GS5802RF

High Efficiency 1.2MHz 2A Step Up Converter

Product Description

The GS5802 is a constant frequency, 6-pin SOT23-6L current mode step-up converter intended for small, low power applications.

The GS5802 switches at 1.2MHz and allows the use of tiny, low cost capacitors and inductors 2mm or less in height. Internal soft-start results in small inrush current and extends battery life.

The GS5802 features automatic shifting to pulse frequency modulation mode at light loads.

The GS5802 includes under-voltage lockout, current limiting, and thermal overload protection to prevent damage in the event of an output overload.

The GS5802 is available in a small 6-pin SOT-23-6L package.

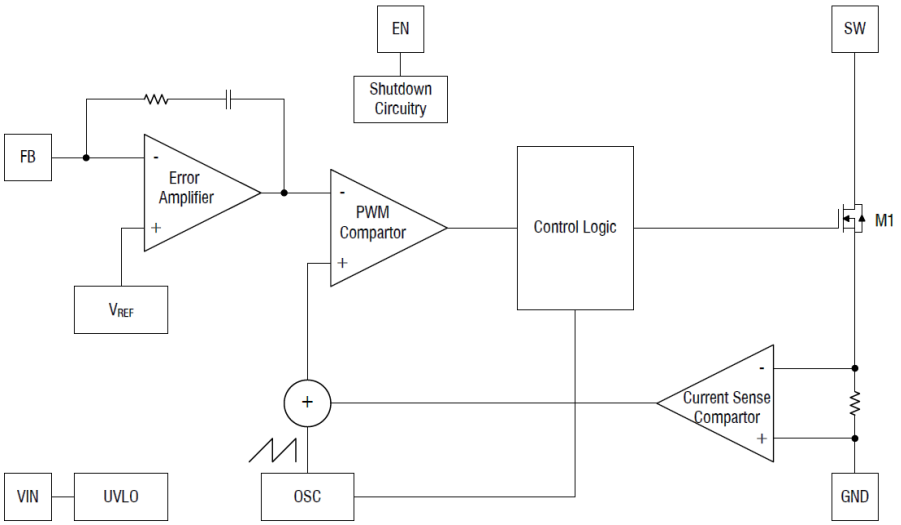
Features

- Integrated 80mΩ Power MOSFET
- 2.0V to 24V Input Voltage
- 1.2MHz Fixed Switching Frequency
- Internal 4A Switch Current Limit
- Adjustable Output Voltage
- Internal Compensation
- Up to 28V Output Voltage
- Automatic Pulse Frequency Modulation Mode at Light Loads
- Up to 93% Efficiency
- Available in a 6-Pin SOT-23-6L Package
- RoHS Compliant, 100%Pb & Halogen Free

Applications

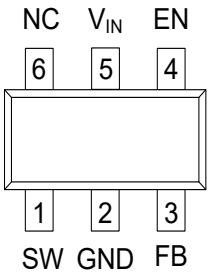
- Battery-Powered Equipment
- Set-Top Boxed
- LCD Bais Supply
- DSL and Cable Modems and Routers
- Networking cards powered from PCI or PCI express slots

Block Diagram



Packages & Pin Assignments

SOT-23-6L



Pin Name	Function
SW	Power Switch Output. SW is the drain of the internal MOSFET switch. Connect the power inductor and output rectifier to SW. SW can swing between GND and 28V.
GND	Ground Pin
FB	Feedback Input. The FB voltage is 0.6V. Connect a resistor divider to FB.
EN	Regulator On/Off Control Input. A high input at EN turns on the converter, and a low input turns it off. When not used, connect EN to the input supply for automatic startup.
V_{IN}	Input Supply Pin. Must be locally bypassed.
NC	No connected.

Ordering and Marking Information

Ordering Information

Part Number	Package	Part Marking	Quantity / Reel
GS5802RF	SOT-23-6L	B628□□	3,000 PCS

GS5802 1 2

- **Product Code:** GS5802
- **Package Code:** 1 is **R** for SOT-23-6L
- **Green Level:** 2 is **F** for RoHS Compliant and Halogen Free

Marking Information

B628□□

Product Code:
B628
GS Code:
□□

Absolute Maximum Ratings (Note 1)

Symbol	Description	Value	Units
V_{IN}	Input Supply Voltage	-0.3 to 26	V
V_{EN}	EN Voltages	-0.3 to 26	V
V_{SW}	SW Voltage	-0.3 to 30	V
V_{FB}	FB Voltage	-0.3 to 6	V
P_D	Power Dissipation	0.6	W
$R\theta_{JA}$	Thermal Resistance Junction to Ambient	250	ºC/W
$R\theta_{JC}$	Thermal Resistance Junction to Case	130	ºC/W
T_A	Operating Temperature Range	-40 to +85	°C
T_J	Junction Temperature (Note 2)	150	°C
T_{STG}	Storage Temperature Range	-65 to +150	°C
T_{LEAD}	Lead Temperature (Soldering,10s)	300	°C
ESD	HBM (Human Body Mode)	2000	V
	MM (Machine Mode)	200	V

Note 1: Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.
Note 2: T_J is calculated from the ambient temperature T_A and power dissipation P_D according to the following formula: $T_J = T_A + (P_D) \times (R_{\theta JA})$.
Note 3: 100% production test at 25°C. Specifications over the temperature range are guaranteed by design and characterization.

Electrical Characteristics (V_{IN}=V_{EN}=5V, T_A = 25°C, unless otherwise noted.)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
V_{IN}	Input Voltage	-	2.0	-	24	V
V_{FB}	FB Voltage	-	0.588	0.6	0.612	V
I_{FB}	FB Input Bias Current	V_{FB}=0.6V	-50	-10		nA
I_{SHDN}	Current (Shutdown)	V_{EN}=0V	-	0.1	1	μA
I_Q	Quiescent Current (PFM Mode)	V_{FB}=0.7V, NO switch	-	100	200	μA
	Quiescent Current (PWM Mode)	V_{FB}=0.5V, switch	-	1.6	2.2	mA
F_{SW}	Switching Frequency	-	-	1.2	-	MHz
$D_{(MAX)}$	Maximum Duty Cycle	V_{FB}=0V	90	-	-	%
$R_{DS(ON)}$	SW On Resistance (4)	-	-	80	150	mΩ
I_{SW}	SW Current Limit (4)	V_{IN}=5V Duty Cycle=50%	-	4	-	A
I_{sw}_Leak	SW Leakage	V_{SW}=20V	-	-	1	μA
V_{UVLO}	Under Voltage Lockout	-	-	-	1.98	V
	Under Voltage Lockout Hysteresis	-	-	100	-	mV
V_{EH}	EN Input High Voltage	-	1.5	-	-	V
V_{EL}	EN Input Low Voltage	-	-	-	0.4	V
T_{SD}	Thermal Shutdown	-	-	155	-	°C

Note 4: Guaranteed by design, not tested.

Typical Performance Characteristics

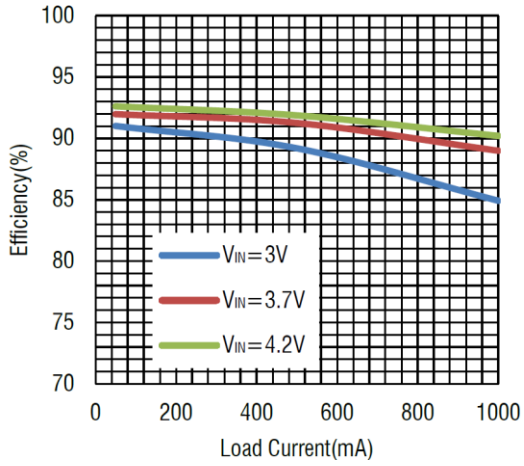


Fig.1 Efficiency vs. Load Current V_{OUT}=5V

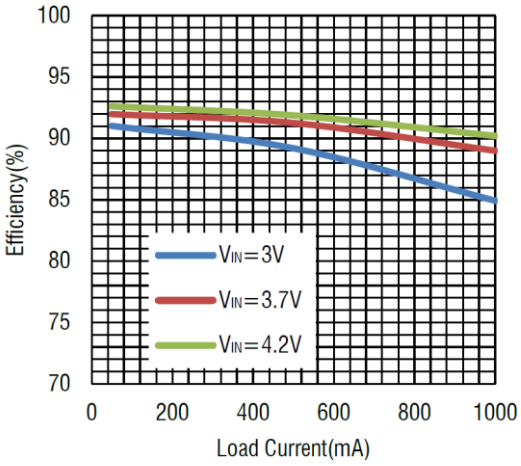


Fig.2 Efficiency vs. Load Current V_{OUT}=18V

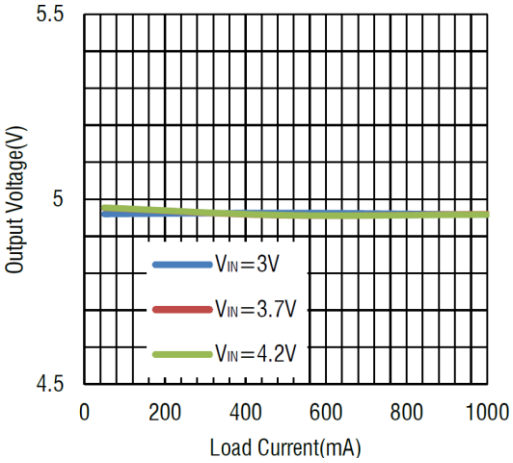


Fig.3 Line/Load Regulation V_{OUT}=5V

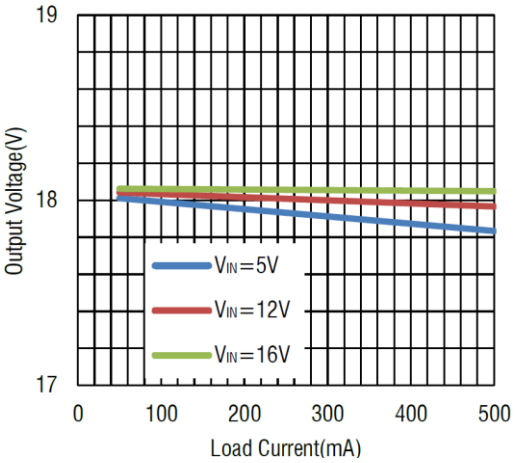


Fig.4 Line/Load Regulation V_{OUT}=18V

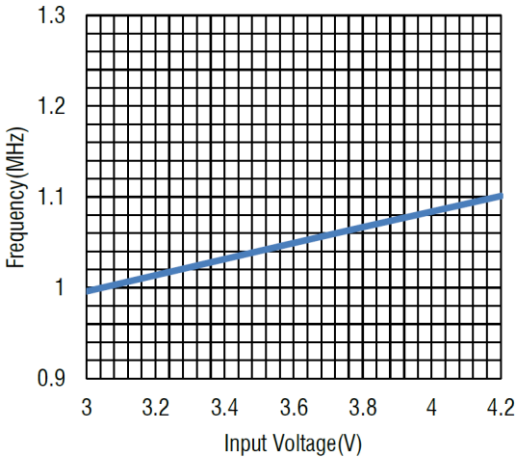


Fig.5 Operation Frequency vs. Input Voltage V_{OUT}=5V

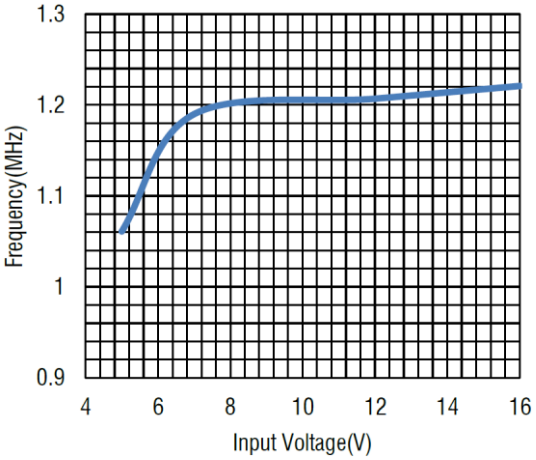
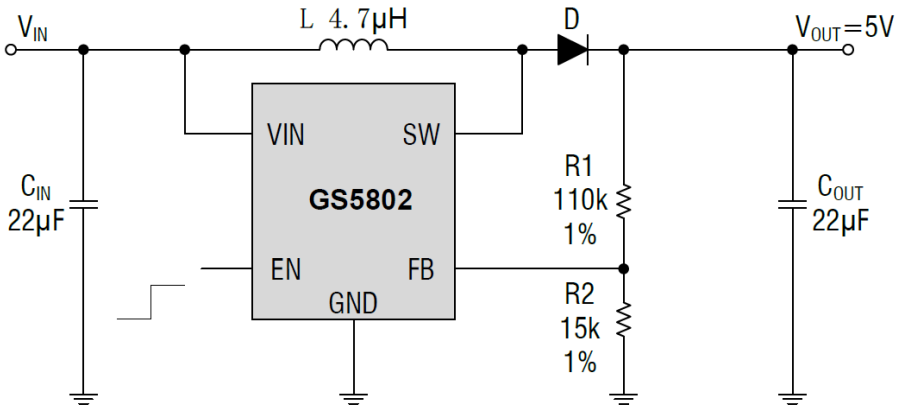


Fig.6 Operation Frequency vs. Input Voltage V_{OUT}=18V

Typical Application Circuit



Applications Information

Operation

The GS5802 uses a fixed frequency, peak current mode boost regulator architecture to regulate voltage at the feedback pin. The operation of the GS5802 can be understood by referring to the block diagram. At the start of each oscillator cycle the MOSFET is turned on through the control circuitry. To prevent sub-harmonic oscillations at duty cycles greater than 50 percent, a stabilizing ramp is added to the output of the current sense amplifier and the result is fed into the negative input of the PWM comparator. When this voltage equals. The output voltage of the error amplifier the power MOSFET is turned off. The voltage at the output of the error amplifier is an amplified version of the difference between the 0.6V bandgap reference voltage and the feedback voltage. In this way the peak current level keeps the output in regulation. If the feedback voltage starts to drop, the output of the error amplifier increases. These results in more current to flow through the power MOSFET, thus increasing the power delivered to the output.

The GS5802 has internal soft start to limit the amount of input current at startup and to also limit the amount of overshoot on the output.

Setting the Output Voltage

The internal reference V_{REF} is 0.6V (Typical). The output voltage is divided by a resistor divider, R1 and R2 to the FB pin. The output voltage is given by:

$$V_{OUT}=V_{REF}x\left(1+\frac{R1}{R2}\right)$$

Inductor Selection

The recommended values of inductor are 4.7 to 22μH. Small size and better efficiency are the major concerns for portable device, such as GS5802 used for mobile phone. The inductor should have low core loss at 1.2MHz and low DCR for better efficiency. To avoid inductor saturation current rating should be considered.

Capacitor Selection

Input and output ceramic capacitors of 22μF are recommended for GS5802 applications. For better voltage filtering, ceramic capacitors with low ESR are recommended. X5R and X7R types are suitable because of their wider voltage and temperature ranges.

Diode Selection

Schottky diode is a good choice for GS5802 because of its low forward voltage drop and fast reverses recovery. Using Schottky diode can get better efficiency. The high speed rectification is also a good characteristic of Schottky diode for high switching frequency. Current rating of the diode must meet the root mean square of the peak current and output average current multiplication as following:

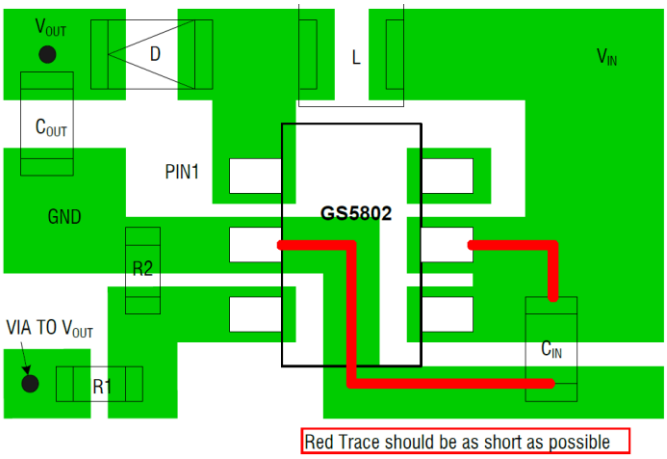
$$I_D(RMS) \approx \sqrt{I_{OUT} x I_{PEAK}}$$

The diode' s reverse breakdown voltage should be larger than the output voltage.

Layout Recommendation

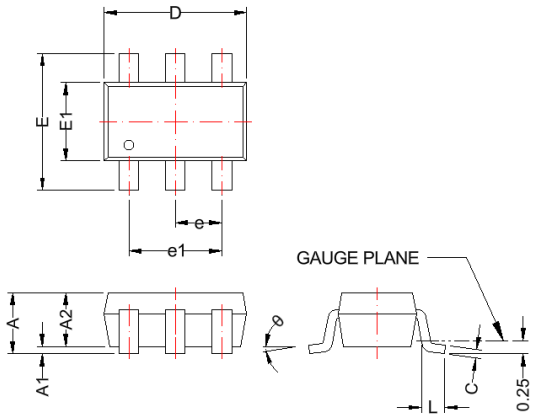
For best performance of the GS5802, the following guidelines must be strictly followed.

1. Input and Output capacitors should be placed close to the IC and connected to ground plane to reduce noise coupling.
2. The GND should be connected to a strong ground plane for heat sinking and noise protection.
3. Keep the main current traces as possible as short and wide.
4. SW node of DC-DC converter is with high frequency voltage swing. It should be kept at a small area.
5. Place the feedback components as close as possible to the IC and keep away from the noisy devices.

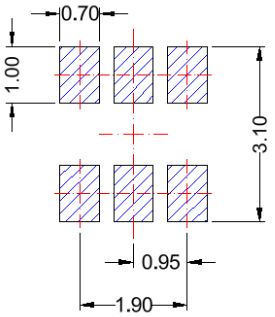


SOT-23-6L

Package Dimension



Recommended Land Pattern



Unit:mm

Dimensions				
Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A	0.90	1.45	0.035	0.057
A1	0.00	0.15	0.000	0.006
A2	0.90	1.30	0.035	0.051
b	0.30	0.50	0.012	0.020
c	0.08	0.26	0.003	0.010
D	2.70	3.10	0.106	0.122
E	2.20	3.00	0.087	0.118
E1	1.30	1.75	0.051	0.069
e	0.95 BSC		0.037 BSC	
e1	1.90 BSC		0.075 BSC	
L	0.30	0.60	0.012	0.024
θ	0°	8°	0°	8°

Note:
Dimensions are exclusive of Burrs, Mold Flash & Tie Bar extrusions.

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