

Analog, Mixed Signal and Power Management

MC33907 and MC33908

Safe and efficient system basis chips (SBCs) for safety critical 32-bit MCU applications



Overview

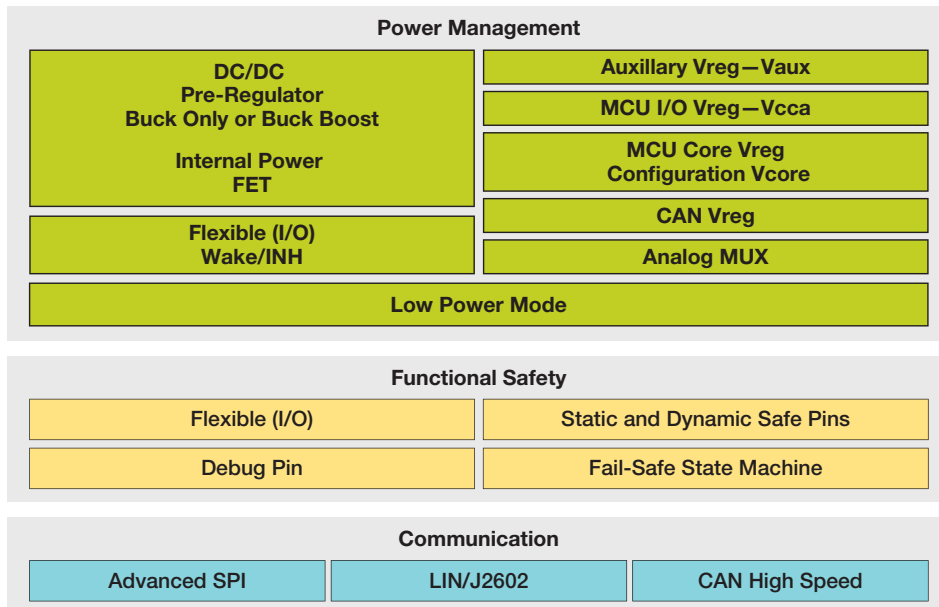
The MC33907 and MC33908 are multi-output power supply integrated circuits (ICs) with HSCAN and LIN transceivers optimized for safety critical applications. Multiple switching and linear voltage regulators are available, including low power modes with various wake up capabilities. An advanced power management scheme is implemented to maintain high efficiency over wide input voltages and output current ranges.

Enhanced safety features and multiple fail-safe outputs enable safety oriented system partitioning in the MC33907 and MC33908 devices. A built-in enhanced high-speed CAN interface fulfills ISO 11898-2 and -5 standards. Local and bus failure diagnostics, protection and fail-safe operation modes are provided. The LIN interface fulfills LIN protocol specifications 2.0, 2.1 and SAEJ2602-2.

Target Applications

- Advanced power train
- Electric power steering
- Safety critical motor control applications
- Safety domain control
- Vehicle dynamic and chassis control

MC33907 and MC33908 Block Diagram



Features

- Power management scalability
 - Integrated switch for improved control and reliability
 - Optional boost feature to maintain functionality down to 2.7 V (support LV124)
 - Dual DC/DC architecture for packaging cost efficiency
 - Family-compatible solution versus power delivery
 - Family pinout-compatible solution
- Energy efficiency
 - 2.4 MHz dedicated Vcore DC/DC, with scalable current vs. P/N
 - Low power modes
 - Wake-up by I/Os, CAN and LIN (up to 25 μ A)
- Functional safety
 - Safety features to target ASILD applications combined with MCUs
 - Fail-safe and configurable state machine
 - Many protections and diagnostics
- Robust physical layers
 - Certification to LIN2.1 and ISO 11898-2-5 standards
 - Re-use existing CAN and LIN IP passing stringent EMC/ESD
- Easy to use
 - Ecosystem to lower development time and simplify access
 - Debug mode to save time during application development
- Ideal companion chip for high-end 32-bit MCUs
 - MPC5643L Qorivva 32-bit MCU

Key Features

- Enhanced safety block associated with fail-safe output
- Secure SPI interface
- Configurable digital I/Os through SPI registers, including monitoring of FCCU
- MUX output terminal for device internal analog signal monitoring and power supply monitoring

Additional Features

- ISO 11898 high-speed CAN interface compatibility for baud rates of 40 kb/s to 1 Mb/s
- LIN 2.1 transceiver with wave shaping
- High EMC immunity and ESD robustness

Freescale SBC Solutions

	MC3907	MC3908
6.5 V Pre-regulator	1.5 A (Buck or Boost_440 kHz)	2 A (Buck or Boost_440 kHz)
MCU core supply VCore/2%	0.8 A (SPMS_2.4 MHz)	1.5 A (SPMS_2.4 MHz)
MCU I/O ATD supply VCCA/1%	100 mA (int) +/-1% or 300 mA (ext.) +/-3%	100 mA (int) +/-1% or 300 mA (ext.) +/-3%
Auxiliary ECU supply Vaux/3%	Up to 300 mA tracker/auxiliary	Up to 300 mA tracker/auxiliary
Can_5V Supply (VCAN)	100 mA	100 mA
CAN interfaces	1	1
LIN interfaces	1 optional LIN	1 optional LIN
I/Os	6 (incl. F/S inputs)	6 (incl. F/S inputs)
Watchdog	Challenger	Challenger
LowQ Voff	25 μ A	25 μ A
AMUX and battery sense	Yes	Yes
Fail-safe	Independent I/O	Independent I/O
Package	LQFP48eP	LQFP48eP

Features to Support ISO 26262 System Requirements

Safety Process	<ul style="list-style-type: none"> • ISO 26262—fit ASIL D <ul style="list-style-type: none"> ◦ Safety assessment of analog architecture and development process (ISO 26262) ◦ Helps to reduce effort and time on ECU functional safety assessment
Safety Hardware	<ul style="list-style-type: none"> • Integrated safety architecture <ul style="list-style-type: none"> ◦ Saves development effort and time as no additional software required (only one main MCU) ◦ Independent voltage monitoring and fail-safe state machine ◦ High HW diagnostic to cover SPF, LT, CCF
Safety Software	<ul style="list-style-type: none"> • Secured SBC and MCU software interactions <ul style="list-style-type: none"> ◦ Multiples registers to help software diagnostics, including safe state machine ◦ Safety mechanisms to secure SPI ◦ Advanced watchdog challenger to secure MCU timing monitoring
Safety Support	<ul style="list-style-type: none"> • Safety documentation provided by Freescale <ul style="list-style-type: none"> ◦ Application recommendations to combine MC33907 and MPC5643L ◦ Safety manual, FMEDA and complete ecosystem to ease development, save time

Features to Support Energy-Efficient Solutions

- Multiple output power supplies from 0.5 up to 2 amps of global current capability with scalable family approach
- Switching mode power supply (SMPS) dedicated to MCU core supply, 1.2 or 3.3 volts selectable through external voltage string
- Linear voltage regulator (3.3–5 V) dedicated to MCU I/O supply
- Linear voltage regulator dedicated to auxiliary functions (3.3–5 V selectable) or to sensor supply (Vcca tracker or independent 3.3–5 V)
- Highly flexible SMPS pre-regulator allowing non-inverting buck-boost or standard buck topologies. Overall device efficiency improvement
- Uses SMARTMOS technology that combines digital, power and standard analog functions

- LV124 low-voltage capable (down to 2.7 V_{IN}), based on optional boost function to improve system availability during cranking pulses
- Multiple wake-up sources combined with ultra low power mode: CAN and LIN interfaces, local wake pins
- Battery voltage sensing before and after reverse battery protection

SafeAssure Program: Functional Safety. Simplified.

The Freescale SafeAssure functional safety program is designed to help you simplify the process of achieving system compliance with functional safety standards in the automotive and industrial markets.

For more information, visit freescale.com/SafeAssure.

For more information, visit freescale.com/analog

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