

# GS5802

## 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.

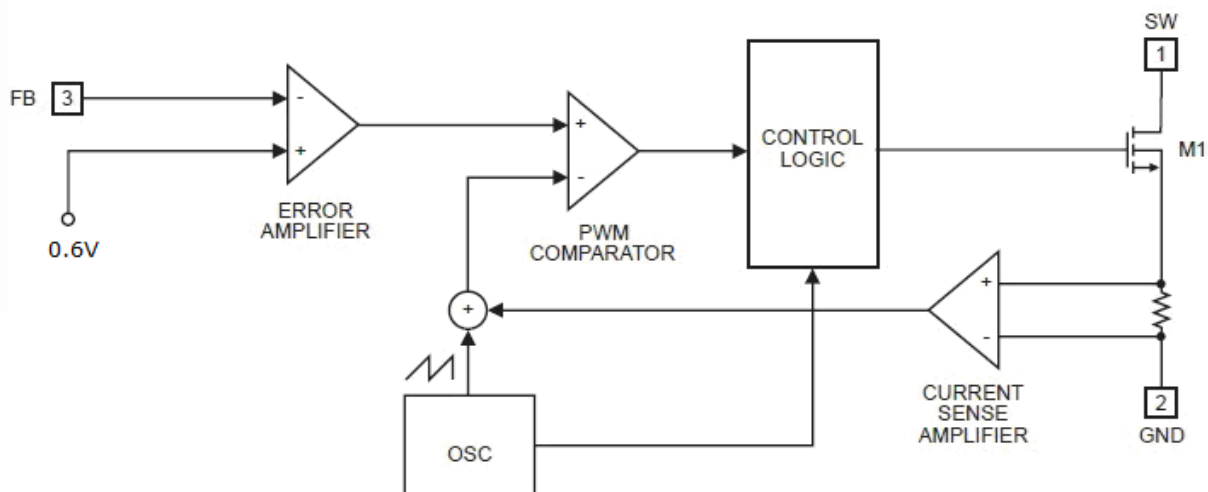
### Features

- Integrated 80mΩ Power MOSFET
- 2.3V 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 97% Efficiency
- Available in a 6-Pin SOT23-6L Package
- RoHS Compliant, 100%Pb & Halogen Free

### Applications

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

### Block Diagram



## Packages & Pin Assignments

GS5802RF (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 <sub>IN</sub>	Input Supply Pin. Must be locally bypassed.
NC	No connected.

## Typical Application Circuit

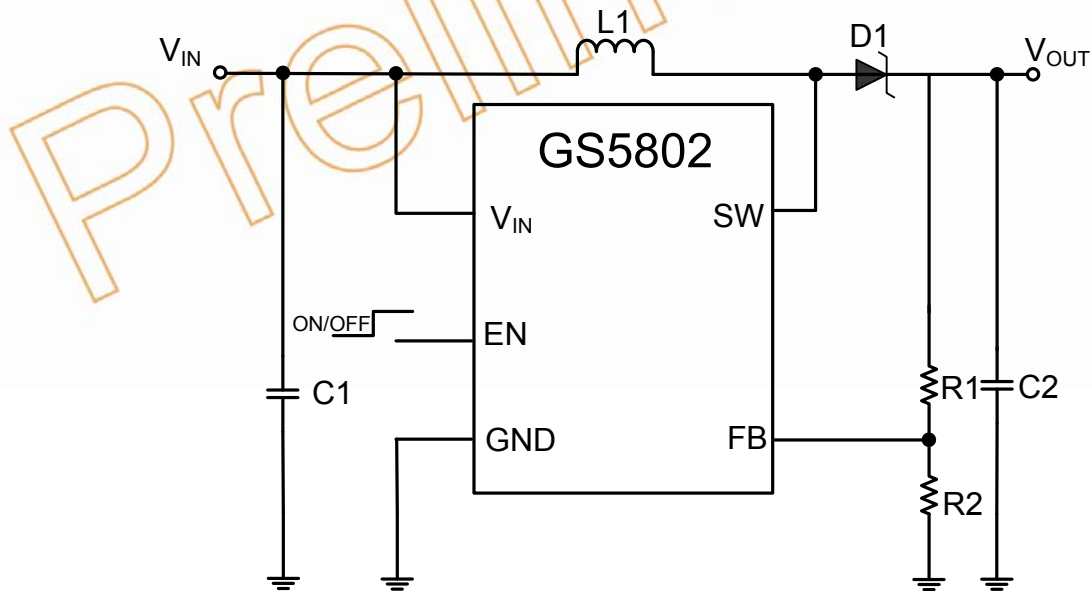
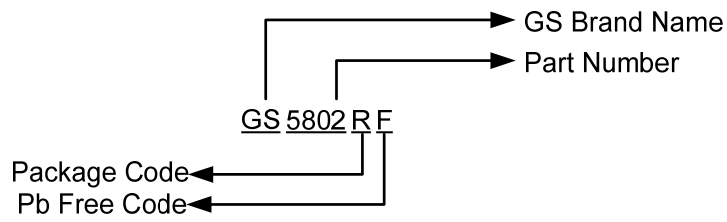
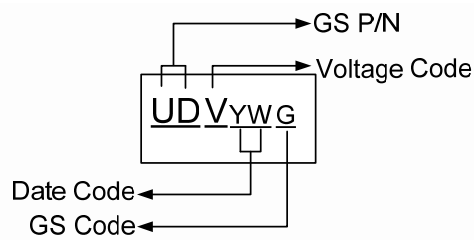


Figure1. GS5802 Adjustable Output Voltage Regulator

## Ordering Information



## Marking Information



Part Number	Package	GS P/N	Voltage Code	Date Code
GS5802RF	SOT-23-6L	UD	A	YW

## Absolute Maximum Ratings

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
$I_{PEAK}$	Peak SW Sink and Source Current	4	A
$T_A$	Operating Temperature Range	-40 to +85	°C
$T_J$	Junction Temperature	160	°C
$T_{STG}$	Storage Temperature Range	-65 to +150	°C
$T_{LEAD}$	Lead Temperature(Soldering,10s)	300	°C

## Electrical Characteristics

$V_{IN}=V_{EN}=5V$ ,  $T_A=25^{\circ}C$ , unless otherwise noted.

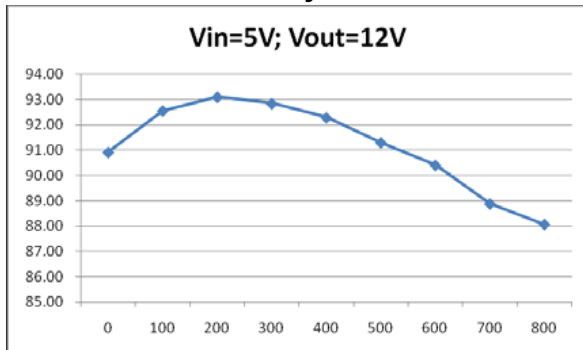
Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
$V_{IN}$	Input Voltage	-	2.3	-	24	V
$V_{UVLO}$	Under Voltage Lockout	-	-	-	1.98	V
	Under Voltage Lockout Hysteresis	-	-	100	-	mV
$I_S$	Current (Shutdown)	$V_{EN}=0V$	-	0.1	1	$\mu A$
$I_Q$	Quiescent Current (PFM Mode)	$V_{FB}=0.7V$ , NO switch	-	100	200	$\mu A$
	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	-	-	%
$V_{EH}$	EN Input High Voltage	-	1.5	-	-	V
$V_{EL}$	EN Input Low Voltage	-	-	-	0.4	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
$R_{DS(ON)}$	SW On Resistance (1)	-	-	80	150	m $\Omega$
$I_{SW}$	SW Current Limit (1)	$V_{IN}=5V$ , Duty cycle=50%	-	4	-	A
$I_{SW\_Leak}$	SW Leakage	$V_{SW}=20V$	-	-	1	$\mu A$
$T_{SD}$	Thermal Shutdown	-	-	155	-	$^{\circ}C$

Note : (1) Guaranteed by design, not tested.

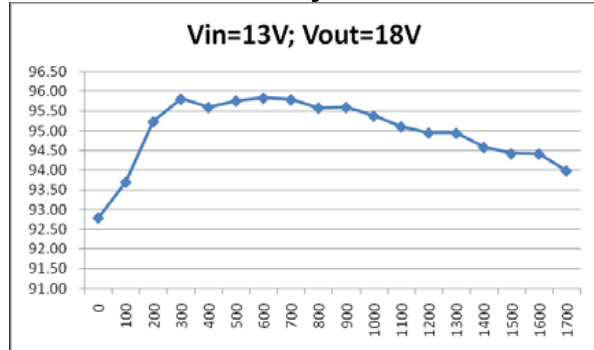
Preliminary

## Typical Performance Characteristics

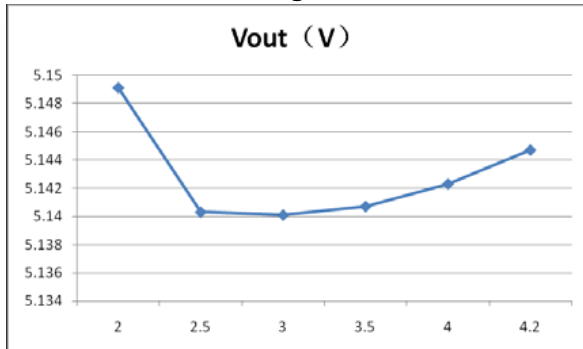
### Efficiency Curve



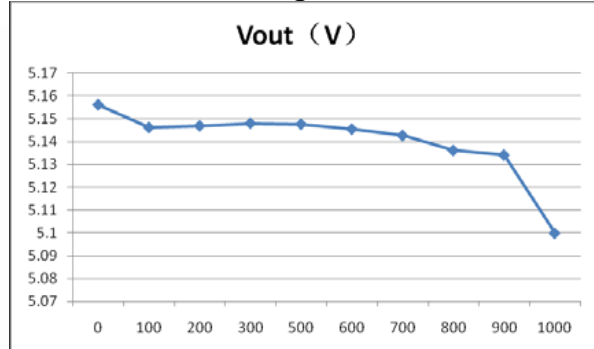
### Efficiency Curve



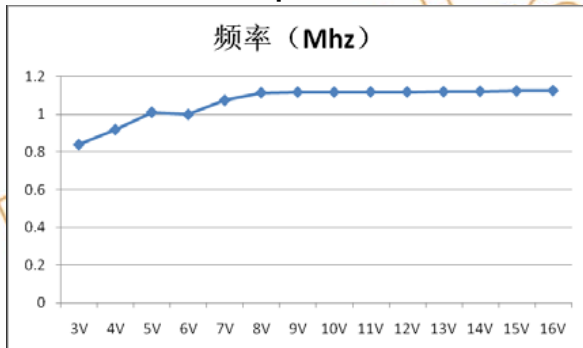
### I<sub>OUT</sub> (mA) line Regulation



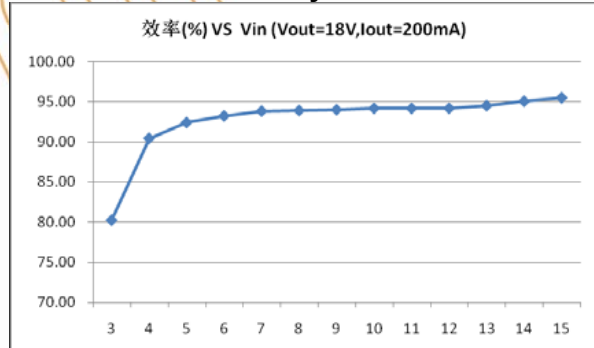
### I<sub>OUT</sub> (mA) Load regulation



### V<sub>IN</sub> (V) Freq VS V<sub>IN</sub>



### I<sub>OUT</sub> (mA) Efficiency VS V<sub>IN</sub>



## 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:

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

### Inductor Selection

The recommended values of inductor are 4.7 to 22 $\mu$ H. 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 22 $\mu$ F 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:

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

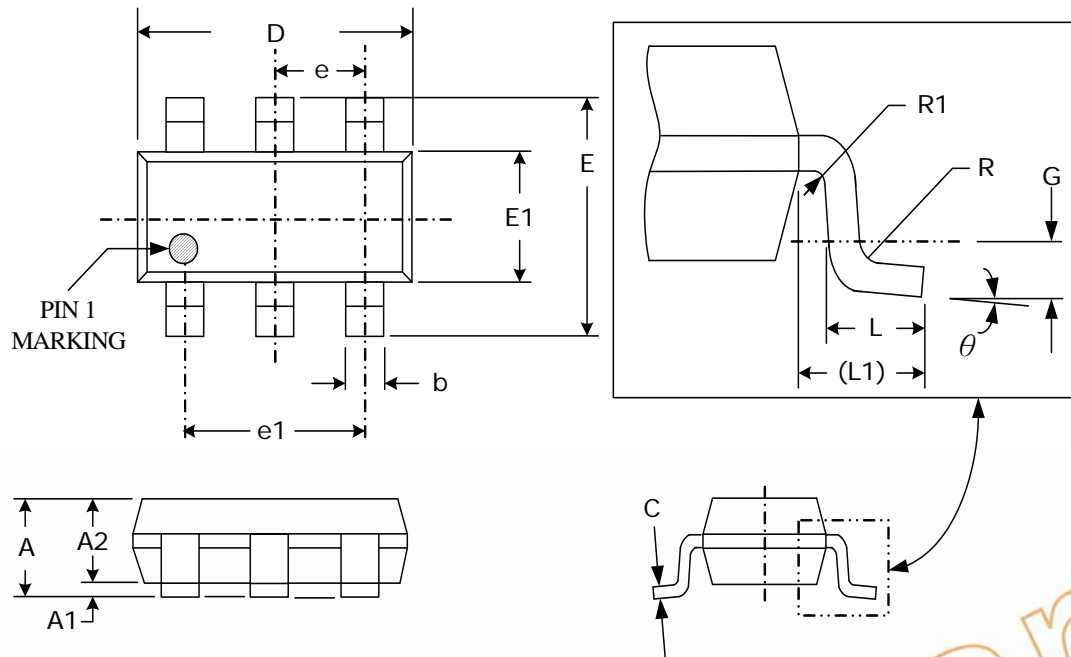
The diode's reverse breakdown voltage should be larger than the output voltage.

### Layout Consideration

1. For best performance of the GS5802, the following guidelines must be strictly followed.
2. Input and Output capacitors should be placed close to the IC and connected to ground plane to reduce noise coupling.
3. The GND should be connected to a strong ground plane for heat sinking and noise protection.
4. Keep the main current traces as possible as short and wide.
5. SW node of DC-DC converter is with high frequency voltage swing. It should be kept at a small area.
6. Place the feedback components as close as possible to the IC and keep away from the noisy devices.

## 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)	
$\theta$	0°	8°	0°	8°



## NOTICE

Information furnished is believed to be accurate and reliable. However Globaltech Semiconductor assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties, which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of Globaltech Semiconductor. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information without express written approval of Globaltech Semiconductor.

## CONTACT US

GS Headquarter	
	4F.,No.43-1,Lane11,Sec.6,Minquan E.Rd Neihu District Taipei City 114, Taiwan (R.O.C)
	886-2-2657-9980
	886-2-2657-3630
	sales_twn@gs-power.com

Wu-Xi Branch	
	No.21 Changjiang Rd., WND, Wuxi, Jiangsu, China (INFO. & TECH. Science Park Building A 210 Room)
	86-510-85217051
	86-510-85211238
	sales_cn@gs-power.com

RD Division	
	824 Bolton Drive Milpitas. CA. 95035
	1-408-457-0587