$$\frac{1}{\sqrt{2}} = \sqrt{\frac{\epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)}{1+\epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)}}$$

$$\frac{1}{2} = \frac{\epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)}{1+\epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)}$$

$$\frac{1}{2} = \frac{1}{2}\epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)$$

$$1 = \epsilon^2 C_k^2\left(\frac{\omega_s}{\omega_c}\right)$$

$$\frac{1}{\epsilon^2} = C_k^2\left(\frac{\omega_s}{\omega_c}\right)$$

$$\frac{1}{\epsilon} = C_k\left(\frac{\omega_s}{\omega_c}\right) = \cos\left(3\cos^{-1}\left(\frac{\omega_s}{\omega_c}\right)\right)$$

$$\cos^{-1}\left(\frac{1}{\epsilon}\right) = 3\cos^{-1}\left(\frac{\omega_s}{\omega_c}\right)$$

$$\cos\left(\frac{\cos^{-1}\left(\frac{1}{\epsilon}\right)}{3}\right) = \frac{\omega_s}{\omega_c}$$

$$\omega_s = \omega_c \cos\left(\frac{\cos^{-1}\left(\frac{1}{\epsilon}\right)}{3}\right) = 100\cos\left(\frac{\cos^{-1}\left(\frac{1}{\epsilon}\right)}{3}\right)$$