
AP63201 EVB User Guide

AE Department

1. General Description

The AP63201 is a 2A, synchronous buck converter with up to 32V wide input voltage range, which fully integrates a 140mΩ high-side MOSFET and a 70mΩ low-side MOSFET to provide high efficiency step-down DC/DC conversion. The AP63201 adopts peak current mode control with the integrated compensation network, which makes AP63201 easily to be used by minimizing the off-chip component count..

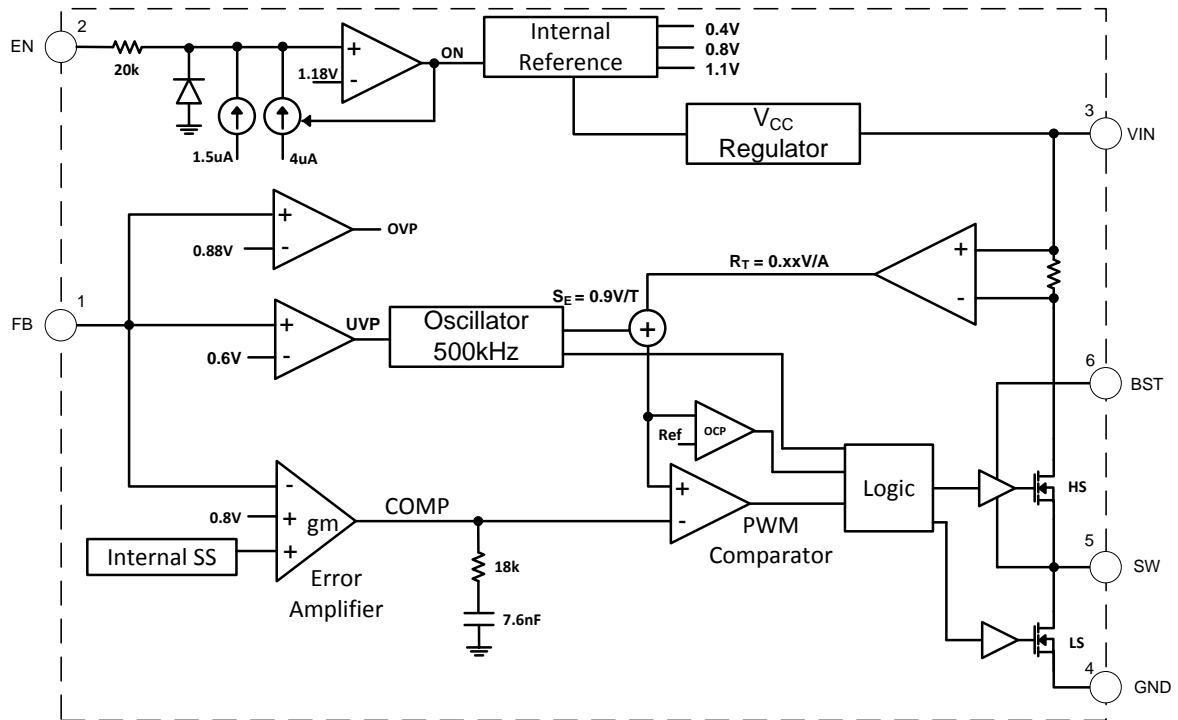
The AP63201 is an Electromagnetic Interference (EMI) friendly buck converter with implementing optimized design for EMI reduction. The AP63201 features Frequency Spread Spectrum (FSS) with $\pm 6\%$ jittering span of the 500 kHz switching frequency and modulation rate 1/512 of switching frequency to reduce the conducted EMI. The converter has proprietary designed gate driver scheme to resist switching node ringing without sacrificing MOSFET turn on and turn off time, which further erases high frequency radiation EMI noise caused by the MOSFETs hard switching.

The AP63201 offers output overvoltage protection, cycle-by-cycle peak current limit, and thermal shutdown protection. The device is available in a low-profile TSOT23-6 package.

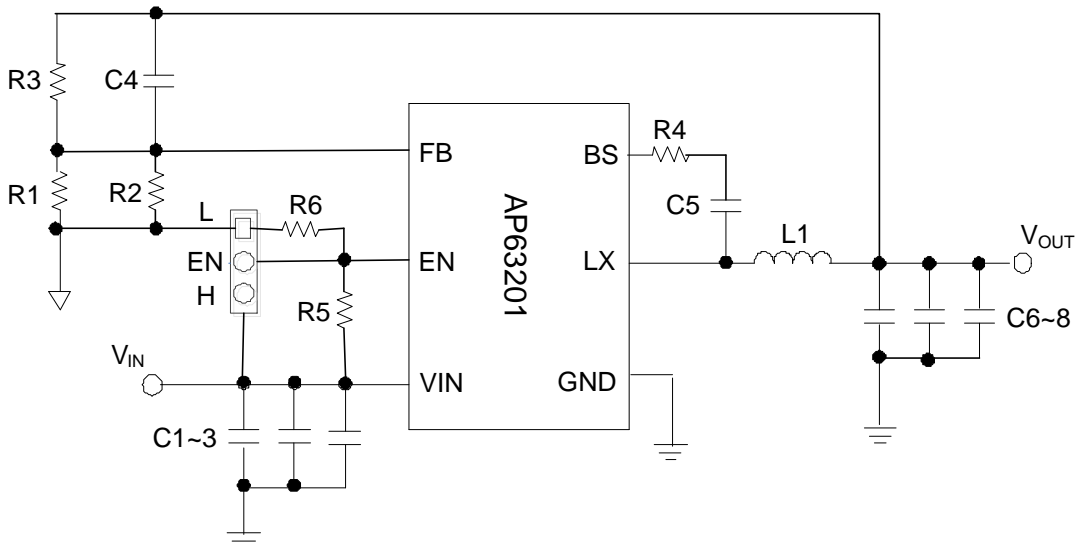
2. Applications

- White Goods, Home Appliance
- Surveillance
- Audio, WiFi Speaker
- Printer
- DTV, STB, Monitor/LCD Display
- Charging Station

3. Function Block



4. AP63201 EV Board Schematic

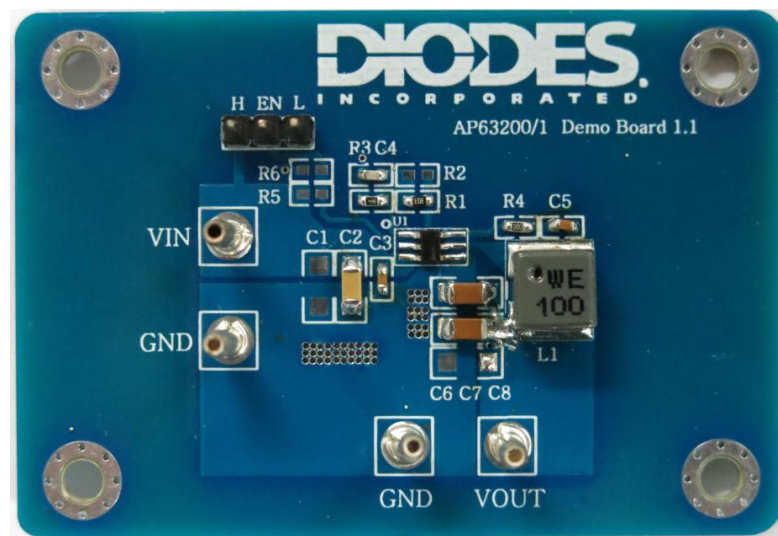


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5. AP63201 EV Board Description

The EV board is suitable evaluation board for the AP63201, a DC/DC converter. The board is targeted to be used in providing a simple and convenient evaluation environment for the AP63201. Requires parts, power supply connectors etc. on the board, which makes it easy to be evaluated.

6. AP63201 EV Board View



7. Setting the Output Voltage of AP63201

(1) Setting the output voltage

The AP63201 features external programmable output voltage by using a resistor divider network R3 and R1 as shown in the typical application circuit. The output voltage is calculated as below,

$$V_{OUT} = 0.8 \times \left(\frac{R_1 + R_3}{R_1} \right)$$

First, select a value for R1 according to the value recommended in the table 1. Then, R3 is determined. The output voltage is given by Table 1 for reference. For accurate output voltage, 1% tolerance is required.

(2) Output feed-forward capacitor selection

The AP63201 has the internal integrated loop compensation as shown in the function block diagram. The compensation network includes an 18k resistor and a 7.6nF capacitor. Usually, the type II compensation

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network has a phase margin between 60 and 90 degree. However, if the output capacitor has ultra-low ESR, the converter results in low phase margin. To increase the converter phase margin, a feed-forward cap C4 is used to boost the phase margin at the converter cross-over frequency, f_c . The feed-forward capacitor is given by Table 1 for reference. The feed-forward capacitor is calculated as below,

$$C_4 = \frac{1}{2\pi \times f_c \times R_3}$$

Table 1. Resistor selection for output voltage setting

Vo	R3	R1	C4	C6-C8
1.8V	77.5 KΩ	62 KΩ	100pF	22uFx2
2.5V	131 KΩ	62 KΩ	100pF	22uFx2
3.3V	182 KΩ	62 KΩ	100 pF	22uFx2
5V	157 KΩ	30 KΩ	100 pF	22uFx2
12V	249 KΩ	18 KΩ	56 pF	22uFx4

8. External Components Selection

1) 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} capacitances are greater than 10uF.
- (4) 44uF ceramic output capacitors recommended work for most applications, ue to a capacitor's de-rating under DC bias, The 88uF is recommend for high output voltage condition. the output capacitor choose is shown on table1.

2) Bootstrap Voltage Regulator

- (1)An external 0.1uF ceramic capacitor is required as bootstrap capacitor between BST and SW pin to work as high side power MOSFET gate driver.

3) Inductor (L)

- (1) Low DCR for good efficiency
- (2) Inductance saturate current must higher than the output current
- (3) The recommended inductance is shown in the table 2 below.

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Table 2. Recommended inductors

Output Voltage	1.8V	2.5 V	3.3 V	5.0 V	12 V
Inductor	3.3 uH	3.3 uH	6.8 uH	10 uH	15 uH
W ü rth PART	744 393 440 33	744 393 440 33	744 393 460 68	744 393 461 00	744 393 461 50

9. EV Board BOM List for AP63201

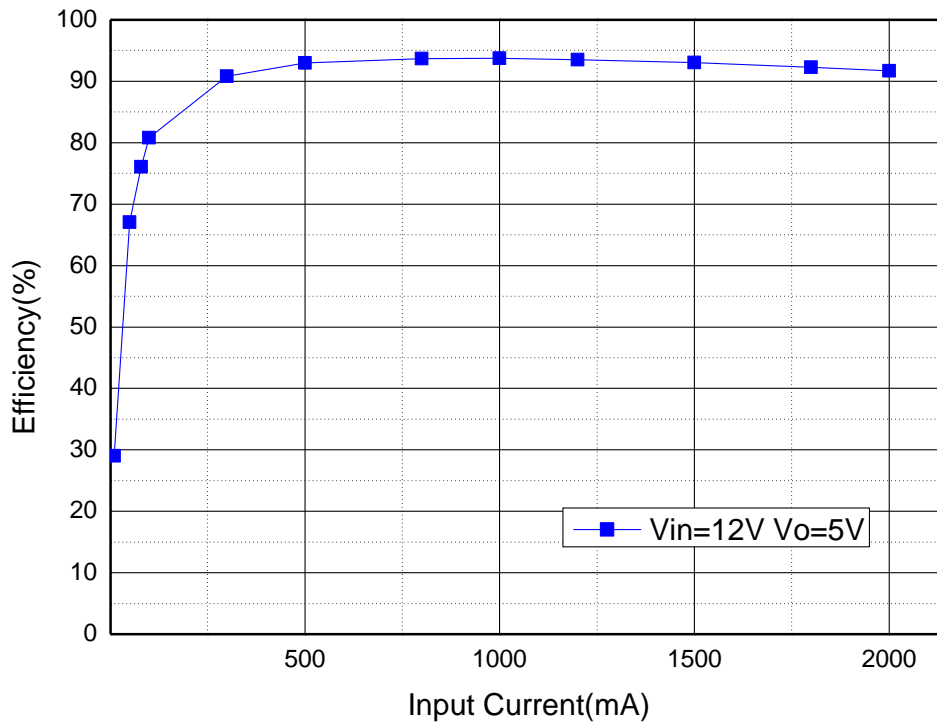
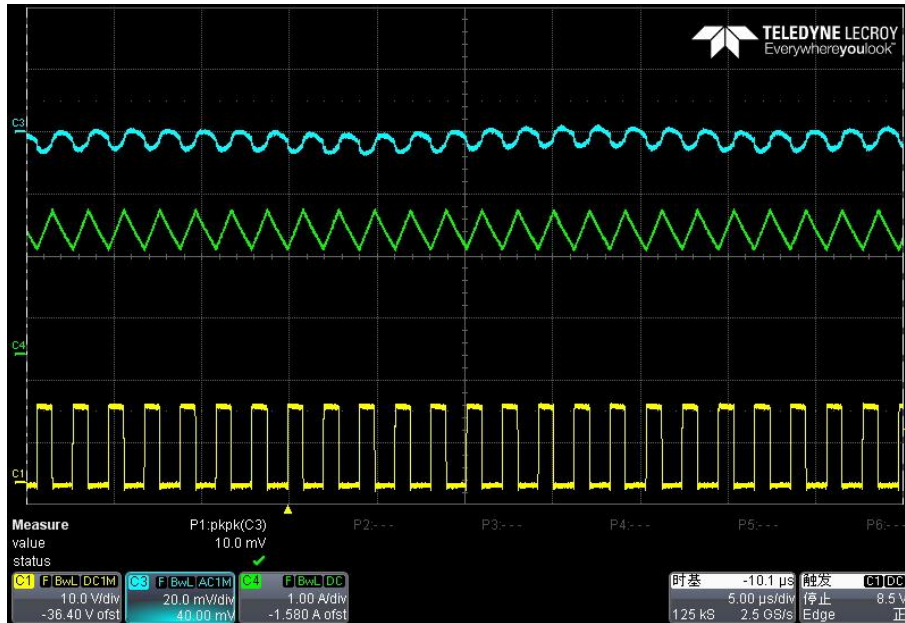
Item	Value	Type	Rating	Description	Description
C2	10uF	X5R/X7R, Ceramic/1206	35V	Input CAP	
C3	0.1uF	X5R/X7R, Ceramic/0603	50V	Input CAP	W ü rth PART 885 012 206 095
C4	100pF	0603	100V	Feedback CAP	W ü rth PART 885 012 206 102
C5	0.1uF	X5R/X7R, Ceramic/0603	50V	Bootstrap CAP	W ü rth PART 885 012 206 095
C6 & C7	22uF	X5R/X7R, Ceramic/1206	25V	Output CAP	
L1	10uH	6060	5.0A	Inductor	W ü rth PART 744 393 461 00
R1	30K	0603	1%	Voltage set RES*	
R3	157K	0603	1%		
R4	0	0603	1%	Bootstrap RES	
U1		AP63201		TSOT23-6	Diodes BCD

*Note: The present value of R3/R1 are based on Vout=5.0V

10. Test Waveforms

Test condition: $V_{in}=12V$ $V_o=5.0V$ $I_o=2.0A$

(Blue: V_{out-AC} ; Yellow: V_{sw} ; Green: I_L)



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