1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A

General Description

The AP3407/A is a 1.4MHz fixed frequency, current mode, PWM synchronous buck (step-down) DC-DC converter, capable of driving a 1.2A load with high efficiency, excellent line and load regulation. The device integrates synchronous P-channel and N-channel power MOSFET switches with low on-resistance. It is ideal for powering portable equipment that runs from a single Li-ion battery.

A standard series of inductors are available from several different manufacturers optimized for use with the AP3407/A. This feature greatly simplifies the design of switch-mode power supplies.

The AP3407/A is available in SOT-23-5.

Features

- Input Voltage Range: 2.5V to 5.5V
- Output Voltage: 0.6V to V_{IN}
- ADJ Output
- Fixed 1.4MHz Frequency
- High Efficiency up to 95%
- Output Current: 1.2A
- Current Mode Control
- 100% Duty Cycle in Dropout
- Built-in Over Current Protection
- Built-in Short Circuit Protection
- Built-in Thermal Shutdown Protection
- Built-in UVLO Function
- Built-in Soft-start

Applications

- Datacom
- Portable Device
- Smart Phone

SOT-23-5

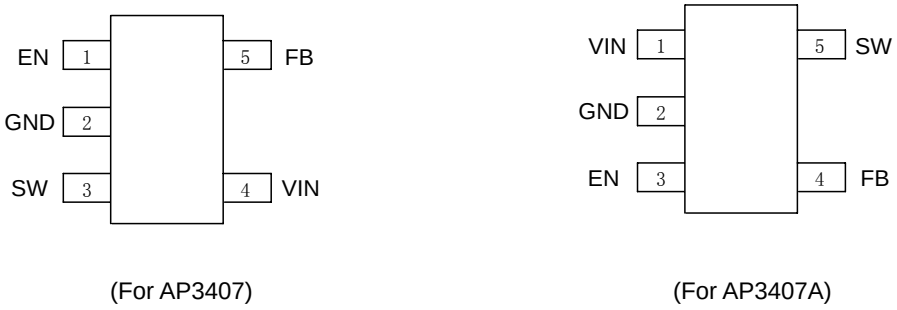
Figure 1. Package Type of AP3407/A

1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A

Pin Configuration

K Package

(SOT-23-5)



(For AP3407) (For AP3407A)

Figure 2. Pin Configuration of AP3407/A (Top View)

Pin Description

Pin Number		Pin Name	Function
AP3407	AP3407A		
1	3	EN	Control input pin. Forcing this pin above 1.5V enables the IC. Forcing this pin below 0.4V shuts down the IC. When the IC is in shutdown mode, all functions are disabled to decrease the supply current below 1.2A
2	2	GND	Ground pin
3	5	SW	Power switch output pin. Inductor connection to drain of the internal PFET and NFET switches
4	1	VIN	Supply input pin. Bypass to GND with a 4.7μF or greater ceramic capacitor
5	4	FB	This is the feedback pin of the device. Connect this pin directly to the output if the fixed output voltage version is used. For the adjustable version an external resistor divider is connected to this pin.

Functional Block Diagram

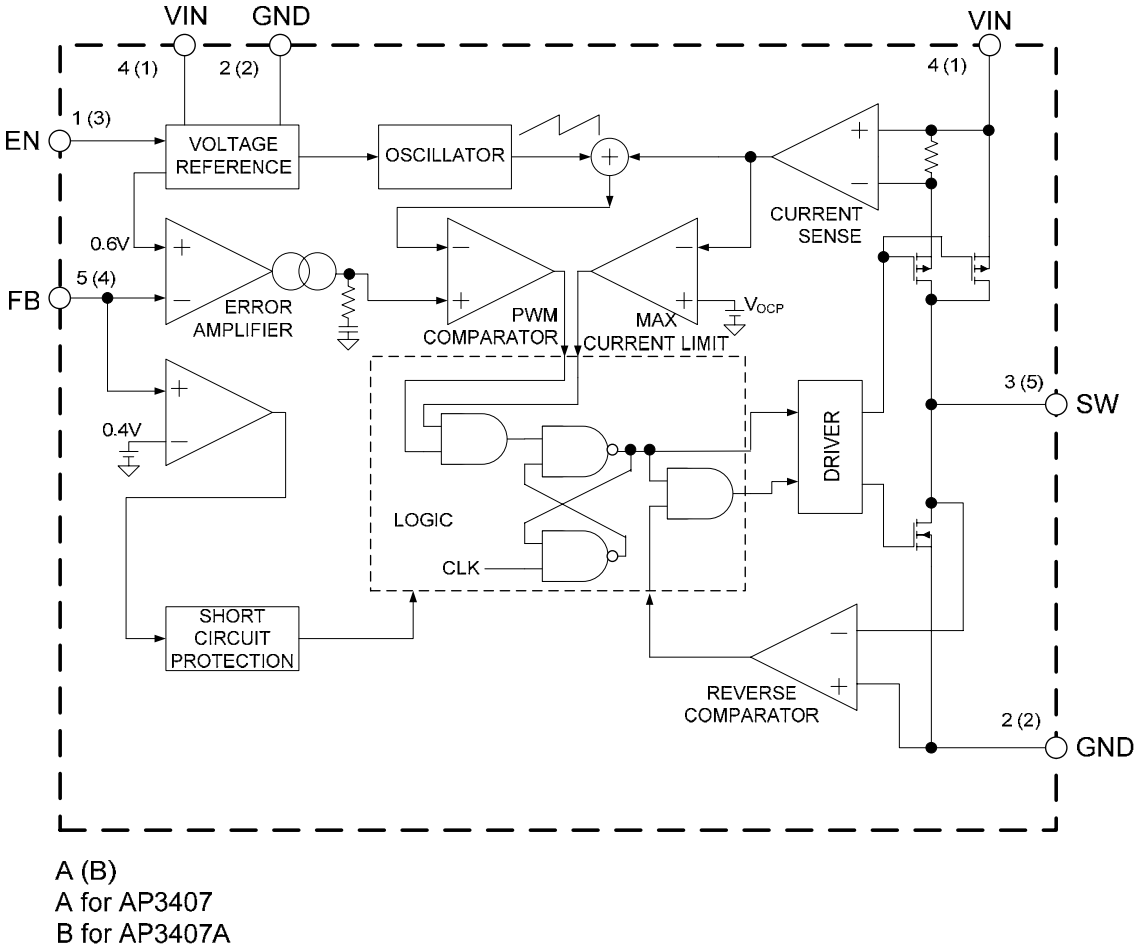
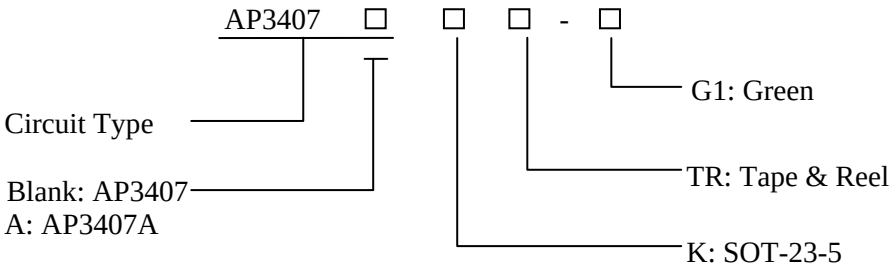


Figure 3. Functional Block Diagram of AP3407/A

1.2A, 1.4MHz High Efficiency Synchronous DC-DC Buck Converter AP3407/A

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
		Green	Green	
SOT-23-5	-40 to 85 ºC	AP3407KTR-G1	GJA	Tape & Reel
		AP3407AKTR-G1	GJB	Tape & Reel

BCD Semiconductor's Pb-free products, as designated with "G1" suffix in the part number, are RoHS compliant and green.

Absolute Maximum Ratings (Note 1)

Parameter	Symbol	Value	Unit
Input Voltage	V_{IN}	-0.3 to 6.0	V
Feedback Voltage	V_{FB}	-0.3 to V_{IN} +0.3	V
EN Pin Voltage	V_{EN}	-0.3 to V_{IN}+0.3	V
SW Pin Voltage	V_{SW}	-0.3 to V_{IN}+0.3	V
Thermal Resistance	θ_{JA}	265	ºC/W
Thermal Resistance	θ_{JC}	60	ºC/W
Power Dissipation	P_D	0.377	W
Operating Junction Temperature	T_J	150	ºC
Storage Temperature	T_{STG}	-65 to 150	ºC
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	ºC

Note 1: Stresses greater than those listed under “Absolute Maximum Ratings” 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 under “Recommended Operating Conditions” is not implied. Exposure to “Absolute Maximum Ratings” for extended periods may affect device reliability.

Note 2: The junction temperature rise is given by $T_{RISING}=P_D*\theta_{JA}$, where P_D is the power dissipated by regulator, θ_{JA} is the thermal resistance from junction of the die to the ambient temperature; The junction temperature, T_J is given by $T_J=T_A+T_R$, where T_A is the ambient temperature.

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.5	5.5	V
Maximum Output Current	$I_{OUT\ (MAX)}$	1.2		A
Operating Ambient Temperature	T_A	-40	85	ºC

Electrical Characteristics

V_{IN}=V_{DD} =V_{PVDD}=3.3V, T_A=25℃, unless otherwise specified.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
Input Voltage	V_{IN}		2.5		5.5	V
Quiescent Current	I_Q	V_{FB}=0.65V		62	100	μA
Shutdown Supply Current	I_{STBY}	V_{EN}=GND		0.1	1	μA
Reference Voltage	V_{REF}	For Adjustable Output Voltage	0.588	0.6	0.612	V
Feedback Bias Current	I_{FB}	V_{FB}=V_{IN}	-0.1		0.1	μA
Output Voltage Accuracy	ΔV_{OUT}		-2		2	%
PMOSFET R_{ON}	$R_{DS(ON)\_P}$	I_{SW} = 200mA		0.28		Ω
NMOSFET R_{ON}	$R_{DS(ON)\_N}$	I_{SW} = -200mA		0.25		Ω
Switch Current Limit	I_{LIM}	V_{FB}=0.55V	1.5	2.0		A
EN Pin Threshold	V_H		1.5			V
	V_L				0.4	
UVLO Threshold	V_{UVLO}	V_{DD} Rising		2.3		V
UVLO Hysteresis	V_{HYS}			0.2		
Oscillator Frequency	f_{OSC}		1.12	1.40	1.68	MHz
Max. Duty Cycle	D_{MAX}	V_{FB}=0V	100			%
Min. Duty Cycle	D_{MIN}	V_{FB}=6.5V			0	
N-MOS SW Leakage Current		V_{IN}=3.3V, V_{SW}=3.3V		0.1		μA
Soft-start Time	t			1		ms
Thermal Shutdown	T_{OTSD}			160		ºC
Thermal Shutdown Hysteresis	T_{HYS}			20		ºC

Typical Performance Characteristics

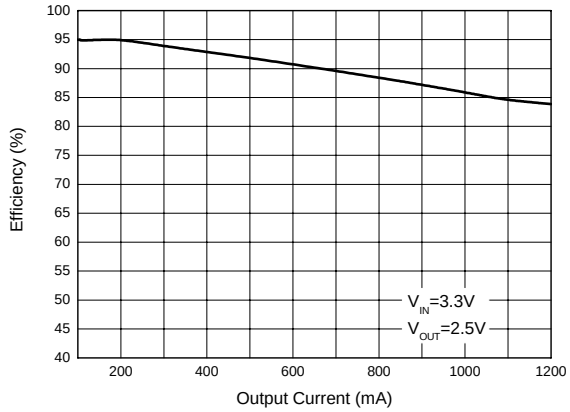


Figure 4. Efficiency vs. Output Current

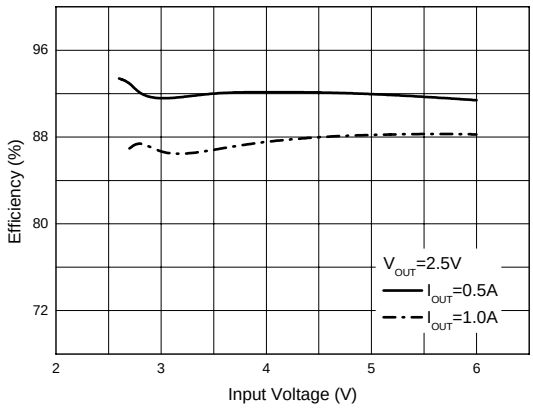


Figure 5. Efficiency vs. Input Voltage

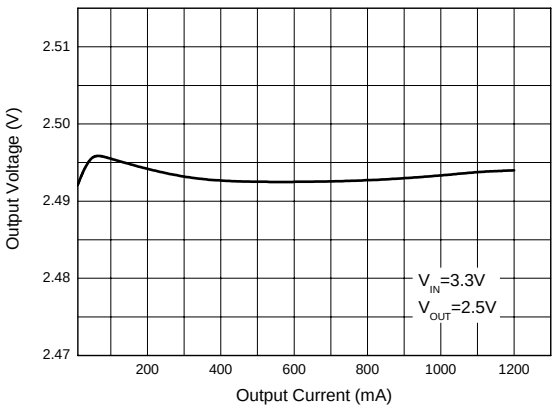


Figure 6. Output Voltage vs. Output Current

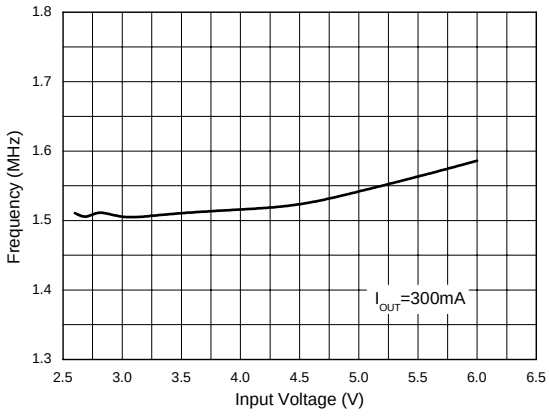


Figure 7. Frequency vs. Input Voltage

Typical Performance Characteristics (Continued)

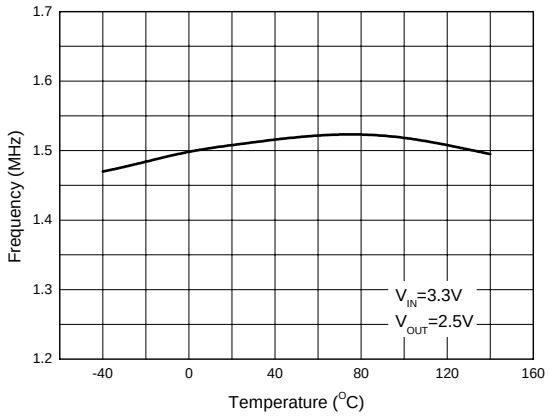


Figure 8. Frequency vs. Temperature

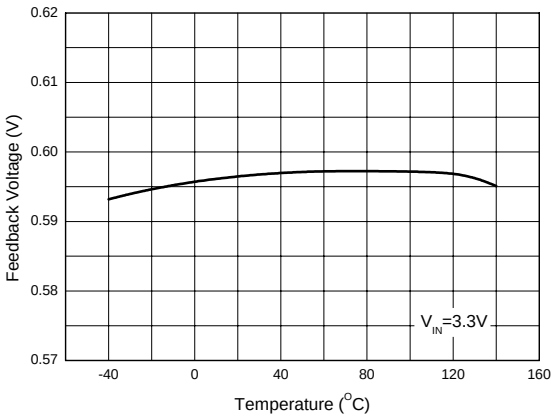


Figure 9. Feedback Voltage vs. Temperature

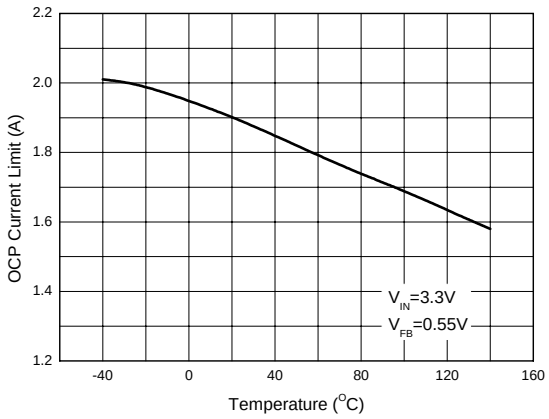


Figure 10. OCP Current Limit vs. Temperature

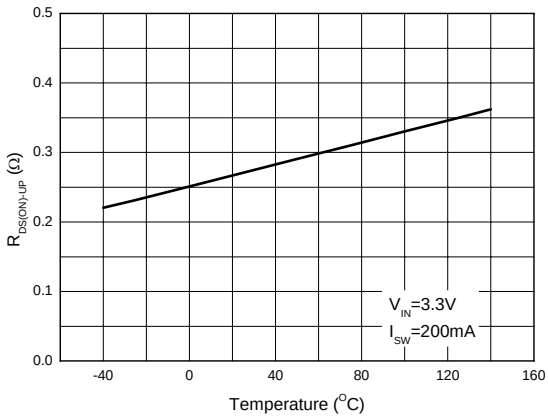


Figure 11. $R_{DS\ (ON)\_UP}$ vs. Temperature

Typical Performance Characteristics (Continued)

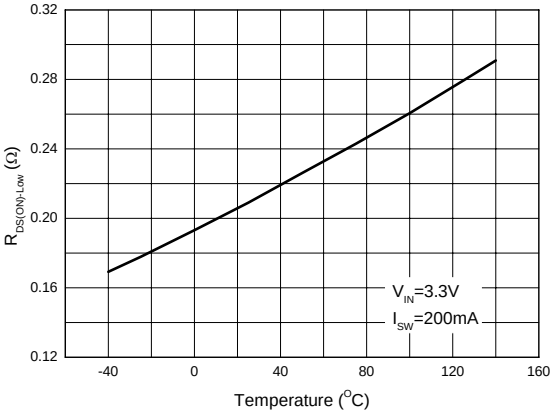


Figure 12. $R_{DS\ (ON)\_LOW}$ vs. Temperature

Typical Application

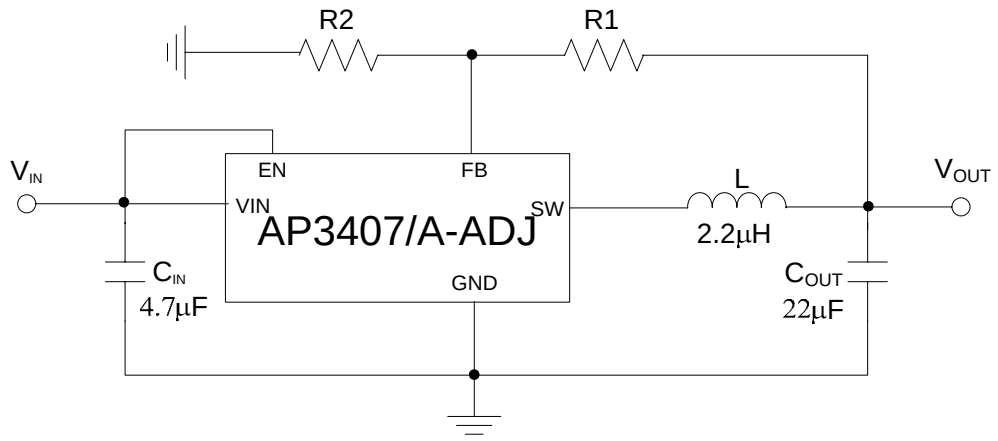
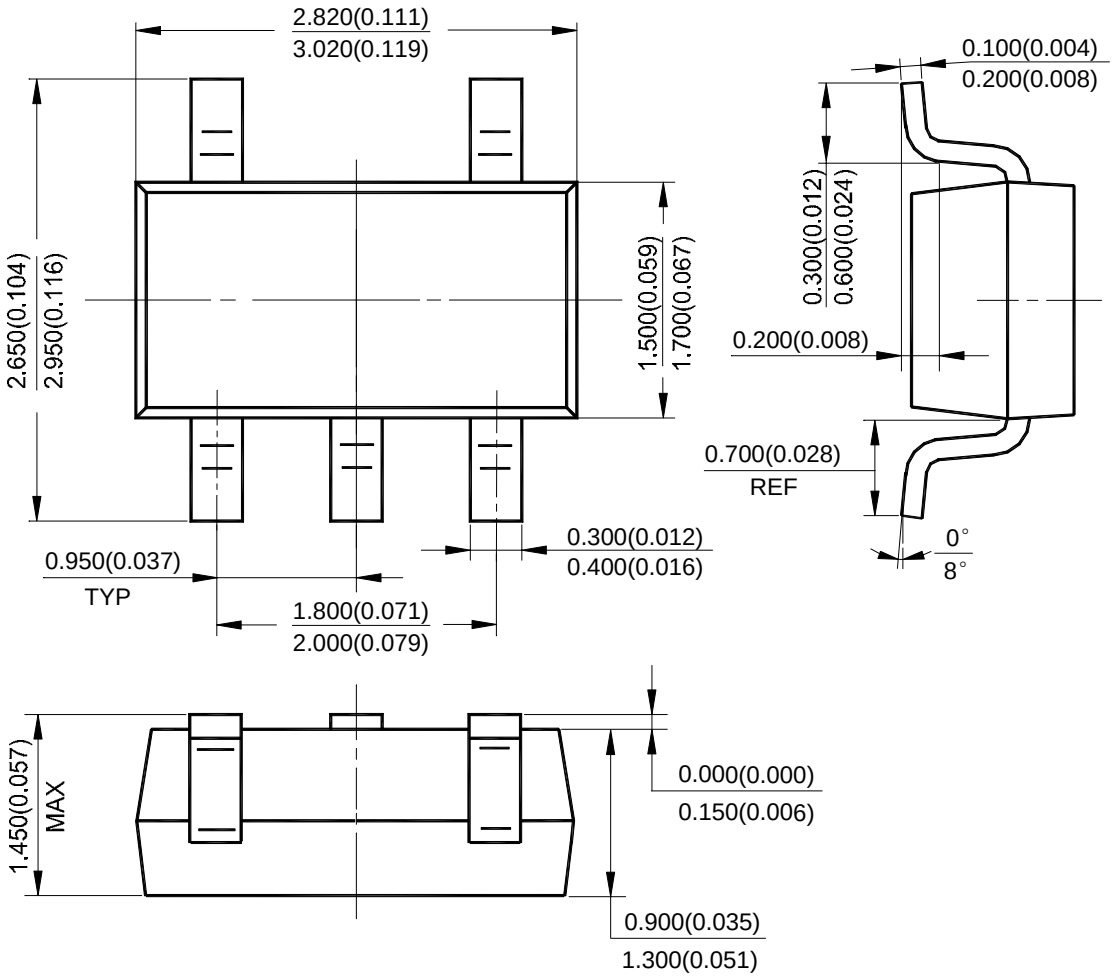


Figure 13. Typical Application of AP3407/A

Mechanical Dimensions

SOT-23-5 **Unit: mm(inch)**



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