

# Automotive

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Because of an order from the United States International Trade Commission, BGA-packaged product lines and part numbers indicated here currently are not available from Freescale for import or sale in the United States prior to September 2010: MPC5668G product families; S12XE, MPC551x, MPC563xM, MPC560xB, MPC5533, MPC5534 and MPC5553 products in 208 MAPBGA packages; MPC564xL in 257 MAPBGA.

## 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.

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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 3 Low-Side drivers, one pre-driver, +5V pre-regulator, ISO-9141 physical interface and MCU watchdog circuit.	3	L	2 @ 4.0 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	Production EVB Ref.Dsgn.
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
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, 32-pin SOICW w/ Exposed Pad, 32-pin QFN w/Exposed Pad	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

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIDGLEVME 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 10 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
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
MC33981	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
MC33982	Self Protected 2 mΩ Switch with Diagnostic and Protection	1	H	30.0	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
MC33984	Self Protected 4 mΩ Switch with Diagnostic and Protection	2	H	15.0	4	75 or 100 Selectable	5.0	SPI and Parallel	SPI	Temp Sense, Over/Undervoltage, Shutdown, Overcurrent, Reverse Polarity, Current Recopy	16-pin PQFN	Production EVB
MC33988	Self Protected 8 mΩ Switch with Diagnostic and Protection	2	H	7.5	8	45 or 60 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 8)											
MM908E622	See Embedded MCU + Power (page 8)											
MM908E624	See Embedded MCU + Power (page 8)											
MM908E625	See Embedded MCU + Power (page 8)											

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

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## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

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

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	Control <sup>1</sup>	Status/Fault Reporting	Protection Features	Packaging	Status
MC33186	H-Bridge Driver (5.0 A)	2	H/L	5.0	150	6.5	20 mA	Parallel	1 Status Pin	Short Circuit, Current Limit, Temp Sense	20-pin HSOP	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 μA	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 μA	SPI w/2 PWM	SPI	Short Circuit, Current Limit, Temp Sense	32-pin SOICW	Production EVB
MC33886	H-Bridge Driver (5.2 A)	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)	2			130	6.0	25 μA	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	2			100	11.5	50 μA	SPI and Parallel	SPI	Open Circuit detect, Undervoltage, Overtemperature Shutdown, Output Short Circuit Current Limit	30-pin HSOP	Production
MC33926	5.0 A Throttle Control H-Bridge	2			120	8.0	50 μA	Parallel	Status Flag	Output Short Circuit Protect, Overcurrent Limit, Overtemperature	32-pin PQFN	Production EVB
MC33931	5.0 A Throttle Control H-Bridge	2			120	8.0	50 μA	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	4			120	8.0	50 μA	Parallel	Status Flag	Output Short Circuit Protect, Overcurrent Limit, Overtemperature	44-pin HSOP	Production EVB

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

### Power Actuation — H-Bridge Stepper Motors

Product	Description	Main Characteristics	Operating Voltage (V)	Packaging	Status
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 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	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, 2 mA (typ)	SPI	Open Load detect, Overcurrent, Overvoltage, Shorted Load detect, Undervoltage, Thermal	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 μA (typ)	SPI, Status Flags	Shorted Load detect, Thermal	32-pin SOICW Exposed Pad	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.	4.5 to 36	Parallel	2L, 4.0 A (typ) 1L, 1.5 A (typ)	Parallel	Overcurrent, Outputs Short to Battery, Overtemperature Protect	32-pin SOICW, Exposed Pad	Production EVB Ref.Dsgn.
MC33883	Quad TMOS driver, for fuel injector	Quad TMOS driver, in H-Bridge configuration	5.5 to 28/55	4 non-invert CMOS, LSTTL logic	n/a	None	Overvoltage, Undervoltage	20-pin SOICW	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	54-pin SOICW Exposed Pad	Production EVB

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

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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 See Signal Conditioning (page 7)	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 IC	Engine control power IC, with 3 Low-Side drivers, one pre-driver, +5V pre-regulator, ISO-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	Production EVB Ref.Dsgn.
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	5.0 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	8.0	120	Parallel	8.0 to 28	32-pin PQFN	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).	See Pg. 4 Pre-Drivers	-	Parallel, SPI	8.0 to 58	54-pin SOICW Exposed Pad	Production EVB
MC33975	22 input Multiple Switch Detect Interface with 32 mA Wetting Current and Wake-up See Signal Conditioning (page 7)	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 KITUSBSPIIDGLEVME 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	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.	CAN High-Speed dual wire	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	Production EVB
MC33889	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-up input, sleep and stop modes	SPI 4 MHz	Fault tolerant	28-pin SOICW	Production EVB
MC33897	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 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-up input, sleep mode, and cyclic sense	SPI 4 MHz	n/a	28-pin SOICW	Production EVB
MC33902	High-speed CAN Interface with Embedded 5 V supply	High-speed CAN physical interface. Includes a 5.0 V internal supply for the CAN bus transceiver	CAN High-Speed, dual wires	5.5 to 27	14	30	Wake-up, Fault reporting, Low power modes	Pseudo SPI, Parallel	Overcurrent, Overtemp., Short circuit, undervolt.	14-pin SOICN	Production EVB
MC33904	System Basis Chip (SBC)-Gen 2-with High Speed CAN Interface	High speed CAN physical interface. 5.0 or 3.3 V and VAux regulators w/current sharing	CAN high-speed, dual wires	5.5 to 27	20	65	Configurable I/O, MUX - out, pin compatible with MC33905	SPI	Overcurrent, Overtemperature, Short circuit, protect	32-pin SOICW, Exposed Pad	1Q2010
MC33905	System Basis Chip (SBC)-Gen 2-with High Speed CAN & LIN Interfaces	High speed CAN & 1 or 2 LIN physical interfaces. 5.0 or 3.3 V and VAux regulators w/current sharing.	CAN high-speed, dual wires. LIN single wire	5.5 to 27	20	65	Configurable I/O, MUX - out, SAFE output, Low power modes w/INT and RST capability.	SPI	Overcurrent, Overtemperature, Short circuit, protect	32-pin SOICW Exposed Pad, 54-pin SOIC Exposed Pad	1Q2010

1. Products available with SPI Control work with the KITUSBSPIEVME and the KITUSBSPIIDGLEVME 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 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.	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
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	Production EVB Ref.Dsgn.
MC33905	System Basis Chip (SBC)-Gen 2-with High Speed CAN & LIN Interfaces	High speed CAN and 1 or 2 LIN physical interfaces. 5.0 or 3.3 V and VAux regulators w/current sharing.	CAN high-speed, dual wires. LIN single wire	5.5 to 27	20	65	Configurable I/O, MUX - out, SAFE output, Low power modes w/INT and RST capability.	SPI	Overcurrent, Overtemperature, Short circuit and undervoltage detect	32-pin SOICW, Exposed Pad 54-pin SOICW, Exposed Pad	1Q2010
MC33910	System Basis Chip with High-Side Drivers and LIN Physical Interface	LIN 2.0 compatible, 5.0 V/60 mA 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 EVB ('912)
MC33911	System Basis Chip with DC Motor Pre-driver and LIN Physical Interface	LIN 2.0 compatible, 5.0 V/60 mA 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 EVB ('912)
MC33912	System Basis Chip with DC Motor Pre-driver and Current Sense and LIN Physical Interface	LIN 2.0 compatible, 5.0 V/60 mA LDO, 2 High-Side drivers & 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 EVB

1. Products available with SPI Control work with the KITUSBSPIEVM and the KITUSBSPIDGLEVM 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.	150 kbps	-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	200 kbps	-40 to +90	n/an/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, 5.0V regulated output, 3 configurable logic pins, CRC generation and checking.	n/a	-40 to +150	3.0/6.0	16-pin SOICN	Production
MC33789	Airbag System Basis Chip (IC) (SBC)	Air bag control module which monitors battery voltage, sensor status and supplies various voltages to the air bag system. Uses SPI for MCU communication. Uses PSI5 for satellite sensors communication.	125 kbps	-40 to +125	n/a	64-pin LQFP Exposed Pad	2Q2010
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

## ANALOG AND MIXED SIGNAL PRODUCTS (continued)

### Signal Conditioning

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
MC33972	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 38/40	5.5 to 26	32-pin SOICW 32-pin SOICW Exposed Pad	Production EVB
MC33975	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 38/40	5.5 to 26.5	32-pin SOICW Exposed Pad	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					
MC33742	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.	CAN High-Speed dual wires	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
MC33889	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-up input, sleep and stop modes	SPI 4 MHz	Fault tolerant	28-pin SOICW	Production EVB
MC33904	System Basis Chip (SBC)-Gen 2-with High Speed CAN Interface	High speed CAN physical interface. 5.0 or 3.3 V and VAux regulators w/current sharing	CAN high-speed, dual wires	5.5 to 27	20	65	Configurable I/O, MUX - out, pin compatible with MC33905	SPI	Overcurrent, Overtemperature, Short circuit and undervoltage detect	32-pin SOICW, Exposed Pad	1Q2010
MC33905	System Basis Chip (SBC)-Gen 2-with High Speed CAN & LIN Interfaces	High speed CAN & 1 or 2 LIN physical interfaces. 5.0 or 3.3 V and VAux regulators w/current sharing.	CAN high-speed, dual wires. LIN single wire	5.5 to 27	20	65	Configurable I/O, MUX - out, SAFE output, Low power modes w/INT and RST capability.	SPI	Overcurrent, Overtemperature, Short circuit and undervoltage detect	32-pin SOICW, Exposed Pad 54-pin SOICW, Exposed Pad	1Q2010
MC33910	System Basis Chip with High-Side Drivers and LIN Physical Interface	LIN 2.0 compatible, 5.0 V/60 mA 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 EVB ('912)
MC33911	System Basis Chip with DC Motor Pre-driver and LIN Physical Interface	LIN 2.0 compatible, 5.0 V/60 mA 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 EVB ('912)
MC33912	System Basis Chip with DC Motor Pre-driver and Current Sense and LIN Physical Interface.	LIN 2.0 compatible, 5.0 V/60 mA 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 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-up 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)
MM912X634	DC Motor Control Using Relays (for example, Window Lift, Sun Roof, and Power Seats), Dual High-Side and Dual Low Side Switches with Embedded S12 MCU + Power + LIN	Cascaded Dual Voltage Regulator 2.5 V/50 mA and 5.0 V/80 mA, LIN Physical Layer with Selectable Slew rates, Window Watchdog with Selectable Timing, Normal/Stop/Sleep Mode Control, Hall Supply of 18 V/30 mA	7 W High-Side Switches, 2.5 W Low-Side Switches for Relay Control	MC9S12132(F)	S12-16-Bit Core, 32K Flash, 2K Bytes RAM, ESCI, Multi-Channel 10-bit ADC, 16-bit 4Channel Timer, Internal Clock Generator	High Voltage Wake-up Inputs, Selectable Gain I-Sense, Battery Voltage Sense.	48-pin LQFP Exposed Pad	1Q2010

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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 PRODUCTS

### 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					
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	Production EVB
MC33742	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 input capabilities	SPI 4 MHz	Current and thermal protection for CAN and regulator	28-pin SOICW	Production EVB
MC33889	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-up 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-up 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.

### Power Management — Switching Regulators

Product	Description	Main Characteristics	Operating Input Voltage (V)	Output Voltages	Protection Features	Packaging	Status
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	Production EVB

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## FREESCALE SEMICONDUCTOR AUTOMOTIVE SENSORS

Sensor Products — Freescale is a leading sensor supplier for automotive safety and is expanding into advanced safety systems such as Tire Pressure Monitoring Systems (TPMS) and Electronic Stability Control (ESC), which are new growth areas in active safety.

Our Zero Defects process and Automotive Electronics Council (AEC) membership are critical in providing world-class quality solutions from entry-level to high-end.

Applications — Freescale Semiconductor automotive sensors are designed for a variety of applications ranging from safety and performance to comfort and control. Our sensors are used in under-hood and in-cabin applications, and are compatible with the Freescale Semiconductor Microcontroller Families.

For additional information, visit the Automotive Home Page at: [www.freescale.com/automotive](http://www.freescale.com/automotive)

## AUTOMOTIVE SENSORS

### Pressure Sensors

Product	Maximum Pressure Rating (kPa)	Full Scale Span Voltage (Typical) (Vdc)	Sensitivity (mV/kPa)	Accuracy 0°C to 85°C (% of V <sub>FSS</sub> )	Packaging	Status
MPX4100A	105	4.6	54	±1.8	Small Outline Package (SOP)	Available
MPXAZ4100A	105	4.6	54	±1.8	SOP — media resistant package	Available
MPX4115	115	4.6	46	±1.5	Super-Small Outline Package (SSOP)	Available
	115	4.4	38	±1.5		SSOP
MPX4250	250	4.7	20	±1.5	SSOP	Available
	250	4.7	19	±1.4	SSOP	Available
MPXV5004	4	3.9	1000	±2.5	SOP	Available
MPXV5010G	10	4.5	450	±5.0	SOP	Available
MPX5100	100	4.5	45	±2.5	6-pin unibody package	Available
MPX5700	700	4.5	6.4	±2.5	6-pin unibody package	Available
MPX5999D	1000	4.5	4.5	±2.5	6-pin unibody package	Available
MPXH6101	102	4.6	54	±1.8	SSOP	Available
MPXA6115A	115	4.6	45.9	±1.5	SOP	Available
MPXAZ6115A	115	4.5	45.9	±1.5	SOP	Available
MPXV6115V	115	4.6	45.9	±1.5	SOP	Available
MPXHZ6115	115	4.5	45.9	±1.5	SSOP	Available
MPXHZ6250	250	4.7	20	±1.5	SSOP	Available
MPXH6300	300	4.7	16	±1.8	SSOP	Available
MPXH6400	400	4.7	12	±1.5	SSOP	Available
MPXHZ6400	400	4.7	12	±1.5	SSOP	Available
MPXV7007	7	4.0	286	±5.0	SOP	Available
MPXV7025	25	4.5	90	±5.0	SOP	Available

### Barometric Absolute Pressure (BAP) and Manifold Absolute Pressure (MAP) Sensors

Product	Maximum Pressure Rating (kPa)	Full Scale Span Voltage (Typical) (Vdc)	Sensitivity (mV/kPa)	Accuracy 0°C to 85°C (% of V <sub>FSS</sub> )	Packaging	Status
MPXH6101A	102	4.6	54	±1.8	Super-Small Outline Package (SSOP)	Available
MPXHZ6115A	115	4.5	45.9	±1.5	SSOP	Available
MPXH6250A	250	4.7	20	±1.5	SSOP	Available

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# AUTOMOTIVE SENSORS (continued)

## Inertial Sensors<sup>1</sup>

Product	Sensing Direction	Acceleration (±g)	Sensitivity (mV/V/g)	Equivalent Self-Test Output	Temperature Range	Roll-Off Frequency	Analog	Digital	Communication	Packaging	Status Pin	Status	Replacement Part	Alternate Parts
MMA1260EG	Z	1.5g	240	2g	-40°C to +105°C	50 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA1260KEG	n/a
MMA1270EG	Z	2.5g	150	1.7g	-40°C to +105°C	50 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA1270KEG	n/a
MMA1250EG	Z	5g	80	3g	-40°C to +105°C	50 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA1250KEG	n/a
MMA1220EG	Z	8g	50	5g	-40°C to +85°C	250 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA1220KEG	n/a
MMA1213EG	Z	50g	40	50g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	n/a	MMA8104TKEG, MMA5106KW
MMA1211EG	Z	150g	2.6	75g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	n/a	MMA8115TKE, MMA5112KW
MMA1212EG	Z	200g	2	40g	-40°C to +105°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	n/a	MMA8125TKEG, MMA5124KW
MMA1200EG	Z	250g	1.6	75g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	n/a	MMA8125TKEG, MMA5124KW
MMA2260EG	X	1.5g	240	2g	-40°C to +105°C	50 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	n/a	MMA6900KQ
MMA2240EG	X	7g	300	2g	-40°C to +125°C	50 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2240KEG	n/a
MMA2244EG	X	20g	100	12g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2244KEG	n/a
MMA2201EG	X	40g	10	12g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2201KEG	n/a
MMA2202EG	X	50g	8	12g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2202KEG	n/a
MMA2204EG	X	100g	4	12g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2204KEG	n/a
MMA2300EG	X	250g	1.6	30g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2300KEG	n/a
MMA2301EG	X	200g	2	30g	-40°C to +125°C	400 Hz	Yes	—	—	16-pin SOIC	Yes	EOL	MMA2301KEG	n/a
MMA6222EG	XY	20/20	24 counts/g	12g	-40°C to +125°C	400 Hz	—	Yes	SPI	20-pin SOIC	Yes	EOL	MMA2301KEG	n/a
MMA6222AEG	XY	20/20	23.4/23.4	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA6222KEG	n/a
MMA3201EG	XY	40g	10	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA6222AKEG	n/a
MMA3221EG	XY	50/20	40/100	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA3201KEG	n/a
MMA6255EG	XY	50/50	9.76 counts/g	12g	-40°C to +125°C	400 Hz	—	Yes	SPI	20-pin SOIC	Yes	EOL	MMA3221KEG	n/a
MMA6255AEG	XY	50/50	9.37/9.37	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA6255KEG	n/a
MMA3204EG	XY	100/30g	4/13	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA6255AKEG	n/a
MMA3202EG	XY	100/50g	4/8	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA3204KEG	n/a
MMA621010EG	XY	100/100	4.88 counts/g	12g	-40°C to +125°C	400 Hz	—	Yes	SPI	20-pin SOIC	Yes	EOL	MMA3202KEG	n/a
MMA621010AEG	XY	100/100	4.68/4.68	12g	-40°C to +125°C	400 Hz	Yes	—	—	20-pin SOIC	Yes	EOL	MMA621010KEG	n/a

1. Freescale Semiconductor reserves the right to modify product specifications and/or introduction dates without any further notice. The product parameters are typical values at  $V_{DD} = 5\text{ V}$  and  $T = 25^\circ\text{C}$ , unless otherwise specified. Additional sensitivity and expanded temperature ranges are available upon request. Consult your Freescale Semiconductor sales representative.

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## AUTOMOTIVE SENSORS (continued)

### Tire Pressure Monitoring Systems

Product	Flash	RAM	RF Transmitter Frequency	Protocols Supported	Clock Type	Timer	Pressure Range	Pressure Sensor Accuracy	Package	Temperature Range	Status	Replacement Part	Alternate Parts	Market Focus
MPXY8300A	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 800 kPA	±10 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8600A	Automotive Pressure Range (with XZ-Axis Accelerometer)
MPXY8300B	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 800 kPA	±10 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8500B MPXY8500D	Automotive Pressure Range (with Z-Axis Accelerometer)
MPXY8300C	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 800 kPA	±10 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8500C	Automotive Pressure Range (without an Accelerometer)
MPXY8310A	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 450 kPA	±7 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8610A	Automotive Pressure Range (with XZ-Axis Accelerometer)
MPXY8310B	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 450 kPA	±7 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8510B MPXY8510D	Automotive Pressure Range (with Z-Axis Accelerometer)
MPXY8310C	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 450 kPA	±7 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8510C	Automotive Pressure Range (without an Accelerometer)
MPXY8320A	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 1500 kPA	±20 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8620A	Truck Tire Pressure Range (with XZ-Axis Accelerometer)
MPXY8320B	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 1500 kPA	±20 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8620B	Truck Tire Pressure Range (with Z-Axis Accelerometer)
MPXY8320C	16 KB	512 B	315/434MHz	ASK and FSK Modulation	OSC	2-CH, 16-bit PWM	100 - 1500 kPA	±20 kPA	SOIC-20 WB	-40 to 125°C	EOL	n/a	MPXY8620C	Truck Tire Pressure Range (without an Accelerometer)

## FREESCALE SEMICONDUCTOR ACCESS AND REMOTE CONTROL PRODUCTS

For additional information, visit:

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

Automotive Home Page  
[www.freescale.com/automotive](http://www.freescale.com/automotive)

## ACCESS AND REMOTE CONTROL PRODUCTS

### 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

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# FREESCALE SEMICONDUCTOR LOCAL INTERCONNECT NETWORK (LIN) SOLUTIONS

Freescale Semiconductor and LIN—As the only semiconductor member of the LIN consortium, Freescale Semiconductor has the industry's most advanced range of components, software, tools, and support available.

Cost Benefits from LIN—A LIN sub-bus system uses a single-wire implementation and self-synchronization, without a crystal or ceramic resonator, in the slave node. With these cost benefits, high-end comfort and convenience features no longer need to be limited only to top-of-the-line cars.

Embedded Controllers—Since the LIN sub-bus is based on common UART/SCI interface hardware, the 8-bit 68HC08, and 16-bit S12 and S12X Families provide the industry's broadest range of performance and features, affording designers the freedom to choose parts ideally suited to their needs.

Advanced Integration with LIN—Microcontrollers will evolve in the LIN environment to integrate the voltage regulator, physical interface, and high-voltage I/O to provide space, cost, and reliability benefits. Freescale Semiconductor solutions provide this capability today.

Software for LIN—Freescale Semiconductor is working closely with the leading LIN tool supplier to ensure a first class, seamless development and debug environment for Freescale Semiconductor LIN products.

For additional information, visit:

Local Interconnect Network (LIN) Home Page

[www.lin-subbus.org](http://www.lin-subbus.org)

Automotive Home Page

## LIN Software Products

Product	68HC05	68HC08	S08	S12	S12X
LIN master	n/a	Available	Available	Available	Available
LIN slave	Available	Available	Available	Available	Available
Operating system	n/a	Available	Available	Available	Available

## LIN Physical Interface

Product	Description	Main Characteristics	Bus Type and Standard	Protection Features	Operating Voltage (V)	Current Limitation Standby (µA)		Other Features	Control and Status Reporting	Packaging	Status
						Typ	Max				
MC33399	Local Interconnect Network LIN Physical Layer	LIN: local interconnect network physical interface	LIN single wire	Current limitation, thermal protection	7.0 to 27	n/a	50	Wake-up input pin, control of external voltage regulator	Parallel Communication	8-pin SOICN	Production EVB
MC33661	eLIN - enhanced LIN Physical layer	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	Current and thermal protection	5.5 to 27	8.0	20	Compatibility with 5.0 V and 3.3 V micros. Wake-up input Control of external regulator	Parallel Communication	8-pin SOICN	Production EVB

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## MCU CHOICES BY APPLICATION

Application	Microcontroller
Transmission, Engine Control and Management Interfaces	MPC5674F, MPC5673F, MPC563xM, MPC5567, MPC5566, MPC5565, MPC5554, MPC5553, MPC5533, <b>S12XE, S12P</b>
Hybrid and Electric Auxillaries	MPC5674F, MPC5673F, MPC563xM, MPC5567, MPC5566, MPC5565, MPC5554, MPC5553, MPC5533
Watchdog	<i>S08QD4, S08SG, S08AW</i> , <b>S12P</b>
High Temperature	<i>S08SG</i> , SCC5566
Body Control Module and Gateway	MPC5668x, MPC560xB, MPC551x, <b>S12XE</b>
HVAC, Lighting, Seats, Window Lift, Doors	MPC560xB, <b>S12XS, S12P</b> , <i>S08D, S08AW, S08EL, S08SG</i>
Body Motor Control	<i>S08MP16</i>
Infotainment	i.MX25, i.MX31, i.MX35, i.MX51
Telematics	MPC5200, MPC5125, MPC5123, i.MX35, i.MX51
Instrument Cluster	<i>S08LG</i> , <b>S12H, S12XH</b> , MPC5121e, MPC560xS, i.MX51
Braking Systems	MPC564xL, MPC560xP, <b>S12XE, S12XS</b>
Electronic Power Steering	MPC564xL, MPC560xP
Semi-Active Suspension	MPC564xL, MPC5567
Airbag	MPC560xP, <b>S12XF, S12XE, S12XS</b> , <i>S08SG</i>
Electronic Stability Control	MPC564xL, MPC560xP, MPC5567
Lane Departure	MPC564xL, MPC5561, MPC5125, i.MX51
Advanced Cruise Control	MPC564xL, MPC5561
Precrash, Blindspot Detection, Backup Warning	MPC5561, MPC564xL, MPC5125
Ethernet	MPC5553, MPC5566, MPC5567, MPC560xS, MPC5668x, MPC5121e, MPC5125, all i.MX
FlexRay	MPC5668x, MPC564xL, MPC560xP, MPC551xG, MPC5674F, MPC5673F, MPC5567, MPC5561, <b>S12XF</b>
CAN	<i>S08D</i> , <b>all S12(X)</b> , all MPC5xxx
LIN	<i>S08SG, S08EL, S08AW, S08D</i> , <b>S12P, S12XS, S12XE</b>
	<b>NOTE:</b> 32-bit in plain, <b>16-bit in bold</b> , <i>8-bit in Italics</i>

## S08 MICROCONTROLLERS — PROVIDE UP TO 40 MHZ CPU SPEED, FULL ON-CHIP IN-CIRCUIT EMULATION (ICE), AND ON-CHIP BACKGROUND DEBUG MODE (BDM)

S08 Core Technology — Optimized for extreme operating economy with a number of low-power options, Freescale's S08 core is particularly attractive for automotive applications. Multiple Stop modes, along with Wait and Standby modes, will help achieve new thresholds in low-power performance under a variety of operating conditions. The S08 core allows efficient, compact, modular coding with full 16-bit stack-pointer and stack-relative addressing, which permit various instruction sizes and enable memory interface in multiple mechanisms and addressing modes. The object code is also compatible with Freescale's legacy HC05 and HC08 cores.

S08 Family Benefits — Freescale's S08 families help save cost, reduce board space, increase performance and improve quality by having everything on-chip. No longer are external components required, such as an external crystal, LVI circuit, voltage regulator, I/O mux, watchdog circuit or EEPROM. With on-chip emulation and debug, changes can be made in application and in real-time, reducing development time. Also, with the S08 CPU running at 40 MHz, MCUs are able to quickly accomplish a task and go back to sleep. Quick execution translates into power savings, which allows customers to add more embedded content while keeping within their power budgets

### S08 Families (Sheet 1 of 3)

Device	Bus Frequency	Flash	RAM	EEPROM	CAN	UART	SPI	I <sup>2</sup> C	SLIC	Analog (ADC)	Timer	Clock	Additional Features	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
S08DZ128	20 MHz	128 KB	8 KB	Up to 2 KB	1	2xSCI	2	2	—	24-CH, 12-bit ADC, 2 comparators	Up to 12-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	48 LQFP, 64 LQFP, 100 LQFP	√
S08DZ96	20 MHz	96 KB	6 KB	Up to 2 KB	1	2xSCI	2	2	—	24-CH, 12-bit ADC, 2 comparators	Up to 12-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	48 LQFP, 64 LQFP, 100 LQFP	√
S08DZ60	20 MHz	60 KB	4 KB	Up to 2 KB	1	2xSCI	1	1	—	Up to 24-CH, 12-bit ADC, 2 comparators	Up to 6-CH+2-CHCH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DZ48	20 MHz	48 KB	3 KB	Up to 1.5 KB	1	2xSCI	1	1	—	Up to 24-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DZ32	20 MHz	32 KB	2 KB	Up to 1 KB	1	2xSCI	1	1	—	Up to 24-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DZ16	20 MHz	16 KB	1 KB	Up to 512B	1	2xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP	√
S08DV128	20 MHz	128 KB	6 KB	—	1	2xSCI	2	2	—	24-CH, 12-bit ADC, 2 comparators	Up to 12-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	48 LQFP, 64 LQFP, 100 LQFP	√
S08DV96	20 MHz	96 KB	4 KB	—	1	2xSCI	2	2	—	24-CH, 12-bit ADC, 2 comparators	Up to 12-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	48 LQFP, 64 LQFP, 100 LQFP	√
S08DV60	20 MHz	60 KB	3 KB	—	1	2xSCI	1	1	—	Up to 16-CH, 12-bit ADC, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DV48	20 MHz	48 KB	2 KB	—	1	2xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DV32	20 MHz	32 KB	2 KB	—	1	2xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DV16	20 MHz	16 KB	1 KB	—	1	1xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP	√
S08DN60	20 MHz	60 KB	2 KB	Up to 2 KB	—	1xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√

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## S08 Families (Sheet 2 of 3)

Device	Bus Frequency	Flash	RAM	EEPROM	CAN	UART	SPI	I <sup>2</sup> C	SLIC	Analog (ADC)	Timer	Clock	Additional Features	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
S08DN48	20 MHz	48 KB	2 KB	Up to 1.5 KB	—	1xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DN32	20 MHz	32 KB	1 KB	Up to 1 KB	—	1xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP, 64 LQFP	√
S08DN16	20 MHz	16 KB	512 B	Up to 512B	—	1xSCI	1	1	—	Up to 16-CH, 12-bit, 2 comparators	Up to 6-CH+2-CH	MCG (PLL, FLL, OSC)	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	32 LQFP, 48 LQFP	√
S08AW60	20 MHz	60 KB	2 KB	—	—	2xSCI	1	1	—	Up to 16-CH, 10-bit	Up to 6-CH+2-CH	ICG	40 MHz CPU, KBI, ICE, BDM, Temp Sensor	2.7 to 5.5	C, V, M	64 QFP, 64 LQFP, 48 QFN, 44 LQFP	√
S08AW48	20 MHz	48 KB	2 KB	—	—	2xSCI	1	1	—	Up to 16-CH, 10-bit	Up to 6-CH+2-CH	ICG	40 MHz CPU, KBI, ICE, BDM, Temp Sensor	2.7 to 5.5	C, V, M	64 QFP, 64 LQFP, 48 QFN, 44 LQFP	√
S08AW32	20 MHz	32 KB	2 KB	—	—	2xSCI	1	1	—	Up to 16-CH, 10-bit	Up to 6-CH+2-CH	ICG	40 MHz CPU, KBI, ICE, BDM, Temp Sensor	2.7 to 5.5	C, V, M	64 QFP, 64 LQFP, 48 QFN, 44 LQFP	√
S08AW16A	20 MHz	16 KB	1 KB	—	—	2xSCI	1	1	—	Up to 8-CH, 10-bit	Up to 4-CH+2-CH	ICG	40 MHz CPU, KBI, ICE, BDM, Temp Sensor	2.7 to 5.5	C, V, M	48 QFN, 44 QFP, 32 LQFP	√
S08EL32	20 MHz	32 KB	1 KB	Up to 512 B	—	1xSCI	1	1	1	Up to 16-CH, 10-bit, 2 comparators	4-CH+2-CH	ICS	LIN Auto-Baud/Synch, 40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	28 TSSOP, 20 TSSOP	√
S08EL16	20 MHz	16 KB	1 KB	Up to 512 B	—	1xSCI	1	1	1	Up to 16-CH, 10-bit, 2 comparators	4-CH+2-CH	ICS	LIN Auto-Baud/Synch, 40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	28 TSSOP, 20 TSSOP	√
S08SL16	20 MHz	16 KB	512 B	Up to 256 B	—	1xSCI	1	1	1	Up to 16-CH, 10-bit, 1 comparator	2-CH+2-CH	ICS	LIN Auto-Baud/Synch, 40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	28 TSSOP, 20 TSSOP	√
S08SL8	20 MHz	8 KB	512 B	Up to 256 B	—	1xSCI	1	1	1	Up to 16-CH, 10-bit, 1 comparator	2-CH+2-CH	ICS	LIN Auto-Baud/Synch, 40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	28 TSSOP, 20 TSSOP	√
S08SG32	20 MHz	32 KB	1 KB	—	—	1xSCI	1	1	—	Up to 16-CH, 10-bit, 1 comparator	2-CH+2-CH	ICS	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M, J, W	28 TSSOP, 20 TSSOP, 16 TSSOP	√
S08SG16	20 MHz	16 KB	1 KB	—	—	1xSCI	1	1	—	Up to 16-CH, 10-bit, 1 comparator	2-CH+2-CH	ICS	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M, J, W	28 TSSOP, 20 TSSOP, 16 TSSOP	√
S08SG8	20 MHz	8 KB	512 B	—	—	1xSCI	1	1	—	Up to 12-CH, 10-bit, 1 comparator	Up to 2-CH+2-CH	ICS	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	20 TSSOP, 16 TSSOP, 8 SOIC	√
S08SG4	20 MHz	4 KB	256 B	—	—	1xSCI	1	1	—	Up to 12-CH, 10-bit, 1 comparator	Up to 2-CH+2-CH	ICS	40 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	20 TSSOP, 16 TSSOP, 8 SOIC	√
S08LG32	20 MHz	32 KB	2 KB	—	—	2xSCI	1	1	—	Up to 16-CH, 12-bit	Up to 2-CH+6-CH	ICS	40 MHz CPU, Up to 37x8/41x4 LCD Driver, Watchdog OSC/Timer, RTC, KBI, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V	80 LQFP, 64 LQFP, 48 LQFP	√

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

## S08 Families (Sheet 3 of 3)

Device	Bus Frequency	Flash	RAM	EEPROM	CAN	UART	SPI	I <sup>2</sup> C	SLIC	Analog (ADC)	Timer	Clock	Additional Features	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
S08LG16	20 MHz	18 KB	2 KB	—	—	2xSCI	1	1	—	Up to 16-CH, 12-bit	Up to 2-CH+6-CH	ICS	40 MHz CPU, Up to 29x8/33x4 LCD Driver, Watchdog OSC/Timer, RTC, KBI, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V	64 LQFP, 48 LQFP	√
S08MP16	20MHz	16 KB	1 KB	—	—	1xSCI	1	1	—	13-CH, 12-bit, 3 comparators	6-CH+2-CH, 16-bit Flextimer with PWM functions	ICS	40 MHz CPU, PGA, PDB (x2), MTIM, RTC, POR, KBI, COP, CRC, ICE, BDM, 5-bit DAC (3x), Temp Sensor	2.7 to 5.5	C, V, M	48 LQFP	√
S08QD4	8 MHz	4 KB	256 B	—	—	—	—	—	—	4-CH, 10-bit	2-CH+1-CH	ICS	16 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	8 SOIC	√
S08QD2	8 MHz	2 KB	128 B	—	—	—	—	—	—	4-CH, 10-bit	2-CH+1-CH	ICS	16 MHz CPU, Watchdog OSC/Timer, COP, LVI, ICE, BDM, POR, KBI, Temp Sensor	2.7 to 5.5	C, V, M	8 SOIC	√

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C

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## THE FREESCALE SEMICONDUCTOR S12 AND S12X 16-BIT MICROCONTROLLER FAMILY

S12 and S12X Cores — The S12X family offers 32-bit performance with all the advantages and efficiencies of a 16-bit MCU. Based on the S12 core, S12X devices deliver 2 to 5 times the performance of a 25 MHz S12 MCU while retaining code compatibility for easy migration. 172 additional instructions were added to the S12X core to improve paging capability and execute 32-bit calculations.

Furthermore, the S12X Family offers an industry first-the XGATE module. This versatile, efficient coprocessor delivers up to 80 MIPS of additional processing power to off load, from the main CPU, tasks such as basic gateway activity and peripheral related processing. The parallel architecture enables more deterministic handling of

interrupts and allows design engineers to avoid conflict between core functions and interrupt processing.

For additional information, visit:

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Automotive Home Page  
[www.freescale.com/automotive](http://www.freescale.com/automotive)

### S12 and SX12 Families

Device	Bus Frequency	Flash	RAM	Data Flash	EEPROM	XGATE	MPU	ECC	FlexRay	CAN	SCI	SPI	̑C	Analog (ADC)	PWM	Motor	SSD	ECT	Timer	PIT	LCD	KWU	EBI	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
S12XEP100	50 MHz	1 MB	64 KB	—	4 KB	√	√	√		5	8	3	2	2x16-CH, 12-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	8-CH, 16-bit	8-CH	—	25	√	3.13 to 5.5	C, V, M	112 LQFP, 144 LQFP, 208 MAPBGA	√
S12XEP768	50 MHz	768 KB	48 KB	—	4 KB	√	√	√		5	8	3	2	2x16-CH, 12-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	8-CH, 16-bit	8-CH	—	25	√	3.13 to 5.5	C, V, M	112 LQFP, 144 LQFP, 208 MAPBGA	√
S12XEQ512	50 MHz	512 KB	32 KB	—	4 KB	√	√	√		4	6	3	2	2x12-CH, 12-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	8-CH	—	25	√	3.13 to 5.5	C, V, M	80 LQFP, 112 LQFP, 144 LQFP	√
S12XEQ384	50 MHz	384 KB	24 KB	—	4 KB	√	√	√		4	4	3	1	2x12-CH, 12-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	25	√	3.13 to 5.5	C, V, M	80 LQFP, 112 LQFP, 144 LQFP	√
S12XET256	50 MHz	256 KB	16 KB	—	4 KB	√	√	√		3	4	3	1	2x12-CH, 12-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	25	√	3.13 to 5.5	C, V, M	80 LQFP, 112 LQFP, 144 LQFP	√
S12XS256	40 MHz	256 KB	12 KB	8 KB	—			√		1	2	1	—	16-CH, 12-bit	8-CH, 8-bit	—	—	—	8-CH, 16-bit	4-CH	—	18		3.13 to 5.5	C, V, M, J	64 LQFP, 80 QFP, 112 LQFP, KGD	√
S12XS128	40 MHz	128 KB	8 KB	8 KB	—			√		1	2	1	—	16-CH, 12-bit	8-CH, 8-bit	—	—	—	8-CH, 16-bit	4-CH	—	18		3.13 to 5.5	C, V, M, J	64 LQFP, 80 QFP, 112 LQFP, KGD	√
S12XS64	40 MHz	64 KB	4 KB	4 KB	—			√		1	2	1	—	16-CH, 12-bit	8-CH, 8-bit	—	—	—	8-CH, 16-bit	4-CH	—	18		3.13 to 5.5	C, V, M, J	64 LQFP, 80 QFP, 112 LQFP, KGD	√
S12XF512	50 MHz	512 KB	32 KB	—	4KB	√		√	√	1	2	2	—	16-CH, 12-bit	6-CH, 15-bit	—	—	—	8-CH, 16-bit	4-CH	—	11		3.13 to 5.5	C, V, M	112 LQFP, 64 LQFP	√
S12XF384	50 MHz	384 KB	24 KB	—	4KB	√		√	√	1	2	2	—	16-CH, 12-bit	6-CH, 15-bit	—	—	—	8-CH, 16-bit	4-CH	—	11		3.13 to 5.5	C, V, M	112 LQFP, 64 LQFP	√
S12XF256	50 MHz	256 KB	20 KB	—	2 KB	√		√	√	1	2	2	—	16-CH, 12-bit	6-CH, 15-bit	—	—	—	8-CH, 16-bit	4-CH	—	11		3.13 to 5.5	C, V, M	112 LQFP, 64 LQFP	√
S12XF128	50 MHz	128 KB	16 KB	—	2 KB	√		√	√	1	2	2	—	16-CH, 12-bit	6-CH, 15-bit	—	—	—	8-CH, 16-bit	4-CH	—	11		3.13 to 5.5	C, V, M	112 LQFP, 64 LQFP	√
S12XHZ512	40 MHz	512 KB	32 KB	—	4 KB	√				2	2	1	2	16-CH, 10-bit	8-CH, 8-bit	24/6	6	8-CH, 16-bit	—	4-CH	32x4	8	√	4.5 to 5.5	C, V, M	112 LQFP, 144 LQFP	√
S12XHZ384	40 MHz	384 KB	28 KB	—	4 KB	√				2	2	1	2	16-CH, 10-bit	8-CH, 8-bit	24/6	6	8-CH, 16-bit	—	4-CH	32x4	8	√	4.5 to 5.5	C, V, M	112 LQFP, 144 LQFP	√
S12XHZ256	40 MHz	256 KB	16 KB	—	4 KB	√				2	2	1	2	16-CH, 10-bit	8-CH, 8-bit	24/6	6	8-CH, 16-bit	—	4-CH	32x4	8	√	4.5 to 5.5	C, V, M	112 LQFP, 144 LQFP	√
S12XDP512	40 MHz	512 KB	32 KB	—	4 KB	√				5	6	3	2	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	112 LQFP, 144 LQFP	√
S12XDT512	40 MHz	512 KB	20 KB	—	4 KB	√				3	6	3	1	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	80 QFP, 112 LQFP, 144 LQFP	√

## S12 and SX12 Families

Device	Bus Frequency	Flash	RAM	Data Flash	EEPROM	XGATE	MPU	ECC	FlexRay	CAN	SCI	SPI	I <sup>2</sup> C	Analog (ADC)	PWM	Motor	SSD	ECT	Timer	PIT	LCD	KWU	EBI	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
S12XDT384	40 MHz	384 KB	20 KB	—	4 KB	√				3	4	3	1	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	80 QFP, 112 LQFP, 144 LQFP	√
S12XDQ256	40 MHz	256 KB	16 KB	—	4 KB	√				4	4	3	1	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	80 QFP, 112 LQFP, 144 LQFP	√
S12XDT256	40 MHz	256 KB	16 KB	—	4 KB	√				3	4	3	1	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	80 QFP, 112 LQFP, 144 LQFP	√
S12XD256	40 MHz	256 KB	14 KB	—	4 KB	√				1	4	3	1	8-CH + 16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24	√	3.15 to 5.5	C, V, M	80 QFP, 12 LQFP, 144 LQFP	√
S12XDG128	40 MHz	128 KB	12 KB	—	2 KB	√				2	2	2	1	16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24		3.15 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12XD128	40 MHz	128 KB	8 KB	—	2 KB	√				1	2	2	1	16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24		3.15 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12XD64	40 MHz	64 KB	4 KB	—	1 KB	√				1	2	2	1	8-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	2-CH	—	24		3.15 to 5.5	C, V, M	80 LQFP	√
S12XB256	33 MHz	256 KB	10 KB	—	2 KB	√				1	2	1	1	16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	4-CH	—	24		3.15 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12XB128	33 MHz	128 KB	6 KB	—	1 KB	√				1	2	1	1	16-CH, 10-bit	8-CH, 8-bit	—	—	8-CH, 16-bit	—	2-CH	—	24		3.15 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12P128	32 MHz	128 KB	6 KB	4 KB	—		√			1	1	1	—	10-CH, 12-bit	6-CH, 8-bit	—	—	—	8-CH, 16-bit	—	—	12		3.13 to 5.5	C, V, M	80 QFP, 64 LQFP, 48 QFN	√
S12P96	32 MHz	96 KB	6 KB	4 KB	—		√			1	1	1	—	10-CH, 12-bit	6-CH, 8-bit	—	—	—	8-CH, 16-bit	—	—	12		3.13 to 5.5	C, V, M	80 QFP, 64 LQFP, 48 QFN	√
S12P64	32 MHz	64 KB	4 KB	4 KB	—		√			1	1	1	—	10-CH, 12-bit	6-CH, 8-bit	—	—	—	8-CH, 16-bit	—	—	12		3.13 to 5.5	C, V, M	80 QFP, 64 LQFP, 48 QFN	√
S12P32	32 MHz	32 KB	2 KB	4 KB	—		√			1	1	1	—	10-CH, 12-bit	6-CH, 8-bit	—	—	—	8-CH, 16-bit	—	—	12		3.13 to 5.5	C, V, M	80 QFP, 64 LQFP, 48 QFN	√
S12HZ128	25 MHz	128 KB	6 KB	—	2 KB					2	2	1	1	16-CH, 10-bit	6-CH, 8-bit	16/4	4	—	8-CH, 8-bit	—	32x4	8		4.5 to 5.5	C, V, M	112 LQFP	√
S12HZ64	25 MHz	64 KB	4 KB	—	1 KB					1	1	1	—	8-CH, 10-bit	4-CH, 8-bit	16/4	4	—	8-CH, 8-bit	—	24x4	8		4.5 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12HN64	25 MHz	64 KB	4 KB	—	1 KB						1	1	—	8-CH, 10-bit	4-CH, 8-bit	16/4	4	—	8-CH, 8-bit	—	24x4	8		4.5 to 5.5	C, V, M	80 QFP, 112 LQFP	√
S12HY64	32 MHz	64 KB	4 KB	4 KB	—					1	1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√
S12HA64	32 MHz	64 KB	4 KB	4 KB	—						1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√
S12HY48	32 MHz	48 KB	4 KB	4 KB	—					1	1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√
S12HA48	32 MHz	48 KB	4 KB	4 KB	—						1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√
S12HY32	32 MHz	32 KB	2 KB	4 KB	—					1	1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√
S12HA32	32 MHz	32 KB	2 KB	4 KB	—						1	1	1	8-CH, 10-bit	8-CH, 8-bit	16/4	Support	—	8-CH+8-CH 16-bit	—	40x4	22		3.13 to 5.5	C, V, M	64 LQFP, 100 LQFP	√

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C

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## THE FREESCALE SEMICONDUCTOR DIGITAL SIGNAL CONTROLLER (MCU/DSP)

**56800E Core**—The 56800E MCU+DSP core was architected specifically to provide users the combined benefits of MCU ease of use together with DSP performance in a single core.

**56F8300 High-Performance Flash Series**—The MC56F8300 Series of controllers combines the 56800E core with flash memory, motor control peripherals, and built-in safety features targeted specifically for automotive applications to provide 60MIPS of performance over the full -40°C to 125°C temperature range.

**Memory**—On-board memory includes Program Flash and RAM, Data Flash and RAM, and BootFlash with EEPROM emulation capability. The modified Harvard architecture enables users to perform up to three simultaneous memory accesses.

**Service**—A full-range of services is offered for the controller devices including software, support, training, and internal and third party development tools.

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### 56F8xxx Family

Product	ROM (KB)	RAM	Flash	Timer	Serial	GPIO (pins)	A/D	PWM	Operating Voltage (V)	Operating Frequency (MHZ)	Temperature	Packaging	Additional Information
56F8013	0	4K	16K	4 x 16-bit	1 SCI/LIN + 1 SPI + 1 I <sup>2</sup> C	26	1 x 4-CH 12-bit	1 x 6-CH	3.3	32	C, M	32-pin LQFP	mcPWM with center alignment, 1 x 4 channel Quad Decoder
56F8355	n/a	20K	280K	16 x 16-bit	2 SCI/LIN + 2 SPI + 1 CAN + 1 I <sup>2</sup> C	49	4 x 4-CH 12-bit	2 x 6-CH	3.3	60	C, M	128-pin LQFP	mcPWM with center alignment, 2 x 4 channel Quad Decoder

## THE FREESCALE SEMICONDUCTOR POWER ARCHITECTURE™ ISA MICROCONTROLLER FAMILY

**MPC56xx** — Leveraging the success of the MPC55xx family, Freescale Semiconductor has begun introducing the next generation of 32-bit microcontrollers, which are based on 90nm Power Architecture™ technology: the MPC56xx Family. The MPC56xx family microcontrollers offer advanced features that help make cars safer and more fuel efficient while reducing harmful emissions. The MPC56xx MCUs target a broad range of powertrain, safety, chassis, instrument cluster, body electronics and gateway applications.

The MPC56xx family consists of an array of package options for systems performance needs and embedded Flash requirements. To assist in developing products, the MPC56xx family offers systems solutions that include application software, development tools, training, documentation and technical support.

The MPC56xx portfolio will continue to grow with devices that offer expanded sets of memory, connectivity and performance options.

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### MPC56xx Product Table

Device	Core Platform	Bus Frequency	Program Flash	SRAM	DMA	EEPROM	MPU/MMU	CTU	SCI (LINFlex)	DSPI	CAN	I <sup>2</sup> C	FlexRay™	Ethernet (100BaseT)	MLB	eTPU	eMIOS	Motor Control Timers	PIT	Analog (ADC)	Operating Voltage	Temp. Range <sup>1</sup>	Debug	Package Options	In Production
MPC5674F	e200z7	150, 200, 264 MHz	4 MB	256 KB	64-CH + 32-CH	Emulated in Program Flash	√	√	3	4 (MSB)	4		√			2x32-CH	32-CH			Quad 64-CH	3.3V, 5V	M	Nexus 3+	324 BGA, 416 BGA, 516 BGA	
MPC5673F	e200z7	150, 200, 264 MHz	3 MB	192 KB	64-CH + 32-CH	Emulated in Program Flash	√	√	3	4 (MSB)	4		√			2x32-CH	32-CH			Quad 64-CH	3.3V, 5V	M	Nexus 3+	324 BGA, 416 BGA, 516 BGA	
MPC5668G	e200z6 + e200z0	128 MHz	2 MB	592KB	16-CH	Emulated in Program Flash			6	4	6	4	√	√	√		16-CH, 24-bit		8-CH	36-CH, 10-bit	3.3V, 5V	V	Nexus3 on z6 and Nexus 2+	208 MAPBGA	
MPC5634M	e200z3	60, 80 MHz	1.5M	94 KB	32-CH	Emulated in Program Flash	8 Entry		2	2	2	0				32-CH	16-CH, 24-bit		5-CH	Dual 34-CH, 12-bit	5V	M	Nexus 2+ Wide trace port in Vertical Calibration System	144 LQFP, 176 LQFP, 208 MAPBGA	
MPC5633M	e200z3	40, 60, 80 MHz	1M	64 KB	32-CH	Emulated in Program Flash	8 Entry		2	2	2	0				32-CH	16-CH, 24-bit		5-CH	Dual 34-CH, 12-bit	5V	M	Nexus 2+ Wide trace port in Vertical Calibration System	100 LQFP, 144 LQFP, 176 LQFP, 208 MAPBGA	
MPC5632M	e200z3	40, 60 MHz	768 KB	48 KB	32-CH	Emulated in Program Flash	8 Entry		2	2	2	0				32-CH	8-CH, 24-bit		5-CH	Dual 32-CH, 12-bit	5V	M	Nexus 2+ Wide trace port in Vertical Calibration System	100 LQFP, 144 LQFP	
MPC5643L	e200z4x2	80/120 MHz	1 MB	128 KB	16-CH	64 KB Data Flash	16 Entry	√	2	3	2	0	√					46-Ch. eTimer/PWM/STM	4-Ch.	Dual 16-Ch., 12-bit	3.3V	M	Nexus 3+	144 LQFP, 257 MAPBGA	

MPC56xx Product Table (continued)

Device	Core Platform	Bus Frequency	Program Flash	SRAM	DMA	EEPROM	MPU/MMU	CTU	SCI (LINFlex)	DSPI	CAN	̑C	FlexRay™	Ethernet (100BaseT)	MLB	eTPU	eMIOS	Motor Control Timers	PIT	Analog (ADC)	Operating Voltage	Temp. Range <sup>1</sup>	Debug	Package Options	In Production
MPC5607B	e200z0	64 MHz	1.5 MB	96 KB	16-CH	64 KB Data Flash	8 Entry	√	Up to 10	6	6	1					64-CH, 16-bit		16-CH, 10/12-bit & up to 32-Ch., 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	176 LQFP		
MPC5606B	e200z0	64 MHz	1 MB	80KB	16-CH	64 KB Data Flash	8 Entry	√	Up to 8	Up to 6	6	1					64-CH, 16-bit		16-CH, 10/12-bit & up to 32-Ch., 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	144 LQFP, 176 LQFP		
MPC5605B	e200z0	64 MHz	768 KB	64KB	16-CH	64 KB Data Flash	8 Entry	√	Up to 8	Up to 6	6	1					64-CH, 16-bit		16-CH, 10/12-bit & up to 32-Ch., 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP, 144 LQFP, 176 LQFP		
MPC5604B	e200z0	64 MHz	512 KB	32KB		64 KB Data Flash	8 Entry	√	4	3	3	1					56-CH, 16-bit	up to 36-CH, 10-bit	up to 36-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP, 144 LQFP		
MPC5603B	e200z0	64 MHz	384 KB	28KB		64 KB Data Flash	8 Entry	√	4	3	3	1					56-CH, 16-bit	up to 36-CH, 10-bit	up to 36-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP, 144 LQFP		
MPC5602B	e200z0	64 MHz	256 KB	24KB		64 KB Data Flash	8 Entry	√	3	3	2	1					56-CH, 16-bit	up to 36-CH, 10-bit	up to 36-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP, 144 LQFP		
MPC5604C	e200z0	64 MHz	512 KB	48 KB		64 KB Data Flash	8 Entry	√	4	3	6	1					28-CH, 16-bit	3-CH	28-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP		
MPC5603C	e200z0	64 MHz	384 KB	40 KB		64 KB Data Flash	8 Entry	√	4	3	6	1					28-CH, 16-bit	3-CH	28-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP		
MPC5602C	e200z0	64 MHz	256 KB	32 KB		64 KB Data Flash	8 Entry	√	4	3	6	1					28-CH, 16-bit	3-CH	28-CH, 10-bit	3.3V, 5V	C, V, M	Nexus 2+ (208MAPBGA Emul. Only Package) JTAG	100 LQFP		
MPC5604P	e200z0	40/64 MHz	512 KB	40 KB	16-CH	64 KB Data Flash		√	2	4	2	0	√					20-CH eTimer/PWM	4-CH	Dual 13-CH, 10-bit	3.3V, 5V	M	Nexus 2+	100 LQFP, 144 LQFP	
MPC5603P	e200z0	40/64 MHz	384 KB	36 KB	16-CH	64 KB Data Flash		√	2	4	2	0	√					20-CH eTimer/PWM	4-CH	Dual 13-CH, 10-bit	3.3V, 5V	M	Nexus 2+	100 LQFP, 144 LQFP	
MPC5602P	e200z0	40/64 MHz	256 KB	20 KB	16-CH	64 KB Data Flash		√	2	3	2	0						14-CH eTimer/PWM	4-CH	16-CH, 10-bit	3.3V, 5V	M	Nexus 1 (Emulation with MPC5604P)	64 LQFP, 100 LQFP	
MPC5601P	e200z0	40/64 MHz	192 KB	12 KB	16-CH	64 KB Data Flash			1	1	1	0						6-CH eTimer	4-CH	11-CH, 10-bit	3.3V, 5V	M	Nexus 1 (Emulation with MPC5604P)	64 LQFP, 100 LQFP	
Device	Core Platform	Bus Frequency	Program Flash	SRAM	eDMA	Emulated EEPROM	TFT Drive	Stepper Drive	SCI (LINFlex)	DSPI	CAN	̑C	LCD	Sound Generator	Memory Expansion	MPU	eMIOS	Timers	Analog (ADC)	Operating Voltage	Temp. Range <sup>1</sup>	Debug	Package Options	In Production	
MPC5606S	e200z0h	64 MHz	1 MB	48 KB + 160 KB Graphics RAM	16-CH	4x16 KB	Display Control Unit (DCU) with Parallel Data Interface (PDI)	6 gauges w/Stepper Stall Detect (SSD)	2	3	2	4	40x4	Yes (using eMIOS)	QuadSPI	12 entry	2-CH	Real Time Counter (RTC), Autonomous Periodic Interrupt (API), 4-CH 32-bit PIT and S/W watchdog timer.	16-CH, 10-bit	3.3V and 5V	C, V, M	Nexus 2+	144 LQFP, 176 LQFP		
MPC5604S	e200z0h	64 MHz	512 KB	48 KB	16-CH	4x16 KB	No	6 gauges w/Stepper Stall Detect (SSD)	2	2	2	2	64x6	√		12 entry	2-CH	Real Time Counter (RTC), Autonomous Periodic Interrupt (API), 4-CH 32-bit PIT and S/W watchdog timer.	16-CH, 10-bit	3.3V and 5V	C, V, M	Nexus 1	100 LQFP, 144 LQFP		
MPC5602S	e200z0h	64 MHz	256 KB	24 KB	16-CH	4x16 KB	No	6 gauges w/Stepper Stall Detect (SSD)	2	3	1	2	64x6	√		12 entry	2-CH	Real Time Counter (RTC), Autonomous Periodic Interrupt (API), 4-CH 32-bit PIT and S/W watchdog timer.	16-CH, 10-bit	3.3V and 5V	C, V, M	Nexus 1	100 LQFP, 144 LQFP		

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C  
 Note: specs given are for the largest package size stated.

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**MPC55xx** — Based on Power Architecture™ technology and system-on-chip (SoC) design, the 32-bit MPC55xx family microcontrollers offer advanced features that help make cars safer and more fuel efficient while reducing harmful emissions. The MPC55xx MCUs target a broad range of automotive applications, including powertrain control, advanced safety, driver assistance, chassis and body electronics.

The MPC55xx family consists of an array of package options for systems performance needs and embedded Flash requirements. Offering pin-compatibility throughout the entire Flash-based family, engineers are given the ability to migrate their efforts from one design to

another, reducing development costs and improving time to market. To assist in developing products, the MPC55xx family offers systems solutions that include application software, development tools, training, documentation and technical support.

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### MPC55XX (eSys) Family

Device	Core Platform	Bus Frequency	Program Flash	SRAM	DMA	EEPROM	eSCI	DSPI	CAN	i <sup>2</sup> C	Flexray	Ethernet (100BaseT)	MLB	External Bus	Debug	eTPU	eMIOS	PIT	Analog (ADC)	Operating Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
MPC5533	e200z3	40, 66, 80 MHz	768 KB	48 KB	32-CH	Emulated in program Flash	1	2	2					√	Nexus 3	32-CH,			40-CH, 12-bit	3.3V and 5V	M	208 MAPBGA, 324 PBGA	√
MPC5534	e200z3	40, 66, 80 MHz	1 MB	64 KB	32-CH	Emulated in program Flash	2	3	2					√	Nexus 3	32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	M	208 MAPBGA, 324 PBGA	√
MPC5553	e200z6	80, 112, 132 MHz	1.5 MB	64 KB	32-CH	Emulated in program Flash	2	3	2			√		√	Nexus 3	32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	M	208 MAPBGA, 324 PBGA, 416 PBGA	√
MPC5554	e200z6	80, 112, 132 MHz	2 MB	64 KB	64-CH	Emulated in program Flash	2	4	3					√	Nexus 3	2x32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	M	416 PBGA	√
MPC5561	e200z6	80, 112, 132 MHz	1 MB	192 KB	32-CH	Emulated in program Flash	4	2	2		√			√	Nexus 3		24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	C, M	324 PBGA	√
MPC5565	e200z6	80, 112, 132 MHz	2 MB	80 KB	32-CH	Emulated in program Flash	2	3	3					√	Nexus 3	32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	M	324 PBGA	√
MPC5566	e200z6	80, 112, 132, 144 MHz	3 MB	128 KB	64-CH	Emulated in program Flash	2	4	4			√		√	Nexus 3	2x32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	C, M	416 PBGA	√
MPC5567	e200z6	80, 112, 132 MHz	2MB	80 KB	32-CH	Emulated in program Flash	2	3	5		√	√	emulated via eTPU	√	Nexus 3	32-CH,	24-CH, 24-bit		40-CH, 12-bit	3.3V and 5V	C, M	324 PBGA, 416 PBGA	√
MPC551x	optional e200z0	48 - 80 MHz	512 KB - 1.5 MB	32 - 80 KB	16-CH	Emulated in program Flash	6	3-4	5-6	1	optional		emulated via z0	√	Nexus 2+		24-CH, 16-bit	8-CH	40-CH, 12-bit	5V	C, V, M	144 LQFP, 176 LQFP, 208 MAPBGA	√

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C.  
Note: specs given are for the largest package size stated.

### MPC52xx and MPC51xx Product Table

Device	Core Platform	Bus Frequency	Cache	Audio Acceleration	DRAM Bandwidth	Bus System	Graphics Acceleration	Display Controller	Memory Interface	External Memory Bus	PSC	i <sup>2</sup> C	CAN	USB 2.0	Secure Digital	Ethernet (100 BaseT)	Temp <sup>1</sup>	Package	In Production
MPC5200B	e300	400 MHz, 760 MIPS	16K I/D	None	300 MBs	Single port	None	None	16/32-bit DDR-I	NOR Flash	6	2	2	2 (USB 1.1)		√	C	272 TE-PBGA	√
MPC5121e	e300	400 MHz, 800 MIPS	32K I/D	AXE, 200 MHz, 32-bit RISC	1100 MBs	5-port 64-bit @200MHz	OpenGL-ES 1.1 OpenVG 1.0	1280x720 24-bit 3-plane blend	16/32-bit DDR-I/II & MobileDDR-I Controller	8/16-bit NAND Flash controller	12	3	4	2	MMC SD SDIO	√	C	516 PBGA	
MPC5123	e300	400 MHz, 800 MIPS	32K I/D	AXE, 200 MHz, 32-bit RISC	1100 MBs	5-port 64-bit @200MHz	None	1280x720 24-bit 3-plane blend	16/32-bit DDR-I/II & MobileDDR-I Controller	8/16-bit NAND Flash controller	12	3	4	2	MMC SD SDIO	√	C	516 PBGA	

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C

# APPLICATIONS PROCESSORS

The AEC-Q100 automotive qualified i.MX are based on ARM9 and ARM11 CPU Cores coupled with a wide range of connectivity peripherals and hardware accelerators. Target applications in automotive include Infotainment, Navigation, Hands-free calling, Telematics and fully configurable Instrumentation clusters.

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## i.MX Family for Automotive

Device	Core Platform	CPU Frequency	Cache	SRAM	DMA	Video Accelerator	Graphics Accelerator	Image Processor	Camera Input	Display Interface	DRAM Support	Flash Support	USB (2.0)	CAN	MLB	SD/MMC/SDIO	i <sup>2</sup> C	SPI	UART	Ethernet (100BaseT)	HDD Interface	SSI/I2S	Sample Rate Converter	SP DIF I/O	PIT	3.3V GPIO	Voltage	Temp. Range <sup>1</sup>	Package Options	In Production
i.MX251	ARM926	400 MHz	L1: 16 KB/16 KB I/D	128 KB	32-Ch.						SDRAM mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy HS Host+FS Phy or ext. HS Phy	2		2	3	3	5	√	ATA-6	2		4	√	1.38V to 1.52V	C	400 MAPBGA	√	
i.MX255	ARM926	400 MHz	L1: 16 KB/16 KB I/D	128 KB	32-Ch.				CCIR656	TFT up to 800x600	SDRAM mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy HS Host+FS Phy or ext. HS Phy	2		2	3	3	5	√	ATA-6	2		4	√	1.38V to 1.52V	C	400 MAPBGA	√	
i.MX351	ARM1136 w/Vector Floating Point	532 MHz	L1: 16 KB/16 KB I/D L2: 128 KB Unified	128 KB	32-Ch.						SDRAM mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy HS Host+FS Phy or ext. HS Phy	2	√	3	3	2	3	√	ATA-6	2+ES AI	Yes, Async.	Yes	3	√	1.22V to 1.47V	C	400 MAPBGA	√
i.MX355	ARM1136 w/Vector Floating Point	532 MHz	L1: 16 KB/16 KB I/D L2: 128 KB Unified	128 KB	32-Ch.			√	CCIR656	TFT up to 800x600	SDRAM mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy HS Host+FS Phy or ext. HS Phy	2	√	3	3	2	3	√	ATA-6	2+ES AI	Yes, Async.	Yes	3	√	1.22V to 1.47V	C	400 MAPBGA	√
i.MX356	ARM1136 w/Vector Floating Point	532 MHz	L1: 16 KB/16 KB I/D L2: 128 KB Unified	128 KB	32-Ch.		OpenVG 1.1	√	CCIR656	TFT up to 800x600	SDRAM mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy HS Host+FS Phy or ext. HS Phy	2	√	3	3	2	3	√	ATA-6	2+ES AI	Yes, Async.	Yes	3	√	1.22V to 1.47V	C	400 MAPBGA	√
i.MX514	ARM Cortex A8 with VPU and NEON	600 MHz	L1: 32KB/32KB I/D L2: 256KB Unified	96 KB	32 Ch.		OpenVG 1.1; OpenGL ES2.0	√	CCIR656	WXGA; Dual TFT	mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy and 3x HS Host			4	3	2	3	√	ATA-6	3		Yes (Tx)	3	√	0.95V to 1.10V	C	529 MAPBGA	√
i.MX516	ARM Cortex A8 with VPU and NEON	600 MHz	L1: 32KB/32KB I/D L2: 256KB Unified	96 KB	32 Ch.	D1 encode: HD720 decode	OpenVG 1.1; OpenGL ES2.0	√	CCIR656	WXGA; Dual TFT	mDDR, DDR2	NOR, SLC NAND MLC NAND	HS OTG+HS Phy and 3x HS Host			4	3	2	3	√	ATA-6	3		Yes (Tx)	3	√	0.95V to 1.10V	C	529 MAPBGA	√

1. C = -40°C to +85°C, V = -40°C to +105°C, M = -40°C to +125°C, J = -40°C to +140°C, W = -40°C to +150°C

## — Definitions —

ADC — Analog-to-Digital Converter  
ASK — Amplitude Shift Keying Modulation  
BDM — Background Debug Mode  
CAN — Controller Area Network  
CDIP — Ceramic Dual In-Line Package  
CLCC — Ceramic Leaded Chip Carrier  
COP — Computer Operating Properly (Watchdog Timer)  
CPU16 — 16-bit Central Processor Unit (HC11 Compatible)  
CPU32 — 32-bit Central Processor Unit (68000 Compatible)  
CTM — Configurable Timer Module (Various Hardware Options)  
DAB — Digital Audio Broadcasting  
DIP — Dual In-line Package  
DSPI — Deserial Peripheral Interface  
EBI — External Bus Interface  
ECT — Enhanced Capture Timer  
eDMA — Enhanced Direct Memory Access Controller  
eTPU — Enhanced Timing Processor Unit  
eMIOS — Enhanced Modular Input Output System  
eQADC — Enhanced Queued Analog-to-Digital Converter  
eSCI — Enhanced Serial Communications Interface  
FSK — Frequency Shift Keying Modulation  
GPT — General-Purpose Timer Module (4 IC, 5 OC, 2 PWM)  
HQFP — Heatsink Quad Flat Package  
HSOP — Heatsink Small Outline Package  
i — Input-Only Port Pins  
i/o — Bidirectional Input and Output Port Pins  
I<sup>2</sup>C — Inter-Integrated Circuit  
IC — Input Capture  
ISPI — Interval Serial Peripheral Interface  
LQFP — Low-Profile Quad Flat Package (1.4mm thick)  
LVI — Low-Voltage Interrupt  
LVR — Low-Voltage Reset  
MCCI — Multi-Channel Communication Interface (2 SCI, SPI)  
MFT — Multi-Function Timer  
MUX — Multiplexed  
OC — Output Compare  
OOK — On-Off Keying  
PBGA — Plastic Ball Grid Array  
PDIP — Plastic Dual In-Line Package  
PEEP — Personality EEPROM  
PEP — Personality EPROM  
PLCC — Plastic Leaded Chip Carrier  
PLL — Phase-Locked Loop  
PQFP — Plastic Quad Flat Pack  
PWM — Pulse-Width Modulation  
QADC — Queued Analog-to-Digital Converter (10-bit)  
PQFN — Quad Flat No-Lead Package  
QFN — Quad Flat No-Lead Package

QFP — Quad Flat Package  
QSM — Queued Serial Module (SCI + QSPI)  
QSPI — Queued SPI  
RTI — Real-Time Interrupt  
SCI — Serial Communication Interface  
SCIE — Enhanced SCI  
SCIM — Single-Chip Integration Module  
SDIP — Shrink Dual In-line Package  
SIM — System Integration Module  
SIML — Low-Power System Integration Module  
SIOP — Simple Serial I/O Port  
SOICN — Small Outline Package Narrow Body  
SOICW — Small Outline Package Wide Body  
SPI — Serial Peripheral Interface  
ESPI — Enhanced SPI  
SRAM — Standby RAM Module  
SSOP — Shrink Small Outline Package  
TPU — Time Processor Unit (16 Programmable Channels)  
TPURAM — Standby RAM Module with TPU Emulation Capability  
TQFP — Thin Quad Flat Package (1.0mm thick)  
TSSOP — Thin Shrink Small Outline Package  
UART — Universal AsynchroNous Receiver/Transmitter  
USB — Universal Serial Bus

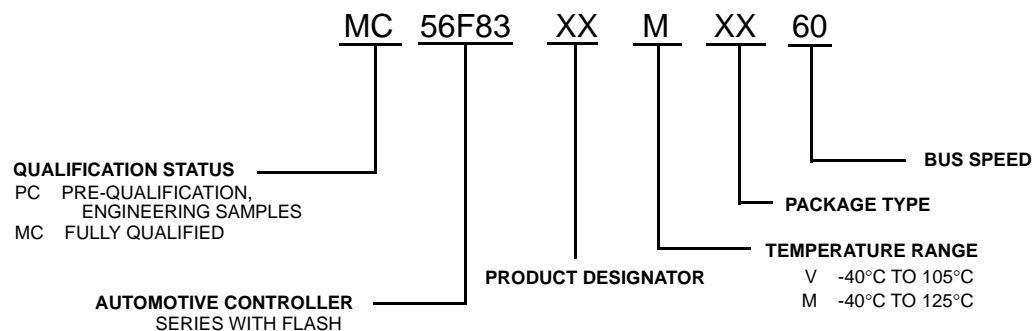
## — Package Designators —

B — Shrink DIP (70 mil spacing)  
DW — Small Outline (Wide-Body SOIC)  
DWB — Small Outline (Wide body SDIB) 0.65 pitch  
FA — 7 x 7 mm Quad Flat Pack (QFP)  
FB — 10 x 10 mm Quad Flat Pack (QFP)  
FC — QFN Quad Flat Pack  
FE — CQFP (windowed) — Samples Only  
FN — Plastic Quad (PLCC)  
FS — CLCC (windowed) — Samples Only  
FT — 28 x 28 mm Quad Flat Pack (QFP)  
FU — 14 x 14 mm Quad Flat Pack (QFP)  
FZ — CQFP (windowed) — Samples Only  
K — Cerdip (windowed) — Samples Only  
L — Ceramic Sidebrazed  
P — Dual in-Line Plastic  
PNA — PQFN Power QFN  
PNB — PQFN Power QFN  
PNC — PQFN Power QFN  
PU — 14 x 14 mm Low-Profile Quad Flat Pack (LQFP)  
PV — 20 x 20 mm Low-Profile Quad Flat Pack (LQFP)  
S — Cerdip (windowed) — Samples Only  
TM — Mechatronics Connector  
VR — Plastic Ball Grid Array (PBGA) with PB-free solder balls  
ZP — 27 x 27 mm Plastic Ball Grid Array (PBGA)

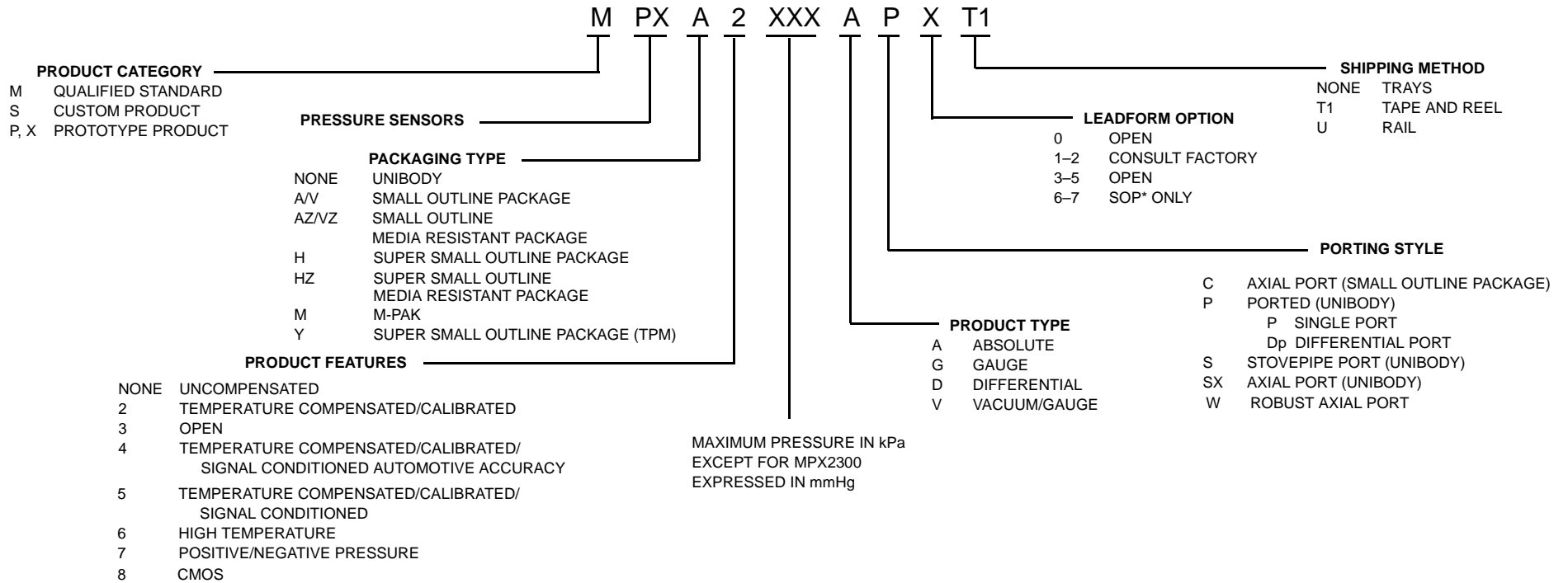
## — Pb-free —

AA — Pb-free 44 to 100 pin QFP  
AB — Pb-free 112 to 288 pin QFP  
AC — Pb-free 16 to 44 pin LQFP  
AE — Pb-free 48 to 64 pin LQFP  
AF — Pb-free 68 to 100 pin LQFP  
AG — Pb-free 108 to 144 pin LQFP  
AH — Pb-free 80 to 100 pin TQFP  
AI — Pb-free FQFP  
AJ — Pb-free CQFP  
AE — Pb-free 22 to 64 pin PDIP  
ED — Pb-free 6 to 20 pin PDIP  
EE — Pb-free PSDIP  
EF — Pb-free 8 to 16 in SOIC  
EG — Pb-free 16 to 28 pin SOIC WIDE  
EH — Pb-free 132 pin PQFP  
EI — Pb-free PLCC  
EJ — Pb-free 8 to 24 pin TSSOP  
EK — Pb-free 32 to 54 pin SOIC WIDE  
EL — Pb-free 26 to 56 pin TSSOP  
EN — Pb-free 8 to 24 pin SSOP  
EO — Pb-free 26 to 56 pin SSOP  
EP — Pb-free QFN & MLF (Exposed Pad)  
ER — Pb-free CATV  
ES — Pb-free SENSOR  
ET — Pb-free RF (POWER CHIPS)  
EU — Pb-free MAC PAAC  
EV — Pb-free MFP (SOEIAJ)  
FC — Pb-free QFN & MLF (Regular)  
FE — Pb-free CerQuads  
VK — Pb-free MAPBGA <=1.3mm (THINMAP) <.7mm Pitch  
VL — Pb-free MAPBGA <=1.3mm (THINMAP) >.7mm Pitch  
VM — Pb-free MAPBGA 1.6mm > .7mm Pitch  
VN — Pb-free MAPBGA 1.6mm < .7mm Pitch  
VO — Pb-free MAPBGA 1.35mm < .7mm Pitch  
VP — Pb-free MAPBGA 1.36mm > .7mm Pitch  
VR — Pb-free PBGA  
VS — Pb-free FC-HITCE LGA (without C5 sphere)  
VT — Pb-free FC PBGA  
VU — Pb-free FC-HITCE  
VV — Pb-free TBGA  
VW — Pb-free HSOP  
VX — Pb-free SMT  
VY — Pb-free UNIBODY

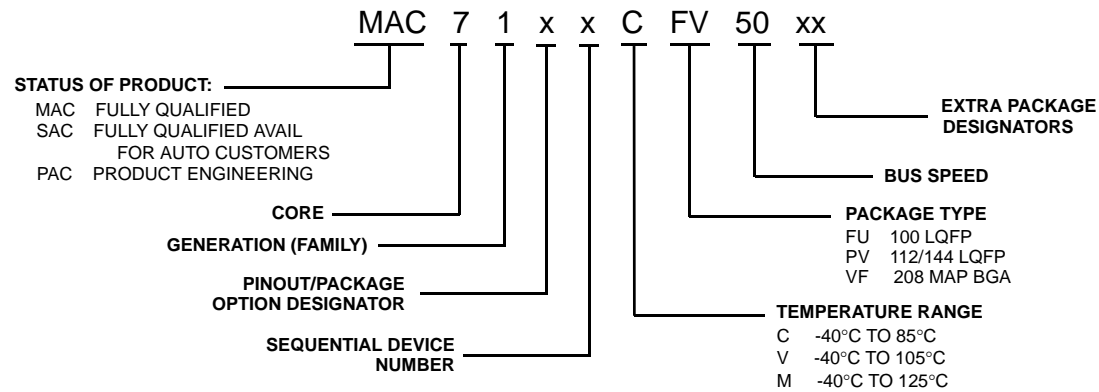
# Product Numbering System for MC56F8300 Series



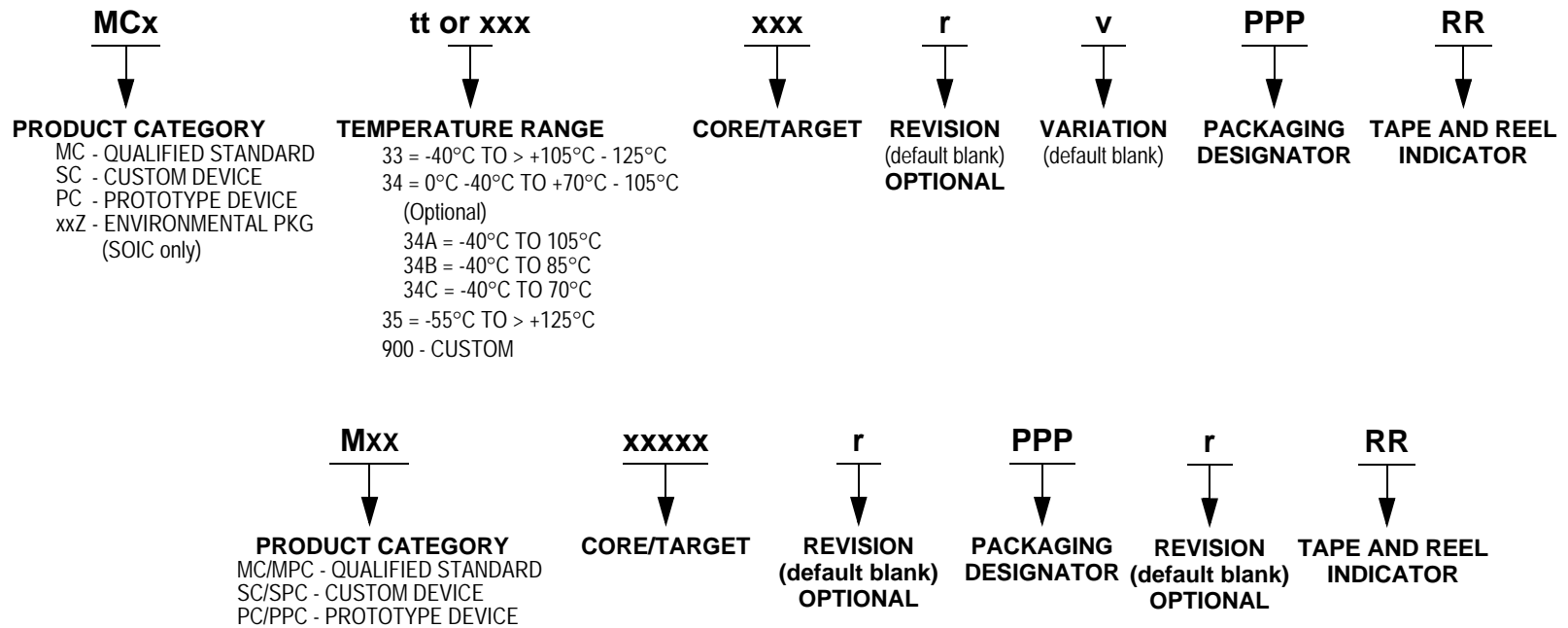
## Product Numbering System for Pressure Sensors



# Product Numbering System for ARM

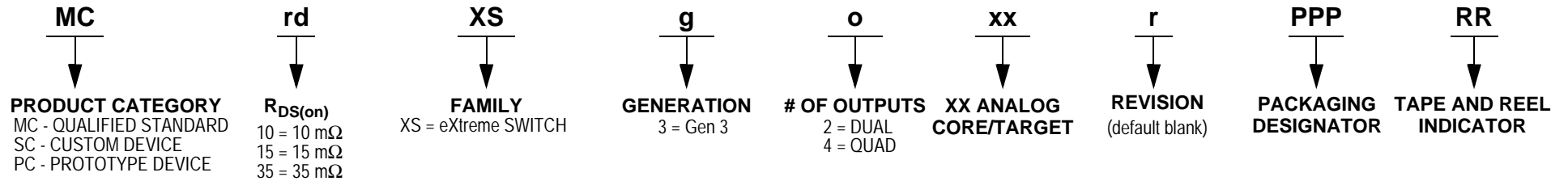


# Product Numbering System for Analog

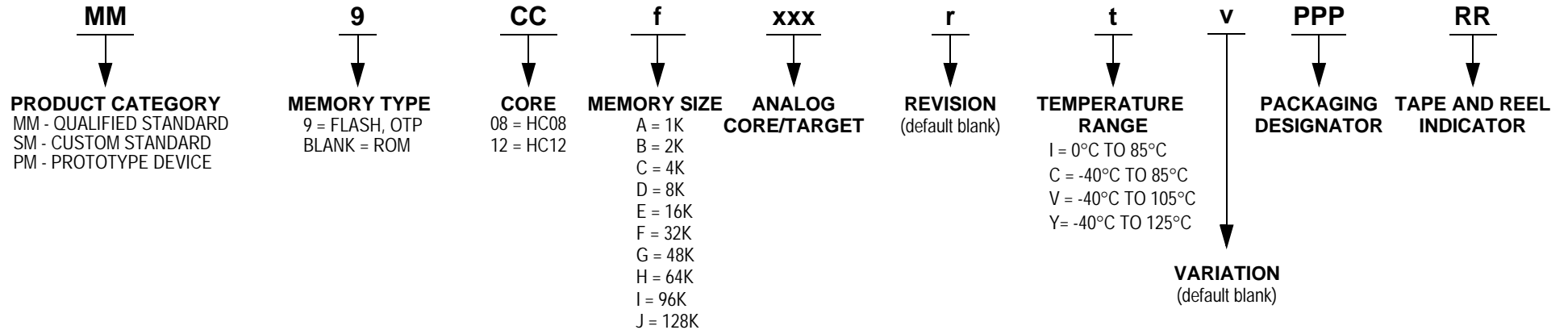


Because of an order from the United States International Trade Commission, BGA-packaged product lines and part numbers indicated here currently are not available from Freescale for import or sale in the United States prior to September 2010: MPC5668G product families; S12XE, MPC551x, MPC563xM, MPC560xB, MPC5533, MPC5534 and MPC5553 products in 208 MAPBGA packages; MPC564xL in 257 MAP-BGA.

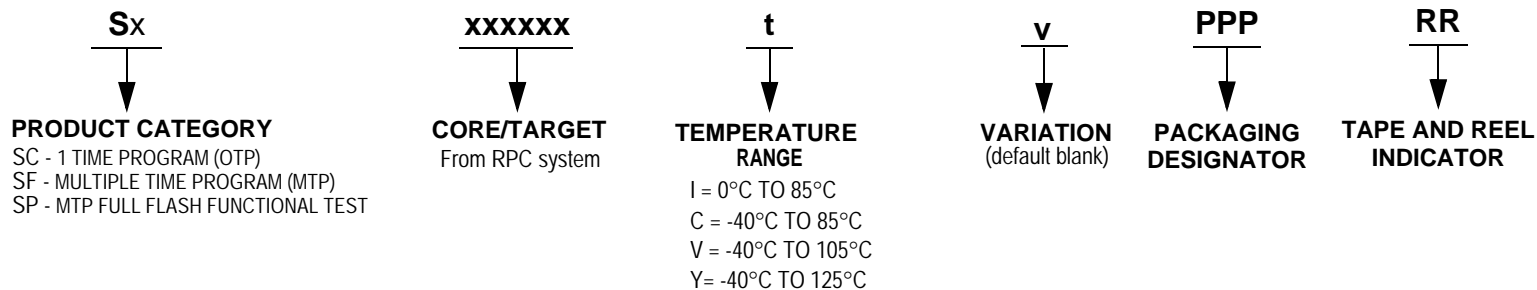
## Product Numbering System for Analog eXtreme



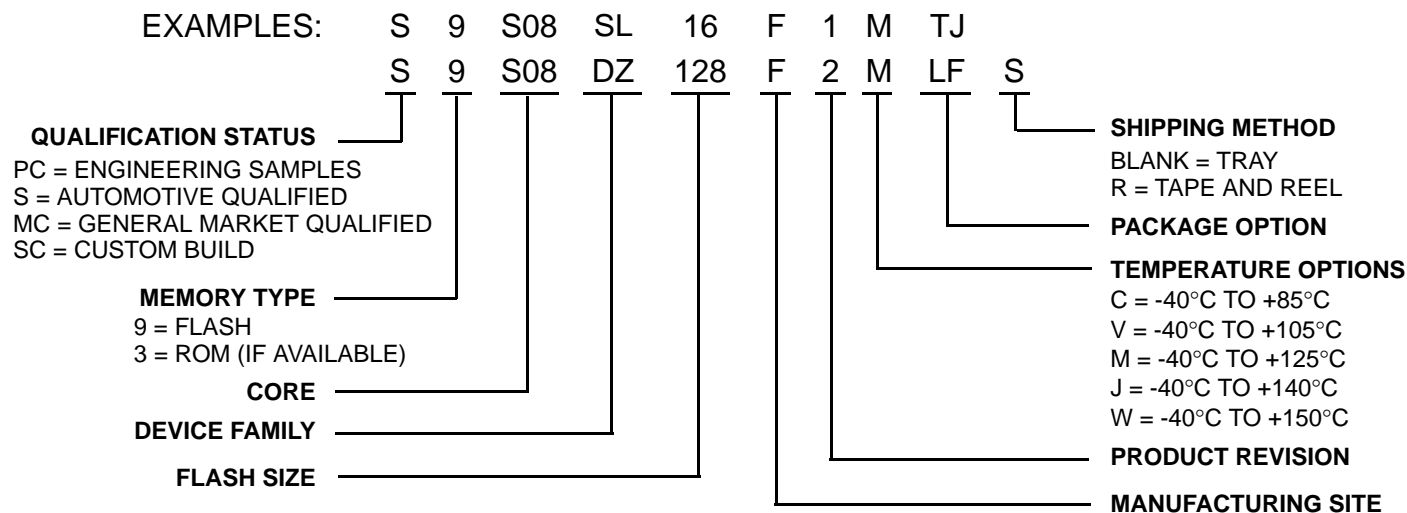
## Product Numbering System for Analog Embedded MCU and Power



## Product Numbering System for Analog Embedded MCU and Power Flash programming

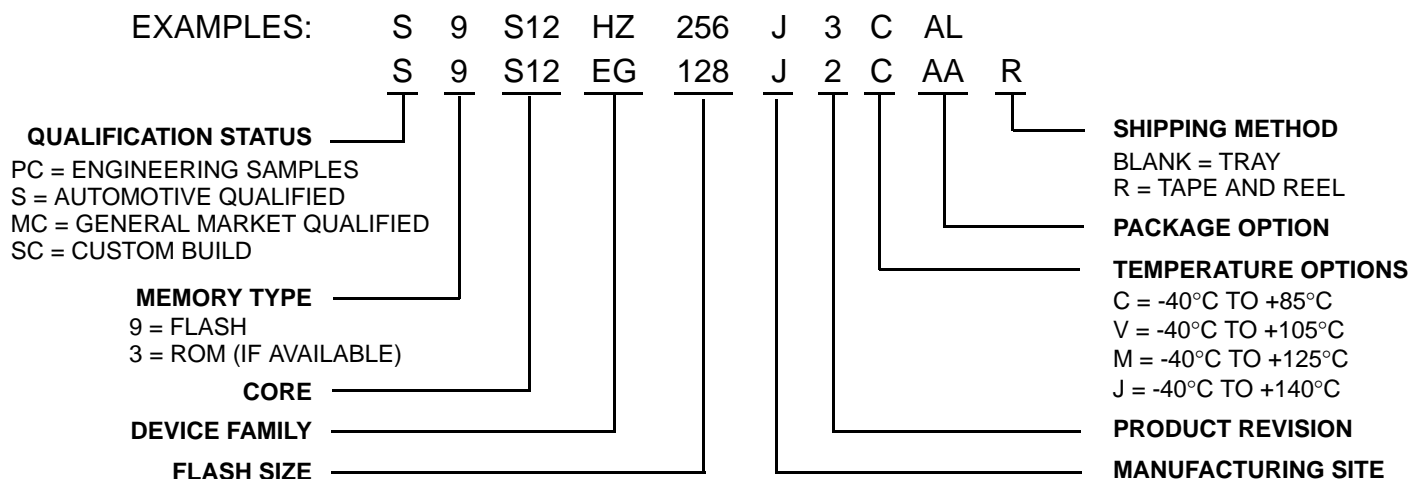


## 8-Bit Automotive Microcontroller Part Numbering System\*



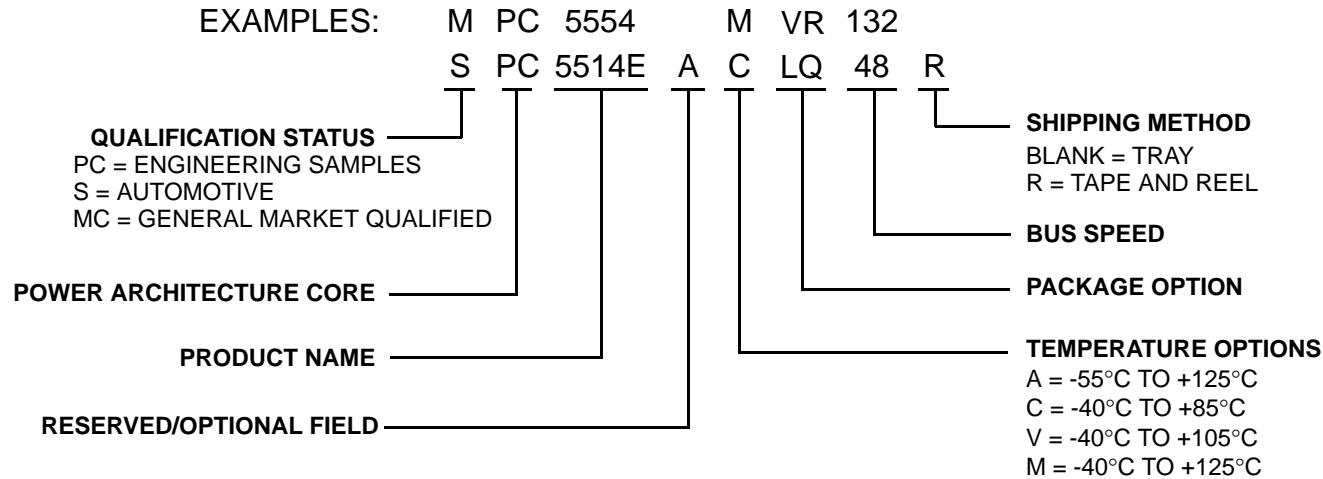
\*NOTE: Freescale's automotive part numbering system has evolved over time, so the decoder scheme shown above may not be relevant for the prior generations.

## 16-Bit Automotive Microcontroller Part Numbering System\*



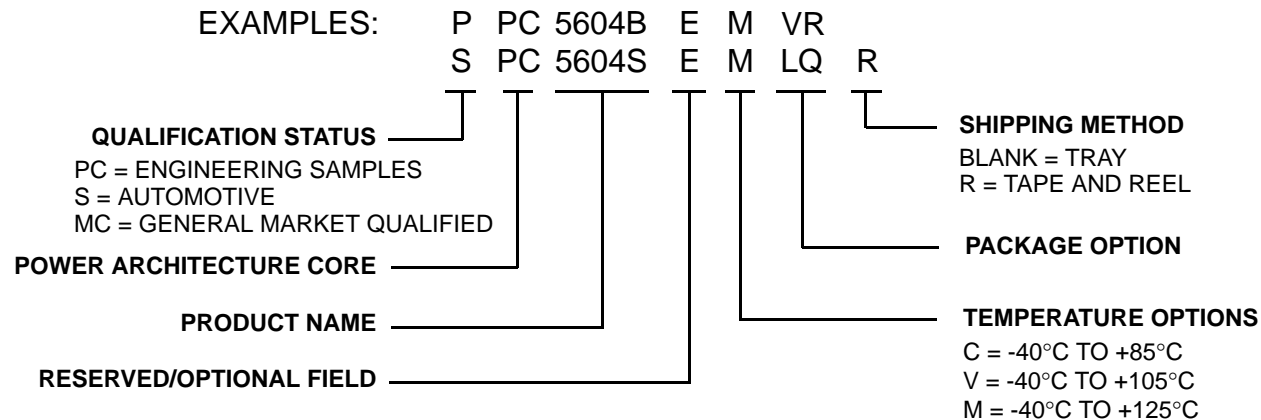
\*NOTE: Freescale's automotive part numbering system has evolved over time, so the decoder scheme shown above may not be relevant for the prior generations.

## 32-Bit Automotive Microcontroller Part Numbering System for 55xx (eSYS) Devices\*



\*NOTE: Freescale's automotive part numbering system has evolved over time, so the decoder scheme shown above may not be relevant for the prior generations.

## 32-Bit Automotive Microcontroller Part Numbering System for 56xx Devices\*



\*NOTE: Freescale's automotive part numbering system has evolved over time, so the decoder scheme shown above may not be relevant for the prior generations.

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Because of an order from the United States International Trade Commission, BGA-packaged product lines and part numbers indicated here currently are not available from Freescale for import or sale in the United States prior to September 2010: MPC5668G product families; S12XE, MPC551x, MPC563xM, MPC560xB, MPC5533, MPC5534 and MPC5553 products in 208 MAPBGA packages; MPC564xL in 257 MAPBGA.