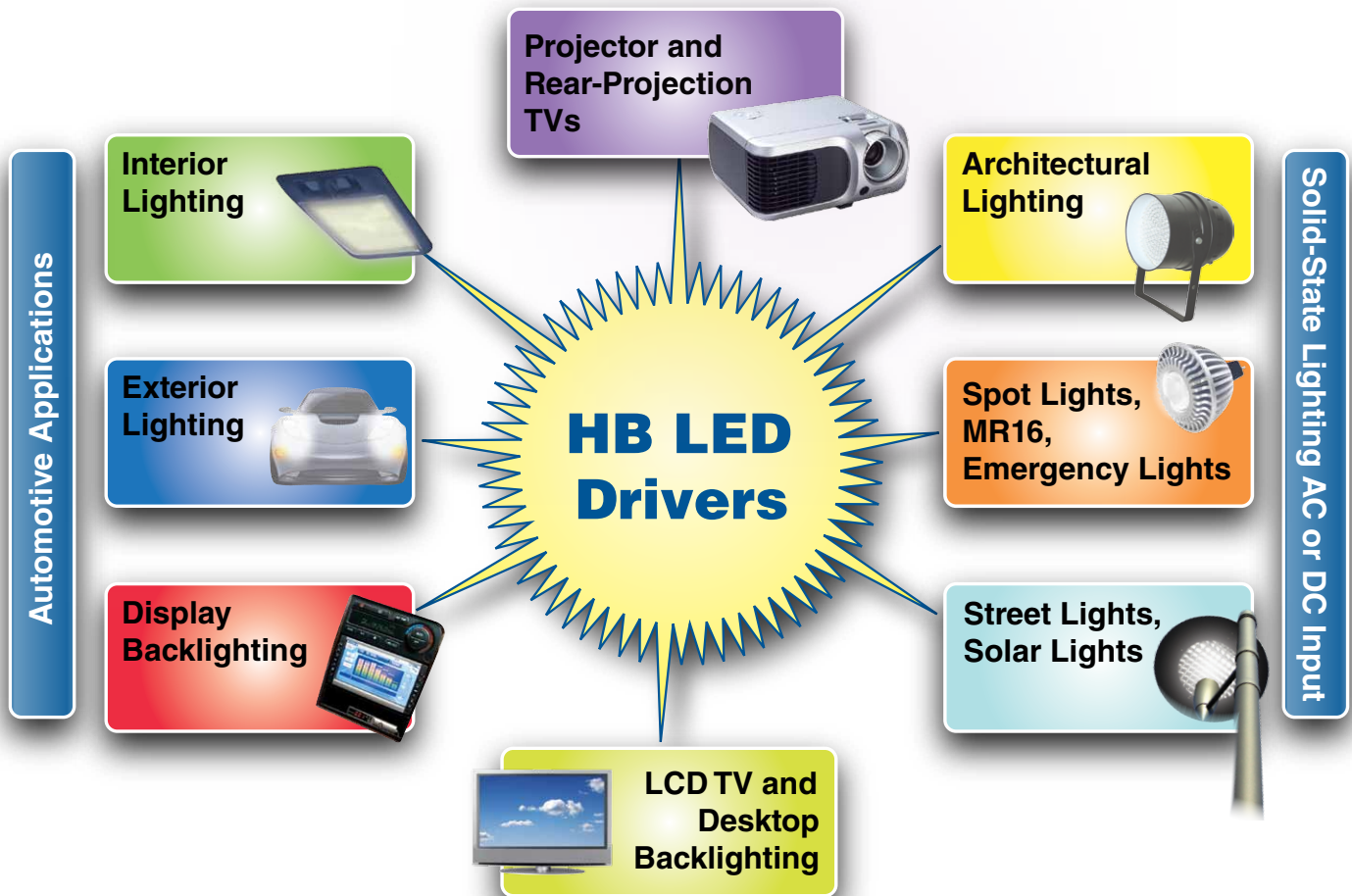


High-Brightness LED Drivers



Maxim's high-brightness LED (HB LED) drivers are dedicated integrated circuits for white or RGB LEDs. They are energy-saving, cost-effective choices that enable the next generation of LCD backlighting, projection, automotive, and general lighting applications. Maxim's continually expanding HB LED portfolio includes 28 products covering the full range of linear and switch-mode topologies (buck, boost, SEPIC, and other topologies).

MAXIM
INNOVATION DELIVERED™

www.maxim-ic.com/LED

HB LED drivers for the widest range of lighting applications

Flexible and robust with wide input-voltage and output-power ranges

Architectural and street lighting

MAX16820/MAX16822/MAX16832

- Low-cost buck drivers
- Up to 65V input

MAX16826

- 4-string switching driver with I²C

MAX16824/MAX16825

- 3-string linear drivers with SPI™



M400

MR16 lights

MAX16834

- Compatible with electronic transformers and triac dimmers
- Enables flicker-free, dimmable MR16s
- Up to 12W of LED power



LuxDot™

Offline lighting

MAX16834

- > 0.90 input power-factor correction (patent pending)
- Compatible with triac dimmers
- Low component count



PAR20

Solar-powered lighting

MAX16821

- Synchronous rectification for driving high-power, common-anode LEDs
- > 94% efficiency, delivers up to 150W

MAX16834

- Boost and buck-boost topologies



SPI is a trademark of Motorola, Inc.
M400 and PAR20 product photos courtesy of LEDtronics, Inc.
LuxDot is a trademark of LedEngin, Inc. Photo courtesy of LedEngin, Inc.
Remaining photo: iStockphoto.com.

Robust HB LED drivers for all automotive lighting applications

Superior efficiency, flexibility, and ease of use

EV kits available

Robust drivers withstand load dump and cold crank, +125°C temps, LED short conditions



Industry's highest efficiency

Front lights, DRL

MAX16821/MAX16834

- Up to 75W; > 94% efficient; buck, boost, or buck-boost; thermal shutdown and overvoltage protection

MAX16812/MAX16832

- 5.5V to 76V operation; compact; PWM/linear dimming; thermal shutdown

MAX16816/MAX16831

- High-power buck, boost, or buck-boost; programmable LED current simplifies design

Widest dimming range

Display backlighting

MAX16807-MAX16810

- Drive 8 to 16 channels; boost or SEPIC modes; 5000:1 dimming range

MAX16826

- I²C-programmable LED current simplifies designs; shorted-LED detection; boost-voltage optimization

Simple to use

Interior lights

MAX16836

- Compact; up to 350mA; low EMI

MAX16804

- PWM/theater dimming; no microcontroller required; low EMI

MAX16805/MAX16806

- Programmable for LED binning, eases manufacturing

Flexible

Tail lamps, CHMSL, sidelights

MAX16823

- Three channels; independent dimming; shorted-LED and open-LED detection

MAX16824

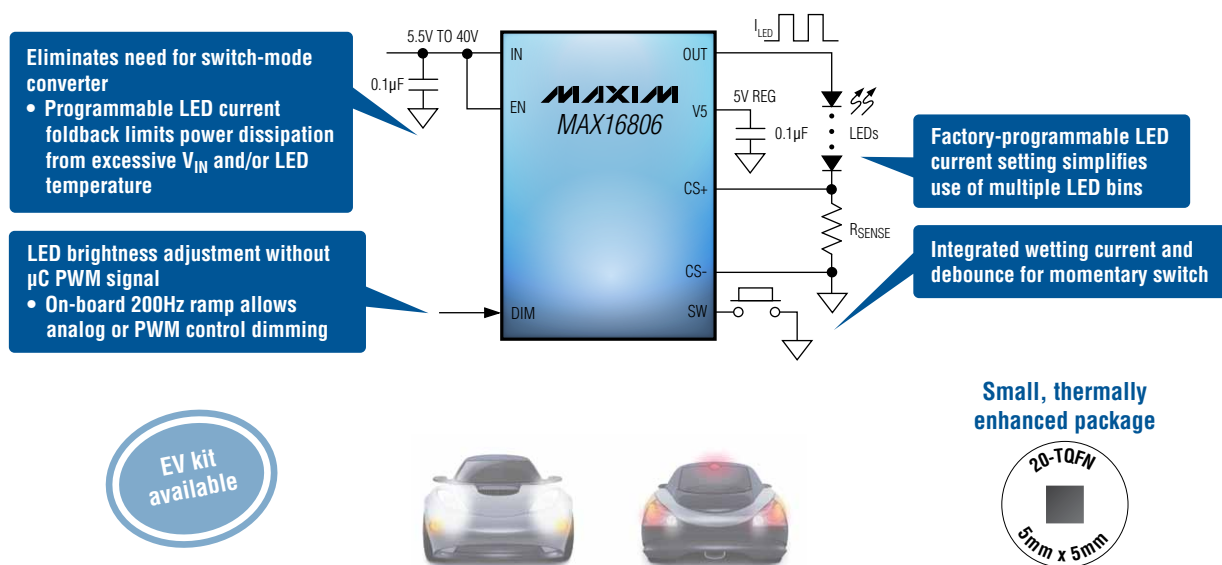
- Three channels; independent dimming; 150mA/channel

MAX16836/MAX16815/MAX16828

- Compact; 350mA/100mA/200mA output; single resistor adjusts current

First high-current, linear LED driver eliminates the need for μC and switch-mode converter

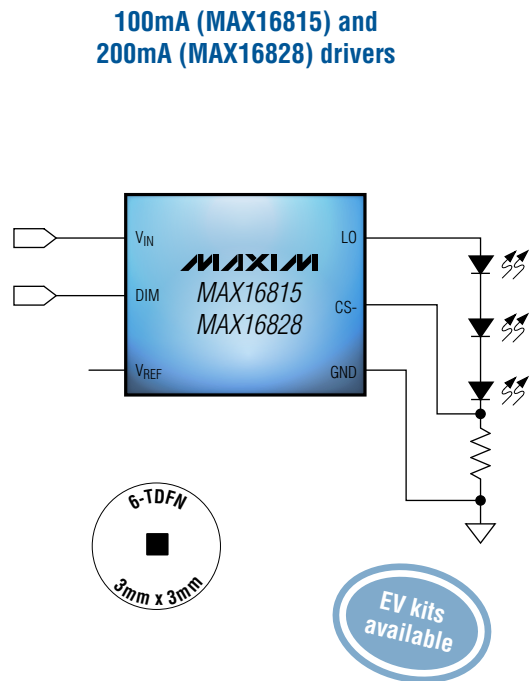
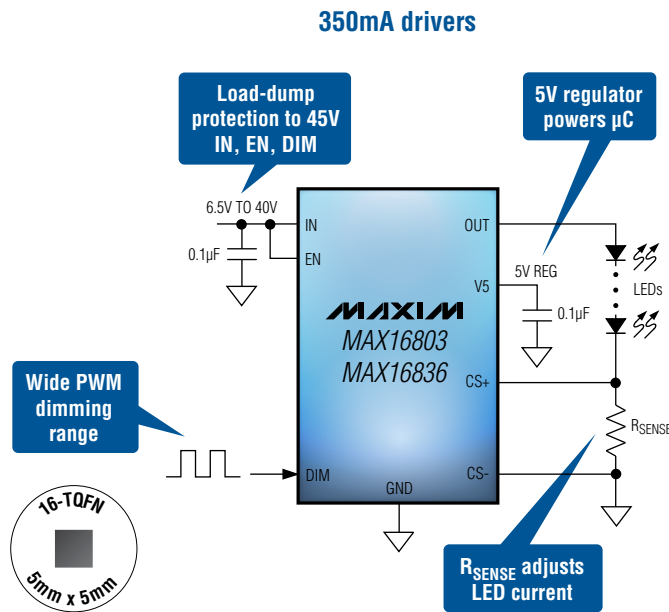
Ideal for automotive lighting applications;
reduces cost and EMI



350mA LED driver family

Part	EN Pin	$\pm 3.5\%$ LED-Current Accuracy	Load-Dump Protected (45V)	5V Output	DIM Input	DIM with DC Signal	V_{IN} Programmable LED-Current Foldback	Programmable LED-Current Reference	Programmable Thermal Foldback	Momentary-Switch Interface
MAX16800	✓	✓	✓	✓						
MAX16803	✓	✓	✓	✓	✓					
MAX16804	✓	✓	✓	✓	✓	✓				
MAX16805	✓	✓	✓	✓	✓	✓	✓	✓		
MAX16806	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
MAX16835	✓	✓	✓	✓						
MAX16836	✓	✓	✓	✓	✓					

Small HB LED drivers simplify lighting design



Features

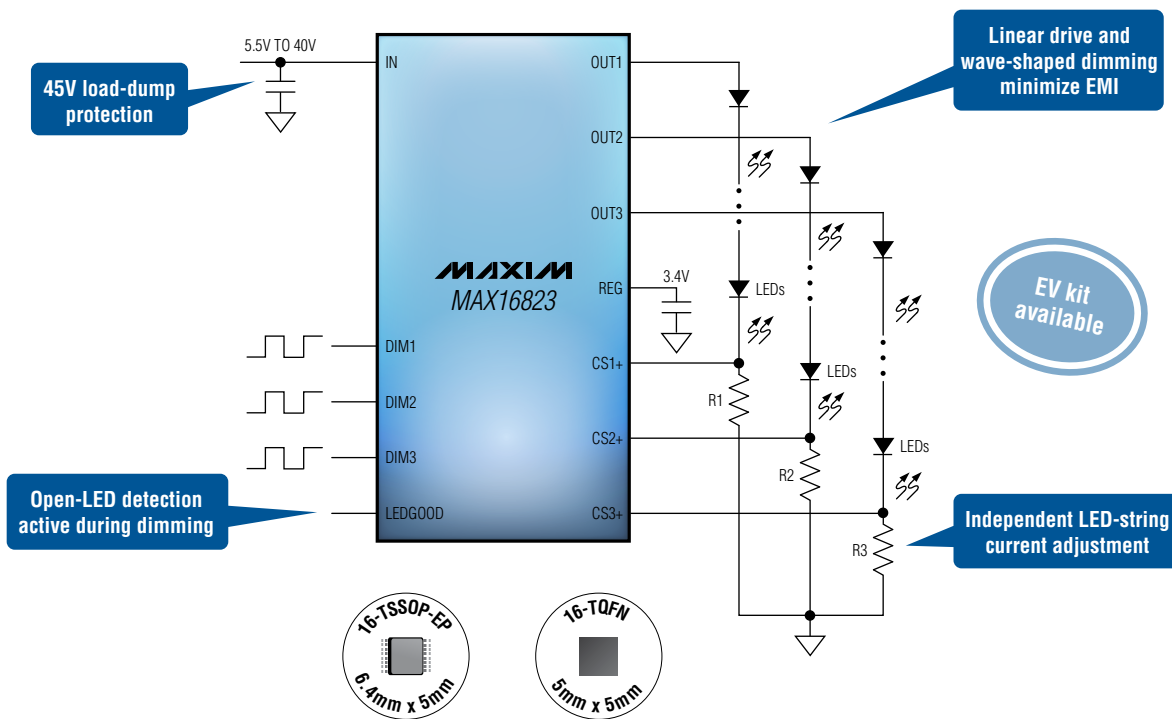
- Up to 1A LED current with external transistor
- $\pm 3.5\%$ LED current accuracy
- Wave-shaped edge control minimizes EMI during PWM dimming
- Low 200mV current-sense reference minimizes power dissipation
- Works down to +5V for automotive cold cranking
- Short-circuit protection
- Thermal shutdown
- Operates from -40°C to $+125^{\circ}\text{C}$

Applications

- Automotive interior lighting
 - Dome lights, map lights
 - Radio/stereo backlighting
 - Dashboard displays
 - Navigation system backlighting
- Automotive exterior lighting
 - Rear combination lights (RCLS)
 - Tail light/side marker assemblies
- Display backlighting
- Signage and indicators
- Ambient and architectural lighting

Highest integration LED driver ideal for automotive applications

High-voltage, 3-channel linear driver with open-LED detection



Flexible

- Adjustable constant LED current (Up to 70mA, 2A with external BJT)
- $\pm 5\%$ LED current accuracy
- Low dropout voltage (0.7V, max)
- +3.4V regulator with 4mA capability

Robust

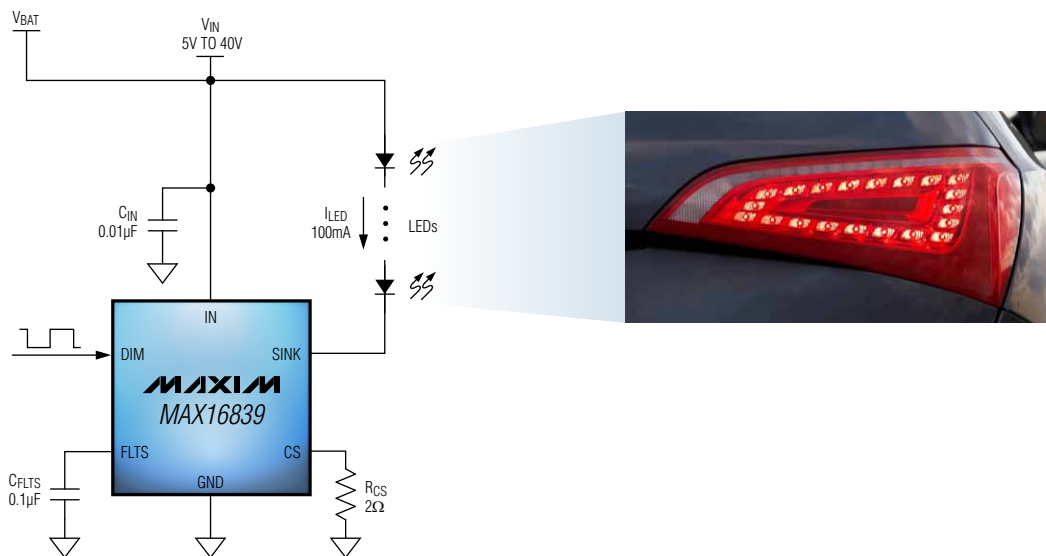
- Undervoltage lockout
- Short-circuit protection
- Thermal shutdown
- Operates from -40°C to $+125^{\circ}\text{C}$

Applications

- Automotive lighting (RCL, CHMSL, RGB ambient)
- Warning lights
- LCD panel backlighting

Linear driver uniquely fulfills automotive fault-detection requirements

Fault output and simultaneous shutdown of multiple strings if one fails



Advanced fault-detection features

- Open-LED detection output
- In multistring applications, if one string fails, all are shut down

Constant-current LED control

- 15mA to 100mA LED current
- ±5% current accuracy

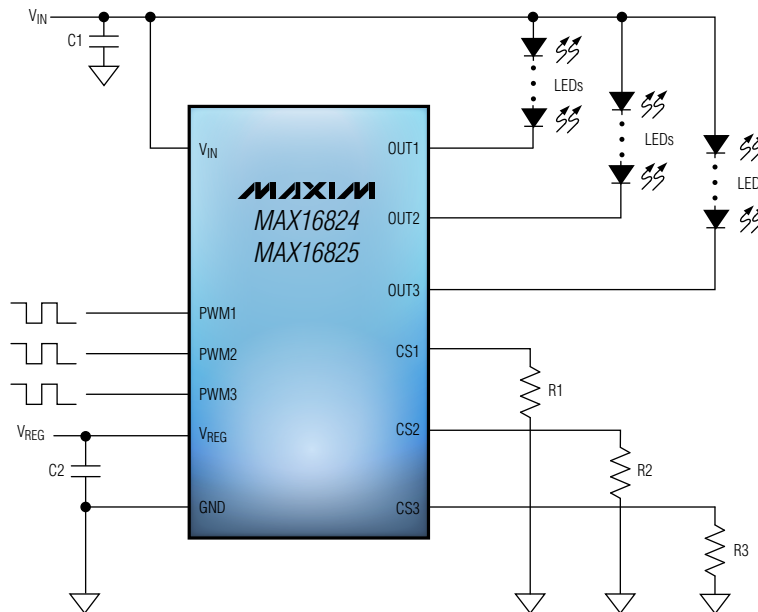
Ideal for automotive voltage and temperature requirements

- 5V to 40V operating input voltage range
- -40°C to +125°C temperature range

Available in 6-pin TDFN and 8-pin SO packages

3-channel HB LED drivers have independent dimming

Drive 150mA LED current with choice of PWM dimming or SPI interface



Features

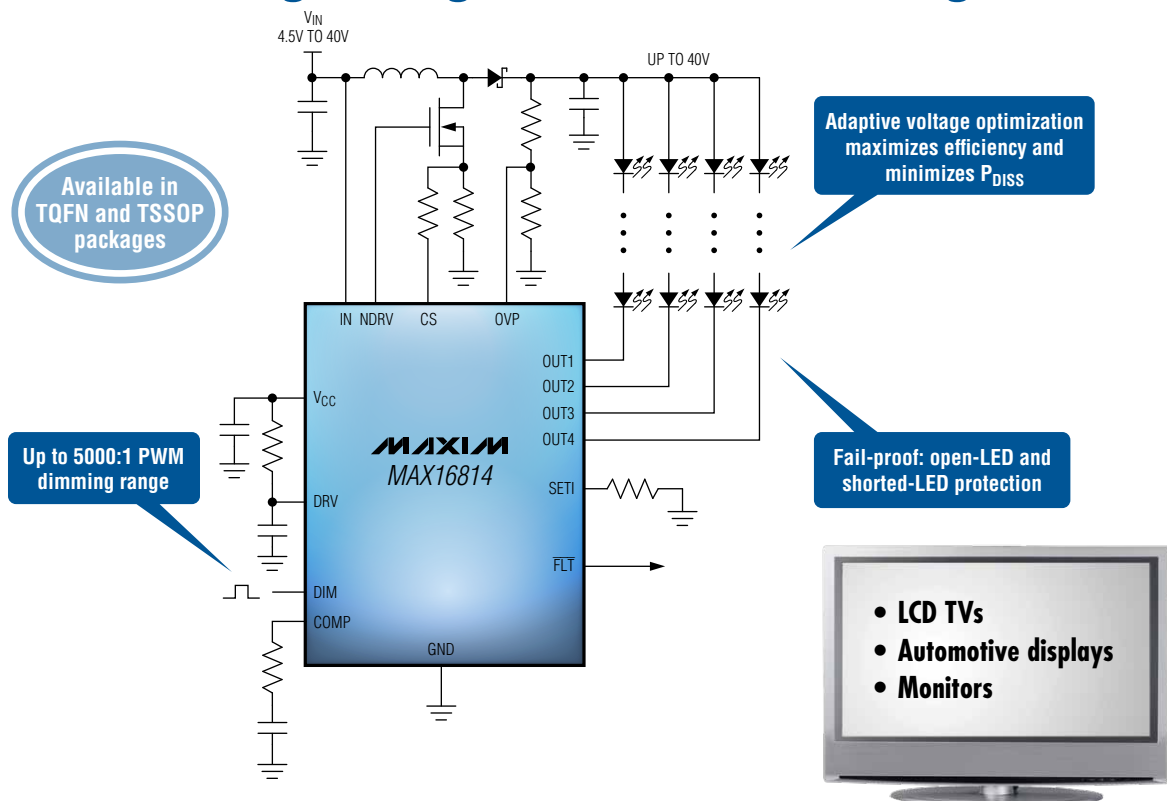
- Up to 36V output voltage range
- Three output channels with independently adjustable LED current (150mA each)
- $\pm 5\%$ LED current accuracy
- Three dedicated dimming-control pins (MAX16824) or 4-wire interface (MAX16825)
- Auxiliary 5V, 4mA voltage regulator
- Short-circuit protection for each output
- Accurate, 200mV current-sense reference reduces power losses
- Thermal shutdown
- Drivers can be cascaded (MAX16825)

Applications

- Small LCD displays
- LED message displays
- Industrial, architectural, and decorative lighting
- Mood lighting
- Signage
- RGB LED lighting

Highly integrated, high-output-current multistring drivers provide a reliable, cost-effective solution

Protect LEDs and driver in case of fault, and allow dimming the light over a 5000:1 range



Robust, fault-tolerant solution

- 40V input capability
- Automatically disable LED strings if LEDs fail as open or short
- Fault-detection output

Allow dimming light over a wide range

- 5000:1 PWM dimming range at 200Hz dimming frequency

Ideal for a wide range of backlighting applications

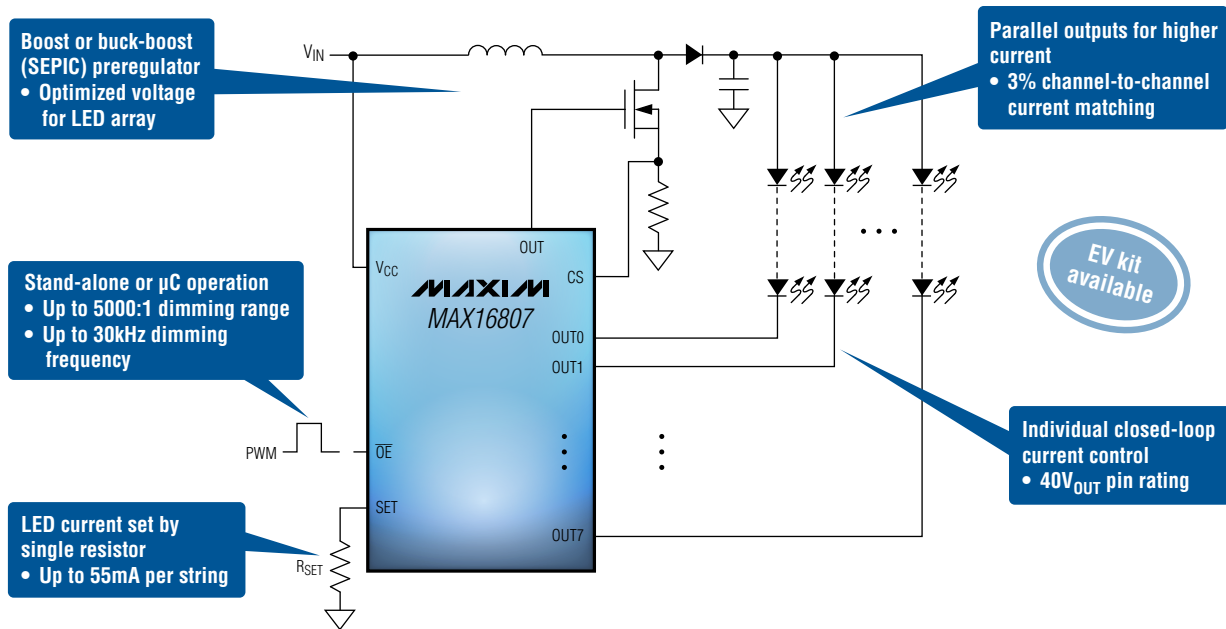
- Four (MAX16814) or two (MAX16838) strings
- Up to 150mA/string

Highly integrated, cost-effective solution

- Internal MOSFETs (except switching MOSFET for MAX16814)
- Output voltage optimization for maximum efficiency
- LED fault protection

Highest integration LED drivers for white or RGB LED LCD backlighting

High-efficiency PWM controllers with 8 or 16 constant-current channels

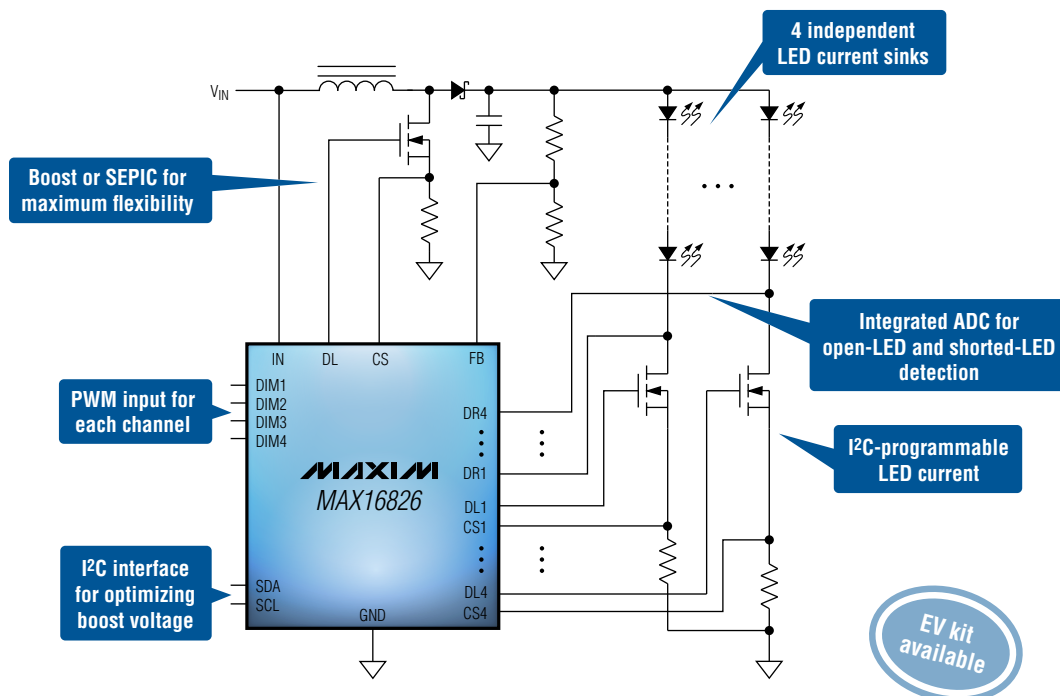


Small, thermally enhanced packages

Part	Channels	Package (mm x mm)
MAX16807	8	28-TSSOP-EP (6.4 x 9.7)
MAX16809	16	38-TQFN (5 x 7)

Programmable HB LED driver optimizes efficiency and eliminates LED binning

Ideal for white or RGB LED LCD backlighting



Flexibility

- Wide 4.75V to 24V input range
- Large number of LEDs per string
- Programmable LED current eliminates LED bins for brightness variation

Efficiency

- Adjusts LED string voltage to maximize efficiency
- Very low, < 20 μ A standby current

Robustness

- Withstands 40V load dump
- External MOSFETs for better thermal management

Precise color and dimming control

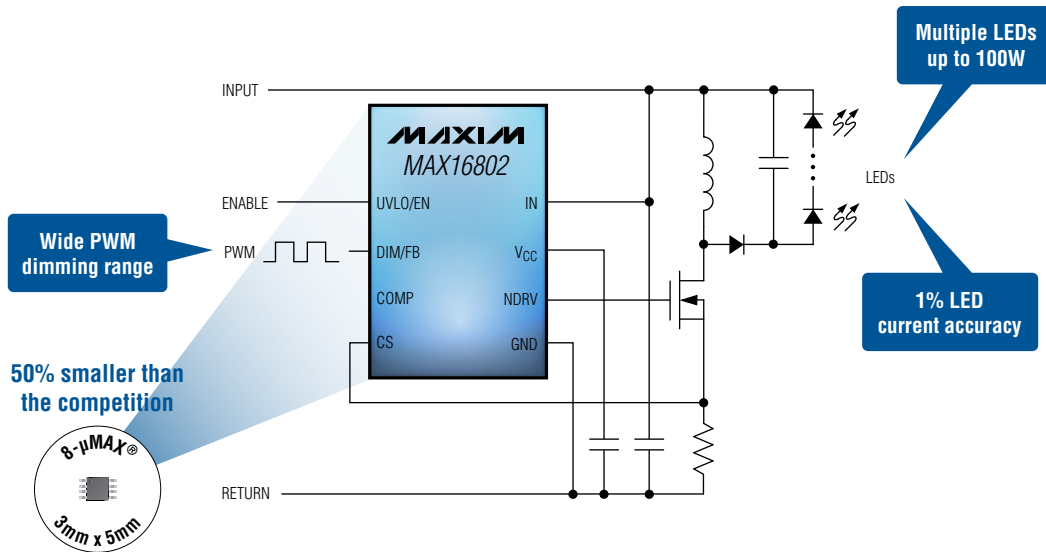
- Drive all white/mono, RGB, or RGB + amber configurations
- Individual PWM inputs
- > 1000:1 PWM dimming range
- Individual LED current adjustment through I²C interface

Applications

- Automotive displays
- Industrial displays
- Desktop displays
- LCD TVs

Low-pin-count HB LED drivers cover wide input-voltage range

PWM dimming and high-accuracy current regulation



Simple and flexible for a wide range of applications



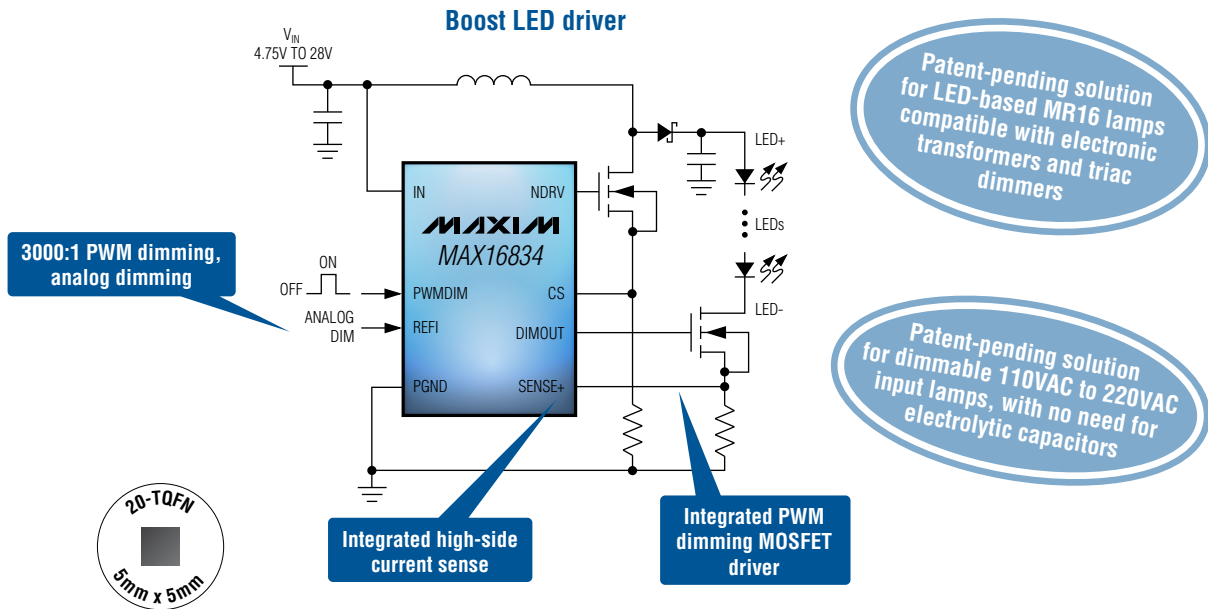
- Offline industrial lighting
- Street lighting

Part	Intended Usage	Supply Voltage	Package
MAX15000	Offline applications	85VAC to 265VAC rectified	10-μMAX
MAX16801	Offline applications	85VAC to 265VAC rectified	8-μMAX
MAX16802	DC applications	Up to 40VDC	8-μMAX

μMAX is a registered trademark of Maxim Integrated Products, Inc.

Flexible HB LED driver supports multiple applications

Configurable for boost, buck-boost, SEPIC,
and high-side buck topologies



Features

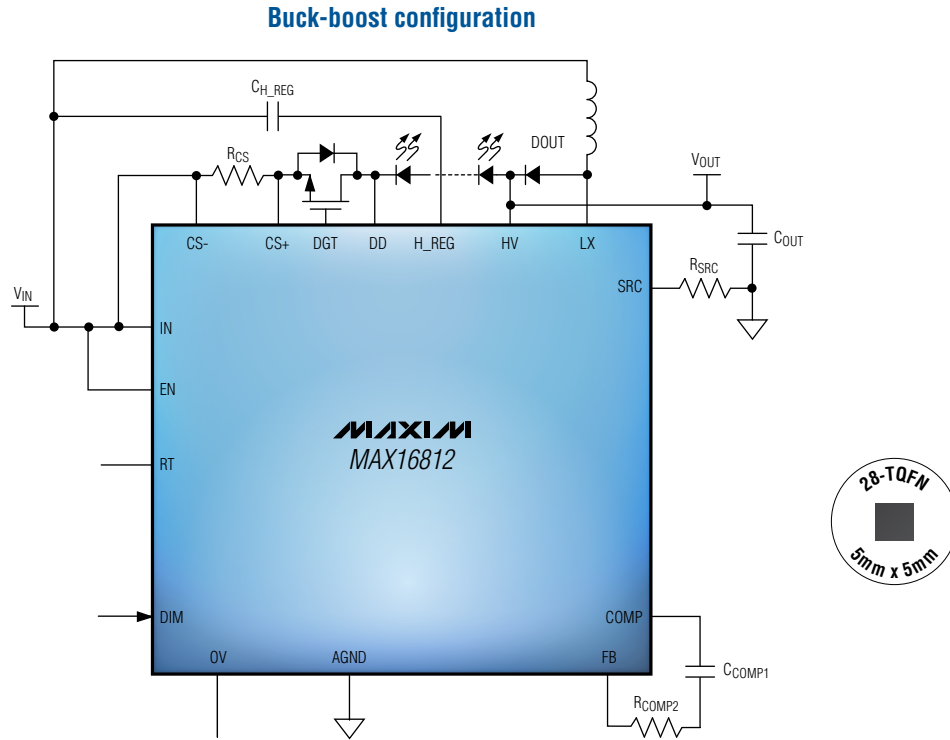
- Wide input operating voltage range (4.75V to 28V)
- 100kHz to 1MHz programmable high-frequency operation
- External clock synchronization input
- Programmable UVLO
- Internal 7V low-dropout regulator
- Fault output (active-low FLT) for overvoltage, overcurrent, and thermal warning faults
- Programmable true differential overvoltage protection
- Operates from -40°C to +125°C

Applications

- LED-based MR16 lamps
- Architectural and decorative lighting
- Automotive rear and front lighting
- DC-DC boost/buck-boost converters
- Projection system RGB LED light sources
- Single-string LED LCD backlighting
- Spot and ambient lighting

Flexible, 76V HB LED driver with linear or PWM dimming control

Integrated dimming MOSFET driver simplifies design and reduces component count



Features

- Integrated 76V, 0.2Ω power MOSFET
- 6.5V to 76V operating range
- Buck, boost, buck-boost (flyback), CUK, and SEPIC configurations
- PWM LED dimming with
 - PWM control signal
 - Analog control signal
 - Chopped V_{IN} input

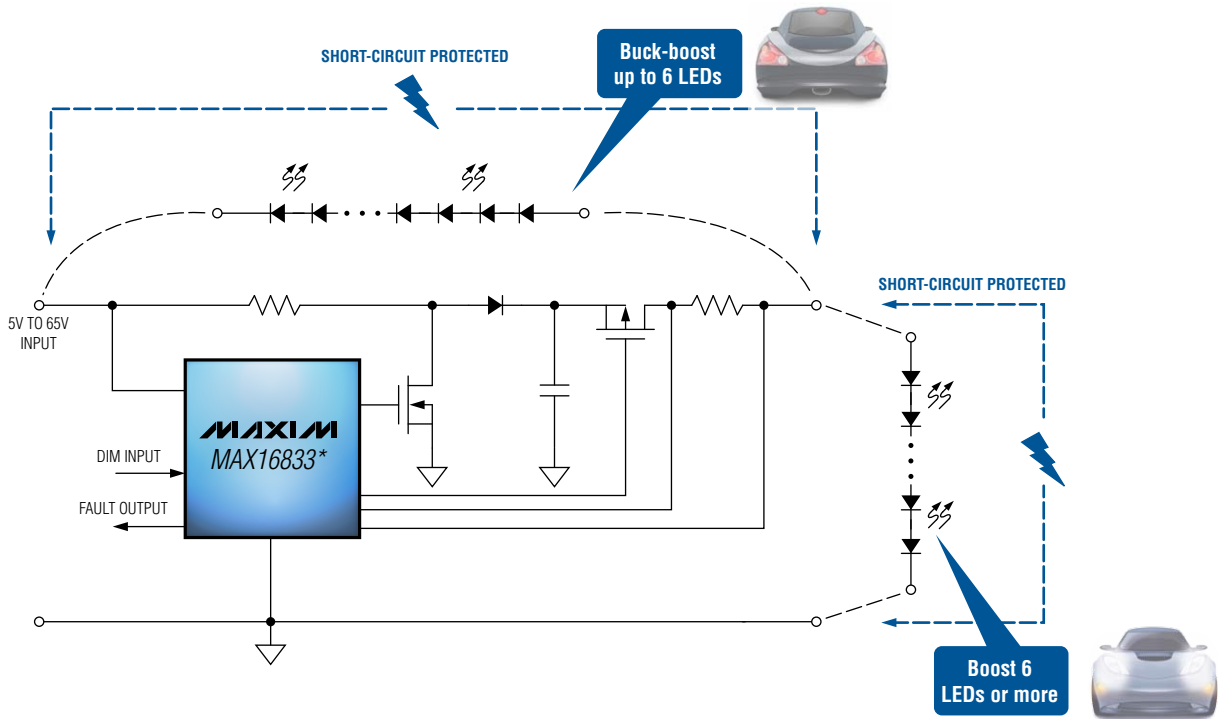
Applications

- Automotive exterior lighting
 - Tail/stop/turn light assemblies
 - Fog and DRL lights



Boost/buck-boost controller enables more reliable, fault-tolerant LED drivers with lower EMI noise

Ideal for all automotive HB LED applications



Reliable, fault-tolerant solution

- High-side current sense and high-side pMOS drivers allow protection against any short between input, output, and ground
- Wide input-voltage capability up to 65V
- Overvoltage and thermal protection
- Fault output
- -40°C to +125°C temperature range

Improved EMI

- Internal frequency dithering improves EMI and reduces EMI filtering needs

Very flexible

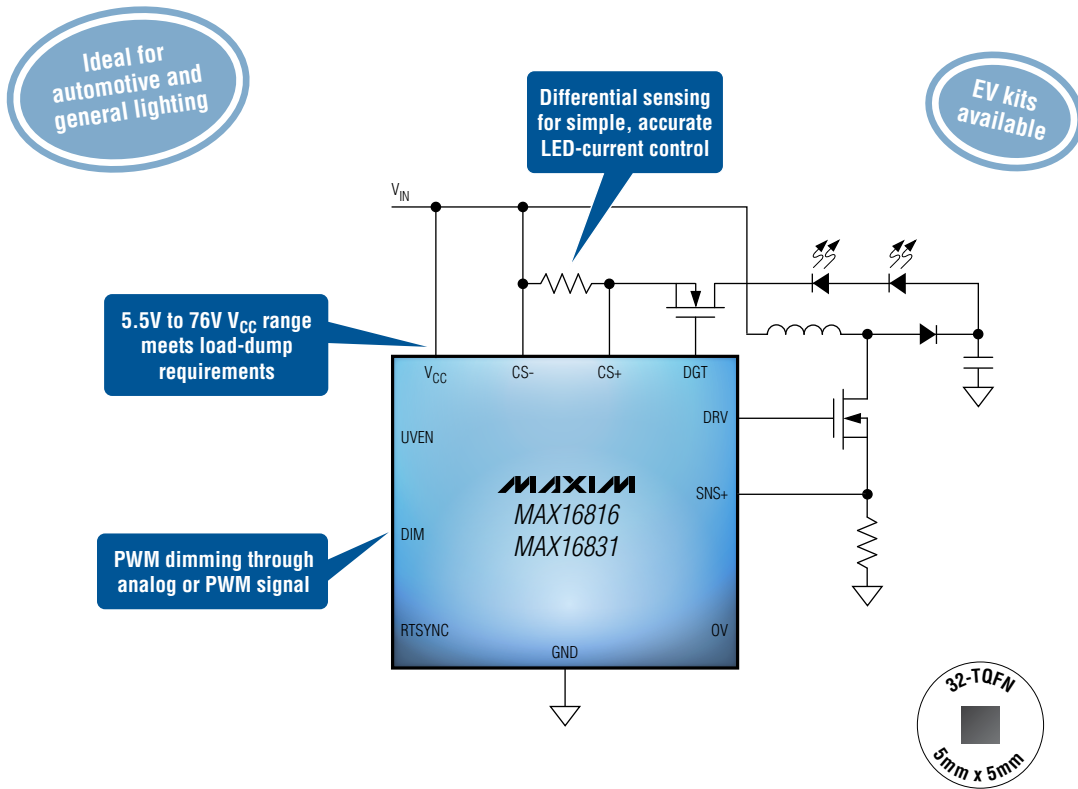
- Boost, buck-boost, buck, and SEPIC configurations
- Wide PWM-dimming range
- Allows single-wire connection to the LEDs
- $\pm 2\%$ accurate voltage reference output (MAX16833B)

16-pin TSSOP package

*Future product—contact factory for availability.

High-voltage, high-power LED drivers simplify dimming

Integrated high-side, n-channel FET drivers provide wide dimming range ideal for automotive and general lighting



Features

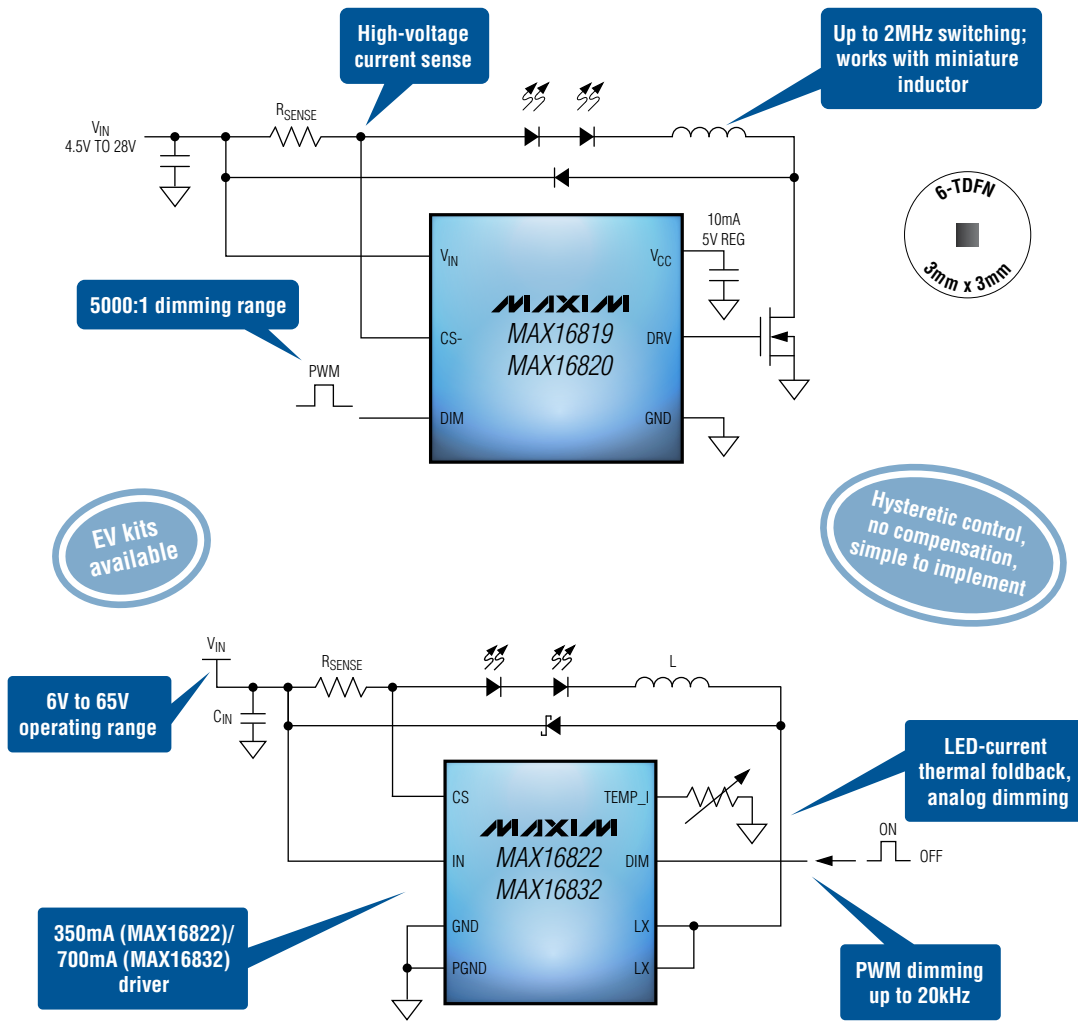
- 100mV high-side, differential LED current sense for high efficiency
- 200mV peak current-mode-control reference
- Boost, buck-boost, buck, or SEPIC topologies
- Programmable LED current, soft-start, and dimming edge control (MAX16816)

Applications

- Automotive lighting (high-beam/low-beam/turn lights, RCL, DRL, fog lights)
- Industrial and architectural lighting
- Warning and emergency lights



High-voltage, high-efficiency HB LED drivers save space and cost



Features

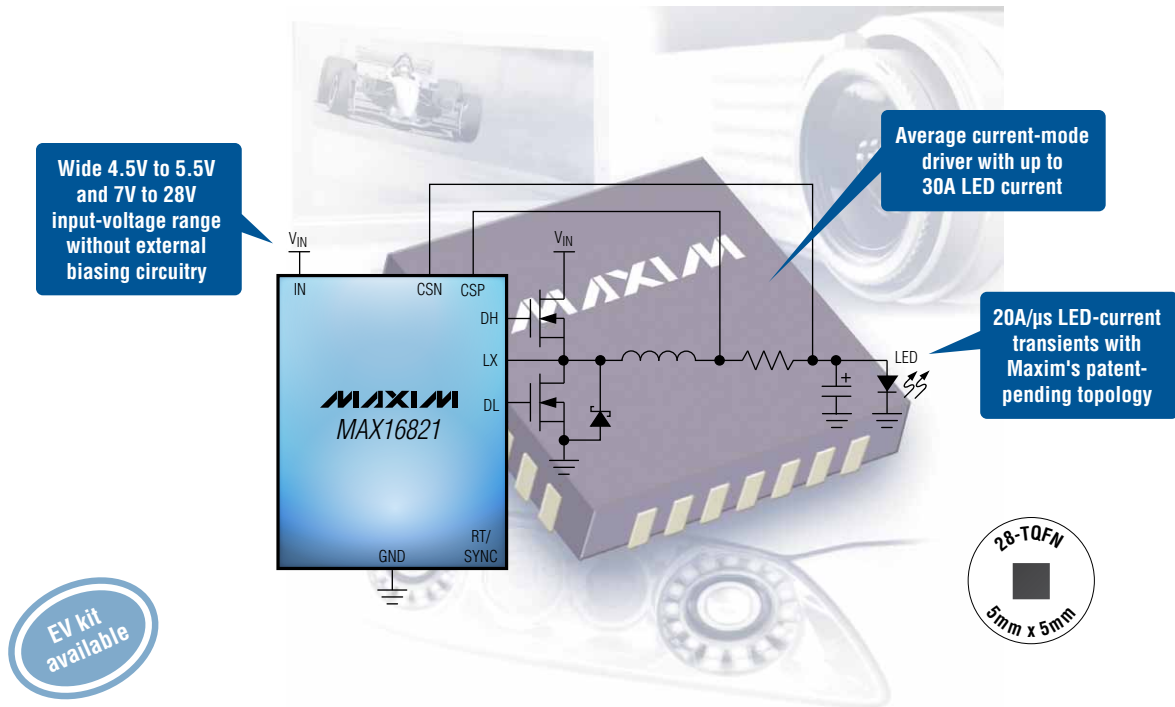
- Up to $\pm 5\%$ LED current accuracy
- Supply up to 35V
- Thermal shutdown
- Operates from -40°C to $+125^{\circ}\text{C}$

Applications

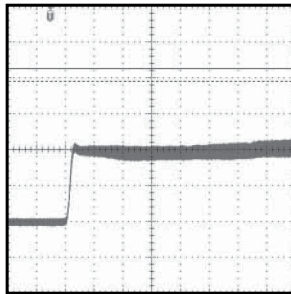
- Architectural and industrial lighting
- MR16 bulbs
- Automotive exterior and interior lighting
- Indicators and emergency lights

High-power LED driver has rapid LED current pulsing

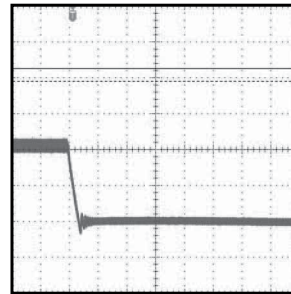
Over 92% efficiency



LED current has fast rise and fall times due to Maxim's patent-pending topology



M 1.00μs



M 1.00μs

Features

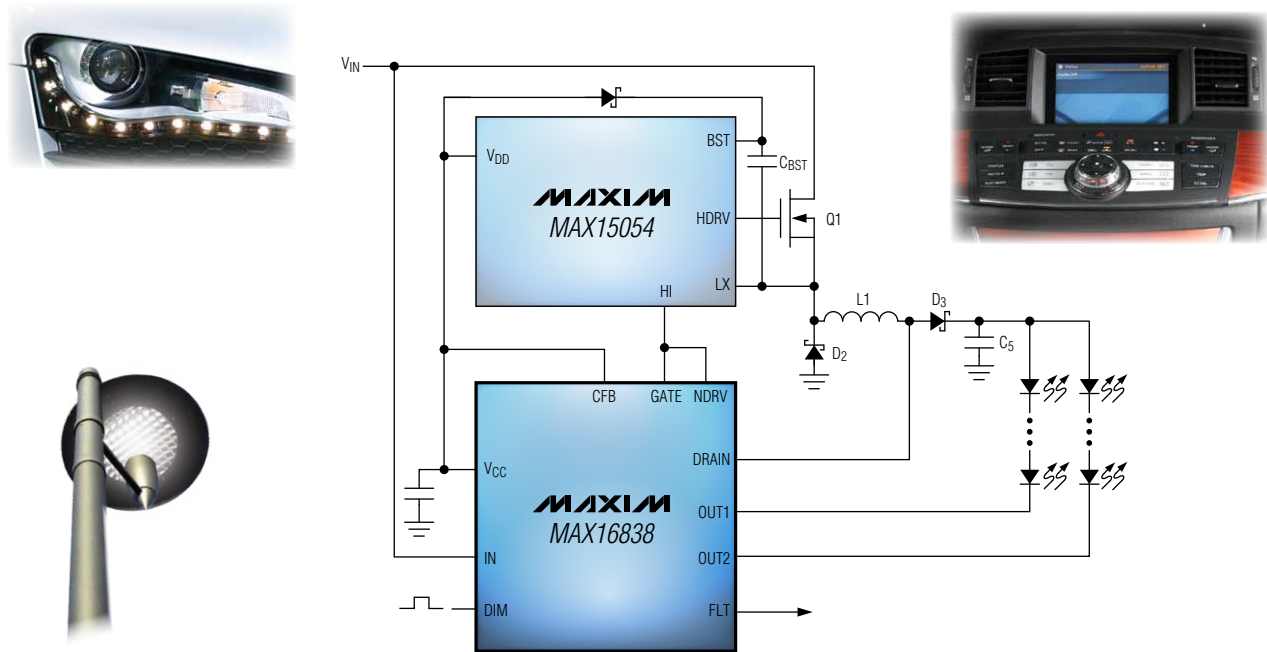
- Suitable for synchronous buck, boost, buck-boost, SEPIC, and common-anode topologies
- 125kHz to 1.5MHz switching frequency
- Wide -40°C to +125°C temperature range
- Overvoltage protection, thermal shutdown

Applications

- Front projectors and rear-projection TV
- Pocket and portable projectors
- Automotive exterior lighting
- Decorative, architectural, and industrial lighting

High-voltage, high-side MOSFET driver for buck and buck-boost HB LED drivers

Ideal for automotive applications



Flexible, low-cost MOSFET driver

- Works with single-string (MAX16834, MAX16833) and multistring (MAX16814, MAX16838) LED drivers with no integrated high-side MOSFET driver
- High-side MOSFET driver allows buck-boost and buck configurations

Ideal for automotive applications

- Up to 60V operating input voltage
- -40°C to +125°C operating temperature range

Improves conversion efficiency

- 2A source/sink current capability
- 6ns output rise and fall times with 1000pF output capacitance
- Low propagation delay (12ns)

Available in a small, 6-pin SOT23 package

Linear HB LED drivers

Part	Applications			V_{IN} (V)	I_{LED} (A, max)	PWM-Dimming Ratio	Package
	Automotive Lighting	General Lighting	Display Backlighting				
MAX16800	✓	✓		6.5 to 40	0.35	1:30	16-TQFN
MAX16803	✓	✓		6.5 to 40	0.35	1:200	16-TQFN
MAX16804/05/06	✓	✓		5.5 to 40	0.35	1:200	20-TQFN
MAX16815	✓	✓		6.5 to 40	0.1	1:100	6-TDFN
MAX16823	✓	✓		5.5 to 40	0.1/ch	1:200	16-TQFN/TSSOP
MAX16824	✓	✓	✓	6.5 to 28	0.15/ch	1:5000	16-TSSOP
MAX16825	✓	✓	✓	6.5 to 28	0.15/ch	1:5000	16-TSSOP
MAX16828	✓	✓		6.5 to 40	0.2	1:100	6-TDFN
MAX16835	✓	✓		6.5 to 40	0.35	1:80	16-TQFN
MAX16836	✓	✓		6.5 to 40	0.35	1:80	16-TQFN
MAX16839	✓	✓		5 to 40	0.1	1:200	6-TDFN/8-SO

Switch-mode HB LED drivers

Part	Applications				Topology	V_{IN} (V)	I_{LED} (A, max)	Frequency (Hz)	PWM-Dimming Ratio	Package
	Automotive Lighting	General Lighting	Projection	Display Backlighting						
MAX16801		✓			Boost, flyback, SEPIC	10.8, 24	10.0	262k	1:3000	8- μ MAX
MAX16802		✓			Boost, buck, flyback, SEPIC	10.8, 24	10.0	262k	1:3000	8- μ MAX
MAX16807				✓	Boost, SEPIC + 8 linear	8, 26.5	0.05/ch	20k to 1M	1:5000	28-TSSOP-EP
MAX16809				✓	Boost, SEPIC + 16 linear	8, 26.5	0.05/ch	20k to 1M	1:5000	38-TQFN
MAX16812	✓	✓	✓		Boost, buck-boost, buck	6.5, 76	0.5	125k to 500k	1:100	28-TQFN
MAX16814	✓	✓		✓	Boost, SEPIC + 4 linear	4.75 to 40	0.15/ch	200k to 2M	1:5000	20-TQFN/TSSOP
MAX16816	✓	✓	✓		Boost, buck, buck-boost, SEPIC	5.5, 76	10.0	500k	1:1000	32-TQFN
MAX16819	✓	✓			Buck	4.5, 28	3.0	20k to 2M	1:5000	6-TDFN
MAX16820	✓	✓			Buck	4.5, 28	3.0	20k to 2M	1:5000	6-TDFN
MAX16821	✓	✓	✓		Boost, buck, buck-boost, SEPIC	4.75 to 5.5, 7 to 28	30.0	125k to 1.5M	1:5000	28-TQFN
MAX16822	✓	✓			Buck	6.5, 65	0.35	20k to 2M	1:1000	8-SO
MAX16826	✓	✓	✓	✓	Boost, SEPIC + 4 linear	4.75 to 24	3.0	100k to 1M	1:2000	32-TQFN-EP
MAX16831	✓	✓	✓	✓	Boost, buck, buck-boost, SEPIC	5.5, 76	10.0	500k	1:1000	32-TQFN
MAX16832	✓	✓			Buck	6.5, 65	0.7	20k to 2M	1:1000	8-SO-EP
MAX16833	✓	✓			Boost, buck, buck-boost, SEPIC	5 to 65	Up to 2	100k to 1M	1:3000	16-TSSOP
MAX16834	✓	✓	✓	✓	Boost, buck, buck-boost, SEPIC	4.5, 28	Up to 2	100k to 1M	1:3000	20-TQFN-EP
MAX16838	✓	✓		✓	Boost, SEPIC + 2 linear	4.75 to 40	0.15/ch	200k to 2M	1:5000	20-TQFN/TSSOP

High-voltage MOSFET drivers

Part	Applications			Topology	V_{IN} (V)	Propagation Delay (ns)	Source/Sink Current (A, max)
	Automotive Lighting	General Lighting	Display Backlighting				
MAX15054	✓	✓	✓	Buck, buck-boost	Up to 60	12	2

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go to: www.maxim-ic.com/samples

