

# PATATO 27MHz AM Transceiver Kit

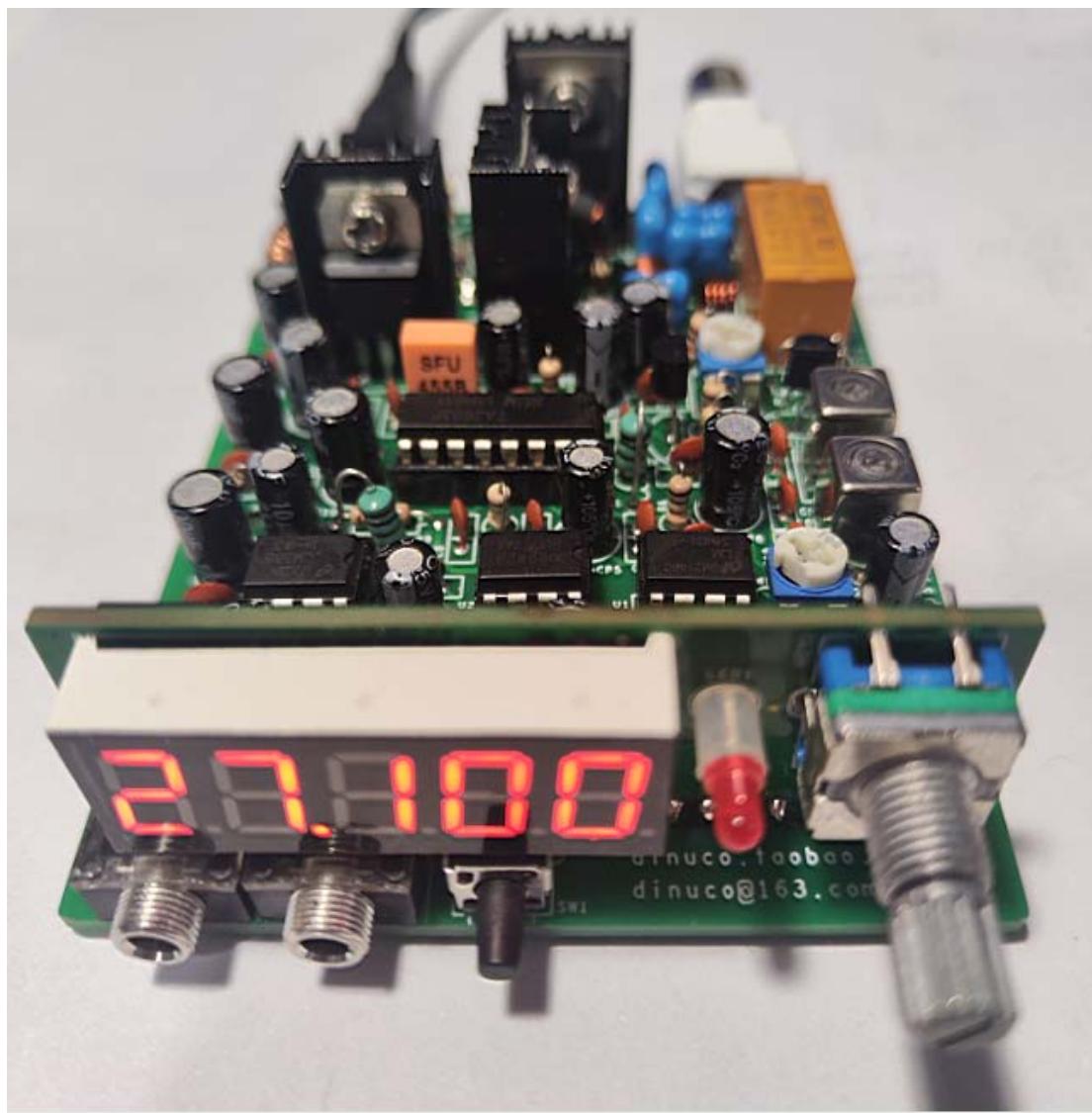
## Assemble Manual V5.0

### Overview

"PATATO" is designed by DINUCO Electronics. It is controlled by STC8H1K17 single chip microcomputer, A PLL device is used as local oscillator, and a high-speed driver chip is used as MOS FET driver, The 5W Class E power output is realized, and the LM386 is used to amplify the audio, and then the TIP42 is driven to modulate the Class E transmitting circuit.

The kit was developed by us, combined with the actual use of the domestic situation, corrected several key problems, after many debugging to form the current version.

The hardware described in this article is V5.0 and the main PCB labelled "POTATO\_5".



### Specifications

Power supply: 12V-13.8V (linear regulated power supply is recommended)

Antenna: 50 ohms, unbalanced

Typical receive current: 100mA

Typical Transmit current: 1300mA

Transmit power: 5W (PEP)

Operating frequency: 26.965-27.405MHz

Working mode: AM

## Circuit Description

Refer to the circuit diagram shown on the last page of this document.

The core of the receiving part is a TA2003, which includes a balanced mixer. The antenna in the signal after two filters, into the mixer, PLL sent out the local oscillator signal, the two signals after mixing, the RF signal conversion to 455KHz IF signal, TA2003 output audio and then sent to the LM386 audio amplification, so as to complete the whole receiving process.

The transmitted part of the RF uses LMG1025-Q1 as buffer amplification, the driven and connected STP16NF06 as class E amplification, and finally the output impedance matching network is matched, and the high-frequency signal is filtered by LPF and then connected to the antenna. After the audio signal is amplified by LM386, TIP42 is driven to modulate the power supply of Class E amplification.

## Component selection

L3, L4, and L5 are air core inductors. L3 uses 0.75 mm enamels to wind 6 times on the magnetic ring, L4 and L5 use 0.75 mm enamels to wind 4.5 times and 3.5 times on the 5 mm diameter drill (or pen), **respectively, paying attention to the direction of the circle.**

All capacitors less than 1000pF are high-frequency tiles, capacitors greater than 1uF are aluminum electrolytic capacitors, and all resistors are 1/4W 5% fixed resistors.

## Assembly and Adjustment

Test all transistors, resistors and capacitors with a multimeter before installing all components. Then install all components against the circuit diagram and the markings on the PCB board.

Generally follow the low to high order of installation. First weld the patch module, and then weld the plug-in device. After welding, check whether there is a solder short circuit.

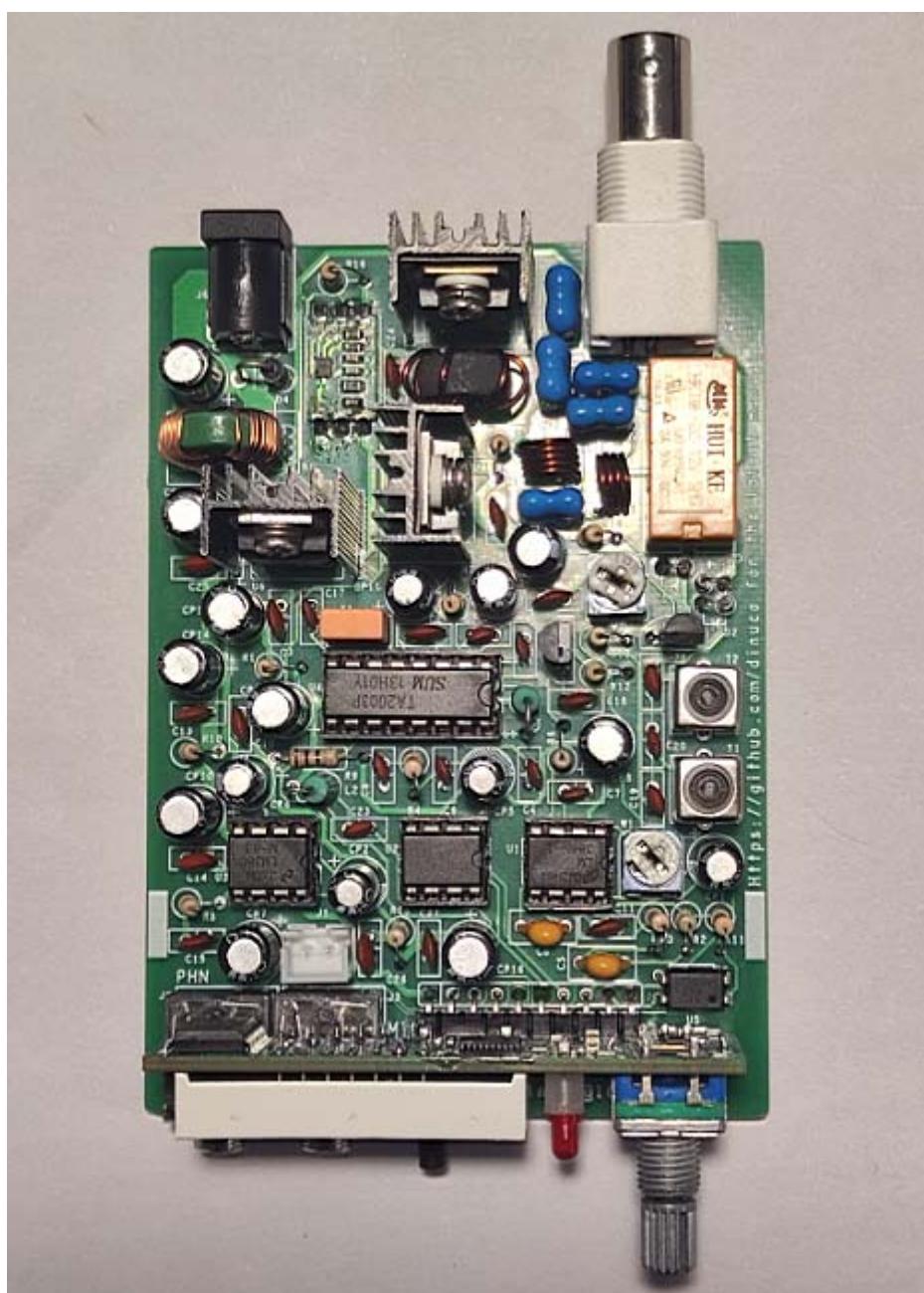
**Due to the MOS field effect tube in the kit, in order to prevent electrostatic breakdown, the soldering iron should be properly grounded or disconnected from the soldering iron power supply and used for waste heat welding.**

After welding is completed, do not install devices to the integrated circuit socket, power on to check whether +5V is normal, if abnormal, it means that the MOS FET may weld breakdown, after checking +5V and then install devices to the integrated circuit socket, which can effectively avoid the core integrated circuit welding bad.

Please refer to the following figure for the installation direction of the DRV driver board.



Note that insulation sheets and washers are not required for the 7805 heat sink, while insulation sheets and washers are required for the STP16NF06 and TIP42.



Everything is in order, check and then connect the power supply, the positive and negative polarity of the power supply must not be connected wrong. Plug your Walkman headphones into the headphone socket and you should hear white noise. Connect 51 ohm resistance at the antenna end to make a fake load, connect the start meter, press PTT, modulate W2, and detect the whole machine emission current, which should be about 1.1A, W2 can not turn clockwise to the end.

Then hold a radio with shortwave reception capability next to it, press PTT, and adjust W1 to receive the best sound.

Note: 1 hand microphone needs to be close to speak in order to normal use, 2 W1 and W2 need to be adjusted to the most appropriate position repeatedly, and do not launch for a long time.

When receiving, select a frequency signal, carefully adjust T1 and T2, and receive the maximum sound. It is recommended to use a non-inductive driver or a plastic driver for adjustment.

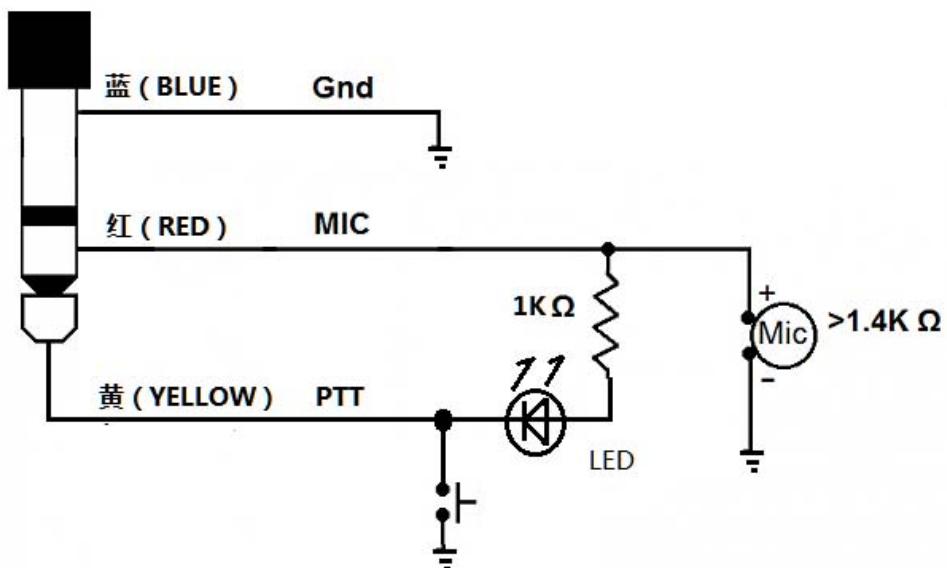
The power plug(5.5/2.1) requirements of the machine are as follows:



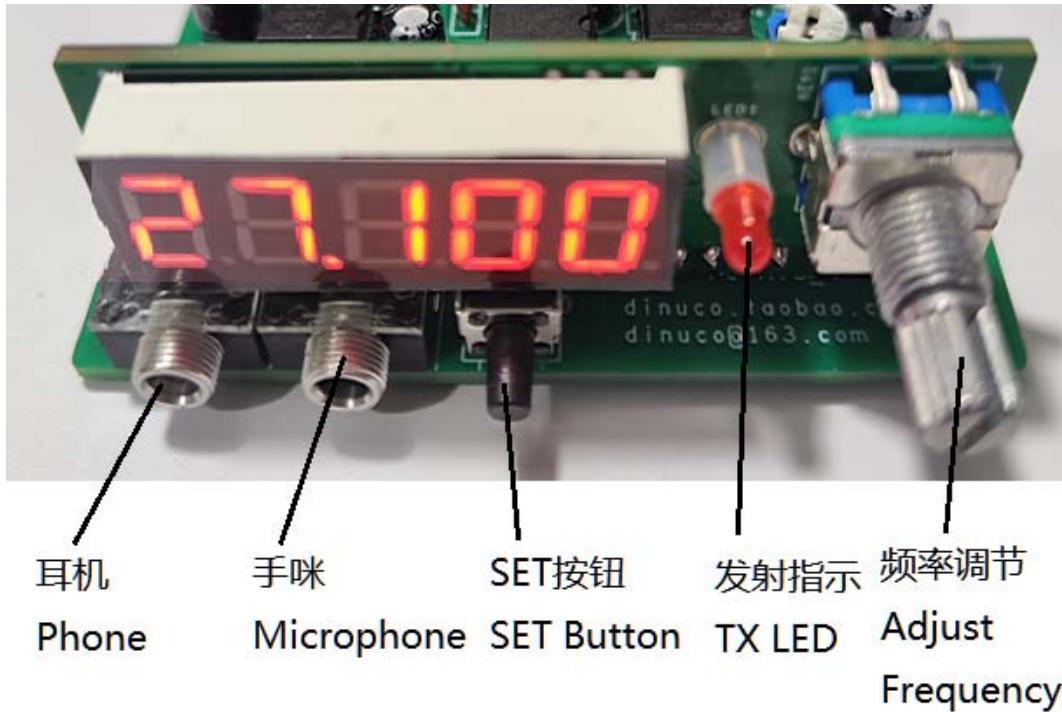
### Instructions for use

When adjusting the frequency, if you press the encoder once, the machine will automatically change from 1KHz step to 10KHz step, which is convenient for quick adjustment, if you press the encoder again, the machine will return to 1KHz step.

There is a stereo plug in the kit. After opening the back cover, solder the microphone wire to the plug in the colors indicated in the image below.



1 After the machine is powered on for the first time, the machine is in frequency adjustment mode by default, and the digital LED displays numbers, representing the frequency value. The panel display as the following:



2 Do not press the SET button first, rotate the encoder to see whether the display frequency of the digital LED display changes.

3 Connect the antenna or fake load, press the set button, then C1\_15 will be displayed, keep pressing the button, exit the configuration mode when C3\_68 is displayed, and enter the working mode again. All modes are described as follows:

C1 15 Sound Settings. The default is 15 and can be adjusted between 0 and 25. The higher the volume, the louder the sound.

C2 55 crystal filter center frequency setting, the default setting is 55, the unit is 100Hz, the default IF frequency is 10 695000Hz +55\*100Hz, if there is an error in the IF frequency, not aligned with the filter center frequency, you can fine-tune this value.

C3 53 25MHz Clock offset. The default value is 53 (unit: 100Hz). The default frequency is 25000Hz +53\*100Hz. If there is any error in the receiving frequency, the 25MHz clock frequency on the PLL small board can be measured by the frequency meter, and the clock frequency offset can be adjusted according to the test value.

Note: C2 C3 can only be set with instruments and experience, and the modified value will not take effect immediately. You need to exit the configuration mode and adjust the working frequency to take effect.

Because it takes time to configure the EEPROM in the MCU, do not power off at will during configuration to avoid misoperation.

If the configuration is wrong, do not panic, hold down the SET key, re-power on, the machine will be restored to the default setting according to the SET key state.

#### **Chassis mounting**

This circuit board can be conveniently placed in a standard aluminum profile case with a size of

76mm\*35mm\*100mm (this case is not included in this kit, please purchase it yourself if necessary).

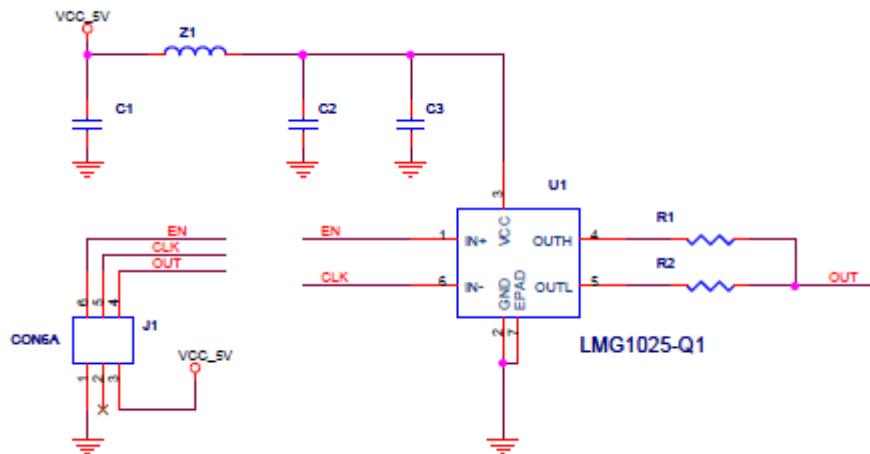
**Parts List**

<b>1/4W resistor and adjustable resistor</b>		
R1,R15	100	
R2	4.7K	
R3,R5,R7,R11,R14	1K	
R4,R16	10K	
R6,R8,R9,R10	10	
R12	470	
R13	100K	
W1	1K	
W2	10K	
<b>Magnetic beads, inductors, transformers</b>		
T1,T2	7x7 IF transformer	
L1,L2	100uH	
,L3	N1065 Magnetic ring	
L4,L5	0.75-5mm	air core inductor
B1	T120604	Common-mode inductance
<b>Chip capacitance</b>		
C1,C2,C3,C10,C11,C12,C13, C14,C15,C18,C24,C25,C26, C27	0.1uF(104)	
C23	100pF(101)	
C4,C7,C8,C9,C16,C17,C22	0.01uF(103)	
C6	4700pF(472)	
C19,C21	12pF	
C20	1.8pF	
<b>Monolithic capacitor</b>		
C5,C6	3.3uF	

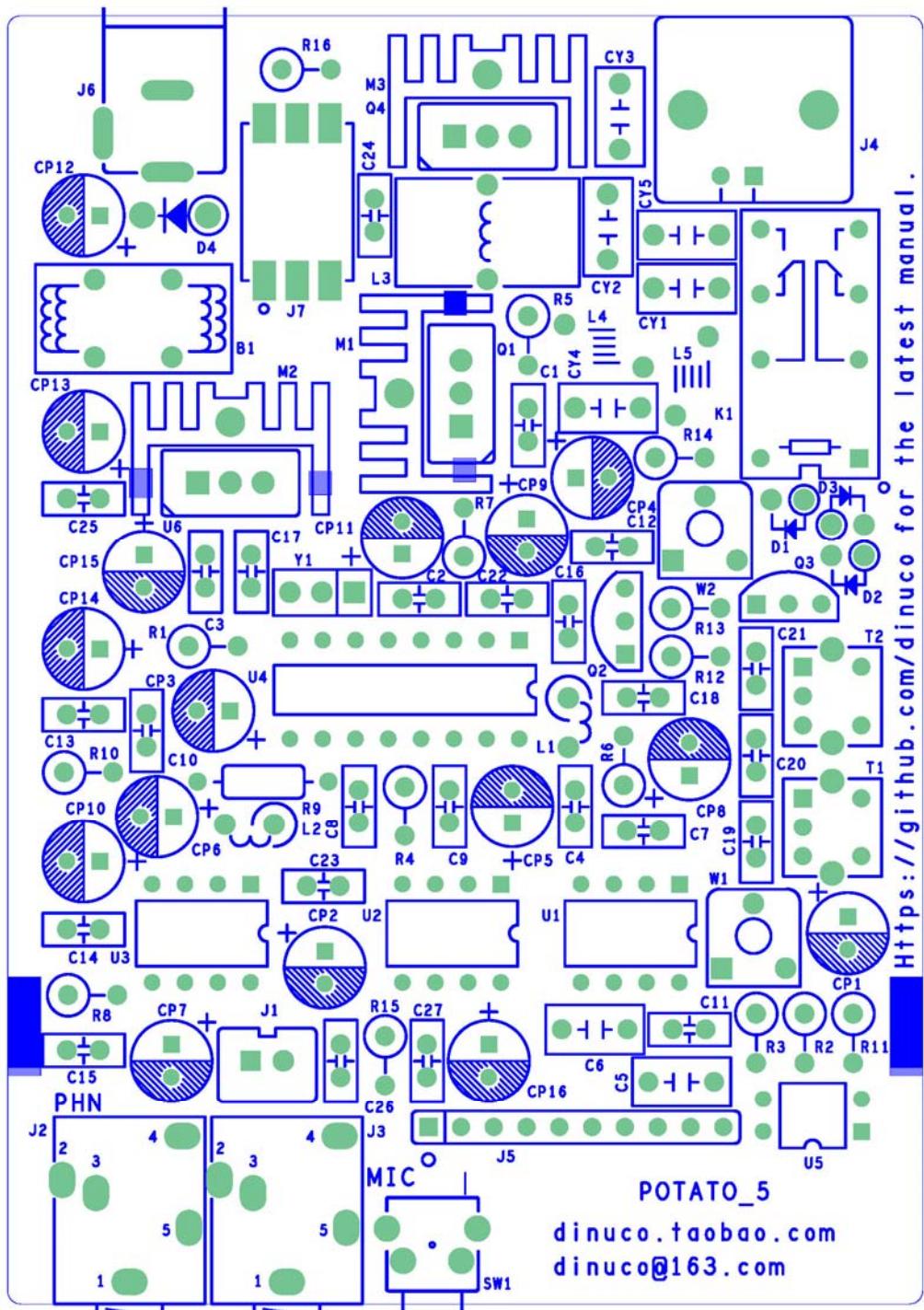
<b>Mica capacitor</b>		
CY1	130pF	
CY2,	680pF	
CY3	200pF	
CY4,CY5	390pF	
<b>Electrolytic capacitance</b>		
CP3,CP4,CP7,CP8,CP10, CP12,CP13,CP14,CP15,CP16	100uF /25V	
CP1,CP2,CP5,CP6,CP9	10uF /25V	
CP11	47uF /25V	
<b>Transistor</b>		
D1,D2,D3	1N4148	
D5	1N4001	
Q1	TIP42	insulation pad and ring are required for heat sink
Q2	J310	
Q3	8050	
Q4	STP16NF06	insulation pad and ring are required for heat sink
<b>Switch</b>		
SW1	Button	
<b>IC</b>		
U1,U3	LM386 (DIP8)	with IC socket
U2	FM62429 (DIP8)	with IC socket
U4	TA2003 (DIP16)	with IC socket
U5	PC817	
U6	7805 (TO220)	with heat sink
<b>Other device</b>		
J1	Speaker socket	SPK
J2	3.5mm stereo socket	PHN (input headphone)
J3	3.5mm stereo socket	MIC (input microphone)
J4	BNC (Q9) socket	
J5	CON10 Inserting pin	Connected to the LED display board
J6	Power socket	
K1	HK19F-12V relay	
Blank PCB board ×1pcs and DRV board ×1pcs		
Diameter 0.75mm enamelled wire		
The display board includes a circuit board, a 3mm LED, a digital LED display, and an encoder		

After receiving the device, please check whether there is any missing, please contact us if there is any problem.

The following is the circuit diagram of the DRV drive board for maintenance reference only.



## PCB Assembly Drawing



### Resistor Color Codes and Ceramic Capacitor Identification

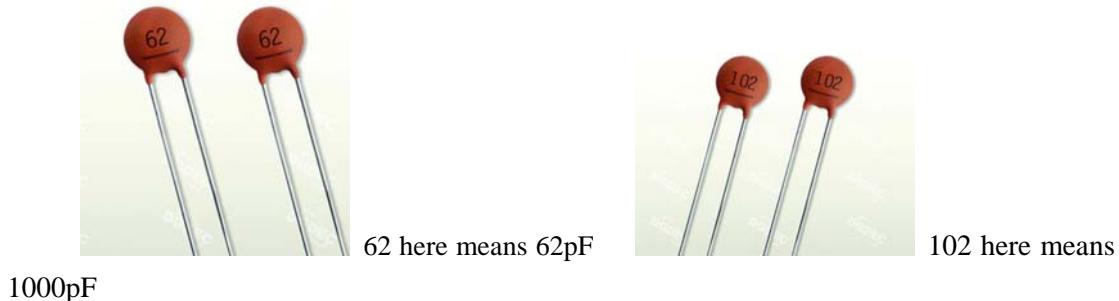
Resistors are marked using colored bands. Most resistors are 5% accuracy parts and marked with four bands. Less common 1% accuracy resistors are marked with 5 color rings. The following table can be used to read the value of these resistors:

**电阻色环对照表**

四环	五环	六环	温度系数 PPM/ $^{\circ}\text{C}$	误差 %	乘数 (W)	代表数值					
			100 50 15 25	$\pm 1\%$ $\pm 2\%$	$10^1$ $10^2$ $10^3$ $10^4$ $10^5$ $10^6$ $10^7$ $10^8$ $10^9$ $10^{-1}$ $10^{-2}$	1 2 3 4 5 6 7 8 9					
			10 5	$\pm 0.5\%$ $\pm 0.25\%$ $\pm 0.1\%$ $\pm 0.05\%$							
			1	$\pm 5\%$ $\pm 10\%$							
10K, 0.5%	470K, 1%	2.2K, 0.1%	15PPM								
黑色	棕色	红色	橙色	黄色	绿色	蓝色	紫色	灰色	白色	金色	银白色

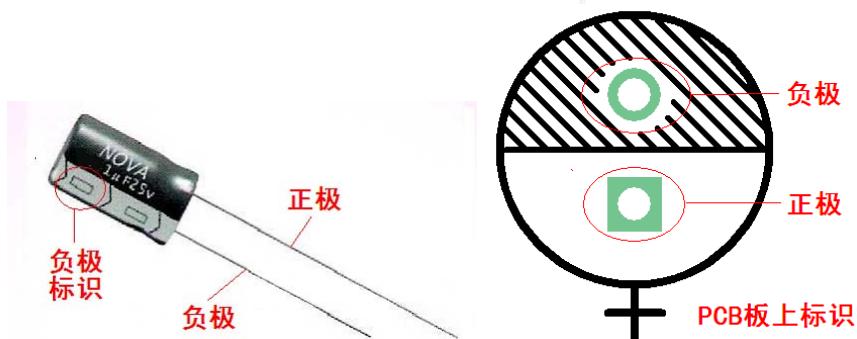
The capacitance of ceramic capacitors is generally denoted in units of pF (p meaning pico or  $10^{-12}$ ). However, some parts are directly labeled, such as 1000p, 220p, etc.

Most are labelled in exponential terms, such as 102,221. The first two digits are two most significant digits of the capacitor's value, the last digit being the number of zeros added after these digits. For example, "102" means that the leading digits are 10, while 2 means that 2 more zeros are added, i.e. 1000pF. Similarly, "221" means that the leading digits are 22, and 1 means that one further zero is added, i.e. 220pF.

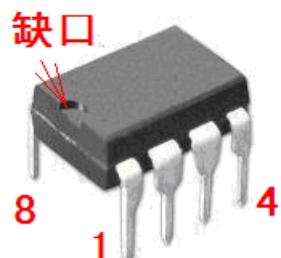


### Polarity of Electrolytic Capacitors

Electrolytic capacitors are polarised. Please make sure that the positive and negative pins of these capacitors correspond correctly to the PCB markings when inserting these parts.



### IC Identification

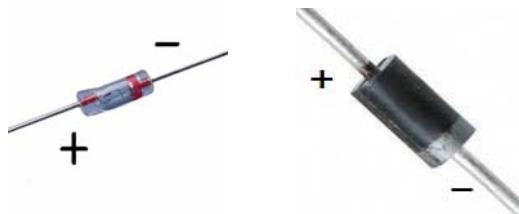


8 脚直插管脚排列

### Identification of Transistors and Diodes

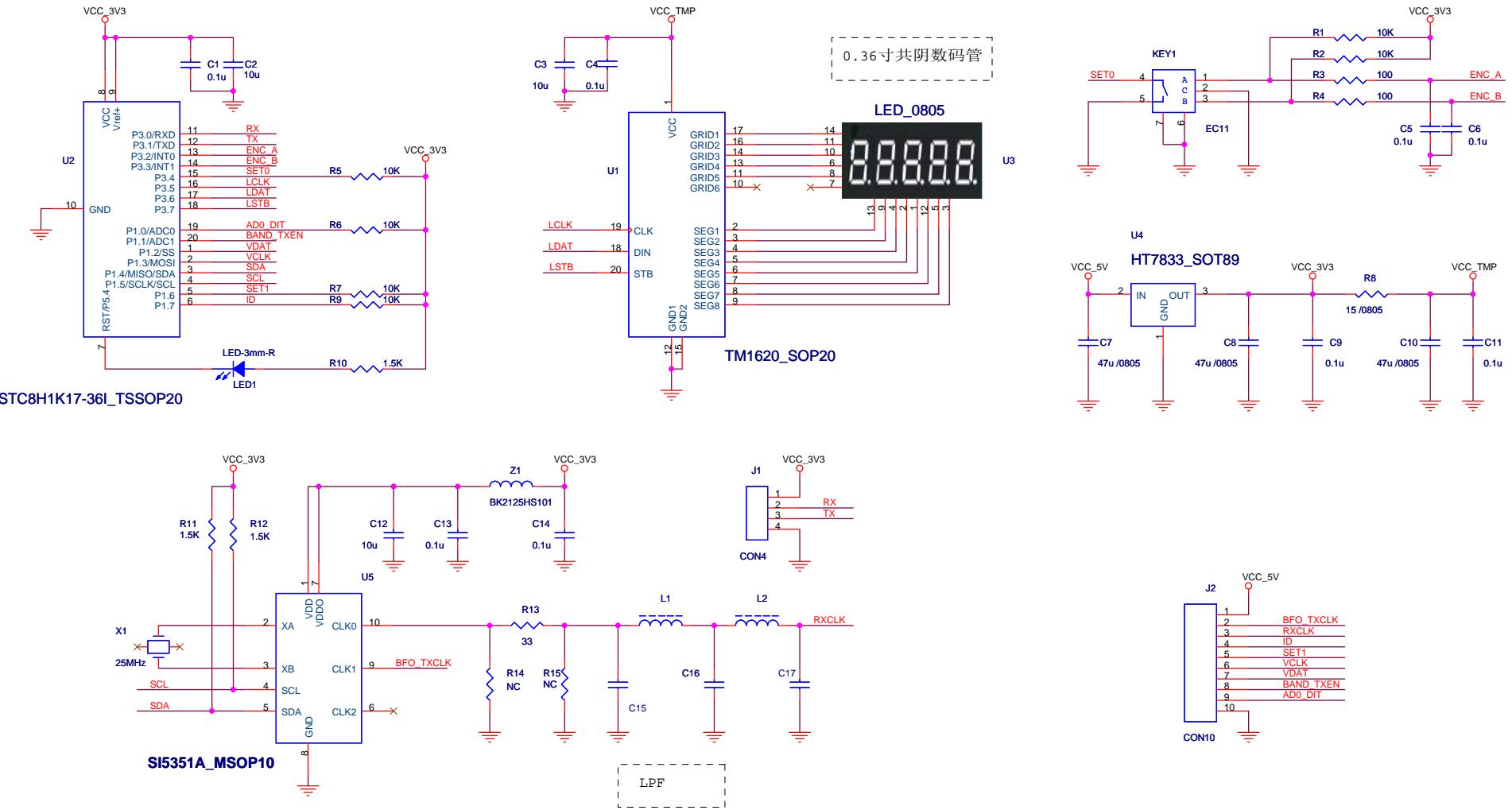


TO-92 package pin arrangement



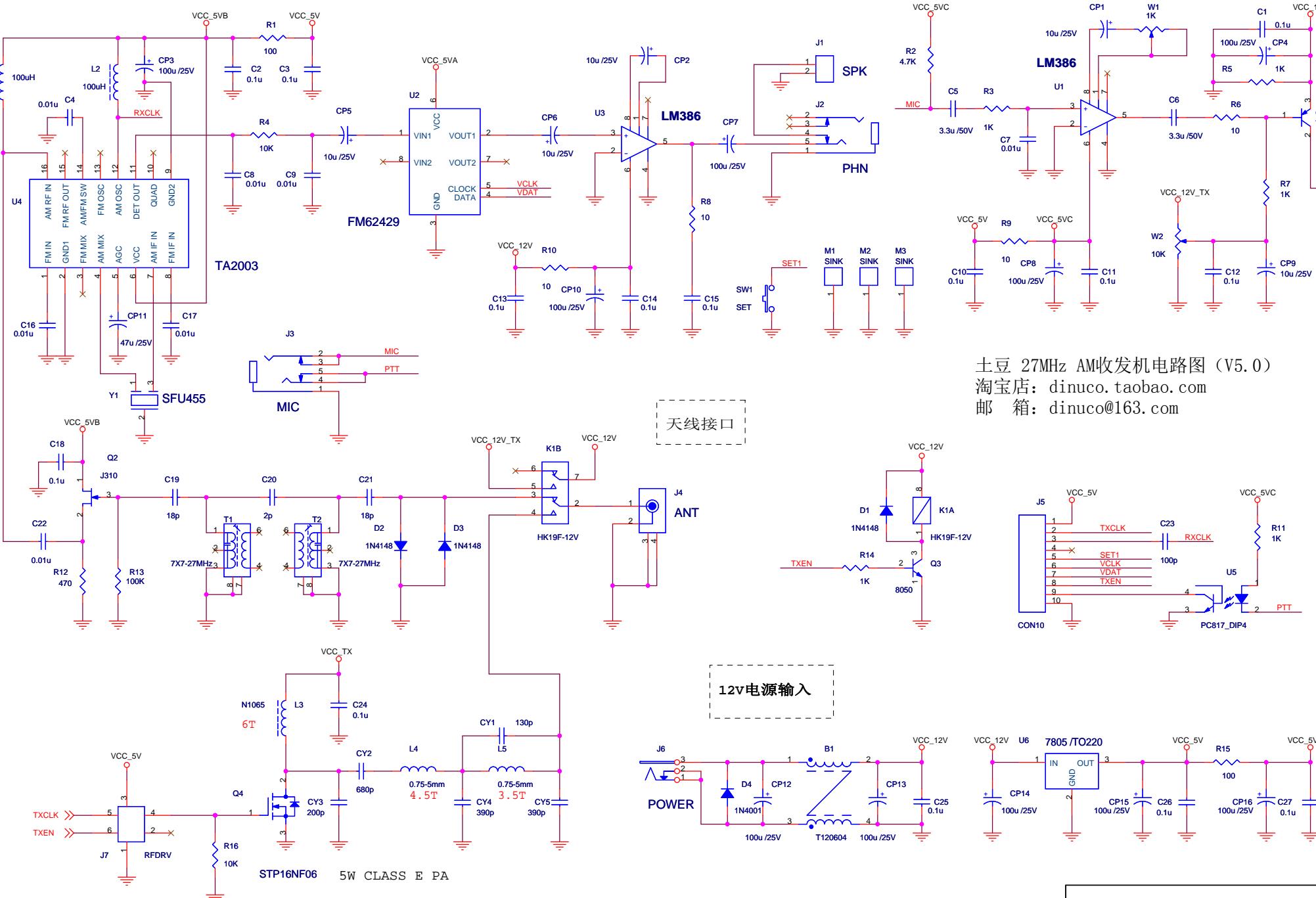
1N4148 diode polarity

1N4001 diode polarity



LED板图纸，仅供参考，  
LED schematic, only for reference

Title		01.MAIN	Rev	5.0
Size		Document Number	HM00LEDA_5	
A3		Date:	Wednesday, November 29, 2023	Sheet 1 of 1



土豆 27MHz AM收发机电路图 (V5.0)  
淘宝店: dinuco.taobao.com  
邮 箱: dinuco@163.com