

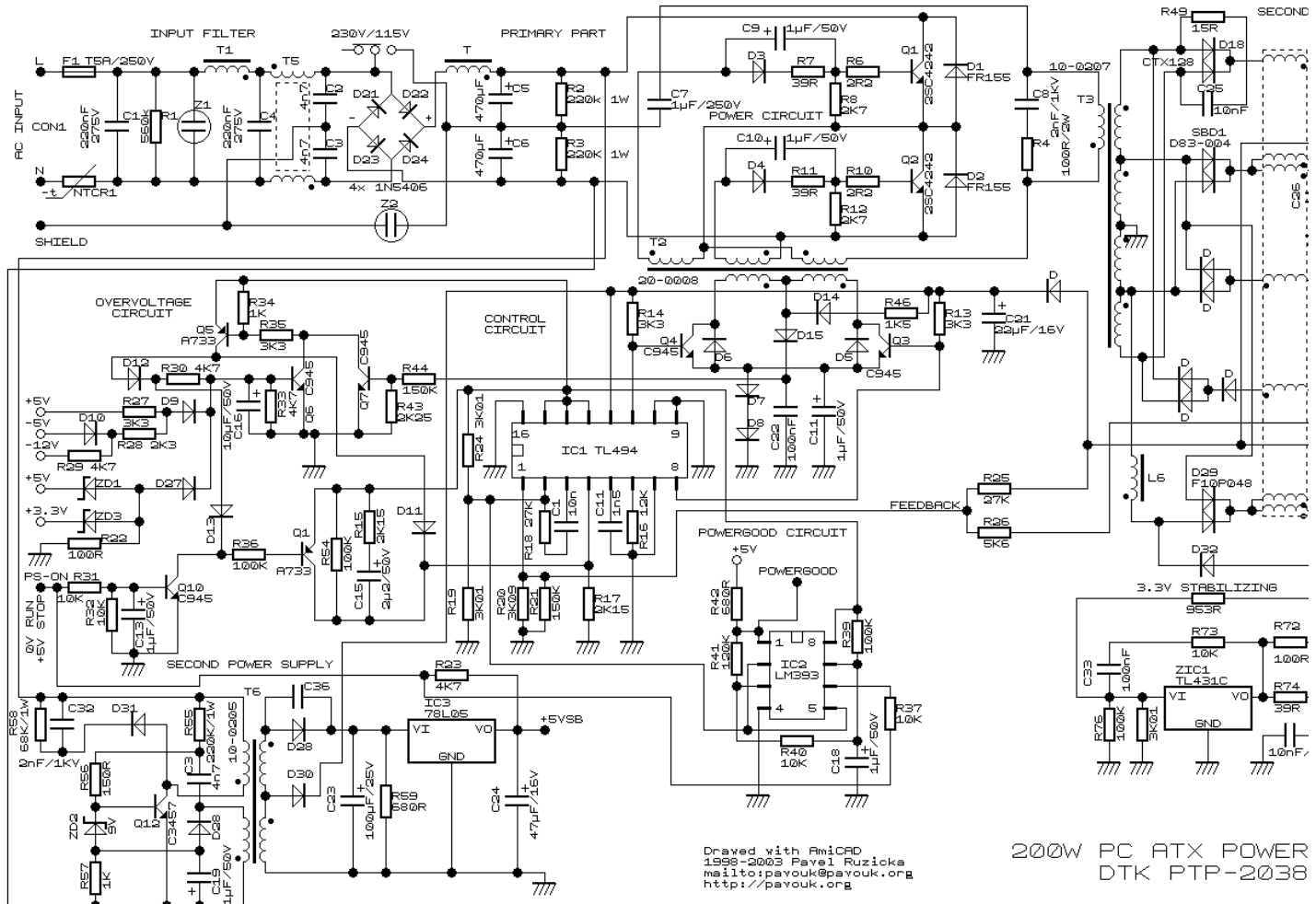
200W ATX PC POWER SUPPLY

► Czech version

Franch version in PDF thanks to Vincent MASSON

Here I bring you wiring diagram of PCs power supply of DTK company. This power supply has ATX design and 200W performance. I was drawn diagram, when I repaired this power supply.

This power supply circuit uses chip TL494. Similar circuit is used in the most power supplies with output power about 200W. Device use push-pull transistor circuit with regulation of output voltage.



Line voltage goes through input filter circuit (C1, R1, T1, C4, T5) to the bridge rectifier. When voltage is switched from 230V to 115V, then rectifier works like a doubler. Varistors Z1 and Z2 have overvoltage protect function on the line input.

Thermistor NTCR1 limits input current until capacitors C5 and C6 are charged. R2 and R3 are only for discharge capacitors after disconnecting power supply. When power supply is connected to the line voltage, then at first are charged capacitors C5 and C6 together for about 300V.

Then take a run secondary power supply controlled by transistor Q12 and on his output will be voltage. Behind the voltage regulator IC3 will be voltage 5V, which goes in to the motherboard and it is necessary for turn-on logic and for "Wake on something" functions.

Next unregulated voltage goes through diode D30 to the main control chip IC1 and control transistors Q3 and Q4. When main power supply is running, then this voltage goes from +12V output through diode D.

Stand-By mode

In stand-by mode is main power supply blocked by positive voltage on the PS-ON pin through resistor R23 from secondary power supply. Because of this voltage is opened transistor Q10, which opens Q1, which applies reference voltage +5V from pin 14 IO1 to pin 4 IO1. Switched circuit is totally blocked. Transistors Q3 and Q4 are both opened and short-circuit winding of auxiliary transformer T2. Due to short-circuit is no voltage on the power circuit. By voltage on pin 4 we can drive maximum pulse-width on the IO1 output. Zero voltage means the highest pulse-width. +5V means that pulse disappear.

Now we can explain function of running power supply.

Somebody pushes the power button on computer. Motheboard logic put to ground input pin PS-ON. Transistor Q10 closes and next Q1 closes. Capacitor C15 begins his charging through R15 and on the pin 4 IC1 begins decrease voltage to zero thanks to R17. Due to this voltage is maximum pulse-width continuously increased and main power supply smoothly goes run.

In a normal operation is power supply controlled by IC1. When transistors Q1 and Q2 are closed, then Q3 and Q4 are opened. When we want to open one from power transistors (Q1, Q2), then we have to close his exciting transistor (Q3, Q4). Current goes via R46 and D14 and one winding T2. This current excite voltage on base of power transistor and due to positive feedback transistor goes quickly to saturation. When the impulse is finished, then both exciting transistors goes to open. Positive feedback disappears and overshoot on the exciting winding quickly closes power transistor. After it is process repeated with second transistor. Transistors Q1 and Q2 alternately connects one end of primary winding to positive or negative voltage. Power branch goes from emitter of Q1 (collector Q2) through the third winding of exciting transformer T2. Next through primary winding of main transformer T3

and capacitor C7 to the virtual center of supply voltage.

Output voltage stabilisation

Output voltages +5V and +12V are measured by R25 and R26 and their output goes to the IC1. Other voltages are not stabilised and they are justified by winding number and diode polarity. On the output is necessary reactance coil due to high frequency interference.

This voltage is rated from voltage before coil, pulse-width and duration cycle. On the output behind the rectifier diodes is a common coil for all voltages. When we keep direction of windings and winding number corresponding to output voltages, then coil works like a transformer and we have compensation for irregular load of individual voltages.

In a common practise are voltage deviations to 10% from rated value. From the internal 5-V reference regulator (pin 14 IC1) goes reference voltage through the voltage divider R24/R19 to inverting input(pin 2) of error amplifier. From the output of power supply comes voltage through divider R25,R26/R20,R21 to the non inverting input (pin 1). Feedback C1, R18 provides stability of regulator. Voltage from error amplifier is compared to the ramp voltage across capacitor C11.

When the output voltage is decreased, then voltage on the error amplifier is too decreased. Exciting pulse is longer, power transistors Q1 and Q2 are longer opened, width of pulse before output coil is grater and output power is increased. The second error amplifier is blocked by voltage on the pin 15 IC1.

PowerGood

Mainboard needs "PowerGood" signal. When all output voltages goes to stable, then PowerGood signal goes to +5V (logical one). PowerGood signal is usually connected to the RESET signal.

+3.3V Voltage stabilisation

Look at circuit connected to output voltage +3.3V. This circuit makes additional voltage stabilisation due to loss of voltage on cables. There are one auxiliary wire from connector for measure 3.3V voltage on motherboard.

Overvoltage circuit

This circuit is composed from Q5, Q6 and many discrete components. Circuit guards all of output voltages and when the some limit is exceeded, power supply is stopped.

For example when I by mistake short-circuit -5V with +5V, then positive voltage goes across D10, R28, D9 to the base Q6. This transistor is now opened and opens Q5. +5V from pin 14 IC1 comes across diode D11 to the pin 4 IC1 and power supply is blocked. Beyond that goes voltage again to base Q6. Power supply is still blocked, until he is disconnected from power line input.

Links

- <http://www.belza.cz/swmodeps/compow1.htm> (Czech language only)
- <http://www.belza.cz/swmodeps/compow2.htm> (Czech language only)
- http://www.epanorama.net/links/psu_computer.html Computer Power Supply Page
- <http://www.webx.dk/oz2cpu/radios/psu-pc1.htm> Power supply modification

ATX Power Connector

Pin	Signal	Color 1	Color 2	Pin	Signal	Color 1	Color 2
1	3.3V	orange	violet	11	3.3V	orange	violet
2	3.3V	orange	violet	12	-12V	blue	blue
3	GND	black	black	13	GND	black	black
4	5V	red	red	14	PS_ON	green	grey
5	GND	black	black	15	GND	black	black
6	5V	red	red	16	GND	black	black
7	GND	black	black	17	GND	black	black
8	PW_OK	grey	orange	18	-5V	white	white
9	5V_SB	violet	brown	19	5V	red	red
10	12V	yellow	yellow	20	5V	red	red

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