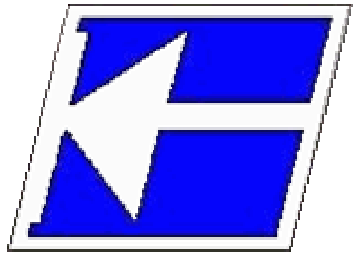
Centro Federal de Educação Tecnológica de Santa Catarina
Departamento de Eletrônica
Eletrônica Básica e Projetos Eletrônicos



Diodos
e
Análise de circuitos simples com diodos

Clóvis Antônio Petry, professor.

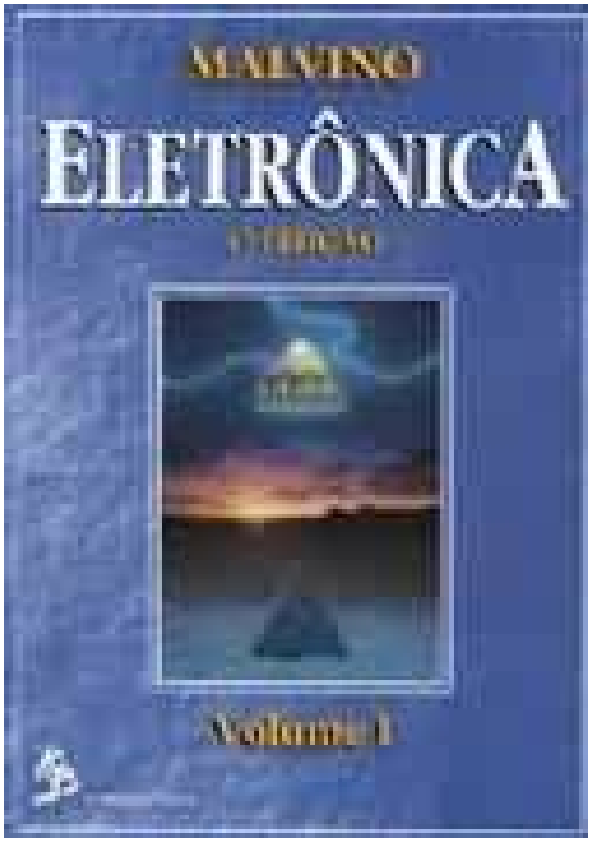
Florianópolis, março de 2007.

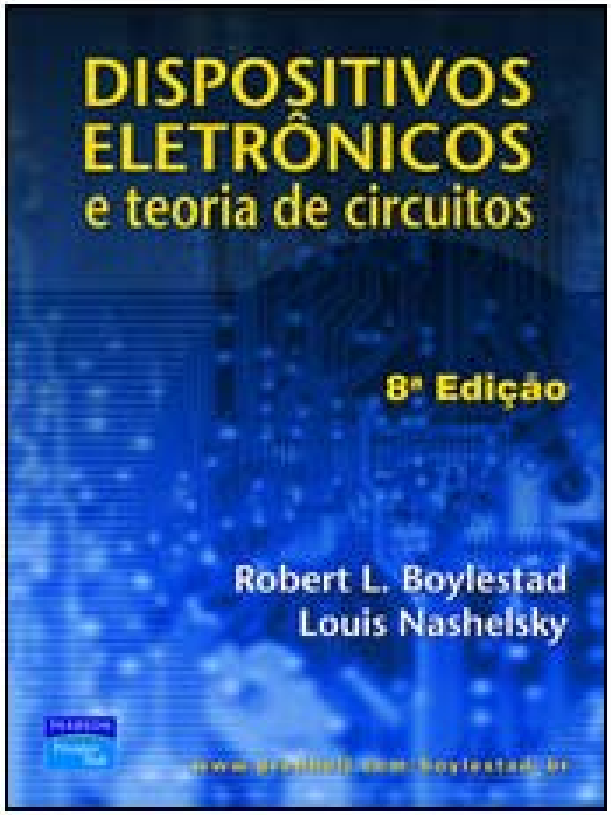
Nesta aula

Seqüência de conteúdos:

1. Características dos diodos;
2. Análise de circuitos com diodos;
3. Aplicações simples.

Bibliografia





www.cefetsc.edu.br/~petry

Características dos diodos

As principais características (grandezas) são:

1. Corrente máxima direta (I_F ou I_o);
2. Tensão de ruptura reversa:
   - VRRM = Tensão de pico inverso repetitivo;
   - VRWM = Tensão de pico inverso de trabalho;
   - VR = Tensão de bloqueio CC.
3. Queda de tensão direta (v_F);
4. Corrente reversa máxima (I_R).
5. Entre outras ....

Características dos diodos

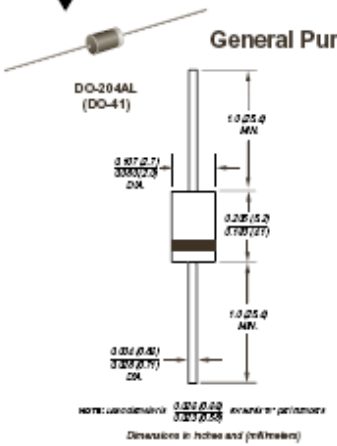
VISHAY

1N4001 thru 1N4007

Vishay Semiconductors
formerly General Semiconductor

General Purpose Plastic Rectifier

Reverse Voltage
50 to 1000V
Forward Current 1.0A



Dimensions in inches and (millimeters)

Features

- Plastic package has Underwriters Laboratories Flammability Classification 94V-0
- Construction utilizes void-free molded plastic technique
- Low reverse leakage
- High forward surge capability
- High temperature soldering guaranteed: 350°C/10 seconds, 0.375" (9.5mm) lead length, 5 lbs. (2.3kg) tension

Mechanical Data

Case: JEDEC DO-204AL, molded plastic body
Terminals: Plated axial leads, solderable per MIL-STD-750, Method 2026
Polarity: Color band denotes cathode end
Mounting Position: Any
Weight: 0.012 oz., 0.3 g

Maximum Ratings & Thermal Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

Parameter	Symb.	1N 4001	1N 4002	1N 4003	1N 4004	1N 4005	1N 4006	1N 4007	Unit
Maximum repetitive peak reverse voltage	V_{RRM}	50	100	200	400	600	800	1000	V
* Maximum RMS voltage	V_{RMS}	35	70	140	280	420	560	700	V
* Maximum DC blocking voltage	V_{DC}	50	100	200	400	600	800	1000	V
* Maximum average forward rectified current 0.375" (9.5mm) lead length at T_A = 75°C	$I_{F(AV)}$	1.0							A
* Peak forward surge current 8.3ms single half sine-wave superimposed on rated load (JEDEC Method) T_A = 75°C	I_{FSM}	30							A
* Maximum full load reverse current, full cycle average 0.375" (9.5mm) lead length T_L = 75°C	$I_{R(AV)}$	30							µA
Typical thermal resistance[1]	$R_{\theta JA}$ $R_{\theta JL}$	50 25							°C/W
* Maximum DC blocking voltage temperature	T_A	+150							V
* Operating junction and storage temperature range	T_J, T_{STG}	–50 to +175							°C

Electrical Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

Maximum instantaneous forward voltage at 1.0A	V_F	1.1	V
* Maximum DC reverse current at rated DC blocking voltage T_A = 25°C T_A = 125°C	I_R	5.0 50	µA
Typical junction capacitance at 4.0V, 1MHz	C_J	15	pF

Note: (1) Thermal resistance from junction to ambient at 0.375" (9.5mm) lead length, P.C.B. mounted *JEDEC registered values

Bulletin PD-20731 rev. C 12/03

International
IOR Rectifier

MUR820
MURB820
MURB820-1

Ultrafast Rectifier

Features

- Ultrafast Recovery Time
- Low Forward Voltage Drop
- Low Leakage Current
- 175°C Operating Junction Temperature

t_{rr} = 25ns
$I_{F(AV)}$ = 8Amp
V_R = 200V

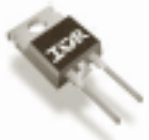
Description/Applications

International Rectifier's MUR.. series are the state of the art Ultra fast recovery rectifiers specifically designed with optimized performance of forward voltage drop and ultra fast recovery time.
The planar structure and the platinum doped life time control, guarantee the best overall performance, ruggedness and reliability characteristics.
These devices are intended for use in the output rectification stage of SMPS, UPS, DC-DC converters as well as free-wheeling diode in low voltage inverters and chopper motor drives.
Their extremely optimized stored charge and low recovery current minimize the switching losses and reduce over dissipation in the switching element and snubbers.

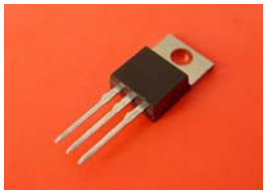
Absolute Maximum Ratings

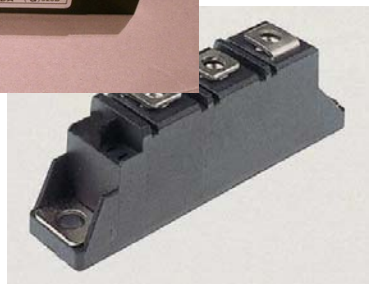
	Parameters	Max.	Units
V_{RRM}	Peak Repetitive Peak Reverse Voltage	200	V
$I_{F(AV)}$	Average Rectified Forward Current Total Device, (Rated V_R), T_C = 150°C	8	A
I_{FSM}	Non Repetitive Peak Surge Current	100	
I_{FM}	Peak Repetitive Forward Current (Rated V_R, Square wave, 20 KHz), T_C = 150°C	16	
T_J, T_{STG}	Operating Junction and Storage Temperatures	-65 to 175	°C

Case Styles

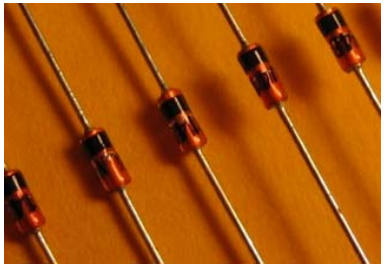
MUR820	MURB820	MURB820-1
		
TO-220AC	D²PAK	TO-262

Características dos diodos

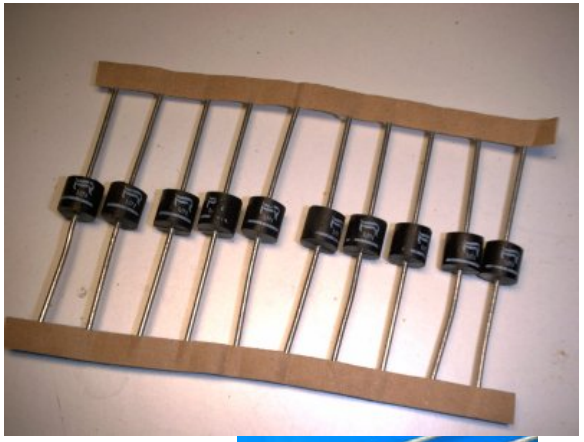


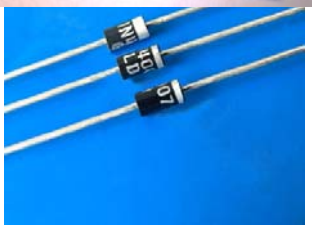


Diodos de potência



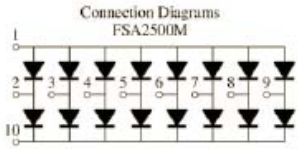
Diodos de sinal

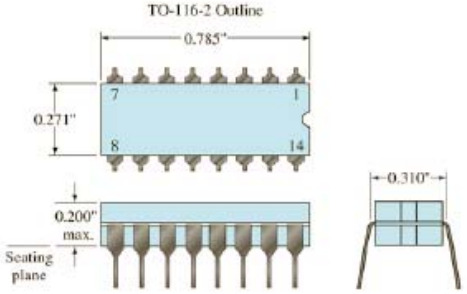




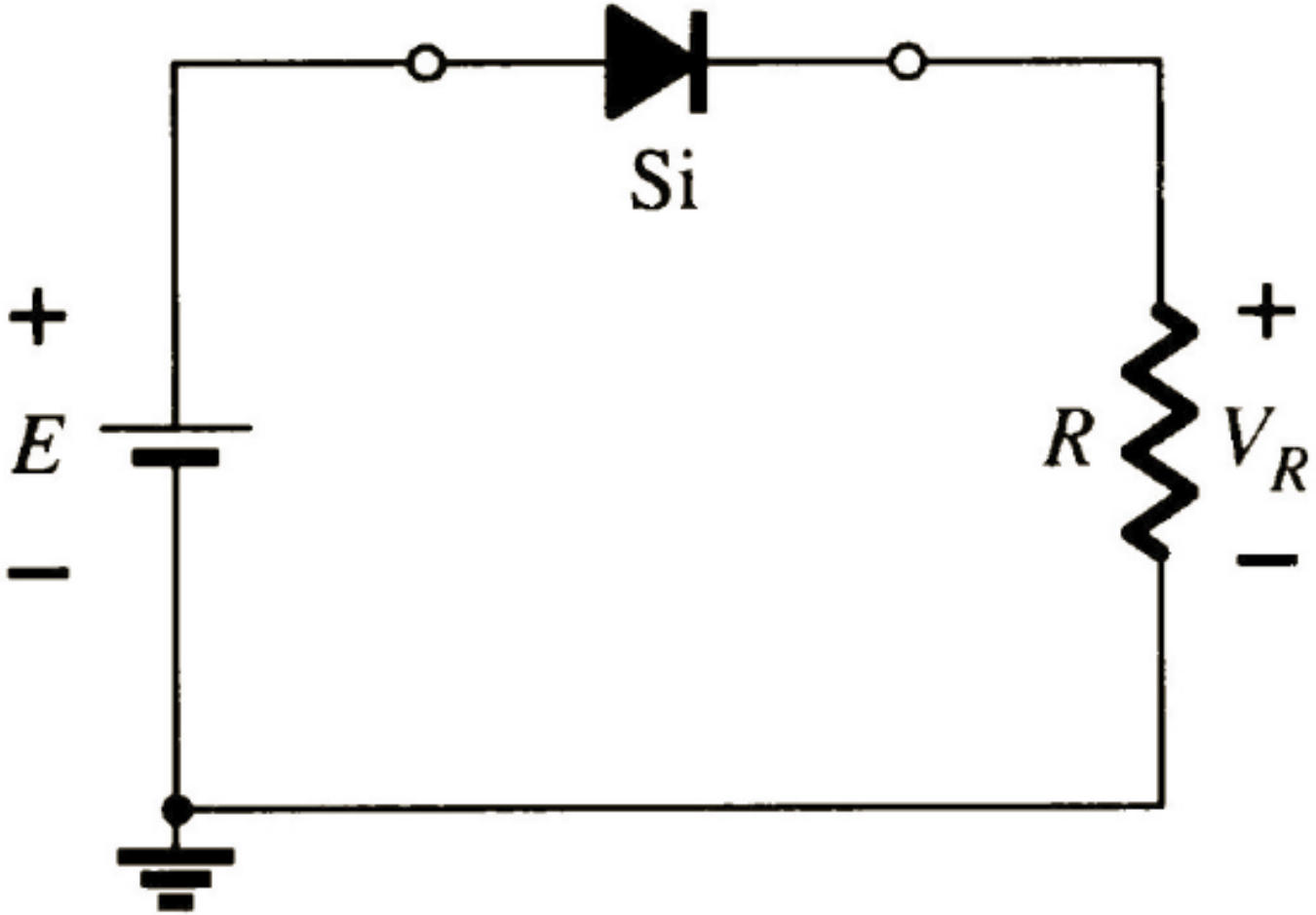
Diodos de uso geral

Circuitos integrados de diodos





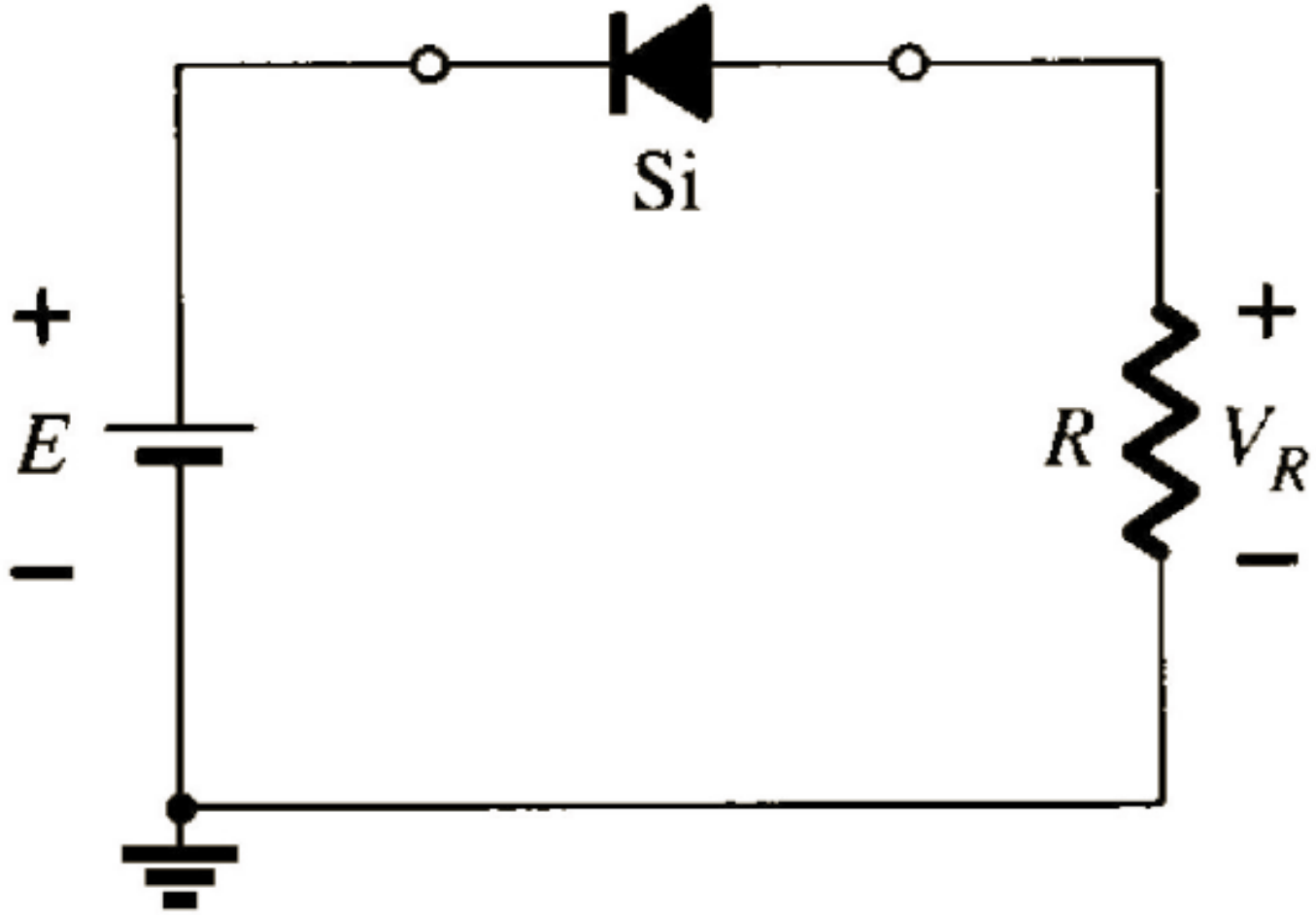
Análise de circuitos com diodos



Determine a tensão e a corrente na carga para diversos valores de E e R:

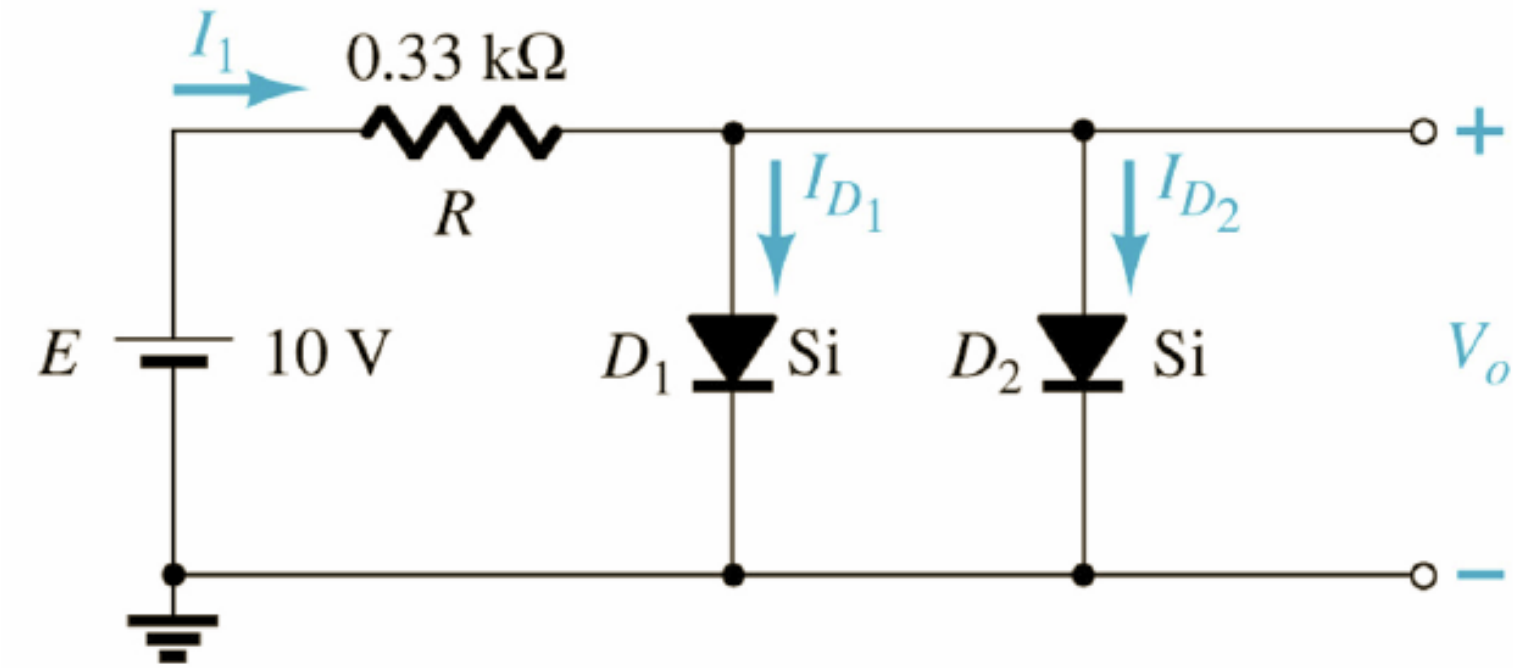
- E = 5 V e R = 1 kΩ;
- E = 10 V e R = 1 kΩ;
- E = 10 V e R = 10 kΩ.

Análise de circuitos com diodos



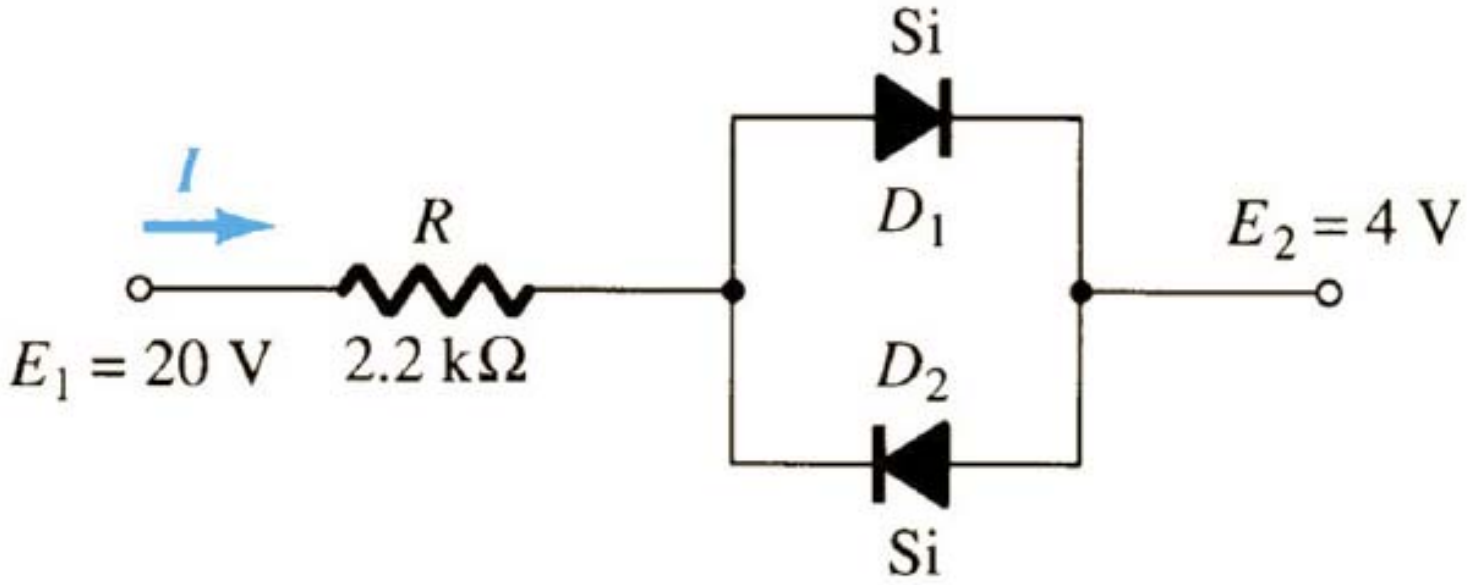
Considerando que o diodo do circuito é o 1N4001, para qual tensão da bateria (E) o diodo entrará em condução reversa?

Análise de circuitos com diodos



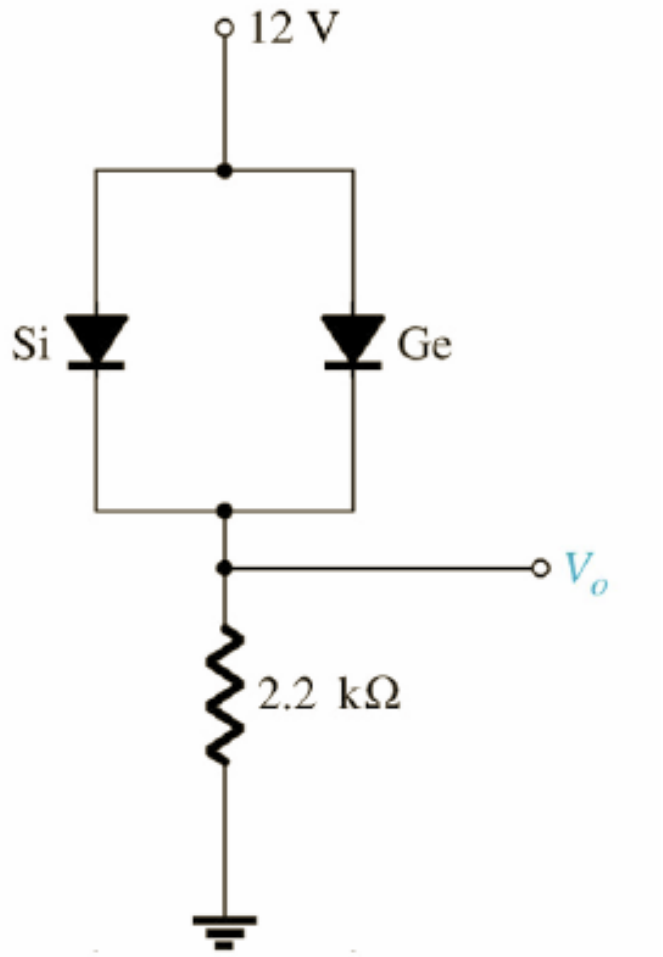
Determine todas as correntes para o circuito acima.

Análise de circuitos com diodos



Determine a corrente I e as correntes nos diodos do circuito acima.

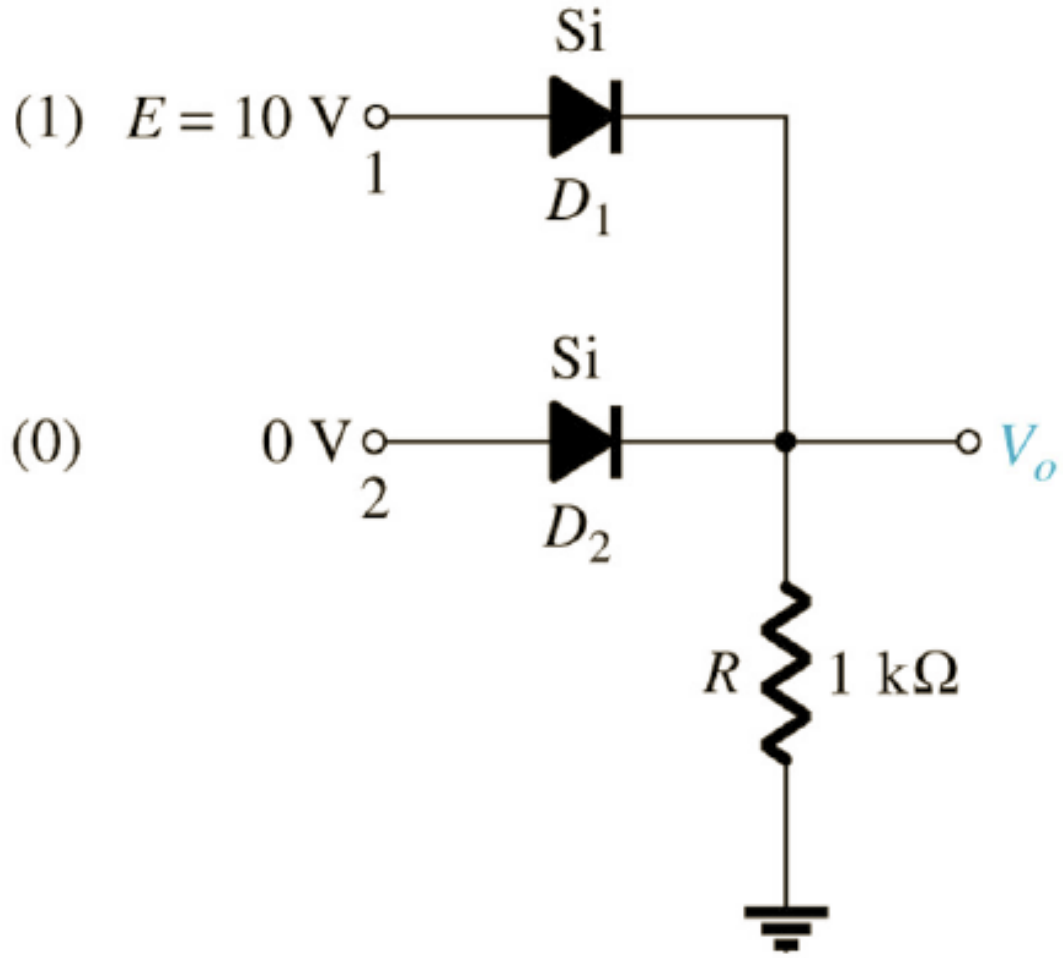
Análise de circuitos com diodos



Determine a tensão V_o e indique o estado dos diodos da figura acima.

Aplicações simples

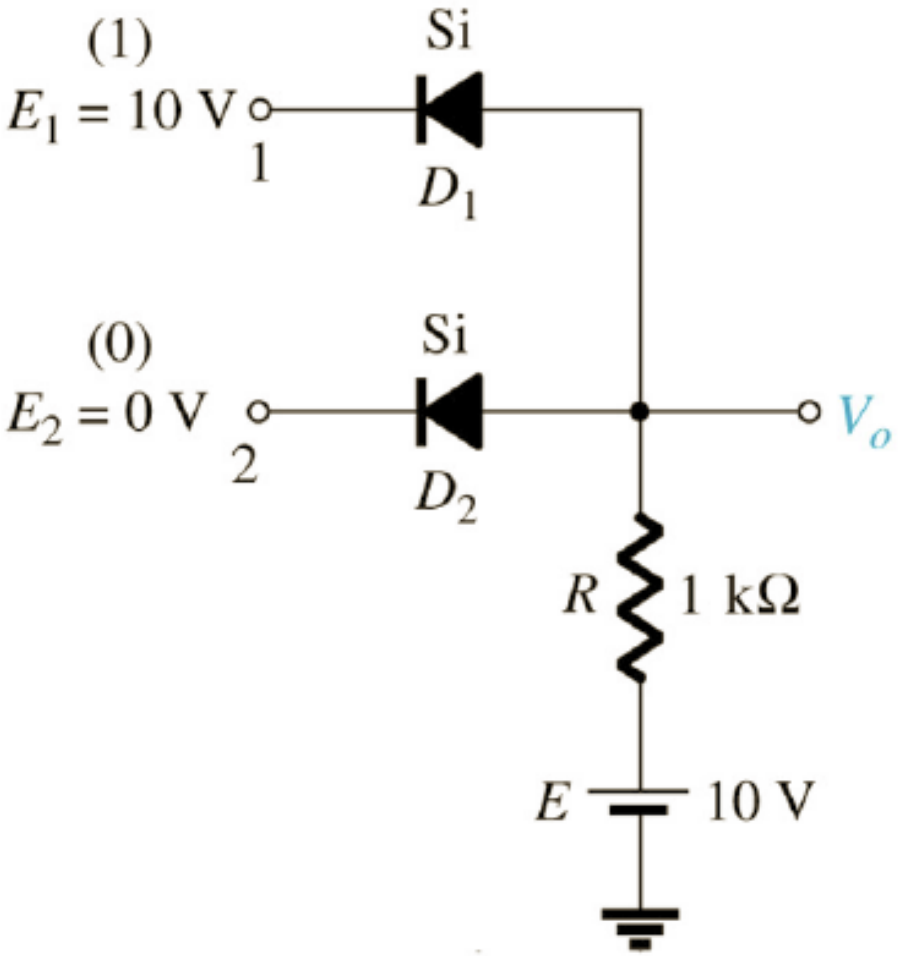
Porta lógica OU (or) com diodos:



Determine a tensão V_o e explique o funcionamento do circuito lógico acima.

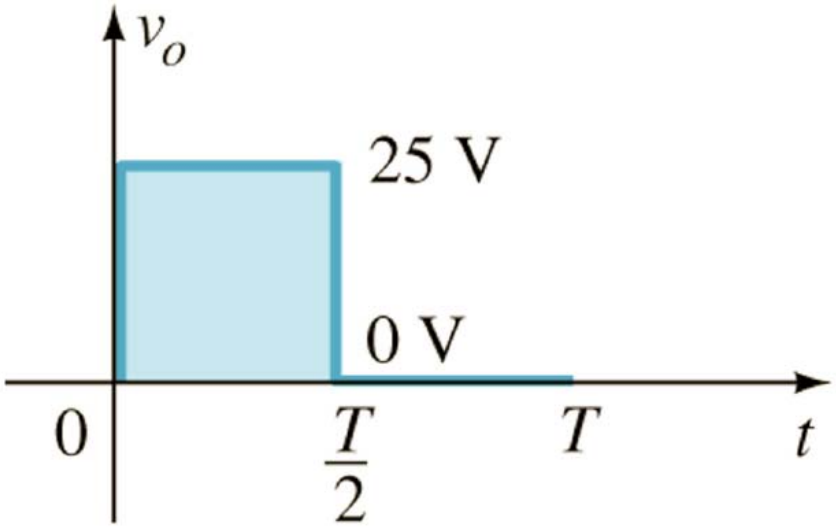
Aplicações simples

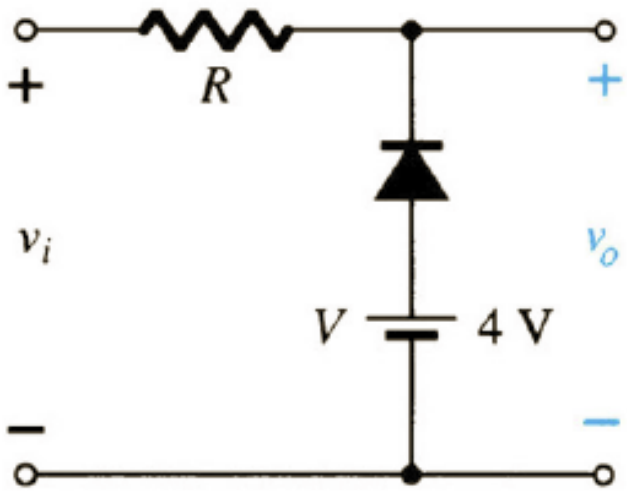
Porta lógica E (AND) com diodos:



Determine a tensão V_o e explique o funcionamento do circuito lógico acima.

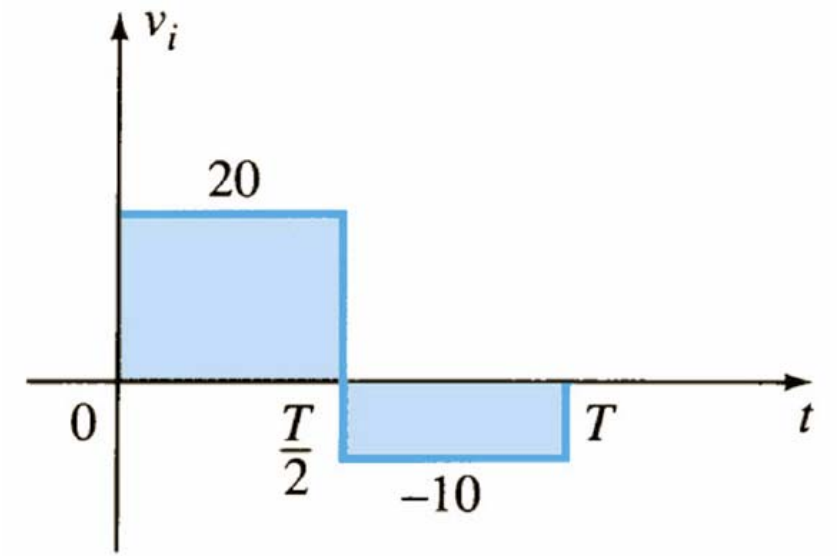
Aplicações simples

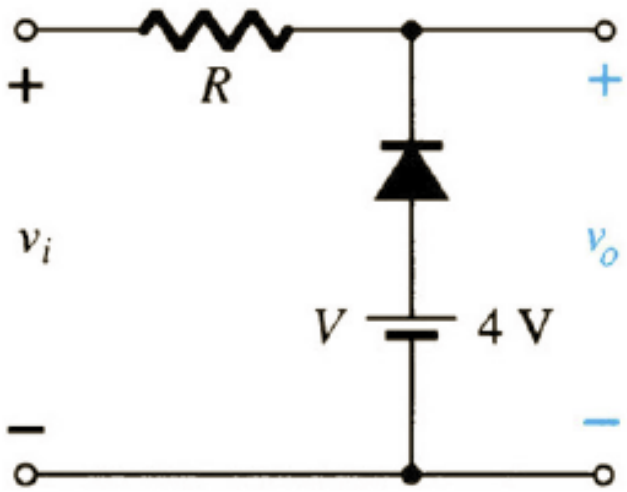




Determine a forma de onda da tensão V_o para o circuito da figura acima.

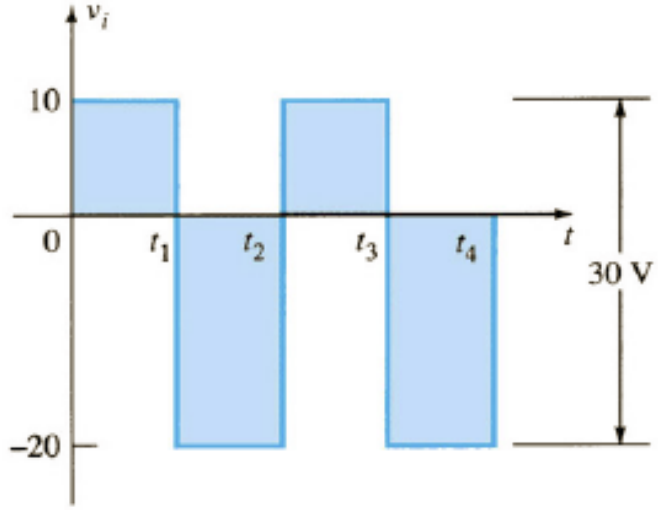
Aplicações simples

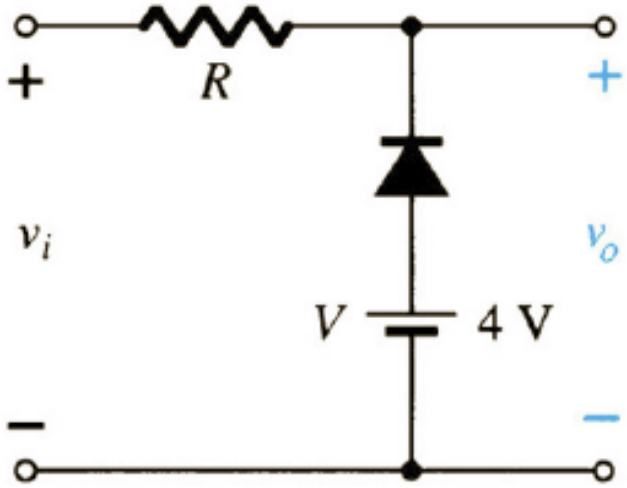




Determine a forma de onda da tensão V_o para o circuito da figura acima.

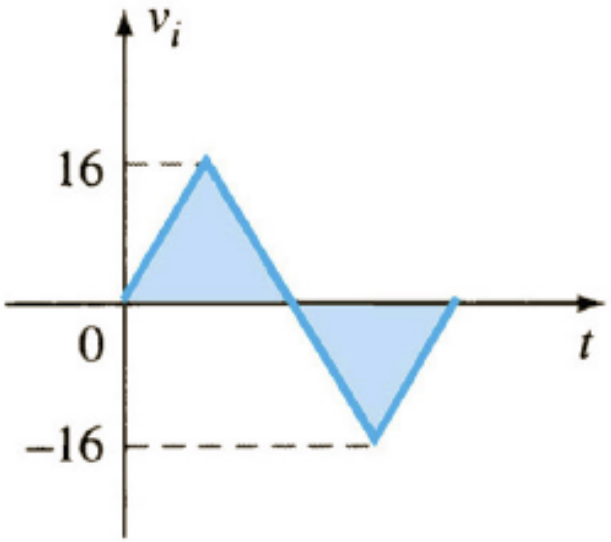
Aplicações simples

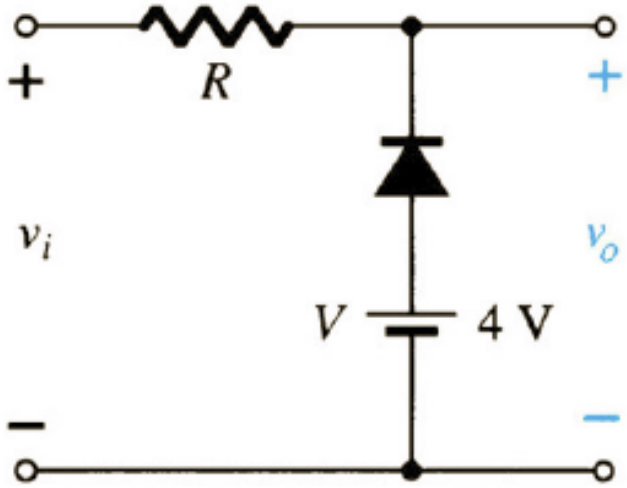




Determine a forma de onda da tensão V_o para o circuito da figura acima.

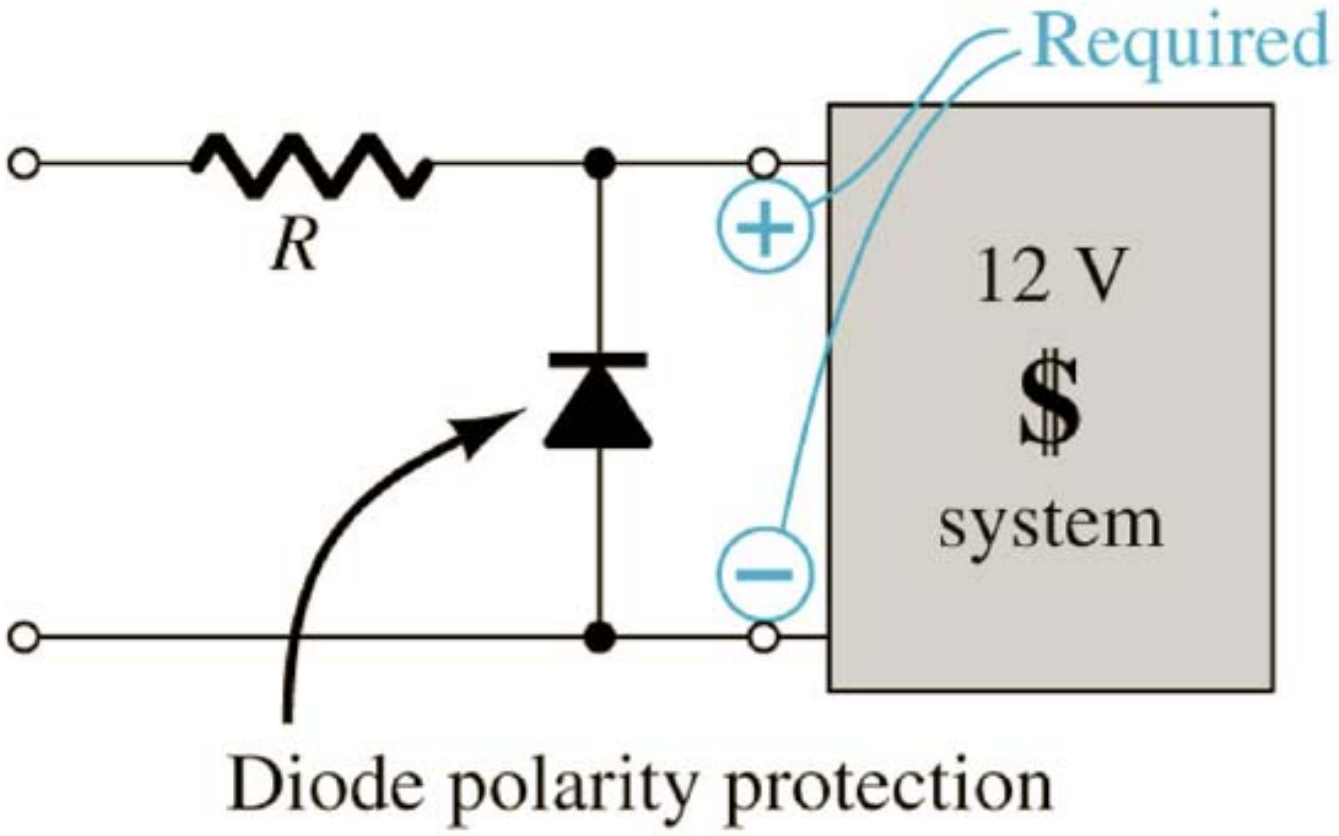
Aplicações simples





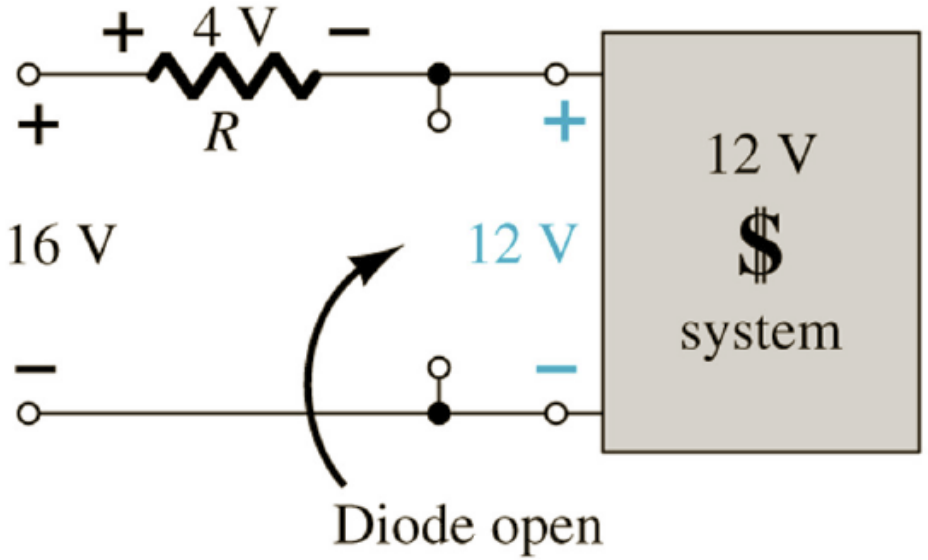
Determine a forma de onda da tensão V_o para o circuito da figura acima.

Aplicações simples



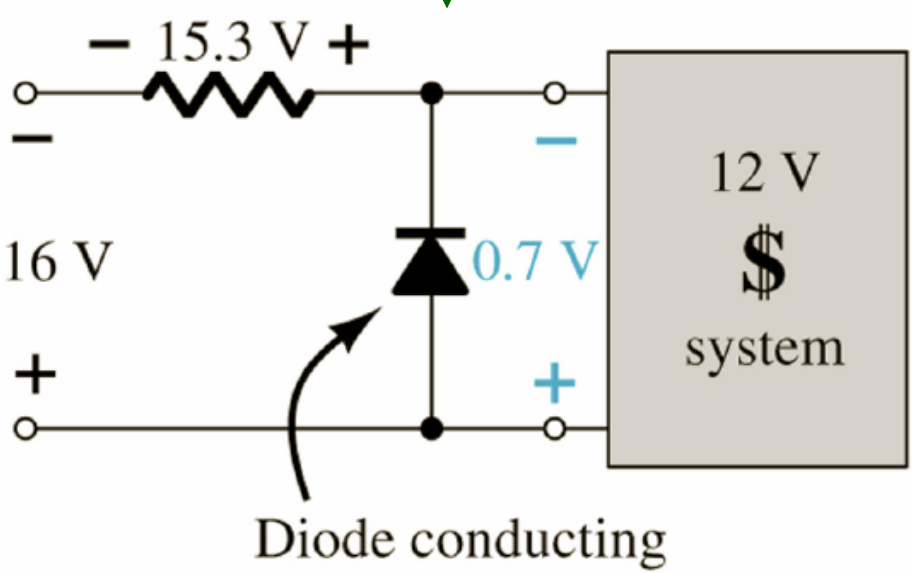
Explique o funcionamento do circuito de proteção contra inversão de polaridade mostrado acima.

Aplicações simples

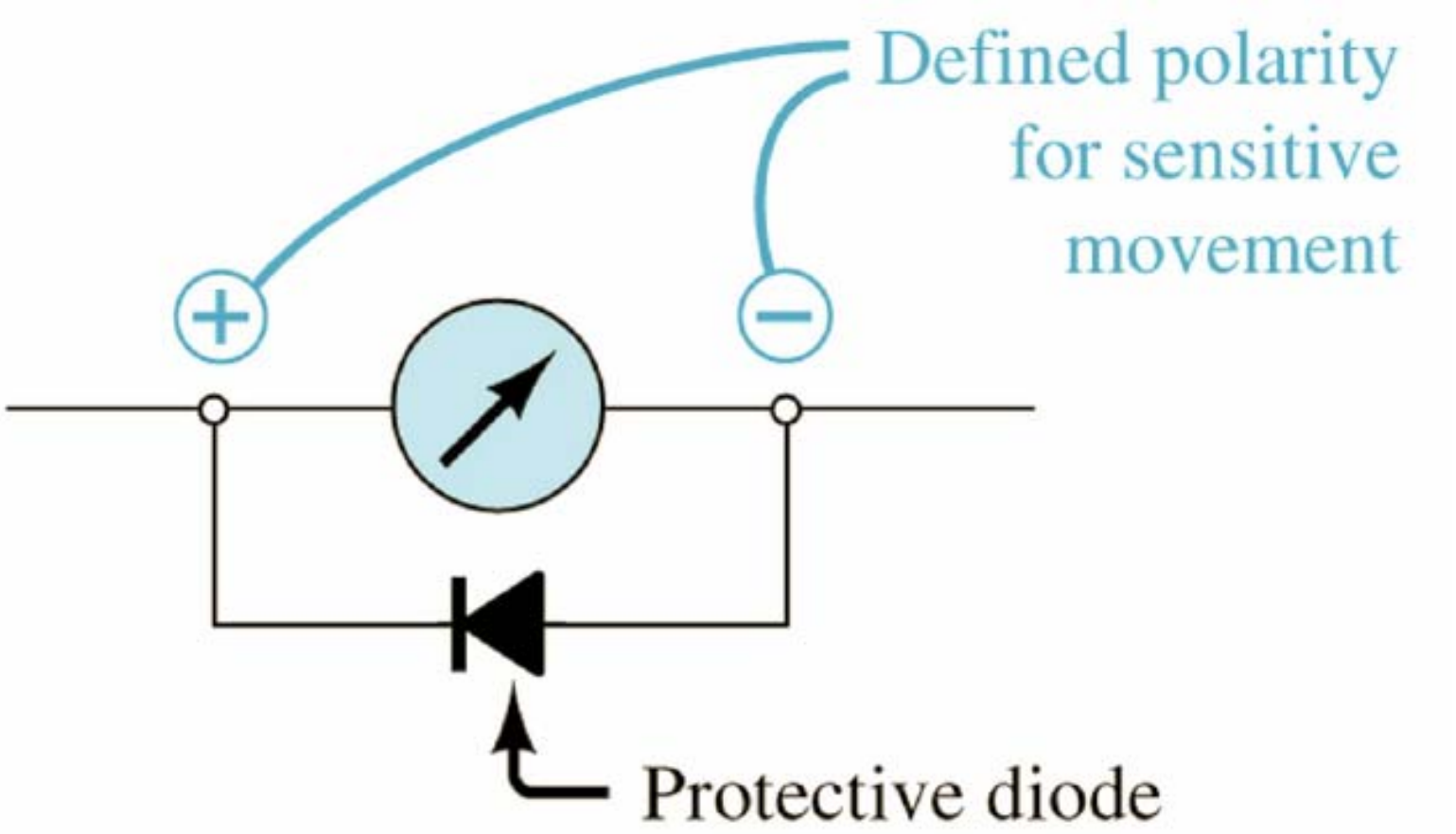


Polaridade correta

Polaridade incorreta

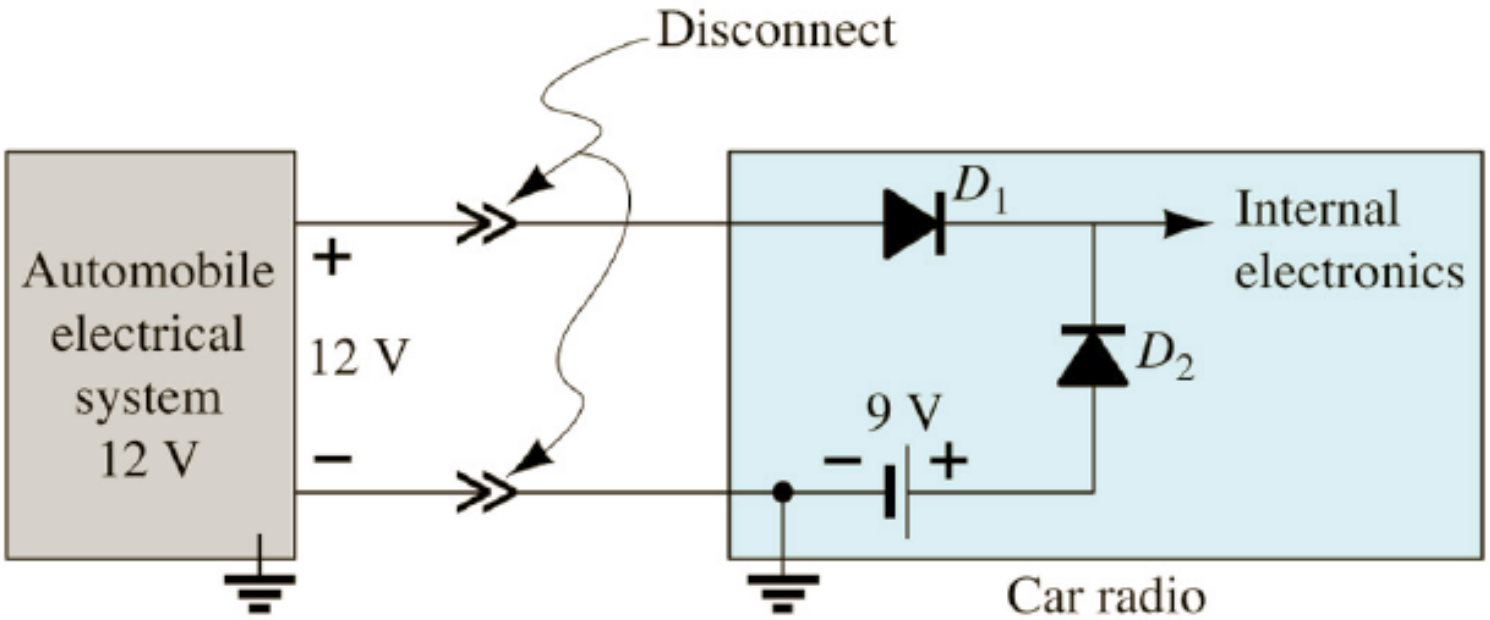


Aplicações simples



Explique o funcionamento do circuito de proteção de instrumentos sensíveis.

Aplicações simples



Explique o funcionamento do circuito de backup de memória de auto-rádios.

Exercícios

Exercícios selecionados:

1. Lista capítulo 3 do Malvino;
2. Entre outros ....

Na próxima aula

Seqüência de conteúdos:

1. Análise de circuitos com diodos no laboratório;
2. Identificação de diodos;
3. Testes com diodos.