

*FOR 2-CELL NIMH DESIGNS

Battery Chargers for NiMH and Li-Ion

- Precision Constant-Current/Constant-Voltage Control
- Only One Low Cost Resistor Required to Program Charge Current
- Tiny, Thermally Enhanced Packages

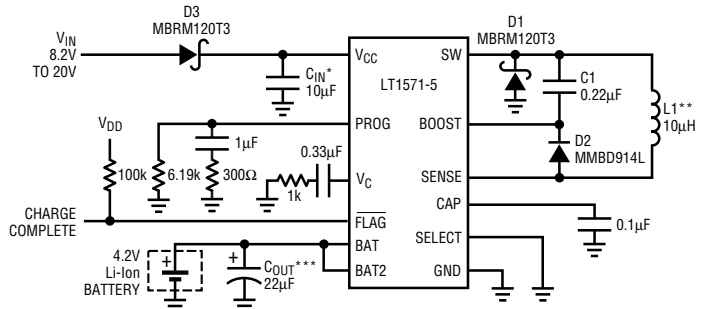
LT1510/LT1512/LT1571:

- High Switching Frequency for Small Inductor Size
- High Efficiency Current Mode PWM
- Battery Negative Terminal May Be Tied Directly to Ground
- LT1571 Has Preset Outputs: 4.1V, 4.2V, 8.2V, 8.4V

LTC1730 Pulse Charger, LTC1731/ LTC1732 Linear Chargers:

- Programmable Charge Termination Timer
- End of Charge Detection Output
- Automatic Trickle Charge of Low Voltage Cells
- Fixed Outputs for Li-Ion Cell Voltages
- Automatic Battery Refresh (LTC1730/LTC1732)
- Battery Temperature Sensing (LTC1730)

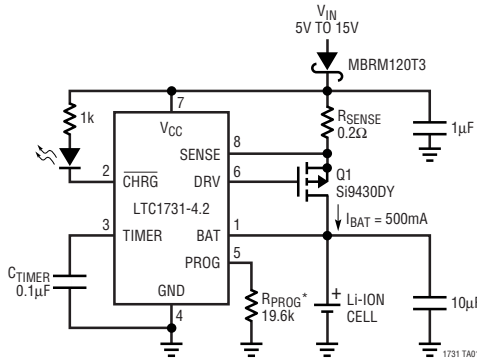
Compact Li-Ion Cell Phone Charger (0.8A)



*TOKIN OR MARCON CERAMIC SURFACE MOUNT
 **COILTRONICS TP3-100, 10µH, 2.2mm HEIGHT (0.8A CHARGING CURRENT)
 COILTRONICS TP1 SERIES, 10µH, 1.8mm HEIGHT (<0.5A CHARGING CURRENT)
 ***PANASONIC EEFCD1B220

1571 F01

500mA Li-Ion Charger



*SHUTDOWN INVOKED BY FLOATING THE PROG PIN



Battery Charger Selection Guides

Characteristics	LT1510-5	LT1512	LT1571-5	LTC1730	LTC1731	LTC1732
Max Charging Current	1.5A	1A	1.5A	1A*	1A**	1A**
Switching Frequency/Type	500kHz	500kHz†	500kHz	Pulse	Linear	Linear
Charges Li-Ion Cells	☑	☑	☑	☑	☑	☑
Charges NiCd and NiMH	☑	☑	☑		☑	☑
Charge Completion Flag			☑	☑		
Charge Termination Timer				☑	☑	☑
Automatic Trickle Charge				☑	☑	☑
Automatic Battery Refresh				☑		☑
Battery Temp Sensing				☑		
Soft-Start with UVLO	☑		☑			
Automatic Sleep Mode	☑		☑	☑	☑	☑
V _{BAT} Maximum	20V	20V††	20V	13.2V	15V	15V
Up to 28V Wall Adapter	☑	☑	☑			
Packages	SSOP-16	SO-8	SSOP-16 SSOP-28	SO-8	MSOP-8 SO-8	MSOP-10

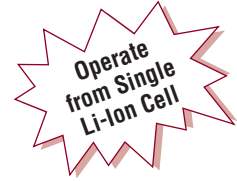
*An external FET may be added for higher charge current
 **Dependent upon external MOSFET selection

†Can be synchronized up to 800kHz
 ††SEPIC operation for step-up and step-down

Low Voltage Step-Down DC/DC Converters

LTC1878: 600mA, Synchronous Buck Switching Regulator

- Industry's Lowest Quiescent Current: 10µA
- High Efficiency: Up to 95%
- Constant Frequency: 550kHz
- Wide Input Voltage Range: 2.65V to 6V
- V_{OUT} from 0.8V Up to V_{IN}
- No Schottky Diode Required
- Selectable Burst Mode™ Operation
- Low Dropout: To 100% Duty Cycle
- Shutdown Mode I_Q: 1µA
- 8-Lead MSOP Package



Burst Mode is a trademark of Linear Technology Corporation.

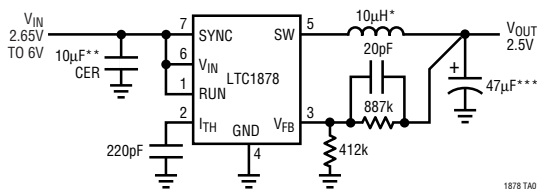
Choose the Right Step-Down Converter for Your Phone*

Characteristics	LTC1433/34	LTC1474/75	LTC1503	LT1612	LTC1701	LTC1771	LTC1877/78
Input Voltage Range	3V to 13.5V	3V to 18V	2.4V to 6V	2V to 5.5V	2.5V to 5.5V	2.7V to 20V	2.65V to 10V (LTC1877) 2.65V to 6V (LTC1878)
Max Output Current	450mA	300mA	100mA	500mA	500mA	5A**	600mA
Quiescent Current	470µA	10µA	25µA	150µA	135µA	10µA	10µA
Switching Frequency	to 700kHz	50kHz to 200kHz†	600kHz	800kHz	1MHz	100kHz to 250kHz†	550kHz
Synchronization Range	to 700kHz						400kHz to 700kHz
Peak Efficiency	93%	92.5%	>80%	>80%	94%	93%	95%
Max Duty Cycle	100%	100%	100%	90%	100%	100%	100%
Other Features	Low Noise Fixed Freq	Programmable Current Limit	No Inductor Tiny Size	Synchronous Constant Freq	< 0.6cm ² Solution	External FET Soft-Start	Synchronous Constant Freq
Packages	SSOP-16 SSOP-20	MSOP-8 SO-8	MSOP-8 SO-8	MSOP-8 SO-8	SOT-23	MSOP-8 SO-8	MSOP-8

*Other switching regulator controllers available for higher output current †Fixed off-time device

**Select external FET for current range desired

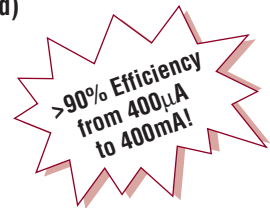
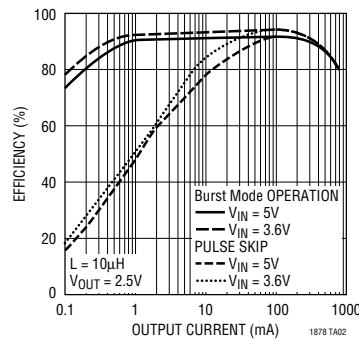
High Efficiency Step-Down Converter



*TOKO D62CB A920CY-100M
**TAIYO-YUDEN CERAMIC LMK325BJ106MM
***SANYO POSCAP 6TPA47M

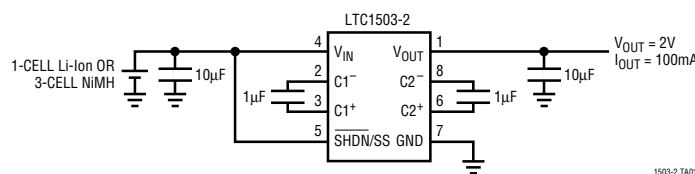


Efficiency vs Output Load Current (Burst Mode Operation Selected)



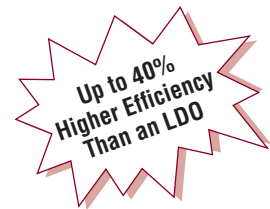
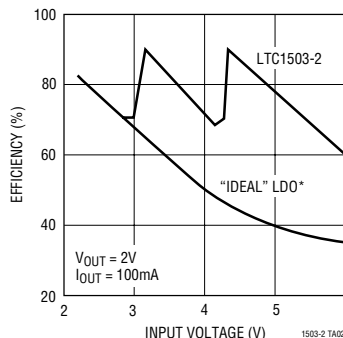
LTC1503: High Efficiency Inductorless Step-Down DC/DC Converter

Single Li-Ion to 2V DC/DC Converter



- No Inductors Needed
- Low Power: 25µA Quiescent Current, 5µA in Shutdown
- Shutdown Disconnects Load from V_{IN}
- Available with Fixed 1.8V or 2V Output
- Small MSOP and SO-8 Packages

Efficiency vs Input Voltage



*LOW DROPOUT VOLTAGE LINEAR REGULATOR

Low Dropout Voltage Regulators

LT1761/LT1762/LT1962/LT1763: Ultralow Noise LDO Regulators with Lowest Quiescent Current

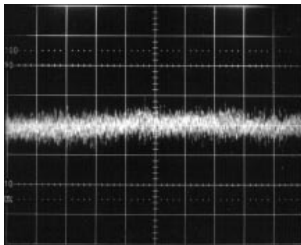
- Low Noise: 20µV_{RMS} (10Hz to 100kHz)
- Micropower: 20µA to 30µA Quiescent Current, 1µA in Shutdown Mode
- Low Dropout Voltage: 250mV to 350mV at Rated Load
- Stable with Tiny Ceramic Output Caps: 1µF to 10µF
- Reverse Battery Protection
- No Protection Diodes Needed
- Fixed and Adjustable Output Versions

Choose the Right LDO Regulator for Your Application

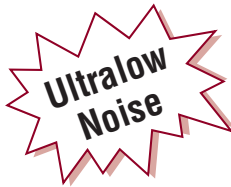
Characteristics	LT1120A	LT1121	LT1129	LT1521	LT1761	LT1762	LT1962	LT1763
Max Output Current	125mA	150mA	700mA	300mA	100mA	150mA	300mA	500mA
Supply Current	20µA	30µA	50µA	12µA	20µA	25µA	30µA	30µA
Max Input Voltage	36V	30V	30V	20V	20V	20V	20V	20V
Dropout Voltage*	0.4V	0.42V	0.45V	0.5V	0.3V	0.35V	0.35V	0.35V
Packages	SO-8	SO-8	SOT-223 SO-8	MSOP-8 SO-8 SOT-223	SOT-23	MSOP-8	MSOP-8	SO-8

*At maximum output current.

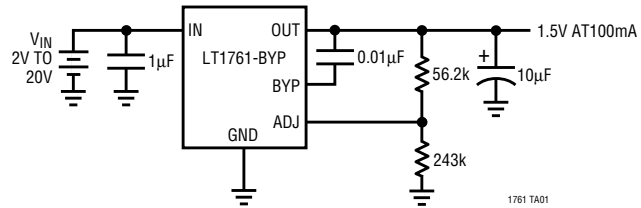
LT1761 Output Noise (BW = 10Hz to 100kHz)



C_{OUT} = 10µF 1ms/DIV
C_{NOISE} = 0.01µF



1.5V Low Noise Supply



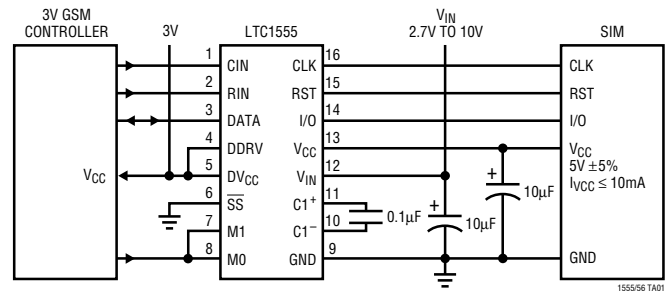
SIM and Smart Card Interface

- > 10kV ESD On All SIM/Smart Card Contact Pins
- Short-Circuit and Overtemperature Protected
- 3V ↔ 5V Signal Level Translators
- Soft-Start Limits Inrush Current at Turn-On



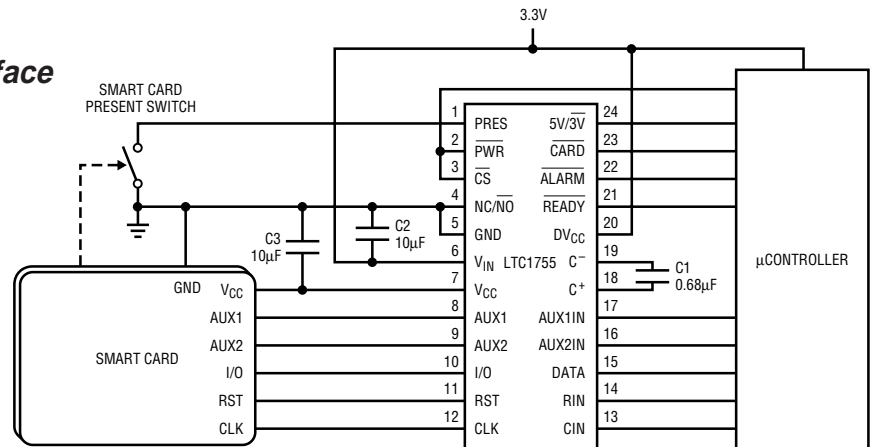
LTC1555/LTC1556 Power Supply and Level Translators for 3V/5V SIM Cards

- Step-Up/Step-Down Charge Pump Generates 5V
- Input Voltage Range: 2.7V to 10V
- Very Low Operating Current: 50µA
- Very Low Shutdown Current: < 1µA
- 650kHz Switching Frequency
- Auxiliary 4.3V LDO or Power Switch (LTC1556)
- 16- and 20-Pin Narrow SSOP



LTC1755/LTC1756 Smart Card Interface

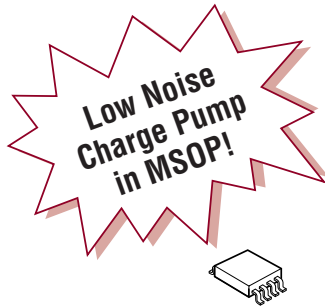
- Fully ISO 7816-3 and EMV Compliant
- Buck-Boost Charge Pump Generates 3V or 5V
- 2.7V to 6V Input Voltage Range
- Alarm Output Indicates Fault (LT1755)
- May Be Paralleled for Multiple Cards (LTC1755)
- Very Low Operating Current: 60µA
- Very Low Shutdown Current: < 2µA
- 16- and 24-Pin Narrow SSOP



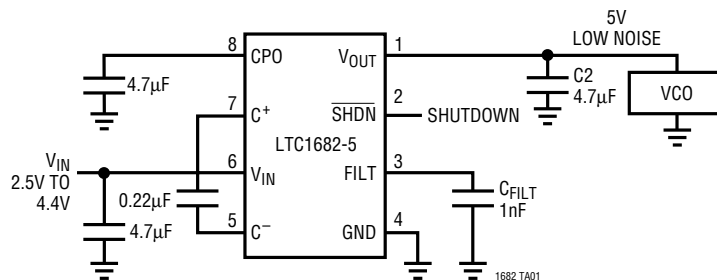
Boost DC/DC Converters

LTC1682: Low Noise Charge Pump with LDO Regulator

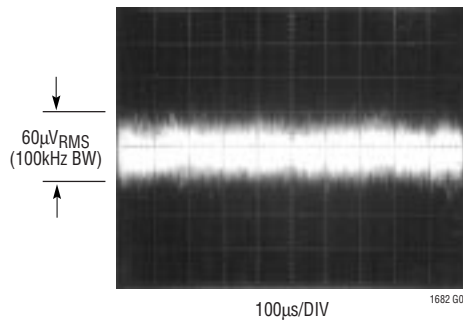
- Adjustable or Fixed Boosted Output: 2.5V to 5.25V
- Low Output Noise: $60\mu\text{V}_{\text{RMS}}$
- Input Voltage Range: 1.8V to 4.4V
- No Inductors Needed
- Output Current to 50mA
- Low Operating Current: $110\mu\text{A}$
- Low Shutdown Current: $1\mu\text{A}$
- Low ESR, Low Value Ceramic Caps
- Doubler Charge Pump with Low Dropout Linear Regulator Output
- 8-Lead MSOP and SO Packages



5V VCO Power Supply, $V_{\text{IN}} = 2.5\text{V to } 4.4\text{V}$



LTC1682-5 Output Noise



High Efficiency Boost Converter Selection Guide

Characteristics	LT1307	LT1308	LT1316	LT1610	LT1615	LT1615-1	LTC1682	LTC1751*	LTC1754*
Input Voltage Range	1V to 12V	1V to 12V	1.65V to 8V	1V to 8V	1.2V to 15V	1V to 15V	1.8V to 4.4V	2.7V to 5.5V	2.7V to 5.5V
Max Switch Current	500mA	2A	500mA	450mA	350mA	100mA	50mA	100mA	50mA
Supply Current	$50\mu\text{A}$	$140\mu\text{A}$	$33\mu\text{A}$	$30\mu\text{A}$	$30\mu\text{A}$	$30\mu\text{A}$	$110\mu\text{A}$	$20\mu\text{A}$	$13\mu\text{A}$
Switching Frequency	600kHz	600kHz	120kHz^\dagger	1.7MHz	to 1.4MHz^\dagger	to 1.4MHz^\dagger	550kHz	800kHz	700kHz
Peak Efficiency	80%	91%	87%	77%	84%	84%		82%	82%
Other Features	Low-Battery Detector	High Power from Single Cell	Adj Current Limit	Tiny Components	34V Switch, Tiny Size	Single Cell Operation	Low Noise $60\mu\text{V}_{\text{RMS}}$	Soft-Start, Power Good	Tiny Size, Load Disconnect
Packages	MSOP-8 SO-8	SO-8	MSOP-8 SO-8	MSOP-8 SO-8	SOT-23	SOT-23	MSOP-8 SO-8	MSOP-8	SOT-23

*Data is shown for 5V output version; varies slightly for 3.3V output version.

†Constant off-time, variable on-time operation.

DC/DC Conversion for LCD Bias

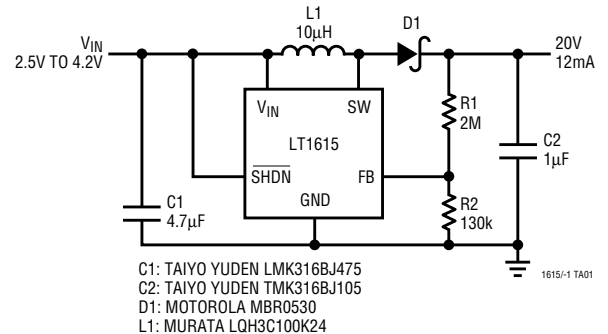
- Contrast Control for LCD Displays
- Boosted Positive or Negative Voltage Regulator with Small Size, Very Low Component Height and Long Battery Life
- Peak Current Controlled to Keep the Inductor from Saturating and to Limit Output Ripple

Inverting Converters for LCD Bias

Characteristics	LT1615	LT1615-1	LT1617	LT1617-1
Input Voltage Range	1.2V to 15V	1V to 15V	1.2V to 15V	1V to 15V
Output Voltage Range	to 34V	to 34V	to -34V	to -34V
Max Switch Current	350mA	100mA	350mA	100mA
Supply Current	30µA	30µA	30µA	30µA
Switching Frequency	to 1.4MHz*	to 1.4MHz*	to 1.4MHz*	to 1.4MHz*
Peak Efficiency	84%	84%	84%	84%
Other Features	34V Switch Tiny Size	Single Cell Operation	Tiny Size	Single Cell
Package	SOT-23	SOT-23	SOT-23	SOT-23

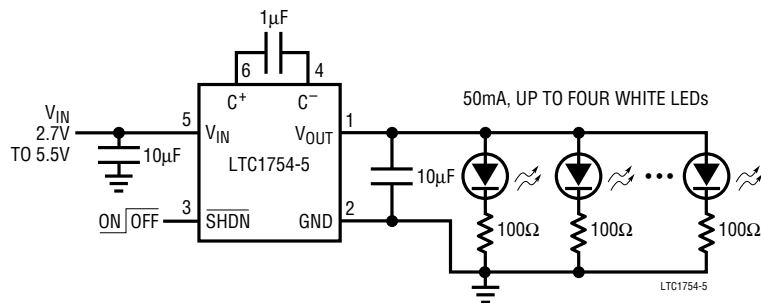
*Constant off-time, variable on-time operation.

Single Cell Li-Ion to 20V Converter for LCD Bias



Color LCD Backlight Supply (White LEDs)

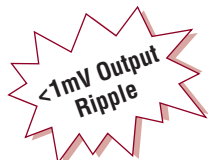
- LTC1754/LTC1751 Are Perfect for 3V to 5V Conversion to Drive White LED Backlights for Color LCD Displays
- LTC1754 is Smallest 50mA Solution
- LTC1751 Adds Power Good and Undervoltage Outputs, Plus 100mA Output
- LTC1751 Includes Soft-Start to Improve PWM Dimming
- LTC1682 for Lowest Noise: Includes LDO Post Regulator



GaAs FET Bias

LTC1550/LTC1551L: Low Noise Charge Pump Negative Bias Generators

- Low Output Ripple: Less Than 1mV_{p-p}
- High Charge Pump Frequency: 900kHz
- Small Charge Pump Capacitors: 0.1µF
- Fixed -4.1V, -2.5V, -2V or Adjustable Output
- Shutdown Mode Drops Supply Current to 0.2µA
- High Output Current: Up to 20mA
- Output Regulation: 2.5%
- MSOP and SO-8 Packages



GaAs FET Bias Generator Family

Characteristics	LTC1261L	LTC1429	LTC1550/LTC1551L
Min Input Voltage	2.7V	3V	2.7V
Quiescent Current	650µA	600µA	3.65mA
Oscillator Frequency	650kHz	to 2MHz	900kHz
Other Features	Converts 3V to -4V	-3.5V, -4V, -4.5V -5V Outputs	<1mV Output Ripple
Packages	SO-8	SO-8, SO-14	SSOP-16 MSOP-8, SO-8