

## ITECH Electronic Load's Test On Switching Power Supply

**Abstract:** The quality of the switching power supply is the guarantee of normal operation of the electrical and electronic equipment; therefore, it is critical to test the switching power supply. The paper focuses on analysis of the rise/drop time test and transient response time test of the switching power supply. In addition, the advantages of the IT8800 series programmable electronic load in both tests are elaborated.

### Text

The electrical and electronic equipment is indispensable in our life, and the power supply with good performance and reliability is required for all electrical and electronic equipment. A good switching power supply must comply with all functional specifications, protection features, safety codes and electromagnetic compatibility, reliability and other special requirements. A number of items of the switching power supply should be tested. In the paper, the rise/drop time test and transient response time test of the switching power supply are analyzed. The two functional tests are main test items and guarantees of key properties of the switching power supply.

The IT8800 series programmable electronic load products of ITECH are star series with complete functions and wide power range (150W to 600KW). Meanwhile, the load current rise/drop speed is 0.0001A/us to 2.5A/us. The load has the 25KHZ dynamic testing function and is applicable to the rise/drop time test and transient response time test of the switching power supply.



**ITECH IT8811 Programmable Electronic Load**

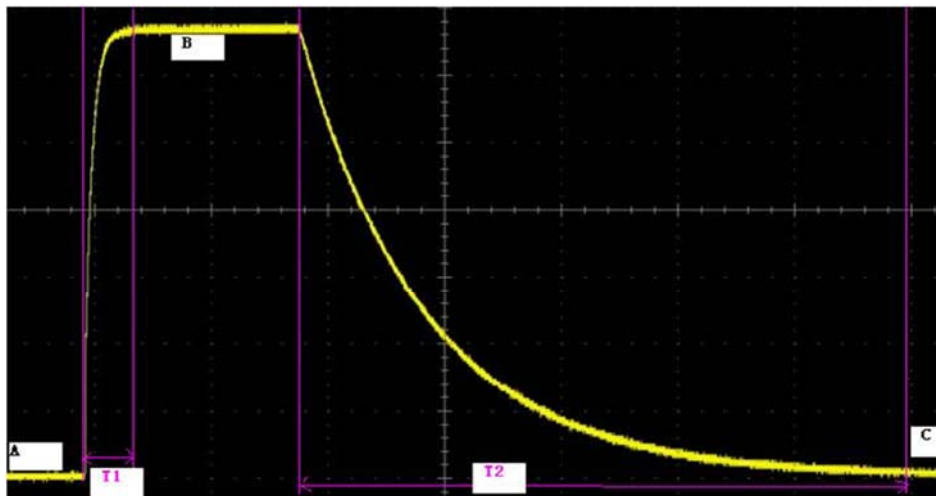
### Voltage Rise/Drop Time Test of Switching Power Supply

The rise/drop time of the power supply is an important parameter of power supply characteristics. Different requirements for the rise and drop time of the power supply module are

put forward in different industries. Take PC for example: to provide the data storage time in case of power failure, i.e. hold up time, the voltage drop time of the power supply must not be too short. However, the power supply of the LED driver has no such requirement, i.e. short drop time. Therefore, the rise time and drop time must be provided in the standard test of the power supply industry. Generally, the rise time of the power supply means the time for the voltage to rise from 10% to 90% of the rated voltage, while the drop time from 90% to 10%.

Most engineers use the oscilloscope, a mainstream test method, to test the rise and drop time of the power supply, as the oscilloscope bandwidth can reach 100MHz or more. For the time sequence measurement, when the Measurement button is pressed, the rise time, drop time, cycle, etc. can be measured directly and the user can obtain the results.

The IT8800 series electronic load of ITECH has the time measurement function of the oscilloscope. It also has the “Measure” function, in which the user can set V1 and V2. With the built-in timing function, the time of rise or drop from V1 to V2 can be measured directly. The engineer does not need to connect one oscilloscope in some load tests, or in case of no oscilloscope, the required voltage rise and drop time can be obtained through the load, thereby saving the cost and making the test simple and quick.



Voltage Rise/Drop Time Test

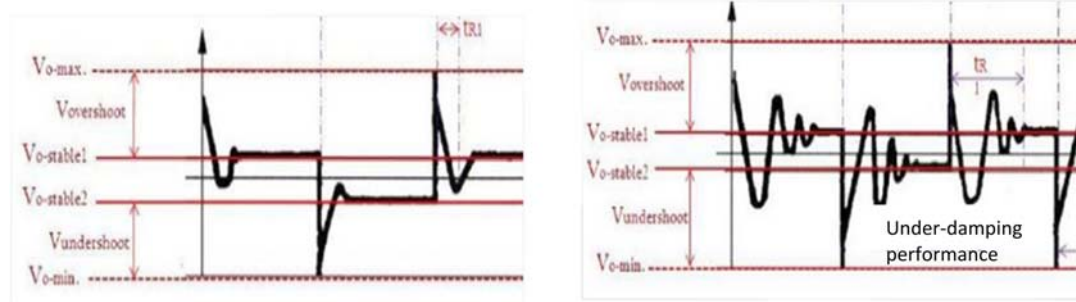
IT8800 is a high-speed electronic load, with the voltage and current sampling rate up to 50KHZ. In the voltage rise/drop time test of the power supply module, the time resolution can reach 20us. Ideally, the minimum rise and drop time which can be measured is 20us, generally less than 100us.

#### **Transient Response Time Test of Switching Power Supply**

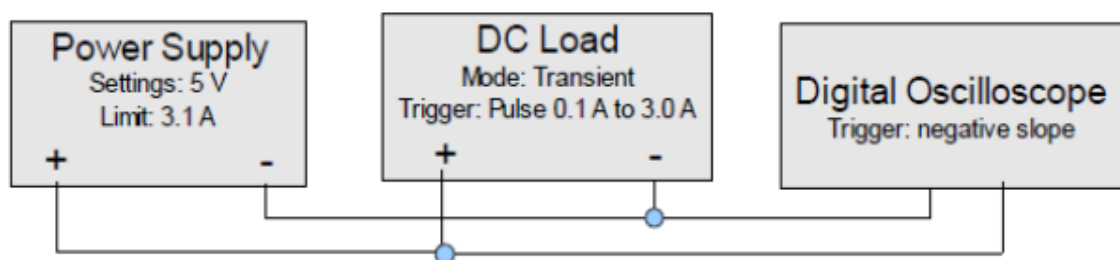
The power supply of constant voltage output is equipped with the feedback control circuit in the design to continuously keep the output voltage stable. As the feedback control circuit has a certain bandwidth, the response of the power supply to load current changes is limited. If the ratio of the phase shift and gain between the input and output of the control circuit is 1 and the degree

exceeds 180, the output of the power supply will be unstable, out of control or vibrating. Actually, the load current of the power supply changes dynamically during operation, therefore, the dynamic load test is critical to the power supply. The programmable electronic load can simulate the worst load condition of the power supply in actual operation, such as the rapid rise/drop slope and cycle of the load current.

The following figure shows the characteristics of the power supply module with different transient response characteristics at the same dynamic changing frequency of the load:



As mentioned above, the electronic load is necessary for the transient response test of the power supply. When the dynamic mode of the IT8800 electronic load is used to test the transient response time of the power supply, the stability of the power supply in the load current stepping changes can be reflected. In the test, the power supply is connected to one IT8800 series DC load, the dynamic mode of the electronic load is used to provide load stepping changes for the power supply to realize switching of the no-load and full-load state of the power supply, and the output voltage waveform changes are observed through the oscilloscope to obtain the response time of the power supply.



In the dynamic mode, the IT8800 series electronic load of ITECH can be switched between two set parameters according to the setting rule. The output voltage waveform is monitored according to the regulation rate and transient response of the power supply under mixed changes of the high current level, low current level, duration and rise/drop rate. This function can be used to test the dynamic characteristics of the power supply. For example, when the computer disc drive runs or stops running, the working current changes accordingly. Such conditions can be simulated by the dynamic load mode. With high-speed development of the electronic industry, the electronic load is more and more important to the transient signal and dynamic response performance.

**Conclusion:**

The electronic load is needed in the early research and development, debugging, testing and final production inspection of the switching power supply. ITECH electronics has been dedicated to the study of related industrial tests with “power electronic” products as the core. The IT8800 series programmable electronic load is one of the star products. With high performance and quality, which are the characteristics of ITECH products, related tests can be done efficiently and accurately, and the quality of the switching power supply can be guaranteed to facilitate the development of the electrical and electronic industry.

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