DESCRIPTION

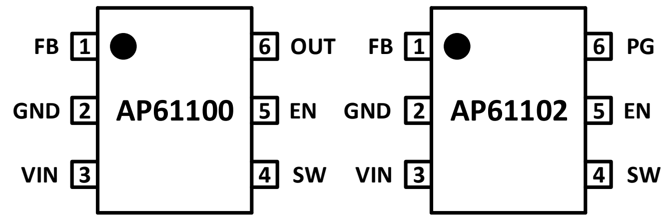
The AP61100 is a 1A, synchronous buck converter with an input voltage range of 2.3V to 5.5V and fully integrates a 120mΩ high-side power MOSFET and a 80mΩ low-side power MOSFET to provide high-efficiency step-down DC/DC conversion.

The AP61100 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. Moreover, AP61100 also features force PWM mode control through EN pin.

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
- Programmable Modulation Mode Through EN
  - PFM (Vin $-V_{EN}$ < 200mV)
  - PWM Regardless of Output Load (Vin – V_{EN} > 200mV)
- Protection Circuitry
  - Undervoltage Lockout (UVLO)
  - VIN Overvoltage Protection (OVP)
  - Peak Current Limit
  - Valley Current Limit
  - Thermal Shutdown

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

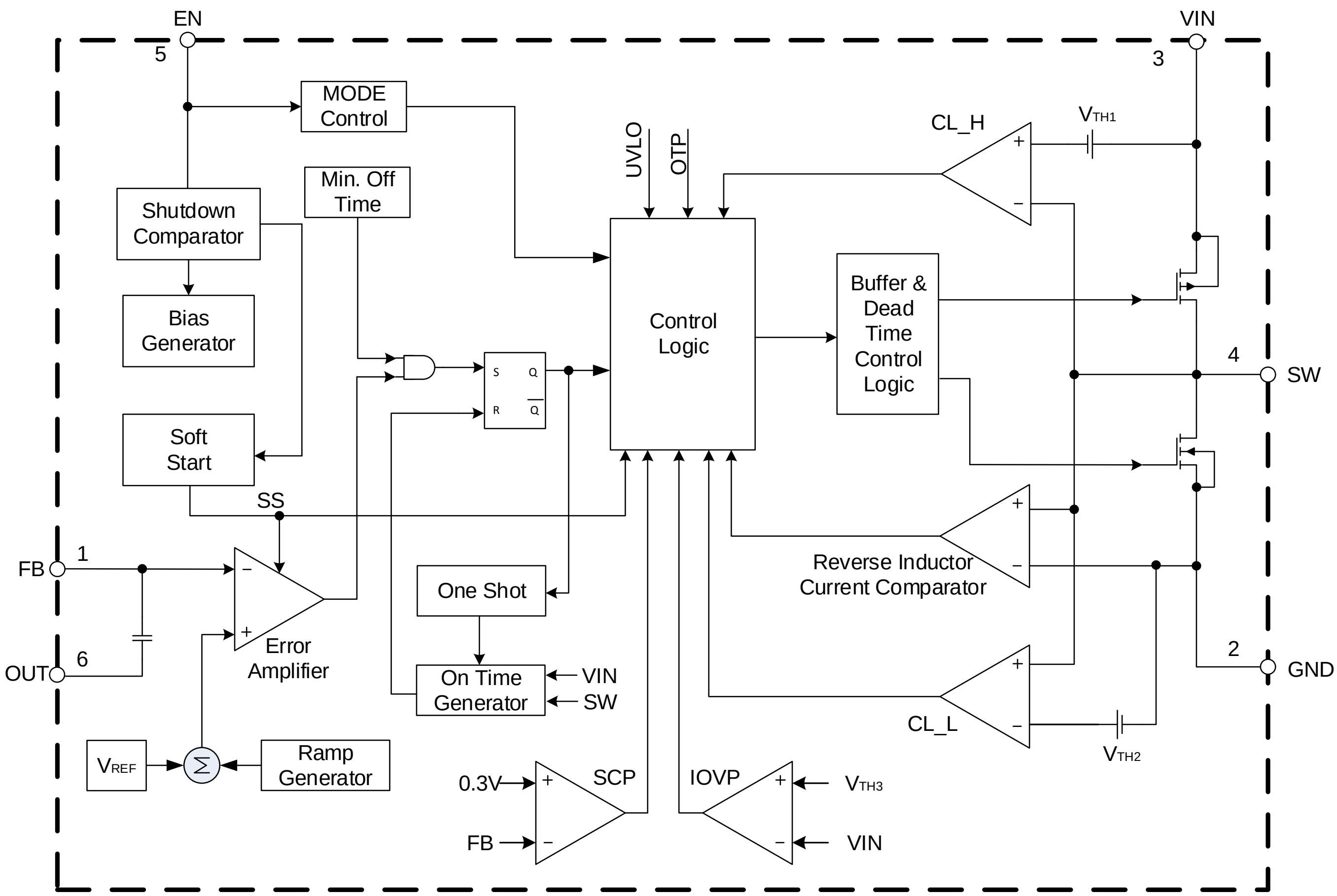


Figure 1. Functional Block Diagram

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
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 (Note 7) (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 AP61100Z6-EVM has a simple layout and allows access to the appropriate signals through test points. To evaluate the performance of the AP61100Z6, follow the procedure below:

1. For evaluation board configured at V_{OUT}=1.8V, connect a power supply to the input terminals V_{IN} and GND. Set V_{IN} to 5V.
2. Connect the positive terminal of the electronic load to V_{OUT} 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 (±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 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 AP61100

1) Setting the output voltage

The AP61100 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

Vo	R1	R2	C3
1.0V	200KΩ	301KΩ	10uF
1.2V	200KΩ	200KΩ	10uF
1.5V	200KΩ	133KΩ	10uF
1.8V	200KΩ	100KΩ	10uF
2.5V	200KΩ	63.2KΩ	10uF
3.3V	200KΩ	44.2KΩ	10uF

EXTERNAL COMPONENT SELECTION:

Inductor (L)

(1) Low DCR for good efficiency
(2) Inductance saturate current must be higher than 2.5A
(3) 1.0uH inductor of Würth Elektronik(PN. 744 383 560 10) is recommended for all application circuit.

EVALUATION BOARD SCHEMATIC

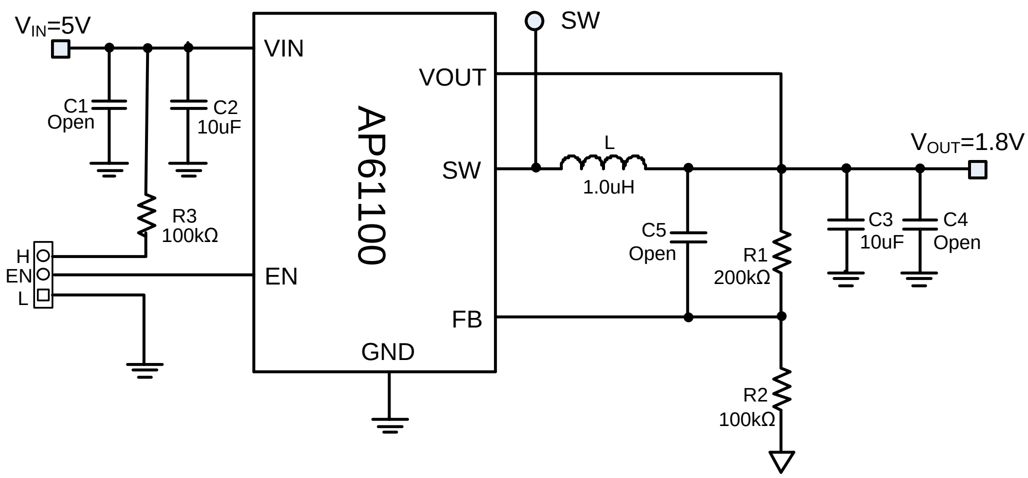


Figure 2. Typical Application Circuit

PCB TOP LAYOUT

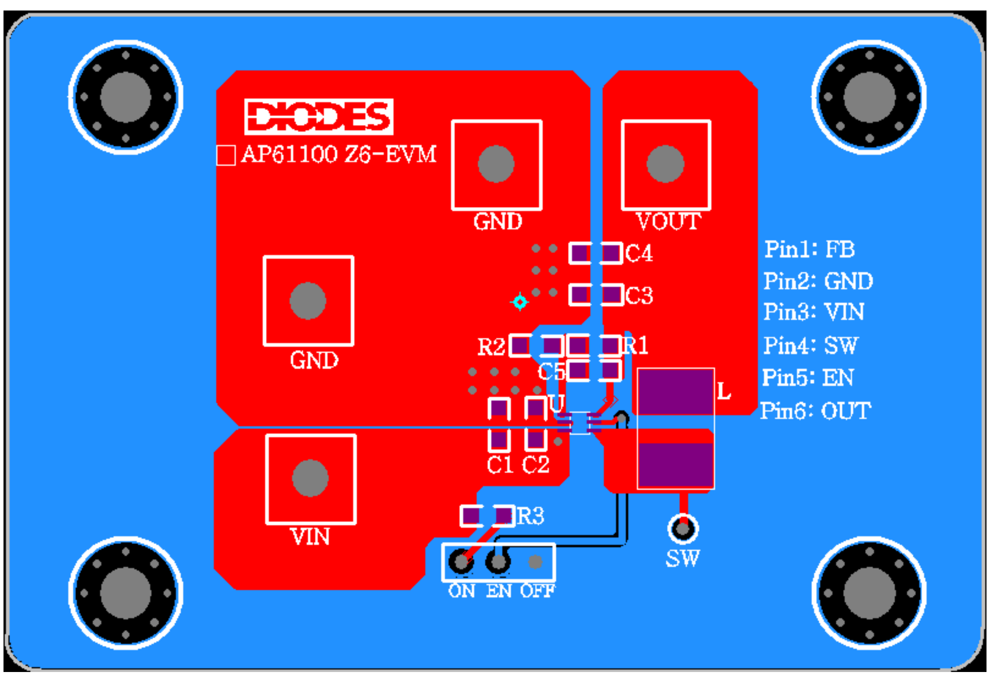


Figure 3. AP61100Z6 - EVM - Top Layer

PCB BOTTOM LAYOUT

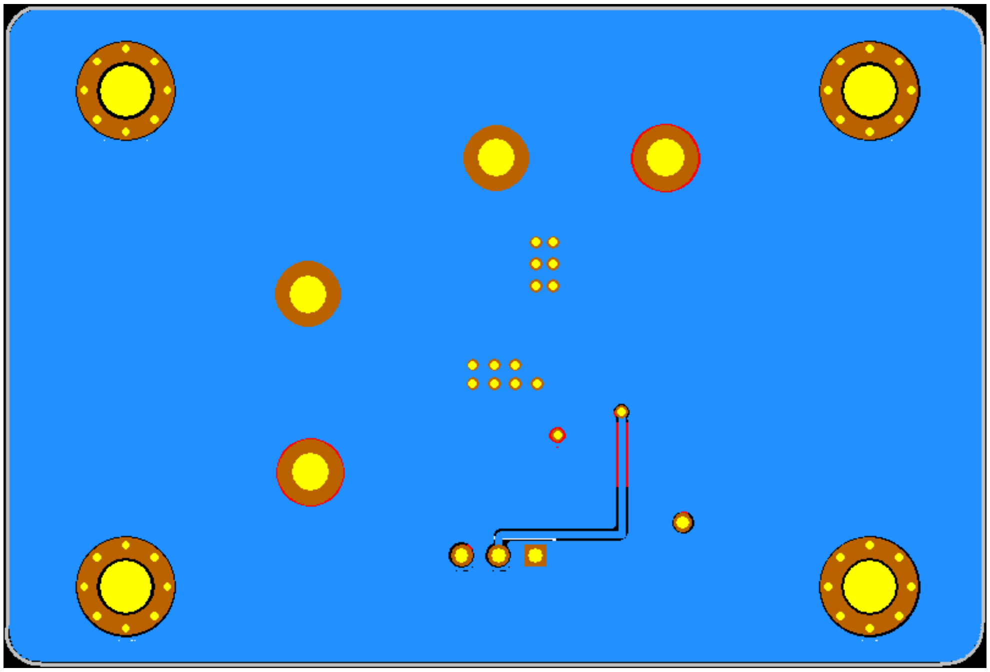


Figure 4. AP61100Z6 - EVM - Bottom Layer

EV Board View

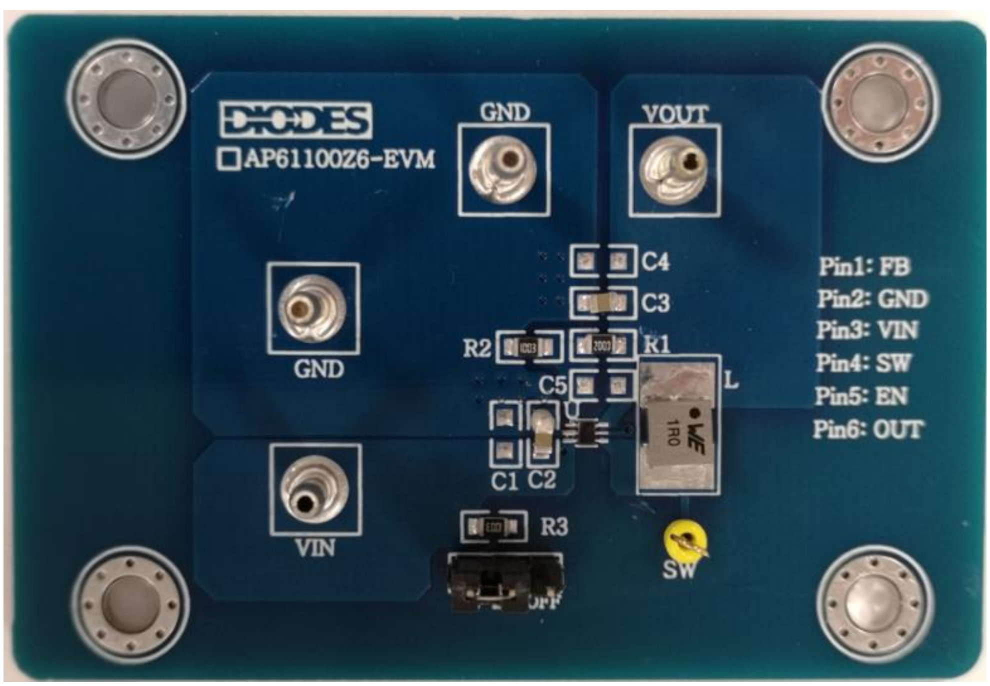


Figure 5. AP61100Z6 EV Board View

BILL OF MATERIALS for AP61100Z6-EVM (V_{OUT}=1.8V)

Item	Value	Type	Rating	Description	Description
C2	10uF	X5R/X7R, Ceramic/0805	10V	Input coupling CAP	TAIYO YUDEN EMK212ABJ106KD-T
C3	10uF	X5R/X7R, Ceramic/0805	10V	Output coupling CAP	TAIYO YUDEN EMK212ABJ106KD-T
L	1.0uH	SMD	>3A	Inductor	WURTH ELEC 74438357010
R1	200K	0805	1%	Voltage set RES*	
R2	100K	0805	1%		
R3	100K	0805	1%	EN RES*	
U1		AP61100		SOT563	Diodes BCD

TYPICAL PERFORMANCE CHARACTERISTICS

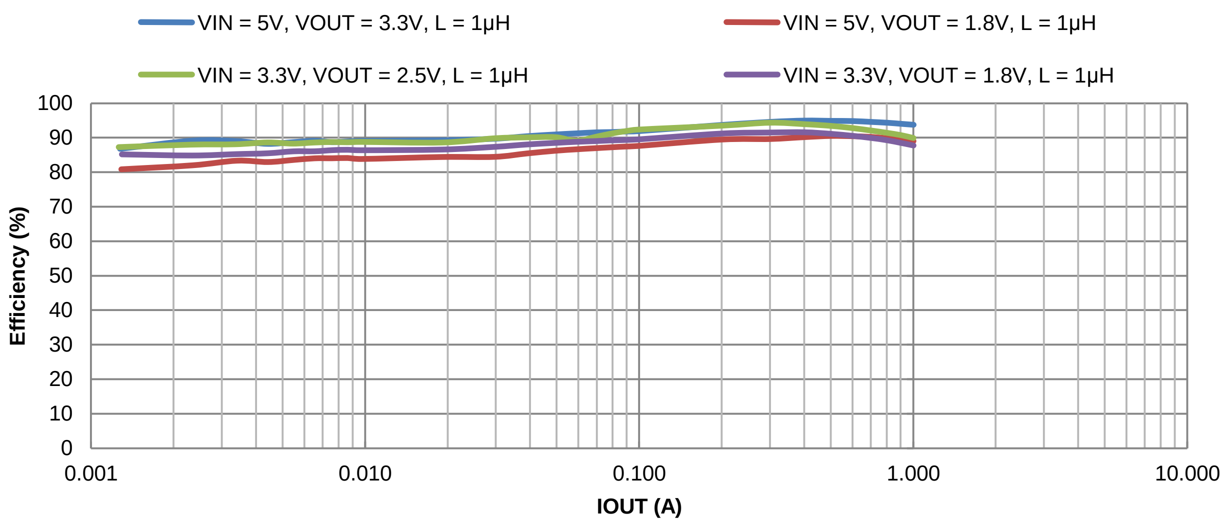


Figure 6. PFM Efficiency vs. Output Current

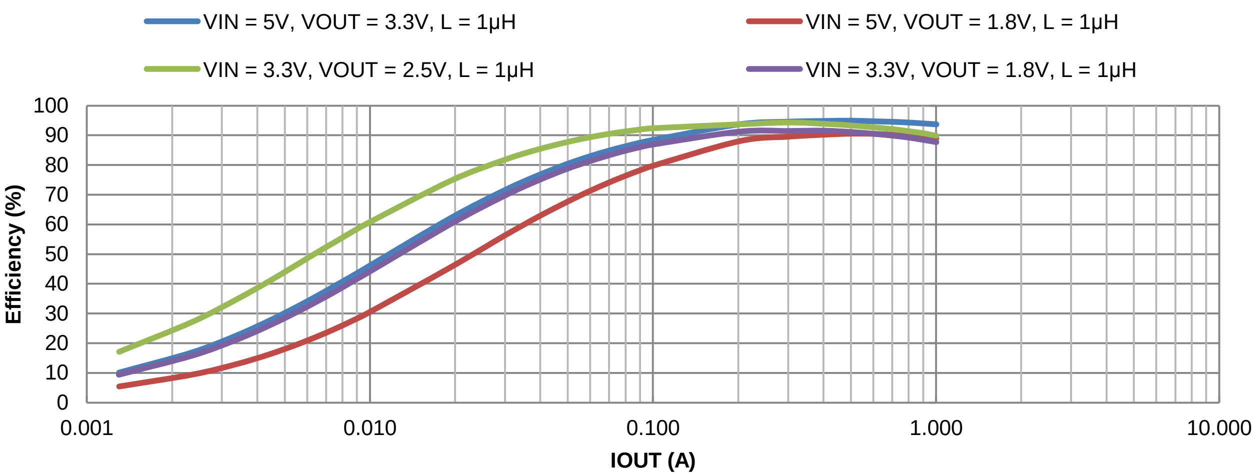


Figure 7. PWM Efficiency vs. Output Current

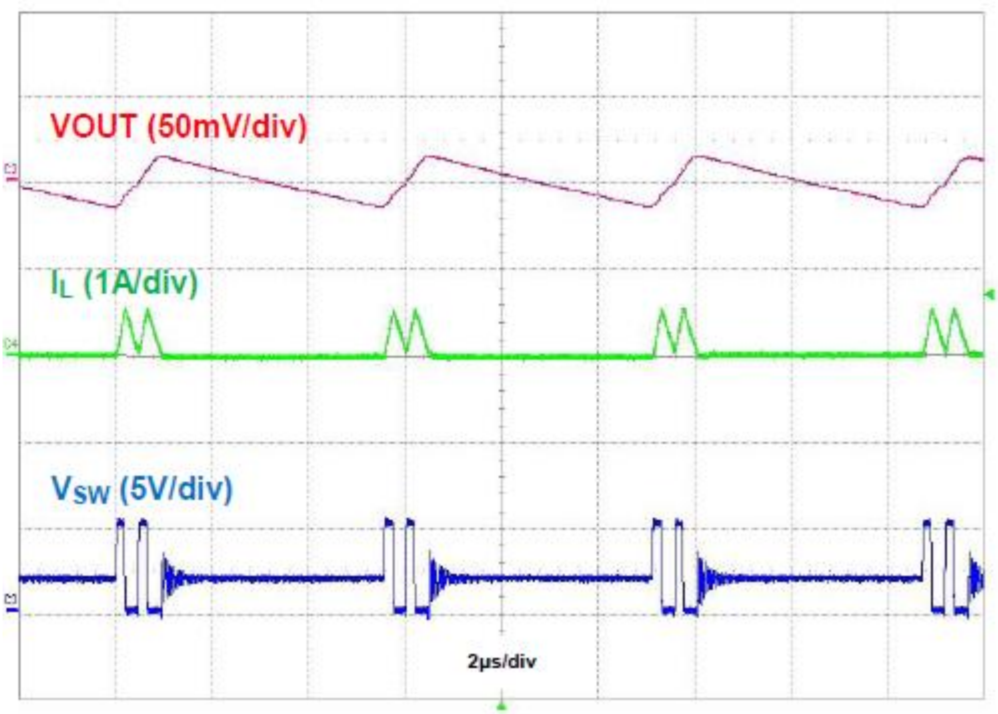


Figure 8. Output Voltage Ripple, IOUT = 50mA

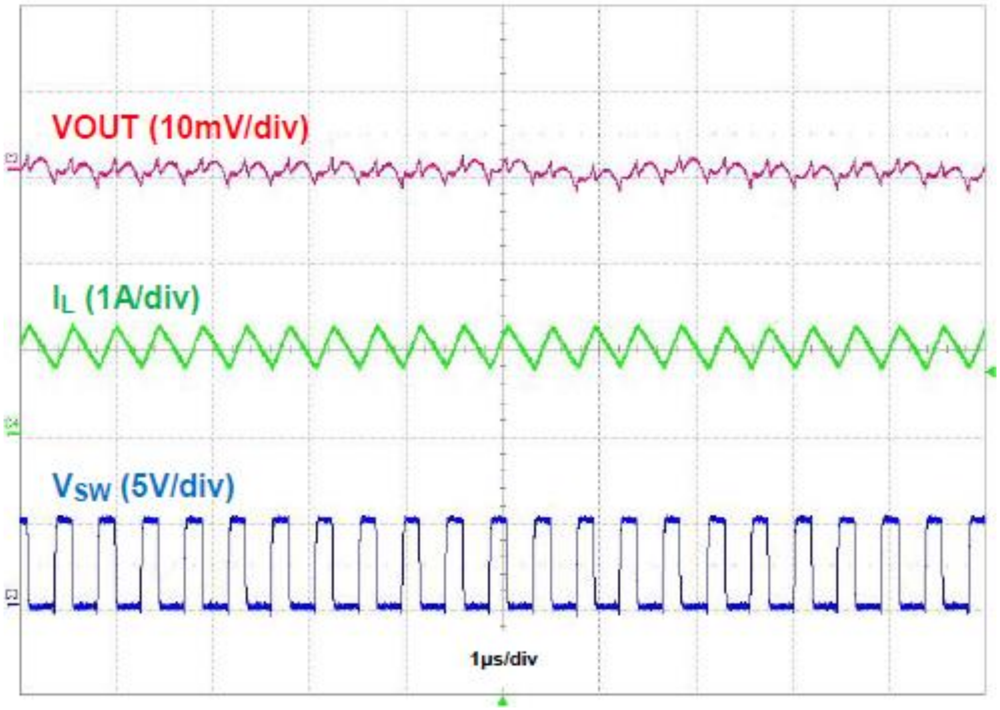


Figure 9. Output Voltage Ripple, IOUT =1A