In classical linear algebra,

$$X^T X \beta = X^T Y$$

$$\hat{\beta} = (X^T X)^{-1} X^+ Y \qquad \text{Let } (X^T X)^{-1} X^T = A$$

$$\hat{\beta} = AY$$

$$\begin{aligned}
Var(\hat{\beta}) &= Var(AY) \\
&= A \, Var(Y) \, A^T \\
&= A \, Var(\beta X + \varepsilon) \, A^T \qquad \beta, x \text{ is fixed} \\
&= A \, Var(\varepsilon) \, A^T \qquad \text{Let } Var(\varepsilon) = \sigma^2 \\
&= A \, \sigma^2 A^T \qquad \sigma \text{ is a column vector} \\
&= A \cdot I \hat{\sigma}^2 A^T \\
&= \hat{\sigma}^2 (A A^+)
\end{aligned}$$

Assume constant variance for error term. The estimate of std of error/residual is $\hat{\sigma}$

$$\begin{aligned}
AA^+ &= ((X^T X)^{-1} X^T)((X^T X)^{-1} X^T)^T \\
&= ((X^T X)^{-1} \underline{X^+)(X} (X^T X)^{-1}) \\
&= (X^+ X)^{-1}
\end{aligned}$$

$$\therefore Var(\hat{\beta}) = \hat{\sigma}^2 \cdot (X^+ X)^{-1}$$

if X scale up to $100X$

$$Var(\hat{\beta})_{new} = \frac{1}{100^2} \hat{\sigma}^2 (X^+ X)^{-1}$$

$$t = \frac{\hat{\beta}}{std(\hat{\beta})} \qquad \therefore t_{new} = \frac{\hat{\beta}/100}{\frac{1}{100} std(\hat{\beta})} = \frac{\hat{\beta}}{std(\hat{\beta})}$$