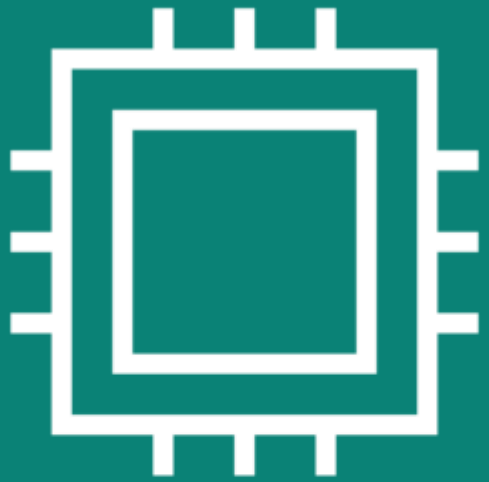


PSOC™ Automotive
Infineon entry level MCU solutions

Carlos Galuzio & Srinivasan Parthasarathy

#1



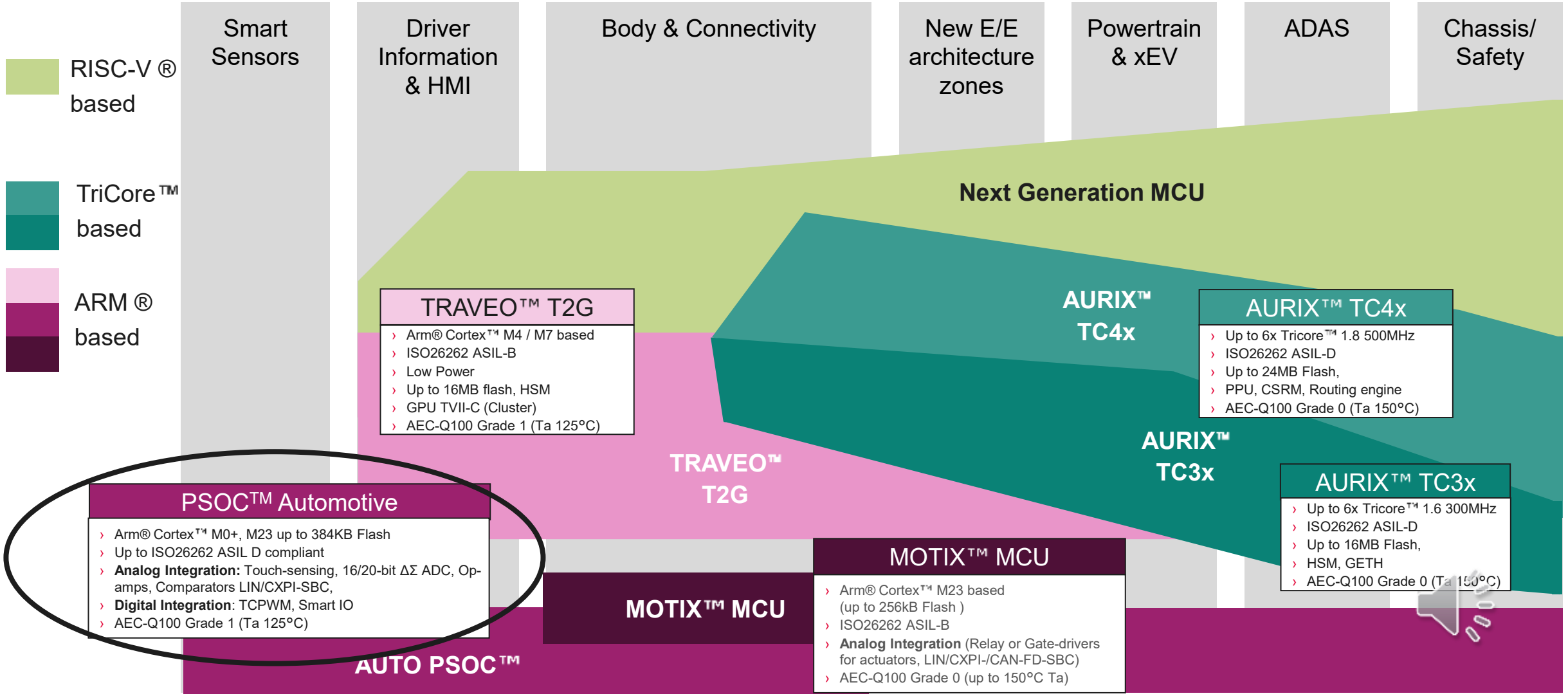
Micro-
controller

We are the new **market leader** in the **global microcontroller market** according to Omdia's latest research*

*Based on or includes research from Omdia: 'Annual 2001-2024 Semiconductor Market Share Competitive Landscaping Tool – 4Q24. March 2025.' Results are not an endorsement of Infineon Technologies AG. Any reliance on these results is at the third party's own risk.

Infineon Microcontroller – most scalable portfolio

PSOC™ Automotive: Entry-level Arm MCUs with differentiated analog & digital peripherals



PSOC™ 4xxx - Entry Level Configurable Automotive MCU



PSOC™ Automotive: Applications

One-stop-shop for automotive HMI, Body & Powertrain

Buttons / sliders



Door / Window control



On-board Charger / DC-DC



Battery Sensors



Touchscreens



Hands-on detection



Interior / exterior Lighting



Inverter



BMS



Touchpads



Door access (touch / prox)



PTC Heater





Body HMI & Entry | **Power-conversion control** | **BMS-sensing** | **Infotainment HMI**

PSOC™ Automotive - Key benefits to Gen. Automotive applications

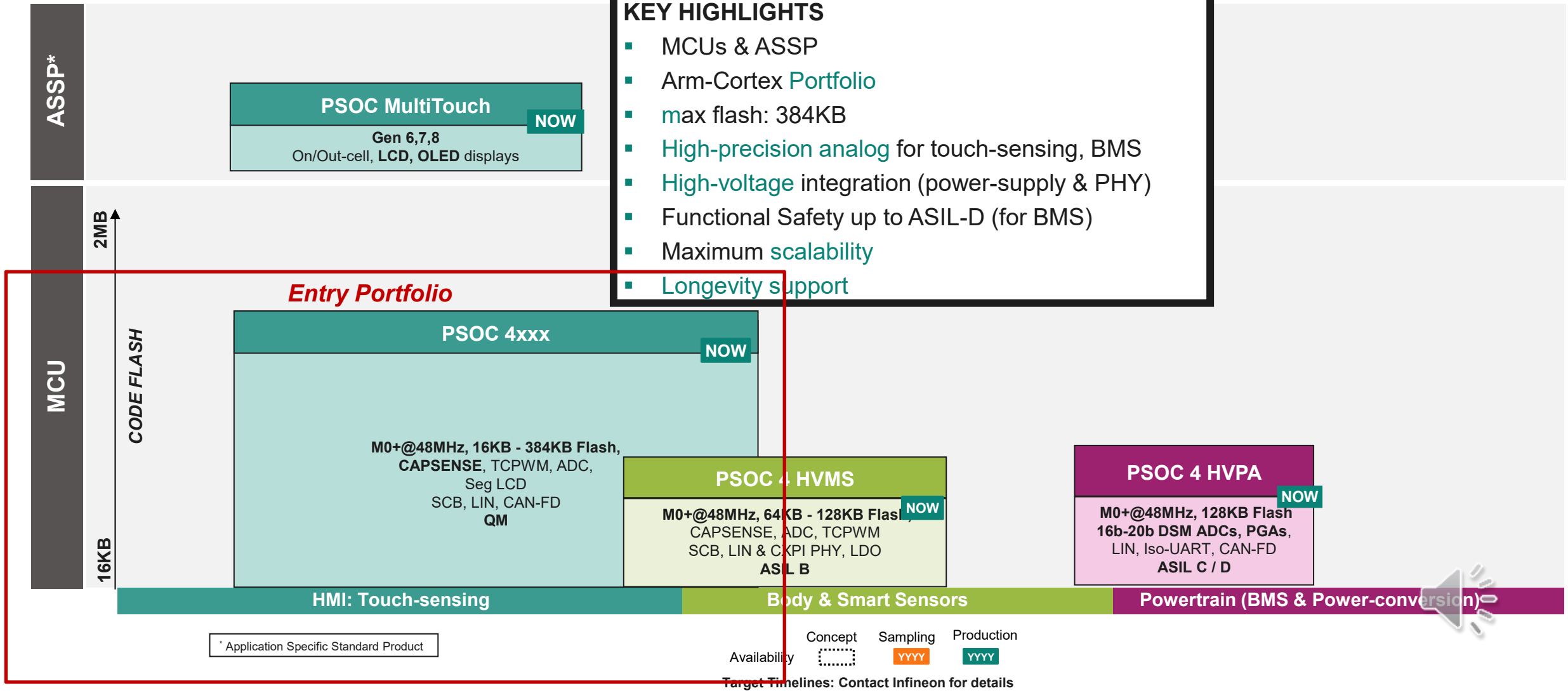
Key features	Key benefits	Value
Maximum memory and I/O integration – Up to 384-KB Flash & 32-KB SRAM Up to 84 pins of analog and digital GPIO available.	Low-power compute & integration, optimized right from the hardware level	Reduced system BOM cost with feature integration in single host MCU
Dual MSC CAPSENSE™ blocks – Support multiple data collection methods from touch to Resistive, inductive and current sensors.	Differentiated Touch HMI features in MCU & Integrate differentiated analog capabilities to support resistive and current sensing.	Improve end-product user experience with robust touch-based user interfaces, and intelligent analog sensing
New variety of on-chip peripherals – CAN, CAN-FD, TX I2S, Fast I2C, Segment LCD, TCPWM x8, SCB x5	High-speed communications from Fast I2C or CAN-FD	Flexible options for automotive applications
Enhanced cryptography – Dedicated HW security block to support AES, SHA, TRNG, PRNG, & CRC functions	Increased security with encryption support for in-vehicle communication	CPU can be offloaded from performing security related tasks
Modern, flexible ModusToolbox™ software for developing embedded applications, ready-to-use code examples, development kits	Easy-to-use software for prototyping and productizing end applications	Future-proof product upgrades for higher feature options, reduces development time

PSOC™ Automotive Portfolio: MCU & ASSP*

Current Portfolio: Gen. Purpose Automotive MCU, HMI, Smart-Sensing & BMS

KEY HIGHLIGHTS

- MCUs & ASSP
- Arm-Cortex Portfolio
- max flash: 384KB
- High-precision analog for touch-sensing, BMS
- High-voltage integration (power-supply & PHY)
- Functional Safety up to ASIL-D (for BMS)
- Maximum scalability
- Longevity support



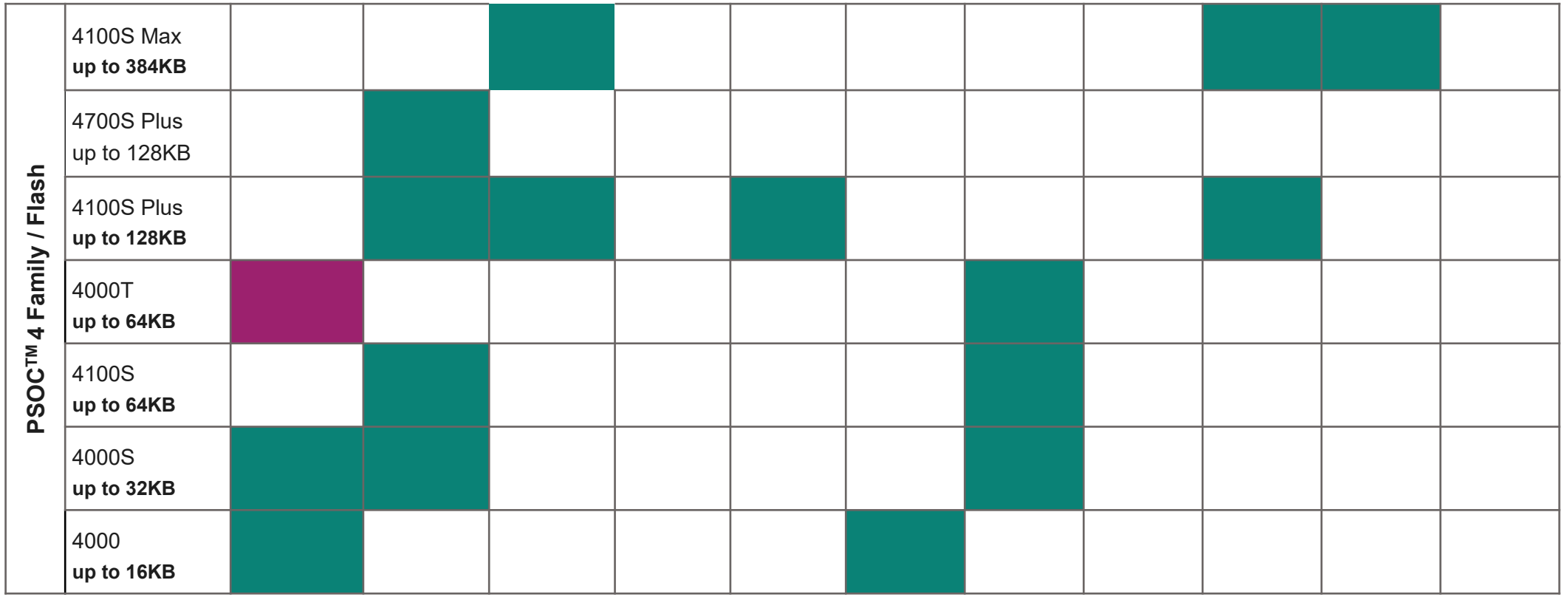
PSOC™ Automotive 4 portfolio – differentiation of product variants

Specifications	PSOC™ 4000	PSOC™ 4000S	PSOC™ 4100S	PSOC™ 4000T	PSOC™ 4100S Plus	PSOC™ 4100S Max
Flash Size/SRAM	16 KB/2 KB	32 KB/4 KB	64 KB/8 KB	64 KB/8 KB	128 KB/16 KB	384 KB/32 KB
DMA channels	0	0	0	0	8	8
ADC	10-bit ΔΣ ADC @ 58 sps	10-bit Single-Slope ADC @ 46.8 ksps	12-bit SAR @1Msps, 10-bit Single-Slope ADC @ 46.8 ksps	-	12-bit SAR[1] @ 1 Msps 10-bit Single-Slope ADC @ 46.8 ksps	12-bit SAR[1] @ 1 Msps
Opamps	0	0	2	4	2	2
Comparators[2]	1	4	4	2	4	2
CAPSENSE™ Generation	3rd Generation	4th Generation	4th Generation	5th Generation (MSCLP)	4th Generation	5th Generation (x2)
CAPSENSE™ Average current[3],SNR	6 µA, >100:1	3 µA, >300:1	3 µA, >300:1	<6 µA, >450:1	3 µA, >300:1	<3 µA, >300:1
UDB Programmable logic	0	0	0	0	0	0
Audio I2S	-	-	-	-	-	Yes
Timers/Counters/PWM's[4]	1/1/1	5/5/5	5/5/5	2/2/2	8/8/8	8/8/8
SPI/I2C/UART/LIN Slaves	0/1/0/0	2/2/2/2	3/3/3/2	2/2/2/2	4/5/5/2	4/5/5/2
USB Full Speed	-	-	-	-	-	-
Crypto (HW encryption module)	No	No	No	No	No	Yes
CAN Controller	-	-	-	-	1	1 CAN FD
I/O's, All with CAPSENSE™	16	24	34	19	54	84
Smart I/O's	0	16	16	0	24	24
Segment LCD Drive (Max.no. Of Pixel)	-	224	128	-	200	448

< 1$*

1 Successive approximation register ADC
2 Maximum number of comparators (including comparators configured using opamps)
3 Average current consumption per sensor * *10K pricing*
4 Maximum number of hardware-based timers, counters and PWMs, using timer/counter/PWM (TCPWM) blocks and universal digital blocks (UDB)
5 Maximum number of hardware-based SPI, I²C, UART, and LIN Slave interfaces, using SCBs and UDBs

PSOC™ Automotive 4 packages
Optimized package variants for specific application needs



Pins	24	40	48	56	64	16	28	48	64	100	124
Package	QFN					SOIC	SSOP	TQFP			VFBGA
Body Size (mm)	4 x 4	6 x 6	7 x 7	8 x 8	9 x 9	3.8 x 9.9	7.5 x 10.3	7 x 7	10 x 10	14 x 14	9 x 9
Pitch (mm)	0.5	0.5	0.6	0.5	0.5	1.27	0.65	0.5	0.5	0.5	0.65

Qualified Under Qualification

PSOC™ 4000S – Robust, cost-optimized HMI/control + integrated analog



PSOC™ Automotive 4000S - Cost-Optimized Automotive HMI & Control

Applications

User interface for infotainment systems, user interface for heating, ventilation, air conditioning

Features

32-bit MCU subsystem
- 48-MHz Arm® Cortex®-M0+ CPU
- Up to 32-KB Flash
- 4-KB SRAM
- Real-time clock (RTC) capability with a watch crystal oscillator (WCO)

Programmable analog blocks
- One 10-bit, 46.8-ksps single-slope analog-to-digital converter (ADC)[1]
- Two low-power comparators (CMP)
- One CAPSENSE™ block that supports low-power operation with self- and mutual-capacitance sensing
- Two 7-bit current-output digital-to-analog converters (IDAC) configurable as a single 8-bit IDAC

Programmable digital blocks
- Five 16-bit timer/counter/pulse-width modulation (TCPWM) blocks
- Two serial communication blocks (SCB) that are configurable as I²C, SPI, UART, or LIN Slave

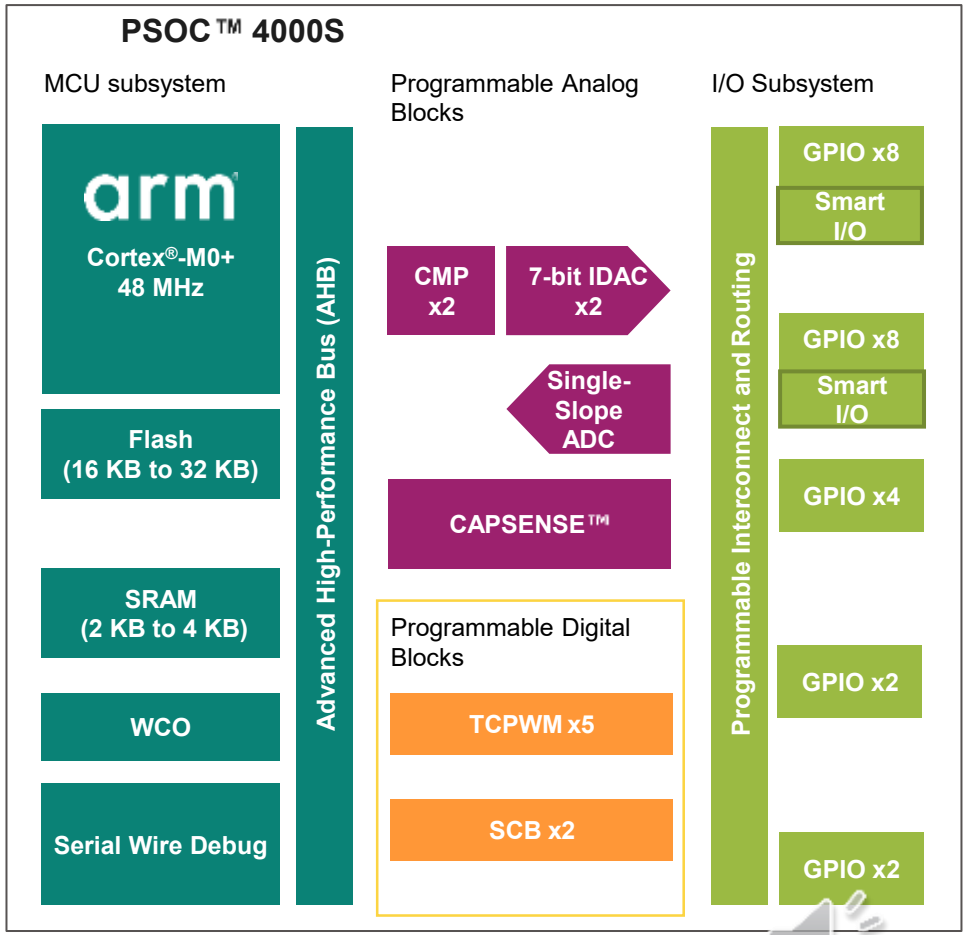
Packages
- 24-pin QFN,28-pin SSOP,40-pin QFN

I/O subsystem
- Up to 24 GPIOs, including 16 Smart I/Os[2]

Collateral

Datasheet: PSOC™ Automotive 4000S

[1] A simple ADC used to measure slow-movingsignals
[2] Embedded programmable digital logic in the I/Osubsystem



Availability

In Production

PSOC™ Automotive 4100S – 4000S + Integrated Analog

Applications

User interface for heating, ventilation, air conditioning, MCU and discrete analog replacement

Features

32-bit MCU subsystem
- 48-MHz Arm® Cortex®-M0+ CPU
- Up to 64-KB Flash
- 8-KB SRAM
- Real-time clock (RTC) capability with a watch crystal oscillator (WCO)

Programmable analog blocks
- One 12-bit, 1-Msps successive approximation register (SAR) analog-to-digital converter (ADC)
- One 10-bit, 46.8-ksps single-slope ADC[1]
- Two opamps configurable as programmable gain amplifiers (PGA), comparators, etc.
- Two low-power comparators (CMP)
- One CAPSENSE™ block that supports low-power operation with self- and mutual-capacitance sensing
- Two 7-bit current-output digital-to-analog converters (IDAC) configurable as a single 8-bit IDAC

Programmable digital blocks
- Five 16-bit timer/counter/pulse-width modulation (TCPWM) blocks
- Three serial communication blocks (SCBs) that are configurable as I²C, SPI, UART, or LIN Slave

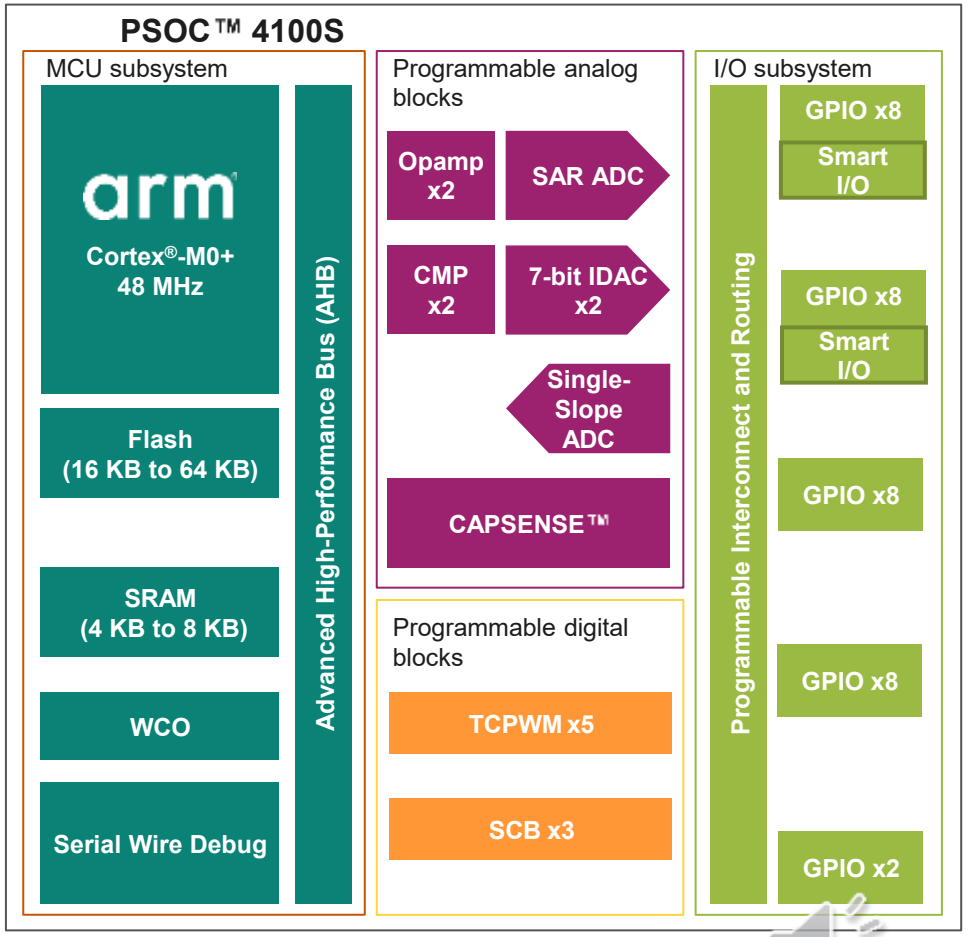
Packages
- 28-pin SSOP and 40-pin QFN

I/O subsystem
- Up to 34 GPIOs, including 16 Smart I/Os[2]

Collateral

Datasheet: PSOC™ Automotive 4100S

[1] A simple ADC used to measure slow-movingsignals
[2] Embedded programmable digital logic in the I/Osubsystem



Availability

In Production

Our new PSOC™ 4000T – With Integrated Inductive & Capacitive Sensing



What makes Infineon's CAPSENSE™ solution superior?



HMI response
Fast reaction to user interaction
120 Hz for smooth user experience



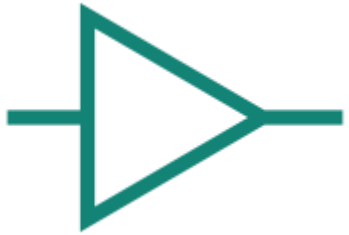
Reliable sensing
Immunity to liquid, snow etc.
Operate with thick gloves



Signal-to-noise ratio
A high SNR indicates a highly reliable touch interface



Multi-sensing
Enable large and complex touch sensing interfaces



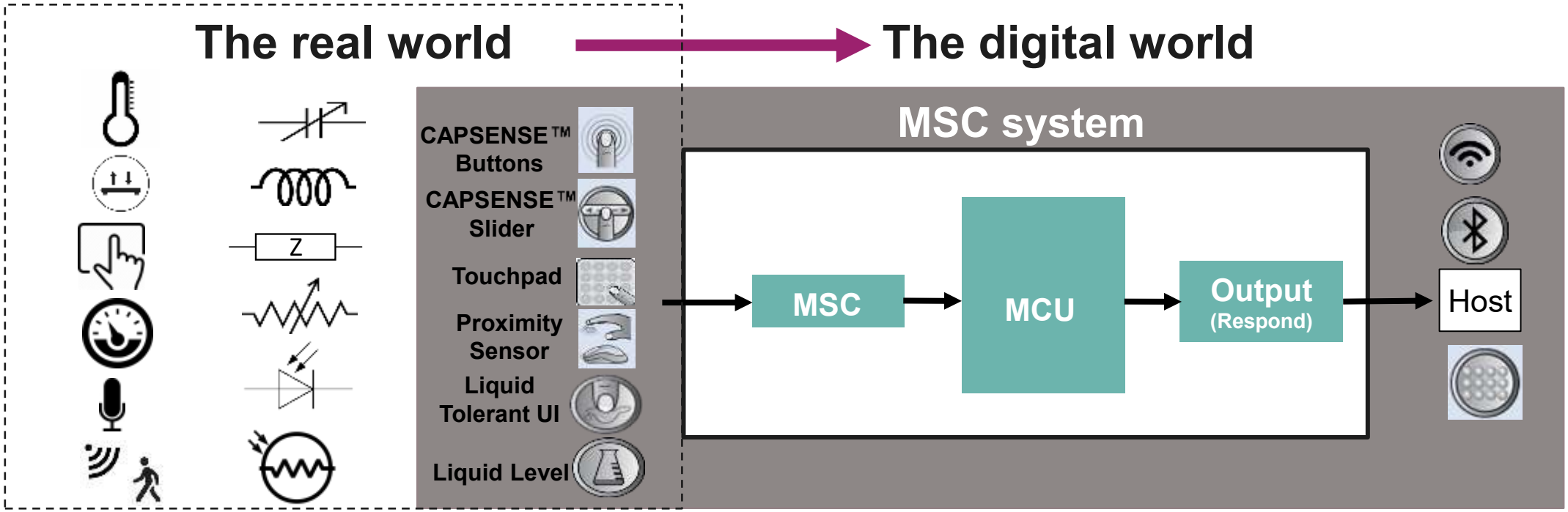
Noise immunity
Best-in-class noise immunity
Reliably works in harsh conditions



Low power
Ultra-low power standby current
Sensing in Deep Sleep domain

Next-generation (5th Gen) sensing technology – Multi Sense Converter

MSC – Multi Sense Converter – An improved ratio-metric architecture (Output ~ Cs/Cref)



Multi Sense Converter:
- Capacitive sensing (Self and Mutual)
- Inductive sensing
- Sensor (Impedance, current & resistor)

16x higher signal-to-noise ratio performance
- <100 aF rms noise floor for Cs = 8 pF
- Supports Cs up to 200 pF

10x lower average power consumption
- Ultra-low power Always-ON sensing
- Autonomous operation without CPU

Enhanced noise immunity
- Differential signal path for high DC noise rejection
- Dithering/Chopping/CIC2/ for improved linearity/noise

PSOC™ Automotive 4000T – Integrated Inductive & Capacitance Sensing

Applications

Door handle sensor, steering wheel buttons& HOD, Liquid level sensing

Features

32-bit MCU subsystem

› 48-MHz Arm® Cortex®-M0+ CPU
› Up to 64-KB Flash with read accelerator
› Up to 8-KB SRAM

Programmable analog blocks

› One 10-bit, 46.8-ksps single-slope ADC[1]
› 5th Generation CAPSENSE™ sensing with multi-sense converter low-power (MSCLP) provides best-in-class signal-to-noise ratio (SNR) (>5:1) and liquid tolerance for capacitive sensing.
› "Always-on" sensing in Deep Sleep mode with hardware-based wake on touch detection for ultra-low-power operation in standby mode. CPU independent autonomous channel scanning.
› Advanced flay-back inductive sensing method with superior noise immunity , supports wide input range from 100nH to 200µH

Programmable digital blocks

› Two 16-bit timer/counter/pulse-width modulation (TCPWM) blocks
› Two serial communication blocks (SCBs) that are configurable as I²C, SPI, UART, or LIN Slave

Packages

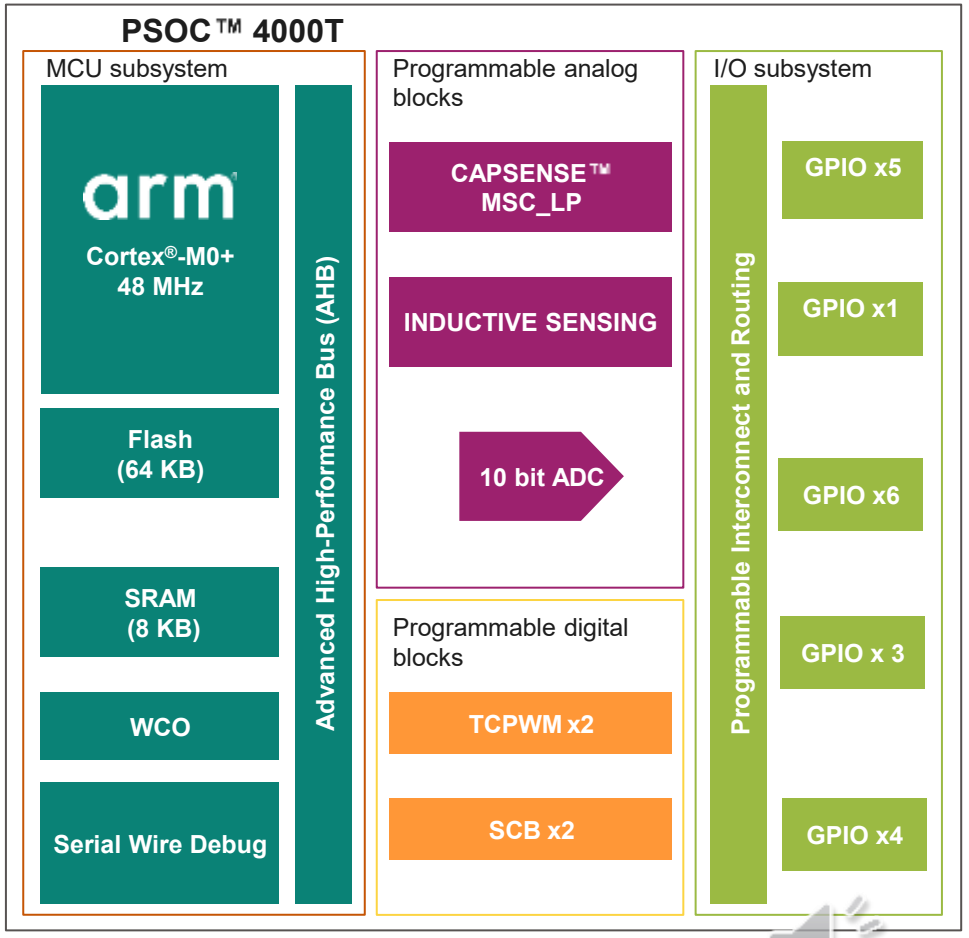
› 24-pin QFN (wettable flank)

I/O subsystem

› Up to 21 programmable GPIOs,

Collateral

Datasheet: PSOC™ Automotive 4000T



Availability

In Sampling (Industrial version)

Automotive interior HMI & Hands-on-Detection

PSOC™ for interior HMI

Interior HMI





- **Touch-sensing with overlay materials:plastic, wood, sheet metal**
- **Integration of LEDs for lighting**

Hands-on-Detection



- **Heating element as HOD sensor**
- **HMI features for steering wheel controls can also be done by PSOC™**

Buttons/Sliders/TP



- **HMI to control infotainment system / cluster setting**
- **Force-sensing, haptics to avoid accidental touches and provide mechanical button-like feedback**

Why PSOC™ Automotive 4000T?

Lowest power solution for Automotive HMI

- Touch-sensing buttons/sliders/touchpads with very **thick overlays (>5 mm)** can be supported by **CAPSENSE™**
- **High refresh rates** to provide intuitive / responsive HMI
- **Low power Sensing supported in Deep Sleep** for applications such as door handles (<6uA)
- **Support force-sensing** with **CAPSENSE™** (capacitive) or **MagSense** (inductive)
- **Metal touch** surfaces can be enabled by MagSense
- Drive **LEDs brightness / effects** with **PWMs**
- **Scalable solution** from 32KB/4KB (Flash/SRAM) up to 64KB/8KB
- **LIN** for car communication
- **I2C / SPI / UART** serial commuication to host controllers

Enabling PSOC™ 4xxx based designs

ModusToolbox™ Software – Key reference links

ModusToolbox™ software and tools product page

ModusToolbox™ Software GitHub Repository

ModusToolbox™ Software Training Repository

ModusToolbox™ community forum

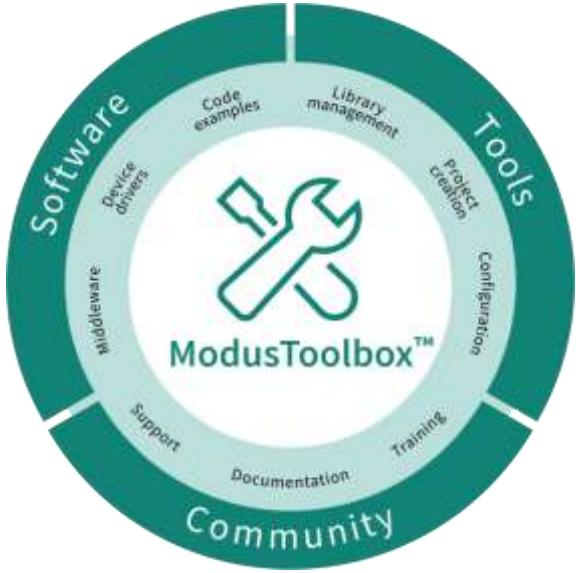


PSOC™ Automotive 4 Series

PSOC™ 4 Peripheral Driver Library

PSOC™ 4 Code Examples

ModusToolbox™ – Development ecosystem



› ModusToolbox™ software is a modern and an extensible development environment supporting a wide range of Infineon microcontroller devices.

› Provided as a collection of development tools, libraries, and embedded runtime assets architected to provide a flexible and comprehensive development experience.

Development tools

ModusToolbox™ tools package includes desktop programs that enable the creation of new embedded applications, managing software components, configuring device peripherals, middleware, and embedded development tools for compiling, programming, and debugging.

Runtime software

ModusToolbox™ software includes an extensive collection of GitHub-hosted repositories comprised of code examples, board support packages, middleware, and application support.

www.infineon.com/modustoolbox

Software and Tools partner ecosystem

– PSOC™ Automotive 4 series is supported by several software and tool partners who offer compilers, an IDE, a debugger / programmer, and communication protocol software drivers (e.g., LIN). Infineon works closely with these partners to enhance customer support and optimize collaboration.

Tool Category	Tool Vendor	PSOC™ 4 Series	PSOC™ 4 HVMS/HVPA
IDE/ComPA/pilers	iar	✓	✓
	arm	✓	
Debugger / Programmer	iar	✓	✓
	arm	✓	
	LAUTERBACH DEVELOPMENT TOOLS	✓	✓
	TASKING	✓	✓
	SEGGER www.segger.com	✓	✓
Communication protocol	ihr		✓
	VECTOR	✓	✓

Kits/boards overview

PSOC™ 4700S Inductive Sensing Evaluation Kit (CY8CKIT-4700S-PLUS)

Short description and key features.

- This kit is cost effective hardware platform for PSOC 4700S Plus MCU
- Inductive sense features : button using MOT(Metal over touch)
- Proximity sensor that supports metal targe detection
- Code examples for both sequential and parallel scanning available.

More information and user manual are available CY8CKIT-4700S-PLUS



PSOC™ 4100S Plus Prototyping Kit (CY8CKIT-149)

Short description and key features.

- This is easy to use and low-cost prototype kit
- Kit comes with on-board push-button and LEDs for visual feedback
- It has three CAPSENSE™ touch buttons and one six-segment CAPSENSE™ slider with visual feedback
- 1.8V to 5V operations
- Code examples are available

More information and user manual are available CY8CKIT-149



PSOC™ 4100S Max Pioneer Kit (CY8CKIT-041S-Max)

Short description and key features.

- This kit is low-cost platform to design and debug the PSOC 4100S Max series MCU
- It comes with 2 boards :i) pioneer board & ii) capacitive sensing expansion board
- Wide range of code examples are available in Modustoolbox ™ for evaluation
- This kit has capacitive sensing interfaces (button, slider, touch pad, proximity sensing

More information and user manual are available CY8CKIT-041S-MAX

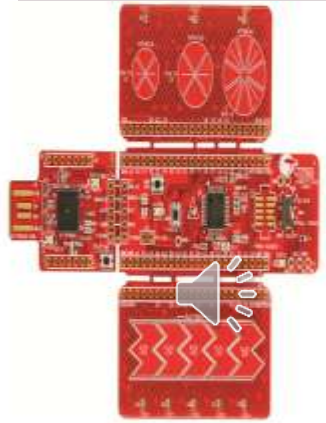


PSOC™ 4000S CAPSENSE™ Prototyping Kit (CY8CKIT-145-40XX)

Short description and key features.

- This prototyping kit enables user to evaluate and develop with fourth generation, low- power CAPSENSE Solutions
- This kit designed with snap-away form factor allows user to separate the Kitprog from the target board to use it indendently.
- Kit integrates kitprog 2, which enable onboard programming, debugging, and bridging functionality such as USB-UART & USB –I2C

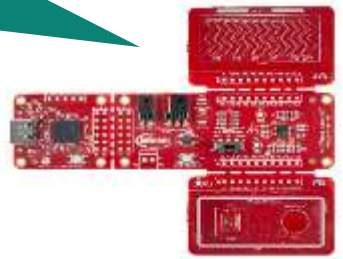
More information and user manual are available CY8CKIT-145-40XX



Overview PSOC™ 4000T Kits – Non-automotive, available now



Industrial Version
Reach out to us with Project details to get one free



	PSOC™ 4000T CAPSENSE Evaluation Kit	PSOC™4000T CAPSENSE™ Proto kit
Kit MPN	CY8CKIT-040T	CY8CPROTO-040T
KitProg3	Yes	Yes
Autonomous operation without CPU	Yes	Yes
Ultra-low power Always-ON sensing	Yes	Yes
CapSense Buttons	One self-cap CapSense touch button	One self-cap button, one mutual-cap button
CapSense Slider	No	5 segment linear slider, self and mutual sensing capable
CapSense Touchpad	4 x 4 Touchpad, self and mutual sensing capable	No
CapSense Proximity Sensor	Yes, Proximity sensor on PCB around the trackpad	Yes, Proximity sensor on PCB
Liquid Tolerance	Yes, Immersible in liquid, full liquid tolerance	No
Liquid Level sensing	No	No
Expansion connectors	Yes, limited	Yes, Fully flexible proto-typing kit
Best suited for	Liquid tolerant, low power, touch, proximity & trackpad interface on this kit, suited for **live demos**, and showcase 5th Generation CapSense capabilities	Traditional proto-typing kit that is easy to use, connect external sensors on your own hardware and enables quick proof of concept development and evaluation of 5th Gen CapSense

Summary – Infineon continues to expand PSOC™ Automotive MCU Portfolio- Reach out to our regional teams to know more ..

- **Reach out to Distribution Partners for further support** :

  https://www.infineon.com/contact-us/where-to-buy?ftab=02

- **Reach out eTailers for Boards :**

DigiKey

Mouser Electronics

Farnell

RS Components


Infineon