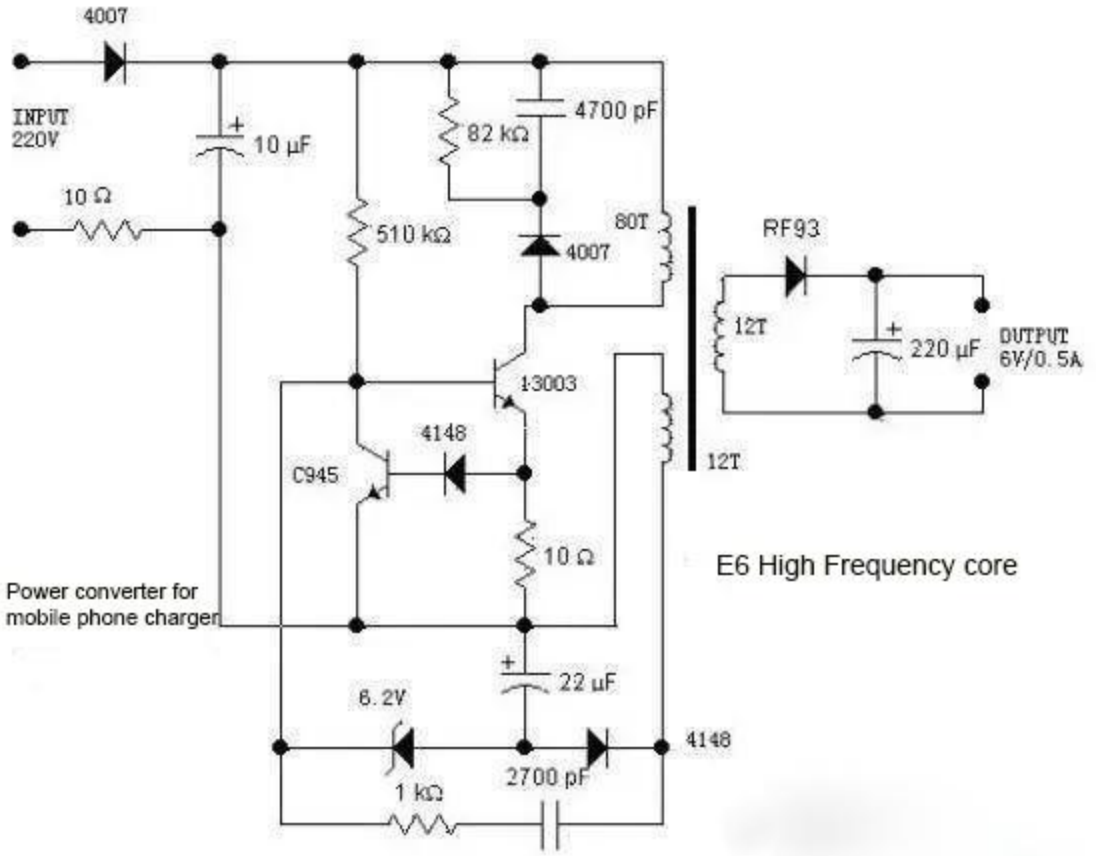
How to analyze a mobile phone charging circuit



Mobile phone chargers can be seen everywhere on the market, and the number of universal chargers continues to increase, but the quality is not very high, problems often occur, and it is a pity to throw them away. Therefore, this article mainly analyzes the principles of mobile phone chargers, hoping to bring some help to everyone.

When analyzing a power supply, we often start with the input.

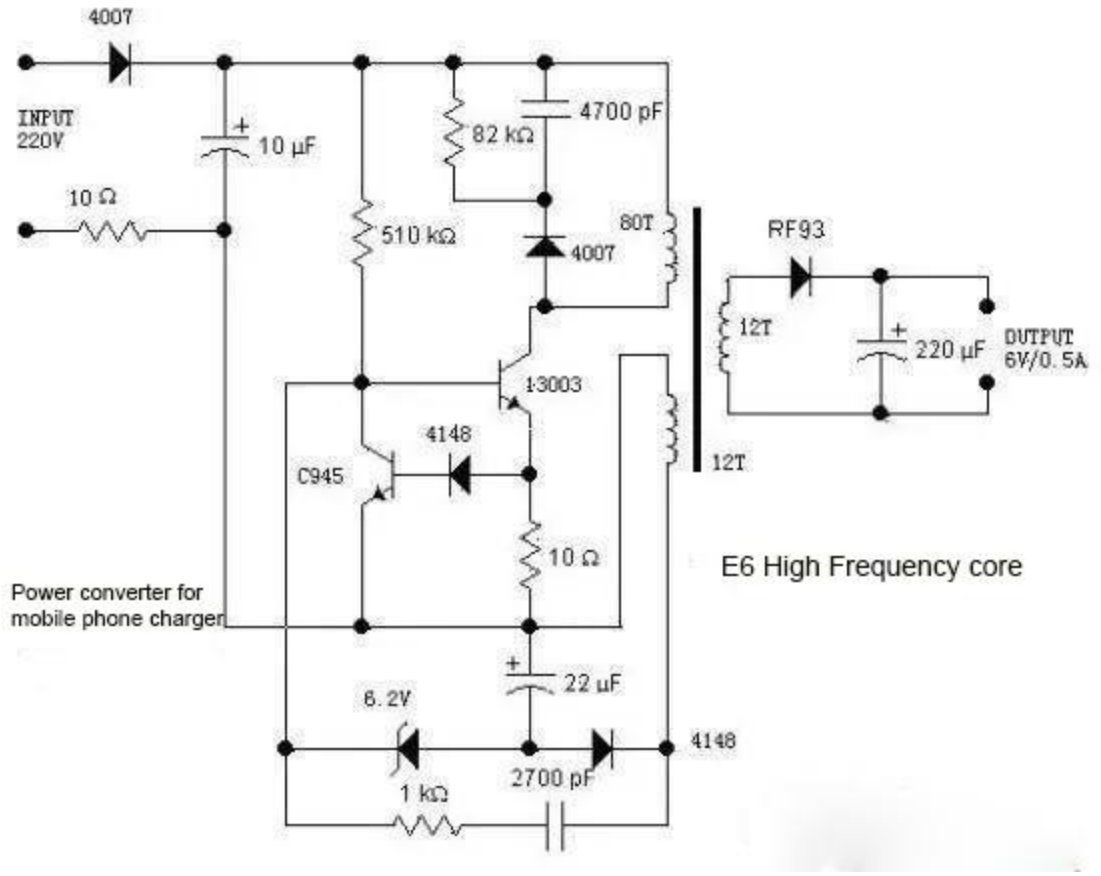
220V AC input, one end passes through a 4007 half-wave rectifier, the other end passes through a 10 ohm resistor, and is filtered by a 10uF capacitor. This 10 ohm resistor is used for protection. If a fault occurs later and causes overcurrent, then this resistor will be burned to avoid causing a larger fault.

The 4007, 4700pF capacitor, and 82KΩ resistor on the right form a high-voltage absorption circuit. When the switch tube 13003 is turned off, it is responsible for absorbing the induced voltage on the coil, thereby preventing high voltage from being added to the switch tube 13003 and causing breakdown.

13003 is a switching tube (the complete name should be MJE13003), with a voltage resistance of 400V, a maximum collector current of 1.5A, and a maximum collector power

consumption of 14W. It is used to control the on and off between the primary winding and the power supply.

When the primary winding is continuously switched on and off, a changing magnetic field will be formed in the switching transformer, thereby generating an induced voltage in the secondary winding. Since the same terminal of the winding is not marked in the figure, it cannot be seen whether it is a forward or flyback type.



However, from the structure of this circuit, it can be inferred that this power supply should be a flyback type.

The 510KΩ at the left end is the starting resistor, which provides the base current for starting the switch tube.

The 10Ω resistor below 13003 is a current sampling resistor. The current is sampled and turned into a voltage (its value is 10*I). This voltage is added to the base of transistor C945 after passing through diode 4148.

When the sampling voltage is greater than 1.4V, that is, when the switch tube current is greater than 0.14A, transistor C945 is turned on, thereby pulling down the base voltage of switch tube 13003, thereby reducing the collector current, thus limiting the switch current and preventing the current from flowing. If it is too large, it will burn out (in fact, this is a

constant current structure, which limits the maximum current of the switch tube to about 140mA).

The induced voltage of the winding (sampling winding) on the lower left side of the transformer is rectified by the rectifier diode 4148 and filtered by the 22uF capacitor to form the sampling voltage.

For the convenience of analysis, we take the emitter end of the triode C945 as ground. Then the sampling voltage is negative (about -4V), and the higher the output voltage, the more negative the sampling voltage is.

After the sampling voltage passes through the 6.2V Zener diode, it is added to the base of the switch tube 13003. As mentioned earlier, when the output voltage is higher, the sampling voltage becomes more negative. When the negative reaches a certain level, the 6.2V Zener diode is broken down, thereby pulling the base potential of switch 13003 low, which will cause the switch tube to Disconnecting or delaying the conduction of the switch controls the input of energy into the transformer, which also controls the increase in the output voltage and realizes the function of voltage-stabilizing output.

The 1KΩ resistor and the 2700pF capacitor in series below are the positive feedback branches. The induced voltage is taken out from the sampling winding and added to the base of the switching tube to maintain oscillation.

There is not much to say about the secondary winding on the right. It is rectified by the diode RF93 and filtered by the 220uF capacitor to output a voltage of 6V.

No information about the diode RF93 was found. It is estimated to be a fast recovery diode, such as a Schottky diode. Because the switching power supply has a high operating frequency, a diode with an operating frequency is needed. Common Schottky diodes such as 1N5816 and 1N5817 can be used here instead.

Also because of the high frequency, the transformer must also use a high-frequency switching transformer. The core is generally a high-frequency ferrite core with high resistivity to reduce eddy currents.