OPTIREG™ System Basis Chips Product Overview

January 2021

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System Basis Chip (SBC)
Collaterals & Support Material

Collaterals and Brochures	– Product Briefs – Selection Guides – Application Brochures – Presentations – Fighting Guides	– Link to SBC family page – Automotive Power Selection Guide – Automotive Application Guide – Automotive In-Vehicle Networking

Technical Material	– Application Notes
	– User Manual
	– Datasheets
	– PCB Design Data
		– Link to SBC family page
		  – Lite SBC family page
		  – Mid-Range+ SBC family page
		  – DCDC+ SBC family page
		  – Multi-CAN Power+ SBC family page

Evaluation Boards & Software	– Evaluation Boards Software: – SBC Config Wizard – Power Dissipation Tool – Bode Plot – CAN PN Wizard – SBC Microcontroller Library – Current Consumption Tool	– Link to board pages – Link to software
Videos / Distribution Trainings	– Technical Videos – eLearnings	– Link to Videos – Link to eLearning

FAQ	– FAQ General SBC
	– FAQ Lite SBC
	– FAQ MR+ SBC
		– Link to SBC FAQ
		  – Link to Lite SBC FAQ
		  – Link to MR+ SBC FAQ

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High performance discrete power portfolio and integrated system solution out of one hand

OPTIREG™

OPTIREG™ Linear

These linear power supply solutions are suited for body, infotainment, chassis, safety, powertrain and transmission applications

- High Performance
- General Purpose
- Voltage Trackers
- Application Specific
- Application Specific (24 V)
- Post Regulators

OPTIREG™ Switcher

These switched mode power supply solutions are ideal for body, infotainment, chassis and safety applications.

- Buck Converter
- Boost Converter
- Buck Controller

OPTIREG™ PMIC

These integrated power supply solutions are targeted for applications like chassis, safety, powertrain and transmission.

- Safe Computing
- Safe Control

System Basis Chips

These high integration solutions offer power supply, communication, diagnosis and supporting feature in a single device

- Lite SBC
- Mid-Range+ SBC
- DCDC+ SBC
- Multi-CAN Power+ SBC

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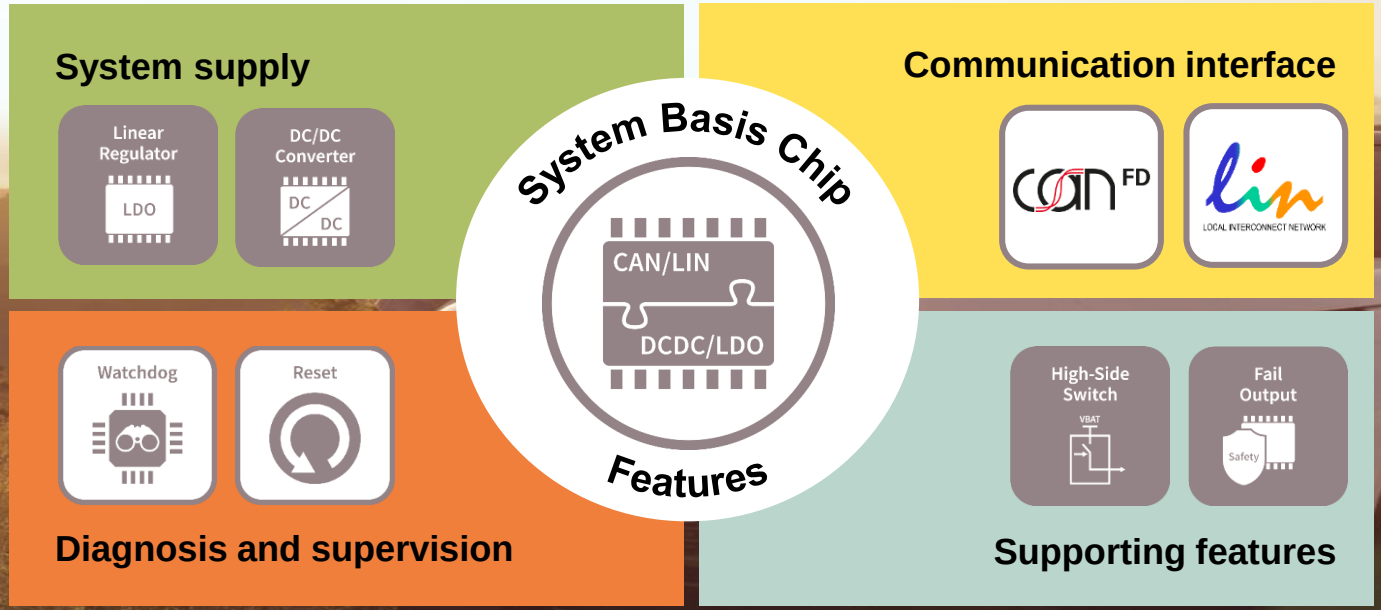
What is an SBC?



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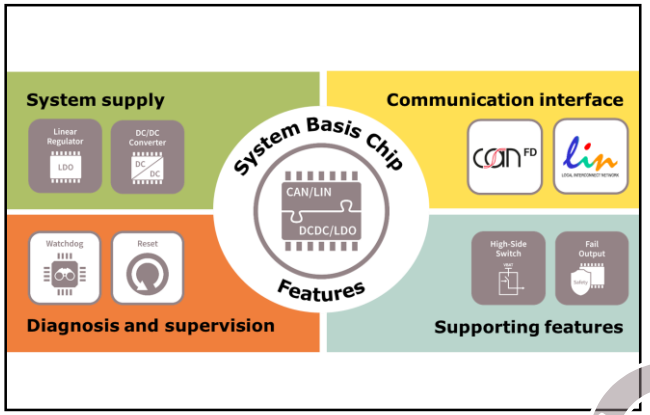
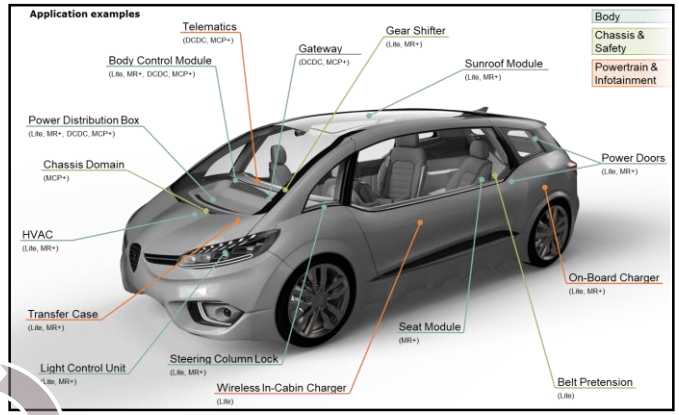
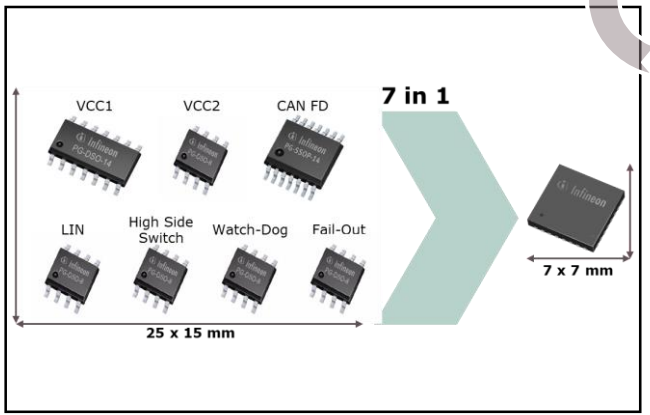
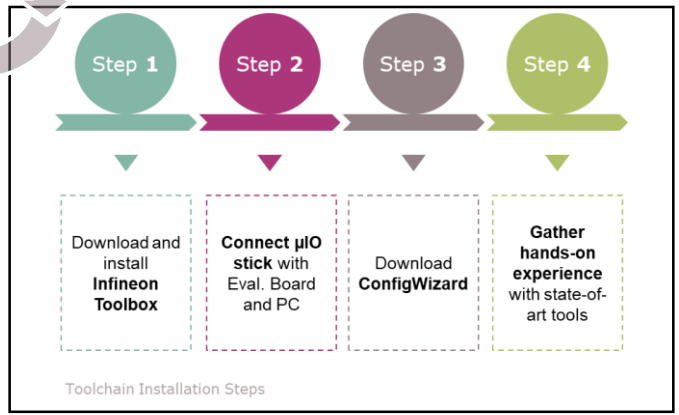
SBCs – What? Where? Why? How?









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Why should I use an SBC?

Space saving	Power, communication, safety and support features are **integrated into one system** solution reduced PCB by ~90% (e.g. 300mm² vs. 34mm² for Lite SBC)
Energy saving	**Extend battery life** with very low quiescent current modes and CAN Partial Networking. Lowest Iq to achieve limitation of <100µA per ECU
High system reliability	Extensive **diagnostics and protections are embedded** within the SBC to support FuSa requirements, reduce external component count, improve system reliability in comparison to discrete solutions
Reduced system cost	Minimum number of components to **reduce system and BOM cost (7 in 1). Reducing Total Cost of Ownership by ~0.1 USD per ECU, due to less active component** (~0.014 USD per active component for assembly, qualification, purchasing, optical insception, logistics, etc.)
Multiple and flexible designs	Compatibility **reduces development time and effort** for SBC by 1-2 man months for electronic design and 50% SPI configuration software development Scalability (transceiver) nodes reduce customer effort in platform approach.

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System Basis Chip in a Nutshell

- **Revenue CAGR >15%** last 5 years **(>20% CAGR in next 5 years)**
- We shipped **more than 400 million** SBC devices
- Globally we serve **more than 50 customers**
- We are **designed-in at major automotive tier-1s** in high volume
- SBC **portfolio** has expanded to **30 product variants**
- **Further portfolio is planned** to expand into further applications

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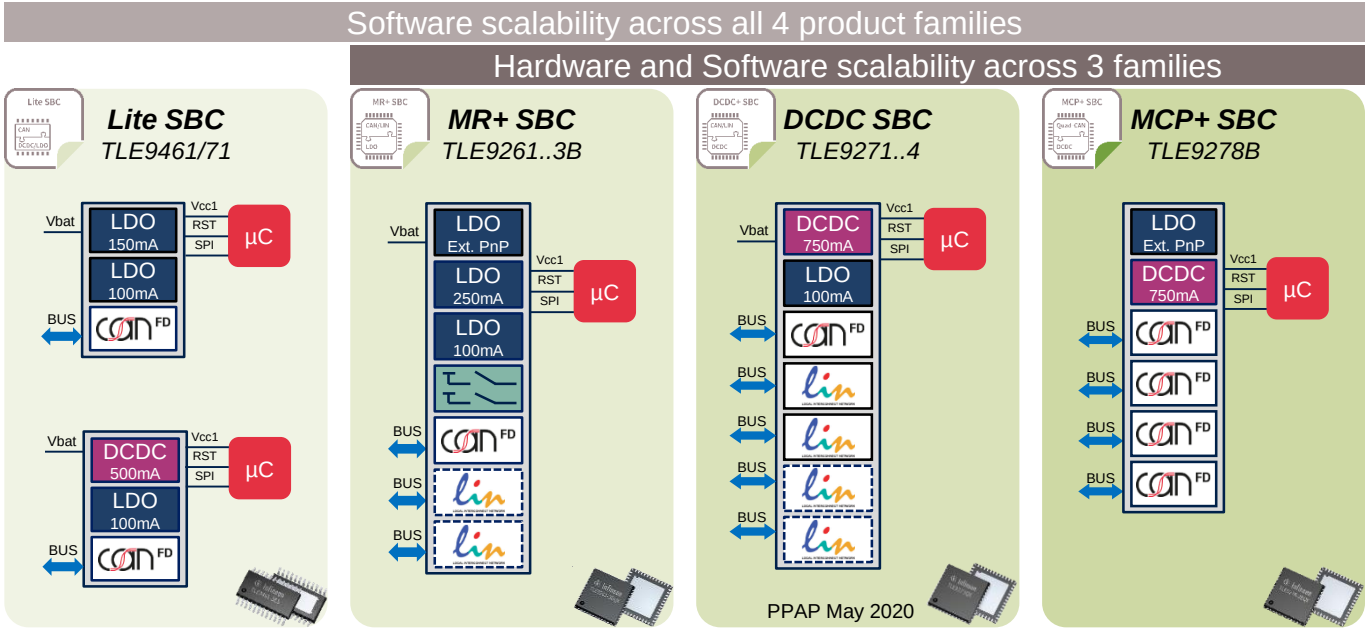
Infineon SBC's offer most complete portfolio and key differentiated USP's



Unparalleled scalability across Product Families for fast time-to-market

Supports **latest networking standards** CAN FD up to 5Mbps & CAN PN supported

Component releases at all major OEMs

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Infineon SBC Families
CAN FD Performance Overview

CAN FD timing parameters

CAN FD EMC Limits

CAN FD EMC & ESD Specification

CAN Partial Networking & FD tolerance

New CAN Wake-up filter timing

SBC Family	Sales Names	CAN FD ISO 11898-2:2016	IEC 62228-3 EMC	US EMC SAE J2962-2*	CAN PN / FD tolerant	t_{Filter} / t_{Wake1} CAN activity filter time
Mid-Range+ SBC	TLE9261(-3)BQX (V33) TLE9262(-3)BQX (V33) TLE9263(-3)BQX (V33)	Yes – 5Mbps	Yes – 5Mbps	Yes – 2Mbps	Yes	0.5µs – 1.8µs
DCDC SBC	TLE9271QX (V33) TLE9272QX (V33) TLE9273QX (V33) TLE9274QX (V33)	Yes – 5Mbps	Yes – 5Mbps	Yes – 2Mbps	No	0.5µs – 3.5µs
Multi-CAN Power+ SBC	TLE9278(-3)BQX (V33)	Yes – 5Mbps	Yes – 5Mbps	Yes – 2Mbps	Yes	0.5µs – 1.8µs
Lite SBC	TLE9461(-3)ES (V33)	Yes – 5Mbps	Yes – 2Mbps	Yes – 2Mbps	Yes	0.5µs – 1.8µs
	TLE9471(-3)ES (V33)	Yes – 5Mbps	Yes – 2Mbps	Yes – 2Mbps	Yes	0.5µs – 1.8µs

* max. 2 Mbps tested according to SAE

First SBC families on the market fulfilling CAN FD ISO 11898-2:2016 and IEC 62228-3 standards up to 5MBit/s CAN-FD

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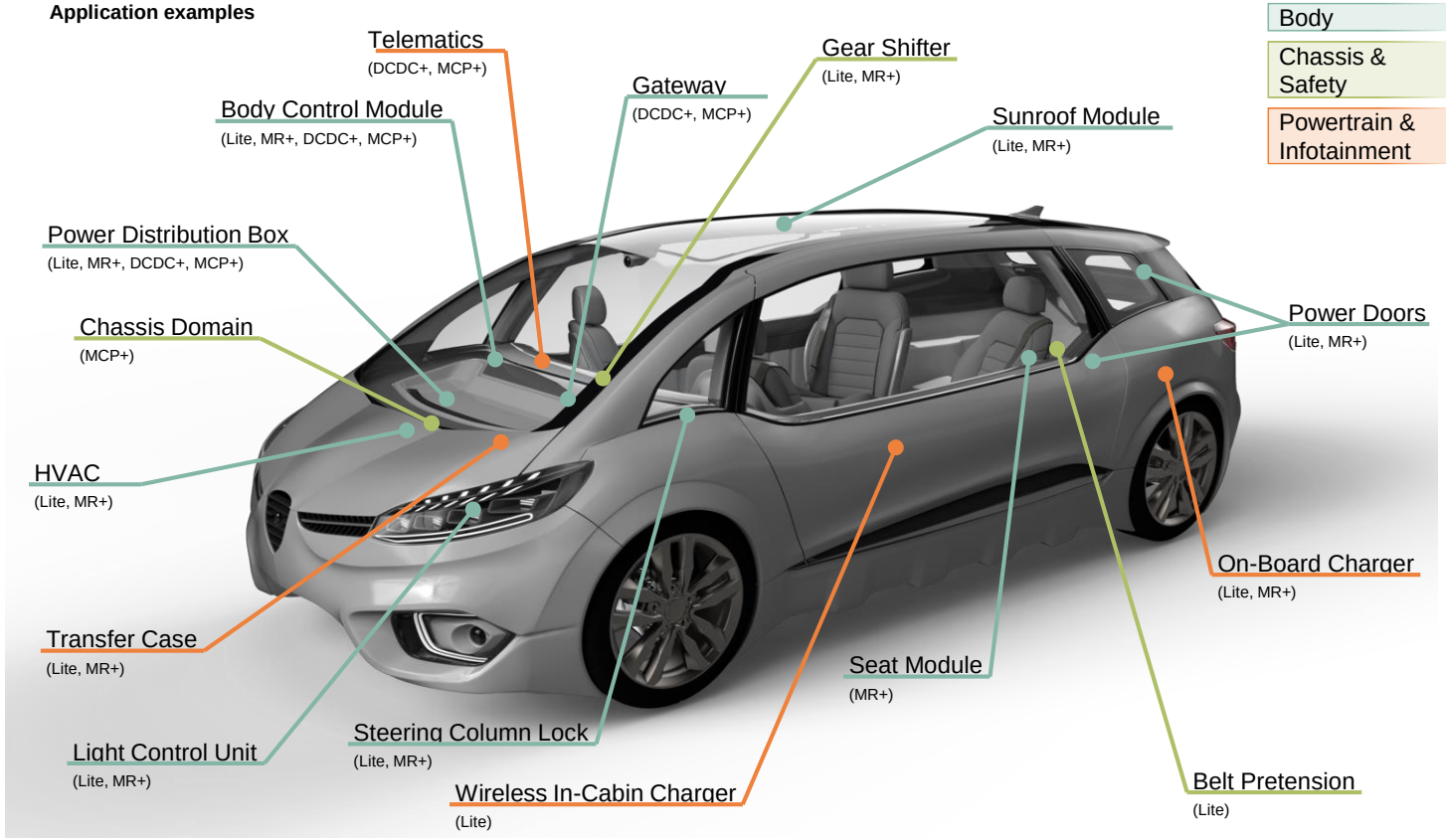
System Basis Chips can be used in any ECU in the car



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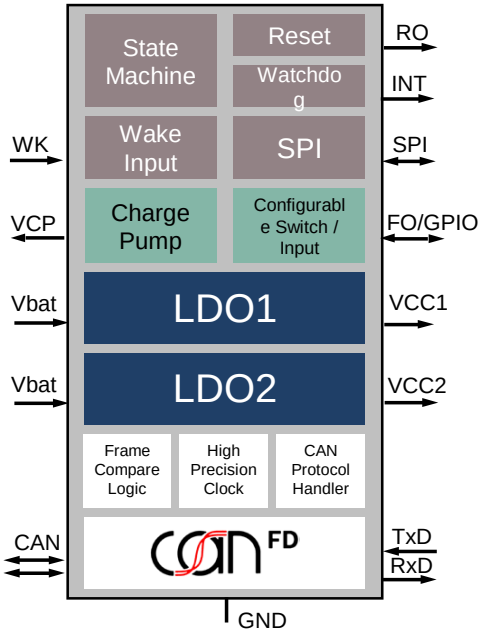
Lite LDO SBC – Overview
TLE9461(-3)ES (V33)

Key Features

- 5V/3.3V Linear Regulator up to 150mA (Vcc1)
- 5V Linear Regulator (off-board protected) up to 100mA (Vcc2)
- CAN FD up to 5Mbps, CAN PN FD Tolerant (“-3” variants)
- 1x HV Wake input, Watchdog, Reset, Interrupt, Fail Output
- Charge Pump Output for Reverse Polarity Control
- Spread Spectrum for EMI mitigation
- Alternative Functions to Fail Output:
  Configurable as Wake, Low-Side or High-Side Switch (up to 45mA) Low Power and Fail-Safe Operating Modes
- Package: 8.65x6mm TSDSO-24
- Software Compatibility w/in TLE9x6y & TLE9x7y

Application Examples



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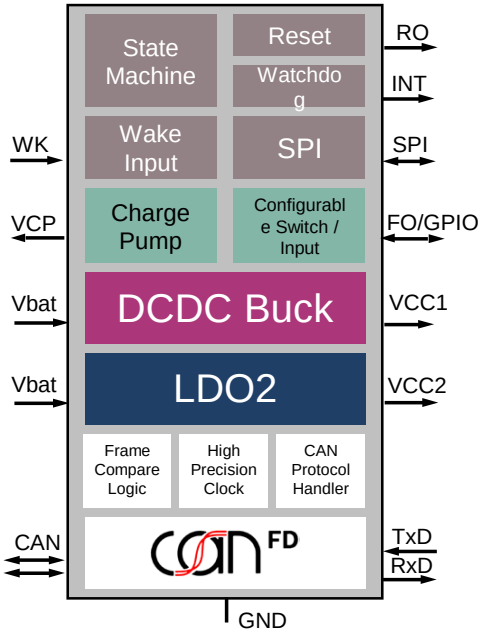
Lite DCDC SBC – Overview
TLE9471(-3)ES (V33)

Key Features

- 5V/3.3V Buck converter up to 500mA
  - Programmable switching f up to 2.4MHz
  - Spread Spectrum for EMI mitigation
- 5V Linear Regulator (off-board protected) up to 100mA (Vcc2)
- CAN FD up to 5Mbps, CAN PN FD Tolerant (“-3” variants)
- 1x HV Wake input, Watchdog, Reset, Interrupt, Fail Output
- Charge Pump Output for Reverse Polarity Control
- Alternative Functions to Fail Output:
  Configurable as Wake, Low-Side or High-Side Switch (up to 45mA)
- Low Power and Fail-Safe Operating Modes
- Package: 8.65x6mm TSDSO-24
- Software Compatibility w/in TLE9x6y & TLE9x7y

Application Examples



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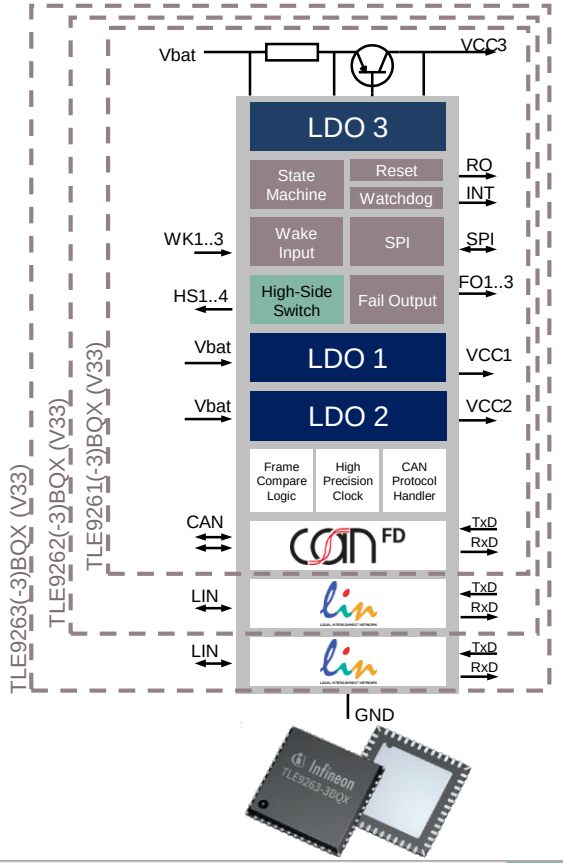
Mid-Range+ SBC Overview
TLE9261/2/3(-3)BQX (V33)

Key Features

- 1-to-1 Drop-In with existing Mid-Range SBC family
- 5V or 3.3V integrated LDO voltage regulators
- 5V/3.3V/1.8V voltage reg. with external PNP
- Support CAN FD communication up to 5Mbps, compliant to ISO11898-2:2016
- CAN PN FD tolerant (-3BQX variants)
- Very low quiescent current
- Low-Power and Fail-Safe Operating Modes
- 7x7mm VQFN-48 supporting AOI
- Software Compatibility w/in TLE926x/927x/946x/947x

Application Examples



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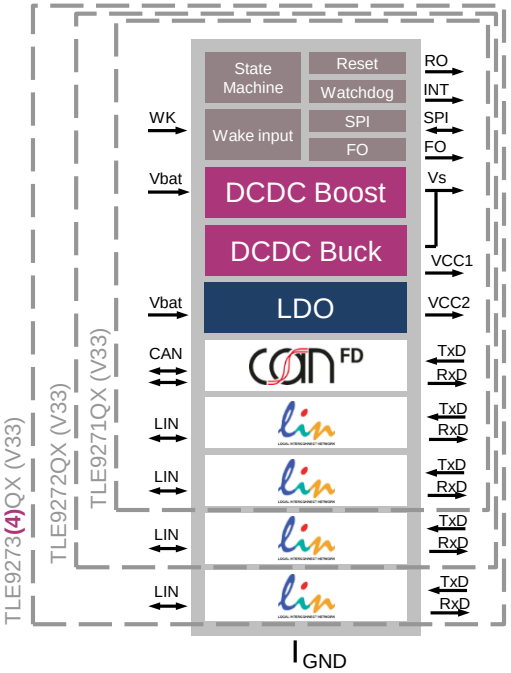
DCDC SBC Overview
TLE9271/2/3/4QX (V33)

Key Features

- 5V(3.3V) BUCK converter up to **750mA**
- 6.5V/8V BOOST controller (Vs) → **Additional 10V BOOST option for TLE9274QX (V33)** NEW
- Switch f = 450kHz w/ edge shaping for low EMI
- LDO voltage regulator @ 5V up to 100mA
- CAN FD communication up to 5Mbps
- Very low quiescent current in PFM mode
- Low power and Fail-Safe Operating Mode
- 7x7mm VQFN-48 w/ exposed pad supporting AOI
- Software Compatibility w/in TLE926x/927x/946x/947x

Application Examples



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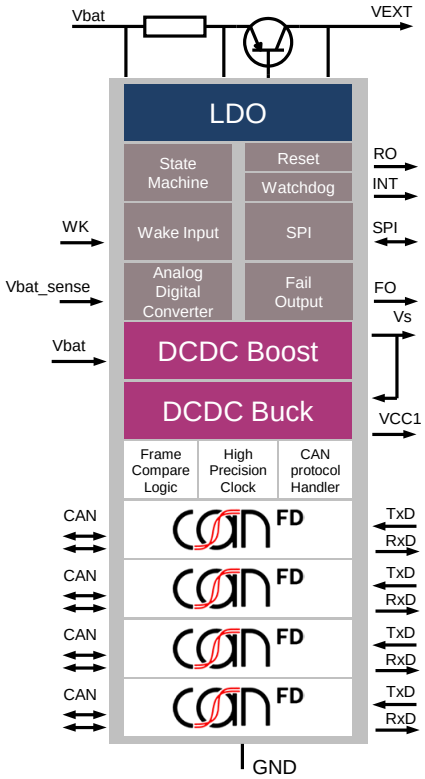
Multi-CAN Power+ SBC Overview
TLE9278(-3)BQX (V33)

Key Features

- 5V/3.3V BUCK converter up to 750mA
- 6.5V/8V/10V/12V BOOST converter
- Switch f = 450kHz w/ edge shaping for low EMI
- 5V/3.3V/1.8V/1.2V LDO with external PNP
- Four ports CAN FD up to 5Mbps
- CAN PN FD Tolerant (“-3” variants)
- Battery Voltage Measurement interface w/ ADC
- Low Power and Fail-Safe Operating Mode
- 7x7mm VQFN-48 w/ exposed pad supporting AOI
- Software Compatibility w/in TLE926x/927x/946x/947x

Application Example



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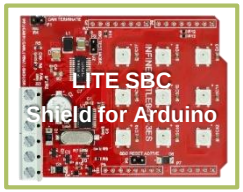
SBC Design Support Tools

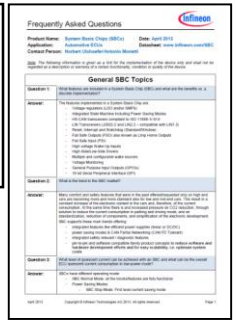
SBC Evaluation Boards

Sales Name of Demoboard	Description
"MID-RANGE+ SBC (V33) BOARD"	*Available. Connect thru µIO.*
"DCDC+ SBC (V33) BOARD"	*Available. Connect thru µIO.*
"MULTI-CAN Power+ SBC (V33) BOARD"	*Available. Connect thru µIO.*
"LITE LDO/DCDC SBC (V33) BOARD"	*Available. Connect thru µIO.*
"SBC-SHIELD_TLE9471"	*Available. Connect thru Arduino.*
"UIO STICK"	*Available. USB dongle between computer & demoboard*



Other design in support material

- Data Sheets (on request before M9)
- EMC Test Reports (on request)
- FIT Rates & Module breakdown (on request)
- eLearning for SBC, Lite SBC and MR+ SBC
- Config Wizard (Toolbox)
- Power Dissipation Tool, CAN PN Wizard, Bode Plot and SBC Microcontroller Library, Current Consumption Tool (Toolbox)



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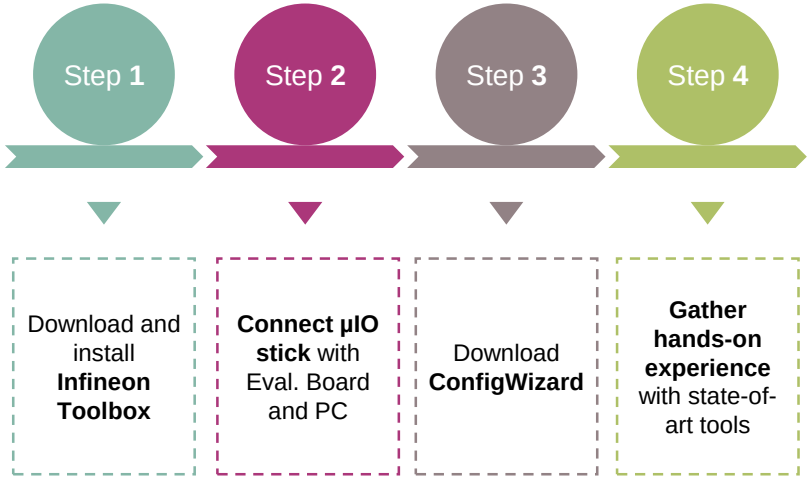
SBC Design in Support & Tool Chain

Various support materials are offered by the Infineon:

- Evaluation Boards
- Shield for Arduino
- SBC Config Wizard (Configuration Tool)
- SBC Microcontroller Library
- Bode Plot
- Power Dissipation Tool
- CAN PN Wizard
- Current Consumption Tool
- Application Notes
- User Manual
- Data Sheets
- eLearnings for SBC, Lite and MR+
- FIT Rates & Module/Area breakdown



Toolchain Installation Steps

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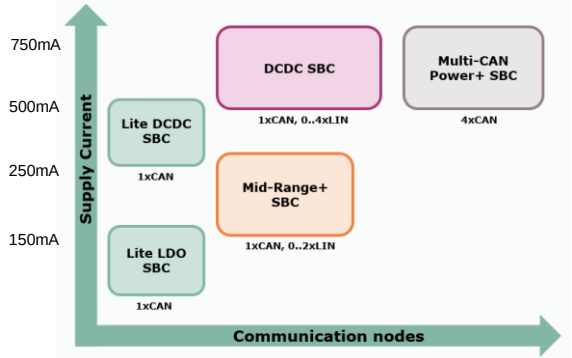
Infineon SBC's offers complete portfolio and key differentiated USP's for customers

SBC Portfolio scaled by Power and Comm. nodes



Support latest advanced networking standards

SBC Family	CAN 2.0 (ISO11898-2/-5)	CAN FD (ISO11898-2) comm. up to 5Mbps[1]	CAN PN FD tolerant[2] (ISO11898-6)
Lite SBC	Yes	Yes	Yes
Mid-Range+ SBC	Yes	Yes	Yes
DC-DC SBC	Yes	Yes	No
Multi-CAN Power SBC	Yes	Yes	Yes

Interoperability/Compliance tested for OEM release

Infineon is your partner of choice for SBC's

- More than **80% board space reduction** compared to discrete solution
- **Unparalleled scalability** across Product Families for fast time-to-market
- Infineon is **FIRST** in the market with SBCs compliant to latest CAN-FD 5Mbps ISO standard
- Interoperability and EMC compliance tests for **component releases at all major OEMs**
- System Basis Chips enable **high integration** and **smart energy efficiency**

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