TRAVEO™ T2G 32-bit Microcontroller

TRAVEO™ T2G Microcontrollers for Smart green mobility and Safety critical industry applications

www.infineon.com/traveo

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Evolution of TRAVEO™ generations

Fostering excellence through continuous innovation

- 16 bit original CPU core
- CAN controller
- 350 nm technology

- 32 bit original CPU core
- FlexRay controller
- 180 nm technology

- Arm Cortex-R4 CPU core
- SHE secuirty
- 2D graphic controller
- 90 nm technology

- Arm Cortex-M4 / M7 CPU core
- SHE / HSM secuirty
- 40 nm technology

| 16LX | 16FX | FR60 | FR81S | FCR4 | TRAVEO™ T1G | TRAVEO™ T2G | New generation |

- 16 bit original CPU core
- LIN controller
- 180 nm technology

- 32-bit original CPU core
- 2D graphic controller
- 90 nm technology

- Arm Cortex-R5 CPU core
- SHE secuirty
- 2D/3D graphic controller
- CAN FD / Ethernet controller
- 55 / 40 nm technology

The architecture of TRAVEO™ Microcontrollers has been actively shaped with 30 years of experience gained by building 5 predecessor MCU series built for the automotive segment.

16LX was the first 16-bit original CPU core Automotive CAN controller that was launched by Infineon (formerly known as Fujitsu products). In order to meet the increasing demands of CPU performance and new automotive features, 16FX was introduced to the market. After that, 32-bit original CPU FR60/81S core was launched to meet the increasing performance requirements of the market. Further to this, FCR4 was introduced , which was the first to adopt Arm Cortex cores.

The TRAVEO™ T1G used Arm Cortex-R5 and CAN FD controller was also newly introduced. The latest TRAVEO™ microcontroller series is the second generation of high-performance 32-bit Arm processors using the same architecture for automotive applications

in the area of instrumentation and body control electronics. Automotive market today needs to integrate more functions electrically without increasing power consumption proportionally. There is also a strong requirement for communication interfaces such as CAN FD and Ethernet to support the ever increasing data needs in automotive networking. There is also a clear demand for increased security and safety having state-of-the-art user-programmable security modules onboard to allow different levels of autonomous driving.

The TRAVEO™ T2G uses similar peripherals across the whole portfolio easing transitions when more code memory is needed, or a larger package becomes necessary. Of course, a lot of the effort needed for such transitions is handled by the AUTOSAR MCAL software designed according ISO 26262 and available for all TRAVEO™ T2G MCUs.

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TRAVEO™ T2G Body

CY	T	X	X	X	X	B	X	A	Q	X	XX	X	GS	X

- Company ID
- ATV MCU family
- MCU core
- Application
- cFlash / wFlash / RAM density
- Package
- Hardware
- Marketing
- Revision
- Fab Location
- Reserved
- Package code
- Temperature
- Quality
- Tape / Reel shipment (opt.)

CY Infineon

T TRAVEO™ T2G

B Body

B eSHE
C HSM (RSA 2K)
D HSM (RSA 4K)

GS Qualified

2 Single Core M4
3 Single Core M7
4 Dual Core M7
6 Quad Core M7

6	512 KB / 64 KB / 64 KB (CYT2B6 series)
7	1 MB / 96 KB / 128 KB (CYT2B7 series)
9	2 MB / 128 KB / 256 KB (CYT2B9 series)
B	4 MB / 256 KB / 768 KB (CYT3BB / CYT4BB series)
L	4 MB / 128 KB / 512 KB (CYT2BL series)
F	8 MB / 256 KB / 1024 KB (CYT4BF series)
J	16 MB / 512 KB / 2048 KB (CYT6BJ series)

3	64 pin
4	80 pin
5	100 pin
7	144 pin
8	176 pin
B	272 balls
C	320 balls

	Ethernet	Flexray	eMMC
A	off	off	off
B	1ch	off	off
C	1ch	on	off
D	1ch	on	on
E	1ch	off	on
F	2ch	off	off
G	2ch	on	off
H	2ch	on	on
J	2ch	off	on

AE	TQFP
AZ	LQFP
BZ	BGA

S	-40 °C - +105 °C
E	-40 °C - +125 °C

Non: Tray
T Tape and Reel shipment

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TRAVEO™ T2G Cluster

| CY | T | X | X | X | X | B | X | A | Q | X | XX | X | GS | X |

Company ID → **CY** Infineon

ATV MCU family → **T** TRAVEO™ T2G

MCU core → **2** Single Core M4 / **3** Single Core M7 / **4** Dual Core M7

Application →
C Cluster
D Cluster w/ 2D graphics
E Cluster w/ 2D graphics + DDR i/f

cFlash / wFlash / RAM density:
L 4 MB / 128 KB / 512 KB (CYT2CL series)
L 4 MB / 128 KB / 384 KB (CYT2DL series)
N 6 MB / 128 KB / 640 KB (CYT4DN/4EN series)

Package:
5 100 pin
5 144 pin
8 176 pin
A 216 balls
B 272 balls
D 500 balls
H 144 pin (0.4 mm pitch)
J 327 balls

Hardware → **B** HSM (RSA 3K) enabled

Marketing

Revision

Fab Location

Reserved

Package code:
AE TQFP
AZ LQFP
BZ BGA

Temperature:
S -40 °C +105 °C
E -40 °C +125 °C

Quality → **GS** Qualified

Tape / Reel shipment (opt.):
Non: Tray
T Tape and Reel shipment

	JPEG Decoder	DAC	MIPI	Device Option	CYT2C	CYT3D	CYT4D	CYT4E
A	no	no	no	no	X	X	X	X
B	no	no	no	yes		X	X	
C	no	no	yes	no		X	X	X
D	no	no	yes	yes		X	X	
E	no	yes	no	no		X	X	X
F	no	yes	no	yes		X	X	
G	no	yes	yes	no		X	X	X
H	no	yes	yes	yes		X	X	
J	yes	no	no	no			X	X
K	yes	no	no	yes			X	
L	yes	no	yes	no			X	X
M	yes	no	yes	yes			X	
N	yes	yes	no	no			X	X
P	yes	yes	no	yes			X	
Q	yes	yes	yes	no			X	X
R	yes	yes	yes	yes	X	X		

Device	Allowed device options	
	No	Yes
CYT2CLxxx	No device options	
CYT3DLxxx	1 × Video-out	2 × Video-out
CYT4DNxxx	1 × SMIF	2 × SMIF
CYT4ENxxx	No device options	

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TRAVEO™ T2G Cluster – Software bundle

| CY | T | X | X | X | X | B | X | A | Q | X | XX | X | GS | X |

Company ID → **CY** Infineon

ATV MCU family → **T** TRAVEO™ T2G

MCU core

Application → **D** Cluster w/2D graphics

cFlash / wFlash / RAM density

Package

Hardware → **B** HSM (RSA 3K) enabled

Marketing

Revision

Fab Location

Reserved

Package code → **AE** TQFP / **BZ** BGA

Temperature → **S** -40 °C +105 °C

Quality → **GS** Qualified

Tape / Reel shipment (opt.) → **Non** Tray / **T** Tape and Reel shipment

3 Single Core M7
4 Dual Core M7

L 4 MB / 128 KB / 384 KB (CYT3DL series)
N 6 MB / 128 KB / 640 KB (CYT4DN series)

A 216 pins
B 272 balls
J 327 balls

Device	Marketing	JPEG decoder	Device option	Run time	Infineon	Graphic driver
CYT3DL series	S	no	2×Video-ut	Qt	yes	
CYT3DL series	Z	no	2×Video-ut	no	yes	
CYT4DN series	S	yes	2×SMIF	Qt	yes	
CYT4DN series	Z	yes	2×SMIF	no	yes	

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TRAVEO™ T2G Product highlights

High performance Body and Driver information Microcontroller

The Infineon TRAVEO™ T2G microcontrollers, based on the Arm® Cortex®-M4/M7 core, offer high performance, advanced human-machine interfaces, and robust security for various automotive applications.

They provide state-of-the-art real-time performance, safety, and security features, and are used in motor control for hybrid and electric vehicles, as well as body electronics. The family supports the latest in-car networks, with a focus on high performance and data security.

TRAVEO™ T2G Body

- Low power consumption
- Deepsleep 35uA ~

- True FOTA support

- Function Safety
- ISO 26262 ASIL-B support and IEC 61508 SIL 2 support

- Full Evita support with ISO 21434-ready

- Widely product portfolio with various communication
  (Ethernet, CAN FD, LIN, CXPI, FlexRay, SPI, UART, I²C)

- High performance motor control

- Media interface
- Audio I²S/TDM 96kHz high resolution support
- SD host controller and eMMC interface

- AUTOSAR software platform

TRAVEO™ T2G Cluster

- Low power consumption
- Deepsleep 50uA ~

- True FOTA support

- Function Safety
- ISO 26262 ASIL-B support and IEC 61508 SIL 2 support

- Full Evita support with ISO 21434-ready

- Widely product portfolio with various communication
  (Ethernet, CAN FD, LIN, CXPI, SPI, UART, I²C)

- High pereformance harware graphic engine

- Media interface
- Audio I²S/TDM 48kHz and Audio D/A converter embedded
- SD host controller and eMMC interface

- AUTOSAR software platform

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TRAVEO™ T2G Body

High performance Body and Driver information Microcontroller

The TRAVEO™ T2G connected ready MCU family is designed for the smart world. The family offers wide scalability and network connectivity built into a single Arm® Cortex®- M4 and dual Cortex®- M7. Performance has also been enhanced from 400 DMIPS in TRAVEO™ T1G, to 1500 DMIPS in TRAVEO™ T2G. The TRAVEO™ T2G for body electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution. TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module),

dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA require-ments. The body family also features six power modes that enable ECUs to minimize overall power consumption. Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware. re provides a flexible and comprehen-sive development experience for the TRAVEO™ T2G devices.

Features and benefits

Key features

Up to dual 350-MHz 32-bit Arm® Cortex®-M7 CPUs, each with
– Single/double-precision floating point unit (FPU)
– Up to 8384 KB of code-flash with an additional up to 256 KB of work-flash
– Up to 1024-KB of SRAM with selectable retention granularity
– Cryptography engine. Supports Enhanced Secure Hardware Extension (eSHE) and Hardware Security Module (HSM)
– Functional safety for ASIL-B
– Low-Power 2.7-V to 5.5-V operation
– Up to 10 CAN FD channels, Up to 20 independent LIN channels
– Up to two 10/100/1000 Mbps Ethernet MAC interfaces conforming to IEEE-802.3az
– FlexRay interface (V2.1) configurable for single or dual data-channels for fault tolerance, supporting data rates up to 10 Mbps
– External memory interface: SPI and HYPERBUS™ interface
– SDHC (Secure Digital High Capacity) and MultiMediaCard (eMMC) interface
– Audio interface: Inter-IC Sound (I2S) Interfaces and Time division multiplexed (TDM) audio formats
– Three SAR 12 bit-A/D converters
– Debug interface: JTAG controller and interface compliant to IEEE-1149.1-2001 and SWD
– Packages: LQFP 64 to T/LQFP 176, 272-BGA and 320-BGA (CYT4BF)
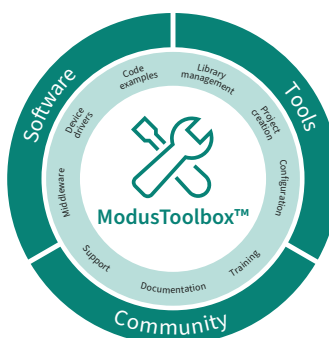– Qualified for automotive application according to AEC-Q100

Key benefits

The TRAVEO™ T2G for body electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution.
TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module), dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA requirements.
Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware.
ModusToolbox™ software provides a flexible and comprehensive development experience for the TRAVEO™ T2G devices.

The TRAVEO™ T2G devices are fully supported by ModusToolbox™
– Variety of code repositories on GitHub that are comprehensive, flexible, and atomic
– Repositories include board support packages (BSPs), low-level resources like a hardware abstraction layer (HAL) and peripheral driver library (PDL)

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TRAVEO™ T2G Cluster

Providing unparalleled excellence for automotive cluster and graphic

TRAVEO™ T2G automotive MCU family for Instrument Cluster with its new graphics architecture enables a more robust and feature-rich graphics engine for automotive display systems. The product families provide the most extensive scalability, covering the conventional gauge instrument cluster, hybrid instrument cluster, and virtual instrument cluster.

The option of line-based operation of the graphics engine within the microcontroller minimizes the memory required for graphics processing. With the optimized 2.5D graphics engine and extended density of embedded Flash and Video RAM, TRAVEO™ T2G graphic MCU can support the virtual instrument cluster with high resolution up to 2880 × 1080.

Features and benefits

Key features

- Up to dual 320-MHz 32-bit Arm® Cortex®-M7 CPUs, each with
- Single/double-precision floating point unit (FPU)
- Up to 6336 KB of code-flash with an additional up to 128 KB of work-flash
- Up to 640-KB of SRAM with selectable retention granularity
- Cryptography engine. Supports Enhanced Secure Hardware Extension (eSHE) and Hardware Security Module (HSM)
- Functional safety for ASIL-B
- Low-Power 2.7-V to 5.5-V operation
- Supports 2D and 2.5D (perspective warping, 3D effects) graphics rendering
- One Capture engine for video input processing for ITU 656 or parallel RGB/YUV or MIPI CSI-2 input
- Up to 2 video output interfaces supporting two displays from Parallel RGB and FPD-link single/dual
- JPEG decoder (CYT4DN/CYT4EN)
- Up to 4 CAN FD channels, up to 2 independent LIN channels
- Up to two 10/100/1000 Mbps Ethernet MAC interfaces conforming to IEEE-802.3az
- Up to 2 SMIF interface (Single SPI/Dual SPI/Quad SPI/Octal SPI/xSPI)
- External memory interface: SPI and HYPERBUS™ interface
- SDHC (Secure Digital High Capacity) and MultiMediaCard (eMMC) interface
- Audio interface: Inter-IC Sound (I2S) Interfaces and Time division multiplexed (TDM) audio formats
- An SAR 12 bit-A/D converters
- Packages: 144-LQFP (0.4 mm/0.5 mm pitch) and 176-LQFP (CYT2CL), 216-TEQFP and 272-BGA (CYT3DL), 327-BGA (CYT4DN), 500-BGA (CYT4EN)
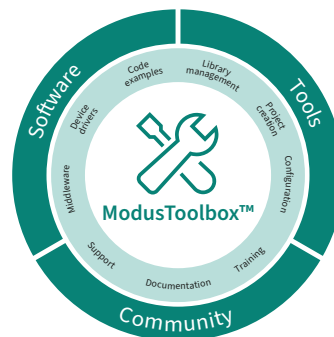
Key benefits

The TRAVEO™ T2G for cluster electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution.
TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module), dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA requirements.

Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware.
ModusToolBox™ software provides a flexible and comprehensive development experience for the TRAVEO™ T2G devices.

The TRAVEO™ T2G devices are fully supported by ModusToolBox™
- Variety of code repositories on GitHub that are comprehensive, flexible, and atomic
- Repositories include board support packages (BSPs), low-level resources like a hardware abstraction layer (HAL) and peripheral driver library (PDL)
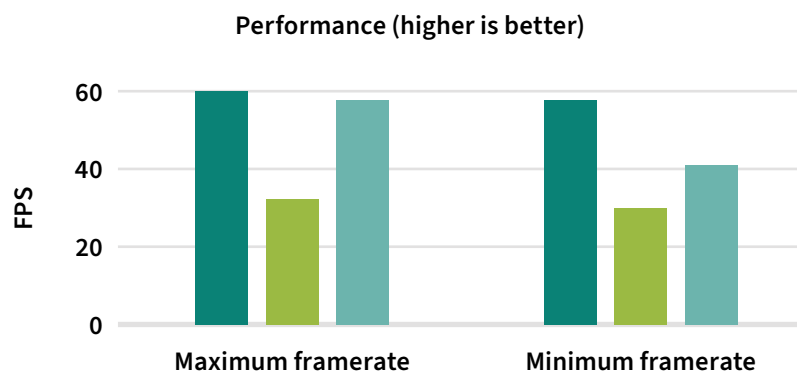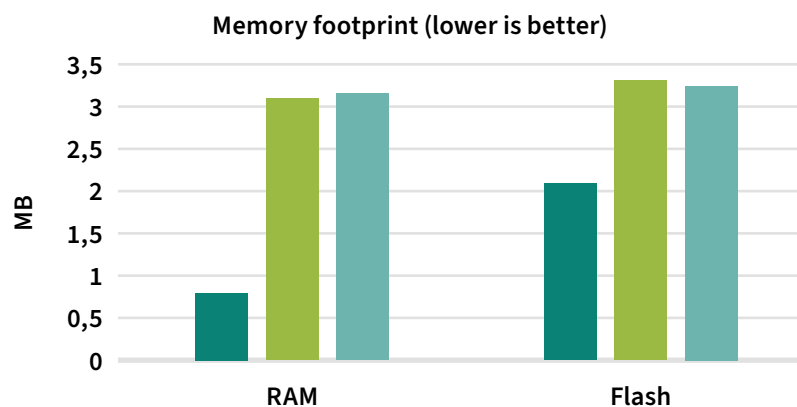
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TRAVEO™ T2G Cluster

Unrivalled Performance
Highest frame rate, lowest footprint

Performance (higher is better)

FPS

Maximum framerate   Minimum framerate

TRAVEO™ T2G™ is the only MCU-based solution for 60 fps at resolutions up to full HD

Memory footprint (lower is better)

MB

RAM   Flash

Highest level of design freedom

Up to 5x less RAM usage compared to the competition

Fast boot time

Infineon and Qt Group take UIs on MCUs to the next level, ensuring maximum performance using minimal resources.
– TRAVEO™ T2G is the only MCU-based solution for 60 fps at resolutions up to **full HD**
– **Up to 5x less RAM** on the same design with Infineon's smart rendering technology
– Significantly **lower boot time** than with an MPU-based solution
– Qt for MCUs on TRAVEO™ T2G empowers the highest level of **design freedom**

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Unrivalled Performance

Key Metrics			Infineon CYT3DL series	Competitor 1	Competitor 2
Display		Resolution	800 × 480	800 × 480	800 × 480
		Pixel Depth	32-bit color	32-bit color	32-bit color
RAM Usage	**Internal**	Qt runtime[1]	143 kB (SRAM + VRAM)	119 kB (LRAM + VRAM)	154 kB (SRAM)
		Framebuffer	638 kB[2] (VRAM)	–	–
		Total	**781 kB**	**119 kB**	**154 kB**
	External	Framebuffer	–	3000 kB (SDRAM)	3000 kB (SDRAM)
		Total	**0 kB**	**3 MB**	**3 MB**
		Total	**781 kB**	**3.1 MB**	**3.1 MB**
Flash Usage	**Internal**	Qt Applicatuions[3]	758 kB (code flash)	846 kB (code flash)	–
		Assets[4]	1317 kB (code flash)	2472 kB (code flash)	–
		Total	**2.08 MB**	**3.32 MB**	**0 MB**
	External	Qt Applicatuions[3]	–	–	593 kB (hyper flash)
		Assets[4]	–	–	2643 kB (hyper flash)
		Total	**0 MB**	**0 MB**	**3.24 MB**
		Total	**2.08 MB**	**3.32 MB**	**3.24 MB**
Frame rate	Max		60	32	58
	Min		58	30	41

1 Includes static allocations plus dynamic allocations (heap, stack, caches)
2 Line buffer for On-The-Fly rendering mode
3 Includes Qt application, library, and platform code, and all its dependencies (drivers, HW libraries)
4 Includes images and fonts. Direct addressing from flash, not cached in RAM on all platforms

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System Architecture

TRAVEO™ T2G Sytem Architectures

FOTA upgradability

Available on all TRAVEO™ T2G

In the automotive embedded systems, FOTA (Firmware over-the-air) update is a remote software management technology that helps to perform wireless firmware upgrade on the device. Upgrading the device firmware once it is on the field might be essential especially when the system demands critical bug fixes, addition of a new feature, removal of an existing feature, and so on. The complete implementation of FOTA, True FOTA is highly dependent on the device architecture.

Features

TRAVEO™ T2G includes all True FOTA requirements:
– Dual-bank memory support
– Read-while-write memory, allowing execution of software (read) while programming (write)
– HSM-level security

Benefits

Customers can update of the software image in the background without interruption of service, not being recognized by the user and Roll-back in case of failure.

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Graphics

Available on TRAVEO™ T2G Cluster

TRAVEO™ T2G cluster families provide the most extensive scalability, which covers the conventional gauge instrument cluster and hybrid instrument cluster, as well as the virtual instrument cluster. With the optimized 2.5D graphics engine TRAVEO™ T2G graphic MCU can support the virtual instrument cluster design with high resolution up to 2880 × 1080. The option of line-based operation of the graphics engine within the microcontroller minimizes the memory required for graphics processing.

Features

Graphics engine composes content from different sources with configurable layers by alpha blending:
– Smooth gradients by an alpha channel inside images/buffers Image independent gradients by a dedicated alpha map
– Fade-in/Fade-out by constant alpha
– 2D operations for layers provides:
– Scaling, Rotation (90° steps) horizontal or vertical flip
– Color format conversions
– Direct image processing from external memory
– Stream video directly from video capture to display (capture-to-display mode)
– Warping on-the-fly eliminates external memory
– Decompression from external memory

Benefits

Infineon offers rich graphics, with cost-competitive scalable solutions with respect to graphics performance, memory, peripherals, security, and functional safety to enable all cluster categories from 2D hybrid clusters to 3D reconfigurable digital clusters with low system power consumption.

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Audio

Available on TRAVEO™ T2G Cluster

TRAVEO™ T2G includes Audio features and used for Front proximity warning, Rear proximity warning, Key input, warning, Hazard sound, Turn sound, Emergency brake, Back sound, Seat belt warning, Emergency speed, Opening sound and so on. Retain quality after synthesis by managing saturation, Minimize required storage memory, Parameterized sound generation for simple signal sound (PDM format), Fade-in/out function supports sound effects such as reverberation, PCM output with 48 kHz and 16-bit resolution per channel, Audio DAC with 2 × 48 kHz and 16-bit resolution per channel.

Features

Audio feature features are:
– Synthesize multiple sound sources
– Mix sources with different frequencies
– PCM sound input via I2S/TDM' SoundGen
– PCM-PWM
– DAC

Benefits

TRAVEO™ T2G cluster Audio system can synthesize multiple sound sources with minimize required storage memory which enables BOM cost reduction.

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Versatile Applications of Artificial Intelligence in TRAVEO™ T2G

Artificial Intelligence Use cases on TRAVEO™ T2G

Sensors	– Rain Sensors – Better detection of raindrops with AI – Window Pinch Detection – Superior accuracy in detection of pinch condition and other Body / Motor control

Predictive Maintenance	– Better prediction of Sensors & Actuator lifetime state- – Health Observation of ECUs for earlier maintenance and replacement / availability-lighting, motors etc.

Gateway & Security	Improved accuracy and anomaly detection for Vehicle Entry systems
	AI based Intrusion Detection on IVN (CAN or Ethernet)

Predictive & Efficiency	HVAC control: AI enables Higher Energy Efficiency
	AI based Predictive Thermal management considering Battery, Drive and ECU heat circuits

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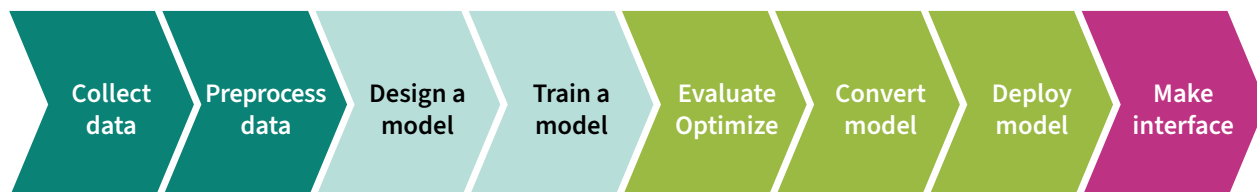
Artificial Intelligence in BCM, Body domain and Zones

Application Use Cases for Embedded AI in BCM, & Body domain/zones

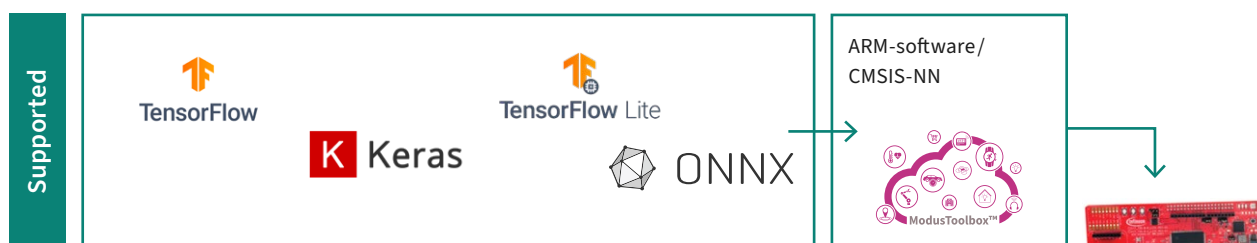| E/E Architecture	Megatrend	Application	Use Case	Technical Benefit of AI
BCM/Body Zone	User Experience	Rain sensor	Improved detection of Raindrops	**AI improves** rain sensor performance
Door Module/BCM/Door Zone	Passenger Safety	Window pinch detection	Detect window pinch condition	**AI better's user safety** by more accurately predicting window pinch condition
Vehicle Entry Body Domain Body Zone	Security	Networking Security	Intrusion Detection	**AI facilitates security** by improving detection of attacks
Body Domain/Body Zone	Diagnostics & Maintenance	Predictive Maintenance	Vehicle/ECU health	**AI enables** a prediction about **lifetime state** of local sensors and actuators such as lighting, power elements & drivers
BCM	Motor Control	Small motor control	Local actuators	Accuracy increase of motor control
BCM/HVAC	Cabin Interior	HVAC Loop	Improved HVAC control	AI improves **Energy efficiency**, better temperature control and in cabin comfort (air mix, flow)
BCM/BDC/Body Zone	eMobility	Thermal Management	Cooling	**AI facilitates** better control of cooling & thermal management and better utilization of sensor information

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Artificial Intelligence
Unleash the Power of AI with TRAVEO™ T2G

Typical AI development Flow

Collect data › Preprocess data › Design a model › Train a model › Evaluate Optimize › Convert model › Deploy model › Make interface

NN deployment reusing ARM ecosystem

Supported

TensorFlow · Keras · TensorFlow Lite · ONNX → ARM-software/CMSIS-NN · ModusToolbox™

Infineon End to End ML development chain

Comming soon

imagimob — An Infineon Technologies Company · ModusToolbox™ VL
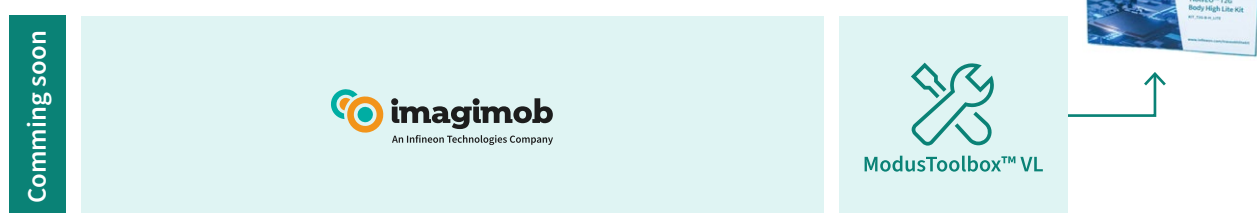
TRAVEO™ T2G supports standard ARM ecosystem for AI training & development & deployment using ModusToolbox™
– Easy Start of Development using standard Ecosystem

Infineon's End to End Machine Learning Solution with Imagimob & Modus Toolbox ML under development
– Out of the box examples will be provided for easy tailoring

imagimob
An Infineon Technologies Company

Imagimob makes it easy for you to use machine learning in your edge devices.
At Imagimob, we focus on helping our customers put their Edge AI applications into production. We offer Imagimob Studio, a development platform for machine learning on edge devices. We also offer several Ready Models for companies who don't want to develop machine learning models from scratch.

Safety
and Security

TRAVEO™ overview and evolution

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ISO 26262 Safety Approach

All process requirements and hardware architectural metrics up to ASIL-C

TRAVEO™ T2G offers a holistic system-level approach for Functional Safety	– An ISO 26262 safety-element-out-of-context product – Support safety critical applications up to ASIL-B – Software is developed according to ISO 26262 – Supplemented by safety documents
Functional safety support for the customers	– Infineon provides the following support for enabling safe applications. These documents help to achieve functional safety at the system level requirements have been derived to detect potential failure modes and to achieve the hardware architectural metrics for ASIL-B. – HW safety manual – FMEDAs for individual TRAVEO™ T2G products – The failure modes, effects, and diagnostics analysis (FMEDA) is a safety analysis used for ISO 26262 compliant developments.
FMEDA	**1. FMEDA overview** This version provides the results of the analysis, the hardware architectural metrics "single point fault metric" (SPFM), "latent fault metric" (LFM), and residual failure rate **2. Detailed FMEDA** The detailed version contains the full analysis, including all the considered failure modes. This allows the customer to tailor the FMEDA to application needs, to adjust the temperature profile, and to choose a method for the base failure rate estimation

By registering for myInfineon Collaboration Platform you can get access to additional add-on technical documentation, trainings, tools, and much more. Please follow these steps in order to get started:

– Register for myInfineon
– For TRAVEO™ documentation please email to traveo@infineon.com
– You will receive a confirmation which explains how to use your new access

www.infineon.com/prosil

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ISO 21434 Secuirty Approach

TRAVEO™ security features

– TRAVEO™ security hardware
– Infineon's TRAVEO™ T2G 32-bit microcontroller family, with its embedded Hardware Security Module (HSM), is a perfect fit for automotive applications where secure on-board communi-cation is required. Infineon not only offers a scalable portfolio of compatible
– TRAVEO™ devices with integrated HSM, but also the necessary software packages and support services. TRAVEO™ T2G supports ISO21434-ready.

Customer benefits

– Secured platform – HSM provides a secured platform, separated from the rest of the micro-controller by a firewall, thereby creating a trusted execution environment.
– Security standard compliance – TRAVEO™ HSM supports up to Full EVITA. In addition to fulfilling the standards, HSM generations provide additional functionalities.
– Security differentiation – customized secure OEM or tier1 crypto apps can be processed within a trusted HSM execution environment, therefore allowing an independent HSM-specific software code review with reference to the huge application host software from multiple parties.
– This helps to harden the security level by reliably avoiding potential security backdoors.
– Convergence of security and safety – TRAVEO™ microcontrollers address both functional safety as well as IT-security requirements, making sure they are properly integrated and don't conflict with one another.
– Secured failure analysis – TRAVEO™ HSM offers JTAG debugger access protection to prevent unauthorized access to the debugging resources.

TRAVEO™ Hardware Security Module (HSM)

– HSM provides a secure computing platform, consisting of a 32-bit CPU, special access-protected memory for storing the cryptographic keys and unique subscriber identifiers and dedicated hard-ware accelerators for the various automotive security use cases. A firewall separates HSM from the rest of the TRAVEO™ microcontroller.
– The TRAVEO™ hardware security module offers a highly flexible and programmable solution based on:
  – Crypto and algorithm agility via software to support customer-specific solutions powered by a 32-bits CPU
  – AIS31-compliant True Random Number Generator (TRNG) and Pseudo Random Number Generator (PRNG)
  – State-of-the-art AES-128/192/256 hardware accelerator matching performance for automotive protocols
  – State-of-the-art 3DES: 64-bit blocks, 64 bit keys
  – State-of-the-art Vector Unit hardware accelerator for asymmetric key cryptography such as RSA and ECC
  – State-of-the-art HASH SHA-1/2/3: SHA-512, SHA-256, SHA-160 hardware accelerator for hashing
  – Secured key storage provided by a separated HSM-SFLASH portion. Alternative secure key storage feasible in dedicated HSM-Code FLASH sections.

Typical use cases

– Secured boot
– Secured on-board communication
– Firmware Over the Air (FOTA) updates
– IP and tuning protection
– Diagnostics via OBD/protected FAR flow/debug protection

www.infineon.com/security

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IEC 61508 Safety approach

All process requirements and hardware architectural metrics up to SIL-2

Providing Functional Safety for Industrial Applications

Infineon microcontrollers, such as AURIX™, TRAVEO™ T2G, and PSOC™ HV, have proven themselves to be not only excellent choices for Automotive Safety applications but also for Industrial Safety related applications. Their versatility and reliability make them an attractive option for a wide range of safety-critical use cases. When focus on TRAVEO™ T2G, it takes a holistic system-level approach to Functional Safety. By adhering to the stringent guidelines of ISO 26262 and supporting multiple Safety Standards under the IEC 61508 umbrella, it ensures a robust safety framework.

As a safety-element-out-of-context, the hardware and its accompanying software can support a wide range of safety-critical applications that conform to the IEC 61508 standard. Notably, it is designed to support safety-critical applications up to SIL 2 (Safety Integrity Level 2), demonstrating its reliability and robustness. Furthermore, Infineon provides comprehensive safety documents, including FMEDAs (Failure Mode and Effects Analysis) for individual products, all of which are meticulously aligned with the IEC 61508 standard.

Applications Examples

- Industrial Robotics
- CNC Machines
- Industrial Automation & PLC
- Human Machine Interface
- Railway Power and Automation
- Elevators
- Tractors & Agricultural machinery
- Construction machinery
- Forklifts
- Aerial Lifts
- Crane
- EVTOL
- Drones

IEC 61508 and relation to other Safety Standards

IEC 61508		TRAVEO™ T2G supports
Automotive	→	ISO 26262
Machinery	→	ISO 13849
Railway	→	EN 50129
Nuclear Power	→	EN 61513
Process Industry	→	IEC 61511
Household Appliances	→	IEC 60335
Furnaces	→	IEC 50156
Agriculture	→	ISO 25119
Aviation	→	DO-178

Probability of Dangerous Failure per Hour (PFHd)	SIL	SIL	PL	AgPL	ASIL
	IEC 61508	EN 62061	ISO 13849	ISO 25119	ISO 26262
10^{-8}	4	–	–	–	–
10^{-7}	3	3	e	e	D
10^{-6}	2	2	d	d	C
					B
3×10^{-6}	1	1	c	c	A
10^{-5}			b	b	
10^{-3}	–	–	a	a	QM
	–	–	–	QM	

Risk of failure

TRAVEO™ T2G supports up to SIL-2 on IEC 61508 with a single device, but can reach higher levels on 2oo2 Architecture

www.infineon.com/functional-safety

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TRAVEO™ T2G Ecosytem

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ModusToolbox™

Architected to provide a flexible and comprehensive development experience

ModusToolbox™ Software is a modern, extensible development ecosystem supporting a wide range of Infineon microcontroller devices, including PSOC™ Arm® Cortex® Microcontrollers, TRAVEO™ T2G Arm® Cortex® Microcontroller. Provided as a collection of development tools, libraries, and embedded runtime assets, ModusToolbox™ Software is architected to provide a flexible and comprehensive development experience.

Run-Time Software

Comprised of middleware, device drivers, and code examples is provided via an extensive collection of GitHub-hosted repositories.
Explore the available run-time software resources cataloged within the ModusToolbox™ Software repository overview.

Development Tools

Supporting Windows, Linux, and macOS are available as a tool's setup program from the Infineon Developer Center. These desktop applications enable the creation of new embedded applications, managing software components, configuring device peripherals and middleware, and embedded development tools for compiling, programming, and debugging. The ModusToolbox™ development tools interface directly with the available run-time software repositories, providing easy access to the latest development resources. Download today to get started with ModusToolbox™.

Community

Forums, knowledge-based articles, and technical blog articles are easily accessible from the Infineon Developer Community. Additional resources to enhance the ModusToolbox™ development experience include comprehensive documentation for both development tools and run-time software, detailed training, and tutorial videos.
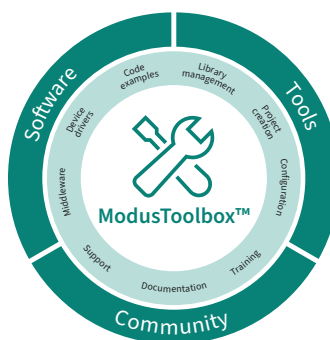
Infineon provides a large collection of code repositories on GitHub.
– This include Board Support Packages (BSPs) aligned with Infineon kits
– Low-level resources, including a hardware abstraction layer (HAL) and peripheral driver library (PDL)
– Middleware enabling industry-leading features such as CAPSENSE™

– Libraries
– Code examples
– Training material
– Board support packages

TRAVEO™ T2G Kits ecosystem

Something for every design adventure and budget

TRAVEO™ T2G Body Entry

- Develop and test the key functionalities provided by TRAVEO™ T2G such as User **Switch**, User **LED**, and **UART** communication
- **Socket** and **solded** version available

- CYTVII-B-E-100-SO
- CYTVII-B-E-176-SO
- CYTVII-B-E-1M-100-CPU
- CYTVII-B-E-1M-176-CPU
- CYTVII-B-E-2M-100-CPU
- CYTVII-B-E-2M-176-CPU
- CYTVII-B-E-4M-176-CPU

TRAVEO™ T2G Body High

- Develop and test functionalities such as **Audio Interface**, Automotive **Ethernet**, **SD Card**, **SMIF**, **Dual QSPI** User **Switch**, User **LED**, and **UART** communication
- **Socket** and **solded** version available

- CYTVII-B-H-176-SO
- CYTVII-B-H-272-SO
- CYTVII-B-H-320-SO
- CYTVII-B-H-4M-176-CPU
- CYTVII-B-H-4M-272-CPU
- CYTVII-B-H-8M-176-CPU
- CYTVII-B-H-8M-272-CPU
- CYTVII-B-H-8M-320-CPU
- CYTVII-B-H-16M-176-CPU
- CYTVII-B-H-16M-320-CPU

TRAVEO™ T2G Body Low cost kits

- **Low-cost**
- **Easy to use** evaluation board based on the TRAVEO™ T2G body **Entry/High** families **Ethernet, Arduino, mikroBUS**
- **ModusToolbox™ compatibility**

- CYTVII-B-E-1M-SK
- **NEW:** KIT_T2G-B-E_LITE
- **NEW:** KIT_T2G-B-H_LITE

www.infineon.com/traveo-kits

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TRAVEO™ T2G Cluster Entry

– Develop and test the key
  functionalities provided by
  TRAVEO™ T2G Cluster entry
  such as User **Switch**, User **LED**,
  and **UART** communication

– CYTVII-C-E-4M-176-CPU

TRAVEO™ T2G Cluster High

– Design and Debug easily the
  T2G-C 2D devicese
– **Graphics** Driver
– **MJPEG, Ethernet, Audio**
  interface, **Display** interface,
  HyperFlas/RAM
– Purchasable as **SET** or
  independently

– CYTVII-C-2D-4M-216-CPU
– CYTVII-C-2D-4M-216-SET
– CYTVII-C-2D-6M-327-CPU
– CYTVII-C-2D-6M-327-SET
– CYTVII-C-2D-6M-DDR-CPU
– CYTVII-C-2D-6M-DDR-SET

TRAVEO™ T2G Cluster Low cost kits

– **Low-cost**
– **Easy to use** evaluation board
  based on the TRAVEO™ T2G
  cluster families **Ethernet,
  Arduino, mikroBUS**
– Supported by our
  Certified HMI tool partners
  (only for the high)

– **NEW:** KIT_T2G_C-2D-4M_LITE
– **NEW:** KIT_T2G_C-2D-6M_LITE

www.infineon.com/traveo-kits

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TRAVEO™ T2G AUTOSAR

AUTOSAR

Infineon TRAVEO™ T2G AUTOSAR Software

The TRAVEO™ AUTOSAR Software was introduced to the market in 2014 and has since undergone numerous improvements and upgrades. For the TRAVEO™ T2G, a mature, feature-rich driver layer is now available, which is developed, maintained, and supported by in-house TRAVEO™ experts. The TRAVEO™ T2G

AUTOSAR Software was developed in compliance with Automotive SPICE and ISO26262 standards, making it suitable for applications with safety targets up to ASIL-B. Additionally, the delivery package includes the EB Tresos™ configuration tool, which comes with a node-locked license.

The AUTOSAR software portfolio comprises

AUTOSAR MCAL (ASR 4.2.2)	TRAVEO™ T2G AUTOSAR drivers enable a wealth of smart hardware features, which make the TRAVEO™ T2G series so attractive, in the AUTOSAR workflow. The Microcontroller Abstraction Layer (MCAL) is the lowest software layer of the Basic Software. It contains drivers, which are software modules with direct access to the µC internal peripherals and memory mapped µC external devices. In addition to the features that AUTOSAR defines, the TRAVEO™ T2G MCAL support safety functions, Trigger connections between internal peripherals, "Smart I/O" functions any many more TRAVEO™ specific design ideas. Software Partner with experience in integrating the TRAVEO™ T2G MCAL include Elektrobit, Etas and Vector Informatik

Microcontroller Drivers			Nem. Drivers	Communictaion Drivers			I/O Drivers					
GPT	MCU	WDG	FLC	SPI	LIN	CAN	ICU	OCU	PWM	ADC	DIO	PORT

AUTOSAR Self-Test Libraries	Available separately to the MCAL, the self-test libraries help to fulfill safety goals by giving a high diagnostic coverage over large parts of the chip area. Self-Test Libraries are defined for CORE, FLASH and RAM. "foreground mode" and "background mode" are available – In "Foreground Mode" the complete test is executed at once, for example at start up. – In "Background Mode" execution is distributed over several times slots intermittently with other task

The AUTOSAR software portfolio comprises

AUTOSAR FLASH EEPROM Emulation (FEE)

Included in the FEE delivery, the FEE Interfaces to TRAVEO™ T2G MCAL FLS abstracts from the physical Flash's segmentation and addressing scheme and provides a virtual addressing and segmentation scheme. It utilizes virtual page sizes of 4 Bytes, which allows for a virtually unlimited number of erase cycles (calculation tool included). The algorithm is robust against power down and has a compact memory footprint.

For details on the TRAVEO™ RT2G AUTOSAR FLASH EEPROM Emulation (FEE), please refer to the following User Guide
– TRAVEO™ T2G Flash EEPROM Emulation

AUTOSAR MCAL Multi-Core Extension

This extension adds "Type II" multi-core support (as defined in ASR 4.4) to defined MCAL drivers, where each CPU core can run an instance of the driver. Peripheral channels and their data are individually allocable to cores but cannot be shared among cores

MCAL Multi-Core Extension feature Type II multi-core support

– ADC (EXpansion pack) 4.0 driver- Each SAR is allocable to each M7 core
– GPT 3.0 driver – Each timer is allocable to each M7 core
– ICU 3.0 driver – Each timer is allocable to each M7 core
– PWM 3.0 driver – Each timer is allocable to each M7 core,
– MCU 3.0 driver – Each M7 core has separate active / sleep modes
– Core Test 3.0 – Execute the test on each M7 core
– SPI 3.0 handler/driver – Each hardware unit is allocable to each M7 core
– Watchdog 3.0 driver – Separate hardware unit is allocated to each M7 core

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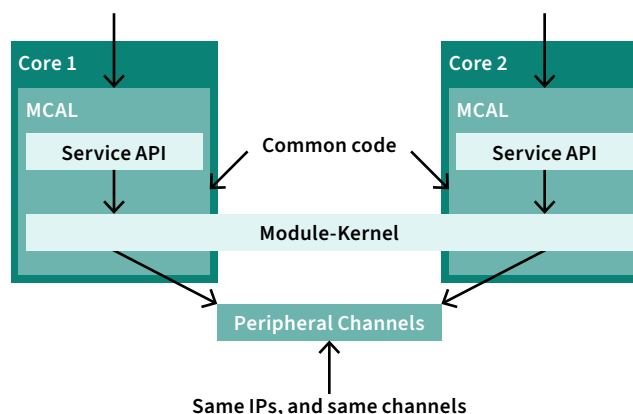
Infineon TRAVEO™ T2G AUTOSAR Software

AUTOSAR MCAL Multi-Core Extension

For this multicore type, the driver has core-independent instances with globally available hardware. This type is referred as "Multicore Type III". Multicore Type III has the following characteristics:
– The code of the driver is shared among all cores.
– A common binary is used for all cores.
– A configuration is common for all cores.
– Each core runs an instance of the driver.
– Peripheral channels are globally available for all cores.

This Type III multi-core support is available for:

DIO 3.0 driver – all pins are accessible from all cores without synchronization

On most above listed "Type II" modules, some APIs can be globally accessed by any M7 core, offering limited Type III multi-core support.
If Multicore Type III is required, the section including the data related to the read-only API or atomic write API must be allocated to the memory, and can be read from any M7 core

AUTOSAR Complex Device Drivers for Code Flash (main Flash)

– Code Flash Driver supports write and erase of main flash.
– Operation can be requested from all CPU Cores (CM4, CM7, CM0+)
– "Dual Bank" support allows to execute the driver form Flash Configuration by EB tresos.

For details on the TRAVEO™ T2G AUTOSAR Complex Device Driver for Code Flash please refer to the following User Guide
– Code Flash Driver

TRAVEO™ T2G AUTOSAR Complex Device Driver for I²C

The I²C driver is a complex driver, which enables you to support I²C communication on special output pins of the MCU. It supports the T2G "serial communication block" (SCB)
– Supports master- and slave mode
– Mode Change at run-time supported
– Configurable with EB-Tresos Studio as AUTOSAR Complex Device Driver
– A single I²C driver supports multiple channels
– Simultaneous communication using multiple channels is possible.
– Each channel can be configured to run in poll or interrupt mode.
– No interrupt between Address field and Data field.
– User can select the I²C transaction to "Normal sequence" or "Repeated Start"
– FIFO mode is supported (by using interrupts, by polling and by using DMA and interrupts).
For details on the TRAVEO™ T2G AUTOSAR Complex Device Driver for I²C, please refer to the following User Guide
– I²C driver

TRAVEO™ T2G AUTOSAR Complex Device Driver for UART

It supports the TRAVEO™ T2G "serial communication block" (SCB)
– Full Duplex Support
– Frame Size 4bit-9bit
– Operation Modes: Synchronous transmit, Asynchronous transmit, Automatic receive, Synchronous receive, Asynchronous receive
For details on the TRAVEO™ T2G AUTOSAR Complex Device Driver for UART, please refer to the following User Guide
– UART Driver
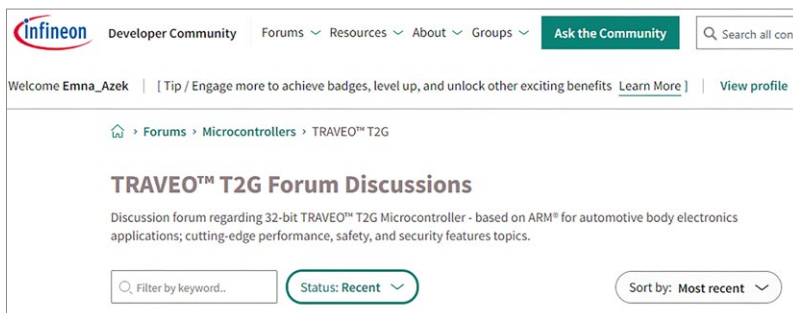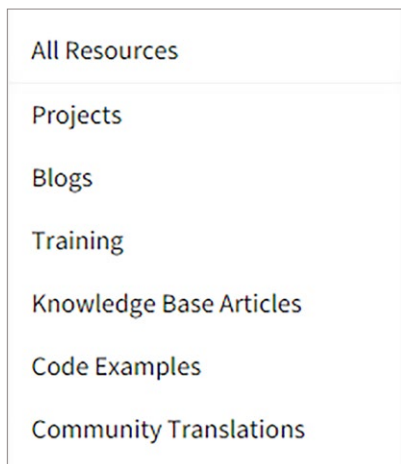
www.infineon.com/traveo-autosar

Online Support

The answers you need, right at your fingertips

TRAVEO™ T2G Community

Introducing the enhanced TRAVEO™ experience! Our strategic shift towards the wider mass market has led to the development of the TRAVEO™ T2G Forum, a dedicated platform designed to support both our mass market and core account customers. We've revolutionized the forum's maintenance to empower our customers to swiftly find the answers they need, right at their fingertips.

To ensure seamless support, we've curated a comprehensive FAQ section covering the most critical topics, resulting in a significant surge in traffic to our TRAVEO™ T2G forum. With these improvements, our customers can now easily access the support they require, making the forum the go-to destination for all TRAVEO™ T2G Automotive needs.

All Resources

Projects

Blogs

Training

Knowledge Base Articles

Code Examples

Community Translations

(infineon Developer Community   Forums ⌄   Resources ⌄   About ⌄   Groups ⌄   **Ask the Community**   🔍 Search all cont

Welcome Emna_Azek | [Tip / Engage more to achieve badges, level up, and unlock other exciting benefits Learn More] | View profile ⌄

⌂ › Forums › Microcontrollers › TRAVEO™ T2G

TRAVEO™ T2G Forum Discussions

Discussion forum regarding 32-bit TRAVEO™ T2G Microcontroller - based on ARM® for automotive body electronics applications; cutting-edge performance, safety, and security features topics.

🔍 Filter by keyword..   Status: Recent ⌄   Sort by: Most recent ⌄

Join our thriving community at Infineon Community and experience the difference!

TRAVEO™ MyICP

By registering for myInfineon Collaboration Platform you can get access to additional add-on technical documentation, trainings, tools, and much more. Please follow these steps in order to get started:
1. Register for myInfineon
2. For TRAVEO™ documentation please email to traveo@infineon.com
3. You will receive a confirmation which explains how to use your new access

Preferred design house partner (PDH) for Infineon microcontrollers

TRAVEO™ T2G

Our Microcontroller ™ preferred design houses is a trusted partners' ecosystem that extends the support force by tailoring their know-how to meet your specific needs.

By partnering with one of our qualified preferred design houses, you can be assured that you'll receive expert advice and customized support to help you achieve your goals. Our team of professionals brings added value to customer service, working together to optimize your design and help you succeed in your business objectives.

We understand that every customer is unique, which is why we offer tailored solutions to meet your specific needs. From product-specific support to application-specific advice, our preferred design house is fully trained to use AURIX™, TRAVEO™ T2G and automotive PSOC™ and provides a wealth of knowledge and expertise to help you succeed.

Together with our partners, we offer optimized customer support for systems using our products. Our preferred design houses are committed to delivering exceptional service and support to ensure your success. So why wait? Contact us today to learn more about how our Preferred design house can help you achieve your goals and take your business to the next level.

Classic – Free of charge

– To be agreed between customers and PDH
– First level customer support covering Infineon products and solutions
– Technical interface and support to the customer
– Driving design at customer
– Basic training for design teams at customer
– 24 h response time to the customer

Premium – Consultancy mode

– Project management and project-specific application support
– Specification of general software architecture, defining required layers, control, safety, security, Multicore and Arm support
– Specification and implementation of custom device drivers and project-specific
– Optimization of software components with regards to speed/code size
– Software testing
– Functional safety engineering and project-specific support for security solution

www.infineon.com/traveo-pdh

	Product Family						Supported Region(s)					
	AURIX™	TRAVEO™ T2G Body	TRAVEO™ T2G Cluster	PSOC™ Automotive	PSOC™ High Voltage	PSOC™ Multitouch & Fingerprint	Global	EMEA	AMR	JP	GC	AP
Altia			•				•					
Amarakosha Technologies	•										•	•
Avin Systems	•						•					
AVL	•				•		•					
Bluewind	•							•				
Candera			•				•					
CATARC	•										•	
Clicktouch				•		•		•				
Colorado Engineering / CEI Colorado Engineering	•								•			
Crevavi	•	•					•					
D3 Engineering	•								•			
Digital Edge Solutions	•											•
DriveXpert / Drive Expert	•							•				
Eagle Wings Design	•	•	•	•	•			•				
Eboata											•	
eInfochip	•	•	•	•	•		•					
Embedded Office	•	•	•	•				•				
Embien Technologies			•									•
Elektrobit Automotive GmbH	•	•	•				•					
FESCARO	•											•
Frobas	•						•					
Galaxi Engineering Technology Services	•											•
G-Pulse	•	•	•	•	•						•	
GRINN	•							•				
Hamso				•			•					
Hightec	•	•	•	•	•		•					
Hitachi Industry & Control Solutions, Ltd.										•		
Hitex	•	•	•	•	•		•					
IAV	•							•				
IMST	•							•				
Intecs Solutions	•							•				
Integra Sources	•							•				
Jingwei HiRain	•	•		•							•	
KPIT Technologies Ltd.	•						•					
L4B software			•					•				
Leadmove	•										•	
Macnica	•	•	•	•						•		
MecTronic	•							•				
Microfuzzy	•	•		•				•				
Mixed Mode	•							•				
Neutron Controls	•	•	•	•	•		•					
NEXTY Electronics Corporation	•	•	•	•						•		
Olvia	•							•				
PiNTeam	•							•				
Precise Biometric						•	•					
QianQin	•										•	
QT			•				•					
Revotech	•	•	•									•
RDM Group / RDM Automotive	•							•				
Samsotec				•	•	•		•				
Seasidetech	•							•				
Sigma Connectivity						•	•					
Siili Auto			•					•				
T & S Engineering	•							•				
Tbench Solutions	•							•				
Techrein	•	•	•									•
Tokyo Electron Device	•	•	•	•	•	•				•		
Tongji	•										•	
Tresa Energy	•											•
ULMA Embedded Solutions	•							•				
Vitalcore Technologies	•	•										•
VECENTEK	•										•	
Witekio			•				•					

TRAVEO™ T2G partners

Experience the Future of Automotive and Smart Mobility with TRAVEO™ T2G Partners

Compiler	Green Hills SOFTWARE	iar	TASKING

AUTOSAR MCAL	EB	hitex EMBEDDED TOOLS & SOLUTIONS	VECTOR

Debugger Test Tools	Green Hills SOFTWARE	iar	iSYSTEM	LAUTERBACH DEVELOPMENT TOOLS	ProMik Trusted Solutions	SEGGER www.segger.com	TASKING

Calibration/ Measurement tool	ETAS VECTOR

Non AUTOSAR RTOS	SAFE RTOS WITTENSTEIN

Artiicial Intelligence	imagimob An Infineon Technologies Company MathWorks

Flash Tools	ACROVIEW MINATO MINATO HOLDINGS INC.	Algocraft OpteeQ	Data I/O PE micro	DediProg ProMik Trusted Solutions	DTS INSIGHT SEGGER www.segger.com	HI-LO SYSTEMS SMH Technologies

Simulation, Modeling	ETAS	LAUTERBACH DEVELOPMENT TOOLS	SYNOPSYS

Timing & Program Analysis	GLIWA	VECTOR

HMI Tools	altia	CANDERA CGISTUDIO	Qt

Security	ETAS	VECTOR

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TRAVEO™ T2G partners

Experience the Future of Automotive and Smart Mobility with TRAVEO™ T2G Partners

Partner logos: AbsInt, Algocraft, altia, Ansys, ARGUS CYBER SECURITY, arm, astc, ATI ACCURATE TECHNOLOGIES, aws, BPM, btv, CANDERA CGISTUDIO, Data I/O, dSPACE, DTS INSIGHT, easycore, EB, ELNEC, Embedded Office, emmtrix Technologies, ETAS, euros, expresslogic, freeRTOS, GAIO TECHNOLOGY, GLIWA, Green Hills SOFTWARE, GÖPEL electronic, HIGHTEC, hitex, HTV, iar, ihr, INCHRON, INTEGRITY SECURITY SERVICES, INTREPID CONTROL SYSTEMS, iSYSTEM, tech, KPIT, KRONO-SAFE, LAUTERBACH DEVELOPMENT TOOLS, LX, MathWorks, MICRO CONSULT, MINATO HOLDINGS INC., novaflash, OpteeQ, Phyton, PiNTeam EMBEDDED, pls Development Tools, ProMik, PROTOS, Qt, SEGGER, SIEMENS, SILEXICA, SMH Technologies, SYNOPSYS, SYSGO EMBEDDING INNOVATIONS, TASKING, TTTech, VECTOR, WITTENSTEIN, WNDRVR

www.infineon.com/traveo-partners

Applications

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

Artificial Intelligence

Safety and Security

TRAVEO™ Ecosystem

Applications

TRAVEO™ overview and evolution

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Product Family

System Architecture

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TRAVEO™ Ecosystem

Applications

Zone controller

## Comprehensive product portfolio for scalable and flexible body control unit solutions in cars

Embrace the shift towards centralized control and optimization in automotive E/E architectures with Infineon's zone controller solutions. The E/E architecture comprises the power distribution (PD) system and the in-vehicle network (IVN). While legacy E/E architectures are pre-dominantly organized in domains connected via gateways, the software defined vehicle (SDV) trend and wire harness optimization are driving the shift towards a zonal architecture with central computing.

In this new architecture, the PD is electrified, and the former relay and fuse box function is decentralized in the zone controllers. In parallel, the IVN for data and signal distribution transitions from a flat domain architecture to a hierarchical layer structure with central computer, zone controllers and endpoints.

Both decentralized PD and centralized IVN lead to aggregating multiple ECU functions in a few zone controllers, encompassing power distribution, gateway, and load control capabilities.

Our advanced chipsets are tailored for this transformation, enabling seamless aggregation of ECU functions across diverse domains, fully unleashing the technical and commercial potential of zonal architectures.

Application diagram
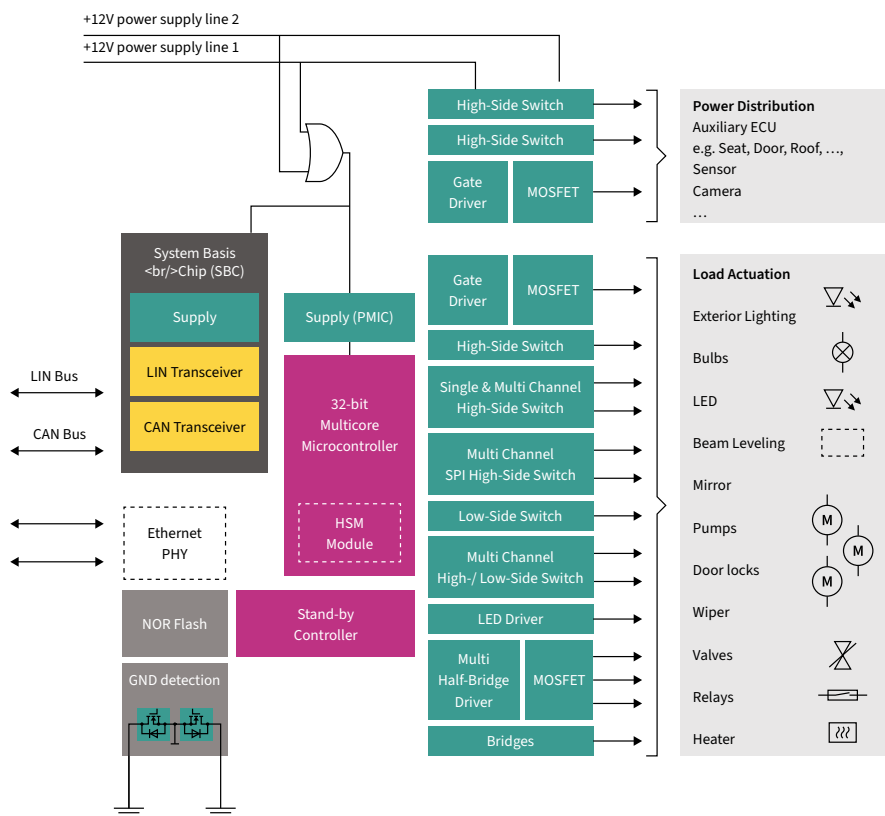
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B

Key benefits

– Enables pretended high performance networking and ECU strong security
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements
– Innovative supply system leads to best-in-class power consumption

Suggested products

– CYT4BF series
– CYT4BB/3BB series

www.infineon.com/traveo-zone-controller

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

Artificial Intelligence

Safety and Security
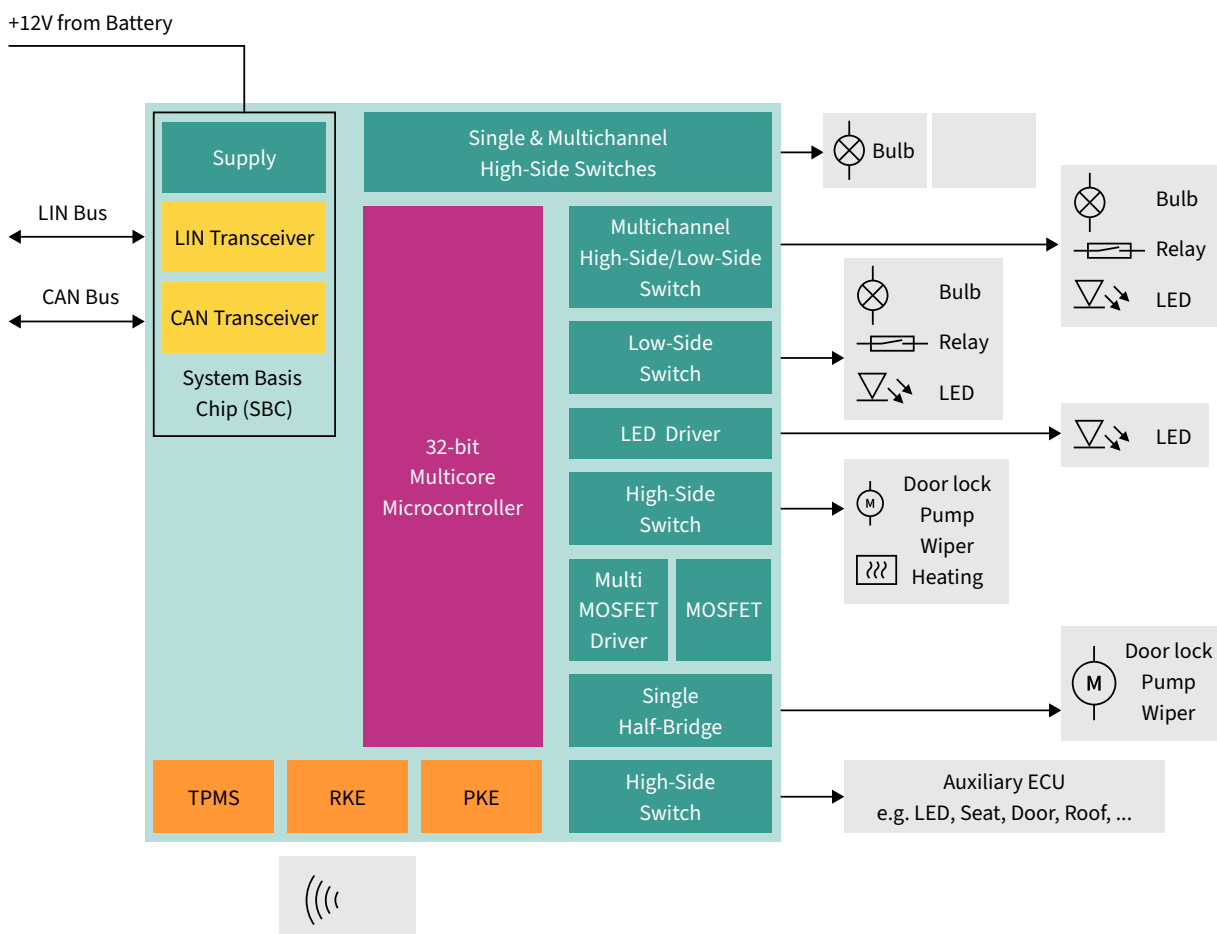
TRAVEO™ Ecosystem

Applications

Automotive body control module

Comprehensive product portfolio for scalable and flexible body control unit solutions in cars

Increased body functions and trim-level variations in vehicles necessitate flexible and scalable product families for the body control module (BCM) platform. For instance, seat modules may offer multiple functionalities but vary based on vehicle type. Combine the essential functions of an ECU: Supply, actuation, sensing, control, and communication with versatile and adaptable body control unit solutions.

Infineon offers a wide variety of products dedicated to body and interior electronics. These include protected power switches for bulb and motor control, dedicated system basis chips and easy-to-use Hall sensor solutions. The TRAVEO™ family provides sufficient performance, as well as dedicated safety and security features, to meet the needs of upcoming domain electronics modules. As one example, a high-feature body control module with integrated gateway functionality.

Application diagram

Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B

Key benefits

– Enables pretended high performance networking and ECU strong security
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements
– Innovative supply system leads to best-in-class power consumption

Suggested products

– CYT4BF series
– CYT4BB / 3BB series
– CYT2BL series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/bcm

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

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Safety and Security
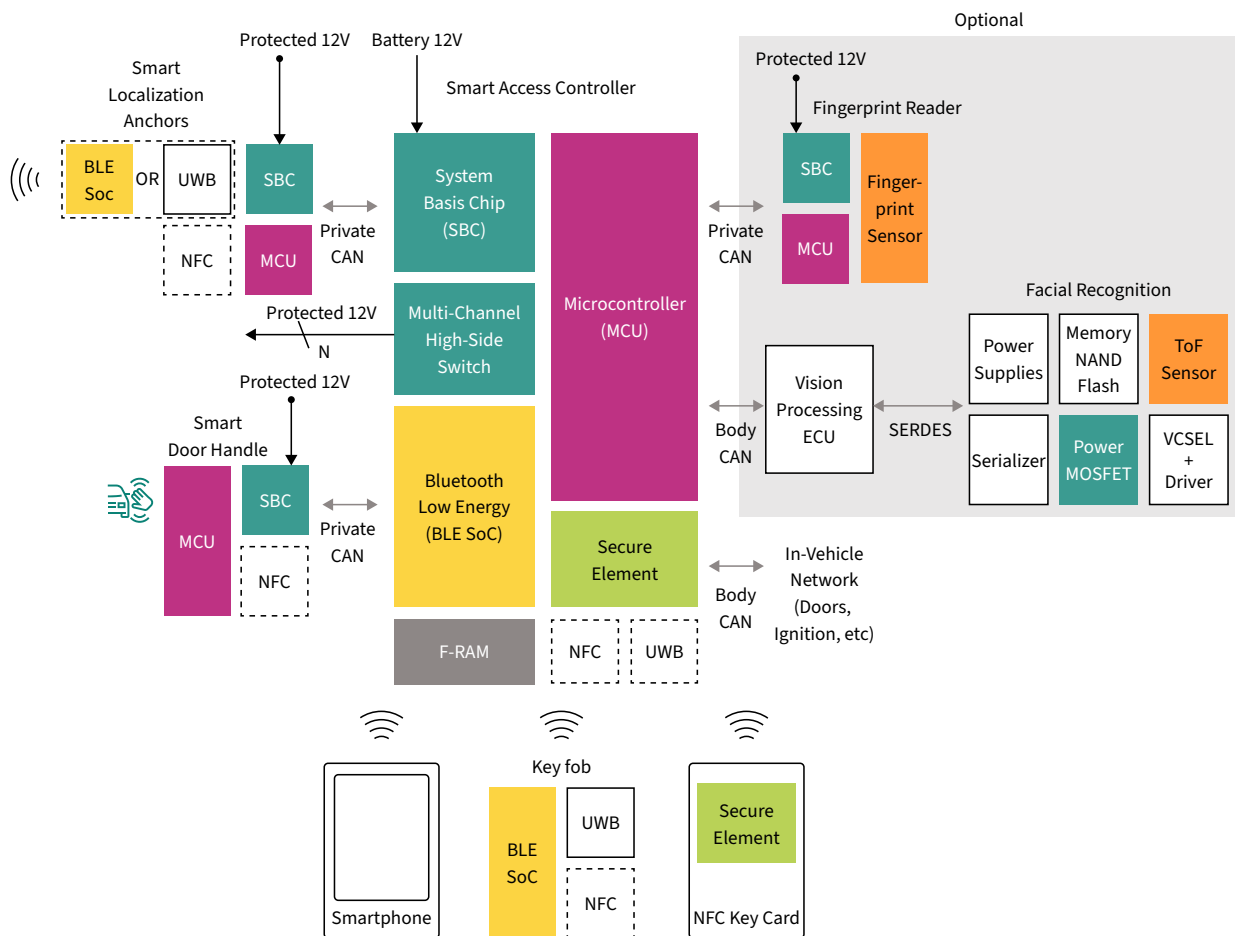
TRAVEO™ Ecosystem

Applications

Car Access

Upgrade your driving experience with Infineon's innovative car access system and let us make your life easier and secure

Looking for a smarter and more convenient way to access the car? Infineon's car access system allows you to unlock your vehicle with ease, simply by using your smartphone, keyfob or even facial recognition.
With a digital key, you can securely grant temporary access to family and friends without worrying about lost or stolen keys.

Infineon uses state-of-the-art encryption and authentication protocols to ensure that only authorized users can access the vehicle, providing peace of mind and unparalleled security.
Upgrade your driving experience with Infineon's innovative car access system and let us make your life easier and secure.

Application diagram

TRAVEO™ overview and evolution

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TRAVEO™ Ecosystem

Applications

Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B

Key benefits

– Enables pretended high performance networking and ECU strong security
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements
– Innovative supply system leads to best-in-class power consumption

Suggested products

– CYT4BB/3BB series
– CYT2BL series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/caraccess

TRAVEO™ overview and evolution

Product Nomenclature Decoder

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TRAVEO™ Ecosystem

Applications

Integrated Thermal Management System

Reduce design complexity and improve efficiency

Electric Water Pumps, Coolant Valves, and Expansion play a vital role in electric vehicle (EV) thermal management, ensuring optimal temperatures for battery cooling, heating, and refrigerant circuit operation. The distributed mechatronic actuators, each with its own ECU, communicate through LIN bus to the Zone Controller, creating a complex system with individual part mounting and connection challenges. To address this, an Integrated Thermal Management System (ITMS) centralizes actuator functions, water tank, chiller, and electronics, controlled by a single ECU connected to the Zone Controller via CAN-FD. The ITMS offers advantages such as reduced complexity, faster system integration, lower assembly costs, and improved overall efficiency through better thermal energy distribution.

The advantages of such an Integrated Thermal Management System are reduced complexity & therein faster system integration, lower assembly & material cost and less engineering resources. Ultimately, the overall efficiency increases through less energy losses and better thermal energy distribution.

Application diagram
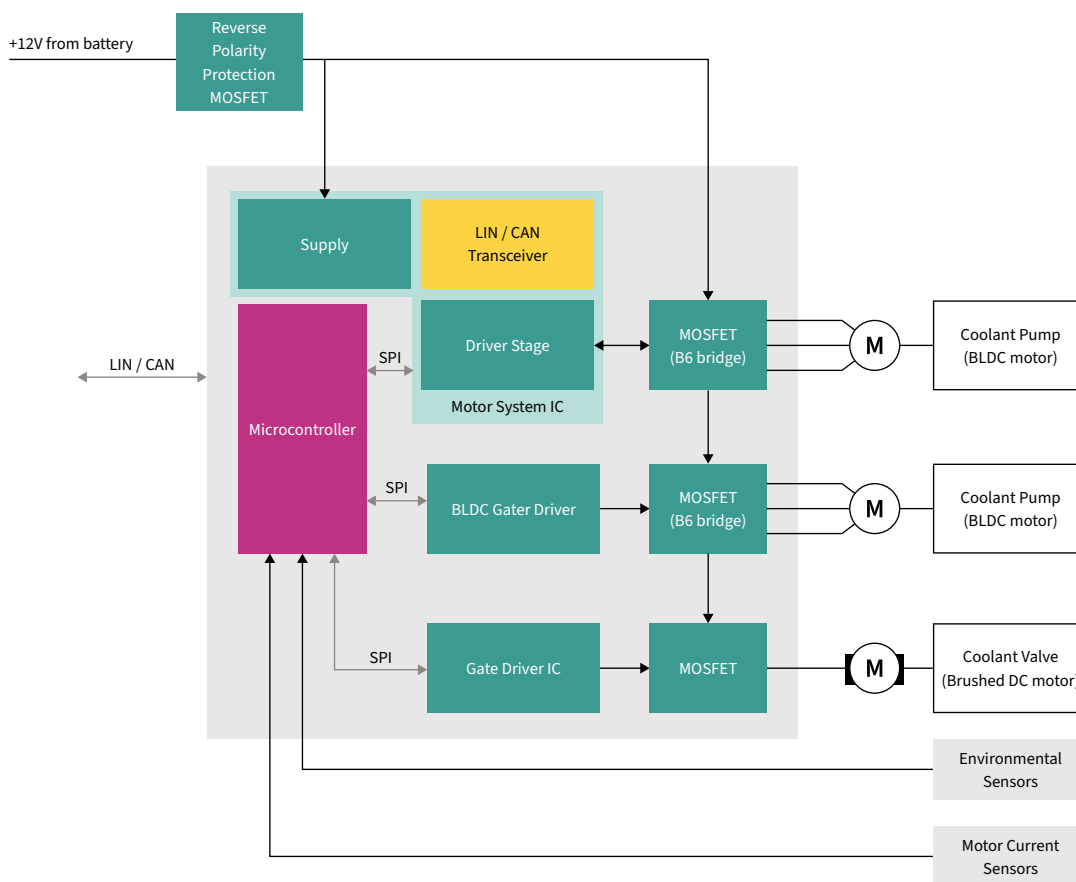
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– Scalable platform – performance, memory size and I/Os
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements
– Motor solution

Suggested products

– CYT2BL series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/traveo-itms

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

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Safety and Security
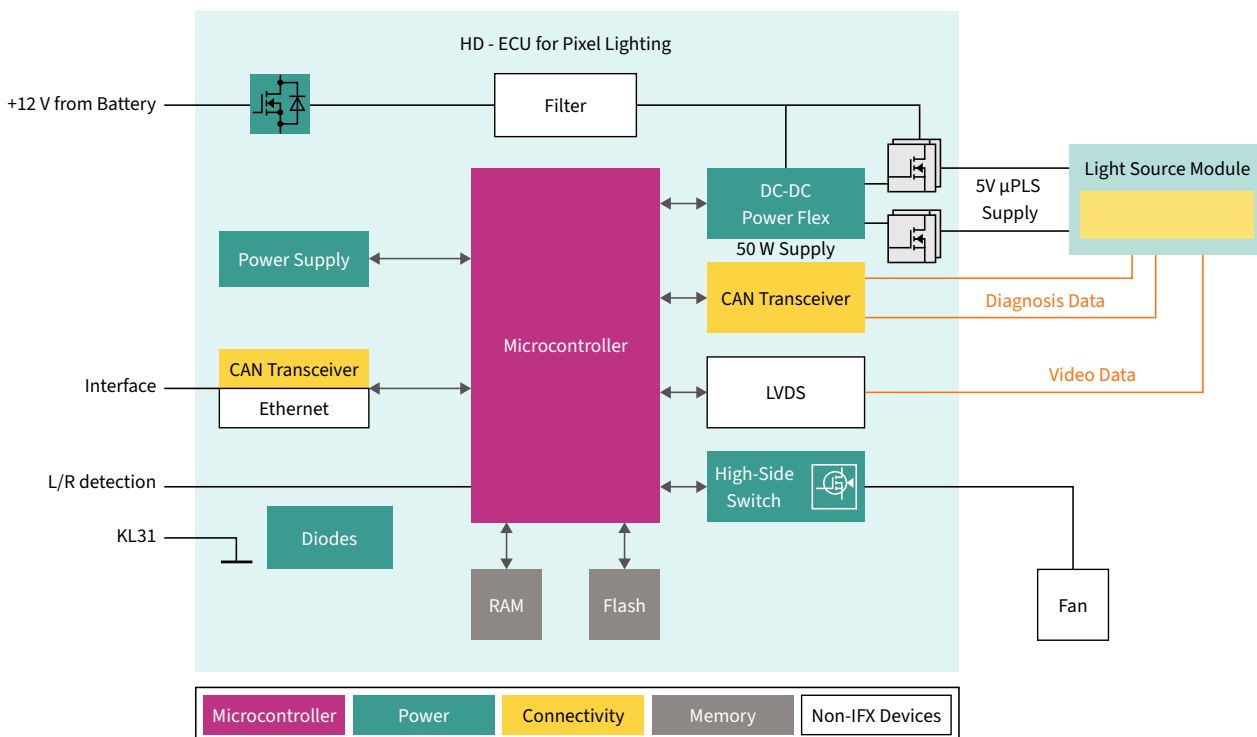
TRAVEO™ Ecosystem

Applications

LED pixel light controller

Pixel light ECUs – HD light engines for improved safety features and enhanced driving comfort

High-definition (HD) light engines pave the way for new and improved safety features and enhance driving comfort. For example, HD light can be used to warn the driver of hazards by highlighting people or objects on the roadside. It can project markings on the road – for example, in order to help the driver navigate through a construction site. And established features such as the glare-free high beam or bending lights run more precisely and smoothly.

TRAVEO™ T2G-C family offers safety features and a graphic engine to achieve a minimal memory footprint for the graphics processing unit. It contains all necessary interfaces to control all front light parts (Base LEDs, Matrix LED, and others). The scalability of the family ensures to find the controller for the pattern generation depending on interfaces and light sources.

Application diagram

TRAVEO™ overview and evolution

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TRAVEO™ Ecosystem

Applications

Features and benefits

Key features

- Scalable MCU family from single to dual core
- Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
- High power efficiency
- eVITA full as high security
- ISO 26262 conformance to support safety requirements Up to ASIL-B
- High performance Graphics authoring tool support (by 3rd party)

Key benefits

- Enables smart headlight solutions with graphical display for high safety
- High integration leads to significant cost savings
- High integration leads to reduced complexity
- ISO 26262 compliance supports ASIL requirements

Suggested products

- CYT4DN series
- CYT3DL series

www.infineon.com/pixel-lights

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

Artificial Intelligence

Safety and Security

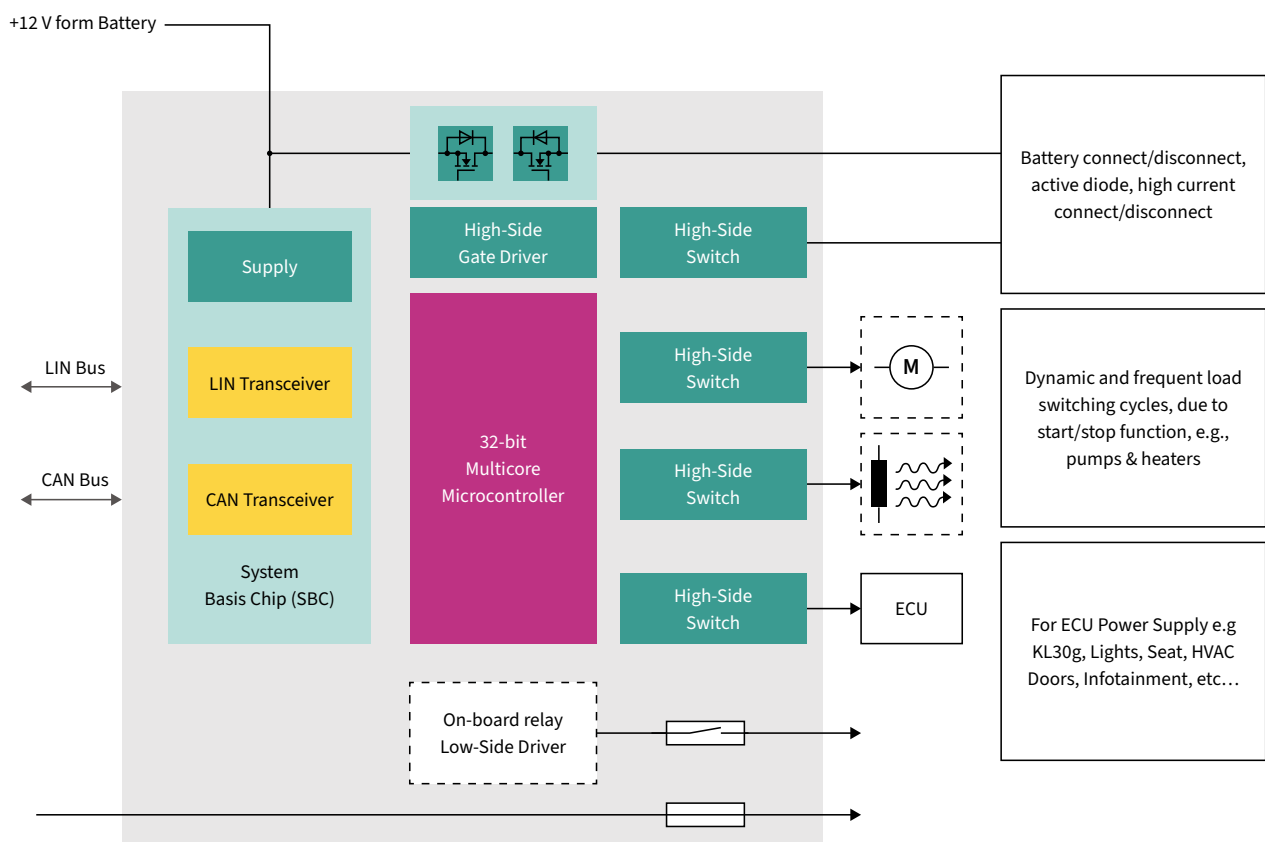TRAVEO™ Ecosystem

Applications

Automotive power distribution system

Optimized E / E architecture with power distribution, decentralization, and electrification

High-definition Automotive power distribution is the controlled transport of energy via the power distribution system from sources (e.g. battery, HV-LV DC-DC) to all kinds of loads in the vehicle. The power distribution system is therefore an essential part of the vehicle E / E architecture. As a consequence of the increasing number of comfort functions, advanced driver assistance systems, and automated driving, the complexity of the E / E architecture and especially the power distribution module has been continuously increasing.

The impact of these application requirements on the primary power distribution is the introduction of safety elements to guaranty a fast failure isolation in less than 100 … 500 µs. As fuses can't fulfil this requirement, a partial or full electrification of the primary power distribution is the consequence. The electrical part of the primary power distribution is no longer called a Pre-Fuse Box, but primary Power Distribution Center.

Application diagram

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Applications

Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– Enables smart headlight solutions with graphical display for high safety
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements

Suggested products

– CYT2BL series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/powerdistribution

TRAVEO™ overview and evolution

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Safety and Security
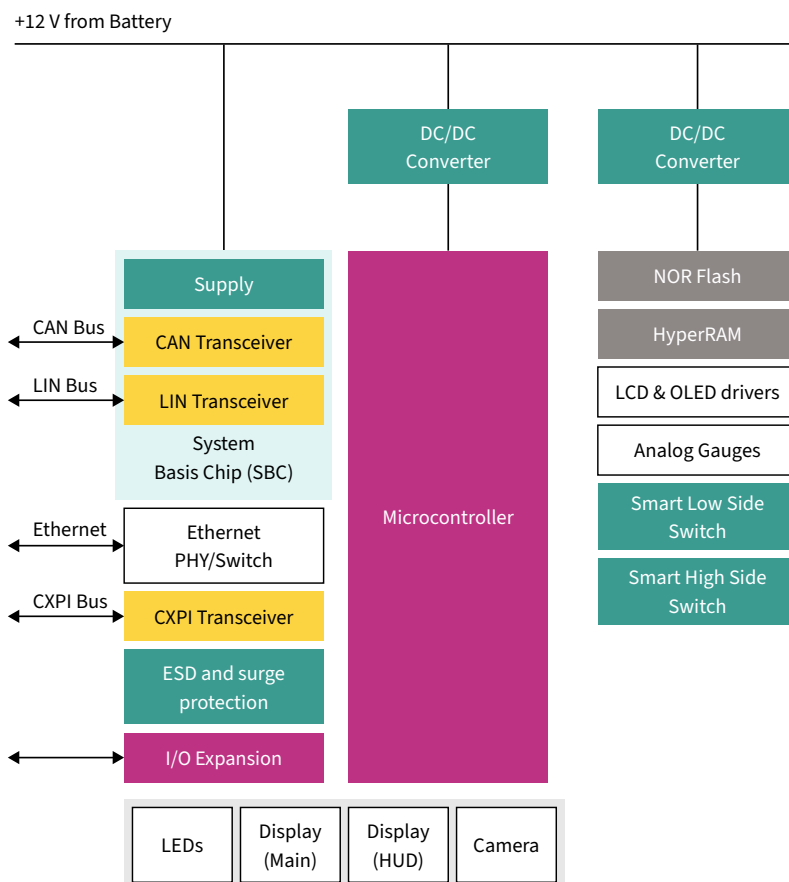
TRAVEO™ Ecosystem

Applications

Automotive instrument cluster

Instrument Cluster Innovation, a new Standard for Scalability and Performance

Infineon's automotive instrument cluster solutions provide drivers with a centralized and easy-to-view display with all key driving information of the vehicle. Our instrument cluster dashboards can be securely updated and offer flexible customization. Benefit from our unparalleled portfolio for a scalable instrument cluster platform

TRAVEO™ T2G-C family provides the most extensive scalability, which covers the conventional gauge instrument cluster and hybrid instrument cluster, as well as the virtual instrument cluster. The option of line-based operation of the graphics engine within the microcontroller minimizes the memory required for graphics processing. With the optimized 2.5D graphics engine and extended density of embedded flash and video RAM, TRAVEO™ T2G graphic MCU can support the virtual instrument cluster design with high resolution up to 2880 × 1080. Infineon's SEMPER™ flash and HYPERRAM™ memory products provide performance and density scalability to meet the requirements of different instrument cluster systems.

Application diagram

TRAVEO™ overview and evolution

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TRAVEO™ Ecosystem

Applications

Features and benefits

Key features

– Scalable MCU family from single to dual core
– High performance GFX engine, high density Video RAM and high communication
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet, SMIF
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– A rich dashboard environment unified by advanced graphics or combining the best of graphics and realistic mechanical mechanisms
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements

Suggested products

– CYT4DN series
– CYT3DL series

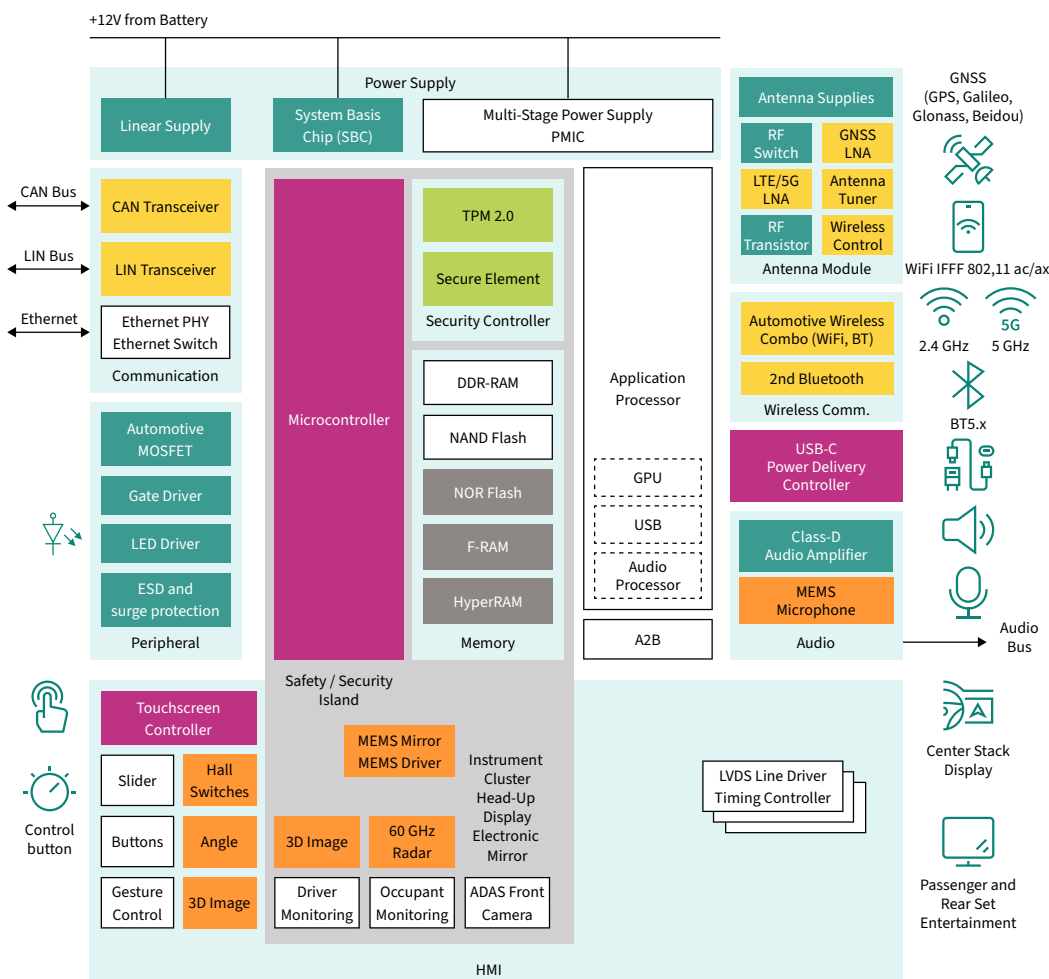**www.infineon.com/traveo-instrument-cluster**

High-performance Cockpit Computer

Broad product portfolio and advanced technologies enable next-generation cockpit system design

The cockpit domain controller (CDC) provides high computer processing power and enhanced user experience, also supporting different operating systems (OS) through a scalable hardware platform. Typically, such systems are enabled by high-performance system-on-chip (SoC), microcontroller, memory, Wi-Fi & Bluetooth®, power supply, and sensor components. In the move to the cockpit controller, our broad product portfolio enables fundamental functions.

TRAVEO™ T2G MCU families offers high performance (up to dual Arm® Cortex®-M7, 1500 DMIPs), wide scalability (memory density and package line-up), best-in-class energy efficiency, ASIL-B functional safety and an integrated hardware security module (HSM).

Application diagram

TRAVEO™ overview and evolution

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Applications

Features and benefits

Key features

– Scalable MCU family from single to dual core
– High performance GFX engine, high density Video RAM and high communication
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet, SMIF
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– Futuristic cockpit environment with large scale graphics and unified HMI.
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements

Suggested products

– CYT4DN series
– CYT3DL series
– CYT2CL series
– CYT2BL series
– CYT2B9 series
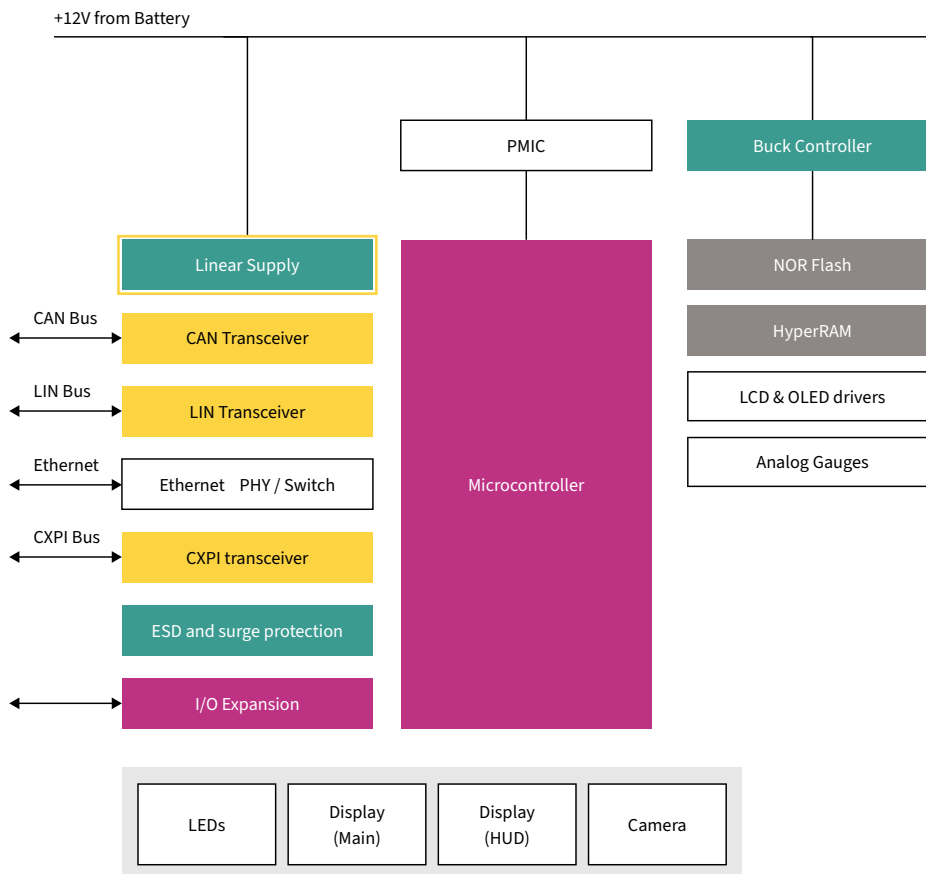– CYT2B7 series

www.infineon.com/traveo-cockpit

Head Up Display

Instrument Cluster Innovation, A new Standard for Scalability and Performance

Infineon offers an unparalleled portfolio for a scalable automotive instrument cluster platform on the Head Up Display market. TRAVEO™ T2G instrument cluster product families provide the most extensive scalability, which covers the conventional gauge instrument cluster and hybrid instrument cluster, as well as the virtual instrument cluster. The option of line-based operation of the graphics engine within the microcontroller minimizes the memory required for graphics processing. With the optimized 2.5D graphics engine and extended density of embedded flash and video RAM, TRAVEO™ T2G graphic MCU can support the virtual instrument cluster design with high resolution up to 2880 × 1080. Infineon's SEMPER™ flash and HYPERRAM™ memory products provide performance and density scalability to meet the requirements of different instrument cluster systems.

These high-performance memory devices provide an ideal solution for real-time graphics and high-speed access. The low-pin count interface also reduces design complexity and PCB size to save design costs.

Application diagram

TRAVEO™ overview and evolution

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Applications

Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security and FOTA supports
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– Visual data on a display at or above the driver's line of sight in a vehicle

Suggested products

– CYT4DN series
– CYT3DL series

www.infineon.com/traveo-head-unit

TRAVEO™ overview and evolution

Product Nomenclature Decoder

Product Family

System Architecture

Artificial Intelligence

Safety and Security

TRAVEO™ Ecosystem

Applications

Smart instrument cluster for two- and three- wheelers

Ride Smarter, Innovative Instrument cluster solutions for two-and three wheeler vehicles

Infineon's automotive instrument cluster solutions provide riders with a centralized and easy-to-view display with mirroring navigation maps and all key riding information of two-wheeler vehicle. Our instrument cluster dashboards can be securely updated and offer flexible customization. Benefit from our unparalleled portfolio for a scalable instrument cluster platform.

Our reference platform delivers a highly cost-effective system (SoM: System on Module) together with best graphics performance. This platform goes beyond vehicles, enables the future of two-wheeled mobility.
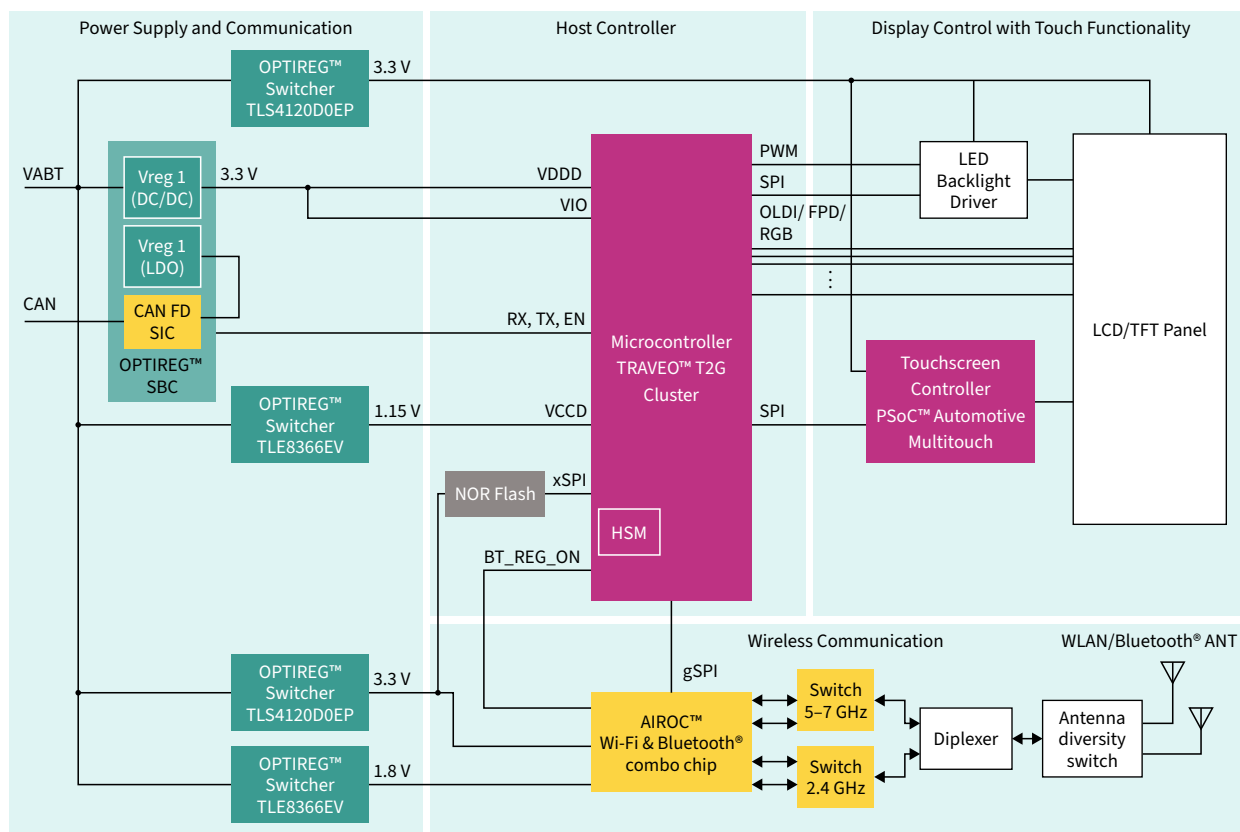
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B
– High performance Graphics authoring tool support (by 3rd party)

Key benefits

– Wireless transfer of (simple) navigation maps from a special smartphone app to the cluster display of a two-wheeler vehicle

Suggested products

– CYT4DN series
– CYT3DL series
– CYT2CL series

www.infineon.com/traveo-2-3-wheeler

TRAVEO™ overview and evolution

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Applications

Commercial, construction, and agricultural vehicles (CAV)

Pioneering the commercial vehicle transformation: Infineon's scalable and efficient system solutions

Stay ahead in the commercial, construction, and agricultural vehicles (CAV) market with Infineon's eco-friendly solutions. Utilizing TRAVEO™ T2G not only minimizes total cost of ownership (TCO) and maximizes productivity but also ensures compliance with critical safety standards such as ISO 26262, IEC 61508, and ISO 13849-1. Embracing autonomous technologies and efficient electrification solutions, our customized system solutions for buses, trucks, construction, and agriculture vehicles empower uninterrupted operations while boosting efficiency. Moreover, our specialized products for 24V systems offer unparalleled flexibility, supporting multiple CAN interfaces and demonstrating compatibility with stringent safety standards. Infineon's commitment lies in providing comprehensive and innovative solutions for vehicle control systems, ensuring safety, reliability, and industry-leading performance.

Together with safety and robustness, they must be compact, reliable, cost- and energy-efficient to stay competitive today. In addition to that, design engineers are looking for reduced time-to-market and total cost of ownership. Infineon is your one-stop-shop with a comprehensive portfolio of power electronics, drivers, and controls.

Application diagram
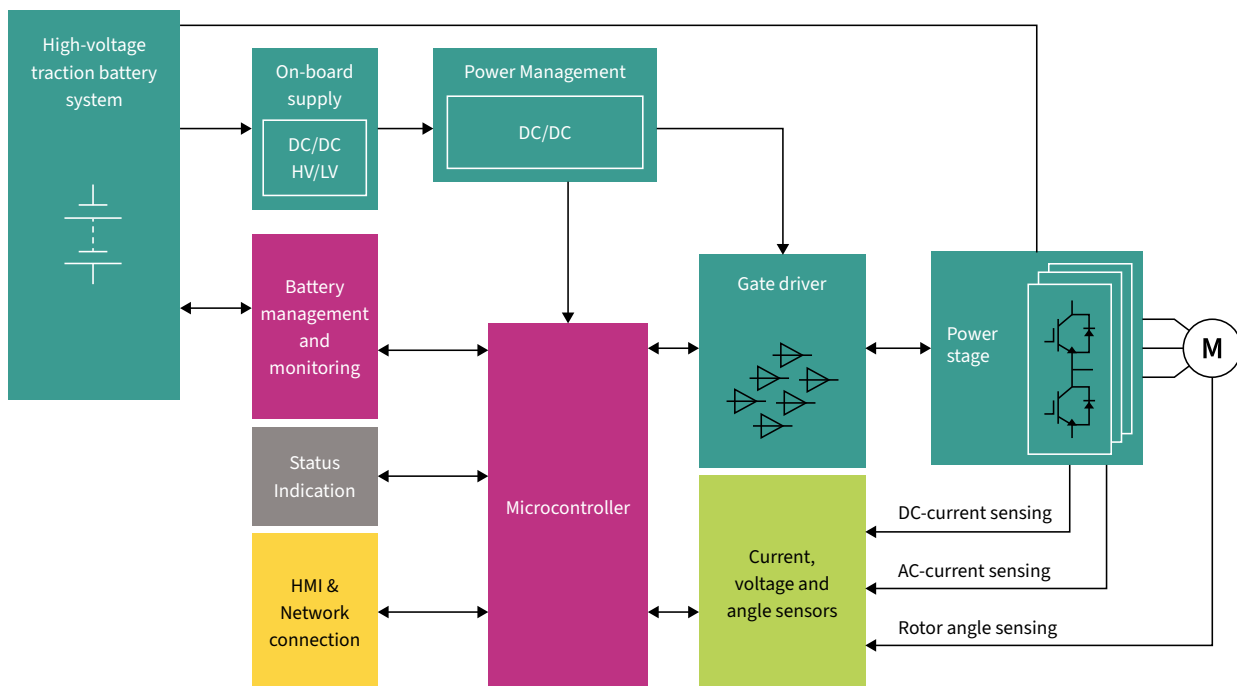
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– ISO 26262 conformance to support safety requirements Up to ASIL-B

Key benefits

– Wireless transfer of (simple) navigation maps from a special smartphone app to the cluster display of a two-wheeler vehicle

Suggested products

– CYT4BF series
– CYT4BB / CYT3BB series

www.infineon.com/cav

TRAVEO™ overview and evolution

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TRAVEO™ Ecosystem

Applications

Industrial (PLC)

Reliable, Robust, and Efficient Solution for Industrial Control and Automation

Infineon's TRAVEO™ T2G microcontroller provides robust support for industrial control, with a particular focus on the essential programmable logic controllers (PLCs) at the core of industrial automation systems. Often referred to as the "brain" of a factory, these PLCs manage a wide array of functions on the factory floor by collecting and processing data from sensors, switches, transmitters, and other devices. The high-safety micro-controller plays a crucial role in ensuring the reliability and stability of PLCs in demanding industrial environments. Prioritizing robustness, reliability, and system stability.

TRAVEO™ T2G facilitates seamless communication with distributed PLCs, remote I/O modules, circuit breakers, actuators, and sensor systems to meet real-time requirements for uninterrupted manufacturing throughput. Furthermore, our semiconductor solutions effectively address space constraints, high density of input/output channels, and power efficiency considerations, aligning effectively with the growing emphasis on environmentally friendly manufacturing processes.

Application diagram
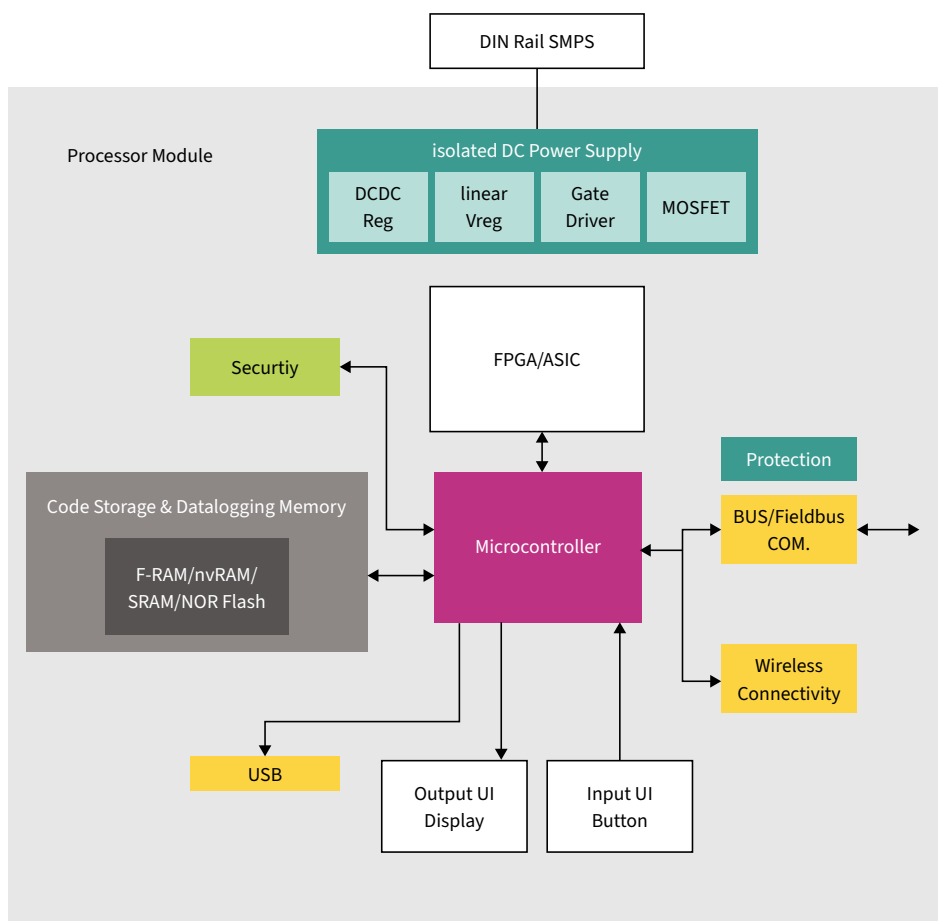
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
– High power efficiency
– eVITA full as high security
– FOTA supports
– IEC 61508 conformance to support safety requirements Up to SIL-2

Key benefits

– Enables pretended high performance networking and Industry strong security
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– IEC 61508 compliance supports SIL requirements
– Innovative supply system leads to best-in-class power consumption

Suggested products

– CYT4BF series
– CYT4BB series
– CYT2BL series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/plc/

TRAVEO™ overview and evolution

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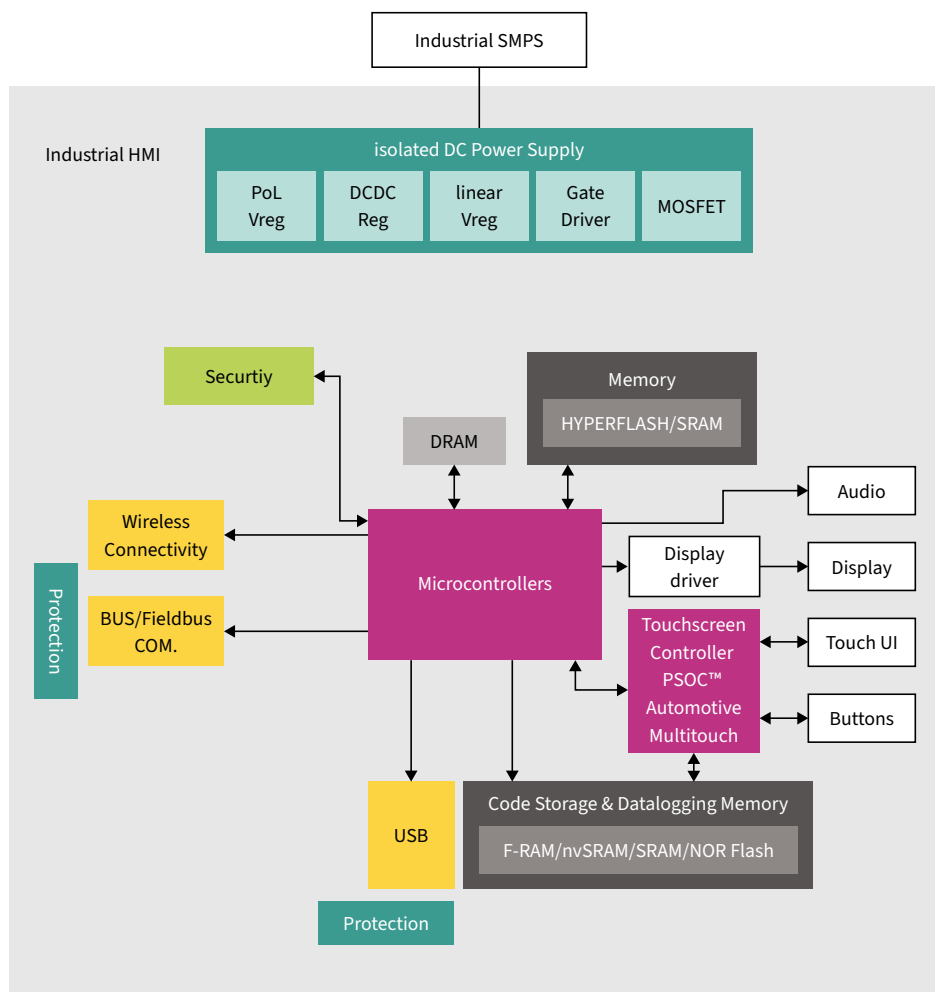Safety and Security

TRAVEO™ Ecosystem

Applications

Industrial (HMI)

The Face of Industry, Graphics Microcontroller for Sophisticated and Safe HMI Applications

Infineon's TRAVEO™ Graphics microcontroller is purpose-built to deliver sophisticated graphical information through TFT displays, specifically designed to meet the unique needs of industrial applications. As a reliable and versatile solution for Human Machine Interface (HMI) requirements, this microcontroller prioritizes durability, ease of operation, and seamless integration. With comprehensive HMI capabilities, including support for various communications such as Ethernet and CAN, alongside display interfaces, IOs, ADCs, PWMs, and other essential features.

TRAVEO™ T2G Graphics effectively meets the diverse demands of industrial interfaces. Moreover, its suitability for safety-related applications based on IEC 61508 up to SIL-2 level makes it an optimal choice for industrial HMI applications.

Application diagram

TRAVEO™ overview and evolution

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Applications

Features and benefits

Key features

- Scalable MCU family from single to dual core
- Advanced communication peripherals CAN FD, LIN, SPI, Ethernet
- High power efficiency
- eVITA full as high security
- FOTA supports
- IEC 61508 conformance to support safety requirements Up to SIL-2

Key benefits

- Scalable MCU family from single to dual core
- High performance GFX engine , high density Video RAM
- High integration leads to reduced complexity
- High performance Graphics authoring tool support (by 3rd party)
- IEC 61508 conformance to support safety requirements Up to SIL 2

Suggested products

- CYT4DN series
- CYT3DL series
- CYT2CL series

www.infineon.com/traveo-hmi

TRAVEO™ overview and evolution

Product Nomenclature Decoder

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TRAVEO™ Ecosystem

Applications

Light Electric Vehicles

We make cars clean, safe and smart

Contrasting to automotive (passenger car) requirements, L-category (light) vehicles (though often also on-road) require different sets of safety and qualification standards. As an example, the newest motorcycle standards place more responsibility on the operator rather than the vehicle itself to mitigate risks. Infineon considers mission profiles of different end applications and offers suitable non-automotive and automotive components for this wide range of use cases.

Different from the traditional vehicles with internal combustion engines, these types of vehicles are powered by battery technology with bus voltage ranging from 28V to 168V. The commonalities among these different types of LEVs are motor inverter/drives, battery management systems, battery charger/battery charging station/ battery swapping station. Additionally, light electric vehicles (LEVs) house increasingly popular smart features and electronics made possible due to their larger battery sizes.

As a leader in power semiconductors, Infineon strives to enable the most efficient, reliable, and smart solutions for e-mobility, Mini mobility and Micromobility markets. Keeping up with the latest market trends worldwide, Infineon prepares for the ramp-up of all forms of light electric vehicles, such as: Micromobility – electric bicycle (e-bike), electric kick-scooter Electric powered 2/3 wheelers (ePTW) – e-moped, e-scooter, e-rickshaw, e-motor-cycle, MicroEV – electric microcars, low-speed electric vehicles (LSEV), neighborhood EV (NEV), electric quadri-cycle, Other electric transporters (e.g. e-forklift, e-golf cart, e-ATV) with less than 200V batteries.

Application diagram
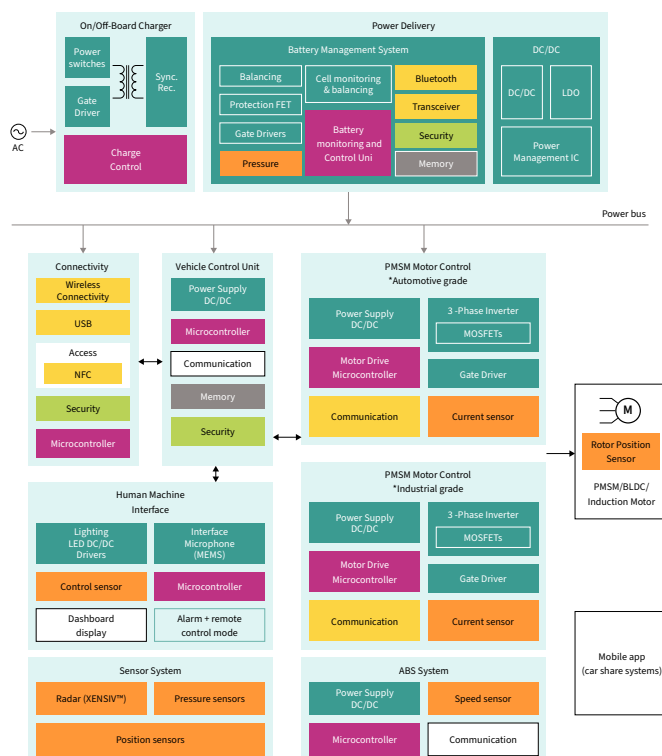
Features and benefits

Key features

– Scalable MCU family from single to dual core
– Motor control for driving
– High accuracy A/D converter for the Battery
  Management
– Communication peripherals: CAN FD, LIN, SPI
– FOTA supports
– eVITA full as high security
– ISO 26262 conformance to support safety
  requirements Up to ASIL-B

Key benefits

– Enables pretended high performance networking
  and ECU strong security
– High integration leads to significant cost savings
– High integration leads to reduced complexity
– ISO 26262 compliance supports ASIL requirements
– Innovative supply system leads to best-in-class
  power consumption

Suggested products

– CYT3BB/4BB series
– CYT2B9 series
– CYT2B7 series

www.infineon.com/lev

Public

Date: 12 / 2024

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