

PTS 800 & Modules Introduction

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Power Electronics Training Platform



PTS800



Simulation Teaching Modules

- PEK-810 PWM Generator Experiment Module
- PEK-820 Buck Circuit Experiment Module
- PEK-830 Boost Circuit Experiment Module
- PEK-840 Buck-Boost Circuit Experiment Module
- PEK-850 Forward Circuit Experiment Module
- PEK-860 Flyback Circuit Experiment Module
- PEK-870 DC-DC Push-Pull Circuit Experiment Module
- PEK-880 Full Bridge Circuit Experiment Module



PEK-810
PWM发生器实验模组



PEK-820
BUCK电路实验模组



PEK-830
BOOST电路实验模组



PEK-840
BUCK-BOOST电路实验模组



PEK-850
正激电路实验模组



PEK-860
反激电路实验模组



PEK-870
直流-直流推挽电路实验模组

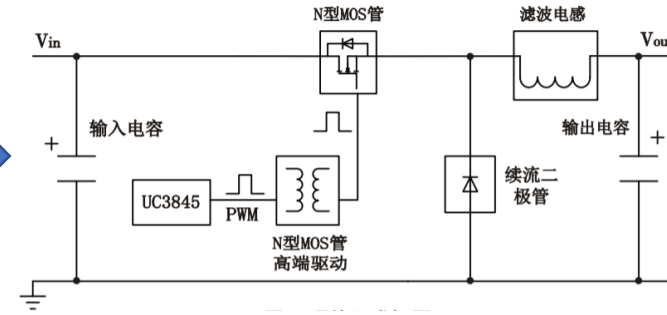
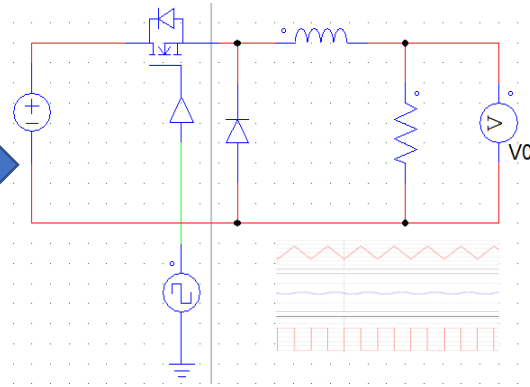


PEK-880
全桥电路实验模组

Power Electronics Training Platform



Experimental Learning Process



Learning of Circuit Principles

Circuit Simulation Verification

Circuit Experiment Verification



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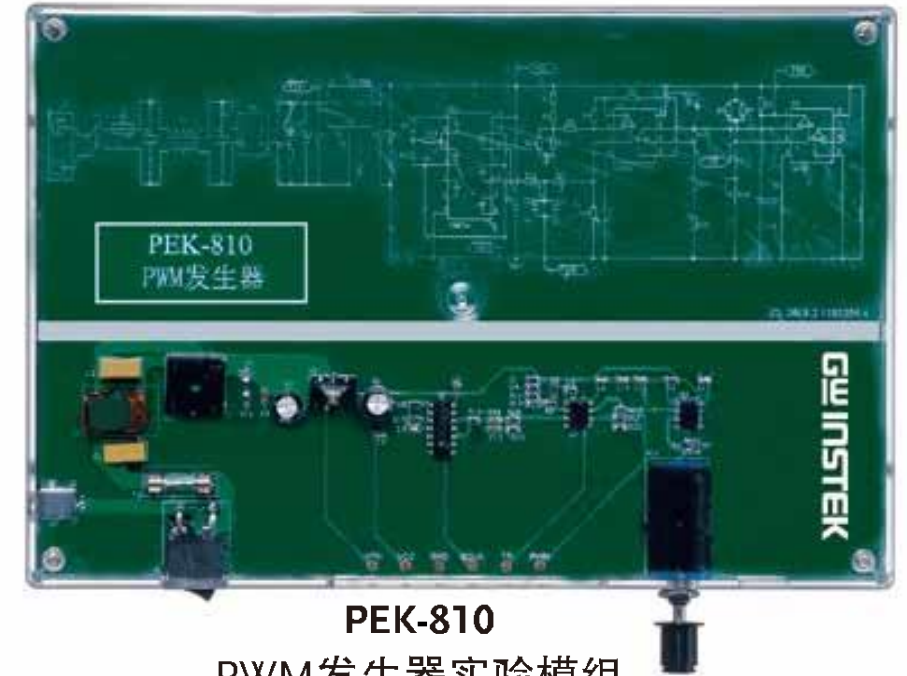
PEK-810

PEK-810 Introduction

The PEK-810 PWM generator experiment board is one of the contents of the power supply experiment. It is an experiment board that integrates the principle circuit (SCH) of the PWM wave generator and the printed board circuit (PCB). On the one hand, students can make a one-to-one correspondence between SCH and PCB; on the other hand, by adjusting the feedback voltage, observe the corresponding PWM duty cycle change rule on the oscilloscope, and master the principle of PWM width adjustment.

PEK-810 Specification

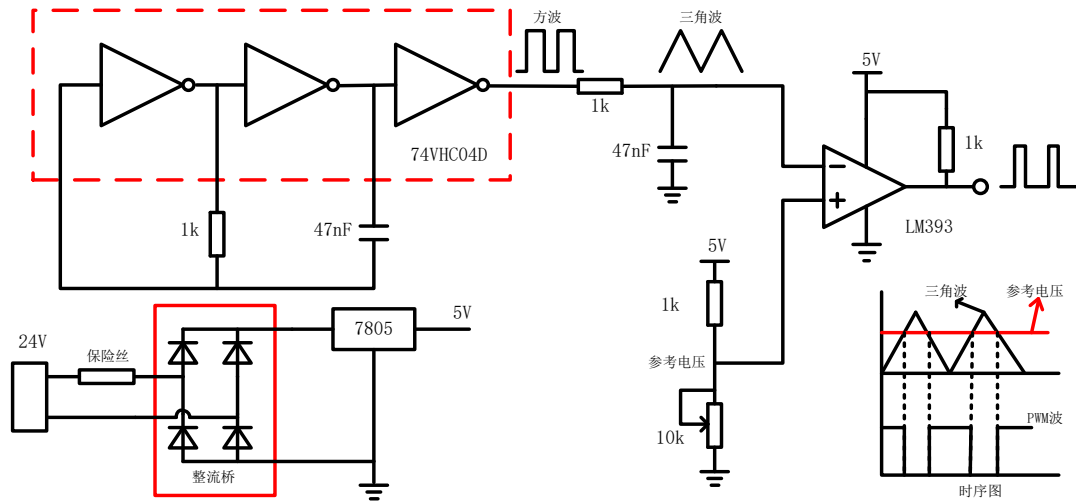
- (1) Input power supply voltage: DC24V (provided by external power adapter);
- (2) Working voltage: DC5V;
- (3) Working frequency: 10kHz \pm 1;
- (4) Duty cycle range: 0 ~ 100% adjustable PWM wave.



PEK-810

PEK-810 Hardware Composition

- (1) Full-wave rectifier bridge: to prevent the power supply from being reversed, and play the role of absolute value.
- (2) LM7805 (three-terminal linear regulator): Convert 24V voltage to 5V, which is 74VHC04 and LM393



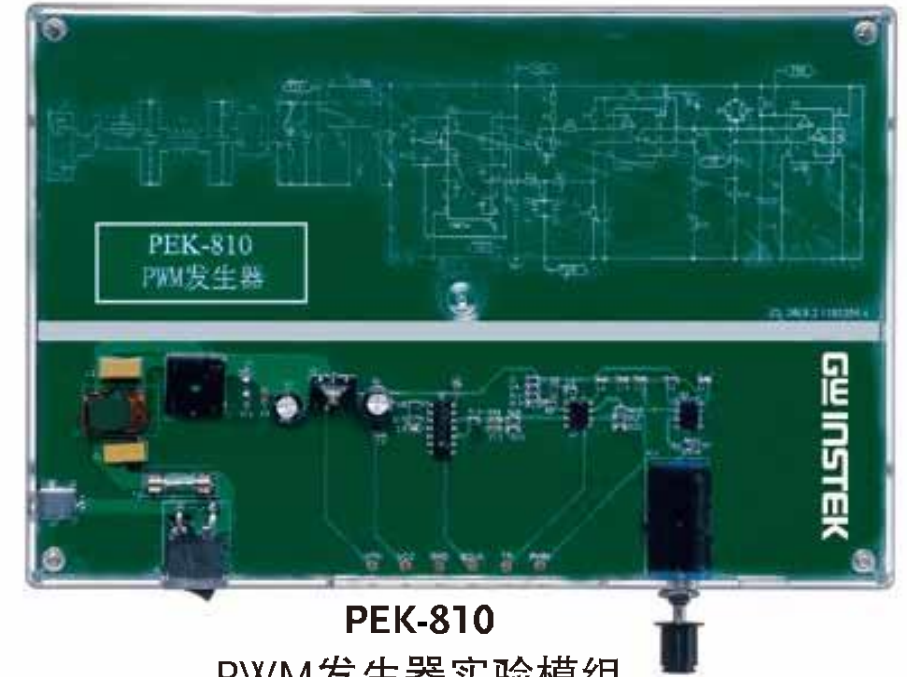
PEK-810
PWM发生器实验模组

PEK-810 Hardware Composition

(3) Square wave generator: use 74VHC04 internal NOT circuit and external resistance-capacitance components to form a fixed frequency square wave generator to output a square wave signal.

(4) Triangular wave generator: The square wave signal output by the square wave generator is integrated by an RC integrator to produce an isosceles triangular wave. The integration time constant of the RC integrator must be equal to one-half of the period of the square wave signal.

(5) Adjust the potentiometer R5 knob to change the reference voltage of the comparator, and compare the reference voltage with the triangular wave signal to get the PWM signal, as shown in Figure 1. The estimation formula of PWM signal frequency is: $f = \frac{1}{2.2 \cdot R \cdot C}$
(R=1kΩ,C=47nF)



Experiment Purpose

1. Learn how the square wave generator works
2. Learn how the triangle wave generator works
3. Learn the principle of PWM signal generation

Experiment Item

1. Measure the carrier signal frequency and compare the measured result with the calculated result.
2. By adjusting the potentiometer, change the modulation signal, observe and record the change of the PWM signal.



PEK-820

GW INSTEK

PEK-820 Introduction

The experiment board uses the BUCK basic circuit topology. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

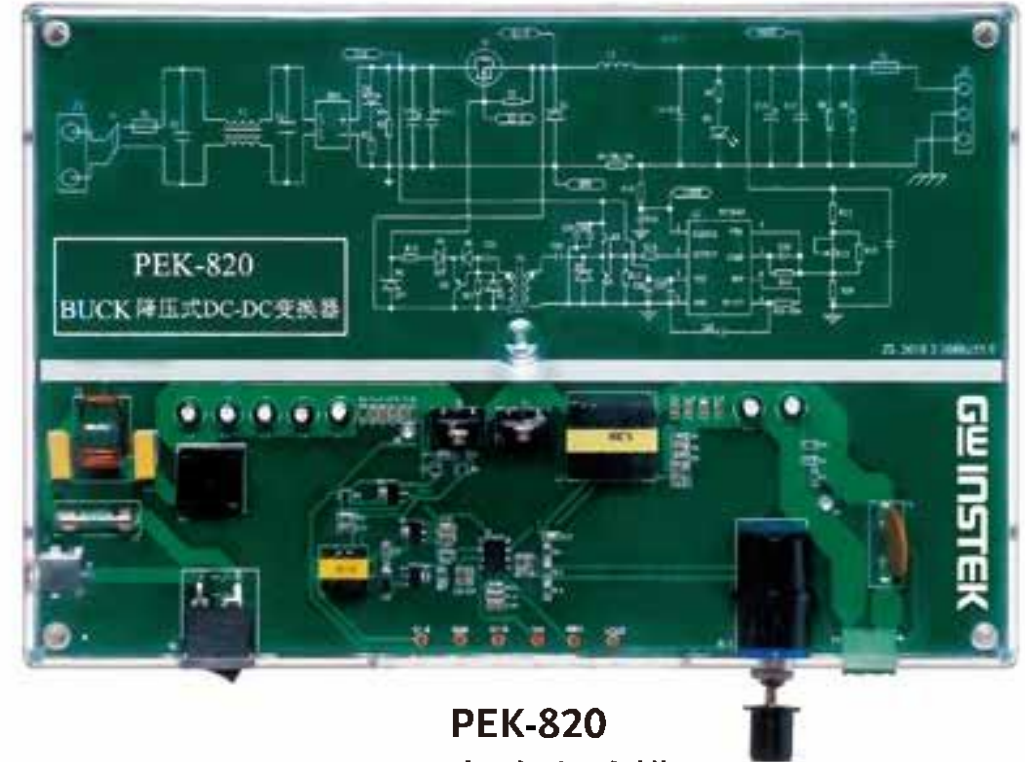
PEK-820 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power adapter).
- (2) Output voltage: 12V (adjustable)
- (3) Output current: $< 2A$

Protective function

- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-820
BUCK电路实验模组

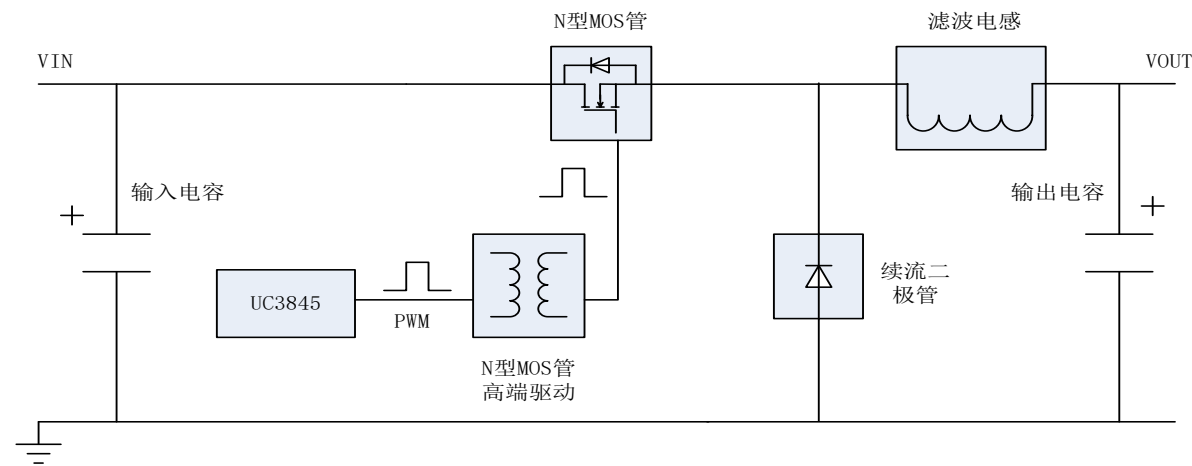
GW INSTEK

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PEK-820 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, UC3845 control chip, N-MOSFET power switch, freewheeling/flyback diode, filter inductor, output filter capacitor, drive transformer.



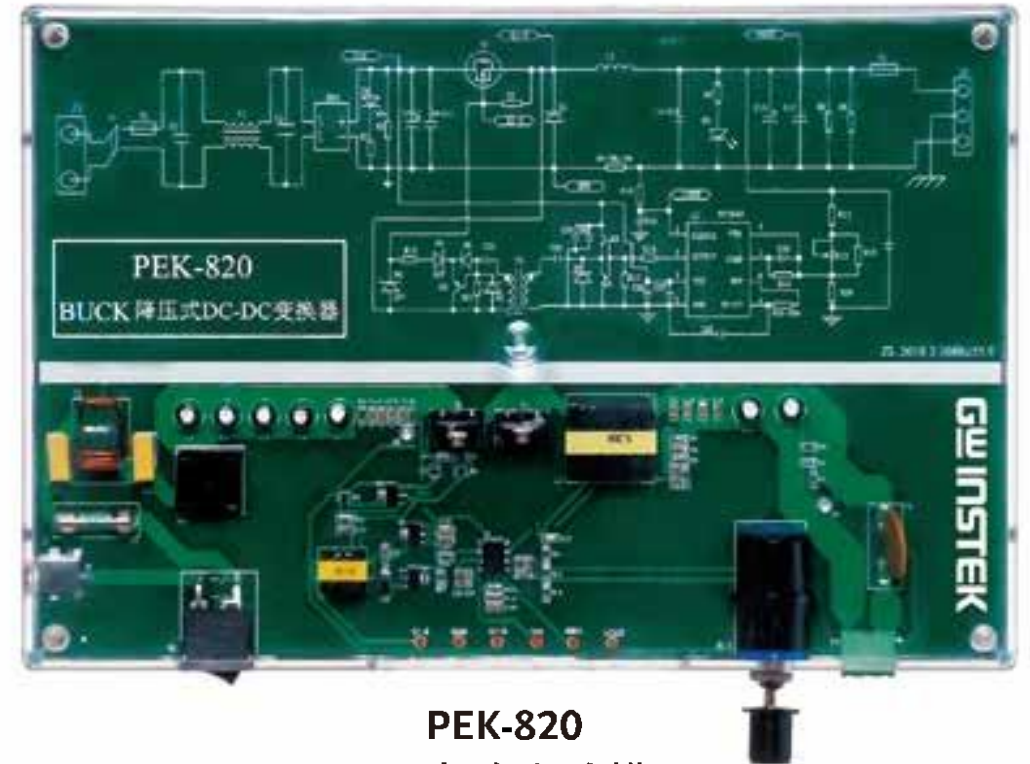
PEK-820
BUCK电路实验模组

Experiment Purpose

1. Learn how the Buck circuit works
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-820
BUCK电路实验模组

PEK-830

GW INSTEK

PEK-830 Introduction

The experiment board uses the Boost basic circuit topology. By adjusting the output voltage and load resistance (output current), observing the change in the duty cycle of the PWM drive signal, master the closed-loop control principle of the BOOST converter.

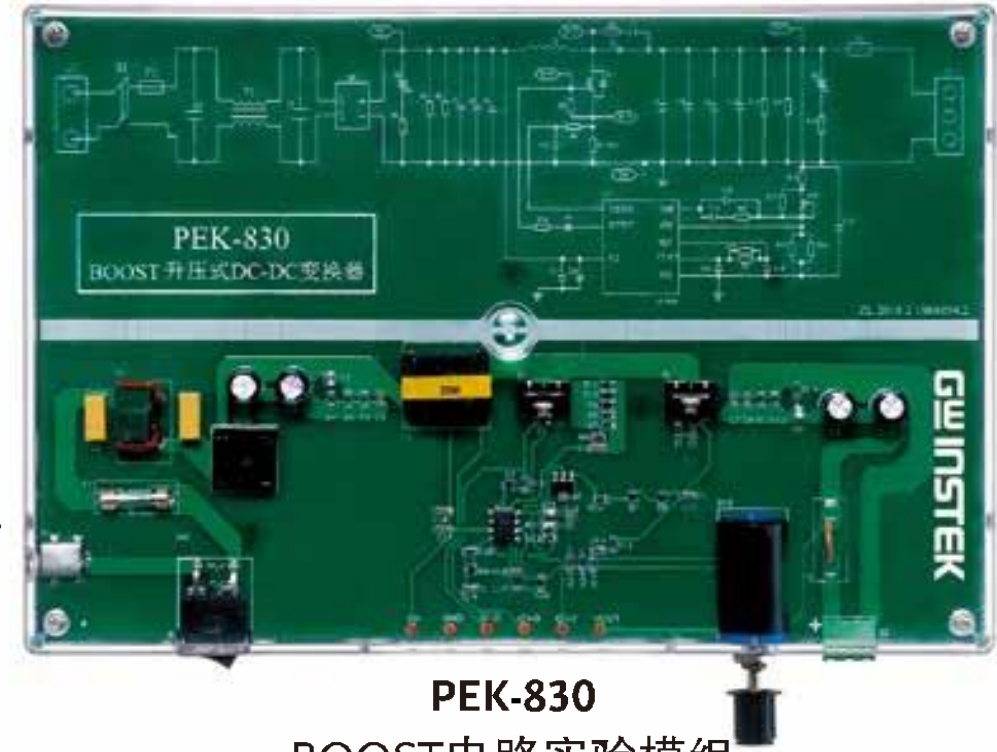
PEK-830 Specification

Input and output parameters

- (1) Input voltage: DC24V±1V (provided by external power adapter).
- (2) Output voltage: 36V (adjustable).
- (3) Output current: $\leq 800\text{mA}$.

Protective function

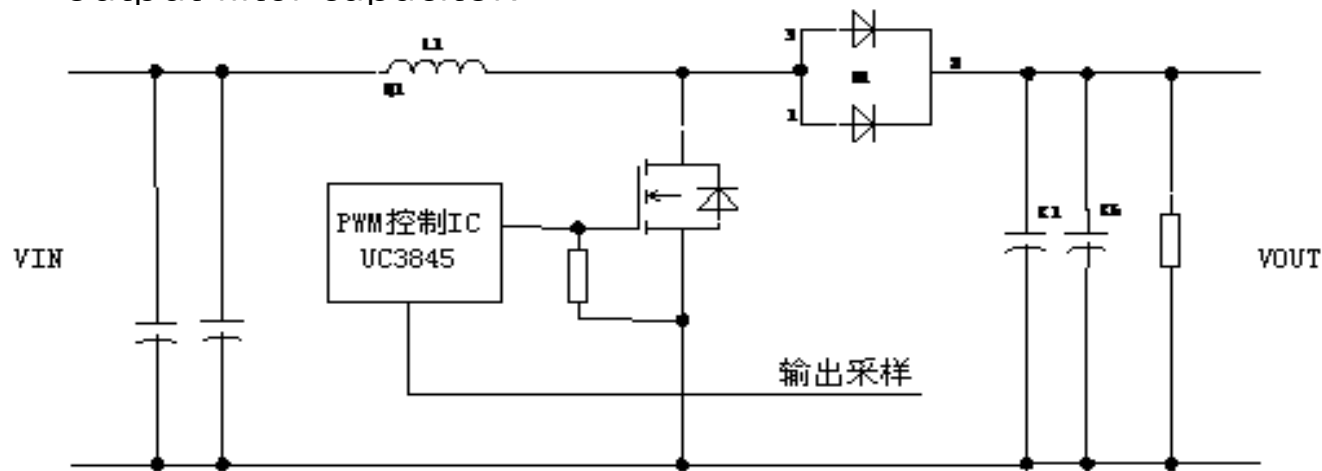
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-830
BOOST电路实验模组

PEK-830 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, control chip UC3845, N-MOSFET power switch, freewheeling/flyback diode, energy storage inductor, output filter capacitor.



PEK-830
BOOST电路实验模组

Experiment Purpose

1. Learn how Boost circuit works
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-830
BOOST电路实验模组

PEK-840

PEK-840 Introduction

The experiment board uses the Buck-Boost basic circuit topology. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

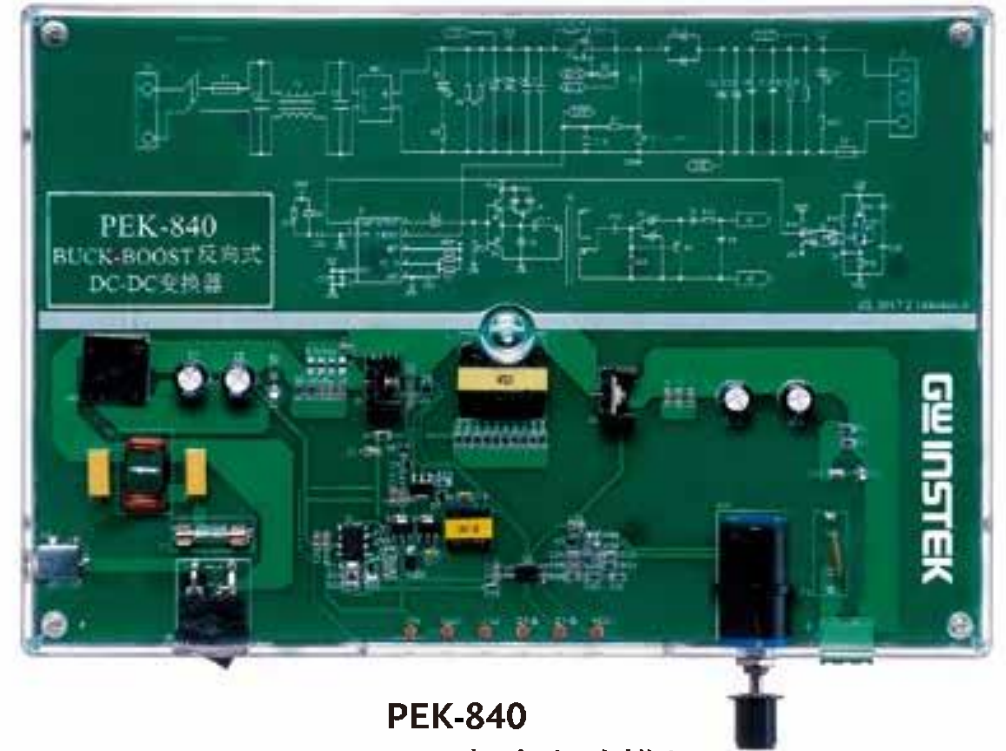
PEK-840 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power adapter).
- (2) Output voltage: 36V (adjustable).
- (3) Output current: $< 800mA$

Protective function

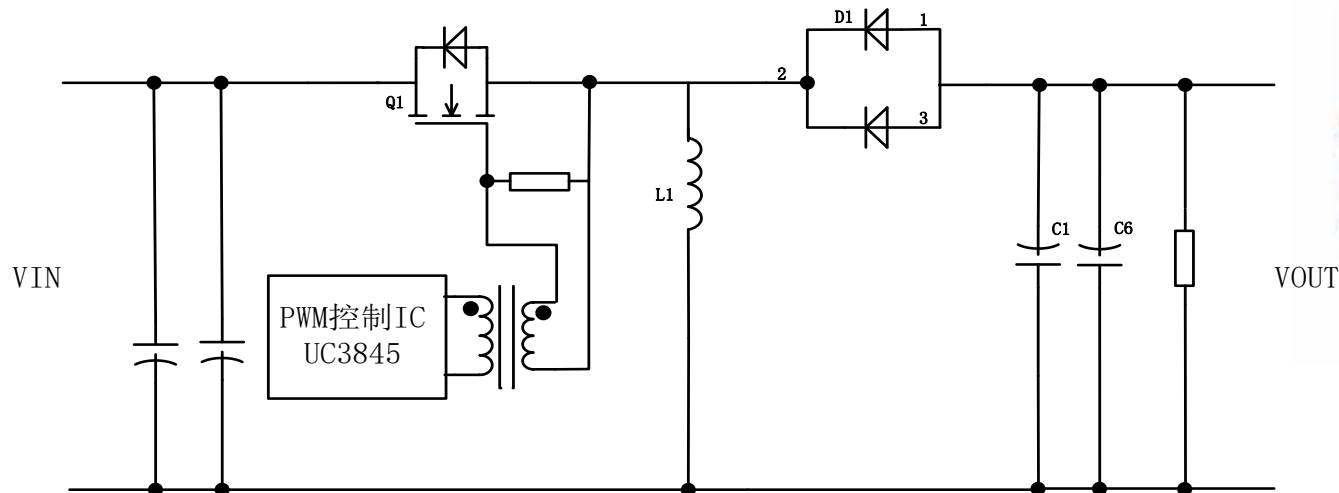
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-840
BUCK-BOOST电路实验模组

PEK-840 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, UC3845 control chip, N-MOSFET power switch, energy storage inductor, output filter capacitor, drive transformer.



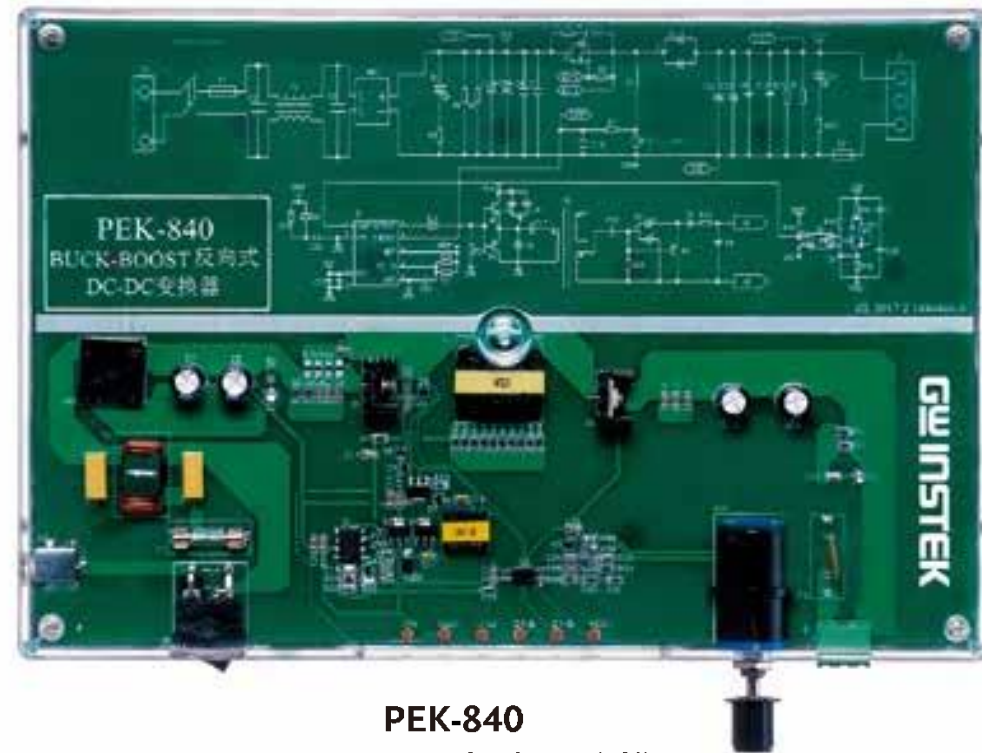
PEK-840
BUCK-BOOST电路实验模组

Experiment Purpose

1. Learn the working principle of the Buck-Boost circuit
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-840
BUCK-BOOST电路实验模组

PEK-850

PEK-850 Introduction

The experiment board uses the forward basic circuit topology. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

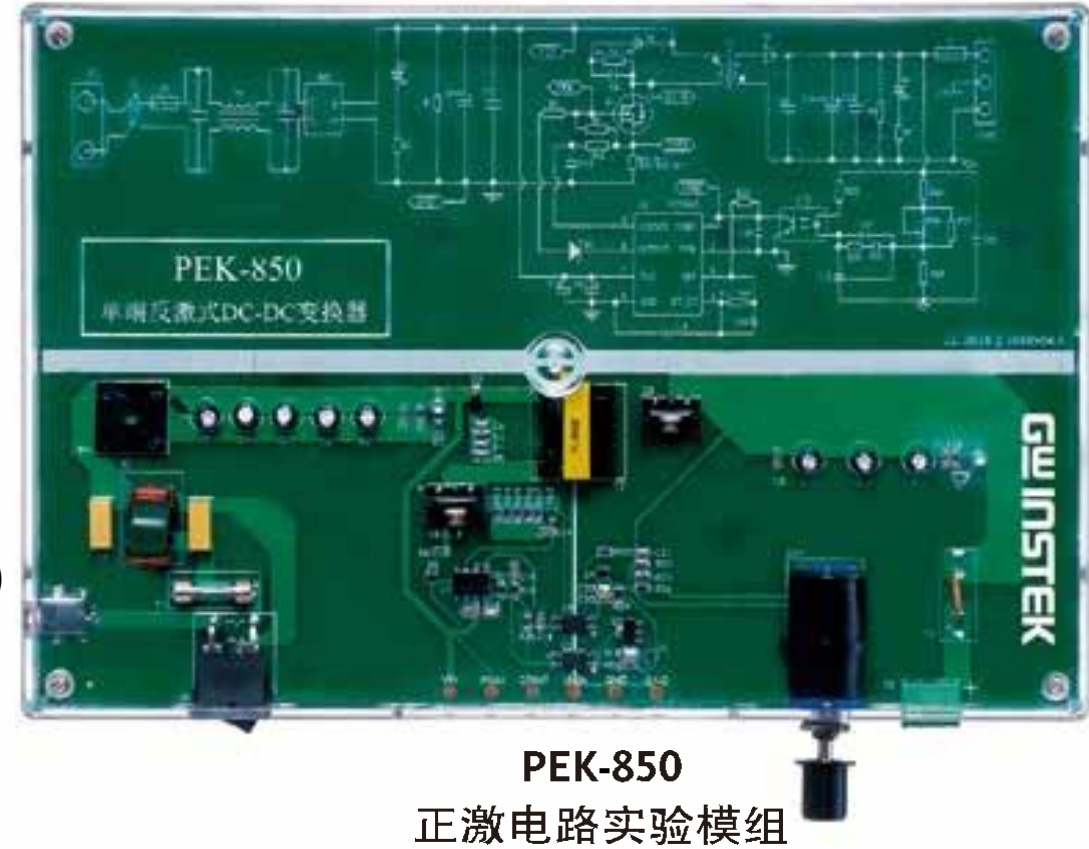
PEK-850 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power adapter)
- (2) Output voltage: 12V (adjustable)
- (3) Output current: $< 2A$

Protective function

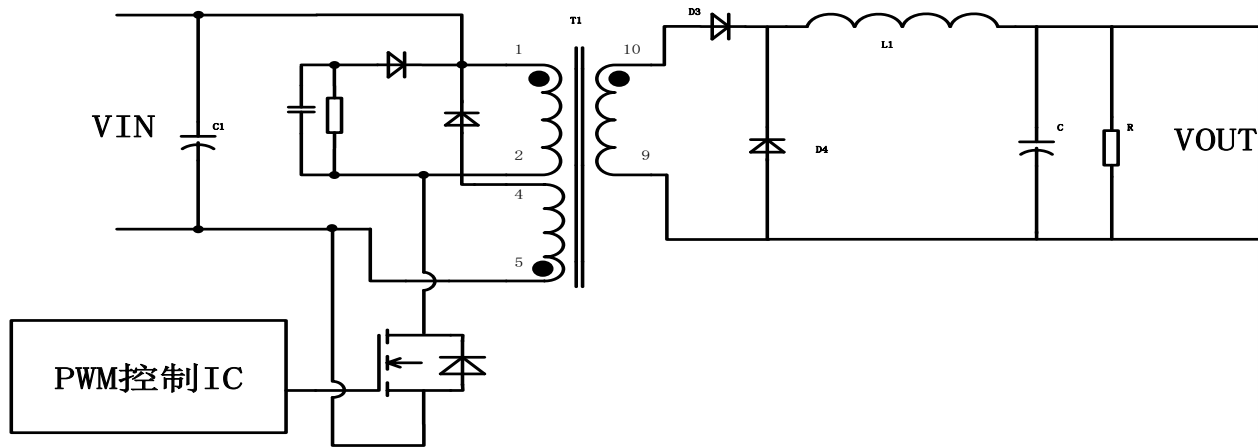
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-850

PEK-850 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, control chip UC3845, N-MOSFET power switch, freewheeling/flyback diode, energy storage inductor, output filter capacitor.



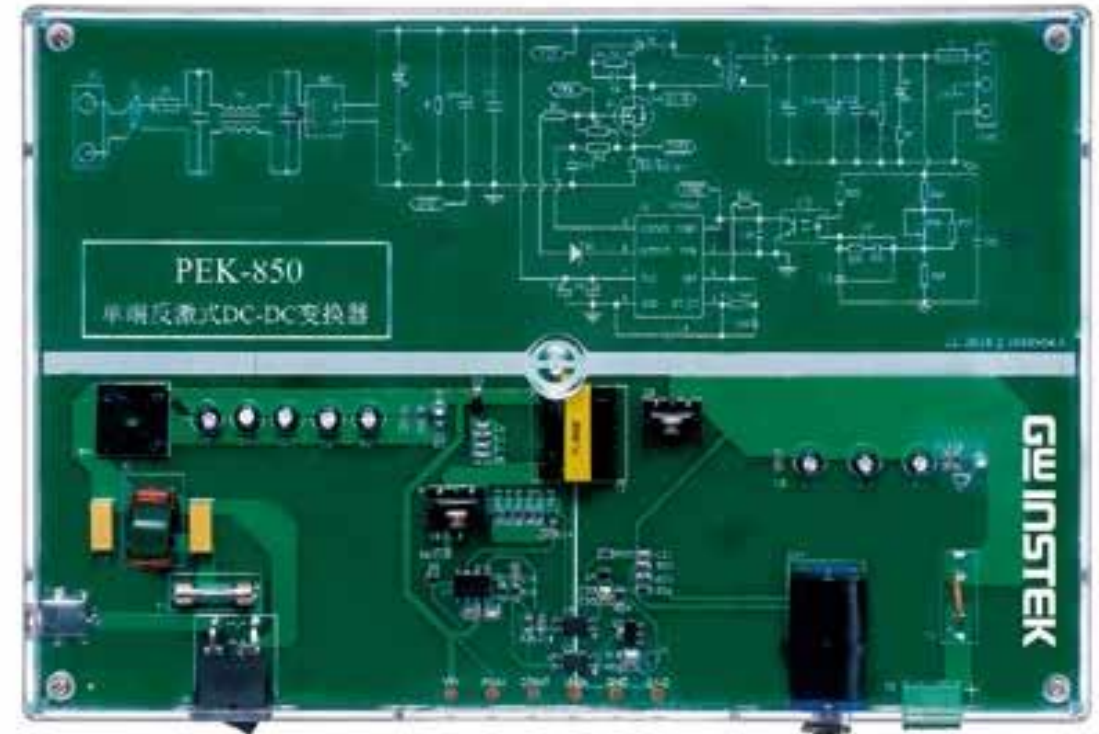
PEK-850
正激电路实验模组

Experiment Purpose

1. Learn the working principle of forward circuit
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-850
正激电路实验模组

PEK-860

PEK-860 Introduction

The experiment board uses the basic circuit topology of flyback. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

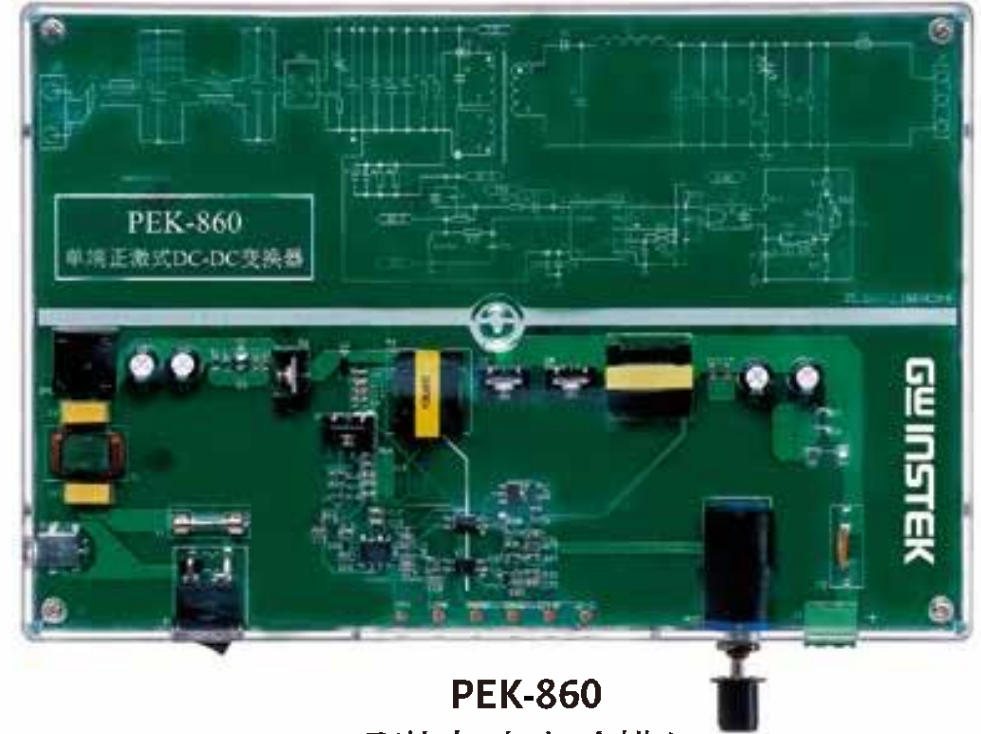
PEK-860 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power adapter)
- (2) Output voltage: 24V (adjustable)
- (3) Output current: $<800mA$

Protective function

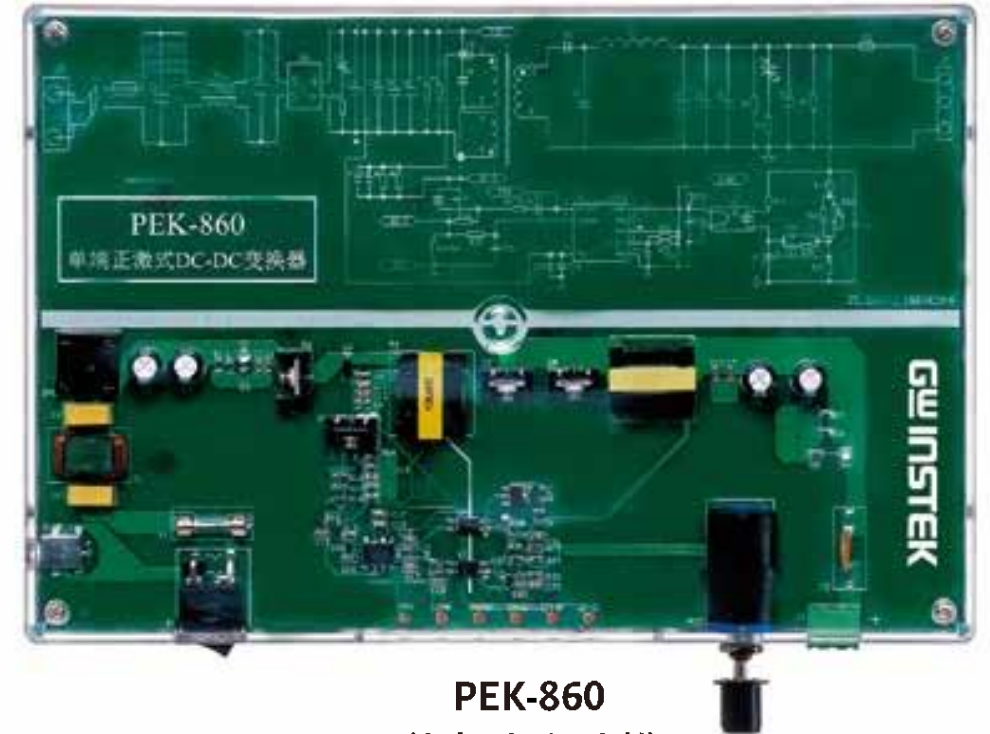
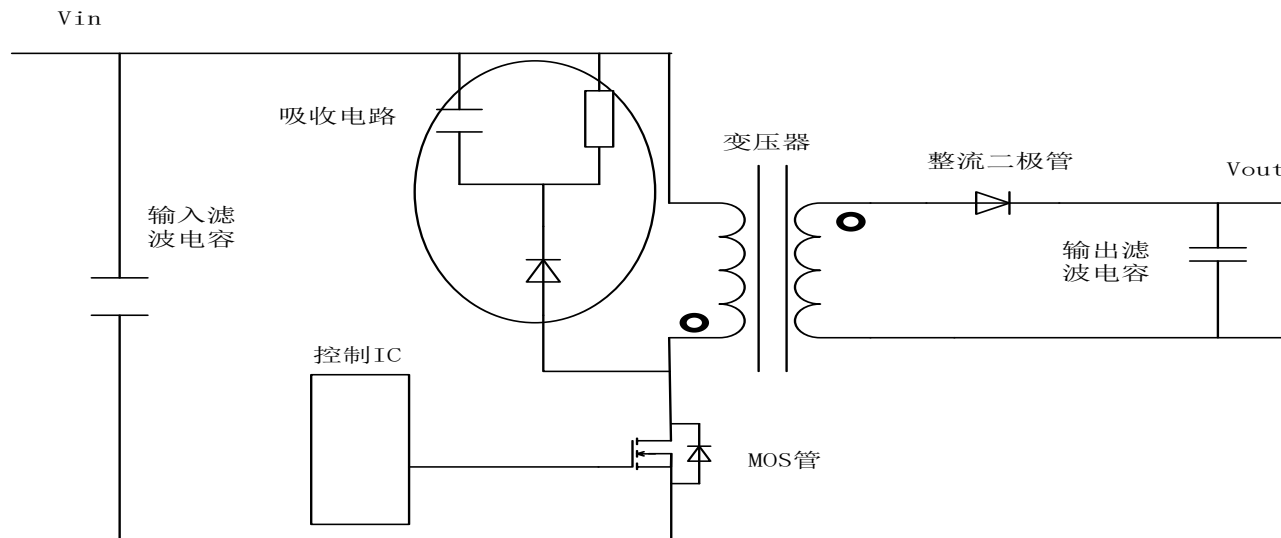
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-860
反激电路实验模组

PEK-860 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, control chip UC3845, N-MOSFET power switch, rectifier diode, transformer, output filter capacitor.



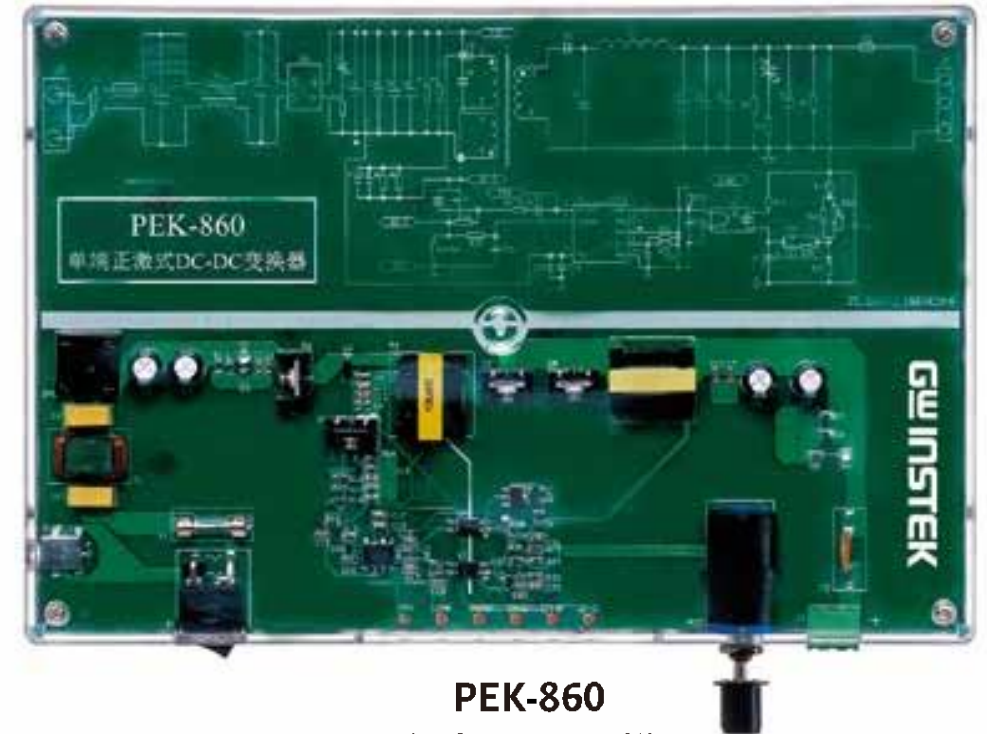
PEK-860
反激电路实验模组

Experiment Purpose

1. Learn how the flyback circuit works
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-860
反激电路实验模组

PEK-870

PEK-870 Introduction

The experiment board uses a push-pull basic circuit topology. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

PEK-870 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power)
- (2) Output voltage: 12V (adjustable)
- (3) Output current: $< 2A$

Protective function

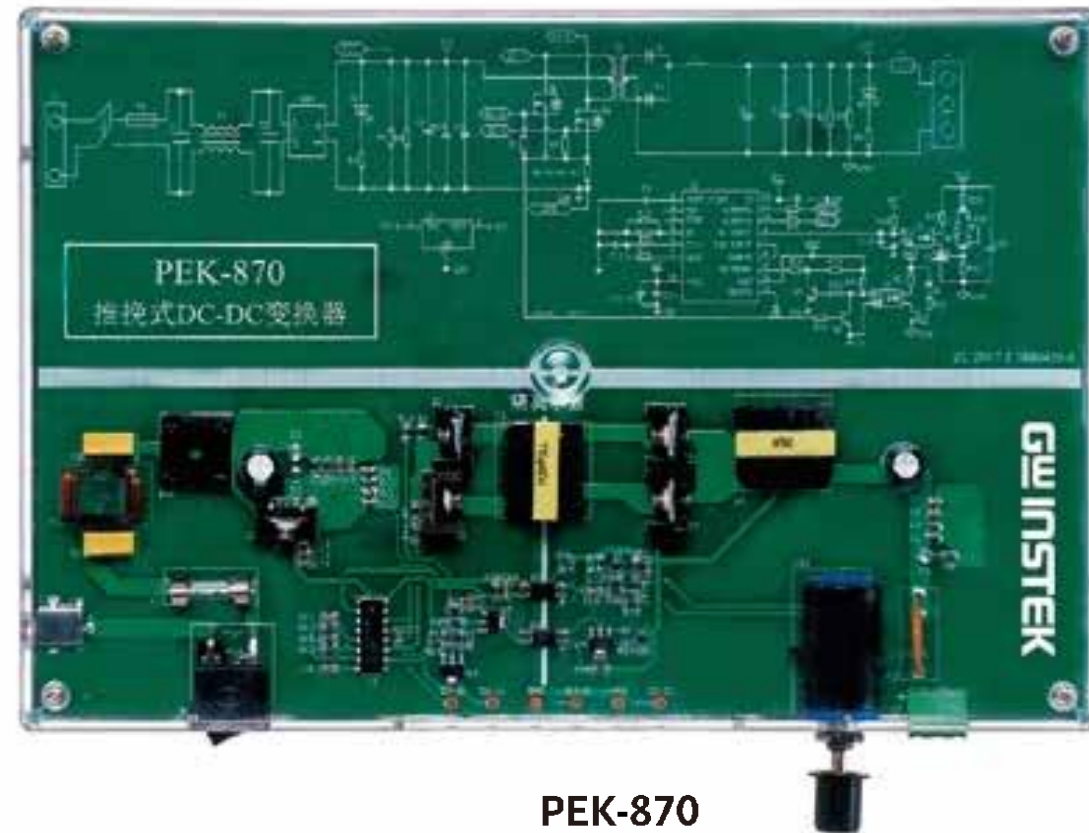
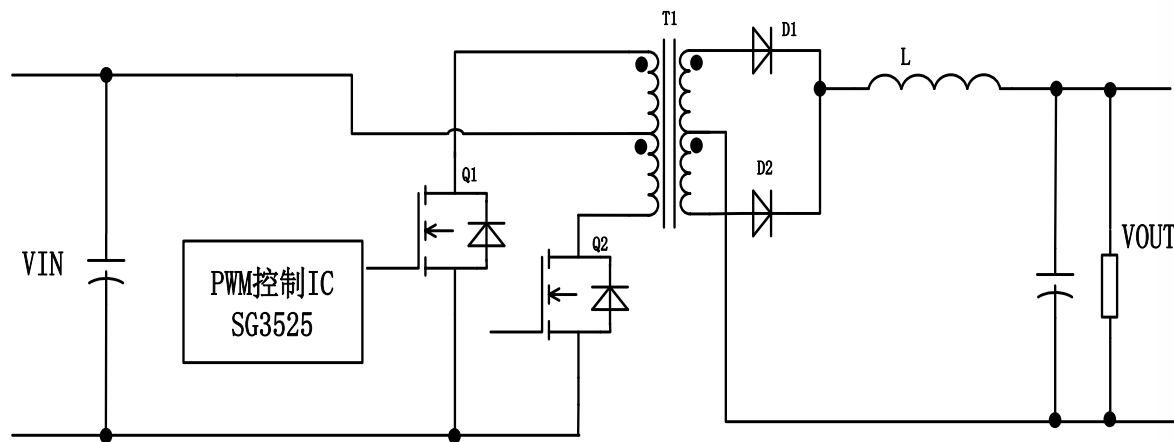
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-870
直流-直流推挽电路实验模组

PEK-870 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, control chip SG3525, N-MOSFET power switch, rectifier diode, energy storage inductor, output filter capacitor.



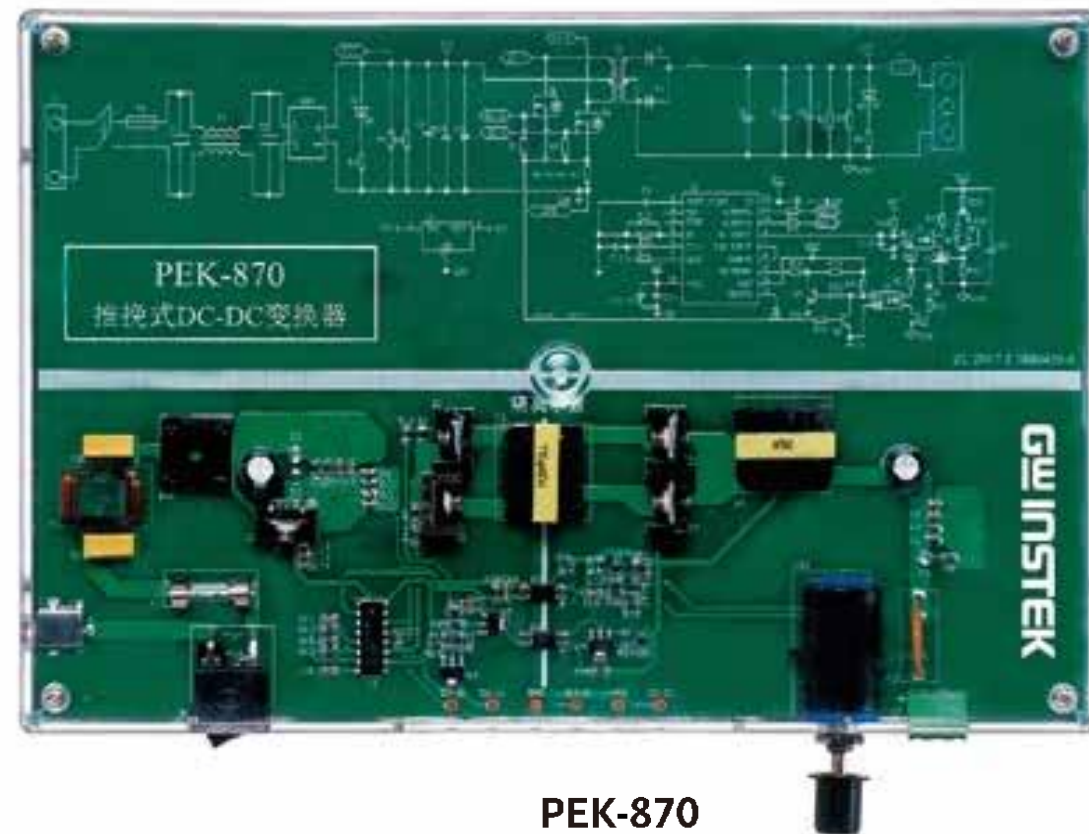
PEK-870
直流-直流推挽电路实验模组

Experiment Purpose

1. Learn how push-pull circuits work
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and record the output voltage waveform
2. Keep the duty cycle constant, change the load, observe and record the output voltage waveform



PEK-870
直流-直流推挽电路实验模组

PEK-880

GW INSTEK

PEK-880 Introduction

The experiment board uses the basic circuit topology of the full bridge. By adjusting the output voltage and load resistance, and observing the change of the corresponding PWM drive signal duty cycle, students can master the principle of PWM width adjustment of the switching power supply.

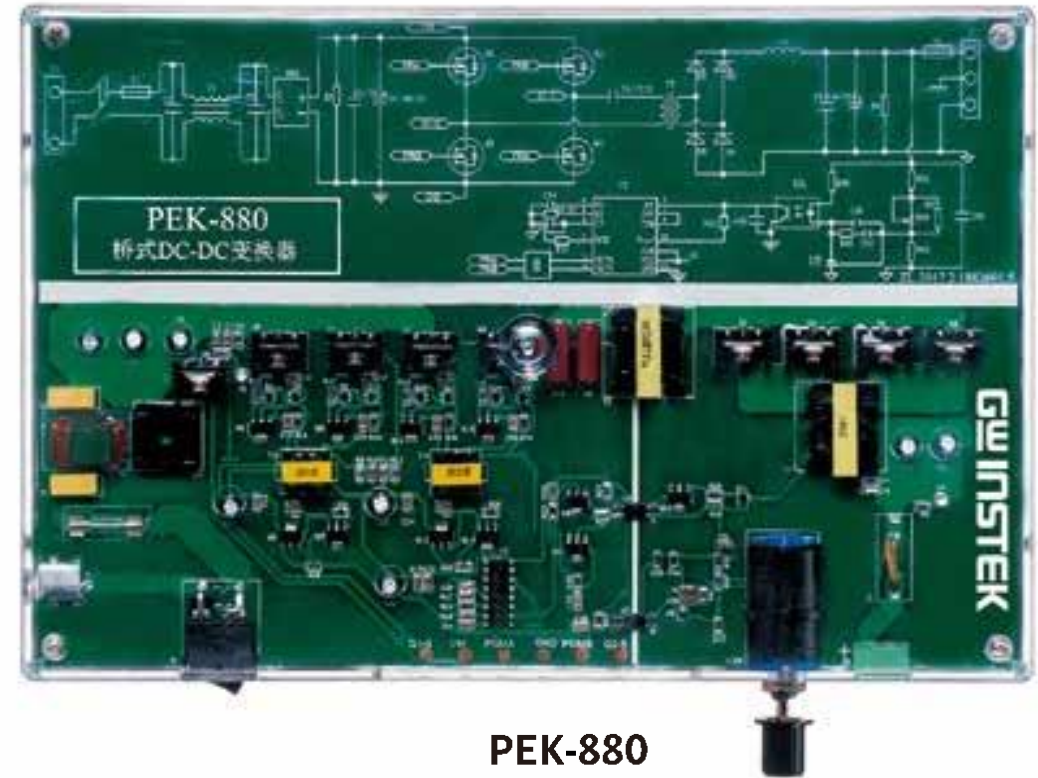
PEK-880 Specification

Input and output parameters

- (1) Input voltage: $24V \pm 1V$ (provided by external power adapter).
- (2) Output voltage: 24V (adjustable).
- (3) Output current: $<1.5A$.

Protective function

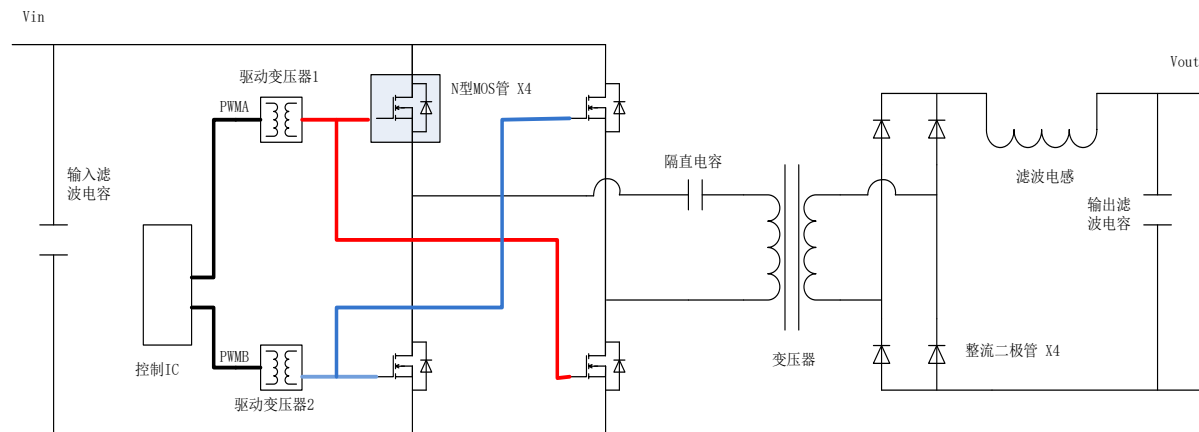
- (1) Output short circuit protection;
- (2) Output overcurrent protection;
- (3) Output overvoltage protection;
- (4) Normal working LED indicator.



PEK-880
全桥电路实验模组

PEK-880 Hardware Composition

The hardware composition block diagram of the experiment board is shown in the figure below. Including: input filter capacitor, control chip SG3525, N-MOSFET power switch, rectifier diode, energy storage inductor, output filter capacitor, drive transformer, transformer, DC blocking capacitor.



PEK-880
全桥电路实验模组

Experiment Purpose

1. Learn how full bridge circuits work
2. Understand relationship between duty cycle and output voltage

Experiment Item

1. Under the same load, change the duty cycle, observe and voltage waveform
2. Keep the duty cycle constant, change the load, observe ar output voltage waveform



PEK-880
全桥电路实验模组

Thank You