

General Description

The SE3508 is a current mode boost DC-DC converter. Its PWM circuitry with built-in 0.16Ω power MOSFET make this regulator highly power efficient. The internal compensation network also minimizes as much as 6 external component counts. The non-inverting input of error amplifier connects to a 1.275V precision reference voltage and internal soft-start function can reduce the inrush current. The SE3508 is available in the PSOP8 package.

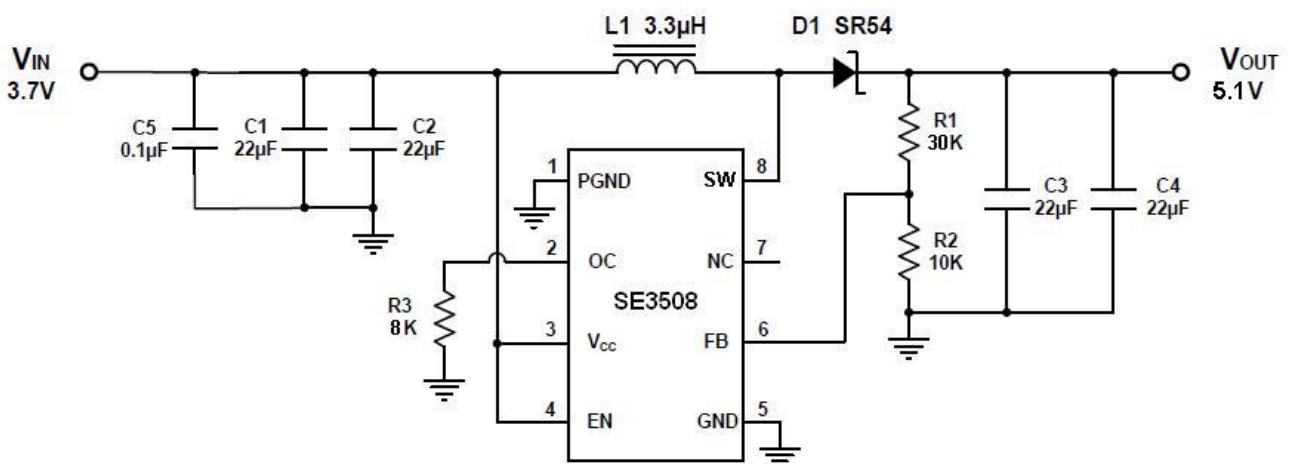
Features

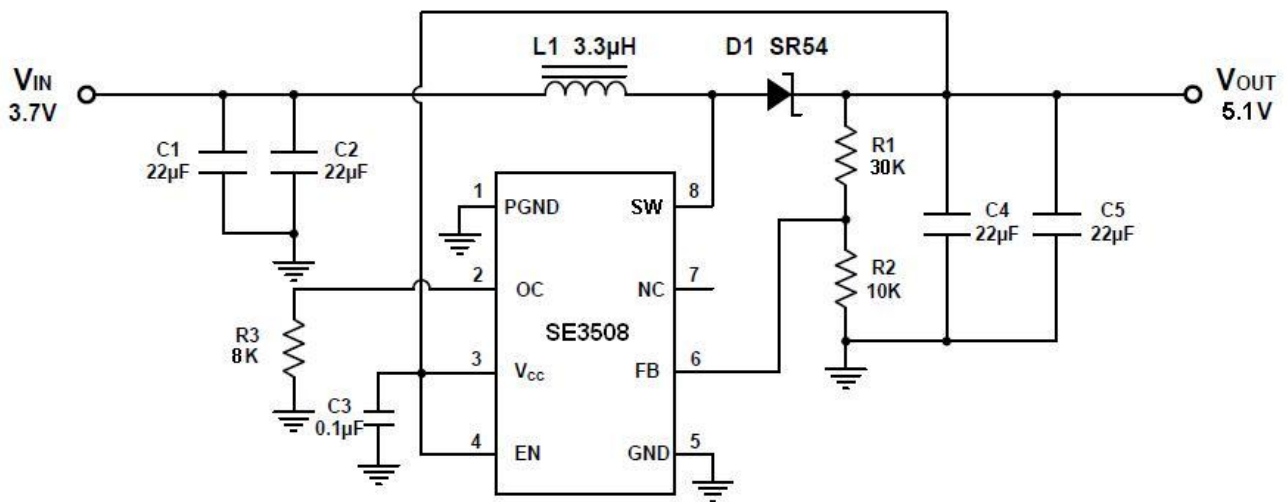
- Adjustable Output up to 6V
- Internal Fixed PWM frequency: 1.0MHz
- Precision Feedback Reference Voltage: 1.275V (±2%)
- Internal 0.16Ω, 5A, 6V Power MOSFET
- Shutdown Current: 0.1μA
- Over Temperature Protection
- Over Voltage Protection
- Adjustable Over Current Protection: 0.5A ~ 5A
- Package: PSOP8

Application

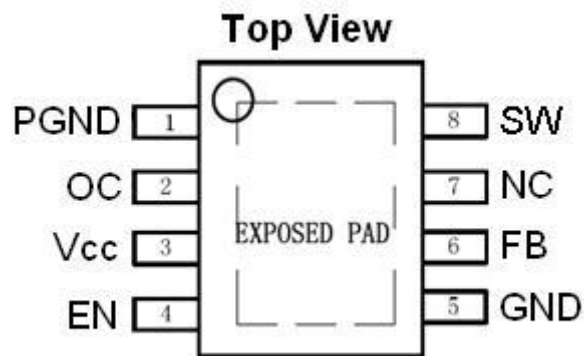
- Chargers
- LCD Displays
- Digital Cameras
- Handheld Devices
- Portable Products

Typical Application





Pin Configuration



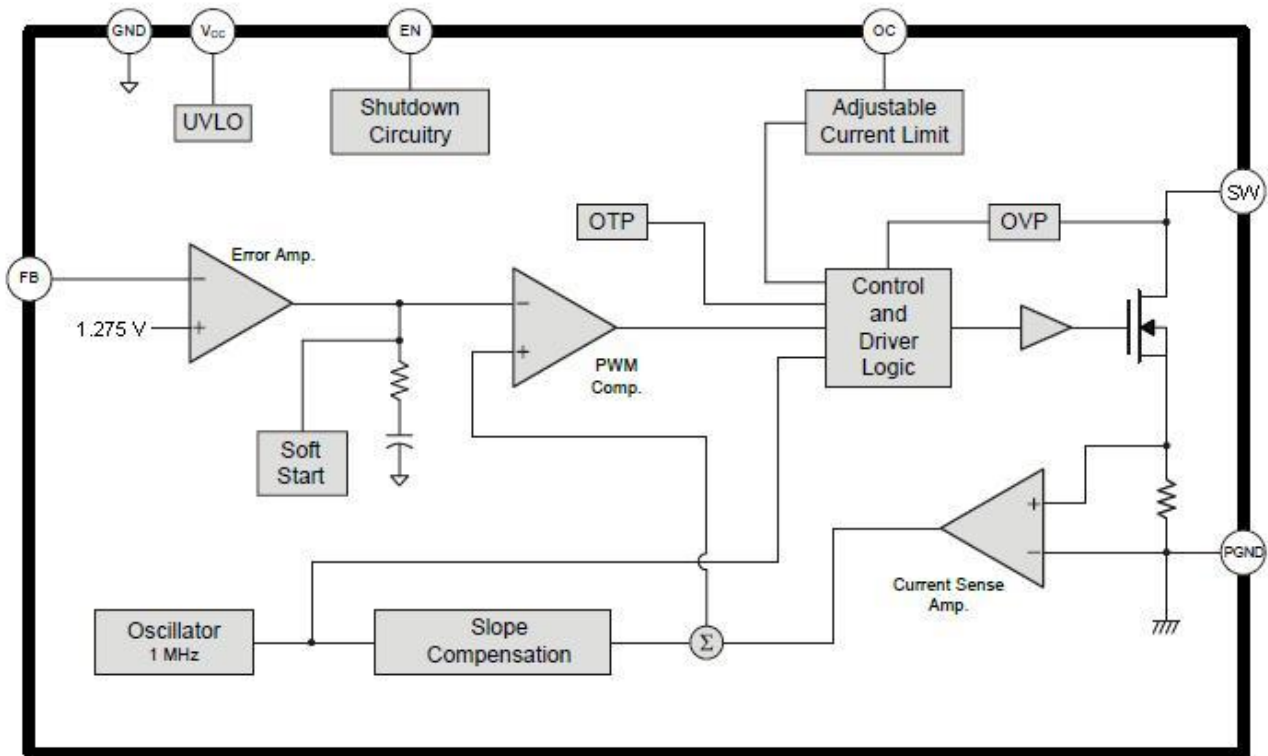
Pin Description

| Number | Pin | Pin Function Description |
|--------|-----------------|---------------------------------|
| 1 | PGND | IC Ground |
| 2 | OC | Adjustable Current Limit |
| 3 | V _{cc} | Input power supply pin |
| 4 | EN | Enable Control (Active High) |
| 5 | GND | Power ground |
| 6 | FB | Error Amplifier Inverting Input |
| 7 | NC | Not Connected |
| 8 | SW | Power Switch Output |

Note: Exposed PAD-Must connect to Ground



Functional Block Diagram



Ordering Information

| Part Number | Marking Information | Package | Remarks |
|-------------|---------------------|---------|--|
| SE3508-LF | SE3508 YYWW-LF | PSOP8 | YYWW means Production batch LF means Lead Free. |

Absolute Maximum Ratings

| Parameter | Symbol | Maximum | Units |
|--------------------------------------|---------------|------------|-------|
| Supply Voltage V_{CC} | V_{CC} | 6 | V |
| SW Voltage | V_{SW} | 6 | V |
| FB, EN Voltage | | 6 | V |
| Thermal Resistance | θ_{JA} | +83 | °C/W |
| Junction Temperature | T_J | +150 | °C |
| Operating Temperature | T_{OP} | -40 to +85 | °C |
| Storage Temperature | T_{ST} | -65 to 150 | °C |
| Lead Temperature (Soldering, 10 sec) | | +260 | °C |



Recommended Operating Conditions

| Parameter | Symbol | Min | Typ | Max | Unit |
|-----------------------------|-----------------|-----|-----|-----|------|
| Supply Voltage | V _{CC} | 2.8 | | 5.5 | V |
| Operating Temperature Range | T _A | -40 | | +85 | °C |

Electrical Characteristics

V_{IN} = 3.3V, T_A = 25°C; unless otherwise specified

| Symbol | Parameter | Test Conditions | Min | Typ | Max | Unit |
|----------------------------|-------------------------------|-------------------------------------|------|-------|-----|------|
| System Supply Input | | | | | | |
| V _{CC} | Input Supply Range | | 2.8 | | 5.5 | V |
| V _{UVLO} | Under Voltage Lockout | | | 2.6 | | V |
| | UVLO Hysteresis | | | 0.1 | | V |
| I _{CC} | Quiescent Current | V _{FB} =1.3V, No switching | | 260 | | uA |
| I _{CC} | Average Supply Current | V _{FB} =1.2V, Switching | | 2 | | mA |
| I _{CC} | Shutdown Supply Current | V _{EN} =GND | | 0.1 | | μA |
| Oscillator | | | | | | |
| F _{OSC} | Operation Frequency | V _{FB} =1.0V | 0.8 | 1.0 | 1.2 | MHz |
| Δf / ΔV | Frequency Change with Voltage | V _{CC} =2.6V to 5.5V | | 5 | | % |
| T _{DUTY} | Maximum Duty Cycle | | | 90 | | % |
| Reference Voltage | | | | | | |
| V _{REF} | Reference Voltage | | 1.25 | 1.275 | 1.3 | V |
| | Line Regulation | V _{CC} =2.6V~5.5V | | 0.05 | | %/V |
| Enable Control | | | | | | |
| V _{EN} | Enable Voltage | | 0.9 | | | V |
| V _{EN} | Shutdown Voltage | | | | 0.7 | V |
| MOSFET | | | | | | |
| R _{DS(ON)} | On Resistance of Driver | I _{LX} =2A | | 0.16 | | Ω |
| Protection | | | | | | |
| I _{OCP} | OCP Current | With External Resistor: 8k | | 5 | | A |
| I _{OCP} | Adjustable OCP Current | With External Resistor: 8k~80k | 0.5 | | 5 | A |
| T _{OTP} | OTP Temperature | | | +150 | | °C |



Operation

The SE3508 is a current mode boost converter. The constant switching frequency is 1MHz and operates with pulse width modulation (PWM). Build-in 6V / 5A MOSFET provides a high output voltage. The control loop architecture is peak current mode control; therefore slope compensation circuit is added to the current signal to allow stable operation for duty cycles larger than 50%.

Soft Start Function

Soft start circuitry is integrated into SE3508 to avoid inrush current during power on. After the IC is enabled, the output of error amplifier is clamped by the internal soft-start function, which causes PWM pulse width increasing slowly and thus reducing input surge current.

Current Limit Program

A resistor between OC and GND pin programs peak switch current. The resistor value should be between 8k and 80k. The current limit will be set from 5A to

0.5A. Keep traces at this pin as short as possible. Do not put capacitance at this pin. To set the over current trip point according to the following equation:

$$I_{OCP} = \frac{40000}{R3}$$

Over Temperature Protection (OTP)

SE3508 will turn off the power MOSFET automatically when the internal junction temperature is over 150°C. The power MOSFET wake up when the junction temperature drops 30°C under the OTP threshold temperature.

Over Voltage Protection (OVP)

In some condition, the resistive divider may be unconnected, which will cause PWM signal to operate with maximum duty cycle and output voltage is boosted higher and higher. The power MOSFET will be turned off immediately, when the output voltage exceeds the OVP threshold level. The SE3508's OVP threshold is 6V.

Application Information

Inductor Selection

Inductance value is decided based on different condition. 3.3uH to 4.7uH inductor value is recommended for general application circuit. There are three important inductor specifications, DC resistance, saturation current and core loss. Low DC resistance has better power efficiency. Also, it avoids inductor saturation which will cause circuit system unstable and lower core loss at 1 MHz.

Capacitor Selection

The output capacitor is required to maintain the DC voltage. Low ESR capacitors are preferred to reduce the output voltage ripple. Ceramic capacitor of X5R and X7R are recommended, which have low equivalent series resistance (ESR) and wider operation temperature range.

Diode Selection

Schottky diodes with fast recovery times and low forward voltages are recommended. Ensure the diode average and peak current ratings exceed the average output current and peak inductor current. In addition, the diode's reverse breakdown voltage must exceed the output voltage.

Output Voltage Programming

Rev1.0

Preliminary and all contents are subject to change without prior notice.

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The output voltage is set by a resistive voltage divider from the output voltage to FB. The output voltage is:

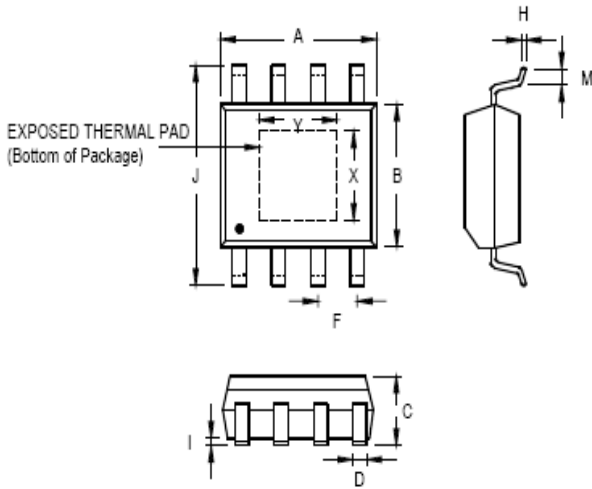
$$V_{OUT} = 1.275V \times \left(1 + \frac{R1}{R2}\right)$$

Layout Considerations

1. The power traces, consisting of the GND trace, the SW trace and the V_{CC} trace should be kept short, direct and wide.
2. SW、L and D switching node, wide and short trace to reduce EMI.
3. Place C_{IN} near V_{CC} pin as closely as possible to maintain input voltage steady and filter out the pulsing input current.
4. The resistive divider R1 and R2 must be connected to FB pin directly as closely as possible.
5. FB is a sensitive node. Please keep it away from switching node, SW.
6. The GND of the IC, C_{IN} and C_{OUT} should be connected close together directly to a ground plane.



Outline Drawing For PSOP8



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min | Max | Min | Max |
| A | 4.801 | 5.004 | 0.189 | 0.197 |
| B | 3.810 | 3.988 | 0.150 | 0.157 |
| C | 1.346 | 1.753 | 0.053 | 0.069 |
| D | 0.330 | 0.508 | 0.013 | 0.020 |
| F | 1.194 | 1.346 | 0.047 | 0.053 |
| H | 0.191 | 0.254 | 0.008 | 0.010 |
| I | 0.000 | 0.152 | 0.000 | 0.006 |
| J | 5.791 | 6.198 | 0.228 | 0.244 |
| M | 0.406 | 1.270 | 0.016 | 0.050 |
| X | 2.057 | 2.515 | 0.081 | 0.099 |
| Y | 2.057 | 3.404 | 0.081 | 0.134 |

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