### **Supplemental Information**

## A Suite of Transgenic Driver and Reporter

# Mouse Lines with Enhanced Brain-Cell-Type

### **Targeting and Functionality**

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 $\textbf{Table S1.} \ Driver \ lines \ generated \ by \ the \ Allen \ Institute \ for \ Brain \ Science. \ Related \ to \ \textbf{Figure 1}.$ 

Line	JAX stock #	Transgenic type	Reference
A930038C07Rik-Tg1-Cre	017346	BAC random insertion	Harris et al., 2014
Adcyap1-F2A-Cre	030155	Knock-in at Stop codon	Harris et al., 2014
Avp-IRES2-Cre	023530	Knock-in at Stop codon	Harris et al., 2014
Camk2a-CreERT2	012362	Random insertion	Madisen et al., 2010
Cart-Tg1-Cre	009615	BAC random insertion	Harris et al., 2014
Ctgf-T2A-dgCre	028535	Knock-in at Stop codon	Tasic et al., 2016
Erbb4-F2A-CreERT2	012360	Knock-in at Stop codon	Madisen et al., 2010
Gnb4-IRES2-Cre	029587	Knock-in at Stop codon	Wang et al., 2017
Ndnf-IRES2-dgCre	028536	Knock-in at Stop codon	Tasic et al., 2016
Nr4a2-SA-IRES-Dre		Knock-in at 2 <sup>nd</sup> intron?	Madisen et al., 2015
Ntng2-IRES2-Cre	029588	Knock-in at Stop codon	Wang et al., 2017
Nxph4-T2A-CreERT2	022861	Knock-in at Stop codon	Harris et al., 2014
Penk-F2A-CreERT2	022862	Knock-in at Stop codon	Harris et al., 2014
Pvalb-T2A-Cre	012358	Knock-in at Stop codon	Madisen et al., 2010
Pvalb-T2A-CreERT2	021189	Knock-in at Stop codon	Harris et al., 2014
Pvalb-T2A-dCre	022863	Knock-in at Stop codon	Harris et al., 2014
Pvalb-T2A-Dre	021190	Knock-in at Stop codon	Madisen et al., 2015
Pvalb-T2A-FlpE	021191	Knock-in at Stop codon	Madisen et al., 2015
Pvalb-T2A-FlpO	022730	Knock-in at Stop codon	Madisen et al., 2015
Rasgrf2-T2A-dCre	022864	Knock-in at Stop codon	Harris et al., 2014
Rorb-IRES2-Cre	023526	Knock-in at Stop codon	Harris et al., 2014
Rorb-T2A-tTA2	028537	Knock-in at Stop codon	Madisen et al., 2015
Scnn1a-Tg1-Cre	009111	BAC random insertion	Madisen et al., 2010
Scnn1a-Tg2-Cre	009112	BAC random insertion	Madisen et al., 2010
Scnn1a-Tg3-Cre	009613	BAC random insertion	Madisen et al., 2010
Slc17a7-IRES2-Cre	023527	Knock-in at Stop codon	Harris et al., 2014
Snap25-IRES2-Cre	023525	Knock-in at Stop codon	Harris et al., 2014
Sst-Cre		Knock-in at Start codon	Harris et al., 2014
Tac1-IRES2-Cre	021877	Knock-in at Stop codon	Harris et al., 2014
Tac2-IRES2-Cre	021878	Knock-in at Stop codon	Harris et al., 2014
Trib2-F2A-CreERT2	022865	Knock-in at Stop codon	Harris et al., 2014
Wfs1-Tg2-CreERT2	009614	BAC random insertion	Madisen et al., 2010
Wfs1-Tg3-CreERT2	009103	BAC random insertion	Madisen et al., 2010
Calb1-IRES2-Cre	028532	Knock-in at Stop codon	This paper
Calb1-T2A-dgCre	023531	Knock-in at Stop codon	This paper
Cart-IRES2-Cre	028533	Knock-in at Stop codon	This paper
Esr2-IRES2-Cre	030158	Knock-in at Stop codon	This paper
Fezf1-T2A-dCre	025110	Knock-in at Stop codon	This paper
Gnb4-IRES2-CreERT2	030159	Knock-in at Stop codon	This paper
Htr1a-IRES2-Cre	030160	Knock-in at Stop codon	This paper
Npr3-IRES2-Cre	031333	Knock-in at Stop codon	This paper
Npy-IRES2-FlpO	030211	Knock-in at Stop codon	This paper
Oxtr-T2A-Cre	031303	Knock-in at Stop codon	This paper
Pdyn-T2A-CreERT2	030197	Knock-in at Stop codon	This paper
Penk-IRES2-Cre-neo	025112	Knock-in at Stop codon	This paper
Plxnd1-IRES2-dgFlpO		Knock-in at Stop codon	This paper
Rasgrf2-T2A-dgFlpO	029589	Knock-in at Stop codon	This paper
Rorb-IRES2-FlpO	029590	Knock-in at Stop codon	This paper
Rorb-P2A-FlpO		Knock-in at Stop codon	This paper
Slc17a6-IRES2-FlpO	030212	Knock-in at Stop codon	This paper
Slc17a8-IRES2-Cre	028534	Knock-in at Stop codon	This paper
Slc32a1-IRES2-FlpO	031331	Knock-in at Stop codon	This paper
Slc32a1-T2A-FlpO	029591	Knock-in at Stop codon	This paper
Tacr1-T2A-Cre		Knock-in at Stop codon	This paper
Tnnt1-IRES2-CreERT2		Knock-in at Stop codon	This paper
Vipr2-IRES2-Cre	031332	Knock-in at Stop codon	This paper

Table S2. Reporter lines generated by the Allen Institute for Brain Science. Related to Figures 2 and 3.

AZIRCLENEP  007993   ROSA26   Madisen et al., 2010	Line	JAX stock #	Knock-in locus	Reference
AGRICLESPED   007906   ROSA26   Madisen et al., 2010   AGRICL-SGreen   007906   ROSA26   Madisen et al., 2010   AGRICL-SGREEN   007906   ROSA26   Madisen et al., 2010   AGRICL-GREHIJSH-AHT   012567   ROSA26   Madisen et al., 2010   ALI-STRICL-ARCHIJSH-EYPP   012569, 024109   ROSA26   Madisen et al., 2012   ALI-STRICL-GREHIJSH-EYPP   012569, 024109   ROSA26   Madisen et al., 2012   ALI-STRICL-ARCHIJSH-EYPP   014538   ROSA26   Madisen et al., 2012   ALI-STRICL-GREHIJSH-EYPP   014539   ROSA26   Madisen et al., 2012   ALI-STRICL-GREHIJSH-EYPP   014539   ROSA26   Madisen et al., 2012   ALI-STRICL-GREHIJSH-EYPP   014539   ROSA26   Madisen et al., 2012   ALI-STRICL-GREHIJSH-STRIP   014539   ROSA26   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   014539   ROSA26   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   022731   TIGRE   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   021875   ROSA26   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   021876   ROSA26   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   021876   ROSA26   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   022538   TIGRE   Madisen et al., 2015   ALI-STRICL-GREHIJSH-STRIP   023532   TIGRE   Madisen et al., 2015   ALI-STRICL-GREEN   ROSA26   TIS paper   ALI-STRICL-GREEN   ROSA26   TIS paper   ALI-STRICL-GREEN   ROSA26   TIS paper   ALI-STRICL-GREEN   ROSA26   TIS paper   ALI-STRICL-GREEN				
Aid(RCL-JCT)				
AJ9(RCL-GT)	· · · · · · · · · · · · · · · · · · ·			
Aid (AUCL-IACT)				
A227(RCL-ChR2H134R-dT)				
Ai35(RCL-chE2H134R-EYFP)	·			
Ai35RCL-Arch-EGFP-ER2  012735   ROSA26				
A338(RCL-GCaMP3)				
Ai39(RCL-eNpHR3.0-EYFP)	· · · · · · · · · · · · · · · · · · ·			
AIST(RCFIL-Jaws)				· · · · · · · · · · · · · · · · · · ·
Ai65(RCFL-tdT)		011007		
AióS(RCFL-IdT)         021875         ROSA26         Madisen et al., 2015           AióE(RCRL-USFPB)         CO21876         ROSA26         Madisen et al., 2015           Ai72(RCL-VSFPB)         023528         TIGRE         Madisen et al., 2015           Ai79(TITL-WSFPB)         023529         TIGRE         Madisen et al., 2015           Ai79(TITL-Jaws)         023529         TIGRE         Madisen et al., 2015           Ai87(TITL-GFP)         023532         TIGRE         Madisen et al., 2015           Ai87(TITL-GFP)         022620         TIGRE         Madisen et al., 2015           Ai87(TITL-GENP6)         026262         TIGRE         Madisen et al., 2015           Ai93(TITL-GCMP66)         024103         TIGRE         Madisen et al., 2015           Aj93(TITL-GCMP66)         024104         TIGRE         Madisen et al., 2015           Aj95(RCL-GCAMP68)         024104         TIGRE         Madisen et al., 2015           Aj96(RCL-GCAMP68)         024106         ROSA26         Madisen et al., 2015           Snap25-1_SL-SL-P2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-1_SL-SL-QCAMP68         025111         Snap25         Madisen et al., 2015           Snap25-1_SL-SL-P2A-GFP         021879         Snap25		022731		
Ai66(RCRL-tdT)				
Ai72(RCL-VSFPB)	·			
Ai78(TITL-VSFPB)		021070		
Ai79(TITL-Jaws)		023528		
Ai82(TITL-GFP)         023532         TIGRE         Madisen et al., 2015           Ai87(TITL-iGluSnFr)         026260         TIGRE         Madisen et al., 2015           Ai87(RCL-iGluSnFr)         ROSA26         Madisen et al., 2015           Ai92(TITL-YCX2,60)         026262         TIGRE         Madisen et al., 2015           Ai93(TITL-GCaMP6f)         024103         TIGRE         Madisen et al., 2015           Aj94(TITL-GCaMP6s)         024104         TIGRE         Madisen et al., 2015           Aj95(RCL-GCaMP6s)         024106         ROSA26         Madisen et al., 2015           Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2017           TITL-R.CAMP1.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-temGP)         ROSA26         This paper           Ai34(RCL-Syp-temGFP)         021188         ROSA26         This paper           Ai47(RCL-triGFP)         021188         ROSA26         This paper           Ai47(RCL-triGFP)         021188         ROSA26         This paper           Ai65R(RCR-tdT)         ROSA26         This paper           Ai65R(RCL-tdT)         ROSA26				
Ai85(RTITL-iGlusnFr)         026260         TIGRE         Madisen et al., 2015           Ai87(RCL-iGlusnFr)         ROSA26         Madisen et al., 2015           Aj92(TITL-YCX2.60)         02662         TIGRE         Madisen et al., 2015           Aj93(TITL-GCaMP6f)         024103         TIGRE         Madisen et al., 2015           Aj95(RCL-GCaMP66)         024105         ROSA26         Madisen et al., 2015           Aj95(RCL-GCaMP66)         024106         ROSA26         Madisen et al., 2015           Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2017           Ai31(RCL-Sp-GFP)         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Sp-GFP)         012570         ROSA26         This paper           Ai47(RCL-sp-HT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai43(RCL-streEFP)         021188         ROSA26         This paper           Ai47(RCL-triGFP)         ROSA26         This paper				
AiST(RCL-iGluSnFr)				
Ai92(TTTL-YCX2,60)         026262         TIGRE         Madisen et al., 2015           Ai93(TTTL-GCaMP66)         024103         TIGRE         Madisen et al., 2015           Ai94(TTTL-GCaMP68)         024104         TIGRE         Madisen et al., 2015           Ai95(RCL-GCaMP66)         024105         ROSA26         Madisen et al., 2015           Ai96(RCL-GCaMP68)         024106         ROSA26         Madisen et al., 2015           Snap25-T2A-GCBP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP68         025111         Snap25         Madisen et al., 2015           TITL-RCAMP1.07         030217         TIGRE         Bethge et al., 2015           Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-EmGFP)         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Steinecke et al., 2017           Ai47(RCL-HCGFP)         ROSA26         This paper         Ai65(RCFL-GT)         ROSA26         This paper           Ai65(RCR-L-dT)         ROSA26         This paper         Ai66(RCR-L-dT)         ROSA26         This paper           Ai75(RCL-nT) </td <td></td> <td>020200</td> <td></td> <td></td>		020200		
Ai93(TTTL-GCaMP6f)   024103   TIGRE   Madisen et al., 2015   Ai94(TTTL-GCaMP6s)   024104   TIGRE   Madisen et al., 2015   Ai95(RCL-GCaMP6f)   024105   ROSA26   Madisen et al., 2015   Ai96(RCL-GCaMP6s)   024106   ROSA26   Madisen et al., 2015   Snap25-LSL-F2A-GFP   021879   Snap25   Madisen et al., 2015   Snap25-T2A-GCaMP6s   025111   Snap25   Madisen et al., 2015   STTL-RCAMP1.07   030217   TIGRE   Bethge et al., 2017   Ai31(RCL-Syp-EmGFP)   ROSA26   This paper   Ai34(RCL-Syp-EmGFP)   ROSA26   This paper   Ai40(RCL-ArchT-EGFP)   021188   ROSA26   This paper, see also Abraira et al., 2017   Ai63(TTT-dT)   TIGRE   This paper   Ai65(RCR-dT)   TIGRE   This paper   Ai65(RCR-dT)   ROSA26   This paper   Ai66(RCR-dT)   ROSA26   This paper   Ai75(RCL-nT)   025106   ROSA26   This paper   Ai80(RCL-ArchT)   025106   ROSA26   This paper   Ai80(RCL-CaCh)   025109   ROSA26   This paper   Ai80(RTTL-ArcLight)   TIGRE   This paper   Ai80(TTTL-ArcLight)   TIGRE   This paper   Ai80(TTTL-ArcLight)   TIGRE   This paper   Ai10(RCL-FnGF-nT)   ROSA26   This paper   Ai10(RCL-FnGF-NT)   ROSA26   This paper   Ai134(TTTL-Chronos)   024100   TIGRE   This paper   Ai134(TTTL-CAR2-YFP)   031334   TIGRE   This paper   Ai134(TTTL-CAR2-YFP)   030216   TIGRE   This paper   Ai136(TTTL-GFP-ICL-TTD)   030219   TIGRE   This paper   Ai140(TTTL-GFP-ICL-TTD)   030219   TIGRE   This paper   Ai140(TTTL-GFP-ICL-TTA2)   030220   TIGRE   This paper   Ai140(TTTL-GFP-ICL-TTA2)   030220   TIGRE   This paper   Ai161(TTTL-GFP-ICL-TTA2)   031561   TIGRE   This paper   Ai161(TTTL-GFP-ICL-TTA2)   031562   TIGRE   This paper   Ai161(TTTL-GRE-ICL-TTA2)   031561   TIGRE   This paper   Ai161(TTTL-GRE-ICL-TTA2)   031569   TIGRE   This paper   Ai161(TTTL-ASAP2-S-ICL-TTA2)   031569   TIGRE   This paper		026262		
Ai94(TITL-GCaMP6s)         024104         TIGRE         Madisen et al., 2015           Ai95(RCL-GCaMP6f)         024105         ROSA26         Madisen et al., 2015           Ai96(RCL-GCaMP6s)         024106         ROSA26         Madisen et al., 2015           Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2015           TITTL-RCAMP1.07         030217         TIGRE         Betge et al., 2017           Ai31(RCL-Syp-EmGFP)         03217         ROSA26         This paper           Ai34(RCL-Syp-EmGFP)         021188         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Steinecke et al., 2017           Ai47(RCL-triGFP)         710RE         This paper, see also Steinecke et al., 2017           Ai63(RCR-LdT)         ROSA26         This paper           Ai65(RCR-tdT)         ROSA26         This paper           Ai66(RCR-tdT)         ROSA26         This paper           Ai80(RCR-L-arch)         025106         ROSA26         This paper           Ai80(RCR-L-arch)         025106         ROSA26         This paper           Ai80(RCR-L-arch)				·
Ai95(RCL-GCaMP6)         024105         ROSA26         Madisen et al., 2015           Ai96(RCL-GCaMP6s)         024106         ROSA26         Madisen et al., 2015           Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2015           TITL-RCAMPI.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-EmGP)         ROSA26         This paper           Ai34(RCL-Syp-tdT)         012570         ROSA26         This paper           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Abraira et al., 2017           Ai47(RCL-triGFP)         ROSA26         This paper           Ai65(RCR-tdT)         ROSA26         This paper           Ai65F(RCF-tdT)         ROSA26         This paper           Ai66R(RCR-tdT)         ROSA26         This paper           Ai80(RCFL-CatCh)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(RTL-Arclight)         TIGRE         This paper           Ai10(RCL-FinGF-nT)         ROSA26         This paper           Ai133(TITL-srChance)         0302				
Ai96(RCL-GCaMP6s)         024106         ROSA26         Madisen et al., 2015           Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2015           TTTL-RCAMP1.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai40(RCL-Syp-EdT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArehT-EGFP)         021188         ROSA26         This paper           Ai47(RCL-triGFP)         ROSA26         This paper, see also Steinecke et al., 2017           Ai63(TTI-dT)         TIGRE         This paper           Ai65F(RCF-tdT)         ROSA26         This paper           Ai66R(RCR-tdT)         ROSA26         This paper           Ai75(RCL-nT)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai90(TTL-Chronos)         024100         TIGRE         This paper           Ai10(RCL-FnGF-nT)         ROSA26         This paper           Ai133(TTTL-ssaPEX2tm)         030213         TIGRE         This paper <t< td=""><td></td><td></td><td></td><td>,</td></t<>				,
Snap25-LSL-F2A-GFP         021879         Snap25         Madisen et al., 2015           Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2017           TTTL-RCAMP1.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-tdT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Steinecke et al., 2017           Ai47(RCL-triGFP)         ROSA26         This paper, see also Steinecke et al., 2017           Ai63(TIT-tdT)         TIGRE         This paper           Ai66R(RCR-tdT)         ROSA26         This paper           Ai75(RCL-nT)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(TITL-ArcLight)         TIGRE         This paper           Ai110(RCL-FnGF-nT)         ROSA26         This paper           Ai110(RCL-FnGF-nT)         ROSA26         This paper           Ai134(TITL-scaPEXEUM)         030213         TIGRE         This paper           Ai134(TITL-scaPEXEUM)         030213         TIGRE         This paper	· · · · · · · · · · · · · · · · · · ·			· · · · · · · · · · · · · · · · · · ·
Snap25-T2A-GCaMP6s         025111         Snap25         Madisen et al., 2015           TTTL-RCaMPI.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-tdT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Steinecke et al., 2017           Ai63(TTT-tdT)         TIGRE         This paper           Ai63(TTT-dT)         ROSA26         This paper           Ai66(RCR-tdT)         ROSA26         This paper           Ai66(RCR-tdT)         ROSA26         This paper           Ai75(RCL-nT)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai90(TTL-ArcLight)         TIGRE         This paper           Ai10(RCL-snGF-nT)         ROSA26         This paper           Ai134(TTL-ssAPEX2tm)         030213         TIGRE         This paper           Ai134(TTL-Chronos)         0410         TIGRE         This paper           Ai134(TTL-ReaChR-YFP)         03134	·			
TTTL-RCaMP1.07         030217         TIGRE         Bethge et al., 2017           Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-tdT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper           Ai47(RCL-triGFP)         ROSA26         This paper, see also Steinecke et al., 2017           Ai63(TTT-tdT)         TIGRE         This paper           Ai65F(RCF-tdT)         ROSA26         This paper           Ai66R(RCR-tdT)         ROSA26         This paper           Ai75(RCL-nT)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai30(TTTL-ArcLight)         TIGRE         This paper           Ai10(RCL-FnGF-nT)         ROSA26         This paper           Ai133(TTTL-ssAPEX2tm)         030213         TIGRE         This paper           Ai134(TTTL-ChR2-YFP)         031334         TIGRE         This paper           Ai134(TTTL-GR2-TF)         030216         TIGRE         This paper           Ai134(TTTL-GFP-ICL-TTA2)         030220 </td <td></td> <td></td> <td></td> <td></td>				
Ai31(RCL-Syp-EmGFP)         ROSA26         This paper           Ai34(RCL-Syp-tdT)         012570         ROSA26         This paper, see also Abraira et al., 2017           Ai40(RCL-ArchT-EGFP)         021188         ROSA26         This paper, see also Steinecke et al., 2017           Ai47(RCL-triGFP)         ROSA26         This paper, see also Steinecke et al., 2017           Ai63(TIT-tdT)         TIGRE         This paper           Ai66R(RCR-tdT)         ROSA26         This paper           Ai75(RCL-nT)         025106         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai80(RCFL-CatCh)         025109         ROSA26         This paper           Ai10(RCL-FnGF-LCTACL)         024100         TIGRE         This paper           Ai110(RCL-FnGF-nT)         ROSA26         This paper           Ai134(TITL-Chronos)         030213         TIGRE         This paper           Ai134(TITL-ReachR-YFP)         030216         TIGRE         This paper           Ai139(TITL-ReachR-YFP)         030216         TIGRE         This paper           Ai140(TITL-GFP-ICL-TA2)         030220         TIGRE         This pa				
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Acronyms: RCL, Rosa26 – CAG promoter – LoxP-STOP-LoxP. RCFL, Rosa26 – CAG promoter – FRT-STOP-FRT – LoxP-STOP-LoxP. RCRL, Rosa26 – CAG promoter – Rox-STOP-Rox – LoxP-STOP-LoxP. RCF, Rosa26 – CAG promoter – FRT-STOP-FRT. RCR, Rosa26 – CAG promoter – Rox-STOP-Rox. LSL, LoxP-STOP-LoxP. TITL, TIGRE – Insulators – TRE promoter – LoxP-STOP-LoxP. TIT, TIGRE – Insulators – TRE promoter – LoxP-STOP-LoxP. TITL, TIGRE – Insulators – TRE promoter – LoxP-STOP-LoxP. ICL, Insulators – CAG promoter – Lox2272-STOP2-Lox2272. ICR, Insulators – CAG promoter – Rox-STOP2-Rox. FnGF, FRT – nls-mNeonGreen – FRT. GC6f, GCaMP6f. GC6s, GCaMP6s. nT, nls-tdTomato. Syp, Synaptophysin. tdT, tdTomato. TPT, tdTomato-P2A-tTA2.

**Table S3.** Driver lines expressing trimethoprim (TMP)-inducible Cre or FlpO. Recombination patterns examined in adult mice (P56 or older) with drivers crossed to either a Cre reporter Ai14 or a Flp reporter Ai65F. Related to **Figure 1**.

Driver line	No TMP induction	With TMP induction in adult stage
	Significant baseline level but not full recombination	Full recombination pattern resembling that of the
Calb1-T2A-dgCre	pattern	endogenous gene
		Full recombination pattern resembling that of the
Ctgf-T2A-dgCre	Very sparse baseline recombination	endogenous gene
	Full recombination pattern resembling that of the	Full recombination pattern resembling that of the
Fezf1-T2A-dCre	endogenous gene, same as with TMP induction	endogenous gene, same as without TMP induction
	Full recombination pattern resembling that of the	Full recombination pattern resembling that of the
Ndnf-IRES2-dgCre	endogenous gene, same as with TMP induction	endogenous gene, same as without TMP induction
	Significant baseline level but not full recombination	Full recombination pattern resembling that of the
Pvalb-T2A-dCre	pattern	endogenous gene
		Full recombination pattern resembling that of the
Rasgrf2-T2A-dCre	Sparse baseline recombination	endogenous gene
		Very sparse recombination pattern as a subset of that
Plxnd1-IRES2-dgFlpO	No recombination	of the endogenous gene
		Scattered recombination pattern as a subset of that of
Rasgrf2-T2A-dgFlpO	No recombination	the endogenous gene

#### Table S4. Protein sequence of soma-enriched voltage sensor ASAP2s-Kv. Related to Figure 4.

The ASAP2s segment is labeled in green, with the circularly permuted GFP sequence underlined. The 65 amino acid segment from the C-terminus of the rat Kv2.1 potassium channel (orange) was fused to the C-terminus of ASAP2s via a flexible linker (blue). Black letters correspond to enzymatic restriction sites. Distinct elements of the protein are color-coded. This segment is sufficient to target a heterologous protein to neuronal soma and proximal dendrites and has been repeatedly used for soma targeting of opsins.

#### **ASAP2s-Kv** sequence

METTVRYEQGSELTKTSSSPTADEPTIKIDDGRDEGNEQDSCSNTIRRKISPFVMSFGFRVFGVVLIIVDIIVVIVDLAISEK KRGIREILEGVSLAIALFFLVDVLMRVFVEGFKNYFRSKLNTLDAVIVVGTLLINMTYSFSDLAAFNSHNVYITADKQKNGIK ANFTVRHNVEDGSVQLADHYQQNTPIGDGPVLLPDNHYLSTQTVLSKDPNEKRDHMVLLEFVTAAGITHGMDELYGGTGGSAS QGEELFTGVVPILVELDGDVNGHKFSVRGEGEGDATIGKLTLKFICTTGKLPVPWPTLVTTLTYGVQCFSRYPDHMKRHDFFK SAMPEGYVQERTISFKDDGKYKTRAVVKFEGDTLVNRIELKGTDFKEDGNILGHKLEYNTDQMPQMVTLLRVLRIVILIRIFQ LASQKKQLEVVTLKGSSGSSGSSTRQSQPILNTKEMAPQSKPPEELEMSSMPSPVAPLPARTEGVIDMRSMSSIDSFISCATD FPEATRF

**Table S5.** Problematic reporter and driver line crosses. Related to **Figure 7**.

Reporter	Driver	Genotype	Phenotype
Ai139	Gad2-IRES-Cre	Ai139/wt; Gad2-IRES-Cre/wt	Embryonic lethal
Ai140	Gad2-IRES-Cre	Ai140/wt; Gad2-IRES-Cre/wt	Embryonic lethal
Ai148	Gad2-IRES-Cre	Ai148/wt; Gad2-IRES-Cre/wt	Embryonic lethal
	Sim1-Cre_KJ18,	Ai139/wt; Sim1-Cre_KJ18/wt;	
Ai136	ROSA26-ZtTA	ROSA26-ZtTA/wt	Embryonic lethal
Ai140	Sim1-Cre_KJ18	Ai140/wt; Sim1-Cre_KJ18/wt	Embryonic lethal
	E 1 DEG 6		Reduced body weight and brain size, thinned cortex, substantial neurodegeneration in hippocampal subfields, and high premature mortality rate; doxycycline treatment (to suppress GFP expression)
Ai140	Emx1-IRES-Cre	Ai140/wt;Emx1-IRES-Cre/wt	did not reverse phenotype
Ai148	Emx1-IRES-Cre	Ai148/wt; Emx1-IRES-Cre/wt	Reduced body weight and brain size, thinned cortex, substantial neurodegeneration in hippocampal subfields, and high premature mortality rate; doxycycline treatment (to suppress GCaMP6f expression) did not reverse phenotype
Ai148	Camk2a-Cre	Ai148/wt; Camk2a-Cre/wt	Reduced brain size and some neurodegeneration in hippocampal subfields
Ai148	Slc17a7-IRES2-Cre	Ai148/wt; Slc17a7-IRES2- Cre/wt	Reduced brain size and some neurodegeneration in hippocampal subfields
Ai148	Sst-IRES-Cre	Ai148/wt; Sst-IRES-Cre/wt	Ulcerative dermatitis (most commonly in anogenital region, lower jaw, and sternum), with occasional rectal prolapse and/or seizure, seen in ~30% mice with an average onset at ~P100
Ai168	Pvalb-IRES-Cre	Ai168/wt; Pvalb-IRES-Cre/wt	Reduced body weight, head tilt and atrophy of hind limbs; phenotype can be ameliorated by doxycycline treatment
Ai75	Snap25-IRES2-Cre	Ai75/wt; Snap25-IRES2-Cre/wt	Premature death (around 4 weeks of age)

**Table S6.** All observations of normal and aberrant cortical activity in cortical pan-excitatory GCaMP6 expressing lines. Related to **Figure 7**.

Animals with aberrant activity are highlighted (gray), observations with aberrant activity are highlighted in red, with the corresponding sex and age of animals at the time of each observation. We found no relationship between these events and the age of the animal.

Genotype	Mouse ID#	Sex	Age at observation (postnatal days)
Slc17a7-IRES2-Cre;Ai162	292915	F	52
Slc17a7-IRES2-Cre;Ai162	292917	F	52
Slc17a7-IRES2-Cre;Ai162	297312	M	110
Slc17a7-IRES2-Cre;Ai162	297310	M	110
Slc17a7-IRES2-Cre;Ai162	304572	F	170
Slc17a7-IRES2-Cre;Ai162	315689	F	120
Slc17a7-IRES2-Cre;Ai162	321607	F	97, 191
Slc17a7-IRES2-Cre;Ai148	343025	M	77
Slc17a7-IRES2-Cre;Ai148	343027	F	77, 99
Slc17a7-IRES2-Cre;Ai148	329284	M	67
Slc17a7-IRES2-Cre;Ai148	329286	M	67
Slc17a7-IRES2-Cre;Ai148	347103	M	57, 79
Slc17a7-IRES2-Cre;Ai148	347105	F	71
Slc17a7-IRES2-Cre;Ai148	347893	M	67, 75
Slc17a7-IRES2-Cre;Camk2a-tTa;Ai93	303474	F	69, 118
Slc17a7-IRES2-Cre;Camk2a-tTa;Ai93	302981	M	60, 68, 111
Slc17a7-IRES2-Cre;Camk2a-tTa;Ai93	301333	F	67, 118
Slc17a7-IRES2-Cre;Camk2a-tTa;Ai93	306069	F	67, 96
Slc17a7-IRES2-Cre;Camk2a-tTa;Ai93	301329	M	67, 118