Description

The MH2566 is a monolithic synchronous buck regulator. The device integrates MOSFETS that provide 3A continuous load current over a wide Operating input voltage of 4.7V to 21V. Current mode control provides fast transient response and cycle-by-cycle current limit.

An adjustable soft-start prevents inrush current at turn-on.In shutdown mode, the supply current drops below 1μA. This device , available in an 8-pin SOP Package , provides a very compact system solution with minimal reliance on external components.

Features

3A Output Current

4.7V to 21V Operating Input Range

Integrated MOSFET Switches

Output Adjustable from 0.92V to 20V

Up to 95% Efficiency

Programmable Soft-Start

Stable with Ceramic Output Capacitors

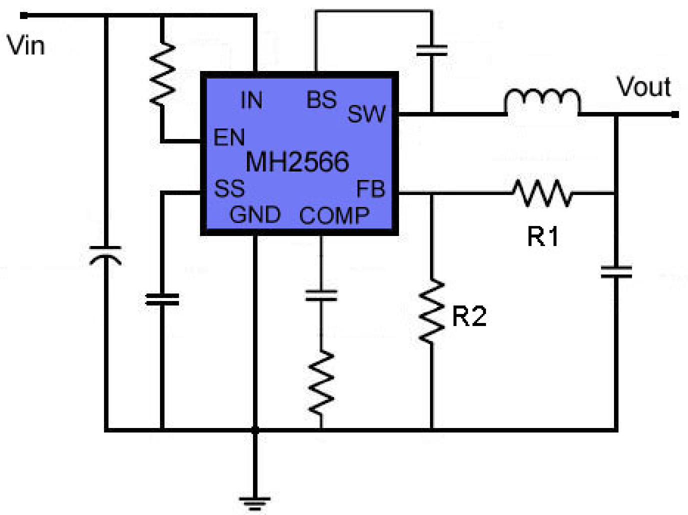
Fixed 350KHz Frequency

Cycle-by-Cycle OverCurrent Protection

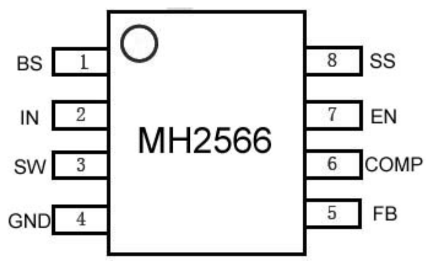
Input Under Voltage Lockout

Thermally Enhanced 8-Pin SOP Package

Typical Application



Package



Pin Assignment

Pin No.	Pin Name	Description
1	BS	High-Side Gate Drive Boost Input. BS supplies the drive for the high-side N-Channel MOSFET switch. Connect a 0.01μF or greater capacitor 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 4.75V to 21V power source. Bypass IN to GND with a suitably large capacitor to eliminate noise on the input to the IC. See Input Capacitor.
3	SW	Power Switching Output. SW is the switching node that supplies power to the output. Connect the output LC filter from SW to the output load. Note that a capacitor is required from SW to BS to power the high-side switch.
4	GND	Ground (Connect Exposed Pad to Pin4).
5	FB	Feed back Input. FB senses the output voltage to regulate that voltage. Drive FB with a resistive voltage divider from the output voltage. The feedback threshold is 0.925V. See Setting the Output Voltage.
6	COMP	Compensation Node. COMP is used to compensate the regulation control loop. Connect a series RC network from COMP to GND to compensate the regulation control loop. In some cases, an additional capacitor from COMP to GND is required. See Compensation Components.
7	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. Pull up with 100kΩ resistor for automatic startup.
8	SS	Soft-Start Control Input. SS controls the soft-start period. Connect a capacitor from SS to GND to set the soft-start period. A 0.1μF capacitor sets the soft-start period to 15ms. To disable the soft-start feature, leave SS unconnected.

Absolute Maximum Ratings

Type	Symbol	Value	Unit
Supply Voltage	Vin	-0.3 ~ 23	V
Switch Voltage	Vsw	–1 ~ Vin+0.3	V
Bootstrap Voltage	V_{BS}	Vsw - 0.3 ~Vsw + 6	V
Enable/UVLO Voltage	V_{EN}	– 0.3 ~ + 6	V
Comp Voltage	V_{COMP}	–0.3 ~ +6	V
Feedback Voltage	V_{FB}	–0.3 ~ +6	V
Junction Temperature		150	℃
Lead Temperature		260	℃
Storage Temperature		–55 ~ +150	℃

Recommended Operating Conditions

Type	Symbol	Value	Unit
Input Voltage	Vin	4.75 ~ 21	V
Output Voltage	Vsw	0.92 ~ 20V	V
Operating Temperature		–20 ~ +85	℃
Thermal Resistance		50	℃/W

Electronic Characteristics

VIN=12V,TA = +25℃, unless otherwise noted.

Parameter	Test Condition	Min	Typ	Max	Unit
Shut down Supply Current	VEN≤0.3V		0.3	3	uA
Supply Current	VEN≥2.6V,VFB=1.0V		1.3	1.5	mA
Feedback Voltage	4.75V ≤ VIN ≤ 21V	900	925	950	mV
Feedback Over voltage Threshold			1.1		V
Error Amplifier Voltage			480		V/V
Error Amplifier Transconductance	ΔIC = ±10μA		800		uA/V
High-Side Switch-On Resistance			100		mΩ
Low-Side Switch-On Resistance			100		mΩ
High-Side Switch Leakage	VEN = 0V,VSW = 0V		0	10	uA
Upper Switch Current Limit			4	5.8	A
Lower Switch Current Limit				0.9	A
COMP to Current Sense Transconductance			5.2		A/V
Oscillator Frequency		310	350	390	KHz
Short Circuit Frequency	VFB = 0V		110		KHz
Maximum Duty Cycle	VFB = 1.0V		90		%
Minimum On Time			220		nS
EN Shutdown Threshold Voltage	VEN Rising	1.1	1.3	1.5	V
EN Shutdown Threshold Voltage Hysterisis			200		mV
EN Lockout Threshold Voltage		2.2	2.5	2.7	V
EN Lockout Hysterisis			210		mV
Input UVLO Threshold Rising	VIN Rising	3.8	4.05	4.4	V
Input UVLO Threshold Hysteresis			210		mV
Soft–start Current	VSS = 0V		6		uA
Soft –start Period	CSS = 0.1μF		15		ms
Thermal Shutdown			160		℃

Application Information

1. Setting the Output Voltage

The output voltage is set using a resistive voltage divider from the output voltage to FB (see Typical Application circuit on page1).The voltage divider divides the output voltage down by the ratio : V_{FB} = Vout ×（R2 /（R1+R2））

Recommended Resistance Value

Vout	R1	R2
1.8V	9.53 KΩ	10 KΩ
2.5V	16.9 KΩ	10 KΩ
3.3V	26.1 KΩ	10 KΩ
5V	44.2 KΩ	10 KΩ
12V	121 KΩ	10 KΩ

2. Inductor

The inductor is required to supply constant current to the output load while being driven by the Switched input voltage. A larger value inductor will resultin less ripple current that will result In lower output ripple voltage. However, the larger value inductor will have a larger physical size, higher series resistance, and /or lower saturation current. A good rule for determining the Inductance to use is to allow the peak-to-peak ripple current in the inductor to be approximately 30% of the maximum switch current limit. Also, make sure that the peak inductor current is Below the maximum switch current limit. The inductance value can be calculated by:

$$L = \frac{V_{OUT}}{f_S \times \Delta I_L} \times \left(1 - \frac{V_{OUT}}{V_{IN}}\right)$$

Where VOUT is the output voltage, VIN is the input voltage,fSisthe switching frequency, and ΔIL is the peak-to-peak inductor ripple current.

3. Optional Schottky Diode

During the transition between high-side switch and low-side switch, the body diode of the low Side power MOSFET conducts the inductor current. The forward voltage of this body diode is high. An optional Schottky diode maybe paralleled between the SW pin and GND pin to improve Overall efficiency.

4. Input Capacitor

The input current to the step-down converter is discontinuous, therefore a capacitor is required To supply the AC current to the step-down converter while maintaining the DC input voltage. Use low ESR capacitors for the best performance. Ceramic capacitors are preferred, but tantalum or low-ESR electrolytic capacitors may also suffice. Choose X5R or X7R dielectrics when using Ceramic capacitors. Since the input capacitor absorbs the input switching current it requires an Adequate ripple current rating. The RMS current in the input capacitor can be estimated by:

$$I_{C1} = I_{LOAD} \times \sqrt{\frac{V_{OUT}}{V_{IN}} \times \left(1 - \frac{V_{OUT}}{V_{IN}}\right)}$$

$$\Delta V_{IN} = \frac{I_{LOAD}}{C1 \times f_S} \times \frac{V_{OUT}}{V_{IN}} \times \left(1 - \frac{V_{OUT}}{V_{IN}}\right)$$

C1 is the input capacitance value.

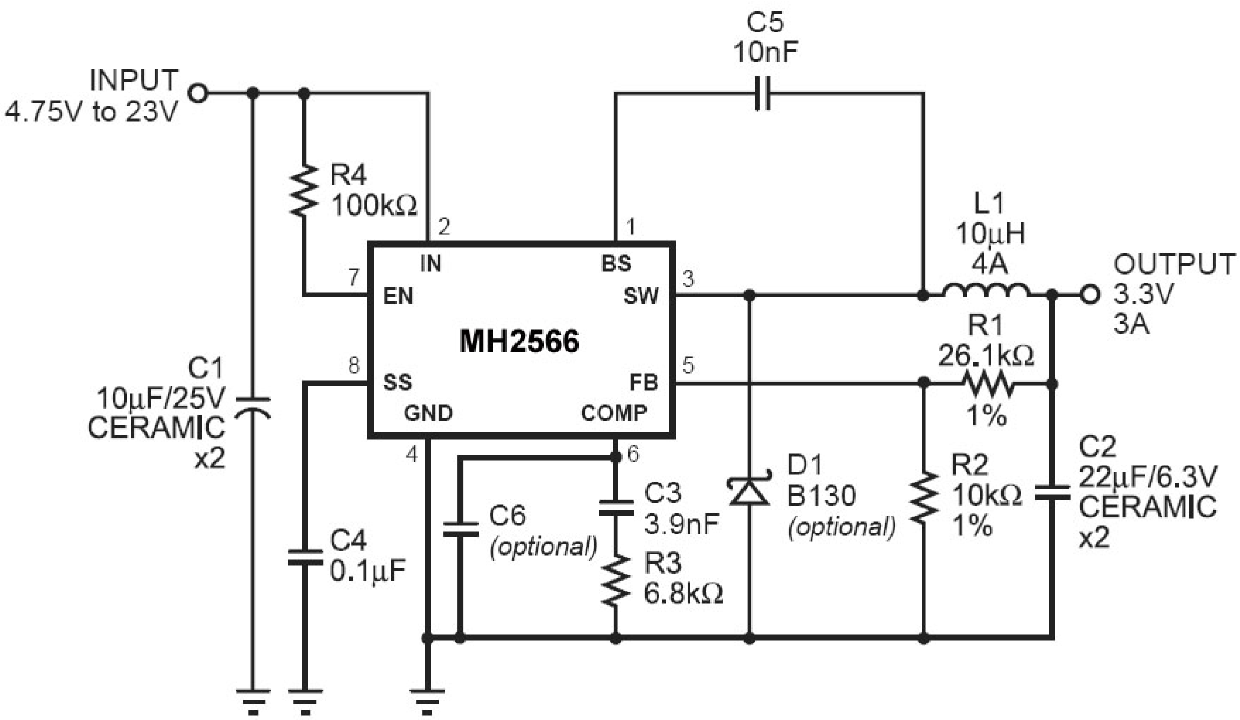
5. Output Capacitor

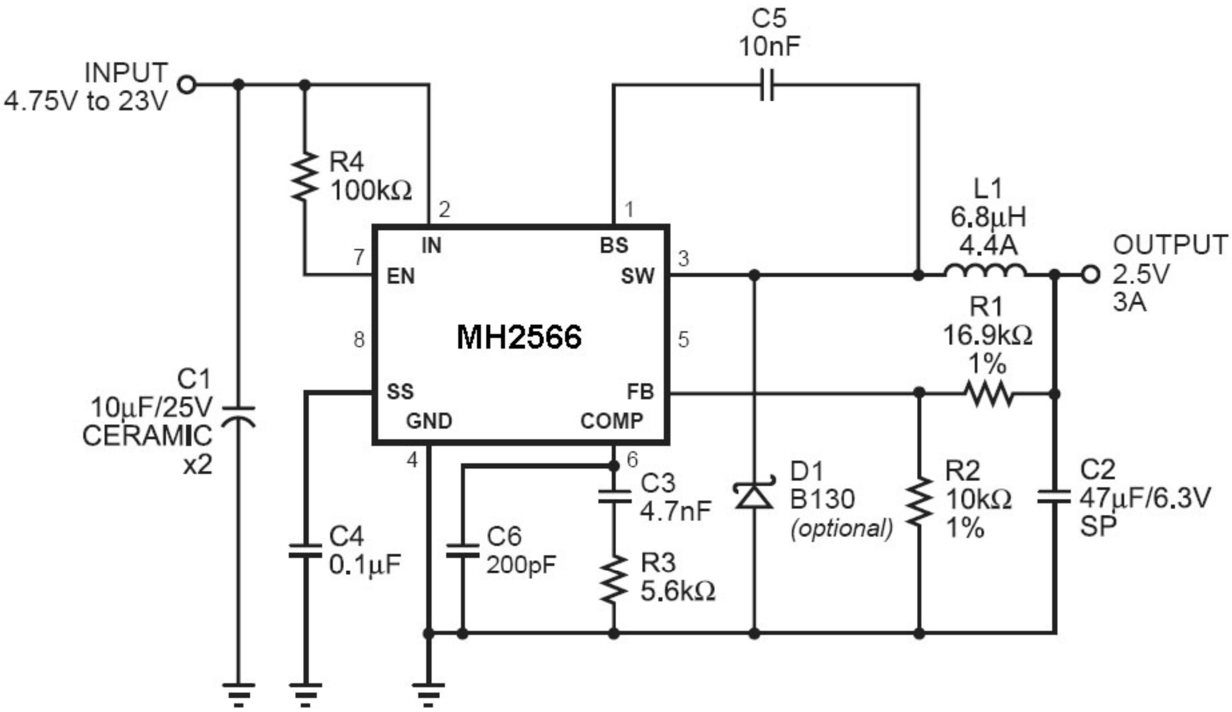
The output capacitor is required to maintain the DC output voltage. Ceramic, tantalum, or low ESR Electrolytic capacitors are recommended. Low ESR capacitors are preferred to keep the output Voltage ripple low. The output voltage ripple can be estimated by:

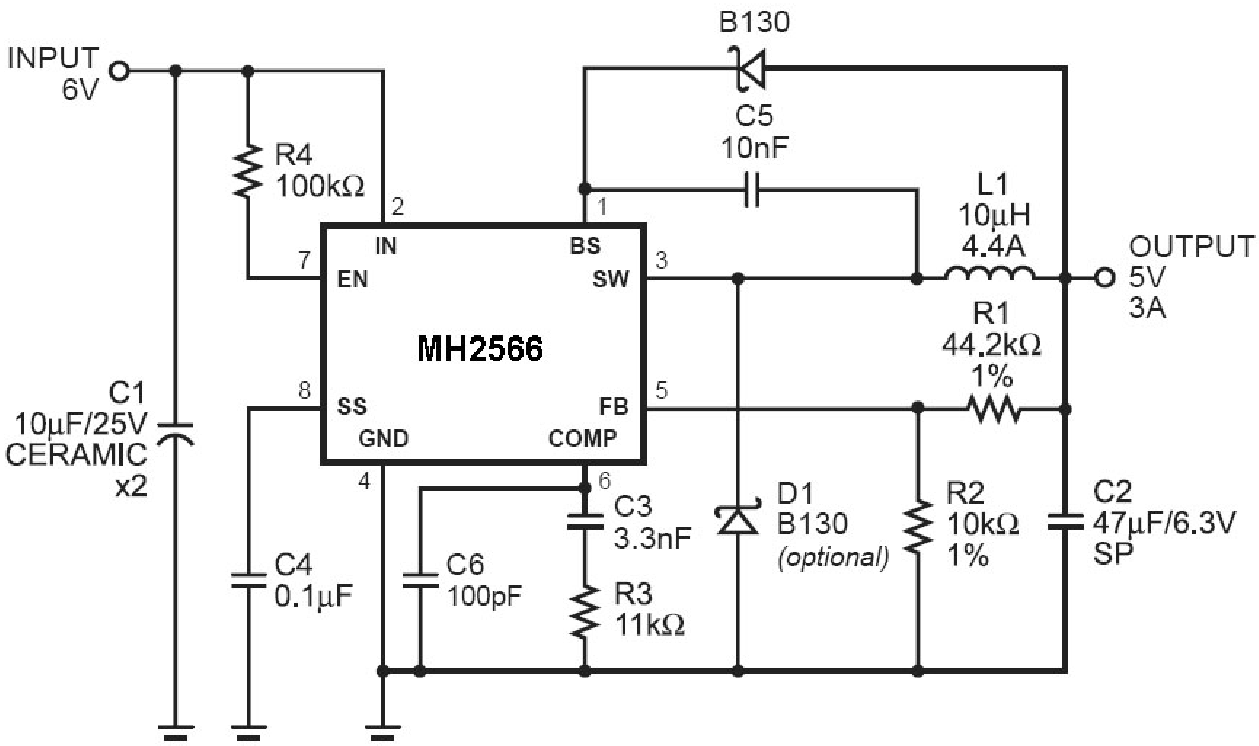
$$\Delta V_{OUT} = \frac{V_{OUT}}{f_S \times L} \times \left(1 - \frac{V_{OUT}}{V_{IN}}\right) \times \left(R_{ESR} + \frac{1}{8 \times f_S \times C2}\right)$$

C2 is the input capacitance value.

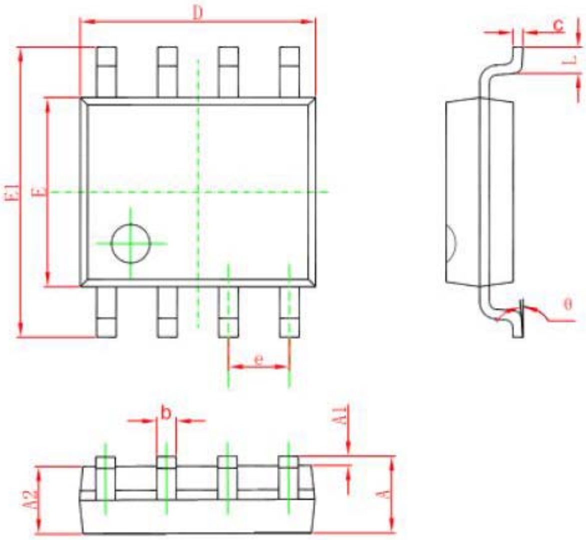
Typical Application Circuits




C5
10nF
INPUT
4.75V to 23V
R4
100kΩ
2
1
L1
6.8µH
4.4A
OUTPUT
2.5V
3A
7
IN
BS
3
EN
SW
8
MH2566
5
R1
16.9kΩ
1%
C1
10µF/25V
CERAMIC
x2
SS
FB
GND
COMP
4
6
C3
4.7nF
D1
B130
(optional)
R2
10kΩ
1%
C2
47µF/6.3V
SP
C4
0.1µF
C6
200pF
R3
5.6kΩ


B130
INPUT
6V
C5
10nF
R4
100kΩ
L1
10µH
4.4A
2
1
OUTPUT
5V
3A
IN
BS
7
3
EN
SW
MH2566
R1
44.2kΩ
1%
C1
10µF/25V
CERAMIC
x2
8
5
SS
FB
GND
COMP
4
6
C3
3.3nF
D1
B130
(optional)
R2
10kΩ
1%
C2
47µF/6.3V
SP
C4
0.1µF
C6
100pF
R3
11kΩ

SOP8 Package Outline



Symbol	Dimensions In Millimoters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.006	0.010
D	4.700	5.100	0.185	0.200
E	3.800	4.000	0.150	0.157
E1	5.800	6.200	0.228	0.244
e	1.270（BSC）		0.050（BSC）	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°