**KANGA PRODUCTS**
Electronic Kits For The Radio Amateur

Universal CW Memory Keyer (4 channel Memory Keyer) Module Only

This is a feature rich low-cost memory Keyer, offering features that you would expect from Keyers that are much more expensive. Unlike most keyers this is designed to work with all transistorised, Valve, or Hybrids rigs and will work with the older Grid Block or Cathode Keying methods favoured by older Kenwood and Heathkit as well as the most modern radios around.

The Keyer is built around a small but powerful microcontroller. The code for the chip is open source from Jan DK3LJ who developed the original program, later modified by Jack AL4SV and then further modified by Don WD9DMP who made some changes that polished Jacks code even more. The finial product rivals professional Keyers costing many times the price.
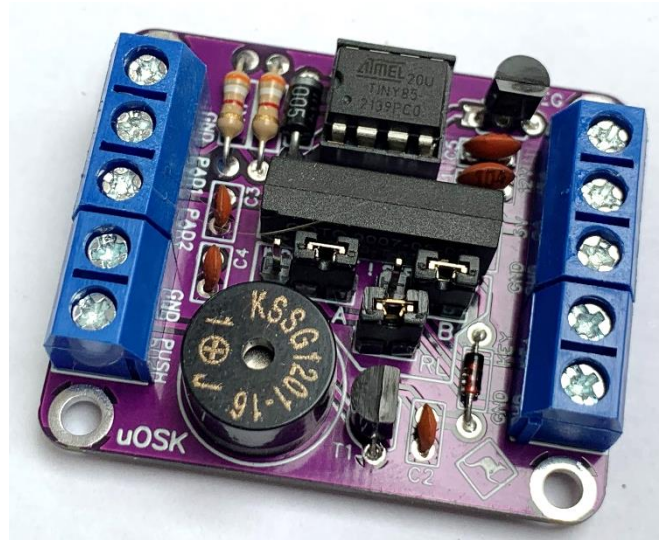
This open source code is now installed on a small but powerful microcontroller. The kit produces a desktop mounting Keyer with many options.

Here is a list of its features.

Iambic A, B, Ultimatic modes
DAH Priority Mode
Paddle Swapping
Sidetone Toggle
Adjustable Sidetone Pitch
ATU Tune Feature (20 Sec Key Down) with one touch cancel
TX Keying Toggle (Sidetone only for practice)
TX Level Inverter mode
WPM Speed feedback
4 x 100 char Memory's
Automatic Beacon (for FOX hunts extra)
Callsign CW Trainer (Sends random callsign, users send back)

Plus more…

For more details of each feature read the user guide at the end of this document.

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Parts List

uOSK Module PCB
Attiny85 OSK Code
DIP8 Socket
R1, R2, 3K9 Resistor
C1, C5 100nF (0.1uF) disk Marked 104
C2,C3, C4 10nF (0.01uF) disk Marked 103
U1 78L05 Voltage regulator
T1 2N2222 or equivalent Transistor
1 x 1N4148 Diode
1 x 1 amp Diode
Piezo Sounder
Push Button
PCB Inline Relay
2 x 3 way Header Pins
1 x 2 way Header Pin
3 x 2 Pin jumper
2 x 3 way terminal blocks
2 x 2 way terminal blocks

The circuit board.
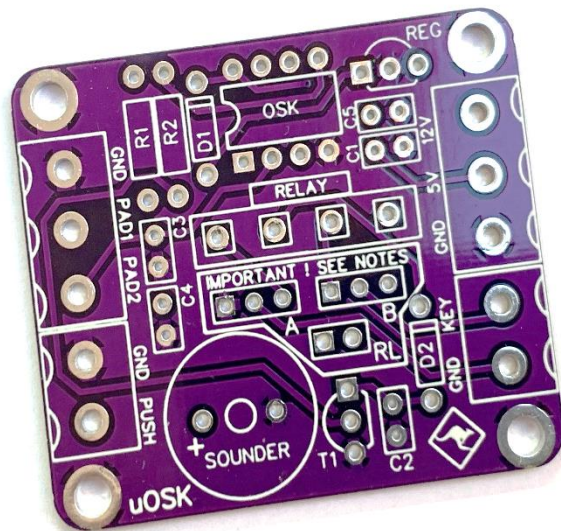
OK so let's make a start building the keyer.

I have given an order to fit the parts below, if you are experienced in kit building you do not need to follow this, it's an easy build and the parts are widely spread over the board, it should not prove very difficult to build.

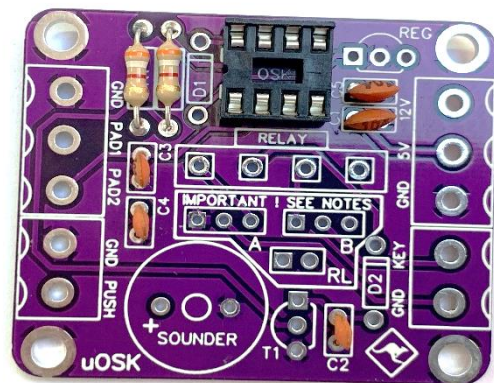If you are new to kit building just follow the instructions below.
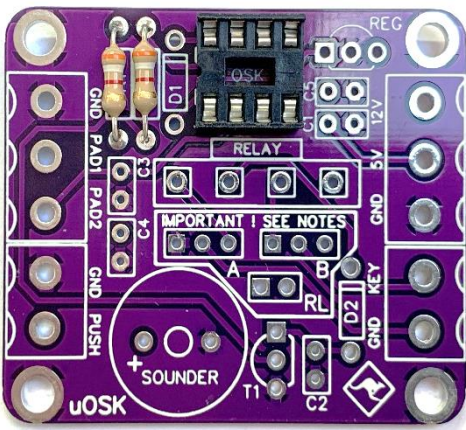
First, The IC Socket and the Resistors

The socket has a small notch on one side, this notch should be nearest to the D1 position on the PCB

There are only two resistors to fit, start with R1 and R2 which are both 3k9 resistors.

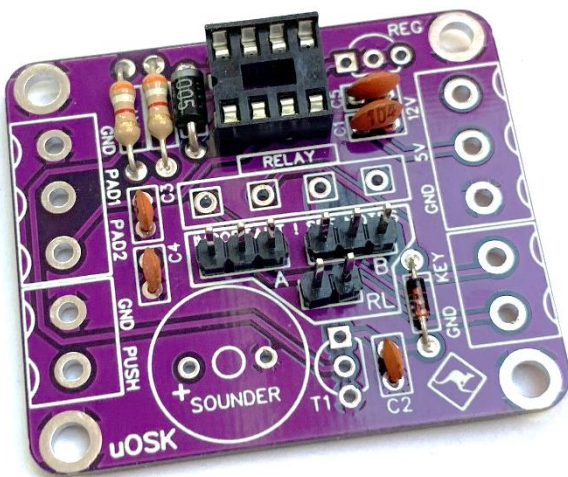Resistors can be fitted either way round.

Next, we will fit the capacitors

C1 and C5 are both 100nF (marked 104).

C2, C3, C4 are all 10nF (marked 103).

The capacitors can be fitted either way round.

Now we can fit the two diodes, D1 first, this is a 1 amp diode (something like a 1N4001 to 1N4007) and is much bigger than the other diode in the kit, it will be black with a white band at one end. This banded end should be nearest to the top edge of the board when fitted in place.

D2 next which is a small signal diode, something like a 1N4148 will be supplied this diode will be brown glass with a black band on one edge, this band should be next to the screen-printed word 'KEY' on the PCB.

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Next we need to fit the keying option header pins, two banks of 3 pins and one of 2 pins. These are marked 'A' and 'B' on the board, the two pin header pins into the place marked RL.

Try and make these pins nice and straight. Do not fit the jumpers just yet.

Now we can fit the Voltage regulator and the switching transistor.

The Voltage regulator and the transistor look the same. look carefully on the flat side of these parts to read the identification markings.

The voltage regulator is a 78L05 (5v voltage reg) . fit this on the board near the top edge where you will find the marking 'Reg' (for regulator) .This must be fitted the correct way round. The silk screen printing shows which way to fit the part.

Next the transistor, this is only acting as a keying switch so this can be a number of different device but something like the 2N2222 will be provide (or equivalent). Again make sure you fit it the right way round and follow the layout on the PCB (T1). The finial part at this stage is the small inline relay, this is a solid black block about 20mm long , it can be fitted either way round in the position marked 'relay' on the PCB just above the header pins.
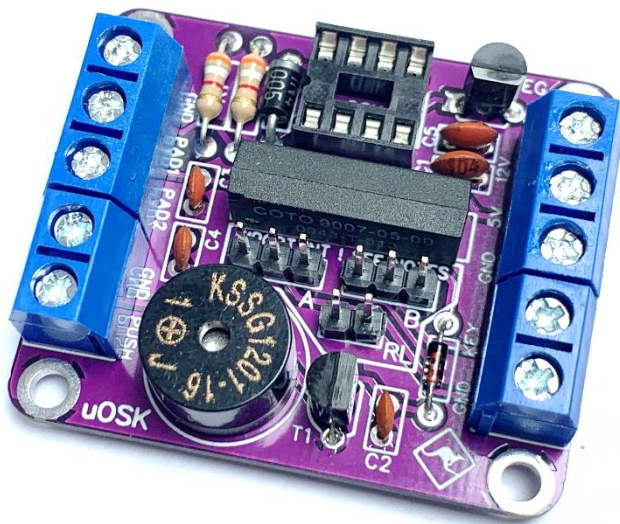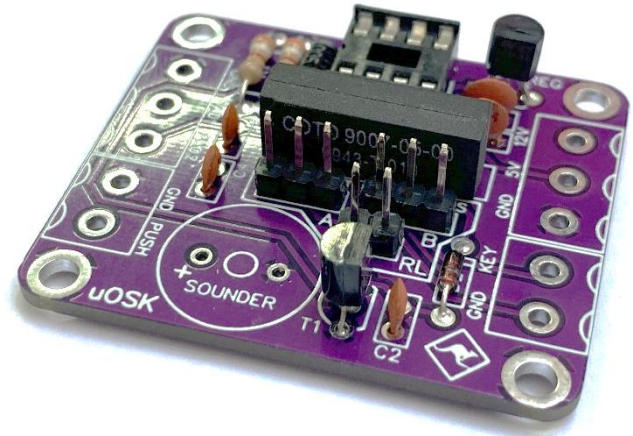
Next fit the sounder, this is for side tone. This id you look on the top of will have a '+' mark on one side. This should be near the left hand side of the PCB. (See photo here).

Now finally fit the terminal blocks for your wires.

Nearly done now, fit the IC microcontroller. This chip MUST be fitted the right way or damage can occur to the keyer.

The chip has a small don't near one pin, this small dot (moulded in the chips plastic top) indicates pin 1. This should be fitted so that pin one is nearest to the black diode D1 and the relay block.

That's the keyer built, now to set the keyer option jumpers and wire it up.

Now fit the keying option header jumpers

There are three positions for the header pins , they are marked A, B, and RL.

These pins allow the keyer to be set for either just modern transistor rigs or for older valve high voltage Grid block or cathode keying.

 If in doubt select the grid block setup configuration. It will work with ALL rigs new or old.

Default settings (suitable for Grid block keying and all modern radios too) are :-

Option 1

A:- Pins 2&3
B:- Pins 2&3
RL :- Jumper ON

These settings mean that you will be using a fully isolated volt free set of relay contacts to do the keying so that will work with ANY rig.

Option 2

A:- 1&2
B:- 1&2
RL:- OFF

These settings will use the transistor for keying, the relay is deactivated with this setting and so the keyer is silent, this must NOT be used with the older valve or hybrid radios (such as the TS-830 etc)

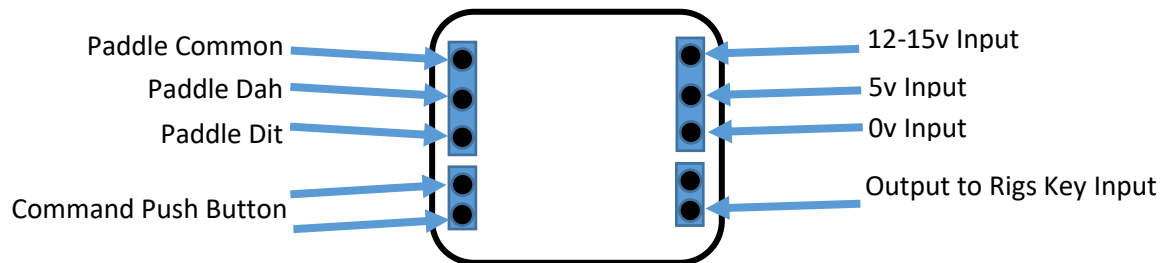**Wiring the keyer.**

Please Note the voltage requirements

The key has a 3 way block for the DC input the top terminal is marked 12v, this in fact can be from about 7 to 15v. the voltage is fed into a on board 5v regulator so a stable safe voltage is presented to the controller. If using the relay option (default) I would suggest that this is the best way to power the keyer.

BUT…. If you want to run the keyer via a battery pack then you can by pass the regulator and connect the supply to the5V unput terminal. This directly powers the processor. The processor will work from about 3 to 5v (3 x AA batteries is ideal) **NO NOT EXCEED 5V** . The chips max voltage is 5.5v more than that will destroy the chip. If you do this I can supply you a replacement chip for just a few pounds so its not the end of the world but your keyer will be out of action when you need it.

 The advantage of running it at this lower level voltage is that the keyer as a very low standby current (just a few microamps) when the voltage regulator is not used so no on/off switch is needed.

Disadvantage of using this low voltage is that the relay is design for 5v so if you use a lower voltage than that the keying may not be so reliable, I suggest that if you want to use the low voltage option use the transistor keying option (option 2 above). This option will not be suitable for the older valve/hybrid rigs.

Wiring to the module:-

Paddle Common — 12-15v Input
Paddle Dah — 5v Input
Paddle Dit — 0v Input
Command Push Button — Output to Rigs Key Input

Keyer Instructions

Version: 0.87 Usage (WD9DMP Fixes and Enhancements)

After Powerup/reset in default mode, the keyer plays "73" to verify that the Code and EEPROM data are programmed correctly. The circuit operates as a regular IAMBIC keyer in IAMBIC B at 15 WPM (words per minute = 60 CPM), with 800 Hz side tone. By default, the transmitter keying signal is positive. The processor will automatically power off after 60 seconds into a low power mode to conserve power.

Speed Change

Speed can be changed by pressing and holding the command key while operating the DIT and DAH paddles, in any mode.

DIT reduces speed while DAH increases speed. The keyer plays an alternating sequence of dit and dah while changing speed without keying the transmitter.

Command mode

Pressing the command button without changing speed will switch the keyer into command mode. This will be confirmed with the '?' character. Another press of the same button takes the keyer back into regular keyer mode and will be confirmed by the 'SK' prosign.

During Command Mode the transceiver is never keyed and sidetone is always activated. Further functions can be accessed by keying one-letter commands as listed below. In general, changes made in Command Mode will be written to EEPROM after a short delay following input and confirmed by an "R" acknowledgement, or by another short press of the Command button (for some commands). The unit will remain in Command Mode for subsequent commands, timing out to Normal Mode after a few more seconds with an "SK" indication. The keyer can also be returned to Normal Mode with an additional button press.

V -Version

The keyer responds with the current keyer software version number

P -Pitch

Allows modifying the sidetone pitch to a higher or lower level. A sequence of dits will be played and the pitch can be modified with the dit and dah paddles. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new pitch to EEPROM and leaving the user in command mode.

R -Reset

All settings are returned to their default values except for the stored messages in the message EEPROM area. Restored settings include speed and pitch, paddle swap, TX level inversion, sidetone Farnsworth setting, and TX keyer settings.

U -Tune

The transceiver is keyed for a duration of 20 seconds for tuning purposes. Tuning mode is aborted once either DIT or DAH paddles are touched or the control key is pressed.

A -Iambic A

Keyer sets IAMBIC A as permanent keying mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

B -Iambic B

Keyer sets IAMBIC B as permanent keying mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

L -Ultimatic

Sets the keyer into ULTIMATIC mode as permanent keying mode. In Ultimatic mode always the last paddle to be touched is repeated indefinitely when paddles are squeezed. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

D -DAH priority mode

Sets the keyer into DAH priority mode as permanent keying mode. In squeezed state a sequence of DAHs is sent. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request. Some of the first generation keyers exhibited this behaviour so the chip can simulate that.

X -Paddle swapping

DIT and DAH paddles are swapped. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

S -Sidetone toggle

The built-in sidetone generator setting is toggled (ON -> OFF or OFF -> ON). NOTE: This setting is only of relevance for regular keying mode. Sidetone is always on in Command Mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

K -TX keying toggle

Toggles the setting of the TX keyer output. In default state the keyer switches the output line when it is in keyer mode. Toggling this setting enables or disables that function. NOTE: Keying is always off in Command mode. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

Z -Set Farnsworth pause

Allows setting of an extended inter-character pause, which makes fast keying easier to understand. A series of "Dit-Dah" sequences will be played. Pressing the "Dah" paddle will decrease the Farnsworth intercharacter spacing. Pressing the "Dit" paddle will increase the Farnsworth Intercharacter spacing. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new setting to EEPROM and leaving the user in command mode. Note that this only affects memory/program playback and transmission. If you desire Farnsworth mode in manual transmission, please manually pause between characters.

F (Flip) -TX level inverter toggle

This function toggles whether the "active" level on the keyer output is VCC or GND. The default is VCC. This setting is dependent upon the attached keying circuit. The setting is written to EEPROM and an 'R' is sounded to acknowledge the request.

W -Query current WPM speed

Keyer responds with current keying speed in WPM.

1, 2, 3, 4 -Record internal messages 1, 2, 3 or 4

The keyer immediately responds with "1" or "2" or "3" or "4" after which a message up to 100 characters can be keyed at current WPM speed. If no paddle is touched for 5 seconds, the acknowledgment signal 'R' is sounded and the mode terminates, writing the new setting to EEPROM and leaving the user in command mode. Choosing "1" or "2" or "3" or "4" but not keying a new message deletes the chosen message buffer content. A command key press during the recording function returns the keyer to command mode, leaving the memory unchanged.

E, I, T and M -Play back internal messages 1 or 2 or 3 or 4

The stored messages 1, 2, 3, or 4 are played back with keying enabled (if configured). A press of the command key aborts the message and immediately returns the keyer to Normal Mode for a QSO, with an "SK" confirmation. After the message plays to completion, the keyer remains in command mode with no "R" indication so another message playback sequence may be started. If no additional message is started, the keyer returns to Normal Mode with an "SK" confirmation.

N -Automatic beacon

The keyer responds with 'N' after which a number between 0 and 9999 can be keyed. After a 5 second timeout the keyer responds by repeating the number and 'R'. Once the keyer returns to keyer mode, the content of message buffer 4 is repeated in intervals of n seconds. The setting is preserved in EEPROM so the chip can be used as a fox hunt keyer. Returning to command mode and entering an interval of 0 (or none at all) stops beacon mode.

0 (zero) -Lock configuration

The 0 (zero) command locks or unlocks the main configuration items but not Version, Pitch, Tune, Callsign Training, WPM Query and Memory Playback functions.

C -Callsign trainer

The keyer plays a generated callsign (sidetone only) and the user must repeat it. If it was repeated correctly, 'R' is played and the next callsign is given. If a mistake was sensed, the error prosign (8 dits) is sounded and the current callsign is repeated again for the user to try once more. If nothing is keyed for 10 seconds, the keyer returns to command mode.

Handy Command Cards to print off

Speed Change = Command + Paddle

V - Version

P - Pitch

R - Reset

U - Tune

A - Iambic A Mode

B - Iambic B Mode

L - Ultimatic Mode

D - DAH priority mode

X - Paddle Swap

S - Sidetone toggle

K - TX Keying toggle

Z - Set Farnsworth pause

F - Flip TX Level inverter toggle

W- Query current WPM speed

1, 2, 3, 4 – Record internal message

E, I, T & M – Play back message

N - Automatic beacon

0 (Zero) – Lock configuration

Speed Change = Command + Paddle
V - Version
P - Pitch
R - Reset
U - Tune
A - Iambic A Mode
B - Iambic B Mode
L - Ultimatic Mode
D - DAH priority mode
X - Paddle Swap
S - Sidetone toggle
K - TX Keying toggle
Z - Set Farnsworth pause
F - Flip TX Level inverter toggle
W- Query current WPM speed
1, 2, 3, 4 – Record internal message
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N - Automatic beacon
0 (Zero) – Lock configuration