Important Schmitt Trigger Formulas PDF

Formulas
Examples
with Units

List of 15
Important Schmitt Trigger Formulas

1) Component Resistance of Controller Formula

Formula

$$R_{comp} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2}}$$

Example with Units

$$3.4211\,k\Omega = \frac{1}{\frac{1}{10\,k\Omega} + \frac{1}{5.2\,k\Omega}}$$

2) Final Voltage of Schmitt Trigger Formula

Formula

$$V_{fi} = A_v \cdot \left(V_+ - V_- \right)$$

Example with Units

$$1.0397v = -1.677 \cdot \left(0.97v - 1.59v \right)$$

3) Hysteresis Loss of Non-Inverting Schmitt Trigger Formula

Formula

$$H = 2 \cdot V_{sat} \cdot \left(\frac{R_2}{R_1} \right)$$

Example with Units

$$1.248v = 2 \cdot 1.2v \cdot \left(\frac{5.2\,k\Omega}{10\,k\Omega} \right)$$

4) Input Current of Schmitt Trigger Formula

Formula

$$i_n = \frac{V_{in}}{R_{in}}$$

Example with Units

$$1.1209\,mA = \frac{10.2v}{9.1\,k\Omega}$$

5) Input Voltage of Inverting Schmitt Trigger Formula

Formula

$$V_- = V_{fi} \cdot \left(\frac{R_1 + R_2}{R_1} \right)$$

Example with Units

$$1.5808v = 1.04v \cdot \left(\frac{10\,k\Omega + 5.2\,k\Omega}{10\,k\Omega} \right)$$

6) Input Voltage of Non-Inverting Schmitt Trigger Formula

Formula

$$V_+ = \left(\frac{R_1}{R_1 + R_2} \right) \cdot V_o$$

Example with Units

$$0.9737v = \left(\frac{10\,k\Omega}{10\,k\Omega + 5.2\,k\Omega} \right) \cdot 1.48v$$

7) Lower Threshold Voltage of Inverting Schmitt Trigger Formula

Formula

$$V_f = -V_{sat} \cdot \left(\frac{R_2}{R_1 + R_2} \right)$$

Example with Units

$$-0.4105\,v = -1.2\,v \cdot \left(\frac{5.2\,k\Omega}{10\,k\Omega + 5.2\,k\Omega} \right)$$

Evaluate Formula

8) Lower Threshold Voltage of Non Inverting Schmitt Trigger Formula

Formula

$$V_{lt} = -V_{sat} \cdot \left(\frac{R_2}{R_1} \right)$$

Example with Units

$$-0.624\,v = -1.2\,v \cdot \left(\frac{5.2\,k\Omega}{10\,k\Omega} \right)$$

Evaluate Formula

9) Negative Saturation Voltage of Srchmitt Trigger Formula

Formula

$$V_{sat} = -V_{ee} + V_{drop}$$

Example with Units

$$1.2\,v = -0.7\,v + 1.90\,v$$

Evaluate Formula

10) Open Loop Gain of Schmitt Trigger Formula

Formula

$$A_v = \frac{V_{fi}}{V_+ - V_-}$$

Example with Units

$$-1.6774 = \frac{1.04\,v}{0.97\,v - 1.59\,v}$$

Evaluate Formula

11) Positive Saturation Voltage of Schmitt Trigger Formula

Formula

$$V_{sat} = +V_{cc} - V_{drop}$$

Example with Units

$$1.2\,v = +3.1\,v - 1.90\,v$$

Evaluate Formula

12) Resistance of Schmitt Trigger Formula

Formula

$$R_{in} = \frac{V_{in}}{i_n}$$

Example with Units

$$9.1071\,k\Omega = \frac{10.2\,v}{1.12\,mA}$$

Evaluate Formula

13) Upper Treshold Voltage of Inverting Schmitt Trigger Formula

Formula

$$V_{ut} = +V_{sat} \cdot \frac{R_2}{R_1 + R_2}$$

Example with Units

$$0.4105\,v = +1.2\,v \cdot \frac{5.2\,k\Omega}{10\,k\Omega + 5.2\,k\Omega}$$

Evaluate Formula

14) Voltage Change of Controller Formula ↗

Formula

$$\Delta V = \frac{2 \cdot V_{sat} \cdot R_1}{R_2 + R_1}$$

Example with Units

$$1.5789\text{v} = \frac{2 \cdot 1.2\text{v} \cdot 10\text{k}\Omega}{5.2\text{k}\Omega + 10\text{k}\Omega}$$

15) Voltage Transfer Equation for Inverting Schmitt Trigger Formula ↗

Formula

$$V_- = V_{off} \cdot \left(\frac{R_2}{R_1 + R_2} \right) + V_o \cdot \left(\frac{R_1}{R_1 + R_2} \right)$$

Example with Units

$$1.5963\text{v} = 1.82\text{v} \cdot \left(\frac{5.2\text{k}\Omega}{10\text{k}\Omega + 5.2\text{k}\Omega} \right) + 1.48\text{v} \cdot \left(\frac{10\text{k}\Omega}{10\text{k}\Omega + 5.2\text{k}\Omega} \right)$$

Variables used in list of Schmitt Trigger Formulas above

- A_v Open Loop Gain
- H Hysteresis Loss *(Volt)*
- i_n Input Current *(Milliampere)*
- R_1 Resistance 1 *(Kilohm)*
- R_2 Resistance 2 *(Kilohm)*
- R_{comp} Component Resistance of Controller *(Kilohm)*
- R_{in} Input Resistance *(Kilohm)*
- V_- Inverting Input Voltage *(Volt)*
- V_+ Non-Inverting Input Voltage *(Volt)*
- V_{cc} Supply Voltage of Op Amp *(Volt)*
- V_{drop} Small Voltage Drop *(Volt)*
- V_{ee} Emitter Voltage *(Volt)*
- V_f Feedback Threshold Voltage *(Volt)*
- V_{fi} Final Voltage *(Volt)*
- V_{in} Input Voltage *(Volt)*
- V_{lt} Lower Threshold Voltage *(Volt)*
- V_o Output Voltage *(Volt)*
- V_{off} Input Offset Voltage *(Volt)*
- V_{sat} Saturation Voltage *(Volt)*
- V_{ut} Upper Threshold Voltage *(Volt)*
- ΔV Voltage Change *(Volt)*

Constants, Functions, Measurements used in list of Schmitt Trigger Formulas above

- Measurement: **Electric Current** in Milliampere (mA)
  Electric Current Unit Conversion ➦
- Measurement: **Electric Resistance** in Kilohm (kΩ)
  Electric Resistance Unit Conversion ➦
- Measurement: **Electric Potential** in Volt (V)
  Electric Potential Unit Conversion ➦

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