Supporting Information for: Optical Gating of Graphene on Photoconductive Fe:LiNbO$_3$

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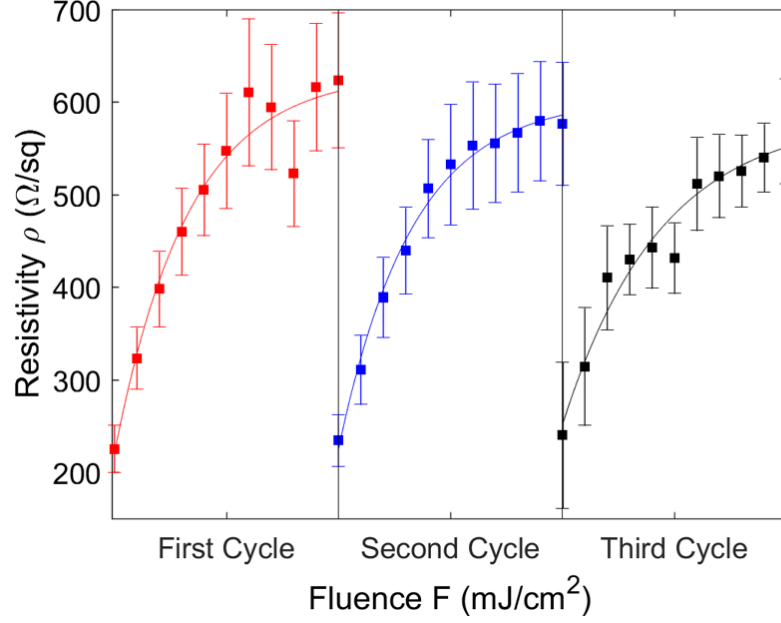
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Figure S1: Graphene sheet resistivity measured via the TLM plotted against illumination fluence for three independent illumination cycles separated by thermal annealing between each cycle. Each cycle consists of illuminating the device with a total fluence of 18,000 mJ/cm² and subsequently annealing at 100°C for 4 hours. The figure illustrates that after each cycle the thermal annealing process returns the device to its initial resistivity values, and that similar increases in the resistivity are observed as a result of illumination over all three cycles. Hence the observed changes of resistivity are not only reversable but also repeatable over a number of cycles. Due to the nature of electrical characterisation. the electrical contacts suffer degradation over time.
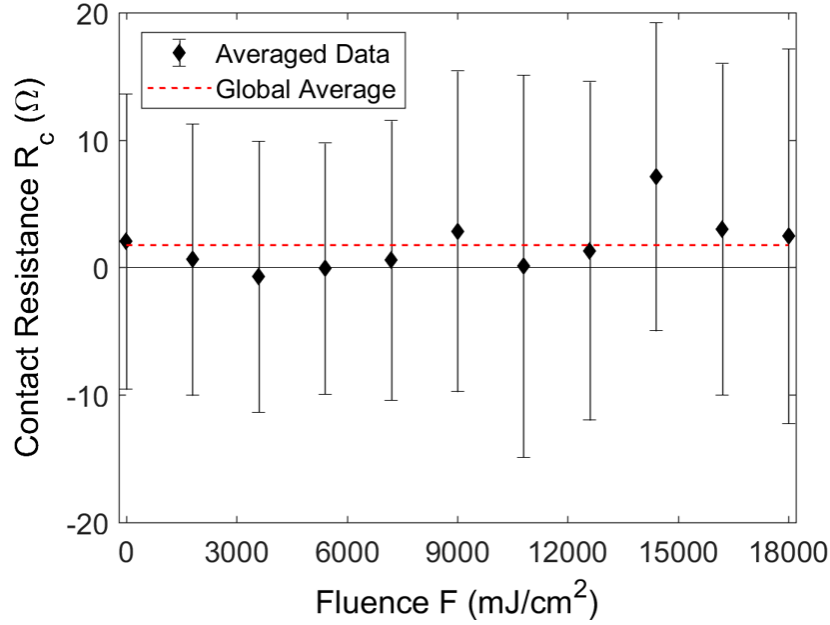
Figure S2: Contact resistance R_c as determined by the TLM method for the datasets shown in Figure 2(b) of the main text measured as a function of illumination fluence for three independent illumination cycles. Over each illumination cycle the device is illuminated at a total fluence dose of 18000 mJ/cm^2 at which point further changes in resistivity are negligible. Then the device is assumed to be saturated and is reset via the thermal annealing process. The average contact resistance over the three cycles are plotted against fluence showing negligable variation with no correlation to fluence dose. Errors in contact resistance for each independent measurement are obtained by the standard error from a least squares fitting to the plot of resistance against electrode spacing as illustrated in Fig. 2(a) of the main text. The errors are then propagated forward to provide an error bar for the average contact resistance at each fluence dose. The red line illustrates the global average of the contact resistance at a value of 1.75 Ω.
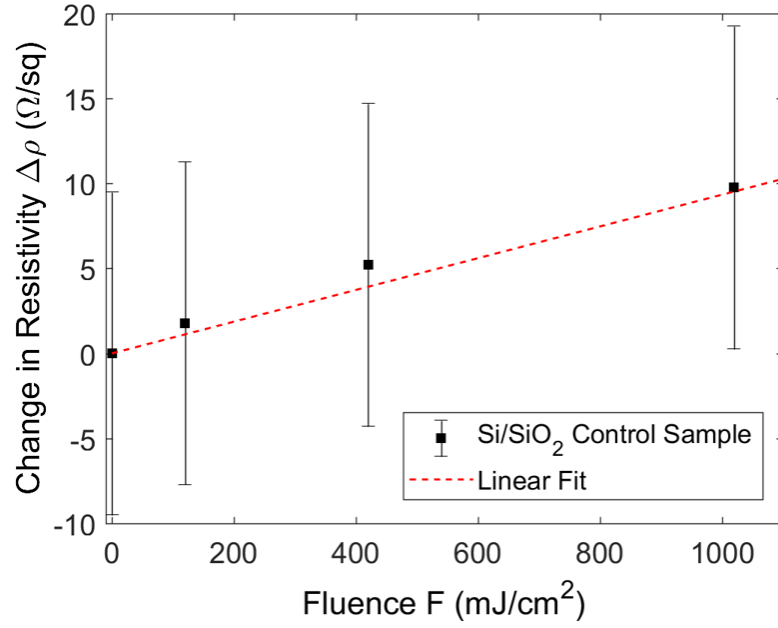
Figure S3: Resistivity change in a control sample of graphene on Si/SiO_2 measured via the TLM method as a function of fluence upto a dose of 1000 mJ/cm^2. The graph shows a small change in resistivity with fluence, however the change is well within experimental error and is an order of magnitude smaller than resistivity changes in $Fe:LiNbO_3$ for the same illumination dose.