For the diagonal Covariance matrix

$$\Sigma = \begin{bmatrix} \sigma_1^2 & 0 & \cdots & 0 \\ 0 & \sigma_2^2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \\ 0 & 0 & & \sigma_D^2 \end{bmatrix},$$

the determinant is the product of the leading diagonal $\therefore \prod_{d=1}^{D} \sigma_d^2$

$$p(w) = \frac{1}{(2\pi)^{\frac{D}{2}} \left(\prod_{d=1}^{D} \sigma_d^2\right)^{\frac{1}{2}}} \exp\left(\sum \frac{-1}{2\sigma^2} (w_d - \mu_d)^2\right)$$

$$= \frac{1}{(2\pi)^{\frac{D}{2}} \left(\prod_{d=1}^{D} \sigma_d^2\right)^{\frac{1}{2}}} \prod_{d=1}^{D} \exp\left(-\frac{1}{2\sigma^2} (w_d - \mu_d)^2\right)$$

$$= \prod_{d=1}^{D} \frac{1}{(2\pi)^{\frac{D}{2}} \sigma_d} \exp\left(-\frac{1}{2\sigma^2} (w_d - \mu_d)\right)$$

This is the product of D independent Univariate Gaussians