



AiP4004A

Low-Noise, Regulated Charge Pump

DC/DC Converter

Product Specification

Specification Revision History:

Version	Date	Description
2020-11-A1	2020-11	New
2021-08-A2	2021-08	Modify the soldering temperature
2022-01-A3	2022-01	Modify ordering information
2023-02-B1	2023-02	Replace the template
2023-07-B2	2023-07	Modify the curve



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1、General Description

AiP4004A is a capacitive voltage multiplier circuit. In the input voltage range of 2.7V to 4.5V, it outputs 5V stable voltage and its maximum output current reaches 230mA. AiP4004 has the function of thermal protection and short circuit protection. When the circuit overheats or has a short circuit, AiP4004A stops the voltage doubling output. AiP4004A has turn-off enabling pins. When SD is grounded, the OUT output is turned off, and the circuit turn-off current is less than 1A.

Features:

- Input voltage range: 2.7V~4.5V
- Output current: 230mA (Max.)
- Stable output voltage: 4.9V ($\pm 3\%$)
- Low noise constant frequency operation
- The turn-off current is less than 1uA.
- Short circuit protection
- Overheat protection
- Packing information: SOT23-6

Application

- White LED backlights
- Lithium-ion battery backup power supply
- 3V to 5V conversion
- Smart card reader
- PCMCIA local 5V power supply

Ordering Information:

Reel packing specifications:

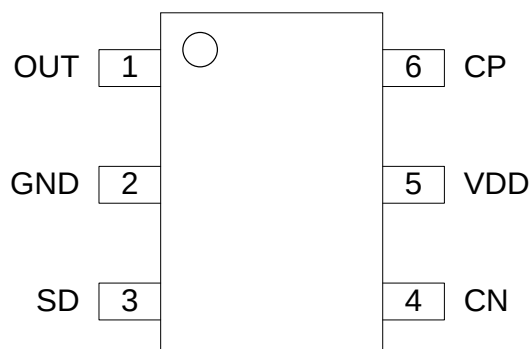
Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP4004AGB236.TR	SOT23-6	4004A	3000PCS/ reel	30000PCS/ box	Dimensions of plastic enclosure: 2.9mm×1.6mm Pin spacing: 0.95mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.



2、Block Diagram And Pin Description

2.1、Pin Configurations



2.2、Pin Description

Pin	Symbol	Description
1	OUT	Voltage output
2	GND	Ground
3	SD	Output turn-off pin (active-High)
4	CN	Bootstrap capacitor negative terminal
5	VDD	Power supply
6	CP	Bootstrap capacitor positive terminal

3、Electrical Parameter

3.1、Absolute Maximum Ratings

($T_{amb}=25^{\circ}\text{C}$, unless otherwise specified)

Characteristic	Symbol	Conditions	Min.	Max.	Unit
Input Voltage	VDD	-	-0.3	+5.5	V
Output Voltage	V_{OUT}	-	-0.3	+5.5	V
SD Pin Voltage	V_{SD}	-	-0.3	+5.5	V
Output Current	I_{OUT}	-	300		mA
Operating Ambient Temperature	T_{amb}	-	-40	+85	$^{\circ}\text{C}$
Storage Temperature	T_{stg}	-	-65	+150	$^{\circ}\text{C}$
Soldering Temperature	T_L	10s	260		$^{\circ}\text{C}$



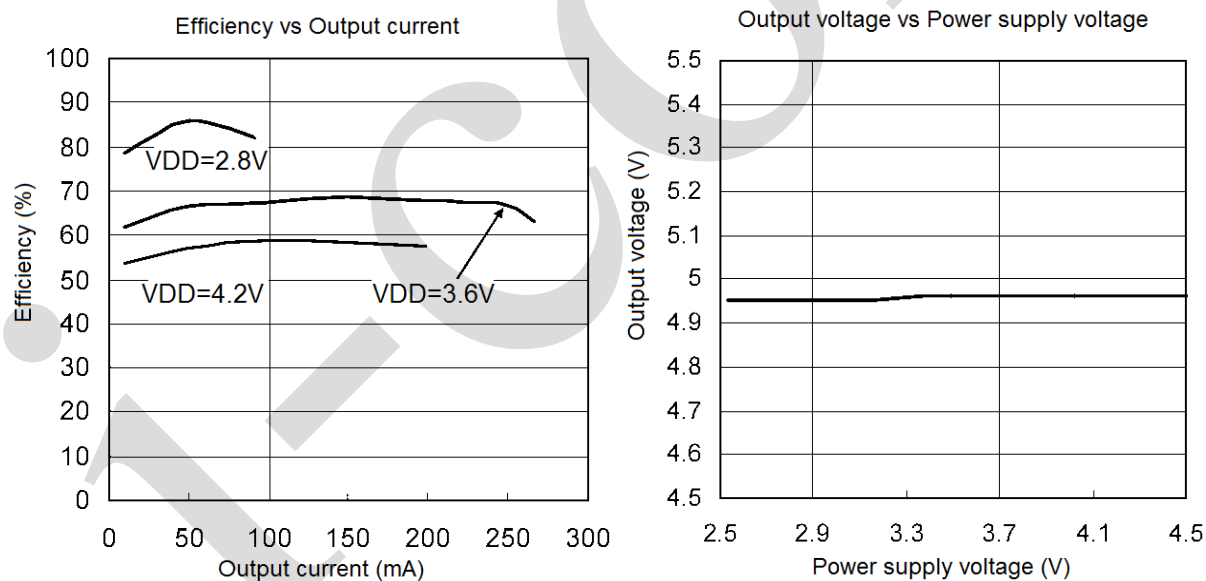
3.2、Electrical Characteristics

3.2.1、DC Characteristics

($V_{SD}=V_{DD}$, $C_{VDD}=C_{OUT}=10\mu F$, $T_{amb}=25^{\circ}C$, unless otherwise specified)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Voltage	VDD	$I_{OUT}=65mA$, $5.1V \geq V_{OUT} \geq 4.8V$	2.7	-	4.5	V
Output Voltage	V_{OUT}	$2.7V < VDD < 5.5V$, $I_{OUT} < 50mA$	4.8	4.94	5.1	V
Standby Current	I_{SD}	$V_{SD}=0V$, $V_{OUT}=0V$	-	<0.1	1	μA
No-Load Input Current	I_{no_load}	$I_{OUT}=0mA$, $VDD=3V$	-	0.4	-	mA
Maximum Output Current	I_{out_max}	-	-	230	-	mA
Output Ripple	V_{RIPPLE}	$VDD=3.6V$, $I_{OUT}=100mA$	0	70	150	mV _{PP}
Efficiency	EFFI	$VDD=3.0V$, $I_{OUT}=100mA$	60	70	-	%
Open-Loop Output Resistance $\frac{2VDD - OUT}{I_{OUT}}$	R_{OL}	$VDD=2.7V$, $I_{OUT}=100mA$	-	4	-	Ω
Switching Frequency	f_{OSC}	-	-	380	-	KHz

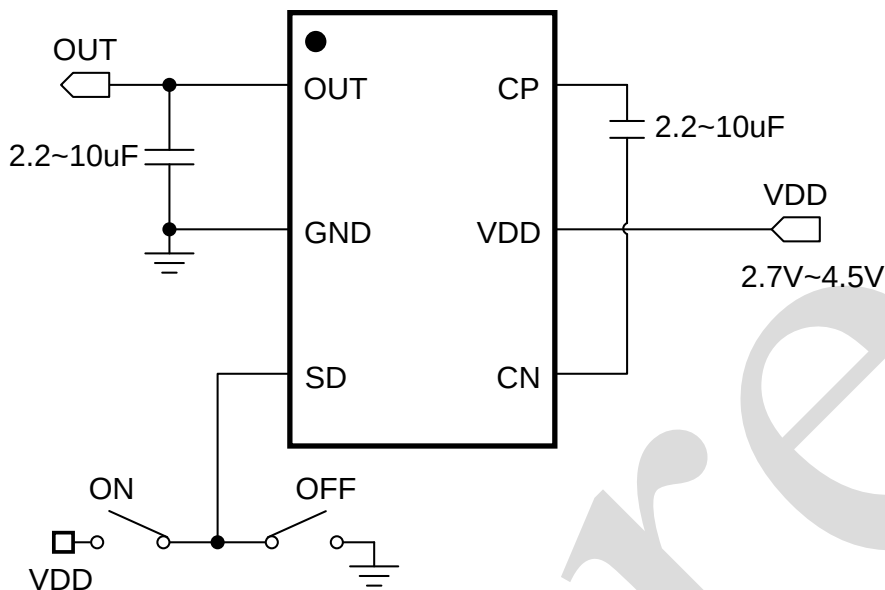
4、Characteristic Curve





5、Typical Application Circuit and Application Note

5.1、Typical Application Circuit



5.2、Application Note

● Operating Principle

AiP4004A adapts switching capacitors to boost the input voltage to a constant output voltage, which is controlled by the amplifier, resistance voltage division, and charge pump current. Through alternating charge and discharge of two clocks without overlapping, the output becomes stable.

When SD is in low-level, the chip is in standby mode and the shutdown current is less than 1uA.

● Short-Circuit Protection

AiP4004A has the function of short-circuit protection. When there is a short circuit, it can automatically limits the output current to less than 300mA.

● VDD, OUT Capacitance

In order to reduce noise and output wave, it is recommended to use a low ESR ceramic capacitor, and it should be no less than 2.2uF.

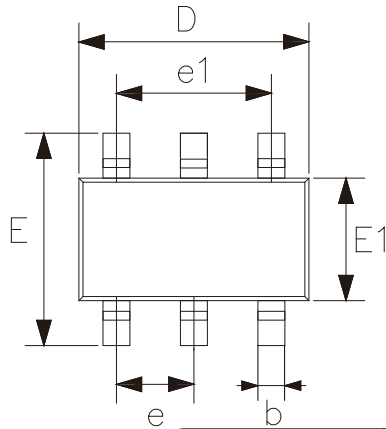
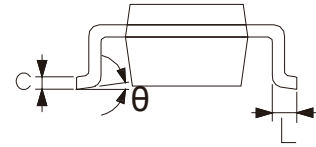
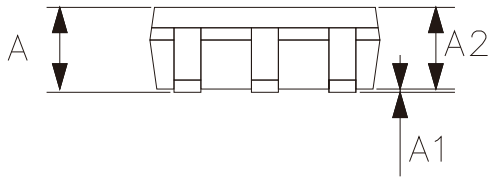
● Bootstrap Capacitor Selection

Bootstrap capacitors are recommended to adapt ceramic capacitors with low ESR and a capacity more than 2.2uF.

● Power Supply Efficiency

For a voltage multiplier, its input current is about twice the output current. There is:

$$\eta = \frac{P_{OUT}}{P_{VDD}} = \frac{OUT * I_{OUT}}{VDD * 2I_{OUT}} = \frac{OUT}{2VDD}$$

**6、Package Information****6.1、SOT23-6**

2023/12/A	Dimensions In Millimeters	
Symbol	Min.	Max.
A	—	1.25
A1	0.00	0.12
A2	1.00	1.20
b	0.30	0.50
c	0.10	0.20
D	2.82	3.02
E	2.60	3.00
E1	1.50	1.70
e	0.95	
e1	1.80	2.00
L	0.30	0.60
θ	0°	8°



7、Statements And Notes

7.1、The name and content of Hazardous substances or Elements in the product

Part name	Hazardous substances or Elements									
	Lead and lead compounds	Mercury and mercury compounds	Cadmium and cadmium compounds	Hexavalent chromium compounds	Polybrominated biphenyls	Polybrominated biphenyl ethers	Dibutyl phthalate	Butylbenzyl phthalate	Di-2-ethylhexyl phthalate	Diisobutyl phthalate
Lead frame	○	○	○	○	○	○	○	○	○	○
Plastic resin	○	○	○	○	○	○	○	○	○	○
Chip	○	○	○	○	○	○	○	○	○	○
The lead	○	○	○	○	○	○	○	○	○	○
Plastic sheet installed	○	○	○	○	○	○	○	○	○	○
explanation	○: Indicates that the content of hazardous substances or elements in the detection limit of the following the SJ/T11363-2006 standard. ×: Indicates that the content of hazardous substances or elements exceeding the SJ/T11363-2006 Standard limit requirements.									

7.2、Notes

We recommend you to read this chapter carefully before using this product.

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