New Product Update

TI's new high efficiency, low-I_Q automotive buck converters

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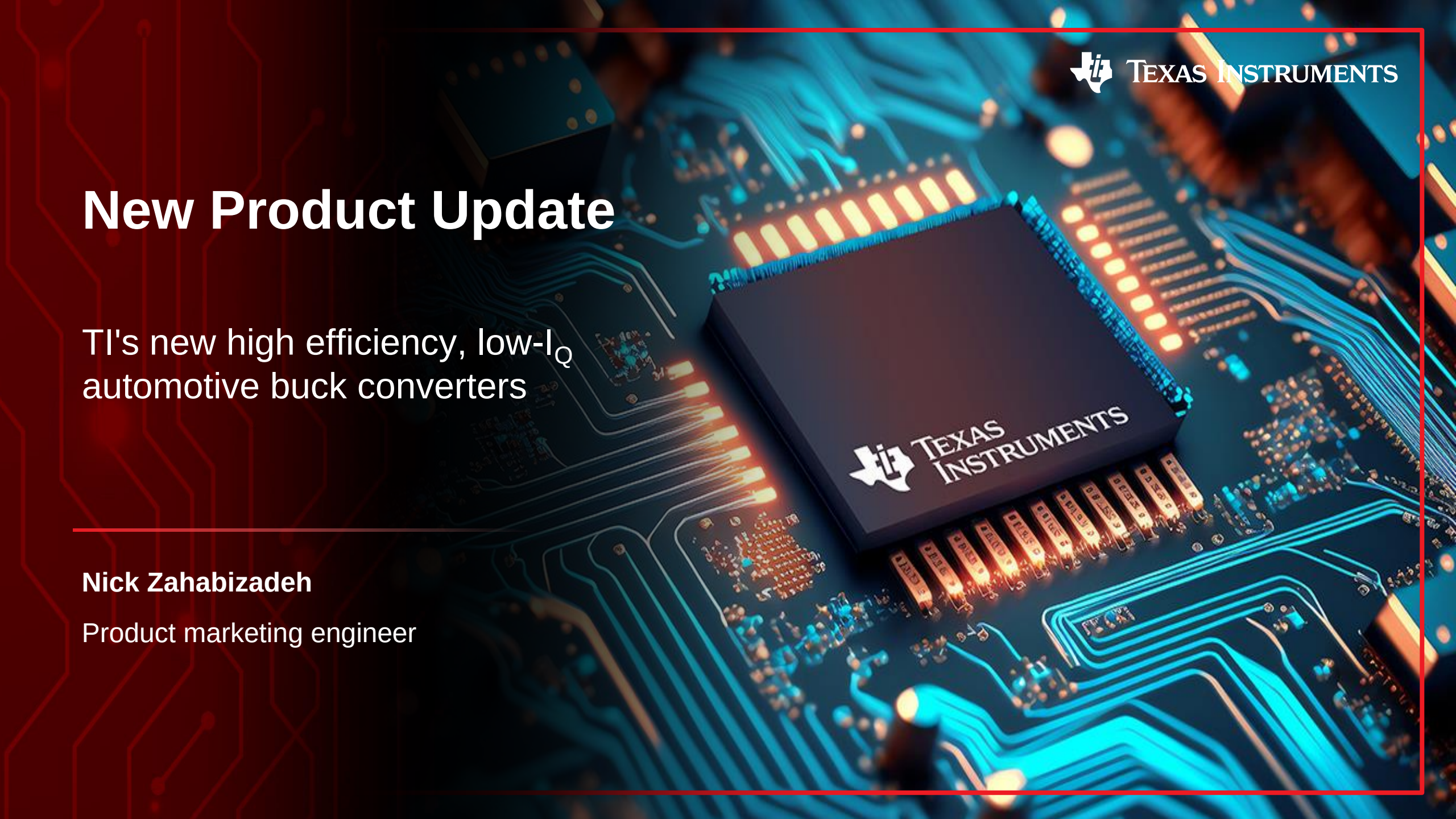
Product marketing engineer



Agenda

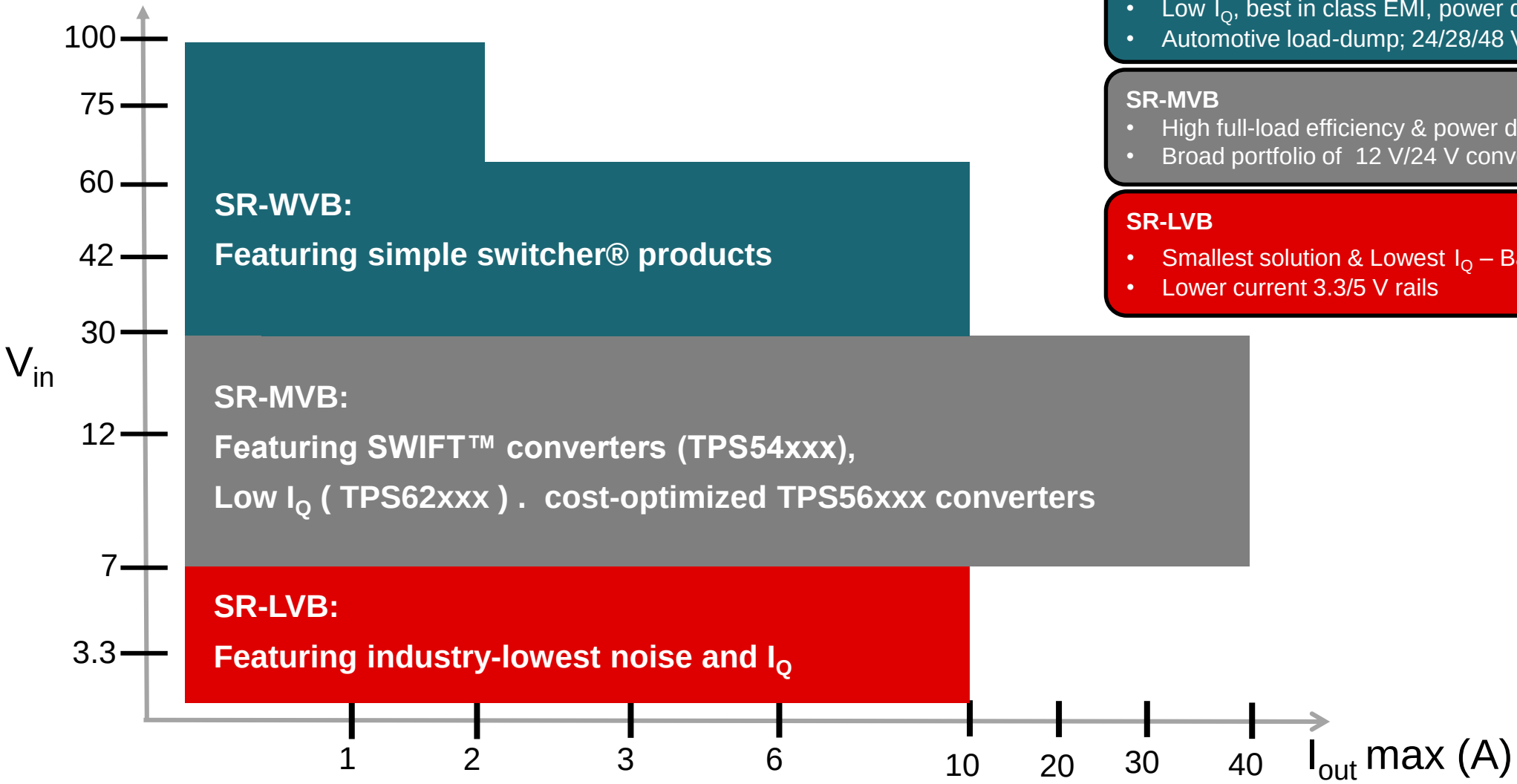
- TI SR portfolio
  - TPS6290x-Q1 / TPS6299x-Q1
- Where MVB sockets can be found
  - “PMIC attach”
- Use Case Examples:
  - ADAS (Advanced Driver Assistance Systems)
  - Powertrain
  - Zonal Architecture
- Q&A

TI's step-down DC/DC converter portfolio

SR-WVB
- Low I_Q, best in class EMI, power density devices
- Automotive load-dump; 24/28/48 V rails

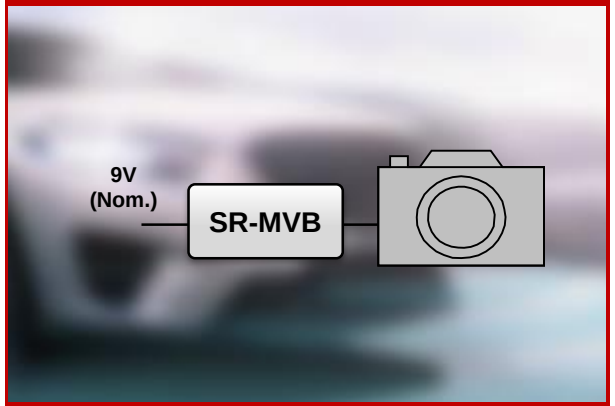
SR-MVB
- High full-load efficiency & power density
- Broad portfolio of 12 V/24 V converters for all markets

SR-LVB
- Smallest solution & Lowest I_Q – Battery Power
- Lower current 3.3/5 V rails



Where might an automotive Mid-Vin part be used?

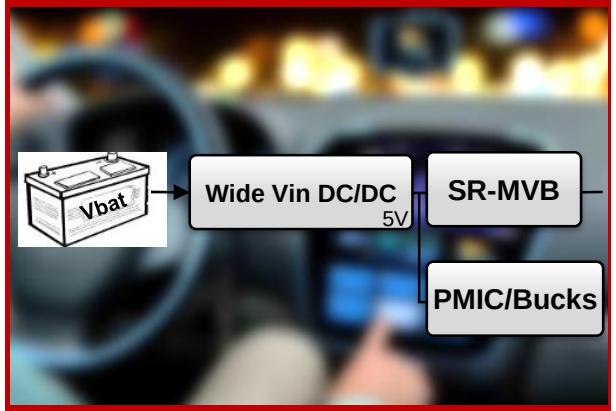
Advanced driver assistance systems (ADAS)



Powering devices off coax

Popular Devices	Key Features
TPS65400-Q1	Multi-channel, PMBus Lite
TPS629210-Q1	Low I_q, small package
TPS62903-Q1	Low I_q, wettable flanks

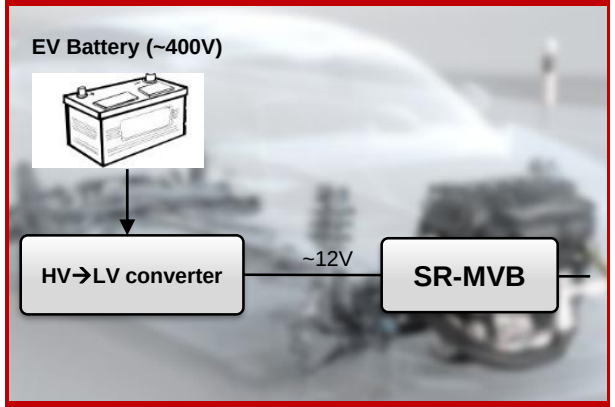
Infotainment



Powering off 5V intermediate rail

Popular Devices	Key Features
TPS65263-Q1	Multi-channel
TPS62913-Q1	Low ripple, high efficiency
TPS62903-Q1	Low I_q, wettable flanks

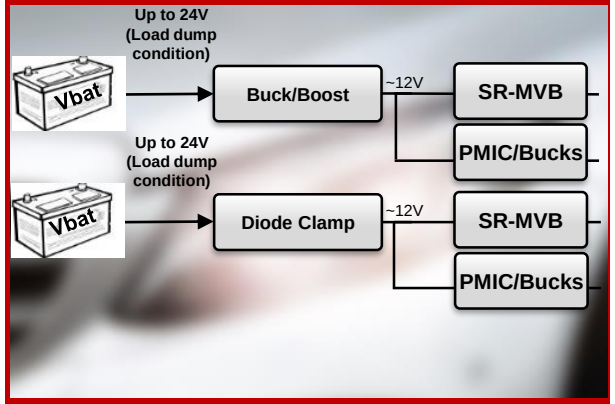
Hybrid, Electric, & Powertrain Systems



EV – LV battery removal

Popular Devices	Key Features
TPS62903-Q1	QFN WF, Q1 Grade 1
TPS629210-Q1	Low I_q, small package
TPS62130A-Q1	Q1 Grade 2

Body Electronics and Lighting



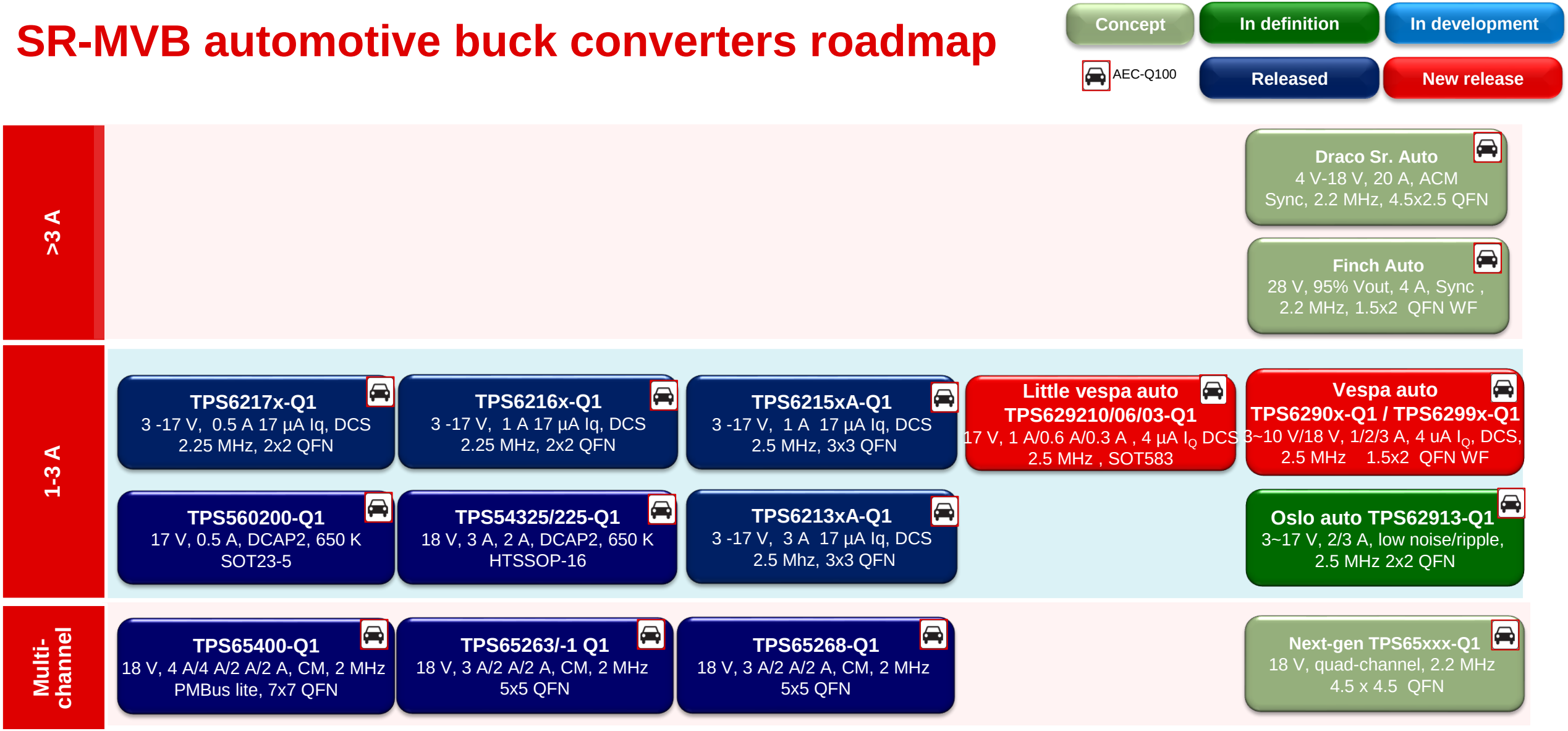
Powering off regulated battery voltage

Popular Devices	Key Features
TPS65263-Q1	Multi-channel
TPS62913-Q1	Low ripple, high efficiency
TPS62903-Q1	Low I_q, wettable flanks

Control architectures

	Fixed-frequency	Constant on time (COT)
When to use	When system predictability is most important	Fast transient response, reduced passive component count, avoiding loop compensation
Example control modes	Voltage mode, current mode, advanced current mode (ACM)	D-CAP family, DCS
Featured product	TPS54331-Q1, TPS62913-Q1	TPS629210-Q1, TPS6290x-Q1
Typical applications	Filter out switching frequency for improving EMI; noise/ripple sensitive	Small solution size, ripple at output OK, need quick load change responses

SR-MVB automotive buck converters roadmap



Interested in future devices? Message me at nz@ti.com

Vespa auto | TPS6290x-Q1

3 V to 18 V, 3 A to 1 A, Low-I_Q , synchronous buck converter in QFN WF package

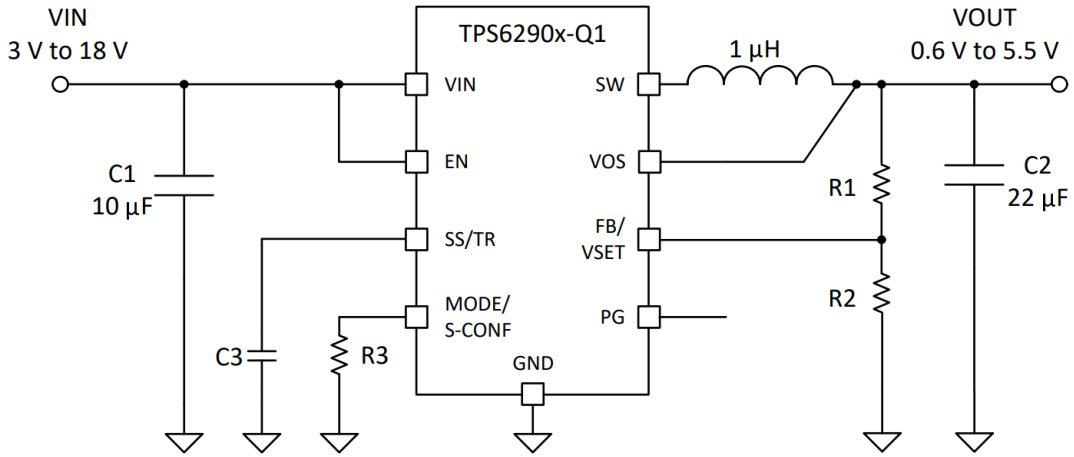
New release!

Features

- Input voltage: 3 V – 18 V (20 V Abs Max)
- Output voltage: 0.4 V – 5.5 V
  - Adj. via external divider, 0.6 V to 5.5 V
  - Internal divider: 16 options from 0.4 to 5.5 V
- 1% output accuracy with selectable forced-PWM operation
- T_J up to 165°C
- Precise-enable, CONFIG-pin, window-PG comparator
- 1 uH inductor, 22 uF cout, no external bootstrap
- Small 2.2 mmx2 mm QFN HR package with wettable flanks
- DCS-Control™ with AEE
- 4 µA quiescent current
- Selectable output discharge
- Highly flexible- & easy-to-use
  - Optimized pinout for single-layer routing
  - Precise enable input
  - Optional forced PWM- or auto-power-save-mode
  - Power good output and active output discharge

Benefits

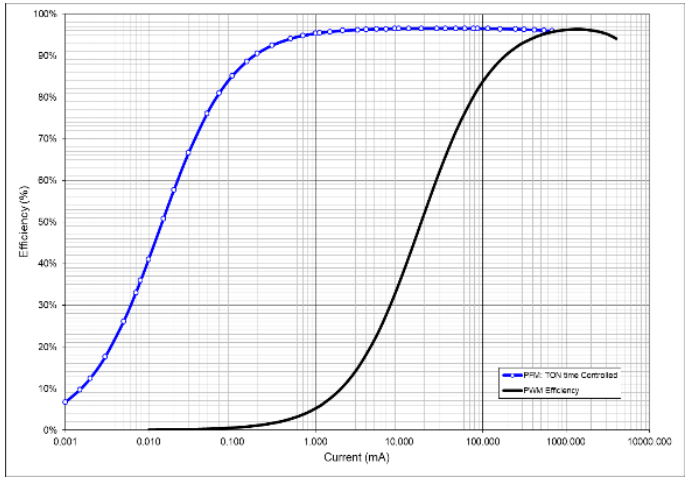
- **Saves PCB area by smallest solution size**
  - No bootstrap-C, fixed V_O options, 1 uH, 22 uF Co
  - Small QFN package with flexible single layer routing
- **AEC-Q100 grade 1**
  - **DFMEA, FS capable (FIT and FMD documentation)**
- **Extended temperature variant available (-55°C – 150°C)**
- **Output monitoring by window-PG comparator**
- **Input monitoring by precise EN-threshold and hysteresis (POC-filter)**
- **1% accurate and low ripple output in forced-PWM configuration**
- **High efficiency at light load**
- **10Vin variant available for cost-effective applications (TPS6299x-Q1)**



Applications

- ADAS – Cameras, Domain Controllers
- Body Electronics – Zonal Controllers
- Powertrain systems – Traction Inverters, Battery Control Units
- Infotainment and cluster – Displays
- Factory Automotion – High-Temp SBC and Application Cards

TPS6290x-Q1 value propositions



High efficiency

- 82% at 1 V/3 A
- 87% peak at 1 V/1 A
- 4 µA Quiescent Current
- 12 Vin @ 1 MHz
- L = 2.2 uH

Content:

- Comparison of TPS6290x vs. TPS621x0

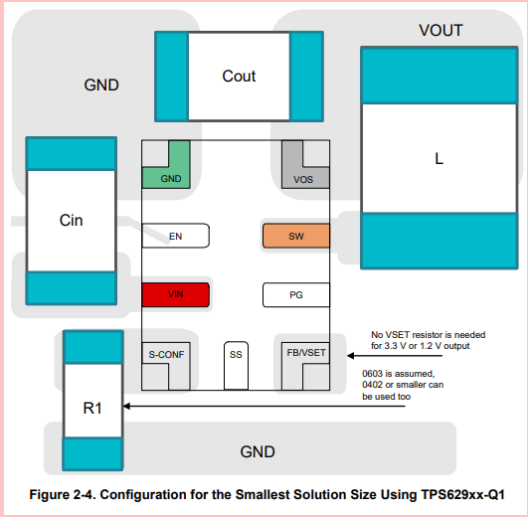


Figure 2-4. Configuration for the Smallest Solution Size Using TPS629xx-Q1

Small-size

2.2 mm x 2.0 mm QFN
HotRod with Wettable flanks
400 um lead length
250 um uniform lead width at package boundary
High Fsw enables 1 uH inductor
Single-layer PCB layout

Flexibility with SCONF (Smart-config-pin)

Table 7-1. SmartConfig Setting Table

#	LEVEL OR RESISTOR VALUE [Ω] (1)	FB/VSET-PIN	F_{SW} (MHz)	OUTPUT DISCHARGE	MODE (AUTO OR FORCED PWM)	DYNAMIC MODE CHANGE
	Setting Options by Level					
1	GND	external FB	2.5	yes	Auto PFM/PWM with AEE	active
2	HIGH (>V_{IH_MODE})	external FB	2.5	yes	Forced PWM	
	Setting Options by Resistor					
3	7.15 k	external FB	2.5	no	Auto PFM/PWM with AEE	not active
4	8.87 k	external FB	2.5	no	Forced PWM	
5	11.0 k	external FB	1	yes	Auto PFM/PWM	
6	13.7 k	external FB	1	yes	Forced PWM	
7	16.9 k	external FB	1	no	Auto PFM/PWM	
8	21.0 k	external FB	1	no	Forced PWM	
9	26.1 k	VSET	2.5	yes	Auto PFM/PWM with AEE	
10	32.4 k	VSET	2.5	yes	Forced PWM	
11	40.2 k	VSET	2.5	no	Auto PFM/PWM with AEE	
12	49.9 k	VSET	2.5	no	Forced PWM	
13	61.9 k	VSET	1	yes	Auto PFM/PWM	
14	76.8 k	VSET	1	yes	Forced PWM	
15	95.3 k	VSET	1	no	Auto PFM/PWM	
16	118 k	VSET	1	no	Forced PWM	

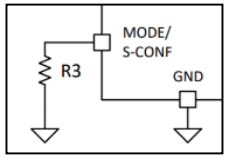
(1) E96 Resistor Series, 1% Accuracy, Temperature Coefficient better or equal than ±200 ppm/°C

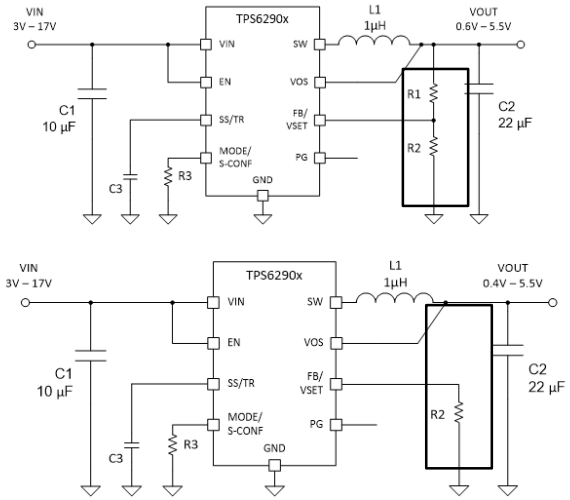
Selectable device setting via Resistor

- Vout set by **FB/VSET** (Adj / fixed)
- **MODE (**Auto-Mode / FPWM)
- **Active discharge (**YES / NO)
- **FSW** (1 MHz / 2.5 MHz)

Content:

- Multi-Function Pins for Easy Designing
- Which pinout is best? How individual, multifunctional and trimmed pinouts help address design challenges





Set Vout by FB(Adj) or VSET

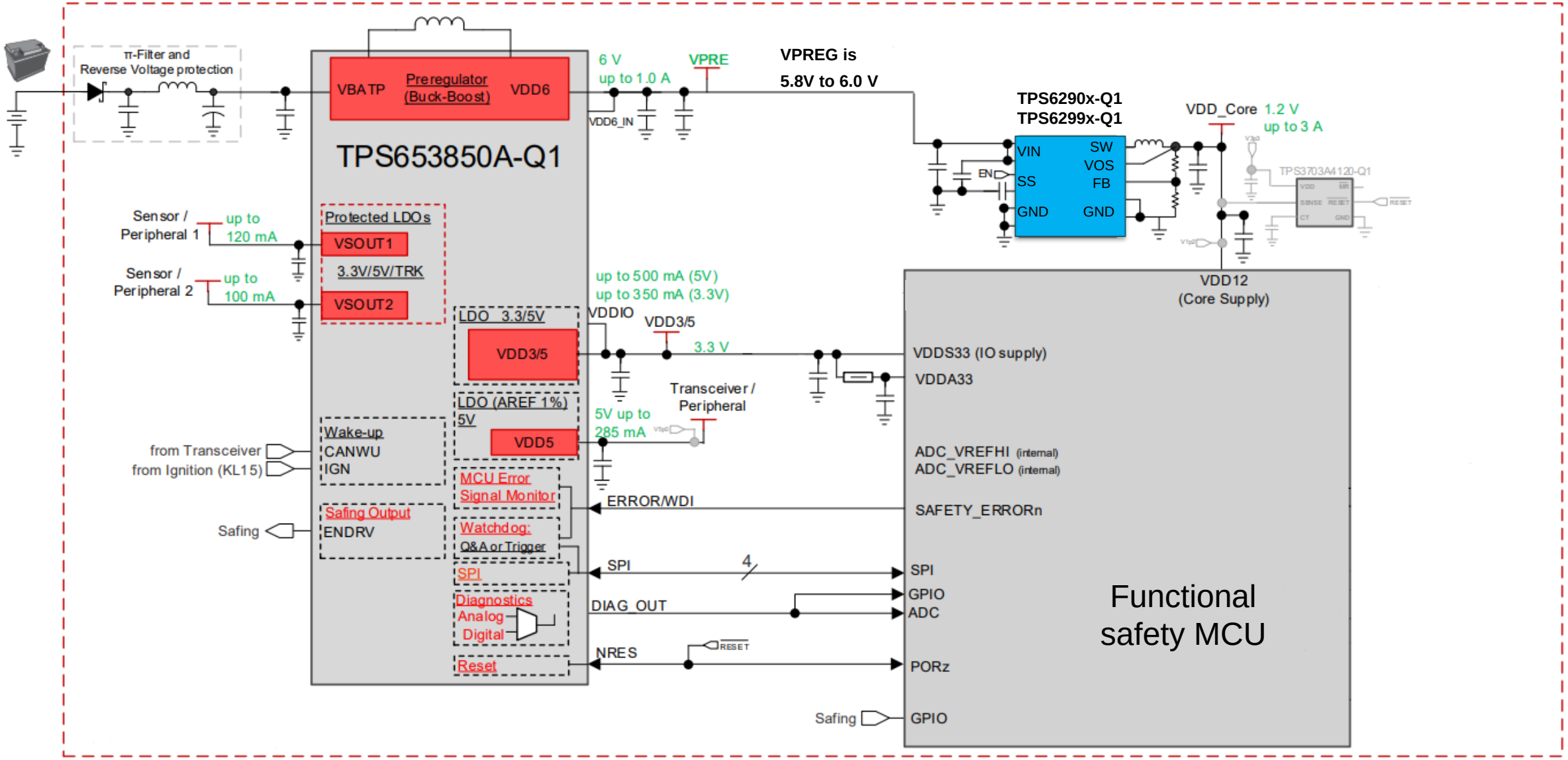
Adjustable Version for

- High flexibility (Vout)
- LED application
- Customers are familiar

VSET version for

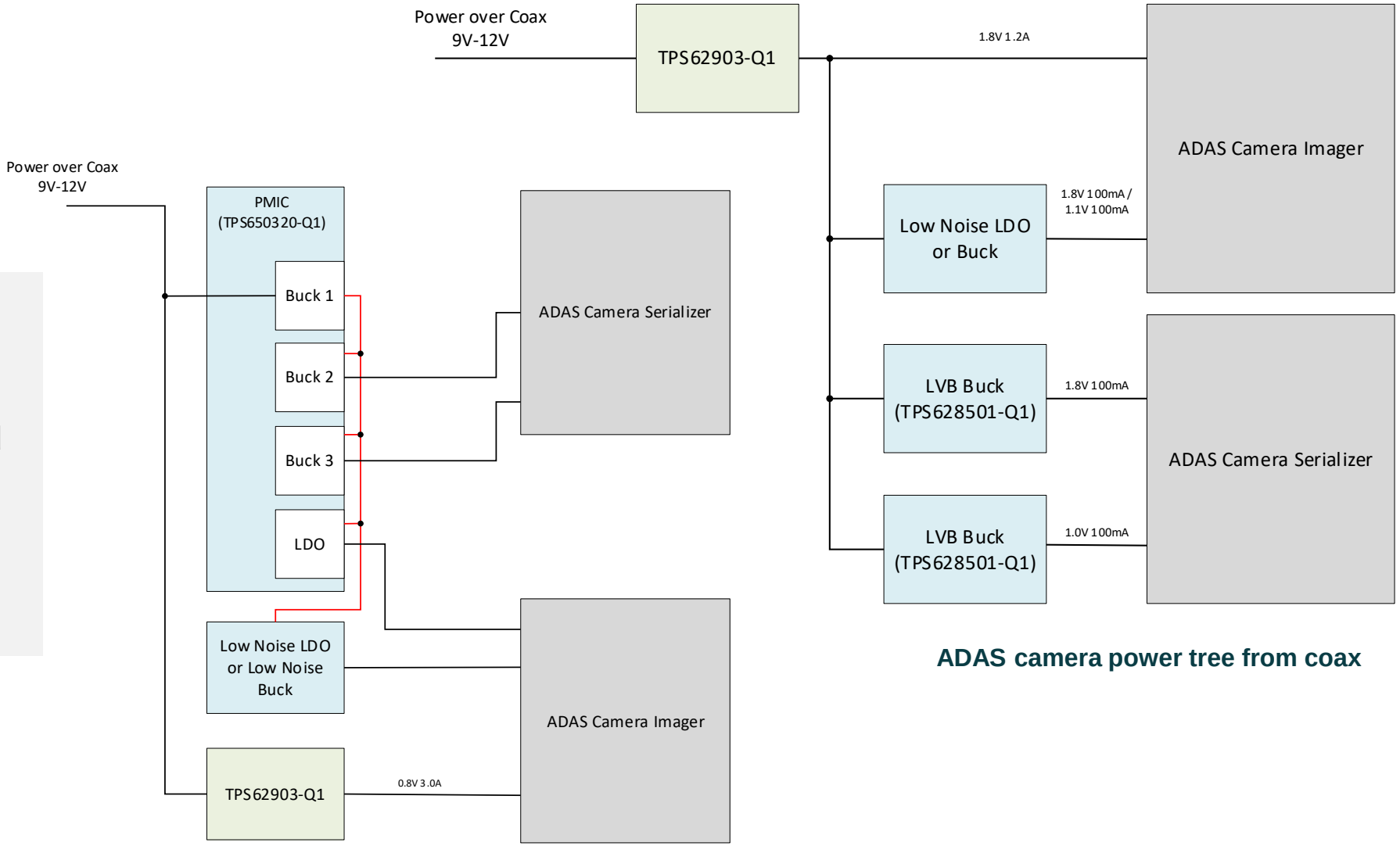
- higher accuracy
  1% VOUT directly
- lower system I_Q
  4 µA
- Smaller & cheaper solution
  up to 2 components less

Functional safety MCU power with PMIC + TPS6290x-Q1 / TPS6299x-Q1



Use case | ADAS

- Low quiescent current
- Small solutions size, reduced number of passives
- Out of AM range (2 MHz+)

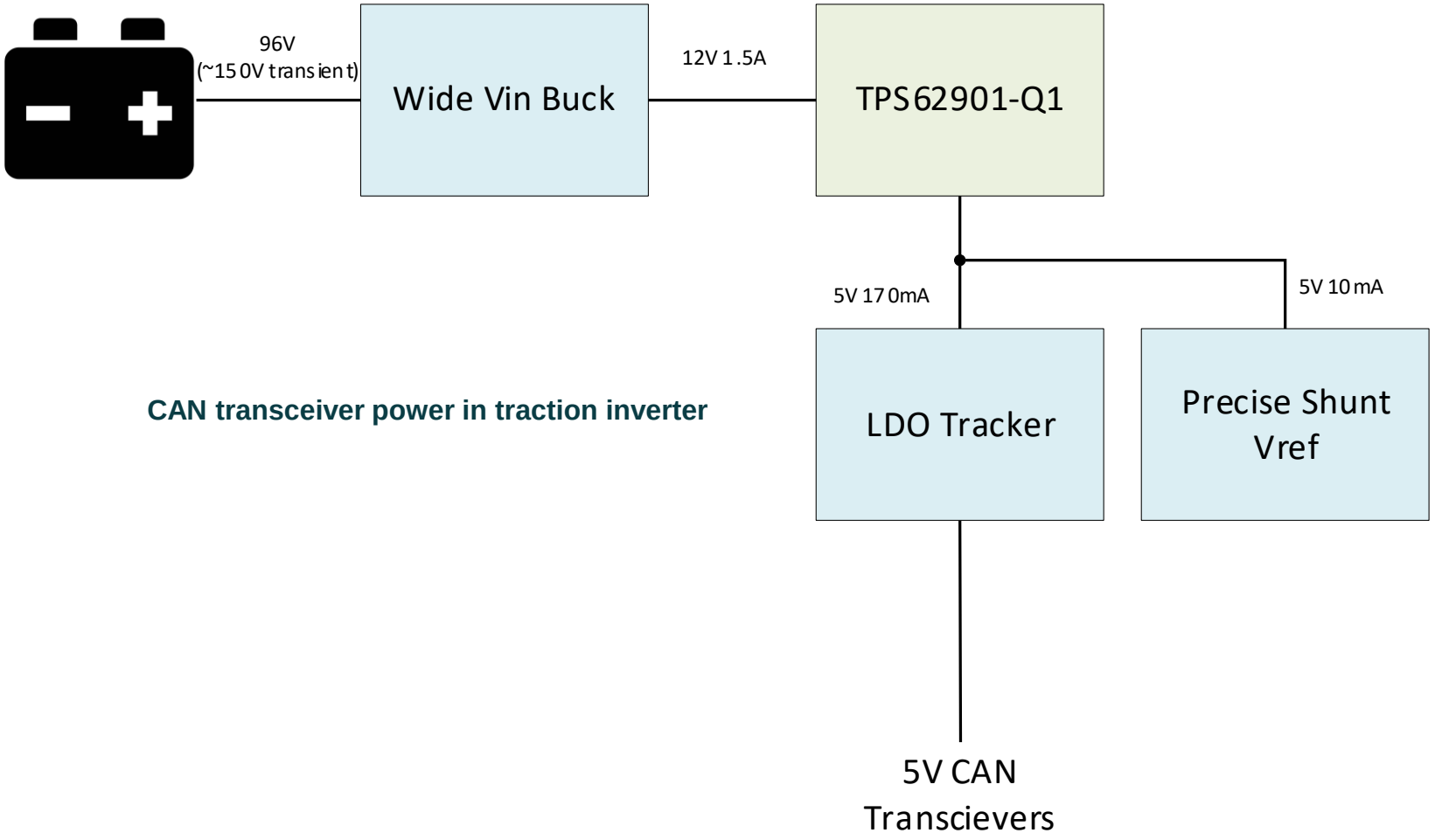


ADAS camera power tree from coax

High-end ADAS camera power tree from coax

Use case | Powertrain

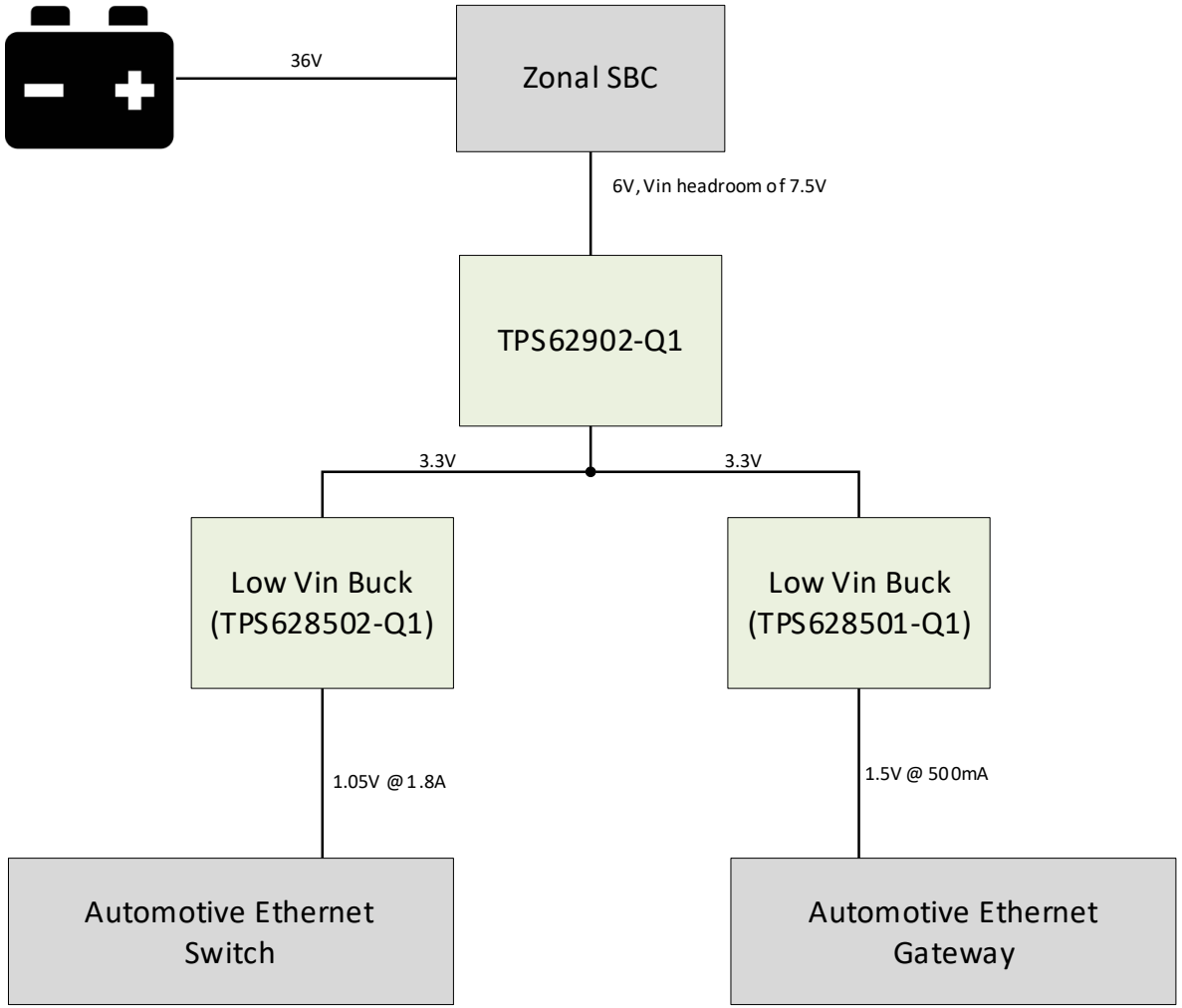
- QFN wettable flanks package
- Efficiency at load
- High thermal spec (grade 1+)



CAN transceiver power in traction inverter

Use case | Zonal

- Low quiescent current
- Efficiency
- Small solutions size, reduced number of passives
- Device flexibility and configuration



Zonal module ethernet power tree

Little vespa (TPS629210 / 06 /03-Q1)

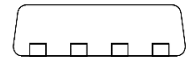
0.3 A/0.6 A/1 A, high efficiency, low I_Q and small size automotive and commercial buck converter family

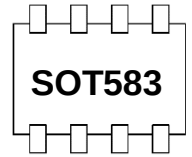
Features

- Input voltage: 3 V – 17 V
- Output voltage: 0.4 V – 5.5 V
  - Adj. via external divider, fixed Voltage options
- 1 A/0.6 A/0.3 A
- 1% output accuracy
- Selectable forced-PWM or auto-PFM operation
- T_J up to 150°C
- Precise-enable, CONFIG-pin, window-PG comparator
- Small SOT583 package (2.1 x 1.6 mm)
- DCS-Control™ with AEE
- 4 µA Quiescent Current

Benefits

- **Saves PCB area by smallest solution size**
  - no Bootstrap-C, fixed V_O options, 2.2 µH, 22µF Co
  - Small SOT583 with flexible single layer routing
- **Q100-qualified version available**
- **Extended leads package available: TPS629210QDYCRQ1**
- **Output monitoring by window-PG comparator**
- **Input monitoring by precise EN-threshold and hysteresis (POC-filter)**
- **1% accurate and low ripple output in forced-PWM configuration**
- **Optimizes battery lifetime & energy budget**

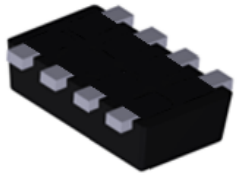




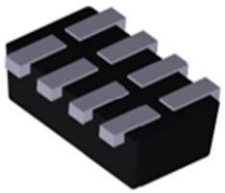
Applications

- ADAS systems
- Factory, building automation
- Grid infrastructure

Standard



Extended Leads



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