**Data and code used for making Extended Data Fig. 8**

**Folder: ExtDataFig8a-f**

Analysis

* ExtDataFig08\_AveTimeCourse\_OptStim\_Neuron.m: Code for plotting the time course of ΔF/F in Extended Data Fig. 8a,d.
* TS\_Img.mat: Time stamps of calcium imaging.
* TS\_OptStimImg.mat: Timings of optogenetic stimulation during calcium imaging.
* ExtDataFig08\_AveTimeCourse\_OptStim\_Song.m: Code for plotting the time course of and the proportions of pulse and sine song in Extended Data Fig. 8a,d.
* ExtDataFig08\_OptStim\_TuningCurve\_Neuron.m: Code for plotting the tuning curves of calcium signals induced by optogenetics in Extended Data Fig. 8b,e.
* ExtDataFig08\_OptStim\_TuningCurve\_Song.m: Code for plotting the tuning curves of pulse and sine songs induced by optogenetics in Extended Data Fig. 8c,f.

Data/Summary\_GENOTYPE

* EthogramComb.mat: File containing the time course of pulse/sine songs. Row: fly ID; Column: time bins at the resolution of microphone recording (1 kHz).
* EthogramCombImg.mat: Same as EthogramComb.mat but the time resolution of calcium imaging.
* EthogramCombPulseTrain.mat: Same as EthogramComb.mat but the inter-pulse intervals are designated as “pulse.”
* FtimeCourseComb.mat: Mean calcium signals (F) in each ROI and the optogenetic stimulation strength in each trial. F\_comb: Time course of F for each ROI (ROI x Time bins x Blocks). Stim\_comb: Stimulation strength (from 1 to 6) in each trial (Column: block; Row: trial).
* Dataset.csv: A spreadsheet summarizing the imaged ROIs and singing behavior in each experiment.

**Folder: ExtDataFig8g-l**

Analysis

* ExtDataFig08\_Example\_TimeCourseRaw\_vPR9NP\_SS1.m: Code for plotting the example time courses of delta F/F in Extended Data Fig. 8g.
* TS\_Img.mat: Time stamps of calcium imaging.
* TS\_OptStimImg.mat: Timings of optogenetic stimulation during calcium imaging.
* ExtDataFig08\_Example\_TimeCourseRaw\_vPR9NP\_SS3.m: Code for plotting the example time courses of delta F/F in Extended Data Fig. 8j.
* ExtDataFig08\_AveTimeCourseSongTrans.m: Code for plotting calcium signals and song probabilities during song type transitions in Extended Data Fig. 8h,k.
* ExtDataFig08\_BidirRespMod\_Normalized\_vPR9.m: Code for plotting the mean change in ΔF/F after song-type transitions relative to ΔF/F before the transitions in Extended Data Fig. 8i,l.

Data/Summary\_GENOTYPE

* EthogramComb.mat: File containing the time course of pulse/sine songs. Row: fly ID; Column: time bins at the resolution of microphone recording (1 kHz).
* EthogramCombImg.mat: Same as EthogramComb.mat but the time resolution of calcium imaging.
* FtimeCourseComb.mat: Mean calcium signals (F) in each ROI and the optogenetic stimulation strength in each trial. F\_comb: Time course of F for each ROI (ROI x Time bins x Blocks). Stim\_comb: Stimulation strength (from 1 to 6) in each trial (Column: block; Row: trial).
* SongExplorer: A folder containing audio data and song segmentation results for each recording.
* Transitions.mat: Variables for running Fig01\_AveTimeCourseSongTrans.m.
* SongTypePrefIndex.mat: Variables for running ExtDataFig08\_BidirRespMod\_Normalized\_vPR9.m.