



High-Performance Power ICs and Hall-Effect Sensors

## *A8698 and A8697: 25 V Input, 3 or 4 Amp Output Step-Down Regulators*



*Power Management  
Business Unit*

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## A8698 - Wide Input Voltage 3.0A Step Down Regulator

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*Datasheets are on the  
Allegro Website*



## What are the products?

- The A8698 and A8697 are constant off-time current mode step-down regulators with a wide input voltage range.
- Regulation voltage is set by external resistors, to output voltages as low as 0.8 V.
- Integrated power DMOS switch to reduce the total solution footprint.
- The A8698 and A8697 are supplied in a low-profile 8-lead SOIC with exposed pad (package LJ) and are rated to “E” ambient temperature code of -40 to +85C.



## Target Markets and Applications

Applications with 8-25 V input voltage range needing a buck regulator for up to 3A or 4A output current. For example:

- Consumer equipment power
- Networking equipment power
- 12 V lighter-powered applications (portable DVD, etc)
- Point of Sale (POS) applications
- Set-top boxes
- HVAC controls

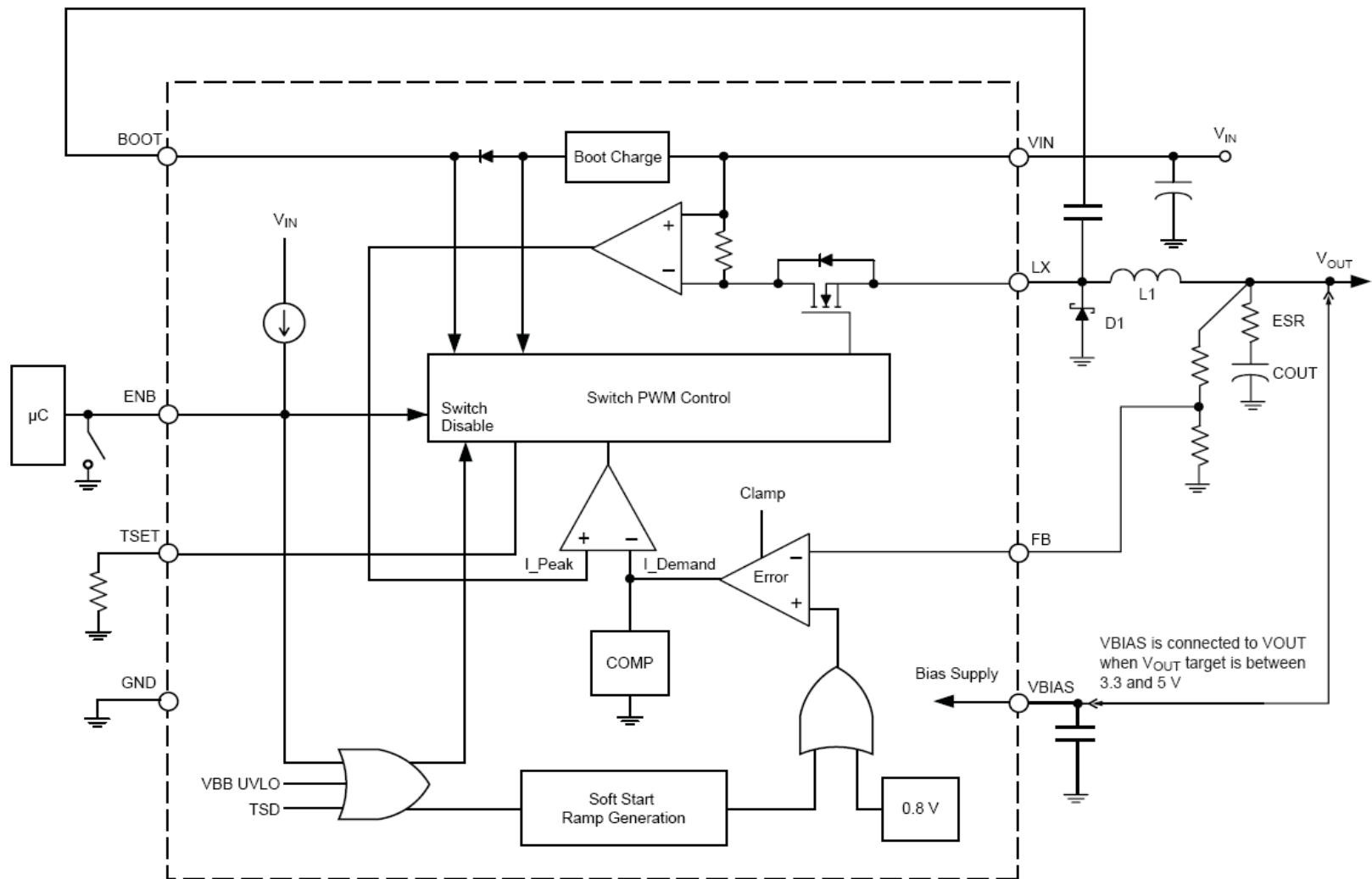


## Features

- 8-25V Input Voltage Range
- Integrated DMOS Switch ---- 180 mOhm  $R_{ds(on)}$
- Adjustable Fixed off-time ---- External R sets up  $T_{off}$
- Adjustable output voltage down to 0.8V, set by voltage divider
- Pulse skipping mode at light load for higher efficiency
- High efficiency curve across output current
- Logic level enable pin to put part in low quiescent current mode
- eSOIC-8 package



## Block Diagram





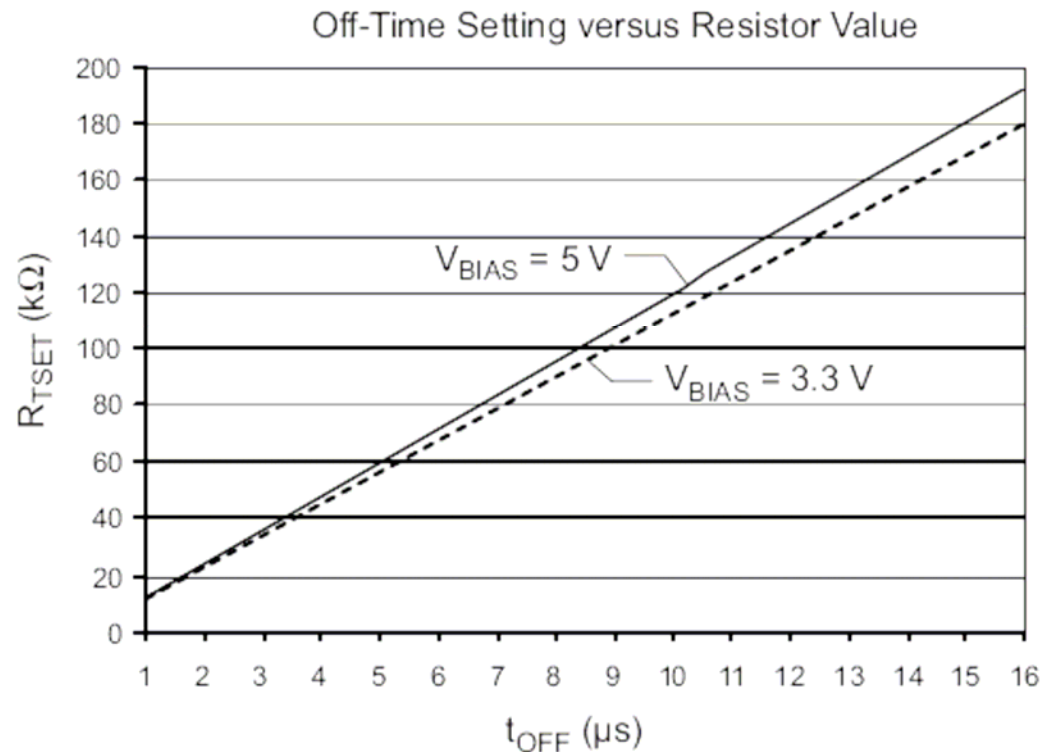
## Toff and Frequency Setup

- Toff time is setup by external resistor

$$T_{off} = \frac{R_{set} (1 - 0.03V_{bias})}{12 \times 10^9}$$

$$T_{on} = \frac{(V_{out} + V_f + I_{out} \cdot R_L) \cdot T_{off}}{(V_{in} - I_{out} \cdot R_{DS(on)} - I_{out} \cdot R_L - V_{out})}$$

$$f_{sw} = \frac{1}{T_{on} + T_{off}}$$





## Advanced Short Circuit Protection

- Current limit of the Buck switch : 3.5 when  $V_{FB} > 0.4V$ .  
1.15A when  $V_{FB} < 0.4V$ .
- $T_{off}$  is extended for low  $V_{out}$  at power up and in case of short to prevent loss of control of current limit.

VFB (V)	TSET Multiplier
$< 0.16$	$8 \times T_{off}$
$< 0.32$	$4 \times T_{off}$
$< 0.5$	$2 \times T_{off}$
$> 0.5$	$T_{off}$

Offtime multiplier vs. FB voltage



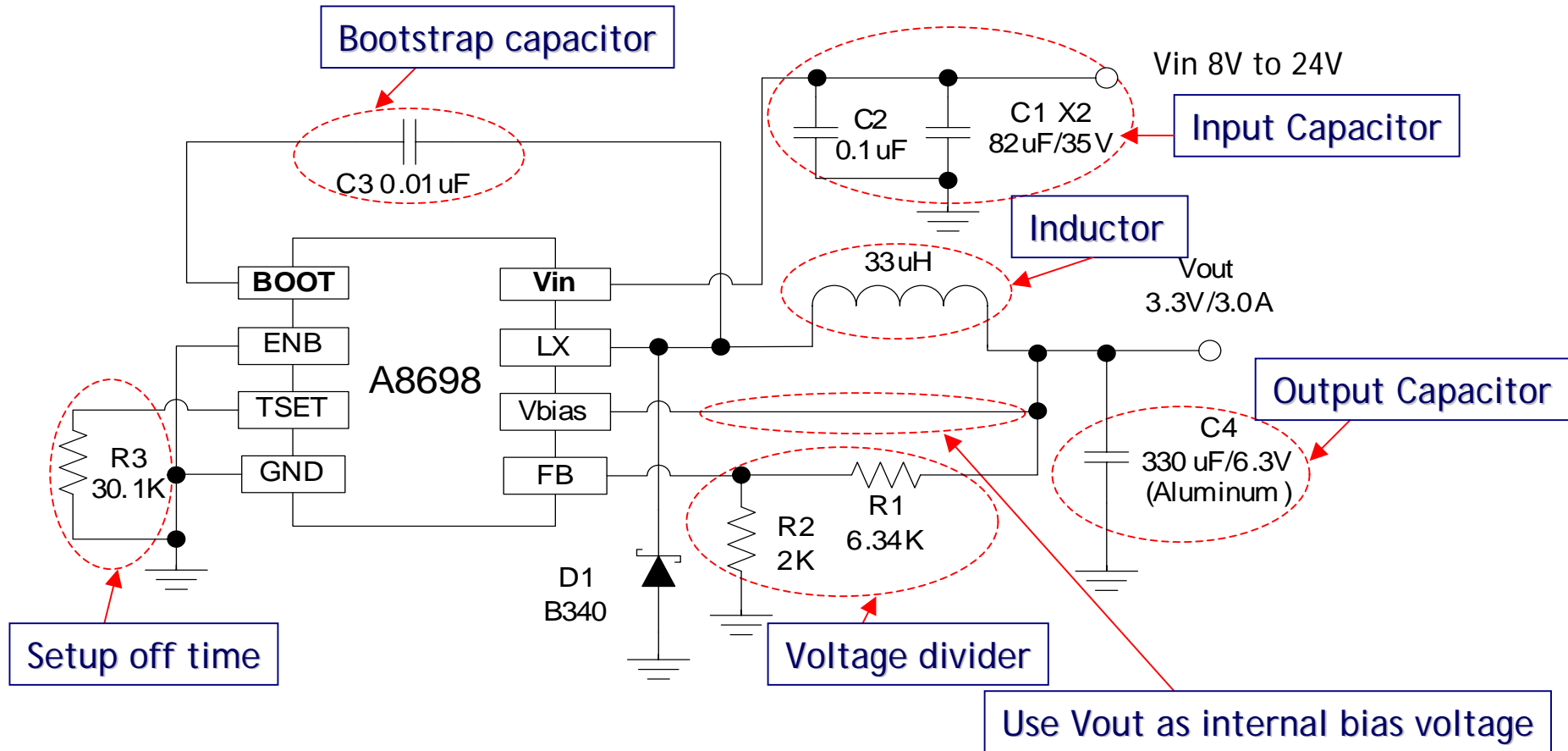


## Optional Vbias Connection

- Bias circuitry runs off  $V_{in}$  supply during start up
- Improved overall system efficiency by running Vbias off  $V_{out}$  (3.3~5.0V) during normal operation
- Connect Vbias to external voltage source
- No sequencing needed for normal operation



## Typical Application Circuit ---- EVB

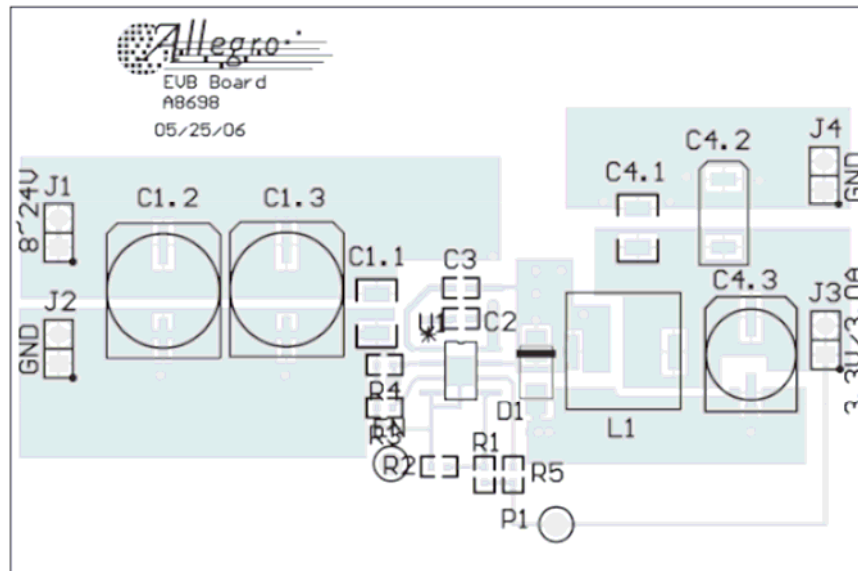


Step down to 3.3V @ 3A

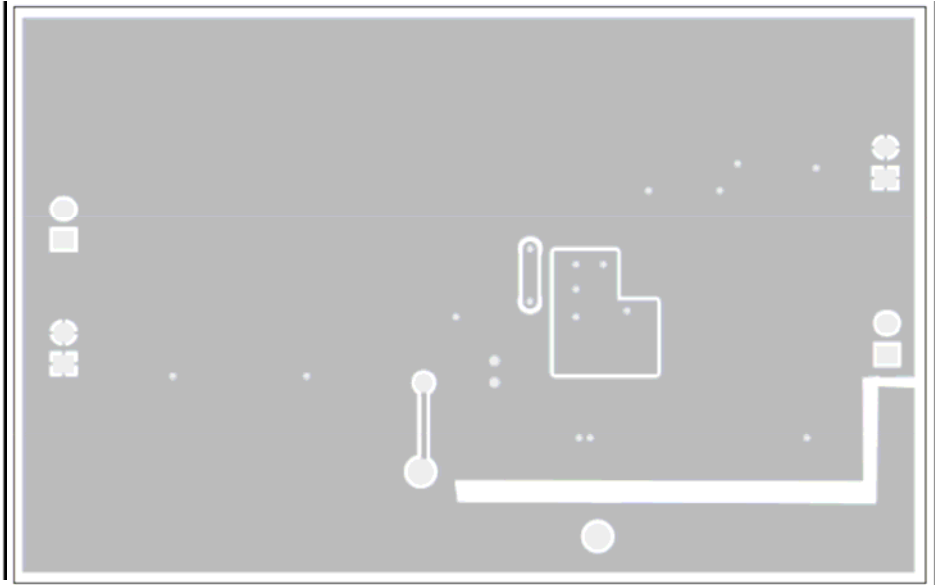


## Typical Application Circuit ---- EVB Layout

Top & silkscreen

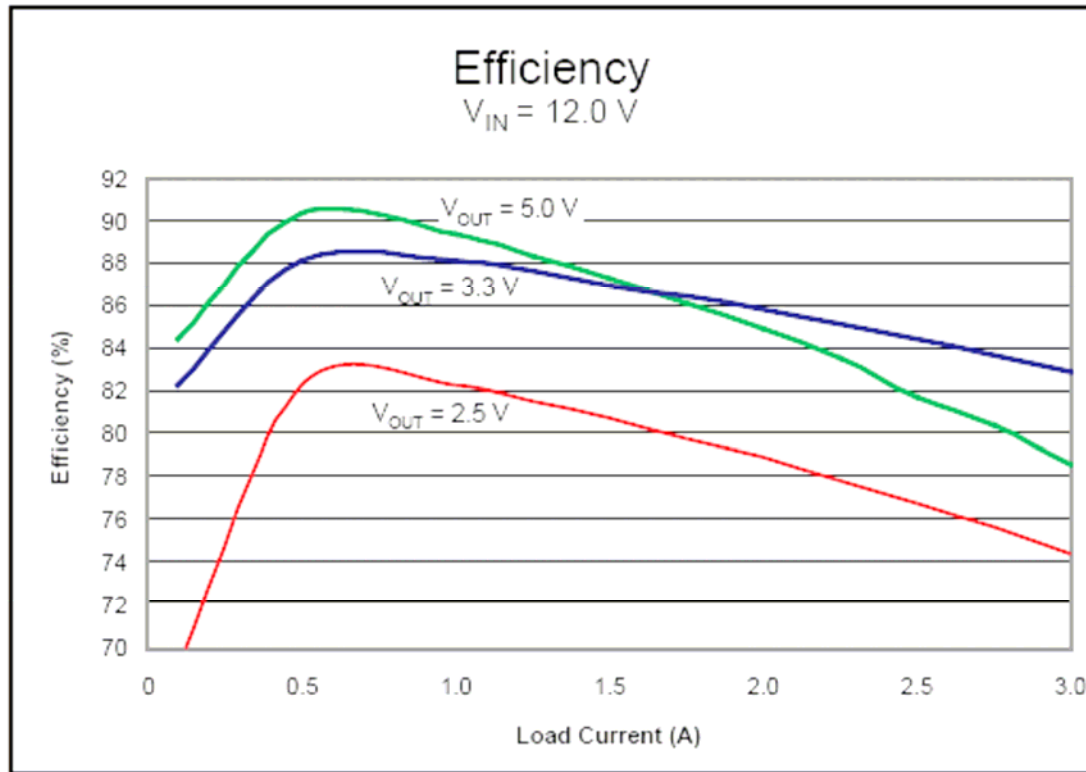


Bottom





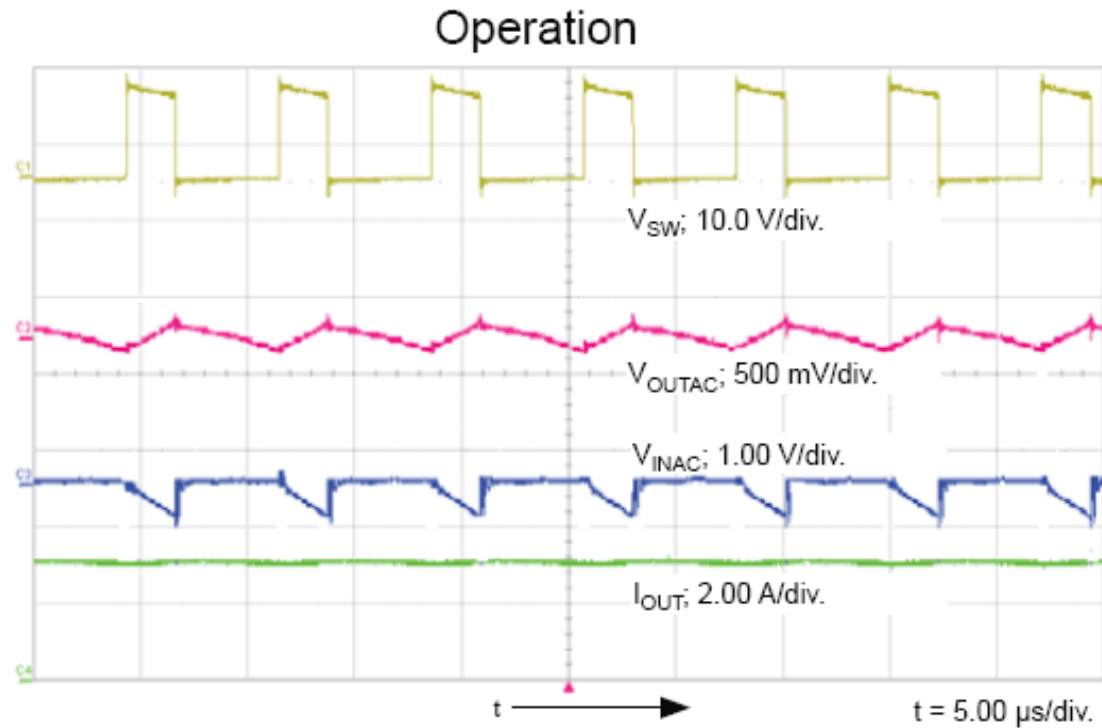
## Performance ---- Efficiency



Efficiency is as high as 91%.



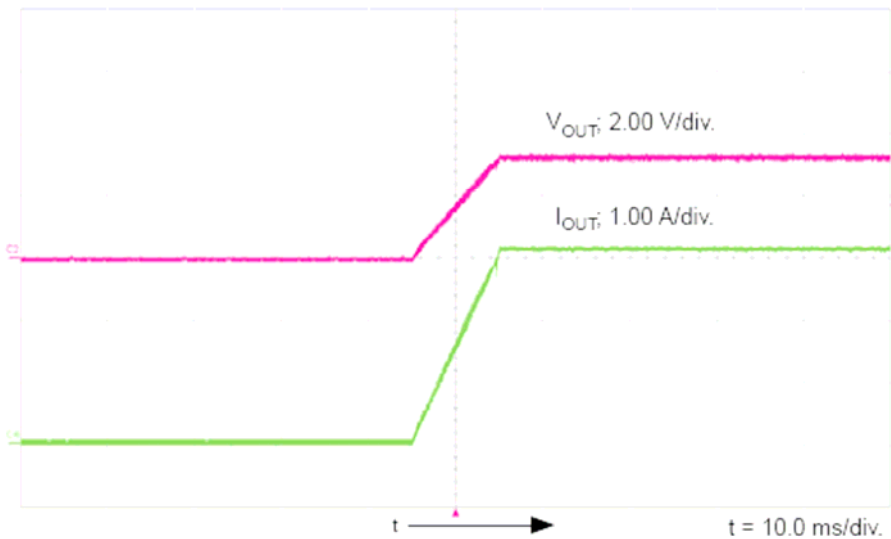
## Performance ---- Ripple & Switching Waveform



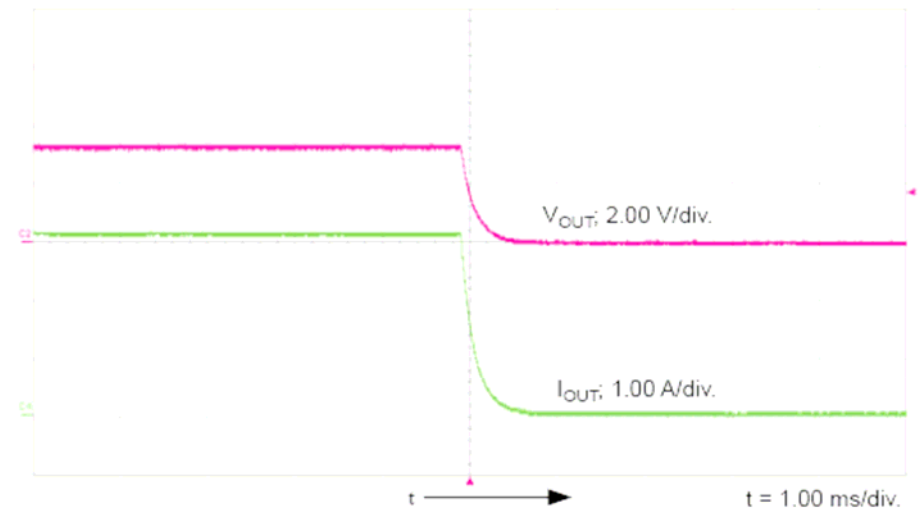


## Performance ---- Start-up & Power Off

Start-up



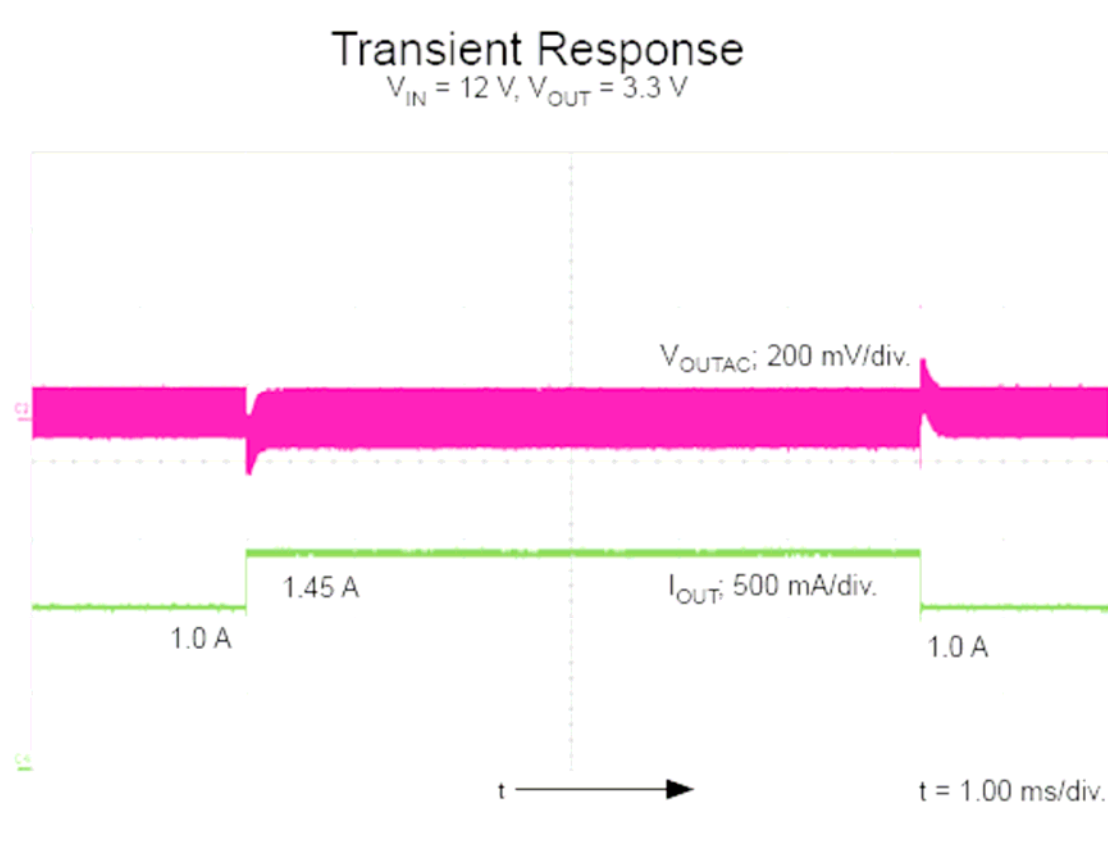
Power Off





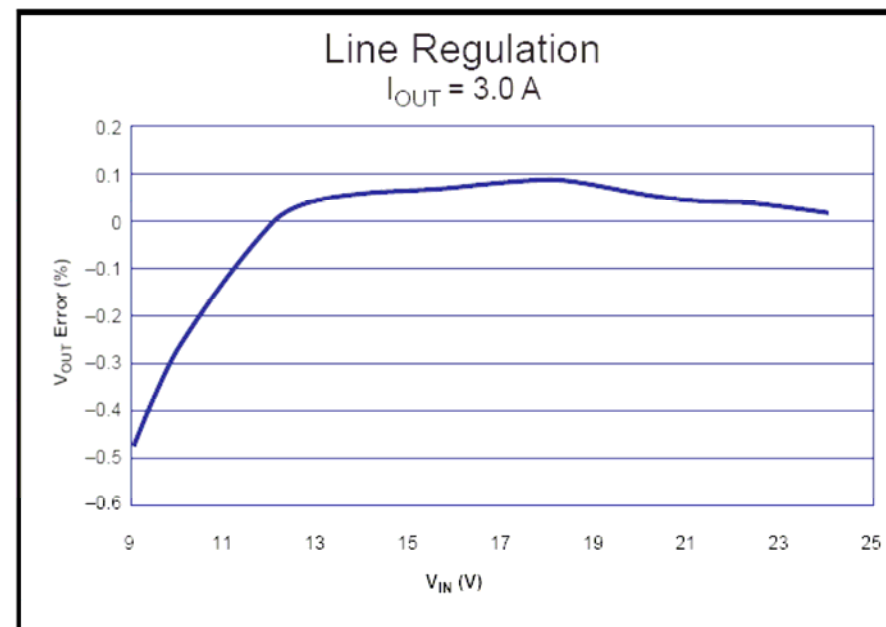
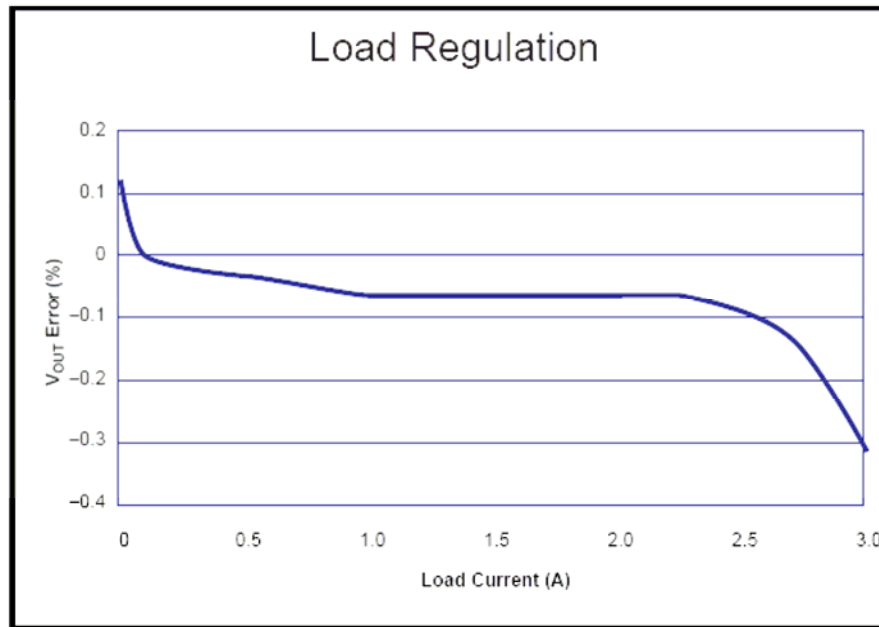


## Performance ---- Transient Response





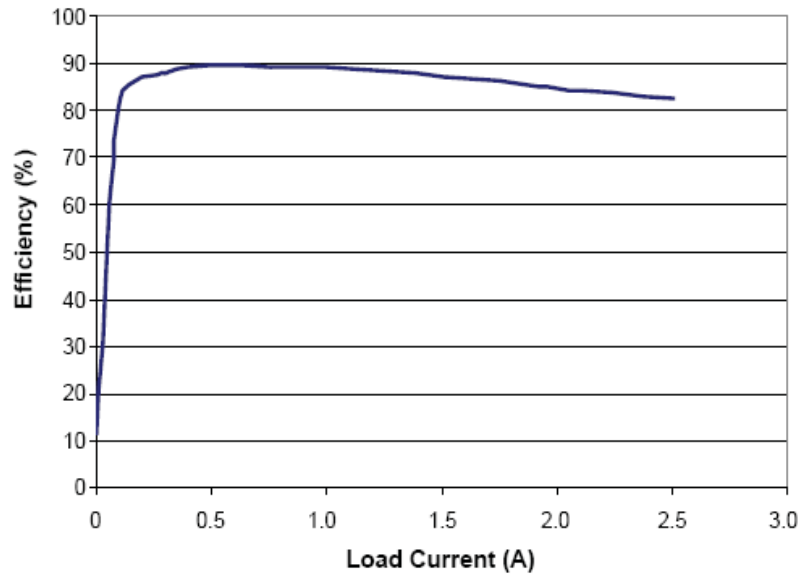
## Performance ---- Load & Line Regulation



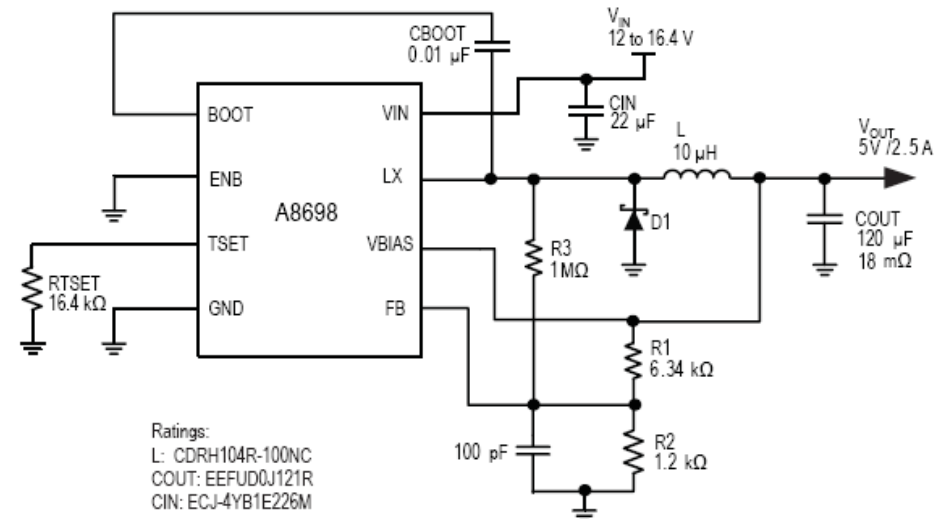


# Low ESR Capacitor Application

Efficiency versus Load Current  
Stabilized with low ESR capacitor;  $f_{SW} = 500 \text{ kHz}$



Circuit with low ESR capacitor

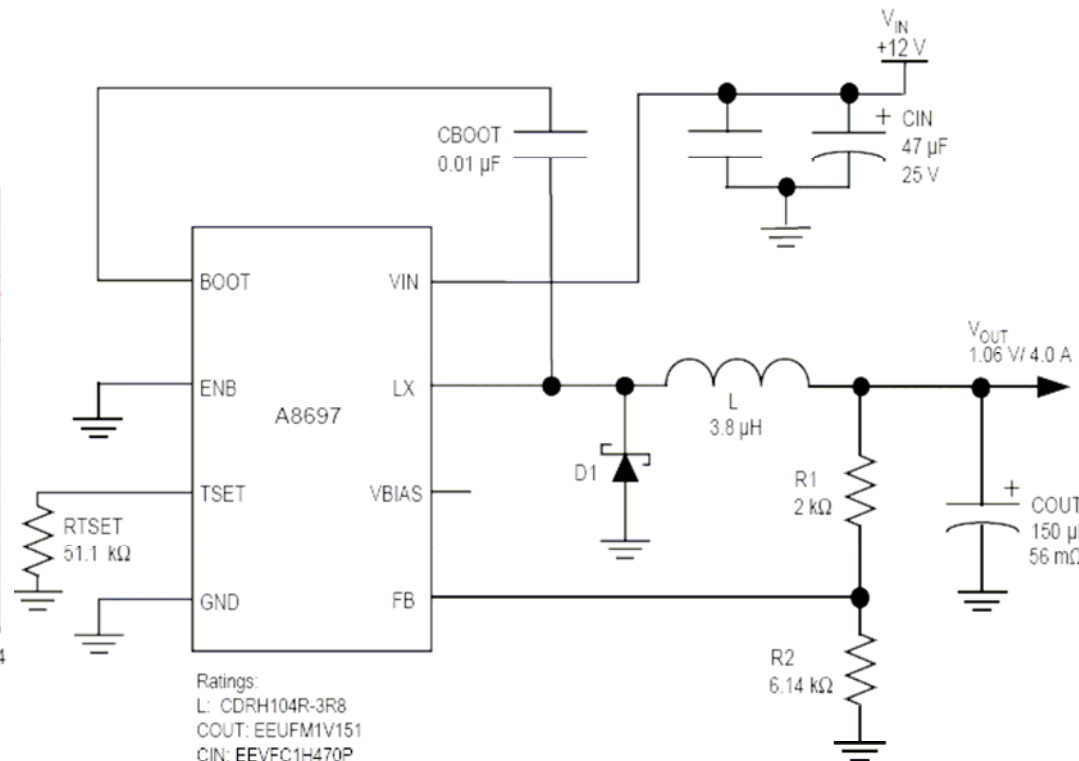
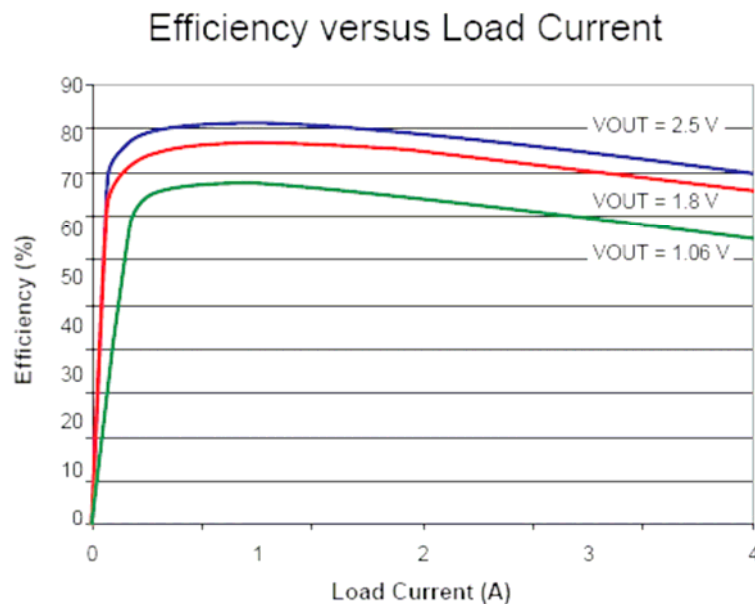


Low ESR capacitor (SP, POSCAP) can be used with RC ripple injection



# A8697 - Wide Input Voltage 4.0A Step Down Regulator

Higher current limit version of A8698

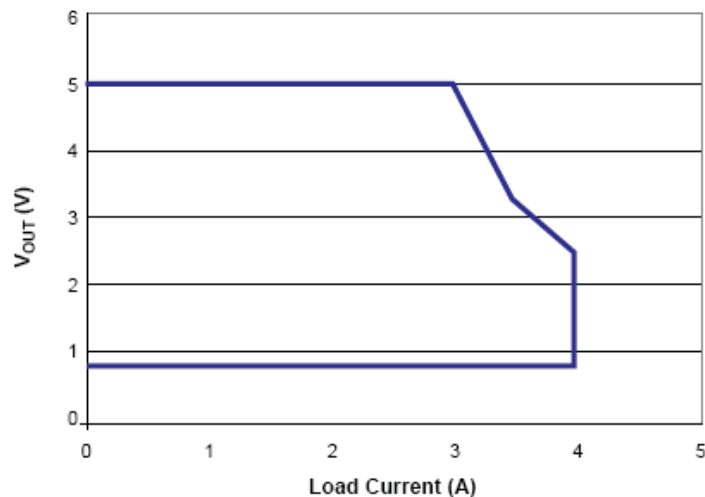


Circuit for 12 V step down to 1.06 V at 4 A



## A8697 ---- Maximum Load Current Derating w/ I<sub>OUT</sub>

Maximum Load Current  
Using Allegro A8698 Evaluation Board\*



\*To test maximum load current, the A8697 IC was mounted on an A8698 Evaluation Board (see next page), and a thermocouple attached to the IC case to measure  $T_C$ . The assembly was placed in an environmental chamber in still air. The initial air temperature in the chamber temperature was  $60^{\circ}\text{C}$  ( $T_A$ ), and during the test,  $I_{OUT}$  was adjusted until  $T_C = 115^{\circ}\text{C}$ .



## Sales Information

Full P/Ns: A8698ELJTR-T & A8697ELJTR-T Pb-Free, Tape/reel  
A8698ELJ-T & A8697ELJ-T Pb-Free, Tubes

Standard pack: 3,000pcs per Reel, 98 pcs per Tube

Samples and Evaluation Boards Available