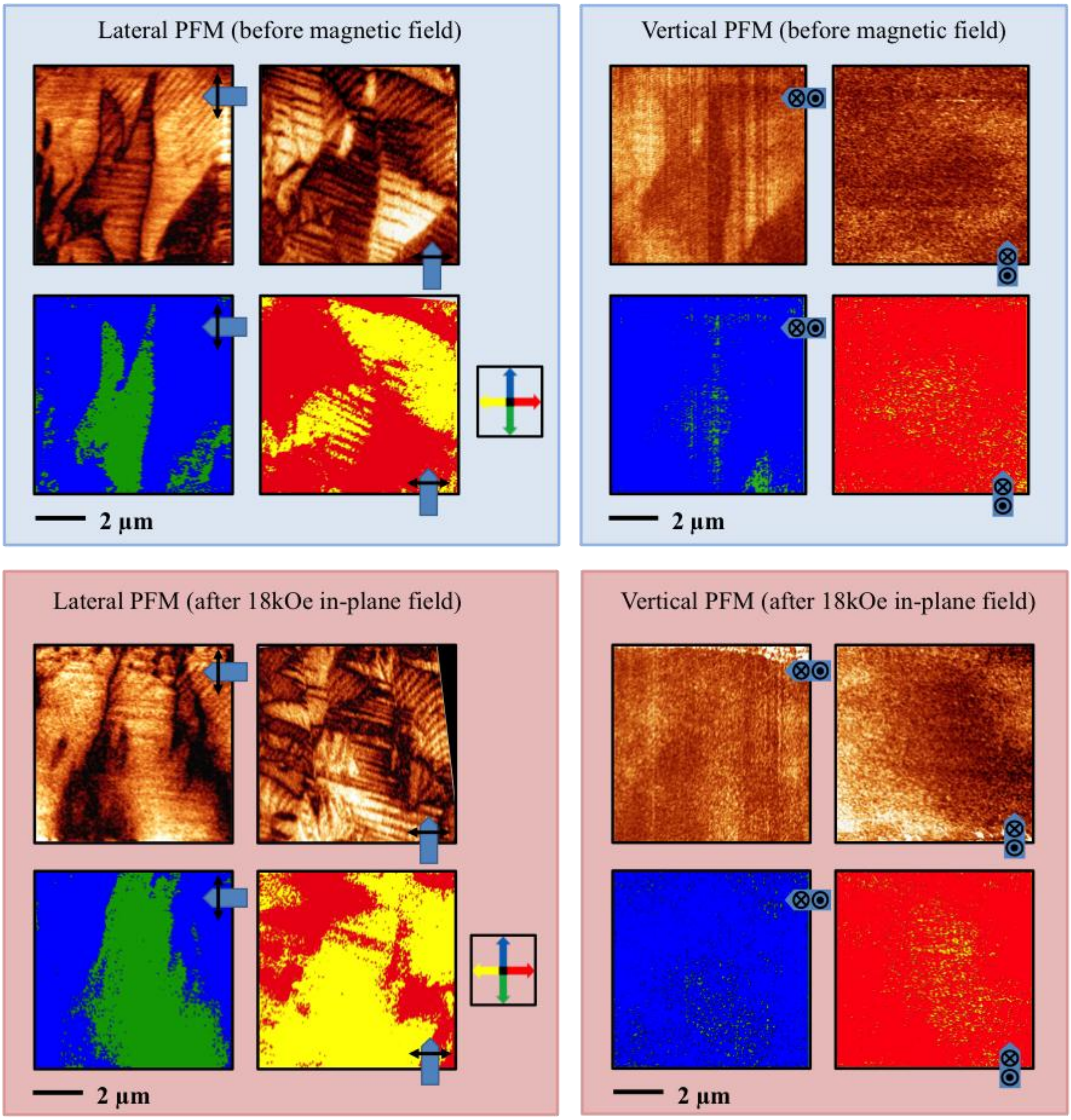
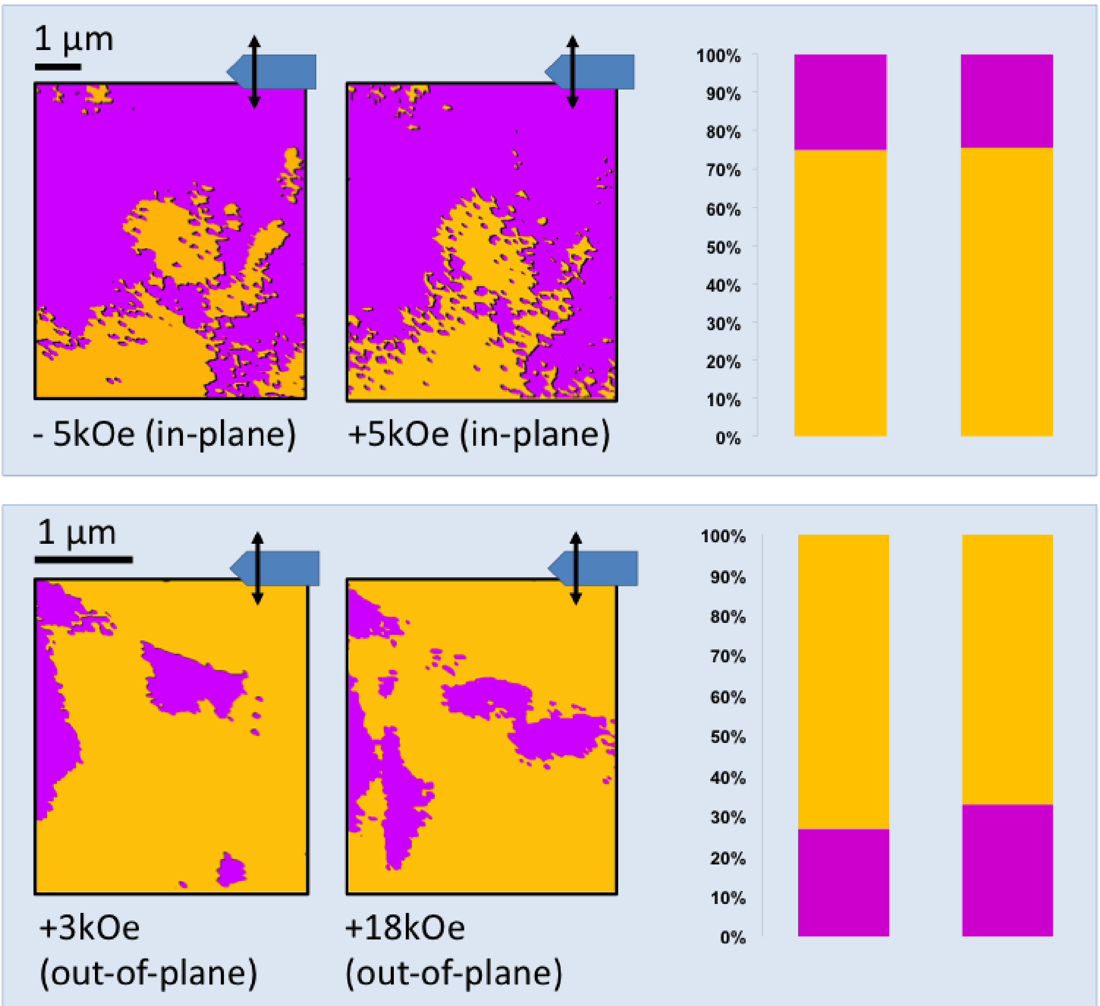
Supplementary Figures



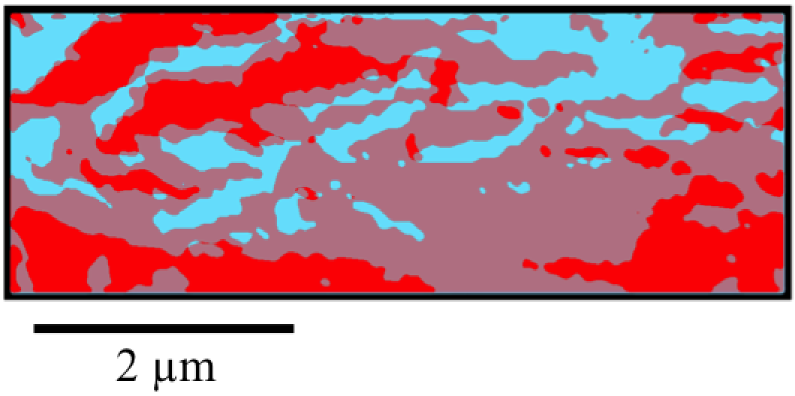
Supplementary Figure S1:

In figure 2 of the main article, phase data (before and after the application of a 1.8T magnetic field) from two orthogonal lateral piezoresponse force microscopy (PFM) images were overlayed. This allowed in-plane polarisation components to be readily visually categorised into four groupings according to local orientation: 'down and left'; 'down and right'; 'up and left' and 'up and right'. Here we present the same lateral PFM data, as well as the vertical PFM (VPFM) data which was not presented in the main article, in a more conventional format: separate amplitude and phase scans with two orthogonal cantilever orientations before the application of a magnetic field (top panels) and after 18kOe applied in the plane of the lamella (bottom panels) are shown. The blue schematic cantilevers show the cantilever orientation for each scan and the black arrows indicate the direction of polarisation component being mapped. As can be seen, the VPFM maps showed little in the way of meaningful domain contrast and it could therefore be that, for this lamella, polarisation vectors were predominantly in-plane.



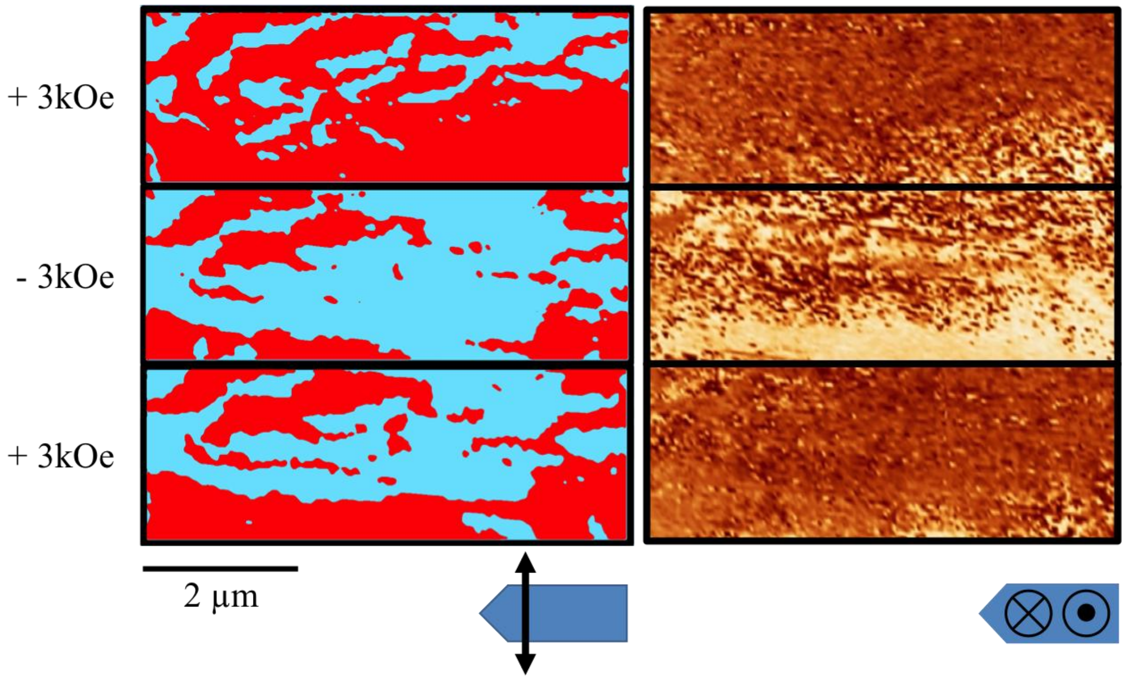
Supplementary Figure S2:

In the main article, changes to ferroelectric domain microstructures induced by large in-plane and more modest out-of-plane magnetic fields were presented. In Supplementary Figure S2 we illustrate typical changes induced by modest in-plane magnetic field variations (top panel) and by increasing the out-of-plane magnetic field beyond 3kOe to 18kOe (bottom panel). In both cases, only minor domain changes or minor additional domain changes have been induced.



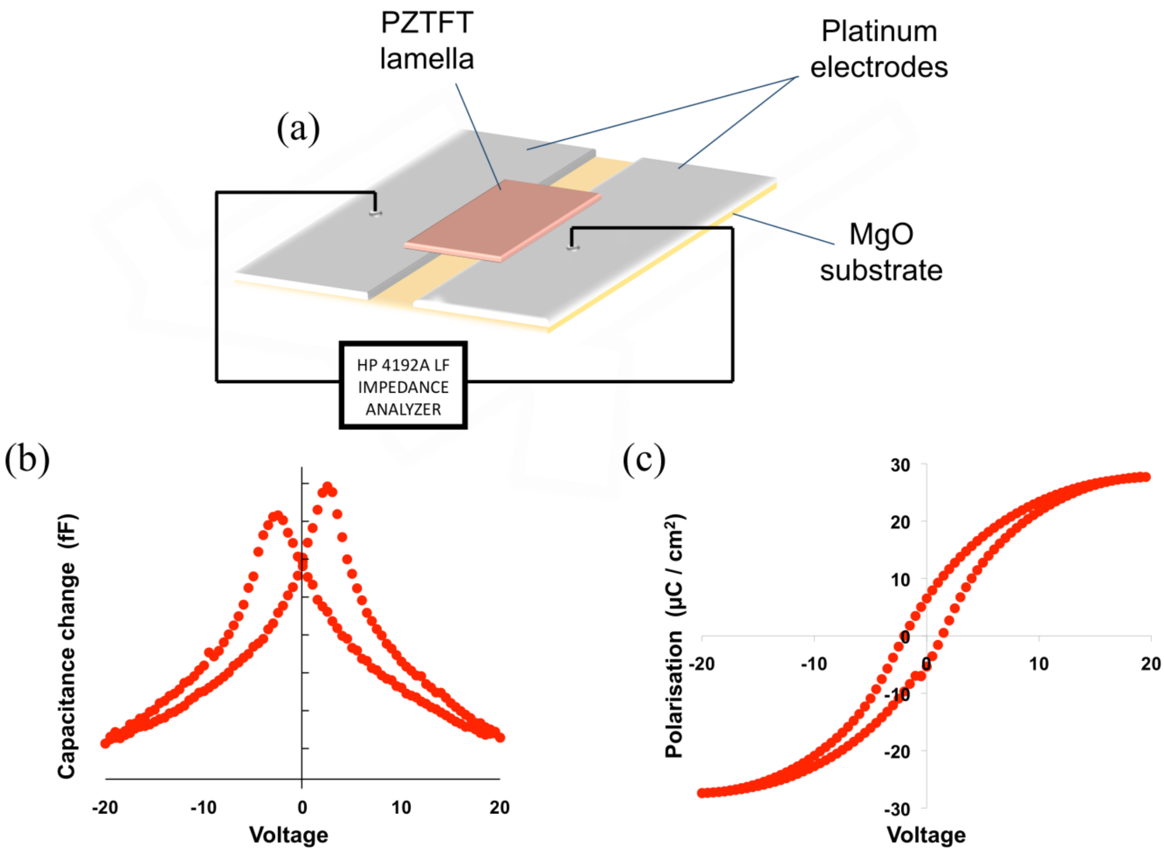
Supplementary Figure S3:

Overlay of lateral PFM phase maps highlighting the regions over which domain growth / contraction has occurred (mauve regions) as a result of changing the out-of-plane magnetic field from a nominal + 3kOe to -3kOe. Light blue and bright red regions represent domain states which have not changed upon reversal of the magnetic field.



Supplementary Figure S4:

Phase information from lateral piezoresponse force microscopy showing changes in ferroelectric domains resulting from changes in applied magnetic field (perpendicular to the lamellar surface) as given in the main manuscript (left three panels). Also presented in here are the corresponding vertical PFM (VPFM) phase images (left three panels). While changes in VPFM phase contrast can be seen, the images appear noisy; the correlation between the VPFM contrast observed and the ferroelectric domains in the imaged region is not compelling.



Supplementary Figure S5:

To determine the order of magnitude of the spontaneous polarisation in PZTFT, a lamella was integrated into a simple coplanar capacitor device structure using pre-patterned thin film Pt electrodes (a). Measured capacitance-voltage response (b) was found to be characteristic of a ferroelectric. Numerical integration was used to develop an integrated charge loop, in the same manner as had been done by Chang *et al* [Appl. Phys. Lett., **93**, 132904 (2008)]; this loop was then calibrated to obtain order of magnitude polarisation information, using the data obtained by Chang *et al.* for $BaTiO_3$ in the same geometry and under the assumption that the lamella of $BaTiO_3$ developed the same spontaneous polarisation as in bulk. As can be seen in (c), this methodology suggests the spontaneous polarisation for a PZTFT lamella (from the grain interior of the polycrystalline ceramic) is of the order of tens of μCcm^{-2}, broadly consistent with reference [24] in the main article and with our order of magnitude calculation of the effective magnetoelectric coupling parameter.