

Intelligent Lighting Family Product Guide

Part Number	Description	Package(s) Available	Page No.
CCFL/EEFL Intelligent Inverter® Controller ICs			
LCD MONITOR (LCDM) APPLICATIONS			
OZ9919	Selectable LCDM Controller	16 SOP, Lead-free	7
OZ9933	LCDM Full-Bridge Controller	16 PDIP, SOP, Lead-free	8
OZ9937	Universal LCD Panel Controller	16 SOP, Lead-free	9
OZ9938	Multi-Lamp Controller	16 PDIP, SOIC, Lead-free	10
LCD TV APPLICATIONS			
OZ9928*	LCD TV Dual Controller	30 SSOP, Lead-free	11
OZ9966*	Large-Size LCD TV Controller	24 SOP, SSOP, Lead-free	12
OZ9972/ OZ9972A*	High Power LCD TV Controller	24 SOP, SSOP, Lead-free/ 28 SSOP, Lead-free	13
OZ9976*	Offline LCD TV Controller	16 SOP, Lead-free	14
LED Backlight Controller ICs			
NOTEBOOK / NETBOOK APPLICATIONS			
OZ9901	LCD Bias Supply Controller	24 QFN, Lead-free	15
OZ9955A	Eight String LED Controller	24 QFN, Lead-free	16
OZ9955B	Eight String SMBus™ LED Controller	24 QFN, Lead-free	17
OZ9956B	Six String LED Controller	20 QFN, Lead-free	18
OZ9956C	White LED Backlight Controller	20 QFN, Lead-free	19
OZ9960	High Power LED Controller	12 DFN, 16 SSOP, Lead-free	20
OZ9979	Six String w/Phase-Shift Dimming, Internal MOSFET	20 QFN, Lead-free	21
OZ9989	Three String LED Controller	12 DFN, Lead-free	22
OZ9993	Low Cost White LED Controller	SOT23-6L, Lead-free	23

* 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.

Intelligent Lighting Family Product Guide

Part Number	Description	Package(s) Available	Page No.
LED Backlight Controller ICs (cont.)			
MONITOR APPLICATIONS			
OZ9902	Dual Channel High Power LED Driver	24 SOP, SSOP, Lead-free	24
OZ9906	Six String LED Controller	28 E-TSSOP, SOP, Lead-free	25
OZ9908	Eight String High Power LED Controller	48 LQFP, 40 QFN, Lead-free	26
OZ9961	Six String LED Controller	20 E-TSSOP, SSOP, Lead-free	27
OZ9967	Six String High Power LED Controller	28 SOP, SSOP, TSSOP, Lead-free	28
OZ9997	LED Backlight Controller	24 E-TSSOP, QFN, SOP, Lead-free	29
OZ9998/ OZ9998A	Eight String High Power LED Controller	24 E-TSSOP, QFN, SOP, Lead-free	30
OZ9998B	Four String High Power LED Controller	16 E-TSSOP, PDIP, QFN, SOP, Lead-free	31
TV APPLICATIONS			
OZ9902	Dual Channel High Power LED Driver	24 SOP, SSOP, Lead-free	24
OZ9902B	Single Channel High Power LED Driver	16 QFN, SOP, Lead-free	32
OZ9904	Four String LED Controller	28 SSOP, Lead-free	33
OZ9904A	Eight String LED Controller	40 QFN, Lead-free	34
OZ9906	Six String LED Controller	28 E-TSSOP, SOP, Lead-free	25
OZ9908	Eight String High Power LED Controller	48 LQFP, 40 QFN, Lead-free	26
OZ9908A	Six String High Power LED Controller	28 SOP, TSSOP, Lead-free	35
OZ9908B	Six String High Power LED Controller	32 LQFP, SOP, Lead-free	36
OZ9967	Six String High Power LED Controller	28 SOP, SSOP, TSSOP, Lead-free	28

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

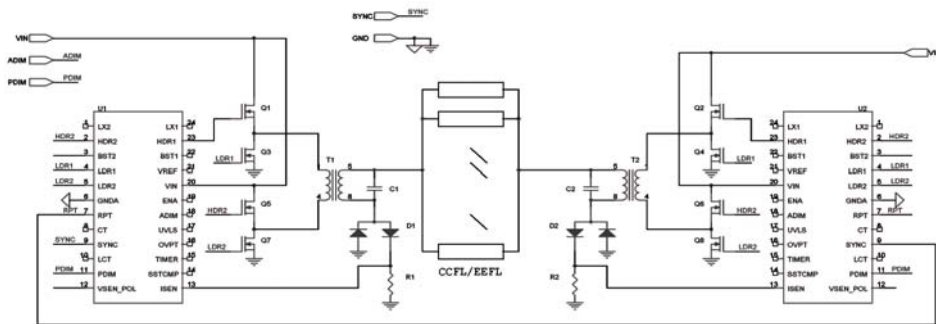
The OZ9966 is a high performance controller designed for large-size LCD TV applications requiring multiple lamps. It achieves a high efficiency power conversion with minimal switching loss using a full-bridge N-Channel MOSFET topology. The OZ9966 is ideal for single-side drive or differential drive applications.

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

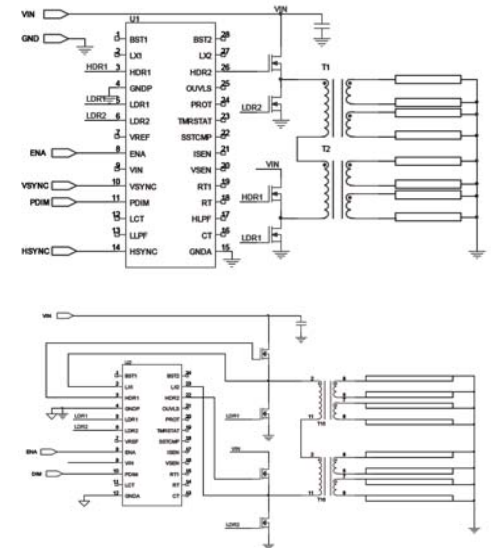
OZ9972/72A are high performance, Pulse Width Modulation (PWM) controllers designed for large-size LCD TV applications requiring multiple lamps. They achieve high efficiency power conversion with minimal switching loss in a PWM, full-bridge, N-Channel MOSFET topology.

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.

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

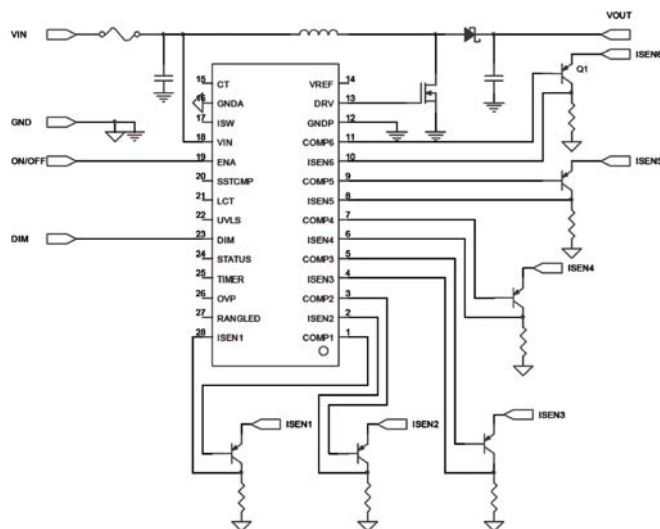
The OZ9967 is an LED controller that drives up to six (6) strings of LEDs in parallel configuration, with multiple LEDs per string connected in series. It provides six (6) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning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

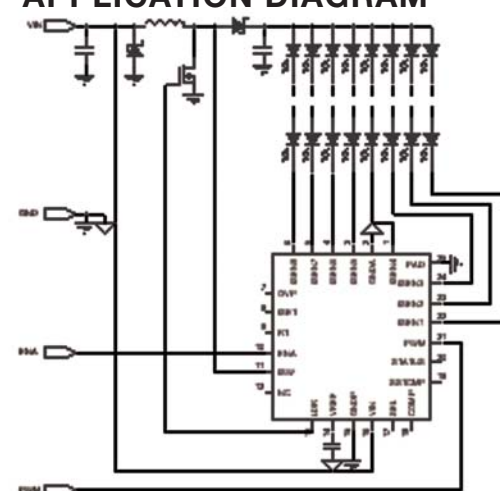
The IC provides eight (8) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string(s) is damaged during normal operation.

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

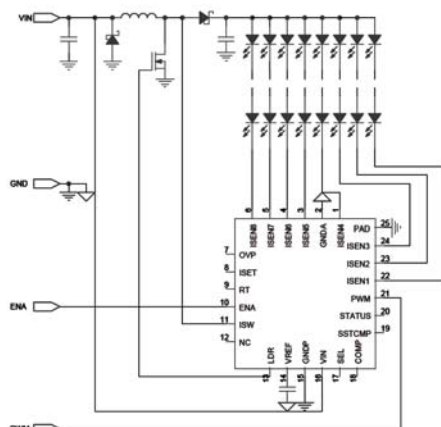
OZ9998/98A are high efficiency, DC/DC controllers that drive up to eight (8) strings of LEDs connected in parallel configuration, with multiple LEDs in each string connected in series. They provide eight (8) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows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

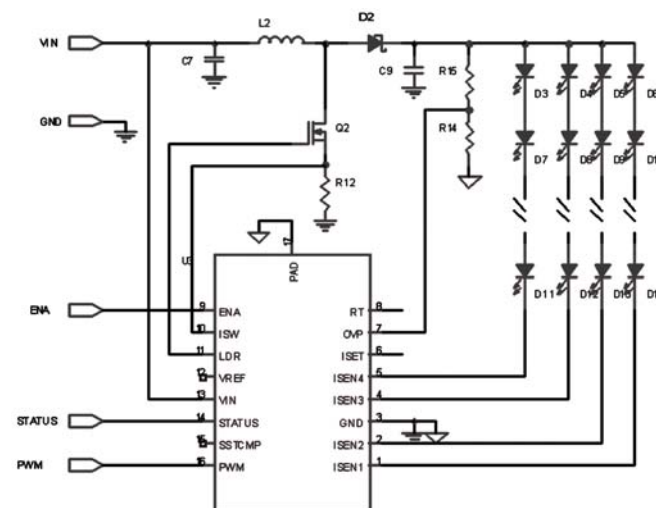
OZ9998B is a high efficiency DC/DC controller that drives up to eight strings connected in parallel configuration with multiple LEDs in each string connected in series. It provides four (4) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to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

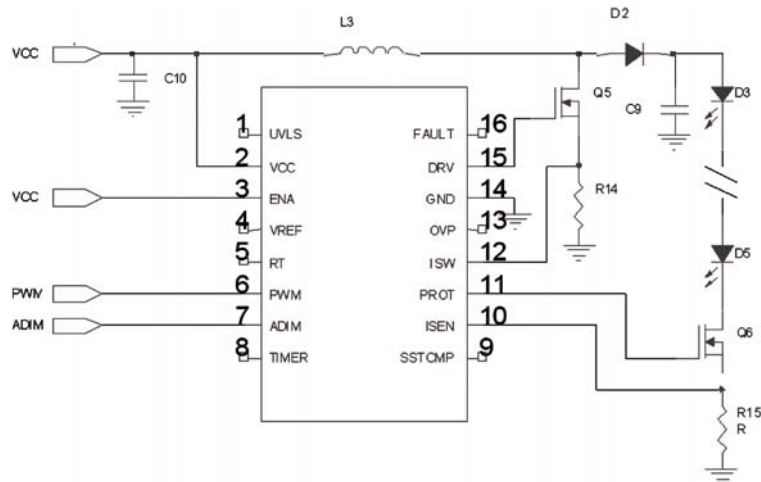
OZ9902B is a single channel high power LED driver designed for LED backlight applications used in large-size LCD TVs.

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.

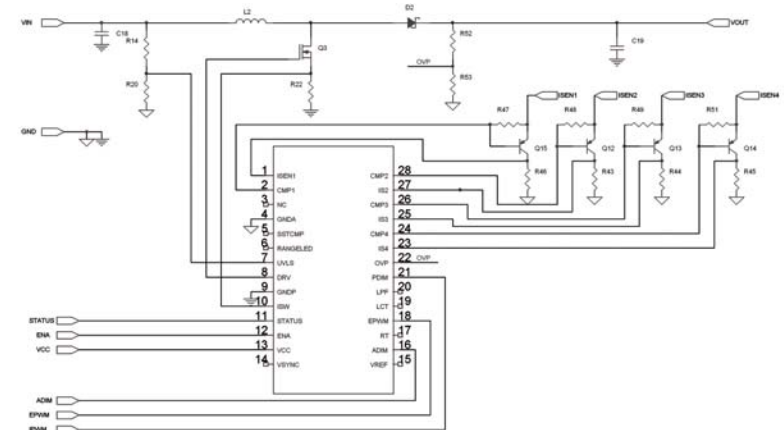
OZ9904 supports both internal and external Pulse Width Modulation (PWM) dimming methods for brightness control of LCDs for various system applications. The internal PWM dimming signal can also be synchronized with the vertical sync signal of the LCD display.

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.

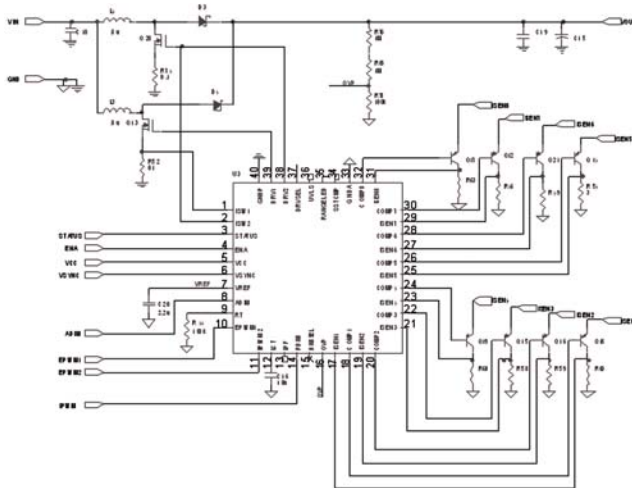
It provides two high-voltage gate drive signals for the boost converters, with 180° phase-shift between the two signals. The IC minimizes input and output current ripple. It also provides a flexible design using only one drive signal for low-power applications through pin DRVSEL.

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

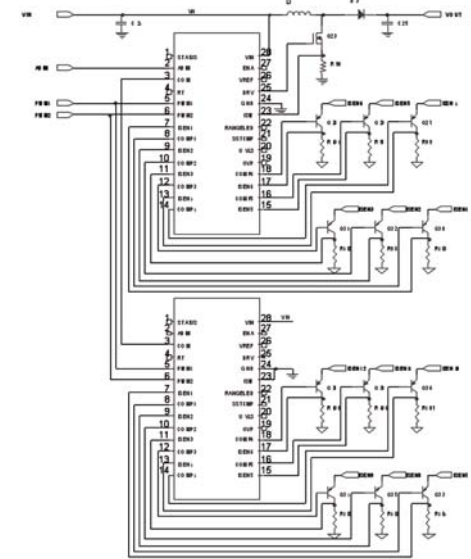
The OZ9908A is a high performance LED driver controller optimized for large screen LED backlight LCD TV applications. It provides an integrated six channel LED current regulation control circuit. Using external balance transistors for each channel, the IC is capable of driving a current up to 350mA per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

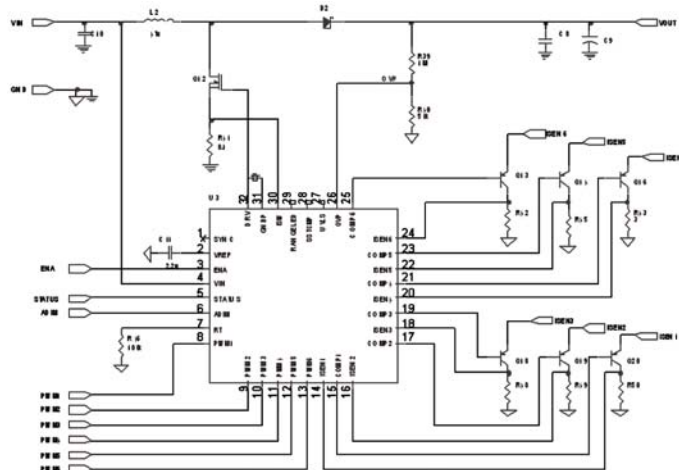
OZ9908B provides 6 individual external Pulse Width Modulation (PWM) dimming interfaces for its respective LED string. The IC is suitable for LCD TV applications using a local-dimming control backlight.

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

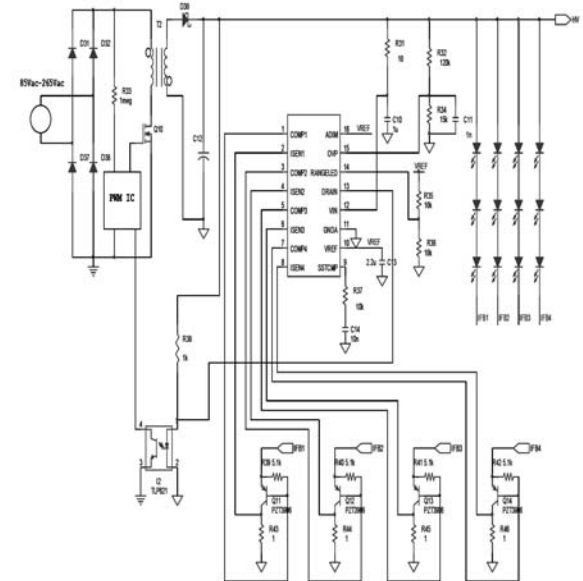
OZ9984 is a high efficiency LED driver IC that works in conjunction with a primary side external Pulse Width Modulation (PWM) controller, for offline, isolated LED lighting application. It has four (4) LED current sense inputs in an “OR” configuration to ensure uniform lighting of the LEDs. It can drive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

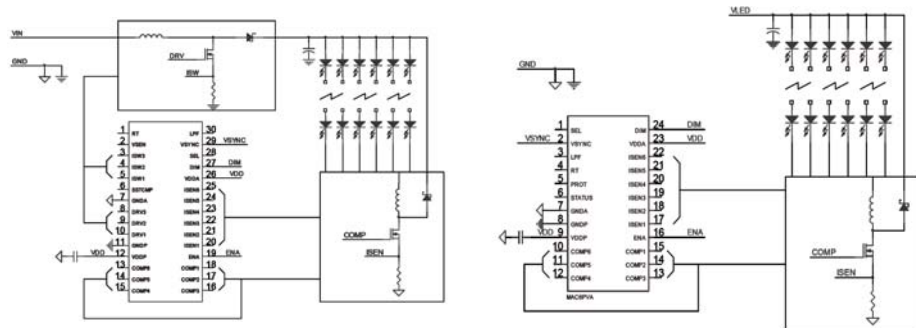
They provide six (6) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that any string (s) is damaged during normal operation.

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



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

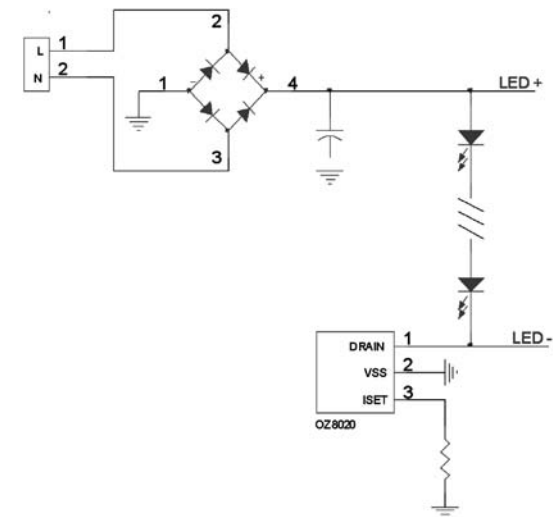
OZ8020 is a linear LED driver for general lighting applications. It requires a minimum number of external components to operate, while providing application flexibility to accommodate different system requirements. For application flexibility, the device can be connected at either the anode or cathode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



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

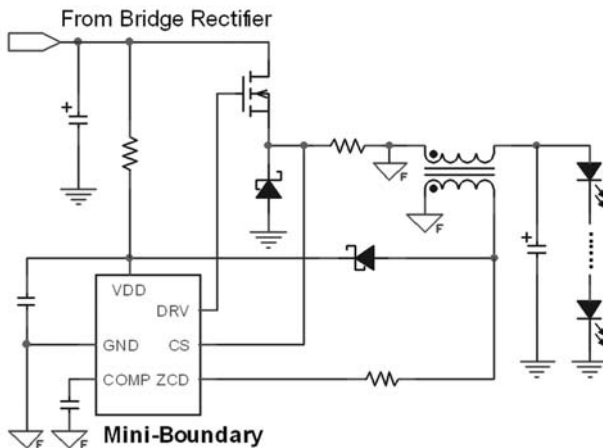
OZ8022 is a controller for Buck converter utilizing quasi-resonant conversion technology. It can be used to drive high-brightness LEDs in offline applications. The controller is implemented with a compensated peak current mode control to regulate the average LED current.

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

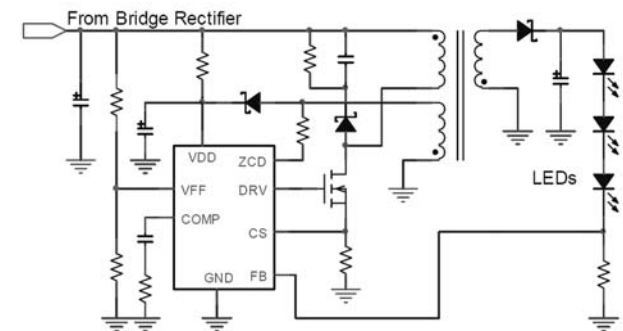
OZ9987 is an integrated current mode Pulse Width Modulated (PWM) controller that is ideal for low power, offline, AC/DC flyback converter applications. The PWM operating frequency is determined by an external resistor.

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

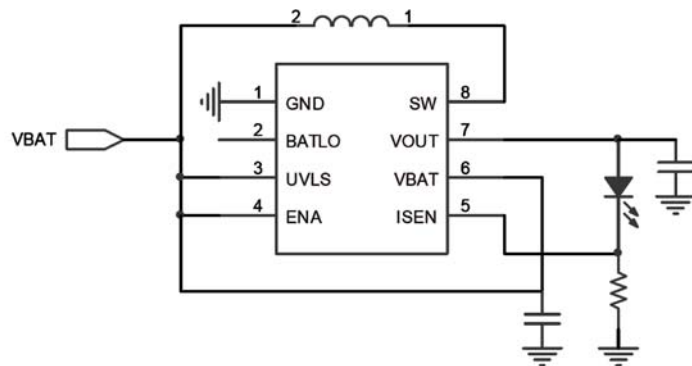
OZ9988 is a high power LED driver controller suitable for applications requiring 1 or 2 cell NiMH or Alkaline batteries. It is used in a high efficiency boost converter which provides constant current drive for LED backlight applications.

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

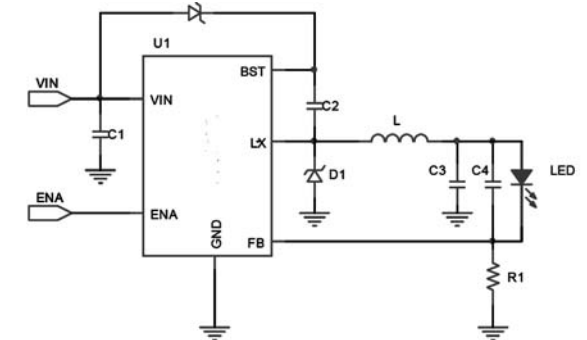
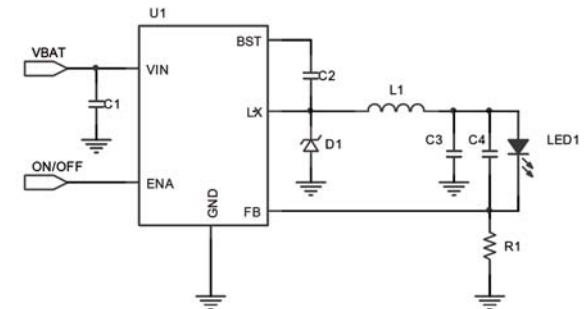
OZ9991/91A are high efficiency, DC/DC step down converters with an integrated power MOSFET that supports 1 string of white LEDs in series.

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

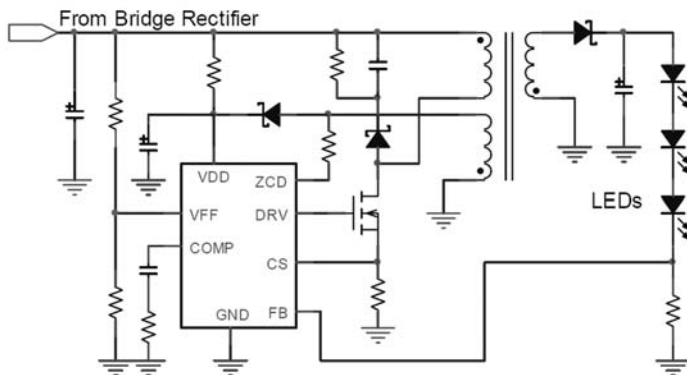
OZ9992 is a controller for offline AC/DC flyback converter applications utilizing quasi-resonant power conversion technology. One application using OZ9992 is for driving the high power LEDs. It uses a compensated peak current mode control to regulate the average current through the LEDs.

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

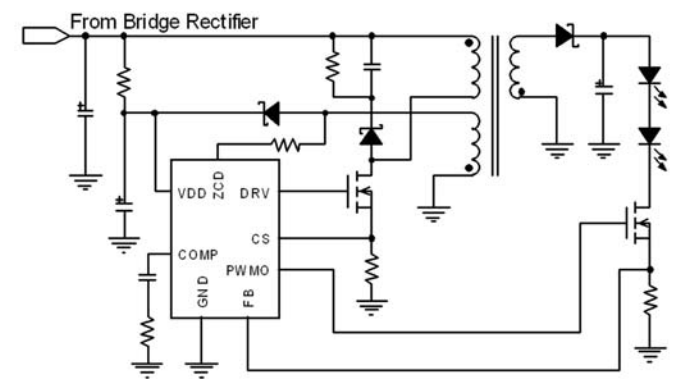
OZ9994 is a controller for offline AC/DC flyback converter applications utilizing quasi-resonant power conversion technology. One application using OZ9994 is for driving the high power LEDs. The controller uses a compensated peak current mode control to regulate the average current of the LEDs.

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

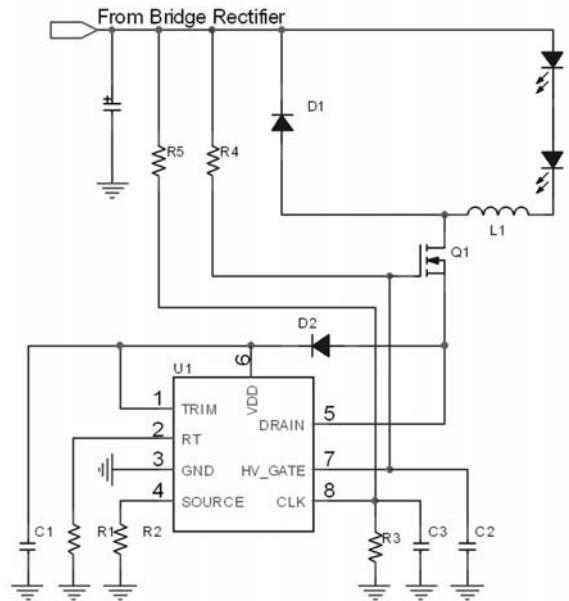
OZ9995 is an optimized DC/DC controller for driving high power LEDs used in offline applications. The IC operates in a constant off-time control mode.

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



Patents pending.

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 $0.9 \cdot V_{IN}$
- 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.

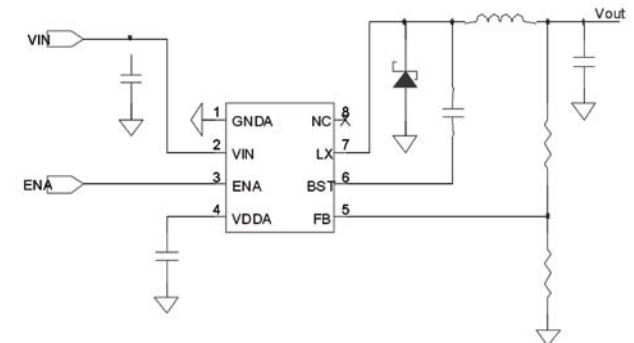
OZ523 is a non-synchronous step down DC/DC converter with a 0.25Ω integrated MOSFET and supports a 1.5A continuous load current with up to 3.2A peak current. The output voltage can be user-defined from 0.8V up to $0.9 \cdot V_{IN}$ using a feedback resistor divider.

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

APPLICATIONS

- General Purpose DC/DC Converter

APPLICATION DIAGRAM



Patents pending.

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.

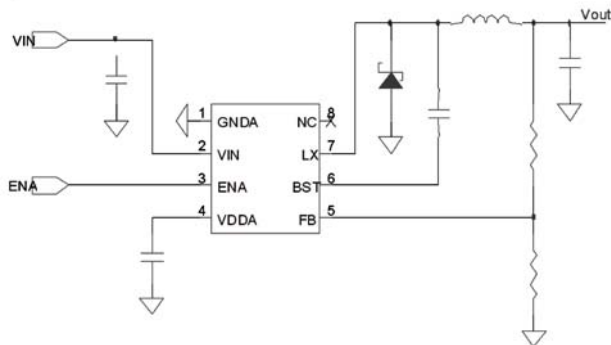
OZ524 is a non-synchronous step down DC/DC converter with a 0.25Ω integrated MOSFET and supports a 3.0A continuous load current with up to 3.2A peak current. The output voltage can be user-defined from 0.8V up to 0.9* V_{IN} using a feedback resistor divider.

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

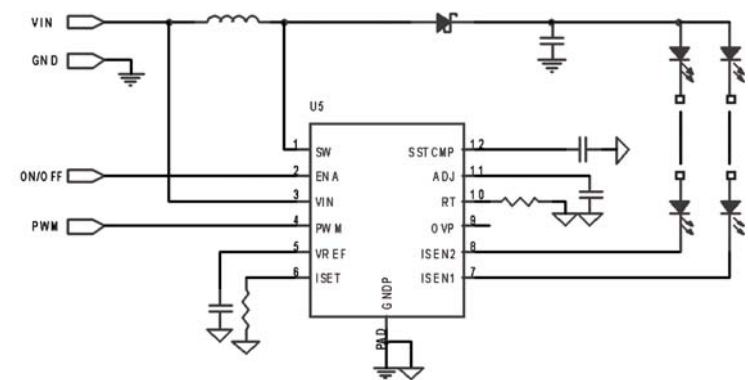
The OZ526 is a high efficiency DC/DC controller with an integrated power MOSFET that drives one string or two LED strings in parallel configuration, with multiple LEDs connected in series. It is targeted for netbook and PND backlight applications.

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.

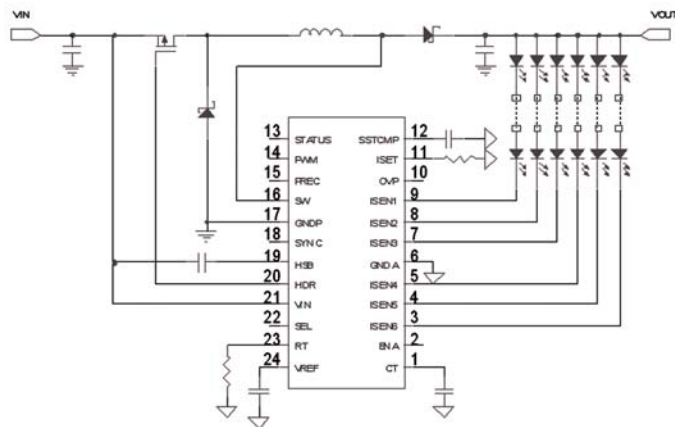
OZ527 provides 6 LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning in the event that a string(s) is damaged during normal operation.

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
- Soft start function
- Negative Charge Pump**
 - Voltage mode control
 - Adjustable power on/off delay time

GENERAL DESCRIPTION

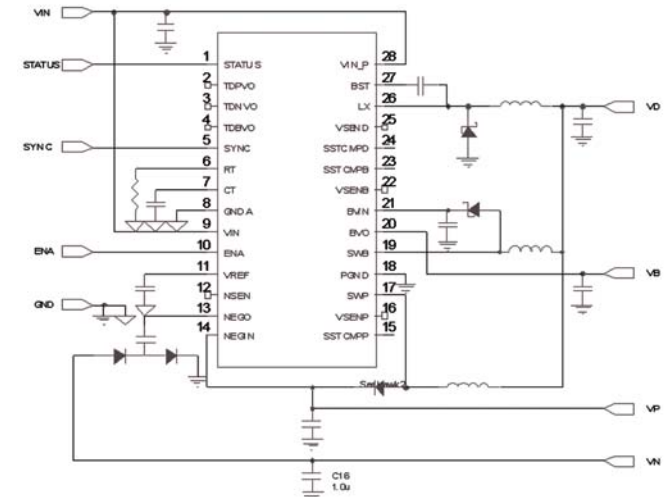
The OZ528 is a LCD panel bias power supply controller and is suitable for GPS application. It generates four voltage rails for a TFT LCD panel. It includes a boost converter to provide the source voltage, buck converter to provide the logic voltage for the system, boost converter for positive gate voltage 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

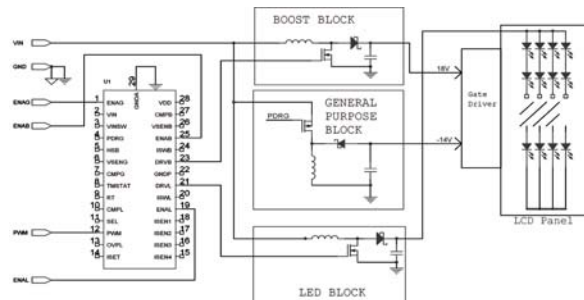
OZ9965 is a wide input range multi-output power management controller for small panel LCD applications. It controls the DC/DC power conversion from a single input supply voltage to provide the power needed to drive an LED backlight module, source drivers and gate drivers used in a LCD application.

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

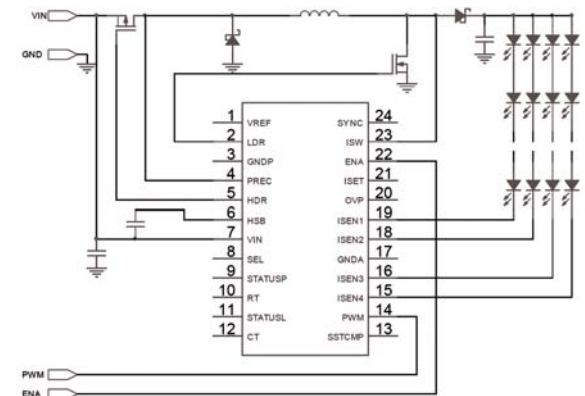
OZ9990 is a LED controller that drives up to four (4) strings connected in parallel configuration, with multiple LEDs per string connected in series. It provides four (4) LED current sense inputs in an “OR” configuration to improve backlight reliability. This allows the backlight to remain functioning 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.

0Z522

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

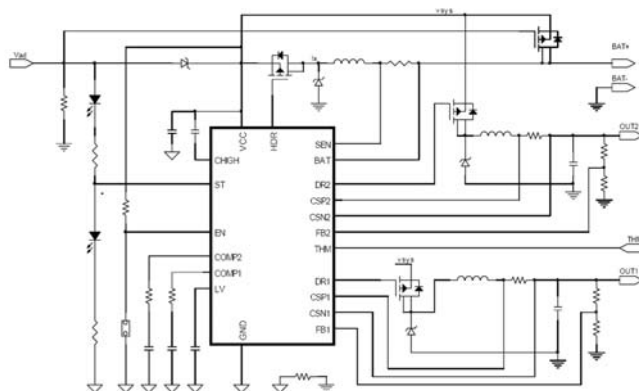
GENERAL DESCRIPTION

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.

0Z525

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

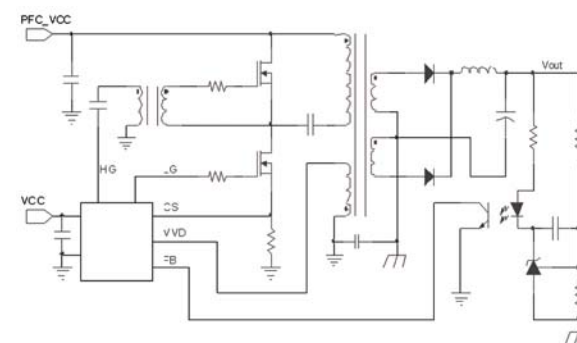
The OZ525 is an energy efficient, switched mode DC/DC controller designed for Switched Mode Power Supply (SMPS) applications, utilizing a half-bridge topology. High level integration and distinctive features result in a cost effective power supply design, requiring few external components.

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

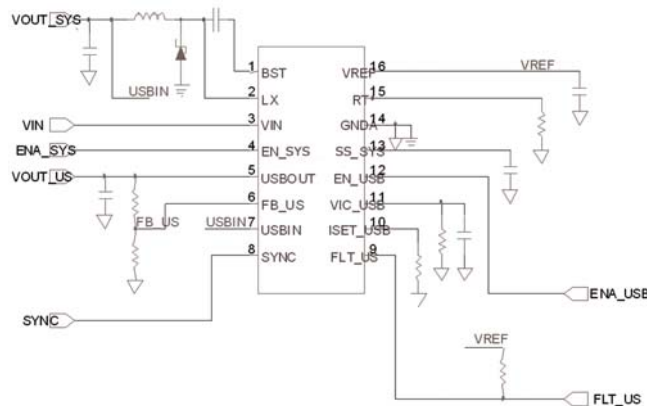
The OZ529 includes a high efficiency DC/DC buck converter and a high current USB power switch for USB port power supply applications.

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



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

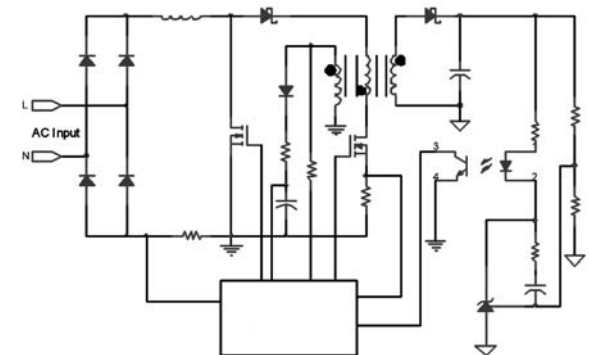
The OZ530 is an integrated circuit featuring a power factor correction (PFC) control and a DC/DC Flyback converter control. Its high-level integration simplifies power supply circuit design with minimum circuit components.

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



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

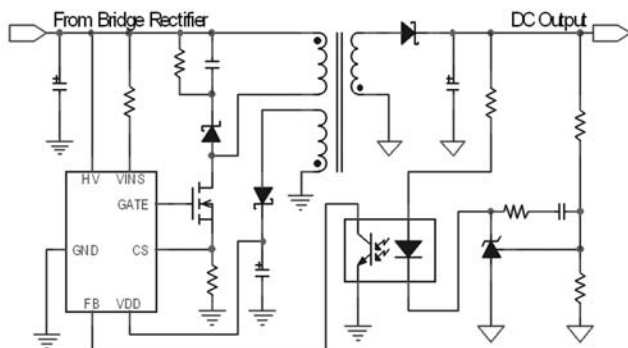
The OZ531 is a highly integrated current mode Pulse Width Modulation (PWM) controller that is ideal for offline AC/DC flyback converter applications.

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, O₂Micro® International Limited (NASDAQ®: OIIM) designs, develops and markets innovative **power management** and **e-commerce** components for the Computer, Consumer, Industrial/Automotive, and Communications markets.

O₂Micro 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 O₂Micro web site at **www.o2micro.com**.