Description

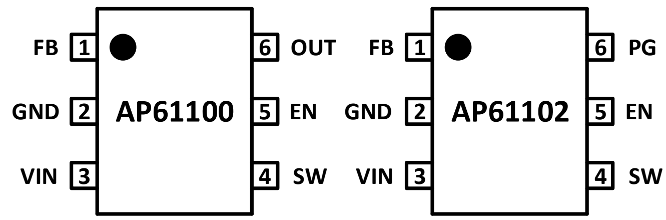
The AP61102 is a 1A, synchronous buck converter with an input voltage range of 2.3V to 5.5V and fully integrates a 120mΩ high-side power MOSFET and a 80mΩ low-side power MOSFET to provide high-efficiency step-down DC-DC conversion.

The AP61102 device is easily used by minimizing the external component count due to its adoption of constant on-time (COT) control to achieve fast transient responses, ease loop stabilization, and low output voltage ripple.

The device is available in a SOT563 package.

Pin Assignments

TOP VIEW



SOT563

Features

- Input Range: 2.3V to 5.5V
- Wide Output Voltage Range: 0.6V to 5.5V
- 1A Continuous Output Current
- 0.6V ± 2% Reference Voltage
- 14µA Ultralow Quiescent Current (Pulse Frequency Modulation)
- 2.2MHz Switching Frequency
- Power Good Indicator
- Programmable Modulation Mode Through EN
  - PFM (Vin –VEN < 200mV)
  - PWM Regardless of Output Load (Vin –VEN > 200mV)
- Protection Circuitry

Applications

- 5V Input Distributed Power Bus Supplies
- White Goods and Small Home Appliances
- FPGA, DSP, and ASIC Supplies
- Network Video Cameras
- Wireless Routers
- Consumer Electronics
- General Purpose Point of Load

Functional Block

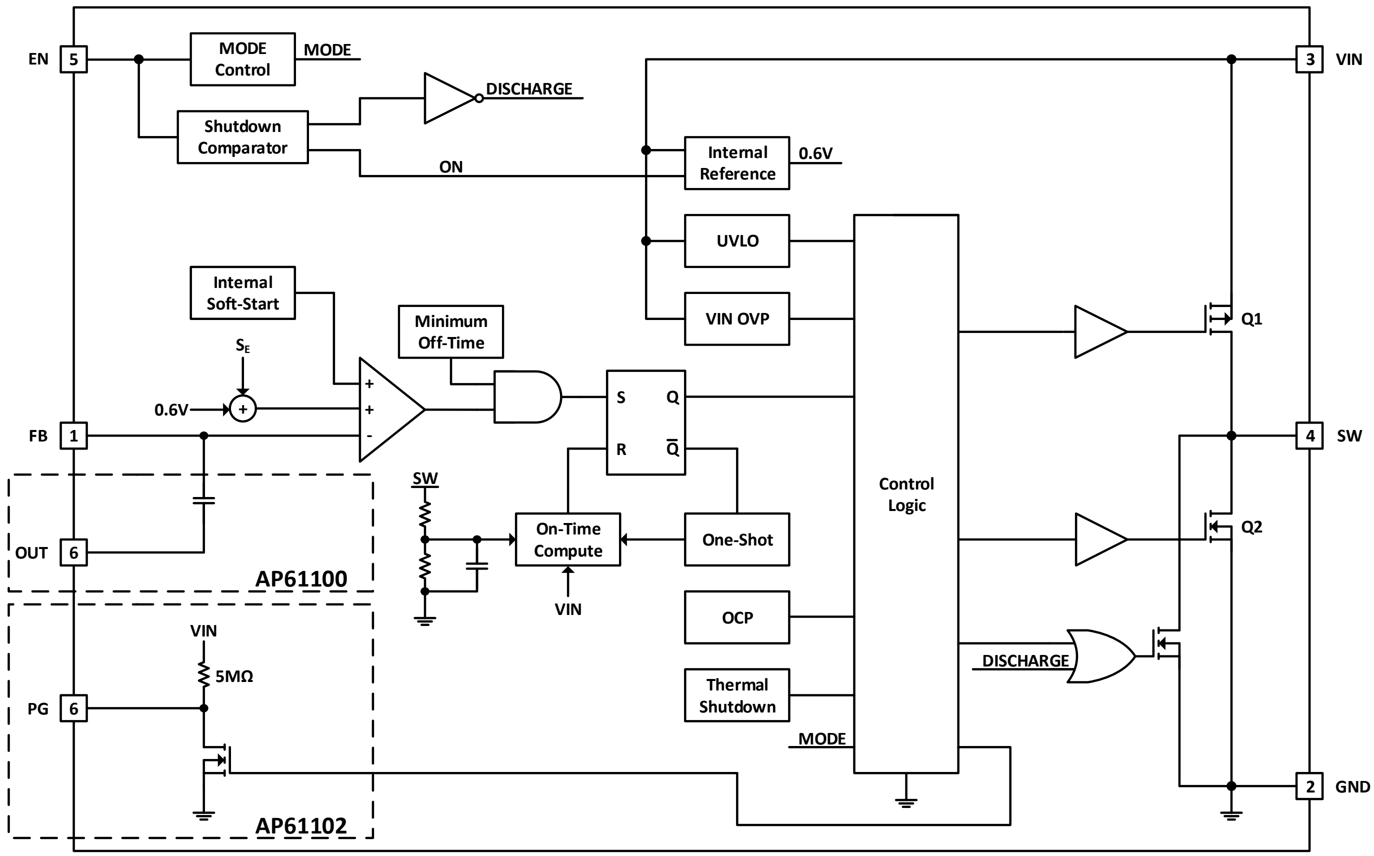


Figure 1. Functional Block Diagram

Absolute Maximum Ratings (Note 4) (At T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Rating	Unit
VIN	Supply Pin Voltage	-0.3 to + 6.0 (DC)	V
		-0.3 to + 6.5(400ms)	
VFB	Feedback Pin Voltage	-0.3 to VIN + 0.3	V
VSW	Switch Pin Voltage	-1.0 to VIN + 0.3 (DC)	V
		-3 to VIN + 2.0 (20ns)	
VEN	Enable Pin Voltage	-0.3 to VIN + 0.3	V
VPG	Power-Good Pin Voltage	-0.3 to +6.0 (DC)	V
TST	Storage Temperature	-65 to +150	°C
TJ	Junction Temperature	+150	°C
TL	Lead Temperature	+260	°C
ESD Susceptibility (Note 5)			
HBM	Human Body Model	2000	V
CDM	Charged Device Model	1000	V

Notes: 4. Stresses greater than the **Absolute Maximum Ratings** specified above may cause permanent damage to the device. These are stress ratings only; functional operation of the device at these or any other conditions exceeding those indicated in this specification is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

5. Semiconductor devices are ESD sensitive and may be damaged by exposure to ESD events. Suitable ESD precautions should be taken when handling and transporting these devices.

Recommended Operating Conditions (At T_A = +25°C, unless otherwise specified.)

Symbol	Parameter	Min	Max	Unit
VIN	Supply Voltage	2.3	5.5	V
VOUT	Output Voltage	0.6	5.5	V
T_A	Operating Ambient Temperature Range	-40	+85	°C
T_J	Operating Junction Temperature Range	-40	+125	°C

Quick Start Guide

The AP61102Z6-EVM has a simple layout and allows access to the appropriate signals through test points. To evaluate the performance of the AP61102Z6-EVM, follow the procedure below:

1. For evaluation board configured at V_{OUT}=1.8V, connect a power supply to the input terminals VIN and GND. Set VIN to 5V.
2. Connect the positive terminal of the electronic load to VOUT and negative terminal to GND.
3. For Enable, place a jumper to “H” position to enable IC. Jump to “L” position to disable IC.
4. The evaluation board should now power up with a 1.8V output voltage.
5. Check for the proper output voltage of 1.8V (±2%) at the output terminals VOUT and GND. Measurement can also be done with a multimeter with the positive and negative leads between VOUT and GND.
6. Set the load to 1A through the electronic load. Check for the stable operation of the SW signal on the oscilloscope. Measure the switching frequency.

Measurement/Performance Guidelines:

1) When measuring the output voltage ripple, maintain the shortest possible ground lengths on the oscilloscope probe. Long ground leads can erroneously inject high frequency noise into the measured ripple.

2) For efficiency measurements, connect an ammeter in series with the input supply to measure the input current. Connect an electronic load to the output for output current. Test the input capacitor voltage and output capacitor voltage with a multimeter as input voltage and output voltage.

Setting the Output Voltage of AP61102

1) Setting the output voltage

The AP61102 features external programmable output voltage by using a resistor divider network R1 and R2 as shown in the typical application circuit. The output voltage is calculated as below,

$$V_{OUT} = 0.6 \times \left(\frac{R_1 + R_2}{R_2} \right)$$

First, select a value for R2 according to the value recommended in the table 1. Then, R2 is determined. The output voltage is given by Table 1 for reference. For accurate output voltage, 1% tolerance is required.

Table 1. Resistor selection for output voltage setting

AP61100/AP61102							
Output Voltage (V)	R1 (kΩ)	R2 (kΩ)	L (µH)	C2 (µF)	C3 (µF)	C5 (pF)	
						AP61100	AP61102
1.0	200.0	301.0	1.0	10	10	OPEN	33
1.2	200.0	200.0	1.0	10	10	OPEN	33
1.5	200.0	133.0	1.0	10	10	OPEN	33
1.8	200.0	100.0	1.0	10	10	OPEN	33
2.5	200.0	63.2	1.0	10	10	OPEN	33
3.3	200.0	44.2	1.0	10	10	OPEN	33

External Component Selection:

1) Inductor (L)

(1) Low DCR for good efficiency

(2) Inductance saturate current must be higher than 2.5A

(3) 1.0µH inductor of Würth Elektronik(PN. 744 383 560 10) is recommended for all application circuit.

Evaluation Board Schematic

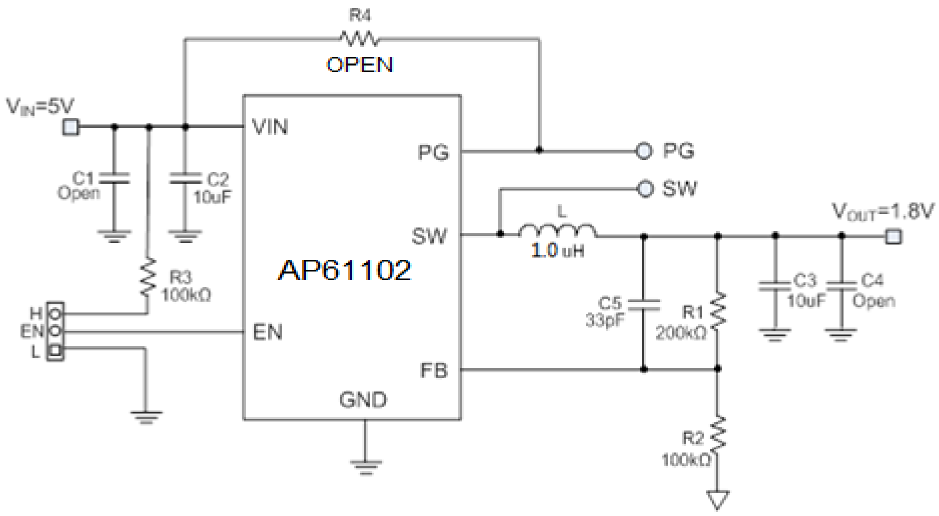


Figure 2. AP61102Z6-EVM Schematic (Vo=1.8V)

PCB Top Layout

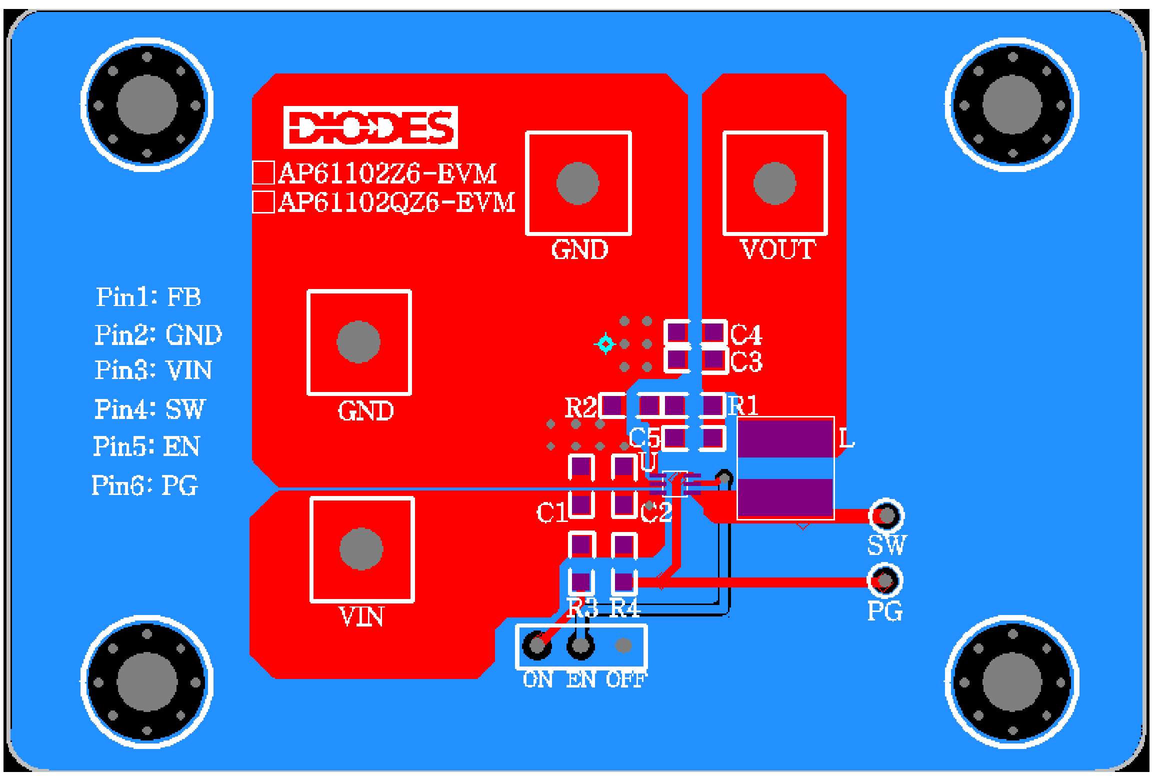


Figure 3. AP61102Z6 - EVM - Top Layer

PCB Bottom Layout

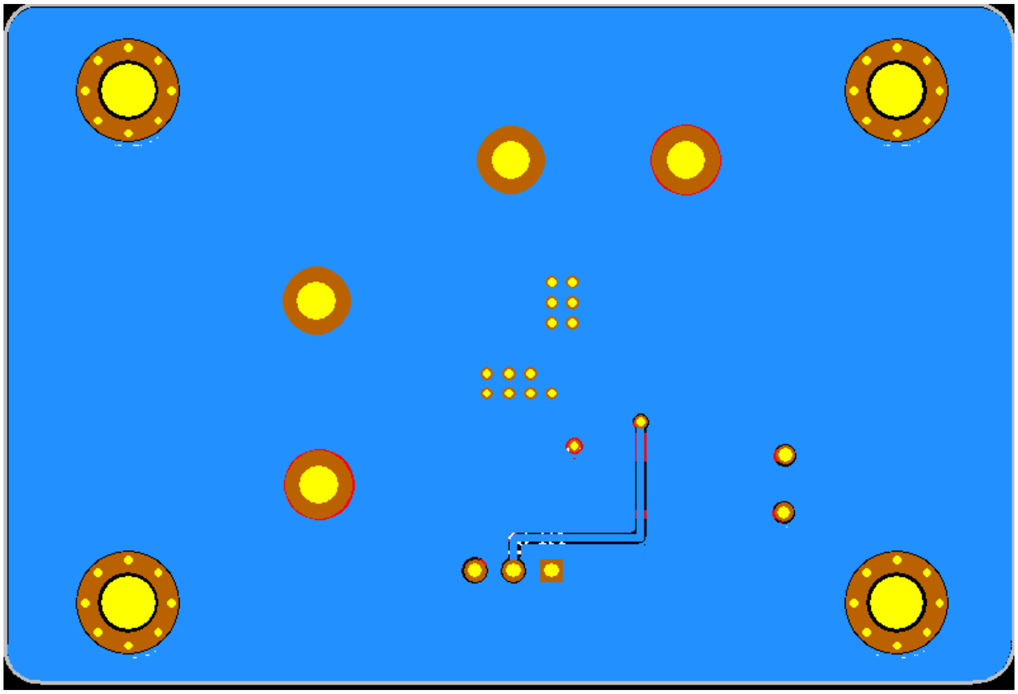


Figure 4. AP61102Z6 - EVM - Bottom Layer EV Board View

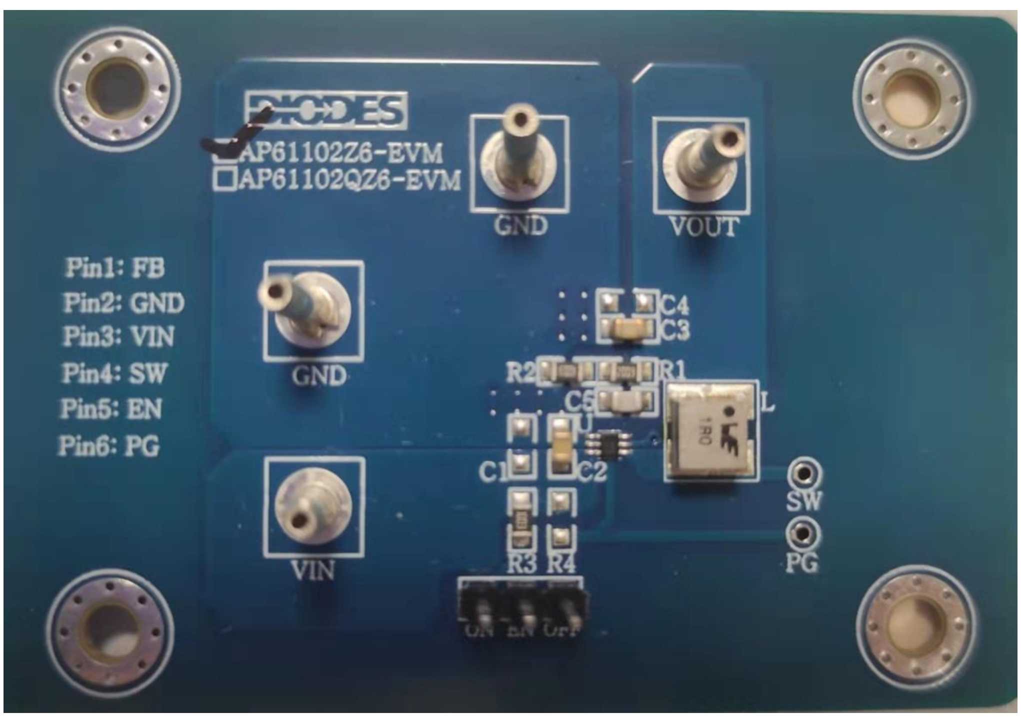


Figure 5. AP61102Z6 EV Board View

Bill of Materials for AP61102Z6-EVM (V_{OUT}=1.8V)

Item	Value	Type	Rating	Description
C2	10µF	X5R/X7R, Ceramic/0805	10V	Input CAP
C3	10µF	X5R/X7R, Ceramic/0805	6.3V	Output CAP
C5	33pF	X5R/X7R, Ceramic/0805	50V	Feedforward CAP
L	1.0µH	Würth Elektronik 74438356010	>3A	Inductor
R1	200K	1%，0805	1%	Voltage set RES
R2	100K	1%，0805	1%	
R3	100K	1%，0805	1%	Enable RES
R4	100K	1%，0805	1%	Power Good RES
U1		AP61102Z6		SOT563

Typical Performance Characteristics

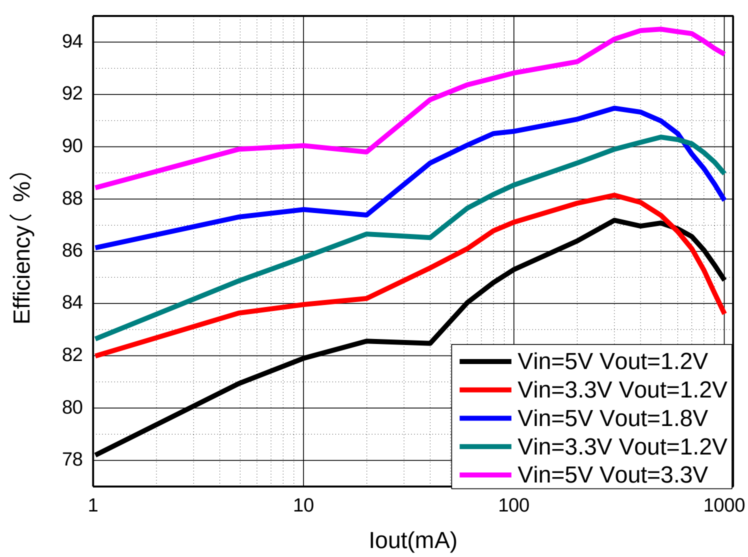


Figure 8. Efficiency vs. Output Current

Figure 9. Output Voltage Ripple, IOUT =1A（VOUT=1.8V）