8.3 (a) The magnetic field is constant in the line, and $E = \sqrt{\frac{\mu}{\varepsilon}} H_0$, then

$$P = \frac{1}{2}\int EH\, da = \frac{ab}{2}\sqrt{\frac{\mu}{\varepsilon}}|H_0|^2 .$$

The energy attenuation is

$$-\frac{dP}{dz} = \frac{1}{2\sigma\delta}\oint |\vec{n}\times\vec{H}_{\parallel}|^2 dl = \frac{1}{2\sigma\delta}\cdot 2H_0^2 b = \frac{H_0^2 b}{\sigma\delta},$$

and $$\gamma = -\frac{1}{2P}\frac{dP}{dz} = \frac{1}{a\sigma\delta}\sqrt{\frac{\varepsilon}{\mu}}$$

The voltage is $V = E\cdot a = \sqrt{\frac{\mu}{\varepsilon}} H_0 a$. and the current is $I = H_0 b$. So,

$$Z_0 = \frac{V}{I} = \sqrt{\frac{\mu}{\varepsilon}}\frac{a}{b}$$

The resistance is $$R = \frac{2}{I^2}\left|\frac{dP}{dz}\right| = \frac{2}{\sigma\delta b}$$

The energy in the wire is $W_{wire} = \frac{1}{2}\mu H_0^2\cdot ab$, in the strip, it is given by

$$W_{strip} = 2\cdot\frac{\mu_c}{2}\cdot b\cdot\int_0^{+\infty} H_0^2 e^{-2\xi/\delta} d\xi = \frac{\mu_c\delta}{2}H_0^2 b.$$ Then,

$$L = \frac{2}{I^2}(W_{wire} + W_{strip}) = \frac{\mu a + \mu_c\delta}{b}$$