

# The **POWER**<sup>®</sup> of **EFFICIENCY** Intelligent Lighting



**O<sub>2</sub>Micro**<sup>®</sup>  
Breathing Life into Mobility

# Intelligent Lighting Family Product Guide

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\* NOTE: The OZ9928, OZ9966, OZ9972/72A, OZ9976, and OZ9977/77A/77B are inverter controllers specially designated for use in televisions or applications with multiple lamps, are warranted and licensed for use in these or any other appropriate applications, and are sold with a license to all relevant O2Micro patents. Sale of all other O2Micro inverter controllers are subject to the following restrictions: (i) the product is not warranted, indemnified, or licensed for use in televisions or applications with multiple lamps; (ii) sale of the product and license to O2Micro inverter controller patents are expressly conditioned upon not using this product in a television or applications with multiple lamps; (iii) by using the product, you agree to notify customers of the limited scope of the license and sale; and (iv) use of the product in a television or applications with multiple lamps is expressly prohibited, is a material breach of such sale, and violates any express or implied license to any O2Micro patent. All sales are subject to O2Micro's conditions and terms of sale and use.

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<b>OZ9906</b>	Six String LED Controller	28 E-TSSOP, SOP, Lead-free	25
<b>OZ9908</b>	Eight String High Power LED Controller	48 LQFP, 40 QFN, Lead-free	26
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# Intelligent Lighting Family Product Guide

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# Intelligent Lighting

## Mission Statement

Be the leading supplier of highly efficient Intelligent Lighting solutions for power management of electronic products in the Computer, Consumer, Industrial, Automotive, and Communications markets worldwide.

## Product

O<sub>2</sub>Micro® offers a family of *Intelligent Lighting* backlight Cold Cathode Fluorescent Lamp (CCFL), External Electrode Fluorescent Lamp (EEFL), Flat Fluorescent Lamp (FFL), and LED controllers ideal for various sizes of Liquid Crystal Display (LCD) and Power Management Unit (PMU) applications – e.g., Monitors, TVs, Notebooks/ Netbooks, PDVDs, Car TVs, GPS, Digital Photo Frames, PNDs (Personal Navigation Devices). Solutions are also available for General Lighting and Automotive applications.

## CONSUMER Applications



# OZ9919

## FEATURES

- Supports half-bridge or push-pull topology
- 0% to 100% PWM dimming range
- Constant operating frequency
- Drives positive/negative-impedance lamps during ignition
- High drive current for external MOSFETs
- User-defined ignition time and shutdown delay time
- Built-in intelligence for lamp ignition and normal operation of CCFLs
- Open-lamp and over-voltage protection
- Soft-start function

## GENERAL DESCRIPTION

OZ9919 is a high performance, cost-effective Cold Cathode Fluorescent Lamp (CCFL) controller designed to drive large-size LCD monitors using 2 or 4 CCFLs.

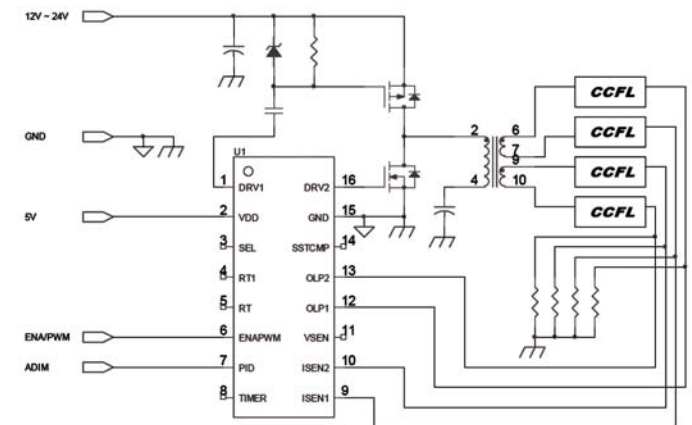
This controller converts an unregulated DC voltage into a nearly sinusoidal lamp voltage and current waveforms. It supports either half-bridge or push-pull power conversion topology, while maintaining high efficiency operation.

The OZ9919 offers a high level of integration, while maintaining flexibility and high efficiency operation that reduces external component heating, resulting in higher reliability and longer CCFL life. The proprietary design technique provides a simple, low-cost system solution.

## APPLICATIONS

- LCD Monitor

## APPLICATION DIAGRAM



U.S. Patent #'s 6,259,615; 6,396,722; 6,559,606; 6,804,129; 6,809,938; 6,856,519; 6,897,698; 6,900,993; 7,026,860; 7,120,035; 7,151,394; 7,394,209; 7,417,382; 7,515,445; 7,515,446; 7,777,425; and more patents pending.



# OZ9933

## FEATURES

- Constant operating frequency
- Drives positive/negative-impedance lamps during ignition
- High drive current for external MOSFETs
- User-defined ignition time and shutdown delay time
- Built-in intelligence for lamp ignition and normal operation of CCFLs
- Open-lamp and over-voltage protection
- Soft start function

## GENERAL DESCRIPTION

OZ9933 is a high performance, cost-effective Cold Cathode Fluorescent Lamp (CCFL) controller designed to drive large-size LCD applications using 2, 4, or 6 CCFLs. It supports a full bridge, power conversion topology, while maintaining high efficiency operation.

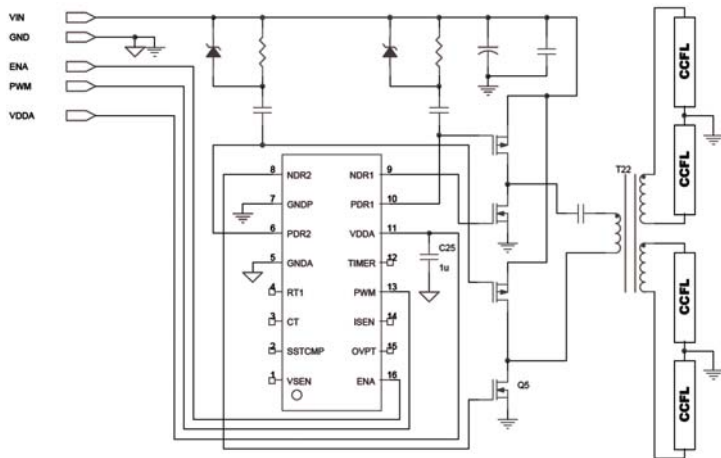
This controller converts an unregulated DC voltage into a nearly sinusoidal lamp voltage and current waveforms. It supports full-bridge power conversion topology, while maintaining high efficiency operation.

The OZ9933 offers a high level of integration, while maintaining flexibility and high efficiency operation that reduces external component heating, resulting in higher reliability and longer CCFL life. The proprietary design technique provides a simple, low-cost system solution.

## APPLICATIONS

- LCD Monitor

## APPLICATION DIAGRAM



U.S. Patent #'s 6,259,615; 6,396,722; 6,559,606; 6,804,129; 6,809,938; 6,856,519; 6,897,698; 6,900,993; 7,026,860; 7,120,035; 7,151,394; 7,394,209; 7,417,382; 7,515,445; 7,515,446; 7,777,425; and more patents pending.

# OZ9937

## FEATURES

- Universal panel interface
- Drives positive/negative-impedance lamps during ignition
- Independent PWM and analog dimming control
- Operating frequency compensation
- User-defined PWM dimming frequency
- User-defined striking and normal operating frequency
- Open-lamp and over-voltage protection
- User-defined ignition and shutdown delay time
- Soft start function

## GENERAL DESCRIPTION

The OZ9937 is a high performance, cost-effective Cold Cathode Fluorescent Lamp (CCFL) controller designed to drive large-size LCD Monitor applications using 2 to 6 CCFLs.

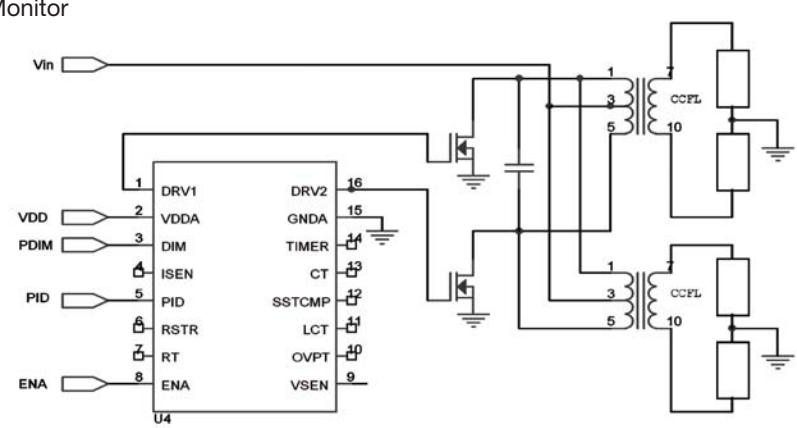
OZ9937 receives a panel ID signal from the system and provides an optimal operating frequency and power to the LCD panel. The adaptive feature enables a single inverter design to suit various panel applications.

The controller converts unregulated DC voltage into a nearly sinusoidal lamp voltage and current waveforms. It provides two drive signals for most power conversion topologies, while maintaining high efficiency operation.

## APPLICATIONS

- LCD Monitor

## APPLICATION DIAGRAM



U.S. Patent #'s 6,259,615; 6,396,722; 6,559,606; 6,804,129; 6,809,938; 6,856,519; 6,900,993; 7,120,035; 7,372,213; 7,394,209; 7,417,382; 7,515,445; 7,515,446; 7,777,425; and more patents pending.

# OZ9938

## FEATURES

- Positive PWM dimming polarity
- Constant operating frequency
- Drives positive/negative-impedance lamps during ignition
- High drive current for external MOSFETs
- User-defined ignition time and shutdown delay time
- Multiple mode dimming control
- Built-in intelligence for lamp ignition and normal operation of CCFLs
- Open-lamp and over-voltage protection
- Soft start function

## GENERAL DESCRIPTION

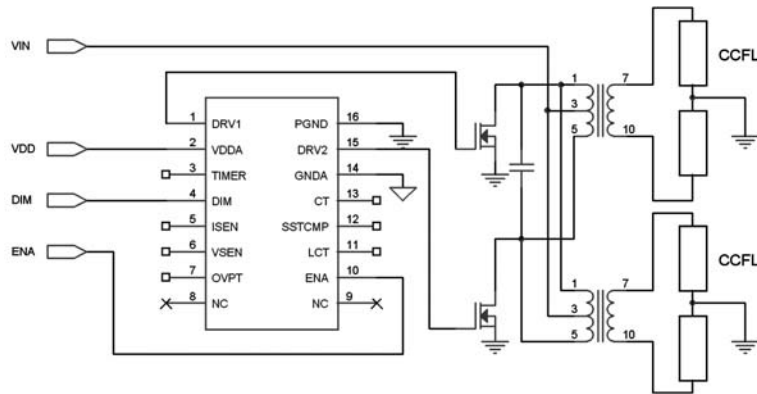
The OZ9938 is a high performance, cost-effective Cold Cathode Fluorescent Lamp (CCFL) controller designed to drive large-size LCD applications requiring 2 to 6 CCFLs.

This controller converts an unregulated DC voltage into a nearly sinusoidal lamp voltage and current waveforms. It provides two drive signals for most power conversion topologies, while maintaining high efficiency operation.

The OZ9938 offers a high level of integration, while maintaining flexibility and high efficiency operation that reduces external component heating. This results in higher reliability and longer CCFL life. The proprietary design technique provides a simple, low-cost system solution.

## APPLICATIONS

- LCD Monitor



U.S. Patent #'s 6,104,146; 6,259,615; 6,396,722; 6,559,606; 6,804,129; 6,809,938; 6,856,519; 6,897,698; 6,900,993; 7,095,392; 7,120,035; 7,151,394; 7,233,117; 7,372,213; 7,394,209; 7,417,382; 7,515,445; 7,515,446; 7,777,425; and more patents pending.

# OZ9928

## FEATURES

- Dual CCFL inverter controller
- Synchronization for multiple ICs
- Supports differential drive
- Supports system operation frequency synchronization
- Constant operating frequency
- 180 degree phase-shift PWM dimming
- Mixed-mode dimming control
- Integrated high side N-MOSFET driver
- High drive capability
- Selectable shutdown protection mode
- User-defined ignition and shutdown delay timers
- Built-in intelligence for lamp ignition and normal operation of CCFLs
- Open-lamp and over-voltage protection
- Soft start function

## GENERAL DESCRIPTION

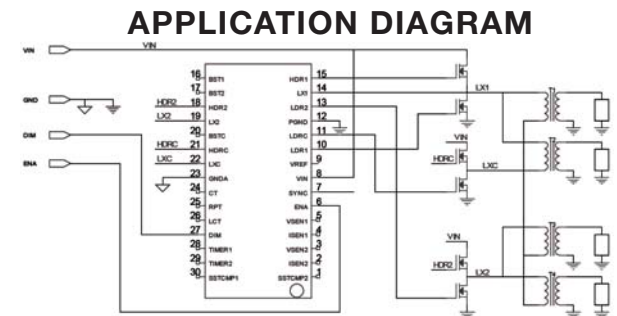
The OZ9928 is a high performance, cost-effective, 2-channel controller designed for large-size Cold Cathode Fluorescent Lamp (CCFL) or External Electrode Fluorescent Lamp (EEFL) LCD TV applications.

The controller provides six drive signals and is capable of driving full-bridge and Class-D topologies. The drive outputs are fixed phase when used for single-side or differential drive applications. Multiple OZ9928s can be synchronized to drive numerous lamps.

OZ9928 provides total system protection for differential drive and single-side drive applications. It receives either a DC voltage and/or external Pulse Width Modulation (PWM) signal to perform mixed-mode PWM dimming.

## APPLICATIONS

- LCD TV



U.S. Patent #'s 6,104,146; 6,259,615; 6,396,722; 6,501,234; 6,570,344; 6,707,264; 6,781,325; 6,804,129; 6,897,698; 6,936,975; 7,075,245; 7,095,392; 7,126,289; 7,151,394; 7,190,123; 7,248,240; 7,345,431; 7,394,209; 7,417,382; 7,425,949; 7,477,024; 7,515,445; 7,515,446; 7,550,928; 7,554,273; 7,777,425; and more patents pending.

# OZ9966

## FEATURES

- Full-bridge or dual-forward topology
- Integrated high side N-MOSFET driver
- High drive capability and System synchronization
- Dedicated pins for Analog and LPWM dimming
- Selectable PWM dimming polarity
- Constant operating frequency
- Built-in intelligence to manage lamp ignition and normal operation
- Open-lamp, over-voltage, over-current, and under-voltage lockout protection
- User-defined striking and shutdown delay timers
- Soft start function

## GENERAL DESCRIPTION

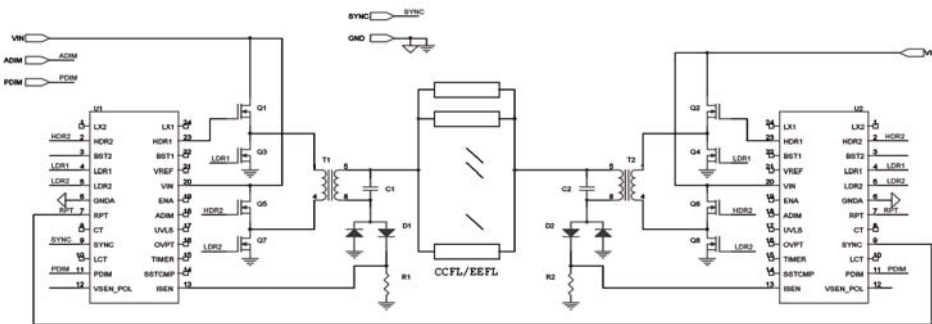
The OZ9966 is a high performance controller designed for large-size LCD TV applications requiring multiple lamps. It achieves a high efficiency power conversion with minimal switching loss using a full-bridge N-Channel MOSFET topology. The OZ9966 is ideal for single-side drive or differential drive applications.

OZ9966 allows selection of the Pulse Width Modulation (PWM) dimming polarity, and provides two dedicated pins for analog and PWM dimming control.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #'s 6,259,615; 6,396,722; 6,570,344; 6,781,325; 6,804,129; 6,897,698; 6,936,975; 7,075,245; 7,126,289; 7,151,394; 7,190,123; 7,248,240; 7,345,431; 7,394,209; 7,417,382; 7,425,949; 7,515,445; 7,515,446; 7,550,928; 7,554,273; 7,777,425; and more patents pending.

# OZ9972/72A

## FEATURES

- **OZ9972:** System synchronization for dimming and operation frequency
- Full-bridge topology
- Integrated high side N-MOSFET driver
- High drive capability and soft start function
- Constant operating frequency
- Built-in intelligence to manage lamp ignition and normal operation of CCFLs
- Open-lamp, over-voltage, over-current, and under-voltage lockout protection
- User-defined striking and shutdown delay timers
- Soft start function

## GENERAL DESCRIPTION

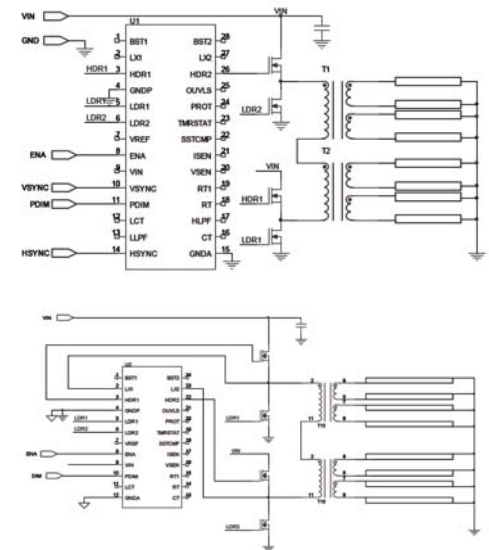
OZ9972/72A are high performance, Pulse Width Modulation (PWM) controllers designed for large-size LCD TV applications requiring multiple lamps. They achieve high efficiency power conversion with minimal switching loss in a PWM, full-bridge, N-Channel MOSFET topology.

OZ9972/72A provide high drive capability, support a wide input range, and provide a constant, user-defined operating frequency.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAMS



U.S. Patent #'s 6,259,615; 6,396,722; 6,570,344; 6,781,325; 6,804,129; 6,897,698; 6,936,975; 7,075,245; 7,126,289; 7,151,394; 7,190,123; 7,248,240; 7,345,431; 7,394,209; 7,417,382; 7,425,949; 7,515,445; 7,515,446; 7,550,928; 7,554,273; and more patents pending.

# OZ9976

## FEATURES

- Offline Inverter Controller (IPB)
- Supports both fixed and variable frequency applications
- Half-bridge or push-pull topology
- Directly drives pulse transformers
- Dedicated pins for Analog and LPWM dimming
- User-defined minimum operating frequency
- User-defined striking frequency range
- Open-load, over-voltage, and under-voltage lockout protection
- User-defined striking and shutdown delay timers
- Soft start function

## GENERAL DESCRIPTION

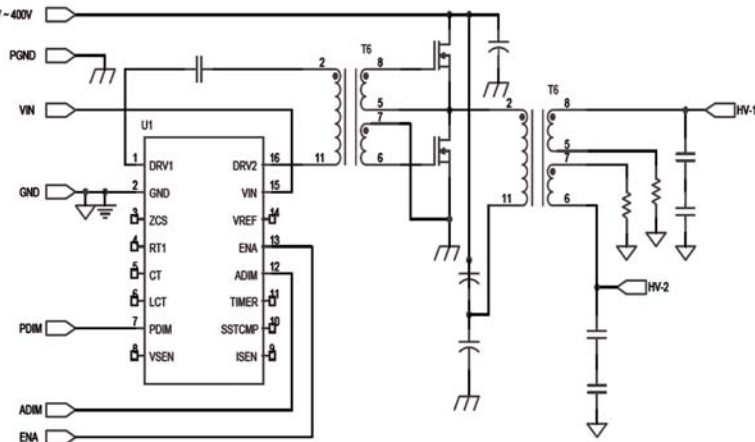
The OZ9976 is a high efficiency, Pulse Width Modulation (PWM) controller designed for off line LCD backlight application. It achieves high efficiency power conversion with minimal switching loss using Zero Current Switching (ZCS) technology. OZ9976 applications can operate under fixed or variable operating frequency with ZCS technology.

The minimum operating frequency can be set by either an external RC network or operate in self-oscillating mode. The intelligent operating frequency management circuitry extends Cold Cathode Fluorescent Lamp (CCFL) lifetime and offers design flexibility.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #'s 6,259,615; 6,396,722; 6,570,344; 6,781,325; 6,804,129; 6,809,938; 6,856,519; 6,900,993; 6,936,975; 7,075,245; 7,120,035; 7,126,289; 7,190,123; 7,248,240; 7,345,431; 7,394,209; 7,417,382; 7,425,949; 7,515,445; 7,515,446; 7,550,928; 7,554,273; and more patents pending.

# OZ9901

## FEATURES

- Integrated 3A, 0.2Ω switching MOSFET
- Integrated VGH and VGL charge pump regulators
- Adjustable VGH Delay
- Operational amplifier for VCOM buffer
- Open-drain reset output for TCON
- 1.2MHz fixed switching frequency boost converter with soft start and adjustable output
- Thermal protection

## GENERAL DESCRIPTION

OZ9901 offers a complete power supply solution for TFT LCD panel applications. The LCD Bias Supply Controller consists of a high performance boost converter, open drain reset output, charge-pump regulators for VGH and VGL, operational amplifier, input voltage detector and a logic-controlled gate-on pulse modulator. The boost converter operates using current mode control, and offers fast line and load responses for LCD bias supplies.

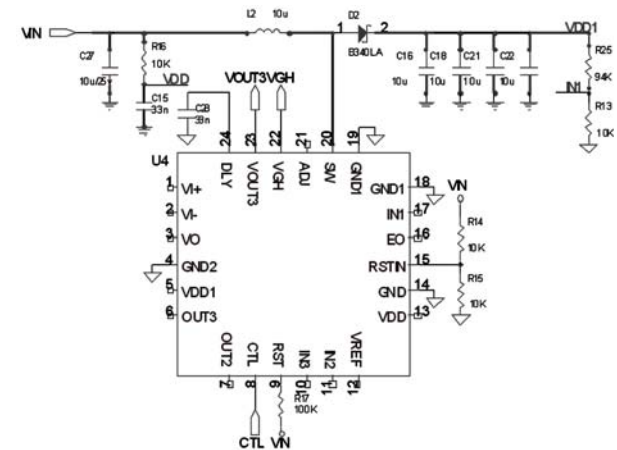
The integrated charge pumps provide a regulated supply for the panel gate driver ICs. The charge-pump regulators provide a positive gate-on supply voltage (VGH) and negative gate-off supply voltage (VGL).

The operational amplifier works as a VCOM buffer and supplies a high output current, fast slew rate and wide bandwidth for driving capacitive loads.

## APPLICATIONS

- Notebook/Netbook Computer

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; and more patents pending.



# OZ9955A

## FEATURES

- 50V internal MOSFET high frequency DC/DC converter controller
- Drives up to 8 strings in parallel
- Integrated LED current balance control circuit
- Integrated power MOSFET
- Up to 2.0MHz user-defined switching frequency
- Supports internal or external PWM dimming
- Over-voltage, over-current, output short circuit, and thermal protection
- LED fault status output
- Soft start function

## GENERAL DESCRIPTION

OZ9955A is a high efficiency, DC/DC controllers that drive up to eight (8) strings of LEDs in parallel configuration, with multiple LEDs in each string connected in series. It provides eight (8) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

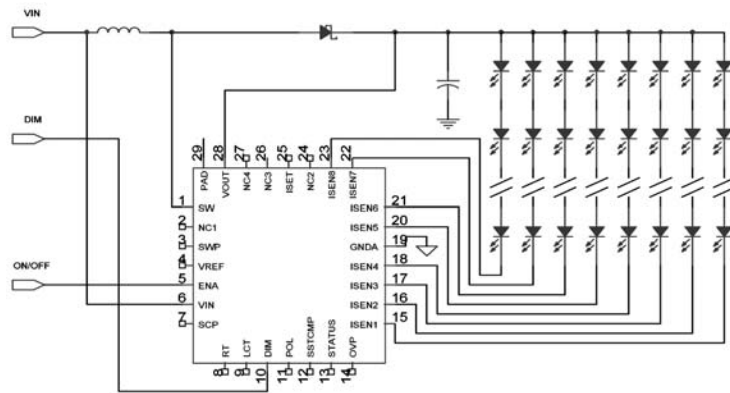
OZ9955A can receive either a DC signal for internal Low frequency Pulse Width Modulation (LPWM) or an external PWM signal.

This IC provides integrated circuits to balance the current flow through each LED string, as well as, integrated power MOSFETs.

## APPLICATIONS

- Notebook/Netbook Computer

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9955B

## FEATURES

- High frequency DC/DC power converter controller
- Drives up to 8 strings in parallel
- Supports SMBus, DPST and SMBus + DPST brightness control modes
- Supports SMBus protocol dimming control
- 256 step dimming control
- Integrated LED current balance control circuit
- Integrated power MOSFET
- Over-current, over-voltage, and thermal protection
- Soft start function

## GENERAL DESCRIPTION

OZ9955B is a LED controller with SMBus interface that drives up to eight (8) strings of LEDs in parallel configuration, with multiple LEDs in each string connected in series. It is targeted for notebook/netbook applications using SMBus dimming control.

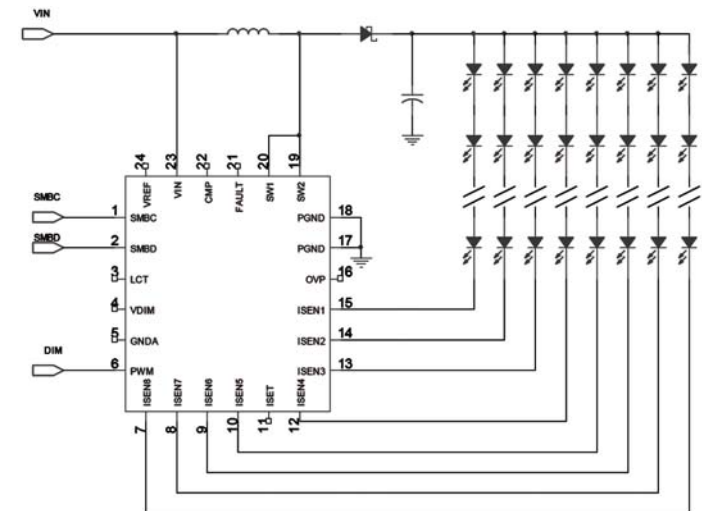
It provides eight (8) LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

This IC provides an integrated circuit to balance the current flow through each LED string, as well as, the integrated power MOSFET.

## APPLICATIONS

- Notebook/Netbook Computer

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9956B

## FEATURES

- High frequency DC/DC power converter controller
- Drives up to 6 strings in parallel
- Integrated LED current balance control circuit
- Wide input voltage range
- Up to 2.0MHz switching frequency
- External PWM dimming
- Over-voltage and over-current protection
- Soft start function

## GENERAL DESCRIPTION

The OZ9956B is a high efficiency, DC/DC controller that drives up to six (6) strings of LEDs in parallel configuration, with multiple LEDs in each string connected in series. It is targeted for notebook/netbook applications.

It provides six (6) LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

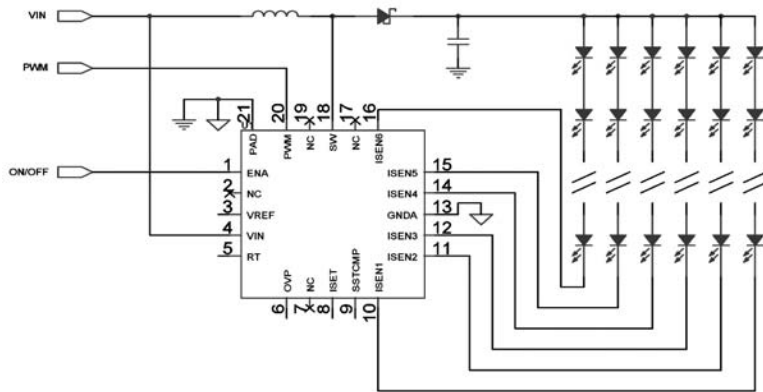
OZ9956B can receive either an analog signal or an external Pulse Width Modulation (PWM) signal for the dimming control function.

This IC provides an integrated circuit to balance the current flow through each LED string, as well as, the integrated power MOSFET.

## APPLICATIONS

- Notebook/Netbook Computer

## APPLICATION DIAGRAM



# OZ9956C

## FEATURES

- High frequency DC/DC power converter controller
- Drives up to 6 strings in parallel
- Integrated LED current balance control circuit
- Integrated power MOSFET
- Up to 1.5MHz switching operation
- Supports phase-shift dimming with adaptive phase control
- External PWM dimming control
- Output over-voltage and short circuit protection
- LED over-current and short circuit protection
- Switch over-current protection
- Thermal protection
- Under-voltage protection

## GENERAL DESCRIPTION

The OZ9956C is a high efficiency, DC/DC controller that drives up to six (6) strings of LEDs in parallel configuration, with multiple LEDs in each string connected in series. It is targeted for notebook/netbook applications.

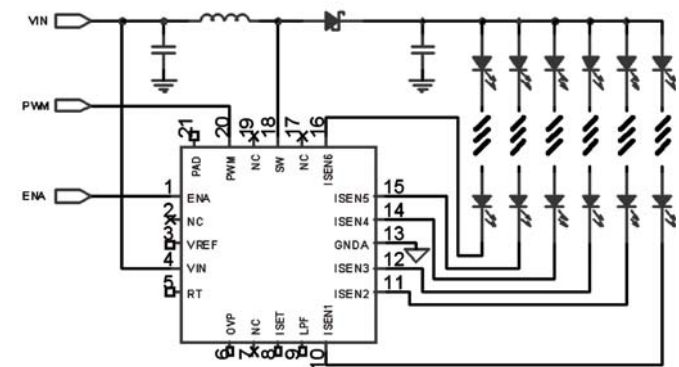
It provides six (6) LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9956C supports an external Pulse Width Modulation (PWM) signal for the phase-shifted dimming control function. It provides an integrated circuit to balance the current flow through each LED string, as well as, the integrated power MOSFET.

## APPLICATIONS

- Notebook/Netbook Computer

## APPLICATION DIAGRAM



# OZ9960

## FEATURES

- High frequency DC/DC boost converter controller
- Integrated power MOSFET
- Supports low input voltage
- Up to 200mA LED current
- External PWM dimming
- Open LED protection
- MOSFET over-current protection
- Soft start function

## GENERAL DESCRIPTION

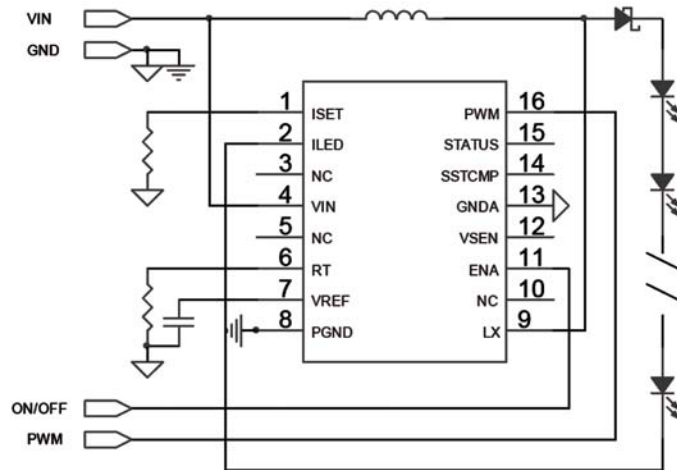
OZ9960 is a high efficiency DC/DC boost converter controller that drives a string of LEDs connected in a serial configuration. It is ideal for small and mid-size LCD backlight applications.

OZ9960 supports a wide input range and constant, user-defined operating frequency for a single string LED application. It receives an external Pulse Width Modulation (PWM) signal for dimming control.

## APPLICATIONS

- Notebook/Netbook Computer
- GPS
- PND

## APPLICATION DIAGRAM



# OZ9979

## FEATURES

- High efficiency DC/DC boost converter controller
- Drives up to 6 strings in parallel
- Enhanced dimming resolution
- Supports 6 equal-delay PWM dimming signals
- Integrated power MOSFET
- Integrated LED current balance control circuit
- Supports external, internal PWM and analog dimming
- PWM dimming frequency synchronized with external signal
- MOSFET over-current protection
- Over-voltage protection
- LED short circuit detection
- Output short circuit/open diode protection
- Thermal protection
- Soft start function

## GENERAL DESCRIPTION

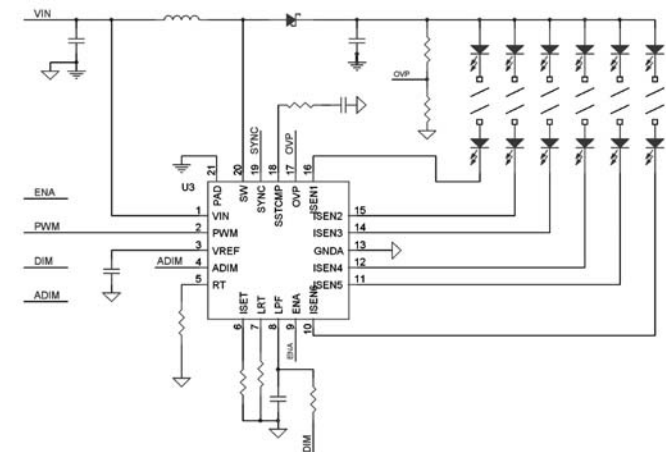
OZ9979 is a high efficiency, DC/DC controller that drives up to six strings of LEDs connected in parallel configuration; with multiple LEDs in each string connected in series. It is targeted for notebook backlight applications.

The IC provides six (6) LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

## APPLICATIONS

- Notebook Computer

## APPLICATION DIAGRAM



# OZ9989

## FEATURES

- High frequency DC/DC power converter controller
- Drives up to 3 strings in parallel
- Integrated power MOSFET
- Integrated LED current balance control circuit
- Fixed 1.3MHz switching frequency
- External PWM dimming
- MOSFET over-current protection
- Over-current protection for each string
- Output short circuit detection
- Open diode, over-voltage and thermal protection
- Soft start function

## GENERAL DESCRIPTION

OZ9989 is a high efficiency, DC/DC controller with an integrated power MOSFET that drives up to three strings of LEDs connected in parallel configuration; with multiple LEDs in each string connected in series. It is targeted for netbook backlight applications.

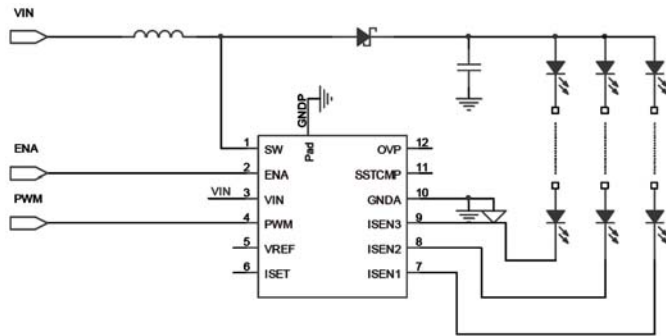
The IC provides three (3) LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9989 uses an external Pulse Width Modulation (PWM) signal for the dimming control function.

## APPLICATIONS

- Netbook Computer
- PND

## APPLICATION DIAGRAM



# OZ9993

## FEATURES

- High frequency DC/DC boost converter controller
- Supports a single cell Lilon battery
- Fixed 900kHz switching frequency
- Integrated power MOSFET with over-current protection
- Open diode, over-voltage, and output short circuit protection
- Thermal protection
- Soft start function

## GENERAL DESCRIPTION

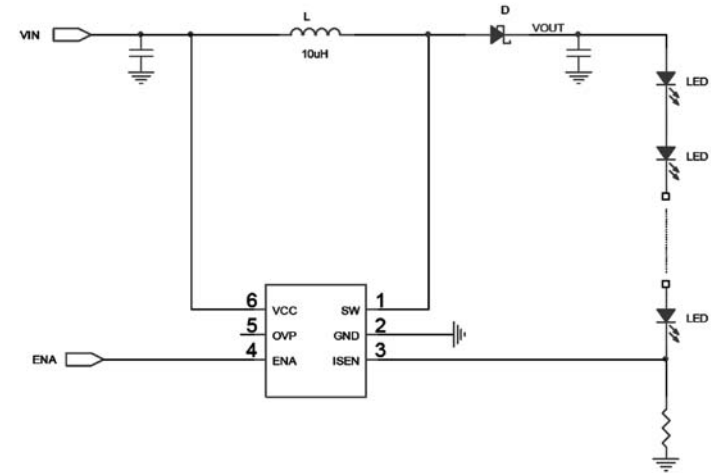
OZ9993 is a high efficiency, DC/DC controller with an integrated power MOSFET that drives one string of LEDs. It provides the user with a low cost solution that requires minimum components for the boost regulator and is suitable for applications requiring a single cell Lithium Ion battery.

A soft start feature is provided to minimize in-rush current during start-up.

## APPLICATIONS

- Netbook
- PND
- Camcorder

## APPLICATION DIAGRAM



# OZ9902

## FEATURES

- Dual Channel DC/DC converter
- Constant current or voltage output
- Drives one string of high power LEDs per channel
- 180 degrees phase-shift between the two driver outputs
- Independent PWM dimming control for each channel
- Analog dimming
- Constant operation frequency
- Operation frequency synchronization
- Power MOSFET over-current protection
- Over-voltage protection
- Output to return and Output to ground short-circuit protection
- Output over load protection
- Limited Current Condition (LCC) protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

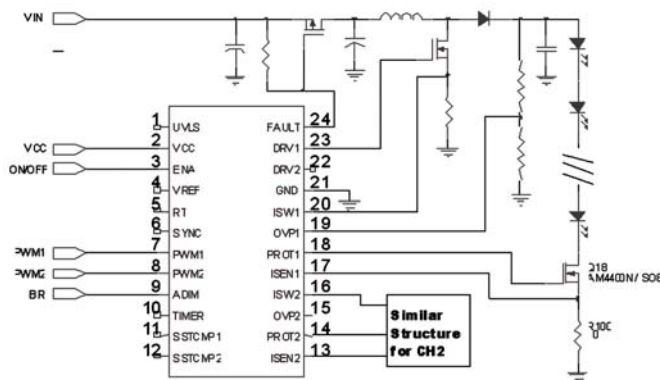
OZ9902 is a dual, high power LED driver designed to build LED backlight for large-size LCD TV applications. It integrates two independently-controlled LED drivers to achieve optimum efficiency. The drive outputs are phase-shifted by 180 degrees to minimize current ripple in high power applications.

OZ9902 supports independent Pulse Width Modulation (PWM) dimming control for each channel and common analog dimming control for both channels. It provides system design flexibility for LCD TV with local dimming or 3D display mode.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



Patents pending.

# OZ9906

## FEATURES

- Switch-mode DC/DC controller to balance LED current
- High current output drive for 6 LED strings
- Spread spectrum feature on operating frequency
- High efficiency LED current regulation
- Supports analog and external PWM dimming
- User-defined phase-shift PWM dimming function with 2 to 6 phase options
- PWM dimming frequency synchronization
- MOSFET over-current protection
- LED short circuit protection
- User-defined short circuit protection threshold
- LED fault status output

## GENERAL DESCRIPTION

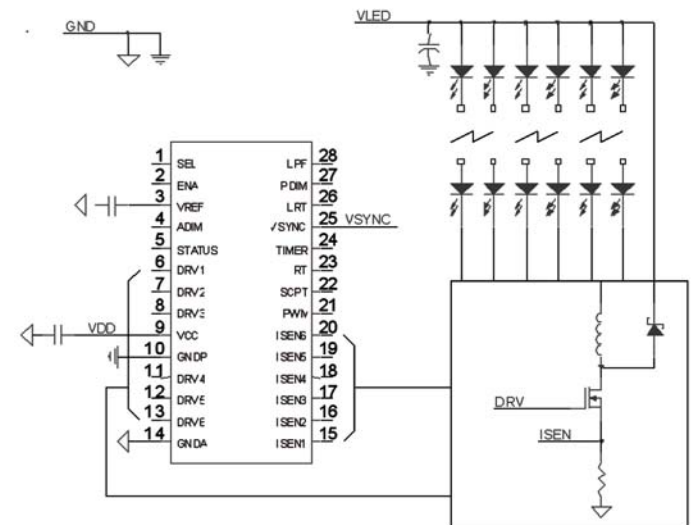
The OZ9906 is a high efficiency switch-mode DC/DC controller that drives up to 6 LED strings connected in parallel. It is targeted for large-size monitor and TV applications.

OZ9906 provides six (6) LED current sense inputs. The IC provides individual LED current regulation for each LED string. This allows the backlight to remain functioning in the event that any string(s) is damaged during normal operation.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,847,783; and more patents pending.



# OZ9908

## FEATURES

- Supports 8 strings of 355mA LEDs
- Supports master-slave synchronous operation
- Boost converter switching at 180 degree phase-shift between master and slave ICs
- Supports analog dimming
- Individual PWM dimming for each LED string
- Supports over-voltage and over-current protections in application
- Supports LED open/short circuit protection
- LED fault status output

## GENERAL DESCRIPTION

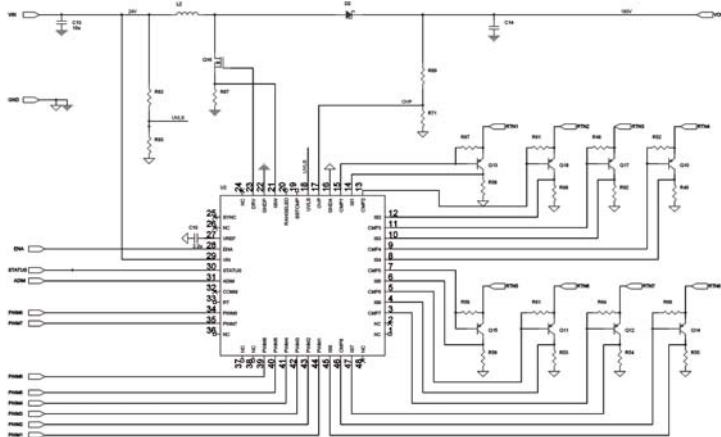
The OZ9908 is a LED driver controller designed for large-screen LCD backlit by LEDs. It provides an integrated eight channel LED current regulation control circuit. Using external balance transistors for each channel, the IC is capable of driving a current up to 350mA per LED channel.

OZ9908 provides individual Pulse Width Modulation (PWM) dimming for its respective LED string. The IC is suitable for LCD TV applications where area-lighting technology using local dimming control is applied.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



# OZ9961

## FEATURES

- High frequency DC/DC power converter controller
- Drives 6 LED strings in parallel
- Integrated LED current balance control circuit
- Up to 2.35MHz switching frequency
- Analog or external PWM or internal LPWM dimming control
- Over-current and over-voltage protection
- Thermal protection
- Open diode and open/short circuit protection
- Soft start function

## GENERAL DESCRIPTION

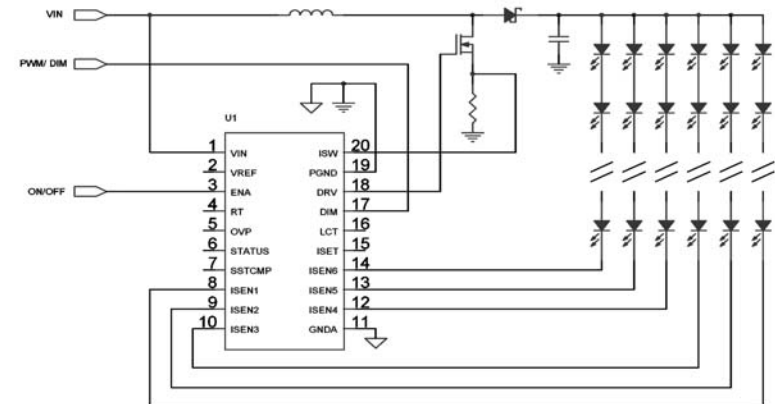
The OZ9961 is a LED controller that drives up to six (6) strings of LEDs in parallel configuration, with multiple LEDs per string connected in series. It provides six (6) LED current sense inputs in an "OR" configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9961 supports either analog, external Pulse Width Modulation (PWM) or internal Low frequency PWM (LPWM) dimming control.

## APPLICATIONS

- LCD Monitor
- GPS

## APPLICATION DIAGRAM



# OZ9967

## FEATURES

- High frequency DC/DC boost converter controller
- Drives 6 LED strings in parallel
- Integrated LED current balance control circuit
- Up to 1MHz switching frequency
- External PWM or internal LPWM dimming control
- LED short circuit protection
- Over-current and over-voltage protection
- Soft start function

## GENERAL DESCRIPTION

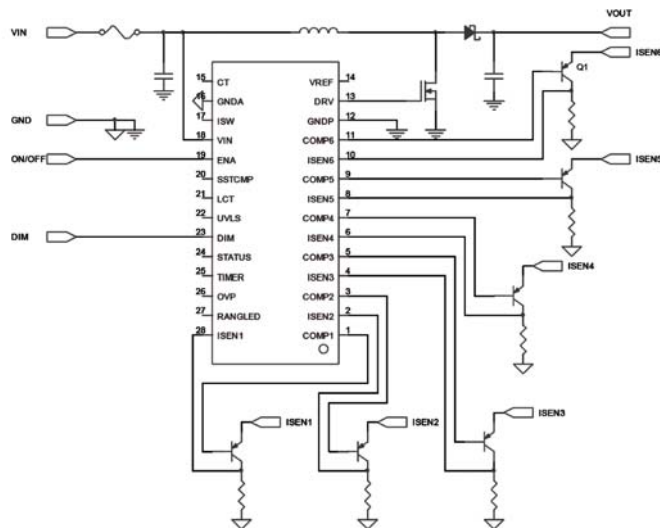
The OZ9967 is an LED controller that drives up to six (6) strings of LEDs in parallel configuration, with multiple LEDs per string connected in series. It provides six (6) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9967 supports external Pulse Width Modulation (PWM) or internal Low frequency PWM (LPWM) dimming control. Plus, it provides an integrated circuit to balance the current flow through each LED string. The balance transistors are external to accommodate different power dissipation resulting from the forward voltage difference among the LED strings.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,847,783; and more patents pending.

# OZ9997

## FEATURES

- High power DC/DC boost converter controller
- Drives up to 8 LED strings in parallel
- External PWM dimming control
- Integrated LED current balance control circuit
- User-defined string selection
- Multi-chip parallel operation for more than 8 LED strings
- MOSFET over-current protection
- LED short circuit and open string protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

The OZ9997 is a high efficiency, DC/DC controller that drives up to eight (8) strings of LEDs in parallel configuration, with multiple LEDs in each string connected in series.

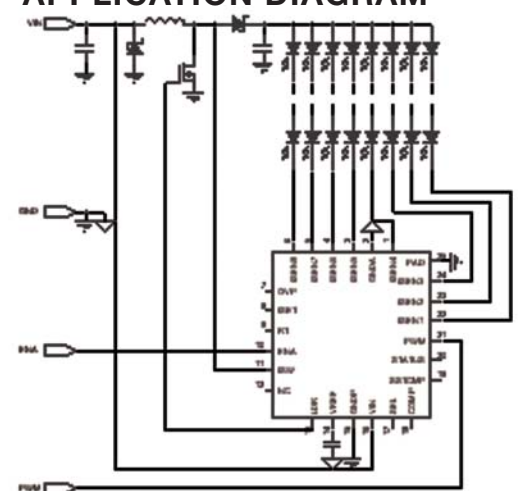
The IC provides eight (8) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string(s) is damaged during normal operation.

OZ9997 supports external Pulse Width Modulation (PWM) dimming control, and provides an integrated circuit to balance the current flow through each LED string.

## APPLICATIONS

- LCD Monitor

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9998/98A

## FEATURES

- **OZ9998:** Up to 60mA per ISEN channel
- **OZ9998A:** Up to 80mA per ISEN channel
- High power DC/DC boost converter controller
- Drives up to 8 strings in parallel
- Integrated LED current balance control circuit
- User-defined string selection
- External PWM dimming control
- Time-shift PWM phase dimming control for low audible noise
- Multi-chip parallel operation for more than 8 LED strings
- MOSFET over-current protection
- LED short circuit and open string protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

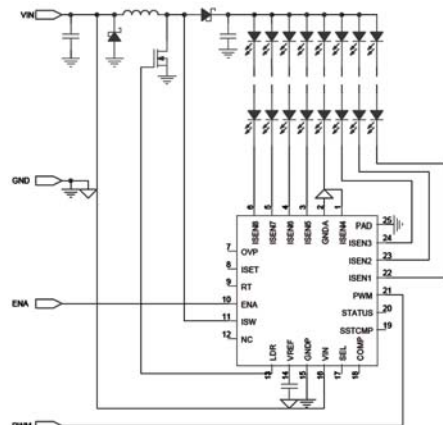
OZ9998/98A are high efficiency, DC/DC controllers that drive up to eight (8) strings of LEDs connected in parallel configuration, with multiple LEDs in each string connected in series. They provide eight (8) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9998/98A support external Pulse Width Modulation (PWM) dimming control. Plus, each provides an integrated circuit to balance the current flow through each LED string.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9998B

## FEATURES

- High power DC/DC boost converter controller
- Drives up to 4 strings in parallel, up to 160mA per string
- Integrated LED current balance control circuit
- External PWM dimming control
- Time-shift PWM phase dimming control for low audible noise
- MOSFET over-current protection
- LED short circuit and open string protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

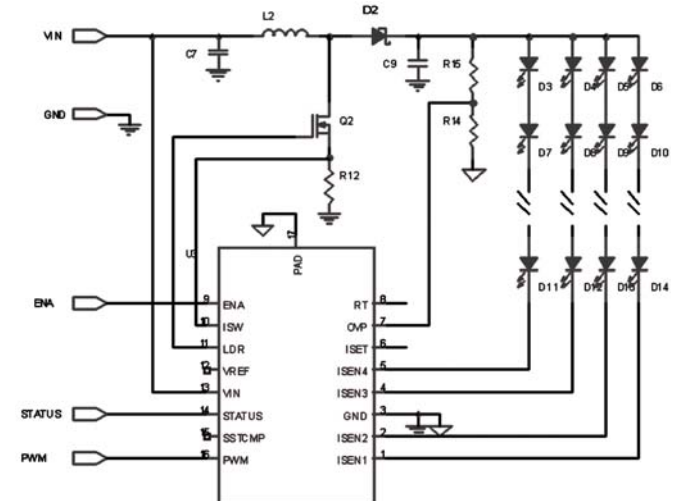
OZ9998B is a high efficiency DC/DC controller that drives up to eight strings connected in parallel configuration with multiple LEDs in each string connected in series. It provides four (4) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that a string(s) is damaged during normal operation.

OZ9998B supports external Pulse Width Modulation (PWM) dimming control.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9902B

## FEATURES

- Constant current or voltage output
- Drives one string of high power LEDs
- Direct PWM dimming control
- Analog dimming
- Constant operation frequency
- Power MOSFET over-current protection
- Over-voltage protection
- Output to return and Output to ground short circuit protection
- Output over load protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

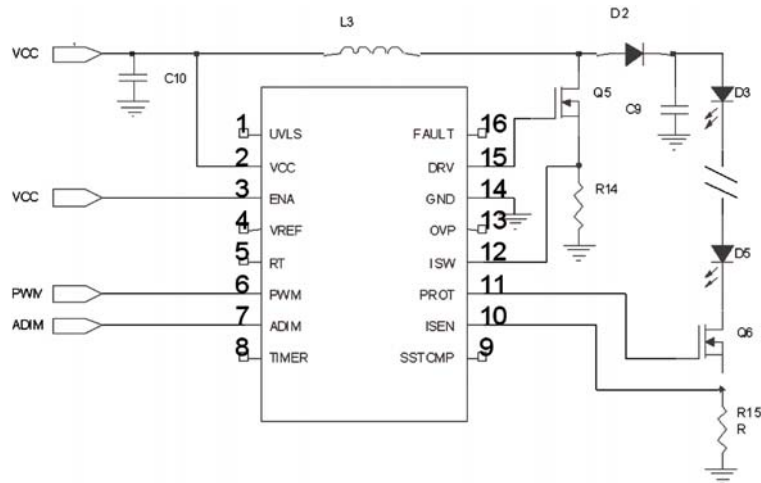
OZ9902B is a single channel high power LED driver designed for LED backlight applications used in large-size LCD TVs.

The controller supports direct Pulse Width Modulation (PWM) dimming control and common analog dimming control for LED string forward current.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



# OZ9904

## FEATURES

- Supports 4 strings
- Up to 355mA LED current per string
- Supports external and internal PWM dimming control
- Supports analog dimming
- Over-voltage and over-current protections in applications
- Supports LED open/short circuit protections in applications
- LED fault status output

## GENERAL DESCRIPTION

The OZ9904 is a LED driver controller optimized for large screen LED backlit LCD TV applications. It provides an integrated four-channel LED current control circuit. In application, it controls external balance transistors to maintain the current balance among LED strings.

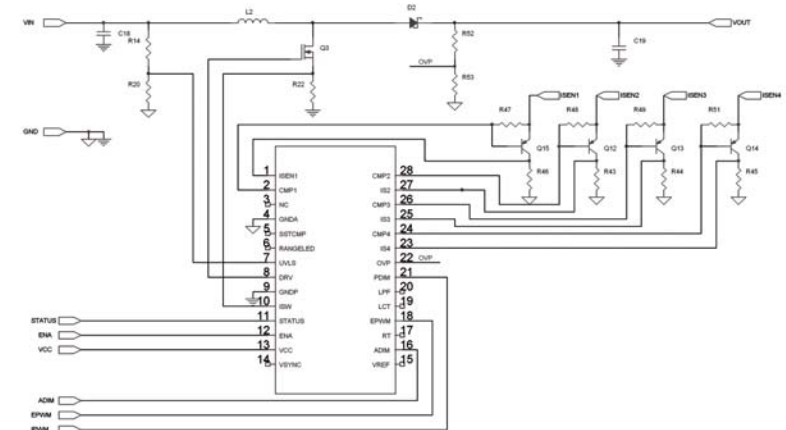
OZ9904 supports both internal and external Pulse Width Modulation (PWM) dimming methods for brightness control of LCDs for various system applications. The internal PWM dimming signal can also be synchronized with the vertical sync signal of the LCD display.

The IC further supports an analog dimming control function, which adjusts the LED current amplitude of all the four ISEN channels simultaneously.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



# OZ9904A

## FEATURES

- Drives up to 8 strings of LEDs
- Up to 350mA LED current per string
- Supports two boost converters in parallel
- 180 degree phase-shift between the two drive outputs
- Provides two sets of PWM dimming control
- Built-in 180 degree phase-shift PWM dimming control synchronization
- Supports analog dimming
- Over-voltage and over-current protection
- Supports LED open/short circuit protection
- LED fault status output

## GENERAL DESCRIPTION

OZ9904A is a high performance LED Driver Controller optimized for large screen LED backlight LCD TV applications.

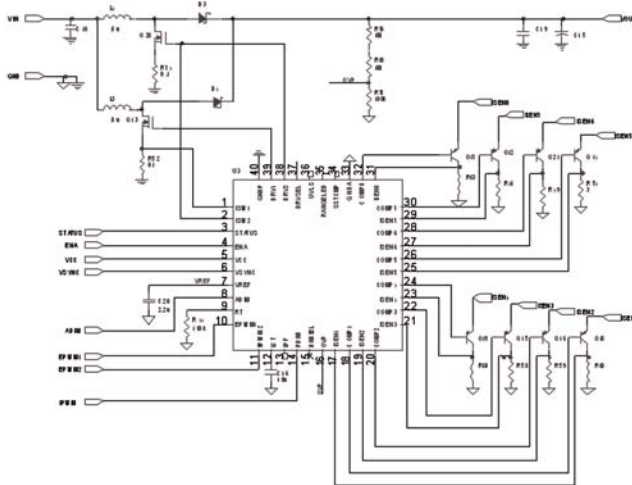
It provides two high-voltage gate drive signals for the boost converters, with 180° phase-shift between the two signals. The IC minimizes input and output current ripple. It also provides a flexible design using only one drive signal for low-power applications through pin DRVSEL.

OZ9904A supports both internal and external Pulse Width Modulation (PWM) dimming interfaces for various system configurations or internal Low Frequency PWM (LPWM) dimming control.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9908A

## FEATURES

- Drives up to 6 strings of LEDs
- Up to 350mA LED current per string
- Multiple IC parallel operation with power train sharing
- Primary side regulation application
- Analog dimming control
- Individual PWM dimming for every 3 strings
- Over-voltage and over-current protection
- LED open/short circuit protection
- LED fault status output

## GENERAL DESCRIPTION

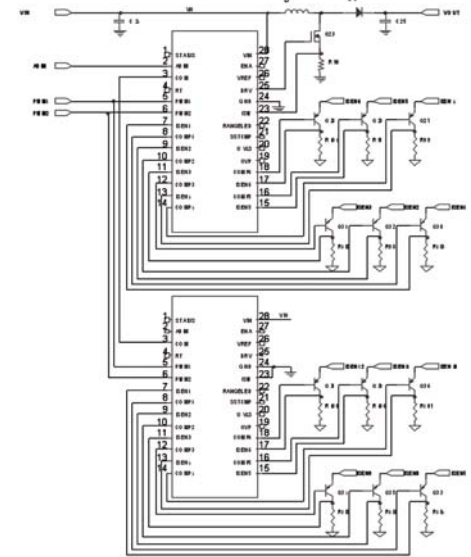
The OZ9908A is a high performance LED driver controller optimized for large screen LED backlight LCD TV applications. It provides an integrated six channel LED current regulation control circuit. Using external balance transistors for each channel, the IC is capable of driving a current up to 350mA per LED channel.

OZ9908A provides two external Pulse Width Modulation (PWM) dimming interfaces for the six LED strings. Each PWM signal controls the brightness of three LED strings. This feature is suitable for LCD TV applications using a scanning backlight or 3-Dimensional display mode functions.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.



# OZ9908B

## FEATURES

- Drives up to 6 strings of LEDs
- Up to 350mA LED current per string
- Supports multiple IC operation synchronization
- Boost drive outputs 180 degree phase-shift between master and slave ICs
- Analog dimming control
- Individual PWM dimming for each string
- Over-voltage and over-current protection
- LED open/short circuit protection
- LED fault status output

## GENERAL DESCRIPTION

The OZ9908B is a high performance LED driver controller optimized for large screen LED backlight LCD TV applications. It provides an integrated six channel LED current regulation control circuit. Using external balance transistors for each channel, the IC is capable of driving a current up to 350mA per LED channel.

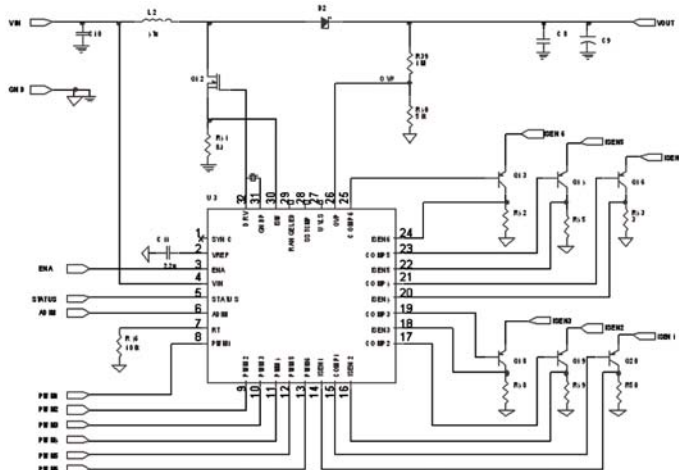
OZ9908B provides 6 individual external Pulse Width Modulation (PWM) dimming interfaces for its respective LED string. The IC is suitable for LCD TV applications using a local-dimming control backlight.

When using multiple ICs, the operating frequency can be synchronized with a 180° phase-shift between the drive outputs of each IC. These features greatly reduce the interference between ICs.

## APPLICATIONS

- LCD TV

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ9984

## FEATURES

- Drives up to 4 LED strings in parallel
- Supports up to 350mA LED current per string
- Integrated LED current balance control circuit
- Multi-chip parallel operation
- Analog dimming control
- Over-voltage and LED short circuit protection
- Soft start function

## GENERAL DESCRIPTION

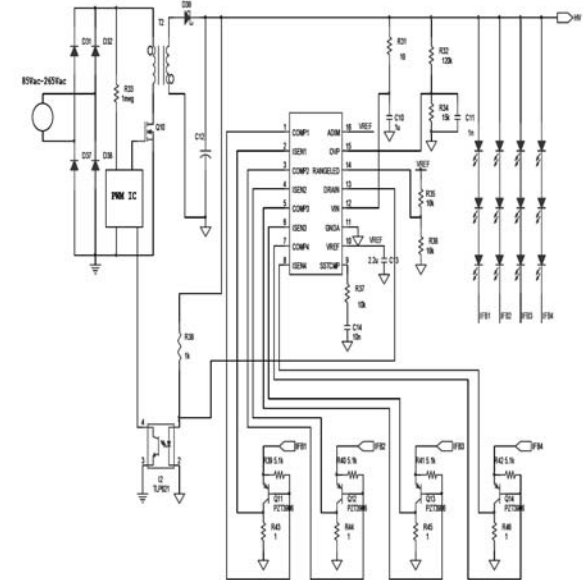
OZ9984 is a high efficiency LED driver IC that works in conjunction with a primary side external Pulse Width Modulation (PWM) controller, for offline, isolated LED lighting application. It has four (4) LED current sense inputs in an “OR” configuration to ensure uniform lighting of the LEDs. It can drive up to 4 strings of LEDs in parallel and up to 9 LEDs per string connected in series.

OZ9984 supports up to 350mA of LED current per string. It is designed in such a way that if any LED string is damaged during normal operation, the remaining string (s) continue normal operation. Multi-chip parallel operation supports additional LED strings.

## APPLICATIONS

- LCD TV
- General Lighting

## APPLICATION DIAGRAM



U.S. Patent #7,847,783; and more patents pending.

# OZ9986/86A

## FEATURES

- **OZ9986:** Boost and buck converter
- **OZ9986A:** Buck converter
- High efficiency DC/DC converter controller
- Drives up to 6 strings in parallel; number of LEDs in series limited by external MOSFET rating
- Supports up to 3 phase-shift drive outputs for boost converter
- High efficiency switching mode LED current balance
- User selectable phase-shift PWM dimming function with 3, 4, 5 and 6 phases
- PWM dimming control signals synchronized with external signal
- Over-voltage and over-current protection
- Soft start function

## GENERAL DESCRIPTION

OZ9986/86A are high efficiency, DC/DC controllers that drive up to six (6) strings connected in parallel configuration with multiple LEDs in each string connected in series. They are targeted for large-size monitor and TV applications.

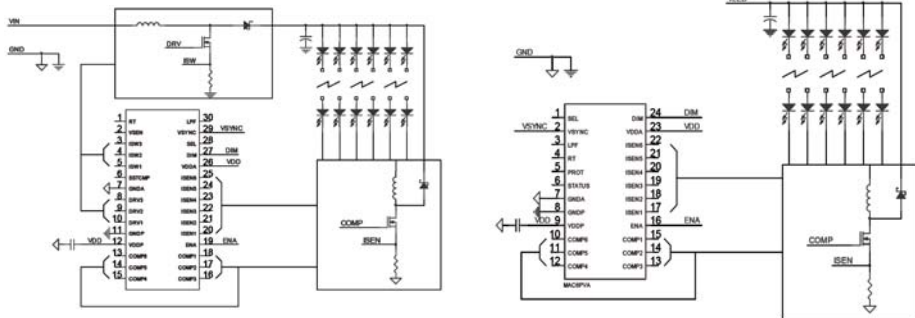
They provide six (6) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9986/86A support internal Pulse Width Modulation (PWM) dimming control. Plus, each provides an integrated circuit to balance the current flow through each LED string.

## APPLICATIONS

- LCD Monitor
- LCD TV

## APPLICATION DIAGRAMS



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ8020

## FEATURES

- Controller for high brightness LEDs
- Supports up to 400V DC
- User-defined constant current control
- Supports LED current up to 100mA
- Thermal protection

## GENERAL DESCRIPTION

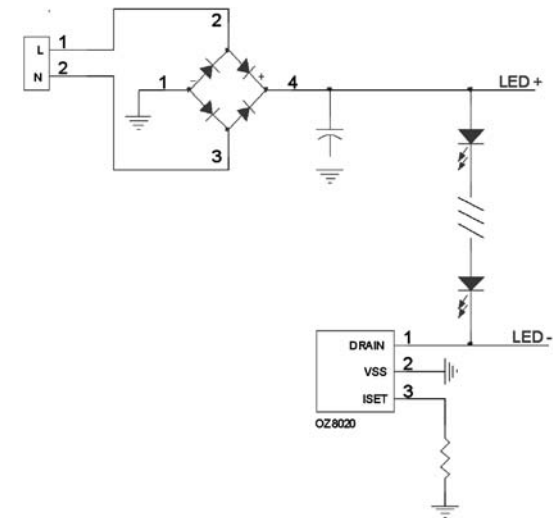
OZ8020 is a linear LED driver for general lighting applications. It requires a minimum number of external components to operate, while providing application flexibility to accommodate different system requirements. For application flexibility, the device can be connected at either the anode or cathode terminal of the LED string.

OZ8020 operates in constant current mode, and the LED current is user-defined through an external resistor.

## APPLICATIONS

- General Lighting

## APPLICATION DIAGRAM



Patents pending.

# OZ8022

## FEATURES

- Quasi-resonant converter controller for high brightness LEDs
- Three-level analog dimming control using a Wall Switch (Patent Pending)
- Low start-up current and operating current maximizing conversion efficiency
- Peak current mode control simplifies circuit design
- Under-voltage lockout with hysteresis
- Minimum off-time control for light-load operation maximizing efficiency
- Provides complete protection functions:
  - Maximum gate drive output at 18V
  - Over-voltage protection for IC bias voltage
  - Cycle-by-cycle current limit at current sense
  - LED short circuit protection
  - Output over-voltage and internal thermal protection

## GENERAL DESCRIPTION

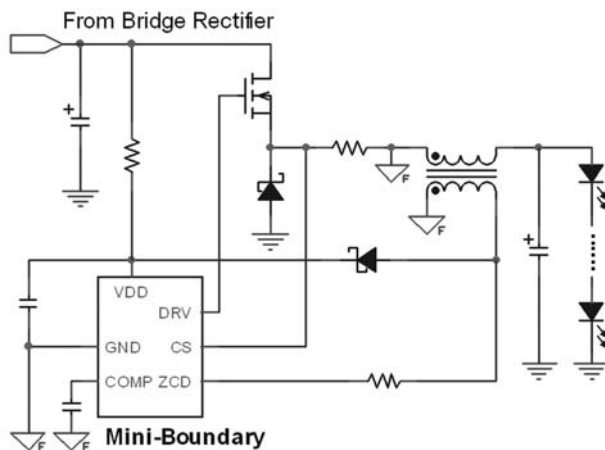
OZ8022 is a controller for Buck converter utilizing quasi-resonant conversion technology. It can be used to drive high-brightness LEDs in offline applications. The controller is implemented with a compensated peak current mode control to regulate the average LED current.

The operation of the Buck converter is between the continuous mode and the discontinuous mode of the inductor current. During light-load condition, it provides a minimum off-time scheme to maximize the operating efficiency. It provides a proprietary (patent pending) dimming technology by turning on/off the wall switch.

## APPLICATIONS

- General Lighting

## APPLICATION DIAGRAM



Patents pending.

# OZ9987

## FEATURES

- Low cost flyback controller
- Audio noise free operation
- Low start-up current
- Current mode operation
- Under-voltage lockout
- Secondary over-current protection with frequency foldback
- Integrated synchronized slope compensation
- Soft driver for improved EMI signature
- User-defined PWM Frequency
- Leading edge blanking on CS pin
- Constant maximum output power for universal AC input range
- Protection features:
  - Clamped GATE output voltage to 178V
  - VDD over-voltage protection
  - Cycle-by-cycle current limiting
  - Secondary output short circuit and over load protection

## GENERAL DESCRIPTION

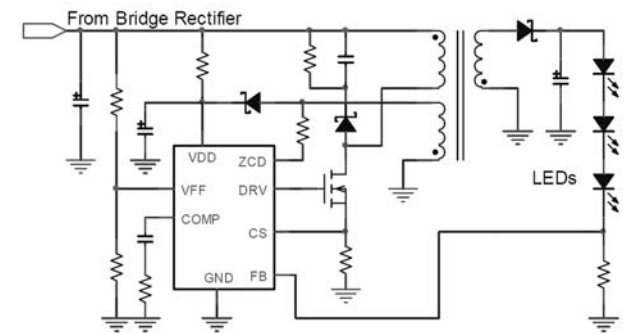
OZ9987 is an integrated current mode Pulse Width Modulated (PWM) controller that is ideal for low power, offline, AC/DC flyback converter applications. The PWM operating frequency is determined by an external resistor.

With a low start-up current, OZ9987 can utilize a large value start-up resistor to minimize start-up power consumption. The line voltage compensation circuit provides a constant power limit throughout the universal AC input voltage range.

## APPLICATIONS

- General Lighting
- AC/DC Power Adapter

## APPLICATION DIAGRAM



Patents pending.

# OZ9988

## FEATURES

- High frequency DC/DC controller
- 1 or 2 cells of NiMH or Alkaline batteries
- Drives either 1 high power White or Blue or Green LED or 2 high power Red LEDs
- 1.25MHz fixed operating frequency
- Over-current, over-voltage and LED short circuit protection
- Thermal protection
- Soft start function

## GENERAL DESCRIPTION

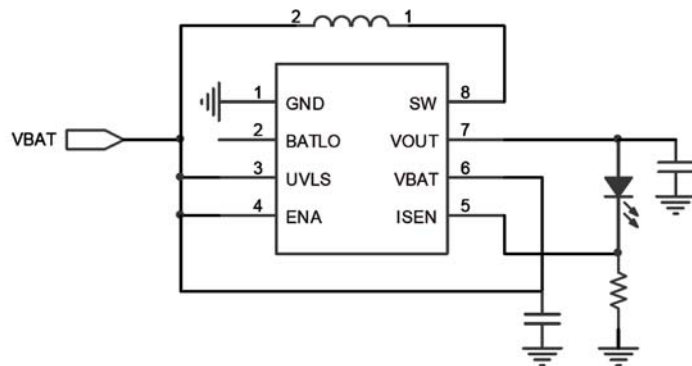
OZ9988 is a high power LED driver controller suitable for applications requiring 1 or 2 cell NiMH or Alkaline batteries. It is used in a high efficiency boost converter which provides constant current drive for LED backlight applications.

This highly integrated controller reduces external circuit components in the boost converter, and offers internal feedback compensation for the control loop.

## APPLICATIONS

- Flashlight
- Landscape Lighting

## APPLICATION DIAGRAM



Patents pending.

# OZ9991/91A

## FEATURES

- **OZ9991:** Input Voltage 4.6V ~ 25.0V; and 1.2MHz fixed switching frequency
- **OZ9991A:** Input Voltage 3.0V ~ 7.0V; and 1MHz fixed switching frequency
- High efficiency DC/DC step down converter
- Integrated power MOSFET with 1A output
- 1MHz fixed switching frequency
- Internally compensated current mode control
- Over-current and thermal protection
- Under-voltage lockout
- Soft start function

## GENERAL DESCRIPTION

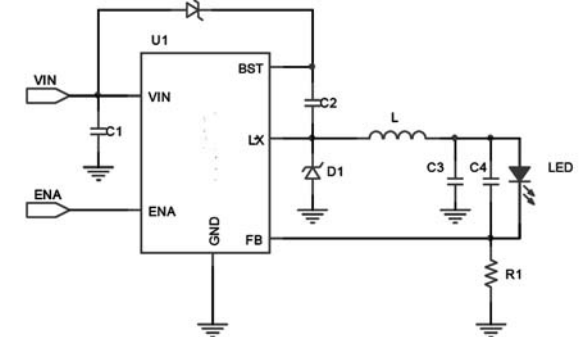
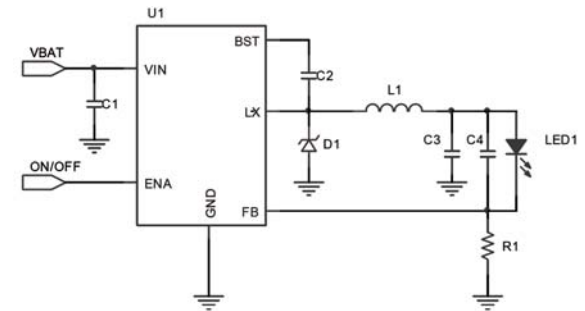
OZ9991/91A are high efficiency, DC/DC step down converters with an integrated power MOSFET that supports 1 string of white LEDs in series.

OZ9991/91A utilize current mode control with internal slope compensation to support a wide input voltage range.

## APPLICATIONS

- Flashlight
- Bicycle Lamp

## APPLICATION DIAGRAMS



Patents pending.

# OZ9992

## FEATURES

- Quasi-resonant AC/DC converter controller for high brightness LEDs
- Three-level analog dimming control brightness levels using a Wall Switch (Patent Pending)
- Low start-up current and operating current maximizing conversion efficiency
- Peak current mode control simplifies circuit design
- Under-voltage lockout with hysteresis
- Minimum off-time control for light-load operation maximizing efficiency
- Constant output power for universal AC input
- Provides complete protection functions:
  - Maximum gate drive output at 18.0V
  - Over-voltage protection for IC bias voltage
  - Cycle-by-cycle current limit at current sense
  - LED short circuit protection
  - Over-voltage and thermal protection

## GENERAL DESCRIPTION

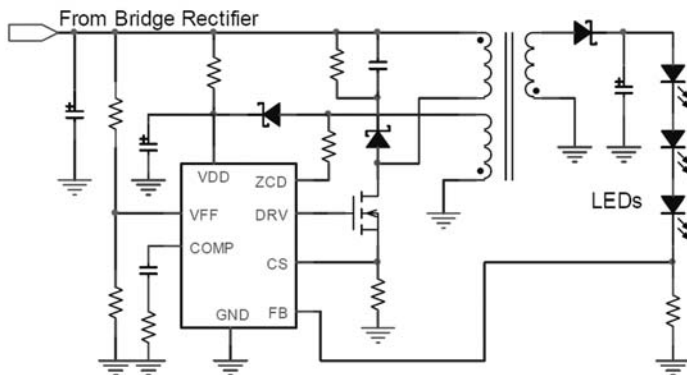
OZ9992 is a controller for offline AC/DC flyback converter applications utilizing quasi-resonant power conversion technology. One application using OZ9992 is for driving the high power LEDs. It uses a compensated peak current mode control to regulate the average current through the LEDs.

OZ9992 requires very low start-up current, which maximizes the efficiency of the converter and provides a proprietary (patent pending) dimming technology by turning-on/off the wall switch.

## APPLICATIONS

- General Lighting

## APPLICATION DIAGRAM



Patents pending.

# OZ9994

## FEATURES

- Quasi-resonant AC/DC converter controller for high brightness LEDs
- Isolated and Non-Isolated Applications
- Three-level PWM brightness control using a Wall Switch (Patent Pending)
- Low start-up current and operating current maximizing conversion efficiency
- Peak current mode control simplifies circuit design
- Under-voltage lockout with hysteresis
- Minimum off-time control for light-load operation maximizing efficiency
- Provides complete protection functions
  - Maximum gate drive output at 18V
  - Over-voltage protection for IC bias voltage
  - Cycle-by-cycle current limit at current sense
  - LED short circuit protection
  - Output over-voltage and internal thermal protection

## GENERAL DESCRIPTION

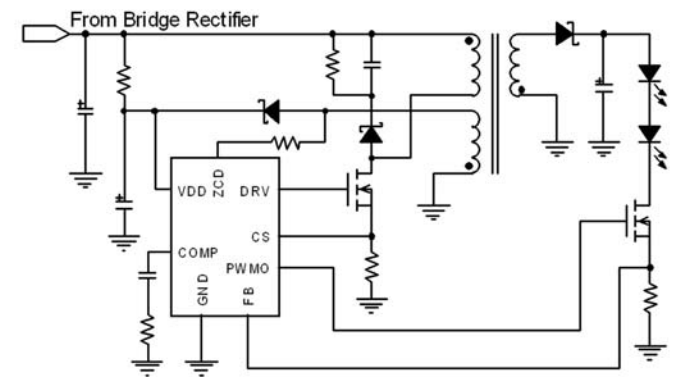
OZ9994 is a controller for offline AC/DC flyback converter applications utilizing quasi-resonant power conversion technology. One application using OZ9994 is for driving the high power LEDs. The controller uses a compensated peak current mode control to regulate the average current of the LEDs.

OZ9994 requires very low start-up current which maximizes the efficiency of the converter. It provides a proprietary (patent pending) dimming technology by turning on/off the wall switch.

## APPLICATIONS

- General Lighting

## APPLICATION DIAGRAM



Patents pending.



# OZ9995

## FEATURES

- Three-step PWM dimming control by toggling a wall switch (Patent Pending)
- Under-voltage lockout with hysteresis
- Constant off-time operation
- Output over-current protection
- LED short circuit protection
- Thermal protection

## GENERAL DESCRIPTION

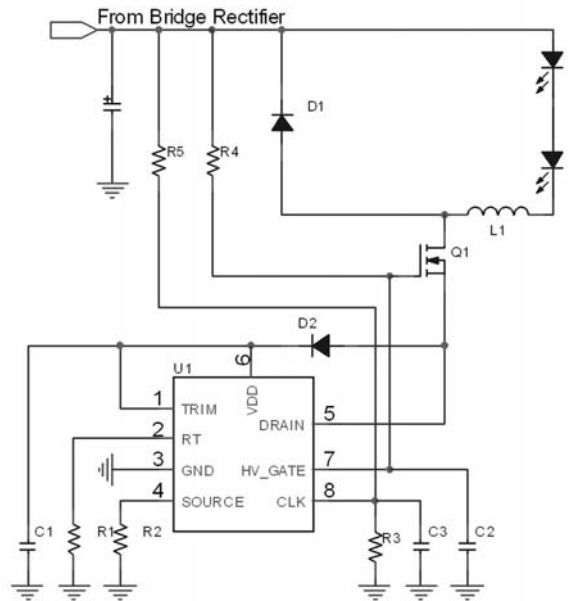
OZ9995 is an optimized DC/DC controller for driving high power LEDs used in offline applications. The IC operates in a constant off-time control mode.

OZ9995 provides a proprietary (patent pending) three-step Pulse Width Modulation (PWM) dimming control technique by toggling ON/OFF a wall switch, simplifying the replacement of traditional lamps with LED lamps without modifying any electrical wiring or the wall switch.

## APPLICATIONS

- General Lighting

## APPLICATION DIAGRAM



# OZ523

## FEATURES

- Supports constant voltage or constant current
- 1.5A continuous output current
- 0.25Ω internal Power MOSFET
- Stable control loop
- $V_{OUT}$  from 0.8V to 0.9\* $V_{IN}$
- Soft start function
- Fixed switching frequency
- Low current shutdown mode
- Over-current protection and thermal protection

## GENERAL DESCRIPTION

The OZ523 is a fast response PWM controller using minimum external components to achieve control loop stability in DC/DC and LED driver applications. It supports both constant voltage and constant current applications.

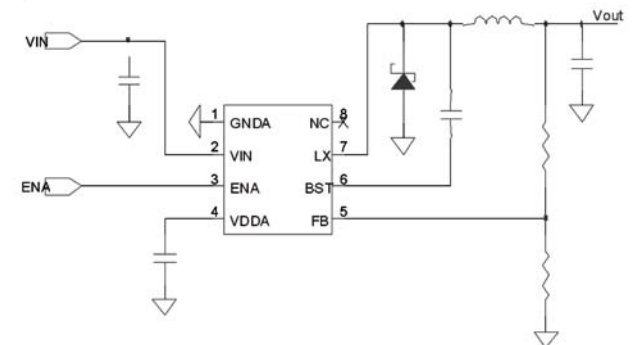
OZ523 is a non-synchronous step down DC/DC converter with a 0.25Ω integrated MOSFET and supports a 1.5A continuous load current with up to 3.2A peak current. The output voltage can be user-defined from 0.8V up to 0.9\* $V_{IN}$  using a feedback resistor divider.

OZ523 can also operate in constant current mode to drive high power LED applications.

## APPLICATIONS

- General Purpose DC/DC Converter

## APPLICATION DIAGRAM



# OZ524

## FEATURES

- Supports constant voltage or constant current
- 3.0A continuous output current
- 0.15Ω internal Power MOSFET
- Stable control loop
- $V_{OUT}$  from 0.8V to 0.9\* $V_{IN}$
- Soft start function
- Fixed switching frequency
- Low current shutdown mode
- Over-current protection and thermal protection

## GENERAL DESCRIPTION

The OZ524 is a fast response PWM controller using minimum external components to achieve control loop stability in DC/DC and LED driver applications. It supports both constant voltage and constant current applications.

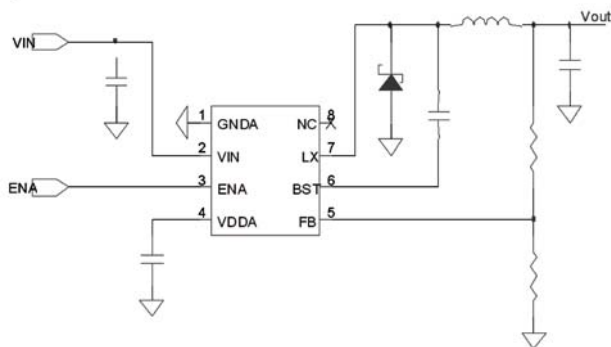
OZ524 is a non-synchronous step down DC/DC converter with a 0.25Ω integrated MOSFET and supports a 3.0A continuous load current with up to 3.2A peak current. The output voltage can be user-defined from 0.8V up to 0.9\* $V_{IN}$  using a feedback resistor divider.

OZ524 can also operate in constant current mode to drive high power LED applications.

## APPLICATIONS

- General Purpose DC/DC Converter

## APPLICATION DIAGRAM



# OZ526

## FEATURES

- High frequency DC/DC power converter for LEDs
- Integrated power MOSFET
- Integrated LED current balance control circuit
- User-defined operation frequency
- Drives 1 or 2 strings
- External PWM and Analog dimming control
- Converter output over-voltage protection
- Internal power MOSFET over-current protection
- Over-current protection for each string
- Output short circuit detection
- Open diode and thermal protection

## GENERAL DESCRIPTION

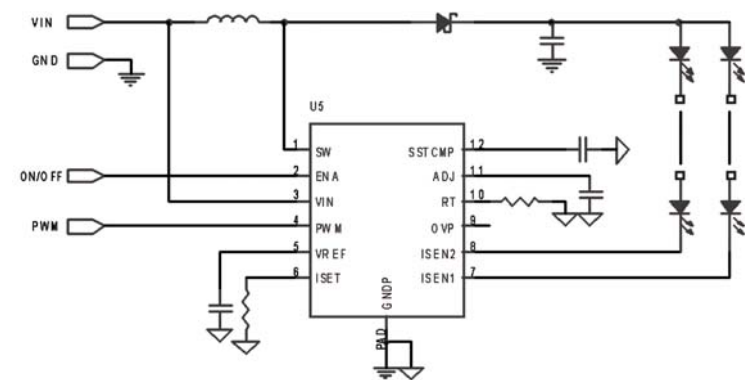
The OZ526 is a high efficiency DC/DC controller with an integrated power MOSFET that drives one string or two LED strings in parallel configuration, with multiple LEDs connected in series. It is targeted for netbook and PND backlight applications.

OZ526 provides two LED current sense inputs in an “OR” configuration for improved backlight reliability. This allows the backlight to remain functioning in the event that any string(s) is damaged during normal operation. The controller receives an external Pulse Width Modulation (PWM) signal for the dimming control function.

## APPLICATIONS

- GPS
- PND

## APPLICATION DIAGRAM



# OZ527

## FEATURES

- High power DC/DC power converter
- Integrated Power N-Channel MOSFET
- Integrated LED current balance control circuit
- Drives up to 6 strings in parallel
- User-defined string selection
- Time-shift PWM phase dimming control for low audible noise
- Operation frequency synchronization
- LED open string protection
- Output short circuit or open diode protection
- LED short circuit protection
- MOSFET over-current protection
- Shutdown under abnormal condition protection
- Thermal protection
- LED fault status output

## GENERAL DESCRIPTION

The OZ527 is a high efficiency DC/DC controller that drives up to six strings connected in parallel configuration with multiple LEDs in each string connected in series.

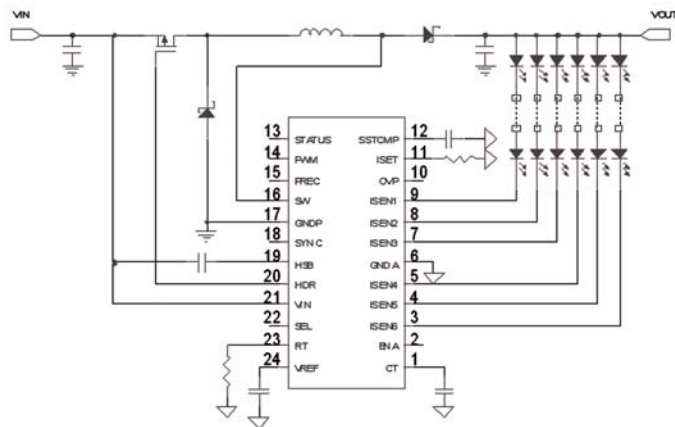
OZ527 provides 6 LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that a string(s) is damaged during normal operation.

OZ527 supports external Pulse Width Modulation (PWM) dimming control.

## APPLICATIONS

- GPS

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ528

## FEATURES

- High power DC/DC power converter
- Operation frequency synchronization
- Optional spread spectrum operation frequency
- Thermal, over-current, and over load protection
- Abnormal pulled-up output protection
- LED fault status output
- **Buck Converter**
  - Integrated power MOSFET
  - Current mode control
- **Soft start function**
- **Two Independent Boost Converters**
  - Integrated power MOSFET
  - Current mode control
  - Wide output range: up to 25.0V
  - Adjustable power on/off delay time
- **Negative Charge Pump**
  - Voltage mode control
  - Adjustable power on/off delay time

## GENERAL DESCRIPTION

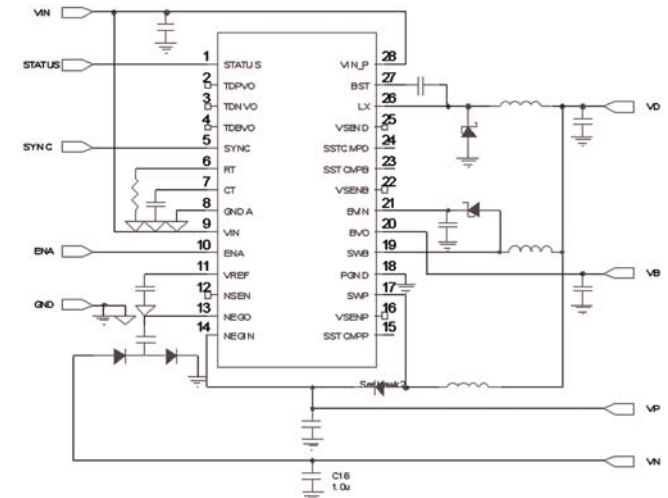
The OZ528 is a LCD panel bias power supply controller and is suitable for GPS application. It generates four voltage rails for a TFT LCD panel. It includes a boost converter to provide the source voltage, buck converter to provide the logic voltage for the system, boost converter for positive gate voltage and a negative charge-pump driver to provide adjustable regulated output voltages to bias the TFT panel.

IC has power-on sequencing. The buck converter is the first to start after the IC is enabled. Two boost converters and a negative charge pump are enabled when their corresponding TIMER reaches approximately 2.0V.

## APPLICATIONS

- GPS

## APPLICATION DIAGRAM



Patents pending.

# OZ9965

## FEATURES

- Integrated LED controller and two (2) DC/DC converters
- User-defined operation frequency
- Wide input voltage range
- Thermal protection
- User-defined shutdown delay time
- LED fault status output

### LED Controller

- User-defined boost topology or buck-boost topology
- Current mode control
- Drives up to 4 strings of LEDs in parallel
- User-defined string selection
- Integrated LED current balance control circuit
- External PWM dimming control
- LED open string and short circuit protection
- MOSFET over-current protection

### LED Controller (cont.)

- Over load protection
- Output short circuit or open diode protection

### Boost Converter

- Current mode control
- Over-voltage protection
- MOSFET over-current protection
- Over load protection
- Soft start function

### General Purpose Converter

- User-defined negative buck-boost or buck topology
- Voltage mode control
- Over-voltage and over-load protection
- Soft start function

## GENERAL DESCRIPTION

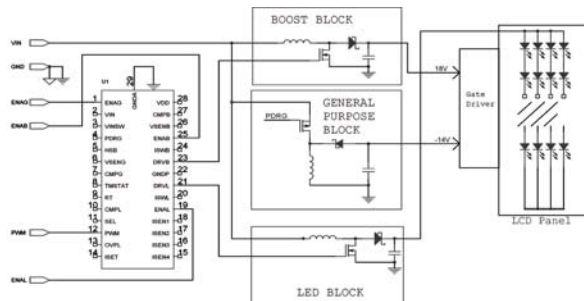
OZ9965 is a wide input range multi-output power management controller for small panel LCD applications. It controls the DC/DC power conversion from a single input supply voltage to provide the power needed to drive an LED backlight module, source drivers and gate drivers used in a LCD application.

OZ9965 includes a high power LED driver controller, a boost converter, and one general purpose converter that can be configured into either a buck or negative buck-boost converter. The LED driver supports external Pulse Width Modulation (PWM) dimming, and can drive 3 or 4 LED strings, depending on the SEL pin voltage setting.

## APPLICATIONS

- Car TV
- GPS

## APPLICATION DIAGRAM



U.S. Patent #7,847,783; and more patents pending.

# OZ9990

## FEATURES

- High power DC/DC power converter controller
- Drives up to 4 strings in parallel
- Integrated LED current balance control circuit
- User-defined string selection
- Operation frequency synchronization
- External PWM dimming control
- Time-shift PWM phase dimming control for low audible noise
- LED open string protection
- Output short circuit and open diode protection
- LED short circuit protection
- MOSFET over-current protection
- Thermal protection
- LED fault status output
- Soft start function

## GENERAL DESCRIPTION

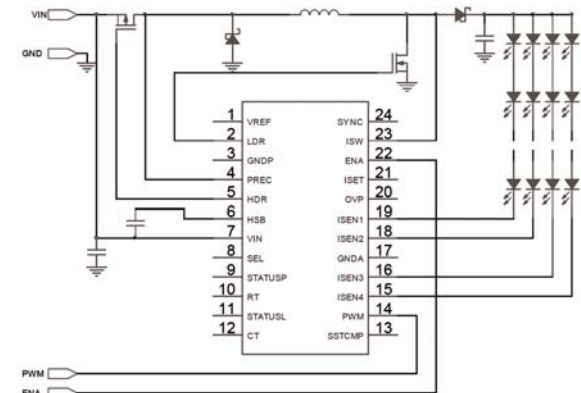
OZ9990 is a LED controller that drives up to four (4) strings connected in parallel configuration, with multiple LEDs per string connected in series. It provides four (4) LED current sense inputs in an ‘OR’ configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

OZ9990 supports external Pulse Width Modulation (PWM) dimming control, and provides an integrated circuit to balance the current flow through each LED string.

## APPLICATIONS

- Car TV
- GPS

## APPLICATION DIAGRAM



U.S. Patent #7,498,793; 7,847,783; and more patents pending.

# OZ522

## FEATURES

### Charger

- 550KHz switching mode charger for 1 – 4 cell Lilon or LiPolymer batteries
- Supports fast charge mode
- Wake up charging function for discharged batteries
- Built-in charge termination function
- Internal safety timer for charger
- 92% efficiency
- Automatic battery recharge
- 1% constant voltage accuracy
- Charge status indication by LED
- Battery absence detection

### DC/DC Converters

- Two switch mode buck converters with under-voltage protection
- 2% voltage accuracy
- Output protection:
  - Over-current for each DC/DC converter
  - Over-voltage lockout on adapter voltage
  - Under-voltage lockout on battery voltage
- Output voltage range of 1.0V to 5.5V
- Integrated soft start function, 4ms soft start function at start-up
- ON/OFF control pin

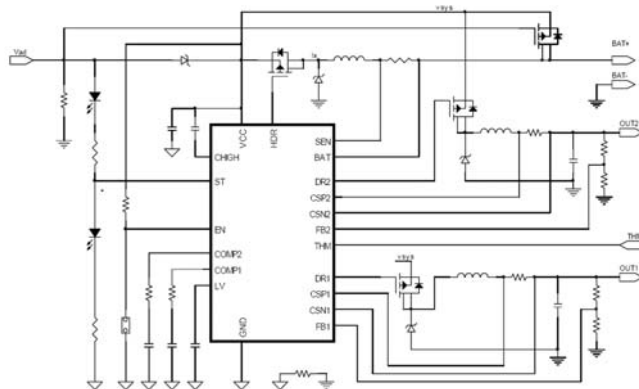
## GENERAL DESCRIPTION

The OZ522 provides a complete charging algorithm to control 1 – 4 cell Lilon batteries, used in Portable DVD (PDVD), and other portable electronic equipment. It delivers a wake-up charging current for discharged batteries followed by a fast charging current to minimize the charging time, and keeps the battery regulation voltage with 1% accuracy. A battery temperature sensing scheme allows the battery to be charged within a user-defined temperature range. The switch mode charger allows use of low AC adapter voltage at high efficiency.

## APPLICATIONS

- PDVD

## APPLICATION DIAGRAM



U.S. Patent #7,268,520; and more patents pending.

# OZ525

## FEATURES

- Asymmetrical switch mode DC/DC Controller
- Voltage mode PWM control with adjustable drive output sequence
- Complementary drive architecture supporting various topologies
- Highly customizable driver sequence to minimize switching loss
- Complete protection features:
  - Over-Voltage Protection (OVP) via VVD pin
  - Two-level Over-Current Protection (OCP) via CS pin
  - Thermal protection via OTP pin
  - Brownout Protection via BO pin
  - Open loop Protection (OLP) via FB pin
  - Adjustable shutdown delay timer via TIMER pin
- Fast line feed forward compensation
- Adjustable start-up delay time to reduce excessive voltage stress to power components
- User-defined soft start time

## GENERAL DESCRIPTION

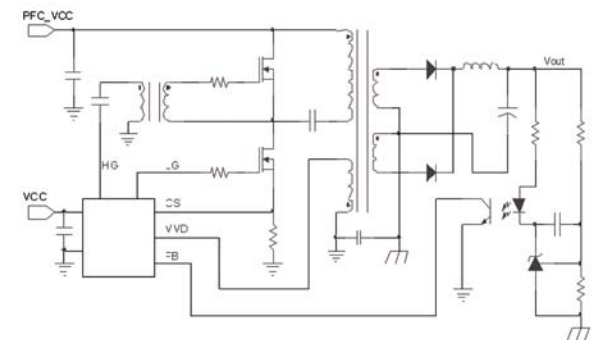
The OZ525 is an energy efficient, switched mode DC/DC controller designed for Switched Mode Power Supply (SMPS) applications, utilizing a half-bridge topology. High level integration and distinctive features result in a cost effective power supply design, requiring few external components.

The controller provides complementary Pulse Width Modulation (PWM) control and enables the designer to customize the drive sequence. Such customization, through dedicated pins, ensures high efficiency and performance in a power supply system by minimizing switching loss.

## APPLICATIONS

- General Purpose AC/DC Converter

## APPLICATION DIAGRAM



Patents pending.



# OZ529

## FEATURES

### DC/DC Buck Converter

- Integrates 40V, 3A N-CH power MOSFET
- Adjustable operation frequency range 200kHz – 800kHz
- Operation frequency synchronization
- System power input under-voltage lockout
- Adaptive output voltage following USB output requirement
- Thermal protection

### USB Power Switch

- Independent ON/OFF control
- Sustains up to 40V input voltage stress
- Up to 1.5A output current capability
- Adjustable over-current limit threshold
- Built in soft start
- Output voltage vs. load current compensation
- Reverse current protection under shutdown condition
- USB fault status output

## GENERAL DESCRIPTION

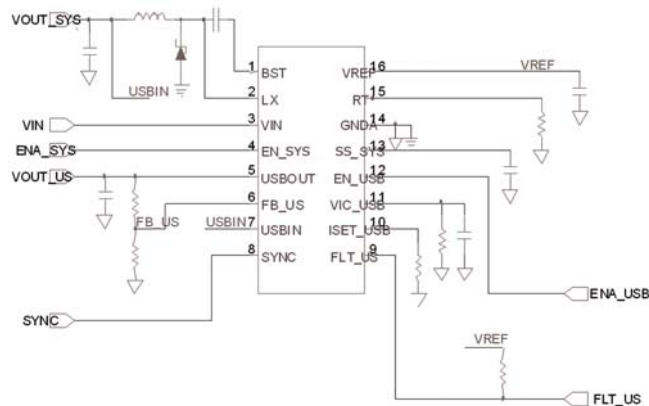
The OZ529 includes a high efficiency DC/DC buck converter and a high current USB power switch for USB port power supply applications.

With current mode DC/DC conversion control and internal compensation, OZ529 provides fast line voltage transient response and minimizes application component count. The USB power switch employs a proprietary design technique providing output voltage vs. load current compensation and the adaptive buck converter output voltage control functions to achieve a reliable, flexible and efficient solution for high current USB port power supply applications.

## APPLICATIONS

- USB Port Power Supply

## APPLICATION DIAGRAM



Patents pending.

# OZ530

## FEATURES

- Integrated boundary-mode PFC and flyback controller
- Clamped Gate Output Voltage
- PFC Features:
  - Zero Current Switching (ZCS)
  - Cycle-by-cycle current limiting
  - Controlled on-time boost converter
- Flyback Features:
  - Zero Voltage Switching (ZVS)
  - Fast transient response
  - Minimum off-time control scheme
  - User-defined soft start and shutdown delay timer
- Protection Features:
  - Over-Voltage Protection (OVP) for both controls
  - Open loop protection for both controls
  - Two-level Over-Current Protection (OCP) for flyback control

## GENERAL DESCRIPTION

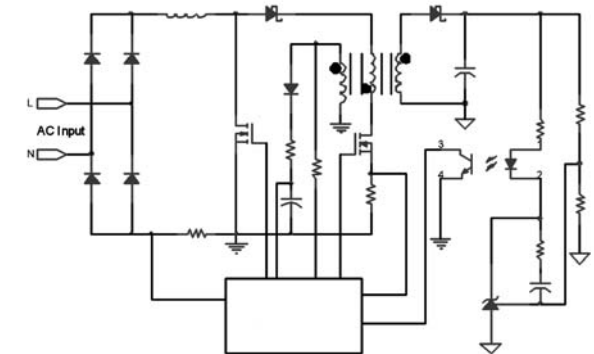
The OZ530 is an integrated circuit featuring a power factor correction (PFC) control and a DC/DC Flyback converter control. Its high-level integration simplifies power supply circuit design with minimum circuit components.

The PFC portion of OZ530 operates under a boundary-mode control regulating a DC output voltage. The flyback controller portion of OZ530 provides a primary-side control designed to optimize offline, quasi-resonant (QR), ZVS flyback converter.

## APPLICATIONS

- AC/DC Power Supply
- PFC

## APPLICATION DIAGRAM



Patents pending.

# OZ531

## FEATURES

- Current mode PWM Controller
- Built-in high voltage (500V) start-up circuit
- Low standby power meets Energy Star specification
- Current mode control with frequency foldback under light-load condition
- Built-in synchronized slope compensation
- Drive current up to 500mA
- Leading-edge blanking at current sense
- Protections:
  - Under-voltage lockout protection
  - Clamped gate output voltage at 18V
  - VDD over-voltage protection
  - Cycle-by-cycle current limiting
  - Output over-current and short circuit protection
  - Thermal protection

## GENERAL DESCRIPTION

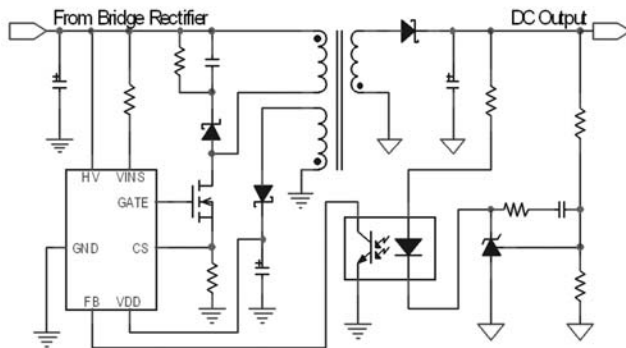
The OZ531 is a highly integrated current mode Pulse Width Modulation (PWM) controller that is ideal for offline AC/DC flyback converter applications.

The controller operates at fixed frequency of 100kHz. With a built-in high voltage start-up circuit, OZ531 eliminates the power loss caused by start-up resistors. The Driver outputs a soft-drive signal which reduces electromagnetic interference in the converter system.

## APPLICATIONS

- AC/DC Power Adapter

## APPLICATION DIAGRAM



# Company Background

Founded in April 1995, O<sub>2</sub>Micro<sup>®</sup> International Limited (NASDAQ<sup>®</sup>: OIIM) designs, develops and markets innovative **power management** and **e-commerce** components for the Computer, Consumer, Industrial/Automotive, and Communications markets.

O<sub>2</sub>Micro maintains an extensive portfolio of intellectual property, and has numerous trademark Applications and Copyright Registrations.

The company's extensive list of customers includes most of the world's leading electronics manufacturers of Computer, Consumer, Industrial and Communication products.

For additional information, including sales office locations, please visit the O<sub>2</sub>Micro web site at [www.o2micro.com](http://www.o2micro.com).

**INDUSTRIAL / AUTOMOTIVE Applications**



**OFFICE LIGHTS**



**STREET & LANDSCAPE  
SOLAR LIGHTING**



**FLASHLIGHT**



**AUTO HEADLIGHT**