

simulink电力电子仿真（2）单相桥式半控整流电路实验

原创

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主要是赶上了疫情，然后期末要疯狂补实验报告，就索性写一下吧，万一以后再做电力电路仿真，可能会有用的，也希望可以帮助别人。

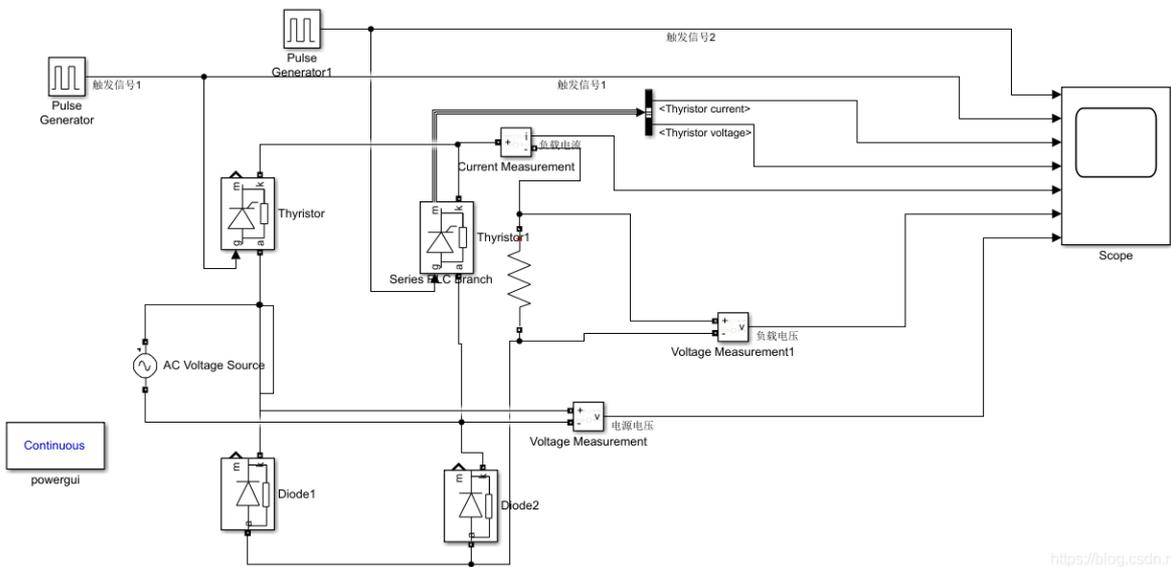
器件的选择及位置

MATLAB的版本 2018a

注：路径是QQ截图提取的文字，有错，但是大概方向不错的；建议选择该路径下，因为这是可以保证连接成功的

器件名称	器件位置
AC Voltage	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Electrical Sources
Scope	Simulink/Sinks/Scope
Voltage Measurement	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Measurements
Current Measurement	Simscape/Power Systems/ Specialized Technology/Fundamental Blocks/ Measurements
Series RLC Branch	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Elements
Ground	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Elements
powergui	Simscape/Power Systems/Specialized Technology/Fundamental Blocks
Diode	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Power Electronics
DC Voltage Source	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Electrical Sources
Thyristor	Simscape/Power Systems/Specialized Technology/Fundamental Blocks/Power Electronics
Pulse Generator	Simulink/Sources

仿真电路的绘制



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参数设定

电源:

Block Parameters: AC Voltage Source
✕

AC Voltage Source (mask) (link)

Ideal sinusoidal AC Voltage source.

Parameters

Load Flow

Peak amplitude (V):

Phase (deg):

Frequency (Hz):

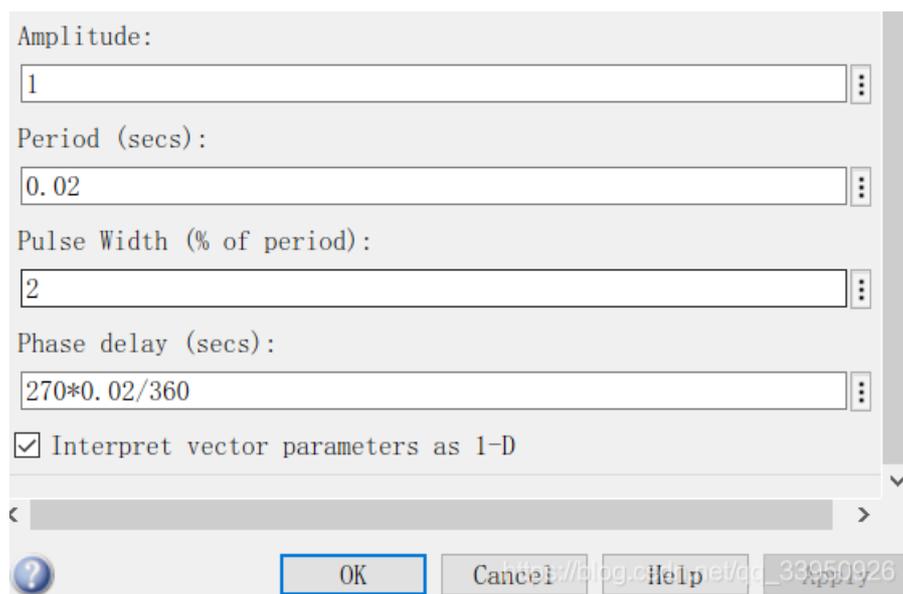
Sample time:

Measurements:

OK
Cancel
Help

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主要是触发信号二：设置上比触发信号一大180°，其他不变。
这里显示的 $270 = 180 + 90$ 是触发信号二的设置，信号一改为90就行。



Amplitude:
1

Period (secs):
0.02

Pulse Width (% of period):
2

Phase delay (secs):
 $270 * 0.02 / 360$

Interpret vector parameters as 1-D

? OK Cancel Help Apply

其他应该默认就行了。

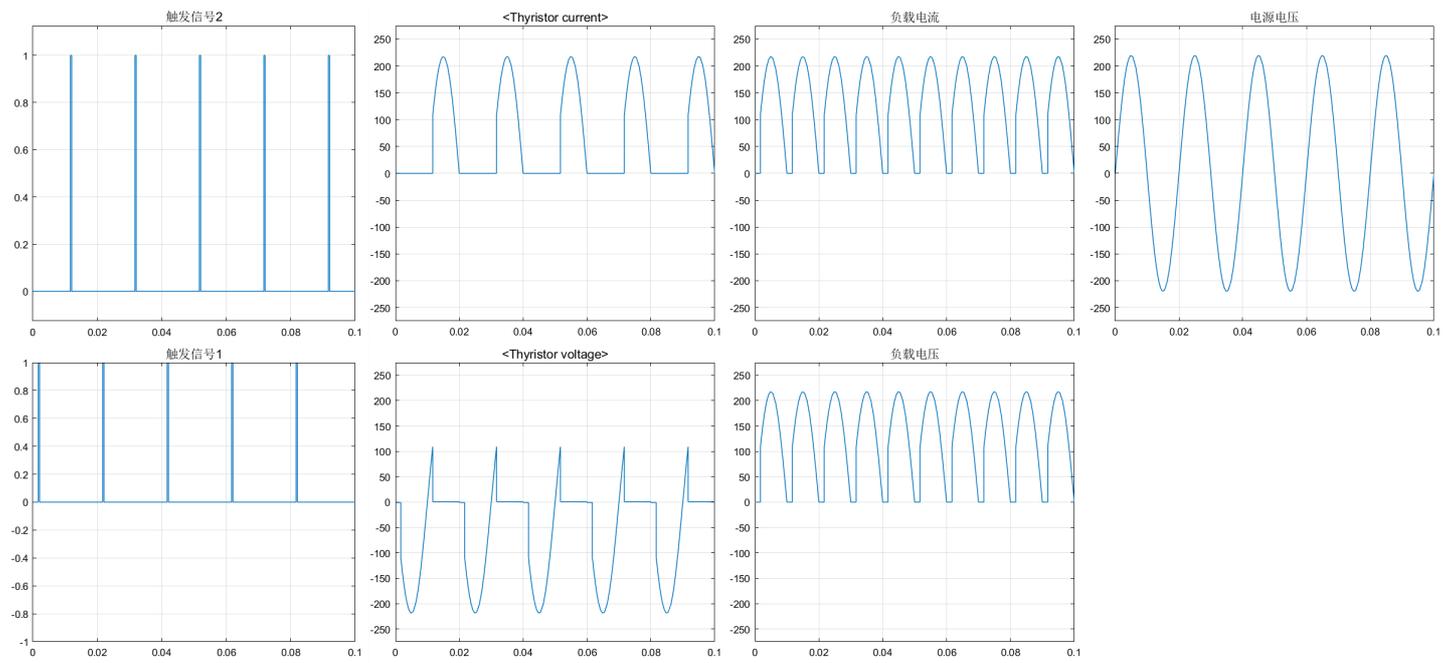
仿真结果演示

示波器设置7路

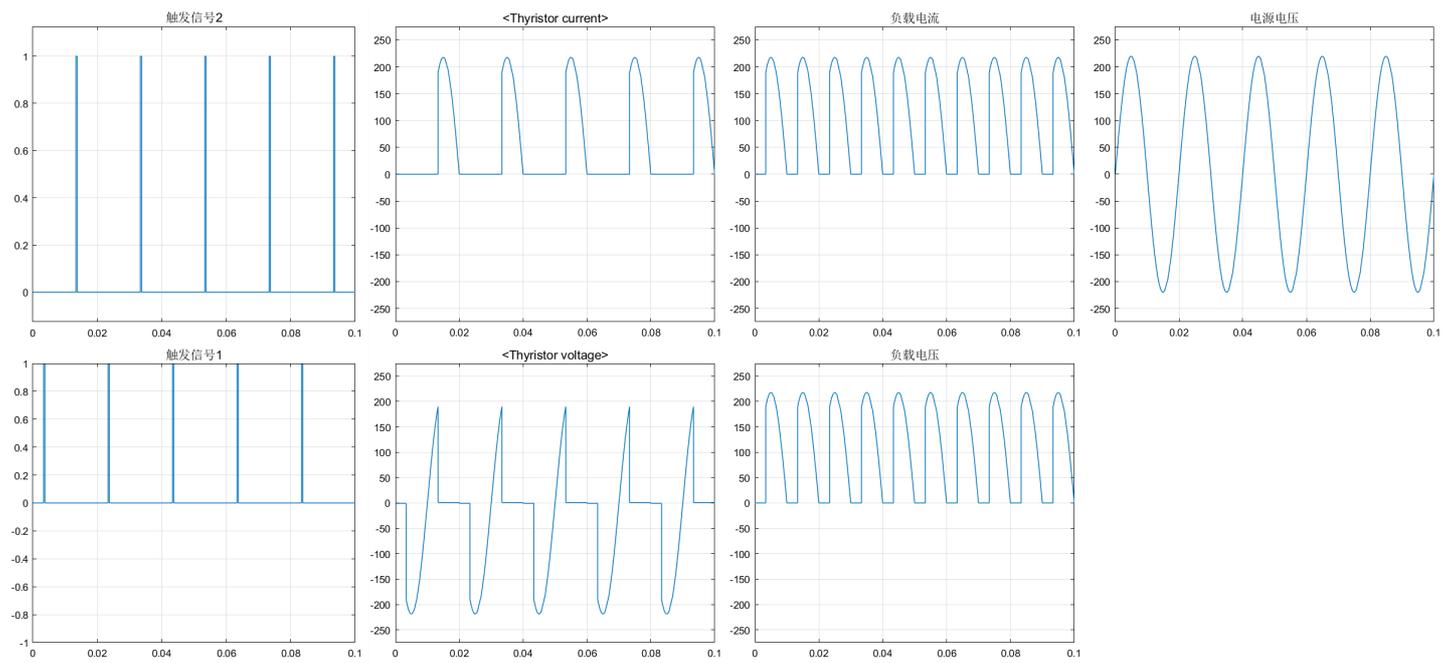
电阻负载

$R=5$ 。

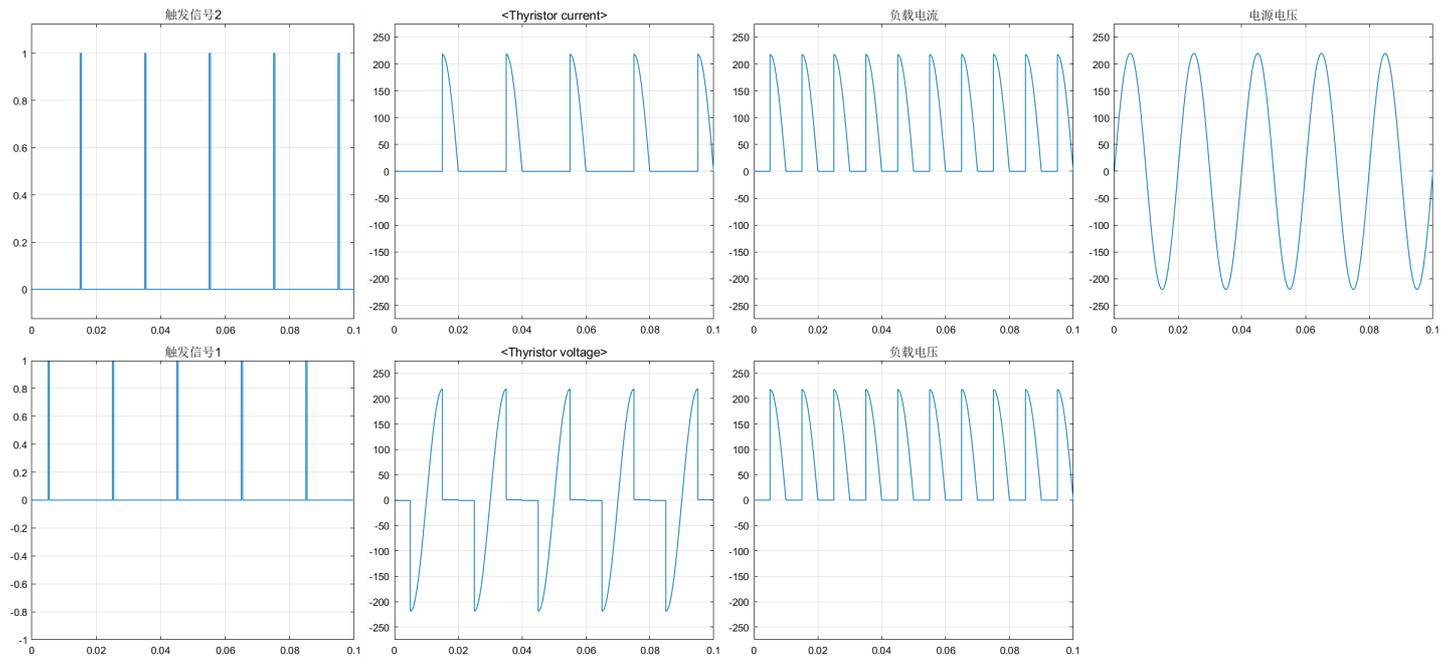
$\alpha=30^\circ$:



$\alpha=60^\circ$:



$\alpha=90^\circ$:



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实验任务

阻性负载

观察 $\alpha=30^\circ$ 、 60° 、 90° 、 120° 、 150° 时 U_d 、 U_r 的波形，并测量直流输出电压 U 和电源电压 U ，记录于下表中。

选定 $R=5$

$U_d = 0.9U_2(1+\cos\alpha)/2$ 使用matlab计算得出，给出代码

```
a = [30 60 90 120 150];
u2 = 220;
ud = 0.9*u2*(1+cos(a/360*2*pi))/2
```

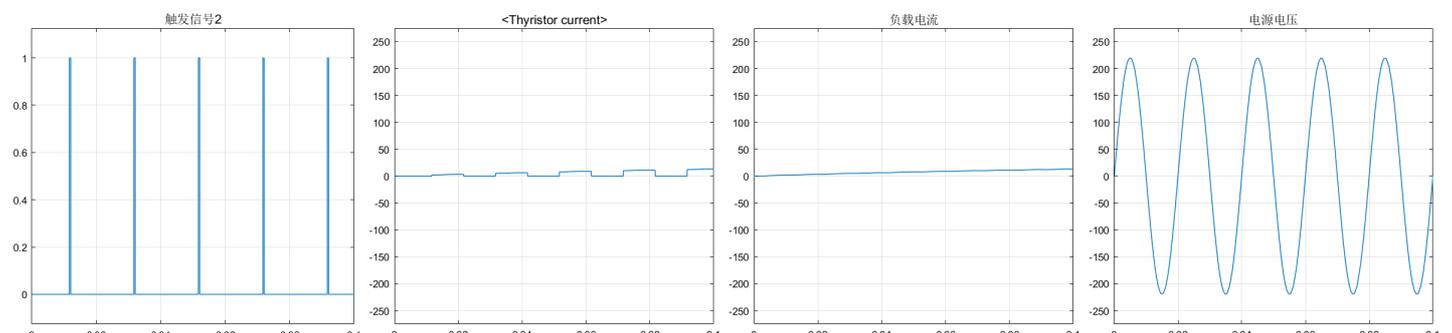
α	30°	60°	90°	120°	150°
$U_2/\sqrt{2}$	220	220	220	220	220
u_d	184.73	148.50	99.0	49.5	13.2635

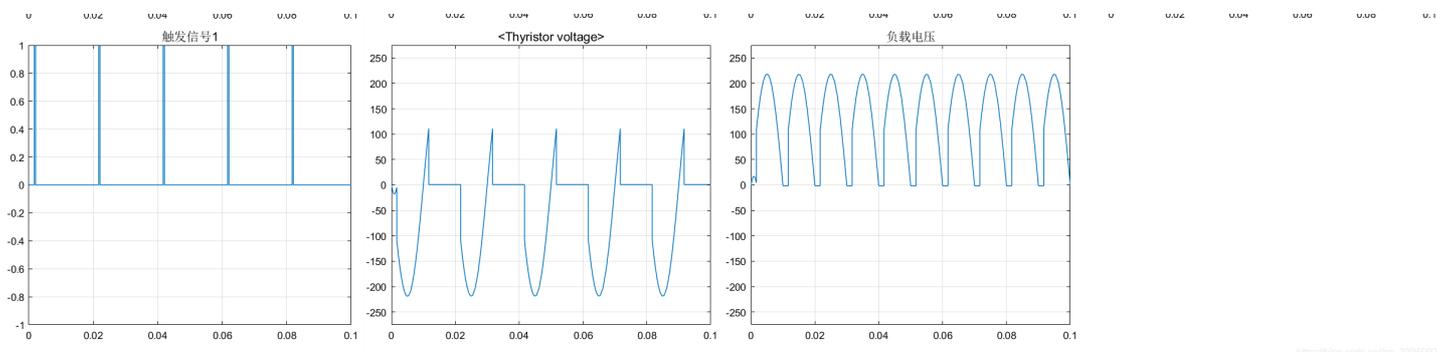
阻感负载

$R=5$, $L=700\text{mH}$

先给出仿真波形：

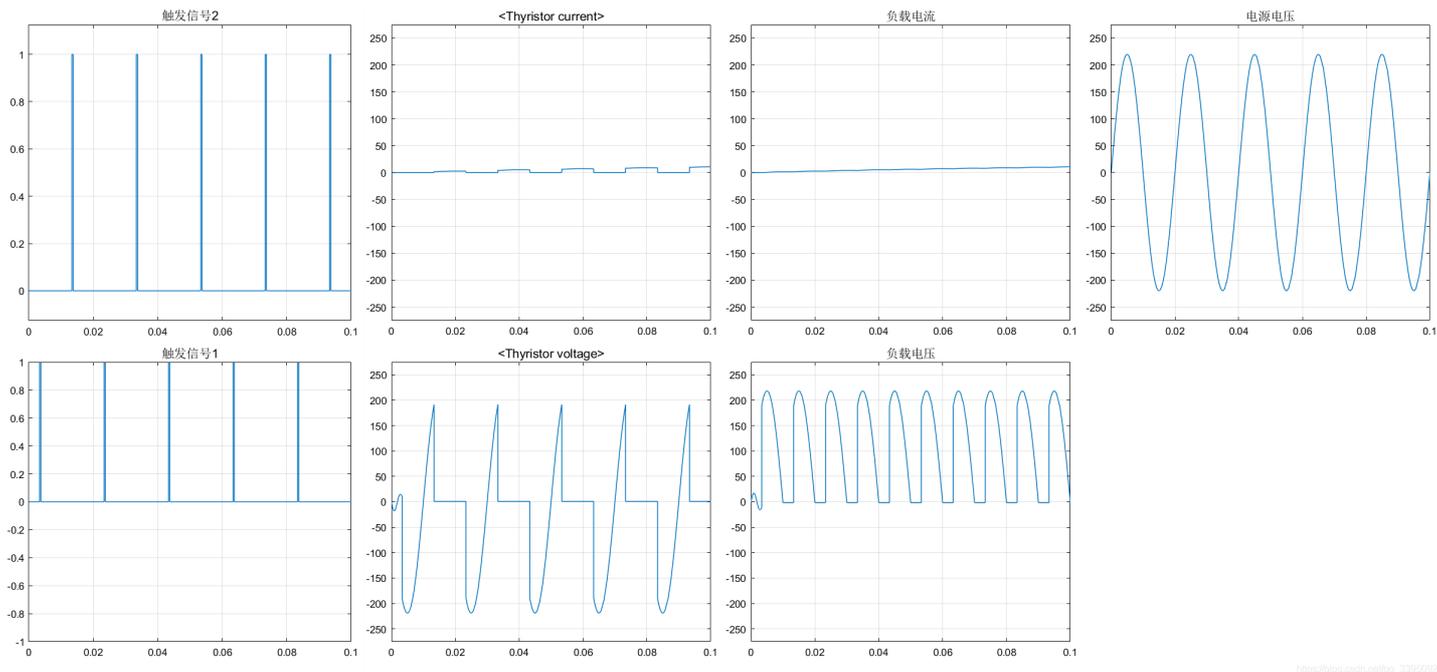
$\alpha=30^\circ$:





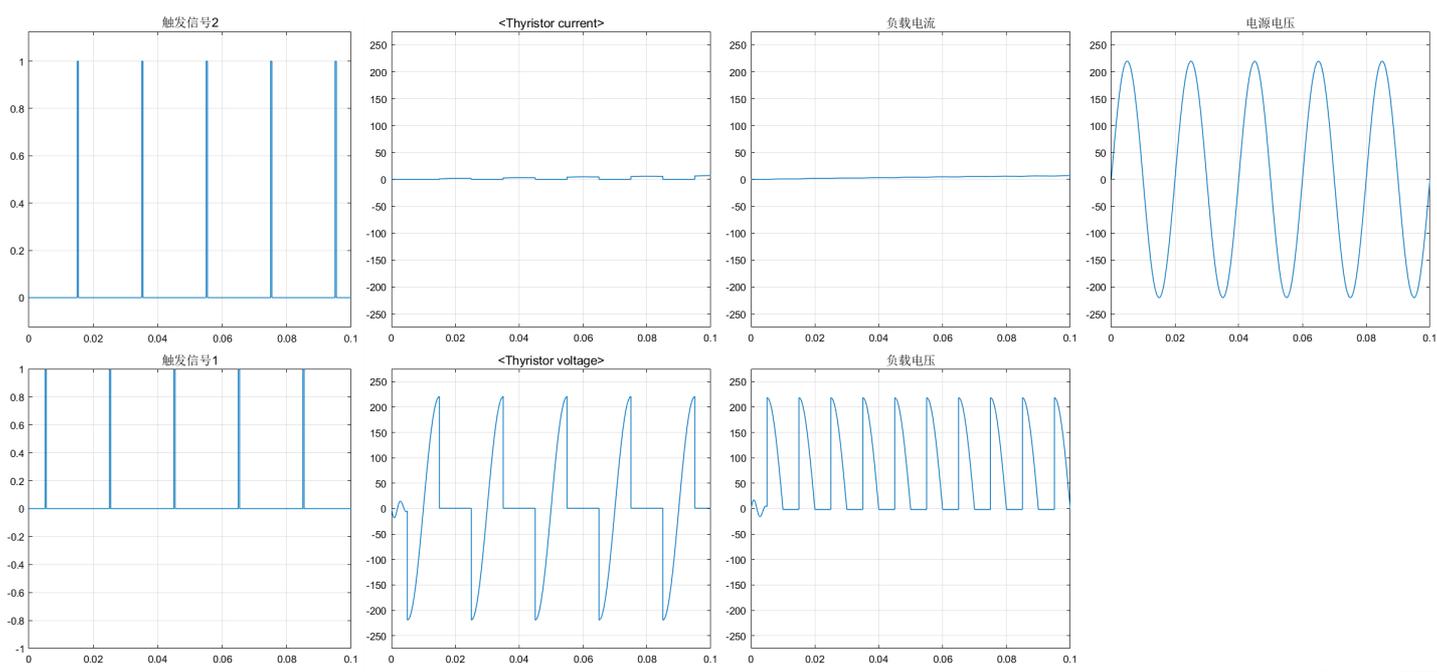
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$\alpha=60^\circ$:



https://img.csdn.net/img_33959526

$\alpha=90^\circ$:



https://img.csdn.net/img_33959526

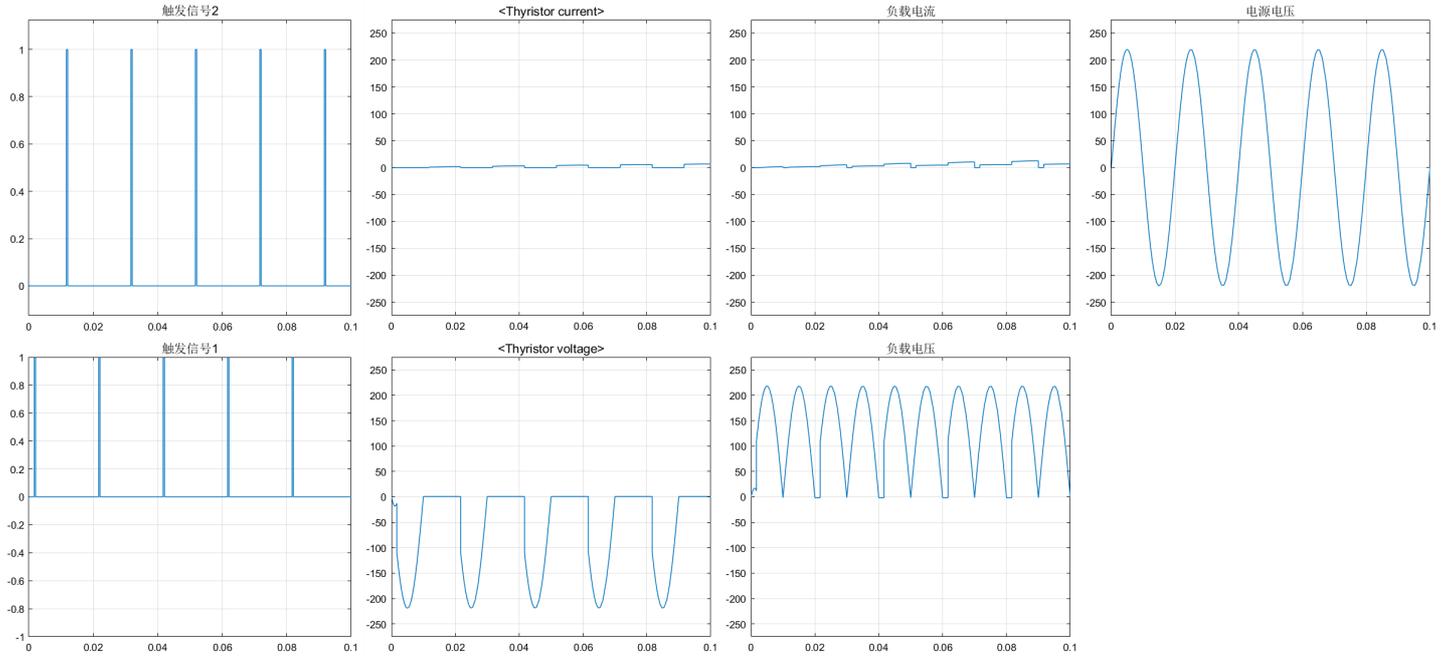
数据记录:
此时ud计算公式:

$$u_d = 0.9 * u_2 * \cos(\alpha / 360 * 2 * \pi)$$

α	30°	60°	90°
$U_2 / \sqrt{2}$	220	220	220
u_d	171.473	99	0.00

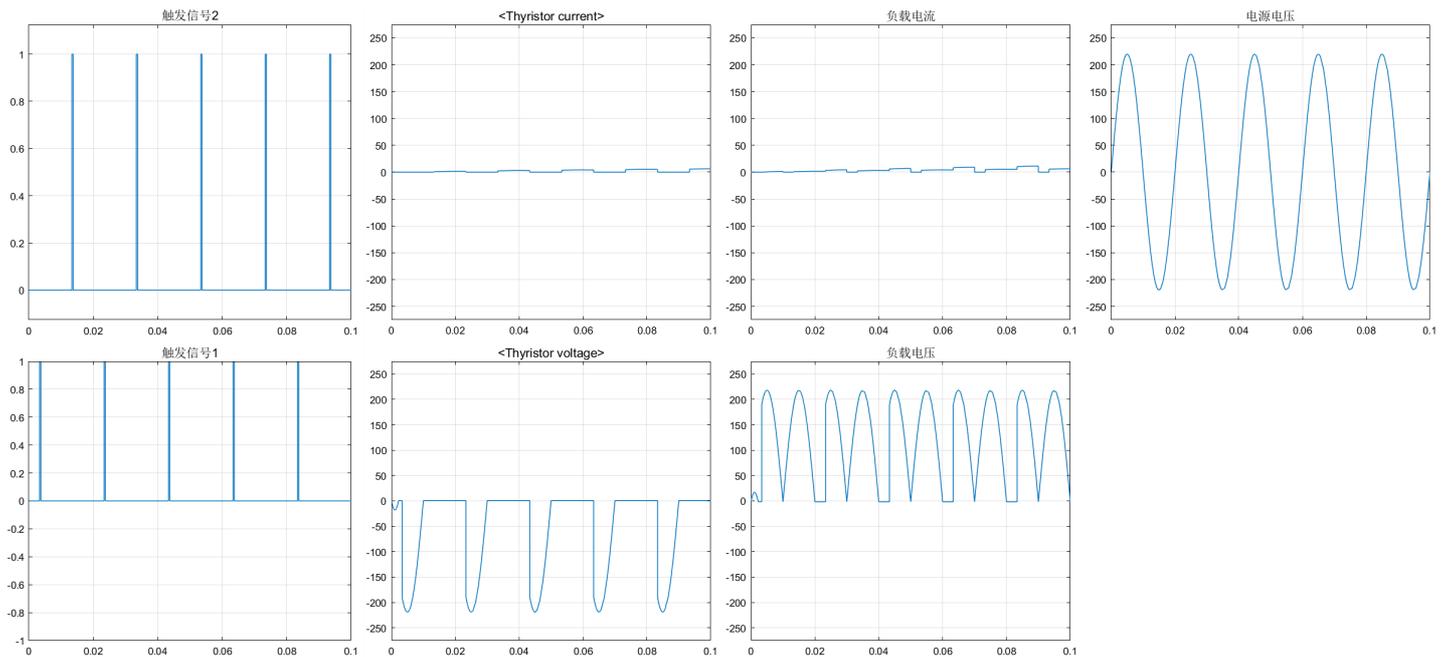
阻感负载加续流二极管

$\alpha = 30^\circ$:



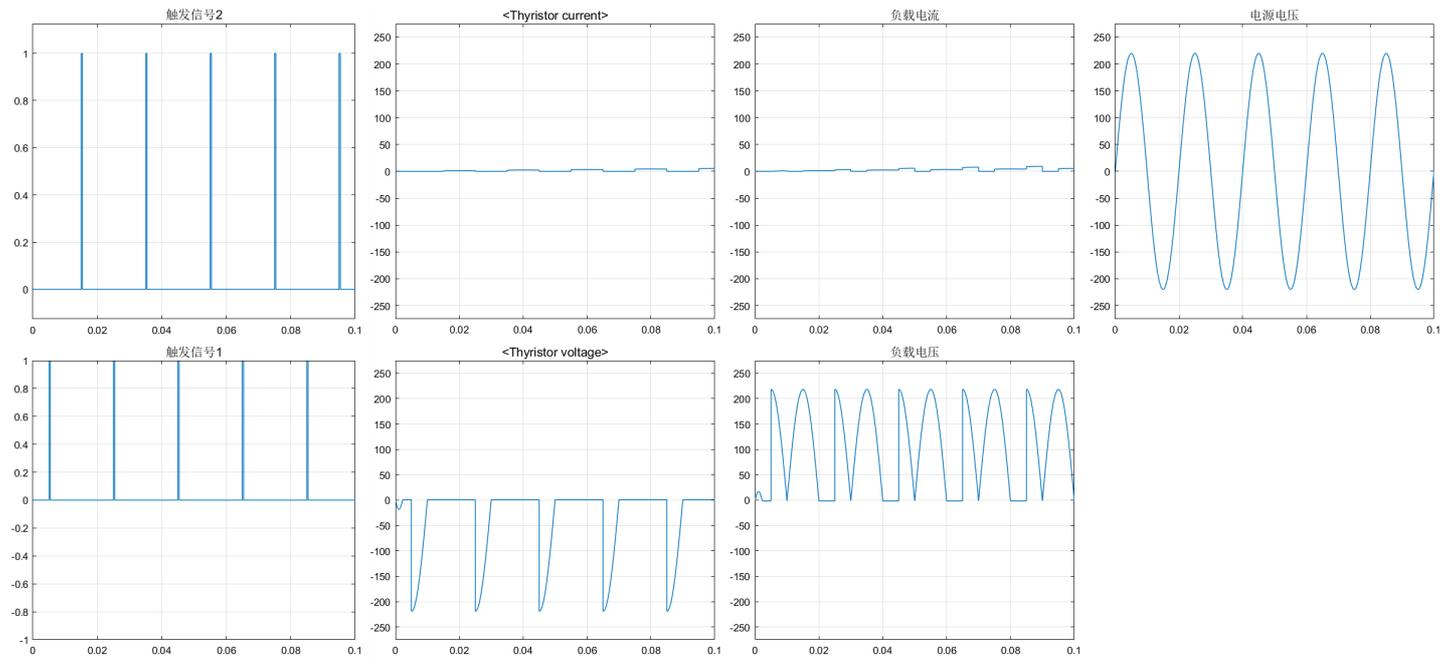
https://blog.csdn.net/mg_33950926

$\alpha = 60^\circ$:



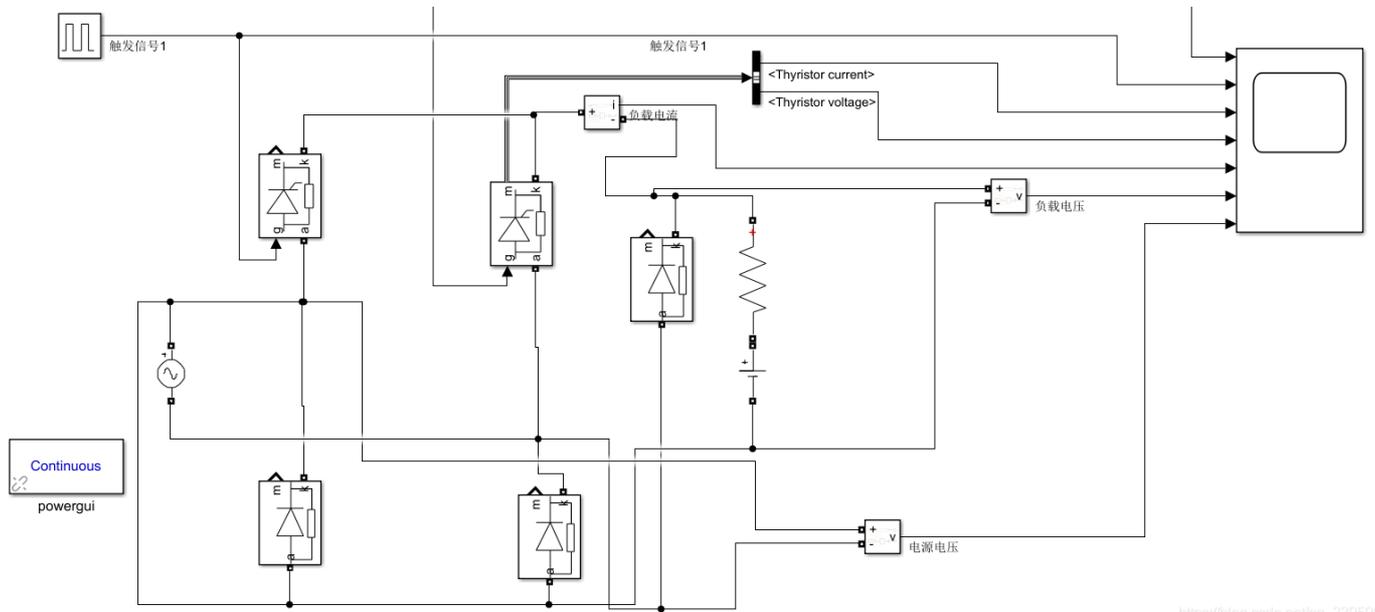
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$\alpha=90^\circ$:



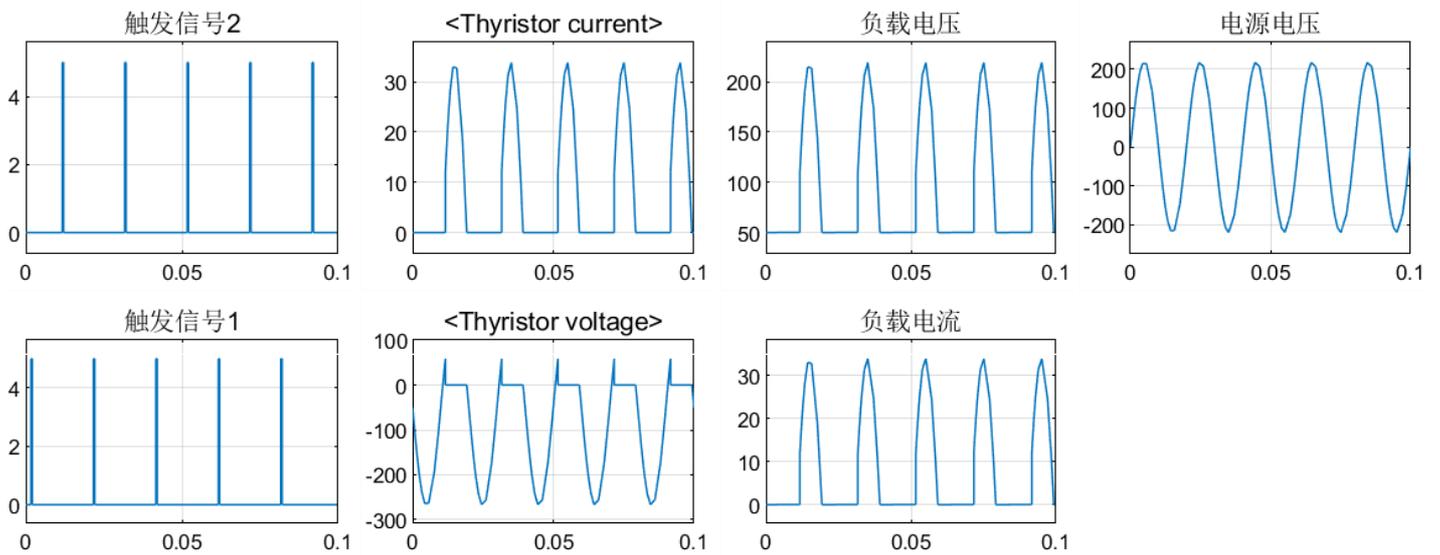
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带反电动势(反电动势大小为50V, 注: 不能太大!! 不然晶闸管不能导通, 看书)



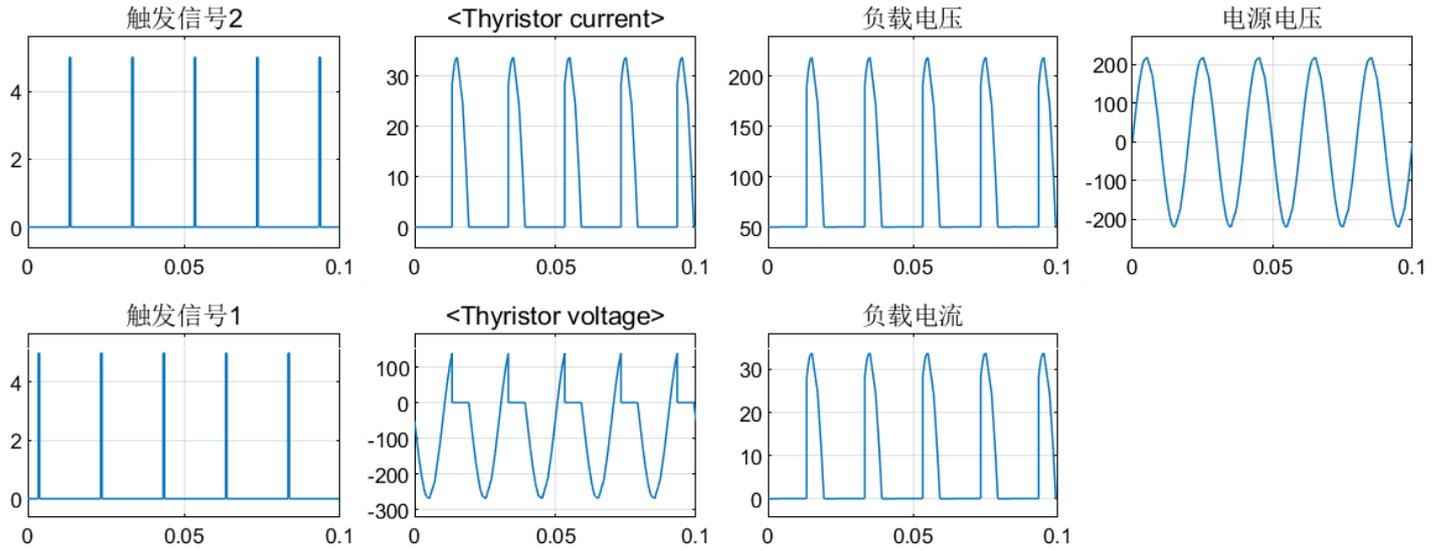
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$\alpha=30^\circ$:



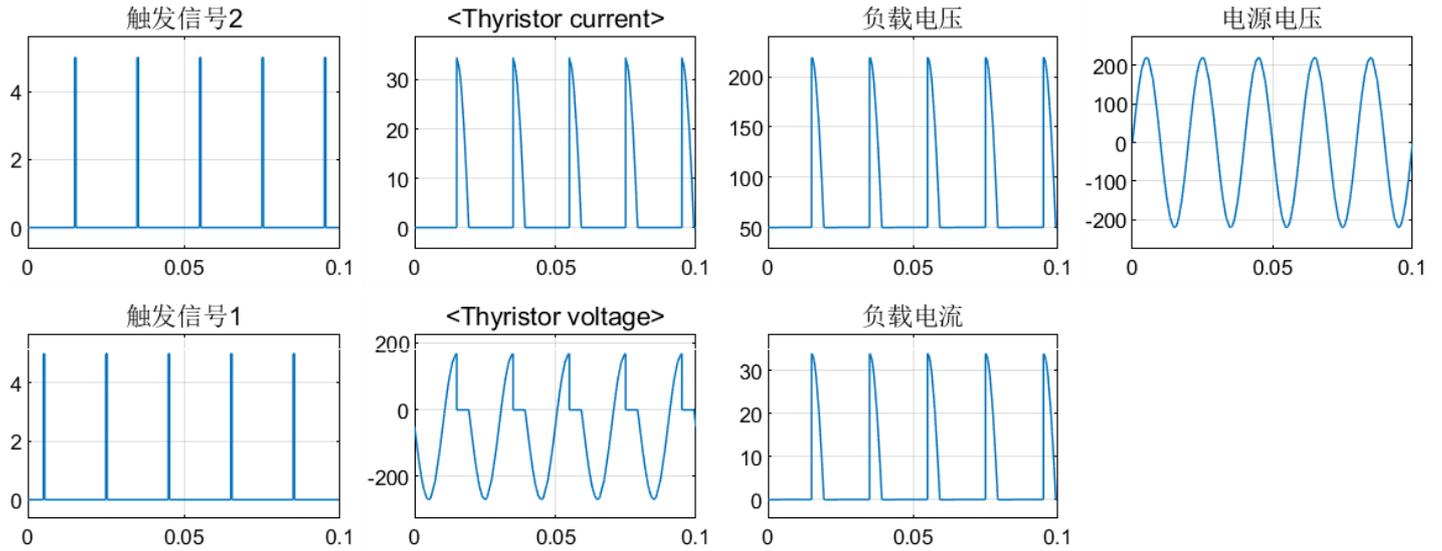
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$\alpha=60^\circ$:



https://blog.csdn.net/qq_33950926

$\alpha=90^\circ$:



https://blog.csdn.net/qq_33950926

实验二结束了。带反电动势的图形，因为不太懂，同时输出波形好怪，时间有点紧，就没再深究了，但是上面的表格中给出了元件的位置。一下可能有错误（可能也是因为加续流二极管了，刚发现，但是没有修改，以后考试结束了可能会再来看看）：

如果有人能看出错误，或者其他，欢迎留言

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