



# 8-bit Automotive: S08 Family Features and Benefits

Freescale microcontrollers are organized by families where each microcontroller within a family has the same general set of features.

The purpose of this matrix is to help the reader identify the S08 family that meets their feature needs and required benefits.

Once the appropriate family is identified, then the reader can determine the device they need.

Features	Customer Benefits	Detailed Benefits	Automotive S08 Families							
			DZ	DV	DN	EN	EL	SG	SL	AW
<b>S08 CPU</b>										
40 MHz core speed, 20MHz bus speed	Performance	Delivers high performance for systems needing more bandwidth.	✓	✓	✓	✓	✓	✓	✓	✓
HC08 instruction set with added BGND instructions	Re-use	Offers code re-use and backward compatibility to HC08 (object and source code.)	✓	✓	✓	✓	✓	✓	✓	✓
<b>On-Chip Memory</b>										
FLASH read/program/erase over full operating voltage and temperature	Flexibility and Reduces development time	Shortens development time by enabling in-circuit programming, field re-programmability, and fast program and erase times.	✓	✓	✓	✓	✓	✓	✓	✓
EEPROM in-circuit programmable memory; 8-byte single-page or 4-byte dual-page erase sector; Program and Erase while executing FLASH; Erase abort	Performance	Provides board space savings with on-chip EEPROM and reduces development time by allowing ability to manipulate diagnostic data at byte level, which provides finer granularity with smaller sector sizes than FLASH.	✓		✓		✓		✓	
Up to 16:1 Flash/RAM ratio	Reduces development time	Reduces development time by providing more RAM for C/C++ programming.	✓	✓			✓	✓	✓	✓
<b>Power Saving Modes</b>										
Two very low power stop modes	Power Savings	Minimizes power draw so there is power left over for other functions. Offers power control and flexibility where multiple modules can run, while others are powered down.	✓	✓	✓	✓	✓	✓	✓	✓
Very low power real time interrupt (RTI) for use in run, wait, and stop	Power Savings	Expands battery life using on-chip functionality.	✓	✓	✓	✓	✓	✓	✓	✓
<b>Clock Source Options</b>										
Oscillator (XOSC) - Loop-control Pierce oscillator; crystal or ceramic resonator range of 31.25kHz to 38.4kHz or 1MHz to 16MHz	Power Savings and flexibility	Optimizes power consumption and provides user flexibility.	✓	✓	✓	✓	✓	✓	✓	✓
Multi-purpose Clock Generator (MCG) - PLL and FLL modes; Internal reference clock with trim adjustment; External reference with oscillator/resonator options	Flexibility	MCG provides flexibility for improved system performance and accuracy using various clock sources.	✓	✓	✓	✓				
Internal Clock Generator (ICG) - Programmable frequency-locked loop (FLL); post-FLL divider; trimmable with temperature and voltage compensation, multiple options for clock sources and in-application clock switching	Cost savings	Provides accurate on-chip clock source and saves cost by eliminating the need for external components.								✓
Internal Clock Source (ICS) - FLL mode; Internal reference clock with trim adjustment; external reference with oscillator/resonator options	Cost savings	Provides accurate on-chip clock source and saves cost by eliminating the need for external components.					✓	✓	✓	
<b>System Protection</b>										
Watchdog Computer Operating Properly (COP) reset with option to run from dedicated 1-kHz internal clock source or bus clock	Security Enhancement	Provides system protection using backup oscillator by resetting the MCU to a known state.	✓	✓	✓	✓	✓	✓	✓	✓
Low-voltage detection with reset or interrupt; selectable trip points	Security Enhancement	Built in system protection to help secure data and warn of possible voltage loss conditions.	✓	✓	✓	✓	✓	✓	✓	✓



**Customer Benefits**

**Detailed Benefits**

**Automotive S08 Families**

DZ DV DN EN EL SG SL AW

**Features**

**System Protection (continued)**

Illegal opcode detection with reset	Security Enhancement	Resets the MCU to a known state due to inadvertent execution of illegal opcodes.	✓	✓	✓	✓	✓	✓	✓	✓
Illegal address detection with reset	Security Enhancement	Resets the MCU to a known state due to inadvertent access to unimplemented or reserved address space.	✓	✓	✓	✓	✓	✓	✓	✓
FLASH block protect	Security Enhancement	Helps provide security by protecting code from unauthorized reading and guards against unintentional write/erase of user-code/data.	✓	✓	✓	✓	✓	✓	✓	✓
EEPROM block protect	Security Enhancement	Helps provide security by protecting code from unauthorized reading and guards against unintentional write/erase of user-code/data.	✓		✓		✓		✓	

**Peripherals**

ADC—2.5µs conversion time, automatic compare function, 1.7mV/°C temperature sensor, internal bandgap reference channel	Performance	Providing fast and easy conversion of analog inputs (e.g. temperature, pressure, and fluid levels.)	✓	✓	✓	✓	✓	✓	✓	✓
ACMPx—Analog comparators with selectable interrupt on rising, falling, or either edge of comparator output; compare option to fixed internal bandgap reference voltage	Performance	Fast and efficient response to analog signals.	✓	✓	✓	✓	✓	✓	✓	
MSCAN—CAN protocol—Version 2.0 A, B; standard and extended data frames; Support for remote frames; Five receive buffers with FIFO storage scheme; Flexible identifier acceptance filters programmable as: 2 x 32-bit, 4 x 16-bit, or 8 x 8-bit	Performance and re-use	Enables higher performance by improving CAN message processing efficiency. Re-uses CAN module from 16-bit that has a large installed base. Meets auto industry CAN standards.	✓	✓						
SC1x—SCI(s) with LIN 2.0 Protocol and SAE J2602 compliance; Master extended break generation; Slave extended break detection; LIN slave supplement on SCI1; Automatic baud rate correction; Message time-out detection	Performance	Enables standard or LIN UART-based communication. Offers additional support for lower power using Wake from STOP feature.	✓	✓	✓	✓	✓	✓	✓	✓
SPI—Full-duplex or single-wire bidirectional; Double-buffered transmit and receive; Master or slave mode; MSB-first or LSB-first shifting	Performance	Delivers fast communication to and from peripheral devices.	✓	✓	✓	✓	✓	✓	✓	✓
IIC (I2C)—Up to 100 kbps with maximum bus loading; Multi-master operation; Programmable slave address; Interrupt driven byte-by-byte data transfer; Broadcast mode enabled	Performance and re-use	Delivers fast communication to and from peripheral devices.	✓	✓	✓		✓	✓	✓	✓
SLIC—Supports LIN 2.x and SAE J2602 protocols; up to 120kbps, full LIN message buffering, auto-baud and auto synchronization, checksum generation and verification, UART-like byte transfer mode (BTM)	Development time, performance, and cost savings	Saves development time by automatically adjusting to LIN speed - no special code changes needed; enables high performance with fewest interrupts on CPU of any known solution; saves cost with use of smaller and simpler driver code.					✓		✓	
TPMx—Selectable input capture, output compare, buffered edge-aligned, or center-aligned PWM on each channel	Flexibility	Flexible multiple time bases and channels provide system timing and functions.	✓	✓	✓	✓	✓	✓	✓	✓
RTC—(Real-time counter) 8-bit modulus counter with binary or decimal based prescaler; External clock source for precise time base, time-of-day calendar or task scheduling functions; Free running on-chip low power oscillator (1 kHz) for cyclic wake-up wit	Cost savings	Improved task scheduling for applications requiring Time of Day calendar functions. Frees up timers for other activities.	✓	✓	✓	✓	✓	✓	✓	
RTI (Real-time interrupt)—mechanism is useful for generating a periodic interrupt after a programmable amount of time; helpful when executing diagnostics, maintenance routines, and polling I/O or events	Cost savings	Provides system timing function, thus freeing other timing modules to perform other tasks.				✓	✓	✓	✓	✓

**Development Support**

Single-wire background debug interface	Reduces development time	Powerful tool for in field, in target debugging, only uses one MCU pin, same BDM interface pod for HC12, HCS12 and HCS08.	✓	✓	✓	✓	✓	✓	✓	✓
On-chip, in-circuit emulation (ICE) with real-time bus capture	Reduces development time, cost savings, and quality	Reduces development time as emulation can be done real-time and on-chip; can be used in the target application at full speed with all the target components being utilized; eliminates expensive external emulator box and interconnect; eliminates timing, loading, and drive issues; capture buffer and logic are the same as the target MCU so no marginal timing.	✓	✓	✓	✓	✓	✓	✓	✓

**Input/Output**

Interrupt pins with selectable polarity on each pin	Flexibility	Offers flexibility by interfacing to a large number of pins that are capable of generating interrupts.	✓	✓	✓	✓	✓	✓	✓	
Hysteresis and configurable pull up device on all input pins	Saves board space and component cost, improves system level integrity	Saves board space and component cost by eliminating the need for external pull up / pull down; resistors and improves system noise immunity.	✓	✓	✓	✓	✓	✓	✓	✓
Configurable slew rate and device strength on all output pins	Performance	Minimizes emissions by controlling rate outputs change state, thereby increasing performance.	✓	✓	✓	✓	✓	✓	✓	✓

**Miscellaneous**

EMC performance	Performance	Low EMC radiated emissions and susceptibility performance.	✓	✓	✓	✓	✓	✓	✓	✓
Wide operating voltage range: 2.7V-5V	Cost Savings	Reduces component cost by eliminating need for external voltage regulator.	✓	✓	✓	✓	✓	✓	✓	✓

**Learn More:** For more information about Freescale products, please visit [www.freescale.com](http://www.freescale.com).

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