**Data and code used for making Extended Data Fig. 5**

**Folder: ExtDataFig5ab**

Analysis

* ExtDataFig05\_Example\_SongPrefIdx\_dPR1.m: Code for showing how to calculate a song type preference n Extended Data Fig. 5a.
* TS\_Img.mat: Time stamps of calcium imaging.
* TS\_OptStimImg.mat: Timings of optogenetic stimulation during calcium imaging.
* ExtDataFig05\_SongTypePref\_dPR1TN1A.m: Code for plotting the distribution of song-type preference for dPR1 and TN1A neurons in Extended Data Fig. 5b.

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).
* ResponseIndex.mat: Response index, which characterizes if a neuron showed a response to optogenetic stimulation, for each neuron.
* SongTypePrefIndex.mat: Song-type preferences for each neuron.

**Folder: ExtDataFig5c-e**

Analysis

* ExtDataFig05\_AveTimeCourse\_OptStim\_Neuron.m: Code for plotting the time course of ΔF/F recorded from TN1 in Extended Data Fig. 5c.
* TS\_Img.mat: Time stamps of calcium imaging.
* TS\_OptStimImg.mat: Timings of optogenetic stimulation during calcium imaging.
* ExtDataFig05\_AveTimeCourse\_OptStim\_Song.m: Code for plotting the tuning curves of pulse and sine songs induced by optogenetics in Extended Data Fig. 5c.
* ExtDataFig05\_OptStim\_TuningCurve\_Neuron.m: Code for plotting the tuning curves of calcium signals of each neuron induced by optogenetics in Extended Data Fig. 5d.
* ExtDataFig05\_OptStim\_TuningCurve\_Song.m: Code for plotting the tuning curves of pulse and sine songs induced by optogenetics in Extended Data Fig. 5e.

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).
* SongTypePrefIndex.mat: Song-type preferences for each neuron.
* ResponseIndex.mat: Response index, which characterizes if a neuron showed a response to optogenetic stimulation, for each neuron.
* EthogramCombPulseTrain.mat: Same as EthogramComb.mat but the inter-pulse intervals are designated as “pulse.”

**Folder: ExtDataFig5f-k**

Analysis

* ExtDataFig05\_Example\_TimeCourseRaw\_TN1dsx.m: Code for plotting the time courses of delta F/F for TN1 neurons and simultaneously recorded song in Extended Data Fig. 5f.
* TS\_Img.mat: Time stamps of calcium imaging.
* TS\_OptStimImg.mat: Timings of optogenetic stimulation during calcium imaging.
* ExtDataFig05\_pIP10\_AveTimeCourse\_OptStim\_Neuron.m: Code for plotting the time course of ΔF/F recorded from dPR1 and TN1A in Extended Data Fig. 5g.
* ExtDataFig05\_pIP10\_AveTimeCourse\_OptStim\_Song.m: Code for plotting the time course of and the proportions of pulse and sine song in Extended Data Fig. 5g.
* ExtDataFig05\_pIP10\_OptStim\_TuningCurve\_Neuron.m: Code for plotting the tuning curves of calcium signals of each neuron induced by optogenetics in Extended Data Fig. 5h.
* ExtDataFig05\_pIP10\_OptStim\_TuningCurve\_Song.m: Code for plotting the tuning curves of pulse and sine songs induced by optogenetics in Extended Data Fig. 5i.
* ExtDataFig05\_AveTimeCourseSongTrans.m: Code for plotting calcium signals and song probabilities during song type transitions in Extended Data Fig. 5j.
* ExtDataFig05\_QtoP\_TN1dsx.m: Code for plotting changes in ΔF/F from quiet to pulse transitions in Extended Data Fig. 5k.

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.
* ResponseIndex.mat: Response index, which characterizes if a neuron showed a response to optogenetic stimulation, for each neuron.
* EthogramCombPulseTrain.mat: Same as EthogramComb.mat but the inter-pulse intervals are designated as “pulse.”
* Transitions.mat: Variables for running ExtDataFig05\_AveTimeCourseSongTrans.m.
* QtoPIndex.mat: Variables for running ExtDataFig05\_QtoP\_TN1dsx.m.