Application Brief

Optimizing Body Control Modules (BCMs) Using Logic and Translation

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Functional Block Diagram

For the purpose of this report, Figure 1 is used to illustrate the logic and translation use cases. Each red block has an associated use-case document. Links are provided in Table 1 and Table 2. For a more complete block diagram, see the *Interactive Online End Equipment Reference Diagram for Body Control Modules.*

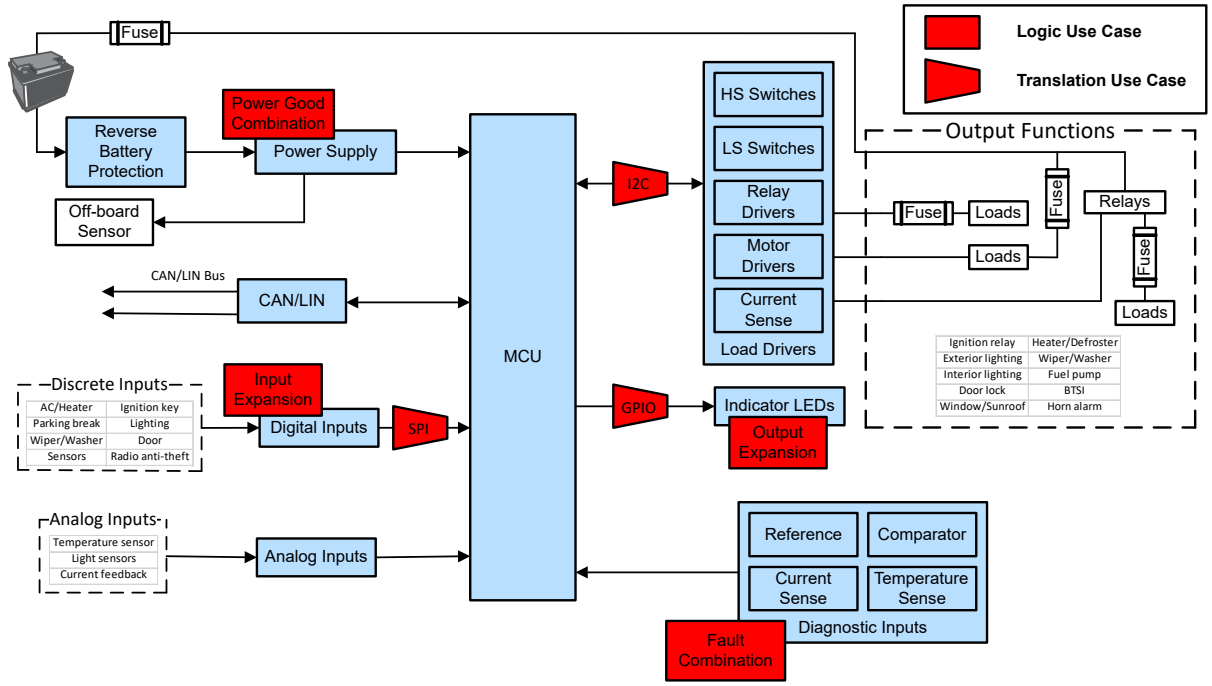


Figure 1. Simplified Body Control Module Block Diagram

Logic and Translation Use Cases

Each use case links to a separate document that provides additional details including a block diagram, design tips, and part recommendations. The nearest block and use-case identifiers are listed to match up exactly to the use cases shown in the provided Figure 1.

Table 1. Logic Use Cases

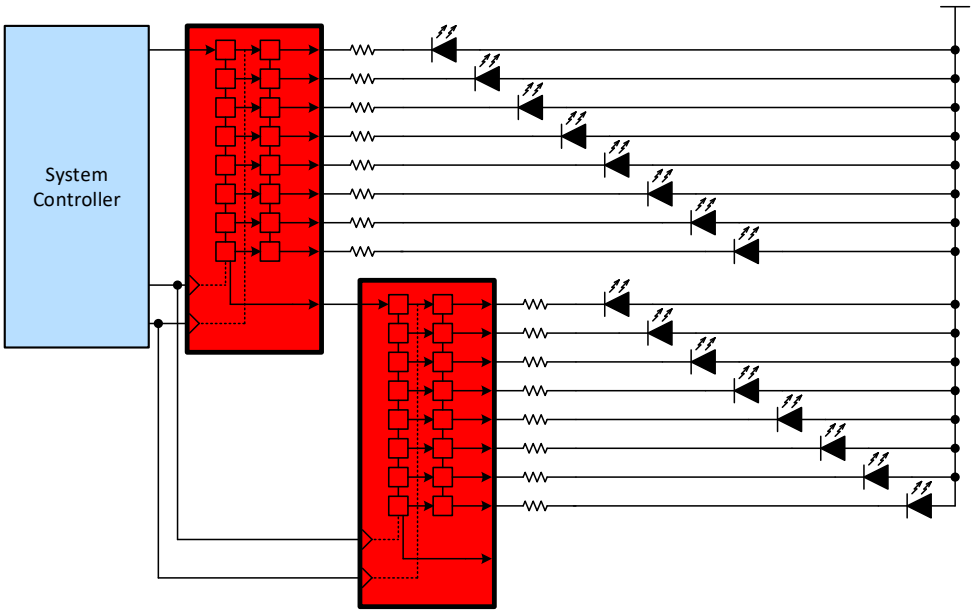
Nearest Block	Use-Case Identifier	Use Case
Power Supply	Power Good Combination	Combine Power Good Signals
Digital Inputs	Input Expansion	Increase the Number of Inputs on a Microcontroller
LED Drivers	Output Expansion	Increase the Number of Outputs on a Microcontroller
Diagnostic Inputs	Fault Combination	Using Fewer Inputs to Monitor Error Signals

Table 2. Translation Use Cases

Nearest Block	Use-Case Identifier	Use Case
Load Drivers	I2C	Translate Voltages for I2C
LED Drivers	GPIO	Translate Voltages for GPIO
Digital Inputs	SPI	Translate Voltages for SPI

Increase the Number of Outputs on a Microcontroller

Microcontrollers often have a very limited number of GPIO pins. Serial-in parallel-out shift registers can be used to output to a large number devices while only using a few GPIO pins from the controller.



See more about this use case in the *Logic Minute* video *Increase the Number of Outputs on a Microcontroller*.

- Serial input data (BR_{in}) must be faster than the desired output data rate (BR_{out}) based on the number of output bits (N) by this equation: BR_{in} (Mbps) = BR_{out} (Mbps) × N
- The clock input controls the rate at which data is loaded into the shift register, F_{clk} (MHz) = BR_{in} (Mbps)
- For more outputs, shift registers can be daisy-chained together
- *[FAQ] What is the default output of a latched device? (Flip-Flop, latch, register)*
- Ask a question on our *TI Engineer-to-Engineer (E2E™) forum*

Recommended Parts

Part Number	V_{CC} Range	Bits	Output Register	Features
SN74HCS594-Q1	2 V to 6 V	8	✓	Schmitt-trigger inputs, Push-pull outputs
SN74HCS595-Q1	2 V to 6 V	8	✓	Schmitt-trigger inputs, 3-state outputs
SN74HCS164-Q1	2 V to 6 V	8		Schmitt-trigger inputs, Push-pull outputs
SN74HCT595-Q1	4.5 V to 5.5 V	8	✓	TTL-compatible CMOS inputs, 3-state outputs

For more devices, browse through the *online parametric tool* where you can sort by desired voltage, channel numbers, and other features.

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