GPM9082

1MHz, 2.5A Boost Convertor

General Description

The GPM9082 step-up switching regulator generates an output voltage of up to 5.5V from an input voltage as low as 2.0V. Ideal for applications where space is limited, it switches at 1.0MHz, allowing the use of tiny, low cost and low profile external components.

Its internal 2.5A, 100mΩ NMOS switch provides high efficiency even at heavy load, while the constant frequency, current mode architecture results in low, predictable output noise that is easy to filter. Internal frequency compensation is designed to accommodate ceramic output capacitors, further reducing noise. The device features very low shutdown current of 0.5uA.

The GPM9082 features over current protection, open load protection, under voltage lock-out and over temperature protection.

The GPM9082 is available in SOT-23-6 package.

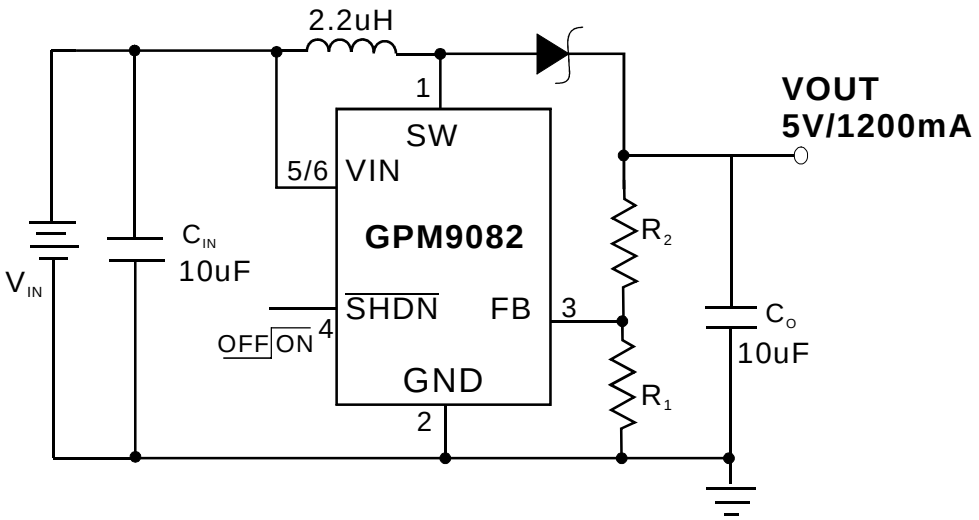
Features

- Internal 2.5A MOSFET Switch
- 1.0MHZ Switching Frequency
- Integrated Soft-Start
- Low 2.0V Vin Operation
- Low Rdson Switch :100mΩ at 5V Output
- Delivers 5V at 1200mA from a 3.3V input
- Cost effective for using smaller devices
- Under-Voltage-Lockout
- Over-Temperature Protection
- Open-Load Protection
- Low profile(1mm):SOT-23-6 package

Applications

- White LED Driver Supply
- Local 3.3V or 5V supply
- Battery Back-up
- Audio System

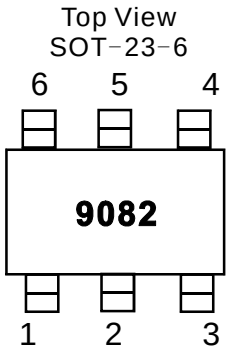
Typical Application



Ordering Inforamtion

Part Number	Temp Range	Switching Frequency	Output Voltage (V)	Output Current (A)	Package	Pins	Top Mark
GPM9082	-40°C to 85°C	1.0MHz	Adjustable	2.5	SOT23-6	6	GPM9082

Pin Configuration& Marking Information



Pin Configuration

Pin Number	Name	Function
1	SW	Switch
2	GND	Ground
3	FB	Feedback
4	SHDN	Shut Down
5	VIN	Input
6	VIN	Input

Absolute Maximum Ratings

(Note: Do not exceed these limits to prevent damage to the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

PARAMETER	VALUE	UNIT
Supply Voltage VIN	-0.3 to 6.5	V
FB, EN Voltage	-0.3 to VIN+0.3	V
SW Voltage	-0.3 to VIN+0.3	V
Operating Ambient Temperature	-40 to 85	°C
Maximum Junction Temperature	125	°C
Storage Temperature	-55 to 150	°C
Lead Temperature (Soldering, 10 sec)	300	°C

Recommend Operation Ratings

Junction Temperature.....–40°C to 125°C Ambient Temperature.....–40°C to 85°C

Thermal Information

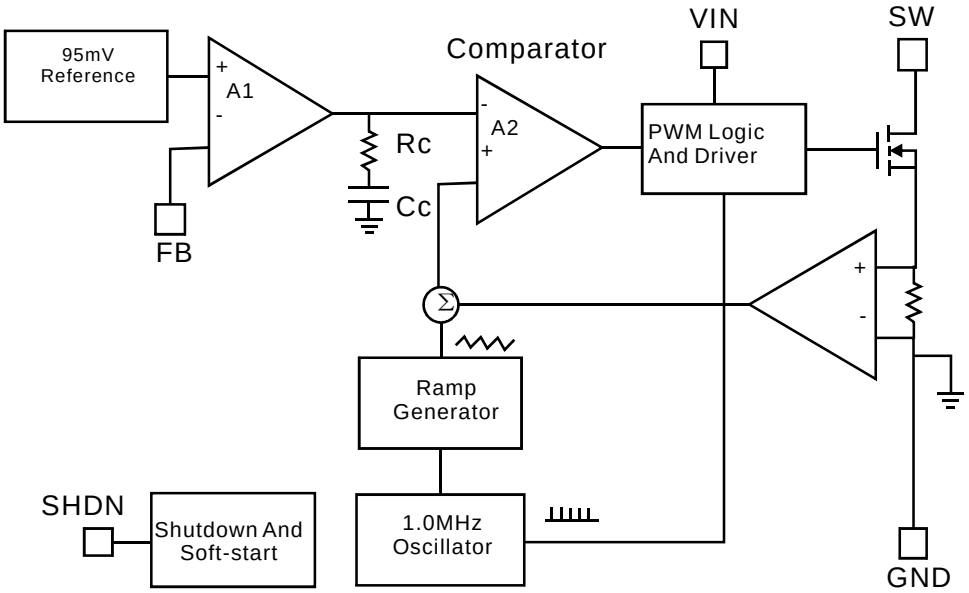
Parameter	Package	Symbol	Maximum	Unit
Thermal Resistance (Junction to Case)	SOT-23-6	θ_{JC}	130	℃/W
Thermal Resistance (Junction to Ambient)	SOT-23-6	θ_{JA}	250	
Internal Power Dissipation	SOT-23-6	P_D	400	mW

Electrical Characteristics

(V_{IN} = 3.6V, VOUT=5V, T_A= 25°C, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage Range	V_{IN}		2.0		6.0	V
Quiescent Current	Iq	V_{FB} =0.7V EN=Vin, I_{Load} =0		65	120	uA
Shutdown Current		V_{EN} =0V, V_{IN} =3.3V		0.5	1	
Regulated Feedback Voltage	V_{FB}	T_a =25°C	0.588	0.6	0.612	V
		0< T_a < 85°C	0.6865	0.6	0.6135	
		-40°C < T_a <85°C	0.585	0.6	0.615	
Reference Voltage Line Regulation		V_{IN} =1.6V to 5.5V		0.05	0.5	%
Output Voltage Load Regulation				0.5		%
Current Limit	I_{PEAK}			2.5	3.0	A
Oscillator Frequency	F_{OSC}	V_{FB}=0.6V or V_{OUT} =100%	0.8	1.0	1.2	MHz
Rds(ON) of NMOS		I_{SW} =-100mA		100	200	mΩ
Enable Threshold		V_{IN} = 1.6V to 5.5V	0.3	1	1.5	V
Enable Leakage Current			-0.1		0.1	μA
SW Leakage Current		V_{EN} = 0V, V_{SW} = 0V or 5V, V_{IN} = 5V			1	uA

Block Diagram



FUNCTIONAL DESCRIPTION

The GPM9082 is a monolithic 1.0MHz boost converter housed in a 6-lead SOT-23 package. The device features fixed frequency, current mode PWM control for excellent line and load regulation.

The low Rdson NMOS switch enables the device to maintain high efficiency over a wide range of load current. Operation of the feedback loop which sets the peak inductor current to keep the output in regulation can be best understood by referring to the Block Diagram.

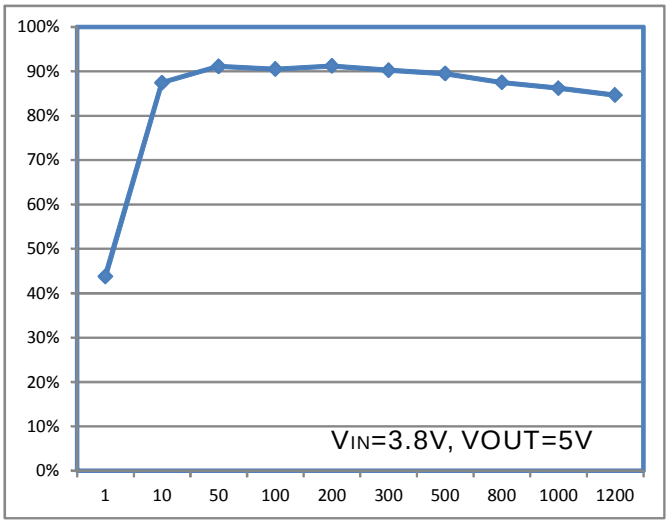
At the start of each clock cycle a latch in the PWM logic is set and the NMOS switch is turned on. The sum of a voltage proportional to the switch current and a slope compensating voltage ramp is fed to the positive input to the PWM comparator. When this voltage exceeds either a voltage proportional to the 2.5A current limit or the PWM control voltage, the latch in the PWM logic is reset and NMOS switch is turned off. The PWM control voltage at the output of the error amplifier is the amplified and compensated difference between the feed- back voltage on the FB pin and the internal reference voltage of 0.6V. If the control voltage increases, more current is delivered to the output. When the control voltage exceeds the I_{LIMIT} reference voltage, the peak current is limited to a minimum of 2.5A.

The current limit helps protect the GPM9082 internal switch and external components connected to it. If the control voltage decreases, less current is delivered to the output. During load transients control voltage may decrease to the point where no switching occurs until the feedback voltage drops below the reference.

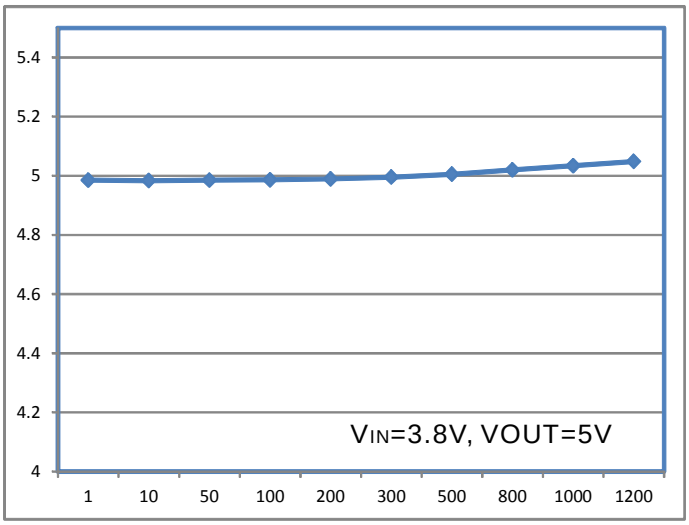
The GPM9082 has an integrated soft-start feature which slowly ramps up the feedback control node from 0V. The soft-start is initiated when EN is pulled high.

Typical Operating Characteristics

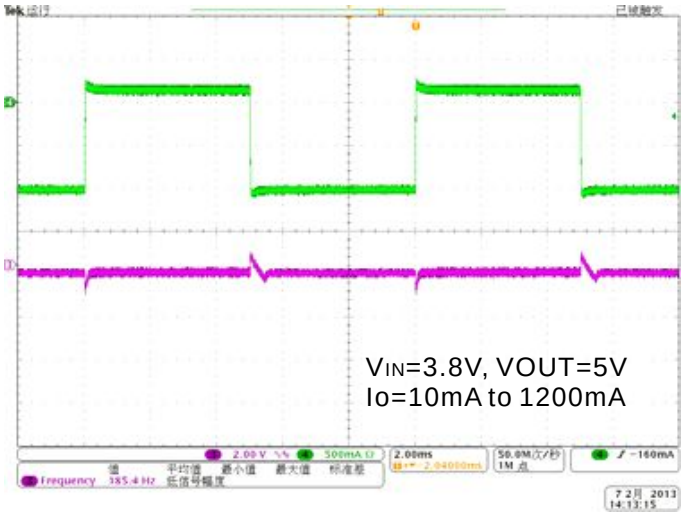
At T_A=25°C ,VOUT=5V,unless otherwise specified.



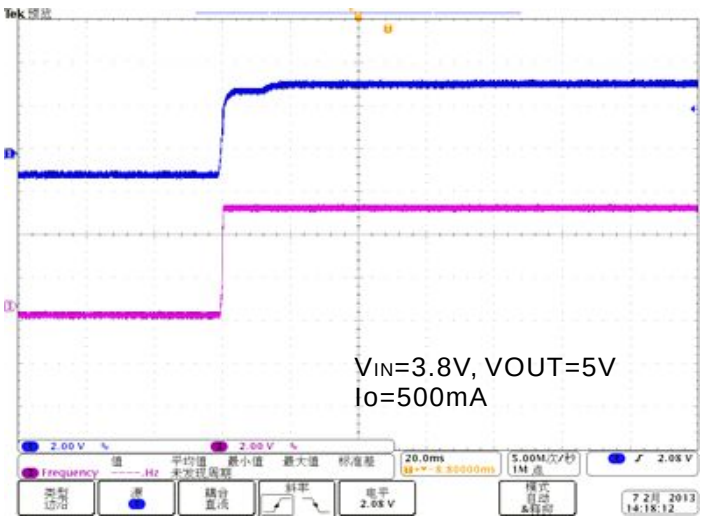
Efficiency VS Output Current



Output Voltage VS Output Current



Load Transient Response



Start-up Response

Application Information

INDUCTOR SELECTION

The GPM9081 can utilize small surface mount inductors due to its 1.0MHz switching frequency. A 2.2μH or 4.7μH inductor will be the best choice for most GPM9082 applications.The inductor should have low DCR (DC resistance) to reduce the I2R power losses, and must be able to handle the peak inductor current without saturating.

Several inductor manufacturers are listed in Table 1 below,

Manufacturer	*Part Number*	*Inductance(uH)*	*DRC(Ω)*	*Dimensions L*W*H(mm3)*
Murata	LQH5BPN	2.2	0.03	5*5*2
	LQH32PN	2.2	0.06	3.2*2.5*1.7
Sumida	CDRH3D16	2.2	0.03	4*4*1.8
		4.7	0.07	

Diode Selection

A Schottky diode is recommended for use with the GPM9082.Use of a low forward voltage diode such as the ON Semiconductor MBRA210LT3 is recommended. A Schottky diode rated at 2A is recommended for use with the GPM9082.

INPUT CAPACITOR SELECTION

The input capacitor reduces input voltage ripple to the converter, low ESR ceramic capacitor is highly recommended. For most applications, a 10~22uF capacitor is used. The input capacitor should be placed as close as possible to VIN and GND.

Recommended: Murata GRM32ER61A106KA01L and Murata GRM32NR61A226KE19L

OUTPUT CAPACITOR SELECTION

A low ESR output capacitor is required in order to maintain low output voltage ripple. In the case of ceramic output capacitors, capacitor ESR is very small and does not contribute to the ripple, so a lower capacitance value is acceptable when ceramic capacitors are used. A 22uF ceramic output capacitor is suitable for most applications.

Recommended: Murata GRM32NR61A226KE19L

OUTPUT VOLTAGE PROGRAMMING

In the adjustable version, the output voltage is set by a resistive divider according to the following equation:

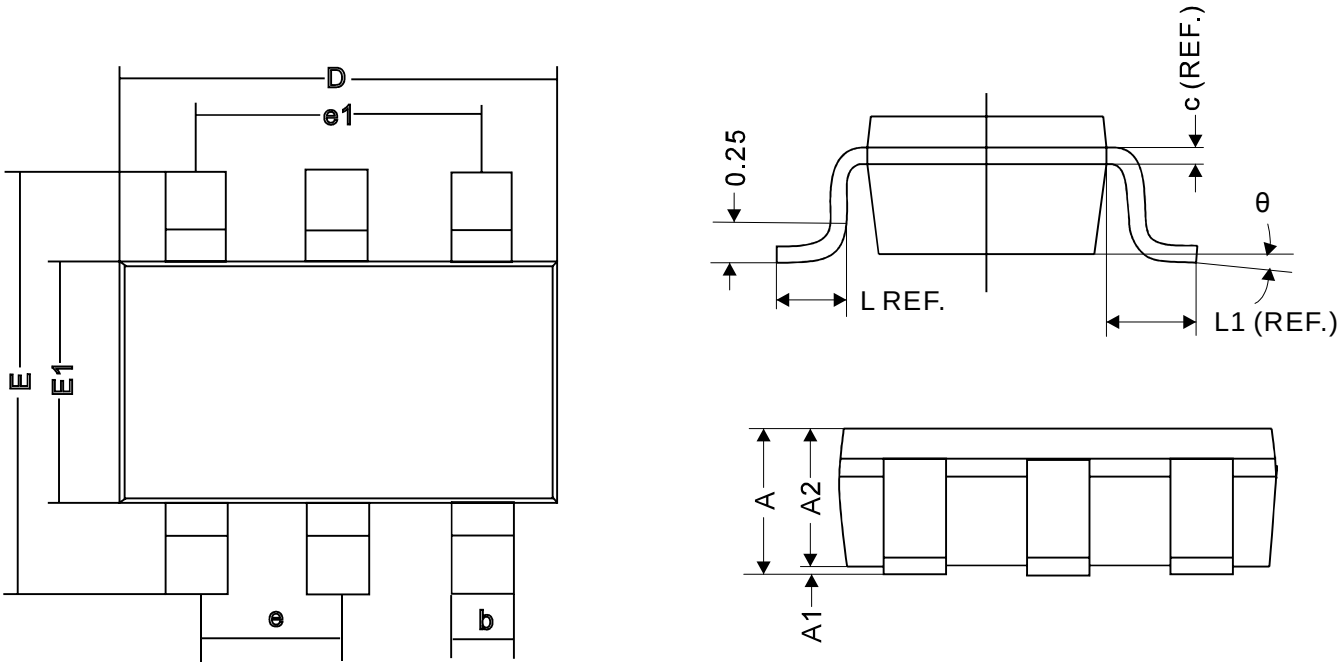
$$R_2 = R_1 \times \left(\frac{V_{OUT}}{0.6} - 1 \right)$$

Typically choose R1=100K and determine R2 from the above equation.

Connect a small capacitor across R1 feed forward capacitance at the FB pin for better performance.

Outline Dimension

SOT23-6



REF.	Millimeter	
	Min	Max
A	1.10MAX	
A1	0	0.10
A2	0.70	1
c	0.12REF.	
D	2.70	3.10
E	2.60	3.00
E1	1.40	1.80
L	0.45REF.	
L1	0.60REF.	
θ	0°	10°
b	0.30	0.50
e	0.95REF.	
e1	1.90REF.	