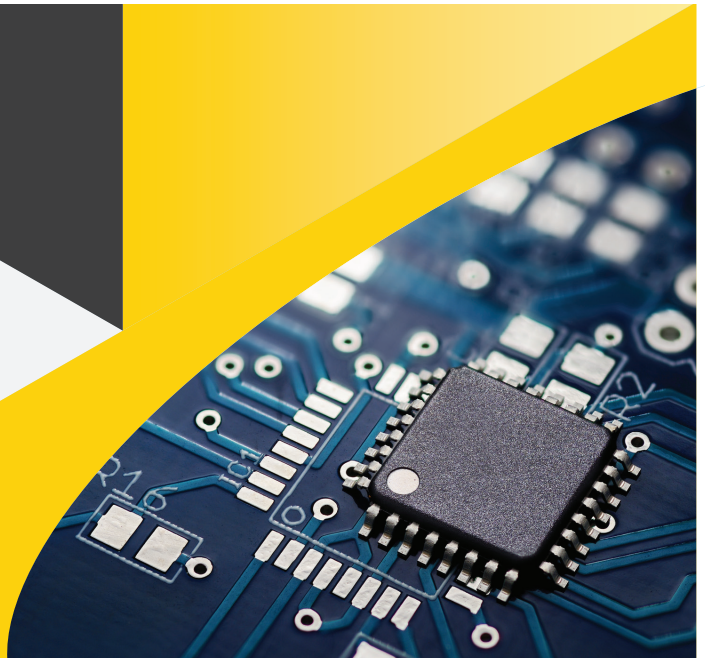




## Automotive MCU with Integrated LIN Phy



This article will introduce a new automotive grade MCU from Lumissil with an integrated LIN Phy. In modern vehicles there are potentially dozens of 8-bit MCUs for simple tasks such as basic buttons, simple sensor interfacing and motor control. Although the trend for many applications is to use more powerful processors like 16-bit or 32-bit, there is still a lot of demand for simple 8-bit MCUs since they are smaller and more cost effective. Many of these 8-bit MCU applications will be LIN nodes since LIN is also a very cost-effective automotive grade data bus for less critical applications like door locks, mirrors, seat adjusters and climate control etc. However up until now each LIN node had a separate LIN transceiver and MCU chips.

To further improve costs and reduce BOM Lumissil's new IS32CS8976 and IS32CS8978 integrate the LIN transceiver and the 8-bit MCU into one small package. Together in one chip will optimize cost, board space and development effort. To be clear this is not just a LIN controller but is a true transceiver built into the MCU so it can connect directly to a LIN bus without the need for another chip.

Figure 1 shows a typical system using a separate LIN system basis chip (SBC) outside the node's MCU.

Figure 2 shows the reduction in complexity by integrating the LIN PHY and controller into one chip.

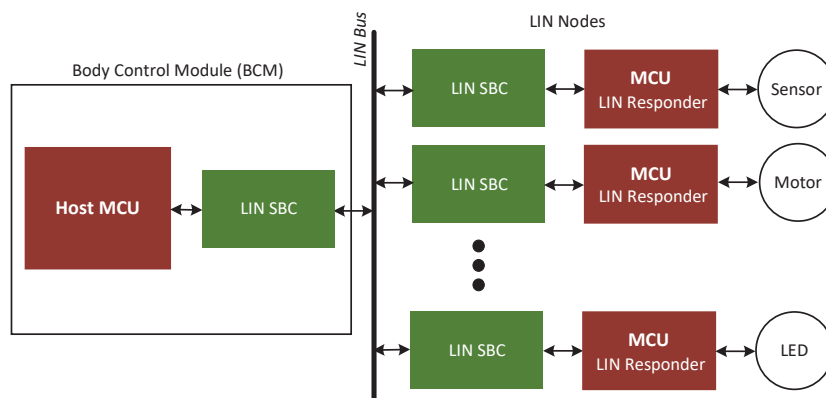


Figure 1: Typical Control Module and LIN Node System

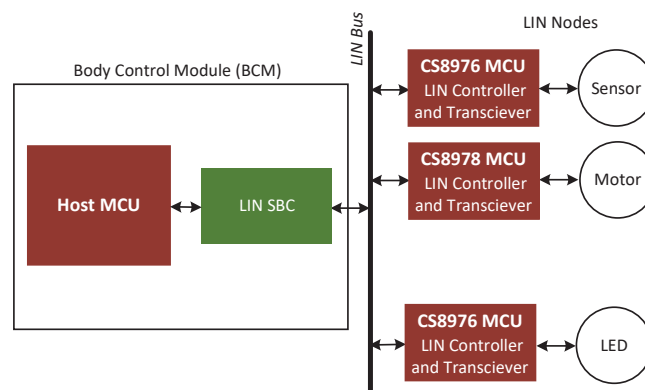
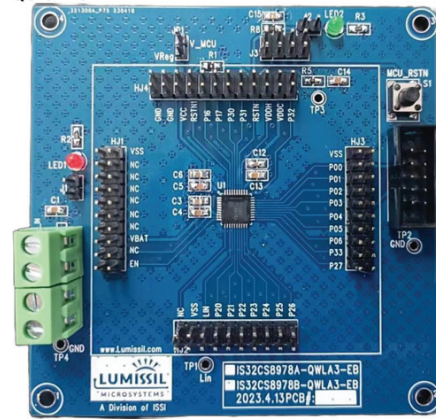


Figure 2: System Diagram Using an Integrated LIN Phy built into an 8-bit MCU

There are many LIN based nodes that can benefit from the integrated MCU. Below is a list of the most common application areas:

1. Door Locks: Controlling the locking and unlocking mechanism of car doors.
2. Window Controllers: Managing the operation of power windows.
3. Mirror Adjusters: Handling the electronic adjustment of side mirrors.
4. Seat Adjusters: Controlling motorized movements of seats, particularly in non-memory seats.
5. Interior Lighting: Managing simple on/off and dimming functions of cabin lights.
6. Climate Control: Basic operations of heating, ventilation, and air conditioning systems.
7. Rain/Light Sensors: Simple sensors for detecting rain or ambient light levels.
8. Steering Wheel Controls: Interfacing with buttons for audio, phone, and other basic controls.
9. Wiper Control: Basic control of windshield wipers, excluding speed-sensitive or automatic functions.
10. Small Motors Control: Operating small motors for applications like headlamp levelers.



Lumissil makes developing your application easy with our hardware development kit [as shown in Fig 3 below] with all I/Os brought out to a header. Microsoft VS Code software development environment also simplifies the task with a project manager, code editor, compiler, and debugger in one.

Lumissil Microsystems Inc. offers a wide range of 8-bit MCUs with advanced capabilities that support modern systems by increasing system performance and accelerating response to system events. Below is a table of our latest generation of MCUs:

| Lumissil's 8-bit MCUs |                                 |                                 |  |   |  |
|-----------------------|---------------------------------|---------------------------------|--|---|--|
| Key Spec              | CS8974                          | CS8975                          | CS8976                                     | CS8977  | CS8978                                     |
| Core                  | 1 Cycle 8051                    |                                 |  |   |  |
| Speed                 | 16 MHz                          | 32 MHz                          |  |   |  |
| RAM                   | 2KB                             | 1KB                             | 1KB  | 2KB   | 2KB  |
| Flash                 | 32KB ECC                        | 16 KB ECC                       | 16KB                                       | 64KB  | 64KB                                       |
| GPIO                  | 20                              | 12                              | 10   | 28  | 20   |
| Interrupts            | 20                              | 6                               | 6  | 6   | 6  |
| I2C                   | 3                               | 2                               | 2  | 2   | 1  |
| SPI                   | 1                               | 1                               | 1  | 1   | 1  |
| UART                  | 2                               | 2                               | 1  | 2   | 2  |
| LIN                   | 1 Controller                    | 1 Controller                    | 1 LIN2.2A,<br>SAEJ2602<br>Controller / Phy | 1 Controller  | 1 LIN2.2A,<br>SAEJ2602<br>Controller / Phy |
| Comparators           | 4                               | 4                               | 2  | 4   | 4  |
| Timers                | 5@16b and 1@24b                 |                                 |  |   |  |
| ADC                   | No                              | 16 ch, 11b SAR                  | 4 ch, 11b SAR                              | 16, 12b SAR   | 16, 12b SAR                                |
| DAC                   | No                              | 1 ch, 8b                        |  |   |  |
| Temp Sensor           | No                              | Yes                             |  |   |  |
| PWM                   | 6 ch, 8b                        | 6 ch, 12b                       |  |   |  |
| Cap Touch             | 19 Gen 3                        | 11 Gen 3                        | 9 Gen 3                                    | 27 Gen 3  | 20 Gen 3                                   |
| Melody Maker          | Yes                             |                                 |  |   |  |
| Package               | TSSOP-24 7.8x4.4<br>QFN-24, 4x4 | TSSOP-16, 5x6.4<br>SOP-8, 4.9x6 | TSSOP-20 6.5x6.4                           | TSSOP-20 6.4x6.5<br>TSSOP-24 6.4x7.8<br>TSSOP-28 6.4x9.7<br>LQFP-32 5x5 | QFN-40 6x6                                 |
| Industrial            | -40 to - 85°C                   |                                 |  |   |  |
| Automotive            | -40 to 125 °C                   |                                 |  |   |  |
| Auto Qual             | AEC-Q100                        |                                 |  |   |  |