$$f \star g = \iint \frac{\widetilde{f}(k)\widetilde{g}(k')}{(2\pi)^{2D}} \hat{\Omega}^{-1}[\circ\!\circ e^{ik_i\hat{x}^i}\, e^{ik'_i\hat{x}^i} \circ\!\circ] d^D k d^D k'$$