1.2A, 1.4MHz, Dual Synchronous DC-DC Buck Converter AP3423

General Description

The AP3423 is a dual high-efficiency, 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 AP3423 integrates synchronous P-channel and N-channel power MOSFET switches with low on-resistance. It is ideal for portable applications powered from a single Li-ion battery. 100% duty cycle and low on-resistance P-channel internal power MOSFET can maximize the battery life.

The switching frequency of AP3423 is 1.4MHz, which allows small-sized components, such as capacitors and inductors. A standard series of inductors from several different manufacturers are available. This feature greatly simplifies the design of switch-mode power supplies.

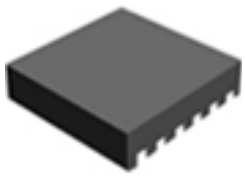
The AP3423 is available in DFN-3×3-12 package.

Features

- Dual Channel DC-DC Converter
- Independent Enable Control
- Input Voltage Range: 2.5 to 5.5V
- Adjustable Output from 0.6 to V_{IN}
- 0.6V Reference Voltage with ± 2% Precision
- Output Current: 1.2A
- High Efficiency: up to 95%
- Low R_{DSON} Internal Switches
- Operation Frequency: 1.4MHz
- Current Mode Control
- 100% Duty Cycle
- Built-in Soft-start
- Built-in UVLO Function
- Built-in Short Circuit Protection
- Built-in Current Limit Function
- Built-in Thermal Shutdown Protection
- DFN-3×3-12 package

Applications

- Portable Media Player
- Digital Still and Video Cameras
- Notebook



DFN-3×3-12

Figure 1. Package Type of AP3423

Pin Configuration

DN Package

(DFN-3×3-12)

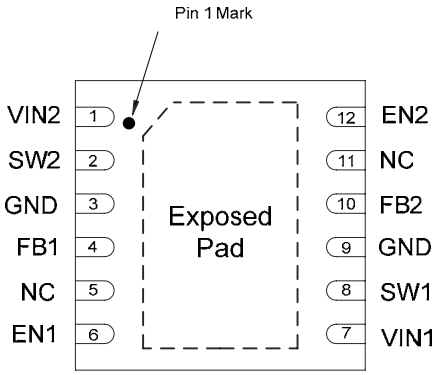


Figure 2. Pin Configuration of AP3423 (Top View)

Pin Description

Pin Number	Pin Name	Description
1	VIN2	Power input supply of channel 2. Decouple this pin to GND with a capacitor
2	SW2	Internal power switch output of channel 2. Connect this pin with one terminal of the inductor
3, 9	GND	Power ground. Connect this pin as close as possible to C_{IN} and C_{OUT}
4	FB1	Feedback voltage of channel 1. This pin is the inverting input of internal error amplifier. It senses the converter output voltage through an external resistor divider. The internal reference voltage is 0.6V, which determines the output voltage through the resistor divider
5, 11	NC	No connection
6	EN1	Chip enable of channel 1 (Active high)
7	VIN1	Power input supply of channel 1. Decouple this pin to GND with a capacitor
8	SW1	Internal power switch output of channel 1. Connect this pin with one terminal of the inductor
10	FB2	Feedback voltage of channel 2. This pin is the inverting input of internal error amplifier. It senses the converter output voltage through an external resistor divider. The internal reference voltage is 0.6V, which determines the output voltage through the resistor divider
12	EN2	Chip enable of channel 2 (Active high)

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Functional Block Diagram

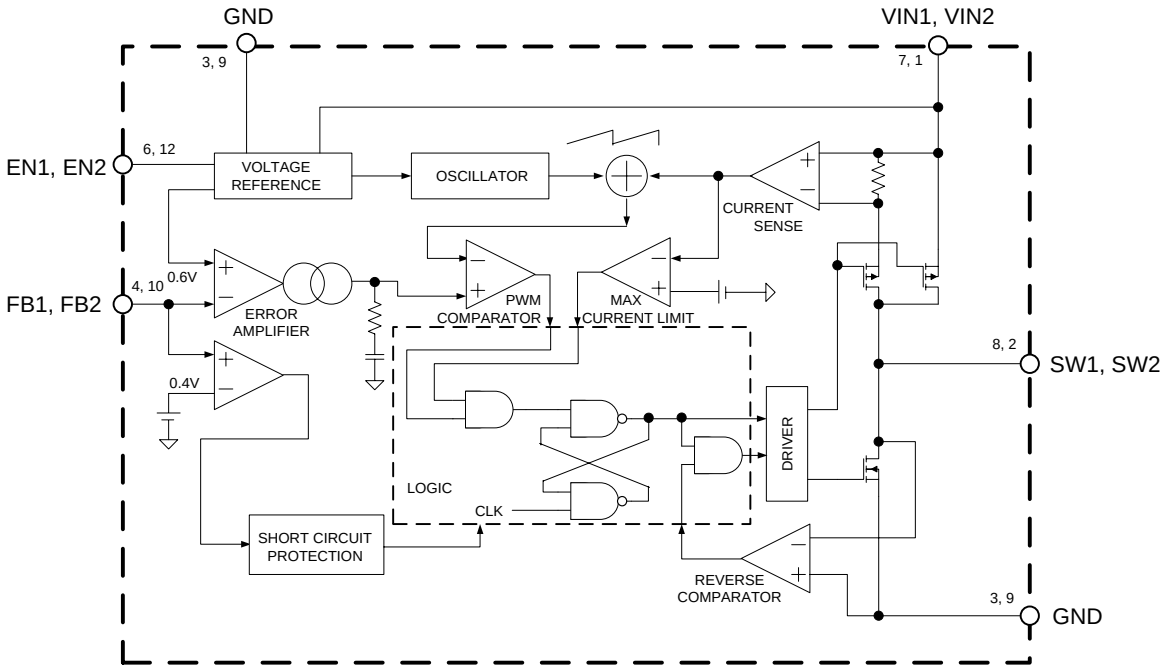
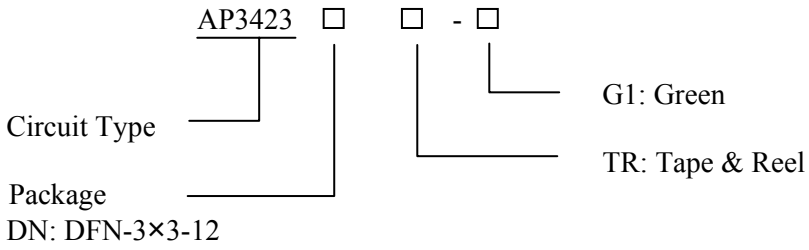


Figure 3. Functional Block Diagram of AP3423

Ordering Information



Package	Temperature Range	Part Number	Marking ID	Packing Type
DFN-3×3-12	-40 to 85ºC	AP3423DNTR-G1	PA	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
VIN1,VIN2 Pin Voltage	V_{IN}	-0.3 to 6	V
FB1, FB2 Pin Voltage	V_{FB}	-0.3 to V_{IN} +0.3	V
EN1, EN2 Pin Voltage	V_{EN}	-0.3 to V_{IN}+0.3	V
SW1, SW2 Pin Voltage	V_{SW}	-0.3 to V_{IN}+0.3	V
Thermal Resistance	θ_{JA}	60	ºC/W
Operating Junction Temperature	T_J	150	ºC
Storage Temperature	T_{STG}	-65 to 150	ºC
Lead Temperature (Soldering, 10sec)	T_{LEAD}	260	ºC
ESD (Machine Model)		200	V
ESD (Human Body Model)		2000	V

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.

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}=3.3V, V_{OUT}=2.5V, T_A=25ºC, unless otherwise specified.

Parameters	Symbol	Conditions	Min	Typ	Max	Unit
CHANNEL 1 and CHANNEL 2						
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_{IN} Rising		2.3		V
UVLO Hysteresis	V_{HYS}			0.2		
Oscillator Frequency	f_{OSC}		1.12	1.4	1.68	MHz
Max. Duty Cycle	D_{MAX}	V_{FB}=0V	100			%
Min. Duty Cycle	D_{MIN}	V_{FB}=6.5V			0	
SW Leakage Current , N-MOS		V_{IN}=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

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

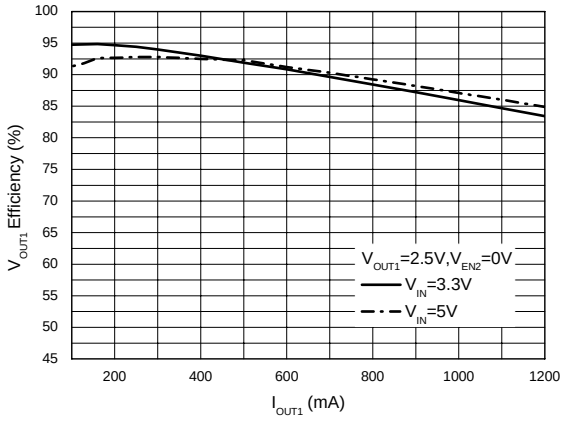


Figure 4. V_{OUT1} Efficiency vs. I_{OUT1}

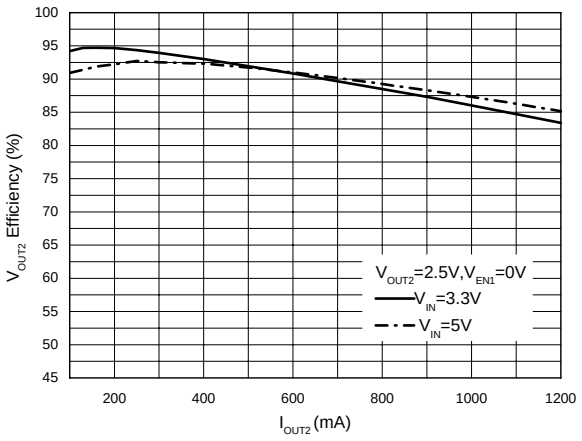


Figure 5. V_{OUT2} Efficiency vs. I_{OUT2}

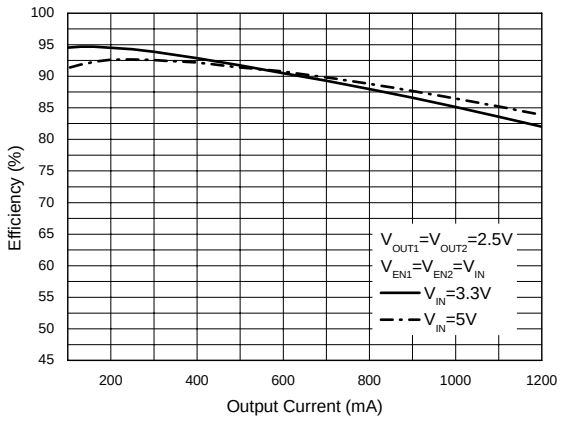


Figure 6. Efficiency vs. Output Current

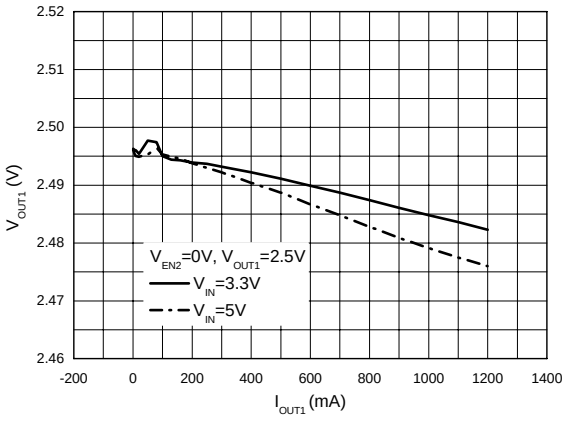


Figure 7. V_{OUT1} vs. I_{OUT1}

Typical Performance Characteristics (Continued)

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

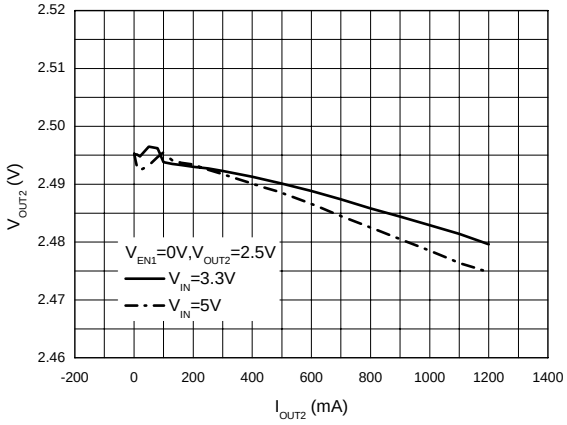


Figure 8. V_{OUT2} vs. I_{OUT2}

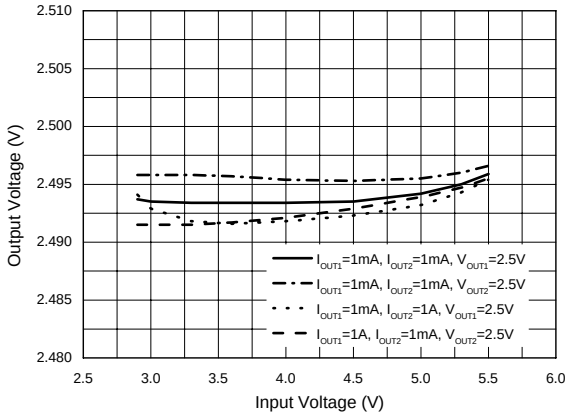


Figure 9. Output Voltage vs. Input Voltage

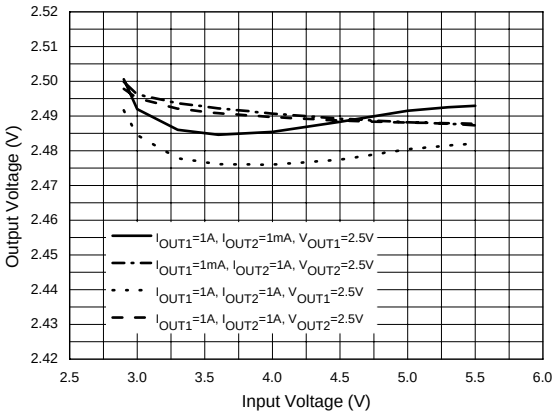


Figure 10. Output Voltage vs. Input Voltage

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Typical Application

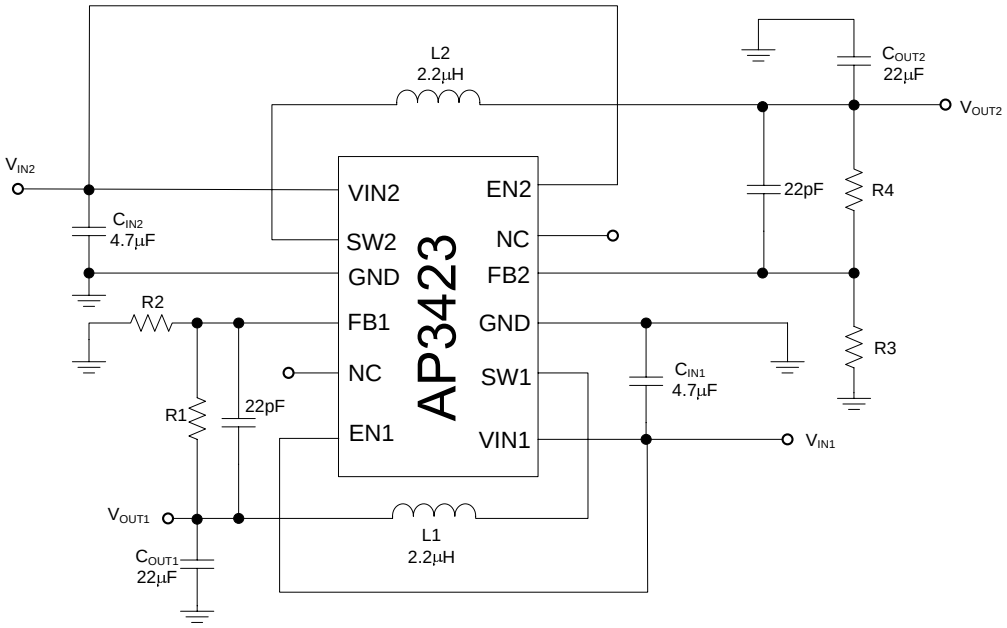
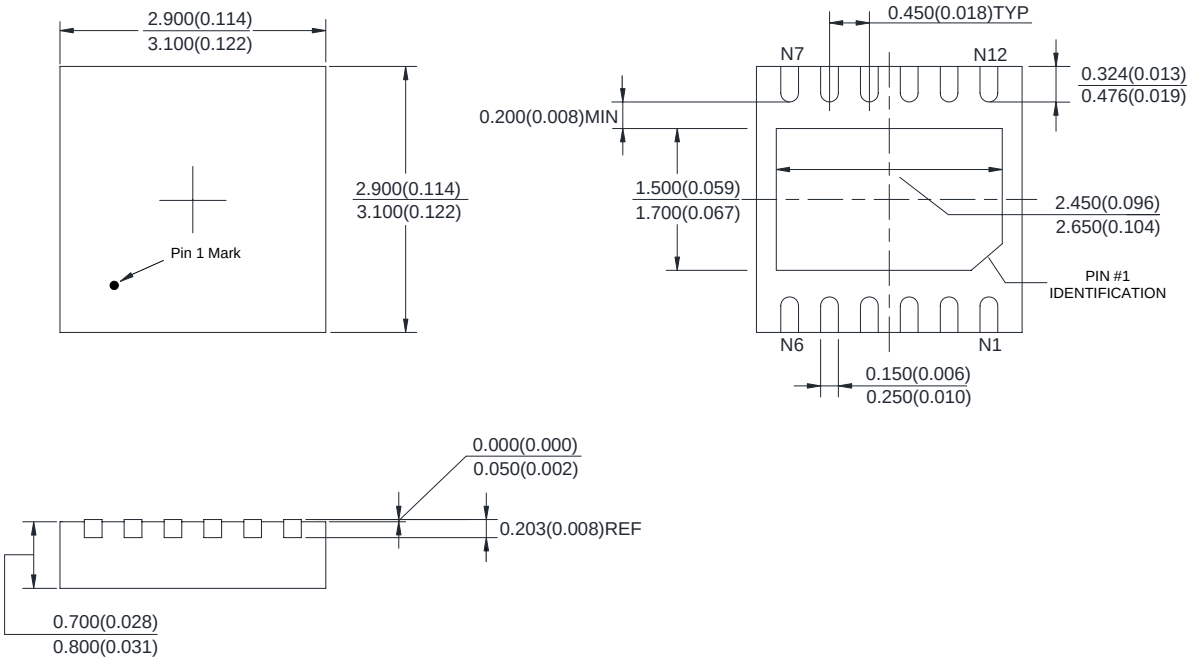


Figure 11. Typical Application of AP3423

1.2A, 1.4MHz, Dual Synchronous DC-DC Buck Converter AP3423

Mechanical Dimensions

DFN-3×3-12 **Unit:mm(inch)**





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