For the first time a single-pass frequency doubled DBR-tapered diode laser suitable for pumping Ti:sapphire lasers generating ultrashort pulses is demonstrated. The maximum output powers achieved when pumping the Ti:sapphire laser are 110 mW (CW) and 82 mW (mode-locked) respectively at 1.2 W of pump power. This corresponds to a reduction in optical conversion efficiencies to 75% of the values achieved with a commercial diode pumped solid-state laser. However, the superior electro-optical efficiency of the diode laser improves the overall efficiency of the Ti:sapphire laser by a factor >2. The optical spectrum emitted by the Ti:sapphire laser when pumped with our diode laser shows a spectral width of 112 nm (FWHM). Based on autocorrelation measurements, pulse widths of less than 20 fs can therefore be expected.