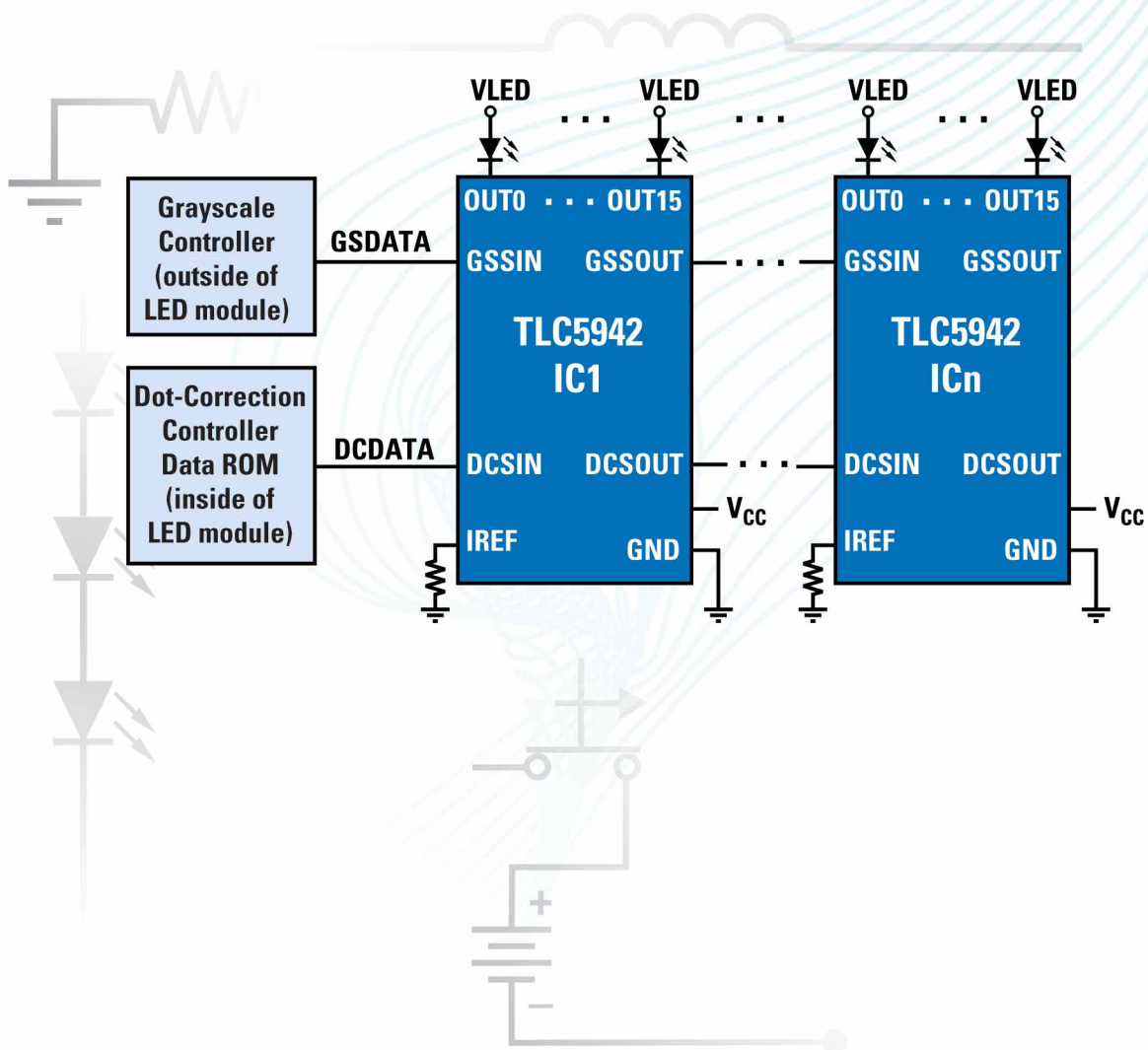


# LED Drivers Catalog



For Video Signage and  
Portable Equipment



## Texas Instruments (TI) has the broadest portfolio of high-performance products for today's LED design requirements

TI's products support applications ranging from ultra-small portable displays to the largest lighting and display panels in the industry. As part of that, a range of evaluation modules and application notes helps during the design process, to get you to market faster.



### LED Signage Selection Guide

Device	Description	Application
TLC5916	8-channel x 120-mA LED driver with 8-bit global dimming	Simple global dimming
TLC5917	8-channel x 120-mA LED driver with 8-bit global dimming; LED short detection	Simple global dimming and LED short detect
TLC5923	16-channel x 80-mA LED driver with 7-bit dot correction per channel	Channel-to-channel dimming
TLC5924	16-channel x 80-mA LED driver with 7-bit dot correction and pre-charge FET for indoor signs	Removes ghosting from multiplexed displays
TLC5940	16-channel x 120-mA LED driver with 12-bit PWM with 6-bit dot correction and integrated EEPROM	On-chip storage of DC values
TLC5941	16-channel x 80-mA LED driver with 12-bit PWM with 6-bit dot correction	Lower-cost TLC5941
TLC5942	16-channel x 50-mA LED driver with 12-bit PWM with 7-bit dot correction	Greater control over PWM and dot correction
TLC5945	16-channel x 80-mA LED driver with 12-bit PWM with 6-bit dot correction; no channel delay	High-speed video
TLC59116	16-channel x 100-mA, 1-MHz I <sup>2</sup> C, 8-bit individual dimming, group dimming, group blinking	I <sup>2</sup> C interface with group dimming and blinking

### LED Drivers for Portable Equipment Selection Guide

Device	V <sub>IN</sub> (V)	Type	Number of LEDs	Quiescent Current (typ) (mA)	Shutdown Current (typ) (μA)	Switching Frequency (max) (kHz)	Switch Current Limit (typ) (A)	Over-Voltage Protection (V)	Synchronous	Peak Efficiency (%)	Load-Disconnect During Shutdown	Package	Price*
TPS61029	0.9 to 6.5	Inductive	1	0.025	0.1	720	1.8	Yes	Yes	96	Yes	SON-10	1.50
TPS61070	0.9 to 5.5	Inductive	1	0.019	0.05	1200	0.7	—	Yes	90	Yes	SOT-6	0.80
TPS61050/2	2.5 to 5.5	Inductive	1	8.5	0.3	2000	1.5	5.8	Yes	96	Yes	SON-10/DSBGA-12	1.40
TPS61080/1	2.5 to 6.0	Inductive	1 OLED or 7	6	1	1200	0.5/1.3	27	No	87	Yes	QFN-10	1.35
TPS61140	3 to 6	Inductive	1 OLED + 4	0.125 to 2	1.5	1200	0.7	28	No	85	Yes	QFN-10	1.85
TPS61160/1	2.7 to 18	Inductive	6/10	1.5	1	600	0.7	26/38	No	80	No	SOT-6	1.00
TPS61165	3 to 18	Inductive	10	1.5	1	1200	1.2	38	No	80	No	SOT-6	1.45
TPS62050	2.7 to 10	Capacitive	2	0.012	1.5	1000	1.4	—	Yes	95	No	MSOP-10	1.85
TPS63000	1.8 to 5.5	Inductive	1	0.04	0.01	1500	1.8	—	Yes	96	Yes	QFN-10	0.80
TCA6507	0 to 5.5	Linear	7	0.01	0.02	—	—	—	—	—	—	BGA-12/QFN-12	1.12

\*Suggested resale price in U.S. dollars in quantities of 1,000.



## 16-Channel LED Driver with 6-Bit Dot Correction and 12-Bit PWM Grayscale

### TLC5940



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/sc/device/TLC5940](http://www.ti.com/sc/device/TLC5940)

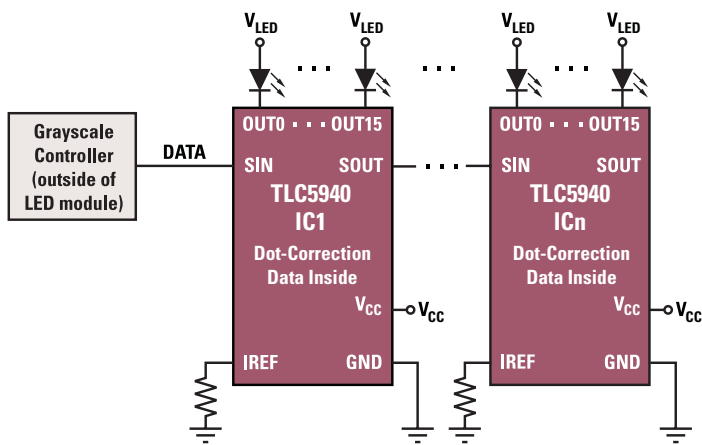
#### Key Features

- 16 constant-current output channels capable of sinking 0 to 120 mA
- Grayscale PWM control: 12 bit (4096 steps)
- Dot correction, 6 bit (64 steps) storable in integrated EEPROM
- LED power supply voltage up to 17 V
- $V_{CC} = 3\text{ V to }5.5\text{ V}$
- Serial data interface
- Controlled in-rush current
- Data transfer rate: 30 MHz
- CMOS level input/output
- Error information:
  - LOD: LED open detection
  - TEF: Thermal error flag
- Outputs able to be paralleled for higher current
- Output current accuracy:
  - Between channels:  $\pm 1\%$
  - Between ICs:  $\pm 3\%$

#### Applications

- Mono-color, multicolor, full-color LED displays
- LED signboards
- Display backlighting
- General, high-current LED drive

#### Typical Application Diagram



## 16-Channel LED Driver with 12-Bit PWM and 7-Bit Brightness Control

### TLC5942



Get samples and datasheets at: [www.ti.com/sc/device/TLC5942](http://www.ti.com/sc/device/TLC5942)

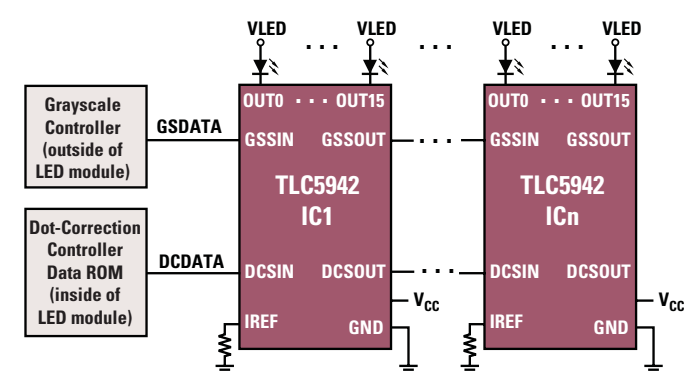
#### Key Features

- 16 constant-current output channels capable of sinking 0 to 50 mA constant current
- Grayscale PWM control: 12 bit (4096 steps)
- Dot correction, seven bit (128 steps)
- LED power supply voltage up to 17 V
- $V_{CC} = 3\text{ V to }5.5\text{ V}$
- Dedicated port for grayscale and dot correction
- Output-current accuracy:
  - Between channels:  $\pm 1.5\%$
  - Between ICs:  $\pm 3\%$
- CMOS level input/output
- Data transfer rate: 30 MHz
- Continuous base LED open detect
- Thermal shutdown (TSD) automatic in high temperature condition and restart in normal temperature
- Noise reduction, four-channel grouped delay to prevent in-rush current

#### Applications

- RGB LED video displays
- LED signboards
- Display backlighting

#### Typical Application Diagram



## LED Driver with 6-Bit Dot Correction, 12-Bit PWM Grayscale and No Delay

### TLC5945



Get samples and datasheets at: [www.ti.com/sc/device/TLC5945](http://www.ti.com/sc/device/TLC5945)

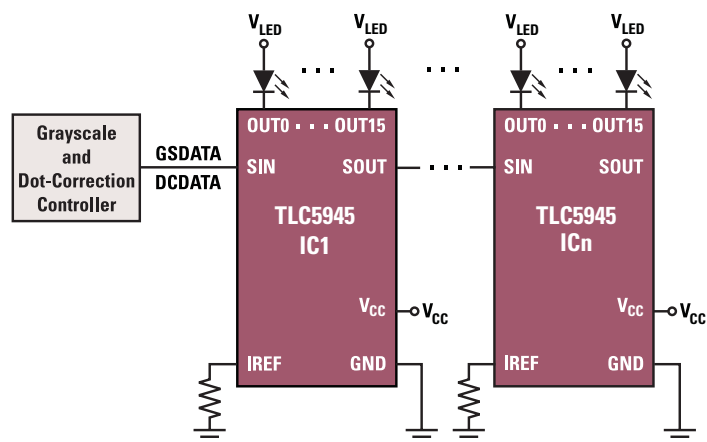
#### Key Features

- 16 constant-current output channels capable of sinking 0 to 80 mA
- Grayscale PWM control: 12 bit (4096 steps)
- Dot correction, 6 bit (64 steps)
- No grouped delay for in-rush current reduction facilitates quicker refresh rates for fast video
- LED power supply voltage up to 17 V
- $V_{CC} = 3\text{ V to }5.5\text{ V}$
- Serial data interface
- Data transfer rate: 30 MHz
- CMOS level input/output
- Error information
  - LOD: LED open detection
  - TEF: Thermal error flag
- Outputs able to be paralleled for higher current
- Output current accuracy:
  - Between channels:  $\pm 1\%$
  - Between ICs:  $\pm 3\%$

#### Applications

- Mono-color, multicolor, full-color LED displays
- LED signboards
- Display backlighting
- General, high-current LED drive

#### Typical Block Diagram



## 16-Channel LED Driver with Fast Mode I<sup>2</sup>C Interface

### TLC59116



Get samples and datasheets at: [www.ti.com/sc/device/TLC59116](http://www.ti.com/sc/device/TLC59116)

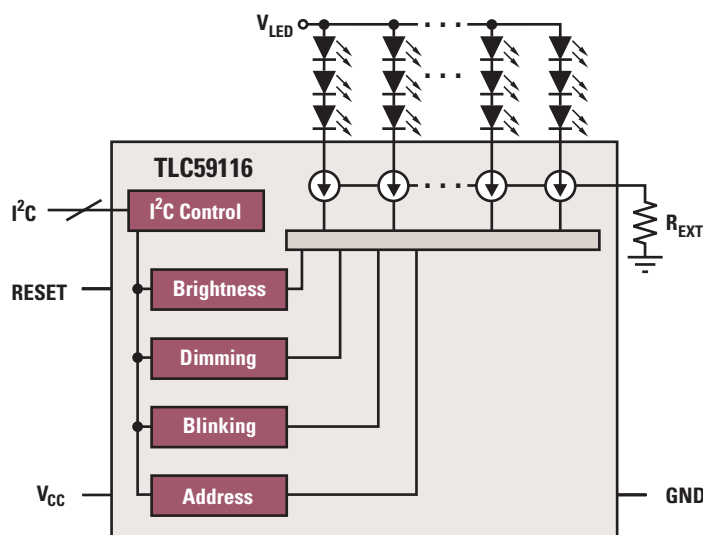
#### Key Features

- 16-channel constant-current sink: 10 mA to 100 mA
- 8-bit linear programmable brightness per LED output
- 8-bit group brightness control allows general dimming
- 8-bit group blinking
- Up to 14 possible hardware-adjustable individual I<sup>2</sup>C-bus addresses
- Open-load/overtemperature detection of individual LED
- LED supply voltage up to 17 V
- 25-MHz internal oscillator requires no external components
- 1-MHz fast mode plus compatible I<sup>2</sup>C-bus interface with 30-mA high-drive capability on SDA output for driving high-capacitive buses
- Supply voltage: 3.3 V or 5 V
- Outputs able to be paralleled for higher current

#### Applications

- Mono-color, multicolor, full-color LED displays
- LED signboards
- Gaming and amusement
- Pachinko machines

#### Typical Block Diagram



## 1.5-A, 96%-Efficient Synchronous Boost LED Driver

### TPS61029



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/sc/device/TPS61029](http://www.ti.com/sc/device/TPS61029)

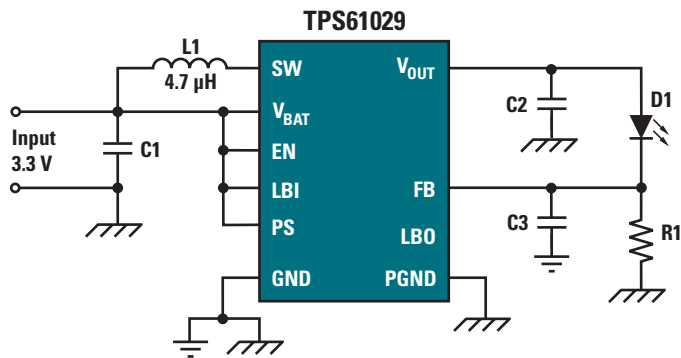
#### Key Features

- Input voltage range: 0.9 V to 5.5 V
- Switch current limit: 1.8 A (typ)
- Up to 96% efficiency, PFM power-save mode
- Quiescent current: 25  $\mu$ A (typ)
- Shutdown: 0.1  $\mu$ A
- Low EMI-converter (integrated anti-ringing switch)
- LDO down-mode
- Low-battery comparator
- Load disconnect during shutdown
- Packaging: 3x3-mm QFN-10

#### Applications

- 1- to 3-cell alkaline/NiMH or 1-cell Li-Ion-powered white-LED applications

#### Typical Application Diagram



## 600-mA LED Driver with Ultra-Low Standby Current

### TPS61070/1



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/sc/device/TPS61070](http://www.ti.com/sc/device/TPS61070) or [www.ti.com/sc/device/TPS61071](http://www.ti.com/sc/device/TPS61071)

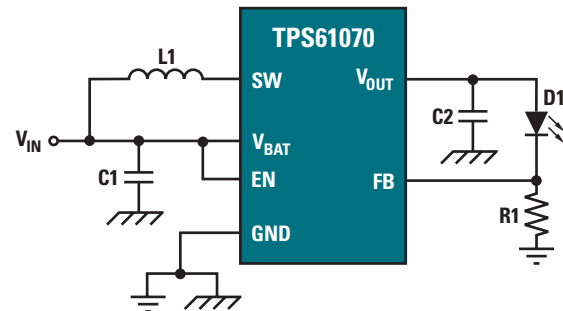
#### Key Features

- Input voltage range: 0.9 V to 5.5 V
- 75 mA at 3.3-V  $V_{OUT}$  and 0.9 V  $V_{IN}$
- 600-mA switch current limit
- Up to 90% efficient over wide load range
- Quiescent current 19  $\mu$ A (typ)
- Load disconnect during shutdown
- Adjustable output voltage up to 5.5 V
- 1.2-MHz switching frequency, synchronous
- Packaging: 3x3x1-mm TSOT-23

#### Applications

- White-LED torch/flash for cell phones, smartphones and PDAs
- Portable medical LCD backlight

#### Typical Application Diagram



## 1.2-A High-Power Flash Light Driver with I<sup>2</sup>C or GPIO Interface

### TPS61050/2



Get samples, datasheets and evaluation modules at: [www.ti.com/sc/device/TPS61050](http://www.ti.com/sc/device/TPS61050) or [www.ti.com/sc/device/TPS61052](http://www.ti.com/sc/device/TPS61052)

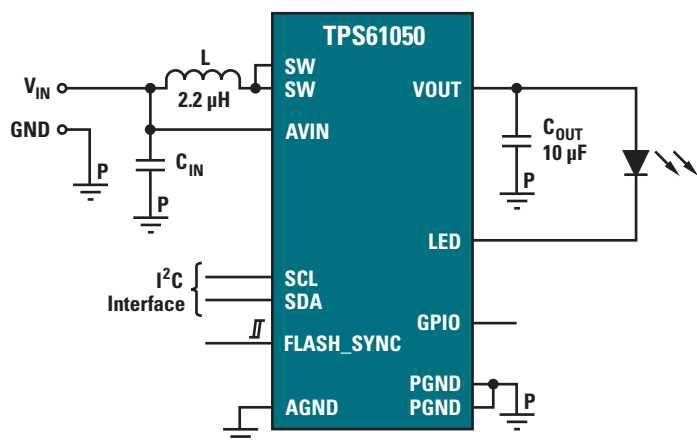
#### Key Features

- Total solution circuit area <math><25\text{ mm}^2</math>
- Packaging: 12-pin NanoFree™ 2x1.5 CSP or 3x3 QFN
- Torch light up to  $I_{LED} = 500\text{ mA}$
- Flash light up to  $I_{LED} = 1200\text{ mA}$
- Integrated LED turn-on safety timer
- Integrated low-light dimming mode
- High current strobe mode
- Efficiency up to 96%
- I<sup>2</sup>C-compatible interface up to 400 kbps
- Zero latency TX-masking input (TPS61050)
- Hardware voltage-mode selection input (TPS61052)
- Integrated ADC for LED VF monitoring

#### Applications

- White-LED torch/flash for cell phones, smartphones and PDAs
- High-power white-LED flash driver and:
  - AF/zoom motor drive supply
  - Audio amplifier power-supply exclusive operation or simultaneous operation
  - Auxiliary-lighting zone power supply

#### Typical Application Diagram



## 27-V, 1.6-A Switch Boost Converter with Input-to-Output Isolation for OLED

### TPS61080/1



Get samples, datasheets, app reports and evaluation modules at: [www.ti.com/sc/device/TPS61080](http://www.ti.com/sc/device/TPS61080) or [www.ti.com/sc/device/TPS61081](http://www.ti.com/sc/device/TPS61081)

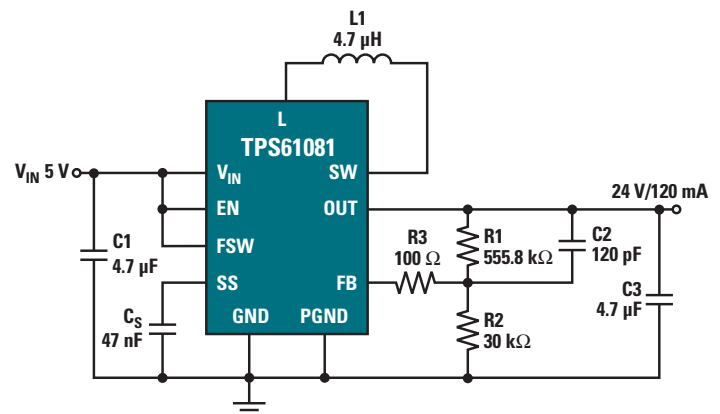
#### Key Features

- Input voltage range: 2.5 V to 6 V
- Boost voltage up to 27 V
- Integrated current switch:
  - 0.7 A (TPS61080)
  - 1.6 A (TPS61081)
- Selectable fixed switching frequency: 1.2 MHz/600 kHz
- Built-in power diode
- Input-to-output isolation
- Short-circuit protection
- Programmable soft start
- Overvoltage protection
- Efficiency up to 85%
- Packaging: 10-pin, 3x3-mm QFN

#### Applications

- White-LED backlight for media form-factor display
- OLED power supply
- xDSL applications
- TFT-LCD bias supply

#### Typical Application Diagram



## Dual-Output, Single-Inductor OLED and LED Driver

### TPS61140



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/sc/device/TPS61140](http://www.ti.com/sc/device/TPS61140)

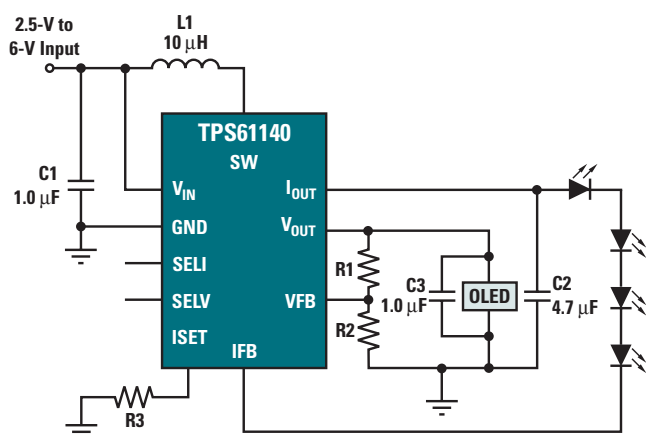
#### Key Features

- Input voltage range: 3 V to 6 V
- Two outputs each up to 27 V
- Integrated current switch: 700 mA
- Built-in power diode
- 1.2-MHz pulse-width modulation (PWM) for white LED
- Pulse-frequency modulation (PFM) for OLED supply
- Individually programmable output current
- Input-to-output isolation
- Short-circuit protection
- Built-in soft start
- Overvoltage protection
- Efficiency up to 82%
- PWM dimming frequency up to 30 kHz
- Packaging: 10-pin, 3x3-mm QFN

#### Applications

- Clamshell phone with OLED/LCD screen
- Single OLED displays and status LEDs

#### Typical Application Diagram



## Dual-Output, Single-Inductor LED Driver

### TPS61150A



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/sc/device/TPS61150A](http://www.ti.com/sc/device/TPS61150A)

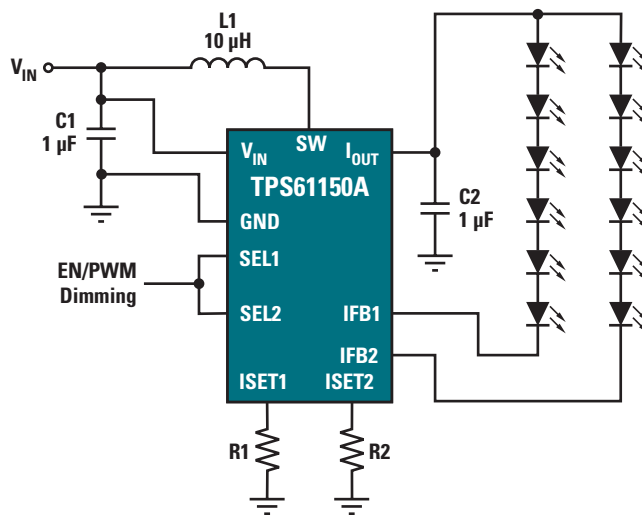
#### Key Features

- Input voltage range: 3 V to 6 V
- Two outputs each up to 27 V
- Integrated switch: 700 mA
- Fixed PWM frequency: 1.2 MHz
- PWM dimming frequency up to 30 kHz
- Individual channel-programmable output current
- Input-to-output isolation
- Built-in power diode
- Built-in soft start
- Overvoltage protection
- Efficiency up to 83%
- Packaging: 10-pin, 3x3-mm QFN

#### Applications

- Sub and main display backlight in clamshell phones
- Display and keypad backlight
- Drive up to 14 WLEDs in two strings

#### Typical Application Diagram



## 38-V White-LED Driver with Digital or PWM Dimming

### TPS61160/1



Get samples, datasheets and evaluation modules at:  
[www.ti.com/sc/device/TPS61160](http://www.ti.com/sc/device/TPS61160) or [www.ti.com/sc/device/TPS61161](http://www.ti.com/sc/device/TPS61161)

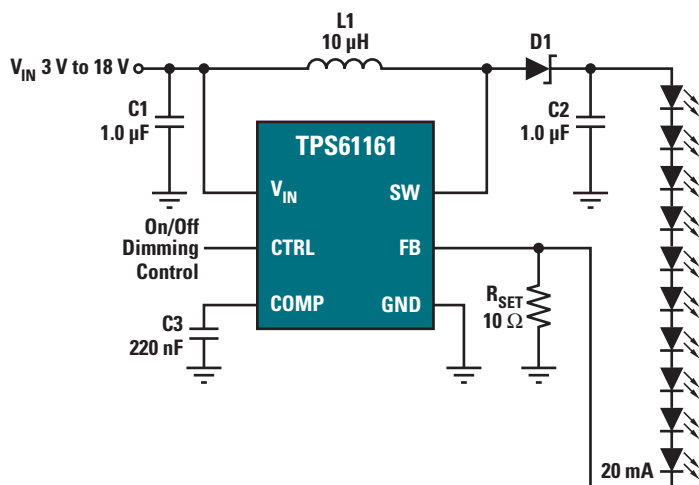
#### Key Features

- Input voltage range: 2.7 V to 18 V
- Max boost voltage protection:
  - 26 V for 6 LEDs (TPS61160)
  - 38 V for 10 LEDs (TPS61161)
- Switch current limit: 700 mA
- PWM brightness control: 32-step digital or 10 kHz to 100 kHz
- Reference voltage: 200 mV with 2% accuracy
- Built-in soft start
- Packaging: 6-pin, 2x2-mm QFN with thermal pad

#### Applications

- Small to medium size screens up to 4 inches
- Cellular phones
- PDAs, handheld computers
- GPS receivers
- White-LED backlighting for media form-factor display

#### Typical Application Diagram



## 38-V High-Power Driver with High-Speed Dimming

### TPS61165



Get samples, datasheets and evaluation modules at:  
[www.ti.com/sc/device/TPS61165](http://www.ti.com/sc/device/TPS61165)

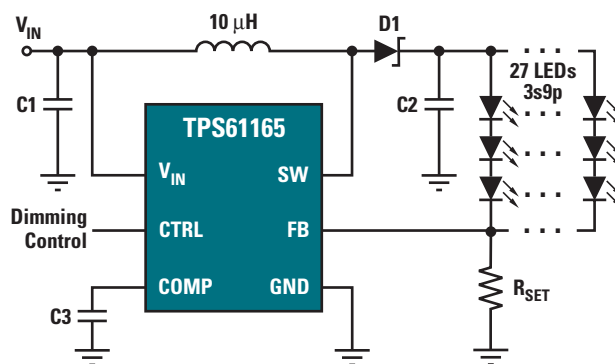
#### Key Features

- Input voltage range: 3 V to 18 V
- Max boost voltage protection: 38 V for 10 LEDs
- Switch current limit: 1.2 A
- No audible noise during brightness control
- Brightness control: 32-step digital or 10-kHz to 100-kHz PWM
- Built-in soft start
- Reference voltage: 200 mV with 2% accuracy
- Packaging: 6-pin, 2x2-mm QFN with thermal pad

#### Applications

- Driving high-brightness LEDs
  - 3 x 350 mA in series from 5 V<sub>IN</sub>
  - 7 x 350 mA in series from 12 V<sub>IN</sub>
- Medium-panel-size backlighting
- Torch light
- Accent lights
- General illumination

#### Typical Application Diagram



## 10-V $V_{IN}$ , 800-mA Step-Down LED Driver for Two-Cell Li-Ion Applications

### TPS62050



Get samples, datasheets, app reports and evaluation modules at: [www.ti.com/sc/device/TPS62050](http://www.ti.com/sc/device/TPS62050)

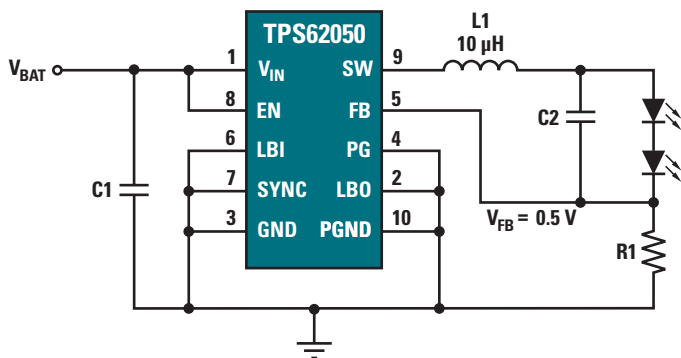
#### Key Features

- Input voltage range: 2.7 V to 10 V
- Output current up to 800 mA
- Drives one or two high-brightness LEDs in series
- 95% efficiency (max)
- PFM power-save mode for light loads
- 850-kHz (typ) operation, synchronizable to external clock up to 1.2 MHz
- Forced-PWM mode available
- Power Good and low-battery detect
- Soft start limits in-rush current
- Low-battery indicator

#### Applications

- 3- to 6-cell alkaline LED lamps
- 1- to 2-cell Li-Ion LED lamps
- 9-V wall adapter LED lamps
- Torch lights

#### Typical Block Diagram



## 7-Channel, SMBus LED Driver with I<sup>2</sup>C Intensity Control

### TCA6507



Get samples and datasheets at: [www.ti.com/sc/device/TCA6507](http://www.ti.com/sc/device/TCA6507)

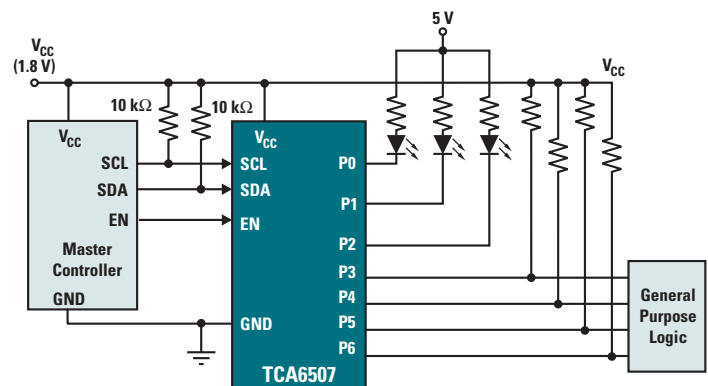
#### Key Features

- Seven LED driver outputs
- Widely programmable blink rates, fade-on and fade-off rates and maximum intensity
- Open-drain outputs directly drive LEDs to 40 mA (max)
- Can be configured into two independent banks of LED drivers
- LED intensity set using pulse-width modulation (PWM)
- Outputs not used as LED drivers can be used as general-purpose open-drain outputs
- Maximum intensity control (16 steps) from fully-off to fully-on states
- Smooth transition with 256 intensity levels during fade-on or fade-off
- Operating power-supply voltage range: 1.65 V to 3.6 V
- Schmitt trigger action allows slow input transition and better switching noise immunity at the inputs
  - $V_{hys} = 0.18$  V typ at 1.8 V
  - $V_{hys} = 0.25$  V typ at 2.5 V
  - $V_{hys} = 0.33$  V typ at 3.3 V
- Open-drain outputs: 5.5 V tolerant
- Low standby current with shutdown capability for additional power savings
- Internal power-on reset
- Internal oscillator requires no external components

#### Applications

- Fun lights
- Indicator lights

#### Typical Block Diagram



## 96%-Efficient Buck/Boost LED Driver

### TPS63000



Get samples, datasheets, app reports and evaluation modules at:  
[www.ti.com/TPS63000](http://www.ti.com/TPS63000)

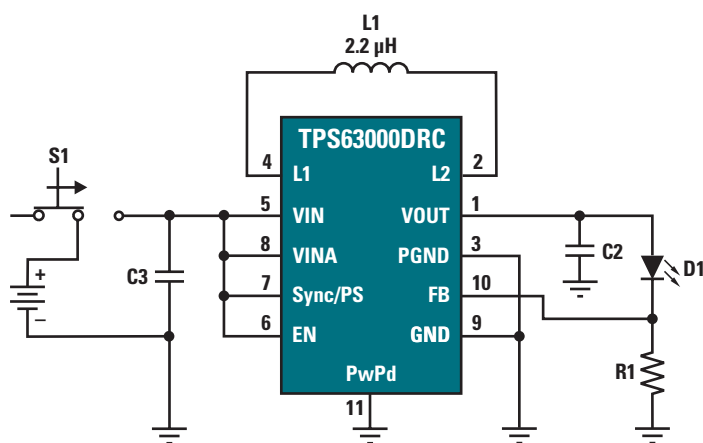
#### Key Features

- Automatic transition between step-down and boost mode
- Input voltage: 1.8 to 5.5 V
- Output voltage: 1.2 to 5.5 V
- Output current switch: 1.8 A
- Up to 1200-mA output current in buck configuration at 3.3 V
- Up to 800-mA output current in boost configuration at 3.3 V
- Efficiency: 96% over wide  $V_{IN}$  range (max)
- Device quiescent current less than 25  $\mu$ A
- Smallest solution size, requires only 2.2- $\mu$ H inductor
- Packaging: 3x3-mm QFN

#### Applications

- 2-cell and 3-cell alkaline, NiCd or NiMH or single-cell Li-Ion battery-powered LED equipment

#### Typical Application Diagram



## TI Worldwide Technical Support

### Internet

**TI Semiconductor Product Information Center Home Page**  
[support.ti.com](http://support.ti.com)

**TI Semiconductor KnowledgeBase Home Page**  
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Internet/Email	<a href="http://support.ti.com/sc/pic/americas.htm">support.ti.com/sc/pic/americas.htm</a>		

#### Europe, Middle East, and Africa

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International +49 (0) 8161 80 2121

Russian Support +7 (4) 95 98 10 701

**Note:** The European Free Call (Toll Free) number is not active in all countries. If you have technical difficulty calling the free call number, please use the international number above.

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Internet

[support.ti.com/sc/pic/euro.htm](http://support.ti.com/sc/pic/euro.htm)

#### Japan

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Internet/Email

[support.ti.com/sc/pic/japan.htm](http://support.ti.com/sc/pic/japan.htm)

Domestic

[www.tij.co.jp/pic](http://www.tij.co.jp/pic)

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Hong Kong 800-96-5941

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[support.ti.com/sc/pic/asia.htm](http://support.ti.com/sc/pic/asia.htm)

Toll-Free Number

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Philippines 1-800-765-7404

Singapore 800-886-1028

Taiwan 0800-006800

Thailand 001-800-886-0010

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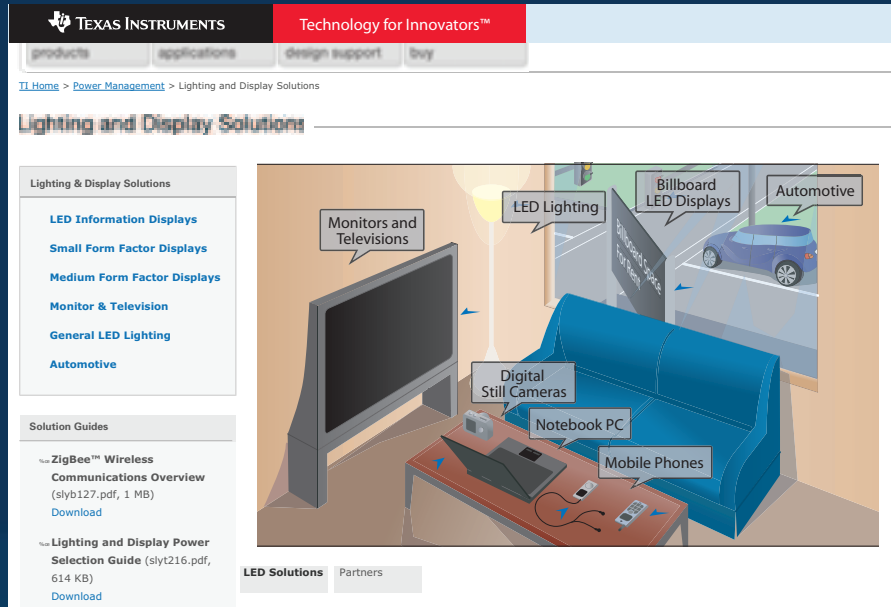
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