AP62150WU -EVM

18V, 1.5A/2.5A, LOW Iq, COT SYNCHRONOUS DC-DC BUCK CONVERTER

Description

The DIODES AP62150 is a 1.5A, synchronous buck converter with a wide input voltage range of 4.2V to 18V. The device fully integrates a 90mΩ (AP62150) high-side power MOSFET and a 65mΩ (AP62150) low-side power MOSFET to provide high-efficiency step-down DC-DC conversion.

The AP62150 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 AP62150 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.

AP62150 is available in a TSOT26 package.

Features

- V_{IN} Range: 4.2V -18V
- Output Voltage range: 0.8V to 7V
- 1.5A Continuous Output Current
- 0.8V ± 1% Reference Voltage (T_A = +25°C) => AP62300 and AP62301
- 135μA Low Quiescent Current
- 1.3MHz Switching Frequency
- Up to 88% 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
- Set Top Boxes
- Consumer Electronics
- Network Systems
- General Purpose Point of Load

Typical Applications Circuit

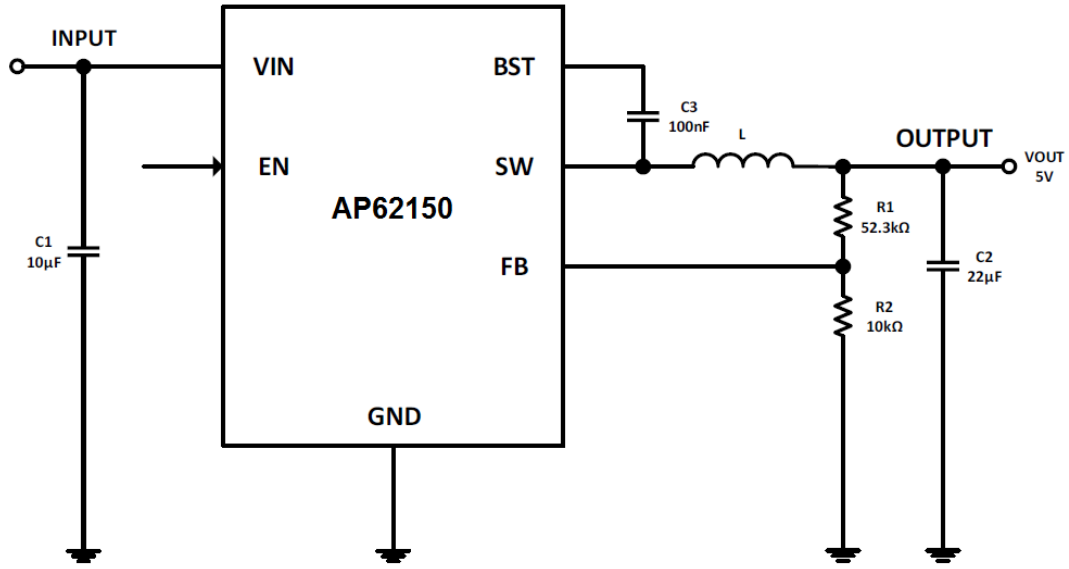


Figure 1. Typical Application Circuit

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

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 AP62150 shows a list of recommended component selections for common output voltages.

VOUT	R1	R2	L1
1.2V	4.99KΩ	10KΩ	1.2μH
1.5V	8.66KΩ	10KΩ	1.5μH
1.8V	12.4KΩ	10KΩ	1.8μH
2.5V	21.5KΩ	10KΩ	2.2μH
3.3V	31.6KΩ	10KΩ	3.3μH
5.0V	52.3KΩ	10KΩ	3.3μH

Table 1. Common Output Voltages (AP62150)

Evaluation Board

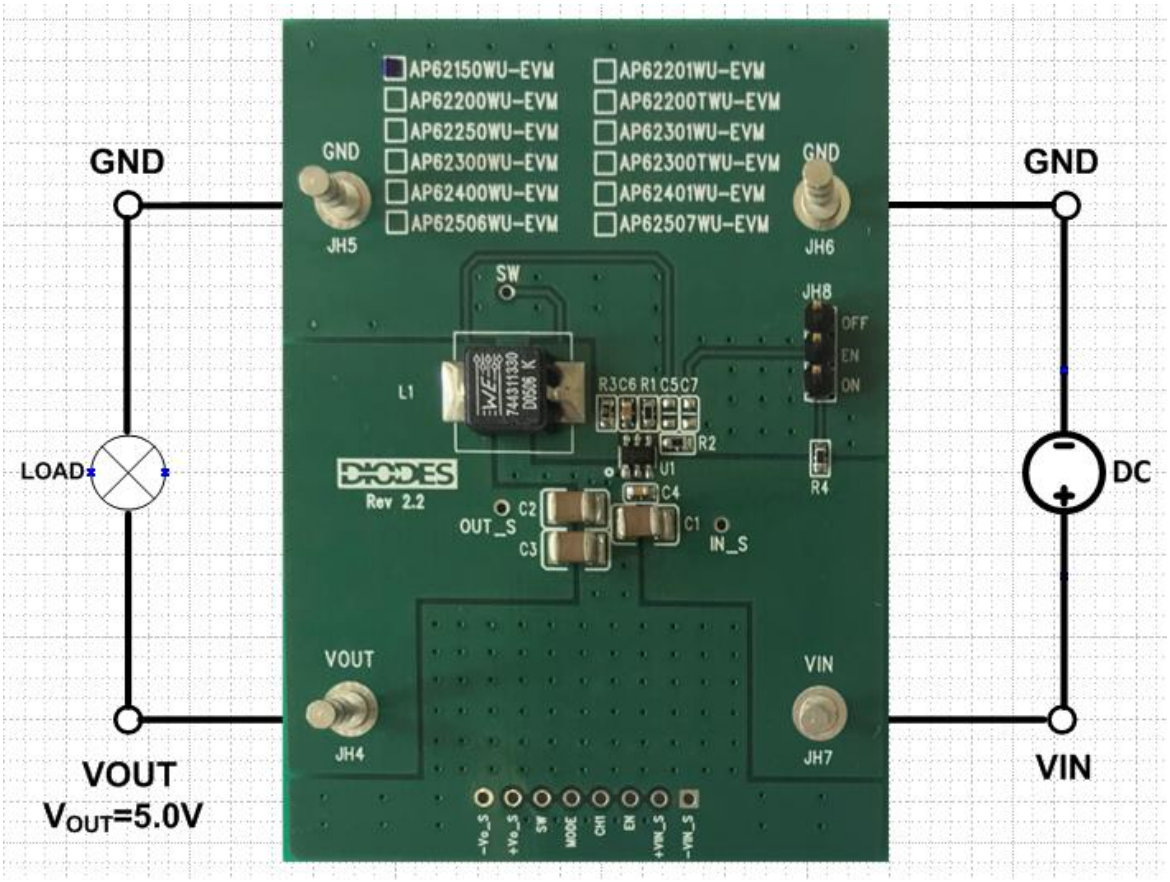


Figure 2. AP62150WU-EVM

Quick Start Guide

The AP62150WU-EVM has a simple layout and allows access to the appropriate signals through test points. To evaluate the performance of the AP62150, follow the procedure below:

1. Connect a power supply to the input terminals VIN and GND. Set VIN to 12V.
2. Connect the positive terminal of the electronic load to VOUT and negative terminal to GND.
3. For Enable, place a jumper at JH8 to “ON” position to connect EN pin to VIN through 100KΩ 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 (±1%) 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 1.5A for AP62150 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.

Evaluation Board Schematic

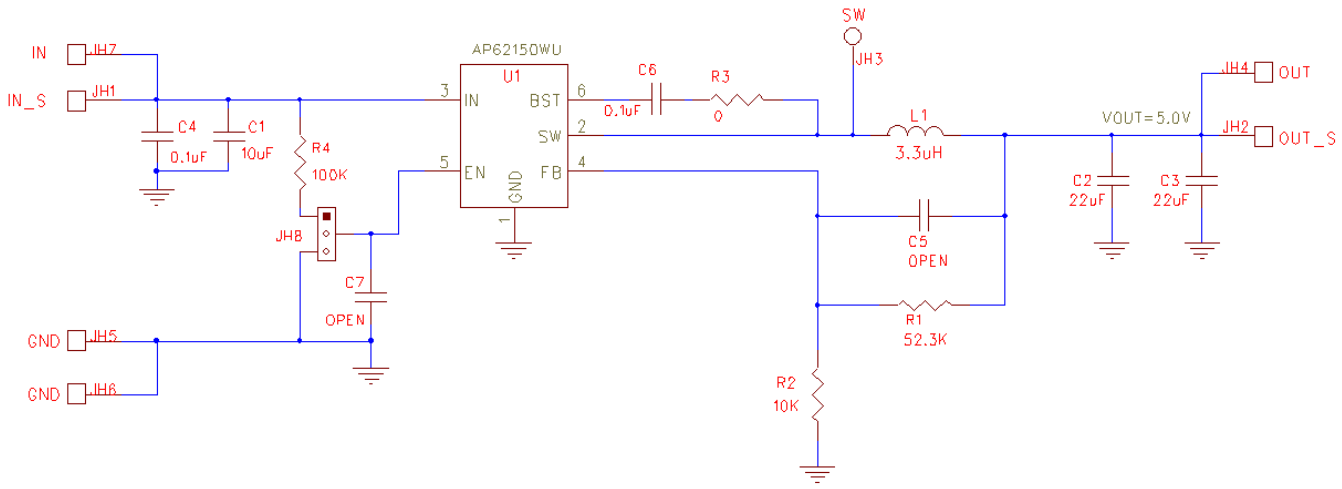


Figure 3. AP62150WU-EVM Schematic

PCB Top/Bottom Layout

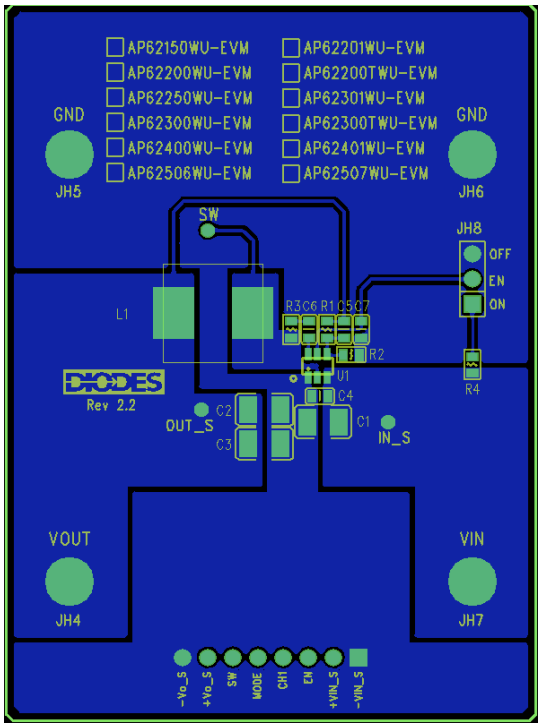


Figure 4. AP62150WU-EVM – Top Layer

PCB Bottom Layout

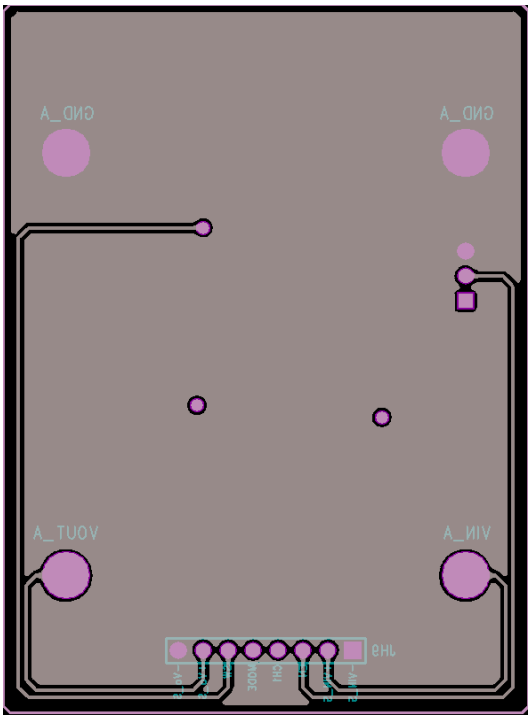


Figure 5. AP62150WU-EVM – Bottom Layer

Bill of Materials for AP62150WU-EVM for V_{OUT}=5V

Ref	Value	Description	Qty	Size	Vendor Name	Manufacturer PN
C1	10µF	Ceramic Capacitor, 25V, X5R	1	1210	Murata	GRM32DR61E106KA12L
C2, C3	22µF	Ceramic Capacitor, 25V, X5R	2	1210	AVX	12103D226KAT2A
C4, C6	0.1µF	Ceramic Capacitor, 50V, X7R, 10%	2	0603	Samsung	GCJ188R71H104KA12D
L1	3.3µH	DCR=17.2mΩ, Ir=6.5A	1	6.9 x 6.9 x 4mm	Wurth Electronics	744311330
R1	52.3KΩ	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3EKF5232V
R2	10KΩ	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3EKF1002V
R3	0Ω	SMD Resistor, 1%	1	0603	Panasonic	ERJ-3GEY0R00V
R4	100KΩ	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	AP62150	Sync Buck DC-DC converter	1	TSOT26	Diodes Inc	AP62150WU-7

Typical Performance Characteristics

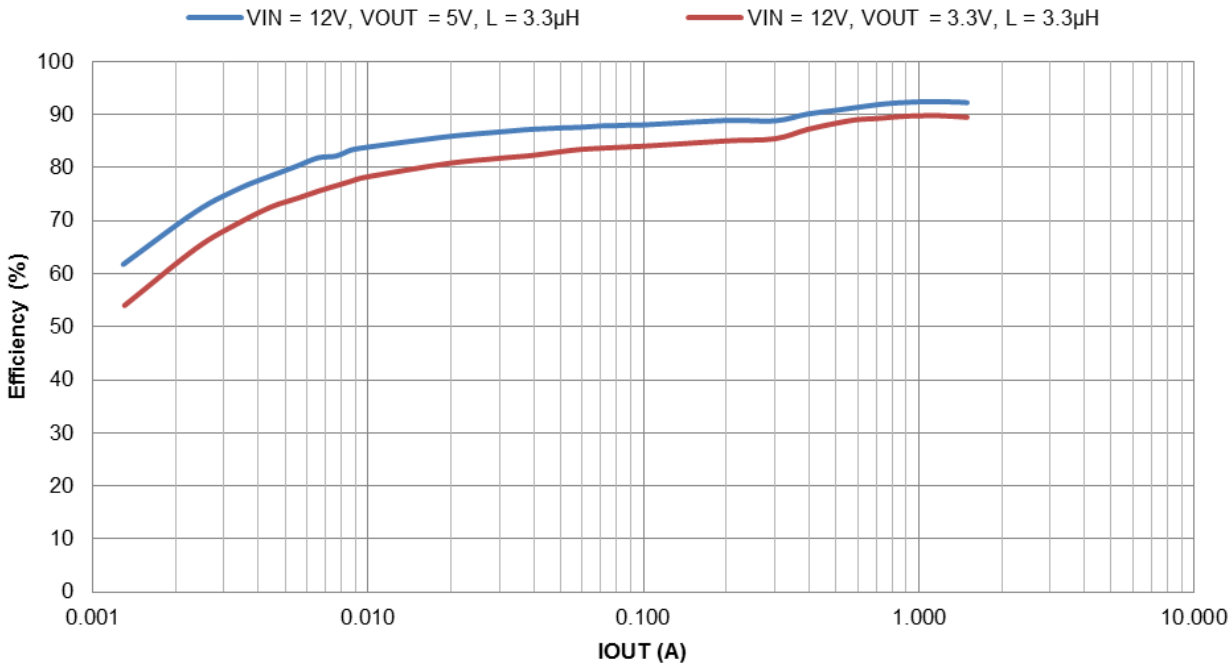


Figure 6. AP62150WU-EVM Efficiency

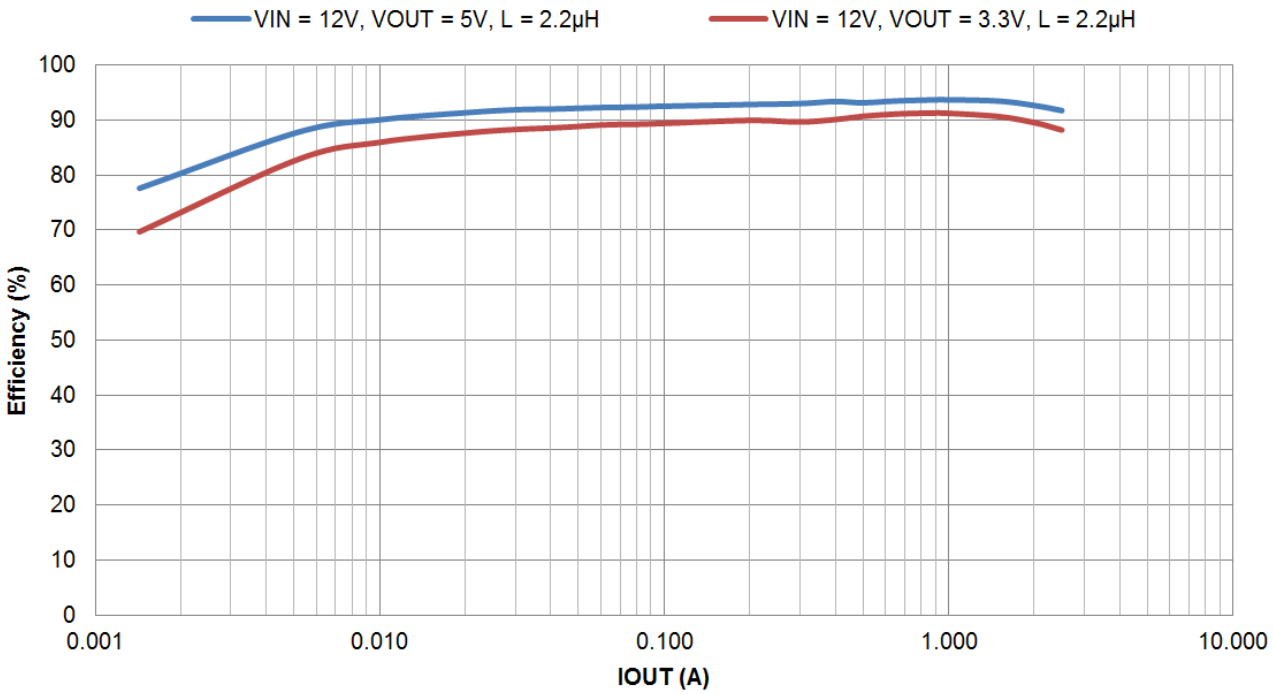
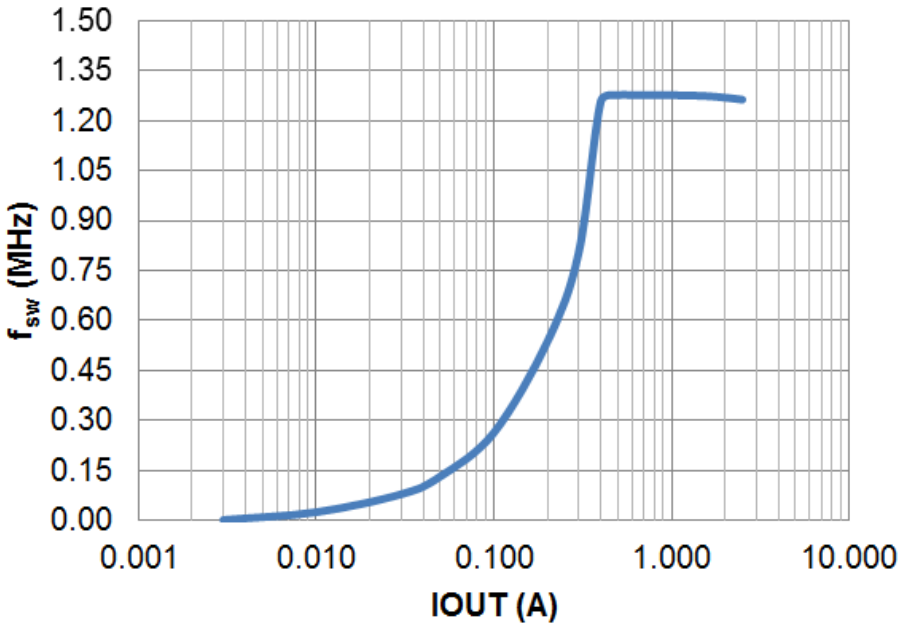
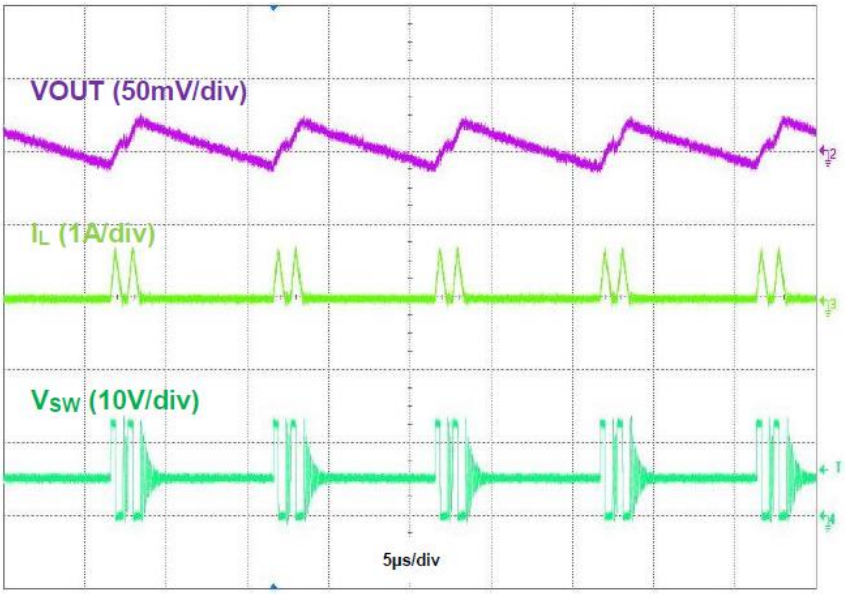


Figure 7. AP62250WU-EVM Efficiency



f_{sw} vs. Load



Output Voltage Ripple, VOUT = 5V, IOUT = 50mA

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