

IS31PW3500

1.1MHZ BOOST CONVERTER WITH 30V INTERNAL FET SWITCH

February 2012

GENERAL DESCRIPTION

The IS31PW3500 is a constant current step-up converter. The step-up converter topology allows series connection of the white LEDs so the LED currents are identical for uniform brightness as well as constant output voltage to drive other devices. The IS31PW3500 switches at 1.1MHz, allowing the use of tiny external components. The input and output capacitor can be as small as 1 μ F, saving space and cost versus alternative solutions. A low 0.25V feedback voltage minimizes power loss in the current setting resistor for better efficiency. The IS31PW3500 is available in small DFN-8, 2mm \times 2mm package.

FEATURES

- 2.4V to 5.5V input range
- 26V output with over voltage protection
- High efficiency :85 % typical
- PWM dimming control
- Internal high power 30V MOSFET switch
- Fast 1.1MHz switching frequency
- Small, low-profile inductors and capacitors
- DFN-8, 2mm \times 2mm package
- RoHS compliant and 100% lead (Pb)-free

APPLICATIONS

- Mobile phone
- Digital still camera
- PDAs, handheld computers
- MP3 players
- GPS receivers

TYPICAL APPLICATION CIRCUIT

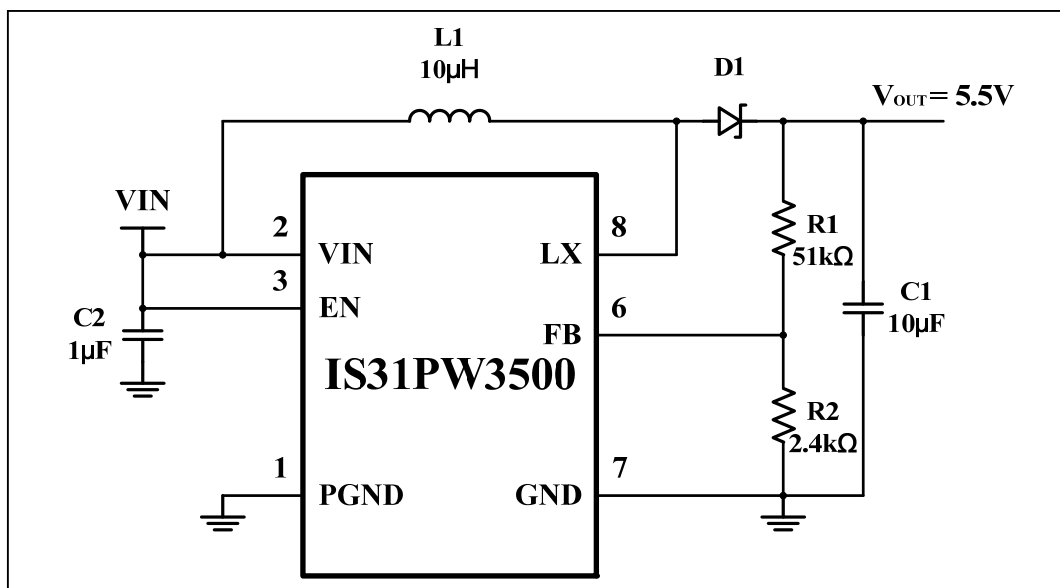
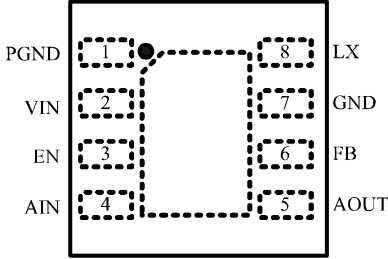


Figure 1 Typical Application Circuit

IS31PW3500

PIN CONFIGURATION

Package	Pin Configuration (Top View)
DFN-8	 <p>The diagram shows a top view of the DFN-8 package with eight pins arranged in two columns. Pin 1 (PGND) is at the top left, pin 2 (VIN) is below it, pin 3 (EN) is below that, and pin 4 (AIN) is at the bottom left. Pin 8 (LX) is at the top right, pin 7 (GND) is below it, pin 6 (FB) is below that, and pin 5 (AOUT) is at the bottom right. A dashed line indicates a connection path from pin 1 to pin 8.</p>

PIN DESCRIPTION

No.	Pin	Description
1	PGND	Signal ground, connect to ground.
2	VIN	Input supply voltage.
3	EN	Chip enable pin. Connect to 1.4V or higher to enable device, 0.4V or less to disable device.
4	AIN	Audio input. <i>(note1)</i>
5	AOUT	Audio output. <i>(note1)</i>
6	FB	Feedback pin. Reference voltage is 0.25V. Connect cathode of lowest LED and resistor here. Calculate resistor value according to the formula: $R_{FB} = 0.25/I_{LED}$, calculate output voltage according to the formula: $V_{OUT} = (R2+R1) \times 0.25V/R2$.
7	GND	Common ground
8	LX	Switch pin. Connect inductor/diode here. Minimize trace area at this pin to reduce EMI.
	Thermal Pad	Connect to GND.

Note 1: See section constant output voltage for Class-G audio amplifier in application information.

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- the risk of injury or damage has been minimized;
- the user assume all such risks; and
- potential liability of Integrated Silicon Solution, Inc is adequately protected under the circumstances



IS31PW3500

ORDERING INFORMATION

Industrial Range: -40°C to +85°C

Order Part No.	Package	QTY/Reel
IS31PW3500-DLS2-TR	DFN-8, Lead-free	3000



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ABSOLUTE MAXIMUM RATINGS

Supply voltage, V_{IN}	-0.3V ~ +6.0V
Voltage at any input pin	-0.3V ~ +6.0V
L_X	-0.3V ~ +30V
Maximum junction temperature, T_{JMAX}	150°C
Storage temperature range, T_{STG}	-65°C ~ +150°C
Operating temperature range, T_A	-40°C ~ +85°C

Note:

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

$V_{IN} = 3.6V$, $T_A = 25^\circ C$, unless otherwise specified.

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
System Supply Input						
V_{IN}	Supply voltage		2.4		6.0	V
UVLO	Under voltage lock out		2.2	2.45	2.6	V
	Maximum Output Voltage				29	V
I_{CC1}	Supply current	$V_{IN} = 6V$, continuously switching			1	mA
I_{CC2}	Quiescent current	$V_{IN} = 6V$, $V_{FB} = 1.3V$, no switching	70	120	170	μA
I_{CC3}	Shutdown current	$V_{IN} = 6V$, $V_{EN} < 0.4V$		0.1	1	μA
Oscillator						
F_{osc}	Operation frequency		0.8	1.0	1.2	MHz
D_{max}	Maximum duty cycle		85	90		%
Reference Voltage						
V_{FB}	Feedback voltage		0.237	0.25	0.263	V
MOSFET						
$R_{ds(on)}$	On resistance of MOSFET		0.6	0.7	1.0	Ω
I_X	Current limit		400	800	1450	mA
Control and Protection						
V_{ENL}	Shutdown voltage				0.4	V
V_{ENH}	Enable voltage		1.4			V
I_{EN}	EN pin pull low current				0.1	μA

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APPLICATION INFORMATION

CONSTANT OUTPUT VOLTAGE

Figure 3 is an application of IS31PW3500 for backlight of main panel and flashlight. Setting the divider-resistors (R1 & R2) is to get a constant output voltage that depends on the forward voltage and the numbers of series-LEDs. There are three kinds of mode controlled by the switches - backlight mode /flashlight mode /backlight + flashlight mode. It can turn on backlight or flashlight at one time or both at the same time. Applying different duty cycle of PWM signal above 22kHz to backlight's switch can also control the brightness. The following formula (2), (3) can determine R3.

$$V_{OUT} = (R2+R1 \times 0.25V) / R2 \quad (1)$$

$$R3 = V_{OUT} - 3V_{FB} - V_{DS} / I_b \quad (2)$$

$$V_{DS} = I_b \times R_{DS(ON)} \quad (3)$$

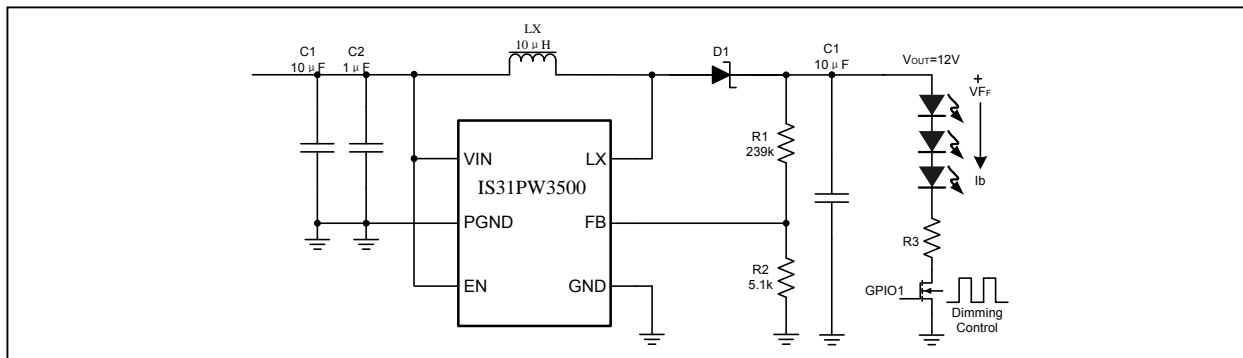


Figure 2 Constant Output Voltage for Backlight and Flashlight

CONSTANT OUTPUT VOLTAGE FOR CLASS-G AUDIO AMPLIFIER

Figure 4 is another application for driving Class G Audio Amplifier, IS31AP4915. Setting the divider-resistors (R1 & R2) is to get a higher constant output voltage that can drive audio amplifier intends to get larger audio power. The following formula (4) can determine the output voltage. Other applications for Audio amplifier, please contact us for more information.

$$V_{OUT} = (R2+R1) \times 0.25V / R2 \quad (4)$$

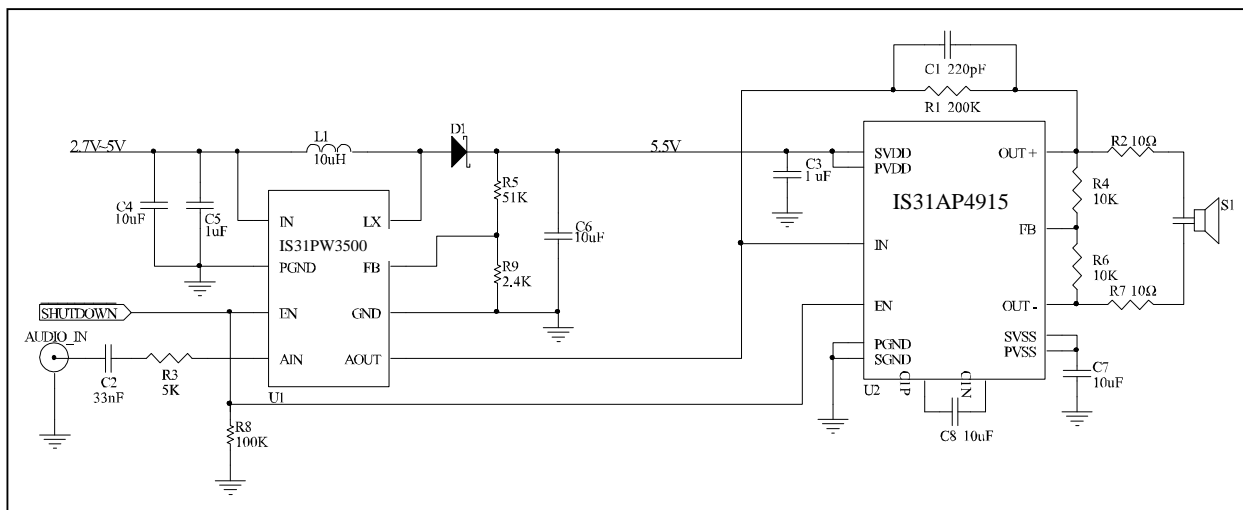


Figure 3 Constant Output Voltage for Class-G Audio Amplifier

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CLASSIFICATION REFLOW PROFILES

Profile Feature	Pb-Free Assembly
Preheat & Soak Temperature min (T _{smin}) Temperature max (T _{smax}) Time (T _{smin} to T _{smax}) (t _s)	150°C 200°C 60-120 seconds
Average ramp-up rate (T _{smax} to T _p)	3°C/second max.
Liquidous temperature (T _L) Time at liquidous (t _L)	217°C 60-150 seconds
Peak package body temperature (T _p)*	Max 260°C
Time (t _p)** within 5°C of the specified classification temperature (T _c)	Max 30 seconds
Average ramp-down rate (T _p to T _{smax})	6°C/second max.
Time 25°C to peak temperature	8 minutes max.

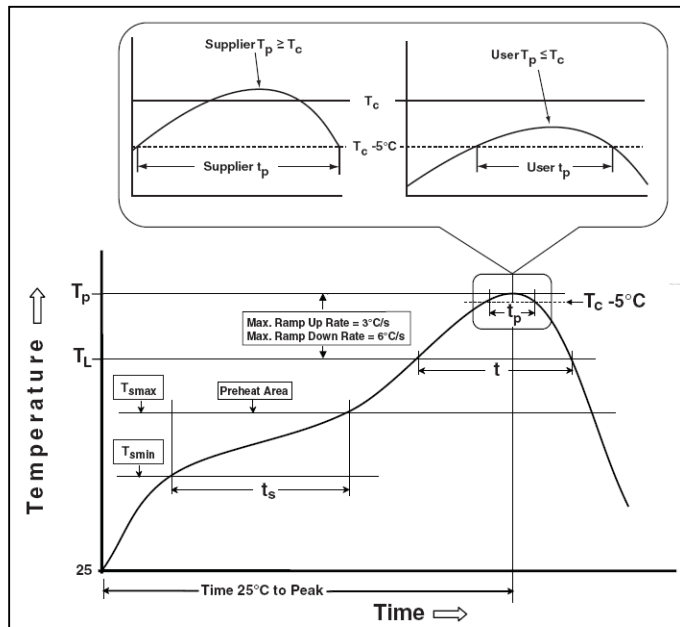
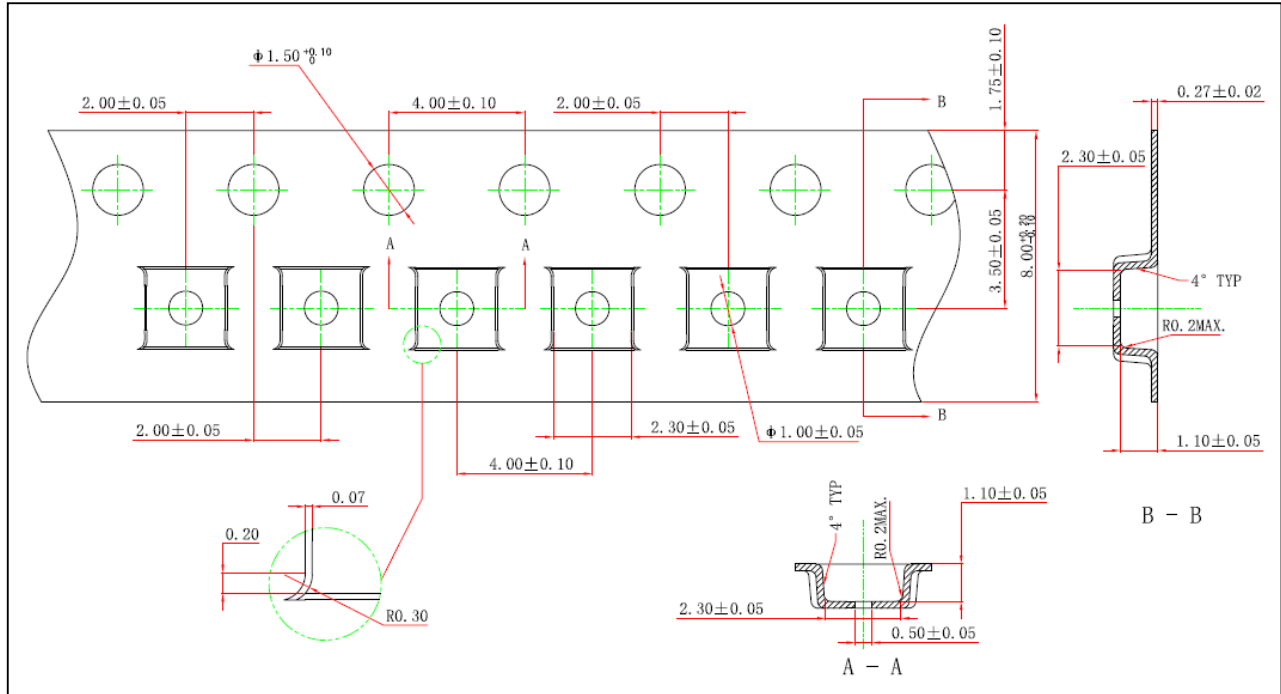


Figure 4 Classification Profile

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TAPE AND REEL INFORMATION

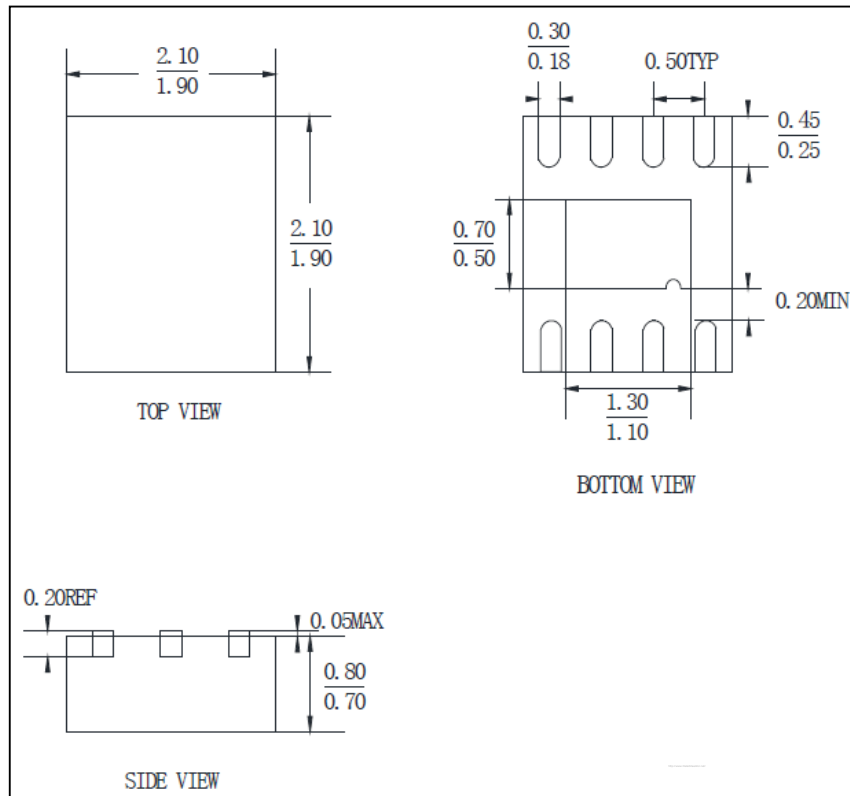


Note: All dimensions in millimeters unless otherwise stated.

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PACKAGE INFORMATION

DFN-8



Note: All dimensions in millimeters unless otherwise stated.