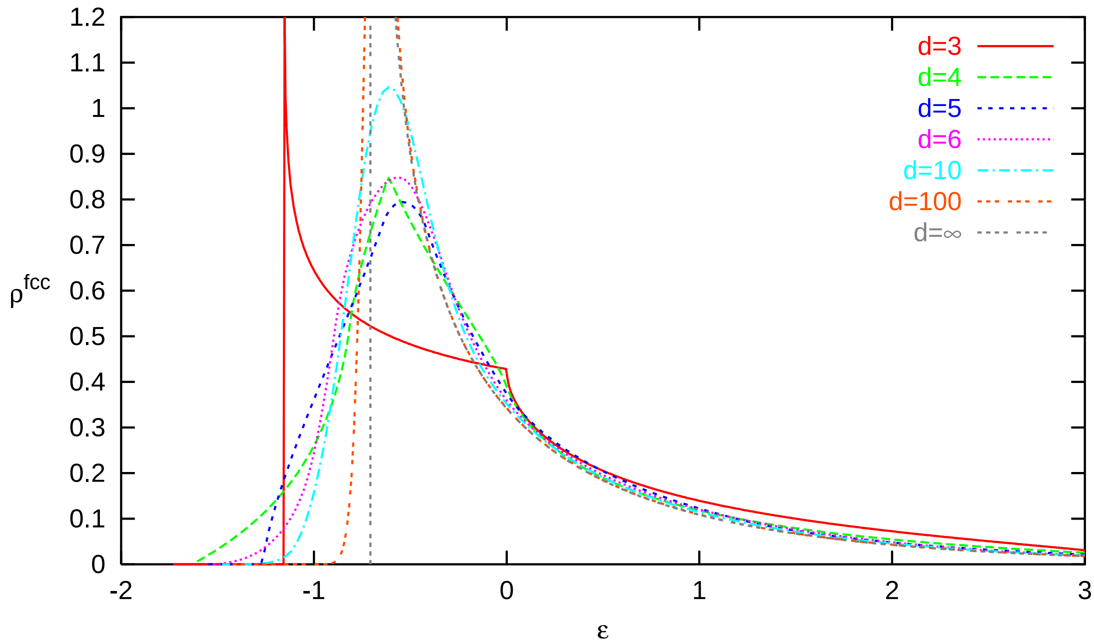

Figure 2.7: DOS of the fcc lattice.

maximum value of $\rho^{\text{fcc}}(\epsilon)$ increases significantly and develops into the square-root singularity observed at $d = \infty$ (see Fig. 2.7). Again, the singularity and the absence of the lower energy tail in this limit are not robust features when the dimensionality is decreased and thus results obtained in $d = \infty$ which depend on the singularity (as opposed to only a strong asymmetry) do not carry over to physically interesting dimensions.

The general behavior seen for t-t' hopping on the hc lattice and for NN hopping on the fcc lattice is easily explained by looking at the expressions for the energies for the hypercube with NN hopping,

$$\epsilon_{\boldsymbol{k}}^{\text{hc}} = -2t \sum_{\alpha=1}^{d} \cos(k_\alpha) \tag{2.14}$$

and the fcc lattice,

$$\begin{aligned}
\epsilon_{\boldsymbol{k}}^{\text{fcc}} &= 2t' \sum_{\substack{\alpha,\beta=1 \\ \alpha\neq\beta}}^{d} \cos(k_\alpha)\cos(k_\beta) && (2.15)\\
&= 2t' \Big[\Big(\sum_{\alpha=1}^{d} \cos(k_\alpha) \Big)^2 - \sum_{\alpha=1}^{d} \cos^2(k_\alpha) \Big] && (2.16)\\
&= dt' \Big[\Big(\sqrt{\frac{2}{d}} \sum_{\alpha=1}^{d} \cos(k_\alpha) \Big)^2 - 1 - \frac{1}{d} \sum_{\alpha=1}^{d} \cos(2k_\alpha) \Big] . && (2.17)
\end{aligned}$$