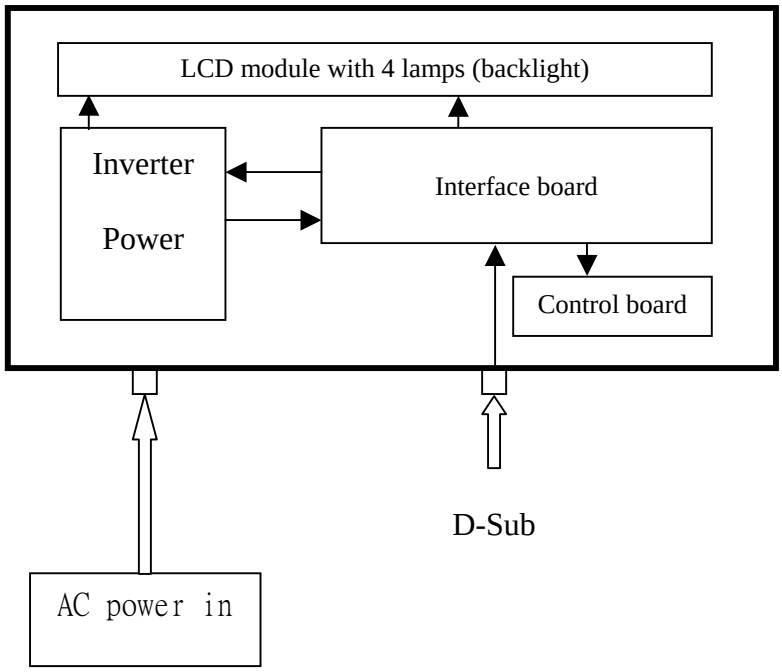
I. Introduction:

The Q7T4 is a 17" SXGA (1280x1024) , 16.2M colors(R, G, B 6-bit data+FRC data) TFT LCD monitor. It's an analog only interface LCD monitor with a 15 pins D-sub signal cable. it's compliant with VESA specification to offer a smart power management and power saving function. It also offers OSD menu for users to control the adjustable items and get some information about this monitor, and the best function is to offer users an easy method to set all adjustable items well just by pressing one key, we called it "Auto key" which can auto adjusting all controlled items. Q7T4 also offer DDC2 function to meet VESA standard.

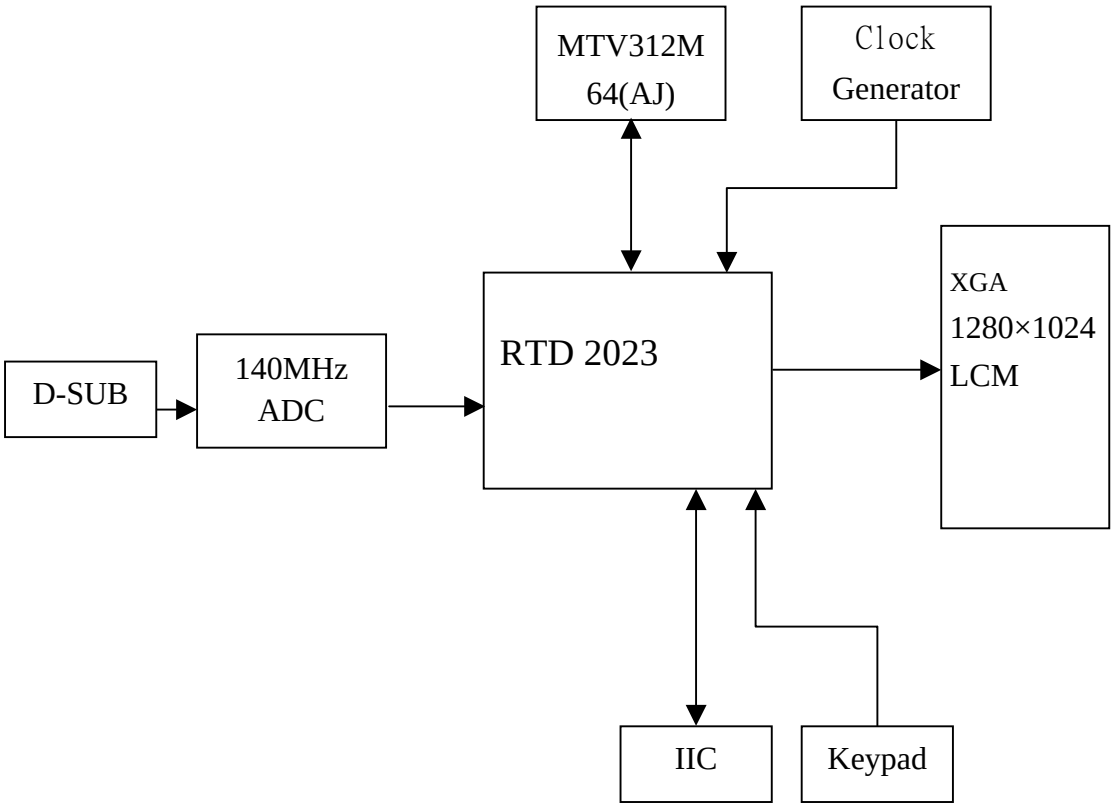
II. Block diagram

The Q7T4 consists of a LCD module with 4 lamps, an power board, a control board ,and a interface BD. The block diagram is shown as below.



III. **Circuit operation theory:**

A-1.) Interface board diagram:



(a) Circuit operation theory:

A basic operation theory for the interface board is to convert input signal into digital RGB . Analog RGB signal is converted to digital signal through ADC. The microprocessor RTD2023 receives video data and optimizes the image automatically. It also supports 16 color from a 64k palette bitmap OSD, and keypad controlling. The output data are sent to LCD module.

(b) IC introduction:

1.) DDC (Display Data Channel) function: We use DDC IC to support DDC/2B function. DDC data is stored in 24C04(EEPROM). Those data related to LCD monitor specification. PC can read them by "SDA" and "SCL" serial communication for I^2C communication for DDC2B.

2.) RTD2023 IC: There are triple ADC, LVDS transmitter ,Scaling, and OSD functions in the RTD2023 IC. Scaling IC is revolutionary scaling engine, capable of expanding any source resolution to a highly uniform and sharp image, combined with the critically proven integrated 8 bit triple-ADC and patented Rapid-lock digital clock recovery system. It also

support detect mode and DPMS control.

3.) MTV312M64: To stored the source code which is accessed by MCU to run program.

4.) EEPROM: We use 24C04 to store all the adjustable data and user settings.And use 24C02 to store DVI EDID data.

A-2.) Control board introduction:

There are 6 keys for user's control which includes “Power”, “Enter”, “Up/Plus”, “Down/Minus” , “Exit”, and “iKey” . The following descriptions are the introduction of these keys.

(1) Power key: to turn/off power of monitor

(2) “Enter” key: to enter sub-menus or select items.

(3) “Up/Plus key: to select previous and to increase adjustment

(4) “Down/Minus” key: to select next and to decrease adjustment

(5) “Exit” key: to back to previous menu, or leave OSD (auto save)

(6) “iKey”: to perform auto adjustment

(7) LED: It indicates the DPMS status of this LCD monitor; green light means DPMS on (Normal operating condition). Amber light means DPMS off (Powersaving).

A-3.) Power board diagram:

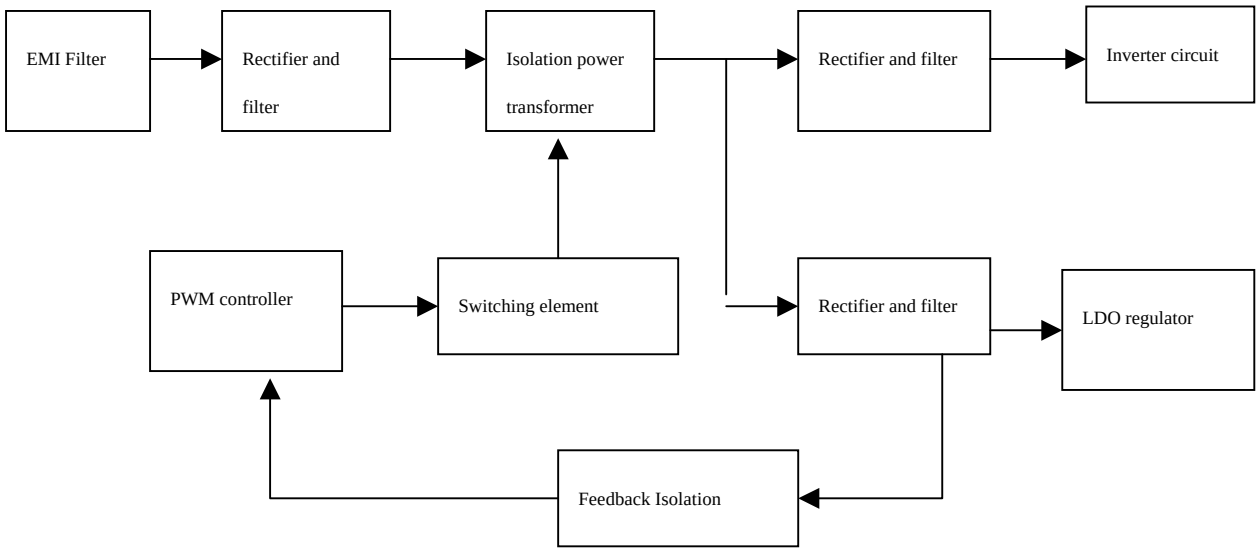


Fig.1

#1 EMI Filter

This circuit (fig. 2) is designed to inhibit electrical and magnetic interference for meeting FCC, VDE, VCCI standard requirements.

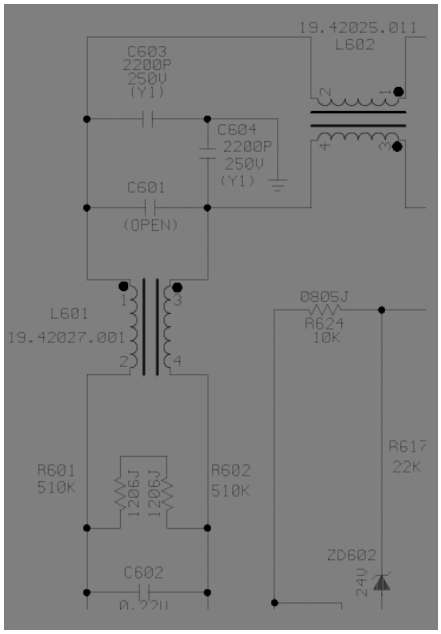


Fig. 2

#2 Rectifier and filter

AC Voltage (90-264V) is rectified and filtered by BD601, C605 (See Fig 3) and the DC Output voltage is 1.4*(AC input). (See Fig.3)

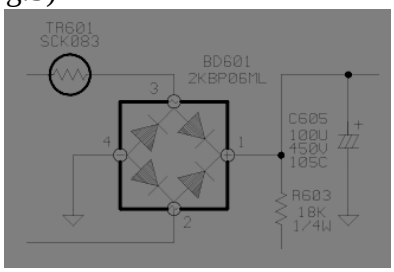


Fig. 3

#3 Switching element and Isolation power transformer

When the Q601 turns on, energy is stored in the transformer. During Q601 turn-off period, the stored energy is delivered to the secondary of transformer. R607, C607 and D601 is a snubber circuit. R615 is current sense resistor to control output power. (See Fig.4)

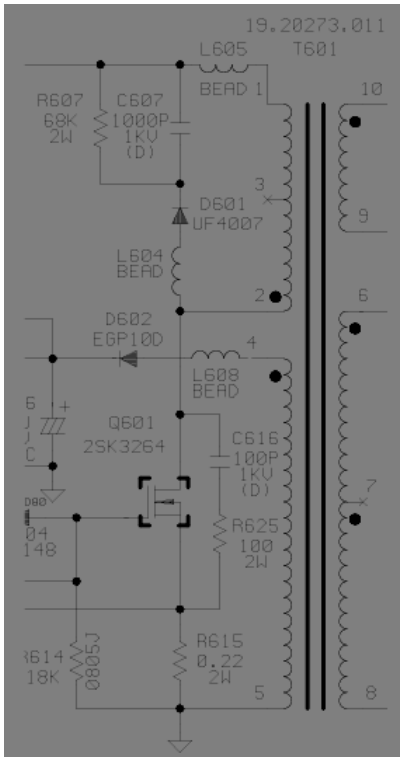


Fig. 4

#4 Rectifier and filter

D701 and C703 are to produce DC output. L701 is used to suppress high Frequency switching spikes. (See Fig.5)

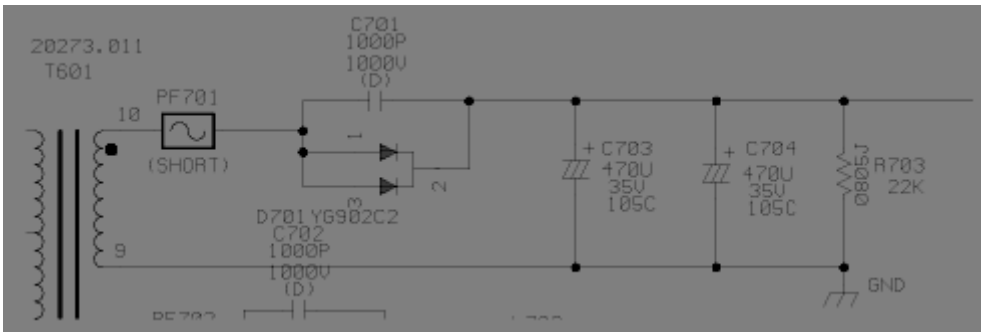


Fig. 5

#5 PWM Controller

The PWM controller NCP1200A implements a standard current mode architecture. With an internal structure operating at a fixed 40KHz. Where the switch time is dictated by the peak current set-point. When the current set-point falls below a given value. The output power demand diminishes, the IC automatically enters the so-called skip cycle mode and provides excellent efficiency.

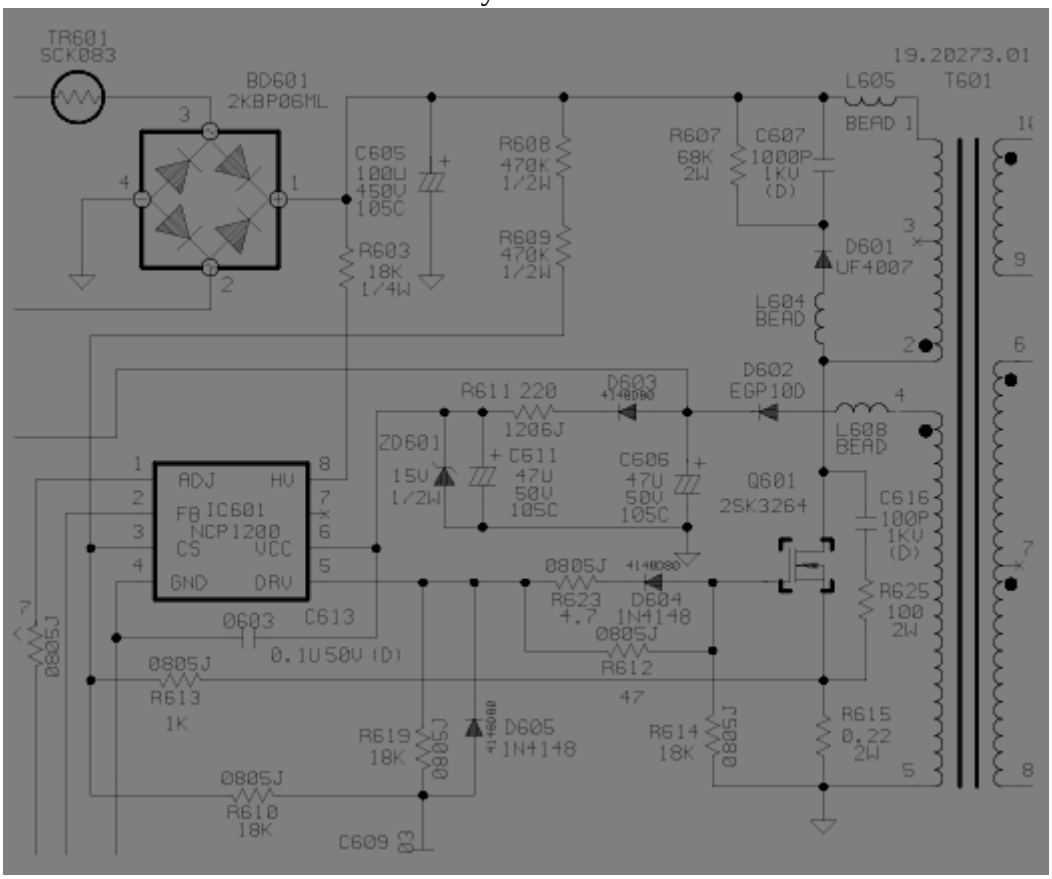


Fig. 6

#6 Feedback circuit

PC123 is a photo-coupler and TL431 is a shunt regulation. They are used to detect the output voltage change and be the primary and secondary isolation. When output voltage changes, the feedback voltage will be compared and duty cycle will be decided to control the correct output voltage. (See Fig.7)

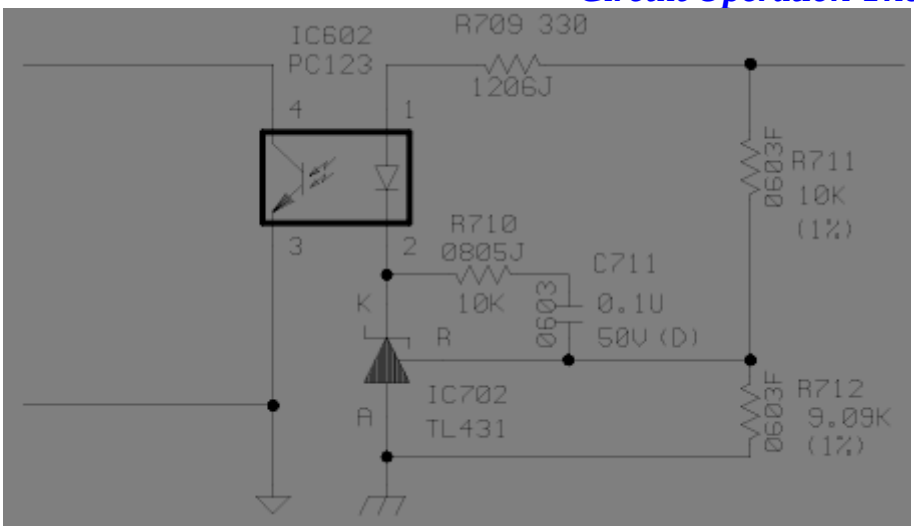


Fig. 7

A-3.) Control board introduction:

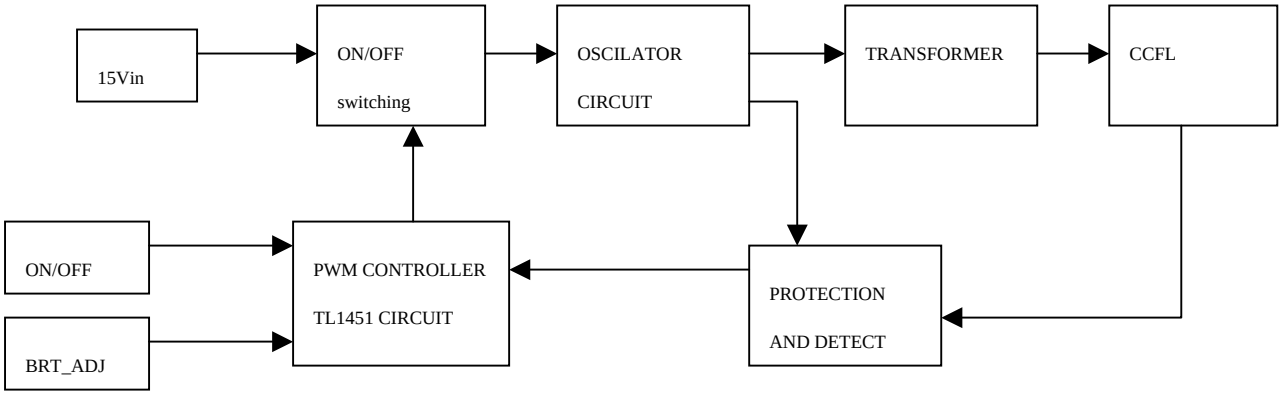
The main parts of the control board are a push button, and a LED.

(a) Push button: It's a simple switch function, pressing it for "ON" to do the auto adjustment function, releasing it for "OFF" to do nothing.

(c) LED: It indicates the DPMS status of this LCD monitor; green light means DPMS on (Normal operating condition). Amber light means DPMS off (Power off condition).

A-4.) Inverter diagram:

1.**Block Diagram:**



2. General Specification

Input Voltage: 15V

Input Current: 2A max.

ON/OFF Voltage: 5V

PWM Duty: 5V/50KHz

Output Requirement:

Max. Output Current: 7.5mA

Min. Output Current: 3.3mA

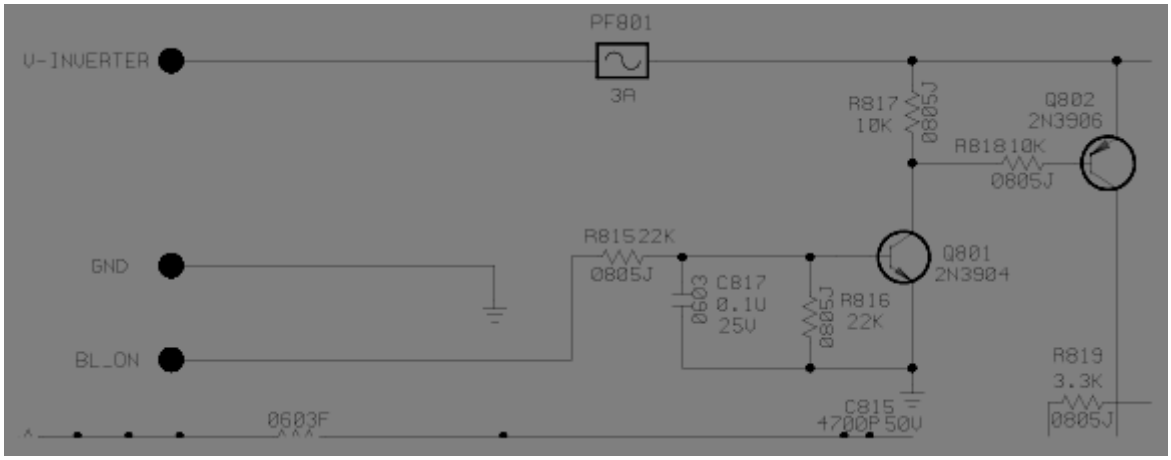
Lamp Working Voltage: 660Vrms

Open Lamp Voltage: 1500Vrms

Frequency: 50KHz

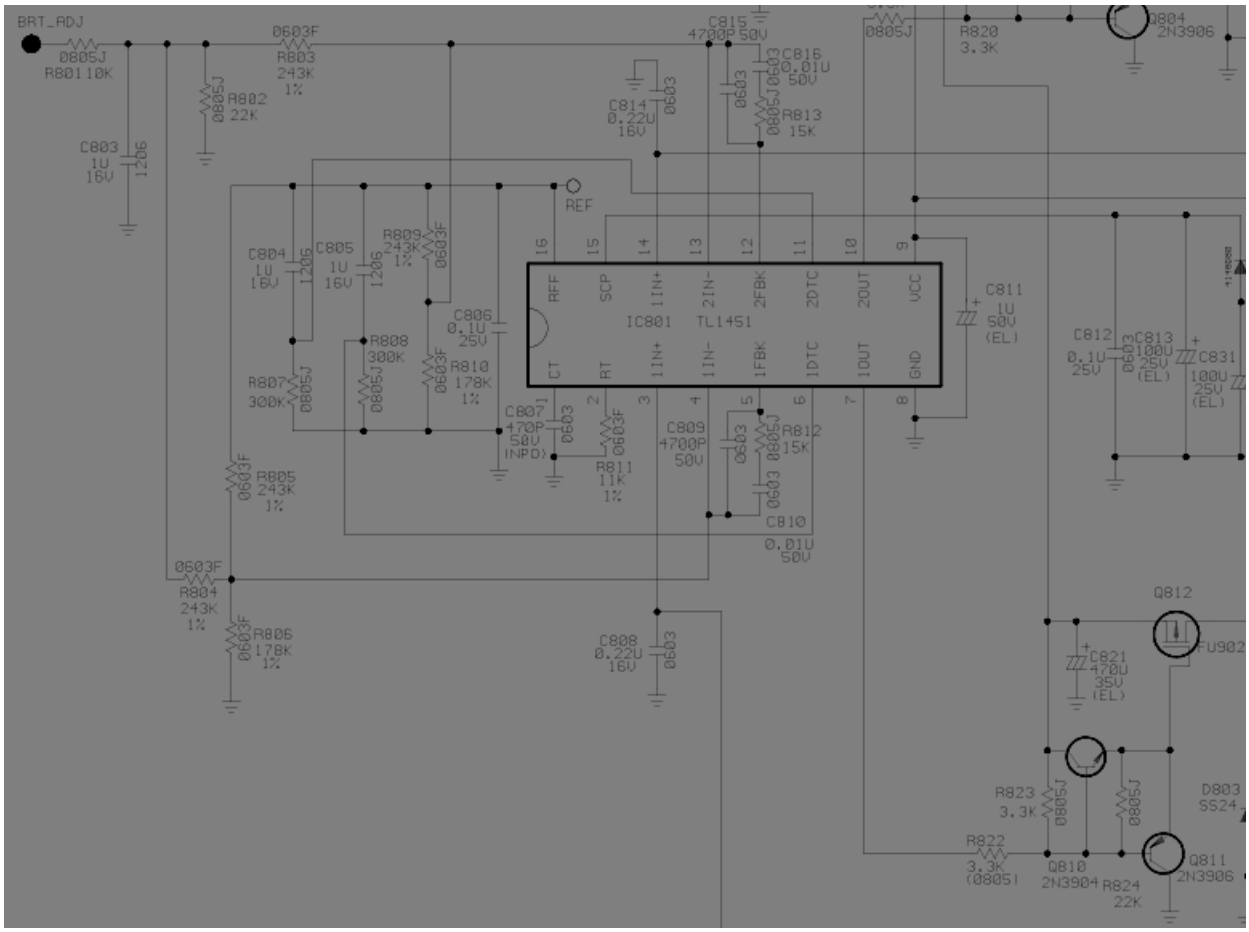
3.Circuit Operation Theorem

3.1 ON/OFF SWITCH



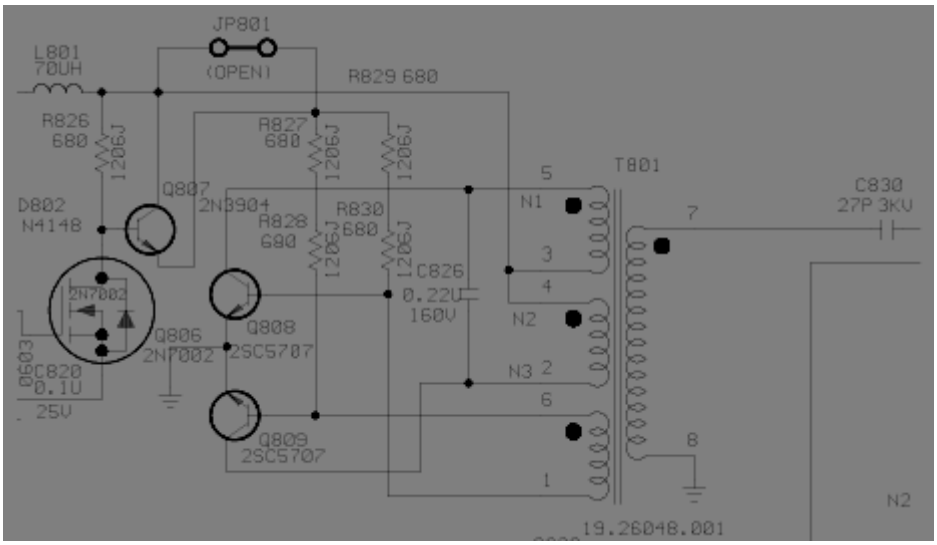
The turn-on voltage was controlled by R815 and R816.The inverter was turned on or off by the switching transistors Q801 and Q802.

3.2 PWM Control circuit



TL1451 is a dual PWM controller.C807 and R811 decide the working frequency.BLT_ADJ signal is from control board, control pulse width then decide how much energy delivery to CCFL also decide CCFL brightness. Q810 and Q811 be the buffer to rise the drive capability and the totem poles circuit can improve a capable of driving for Q812.C813 decide the striking time delay.

3.3 Oscillator Circuit



Royer circuit uses the characteristic of transformer saturation to oscillate. When the DC power inject, Q808 or Q809 will turns on, and the current Ic increases. After a period, the transistor will leave the saturation status and Vce increase. The result causes the voltage of primary coil get lower. Finally the transistor turn off, and another transistor turn on. These statuses are repeated and the pin7 and pin8 of T801 will get a sine wave to turn on CCFL.