

GS5901

1.4A, Boost for White LED Driver

Product Description

The GS5901 is a high frequency, asynchronous boost converter. The internal MOSFET can support up to 8 White LEDs for backlighting and OLED power application, and the internal soft start function can reduce the inrush current.

The GS5901 uses current mode, 1.0MHz fixed frequency architecture to regulate the LED current, which is set through an external current sense resistor.

The OVP pin monitors the output voltage and turns off the converter if an over-voltage condition is present due to an open circuit condition.

The GS5901 includes under-voltage lockout, current limiting and thermal shutdown protection preventing damage in the event of an output overload. The driver is available in small SOT23-6L & TSOT-23-6L packages.

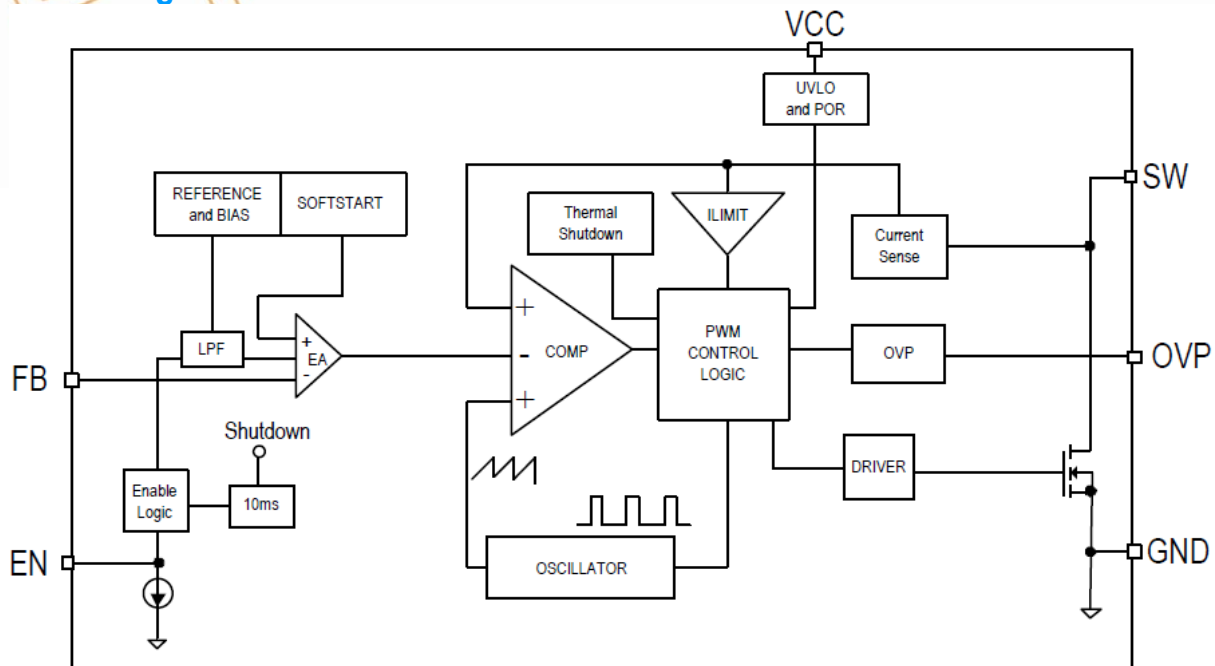
Features

- 2.5V to 5.5V operating input voltage range
- Drives up to 8 series White LEDs
- 1.0MHz Fixed Switching Frequency
- Wide range for PWM dimming (200Hz to 200KHz)
- Internal 1.4A switching current limit
- Over Voltage Protection (OVP)
- Internal Soft-start Function
- Current limit and Thermal shutdown protection
- Under voltage Lockout
- RoHS Compliant, 100%Pb & Halogen Free

Applications

- Cellular Phones
- Digital Cameras
- Tablet PC and Handheld Computers
- PDA, DVD and GPS Receivers
- Portable Instruments

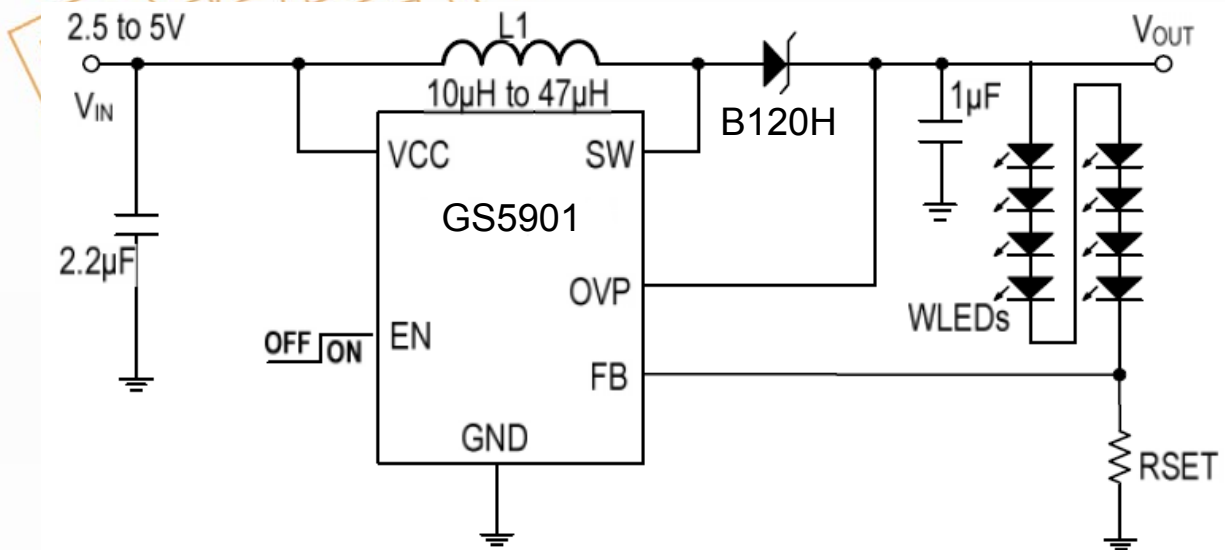
Block Diagram



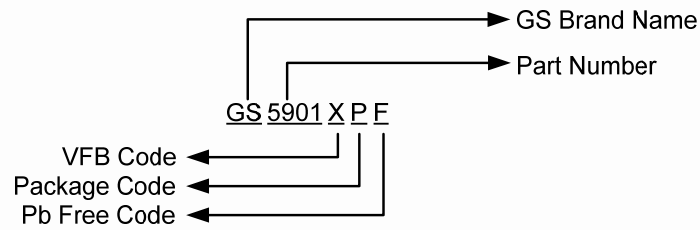
Packages & Pin Assignments

SOT-23-6L		TSOT-23-6L	
VCC OVP EN		VCC OVP EN	
6 5 4		6 5 4	
1 2 3		1 2 3	
SW GND FB		SW GND FB	
Pin Name	Function		
VCC	Power Input Pin		
GND	Ground Pin		
FB	Feedback Pin		
EN	Chip Enable & Dimming pin. Active high. Internal pull low		
OVP	Over voltage detect pin		
SW	Switching Pin		

Typical Application Circuit



Ordering Information



Marking Information



Part Number	Package	GS P/N	VFB Code	Date Code
GS5901ARF	SOT-23-6L	US/A1	B	YW
GS5901ATRF	TSOT-23-6L	US/A1	B	YW
GS5901BRF	SOT-23-6L	US/A2	C	YW
GS5901BTRF	TSOT-23-6L	US/A2	C	YW

Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$

Symbol	Description	Value	Units
V_{IN}	VCC pin Voltage	-0.3 to 6	V
V_{SW}	SW pin Voltage	-0.3 to 33	V
V_{ovp}	OVP pin Voltage	-0.3 to 33	V
	EN, FB pins voltage	-0.3 to $V_{IN}+0.3$	V
P_D	Continuous Power Dissipation	$(T_J - T_A) / \theta_{JA}$	mW
T_J	Operating Junction Temperature	-40 to 125	$^\circ\text{C}$
T_{STG}	Storage Temperature Range	-65 to 150	$^\circ\text{C}$
θ_{JC}	Thermal Resistance from Junction to case	180	$^\circ\text{C/W}$
θ_{JA}	Thermal Resistance from Junction to ambient	250	$^\circ\text{C/W}$

Electrical Characteristics

$V_{IN}=V_{EN}=5V, I_{OUT}=20mA, T_A=25^{\circ}C$

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage Range	-	2.5	-	5.5	V
UVLO	Input UVLO	Rising	-	2.25	2.45	V
	UVLO Hysteresis	-	-	0.1	-	V
OVP	OVP Sense Voltage	-	27.5	29	-	V
I_{SD}	Shutdown Current	$V_{EN} = 0V, T_{EN} > 20mS$	-	1	4	μA
I_{IN}	Supply Current	$V_{FB}=0V, \text{Switching}$	-	1	2	mA
I_Q	Quiescent Current	$V_{FB} = 0.5V, I_{OUT} = 0mA$	-	200	400	μA
F_{SW}	Switching Frequency	-	0.75	1	1.25	MHz
	Dimming clock rate	-	0.2	-	200	KHz
C_L	Current Limit	-	-	1.4	-	A
		Duty on 50%	-	1.9	-	A
$D_{(MAX)}$	Maximum Duty Cycle	-	-	92	-	%
REG_{LOAD}	Load Regulation	$1mA < I_{OUT} < 20mA$	-	1	-	%
REG_{LINE}	Line Regulation	$3V < V_{IN} < 4.3V$	-	1	-	%
V_{ENH}	EN Pin Voltage High	-	1.4	-	-	V
V_{ENL}	EN Pin Voltage Low	-	-	-	0.4	V
	EN Hysteresis	-	-	0.1	-	V
I_{IH}	EN Pin sink Current	-	-	1	-	μA
V_{FB}	FB Pin Voltage	GS5901A	0.285	0.300	0.315	V
		GS5901B	0.190	0.200	0.210	V
I_{FB}	FB Pin Current	-	-	-	± 100	nA
$R_{DS(ON)}$	SW On Resistance	$V_{IN}=3.6V$	-	0.5	1.0	Ω
T_{SD}	Thermal Shutdown	-	-	155	-	$^{\circ}C$
T_{SH}	Thermal Shutdown Protection hysteresis	-	-	25	-	$^{\circ}C$

Applications Information

Setting the I_{LED} Current

Application circuit item shows the basic application circuit with GS5901 adjustable output version. The external resistor sets the LED output current according to the following equation:

I_{LED}	RSET	
20mA	15 Ω	6mW
350mA	0.857 Ω	105mW

GS5901A equation

I_{LED}	RSET	
20mA	10 Ω	4mW
350mA	0.570 Ω	70mW

GS5901B equation

Under Voltage Lockout (UVLO)

To avoid mis-operation of the device at low input voltages an under voltage lockout is included that disables the device, if the input voltage falls below (2.25V-100mV).

Over Voltage Protection

OVP measure the output voltage for open circuit protection. Connect OVP pin to the output at the top of the LED string. If V_{OUT} above 29V, the OVP protection is happened that stops the internal driver until V_{OUT} below 29V.

Input Capacitor Selection

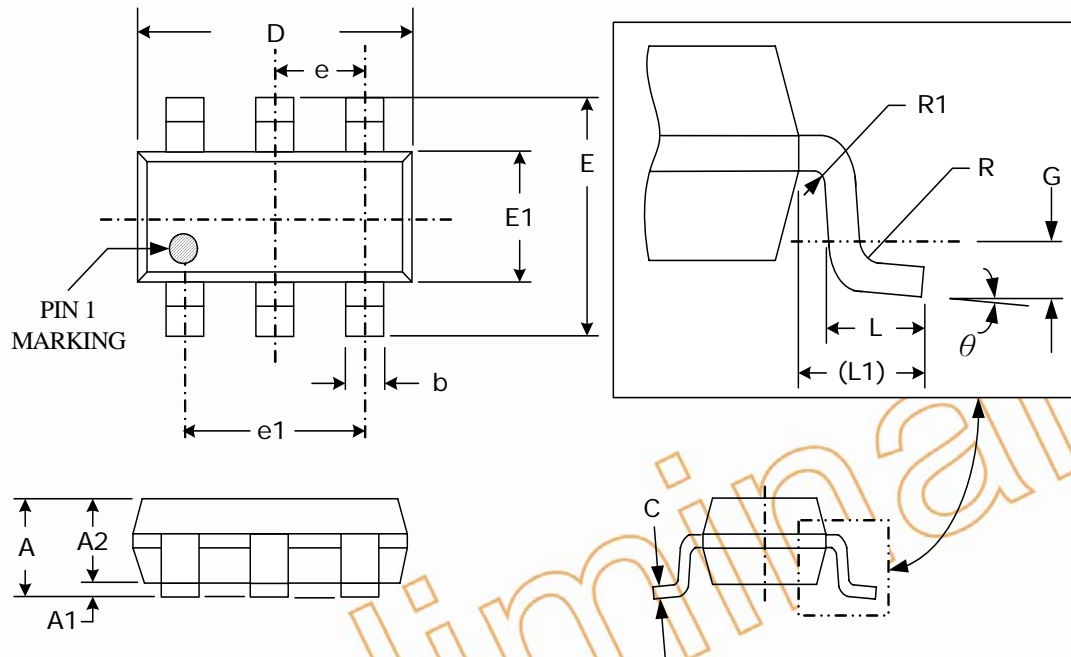
The input capacitor reduces the surge current drawn from the input and switching noise from the device. The input capacitor impedance at the switching frequency shall be less than input source impedance to prevent high frequency switching current passing to the input. A low ESR input capacitor sized for maximum RMS current must be used. Ceramic capacitors with X5R or X7R dielectrics are highly recommended because of their low ESR and small temperature coefficients. A 2.2 μ F ceramic capacitor for most applications is sufficient. For a lower output power requirement application, this value can be decreased.

Output Capacitor Selection

The output capacitor is required to keep the output voltage ripple small and to ensure regulation loop stability. The output capacitor must have low impedance at the switching frequency. Ceramic capacitors with X5R or X7R dielectrics are recommended due to their low ESR and high ripple current. A 1 μ F ceramic capacitors works for most of the applications. Higher capacitor values can be used to improve the load transient response.

Package Dimension

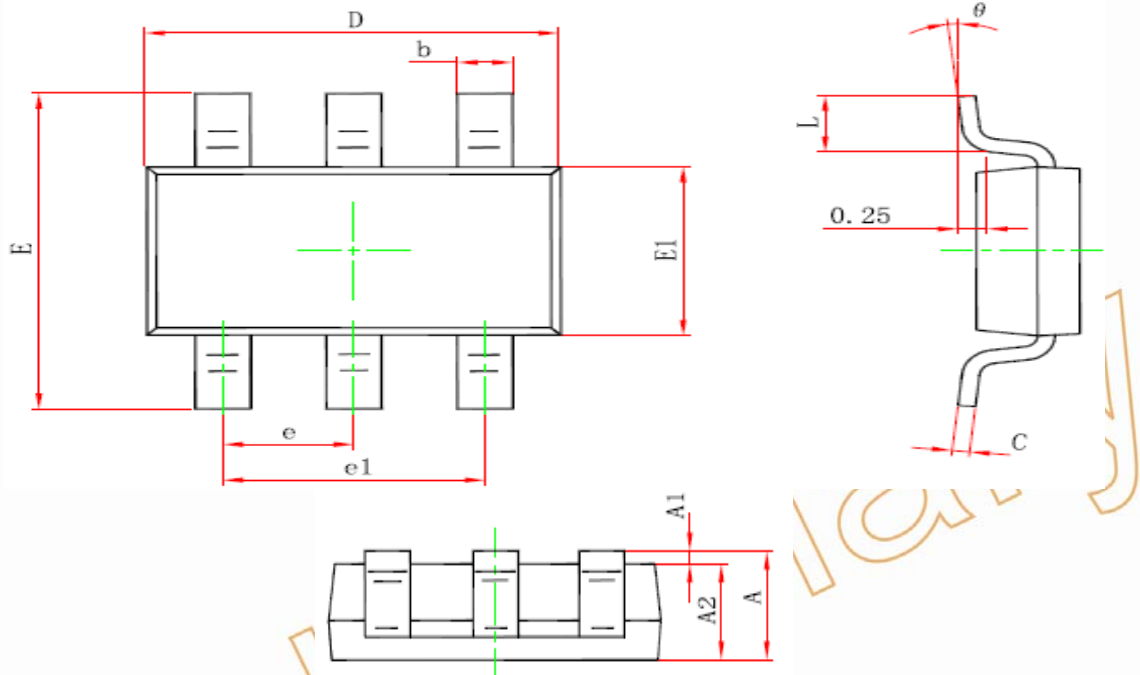
SOT-23-6L PLASTIC PACKAGE



Dimensions

SYMBOL	Millimeters		Inches	
	MIN	MAX	MIN	MAX
A	-	1.10	-	.043
A1	0.00	0.10	0	.004
A2	0.70	1.00	.028	.039
b	0.30	0.50	.012	.020
c	0.08	0.20	.003	.008
D	2.90 (TYP)		.114 (TYP)	
E	2.80 (TYP)		.110 (TYP)	
E1	1.60 (TYP)		.063 (TYP)	
e	0.95 (TYP)		.037 (TYP)	
e1	1.90 (TYP)		.075 (TYP)	
L	0.30	0.60	.014	.022
L1	0.60 (TYP)		.024 (TYP)	
R	0.10	-	.004	-
R1	0.10	0.25	.004	.010
G	0.25 (TYP)		.010 (TYP)	
θ	0°	8°	0°	8°

TSOT-23-6L PLASTIC PACKAGE







Dimensions

Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	-	0.900	-	0.035
A1	0.000	0.100	0.000	0.004
A2	0.700	0.800	0.028	0.031
b	0.350	0.500	0.014	0.020
c	0.080	0.200	0.003	0.008
D	2.820	3.020	0.111	0.119
E1	1.600	1.700	0.063	0.067
E	2.650	2.950	0.104	0.116
e	0.95 (BSC)		0.037 (BSC)	
L	0.300	0.600	0.012	0.024
e1	1.90 (BSC)		0.075 (BSC)	
θ	0°	8°	0°	8°



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