Automotive PSoC™4 (S-Series) Solution Examples

ATV MC SBS

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Automotive PSoC™4 (S-Series) solution example
Exterior HMI : Door handle

Design Problems
› Implement capacitive touch buttons for door lock / unlock function
› Ensure robust operation in wet conditions
› High response time and low power consumption

Automotive PSoC™4 (S-Series) Solution
› Provides Infineon's fourth-generation CAPSENSE™ with superior noise immunity (SNR >300:1)
› Implements reliable, liquid-tolerant CAPSENSE™ buttons that do not false touch even with presence of grounded-water
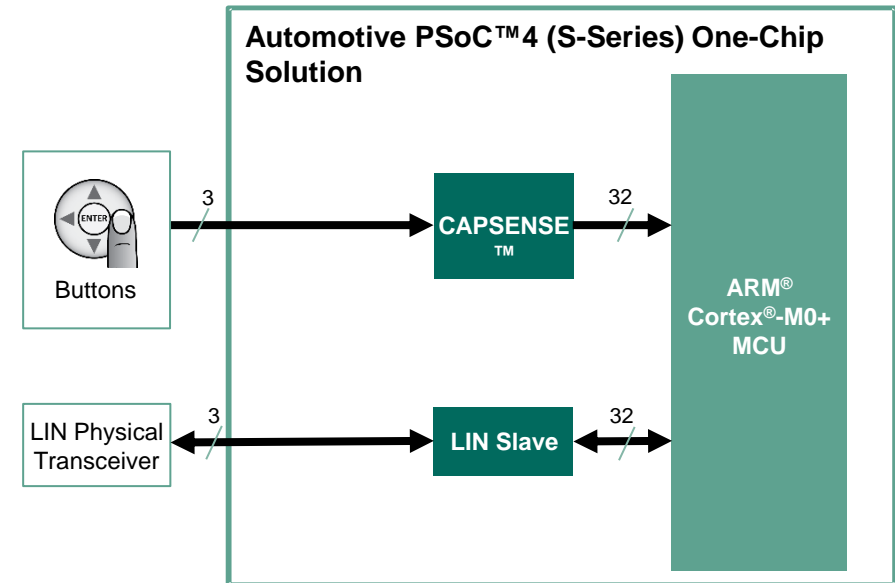› Provides high response time with ultra low power consumption

Suggested Collateral
› Design Software: *ModusToolbox*
› App Note: *Getting Started with PSoC™4 (S-Series)*
› Kit: PSoC™4 (S-Series) Pioneer Kit *(CY8CKIT-041)*
› Design Guide: *Getting Started with CAPSENSE™*

Automotive PSoC™ Creator Components
› CAPSENSE™ (Implements capacitive touch-sensing)
› LIN Slave (enables Local Interconnect Network protocol)

Block Diagram

Automotive PSoC™4 (S-Series) One-Chip Solution

Buttons — 3 — CAPSENSE™ — 32 — ARM® Cortex®-M0+ MCU

LIN Physical Transceiver — 3 — LIN Slave — 32 — ARM® Cortex®-M0+ MCU

The automotive PSoC™4 (S-Series) enables capacitive touch-buttons for implementing the lock function for car doors

Automotive PSoC™4 (S-Series) solution example
Exterior HMI: Trunk-opener/foot-kick

Design Problems
› Implement reliable foot-kick detection based on proximity sensing
› Design reliable sensor for measuring maximum proximity distance
› Communicate over LIN to the host ECU

Automotive PSoC™4 (S-Series) Solution
› Enables reliable capacitive based proximity sensing for gesture detections such as foot-kick
› Provides proven design guidelines for proximity sensor layouts
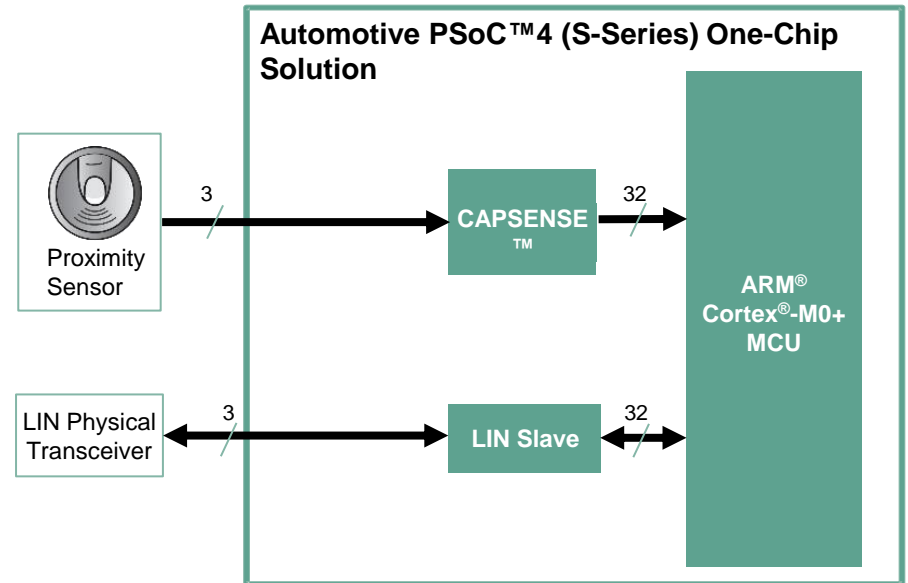› Integrates LIN slave controller for communication to ECU

Suggested Collateral
› Design Software: *ModusToolbox*
› App Note: *Getting Started with PSoC™4 (S-Series)*
› Kit: PSoC™4 (S-Series) Pioneer Kit (*CY8CKIT-042*)
› Design Guide: *Getting Started with CAPSENSE™*

PSoC™ Creator Components
› CAPSENSE™ (Implements capacitive proximity sensing)
› LIN Slave (enables Local Interconnect Network protocol)

Block Diagram

Automotive PSoC™4 (S-Series) One-Chip Solution

Proximity Sensor — 3 → CAPSENSE™ — 32 → ARM® Cortex®-M0+ MCU

LIN Physical Transceiver ←3→ LIN Slave ←32→ ARM® Cortex®-M0+ MCU

The automotive PSoC™4 (S-Series) enables reliable foot-kick gesture detection based on capacitive proximity sensing

Automotive PSoC™4 (S-Series) solution example: interior HMI – includes Force Touch, Touch under Metal and Gearshift

Design Problems
› Power directly for car battery
› Outdoor touch buttons exposed to dirt, water and moisture.
› External temperature monitoring
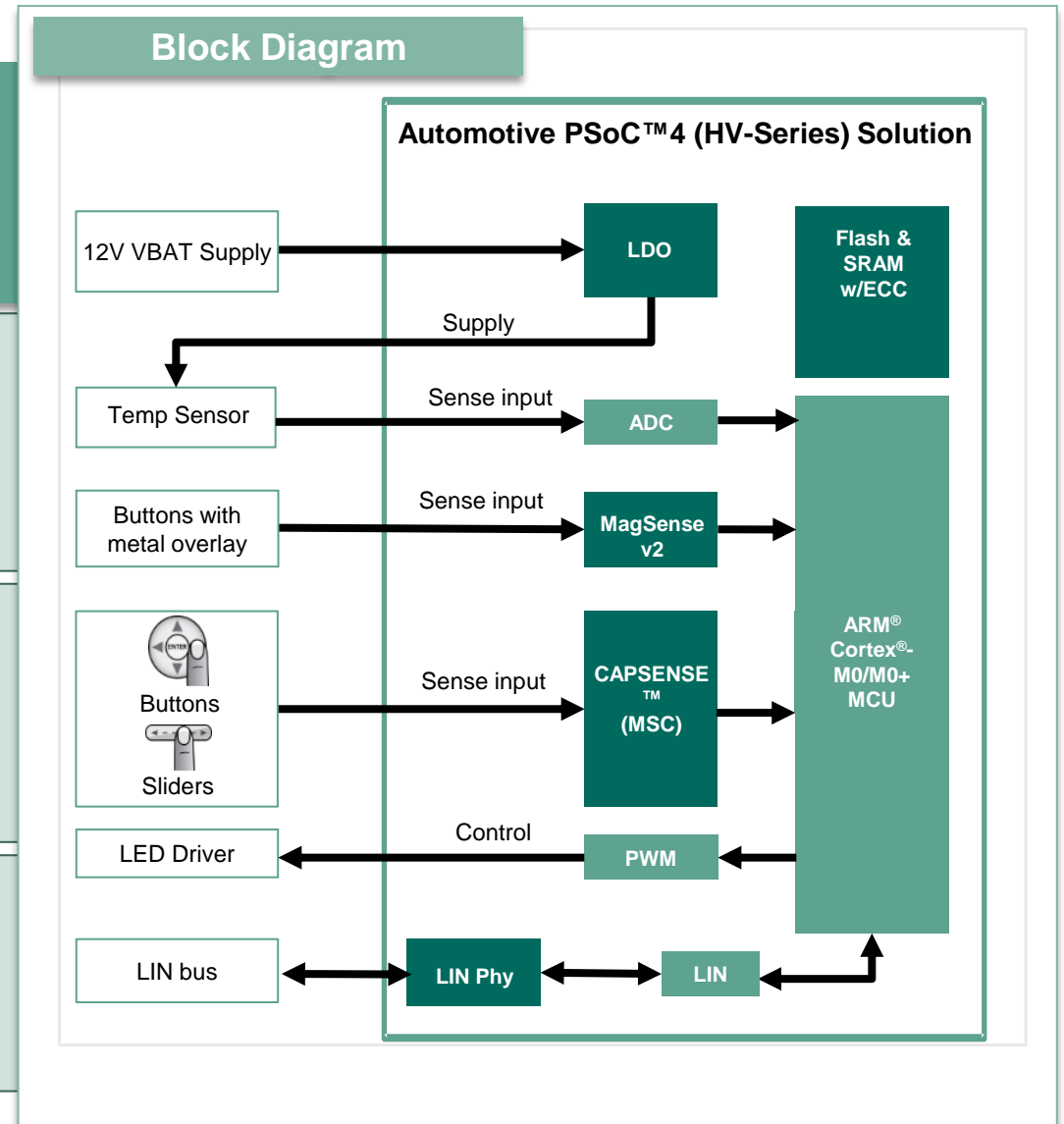› Automotive LIN Bus

Automotive PSoC™4 (S-Series) Solution
› Integrated LDO with up to 60mA output current (3.3V or 5V).
› Capacitive and Inductive touch sensing
› Integrated LIN PHY block (2 independent channels)

Suggested Collateral
› Design Software: *ModusToolbox*
› App Note: *Getting Started with PSoC™4 (S-Series)*
› Kit: PSoC™4 (S-Series) *Pioneer Kit (CY8CKIT-041)*
› Design Guide: *Getting Started with CAPSENSE™*

Automotive PSoC™ Creator Components
› CAPSENSE™ (Implements capacitive touch-sensing)
› LIN Slave (enables Local Interconnect Network protocol)

Block Diagram

Automotive PSoC™4 (HV-Series) Solution

Automotive PSoC™4 (S-Series) solution example:
Steering wheel: control

Block Diagram

Design Problems
› Implement capacitive touch buttons for control on steering wheel
› Communicate over LIN to the host ECU
› Implement LED control

Automotive PSoC™4 (S-Series) Solution
› Provides Cypress's fourth-generation CAPSENSE™ with superior noise immunity (SNR >300:1)
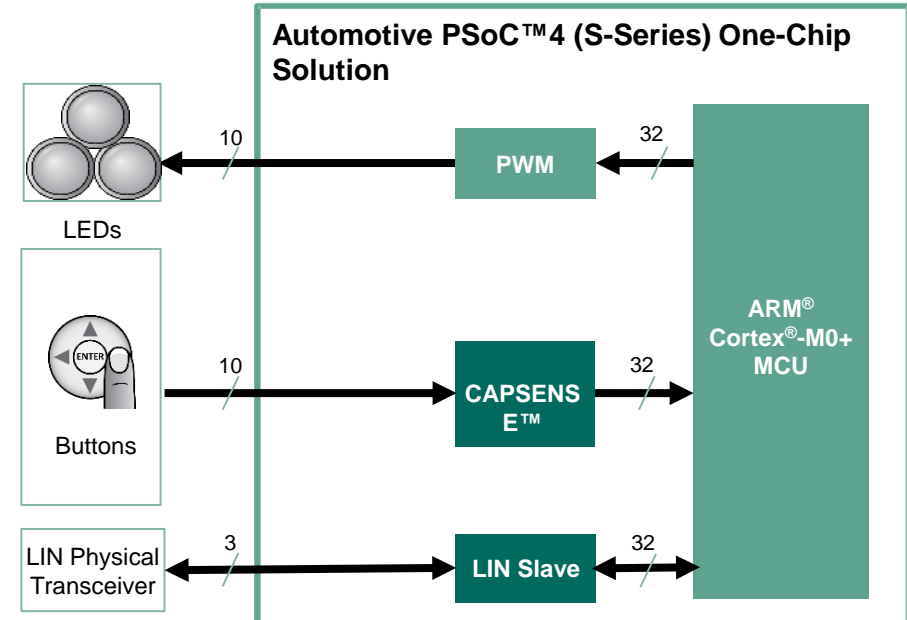› Integrates up to two LIN Slave controllers in a one-chip solution
› Drives LEDs using PWM

Suggested Collateral
› Design Software: *ModusToolbox*
› App Note: *Getting Started with PSoC™4 (S-Series)*
› Kit: PSoC™4 (S-Series) Pioneer Kit *(CY8CKIT-041)*
› Design Guide: *Getting Started with CAPSENSE™*

PSoC™ Creator Components
› CAPSENSE™ (Implements capacitive touch-sensing)
› LIN Slave (enables Local Interconnect Network protocol)
› PWM (Controls the brightness of LEDs)

The automotive PSoC™4 (S-Series) enables capacitive touch-buttons and integrate LIN communication

Automotive PSoC™4 (S-Series) solution example: Liquid-level sensing

Design Problems

› Reduce the overall cost of the Liquid-Level Sensing system
› Provide a reliable capacitive Liquid-Level Sensing system that works in the presence of noi
› Quickly design and implement a Liquid-Level Sensing solution

Automotive PSoC™4 (S-Series) Solution

› Enables a low-cost Liquid-Level Sensing solution that replaces an expensive incumbent solution using a magnetic sensor
› Delivers a reliable solution with a high SNR (>300:1) that "just works"
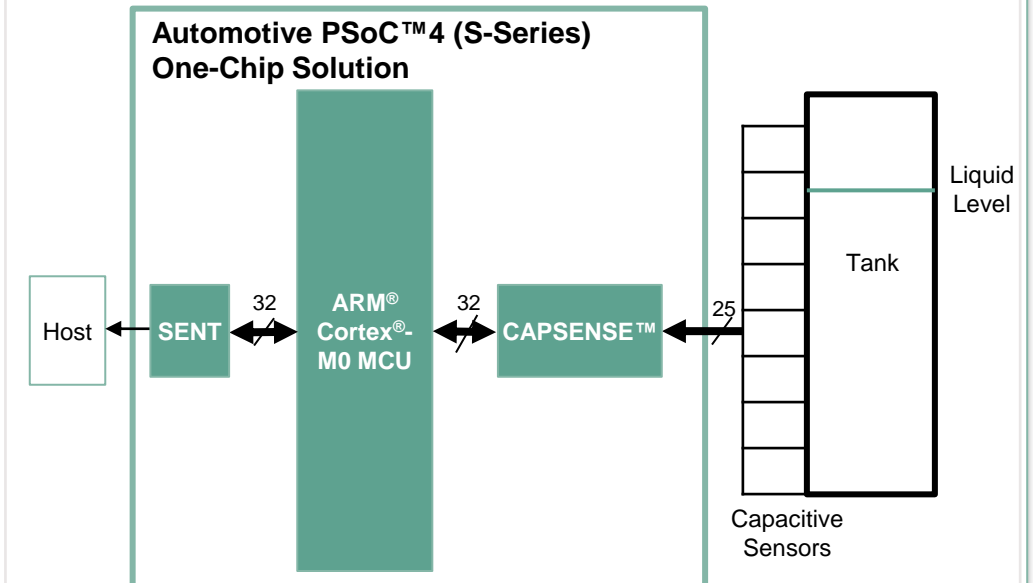› Enables an easy-to-design Liquid-Level Sensing system

Suggested Collateral

› Design Software: *ModusToolbox*
› Kit: PSoC™4 (S-Series) Pioneer Kit *(CY8CKIT-041)*
› Liquid-Level Sensing Shield *(CY8CKIT-022)*
› Design Guide: *Getting Started with CAPSENSE™*
› App Note: PSoC™ Liquid-Level Sensing *(AN202478)*

PSoC™ Creator Components

› CAPSENSE™ (Implements capacitive Liquid-Level Sensing)
› SENT (Enables Single Edge Nibble Transmission protocol)

Block Diagram

Liquid Level sensor

The automotive PSoC™ 4 (S-Series) enables a robust, Liquid-Level Sensing solution based on CAPSENSE™ to measure the level of Fuel / water / DEF in the tank

Automotive PSoC™4 (S-Series) solution example: Steering wheel: Hands-on detection

Design Problems

› Detect presence or removal of hand from the car steering wheel
› Implement a reliable sensor on the steering wheel
› Maintain the temperature of the steering wheel
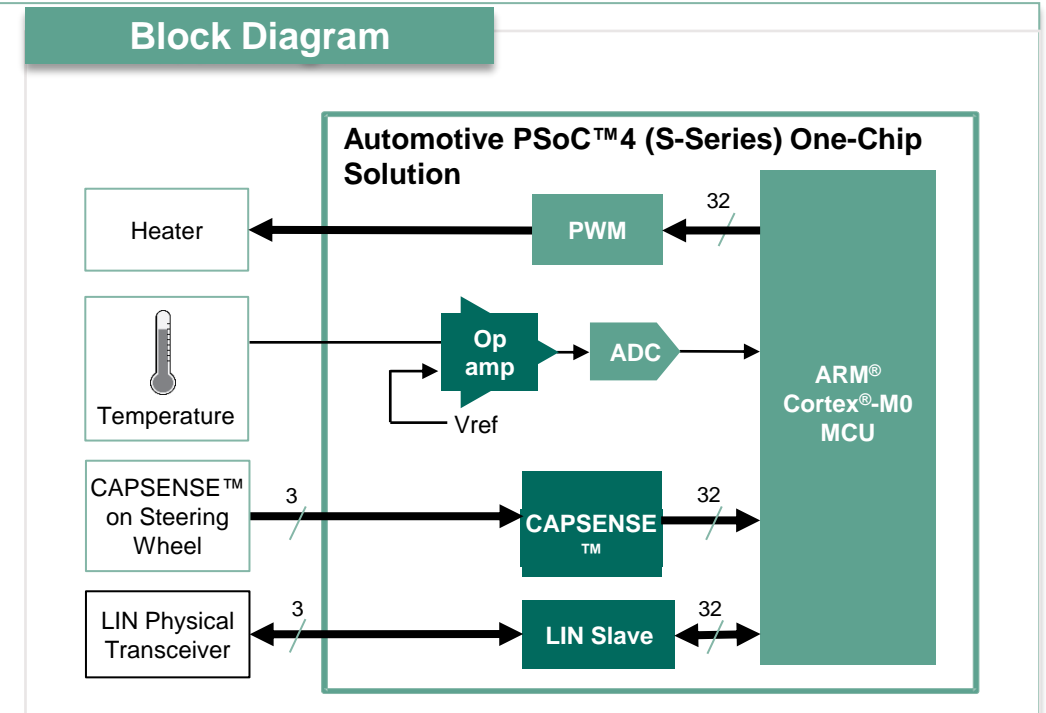
Automotive PSoC™4 (S-Series) Solution

› Enables robust capacitive sensing through CAPSENSE™ for detection of hand presence or absence
› Cypress provides design guidelines and support for designing capacitive sensors
› Measure the temperature and drive the heater motor with a PWM

Suggested Collateral

› Design Software: *ModusToolbox*
› App Note: *Getting Started with PSoC™4 (S-Series)*
› Kit: PSoC™4 (S-Series) Pioneer Kit *(CY8CKIT-041)*
› Design Guide: *Getting Started with CAPSENSE™*

PSoC™ Creator Components

› CAPSENSE™ (Implements capacitive touch-sensing)
› LIN Slave (enables Local Interconnect Network protocol)
› PWM (Controls the brightness of LEDs)
› Opamps (amplifies the signal from an analog sensor output)
› ADC (Converts analog voltage to digital values)

Block Diagram

The automotive PSoC™4 (S-Series) enables detection of hand and drives PWM for the heater motor

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