

# Innovative Automotive Glass Solutions for Sustainable & adaptive In-Cabin Climate Control to enhance passenger comfort

## The Client

This case study is for a client in the automotive industry seeking to enhance in-cabin comfort and energy efficiency through innovative thermal management solutions.

Motherson Technology Services helps a leading automotive supplier sought to enhance in-cabin comfort and energy efficiency in their vehicles. Their vision involved integrating PDLC (Polymer Dispersed Liquid Crystal) technology to create touch-controlled smart glass for adjustable cabin lighting and temperature control.

## Overview

The project aimed to develop a smart in-cabin thermal management system that utilizes PDLC smart glass technology and sensor-based control. The system dynamically adjusts the transparency of the PDLC glass based on user touch input and environmental conditions, optimizing thermal comfort and energy consumption within the vehicle.



### Engagement

Mechanical enclosure  
PCB circuit layout  
CAN protocol



### Tools

Hardware Schematic  
PDLC and Sensor board  
Software Design  
Functional Testing  
System Validation

## Expertise

This project involved expertise in various domains:



Embedded Systems Design



Sensor Integration (Touch, Temperature, Humidity, Light)



CAN Bus Communication Protocol



PCB Design and Layout



Mechanical Design



Control Algorithm Development

## The Solution

Motherson Technology Services delivered a multifaceted solution for the in-cabin thermal management system. The hardware team designed and validated a PCB circuit with 48VAC generation for PDLC power, an H-bridge circuit for controlling transparency, sensor interfaces, and a central STM32 microcontroller. A mechanical enclosure was designed for protection. The software team developed firmware for the microcontroller to process touch commands, acquire sensor data (temperature, humidity, light intensity) and transmit it via CAN protocol, and calculate sun angle for optimized thermal strategies. This approach resulted in a system with touch controlled PDLC glass, integrated sensors for environmental monitoring, sun angle calculation for thermal optimization, and seamless CAN protocol communication

## Business Value Delivered

The development of the smart glass thermal management system delivered significant business value by enhancing passenger comfort and energy efficiency. By integrating PDLC (Polymer Dispersed Liquid Crystal) glass with intelligent touch controls, the solution allowed users to dynamically adjust glass opacity for optimal lighting and privacy. This reduced the dependence on HVAC systems, contributing to lower energy consumption and extended battery range in electric vehicles. Seamless communication via the CAN protocol ensured reliable integration with the vehicle's control systems, offering a smooth user experience and robust system performance. Overall, the solution helped improve passenger satisfaction, support sustainability goals, and differentiate the client's vehicle offering with advanced in-cabin technology.