



Infineon's solution for instrument cluster and digital cockpit

Towards a next in-vehicle user experience



Introduction

Instrument Cluster, Head Unit, and Cockpit Domain Controller are the central-control and user-interface systems that manage and deliver driving information and entertainment to the driver and passengers – all through audio and video interfaces, control elements such as touch screen displays, button panels, voice commands, and more. Telematics plays an important role in autonomous driving and service-over-air updates for vehicle safety and security.

Now and for the foreseeable future, in-car electronic performance is a major decision of driver when purchasing a new car. Vehicles have evolved from hardware-driven machines to software-driven electronic devices. Through this trend, the importance of electronics and software is increasing. System complexity has become a major challenge for automotive electronics designers; engineers must continue to add new connectivity solutions, new comfort applications, and advanced driver assistance

systems. The differentiation will focus more on the user-interface and experience elements powered by advanced electronic devices and application software.

Intuitive Human-Machine Interface (HMI) sensing, seamless wireless connection, secured data access, reliable high-performance computing and storage are all key technologies provided by Infineon that can significantly enhance the in-vehicle customer experience. Together with the leading and full-spectrum portfolio of all power technologies, Infineon's products will provide reliable and highly efficient solutions for your automotive infotainment applications.

Below we dive deeper into Instrument Cluster, Head Unit, & Cockpit Applications and Solutions.



Instrument cluster application and solutions

The Instrument Cluster is a system to display important vehicle operation information to the driver such as vehicle speed, fuel level and the status of various other vehicular systems.

With consumers' increased use experience requirements, instrument clusters are evolving from analog gauges to high-graphic resolution digital clusters. Infineon products for instrument clusters address following **major market trends** in:

- › **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.
- › **Functional safety**, with TRAVEO™ T2G microcontroller families and SEMPER™ NOR Flash memory to achieve the “ASIL-B” safety level specified by ISO 26262.
- › **Security**, with the integrated Hardware Security Module (HSM), TRAVEO™ T2G microcontroller families support on-chip security compliant to the EVITA Full standard.
- › **Firmware update over-the-air (FOTA)**, with dual bank memory split and integrated HSM, TRAVEO™ T2G microcontroller families support secure software image update in the background without interruption of service.



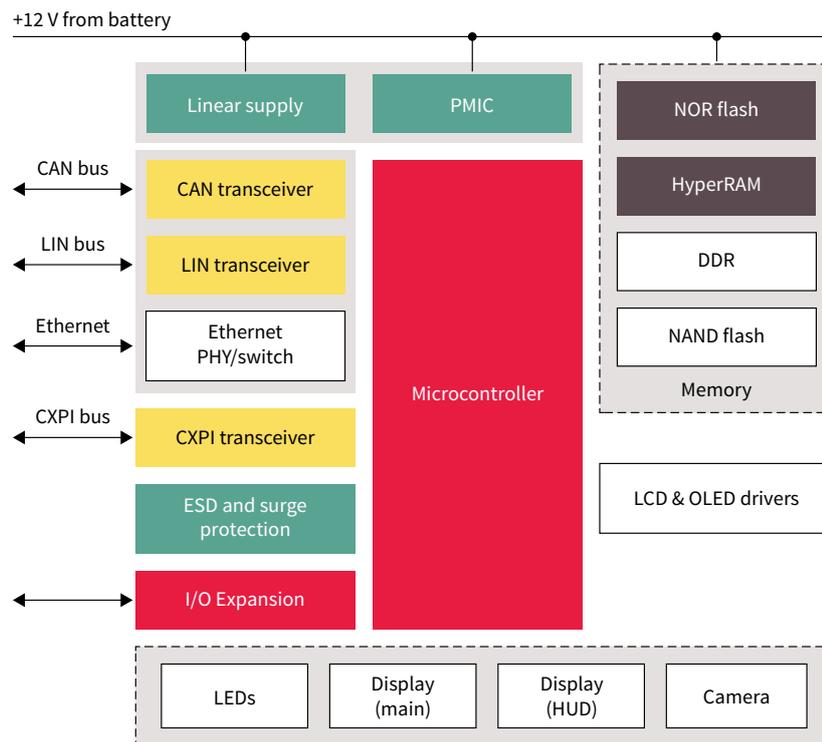
System benefits

- › Scalability: Full range of product offerings for instrument clusters: MCU, memory and power products; TRAVEO™ T2G MCUs enable scalable instrument cluster solutions with optimized system cost, from 2.3” to 3.5” dot matrix instrument clusters (resolution 320 x 240), up to dual display 8” to 12 “ virtual instrument clusters (resolution 1920 x 720).
- › Functional Safety: Hardware (TRAVEO™ T2G graphic MCU, SEMPER™ NOR Flash™) and software are both in compliance with ISO 26262 ASIL-B functional safety.
- › Secured Updatability: Enhanced vehicle secure updatability with TRAVEO™ T2G MCU Hardware Security Module (Evita Full HSM) and embedded read-while-write memory, plus external SEMPER™ NOR Flash, which allows for the execution of software (read) while programming (write) for secured Firmware-Over-The-Air (FOTA) updates.

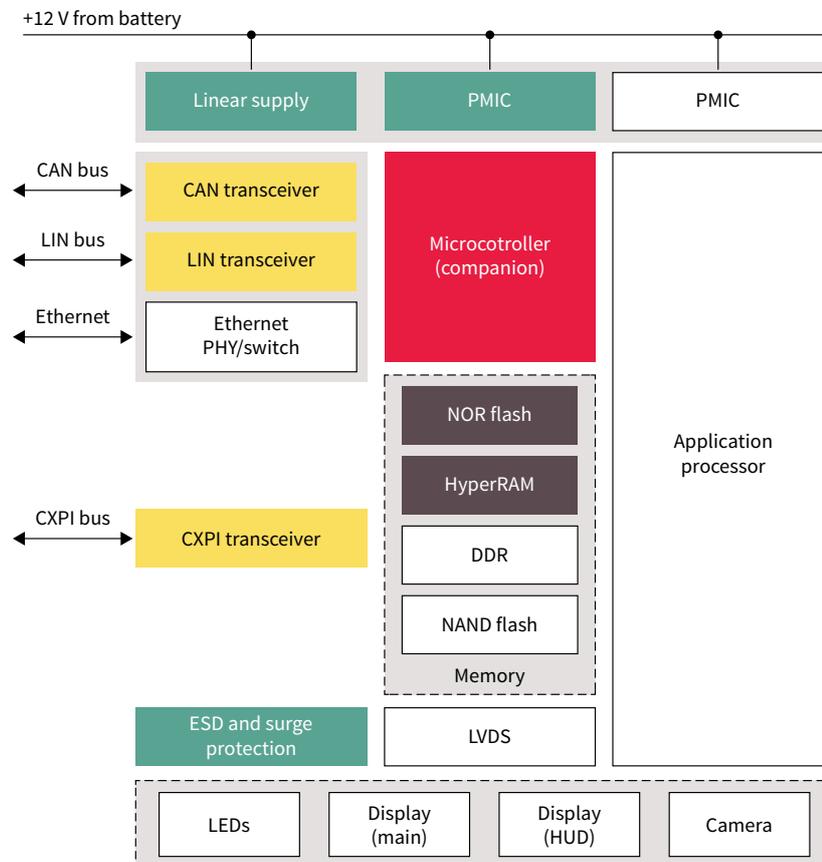
Suggested products

Product type	Description
Microcontroller	TRAVEO™ T2G CYT2Cx/3Dx/4Dx Cluster MCU Series TRAVEO™ T2G CYT2Bx/3Bx/ CYT4Bx Body MCU Series
SEMPER™ NOR Flash	SEMPER™ NOR Flash, HYPERBUS™ NOR Flash, Standard SPI NOR Flash Families
HYPERRAM™ 2.0	HYPERRAM™ 2.0 pseudostatic RAM
Power Supply IC	OPTIREG™ PMIC, Linear, Switcher and System Basis Chips (SBC)
In-vehicle-networking	OPTIREG™ System Basis Chip Family, CAN, LIN Transceivers
Software	AUTOSAR 4.2.2 SW (ASIL-B), Graphics software including Graphic Driver, JPEG Decoder Driver, Functional Safety Software.

Hybrid cluster system – block diagram



3D digital cluster system – block diagram



To know more on Instrument clusters click here:

<https://www.infineon.com/cms/en/applications/automotive/infotainment/instrument-cluster/>



Head unit & cockpit application and solutions

The Head Unit is an electronic control unit (ECU) in cabin, which provides driving information and entertainment to driver and passengers, from audio, touchscreen displays to navigation, connectivity and cloud-based services. It interacts with driver and passengers through various Human-Machine Interface (HMI) technologies, such as touch screen, voice commands and gesture recognitions.

With the automotive E/E architecture is shifting to software-defined-vehicles, domain controllers or higher-performance computer integrate multiple functions. Such as the **Cockpit** seamlessly integrated the functions of Head Unit, Cluster, Head Up display, rear seat entertainment and audio processing functions into one ECU, which interacts with a vehicle ethernet backbone. Especially the technologies such as 5G, cloud computing, Internet of Things (IoT), and self-driving are appearing in cars, people expect higher-resolution displays and “full-time connected” when sitting in cars, so the Cockpit is reimagined as a more social and connected space to support better user experience.

Infineon, as the number one semiconductor supplier in the automotive industry, continues to develop new technologies and products to enable customers' innovation and success. Our extensive products help to develop modern Head Unit and Cockpit systems to meet future trends.

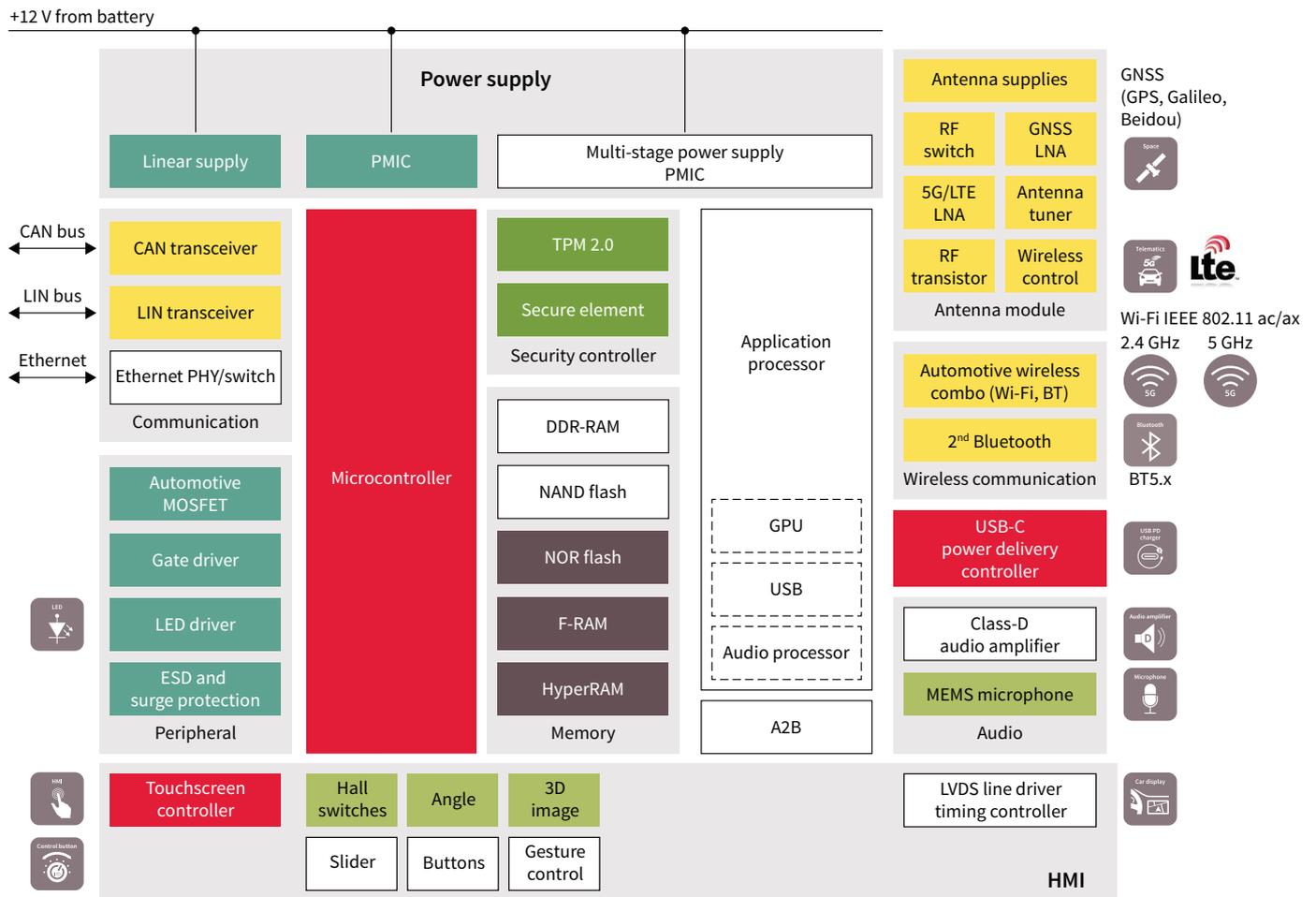
- › **Computing:** We offer a very comprehensive Automotive MCU portfolio, from TRAVEO™ MCUs based on ARM Cortex M cores, featuring up to 8MB of flash, supporting ASIL-B that are designed for low power covering the low to mid end systems to the well-known AURIX™ MCUs with their powerful Tricores, supporting functional safety up to ASIL-D, 16 MB of flash, offering high performance and fulfilling requirements up to the very high end of MCU applications.
- › **Touch & Capacitive Sensing:** With cutting-edge touch sensing technologies, Infineon provides a wide range of sensing products including the PSoC Automotive Multi-touch touchscreen controller for high-resolution displays and PSoC® 4 SoC for touch button or slider controller.

- › **Audio Sensing:** Infineon's automotive qualified XENSIV™ silicon microphone enables distortion-free audio capturing for all speech-related applications, improving speech intelligibility for voice recognition algorithms.
 - › **In-cabin Sensing:** Infineon's REAL3™ ToF sensors and highly integrated mmWave XENSIV™ 60 GHz radar sensor brings innovative, intuitive and robust depth sensing capabilities to many in-cabin sensing applications such as DMS (Driver Monitor System), ICMS (In-Cabin-Monitor-System) and OMS (Occupant-Monitor-System)
 - › **Connectivity & Communication:** Broad Wi-Fi & Bluetooth portfolio supports various in-cabin wireless connections; CAN, LIN transceivers and System Basis Chips (SBC) families connect head unit to in-vehicle-networking.
 - › **Power supply:** OPTIREG™ PMIC, Linear, Switcher and support reliable power supply; USB-C PD controllers support fast charging (up to 100 W) with best-in-Class interoperability and compliance with all kinds of mobile devices.
 - › **Storage:** Broad automotive qualified NOR-Flash, SRAM and F-RAM portfolio provide safe, secure, and reliable data storage.
- System benefits**
- › **Scalability:** Scalable family solutions with wide compatibilities on both hardware and software support designs from low to high-end systems with less design efforts.
 - › **Performance:** Best-in-class performance of sensing solutions (touchscreens, microphones, etc.), wireless solutions (Wi-Fi & Bluetooth) and fast-charging solutions (USB-C PD) improve customer experience significantly.
 - › **Security:** Secured MCU, secured memory and secured connectivity support secured Firmware update Over-the-air (FOTA), and safeguard the consumers from cyber-attacks.
 - › **Safety:** TRAVEO™ T2G cluster MCU solution provides ASIL-B functional safety to cluster display via adding safety overlays on 3D SoC display contents; REAL3™ ToF 3D image sensor supports vision based in-cabin-monitoring-system (ICMS) solution, and XENSIV™ 60 GHz radar (+ AURIX™ MCU) provides total solution for radar based ICMS.
 - › **Total cost of ownership:** Broad portfolio provides one-stop-shop on both commercial and technical which significantly reduce purchase cost as well as the system design efforts.

Suggested products

Product type	Description
Microcontroller	TRAVEO™ T2G CYT2Bx/3Bx/4Bx Body MCU Series TRAVEO™ T2G CYT2Bx/3Bx/ CYT4Bx Body MCU Series
Microcontroller	AURIX™ TC2xx/TC3xx Family
Touch screen/button	PSoC Automotive Multitouch, PSoC® 4 Programmable embedded System-on-Chip
Wi-Fi & bluetooth	CYW89570, CYW89570XR, CYW89459, CYW89373, CYW89072, CYW89820
Power Supply IC	OPTIREG™ PMIC, Linear, Switcher and System Basis Chips (SBC)
In-vehicle-networking	OPTIREG™ System Basis Chip (SBC) Family, CAN, LIN Transceivers
Memories	SEMPER™ NOR Flash, HYPERRAM™ 2.0
USB-C PD controller	EZ-PD™ CCG7D, EZ-PD™ CCG7S
MEMS microphone	XENSIV™ MEMS microphone, IM67D120A, IM67D130A
Image sensor & 60 GHz radar	REAL3™ ToF image sensor, XENSIV™ 60 GHz radar sensors
Security controller	SLI37CMXXX family
Safety cluster	TRAVEO™ T2G CYT2Cx/3Dx/4Dx Cluster MCU Series
Software	AUTOSAR MCAL/FEE, Safety software for AURIX™ to support up to ASIL-D

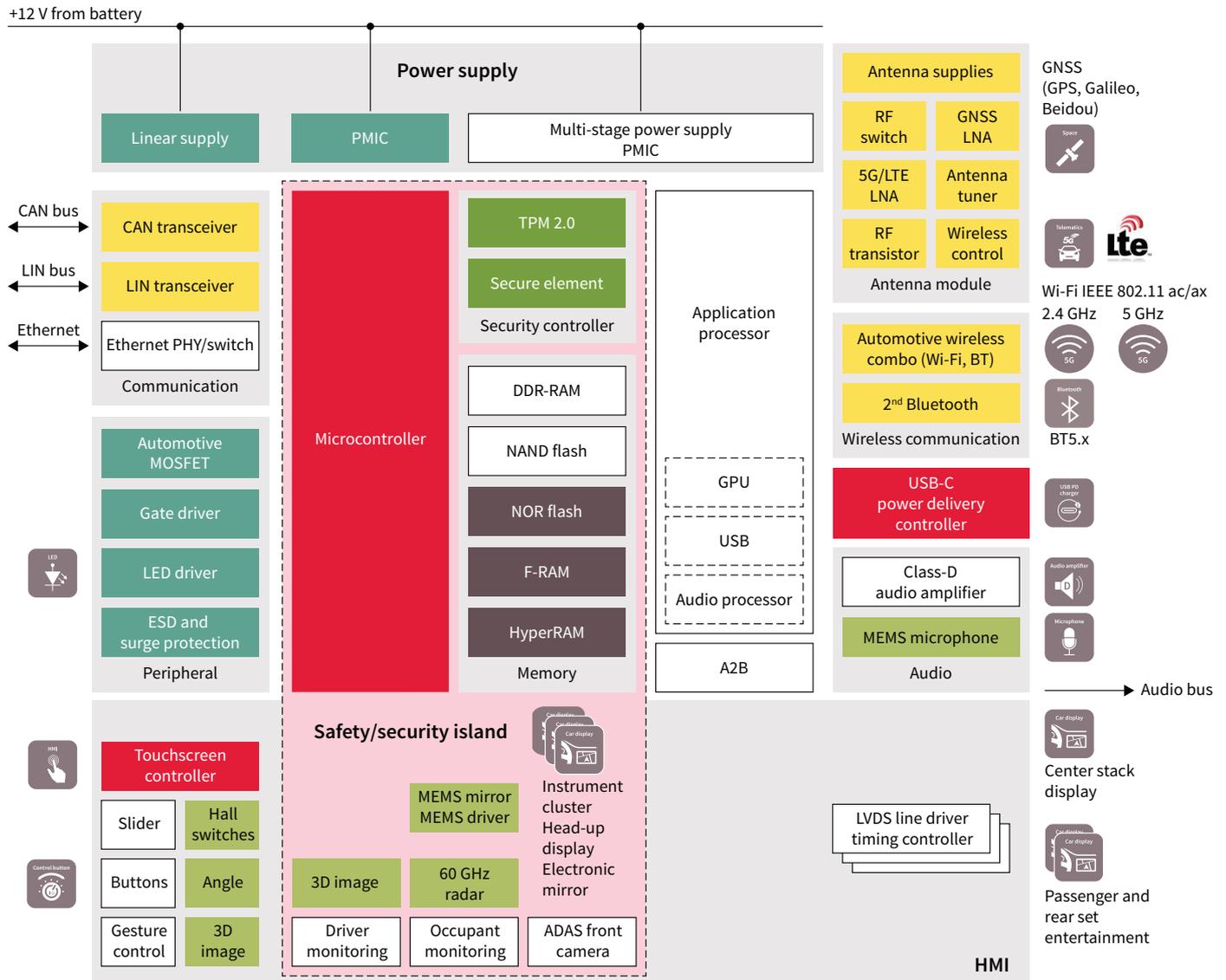
Head unit system – block diagram



To know more on Head-unit solutions click here:

<https://www.infineon.com/cms/en/applications/automotive/infotainment/head-unit/>

Cockpit system – block diagram



To know more on Cockpit solutions click here:

<https://www.infineon.com/cms/en/applications/automotive/infotainment/cockpit/>



Infineon Automotive

We make cars clean, safe and smart.

The ATV division is shaping the future of mobility by enabling clean, safe, and smart cars. Its product and solution offering is powering the transition to hybrid and all-electric vehicles. It is supporting the next stages of automated driving as well as higher levels of connectivity, digitalization, and security in today's cars. ATV drives safety, digital cockpit, infotainment, comfort, and lighting innovations. Its portfolio integrates sensors, microcontrollers, high-performance memories for specific applications, power semiconductors based on silicon (Si) and silicon carbide (SiC), as well as components for human-machine interaction and vehicle connectivity. Infineon is the world leader in automotive semiconductors

The automotive industry is currently undergoing extreme transformation. More changes are expected in the next five years than in the past 20 combined. Semiconductor suppliers like Infineon are essential to enabling these mega trends a reality. Our goal is to make the car of the future a reality: all-electric and autonomous, fully connected, always online and cybersecure.

Infineon's automotive product portfolio is the industry's broadest – ranging from sensors, microcontrollers and high-performance memory for specific applications all the way to power semiconductors and devices for human-machine interaction and vehicle connectivity.

To know more visit our Automotive solutions page:
<https://www.infineon.com/automotive>

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- > India 000 800 4402 951 (English)
- > USA 1-866 951 9519 (English/German)
- > Other countries 00* 800 951 951 951 (English/German)
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