DESCRIPTION

The A7508 is a synchronous, fixed frequency, step-up DC/DC converters delivering high efficiency in a 6-lead SOT package. Capable of supplying 5V at 800mA from a Lithium Battery input, the devices contain an internal NMOS switch and PMOS synchronous rectifier.

A switching frequency of 1.3MHz 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. The A7508 features automatic shifting to power saving PFM Mode operation at light loads. Antiringing control circuitry reduces EMI concerns by damping the inductor in discontinuous mode, and the devices feature low shutdown current of under 1μA.

The A7508 is available in SOT-26 Package

ORDER INFORMATION

Package Type	Part Number	
SOT-26	E6	A7508E6R-XXX
		A7508E6VR-XXX
Note	XXX=Output ,ADJ=Adjustable V: Halogen free Package R : Tape & Reel	
AiT provides all RoHS products Suffix " V " means Halogen free Package		

FEATURES

- Up to 93% Efficiency
- 1.3MHz Fixed Frequency Switching
- Internal Synchronous Rectifier
- 2.5V to 5V Output Range
- Automatic PFM/PWM Mode Operation
- Logic Controlled Shutdown (<1μA)
- Antiringing Control Minimizes EMI
- Tiny External Components
- Available in SOT-26 Package.

APPLICATION

- MP3/4 PMP
- Digital Camera
- LCD Bias Voltage
- Handheld Instruments
- Wireless Handsets
- GPS Receivers

TYPICAL APPLICATION

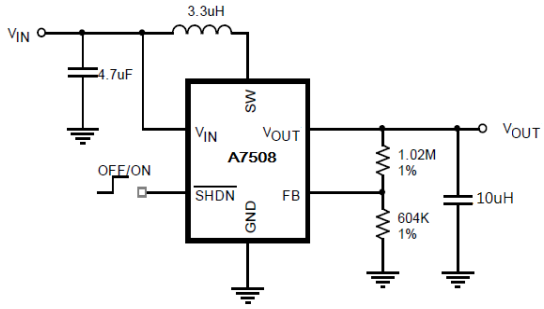


Figure 1. V_{OUT}=3.3V

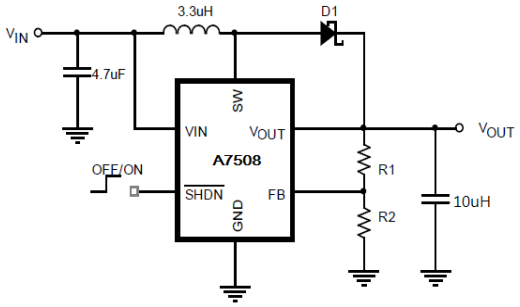
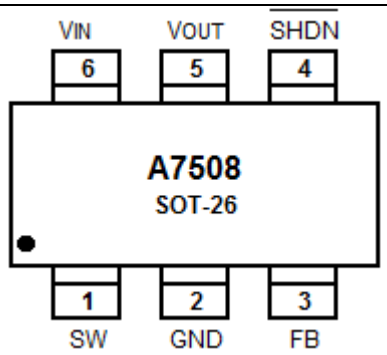


Figure 2.V_{OUT}>4.5V

PIN DESCRIPTION



Top View

Pin #	Symbol	Function
1	SW	Switch Pin
2	GND	Ground Pin
3	FB	Feedback Pin
4	$\overline{SHDN}$	Chip Enable pin. Active high. Internal pull high for auto start up
5	V_{OUT}	Output Pin
6	V_{IN}	Startup input Pin

ABSOLUTE MAXIMUM RATINGS

V_{IN}, Input Voltage		V_{SS}-0.3V ~ V_{SS}+6V
V_{SW}, Input Voltage		Vss-0.3V ~V_{IN}+0.6V
$V_{\overline{SHDN}}$,FB ,V_{OUT}, Input Voltage		V_{SS}-0.3V ~ V_{IN}+0.3 V
P_D, Power Dissipation	SOT-26	300mW
T_{OPR}, Operating Ambient Temperature		-40°C ~ +85°C
T_{STG}, Storage Temperature		-40°C ~ +125°C
T_{REFL}, Reflow Temperature(soldeing,10s)		250°C

Stresses above may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated in the Electrical Characteristics is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ELECTRICAL CHARACTERISTICS

V_{IN} =2.5V, V_{OUT}=3.3V, T_A = 25°C, unless otherwise specified.

Parameter	Conditions	Min	Typ.	Max	Unit
Minimum Start-Up Voltage	I_{LOAD} = 1mA		1.5		V
Output Voltage Adjust Range		2.5		5	V
Feedback Voltage		1.16	1.18	1.20	V
Feedback Input Current	V_{FB} = 1.18V		1		nA
Quiescent Current (Shutdown)	$V_{\overline{SHDN}}$ = 0V, Not Including Switch Leakage		0.01	1	uA
Quiescent Current (Active)	Measured On V_{OUT}		300	400	uA
NMOS Switch Leakage	V_{SW} = 5V		0.1	5	uA
PMOS Switch Leakage	V_{SW} = 0V		0.1	5	uA
NMOS Switch On Resistance	V_{OUT} = 3.3V		0.35		Ω
	V_{OUT} = 5.0V		0.2		Ω
PMOS Switch On Resistance	V_{OUT} = 3.3V		0.45		Ω
	V_{OUT} = 5.0V		0.3		Ω
NMOS Current Limit		1.5	2.0		A
Max Duty Cycle		75		85	%
Switching Frequency		1.1	1.3	1.5	MHz
$\overline{SHDN}$ input high		0.65			V
$\overline{SHDN}$ input low				0.5	V
$\overline{SHDN}$ input current	$V_{\overline{SHDN}}$ = 5.5V		0.1	1	uA

TYPICAL PERFORMANCE CHARACTERISTICS

Figure1. V_{OUT} VS Temperature
(V_{IN}=CE=2.5V,I_{LOAD}=30mA)

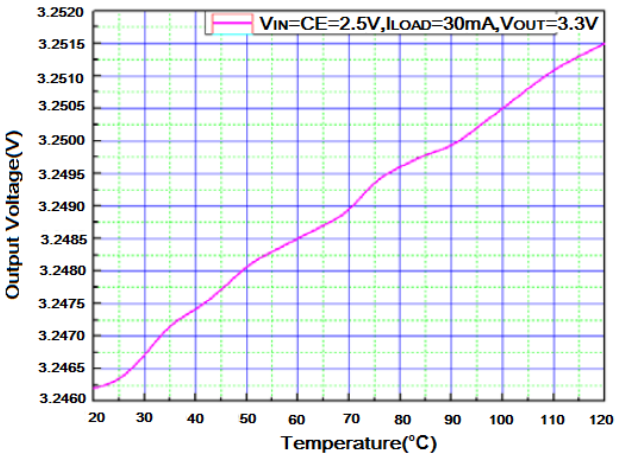


Figure2. Oscillation Frequency VS Temperature
(V_{IN}=CE=2.5V,I_{LOAD}=300mA)

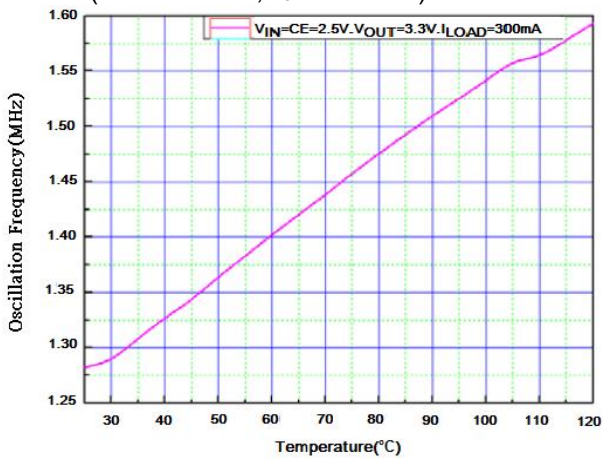


Figure3. Load Transient Response
(V_{IN}=CE=2.5V,V_{OUT}=3.3V,I_{LOAD}=0~400mA)

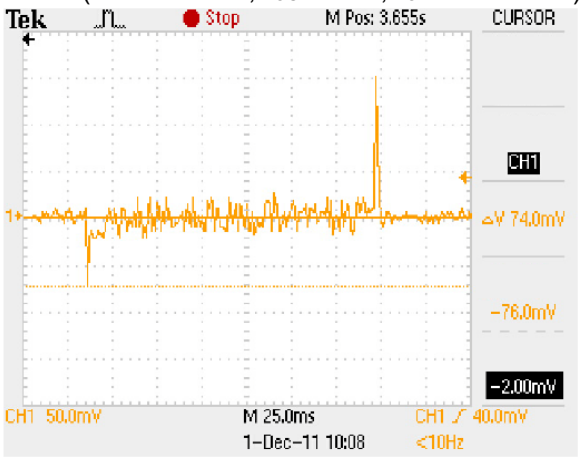


Figure4. Wave form in PWM Mode
(V_{IN}=2.5V,V_{OUT}=3.3V,I_{LOAD}=400mA)

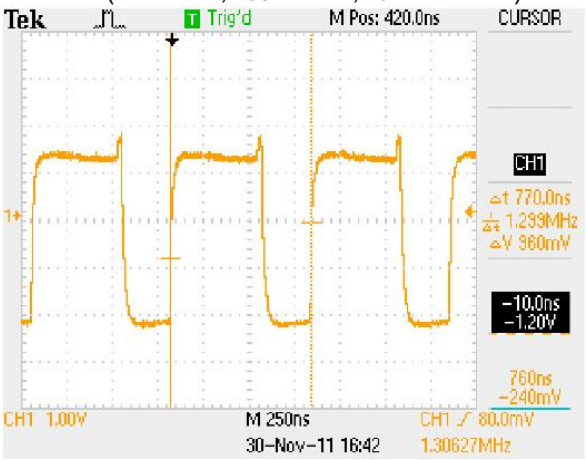
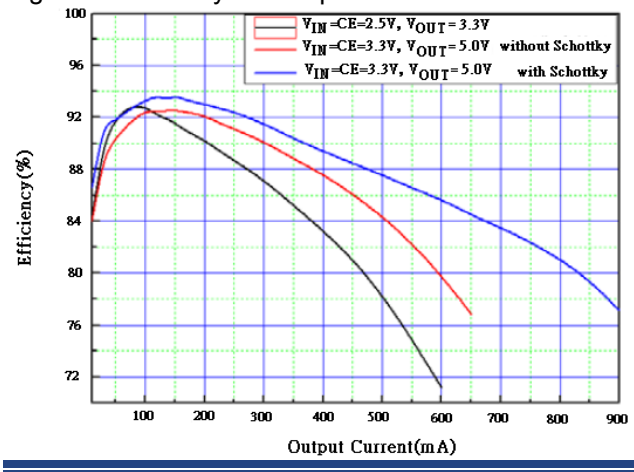
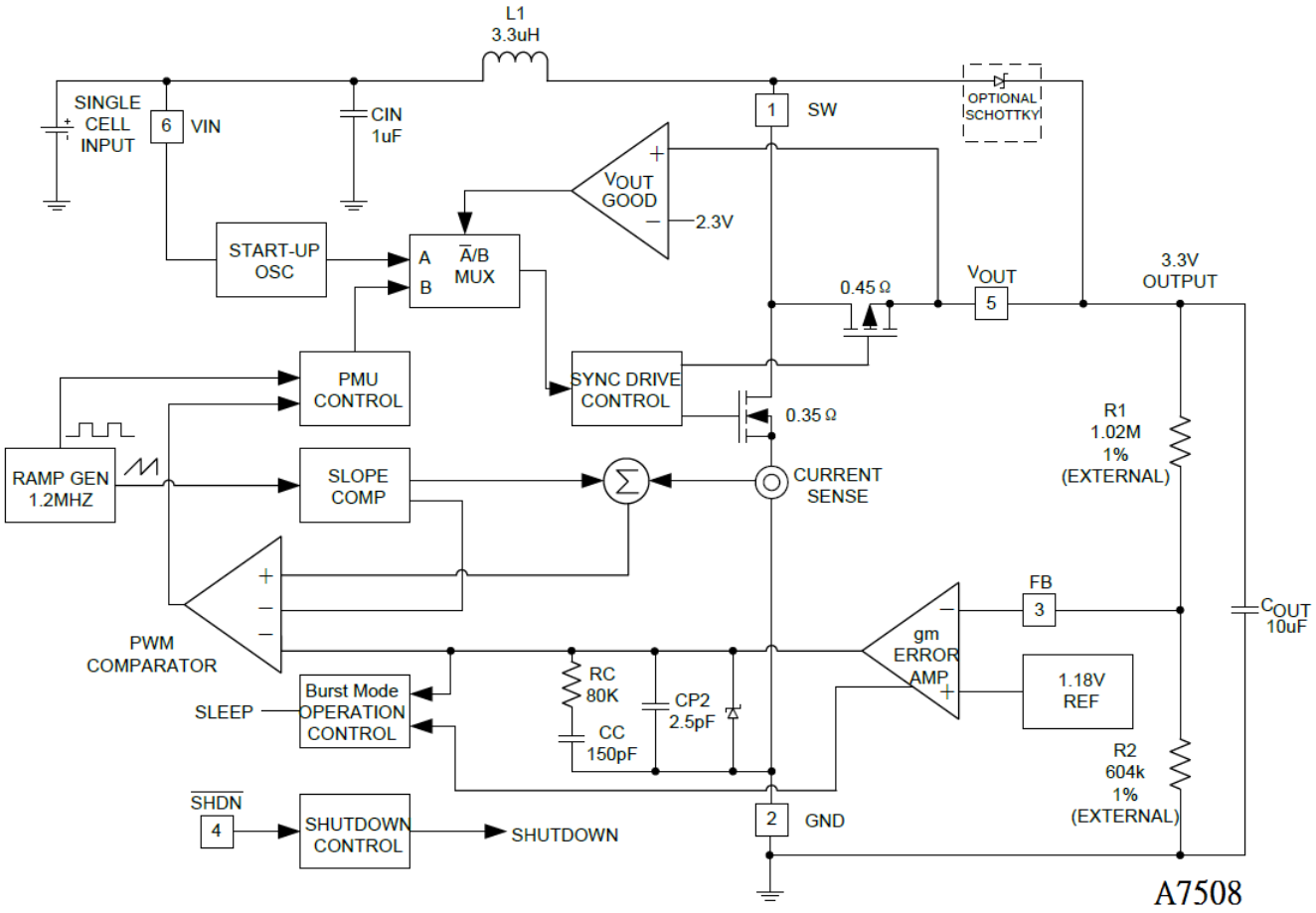


Figure5. Efficiency VS Output Current



BLOCK DIAGRAM



DETAILED INFORMATION

Operation

The A7508 are 1.3MHz, synchronous boost converters housed in SOT-26 package. The devices feature fixed frequency, current mode PWM control for exceptional line and load regulation. With its low $R_{DS(ON)}$ and gate charge internal MOSFET switches, the devices maintain high efficiency over a wide range of load current. Detailed descriptions of the three distinct operating modes follow. Operation can be best understood by referring to the Block Diagram.

Device Enable

The device starts to work when $\overline{SHUTDOWN}$ is higher than 0.65V. And it shuts down when $\overline{SHUTDOWN}$ is lower than 0.5V.In shutdown mode, the regulator stops switching, all internal control circuit is off and the load is disconnected from the input.

Error Amp

The error amplifier is an internally compensated transconductance type amplifier. The internal 1.18V reference voltage is compared with the voltage at the FB pin to generate an error signal at the output of the error amplifier.

Current Sensing

A signal representing NMOS switch current is summed with the slope compensator. The summed signal is compared to the error amplifier output to provide a peak current control command for the PWM. Peak switch current is limited to approximately 2.0A independent of input or output voltage.

Zero Current Comparator

The zero current comparator monitors the inductor current to the output and shuts off the synchronous rectifier once this current reduces to approximately 20mA. This prevents the inductor current from reversing in polarity improving efficiency at light loads.

APPLICATION INFORMATION

Setting the Output Voltage

The external voltage divider from V_{OUT} to GND programs the output voltage via FB from 2.5V to 5V according to the formula:

$$Vout = 1.18V \times (1 + \frac{R1}{R2})$$

Setting the Inductor

The inductor with 1.6A current rating and low DC resistance is recommended. The inductance value can be calculated from the following formula:

$$L = \frac{Vin \times (Vout - Vin)}{Vout \times \Delta IL \times fs}$$

Where ΔIL is the inductor current ripple. It is recommended the inductor current ripple to be around 30%~50% of the input current.

Setting the Input Capacitor

The input capacitor (C1) is required to maintain the DC input voltage. Ceramic capacitors with low ESR/ESL types are recommended. The input voltage ripple can be estimated by:

$$\Delta Vin = \frac{Vin}{8 \times fs^2 \times L \times C1} \times (1 - \frac{Vin}{Vout})$$

Typically, a 4.7μF X7R ceramic capacitor is recommended.

Setting the Output Capacitor

The output current to the step-up converter is discontinuous, therefore a capacitor is essential to supply the AC current to the load. Use low ESR capacitors for the best performance. Ceramic capacitors with X7R dielectrics are highly recommended because of their low ESR and small temperature coefficient. The output voltage ripple can be estimated by:

$$\Delta Vout = \frac{Vout}{C2 \times fs \times RL} \times (1 - \frac{Vin}{Vout})$$

Typically, a 10μF X7R ceramic capacitor is recommended.

RC Snubber Circuit

For applications with input voltages above 4.5V which could exhibit an overload or short-circuit condition, a RC Snubber circuit is required between the SW pin and GND. The recommended parameters are R3=2Ω, C5=1nF. The circuit can be seen in Figure 3.

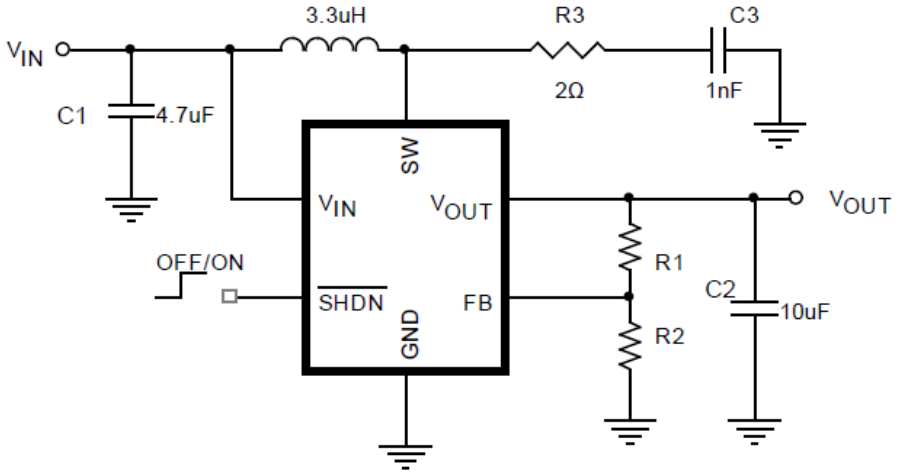
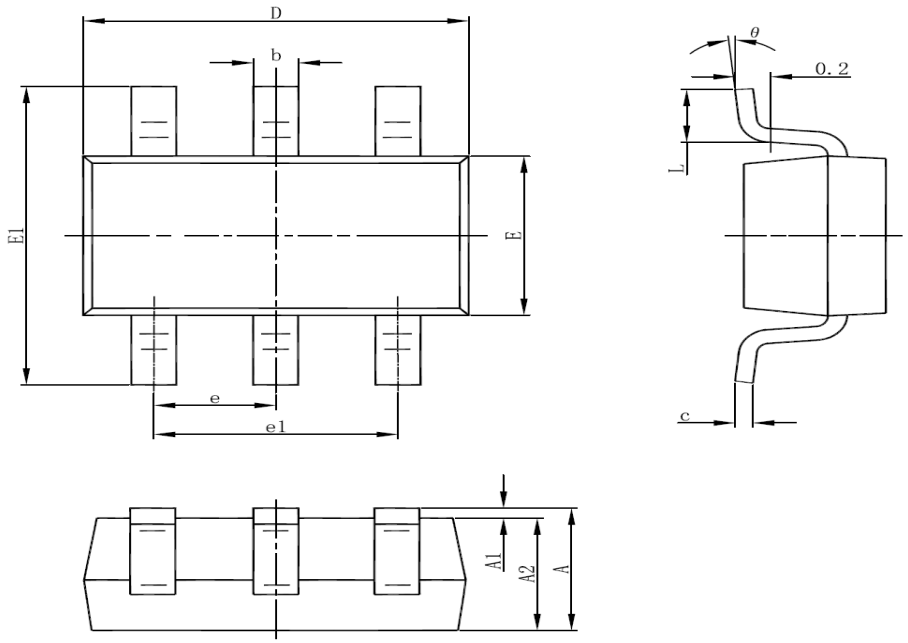


Figure 3.Vin>4.5V

PACKAGE INFORMATION

Dimension in SOT-26 (Unit: mm)



SYMBOL	MIN	MAX
A	1.050	1.250
A1	0.000	0.100
A2	1.050	1.150
b	0.300	0.500
c	0.100	0.200
D	2.820	3.020
E	1.500	1.700
E1	2.650	2.950
e	0.950(BSC)	
e1	1.800	2.000
L	0.300	0.600
θ	0°	8°

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