

Supporting Information

Collective dynamics of neuronal activities in various modular networks

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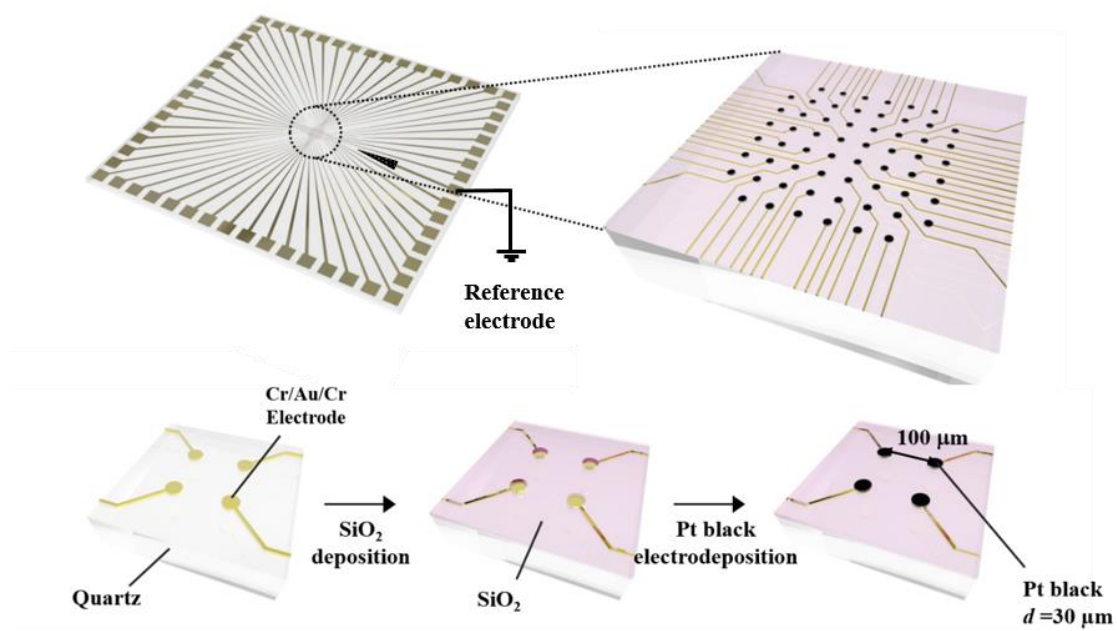


Figure S1. Fabrication procedure for the multi-electrode array (MEA).

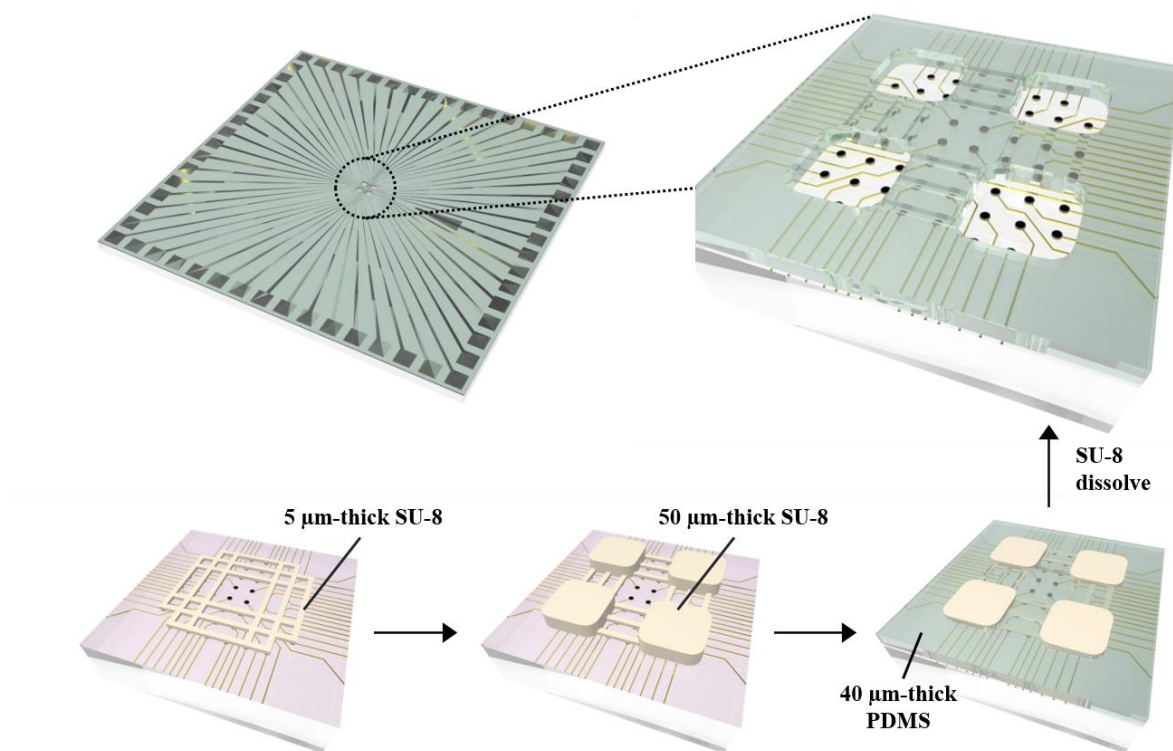


Figure S2. Fabrication procedure for the PDMS microstructure on the MEA.

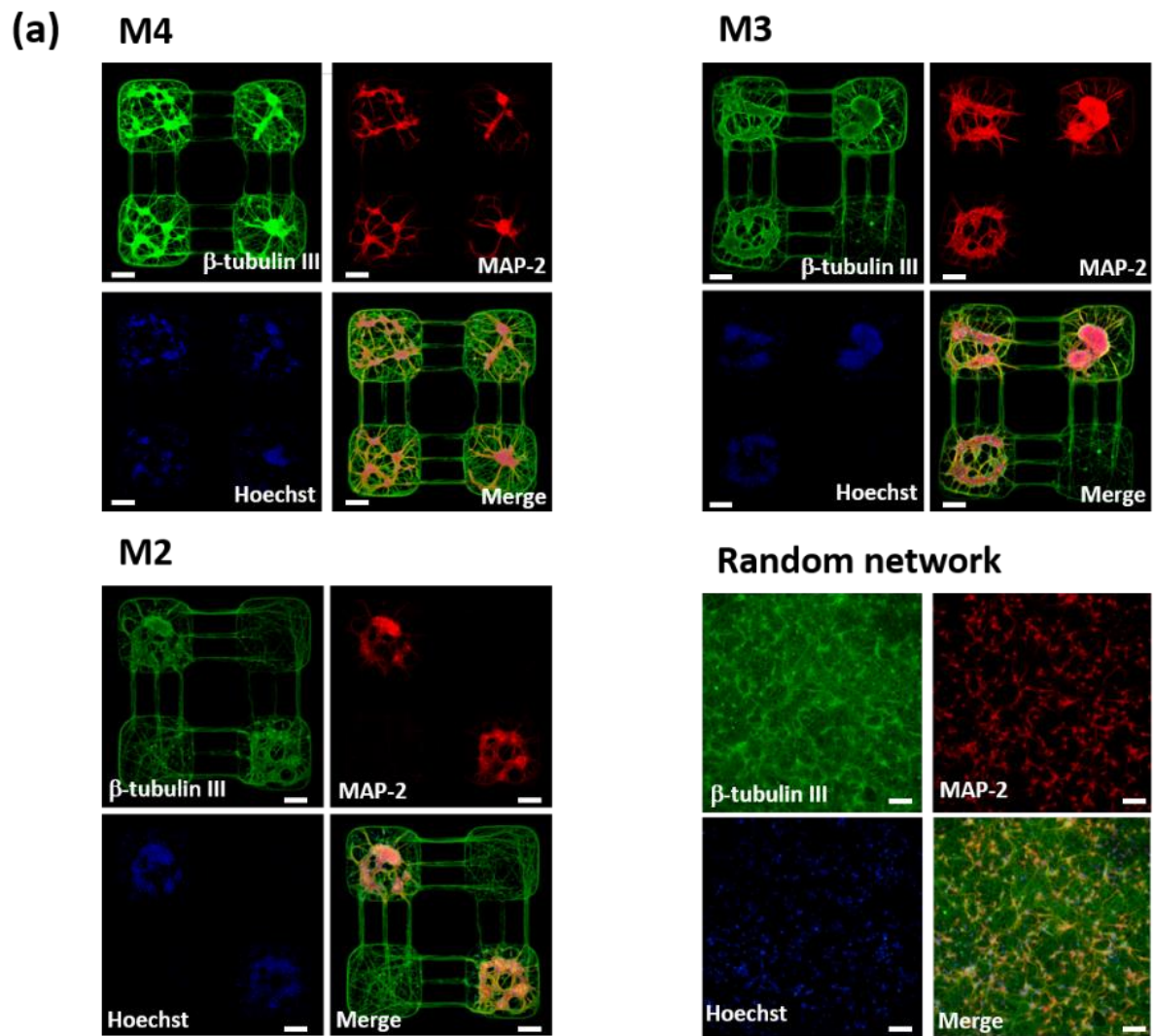


Figure S3. (a) Axons (β -tubulin III, green), dendrites (MAP2, red), and nuclei (Hoechst, blue) and merged images acquired from M4, M3, M2, and a random network.

(b)

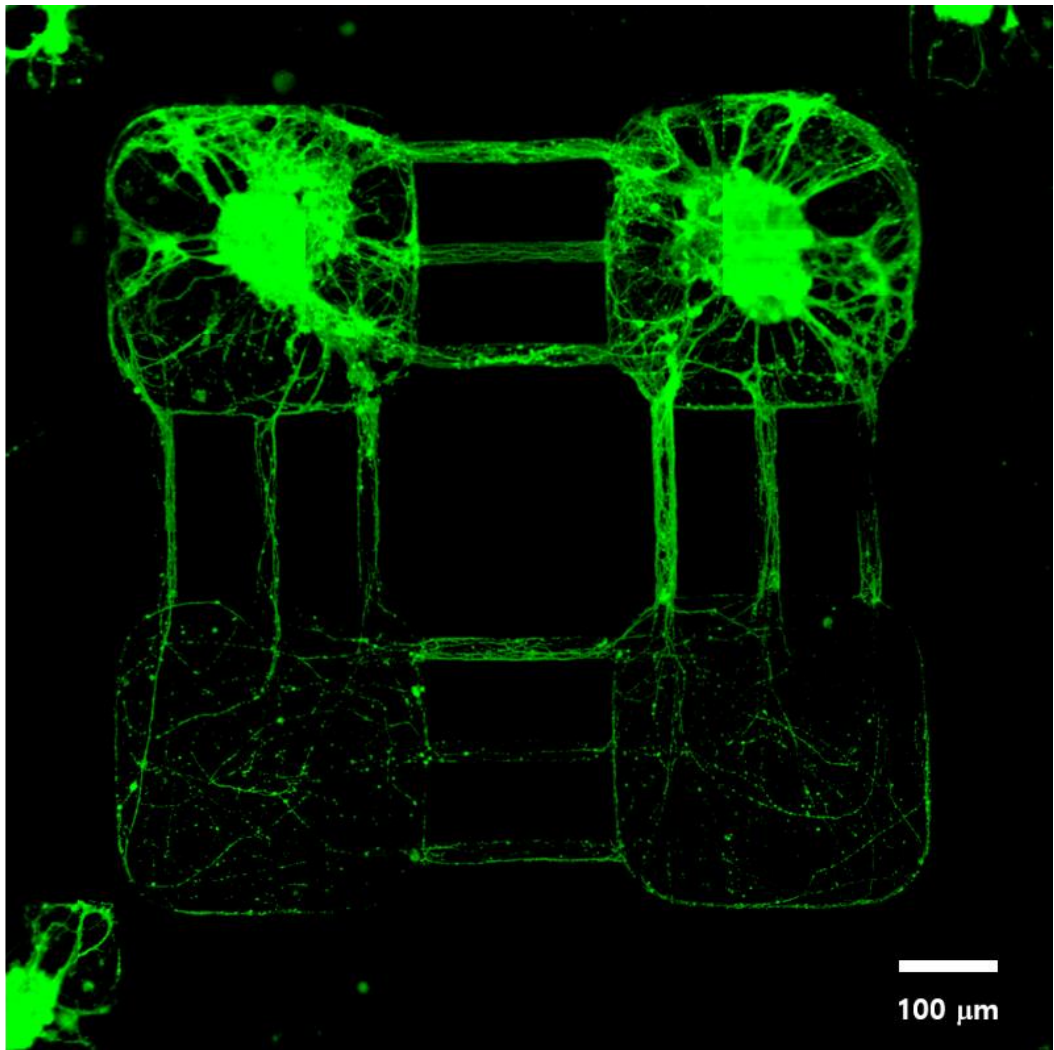


Figure S3. (b) Image of axons (β -tubulin III, green) acquired from a modular neuronal network with neurons in the upper two chambers and neurons in the lower two chambers.

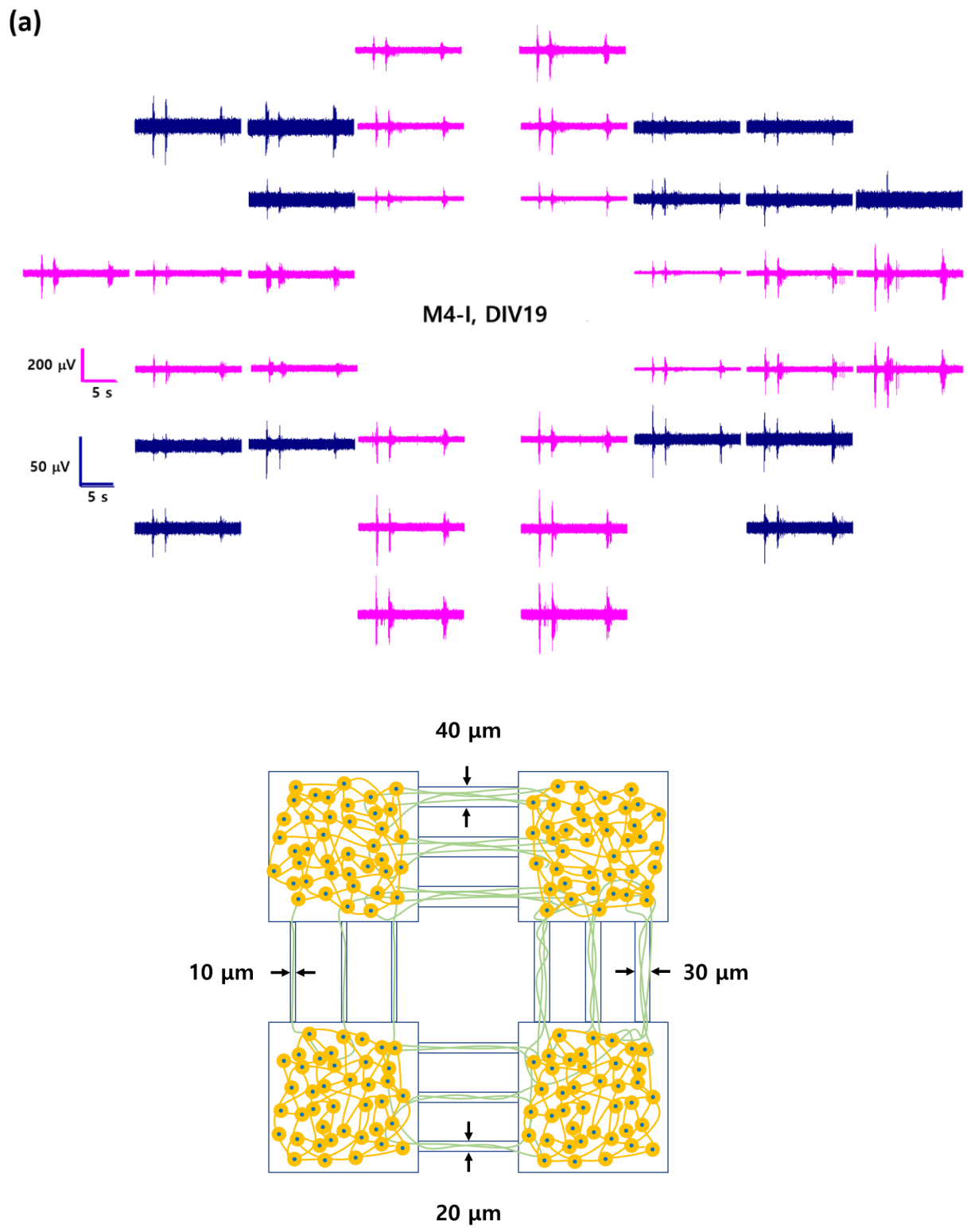


Figure S4. (a) Spontaneous electrical activities recorded from all active electrodes of M4-I on DIV 19.

(b)

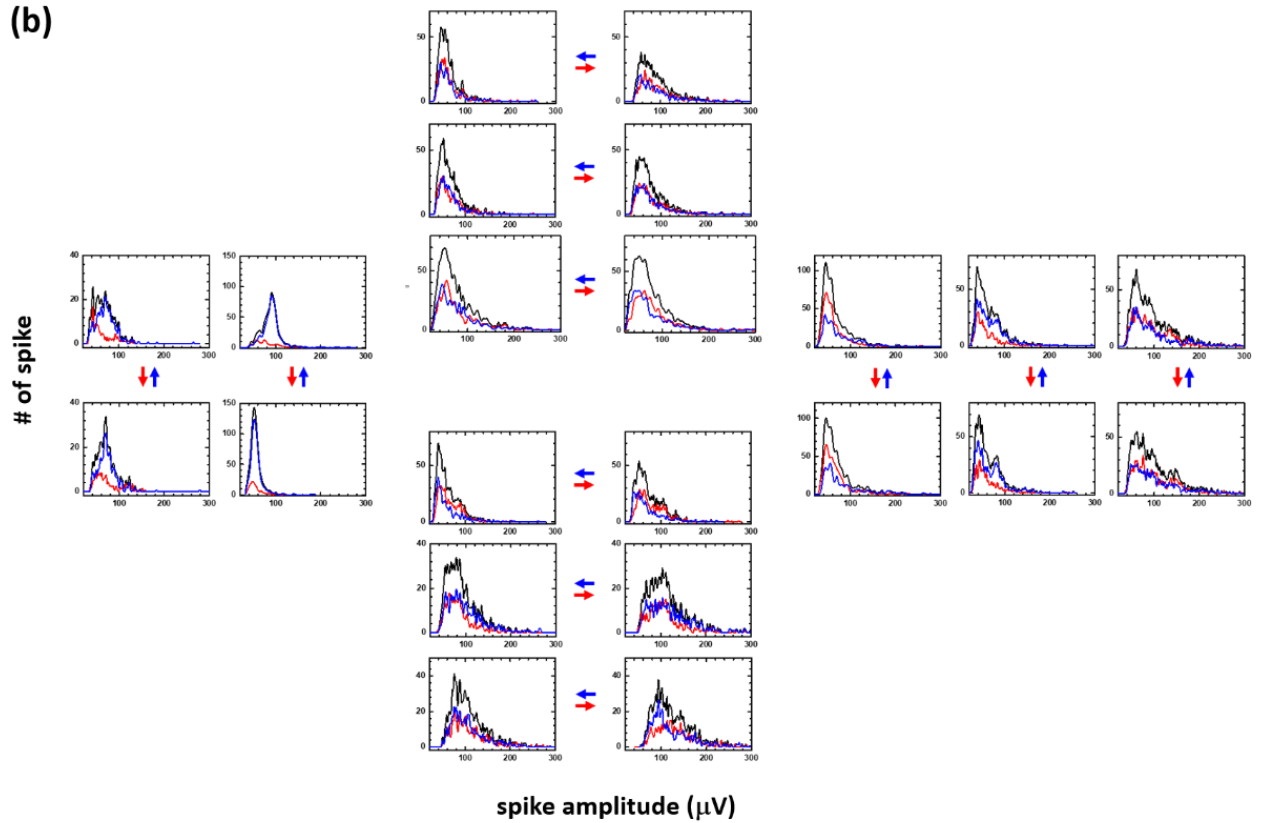


Figure S4. (b) The number of individual spikes propagating from left/top to right/bottom (red) or from right/bottom to left/top (navy) as a function of spike amplitude estimated from the data for M4-I. The total spike amplitude distributions are denoted by black curves.

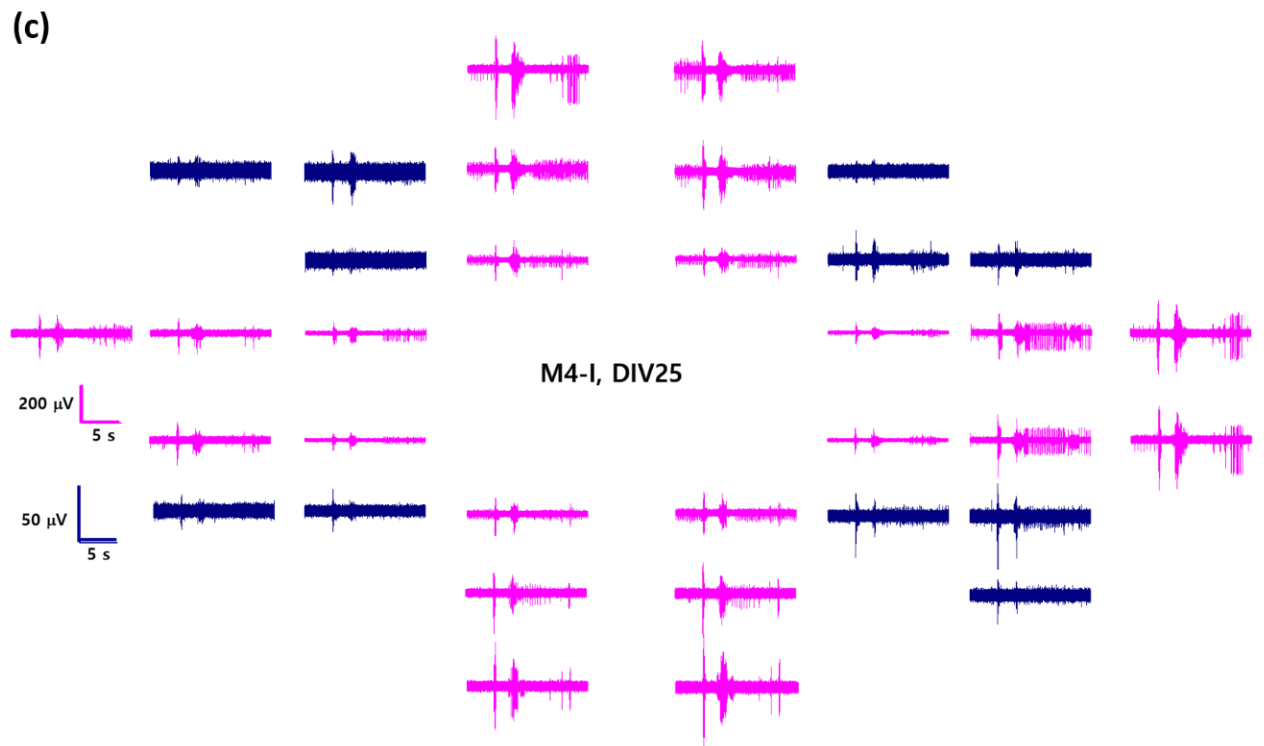


Figure S4. (c) Spontaneous electrical activities recorded from all active electrodes of M4-I on DIV 25.

(d)

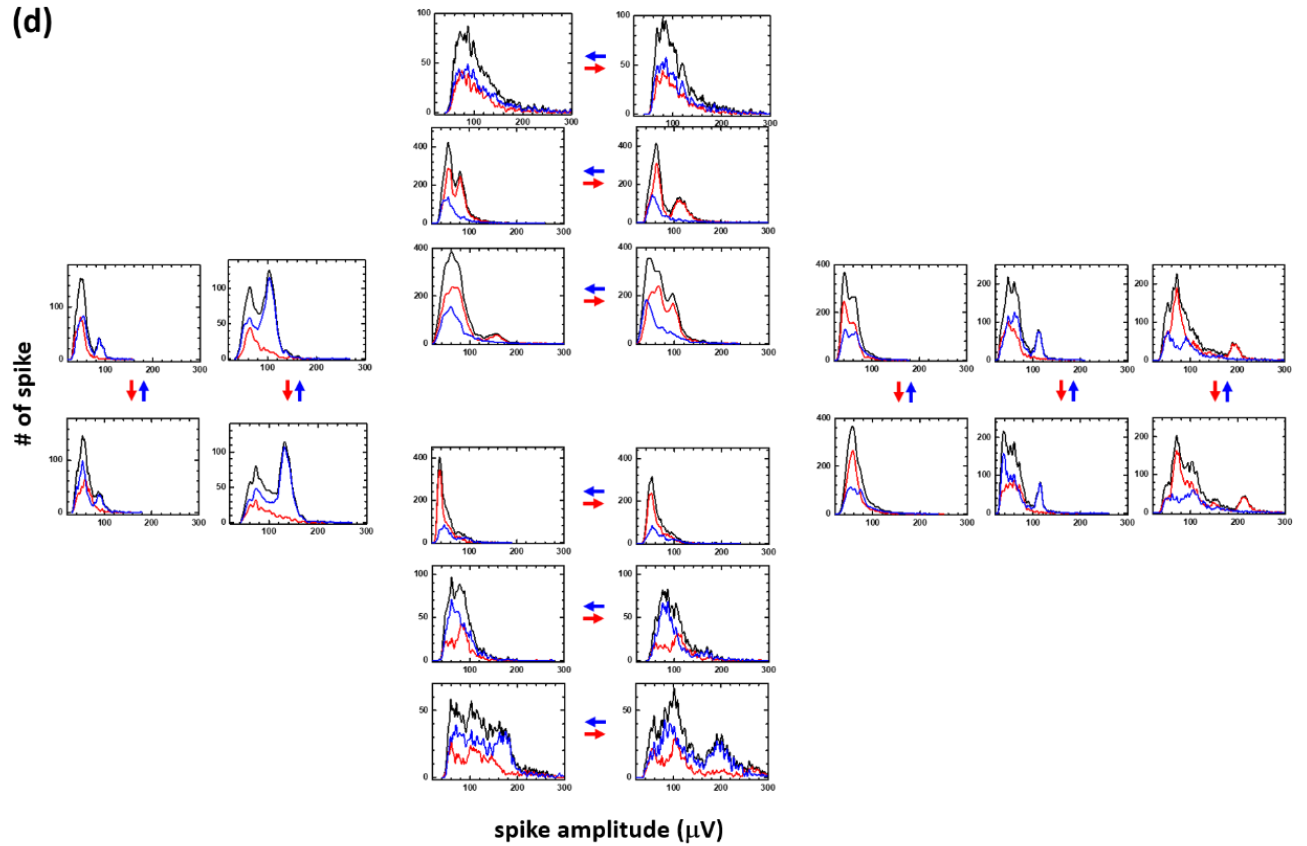


Figure S4. (d) The number of individual spikes propagating from left/top to right/bottom (red) or from right/bottom to left/top (navy) as a function of spike amplitude estimated from the data for M4-I. The total spike amplitude distributions are denoted by black curves.

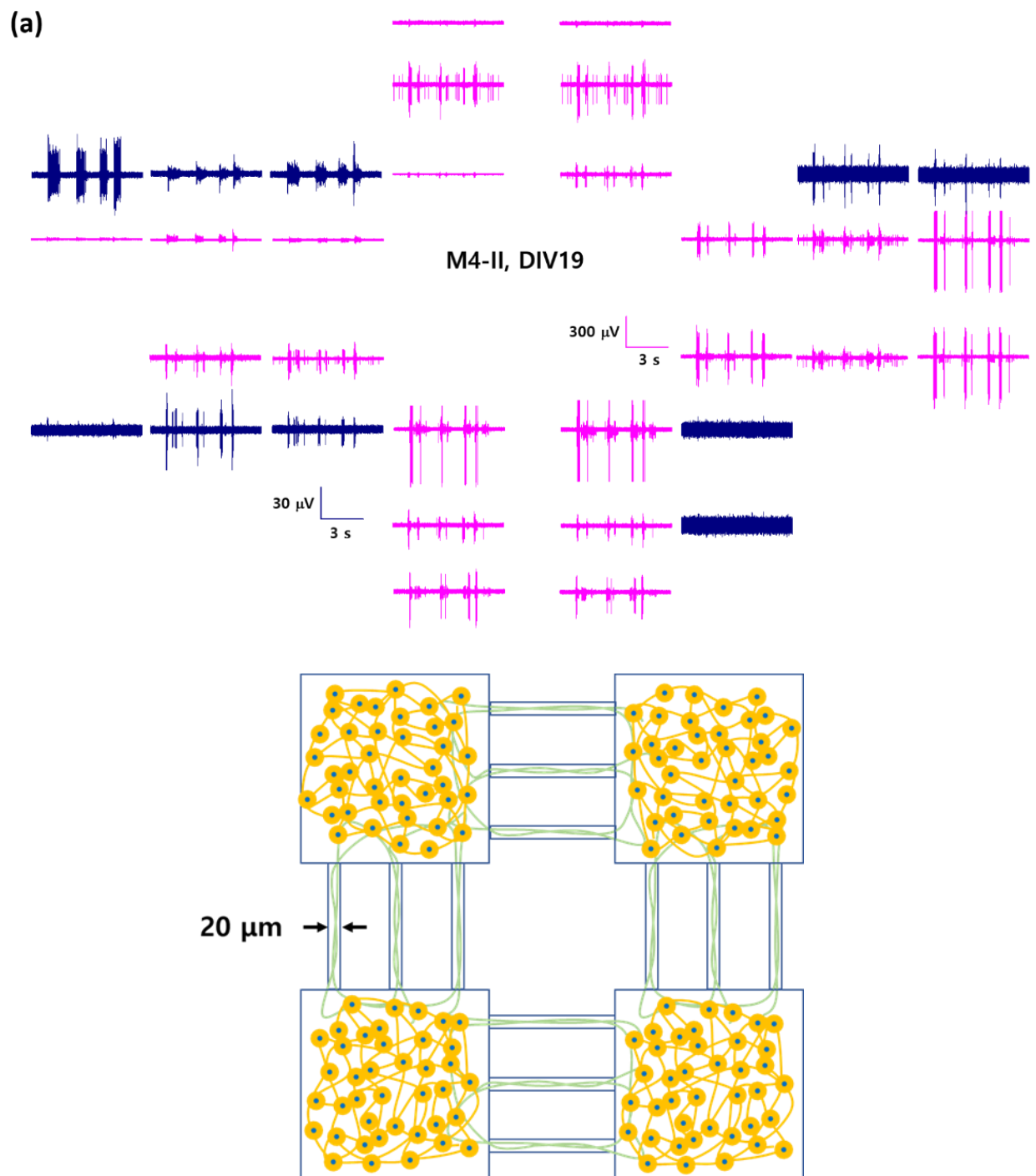


Figure S5. (a) Spontaneous electrical activities recorded from all active electrodes of M4-II on DIV 19.

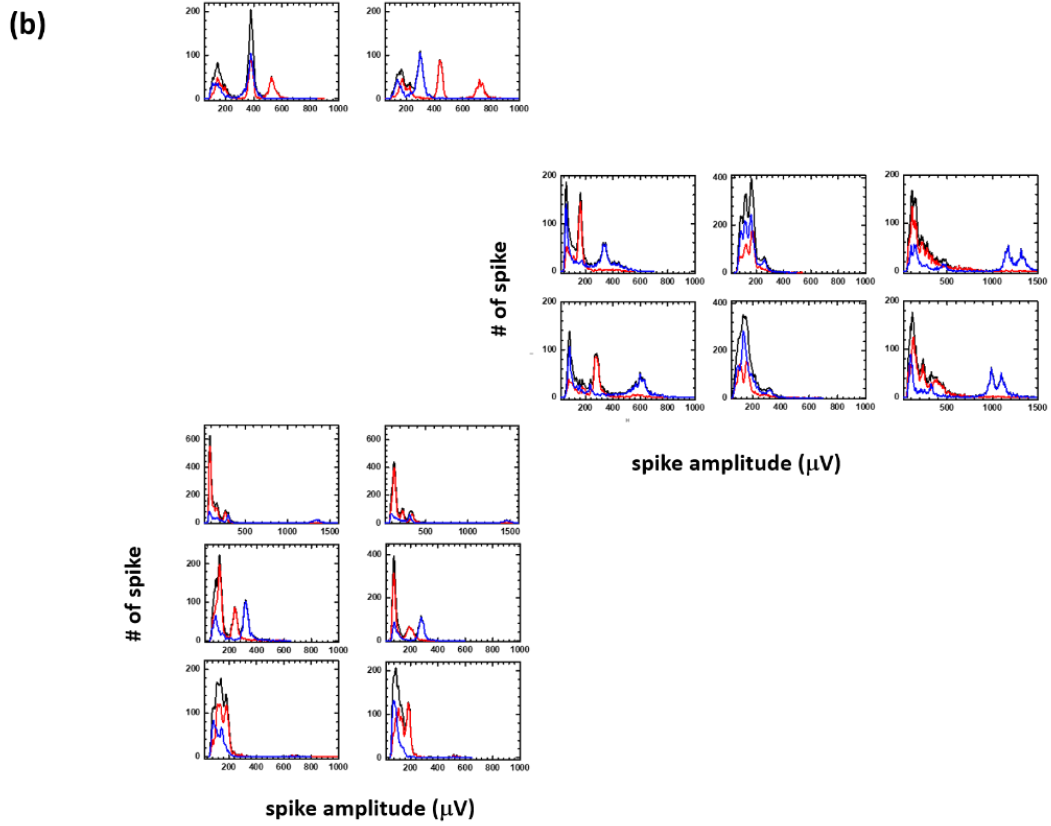


Figure S5. (b) The number of individual spikes propagating from left/top to right/bottom (red) or from right/bottom to left/top (navy) as a function of spike amplitude estimated from the data for M4-I. The total spike amplitude distributions are denoted by black curves.

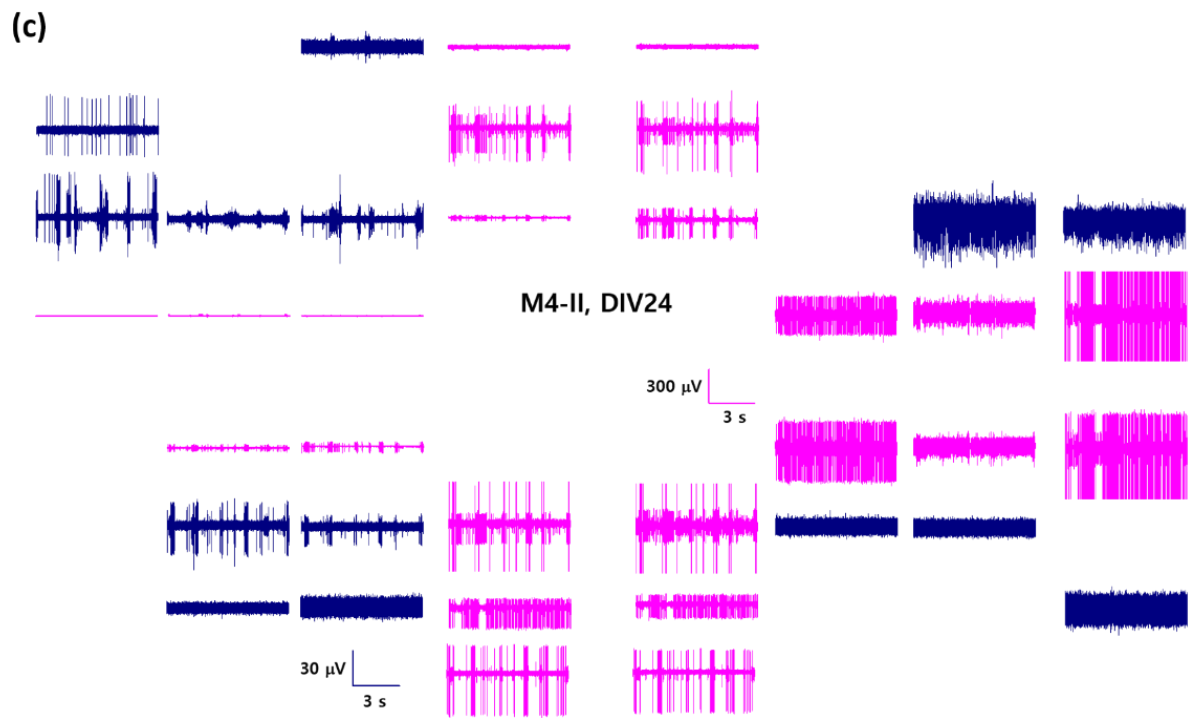


Figure S5. (c) Spontaneous electrical activities recorded from all active electrodes of M4-I on DIV 24

(d)

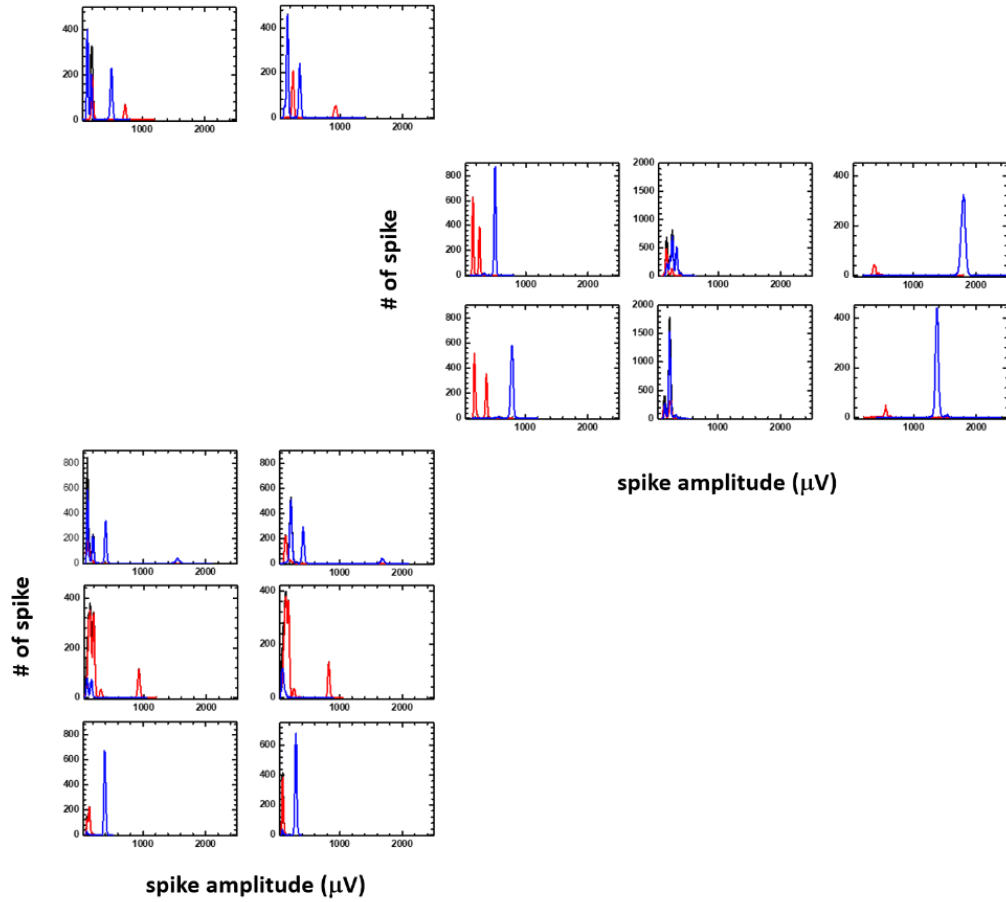


Figure S5. (d) The number of individual spikes propagating from left/top to right/bottom (red) or from right/bottom to left/top (navy) as a function of spike amplitude estimated from the data for M4-I. The total spike amplitude distributions are denoted by black curves.

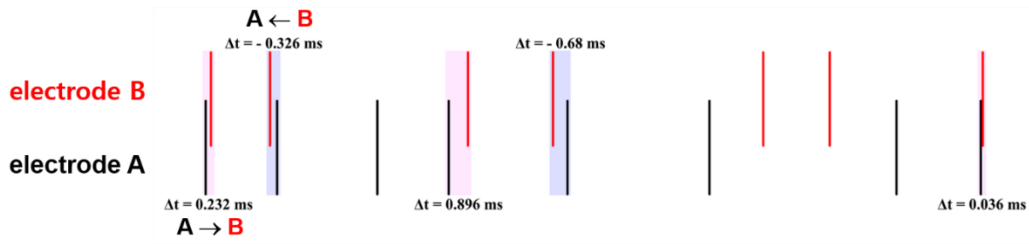


Figure S6. Analysis of the propagation properties of individual spikes recorded at electrodes A and B in the same channel.

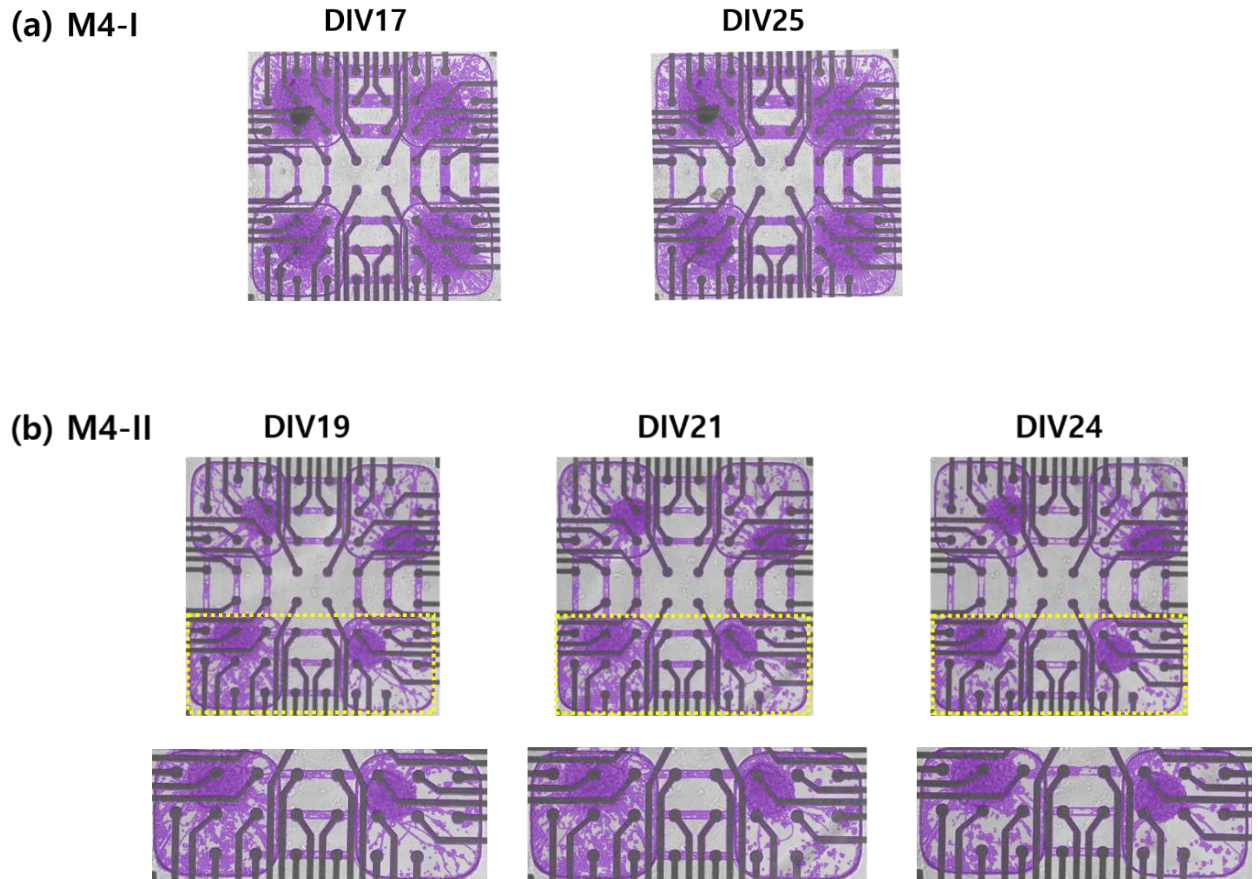


Figure S7. Time-lapse optical images acquired from (a) M4-I and (b) M4-II. The canny edge detector was used to make the neurons more visible.

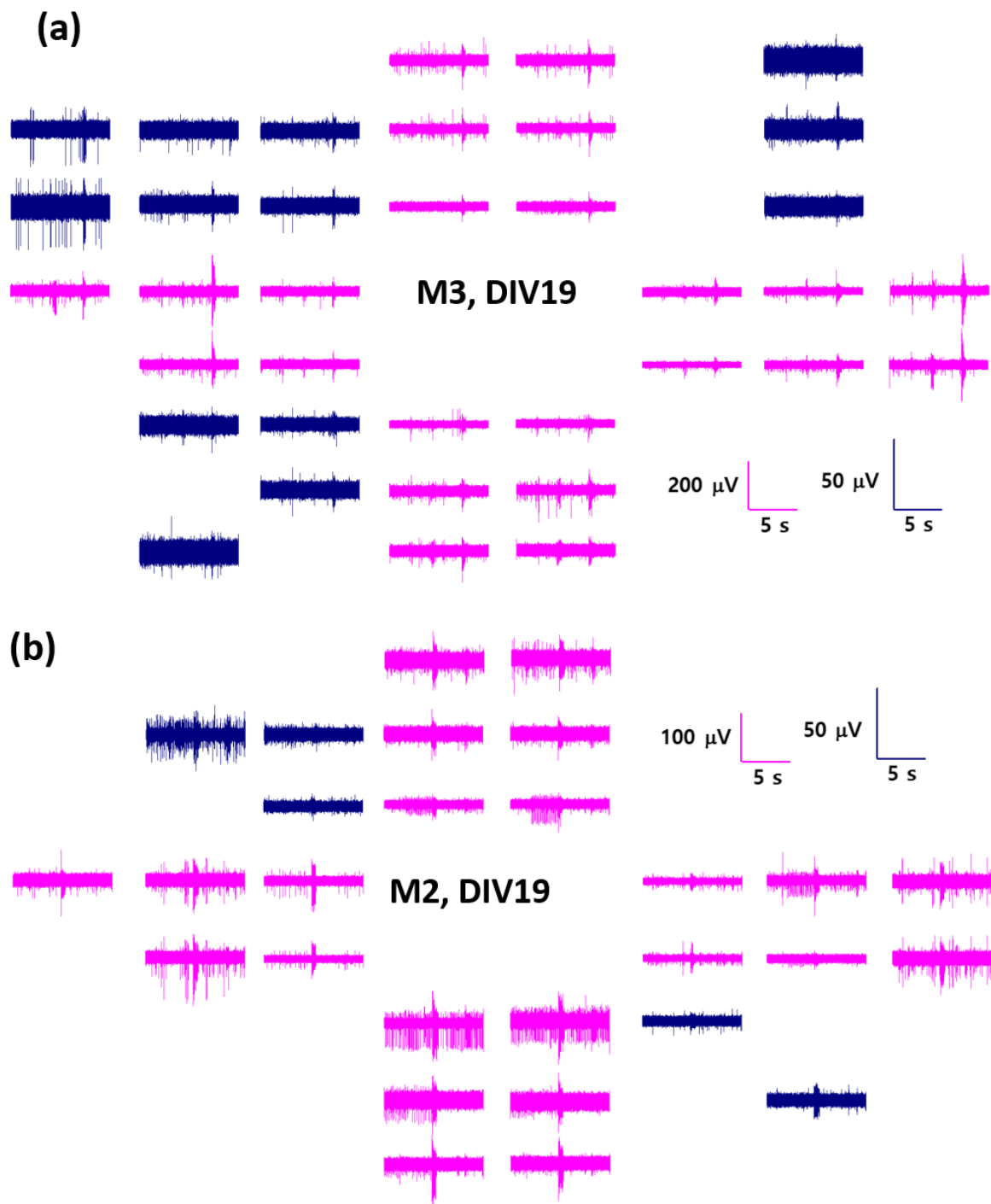


Figure S8. Spontaneous electrical activities recorded from all active electrodes of (a) M3 and (b) M2 on DIV 19.

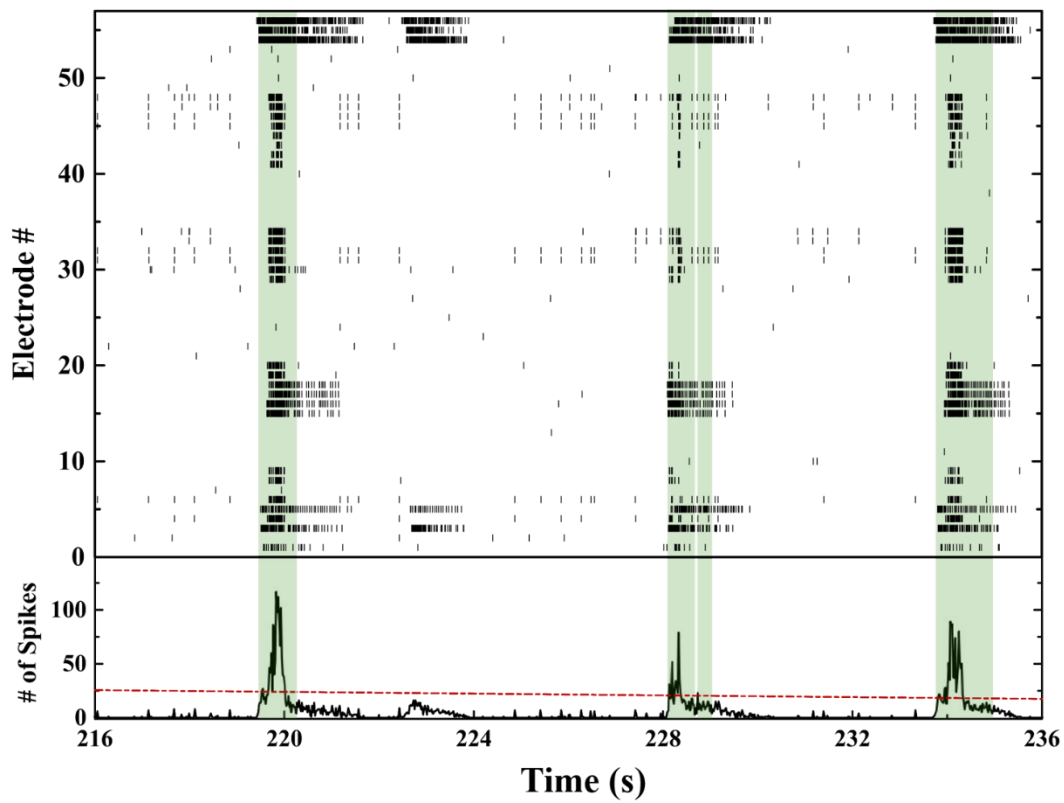


Figure S9. A raster plot (upper) and spike histogram (lower) estimated from the data for M4-I. The network burst is defined as events with at least as many spikes as active electrodes denoted by the red dashed line, and the network burst duration time is determined at 1/5 of the maximum number of spikes in the spike histogram, which is represented by the green shaded region.