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Author Topic: LM7805 unstable (Read 4714 times)

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bogdant
Regular Contributor
Posts: 74
Country:

LM7805 unstable
« **on:** February 18, 2019, 05:59:17 am »

For Vin=35V then Vout of Lm7805 is 9.5V! The Cin =0.1uF and Cout=0.1uF. This is a surprize for me, I would expect to work, even is on maxim specified voltage. Even more, for Vin>20V the stability of LM7805 dependes on load.
Can you find this in datasheet ? What would be a solution in my case for Vin=35V?

Logged

ebastler
Super Contributor
Posts: 4094
Country:

Re: LM7805 unstable
« **Reply #1 on:** February 18, 2019, 06:42:03 am »

35V is specified as the "absolute maximum rating", i.e. the LM7805 will not be damaged if you apply this voltage. But if you look at the "electrical characteristics" table, you will find that the output regulation propoerties are only specified for up to 25V input voltage.

For such a large step down in voltage, I would prefer a buck converter which does not convert the excess power into heat. Off the cuff, I don't know one with 35V input voltage range, but I trust you can get them. Google for "step-down converter" or "buck converter". You can get the bare ICs, and also little piggyback modules which come complete with the required passive components. The latter are cheap on ebay, Aliexpress etc., and are convenient for a one-off or a small number of units.

« Last Edit: February 18, 2019, 06:43:37 am by ebastler »

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The following users thanked this post: bogdant

Nerull

Frequent Contributor

Posts: 694

Re: LM7805 unstable
« **Reply #2 on:** February 18, 2019, 06:52:05 am »

Just below "Absolute Maximum Ratings", it the TI datasheet states:

Quote

> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied.

The 7805 is designed to survive 35V, not operate at 35V.

Just below that are the "Recommended Operating Conditions", where Vin max is 25V.

https://www.sparkfun.com/datasheets/Components/LM7805.pdf

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The following users thanked this post: SeanB, bogdant

bogdant

Regular Contributor

Posts: 74
Country:

Re: LM7805 unstable
« **Reply #3 on:** February 18, 2019, 08:33:02 am »

thank you

Logged

wraper

Supporter

Posts: 14125
Country:

Re: LM7805 unstable
« **Reply #4 on:** February 18, 2019, 08:34:19 am »

In addition to already said, isn't it some counterfeit junk from ebay?

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The following users thanked this post: bogdant

Zero999

Super Contributor

Posts: 16642
Country:

0999

Re: LM7805 unstable
« **Reply #5 on:** February 18, 2019, 08:35:10 am »

Your LM7805 is bad. It shouldn't give that higher voltage, even with 35V in.

Logged

The following users thanked this post: bogdant

alex-sh

Regular Contributor

Posts: 153

Re: LM7805 unstable
« **Reply #6 on:** February 18, 2019, 09:03:56 am »

Is your 7805 operating the same at, say, 24V? If yes, perhaps it is damaged?

There are plenty of those buck converters on Ali or Amazon:

https://www.amazon.co.uk/LM2596-Converter-3-0-40V-1-5-35V-Supply/dp/B01GJ0SC2C

this is the one I have based on LM2596.
35V is too high for LM7805. Either decrease voltage to below 25V or use the above buck converter.

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The following users thanked this post: bogdant

StillTrying

Super Contributor

Posts: 2803
Country:

Country: Broken Britain

Re: LM7805 unstable
« **Reply #7 on:** February 18, 2019, 09:21:14 am »

You don't mention any mA load on the output, most regulators need at least some small load to stop the output rising.

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. That took *much* longer than I thought it would.

The following users thanked this post: bogdant

wraper

Supporter

Posts: 14125
Country:

Re: LM7805 unstable
« **Reply #8 on:** February 18, 2019, 09:39:31 am »

Quote from: alex-sh on February 18, 2019, 09:03:56 am

> Is your 7805 operating the same at, say, 24V? If yes, perhaps it is damaged?
>
> There are plenty of those buck converters on Ali or Amazon:
>
> https://www.amazon.co.uk/LM2596-Converter-3-0-40V-1-5-35V-Supply/dp/B01GJ0SC2C
>
> this is the one I have based on LM2596.
> 35V is too high for LM7805. Either decrease voltage to below 25V or use the above buck converter.

Based on fake LM2596 which does not even operate at the same frequency as original.

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The following users thanked this post: newbrain, bogdant

wraper

Supporter

Posts: 14125
Country:

Re: LM7805 unstable
« **Reply #9 on:** February 18, 2019, 09:42:37 am »

Quote from: StillTrying on February 18, 2019, 09:21:14 am

> You don't mention any mA load on the output, most regulators need at least some small load to stop the output rising.

Actually they don't. Usually only adjustable regulators such as LM317 need minimum load. 7805 does not need it because a few mA quiescent

current flows through it's GND pin.

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The following users thanked this post: bogdant

JackJones

Regular Contributor

Posts: 227
Country:

Re: LM7805 unstable
« **Reply #10 on:** February 18, 2019, 10:05:51 am »

Some of the 78xx datasheet do mention a minimum load current. For example here: https://www.st.com/resource/en/datasheet/l78.pdf

> **Quote**
>
> Note: Minimum load current for regulation is 5 mA.

Other datasheets don't, I guess that depends on the manufacturer. Better always to double check the datasheet from a particular manufacturer.

Edit: Actually, I checked a bunch of other 7805 datasheets. While they don't explicitly mention minimum of 5mA, they all seem to use that 5mA as minimum in their electrical characteristics. So maybe it is a requirement for all of them.

Here's a couple datasheets to check:

http://ee-classes.usc.edu/ee459/library/datasheets/LM7805.pdf
https://www.sparkfun.com/datasheets/Components/LM7805.pdf
https://static1.squarespace.com/static/5416a926e4b09de8832655bc/t/54427078e4b03de3b67b89af/1413640312811/lm7805.pdf

They all have that output voltage parameter test conditions as "Io = 5 mA to 1 A"

And you're absolutely correct about those fake LM2596s. I recently bought some of them from several different sellers, all of them fake. Most of them didn't work in the inverting configuration at all, and even those that did had only ~50kHz switching frequency. I wouldn't bother with ebay/ali for those, LCSC seems to have the for dirt cheap and the western sellers for next to dirt cheap.

« Last Edit: February 18, 2019, 10:14:55 am by JackJones »

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The following users thanked this post: bogdant

wraper

Supporter

Posts: 14125
Country:

Re: LM7805 unstable
« **Reply #11 on:** February 18, 2019, 11:10:19 am »

> **Quote from: JackJones on February 18, 2019, 10:05:51 am**
>
> Some of the 78xx datasheet do mention a minimum load current. For example here: https://www.st.com/resource/en/datasheet/l78.pdf
>
> > **Quote**
> >
> > Note: Minimum load current for regulation is 5 mA.

> Other datasheets don't, I guess that depends on the manufacturer. Better always to double check the datasheet from a particular manufacturer.
>
> Edit: Actually, I checked a bunch of other 7805 datasheets. While they don't explicitly mention minimum of 5mA, they all seem to use that 5mA as minimum in their electrical characteristics. So maybe it is a requirement for all of them.

Some might say minimum load but any of them will work without a load just fine. It's only that some spec might not be met. Unless op says where he bought it, I expect it to be counterfeit.

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The following users thanked this post: bogdant

CJay

Super Contributor

Posts: 3990

Country:

Re: LM7805 unstable

« **Reply #12 on:** February 18, 2019, 11:17:13 am »

> **Quote from: wraper on February 18, 2019, 11:10:19 am**
>
> > **Quote from: JackJones on February 18, 2019, 10:05:51 am**
> >
> > Some of the 78xx datasheet do mention a minimum load current. For example here: https://www.st.com/resource/en/datasheet/l78.pdf
> >
> > **Quote**
> >
> > > Note: Minimum load current for regulation is 5 mA.
> >
> > Other datasheets don't, I guess that depends on the manufacturer. Better always to double check the datasheet from a particular manufacturer.
> >
> > Edit: Actually, I checked a bunch of other 7805 datasheets. While they don't explicitly mention minimum of 5mA, they all seem to use that 5mA as minimum in their electrical characteristics. So maybe it is a requirement for all of them.
>
> Some might say minimum load but any of them will work without a load just fine. It's only that some spec might not be met. Unless op says where he bought it, I expect it to be counterfeit.

I've always found them to be on the mark for rated voltage output too when unloaded but...

Must, must must check capacitor requirements for regulators, there's a batch I have which give really odd output voltages if you don't have a suitable capacitor on the output, add the capacitor and it behaves perfectly.

I found out the hard way and now the box has a large handwritten comment with capacitor specs.

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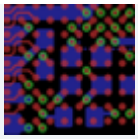
The following users thanked this post: bogdant

ebastler

Super Contributor

Re: LM7805 unstable

« **Reply #13 on:** February 18, 2019, 11:39:02 am »



Posts: 4094
Country:

> **Quote from: wraper on February 18, 2019, 09:39:31 am**
>
> Based on fake LM2596 which does not even operate at the same frequency as original.

Hmm... How do you know that? Can't recognize anything obvious that seems suspicious (beyond the low price, of course) in the Amazon description?

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The following users thanked this post: bogdant

bogdant

Regular Contributor

Posts: 74
Country:

Re: LM7805 unstable
« **Reply #14 on:** February 18, 2019, 12:03:08 pm »

> **Quote from: StillTrying on February 18, 2019, 09:21:14 am**
>
> You don't mention any mA load on the output, most regulators need at least some small load to stop the output rising.

if you add a load 500 the voltage drops from Vout= 9V-> 5V, but does not regulate.

Logged

bogdant

Regular Contributor

Posts: 74
Country:

Re: LM7805 unstable
« **Reply #15 on:** February 18, 2019, 12:05:21 pm »

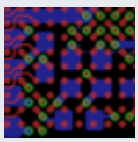
> **Quote from: alex-sh on February 18, 2019, 09:03:56 am**
>
> Is your 7805 operating the same at, say, 24V? If yes, perhaps it is damaged?

If Vin <20V the LM7805 works Ok. I did try another sample, but it is the same. There are from ST.

Logged

ebastler

Super Contributor



Posts: 4094
Country:

Re: LM7805 unstable
« **Reply #16 on:** February 18, 2019, 12:15:01 pm »

> **Quote from: bogdant on February 18, 2019, 12:05:21 pm**
>
> There are from ST.

But where did you buy them? Can you be sure they are genuine?

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The following users thanked this post: bogdant

bd139

Super Contributor

Re: LM7805 unstable
« **Reply #17 on:** February 18, 2019, 12:24:57 pm »

Posts: 20504
Country:

None of the voltage regulators work properly above about 20V if you want 5V out. If you need to drop more, add a preregulator.

I found this out the hard way as well dropping 28V to 5V DC for logic in an RF PA driver. Currently waiting for a board spin. I only needed 50mA and didn't want RF noise so I went with a simple MOSFET/zener /resistor preregulator to drop it down to 18Vish. Because the current requirements are relatively low I don't need to heatsink either then as the load is spread evenly across both MOSFET and 7805.

Edit: also if you value the circuit it's driving, stick a 5W 5.6V zener across the regulator output. That will smoke the prereg / regulator not the load!

Logged

The following users thanked this post: SeanB, bogdant

wraper

Supporter

Posts: 14125
Country:

Re: LM7805 unstable
« **Reply #18 on:** February 18, 2019, 12:39:06 pm »

> **Quote from: bogdant on February 18, 2019, 12:05:21 pm**
> I did try another sample, but it is the same. **There are from ST.**

If it's from ebay/ali, 95+% of them are counterfeit. Post a picture.

Logged

The following users thanked this post: bogdant

bogdant

Regular Contributor

Posts: 74
Country:

Re: LM7805 unstable
« **Reply #19 on:** February 18, 2019, 01:20:16 pm »

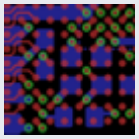
> **Quote from: ebastler on February 18, 2019, 12:15:01 pm**
> > **Quote from: bogdant on February 18, 2019, 12:05:21 pm**
> > There are from ST.
>
> But where did you buy them? Can you be sure they are genuine?

They are from tme.eu. I have no idee if there are contrafit.

Logged

ebastler

Super Contributor



Posts: 4094
Country:

Re: LM7805 unstable
« **Reply #20 on:** February 18, 2019, 01:34:14 pm »

TME is a „proper“ distributor; so the regulators should be genuine. I think the tendency on this forum to conclude „counterfeit!“ is a bit too pronounced...

Logged

bd139

Super Contributor

Posts: 20504
Country:

Re: LM7805 unstable
« **Reply #21 on:** February 18, 2019, 02:18:47 pm »

Yes. Even the counterfeit ones tend to work properly as well.

It's that huge dropout voltage I reckon. All the designs are marginal above 20V. Says so on every vendors' datasheets, including Linear who product exceptional stuff.

Logged

tsman

Frequent Contributor

Posts: 599
Country:

Re: LM7805 unstable
« **Reply #22 on:** February 18, 2019, 02:44:56 pm »

Quote from: ebastler on February 18, 2019, 11:39:02 am

> Hmm... How do you know that? Can't recognize anything obvious that seems suspicious (beyond the low price, of course) in the Amazon description?

The low price nearly guarantees that it'll have a counterfeit LM2596 chip. It has been tested by multiple people online so just search for "LM2596 counterfeit". If you put a scope on the output then you'll see the switching frequency is far lower than the 150KHz for a real LM2596.

The modules do work but you shouldn't draw anything approaching the advertised maximum current and you must provide good cooling. Whatever chip they're actually using doesn't have thermal overload protection and will fail with a input to output short.

Logged

The following users thanked this post: ebastler, newbrain

mariush

Super Contributor

Posts: 4319
Country:

.

Re: LM7805 unstable
« **Reply #23 on:** February 18, 2019, 03:04:49 pm »

Some datasheets don't say a minimum load is required, but you basically satisfy that condition through the current used to set the output voltage.

In case of an adjustable regulator like LM317, datasheets recommend a 120 ohm or 240 ohm resistor and a higher value resistor to set the output voltage ... using the simplified formula Vout = Reference Voltage (1.25v typ.) x (1 + R2/R1) where R1 is usually 120 ohm or 240 ohm.

So you get a few mA of load just by setting the output voltage.

Often I see people just connecting a red led with a 1-2k resistor in series on the output, so you basically get 3-5mA of current consumed by the led which also functions as a convenient "power on" indicator.

If you know the average current consumed by your circuit, you could put a resistor before the regulator to drop some voltage ... for example, if your circuit will use maximum 100mA, then use V = I x R ... so if you use a 150 ohm resistor, you have a voltage drop of V = 0.1A x 150 = 15v and the power dissipated on the resistor is P = IxIxR = 0.1x0.1x150 =

1.5w , so you'll probably have to use a 3w or 5w resistor.

Logged

Jwillis

Super Contributor

Posts: 1184

Country:

Re: LM7805 unstable

« **Reply #24 on:** February 19, 2019, 05:21:18 am »

Sometimes data sheets can be a little unclear .This is the one I use and I have never destroyed a 78xx/79xx with this information.It clearly states the maximum input voltage for each rated regulator on page 3 .https://www.sparkfun.com/datasheets/Components/LM7805.pdf. I find the Texas Instrument Data sheets to be the clearest to understand.

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