

Steering—Electronic Power Assisted

Overview

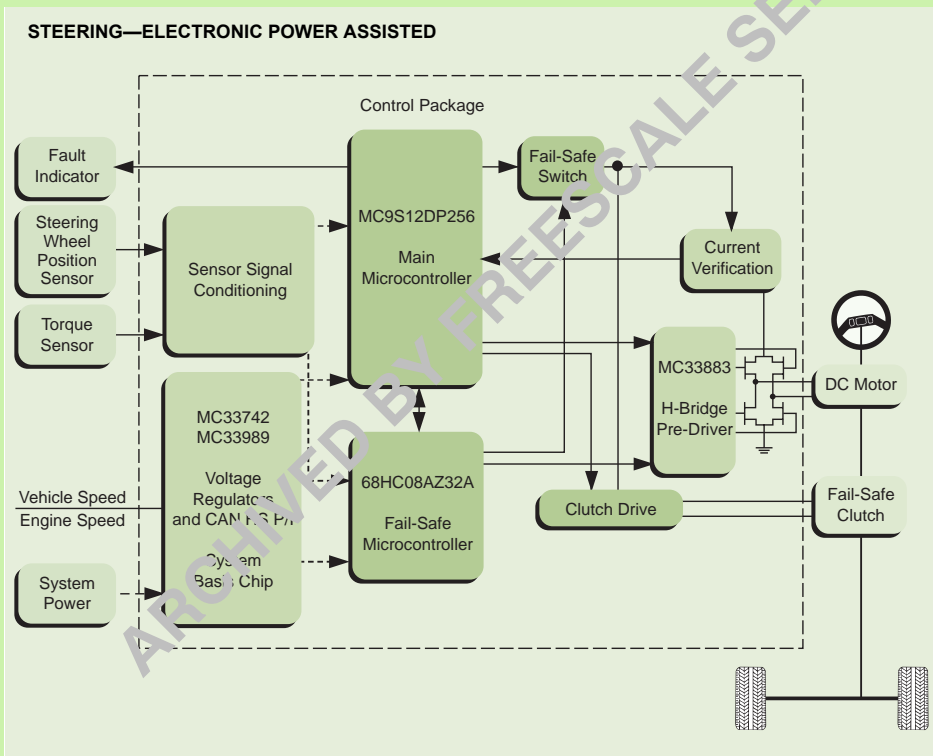
Electric power assisted steering (EPAS) is designed to use an electric motor to provide directional control to the driver of a vehicle. Most EPAS systems have variable assist, which allows for more assistance as the speed of a vehicle decreases and less assistance from the system during high-speed situations. This functionality requires a delicate balance of power and control that has only been available to manufacturers in recent years. The EPAS system is replacing the hydraulic steering system and is

destined to soon become mainstream among automotive manufacturers.

Electric power assisted steering systems do not require engine power to operate. Thus, a vehicle equipped with an EPAS system may achieve an estimated three percent greater fuel economy than the same vehicle with conventional hydraulic power steering. Consequently, more of the engine's power is transmitted to its intended location—the wheels.

Key Benefits

- > Reduces system mass compared to hydraulic power-assisted steering
- > Reduces fuel consumption because power is not taken from the engine to operate the hydraulic pump
- > Offers a lower cost solution than hydraulic power steering
- > Increases the flexibility of component placement by removing the hydraulic system



Freescale Ordering Information^{Note}

Part Number	Product Highlights	Additional Information
MC33742	System Basis Chip with Enhanced High-Speed CAN	www.freescale.com/analog
MC33883	H-Bridge Pre-Driver	
MC33989	System Basis Chip High-Speed CAN	
MC9S12DP256	Microcontroller	www.freescale.com
68HC08AZ32A	Fail-Safe Microcontroller	

Note: Search on the listed part number.

Design Challenges

Power steering applications require that the assist device mimic the driver's inputs at the steering wheel. The inputs are typically precise course corrections followed by periods of inactivity. This condition presents an interesting challenge to any motor design. The motors must also operate for extended periods in an under-hood environment that can sometimes reach temperatures of up to 150 degrees Celsius with little or no maintenance.

An acceptable motor design, with a high efficiency and temperature tolerance, is one that can be precisely manipulated. Today's multiple-poled "brushless" DC motors have been designed with tasks like these in mind. Their brushless design moves the electrical windings to the stator, the outer housing, which eliminates the need for motor brushes and can help to improve overall efficiency. This combination enables the motors to be used in the harshest conditions with a very long service life.

Freescale Semiconductor Solution

The Freescale Semiconductor established HC12 architecture family contains ideal on-chip Flash solutions for EPAS applications, which are currently available. They include four to eight pulse width modulation (PWM) channels, timer channels, and A/D channels to help control the motor in the EPAS system. Packages include 112 LQFP and 80 QFP. A wide variety of tools are also available.

Analog System Basis Chips offer HS CAN with voltage regulation and multiple wake-up capabilities with low sleep current.

Development Tools^{Note}

Vendor	MPC555	MPC561	MPC562	MPC563	MPC564	MPC565	MPC566	TPU
Metrowerks								
CodeWarrior™ for Embedded PowerPC ISA	•	•	•	•	•	•	•	
CodeWarrior for OSEK RTOS	•	•	•	•	•	•	•	
CodeWarrior Development Systems	•					•		
OSEKturbo (RTOS)	•	•		•		•		
TPU Low-Level Driver Library								•
Flash Programming — CodeWarrior for Embedded PowerPC ISA	•			•	•	•	•	
Flash Programming — CodeWarrior for OSEK RTOS	•			•	•	•	•	
Wind River Systems								
BDM Debugger — SingleStep	•	•		•		•		
BDM Debugger — SingleStep with Vision	•	•		•		•		
Flash Programming — SingleStep	•			•		•		
BDM Debugger — VisionCLICK	•	•		•		•		
Nexus Debugger — VisionCLICK		•		•		•		
Nexus Debugger — SingleStep with Vision		•		•		•		
Flash Programming — VisionCLICK	•			•		•		
Compiler — DiabData	•	•	•	•	•	•	•	
MATRIX	•	•		•		•		
Simulator — SingleStep	•	•	•	•	•	•	•	

Note: Search on the listed product name.

Development Tools (continued)^{Note}

Vendor	MPC555	MPC561	MPC562	MPC563	MPC564	MPC565	MPC566	TPU
Lauterbach								
BDM Debugger Trace32	•	•	•	•	•	•	•	•
Nexus Debugger Trace32		•	•	•	•	•	•	•
Code Trace (with Bus access)	•	•	•	•	•	•	•	
Code Trace (Nexus)	•	•	•	•	•	•	•	
Axiom Manufacturing								
Low-Cost Evaluation Board	•	•						
Mid-Range Evaluation Board	•	•						
Full-Feature Evaluation Board	•	•	•	•	•	•	•	
Ashling Microsystems								
BDM Debugger — Opella, Genia, and Vitra	•	•	•	•	•	•	•	
Nexus Debugger — Vitra (w/trace)		•		•		•		•
Nexus Debugger — Opella, Genia		•		•		•		
Green Hills Software								
IDE, Debugger — Multi	•	•		•		•		
Compiler — C/C++/EC++	•	•		•		•		
P&E Microcomputer Systems								
Low-Cost Debugger	•	•				•		
Flash Programming Tools	•			•		•		
GNU								
Compiler/Debugger	•	•		•		•		
ASH WARE								
TPU Simulator								•
ETAS								
ErCOSEK	•	•		•		•		
Calibration Tools (ETK)	•	•		•		•		
Calibration Tools (ETK) Nexus	•	•		•		•		
dSPACE								
TargetLink	•	•		•		•		
dli								
Logic Analyzer	•	•		•		•		
Agilent Technologies								
Logic Analyzer	•	•		•		•		
Inverse Assembler, Source Correlation	•	•		•		•		
Emulation Probe (BDV)	•	•		•		•		
Tektronix								
Logic Analyzer	•	•		•		•		
Abatron AG								
BDM Support	•	•		•		•		
Accelerated Technology								
Nucleus (RTOS)	•	•		•		•		

Note: Search on the listed product name.

Tool Type	Product Name	Vendor	Description	Additional Information
Evaluation Kit	KIT33742DWEVB	Metrowerks	System Basis Chip with Enhanced High-Speed CAN	www.metrowerks.com

Note: Search on the listed product name.

Disclaimer

This document may not include all the details necessary to completely develop this design. It is provided as a reference only and is intended to demonstrate the variety of applications for the device.

Third Party Support

Vendor	Contact Information
Metrowerks	800-377-5416 (www.metrowerks.com)
Axiom Manufacturing	972-926-9303 (www.axman.com)
Wind River Systems	800-872-4977 (www.windriver.com)
Green Hills Software	805-965-6044 (www.ghs.com)
Lauterbach	508-303-6812 (www.lauterbach.com)
Accelerated Technology	800-468-6853 (www.acceleratedtechnology.com)
Ashling Microsystems	408-732-6490 (www.ashling.com)
ASH WARE	503-533-0271 (www.ashware.com)
GNU	617-542-5942 (www.gnu.org)
ETAS	888-382-7462 (www.etasinc.com)
dSPACE	248-567-1300 (www.dspace.com)
P&E Microcomputer Systems	617-353-9206 (www.pemicro.com)

Online Topics

Description	Location
Analog and Mixed Signal	www.freescale.com
M68HC08	
M68HC12	

Related Documentation^{Note}

Document Number	Description	Additional Information
APDPAK	Analog ICs Integrated Solutions Pitch Pack	www.freescale.com
SG187	Automotive Selector Guide	

Note: Search on the listed document number.

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