$$p(\theta, w \mid \mathbf{y}) \propto w^{(n+d+1)/2-1} \exp\left(-w(n+\kappa)\frac{\left(\theta - \frac{n\overline{y} + \mu\kappa}{n+\kappa}\right)^2}{2}\right) \exp\left(-\frac{w}{2}\left(\mathbf{y}^\top \mathbf{y} + \kappa\mu^2 + \eta\right)\right)$$

$$d^* = n + d, \ \eta^* = \mathbf{y}^\top \mathbf{y} + \kappa\mu^2 + \eta, \ \kappa^* = (n+\kappa), \ \mu^* = \overline{y}\frac{n}{n+\kappa} + \frac{\kappa}{n+\kappa}\mu$$

$$p(\theta, w \mid \mathbf{y}) \propto w^{(d^*+1)/2-1} \exp\left(-w\frac{\kappa^*(\theta - \mu^*)^2}{2}\right) \exp\left(-w\frac{\eta^*}{2}\right)$$

$$p(\theta \mid \mathbf{y}) \propto \int_0^\infty w^{(d^*+1)/2-1} \exp\left(-w\frac{\kappa^*(\theta - \mu^*)^2}{2}\right) \exp\left(-w\frac{\eta^*}{2}\right) dw$$

$$\propto \int_0^\infty w^{(d^*+1)/2-1} \exp\left(-\left(\frac{\kappa^*(\theta - \mu^*)^2}{2} + \frac{\eta^*}{2}\right)w\right) dw$$

$$\propto \Gamma\left(\frac{d^*+1}{2}\right)\left(\frac{\kappa^*(\theta - \mu^*)^2}{2} + \frac{\eta^*}{2}\right)^{-\frac{d^*+1}{2}}$$

$$\propto \left(\frac{\eta^*}{2}\right)^{-\left(\frac{d^*+1}{2}\right)} \Gamma\left(\frac{d^*+1}{2}\right)\left(\frac{1}{d^*}\left(\frac{\theta - \mu^*}{\sqrt{\eta^*/\kappa^* d^*}}\right)^2 + 1\right)^{-\frac{d^*+1}{2}}$$

$$m = \mu^* = \frac{n\overline{y} + \mu\kappa}{n+\kappa}, \ s = \sqrt{\eta^*/\kappa^* d^*} = \sqrt{\frac{\mathbf{y}^\top \mathbf{y} + \kappa\mu^2 + \eta}{(n+\kappa)(n+d)}}$$