

# Analog and Mixed Signal Power Management

Quarter 2, 2009  
SG1002Q22009 Rev 0

**Analog and Mixed Signal**  
Power Actuation  
Network Transceivers  
Signal Conditioning  
System Basis Chip  
Embedded MCU + Power

**Power Management**  
Linear Regulator  
Switching Regulator  
LED Drivers  
Battery Management  
Power over Ethernet

# FREESCALE SEMICONDUCTOR ANALOG AND MIXED SIGNAL PRODUCTS

The product categories range from Power Actuation and Network Transceivers to Signal Conditioning and Embedded MCU + Power. Power Actuation covers a broad range of load control and drivers, including motor control.

**SMARTMOS™**—Freescale Semiconductor SMARTMOS technology allows designers to interface high-precision components with the harsh automotive environment.

**Cost-Effective**—Ideally suited for rugged automotive applications, SMARTMOS solutions offer a cost-effective blend of analog, digital, and robust power silicon that enables integrated, mixed-signal, power control ICs.

**Functionality**—SMARTMOS solutions implement traditional analog functions with smaller die size, and a modular process produces components with the minimum number of process steps for each circuit, minimizing overhead.

**Benefits**—Freescale Semiconductor SMARTMOS technology brings a wide range of benefits to today's designs, including component reductions, power flexibility, durability, efficiency, precision, high-performance analog, and robustness.

**Packaging** - Freescale devices may be offered in EPP and RoHS compliant packages; view the external web for specifics.

For additional information, visit:

Documentation, Tool, and Product Libraries  
[www.freescale.com](http://www.freescale.com)  
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## ANALOG AND MIXED SIGNAL PRODUCTS

### Power Actuation — Low-Side Switches (Solid State Intelligent Switches)

Product	Description	No of Outputs	High-Side or Low-Side	Continuous Current Each Output (A)	R <sub>DS(on)</sub> (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max (μA)	Control <sup>1</sup>	Status/Fault Reporting	Protection Features	Packaging	Status
MC33800	Engine Control IC, with Eight Low-Side Switches, Two Constant Current Low-Side Switches and Six MOSFET gate pre-drivers	8	L	8 @ 0.35	2 @ 700 6 @ 1000	2 @ 6.0 6 @ 2.0	30	Parallel, SPI	SPI	Open Load detect, Overcurrent protect, Overvoltage protect, Shorted Load detect, Undervoltage protect, Thermal protect	54-pin SOICW Exposed Pad	Production EVB
MC33810	Engine Control Integrated Circuit capable of driving a combination of four Low-Side loads and four MOSFETs or IGBT gates	4	L	1.0	100	6.0	30	Parallel, SPI	SPI Status Flags	Shorted Load detect, Thermal protect	32-pin SOICW Exposed Pad	Production EVB
MC33812	Engine control power IC, with three Low-Side drivers, one pre-driver, +5V pre-regulator, ISO-9141 physical interface and MCU watchdog circuit.	3	L	2 @ 4.5 1 @ 1.5	2 @ 200 1 @ 1000	2 @ 6.0 1 @ 2.0	2 @ 1000 1 @ 20	Parallel	Parallel	Overcurrent, Outputs Short to Battery, Overtemperature protect	32-pin SOICW Exposed Pad	2Q2009
MC33879	(1.0 Ω R <sub>DS(on)</sub> ) Configurable Eight Output SPI Controlled Switch	8	H/L	0.35	550	1.2	25	SPI w/ 2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW Exposed Pad	Production EVB
MC33880	(1.0 Ω R <sub>DS(on)</sub> ) Configurable Eight Output SPI Controlled Switch	8	H/L	0.5	550	1.2	25	SPI w/ 2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW	Production EVB
MC33882	(0.8 Ω R <sub>DS(on)</sub> ) Smart Six Output Switch with SPI and Parallel Input Control	8	L	1.0	375	3.0	10	SPI	SPI	Short Circuit, Current Limit, Temp Sense	30-pin HSOP	Production
MC33888	Quad High-Side Switch and Octal Low-Side Switch	12	H/L	2 @ 10 A 8 @ 500 mA 2 @ 5.0 A	2 x 10, 2 x 40, 8 x 600	45/20	5.0	SPI	SPI	Short Circuit, Current Limit, Temp Sense, Current Recopy	36-pin PQFN	Production
MC33996	16 Output Hardware Low-Side Switch with 24-Bit Serial Input Control	16	L	0.5	450	1.0 to 2.5	50	SPI	SPI	Short Circuit, Current Limit, Temp Sense, Open Load	32-pin SOICW	Production EVB
MC33999	16 Output Hardware Low-Side Switch with 24-Bit Serial Input Control and 8 Parallel Control	16	L	0.5	450	1.0 to 2.5	50	SPI and Parallel	SPI	Short Circuit, Current Limit, Temp Sense, Open Load	54-pin SOICW	Production EVB
MM908E630	See parameters on page 9 (Description column)											

1. Products available with SPI Control work with the KITUSBSP1EVM and the KITUSBSP1DGLVME USB-SPI Interface Boards.

A change bar appears in the left margin to mark the location of new or revised information.

## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Power Actuation — High-Side Switches (Solid State Intelligent Switches)

Product	Description	No of Outputs	High-Side or Low-Side	Continuous Current Each Output (A)	R <sub>DS(on)</sub> (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max (μA)	Control <sup>1</sup>	Status/Fault Reporting	Protection Features	Packaging	Status
MC10XS3412	Quad High-Side Switch (2 x 10 mΩ, 2 x 12 mΩ), with PWM, Protection, Diagnostics and SPI Control	4	H	6.0	2 x 10, 2 x 12	30	5.0	SPI and Parallel	SPI	Fail Safe Mode, Overcurrent Shutdown, Overtemperature, Short Circuit	24-pin PQFN	Production EVB
MC10XS3435	Quad High-Side Switch (2 x 12 mΩ, 2 x 35 mΩ), with PWM, Protection, Diagnostics and SPI Control	4	H	6.0	2 x 10, 2 x 35	30	5.0	SPI and Parallel	SPI	Fail Safe Mode, Overcurrent Shutdown, Overtemperature, Short Circuit	24-pin PQFN	Production EVB
MC15XS3400	Quad High-Side Switch (4 x 15 mΩ), with PWM, Protection, Diagnostics and SPI Control	4	H	6.0	15	30	5.0	SPI and Parallel	SPI	Fail Safe Mode, Overcurrent Shutdown, Overtemperature, Short Circuit	24-pin PQFN	Production EVB
MC33580B	Quad High-Side Switch (15 mΩ), with Protection and Diagnostics	4	H	10	15	100	5.0	SPI and Parallel	SPI, Status Pin	Overcurrent, Overtemperature, Short Circuit, Reverse Battery, Undervoltage Lock Out	24-pin PQFN	Production
MC33874B	Quad High-Side Switch (35 mΩ), with Protection and Diagnostics	4	H	5	35	55	5.0	SPI and Parallel	SPI, Status Pin	Overcurrent, Overtemperature, Short Circuit, Reverse Battery, Undervoltage Lock Out	24-Pin PQFN	Production
MC33879	(1.0 Ω R <sub>DS(on)</sub> ) Configurable Eight Output SPI Controlled Switch	8	H/L	0.35	550	1.2	25	SPI w/ 2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW Exposed Pad	Production EVB
MC33880	Configurable Eight Output SPI Controlled Switch	8	H/L	0.5	550	1.2	25	SPI w/ 2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW	Production EVB
MC33888	Quad High-Side Switch and Octal Low-Side Switch	12	H/L	2 @ 10 A 8 @ 500 mA 2 @ 5.0 A	2 x 10, 2 x 40, 8 x 600	45/20	5.0	SPI	SPI	Short Circuit, Current Limit, Temp Sense, Current Recopy	36-pin PQFN	Production
MC33981B	Single High-Side Switch (4.0 mΩ), with PWM, Protection and Diagnostics	1	H	40.0	4	100	5.0	Parallel	Status Pin, Current Monitor, Temperature	Overcurrent, Overtemperature, Short Circuit, Undervoltage Lock Out	16-pin PQFN	Production
MC33982B	Self Protected 2 mΩ Switch with Diagnostic and Protection	1	H	60.0	2	100 or 150 Selectable	5.0	SPI and Parallel	SPI	Temp Sense, Over/Undervoltage, Shutdown, Overcurrent, Reverse Polarity, Current Recopy	16-pin PQFN	Production EVB
MC33984B	Self Protected 4 mΩ Switch with Diagnostic and Protection	2	H	30.0	4	100 or 75 Selectable	5.0	SPI and Parallel	SPI	Temp Sense, Over/Undervoltage, Shutdown, Overcurrent, Reverse Polarity, Current Recopy	16-pin PQFN	Production EVB
MC35XS3400	Quad High-Side Switch (4 x 35 mΩ), with PWM, Protection, Diagnostics and SPI Control	4	H	6.0	35	30	5.0	SPI and Parallel	SPI	Fail Safe Mode, Overcurrent Shutdown, Overtemperature, Short Circuit	24-pin PQFN	Production EVB
MM908E621	See Embedded MCU + Power (page 9)											
MM908E622	See Embedded MCU + Power (page 9)											
MM908E624	See Embedded MCU + Power (page 9)											
MM908E625	See Embedded MCU + Power (page 9)											
MM908E630	See Embedded MCU + Power (page 9)											

1. Products available with SPI Control work with the KITUSBSPiEVME and the KITUSBSPiDGLVME USB-SPI Interface Boards.

## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Power Actuation — H-Bridges and Motor Drivers

Product	Description	Main Characteristics	No of Outputs	$R_{DS(on)}$ (m $\Omega$ ) of Each Output	Peak Current Limitation (A)	Current Limitation Standby Max	Control <sup>1</sup>	Status Reporting	Protection Features	Packaging	Status
MC33879	(1.0 $\Omega$ $R_{DS(on)}$ ) Configurable Eight Output SPI Controlled Switch	(1.0 $\Omega$ $R_{DS(on)}$ ) Configurable Eight Output SPI Controlled Switch	8	550	1.2	25 $\mu$ A	SPI w/2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW Exposed Pad	Production EVB
MC33880	Configurable Eight Output SPI Controlled Switch	(1.0 $\Omega$ $R_{DS(on)}$ ) Configurable Eight Output SPI Controlled Switch	8	550	1.2	25 $\mu$ A	SPI w/2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW	Production EVB
MC33886	H-Bridge Driver (5.2 A)	225 m $\Omega$ @150°C	2	120	6.0	20 mA	Parallel	1 Status Pin (Overcurrent / Overtemp)	Short Circuit, Current Limit, Temp Sense	20-pin HSOP	Production EVB
MC33887	H-Bridge Driver with Sleep Mode (5.2 A)	130 m $\Omega$ @ 25°C, sleep mode, current sense	2	130	6.0	25 $\mu$ A	Parallel	1 Status Pin (Overcurrent / Overtemp)	Short Circuit, Current Limit, Temp Sense	20-pin HSOP 54-pin SOICW 36-pin PQFN	Production EVB
MC33899	Programmable H-Bridge Power IC	Designed to drive a DC motor in both forward and reverse shaft rotation under Pulse-Width Modulation (PWM) of speed and torque.	2	100	11.5	50 $\mu$ A	SPI and Parallel	SPI	Open Circuit detect, Undervoltage, Overtemperature Shutdown, Output Short Protect, Short Circuit Current Limit	30-pin HSOP	Production
MC33926	5.0 A Throttle Control H-Bridge	H-Bridge power IC for DC servo motor control like engine throttle control. Load can be PWM'ed up to 20 KHz.	2	120	8.0	50 $\mu$ A	Parallel	Status Flag	Output Short Circuit Protect, Overcurrent Limit, Overtemperature	32-pin PQFN	2Q2009 EVB
MC33931	5.0 A Throttle Control H-Bridge	H-Bridge power IC for DC servo motor control like engine throttle control. Load can be PWM'ed up to 11 KHz	2	120	8.0	50 $\mu$ A	Parallel	Status Flag	Output Short Circuit Protect, Overcurrent Limit, Overtemperature	44-pin HSOP	Production EVB ('932)
MC33932	5.0 A Throttle Control Dual H-Bridge	H-Bridge power IC for DC servo motor control like engine throttle control. Load can be PWM'ed up to 11 KHz	4	120	8.0	50 $\mu$ A	Parallel	Status Flag	Output Short Circuit Protect, Overcurrent Limit, Overtemperature	44-pin HSOP	Production EVB
MPC17C724	0.4A Dual H-Bridge Motor Driver IC	H-Bridge driver for bipolar stepper motors and brush DC motors. Load can be PWM'ed up to 200 KHz, for speed/ torque and current control.	2	1000	0.80	1 $\mu$ A	Parallel	—	Shoot Through Protect, Undervoltage Detect	16-pin QFN	Production EVB
MPC17510	0.45 $\Omega$ H-Bridge	Single 15 V H-Bridge with charge pump	2	450	3.0	1.0 mA	Parallel	Shutdown Undervoltage	Shoot Through Undervoltage Detect	24-pin TSSOP	Production
MPC17511	0.46 $\Omega$ H-Bridge	Single 6.8 V H-Bridge with charge pump	2	460	3.0	1.0 mA	Parallel	Shutdown Undervoltage	Shoot Through Undervoltage Detect	16-pin VMFP 24-pin QFN	Production
MPC17529	0.7 $\Omega$ Dual 6.8 V with Charge Pump, 3.3 V Logic	Dual 6.8 V with Charge Pump	2	700	1.4	1.0 mA	Parallel	Shutdown Undervoltage	Shoot Through Undervoltage Detect	20-pin VMFP	Production
MPC17531	0.7 $\Omega$ Dual 8.6 V with Charge Pump and Sleep Mode	Dual 8.6 V with Charge Pump	2	700	1.4	1.0 mA	Parallel	Shutdown Undervoltage	Shoot Through Undervoltage Detect	20-pin VMFP 24-pin QFN	Production
MPC17533	0.7 $\Omega$ Dual 6.8 V External Charge Pump	Dual 6.8 V external Charge Pump	2	700	1.4	< 200 $\mu$ A	Parallel	Shutdown Undervoltage	Shoot Through Undervoltage Detect	16-pin VMFP	Production

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME USB-SPI Interface Boards.

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### Power Actuation — H-Bridge Stepper Motors

Product	Description	Main Characteristics	Operating Voltage (V)	Packaging	Status
MC33970	Dual Gauge Driver Large Pointer	4 Dual Output H-Bridge coil drivers, MMT-licensed two-phase stepper motor compatible, analog microstepping (12-steps/deg of pointer movement)	6.2 to 26	24-pin SOICW	Production
MC33976	Dual Gauge Driver with Configurable Response Time	4 Dual Output H-Bridge coil drivers, MMT-licensed two-phase stepper motor compatible, analog microstepping (12-steps/deg of pointer movement) with unproved pointer movement	6.2 to 26	24-pin SOICW	Production
MC33977	Single Gauge Driver	Monolithic IC has 4 Output H-Bridge coil drivers and their associated control and management logic, automatically controls speed, direction, and magnitude of current	6.2 to 26	24-pin SOICW	Production
MC33991	Dual Gauge Driver Integrated Circuit	4 Dual Output H-Bridge coil drivers, MMT-licensed two-phase stepper motor compatible, analog microstepping (12-steps/deg of pointer movement)	6.2 to 26	24-pin SOICW	Production
MM908E626	Stepper Motor Control, Quad Half-Bridge with Embedded MCU and LIN for High Temperature $T_J = 135^{\circ}\text{C}$	Voltage Regulator 5.0 V/60 mA, LIN Physical Layer with Selectable Slewrates	5 to 28	54-pin SOICW Exposed Pad	Production EVB ('625)

### Power Actuation — Pre-Drivers (High-Side MOSFET Gate Drivers)

Product	Description	Main Characteristics	Operating Voltage (V)	Control <sup>1</sup>	Output Drives High/Low-Side, Drive Current	Status Reporting <sup>1</sup>	Protection Features	Packaging	Status
MC33800	Engine Control Integrated Circuit	Engine control IC, with six MOSFET gate pre-drivers, eight Low-Side Switches, and two constant current Low-Side switches	5.0 to 36	Parallel, SPI	6 H, 2mA (typ)	SPI	Open Load Detect, Overcurrent Protect, Overvoltage Protect, Shorted Load Detect, Undervoltage Protect, Thermal Protect	54-pin SOICW Exposed Pad	Production EVB
MC33810	Automotive Engine Control IC	Engine control IC with four MOSFET/IGBT gate drivers and four Low-Side switches.	4.5 to 36	Parallel, SPI	4 L, 780 $\mu\text{A}$ (typ)	SPI, Status Flags	Shorted Load Detect, Thermal Protect	32-pin SOICW Exposed Pad	Production EVB
MC33812	Single Cylinder Engine Control IC	Engine control power IC with three Low-Side driver, one pre-driver, +5V pre-regulator, IOS-9141 physical interface and MCU watchdog circuit.	4.5 to 36	Parallel	1 H, 50 mA (typ)	Parallel	Overcurrent Outputs Short to Battery, Overtemperature Protect	32-pin SOICW Exposed Pad	2Q2009
MC33927	Three-Phase Field Effect Transistor Pre-Driver	Triple High-Side and Low-Side FET pre-drivers, with parallel & SPI control and programmable deadtime (shoot-through protect).	8.0 to 40	Parallel, SPI	3 H, 3 L, 1.0 A (typ)	SPI	Programmable Deadtime, Reverse Charge Injection Protect	54-pin SOICW Exposed Pad	Production EVB
MC33937	Three-Phase Field Effect Transistor Pre-Driver	Triple High-Side and Low-Side FET pre-drivers, with parallel & SPI control and programmable deadtime (shoot-through protect).	8.0 to 58	Parallel, SPI	3 H, 3 L, 1.0 A (typ)	SPI	Programmable Deadtime, Reverse Charge Injection Protect	54-pin SOICW Exposed Pad	Production

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME USB-SPI Interface Boards.

### Power Actuation — LED Drivers

Product	Description	Main Characteristics	Operating Input Voltage (V)	Output Voltages	Protection Features	Packaging	Status
MC34844	10 Channel LED Backlight Driver with Integrated Power Supply	High efficiency LED driver for use in backlighting LCD displays. Capable of driving more than 150 LEDs, in 10 parallel strings. Currents in the 10 strings are matched to within $\pm 2\%$ . Controlled through an I <sup>2</sup> C bus. Contains a PWM generator for LED dimming.	7.0 to 28	Output voltage of 60 V, with max. current of 3000 mA	Undervoltage Lockout, Overvoltage protection. Over-temperature protect. Overcurrent protection. Output Short protect	32-pin QFN, Exposed Pad	Production EVB <sup>1</sup>
MC34845	6 Channel LED Backlight Driver with Integrated Power Supply	High efficiency LED driver for use in backlighting LCD displays. Capable of driving more than 96 LEDs, in 6 parallel strings. Currents in the 6 strings are matched to within $\pm 2\%$ . Programmable LED current setting. Contains a PWM generator for LED dimming.	6.0 to 21	Output voltage of 60 V, with max. current of 2100 mA	Undervoltage Lockout, Overvoltage protection. Over-temperature protect. Overcurrent protection. Output Short and Open protect	24-pin QFN, Exposed Pad	2Q2009

1. Supporting backlight EVB - KITLEDCLK16EVBE

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## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Power Actuation — Squib Drivers

Product	Description	Main Characteristics	Regulation Voltage	Operating Voltage (V)	Packaging	Status
MC33797	Four Channel Squib Driver IC	Four-Channel High-Side and Low-Side 2.0 A FET Switches, Externally Adjustable FET Current Limiting, Adjustable Current Limit Range: 0.8 A to 2.0 A, 8-Bit SPI for Diagnostics and FET Switch Activation, Diagnostics for High-Side Safing Sensor Status	7.0 to 35	4.75 to 5.25	32-pin SOICW	Production

### Power Actuation — Powertrain Control and Engine Management

Product	Description	Main Characteristics	Peak Current Limit (A)	R <sub>DS(on)</sub> (mΩ)	Control <sup>1</sup>	Operating Voltage (V)	Packaging	Status
MC33800	Engine Control Integrated Circuit	Engine control IC, with six MOSFET gate pre-drivers, eight Low-Side Switches, and two constant current Low-Side switches	2 @ 6.0 6 @ 2.0 1 @ 2.8 1 @ 1.0	2 @ 700 6 @ 1000 1 @ 250 1 @ 1000	SPI, Parallel	5.0 to 36	54-pin SOICW Exposed Pad	Production EVB
MC33810	Automotive Engine Control IC	Engine control IC with four MOSFET/IGBT gate drivers and four Low-Side switches.	6.0	100	SPI, Parallel	4.5 to 36	32-pin SOICW Exposed Pad	Production EVB
MC33811	Solenoid Monitor Integrated Circuit	5 input solenoid monitoring to verify proper electrical and mechanical solenoid operation.	—	—	SPI	10.5 to 15.5	16-pin SOICW	Production EVB
MC33812	Single Cylinder Engine Control Integrated Circuit	Engine control power IC, with three Low-Side drivers, one pre-driver, +5V pre-regulator, IOS-9141 physical interface and MCU watchdog circuit.	2 @ 6.0 1 @ 2.0	2 @ 200 1 @ 1000	Parallel	4.5 to 36	32-pin SOICW Exposed Pad	2Q2009
MC33899	Programmable H-Bridge Power IC	Designed to drive a DC motor in both forward and reverse shaft rotation under Pulse-Width Modulation (PWM) of speed and torque. Can be controlled by SPI or parallel control lines.	15.0	90	SPI, Parallel	6.0 to 26.5	30-pin HSOP	Production
MC33926	5.0A Throttle Control H-Bridge	H-Bridge power IC for DC servo motor control like engine throttle control. Load can be PWM'ed up to 20 KHz	8.0	120	Parallel	8.0 to 28	32-pin PQFN	2Q2009 EVB
MC33927	Three-Phase Field Effect Transistor Pre-Driver	This IC contains three High-Side FET pre-drivers and three Low-Side FET pre-drivers, with parallel and SPI control.	—	—	SPI, Parallel	8.0 to 40	54-pin SOICW Exposed Pad	Production EVB
MC33975 MC33975A	22 input Multiple Switch Detect Interface with 32 mA Wetting Current and Wake-up	22 inputs contact monitoring (14 GND, 8 configurable), 4.0 mA or 32 mA pulse wetting current, low-power mode interrupt capability, wake-up. Can supply current to external sensors.	—	—	SPI	5.5 to 26.5	32-pin SOICW Exposed Pad	Production EVB

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME USB-SPI Interface Boards.

### Network Transceivers — CAN Physical Interface Components

Product	Description	Main Characteristics	Communication Protocol	Operating Voltage (V)	Current Limitation Standby (μA)		Other Features	Control and Status Reporting <sup>1</sup>	Protection Features	Packaging	Status
					Typ	Max					
MC33742 MC33742S	System Basis Chip with Enhanced High Speed CAN (250k to 1Mbps)	Dual V <sub>REG</sub> , Enhance HS CAN with Bus failure diagnostic capability, 4 wake-up inputs, pin and function compatible with MC33989	CAN high-speed dual wires	5.5 to 27	60	150	Low power modes, remote and local wake-up capabilities	4 MHz SPI (for diag)	Current and thermal protection for CAN and regulator	28-pin SOICW 48-pin QFN Exposed Pad	Production EVB
MC33889B MC33889D	System Basis Chip Lite with Low-Speed CAN	Dual V <sub>REG</sub> , LS CAN, 2 wake-up inputs	CAN low-speed, dual wires	5.5 to 27	100	100	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	Fault tolerant	28-pin SOICW	Production
MC33897C MC33897D	Single-Wire CAN	Low or high (33.3 kbps or 83.3 kbps) data rates, wake-up capability (GMW3089 v2.3 compatible)	Single-wire CAN	6.0 to 27	45	60	Regulator Control Output Waveshaping Undervoltage lockout detect and handle loss of GND	2 Mode Control Pins	Thermal shutdown, current limit	14-pin SOICN 8-pin SOICN	Production
MC33989	System Basis Chip with High-Speed CAN	Dual V <sub>REG</sub> , HS CAN, 4 wake-up inputs	CAN high-speed, dual wires	5.5 to 27	150	150	Dual voltage regulator, watchdog, wake input, sleep mode, and cyclic sense	SPI 4 MHz	n/a	28-pin SOICW	Production EVB
MC33902	High-speed CAN Interface with Embedded 5V supply	High-speed CAN physical interface. Includes a 5.0V internal supply for the CAN bus transceiver	CAN high-speed, dual wires	5.5 to 27	14	30	Wake-up, Fault tolerant, Fault reporting, Low power modes	Pseudo SPI, Parallel	Overcurrent, Overtemperature, Short circuit, VBAT undervoltage detect	14-pin SOICN	2Q2009

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME USB-SPI Interface Boards.

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## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Network Transceivers – LIN, ISO-9141, J-1850 Physical Interface Components

Product	Description	Main Characteristics	Communication Protocol	Operating Voltage (V)	Current Limitation Standby (µA)		Other Features	Control and Status Reporting <sup>1</sup>	Protection Features	Packaging	Status
					Typ	Max					
MC33399	Local Interconnect Network (LIN) Physical Layer	Offers speed communication from 1.0 kbps to 20 kbps, and up to 60 kbps for Programming Mode. It has two operating modes: Normal and Sleep. The 33399 supports LIN Protocol Specification 1.3.	LIN single wire	7.0 to 27	20	50	Wake-up input pin, control of external voltage regulator	Parallel Communication	Current limitation, thermal protection	8-pin SOICN	Production EVB
MC33661	eLIN – Enhanced LIN Physical Layer (Local Interconnect Network)	Selectable slew rate for operations at 10, 20, 100 kbps; bus short to ground fail safe; excellent EMC behavior, pin and function compatible with MC33399	LIN single wire	5.5 to 27	8.0	12	Compatibility with 5.0 V and 3.3 V micros, wake-up input control of external regulator	Parallel Communication	Current limitation, thermal protection	8-pin SOICN	Production EVB
MC33689D	System Basis Chip with Enhanced LIN Physical Interface	Low power modes with remote and local wake-up; 5.0 V/60 mA V <sub>REG</sub> with reset and selectable W/D; enhanced LIN physical layer (same as MC33661)	LIN single wire	5.5 to 27	35	45	Dual HS switch (150 mA) and single HS switch (50 mA) 2 wake-up inputs, sense amplifier, Overvoltage and Undervoltage detection	4 MHz SPI (for diag)	Current and thermal protection for LIN, regulator and HS switches	32-pin SOICW	Production EVB
MC33812	Single Cylinder Engine Control IC	Engine control power IC, with 3 Low-Side drivers, one pre-driver, +5V pre-regulator, ISO-9141 physical interface and MCU watchdog circuit.	ISO-9141	4.5 to 36	—	—	MCU Watchdog timer, +5V pre-regulator for MCU, MCU Power on RESET	Parallel	Overcurrent, Outputs Short to Battery, Overtemperature Protect	32-pin SOICW Exposed Pad	2Q2009
MC33910 MC34910	2nd Generation System Basis Chip with High-Side Drivers	LIN 2.0 compatible, 5.0 v60mA LDO, 2 High-Side drivers w/PWM, 1 analog/digital input	LIN single wire	5.5 to 18	48	80	Hall Sensor supply, Configurable Window Watchdog	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33911 MC34911	2nd Generation System Basis Chip with DC Motor Pre-driver	LIN 2.0 compatible, 5.0 v60mA LDO, 1 High-Side driver & 2 Low-Side drivers w/PWM, 2 analog/digital inputs	LIN single wire	5.5 to 18	48	80	Configurable Window Watchdog	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33912 MC34912	2nd Generation System Basis Chip with DC Motor Pre-driver and Current Sense	LIN 2.0 compatible, 5.0 v60mA LDO, 2 High-Side drives & 2 Low-Side drivers w/PWM, 4 analog/digital inputs	LIN single wire	5.5 to 18	48	80	Hall Sensor supply, Configurable Window Watchdog, Current Sense	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33990	Serial Link J-1850 Bus Transceiver	J-1850 multiplexing bus with loss of ground protection	J-1850	9.0 to 16	n/a	65	Internally reverse battery protected Waveshaping	Parallel Communication	Current limitation, thermal protection	8-pin SOICN	Production

1. Products available with SPI Control work with the KITUSBSP1EVME and the KITUSBSP1DGLVME USB-SPI Interface Boards.

### Network Transceivers – Distributed Systems Interface (DSI) Components

Product	Description	Main Characteristics	Max Data Rate	Operating Temp Range (°C)	Bus Sw. Resistance, typ/max (Ω)	Packaging	Status
MC33780	Dual DSI Master with Differential Drive	Bus controller for two differential DSI channels. SPI port for uC interface. Variable CRC generation and detection, thermal protection, frequency spreading.	150kbps	-40 to +85	n/a	16-pin SOICW	Production
MC33781	Quad DSI Master with Differential Drive	Bus controller for four differential DSI channels. Dual SPI ports for uC and safing interfaces. Variable CRC generation and detection, comprehensive fault detection, thermal protection, frequency spreading	200kbps	-40 to +90	n/a	32-pin SOICW Exposed Pad	Production
MC33784	DSI Sensor Interface	DSI slave device optimized as a sensor interface. Differential bus capability & dual bus switches for improved EMC performance, 2-channel 10-bit ADC, 5.0 V regulated output, 3 configurable logic pins, CRC generation and checking.	n/a	-40 to +150	3.0/6.0	16-pin SOICN	Production
MC33793	DSI Sensor Interface	DSI slave device. 5.0 V regulated output, 4 configurable I/O pins (logic I/O or 8-bit ADC), fault tolerant, logic output high current buffer.	n/a	-40 to +125	4.0/8.0	16-pin SOICN	Production

A change bar appears in the left margin to mark the location of new or revised information.

## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Signal Conditioning — Switch Monitoring

Product	Description	Main Characteristics	Switch Monitor Voltage (V)	Operating Voltage (V)	Packaging	Status
MC33811	Solenoid Monitor Integrated Circuit	5 input solenoid monitoring to verify proper electrical and mechanical solenoid operation.	0 to 64	10.5 to 15.5	16-pin SOICW	Production EVB
MC33884	Switch Monitor Interface	12 input contact monitoring (6 GND, 2 VBAT, 4 configurable), 25 mA pulse wetting current, master, slave, and low-power mode interrupt capability.	-14 to 40	7.0 to 26	24-pin SOICW	Production
MC33972 MC33972A	22 input Multiple Switch Detect Interface with 16 mA Wetting Current and Suppressed Wake-up	Multiple switch detection interface with suppressed wake-up designed to detect closing and opening of up to 22 switch contacts (14 GND, 8 configurable), wetting current of 2.0 mA or 16 mA.	-14 to 38 -14 to 40	5.5 to 26	32-pin SOICW 32-pin SOICW Exposed Pad	Production EVB
MC33975 MC33975A	22 input Multiple Switch Detect Interface with 32 mA Wetting Current and Wake-up	22 inputs contact monitoring (14 GND, 8 configurable), 4.0 mA or 32 mA pulse wetting current, low-power mode interrupt capability, wake-up. Can supply current to external sensors.	-14 to 38 -14 to 40	5.5 to 26.5	32-pin SOICW Exposed Pad	Production EVB
MC33993	22 input Multiple Switch Detect Interface with 16 mA Wetting Current and Wake-up	22 inputs contact monitoring (14 GND, 8 configurable), pulse wetting current of 2.0 mA or 16 mA, low-power mode interrupt capability, wake-up.	-14 to 40	5.5 to 26.5	32-pin SOICW	Production EVB

### System Basis Chip

Product	Description	Main Characteristics	Bus Type and Standard	Operating Voltage (V)	Current Limitation Standby (µA)		Other Features	Diagnostics <sup>1</sup>	Protection Features	Packaging	Status
					Typ	Max					
MC33689D	System Basis Chip with Enhanced LIN Physical Interface	Low power modes with remote and local wake-up; 5.0 V/60 mA V <sub>REG</sub> with reset and selectable W/D; enhanced LIN physical layer (same as MC33661)	LIN single wire	5.5 to 27	35	45	Dual HS switch (150 mA) and single HS switch (50 mA) 2 wake-up inputs, sense amplifier, Overvoltage and Undervoltage detection	SPI 4 MHz	Current and thermal protection for LIN, regulator and HS switches	32-pin SOICW	Production EVB
MC33742 MC33742S	System Basis Chip with Enhanced High Speed CAN (250K to 1Mbps)	SBC, Dual V <sub>REG</sub> , Enhance HS CAN with Bus failure diagnostic capability, 4 wake-up inputs; pin and function compatible with MC33989	CAN HS dual wire	5.5 to 27	60	150	Low power modes, remote and local wake-up capabilities	SPI 4 MHz	Current and thermal protection for CAN and regulator	28-pin SOICW 48-pin QFN	Production EVB
MC33889D	System Basis Chip with Low Speed Fault Tolerant CAN	Dual 5.0 V regulators LS CAN, 2 wake-up inputs	CAN low-speed, dual wires	5.5 to 27	60	100	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	Fault tolerant	28-pin SOICW	Production EVB
MC33910 MC34910	2nd Generation System Basis Chip with High-Side Drivers	LIN 2.0 compatible, 5.0 v60mA LDO, 2 High-Side drivers w/PWM, 1 analog/digital input	LIN single wire	5.5 to 18	48	80	Hall Sensor supply, Configurable Window Watchdog	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33911 MC34911	2nd Generation System Basis Chip with DC Motor Pre-driver	LIN 2.0 compatible, 5.0 v60mA LDO, 1 High-Side driver & 2 Low-Side drivers w/PWM, 2 analog/digital inputs	LIN single wire	5.5 to 18	48	80	Configurable Window Watchdog	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33912 MC34912	2nd Generation System Basis Chip with DC Motor Pre-driver and Current Sense	LIN 2.0 compatible, 5.0 v60mA LDO, 2 High-Side drives & 2 Low-Side drivers w/PWM, 4 analog/digital inputs	LIN single wire	5.5 to 18	48	80	Hall Sensor supply, Configurable Window Watchdog, Current Sense	SPI 4 MHz	Multiple wake-up sources, LDO Fault Detect, Low Voltage Reset	32-pin LQFP	Production
MC33989	System Basis Chip with High Speed CAN	Dual 5.0 V regulators HS CAN, 4 wake-up inputs	CAN high speed, dual wires	5.5 to 27	80	150	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	Current limitation, thermal	28-pin SOICW	Production EVB

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME USB-SPI Interface Boards.

## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Embedded MCU + Power

Product	Description	Main Characteristics	Power Features	MCU Reference	MCU Detail	Additional Information	Packaging	Status
MM908E621	DC Motor/Mirror Control and LIN Mirror Control, Integrated Quad Half-Bridge and Triple High-Side with Embedded MCU and LIN for High End Mirror	Voltage Regulator 5.0 V/60 mA, LIN Physical Layer with Selectable Slew rates, Window Watchdog, *Normal/Stop/Sleep Mode *Control	2 x 275 mΩ Half-Bridges; 2 x 750 mΩ Half-Bridges; 1 x 185 mΩ High-Side; 2 x 440 mΩ High-Side; Switched 5.0 V Output (25 mA)	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 8-Channel 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	2/3 Pin Hall Sensor Input, Analog Input with Current Source, 40 V Rated Wake-up Input, V <sub>sup</sub> , Chip Temperature and Current Sensing	54-pin SOICW Exposed Pad	Production
MM908E622	DC Motor/Mirror Control and LIN Mirror Control, Integrated Quad Half-Bridge, Triple High-Side and EC Glass Driver with Embedded MCU and LIN for High End Mirror	Voltage Regulator 5.0 V/60 mA, LIN Physical Layer with Selectable Slew rates, Window Watchdog, *Normal/Stop/Sleep Mode *Control	2 x 275 mΩ Half-Bridges; 2 x 750 mΩ Half-Bridges; 1 x 185 mΩ High-Side; 2 x 440 mΩ High-Side; Switched 5.0 V Output (25 mA) EC Glass Driver	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 8-Channel 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	2/3 Pin Hall Sensor Input, Analog Input with Current Source, 40 V Rated Wake-up Input, V <sub>sup</sub> , Chip Temperature and Current Sensing	54-pin SOICW Exposed Pad	Production
MM908E624	DC Motor Control Using Relays (for example, Window Lift, Sun Roof, and Power Seats), Triple High-Side Switch with Embedded MCU + Power + LIN	Voltage Regulator 5.0 V/50 mA, LIN Physical Layer with Selectable Slew rates, Window Watchdog with Selectable Timing, Normal/Stop/Sleep Mode Control	1 x 7 Ω High-Side, 2 x 2.5 Ω High-Side Switches for Relay Control	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 8-Channel 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	Operational Amplifier, 2 x 40 V Rated Wake-up Inputs	54-pin SOICW	Production EVB
MM908E625	Mirror Control, Stepper Motor Control, Door Lock Quad Half-Bridge and Single High-Side with Embedded MCU and LIN	Voltage Regulator 5.0 V/60 mA, LIN Physical Layer with Selectable Slew rates, Timeout Watchdog with Periodic Wake-up Feature, Normal/Stop Mode Control	4 x 400 mΩ Half-Bridges with Current Control; 1 x 600 mΩ High-Side; Switched 5.0 V Output (25 mA)	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 8-Channel 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	3 x 2 Pin Hall Sensor Inputs with Cyclic Wake-up Feature, Analog Input with Current Source, V <sub>sup</sub> , Chip Temperature and Current Sensing	54-pin SOICW Exposed Pad	Production EVB
MM908E626	Stepper Motor Control, Quad Half-Bridge with Embedded MCU and LIN for High Temperature T <sub>j</sub> = 135°C	Voltage Regulator 5.0 V/60 mA, LIN Physical Layer with Selectable Slew rates	4 x 400 mΩ Half-Bridges with Current Control; Switched 5.0 V Output (24 mA)	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 8-Channel 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	V <sub>sup</sub> , Chip Temperature and Current Sensing	54-pin SOICW Exposed Pad	Production (EVB - use '625)
MM908E630	Relay Control, using 2 High-Side and 2 Low-Side Switches, with an Embedded MCU and LIN Interface for High Temperature T <sub>j</sub> = 125°C	2 Voltage regulators 5.0 V @ 50 mA, 5.0 V @ 15 mA, LIN Physical Interface with Selectable Slew Rates	2 x 7 Ω High-Side Switches, 2 x 2.5 Ω Low-Side Switches, Hall Sensor Switched Supply	MC68HC908EY16	HC08 Core, 16K Flash, 512 Bytes RAM, ESCI, 10-bit ADC, Two 16-bit 2 Channel Timers, Internal Clock Generator	PWM Capable, Current Sensing, 4 Analog/Digital Wake-up Inputs, Window Watchdog Timer	44-pin QFN	2Q2009

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# FREESCALE SEMICONDUCTOR POWER MANAGEMENT PRODUCTS

The Power Management products portfolio provides solutions for Linear and Switching voltage regulators. Hot Swap control and Power over Ethernet devices for use in applications ranging from Consumer and Industrial to Automotive.

**SMARTMOS™**—Freescale Semiconductor SMARTMOS technology allows designers to interface high-precision components with the harsh automotive environment.

**Cost-Effective**—Ideally suited for rugged automotive applications, SMARTMOS solutions offer a cost-effective blend of analog, digital, and robust power silicon that enables integrated, mixed-signal, power control ICs.

**Functionality**—SMARTMOS solutions implement traditional analog functions with smaller die size, and a modular process produces components with the minimum number of process steps for each circuit, minimizing overhead.

**Benefits**—Freescale Semiconductor SMARTMOS technology brings a wide range of benefits to today's designs, including component reductions, power flexibility, durability, efficiency, precision, high-performance analog, and robustness.

**Packaging** - Freescale devices may be offered in EPP and RoHS compliant packages; view the external web for specifics.

For additional information, visit:

Documentation, Tool, and Product Libraries  
[www.freescale.com](http://www.freescale.com)  
[www.freescale.com/analog](http://www.freescale.com/analog)  
[www.freescale.com/powermanagement](http://www.freescale.com/powermanagement)

## POWER MANAGEMENT

### Linear Regulators

Product	Description	Main Characteristics	Bus Type and Standard	Operating Voltage (V)	Current Limitation Standby (µA)		Other Features	Diagnostics <sup>1</sup>	Protection Features	Packaging	Status
					Typ	Max					
MPC18730	1.15 V/2.4 V 2-CH DC to DC converters with 3 low dropout regulators	2 Programmable DC-DC Converters, 3 Programmable Low Drop Regulators, Low Battery Operation 0.9 V	n/a	0.9 to 4.2	5.0	12	Pow Switches, Vout Set by Serial Input	SPI 4 MHz	n/a	64-pin QFN	Production EVB
MC33689D	System Basis Chip with Enhanced LIN Physical Interface	Low power modes with remote and local wake-up; 5.0 V/60 mA V <sub>REG</sub> with reset and selectable W/D; enhanced LIN physical layer (same as MC33661)	LIN single wire	5.5 to 27	35	45	Dual HS switch (150 mA) and single HS switch (50 mA) 2 wake-up inputs, sense amplifier, Overvoltage and Undervoltage detection	SPI 4 MHz	Current and thermal protection for LIN, regulator and HS switches	32-pin SOICW	Production EVB
MC33730	Switch Mode Power Supply with Multiple Linear Regulators and Power Sequencing	Step-down Switching regulator (2.0 A), with 3 Programmable Linear Regulators (15 mA, 15 mA, 15 mA) and two 5.0 V Sensor supplies (100 mA, 100 mA).	n/a	4.5 to 28	150	—	Programmable voltage regulator, power sequencing, adjustable OSC - Switcher	None	Reverse Battery Protect, Undervoltage and Overvoltage Lockout, Reset monitor signals for regulators (4)	32-pin SOICW-EP Exposed Pad	Production
MC33742 MC33742S	System Basis Chip with Enhanced High Speed CAN (250 K to 1 Mbps)	SBC, Dual V <sub>REG</sub> , Enhance HS CAN with Bus failure diagnostic capability, 4 wake-up inputs; pin and function compatible with MC33989	CAN HS dual wire	5.5 to 27	60	150	Low power modes, remote and local wake-up capabilities	SPI 4 MHz	Current and thermal protection for CAN and regulator	28-pin SOICW 48-pin QFN Exposed Pad	Production EVB
MC33889D	System Basis Chip with Low Speed Fault Tolerant CAN	Dual 5.0 V regulators LS CAN, 2 wake-up inputs	CAN low-speed, dual wires	5.5 to 27	60	100	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	Fault tolerant	28-pin SOICW	Production EVB
MC33989	System Basis Chip with High Speed CAN	Dual 5.0 V regulators HS CAN, 4 wake-up inputs	CAN high speed, dual wires	5.5 to 27	80	150	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	Current limitation, thermal	28-pin SOICW	Production EVB
MC34700	3.6 V/5.25 V 3-CH DC-DC converters and 1- 3.6 V Linear regulator.	3 adjustable Buck switching regulators and 1 adjustable Linear regulator. ±1.5% output voltage accuracy. 800 KHz switching frequency.	n/a	1.5 to 6.0 & 9.0 to 18	—	—	Power-up sequencing, Separate enable functions	PGOOD signal	Current limit, Short Circuit protect, Overtemperature protection, Overvoltage & Undervoltage protection	32-pin QFN Exposed pad	Production EVB

1. Products available with SPI Control work with the KITUSBSPIEVM and the KITUSBSPIDGLEVM USB-SPI Interface Boards.

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## POWER MANAGEMENT (continued)

### Switching Regulators

Product	Description	Main Characteristics	Operating Input Voltage (V)	Output Voltages	Protection Features	Packaging	Status
MPC18730	1.15 V/2.4 V 2-CH DC to DC converters with 3 low dropout regulators	2 Programmable DC-DC Converters, 3 Programmable Low Drop Regulators, Low Battery Operation 0.9 V	0.9 to 4.2	DC-DC: 1.6 to 3.2 V, 0.8 to 1.5 V 3LDO: 2.8 V adj. down	n/a	64-pin QFN	Production EVB
MC33730	Switch Mode Power Supply with Multiple Linear Regulators and Power Sequencing	Step-down switching regulator (2.0 A), with 3 Programmable Linear Regulators (15 mA, 15 mA, 15 mA) and 2 x 5.0 V sensor supply (100 mA, 100 mA).	4.5 to 28	4.9 to 5.1 V, 2.0 to 3.3 V, 1.5 to 3.3 V, 1.0 to 5.0 V, 5.0 V	Reverse Battery Protect, Undervoltage and Overvoltage Lockout, Reset monitor signals for regulators (4)	32-pin SOICW-EP Exposed Pad	Production
MC33998	2.6/5.0 Volt Switching Power Supply for Engine control	Step-down switching regulator, 3.3 V linear regulator, 2.6 V standby regulator, 2 x 5.0 V sensor supply, power sequencing, and reset	6.0 to 26.5 (40 transient)	5.0 V @ 1400 mA 2 x 5.0 V @ 200 mA 2.6 V @ 400 mA 2.6 V @ 10 mA	Undervoltage shutdown, V <sub>DDH</sub> current limit, V <sub>KAM</sub> current limit, Short Circuit to GND, Short Circuit to V <sub>PWR</sub>	24-pin SOICW	Production
MC34700	3.6 V/5.25 V 3-CH DC-DC converters and 1- 3.6 V Linear regulator.	3 adjustable Buck switching regulators and 1 adjustable Linear regulator. ±1.5% output voltage accuracy. 800 KHz switching frequency. The switching regulators utilize voltage-mode control with external compensation.	1.5 to 6.0 & 9.0 to 18	3.6 V (adj.) @400 mA 5.25 V (adj.) @1500 mA 2 - 3.6 V (adj.) @1250 mA	Current limit, Short Circuit protect, Overtemperature protection, Overvoltage & Undervoltage protection.	32-pin QFN Exposed Pad	Production EVB
MC34701	Dual Output Power Supply Switching (1.5 A)	Step-down switching regulator and Linear regulator with adjustable output voltage from 0.8 V to 5.0 V. Power sequencing, I <sup>2</sup> C bus interface, watchdog, voltage margining, reset.	2.8 to 6.0	Adjustable	Current limit, Undervoltage shutdown, Overvoltage detect, Overtemperature shutdown	32-pin SOICW	Production EVB
MC34702	Dual Output Power Supply Switching (3.0 A)	Step-down switching regulator and Linear regulator with adjustable output voltage from 0.8 V to 5.0 V. Power sequencing, I <sup>2</sup> C bus interface, watchdog, voltage margining, reset.	2.8 to 6.0	Adjustable	Current limit, Undervoltage shutdown, Overvoltage detect, Overtemperature shutdown	32-pin SOICW	Production EVB
MC34704A MC34704B	A multi-channel voltage regulator used to address power management needs for various multimedia application MCUs.	The 34704 features 8(A) or 5(B) buck & boost DC/DC switching regulators, with up to ±2% output voltage accuracy. It provides dynamic voltage scaling on all regulators. It is capable of operating at a switching frequency of up to 2 MHz. The 34704 utilizes I <sup>2</sup> C programmability.	2.7 to 5.5	15.0 V (adj.) @ 30 mA 15.0 V (adj.) @ 60 mA (A only) 5.0 V @ 500 mA (A only) 3 - 3.6 V (adj.) @ 300/500 mA 1.8 V (adj.) @ 550 mA -9.0 V (adj.) @ 60 mA (A only)	Output Undervoltage & Overvoltage detect, Overcurrent limit detection and Short Circuit protect, Thermal limit detect	56-pin QFN Exposed Pad	Production EVB(A) EVB(B)
MC34712	Single synchronous DDR Switch-Mode regulator (±3.0 A)	Synchronous buck switching regulator with adjustable output and an accuracy of ±2% and a programmable switch frequency of 200 KHz to 1.0 MHz.	3.0 to 6.0	0.7 to 1.35 V	Overcurrent limit, Short Circuit protect, Thermal shutdown, Output Overvoltage & Undervoltage detect	24-pin QFN	Production EVB
MC34713	Single synchronous buck switching regulator (5.0 A)	Synchronous buck switching regulator with adjustable output and an accuracy of ±2% and a programmable switch frequency of 200 KHz to 1.0 MHz.	3.0 to 6.0	0.7 to 3.6 V	Overcurrent limit, Short Circuit protect, Thermal shutdown, Output Overvoltage & Undervoltage detect	24-pin QFN	Production EVB
MC34716	Dual synchronous DDR Switch-Mode regulators (5.0 A, ±3.0 A)	Synchronous buck switching regulators with adjustable outputs and an accuracy of ±2% and a programmable switch frequency of 200 KHz to 1.0 MHz.	3.0 to 6.0	0.7 to 3.6 V, 0.7 to 1.35 V	Overcurrent limit, Short Circuit protect, Thermal shutdown, Output Overvoltage & Undervoltage detect	26-pin QFN	Production EVB
MC34717	Dual synchronous buck switching regulators (5.0 A, 5.0 A)	Synchronous buck switching regulators with adjustable outputs and an accuracy of ±2% and a programmable switch frequency of 200 KHz to 1.0 MHz.	3.0 to 6.0	0.7 to 3.6 V, 0.7 to 3.6 V	Overcurrent limit, Short Circuit protect, Thermal shutdown, Output Overvoltage & Undervoltage detect	26-pin QFN	Production EVB
MC34726	A high efficiency, low quiescent current synchronous buck regulator implementing Freescale's innovative Z-Mode architecture.	Voltages ranging from 0.8 V to 3.3 V reduce the number of extra components. The part is able to provide 300 mA continuous load current across the input and output voltage ranges. Switching frequency options of 2 MHz and 4 MHz.	2.7 to 5.5	1.2 V - 3.3 V (C) @ 300 mA	Internal 2 ms Soft Start, Thermal & Overcurrent protection	8-pin UDFN (2x2)	Production EVB use '727
MC34727	A high efficiency, low quiescent current synchronous buck regulator implementing Freescale's innovative Z-Mode architecture	Voltages ranging from 0.8 V to 3.3 V, reduce the number of extra components. The part is able to provide 600 mA continuous load current across the input and output voltage ranges. Switching frequency of 2 MHz	2.7 to 5.5	1.2 V - 3.3 V (C) @ 600 mA	Internal 2 ms Soft Start, Thermal shutdown, Current limit, Undervoltage lock-out	8-pin UDFN (2x2)	Production EVB

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## POWER MANAGEMENT (continued)

### LED Drivers

Product	Description	Main Characteristics	Operating Input Voltage (V)	Output Voltages	Protection Features	Packaging	Status
MC34844	10 Channel LED Backlight Driver with Integrated Power Supply	High efficiency LED driver for use in backlighting LCD displays. Capable of driving more than 150 LEDs, in 10 parallel strings. Currents in the 10 strings are matched to within $\pm 2\%$ . Controlled through an I <sup>2</sup> C bus. Contains a PWM generator for LED dimming.	7.0 to 28	Output voltage of 60 V, with max. current of 3000 mA	Undervoltage Lockout, Overvoltage protection. Over-temperature protect. Overcurrent protection. Output Short protect	32-pin QFN, Exposed Pad	Production EVB <sup>1</sup>
MC34845	6 Channel LED Backlight Driver with Integrated Power Supply	High efficiency LED driver for use in backlighting LCD displays. Capable of driving more than 96 LEDs, in 6 parallel strings. Currents in the 6 strings are matched to within $\pm 2\%$ . Programmable LED current setting. Contains a PWM generator for LED dimming.	6.0 to 21	Output voltage of 60 V, with max. current of 2100 mA	Undervoltage Lockout, Overvoltage protection. Over-temperature protect. Overcurrent protection. Output Short and Open protect	24-pin QFN, Exposed Pad	2Q2009

1. Supporting backlight EVB - KITLEDCLK16EVBE

### Battery Management

Product	Description	Main Characteristics	Operating Input Voltage (V)	Output Voltages	Protection Features	Packaging	Status
MC34671	High-input Voltage Charger for Single-cell Li-Ion or Li-Polymer Batteries	Fixed output charge voltage with $\pm 0.7\%$ voltage accuracy and a maximum user programmable charge current of 600 mA, with $\pm 5\%$ current accuracy. Supports trickle, CC and CV charge modes.	2.6 to 10	4.2 V @ 600 mA	Undervoltage POR, Input Overvoltage protection above 11 V, Overtemperature protect. Tolerates input voltage up to 28 V DC.	8-pin UDFN Exposed Pad	Production EVB
MC34673	High-input Voltage Charger for Single-cell Li-Ion or Li-Polymer Batteries	Fixed output charge voltage with $\pm 0.7\%$ voltage accuracy and a maximum user programmable charge current of 1200 mA, with $\pm 6\%$ current accuracy. Supports trickle, CC, and CV charge modes.	2.6 to 6.6	4.2 V @ 1200 mA	Undervoltage POR, Input Overvoltage protection above 6.8 V, Overtemperature protect. Tolerates input voltage up to 28 V DC.	8-pin UDFN Exposed Pad	Production EVB
MC34674	High-input Voltage Travel Charger for Single-cell Li-Ion or Li-Polymer Batteries	Fixed output charge voltage with $\pm 0.4\%$ voltage accuracy and a maximum factory selectable charge current of 1050 mA, with $\pm 8\%$ current accuracy. Supports trickle, CC, and CV charge modes. Interface to NTC thermistor.	4.3 to 10.0	4.2 V @ various currents - see Data Sheet	Undervoltage POR, Input Overvoltage protection above 11 V, Overtemperature protect. Tolerates input voltage up to 28 V DC.	8-pin UDFN Exposed Pad	Production EVB
MC34675	High-input Voltage Charger for Single-cell Li-Ion Batteries with Linear Regulator	Fixed output charge voltage with $\pm 0.7\%$ voltage accuracy and a maximum user programmable charge current of 1000 mA, with $\pm 6\%$ current accuracy. Supports trickle, CC, CV and EOC charge modes. The 4.85 V linear regulator is capable of 10 mA output current	4.3 to 6.6	4.2 V @ 1000 mA 4.85 V @ 10 mA	Undervoltage POR, Input Overvoltage protection above 6.8 V, Overtemperature protection. Tolerates input voltage up to 28 V DC.	8-pin UDFN Exposed Pad	Production
MC34676	High-input Voltage Charger for Single-cell Li-Ion Batteries with Linear Regulator and dual input voltage supplies (AC & USB)	Fixed output charge voltage with $\pm 0.7\%$ voltage accuracy and a maximum user programmable charge current of 400/1200 mA, with $\pm 5\%$ current accuracy. Supports trickle, CC, CV and EOC charge modes. A 4.85 V linear regulator function can supply 50 mA and 12 mA of output current.	4.0 to 5.5 (USB) 4.0 to 6.6 (AC)	4.2 V @ various currents - see Data Sheet  4.85 V @ various currents - see Data Sheet	Undervoltage POR, Input Overvoltage protection above 6.8 V (AC) or 5.8 V (USB), Overtemperature protection. Tolerates input voltage up to 28 V DC.	12-pin UDFN Exposed Pad	Production EVB

### Power over Ethernet (PoE)

Product	Description	Main Characteristics	Operating Input Voltage (V)	Max Current Limit (A)	Number of Channels	Protection Features	Packaging	Status
MC34670	IEEE 802.3af Powered Device with Current Mode Switching Regulator	Integrated IEEE 802.3af Compliant Interface, Signature Detection and Power Classification Functionality, High Performance Current Mode Switching Regulator	30 to 60	2.1	1	Fast Short Circuit Detect, Thermal Shutdown, Overvoltage Shutdown, Inrush Current Limit, Overvoltage Lock Out	20-pin SOICW	Production EVB

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# FREESCALE SEMICONDUCTOR ACCESS AND REMOTE CONTROL PRODUCTS

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www.freescale.com/automotive

## Transmitters and Receivers Stand-Alone RF Products

Product	RF Type	RF Frequency	Protocols Supported	Clock Type	Bandwidth	Sensitivity	Temperature	Package	Additional Features	In Production	Market Focus
MC33591/2/3/4	Receiver	315 MHz, 434 MHz or 868 MHz - 915 MHz	OOK and FSK Demodulation	Clock Generator and Strobe OSC	300 kHz or 500 kHz	105 dBm RF Sensitivity at 4.8 kbps	-40°C to +85°C	24 LQFP	Date Manager, Internal or Existing Strobing Byte and Tone detection, Manchester Coded Data Clock recovery up to 11 kbps. Fully configurable by SPI interface.	Yes	UHF RF Receiver, RF, Remote and Secure Entry
MC33596	Receiver	315 MHz - 915 MHz	OOK and FSK Demodulation	Programmable PLL and Strobe OSC	380 kHz	-103 dBm to -81 dBm typ in 4 steps	-40°C to +85°C	32 LQFP, 32 QFN	RSSI (75 dB digital and 55 dB analog), Strobe OSC and Data Manager with clock recovery for Manchester coded signals	Yes	UHF RF Receiver, RF, Remote and Secure Entry
MC33696	Transceiver	315 MHz - 915 MHz	OOK and FSK Demodulation	Programmable PLL and Strobe OSC	380 kHz	-103 dBm to -81 dBm typ in 4 steps	-40°C to +85°C	32 LQFP, 32 QFN	RSSI (75 dB digital and 55 dB analog), Strobe OSC and Data Manager	Yes	Remote/Secure Entry (2-way RF)
MC33493	Transmitter	315 MHz, 434 MHz or 868 MHz - 915 MHz	OOK and FSK Demodulation	PLL with integrated VCO	—	+5 dBm output power	-40°C to +125°C	14 TSSOP	11 kbps max data rate for Manchester code	Yes	Remote/Secure Entry (1-way RF)

## Tag Reader (STARC) for Immobilizer Applications

Product	Description	Packaging	Band	Data Rate	MCU Interface	Operating Voltage	Status
MC33690	Stand-alone TAG reader with voltage regulator	20-pin SOIC	125 kHz	0.5 to 8 kbps	K line (ISO-9141)	12 V	Available

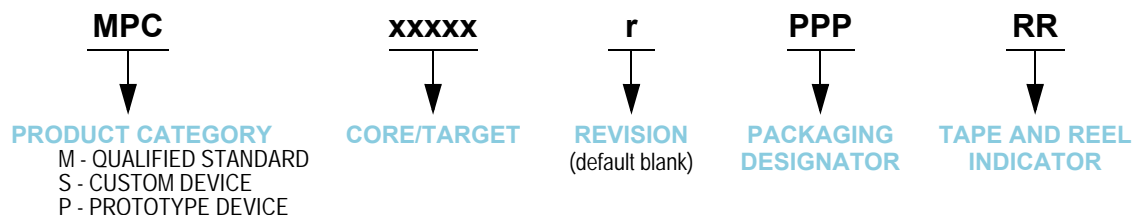
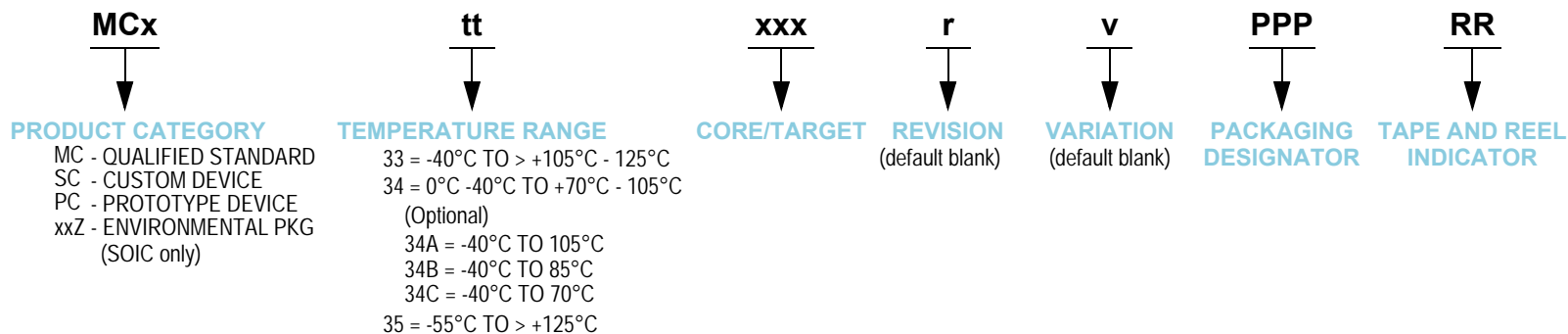
## Wireless RF System Solutions

Product	RF Type	Flash	RAM	RF Frequency	Protocols Supported	Clock Type	ADC	SPI	Timer	Package	Additional Features	Automotive Pressure Range	Truck Tire Pressure Range	Pressure Range	Pressure Sensor Accuracy*	Embedded Rotation Speed Sensor	Tire Localization	Accelerometer Physical Self Test	Market Focus
MC68HC908RK2	—	2 KB	128 B	—	OOK and FSK Demodulation	ICG, OSC	4-CH, 12-bit	—	2-CH, Timer	32 QFP	RF Transmitter, COP, LVI, POR, KBI	—	—	—	—	—	—	—	RKE, Remote/Secure Entry
MC68HC908RF2	Transmitter	2 KB	128 B	—	OOK and FSK Demodulation	ICG, OSC	4-CH, 12-bit	—	2-CH, Timer	32 QFP	RF Transmitter, COP, LVI, POR, KBI	—	—	—	—	—	—	—	TPMS
MPXY80201	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	PZT Motion Sensor	—	—	—	—	—	—	—	TPMS (Motion Sensor-Based)
MPXY8300A	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	Yes	—	100-800 kPa	±10 kPa	Yes	Yes	Yes	TPMS (Accelerometer-Based)
MPXY8300B	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	Yes	—	100-800 kPa	±10 kPa	Yes	—	Yes	TPMS (Accelerometer-Based)
MPXY8300C	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	Yes	—	100-800 kPa	±10 kPa	—	—	Yes	TPMS (Accelerometer-Based)
MPXY8320A	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	—	Yes	100-1500 kPa	±10 kPa	Yes	Yes	Yes	TPMS (Accelerometer-Based)
MPXY8320B	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	—	Yes	100-1500 kPa	±10 kPa	Yes	—	Yes	TPMS (Accelerometer-Based)
MPXY8320C	Transmitter	16 KB	512 B	315MHz/434MHz RF Transmitter	ASK and FSK Modulation	OSC	8-CH, 10-bit	1	2-CH, 16-bit Timer/Pulse-Width Modulator	SOIC Pressure Package	X-Y Accelerometer	—	Yes	100-1500 kPa	±10 kPa	—	—	Yes	TPMS (Accelerometer-Based)

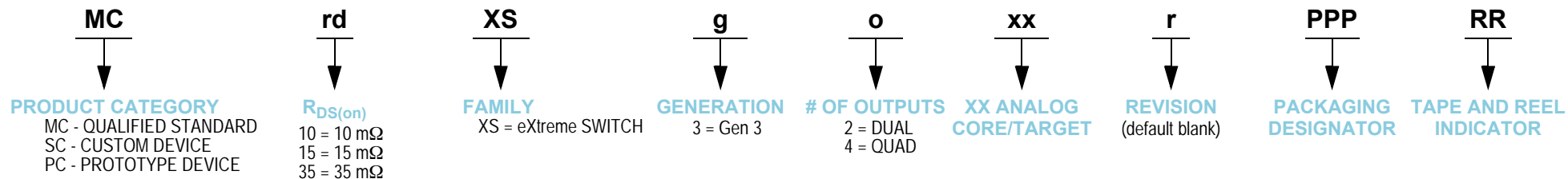
## GPS Downconverter

Product	RF Freq (MHz)	Supply Voltage Range (Vdc)	Supply Current (Typ) (mA)	Standby Current (mA)	Conversion Gain (typ) (dB)	Packaging	System Applicability	Documentation
MRFC1505A	1575.42	2.7 to 3.3	28	3	105	48-pin LQFP (Case No 932)	GPS	MRFC1505

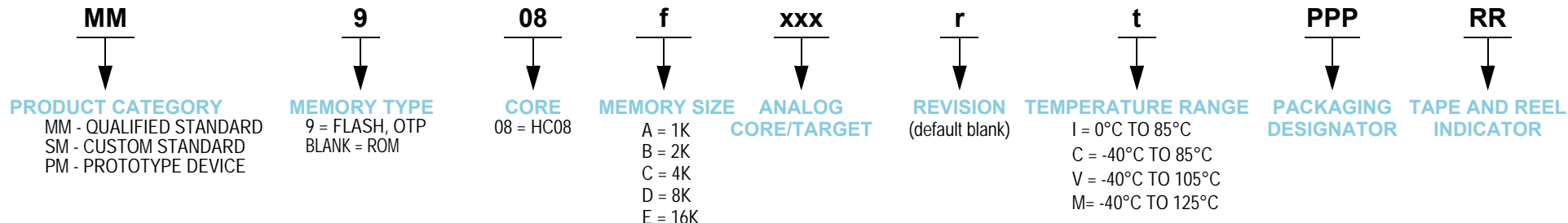
## PRODUCT NUMBERING — ANALOG



## PRODUCT NUMBERING — ANALOG eXtreme SWITCH



## PRODUCT NUMBERING — ANALOG EMBEDDED MCU + POWER



## **NOTES**

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