

Automotive High Efficiency High Density Dual-Phase Hybrid Buck Controller

General Description

The evaluation circuit EVAL-LTC7822-1-AZ features LTC7822-1: an automotive dual-phase hybrid step-down synchronous controller with a load current monitor. The LTC7822-1 uses an ADI-proprietary architecture that merges a soft switching charge pump topology with a dual-phase interleaved synchronous step-down converter to provide superior efficiency and low EMI performance. The LTC7822-1 can operate at a wide V_{IN} Range: 19V to 90V (100V ABS Max), output voltage up to 35V and a phase-lockable fixed frequency from 150kHz to 1.5MHz, enabling flexible configuration for different applications.

The EVAL-LTC7822-1-AZ operates from 36V to 60V input voltage with full power capabilities from 42V to 60V and produces an output of 12V. Utilizing airflow or a heat sink, more than 1kW of output power delivery is achieved within a quarter-brick solution size. Peak efficiency of 98.4% is achieved at 48 V_{IN} and 30A. Optimized at 150kHz, the EVAL-LTC7822-1-AZ is ideal for 48V to 12V applications with high efficiency and high-power density.

Due to the proprietary architecture, the dual-phase EVAL-LTC7822-1-AZ features a minimum total C_{MID} capacitance value compared with traditional paralleled single-phase hybrid switch cap solutions. 10V gate drive voltage of the

LTC7822-1 reduced MOSFETs' power loss. The $EXTV_{CC}$ pin allows LTC7822-1's internal LDO to utilize a lower power supply voltage than the lossy V_{IN} . Furthermore, the coupled inductor applied on the board enables minimum solution size and the highest efficiency performance. All components on the EVAL-LTC7822-1-AZ are automotive AEC-Q qualified.

The output voltage and V_{IN} ENABLE/UVLO voltage are both programmed by resistor dividers on the FB pin and RUN pin, respectively. $\overline{FAULT}$ and PGOOD status flags indicate MID_{SNS} voltage, die temperature, and V_{OUT} voltage deviation. IMON and IMON_REF reports output current and can be easily accessed on the board for system monitoring purpose.

The EVAL-LTC7822-1-AZ allows paralleling multiple boards to achieve higher output power. For more details, follow the instructions in this user guide.

The LTC7822AUKM-1#WPBF is in a 48-Lead 7mm x 7mm plastic QFN package. The LTC7822-1 data sheet gives a complete description of the part operation and application information. The LTC7822-1 data sheet must be read in conjunction with this user guide to properly use the evaluation circuit EVAL-LTC7822-1-AZ.

Performance Summary ($T_A = 25^\circ\text{C}$)

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range	V_{IN}		36		60	V
Output Voltage	V_{OUT}			12		V
Output Current	I_{OUT}	With Airflow		85		A
Gate Driver Supply Voltage	V_{DRVCC}			10		V
V_{IN} Turn-On Rising	$V_{IN_EN(+)}$	$R5 = 1\text{M}\Omega$, $R7 = 37.4\text{k}\Omega$		33		V
V_{IN} Undervoltage Lockout (UVLO) Falling	$V_{IN_UVLO(-)}$	$R5 = 1\text{M}\Omega$, $R7 = 37.4\text{k}\Omega$		27		V
Switching Frequency	f_{SW}	$R_T = 332\text{k}\Omega$		150		kHz
Full Load Efficiency	η_{FULL}	$I_{OUT} = 80\text{A}$	$V_{IN} = 42\text{V}$	96.6		%
			$V_{IN} = 48\text{V}$	97.6		%
			$V_{IN} = 54\text{V}$	97.7		%
Peak Efficiency	η_{PEAK}	$I_{OUT} = 30\text{A}$	$V_{IN} = 48\text{V}$	98.4		%

Notes

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