

## 1.2A, 1.2MHz Synchronous Buck Converter with 7.2V OVP

### DESCRIPTION

The ETA3496 is a high-efficiency, DC-to-DC step-down switching regulator, capable of delivering up to 1.2A of output current. The devices operate from an input voltage range of 2.5V to 7.2V and provide output voltages from 0.6V to 5V, making the ETA3496 ideal for low voltage power conversions. Running at a fixed frequency of 1.2MHz allows the use of small inductance value and low DCR inductors, thereby achieving higher efficiencies. Other external components, such as ceramic input and output caps, can also be small due to higher switching frequency, while maintaining exceptional low noise output voltages. Built-in EMI reduction circuitry makes this converter ideal power supply for RF applications. Internal soft-start control circuitry reduces inrush current. Short-circuit and thermal-overload protection improves design reliability. ETA3496 is housed in a tiny SOT23-5L package

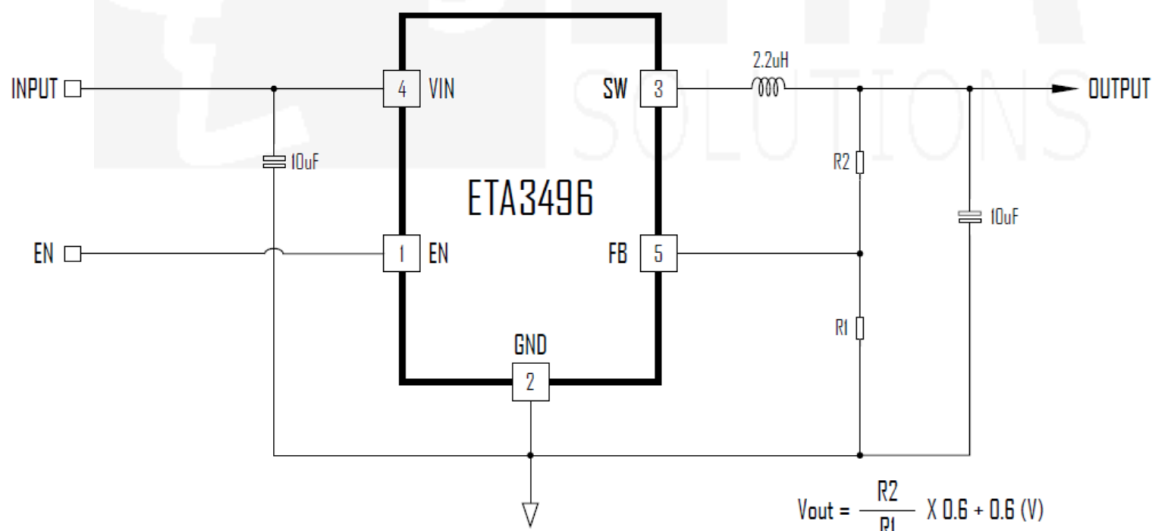
### FEATURES

- ◆ Wide Input Voltage Range: 2.2 – 7.2V
- ◆ Standby Current 40uA (Vout=3.3V, Iout=0A)
- ◆ Up to 96% Efficiency
- ◆ Up to 1.2A Max Output Current
- ◆ 1.2MHz Frequency
- ◆ Light Load operation
- ◆ Internal Compensation
- ◆ Tiny SOT23-5L Package

### APPLICATIONS

- ◆ Set-Top Box
- ◆ Mobile Wi-Fi Hotspot
- ◆ IPTV
- ◆ All devices powered by 5V adapter

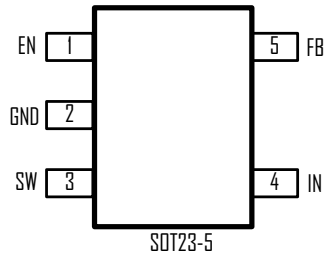
### TYPICAL APPLICATION



### ORDERING INFORMATION

PART No.	PACKAGE	TOP MARK	Pcs/Reel
ETA3496S2F	SOT23-5	BFYW	3000

## PIN CONFIGURATION



## ABSOLUTE MAXIMUM RATINGS

(Note: Exceeding these limits may damage the device. Exposure to absolute maximum rating conditions for long periods may affect device reliability.)

IN,FB, EN Voltage.....	-0.3V to 12V
SW Voltage.....	-0.3V(-2.5V for <10nS) to 12V
SW to ground current .....	1.8A
Maximum Power Dissipation.....	400mW
Operating Temperature Range .....	-40°C to 85°C
Storage Temperature Range .....	-55°C to 150°C
Thermal Resistance	$\theta_{JC}$ $\theta_{JA}$
SOT23-5.....	110.....220..... °C/W
Lead Temperature (Soldering, 10ssec) .....	260°C
ESD HBM (Human Body Mode) .....	2KV
ESD MM (Machine Mode) .....	200V

## ELECTRICAL CHARACTERISTICS

( $V_{IN} = 3.6V$ , unless otherwise specified. Typical values are at  $T_A = 25^\circ C$ .)

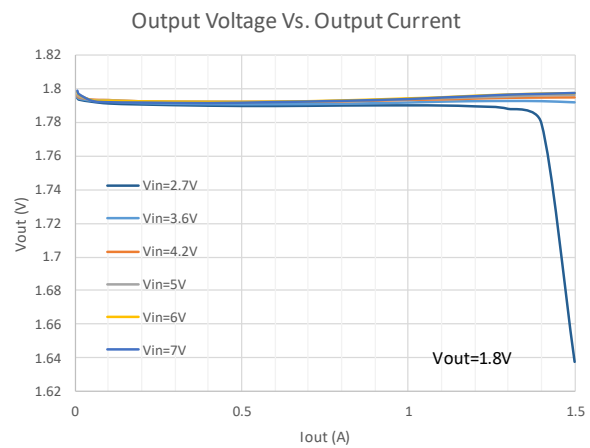
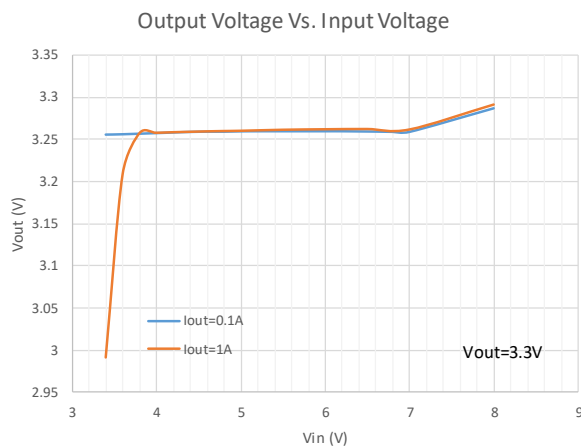
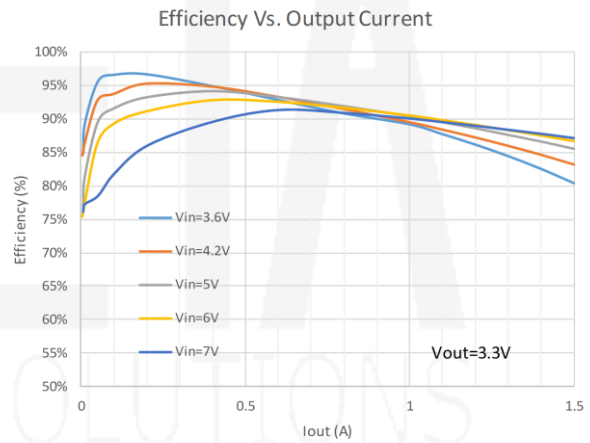
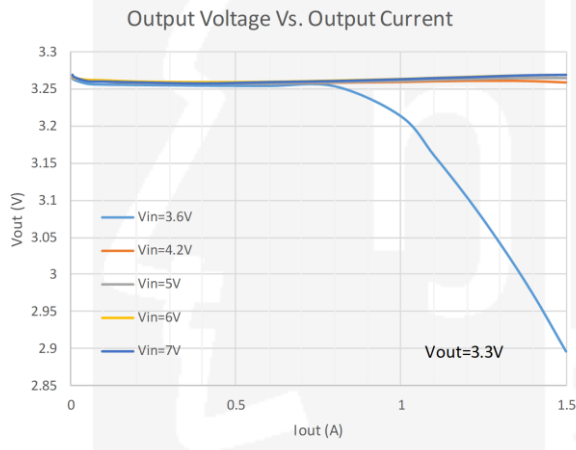
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range		2.5		7.2	V
Input UVLO	Rising, Hysteresis=200mV	2.15	2.3	2.45	V
Input Supply Current	$V_{FB} = 0.65V$		34	60	$\mu A$
Input Shutdown Current				1	$\mu A$
FB Feedback Voltage	$V_{IN} = 3.6V$	0.588	0.6	0.612	V
FB Input Current			0.01		$\mu A$
Output Voltage Range		0.6		$V_{IN}$	V
Load Regulation	$I_{load} = 0.2A$ to 1A		0.1		%/A
Line Regulation	$V_{IN} = 2.7$ to 5.5V @ $I_{load} = 1A$		0.06		%/V
Switching Frequency			1.2		MHz
NMOS Switch On Resistance	$I_{SW} = 200mA$		173		m $\Omega$
PMOS Switch On Resistance	$I_{SW} = 200mA$		318		m $\Omega$
PMOS Switch Current Limit		1.8			A
SW Leakage Current	$V_{IN} = 5.5V, V_{SW} = 0$ or 5.5V, EN= GND			10	$\mu A$
EN Input Current				1	$\mu A$
EN Input Low Voltage				0.4	V
EN Input High Voltage		1.5			V

## PIN DESCRIPTION

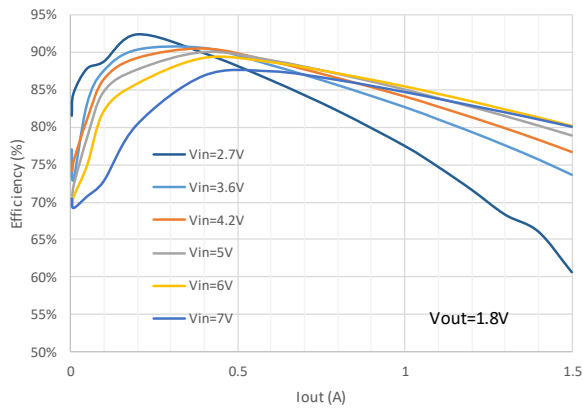
PIN #	NAME	DESCRIPTION
1	EN	Enable pin for the IC. Drive this pin high to enable the part, low to disable.
2	GND	Ground
3	SW	Inductor Connection. Connect an inductor Between SW and the regulator output.
4	IN	Supply Voltage. Bypass with a 10 $\mu$ F ceramic capacitor to GND
5	FB	Feedback Input. Connect an external resistor divider from the output to FB and GND to set the output to a voltage between 0.6V and VIN

## TYPICAL CHARACTERISTICS

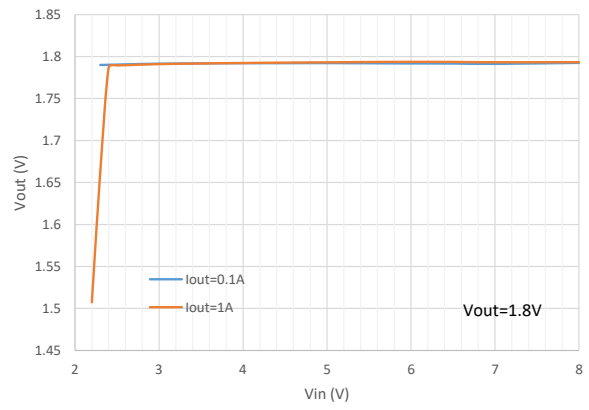
(Typical values are at  $T_A = 25^\circ\text{C}$  unless otherwise specified.)



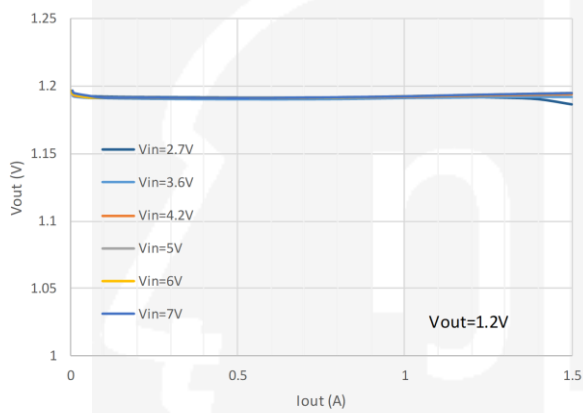
Efficiency Vs. Output Current



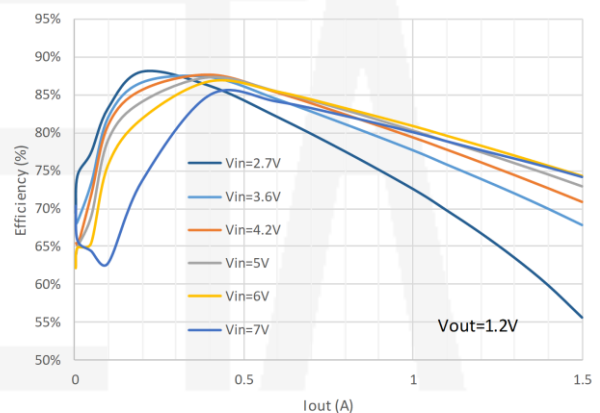
Output Voltage Vs. Input Voltage



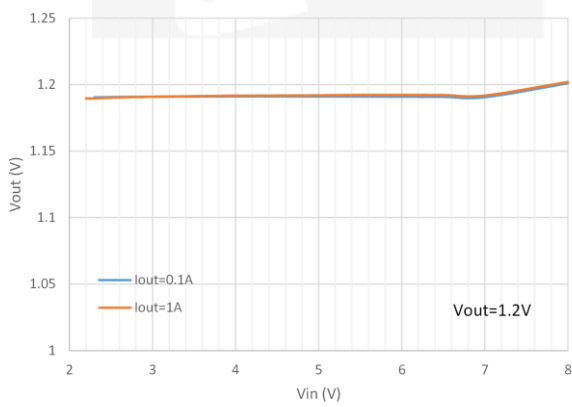
Output Voltage Vs. Output Current



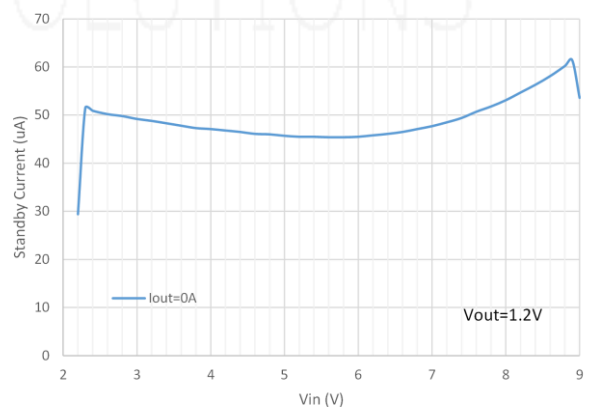
Efficiency Vs. Output Current



Output Voltage Vs. Input Voltage



Standby Current Vs. Input Voltage



## APPLICATION INFORMATION

### FUNCTION DESCRIPTION

The ETA3496 high efficiency switching regulator is a small, simple, DC-to-DC step-down converter capable of delivering up to 1.2A of output current. The device operates in pulse-width modulation (PWM) at 1.2MHz from a 2.6V to 7.2V input voltage and provides an output voltage from 0.6V to VIN, making the ETA3496 ideal for on-board post-regulation applications. An internal synchronous rectifier improves efficiency and eliminates the typical Schottky free-wheeling diode. Using the on resistance of the internal high-side MOSFET to sense switching currents eliminates current-sense resistors, further improving efficiency and cost.

### Loop Operation

ETA3496 uses a PWM current-mode control scheme. An open-loop comparator compares the integrated voltage-feedback signal against the sum of the amplified current-sense signal and the slope compensation ramp. At each rising edge of the internal clock, the internal high-side MOSFET turns on until the PWM comparator terminates the on cycle. During this on-time, current ramps up through the inductor, sourcing current to the output and storing energy in the inductor. The current mode feedback system regulates the peak inductor current as a function of the output voltage error signal. During the off cycle, the internal high-side P-channel MOSFET turns off, and the internal low-side N-channel MOSFET turns on. The inductor releases the stored energy as its current ramps down while still providing current to the output.

### Current Sense

An internal current-sense amplifier senses the current through the high-side MOSFET during on time and produces a proportional current signal, which is used to

sum with the slope compensation signal. The summed signal then is compared with the error amplifier output by the PWM comparator to terminate the on cycle.

### Current Limit

There is a cycle-by-cycle current limit on the high-side MOSFET. When the current flowing out of SW exceeds this limit, the high-side MOSFET turns off and the synchronous rectifier turns on. ETA3496 utilizes a frequency fold-back mode to prevent overheating during short-circuit output conditions. The device enters frequency fold-back mode when the FB voltage drops below 200mV, limiting the current to  $I_{PEAK}$  and reducing power dissipation. Normal operation resumes upon removal of the short-circuit condition.

### Soft-start

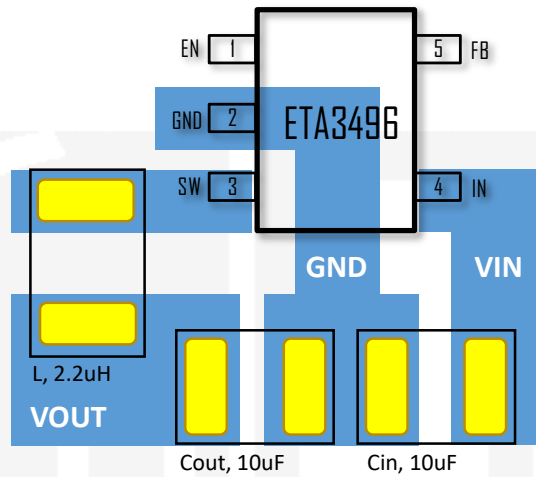
ETA3496 has an internal soft-start circuitry to reduce supply inrush current during startup conditions. When the device exits under-voltage lockout (UVLO), shutdown mode, or restarts following a thermal-overload event, the soft-start circuitry slowly ramps up current available at SW.

### UVLO and Thermal Shutdown

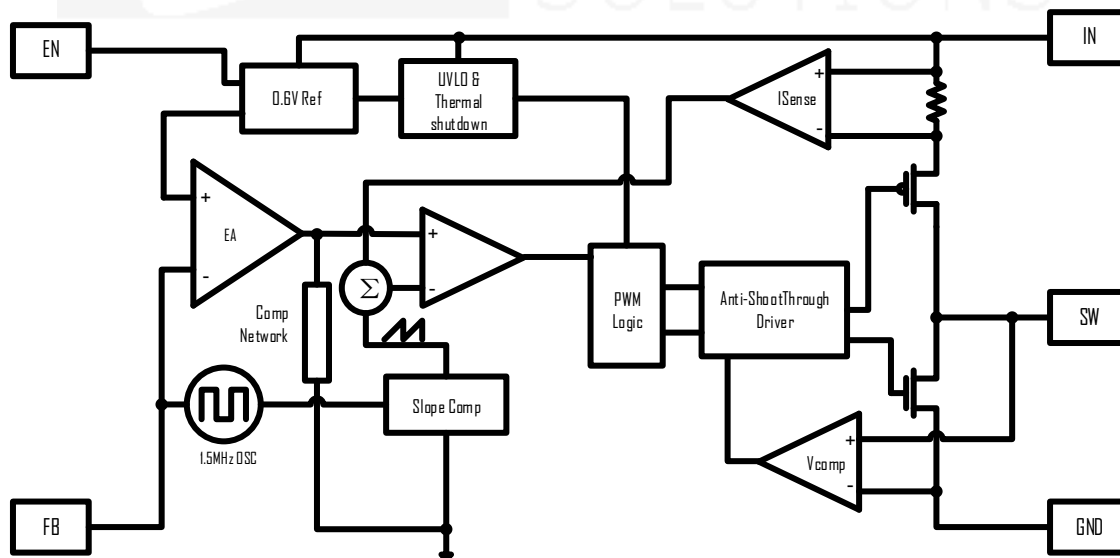
If IN drops below 2.3V, the UVLO circuit inhibits switching. Once IN rises above 2.5V, the UVLO clears, and the soft-start sequence activates. Thermal-overload protection limits total power dissipation in the device. When the junction temperature exceeds  $T_J = +160^{\circ}\text{C}$ , a thermal sensor forces the device into shutdown, allowing the die to cool. The thermal sensor turns the device on again after the junction temperature cools by  $15^{\circ}\text{C}$ , resulting in a pulsed output during continuous overload conditions. Following a thermal-shutdown condition, the soft-start sequence begins.

## PCB GUIDELINES

Please place the input capacitor as close to the chip as possible. And try to keep the GND traces in a “star shape” connection, which is to have the ground of input capacitor, the ground of output capacitor, and the ground of the chip (Pin 2) to just join at one point. A PCB guide is shown below:

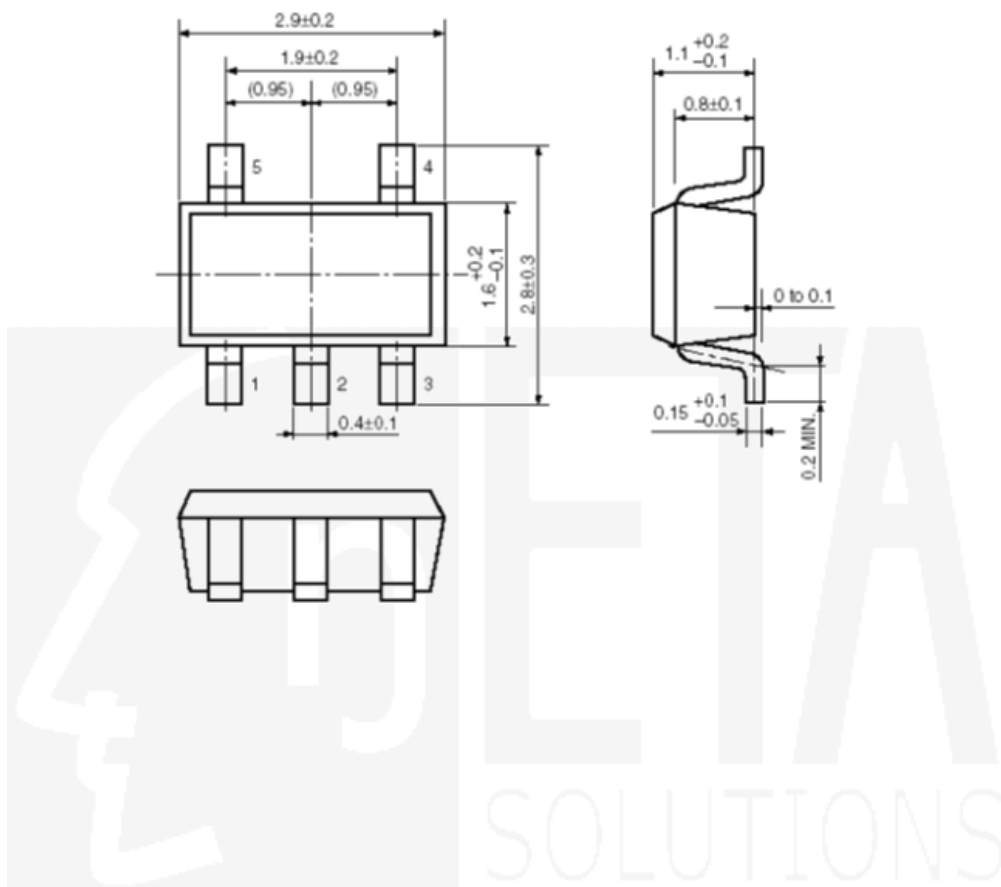


## BLOCK DIAGRAM



## PACKAGE OUTLINE

Package: SOT23-5



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