

Important CV Actions of Common Stage Amplifiers Formulas PDF



Formulas Examples with Units

List of 18 Important CV Actions of Common Stage Amplifiers Formulas

1) Emitter Current of Common-Base Amplifier Formula

Formula

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

Example with Units

$$37.3134 \text{ mA} = \frac{2.5 \text{ V}}{0.067 \text{ k}\Omega}$$

Evaluate Formula 

2) Fundamental Voltage in Common-Emitter Amplifier Formula

Formula

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

Example with Units

$$4.8928 \text{ V} = 0.301 \text{ k}\Omega \cdot 16.255 \text{ mA}$$

Evaluate Formula 

3) Input Impedance of Common-Base Amplifier Formula

Formula

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

Example with Units

$$0.064 \text{ k}\Omega = \left(\frac{1}{0.067 \text{ k}\Omega} + \frac{1}{1.45 \text{ k}\Omega} \right)^{-1}$$

Evaluate Formula 

4) Input Resistance of Common Emitter Amplifier Formula

Formula

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

Example with Units

$$0.2953 \text{ k}\Omega = \left(\frac{1}{1.213 \text{ k}\Omega} + \frac{1}{0.534 \text{ k}\Omega} + \frac{1}{1.45 \text{ k}\Omega} \right)^{-1}$$

Evaluate Formula 

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

Formula

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

Evaluate Formula 

Example with Units

$$0.3197 \text{ k}\Omega = \left(\frac{1}{1.213 \text{ k}\Omega} + \frac{1}{0.534 \text{ k}\Omega} + \frac{1}{1.45 \text{ k}\Omega + (12 + 1) \cdot 0.067 \text{ k}\Omega} \right)^{-1}$$



6) Input Resistance of Common-Base Circuit Formula

Formula

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

Example with Units

$$0.2134 \text{ k}\Omega = \frac{0.067 \text{ k}\Omega \cdot (0.35 \text{ k}\Omega + 1.013 \text{ k}\Omega)}{0.35 \text{ k}\Omega + \left(\frac{1.013 \text{ k}\Omega}{12 + 1} \right)}$$

Evaluate Formula 

7) Input Resistance of Common-Collector Amplifier Formula

Formula

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

Example with Units

$$0.3076 \text{ k}\Omega = \frac{5 \text{ V}}{16.255 \text{ mA}}$$

Evaluate Formula 

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

Formula

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

Example with Units

$$0.3076 \text{ k}\Omega = \left(\frac{1}{1.213 \text{ k}\Omega} + \frac{1}{0.534 \text{ k}\Omega} + \frac{1}{(0.072 \text{ k}\Omega + 0.067 \text{ k}\Omega) \cdot (12 + 1)} \right)^{-1}$$

Evaluate Formula 

9) Instantaneous Drain Current using Voltage between Drain and Source Formula

Formula

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

Example with Units

$$17.4891 \text{ mA} = 2.95 \text{ mA/V}^2 \cdot (3.775 \text{ V} - 2 \text{ V}) \cdot 3.34 \text{ V}$$

Evaluate Formula 

10) Load Voltage of CS Amplifier Formula

Formula

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

Example with Units

$$10.525 \text{ V} = 4.21 \cdot 2.5 \text{ V}$$

Evaluate Formula 

11) Output Resistance at Another Drain of Controlled Source Transistor Formula

Formula

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

Example with Units

$$0.3585 \text{ k}\Omega = 0.064 \text{ k}\Omega + 2 \cdot 0.065 \text{ k}\Omega + 2 \cdot 0.065 \text{ k}\Omega \cdot 19.77 \text{ mS} \cdot 0.064 \text{ k}\Omega$$

Evaluate Formula 



12) Output Resistance of CS Amplifier with Source Resistance Formula

Formula

Evaluate Formula 

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

Example with Units

$$0.3587 \text{ k}\Omega = 0.35 \text{ k}\Omega + 0.0011 \text{ k}\Omega + (19.77 \text{ mS} \cdot 0.35 \text{ k}\Omega \cdot 0.0011 \text{ k}\Omega)$$

13) Output Resistance of Emitter-Degenerated CE Amplifier Formula

Formula

Evaluate Formula 

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

Example with Units

$$0.3501 \text{ k}\Omega = 0.35 \text{ k}\Omega + (19.77 \text{ mS} \cdot 0.35 \text{ k}\Omega) \cdot \left(\frac{1}{0.067 \text{ k}\Omega} + \frac{1}{1.45 \text{ k}\Omega} \right)$$

14) Output Voltage of Controlled Source Transistor Formula

Formula

Evaluate Formula 

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

Example with Units

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

15) Resistance of Emitter in Common-Base Amplifier Formula

Formula

Example with Units

Evaluate Formula 

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

$$0.067 \text{ k}\Omega = \frac{2.5 \text{ V}}{37.31 \text{ mA}}$$

16) Signal Current in Emitter given Input Signal Formula

Formula

Example with Units

Evaluate Formula 

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

$$74.6269 \text{ mA} = \frac{5 \text{ V}}{0.067 \text{ k}\Omega}$$

17) Transconductance in Common Source Amplifier Formula

Formula

Example with Units

Evaluate Formula 

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

$$19.7663 \text{ mS} = 51.57 \text{ Hz} \cdot (145.64 \text{ }\mu\text{F} + 237.65 \text{ }\mu\text{F})$$



18) Transconductance using Collector Current of Transistor Amplifier Formula

Formula

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

Example with Units

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

Evaluate Formula 



Variables used in list of CV Actions of Common Stage Amplifiers Formulas above

- 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)

Constants, Functions, Measurements used in list of CV Actions of Common Stage Amplifiers Formulas above

- **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 Kilohm ($k\Omega$)
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 



- 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



Download other Important Transistor Amplifiers PDFs

- **Important Transistor Amplifier Characteristics Formulas** 

Try our Unique Visual Calculators

-  **Percentage of number** 
-  **LCM calculator** 
-  **Simple fraction** 

Please SHARE this PDF with someone who needs it!

This PDF can be downloaded in these languages

[English](#) [Spanish](#) [French](#) [German](#) [Russian](#) [Italian](#) [Portuguese](#) [Polish](#) [Dutch](#)

7/10/2024 | 3:47:55 AM UTC

