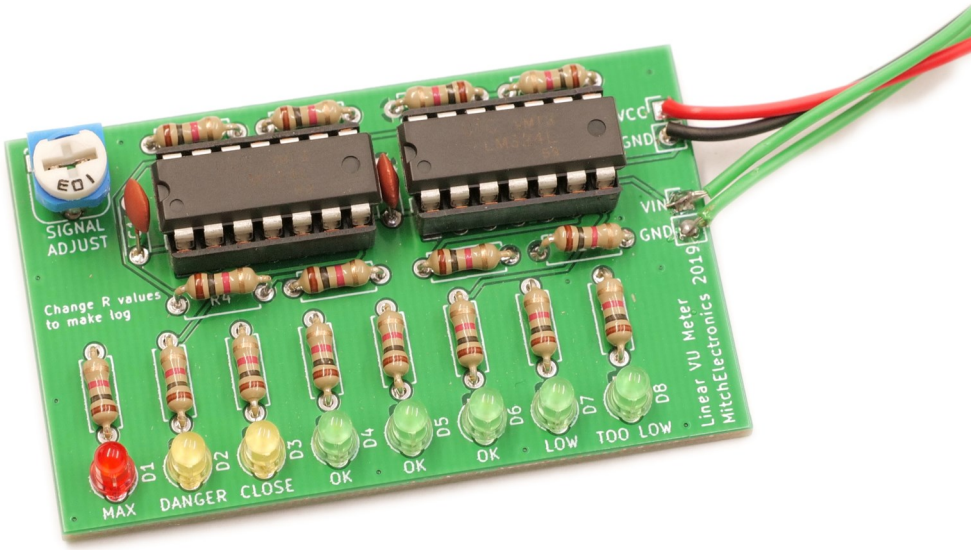
Volume Meter



MitchElectronics® 2020

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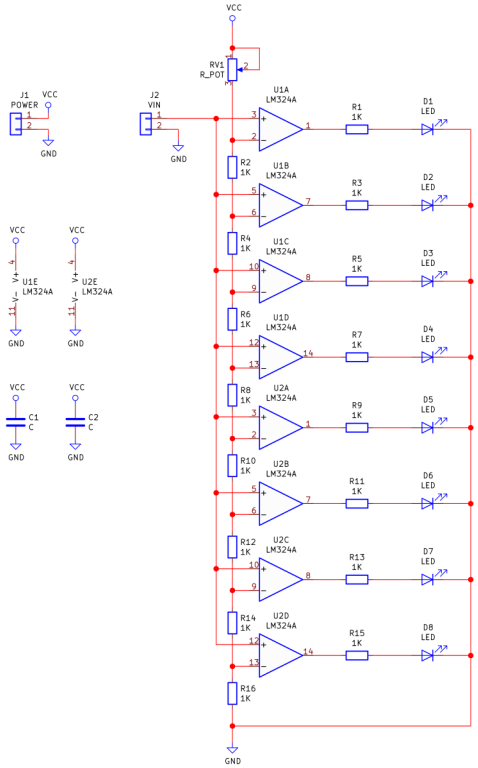
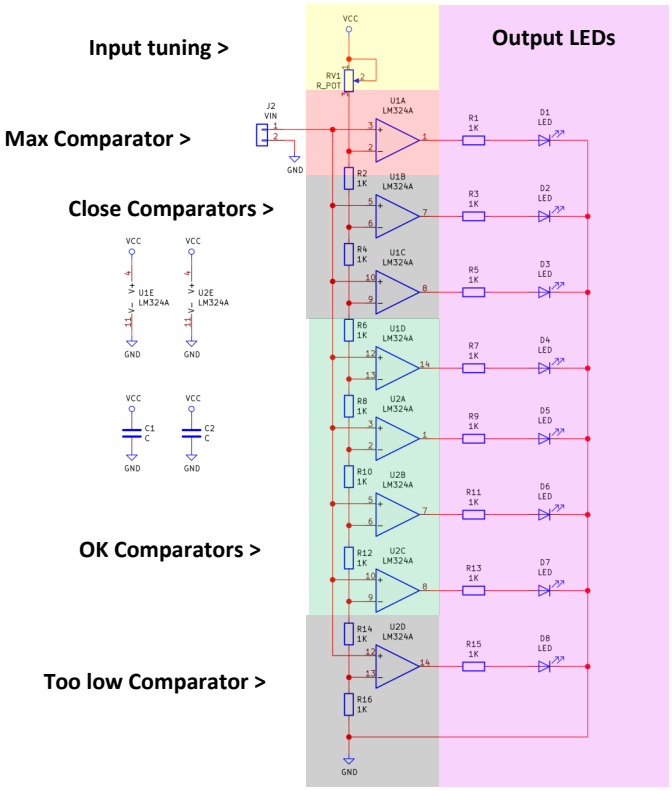
SCHEMATIC



Schematic (Blocktised)



SCHEMATIC EXPLANATION

Volume meters are a very useful tool for knowing how loud a signal is without actually having to hear it. They are also useful as they can provide a visual cue if the volume is close to the max possible value and therefore warn the viewer that the volume may “clip”. Volume meters are found on many audio devices ranging from mixers to sound systems and in this kit we will build a volume meter.

Warning! This kit allows you to build either a LINEAR or LOGARITHMIC meter. Linear meters are used with sensors such as light and temperature sensors whereas logarithmic sensors are used with audio systems. If you want to use this kit in ANY audio project then make sure to use resistor values in the LOG table!

Warning! This circuit can only handle POSITIVE voltages. If you need to connect an audio signal into the circuit then make sure to use a diode to remove any negative incoming voltage!

The volume meter circuit consists of two LM324 ICs which both include four op-amps. All of the op-amps are configured as comparators that output VCC when their + input becomes greater than their - input, and output 0V when their + input becomes smaller than their - input. The input signal is connected to each and every + input of all comparators while all the - inputs of the comparators are connected to different stages in a large potential divider made up of resistors R2, R4, R6, R8, R10, R12, R14, and R16. The resistor R16 has the smallest voltage across it while R2 has the largest with the resistors in between having progressivly larger voltages.

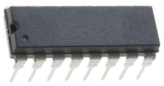
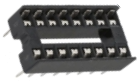
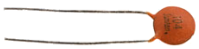
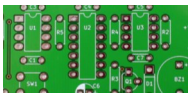
Since each comparator is connected to a different stage in the large potential divider each comparator will turn on at different voltage inputs. U2D will turn on when a small voltage is present on the input while U1A will only turn on when a large input voltage is present. Therefore, as the input voltage increases the comparators will turn on one after the other in the order of U2D, U2C, U2B, U2A, U1D, U1C, U1B, and U1A. The potentiometer RV1 is used to trim the potential divider to work with a range of different inputs.

When building the circuit please choose the resistors from the table below depending on if you want a linear meter or a log meter.

Resistor	Linear (Sensors)	Log (Audio)
R2	1K	1K
R4	1K	1.5K
R6	1K	2.2K
R8	1K	4.7K
R10	1K	15K
R12	1K	22K
R14	1K	47K
R16	1K	100K

MATERIALS

Check that you have the following components

Component	Component Name	Quantity	Looks like
LM324	U1, U2	2	
14 DIP Socket	U1, U2	2	
1KΩ Resistor	**All Resistor if Linear** **R1, R2, R3, R5, R7, R9, R11, R13, R15 if log**	16	
1.5KΩ Resistor	See Previous Table	1	
2.2KΩ Resistor	See Previous Table	1	
4.7KΩ Resistor	See Previous Table	1	
15KΩ Resistor	See Previous Table	1	
22KΩ Resistor	See Previous Table	1	
47KΩ Resistor	See Previous Table	1	
100KΩ Resistor	See Previous Table	1	
10KΩ Potentiometer	RV1	1	
100nF Capacitor	C1, C2	2	
3mm Green LED	D4, D5, D6, D7, D8	5	
3mm Yellow LED	D3, D2	2	
3mm Red LED	D1	1	
PP3 Connector	J1	1	
PCB	-	1	

CONSTRUCTION

Download the electronics construction manual

To learn how to construct circuits on PCBs download the Electronics Construction Manual from MitchElectronics using the link below. This document shows you how to install all electronic components used in MitchElectronics kits. The list below shows the sections relevant to this kit so do not worry if you see component sections in the document that don't come with this kit!

www.mitchelectronics.co.uk/electronicsConstructionManual.pdf

Relevant sections in the electronics construction manual

Resistors

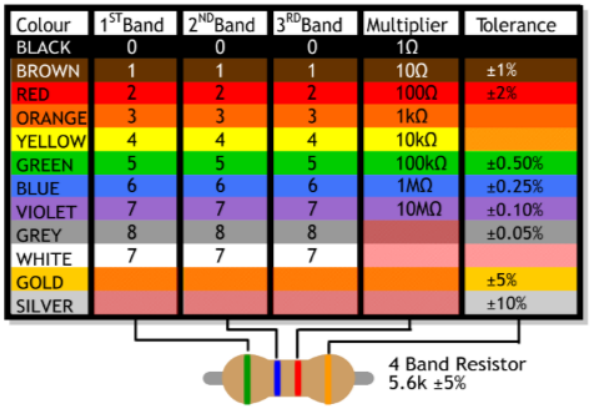
Capacitors

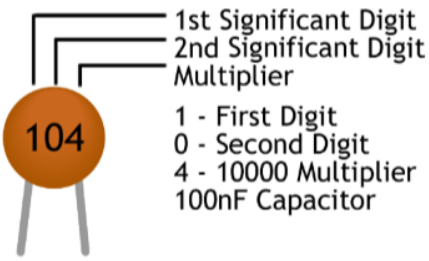
Transistor

ICs

Wires

RESISTOR AND CAPACITOR IDENTIFICATION

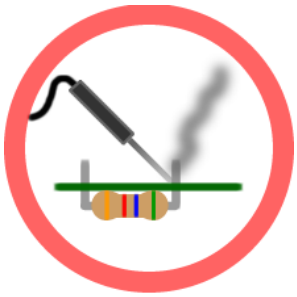




IMPORTANT INFORMATION

RoHS Compliant Kit (Lead free)

Low Voltage Kit



Caution! Soldering Required

TERMS AND CONDITIONS

MitchElectronics Mission

The main goal of MitchElectronics products is to provide safe electronics to makers and professionals alike while keeping the cost affordable. MitchElectronics kits are ideal for classrooms whereby students can learn about electronics using a hands-on approach which is not only highly effective at teaching students but also improves hand-eye co-ordination as well as grow interest in electronics. Since MitchElectronics kits are aimed at novices and those who are new to electronics they are designed to use low voltage power supplies such as 9V batteries which are inherently safe due to their limited voltage and current capabilities.

MitchElectronics Liability

MitchElectronics kits must be inspected and tested by a competent individual before use and must be constructed by those who are competent to do so. MitchElectronics is not liable for kits and products that are constructed incorrectly or to a poor standard whereby poor standard includes (but not limited to) poor solder connections, overheated components, and damaged components. MitchElectronics is not liable for harm, injury, or damage caused by the misuse of kits and/or products if

- Incorrectly constructed
- Powered by sources other than “portable batteries” or the specified power supply
- Kits used outside their operational range (such as voltage supply, temperature etc.)
- Used as a sub-system (i.e. connected to additional circuits and modules)
- Used in a non-educational environment
- Used in a commercial environment
- Used in any dangerous or potentially hazardous environment
- Purchased from an unauthorised third party

Portable batteries refers to low powered alkali batteries. Lithium-based batteries and those with large current capabilities (such as lead-acid batteries) are not considered portable or safe

The use of the kits or products in the above scenarios automatically voids any warrantee or guarantee of that kit or product.

Kits must be

- Inspected for damage before and after construction
- Inspected for missing parts
- Constructed correctly by a qualified individual
- Used in an appropriate manner (i.e. within operational ranges)
- Purchased from an authorised seller

Those who are not competent to construct, inspect, and test kits and products must be accompanied by a competent individual and that competent individual assumes all responsibility for harm or damages and MitchElectronics is not liable for any harm or damage.

Missing Parts

MitchElectronics is only liable for missing parts for kits that have been purchased within 28 days and that have been purchased directly from www.mitchelectronics.co.uk. MitchElectronics is not liable for any product sold by an unauthorised third party.