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CV Actions of Common Stage Amplifiers Formulas

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List of 18 CV Actions of Common Stage Amplifiers Formulas

CV Actions of Common Stage Amplifiers

1) Emitter Current of Common-Base Amplifier

$$\text{fx } i_e = \frac{V_{in}}{R_e}$$

[Open Calculator !\[\]\(a870788d6ed9b8fd294b7654a8c8526b_img.jpg\)](#)

$$\text{ex } 37.31343\text{mA} = \frac{2.5\text{V}}{0.067\text{k}\Omega}$$

2) Fundamental Voltage in Common-Emitter Amplifier

$$\text{fx } V_{fc} = R_{in} \cdot i_b$$

[Open Calculator !\[\]\(c50c8b7b2cc2cf9ff925edec0ee94c0d_img.jpg\)](#)

$$\text{ex } 4.892755\text{V} = 0.301\text{k}\Omega \cdot 16.255\text{mA}$$

3) Input Impedance of Common-Base Amplifier

$$\text{fx } Z_{in} = \left(\frac{1}{R_e} + \frac{1}{R_{sm}} \right)^{-1}$$

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

$$\text{ex } 0.064041\text{k}\Omega = \left(\frac{1}{0.067\text{k}\Omega} + \frac{1}{1.45\text{k}\Omega} \right)^{-1}$$



4) Input Resistance of Common Emitter Amplifier 

$$fx \quad R_{in} = \left(\frac{1}{R_b} + \frac{1}{R_{b2}} + \frac{1}{R_{sm}} \right)^{-1}$$

Open Calculator 

$$ex \quad 0.295271k\Omega = \left(\frac{1}{1.213k\Omega} + \frac{1}{0.534k\Omega} + \frac{1}{1.45k\Omega} \right)^{-1}$$

5) Input Resistance of Common Emitter Amplifier given Small-Signal Input Resistance 

$$fx \quad R_{in} = \left(\frac{1}{R_b} + \frac{1}{R_{b2}} + \frac{1}{R_{sm} + (\beta + 1) \cdot R_e} \right)^{-1}$$

Open Calculator 

$$ex \quad 0.319702k\Omega = \left(\frac{1}{1.213k\Omega} + \frac{1}{0.534k\Omega} + \frac{1}{1.45k\Omega + (12 + 1) \cdot 0.067k\Omega} \right)^{-1}$$

6) Input Resistance of Common-Base Circuit 

$$fx \quad R_{in} = \frac{R_e \cdot (R_{out} + R_L)}{R_{out} + \left(\frac{R_L}{\beta + 1} \right)}$$

Open Calculator 

$$ex \quad 0.213405k\Omega = \frac{0.067k\Omega \cdot (0.35k\Omega + 1.013k\Omega)}{0.35k\Omega + \left(\frac{1.013k\Omega}{12+1} \right)}$$

7) Input Resistance of Common-Collector Amplifier 

$$fx \quad R_{in} = \frac{V_{fc}}{i_b}$$

Open Calculator 

$$ex \quad 0.307598k\Omega = \frac{5V}{16.255mA}$$




8) Input Resistance of Common-Emitter Amplifier given Emitter Resistance 

$$fx \quad R_{in} = \left(\frac{1}{R_b} + \frac{1}{R_{b2}} + \frac{1}{(R_t + R_e) \cdot (\beta + 1)} \right)^{-1}$$

Open Calculator 

ex


$$0.307648k\Omega = \left(\frac{1}{1.213k\Omega} + \frac{1}{0.534k\Omega} + \frac{1}{(0.072k\Omega + 0.067k\Omega) \cdot (12 + 1)} \right)^{-1}$$

9) Instantaneous Drain Current using Voltage between Drain and Source 

$$fx \quad i_d = K_n \cdot (V_{ox} - V_t) \cdot V_{gs}$$

Open Calculator 


$$ex \quad 17.48907mA = 2.95mA/V^2 \cdot (3.775V - 2V) \cdot 3.34V$$

10) Load Voltage of CS Amplifier 

$$fx \quad V_L = A_v \cdot V_{in}$$

Open Calculator 

$$ex \quad 10.525V = 4.21 \cdot 2.5V$$

11) Output Resistance at Another Drain of Controlled Source Transistor 

$$fx \quad R_d = R_2 + 2 \cdot R_{fi} + 2 \cdot R_{fi} \cdot g_{mp} \cdot R_2$$

Open Calculator 

$$ex \quad 0.358486k\Omega = 0.064k\Omega + 2 \cdot 0.065k\Omega + 2 \cdot 0.065k\Omega \cdot 19.77mS \cdot 0.064k\Omega$$

12) Output Resistance of CS Amplifier with Source Resistance 

$$fx \quad R_d = R_{out} + R_{so} + (g_{mp} \cdot R_{out} \cdot R_{so})$$

Open Calculator 

$$ex \quad 0.358711k\Omega = 0.35k\Omega + 0.0011k\Omega + (19.77mS \cdot 0.35k\Omega \cdot 0.0011k\Omega)$$



13) Output Resistance of Emitter-Degenerated CE Amplifier 

$$f_x R_d = R_{out} + (g_{mp} \cdot R_{out}) \cdot \left(\frac{1}{R_e} + \frac{1}{R_{sm}} \right)$$

Open Calculator 

$$ex \quad 0.350108k\Omega = 0.35k\Omega + (19.77mS \cdot 0.35k\Omega) \cdot \left(\frac{1}{0.067k\Omega} + \frac{1}{1.45k\Omega} \right)$$

14) Output Voltage of Controlled Source Transistor 

$$f_x V_{gsq} = (A_v \cdot i_t - g'_m \cdot V_{od}) \cdot \left(\frac{1}{R_{final}} + \frac{1}{R_1} \right)$$

Open Calculator 

$$ex \quad 10.0982V = (4.21 \cdot 4402mA - 2.5mS \cdot 100.3V) \cdot \left(\frac{1}{0.00243k\Omega} + \frac{1}{0.0071k\Omega} \right)$$

15) Resistance of Emitter in Common-Base Amplifier 

$$f_x R_e = \frac{V_{in}}{i_e}$$

Open Calculator 

$$ex \quad 0.067006k\Omega = \frac{2.5V}{37.31mA}$$

16) Signal Current in Emitter given Input Signal 

$$f_x i_{se} = \frac{V_{fc}}{R_e}$$

Open Calculator 

$$ex \quad 74.62687mA = \frac{5V}{0.067k\Omega}$$



17) Transconductance in Common Source Amplifier 

$$\text{fx } g_{\text{mp}} = f_{\text{ug}} \cdot (C_{\text{gs}} + C_{\text{gd}})$$

[Open Calculator](#) 

$$\text{ex } 19.76627\text{mS} = 51.57\text{Hz} \cdot (145.64\mu\text{F} + 237.65\mu\text{F})$$

18) Transconductance using Collector Current of Transistor Amplifier 

$$\text{fx } g_{\text{mp}} = \frac{i_c}{V_t}$$

[Open Calculator](#) 

$$\text{ex } 19.76\text{mS} = \frac{39.52\text{mA}}{2\text{V}}$$



Variables Used









- A_V Voltage Gain
- C_{gd} Capacitance Gate to Drain (*Microfarad*)
- C_{gs} Gate to Source Capacitance (*Microfarad*)
- f_{ug} Unity Gain Frequency (*Hertz*)
- g'_m Short Circuit Transconductance (*Millisiemens*)
- g_{mp} MOSFET Primary Transconductance (*Millisiemens*)
- i_b Base Current (*Milliampere*)
- i_c Collector Current (*Milliampere*)
- i_d Drain Current (*Milliampere*)
- i_e Emitter Current (*Milliampere*)
- i_{se} Signal Current in Emitter (*Milliampere*)
- i_t Electric Current (*Milliampere*)
- K_n Transconductance Parameter (*Milliampere per Square Volt*)
- R_1 Resistance of Primary Winding in Secondary (*Kilohm*)
- R_2 Resistance of Secondary Winding in Primary (*Kilohm*)
- R_b Base Resistance (*Kilohm*)
- R_{b2} Base Resistance 2 (*Kilohm*)
- R_d Drain Resistance (*Kilohm*)
- R_e Emitter Resistance (*Kilohm*)
- R_{fi} Finite Resistance (*Kilohm*)
- R_{final} Final Resistance (*Kilohm*)
- R_{in} Input Resistance (*Kilohm*)



- R_L Load Resistance (Kilohm)
- R_{out} Finite Output Resistance (Kilohm)
- R_{sm} Small Signal Input Resistance (Kilohm)
- R_{so} Source Resistance (Kilohm)
- R_t Total Resistance (Kilohm)
- V_{fc} Fundamental Component Voltage (Volt)
- V_{gs} Voltage between Gate and Source (Volt)
- V_{gsq} DC Component of Gate to Source Voltage (Volt)
- V_{in} Input Voltage (Volt)
- V_L Load Voltage (Volt)
- V_{od} Differential Output Signal (Volt)
- V_{ox} Voltage across Oxide (Volt)
- V_t Threshold Voltage (Volt)
- Z_{in} Input Impedance (Kilohm)
- β Collector Base Current Gain



Constants, Functions, Measurements used

- **Measurement: Electric Current** in Milliampere (mA)
Electric Current Unit Conversion 
- **Measurement: Frequency** in Hertz (Hz)
Frequency Unit Conversion 
- **Measurement: Capacitance** in Microfarad (μF)
Capacitance Unit Conversion 
- **Measurement: Electric Resistance** in Kiloohm ($\text{k}\Omega$)
Electric Resistance Unit Conversion 
- **Measurement: Electric Conductance** in Millisiemens (mS)
Electric Conductance Unit Conversion 
- **Measurement: Electric Potential** in Volt (V)
Electric Potential Unit Conversion 
- **Measurement: Transconductance** in Millisiemens (mS)
Transconductance Unit Conversion 
- **Measurement: Transconductance Parameter** in Milliampere per Square Volt (mA/V^2)
Transconductance Parameter Unit Conversion 



Check other formula lists

- [Common Stage Amplifiers Gain Formulas](#) 
- [CV Actions of Common Stage Amplifiers Formulas](#) 
- [Multi Stage Transistor Amplifiers Formulas](#) 
- [Transistor Amplifier Characteristics Formulas](#) 

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