Power Management for LEDs
High Performance Analog ICs
LEDs and LED Driver Technology

LEDs

A light-emitting diode (LED) is a semiconductor device that emits narrow-spectrum incoherent light when forward-biased. The color of the emitted light depends on the chemical composition of the semiconductor material used, and can be near-ultraviolet, visible or infrared. LEDs are more prevalent today than ever before, replacing traditional incandescent and fluorescent bulbs in many lighting applications. Incandescents use a heated filament, are subject to breakage and burn-out and operate at a luminous efficiency of 2% to 4%. Fluorescents are more efficient, at 7% to 12%, but require high drive voltage and contain mercury, a toxic substance that may be eventually banned in certain countries. LEDs, however, produce light directly through electroluminescence, operate at low voltage and can deliver over 20% luminous efficiency.

Key Advantages of LEDs and Their Operation Versus Alternative Lighting Sources

- High energy efficiency: LEDs are 7x to 10x more efficient at producing light (lumens) than incandescent bulbs
- Extremely long life span: Typically 100,000 hours for LEDs versus 1,000 hours for incandescent bulbs and 10,000 hours for fluorescent bulbs
- Solid state reliability
- Nearly indestructible, solid epoxy lens cases – insensitive to vibration and shocks
- Fast “turn-on” time – light up very quickly
- Compact size
- Focused light output – incandescent and fluorescent sources often require an external reflector to collect light and direct it in a usable manner
- Gradual reduction of light output over time, rather than sudden burn-out of incandescent bulbs

LEDs deliver high efficiency, a key advantage in lighting systems. Incandescent bulbs generate significant heat as part of the light-production process. This is inefficient energy use since over 95% of the energy is not converted into visible light. On the other hand, LEDs convert a much higher percentage of electrical power into light output, substantially reducing power consumption.

Key advancements in LED reliability have enabled lifetimes in excess of 100,000 hours. Recently, these have included alternative semiconductor doping techniques, new optical lens technologies and advanced heat sink and packaging techniques. Many developments are underway that will increase efficiency and lifetime even further, including improved case/housing designs, further improvements in light conversion efficiency and more thermally efficient packages for higher current operation.

LED Driver Technology

LED driver circuits are available in several topologies:

- Inductor-based Buck, Boost, Buck-Boost and SEPIC designs (these generally drive LEDs in series or multiple strings of LEDs in series):
  - LED currents range from a few milliamps to multiple amps
  - Efficiencies in excess of 90%
  - Drivers act as constant current sources
  - Many devices use high side current sense: LED string can be returned to ground
Inductorless charge pump-based Buck, Boost, Buck-Boost designs (these generally drive a single LED or LED strings in parallel):
- LED currents range from a few milliamps to 1A
- Average efficiencies over the Li-Ion battery range in excess of 80%
- Drivers act as constant current sources
- Very small solution footprints – ideal for handheld devices

Deciding which IC and topology to use depends on the following factors:
- The required LED current
- The relation of LED(s) forward voltage to the input voltage range: Buck, Boost, Buck-Boost, SEPIC or Flyback
- Efficiency – crucial for driving high brightness (HB) LEDs while minimizing thermal and battery life constraints
- Current consumption required during off-time
- Dimming characteristics – PWM dimming preserves chromatic characteristics across brightness levels and avoids color shifting
- Number of LEDs / serial or parallel
- Total solution size and cost constraints

ICs specifically designed as LED drivers tend to be smaller in size compared to general-purpose alternative solutions, increasing their appeal in space-constrained portable power applications. Popular switchmode LED driver configurations include Buck, Boost, Buck-Boost and SEPIC, and can deliver current from 3mA/LED to 3A/LED or more.

Choosing the best LED driver or display bias power IC depends on many factors and tradeoffs. Linear Technology provides targeted solutions for most applications.

Key LED Applications for Semiconductor ICs

- Automotive Lighting – Interior and Exterior
- Portable Electronic Devices
- LCD and CCD Panel Backlights
- Signaling
- Signs and Illumination
- Photo Sensors
- Commercial Lighting
- Residential Lighting

LED Driver Solutions Overview

Linear Technology offers a broad line of LED drivers including both inductor-based (for LEDs in series) and inductorless (for LEDs in parallel) converters. These are offered in several different topologies, providing the highest efficiency, lowest noise and smallest footprints. Other features include integrated Schottky diodes, accurate LED current matching, a variety of dimming options and multiple output capability.

This selection guide features Linear Technology solutions for a wide variety of LED driver applications. For more information on our latest products, visit our website at www.linear.com.
High Current LED Driver ICs (>350mA)

Switching Regulator-Based (Inductor), LEDs in Series
- Buck
- Boost
- Buck-Boost
- SEPIC-Flyback
- Photoflash/Camera Torch

Charge Pump-Based (Inductorless), LEDs in Parallel
- Single Output – Camera Flash/Torch

Medium Current LED Driver ICs (100-350mA)

Switching Regulator-Based (Inductor), LEDs in Series
- Buck
- Boost
- Buck-Boost
- Multidisplay

Low Current LED Driver ICs (20mA to 90mA)

Switching Regulator-Based (Inductor), LEDs in Series
- Multidisplay
- Buck for Large Panel TFT LCDs
- Boost
- Charge Pump-Based (Inductorless), LEDs in Parallel
- Multidisplay
- General Purpose

Multichannel LED Drivers for Large LCD Panels (30mA to 50mA)

OLED
- Switching Regulator Based (Inductor)
- LCD & CCD Bias

Series LED Driver ICs

Parallel LED Driver ICs
High Current (350mA to 10A) LED Drivers – Buck

High-current inductor-based step-down switching LED drivers provide tiny, efficient high power LED lighting solutions for automotive, architectural and display backlighting. Key features include wide-ranging True Color PWM™ dimming, wide input voltage range, high side sensing and high switching frequency.

**Applications:**
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

**LT3756: 100V High Voltage Full Featured LED Driver**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x ILED from 24VIN</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>ISW (A)</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
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<tbody>
<tr>
<td>LT3474/-1</td>
<td>Buck</td>
<td>400:1 PWM</td>
<td>4 x 1A</td>
<td>Series</td>
<td>3 to 30 (40V_{max})</td>
<td>15/25</td>
<td>1.5</td>
<td>88</td>
<td>TSSOP-16E</td>
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<td>Buck</td>
<td>10:1 Analog</td>
<td>4 x 500mA</td>
<td>Series</td>
<td>4 to 36</td>
<td>30</td>
<td>0.8</td>
<td>88</td>
<td>2x2 DFN-10 MSOP-10E</td>
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<td>Buck</td>
<td>5000:1 PWM</td>
<td>5 x 1A</td>
<td>Series</td>
<td>3 to 30 (40V_{max})</td>
<td>40</td>
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<td>92</td>
<td>4x4 QFN-16 TSSOP-16E</td>
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<td>Buck</td>
<td>5000:1 PWM</td>
<td>5 x 1.5A</td>
<td>Series</td>
<td>3 to 30 (40V_{max})</td>
<td>40</td>
<td>2.3</td>
<td>92</td>
<td>4x4 QFN-16 TSSOP-16E</td>
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<td>LT3496</td>
<td>Triple Buck</td>
<td>3000:1 PWM</td>
<td>3 x 5 x 0.5A</td>
<td>3 x Series Strings</td>
<td>3 to 30 (40V_{max})</td>
<td>40</td>
<td>3 x 0.75</td>
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<td>3000:1 PWM</td>
<td>2 x 4 x 1.5A</td>
<td>2 x Series Strings</td>
<td>4 to 36</td>
<td>15/25</td>
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<td>TSSOP-20E</td>
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<td>LT3478/-1</td>
<td>Buck</td>
<td>3000:1 PWM</td>
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<td>Series</td>
<td>2.7 to 36</td>
<td>30</td>
<td>4.5</td>
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<td>TSSOP-16E</td>
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<td>Quad Buck</td>
<td>1000:1 PWM</td>
<td>4 x 5 x 1A</td>
<td>4 x Series Strings</td>
<td>2.8 to 36</td>
<td>30</td>
<td>4 x 1.5</td>
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<td>LTC3783</td>
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<td>3000:1 PWM</td>
<td>5 x 1A +</td>
<td>Series</td>
<td>3 to 36</td>
<td>36</td>
<td>Ext FET</td>
<td>95</td>
<td>4x5 DFN-16 TSSOP-16</td>
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<td>Buck</td>
<td>3000:1 PWM</td>
<td>5 x 1A +</td>
<td>Series</td>
<td>4.5 to 40</td>
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<td>Ext FET</td>
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<td>LT3756</td>
<td>Buck</td>
<td>3000:1 PWM</td>
<td>5 x 1A +</td>
<td>Series</td>
<td>6 to 100</td>
<td>100</td>
<td>Ext FET</td>
<td>96</td>
<td>3x3 QFN-16 MSOP-16E</td>
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</table>

**Applications:**
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

**LT3756: Actual Size, Complete Solution**

**Buck Mode 1A LED Driver with High Dimming Ratio and Open LED Reporting**

**Efficiency vs VIN**

**Diagram**
High Current (350mA to 10A) LED Drivers – Boost

High current inductor-based step-up switching LED drivers provide compact, efficient high power LED lighting solutions for automotive, architectural and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing and high switching frequency.

**Applications:**
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

**LT3755: 75V High Voltage Full Featured LED Driver**

![LT3755 Circuit Diagram]

### Table: High Current (350mA to 10A) LED Drivers – Boost

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x I_LED from 12V_IN</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I_OUT (A)*</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
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<td>Dual Boost</td>
<td>1000:1 PWM</td>
<td>2 x 5 x 350mA</td>
<td>2x Series Strings</td>
<td>2.7 to 24</td>
<td>35</td>
<td>2 x 1.3</td>
<td>85</td>
<td>3x5 DFN-16</td>
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<td>Boost</td>
<td>5000:1 PWM</td>
<td>8 x 350mA</td>
<td>Series</td>
<td>3 to 30 (40V_MAX)</td>
<td>45</td>
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<td>87</td>
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<td>Boost</td>
<td>Analog/PWM</td>
<td>6 x 350mA</td>
<td>Series</td>
<td>1.6 to 18</td>
<td>36</td>
<td>1.5</td>
<td>85</td>
<td>3x3 DFN-10 MSOP-10</td>
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<td>Boost</td>
<td>5000:1 PWM</td>
<td>11 x 350mA</td>
<td>Series</td>
<td>3 to 30 (40V_MAX)</td>
<td>45</td>
<td>2.3</td>
<td>87</td>
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<tr>
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<td>Triple Boost</td>
<td>3000:1 PWM</td>
<td>3 x 4 x 350mA</td>
<td>3 x Series Strings</td>
<td>3 to 30 (40V_MAX)</td>
<td>45</td>
<td>3 x 0.75</td>
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<td>3000:1 PWM</td>
<td>10 x 700mA</td>
<td>Series</td>
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<td>40</td>
<td>4.5</td>
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<td>TSSOP-16E</td>
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<td>Quad Boost</td>
<td>1000:1 PWM</td>
<td>4 x 8 x 350mA</td>
<td>4 x Series Strings</td>
<td>2.8 to 16</td>
<td>36</td>
<td>4 x 1.5</td>
<td>87</td>
<td>5x7 QFN-38</td>
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<tr>
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<td>Boost</td>
<td>3000:1 PWM 10:1 Analog</td>
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<td>Series</td>
<td>3 to 36+</td>
<td>36</td>
<td>Ext FET</td>
<td>93</td>
<td>4x5 DFN-16 TSSOP-16E</td>
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<tr>
<td>LT3755/-1</td>
<td>Boost</td>
<td>3000:1 PWM</td>
<td>15 x 1A</td>
<td>Series</td>
<td>4.5 to 40</td>
<td>75</td>
<td>Ext FET</td>
<td>93</td>
<td>3x3 QFN-16 MSOP-16E</td>
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<tr>
<td>LT3756</td>
<td>Boost</td>
<td>3000:1 PWM</td>
<td>25 x 0.5A</td>
<td>Series</td>
<td>6 to 100</td>
<td>100</td>
<td>Ext FET</td>
<td>93</td>
<td>3x3 QFN-16 MSOP-16E</td>
</tr>
</tbody>
</table>

* I_OUT = 0.65 I_MAX (V_IN / V_MAX). Estimate: may vary depending on external component selection.
High Current (350mA to 10A) LED Drivers – Buck-Boost

High current inductor-based buck-boost switching LED drivers provide flexible, tiny, efficient solutions for TFT backlighting, automotive and avionic lighting applications. Key features include high current, high voltage switches, adjustable LED currents, wide input voltage range, and high switching frequency.

**LT3476: High Current Quad Output LED Driver**

**Applications:**
- RGGB Lighting
- Automotive and Avionic Lighting
- TFT LCD Backlighting
- Constant-Current Sources

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**Part Number** | **Topology** | **Dimming Type** | **Max # of LEDs x \(I_{LED}\) from 12\(V_{IN}\)** | **LED Configuration** | **Input Voltage Range (V)** | **Max. Output Voltage (V)** | **\(I_{SW}\) (A)** | **Operating Efficiency (%)** | **Package**
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
LT3517 | Buck-Boost | 5000:1 PWM | 6 x 350mA | Series | 3 to 30 (40\(V_{IN}\)) | 45 | 1.5 | 80 | 4x4 QFN-16 TSSOP-16E
LT3518 | Buck-Boost | 5000:1 PWM | 6 x 500mA | Series | 3 to 30 (40\(V_{IN}\)) | 45 | 2.3 | 80 | 4x4 QFN-16 TSSOP-16E
LT3496 | Triple Buck-Boost | 3000:1 PWM | 3 x 350mA | Series | 3 to 30 (40\(V_{IN}\)) | 45 | 3 x 0.75 | 80 | 4x5 QFN-28
LT3478/-1 | Buck-Boost | 3000:1 PWM | 5 x 700mA | Series | 2.7 to 36 | 40 | 4.5 | 80 | TSSOP-16E
LT3476 | Quad Buck-Boost | 1000:1 PWM | 4 x 5 x 350mA | 4 x Series Strings | 2.8 to 16 | 36 | 4 x 1.5 | 80 | 5x7 QFN-38
LTC3783 | Buck-Boost | 3000:1 PWM 10:1 Analog | 6 x 1A | Series | 3 to 36+ | 36 | Ext FET | 85 | 4x5 DFN-16 TSSOP-16
LT3755/-1 | Buck-Boost | 3000:1 PWM | 10 x 1A | Series | 4.5 to 40 | 75 | Ext FET | 85 | 3x3 QFN-16 MSOP-16E
LT3756 | Buck-Boost | 3000:1 PWM | 15 x 1A | Series | 6 to 100 | 100 | Ext FET | 85 | 3x3 QFN-16 MSOP-16E
High Current (350mA to 10A) LED Drivers – SEPIC and Flyback

High current inductor-based multistep switching LED drivers provide flexible solutions for high voltage LED arrays. Key features include high current, wide input voltage range, scalable output voltage, and wide-ranging True Color dimming.

Applications:
- High Power LED Applications
- Industrial
- Automotive

LT3755: 75V High Voltage Full Featured LED Driver

<table>
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<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x I_{LED} from 12 V_{IN}</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I_{SW} (A)</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
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<tr>
<td>LT3517</td>
<td>SEPIC/FlyBack</td>
<td>PWM</td>
<td>4 x 350mA</td>
<td>Series</td>
<td>3 to 30</td>
<td>45°</td>
<td>1.5</td>
<td>80</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3518</td>
<td>SEPIC/FlyBack</td>
<td>PWM</td>
<td>6 x 350mA</td>
<td>Series</td>
<td>3 to 30</td>
<td>45°</td>
<td>2.3</td>
<td>80</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3478/-1</td>
<td>SEPIC/FlyBack</td>
<td>PWM</td>
<td>6 x 500mA</td>
<td>Series</td>
<td>2.7 to 36</td>
<td>40°</td>
<td>4.5</td>
<td>80</td>
<td>TSSOP-16E</td>
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<tr>
<td>LT3476</td>
<td>Quad SEPIC/ FlyBack</td>
<td>PWM</td>
<td>4 x 3 x 350mA</td>
<td>4 x Series Strings</td>
<td>2.8 to 16</td>
<td>36°</td>
<td>4 x 1.5</td>
<td>80</td>
<td>5x7 QFN-38</td>
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<td>LTC3783</td>
<td>SEPIC/FlyBack</td>
<td>PWM 10:1 Analog</td>
<td>6 x 1A</td>
<td>Series</td>
<td>3 to 36+</td>
<td>Limited by ext. FET</td>
<td>Ext FET</td>
<td>85</td>
<td>4x5 DFN-16 TSSOP-16</td>
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<td>LT3755/-1</td>
<td>SEPIC/FlyBack</td>
<td>PWM</td>
<td>6 x 1A</td>
<td>Series</td>
<td>4.5 to 40</td>
<td>75</td>
<td>Ext FET</td>
<td>85</td>
<td>3x3 QFN-16 MSOP-16E</td>
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<tr>
<td>LT3756</td>
<td>SEPIC/FlyBack</td>
<td>PWM</td>
<td>8 x 1A</td>
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<td>6 to 100</td>
<td>100</td>
<td>Ext FET</td>
<td>90</td>
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\[ V_{IN} = V_{OUT} \]

LT3755: SEPIC Demo Circuit. Actual Size, Complete Solution

SEPIC Efficiency vs V_{IN}
Medium to High Current (100mA to 1A) LED Drivers for Photoflash/Torch Lighting

High current inductor-based switching LED drivers for camera photoflash, torch and video lighting feature various topologies including buck-boost and boost and provide tiny, efficient high power solutions for camera phone applications.

Applications:
- Cell Phone Camera Flash
- Cell Phone Torch Lighting
- Digital Cameras
- PDAs
- Miscellaneous Li-Ion/Polymer-Based LED Driver Applications

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>$V_{IN}$ (V)</th>
<th>$V_{OUT}$ (V)*</th>
<th>Max. Total LED Current (mA)*</th>
<th>Max. No. of White LEDs</th>
<th>Dimming Control</th>
<th>Frequency (MHz)</th>
<th>$I_Q$ (mA)</th>
<th>$I_{SD}$ (µA)</th>
<th>Package</th>
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<td>Buck-Boost</td>
<td>2.7 to 5.5</td>
<td>4.5</td>
<td>200</td>
<td>4</td>
<td>DC/PWM</td>
<td>1</td>
<td>0.6</td>
<td>&lt;1</td>
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<td>LTC3490</td>
<td>Boost</td>
<td>1.0 to 3.2</td>
<td>4</td>
<td>350</td>
<td>1</td>
<td>DC/PWM</td>
<td>1.3</td>
<td>1</td>
<td>&lt;50</td>
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<td>500</td>
<td>1</td>
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<td>1</td>
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<td>&lt;6</td>
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<td>Buck-Boost</td>
<td>1.6 to 18</td>
<td>34</td>
<td>500</td>
<td>1</td>
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<td>1.8</td>
<td>&lt;1</td>
<td>MSOP-10</td>
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<td>1A</td>
<td>1</td>
<td>DC/PWM</td>
<td>1</td>
<td>0.8</td>
<td>&lt;1</td>
<td>3x3 DFN-10</td>
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</table>

* Output voltage and current depend on the choice of external components
High Current LED Drivers for Camera Flash/Torch – Inductorless

Our family of inductorless charge pump-based camera LED driver products offers high efficiency and low ripple and can be used to boost an input voltage to drive high current LEDs for camera torch (continuous) and flash applications. By eliminating the inductor, these switched capacitor converters provide a small solution footprint and a simple design.

Applications:
- LED Camera Light Supply for Cellphones/DSCs/PDAs

LTC3218: 400mA Single Wire Camera LED Charge Pump

<table>
<thead>
<tr>
<th>Part Number</th>
<th>V_IN (V)</th>
<th>Conversion Ratio/Boost Factor</th>
<th>Total LED Current (mA)</th>
<th>Max. # of White LEDs x I_LED</th>
<th>Dimming Control</th>
<th>Maximum Operating Efficiency** (%)</th>
<th>Frequency (MHz)</th>
<th>I_Q (mA)</th>
<th>I_SD (µA)</th>
<th>Package</th>
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<tbody>
<tr>
<td>LTC3218</td>
<td>2.9 to 4.5</td>
<td>1x/2x</td>
<td>400</td>
<td>1 x 400mA*</td>
<td>Resistor/PWM</td>
<td>92</td>
<td>1</td>
<td>0.98</td>
<td>&lt;1</td>
<td>2x3 DFN-10</td>
</tr>
<tr>
<td>LTC3214</td>
<td>2.9 to 4.4</td>
<td>1x/1.5x/2x</td>
<td>500</td>
<td>1 x 500mA*</td>
<td>Resistor/PWM</td>
<td>85</td>
<td>0.9</td>
<td>0.98</td>
<td>&lt;2.5</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LTC3217</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>600</td>
<td>4 x 150mA*</td>
<td>Resistor/PWM</td>
<td>86</td>
<td>0.9</td>
<td>0.4</td>
<td>&lt;4</td>
<td>3x3 QFN-16</td>
</tr>
<tr>
<td>LTC3215</td>
<td>2.9 to 4.4</td>
<td>1x/1.5x/2x</td>
<td>700</td>
<td>1 x 700mA*</td>
<td>Resistor/PWM</td>
<td>90</td>
<td>0.9</td>
<td>0.3</td>
<td>&lt;2.5</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LTC3216</td>
<td>2.9 to 4.4</td>
<td>1x/1.5x/2x</td>
<td>1000</td>
<td>1 x 1A*</td>
<td>Resistor/PWM</td>
<td>90</td>
<td>0.9</td>
<td>0.3</td>
<td>&lt;2.5</td>
<td>3x4 DFN-12</td>
</tr>
</tbody>
</table>

* Flash Mode
** Dependent on V_IN, V_LED, I_LED

Efficiency vs V_IN
Medium Current (100mA to 350mA) LED Drivers – Buck

Medium-current inductor-based step-down switching LED drivers provide tiny, efficient high power LED lighting solutions for automotive, architectural and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing and high switching frequency.

Applications:
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

LT3592: 500mA Wide Input Voltage Range Step-Down LED Driver with 10:1 Dimming

LED Power Efficiency vs $I_{LED}$

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x $I_{LED}$ from $24V_{in}$</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>$I_{SW}$ (A)</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT3591</td>
<td>Buck</td>
<td>80:1 PWM</td>
<td>5 x 200mA</td>
<td>Series</td>
<td>2.5 to 12</td>
<td>30</td>
<td>0.5</td>
<td>92</td>
<td>2x3 DFN-8</td>
</tr>
<tr>
<td>LT3517</td>
<td>Buck</td>
<td>5000:1 PWM</td>
<td>5 x 300mA</td>
<td>Series (40$V_{mos}$)</td>
<td>30</td>
<td>1.5</td>
<td>92</td>
<td></td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3592</td>
<td>Buck</td>
<td>10%/100% Analog</td>
<td>6 x 350mA</td>
<td>Series (60$V_{mos}$)</td>
<td>32</td>
<td>0.8</td>
<td>92</td>
<td></td>
<td>2x3 DFN-10 MSOP-10E</td>
</tr>
<tr>
<td>LT3496</td>
<td>Buck</td>
<td>3000:1 PWM</td>
<td>3 x 5 x 300mA</td>
<td>3 x Multiple Series Strings (40$V_{mos}$)</td>
<td>30</td>
<td>3 x 0.75</td>
<td>92</td>
<td></td>
<td>4x5 QFN-28</td>
</tr>
</tbody>
</table>
Medium Current (100mA to 350mA) LED Drivers – Boost

Applications:
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

### Efficiency vs \( I_{LED} \)

**LT3496**: Triple Output LED Driver

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x ( I_{LED} ) from 12( V_{IN} )</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>( I_{SW} ) (A)*</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT3486</td>
<td>Dual Boost</td>
<td>1000:1</td>
<td>2 x 8 x 100mA</td>
<td>2 x Series Strings</td>
<td>2.7 to 24</td>
<td>35</td>
<td>2 x 1.3</td>
<td>87</td>
<td>3x5 DFN-16</td>
</tr>
<tr>
<td>LT3517</td>
<td>Boost</td>
<td>5000:1</td>
<td>10 x 200mA</td>
<td>Series</td>
<td>3 to 30 (40( V_{MAX} ))</td>
<td>45</td>
<td>1.5</td>
<td>87</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3518</td>
<td>Boost</td>
<td>5000:1</td>
<td>10 x 300mA</td>
<td>Series</td>
<td>3 to 36 (60( V_{MAX} ))</td>
<td>45</td>
<td>2.3</td>
<td>87</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3496</td>
<td>Triple Boost</td>
<td>3000:1</td>
<td>3 x 10 x 100mA</td>
<td>3 x Series Strings</td>
<td>3 to 30 (40( V_{MAX} ))</td>
<td>45</td>
<td>3 x 0.75</td>
<td>87</td>
<td>4x5 QFN-28</td>
</tr>
</tbody>
</table>

* \( I_{SW} = 0.65 \times \frac{I_{LED}}{V_{IN}} \). Estimate may vary depending on external component selection.
Medium Current (100mA to 350mA) LED Drivers – Buck-Boost

Applications:
- Automotive and Avionic Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

LT3518: Full-Featured LED Driver with 2.3A Switch Current

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Topology</th>
<th>Dimming Type</th>
<th>Max # of LEDs x I&lt;sub&gt;LED&lt;/sub&gt; from 12V&lt;sub&gt;IN&lt;/sub&gt;</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I&lt;sub&gt;sw&lt;/sub&gt; (A)*</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT3517</td>
<td>Buck-Boost</td>
<td>5000:1 PWM</td>
<td>6 x 300mA</td>
<td>Series</td>
<td>3 to 30 (40V&lt;sub&gt;MAX&lt;/sub&gt;)</td>
<td>45</td>
<td>1.5</td>
<td>80</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3518</td>
<td>Buck-Boost</td>
<td>5000:1 PWM</td>
<td>8 x 300mA</td>
<td>Series</td>
<td>3 to 36 (60V&lt;sub&gt;MAX&lt;/sub&gt;)</td>
<td>45</td>
<td>2.3</td>
<td>80</td>
<td>4x4 QFN-16 TSSOP-16E</td>
</tr>
<tr>
<td>LT3496</td>
<td>Triple</td>
<td>3000:1 PWM</td>
<td>3 x 6 x 100mA</td>
<td>3 x Series Strings</td>
<td>3 to 30 (40V&lt;sub&gt;MAX&lt;/sub&gt;)</td>
<td>45</td>
<td>3 x 0.75</td>
<td>80</td>
<td>4x5 QFN-28</td>
</tr>
</tbody>
</table>

* I<sub>sw</sub> = 0.65 I<sub>LED</sub> x (V<sub>MAX</sub> / V<sub>IN</sub>). Estimate: may vary depending on external component selection.
Low to Medium Current (20-200mA/LED) Multidisplay LED Drivers – Inductor Based

Multidisplay inductor-based white LED drivers are capable of driving up to 20 white LEDs from a single cell Li-Ion input. Key features include high-voltage internal power switches, internal Schottky diodes, adjustable switching frequency, DC dimming control, open LED protection and optimized internal compensation. They are ideal solutions for multipanel LCD backlight applications or space-constrained portable applications such as cellular phones, PDAs and digital cameras.

Applications:
- Main/Sub-Displays
- Digital Cameras, Sub-Notebook PCs
- PDAs, Handheld Computers
- Automotive

LT3486: Dual 1.3A White LED Step-Up Converter with 1000:1 Dimming Range

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Type</th>
<th>Dimming Type</th>
<th>Max # of LEDs x I_{out}*</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I_{out} (mA)</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT3466-1</td>
<td>LED Driver and Boost Converter</td>
<td>DC/PWM</td>
<td>10 x 25mA</td>
<td>Series</td>
<td>2.7 to 24</td>
<td>39.4</td>
<td>2 x 320</td>
<td>84</td>
<td>3x3 DFN-10 TSSOP-16E</td>
</tr>
<tr>
<td>LT3466</td>
<td>Dual LED Driver</td>
<td>DC/PWM</td>
<td>2 x 25 x 25mA</td>
<td>Dual Series Strings</td>
<td>2.7 to 24</td>
<td>39.4</td>
<td>2 x 320</td>
<td>84</td>
<td>3x3 DFN-10 TSSOP-16E</td>
</tr>
<tr>
<td>LTC3452</td>
<td>Synchronous Buck-Boost LED Driver</td>
<td>DC/PWM</td>
<td>5 x 20mA + 1 x 200mA</td>
<td>Parallel</td>
<td>2.7 to 5.5</td>
<td>4.5</td>
<td>1A</td>
<td>88</td>
<td>4x4 QFN-20</td>
</tr>
<tr>
<td>LT3486</td>
<td>Dual LED Driver</td>
<td>1000:1 PWM</td>
<td>2 x 8 x 100mA</td>
<td>Dual Series Strings</td>
<td>2.7 to 24</td>
<td>35.4</td>
<td>2 x 1.3A</td>
<td>85</td>
<td>3x4 DFN-16 TSSOP-16E</td>
</tr>
</tbody>
</table>

* Dependent on Input Voltage, number of LEDs from a 12V Input
Low Current (20mA to 50mA) LED Drivers – Buck

Low current inductor-based step-down switching LED drivers provide tiny, efficient high power LED lighting solutions for automotive, architectural and display backlighting. Key features include wide-ranging True Color PWM dimming, wide input voltage range, high side sensing and high switching frequency.

Applications:
- Automotive and Avionics Lighting
- Architectural Detail Lighting
- Display Backlighting
- Constant Current Sources

### LT3590: 48V Buck Mode 50mA LED Driver in 2mm x 2mm DFN

**Part Number** | **Topology** | **Dimming Type** | **Max # of LEDs x I_{LED} from 40V_{IN}** | **LED Configuration** | **Input Voltage Range (V)** | **Max. Output Voltage (V)** | **I_{SW} (mA)** | **Operating Efficiency (%)** | **Package**
--- | --- | --- | --- | --- | --- | --- | --- | --- | ---
LT3590 | Buck | 10:1 DC | 8 x 50mA | Series | 4.5 to 55 | 40 | 80 | 90 | 2x2 DFN-6 SC-70
LT3517 | Buck | 5000:1 PWM | 8 x 50mA | Series | 3 to 30 (40V_{MAX}) | 40 | 1.5A | 92 | 4x4 QFN-16 TSSOP-16E
LT3595 | 16-Channel Buck | 5000:1 PWM | 16 x 10 x 50mA | 16 x Multiple Series Strings | 4.5 to 45 | 45 | 16 x 0.09 | 92 | 5x9 QFN-56
LT3496 | Buck | 3000:1 PWM | 3 x 8 x 50mA | 3 x Multiple Series Strings | 3 to 30 (40V_{MAX}) | 40 | 3 x 0.75 | 95 | 4x5 QFN-28
Low Current (20mA to 50mA) LED Drivers – Boost

LT3593: 1MHz White LED Driver with Digitally Controlled Current

Conversion Efficiency

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Type Description</th>
<th>Dimming Type</th>
<th>Max # of LEDs x I_{out}^* ( (V_{in}=3.6\text{V}) )</th>
<th>LED Configuration</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I_{out} (mA)^*</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LT3491</td>
<td>Boost LED Driver</td>
<td>300:1 PWM</td>
<td>6 x 25mA</td>
<td>Series</td>
<td>2.5 to 12</td>
<td>27</td>
<td>260</td>
<td>76</td>
<td>SC70</td>
</tr>
<tr>
<td>LT3498</td>
<td>Boost LED Driver</td>
<td>DC/PWM</td>
<td>6 x 20mA</td>
<td>Series</td>
<td>2.5 to 12</td>
<td>32</td>
<td>300 + 180</td>
<td>77</td>
<td>2x3 DFN-12</td>
</tr>
<tr>
<td>LT3591</td>
<td>Boost LED Driver</td>
<td>90:1 PWM</td>
<td>10 x 25mA</td>
<td>Series</td>
<td>2.5 to 12</td>
<td>42</td>
<td>450</td>
<td>77</td>
<td>2x3 DFN-8</td>
</tr>
<tr>
<td>LT3593</td>
<td>Boost LED Driver</td>
<td>32:1 Digital</td>
<td>10 x 25mA</td>
<td>Series</td>
<td>2.5 to 5.5</td>
<td>45</td>
<td>550</td>
<td>80</td>
<td>2x2 DFN-6 ThinSOT</td>
</tr>
<tr>
<td>LT3497</td>
<td>Dual Boost LED Driver</td>
<td>250:1 PWM</td>
<td>2 x 6 x 20mA</td>
<td>2 Parallel Series Strings of 6</td>
<td>2.5 to 10</td>
<td>32</td>
<td>2 x 300</td>
<td>77</td>
<td>2x3 DFN-10</td>
</tr>
<tr>
<td>LT3466</td>
<td>Dual Boost LED Driver</td>
<td>DC/PWM</td>
<td>2 x 10 x 25mA</td>
<td>2 Parallel Series Strings of 10</td>
<td>2.7 to 24</td>
<td>40</td>
<td>2 x 320</td>
<td>84</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LT3466-1</td>
<td>Boost LED Driver + Boost</td>
<td>DC/PWM</td>
<td>10 x 25mA</td>
<td>Series</td>
<td>2.7 to 24</td>
<td>40</td>
<td>2 x 320</td>
<td>84</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LT3598</td>
<td>6-Channel Buck LED Driver</td>
<td>1000:1 PWM</td>
<td>6 x 10 x 30mA</td>
<td>6 x Multiple Series Strings</td>
<td>3 to 30 ( (40V_{in}) )</td>
<td>44</td>
<td>1.5A</td>
<td>88</td>
<td>4x4 QFN-24</td>
</tr>
<tr>
<td>LT1942</td>
<td>Quad DC/DC Converter and LED Driver</td>
<td>DC/PWM</td>
<td>12 x 25mA</td>
<td>2 Parallel Series Strings of 6</td>
<td>2.6 to 16</td>
<td>44</td>
<td>550</td>
<td>77</td>
<td>4x4 QFN-24</td>
</tr>
</tbody>
</table>

*I_{out} = 0.65 I_{out} \times (N_{out} / V_{in})*. Estimate: may vary depending on external component selection.
Multichannel LED Drivers for Large LCD Panels (30mA to 50mA)

**LT3598: 1.5A Boost Converter with 6-Channel 30mA LED Driver**
- Drives Six Strings of LEDs at Up to 30mA
- 2% Accurate LED Current Regulation
- Wide Input Voltage Range:
  - Operation from 3V to 30V
  - Transient Protection to 40V
- Output Voltage Up to 50V
- Regulates Current Even When $V_{IN} > V_{OUT}$
- Disconnects LEDs in Shutdown
- Analog and PWM Dimming Control
- Programmable Open LED Protection (Regulated)
- OPENLED Alert Pin
- Programmable LED Temperature Derating
- Adjustable Frequency: 200kHz to 2.5MHz
- Synchronizable to an External Clock
- 4mm x 4mm QFN-24 Package

**LT3598: Actual Size, Complete Solution**
Multichannel LED Drivers for Large LCD Panels (30mA to 50mA)

**LT3595: 16-Channel Buck Mode 50mA LED Driver**

- 4.5V to 45V Input Supply Range
- Up to 50mA LED Current per Channel
- 100mA, 45V Internal Switches
- 8% Relative LED Current Match at 20mA
- 16 Independent LED Channels
- 5000:1 True Color PWM Dimming Range
- LEDs Disconnected in Shutdown
- Internal Schottky Diodes
- Low Quiescent Current
- 2MHz Switching Frequency
- \( R_{\text{SET}} \) Pin Sets Master LED Current
- Typical Efficiency: 92%

**Conversion Efficiency**

- 5000:1 PWM Dimming at 100Hz

**30W LED Driver for 160 LEDs (16 Strings, 10 LEDs per String) at 50mA**

LT3595: Actual Size, Complete Solution
**Low Current Multidisplay LED Drivers – Inductorless**

Our family of inductorless, charge pump-based multidisplay LED drivers feature the highest level of integration, smallest footprint and highest efficiency. Individual display driver outputs eliminate the need for ballast resistors, while the universal topology enables an even higher level of design flexibility without display type restrictions. These ICs optimize designs for a wide range of applications, from general illumination and keypads to portable products such as multidisplay cellular phones and high current/high resolution camera flash devices.

### Applications:
- Video Phones with QVGA+ Displays
- Keyboard Lighting
- General Lighting

---

#### LTC3220/-1: 360mA Universal 18-Channel LED Driver

![Diagram of LTC3220/-1](image)

---

<table>
<thead>
<tr>
<th>Part Number</th>
<th>$V_{IN}$ (V)</th>
<th>Conversion Ratio/Boost Factor</th>
<th>Total LED Current (mA)</th>
<th>Max. # of White LEDs x $I_{LED}$</th>
<th>Display Types</th>
<th>Number of Displays</th>
<th>Dimming Control</th>
<th>Maximum Operating Efficiency*** (%)</th>
<th>Frequency (MHz)</th>
<th>$I_{LP}$ (µA)</th>
<th>$I_{LED}$ (µA)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTC3212</td>
<td>2.7 to 5.5</td>
<td>1x/2x</td>
<td>75</td>
<td>3”x25mA</td>
<td>RGB</td>
<td>3</td>
<td>1-wire</td>
<td>81</td>
<td>0.9</td>
<td>400</td>
<td>&lt;3</td>
<td>2x3 DFN-12</td>
</tr>
<tr>
<td>LTC3230</td>
<td>2.7 to 5.5</td>
<td>1x/1.5x/2x</td>
<td>125</td>
<td>5x25mA</td>
<td>Main, Sub, + 2 LDOs</td>
<td>2</td>
<td>1-wire</td>
<td>91</td>
<td>0.8</td>
<td>400</td>
<td>&lt;3</td>
<td>3x3 QFN-20</td>
</tr>
<tr>
<td>LTC3219</td>
<td>2.9 to 5.5</td>
<td>1x/1.5x/2x</td>
<td>250</td>
<td>9x28mA</td>
<td>Universal</td>
<td>Up to 9</td>
<td>PC</td>
<td>91</td>
<td>0.85</td>
<td>400</td>
<td>&lt;2</td>
<td>3x3 QFN-20</td>
</tr>
<tr>
<td>LTC3220</td>
<td>2.9 to 5.5</td>
<td>1x/1.5x/2x</td>
<td>360</td>
<td>18x20mA</td>
<td>Universal</td>
<td>Up to 18</td>
<td>PC</td>
<td>91</td>
<td>0.85</td>
<td>500</td>
<td>&lt;4</td>
<td>4x4 UTQFN-28</td>
</tr>
<tr>
<td>LTC3206</td>
<td>2.8 to 4.5</td>
<td>1x/1.5x</td>
<td>400</td>
<td>(5+3+3)x35mA</td>
<td>Main, SUB, RGB</td>
<td>3</td>
<td>SPI*</td>
<td>90</td>
<td>1</td>
<td>180</td>
<td>&lt;1</td>
<td>4x4 QFN-24</td>
</tr>
<tr>
<td>LTC3210/-1</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>500</td>
<td>4x25mA + 1**x400mA</td>
<td>Main, CAM</td>
<td>2</td>
<td>1-wire</td>
<td>93</td>
<td>0.8</td>
<td>400</td>
<td>&lt;3</td>
<td>3x3 QFN-16</td>
</tr>
<tr>
<td>LTC3209-1</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>600</td>
<td>6x25mA + 1x15mA + 1**x400mA</td>
<td>Main, Aux, CAM</td>
<td>3</td>
<td>PC</td>
<td>94</td>
<td>0.85</td>
<td>400</td>
<td>&lt;3</td>
<td>4x4 QFN-20</td>
</tr>
<tr>
<td>LTC3209-2</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>600</td>
<td>5x25mA + 1x15mA + 2**x200mA</td>
<td>Main, Aux, CAM</td>
<td>3</td>
<td>PC</td>
<td>94</td>
<td>0.85</td>
<td>400</td>
<td>&lt;3</td>
<td>4x4 QFN-20</td>
</tr>
<tr>
<td>LTC3207</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>600</td>
<td>12x28mA + 1**x425mA</td>
<td>Universal, CAM</td>
<td>Up to 13</td>
<td>PC</td>
<td>91</td>
<td>0.85</td>
<td>500</td>
<td>&lt;2</td>
<td>4x4 QFN-24</td>
</tr>
<tr>
<td>LTC3208</td>
<td>2.9 to 4.5</td>
<td>1x/1.5x/2x</td>
<td>1000</td>
<td>(4+2+3+4)x27.5mA + 4x100mA</td>
<td>Main, SUB, RGB, Aux, CAM</td>
<td>5</td>
<td>PC</td>
<td>95</td>
<td>0.85</td>
<td>250</td>
<td>&lt;1</td>
<td>5x5 QFN-32</td>
</tr>
</tbody>
</table>

* Serial Peripheral Interface  
** High Current Camera LED >=200-425mA  
*** Dependent on $V_{IN}$, $V_{LED}$, $I_{LED}$  
* Different I2C address  
** Red, Green, Blue LEDs
Low Current General Purpose LED Drivers – Inductorless

Our family of charge pumps includes the widest selection of simple and compact inductorless DC/DC converter designs. These step-up converters offer low ripple and can be used to boost an input voltage to drive parallel LEDs. By eliminating the inductor, these switched capacitor converters provide a small solution footprint and a simple design. The ICs efficiently drive low current white LEDs for a wide range of applications.

Applications:
- 2 AA Cell to 3.3V
- Li-Ion/Polymer to 5V
- USB On-the-Go Devices
- LED Drivers
- Handheld Devices

<table>
<thead>
<tr>
<th>Applications:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 AA Cell to 3.3V</td>
</tr>
<tr>
<td>Li-Ion/Polymer to 5V</td>
</tr>
<tr>
<td>USB On-the-Go Devices</td>
</tr>
<tr>
<td>LED Drivers</td>
</tr>
<tr>
<td>Handheld Devices</td>
</tr>
</tbody>
</table>

LTC3204/B: Low Noise, Miniature 2x2 DFN Regulated Charge Pump Doubler

LTC3204/B: Actual Size, Complete Solution

![Diagram](image)

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Dimming Type</th>
<th># of LEDs</th>
<th>LED Configuration</th>
<th>( V_{IN} ) (V)</th>
<th>Output Voltage (V)</th>
<th>Total Output Current (mA)</th>
<th>Maximum Operating Efficiency** (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTC3200</td>
<td>PWM</td>
<td>5+</td>
<td>parallel</td>
<td>2.7 to 4.5</td>
<td>Adj (1.268 to 5.4)</td>
<td>100</td>
<td>87</td>
<td>MSOP-8</td>
</tr>
<tr>
<td>LTC3200-5</td>
<td>PWM</td>
<td>5</td>
<td>parallel</td>
<td>2.7 to 4.5</td>
<td>5</td>
<td>100</td>
<td>87</td>
<td>ThinSOT™</td>
</tr>
<tr>
<td>LTC3201</td>
<td>DAC</td>
<td>5</td>
<td>parallel</td>
<td>2.7 to 4.5</td>
<td>Adj (3.19 to 4.6)</td>
<td>100</td>
<td>87</td>
<td>MSOP-10</td>
</tr>
<tr>
<td>LTC3202</td>
<td>DAC</td>
<td>6</td>
<td>parallel</td>
<td>2.7 to 4.5</td>
<td>Adj (3.3 to 4.0)</td>
<td>125</td>
<td>87</td>
<td>3x3 DFN-10 MSOP-10</td>
</tr>
<tr>
<td>LTC3204-5*</td>
<td>PWM</td>
<td>6</td>
<td>parallel</td>
<td>2.7 to 5.5</td>
<td>5</td>
<td>150</td>
<td>93</td>
<td>2x2 DFN-6</td>
</tr>
<tr>
<td>LTC3204B-5</td>
<td>PWM</td>
<td>6+</td>
<td>parallel</td>
<td>2.7 to 5.5</td>
<td>5</td>
<td>150</td>
<td>93</td>
<td>2x2 DFN-6</td>
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<td>LTC3203B</td>
<td>PWM</td>
<td>6+</td>
<td>parallel</td>
<td>2.7 to 5.5</td>
<td>Adj (0.9 to 5.4)</td>
<td>500</td>
<td>90</td>
<td>3x3 DFN-10</td>
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<td>LTC3203-1*</td>
<td>PWM</td>
<td>6+</td>
<td>parallel</td>
<td>2.7 to 5.5</td>
<td>4.5, 5</td>
<td>500</td>
<td>90</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LTC3203B-1</td>
<td>PWM</td>
<td>6+</td>
<td>parallel</td>
<td>2.7 to 5.5</td>
<td>4.5, 5</td>
<td>500</td>
<td>90</td>
<td>3x3 DFN-10</td>
</tr>
</tbody>
</table>

* Burst Mode® Operation

** Dependent on \( V_{IN}, V_{LED}, I_{LED} \)
Organic LED (OLED) Bias – Low to High Current (50mA to 2A) Drivers

Linear Technology delivers highly integrated solutions for OLED bias applications. Key features include output disconnect, soft start and integrated Schottky diodes. Their small circuit size and high efficiency make them ideal solutions for space-conscious portable device applications such as cellular phones and media players.

**Applications:**
- Organic LED Power Supply
- Digital Cameras
- White LED Power Supply
- Cellular Phones
- Medical Diagnostic Equipment
- Local ±5V or ±12V Supply
- TFT-LCD Bias Supply

**LT3494:** Actual Size, Complete Solution

**LT3494: Micropower Low Noise Boost Converter with Output Disconnect**

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Configuration</th>
<th>Topology</th>
<th>Input Voltage Range (V)</th>
<th>Max. Output Voltage (V)</th>
<th>I\text{\textsubscript{SW}} (mA)*</th>
<th>Operating Efficiency (%)</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTC3459</td>
<td>Single</td>
<td>Synchronous Boost</td>
<td>1.5 to 5.5</td>
<td>10</td>
<td>60</td>
<td>89</td>
<td>ThinSOT™</td>
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<tr>
<td>LT3464</td>
<td>Single</td>
<td>Boost</td>
<td>2.3 to 10</td>
<td>34</td>
<td>85</td>
<td>84</td>
<td>ThinSOT™</td>
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<tr>
<td>LT3494/A</td>
<td>Single</td>
<td>Boost</td>
<td>2.3 to 16</td>
<td>40</td>
<td>150/300</td>
<td>85</td>
<td>2x3 DFN-8</td>
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<td>LT3498</td>
<td>Dual</td>
<td>Dual Boost</td>
<td>2.5 to 12</td>
<td>32</td>
<td>300/180</td>
<td>77</td>
<td>2x3 DFN-12</td>
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<td>LT3463</td>
<td>Dual</td>
<td>Boost and Inverter</td>
<td>2.4 to 15</td>
<td>±40</td>
<td>180/320</td>
<td>77</td>
<td>3x3 DFN-10</td>
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<tr>
<td>LT3472</td>
<td>Dual</td>
<td>Boost and Inverter</td>
<td>2.2 to 16</td>
<td>±40</td>
<td>250/300</td>
<td>83</td>
<td>3x3 DFN-10</td>
</tr>
<tr>
<td>LT3582</td>
<td>Dual</td>
<td>Boost and Inverter</td>
<td>2.58 to 5.5</td>
<td>±14</td>
<td>290/500</td>
<td>83</td>
<td>3x4 DFN-16</td>
</tr>
<tr>
<td>LT3495(B)/-1</td>
<td>Single</td>
<td>Boost</td>
<td>2.3 to 16</td>
<td>40</td>
<td>350/650</td>
<td>85</td>
<td>2x3 DFN-10</td>
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<td>LT1613</td>
<td>Single</td>
<td>Boost</td>
<td>0.9 to 10</td>
<td>34</td>
<td>550</td>
<td>89</td>
<td>ThinSOT™</td>
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<td>LT3487</td>
<td>Dual</td>
<td>Boost and Inverter</td>
<td>2.3 to 16</td>
<td>±28</td>
<td>750/900</td>
<td>77</td>
<td>3x3 DFN-10</td>
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<td>LT3473/A</td>
<td>Single</td>
<td>Boost</td>
<td>2.2 to 16</td>
<td>36</td>
<td>1.2A</td>
<td>77</td>
<td>3x3 DFN-8</td>
</tr>
<tr>
<td>LT3467/A</td>
<td>Single</td>
<td>Boost</td>
<td>2.4 to 16</td>
<td>40</td>
<td>1.4A</td>
<td>90</td>
<td>ThinSOT™</td>
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<tr>
<td>LT3471</td>
<td>Dual</td>
<td>Boost or Inverter</td>
<td>2.4 to 16</td>
<td>±40</td>
<td>2 x 1.5A</td>
<td>86</td>
<td>3x3 DFN-10</td>
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<tr>
<td>LTC3458/L</td>
<td>Single</td>
<td>Synchronous Boost</td>
<td>1.5 to 6</td>
<td>7.5/6</td>
<td>1.4A/1.7A</td>
<td>96</td>
<td>3x4 DFN-12</td>
</tr>
</tbody>
</table>

* I\text{\textsubscript{SW}} = 0.65 I\text{\textsubscript{SW}} x (V\text{\textsubscript{IN}} / V\text{\textsubscript{OUT}}). Estimate: may vary depending on external component selection.
**LCD and CCD Bias Power**

LCD and CCD Bias ICs deliver highly compact and efficient power supply solutions for small LCD displays. Key features include wide input voltage range, built-in inrush current limiting, output disconnect and power saving controls to simplify the task of implementing power-friendly LCD displays.

**LT3587: High Voltage Monolithic Inverter and Dual Boost**

![LT3587 Circuit Diagram]

**Applications:**
- Digital Still and Video Cameras
- Cellular Handsets with Color Display
- Scanner and Display Systems
- Handheld Instruments
- CCD Imager Bias
- PDAs

---

**Part Number | Number of Outputs | V\text{in} (V) | V\text{out} (V) | I\text{sw} (\text{A})^* | Frequency | I\text{o} (\text{\mu A}) | Output Disconnect | Package**
---|---|---|---|---|---|---|---|---
LT1611 | 1 | 1.1 to 10 | -34 | 0.55 | 1.4MHz | 3mA | – | ThinSOT
LT1945 | 1 | 1.2 to 15 | ±34 | 0.25 | Constant Off-Time | 20 | – | MSOP-10
LT1618 | 1 | 1.6 to 18 | 36 | 1.50 | 1.4MHz | 1.8mA | – | MSOP-10
LT3472 | 1 | 2.2 to 16 | ±34 | 0.35 | 1.2MHz | 2.8mA | Yes | 3x3 DFN-10
LT3473/A | 1 | 2.2 to 16 | 34 | 1.20 | 1.2MHz | 150 | Yes | 3x3 DFN-8
LT3464 | 1 | 2.3 to 10 | 34 | 0.085 | Constant Off-Time | 25 | – | ThinSOT
LT3467 | 1 | 2.4 to 16 | 40 | 1.10 | 1.3MHz | 1mA | – | ThinSOT
LT3479 | 1 | 2.5 to 24 | 40 | 3.00 | 3.5MHz | 5mA | – | 3x4 DFN-14 TSSOP-16
LT3461/A | 1 | 2.5 to 16 | 38 | 0.30 | 1.3MHz/ 3MHz | 2.8mA | – | ThinSOT
LT1930/A | 1 | 2.6 to 16 | 34 | 1.00 | 1.2MHz/ 2.2MHz | 4.2mA/5.5mA | – | ThinSOT
LT1931/A | 1 | 2.6 to 16 | -34 | 1.00 | 1.2MHz/ 2.2MHz | 5.8mA | – | ThinSOT
LT1697 | 1 | 2.8 to 5.5 | 6 | 0.9 | 300kHz | 0.9mA | – | MSOP-10
LT1617/-1 | 2 | 1.2 to 15 | -34 | 0.35/0.10 | Constant Off-Time | 20 | – | ThinSOT
LT3463/A | 2 | 2.4 to 15 | ±40 | 0.25 x 2 | Constant Off-Time | 40 | Yes | 3x3 DFN-10
LT3587 | 4 | 2.5 to 6 | ±32 | 0.8/0.4/0.9 | 1.0MHz | 2.4mA | Yes | 3x3 QFN-20
LT3471 | 2 | 2.4 to 16 | ±40 | 2 x 1.30 | 1.2MHz | 2.5mA | – | 3x3 DFN-10
LT3466-1 | 2 | 2.7 to 24 | 40 | 0.32 x 2 | 1.0MHz | 5mA | – | 3x3 DFN-10 TSSOP-16E
LT3450 | 3 | 1.5 to 4.6 | ±15 | 0.09 | 550kHz | 75 | – | 3x3 QFN-16
LT3524 | 5 | 2.5 to 6.0 | 5, ±20 | 0.5 | 1.5MHz | 4.2mA | Yes | 4x4 QFN-24
LT1942 | 4 | 2.6 to 16 | 44 | 0.55/0.15/0.5 | 1MHz | 7mA | Yes | 4x4 QFN-24

* \(I_{\text{sw}} = 0.65 I_{\text{o}} \times (V_{\text{in}} / V_{\text{out}})\). Estimate: may vary depending on external component selection.