

# Supporting Information: Segment-Specific Optogenetic Stimulation in *Drosophila melanogaster* with Linear Arrays of Organic Light-Emitting Diodes

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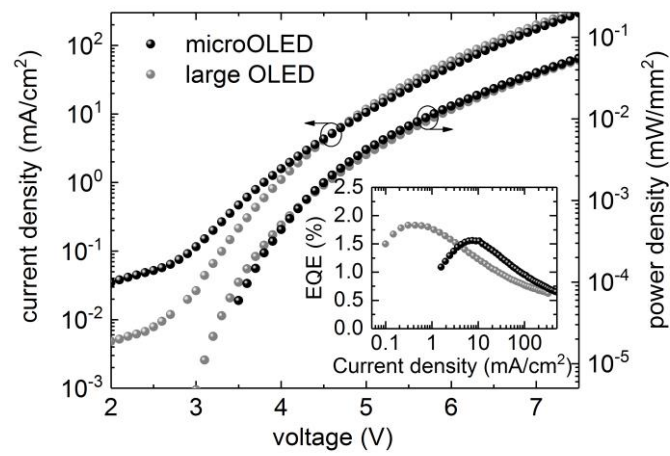
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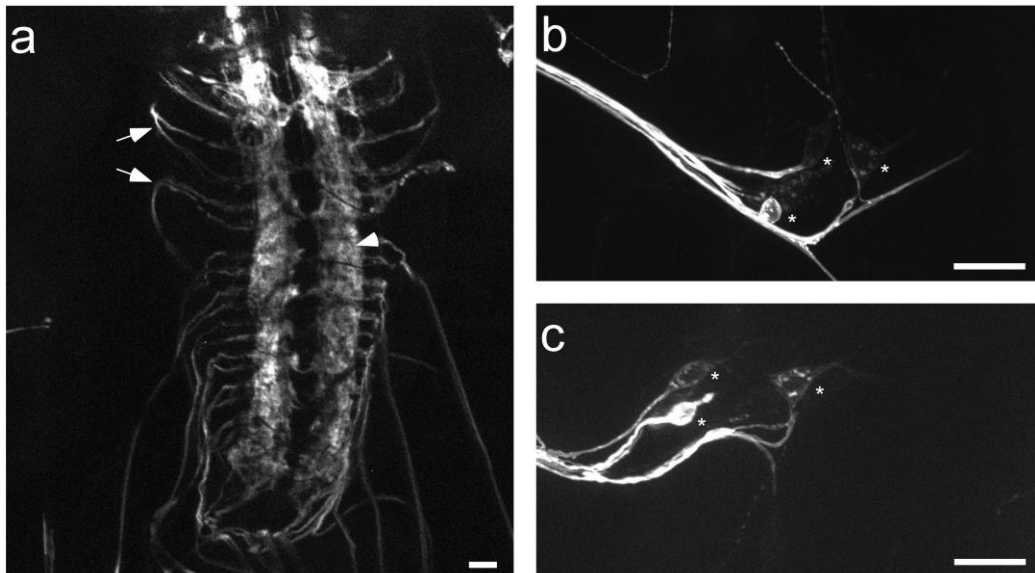
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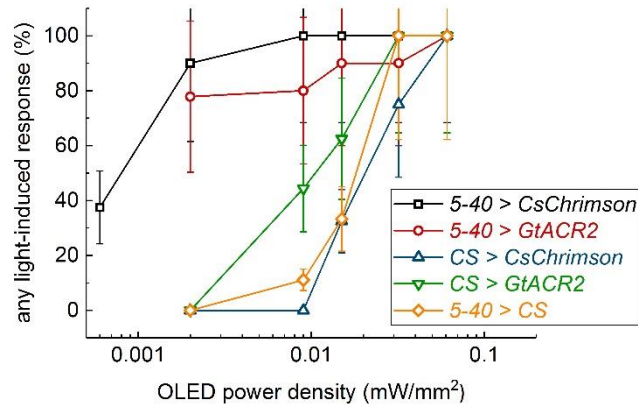
## Supplementary Figures



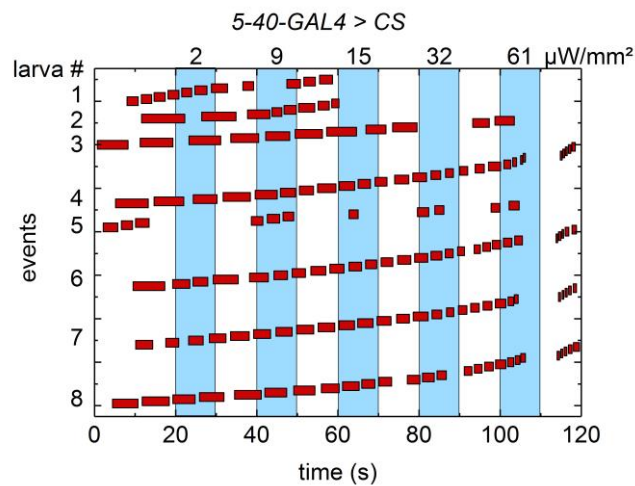
**Supplementary Figure 1.** Current density and optical power density as a function of the voltage for large ( $4 \times 4 \text{ mm}^2$ ) and for microstructured OLEDs. Inset: External quantum efficiency as a function of the current density.



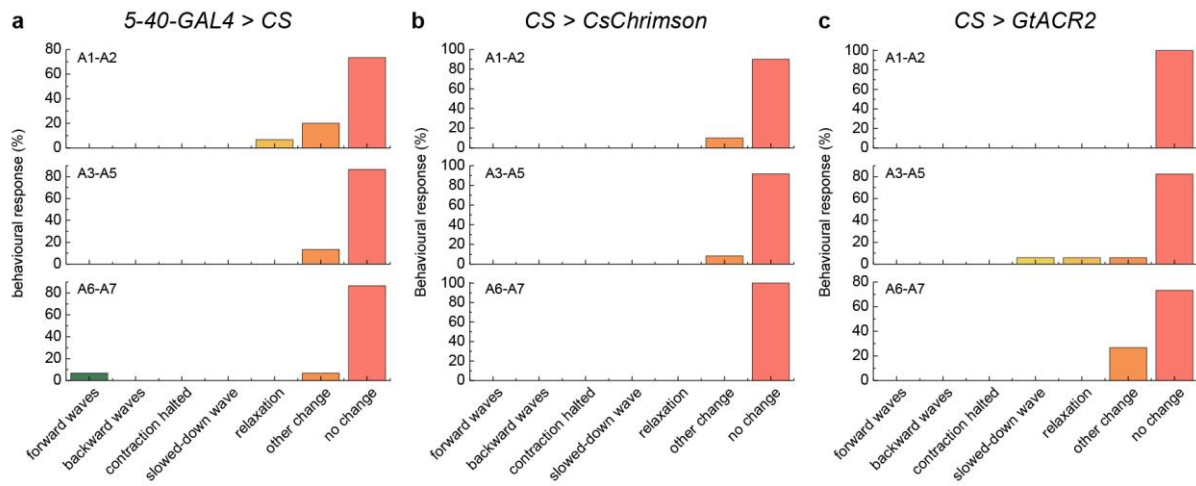
**Supplementary Figure 2.** Expression pattern of 5-40-GAL4. a) 3<sup>rd</sup> instar larval ventral nerve cord showing dense CsChrimson expression in neuropil regions (arrowhead) and nerve roots (arrows). Note lack of expression in any cell bodies in the central nervous system. b,c) 5-40-GAL4 expression in sensory neuron cell bodies in the peripheral nervous system (asterisks). Scale bars: 20  $\mu\text{m}$  in all panels.



**Supplementary Figure 3.** Dose-response curve for detecting any light-induced behaviour, e.g., twitching or stronger head movements, during exposure to blue light illumination from 4×4 mm<sup>2</sup> OLEDs. Control larvae showed a light-evoked behaviour for intensities of around 15 μW mm<sup>-2</sup> and higher. Data shows mean ± SEM; *n* ≥ 7 larvae in each genotype.



**Supplementary Figure 4.** Wave duration of forward muscle contraction waves upon stimulation with a large OLED at different brightness levels (OLED power density as indicated in top axis) for 5-40-GAL4 > CS larvae. Different events are spread across the y-axis. Numbers label events from individual animals (*n* = 8 larvae). Muscle contraction waves significantly accelerated at power densities above 32 μW mm<sup>-2</sup> and were accompanied with strong head and tail movements (Supporting Movie 3).



**Supplementary Figure 5.** Behavioural response of controls upon local stimulation with three neighbouring OLED pixels delivering  $15 \mu\text{W mm}^{-2}$  for 10 s. Most larvae ( $> 70\%$  for each condition) showed no response. Some larvae showed a change in behaviour, however, this is attributed to random, non-light-induced changes. Importantly, no muscle contraction waves were evoked.  $n \geq 4$  larvae for each condition.