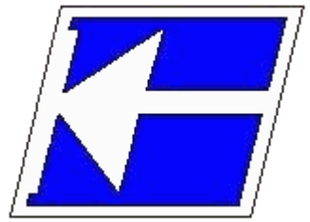
Instituto Federal de Educação, Ciência e Tecnologia de Santa Catarina
Departamento Acadêmico de Eletrônica

Eletrônica de Potência



Conversores CC-CC Isolados

Prof. Clovis Antonio Petry.

Florianópolis, outubro de 2025.

Eletrônica de Potência

O material do curso está disponível em:

1. Moodle para os alunos matriculados na disciplina.
2. Página do professor.
3. Canal no youtube do professor.

https://moodle.ifsc.edu.br

www.ProfessorPetry.com.br

https://www.youtube.com

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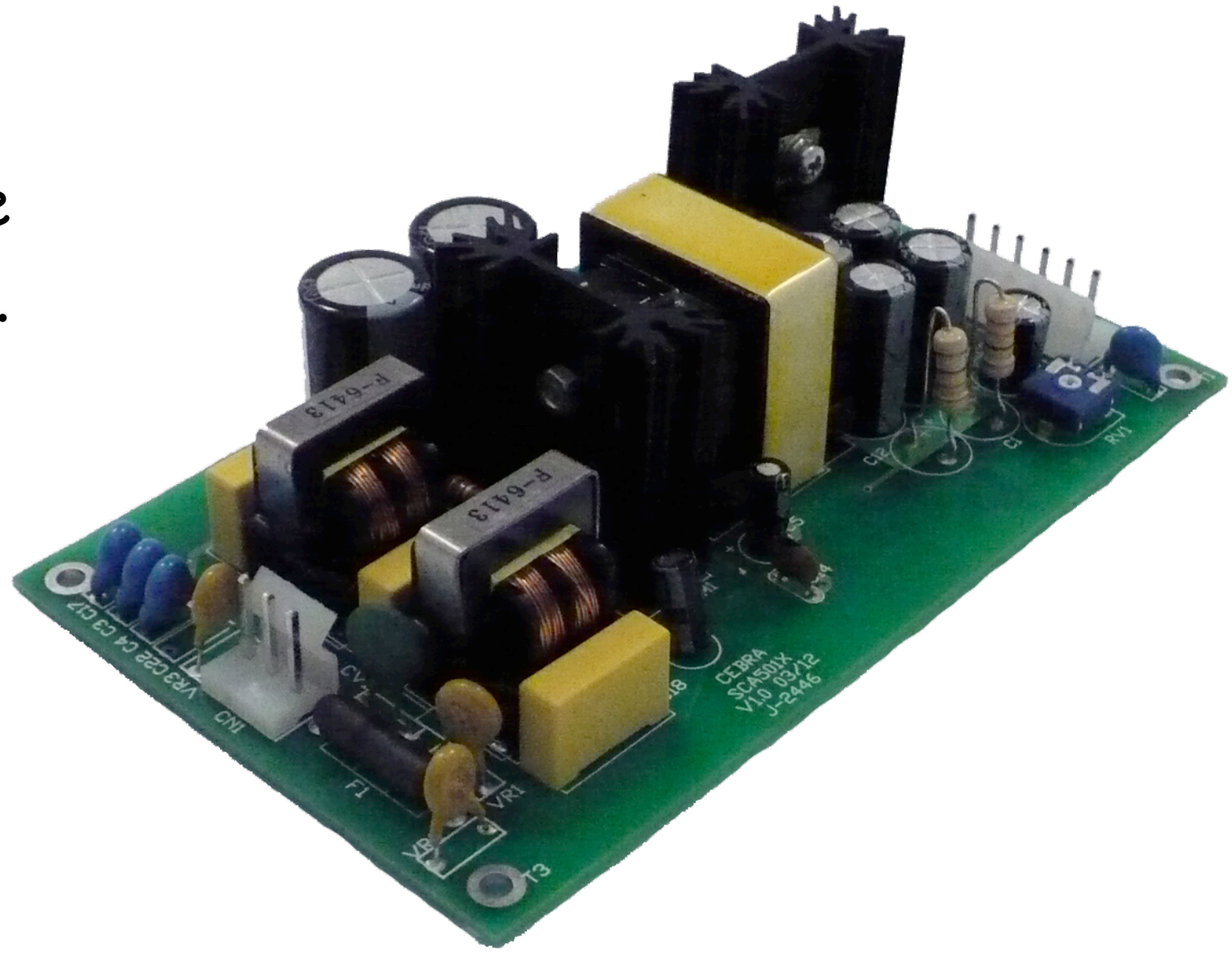
Agenda

Conversores cc-cc isolados:

- Conversor Flyback;
- Conversor Forward;
- Outros conversores isolados.

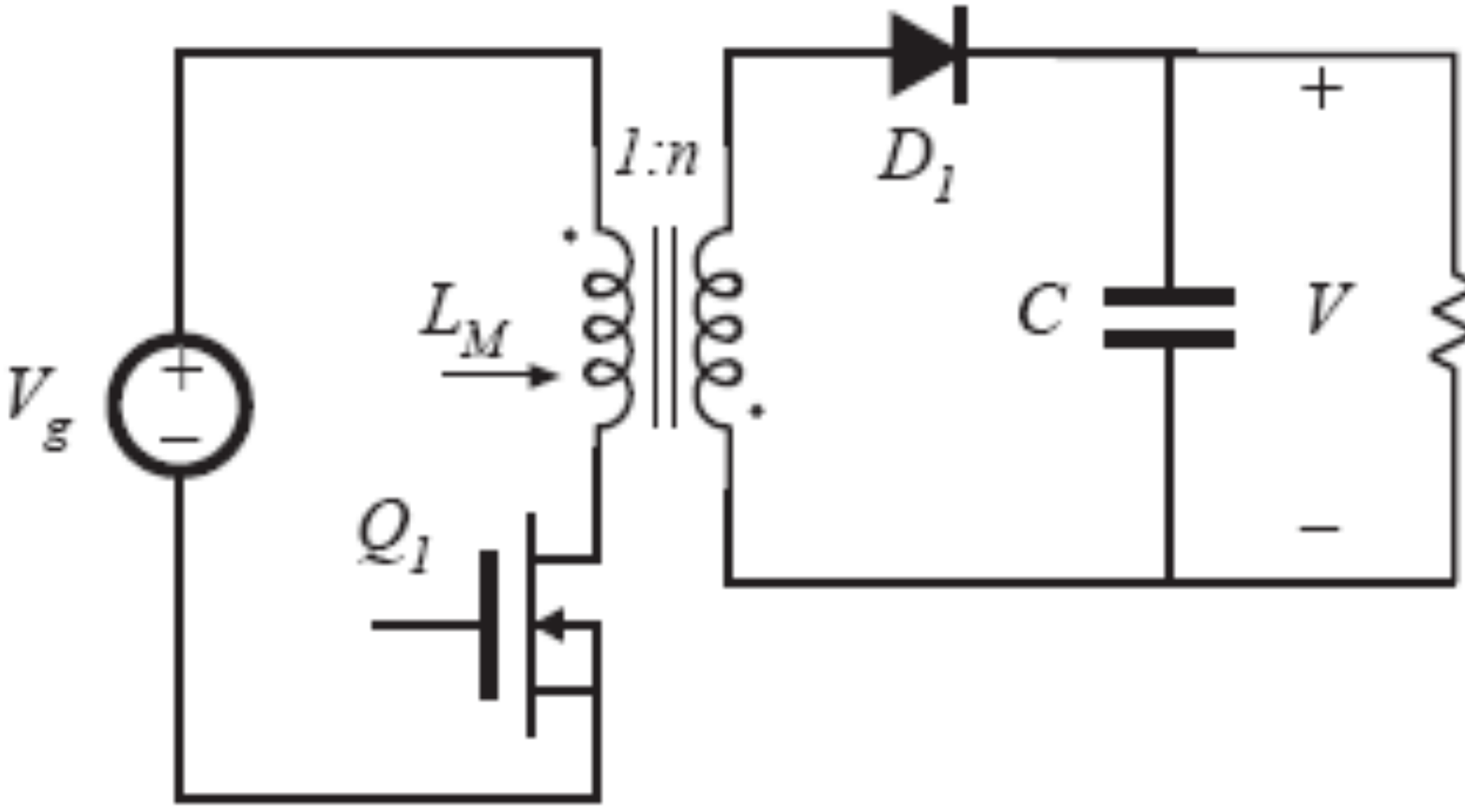
Motivação

Os conversores cc-cc isolados são amplamente utilizados para fontes de alimentação de uso geral.



https://www.cebra.com.br

Conversor Flyback



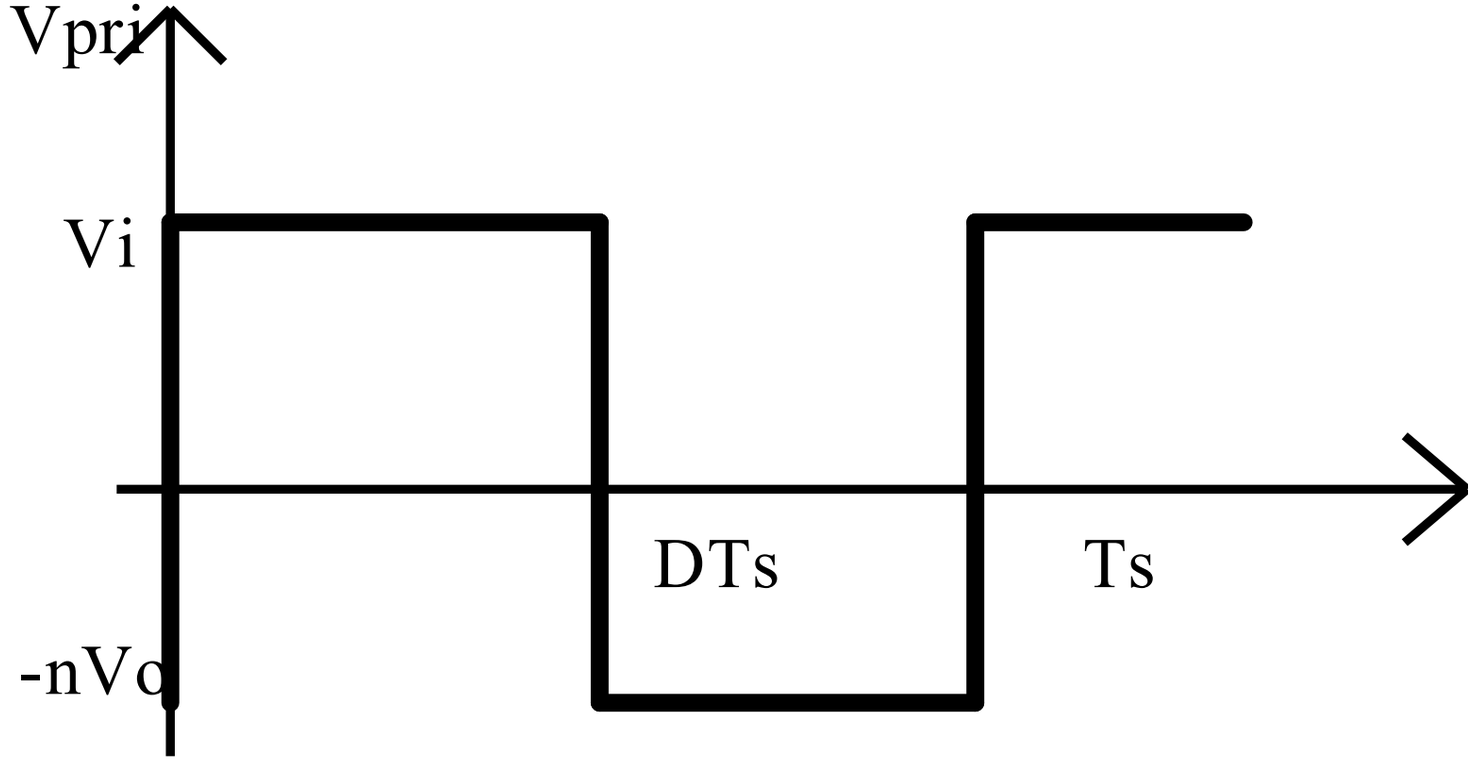
Conversor Flyback

$$V_{pri} = \frac{1}{T_s}\int_{0}^{D\cdot T_s} V_i \cdot dt + \frac{1}{T_s}\int_{D\cdot T_s}^{T_s} \left(-n\cdot V_o\right)\cdot dt$$

$$\frac{n\cdot V_o}{V_i} = \frac{D}{1-D}$$

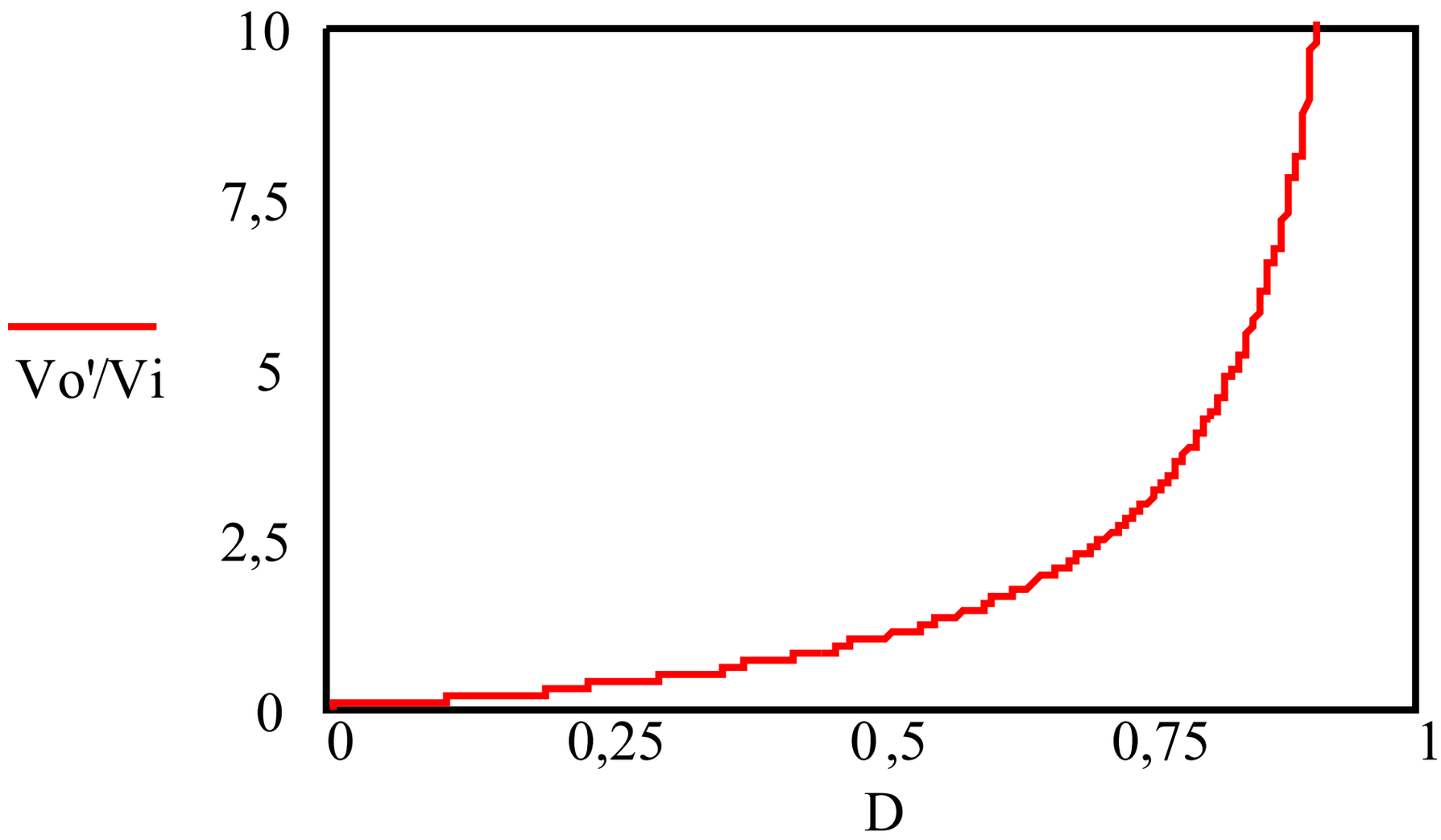
$$V_o^{'} = n\cdot V_o$$

$$\frac{V_o^{'}}{V_i} = \frac{D}{1-D}$$

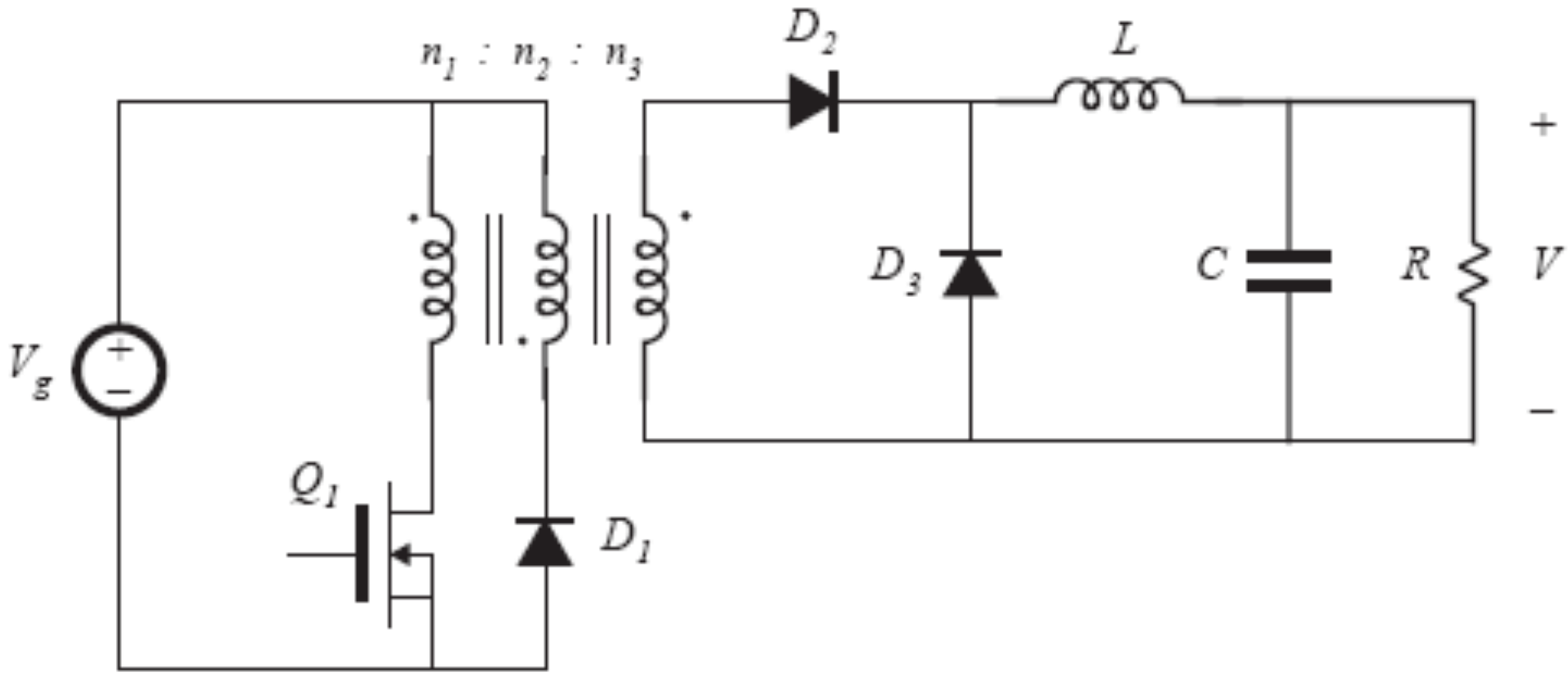


Conversor Flyback

Ganho estático em função da razão cíclica:



Conversor Forward



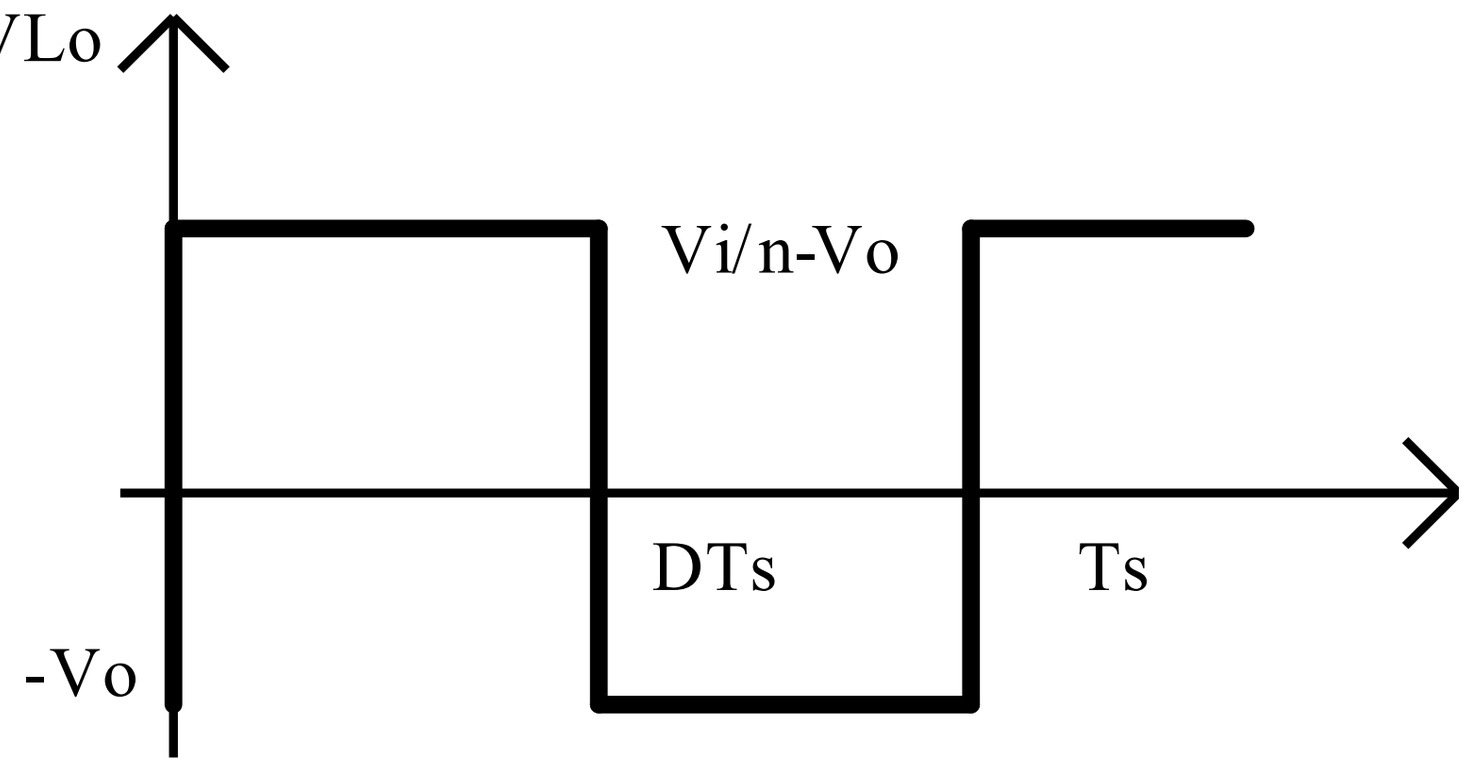
Conversor Forward

$$\frac{1}{T_s}\int_0^{DT_s}\left(\frac{V_i}{n}-V_o\right)dt=\frac{1}{T_s}\int_0^{(1-D)T_s}V_o\,dt$$

$$\frac{n\cdot V_o}{V_i}=D$$

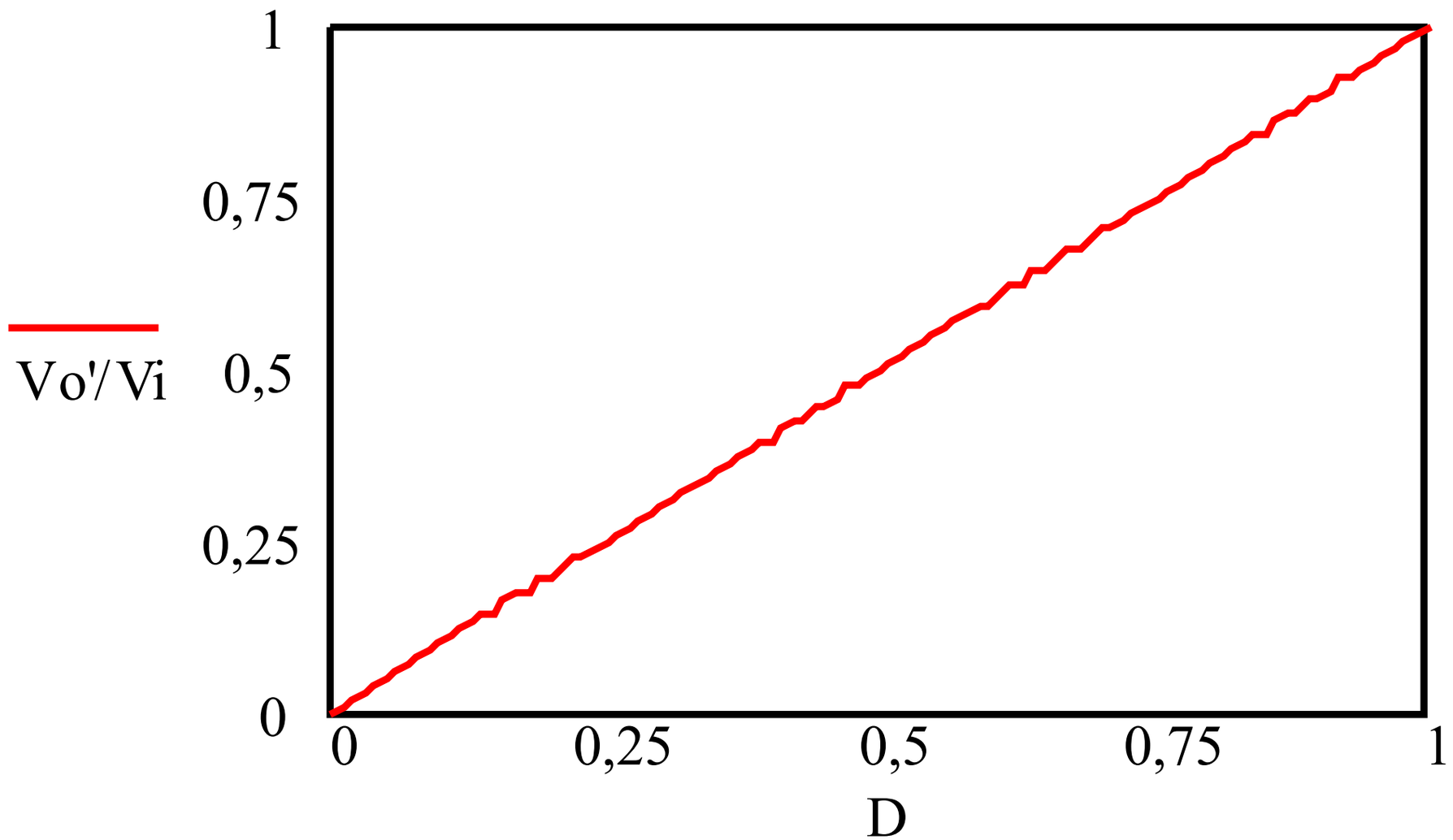
$$V_o^{'}=n\cdot V_o$$

$$\frac{V_o^{'}}{V_i}=D$$

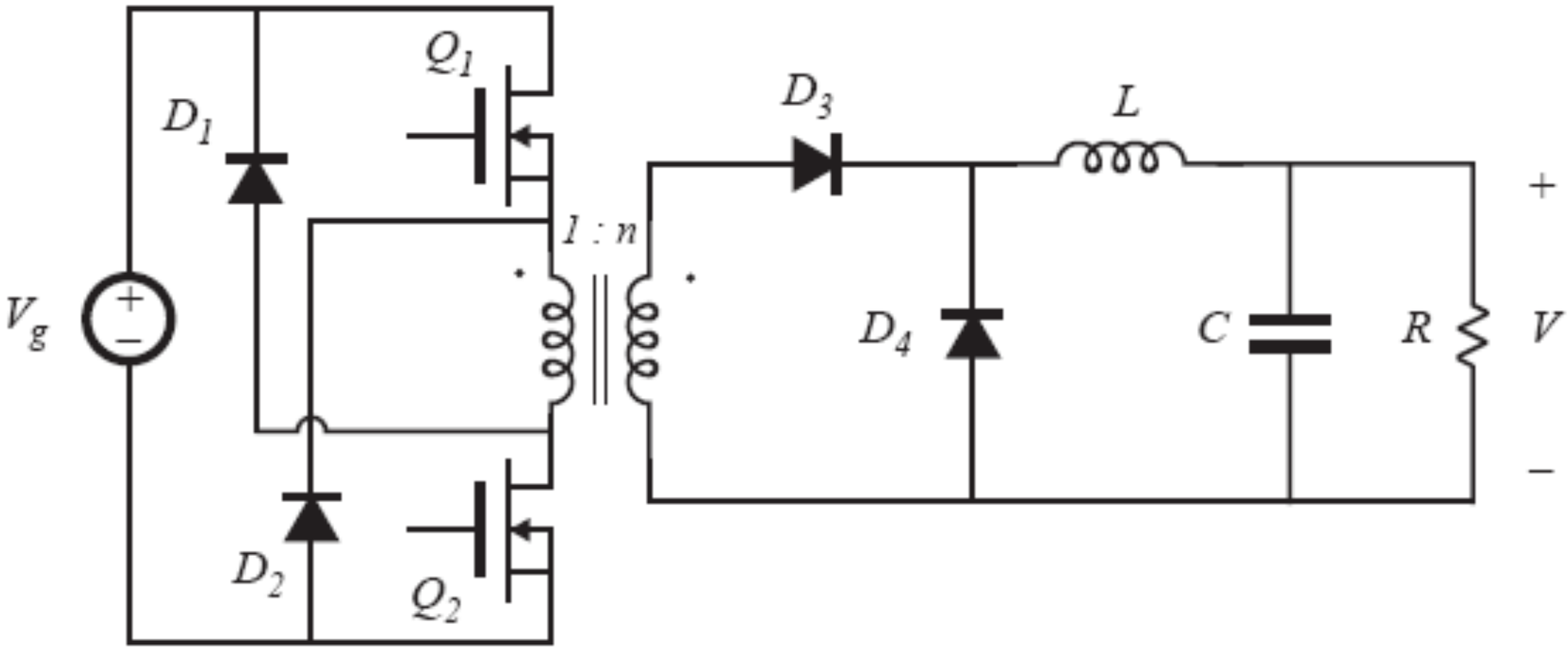


Conversor Forward

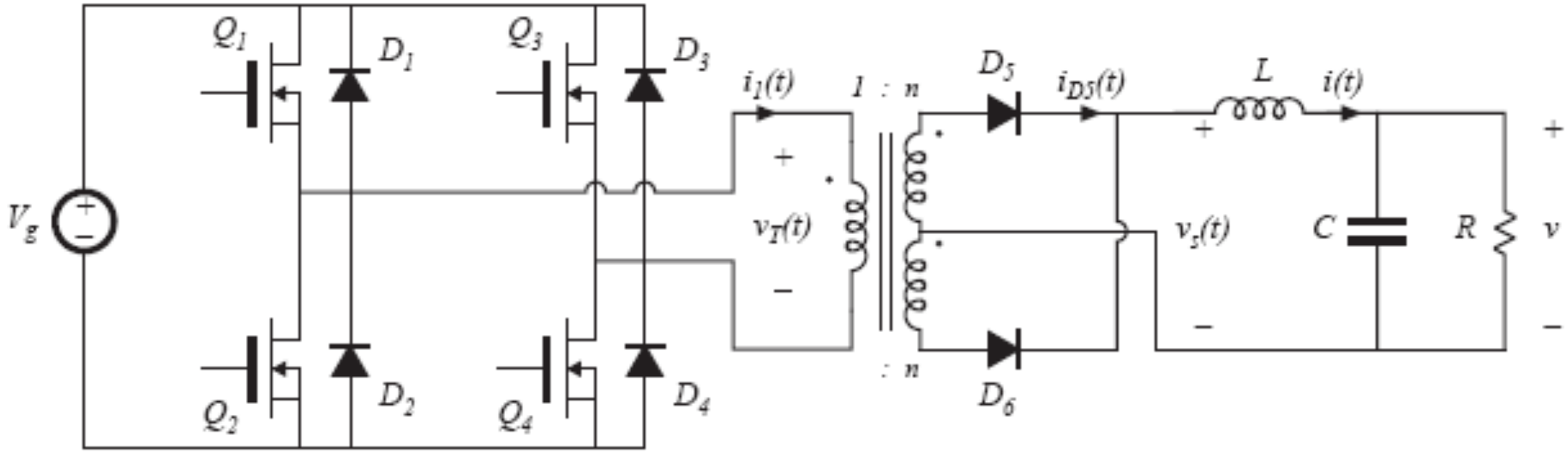
Ganho estático em função da razão cíclica:



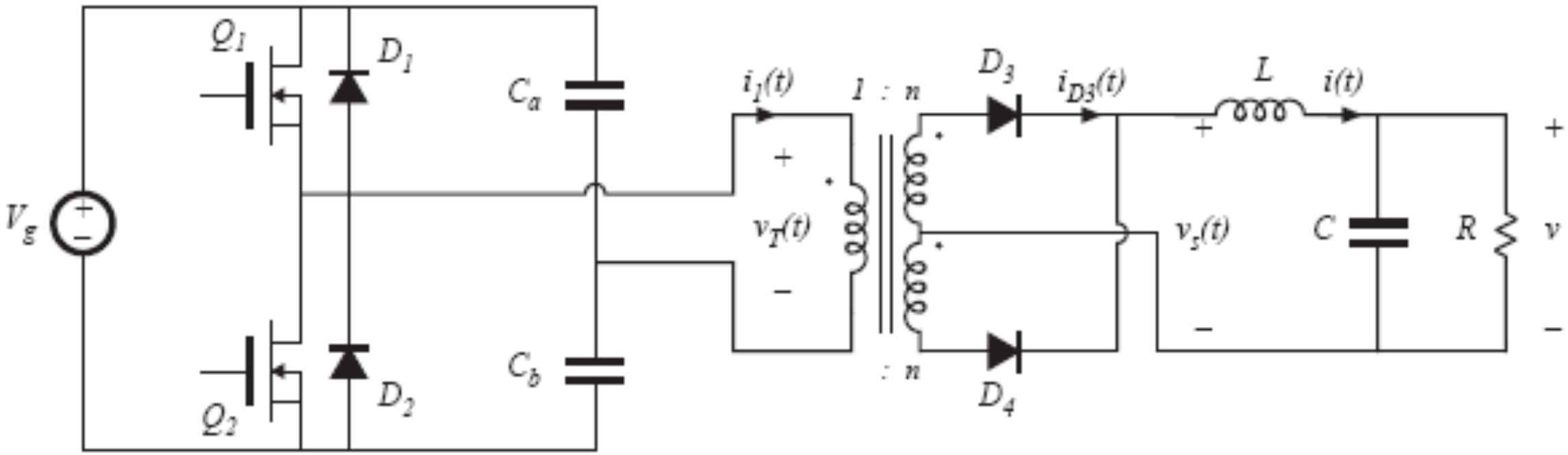
Conversor Forward com Dois Transistores



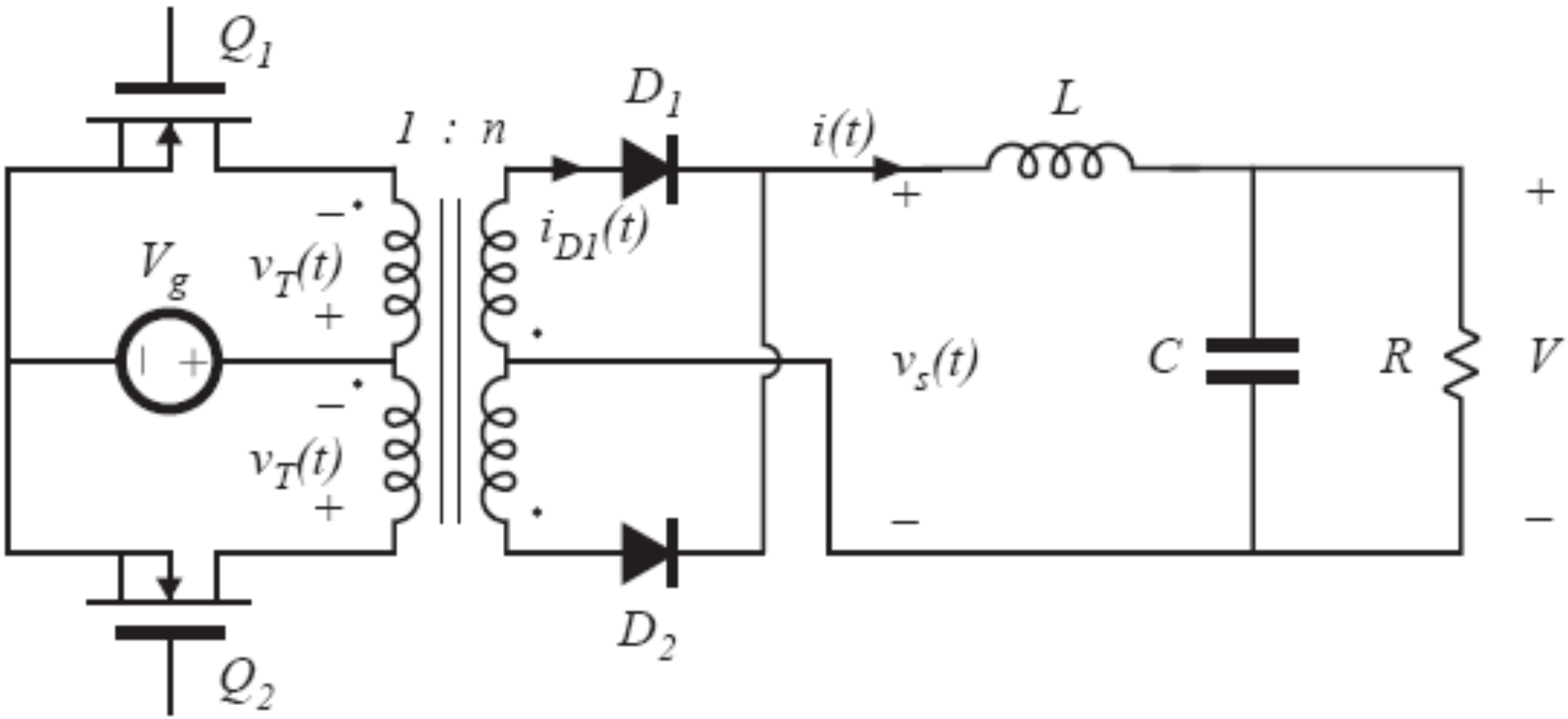
Conversor Ponte Completa Isolado



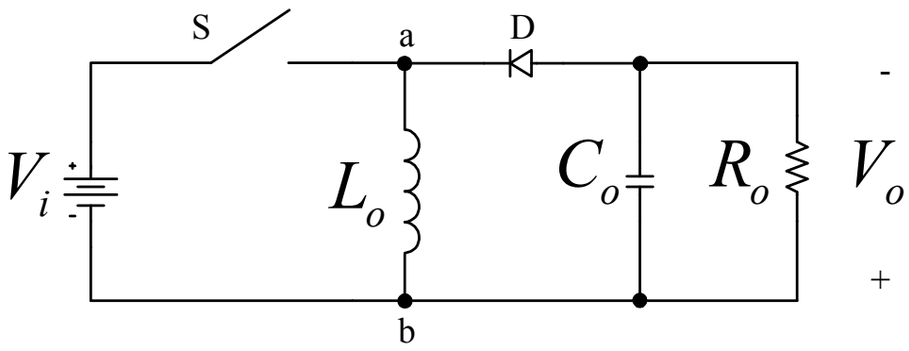
Conversor Meia Ponte Isolado

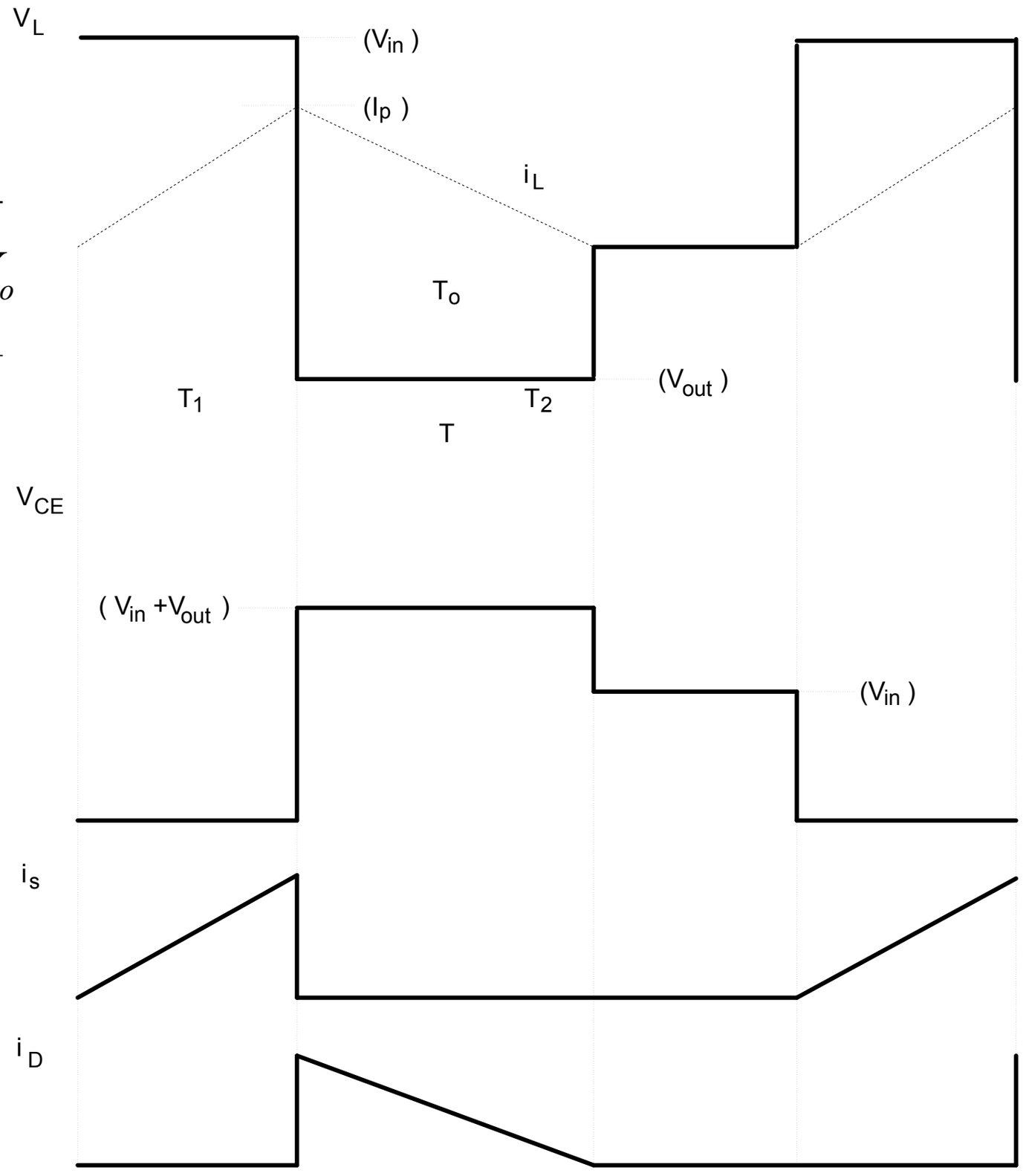


Conversor Push-Pull

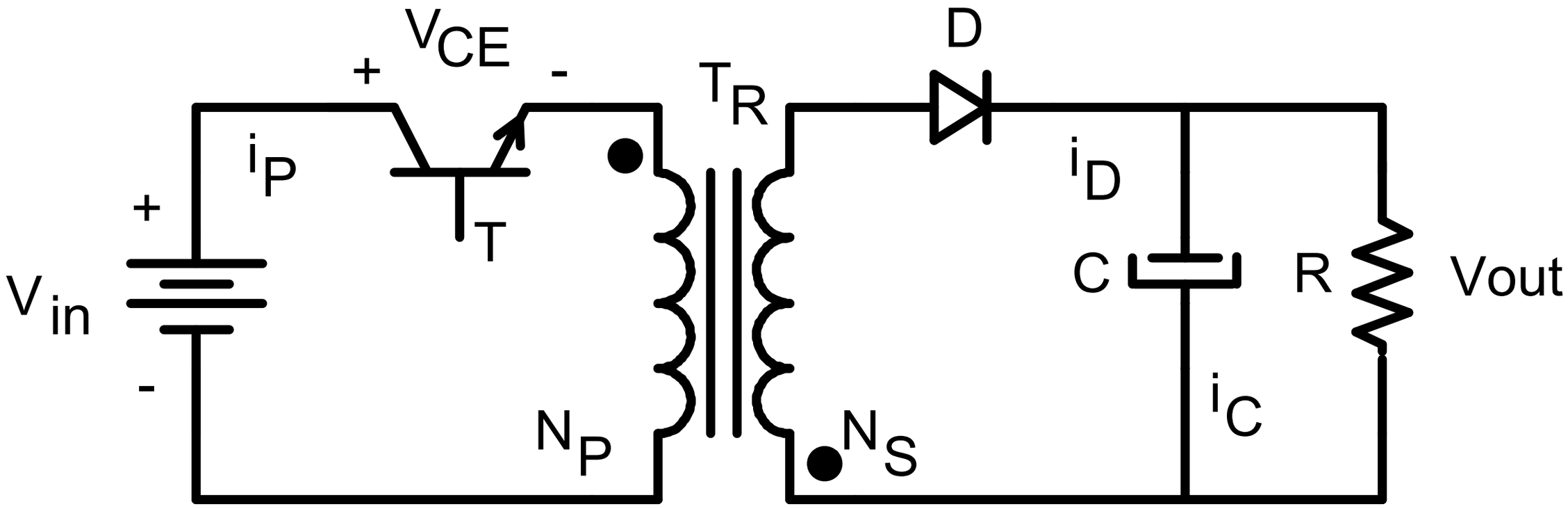


Conversor Flyback - Detalhamento

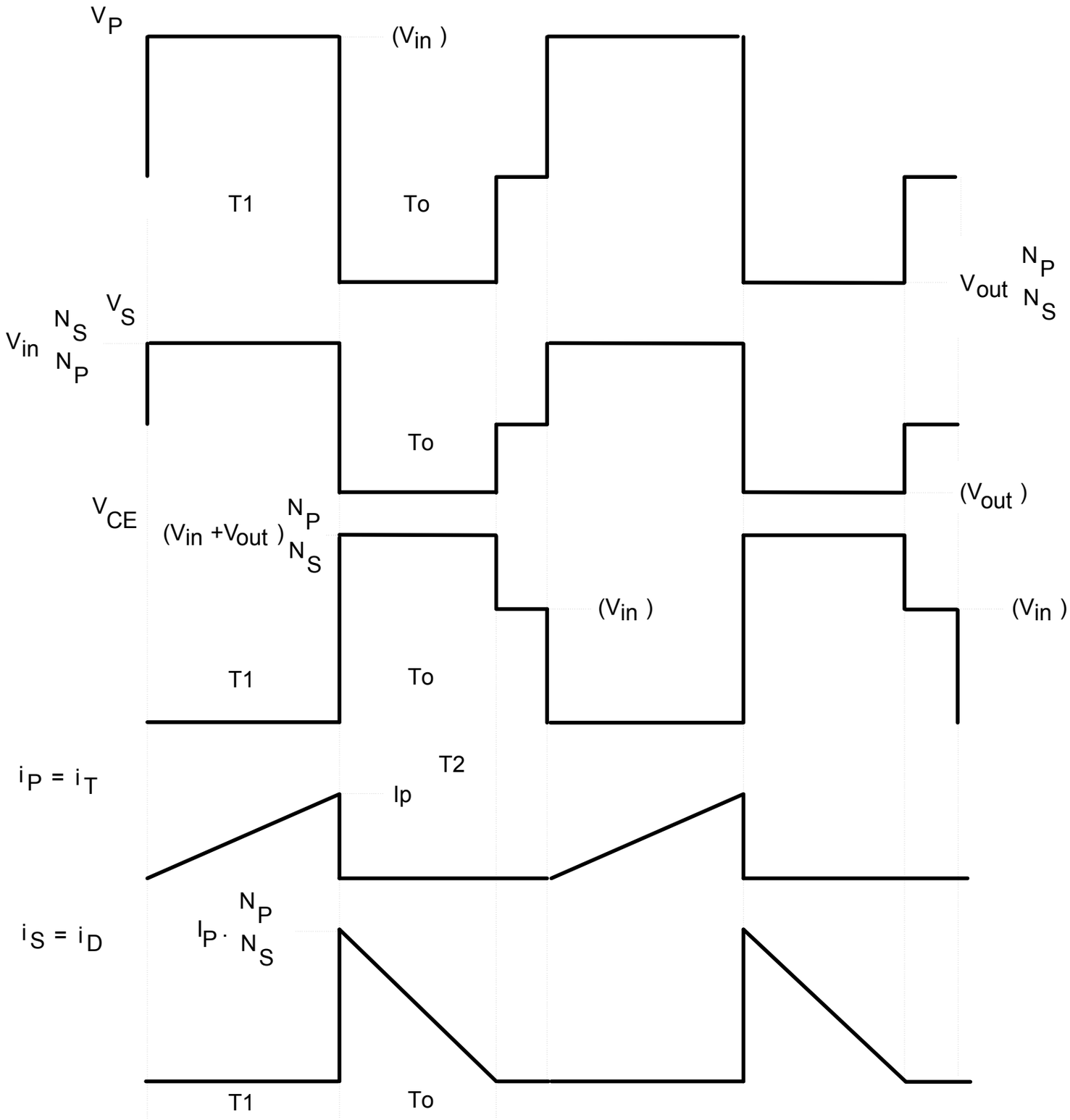




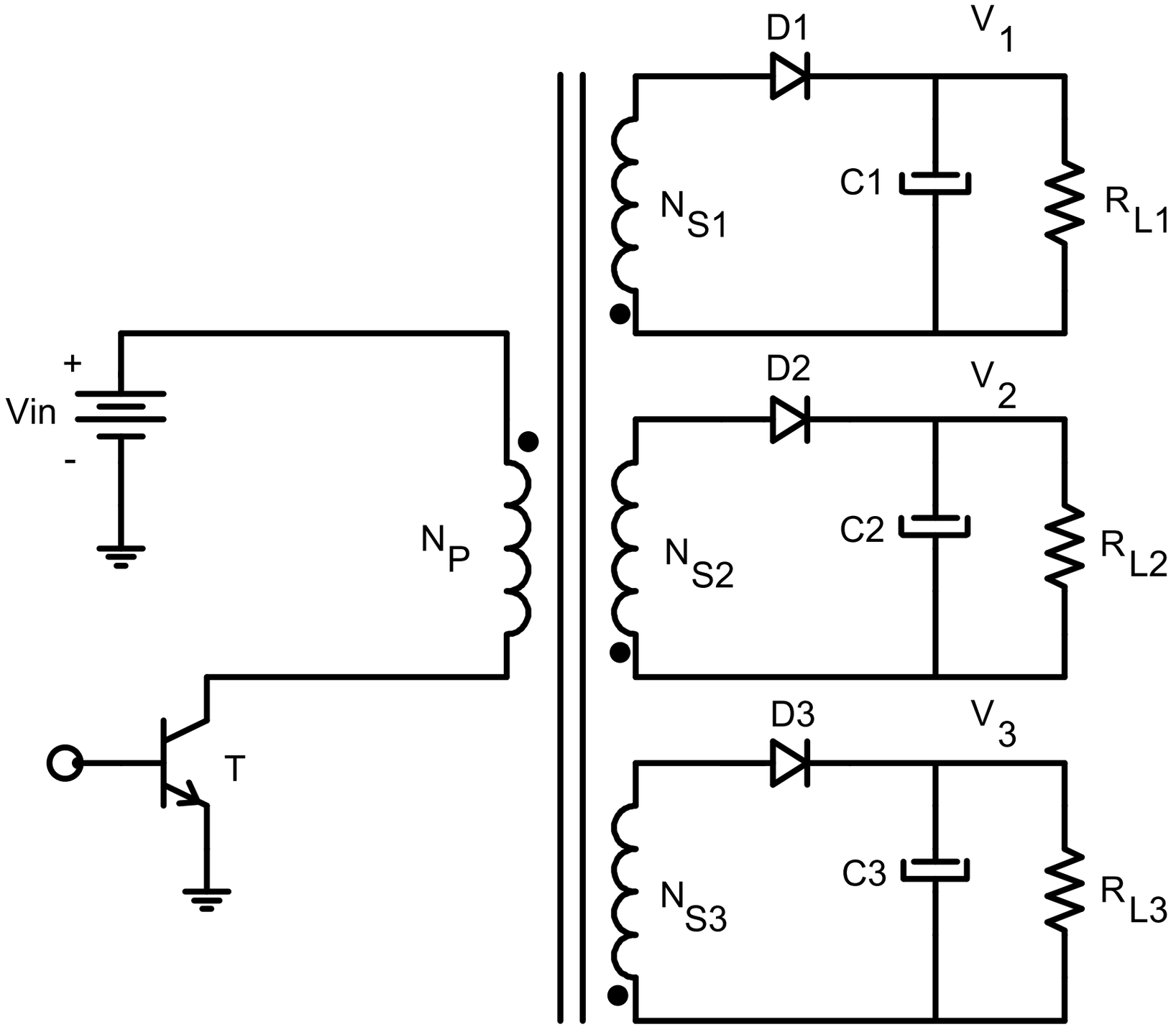
Conversor Flyback - Detalhamento



Conversor Flyback - Detalhamento



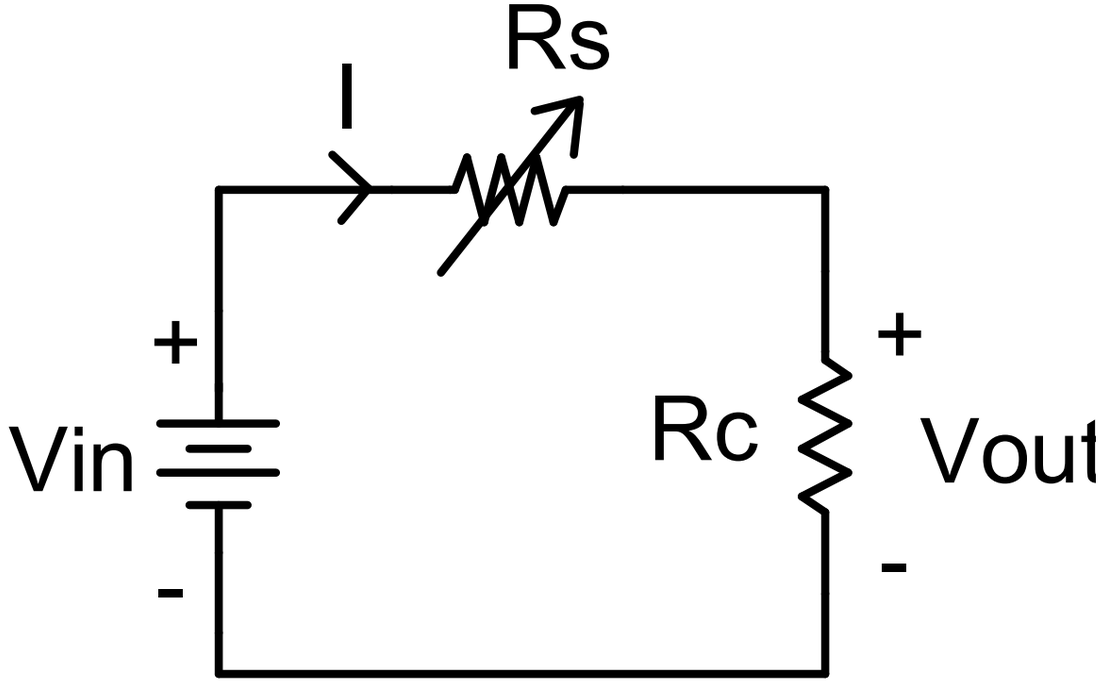
Conversor Flyback - Detalhamento



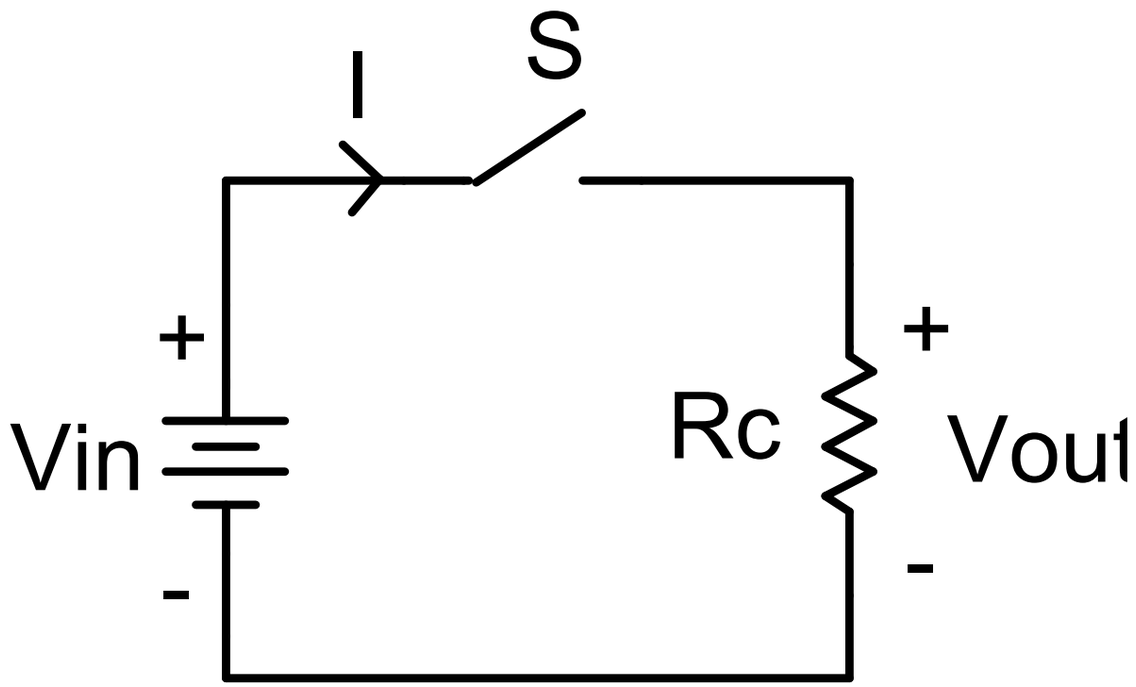
Fontes Lineares x Fontes Chaveadas

Fontes de tensão lineares e chaveadas:

- As fontes lineares convertem a tensão alternada da rede em tensões contínuas, normalmente de baixa amplitude, sem o uso de componentes chaveados (comutados);
- Fontes chaveadas exercem a mesma função, mas utilizando componentes comutados (chaveados).



Regulador linear



Regulador chaveado

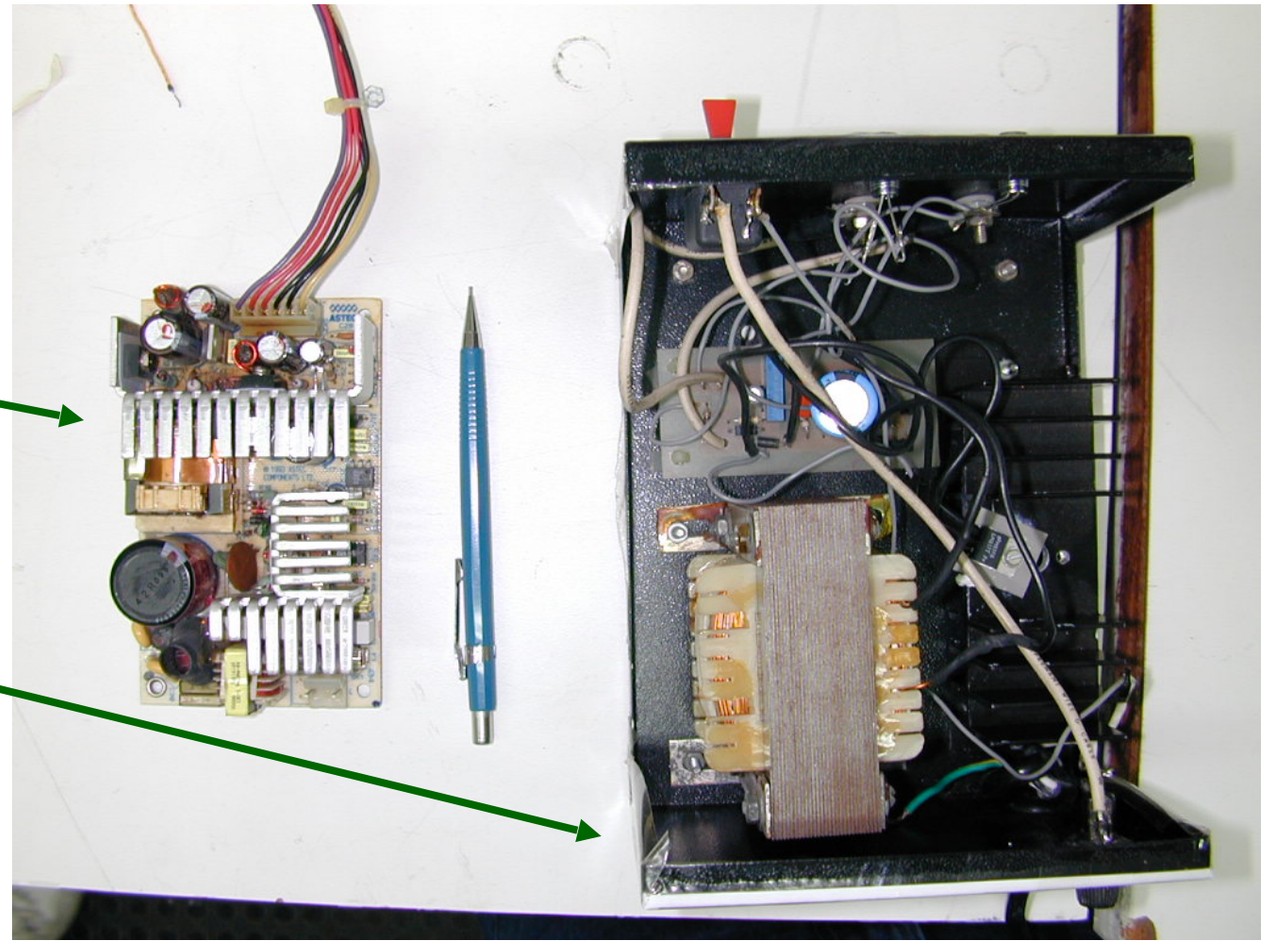
Fontes Lineares x Fontes Chaveadas

Fontes de tensão lineares x chaveadas:

- Fontes lineares: são mais robustas, simples e fáceis de projetar, podem ser mais baratas ou não, são muito volumosas e pesadas.
- Fontes chaveadas: não são tão robustas, mais difíceis de projetar e **consertar**, podem ser mais baratas ou não, são pequenas e leves.

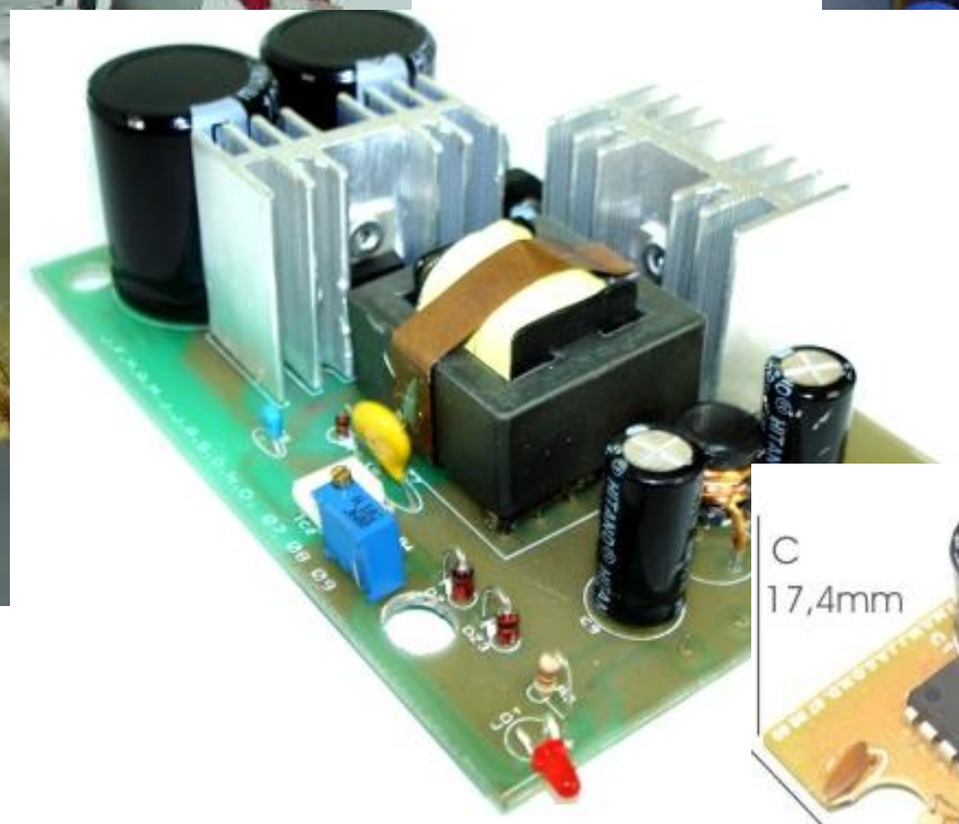
Fonte chaveada de 65 W

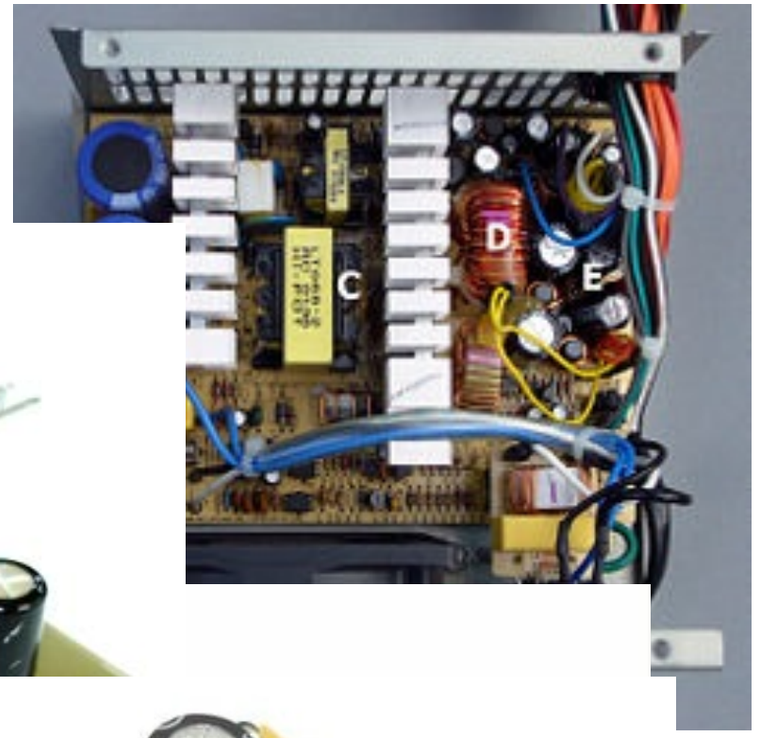
Fonte linear de 29 W



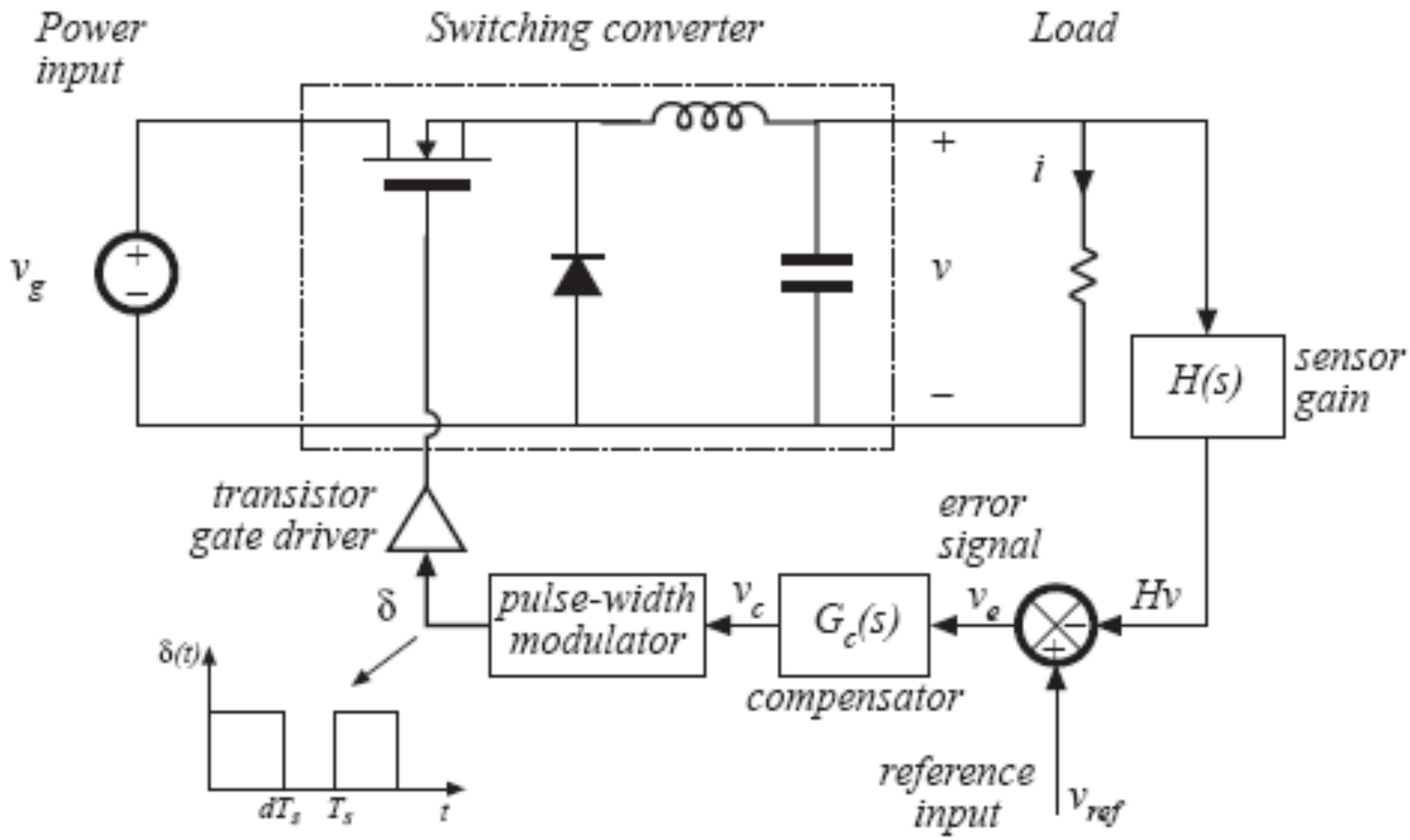
http://www.priberam.pt/

Fontes Chaveadas

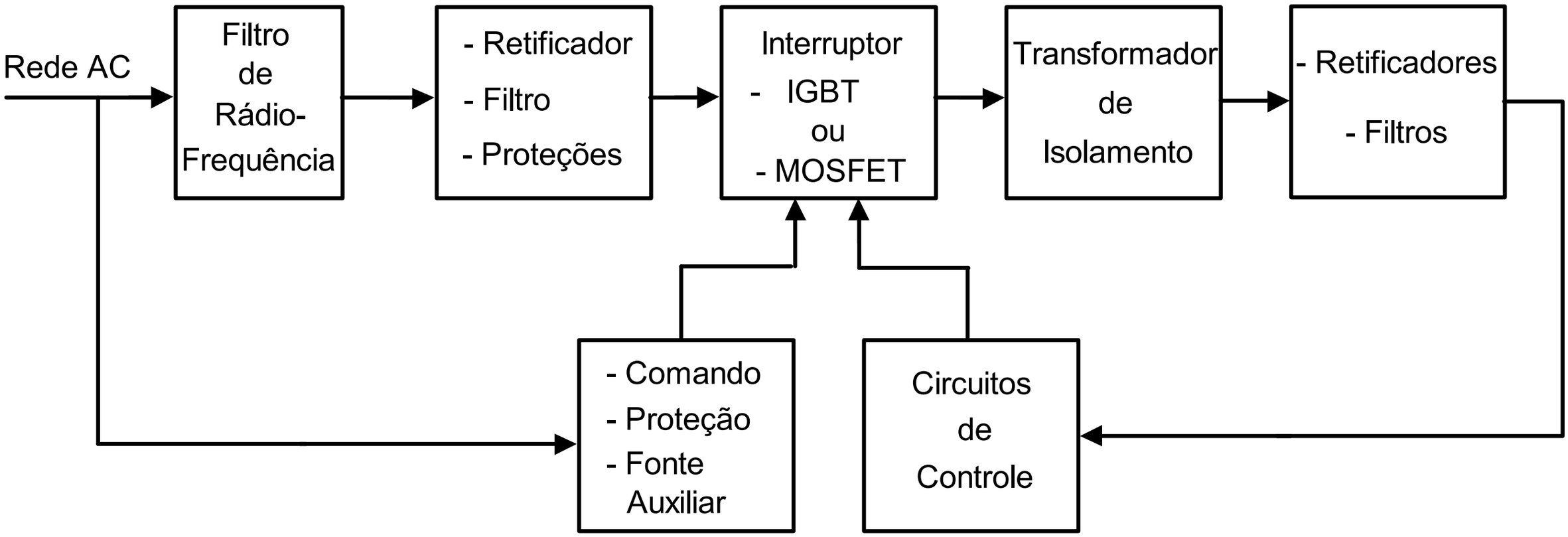




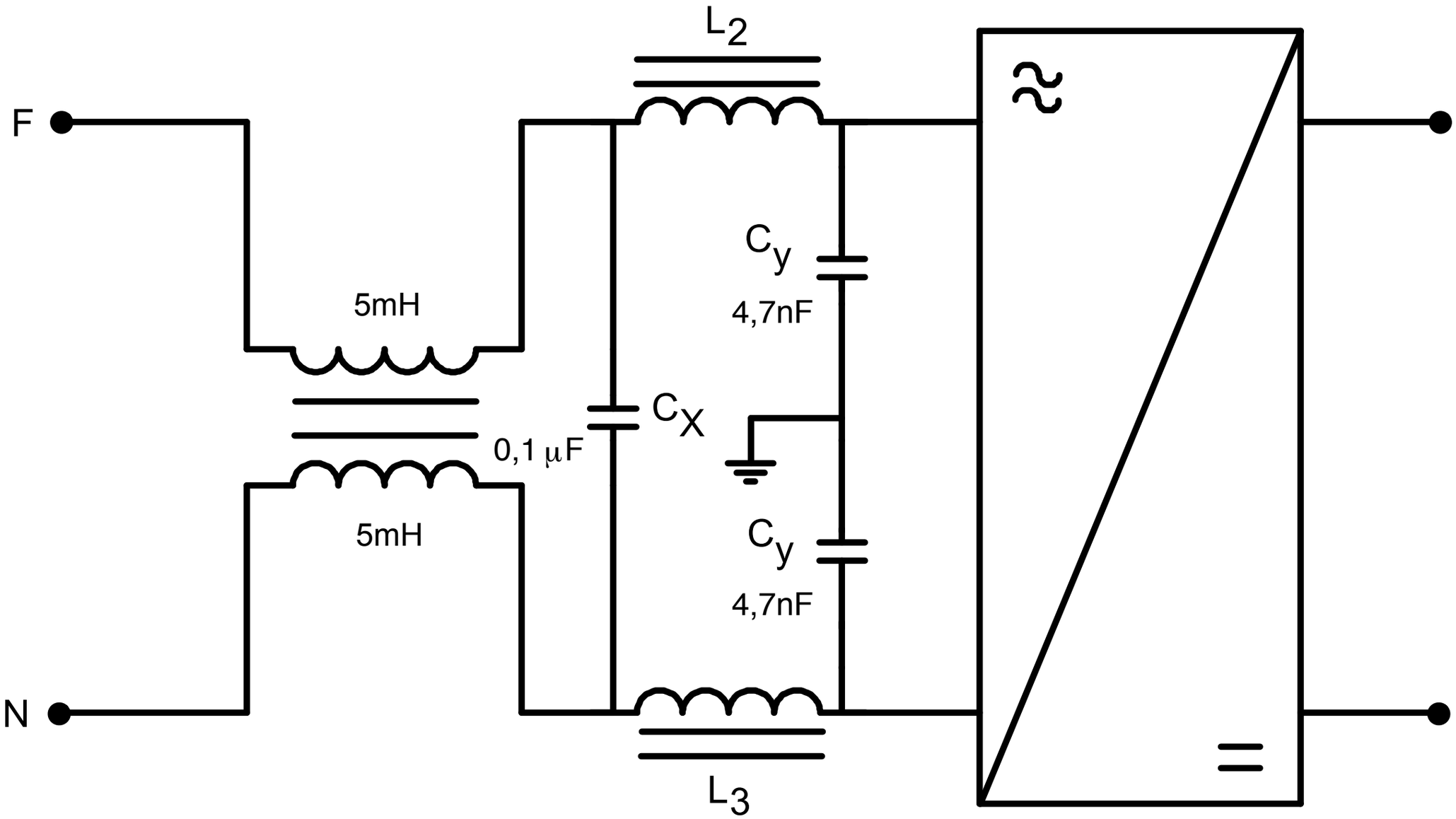
Fontes Chaveadas - Diagrama de Blocos



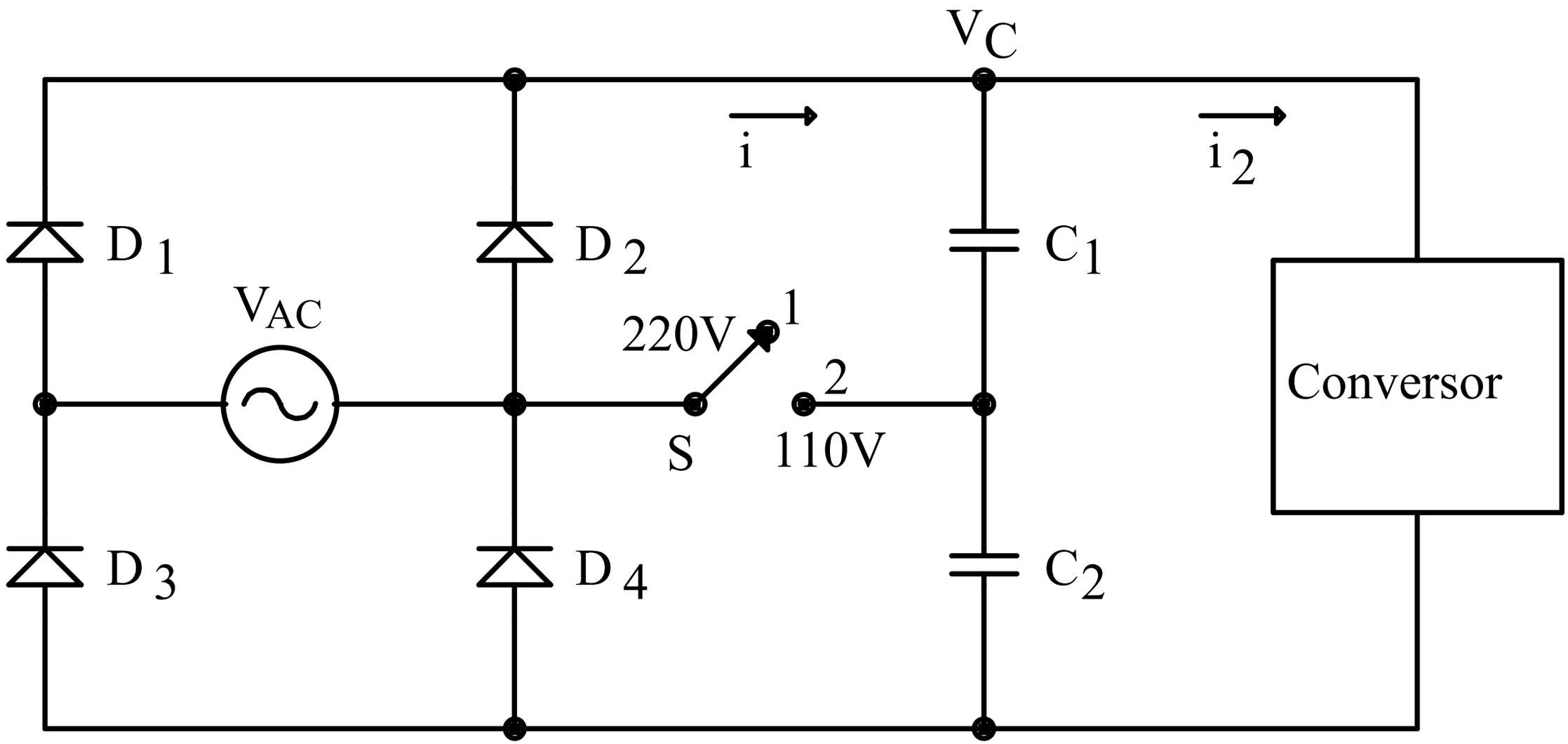
Fontes Chaveadas - Diagrama de Blocos



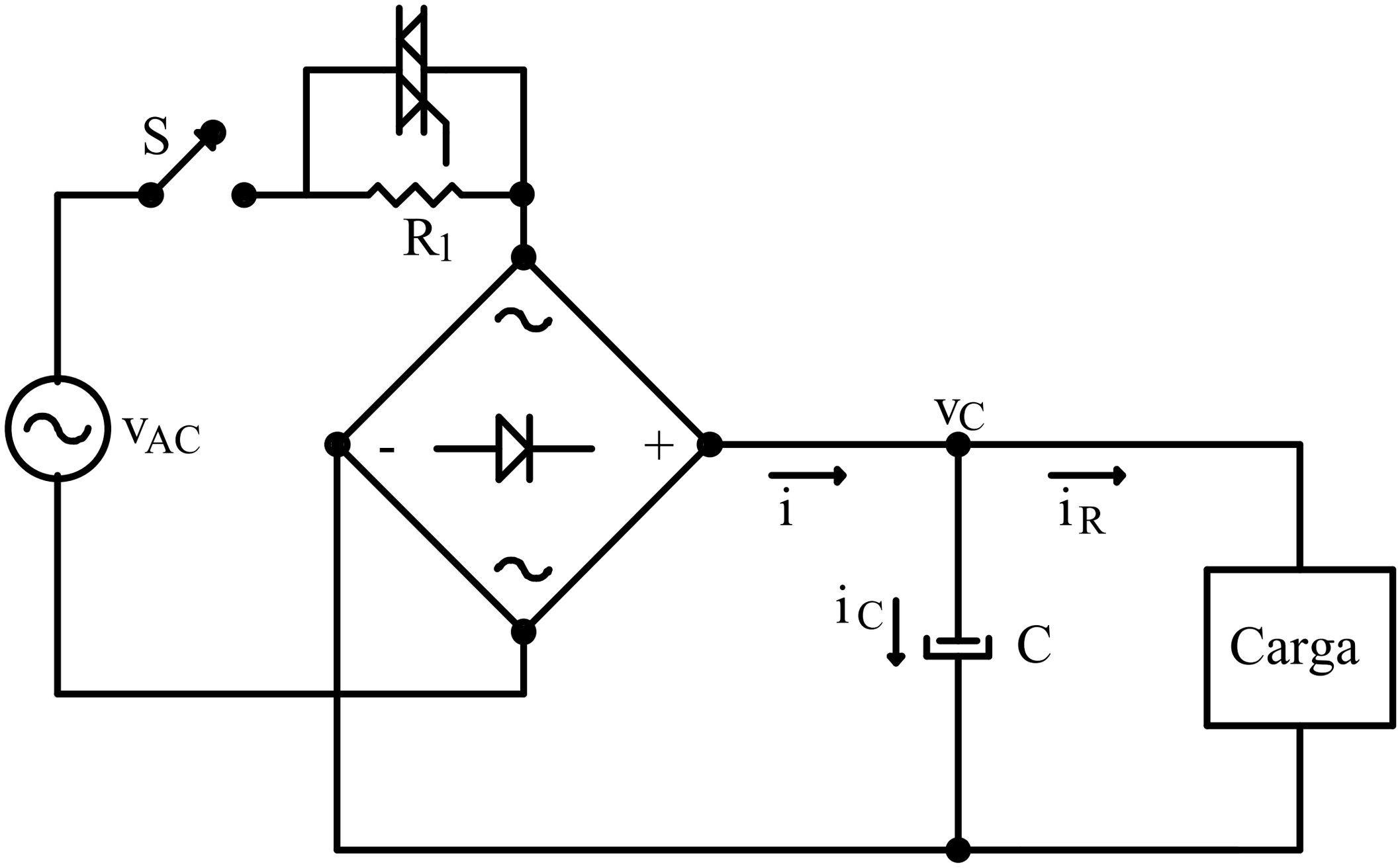
Fontes Chaveadas - Filtro de EMI



Fontes Chaveadas - Retificador de Entrada



Fontes Chaveadas - Retificador de Entrada



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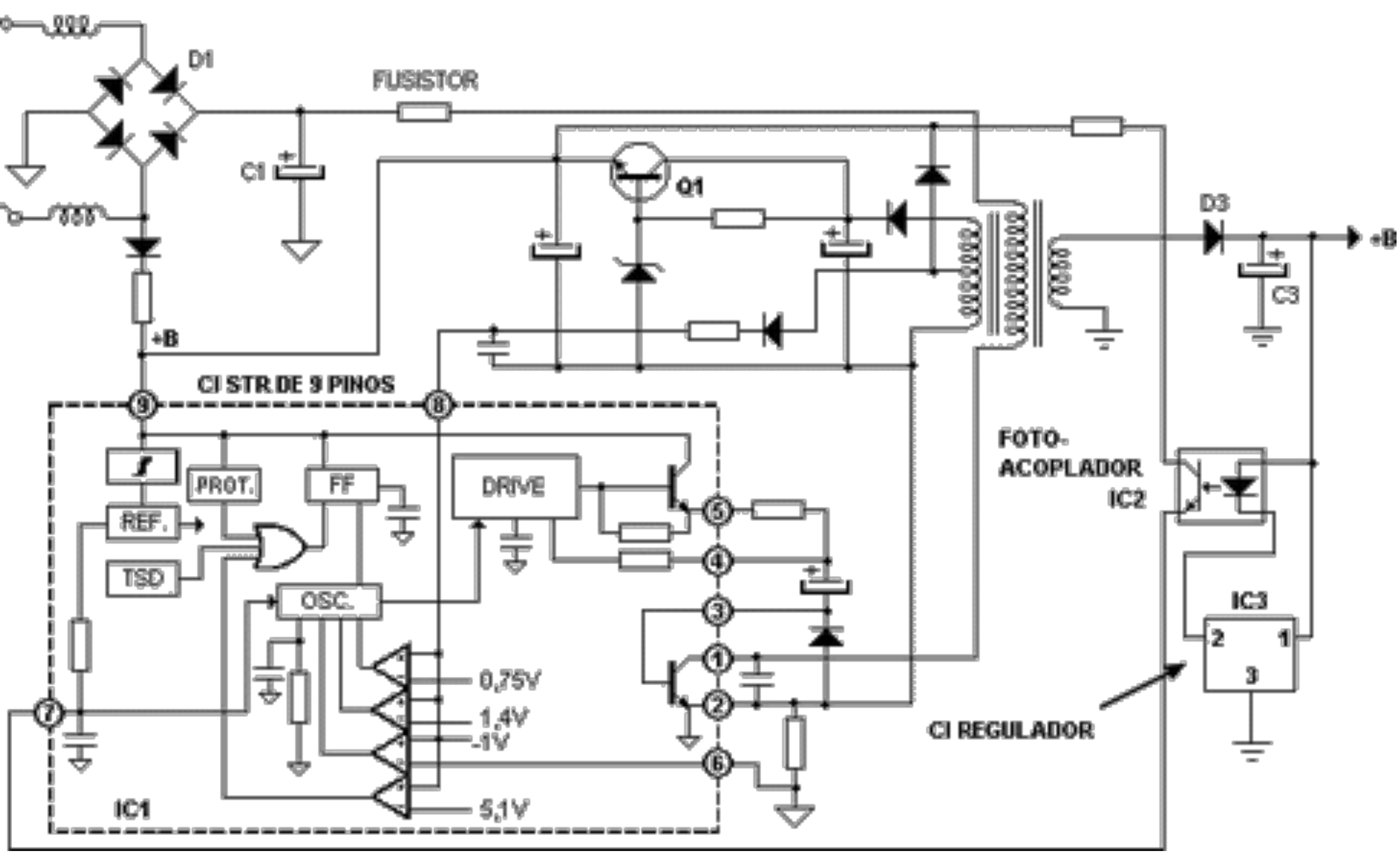
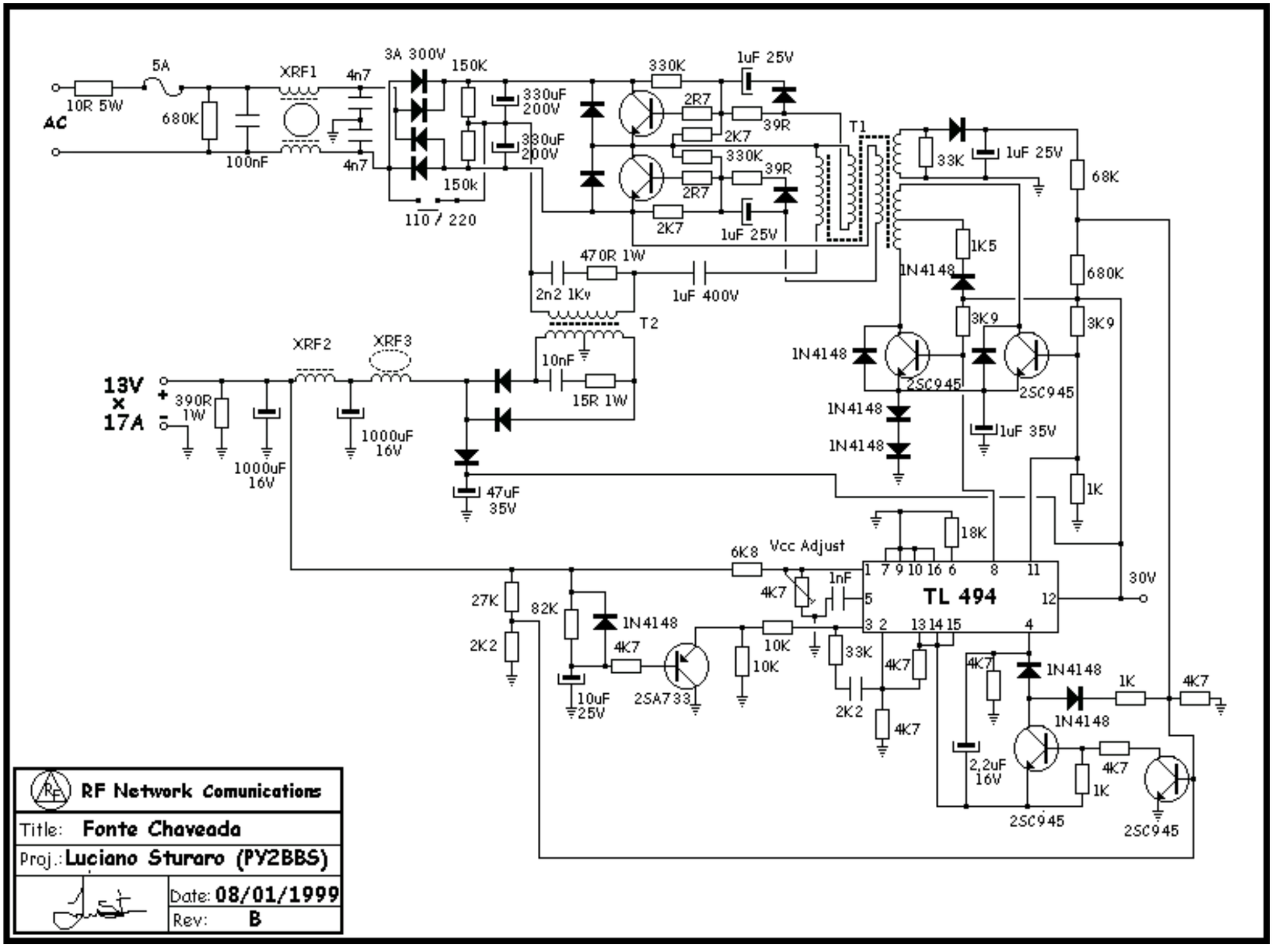
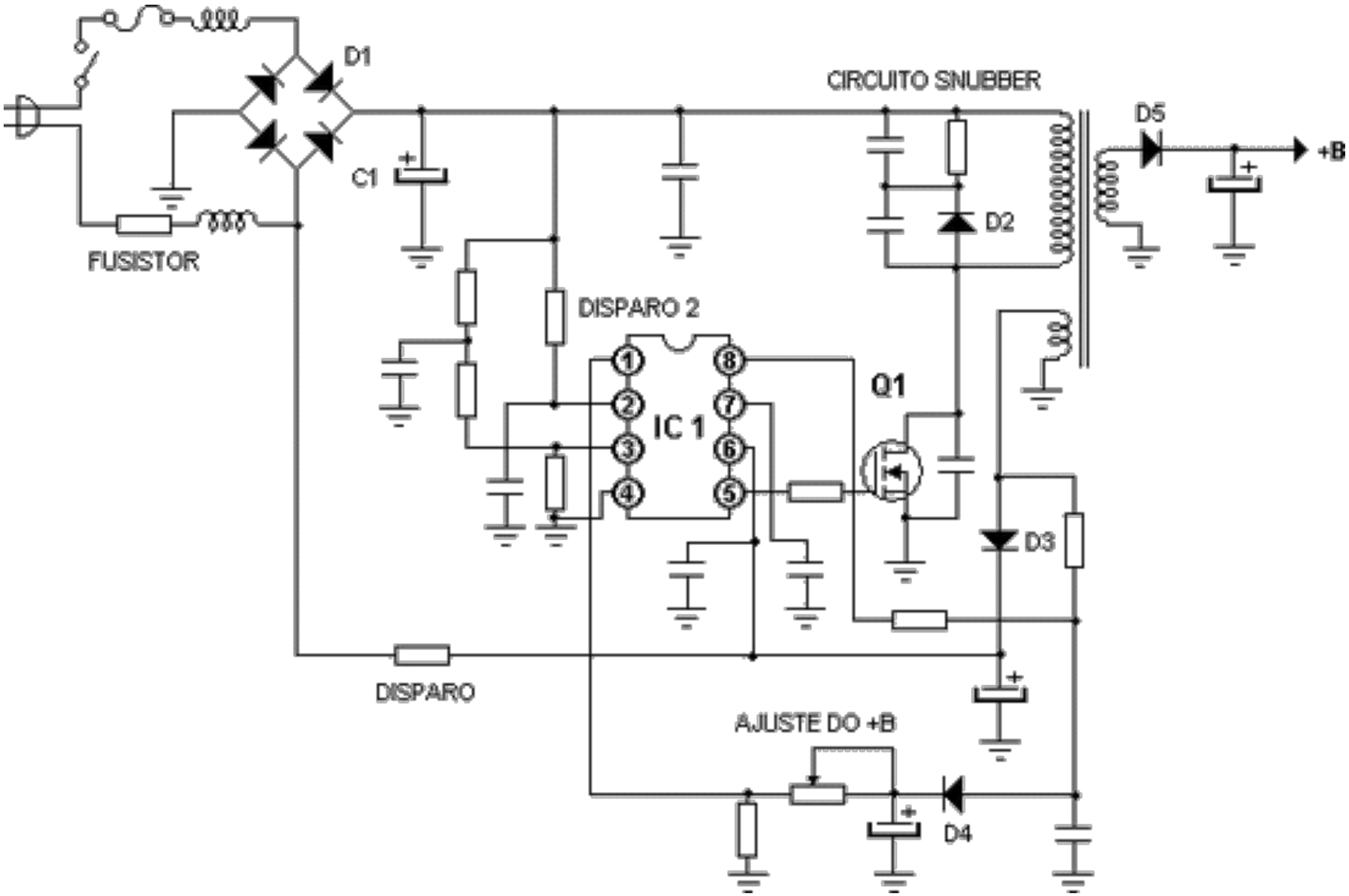
Fontes Chaveadas - Circuitos Eletrônicos



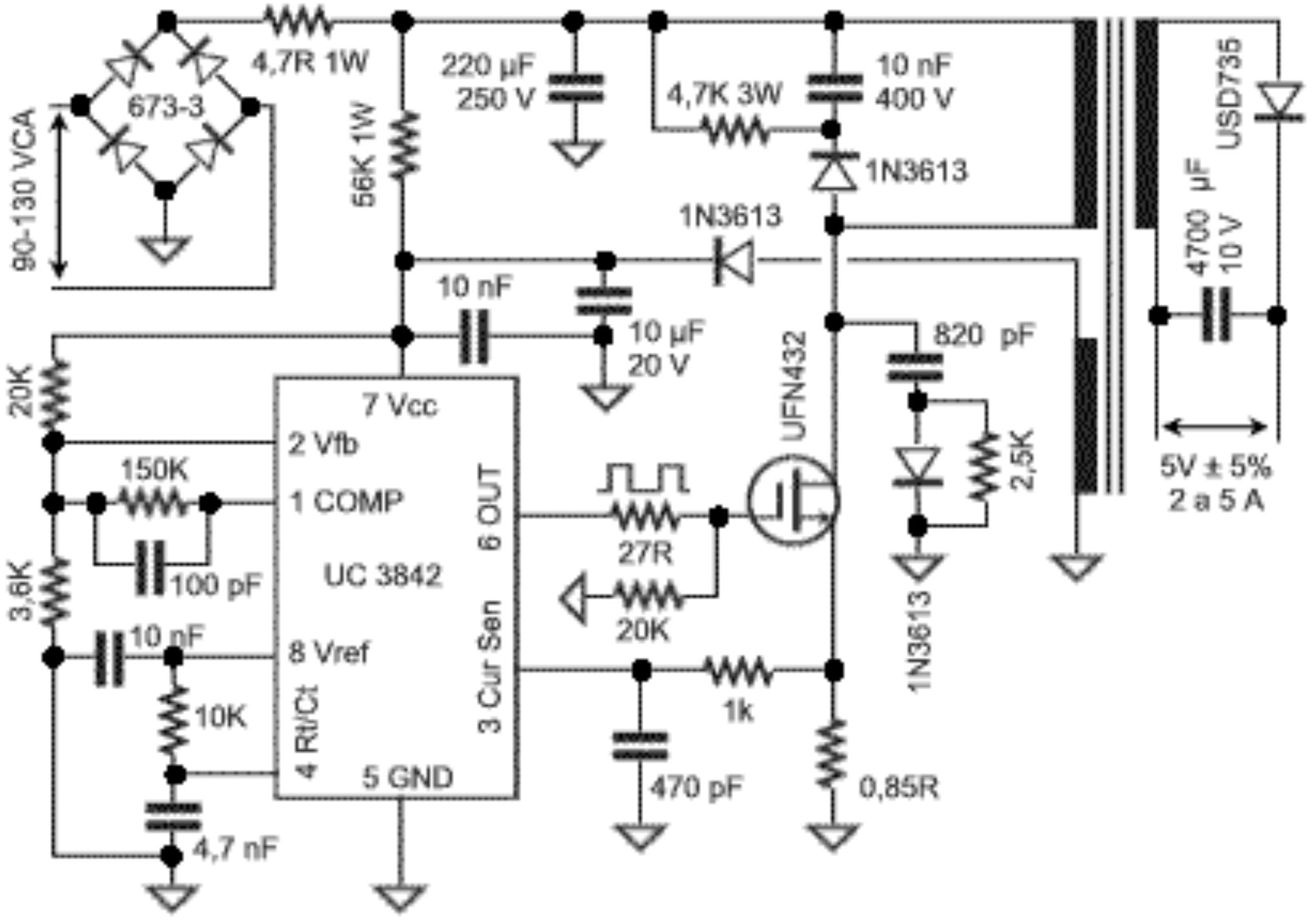
Fontes Chaveadas - Circuitos Eletrônicos



Fontes Chaveadas - Circuitos Eletrônicos



Fontes Chaveadas - Circuitos Eletrônicos



Fontes Chaveadas - Circuitos Integrados Dedicados

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FAIRCHILD
SEMICONDUCTOR®

www.fairchildsemi.com

UC3842/UC3843/UC3844/UC3845

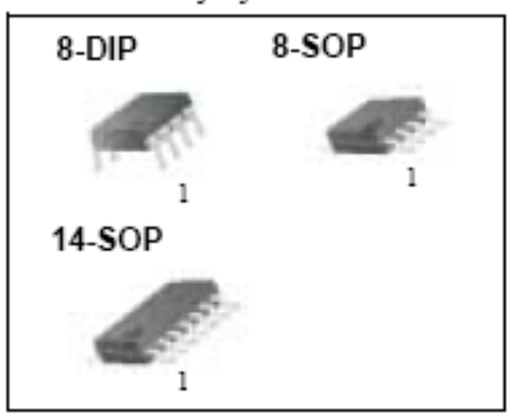
SMPS Controller

Features

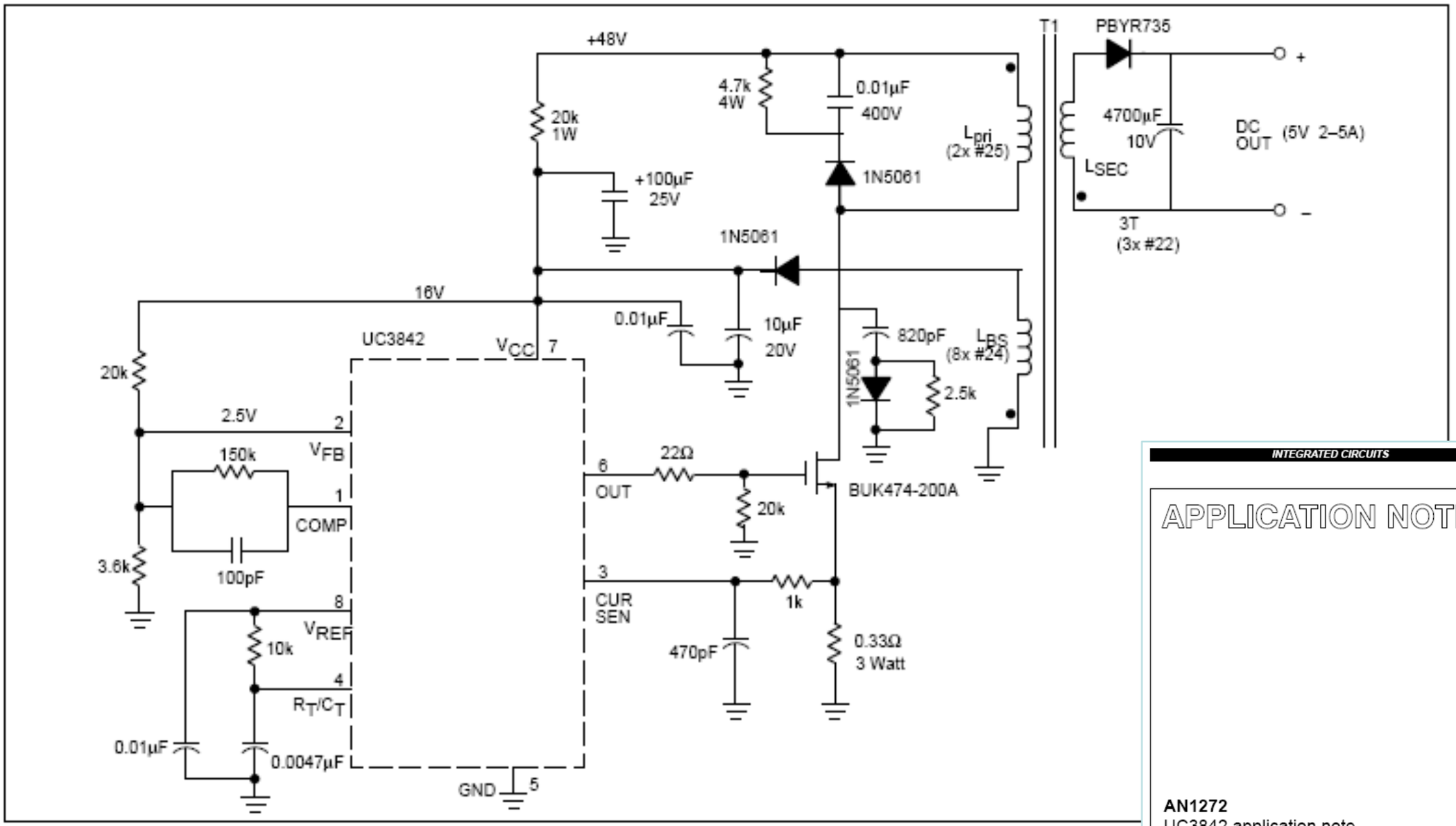
- Low Start up Current
- Maximum Duty Clamp
- UVLO With Hysteresis
- Operating Frequency up to 500KHz

Description

The UC3842/UC3843/UC3844/UC3845 are fixed frequencycurrent-mode PWM controller. They are specially designed for Off-Line and DC to DC converter applications with minimum external components. These integrated circuits feature a trimmed oscillator for precise duty cycle control, a temperature compensated reference, high gain error amplifier, current sensing comparator and a high current totempole output for driving a Power MOSFET. The UC3842 and UC3844 have UVLO thresholds of 16V (on) and 10V (off). The UC3843 and UC3845 are 8.5V(on) and 7.9V (off). The UC3842 and UC3843 can operate within 100% duty cycle. The UC3844 and UC3845 can operate with 50% duty cycle.



Fontes Chaveadas - Circuitos Integrados Dedicados



INTEGRATED CIRCUITS

APPLICATION NOTE

AN1272
UC3842 application note

Author: Lester J. Hadley, Jr.

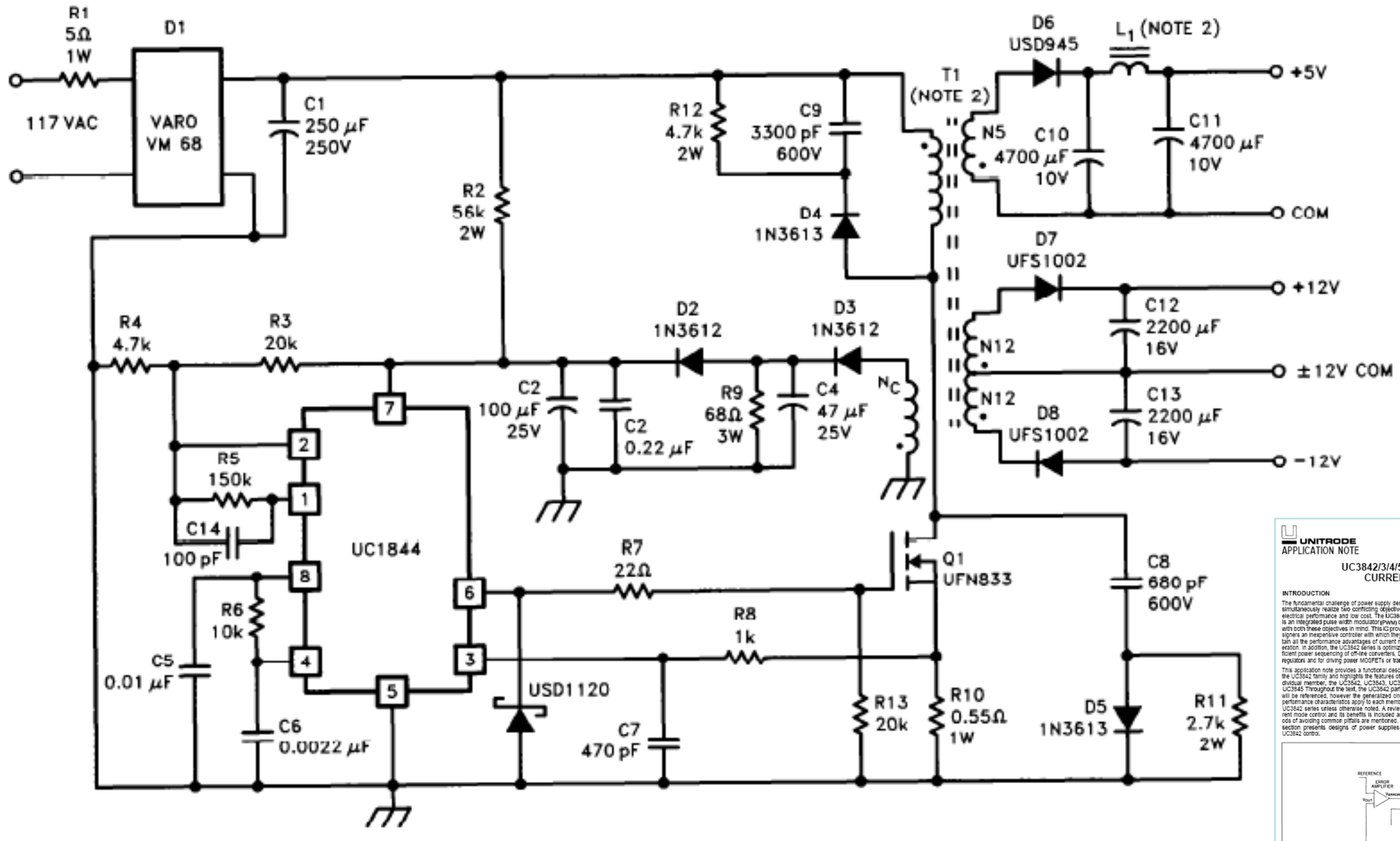
1991 Dec
Rev 1: 1996 Apr

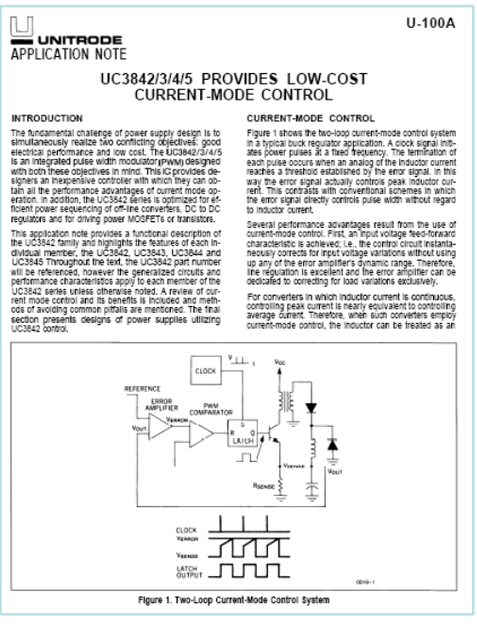
Philips Semiconductors

PHILIPS

AN1272

Fontes Chaveadas - Circuitos Integrados Dedicados





U-100A

UNITRODE
APPLICATION NOTE

UC3842/3/4/5 PROVIDES LOW-COST CURRENT-MODE CONTROL

INTRODUCTION

The fundamental challenge of power supply design is to simultaneously realize two conflicting objectives: good electrical performance and low cost. The UC3842/3/4/5 is an integrated pulse width modulator (PWM) designed with both these objectives in mind. This IC provides designers an inexpensive controller with which they can obtain all the performance advantages of current mode operation. In addition, the UC3842 series is optimized for efficient power sequencing of off-line converters, DC to DC regulators and for driving power MOSFETs or transistors.

This application note provides a functional description of the UC3842 family and highlights the features of each individual member, the UC3842, UC3843, UC3844 and UC3845. Throughout the text, the UC3842 part number will be referenced, however the generalized circuits and performance characteristics apply to each member of the UC3842 series unless otherwise noted. A review of current mode control and its benefits is included and methods of avoiding common pitfalls are mentioned. The final section presents designs of power supplies utilizing UC3842 control.

CURRENT-MODE CONTROL

Figure 1 shows the two-loop current-mode control system in a typical buck regulator application. A clock signal initiates power pulses at a fixed frequency. The termination of each pulse occurs when an analog of the inductor current reaches a threshold established by the error signal. In this way the error signal actually controls peak inductor current. This contrasts with conventional schemes in which the error signal directly controls pulse width without regard to inductor current.

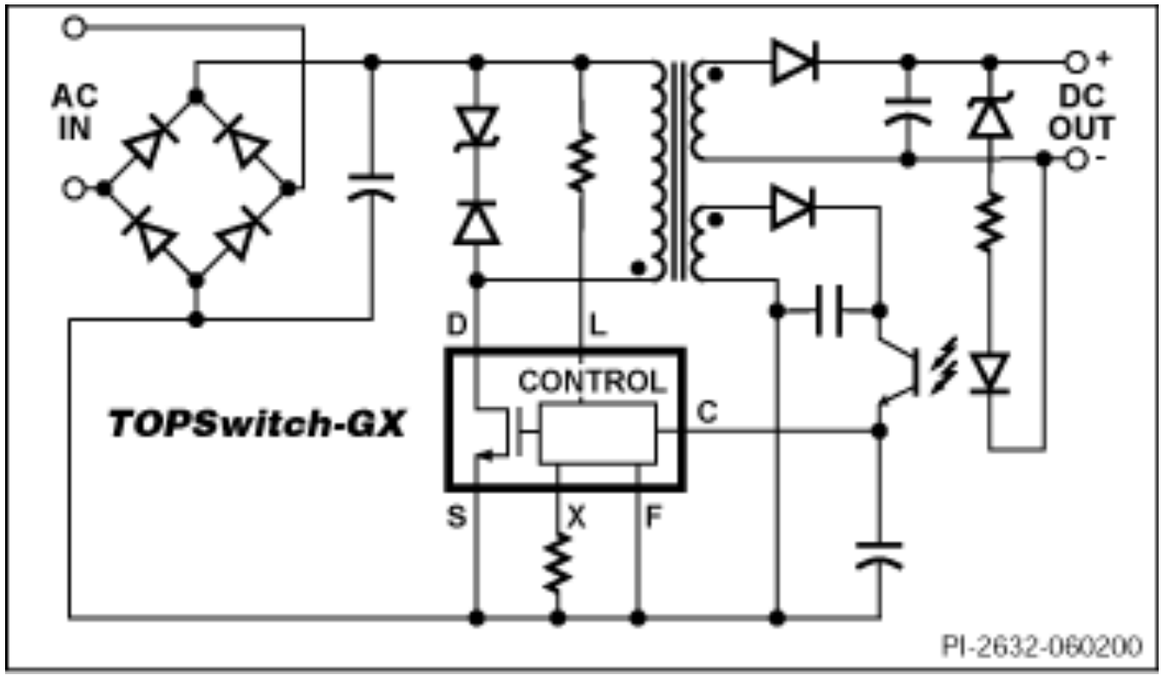
Several performance advantages result from the use of current-mode control. First, an input voltage feed-forward characteristic is achieved; i.e., the control circuit instantaneously corrects for input voltage variations without using up any of the error amplifier's dynamic range. Therefore, line regulation is excellent and the error amplifier can be dedicated to correcting for load variations exclusively.

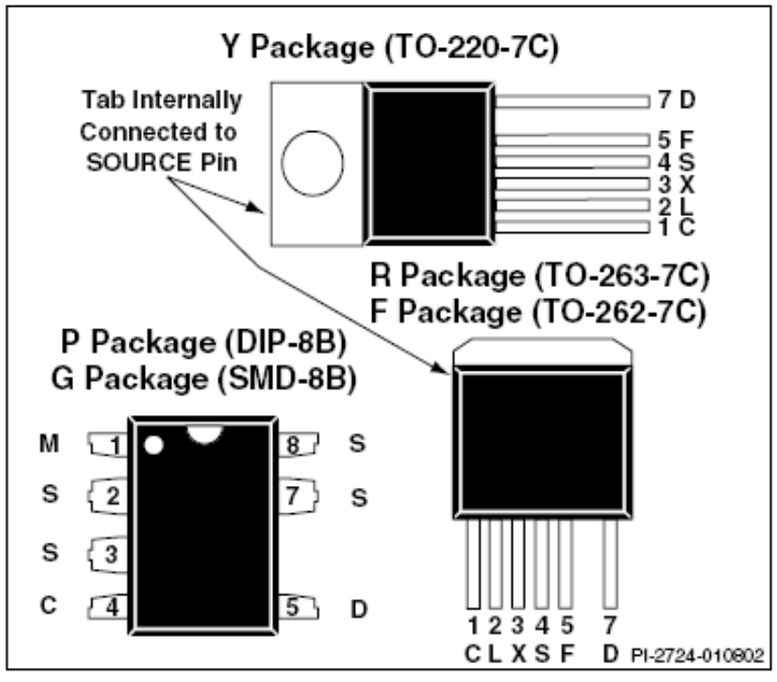
For converters in which inductor current is continuous, controlling peak current is nearly equivalent to controlling average current. Therefore, when such converters employ current-mode control, the inductor can be treated as an

Figure 1. Two-Loop Current-Mode Control System

slua143

Fontes Chaveadas - Circuitos Integrados Dedicados

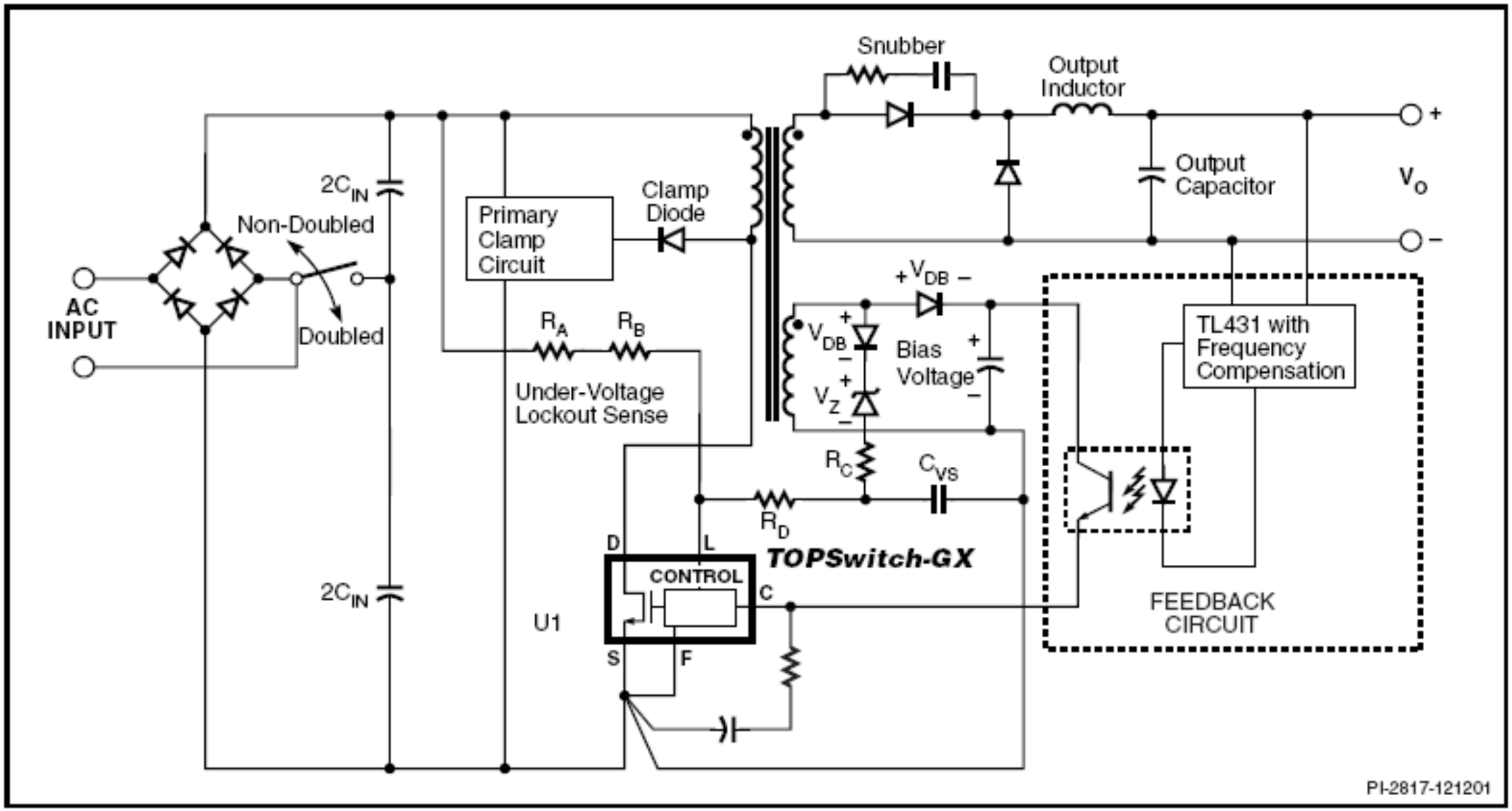




OUTPUT POWER TABLE				
PRODUCT[3]	230 VAC ±15%[4]		85-265 VAC	
	Adapter[1]	Open Frame[2]	Adapter[1]	Open Frame[2]
TOP242 P or G	9 W	15 W	6.5 W	10 W
TOP242 R	15 W	22 W	11 W	14 W
TOP242 Y or F	10 W	22 W	7 W	14 W
TOP243 P or G	13 W	25 W	9 W	15 W
TOP243 R	29 W	45 W	17 W	23 W
TOP243 Y or F	20 W	45 W	15 W	30 W
TOP244 P or G	16 W	28 W	11 W	20 W
TOP244 R	34 W	50 W	20 W	28 W
TOP244 Y or F	30 W	65 W	20 W	45 W
TOP245 P or G	19 W	30 W	13 W	22 W
TOP245 R	37 W	57 W	23 W	33 W
TOP245 Y or F	40 W	85 W	26 W	60 W
TOP246 P or G	21 W	34 W	15 W	26 W
TOP246 R	40 W	64 W	26 W	38 W
TOP246 Y or F	60 W	125 W	40 W	90 W
TOP247 R	42 W	70 W	28 W	43 W
TOP247 Y or F	85 W	165 W	55 W	125 W
TOP248 R	43 W	75 W	30 W	48 W
TOP248 Y or F	105 W	205 W	70 W	155 W
TOP249 R	44 W	79 W	31 W	53 W
TOP249 Y or F	120 W	250 W	80 W	180 W
TOP250 R	45 W	82 W	32 W	55 W
TOP250 Y or F	135 W	290 W	90 W	210 W

http://www.powerint.com

Fontes Chaveadas - Circuitos Integrados Dedicados



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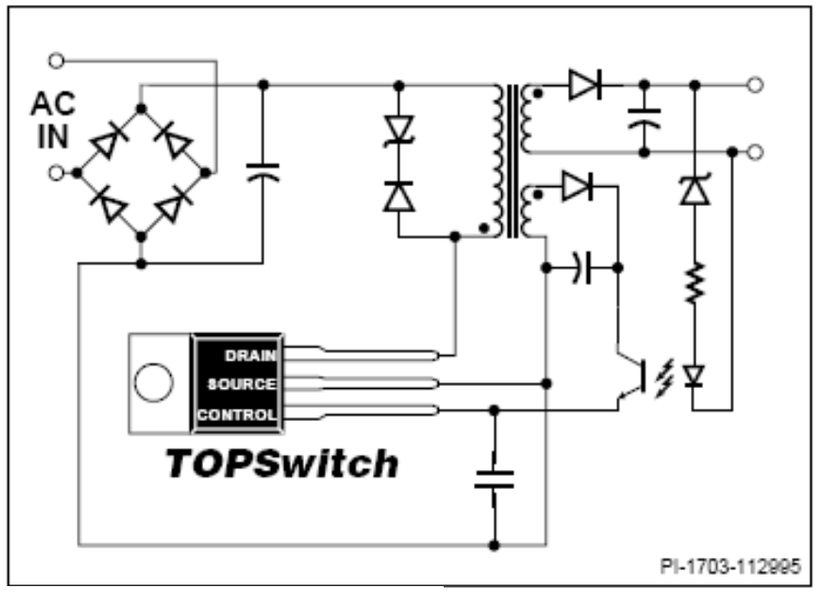
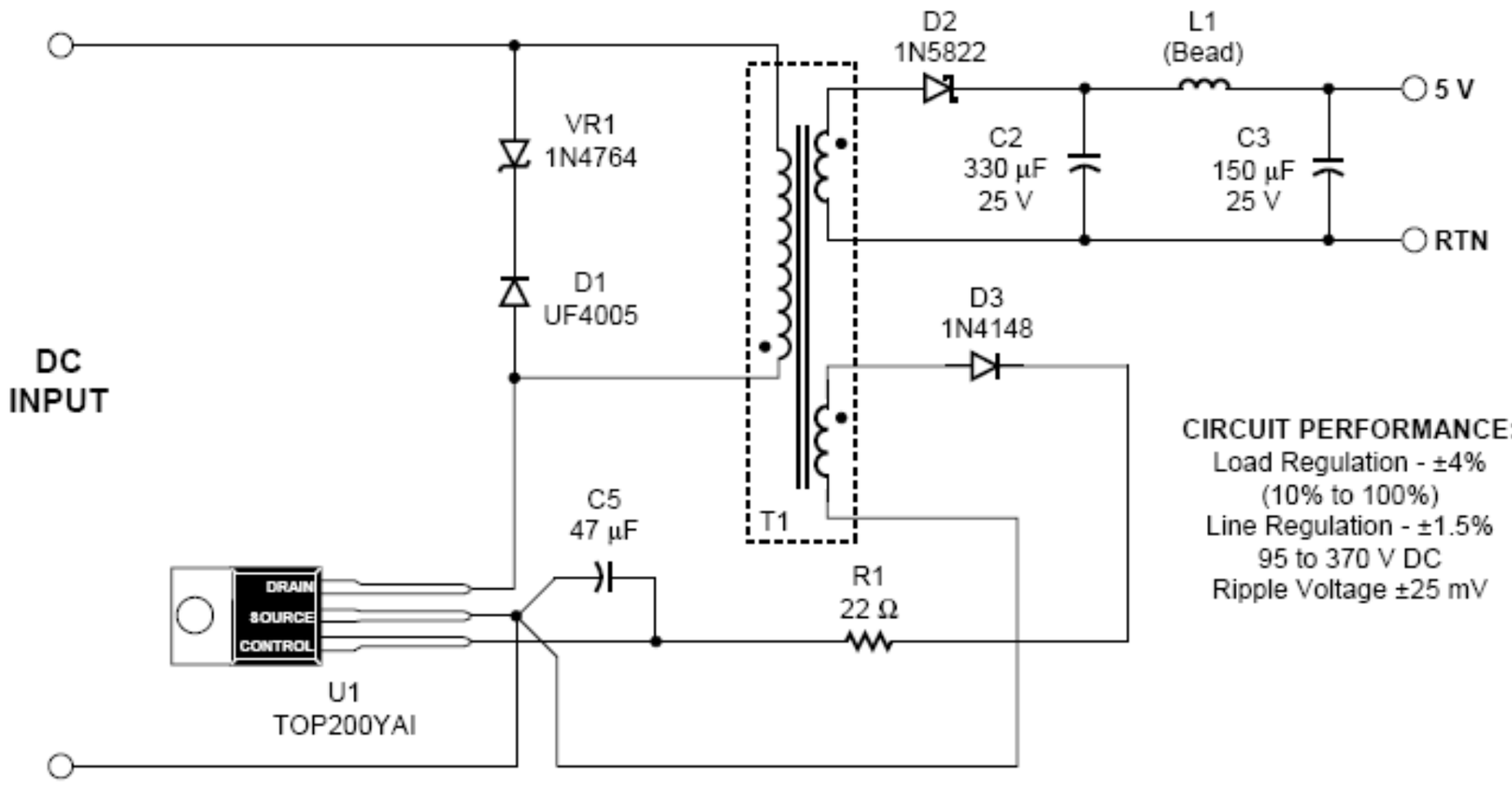
Fontes Chaveadas - Circuitos Integrados Dedicados

TOP200-4/14

TOPSwitch® Family

Three-terminal Off-line PWM Switch





CIRCUIT PERFORMANCE:
Load Regulation - ±4%
(10% to 100%)
Line Regulation - ±1.5%
95 to 370 V DC
Ripple Voltage ±25 mV

Próxima Aula

Conversores cc-cc:

- Conversores integrados.