



S12 MagniV Mixed-Signal MCUs

# S12ZVH MagniV Automotive Instrument Cluster Reference Solution

## Overview

While low-end instrument cluster features haven't changed much in the recent years, the technology that drives these features has advanced tremendously. The basic/low-end line of instrument clusters relies on analog gauges, segment or dot matrix LCDs and tell-tales (LEDs) to inform the user of the current status of their vehicle. The S12ZVH automotive instrument cluster reference solution features all these functionalities on a production-looking design that leverages on the impressive integration provided by the S12ZVH MagniV microcontroller.

The S12ZVH automotive instrument cluster reference solution is aimed to be taken as a design base for customers that wish to start an instrument cluster project. This reference solution features four analog gauges controlled by the on-chip stepper

motor drivers, a 160-segment LCD display, a real-time counter with capabilities for hour, minute and second tracking and a speaker for tone and alert generation. The user interface design has buttons to modify the display contents, activate/deactivate turn signals and modify the current time. It also has two potentiometers that control the backlight dimming and sound alerts volume respectively. For communications, the design has CAN communication provided by the on-chip CAN physical transceiver and LIN provided by an off-chip physical transceiver. The power regulation on the design is done by the S12ZVH microcontroller itself thanks to the on-chip voltage regulator.

This reference design is not only provided as a hardware reference but also as a software and mechanical design. The software on the reference design implements low-level drivers for several peripherals on the MCU (e.g., PWM, ADC, Timer, Real-Time Counter, Simple Sound Generator, Motor Controller, Stepper Stall Detection, LCD and more). The architecture of the application software uses a scheduler to execute periodic tasks such as controlling motor movement, LCD updates and tell-tale illumination and animation. The mechanical elements of the reference solution are provided so that they can be replicated, modified and reused freely.

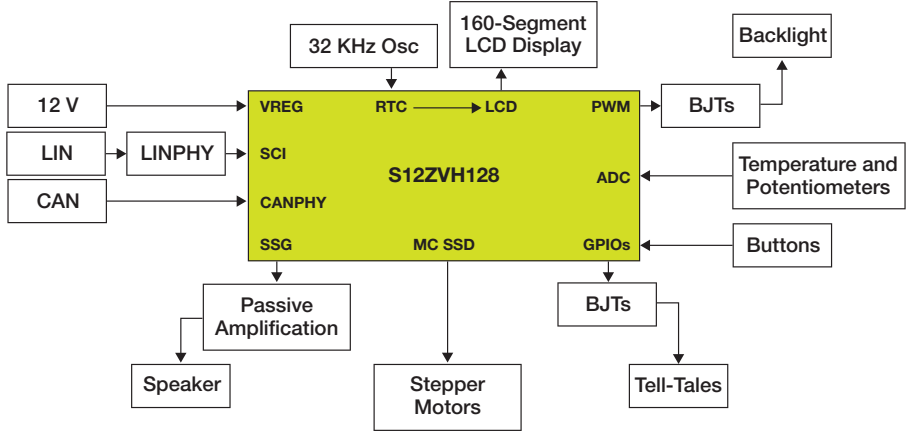
## S12ZVH128 Automotive Instrument Cluster Reference Solution



## Automotive Cluster Reference Design Key Features

- S12ZVH128 MCU with on-chip voltage regulator
- 160-segment LCD
- Four analog gauges (stepper motors)
- Piezoelectric speaker for alert generation
- RTC for accurate time keeping
- CAN (on-chip PHY)
- LIN with off-chip PHY
- Twelve tell-tales
- Dimmable background

## Automotive Cluster Reference Design Board Block Diagram

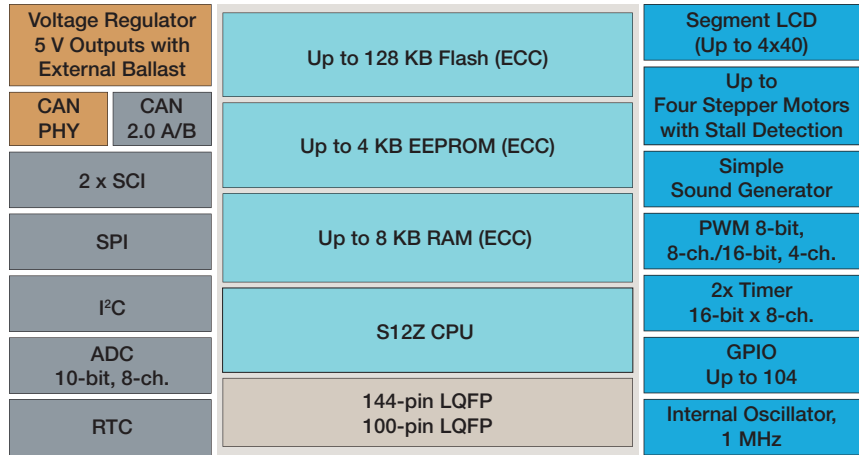


Freescale Technology

## S12ZVH MCU Key Features

- S12Z improved performance 16-bit core
- 128 KB of flash with ECC
- 4 KB of EEPROM with ECC
- 8 KB of RAM with ECC
- Up to 18 V voltage regulator (up to 40 for limited periods)
- CAN physical transceiver
- -40 °C to 105 °C
- 100 LQFP and 144 LQFP package options

## S12ZVH Family Block Diagram



For more information, visit [freescale.com/S12ZVH](http://freescale.com/S12ZVH).

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