

DESCRIPTION

The AP62301 is a 3A, synchronous buck converter with a wide input voltage range of 4.2V to 18V. The device fully integrates a 75mΩ high-side power MOSFET and a 45mΩ low-side power MOSFET to provide high-efficiency step-down DC-DC conversion.

The AP62301 device is easily used by minimizing the external component count due to its adoption of Constant On-Time (COT) control to achieve fast transient response, easy loop stabilization, and low output voltage ripple.

The AP62301 design is optimized for Electromagnetic Interference (EMI) reduction. The device has a proprietary gate driver scheme to resist switching node ringing without sacrificing MOSFET turn-on and turn-off times, which reduces high-frequency radiated EMI noise caused by MOSFET switching.

AP62301 is available in a TSOT26 package.

FEATURES

- V_{IN} Range: 4.2V to 18V
- Output Voltage range: 0.8V to 7V
- 3A Continuous Output Current
- $0.8V \pm 1\%$ Reference Voltage ($T_A = +25^\circ C$) => AP62301
- 155μA Low Quiescent Current
- 750kHz Switching Frequency
- Up to 83% Efficiency at 5mA Light Load
- Proprietary Gate Driver Design for Best EMI Reduction
- Protection Circuitry
 - Undervoltage Lockout (UVLO)
 - Cycle-by-Cycle Valley Current Limit
 - Thermal Shutdown
- **Totally Lead-Free & Fully RoHS Compliant**
- **Halogen and Antimony Free. “Green” Device**

APPLICATIONS

- Flat Screen TV Sets and Monitors
- Consumer Electronics
- Network Systems
- General Purpose Point of Load

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Rating	Unit
VIN	Supply Pin Voltage	-0.3 to +20.0 (DC)	V
		-0.3 to 22.0 (400ms)	
V _{SW}	Switch Pin Voltage	-1.0 to VIN + 0.3 (DC)	V
		-2.5 to VIN + 2.0 (20ns)	
V _{BST}	Bootstrap Pin Voltage	V _{SW} - 0.3 to V _{SW} + 6.0	V
V _{EN}	Enable/UVLO Pin Voltage	-0.3 to +6.0	V
V _{FB}	Feedback Pin Voltage	-0.3 to +6.0	V
T _{ST}	Storage Temperature	-65 to +150	°C
T _J	Junction Temperature	+150	°C
T _L	Lead Temperature	+260	°C
ESD Susceptibility			
HBM	Human Body Mode	2000	V
CDM	Charge Device Model	500	V

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Rating	Unit
V _{IN}	Supply Voltage	4.2 to 18	V
V _{OUT}	Output Voltage Range	0.8 to 7	V
T _A	Operating Ambient Temperature	-40 to +85	°C
T _J	Operating Junction Temperature	-40 to +125	°C

SETTING OUTPUT VOLTAGE:

Table 1 for **AP62301** shows a list of recommended component selections for common output voltages.

V _{OUT}	C1	C2, C3	R1	R2	L1	C6
1.2V	10μF	2 x 22μF	4.99KΩ	10KΩ	1.5μH	100nF
1.5V	10μF	2 x 22μF	8.66KΩ	10KΩ	1.5μH	100nF
1.8V	10μF	2 x 22μF	12.4KΩ	10KΩ	2.2μH	100nF
2.5V	10μF	2 x 22μF	21.5KΩ	10KΩ	2.2μH	100nF – 220nF
3.3V	10μF	2 x 22μF	31.6KΩ	10KΩ	3.3μH	100nF – 330nF
5.0V	10μF	2 x 22μF	52.3KΩ	10KΩ	3.3μH	100nF – 330nF

Table 1. Common Output Voltages

EVALUATION BOARD

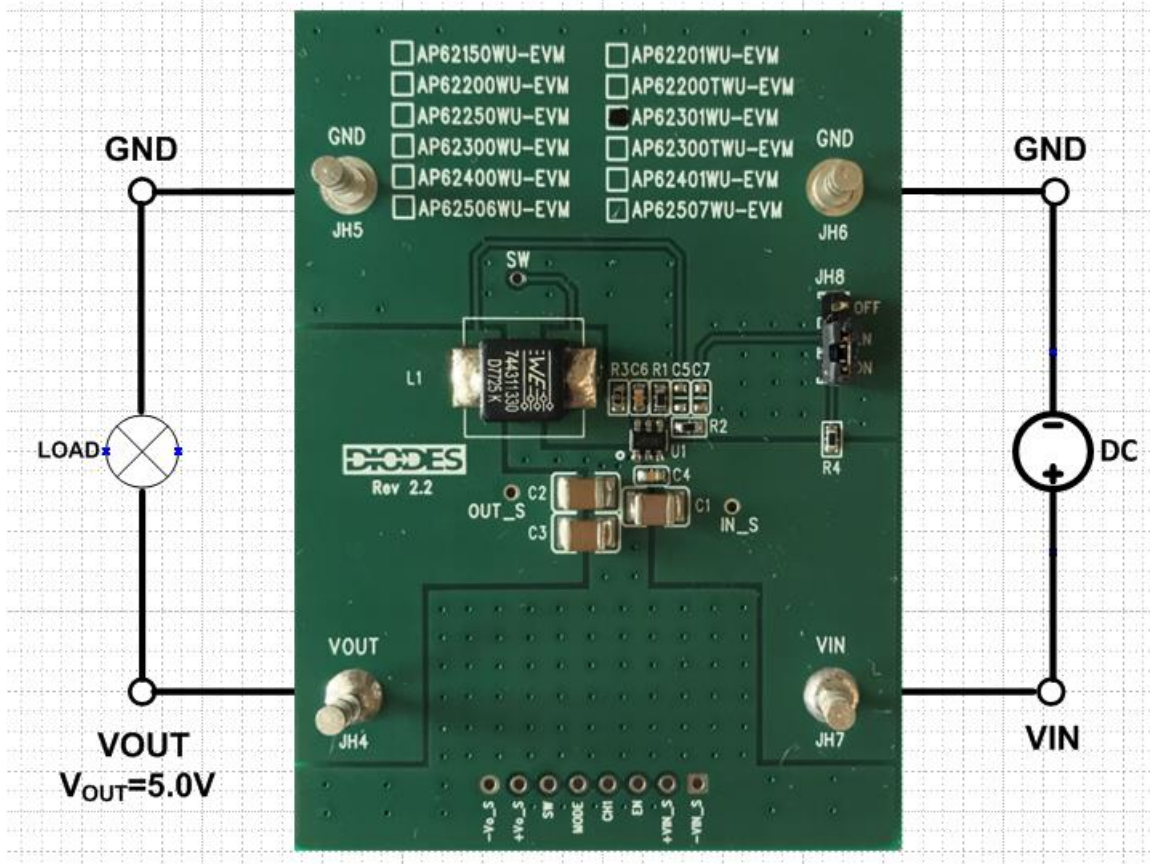


Figure 1. AP62301WU-EVM

QUICK START GUIDE

The AP62301WU-EVM has a simple layout and allows access to the appropriate signals through test points. To evaluate the performance of the AP62301WU-EVM, follow the procedure below:

1. Connect a power supply to the input terminals V_{IN} and GND. Set V_{IN} to 12V.
2. Connect the positive terminal of the electronic load to V_{OUT} and negative terminal to GND.
3. For Enable, place a jumper at JH8 to "ON" position to connect EN pin to V_{IN} through 100K Ω resistor to enable IC or leave it OPEN. Jump to "OFF" position to disable IC.
4. The evaluation board should now power up with a 5.0V output voltage.

5. Check for the proper output voltage of 5.0V ($\pm 1\%$) at the output terminals V_{OUT} and GND. Measurement can also be done with a multimeter with the positive and negative leads between V_{OUT} and GND.
6. Set the load to 3A 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.

BOOTSTRAP CAPACITOR GUIDELINES:

To ensure proper operation, a ceramic capacitor must be connected between the BST and SW pins to supply the drive voltage for the high-side power MOSFET. A 100nF ceramic capacitor is sufficient for most applications. In the cases where output voltage is higher than 2.5V, a higher capacitance is recommended to help maintain stable voltage from BST to SW. Please refer to Table 1 for details.

EVALUATION BOARD SCHEMATIC

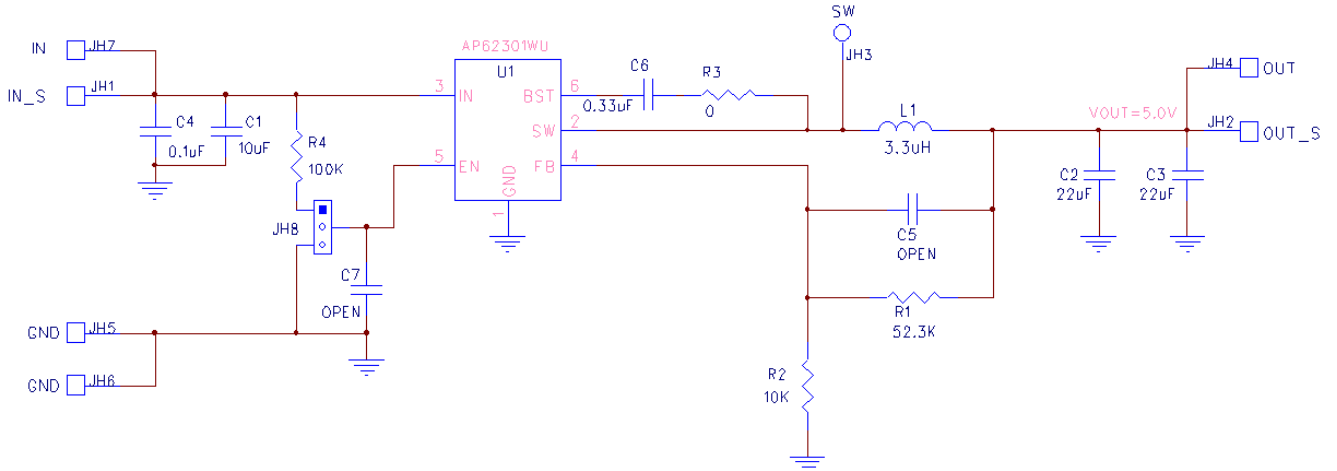


Figure 2. AP62301WU-EVM Schematic

PCB TOP LAYOUT

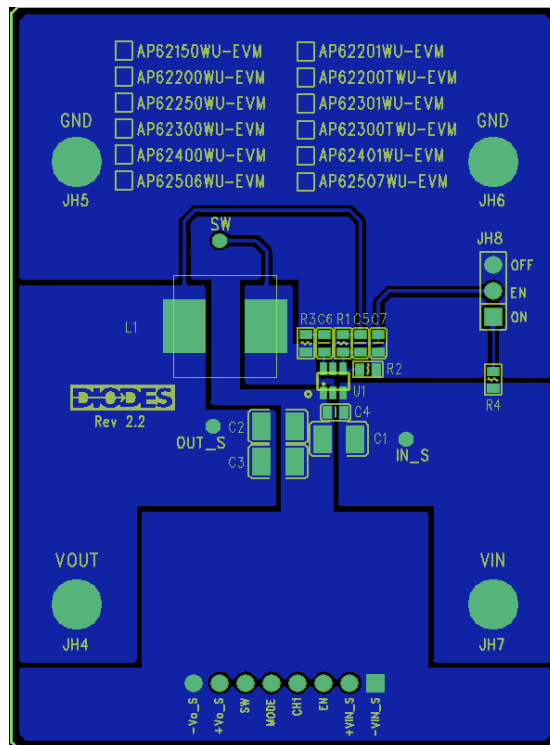


Figure 3. AP62301WU-EVM – Top Layer

PCB BOTTOM LAYOUT

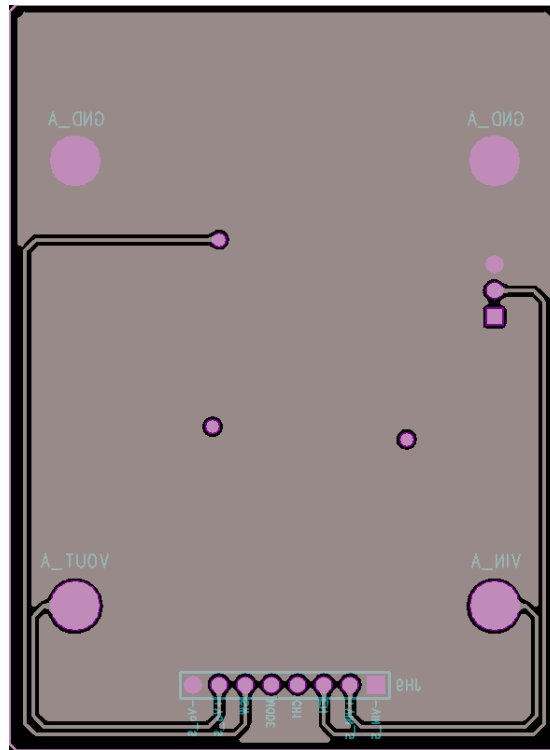
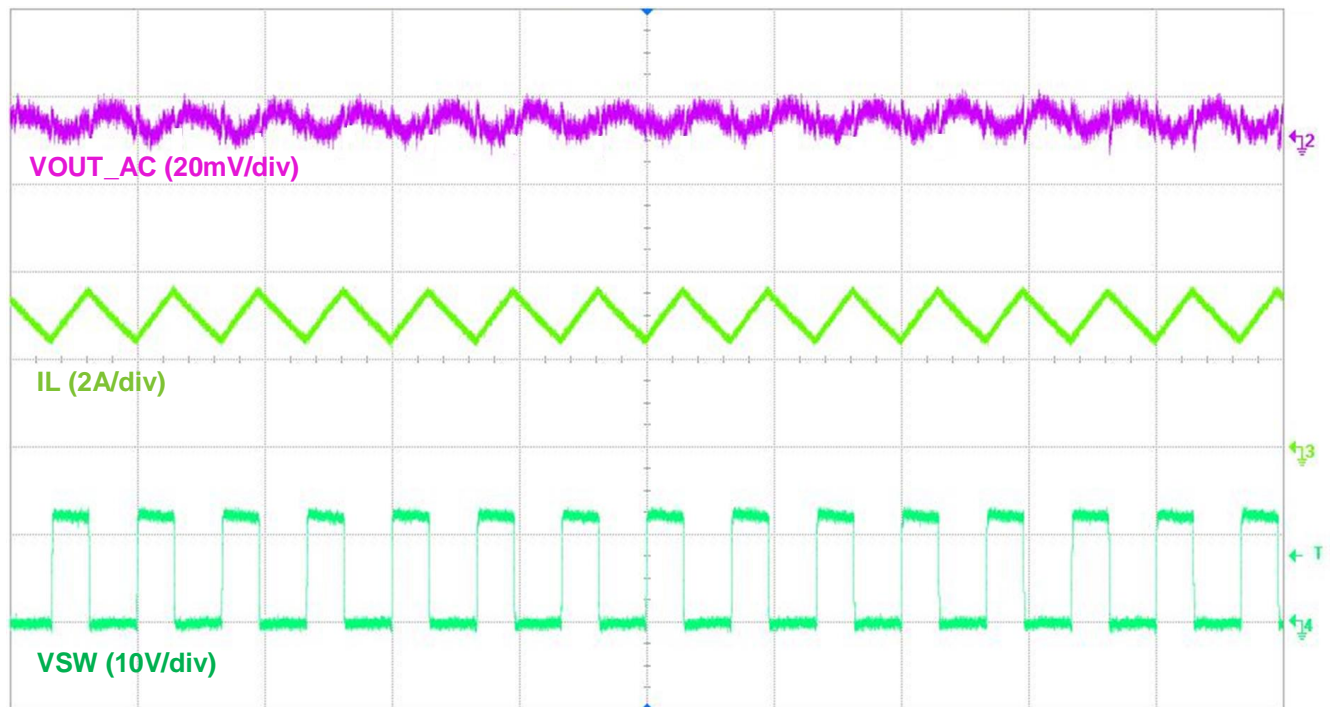
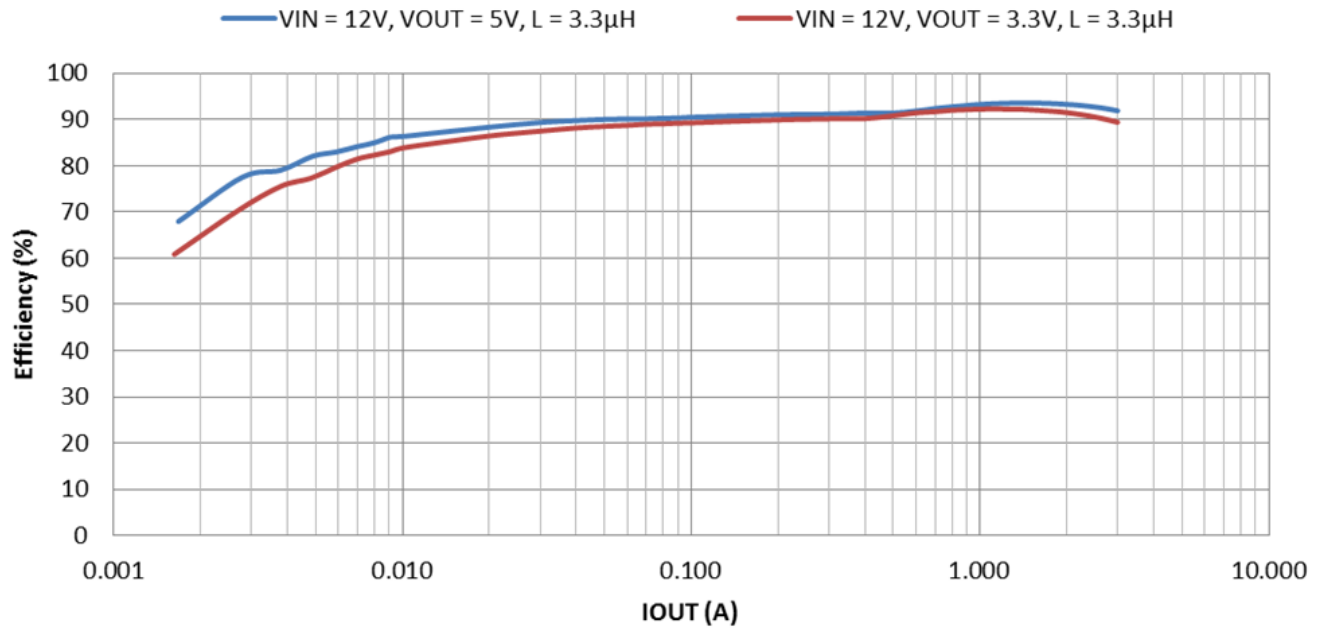


Figure 4. AP62301WU-EVM – Bottom Layer

BILL OF MATERIALS for AP62301WU-EVM for $V_{OUT}=5V$

Ref	Value	Description	Qty	Size	Vendor Name	Manufacturer PN
C1	10 μ F	Ceramic Capacitor, 25V, X7R, 10%	1	1210	KEMET	C1210C106K3RACTU
C2, C3	22 μ F	Ceramic Capacitor, 25V, X7R, 10%	2	1210	KEMET	C1210C226K3RAC7800
C4	0.1 μ F	Ceramic Capacitor, 50V, X7R, 10%	1	0603	KEMET	C0603C104K5RACTU
C6	0.33 μ F	Ceramic Capacitor, 16V, X7R, 10%	1	0603	Samsung	CL10B334KO8NNNC
L1	3.3 μ H	DCR=17.2m Ω , Ir=6.5A	1	7x6.9x4mm	Würth Electronics	744311330
R1	52.3K Ω	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3EKF5232V
R2	10K Ω	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3EKF1002V
R3	0 Ω	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3GEY0R00V
R4	100K Ω	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3EKF1003V
JH4, JH5, JH6, JH7	1598	Terminal Turret Triple 0.094" L (Test Points)	4	Through-Hole	Keystone Circuit	1598-2
JH8		PCB Header, 40 POS	1	1X3	3M	2340-6111TG
U1	AP62301	Sync Buck DC-DC converter	1	TSOT26	Diodes Inc	AP62301WU-7

TYPICAL PERFORMANCE CHARACTERISTICS



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