3A 23V Synchronous PWM Step-Down Converter with Low Dropout Voltage Output

FEATURES

- 3A Continuous Output Current
- internal Soft Start
- Up to 90% Efficiency for Heavy Load
  (Vin=12V, Vout=3.3V, Iout=3.0A)
- Low Rds(on) Internal Switches: 150mΩ and 120mΩ
- Stable with Low ESR Output Ceramic Capacitors
- Up to 93% Efficiency
- <1μA Supply Current in Shutdown Mode
- Fixed 340KHz Frequency
- Thermal Shutdown
- Cycle by Cycle Over Current Protection
- Wide 4.5 to 23V Operating Input Range
- Output Adjustable from 0.925V to 12V
- Under Voltage Lockout
- Output Voltage 2 is available from 0.8V~5V Adjustable Version.
- Available in ± 2% Output Tolerance.
- Extra Mosfet to control current of output voltage 2.
- Internal OVP UVLO for Output1 and Output2

APPLICATIONS

- Networking Systems
- Distributed Power Systems
- Pre-Regulator for Linear Regulators.
- LCD TV, LCD Monitor, DPF.
- Portable AV Equipment.
- Note Book PC Applications.
- PC Peripherals.
- Set-top Box

DESCRIPTION

The AIC2802 is a synchronous step-down regulator with an integrated Power MOSFET and extra Power MOSFET to control coutput voltage2. It achieves 3A continuous output current over a wide input supply range with excellent load and line regulation.

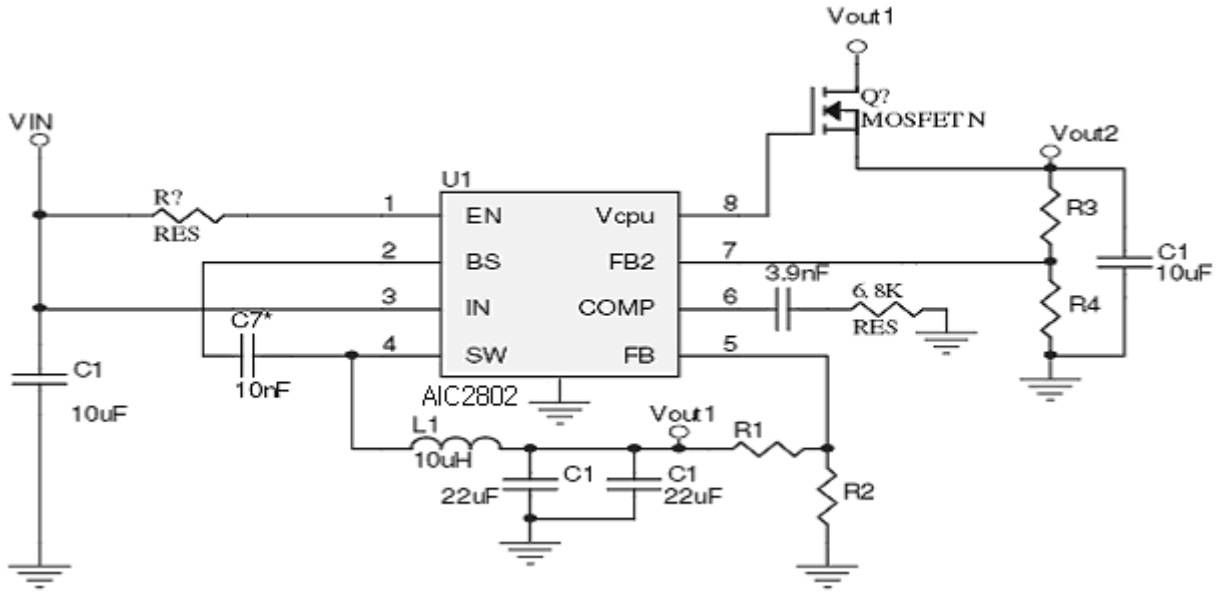
Current mode operation provides fast transient response and eases loop stabilization.

The Output Voltage1 adjusted by R1, R2 and Output Voltage 2 adjusted by R3, R4.

Fault condition protection includes cycle-by-cycle current limiting and thermal shutdown. Internal soft-start reduces the stress on the input source and the output overshoot at turn-on. In shutdown mode, the regulator draws 1μA or less of supply current.

The AIC2802 is available in SOP-8 with Exposed Pad Package.

TYPICAL APPLICATIONS CIRCUIT



AIC2802 Application Circuit

PIN CONFIGURATION

AIC2802-XXXXXX

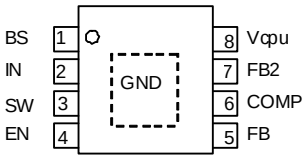
- PACKING TYPE
  TR: TAPE & REEL
  TB: TUBE
- PACKAGING TYPE
  R8: SOP-8 Exposed Pad
- G: GREEN PACKAGE
- 3: 340KHz
  5: 550KHz

Example:

AIC2802-3GR8TR

→ 340KHz GREEN SOP-8 Exposed Pad (Heat Sink) Package and TAPE & REEL Packing Type

SOP-8 Exposed Pad (Heat Sink)
TOP VIEW



Note:
The exposed pad must be connected with GND pin

ABSOLUTE MAXIMUM RATINGS

Input Voltage (V_{IN}) ..... -0.3V to 26V
SW pin Voltage (V_{SW}) ..... -1V to V_{IN} +0.3V
BS Pin Voltage ..... V_{SW}-0.3V to V_{SW}+6V
EN Pin Voltage ..... -0.3V to V_{IN}
All Other Pins Voltage ..... -0.3V to 6V
Operating Ambient Temperature Range T_A ..... -40ºC~85ºC
Operating Maximum Junction Temperature T_J 150ºC
Storage Temperature Range T_{STG} ..... -65ºC~150ºC
Lead Temperature (Soldering 10 Sec.) 260ºC
Thermal Resistance Junction to Case SOP-8 Exposed Pad* ..... 15°C/W
Thermal Resistance Junction to Ambient SOP-8 Exposed Pad* ..... 60°C/W
(Assume no Ambient Airflow)

Absolute Maximum Ratings are those values beyond which the life of a device may be impaired.

*The package is place on a two layers PCB with 2 ounces copper and 2 square inch, connected by 8 vias.

ELECTRICAL CHARACTERISTICS

V_{IN}=12V, unless otherwise specified. Typical values are at TA=+25°C

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNITS
Shutdown Supply Current		V_{EN} = 0V		0.3	3	μA
Supply Current		V_{FB}= 1.0V		1.9	2.4	mA
Feedback Voltage 1	V_{FB}	4.5V ≤ V_{IN} ≤ 23V	0.9	0.925	0.95	V
Feedback Overvoltage 1Threshold				1.2		V
Feedback Voltage 2	V_{FB2}	4.5V ≤ V_{o1} ≤ 7V	0.588	0.6	0.612	V
Feedback Overvoltage 2Threshold				0.625		V
Error Amplifier Voltage Gain	A_{EA}			400		V/V
Error Amplifier Transconductance	G_{EA}	ΔI_{COMP} = ± 10μA		820		μA/V
High-Side Switch On-Resistance	$R_{DS\ (ON)\ 1}$			110		mΩ
Low-Side Switch On-Resistance	$R_{DS\ (ON)\ 2}$			85		mΩ
High-Side Switch Leakage Current		V_{EN} = 0V, V_{SW} = 0V			10	μA
Upper Switch Current Limit		Minimum Duty Cycle	4	5.5		A
Lower Switch Current Limit		From Drain to Source		0.9		A
COMP to Current Sense Transconductance	G_{CS}			5.2		A/V
Oscillation Frequency	f_{OSC}		300	340	380	KHz
Short Circuit Oscillation Frequency		V_{FB}= 0V		110		KHz
Maximum Duty Cycle	D_{MAX}	V_{FB}= 0.8V		90		%
Minimum On Time	T_{ON}			220		ns
EN Shutdown Threshold Voltage		V_{EN} Rising	1.1	1.5	2.2	V
EN Shutdown Threshold Voltage Hysteresis				220		mV
Under Voltage Lockout Threshold		V_{IN} Rising	3.7	4.1		V
Under Voltage Lockout Threshold Hysteresis				210		mV
Soft-Start Period for Vout1				5		ms
Soft-Start Period for Vout2				0.5		ms
Vcpu Voltage					5	V
Thermal Shutdown				160		°C

Note 1: Specifications are production tested at T_A=25°C. Specifications over the -40°C to 85°C operating temperature range are assured by design, characterization and correlation with Statistical Quality Controls (SQC).

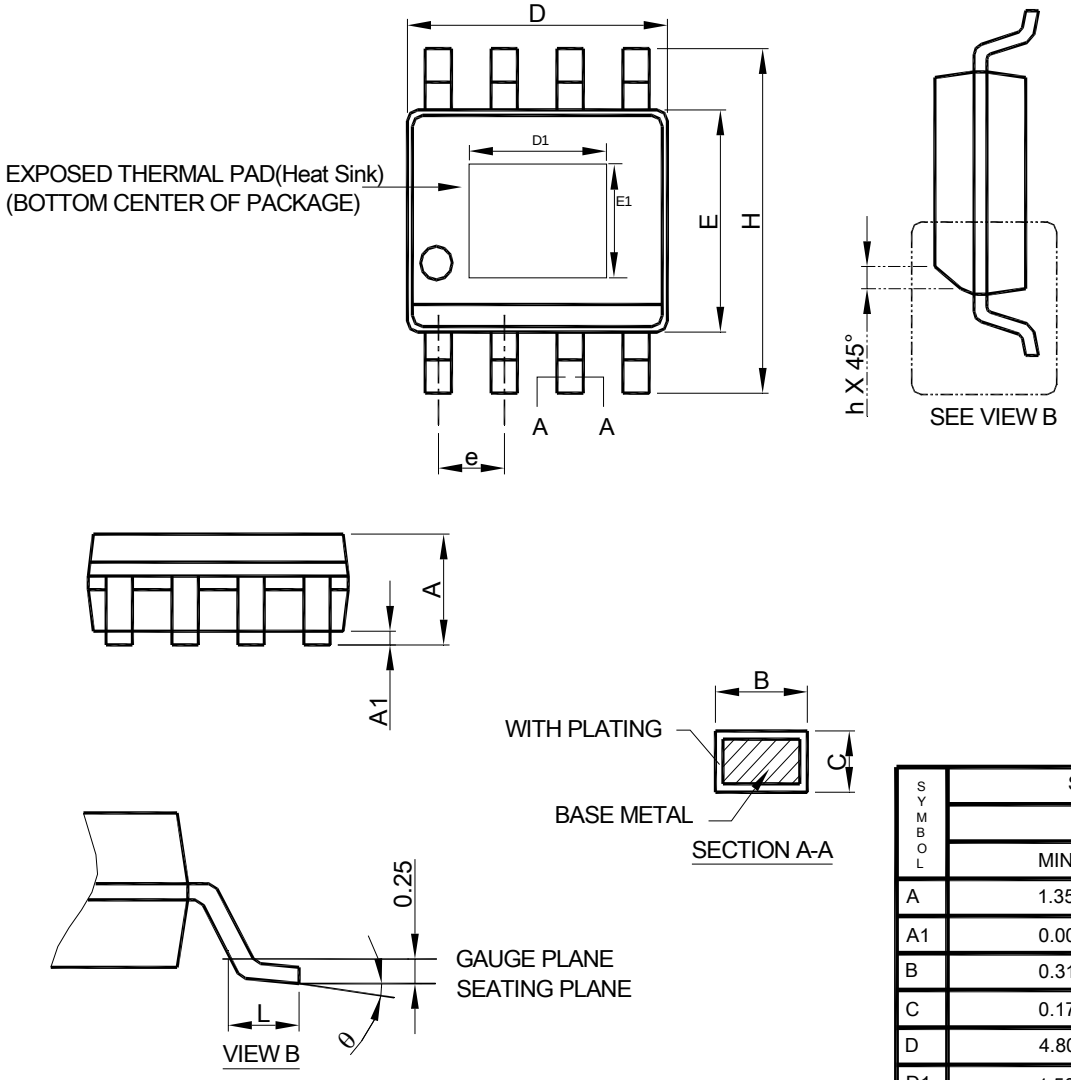
Note 2: It is recommended to use duty ratio above 10% for minimizing resultant duty cycle jitter.

PIN DESCRIPTIONS

SOP-8 Pin No.	Pin Name	Pin Function
1	BS	High Side Gate Drive Boost Input. BS supplies the drive for the high-side N-Channel MOSFET switch. Connect a 10nF or greater capaitor from SW to BS to power the high-side switch.
2	IN	Power Input. IN supplies the power to the IC, as well as the step-down converter switches. Drive IN with a 4.5 to 23V power source. By pass IN to GND with a suitably large capacitor to eliminate noise on the input to the IC.
3	SW	Power Switching Output. SW is the switching node that supplies power to the output. Connect the output LC filter from switch to the output load. Note that a capacitor is required from SW to BS to power the high-side switch.
4	EN	Enable Input. EN is a digital input that turns the regulator on or off. Drive EN high to turn on the regulator. Drive it low to turn it off. For automatic strat-up, attach to IN with a 100kΩ pull up resistor.
5	FB	Feedback Input. FB senses the output voltage to regulate that voltage. Drive feedback with a resistive voltage divider from the output voltage.
6	COMP	Compensation Node. COMP is used to compensate the regulation control loop. Connect a series RC network form COMP to GND to compensate the regulation control loop. In some cases, an additional capacitor from COMP to GND is required.
7	FB2	Feedback Input2. FB2 senses the output voltage 2 to regulate that voltage. Drive feedback with a resistive voltage divider from the output voltage.
8	VCPU	To Driver the Mosfet for extra output voltage 2.
9	GND	Ground. Connect the exposed pad on backside.

PHYSICAL DIMENSIONS

- **SOP-8 Exposed Pad(Heat Sink)**



SYMBOL	SOP-8 Exposed Pad(Heat Sink)	
	MILLIMETERS	
	MIN.	MAX.
A	1.35	1.75
A1	0.00	0.15
B	0.31	0.51
C	0.17	0.25
D	4.80	5.00
D1	1.50	3.50
E	3.80	4.00
E1	1.0	2.55
e	1.27 BSC	
H	5.80	6.20
h	0.25	0.50
L	0.40	1.27
θ	0°	8°

Note : 1. Refer to JEDEC MS-012E.
2. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 6 mil per side .
3. Dimension "E" does not include inter-lead flash or protrusions.
4. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

Note: