Hexagonal GaN films with the [0001] direction parallel to the surface normal were grown on (111) oriented single crystalline diamond substrates by plasma-assisted molecular beam epitaxy. Pre-treatments of the diamond surface with the nitrogen plasma beam, prior the nucleation of a thin AlN layer, eliminated the inversion domains and reduced the density of threading dislocations in the GaN epilayers. The films have an in-plane epitaxial relationship [1010]GaN//[110]diamond. Thus GaN (0001) thin films of single epitaxial relationship and of single polarity were realised on diamond with AlN buffer.