Multi-Topology LED Driver

General Description

The A5102 is a current mode PWM regulator for LED driving applications. With a 2A switch on board and wide input (3.5V to 40V) and/or output (up to 40V) ranges the A5102 can operate in any of the three common topologies: Buck, Boost or Buck-Boost.

With a 500kHz operating frequency, the external PWM inductor and input/output capacitors can all be small. High efficiency is achieved with a 100mV current sensing. Dimming can be either analog or PWM, a unique built-in clamping comparator and filtering resistor allow easy low noise analog dimming conversion from PWM signal.

Features

- High Voltage : Vin and Vout Up to 40V.
- 2A Switch Current
- Buck, Boost or Buck-Boost Operation
- Current Mode PWM with 500KHz Switching Frequency.
- Easy Dimming : Analog, PWM
- Soft Start to Avoid Inrush Current
- Programmable Over Voltage Protection to Limit Output Voltage
- VIN Under voltage Lockout and Thermal Shutdown

Applications

- GPS, Portable DVD Backlight
- Desk Lights and Room Lighting
- Industrial Display Backlight
- MR16　Lamp

Pin Assignment
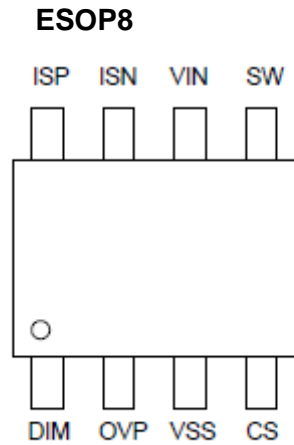
ESOP8

Pin Descriptions (ESOP8)

Pin #	Name	Description
1	DIM	The PWM dimming signal on DIM pin will be averaged and converted into analog dimming signal
2	OVP	Over voltage protection. PWM boost converter turns off when VOVP goes higher than 1.25V
3	VSS	Ground. The exposed pad must be soldered to a large PCB and connected to GND for maximum power dissipation
4	CS	This pin connects a current-sense resistor to sense the MOSFET current.
5	SW	PWM Boost Converter Switch Node
6	VIN	Power Supply of the Chip. For good bypass, a low ESR capacitor is required
7	ISN	Current Sense Amplifier Negative Input. Voltage threshold between ISP and ISN is 100mV.
8	ISP	Current Sense Amplifier Positive Input

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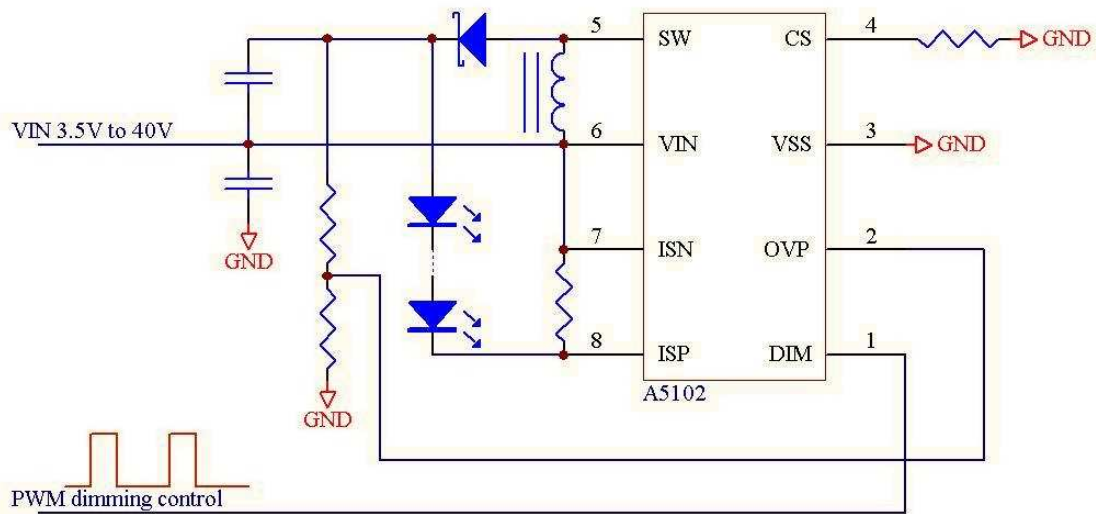## TYPICAL APPLICATION CIRCUIT

Figure 1. PWM to Analog Dimming BUCK-BOOST Configuration

Applications Information

The A5102 is designed can operate in any of the three common topologies applications. This device uses a fixed frequency, current mode control scheme to provide excellent line and load regulation. The control loop has a current sense amplifier to sense the voltage between the ISP and ISN pins. A PWM comparator then turns off the internal power switch when the sensed power switch current exceeds the compensated voltage. The programmed voltage across the sense resistor is regulated by the control loop.

The current through the sense resistor is setting by the programmed voltage and the sense resistance. The voltage across the sense resistor can be programmed by the analog or PWM signal at the DIM pin.

The protection schemes in A5102 include over temperature, over voltage, and switch current-limit to prevent the abnormal situation.

Soft Start

The A5102 built-in soft-start circuit to reduce the start-up current spike and output voltage overshoots. The soft-start time is about 4ms.

Current-Limit Protection

The A5102 can limit the peak switch current by internal over current protection feature. In normal operation, the power switch is turned off when the switch current hits the loop-set value. The over current protection function will turn off the power switch independent of the loop control when the peak switch voltage reaches around 0.2V.

Over Temperature Protection

The A5102 has over temperature protection (OTP) function to prevent the excessive power dissipation from overheating. The OTP function will shut down switching operation when the die junction temperature exceeds 145℃ . The chip w ill automatically start to switch again when the junction temperature cools off.

LED current Setting

The LED current can be calculated by the following equation :

LED(MAX)=(Visp-Visn)/R

Where, Visp – Visn is the voltage between ISP and ISN (100mV typ.) and the R is the resister between ISP and ISN.