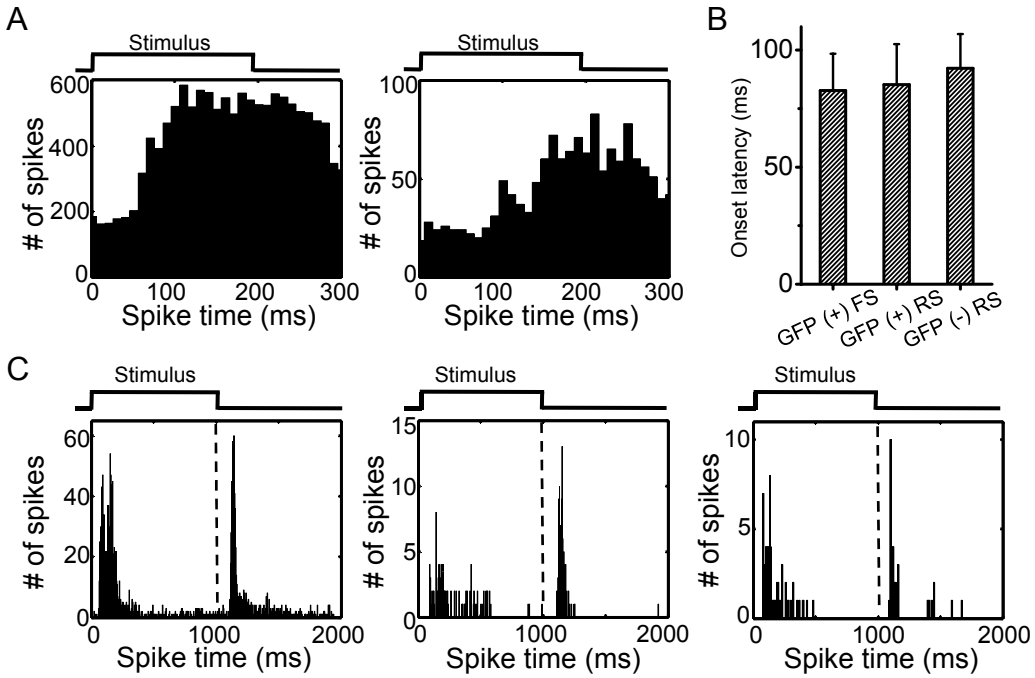

Figure S1. spike response latency for cortical neurons of mouse V1.
(A) the peri-stimulus-spike-time histograms (PSTH) of spike responses recorded from the cells shown in **Fig 5 A** (left) and **B**(right), which were evoked by stimuli of 200ms duration starting at 0ms. (B) The onset latency of spike responses was summarized for three groups of neurons, GFP (+) FS, GFP (+) RS and GFP (-) RS. Error bar=SD. (C) the PSTH of spike responses evoked by bright stimuli of 1sec duration staring at 0ms for three cells. Dashed lines mark the off transitions that happen at 1000ms. The latency for responses to the on and off transitions is 65/100ms, 90/115ms and 80/95ms, respectively.

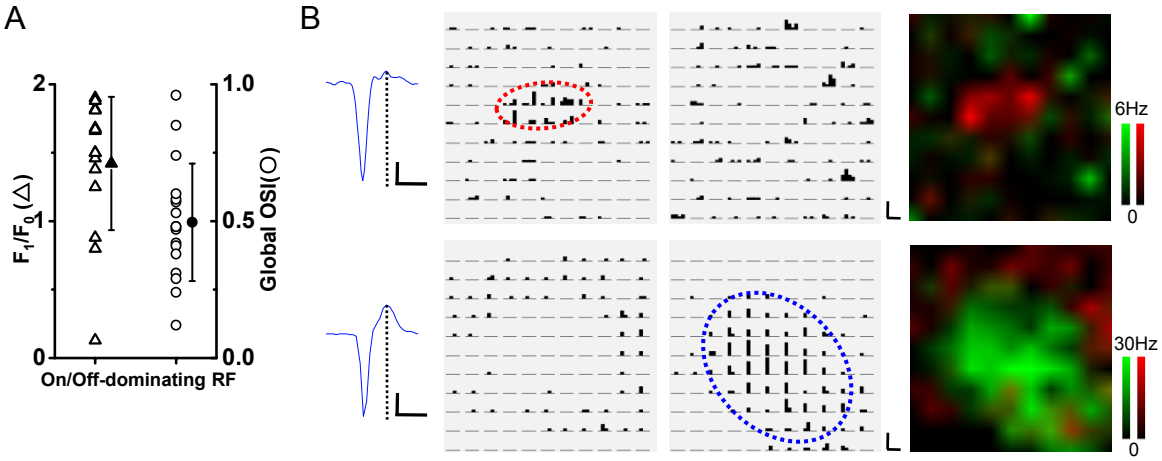

Figure S2. Properties of On- and Off- dominating cells in mice V1.
(A) Distribution of modulation ratio F_1/F_0 (triangle) and Global OSI (circle) for On- and Off-dominating RFs. Solid symbol=mean value; error bar=SD. (B) Two examples of center-surround like RFs in Layer 4. Left, example spike waveforms. Dashed lines mark the position of the peak. Scale: horizontal,1 ms; vertical, 44pA (top), 30pA (bottom). middle, On and Off responses to all the stimuli. The trace in each pixel represents the peri-stimulus-spike-time histogram (PSTH) for spike responses (generated from all the trials) to a unit stimulus at the corresponding location. Each pixel represents a visual space of 4 ° (top), 5 ° (bottom). Red and blue ovals depict the 2-D Gaussian fit of On and Off subfield, respectively. Scale: horizontal, 200ms; vertical, 9Hz (top), 40Hz (bottom). Right, superimposed color maps for spike On (red) and Off (green) responses. The brightness of the color represents the evoked firing rate (Hz). The maps were smoothed by using bilinear interpolation.

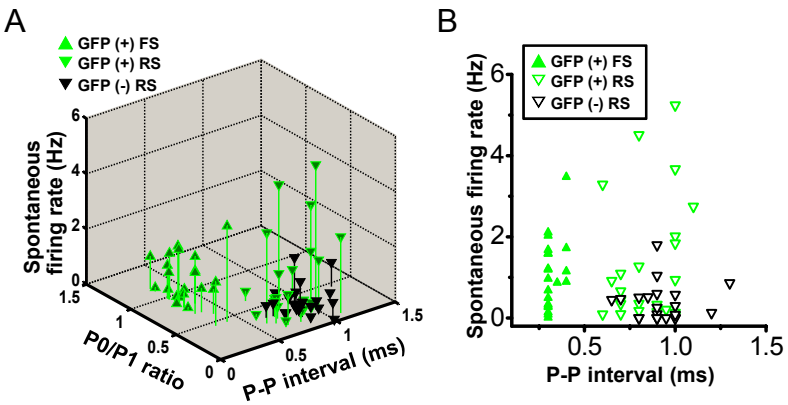

Figure S3. (A) 3-D plot of relationship between spontaneous firing rate, P0/P1 ratio and peak-peak interval. (B) Plot of spontaneous firing rate against peak-peak ratio. In **A** there was a large overlap between data sets for excitatory neurons and RS inhibitory neurons, and excitatory neurons did not separate from RS inhibitory neurons as a distinct cluster.

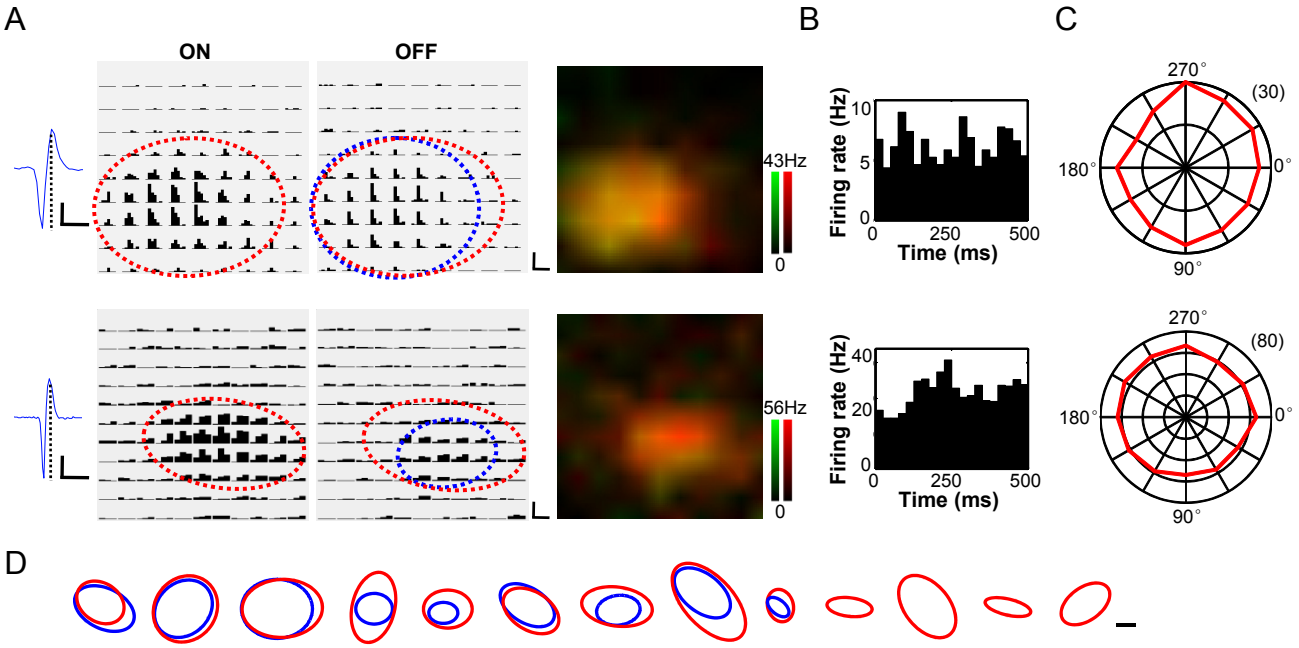

Figure S4. Spike receptive field structure of Layer 4 fast-spike inhibitory neurons in V1 of wild type mice. (A) two example spike RFs of L4 fast-spike inhibitory neurons obtained in blind loose-patch recordings. Left, the example spike waveforms. Scale: horizontal, 1ms; vertical 105pA (top) and 120pA (bottom). Middle, the On and Off responses to all the stimuli. The plot in each pixel represents the peri-stimulus-spike-time histogram (PSTH) of spike responses (generated from all the trials) to a unit stimulus at the corresponding location. Each pixel represents a visual space of 5 °. Red and blue ovals depict the 2-D Gaussian fits of the On and Off subfields, respectively. Scale: horizontal, 200ms; vertical, 96Hz (top), 60Hz (bottom). The colormap of superimposed spike On (red) and Off (green) subfields. The brightness of the color represents the firing rate (Hz) under a unit stimulus. The maps were smoothed using bilinear interpolation method. (B) PSTH plots of spike responses evoked by moving sinusoidal grating within one cycle for the two cells shown in **A**. The modulation ratio is 0.02 for the top one and 0.16 for the bottom one**.** (C) Polar graphs of orientation tuning for the two cells shown in **A**. No fast-spike neuron with strong modulation or orientation selectivity was observed in layer 4, consistent with the results of Niell and Stryker 2008. (D) Outlines of fitted On (red)/Off (blue) subfields of the fast-spike inhibitory neurons. Scale bar, 10°.