

OPTIREG™ General Purpose PMIC

Product presentation

PMIC

OPTIREG™

Find it online !

ATV SP APS

Q2 2026

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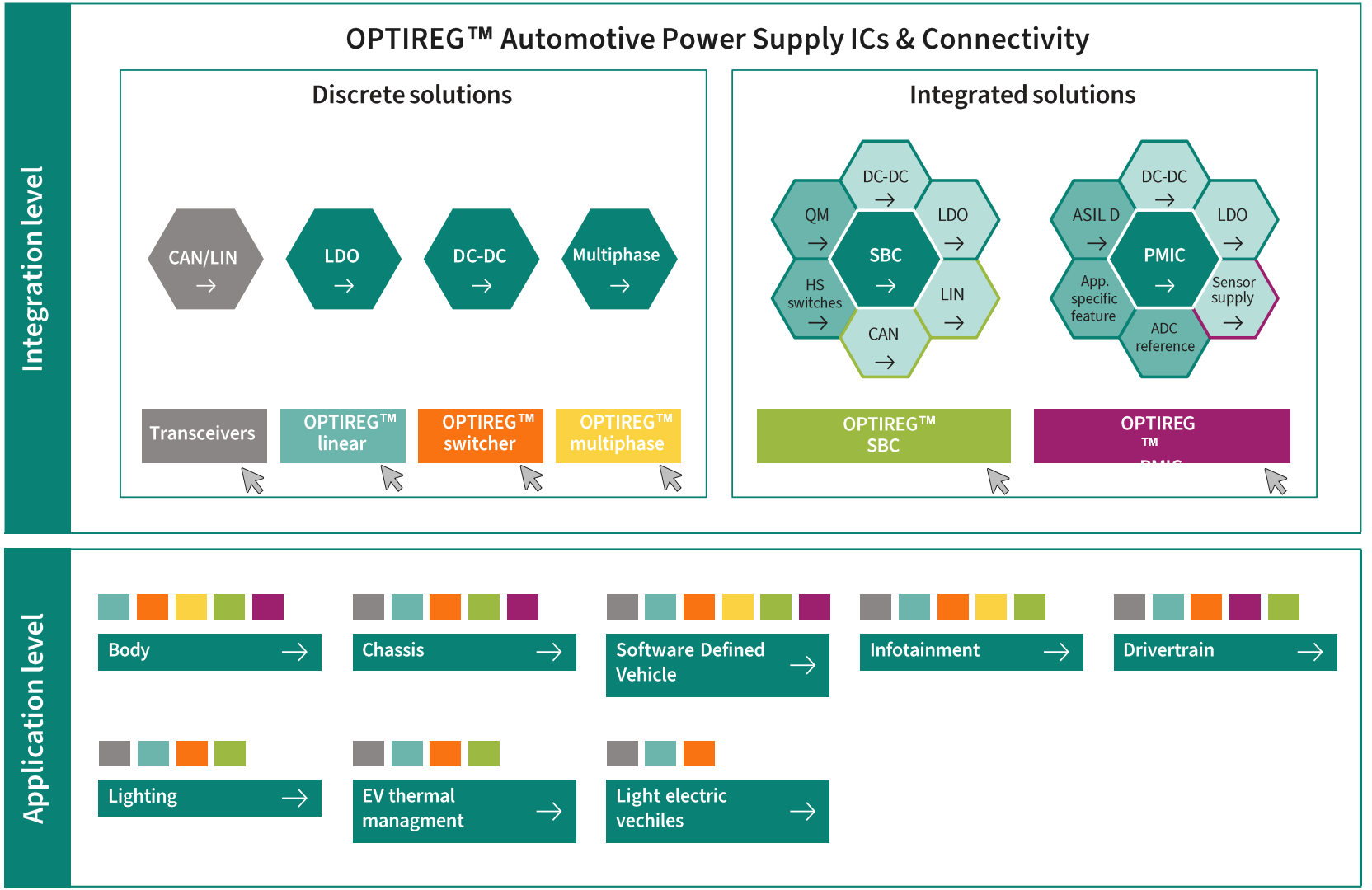
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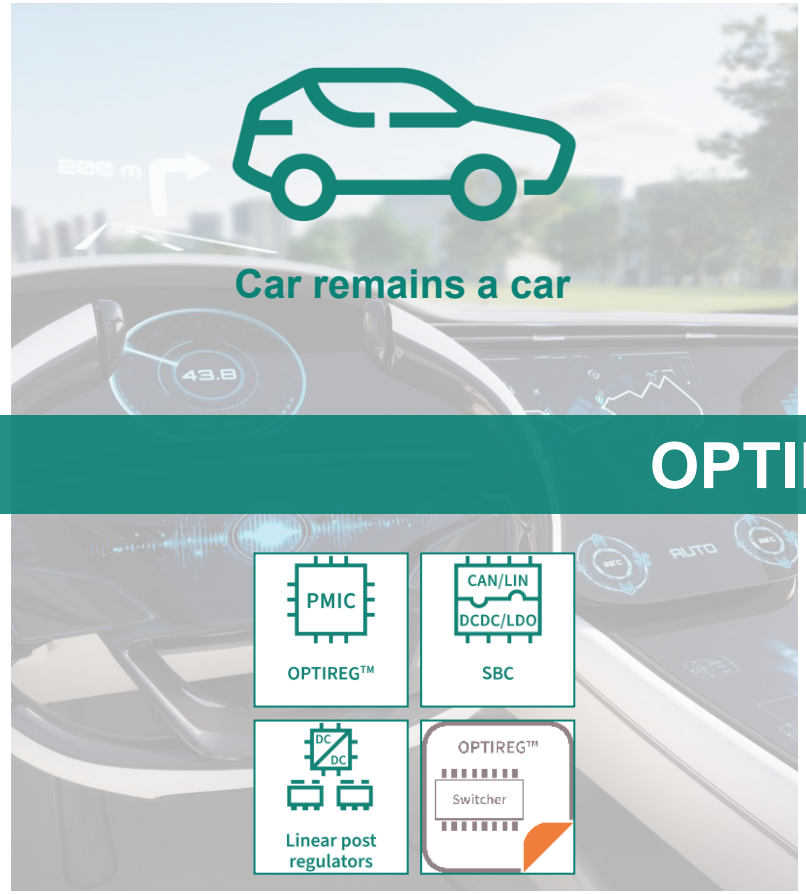
OPTIREG™

OPTIREG™ Portfolio



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OPTIREG™ Power Supply fits in all automotive relevant trends







OPTIREG™ provides the right products

to support all these trends

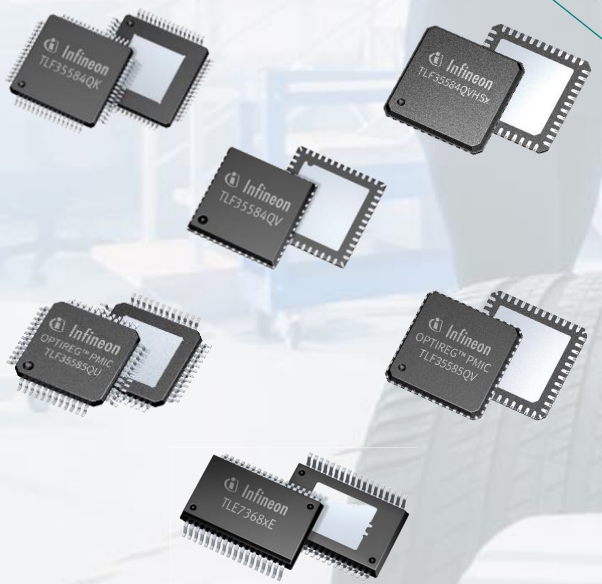
Traditional applications ***Efficient supply concepts*** ***Emerging business models***

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OPTIREG™ General Purpose PMIC

OPTIREG™ General Purpose PMIC

Product families



PMIC

OPTIREG™

Small, Efficient and Reliable

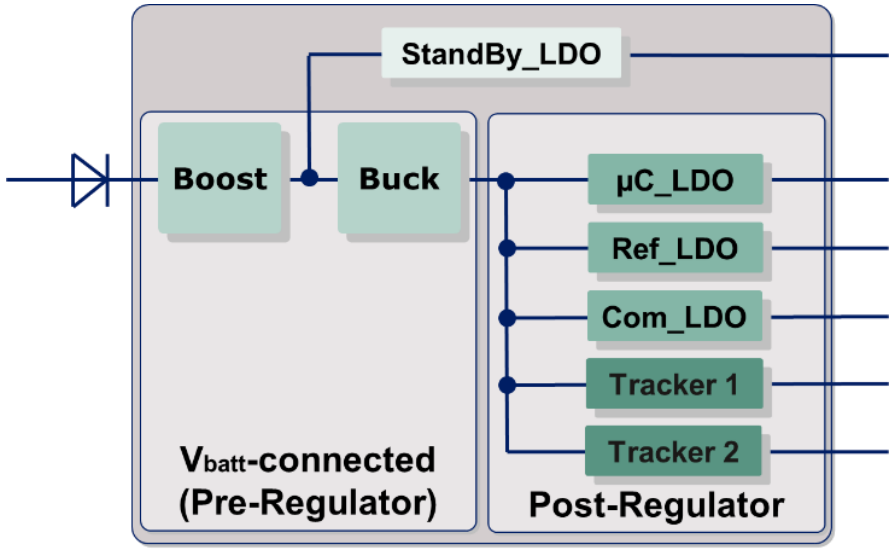
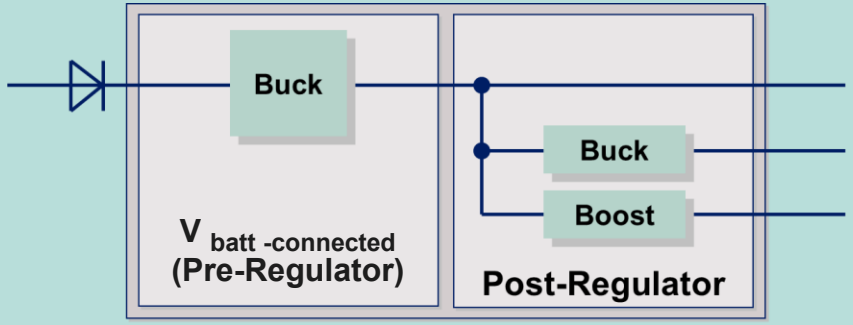
Key Feature	Customer Benefit
ISO 26262-compliant	Usage in applications with ASIL-requirement
Multiple voltage supplies	System supply: µC, communication, sensors
Very low quiescent current	Longer battery life in low-power modes
Boost capability	Ensure operation in cold cranking condition
Dedicated reference voltage supply	ADC-supply independent of µC-load
Pre-/Post-Regulator architecture	High Efficiency

Applications

BMS · Body control module · On-board charger · xEV · Electric power steering · Zonal architecture · Braking · Autonomous driving · Power distribution · CAV

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OPTIREG™ PMIC Overview
Supply Topology

Product	Applications	Integrated Supplies	Block Diagram
TLF35584 **TLF35585** PRO SIL ISO 26262 compliant	• Engine Management • Transmission • Transfer Case • Clutch Actuator • Starter Generator (e.g. ISG) • Battery Management • Inverter • Onboard Charger • Electr. Power Steering • Electr. Steering Column Lock • Braking (e.g. Brake Booster) • Electr. Parking Brake • Active Suspension • Chassis Domain Control • PT Domain Control • ADAS Domain Control	Pre-Regulator: Boost/Buck StandBy-LDO Post-Regulators: Linear & Tracker	
TLF30682	**TLF30682:** • 76-81GHz-Radar • 24GHz-Radar • 60GHz-Radar • Camera • Cluster / Center Stack • Display	Pre-Regulator & PoL: Buck Post-Regulators: Buck & Boost	

PoL: Point Of Load

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OPTIREG™ PMIC Overview

Supply	TLF35584	TLF35585	TLF30682	TLE9243
	PRO SIL ISO 26262 compliant	PRO SIL ISO 26262 compliant		PRO SIL ISO 26262 compliant
Supply Topology	Boost/Buck-PreReg Linear PostRegs & Tracker	Boost/Buck-PreReg Linear PostRegs & Tracker	1x Vbatt-Buck 1x SMPR-Buck 1x SMPR-Boost	Boost/Buck-PreReg Linear PostRegs & Tracker
Vbatt-connected Boost (Pre-Regulator)	Y	Y	-	Y
Vbatt-connected Buck(s) (Pre-Regulator and/or PoL)	5V8 @ 1.3A	5V8 @ 1.5A	3V3 or 3V9* @ 3.5A	5V8 @ 1.5A
SMPR Buck	-	-	Core @ 2A	-
SMPR Boost	-	-	5V @ 250mA	-
µC_LDO (PostReg)	3V3 or 5V @ 600mA	3V3 or 5V @ 600mA	-	5V @ 800mA
Ref_LDO (PostReg)	5V @ 150mA	5V @ 150mA	-	5V @ 150mA
Com_LDO (PostReg)	5V @ 200mA	5V @ 200mA	-	5V @ 240mA
Voltage-rating PostRegs	7V w/o RCP	7V w/o RCP	7V	40V
Tracker 1 (PostReg)	5V @ 150mA	5V @ 150mA	-	5V @ 150mA
Tracker 2 (PostReg)	5V @ 150mA	5V @ 150mA	-	5V @ 150mA
StandBy_LDO	3V3 or 5V @10mA	3V3 or 5V @10mA	-	-
Wheel Speed Sensor Supply	-	-	-	3x 9V @ 50mA

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OPTIREG™ PMIC Overview

Functional Safety	TLF35584 PRO SIL ISO 26262 compliant	TLF35585 PRO SIL ISO 26262 compliant	TLF30682	TLE9243 PRO SIL ISO 26262 compliant
SEooC for systems up to	ASIL-D	ASIL-D	QM/ASIL-B	ASIL-D
Window-WD	Y	Y	Y	Y
Functional-WD	Y	Y	-	Y
ERR-Monitoring	Y	Y	-	Y
UV/OV-Monitoring	Y	Y	Y	Y
Safe State Controller	Y	Y	-	Y
Safe State Outputs / Safety Switch Control ch.	2 / -	2 / -	- / -	- / 3
Add. information	**TLF35584**	**TLF35585**	**TLF30682**	**TLE9243**
Status	Released	In Released	Released	Released
Packages	“QV”: VQFN-48 “QK”: LQFP-64	“QV”: VQFN-48 “QU”: TQFP-48	“QV”: VQFN-48	“QK”: LQFP-64
Variants	“VS1”: 5V0 µC “VS2”: 3V3 µC	“S01”: 5V0 µC “S02”: 3V3 µC	“S01”: 3V3 Buck1 “S02”: 3V9 Buck1*	-

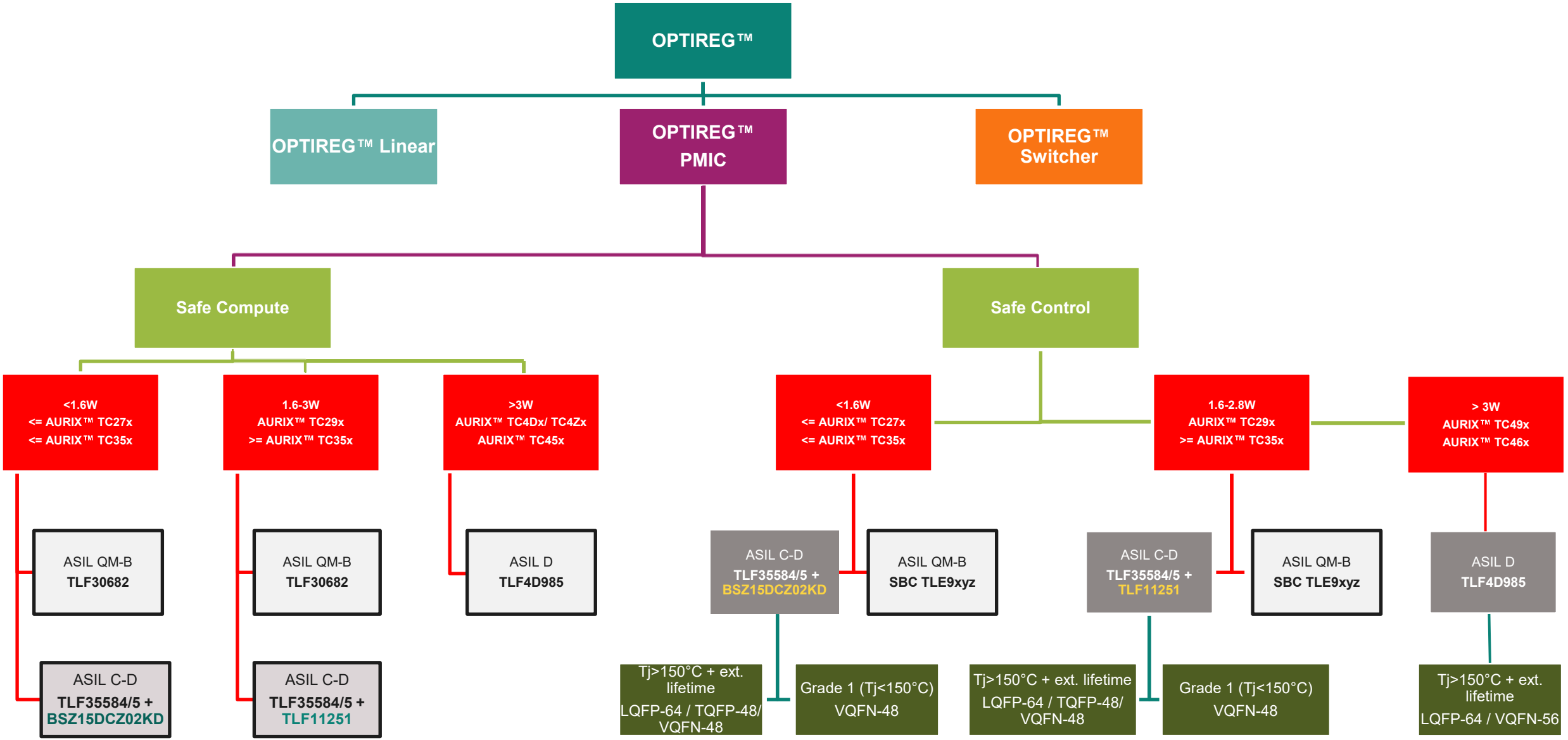
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Feature density

	TLF35584	TLF35585	TLF4A	TLF4D
System Power:	6.96W	8.7W	11.6W	55W
Operating range:	3V – 40V	3V – 40V	3.2V – 40V	3.3V – 60V
Pre-regulator	1.2A @ 5.8V	1.5A @ 5.8V	2A @ 5.8V	5A / 10A @ 4V or 5.5V
LDO µC-IO	600 mA @ 3.3V or 5V	600 mA @ 3.3V or 5V	200 mA @ 3.3V or 5V	600 mA @ 3.3V or 5V
Reference-LDO	150 mA @ [5V±1%]	150 mA @ [5V±1%]	110 mA @ [3.3V±1%] or [5V±1%]	150 mA @ range [5V ±1%]
Communication LDO	200 mA @ 5V	200 mA @ 5V	200 mA @ 5V	600 mA @ 5V
2 X Tracker	150 mA @ 5V	150 mA @ 5V	150 mA @ 5V	
Buck core supply	-	-	3.5A peak @ 0.75V..1V25´ or 1V8@1.2A or 3V3@0.75A	7A @ range [0.7 - 1.1V]
Buck interface regulator	-	-	-	1.2A @ 1.8V / 3V
Post Boost	-	-	-	1A @ 5.8V
Quiescent current, Standby on	120µA max (28V, 85°C)	70µA max (28V, 85°C)	35µA max (28V, 85°C)	70µA max (28V, 85°C)
Safety features	Pre-defined safety reactions	Pre-defined safety reactions	Safety switch; Configurable safety reactions	Safety switch; Pre-defined safety reactions; Reverse polarity protection
Application examples	Transmission; Electric power steering; BMS; Domain & zone control; Traction inverter; Engine management	Electric power steering; BMS; Domain & zone control; Traction inverter; Engine management	Braking; Electric power steering; BMS; Domain & zone control; Traction inverter; Engine management	Truck; CAV; Sensor fusion; Domain & zone control; Traction inverter; Engine management
Packaging options	 LQFP-64 VQFN-48	 TQFP-48 VQFN-48	 TQFP-48 VQFN-48	 LQFP-64 VQFN-56

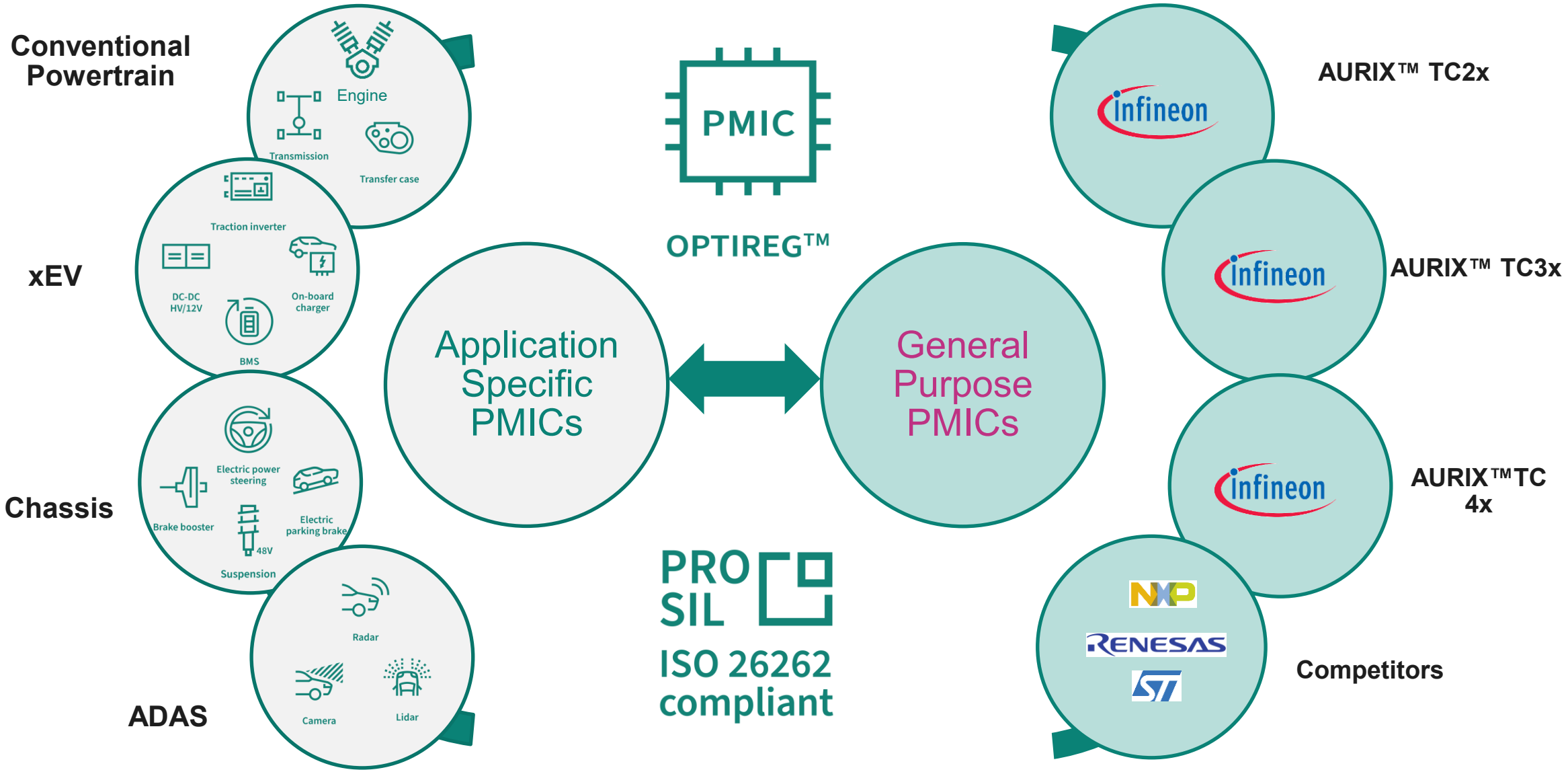
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OPTIREG™ PMIC Decision Tree



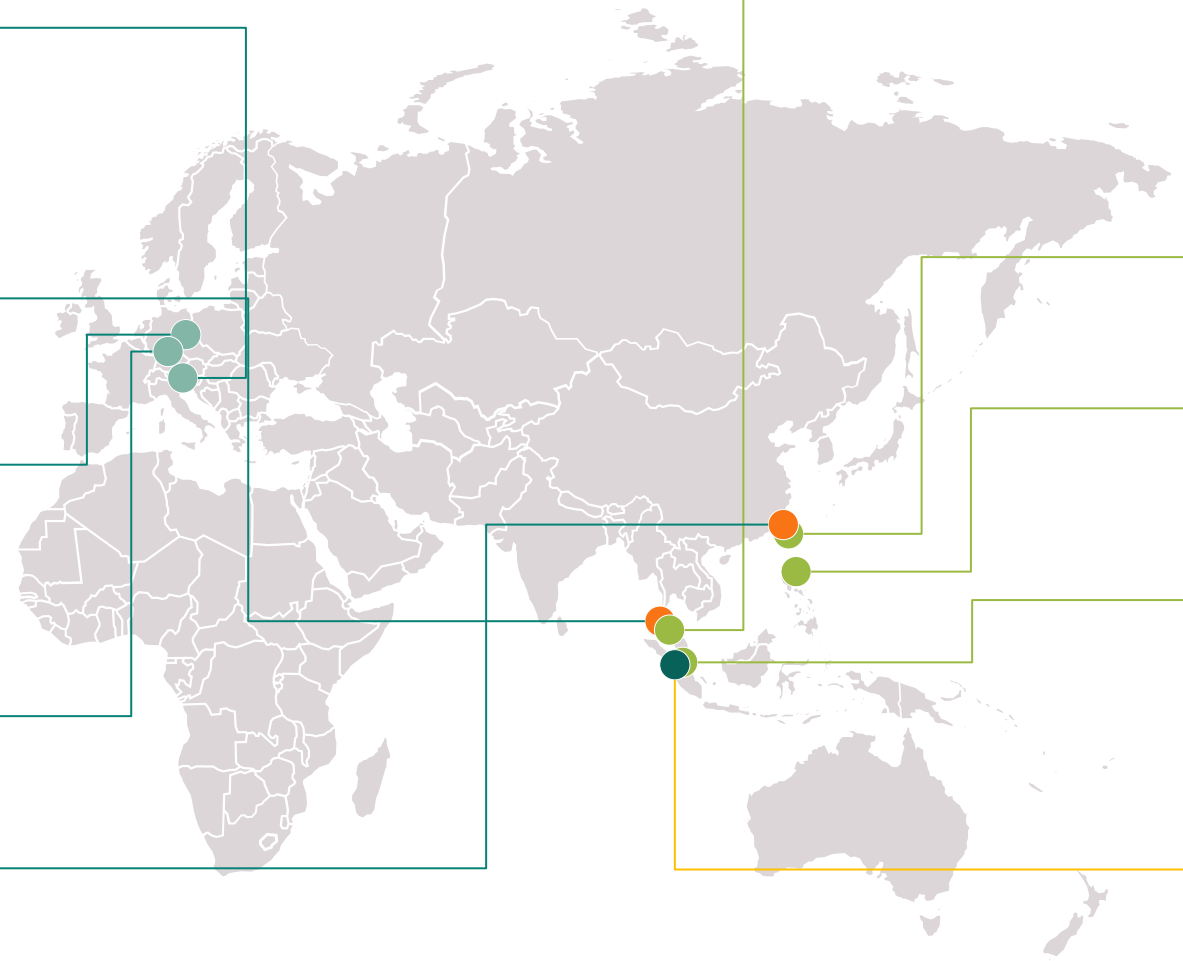
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OPTIREG™ PMIC: Strong commitment to General Purpose and Application Specific PMIC solutions



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Production Sites



Villach
SPT4_60V
SPT4_90V

Kulim
SPT5

Dresden
SPT9 / SPT10

Regensburg
SPT9

UMC
SPT9

Melaka
DSO-14 / DSO150
VQFN-48
LQFP-64
TQFP-48

ASE KH
LQFP-64

Amkor (ATP)
VQFN-48
VQFP-56

Batam
DSO-20 / DSO300
DSO-36 / DSO430
DSO-36 / DSO300
Testing DSO-14 -> transfer ongoing
LQFP-64 -> Will enable for testing in future

Singapore
VQFN/LQFP/TQFP
DSO-14 -> Batam transfer ongoing

Frontend Wafer Test Backend Final Test

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Legacy Products Overview

TLE7368/-2/-3
Optimized Supply of 32-bit µC

Key Features

- Input voltage range from 4.5V to 45V
- Wide ambient operation range: -40°C to 150°C
- DC/DC buck pre-regulator to 5.5V/2.5A
- Post-regulators for µC & on Board:
  - LDO1: 5V (± 2%), 700mA
  - LDO2: 3.3V or 2.6V (± 2%), 500mA
  - LDO3: control for ext. NPN
  - LDO3 1.5V, 1.2V, and 1.3V (± 2%)
  - 2 trackers for off board supply: 5V, 105mA/50mA
- Stand-by regulator for lowest current consumption
- 2 enable inputs
- Reset for all LDOs with adj. reset delay time
- Window Watchdog with adj. timing
- Monitoring circuit for stand-by supply
- Power sequencing on contr. Supplies
- Over-current protection for all regulators
- Over-temperature shutdown

Package

AEC Qualified



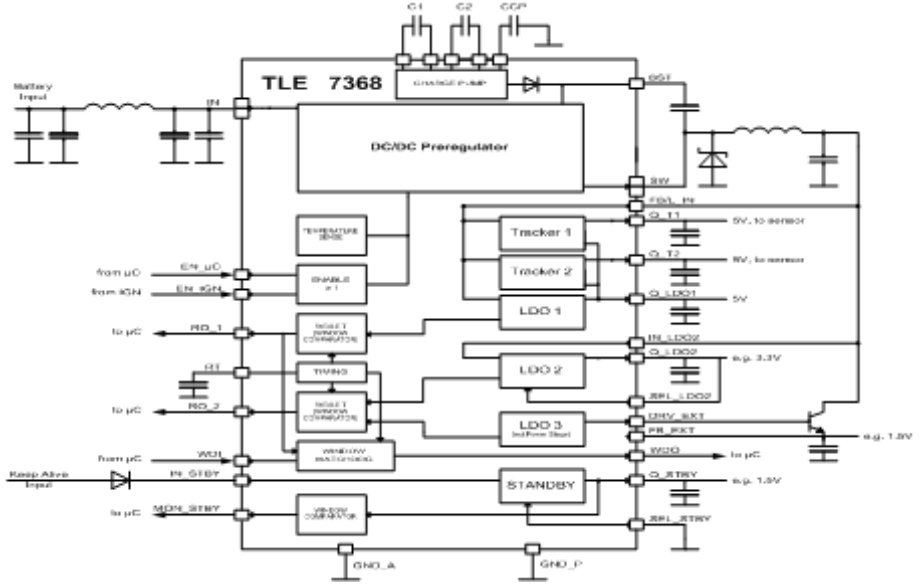
PG-DSO-36 (300mil)

RoHS

Applications

- Powertrain: Transmission
- EPS

Application/Block Diagram



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TLE7368/-2/-3
Features - Benefits

PMIC OPTIREG™

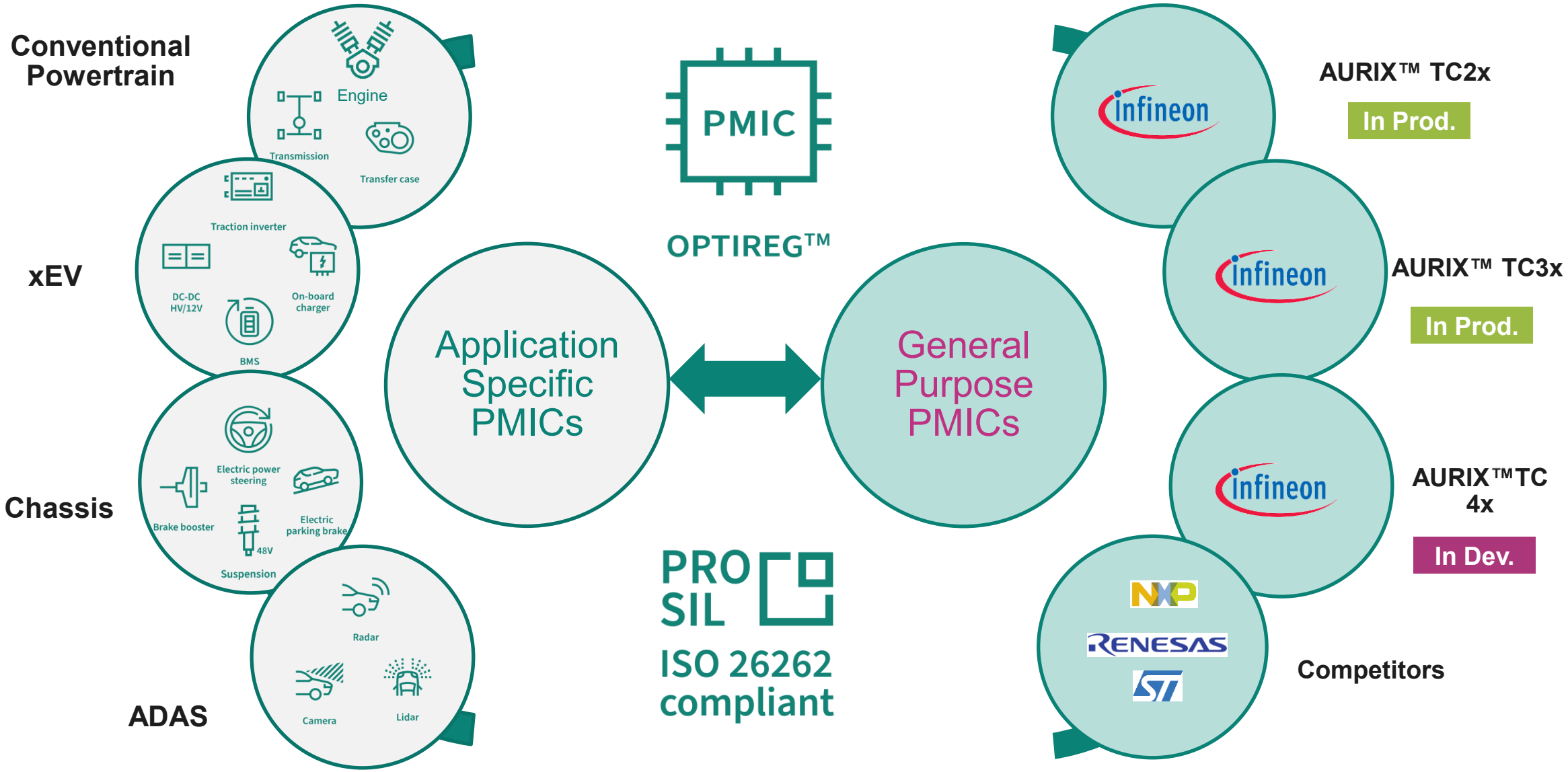
Features		Benefits
High Buck output power	→	Maintains operation under sensor short circuit condition
5V plus 3.3V/2.6V plus core-supply (1.2V or 1.3V or 1.5V)	→	One supply for AUDO plus OAK plus AUDO NG plus “Snakes”
Operating range 4.5V to 45V	→	Suitable for 12V/24V applications (clamped load dump)
Integrated slew rate control	→	EME reduction (high frequency content)
Two separated enable inputs	→	µC-hold function possible
Two integrated sensor supplies	→	Off board supply incl. GND shifts



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TLF35x Family for Safety-relevant applications

OPTIREG™ PMIC: Strong commitment to General Purpose and Application Specific PMIC solutions

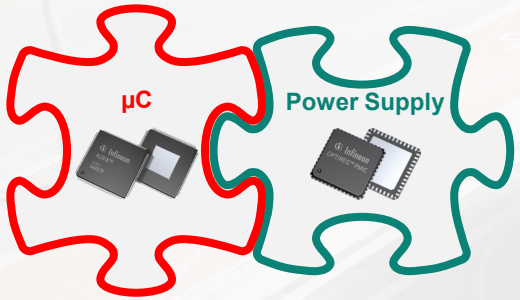


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Infineon's OPTIREG™ PMIC TLF35x Family provides robust, safe and reliable supply for AURIX™ microcontrollers up to TC3x for a dependable system with the highest functional safety demand

Our OPTIREG™ PMIC features

- **OPTIREG™TLF35584 PMIC > 70 M units**
- **Functional Safety** ISO 26262:2018 up to **ASIL-D**
- Up to **AEC-Q100 Grade 0+** (Ta ≤ 150 °C and extended operating lifetime)
- High level of **MCU** & **PMIC interoperability:** Every AURIX™ up to TC3x has a OPTIREG™ PMIC



- Dependable Electronics
- Backward compatibility (Software and pin-to-pin VQFN)
- Partners ecosystem for SW support
- Long-term supply availability

A scalable PMIC portfolio which can cover the complete AURIX™ TC2x/TC3x portfolio

PMIC
OPTIREG™



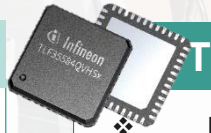
TLF35584QKVSx

- PG-LQFP-64
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 150°C
- Grade 1+
- 12 mm x 12 mm
- Development acc. ISO 26262 Safety Standard



TLF35584QVVSx

- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 150°C
- Grade 1
- 7 mm x 7 mm
- Lead-tip inspection
- Development acc. ISO 26262 Safety Standard



TLF35584QVHSx

- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
- **Grade 0+**
- 7 mm x 7 mm
- Lead-tip inspection
- Development acc. ISO 26262 Safety Standard



TLF35585QUSxx

- PG-TQFP-48
- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
- **Target Grade 0+**
- **9 mm x 9 mm**
- Development acc. ISO 26262 Safety Standard

New



TLF35585QVSxx

- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
- **Target Grade 0+**
- **7 mm x 7 mm**
- Lead-tip inspection
- Development acc. ISO 26262 Safety Standard

New

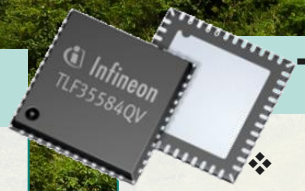
OPTIREG™ PMIC TLF35x Family

Infineon's OPTIREG™ PMIC TLF35x Family provides robust, safe and reliable supply for AURIX™ microcontrollers up to TC3x for a dependable system with the highest functional safety demand



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- PG-LQFP-64
- S1 (5.0V), S2 (3.3V)
- Tj: -40°C .. 150°C
- Grade 1+
- 12 mm x 12 mm
- Development acc. ISO 26262 Safety Standard



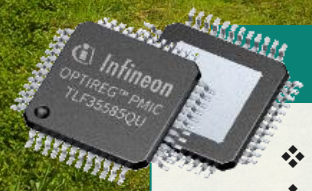
TLF35584QVVSx

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- Grade 1
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- Development acc. ISO 26262 Safety Standard



TLF35584QVHSx

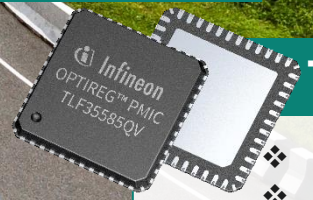
- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
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TLF35585QUSxx

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- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
- **Target Grade 0+**
- **9 mm x 9 mm**
- Development acc. ISO 26262 Safety Standard

New



TLF35585QVSxx

- PG-VQFN-48
- S1 (5.0V), S2 (3.3V)
- **Tj: -40°C .. 175°C**
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- Development acc. ISO 26262 Safety Standard

New

PMIC

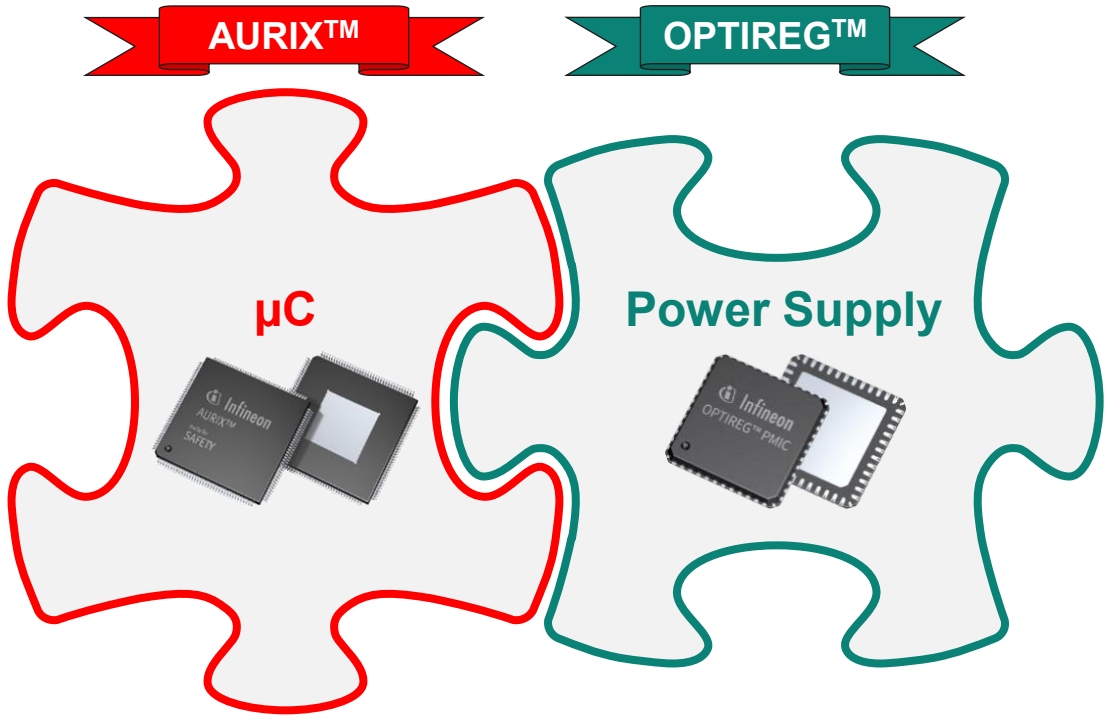
OPTIREG™

OPTIREG™ PMIC together with OPTIREG™ TLF11251 for a safe and optimized multi-channel power supply of Infineon µC families

IFX offers a scalable PMIC portfolio which can cover the complete AURIX™ TC2x/TC3x portfolio

- 2 x AURIX™ TC39x
- AURIX™ TC39x
- AURIX™ TC3Ex
- AURIX™ TC38x
- AURIX™ TC37x
- AURIX™ TC36x
- AURIX™ T33x
- AURIX™ TC32x

AURIX™ MCU

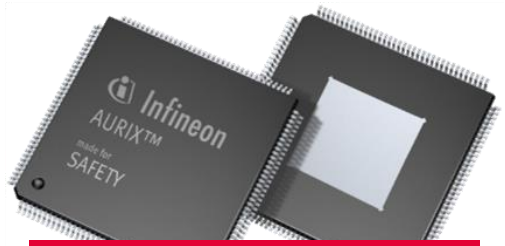


TLF35584 2x TLF11251	TLF35585 2x TLF11251
TLF35584 TLF11251	TLF35585 TLF11251
TLF35584 & N/P-EVRC	TLF35585 & N/P-EVRC
TLF35584 & AURIX™ EVRC	TLF35585 & AURIX™ EVRC

OPTIREG™ PMIC

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OPTIREG™ PMIC powers up your automotive system while supervising the microcontroller and the power supply





AURIX™ MCU

- Supply
- SPI
- Sensors
- Interrupt
- SMU

PRO SIL ISO 26262 compliant

OPTIREG™ PMIC

- Supply
- SPI
- V-MON
- WD
- ERR
- Safe State Con trol

PRO SIL ISO 26262 compliant

PMIC internal

- Internal supplies
- SPI error
- Thermal sensors
- BIST

Voltage Monitoring

- Over voltage
- Under voltage
- Over current

Watchdog

- Timing error
- Software execution error

Error monitor

- React on MCU Alarm

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OPTIREG™ PMIC & AURIX™ microcontroller team up for system optimization and functional safety

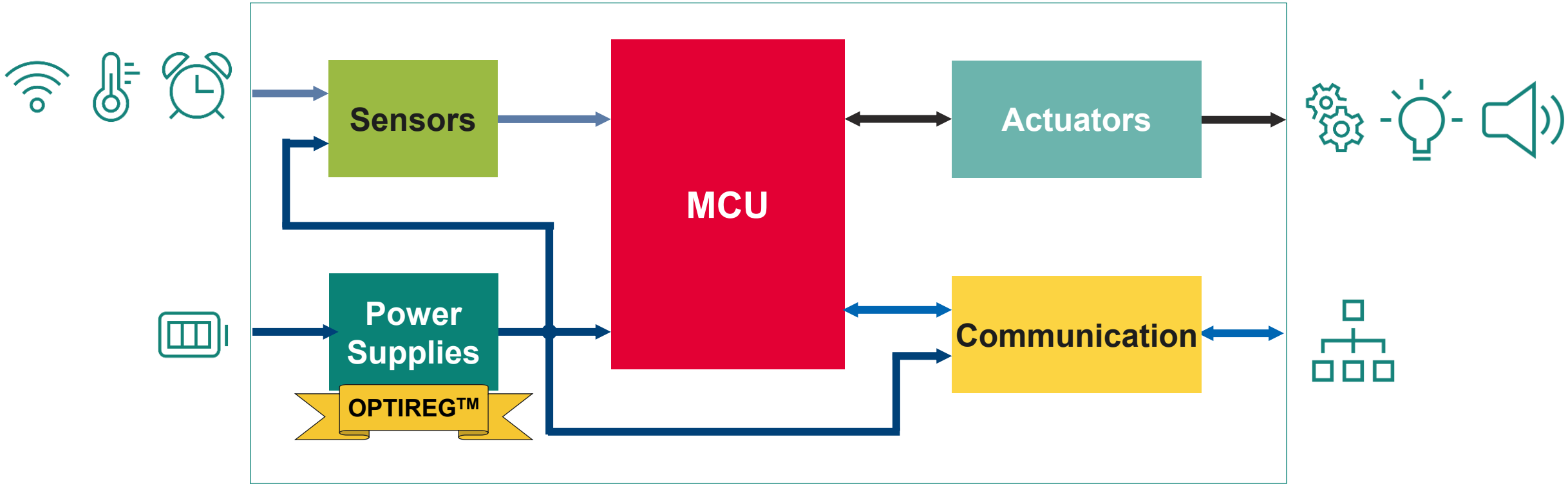






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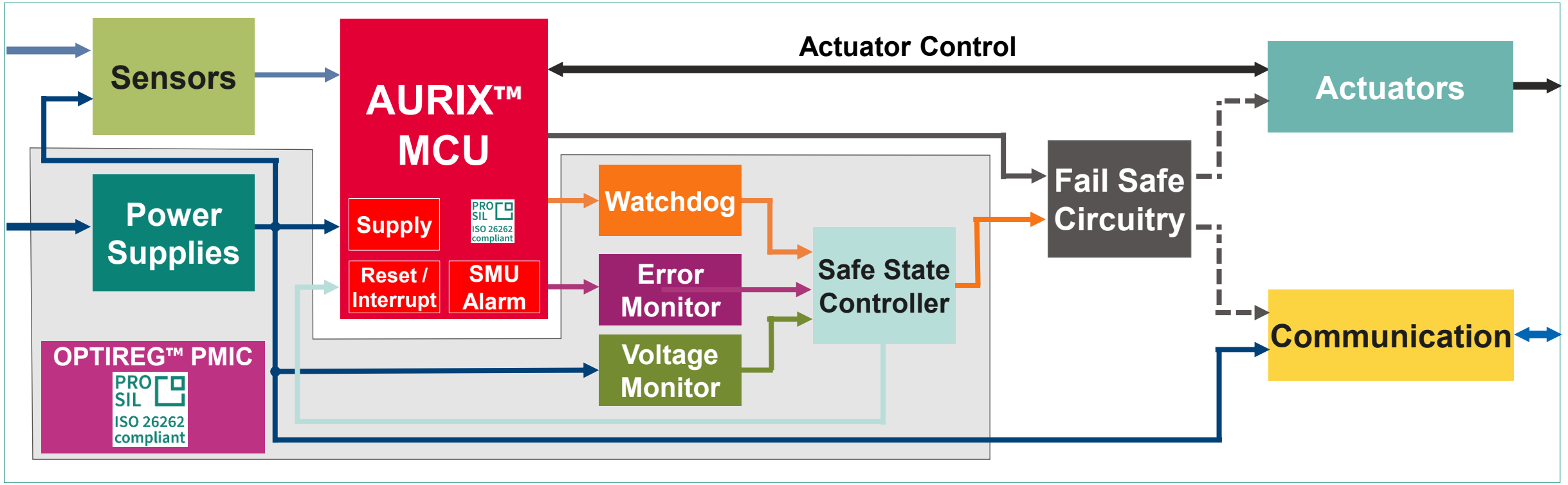
Automotive system



system: set of components or subsystems that relates at least a sensor, a controller and an actuator with one another

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Automotive system



Safety MCU:
System level hardware requirements

Safety path activated by microcontroller as main decision maker

Secondary safety path for faults that may lead to an unreliable MCU

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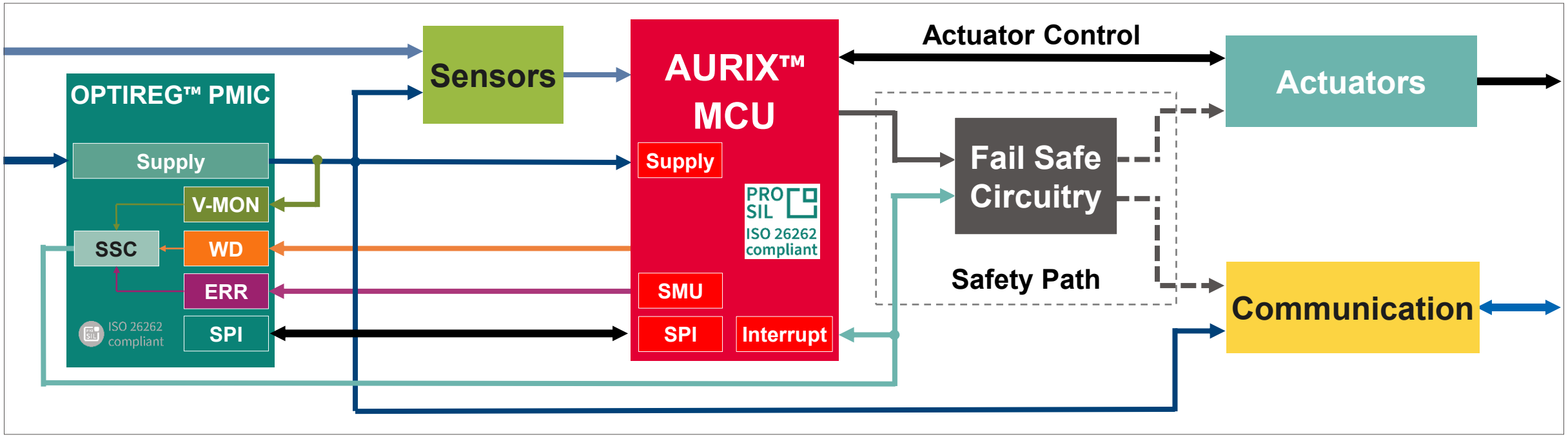
PMIC supervision
Monitoring of fault events

Voltage Monitor
- Over voltage
- Under voltage
- Over current

Watchdog
- Timing error
- Software execution error

Error monitor
- React on MCU Alarm

PMIC internal
- Internal supplies
- SPI error
- Thermal sensors
- BIST



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Safety functions
Voltage monitoring

Undervoltage- and overvoltage-monitoring

- MCU supply rails
- Peripherals supply rails (e.g. sensors, communication)
- Optional: additional monitor channel(s) for external rails

Multiple bandgap architecture (avoidance of common cause failures)

- Available dedicated and independent for both supply block and safety block
- Located in different areas of the chip (distance)
- Mutual supervision of bandgap1 (supply block) and bandgap2 (safety block)

Fault reactions (depending on kind and on what domain fault is occurring)

- Reset
- Shut down regulator / restart regulator
- Signal to MCU through INT pin → Let MCU take further actions
- Activation of secondary safety path → Override MCU, PMIC responsible for safe state of system

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Safety functions
Watchdog

Flexibility: Several MCU watchdog variants

- **Window watchdog** – periodically triggered to monitor the MCU's behavior and the plausibility of the software program sequence
- **Functional watchdog (Q/A-based)** – logical monitoring of the correct sequence of individual software program sections

Flexibility: Configurability

- Watchdog type/behavior programmable
- Dedicated watchdog error counter with dedicated selectable error threshold for each watchdog
- Window sizes (open/close) programmable
- Trigger via SPI or via dedicated input pin (WWD only)

Fault reactions

- Single error → Notify MCU with interrupt reaction (INT)
- Counter overflow → Activation of secondary safety path

Fault handling time interval

- Influenced by timing and configuration settings

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Safety functions
MCU error monitoring

AURIX™ safety management unit (SMU)

- Indicating serious errors to the PMIC through the Fault Signaling Protocol (toggling signal at the ERR pin)
- Avoidance of faults where the signal stuck-at high/low in MCU or on PCB level

PMIC's ERR-monitoring

Detecting errors in case
- signal is stopped (high or low)
- the wrong frequency
- wrong duty-cycle

Optional recovery delay time

Allow MCU to recover from fault within the accepted fault tolerant time interval of the application
→ increased availability

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Safety functions
PMIC internal monitoring

Detection and control of potential faults internally in the PMIC

Internal Supplies

- Analog / Logic level supplies
- Bias current
- VBAT supply
- Internal clock

Thermal Sensors

- Warning level
- Shutdown level
- Separate sensors

SPI Faults

- SPI frame error
- Protection with parity-bit, CRC and Unlock/Lock sequences
- Protected PMIC registers

BIST

- Testing that the voltage monitors are working correctly
- Activation by MCU
- MCU software test correctness of watchdog and error monitoring

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Safe state controller



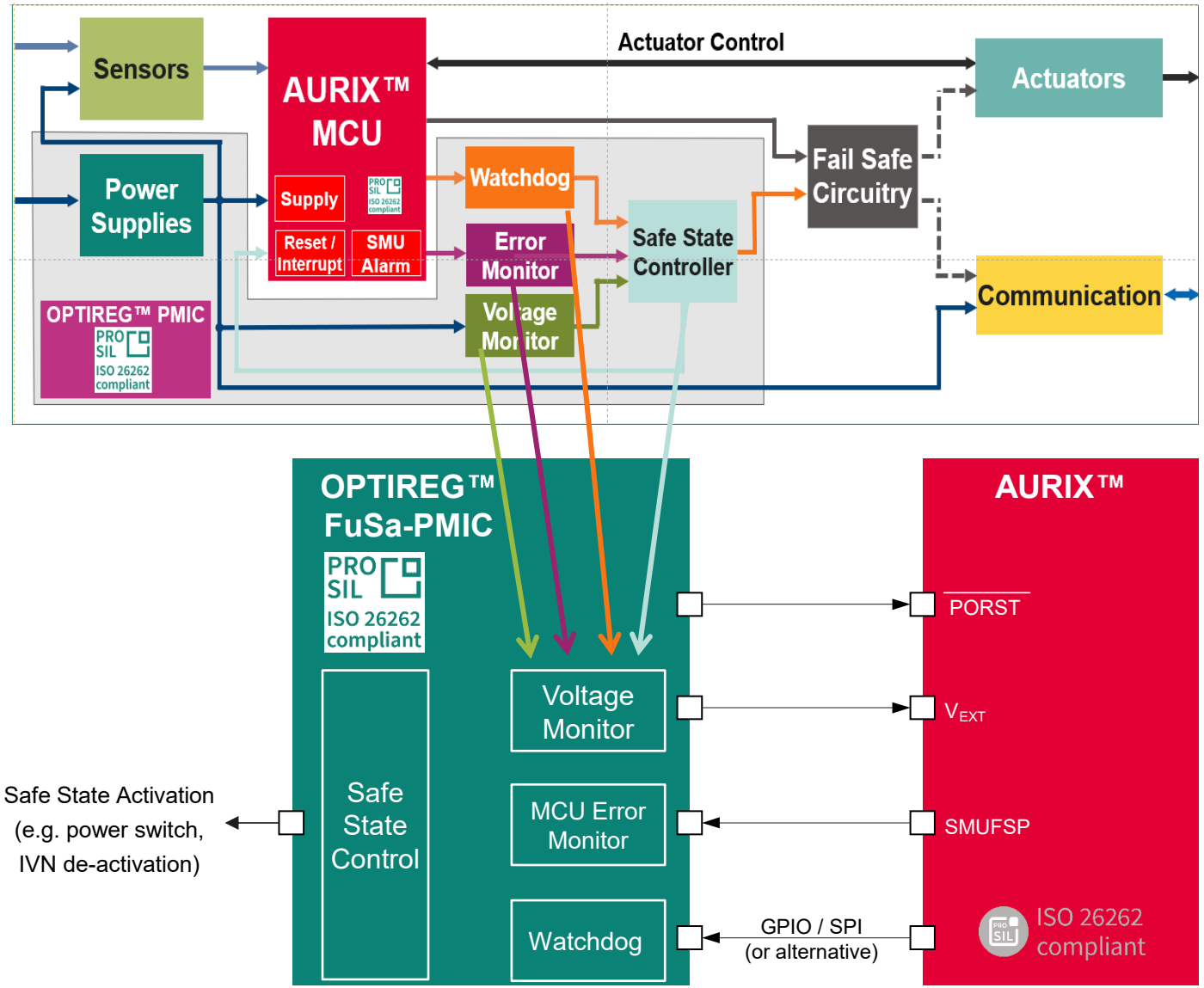
- Collects fault reports from all monitoring functions
- Handle the configurability of safety mechanisms
- Electrical separation and isolation from rest of the PMIC
  - Support safe state handling independent of internal faults

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OPTIREG™ FuSa-PMIC
Genesis of Safety Requirements

- OPTIREG™ FuSa-PMICs have been defined based on AURIX™ requirements for external monitoring
- Those requirements have then been extended to support also other MCUs.
  - Choice between different types of flexible watchdogs (Window- & Functional-Watchdogs)
  - Ability to monitor MCU core supply
- OPTIREG™ FuSa-PMICs are developed as Safety Element out of Context (SEooC) supporting ASIL-D acc. ISO 26262

PRO SIL ISO 26262 compliant



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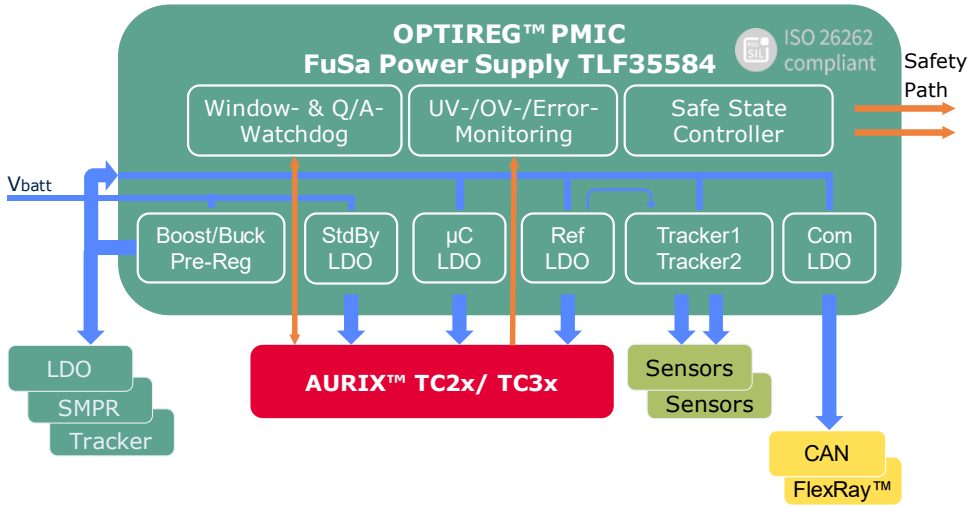
TLF35584 PMIC for Safety-relevant applications

TLF35584
OPTIREG™ PMIC for Functional Safety Applications

Key Features

- Buck/Boost-Pre-Regulator
  - I_{load} = 1.3A; f: 300kHz-2.5MHz
- µC-Supply: 3.3V/5V @ 600mA
- Reference-LDO: 5V @ 150mA (±1%)
- 2x Tracker: 5V @ 150mA
- Communication-Supply: 5V @ 200mA
- StandBy-LDO: 3.3V/5V @ 10mA

Block Diagram



- EN/Wake (T15 and CAN/FlexRay™)
- SPI
- Safety Features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-Monitoring, ERR-Monitoring
  - Functional-WD & Window-WD
  - Safe State Control Secondary Safety Path
  - Protected safety area
  - Built In Self Test
  - Development acc. ISO26262
- Vin: 3V .. 40V

PRO SIL
ISO 26262 compliant

Package



PG-VQFN-48
Available in Grade 0 and 1



PG-LQFP-64
Grade 1

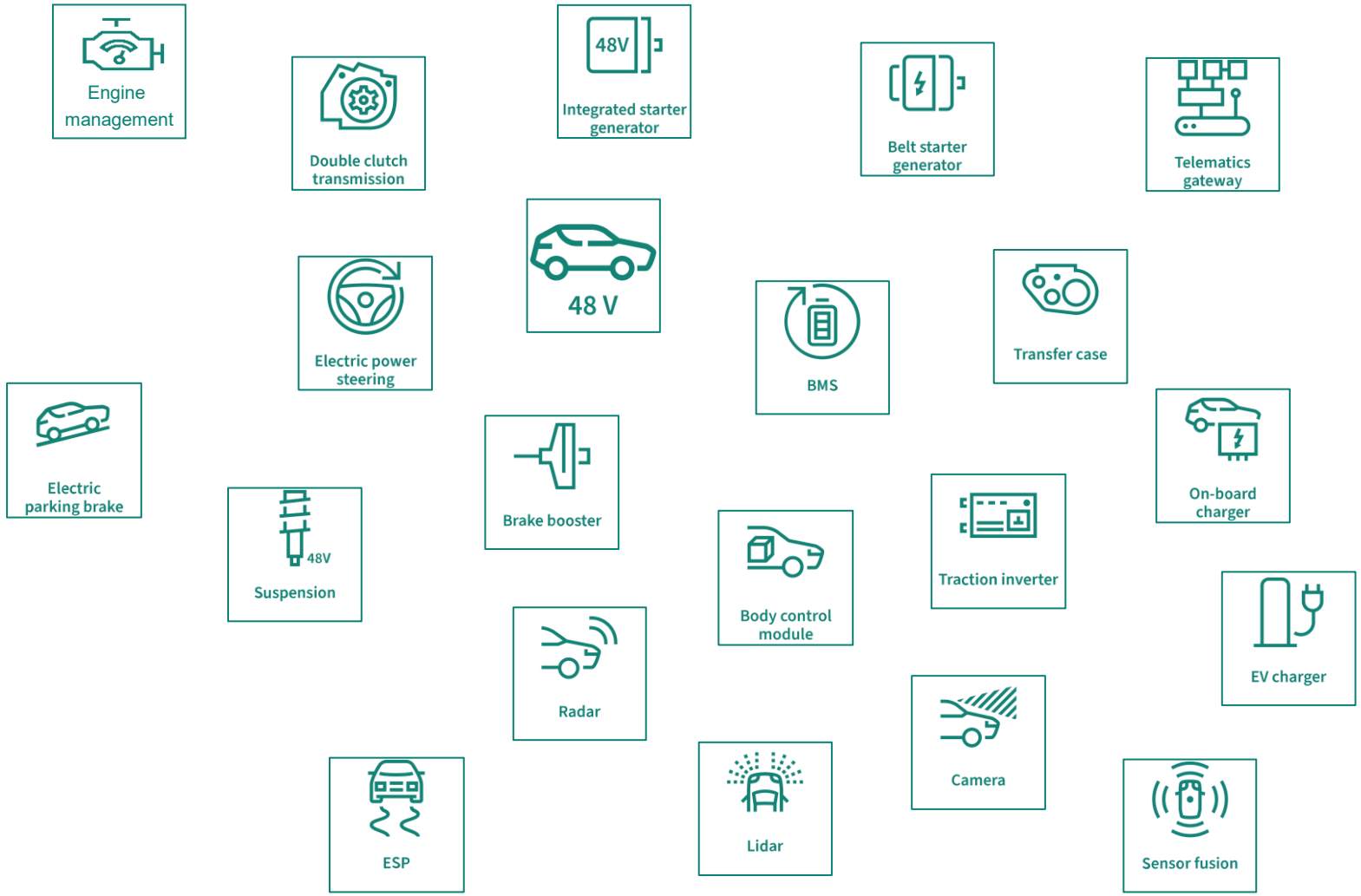
RoHS
AEC Qualified

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TLF35584
OPTIREG™ PMIC for Functional Safety Applications

- Powertrain
  - Engine Management
  - Transmission
  - Transfer Case
  - Clutch Actuator
  - Starter Generator (e.g. ISG)
- xEV

  Battery Management
  - Inverter
  - ...
- Chassis/Safety
  - Electrical Power Steering
  - Electr. Steering Column Lock
  - Braking (e.g. Brake Booster)
  - Electr. Parking Brake
  - Active Suspension
  - Chassis Control
  - ADAS Domain Control



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TLF35584 – OPTIREG™ PMIC for Functional Safety Applications
Features - Benefits



Features	Benefits
ISO 26262-compliant	Usage in applications with ASIL-requirement
Boost capability	Ensure operation in cold cranking condition
Pre-/Post-Regulator architecture	High Efficiency
Multiple voltage supplies	System supply: µC, communication, sensors
Dedicated reference voltage supply	ADC-supply independent of µC-load
Bandgap for both safety and supply plus electrical isolation	Avoid common cause failures
WWD & Q/A-WD	Flexible WD to achieve proper ASIL-level
BIST (analog & logic)	Ensuring “safe” operation
UV/OV-monitoring	Flexible RESET/interrupt management
Flexible safe state control	Ensuring “safe” operation
Enable/Wake	Flexible wake-up management

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TLF35584QVVSx/QKVSx
OPTIREG™ PMIC for Functional Safety Applications

Key Features

- Buck/Boost-Pre-Regulator
  - I_{load} = 1.25A; f: 300kHz-2.5MHz
- µC-Supply: 3.3V/5V @ 600mA
- Reference-LDO: 5V @ 150mA (±1%)
- 2x Tracker: 5V @ 150mA
- Communication-Supply: 5V @ 200mA
- StandBy-LDO: 3.3V/5V @ 10mA
- Vin: 3V .. 40V



PG-VQFN-48
Available in Grade 0 and 1



PG-LQFP-64
Grade 1

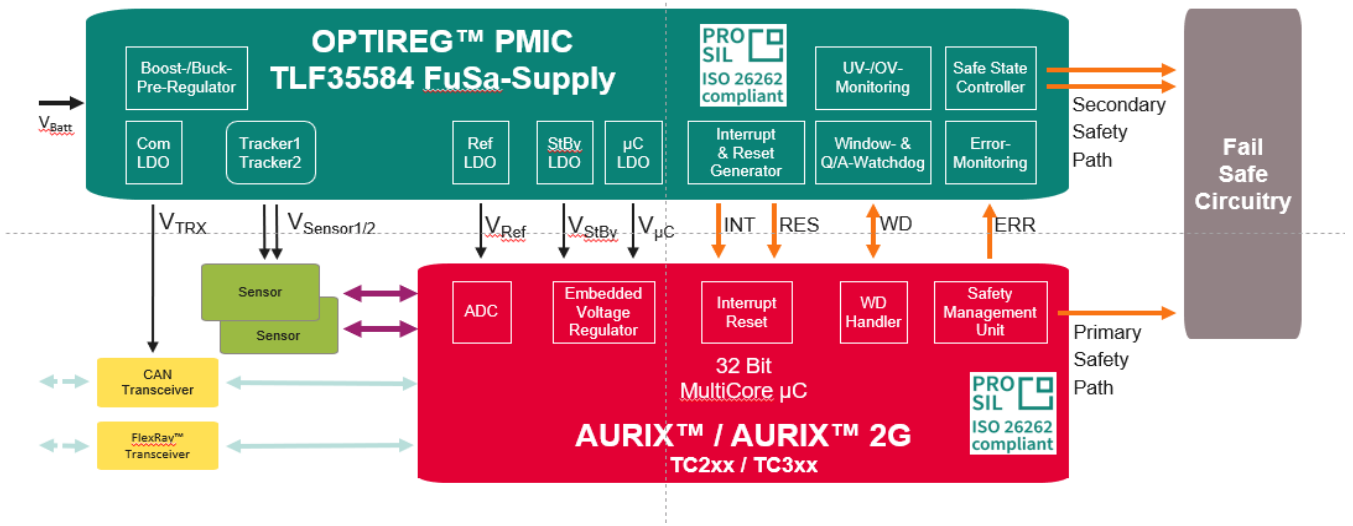
AEC Qualified

RoHS

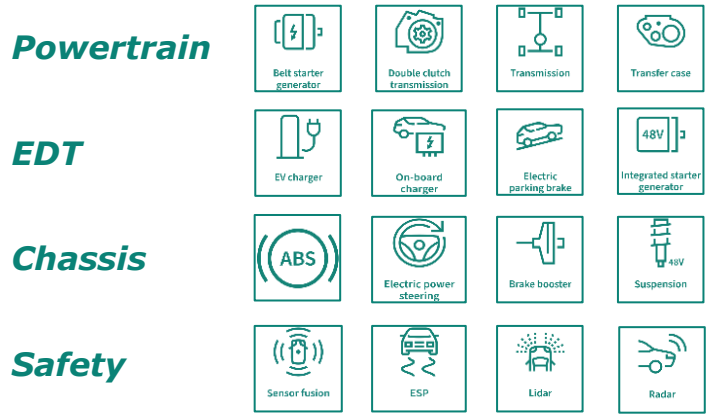
PRO SIL ISO 26262 compliant

- EN/Wake (T15 and CAN/FlexRay)
- SPI
- Safety Features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-Monitoring, ERR-Monitoring
  - Functional-WD & Window-WD
  - Safe State Control, Secondary Safety Path
  - Protected safety area
  - Built In Self Test

Application Diagram



Applications



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TLF35584QVHSx
OPTIREG™ PMIC for Functional Safety Applications

Key Features

- Buck/Boost-Pre-Regulator
  - I_{load} = 1.25A; f: 300kHz-2.5MHz
- µC-Supply: 3.3V/5V @ 600mA
- Reference-LDO: 5V @ 150mA (±1%)
- 2x Tracker: 5V @ 150mA
- Communication-Supply: 5V @ 200mA
- StandBy-LDO: 3.3V/5V @ 10mA
- Vin: 3V .. 40V



PG-VQFN-48
Grade 0

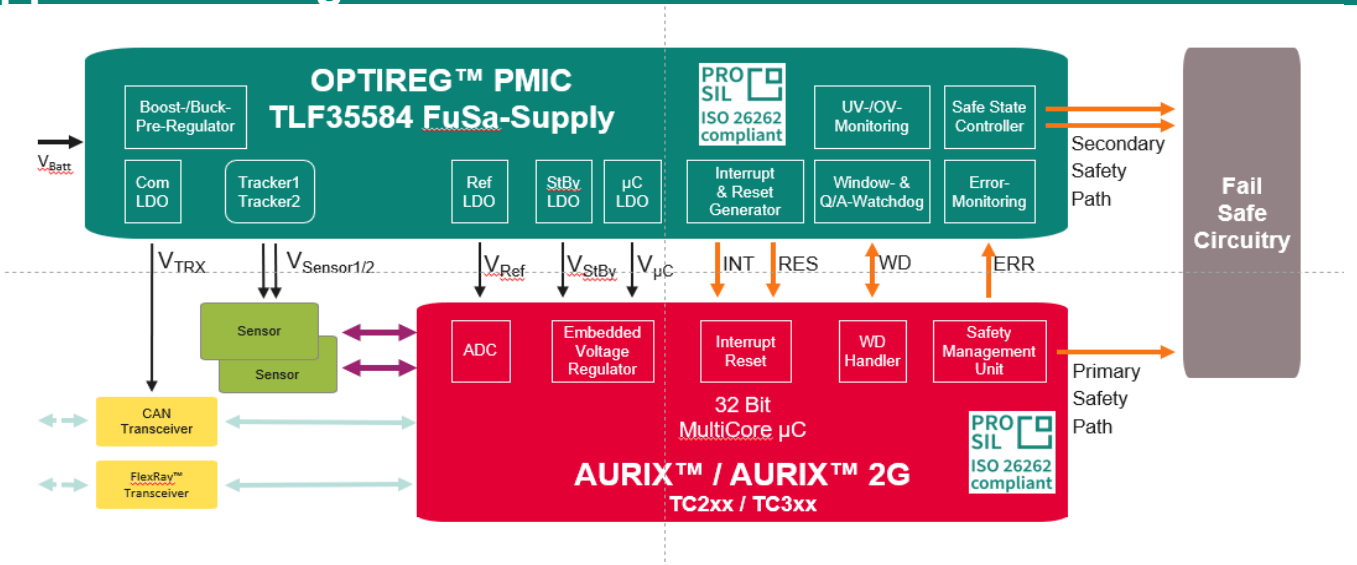
AEC Qualified

RoHS

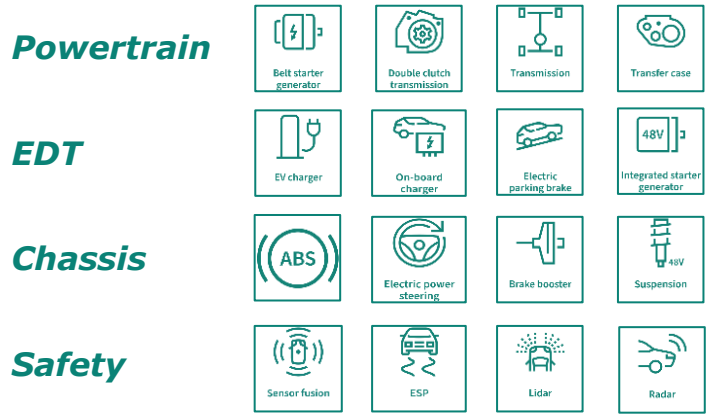
PRO SIL ISO 26262 compliant

- EN/Wake (T15 and CAN/FlexRay)
- SPI
- Safety Features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-Monitoring, ERR-Monitoring
  - Functional-WD & Window-WD
  - Safe State Control, Secondary Safety Path
  - Protected safety area
  - Built In Self Test

Application Diagram



Applications



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TLF35585 PMIC for Safety-relevant applications

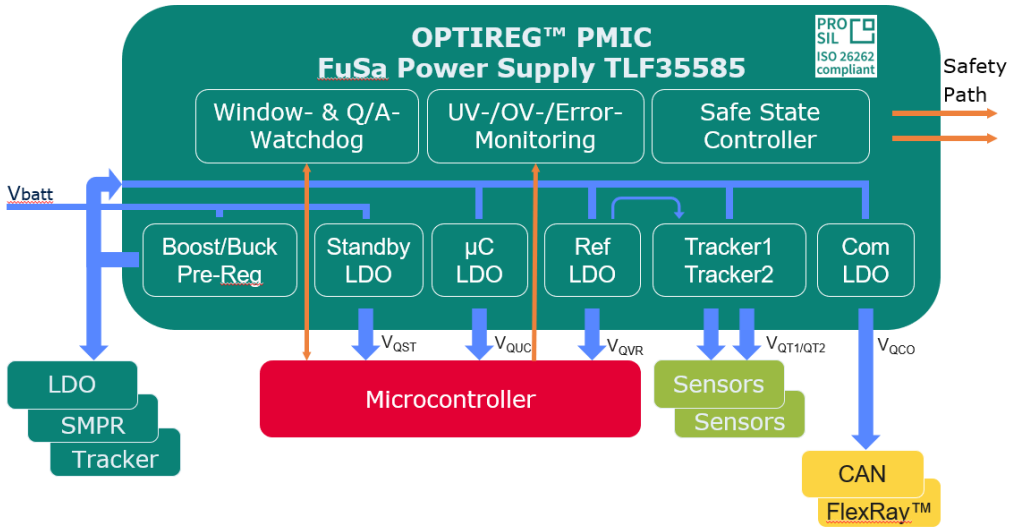
TLF35585
OPTIREG™ PMIC for Functional Safety Applications

Key Features

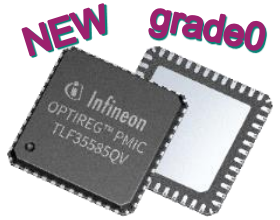
- Buck/Boost-Pre-Regulator
- NEW – I_{load} = 1.5A; f: 300kHz-2.5MHz
- µC-Supply: 3.3V/5V @ 600mA
- Reference-LDO: 5V @ 150mA (±1%)
- Communication-Supply: 5V @ 200mA
- 2x Tracker: 5V @ 150mA
- StandBy-LDO: 3.3V/5V @ 10mA
- EN/Wake (T15 and CAN/FlexRay)
- SPI **Added Registers**
- NEW – Low current consumption (<10-15µA)
- Feature Enhancement vs. TLF35584
  - E.g. additional diagnostics information, extended timer functionality
- Safety Features
  - Multiple bandgap (supply vs V-monitoring)
  - UV/OV-Monitoring, ERR-Monitoring
  - Functional-WD & Window-WD
  - Safe State Control / Secondary Safety Path
  - Protected safety area
  - Built In Self Test
  - Development acc. ISO26262
- Vin: 3V .. 40V

PRO SIL ISO 26262 compliant

Block Diagram



Package



PG-VQFN-48



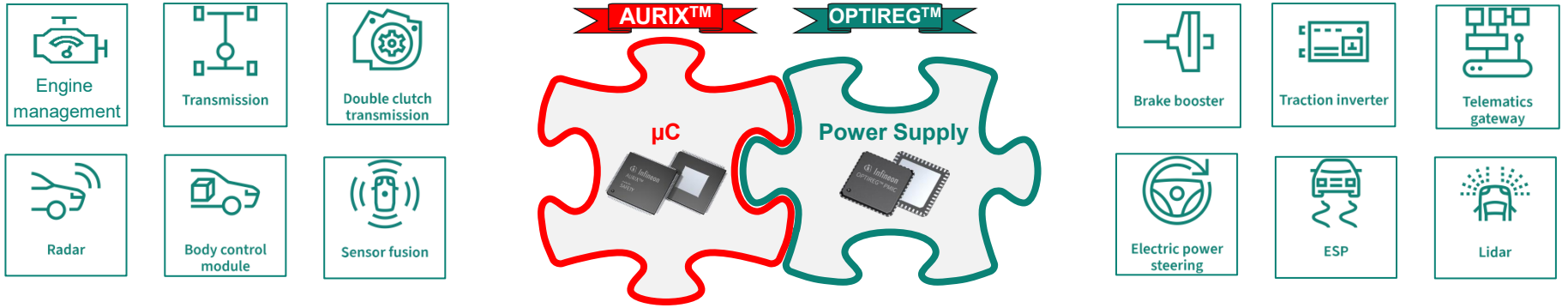
PG-TQFP-48

RoHS

AEC Qualified

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OPTIREG™ PMIC TLF35585: The robust, safe and reliable supply companion for AURIX™ TC3x microcontrollers in FuSa applications



Key Features

- Adjustable switching speed of the step-down regulator
- Grade 0 and ASIL-D enabled by default
- Increased buck converter current capability
- Lower Quiescent current in STANDBY with Standby-LDO active
- Microcontroller Programming Support (MPS) control via SPI

Key Benefits

- Flexibility in the optimization of efficiency and EMC performance
- Address applications requiring tj >150°C, extended lifetime and highest degree of FuSa
- Support high end AURIX™ 2G (TC38/39) covering more applications
- Support tighter stand-by currents
- Easier debugging

Value

- Increased system efficiency
- Easy to design products
- Extended lifetime & temperature
- Reduced system costs
- Smaller system size

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Functional Safety
Relevant applications

Safe Control

Conventional Powertrain

- Engine management
- Transmission
- Transfer case
- Integrated starter generator (48V)

Electrical Drive Train

- BMS
- Traction inverter
- On-board charger

Chassis

- Electric power steering
- ABS
- Suspension (48V)

Safe Compute

Body

- Car lighting
- Telematics gateway

Safety / ADAS

- Airbag
- Radar
- Lidar
- Camera
- Sensor fusion



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TLF4D985 PMIC for Safety-relevant applications

OPTIREG™ PMIC :
The #1 power supply solution for AURIX™ microcontroller family

OPTIREG™ PMIC : THE AURIX™ supply

- #1 Functional Safety supply for AURIX™
- >300 projects secured at all major OEMs and >30 different applications in safe compute and control e.g., Zones xEV, Chassis, Safety, ADAS, Body)
- High scalability over the entire AURIX™ portfolio with high hardware & software re-use
- Product-to-System full interoperability between OPTIREG™ PMIC & AURIX™



General Purpose AURIX™ TC4x PMIC

TLF4D985 & TLF4A985 (In development)

- Scalable general purpose PMIC family for AURIX™ TC4x
- Release schedule aligned with AURIX™ TC4x family
- Joint product definition between AURIX™ and PMIC for most optimum power supply solutions





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New OPTIREG™ PMIC TLF4x family offers unique advantages alongside AURIX™ TC4x family

OPTIREG™ PMIC TLF4x Key features

P2S development ensures fully digital and power **interoperability**

Scalability over the entire AURIX™ portfolio

Right **application fit** with dedicated features for compute & control segments

ASIL D compliant safety features supporting system integrity

Support AURIX ™ **Freedom from Interference**

Customer advantages

- ✓ Optimized Bill of Material
- ✓ Unique fit to TC4x
- ✓ Ease of use

- ✓ Hardware & Software reuse
- ✓ Lower R&D effort

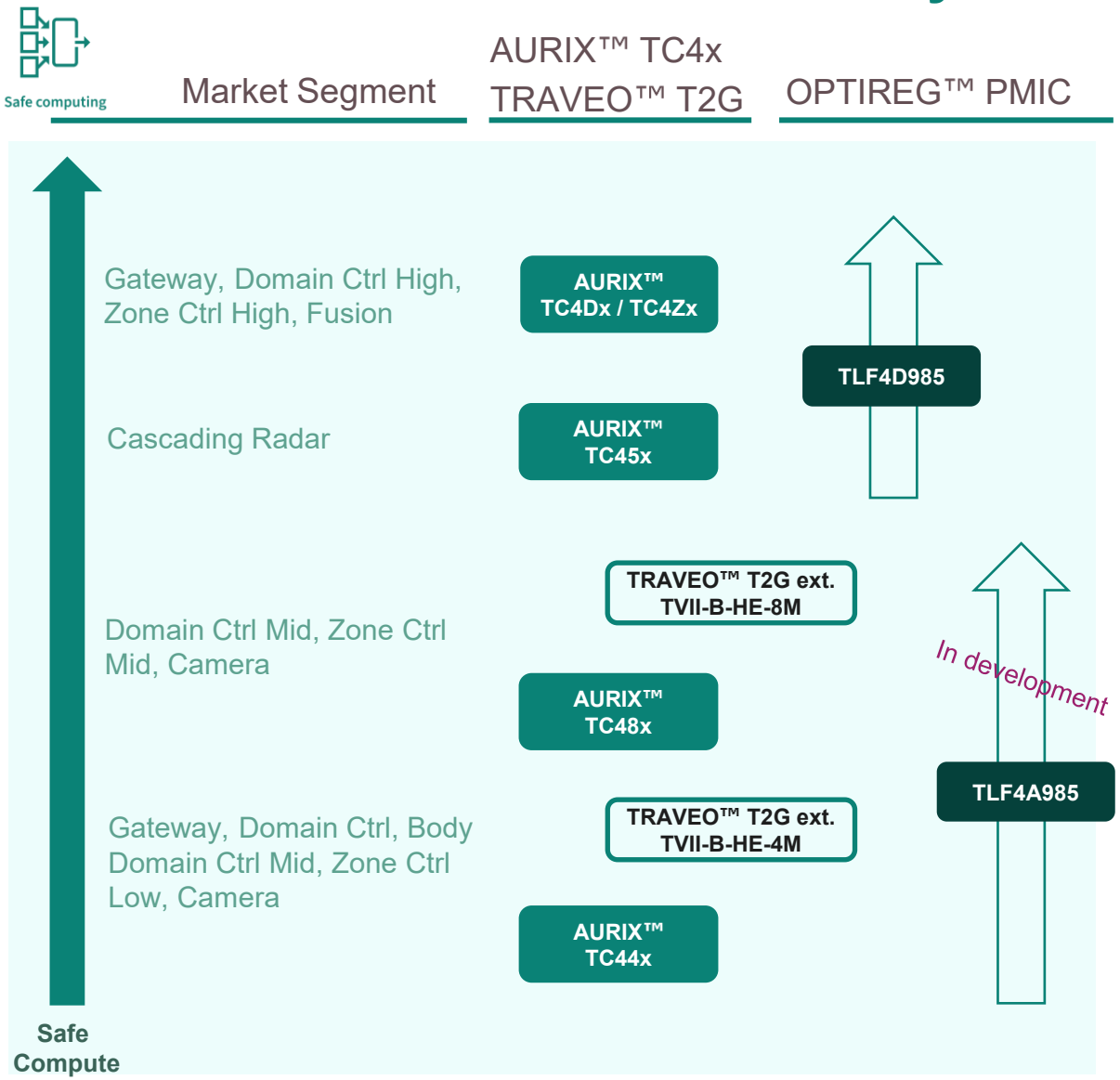
- ✓ Smaller PCB size
- ✓ Optimized Bill of Material
- ✓ Centralized power management

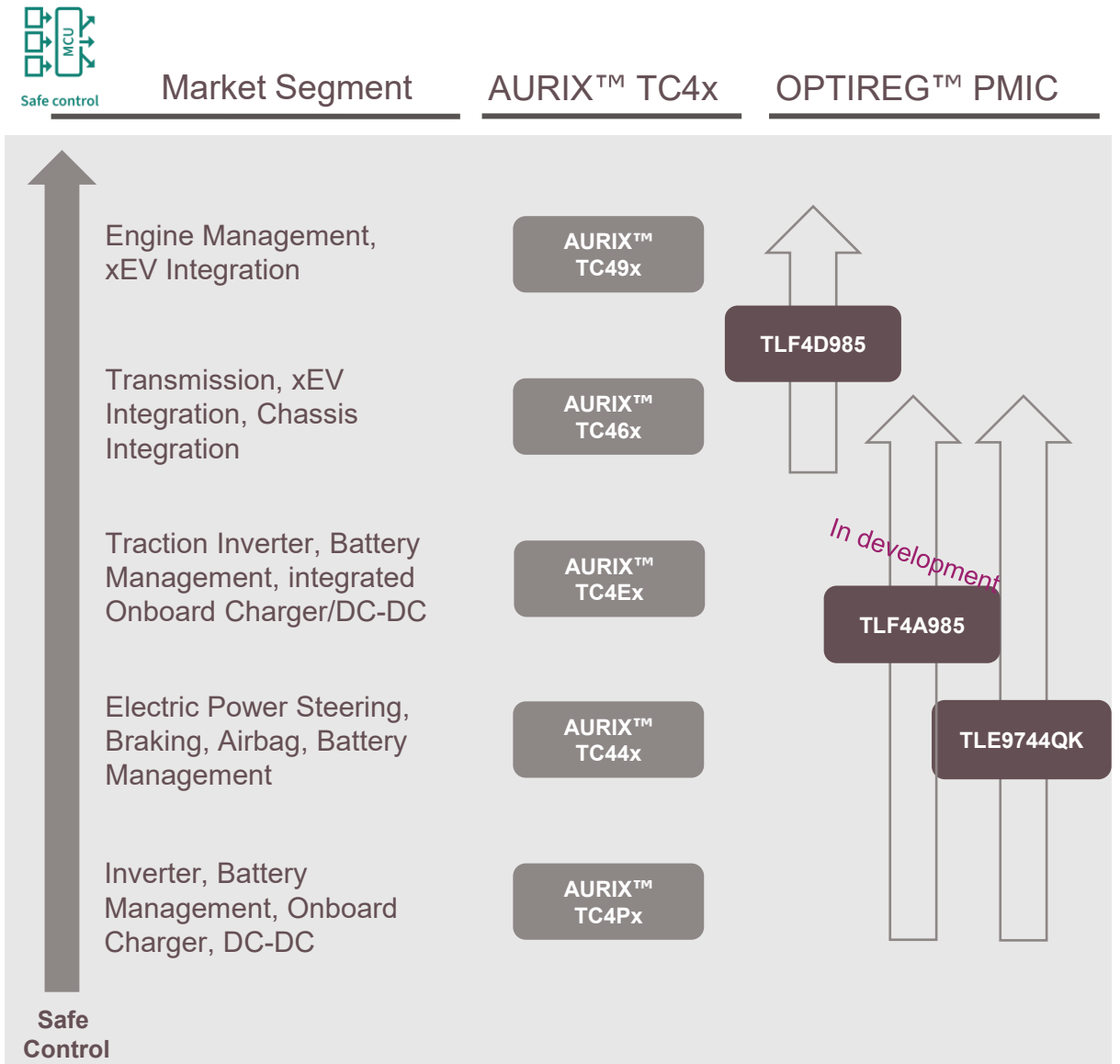
- ✓ Safe supply and safety MCU supervision with Safe state output reactions

- ✓ Support of multi-CPU and multi-threading systems
- ✓ Independent safe state handling capabilities

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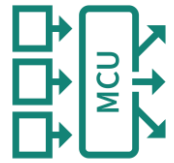
Fully scalable & flexible PMIC power supply solution for AURIX™ TC4x & TRAVEO™T2G ext. family





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OPTIREG™ PMICs Application Fit for Automotive Applications



Safe control



Safe computing

	High		Entry	
Conventional Powertrain	AURIX™ TC49x	+ OPTIREG™ TLF4D985	AURIX™ TC46x	+ OPTIREG™ TLF4A985
Electrical Drive Train 	AURIX™ TC49x	+ OPTIREG™ TLF4D985	AURIX™ TC46x / 4Ex / 4Px	+ OPTIREG™ TLF4A985 TLE9744QK
Chassis / Safety 	AURIX™ TC46x / 44x	+ OPTIREG™ TLF4A985 *In development*	AURIX™ TC36x / 33x	+ OPTIREG™ TLF35585 / 84
ADAS 	AURIX™ TC4Dx/TC4Zx	+ OPTIREG™ TLF4D985	AURIX™ TC48x / 44x / 42x	+ OPTIREG™ TLF4A985
Body 	AURIX™ TC4Dx/TC4Zx	+ OPTIREG™ TLF4D985	AURIX™ TC48x / 44x / 42x	+ OPTIREG™ TLF4A985

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OPTIREG™ PMIC TLF4D985 AURIX™ TC4Dx/49x/4Zx Companion System Supply IC

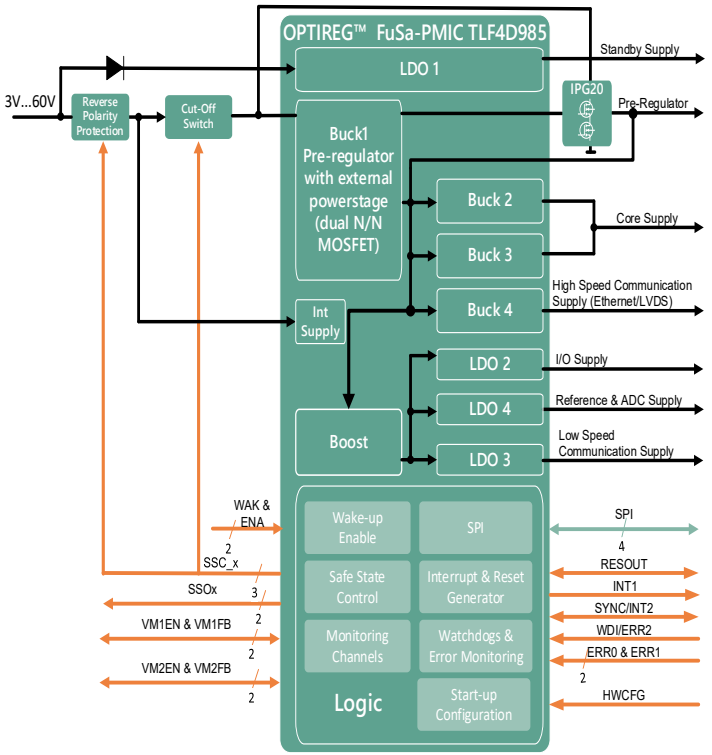
Main Features

- Optimized supply solution for AURIX™ TC4Dx/49x/4Zx.
- **Grade 0 and ASIL-D** enabled by default,**Functional Safety**: ISO 26262 compliance (safety goal target ASIL-D).
- **Cutoff switch** for redundant supply domain isolation for critical faults with external components
- Pre-Regulator Buck-Controller with N/N MOSFET driver providing **up to 50W**
- Microcontroller I/O supply of **3.3V/5V @ 600mA**
- Microcontroller Programming Support (MPS) control via **SPI.**

Key Benefits

- Support **high-end AURIX™ TC4Dx/49x/4Zx** covering more applications
- Address applications requiring **Tj >150°C**, extended lifetime and highest degree of **FuSa.**
- Flexibility in the **optimization of efficiency and EMC** performance.
- Support tighter stand-by currents.
- Easier debugging.

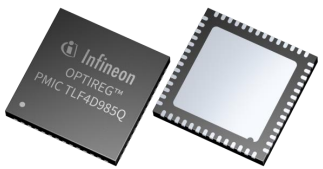
Block Diagram





LQFP-64

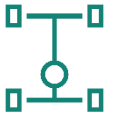
VQFN-56



Applications



Sensor fusion



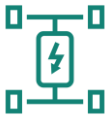
Transmission



Engine Management



Telematics gateway



xEV



Radar

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Learn more about OPTIREG™ TLF4x PMICs for AURIX™ TC4x

Product & Technical Material on myICP

- Product briefs
- Product Presentations
- Datasheets
- Application Notes
- Simulations models

TLF4x myICP*

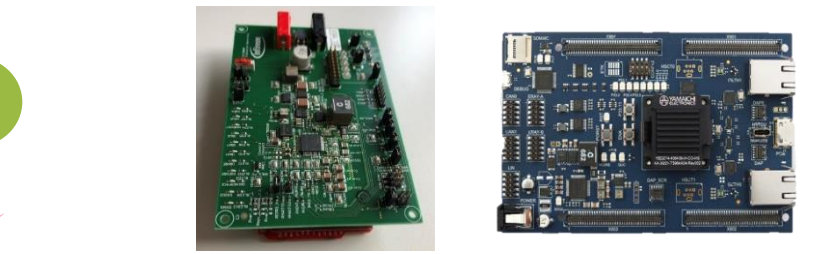
TLF4D985 myICP*

Evaluation Boards

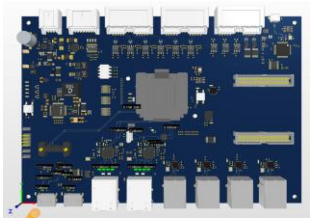
- Evaluation boards
- Demo boards
- Reference designs
- Software support – Complex device driver (CDD)

TLF4D985 Eval Board

TC4Dx TriBoard



TLF4Dx + TC4Dx Zone controller Board



* Accessible only for customers under NDA

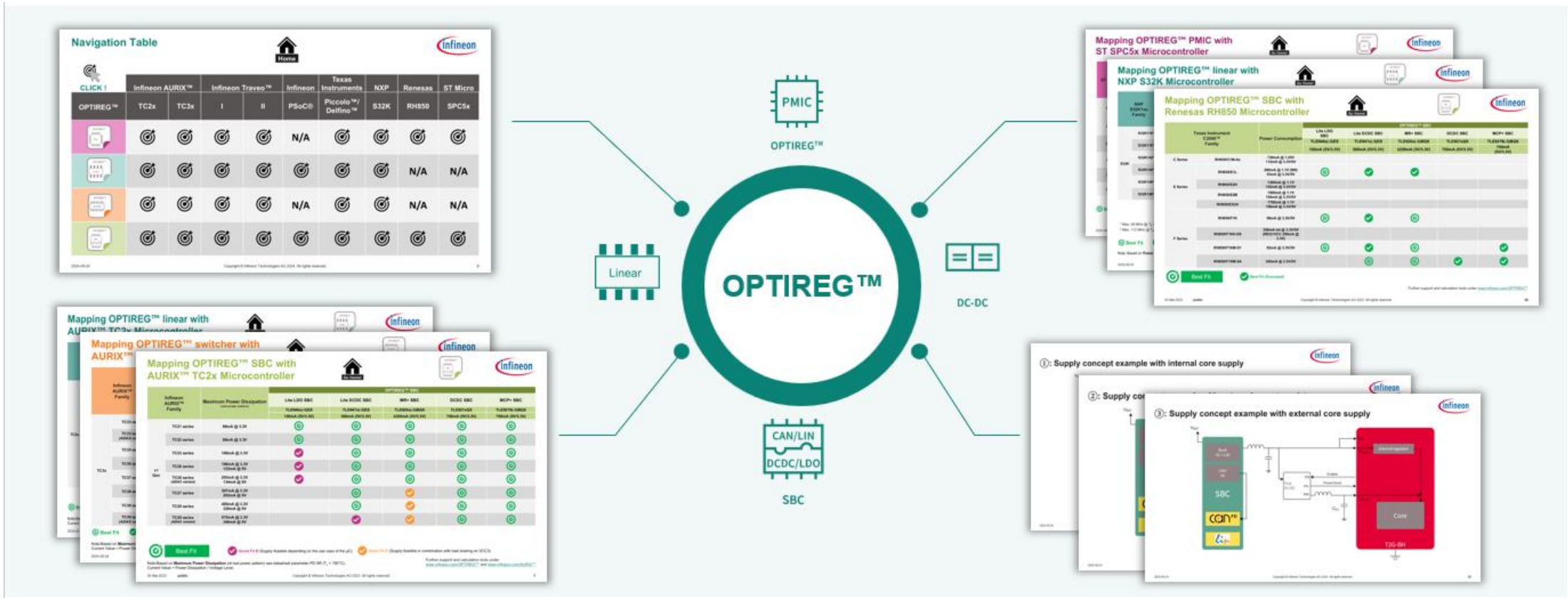
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Cross-selling

Mapping of OPTIREG™ with various microcontrollers
Find the right OPTIREG™ for your microcontroller in just a few clicks!

Scan

Click



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Mapping of OPTIREG™ with various microcontrollers
Find the right OPTIREG™ for your microcontroller in just a few clicks!

Scan

Click

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

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TLF11251LD/EP Integrated Half-Bridge for AURIX™-µC's Embedded Core Controller (EVRC)

TLF11251LD/EP - Integrated Half-Bridge for Embedded Core Controller (EVRC)

Key Features

- Integrated PMOS and NMOS complementary output bridge
- Current capability 2.5 A
- Integrated gate drivers
- Integrated level shifter
- Single control input with an integrated dead-time logic allows for optimized control and high efficiency
- Output current sensing and limitation
- Over-temperature protection
- Low quiescent current
- No external dead-time adjustment required
- Packages:
  - PG-TSON-10 (Grade 1)
  - PG-TSDSO-14 (Grade 0)

Package

AEC Qualified



PG-TSON-10



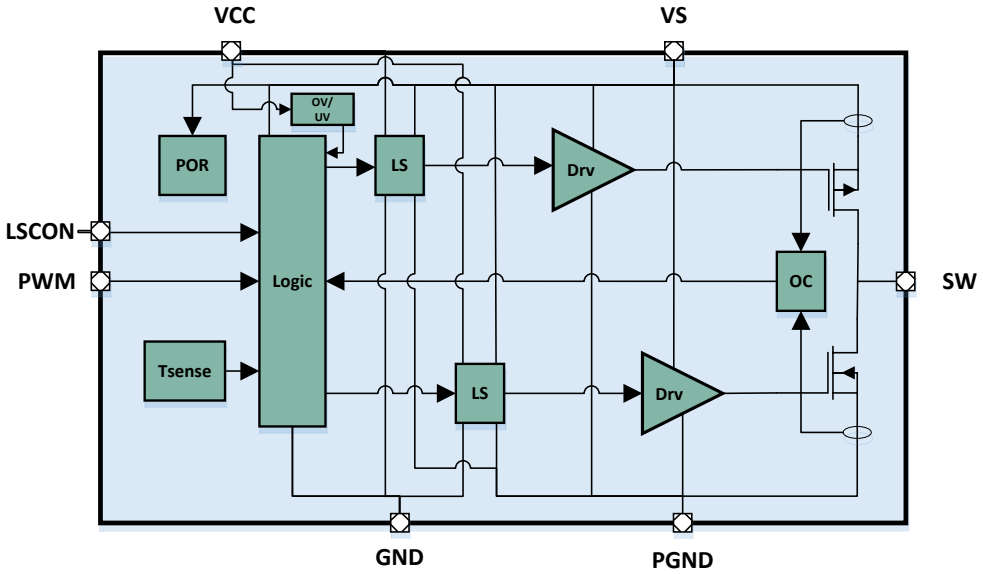
PG-TSDSO-14

RoHS

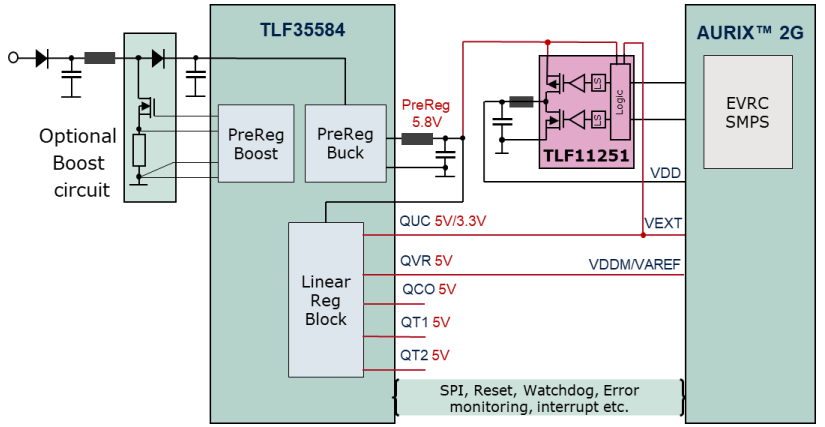
Applications

- Core-Supply Switch for Embedded Core Controller

Block Diagram



Application Diagram



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Trainings

OPTIREG™ linear trainings

Training name	Content
Online Course Infineon's automotive PMICs: OPTIREG™ PMIC (S1)	By the end of this training, users will: • Recognize devices out of the OPTIREG™ PMIC product family. • Identify Infineon's portfolio of PMICs, and know which devices are currently under development.
Online Course OPTIREG™ PMIC - Technical safety requirements and goals (E2)	By the end of this training, users will: • Understand the strategy of main functional safety features (TSRs) of OPTIREG™ Safety Power Management ICs (PMIC). • After the training, you will be aware of the benefits and scope of our Safety PMICs, that are provided to safety-related applications.

Click on the training title to access it

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Supporting Tools & Documents

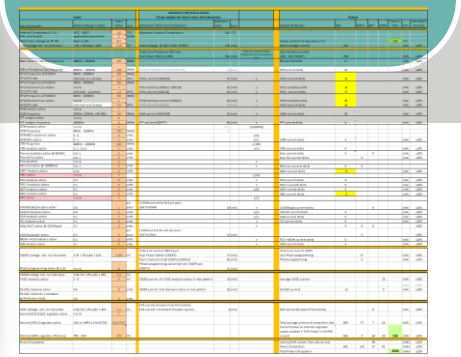
OPTIREG™ PMIC
Identify

Solution Finder

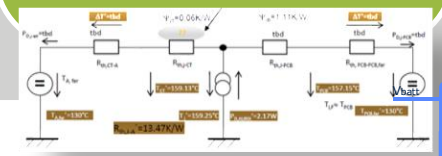
Choose AURIX™ µC



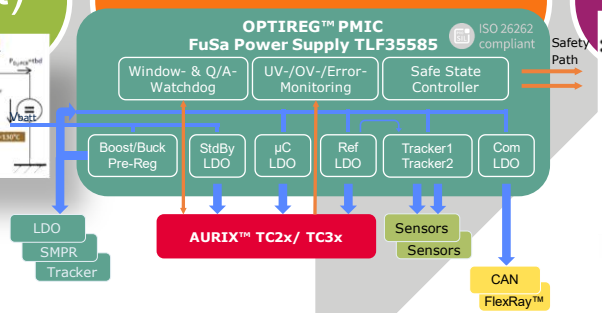
Perform AURIX™ Loading Calculation



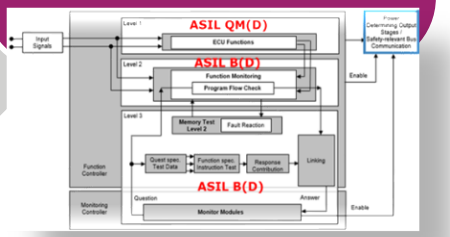
Identify Environmental Conditions (temperature, PCB data, cooling concept)



Determine Additional Loads in Application (IVN, Sensors, etc.)



Identify ASIL Decomposition of Functional Safety Requirements

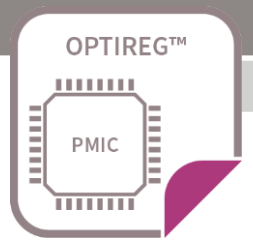


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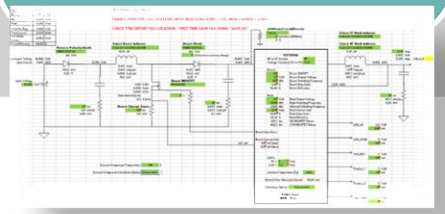
OPTIREG™ PMIC
Design-In

Design-In

Choose the right OPTIREG™ PMIC



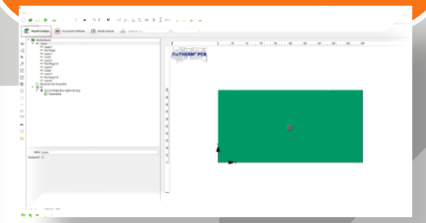
Power Loss Calculation



Lifetime Requirements / Mission profile Check



Thermal Simulation (TTM, Ansys® Icepak™, Mentor® FloTHERM™)



Choose the right Package

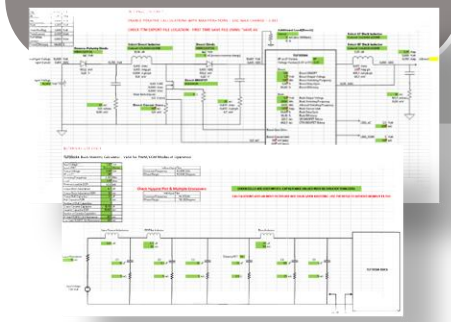


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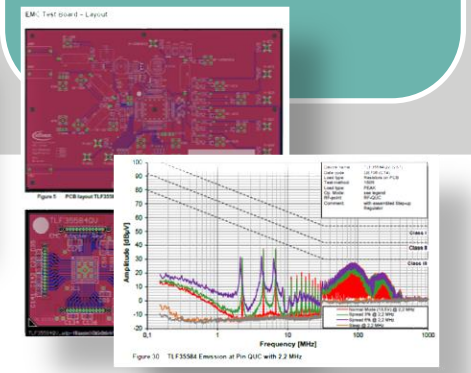
OPTIREG™ PMIC
Schematic and Layout: Design & Review

Design-In

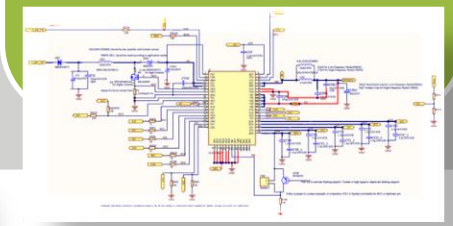
Stability Analysis and Choice of External Components



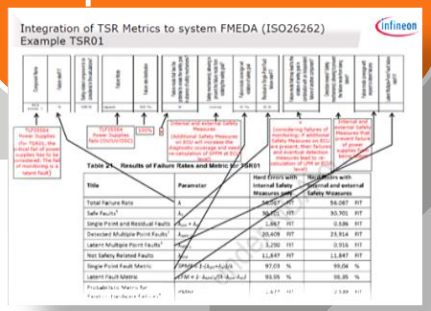
EMC Analysis and Improvement



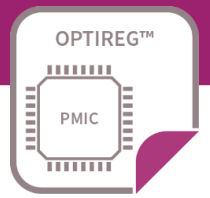
Layout & Schematic Review



FMEDA Adjustment and Implementation



Completed OPTIREG™ PMIC Design



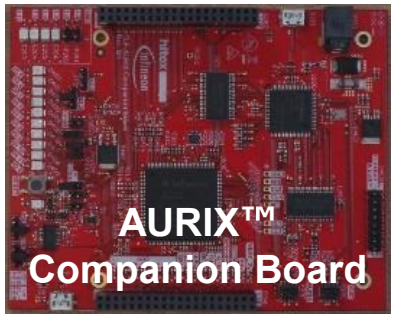
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OPTIREG™ PMIC Evaluation Boards

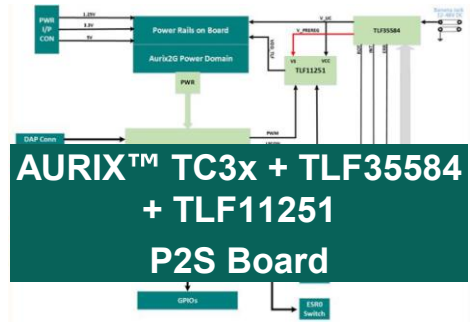
PMIC Evaluation Boards

Sales Name of Board	Description
TLF35584QxVSx Board	*PMIC Evaluation Board*
TLF35584MC BOARD	*Microcontroller Companion Board*
TLF30682 Board	*PMIC Evaluation Board*
A2G P2S TC3x9	*Application Board*



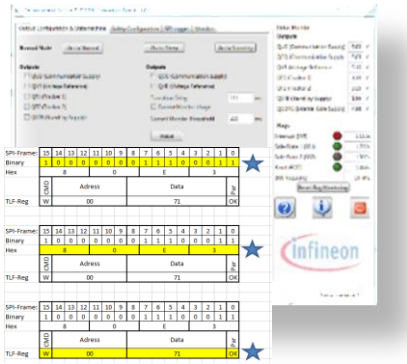


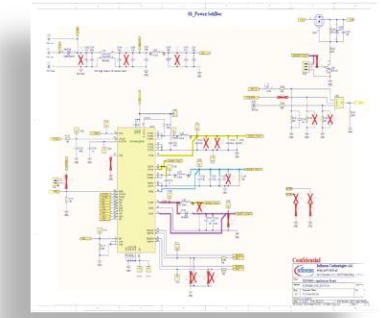


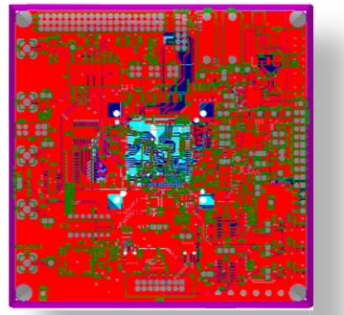


Additional Evaluation Board Tools

- Graphical User Interface (GUI)
- SPI Configurator
- User Manual
- Schematics and Layout







OPTIREG™ PMIC TLF35x Family
Evaluation Boards and their functionality

Evaluation Board

Analog Performance

- Analog testing of TLF35x power supply performance w/o the need of a MCU



Evaluation Board + MC Board

Analog & Digital Performance

- Analog testing of TLF35x power supply performance
- Digital testing of TLF35x functionalities (e.g. WWD, FWD, SPI, …) through the GUI



Triboard Manual TC3X9

SW Development

- Eval. Board for SW development and pre-test, e.g. to develop SW drivers for the TLF35x
- TLF11251 is used to power TC38x/9x: see the reference schematics
- Triboard Manuals myICP folder

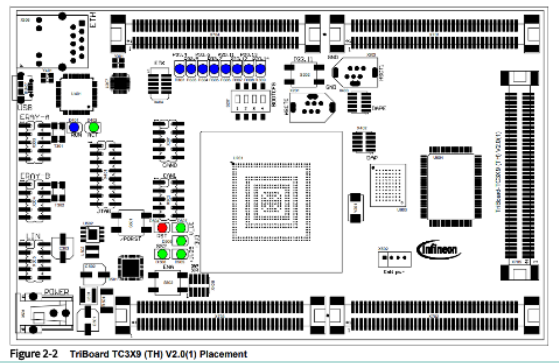
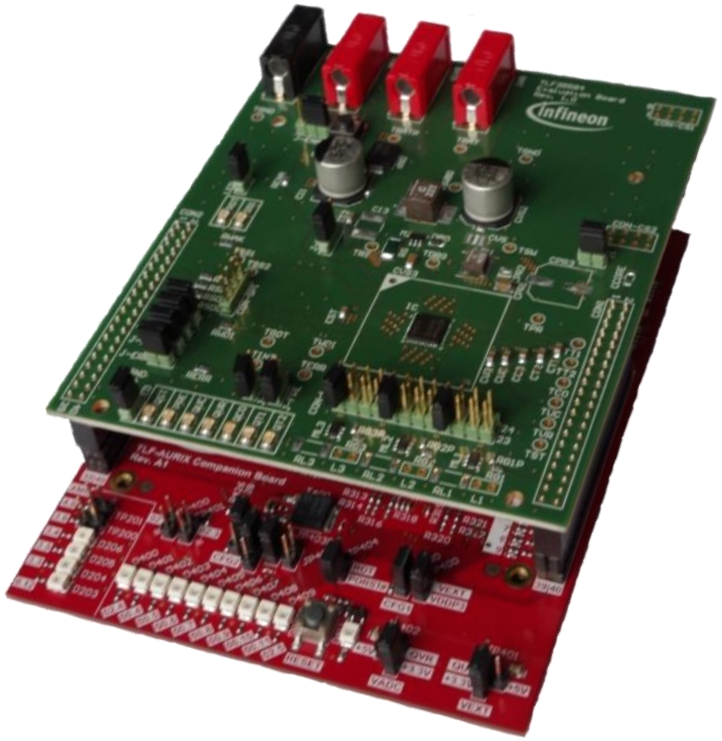


Figure 2-2 TriBoard TC3X9 (TH) V2.0(1) Placement

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OPTIREG™ TLF35584 PMIC Evaluation Environment

- TLF35584-Evaluation-Boards (Green)
  - Equipped either with 3V3- or 5V-variant
  - Can be adapted to high- and low-switching frequency
- µC-Companion-Board (Red)
  - For TLF35584-configuration
  - Stack-concept
  - GUI
    - Setting parameter
    - Monitoring functions
    - Logging SPI-communication
    - Writing registers
    - Reading flags



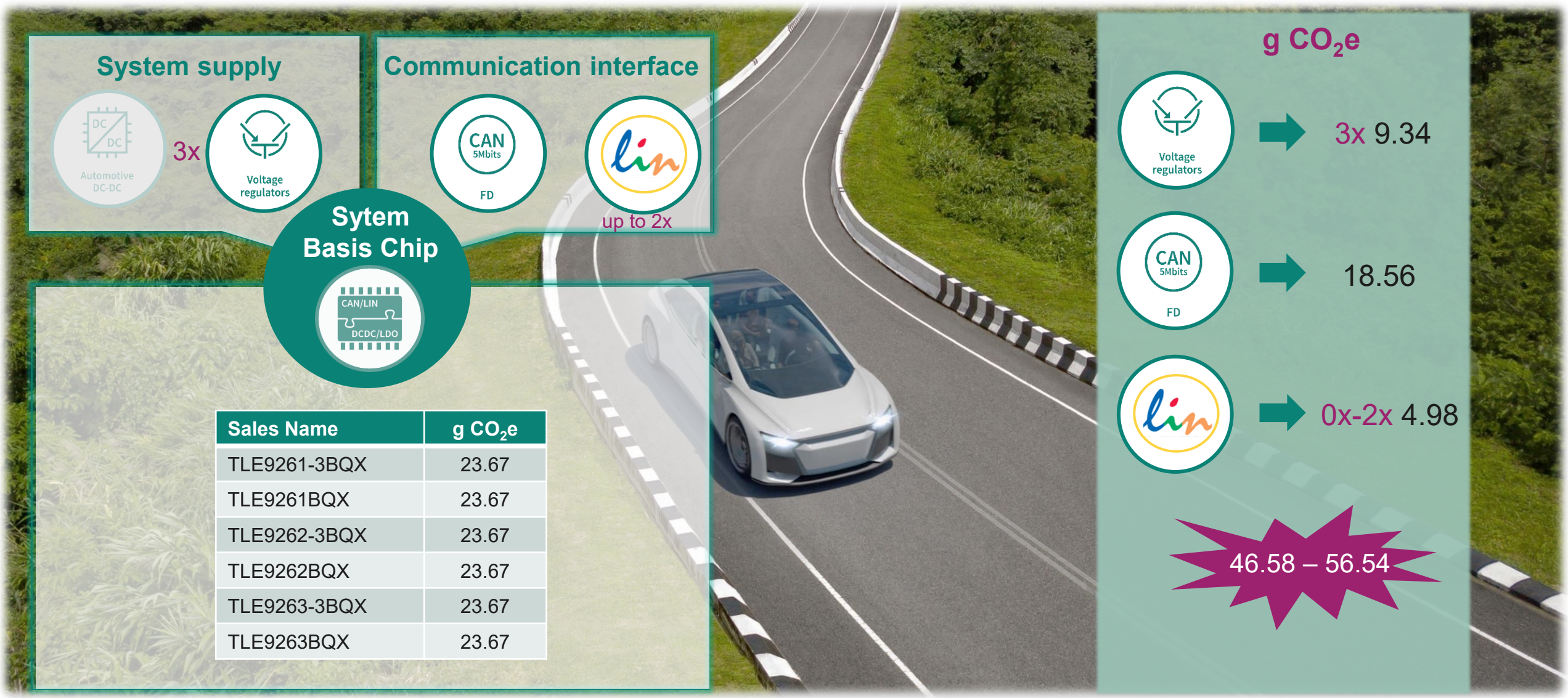






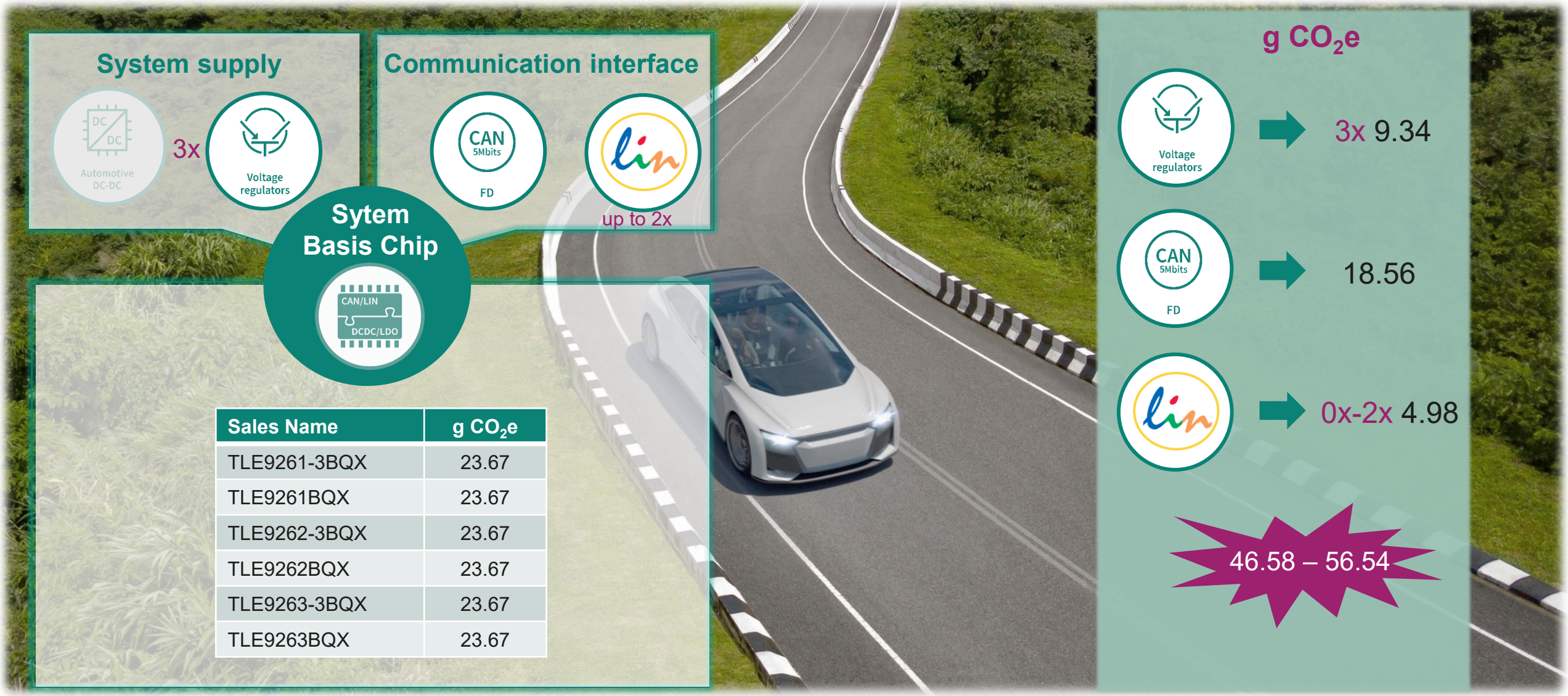
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OPTIREG™ Mid-Range+ SBC family product CO_2 footprint vs. discrete solution



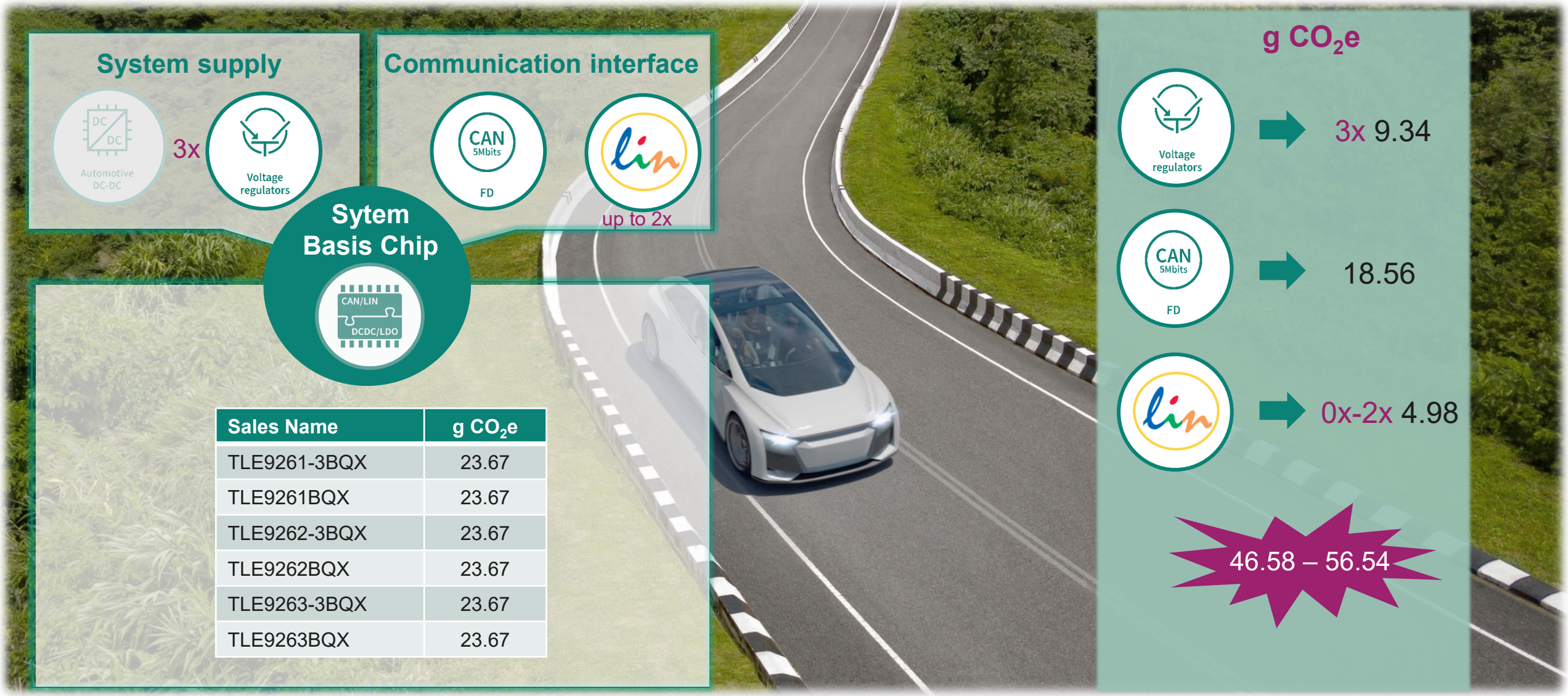
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TLE9261BQX	23.67
TLE9262-3BQX	23.67
TLE9262BQX	23.67
TLE9263-3BQX	23.67
TLE9263BQX	23.67

OPTIREG™ Mid-Range+ SBC family product CO_2 footprint vs. discrete solution



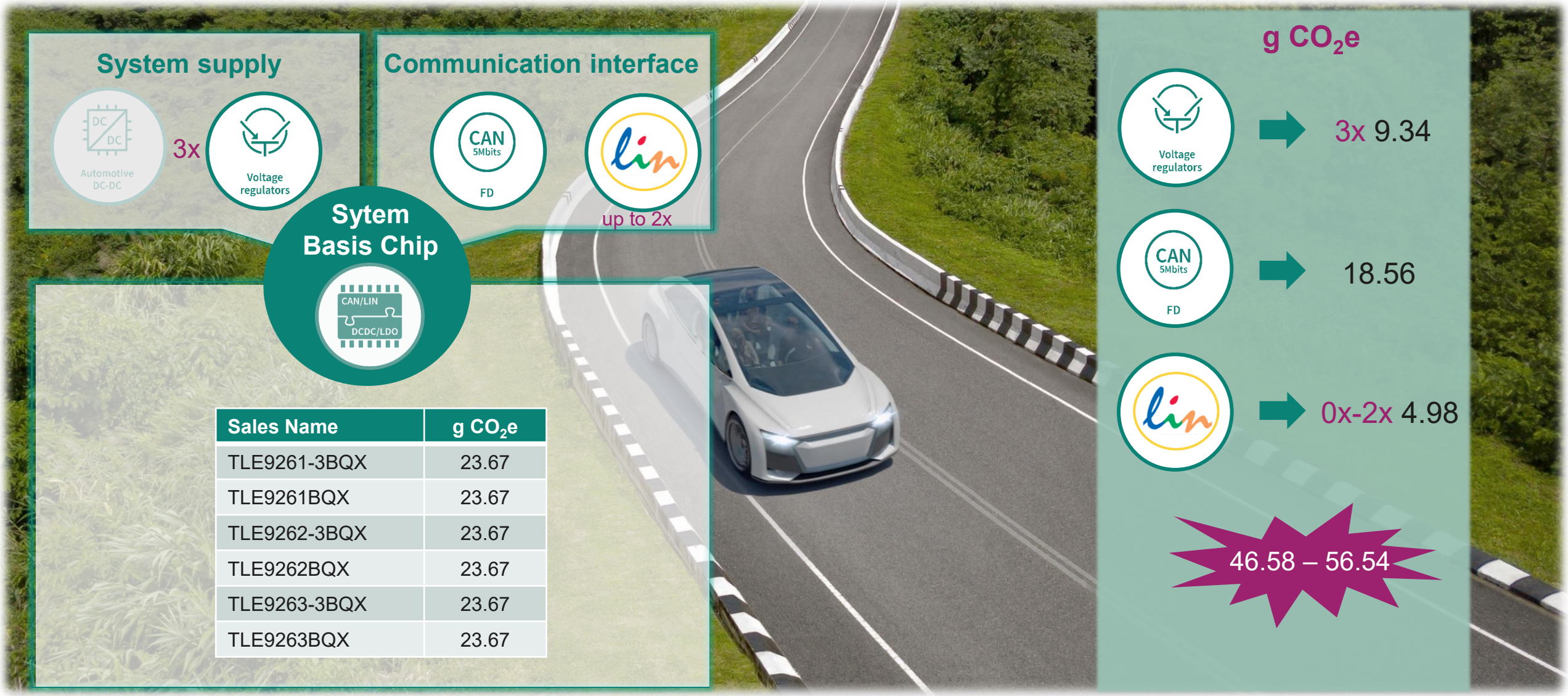
Sales Name	g CO_2e
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TLE9261BQX	23.67
TLE9262-3BQX	23.67
TLE9262BQX	23.67
TLE9263-3BQX	23.67
TLE9263BQX	23.67

OPTIREG™ Mid-Range+ SBC family product CO_2 footprint vs. discrete solution



Sales Name	g CO_2e
TLE9261-3BQX	23.67
TLE9261BQX	23.67
TLE9262-3BQX	23.67
TLE9262BQX	23.67
TLE9263-3BQX	23.67
TLE9263BQX	23.67

OPTIREG™ Mid-Range+ SBC family product CO_2 footprint vs. discrete solution



Sales Name	g CO_2e
TLE9261-3BQX	23.67
TLE9261BQX	23.67
TLE9262-3BQX	23.67
TLE9262BQX	23.67
TLE9263-3BQX	23.67
TLE9263BQX	23.67

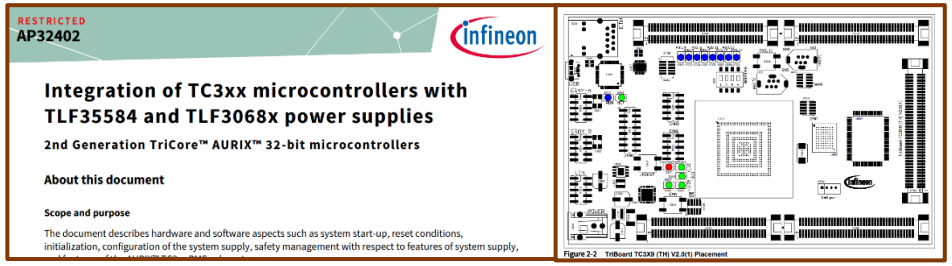
OPTIREG™ PMIC TLF35x Family
Tools & Software

Prototype (design) → Purchase (order)

PMIC OPTIREG™

Learn how to integrate AURIX™ TC3xx microcontrollers with Infineon system power supplies of the TLF family and check out existing HW

- TLF35584 Application Note*
- TLF35585 Application Note*
- Triboard Manuals *



Find out more on AURIX™ support

Get software support from the wide partners ecosystem of Infineon

- Hitex SafeTpack TC3x
- Vector vSBC
- AURIX ™ SafeTlibTC2x*





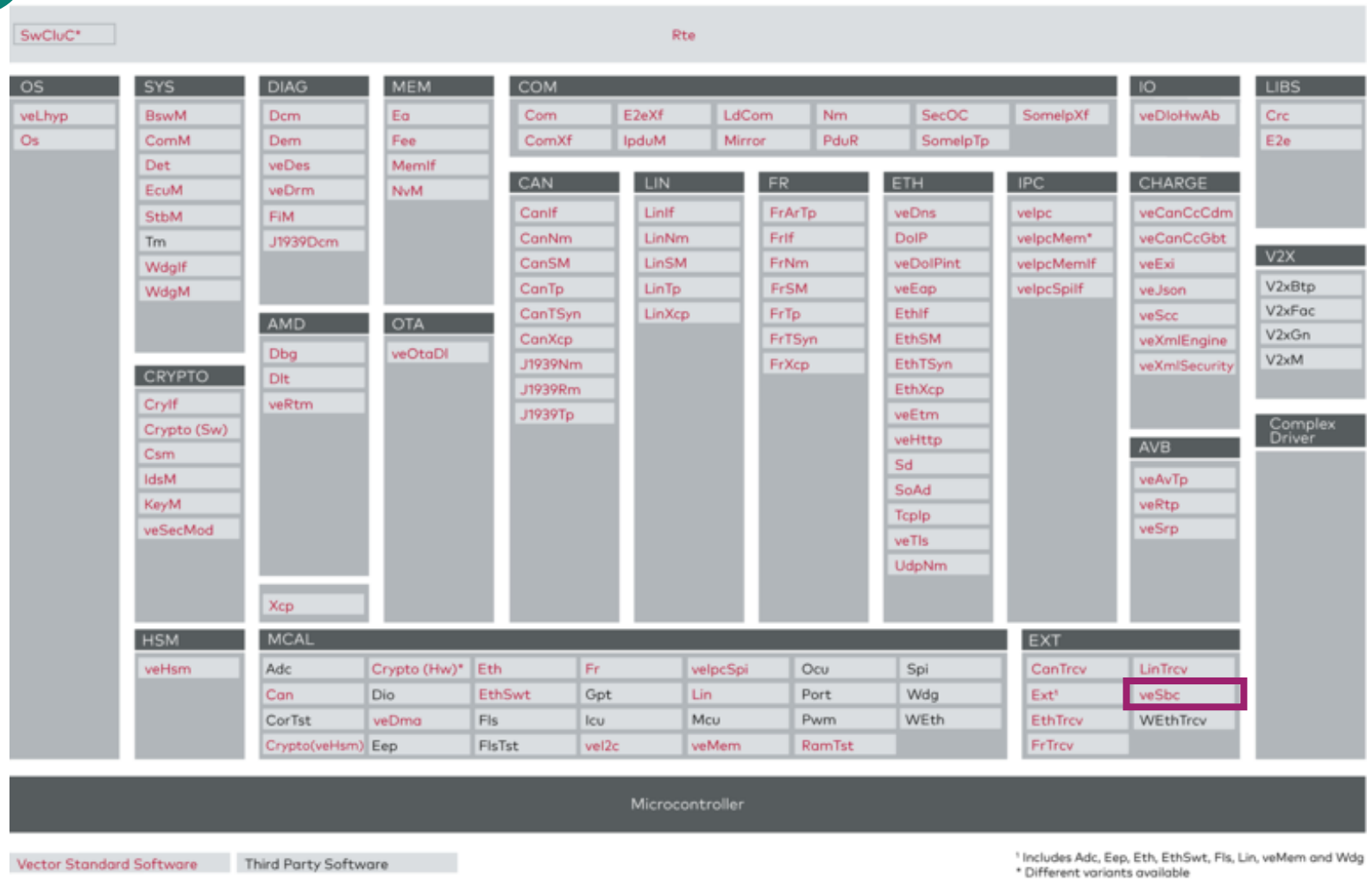
More info on the power supply partners

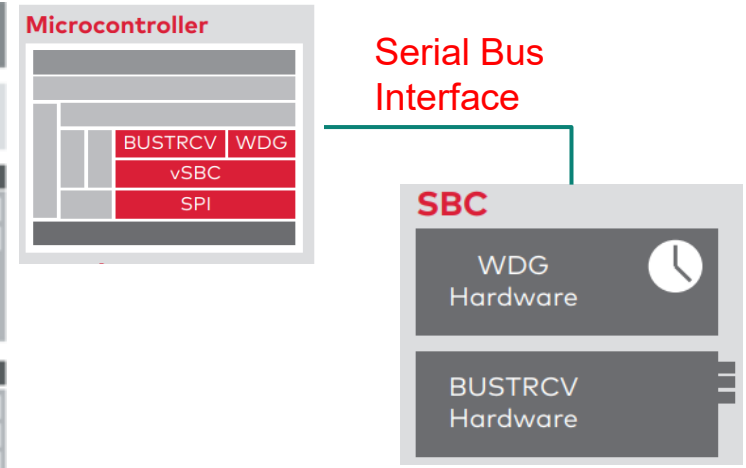
* myICP Access required

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OPTIREG™ PMIC TLF35x Family
Software from the partner Vector

Find out more on offering





- AUTOSAR 4 basic software fulfills the requirements of ISO 26262 up to the ASIL D level
- Registers can be handled through the RAW-API
- Virtual developing and testing AUTOSAR software though DaVinci Configurator Pro
- Independent of MCUs and compilers

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OPTIREG™ TLF35584 PMIC
Learn more about OPTIREG™ PMICs support material

Collaterals and Brochures
- Product briefs
- Selection guides
- Application brochures
- Presentations
- Press releases

Technical Material
- Application notes
- Technical articles
- Simulation models
- Datasheets, MCDS Files
- PCB Design Data

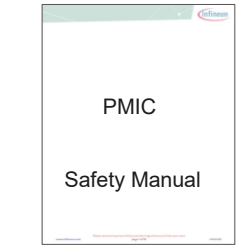
Evaluation Boards
- Evaluation boards
- Demoboards
- Reference designs

Further Info
- Technical videos
- Product videos

TLF35584QKVS1 Webpage
TLF35584QVHS1 Webpage
TLF35584QVVS1 Webpage
TLF35584QKVS2 Webpage
TLF35584QVHS2 Webpage
TLF35584QVVS2 Webpage

TLF35584 Datasheet*
TLF35584QVHSx Datasheet*
TLF35584 Technical Material*
TLF35584QVHSx Technical Material*

TLF35584 MC Board
PMIC Boards
TLF35584QVVS1 Board
TLF35584QVVS2 Board





Evaluation Board



Companion Board



AURIX™

› Why Infineon's OPTIREG™ PMIC family is relevant for safety-related automotive applications (E1)
› ATV: OPTIREG™ PMIC - Technical safety requirements and goals (E2)



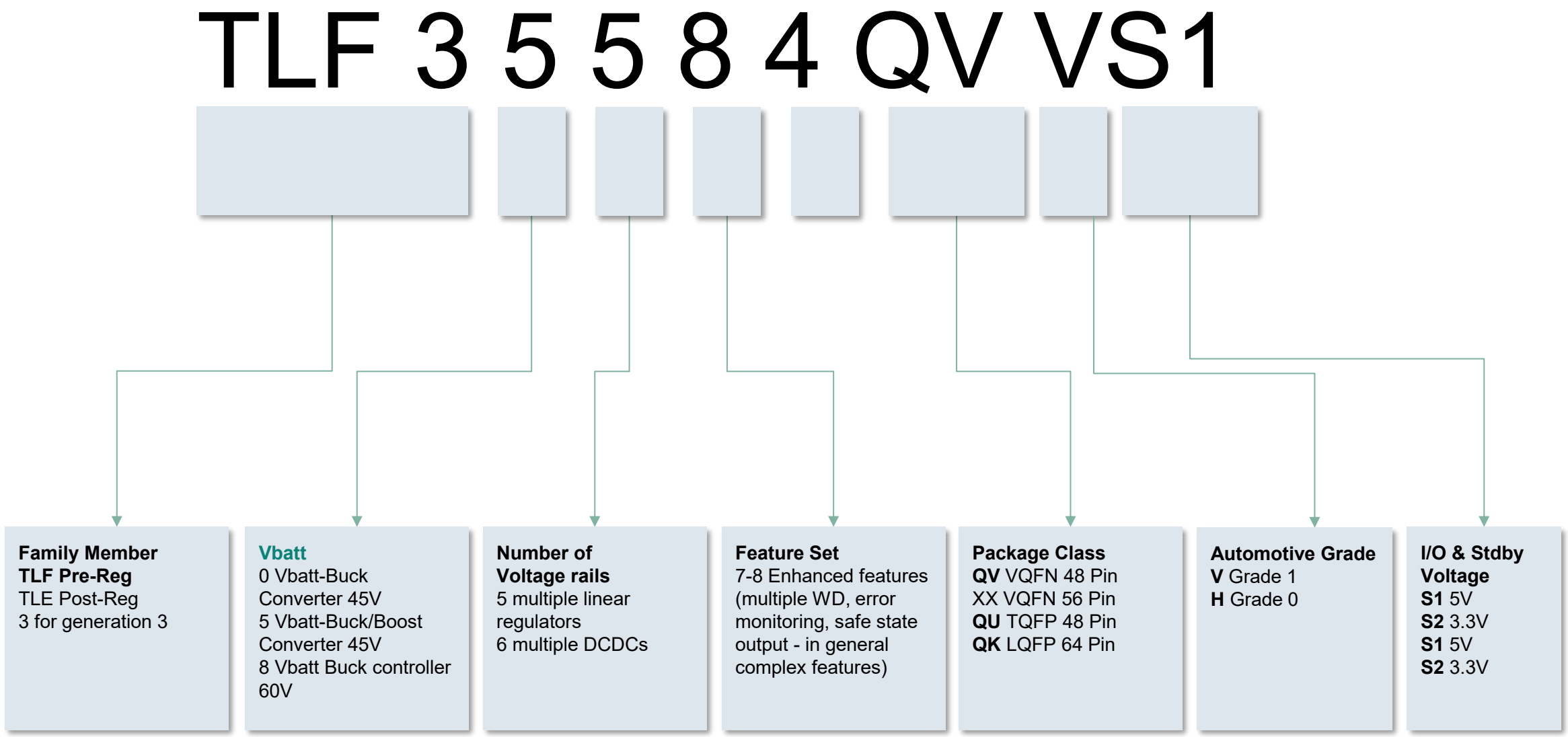


* Accessible only via myICP

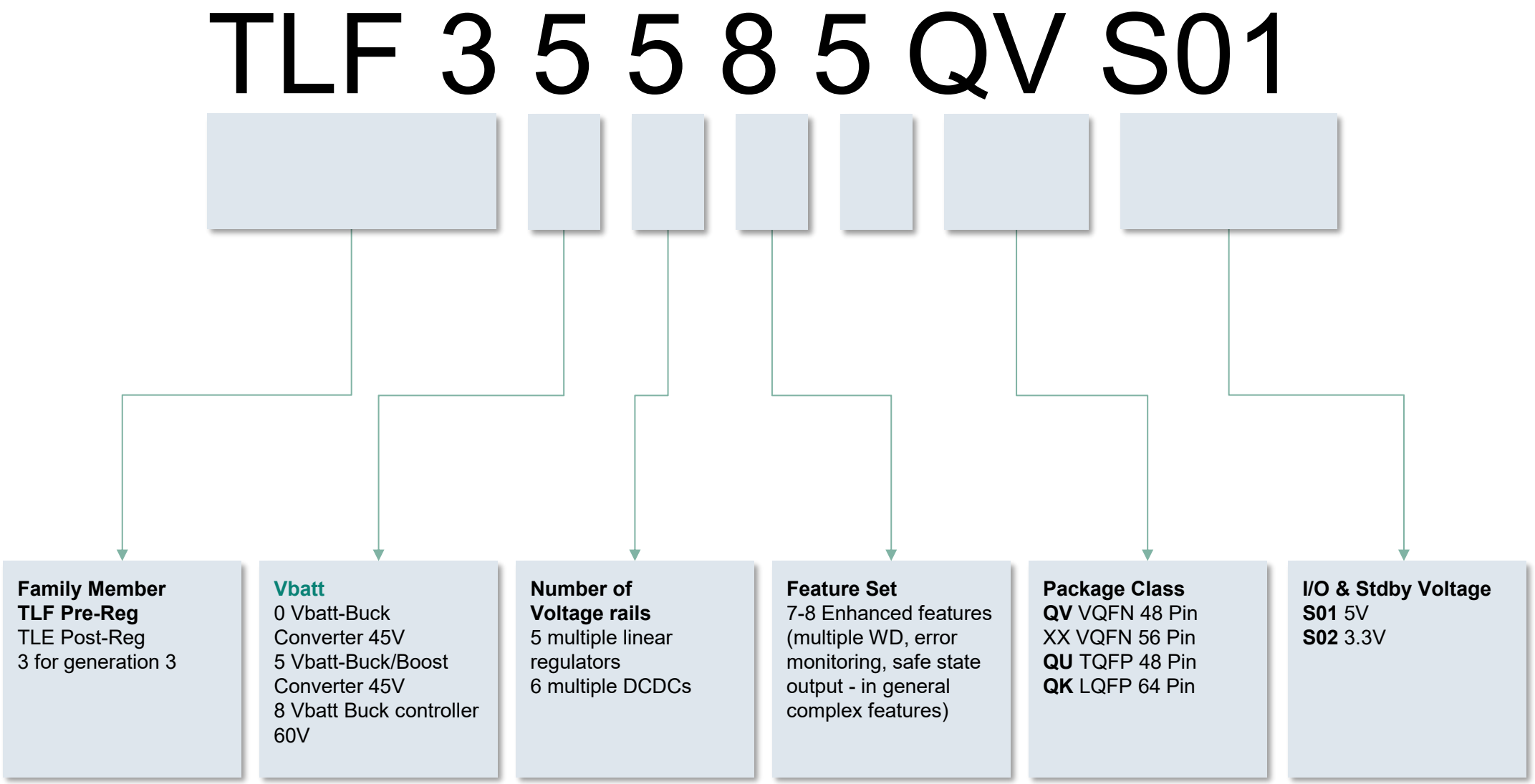
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Device Naming Nomenclature

OPTIREG™ – PMICs



OPTIREG™ – PMICs



OPTIREG™ – PMICs for AURIX™ 3rd Gen. Microcontrollers and more
This is a product nomenclature guide not Legos = read not write

PMIC
OPTIREG™

TLF 4 D 9 8 5 QV A 01

Family Member

TLF PMIC

Microcontroller
PMIC gen for AURIX ™ up to TC4**x**
4D Upto TC4Dx
4A Upto TC48x
40 Upto TC42x
...

Digit #1 Feature set identifier
1..9 1..9
Digit #2 Number of differentiating Features
1..9 1..9
e.g. CHP, RSTP, hvsense, # wake sources, ext. rail supervision, low power mode
Digit #3 FuSa Feature Set
2 : Tailored FuSa
(VMON, FSP, WWD)
4 : 48V power net capable
5 : Standard ASIL D
(VMON, FSP, WWD, FWD, SMC)
6 : Enhanced ASIL D
/7 (VMON, FSP, WWD, FWD SMC, safety/phase disconnect/s)
9 : Active Safety (Safety Engine)

Package Class
QV VQFN 48 /56 Pin
QU TQFP 48 Pin
QK LQFP 64 Pin

Target MCU core Voltage
A(V) 1.0V (AURx)
R 1.1V (R)
T 1.15V (TVII)

Differentiating voltage or config variants (MCU I/O, Peripheral, etc.) :
50 – 5V I/O
33 – 3V3 I/O
01 – 5V0 I/O & 3V3 Peri
02 – 3V3 I/O & 3V3 Peri
03 – 3V3 I/O & 1V8 Peri
..

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