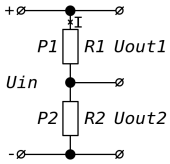
Делитель напряжения на 2-х резисторах

версия 4.1 (наброски, черновик)

Схема делителя



R1 - она же переменная, он же резистор R1.
R2 - она же переменная, он же резистор R2.

Формулы

——[Выходное напряжение ***Uout1***, ***Uout2***]——

$$Uout1 = \frac{R1}{R1 + R2} \cdot Uin$$

$$Uout2 = \frac{R2}{R1 + R2} \cdot Uin$$

$$Uout1 = Uin - Uout2$$

$$Uout2 = Uin - Uout1$$

——[Входное напряжение ***Uin***]——

$$Uin = \frac{R1 + R2}{R1} \cdot Uout1$$

$$Uin = \frac{R1 + R2}{R2} \cdot Uout2$$

$$Uin = Uout1 + Uout2$$

——[Сопротивление ***R1***, ***R2***, и их ***Rtotal***]——

$$R1 = \frac{Uin \cdot R2}{Uout2} - R2$$

$$R2 = \frac{Uin \cdot R1}{Uout1} - R1$$

$$R1 = \frac{Uout1 \cdot Rtotal}{Uin}$$

$$R2 = \frac{Uout2 \cdot Rtotal}{Uin}$$

Примечание.
Rtotal - суммарное сопротивление резисторов *R1* + *R2*.

$$R1 = \frac{Uout1 \cdot Rtotal}{Uout1 + Uout2}$$

$$R2 = \frac{Uout2 \cdot Rtotal}{Uout1 + Uout2}$$

$$R1 = Rtotal - R2$$

$$R2 = Rtotal - R1$$

$$Rtotal = \frac{Uin}{I}$$

——[Рассеиваемая мощность на **R1**, **R2** (***P1***, ***P2***)]——

$$P1 = \frac{Uout1 \cdot Uout1}{R1}$$

$$P2 = \frac{Uout2 \cdot Uout2}{R2}$$

——[Ток ***I***]——

$$I = \frac{Uout1}{R1}$$

$$I = \frac{Uout2}{R2}$$

$$I = \frac{Uin}{R1 + R2}$$

$$I = \frac{Uin}{Rtotal}$$

Расчёты

——[Выходное напряжение ***Uout1***, ***Uout2***]——

$$Uout1 = \frac{1000_{R1}}{1000_{R1} + 2000_{R2}} \cdot 10_{Uin} = 3.33B$$

$$Uout2 = \frac{2000_{R2}}{1000_{R1} + 2000_{R2}} \cdot 10_{Uin} = 6.66B$$

$$Uout1 = 10_{Uin} - 6.66_{Uout2} = 3.33B$$

$$Uout2 = 10_{Uin} - 3.33_{Uout1} = 6.66B$$

——[Входное напряжение ***Uin***]——

$$Uin = \frac{1000_{R1} + 2000_{R2}}{1000_{R1}} \cdot 3.33_{Uout1} = 10B$$

$$Uin = \frac{1000_{R1} + 2000_{R2}}{2000_{R2}} \cdot 6.66_{Uout2} = 10B$$

$$Uin = 3.33_{Uout1} + 6.66_{Uout2} = 10B$$

——[Сопротивление ***R1***, ***R2***, и их ***Rtotal***]——

$$R1 = \frac{10_{Uin} \cdot 2000_{R2}}{6.66_{Uout2}} - 2000_{R2} = 10000м$$

$$R2 = \frac{10_{Uin} \cdot 1000_{R1}}{3.33_{Uout1}} - 1000_{R1} = 20000м$$

$$R1 = \frac{3.33_{Uout1} \cdot 3000_{Rtotal}}{10_{Uin}} = 10000м$$

$$R2 = \frac{6.66_{Uout2} \cdot 3000_{Rtotal}}{10_{Uin}} = 20000м$$

Примечание.
Rtotal - суммарное сопротивление резисторов *R1* + *R2* ($1000_{R1} + 2000_{R2} = 3000_{Rtotal}$).

$$R1 = \frac{3.33_{Uout1} \cdot 3000_{Rtotal}}{3.33_{Uout1} + 6.66_{Uout2}} = 10000м$$

$$R2 = \frac{6.66_{Uout2} \cdot 3000_{Rtotal}}{3.33_{Uout1} + 6.66_{Uout2}} = 20000м$$

$$R1 = 3000_{Rtotal} - 2000_{R2} = 10000м$$

$$R2 = 3000_{Rtotal} - 1000_{R1} = 20000м$$

$$Rtotal = \frac{10_{Uin}}{0.00333_{I}} = 3000Ом$$

——[Рассеиваемая мощность на **R1**, **R2** (***P1***, ***P2***)]——

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

——[Ток ***I***]——

$$I = \frac{3.33_{Uout1}}{1000_{R1}} = 0.00333A$$

$$I = \frac{6.66_{Uout2}}{2000_{R2}} = 0.00333A$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333A$$

$$I = \frac{10_{Uin}}{3000_{Rtotal}} = 0.00333A$$

Расчёты (задачи)

——[Задача 1]——

Дано:

Uin = 10В
R1 = 10000Ом = 1кОм
R2 = 20000Ом = 2кОм

Найти: ***Uout1***, ***Uout2***, ***P1***, ***P2***, ***I***

Решение:

$$Uout1 = \frac{1000_{R1}}{1000_{R1} + 2000_{R2}} \cdot 10_{Uin} = 3.33В$$

$$Uout2 = \frac{2000_{R2}}{1000_{R1} + 2000_{R2}} \cdot 10_{Uin} = 6.66В$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333A$$

Ответ:

Uout1 = 3.33В
Uout2 = 6.66В
P1 = 0.0110Вт
P2 = 0.0221Вт
I = 0.00333A

——[Задача 2]——

Дано:

Uout1 = 3.33В
R1 = 10000Ом = 1кОм
R2 = 20000Ом = 2кОм

Найти: ***Uin***, ***Uout2***, ***P1***, ***P1***, ***I***

Решение:

$$Uin = \frac{1000_{R1} + 2000_{R2}}{1000_{R1}} \cdot 3.33_{Uout1} = 10В$$

$$Uout2 = 10_{Uin} - 3.33_{Uout1} = 6.66В$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333A$$

Ответ:

Uin = 10В
Uout2 = 6.66В
P1 = 0.0110Вт
P2 = 0.0221Вт
I = 0.00333A

——[Задача 3]——

Дано:

Uout2 = 6.66В
R1 = 10000Ом = 1кОм
R2 = 20000Ом = 2кОм

Найти: ***Uin***, ***Uout1***, ***P1***, ***P2***, ***I***

Решение:

$$Uin = \frac{1000_{R1} + 2000_{R2}}{2000_{R2}} \cdot 6.66_{Uout2} = 10В$$

$$Uout1 = 10_{Uin} - 6.66_{Uout2} = 3.33В$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333A$$

Ответ:

Uin = 10В
Uout1 = 3.33В
P1 = 0.0110Вт
P2 = 0.0221Вт
I = 0.00333A

——[Задача 4]——

Дано:

Uout1 = 3.33В
Uout2 = 6.66В

Найти: ***Uin***

Решение:

$$Uin = 3.33_{Uout1} + 6.66_{Uout2} = 10В$$

Ответ:

Uin = 10В

——[Задача 5]——

Дано:

$$\begin{aligned} \mathbf{Uin} &= 10В \\ \mathbf{Uout2} &= 6.66В \\ \mathbf{R2} &= 2000Ом = 2кОм \end{aligned}$$

Найти: ***Uout1***, ***R1***, ***P1***, ***P2***, ***I***

Решение:

$$Uout1 = 10_{Uin} - 6.66_{Uout2} = 3.33В$$

$$R1 = \frac{10_{Uin} \cdot 2000_{R2}}{6.66_{Uout2}} - 2000_{R2} = 1000Ом$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333А$$

Ответ:

$$\begin{aligned} \mathbf{Uout1} &= 3.33В \\ \mathbf{R1} &= 1000Ом = 1кОм \\ \mathbf{P1} &= 0.0110Вт \\ \mathbf{P2} &= 0.0221Вт \\ \mathbf{I} &= 0.00333А \end{aligned}$$

——[Задача 6]——

Дано:

$$\begin{aligned} \mathbf{Uin} &= 10В \\ \mathbf{Uout1} &= 3.33В \\ \mathbf{R1} &= 1000Ом = 1кОм \end{aligned}$$

Найти: ***Uout2***, ***R2***, ***P1***, ***P2***, ***I***

Решение:

$$Uout2 = 10_{Uin} - 3.33_{Uout1} = 6.66В$$

$$R2 = \frac{10_{Uin} \cdot 1000_{R1}}{3.33_{Uout1}} - 1000_{R1} = 2000Ом$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{1000_{R1} + 2000_{R2}} = 0.00333А$$

Ответ:

$$\begin{aligned} \mathbf{Uout2} &= 6.66В \\ \mathbf{R2} &= 2000Ом = 2кОм \\ \mathbf{P1} &= 0.0110Вт \\ \mathbf{P2} &= 0.0221Вт \\ \mathbf{I} &= 0.00333А \end{aligned}$$

——[Задача 7]——

Дано:

$$\begin{aligned} \mathbf{Uin} &= 10В \\ \mathbf{Uout1} &= 3.33В \\ \mathbf{Rtotal} &= 3000Ом = 3кОм \end{aligned}$$

Найти: ***Uout2***, ***R1***, ***R2***, ***P1***, ***P2***, ***I***

Решение:

$$Uout2 = 10_{Uin} - 3.33_{Uout1} = 6.66В$$

$$R1 = \frac{3.33_{Uout1} \cdot 3000_{Rtotal}}{10_{Uin}} = 1000Ом$$

$$R2 = 3000_{Rtotal} - 1000_{R1} = 2000Ом$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{3000_{Rtotal}} = 0.00333А$$

Ответ:

$$\begin{aligned} \mathbf{Uout2} &= 6.66В \\ \mathbf{R1} &= 1000Ом = 1кОм \\ \mathbf{R2} &= 2000Ом = 2кОм \\ \mathbf{P1} &= 0.0110Вт \\ \mathbf{P2} &= 0.0221Вт \\ \mathbf{I} &= 0.00333А \end{aligned}$$

——[Задача 8]——

Дано:

$$\begin{aligned} \mathbf{Uin} &= 10В \\ \mathbf{Uout2} &= 6.66В \\ \mathbf{Rtotal} &= 3000Ом = 3кОм \end{aligned}$$

Найти: ***Uout1***, ***R1***, ***R2***, ***P1***, ***P2***, ***I***

Решение:

$$Uout1 = 10_{Uin} - 6.66_{Uout2} = 3.33В$$

$$R2 = \frac{6.66_{Uout2} \cdot 3000_{Rtotal}}{10_{Uin}} = 2000Ом$$

$$R1 = 3000_{Rtotal} - 2000_{R2} = 1000Ом$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{3000_{Rtotal}} = 0.00333А$$

Ответ:

$$\begin{aligned} \mathbf{Uout1} &= 3.33В \\ \mathbf{R1} &= 1000Ом = 1кОм \\ \mathbf{R2} &= 2000Ом = 2кОм \\ \mathbf{P1} &= 0.0110Вт \\ \mathbf{P2} &= 0.0221Вт \\ \mathbf{I} &= 0.00333А \end{aligned}$$

——[Задача 9]——

Дано:

$$\begin{aligned} \mathbf{Uout1} &= 3.33В \\ \mathbf{Uout2} &= 6.66В \\ \mathbf{Rtotal} &= 3000Ом = 3кОм \end{aligned}$$

Найти: ***Uin***, ***R1***, ***R2***, ***P1***, ***P2***, ***I***

Решение:

$$Uin = 3.33_{Uout1} + 6.66_{Uout2} = 10В$$

$$R1 = \frac{3.33_{Uout1} \cdot 3000_{Rtotal}}{3.33_{Uout1} + 6.66_{Uout2}} = 10000м$$

$$R2 = \frac{6.66_{Uout2} \cdot 3000_{Rtotal}}{3.33_{Uout1} + 6.66_{Uout2}} = 20000м$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

$$I = \frac{10_{Uin}}{3000_{Rtotal}} = 0.00333A$$

Ответ:

Uin = 10В
R1 = 10000м = 1кОм
R2 = 20000м = 2кОм
P1 = 0.0110Вт
P2 = 0.0221Вт
I = 0.00333A

——[Задача 10]——

Дано:

I = 0.00333A
Uin = 10В
Uout1 = 3.33В

Найти: ***Uout2***, ***R1***, ***R2***, ***P1***, ***P2***

Решение:

$$Uout2 = 10_{Uin} - 3.33_{Uout1} = 6.66В$$

$$Rtotal = \frac{10_{Uin}}{0.00333_{I}} = 3000Ом$$

$$R1 = \frac{3.33_{Uout1} \cdot 3000_{Rtotal}}{10_{Uin}} = 10000м$$

$$R2 = 3000_{Rtotal} - 1000_{R1} = 20000м$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

Ответ:

Uout2 = 6.66В
R1 = 10000м = 1кОм
R2 = 20000м = 2кОм
P1 = 0.0110Вт
P2 = 0.0221Вт

——[Задача 11]——

Дано:

I = 0.00333A
Uin = 10В
Uout2 = 6.66В

Найти: ***Uout1***, ***R1***, ***R2***, ***P1***, ***P2***

Решение:

$$Uout1 = 10_{Uin} - 6.66_{Uout2} = 3.33В$$

$$Rtotal = \frac{10_{Uin}}{0.00333_{I}} = 3000Ом$$

$$R2 = \frac{6.66_{Uout2} \cdot 3000_{Rtotal}}{10_{Uin}} = 20000м$$

$$R1 = 3000_{Rtotal} - 2000_{R2} = 10000м$$

$$P1 = \frac{3.33_{Uout1} \cdot 3.33_{Uout1}}{1000_{R1}} = 0.0110Вт$$

$$P2 = \frac{6.66_{Uout2} \cdot 6.66_{Uout2}}{2000_{R2}} = 0.0221Вт$$

Ответ:

Uout1 = 3.33В
R1 = 10000м = 1кОм
R2 = 20000м = 2кОм
P1 = 0.0110Вт
P2 = 0.0221Вт

Примечание.
Расчёты с небольшими погрешностями!

Раздел «**Формулы**» - n-часть формул из интернета, некоторые написал сам!

Демидов С.В.

Незаконченная работа!

Для заметок