Supplementary Figure 1. Effect of photo stimulation on broad-spiking and narrow-spiking neurons. (a) Left, average spike waveforms for all units in the experiments of PV suppression from anaesthetized mice. The waveforms were aligned to minimum and normalized by trough depth. Right, scatter plot of spike waveform parameters for all units. Green, narrow-spiking; orange, broad-spiking. (b) Spike waveforms for all units in the experiments of PV suppression from awake mice. Same as described in (a). (c) Spike waveforms for all units in the experiments of SOM suppression from anesthetized mice. (d) Spike waveforms for all units in the experiments of SOM suppression from awake mice. (e) The peak width of spike waveform was not significantly different between broad-spiking cells in PV and SOM suppression experiments (P = 0.39, n = 126 and 76, Wilcoxon rank-sum test). (f) The end slope of spike waveform was not significantly different between broad-spiking cells in PV and SOM suppression experiments (P = 0.16, Wilcoxon rank-sum test). (g) PV suppression-induced change in movie-evoked firing rate for broad-spiking (P = 1.1×10^{-9}, n = 126 from both anaesthetized and awake mice, Wilcoxon signed-rank test) and narrow-spiking cells (P = 0.04, n = 48 from both anaesthetized and awake mice, Wilcoxon signed-rank test). (h) SOM suppression-induced change in movie-evoked firing rate for broad-spiking (P = 9.0×10^{-13}, n = 76, Wilcoxon signed-rank test) and narrow-spiking cells (P = 0.2, n = 33, Wilcoxon signed-rank test). (i) Distribution of change in spontaneous firing rate of broad-spiking cells for PV suppression (left) and SOM suppression (right) experiments. The distributions were not significantly different between PV and SOM suppression experiments (P = 0.66, Kolmogorov-Smirnov test). Error bars, ± s.e.m. ***, P < 0.0001. *, P < 0.05.
Supplementary Figure 2. Effect of photo stimulation on spontaneous local field potential (LFP). (a) LFP responses during PV suppression. Moderate and high light intensities were used for the upper 5 and lower 5 traces, respectively. Note that high light intensity induced epileptiform activity, which was avoided in our experiments. (b) LFP responses during SOM suppression, same as described in (a). Green area, photo stimulation.
Supplementary Figure 3. Between-trial correlation coefficient measured at different bin sizes. (a) Summary of CCs with and without photo stimulation for responses binned at 20 ms. Upper, PV suppression, $P = 8.7 \times 10^{-12}$, $n = 126$; lower, SOM suppression, $P = 0.19$, $n = 76$, Wilcoxon signed-rank test. (b) Same as described in (a) except that the responses were binned at 100 ms. $P = 2.6 \times 10^{-11}$ for PV suppression and $P = 0.72$ for SOM suppression. (c) Same as described in (a) except that the responses were binned at 200 ms. $P = 1.4 \times 10^{-10}$ for PV suppression and $P = 0.48$ for SOM suppression. (d) Same as described in (a) except that the responses were binned at 300 ms. $P = 1.6 \times 10^{-8}$ for PV suppression and $P = 0.24$ for SOM suppression. Error bars, ± s.e.m.
Supplementary Figure 4. Photo stimulation itself has no effect on visual responses of control mice in which virus was not injected. (a) Firing rates of V1 neurons recorded from PV-Cre mice in response to natural movies with and without photo stimulation (n = 15 cells from 2 experiments, P = 0.98, Wilcoxon signed-rank test). (b) Summary of between-trial correlation coefficient with and without photo stimulation for responses binned at the stimulus frame rate (P = 0.36, Wilcoxon signed-rank test). (c) Summary of response sparseness with and without photo stimulation (P = 0.39, Wilcoxon signed-rank test). Error bars, ± s.e.m.
Supplementary Figure 5. Comparison of response properties between broad-spiking cells in PV and SOM suppression experiments. (a) Distributions of percent change in the evoked firing rate were not significantly different between cells in PV and SOM suppression experiments ($P = 0.12$, Kolmogorov-Smirnov test). (b) Distributions of firing rate during control trials were not significantly different between cells in PV and SOM suppression experiments ($P = 0.89$, Kolmogorov-Smirnov test). (c) Distributions of CC (for responses binned at the stimulus frame rate) during control trials were not significantly different between cells in PV and SOM suppression experiments ($P = 0.32$, Kolmogorov-Smirnov test). $n = 126$ and 76 for PV and SOM suppression experiments, respectively.
Supplementary Figure 6. Comparison of the effects of PV and SOM suppression on CC. (a) Left, the distributions of ΔCC were significantly different between PV and SOM suppression experiments ($P = 1.1 \times 10^{-7}$, Kolmogorov-Smirnov test). Triangles represent the mean values of the distributions. Right, a line was fitted to the CCs with and without photo stimulation for PV and SOM suppression experiments, respectively. The slopes of the lines were significantly different between PV and SOM suppression experiments ($P = 2.8 \times 10^{-6}$, ANCOVA). n = 126 and 76 for PV and SOM suppression experiments, respectively. The CCs were computed from the responses binned at the stimulus frame rate. (b) Same as described in (a) except that the responses were binned at 200 ms. Left, $P = 3.2 \times 10^{-4}$, Kolmogorov-Smirnov test. Right, $P = 2.0 \times 10^{-4}$, ANCOVA.
Supplementary Figure 7. Comparison of CCs after spike rate equalization. (a) CCs for PV suppression, bin size = 200 ms. After spike rate equalization, the CCs with PV suppression remained significantly smaller than those without PV suppression ($P = 2.1 \times 10^{-4}$, Wilcoxon signed-rank test). (b) CCs for SOM suppression, bin size = 200 ms. After spike rate equalization, the CCs with SOM suppression were significantly larger than those without SOM suppression ($P = 4.9 \times 10^{-4}$, Wilcoxon signed-rank test). (c) Comparison of the effects of PV and SOM suppression on CC (bin size = 200 ms) computed after spike rate equalization. A line was fitted to the CCs with and without photo stimulation for PV and SOM suppression experiments, respectively. The slopes of the lines were significantly different between PV and SOM suppression experiments ($P = 2.0 \times 10^{-5}$, ANCOVA). (d) The distributions of $\Delta$CC (bin size = 200 ms) were significantly different between PV and SOM suppression experiments ($P = 4.5 \times 10^{-6}$, Kolmogorov-Smirnov test). Triangles represent the mean values of the distributions. (e) Same as described in (a) except that bin size = 300 ms. $P = 3.4 \times 10^{-4}$, Wilcoxon signed-rank test. (f) Same as described in (b) except that bin size = 300 ms. $P = 0.007$, Wilcoxon signed-rank test. (g) Same as described in (c) except that bin size = 300 ms. $P = 5.0 \times 10^{-4}$, ANCOVA. (h) Same as described in (d) except that bin size = 300 ms. $P = 1.2 \times 10^{-4}$, Kolmogorov-Smirnov test. Error bars, ± s.e.m. $n = 126$ and 76 for PV and SOM suppression experiments, respectively.
Supplementary Figure 8. Laminar distribution of the effect of photo suppression on response reliability. (a) Cortical layers identified by CSD analysis. The two CSD profiles were measured using the same electrode at two different cortical depths. Left, measured at a depth of 800 μm for the electrode tip. Right, measured at a depth of 890 μm for the electrode tip. Black traces, LFP responses at different recording sites evoked by flash stimuli. S, supragranular; G, granular, I: infragranular. (b) Summary of CCs (for responses binned at the stimulus frame rate) with and without PV suppression for neurons recorded in different layers ($P = 2.2 \times 10^{-4}$, $4.5 \times 10^{-5}$, and $9.8 \times 10^{-4}$, $n = 26$, 35, and 25 for supragranular, granular, and infragranular layer, Wilcoxon signed-rank test). (c) Summary of CCs with and without SOM suppression for neurons recorded in different layers ($P = 0.83$, 0.9, and 0.45, $n = 17$, 11, and 45 for supragranular, granular, and infragranular layer, Wilcoxon signed-rank test).
Supplementary Figure 9. Effect of PV suppression on the firing rates of events and non-events. (a) PV suppression significantly increased the responses of non-events ($P = 5.7 \times 10^{-16}$ and $3.4 \times 10^{-5}$, $n = 98$ and 28 for anaesthetized and awake mice) and decreased the responses of events ($P = 1.2 \times 10^{-6}$ and 0.02 for anaesthetized and awake mice). Error bars, ± s.e.m. (b) ΔCC versus change in event firing rate (defined as event rate with PV suppression minus that without PV suppression) ($r = 0.6$, $P = 5.9 \times 10^{-11}$ for anaesthetized mice, $r = 0.75$, $P = 5.2 \times 10^{-6}$ for awake mice). (c) ΔCC versus change in non-event firing rate (defined as non-event rate with PV suppression minus that without PV suppression) ($r = 0.02$, $P = 0.84$ for anaesthetized mice, $r = 0.1$, $P = 0.63$ for awake mice). (d) ΔSNR versus change in event firing rate ($r = 0.87$, $P = 1.3 \times 10^{-30}$ for anaesthetized mice, $r = 0.88$, $P = 7.5 \times 10^{-10}$ for awake mice). ***, $P < 0.0001$. *, $P < 0.05$. 
Supplementary Figure 10. Comparison of the effects of PV and SOM suppression on the change in SNR. The distributions of ΔSNR were significantly different between PV and SOM suppression experiments ($P = 9.8 \times 10^{-9}$, Kolmogorov-Smirnov test). $n = 126$ and 76 for PV and SOM suppression experiments, respectively. Triangles represent the mean values of the distributions.
Supplementary Figure 11. PV but not SOM suppression increases Fano factor (FF) of the event responses. (a) Summary of FF with and without PV suppression ($P = 0.001$, $n = 126$, Wilcoxon signed-rank test). (b) Summary of FF with and without SOM suppression ($P = 0.76$, $n = 76$, Wilcoxon signed-rank test). The histogram shows the distribution of ΔFF (computed as FF with photo stimulation minus that without photo stimulation). The distributions of ΔFF were significantly different between PV and SOM suppression experiments ($P = 0.04$, Kolmogorov-Smirnov test). $n = 126$ and 76 for PV and SOM suppression experiments, respectively. Error bars, ± s.e.m.
Supplementary Figure 12. Changes of event responses for narrow-spiking cells in PV suppression experiments. (a) Example PSTHs of narrow-spiking cells. Black, control; Blue, PV suppression. Dashed line: 25% of the maximum response of the control PSTH. (b) The decreases in event rates were 2.4±0.5, 3.4±1.0, and 10.7±2.0 spikes/s (s.e.m., P = 4.9×10⁻⁴, 0.004, and 5.3×10⁻⁴, Wilcoxon signed-rank test) for cells whose event rates during control trials were <10, 10–20, and >20 spikes/s (n = 12, 20, and 16), respectively. **, P < 0.01.
Supplementary Figure 13. Spikes detected at the time of the experiment were sorted offline with the Offline Sorter (Plexon Inc.) using cluster analysis of principal component amplitudes. Left, spike waveforms of two example units. The black and red thick lines are the average spike waveforms for the two units, respectively. Right, the scores of the first two principal components of the waveform shape for the two units.