Control an LM317T with a PWM signal

FEBRUARY 3, 2011 < HTTPS://WWW.EDN.COM/CONTROL-AN-LM317T-WITH-A-PWM-SIGNAL/>

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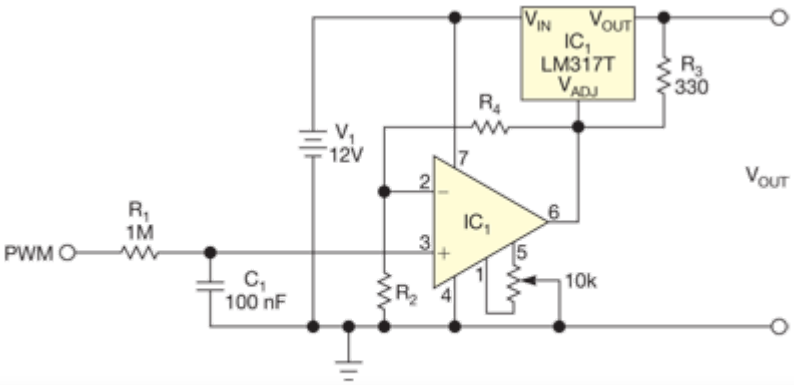
The LM317T from National Semiconductor < http://www.national.com> is a popular adjustable-voltage regulator that provides output voltages of 1.25 to 37V with maximum 1.5A current. You can adjust the output voltage with a potentiometer. The circuit in **Figure 1** replaces the potentiometer with an analog voltage that you can control from a PWM (pulse-width-modulation) signal. You control this signal with a microcontroller or any other digital circuit. You can use the same microcontroller to dynamically monitor the output and adjust the LM317T.



< http://www.edn.com/designideas> For scenarios in which you must multiply the input voltage by two, the LM317's adjustment pin receives 0 to 10V. Its output-voltage range is 1.25 to 11.25V. The equation $V_{OUT}=V_{ADJ}+1.25V$ governs the LM317's output voltage. You can change the op amp's gain by choosing proper values for R_4 and R_2. You must be able to remove offset voltages from the op amp. Use an op amp, such as a National Semiconductor LM741, with null adjustment. The selection of values for the capacitor and resistor for the RC lowpass filter depends on the PWM signal's frequency. This circuit uses values for a 1-kHz PWM signal.

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You can improve the circuit by replacing the RC lowpass filter with an active filter and then feeding a feedback signal from the circuit's output into the microcontroller for dynamic adjustments.

Also see :

- LM317 smooths but doesn't regulate < http://www.edn.com/design/power-management/4442151/lm317-smooths-but-doesn-t-regulate>
- Use an LM317 as 0 to 3V adjustable regulator < http://www.edn.com/design/analog/4326465/use-an-lm317-as-0-to-3v-adjustable-regulator>
- Three paths to a free DAC < http://www.edn.com/electronics-blogs/benchtalk/4435841/three-paths-to-a-free-dac>

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27 COMMENTS ON "CONTROL AN LM317T WITH A PWM SIGNAL"

mehcaver
August 9, 2012

A particular limitation of arduino, and many pic microcontrollers is the absence of any DAC output. When arduino designers say there is an analog output, they are referring to the PWM channel(s). Not being an ee myself, I wonder if PWM can be simply an

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michou
April 24, 2013

May 15, 2013

Dear Aruna,

There is definitely something missing in this scheme. It doesn't work.
I've implemented this with real hardware.

I've a PWM signal with a frequency of 400 Hz and pulse voltage of 3 Volts.
The gain of IC1 (Op amp LM741) is 3,2 (R2=10K and R4=2

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SensorsTechnology

June 3, 2013

1M 100nF can permit 0.1s rise time of fall time or 0.3Hz for control PWM input at best. Perhaps you can change the RC time constant of the input filter.

The second problem is if load has charge storage possibility like capacitive or inductive load then on

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SensorsTechnology

June 3, 2013

Output can't go to zero in any condition and minimum voltage will be above 1.2V even if 741 output is at zero volt. That is the basic property of the.

This circuit is not at all a PWM circuit but a variable DC voltage circuit for PWM input as it averages

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SensorsTechnology

June 3, 2013

Null offset has meaning only if negative supply is used. 741 is not meant to be used near supply voltages and perhaps LM324 is a better choice or any rail to rail amplifier is much better. It may also be a good thing to use -1.2V / -1.5V to negative supply

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SensorsTechnology

June 3, 2013

Just to increase output current I suppose.

Dr. Shyam

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SensorsTechnology

Julirob

September 5, 2013

Okay, I will try using this circuit diagram to create a voltage regulator, because it will help me to run many gadgets even with the low voltage power supply.
[url=http://www.orangecountymoversca.net]OC Moving company[/url]

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aruna1

November 9, 2013

Hi
please use LM358 or any other single supply opamp.
LM741 was used as a reference to an opamp with null offset adjustment.
I can see the info in article is misleading.
Sorry for any inconvenience that might have caused

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aruna1

November 9, 2013

Hi
please use LM358 or any other single supply opamp. I have made this and its working properly.
LM741 was used as a reference to an opamp with null offset adjustment.
I can see the info in article is misleading.
Sorry for any inconvenience that might h

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mtripoli

May 27, 2014

“It's been some time since I used a '317 so I don't remember how much current is in the ADJ leg of this device. If it is low enough, one could use a “digital pot” to achieve digital control of the '317. Depending on the dpot used one could get minimum 32

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breakthedawn

March 6, 2015

“Not the best design. If u use a 741 which isn't recommended at all then u should have a positive and a negative power supply which would make the circuit even more complicated.”

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AngelC737

slavabvx

August 20, 2015

“Old answer, but anyway, yes it can be converted to your signal of interest. The answer lies in the frequency spectrum of the PWM signal. The DC component will depend on the duty cycle and the driving signal amplitude. If you filter out all harmonics (idea

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slavabvx

August 20, 2015

“Integrated opamps with Vout over approx. 50V are hard to find. You really want to add an additional driver stage. Use the opamps you got or design a discrete stage to drive a high voltage output stage. This output stage could be whatever class you want or

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slavabvx

August 20, 2015

“But much more expensive! For any reasonable resolution, a DAC based control would quickly beat a digital pot to the price for this kind of application. For the cheapest high resolution (but also low SNR!) solutions, this is the way to go. Remember that th

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SensorsTechnology

December 28, 2015

“This design will cause ripple due to 1M and 100nF averaging RXC time constant. nnShyam Sunder Tiwari, PhD Physicsnwww.sensorstechnology.com/ **http://www.asro.in/ < http://www.asro.in/>** “

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LSE136

February 17, 2016

“LTC6090 140V, RR, 12 MHz”

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LSE136

February 17, 2016

“There are OPAs with 2500V = +/- 1250V available : PA99 from APEX for 990 u20ac only …… but the have also cheaper ones.nnA LM4702 can use 200V , this is a driver for audio amp.”

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Deloca

December 10, 2016

“Seems odd to need to advertise oneself here, down to “PhD in Physics” here. I'm sure all visitors to this page have similar or higher credentials.”

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Jejjai

December 13, 2016

“Can u share the link”

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DakLak

March 4, 2017

“He's done the time so why not? Google will know, now, and thus the whole world.nnAnd not all contributors have qualifications – look at the scores of successful hobby inventors.”

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BaysideBecca

April 5, 2017

“Check out apexanalog.com. Their PA04 is a 200V, 20A power op amp.”

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Michael Dunn

July 19, 2018

“The ripple will be ~0.2% FS, which might be bearable. If not:nn – Increase f(pwm), and/orn – Increase RC, and/orn – Optimize PWM waveform (MLS, bit reversal (see “Free DAC” link above))n”

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Michael Dunn

July 19, 2018

“R3 does nothing and should be removed.”

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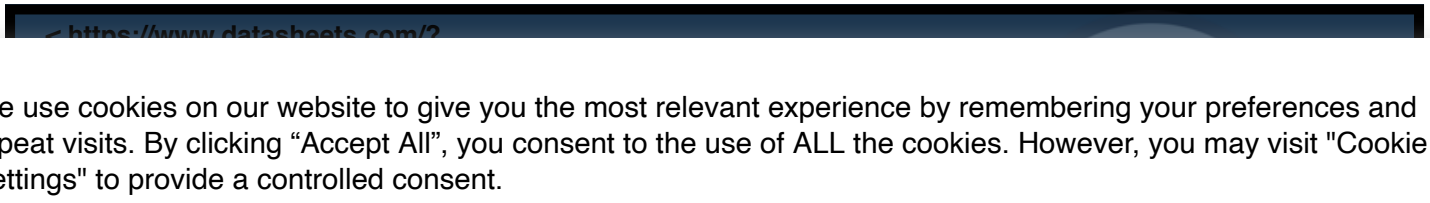

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