



# Applications Analog and Power Management

Making embedded systems better with robust reliable performance



## Applications- Robust, Reliable, Performance

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### GENERIC SYSTEM DIAGRAMS

- **MOTOR CONTROL** — Regulates the speed, rotation, and torque of a motor
- **MOTION CONTROL** — Governs the physical displacement movement, location, or position of a mechanical assembly, driven by an intermittent duty motor
- **STATIC LOAD CONTROL** — Fully or partially powers-up the elements of a relatively constant load
- **POWERTRAIN AND ENGINE MANAGEMENT** — Provides functionality for controlling and monitoring engine and transmission system loads
- **NETWORK COMMUNICATIONS** — Provides device-to-device communication within a system
- **EMBEDDED MCU PLUS POWER** — Provides an integrated single package solution with MCU, Voltage Regulation, Power Actuation, and LIN bus transceiver
- **BATTERY CHARGER** — Provides high voltage accuracy over the full temperature range due to the different charging process
- **RADAR SYSTEMS** — Provides long- and mid-range functionality, allowing automotive systems to monitor the environment around the vehicle to help prevent crashes
- **POWER MANAGEMENT** — Converts system input power to the voltages and currents required by the MCU and DSP
- **BATTERY MANAGEMENT** — Provides highest performance and accuracy, as well as exceptional configuration flexibility

**MOTOR CONTROL GENERIC SYSTEM DIAGRAM**

Motor control is the function of regulating the speed, rotation, and torque of a motor.

**TYPICAL APPLICATIONS:**

- Blowers
- Fans
- Vacuums
- Pumps
- Compressors
- Golf Carts
- Scooters
- Electric Wheelchairs
- Electric Boats
- Conveyors
- Shakers
- Vibrators
- Mixers
- Shredders
- Winches
- Elevators
- Treadmills
- Power Tools

**LOOP CONTROL SCHEMA:**

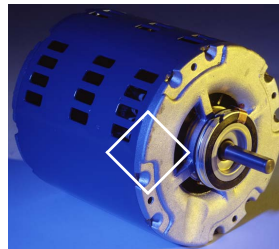
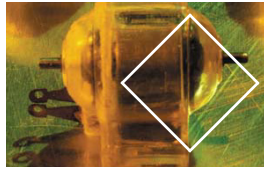
- Speed
- Torque/Current
- Voltage
- Rotation (CW/CCW)
- None (Open Loop)

**POWER CONTROL SCHEMA:**

- ON/OFF
- PWM
- Linear
- Volts/Hertz (V/f)
- Rotating Vector
- Phase Angle

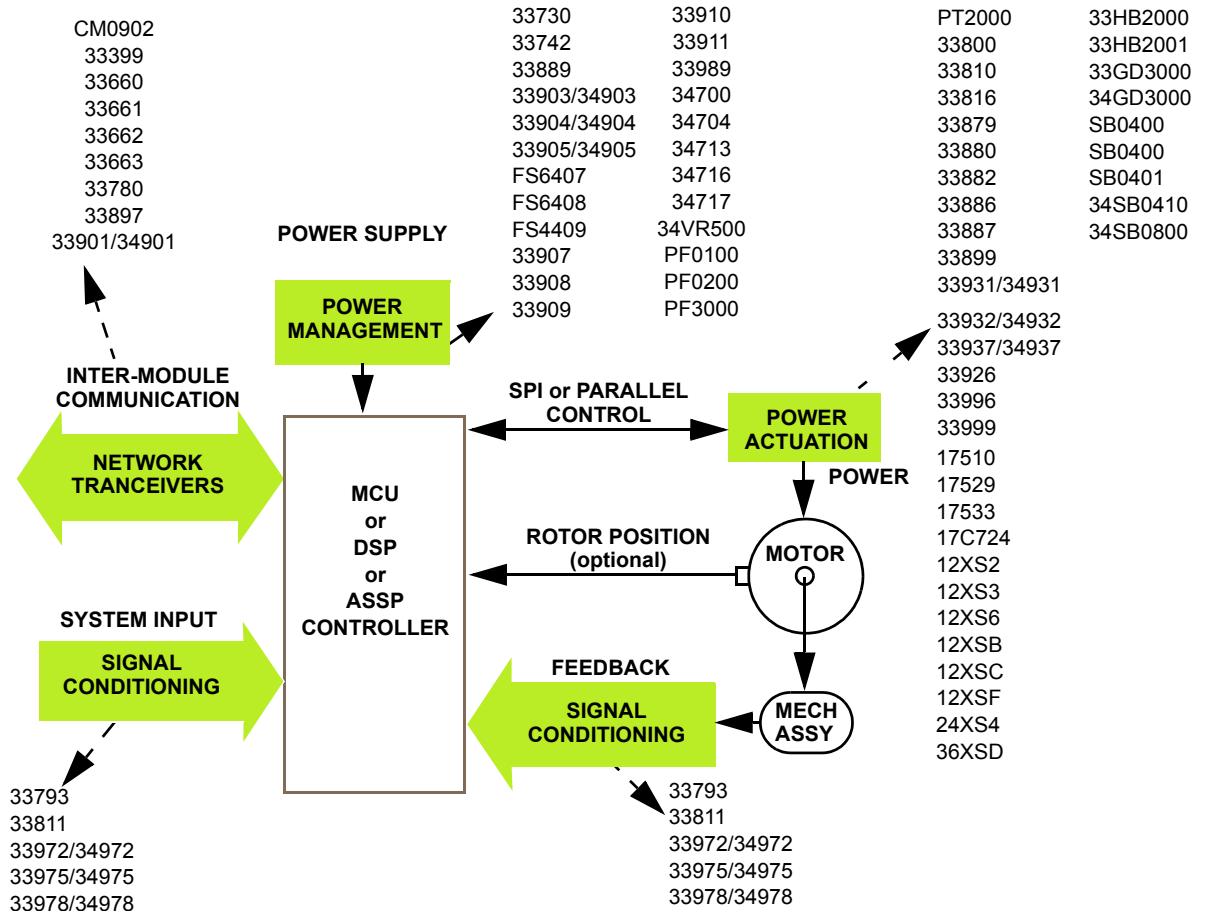
**MOTOR TYPES:**

- DC Brush Commutator
- DC 3-Phase Brushless
- Universal
- AC Induction
- Switched Reluctance
- Stepper



**CONSIDER:**

- S08
- S12
- i.MX6/7
- Qorivva 32-bit
- Kinetis



**MOTION CONTROL GENERIC SYSTEM DIAGRAM**

Motion control is the function of governing the physical displacement, movement, location, or position of a mechanical assembly driven by an intermittent duty motor.

**TYPICAL APPLICATIONS:**

- CNC Machining
- Robotics
- HVAC Mix Louvers
- Hard Automation
- Power-Assisted
- Operator Controls
- Process Controls
- Autopilots
- Guidance/Steering
- Controls
- Servos and Radio
- Controls
- Antenna Rotors
- Dish Positioners
- Power Adjustable
- Beds
- Remote Pan and Tilt
- Mounts

- Printer Paper Handler
- Scanners
- Conveyors
- Shakers
- Consumer Portable Products
- Digital Cameras
- Printers
- Office Equipment
- Industrial Controller
- Force
- Spot Welding
- Fluid Coating
- Flight Simulator
- Temperature Control
- Brake Pressure
- Laser Cutting
- Bottle Moulding
- Filling Pressure

**LOOP CONTROL SCHEMA:**

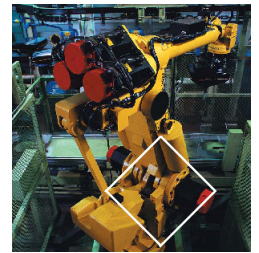
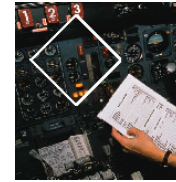
- Rotation (CW/CCW)
- Position
- Step Count
- Operator (Open Loop)

**POWER CONTROL SCHEMA:**

- ON/OFF
- PWM
- Linear
- Stepper (Pulse & Hold)

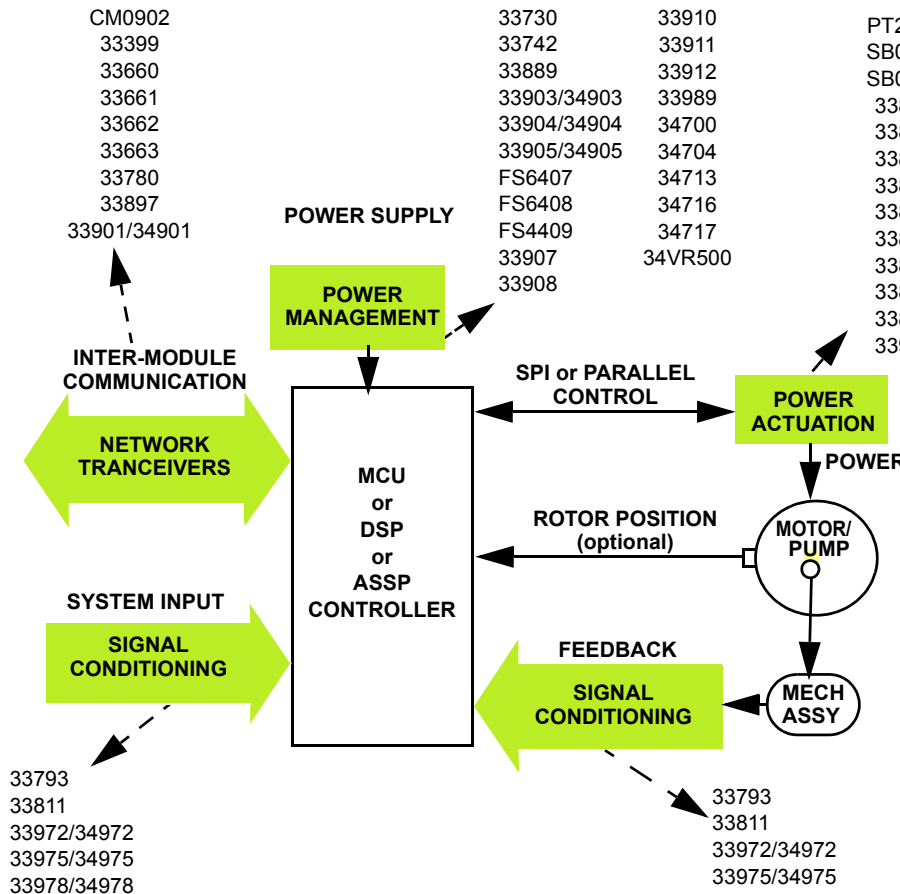
**MOTOR TYPES:**

- DC Brush Commutator
- Brushless DC
- Stepper
- Linear
- Solenoid
- Servos



**CONSIDER:**

- S08
- S12
- i.MX6/7
- Qorivva 32-bit
- Kinetis



- CM0902
- 33399
- 33660
- 33661
- 33662
- 33663
- 33780
- 33897
- 33901/34901

- 33730
- 33742
- 33889
- 33903/34903
- 33904/34904
- 33905/34905
- FS6407
- FS6408
- FS4409
- 33907
- 33908

- 33910
- 33911
- 33912
- 33989
- 34700
- 34704
- 34713
- 34716
- 34717
- 34VR500

- PT2000
- SB0410
- SB0800
- 33800
- 33810
- 33816
- 33879
- 33880
- 33882
- 33886
- 33887
- 33899
- 33926
- 33931/34931
- 33932/34932
- 33937/34937
- 33996
- 33999
- 34933
- 17510
- 17529
- 17533
- 17C724
- 12XS2
- 12XS3
- 12XS6
- 12XSB
- 12XSC
- 12XSF
- 24XS4
- 36XSD
- SB0400
- SB0401
- 33HB2000
- 33HB2001
- 33GD3000
- 34GD3000

- 33793
- 33811
- 33972/34972
- 33975/34975
- 33978/34978

- 33793
- 33811
- 33972/34972
- 33975/34975

**STATIC LOAD CONTROL GENERIC SYSTEM DIAGRAM**

Static load control is the function of fully or partially powering-up the elements of a relatively constant load.

**TYPICAL APPLICATIONS:**

- Security Systems
- HVAC
- Water Heaters
- Charging Systems
- Lighting Displays
- Score Boards
- Irrigation Control
- Programmable Thermostats
- Gaming Machines
- Industrial Controls
- Automotive Body Electronics
- Large Building Automation
- White Goods Appliances
- Automotive Safety Systems
- LED Backlighting/Displays

**LOOP CONTROL SCHEMA:**

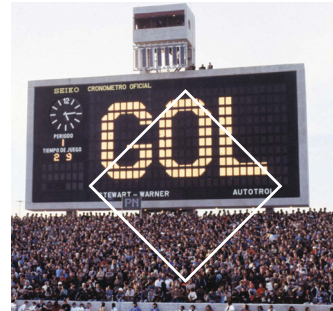
- Current
- Voltage
- Sensor Feedback
- Limit Switch (Bang-Bang)
- None (Open Loop)

**POWER CONTROL SCHEMA:**

- ON/OFF
- PWM
- PFM
- Linear
- Phase Angle

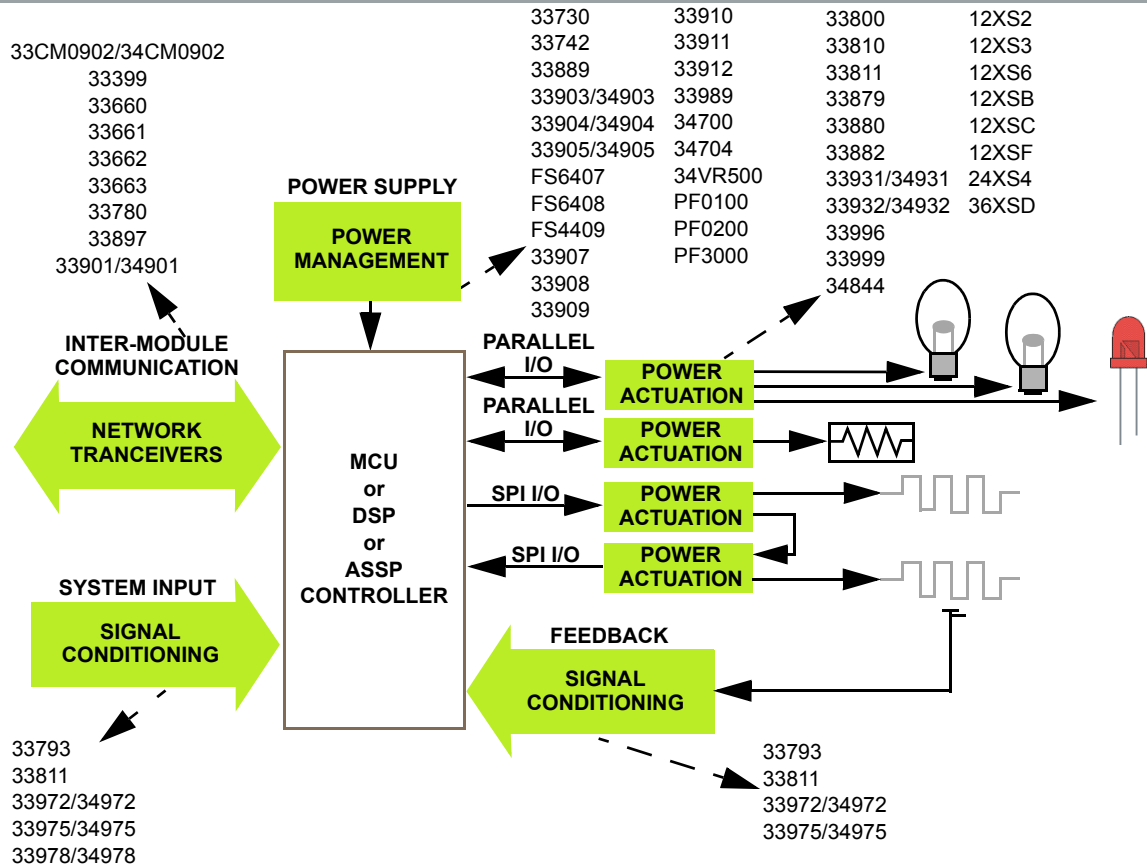
**STATIC LOAD TYPES:**

- Incandescent Lamps
- Heating Elements
- LEDs/Lasers
- Ultrasonic Transducers
- Piezo Transducers
- Induction Coils
- Sirens/Horns/Bells



**CONSIDER:**

- S08
- S12
- i.MX6/7
- Qorivva 32-bit
- Kinetis



**POWERTRAIN AND ENGINE MANAGEMENT SYSTEM DIAGRAM**

These components represent devices that are designed to function in the automotive environment. They provide the functionality needed for controlling and monitoring engine and transmission systems loads and inputs. The functions available range from alternator voltage regulator control to Low-side switches, H-Bridge drivers, MOSFET/IGBT Pre-drivers, switch and solenoid monitoring, and more.

**TYPICAL APPLICATIONS:**

- Marine Engine
- Boat Motor
- Jet Ski Engine
- ATV / Motorcycle Engine
- Industrial Engines
- Heavy Equipment
- Automobile Engines (2-12 cylinders)

**LOOP CONTROL SCHEMA:**

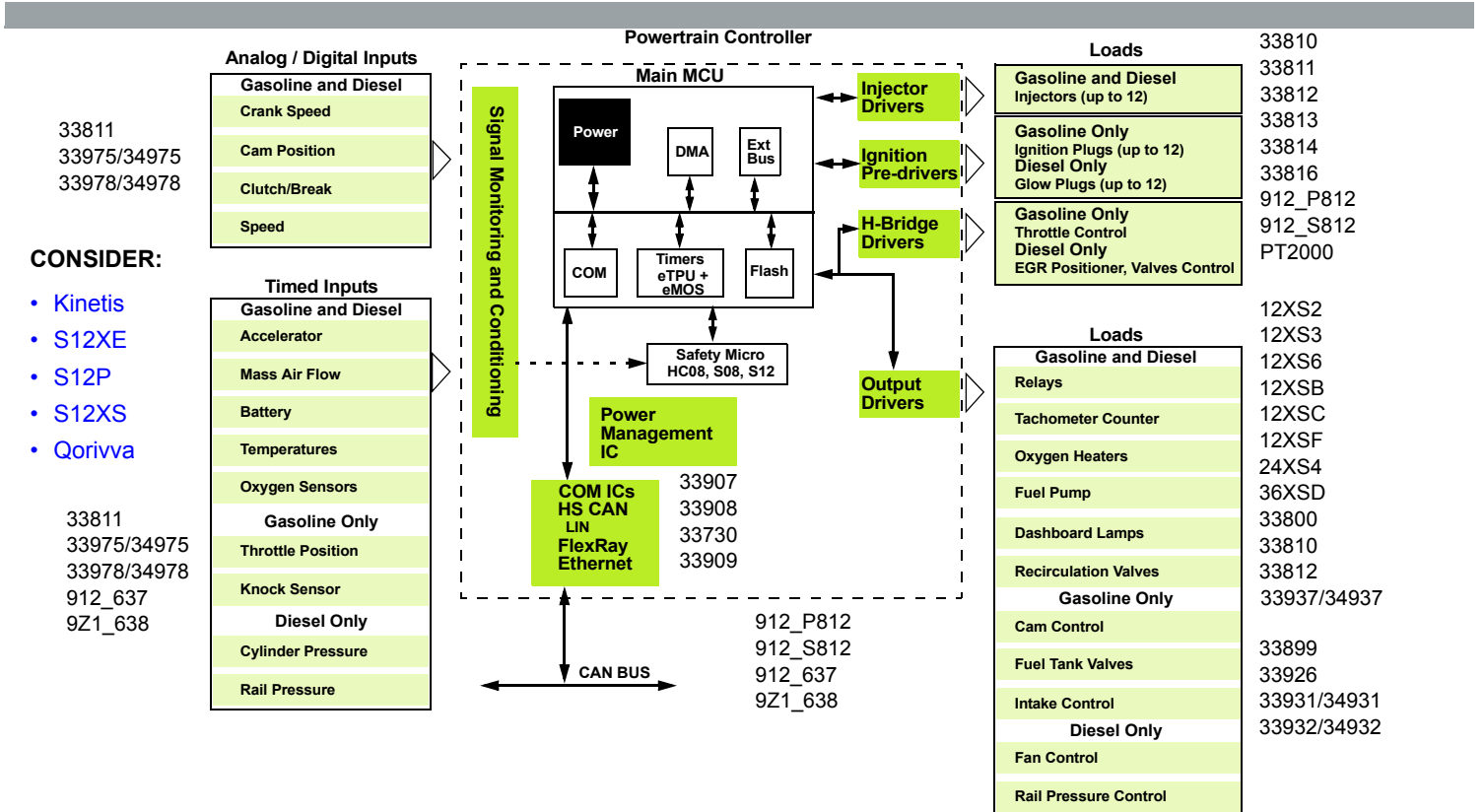
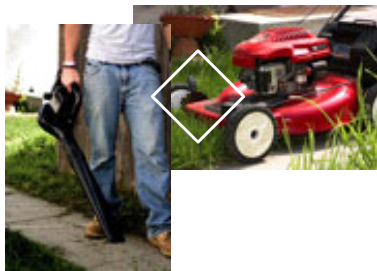
- Current
- Voltage
- Sensor Feedback
- Limit Switch (Bang-Bang)
- None (Open Loop)

**POWER CONTROL SCHEMA:**

- ON/OFF
- PWM
- PFM
- Linear
- Phase Angle

**LOAD TYPES:**

- Incandescent Lamps
- Heating Elements
- LEDs/Lasers
- Ultrasonic
- Transducers
- Piezo Transducers
- Induction Coils
- Sirens/Horns/Bells

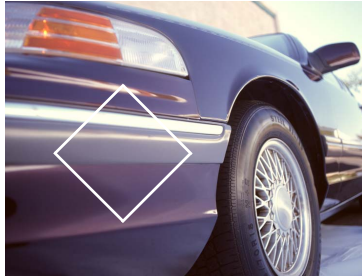


**NETWORK COMMUNICATIONS SYSTEM DEVICES**

Network communication provides information between two or more devices in a system.

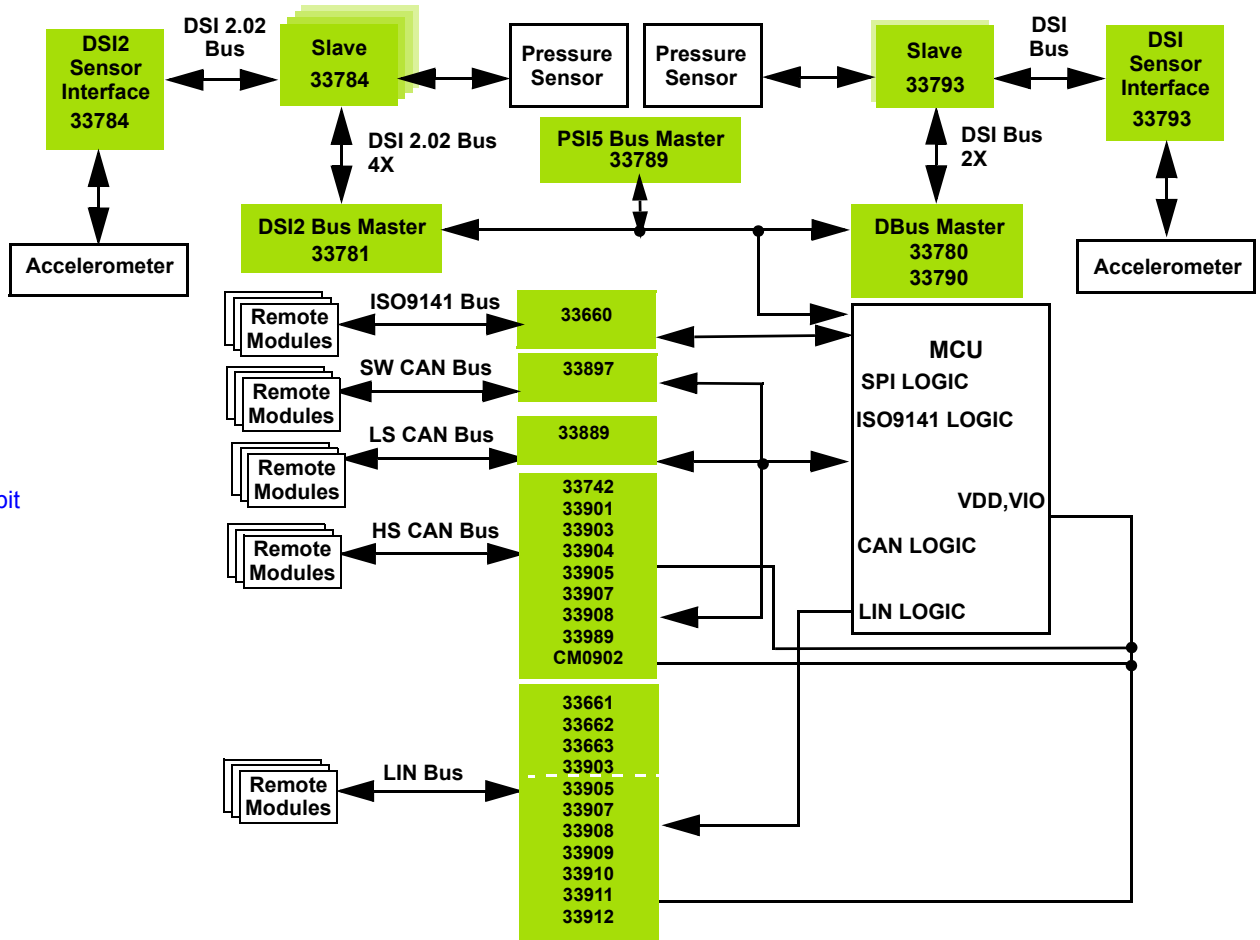
**TYPICAL APPLICATIONS:**

- Aircraft Systems
- Antenna Controllers
- Appliances
- Automotive Body Electronics
- Automotive Safety Systems
- Conveyors
- Elevators
- Gaming Machines
- Heating & Cooling
- Irrigation Control
- Lighting
- Machinery/Robotics
- Score Boards
- Security Systems
- Vending Machines
- Watercraft Systems
- Water Heaters



**COMMUNICATIONS SCHEMA:**

- Bidirectional
- Combined Power & Signaling Error Detection
- Fault Tolerant
- Full/Half Duplex
- Hi/Med/Low Speed
- Predictive
- Single Ended/ Differential
- Single/Multi Master
- Single/Multi Slave
- Timing Critical
- Voltage/Current Signaling



**CONSIDER:**

- S08
- S12
- Qorivva 32-bit
- Kinetis

**EMBEDDED MCU PLUS POWER GENERIC SYSTEM DIAGRAM**

Motor control is the function of regulating the speed, rotation and torque of a motor.

**TYPICAL APPLICATIONS:**

- Blowers
- Fans
- Pumps
- Power Seats
- Power Windows
- Power Door Locks
- HVAC Doors/Vents
- Power Sunroof
- Side-view Mirrors
- Keypad
- Light Leveling
- Adaptive Lighting

**LOOP CONTROL SCHEMA:**

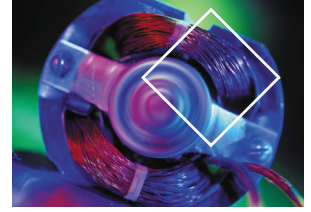
- Speed
- Torque/Current
- Voltage
- Rotation (CW/CCW)
- None (Open Loop)

**POWER CONTROL SCHEMA:**

- ON/OFF
- PWM
- Linear
- Volts/Hertz

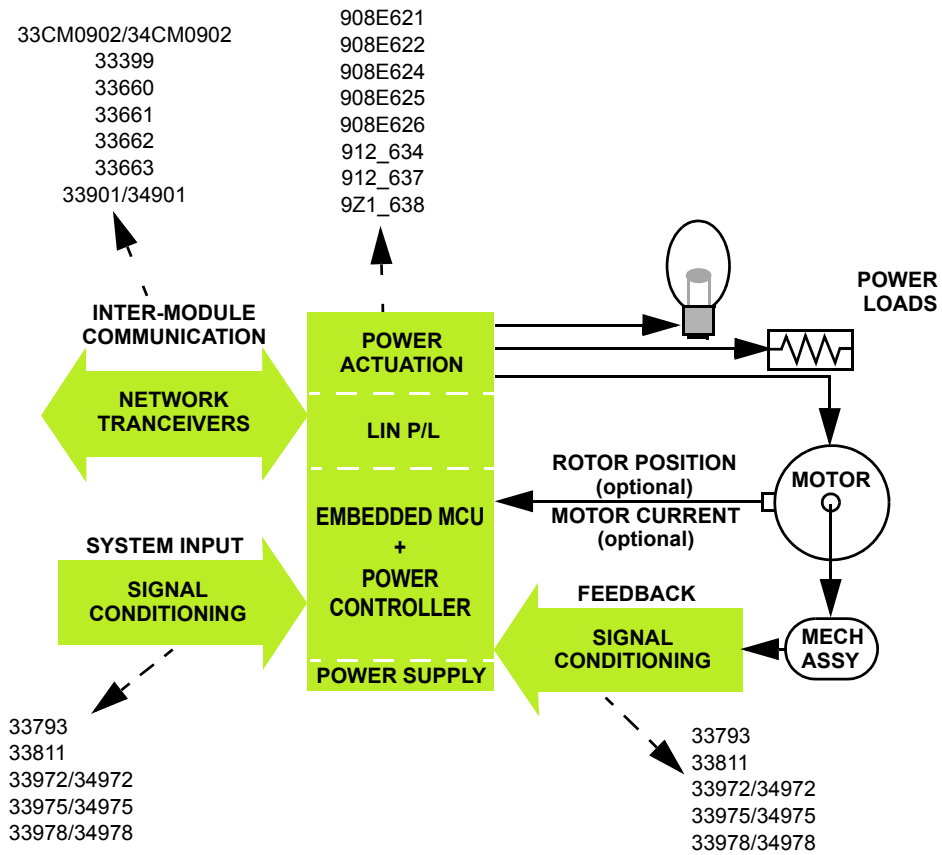
**MOTOR TYPES:**

- DC Brush Commutator
- DC 3-Phase Brushless
- Universal
- 2-Phase Stepper



**EMBEDDED:**

- S12 MagniV
- S12Z
- S12



**BATTERY CHARGER**

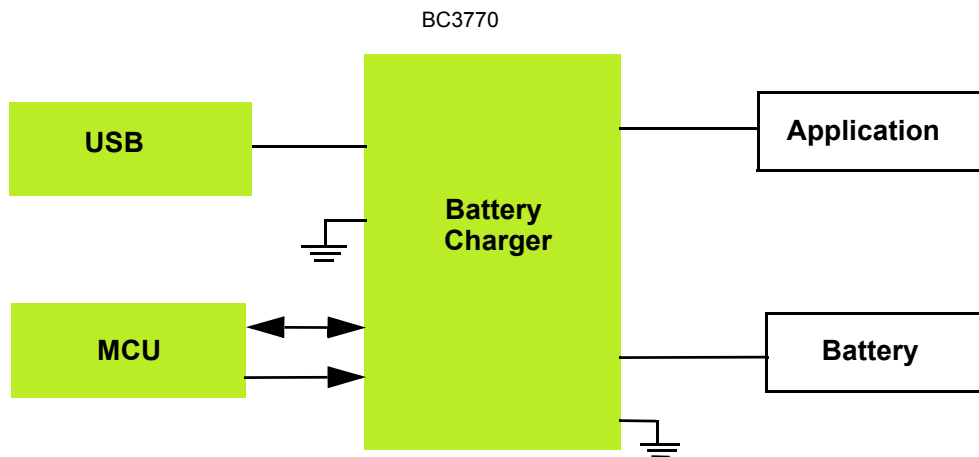
Portable Navigation Devices (PND) are expanding their reach to be embedded in everything from smartphones to auto infotainment systems. Battery Charger provides flexible solutions to develop innovative navigation devices with wide range of features.

**TYPICAL APPLICATIONS:**

- Internet of Things (IoT)
- Handheld consumer devices
- Wearable market
- PoS terminals
- Medical portable equipment
- Consumer tablets

**CHARGE CURRENT TYPES:**

- Constant Charge Current
- Constant Charge Voltage
- Pre-charge
- Trickle





**RADAR SYSTEMS**

77 GHz radar systems support adaptive cruise control, pre-crash protection and collision warning systems with and without automatic steering and braking intervention. In a collision warning system, the radar chipset can detect and track objects, automatically adjusting the vehicle's speed and distance in response to the traffic ahead and triggering a driver warning of an imminent collision and initiate emergency braking intervention.

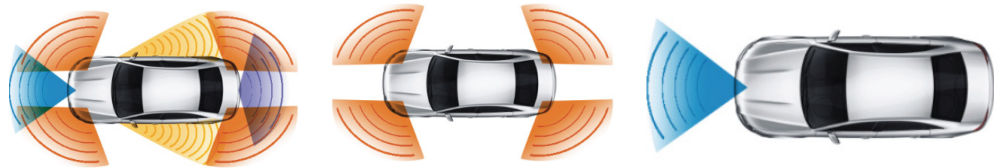
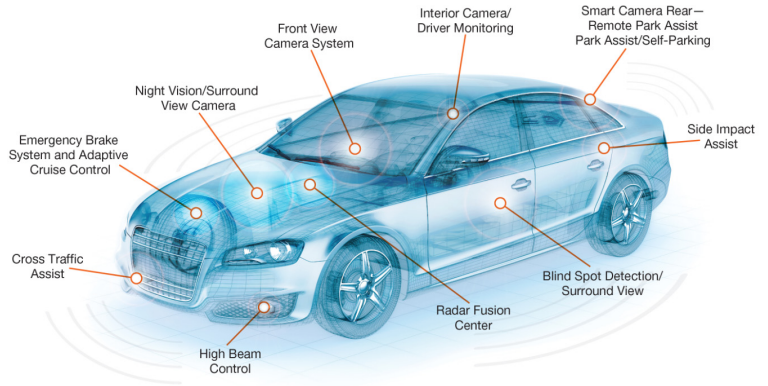
**TYPICAL APPLICATIONS:**

**Automotive**

- Adaptive Cruise Control (ACC)
- Blind-spot Detection (BSD)
- Emergency Braking
- Forward Collision Warning (FCW)
- Headway Alert
- Mitigation and Brake Support
- Pre-crash Detection
- Rear Collision Protection (RCP)
- Stop & Go

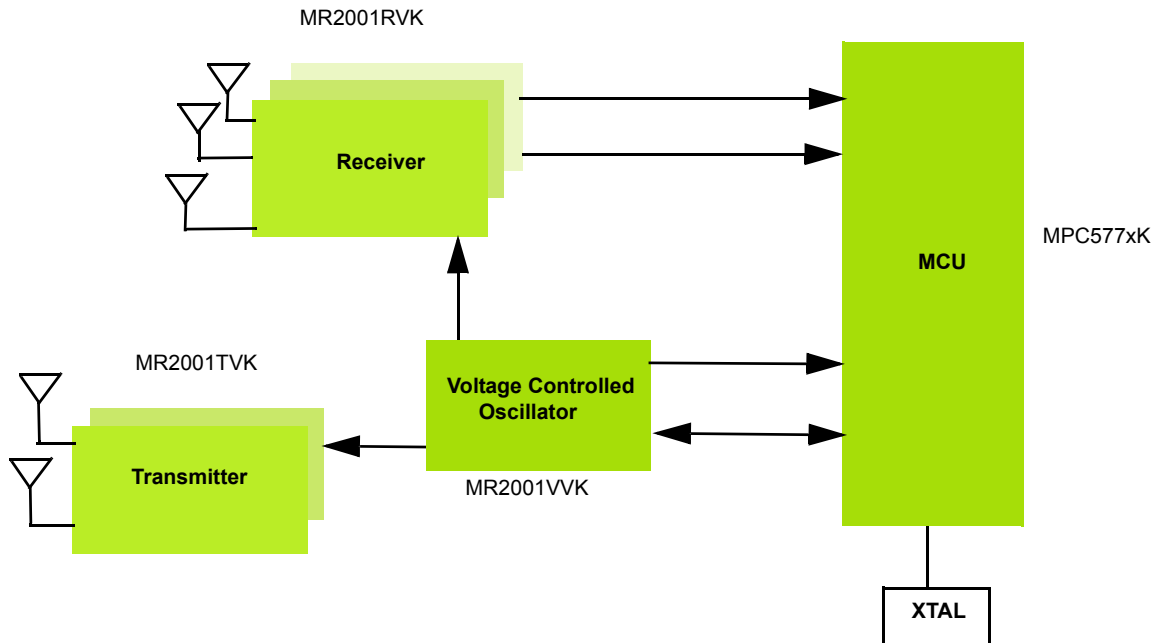
**Industrial**

- Robotics
- Industrial Automation precision monitor
- Industrial Surveillance and Security Systems
- Millimeter Wave Backhaul Systems
- Industrial Safety
- Precision Distance Measurement Systems



**CONSIDER:**

- Qorivva 32-bit



**POWER MANAGEMENT GENERIC SYSTEM DIAGRAM**

Embedded power regulation is the function of converting system input power to the voltages and currents required by the MCU or DSP as well as DDR (Double Data Rate) memory.

**TYPICAL APPLICATIONS:**

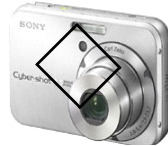
- Industrial Controls
- Embedded Control Modules
- Consumer Appliances
- Marine Electronics
- Engine/Generator Control
- Network Equipment
- Set-Top Box
- Battery Chargers
- Travel Chargers

**LOOP CONTROL SCHEMA:**

- Voltage Mode Feedback
- Current Mode Feedback

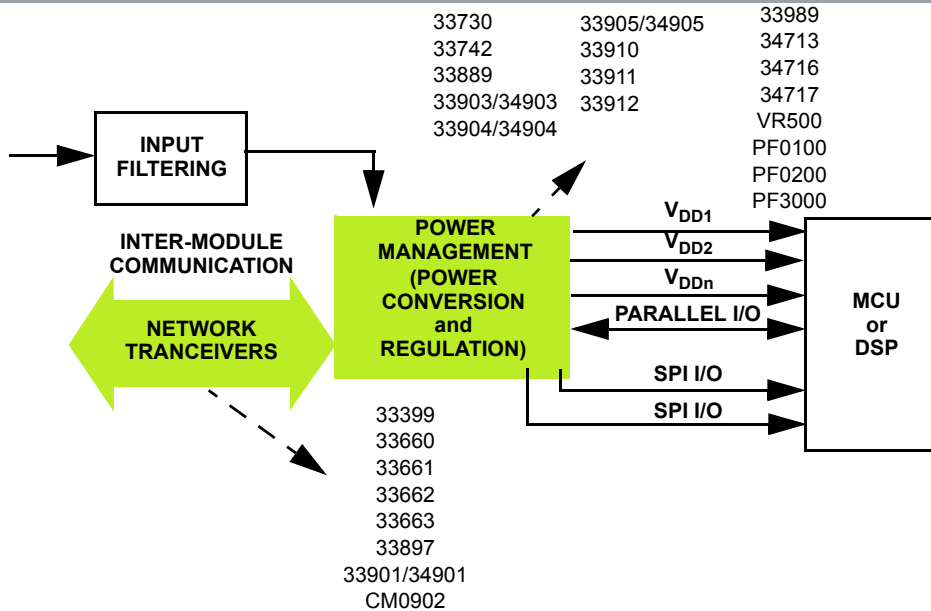
**POWER CONTROL SCHEMA:**

- Linear Regulators
- Switching Regulators
- Battery Management



**CONSIDER:**

- S08
- S12
- i.MX6/7



### BATTERY MANAGEMENT GENERIC SYSTEM DIAGRAM

For lead acid batteries, an intelligent sensor combines the requirements of accurate measurement sensing with logic capability to bring decision making to the sensing solution.

**TYPICAL APPLICATIONS:**

For mission critical battery operations:

**Automotive**

- 12 V Lead Acid, 14V Li-Ion
- HV Battery Junction Box
- Multi-Battery Applications

**Trucks and Utilities**

- 24 V Lead Acid

**Industrial**

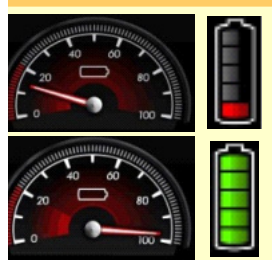
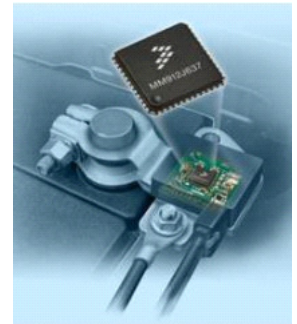
- Energy Storage Systems (ESS)
- UPS
- Industrial Automation precision monitor
- eBike
- Power tools Network Equipment
- Set-Top Box
- Battery Chargers
- Travel Chargers

**LOOP CONTROL SCHEMA:**

- Voltage
- Temperature Current

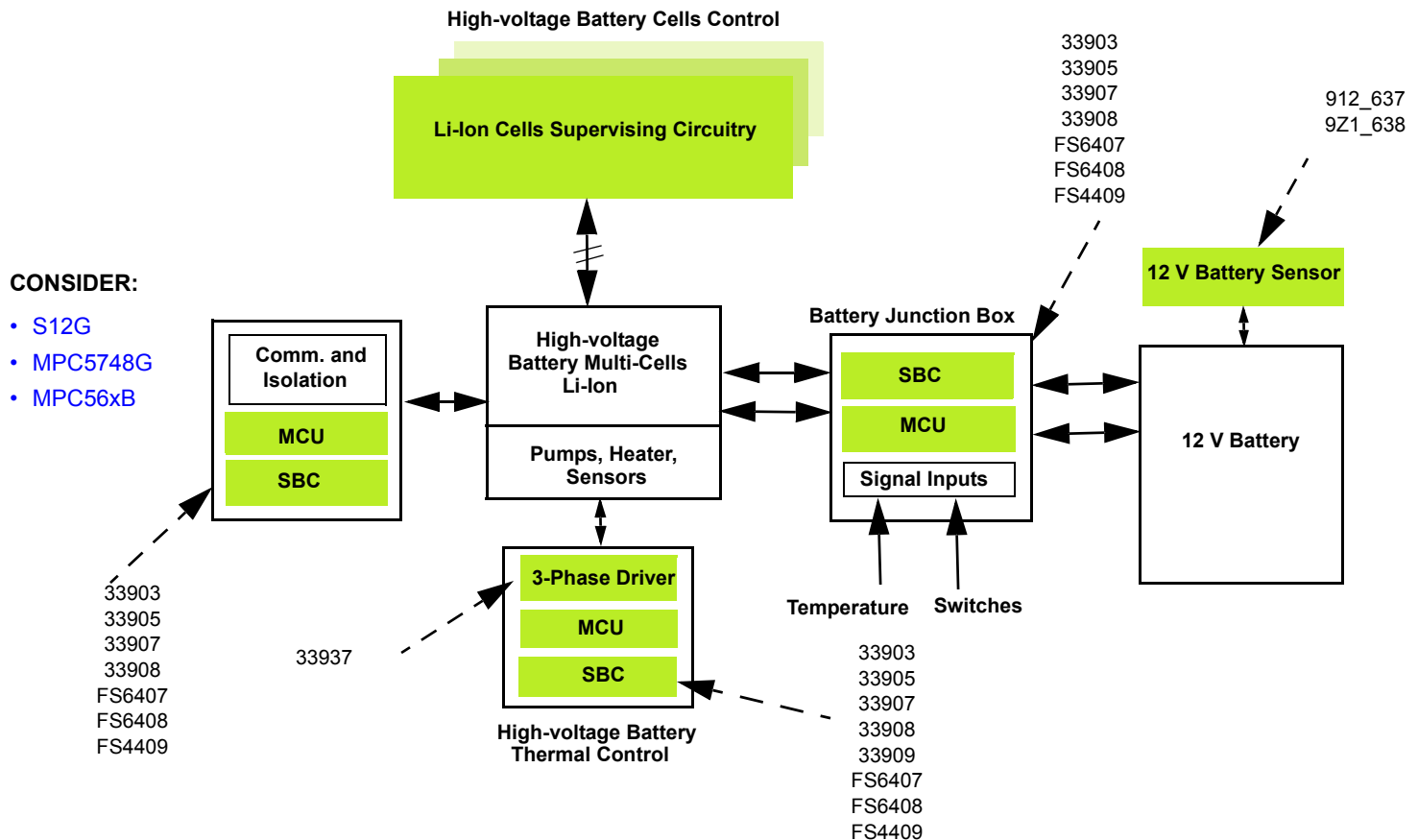
**POWER CONTROL SCHEMA:**

- Linear Regulators



**BATTERY TYPES:**

- 12 V Lead Acid Battery
- 14 V Li-Ion Battery
- Lead Acid Multi-battery



**CONSIDER:**

- S12G
- MPC5748G
- MPC56xB

## ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR

Freescal Part Number	Description	Main Characteristics			
12XS2	12 V Multipurpose Low $R_{DS(on)}$ eXtreme Switch	The eXtreme switch MC12XS2 family consists of very low $R_{DS(on)}$ devices in single or dual high-side configuration to replace electromechanical relays or discrete devices, in power management applications and DC motor control. The devices are designed for harsh environments, and it includes self-recovery features. The devices are suitable for loads with high inrush current, as well as motors and all types of resistive and inductive loads.			
	<b>Product</b>			<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>
	MC33981			Single	1 X 4.0
	MC33982			Single	1 X 2.0
	MC33984			Dual	2 X 4.0
MC33988	Dual	2 X 8.0			
12XS3	12 V Automotive Exterior Lighting Multichannel eXtreme Switch	The eXtreme Switch Gen3 12 V devices are SPI-Controlled smart high-side switches providing diagnostics for the switch, light source and wiring harness, as well as comprehensive fault management and control of the loads without complex software. The devices use a programmable multi-step latched overcurrent shutdown protection.			
	<b>Product</b>			<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>
	MC06XS3517			Penta	3 X 6.0 2 X 17.0
	MC07XS3200			Dual	2 X 7.0
	MC09XS3400			Quad	4 X 9.0
	MC10XS3412			Quad	2 X 10.0 2 X 12.0
	MC10XS3425			Quad	2 X 10.0 2 X 25.0
	MC10XS3435			Quad	2 X 10.0 2 X 35.0
	MC10XS3535			Penta	3 X 10.0 2 X 35.0
	MC15XS3400			Quad	4 X 15.0
	MC35XS3400			Quad	4 X 35.0
MC35XS3500	Penta	5 X 35.0			
12XS6	External Automotive Lighting Multichannel Scalable eXtreme Switch	The Gen4 eXtreme Switch is the latest achievement in automotive lighting drivers. It belongs to an expanding family to control and diagnose bulbs and also the light emitting diodes (LEDs) with enhanced diagnostic precision. It combines flexibility through daisy chainable SPI at 5.0 MHz, extended digital and analog feedbacks, safety and robustness. Its low $R_{DS(on)}$ and high integration allows power and space saving at the module level. It is also compliant with an Asil-B module design. This family is packaged in a Pb-Free power-enhanced SOIC package with exposed pad, which is ELV compliant.			
	<b>Product</b>			<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>
	MC07XS6517			Penta	3 X 7.0 2 X 17.0
	MC08XS6421			Quad	2 X 8.0 2 X 21.0
	MC10XS6200			Dual	2 X 10.0
	MC10XS6225			Dual	1 X 10.0 1 X 25.0
	MC10XS6325			Triple	2 X 10.0 1 X 25.0
	MC17XS6400			Quad	4 X 17.0
	MC17XS6500			Penta	5 X 17.0
	MC25XS6300			Triple	3 X 25.0
MC40XS6500	Penta	5 X 40.0			

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescal Part Number	Description	Main Characteristics		
24XS4	24 V Multipurpose Low $R_{DS(on)}$ Intelligent eXtreme Switch	These devices are part of a 24 V high-side switch product family with integrated control, and a high number of protective and diagnostic functions. It is designed for truck, bus, and 24 V based transportation systems. The low $R_{DS(on)}$ channels can control different load types; lamps, solenoids, or DC motors. Control, device configuration, and diagnostics are performed through a 16-bit serial peripheral interface (SPI), allowing easy integration into existing applications.		
	<b>Product</b>	<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>	
	MC06XS4200	Dual	2 X 6.0	
	MC10XS4200	Dual	2 X 10.0	
	MC20XS4200	Dual	2 X 20.0	
	MC22XS4200	Dual	2 X 22.0	
	MC50XS4200	Dual	2 X 50.0	
12XSB	12 V Industrial Multipurpose Low $R_{DS(on)}$ eXtreme Switch	The 12 V eXtreme Switch family consists of very low $R_{DS(on)}$ devices in single high-side configuration, to replace electromechanical relays or discrete devices in industrial power management applications and DC motor control. The devices are designed for harsh environments, and include self-recovery features. The devices are suitable for loads with high inrush current, as well as motors and all types of resistive and inductive loads.		
	<b>Product</b>	<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>	
	MC34981	Single	1 X 4.0	
	MC34982	Single	1 X 2.0	
	MC34984	Dual	2 X 4.0	
MC34988	Dual	2 X 8.0		
12XSC	12 V External Industrial Lighting Multichannel eXtreme Switch	The eXtreme switch devices are SPI-controlled smart high-side switches for industrial applications, providing diagnostics, as well as comprehensive fault management and control of the loads without complex software. The devices use a programmable multi-step latched overcurrent shutdown protection. This technique is preferable to the current limit method because it minimizes the thermal stress within the device during an overload condition, greatly reducing the junction temperature rise and vastly improving reliability.		
	<b>Product</b>	<b># of outputs</b>	<b><math>R_{DS(on)}</math> (mOhm)</b>	
	MC06XSC517	Penta	3 X 6.0 2 X 17.0	
	MC07XSC200	Dual	2 X 7.0	
	MC09XSC400	Quad	4 X 9.0	
	MC10XSC412	Quad	2 X 10.0 2 X 12.0	
	MC10XSC425	Quad	2 X 10.0 2 X 25.0	
	MC10XSC435	Quad	2 X 10.0 2 X 35.0	
	MC10XSC535	Penta	3 X 10.0 2 X 35.0	
	MC15XSC400	Quad	4 X 15.0	
	MC35XSC400	Quad	4 X 35.0	
MC35XSC500	Penta	5 X 35.0		

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescle Part Number	Description			Main Characteristics
12XSF	External Industrial Lighting Multichannel Scalable eXtreme Switch			The eXtreme switch products are the latest achievement in DC motors and industrial lighting drivers. They belong to an expanding family to control and diagnose various types of loads, such as incandescent bulbs or light emitting diodes (LEDs), with enhanced precision. The products combine flexibility through daisy chainable SPI at 5.0 MHz, extended digital and analog feedbacks, which supports safety and robustness. This new generation of Freescale's high-side switch products family facilitates electronic control unit designs supported by the use of compatible MCU software and PCB footprints, for each device variant.
	Product	# of outputs	R <sub>DS(on)</sub> (mOhm)	
	MC07XSF517	Penta	3 X 7.0 2 X 17.0	
	MC08XSF421	Quad	2 X 8.0 2 X 21.0	
	MC10XSF200	Dual	2 X 10.0	
	MC10XSF225	Dual	1 X 10.0 1 X 25.0	
	MC10XSF325	Triple	2 X 10.0 1 X 25.0	
	MC17XSF400	Quad	4 X 17.0	
	MC17XSF500	Penta	5 X 17.0	
	MC25XSF300	Triple	3 X 25.0	
MC40XSF500	Penta	5 X 40.0		
36XSD	36 V Multipurpose Industrial Low R <sub>DS(on)</sub> Intelligent eXtreme Switch			Freescale's family of intelligent, dual high-side eXtreme switches for 36 V systems offers devices with current capability ranging from one to 12 A DC that are fully compatible in footprint and software within the PQFN sub family. Each output can be programmed to be used for any kind of loads, including lamps, LEDs, motors or solenoids. This allows customers to design a flexible module which can become specific and optimized for a given application through software. Freescale's 36 V eXtreme switch solution provides robust design, intelligence and safety needed for industrial applications up to 36 V supply voltage.
	Product	# of outputs	R <sub>DS(on)</sub> (mOhm)	
	MC06XSD200	Dual	2 X 6.0	
	MC10XSD200	Dual	2 X 10.0	
	MC16XSD200	Dual	2 X 16.0	
	MC22XSD200	Dual	2 X 22.0	
MC50XSD200	Dual	2 X 50.0		
33399	Local Interconnect Network (LIN) Physical Interface			LIN Transceiver with Wake and Enable Inputs, Inhibit Output
33660	ISO K Line Serial Link Interface			A serial link bus interface device designed to provide bi-directional half-duplex communication interfacing in automotive diagnostic applications. It is designed to meet the automotive diagnostic systems ISO9141 specification.
33661	Enhanced LIN Transceiver			Selectable Slew Rate for Operations at 10, 20, and 100 kbps; Bus Short to Ground Fail-safe; Excellent EMC Behavior
33662	LIN 2.1 / SAEJ2602-2, LIN Physical Layer Transceiver			The 33662s are physical Layer components dedicated to automotive LIN sub-bus applications. They features either a 20 kbps baud rate or a 10 kbps baud rate. The 33662s integrate fast baud rate for test and programming modes, and provide excellent ESD robustness, immunity against disturbance, and radiated emission performance.
33663	LIN 2.1 / SAEJ2602-2 Dual LIN Physical Layer			The 33663 product line integrates two physical layer LIN bus dedicated to automotive LIN sub-bus applications. The MC33663LEF and MC33663SEF devices offer normal baud rate (20 kbps) and the MC33663JEF slow baud rate (10 kbps). Both devices integrate fast baud rate (above 100 kbps) for test and programming modes.
33664	Isolated Network High-speed Transceiver Physical Layer (TPL)			The 33664TL is a transceiver physical layer transformer driver designed to conveniently interface a microcontroller to a high-speed isolated communication network.

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescall Part Number	Description	Main Characteristics
33730	Switch Mode Power Supply with Multiple Linear Regulators	The 33730 is a multiple output power supply integrated circuit for automotive applications. The integrated circuit (IC) incorporates a switching regulator which operates over a wide input voltage range from +4.5 V to +26.5 V. The step-down switching regulator uses a fixed frequency PWM voltage mode control. It has a 3.5 A current limit (typical) and the slew-rate is adjustable via a control pin to reduce switching noise. The linear regulators can be configured either as two normal mode regulators (VDD3, VDDL) and one standby regulator (VKAM), or as one normal mode linear regulator (VDDL) and two standby regulators (VKAM and VDD3 Standby).
33742	System Basis Chip with Enhanced High-speed CAN Transceiver	SBC, Dual $V_{REG}$ , Enhance HS CAN with Bus Failure Diagnostic Capability, 4 Wake-up Inputs
33771	Battery Cell Controller IC (BCC)	The 33771 is a lithium ion Battery Cell Controller IC designed for automotive applications, such as hybrid electric (HEV) and electric vehicle (EV) systems as well as industrial applications, such as energy storage systems (ESS) and uninterruptible power supply (UPS) systems.
33780	Dual DBUS Master with Differential Drive and Frequency Spreading	The 33780 is a master device for two differential DBUS buses. It contains the logic to interface the buses to a standard serial peripheral interface (SPI) port and the analog circuitry to drive data and power over the bus as well as receive data from the remote slave devices.
33781	Quad DBUS Master with Differential Drive and Frequency Spreading	The 33781 is a master device for four differential DBUS buses. It contains the logic to interface the buses to a standard serial peripheral interface (SPI) port and the analog circuitry to drive data and power over the bus as well as receive data from the remote slave devices.
33784	Distributed System Interface (DSI) Sensor Interface	2-Channel, 10-Bit A-to-D, 5.0 V Regulated Output, DSI Bus, 3 Configurable I/O, Fault Tolerant, High Drive Output
33789	Airbag System Basis Chip (SBC) with Power Supply and PSI5 Sensor Interface	The 33789 offers an industry standard serial peripheral interface (SPI) and four PSI5 master interfaces. The 33789 has a dedicated safing state machine that complements an airbag's MCU hardware/ software safing approach. Also included are a diagnostic - self protection capability.
33790	Two-Channel Distributed System Interface (DSI) Physical Interface Device	The 33790 is a dual channel physical layer interface IC for the Distributed System Interface (DSI) bus. It is designed to meet automotive requirements. It can also be used in non automotive applications. It supports bidirectional communication between slave and master ICs. Some slave devices derive a regulated 5.0 V from the bus, which can be used to power sensors, thereby eliminating the need for additional circuitry and wiring.
33793	Distributed System Interface (DSI) Share Interface Sensor	4-Channel, 8-Bit A-to-D, 5.0 V Regulated Output, DSI Bus, Configurable I/O, Fault Tolerant
33800	Engine Control Integrated Circuit (IC)	16 Channel low-side and gate driver IC. Provides 8 low-side switches, 2 constant current low-side switches, and 6 external MOSFET gate drivers.
33810	Eight Channel Ignition and Injector Driver	8 Channel load driver. Comprised of 4 low-side output drivers and 4 external MOSFET, or IGBT gate drivers
33811	Solenoid Monitor Integrated Circuit (IC)	A 5 Channel solenoid monitor IC. Provides verification of solenoid operation by monitoring the solenoid current waveform.
33812	Multifunction Ignition and Injector Driver	Three low-side drivers, one pre-driver, a +5.0 V voltage pre-regulator, an MCU watchdog circuit and a ISO 9141 K-Line interface, for single/ dual cylinder engine control.
PT2000	Programmable Solenoid Controller	The PT2000 is a SMARTMOS programmable gate driver IC for precision solenoid control applications, which makes the component very flexible and relieves the main microcontroller from the heavy task of the actuator control.
33879	Configurable Octal Serial Switch with Open Load Detect Current Disable	An 8-output hardware-configurable, high-side/low-side switch, with a 16-bit serial (SPI) input control. 0.75 Ohm $R_{DS(on)}$
33880	Configurable Eight Output Control Switch with SPI (0.55 Ohm $R_{DS(on)}$ )	8-output hardware configurable high-side/low-side switch with 8-bit serial input control
33882	Output Switch with SPI and Parallel Input Control (0.3 Ohm $R_{DS(on)}$ ). Contains 6 Low-side Switches.	Fully protected, 6 x 1.0 a (SPI and parallel control) + 2 x 30 ma (parallel control) switches, and SPI diagnostics
33886	H-Bridge Driver (5.0 A H-Bridge)	Monolithic H-Bridge ideal for fractional horsepower DC motor and bidirectional thrust solenoid control

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescale Part Number	Description	Main Characteristics
33887	H-Bridge with Load Current Feedback (5.0 A H-Bridge)	Supports forward, reverse, freewheeling, 10 kHz PWM, status, disable inputs, and load current feedback
33889	System Basis Chip with Low Speed Fault Tolerant CAN	2x regulator, high-side switched power, LS CAN, SPI, wake-up inputs, window watchdog, reset, and interrupt
33897	Single Wire CAN Transceiver	Carrier sense multiple access/collision resolution (CSMA/CR) data link, and bus activity sleep/wake-up
33899	Programmable H-Bridge Power Integrated Circuit (IC)	Programmable H-Bridge controller for a DC motor or two solenoids. Parallel inputs as well as a SPI interface provided control and diagnostic reporting, including PWM'ed outputs.
33CM0902 34CM0902	Dual CAN High-Speed Transceiver	The CM0902 Dual CAN High-speed physical layer is Freescale's cost-effective product designed to target standard CAN High-speed applications requiring multiple transceivers.
33901 34901	High-Speed CAN Transceiver	The 33/34901 is the latest standard cost-effective product designed to target CAN FD (flexible data) operation up to 2 Mbps and used to convert digital protocol information into analog CAN communication. The device supports long-length CAN node interconnects for industrial applications.
33903 34903	System Basis Chip Gen2 with High-Speed CAN and LIN Interface	The 33/34903 is the second generation family of System Basis Chips which combine several features and enhance present module designs. The device works as an advanced power management unit for the MCU and additional integrated circuits such as sensors, CAN transceivers. It has a built-in enhanced high-speed CAN interface (ISO11898-2 and -5), and may include zero, one or two LIN 2.0 interfaces
33904 34904	System Basis Chip Gen2 with High-speed CAN	The 33/34904 is the second generation family of System Basis Chips which combine several features and enhance present module designs. The device works as an advanced power management unit for the MCU and additional integrated circuits such as sensors, CAN transceivers. It has a built-in enhanced high-speed CAN interface (ISO11898-2 and -5).
33905 34905	System Basis Chip Gen2 with High-speed CAN and LIN Interface	The 33/34905 is the second generation family of System Basis Chips which combine several features and enhance present module designs. The device works as an advanced power management unit for the MCU and additional integrated circuits such as sensors, CAN transceivers. It has a built-in enhanced high-speed CAN interface (ISO11898-2 and -5), and may include one or two LIN 2.0 interfaces.
33910 34910	System Basis Chip (SBC) with LIN Transceiver - Low End	SBC device combines a 5.0 V, 60 mA LDO, LIN transceiver, a high-side switch output, one analog/logic input and a watchdog timer, with SPI and PWM control
33911 34911	System Basis Chip (SBC) with LIN Transceiver - Medium End	SBC device combines a 5.0 V, 60 mA LDO, LIN transceiver, one high-side switch output, two low-side switch outputs, two analog/logic inputs and a watchdog timer, with SPI and PWM control.
33912 34912	System Basis Chip (SBC) with LIN Transceiver - High End	SBC device combines a 5.0 V, 60 mA LDO, a switched 5.0 V output, LIN transceiver, two high-side switch outputs, two low-side switch outputs, four analog/logic inputs and a watchdog timer, with SPI and PWM control.
33926	5.0 A throttle Control H-Bridge Power Integrated Circuit (IC)	This device drives a DC motor or 2 solenoids for actuator control. Parallel input control of outputs and fault reporting.
33931 34931	5.0 A Throttle Control H-Bridge	The 33/34931 is a monolithic H-Bridge power IC in a robust thermally enhanced package. It is designed for automotive electronic throttle control, but is applicable to any industrial low-voltage DC servo motor control application.
33932 34932	5.0 A Throttle Control H-Bridge (Dual)	The 33/34932 is a monolithic H-Bridge power IC in a robust thermally enhanced package. The 33/34932 has two independent monolithic H-Bridge Power ICs in the same package. They are designed for automotive electronic throttle control, but is applicable to any industrial low-voltage DC servo motor control application.
33937 34937	Three Phase Field Effect Transistor Pre-driver	The 33/34937 is a field effect transistor (FET) pre-driver designed for three phase motor control and similar applications. The IC contains three high-side FET pre-drivers and three low-side FET pre-drivers. Three external bootstrap capacitors provide gate charge to the high-side FETs.



**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescal Part Number	Description	Main Characteristics
33972 34972	Multiple Switch Detection Interface with Suppressed Wake-up	Multiple switch detection interface with suppressed wake-up designed to detect closing and opening of up to 22-switch contacts.
33975 34975	Multiple Switch Detection Interface with Suppressed Wake-up and 32 mA Wetting Current	22 inputs contact monitoring (14 GND, 8 configurable), and selectable wake-up on change of state.
33978 34978	Configurable IO - Multiple Switch Detection Interface	The MC33978/MC34978 configurable I/O is an analog switch interface used to translate 22 I/Os onto a single MCU SPI bus, with low power auto-wake modes and programmable wetting currents.
33989	System Basis Chip with High-speed CAN	2x regulator, high-side switched power, SPI, wake-up inputs, window watchdog, interrupt, and CAN transceiver
33996	16 Output Switch with SPI Control. (0.55 Ohm $R_{DS(on)}$ )	A 16-output low-side switch with a 24-bit serial input control (SPI), for control and diagnostics. Outputs are current limited (0.9 to 2.5 A). Output voltage clamp of +50 V during inductive switching. selectable PWM control of outputs. Protection circuits
33999	16 Output Switch with SPI and PWM Control (0.55 Ohm $R_{DS(on)}$ )	A 16-output low-side switch with a 24-bit serial control (SPI) The SPI provides both input control and diagnostic readout. Eight parallel inputs also provide direct pulse width modulation (PWM) control of eight dedicated outputs. Reset input.
MR2001	77 GHz Radar Transceiver Chipset	The MR2001 is a high-performance 77 GHz radar transceiver chipset scalable for multi-channel operation enabling a single radar platform with electronic beam steering and wide field of view to support long-range radar (LRR), mid-range radar (MRR) and short-range radar (SRR) applications.
34671	600 mA High Input Voltage Charger for Single-cell Li-Ion and Li-Polymer Batteries	The MC34671 is a cost-effective fully integrated battery charger for Li-Ion or Li-Polymer batteries. It tolerates an input voltage up to 28 V, which eliminates the input over-voltage protection circuit required in handheld devices. A charge cycle includes trickle, constant-current (CC) and constant-voltage (CV) charge modes.
34673	1.2 A High Input Voltage Charger for Single Cell Li-Ion and Li-Polymer Batteries	The MC34673 is a cost-effective fully-integrated battery charger for Li-Ion or Li-Polymer batteries. It tolerates an input voltage up to 28 V, which eliminates the input over-voltage protection circuit required in handheld devices. A charge cycle includes trickle, constant-current (CC) and constant-voltage (CV) charge modes.
34674	High Input Voltage Travel Charger for Single Cell Li-Ion and Li-Polymer Batteries	The MC34674 is a fully integrated single-cell Li-Ion and Li-Polymer battery charger optimized for travel charger applications. The few external components required include a dual color LED for charge status indication, a negative temperature coefficient (NTC) thermistor circuit for setting the charge temperature window, and two decoupling capacitors. The MC34674 tolerates an input voltage up to 28 V, which allows low cost AC/DC converters to be used for further system cost reduction. A charge cycle of the MC34674 includes trickle, constant current (CC) and constant voltage (CV) charge modes. The CC-mode current is selectable from 50 mA to 1.05 A, with 10% accuracy and the constant-output voltage in the CV-mode is fixed at 4.2 V.
BC3770	2.0 A Switch-Mode Li-ion/Li-polymer Battery Charger	The BC3770 is a fully programmable switching charger with dual-path output for single-cell Li-Ion and Li-Polymer battery. This dual-path output allows mobile applications with a fully discharged battery to boot up the system.
34676	Dual 28 V Input Voltage Charger with Linear Regulator	The 34676 is a dual 28 V input voltage and fully-integrated single cell Li-Ion battery charger targeting smart handheld applications. One of the inputs is optimized for charging with a USB port and the second is optimized for an AC/DC adapter power source. The charger has two 28 V power devices to eliminate the needs of any external power-source selection and input over-voltage-protection circuitry. Each of the power devices independently controls the charge current from the input and behaves as an independent charger. Only one of the two chargers operates at a time. The AC charger current and the USB charger current are programmable up to 1.2 A and 400 mA with an external resistor respectively.
34700	9-18 V Four Output, Multi-Purpose Switching Power Supply	The 34700 is a compact, high efficiency power supply, with on-chip power MOSFETs that feature three step down switching regulators and one low dropout linear regulator. The switching regulators utilize voltage mode control with external compensation, allowing flexibility in optimizing the performance of the 34700 for a given application.

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescale Part Number	Description	Main Characteristics
34704	Multi-channel Power Management IC (PMIC)	The 34704 is a multi-channel power management IC (PMIC) used to address power management needs for various multimedia application microprocessors. Its ability to provide either 5 or 8 independent output voltages with a single input power supply (2.7 and 5.5 V) together with its high efficiency, make it ideal for portable devices powered up by Li-Ion/polymer batteries or for USB powered devices as well.
34708	Power Management Integrated Circuit (PMIC) for the i.MX50/53 Families	The 34708 is the PMIC designed specifically for use with the Freescale i.MX50 and i.MX53 processor families. As the companion PMIC on several i.MX reference designs, it is a proven solution, which enables a faster time to market with fewer resources.
34709	Power Management Integrated Circuit (PMIC) for i.MX50/53 Families	The 34709 is the Power Management Integrated Circuit (PMIC) designed primarily for use with the Freescale i.MX50 and i.MX53 families. It offers a low cost solution targeting embedded applications that do not require a battery charger.
34VR500	Power Management Integrated Circuit for QorIQ LS1 networking communications processors	The 34VR500 is a high performance, highly integrated, multi-output, SMARTMOS, DC/DC regulator solution, with integrated power MOSFETs ideally suited for the LS1 family of communication processors.
PF0100	14 Channel Configurable Power Management Integrated Circuit	The PF0100 Power Management Integrated Circuit (PMIC) provides a highly programmable/ configurable architecture, with fully integrated power devices and minimal external components. With up to six buck converters, six linear regulators, RTC supply, and coin-cell charger, the PF0100 can provide power for a complete system, including applications processors, memory, and system peripherals, in a wide range of applications.
PF0200	12 Channel Configurable Power Management Integrated Circuit	The PF0200 Power Management Integrated Circuit (PMIC) provides a highly programmable/ configurable architecture, with fully integrated power devices and minimal external components. With up to four buck converters, one boost regulator, six linear regulators, RTC supply, and coin-cell charger, the PF0200 can provide power for a complete system, including applications processors, memory, and system peripherals, in a wide range of applications.
PF3000	Power Management Integrated Circuit (PMIC) for i.MX 7 & i.MX 6 DL/SL/SX	The PF3000 is a Power Management Integrated Circuit (PMIC) designed specifically for use with the Freescale i.MX 7 and i.MX 6 DL/SL/SX application processors.
34713	Single Synchronous Buck Switching Regulator (5.0 A)	Synchronous buck switching regulator with adjustable output and an accuracy of $\pm 2\%$ and a programmable switch frequency of 200 KHz to 1.0 MHz.
34716	Dual Synchronous Buck Switching Regulators (5.0 A, +/-3.0 A)	Synchronous buck switching regulators with adjustable outputs and an accuracy of $\pm 2\%$ and a programmable switch frequency of 200 KHz to 1.0 MHz.
34717	Dual Synchronous Buck Switching Regulators (5.0 A, 5.0 A)	Synchronous buck switching regulators with adjustable outputs and an accuracy of $\pm 2\%$ and a programmable switch frequency of 200 KHz to 1.0 MHz.
34844	10 Channel LED Backlight Driver with Integrated Power Supply	The 34844 is a high efficiency, LED driver for use in backlighting LCD displays from 10" to 20"+. Operating from supplies of 7.0 to 28 V, the 34844 is capable of driving up to 160 LEDs in 10 parallel strings.
FS6407	Safe System Basis Chip with Buck and Boost DC/DC up to 800 mA	Multiple switching and linear voltage regulators, built-in enhanced high-speed CAN interface fulfills the ISO11898-2 and -5 standards.
FS6408	Safe System Basis Chip with Buck and Boost DC/DC up to 1.5 A	Multiple switching and linear voltage regulators, built-in enhanced high-speed CAN interface fulfills the ISO11898-2 and -5 standards.
33909 FS4409	System Basis Chip with Multiple Switch-to-Ground Interface	The 33909/34FS4409 integrates the common functionality of system basis chips with switch detection inputs. The device works as an advanced power management unit for the MCU and additional integrated circuits such as sensors, CAN transceivers, and eXtreme switches.
34933	1.4 A Dual H-Bridge Driver Compatible with 3.0 V Logic	The 34933 is a two channel H-Bridge driver aimed at the digital camera market. There are a variety of applications containing bipolar step motors and/or brush DC motors, such as Auto Focus control for the digital camera lens. The 34933 uses Freescale's proprietary SMOS8 Bi CMOS process to deliver a low power device, with a maximum quiescent current of 100 $\mu$ A for the motor drive supply and 400 $\mu$ A for the Control Logic supply.

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

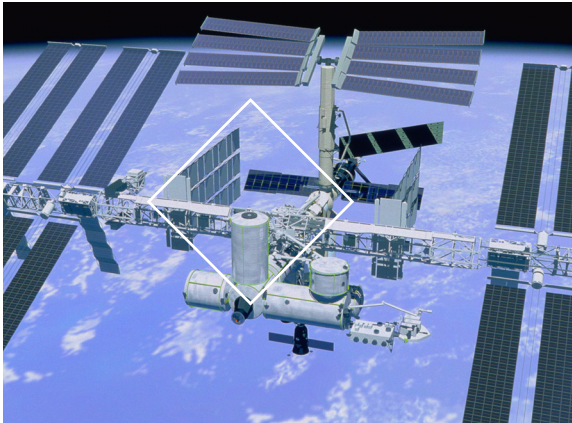
Freescal Part Number	Description	Main Characteristics
908E621	Integrated Quad Half-bridge and Triple High-side with Embedded MCU and LIN for High End Mirror	A high performance HC08 microcontroller with a <i>SMARTMOS</i> analog control IC. The analog control die provides four half-bridges and three high-side outputs with diagnostic functions, a Hall Effect sensor input, analog inputs, voltage regulator, window watchdog, and local interconnect network (LIN) physical layer.
908E622	Integrated Quad Half-bridge, Triple High-side and EC Glass Driver with Embedded MCU and LIN for High End Mirror	A high performance HC08 microcontroller with a <i>SMARTMOS</i> analog control IC. The analog control die provides four half-bridge and three high-side outputs with diagnostic functions, an EC glass driver circuit, a Hall Effect sensor input, analog inputs, voltage regulator, window watchdog, and local interconnect network (LIN) physical layer.
908E624	Integrated Triple High-side Switch with Embedded MCU and LIN Serial Communication for Relay Drivers	A high performance HC08 microcontroller with a <i>SMARTMOS</i> analog control IC. The analog control die provides three high-side outputs with diagnostic functions, voltage regulator, watchdog, current sense operational amplifier, and local interconnect network (LIN) physical layer.
908E625	Integrated Quad Half H-Bridge with Power Supply, Embedded MCU, and LIN Serial Communication	A high performance HC08 microcontroller with a <i>SMARTMOS</i> analog control IC. The analog control die provides fully protected H-Bridge/high-side outputs, voltage regulator, autonomous watchdog with cyclic wake-up, and local interconnect network (LIN) physical layer.
908E626	Integrated Stepper Motor Driver with Embedded MCU and LIN Serial Communication	The analog control die provides fully protected H-Bridge outputs, voltage regulator, autonomous watchdog, and local interconnect network (LIN) physical layer.
912_634	Integrated S12 Based Relay Driver products with LIN, with 32/ 48/ 64 kB Flash memory	The MM912_634 products are integrated single package solutions that integrate an HCS12 microcontroller with a <i>SMARTMOS</i> analog control IC, which combine a system base chip and application specific functions, including a Local Interconnect Network (LIN) transceiver
912_637	Battery Sensor with LIN for 12 V Lead-acid Batteries	The MM912_637 is an integrated single package solution that integrates an HCS12 microcontroller, with a <i>SMARTMOS</i> analog control IC containing system base chip and application specific functions, including a LIN transceiver
9Z1_638	Battery Sensor with CAN and LIN	The MM9Z1_638 enables precision measurement of key battery parameters in automotive and other applications. The device integrates an S12Z microcontroller and a <i>SMARTMOS</i> analog control IC into a single package solution.
912_P812	S12P MCU and Multifunctional Ignition and Injector Driver System In Package (SiP)	The MM912_P812 is an engine control IC combining an MCU (S12P) and analog control die (MC33812) intended for motorcycle and other single/dual cylinders small engine control applications.
912_S812	S12XS MCU and Multifunctional Ignition and Injector Driver System In Package (SiP)	The MM912_S812 is an engine control IC combining an MCU (S12XS) and analog control die (MC33812) intended for motorcycle and other single/dual cylinders small engine control applications.
17510	0.45 Ohm (TYP) H-Bridge Motor Driver	The 17510 is a monolithic H-Bridge that is ideal in portable electronic applications to control small brush DC motors such as digital still and single lens cameras.
17529	0.7 Ohm TYP Dual H-Bridge Motor Driver	The 17529 is a monolithic dual H-Bridge that is ideal in portable electronic applications to control bipolar stepper motors and brush DC motors such as found in camera lens shutters, optical disk drives and other head positioners.
17531	700 mA Dual H-Bridge Motor Driver with 3.0 V Compatible Logic I/O	The 17531 is a monolithic dual H-Bridge driver IC with integrated charge pump and protection.
17533	0.7 Ohm (TYP) Dual H-Bridge Motor Driver	The 17533 is a monolithic dual H-Bridge IC that is ideal in portable electronic applications for controlling stepper or brush DC-motors for example, camera lens shutters and optical disk drives.
17C724	0.4 Amp Dual H-Bridge Motor Driver IC	A dual-channel H-Bridge power IC is deal for portable electronic applications containing bipolar stepper motors or brush DC motors, like those in cameras.
33HB2000	10 A H-Bridge, Programmable Brushed DC Motor Driver	The 33HB2000 is a monolithic H-Bridge Power IC, enhanced with SPI configurability and diagnostic capabilities.
33HB2001	10 A H-Bridge, Programmable Brushed DC Motor Driver	The 33HB2001 is a monolithic H-Bridge Power IC, enhanced with SPI configurability and diagnostic capabilities.
33GD3000 34GD3000	Three Phase Field Effect Transistor Pre-driver	The GD3000 is a field effect transistor (FET) pre-driver designed for three phase motor control and similar applications.

**ANALOG DEVICES FOR POWER ACTUATION, POWER MANAGEMENT, NETWORK TRANSCEIVERS, SIGNAL CONDITIONING, AND RADAR (continued)**

Freescal Part Number	Description	Main Characteristics
<a href="#">SB0400</a>	Two-Wheel Antilock Braking (ABS) Controller for Motorcycles	The MC33SB0400 motorcycle antilock brake (ABS) controller has two high current low-side drivers for solenoid valves, two configurable wheel speed sense inputs for active sensors, and high-side gate drivers for controlling two external N-channel MOSFETs.
<a href="#">SB0401</a>	One-Wheel Antilock Braking (ABS) for Motorcycles	The MC33SB0401 motorcycle antilock brake (ABS) controller has four high current low-side drivers for solenoid valves, two configurable wheel speed sense inputs for handling active sensors, and high-side gate drivers for controlling two external N-channel MOSFETs.
<a href="#">34SB0410</a>	Quad Valve Controller System on Chip	The Quad Valve Controller system on a chip (SoC), with integrated pump driver, consists of four regulated low-side drivers and a high-side driver to control a DC motor.
<a href="#">34SB0800</a>	Octal Valve Controller System on Chip	The Octal Valve Controller system on a chip (SoC), with integrated pump driver, consists of four regulated low-side drivers and four digital low-side driver, plus a high-side driver to control a DC motor.

References	Topic	URL
<a href="#">BR1567</a>	Analog ICs Integrated Solutions Technology - Brochure	<a href="http://www.freescale.com/files/analog/doc/brochure/BR1567.pdf">http://www.freescale.com/files/analog/doc/brochure/BR1567.pdf</a>
<a href="#">BR1568</a>	Analog ICs Integrated Solutions Packaging - Brochure	<a href="http://www.freescale.com/files/analog/doc/brochure/BR1568.pdf">http://www.freescale.com/files/analog/doc/brochure/BR1568.pdf</a>
<a href="#">SG1002</a>	Analog, Mixed Signal and Power Management - Selector Guide	<a href="http://www.freescale.com/files/shared/doc/selector_guide/SG1002.pdf">http://www.freescale.com/files/shared/doc/selector_guide/SG1002.pdf</a>
<a href="#">SG187</a>	Automotive - Selector Guide	<a href="http://www.freescale.com/files/microcontrollers/doc/selector_guide/SG187.pdf">http://www.freescale.com/files/microcontrollers/doc/selector_guide/SG187.pdf</a>
<a href="#">SG200</a>	Analog and Power Management Industrial Products - Selector Guide	<a href="http://www.freescale.com/files/shared/doc/selector_guide/SG200.pdf">http://www.freescale.com/files/shared/doc/selector_guide/SG200.pdf</a>
<a href="#">BRAUTOSOL</a>	Automotive Solutions - Brochure	<a href="http://www.freescale.com/files/microcontrollers/doc/brochure/BRAUTOSOL.pdf">http://www.freescale.com/files/microcontrollers/doc/brochure/BRAUTOSOL.pdf</a>
<a href="#">MDAPPUSGDRM118</a>	Medical Applications - User Guide	<a href="http://www.freescale.com/files/microcontrollers/doc/user_guide/MDAPPUSGDRM118.pdf">http://www.freescale.com/files/microcontrollers/doc/user_guide/MDAPPUSGDRM118.pdf</a>

# Communicating



# Controlling



# Protecting



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