



555 theoretical frequency calculation

$$F = 0.71 / R_{\text{trimpot}} / C_{\text{timingcap}}$$

$$RV1 = 2 \text{ M}\Omega - 20 \text{ k}\Omega$$

$$RV2 = 50 \text{ k}\Omega - 500 \text{ }\Omega$$

$$F(RV1) = 5 \text{ Hz} - 525 \text{ Hz}$$

$$F(RV2) = 210 \text{ Hz} - 21 \text{ kHz}$$

MOSFET gate charge freq limitations

$$T_{\text{fret}} = Q_{\text{gatecharge}} / I_{\text{max}}$$

$$T_{\text{fret}} = 9.4 \text{ nC} / 100 \text{ mA}$$

$$T_{\text{fret}} = 94 \text{ ns}$$

theoretical max cap charge frequency

$$Q_{\text{timingcap}} = Q(2/3V_{\text{cc}}) - Q(1/3V_{\text{cc}})$$

$$Q(2/3V_{\text{cc}}) = C_{\text{timingcap}} * 2/3V_{\text{cc}}$$

$$Q(2/3V_{\text{cc}}) = 68 * 10^{-9} * 3.33 \text{ V} = 226 \text{ nC}$$

$$Q(1/3V_{\text{cc}}) = C_{\text{timingcap}} * 1/3V_{\text{cc}}$$

$$Q(1/3V_{\text{cc}}) = 68 * 10^{-9} * 1.66 \text{ V} = 113 \text{ nC}$$

$$Q_{\text{timingcap}} = 113 \text{ nC}$$

$$T_{\text{rise}} = Q_{\text{timingcap}} / I$$

$$T_{\text{riseusb}} = 113 \text{ nC} / 500 \text{ mA}$$

$$T_{\text{riseusb}} = 226 \text{ ns}$$

$$T_{\text{riseusb}} = 113 \text{ nC} / 2 \text{ A}$$

$$T_{\text{riseusb}} = 56 \text{ ns}$$

$$(F(RV3)_{\text{max}})^{-1} / T_{\text{riseusb}} = 4.43$$

$$(F(RV3)_{\text{max}})^{-1} / T_{\text{riseusb}} = 17.86$$

$$(F(RV4)_{\text{max}})^{-1} / T_{\text{riseusb}} = 0.88$$

$$(F(RV4)_{\text{max}})^{-1} / T_{\text{riseusb}} = 3.57$$

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