



28 μ A I_Q Triple Output, Buck/Buck/Boost Synchronous DC/DC Controller Maintains Regulation in Automotive Start/Stop Systems

MILPITAS, CA – February 7, 2013 – Linear Technology Corporation introduces the [LTC3859AL](#), a triple output (buck, buck, boost), low quiescent current synchronous DC/DC controller that maintains all output voltages in regulation during automotive cold crank conditions. A 12V automotive battery can droop to less than 4 volts during engine restart or cold crank, causing reset of infotainment systems and other electronics that operate from 5 volts and higher. The high efficiency synchronous boost converter feeds the two step-down converters, avoiding output voltage dropout when the car battery droops, a useful feature in automotive start/stop systems that shut off the engine at idle to save fuel. Alternatively, the buck controllers can be powered from the input for a general purpose triple output controller.

The LTC3859AL operates from an input voltage of 4.5V to 38V during start-up and maintains operation down to 2.5V after start-up. The synchronous boost converter can produce output voltages up to 60V and can run at 0% duty cycle (synchronous switch ON) to pass through the input voltage when required to maximize efficiency. The two step-down converters can produce output voltages from 0.8V to 24V with the entire system achieving efficiency as high as 95%. In addition, the LTC3859AL can be configured for Burst Mode[®] operation, reducing quiescent current to 28 μ A per channel (38 μ A for all three on) in sleep mode, a useful feature for preserving battery run-times. The powerful 1.1Ohm onboard all N-channel gate drivers minimize MOSFET switching losses and provide an output current of more than 10 amps per channel, limited only by external components. Furthermore, the output current for each

converter is sensed by monitoring the voltage drop across the inductor (DCR) or by using a separate sense resistor. The LTC3859AL's constant frequency current mode architecture enables a selectable frequency from 50kHz to 900kHz or it can be synchronized to an external clock with its internal phase-locked loop (PLL) from 75kHz to 850kHz.

Additional features include an onboard LDO for IC power and gate drive, output voltage tracking or adjustable soft start, a power good signal and an external V_{CC} input. The reference voltage accuracy is $\pm 1\%$ over a -40°C to 125°C operating temperature range.

The LTC3859AL is available in 38-lead SSOP and 38-pin 5mm x 7mm QFN packages. Four temperature grades are available, with operation from -40 to 125°C for the extended and industrial grades, a high temp automotive range of -40°C to 150°C and a military grade of -55°C to 150°C. The 1,000-piece price starts at \$4.76. For more information, visit www.linear.com/product/LTC3859AL.


Photo Caption: Triple Output Buck/Buck/Boost DC/DC Controller

Summary of Features: LTC3859AL

- All Outputs Remain in Regulation During Engine Restart
- Wide Input Voltage Range from 4.5V to 38V During Start-Up, Down to 2.5V After Start-Up
- Boost Output Voltage Up to 60V
- Buck Output Voltage Range: 0.8V to 24V
- Low 38 μ A Quiescent Current During Standby Condition
- Up to 95% Efficiency
- Powerful Onboard All N-Channel Gate Drivers
- R_{SENSE} or DCR Current Sensing
- Power Up/Down Tracking & Sequencing
- Fixed Programmable Operating Frequency from 50kHz to 900kHz
- Synchronizable with Phase-Locked Loop (PLL) from 75kHz to 850kHz
- $\pm 1\%$ V_{REF} Accuracy over a -40°C to 125°C Operating Temp Range
- Current-Mode Control

About Linear Technology

Linear Technology Corporation, a member of the S&P 500, has been designing, manufacturing and marketing a broad line of high performance analog integrated circuits for major companies worldwide for three decades. The Company's products provide an essential bridge between our analog world and the digital electronics in communications, networking, industrial, automotive, computer, medical, instrumentation, consumer, and military and aerospace systems. Linear Technology produces power management, data conversion, signal conditioning, RF and interface ICs, μ Module[®] subsystems, and wireless sensor network products. For more information, visit www.linear.com

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