



Analog, Mixed-Signal and Power Management

MM9Z1_638 and MM9Z1_638C

Xtrinsic Battery Sensor with Multiple Voltage and Temperature Sense Inputs, MSCAN and LIN

Target Applications

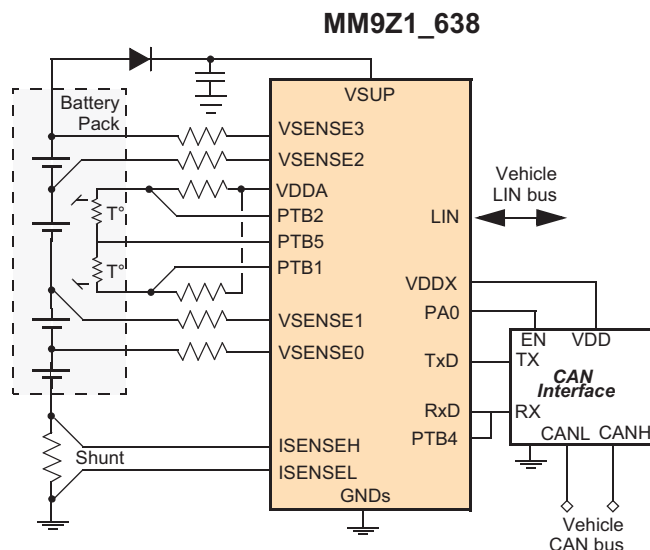
- Automotive
 - Battery monitoring
 - Hybrid electric vehicle (HEV) inverter controller
- Industrial
 - Energy storage systems (ESS)
 - Hybrid electric vehicle (HEV)
 - Cordless tools and appliances

Overview

The MM9Z1_638 and MM9Z1_638C are fully integrated battery monitoring devices for automotive and industrial mission critical applications. The device integrates an S12Z microcontroller and a SMARTMOS analog control IC into a single-package solution. The analog die combines system basis and application-specific functions, including a Local Interconnect Network (LIN) transceiver and a two-channel 16-bit sigma-delta ($\Sigma\Delta$) analog-to-digital converter (ADC) for simultaneous measurement of battery voltage and current.

An integrated temperature sensor combined with battery mounting allows accurate measurement of battery temperature. Control of the analog die is through the high-performance internal die-to-die interface (D2D), which seamlessly integrates the analog IC registers into the MCU register map, providing faster access than SPI-based systems. The MM9Z1_638/634C also includes an internal oscillator, 96 KB or 128 KB of flash memory and 8 KB of RAM, as well as an MSCAN module. Multiple external temperature sensors are also supported.

MM9Z1_638 Simplified Application Drawing



Customer Benefits

Integration of MCU and analog features into a system-in-package solution results in an optimized, economical and autonomous multifunction solution, provides enhanced reliability and requires few external components when compared to discrete solutions

- Fully integrated and optimized signal chains, using three individual sigma-delta ADC to measure current, voltage and temperature
- Four dedicated voltage sense inputs with internal divider covering a voltage range from 1.25–52 V
- Reverse battery-protected voltage sense pins
- Full LIN solution with integrated physical interface and MSCAN module
- MM9Z1_638: Fully AEC-Q100 automotive qualified, and designed to meet highest automotive robustness standards for ESD, EMC and Zero Defect Quality levels
- MM9Z1_638C: Industrial-qualified option



(PB-FREE) 48-PIN QFN-EP
98ASA00343D

Freescal: A Leader in Analog Solutions

Expanding on more than 30 years of innovation, Freescal is a leading provider of high-performance products that use SMARTMOS technology combining digital, power and standard analog functions. Freescal supplies analog and power management ICs that are advancing the automotive, consumer, industrial and networking markets. Analog solutions interface with real-world signals to control and drive for complete embedded systems.



Product Features

Battery voltage measurement

- Dedicated 16-bit second-order $\Sigma\Delta$ ADC, full measurement range 3.5–28 V, with a maximum gain error accuracy of 0.15 percent for 5–18 V range
- Simultaneous sampling with current channel
- Programmable signal filtering shared with current measurement
- Four battery voltage measurement with internal divider
- Five voltage sensor inputs routable to both voltage and temperature channel

Differential battery current measurement

- Dedicated 16-bit second-order $\Sigma\Delta$ ADC with a programmable gain amplifier with eight programmable gain factors
- Gain control block for automatic gain adjustment
- Measurement range up to ± 2000 A with an accuracy of 5 mA and a resolution of 1 mA

Temperature measurement

- Internal, on-chip temperature sensor
- Dedicated 16-bit ADC with anti-aliasing filter
- Accuracy: ± 2 °C (-20 to 60 °C) and ± 3 °C (-40 to 125 °C)
- Five single-ended sensor inputs routable to both voltage and temperature channels
- Internal supply for external sensors

Normal and low-power mode

- Current integration via 32-bit accumulator during low-power mode
- Programmable current threshold detection during low-power mode
- Programmable wake-up timer, triggered wake-up from LIN

Advanced system-level management

- Internal oscillator with one percent accuracy
- Communication via LIN 2.1, LIN 2.0 interface with fast mode for flash programming over LIN
- MSCAN protocol controller with TxD and RxD pins, and bus wake-up detection
- S12Z micro controller with 128 KB flash, 8 KB RAM, 4 KB EEPROM—all with ECC
- Enhanced VDDX capability to supply MCU and external components
- Fast, die-to-die bus interface with transparent integration of analog IC registers into the MCU register map, automatic synchronization and error detection
- Automotive EMC and ESD performance

Documentation

Freescal Document Number	Title	Description
MM9Z1_638D1	Xtrinsic Battery Sensor with Multiple Voltage and Temperature Sense Inputs, MSCAN and LIN	Data sheet
SG1002	Analog Product Selector Guide	Selector guide
SG187	Automotive Product Selector Guide	Selector guide
SG200	Analog and Power Management Industrial Selector Guide	Selector guide

Development Tools

Part Number	Description
KIT9Z1J638EVM	Evaluation board to demonstrate the key features of the MM9Z1_638. In development. Contact Sales for pricing.

For more information, visit freescal.com/Xtrinsic

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