



OPTIREG™ System Basis Chips

Product presentation

Infineon Automotive Division

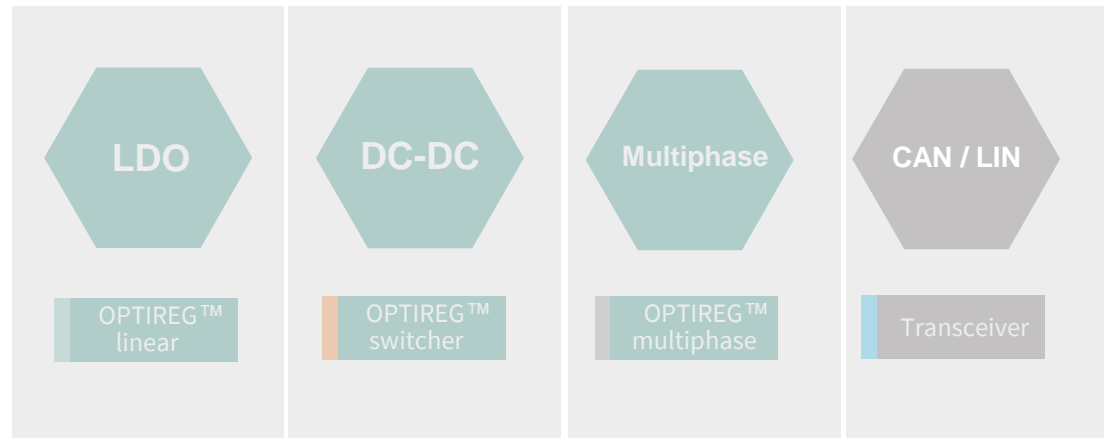
Q2 2024



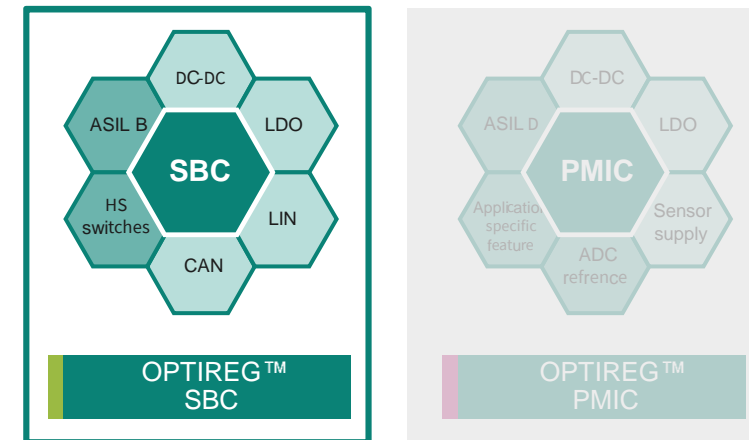


Integration

Discrete solutions



Integrated solutions



Application

Body



- BCM
- HVAC
- Display
- Dashboard

Infotainment



- Multimedia
- Navigation
- Telematics
- USB

Chassis/ADAS



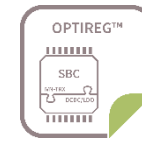
- Camera
- ADAS
- EPS
- Braking
- Park assist

Powertrain

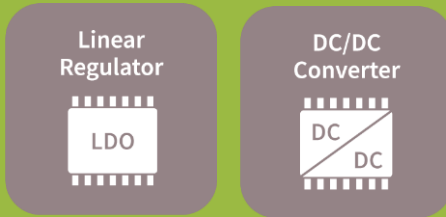


- EMS
- Transmission
- Inverter
- BMS

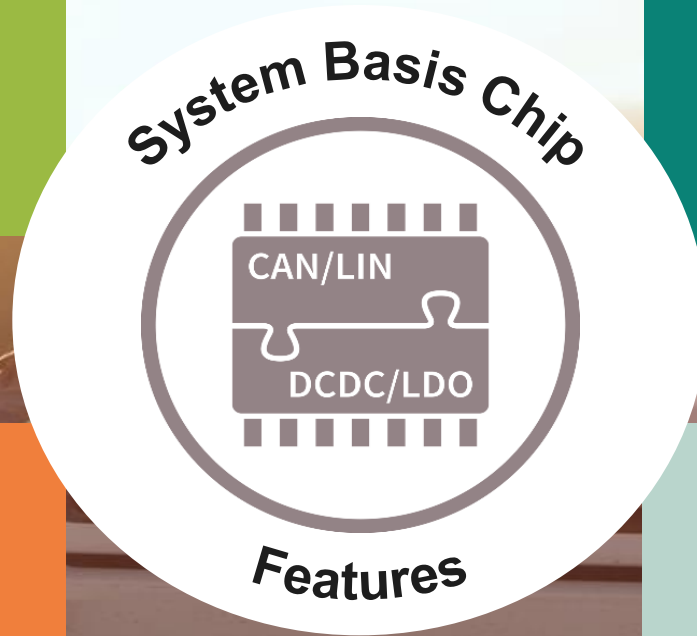
What is an SBC?



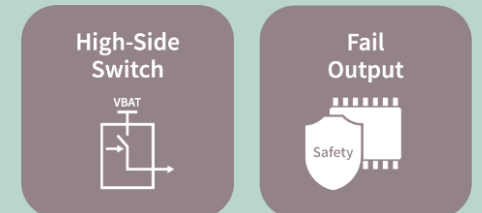
System supply



Communication interface

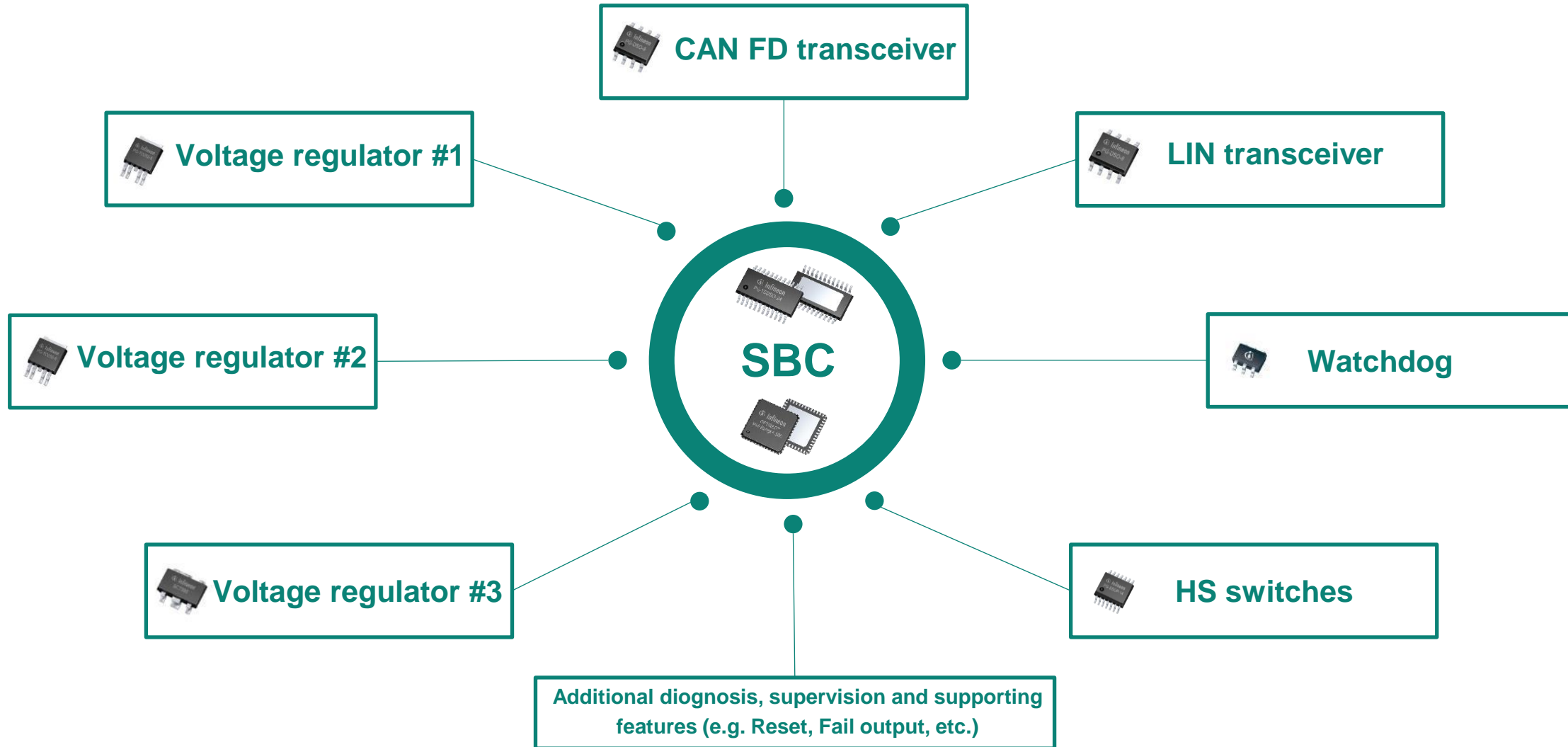


Diagnosis and supervision



Supporting features

Infinion OPTIREG™ SBCs combine multiple features into one single chip



Why should I use an OPTIREG™ SBC instead of a discrete solution?



Space saving

- Power, communication, safety and support features are **integrated into one solution with reduced PCB space** by up to ~90% (e.g. 300mm² vs. 34mm² for Lite SBC)



Energy saving

- **Extended battery life** with very low quiescent current modes and CAN Partial Networking
- Lowest I_q to achieve limitation of <math><100\mu\text{A}</math> per ECU



High system reliability

- Extensive **diagnostics and protections are embedded** within the SBC to support ISO26262 requirements, reduce external component count, improve system reliability in comparison to discrete solutions



Reduced system cost

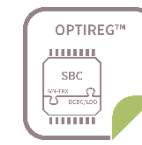
- Minimum number of components to **reduce system and BoM cost**
- **Reduction of Total Cost of Ownership by ~0.1 USD per ECU, due to fewer active components** (~0.014 USD per active component for assembly, qualification, purchasing, optical inspection, logistics, etc.)



Multiple and flexible designs

- Compatibility **reduces development time and effort** for SBC by 1-2 man-months for electronic design and software development. Scalability (transceiver) nodes reduce customer effort in platform approach.

System Basis Chip in a Nutshell



Revenue CAGR >15% last 5 years
(>20% CAGR in next 5 years)



We shipped more than 700 million SBC devices



Globally we serve more than 50 customers



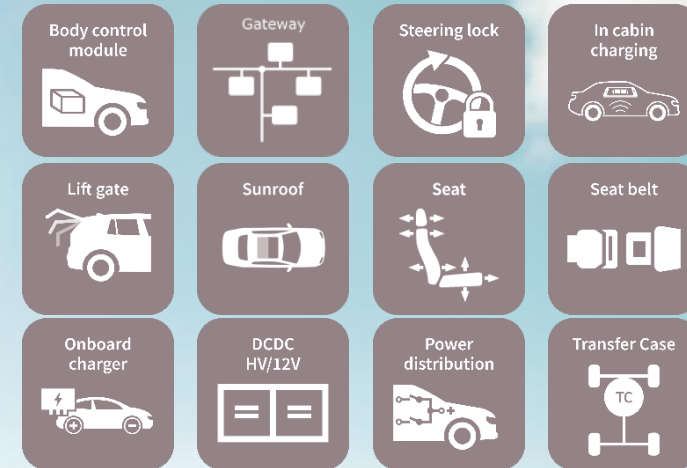
We are designed-in at major automotive tier-1s in high volume



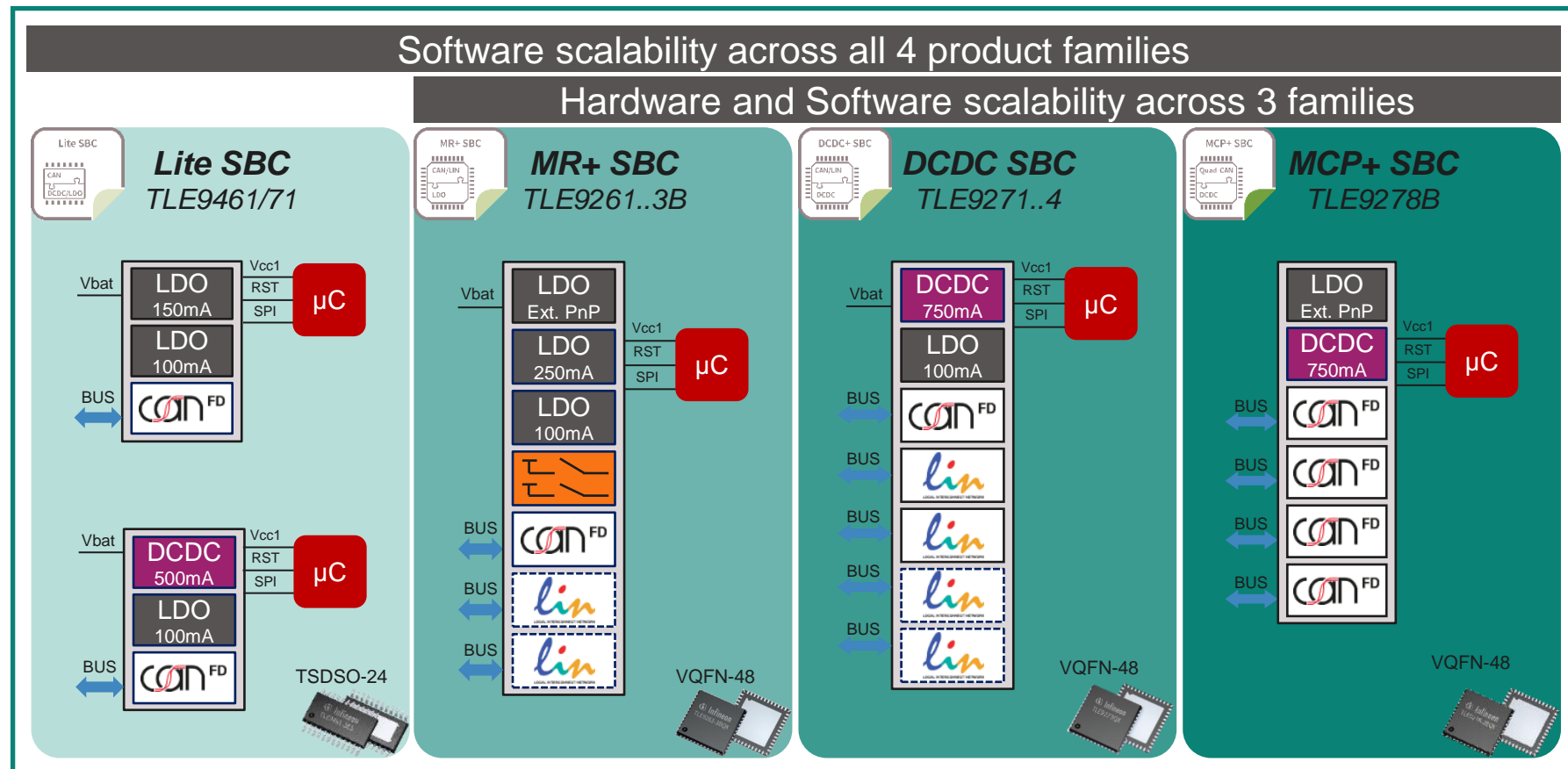
SBC portfolio has expanded to 30 product variants



Further portfolio is planned to expand into further applications



Infineon OPTIREG™ SBCs offer most complete portfolio and key differentiated USPs



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



Supports **latest networking standards** CAN FD up to 5Mbps (soon: CAN FD SIC) & CAN PN

Component releases at all major OEMs

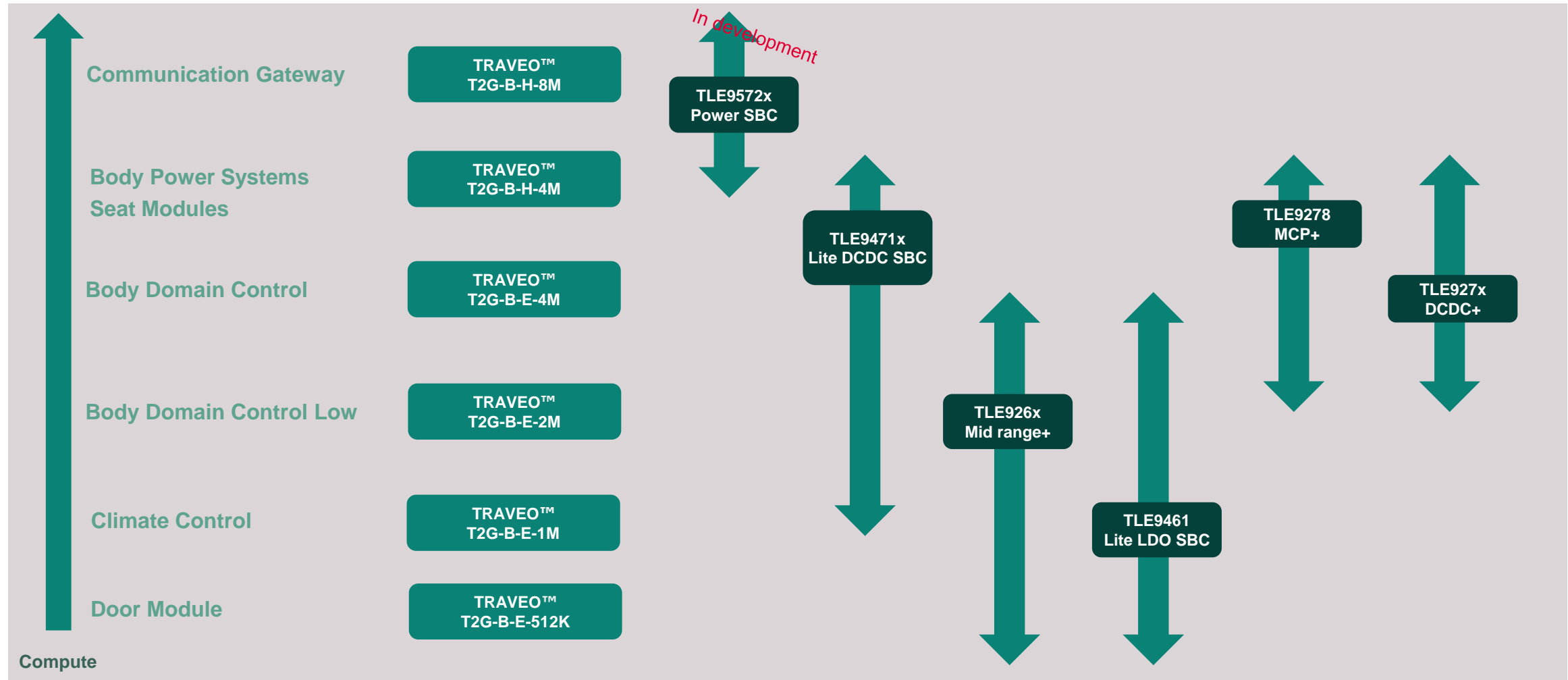
Fully scalable & flexible SBC solution for TRAVEO™ T2Gx family



Market Segment

TRAVEO™ T2Gx

OPTIREG™ SBC



Infinion OPTIREG™ SBC Families

CAN FD Performance Overview

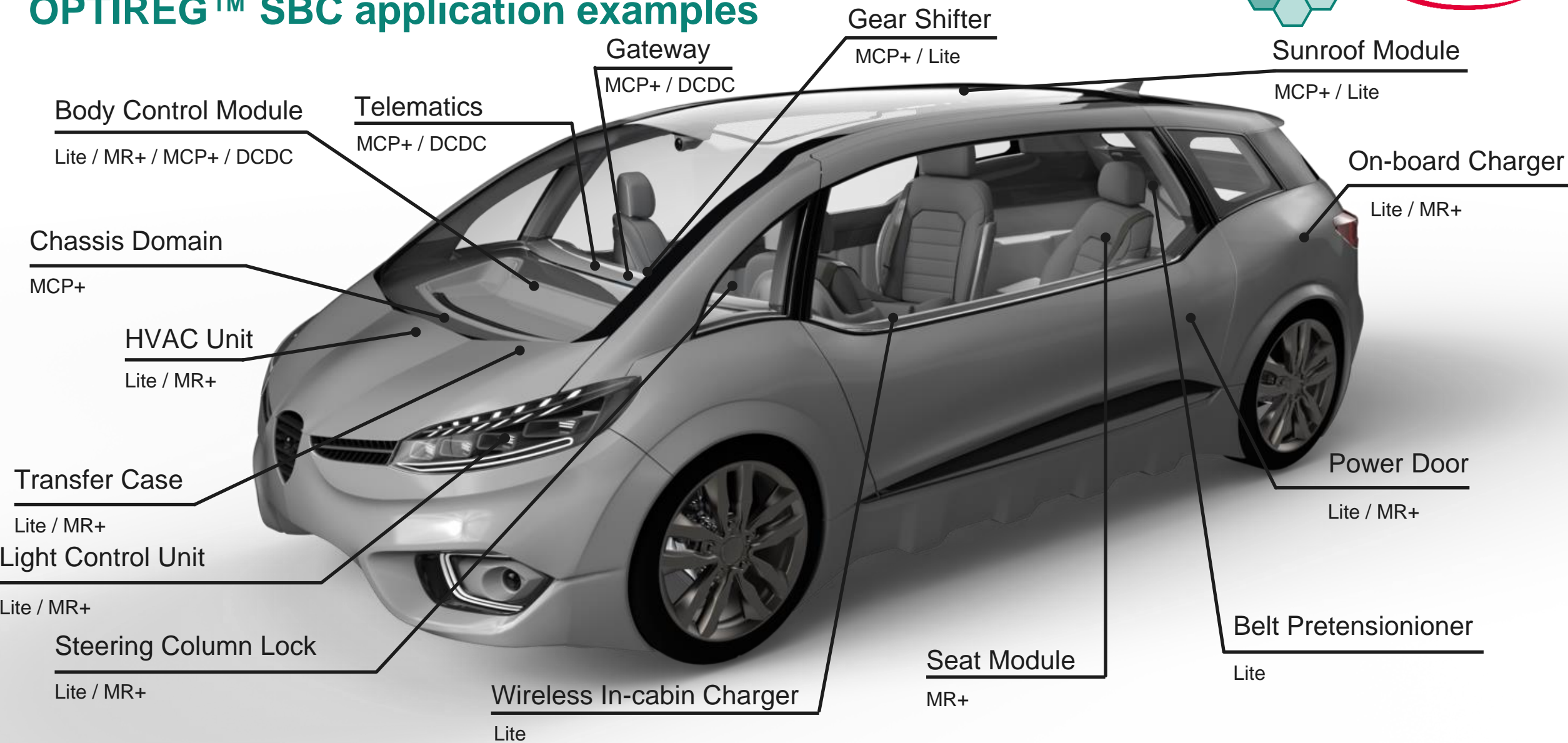


SBC Family	Sales Names	CAN FD ISO 11898-2:2016	IEC 62228-3 EMC	US EMC SAE J2962-2*	CAN PN / FD tolerant	t_{Filter} / t_{Wake1} CAN activity filter time
Mid-Range+ SBC	TLE9261(-3)BQX (V33) TLE9262(-3)BQX (V33) TLE9263(-3)BQX (V33)	Yes – 5Mbps	Yes – 5Mbps	Yes – 2Mbps	Yes	0.5 μ s – 1.8 μ s
DCDC SBC	TLE9271QX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

* max. 2 Mbps tested according to SAE

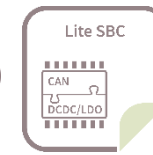


OPTIREG™ SBC application examples



Lite LDO SBC – Overview

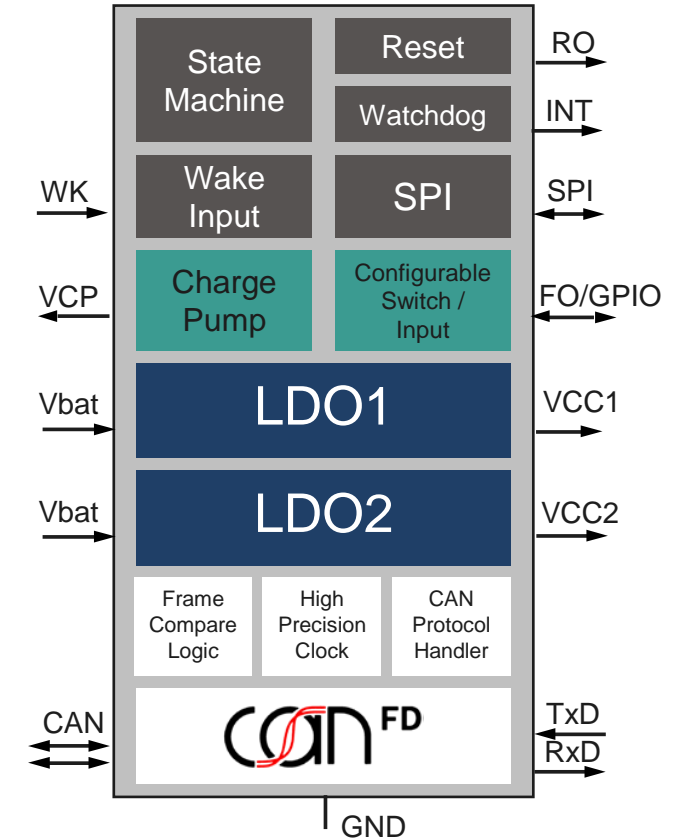
TLE9461(-3)ES (V33)



Key Features

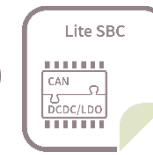
- › 5V/3.3V Linear Regulator up to 150mA (Vcc1)
- › 5V Linear Regulator (off-board protected) up to 100mA (Vcc2)
- › CAN FD up to 5Mbps, CAN PN FD Tolerant (“-3” variants)
- › 1x HV Wake input, Watchdog, Reset, Interrupt, Fail Output
- › Charge Pump Output for Reverse Polarity Control
- › Spread Spectrum 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



Lite DCDC SBC – Overview

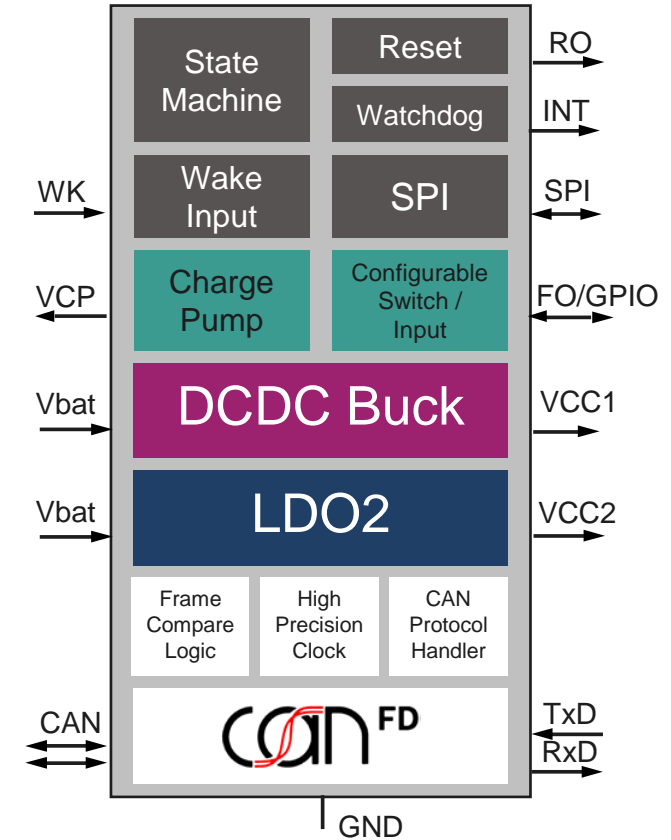
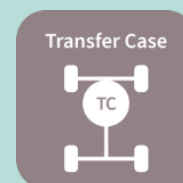
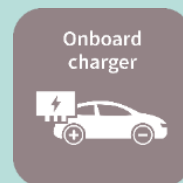
TLE9471(-3)ES (V33)



Key Features

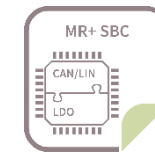
- › 5V/3.3V Buck converter up to 500mA
 - Programmable switching f up to 2.4MHz
 - Spread Spectrum for EMI mitigation
- › 5V Linear Regulator (off-board protected) up to 100mA (Vcc2)
- › CAN FD up to 5Mbps, CAN PN FD Tolerant ("-3" variants)
- › 1x HV Wake input, Watchdog, Reset, Interrupt, Fail Output
- › 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



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

Body Control Module



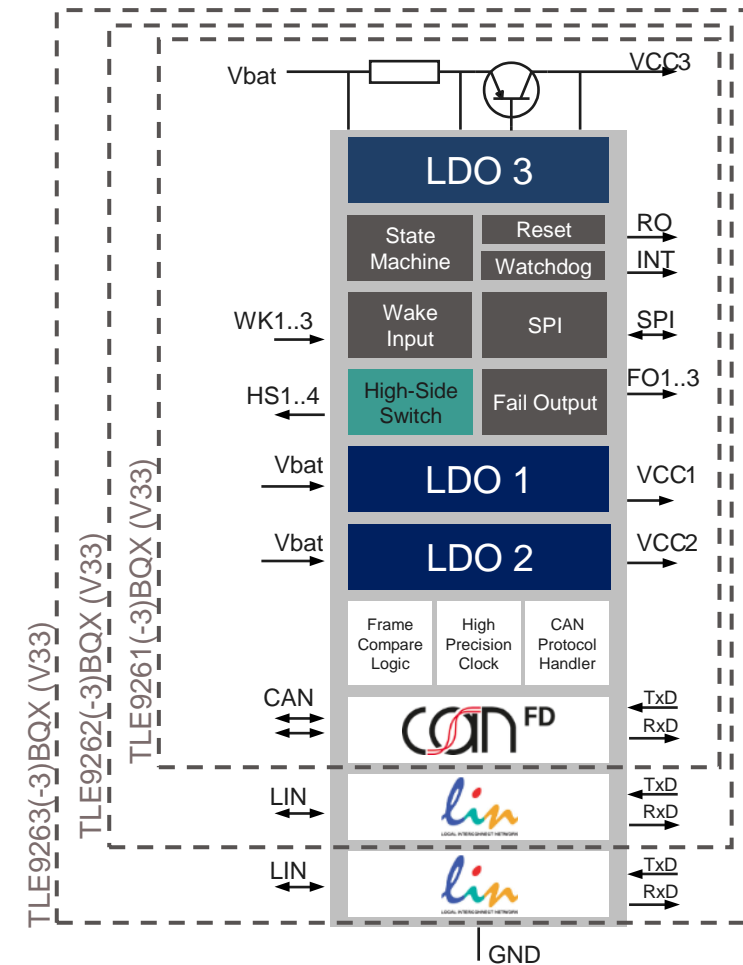
Seat



Lift gate

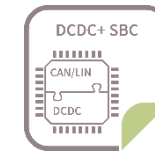


Sunroof



DCDC SBC Overview

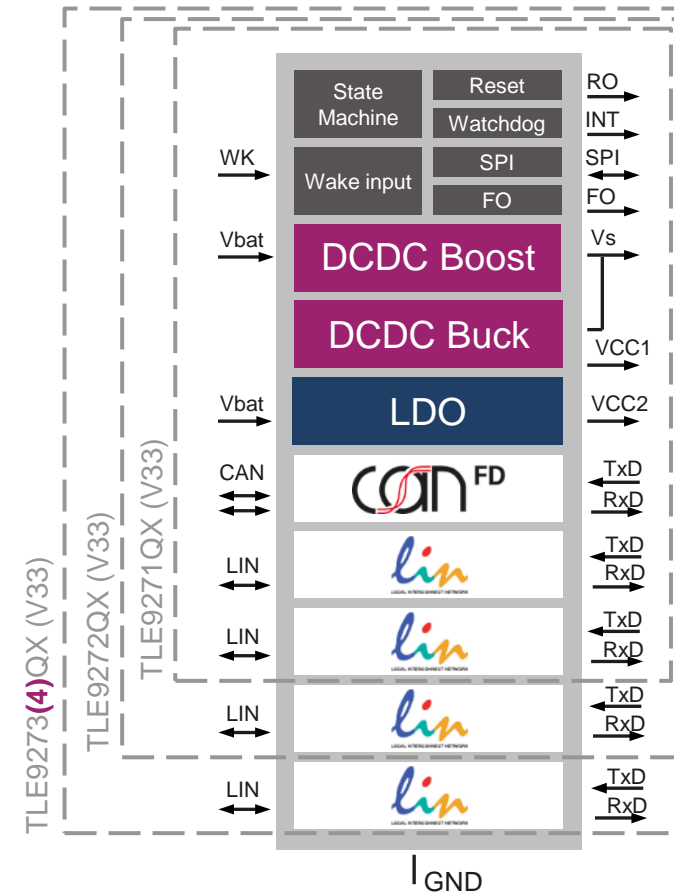
TLE9271/2/3/4QX (V33)



Key Features

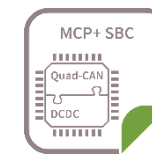
- > 5V(3.3V) BUCK converter up to **750mA**
- > 6.5V/8V BOOST controller (Vs) → **Additional 10V BOOST option for TLE9274QX (V33)**^{NEW}
- > Switch f = 450kHz w/ edge shaping for low EMI
- > LDO voltage regulator @ 5V up to 100mA
- > CAN FD communication up to 5Mbps
- > Very low quiescent current in 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



Multi-CAN Power+ SBC Overview

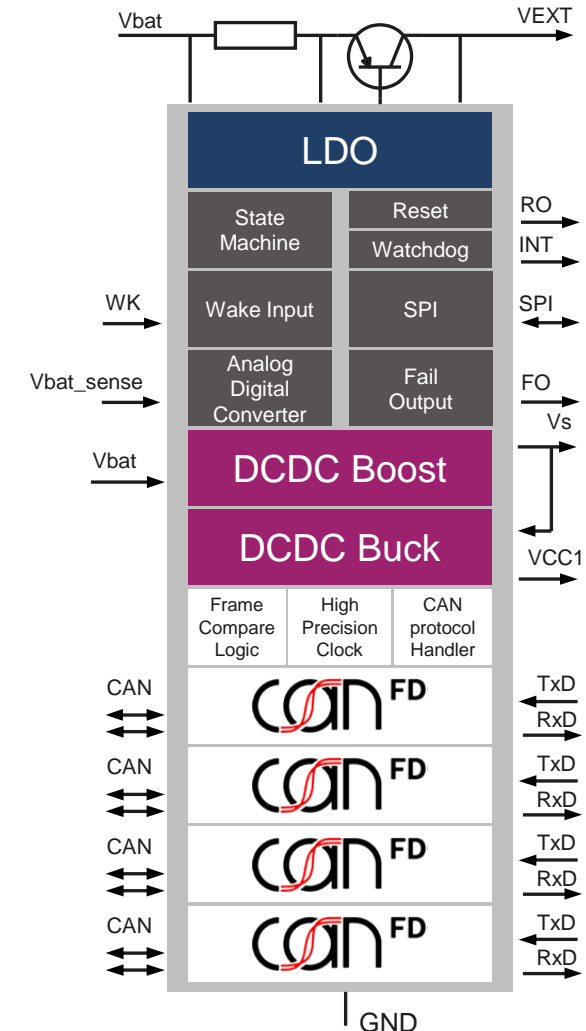
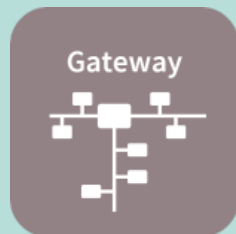
TLE9278(-3)BQX (V33)



Key Features

- > 5V/3.3V BUCK converter up to 750mA
- > 6.5V/8V/10V/12V BOOST converter
- > Switch $f = 450\text{kHz}$ 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

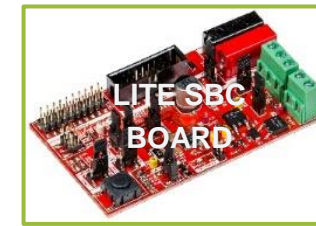
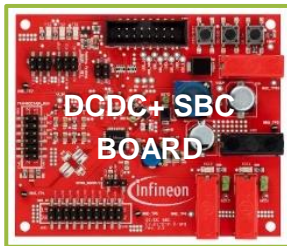


SBC Design Support Tools



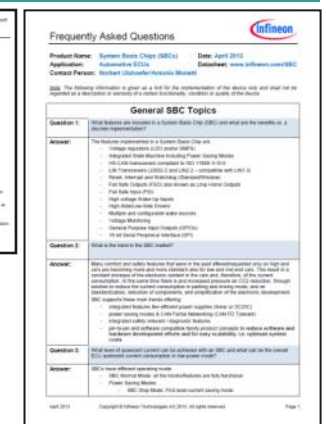
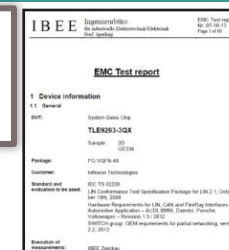
SBC Evaluation Boards

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

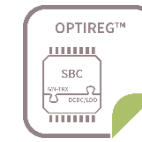


Other design in support material

- 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)

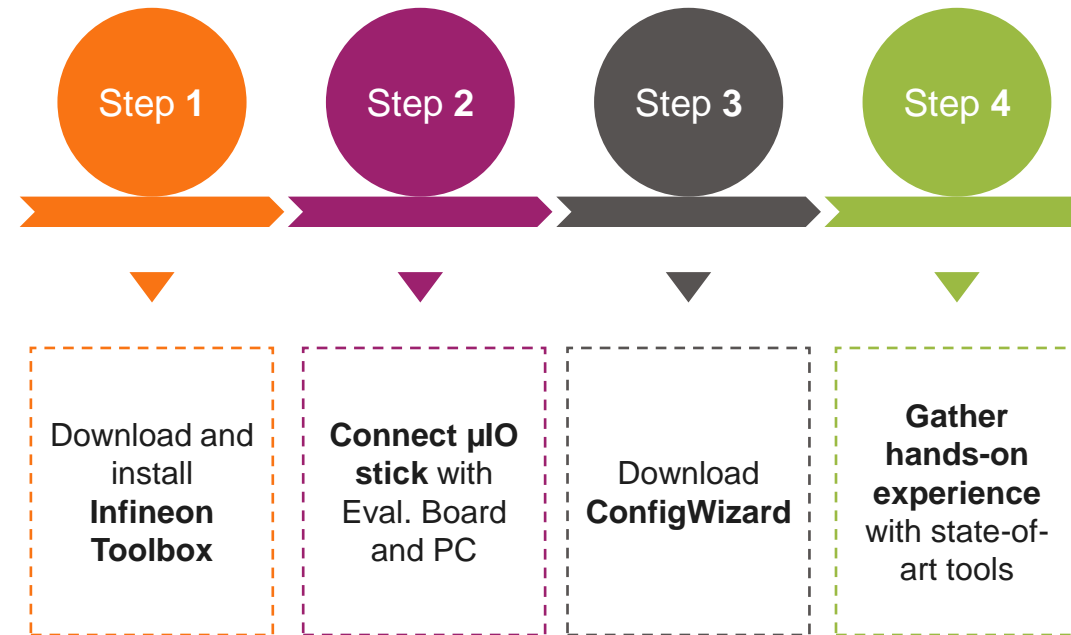


SBC Design in Support & Tool Chain



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

Mapping of OPTIREG™ with various microcontrollers

Find the right OPTIREG™ for your microcontroller in just a few clicks!



Navigation Table



CLICK !

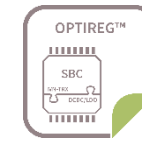
OPTIREG™	Infineon AURIX™		Infineon Traveo™		Infineon	Texas Instruments	NXP	Renesas	ST Micro
	TC2x	TC3x	I	II	PSoC®	Piccolo™ / Delfino™	S32K	RH850	SPC5x
					N/A				
								N/A	N/A
					N/A			N/A	N/A



Click to access the mapping document

System Basis Chip (SBC)

Collaterals & Support Material

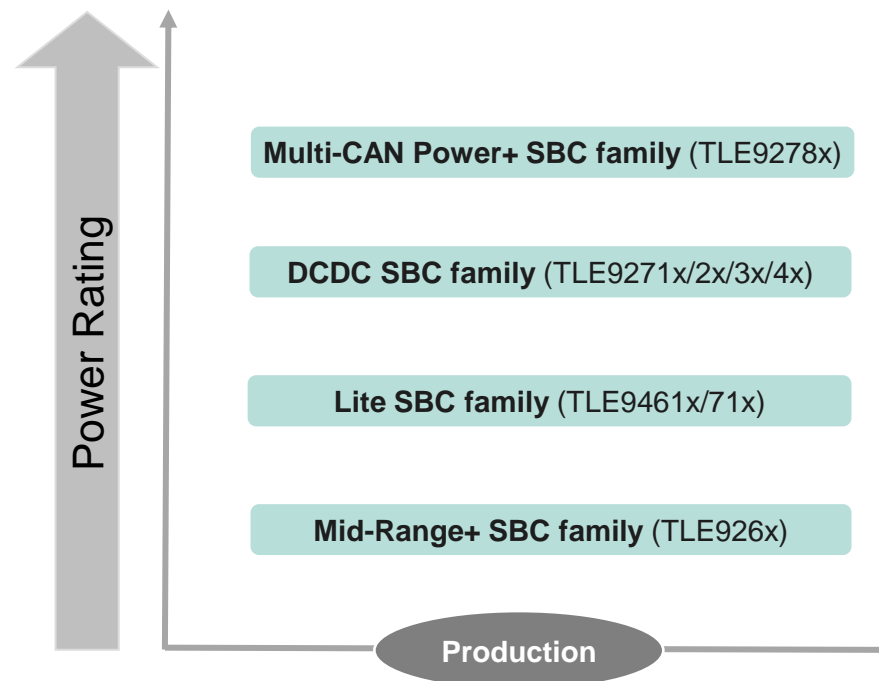


Collaterals and Brochures	<ul style="list-style-type: none">- Product Briefs- Selection Guides- Application Brochures- Presentations- Fighting Guides	<ul style="list-style-type: none">- Link to SBC family page- Automotive Power Selection Guide- Automotive Application Guide- Automotive In-Vehicle Networking - Link to SBC family page<ul style="list-style-type: none">- Lite SBC family page- Mid-Range+ SBC family page- DCDC+ SBC family page- Multi-CAN Power+ SBC family page - Link to board pages- Link to software - Link to Videos- Link to eLearning - Link to SBC FAQ<ul style="list-style-type: none">- Link to Lite SBC FAQ- Link to MR+ SBC FAQ
Technical Material	<ul style="list-style-type: none">- Application Notes- User Manual- Datasheets- PCB Design Data	
Evaluation Boards & Software	<ul style="list-style-type: none">- Evaluation BoardsSoftware:<ul style="list-style-type: none">- SBC Config Wizard- Power Dissipation Tool- Bode Plot- CAN PN Wizard- SBC Microcontroller Library- Current Consumption Tool	
Videos / Distribution Trainings	<ul style="list-style-type: none">- Technical Videos- eLearnings	
FAQ	<ul style="list-style-type: none">- FAQ General SBC- FAQ Lite SBC- FAQ MR+ SBC	



OPTIREG™ System Basis Chip – Summary

- › **OPTIREG™ SBC** shipped >700 M units
- › Components **released** @ all major **OEMs**
- › **SBC portfolio** > 30 product variants
- › High level of **compatibility** and **re-usability**
- › **Power Efficiency** over entire load range
- › **CAN FD** transceiver w/ **Signal Improvement Capability (SIC)** up to **8 Mbit/s**
- › **Functional Safety** ISO 26262:2018 up to **ASIL B**
- › **AEC-Q100 Grade 1** ($T_a \leq 125\text{ °C}$)



OPTIREG™ TLE926x/TLE927x/TLE946/71 families

- ✓ Power efficiency
- ✓ CAN FD
- ✓ QM

