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Digital multimeter circuit using ICL7107

Last Updated on: August 16, 2022 by Apichet Garaipoom

I am showing you a digital multimeter circuit using ICL7107.

We modify them from a normal DC digital voltage meter circuit to smart multimeter. It is so versatile available function.

For example, Measure DC voltage, ACV, DC Amp meter, AC Amp meter and as the Ohms meter, etc.

Try to build this project to use it really worth and fully enjoy.

Thanks, Photo from the AstroAI Digital Multimeter. Why is a good tool? You can get an answer from here.



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5 Special Features

- 1. DC Voltage: 200mV, 2V, 20V, 200V, 2KV, 20KV
- 2. AC Voltage: 200mV, 2V, 20V, 200V, 2KV, 20KV
- 3. DC Amp: 200uA, 2mA, 20mA, 2A, 10A
- 4. AC Amp: 200uA, 2mA, 20mA, 2A, 10A
- 5. Ohms meter: 200, 2K, 20K, 200K, 2M, 20M

<div>S1 Function</div> <div>Range S2</div>	A	B	C	D	E	F
1 OFF						
2 DC	200mV	2V	20V	200V	2KV	20KV
3 AC	200mV	2V	20V	200V	2KV	20KV
4 DC AMP	200uA	2mA	20mA	200mA	2A	10A
5 AC AMP	200uA	2mA	20mA	200mA	2A	10A
6 OHM	200	2K	20K	200K	2M	20M

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Special Feature of Digital Multimeter circuit

Function 1: Digital DC voltmeter circuit

In Figure 1: the schematic diagram of this project. Of course, the easiest way is used as the [DC voltage meter circuit](#).

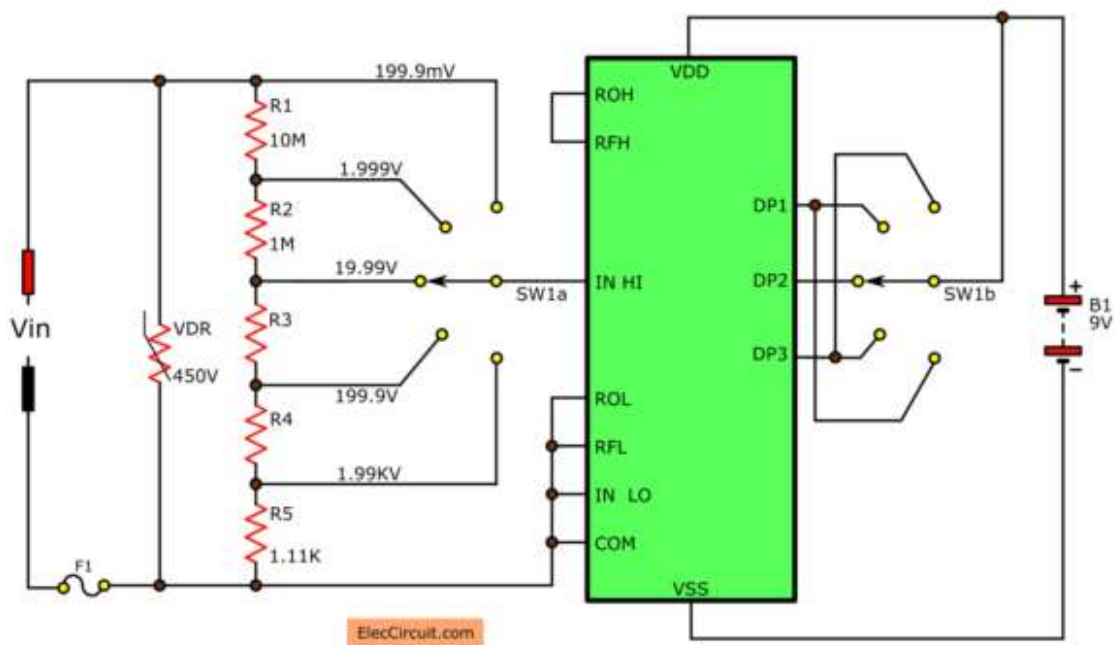


Figure1: DC voltage measurement circuit

The original characteristics of this circuit can measure voltages up to 200 mV only.

However, we can apply it to measure the voltage range higher with a few input resistors. See in Table 1:

R1	R2	R3	R4	R5	INPUT Z.
9M	900K	90K	9K	1K	10M
10M	1M	100K	10K	1.11K	11.11M

Table 1 is shown in the resistance at various ranges.

Note:

We may choose resistors in both formats.

For the too high voltage measurement. It is necessary to use the external high voltage probe.

$R3 = 100K$; $R4 = 10K$

Function 2: DC ampere meter circuit

Next, take a look at the simple digital DC ampere meter circuit. The appropriate designing, determine with resistance in parallel on the input of voltmeter.

The main principle to calculate.

The resistance is the voltage caused by the flow of current through the resistor. In each range is maximum up to 200mV.

As shown circuit diagram below.

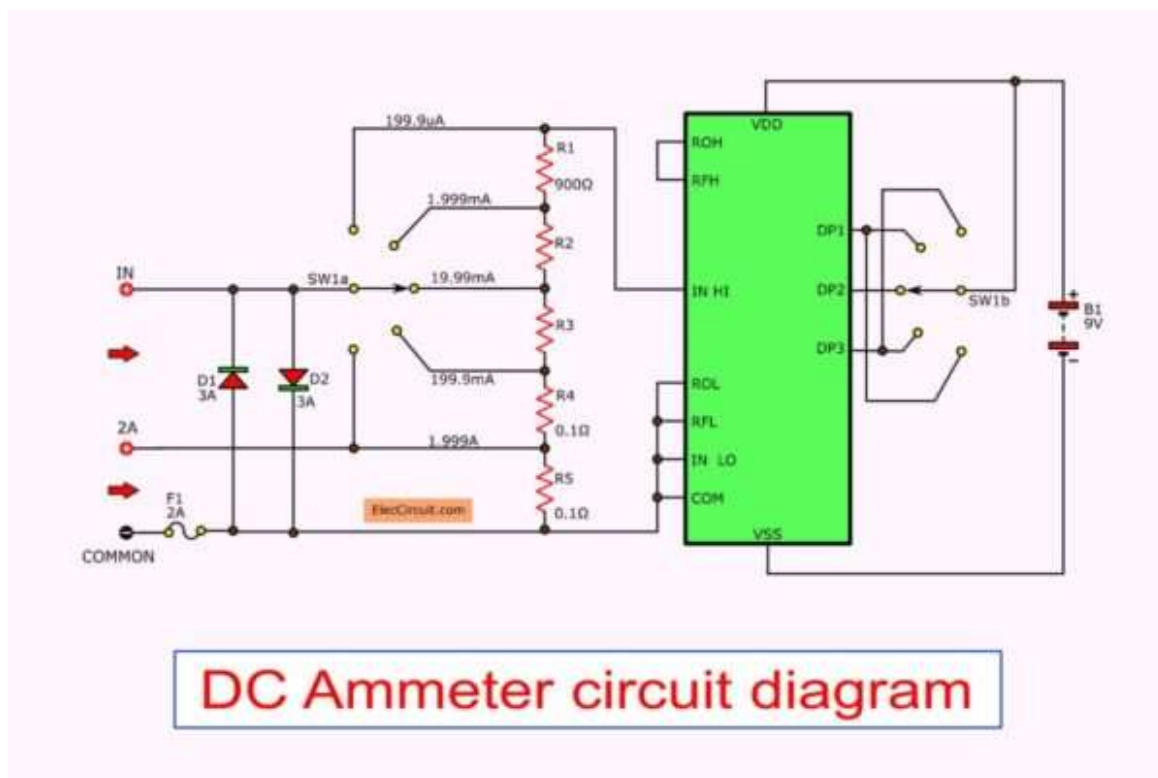


Figure 2: DC Ammeter circuit

See the circuit in Figure 2. Designing having a range of up to 5 range.

For the high current measurement 2 Amperes. You should separate it from other input. Because the contact of switch that can not withstand currents.

PCBWay

Diode D1 and D2 are overload protection to provide the input.

Note: $R2 = 90\ \Omega$, $R3 = 9\ \Omega$

Function 3: AC voltage measurement

We can design the AC voltage measurement circuit. By adding the AC to DC converter circuit. They have a relationship together. As shown in Figure 3.

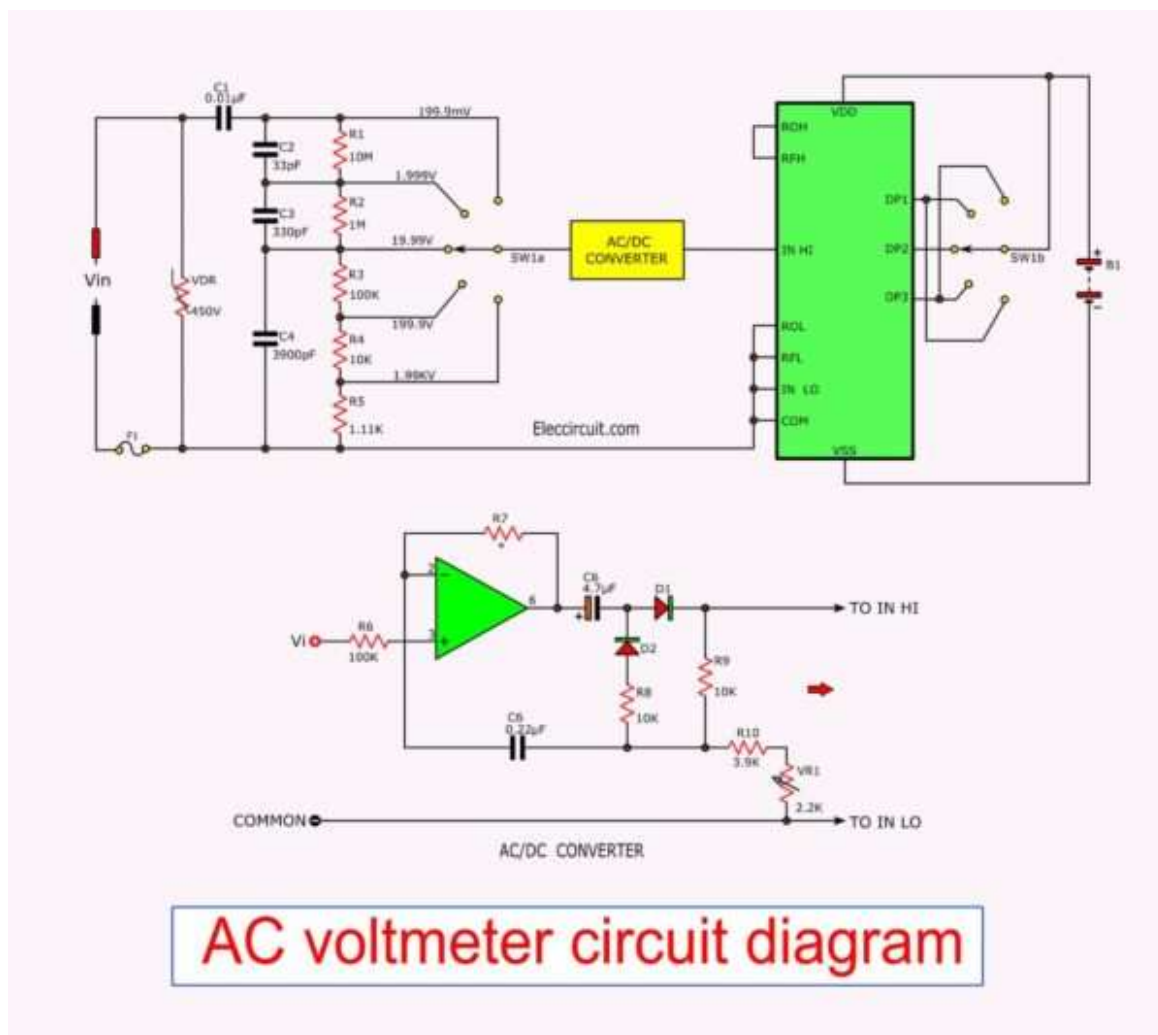


Figure 3: Digital AC voltmeter circuit without transformer

The AC voltage is measured to reduce voltage same the DC voltmeter circuit. Then, enter to the AC to DC converter circuit by IC1 and accessories in Figure 3.

Adjust VR1 to tune a correct voltage reading.

Function 4: AC Ammeter Circuit

The same principle applies to the DC voltmeter circuit. We can be applied to the AC ammeter by adding the AC to DC converter before as shown in Figure 4

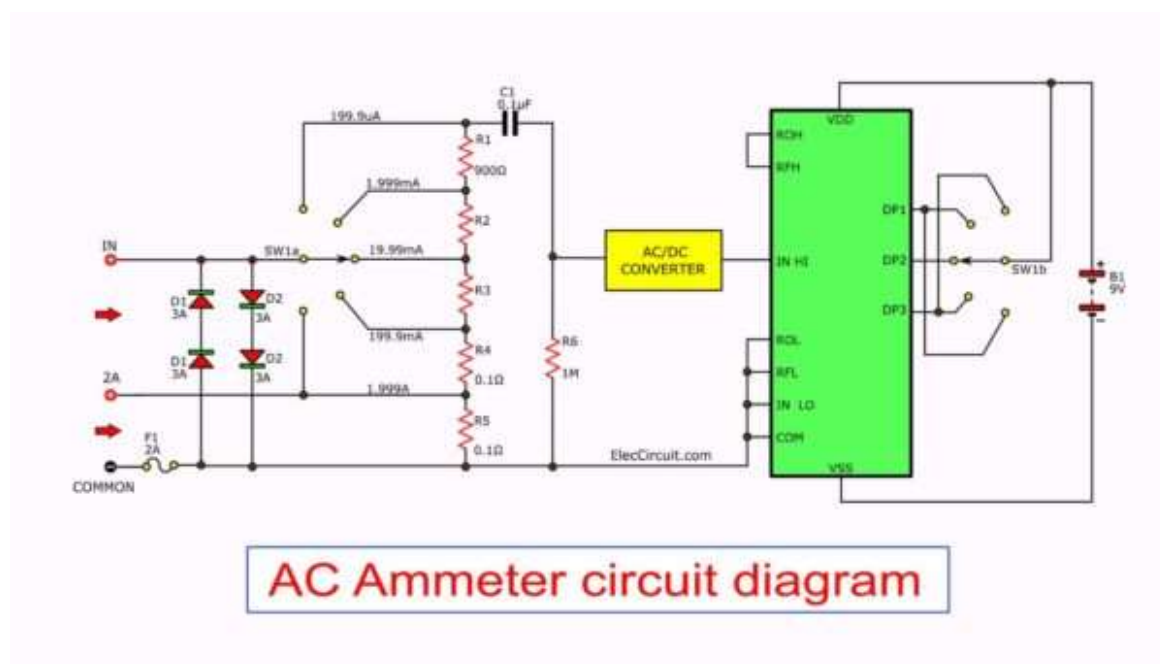


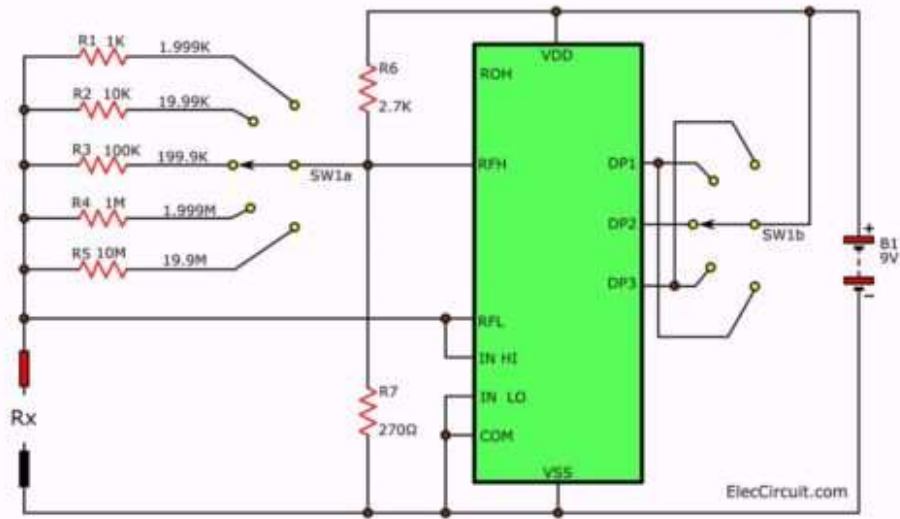
Figure 4: AC Ammeter measurement

Function 5: Ohms meter

The advantaged of this digital multimeter better than a regular meter:

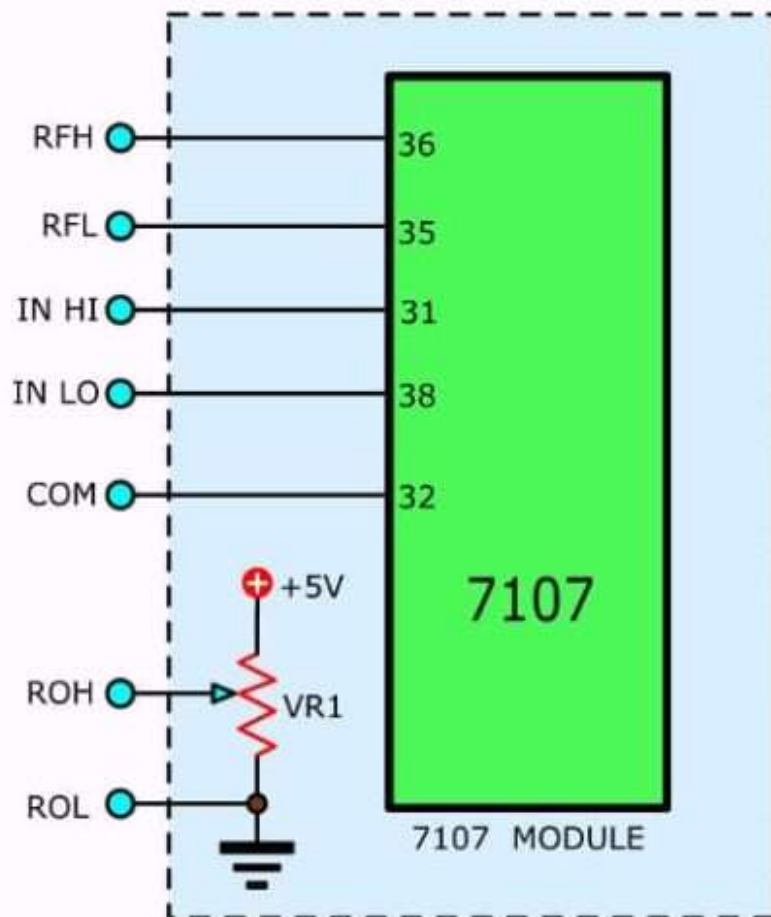
This can read accurately. And can measure the resistance of 0.1 ohms or less. And higher as 10M easily.

With circuit connecting as shown in Figure 5.



Digital ohmmeter circuit diagram

Figure 5 the ohms meter circuit



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Figure 6 the ICL7107 module

The digital meter module in Figure 1-5 Show legs of ICL7107.

Compared to the legs of the modules to Easy to write all the circuits. The ROH pin is the output reference voltage at a middle leg of the horseshoe-shaped resistor.

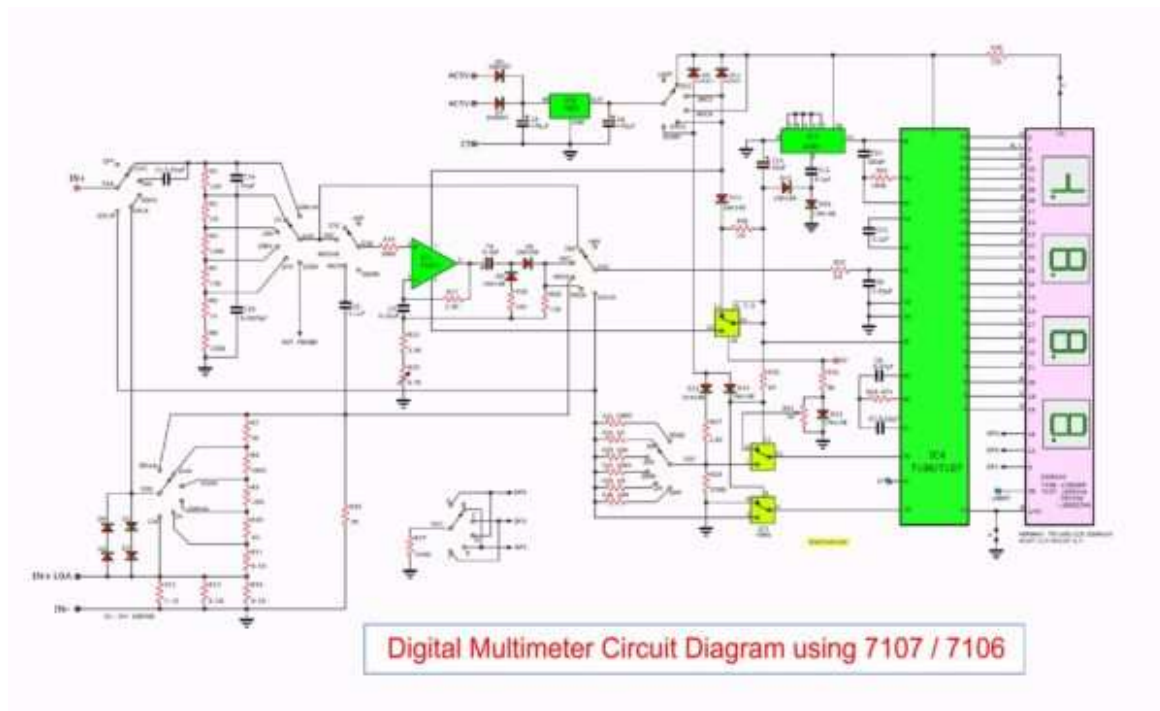


Figure 7: Full a digital multimeter circuit diagram

Here is a full circuit that works perfectly.

Parts you will needs

- IC1: TL071, Operational Amplifiers – Op Amps JFET Input Low Noise
- IC5: [LM7805](#), [Standard Regulator 5 Volt 1 Amp](#) 3 Pin 3+ Tab TO-220
- IC3: CD4049, CMOS Hex Inverting Buffer/Converter
- IC2: CD4066, Quad Analog Switch/Multiplexer/Demultiplexer
- IC4: ICL7107 or ICL7106, Analog to Digital Converter Single Dual Slope 0.003k SPS 3 1/2 Digit LED 40-Pin PDIP
- LED 7 segment or LCD display

More Switches please read in a text

0.5W Resistors tolerance: 1%

- R1, R26: 10M
- R2, R25, R30, R33, R36, R38: 1M
- R3, R15, R24: 100K
- R4, R19, R20, R23: 10K

- R5, R22: 1K
- R6: 110 ohms
- R7: 1K
- R8: 100 ohms
- R9: 10 ohms
- R10: 1 ohm **1 watt**
- R11, R12, R13, R14: 0.1 ohms **2 watts**
- R16: 3.3K
- R17, R27: 2.2K
- R21: 100 ohms
- R28: 270 ohms
- R29: 47K
- R32: 5K

MKT capacitors

- C14: 33pF 63V
- C15: 330pF 63V
- C16: 0.0039uF 63V
- C11: 100pF 63V
- C10: 0.1uF 63V
- C9: 0.01uF 63V
- C8: 0.47uF 63V
- C7: 0.22uF 63V

- **Electrolytic capacitors**

- C5, C6: 470uF 16V
- C13: 10uF 16V

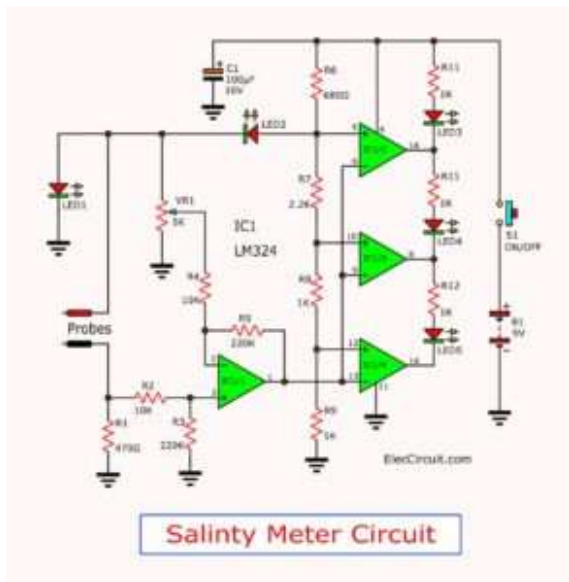
Diodes

- D1-D4: 1N5408
- D7, D8, D9, D10: 1N4001
- D5, D6, D11, D12, D13, D14, D15: 1N4148

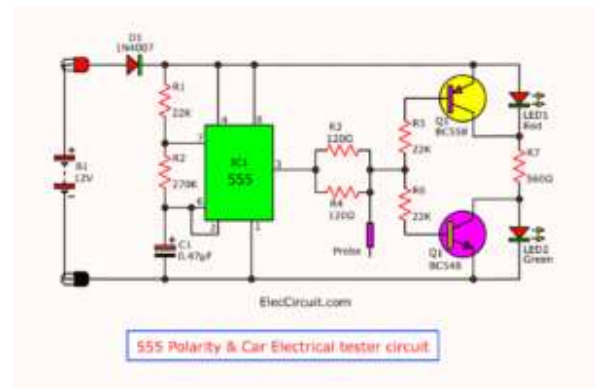
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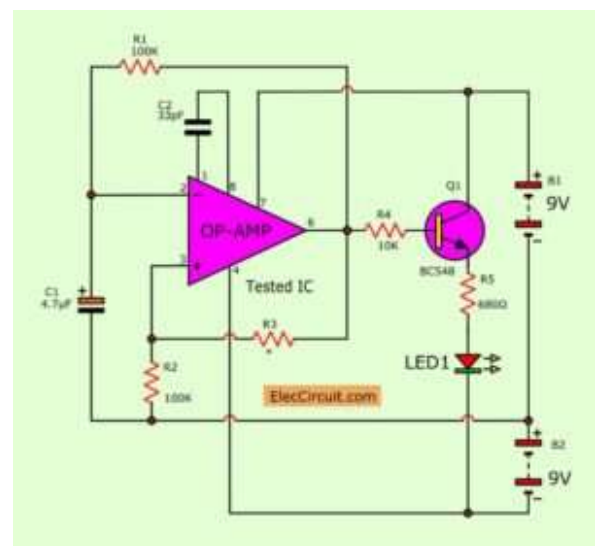
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18 thoughts on “Digital multimeter circuit using ICL7107”

Salim Khan

February 16, 2015 at 4:10 am

Awesome, Thanks.

[Reply](#)

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June 28, 2015 at 6:09 am

Hi Ehsan,
You can send me email.
Thanks.

[Reply](#)

Ehsan

June 29, 2015 at 10:12 pm

thanks for answer
my email: mahmoodkhalili0@gmail.com

[Reply](#)

Ehsan

July 7, 2015 at 5:35 am

hi momename please send me a video from your project or a pdf file for more
explore
thx for your answers

[Reply](#)

khava

September 2, 2015 at 1:07 am

i need help with building the AC ammeter of 50 hz and i have to use leds to
display my values

[Reply](#)

Alex

January 10, 2016 at 7:01 pm

hello ,can you explain me more, i don't understand the unions with the switches

Thanks

[Reply](#)

Alex

January 10, 2016 at 8:17 pm

how many ic2 i need, and why one of them has pin 16?

[Reply](#)

jon

February 4, 2016 at 9:10 pm

Hello, what model of LED display is used here? I am looking at the schematic and It is saying LA601VA, but I cannot find any information on that model. Will something like the UN4043-13 or LFD5221-20/A-PF work just as well? Thoughts?

[Reply](#)

belsin

February 29, 2016 at 8:09 am

sorry I need more detail about this please help me brother

[Reply](#)

belsin

February 29, 2016 at 8:09 am

sorry I need more detail about this please help me brother send pdf or video to belsinben@Gmail.com

[Reply](#)

amrita patil

November 2, 2016 at 11:39 pm

what is need of ic cd4049 in this circuit?

[Reply](#)

Sujata Made

November 4, 2016 at 7:32 am

Please send me EAGLE design(pcb design) and tell me more about power supply used....email id:mesujatamade@gmail.com

[Reply](#)

craig

December 8, 2016 at 11:50 pm

This circuit is awesome. I was planning on building a simple voltmeter but now I am going to give this more complex version a try. Thanks!

[Reply](#)

Asmaa

November 19, 2017 at 3:12 am

Mr have u become able to build it ???

I saw another digital voltmeter but using 3162 and unfortunately i could not find that Ic

[Reply](#)

Jean

December 11, 2017 at 1:07 pm

The IC 2 has 14 legs, the bilateral switches will not work properly because wrong pinning, and diodes 9 and 10 are not mounted at the printed circuit. Also the layout is blurry.

Please in the future publish something working or don't

grts,

Jean

[Reply](#)

hakan

August 22, 2019 at 7:07 am

Thank you very much. Very good

[Reply](#)

RAMKRISHNA BAL

October 20, 2023 at 10:18 pm

Thanks for important ckts. which helps us to understand electronics is a good way. 👍

[Reply](#)

Chayaporn Garaipoom

October 25, 2023 at 9:41 pm

Thank you. I'm so glad you found our website helpful. 😊

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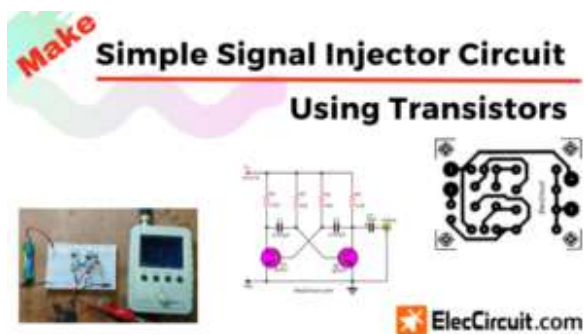
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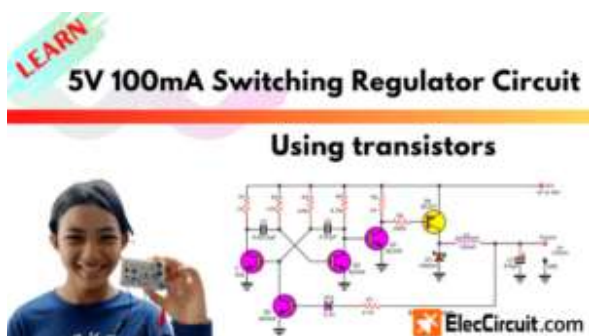
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