

LLC Transformer Driver Use Case: DC Fast-Charge Stations

This use case examines the application of the [MPQ18913](#) in DC fast-charge (DCFC) stations



Figure 1: DC Fast-Charge Stations

The MPQ18913's LLC resonant topology offers several key features, including a resonant LLC tank with a magnetizing inductor (L_M) for energy transfer, as well as an additional capacitor (C_R) and inductor that make the tank resonate at a certain frequency.

Flyback topology is typically used as the gate driver's power supply for insulated-gate bipolar transistor (IGBTs) or silicon carbide (SiC) FETs. As the battery voltage (V_{BATT}) in electric vehicles continues to scale up from 400V to above 800V, it has become more challenging to meet the isolation requirements of high-power charging systems such as DCFC stations while minimizing the interwinding capacitance in the design. LLC resonant topology is optimal for higher voltage systems because it allows for isolation voltages up to 5kV and minimizes interwinding capacitances down to 6pF or less with a resonant LLC tank.

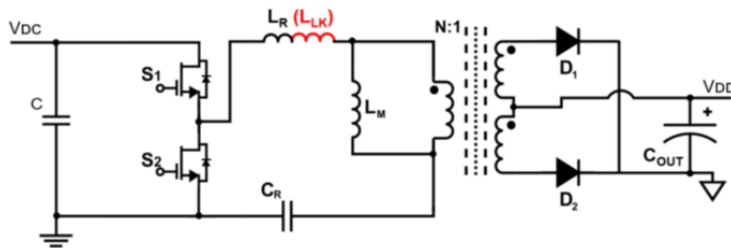


Figure 2: LLC Topology

The MPQ18913 is a high-frequency, half-bridge transformer driver that biases SiC FETs. The MPQ18913's LLC resonant topology offers several key features, including a resonant LLC tank with a magnetizing inductor (L_M) for energy transfer, as well as an additional capacitor (C_R) and inductor that make the tank resonate at a certain frequency. The leakage inductance from the resonant inductor in the tank eliminates voltage spikes and improves efficiency compared to flyback topologies. As a result, the MPQ18913 can effectively meet the higher power requirements of DCFC stations.

A charging station system solution can be designed integrating the MPQ18913 and dual-channel isolated gate drivers. For signal isolation, MPS offers quad-channel digital isolators ([MP27922](#), [MP27931](#), and [MP27940](#)) as well as 6-channel digital isolators ([MP27933](#), [MP27942](#), and [MP27960](#)).

Additional features of the MPQ18913 include:

- High Performance:
 - Configurable Switching Frequency (f_{sw}), Up to 5MHz
 - Automatic Resonant Frequency Detection during Start-Up
 - Frequency Spread Spectrum (FSS) for Reduced EMI
 - Supports Up to 6W of Output Power
 - 5V to 30V Input Voltage (V_{IN}) Range
- Robust Design for Automotive Environments:
 - -40°C to +150°C Junction Temperature (T_J) Range
 - Available in a Tiny QFN-10 (2mmx2.5mm) Package
 - Available in a Wettable Flank Package to Enable Optical Inspection
 - Available in AEC-Q100 Grade 1

For more information, explore MPS's family of [isolated solutions](#) for automotive applications.