
AP3401 EV Board User Guide

1. AP3401 General Description

The AP3401 is a 1A step-down DC-DC converter. At heavy load, the constant-frequency PWM control performs excellent stability and transient response. No external compensation components are required.

The AP3401 supports a range of input voltages from 2.5V to 5.5V, allowing the use of a single Li+/Li-polymer cell, multiple Alkaline/NiMH cell, and other standard power sources. The output voltage is adjustable from 0.6V to the input voltage. The AP3401 employs internal power switch and synchronous rectifier to minimize external part count and realize high efficiency. During shutdown, the input is disconnected from the output and the shutdown current is less than 1 μ A. Other key features include over-temperature and short circuit protection, and under-voltage lockout to prevent deep battery discharge.

The AP3401 delivers 1A maximum output current while consuming only 40 μ A of no-load quiescent current. Ultra-low RDS(ON) integrated MOSFETs and 100% duty cycle operation make the AP3401 an ideal choice for high output voltage, high current applications which require a low dropout threshold.

The AP3401 is available in U-DFN2020-6 packages and TSOT23-6 packages.

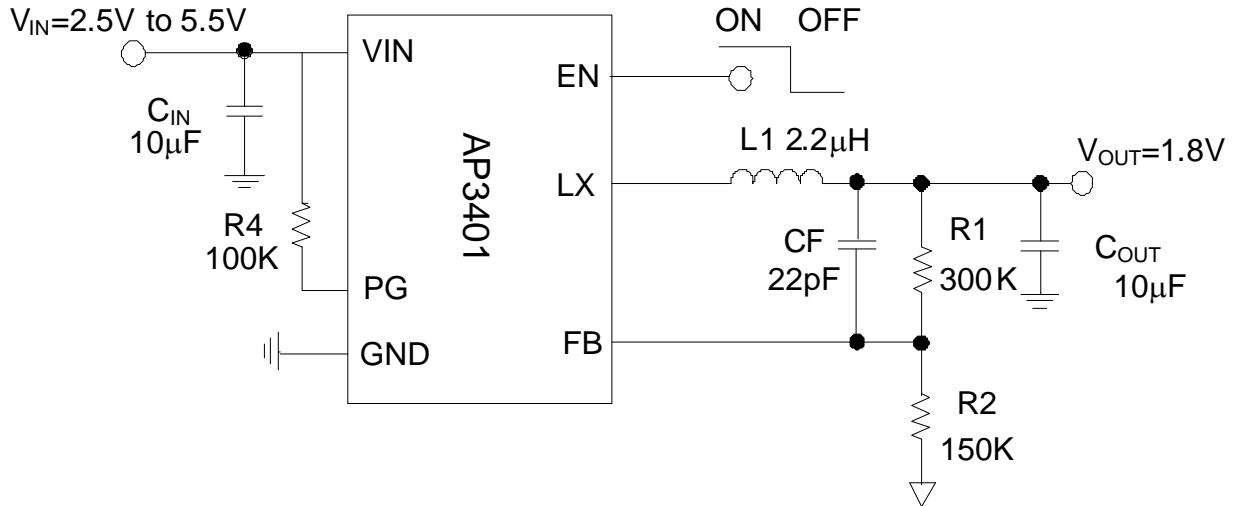
2. Key Features

- Output Current: Up to 1A
- Output Voltage: 0.6V to V_{in}
- Input Voltage: 2.5V to 5.5V
- 0.6V Reference Voltage With $\pm 2\%$ Precision
- 40 μ A (Typ) No Load Quiescent Current
- Shutdown Current: $< 1 \mu$ A
- 100% Duty Cycle Operation
- 1.5MHz Switching Frequency
- Internal Soft Start
- No external Compensation Required
- Current Limit Protection
- Thermal Shutdown

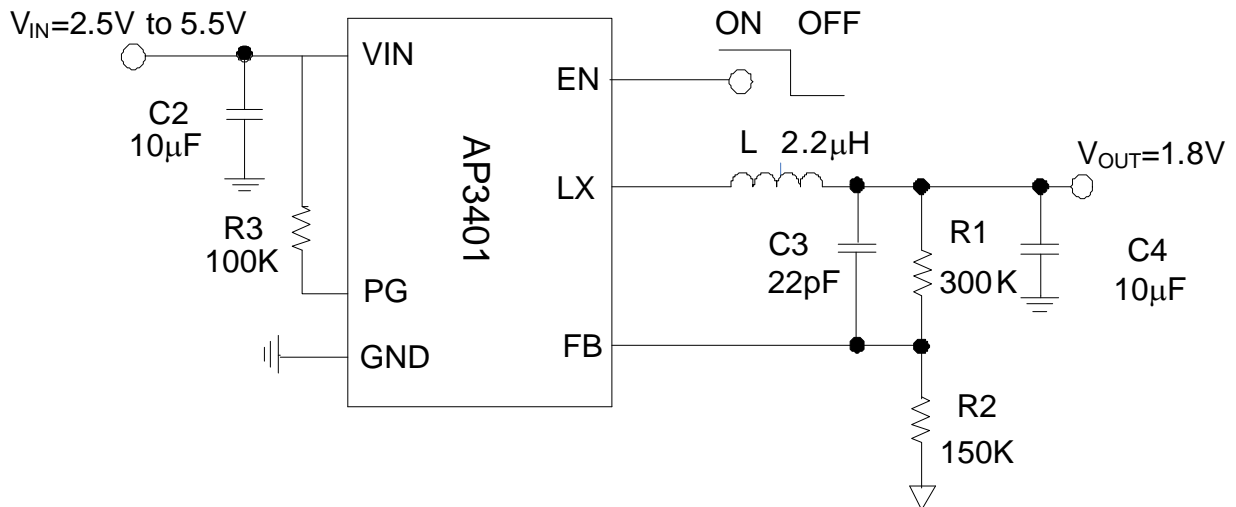
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3. EV Board Schematic



UDFN2020-6 Packages EVB



TSOT23-6 Package EVB

4. EVB AP3401 Description

AP3401 EVB is suitable evaluation board for the AP3401, a DC/DC converter. The board is targeted to be used in providing a simple and convenient evaluation environment for the AP3401. Requires parts, power supply connectors etc. on the board, which makes it easy to be evaluated.

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5. EV Board View



UDFN2020-6 Packages EVB



TSOT23-6 Package EVB

6. Resistor select for output voltage setting

$$V_{out} = (1 + R1/R2) \times V_{ref} \quad (V_{ref}=0.6V)$$

V_o	R1	R2	CF/C3	L
3.3V	450k	100k	22pF	2.2uH
1.8V	300k	150k	22pF	2.2uH
1.0V	91k	120k	22pF	2.2uH

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7. External Components Selection

Input & output Capacitors (C_{in} , C_{out})

- (1) For lower output ripple, low ESR is required.
- (2) Low leakage current needed, X5R/X7R ceramic recommend, multiple capacitor parallel connection.
- (3) The C_{in} and C_{out} capacitances are greater than 4.7uF and 10uF respective.

Output Voltage programmer resistors (R_1 , R_2)

- (1) For programmer output voltage
- (2) For accurate output voltage, 1% tolerance is required.

Inductor (L)

- (1) Low DCR for good efficiency
- (2) Inductance saturate current must higher than the output current
- (3) The recommend inductance is 2.2uH

8. Evaluation board BOM list for AP3401:

Item(UDFN/TSOT)	Value	Type	Rating	Description	Description
CIN/C2	10uF	X5R/X7R, Ceramic/0805	10V	Input coupling CAP	TAIYO YUDEN EMK212ABJ106KD-T
COU/C4	10uF	X5R/X7R, Ceramic/0805	10V	Output coupling CAP	TAIYO YUDEN EMK212ABJ106KD-T
L1/L	2.2uH		>3A	Inductor	
R1	300K	0805	1%	Voltage set RES*	
R2	150K	0805	1%		
R4/R3	100K	0805	1%	Power Good RES	
CF/C3	22pF	0805		Feedforward CAP	
U1		AP3401		UDFN2020/TSOT23-6	

*Note: The present value of R1/R2 are based on $V_{out}=1.8V$

9. Test result:

Converter Operation Waveform:



Operation waveform at Iout=1A
(Blue-VoutAC; Yellow-Vsw; Green-IL)

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