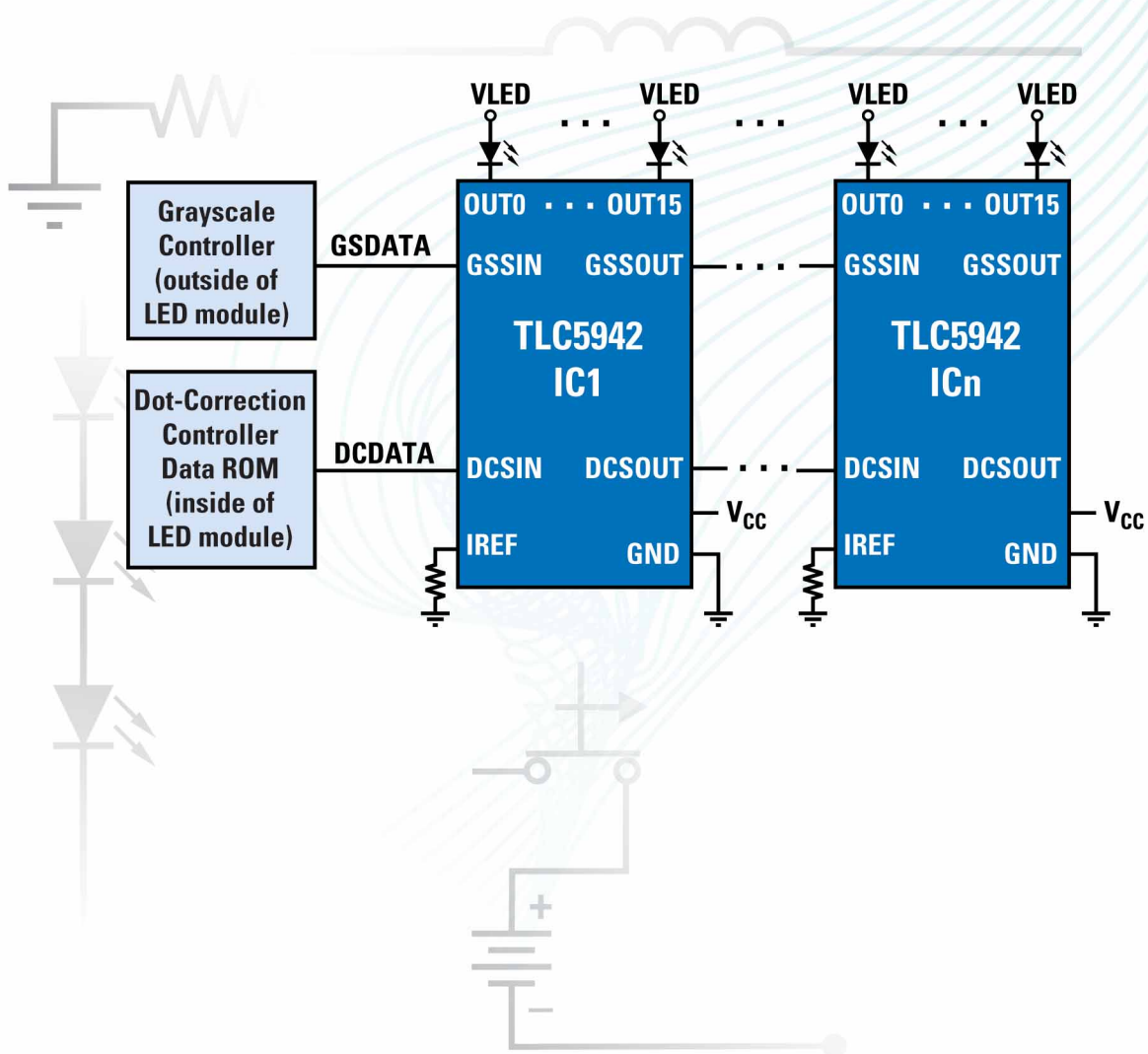


LED Drivers Catalog



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 ² C, 8-bit individual dimming, group dimming, group blinking	I ² C interface with group dimming and blinking

LED Drivers for Portable Equipment Selection Guide

Device	V _{IN} (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.

8-Channel Constant-Current LED Sink Driver

TLC5916/7



Get samples and datasheets at: www.ti.com/sc/device/TLC5916 or www.ti.com/sc/device/TLC5917

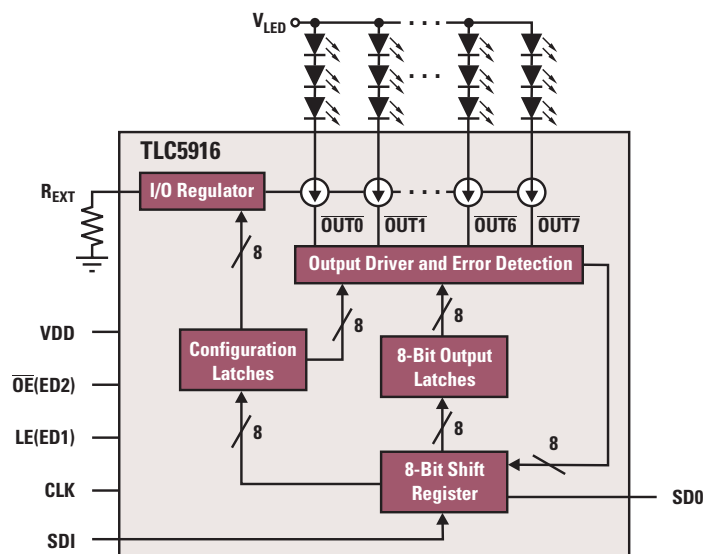
Key Features

- Eight constant-current output channels capable of sinking 5 mA to 120 mA
- Constant output current invariant to load voltage change
- Open-load, short-load and overtemperature detection
- 256-step programmable global current gain
- Outputs able to be paralleled for higher current
- Output current accuracy:
 - Between channels: $\pm 3\%$ (max)
 - Between ICs: $\pm 6\%$ (max)
- Clock frequency: 30 MHz
- CMOS-level input/output
- LED supply voltage up to 17 V
- $V_{DD} = 3.3\text{ V}$ or 5 V
- Thermal shutdown for overtemperature protection

Applications

- General LED lighting applications
- LED display systems
- LED signage
- Automotive LED lighting
- White goods
- Gaming machines/entertainment

Typical Block Diagram



16-Channel LED Driver with 7-Bit Dot Correction and Pre-Charge FET

TLC5924



Get samples, datasheets, app reports and evaluation modules at: www.ti.com/sc/device/TLC5924

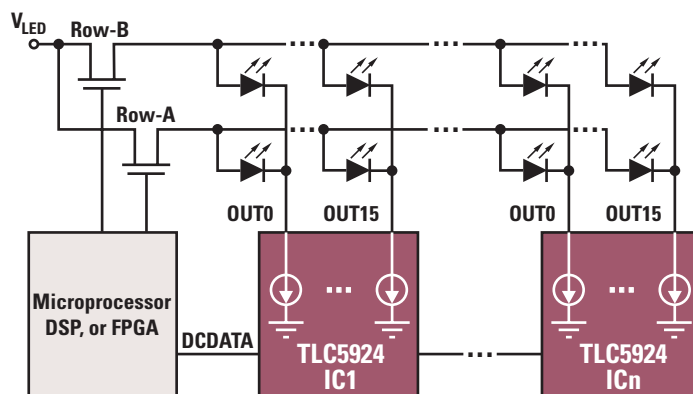
Key Features

- 16 constant-current output channels capable of sinking 0 to 80 mA
- Integrated pre-charge FETs to reduce multiplexing-related artifacts by charging stray board capacitance via controlled power path and not the LED
- Dot correction, 7 bit (128 steps), individually adjustable for each channel
- Channel-to-channel constant-current accuracy: $\pm 1\%$ (typ)
- Fast switching output: $t_r/t_f = 10\text{ ns}$ (typ)
- CMOS level input/output
- Serial data transfer rate: 30 MHz
- $V_{CC} = 3.0\text{ V}$ to 5.5 V
- Outputs able to be paralleled for higher current
- Output current accuracy:
 - Between channels: $\pm 1\%$
 - Between ICs: $\pm 3\%$
- Operating temperature: -40°C to 85°C
- LED supply voltage up to 15 V
- Controlled in-rush current

Applications

- Multiplexed indoor electronic signage
- Mono-color, multicolor, full-color LED display
- Display backlighting
- Multicolor LED lighting applications

Typical Block Diagram



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

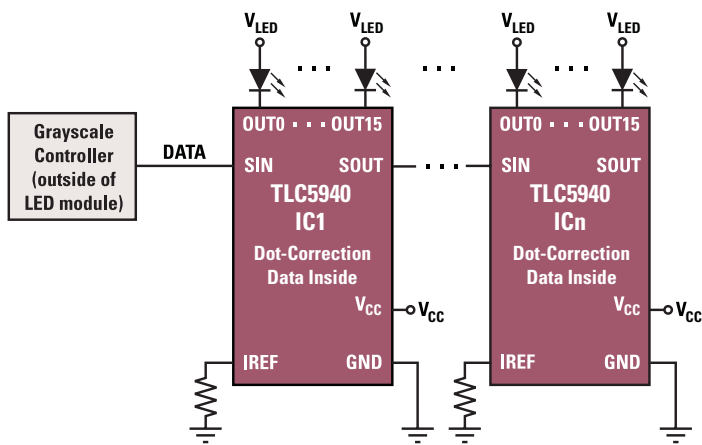
Key Features

- 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

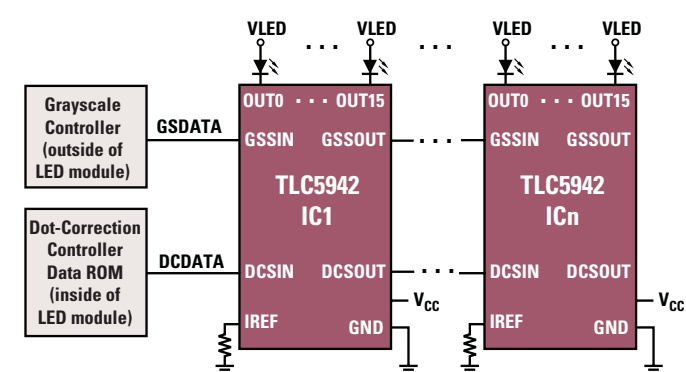
Key Features

- 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

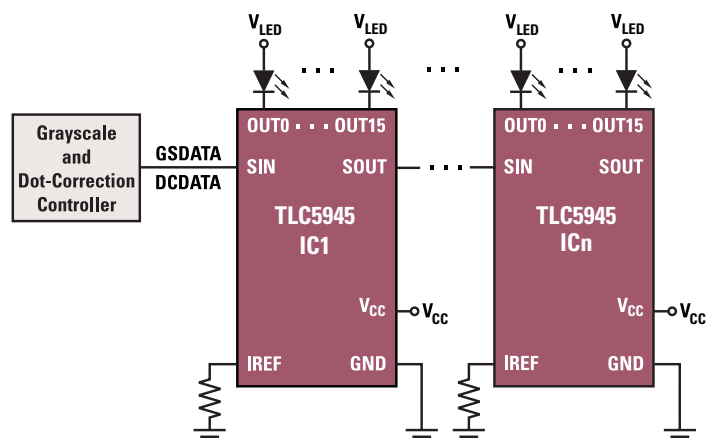
Key Features

- 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 I²C Interface

TLC59116



Get samples and datasheets at: www.ti.com/sc/device/TLC59116

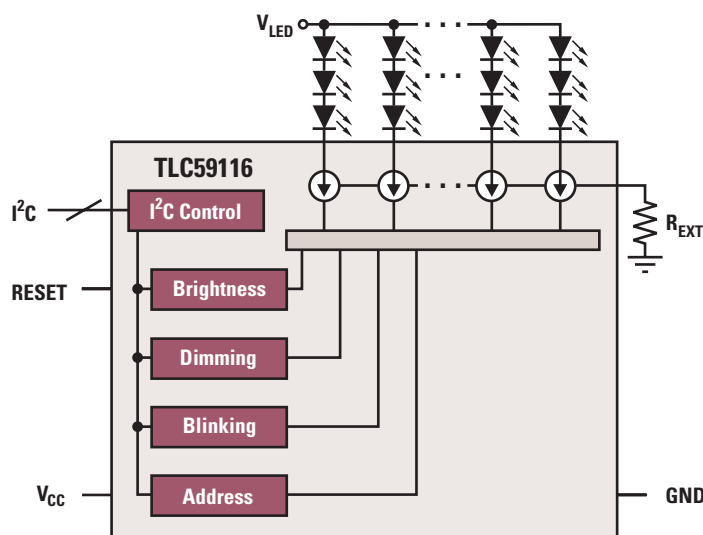
Key Features

- 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 I²C-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 I²C-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:
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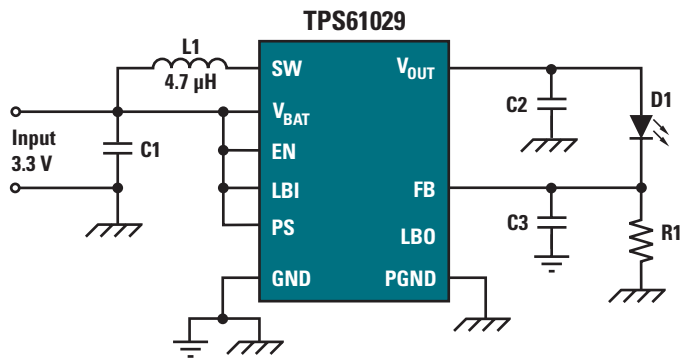
Key Features

- 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 μ A (typ)
- Shutdown: 0.1 μ 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 or www.ti.com/sc/device/TPS61071

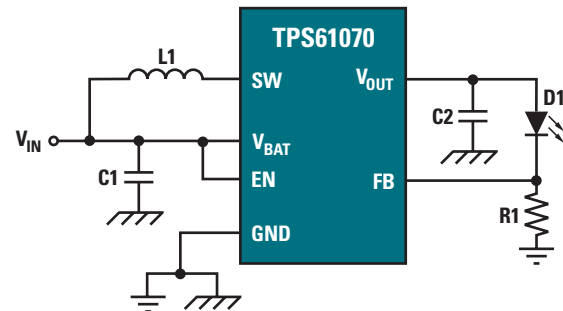
Key Features

- 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 μ 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 I²C or GPIO Interface

TPS61050/2



Get samples, datasheets and evaluation modules at: www.ti.com/sc/device/TPS61050 or www.ti.com/sc/device/TPS61052

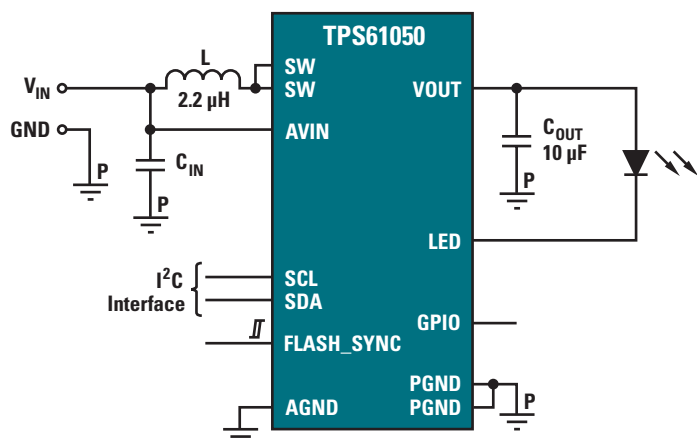
Key Features

- 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%
- I²C-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 or www.ti.com/sc/device/TPS61081

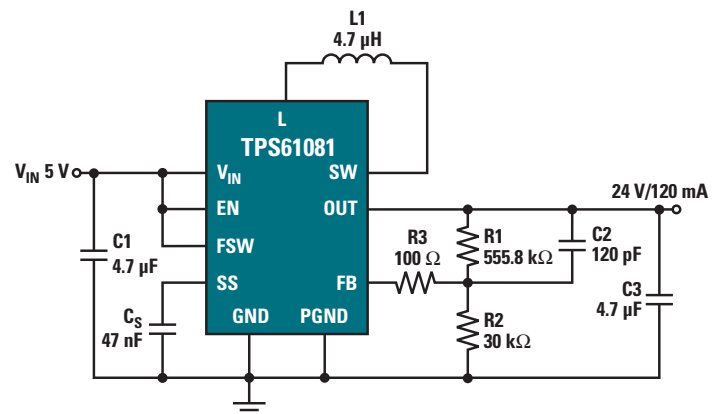
Key Features

- 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

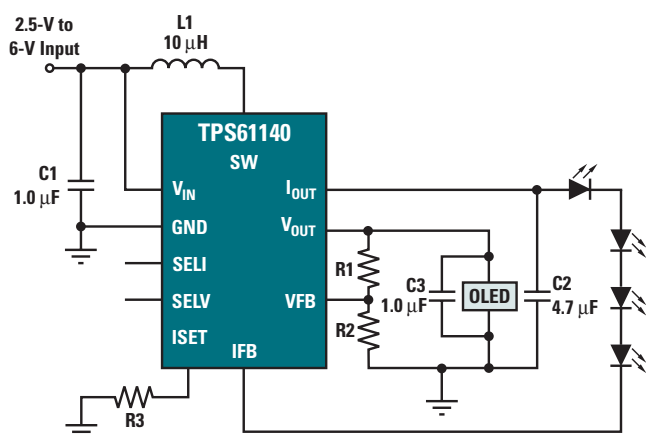
Key Features

- 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

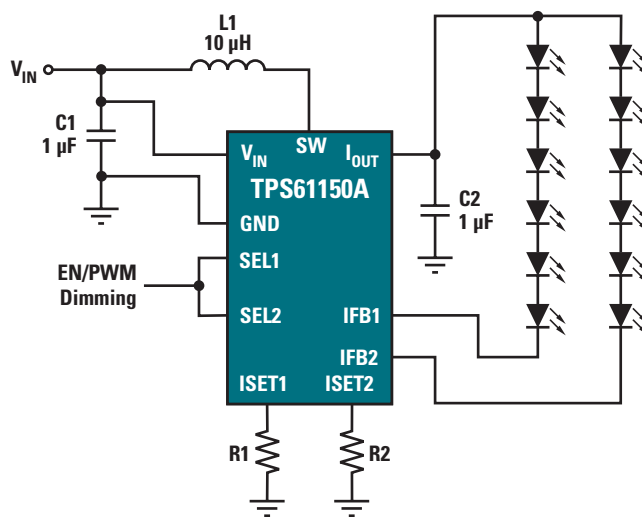
Key Features

- 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 or www.ti.com/sc/device/TPS61161

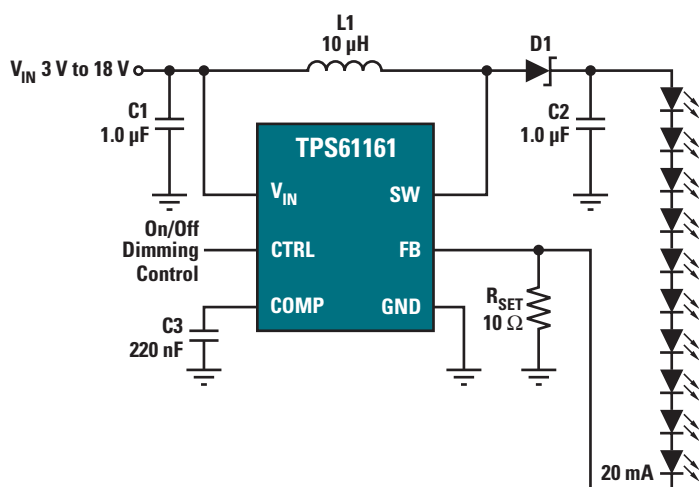
Key Features

- 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

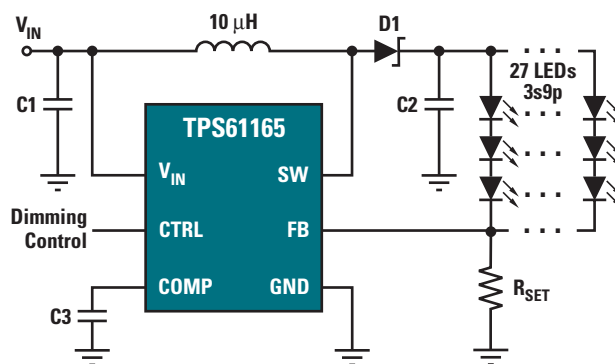
Key Features

- 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_{IN}
 - 7 x 350 mA in series from 12 V_{IN}
- 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

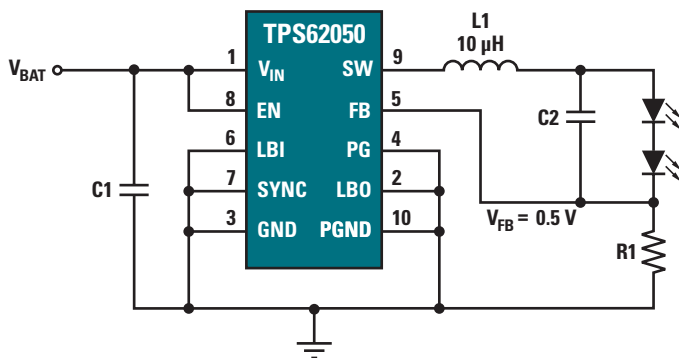
Key Features

- 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 I²C Intensity Control

TCA6507



Get samples and datasheets at: www.ti.com/sc/device/TCA6507

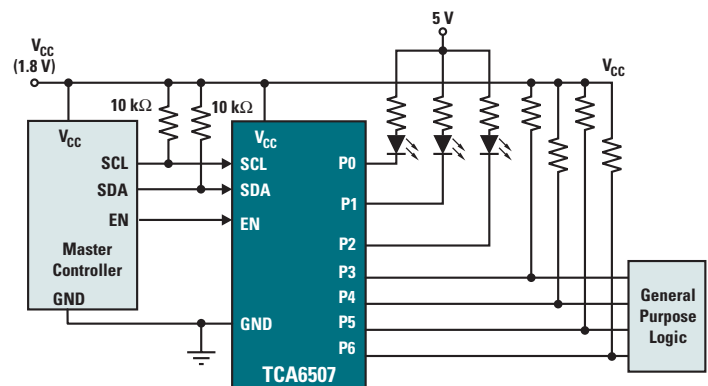
Key Features

- 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

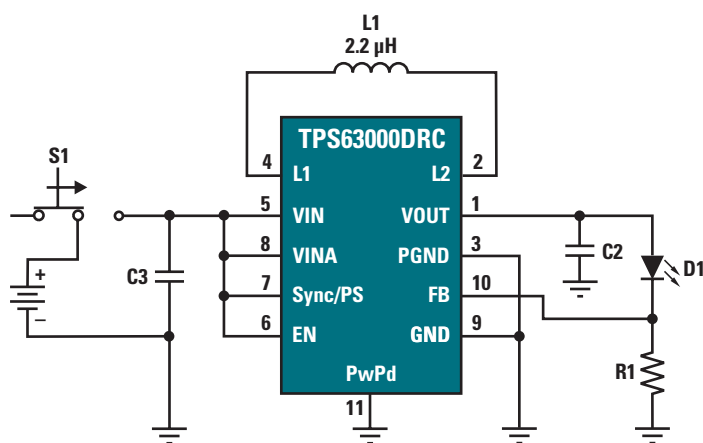
Key Features

- 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 μ A
- Smallest solution size, requires only 2.2- μ 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



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Product Information Centers

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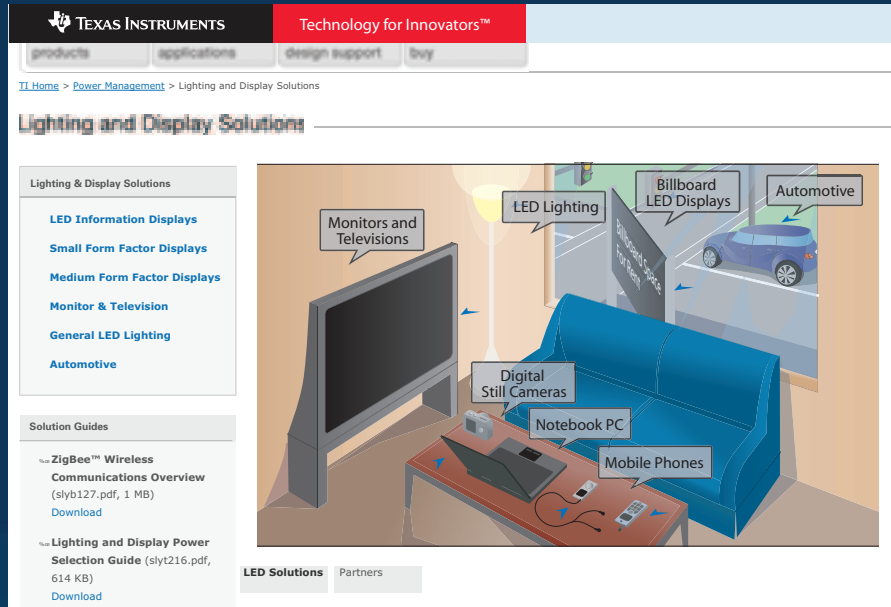
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