



# ACE708C

**0.85V startup, 1MHz, 300mA I<sub>out</sub>, Low I<sub>q</sub>, Synchronous Boost Converter**

## Description

The ACE708C is a step-up converter that provides a boosted output voltage from a low voltage source. Because of its proprietary design, it starts up at a very low input voltage down to 850mV, and only consume 15uA at standby, making it an ideal choice for single cell alkaline/NiMH battery operations.

A switching frequency of 1MHz minimizes solution footprint by allowing the use of tiny, low profile inductors and ceramic capacitors. The current mode PWM design is internally compensated, reducing external parts count.

## Features

- Up to 95% Efficiency
- Typical 15uA standby current
- 1MHz Switching Frequency allows small inductor and output cap
- Input boost-strapping allows using small or no input cap
- Low Vin Start-up Voltage down to 850mV Ideal for Single Alkaline Cell operations
- Maximum Output Current up to 300mA
- Low Noise PWM control
- Internally Compensated Current Mode Control
- Internal Synchronous Rectifier
- Logic Control Shutdown ( $I_Q < 1\mu A$ )

## Application

- One to Three Cell Battery Operated Devices
- Medical Instruments
- Bluetooth Headsets
- Flash-Based MP3 Players
- Noise Canceling Headphones

## Absolute Maximum Ratings

Parameter	Max	Unit
SW Voltage	-0.3~6	V
EN, FB, OUT Voltage	-0.3~6	V
Junction to Ambient Thermal Resistance	190	°C/ W
Maximum Power Dissipation	0.45	W
Operating Temperature Range	-40~150	°C
Storage Temperature	-55~150	°C

Note: Exceed these limits to damage to the device.

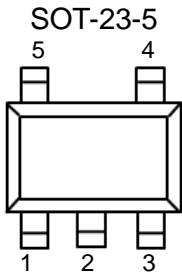
Exposure to absolute maximum rating conditions may affect device reliability.



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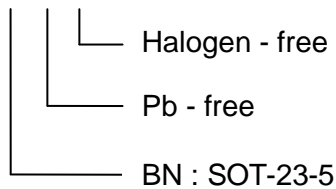
## Packaging Type



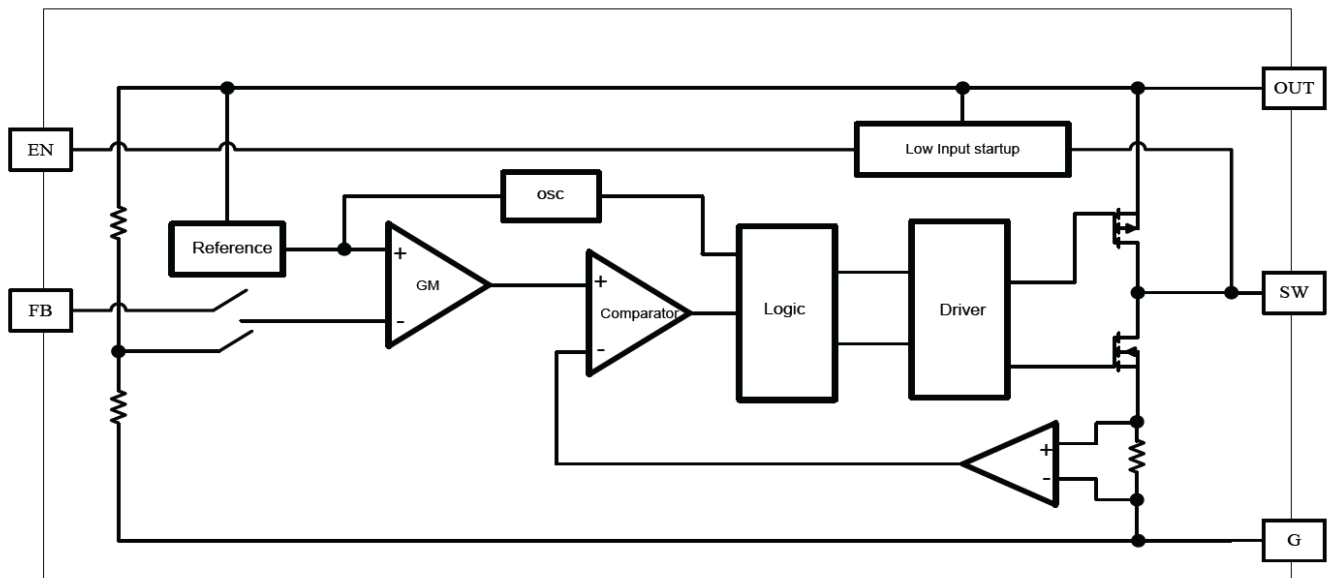
SOT-23-5	Description
1	FB
2	GND
3	EN
4	SW
5	OUT

## Ordering information

ACE708C XX + H



## Block Diagram





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## Detail Description

ACE708C is a low input voltage start up, current mode dc-dc step up converter. It's operation can be best understood by referring to the block diagram. Upon starting up, the low voltage startup circuitry drives SW with on-off cycles, transferring energy from input to OUT by storing energy in the inductor during on-time and releasing it to the output during off-time. When OUT reaches 2V, the startup circuit turns off and the main controller takes over. The main control loop consists of a reference, a GM error amplifier, a PWM controller, a current sense amplifier, an oscillator, a PWM logic control, and it is power stage including its driver. The main control loop is a classic current mode control loop. The GM stage integrates the error between FB and REF, and its output is used to compare with a triangular wave which the summing result of the current sense amplifier output and a slope compensation voltage. The output of the comparator is used to drive the power stage to reach regulation.

## Application Information

### Output Voltage selection

The output voltages can be set by connecting FB to OUT, to G or to the midpoint of a resistor divider connected to OUT. See below table for details.

FB=G	$V_{OUT}=5.0V$
FB=OUT	$V_{OUT}=3.3V$
FB to resistor divider	$V_{OUT}=0.6V(1+R1/R2)$

### Inductor selection

With switching frequency up to 1MHz, small surface mount inductors can be used with values from 2.2uH to 4.7uH. For a given chosen inductor value and application conditions make sure the peak inductor current does not exceed the maximum current rating of the selected vendor's inductor.

### Input and output capacitor selection

The ACE708C's bootstrap architecture allows the use of very small input capacitor. For applications that only need to drive small output load current, the input capacitor is optional, because once output is started up, the IC's is powered by OUT, a quiet power supply.

The output capacitor is used to stabilize the loop and provide ac current to the load. A low ESR ceramic cap with values from 2.2uF to 22uF can be used. Smaller value capacitors are generally cheaper with small footprints, while larger capacitor provides lower ripples and better transient load responses. Also, when extreme low startup voltage is needed, larger output capacitors are needed for the part to startup under heavy load condition.



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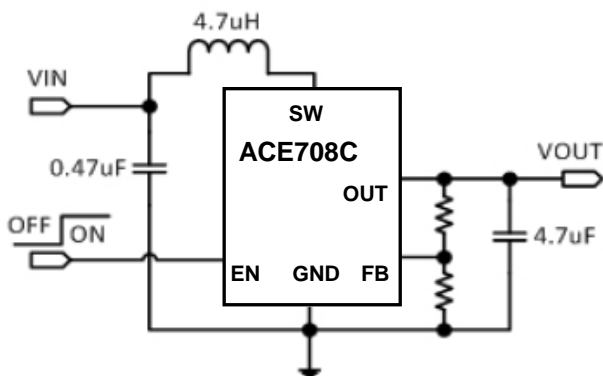
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## Electrical Characteristics

Test condition:  $V_{in}=1.8V$ ,  $V_{out}=3.3V$ ,  $T_A=25^{\circ}C$ , unless otherwise specified.

Parameter	Test Conditions	Min	Typ	Max	Unit
Minimum Input Voltage			0.7		V
Startup Voltage			0.85	1.1	V
Dropout Voltage, $V_{out} \geq 2.8V$	FB=OUT	3.2	3.3	3.4	V
	FB=G	4.85	5	5.15	V
FB Feedback Voltage	$V_{out}=2.5$ to $5V$	0.582	0.6	0.618	V
FB Input Current				50	nA
Output Voltage Range	External divider	2.5		5.0	V
Quiescent Current at OUT	$V_{FB}=0.7V$		10	20	$\mu A$
Shutdown Supply Current at OUT	EN=G		0.1	1	$\mu A$
NMOS Switch On Resistance	$I_{sw}=100mA$		0.3		$\Omega$
PMOS Switch On Resistance	$I_{sw}=100mA$		0.7		$\Omega$
NMOS Switch Current Limit		1			A
SW Leakage Current	$V_{out}=5.5V$ , $V_{sw}=0$ or $5.5V$ , EN=G			1	$\mu A$
EN Input Current				1	$\mu A$
EN Input Voltage for "Low"				0.3	V
EN Input Voltage for "High"		0.6			V

## Typical Application Circuit



Note: Input capacitor ( $C_{in}=0.47\mu F$ ) and Output capacitor ( $C_{out} \geq 4.7\mu F$ ) are recommended in all application circuit.

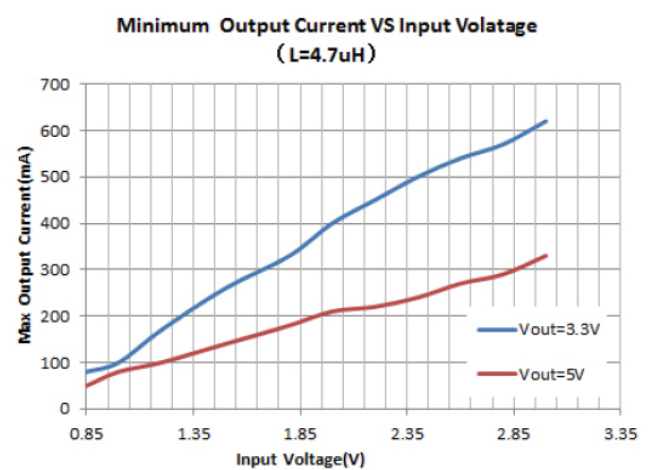
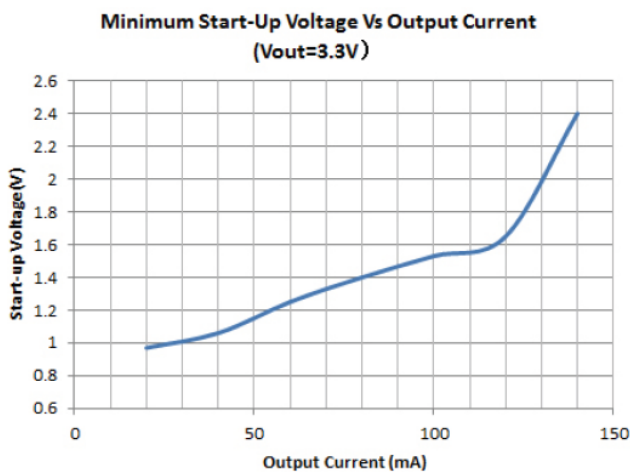
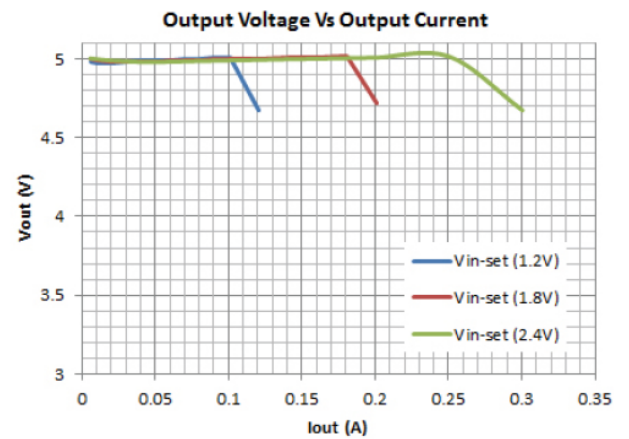
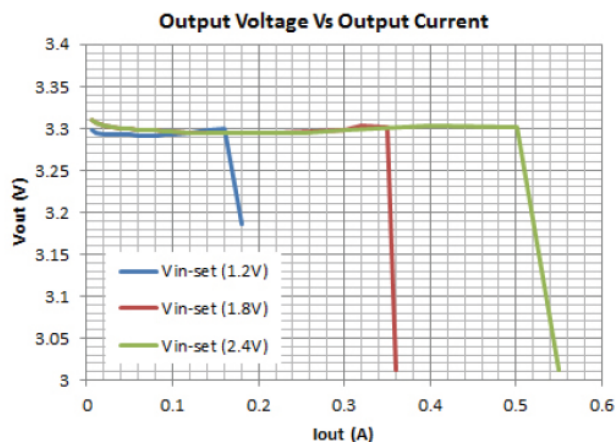
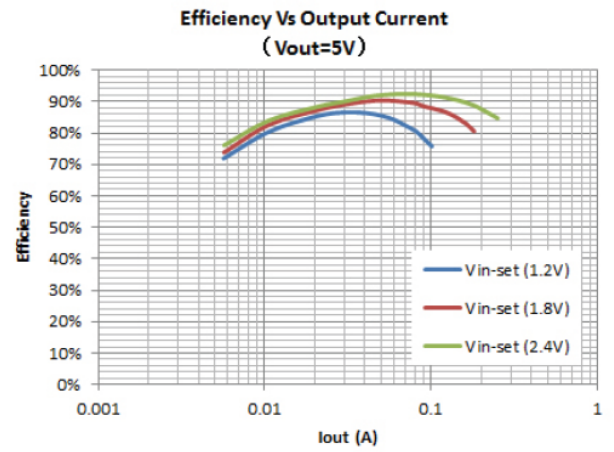
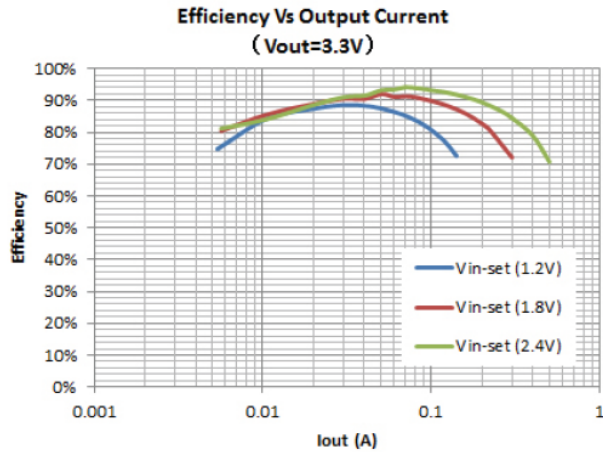


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## Typical Performance Characteristics

Typical values are tested at T<sub>A</sub>=25°C, unless otherwise specified.





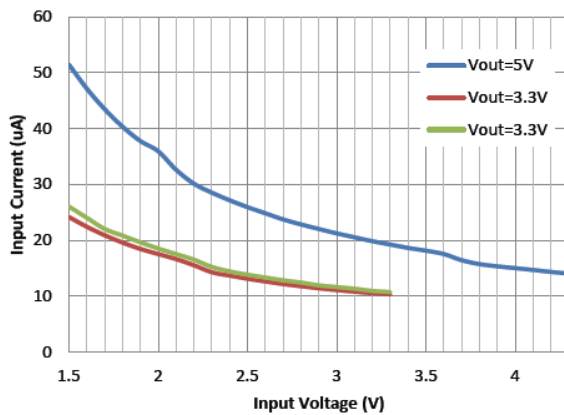
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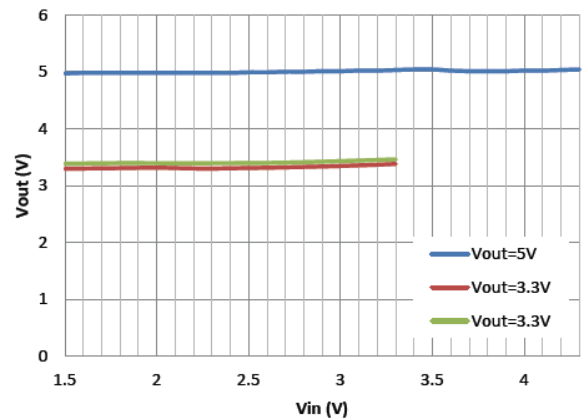
## Typical Performance Characteristics

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Input Current Vs. Input voltage  
at Zero Load



Output Voltage Vs. Input Voltage  
at Zero Load



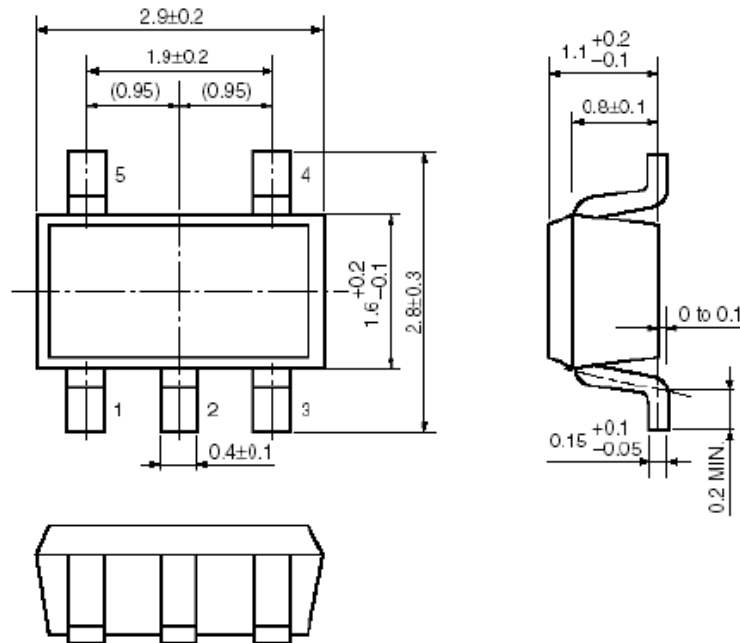


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### Packing Information

#### SOT-23-5





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### Notes

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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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