5.38 We have to apply 2.115 to marginalize out $\mathbf{w}$ in 5.168.

We are given:

$$p(t|\mathbf{x}, \mathbf{w}) \simeq \mathcal{N}(t|y(\mathbf{x}, \mathbf{w}_{MAP}) + \mathbf{g}^T(\mathbf{w} - \mathbf{w}_{MAP}), \beta^{-1})$$

and

$$p(\mathbf{w}|\mathcal{D}) \simeq \mathcal{N}(\mathbf{w}|\mathbf{w}_{MAP}, \mathbf{A}^{-1})$$

Applying 2.115,

$$p(t|\mathbf{x}, \mathcal{D}) \simeq \mathcal{N}\left(y(\mathbf{x}, \mathbf{w}_{MAP}) + \mathbf{g}^T(\mathbf{w}_{MAP} - \mathbf{w}_{MAP}), \beta^{-1} + \mathbf{g}^T\mathbf{A}^{-1}\mathbf{g}\right)$$

$$= \mathcal{N}\left(y(\mathbf{x}, \mathbf{w}_{MAP}), \beta^{-1} + \mathbf{g}^T\mathbf{A}^{-1}\mathbf{g}\right)$$