high-performance 8051 microcontroller, now "Grade 0" qualified at 150°C ambient temperature.

Additionally, the XC800 A-Family is further enhanced with a dedicated new low-cost family with an optimized feature set for lowest-end applications. This provides full scalability and flexibility, therefore satisfying major market requirements.

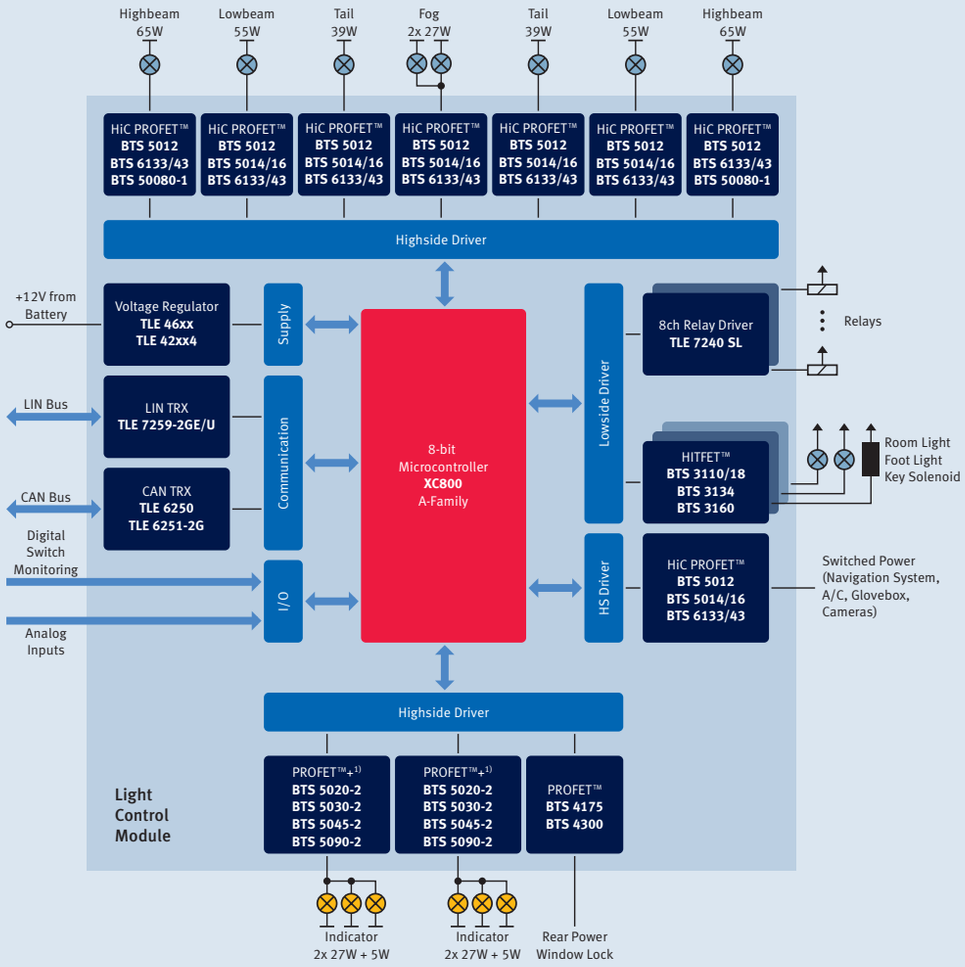
XC800 A-Family for 2-/3-/4-Wheelers

	TSSOP-16	TSSOP-28	TSSOP-38	VQFP-48	QFP-48	QFP-64
64kB				**XC874** 26.7MHz		**XC878** 26.7MHz
52kB				**XC874** 26.7MHz		**XC878** 26.7MHz
32kB					**XC886** 24MHz	**XC888** 24MHz
24kB					**XC886** 24MHz	**XC888** 24MHz
16kB			**XC866** 26.7MHz			
8kB		**XC836** 24MHz	**XC866** 26.7MHz			
4kB	**XC822** 24MHz	**XC836** 24MHz	**XC866** 26.7MHz			
2kB	**XC822** 24MHz				■ ROM version available	

XC800 A-Family Block Diagram



Application Example



Light Control Module + Smart Junction Box

The light control module is mainly used in the low-cost car market supporting all kinds of lighting systems, incl. smart junction box.

The XC800 A-Family is the microcontroller of choice for such applications.

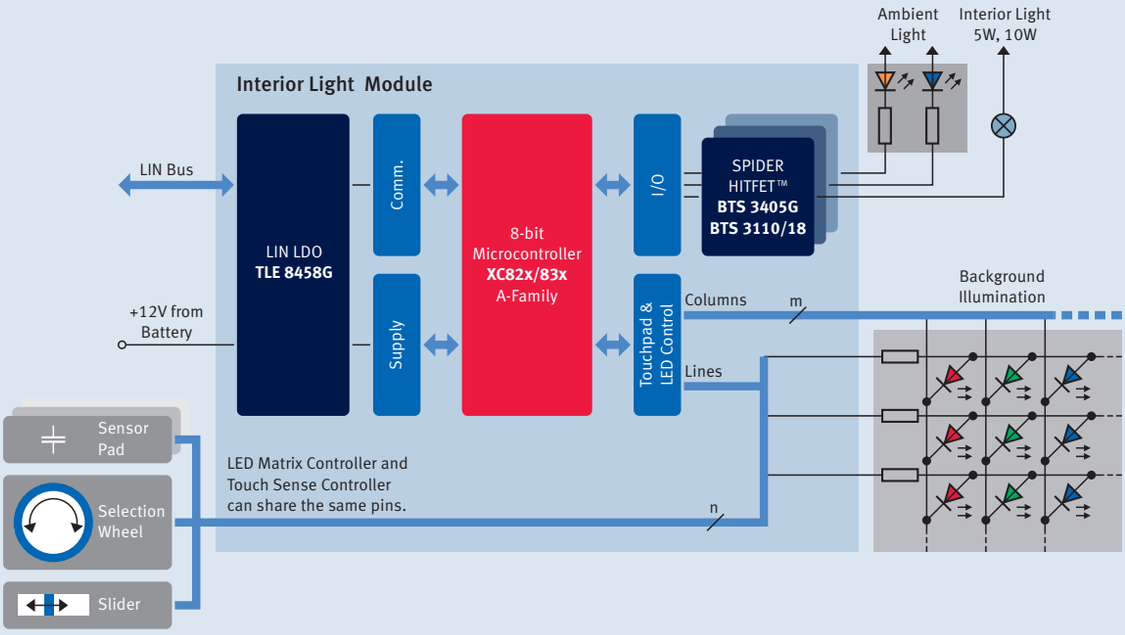
Benefits

- Supports all kinds of lighting systems: HID, LED etc.
- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- CAN/LIN option
- Up to 10 PWM channels
- Direct trigger from ADC to CCU6 via PWM timer
- Up to 8-channel 10-bit ADC (light bulb diagnosis)
- Fully scalable over package and memory
- Flexible power concept

Application Example



Interior Light Control with Capacitive Touch Sensor

The light control module is mainly used in the low-cost car market supporting all kinds of lighting systems.

The XC800 A-Family is the microcontroller of choice for such applications.

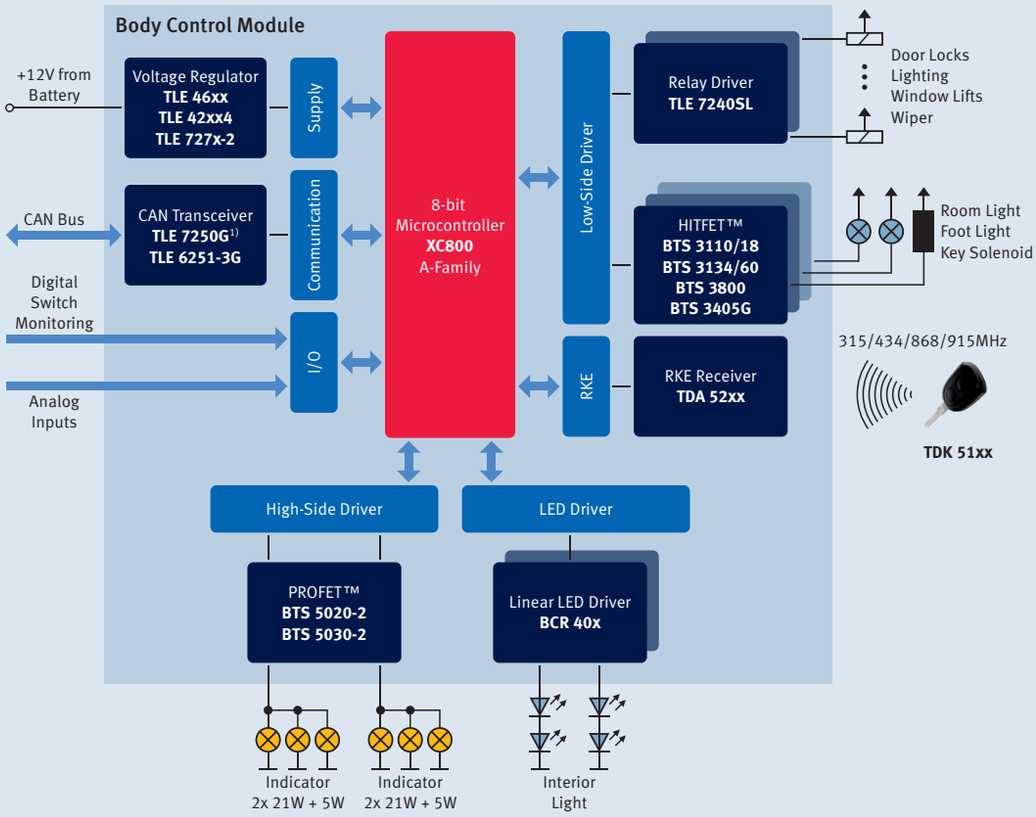
Benefits

- Supports all kinds of lighting systems: HID, LED etc.
- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- CAN/LIN option
- Up to 10 PWM channels
- Direct trigger from ADC to CCU6 via PWM timer
- Up to 8-channel 10-bit ADC (light bulb diagnosis)
- Fully scalable over package and memory
- Flexible power concept

Application Example



Low-Cost Body Control Module

The low-cost body control module solution is perfectly suited to the ultra low-cost car market as well as the 2-/3-wheeler motorcycle market, supporting basic light functionality, car access and door modules with lighting, window lift, mirror positioning, refueling indicator for windscreen wipers and clock.

High scalability of the XC800 A-Family supports low-end to high-end solutions.

Benefits

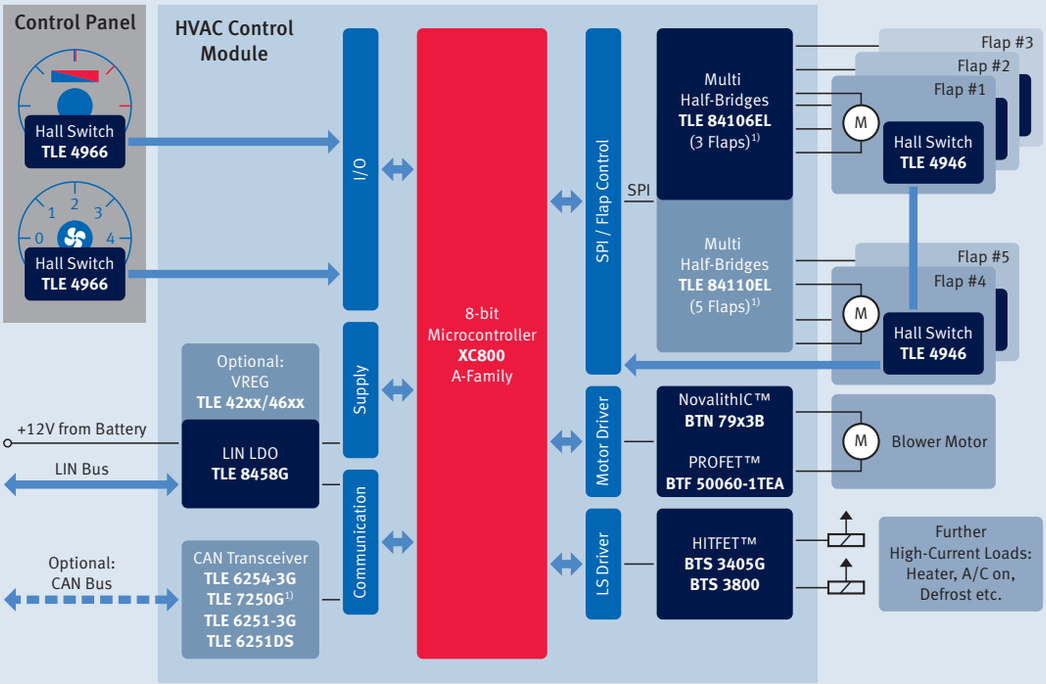
- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- 4kB to 64kB Flash with emulated EEPROM
- CAN/LIN option
- Up to 8 ADC channels
- Up to 10 PWM channels

1) In development

Application Example



HVAC Control Module

Balancing comfort and fuel efficiency is very important in automotive air conditioning. Reduced fuel consumption can be achieved via demand-oriented air-conditioning regulation. This could be covered by fresh air regulation (recirculating air operation) or the use of brushless DC motors in fans, for example.

Benefits

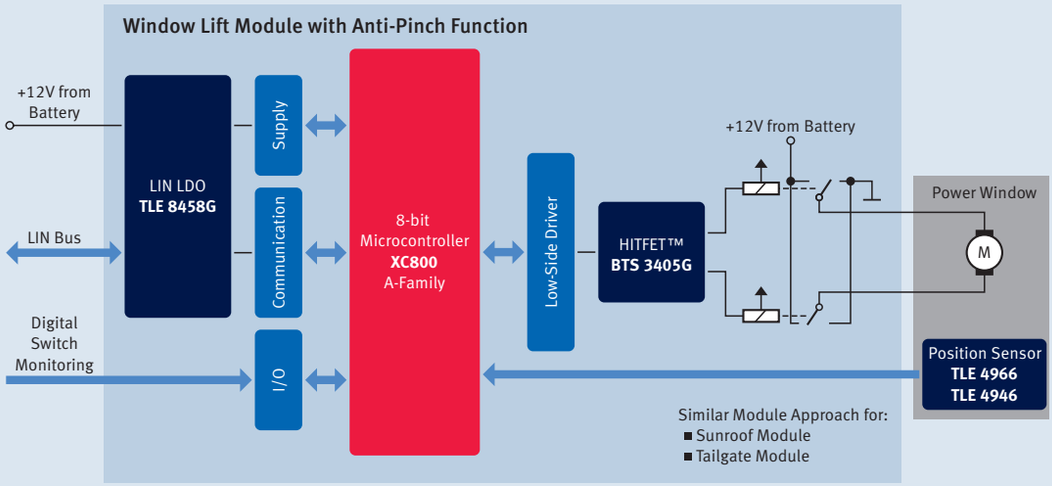
- CCU6/MDU/CORDIC supports sinus-based system solution
- Stepper motor drive
- Fully scalable over package and memory
- High-speed ADC: 1.5ms conversion cycle

Key Features

- Up to 64kB Flash with emulated EEPROM
- CAN/LIN option
- Up to 8 ADC channels
- Up to 10 PWM channels

1) In development

Application Example



Window Lift Module with Anti-Pinch

The XC800 A-Family offers an excellent price-performance ratio for cost-sensitive solutions as window lift modules with anti-pinch functionality.

High scalability of the XC800 A-Family supports low-end to high-end solutions.

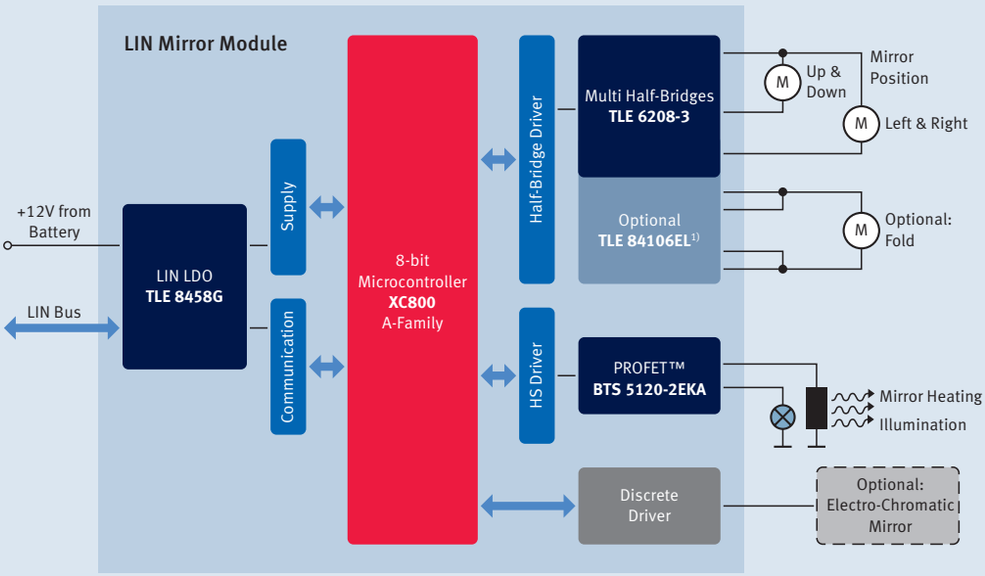
Benefits

- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- LIN option
- Up to 8-channel 10-bit ADC
- Up to 10 PWM channels
- Small footprint packages

Application Example



Decentralized Mirror Module

The XC800 A-Family offers an excellent price-performance ratio for cost-sensitive solutions as decentralized mirror modules.

Furthermore, the availability of small footprint packages allows cost-optimized PCB layouts.

Benefits

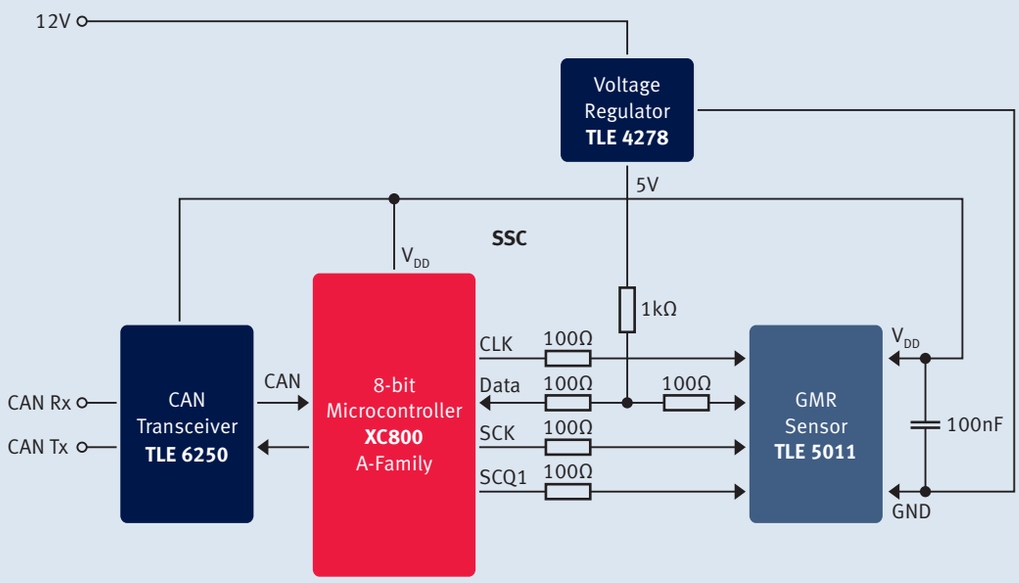
- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- LIN option
- Up to 8-channel 10-bit ADC
- Up to 10 PWM channels
- Small footprint packages

1) In development, samples available

Application Example



Steering Wheel Sensor

The feature set of the XC800 A-Family enables easy interfacing with sensors such as the GMR sensor for angle measurement and control. The system solution can also be used in applications such as gearboxes, actuator controls etc.

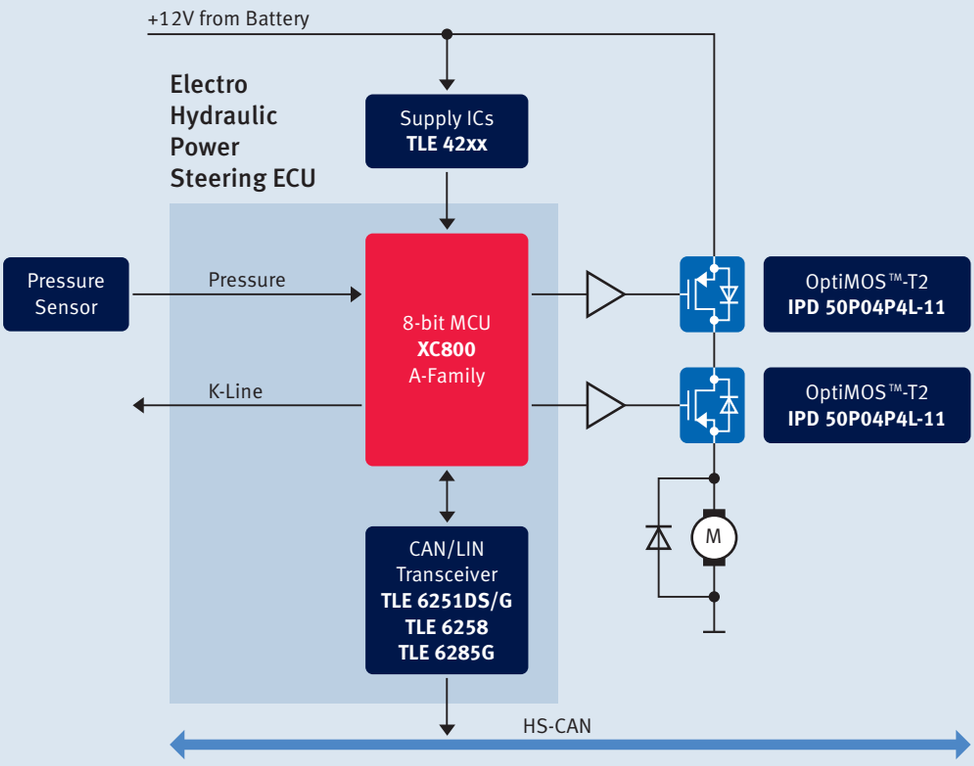
Benefits

- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions
- Free tool chain
- DAVE™ autocode generator

Key Features

- High-performance 8-bit MCU from 4kB to 64kB Flash
- CORDIC (Coordinate Rotation Digital Computer) coprocessor – Performs 16-bit trigonometric, hyperbolic and linear functions
- CAN connectivity

Application Example



Electro Hydraulic Power Steering System for Low-Cost Cars

The rich portfolio of the XC800 A-Family offers a cost-optimized fit for all requirements of an Electro Hydraulic Power Steering system.

With this basic system approach, even low-cost cars can reap the benefits of EHPS in reducing CO_2 emissions by 3%.

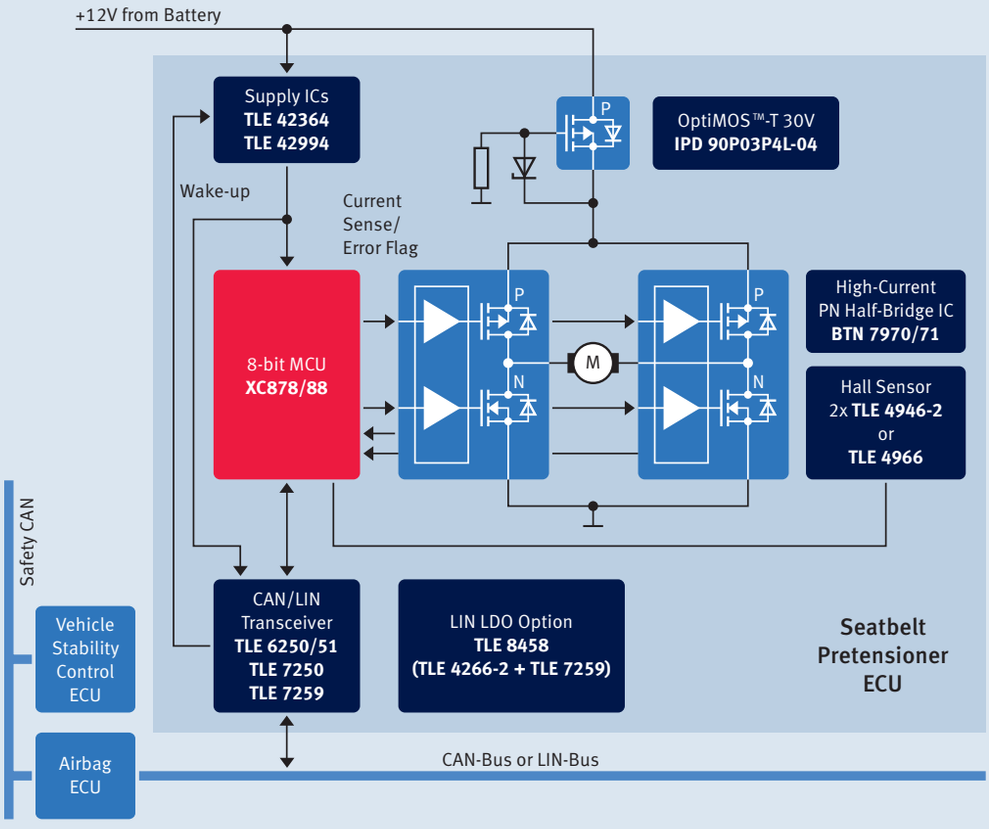
Benefits

- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions
- Free tool chain
- DAVE™ autocode generator

Key Features

- 4 to 64kB Flash
- EEPROM emulation for diagnostics
- CAN/LIN option
- Up to 8-channel 10-bit ADC
- Up to 10 PWM channels

Application Example



Reversible Seatbelt Pretensioner

The XC800 A-Family offers a perfect product fit for all kinds of belt-pretensioner applications.

Its wide scalability of low-end products and their cost-optimized feature sets give system suppliers the opportunity to choose the best-fit product in this low-end safety application.

Benefits

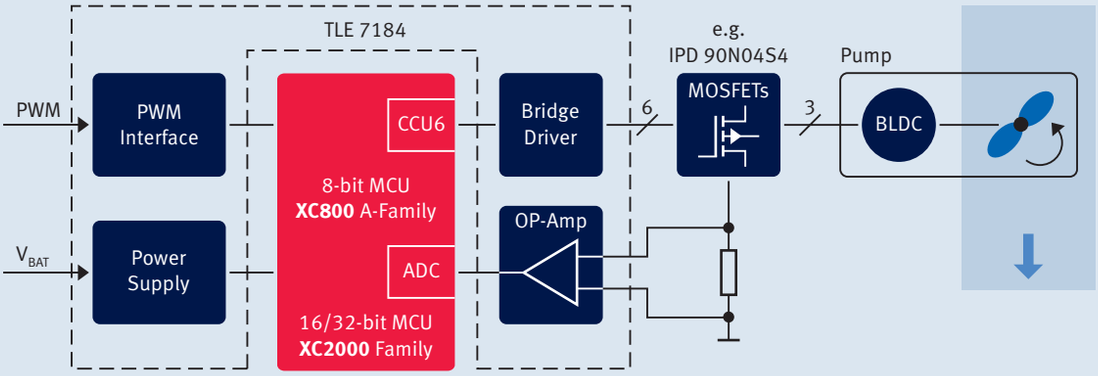
- Low power consumption
- Low quiescent current
- Excellent price-performance ratio
- High scalability supports low-end to high-end solutions

Key Features

- CAN/LIN option
- Up to 8-channel 10-bit ADC
- Up to 10 PWM channels
- Small footprint packages

Application Example

Low-Cost



Electric Fan/Pump Application

"Power on demand" is the trend for state-of-the-art powertrain peripheral aggregates across all automotive segments. Fuel pumps, water pumps, ventilation and air management all consume energy. Optimizing the efficiency of these aggregates significantly reduces emissions and improves performance.

The XC800 A-Family offers a perfect product fit for electric fan/pump applications.

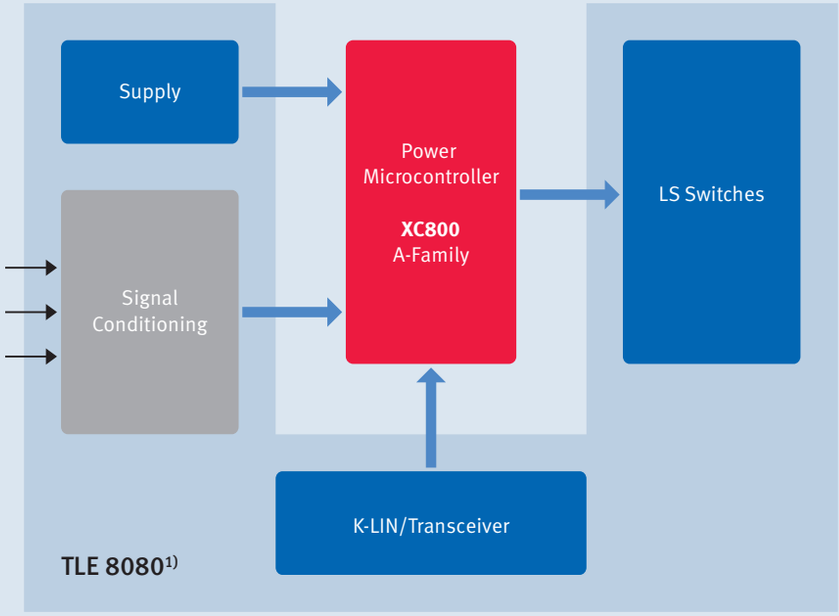
Benefits

- Improved engine thermal control
- Better pump efficiency
- Reduced power consumption
- Speed can be adjusted to actual needs
- Completely switched off when engine starts for a faster warm-up

Key Features

- High-performance 8-bit MCU with up to 64kB Flash
- Flexible PWM unit
- Fast 10-bit ADC
- LIN/CAN connectivity
- CCU6/MDU/CORDIC support sinus-based system solution/block commutation

Application Example



Motorcycle Engine Management

The next generation of small combustion engines requires more functions to comply with emission regulations, performance requirements and comfort expectations.

Especially in the low-cost market for two wheelers, the XC800 A-Family is a perfect fit for the requirements and provides a cost-sensitive solution.

Benefits

- Low-cost 2-chip system solution for motorcycle EMS
- Supports EFI, including EU3 emission standards

Key Features

- 5V supply and K-Line
- Supports injector, multi-indication lamp

1) In development, samples available

XC800 150°C-Series Overview

XC800 150°C-Series – Grade 0 environment

Applications

Automotive

- Turbocharger
- Engine cooling fan
- Throttle control
- Valve control
- Failsafe EPS
- Fuel/Oil Sensor
- Water/Oil/Fuel pump

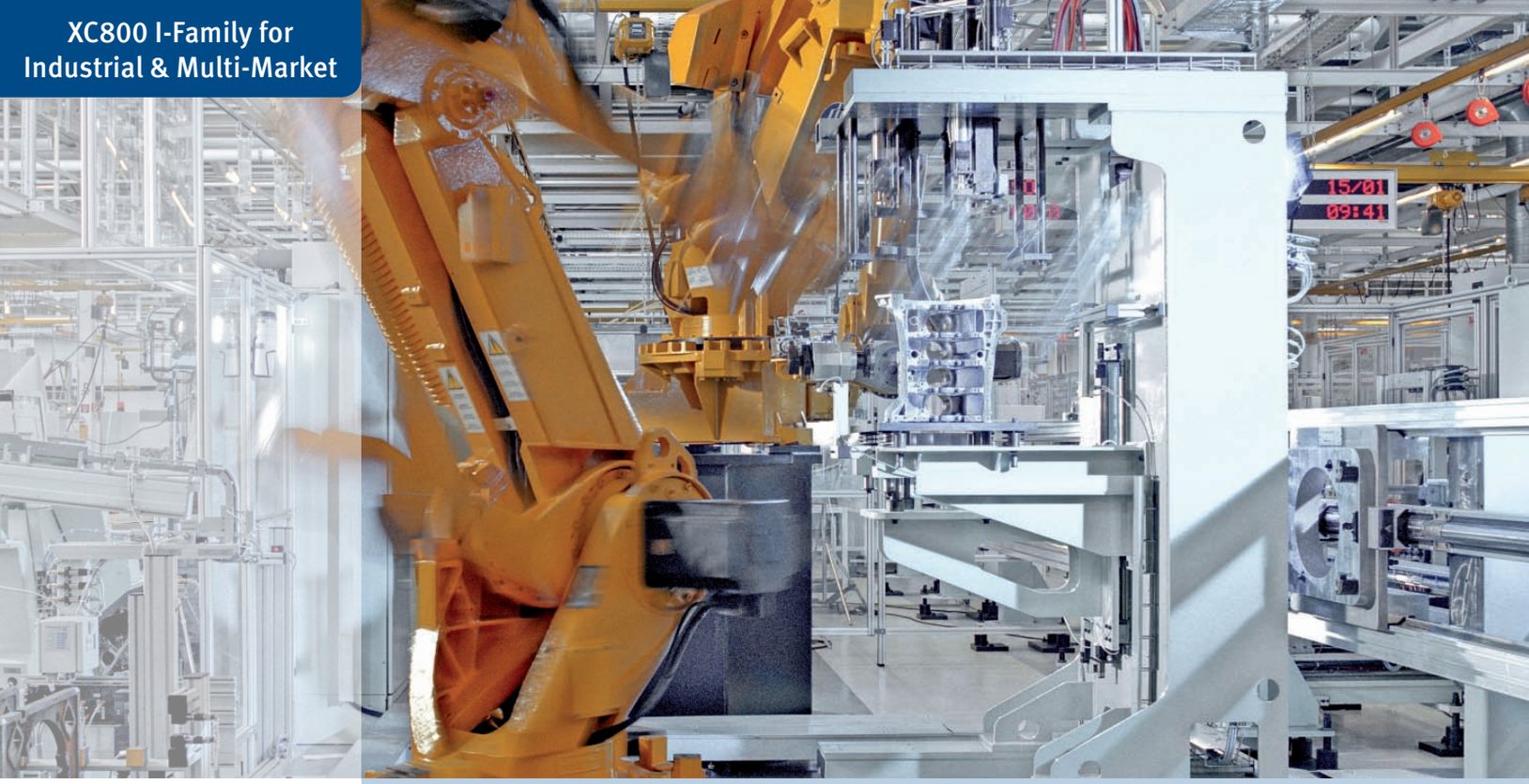
Key Features

- T_a = -40°C – 150°C[1)]
- AECQ-100
- Grade 0

16-bit Vector Computer for
Field-Oriented Control

- Nested execution of CORDIC and MDU
- Vector rotation and transformations

1) For details please check data sheet on www.infineon.com/XC800



XC800 I-Family – Dedicated to Industrial Applications

The XC800 I-Family consists of six series of 8-bit microcontrollers based on the 8051 core architechture. It features a set of peripherals which enables use in real-time control environments such as motor control, as well as for communication purposes, capacitive touch and display control or LED lighting. All devices are developed to meet high quality and reliability requirements and a comprehensive portfolio of application-oriented tools and kits provides short time-to-market solutions for developers.

Real-Time Control @ Low Cost

- High-performance 48MHz Capture/ Compare Unit with ADC trigger and ‹ 1µs A/D conversion time for precise and fast control loops
- Math & control code ROM libraries – optimized & automated code execution saves CPU and Flash resources
- 16-bit coprocessor for executing the MDU or CORDIC algorithm

High Reliability @ Low Cost

- Up to 130 thousand hours of operation and 20-year data retention
- Flash error correction & protection, brownout detection, automated dead-time control
- For use in IEC 60730/Class B-certified applications

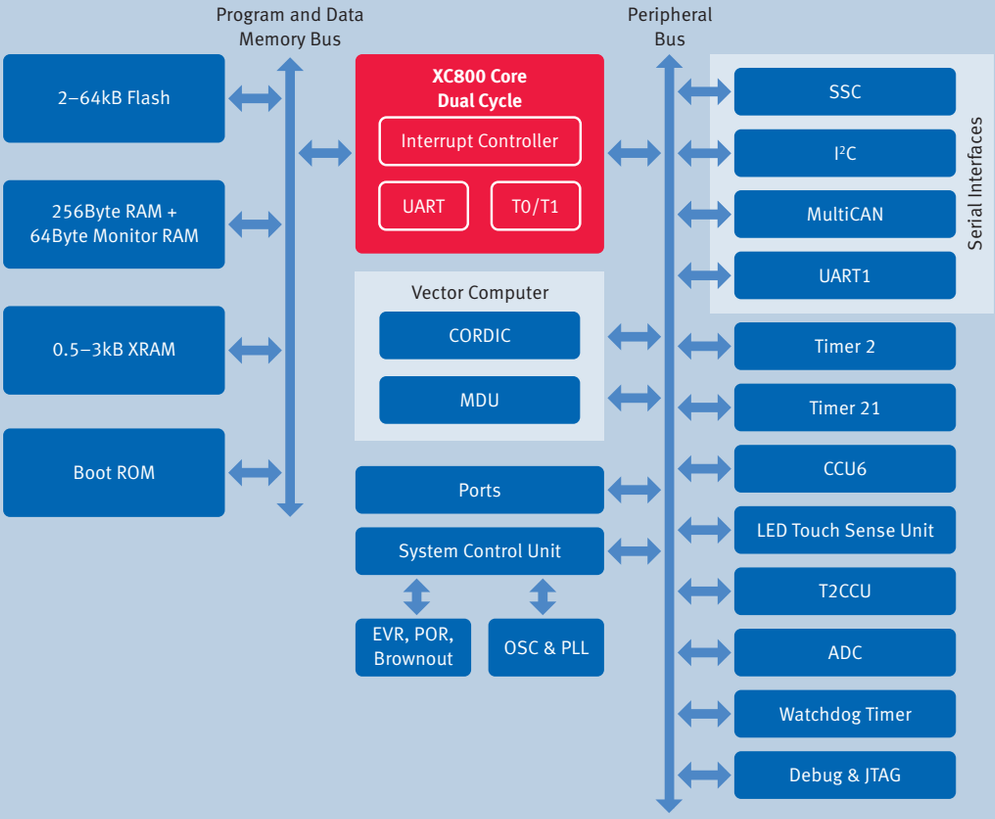
Short Time-to-Market Solutions

- Automated device configuration and code generation, complete Infineon application solution kits
- Free Infineon development tool chain; support from leading tool chain suppliers
- Scalable product family with “pin-to-pin” compatible devices

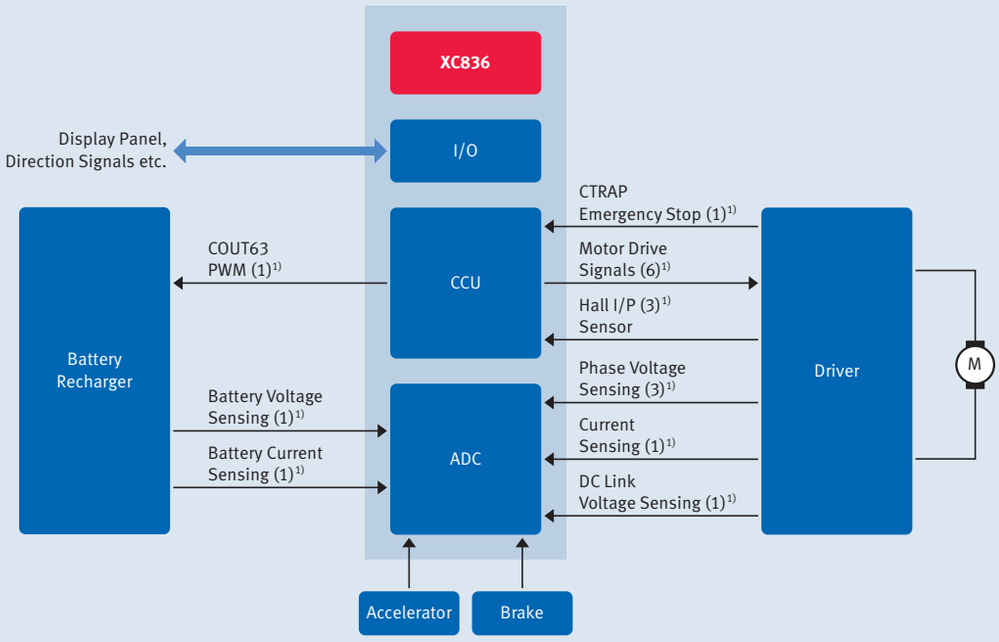
XC800 I-Family Portfolio

	TSSOP-16 0.65mm pitch	TSSOP-20 0.65mm	DSO-20 1.27mm	DSO-24 1.27mm	TSSOP-28 0.65mm	TSSOP-38 0.50mm	LQFP-48 0.50mm	LQFP-64 0.50mm
64kB								XC878
								XC858
52kB								XC878
								XC858
36kB								XC858
32kB							XC886	XC888
24kB							XC886	XC888
16kB						XC866		
8kB				XC835	XC836	XC866		
4kB	XC822	XC864	XC824		XC836	XC866		
2kB	XC822							

XC800 I-Family Block Diagram



Application Example



E-Bike

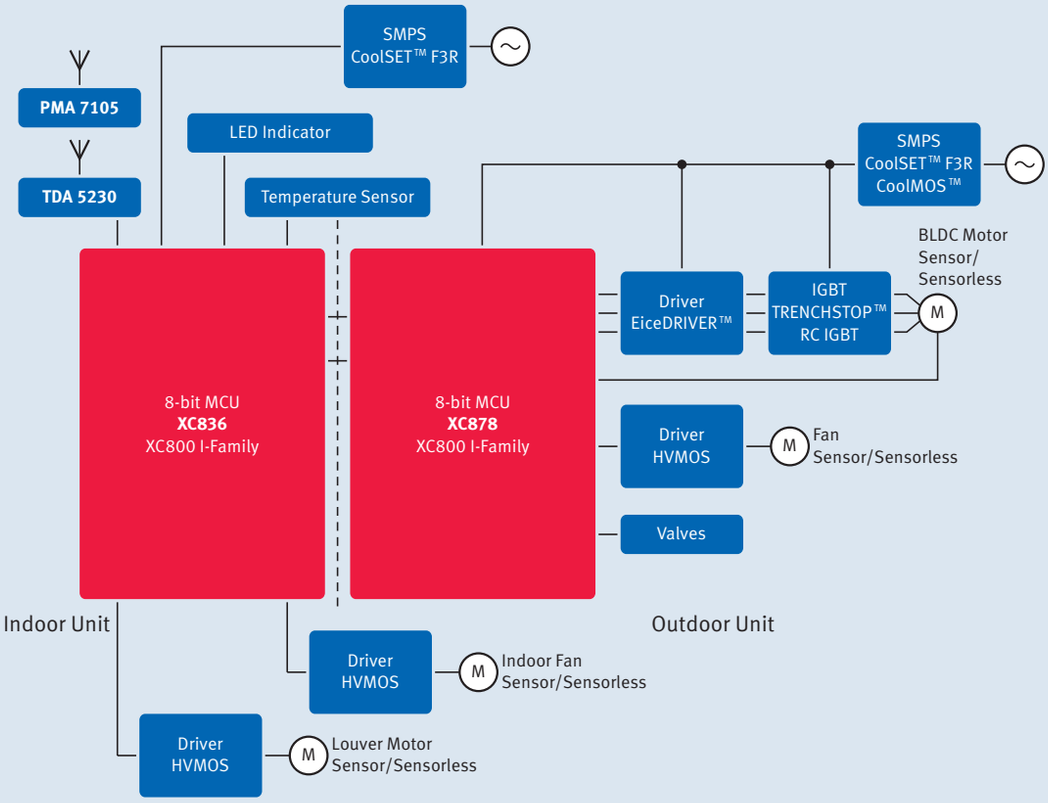
In the growing market for electronic vehicles like the E-Bike, low-cost and highly-efficient control solutions are required. In this example, the XC836 microcontroller handles the motor control, battery charging and other functions of the ECU. Key features of the controller include symmetric PWM with automatic dead-time for up to three phases, a fast AD converter that can be triggered synchronously with PWM, hardware-implemented fault handling and automatic Hall-effect sensor decoding and a HW noise filter.

Key Features

- High-performance motor control @ 48MHz
- Symmetric PWM with automatic dead-time for up to three phases
- Fast AD converter that can be triggered synchronously to PWM
- Hardware-implemented fault handling
- Automatic Hall-effect sensor decoding and HW noise filter

1) Number of signals

Application Example



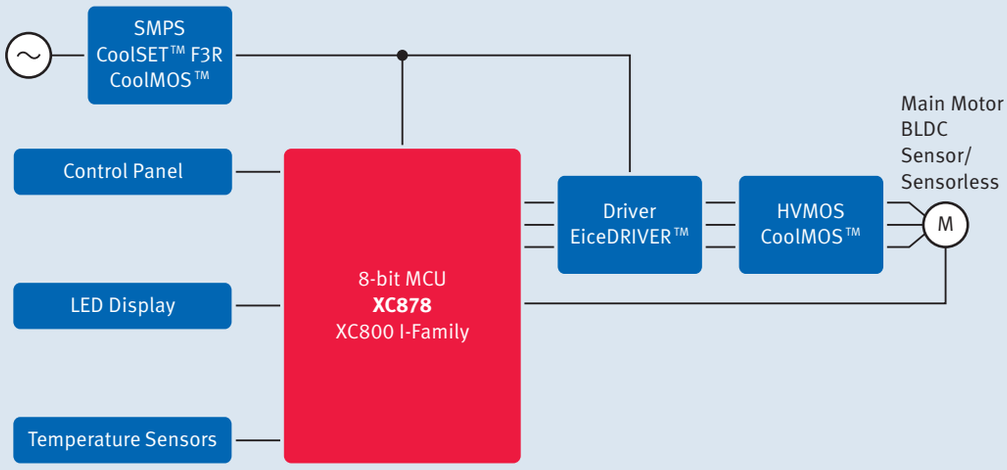
Air Conditioner

Due to the scarcity of fossil fuels and the negative environmental impact of CO_2 emissions, energy-efficient designs – especially in the case of mass applications – are crucial. Such mass applications include air conditioners – nowadays predominantly with low-efficiency motor drive and power conversion solutions. This example shows an improved solution with the use of only two 8-bit microcontrollers.

Key Features

- Inverter control
- Compressor restart delay
- Outdoor fan speed control
- Overcurrent protection
- Temperature control
- Power Factor Correction (PFC)
- Safety
- Temperature arithmetic processing
- Indoor fan control

Application Example



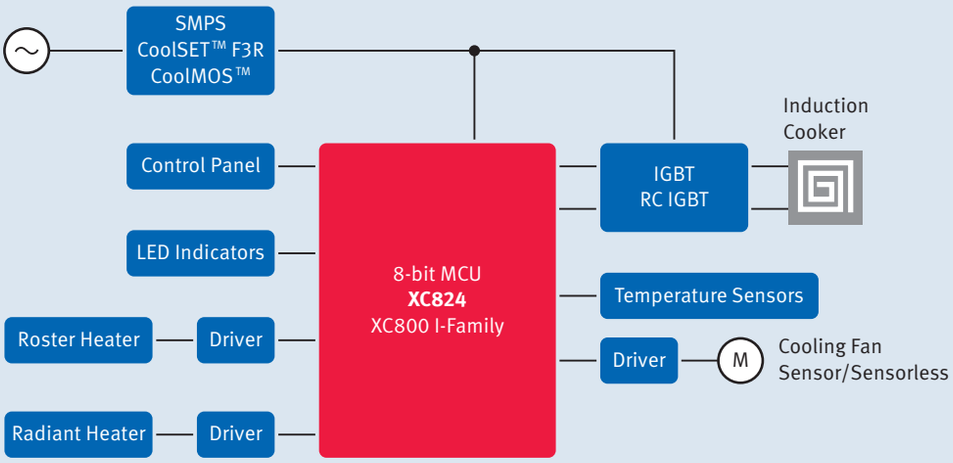
High-Efficiency Pumps/Fans

High-efficiency pumps/fans are another mass application and another good example of the high feature integration in our 8-bit microcontrollers. The XC878 handles the operation of high-efficiency pumps and fans, providing advanced motor control functionality such as field-oriented control for higher operation efficiency. Furthermore, the same microcontroller also performs power factor correction to increase the efficiency of power conversion. IEC 60730/Class B certification guarantees a proven secure solution for home appliance devices.

Key Features

- Temperature control
- LED display
- Inverter control
- Power Factor Correction (PFC)
- Safety

Application Example



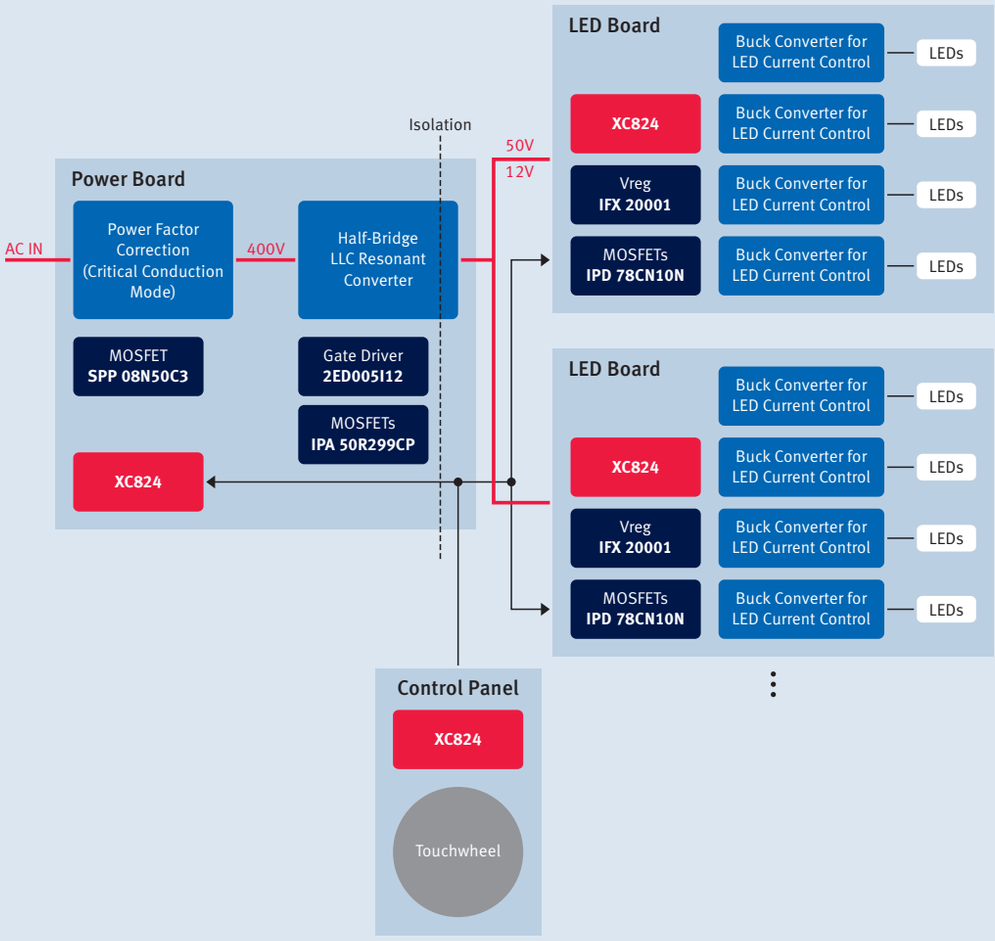
Induction Cooker

The electronic design of an induction cooker offers an excellent example of the high feature integration in our 8-bit microcontrollers. The XC824T microcontroller with only 4kB of Flash in a mere 20-pin package manages the cooking temperature control and provides advanced power switch control for increased efficiency and device durability. Furthermore, it enables a human-machine interface based on capacitive touch sense control and direct drive of the corresponding LED display.

Key Features

- Control panel capacitive touch sense control
- Direct drive of LED display
- Temperature control
- Timer control
- Power control
- Safety

Application Example



High-Brightness LED Lamp System

The No. 1 trend in contemporary lighting design is probably the advance made by high-brightness LEDs, driven by the high energy-efficiency and durability of LED. In addition to this, connectivity with lighting networks offers yet another incentive to increase the efficiency of solutions. The XC824 in this example enables a street lighting system design with a flexible and efficient power supply and network communication for remote light control. A major benefit to customers is the fact that this allows them to protect their solution and maintain flexibility using a SW solution stored in the MCU Flash memory.

Key Features

- Primary side AC/DC PFC and DC/DC control supporting a flexible output from 12V to 50V for various luminairs
- Secondary side LED current control
- Remote light control communication network
- Flexible and protectable SW solution stored in the MCU Flash

Low-Cost Solutions for Motor Control and Automation

In fast-growing mass markets in particular, low-cost and fast time-to-market solutions are crucial. Nevertheless, customers will accept no compromises in their quest for smart and energy-efficient designs. The mass markets for electric drives are increasingly adopting more efficient brushless motors or even sensorless motors, thereby reducing the bill of material (BOM) and making magnetic field sensors obsolete. Infineon's XC800 microcontrollers and solutions are an excellent fit for these emerging requirements. For many years now, Infineon has been a leading supplier of motor control in eBikes.

Product Benefits

The XC800 product family of 8-bit microcontrollers provides a scalable portfolio of low-cost devices for various types of motor control and industrial automation:

- Portfolio from 2kB to 64kB Flash and from 16-pin to 64-pin package options, qualified up to an operating temperature of 85°C
- Optimized peripherals and ROM code for field-oriented 3-phase motor control (FOC) solutions for AC/DC Power Factor Correction MultiCAN technology supporting 2 CAN nodes with 32 message objects
- Direct drive of stepper gauges 25mA with a sink current up to 50mA and overcurrent detection
- Protocol stack for implementation into IO-Link sensor/actuator networks
- For use in IEC 60730/Class B-certified applications

Scalable Motor Control Solutions

The XC800 microcontroller portfolio features scalability for various motor contol schemes.

XC866	XC822 XC824 + MDU	XC835 XC836 + Vector Computer	XC886 XC888 + Vector Computer	XC874 XC878 + Enhanced Vector Computer	XE166 XC2000 + MAC Unit
PWM Unit with Hall Sensor Mode	Fast PWM Unit with Hall Sensor Mode	PWM Unit Triggers ADC Unit	PWM Unit Triggers ADC Unit	Two PWM Units Trigger ADC Unit	Three PWM Units Trigger two ADC Units
Block Commutation with Hall Sensors	Sinusoidal Commutation with Hall Sensors	Field-oriented Control Sensorless	Field-oriented Control Sensorless	Field-oriented Control Sensorless	Dual Motor Field-oriented Control Sensorless

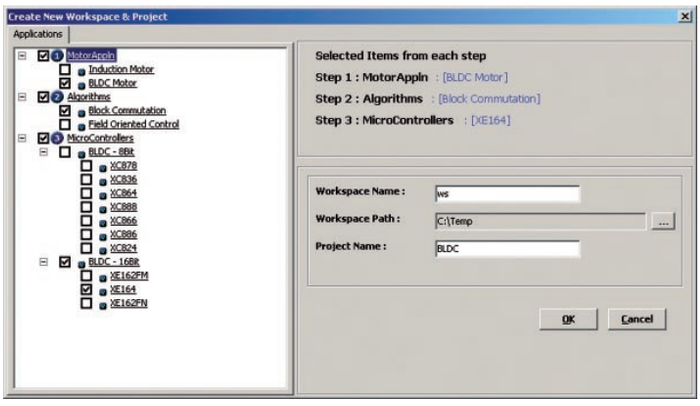
Infineon provides a wide range of BLDC bridge drivers, microcontroller-optimized for complete motor control solutions.

TLE 7183F	5.5 ... 28V	0 ... 100% Duty Cycle	1 OPAmp	No VReg	2-bit Diagnosis
TLE 7184F	7.0 ... 40V	0 ... 95% Duty Cycle	1 OPAmp	5V LDO Integrated	1-bit Diagnosis
TLE 7185E	5.5 ... 40V	0 ... 95% Duty Cycle	0 OPAmp	No VReg	1-bit Diagnosis
TLE 7188F	5.5 ... 28V	0 ... 100% Duty Cycle	2 OPAmps	No VReg	2-bit Diagnosis
TLE 7189F	5.5 ... 28V	0 ... 100% Duty Cycle	2 OPAmps	No VReg	2-bit Diagnosis

DAVE™ Drive – Application Code Generator for Motor Control

The DAVE™ Drive auto-code generator provides application code for a complete motor control system

- Significantly shortens the evaluation time for motor control developers as the motor control code can be generated via a GUI instead of writing several thousand lines of code by hand
- Gives hardware engineers easy access to electronic systems
- Uses the full power of Infineon's microcontroller – it generates, for example, optimized algorithm code for devices, a task which usually requires expert knowledge in both motor control and assembler programming
- Free download at www.infineon.com/davedrive



IO-Link Slave Solution for XC800

What is IO-Link?

- Standardized sensor/actuator interconnection
- Simple 3-wire point-to-point connection
- Sensor/actuator fully visible from the lowest to the highest communication layer
- Find out more at www.infineon.com/io-link

Benefits during installation, operation and maintenance

- Robust communication with built-in error detection
- Easy (re-)calibration and parameterization without engagement on sensor/actuator level, but from the top-level communication layer
- Easy integration into well-established fieldbus systems based on reduced and unshielded cabling

IO-Link

Partners for IO-Link SW Stack

Technologie Management Gruppe Karlsruhe

www.tmg-karlsruhe.de

MESCO Engineering

www.mesco.de

Motor Control Application Kits

Infineon's application kits for low-cost motor control and automation offer full hardware (HW) and software (SW) solutions for different power classes and topologies.

LIN Stepper Application Kit

www.infineon.com/LinStepper

Key Features

- XC866
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Supports 50 to 200mA stepper motor
- On-board stepper gauge
- Software package included to control the stepper motor and deploy your own design
- Free toolchain including compiler and debugger
- MiniWiggler for JTAG debug via USB interface
- Ready for LIN prototyping
- DAVE™-compatible software packages
- Suitable for Windows 98/2000/XP/7

Applications

- Instrumentation/gauges
- Multi-axis positioning
- Surveillance equipment
- CNC machining
- Printers
- Business machines

Automotive BLDC Motor Drive Kit

www.infineon.com/bldc

Key Features

- Scalable 3-phase inverter
- Sample code:
  FOC & V/f for XC886 and XC2238N
- Integrated protection features for high system reliability
- Complete IDE software packages included
- Easy installation, plug & play

Applications

- Pumps
- Fans

BLDC (Brushless DC) Application Kit

www.infineon.com/BLDC

Key Features

- XC866
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power board 9V – 18V, 20A
- 50W PMSM motor and plug-in 12V power supply
- Uses Infineon NovalithIC™ BTN 7960B and TLE 4264 LDO
- DAVE™ Drive auto-code generator (fully-functional application code) for
  - Block switching with Hall sensors and sensorless
  - Free toolchain including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- Tutorial videos demonstrating how to use the kit
- Suitable for Windows 98/2000/XP/7

Applications

- Water pumps
- Fuel pumps
- Fans
- Valves
- Power tools

DAVE™ Drive Application Kit

www.infineon.com/davedrive

Key Features

- XC886 with vector computer
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power Board 23V – 56V, 7.5A
- 15W PMSM motor and plug-in 24V power supply
- Uses Infineon 6ED003L06 gate driver, BSC196N10, MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- DAVE™ Drive auto-code generator (fully-functional application code) for
  - Block switching with Hall sensors and sensorless
  - Sensorless FOC of PMSM
- Free toolchain integrated in DAVE™ Drive
  - Flexibly generates optimized code and is not based on static libraries
  - Configures Infineon's powerful and flexible motor control peripherals
  - Compresses a detailed user manual into a few mouse clicks
  - Helps designers to quickly and easily implement advanced motor control techniques on low-cost components
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- Suitable for Windows 98/2000/XP/7

Applications

- Industrial motor controls
- Transportation systems
- Consumer motor controls
- Appliance motor controls

FOC Drive Application Kit

www.infineon.com/FOCdrive

Key Features

- XC878 with vector computer
  - Two independent PWM units
  - Fast ADC with ‹200ns sample time
- XE164 real-time signal controller with MAC unit
  - Three independent PWM units
  - Two independent fast ADCs with ‹200ns sample time
- Power board 23V – 56V, 7.5A
- 15W PMSM motor and plug-in 24V power supply
- Uses Infineon 6ED003L06 gate driver, BSC196N10, MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Sensorless FOC of PMSM with XE164
  - Sensorless FOC of PMSM with XC878
- Free toolchain for XC878 and XE164 including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAVE™-compatible software packages
- Suitable for Windows 98/2000/XP/7

Applications

- Industrial drives
- Fans, blowers
- Pumps

3-Phase Drive Application Kit

www.infineon.com/3phasedrive

Key Features

- XC886 with vector computer
  - PWM unit
  - Fast ADC with ‹200ns sample time
- Power board 110V – 230V AC, 3A
  - Inverter with 375W – 750W
- Uses Infineon IKCS12F60 CIPoS™ 12A, CoolSET™ ICE 3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Sensorless FOC of PMSM
  - V/f control of ACIM for quick evaluation
  - Free toolchain including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAVE™-compatible software packages
- DAVE™ Drive-ready
- Suitable for Windows 98/2000/XP/7

Applications

- Home appliances
  - Washing machines
  - Dishwashers
- Industrial motor controls
  - Pumps
  - Fans

Dual Motor Drive Application Kit

www.infineon.com/2motordrive

Key Features

- XC878 with vector computer
  - Two independent PWM units
  - Fast ADC with ‹200ns sample time
- XE164 real-time signal controller with MAC unit
  - Three independent PWM units
  - Two independent fast ADCs with ‹200ns sample time
- Power Board 110V – 230V AC, 8A
  - Inverter A with 900W – 1800W
  - Inverter B with 100 – 200W
  - Boost converter for Power Factor Correction (PFC)
- Uses Infineon IKCS17F60 CIPoS™ 17A, 6ED003L06 gate driver, SPD04N50C3 MOSFETs, IDT08S60 SiC diode, SPA15N60C3 MOSFETs, CoolSET™ ICE3B0565 power supply and TLE 4264 LDO
- Software package including source code
  - Simultaneous control of two PMSMs with sensorless FOC & digital PFC with XE164
  - Sensorless FOC & digital PFC with XC878
  - V/f control of ACIM for quick evaluation
- Free toolchain for XC878 and XE164 including compiler and debugger
- Digital isolated real-time monitoring tool (USB to JTAG and CAN bridge)
- DAVE™-compatible software packages
- Suitable for Windows 98/2000/XP/7

Applications

- Air conditioning
- Industrial drives
- Fans, blowers
- Pumps
- White goods

IO-Link Kit

www.infineon.com/io-link

Key Features

- XC800 8-bit microncontroller
  - High-performance 8051
  - Device IO-Link for intelligent control nodes
  - SPI interface
  - CAN, ADC, PWM, Timers
- XE166 16-bit real-time signal controller
  - Real-time performance
  - DSC
  - SPI interface
  - Hardware support for up to 10 IO-Link channels with FIFO buffer for each channel
  - Parallel Interface, CAN, ADC, PWM, Timers

Solutions for Advanced Touch Control

Infineon's technology is based on the capacitive touch sense principle and was optimized for easy use in highly-integrated industrial and automotive applications. The actual sensing is controlled via a dedicated functional unit on the microcontroller.

The high operation frequency allows time-multiplexed operations through the same pins. This way, for example, touch sensing can be combined with the control of an LED matrix used in displays.

Our dedicated microcontrollers from the XC82x and XC83x series feature a library for this solution as part of the ROM code.

Product Benefits

- Reliable touch control technology based on oscillator relaxation topology
- Adjustable to suit various cover materials
- Dedicated peripheral unit with 7 I/Os featuring combined touch and display control
- Low pin-count and cheap single-layer PCB designs
- Direct drive of stepper motors or displays with up to 50mA
- ROM library saves development time, Flash memory and CPU resources

Thanks to Infineon's touch control technology, customers can enjoy the benefits of a highly-customized touch interface layout – meaning that their human-machine interfaces will have a unique look and feel.

Button

The capacitance of the button electrode is gauged by the controller IC. The button's primary function involves detecting the presence of the user's finger. All types of button designs can be realized.

Slider

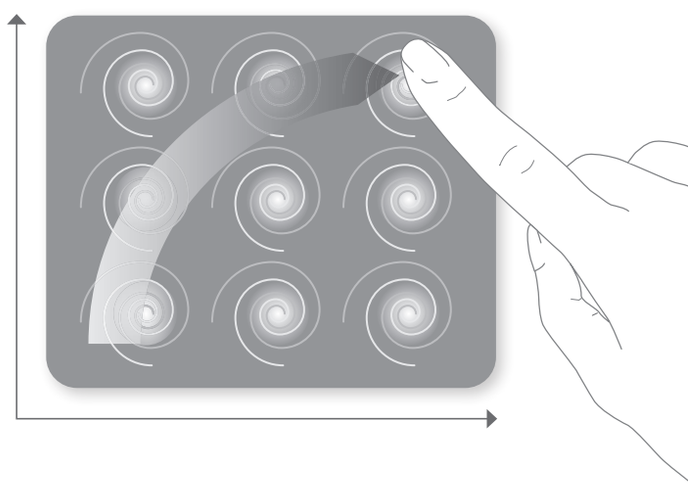
Finger movement along a one-dimensional path is detected by the slider function. Volume control is just one of the many areas to benefit from slider technology.

Wheel

A small amount of electrodes experience an increase in capacitance whenever a user scrolls the wheel with his/her finger. The precise position of the finger is then determined based on the calculated rise in capacitance.

Matrix

Numbers and letters are identified via matrix functionality. Finger movement is decoded to determine the precise function that the user wishes to access.



Application Kits for Advanced Touch Control

Color Wheel Application Kit — www.infineon.com

This kit is built around Infineon's new XC822 8-bit microcontroller and is a ready-to-use solution for adjusting the color, saturation or brightness of light using a capacitive touch wheel and button as its HMI.

The application example code is loaded to the microcontroller's Flash memory and can be accessed and modified with DAVE™ Bench – Infineon's free development tool chain. Customers can easily build up on this code and develop their own solution with a fast time-to-market.

Key Features

- Flexible and ready-to-use control solution for adjusting LED colors with a touch wheel XC822 microcontroller featuring capacitive touch and LED supply control
- Application example code for touch wheel/button and LED color control
- Documentation and tools on CD-ROM
  - DAVE™ Bench free development tool chain
  - Product and application documentation
- USB I/F for power supply and programming access

7-Button Application Kit www.infineon.com

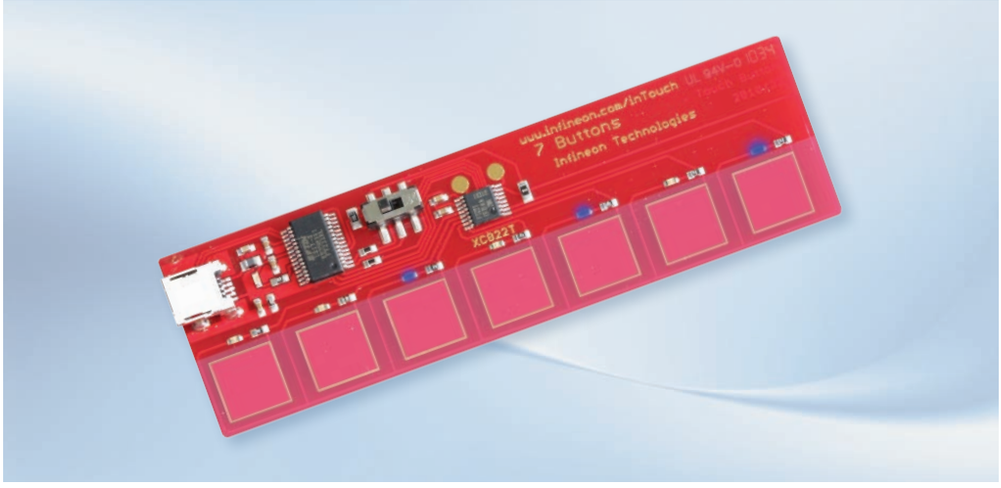
This kit is built around Infineon's new XC822 8-bit microcontroller and is a combined control solution for capacitive touch buttons and LED-display functionality. The sensing sensitivity is adjusted to work with a 2mm acrylic glass cover mounted on the substrate.

A dedicated functional unit on the XC822 microcontroller manages both the control of the capactitive touch sensing and the driving of an LED matrix for use in displays. A specific ROM code is part of the device – this reduces the workload involved in configurating and calibrating the design.

The application example code is loaded to the microcontroller's Flash memory and can be accessed and modified with DAVE™ Bench – Infineon's free development tool chain. Customers can easily build up on this code and develop their own solution with a fast time-to-market.

Key Features

- Flexible and ready-to-use solution for combined capacitive touch and LED-display control
- XC822 microcontroller featuring a dedicated functional unit for touch and display control and a ROM library for supporting configuration and calibration
- Application example code for controlling 7 touch buttons and 7 touch indicator LEDs
- Documentation and tools on CD-ROM
  - DAVE™ Bench free development tool chain
  - Product and application documentation
- USB I/F for power supply and programming access



Solutions for Intelligent Industrial Lighting

Due to escalating energy costs and a heightened awareness of energy consumption, lighting systems are more often viewed from a total cost of ownership (TCO) perspective.

Particularly in the field of industrial lighting systems such as office, building or street lighting, investments in advanced lighting and lighting control technologies pay off quickly. Effective measures aimed at increasing energy efficiency include the use of high-brightness LEDs, integration into lighting networks and the improvement of power stage efficiency. Especially when designing LED systems, consideration has to be given to the fact that LED light efficacy (lumen per Watt) will continue to increase due to ongoing progress in LED technology development.

All this drives the need for intelligent digital control and flexible system solutions.

Product Benefits

- A Capture/Compare Unit with direct ADC hardware link and flexible duty-cycle PWM with two 16-bit 48MHz timers e.g. for real-time control of power stages
- Multiple communication interfaces (UART, SPI, I_2C) and DALI protocol stacks for network integration
- Excellent device robustness for a long application lifetime (20-year data retention and over 130 thousand hours of operation)

DALI Solutions

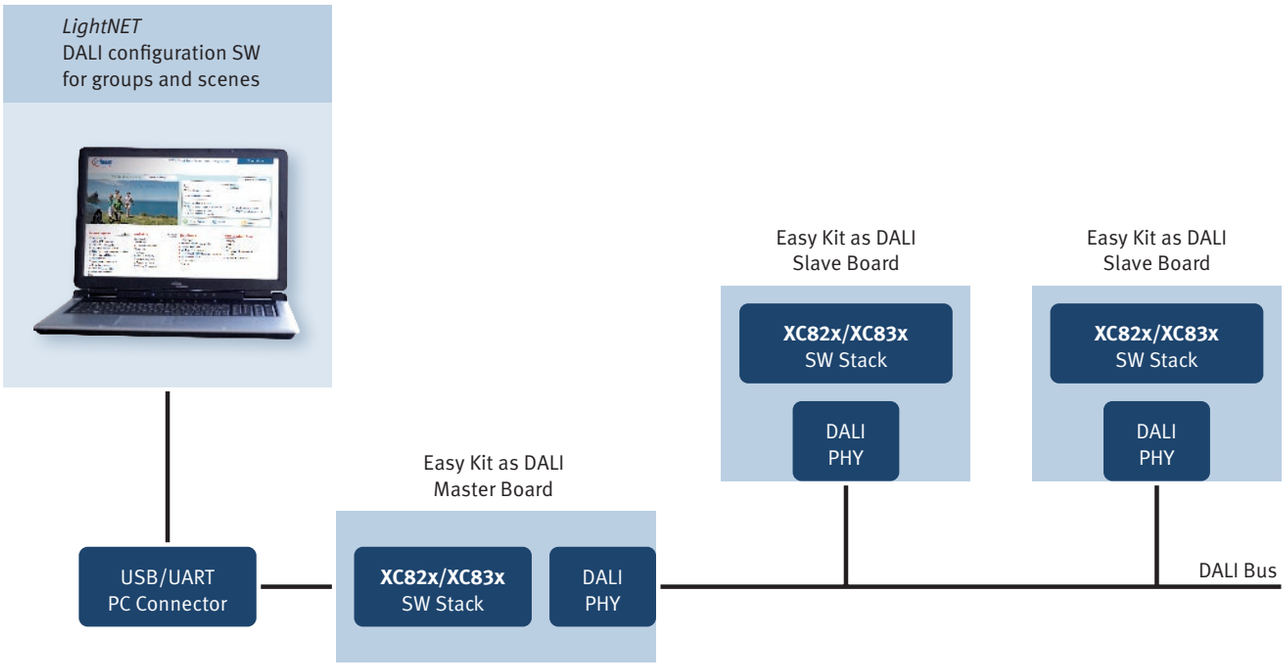
The Digital Addressable Lighting Interface (DALI) is a protocol that enables the design of lighting communication networks. For detailed information on DALI, please refer to www.dali-ag.org.

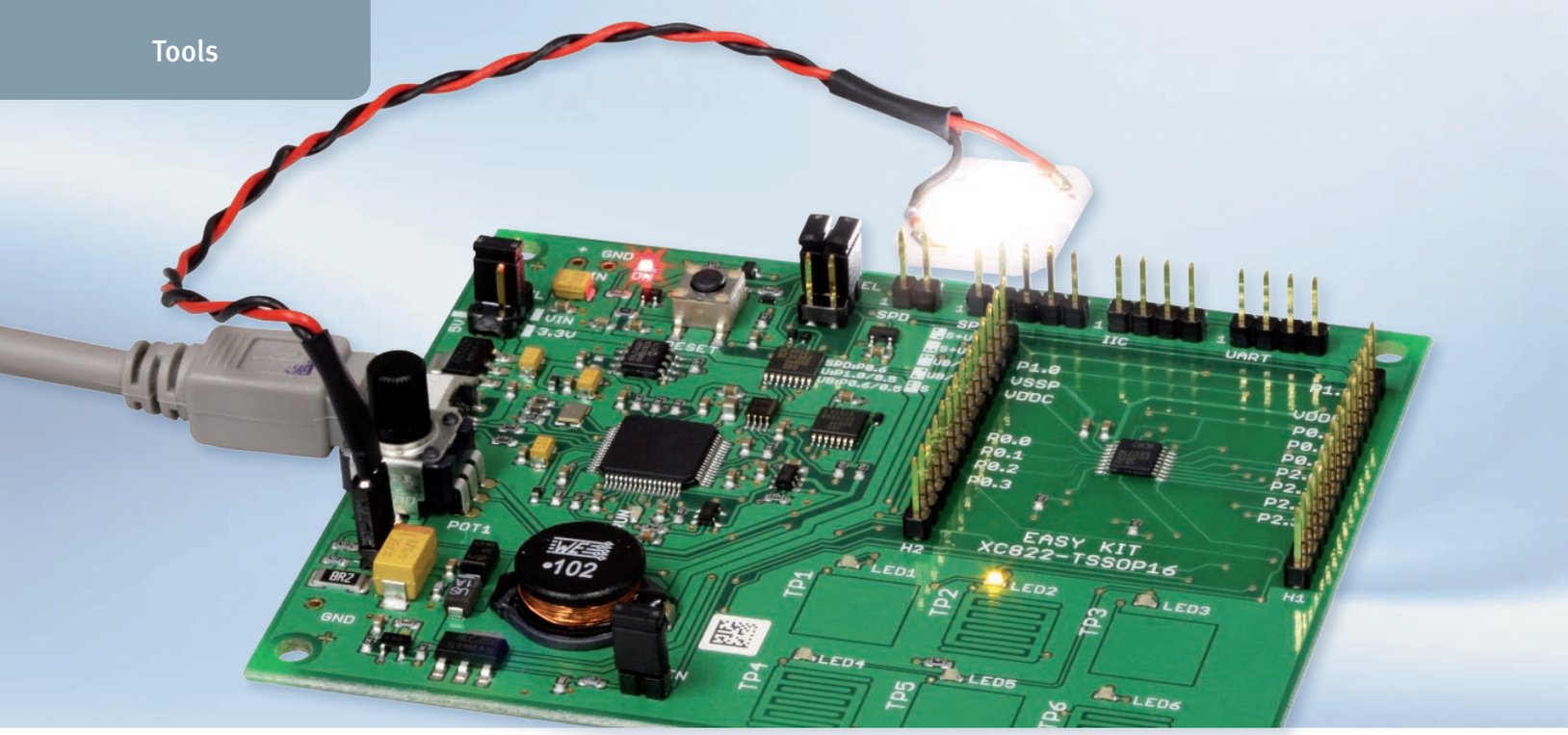
With its XC82x- and XC83x-Series, Infineon provides low pin-count microcontrollers for designing DALI-conforming control gears.

The DALI control gear software stack was tailored to suit these product series and is available as a free download (go to www.infineon.com/inlight and select the "DALI solutions" subcategory).

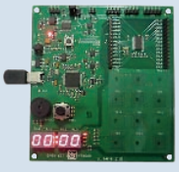
A dedicated evaluation kit will soon be available.

DALI Evaluation Kit and Tools from Infineon





Starter Kits

Board	Product Names	Description	Order No.
	XC822 8-bit Microcontroller	For evaluating XC822 microcontrollers; including USB cable, high-power LED module, boost converter, capacitive touch pads and CD-ROM with technical documentation (user manual, data sheets, board documentation, Errata sheets), DAVE™ Bench free development tool chain (compiler, debugger, Flash loader) and application code examples with hands-on training.	KIT_XC822_EK_V1
	XC835 XC836 8-bit Microcontroller	For evaluating XC835 and XC836 microcontrollers; including USB cable, capacitive touch pads, LED display and CD-ROM with technical documentation (user manual, data sheets, board documentation, Errata sheets), DAVE™ Bench free development tool chain (compiler, debugger, Flash loader) and application code examples with hands-on training.	KIT_XC836_EK_V1
	XC864 XC866 XC878 XC886 XC888 8-bit Microcontroller	For evaluating XC864/ XC866/XC878/XC886/XC888 microcontrollers; including documentation, compiler, debugger, operating system, parallel cable and one extension board.	KIT_XC864_EK_V1 KIT_XC878_EK_V1

USB Development Tools

XC800 USCALE – Starter Kit

The XC800 USCALE kit is a low-cost USB stick providing full evaluation capability for the XC866, XC886 and XC888 8-bit family of microcontrollers, all on a single platform. The kit includes a development tool chain, demos and tutorials for quick installation and ease-of-use, as well as access to the key features and hardware signals of each of the three microcontrollers for more extensive benchmarking and evaluation.

Key Features

- Low-cost USB stick format provides a single evaluation platform for the XC866, XC886 and XC888 8-bit microcontrollers
- Complete tool chain support for the XC800, high-performance 8051 family of products
- Access to hardware signals through a 16-pin connector for evaluating the key features of each 8-bit XC800 8051 microcontroller: CAN, ADC, CapCom6E and the 16-bit vector computer
- Easy installation with demos and tutorials for ease-of-use and quick evaluation of key features

DAP miniWiggler – High-Performance and Cost-Efficient Debugging Tool

The miniWiggler is Infineon‘s high-performance and cost-efficient debugging tool for the future. On the host side, it has an USB interface, which is available on every computer. On the device side, the communication is via Infineon 10-pin DAP or 16-pin OCDSL1 interfaces. The miniWiggler was designed especially to work in combination with Infineon’s Debug Access Software (DAS).

Key Features

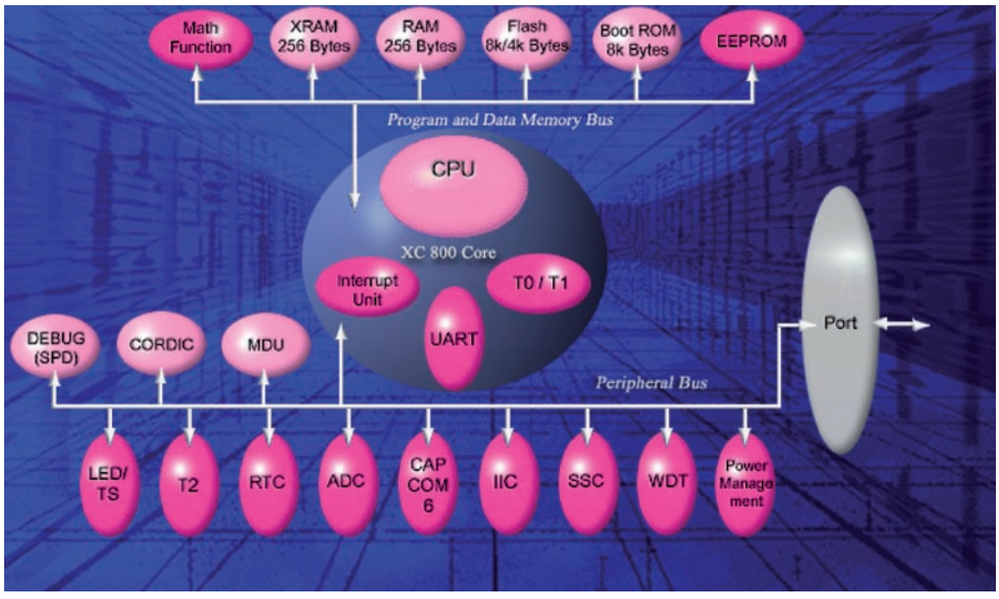
- Compatible with Infineon DAP and SPD
- Compatible with JTAG/IEEE 1149.1
- Clock rate up to 30MHz (programmable)
- All signals are 5.5V, scaling down to 1.65V
- USB 2.0 (high-speed)
- Certified drivers for Microsoft Windows 2000/XP/VISTA/7
- USB, JTAG and DAP/SPD hotplug and unplug
- Three on-board status LEDs
- Support for OCDS1 16-pin and DAP 10-pin connectors

DAVE™ – Digital Application Virtual Engineer

DAVE™ helps you to program the Infineon microcontroller of your choice, by offering intelligent wizards that configure the chip to work the way you need it and automatically generate C-code with appropriate driver functions for all of the on-chip peripherals and interrupt controls.

DAVE™ interacts directly with the IDEs from leading tool suppliers and with Infineon's free toolchain DAVE™ Bench.

To use DAVE™, you need the DAVE™ mother system and the DIP file for your specific microcontroller.



Key Features

- DAVE™ generates initialization code for Infineon microcontrollers
- DAVE™ displays all available peripherals in a block diagram at the start
- Click on a peripheral to define its functionality

DAVE™ Bench – The New Platform for Free Tools and Software

DAVE™ Bench is an eclipse-based platform for providing a complete set of development tools and support SW in a unified integrated development environment for Infineon microcontrollers. The first implementation supports the Infineon XC800 family.

Key Features

- Easy to use
  - The eclipse platform has been tailored for quick success and ease-of-use.
- Active project
  - By defining an active project, errors when building or debugging projects are avoided.
- Interface to DAVE™
  - The Infineon solution for generating configuration code: Easy import and switch between DAVE™ Bench and DAVE™.
- SDCC Compiler
  - Optimized for the XC800 family with an easy-to-use build management.
- FLOAD
  - Flash loader for downloading the hex code to the target via JTAG or UART/LIN BSL.
- Hitop Eclipse Debugger
  - Level one debugger that supports the Infineon miniWiggler and Easy Kit UAB adapter. It also includes an instruction set simulator.
- U-SPY
  - UART terminal including support to filter and sending predefined messages and visualizing received data.

Development Support/Tool Partners

Integrated Compiler Development Environment

KEIL An ARM® Company · Altium · IAR Systems · hitex Development Tools · DAVE™ Bench

Emulator & Debugger Development Systems

KEIL An ARM® Company · iSYSTEM · 伟福 · hitex Development Tools

Programmer/Programming Software

ELNEC · HI-LO SYSTEMS · BPM Microsystems · XELTEK Electronics · hitex Development Tools · SMH Technologies · Phyton · Zhiyuan Electronics

Operating System & Software

KEIL An ARM® Company

Simulation, Modelling & Rapid Prototyping

KEIL An ARM® Company · Altium

Auto-Code Generation Tools

DAVE™ · DAVE™ Drive

Software Partners

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Feature Overview XC800 A-Family

	Core		Flash with ECC		ROM	SRAM			I²C	FOC	UART	CAN	SPI	ADC	Capture/ Compare Units		Touch sense control	High current pads	PWM channels	Package	Temperature ($T_{ambient}$)
	Core	Frequency (MHz)	Program Flash	Data Flash	Program	Σ SRAM	RAM	XRAM		MDU	LIN	Channels	SSC	Channels	T2CCU	CCU6					
Feature Overview XC800 A-Family for Automotive																					
7-Series	8051	27	24-64	Up to 4		3328	256+64	3008	–	yes	3	Up to 2	1	8	1	1	–	–	10	LQFP-64	-40°C to +125°C
8-Series	8051	24	24-32	Up to 8	24-32	1792	256	1536	–	yes	2	Up to 2	1	8	–	1	–	–	4	TQFP-48/ LQFP-64	-40°C to +150°C
6-Series	8051	27	4-16	Up to 4	4-16	768	256	512	–	–	1	–	1	8	–	1	–	–	4	TSSOP-38	-40°C to +150°C
3-Series	8051	24	4-8	0.128		512	256	256	yes	yes	1	–	1	4/8	–	1	yes	yes	4	TSSOP-28	-40°C to +125°C
2-Series	8051	24	4	0.128		512	256	256	yes	yes	1	–	1	4	–	1	–	–	4	TSSOP-16	-40°C to +125°C

www.infineon.com/XC800

Feature Overview XC800 I-Family

	Core		Flash		SRAM	I²C	FOC	UART	CAN	SPI	ADC	Capture/ Compare Units		Touch sense control	High current pads	PWM channels	Package	Temperature ($T_{ambient}$)
	Core	Frequency (MHz)	Program Flash (KB)	Data Flash (KB)	Σ SRAM		CORDIC/MDU		Channels (messege objects)	SSC	Channels	T2CCU	CCU6					
Feature Overview XC800 I-Family for Industrial & Multi-Market																		
7-Series	8051	27.67	52/64	Up to 4	3320	no	yes	yes	2 (32)	yes	8	1	1	no	no	10	TQFP-64	-40°C to +125°C
5-Series	8051	27.67	24/52/64	Up to 4	3320	no	no	yes	2 (32)	yes	8	1	1	no	no	10	TQFP-64	-40°C to +125°C
8-Series	8051	24	24/32	Up to 8	1792	no	yes	yes	2	yes	8	0	1	no	no	4	TQFP-48/ TQFP-64	-40°C to +125°C
6-Series	8051	27.67	4/8/16	Up to 8	768	no	no	yes	0	yes	8	0	1	no	no	4	TSSOP-20/ TSSOP-38	-40°C to +125°C
3-Series	8051	24	4/8	0.128	512	yes	yes	yes	0	yes	8	0	1	yes	yes	4	DSO-24/ TSSOP-28	-40°C to +125°C
2-Series	8051	24	4	0.128	512	yes	no	yes	0	yes	4	0	1	yes	no	4	TSSOP-16/ DSO-20	-40°C to +125°C

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