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AUTOMOTIVE SELECTOR GUIDE

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What's New!

Section	Description
HC08 Family	Upgrade of PC68HC908AS32A and PC68HC908EY16 to MC qualification status
HCS12 Family	Upgrade of PC9S12DJ64, PC9S12D64, PC9S12H256, and PC9S12DB128 to MC qualification status. Added the MC9S12H128 device
Access and Remote Control	Upgrade of MC33594 to MC qualification status
Definitions	Addition of ZP package designator definition
Packaging	Addition of 48-lead QFP package diagram
System Example Diagrams	Revision of TPMS diagram
Pressure Sensors Family	Addition of SSOP with improved media resistance pressure sensor for automotive media
Analog	Added devices MC33389D, MC33895, MC34920, MC34923, MPC17510, MPC17511, MPC17517, MPC17529, MPC17533, MPC17550, PC33661, PC33689, PC33742, PC33984, and PM908E625

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MOTOROLA ANALOG PRODUCTS

SMARTMOS   Motorola's SMARTMOS 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   Motorola's 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.

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Power ICs — Low-Side Switches (Solid State Intelligent Switches)

Product	Description	No of Outputs	High Side or Low Side	Continuous Current Each Output (A)	$R_{DS(on)}$ (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max (μA)	Protection Features	Control	Status/Fault Reporting	Packaging	Status
MC33291	(1.2 Ω $R_{DS(on)}$) Smart Eight Output Switch with SPI Interface	8	L	0.5	1000	1 to 3.0	25	Short Circuit, Current Limit, Temp Sense	SPI	SPI	24-pin SOICW	Production EVB
MC33291L	(1.6 Ω $R_{DS(on)}$) Smart Eight Output Switch with SPI Interface	8	L	0.5	1400	1 to 3.0	25	Short Circuit, Current Limit, Temp Sense	SPI	SPI	24-pin SOICW	Production EVB
MC33298	(0.8 Ω $R_{DS(on)}$) Smart Eight Output Switch with SPI I/O Control	8	L	1.0	650	3 to 6.0	50	Short Circuit, Current Limit, Temp Sense	SPI	SPI	24-pin SOICW	Production EVB
MC33385	(0.25 Ω $R_{DS(on)}$) Quad Low-Side Injector Driver	4	L	2.0	500	3.0	6 mA	Short Circuit, Current Limit, Temp Sense	Parallel	SPI	20-pin HSOP	Production
MC33397	(0.9 Ω $R_{DS(on)}$) Smart Dual/Hex Output Switch with SPI and Parallel Input Control	2 or 6	L	0.35	2 x 223, 6 x 700	1.5	10	Short Circuit, Current Limit, Temp Sense	SPI	SPI	24-pin SOICW 32-pin QFN (7 x 7)	Production EVB
MC33880	(1.0 Ω $R_{DS(on)}$) Configurable Eight Output SPI Controlled Switch	8	H/L	0.25	1000	1.2	25	Short Circuit, Current Limit, Temp Sense	SPI w/2 PWM	SPI	28-pin SOICW	Samples; Production EVB
MC33882	(0.8 Ω $R_{DS(on)}$) Smart Six Output Switch with SPI and Parallel Input Control	8	L	1.0	375	3.0	10	Short Circuit, Current Limit, Temp Sense	SPI	SPI	30-pin HSOP 32-pin QFN (7 x 7)	Production
PC33996	16 Output Hardware Low-Side Switch with 24-Bit Serial Input Control	16	L	1.0	600	1–2.5	50	Short Circuit, Current Limit, Temp Sense, Open Load	SPI	SPI	32-pin SOICW	Samples Now Production Q1/2004

Analog Products

Analog Products

Power ICs — High-Side Switches (Solid State Intelligent Switches)

Product	Description	No of Outputs	High Side or Low Side	Continuous Current Each Output (A)	$R_{DS(on)}$ (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max (μA)	Protection Features	Control	Status/Fault Reporting	Packaging	Status
MC33143	Smart Dual High-Side Switch	2	H	3.0	380	3 to 6	300	Short Circuit, Current Limit, Temp Sense	Parallel	2 Status Pins	24-pin SOICW	Production
MC33286	Dual High-Side Switch	2	H	6.0	2 x 35	30	5	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overtemp / Openload)	20-pin SOICW	Production
MC33288	Solid State Relay for High-Current Incandescent Lamps	2	H	8.0	2 x 20	30	5	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overtemp / Openload)	20-pin HSOP	Production
MC33289	Dual High-Side Switch for Inductive Load	2	H	4.0	2 x 40	9	5	Short Circuit, Current Limit, Temp Sense, Current Recopy	Parallel	1 Status Pin (Overtemp / Openload)	20-pin SOICW	Production
MC33486	Dual High-Side Switch for H-Bridge	2	H	10	15	35	5	Short Circuit, Current Limit, Temp Sense, Current Recopy	Parallel	1 Status Pin (Overtemp / Overcurrent)	20-pin HSOP	Production
MC33880	Configurable Eight Output SPI Controlled Switch	8	H/L	0.5	1000	1.2	25	Short Circuit, Current Limit, Temp Sense	SPI w/2 PWM	SPI	28-pin SOICW 32-pin QFN (7 x 7)	Production
MC33888	Quad High-Side Switch and Octal Low-Side Switch	12	H	4 @ 10 A 8 @ 500 mA	2 x 10, 2 x 40, 8 x 600	45/20	5	Short Circuit, Current Limit, Temp Sense, Current Recopy	SPI	SPI	64-pin HQFP 35-pin PQFN	Production Production Q4/2003
PC33982	Self Protected 2 mΩ Switch with Diagnostic and Protection	1	H	60.0	2	100 or 150 Selectable	5	Current Limit, Temp Sense, Over/Under Voltage, Shutdown, Reverse Polarity	SPI	SPI	16-pin PQFN	Limited Samples; Production Q4/2003
PC33984	Self Protected 4 mΩ Switch with Diagnostic and Protection	2	H	20.0	4	Programmable	5	Over / Under Voltage Independant Thermal Shutdown	SPI	SPI	16-pin PQFN	Samples June 2003; Production Q1/2004

Power ICs — H-Bridges and Configurable Switches (Totem-Pole Output Devices)

Product	Description	Main Characteristics	No of Outputs	$R_{DS(on)}$ (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max	Protection Features	Control	Status Reporting	Packaging	Status
MC33186	H-Bridge Driver (5 A)	40 V/150 mΩ per FET	2	150	6	20 mA	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overcurrent / Overtemp)	20-pin HSOP	Production
MC33395	Three-Phase Bridge Gate Driver IC	Three-channel high-side/three-channel low-side MOSFET driver with fault report pin, mode selectable	6	n/a	Internal comparator	60 mA	Current Limit, Temp Sense	Parallel	No Status	32-pin SOICW	Production
MC33486	Dual High-Side Switch for H-Bridge	40 mΩ, 10 A	2	2 x 15	35	5 µA	Short Circuit, Current Limit, Temp Sense, Current Recopy	Parallel	1 Status Pin (Overcurrent / Overtemp)	20-pin HSOP	Production
MC33886	H-Bridge Driver (5.2 A)	225 mΩ @150°C	2	120	6	20 mA	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overcurrent / Overtemp)	20-pin HSOP	Production EVB
MC33887	H-Bridge Driver with Sleepmode (5.2 A)	130 mΩ @ 25°C, sleep mode, current sense	2	130	6	25 µA	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overcurrent / Overtemp)	20-pin HSOP 54-pin SOICW	Production EVB
MC33888	Quad High-Side Switch and Octal Low-Side Switch	Various 10 A to 500 mA	12	2 x 10, 2 x 40, 8 x 500	45/20	5 µA	Short Circuit, Current Limit, Temp Sense, Current Recopy	SPI	SPI	64-pin HQFP 35-pin PQFP	Production Production Q4/2003
MC33895	Quad half bridge with LIN physical interface and low power mode	Low power mode 4 x Half Bridge Outputs (4 x 500 mOhm) 1 x High Side Output (700 mOhm) 1 x switchable 5V output LIN Physical Layer	5	4 x 500 1 x 700	5	100 µA	Current Voltage and Thermal Protection and Reporting for LIN, HS/HB and Hall Ports	SPI	TBD	32-pin QFN (7 x 7)	Production
MC33972	Dual H-Bridge Driver with Sleepmode (5.2 A)	130 mΩ @ 25°C, sleep mode, current sense	2	130	6	25 µA	Short Circuit, Current Limit, Temp Sense	Parallel	1 Status Pin (Overcurrent / Overtemp)	29-pin PQFN (10 x 10)	Samples Now
MC34920	.77 ohm max Dual 45v H-Bridge DC/stepper motors w/chg pump and dual regulators	Dual 45v H-Bridge Driver for DC/stepper motor w/chg pump and dual regulators	3	2.8	2.4 [Note]	14 ma (nom)	Over Current Under Voltage Over Temp ShutDown	Serial I/F	System Reset on Faults	44-pin PLCC	Production
MC34923	Single 45V H-Bridge w/charge pump	Single 45V H-Bridge w/charge pump	1	0.6	8.0 [Note]	—	Over Current Under Voltage Over Temp Reverse Battery	Serial I/F	Over Current Under Voltage Over Temp Reverse Battery	24-pin SOICW	Production
MPC17510	0.45 Ohm H-Bridge	Single 15V H-Bridge w/charge pump	1ch	0.45	3 [Note]	1 ma	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	24-pin TSSOP	Production
MPC17511	0.46 Ohm H-Bridge	Single 6.8V H-Bridge w/charge pump	1ch	0.46	3 [Note]	1 ma	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	16-pin VMFP	Production

Note: Peak Current Limitation

Analog Products

Power ICs — H-Bridges and Configurable Switches (Totem-Pole Output Devices) (Continued)

Product	Description	Main Characteristics	No of Outputs	$R_{DS(on)}$ (mΩ) of Each Output	Current Limitation (A)	Current Limitation Standby Max	Protection Features	Control	Status Reporting	Packaging	Status
MPC17517	0.46 Ohm, 3-Phase 6.8V Bridge w/charge pump	3-Phase 6.8V Bridge w/charge pump	1.5	0.46	3 [Note]	1 ma	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	16-pin TSSOP	Production
MPC17529	0.7 Ohm Dual 6.8V w/charge pump	Dual 6.8V w/charge pump	2	0.7	1.4 [Note]	1 ma	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	20-pin VMFP	Production
MPC17533	0.7 ohm Dual 6.8V external charge pump	Dual 6.8V external charge pump	2	0.7	1.4 [Note]	< 200 uA	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	16-pin VMFP	Production
MPC17550	0.7 Ohm Quad 5V H-Bridge Driver w/DC-DC Converter	Quad 5V H-Bridge Driver w/DC-DC Converter	4	0.7	2 [Note]	5 uA	Shoot through Undervoltage detect	Parallel	Shutdown Undervoltage	36-pin VMFP	Production

Note: Peak Current Limitation

Power ICs — Pre-Drivers (High-Side MOSFET Gate Drivers)

Product	Description	Main Characteristics	Operating Voltage (V)	Input Control	Output Drives High/Low Side Drive Current	Protection Features	Status Reporting	Packaging	Status
MC33198	High-Side, N-Channel MOSFET Gate Driver for Driving Loads with High In-Rush Current — Lamp Driver	Single-channel high-side MOSFET gate driver with 1 kHz PWM capability and status report pin	7 to 20	1 CMOS logic	1H 110 μA typ.	Short Circuit, Overvoltage Load Dump	1 Status Pin	8-pin SOICN	Production
MC33285	Dual High-Side TMOS Driver	Dual channel high-side MOSFET gate driver with fault report pin	7 to 40	1 analog	2H 110 μA typ.	Short Circuit Overvoltage Load Dump Rev. Battery	None	8-pin SOICN	Production
MC33395	Three-Phase Bridge Gate Driver IC	Three-channel high-side/three-channel low-side MOSFET driver with fault report pin, mode selectable	5.5 to 26	1 CMOS logic	3H, 3L	Overvoltage Current Limit, Thermal Unit	None	32-pin SOICN	XC status
MC33883	H-Bridge Pre-Driver	Full bridge driver, fast PWM, global enable	5.5 to 55	4 non-invert CMOS, LSTTL logic	2H, 2L 1A pulse	Overvoltage, Undervoltage	None	20-pin SOICN	Production

Power Management — Switching Regulators

Product	Description	Main Characteristics	Operating Input Voltage	Output Voltages	Protection Features	Packaging	Status
MC33394	Multi-Output Power Supply	Step-down/step-up switching pre-regulator, 8 voltage regulators (5 V, 3.3 V, 2.6 V adj.), 2.6 V adj. standby regulator, switched battery output, power sequencing, resets, SPI, high-speed CAN transceiver with wake-up function	4.0 V to 26.5 V (45 V transient)	5 V @ 400 mA 3 x 5 V @ 100 mA 5 V/3.3 V @ 150 mA 3.3 V @ 120 mA 2.6 V-adjustable @ 400 mA 2.6 V-adjustable @ 60 mA standby switched battery	Short circuit to GND, short circuit to battery, current limit, therm	44-pin HSOP 44-pin QFN 54-pin SOICW	Production
MC33997	3.3/5.0 Volt Switching Power Supply	Step-down switching pre-regulator, 5 voltage regulators (5 V, 3.3 V), 3.3 V standby regulator, switched battery output power sequencing, resets	6.0 V to 26.5 V (40 V transient)	5 V @ 1400 mA 2 x 5 V @ 200 mA 3.3 V @ 400 mA typ 3.3 V @ 10 mA	Undervoltage shutdown, V_{DDH} current limit, V_{KAM} current limit, short circuit to GND, short circuit to V_{PWR}	24-pin SOICW	Production
PC33998	2.6/5.0 Volt Switching Power Supply	Step-down switching pre-regulator, 5 voltage regulators (5 V, 2.6 V), 2.6 V standby regulator, switched battery output power sequencing, and reset	6.0 V to 26.5 V (40 V transient)	5 V @ 1400 mA 2 x 5 V @ 200 mA 2.6 V @ 400 mA 2.6 V @ 10 mA	Undervoltage shutdown, V_{DDH} current limit, V_{KAM} current limit, short circuit to GND, short circuit to V_{PWR}	24-pin SOICW	Samples; Production May 2003

Power Management — Linear Regulators

Product	Description	Main Characteristics	Bus Type and Standard	Protection Features	Operating Voltage (V)	Current Limitation (μA) Typ	Standby Max	Other Features	Diagnostics	Packaging	Status
MC33389A MC33389C MC33389D	System Basis Chip	Dual 5.0 V regulators LS CAN, Watchdog, 3 wakeup inputs	CAN low-speed, dual wires	Fault tolerant	5.5 to 27	—	150	Dual voltage regulator, watchdog, wakeup input, sleep mode, cyclic sense	SPI 2 MHz	28-pin SOICW 20-pin HS0P	Production
MC33889	System Basis Chip with Low Speed Fault Tolerant CAN	Dual 5.0 V regulators LS CAN, 2 wakeup inputs	CAN low-speed, dual wires	Fault tolerant	5.5 to 27	60	100	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	28-pin SOICW	Production
MC33989	System Basis Chip with High Speed CAN	Dual 5.0 V regulators HS CAN, 4 wakeup inputs	CAN high speed, dual wires	Current limitation, thermal	5.5 to 27	80	150	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 4 MHz	28-pin SOICW	Production
PC33689	System Basis Chip with enhanced LIN physical interface	Low power modes with remote and local wake up; 5V/60mA Vreg with reset and selectable W/D; enhanced LIN physical layer (same as MC33661)	LIN single wire	Current and thermal protection for LIN, regulator and HS switches	5.5 to 27	30	50	Dual HS switch (150 mA) and single HS switch (50 mA) 2 wake up input Sense amplifier Over and Under voltage detection	SPI 4 MHz	32-pin SOICW	Samples available Production Q3/2003
PC33742	System Basis Chip with enhanced High Speed CAN (250k to 1Mbps)	SBC, Dual Vreg, Enhance HS CAN with Bus failure diagnostic capability, 4 Wake Up inputs; Pin and fucntion compatible with MC33989	CAN HS dual wire	Current and thermal protection for CAN and regulator	5.5 to 27	60	150	Low power modes Remote and local wake up capabilities	SPI 4 MHz	28-pin SOICW	Samples June 2003 Production Q3/2003

Analog Products

Analog Products

Communication Protocols — LIN, ISO-9141, J-1850 Physical Interfaces

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				
MC33290	Serial ISO-9141 K-Line Interface	K line only — OBD II compatible	ISO-9141 K line	Current limitation, thermal	8.0 to 18	TBD	50	Sleep mode	Parallel Communication	8-pin SOICN	Production
MC33390	Serial Link J-1850 Bus Transceiver	J-1850 low-speed multiplexing bus	J-1850	Current limitation	9.0 to 16	TBD	65	Sleep mode	Parallel Communication	8-pin SOICN	Production
MC33399	Local Interconnect Network-LIN-Physical Layer	LIN: local interconnect network physical interface	LIN single wire	Current limitation, thermal	7.0 to 27	TBD	50	Wakeup input pin, control of external voltage regulator	Parallel Communication	8-pin SOICN	Production
MC33895	Quad half bridge with LIN physical interface and low power mode	Low power mode 4 x Half Bridge Outputs (4 x 500 mOhm) 1 x High Side Output (700 mOhm) 1 x switchable 5V output LIN Physical Layer	LIN single wire	Current voltage and thermal protection and reporting for LIN, HS/HB and Hall ports	8 to 18	TBD	100	3 x Hall sensor inputs 1 x Analog inputs with current source wakeup input PWM feature	4MHz SPI (for diag)	32-pin QFN (7 x 7)	Production
MC33990	Serial Link J-1850 Bus Transceiver	J-1850 multiplexing bus with loss of ground protection	J-1850	Current limitation	9.0 to 16	TBD	20	Internally reverse battery protected	Parallel Communication	8-pin SOICN	Production
PC33661	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 behaviour; Pin and fucntion compatible with MC33399	LIN single wire	Current and thermal protection	5.5 to 27	8	20	Compatibility with 5.0V and 3.3V micros. Wakeup input Control of external regulator	Parallel Communication	8-pin SOICN	Samples available Production Q3/2003
PC33689	System Basis Chip with enhanced LIN physical interface	Low power modes with remote and local wake up; 5V/60mA Vreg with reset and selectable W/D; enhanced LIN physical layer (same as MC33661)	LIN single wire	Current and thermal protection for LIN, regulator and HS switches	5.5 to 27	30	50	Dual HS switch (150 mA) and single HS switch (50 mA) 2 wakeup input Sense amplifier Over and under voltage detection	4MHz SPI (for diag)	32-pin SOICW	Samples available Production Q3/2003
PC33742	System Basis Chip with enhanced High Speed CAN (250k to 1Mbps)	SBC, Dual Vreg, Enhance HS CAN with Bus failure diagnostic capability, 4 Wakeup inputs; Pin and fucntion compatible with MC33989	CAN HS dual wire	Current and thermal protection for CAN and regulator	5.5 to 27	60	150	Low power modes Remote and local wakeup capabilities	4MHz SPI (for diag)	28-pin SOICW	Samples June 2003 Production Q3/2003

Communication Protocols — CAN Physical Interface Components

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				
MC33388	Fault-Tolerant CAN Interface	CAN low-speed fault tolerant physical interface	CAN low-speed, dual wires	Fault tolerant	6.0 to 27	25	25	Wakeup input pin, fault tolerant physical interface	Parallel Communication	14-pin SOICN	Production
MC33389A MC33389C MC33389D	System Basis Chip	Dual Vreg, LS CAN, Watchdog, 3 wakeup inputs	CAN low-speed, dual wires	Fault tolerant	5.5 to 27	150	150	Dual voltage regulator, watchdog, wake up input, sleep mode, cyclic sense	SPI 2 MHz	28-pin SOICW 20-pin HSOP	Production
MC33889	System Basis Chip Lite with Low-Speed CAN	Dual Vreg, LS CAN, 2 wakeup inputs	CAN low-speed, dual wires	Fault tolerant	5.5 to 27	100	100	Dual voltage regulator, watchdog, wake input, sleep and stop modes	SPI 2 MHz	28-pin SOICW	Production
MC33989	System Based Chip with High-Speed CAN	SBC dual Vreg, HS CAN, 2 wakeup inputs	CAN high-speed, dual wires	Fault tolerant	5.5 to 27	150	150	Dual voltage regulator, watchdog, wake input, sleep mode, and cyclic sense	SPI 2 MHz	20-pin HSOP 28-pin SOICW	Production
PC33897	Single-Wire CAN	33.3K Standard data rate, wakeup capability (GMW3089 v2.1 compatible)	SW CAN	Thermal Shutdown, Current Limit	6.0 to 27	80	80	Regulator Control Output	2 Mode Control Pins	8-pin SOIC	Samples; Production Q1/2003

Communication Protocols — Distributed Systems Interface Components

Product	Description	Main Characteristics	System Type	No of Channels	Current Limit (mA)	Max Voltage	Communications	Packaging	Status
MC33790	Distributed System Interface (DSI) Physical Interface (DSIP)	Dual current-limited waveshaped outputs, current sensing inputs, 3.3 V and 5 V	Distributed	2	150	26.5	DSI	16-pin SOICW	Production
MC33793	Distributed System Interface (DSI) Share Interface Sensor	4-channel, 8-bit A-to-D converter, 5 V regulated output from DSI bus, configurable I/O, fault tolerant, high drive output	Distributed	4	6	40	DSI	16-pin SOICN	Production
MC68HC55	2-Channel SPI and DSI Protocol Converter for Bus Masters	Allows any MCU with an SPI to use a DSI Bus	Distributed	2	n/a	n/a	SPI/DSI	16-pin SOICN	Production

Intelligent Distributed Control

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				
PM908E625	Highly integrated single package solution including a high performance HC08 µC with Half Bridge, High side outputs, VREG and LIN physical layer	HC08 µC with Flash Memory, Timer, ESCI, A/D converter, SPI, internal clock generator module (ICG); 4 x Half Bridge Outputs (4 x 500 mOhm); 1 x High Side Output (700 mOhm); 1 x switchable 5V output; Voltage regulator 5V/60mA; LIN Physical Layer with selectable slew rate	LIN single wire	Current voltage and thermal protection and reporting for LIN, regulator, HS/HB and Hall ports	8 to 18	20	TBD	3 x Hall sensor Inputs 1 x Analog Inputs with Current Source Wake Up Input	4MHz SPI (for diag)	54-pin SOICW	Samples June 2003 Production Q4/2003

Analog Products

Analog Products

Safety, Security, and Sensors

Product	Description	Main Characteristics	No of Channels	Current Limit (mA)	Max Voltage	Communications	Packaging	Status
MC33790	2-Channel DSI Physical Interface for Bus Masters	Dual current-limited waveshaped outputs, current sensing inputs, 3.3 V and 5 V	2	150	26.5	DSI	16-pin SOICW	Production
MC33793	DSI Slave for Remote Sensing	4-channel 8-bit A-to-D converter, 5 V regulated output from DSI bus, configurable I/O, fault tolerant, high drive output	4	6	40	DSI	16-pin SOICN	Production
MC33794	Electric Field Imaging Devices (ODS)	125 kHz generator, shield driver, 9 electrodes + 2 V_{ref} outputs, detector, 5 V regulator, MCU support	11	75	40	ISO-9141	44-pin HSOP 54-pin SOICW	Production
MC68HC55	2-Channel SPI to DSI Protocol Converter for Bus Masters	Allows any MCU with an SPI to use a DSI bus	2	n/a	n/a	SPI/DSI	16-pin SOICN	Production

Peripheral and Special Function — Alternator Voltage Regulators

Product	Description	Main Characteristics	Operating Voltage (V)	Packaging	Status
MC33099	Adaptive Alternator Voltage Regulator	Internal lamp driver. LRC response during initial start. Programmable LRC rates from 1.8 to 7.4 sec. Fault detection of undervoltage/overvoltage, phase loss and high remote sense resistance.	4.5 to 24	16-pin SOICW	Production

Peripheral and Special Function — Contact Monitor and Accessory Control

Product	Description	Main Characteristics	Operating Voltage (V)	Packaging	Status
MC33287	Contact Monitoring and Dual Low-Side Protected Driver	Contact monitor and dual 500 mA low-side	7 to 18	20-pin SOICW	Production
MC33884	Switch Monitor Interface	12 inputs contact monitoring (6 GND, 2 Vbat, 4 configurable), pulse wetting current Master, slave, and low-power mode interrupt capability	7 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 (nominal)	24-pin SOICW	Production
PC33993	22 input Multiple Switch detect interface SW TO GND	2 inputs contact monitoring (16 GND, 2 Vbat, 4 configurable), pulse wetting current Master, slave, and low-power mode interrupt capability	5.5 to 26	32-pin SOICW	Production

MOTOROLA ACCESS AND REMOTE CONTROL PRODUCTS

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Transmitters and Receivers

Product	Description	Packaging	Band	Data Rate	MCU Interface	Operating Voltage	Status
TRANSMITTER (TANGO3)							
MC33493	PLL-tuned UHF transmitter, OOK/FSK modulation, –40°C to +125°C	TSSOP 14	315/434/868MHz	1–11 kbps	2 logic lines	1.8–3.6V	Available
RECEIVER							
MC33591	PLL-tuned UHF receiver, OOK modulation, IF BW = 500kHz, –40°C to +85°C	LQFP 24	315/434MHz	1–11 kbps	SPI	5V	Available
MC33592	PLL-tuned UHF receiver, OOK modulation, IF BW = 300kHz, –40°C to +85°C	LQFP 24	315/434MHz	1–11 kbps	SPI	5V	Available
MC33593	PLL-tuned UHF receiver, OOK/FSK modulation, IF BW = 500kHz, –40°C to +85°C	LQFP 24	868MHz	1–11 kbps	SPI	5V	Production Q3/2003
MC33594	PLL-tuned UHF receiver, OOK/FSK modulation (data manager in FSK only), IF BW = 500kHz, –40°C to +105°C extended temperature	LQFP 24	315/434MHz	1–11 kbps	SPI	5V	Available
TAG READER (STARC) FOR IMMOBILIZER APPLICATIONS							
MC33690	Stand-alone TAG reader with voltage regulator	SO20WB	125kHz	—	K line (ISO9141)	12V	Available

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	COP	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Comments	Documentation
MC68HC908RK2	—	128	2K FLASH	—	2-CH, 16-Bit	14	—	—	—	See Timer	Y	20 SSOP(SD)	1.8 to 3.6	4.0 Max	C	—	Production	Low-power embedded FLASH routine	MC68HC908RK2/D
MC68HC908RF2	—	128	2K FLASH	—	1-CH, 16-Bit	12	—	—	—	See Timer	Y	32 LQFP(FA)	1.8 to 3.6	4.0 Max	C, M	—	Production	RF transmitter integrated	MC68HC908RF2/D

Access/Remote Control

Access/Remote Control

GPS Amplifier

Product	RF Freq. (MHz)	Supply Voltage Range (Vdc)	Supply Current (Typ) (mA)	RF Gain (Typ) (dB)	Noise Figure (Typ) (dB)	Case No. Package	System Applicability	Documentation
MRFIC1501	1575.42	3.0 to 5.0	5.9mA @5V	18	1.1	751-05 8-pin SO	GPS	MRFIC1501/D

GPS Downconverter

Product	RF Freq. (MHz)	Supply Voltage Range (Vdc)	Supply Current (Typ) (mA)	Standby Current (mA)	Conversion Gain (typ) (dB)	Case No. Package	System Applicability	Documentation
MRFIC1505	1575.42	2.7 to 3.3	28	3	105	932 48-pin LQFP	GPS	MRFIC1505/D

MOTOROLA AUTOMOTIVE SENSORS

Sensor Products Division   Our focus for 2003 is on new products that will continue to meet customers' needs. This year we are proud to announce the Tire Pressure Monitoring Sensors, which expand the pressure sensor automotive portfolio. These products are ideal for tire pressure measurement. The expansion of our Low g accelerometer product offering will continue with new Low g x- and xy-axis accelerometers. These products are ideal for automotive applications involving small movements such as tilt, vibration, shock, and inclination.

Accelerometers   We use surface micromachining technology for a capacitive "sensing" structure. A g-cell is coupled with a control chip for signal amplification, signal conditioning, low-pass filter, and temperature compensation.

Pressure Sensors   Our pressure sensors are silicon micromachined products with integrated on-chip circuitry. These devices are ideal for a microprocessor interface and are designed to perform in the automotive environment.

Tire Pressure Monitoring Sensors The device is a CMOS-based pressure and temperature sensor housed in our newly designed super-small outline package (SSOP). By using a CMOS-based surface micromachining technology, we are able to offer a device with low power consumption for this application.

Applications   Motorola's 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 Motorola Microcontroller Families.

Got a new idea? Our marketing and engineering support staff is ready to assist you on your new design. Call (480) 413-3333, or, for additional information, please visit the Automotive Home Page at:

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Tire Pressure Monitoring Sensors[1], [2], [3]

Product	Maximum Pressure Rating (kPa)	Full Scale Span Output (Digital)	Pressure Sensitivity (kPa/bit)	Best Possible Pressure Accuracy (-20°C to 70°C)	Packaging	Best Possible Temperature Accuracy (-20°C to 70°C)	Supply Voltage (V)
PPXY8020	637.5	8-bit	2.5	±7.5k Pa	8-pin SSOP	±4°C	2.1 – 3.6

1. Pressure accuracy varies with temperature, pressure, and supply voltage. Temperature accuracy varies with temperature.
2. Wake-up pulse set at 3 second intervals. See product specification for operating mode details.
3. Motorola reserves the right to modify product specifications and/or introduction dates without any further notice. The product parameters are typical values unless otherwise specified. Other specifications can be developed upon request. Please consult your Motorola sales representative.

Operating Mode at 3.0 V, 25°C			
Mode	Typical Response Time (μs)	Typical Current (μA)	Status
Standby/reset	—	0.6	Engineering evaluation samples Q1/2003; full production Q2/2003
Measure temp	70	500	
Measure pressure	100	1400	
Output read	50	500	

Sensors

Pressure Sensors

Product	Maximum Pressure Rating (kPa)	Full Scale Span Voltage (Typical) (Vdc)	Sensitivity (mV/kPa)	Accuracy 0–85°C (% of V_{FSS})	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
MPXA4101A	102	4.6	54	±1.8	SOP	Available
MPX4101A	102	4.6	54	±1.8	6-pin unibody package	Available
MPX4250A	250	4.7	20	±1.5	SOP	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	Super-small outline package (SSOP)	Available
MPXA6115A	115	4.6	45.9	±1.5	SOP	Available
MPXAZ6115A	115	4.6	45.9	±1.5	SOP	Available
MPXH6115A	115	4.6	45.9	±1.5	SSOP	Available
MPXHZ6115A	115	4.6	45.9	±1.5	SSOP	Available
MPXV6115V	115	4.6	45.9	±1.5	SOP	Available
MPXH6300	300	4.7	16	±1.8	SSOP	Available

Inertial Sensors[1]

Product	Sensing Direction	G-Range	AC Sensitivity	Equivalent Self-Test Output	Temperature Range	Roll-Off Frequency	Packaging	Status Pin	Status
MMA1260D	Z	1.5g	1200mV/g	2g	–40°C to +105°C	50Hz	16-pin SO	Yes	Available
MMA1270D	Z	2.5g	750mV/g	1.7g	–40°C to +105°C	50Hz	16-pin SO	Yes	Available
MMA1250D	Z	5g	400mV/g	3g	–40°C to +105°C	50Hz	16-pin SO	Yes	Available
MMA1220D	Z	8g	250mV/g	5g	–40°C to +85°C	250Hz	16-pin SO	Yes	Available
MMA2201D	X	40g	50mV/g	12g	–40°C to +85°C	400Hz	16-pin SO	Yes	Available
MMA3201D	XY	40g	500mV/g	12g	–40°C to +85°C	400Hz	16-pin SO	Yes	Available
MMA2202D	XY	50g	40mV/g	12g	–40°C to +85°C	400Hz	16-pin SO	Yes	Available
MMA1200D	Z	250g	8mV/g	75g	–40°C to +85°C	400Hz	16-pin SO	Yes	Available
MMA2300D	X	250g	8mV/g	30g	–40°C to +125°C	400Hz	16-pin SO	Yes	Available

1. Motorola 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 V and T = 25°C, unless otherwise specified. Additional sensitivity and expanded temperature ranges are available upon request. Please consult your Motorola sales representative.

THE MOTOROLA 68HC08 8-BIT MICROCONTROLLER FAMILY

68HC08   Motorola's 68HC08 Family represents one of the leading product families currently used in automotive applications and is an industry standard architecture.

Memory   The 68HC08 Family offers significantly improved performance over the 68HC05, with increased C compiler code efficiency and the option of on-chip FLASH memory and EEPROM. The HC908AZ60 is the world's first 8-bit MCU with integrated FLASH programmable memory, EEPROM, and CAN/J1850.

msCAN   The integrated msCAN module (available on selected products) offers designers a cost-effective CAN controller which is compliant with parts 2.0a and 2.0b of the CAN specification.

Technology   Motorola is aggressively transferring products from 0.65µ technology (80% UDR) to 0.5µ technology (85% and below UDR). A number of new products are being introduced in 2001 at 0.5µm.

Support and Services   Motorola offers a full range of services to accompany all of our microcontrollers, which includes software development tools and product applications support.

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68HC08 Family (Sheet 1 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	COP	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
MC68HC08AB16A	16K	512	—	512	4-CH + 4-CH 16-Bit	51	SCI SPI	—	8-CH 8-Bit	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, M	908AB32	Production	Recommended for new design-ins.	MC68HC08AB16A/D
MC68HC908AB32	—	1K	32K FLASH	512	4-CH + 4-CH 16-Bit I/C, O/C, or PWM	51	SCI SPI	—	8-CH 8-Bit	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	Order part number SC510727.	MC68HC908AB32/D
MC68HC908AS60A	—	2K	60K FLASH	1K	6-CH 16-Bit I/C, O/C, or PWM	40/50	SCI SPI	J1850	15-CH 8-Bit	See Timer	Y	52-pin PLCC(FN) 64-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	Recommended for new design-ins.	MC68HC908AZ60A/D
MC68HC908AS32A	—	1K	32K	512	6-CH 16-Bit I/C, O/C, or PWM	40	SCI SPI	J1850	8-CH 8-Bit	See Timer	Y	52-pin PLCC(FN)	5.0	8.0 Max	C, V, M	—	Production	Recommended for new design-ins.	MC68HC908AS32A/D
MC68HC08AS32	32K	1K	—	512	6-CH 16-Bit I/C, O/C, or PWM	40/46	SCI SPI	J1850	8-CH 8-Bit	See Timer	Y	52-pin PLCC(FN) 64-pin QFP(FU)	5.0	8.0 Max	C, V, M	908AS60A	Production	Recommended for new design-ins.	MC68HC08AS32/D
MC68HC908AZ60A	—	2K	60K FLASH	1K	6-CH + 2-CH 16-Bit I/C, O/C, or PWM	50	SCI SPI	CAN 2.0a/2.0b	15-CH 8-Bit	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	Recommended for new design-ins.	MC68HC908AZ60A/D

68HC08 Family

68HC08 Family

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	COP	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
MC68HC08AZ32A	32K	1K	—	512	4-CH + 4-CH 16-Bit I/C, O/C, or PWM	48	SCI SPI	CAN 2.0a/2.0b	15-CH 8-Bit	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	908AZ60A	Production	Recommended for new design-ins.	MC68HC08AZ32A/D
MC68HC08AZ60	60K	2K	—	1K	6-CH + 2-CH 16-Bit I/C, O/C, or PWM	48	SCI SPI	CAN 2.0a/2.0b	15-CH 8-Bit	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	908AZ60A	Production	80% UDR	MC68HC08AZ60/D
MC68HC908EY16	—	512	16K FLASH	—	2-CH + 2-CH 16-Bit I/C, O/C, or PWM	24	ESCI SPI	—	8-CH 10-Bit	See Timer	Y	32-pin QFP(FA)	3.0, 5.0	8.0 Max	C, V, M	—	Production	First product of the MC68HC908EYx Family for LIN and general market	MC68HC908EY16/D
MC68HC908GZ8	—	1K	8K FLASH	—	Dual 2-CH, 16-Bit I/C, O/C, or PWM	Up to 37	ESCI SPI	—	8-CH 10-Bit	See Timer	Y	32-pin QFP(FJ) 48-pin LQFP(FA)	3.0, 5.0	8.0 Max	C, V, M	—	Available	MSCAN 2.0	MC68HC908GZ16/D
MC68HC908GAZ16	—	1K	16K FLASH	—	Dual 2-CH, 16-Bit I/C, O/C, or PWM	Up to 37	ESCI SPI	—	8-CH 10-Bit	See Timer	Y	32-pin QFP(FJ) 48-pin LQFP(FA)	3.0, 5.0	8.0 Max	C, V, M	—	Available	MSCAN 2.0	MC68HC908GZ16/D
MC68HC08JL3	4K	128	—	—	2-CH, 16-Bit I/C, O/C, or PWM	23	—	—	12-CH 8-Bit	See Timer	Y	28-pin DIP(P) 28-pin SOIC(DW)	3.0, 5.0	8.0 Max	C, M	908JL3	Production	RC oscillator option, LVR with selectable trip points, 6-pin LED drive	MC68HC08JL3/H
MC68HC908JL3	—	128	4K FLASH	—	2-CH, 16-Bit I/C, O/C, or PWM	23	—	—	12-CH 8-Bit	See Timer	Y	28-pin DIP(P) 28-pin SOIC(DW)	3.0, 5.0	8.0 Max	C. M	—	Production	RC oscillator option, LVR with selectable trip points, 6-pin LED drive	MC68HC908JL3/H
MC68HC908RK2	—	128	2K FLASH	—	2-CH, 16-Bit	14	—	—	—	See Timer	Y	20-pin SSOP(SD)	1.8 to 3.6	4.0 Max	C	—	Production	Low-power embedded FLASH routine	MC68HC908RK2/D
MC68HC908RF2	—	128	2K FLASH	—	1-CH, 16-Bit	12	—	—	—	See Timer	Y	32-pin LQFP(FA)	1.8 to 3.6	4.0 Max	C	—	Production	RF transmitter integrated	MC68HC908RF2/D

68HC08 Reference Manuals

CPU08RM/AD	HC08 CPU Reference Manual
TIM08RM/AD	HC08 Timer Reference Manual

68HC08 Emulators, Cables, and Adapters

Product	Platform	Emulation Modules	Packages Supported	Flex Cable	Target Head Adapter	Surface Mount Adapter
68HC08AS20/32/60 68HC908AS32/48/60 68HC908AS60A	M68MMPFB0508 or M68MMDS0508	M68EM08AS60	52-pin PLCC-FN	M68CBL05C	X68TC08AX48FN52	
			64-pin QFP-FU	M68CBL05C	X68TC08AX48FU64	M68TQS064SAG1[2] M68TQP064SA1[2]
68HC08AZ32/60 68HC908AZ60 68HC908AZ60A 68HC908AZ32A	M68MMPFB0508 or M68MMDS0508	M68EM08AZ60	52-pin PLCC-FN	M68CBL05C	X68TC08AX48FN52	
			64-pin QFP-FU	M68CBL05C	X68TC08AX48FU64	M68TQS064SAG1[2] M68TQP064SA1[2]

1. Each QFP target head adapter includes one TQSOCKET with guides (M68TQSxxxSyG1) and one TQPACK disposable surface mount adapter (M68TQPxxxSy1 – 1.2-mm lead length or M68TQPxxxSyMO1 – 1.6-mm lead length). Order additional TQPACKs and TQSOCKETs (optional) using part numbers referenced in the Surface Mount Adapters column to support multiple target systems.

68HC08 Family

THE MOTOROLA HCS12 16-BIT MICROCONTROLLER FAMILY

HCS12   Continuing Motorola's legacy of best in class automotive MCUs, Motorola announces a full family of 0.25µ, 16-bit products based on the powerful HCS12 CPU. The entire family utilizes the latest synthesized design techniques, and will be pin compatible and memory upgradeable, with a variety of on-chip peripheral options. Leading this family is the MC9S12DP256 with 256K FLASH memory and five integrated CAN modules. (These products were previously known as STAR12.)

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HCS12 Family (Sheet 1 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
PC9S12DP512	—	14K	512K FLASH	4K	8-CH, 16-Bit ECT	Up to 91	2 SCI 3 SPI IIC	5 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25/33	C, V, M[1]	—	Samples		MC9S12DP256/D CPU12RM/AD
MC9S12DP256B	—	12K	256K FLASH	4K	8-CH, 16-Bit ECT	Up to 91	2 SCI 3 SPI IIC	5 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DP256BDGV2/D CPU12RM/AD
MC9S12DT256B	—	12K	256K FLASH	4K	8-CH, 16-Bit ECT	Up to 91	2 SCI 3 SPI IIC	3 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production	Family offers pin-for-pin compatability	9S12DP256BDGV2/D CPU12RM/AD
MC9S12DJ256B	—	12K	256K FLASH	4K	8-CH, 16-Bit ECT	Up to 91	2 SCI 3 SPI IIC	2 CAN and 1xJ1850	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DP256BDGV2/D CPU12RM/AD
MC9S12DJ256B	—	12K	256K FLASH	4K	8-CH, 16-Bit ECT	Up to 59	2 SCI 2 SPI IIC	2 CAN and 1xJ1850	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Production		9S12DP256BDGV2/D CPU12RM/AD
MC9S12DG256B	—	12K	256K FLASH	4K	8-CH, 8-Bit ECT	Up to 91	2 SCI 3 SPI IIC	2 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DP256BDGV2/D CPU12RM/AD
MC9S12DB128B	—	8K	128K FLASH	2K	8-CH, 16-Bit IC, OC, PA	Up to 91	2 SCI 2 SPI	1 CAN Byteflight	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	80-pin QFP (FU) 112-pin LQFP (PV)	5.0	25.0	C, V, M	—	Available	—	9S12DT128BDGV1/D CPU12RM/AD
MC9S12DT128B	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 91	2 SCI 2 SPI IIC	3 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DT128BDGV1/D CPU12RM/AD
MC9S12DJ128B	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 91	2 SCI 2 SPI IIC	2 CAN and 1xJ1850	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DT128BDGV1/D CPU12RM/AD
MC9S12DJ128B	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 59	2 SCI 2 SPI IIC	2 CAN and 1xJ1850	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Production		9S12DT128BDGV1/D CPU12RM/AD

HCS12 Family (Sheet 2 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
MC9S12DG128B	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 91	2 SCI 2 SPI IIC	2 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production		9S12DT128BDGV1/D CPU12RM/AD
MC9S12DG128B	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 59	2 SCI 2 SPI IIC	2 CAN	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Production		9S12DT128BDGV1/D CPU12RM/AD
MC9S12DJ64	—	4K	64K FLASH	1K	8-CH, 16-Bit ECT	Up to 91	2 SCI 1 SPI IIC	1 CAN and 1xJ1850	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production	Emulator DP256 product available now	MC9S12DP256/D CPU12RM/AD
MC9S12DJ64	—	4K	64K FLASH	1K	8-CH, 16-Bit ECT	Up to 59	2 SCI 1 SPI IIC	1 CAN and 1xJ1850	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Production	Emulator DP256 product available now	MC9S12DP256/D CPU12RM/AD
MC9S12D64	—	4K	64K FLASH	1K	8-CH 16-Bit ECT	Up to 91	2 SCI 1 SPI IIC	1 CAN	2 x 8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	112-pin LQFP	5.0	25.0	C, V, M[1]	—	Production	Emulator DP256 product available now	MC9S12DP256/D CPU12RM/AD
MC9S12D64	—	4K	64K FLASH	1K	8-CH, 16-Bit ECT	Up to 59	2 SCI 1 SPI IIC	1 CAN	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Production	Emulator DP256 product available now	MC9S12DP256/D CPU12RM/AD
PC9S12D32	—	2K	32K FLASH	1K	8-CH, 16-Bit ECT	Up to 59	2 SCI 1 SPI	1 CAN	1 x 8-CH 10-Bit	7-CH, 8-Bit or 3-CH, 16-Bit	80-pin QFP	5.0	25.0	C, V, M[1]	—	Samples	Emulator DP256 product available now	MC9S12DP256/D CPU12RM/AD
MC9S12H256	—	12K	256K FLASH	4K	8-CH, 16-Bit	99 plus 18 inputs	SCI, SPI, IIC	2 CAN 2.0a/2.0b	16-CH 10-Bit	6-CH 8-Bit or 3-CH 16-Bit	112-pin LQFP 144-pin LQFP	5.0	16.0	C, V	—	Production	32 x 4 liquid crystal display (LCD) controller/driver and a motor pulse width modulator (MC) consisting of 24 high current outputs suited to drive up to 6 stepper motors	9S12H256DGV1/D CPU12RM/AD
MC9S12H128	—	6K	128K FLASH	2K	8-CH 16-Bit	61	SCI, SPI	2 CAN 2.0a/2.0b	8-CH 10-Bit	2-CH 8-Bit	112-pin LQFP	5.0	16.0	C,V	—	Production	28 x 4 liquid crystal display (LCD) controller/driver and a motor pulse width modulator (MC) consisting of 24 high current outputs suited to drive up to 6 stepper motors	
PC9S12C32	—	2K	32K FLASH	No	5-CH TIM	Up to 28	1 SCI 1 SPI	CAN 2.0a/2.0b	8-CH 10-Bit	3-CH 16-Bit TPM	48/52/80-pin QFP	3 to 5	16.0	C, V, M[1]	—	Samples	Pre-Si emulator	MC9S12C32PP
MC9S12T64	—	2K + 2K CALRAM	64K FLASH	—	8-CH, 16-Bit IC, OC, PA	25	2 SCI 1 SPI	—	8-CH 10-Bit	8-CH, 8-Bit or 4-CH, 16-Bit	80-pin QFP (PK)	5.0	16.0	C, V, M	—	Available	FBDM (Fast Background Debug Mode)	9S12T64BDGV1/D CPU12RM/AD

M68KIT912DP256: Evaluation board kit for MC9S12DP256, includes evaluation boards, serial debugger interface, and evaluation compiler.

1. M temperature range limited to single-chip mode

HCS12 Family

THE MOTOROLA 68HC12 AND 68HC16 16-BIT MICROCONTROLLER FAMILIES

68HC12   Motorola's 68HC12 and 68HC16 Families of microcontrollers represent two of the leading product families used in automotive applications.

Automotive   The 68HC12 Family is based around Motorola's CPU12 core and is complemented by various on-board peripherals such as memory, timers, and analog-to-digital converters as well as communications modules such as CAN, SCI, and SPI. The HC12 Family primarily is targeted at automotive applications.

Memory   FLASH is the dominant memory type used by the 16-bit families. Motorola has implemented a new split-gate FLASH cell, providing great reliability benefits by using a proven technology.

NmsCAN   The integrated msCAN module (available on selected HC12 products) offers designers a cost-effective CAN controller which is compliant with parts 2.0a and 2.0b of the CAN specification.

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68HC12 Family (Sheet 1 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
XC68HC912B32	—	1K	32K FLASH	768	8-CH, 16-Bit	Up to 63	1 SCI 1 SPI	J1850	8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	80-pin QFP	5.0	8.0	C, V, M[1]	—	Production	J1850 muxed bus, BDM	MC68HC912B32/D CPU12RM/AD
XC68HC912BC32	—	1K	32K FLASH	768	8-CH, 16-Bit	Up to 63	1 SCI 1 SPI	CAN 2.0a/b	8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	80-pin QFP	5.0	8.0	C, V, M[1]	—	Production	MSCAN module on board, BDM	MC68HC912B32TS/D CPU12RM/AD
XC68HC12BC32	32K	1K	—	768	8-CH, 16-Bit	Up to 63	1 SCI 1 SPI	CAN 2.0a/b	8-CH 10-Bit	4-CH 8-Bit	80-pin QFP	5.0	8.0	C, V, M[1]	HC912BC32	Production	CAN 2.0a/b compatible	MC68HC912B32TS/D CPU12RM/AD
MC68HC12BE32	32K	1K	—	768	8-CH, 16-Bit enchanced capture timer (ECT)	Up to 63	1 SCI 1 SPI	J1850	8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	80-pin QFP	5.0	8.0	C, V, M[1]	HC912B32	Production	J1850 muxed bus	MC68HC912B32TS/D CPU12RM/AD
MC68HC912D60A	—	2K	60K FLASH	1K	8-CH, 16-Bit ECT	Up to 66, plus up to 18 input only lines	2 SCI 1 SPI	CAN 2.0a/b	2 x 8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	80-pin QFP[2] 112-pin LQFP	5.0	8.0	C, V, M[1]	—	Production	0.5µ technology, 5V FLASH. Replacement for XC68HC912D60	MC68HC912D60A/D CPU12RM/AD
XC68HC12D60	60K	2K	—	1K	8-CH, 16-Bit ECT	Up to 66, plus up to 18 input only lines	2 SCI 1 SPI	CAN 2.0a/b	2 x 8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	80-pin QFP[2] 112-pin LQFP	5.0	8.0	C, V, M[1]	HC912D60A	Production		MC68HC912D60/D CPU12RM/AD

68HC12 Family (Sheet 2 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	MUX	A/D	PWM	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
MC68HC912DG128A	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 67, plus up to 18 input only lines	2 SCI 1 SPI	2 x CAN 2.0a/b I^2C	2 x 8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	112-pin LQFP	5.0	8.0	C, V, M[1]	—	Production	0.5µ technology, 5V FLASH. Ideal for gateway applications. Replacement for XC68HC912DG128	MC68HC912DT128A/D CPU12RM/AD
MC68HC912DT128A	—	8K	128K FLASH	2K	8-CH, 16-Bit ECT	Up to 67, plus up to 18 input only lines	2 SCI 1 SPI	3 x CAN 2.0a/b I^2C	2 x 8-CH 10-Bit	4-CH 8-Bit or 2-CH 16-Bit	112-pin LQFP	5.0	8.0	C, V, M[1]	—	Production	0.5µ technology. 5V FLASH. Ideal for gateway applications	MC68HC912DT128A/D CPU12RM/AD

M68DB912DP256: Daughter board for M68KIT912DP256

1. M temperature range limited to single-chip mode
2. 1 x 8-CH 10-bit ATD in 80 QFP option

68HC16 Family

Product	ROM (Bytes)	RAM (Bytes)	FLASH (Kbytes)	Product Integration	Timers	Serial Communication	Analog	Packaging	Operating Voltage (V)	Operating Frequency (MHz)	Temperature	FLASH or OTP	Status	Documentation
MC68HC16Z3	8K	4K	0	SIM	GPT	Serial SCI, queued SPI	8-CH 10-BIT	132-pin PQFP 144-pin LQFP	5.0	16	C, V	n/a	Production	MC68HC16ZUM/AD

68HC16 Reference Manuals

CPU16RM/AD	68HC16 CPU Reference Manual	ADCRM/AD	Analog-to-Digital Converter Reference Manual
SIMRM/AD	System Integration Module Reference Manual	CTMRM/D	Configurable Timer Reference Manual
TPURM/AD	Timer Processor Unit Reference Manual	MCCIRM/AD	Multi-Channel Communication Interface Reference Manual
GPTRM/AD	General-Purpose Timer Reference Manual	SCIMRM/AD	Single-Chip Integration Module Reference Manual
QSMRM/AD	Queued Serial Module Reference Manual		

68HC12/68HC16 Families

MOTOROLA LOCAL INTERCONNECT NETWORK (LIN) SOLUTIONS

Motorola and LIN   As the only semiconductor member of the LIN consortium, Motorola 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 68HC12 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. Motorola's solutions provide this capability today.

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

68HC(9)08EYx Family   Motorola is pleased to announce the design of the first family of dedicated LIN devices. A member of the high-performance HC08 Family of 8-bit MCUs, the 68HC(9)08EYx Family is based on 0.5μ technology and includes all of the peripherals necessary for a wide range of LIN applications, whether master or slave. Device peripheral features include an Enhanced Serial Communications Interface (ESCI) and stable on-chip RC oscillator with an accuracy of 2%, both of which are key features when synchronizing with the LIN protocol bus.

For additional information, please visit:

LIN Home Page
www.lin-subbus.org

Automotive Home Page
motorola.com/semiconductors/automotive

LIN Software Products

Product	68HC05	68HC08	68HC12	MC9S12DP256
LIN master		Available	Available	Available
LIN slave	Available	Available	Available	Available
Operating system		Available	Available	Available

LIN Physical Interface

Product	Supply	Wakeup	Sleep Mode	Slew Rate	I Standby Max	Packaging	Protection	Additional Information	Control Status and Recording	Status
MC33399D	7V to 27V	Several Modes	Yes	1 to 2V/μs	50μA	S08	1 LIM thermal	Wakeup input pin Control of external voltage regulator	Parallel communication	Available

Mechatronics LIN Slave MCU

Product	ROM (Bytes)	RAM (Bytes)	FLASH (Bytes)	EEPROM (Bytes)	Timer	Packaging	Additional Information	Documentation
MC33393TM	—	64	—	1K	16-Bit	8-pin SO	Timer, oscillator, 2 x 175 mA H-bridge, mechatronics	Contact sales for product reviews

LIN Slave MCUs

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	A/D	PWM	COP	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	FLASH or OTP	Status	Additional Information	Documentation
MC68HC08AB16A	16K	512	—	512	4-CH + 2-CH, 16-Bit I/C, O/C, or PWM	51	SCI, SPI	8-CH 8-Bit	See Timer	Y	64-pin QFP (FU)	5.0	8.0 Max	C, V	—	Production	Recommended for new design-ins.	MC68HC08AB16A/D
MC68HC908AB32	—	1K	32K FLASH	512	4-CH + 4-CH, 16-Bit I/C, O/C, or PWM	51	SPI, SCI	8-CH 8-Bit	See Timer	Y	64-pin QFP (FU)	5.0	8.0 Max	C, V, M	—	Production	Order # SC510727	MC68HC908AB32A/D
MC68HC908EY16	—	512	16K FLASH	—	2-CH + 2-CH, 16-Bit I/C, O/C, or PWM	24	ESCI, SPI	8-CH 10-Bit	See Timer	Y	32-pin QFP (FA)	3.0, 5.0	8.0 Max	C, V, M	—	Samples	AdrenaLIN 16K device	MC68HC908EY16/D
MC68HC908JL3	—	128	4K FLASH	—	2-CH, 16-Bit I/C, O/C, or PWM	23	—	12-CH 8-Bit	See Timer	Y	28-pin DIP (P) 28-pin SOIC (DW)	3.0, 5.0	8.0 Max	C, M	—	Production	Automotive qual TBD RC oscillator option, LVR w/ selectable trip points, 6-pin LED drive	MC68HC908JL3/H
MC68HC08JL3	4K	128	—	—	2-CH, 16-Bit I/C, O/C, or PWM	23	—	12-CH 8-Bit	See Timer	Y	28-pin DIP (P) 28-pin SOIC (DW)	3.0, 5.0	8.0 Max	C, M	908JL3	Production	RC oscillator option, LVR with selectable trip points, 8-pin LED drive	MC68HC08JL3/H

Local Interconnect Network

LIN Master MCUs

Product	ROM (Bytes)	RAM (Bytes)	FLASH or OTP (Bytes)	EEPROM (Bytes)	Timer	I/O	Serial	A/D	Mux	PWM	COP	Packaging	Oper. Voltage (V)	Oper. Freq. (MHz)	Temp.	OTP	Status	Additional Information	Documentation
MC68HC908AZ60A	—	2K	60K FLASH	1K	6-CH + 2-CH, 16-Bit I/C, O/C, or PWM	48	SCI SPI	15-CH 8-Bit	CAN 2.0a/2.0b	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	Recommended for new design-ins	MC68HC908AZ60A/D
MC68HC08AZ60	60K	2K	—	1K	6-CH + 2-CH, 16-Bit I/C, O/C, or PWM	48	SCI SPI	15-CH 8-Bit	CAN 2.0a/2.0b	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	908AZ60A	Production	80% UDR	MC68HC08AZ60/D
MC68HC08AZ32A	32K	1K	—	512	4-CH + 4-CH, 16-Bit I/C, O/C, or PWM	48	SCI SPI	15-CH 8-Bit	CAN 2.0a/2.0b	See Timer	Y	64-pin QFP(FU)	5.0	8.0 Max	C, V, M	908AZ60A	Production	Recommended for new design-ins CAN 2.0a and 2.0b	MC68HC08AZ32A/D
MC9S12DP256B	—	12K	256K FLASH	4 K	8-CH, 16-Bit	Up to 45	2 SCI 1 SPI	2 x 8-CH 10-Bit	Up to 5 CAN and 1 x J1850	8-CH, 8-Bit or 4-CH, 16-Bit	Y	112-pin LQFP 80-pin QFP	5.0	25.0	C, V, M[1]	—	Production	Please refer to 68HC12 Family section for more derivatives.	MC9S12DP256/D
XC68HC912B32	—	1K	32K FLASH	768	8-CH, 16-Bit I/C or O/C, RTI, pulse accumulator	Up to 63	SCI SPI	8-CH 8-Bit	J1850	4-CH, 8-Bit or 2-CH, 16-Bit	Y	80-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	J1850, muxed bus, BDM	MC68HC912B32/D
MC68HC12BE32	32K	1K	—	768	8-CH, 16-Bit I/C or O/C, RTI, pulse accumulator	Up to 63	SCI, SPI	8-CH 10-Bit	CAN J1850	4-CH, 8-Bit or 2-CH, 16-Bit	Y	80-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	BDM, enhanced timer	MC68HC912B32/D
XC68HC912BC32	—	1K	32K FLASH	768	8-CH, 16-Bit I/C or O/C, RTI, pulse accumulator	Up to 63	SCI, SPI	8-CH 10-Bit	CAN J1850	4-CH, 8-Bit or 2-CH, 16-Bit	Y	80-pin QFP(FU)	5.0	8.0 Max	C, V, M	—	Production	msCAN CAN 2.0a and 2.0b, BDM	MC68HC912B32TS/D
MC68HC912D60A	—	2K	60K FLASH	1 K	8-CH, 16-Bit enhanced capture timer (ECT)	Up to 66, plus up to 18 input-only lines	2 SCI 1 SPI	2 x 8-CH 10-Bit	CAN 2.0a/2.0b	4-CH, 8-Bit or 2-CH, 16-Bit	Y	112-pin QFP	5.0	8.0	C, V, M[1]	—	Production	0.5μ technology, 5V FLASH,	MC68HC912D60/D
MC68HC912DG128A	—	8K	128K FLASH	2 K	8-CH, 16-Bit buffered input captures	Up to 67, plus up to 18 input-only lines	2 SCI 1 SPI	2 x 8-CH 10-Bit	2 x CAN 2.0a/2.0b	4-CH, 8-Bit or 2-CH, 16-Bit	Y	112-pin LQFP	5.0	8.0	C, V, M[1]	—	Production	0.5μ technology, 5V FLASH, ideal for gateway applications. Replacement for XC68HCDG128.	MC68HC912DT128A/D
MC68HC912DT128A	—	8K	128K FLASH	2 K	8-CH, 16-Bit buffered input captures	Up to 67, plus up to 18 input-only lines	2 SCI 1 SPI	2 x 8-CH 10-Bit	3 x CAN 2.0a/2.0b	4-CH, 8-Bit or 2-CH, 16-Bit	Y	112-pin LQFP	5.0	8.0	C, V, M[1]	—	Production	0.5μ technology,, 5V FLASH, ideal for gateway applications	MC68HC912DT128A/D
XC68HC12D60	60K	2K	—	1K	8-CH, 16-Bit enhanced capture timer (ETC)	Up to 66, plus up to 18 input only lines	2 SCI 1 SPI	2 x 8-CH 10-Bit	CAN 2.0a/2.0b	4-CH, 8-Bit or 2-CH, 16-Bit		80-pin QFP 112-pin LQFP	5.0	8.0	C, V, M[1]	912DG60A	Production		MC68HC912D60/D

1. M temperature range limited to single-chip mode

The Motorola 68HC05 and 68HC11 8-Bit Microcontroller Families

68HC05 and 68HC11   Motorola's 8-bit 68HC05 and 68HC11 Families represent two of the main product families in Motorola's legacy of best in class MCUs

Automotive   The 68HC05 and 68HC11 Families are complemented by various on-board peripherals such as memory, as well as timers and analog-to-digital converters. Targeted at many applications including body electronics applications, air conditioning, and window lift, the 68HC05 and 68HC11 Families also are widely used in many white good or non-automotive applications.

Memory   The 68HC05 and 68HC11 Families have several memory options such as ROM, EEPROM, and OTP and are available in a range of memory sizes (4K – 32K).

Service   Motorola offers a full range of services to accompany all of our microcontrollers which include software solutions and support as well as suitable development tools.

Product   Motorola is committed to serving the 8-bit market and has extensive offerings of 68HC05 and 68HC11 products for automotive applications.

For a full list of Motorola's 8-bit 68HC05 and 68HC11 products, please visit:

Motorola Microcontroller Selector Guide:
http://e-www.motorola.com/brdata/PDFDB/docs/SPSSG1006.pdf

Motorola Online Product Library:
http://e-www.motorola.com/webapp/sps/library/prod_lib.jsp

Motorola Documentation, Tool, and Product Libraries:
motorola.com/semiconductors
(Then click documentation, tools, or products)

Motorola Automotive Home Page:
http://motorola.com/semiconductors/automotive

68HC05 Reference Manuals
M68HC05AG/AD — Applications Guide
M68HC05TB/D — Understanding Small Microcontrollers Text Book

68HC11 Reference Manual
M68HC11RM/D — 68HC11 Reference Manual

SG187–25

68HC05/68HC11 Families

THE MOTOROLA 683XX AND PowerPC ISA MICROCONTROLLER FAMILIES

32-Bit Legacy   Motorola's PowerPC ISA and MC683XX Families of microcontrollers (MCU) represent two of the leading product families currently used in automotive applications.

Automotive   At the heart of the industry's smartest automotive systems is the PowerPC ISA 32-bit RISC core, a high-performance MCU that provides customers with added performance to tackle increasingly complex control functions. The PowerPC ISA Family is code compatible and complemented by various on-board peripherals such as memory, timers, and analog-to-digital converters as well as communications modules such as CAN, SCI, and SPI.

Memory   FLASH is the dominant memory type used by the 32-bit families. Motorola is implementing a new split-gate FLASH cell, providing great reliability benefits by using a proven technology.

MPC563   The MPC563 32-bit embedded microcontroller from Motorola offers a high-performance PowerPC compliant core, enhanced interrupt architecture and improved analog-to-digital conversion capabilities to enable simultaneous sampling for motor control and other operations. With 512K bytes of on-chip FLASH memory available, the MPC563 can provide the performance and functionality necessary for executing complex automotive

applications such as engine management and electronic transmission control, as well as general applications such as robotics and avionics control. The MPC500 Family provides the performance and integration of powerful peripherals that systems designers require for embedded applications and is considered as a standard for products manufactured by automotive industry leaders in North America, Europe, and Japan. The MPC563 complements the MPC555 and MPC565, which provide 448K bytes and 1 megabyte of on-board FLASH, respectively. Engineering samples are available now.

Service   Motorola offers a full range of services to accompany all of its microcontrollers, along with software solutions, support, and a wide range of low-cost development tools.

For additional information, please visit:

Documentation, Tool, and Product Libraries
motorola.com/semiconductors
(Then click on documentation, tools, or products)

Automotive Home Page
motorola.com/semiconductors/automotive

MPC5XX Family (Sheet 1 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH (Bytes)	Product Integration	Timer	Serial	MUX	A/D	PWM	Operating Voltage	Operating Frequency (MHz)	Temp.	Packaging	Additional Information	Documentation
MPC555	0	26 + 6 for TPU	448	USIU	50-channel timer system: 2 TPU3 + MIOS1	QSMCM (2 SCI + QSPI) + 2 TouCAN	2 x TouCAN	2 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	8 x PWM	3.3 Vdc for core, 5.0 Vdc for Flash	40	A, C, M	272-ball PBGA	Available	MPC555UM/AD TPURM/AD RCPURM/AD
MGT560	0	24K + 4K for TPU	0	USIU	1 TPU3 MIOS 14	QSMCM (2 SCI + QSPI) + 2 TouCAN	2 x TouCAN	1 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	5 x PWM	2.6 Vdc for core, 3.3 Vdc for A/D and I/O	40 or 56	V	208-ball MAPBGA	Available	MGT560RM/D
MPC561	0	32 + 8 for TPU + 2 for DECRAM	0	USIU	54-channel timer system: 2 TPU3 + MIOS14	QSMCM (2 SCI + 1 QSPI) + 3 TouCAN	3 x TouCAN	2 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	12 x PWM	2.6 Vdc for core, 5.0 Vdc for A/D and I/O	40, 56, 66	C, M	388-ball PBGA	Available	MPC561UM/AD TPURM/AD RCPURM/AD
MPC562	0	32 + 8 for TPU + 2 for DECRAM	0	USIU	54-channel timer system: 2 TPU3 + MIOS14	QSMCM (2 SCI + 1 QSPI) + 3 TouCAN	3 x TouCAN	2 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	12 x PWM	2.6 Vdc for core, 5.0 Vdc for A/D and I/O	40, 56, 66	C, M	388-ball PBGA	Available Offers code compression.	MPC561UM/AD TPURM/AD RCPURM/AD

MPC5XX Family (Sheet 2 of 2)

Product	ROM (Bytes)	RAM (Bytes)	FLASH (Bytes)	Product Integration	Timer	Serial	MUX	A/D	PWM	Operating Voltage	Operating Frequency (MHz)	Temp.	Packaging	Additional Information	Documentation
MPC563	0	32 + 8 for TPU + 2 for DECRAM	512	USIU	54-channel timer system: 2 TPU3 + MIOS14	QSMCM (2 SCI + 1 QSPI) + 3 TouCAN	3 x TouCAN	2 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	12 x PWM	2.6 Vdc for core, 5.0 Vdc for A/D and I/O	40, 56, 66	C, M	388-ball PBGA	Available	MPC563UM/AD TPURM/AD RCPURM/AD
MPC564	0	32 + 8 for TPU + 2 for DECRAM	512	USIU	54-channel timer system: 2 TPU3 + MIOS14	QSMCM (2 SCI + 1 QSPI) + 3 TouCAN	3 x TouCAN	2 QADC (10-Bit A/D with 64 result registers each) 32 channels on chip	12 x PWM	2.6 Vdc for core, 5.0 Vdc for A/D and I/O	40, 56, 66	C, M	388-ball PBGA	Available Offers code compression	MPC563UM/AD TPURM/AD RCPURM/AD
MPC565	0	32 + 10 for TPU + 4 for DECRAM	1M	USIU	70-channel timer system: 3 TPU3 + MIOS14	QSMCM x 2 (4 SCI + 2 QSPI) + 3 TouCAN	3 x TouCAN 1 x J1850	2 QADC (10-Bit A/D with 64 result registers each) 40 channels on chip	12 x PWM	2.6Vdc for core, 5.0Vdc for A/D and I/O	40 or 56	C, M	388-ball PBGA	Available	MPC566UM/AD TPURM/AD RCPURM/AD
MPC566	0	32 + 10 for TPU + 4 for DECRAM	1M	USIU	70-channel timer system: 3 TPU3 + MIOS14	QSMCM x 2 (4 SCI + 2 QSPI) + 3 TouCAN	3 x TouCAN 1 x J1850	2 QADC (10-Bit A/D with 64 result registers each) 40 channels on chip	12 x PWM	2.6Vdc for core, 5.0Vdc for A/D and I/O	40 or 56	A, C, M	388-ball PBGA	Available Offers code compression	MPC566UM/AD TPURM/AD RCPURM/AD

Note: All package, speed, and temperature combinations may not be valid. Consult factory to verify.

| Product	Processor Speed (Typ)	Drystone Performance (MIPS)	Microprogrammable Module	Translation Lookaside Buffers	FPU Floating Point Unit	Parallel (Bits)	Power Dissipation (Typ)	Miscellaneous Peripherals	Cache-L1 Instructional	Cache-L1 Data
MPC823E	81 MHz	105 @ 80 MHz	CPM	8-entry	—	53	170 m @ 25 MHz	2 UARTs, 1 IC, 1 SPI, USB	16 KBytes	8 KBytes

683XX Family

Product	ROM (Kbytes)	RAM (Kbytes)	Flash (Kbytes)	Device Integration	Timer	Serial	A/D	Operating Voltage (V)	Operating Frequency (MHz)	Temp	Packaging	Status	Additional Information	Documentation
MC68331	0	0	0	SIM	GPT	SCI, queued SPI	n/a	5.0	16, 20, 25	C, V, M	132-pin PQFP 144-pin LQFP	Available	2.7V–3.6V, 16MHz version (MC68CK331). MC68CK331 is on end of life.	MC68331UM/AD MC68CK331EC16/D
MC68332	0	2	0	SIM	TPU	SCI, queued SPI	n/a	5.0	16, 20, 25	C, V, M	132-pin PQFP 144-pin LQFP	Available	3.0V–3.6V, 16MHz version (MC68LK332)	MC68332UM/AD MC68LK332EC16/D
MC68336	0	4K + 3.5	0	SIM	TPU CTM4	SCI, queued SPI	Queued 16-CH 10-Bit	5.0	20, 25	C, V, M	160-pin QFP	Available	—	MC68336/376PP/D MC68336/376UM/AD
MC68376	8	4K + 3.5	0	SIM	TPU CTM4	CAN, SCI, queued SPI	Queued 16-CH 10-Bit	5.0	20, 25	C, V, M	160-pin QFP	Available	—	MC68336/376PP/D MC68336/376UM/AD

Note: All package, speed, and temperature combinations may not be valid. Consult factory to verify.

683xx Reference Manuals

CPU32RM/AD, CPU32 Reference Manual
SIMRM/AD, System Integration Module Reference Manual
TPURM/AD, Timer Processor Unit Reference Manual
GPTRM/AD, General-Purpose Timer Reference Manual
QSMRM/AD, Queued Serial Module Reference Manual
ADCRM/AD, Analog-to-Digital Converter Reference Manual
CTMRM/D, Configurable Timer Module Reference Manual

683XX/PowerPC Families

Block Diagrams

Anti-Lock Braking System Control Package
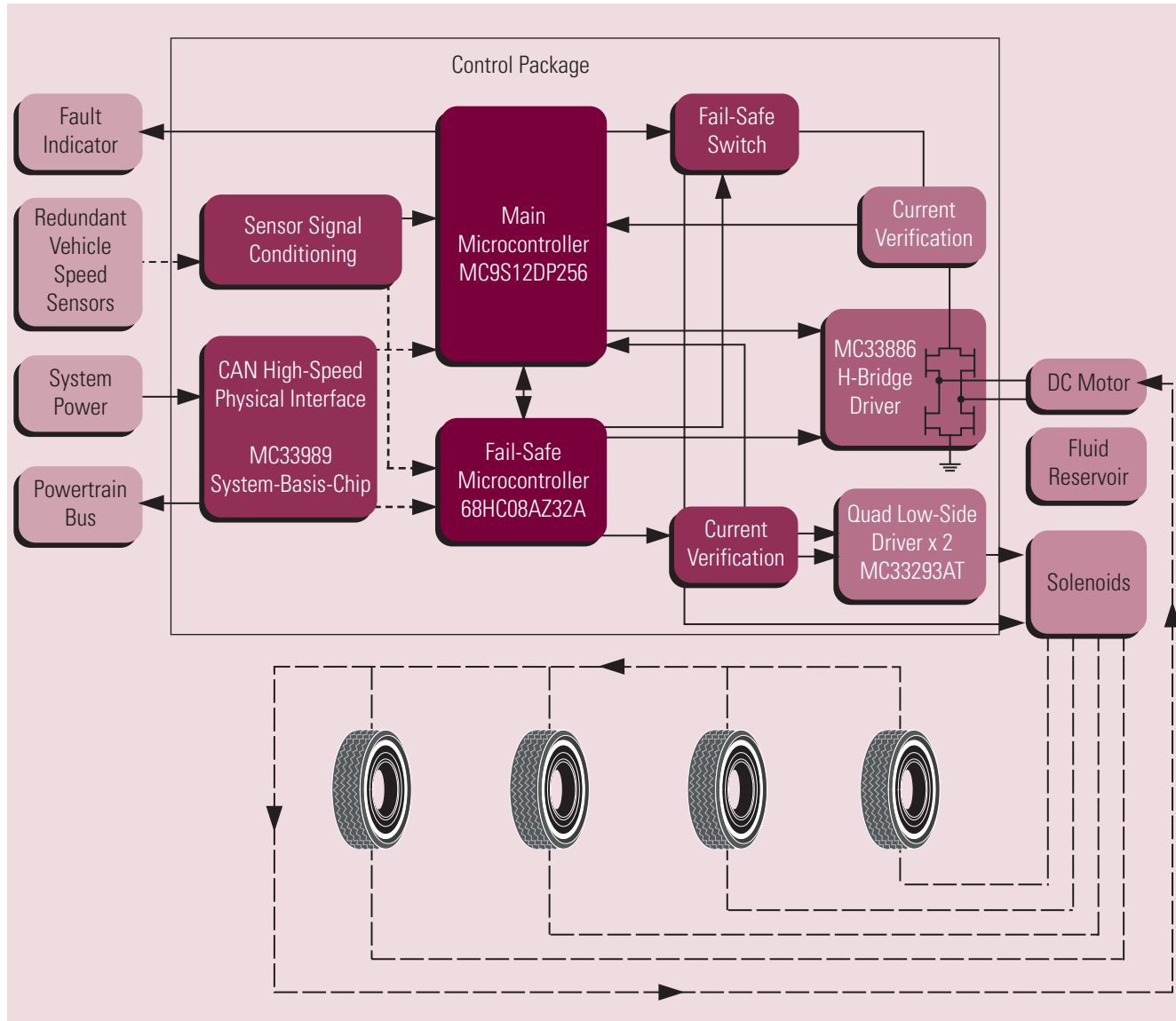
For additional application information, refer to SG2006/D, *Anti-Lock Braking Systems*.

Electrohydraulic Braking Block Diagram

Pedal Sensor

Hydraulic Pump

EHB Control Unit
• MCU
• Output Driver Hardware

Accumulator

M

Backup Valve

Hydraulic Brake Actuators
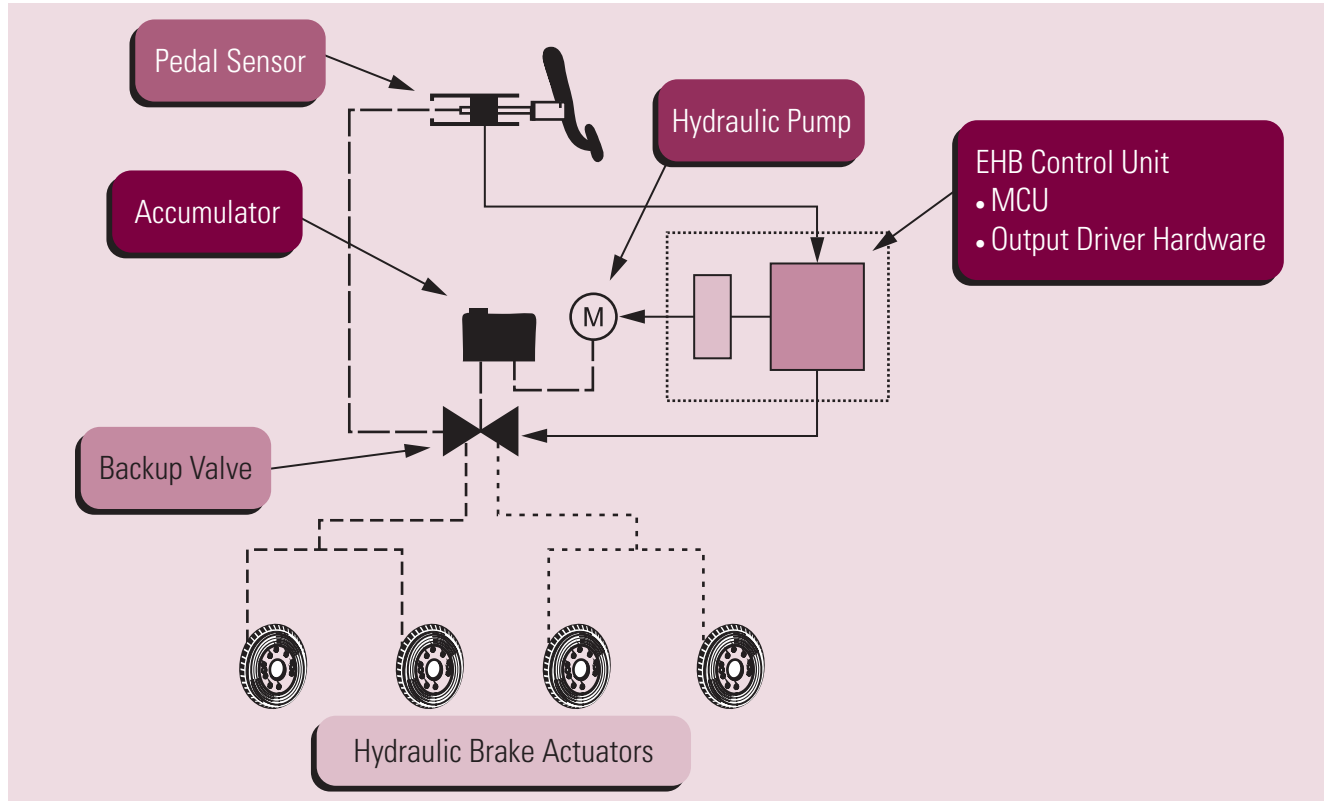
For additional application information, refer to SG2007/D, *Electrohydraulic Braking*.

Block Diagrams

Block Diagrams

Electromechanical Braking Control Package

Wheel or Corner Node:
- Fail Safe
- Low to Medium Performance
  (Depending on Corner Technology)
    e.g., eSys Coral/Copperhead

Pedal Node:
- Highest Level of Fault Tolerance
- Lowest Performance
    e.g., ARM7/eSys Coral

Vehicle Dynamic Control ECU:
- Fail Safe or Fault Tolerant
- Highest Performance
    e.g., eSys Cobra
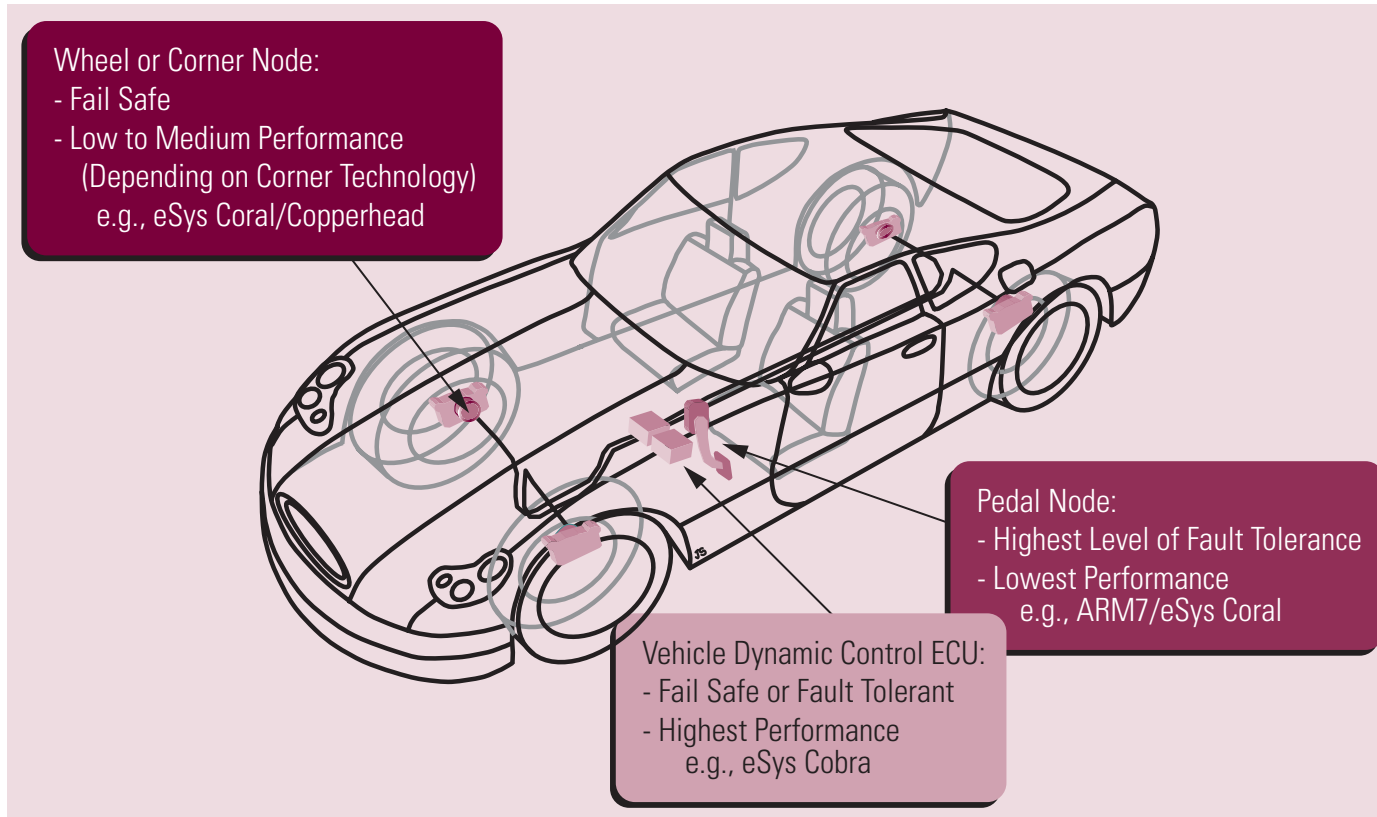
For additional application information, refer to SG2008/D, *Electromechanical Braking (Brake By-Wire)*.

Electronic Stability Program

Lateral G-force & Yaw Rate:
- Measure Lateral Acceleration for Cornering
- Measure Vehicle Yaw Rate to Detect Skids
- Small Communications Node MCU-S12

Sub-System ECUs:
- Control Data Sent to Engine ECU and Braking System to Modify Vehicle Response

Steering Angle:
- Measures Driver Input to Identify Desired Vehicle Position
- Computational Processor e.g., DSP

Vehicle Dynamic Control ECU:
- Take Actual Vehicle Data, Compare with Desired and Direct Intervention
- High-End MCU Performance e.g., PPC

For additional application information, refer to SG2009/D, *Electronic Stability Program*.

Block Diagrams

Block Diagrams

Steering—Electronic Power Assisted
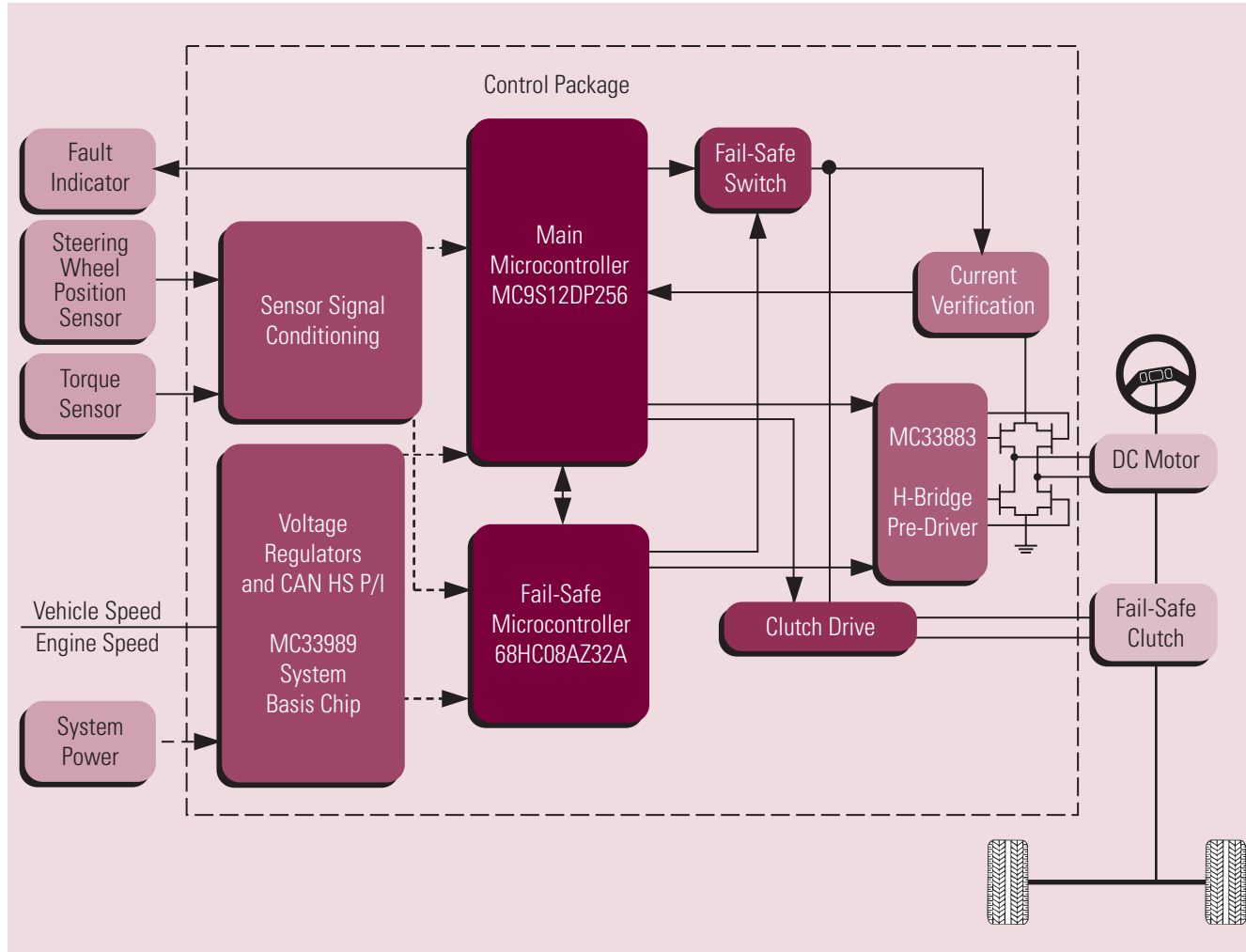
For additional application information, refer to SG2010/D, *Steering–Electronic Power Assisted*.

MPC500-Based Transmission Control Unit
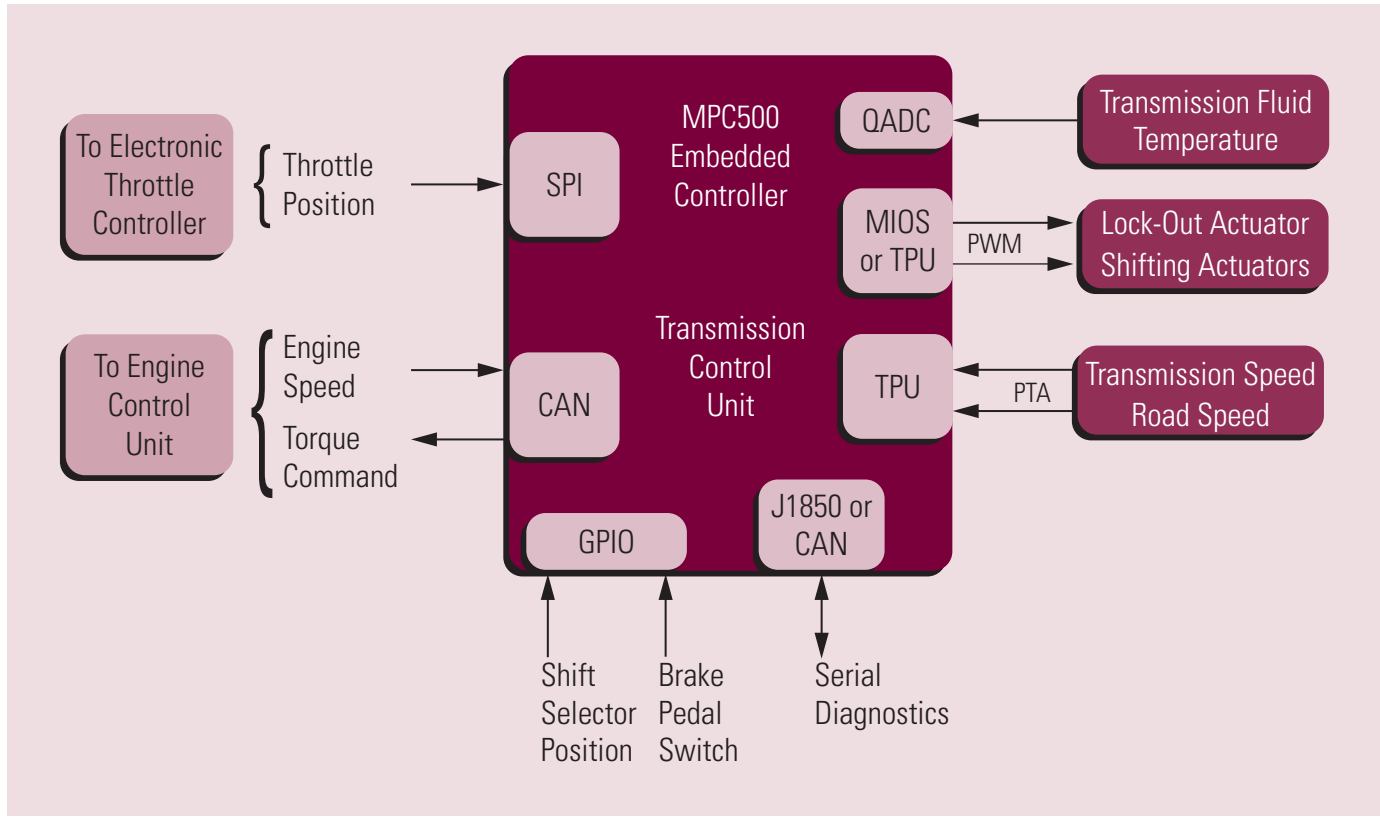

For additional application information, refer to SG2023/D, *Electronic Transmission Control/Continuously Variable Transmission Control*.

Block Diagrams

## Gear Ratio of EXTROID CVT
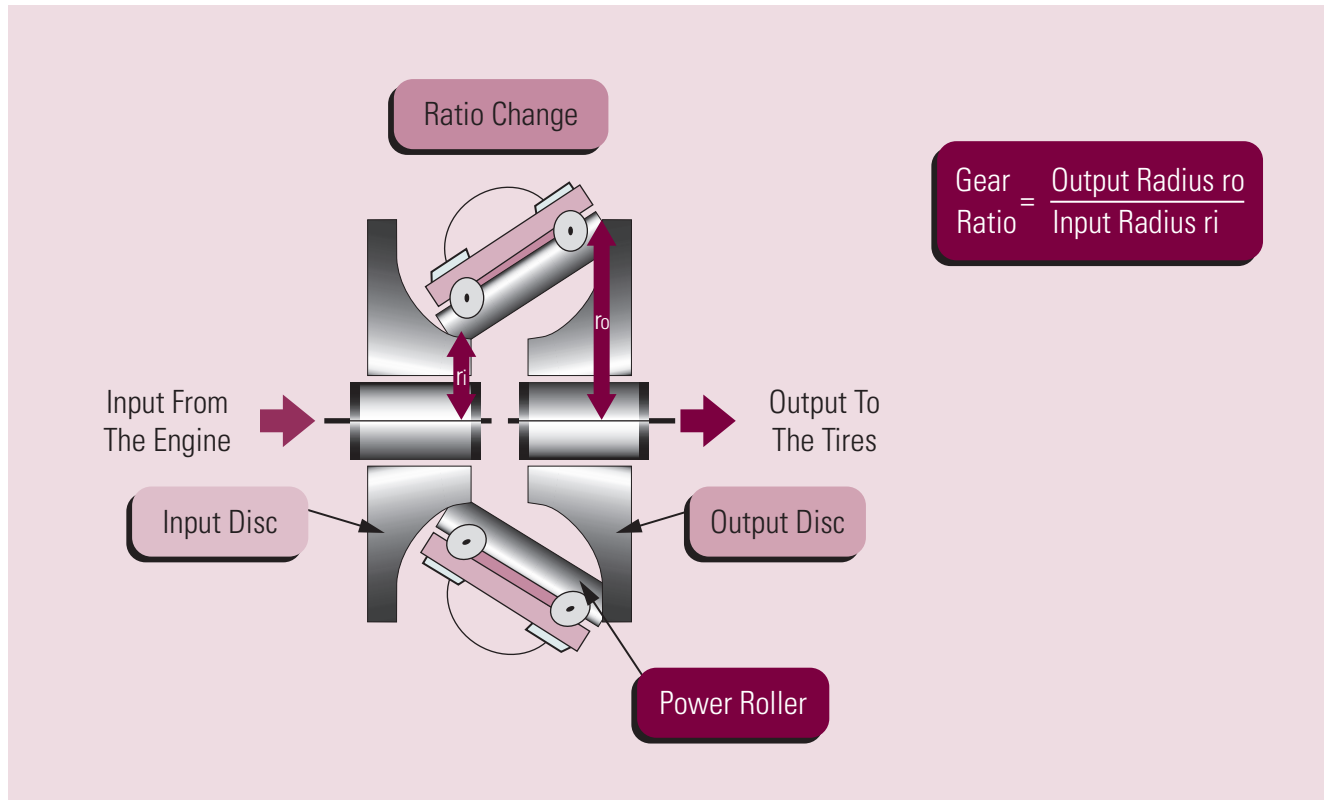
Ratio Change

$$\frac{\text{Gear}}{\text{Ratio}} = \frac{\text{Output Radius ro}}{\text{Input Radius ri}}$$

ro

ri

Input From
The Engine

Output To
The Tires

Input Disc

Output Disc

Power Roller

For additional application information, refer to SG2023/D, *Electronic Transmission Control/Continuously Variable Transmission Control.*

Belt-Driven CVT System

For additional application information, refer to SG2023/D, *Electronic Transmission Control/Continuously Variable Transmission Control*.

SG187–35

Block Diagrams

Block Diagrams

Engine Control System Block Diagram

Voltage Regulators — Transient Protection — + 12 V

MCU Reset Control

MPC500/ MPC5500 MCU — RESET

Input Devices

- Crank Position
- Vehicle Speed
- Engine Temp.
- Ambient Temp.
- Manifold Absolute Pressure
- Throttle Position
- Mass Air Flow
- Knock Sensor
- O2 Sensor
- Oil Pressure Sensor
- Fuel Pressure Sensor
- Analog Inputs
- Analog Outputs

Input Signal Conditioning

Amplifier

Peripheral Devices

Drivers — API

Application Code

Diagnostic Code

Operating System

API — Drivers

SPI

SCI/CAN/FlexRay

Fuel Injector Drivers

Ignition Coil Drivers

Solenoid Driver

Solenoid Driver

Diagnostic BUS Driver

Output Devices

- Fuel Injector
- Fuel Injector
- Ignition Coil
- Ignition Coil
- EGR Valve
- Idle Speed Valve
- Diagnostic Bus

For additional application information, refer to SG2024/D, *Gasoline Engine Management*.

Brake By-Wire System Architecture and Performance Requirements

Wheel or Corner Node:
- Fail Safe
- Low to Medium Performance
  MPC5500 MCU
  (i.e., MPC5552, MPC5554)

Pedal Node:
- Highest Level of Fault Tolerance
- Low-end MPC5500 MCU
    (i.e., MPC5552)

Vehicle Dynamic Control ECU:
- Fail Safe or Fault Tolerant
- Highest Performance
    (i.e., MPC5500)
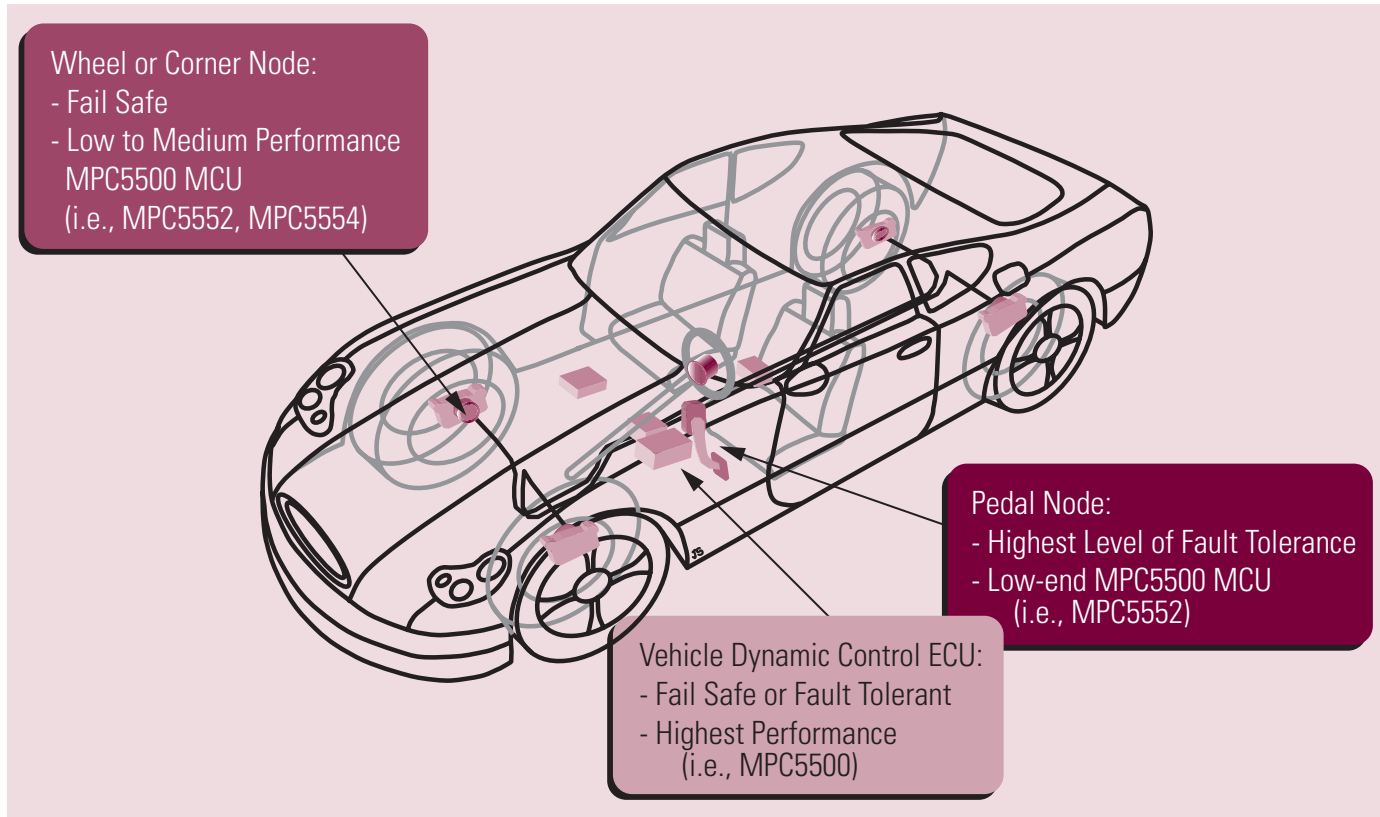
For additional application information, refer to SG2031/D, *By-Wire*.

Block Diagrams

Automotive CAN Networks

Engine Management Module

Adaptive Cruise Control Module

Active Suspension Control Module

Tranmission Control Module

Diagnostic Port Gateway

Diagnostic Connector

Instrument Cluster/ Powertrain-Body Gateway

Central Body Control Module

HVAC Climate Module — LIN SUB-BUS

Steering Column/ Ignition Module — LIN SUB-BUS

Driver Seat Module — LIN SUB-BUS

Driver-Side Door Module — LIN SUB-BUS

Passenger Seat Module — LIN SUB-BUS

Passenger-Side Door Module — LIN SUB-BUS

Rear Seat Module — LIN SUB-BUS

Occupant Safety Gateway — FlexRay

Multimedia Gateway/ Telematics Module — MOST

Rear Lighting/ Trunk Control

For additional application information, refer to SG2032/D, *Automotive Controller Area Network (CAN) Applications*.

SG187–38

Typical LIN Master Module
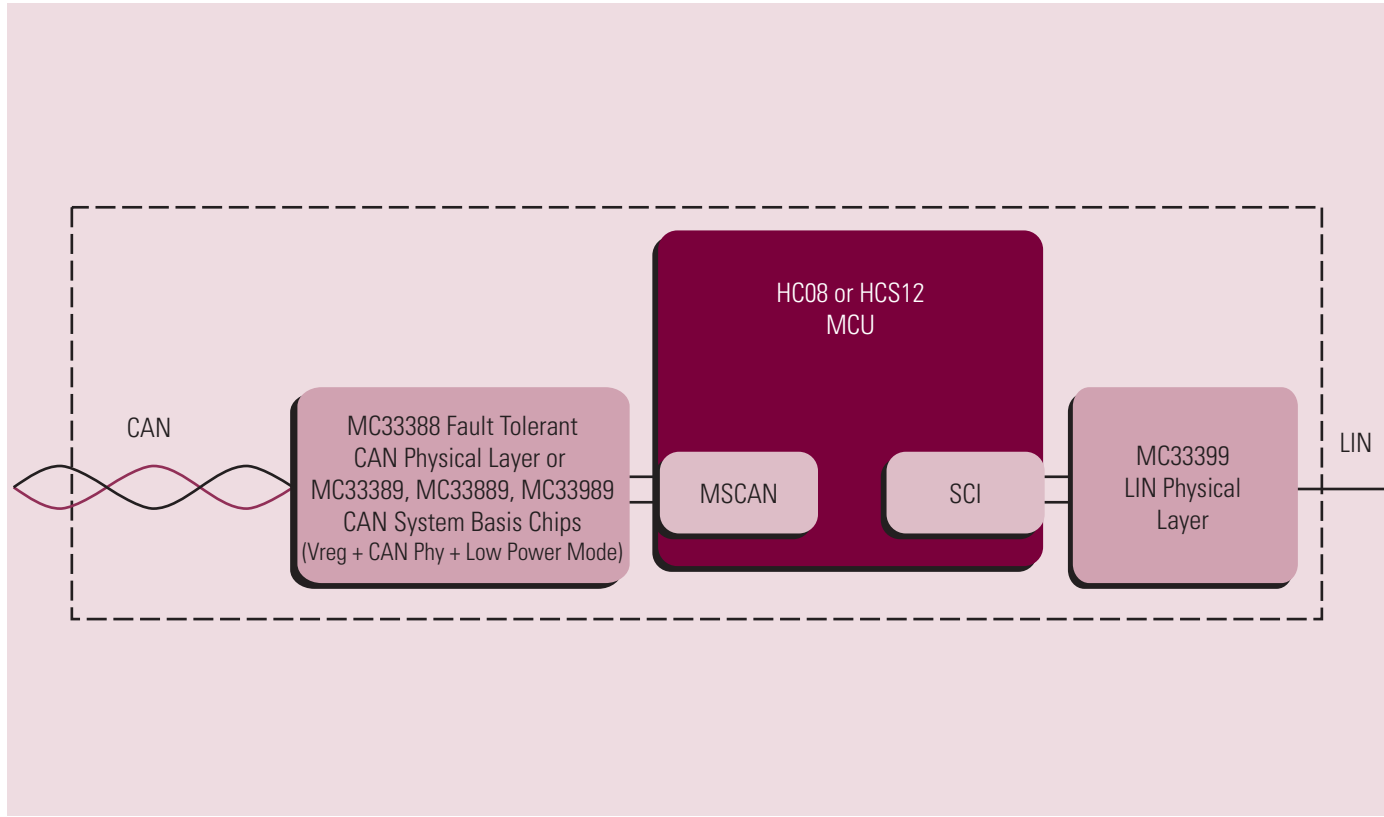
For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

SG187–39

Block Diagrams

Block Diagrams

Typical LIN Slave Module
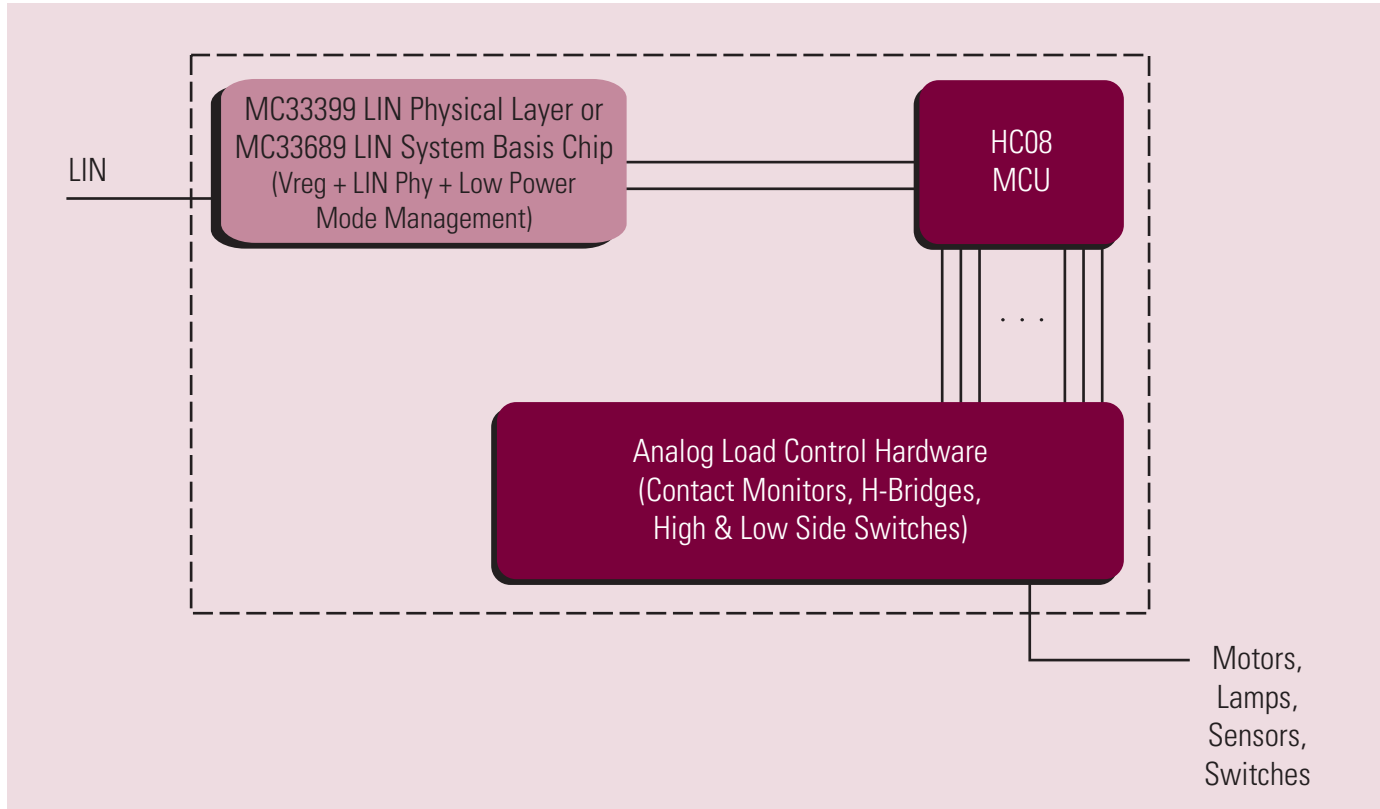
For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

Automotive LIN Door System Block Diagram

CAN

Control Switch Panel

HCS12 or HC08
LIN Master

LIN
(Bus, Power, Ground)   3

Headrest
Height Motor   M

Headrest
Angle Motor   M

HC08 LIN Slave

Lumbar
Adjust Motor   M

HC08 LIN Slave

Backrest
Angle Motor   M

HC08 LIN Slave

Rear Seat
Height Motor   M

HC08 LIN Slave

Front Seat
Height Motor   M

HC08 LIN Slave

Longitudinal Seat
Travel Motor   M

HC08 LIN Slave

Seat Front
Angle Motor   M

HC08 LIN Slave

Seat Ventilation Fan

HC08 LIN Slave

Seat Heating Element   M

HC08 LIN Slave

For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

SG187–41

Block Diagrams

Driver's Side: LIN Door System Block Diagram

Driver's Side

Control Switch Panel

HCS12 or HC08
LIN Master

CAN

3 / LIN   3 / LIN

Front Window
Lifter Motor

...ave

Front Door
Lock Motor
Assembly

HC08 LIN Slave

Anti-Pitch
Sensor

Sensor

HC08 LIN Slave

(Bus, Power, Ground)

(Bus, Power, Ground)

Rear Window
Lifter Motor

Rear Door Lock
Motor Assembly   ...ave

HC08 LIN Slave

Driver
Power
Mirror
Assembly

Electrochrome

HC08/Mechatronics
LIN Slave

For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

Passenger's Side: LIN Door System Block Diagram
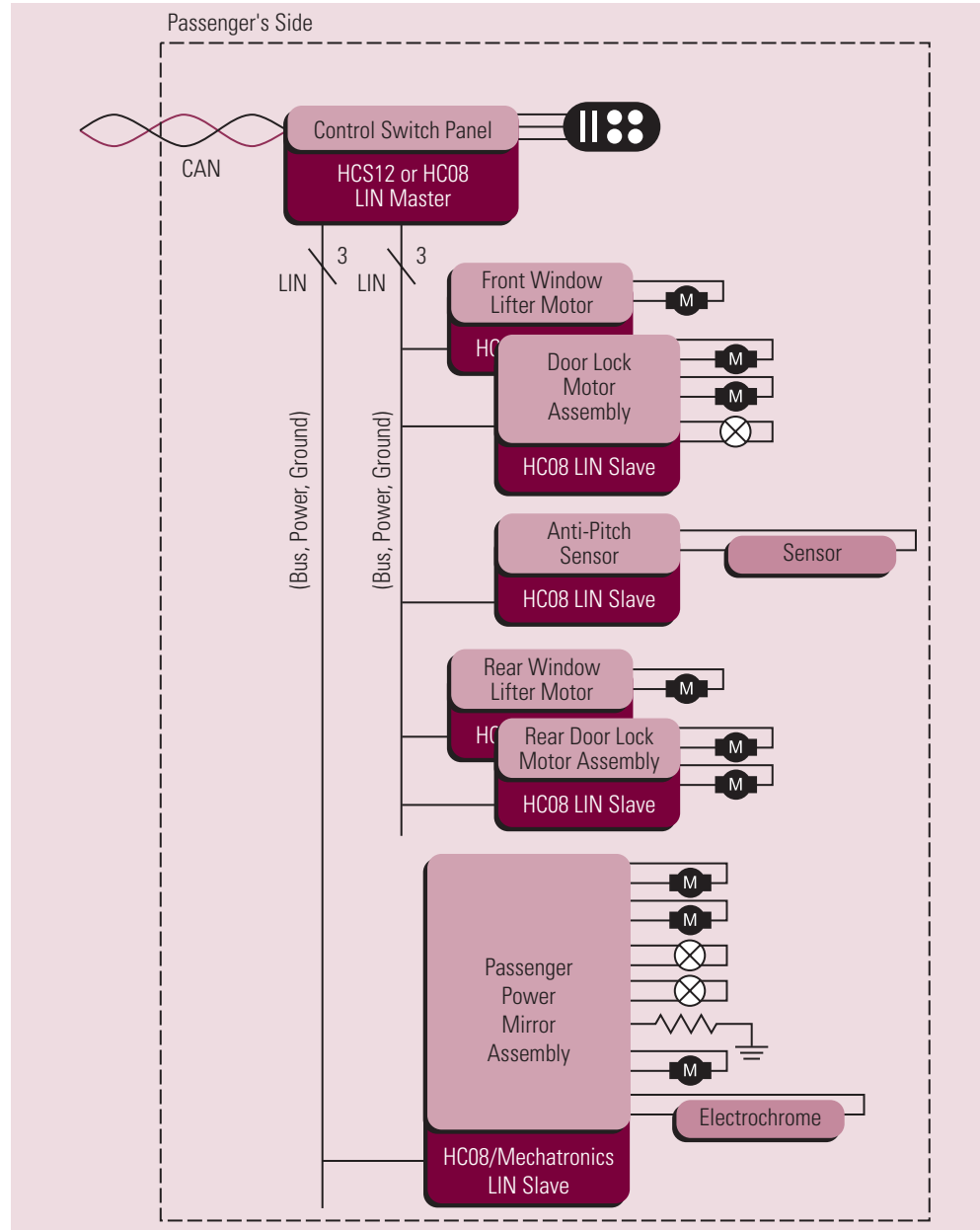
Passenger's Side

CAN

Control Switch Panel

HCS12 or HC08 LIN Master

3 LIN   3 LIN

(Bus, Power, Ground)   (Bus, Power, Ground)

Front Window Lifter Motor   M

HC

Door Lock Motor Assembly   M M

HC08 LIN Slave

Anti-Pitch Sensor   Sensor

HC08 LIN Slave

Rear Window Lifter Motor   M

HC   Rear Door Lock Motor Assembly   M M

HC08 LIN Slave

Passenger Power Mirror Assembly   M M

Electrochrome

HC08/Mechatronics LIN Slave

For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

SG187–43

Block Diagrams

Automotive HVAC System Using LIN
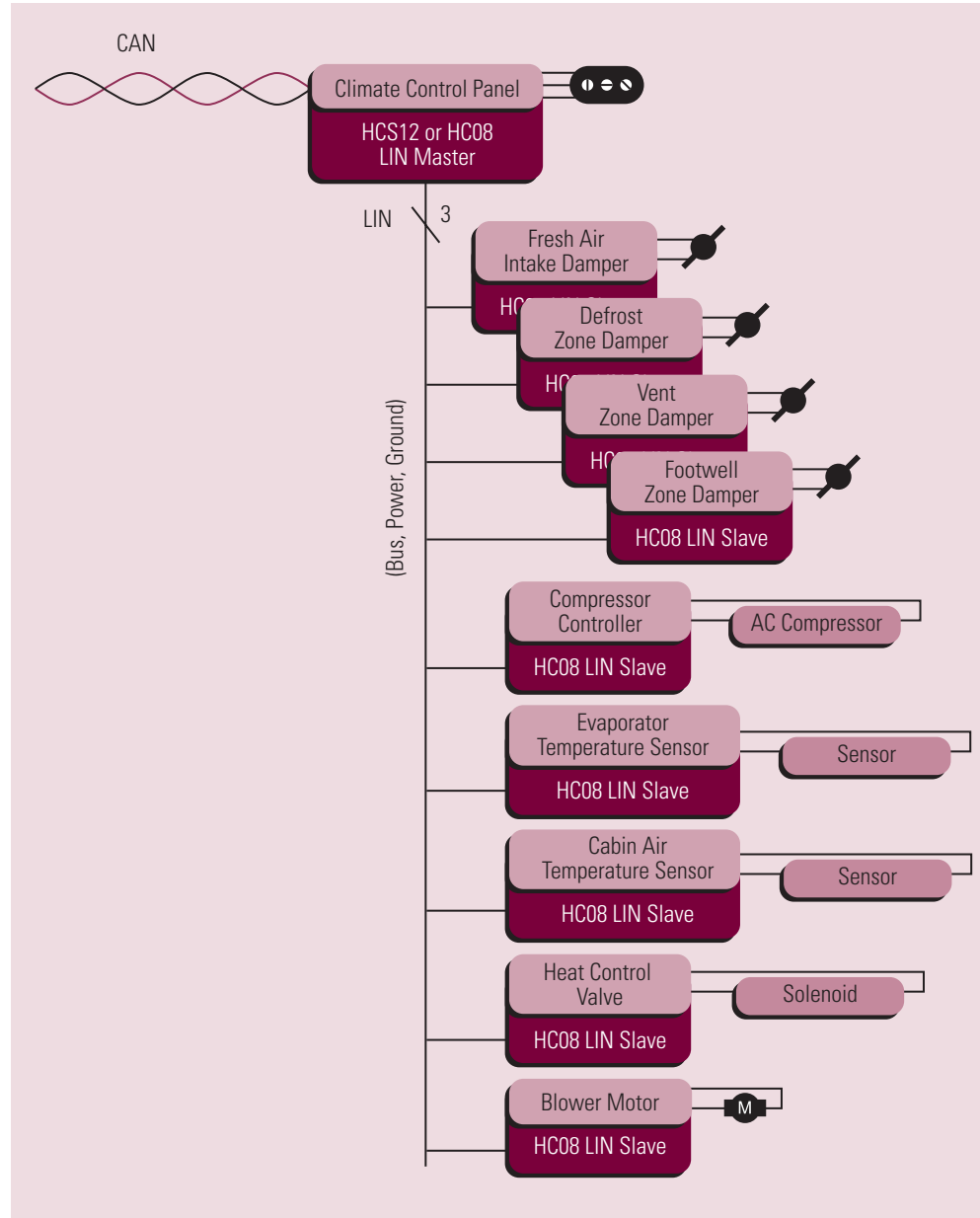
CAN

Climate Control Panel

HCS12 or HC08
LIN Master

LIN   3

(Bus, Power, Ground)

Fresh Air
Intake Damper

Defrost
Zone Damper

Vent
Zone Damper

Footwell
Zone Damper

HC08 LIN Slave

Compressor
Controller

AC Compressor

HC08 LIN Slave

Evaporator
Temperature Sensor

Sensor

HC08 LIN Slave

Cabin Air
Temperature Sensor

Sensor

HC08 LIN Slave

Heat Control
Valve

Solenoid

HC08 LIN Slave

Blower Motor   M

HC08 LIN Slave

For additional application information, refer to SG2034/D, *Automotive Local Interconnect Network (LIN) Applications*.

SG187–44

Low-Cost Bluetooth-Enabled Hands-Free Speaker Phone

Speaker Phone Sub-System

- CARP-1 I/F
  - Speaker Phone Management Entity
  - MMI Management Entity
- Phone Lib (AEC, NS, Ring Gen)
- System Service Lib (I/O, Timer, Mem)
- Board Support Packet (SCI, SSI, SPI, Timer H/W Driver)

CARP-1

- CARP-1 API
- HFP
- Blue SDK Stack
  - Event Manager
  - RFCOMM
  - SDP
  - L2CAP
  - Management Entity
  - Security Manager
  - HCI API Layer
- Mini-OS (I/O API, OS API)

DSP H/W

- SPI → LCD
- GPIO → Keypad
- SSI → CODEC → Aux → Car Radio
- SSI → P1.5
- SPI → P1.5

Mic in
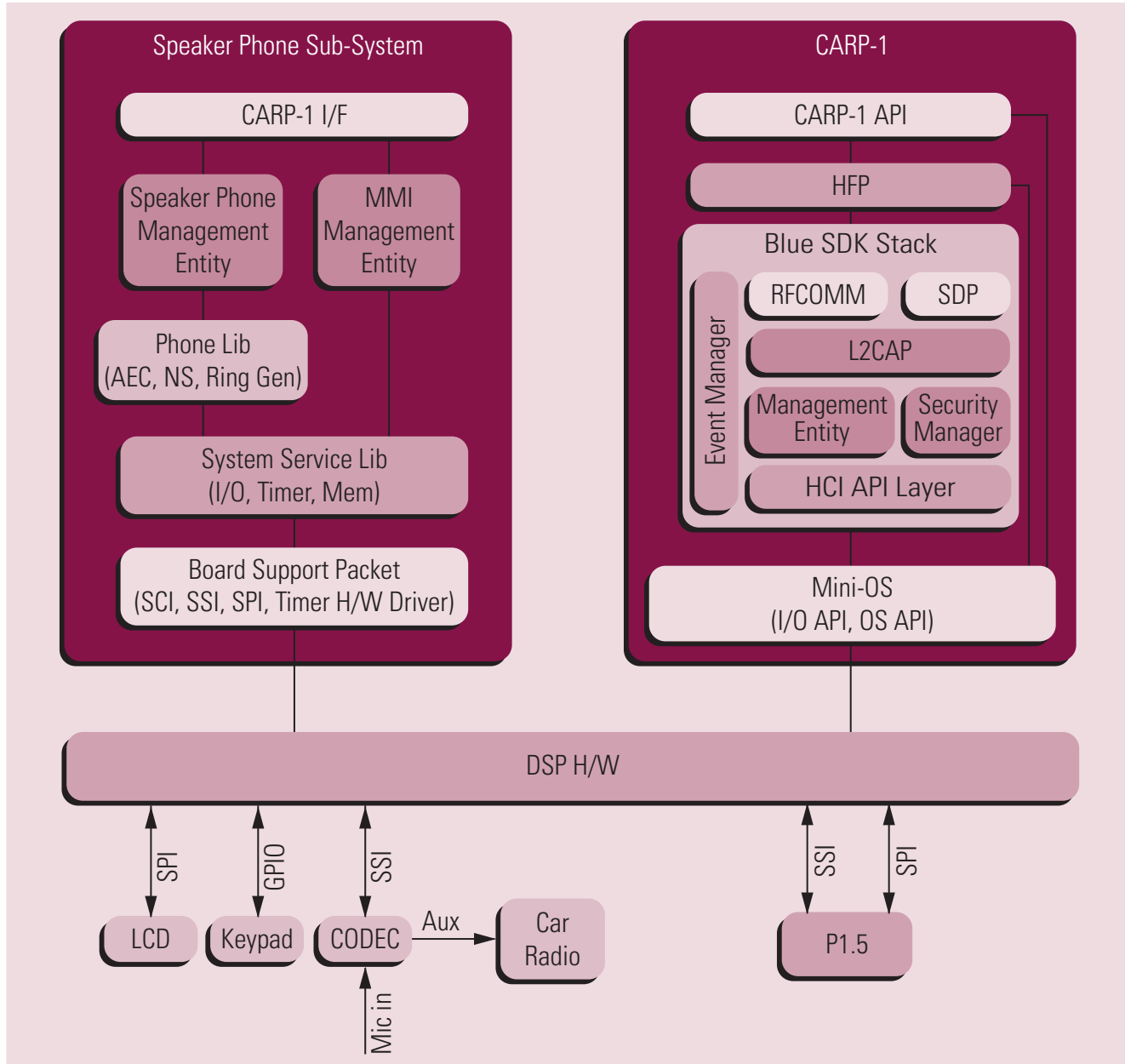
For additional application information, refer to SG2045/D, *Hands-Free Speaker Phone Via Bluetooth*.

Block Diagrams

Block Diagrams

Tire Pressure Monitoring System (TPMS) Enabling Chip Set
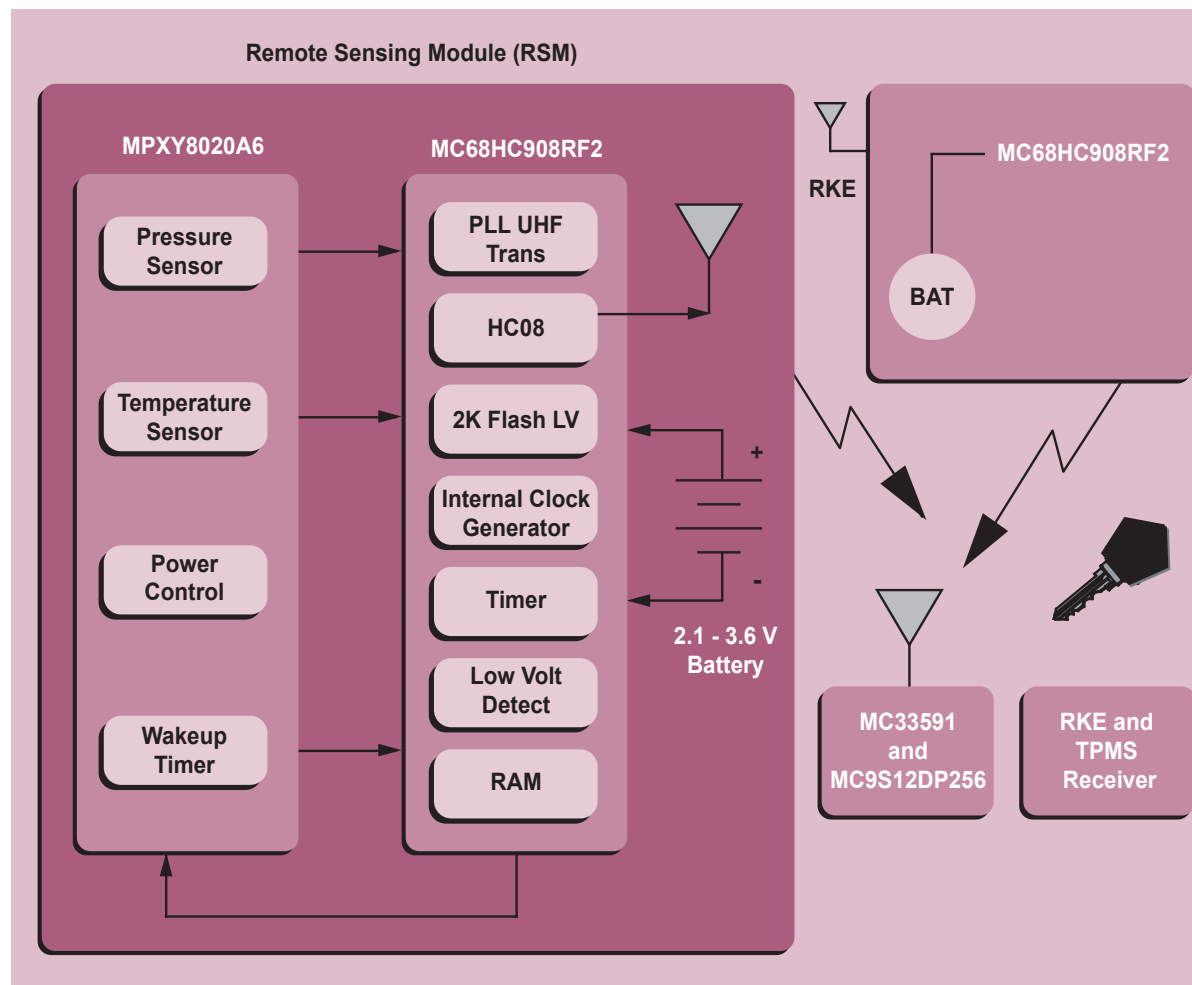
Product Application	Suggested Product	Product Highlights
Pressure sensor	PPXY8020	Surface micromachined CMOS technology, power control, battery voltage detection, and wakeup, SSOP package
UHF Receiver	MC33591	PLL-tuned UHF OOK receiver
UHF Transmitter + MCU (Flash)	MC68HC908RF2	2K user Flash ROM, 128 RAM, timer, integrated RF transmitter.
Receiver Microcontroller	MC9S12DP256	256K Flash, 12K RAM, 4K EEPROM, up to 5 CAN, 1xJ1850, 256-MHz operating speed.

SG187–46

RKE Transmitter System Example

SG187–47

Product Application	Suggested Product	Product Highlights
Microcontroller	MC68HC908RK2	2K Flash, 128 bytes RAM, timer, low-power embedded Flash routine
Microcontroller	MC68HC908RF2	2K Flash, 128 bytes RAM, timer, integrated RF transmitter
RF Transmitter/Receiver	MC33493	PLL tuned UHF transmitter (ASK and FSK modulation)
RF Transmitter/Receiver	MC33591/2/3/4	PLL tuned UHF ASK and FSK receiver
Microcontroller	XC68HC08AZ32A	32K ROM, 1K RAM, 512 EEPROM, timer, A/D, SCI, SPI, CAN 2 0a/b
J1850 Serial Link Transceiver	MC33390D/MC33990	J1850 serial transceiver with enhanced ground
CAN Physical Interface	MC33386D	SPI, CAN low-speed tolerant physical interface (125 kpbs)
CAN Physical Interface	MC33889/MC33389A	CAN low-speed tolerant physical interface, dual voltage regulator, watchdog, sleep mode

Block Diagrams

Block Diagrams

RKE Receiver System Example

Product Application	Suggested Product	Product Highlights
Microcontroller	MC68HC908RK2	2K Flash, 128 bytes RAM, timer, low-power embedded Flash routine
Microcontroller	MC68HC908RF2	2K Flash, 128 bytes RAM, timer, integrated RF transmitter
RF Transmitter/Receiver	MC33493	PLL tuned UHF transmitter (ASK and FSK modulation)
RF Transmitter/Receiver	MC33591/2/3/4	PLL tuned UHF ASK and FSK receiver
Microcontroller	XC68HC08AZ32A	32K ROM, 1K RAM, 512 EEPROM, timer, A/D, SCI, SPI, CAN 2 0a/b
J1850 Serial Link Transceiver	MC33390D/MC33990	J1850 serial transceiver with enhanced ground
CAN Physical Interface	MC33386D	SPI, CAN low-speed tolerant physical interface (125 kpbs)
CAN Physical Interface	MC33889/MC33389A	CAN low-speed tolerant physical interface, dual voltage regulator, watchdog, sleep mode

— 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

EBI — External Bus Interface

ECT — Enhanced Capture Timer

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^2C — 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)

QFN — Quad Flat Package No-Lead

QFP — Quad Flat Pack

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)

FA — 7 x 7 mm Quad Flat Pack (QFP)

FB — 10 x 10 mm Quad Flat Pack (QFP)

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 Sidebraze

P — Dual in-Line Plastic

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

ZP — 27 x 27 mm Plastic Ball Grid Array (PBGA)

Definitions

Product Numbering System for Microcontrollers

MC 68HC 908 JK3 X XX

QUALIFICATION STATUS
MC = FULLY QUALIFIED PRODUCTION
XC = INITIAL PRODUCTION QUALIFICATION, NOT FULLY
         CHARACTERIZED
PC = PRE-QUALIFICATION – ENGINEERING SAMPLES ONLY

CORE

0x ROM
70x OTP
80x EEPROM
90x FLASH

FAMILY

PACKAGING DESIGNATOR

TEMPERATURE RANGE
C = –40°C to 85°C
V = –40°C to 105°C
M = –40°C to 125°C

Product Numbering System for HCS12

MC 9 S12 Dx 256 X XX

QUALIFICATION STATUS
MC = FULLY QUALIFIED
XC = INITIAL PRODUCTION
PC = PRE-QUALIFICATION

9 = FLASH

CORE

FAMILY

FLASH SIZE

PACKAGE

TEMPERATURE RANGE
C = –40°C to 85°C
V = –40°C to 105°C
M = –40°C to 125°C

SG187–50

Product Numbering System for MPC5xx

```
MPC   5xx   L   F   M   ZP   40
```

- **QUALIFICATION STATUS**
  - PPC = ENGINEERING SAMPLES
  - XPC = PILOT PRODUCTION
  - MPC = FULL SPEC QUALIFIED PRODUCT
- **PRODUCT DESIGNATOR**
  - 500 – 599
- **TPU MASK**
  - BLANK
  - L = TPU2 A/G COMBO
- **MEMORY TYPE**
  - BLANK = NONE
  - F = FLASH
- **TEMPERATURE RANGE**
  - A = –55°C to +125°C
  - C = –40°C to 85°C
  - V = –40°C to 105°C
  - M = –40°C to 125°C
- **PACKAGE TYPE**
- **BUS SPEED**

Product Numbering System for Pressure Sensors

```
M   PX   A   2   XXX   A   P   X   T1
```

- **PRODUCT CATEGORY**
  - M   QUALIFIED STANDARD
  - S   CUSTOM PRODUCT
  - P, X   PROTOTYPE PRODUCT
- PRESSURE SENSORS
- **PACKAGING TYPE**
  - NONE   UNIBODY
  - A/V   SMALL OUTLINE PACKAGE
  - AZ   SMALL OUTLINE MEDIA RESISTANT PACKAGE
  - H   SUPER SMALL OUTLINE PACKAGE
  - HZ   SUPER SMALL OUTLINE MEDIA RESISTANT PACKAGE
  - M   M-PAK
  - Y   SUPER SMALL OUTLINE PACKAGE (TPM)
- **PRODUCT FEATURES**
  - NONE   UNCOMPENSATED
  - 2   TEMPERATURE COMPENSATED/CALIBRATED
  - 3   OPEN
  - 4   TEMPERATURE COMPENSATED/CALIBRATED/ SIGNAL CONDITIONED AUTOMOTIVE ACCURACY
  - 5   TEMPERATURE COMPENSATED/CALIBRATED/ SIGNAL CONDITIONED
  - 6   OPEN
  - 7   OPEN
  - 8   CMOS
- MAXIMUM PRESSURE IN kPa, EXCEPT FOR MPX2300 EXPRESSED IN mmHg
- **PRODUCT TYPE**
  - A   ABSOLUTE
  - G   GAUGE
  - D   DIFFERENTIAL
  - V   VACUUM/GAUGE
- **PORTING STYLE**
  - C   AXIAL PORT (SMALL OUTLINE PACKAGE)
  - P   PORTED (UNIBODY)
    - P = SINGLE PORT
    - Dp = DIFFERENTIAL PORT
  - S   STOVEPIPE PORT (UNIBODY)
  - SX   AXIAL PORT (UNIBODY)
- **LEADFORM OPTION**
  - 0   OPEN
  - 1–2   CONSULT FACTORY
  - 3–5   OPEN
  - 6–7   SOP* ONLY
- **SHIPPING METHOD**
  - NONE   TRAYS
  - T1   TAPE AND REEL
  - U   RAIL

SG187–51

Nomenclature

Packaging

14-Lead SOIC

D

1.27 mm Pitch
8.6 mm x 3.9 mm Body

16-Lead SOIC

D

1.27 mm Pitch
9.9 mm x 3.9 mm Body

16-Lead SOIC

DW

50 mil/1.27 mm Pitch
10.35 mm x 7.5 mm Body

20-Lead SOIC

DW

50 mil/1.27 mm Pitch
12.8 mm x 7.5 mm Body

28-Lead SOIC

DW

50 mil/1.27 mm Pitch
18.0 mm x 7.5 mm Body

32-Lead SOICW

DWB

.65 mm Pitch
11.0 mm x 7.5 mm Body

160-Lead QFP

FT

.65 mm Pitch
28 mm x 28 mm Body

144-Lead LQFP

PV
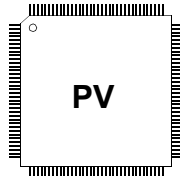
.5 mm Pitch
20 mm x 20 mm Body

132-Lead PQFP

FC
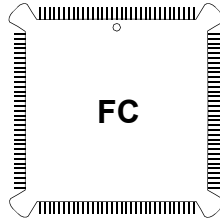
25 mil/06.35 mm Pitch
0.950 in x 0.950 in Body
(Nominal, w.o. Bumpers)

112-Lead LQFP

PV
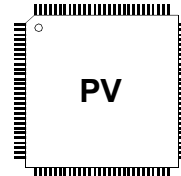
.65 mm Pitch
20 mm x 20 mm Body

100-Lead LQFP

PU
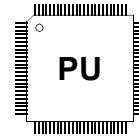
.5 mm Pitch
14 mm x 14 mm Body

80-Lead QFP/LQFP

FU/PU
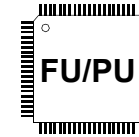
.65 mm Pitch
14 mm x 14 mm Body

64-Lead QFP

FU
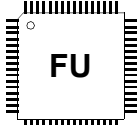
.8 mm Pitch
14 mm x 14 mm Body

52-Lead QFP

PB

.65 mm Pitch
10 mm x 10 mm Body

48-Lead QFP

FA

.8 mm Pitch
7 mm x 7 mm Body

32-Lead QFP

FJ

.8 mm Pitch
7 mm x 7 mm Body

272-Ball PBGA

ZP
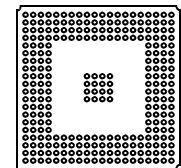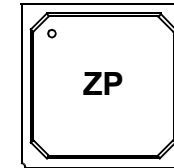
1.27 mm Pitch
27.0 mm x 27.0 mm Body

52-Lead PLCC/CLCC

FN/FS
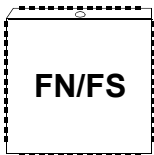
50 mil/1.27 mm Pitch
0.750 in x 0.750 in Body

28-Pin DIP

P
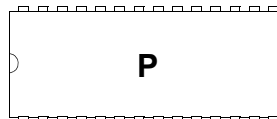
100 mil/2.54 mm Pitch
1.45 in x .55 in Body
(100 mil x 600 mil pin centers)

388-Ball PBGA

ZP
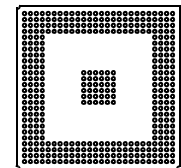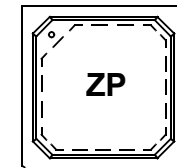
1 mm Pitch
27.0 mm x 27.0 mm Body

8-Lead SOIC

D

1.27 mm Pitch
4.9 mm x 3.9 mm Body

24-Lead SOIC-WB

DW

1.27 mm Pitch
15.4 mm x 7.5 mm Body

20-Lead SSOP

DB

0.65 mm Pitch
7.2 mm x 5.3 mm Body

28-Lead SSOP

DB

0.65 mm Pitch
10.2 mm x 5.3 mm Body

14-Lead TSSOP

DTB

0.65 mm Pitch
5 mm x 4.4 mm Body

24-Lead LQFP

FTA

0.5 mm Pitch
4 mm x 4 mm Body

32-Lead QFN

FC

.65 mm Pitch
7 mm x 7 mm Body

44-Lead QFN

FC

.65 mm Pitch
9 mm x 9 mm Body

20-Lead HSOP

DH
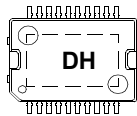
1.27 mm Pitch
16 mm x 11 mm Body

30-Lead HSOP

DH
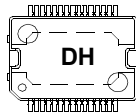
.8 mm Pitch
16 mm x 11 mm Body

44-Lead HSOP

DH
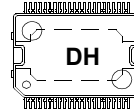
.65 mm Pitch
16 mm x 11 mm Body

64-Lead HQFP

DH
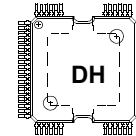
.65 mm Pitch
14 mm x 14 mm Body

Packaging

Packaging

Pressure Sensor Packaging
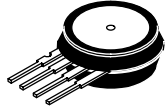
Unibody
Basic Element
Case 344
Suffix A/D

Unibody
Single Port
Case 344B
Suffix AP/GP
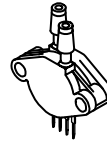
Unibody
Dual Port
Case 344C
Suffix DP
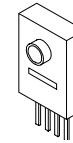
Medical
Chip Pak
Case 423A
Suffix DT1

Unibody
Stovepipe Port
Case 344E
Suffix AS/GS
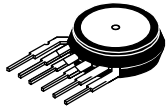
Unibody
Basic Element
Case 867
Suffix A/D

Unibody
Single Port
Case 867B
Suffix AP/GP
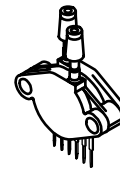
Unibody
Dual Port
Case 867C
Suffix DP
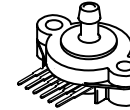
Unibody
Axial Port
Case 867F
Suffix ASX/GSX

Unibody
Stovepipe Port
Case 867E
Suffix AS/GS

Preferred Pressure Sensor Packaging Options
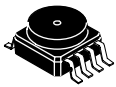
SOP
Case 482
Suffix AG/G6
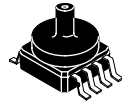
SOP Axial Port
Case 482A
Suffix AC6/GC6
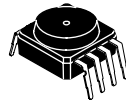
SOP
Case 482B
Suffix G7U
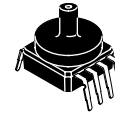
SOP Axial Port
Case 482C
Suffix GC7U
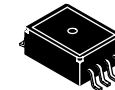
MPAK
Case 1320
Suffix A/D
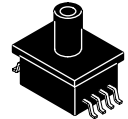
MPAK Axial Port
Case 1320A
Suffix AS/GS
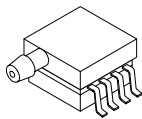
SOP Side Port
Case 1369
Suffix AP/GP
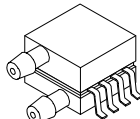
SOP Dual Port
Case 1351
Suffix DP
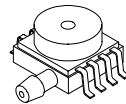
SOP Vacuum Port
Case 1368
Suffix GVP
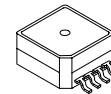
SSOP
Case 1317
Suffix A6
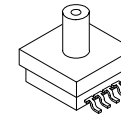
SSOP Axial Port
Case 1317A
Suffix AC6
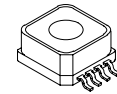
SSOP Tire Pressure Monitor
Case 1352
Suffix A6

Acceleration Sensors Packaging

16

9

1

8
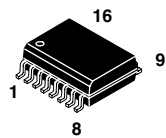
16-Pin SOIC
Case 475
D Suffix

20

1

11

10
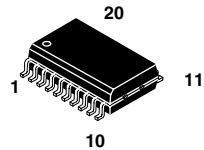
20-Pin SOIC
Case 475A
D Suffix

10 9
11
12
13
14
15
16

1 2 3 4 5 6 7 8
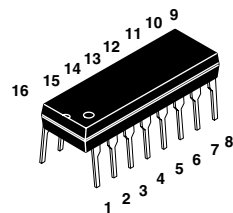
DIP Package
Case 648C
P Suffix

1
2
3
4
5
6
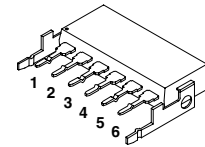
Wingback Package
Case 456
W Suffix

Safety and Alarm Integrated Circuits Packaging

16

1
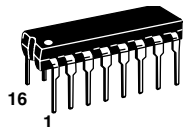
Plastic DIP
Case 648
P Suffix

16

1
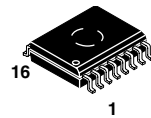
SOIC Package
Case 751G
DW Suffix

Note: P or P1 = 16-pin DIP, DW = SOIC 16-pin, DWR2 = SOIC 16-pin tape and reel

Image Sensor Packaging

LCC Package
Case 745B
O Suffix

Packaging

Packaging

Analog Products Low Power Packages

8-Pin SOICN
1.27 mm Pitch
4.9 mm x 3.9 mm Body

14-Pin SOICN
1.27 mm Pitch
8.6 mm x 3.9 mm Body

16-Pin SOICN
1.27 mm Pitch
9.9 mm x 3.9 mm Body

16-Pin SOICW
1.27 mm Pitch
10.3 mm x 7.5 mm Body

20-Pin SOICW
1.27 mm Pitch
12.8 mm x 7.5 mm Body

24-Pin SOICW
1.27 mm Pitch
15.4 mm x 7.5 mm Body

28-Pin SOICW
1.27 mm Pitch
18.0 mm x 7.5 mm Body

32-Pin SOICW
0.65 mm Pitch
11.0 mm x 7.5 mm Body

54-Pin SOICW
0.65 mm Pitch
17.9 mm x 7.5 mm Body

24-Pin LQFP
0.50 mm Pitch
4.0 mm x 4.0 mm Body

32-Pin LQFP
0.80 mm Pitch
7.0 mm x 7.0 mm Body

44-Pin LQFP
0.80 mm Pitch
10.0 mm x 10.0 mm Body

48-Pin LQFP
0.50 mm Pitch
7.0 mm x 7.0 mm Body
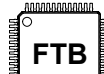
52-Pin LQFP
0.65 mm Pitch
10.0 mm x 10.0 mm Body

64-Pin LQFP
0.50 mm Pitch
10.0 mm x 10.0 mm Body
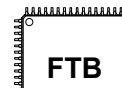
64-Pin LQFP
0.80 mm Pitch
14.0 mm x 14.0 mm Body

80-Pin LQFP
0.65 mm Pitch
14.0 mm x 14.0 mm Body
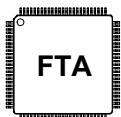
100-Pin LQFP
0.50 mm Pitch
14.0 mm x 14.0 mm Body
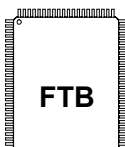
100-Pin LQFP
0.65 mm Pitch
20.0 mm x 14.0 mm Body
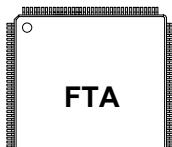
144-Pin LQFP
0.50 mm Pitch
20.0 mm x 20.0 mm Body

20-Pin PDIP
2.54 mm Pitch
26.4 mm x 6.4 mm Body

Analog Products Low Power Packages (continued)

FN
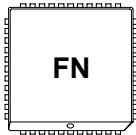
44-Pin PLCC
1.27 mm Pitch
17.5 mm x 17.5 mm Body

SD

20-Pin SSOP
0.65 mm Pitch
7.2 mm x 5.2 mm Body

FTB

52-Pin TQFP
0.65 mm Pitch
10.0 mm x 10.0 mm Body

FTA
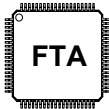
80-Pin TQFP
0.50 mm Pitch
12.0 mm x 12.0 mm Body

DTB/VM

14-Pin TSSOP
0.65 mm Pitch
5.0 mm x 4.4 mm Body

DTB/MTB
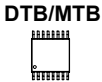
16-Pin TSSOP
0.65 mm Pitch
5.0 mm x 4.4 mm Body

DT

20-Pin TSSOP
0.65 mm Pitch
6.5 mm x 4.4 mm Body

DTB

24-Pin TSSOP
0.65 mm Pitch
7.8 mm x 5.6 mm Body

DTB

28-Pin TSSOP
0.65 mm Pitch
9.7 mm x 4.4 mm Body

16-Pin MFP
1.27 mm Pitch
10.2 mm x 5.3 mm Body

20-Pin MFP
1.27 mm Pitch
12.6 mm x 5.3 mm Body

SG187–57

Packaging

Packaging

Analog Products Power Packages

32-Pin SOICW-EP
0.65 mm Pitch
11.0 mm x 7.5 mm Body
6.1 mm x 5.0 mm Exposed Pad

32-Pin SOICW-EP
0.65 mm Pitch
11.0 mm x 7.5 mm Body
4.7 mm x 4.7 mm Exposed Pad

54-Pin SOICW-EP
0.65 mm Pitch
17.9 mm x 7.5 mm Body
6.3 mm x 4.6 mm Exposed Pad

54-Pin SOICW-EP
0.65 mm Pitch
17.9 mm x 7.5 mm Body
4.6 mm x 4.6 mm Exposed Pad

54-Pin SOICW-EP
0.65 mm Pitch
17.9 mm x 7.5 mm Body
10.3 mm x 5.1 mm Exposed Pad

52-Pin LQFP-EP
0.65 mm Pitch
10.0 mm x 10.0 mm Body
7.0 mm x 7.0 mm Exposed Pad

64-Pin LQFP-EP
0.50 mm Pitch
10.0 mm x 10.0 mm Body
6.5 mm x 6.5 mm Exposed Pad

9-Pin MECH
3.16 mm Pitch
17.9 mm x 16.6 mm Body

48-Pin TQFP-EP
0.50 mm Pitch
7.0 mm x 7.0 mm Body
3.4 mm x 3.4 mm Exposed Pad
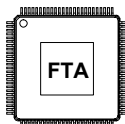
100-Pin TQFP-EP
0.50 mm Pitch
14.0 mm x 14.0 mm Body
9.0 mm x 9.0 mm Exposed Pad
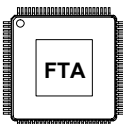
128-Pin TQFP-EP
0.40 mm Pitch
14.0 mm x 14.0 mm Body
8.9 mm x 8.9 mm Exposed Pad
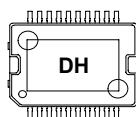
20-Pin HSOP
1.27 mm Pitch
16.0 mm x 11.0 mm Body
12.2 mm x 6.9 mm Exposed Pad
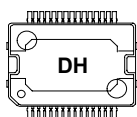
30-Pin HSOP
0.80 mm Pitch
16.0 mm x 11.0 mm Body
12.2 mm x 6.9 mm Exposed Pad
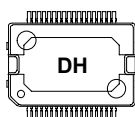
36-Pin HSOP
0.65 mm Pitch
16.0 mm x 11.0 mm Body
11.0 mm x 6.8 mm Exposed Pad
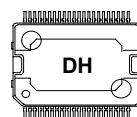
44-Pin HSOP
0.65 mm Pitch
16.0 mm x 11.0 mm Body
12.2 mm x 6.9 mm Exposed Pad
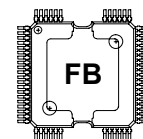
64-Pin HQFP
0.65 mm Pitch
14.0 mm x 14.0 mm Body
9.5 mm x 9.5 mm Exposed Pad
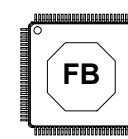
100-Pin HQFP
0.50 mm Pitch
14.0 mm x 14.0 mm Body
9.0 mm x 9.0 mm Exposed Pad

32-Pin QFN
0.65 mm Pitch
7.0 mm x 7.0 mm Body
4.7 mm x 4.7 mm Exposed Pad

44-Pin QFN
0.65 mm Pitch
9.0 mm x 9.0 mm Body
6.7 mm x 6.7 mm Exposed Pad

16-Pin PQFN
0.90 mm Pitch
12.0 mm x 12.0 mm Body

22-Pin PQFN
0.90 mm Pitch
12.0 mm x 12.0 mm Body

29-Pin PQFN
0.80 mm Pitch
10.0 mm x 10.0 mm Body

30-Pin PQFN
0.80 mm Pitch
10.0 mm x 10.0 mm Body

35-Pin PQFN
0.90 mm Pitch
12.0 mm x 12.0 mm Body

Analog Products Low Power Packages

8-Pin SOICN
Case 751

14-Pin SOICN
Case 751A

16-Pin SOICN
Case 751B
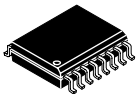
16-Pin SOICW
Case 751G
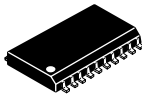
20-Pin SOICW
Case 751D
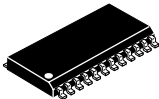
24-Pin SOICW
Case 751E
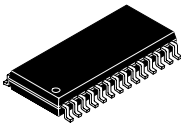
28-Pin SOICW
Case 751F

32-Pin SOICW
Case 1324

54-Pin SOICW
Case 1365

24-Pin LQFP
Case 977

32-Pin LQFP
Case 873A
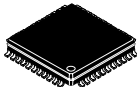
44-Pin LQFP
Case 824D

48-Pin LQFP
Case 932
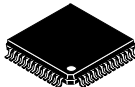
52-Pin LQFP
Case 848D

64-Pin LQFP
Case 840F

64-Pin LQFP
Case 840E
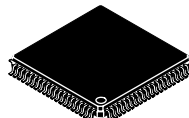
80-Pin LQFP
Case 841E
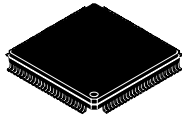
100-Pin LQFP
Case 842F
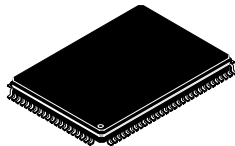
100-Pin LQFP
Case 983A
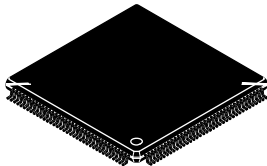
144-Pin LQFP
Case 918
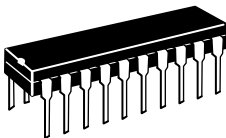
20-Pin PDIP
Case 738

Packaging

Packaging

Analog Products Low Power Packages (continued)
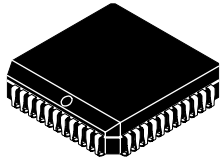
44-Pin PLCC
Case 777

20-Pin SSOP
Case 940C
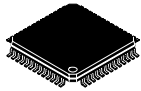
52-Pin TQFP
Case 824D
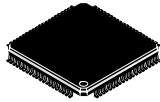
80-Pin TQFP
Case 932

14-Pin TSSOP
Case 948G

16-Pin TSSOP
Case 948F

20-Pin TSSOP
Case 948E
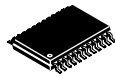
24-Pin TSSOP
Case 948K

28-Pin TSSOP
Case 1168

16-Pin MFP
Case 966
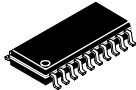
20-Pin MFP
Case 967

Analog Products Power Packages

32-Pin SOICW-EP
Case 1437

32-Pin SOICW-EP
Case 1454

54-Pin SOICW-EP
Case 1377

54-Pin SOICW-EP
Case 1390

54-Pin SOICW-EP
Case 1400

52-Pin LQFP-EP
Case 1336
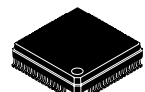
64-Pin LQFP-EP
Case 840K

9-Pin MECH
Case 1211A

48-Pin TQFP-EP
Case 932F
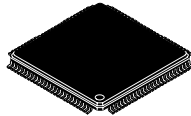
100-Pin TQFP-EP
Case 983E

128-Pin TQFP-EP
Case 1356
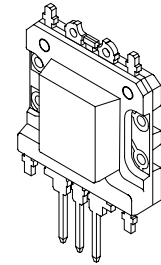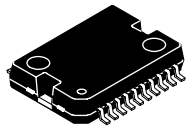
20-Pin HSOP
Case 979C
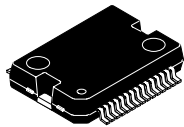
30-Pin HSOP
Case 979B
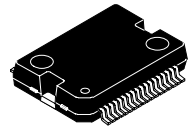
36-Pin HSOP
Case 1403
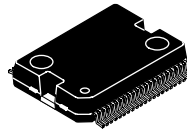
44-Pin HSOP
Case 1291
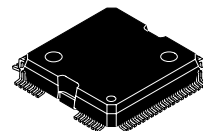
64-Pin HQFP
Case 1315
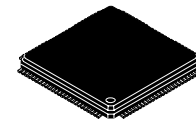
100-Pin HQFP
Case 983D

32-Pin QFN
Case 1306

44-Pin QFN
Case 1310
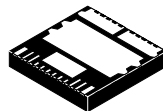
16-Pin PQFN
Case 1402
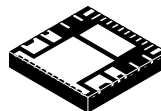
22-Pin PQFN
Case 1431
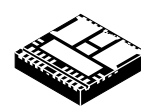
29-Pin PQFN
Case 1445
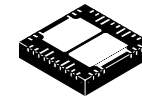
30-Pin PQFN
Case 1469

35-Pin PQFN
Case 1438

SG187–61

Packaging

HOW TO REACH US:

MOTOROLA