

February 2017

New Products Catalog

High Performance Analog ICs



LTC2944 60V Battery Gas Gauge with Temperature, Voltage and Current Measurement

LTC2358-16 Buffered Octal, 16-Bit, 200ksp/s/Ch Differential $\pm 10.24\text{V}$ ADC with $30\text{V}_{\text{p-p}}$ Common Mode Range

LTC5566 300MHz to 6GHz Dual Programmable Gain Downconverting Mixer

LTM4636 40A DC/DC μ Module Regulator

LTC3119 18V, 5A Synchronous Buck-Boost DC/DC Converter

LT8390 60V Synchronous 4-Switch Buck-Boost Controller with Spread Spectrum

Amplifiers

LTC®6261/LTC6262/LTC6263 30MHz, 240µA Power Efficient Rail-to-Rail I/O Op Amps 1

Coulomb Counter

LTC2944 60V Battery Gas Gauge with Temperature, Voltage and Current Measurement..... 3

Data Converters

LTC2310-12 12-Bit + Sign, 2Msps Differential Input ADC with Wide Input Common Mode Range 4

LTC2310-14 14-Bit + Sign, 2Msps Differential Input ADC with Wide Input Common Mode Range 5

LTC2320-16 Octal, 16-Bit, 1.5Msps/Ch Simultaneous Sampling ADC 6

LTC2341-16 Dual, 16-Bit, 666ksps/Ch Differential SoftSpan™ ADC with Wide Input Common Mode Range 7

LTC2341-18 Dual, 18-Bit, 666ksps/Ch Differential SoftSpan ADC with Wide Input Common Mode Range 8

LTC2358-16 Buffered Octal, 16-Bit, 200ksps/Ch Differential ±10.24V ADC with 30V_{P-P} Common Mode Range 9

LTC2374-16 16-Bit, 1.6Msps, 8-Channel SAR ADC with 96dB SNR 10

LTC2512-24 24-Bit Oversampling ADC with Configurable Flat Passband Digital Filter 11

High Frequency

LTC5566 300MHz to 6GHz Dual Programmable Gain Downconverting Mixer 12

InterfaceLTM®2885 6500V_{RMS} Isolated RS485/RS422 µModule® Transceiver + Power 13LTM2887 SPI/Digital or I²C µModule Isolator with Dual Adjustable 5V Regulators 14**Power over Ethernet Controller**

LTC4279 Single Port PoE/PoE+/LTPoE++® PSE Controller 16

µModule Regulators

LTM4636 40A DC/DC µModule Regulator..... 17

LTM4647 30A DC/DC Step-Down µModule Regulator 18

Switching Regulators—Monolithic

LTC3119 18V, 5A Synchronous Buck-Boost DC/DC Converter	20
LT®8606 42V, 350mA Synchronous Step-Down Regulator with 2.5µA Quiescent Current.....	21
LT8607 42V, 750mA Synchronous Step-Down Regulator with 2.5µA Quiescent Current.....	22
LT8630 100V, 0.6A Synchronous Micropower Step-Down High Efficiency Switching Regulator	23

Switching Regulators—Controllers

LTC3897 PolyPhase® Synchronous Boost Controller with Input/Output Protection.....	24
LT8390 60V Synchronous 4-Switch Buck-Boost Controller with Spread Spectrum.....	25
LT8705A 80V V_{IN} and V_{OUT} Synchronous 4-Switch Buck-Boost DC/DC Controller	26

Design Notes

DN557 Low EMI LED Driver Features 2A, 40V, Integrated, Synchronous Switches for Automotive Lighting	
DN558 Bidirectional DC/DC Regulator and Supercapacitor Charger	

LTC6261/LTC6262/LTC6263 30MHz, 240µA Power Efficient Rail-to-Rail I/O Op Amps

FEATURES

- **Gain-Bandwidth Product: 30MHz**
- **Low Quiescent Current: 240µA**
- **Op Amp Drives Up to 1nF Capacitive Loads**
- **Offset Voltage: 400µV Maximum**
- **Rail-to-Rail Input and Output**
- **Supply Voltage Range: 1.8V to 5.25V**
- Input Bias Current: 200nA Maximum
- CMRR/PSRR: 100dB/95dB
- Shutdown Current: 9µA Maximum
- Operating Temperature Range: -40°C to 125°C
- Single in 2mm × 2mm DFN Packages
- Dual in 8-Lead MS8, MS10, TS0T-23, 2mm × 2mm DFN Packages
- Quad in MS16 Package

APPLICATIONS

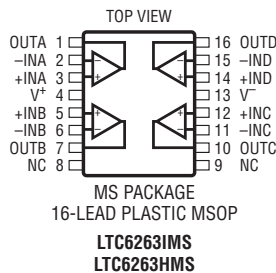
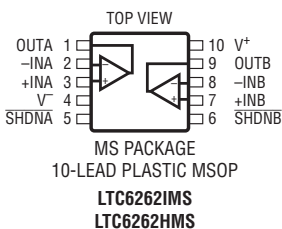
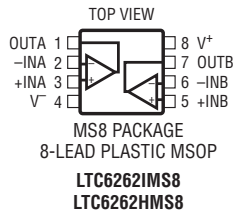
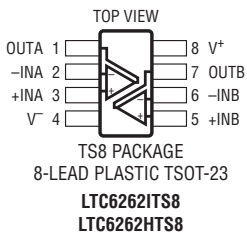
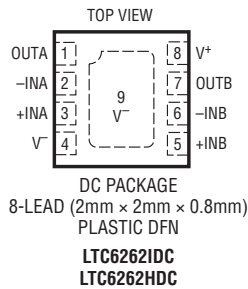
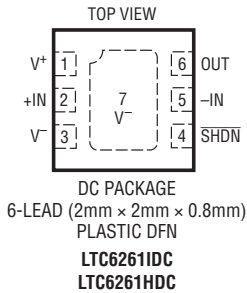
- Micropower Active Filters
- Portable Instrumentation
- Battery or Solar Powered Systems
- Automotive Electronics

DESCRIPTION

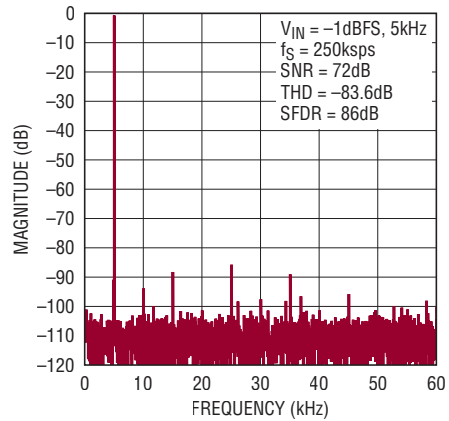
The LTC6261/LTC6262/LTC6263 are single/dual/quad operational amplifiers with low noise, low power, low supply voltage, and rail-to-rail inputs and outputs. They are unity gain stable with capacitive loads up to 1nF. They feature 30MHz gain-bandwidth product, 7V/µs slew rate while consuming only 240µA of supply current per amplifier operating on supply voltages ranging from 1.8V to 5.25V. The combination of low supply current, low supply voltage, high gain-bandwidth product and low noise makes the LTC6261 family unique among rail-to-rail input/output op amps with similar supply current. These operational amplifiers are ideal for low power and low noise applications.

For applications that require power-down, the LTC6261 in 2mm × 2mm DFN and LTC6262 in MSOP-10 packages offer shutdown which reduces the current consumption to 9µA maximum.

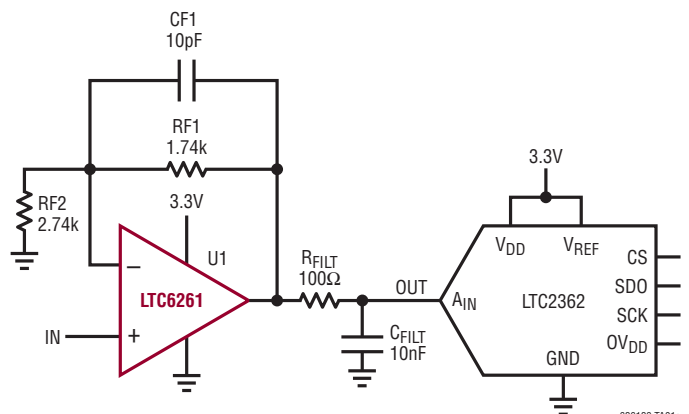
The LTC6261 family can be used as plug-in replacements for many commercially available op amps to reduce power and improve input/output range and performance.



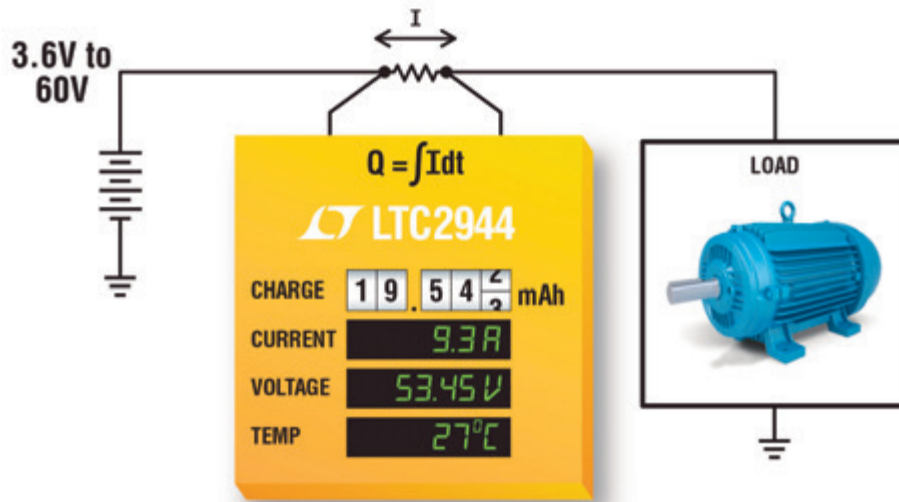
LTC6261 Driving LTC2362 ADC



Low Power, Low Distortion ADC Driver



60V Battery Gas Gauge

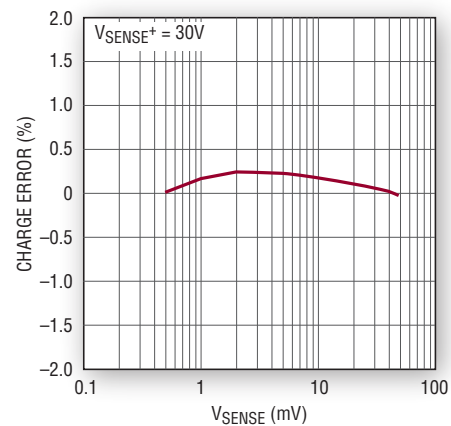


The LTC[®]2944 multicell battery gas gauge makes direct measurements of 3.6V to 60V battery stacks. Absolutely no level shifting circuitry is required to interface with multicell voltages, minimizing current consumption and preserving measurement accuracy. The LTC2944 is a true high voltage gas gauge that measures charge, voltage, current and temperature to within 1% accuracy — all of the essential parameters required to accurately assess battery state of charge (SOC).

Features

- Measures Accumulated Battery Charge and Discharge
- 3.6V to 60V Operating Range for Multicell Applications
- 16-Bit ADC Measures Voltage, Current and Temperature
- 1% Charge, Voltage, Current and Temperature Accuracy
- I²C/SMBus Interface
- Configurable Alert Output/Charge Complete Input
- Quiescent Current <150µA
- Small 8-Pin 3mm × 3mm DFN Package

Total Charge Error vs Differential Sense Voltage



Battery Gas Gauges and Power Monitors

Part Number	Operating Range (V)	Interface	Integrated Sense Resistor	Measures					
				Energy	Charge	Power	Voltage	Current	Temperature
LTC2941/LTC2941-1	2.7 to 5.5	I ² C	-/1A		•				
LTC2942/LTC2942-1	2.7 to 5.5	I ² C	-/1A		•		•		•
LTC2943/LTC2943-1	3.6 to 20	I ² C	-/1A		•		•	•	•
LTC2944	3.6 to 60	I ² C			•		•	•	•
LTC4151	7 to 80	I ² C					•	•	
LTC2945	0 to 80	I ² C				•	•	•	
LTC2946	0 to 100	I ² C		•	•	•	•	•	•
LTC2947	0 to 15	I ² C	30A	•	•	•	•	•	•
LTC4150	2.7 to 8.5	Interrupt			•				



L^T, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

LTC2944

60V Battery Gas Gauge with Temperature, Voltage and Current Measurement

FEATURES

- Measures Accumulated Battery Charge and Discharge
- 3.6V to 60V Operating Range for Multiple Cells
- 14-Bit ADC Measures Voltage, Current and Temperature
- 1% Voltage, Current and Charge Accuracy
- ±50mV Sense Voltage Range
- High Side Sense
- I²C Interface/SMBus Interface
- General Purpose Measurements for Any Battery Chemistry and Capacity
- Configurable Alert Output/Charge Complete Input
- Quiescent Current Less Than 150µA
- Small 8-Lead 3mm × 3mm DFN Package

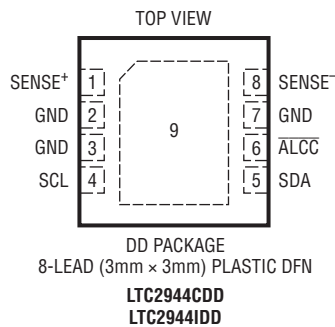
APPLICATIONS

- Electric and Hybrid Electric Vehicles
- Power Tools
- Electric Bicycles, Motorcycles, Scooters
- High Power Portable Equipment
- Photo Voltaics
- Backup Battery Systems

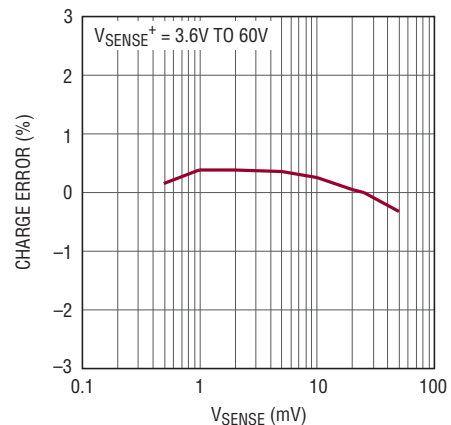
DESCRIPTION

The LTC2944 measures battery charge state, battery voltage, battery current and its own temperature in portable product applications. The wide input voltage range allows use with multicell batteries up to 60V. A precision coulomb counter integrates current through a sense resistor between the battery's positive terminal and the load or charger. Voltage, current and temperature are measured with an internal 14-bit No Latency $\Delta\Sigma$ ™ ADC. The measurements are stored in internal registers accessible via the onboard I²C/SMBus Interface.

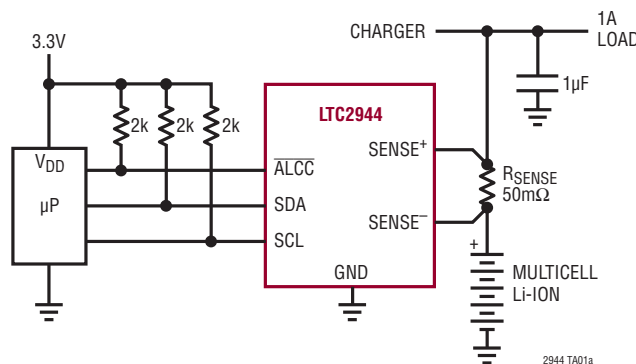
The LTC2944 features programmable high and low thresholds for all four measured quantities. If a programmed threshold is exceeded, the device communicates an alert using either the SMBus alert protocol or by setting a flag in the internal status register. The LTC2944 requires only a single low value sense resistor to set the measured current range.



Total Charge Error vs Differential Sense Voltage



2944 TA01b



2944 TA01a

LTC2310-12

12-Bit + Sign, 2Msps Differential Input ADC with Wide Input Common Mode Range

FEATURES

- 2Msps Throughput Rate
- ±1LSB INL Guaranteed
- Guaranteed 12-Bit, No Missing Codes
- 8V_{P-P} Differential Inputs with Wide Input Common Mode Range
- 73dB SNR (Typ) at f_{IN} = 500kHz
- -85dB THD (Typ) at f_{IN} = 500kHz
- No Cycle Latency
- Guaranteed Operation -40°C to 125°C
- Single 3.3V or 5V Supply
- Low Drift (20ppm/°C Max) 2.048V or 4.096V Internal Reference with 1.25V External Reference Input
- 1.8V to 2.5V I/O Voltages
- CMOS or LVDS SPI-Compatible Serial I/O
- Power Dissipation 35mW at V_{DD} = 5V (Typ)
- Small 16-Lead (4mm × 5mm) MSOP Package

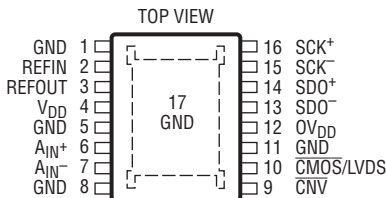
APPLICATIONS

- High Speed Data Acquisition Systems
- Communications
- Remote Data Acquisition
- Imaging
- Optical Networking
- Automotive
- Multiphase Motor Control

DESCRIPTION

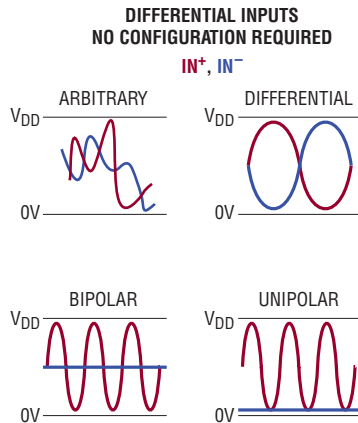
The LTC2310-12 is a low noise, high speed 12-bit + sign successive approximation register (SAR) ADC with differential inputs and wide input common mode range. Operating from a single 3.3V or 5V supply, the LTC2310-12 has an 8V_{P-P} differential input range, making it ideal for applications which require a wide dynamic range with high common mode rejection. The LTC2310-12 achieves ±1LSB INL guaranteed, no missing codes at 12 bits and 73dB SNR typical.

The LTC2310-12 has an onboard low drift (20ppm/°C max) 2.048V or 4.096V temperature compensated reference and provides an external 1.25V buffered reference input. The LTC2310-12 also has a high speed SPI-compatible serial interface that supports CMOS or LVDS. The fast 2Msps throughput with no cycle latency makes the LTC2310-12 ideally suited for a wide variety of high speed applications. The LTC2310-12 dissipates only 35mW with a 5V supply and offers nap and sleep modes to reduce the power consumption for further power savings during inactive periods.

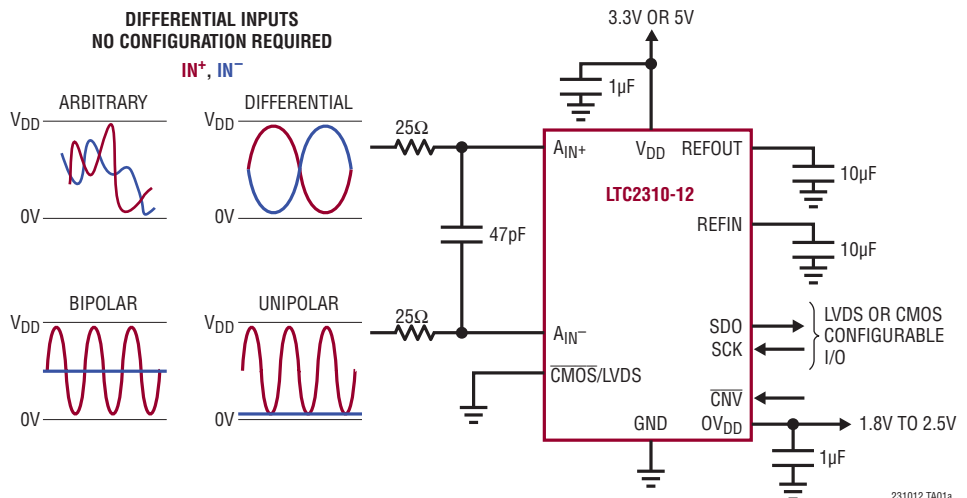
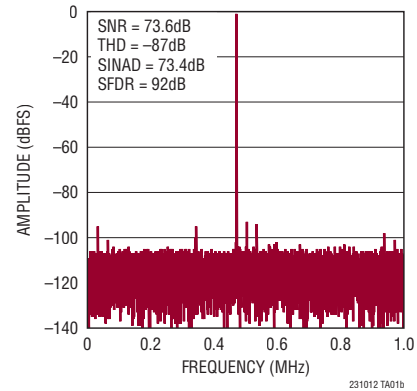


MSE PACKAGE
16-LEAD (4mm × 5mm) PLASTIC MSOP

LTC2310CMSE-12
LTC2310IMSE-12
LTC2310HMSE-12



32k Point FFT f_{SAMPL} = 2Msps, f_{IN} = 500kHz



LTC2310-14

14-Bit + Sign, 2Msps Differential Input ADC with Wide Input Common Mode Range

FEATURES

- **2Msps Throughput Rate**
- **±2.5LSB INL Guaranteed**
- **Guaranteed 14-Bit, No Missing Codes**
- **8V_{P-P} Differential Inputs with Wide Input Common Mode Range**
- **82dB SNR (Typ) at f_{IN} = 500kHz**
- **-93dB THD (Typ) at f_{IN} = 500kHz**
- **No Cycle Latency**
- Guaranteed Operation -40°C to 125°C
- Single 3.3V or 5V Supply
- Low Drift (20ppm/°C Max) 2.048V or 4.096V Internal Reference with 1.25V External Reference Input
- 1.8V to 2.5V I/O Voltages
- CMOS or LVDS SPI-Compatible Serial I/O
- Power Dissipation 35mW at V_{DD} = 5V (Typ)
- Small 16-Lead (4mm × 5mm) MSOP Package

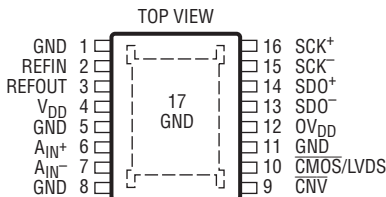
APPLICATIONS

- High Speed Data Acquisition Systems
- Communications
- Remote Data Acquisition
- Imaging
- Optical Networking
- Automotive
- Multiphase Motor Control

DESCRIPTION

The LTC2310-14 is a low noise, high speed 14-bit + sign successive approximation register (SAR) ADC with differential inputs and wide input common mode range. Operating from a single 3.3V or 5V supply, the LTC2310-14 has an 8V_{P-P} differential input range, making it ideal for applications which require a wide dynamic range with high common mode rejection. The LTC2310-14 achieves ±2.5LSB INL guaranteed, no missing codes at 14 bits and 82dB SNR typical.

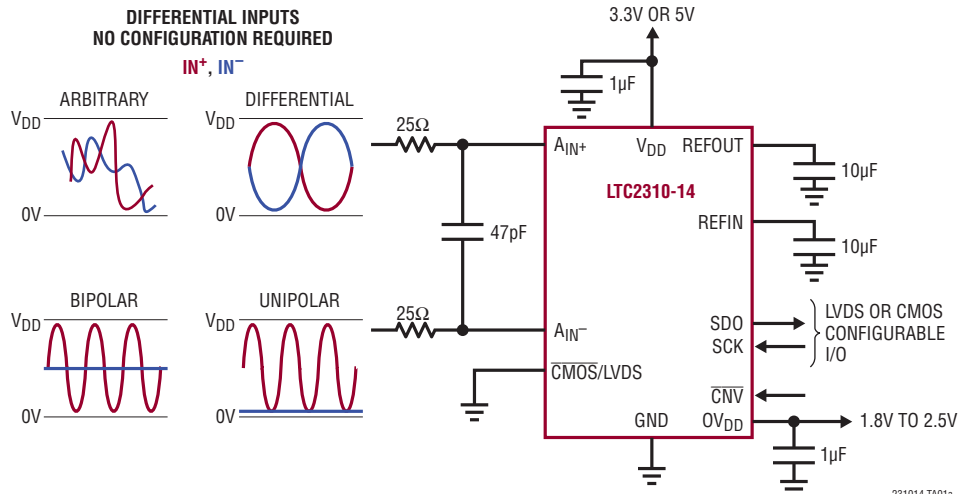
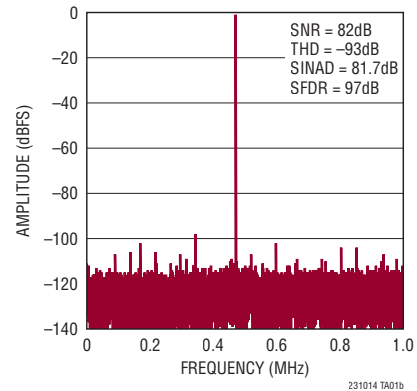
The LTC2310-14 has an onboard low drift (20ppm/°C max) 2.048V or 4.096V temperature compensated reference and provides an external 1.25V buffered reference input. The LTC2310-14 also has a high speed SPI-compatible serial interface that supports CMOS or LVDS. The fast 2Msps throughput with no cycle latency makes the LTC2310-14 ideally suited for a wide variety of high speed applications. The LTC2310-14 dissipates only 35mW with a 5V supply and offers nap and sleep modes to reduce the power consumption for further power savings during inactive periods.



MSE PACKAGE
16-LEAD (4mm × 5mm) PLASTIC MSOP

LTC2310CMSE-14
LTC2310IMSE-14
LTC2310HMSE-14

32k Point FFT f_{SAMPL} = 2Msps, f_{IN} = 500kHz



231014 TA01a

LTC2320-16

Octal, 16-Bit, 1.5Msps/Ch
Simultaneous Sampling ADC

FEATURES

- 1.5Msps/Ch Throughput Rate
- Eight Simultaneously Sampling Channels
- Guaranteed 16-Bit, No Missing Codes
- 8V_{P-P} Differential Inputs with Wide Input Common Mode Range
- 82dB SNR (Typ) at f_{IN} = 500kHz
- -90dB THD (Typ) at f_{IN} = 500kHz
- Guaranteed Operation to 125°C
- Single 3.3V or 5V Supply
- Low Drift (20ppm/°C Max) 2.048V or 4.096V Internal Reference
- 1.8V to 2.5V I/O Voltages
- CMOS or LVDS SPI-Compatible Serial I/O
- Power Dissipation 20mW/Ch (Typ)
- Small 52-Lead (7mm × 8mm) QFN Package

APPLICATIONS

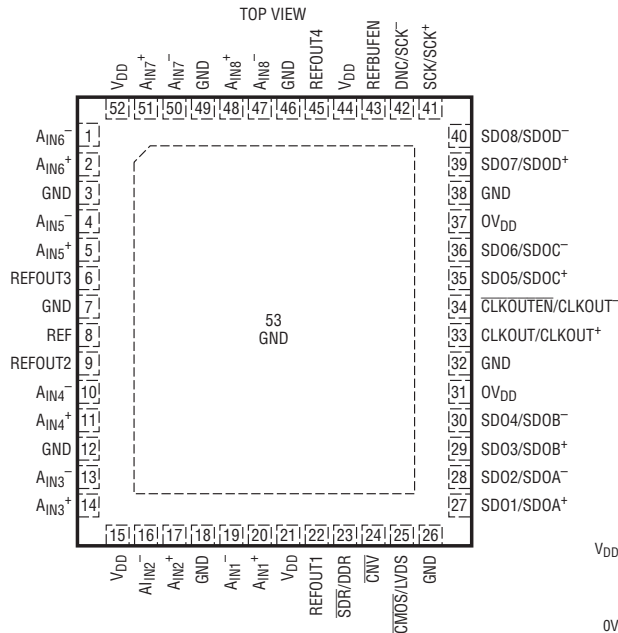
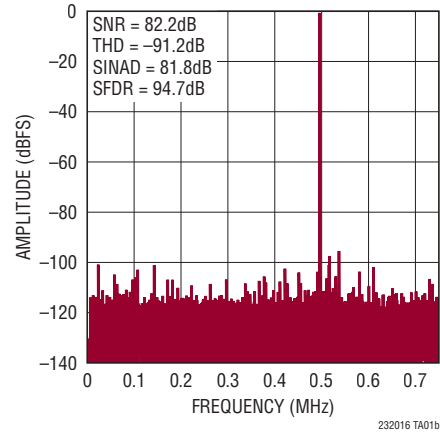
- High Speed Data Acquisition Systems
- Communications
- Optical Networking
- Multiphase Motor Control

DESCRIPTION

The LTC2320-16 is a low noise, high speed octal 16-bit successive approximation register (SAR) ADC with differential inputs and wide input common mode range. Operating from a single 3.3V or 5V supply, the LTC2320-16 has an 8V_{P-P} differential input range, making it ideal for applications which require a wide dynamic range with high common mode rejection. The LTC2320-16 achieves ±2LSB INL typical, no missing codes at 16 bits and 82dB SNR.

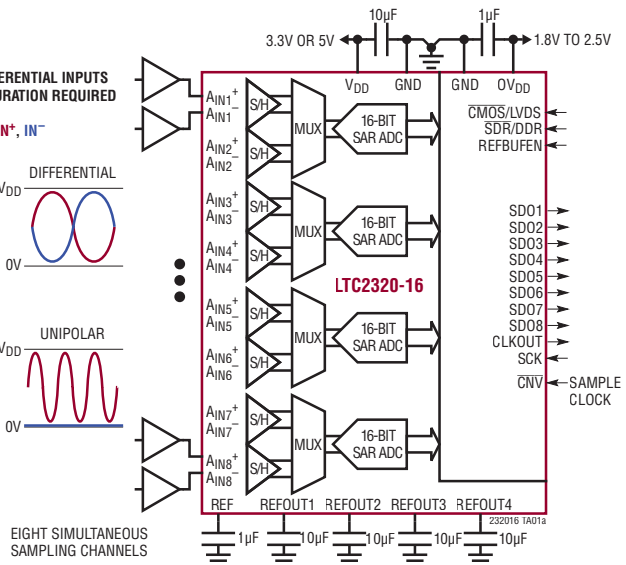
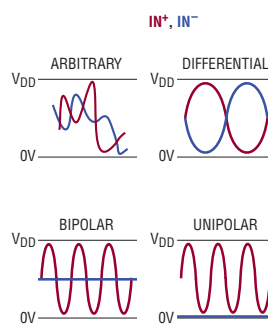
The LTC2320-16 has an onboard low drift (20ppm/°C max) 2.048V or 4.096V temperature compensated reference. The LTC2320-16 also has a high speed SPI-compatible serial interface that supports CMOS or LVDS. The fast 1.5Msps per channel throughput with no latency makes the LTC2320-16 ideally suited for a wide variety of high speed applications. The LTC2320-16 dissipates only 20mW per channel and offers nap and sleep modes to reduce the power consumption to 26μW for further power savings during inactive periods.

32k Point FFT f_{SMPL} = 1.5Msps, f_{IN} = 500kHz



UKG PACKAGE
52-LEAD (7mm × 8mm) PLASTIC QFN
LTC2320CUKG-16
LTC2320IUKG-16
LTC2320HUKG-16

TRUE DIFFERENTIAL INPUTS
NO CONFIGURATION REQUIRED



LTC2341-16

Dual, 16-Bit, 666ksps/Ch Differential SoftSpan ADC with Wide Input Common Mode Range

FEATURES

- 666ksps per Channel Throughput
- Two Simultaneous Sampling Channels
- ±1.25LSB INL (Maximum)
- Guaranteed 16-Bit, No Missing Codes
- Differential, Wide Common Mode Range Inputs
- Per Channel SoftSpan Input Ranges:
 - ±4.096V, 0V to 4.096V, ±2.048V, 0V to 2.048V
 - ±5V, 0V to 5V, ±2.5V, 0V to 2.5V
- 93.4dB Single-Conversion SNR (Typical)
- 114dB THD (Typical) at $f_{IN} = 2\text{kHz}$
- 105dB CMRR (Typical) at $f_{IN} = 200\text{Hz}$
- Rail-to-Rail Input Overdrive Tolerance
- Guaranteed Operation to 125°C
- Integrated Reference and Buffer (4.096V)
- SPI CMOS (1.8V to 5V) and LVDS Serial I/O
- Internal Conversion Clock, No Cycle Latency
- 74mW Power Dissipation (Typical)
- 32-Lead (5mm × 5mm) QFN Package

APPLICATIONS

- Programmable Logic Controllers
- Industrial Process Control
- Medical Imaging
- High Speed Data Acquisition

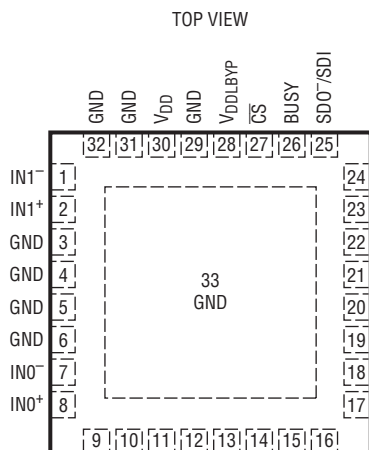
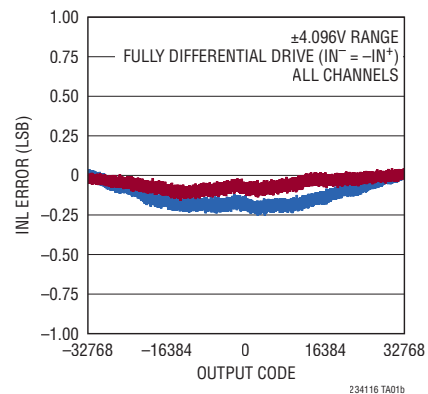
DESCRIPTION

The LTC2341-16 is a 16-bit, low noise 2-channel simultaneous sampling successive approximation register (SAR) ADC with differential, wide common mode range inputs. Operating from a 5V supply and using the internal reference and buffer, both channels of this SoftSpan ADC can be independently configured on a conversion-by-conversion basis to accept ±4.096V, 0V to 4.096V, ±2.048V, or 0V to 2.048V signals. One channel may also be disabled to increase throughput on the other channel.

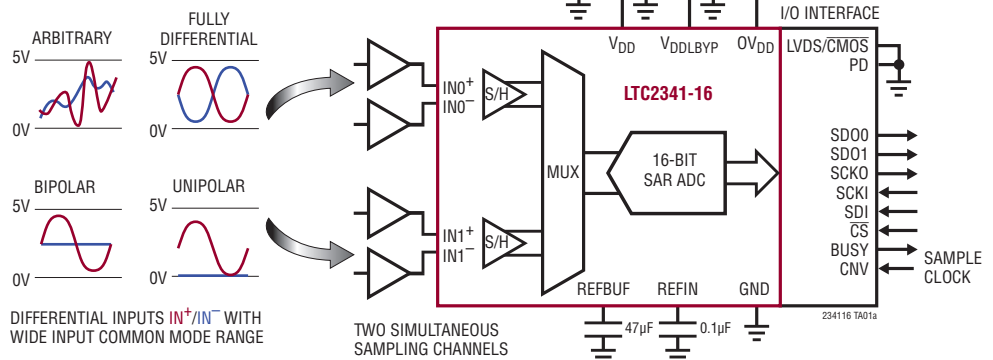
The wide input common mode range and 105dB CMRR of the LTC2341-16 analog inputs allow the ADC to directly digitize a variety of signals, simplifying signal chain design. This input signal flexibility, combined with ±1.25LSB INL, no missing codes at 16 bits, and 93.4dB SNR, makes the LTC2341-16 an ideal choice for many applications requiring wide dynamic range.

The LTC2341-16 supports pin-selectable SPI CMOS (1.8V to 5V) and LVDS serial interfaces. Either one or two lanes of data output may be employed in CMOS mode, allowing the user to optimize bus width and throughput.

Integral Nonlinearity vs Output Code and Channel



UH PACKAGE
32-LEAD (5mm × 5mm) PLASTIC QFN
LTC2341CUH-16
LTC2341IUH-16
LTC2341HUH-16



LTC2341-18

Dual, 18-Bit, 666ksps/Ch Differential SoftSpan ADC with Wide Input Common Mode Range

FEATURES

- 666ksps per Channel Throughput
- Two Simultaneous Sampling Channels
- ± 4 LSB INL (Maximum)
- Guaranteed 18-Bit, No Missing Codes
- Differential, Wide Common Mode Range Inputs
- Per Channel SoftSpan Input Ranges:
 - $\pm 4.096\text{V}$, 0V to 4.096V , $\pm 2.048\text{V}$, 0V to 2.048V
 - $\pm 5\text{V}$, 0V to 5V , $\pm 2.5\text{V}$, 0V to 2.5V
- 95dB Single-Conversion SNR (Typical)
- -114dB THD (Typical) at $f_{\text{IN}} = 2\text{kHz}$
- 105dB CMRR (Typical) at $f_{\text{IN}} = 200\text{Hz}$
- Rail-to-Rail Input Overdrive Tolerance
- Guaranteed Operation to 125°C
- Integrated Reference and Buffer (4.096V)
- SPI CMOS (1.8V to 5V) and LVDS Serial I/O
- Internal Conversion Clock, No Cycle Latency
- 74mW Power Dissipation (Typical)
- 32-Lead ($5\text{mm} \times 5\text{mm}$) QFN Package

APPLICATIONS

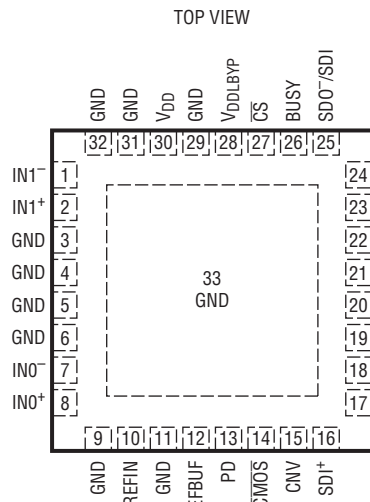
- Programmable Logic Controllers
- Industrial Process Control
- Medical Imaging
- High Speed Data Acquisition

DESCRIPTION

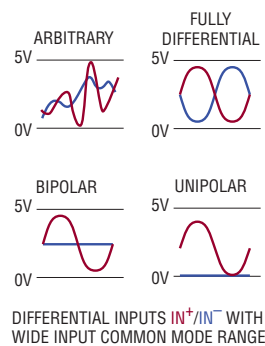
The LTC2341-18 is an 18-bit, low noise 2-channel simultaneous sampling successive approximation register (SAR) ADC with differential, wide common mode range inputs. Operating from a 5V supply and using the internal reference and buffer, both channels of this SoftSpan ADC can be independently configured on a conversion-by-conversion basis to accept $\pm 4.096\text{V}$, 0V to 4.096V , $\pm 2.048\text{V}$, or 0V to 2.048V signals. One channel may also be disabled to increase throughput on the other channel.

The wide input common mode range and 105dB CMRR of the LTC2341-18 analog inputs allow the ADC to directly digitize a variety of signals, simplifying signal chain design. This input signal flexibility, combined with ± 4 LSB INL, no missing codes at 18 bits, and 95dB SNR, makes the LTC2341-18 an ideal choice for many applications requiring wide dynamic range.

The LTC2341-18 supports pin-selectable SPI CMOS (1.8V to 5V) and LVDS serial interfaces. Either one or two lanes of data output may be employed in CMOS mode, allowing the user to optimize bus width and throughput.

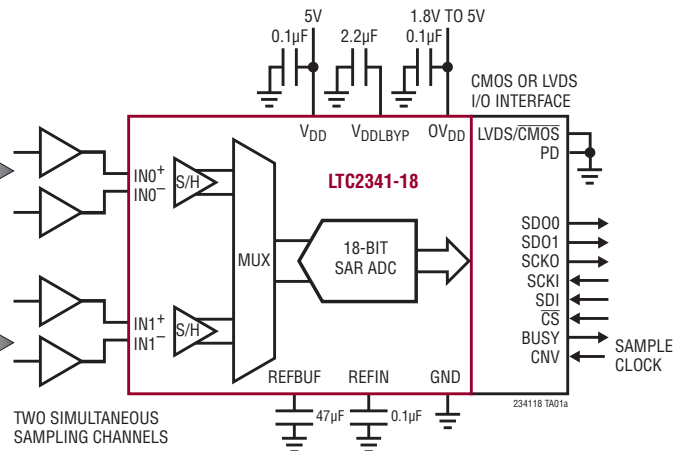
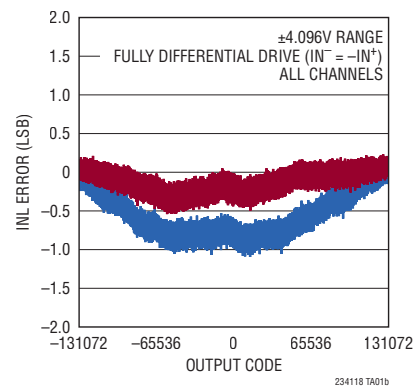


UH PACKAGE
32-LEAD ($5\text{mm} \times 5\text{mm}$) PLASTIC QFN
LTC2341CUH-18
LTC2341IUH-18
LTC2341HUH-18



DIFFERENTIAL INPUTS IN^+/IN^- WITH WIDE INPUT COMMON MODE RANGE

Integral Nonlinearity vs Output Code and Channel



LTC2358-16

Buffered Octal, 16-Bit, 200ksps/Ch Differential $\pm 10.24V$ ADC with $30V_{P-P}$ Common Mode Range

FEATURES

- 200ksps per Channel Throughput
- Eight Buffered Simultaneous Sampling Channels
- 400pA/4nA Max Input Leakage at 85°C/125°C
- ± 1 LSB INL (Maximum, $\pm 10.24V$ Range)
- Guaranteed 16-Bit, No Missing Codes
- Differential, Wide Common Mode Range Inputs
- Per Channel SoftSpan Input Ranges:
 - $\pm 10.24V$, 0V to 10.24V, $\pm 5.12V$, 0V to 5.12V
 - $\pm 12.5V$, 0V to 12.5V, $\pm 6.25V$, 0V to 6.25V
- 94.2dB Single-Conversion SNR (Typical)
- -111 dB THD (Typical) at $f_{IN} = 2kHz$
- 128dB CMRR (Typical) at $f_{IN} = 200Hz$
- Rail-to-Rail Input Overdrive Tolerance
- Integrated Reference and Buffer (4.096V)
- SPI CMOS (1.8V to 5V) and LVDS Serial I/O
- Internal Conversion Clock, No Cycle Latency
- 219mW Power Dissipation (27mW/Ch Typical)
- 48-Lead (7mm x 7mm) LQFP Package

APPLICATIONS

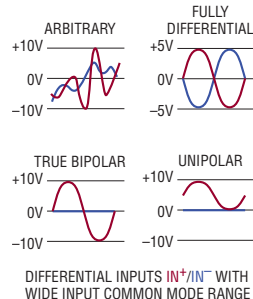
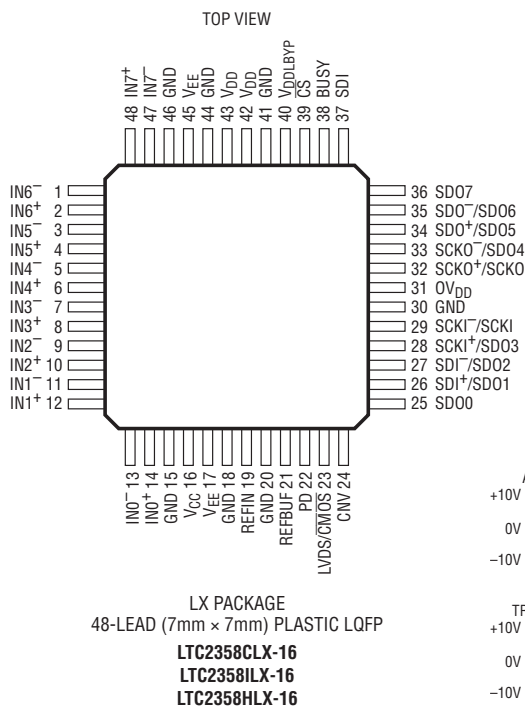
- Programmable Logic Controllers
- Industrial Process Control
- Power Line Monitoring
- Test and Measurement

DESCRIPTION

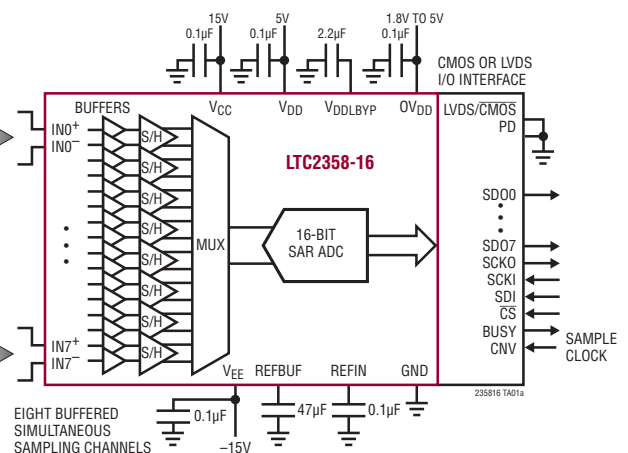
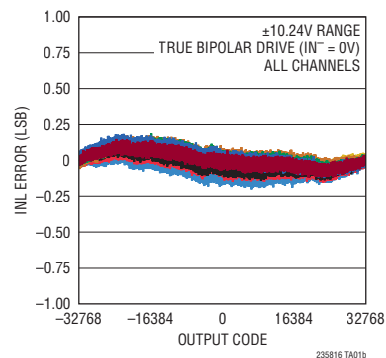
The LTC2358-16 is a 16-bit, low noise 8-channel simultaneous sampling successive approximation register (SAR) ADC with buffered differential, wide common mode range picoamp inputs. Operating from a 5V low voltage supply, flexible high voltage supplies, and using the internal reference and buffer, each channel of this SoftSpan ADC can be independently configured on a conversion-by-conversion basis to accept $\pm 10.24V$, 0V to 10.24V, $\pm 5.12V$, or 0V to 5.12V signals. Individual channels may also be disabled to increase throughput on the remaining channels.

The integrated picoamp-input analog buffers, wide input common mode range and 128dB CMRR of the LTC2358-16 allow the ADC to directly digitize a variety of signals using minimal board space and power. This input signal flexibility, combined with ± 1 LSB INL, no missing codes at 16 bits, and 94.2dB SNR, makes the LTC2358-16 an ideal choice for many high voltage applications requiring wide dynamic range.

The LTC2358-16 supports pin-selectable SPI CMOS (1.8V to 5V) and LVDS serial interfaces. Between one and eight lanes of data output may be employed in CMOS mode, allowing the user to optimize bus width and throughput.



Integral Nonlinearity vs Output Code and Channel



LTC2374-16

16-Bit, 1.6Msps, 8-Channel SAR ADC with 96dB SNR

FEATURES

- 1.6Msps Throughput Rate
- 16-Bit Resolution with No Missing Codes
- 8-Channel Multiplexer with Selectable Input Range
 - Fully Differential ($\pm 4.096\text{V}$)
 - Pseudo-Differential Unipolar (0V to 4.096V)
 - Pseudo-Differential Bipolar ($\pm 2.048\text{V}$)
- INL: $\pm 1\text{LSB}$ (Maximum)
- SNR: 96dB (Fully Differential)/93dB (Pseudo-Differential) (Typical) at $f_{IN} = 1\text{kHz}$
- THD: -114dB (Typical) at $f_{IN} = 1\text{kHz}$
- Programmable Sequencer
- Selectable Digital Gain Compression
- Single 5V Supply with 1.8V to 5V I/O Voltages
- SPI-Compatible Serial I/O
- Onboard 2.048V Reference and Reference Buffer
- No Pipeline Delay, No Cycle Latency
- Power Dissipation 55mW (Typical)
- 32-Lead 5mm x 5mm QFN Package

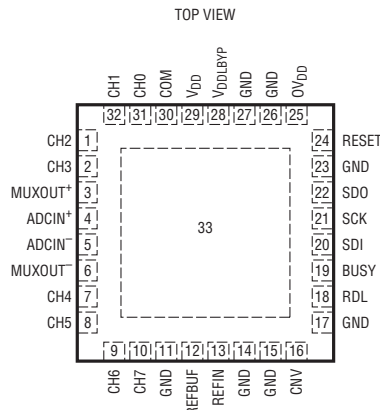
APPLICATIONS

- Programmable Logic Controllers
- Industrial Process Control
- High Speed Data Acquisition
- Portable or Compact Instrumentation
- Automatic Test Equipment

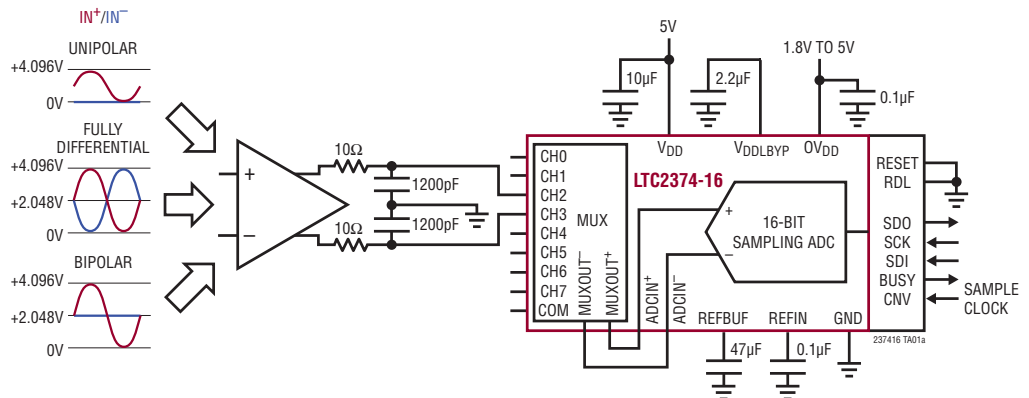
DESCRIPTION

The LTC2374-16 is a low noise, high speed, 8-channel 16-bit successive approximation register (SAR) ADC. Operating from a single 5V supply, the LTC2374-16 has a highly configurable, low crosstalk 8-channel input multiplexer, supporting fully differential, pseudo-differential unipolar and pseudo-differential bipolar analog input ranges. The LTC2374-16 achieves $\pm 1\text{LSB}$ INL (maximum) in all input ranges, no missing codes at 16-bits and 96dB (fully differential)/ 93dB (pseudo-differential) SNR (typical).

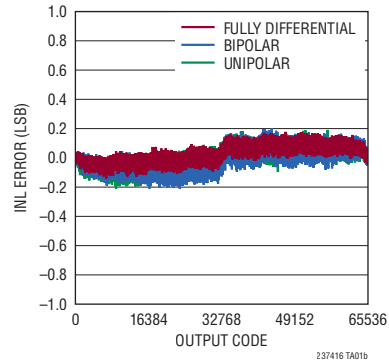
The LTC2374-16 has an onboard low drift ($20\text{ppm}/^\circ\text{C}$ max) 2.048V temperature-compensated reference and a single-shot capable reference buffer. The LTC2374-16 also has a high speed SPI-compatible serial interface that supports 1.8V, 2.5V, 3.3V and 5V logic through which a sequencer with a depth of 16 may be programmed. An internal oscillator sets the conversion time, easing external timing considerations. The LTC2374-16 dissipates only 55mW and automatically naps between conversions, leading to reduced power dissipation that scales with the sampling rate. A sleep mode is also provided to reduce the power consumption of the LTC2374-16 to $300\mu\text{W}$ for further power savings during inactive periods.



UH PACKAGE
32-LEAD (5mm x 5mm) PLASTIC QFN
LTC2374CUH-16
LTC2374IUH-16



Integral Nonlinearity vs Output Code



LTC2512-24

24-Bit Oversampling ADC with Configurable Flat Passband Digital Filter

FEATURES

- ± 1 ppm INL (Typ)
- 117dB Dynamic Range (Typ) at 50ksps
- 108dB Dynamic Range (Typ) at 400ksps
- Guaranteed 24-Bit No Missing Codes
- Configurable Digital Filter with Synchronization
 - Relaxed Anti-Aliasing Filter Requirements
- Dual Output 24-Bit SAR ADC
 - 24-Bit Digitally Filtered Low Noise Output
 - 14-Bit Differential + 8-Bit Common Mode No Latency Output
- Wide Input Common Mode Range
 - Guaranteed Operation to 85°C
 - 1.8V to 5V SPI-Compatible Serial I/O
 - Low Power: 30mW at 1.6Msps
 - 24-Lead 7mm x 4mm DFN Package

APPLICATIONS

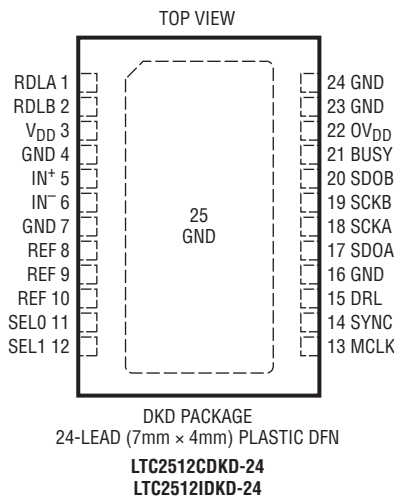
- Seismology
- Energy Exploration
- Automated Test Equipment (ATE)
- High Accuracy Instrumentation

DESCRIPTION

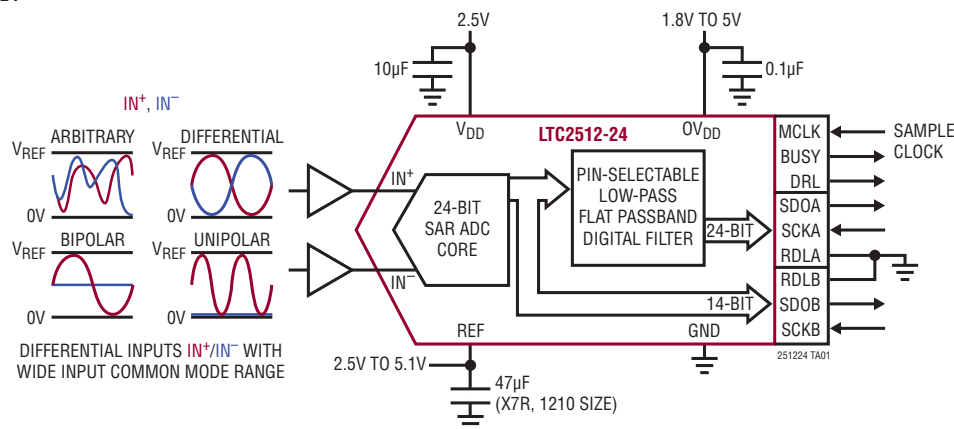
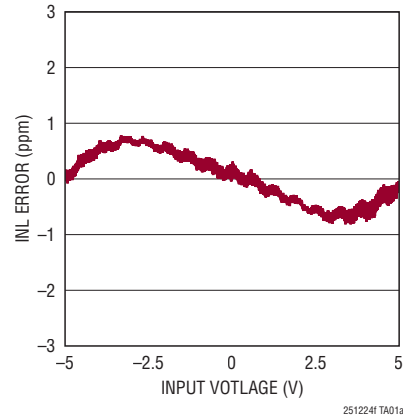
The LTC2512-24 is a low noise, low power, high performance 24-bit ADC with an integrated configurable digital filter. Operating from a single 2.5V supply, the LTC2512-24 features a fully differential input range up to $\pm V_{REF}$, with V_{REF} ranging from 2.5V to 5.1V. The LTC2512-24 supports a wide common mode range from 0V to V_{REF} simplifying analog signal conditioning requirements.

The LTC2512-24 simultaneously provides two output codes: (1) a 24-bit digitally filtered high precision low noise code, and (2) a 22-bit no latency composite code. The configurable digital filter reduces measurement noise by lowpass filtering and down-sampling the stream of data from the SAR ADC core, giving the 24-bit filtered output code. The 22-bit composite code consists of a 14-bit code representing the differential voltage and an 8-bit code representing the common mode voltage. The 22-bit composite code is available each conversion cycle, with no cycle of latency.

The digital filter can be easily configured for 4 different down-sampling factors by pin strapping. The configurations provide a dynamic range of 108dB at 400ksps and 117dB at 50ksps. The digital lowpass filter relaxes the requirements for analog anti-aliasing. Multiple LTC2512-24 devices can be easily synchronized using the SYNC pin.



Integral Nonlinearity vs Input Voltage



LTC5566

300MHz to 6GHz Dual Programmable Gain Downconverting Mixer

FEATURES

- 12dB Power Conversion Gain
- 35dBm Output IP3
- 15.5dB Range IF DVGA in 0.5dB Steps
- Programmable RF Input Tuning
- Reduced Power Mode
- 3.3V Single Supply
- Simple SPI for Fast Development
- -40°C to 105°C Operation (T_C)
- Very Small Solution Size
- 32-Lead (5mm × 5mm) QFN Package

APPLICATIONS

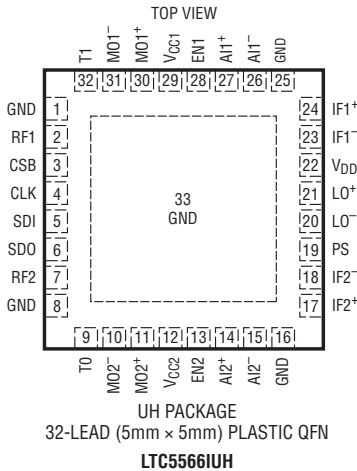
- 4G and 5G MIMO Receivers
- Diversity Receivers
- Distributed Antenna Systems (DAS)
- Network Test/Monitoring Equipment
- Software-Defined Radios

DESCRIPTION

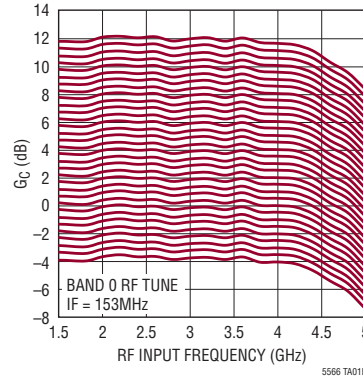
The LTC5566 dual programmable gain downconverting mixer is ideal for diversity and MIMO receivers that require precise gain setting. Each channel incorporates an active mixer and a digital IF VGA with 15.5dB gain control range. The IF gain of each channel is programmed in 0.5dB steps through the SPI.

Programmable RF input tuning via the SPI or parallel control lines makes the device attractive for wideband radio applications. Furthermore, a reduced power mode is available, programmed through the SPI.

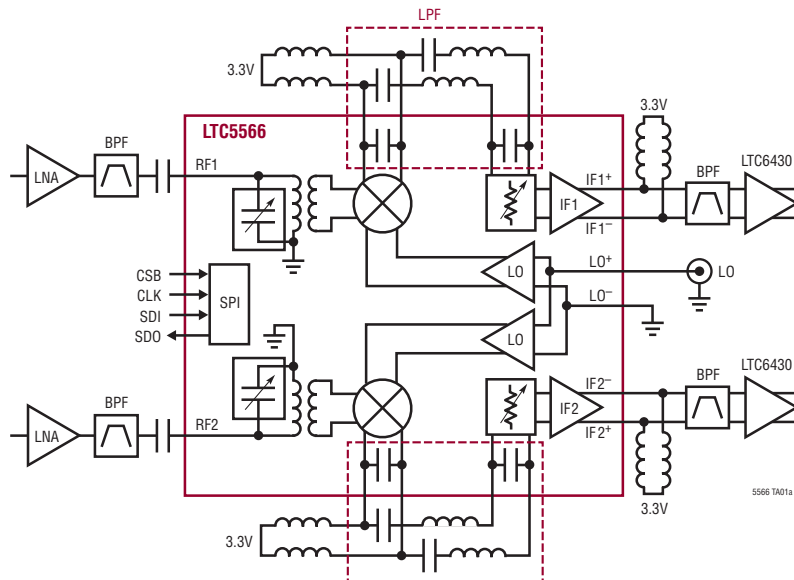
Integrated RF transformers provide single-ended 50Ω inputs. The differential LO input is designed for single-ended or differential drive. The differential IF output simplifies the interface to differential IF filters and amplifiers. The mixers are optimized for use up to 5GHz but may be used up to 6GHz with degraded performance.



LTC5566 Conversion Gain vs RF Frequency and IF Attenuation (0.5dB Gain Steps)



Dual Channel MIMO Receiver with Programmable 0.5dB Gain Steps



LTM2885

6500V_{RMS} Isolated RS485/RS422
μModule Transceiver + Power

FEATURES

- RS485/RS422 Transceiver: 6500V_{RMS} for 1 Minute
- Reinforced Insulation
- Isolated DC Power: 5V at 150mA
- No External Components Required
- 20Mbps or Low EMI 250kbps Data Rate
- High ESD: ±15kV HBM on Transceiver Interface
- High Common Mode Transient Immunity: 50kV/μs
- Integrated Selectable 120Ω Termination
- Extended Creepage and Clearance ~14.6mm
- 1.62V to 5.5V Logic Supply Pin for Flexible Digital Interface
- Maximum Continuous Working Voltage: 690V_{RMS}
- High Input Impedance Failsafe RS485 Receiver
- Current Limited Drivers and Thermal Shutdown
- Compatible with TIA/EIA-485-A and PROFIBUS
- High Impedance Output During Internal Fault Condition
- Low Current Shutdown Mode (< 10μA)
- General Purpose CMOS Isolated Channel
- 22mm × 9mm × 5.16mm Surface Mount BGA Package

APPLICATIONS

- Isolated RS485/RS422 Interface
- Industrial Networks
- Breaking RS485 Ground Loops
- Isolated PROFIBUS-DP Networks

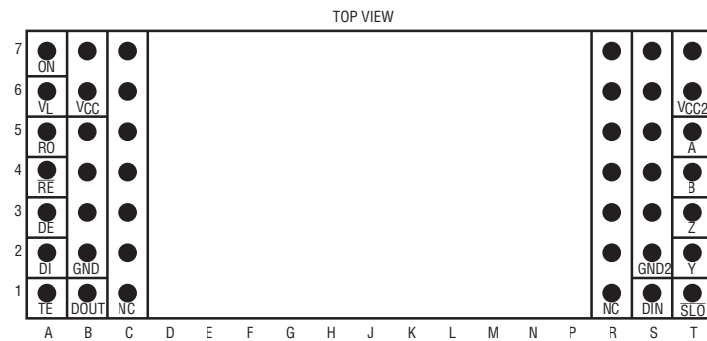
DESCRIPTION

The LTM2885 is a complete galvanically isolated full-duplex RS485/RS422 μModule (micromodule) transceiver. No external components are required. A single supply powers both sides of the interface through an integrated, isolated, low noise, efficient 5V output DC/DC converter.

Coupled inductors and an isolation power transformer provide 6500V_{RMS} of isolation between the line transceiver and the logic interface. This device is ideal for systems where the ground loop is broken allowing for large common mode voltage variation. Uninterrupted communication is guaranteed for common mode transients up to 50kV/μs.

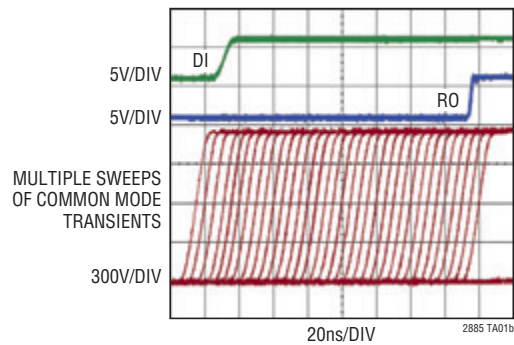
Maximum data rates are 20Mbps or 250kbps in slew limited mode. Transmit data, DI, and receive data, RO, are implemented with event driven low jitter processing. The receiver has a one-eighth unit load supporting up to 256 nodes per bus. A logic supply pin allows easy interfacing with different logic levels from 1.62V to 5.5V, independent of the main supply.

Enhanced ESD protection allows this part to withstand up to ±15kV (human body model) on the transceiver interface pins to isolated supplies and ±25kV through the isolation barrier to logic supplies without latch-up or damage.

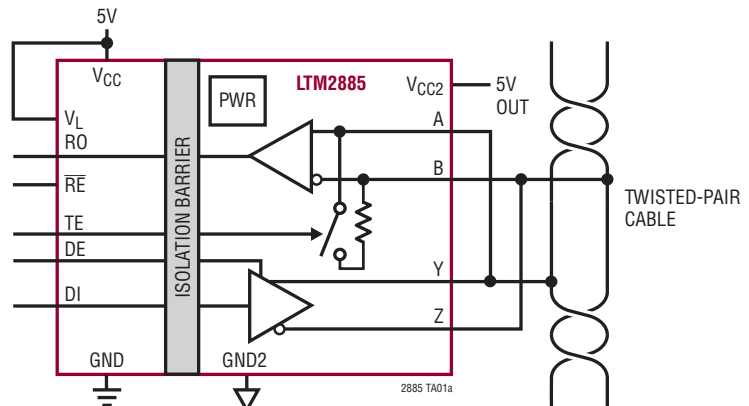


BGA PACKAGE
42-PIN (22mm × 9mm × 5.2mm)
LTM2885CY
LTM2885IY
LTM2885HY

LTM2885 Operating Through 100kV/μs CM Transients



Isolated Half-Duplex RS485 μModule Transceiver



LTM2887

SPI/Digital or I²C μModule Isolator with Dual Adjustable 5V Regulators

FEATURES

- **6-Channel Logic Isolator: 2500V_{RMS} for 1 Minute**
- **UL-CSA Recognition Pending**
- **Isolated DC Power:**
 - **1.8V to 5V Logic Supply at Up to 100mA**
 - **0.6V to 5V Auxiliary Supply at Up to 100mA**
- **No External Components Required**
- **SPI/Digital (LTM2887-S) or I²C (LTM2887-I) Options**
- **High Common Mode Transient Immunity: 30kV/μs**
- **High Speed Operation:**
 - **10MHz Digital Isolation**
 - **4MHz/8MHz SPI Isolation**
 - **400kHz I²C Isolation**
- **3.3V (LTM2887-3) or 5V (LTM2887-5) Operation**
- **1.62V to 5.5V Logic Supply**
- **±10kV ESD HBM Across the Isolation Barrier**
- **Maximum Continuous Working Voltage: 560V_{PEAK}**
- **Low Current Shutdown Mode (<10μA)**
- **Low Profile 15mm × 11.25mm × 3.42mm BGA Package**

APPLICATIONS

- Isolated SPI or I²C Interfaces
- Industrial Systems
- Test and Measurement Equipment
- Breaking Ground Loops

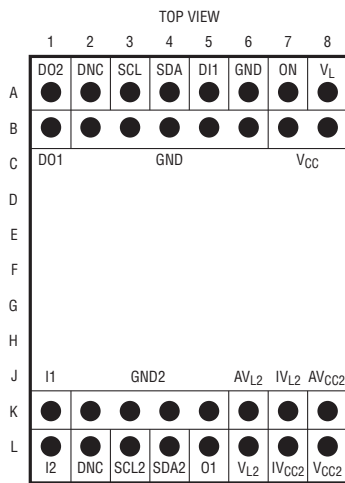
DESCRIPTION

The LTM2887 is a complete galvanic digital μModule (micromodule) isolator. No external components are required. A single 3.3V or 5V supply powers both sides of the interface through an integrated, isolated DC/DC converter. A logic supply pin allows easy interfacing with different logic levels from 1.62V to 5.5V, independent of the main supply.

Available options are compliant with SPI and I²C (master mode only) specifications.

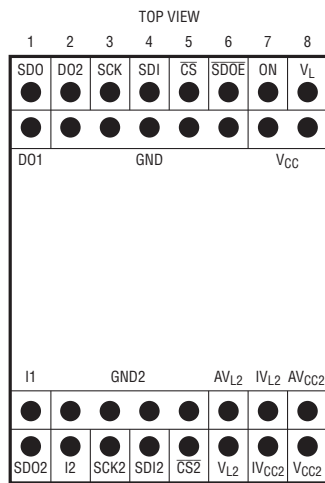
The isolated side includes two 5V nominal power supplies, including programmable current limit, each capable of providing more than 100mA of load current. The supplies may be adjusted from their nominal value using a single external resistor.

Coupled inductors and an isolation power transformer provide 2500V_{RMS} of isolation between the input and output logic interface. This device is ideal for systems where the ground loop is broken, allowing for a large common mode voltage range. Communication is uninterrupted for common mode transients greater than 30kV/μs.



BGA PACKAGE
32-PIN (15mm × 11.25mm × 3.42mm)

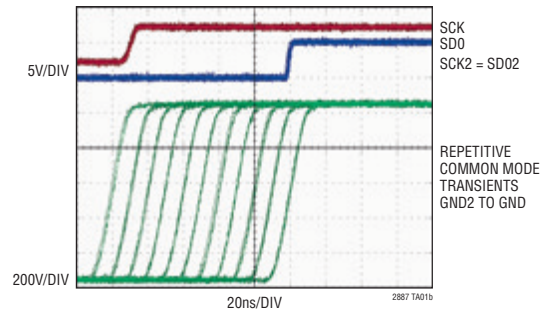
- LTM2887CY-3I
- LTM2887IY-3I
- LTM2887HY-3I
- LTM2887CY-5I
- LTM2887IY-5I
- LTM2887HY-5I



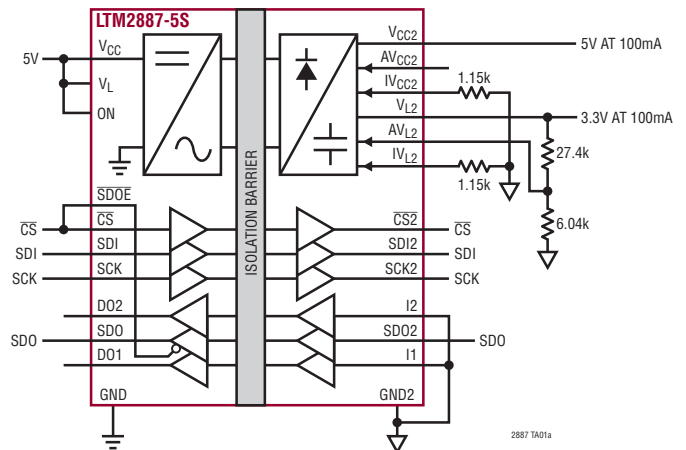
BGA PACKAGE
32-PIN (15mm × 11.25mm × 3.42mm)

- LTM2887CY-3S
- LTM2887IY-3S
- LTM2887HY-3S
- LTM2887CY-5S
- LTM2887IY-5S
- LTM2887HY-5S

LTM2887 Operating Through 50kV/μs CM Transients

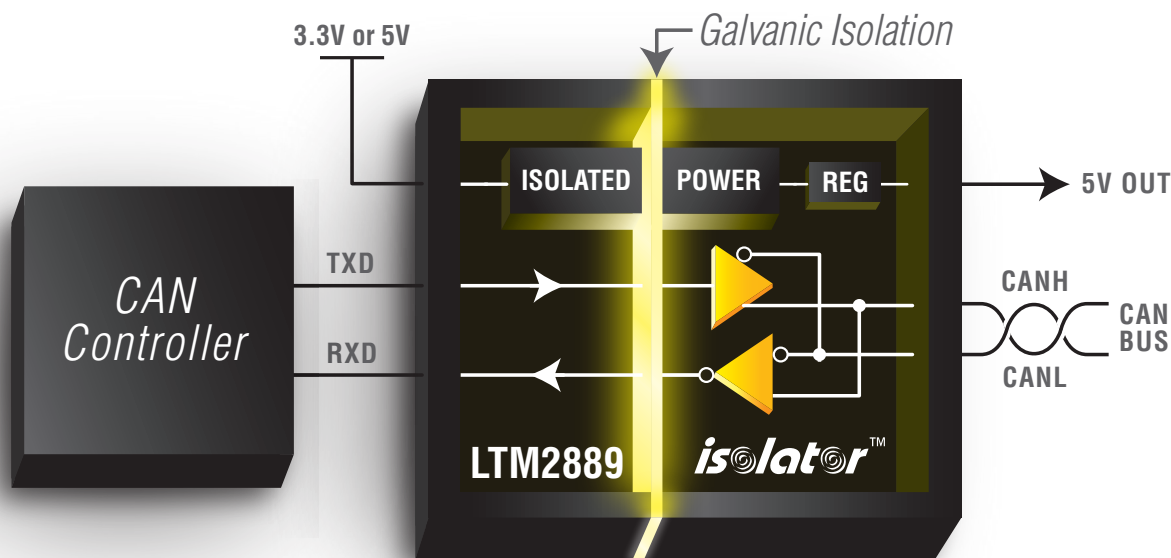


Isolated 4MHz SPI Interface



Isolated CAN + Power

Rugged 4Mbps μ Module CAN Transceiver
 Features 2500V_{RMS} Isolation and ± 25 kV ESD Protection



The LTM[®]2889 is a robust isolated CAN transceiver that breaks ground loops by isolating the logic level interface and line transceiver. An onboard DC/DC converter powers the transceiver and provides 0.75W for powering additional system circuitry. The ISO 11898-2 compliant CAN transceiver supports an extended common mode range of ± 36 V, is ± 60 V fault protected and ± 25 kV ESD protected, and provides uninterrupted communication during common mode transients over 30kV/ μ s. This ensures high system reliability under the harshest operating conditions.

▼ Features

- Isolated 4Mbps CAN Transceiver
- 2500V_{RMS} for 1 Minute per UL1577
- Up to 150mA Isolated Power Output
- ± 60 V Fault Protection
- High Common Mode Transient Immunity: 30kV/ μ s
- ± 25 kV ESD Transceiver Interface
- 15mm x 11.25mm BGA Package

LTM2889 ± 25 kV ESD Protection



▼ Info & Free Samples

www.linear.com/product/LTM2889

www.linear.com/products/umodule_solutions

1-800-4-LINEAR

LT, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

LTC4279 Single Port PoE/PoE+/LTPoE++ PSE Controller

FEATURES

- Compliant with IEEE 802.3at Type 1 and 2
- Supports LTPoE++ Up to 90W
- Supports Dual-Signature PDs
- Fully Autonomous Operation without Microcontroller
 - 0.1Ω Sense Resistance
 - Low $R_{DS(ON)}$ External MOSFET
- Very High Reliability 4-Point PD Detection
 - 2-Point Forced Voltage and Forced Current
- Robust Short-Circuit Protection
- Cable Surge Protected $\pm 80V$ OUT Pin
- Classification Dependent I_{CUT} and I_{LIM} Current Thresholds
- Supports 2-Pair and 4-Pair Output Power
- UltraPWR Mode Supports Custom PDs Up to 123W
- Pin-Selectable Detection Backoff Timer for Midspans
- Pin Programmable Legacy PD Detection
- Pin Programmable Maximum Power Mode
- Status LED Pin
- Available in 20-Lead QFN and 16-Lead SO Packages

APPLICATIONS

- PoE PSE Endpoints (Switch/Router)
- PoE Midspan Power Injectors
- Power Forwarders
- Femto Cells
- Security Systems

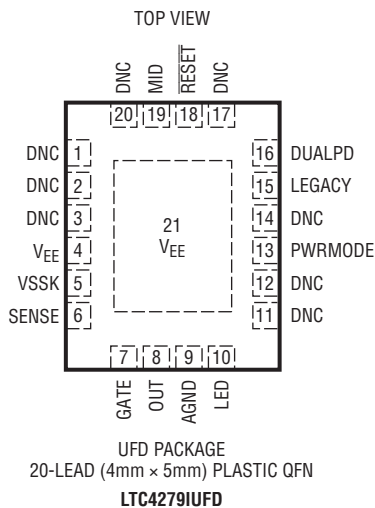
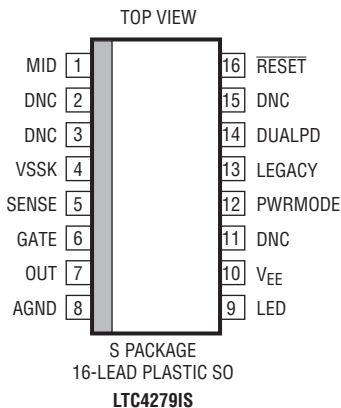
DESCRIPTION

The LTC4279 is an autonomous single port power sourcing equipment (PSE) controller designed for use in IEEE 802.3at Type 1, Type 2 and LTPoE++ compliant Power over Ethernet (PoE) systems. The LTC4279 provides fully autonomous IEEE 802.3 and LTPoE++ compliant operation without a microcontroller. The LTC4279 simplifies PSE implementation, requiring only a single supply and a small number of passive support components.

The LTC4279 delivers lowest-in-industry heat dissipation by utilizing a low $R_{DS(ON)}$ external MOSFET and a 0.1Ω sense resistor, eliminating the need for expensive heat sinks and increasing efficiency.

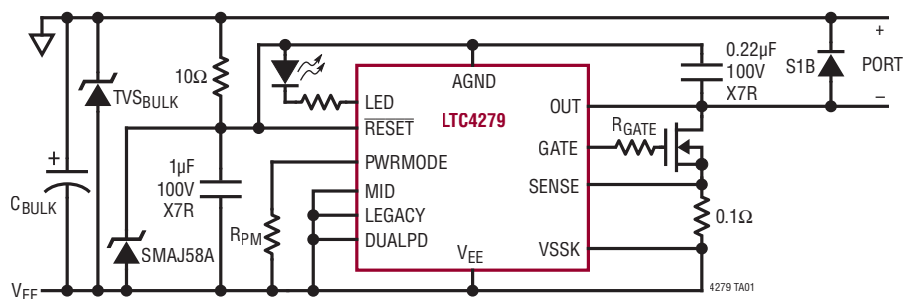
PD discovery uses a proprietary dual-mode 4-point detection mechanism ensuring excellent immunity from false PD detection. Midspan PSEs are supported with physical layer classification and a 2.5 second backoff timer.

Legacy and custom PDs are supported with pin-selectable LEGACY and UltraPWR modes. LEGACY mode detects and powers pre-IEEE specification PDs. UltraPWR mode aggressively turns on and powers custom PDs requiring high inrush and/or operational currents.



MAXIMUM PD INPUT POWER	R_{PM} ($\pm 1\%$)
Type 1 (13W)	2.37k
Type 2 (25.5W)	3.32k
LTPoE++ 38.7W	4.64k
LTPoE++ 52.7W	5.90k
LTPoE++ 70W	7.87k
LTPoE++ 90W	10.0k
UltraPWR – (Up to 123W*)	13.0k

*Depending on V_{PSE}



LTM4636 40A DC/DC µModule Regulator

FEATURES

- Stacked Inductor Acts as Heat Sink
- Wide Input Voltage Range: 4.7V to 15V
- 0.6V to 3.3V Output Voltage Range
- ±1.3% Total DC Output Voltage Error Over Line, Load and Temperature (–40°C to 125°C)
- Differential Remote Sense Amplifier for Precision Regulation
- Current Mode Control/Fast Transient Response
- Frequency Synchronization
- Parallel Current Sharing (Up to 240A)
- Internal or External Compensation
- 88% Efficiency (12V_{IN}, 1V_{OUT}) at 40A
- Overcurrent Foldback Protection
- 16mm × 16mm × 7.07mm BGA Package

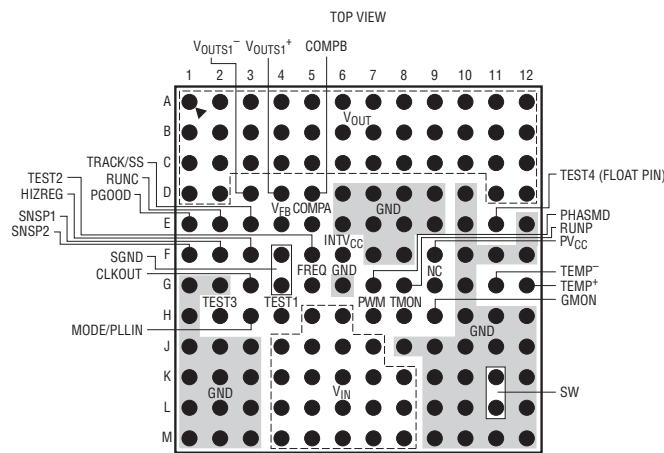
APPLICATIONS

- Telecom Servers and Networking Equipment
- Industrial Equipment and Medical Systems

DESCRIPTION

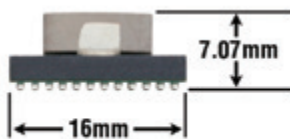
The LTM4636 is a 40A step-down µModule (power module) switching regulator with a stacked inductor as a heat sink for quicker heat dissipation and cooler operation in a small package. The exposed inductor permits direct contact with airflow from any direction. The LTM4636 can deliver 40W (12V_{IN}, 1V_{OUT}, 40A, 200LFM) with only 40°C rise over the ambient temperature. Full-power 40W is delivered, up to 83°C ambient and half-power 20W is supported at 110°C ambient.

The LTM4636 operates at 92%, 90% and 88% efficiency, delivering 15A, 30A and 40A, respectively, to a 1V load (12V_{IN}). The µModule regulator is scalable such that four µModules in current sharing mode deliver 160W with only 40°C rise and 88% efficiency (12V_{IN}, 1V_{OUT}, 400LFM). The LTM4636 is offered in a 16mm × 16mm × 7.07mm BGA package.

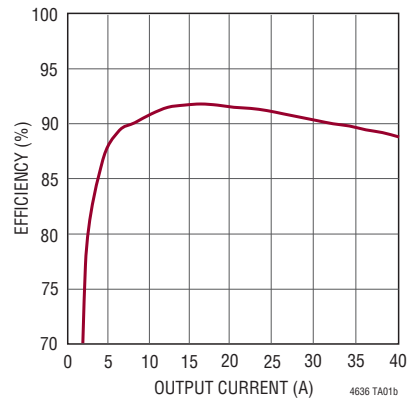


BGA PACKAGE
144-LEAD (16mm × 16mm × 7.07mm)

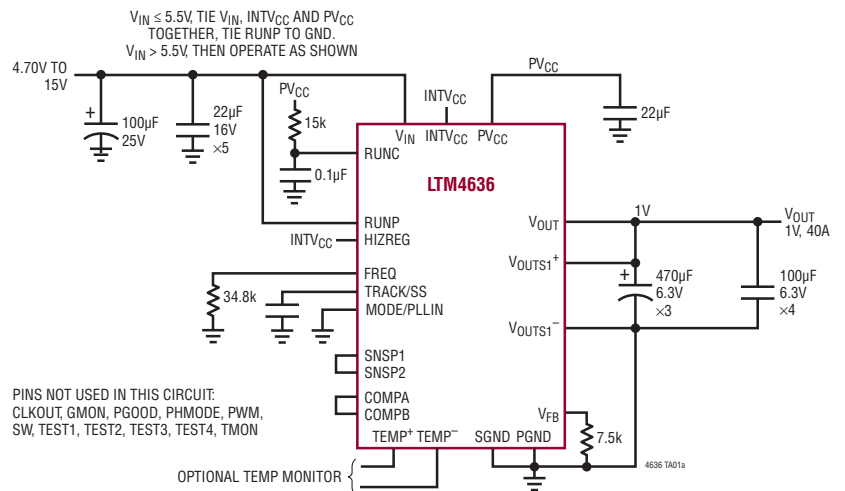
LTM4636EY
LTM4636IY



12V_{IN}, 1V_{OUT} Efficiency vs Output Current



1V, 40A DC/DC µModule Regulator



LTM4647

30A DC/DC Step-Down µModule Regulator

FEATURES

- 4.7V to 15V Input Voltage Range
- 0.6V to 1.8V Output Voltage Range
- 30A DC Output Current
- ±1.2% Total DC Output Voltage Error (–40°C to 125°C)
- High Reliability N + 1 Phase Redundancy Supported
- Internal or External Control Loop Compensation
- Differential Remote Sense Amplifier for Precision Regulation
- Current Mode Control/Fast Transient Response
- Multiphase Current Sharing Up to 180A
- Built-In Temperature Monitoring
- Selectable Pulse-Skipping, Burst Mode® Operation
- Soft-Start/Voltage Tracking
- Frequency Synchronization
- Output Overvoltage Protection
- Output Overcurrent Foldback Protection
- 9mm × 15mm × 5.01mm BGA Package

APPLICATIONS

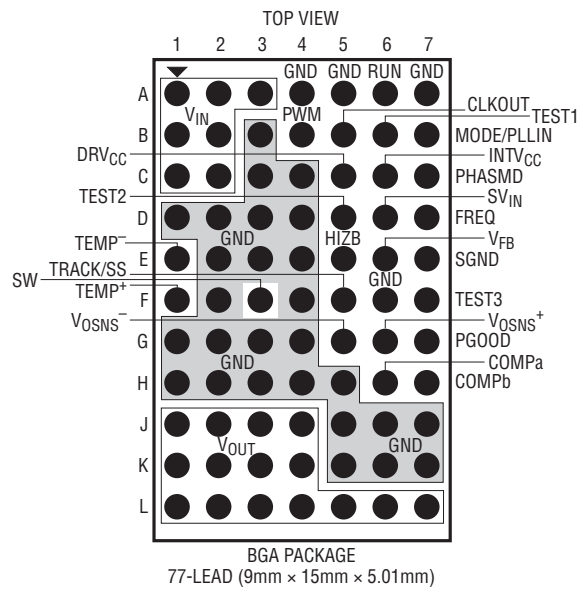
- Telecom, Networking and Industrial Equipment
- Point-of-Load Regulation

DESCRIPTION

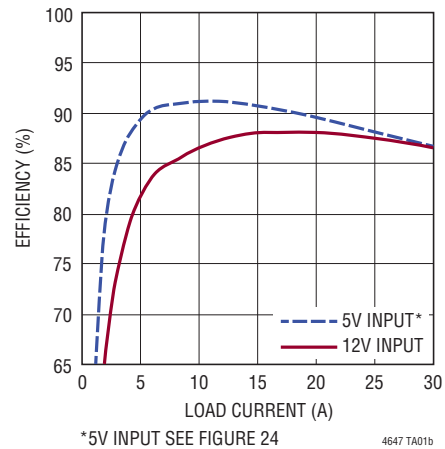
The LTM4647 is a complete 30A output switching mode step-down DC/DC µModule (power module) regulator. Included in the package are the switching controller, power FETs, inductor and all supporting components. Operating over an input voltage range of 4.7V to 15V, the LTM4647 supports an output voltage range of 0.6V to 1.8V, set by a single external resistor. Only a few input and output capacitors are needed.

Its high efficiency design delivers 87% efficiency from 12V input to 1.0V output with 30A continuous load current. High switching frequency and a current mode architecture enable a very fast transient response to line and load changes without sacrificing stability. The device supports frequency synchronization, programmable multiphase operation, N + 1 phase redundancy, and output voltage tracking for supply rail sequencing.

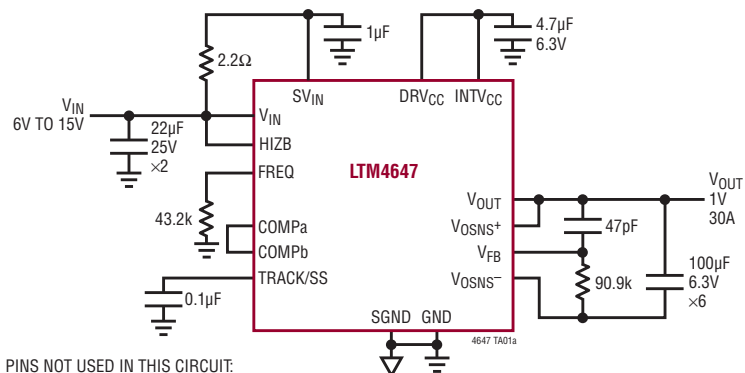
Fault protection features include overvoltage and overcurrent protection. The power module is offered in a space saving 9mm × 15mm × 5.01mm BGA package. The LTM4647 is available with SnPb (BGA) or RoHS compliant terminal finish.



1V_{OUT} Efficiency vs Load Current

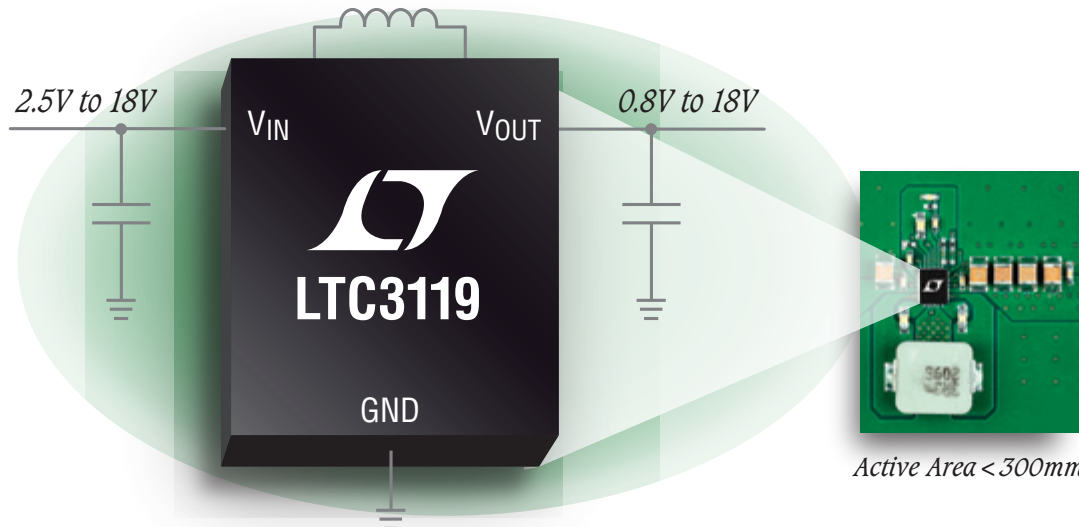


12V_{IN}, 1V_{OUT}, 30A DC/DC µModule Regulator



PINS NOT USED IN THIS CIRCUIT:
CLKOUT, MODE/PLLIN, PGOOD,
PHASMD, PWM, RUN, SW, TEMP+, TEMP-

18V/5A Monolithic Buck-Boost



Internal FETs & Sense Resistor Simplify Design

Our LTC3119 brings a new level of performance and integration to our growing family of monolithic Buck-Boost converters. Its internal switches can deliver up to 5A of output current while having fast transient response due to its current mode control and a compact solution footprint. Its 2.5V to 18V input range is ideal for single to multicell battery configurations as well as poorly regulated 5V or 12V adapters and the output can be set to any voltage from 0.8V to 18V. The LTC3119 has a low 35 μ A quiescent current, programmable switching frequency from 400kHz to 2MHz and can deliver up to 98% conversion efficiency allowing design flexibility and a low noise output.

▼ Broad Line of Monolithic Buck-Boost Converters

Part Number	V _{IN} Range (V)	V _{OUT} Range (V)	I _{OUT} in Buck Mode (A)	Comments
LTC3114-1	2.2 to 40	2.7 to 40	1	I _Q = 30 μ A, Efficiency up to 96%, Programmable Output Current
LTC3118	2.2 to 18	2 to 18	2	Dual Input PowerPath™, Efficiency up to 94%
LTC3115	2.7 to 40	2.7 to 40	2	I _Q = 30 μ A, Efficiency up to 95%, UVLO
LTC3112	2.7 to 15	2.5 to 14	2.5	I _Q = 50 μ A, Efficiency up to 95%, OVP, Output Disconnect
LTC3113	1.8 to 5.5	1.8 to 5.5	4	I _Q = 40 μ A, Efficiency up to 96%, Output Disconnect
LTC3119	2.5 to 18	0.8 to 18	5	I_Q = 35μA, Efficiency up to 98%, MPPC
LTM8054	5 to 36	1.2 to 36	5.4	15mm x 11.25mm x 3.42mm BGA Package, Internal Inductor
LTM8056	5 to 58	1.2 to 48	5.5	15mm x 15mm x 4.92mm BGA Package, Internal Inductor
LTM8055	5 to 36	1.2 to 36	8.5	15mm x 15mm x 4.92mm BGA Package, Internal Inductor
LTM4607	4.5 to 36	0.8 to 24	10	15mm x 15mm x 2.82mm LGA Package, External Inductor
LTM4609	4.5 to 36	0.8 to 34	10	15mm x 15mm x 2.82mm LGA or 15mm x 15mm x 3.42mm BGA Package, External Inductor
LTM4605	4.5 to 20	0.8 to 16	12	15mm x 15mm x 2.82mm LGA Package, External Inductor

▼ Info & Free Samples

www.linear.com/product/LTC3119
1-800-4-LINEAR

LT, LT, LTC, LTM, Linear Technology, the Linear logo and PowerPath are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

LTC3119 18V, 5A Synchronous Buck-Boost DC/DC Converter

FEATURES

- **Input Voltage Range: 2.5V to 18V**
- **Runs Down to $V_{IN} = 250mV$ After Start-Up**
- **Output Voltage Range: 0.8V to 18V**
- **5A Output Current in Buck Mode, $V_{IN} > 6V$**
- **3A Output Current for $V_{IN} = 3.6V$, $V_{OUT} = 5V$**
- Programmable Switching Frequency: 400kHz to 2MHz
- Synchronizable with an External Clock Up to 2MHz
- Accurate Run Comparator Threshold
- Burst Mode Operation, No-Load $I_Q = 35\mu A$
- Ultralow Noise Buck-Boost PWM
- Current Mode Control
- Maximum Power Point Control
- Power Good Indicator
- Internal Soft-Start
- 28-Lead 4mm × 5mm QFN and TSSOP Packages

APPLICATIONS

- Wide Input Range Power Supplies
- 1- to 4-Cell Lithium Battery Powered Products
- RF Power Supplies
- Solar Battery Chargers
- System Backup Power Supplies
- Lead-Acid to 12V Regulator

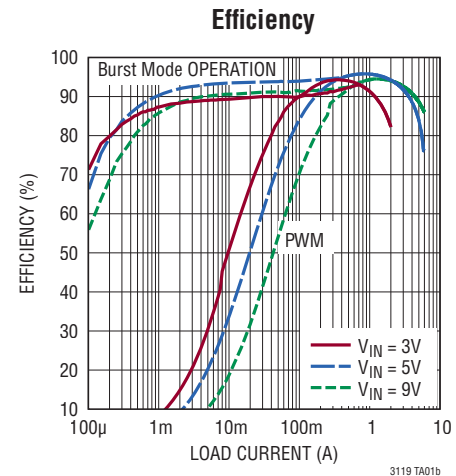
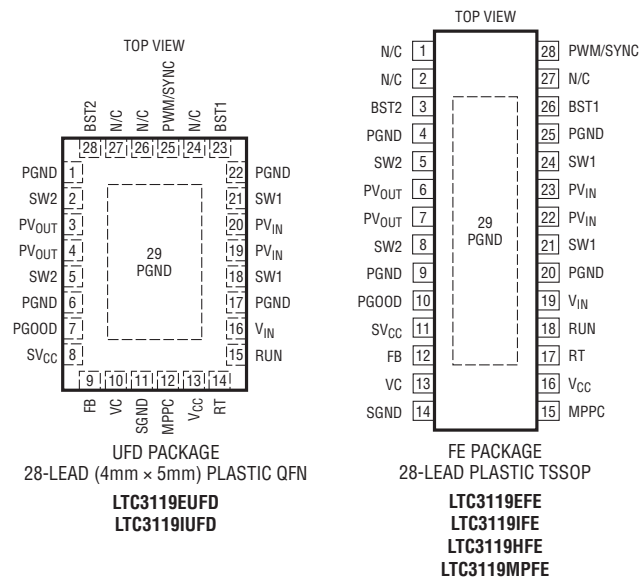
DESCRIPTION

The LTC3119 is a high efficiency 18V monolithic buck-boost converter that can deliver up to 5A of continuous output current. Extensive feature integration and very low resistance internal power switches minimize the total solution footprint for even the most demanding applications. A proprietary 4-switch PWM architecture provides seamless low noise operation from input voltages above, equal to or below the output voltage.

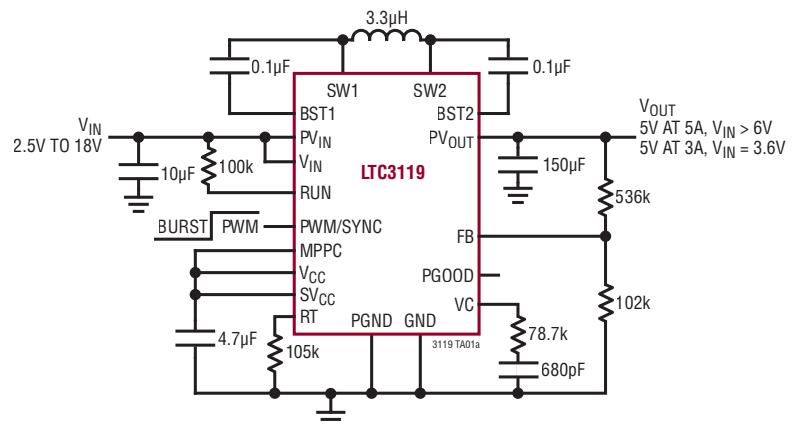
External frequency programming as well as synchronization using an internal PLL enable operation over a wide switching frequency range of 400kHz to 2MHz. The wide 2.5V to 18V input range is well suited for operation from unregulated power sources including battery stacks and backup capacitors. After start-up, operation is possible with input voltages as low as 250mV.

Other features include: output short-circuit protection, thermal overload protection, less than 3 μA shutdown current, power good indicator, Burst Mode operation, and maximum power point control.

The LTC3119 is offered in thermally enhanced 28-lead 4mm × 5mm QFN and TSSOP packages.



Wide Input Range 5V Regulator



LT8606 42V, 350mA Synchronous Step-Down Regulator with 2.5 μ A Quiescent Current

FEATURES

- Wide Input Voltage Range: 3.0V to 42V
- Ultralow Quiescent Current Burst Mode Operation:
 - <2.5 μ A I_Q Regulating 12V_{IN} to 3.3V_{OUT}
 - Output Ripple <10mV_{P-P}
- High Efficiency 2MHz Synchronous Operation:
 - >92% Efficiency at 0.5A, 5V_{OUT} from 12V_{IN}
- 350mA Maximum Continuous Output
- Fast Minimum Switch-On Time: 45ns
- Adjustable and Synchronizable: 200kHz to 2.2MHz
- Spread Spectrum Frequency Modulation for Low EMI
- Allows Use of Small Inductors
- Low Dropout
- Peak Current Mode Operation
- Accurate 1V Enable Pin Threshold
- Internal Compensation
- Output Soft-Start and Tracking
- Small 10-Lead MSOP Package or 8-Lead 2mm \times 2mm DFN Package

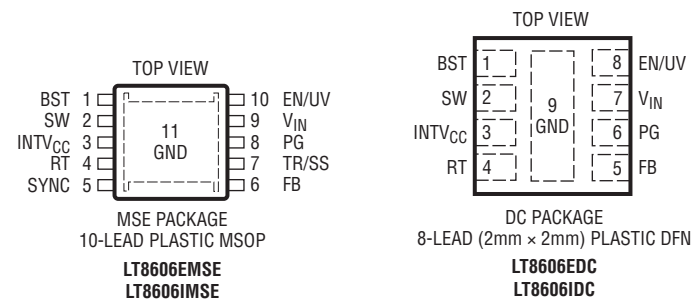
APPLICATIONS

- General Purpose Step-Down
- Low EMI Step-Down

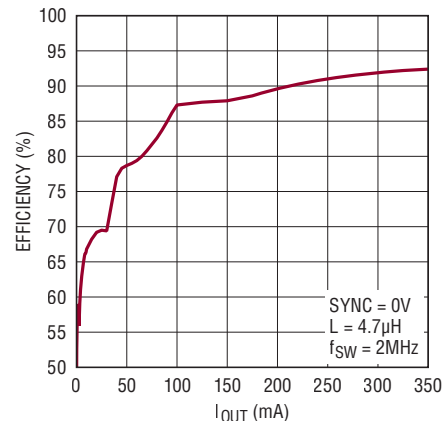
DESCRIPTION

The LT8606 is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator that consumes only 1.7 μ A of non-switching quiescent current. The LT8606 can deliver 350mA of continuous current. Top and bottom power switches are included with all necessary circuitry to minimize the need for external components. Low ripple Burst Mode operation enables high efficiency down to very low output currents while keeping the output ripple below 10mV_{P-P}. Internal compensation with peak current mode topology allows the use of small inductors and results in fast transient response and good loop stability. The EN/UV pin has an accurate 1V threshold and can be used to program V_{IN} undervoltage lockout or to shut down the LT8606 reducing the input supply current to 1 μ A. The PG pin signals when V_{OUT} is within \pm 8.5% of the programmed output voltage as well as fault conditions.

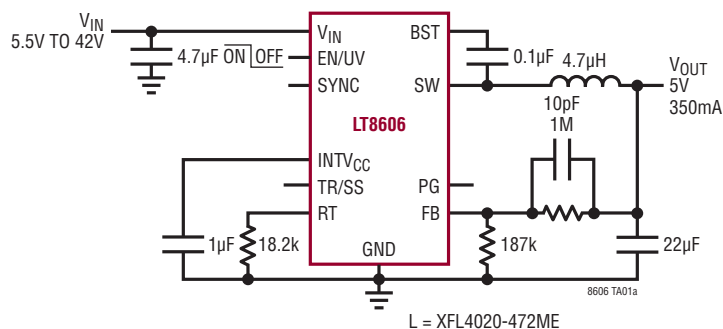
The LT8606 in the 10-lead MSOP allows selection of low I_Q Burst Mode operation, pulse-skipping or spread spectrum operation for low EMI, and can be synchronized to an external clock. The 8-lead 2mm \times 2mm DFN package operates in Burst Mode operation. The MSOP has programmable soft-start and tracking.



12V_{IN} to 5V_{OUT} Efficiency



5V, 2MHz Step-Down



LT8607 42V, 750mA Synchronous Step-Down Regulator with 2.5 μ A Quiescent Current

FEATURES

- Wide Input Voltage Range: 3.0V to 42V
- Ultralow Quiescent Current Burst Mode Operation:
 - <2.5 μ A I_Q Regulating 12V_{IN} to 3.3V_{OUT}
 - Output Ripple <10mV_{P-P}
- High Efficiency 2MHz Synchronous Operation:
 - >92% Efficiency at 0.5A, 5V_{OUT} from 12V_{IN}
- 750mA Maximum Continuous Output
- Fast Minimum Switch-On Time: 45ns
- Adjustable and Synchronizable: 200kHz to 2.2MHz
- Spread Spectrum Frequency Modulation for Low EMI
- Allows Use of Small Inductors
- Low Dropout
- Peak Current Mode Operation
- Accurate 1V Enable Pin Threshold
- Internal Compensation
- Output Soft-Start and Tracking
- Small 10-Lead MSOP Package or 8-Lead 2mm \times 2mm DFN Package

APPLICATIONS

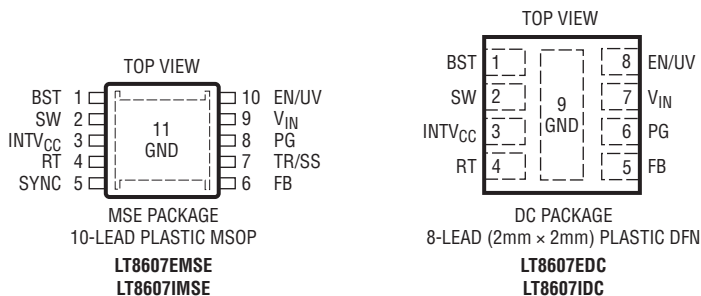
- General Purpose Step-Down
- Low EMI Step-Down

DESCRIPTION

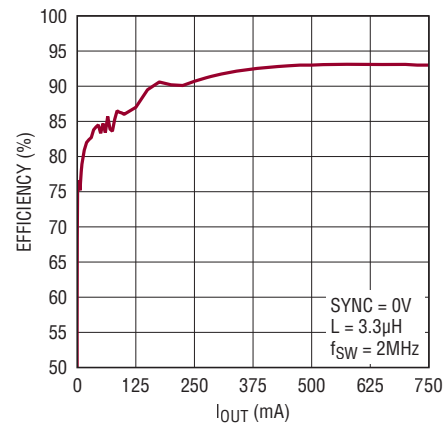
The LT8607 is a compact, high efficiency, high speed synchronous monolithic step-down switching regulator that consumes only 1.7 μ A of non-switching quiescent current. The LT8607 can deliver 750mA of continuous current. Top and bottom power switches are included with all necessary circuitry to minimize the need for external components. Low ripple Burst Mode operation enables high efficiency down to very low output currents while keeping the output ripple below 10mV_{P-P}. Internal compensation with peak current mode topology allows the use of small inductors and results in fast transient response and good loop stability. The EN/UV pin has an accurate 1V threshold and can be used to program V_{IN} undervoltage lockout or to shut down the LT8607 reducing the input supply current to 1 μ A. The PG pin signals when V_{OUT} is within \pm 8.5% of the programmed output voltage as well as fault conditions.

The LT8607 in the 10-lead MSOP allows selection of low I_Q Burst Mode operation, pulse-skipping or spread spectrum operation for low EMI, and can be synchronized to an external clock.

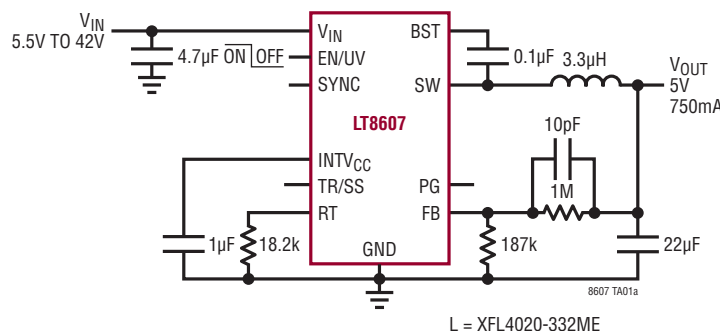
The 8-lead 2mm \times 2mm DFN package operates in Burst Mode operation. The MSOP has programmable soft-start and tracking.



12V_{IN} to 5V_{OUT} Efficiency



5V, 2MHz Step-Down



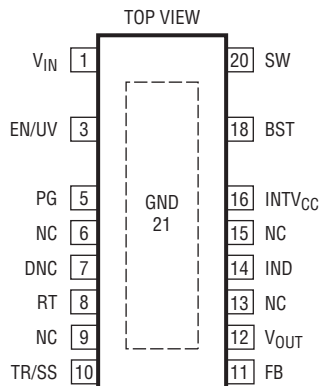
LT8630 100V, 0.6A Synchronous Micropower Step-Down High Efficiency Switching Regulator

FEATURES

- **Ultrawide Input Voltage Range: 3V to 100V**
- **Boundary Mode Switching for Highest Efficiency**
- **Output Voltage Range: 0.8V to 60V**
- **Internal Synchronous Switches**
- **Burst Mode Operation:**
 - $16\mu\text{A } I_Q$ at $12V_{IN}$ to $5V_{OUT}$
 - $7\mu\text{A } I_Q$ at $48V_{IN}$ to $5V_{OUT}$
- **Low Dropout: 99% Maximum Duty Cycle**
- **Peak Current Mode Control**
- **Programmable Undervoltage Lockout**
- **Power Good Flag**
- Flexible Output Voltage Tracking
- Short-Circuit Protection
- Low Shutdown Current: $5\mu\text{A}$
- Tolerates Pin Open/Short Faults
- Thermally Enhanced 20-Lead TSSOP with High Voltage Lead Spacing

APPLICATIONS

- Automotive Supplies
- Telecom Supplies
- Distributed Supply Regulation

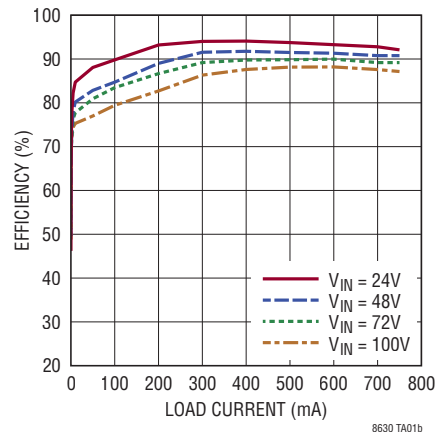


FE PACKAGE
VARIATION FE20(16)
20-LEAD PLASTIC TSSOP
LT8630EFE
LT8630IFE

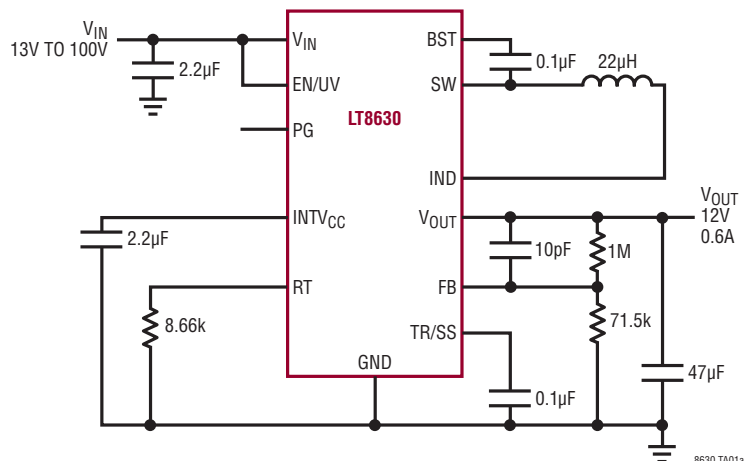
DESCRIPTION

The LT8630 is a current mode PWM step-down DC/DC converter with internal synchronous switches that provide current for output loads up to 0.6A. The wide input range of 3V to 100V makes the LT8630 suitable for regulating power from a wide variety of sources, including automotive and industrial systems and 36V to 72V telecom supplies. Variable frequency boundary mode switching maximizes efficiency across a wide range of input voltages. Low ripple Burst Mode operation enables high efficiency operation down to very low output currents while keeping the output ripple below 5mV. The soft-start feature controls the ramp rate of the output voltage, eliminating input current surge during start-up, while also providing output tracking. A power good flag signals when the output voltage is within $\pm 7.5\%$ of the regulated output. Undervoltage lockout can be programmed using the EN/UV pin. Shutdown mode reduces the total quiescent current to $< 5\mu\text{A}$. The LT8630 is available in a 20-lead TSSOP package with exposed pad for low thermal resistance and high voltage lead spacing.

Efficiency at $V_{OUT} = 12V$



12V, 0.6A Step-Down Converter



LTC3897 PolyPhase Synchronous Boost Controller with Input/Output Protection

FEATURES

- Input Supply Range: 4.5V to 65V (Up to 75V Surge)
- Reverse Input Protection to -40V
- Inrush Current Control, Overcurrent Protection and Output Disconnect for Boost Converter
- Input Voltage Surge Protection with Adjustable Clamp Voltage
- Onboard Ideal Diode Controller
- Low Quiescent Current: 55µA
- 2-Phase Operation Reduces Required Input and Output Capacitance and Noise
- Output Voltage Up to 60V
- Adjustable Gate Drive Level 5V to 10V (OPTI-DRIVE) for Logic-Level or Standard Threshold FETs
- No External Bootstrap Diodes Required

APPLICATIONS

- Industrial
- Automotive
- Military/Avionics

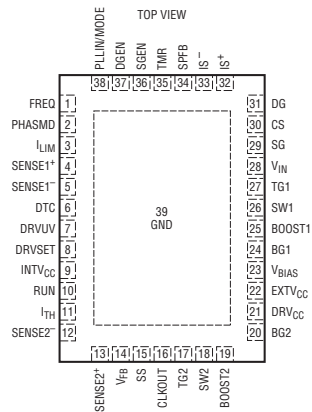
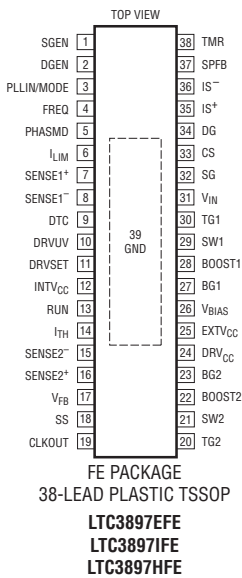
DESCRIPTION

The LTC3897 is a synchronous boost DC/DC controller with surge stopper and ideal diode controller.

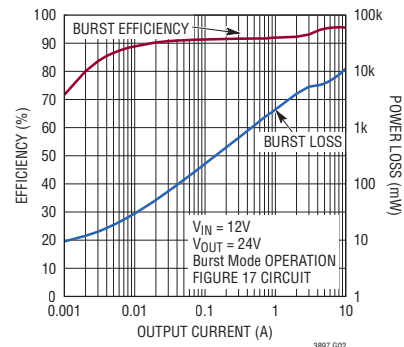
The boost controller drives two N-channel power MOSFET stages out-of-phase to reduce input and output capacitor requirements, allowing the use of smaller inductors than the single-phase equivalent. Synchronous rectification reduces power loss and eases thermal requirements.

The surge stopper controls the gate of an external N-channel MOSFET to protect against high voltage input transients and provides inrush current control, overcurrent protection and output disconnect for the boost converter. The integrated ideal diode controller drives another N-channel MOSFET to replace a Schottky diode for reverse input protection and voltage holdup or peak detection. It controls the forward voltage drop across the MOSFET and minimizes reverse current flow.

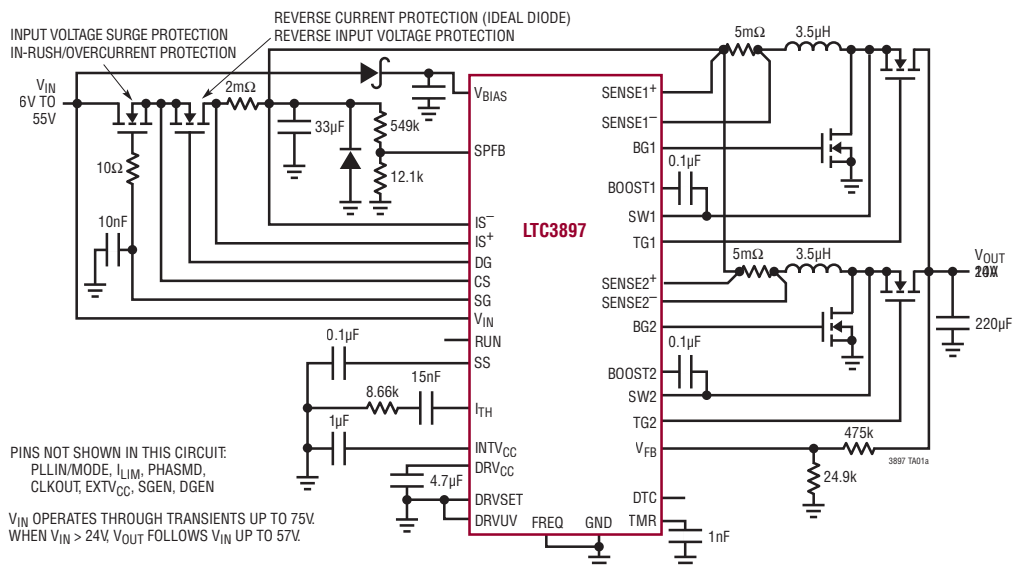
The LTC3897 is available in thermally enhanced 38-lead (leadless) QFN or 38-lead TSSOP packages.



Efficiency and Power Loss vs Output Current



24V/10A 2-Phase Synchronous Boost Converter with Surge Protection and Reverse Protection



LT8390 60V Synchronous 4-Switch Buck-Boost Controller with Spread Spectrum

FEATURES

- 4-Switch Single Inductor Architecture Allows V_{IN} Above, Below or Equal to V_{OUT}
- Synchronous Switching: Up to 98% Efficiency
- Proprietary Peak-Buck Peak-Boost Current Mode
- Wide V_{IN} Range: 4V to 60V
- $\pm 1.5\%$ Output Voltage Accuracy: $1V \leq V_{OUT} \leq 60V$
- $\pm 3\%$ Input or Output Current Accuracy with Monitor
- Spread Spectrum Frequency Modulation for Low EMI
- High Side PMOS Load Switch Driver
- Integrated Bootstrap Diodes
- No Top MOSFET Refresh Noise in Buck or Boost
- Adjustable and Synchronizable: 150kHz to 650kHz
- V_{OUT} Disconnected from V_{IN} During Shutdown
- Available in 28-Lead TSSOP with Exposed Pad and 28-Lead QFN (4mm \times 5mm)

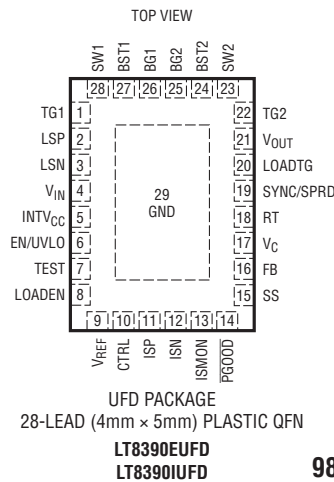
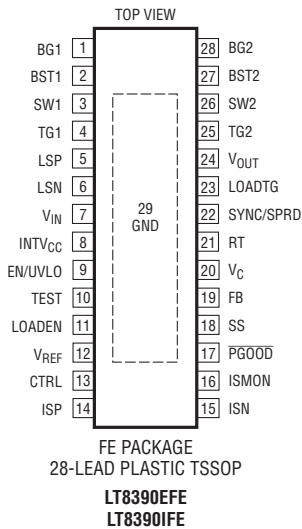
APPLICATIONS

- Automotive, Industrial, Telecom Systems
- High Power Battery-Powered System

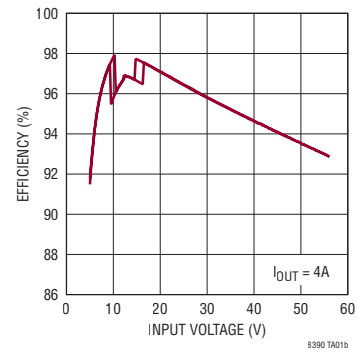
DESCRIPTION

The LT8390 is a synchronous 4-switch buck-boost DC/DC controller that regulates output voltage, input or output current from an input voltage above, below or equal to the output voltage. The proprietary peak-buck/peak-boost current mode control scheme allows adjustable and synchronizable 150kHz to 650kHz fixed frequency operation, or internal $\pm 15\%$ triangle spread spectrum frequency modulation for low EMI. With a 4V to 60V input voltage range, 0V to 60V output voltage capability, and seamless low noise transitions between operation regions, the LT8390 is ideal for voltage regulator, battery and supercapacitor charger applications in automotive, industrial, telecom and even battery-powered systems.

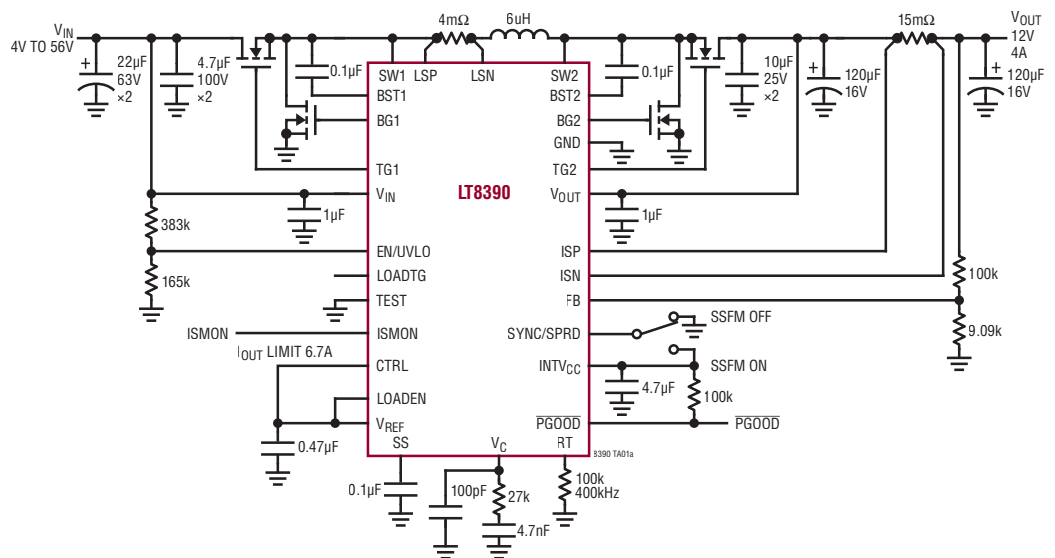
The LT8390 provides input or output current monitor and power good flag. Fault protection is also provided to detect output short-circuit condition, during which the LT8390 retries, latches off or keeps running.



Efficiency vs V_{IN}



98% Efficient 48W (12V 4A) Miniature Buck-Boost Voltage Regulator



LT8705A

80V V_{IN} and V_{OUT} Synchronous 4-Switch Buck-Boost DC/DC Controller

FEATURES

- Single Inductor Allows V_{IN} Above, Below, or Equal to Regulated V_{OUT}
- V_{IN} Range 2.8V (Need $EXTV_{CC} > 6.4V$) to 80V
- V_{OUT} Range: 1.3V to 80V
- Quad N-Channel MOSFET Gate Drivers
- Synchronous Rectification: Up to 98% Efficiency
- Input and Output Current Monitor Pins
- Synchronizable Fixed Frequency: 100kHz to 400kHz
- Integrated Input Current, Input Voltage, Output Current and Output Voltage Feedback Loops
- Improved Light Load Transition from DCM to FCM
- Improved IMON_OUT, IMON_IN Offset When Cold
- Clock Output Usable to Monitor Die Temperature

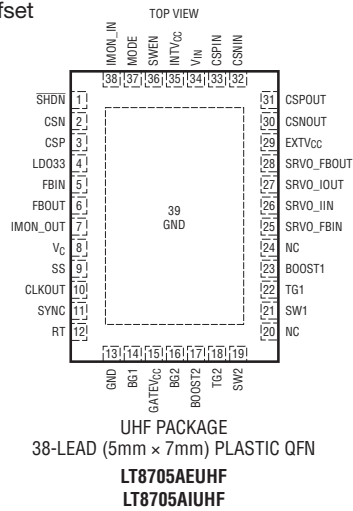
APPLICATIONS

- High Voltage Buck-Boost Converters
- Input or Output Current Limited Converters

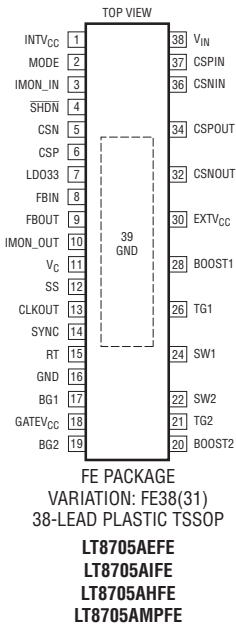
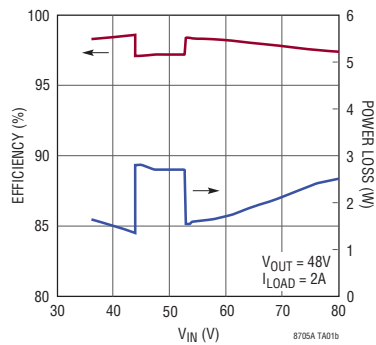
DESCRIPTION

The LT8705A is a high performance buck-boost switching regulator controller that operates from input voltages above, below or equal to the output voltage. The part has integrated input current, input voltage, output current and output voltage feedback loops. With a wide 2.8V to 80V input and 1.3V to 80V output range, the LT8705A is compatible with most solar, automotive, telecom and battery-powered systems. The LT8705A is an improved pin-compatible version of the LT8705 and is recommended for new designs. See LT8705A vs LT8705 in the Applications Information section for more information.

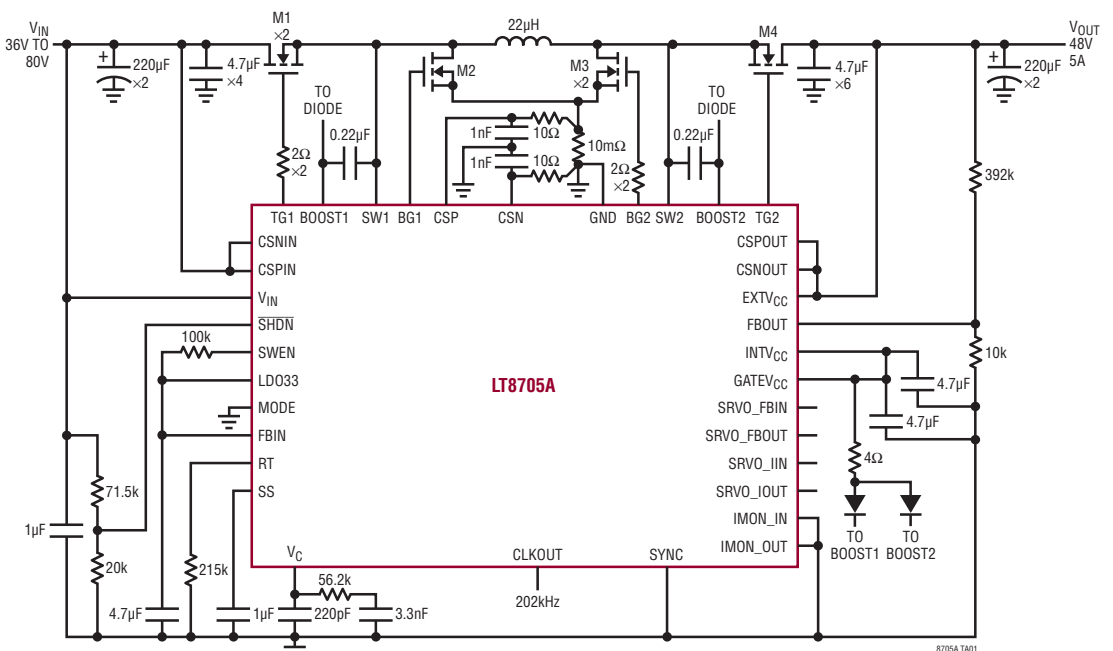
The LT8705A includes a MODE pin to select among Burst Mode operation, discontinuous or continuous conduction mode at light loads. Additional features include a 3.3V/12mA LDO, a synchronizable fixed operating frequency, and onboard gate drivers.

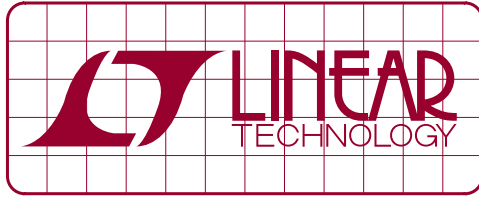


Efficiency and Power Loss



Telecom Voltage Stabilizer





DESIGN NOTES

Low EMI LED Driver Features 2A, 40V, Integrated, Synchronous Switches for Automotive Lighting

Design Note 557

Keith Szolusha

Introduction

The breadth of LED applications has grown to encompass everything from general lighting to automotive, industrial and test equipment, sign boards and safety instruments. Feature requirements for LED drivers have become more extensive. The latest LED solutions require drivers that are compact, efficient, low noise, and have high dimming ratios and advanced fault protection. The LT3922 meets these demands.

The LT3922 synchronous LED driver with integrated 2A, 40V switches can be configured as a boost, buck or boost-buck LED driver. Its high efficiency integrated switches fit into a tiny 4mm × 5mm QFN package. This device integrates Linear’s most advanced switching technologies, condensing high power capability into tight spaces while controlling the edge rates and mitigating unwanted EMI. The LT3922 features controlled switching edges that do not ring—offering just the

right balance of high efficiency and low noise. They can be run at up to 2.5MHz for compact solutions.

The tiny LT3922 LED driver features low EMI, high efficiency and fault protection required in automotive environments. It can handle 36V automotive transients and 3V cold crank. Its Silent Switcher® architecture, spread spectrum frequency modulation (SSFM) and controlled switching edges make it ideal for powering LEDs with low EMI. Its flexible topology is useful in daytime running lights, signal lights, taillights, and headlight segments as well as dashboard and heads-up displays with high dimming ratios. Built-in fault protection reduces the number of extra components required to protect against short and open LEDs.

LT, LT, LTC, LTM, Linear Technology, the Linear logo and Silent Switcher are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

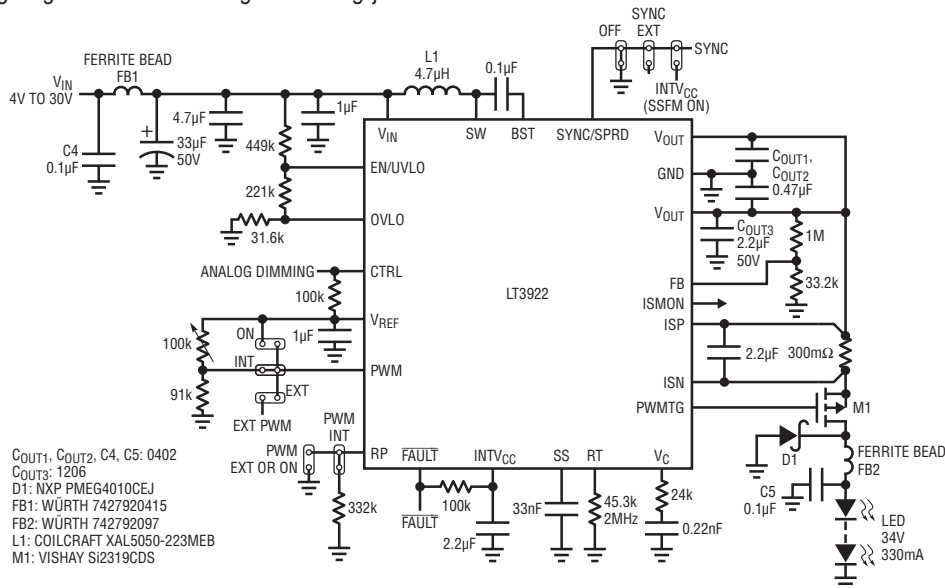


Figure 1. 2MHz Automotive Boost LED Driver Features Low EMI and Internally Generated PWM Dimming Has 91% Efficiency and Passes CISPR 25 Class 5 EMI

Built-In Features Enable Low EMI

The LT3922 includes a number of features that allow it to easily achieve low EMI. First, it incorporates Linear's patented Silent Switcher architecture, where internal synchronous switches minimize hot-switching-loop size and controlled switching edges that do not ring. Its pinout enables placement of small, high frequency capacitors near the two V_{OUT} pins to minimize hot-loop size and EMI. The switching edge rate is controlled by the IC, eliminating high frequency ringing that is common to converters without this feature, reducing high frequency EMI without degrading power or efficiency.

SSFM in the LT3922 spreads the resistor-set switching frequency up and down from 100% to 125% of its value. This decreases both peak and average EMI in the converter at low and high frequencies.

Boost, Buck and Boost-Buck

Since LEDs are light sources driven by controlled current, either or both of LED^+ and LED^- can be attached to non-ground potentials. This opens options for LED driver topologies, including boost-buck (step-up and step-down) and buck mode (step-down). The high side PWM TG driver and low EMI switches can be configured as boost, buck, or boost-buck LED drivers while retaining use of all of the IC's desirable features—low EMI, SSFM and internal PWM dimming.

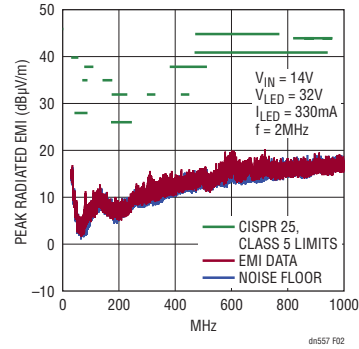


Figure 2. LT3922 Boost Passes CISPR 25 Class 5 Radiated and Conducted EMI

The LT3922 can power LEDs up to 34V as a boost converter. For automotive applications it can be configured as a highest efficiency 400kHz converter or a smallest size 2MHz converter with up to 5000:1 PWM dimming range.

The LT3922 boost-buck topology in Figure 3 supports an input voltage range extending above and below the LED string voltage. This patented low EMI topology features a boost-type low ripple input inductor and a buck-type low ripple output-facing inductor. A 4V to 18V input can drive an LED string voltage between 3V and 16V.

Conclusion

The LT3922 synchronous LED driver meets the many demands of automotive and industrial LED drivers.

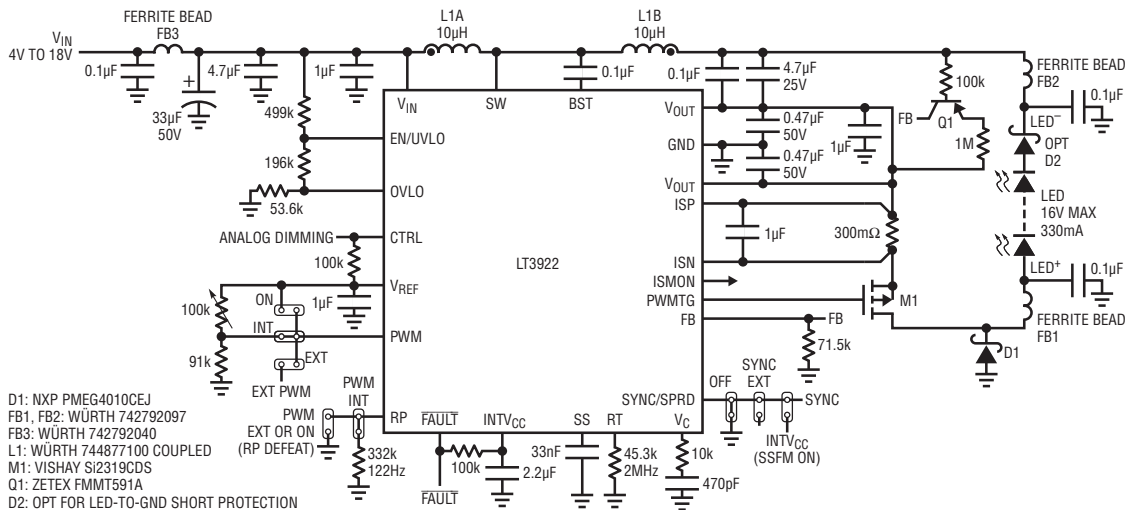


Figure 3. 2MHz Boost-Buck LED Driver with Low Input and Output Ripple. Passes CISPR 25 Class 5 EMI

Data Sheet Download

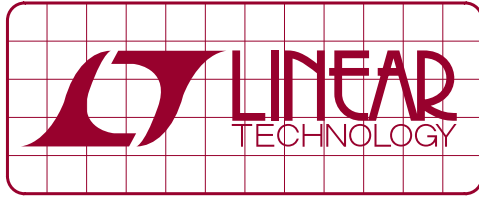
www.linear.com/LT3922

For applications help,
 call (408) 432-1900, Ext. 3801

Linear Technology Corporation
 1630 McCarthy Blvd., Milpitas, CA 95035-7417
 (408) 432-1900 • FAX: (408) 434-0507 • www.linear.com

DN557 LT/AP 1216 71K • PRINTED IN THE USA

LINEAR TECHNOLOGY
 © LINEAR TECHNOLOGY CORPORATION 2016



DESIGN NOTES

Bidirectional DC/DC Regulator and Supercapacitor Charger

Design Note 558

Victor Khasiev

Introduction

The LTC[®]3110 bidirectional buck-boost DC/DC regulator charges and balances a supercapacitor when a bus voltage is present (for example 3.3V) and discharges the supercapacitor into the load when the bus fails. The LTC3110 maintains the bus's nominal level (3.3V in the example in Figure 1) even if the supercapacitor voltage is above or below the nominal bus voltage. Supporting the load this way allows data backup and retention during a power interruption—important in a wide variety of industrial and automotive applications.

Low Profile Data Backup Power Supply

Industrial and automotive applications are distinguished by their lack of stable, high quality voltage sources. In automotive environments, a 12V nominal voltage rail can change from 4V to above 40V during cold starts and load dumps. The 24V equipment bus used in factories and plants suffers voltage spikes and brownouts just from cycling electric motors and solenoids.

Industrial applications, however, share something in common with consumer electronics: the trend toward increased portability and mobility. Space is increasingly limited for electronics inside modern industrial equipment. The volume, in particular the thickness, of a data storage unit is at a premium in industrial assemblies and modules. With that in mind, the solution herein aims to minimize the profiles of the selected components. Table 1 shows two passive component group options, arranged by thickness: 1mm and 2.5mm. The required semiconductor parts are not listed because the controllers, MOSFETs and resistors do not exceed 1mm thickness.

Figure 2 shows a low profile energy storage solution for data backup or wireless data transmission in situations where the input voltage changes in an extremely wide range from 4V to 40V, with possible input voltage interruption.

LT, LT, LTC, LTM, Linear Technology, Burst Mode and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

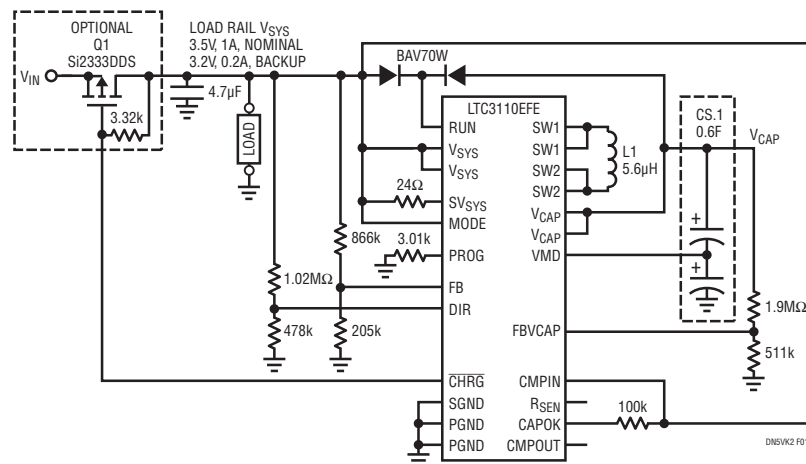


Figure 1. LTC3110 Application, $V_{SYS} = 3.3V$, $V_{CAP} = 5.0V$

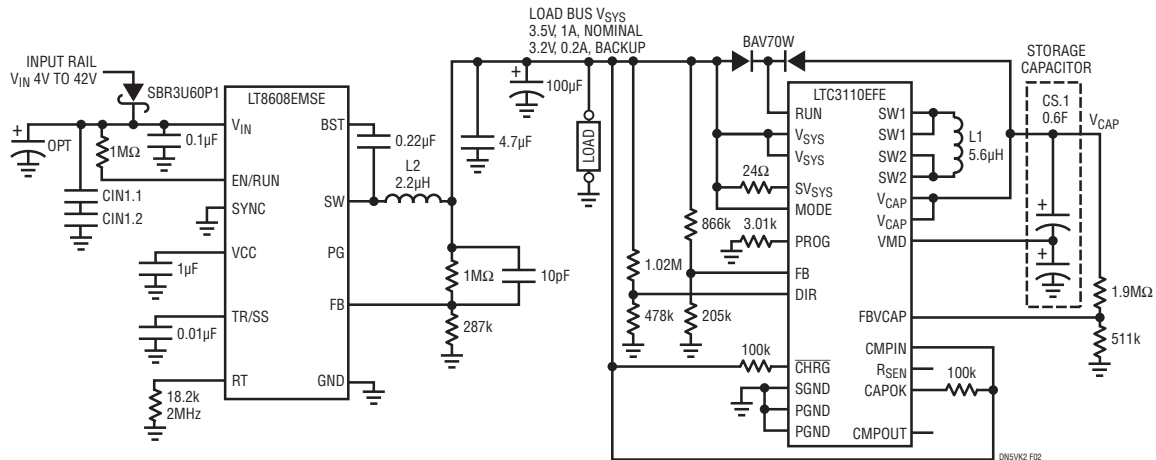


Figure 2. LTC3110, High Voltage Application, $V_{IN} = 4V$ to $40V$, $V_{SYS} = 3.3V$, $V_{CAP} = 5.0V$

This solution uses two converters to produce a complete industrial/automotive application. The converter, based on the LTC3110 supercapacitor charger (SCCH), charges the storage capacitor when the input voltage is present and provides a regulated system output during power interruption. Under normal operating conditions, when a 4V to 40V input supply is present, sensitive electronic loads and the LTC3110 are supported by a step-down converter (SDC) based on the LT8608.

The LT8608 is a low quiescent current, high efficiency, highly integrated synchronous buck converter featuring a wide input voltage range extending from 3V to 42V. Its 42V upper limit minimizes the volume required for system protection circuitry, practically eliminating the need for traditional transient voltage suppressor diodes (TVS). The SDC maintains the system voltage within 3.3V bus rail limits.

If the input voltage is disconnected, the SCCH takes over, powering the regulated 3.3V rail. The LT8608 supplies 3.5V to the system bus under normal circumstances; the LTC3110 supplies 3.2V when it registers a power failure and supports the load. These supply

voltages are well within the recommended limits for 3.3V logic power supplies. The \overline{CHRG} flag can be used to alert digital systems to disconnect non-essential loads and begin data backup or wireless transmission.

Figure 3 shows the beginning of the switchover process; with the input voltage disconnected, the SDC turns off while the SCCH is turning on.

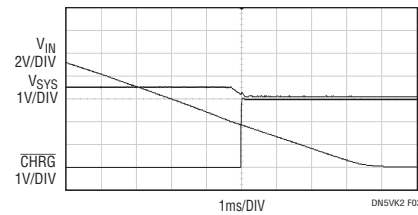


Figure 3. Switchover [V_{SYS} Load Voltage, V_{IN} Input Voltage, \overline{CHRG} Flag Status]

Conclusion

LTC3110 is a highly integrated, high performance supercapacitor charger and balancer, which can be implemented in low profile solutions for data retention and backup in automotive and industrial applications.

Table 1. Converter Components for 1mm and 2.5mm Thickness Solutions

Height	L1	L2	CS1	CIN1
Vendor	Wurth Elektronik	Wurth Elektronik	CAP-XX	TDK
1mm	74437321022	74437321056	2 x HS103F	2 x C3216JB1H475K085AB
2.5mm	74437334022	74437334056	HS206F	C3225X7R2A225K230AB

[Data Sheet Download](#)
www.linear.com/LTC3110

For applications help,
call (408) 432-1900, Ext. 3161

Sales Offices

NORTH AMERICA

WESTERN U.S.

2085 E. Technology Cir., Ste. 101
Tempe, AZ 85284
Tel: (480) 777-1600
Fax: (480) 838-1104

7595 Irvine Center Dr., Ste. 120
Irvine, CA 92618
Tel: (949) 453-4650
Fax: (949) 453-4765

11300 W. Olympic Blvd., Ste. 700
Los Angeles, CA 90064
Tel: (818) 703-0835
Fax: (818) 703-0517

720 Sycamore Dr.
Milpitas, CA 95035
Tel: (408) 428-2050
Fax: (408) 432-6331

3009 Douglas Blvd., Ste. 140
Roseville, CA 95661
Tel: (916) 787-5210
Fax: (916) 787-0110

5465 Morehouse Dr., Ste. 155
San Diego, CA 92121
Tel: (858) 638-7131
Fax: (858) 638-7231

7102 La Vista Place, Ste. 201
Niwot, CO 80503
Tel: (303) 926-0002
Fax: (303) 530-1477

Salt Lake City, NV
Tel: (801) 731-8008

5285 SW Meadows Rd., Ste. 240
Lake Oswego, OR 97035
Tel: (503) 431-6960
Fax: (503) 431-6961

2018 156th Ave. NE, Ste. 100
Bellevue, WA 98007
Tel: (425) 748-5010
Fax: (425) 748-5009

MIDWEST U.S.

2040 E. Algonquin Rd., Ste. 512
Schaumburg, IL 60173
Tel: (847) 925-0860

Indiana
Tel: (847) 925-0860

Iowa
Tel: (847) 925-0860

Kansas
Tel: (913) 634-7966

Michigan
Tel: (440) 239-0817

7805 Telegraph Rd., Ste. 225
Bloomington, MN 55438
Tel: (952) 903-0605

Missouri
Tel: (913) 634-7966

Columbus, OH
Tel: (614) 488-4466

7550 Lucerne Dr., Ste. 106
Middleburg Heights, OH 44130
Tel: (440) 239-0817
Fax: (440) 239-1466

Wisconsin
Tel: (262) 331-4040

NORTHEAST U.S.

Connecticut
Tel: (860) 228-4104

15 Research Place
North Chelmsford, MA 01863
Tel: (978) 656-4750
Fax: (978) 656-4760

New York
Tel: (978) 656-4750

3220 Tillman Dr., Ste. 120
Bensalem, PA 19020
Tel: (215) 638-9667
Fax: (215) 638-9764

SOUTHEAST U.S.

Huntsville, AL
Tel: (256) 881-9850

Fort Lauderdale, FL
Tel: (407) 688-7616

Orlando, FL
Tel: (407) 688-7616

Tampa, FL
Tel: (813) 634-9434

Atlanta, GA
Tel: (770) 888-8137

170 Weston Oaks Ct.
Cary, NC 27513
Tel: (919) 677-0066
Fax: (919) 678-0041

8500 N. Mopac, Ste. 603
Austin, TX 78759
Tel: (512) 795-8000
Fax: (512) 795-0491

22515 Sail Harbour Ct.
Katy, TX 77450
Tel: (713) 463-5002

2301 W. Plano Pkwy., Ste. 109
Plano, TX 75075
Tel: (972) 733-3071
Fax: (972) 380-5138

CANADA

Calgary, AB
Tel: (403) 455-3577

Vancouver, BC
Tel: (604) 783-3084

Ottawa, ON
Tel: (613) 680-3473

Toronto, ON
Tel: (440) 239-0817

Montreal, QC
Tel: (514) 236-6261

ASIA/PACIFIC

AUSTRALIA/NEW ZEALAND

133 Alexander Street
Crows Nest, **NSW** 2065, **Australia**
Tel: +61 (0)2 9432 7803
Fax: +61 (0)2 9439 2738

Suite 121A, 89 High Street
Kew, **Victoria** 3101, **Australia**
Tel: +61 3 9854 6120

CHINA

Room 1763, Office Building
New Century Hotel
No. 6 Southern Road of Capital Gym
Haidian District
Beijing, China 100044
Tel: +86 (10) 6801-1080
Fax: +86 (10) 6805-4030

Unit 09, 14/F, Complex Building
No. 88 Shenghe Yi Rd., Hi-Tech Zone
Sichuan Province, **Chengdu City**
China 610041
Tel: +86 028-8555 9725
Fax: +86 028-8542 6859

Unit 1503-04, Metroplaza Tower 2
223 Hing Fong Road
Kwai Fong, N.T., **Hong Kong**
Tel: +852 2428-0303
Fax: +852 2348-0885

Room 2701, City Gateway
No. 398 Cao Xi North Road
Shanghai, China 200030
Tel: +86 (21) 6375-9478
Fax: +86 (21) 5465-5918

Room 2109-2111, 21/F, Block D
Southern International Plaza
3013 Yitian Road, Futian District
Shenzhen, China 518048
Tel: +86 755-2360-4866
Fax: +86 755-2360-4966

Room 1805, Tower A
Optics Valley International Plaza
No. 889 Luoyu Rd., Wuchang District
Wuhan, China 430074
Tel: +86 027-8665 9231
Fax: +86 027-8665 9241

Rm. 2410, Tower A, Greenland SOHO
No. 5 ZhangBa 1 Road
High-Tech Development Zone
Shaanxi Province
Xian, China 710065
Tel: +86 029-6851 8978/6851 8979
Fax: +86 029-6851 8976

INDIA

602, 6th Floor, Prestige Meridian-1
No. 29, MG Road, **Bangalore**
560001, India
Tel: +91 80 4012-4610
Fax: +91 80 4012-4612

JAPAN

7F, Sakuradori Ohtsu KT Bldg.
3-20-22 Marunouchi, Naka-ku
Nagoya-shi, 460-0002, Japan
Tel: +81 (52) 955-0056
Fax: +81 (52) 955-0058

6F Kearny Place Honmachi Bldg.
1-6-13 Awaza, Nishi-ku
Osaka-shi, 550-0011, Japan
Tel: +81 (6) 6533-5880
Fax: +81 (6) 6543-2588

8F Shuwa Kioicho Park Bldg.
3-6 Kioicho Chiyoda-ku
Tokyo, 102-0094, Japan
Tel: +81 (3) 5226-7291
Fax: +81 (3) 5226-0268

KOREA

10F, Yundang Building
439 Teheran-Ro, Gangnam-Gu
Seoul, Korea 06158
Tel: +82 (2) 792-1617
Fax: +82 (2) 792-1619

SINGAPORE

507 Yishun Industrial Park A
Singapore 768734
Tel: +65 6753-2692
Fax: +65 6752-0108

TAIWAN

8F-1, 77, Nanking E. Rd., Sec. 3
Taipei, Taiwan
Tel: +886 (2) 2505-2622
Fax: +886 (2) 2516-0702

EUROPE

FINLAND

Kirkkokatu 31
90100 **Oulu**, Finland
Tel: +358 (0)46 712 2171
Fax: +358 (0)46 712 2175

Teknobulevardi 3-5, P.O. Box 35
FIN-01531 **Vantaa**, Finland
Tel: +358 (0)46 712 2171
Fax: +358 (0)46 712 2175

FRANCE

Parc Tertiaire Siliic
2 Rue de la Couture, BP10217
94518 **Rungis** CEDEX, France
Tel: +33 (1) 56 70 19 90
Fax: +33 (1) 56 70 19 94

GERMANY

Haselburger Damm 4
D-59387 **Ascheberg**, Germany
Tel: +49 (2593) 9516-0
Fax: +49 (2593) 951679

Osterfeldstrasse 84, Haus C
D-85737 **Ismaning**, Germany
Tel: +49 (89) 962455-0
Fax: +49 (89) 963147

Jesinger Strasse 65
D-73230 **Kirchheim/Teck**, Germany
Tel: +49 (0)7021 80770
Fax: +49 (0)7021 807720

ITALY

Via Torri Bianche 3, Palazzo Larice
20871 **Vimercate** (MB), Italy
Tel: +39 039 596 5080
Fax: +39 039 596 5090

SWEDEN

Electrum 204, Isafjordsgatan 22
SE-164 40 **Kista**, Sweden
Tel: +46 (8) 623 16 00
Fax: +46 (8) 623 16 50

UNITED KINGDOM

3 The Listons, Liston Road
Marlow, Buckinghamshire SL7 1FD
United Kingdom
Tel: +44 (1628) 477066
Fax: +44 (1628) 478153

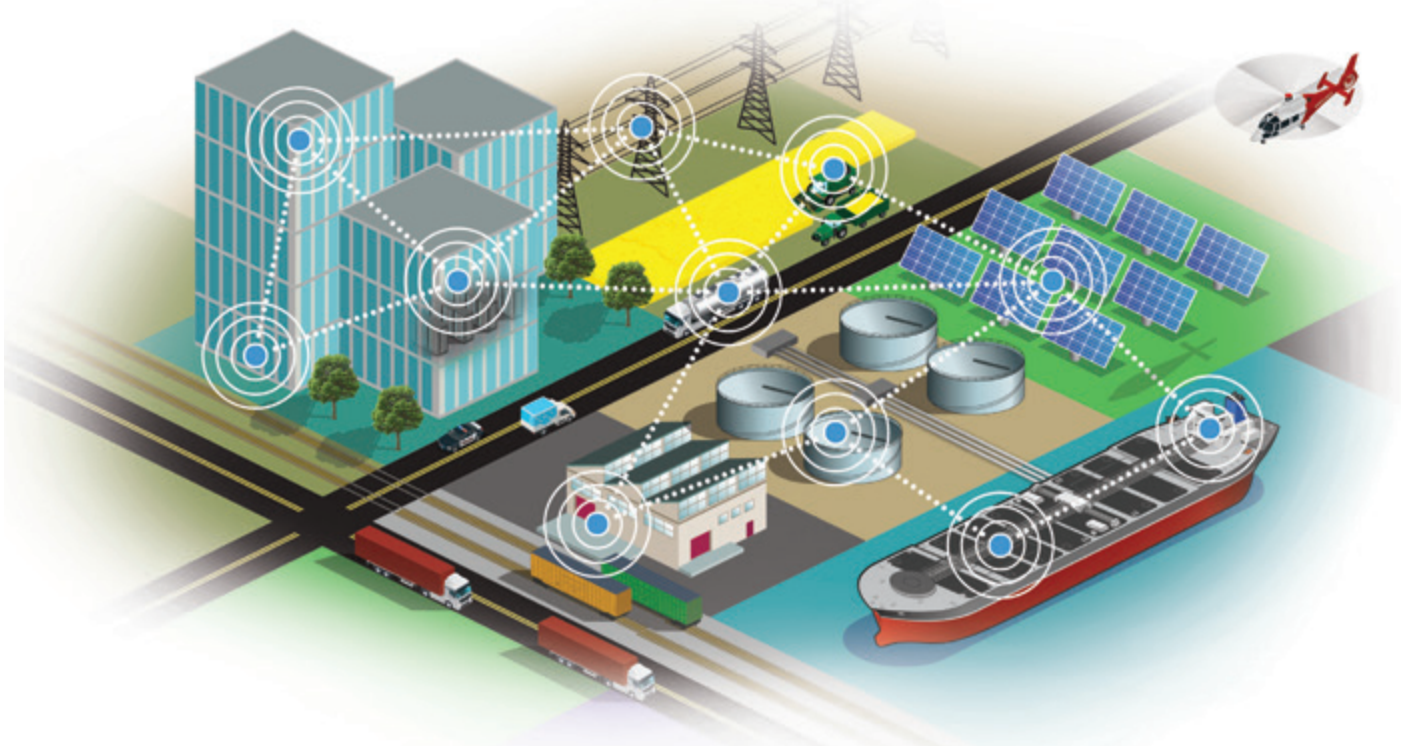


Linear Technology Corporation

1630 McCarthy Blvd., Milpitas, CA 95035-7417

Industrial Wireless Sensor Networking

SmartMesh®



In a commercial building, factory, smart grid, industrial plant or for transportation, you need a wireless sensor network that performs in tough RF environments, in extreme environmental conditions, and operates reliably for many years. With over 50,000 customer networks in over 120 countries, SmartMesh is field-proven to deliver >99.999% data reliability and >10 year battery life. Customers trust SmartMesh to deliver their business-critical data and enable their Industrial IoT businesses.

▼ Features

- The Only Network Built for Industrial IoT
- Complete Networking Software Speeds Development
- Engineered for Years of Trouble-Free Operation

Reliable Wireless Sensor Network Streamlines Manufacturing Operations



video.linear.com/7254

▼ Learn More

www.linear.com/SmartMesh

1-800-4-LINEAR

LT, LT, LTC, LTM, Linear Technology, SmartMesh and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.