Step 1 - Convolution

Additional Reading:

Introduction to Convolutional Neural Networks

By Jianxin Wu (2017)

Link:
http://cs.nju.edu.cn/wujx/paper/CNN.pdf

$$\frac{\partial z}{\partial (\text{vec}(\boldsymbol{y})^T)}(F^T \otimes I) = \left((F \otimes I)\frac{\partial z}{\partial \text{vec}(\boldsymbol{y})} \right)^T$$

$$= \left((F \otimes I)\,\text{vec}\left(\frac{\partial z}{\partial Y} \right) \right)^T$$

$$= \text{vec}\left(I\frac{\partial z}{\partial Y}F^T \right)^T$$

$$= \text{vec}\left(\frac{\partial z}{\partial Y}F^T \right)^T,$$