Product Overview
CCS-Compliant Electric Vehicle Service Equipment Reference Design for Level 1 and 2 EV Charger

Description

Electric vehicle service equipment (EVSE) facilitates power delivery to electric vehicles safely from the grid. An EVSE control system consists of an auxiliary power stage, an off-board AC/DC high power stage (only in DC charging stations), energy metering unit, AC and DC residual current detector, an isolation monitor unit, relays and contactors with drive, two-way communication over single wire, and service and user interfaces. This reference design highlights an ultra-low standby isolated AC/DC auxiliary power stage followed by converters and linear regulators, a comparator-based control pilot interface to meet the IEC61851 standard, an efficient relay and contactor drive, plug lock motor driver, flux gate circuit to detect AC and DC currents for RCD applications, and isolated line voltage sensing across the relay and contactor.

TIDA-010239 Board
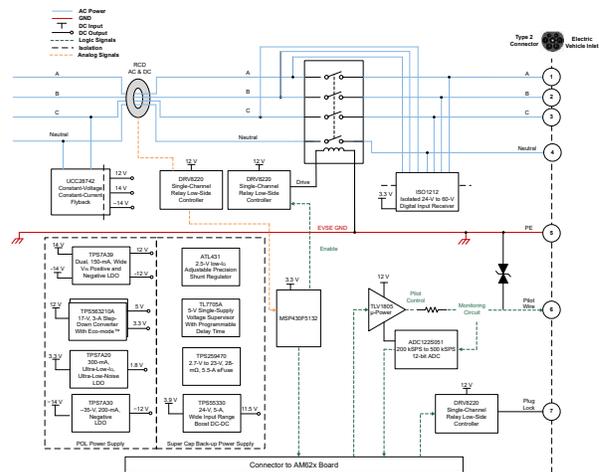
TIDA-010239 Block Diagram

Features

- Ultra-low standby UCC28742-based isolated AC/DC stage to achieve ENERGY STAR® certification for electric vehicle (EV) charging stations
- Tight output voltage regulation (< ±5%) of LDOs and the high slew rate of the TLV1805 device for control pilot interface
- Ultra-low standby as well as cost-optimized converters and linear regulators to power up points-of-load
- DRV8220 current controller to drive high-current relays and contactors for thermal protection, RCD AC and DC detection, and plug lock control
- Isolated line voltage sensing using the ISO1212 digital-input receiver for welded relay and contactor detection

Applications

- [AC charging (pile) station](#)

TI Resources

- *Build a smart EV charging station with Vehicle-to-Grid (V2G) communication*
- TIDA-010239: *CCS-compliant electric vehicle service equipment reference design for level 1 and 2 EV charger*
- ATL431: 2.5-V low-I_Q adjustable precision shunt regulator
- ADC122S051: 2 Channel, 200 ksps to 500 ksps 12-Bit A/D Converter
- DRV8220: 20-V, 1.76-A H-bridge motor driver with auto sleep mode
- INA293: -4-V to 110-V, 1.3-MHz, ultra-precise current sense amplifier
- ISO1212: *Dual-channel Isolated 24-V to 60-V digital input receiver for digital input modules*
- MSP430F5132: 25 MHz MCU with 8KB Flash, 1KB SRAM, 10-bit ADC, comparator, DMA, 16-bit High Resolution timer
- OPA202: Low noise (0.2-µVPP, 9-nV/√Hz), heavy capacitive drive (25-nF), super beta, precision op amp
- TLV1805: *High voltage comparator with push-pull output and shutdown*
- TLV7011: Low power, small size comparator with push-pull output
- TL7705A: 5-V single-supply voltage supervisor with programmable delay time
- TPS25947: 2.7-V to 23-V, 28-mΩ, 5.5-A eFuse with integrated reverse polarity protection
- TPS55330: Integrated 5-A 24-V Wide Input Range Boost/SEPIC/Flyback DC-DC Regulator
- TPS563210A: 17V Input, 3A Synchronous Step-Down Regulator in SOT-23 w/ Advanced Eco-mode™, PG, Soft Start
- TPS65130: Split-Rail Converter with Dual, Positive and Negative Outputs (300mA typ)
- TPS7A20: 300-mA, ultra-low-noise, low-I_Q, low-dropout (LDO) linear regulator with high PSRR
- TPS7A39: 150-mA, 33-V, low-noise, high-PSRR, dual-channel positive and negative low-dropout voltage regulator
- SN74AUP1G08: Single 2-input, 0.8-V to 3.6-V low power AND gate
- UCC24612: High-frequency multi-mode synchronous rectifier controller
- UCC28742: High-efficiency flyback controller with 1% output regulation accuracy

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