

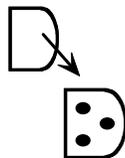
This document describes the assembly, checkout, and hook up of the K1EL Winkey Kit with a version V4 PCB. This design is powered directly off the PC's serial port and does not require an external power source. Current draw is minimal, a low dropout, low quiescent current voltage regulator helps in this regard. Open collector keying and PTT outputs are provided as well as speed pot and iambic paddle connections.

WinKey PCB Bill of Materials

R1, R7, R8, R10	4.7K ¼W resistor
R3, R4	3.3K ¼W resistor
R2, R5, R6, R9	10K 1/4W resistor
Rx	10K Linear Taper Speed potentiometer
Q1	2N3906 PNP transistor TO92
Q2	2N3904 NPN transistor TO92
Q3	2N2222A NPN transistor TO92
Q4, Q5	2N7000 MOSFET TO92 (2N2222A may be substituted)
D1, D3	1N5818 or 1N5817 Schottky Diode
D2, D4, D5	1N4148 or 1N914 silicon diode
U1	ST L4931CZ50 TO92
U2	WinKey PIC processor
C1, C3, C4, C7, C8	.01 uF ceramic capacitor (103)
C2	100 uF electrolytic capacitor
C5, C6	.001 uF ceramic disc capacitor (102) (was 220pf)
J1	DB9 9 pin female D connector
S1	8 pin DIP socket

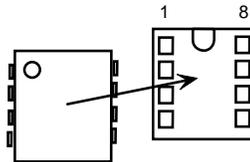
Kit Assembly

- 1) Verify and check off all components against the bill of materials listed above. If there are shortages notify K1EL by email as soon as possible and we will send out any missing parts.
- 2) The WinKey PCB does have a solder mask but it is quite easy to inadvertently bridge two etches or pads together. Please solder carefully and use the checkplots below to resolve any connections in question. 95% of all kits returned for repair have had soldering errors
- 3) Carefully check the PC board for any defects, although it's rare there have been problems reported.
- 4) Follow the silkscreen and carefully install all 10 resistors then solder and trim leads
- 5) Observe polarity band markings and install the 5 diodes. Solder and trim leads
- 6) Install and solder the 8 pin socket, make sure the alignment marking matches the silkscreen.
- 7) Install the transistors and voltage regulator U1, make sure the flat side of the component body lines up with the silkscreen, you may have to bend the leads of Q1 or Q2 to get it right. Try to keep all transistors the same height above the board for a professional appearance. Solder and trim leads.



- 8) Install the disc capacitors then solder and trim leads.
- 9) Install the electrolytic cap C2, the long lead is positive (+), observe the silkscreen. Solder & trim.

- 10) Next install the DB9 connector, it is a snug fit, carefully push it into place and solder. Make sure to solder the ground lugs, it takes some extra time and solder to get it right.
- 11) Now wire up the speed pot. The center lug of the pot goes to PC board pad marked **W**. Looking at the pot from the back the lug clockwise from the center goes to the pad **T** and the remaining lug goes to pad **G**. If you are not using a speed pot be sure to install and solder a piece of resistor lead between pads **W** and **G**.
- 12) Now is a good time to wire up the paddle connector, there are three leads left paddle to **L**, right paddle to **R**, and common ground to **G**.
- 13) Finally install the WK chip U2, making sure the dimple in the top of the package lines up with pin 1 on the socket.



Kit Wiring

Here is a handy table of all PCB connections:

Pad Label	Wire Connection
T	Top of Speed Pot (10K Linear Taper)
W	Speed Pot Wiper (10K Linear Taper)
G	Bottom of Speed Pot (Ground)
L	Left Paddle
R	Right Paddle
G	Paddle Ground
K	Open collector keying output (50 VDC max)
G	Keying Ground
P	Open collector PTT or Sidetone output
G	PTT Ground

Figure 1 – WinKey PCB Connection List

Here is a diagram showing the speed pot hookup.

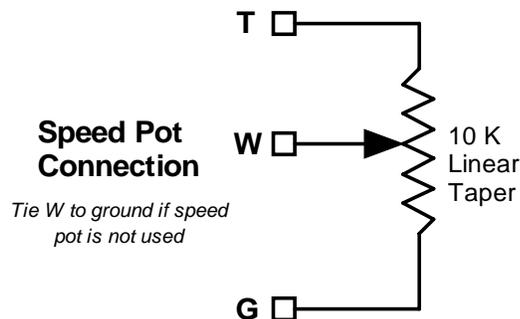


Figure 2 – Speed pot Connection

WinKey RS232 Interface Cable

WinKey should be connected via a straight through cable (not null modem). The cable will need a plug at one end and a socket at the other.

If you make up your own cable, note that WinKey uses DTR and RTS to derive power, so these lines must be connected in addition to the normal TxD, RxD and Ground.

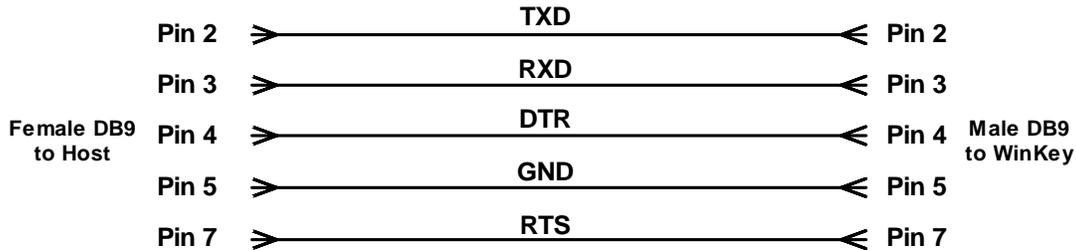


Figure 3 – WinKey RS232 Interface Cable Schematic

WinKey does not require external power, it is powered from the PC's RS232 serial interface. BUT !! Note carefully that WinKey will not work unless an appropriate application is running and it is configured to use the correct serial port asserting the RTS and DTR lines properly. The V4 PCB provides an external battery connection, more details on page 10.

For Mac users, be sure your interface is RS232 not RS422, the Winkey kit will not work with RS422 serial.

Kit Checkout

Take a look at the Winkey PCB schematic on page 5 to familiarize yourself with the circuitry on the PCB. It is a fairly simple design. The PCB requires a positive and a negative power supply to operate. The positive supply comes from RS232 signal DTR on Pin 4 of the DB9. This voltage is connected to a 5 volt regulator that powers the Winkey chip. It also provides the positive bias for the plus swing of RS232 transmit back to the PC. The negative supply comes from RS232 signal RTS pin 7 of the DB9. This supply is used only as the negative bias for the minus swing of RS232 transmit. Transistor Q3, diode D4, and resistor R1 level convert the incoming bipolar RS232 receive signal to 5 volt TTL suitable to drive the winkey chip. The circuit made up of Q1, Q2 and associated resistors convert the 5 volt TTL output of the Winkey serial transmit pin to bipolar RS232.

The paddle inputs to winkey are sensed on a single pin by an analog to digital converter inside the chip. A simple resistor network made up of R6, R9, and R10 provide three different voltages based on which or both paddles are pressed. Two open collector transistors Q4 and Q5 provide a high drive capability for the Key and PTT outputs of the Winkey chip.

The best application to use to check out the winkey kit is the K1EL Testbed Application with runs under WindowsXP. A version is also available for Win95/98. Although the interface is daunting at first look, there are only a few controls that need to be played with. Here is a link to the XP version.

<http://www.k1el.com/setupWKXP.exe>

There is a good help file included with the app that give details on how to run it but here is a brief procedure to follow:

- 1) Install the application and Start it up

- 2) Tell the app which com port Winkey will be attached to, pull down the COM selection from the MenuBar to do this. if you are using a USB to serial adapter you will have to determine which COM port the USB serial port is installed on. You can find this by looking at: Control Panel->System->Hardware->Device Manager->Ports
- 3) Make sure you have WK connected to the configured port with a straight through cable, if you don't have a cable or unsure of it you can remove the screw lugs on the WK DB9 connector and plug the PC board right into the PC comport.
- 4) Click on OpenWK
- 5) The app will attempt to open Winkey and it will display a status message to let you know if it was successful. If it was it will tell you the version of the Winkey chip it found. If it wasn't it will tell you what the error is. If it says comport open error, you have may not have selected the correct port or there is another device using that port. Otherwise you will get either an echo or response error. This means the port opened properly but winkey did not respond.
- 6) If Winkey did not respond you can test the board using the Diags feature of the testbed. Click on the Debug menu pick and select power on. This will drive the DTR pin on the port interface and you can use a voltmeter to see if the voltage regulator is working. You should be able to measure 5 volts between pin 1 and 8 on the winkey IC. If no 5V, carefully check the voltage supply circuitry for a problem.
- 7) If you have 5 volts on winkey then you need to figure out why the PC can't talk to it. A good strategy at this point is to carefully go over the whole board looking for bad or missing solder connections, solder shorts or missing wrongly installed components. That is the most common problem at this stage. If you have a scope you can trace the receive data path from the connector through Q3 to winkey pin 4. Click on WKopen while looking... a short burst of serial data is sent every time you click on WKopen. If you see it reach the winkey chip, the next thing to do is trace transmit from the chip back to pin2 on the DB9 connector. You should see a clean swing from about -9 to +9 volts. It can be more or less but should swing both plus and minus in order for the PC host to see it.
- 8) Once you get Winkey to open properly you can play around with various controls on the testbed application. Place the cursor into the Keyboard Entry Window and type, this will cause Winkey to transmit what you type. Click the paddle and serial echo checkboxes and winkey will echo what's sent to the Outgoing Morse Window. You can test the paddles at this point and you will see BreakIn status reported and also entered letters will be echoed. The last thing to check is the speed pot, click on PotLock and twist the speed pot, the scroll bar and WPM readout should track the twist.
- 9) If you change any of the settings in the Customize group make sure you press the Update button to force the app to write the new value to WK.

Precautions when connecting kit to a rig

NOTE !!! : The on-board keying circuit on the WinKey PCB is only capable of keying positive voltages up to 50 VDC and is not compatible with transmitters that use negative keying voltages.

There are several RF filter points included in the WinKey circuit design. Caps C7 and C8 on the Key and PTT lines prevent RF from coming back through the keying lines. C5 and C6 shunts any RF arriving over the paddle leads. C4 shunts any RF arriving over the speed pot leads. These components also reduce RF radiation from WinKey. No bypass is provided on the RS232 interface leads. For maximum RF immunity a shielded RS232 cable is recommended.

Even with good filtering the Winkey PCB is susceptible to problems caused by high RF potentials in the shack. Please observe standard RF grounding precautions to reduce RF at the operation position. This includes but is not limited to: multiple connection paths to a good earth ground, common grounding for all equipment, quarter wave stubs at particularly troublesome frequencies, and double checking all mechanical ground connections for oxidation.

Winkey PCB V4 Layout

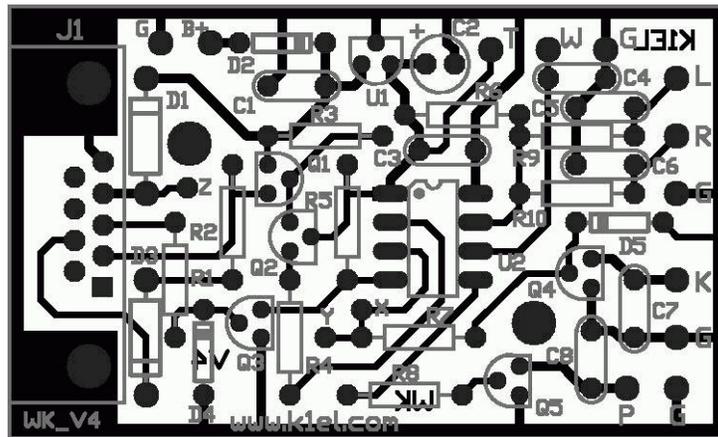


Figure 5 - WinKey PCB Check Plot

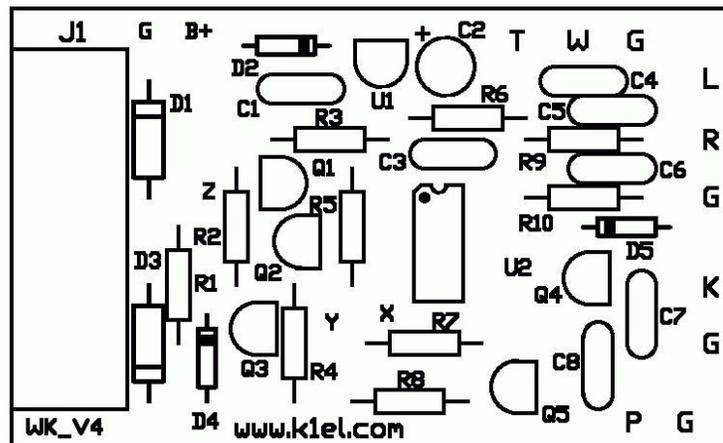


Figure 6 - WinKey PCB Silkscreen

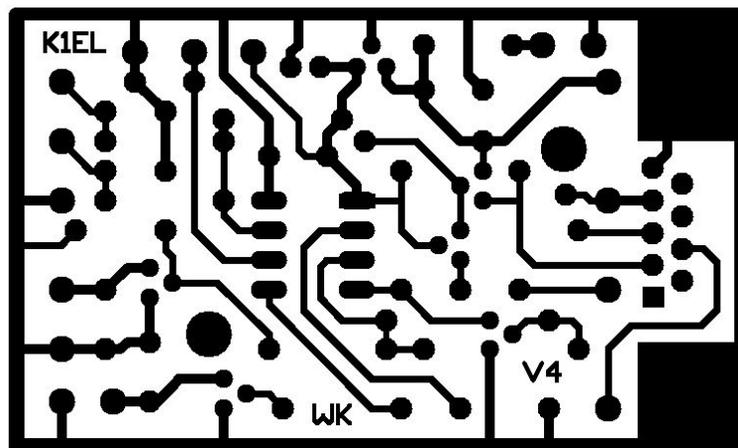
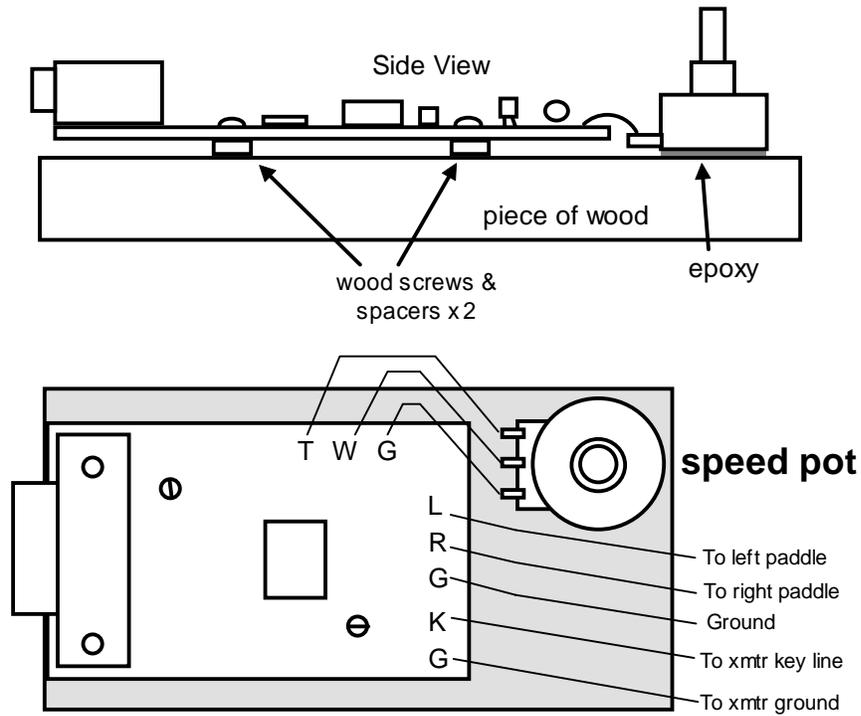


Figure 7 - WinKey PCB Solder Side

What's Next

Now it's time to make a more permanent installation.

If you are in a hurry and want to get WK going quickly the following setup will work FB. It's not pretty but will do the job.

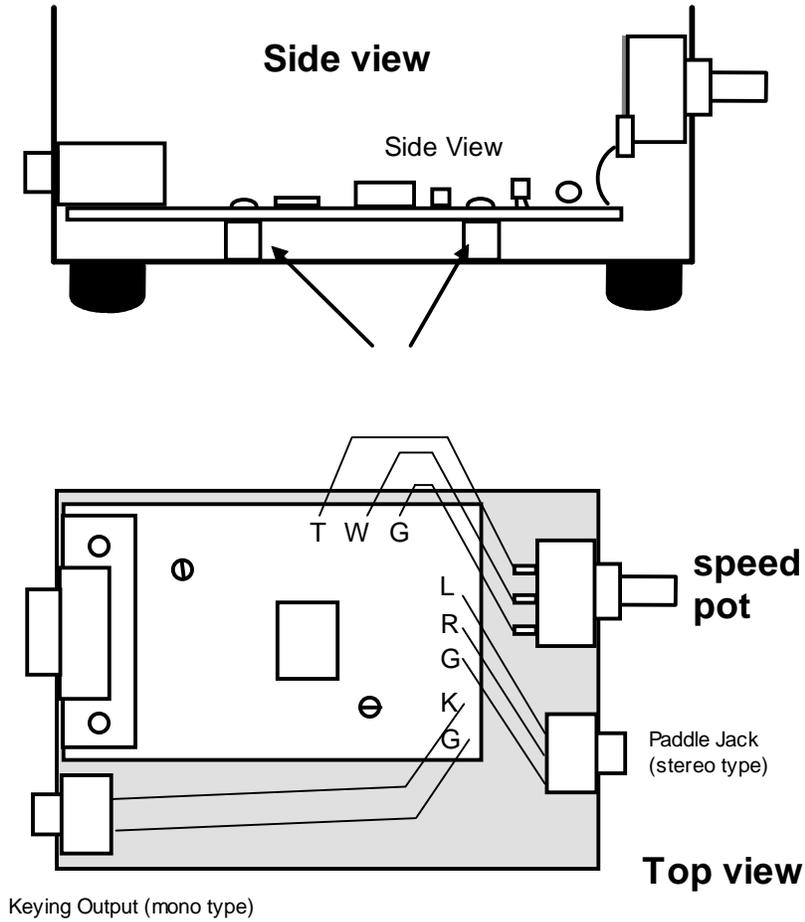


Quick and Easy Test Setup

Figure 8 – Quick WinKey Prototype Suggestion

K1EL sells a nice painted and silkscreened enclosure for the Winkey kit. It is a bargain at \$19 and includes all connectors and hardware. It comes complete with assembly instructions.

The following diagrams illustrate Winkey installed in a generic enclosure.



Winkey in an enclosure

Figure 9

Sidetone Connection

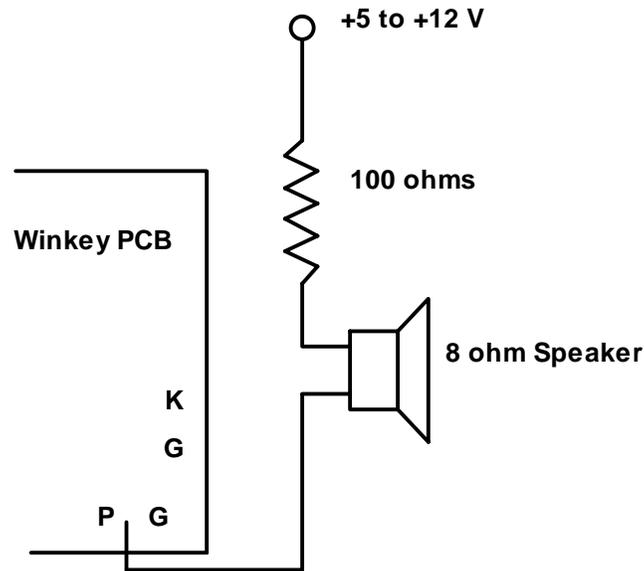


Figure 10 - Sidetone Connection for WinKey PCB

Although most users will want to use their rig's sidetone, the WK PCB does provide a sidetone output pin. If you elect to use this, the PTT output will be unavailable. The figure above illustrates how to hook up an external speaker. Note that a winkey powered from the PC's serial port does not have enough drive to run an external speaker thus an external power supply is needed.

Winkey Compatibility Mode

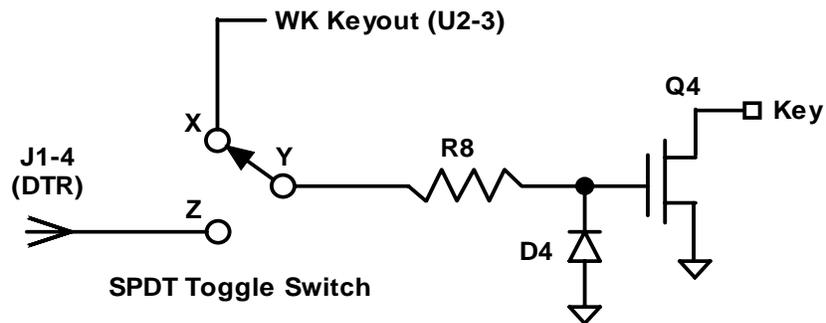


Figure 11 – Key Out Source Switching Option

A simple means is provided on the PCB to bypass WinKey and allow an alternate software app to control the key line. A single pole double throw switch is required and the etch between X and Y must be cut. Wire up the switch as shown. When the switch is in the X position Winkey will control the key output, when in the Z position the software package will control the key output by means of the DTR serial output. Please make sure D4 is installed before wiring up and testing the circuit as shown.

External Battery Connection

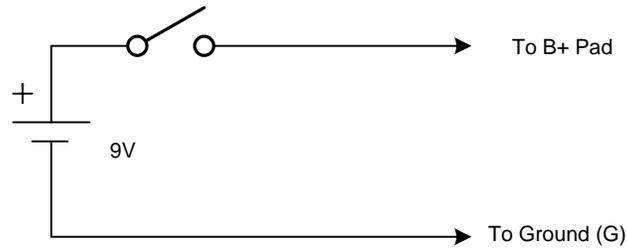


Figure 12 – External Battery Hookup

In the event the PC serial port does not have sufficient voltage output to reliably run Winkey, an external battery can be connected to the V4 PCB. A power on switch must be used to prevent battery drain when Winkey is not being used.

MCW Application

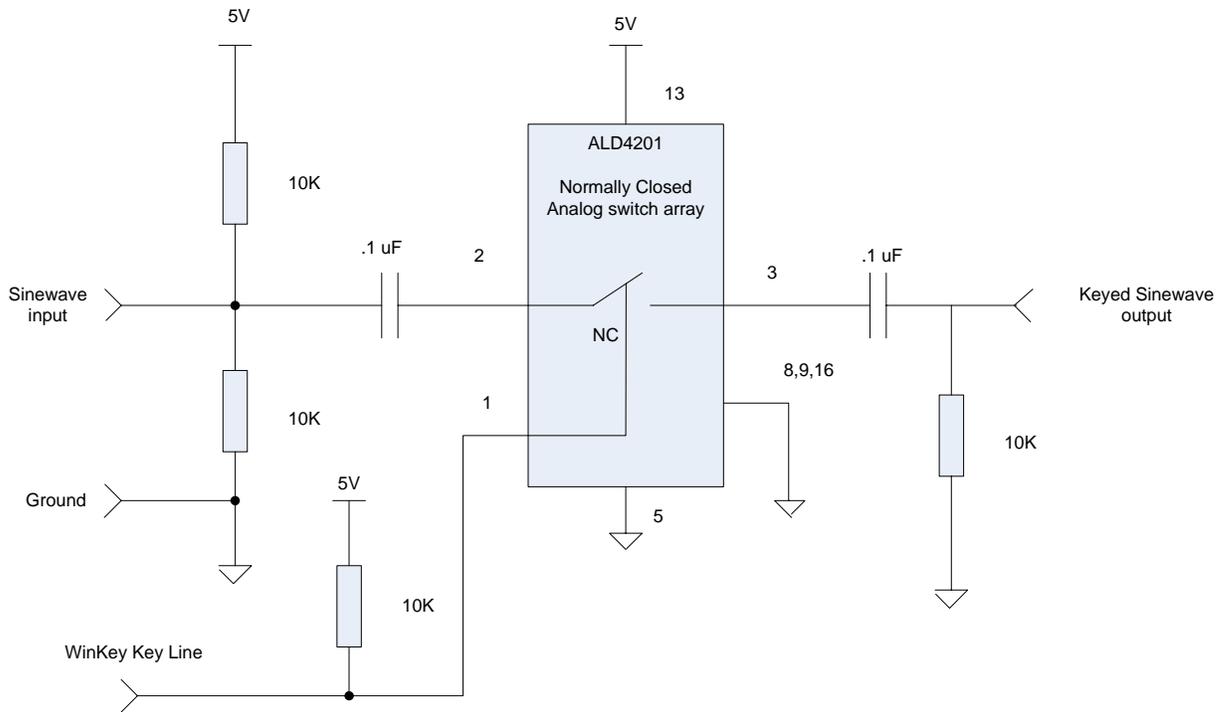


Figure 13 – Using Winkey in an MCW application

Here is a circuit that can be used to key a sinewave tone for MCW operation.