# Tuberous sclerosis complex 1 (Tsc1) enforces quiescence of naive T cells to promote immune homeostasis and function

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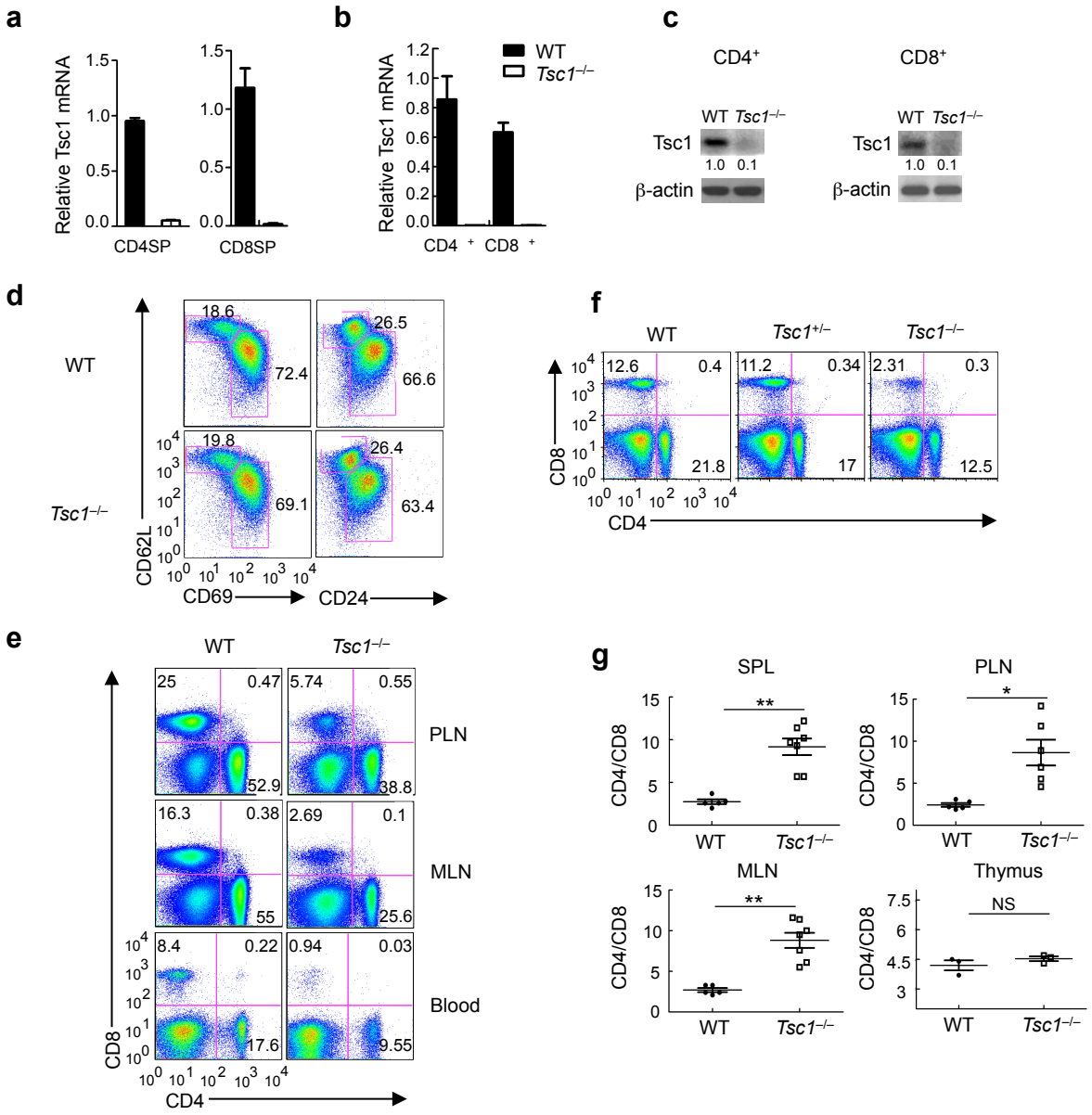
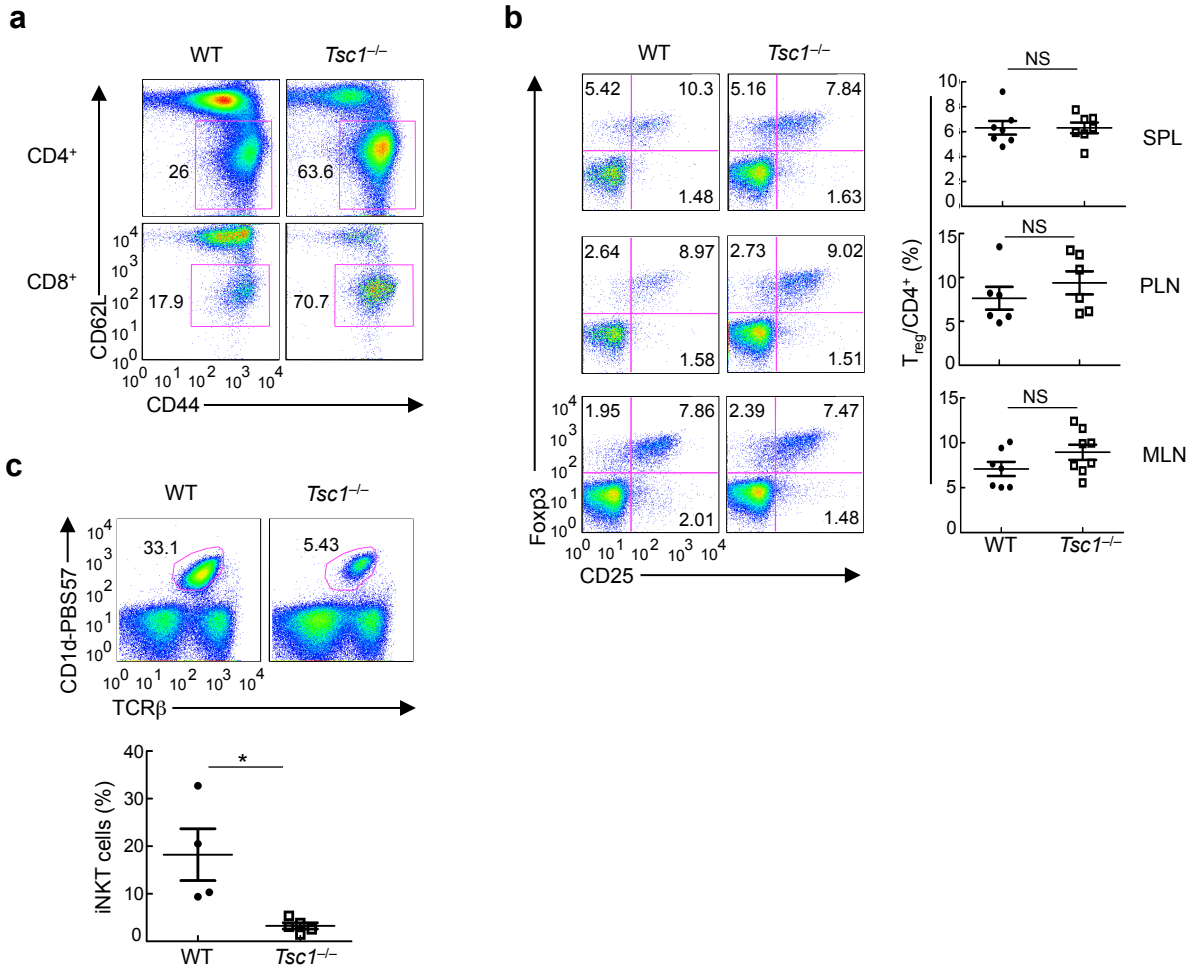
## Supplementary Figure 1



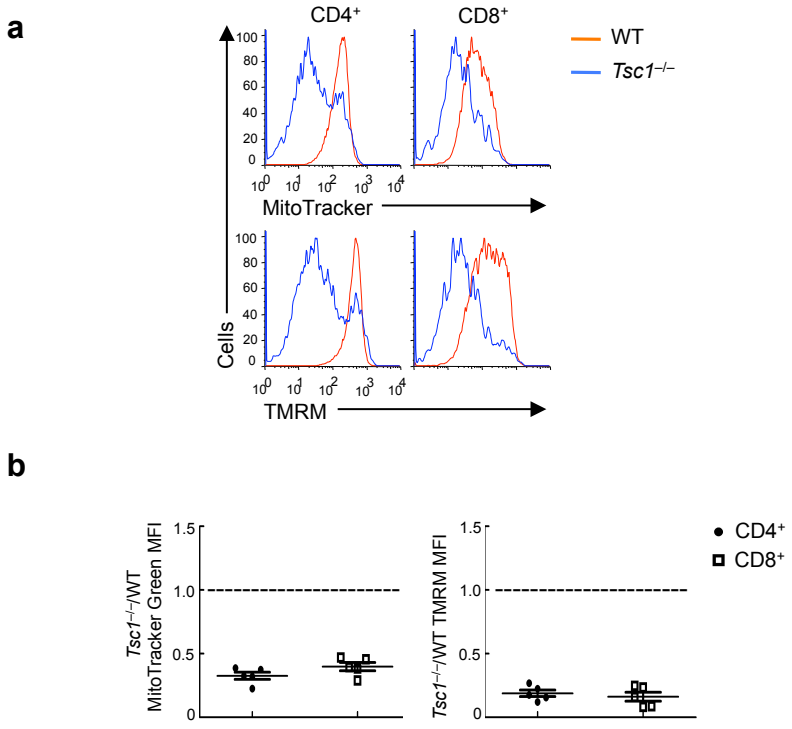

**Supplementary Figure 1. T cell-specific deletion of *Tsc1* results in altered homeostasis of peripheral but not thymic T cells. (a,b)** Analysis of Tsc1 mRNA expression in CD4SP and CD8SP thymocytes **(a)** and in peripheral CD4 and CD8 T cells **(a)**. **(c)** Western blot of Tsc1 expression in peripheral CD4 and CD8 T cells. Numbers below lanes indicate band intensity relative to that of the loading control β-actin. **(d)** Normal expression of maturation markers on *Tsc1*$^{-/-}$ CD4SP thymocytes. **(e)** Reduced CD4 and CD8 populations in peripheral lymph nodes (PLN), mesenteric lymph nodes (MLN) and blood of *Tsc1*$^{-/-}$ mice. **(f)** Normal distribution of CD4 and CD8 populations in the spleen of *Tsc1*$^{+/-}$ mice. **(g)** Increased ratios of CD4 vs CD8 T cells in the peripheral but not thymic T cells from *Tsc1*$^{-/-}$ mice (n=3-7). SPL, spleen. * $P < 0.01$; ** $P < 0.001$; NS, not significant. Data are representative of 3-4 independent experiments.

## Supplementary Figure 2



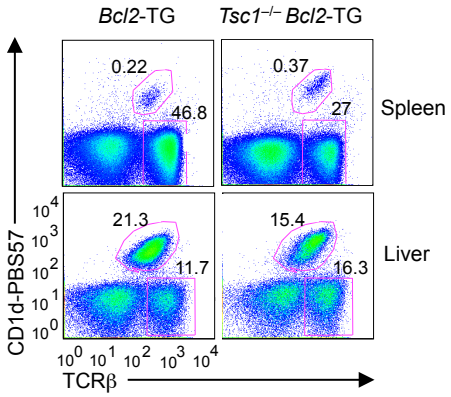

**Supplementary Figure 2. Analysis of T cell subsets in the periphery of *Tsc1*$^{-/-}$ mice. (a)** Flow cytometry of CD62L and CD44 expression in mice at 8 months of age showed expansion of the CD62L$^{lo}$CD44$^{hi}$ population in *Tsc1*$^{-/-}$ cells. **(b)** Flow cytometry of Foxp3 and CD25 expression revealed normal frequency of $T_{reg}$ cells in the periphery of *Tsc1*$^{-/-}$ mice (n=6-8). **(c)** Flow cytometry analysis of iNKT cells (TCRβ$^{+}$CD1d-PBS57$^{+}$) in the livers of WT and *Tsc1*$^{-/-}$ mice (n=4-5). * $P$<0.05; NS, not significant. Data are representative of 4 independent experiments.

## Supplementary Figure 3



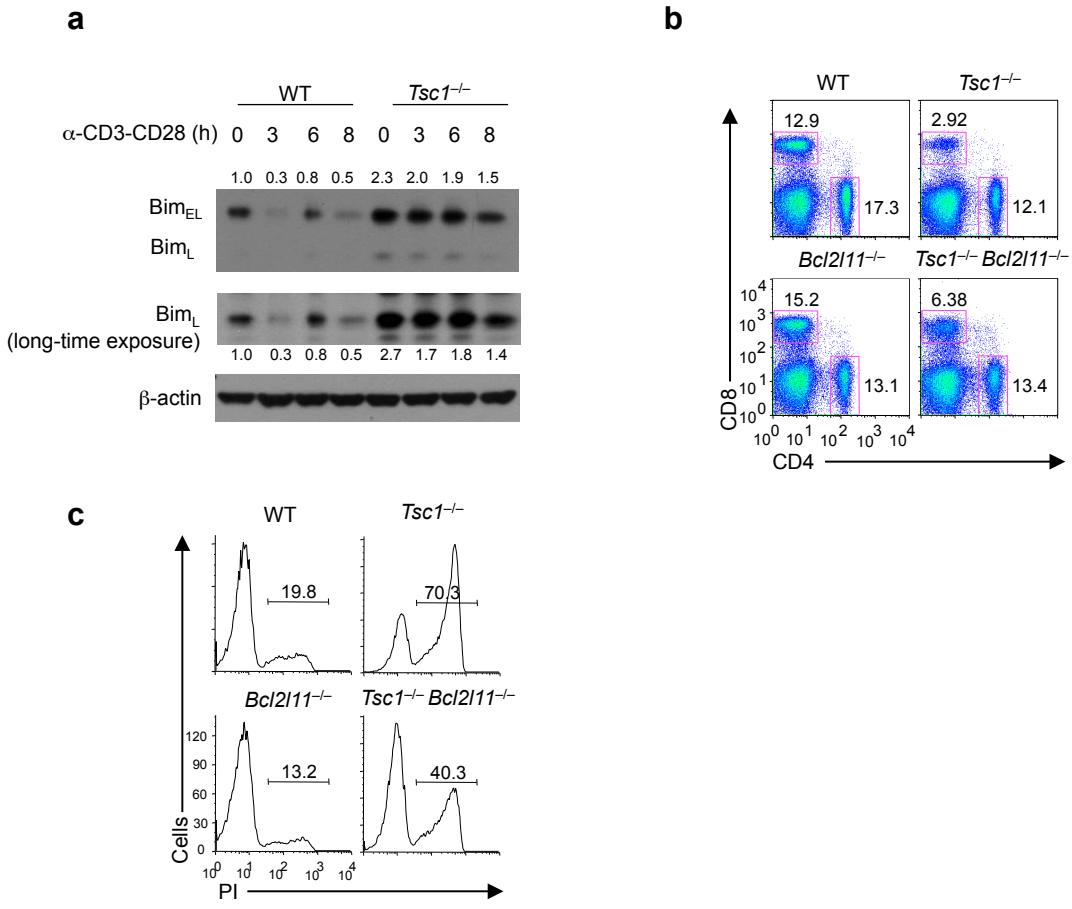

**Supplementary Figure 3. Altered mitochondrial homeostasis in *Tsc1*$^{-/-}$ T cells.** **(a)** CD4 and CD8 T cells from WT and *Tsc1*$^{-/-}$ mice were stained with MitoTracker Green and TMRM and analyzed by flow cytometry. **(b)** Ratios of *Tsc1*$^{-/-}$/WT for the mean fluorescent intensity (MFI) of MitoTracker Green and TMRM staining (n=5). Data are representative of 4 independent experiments.

## Supplementary Figure 4



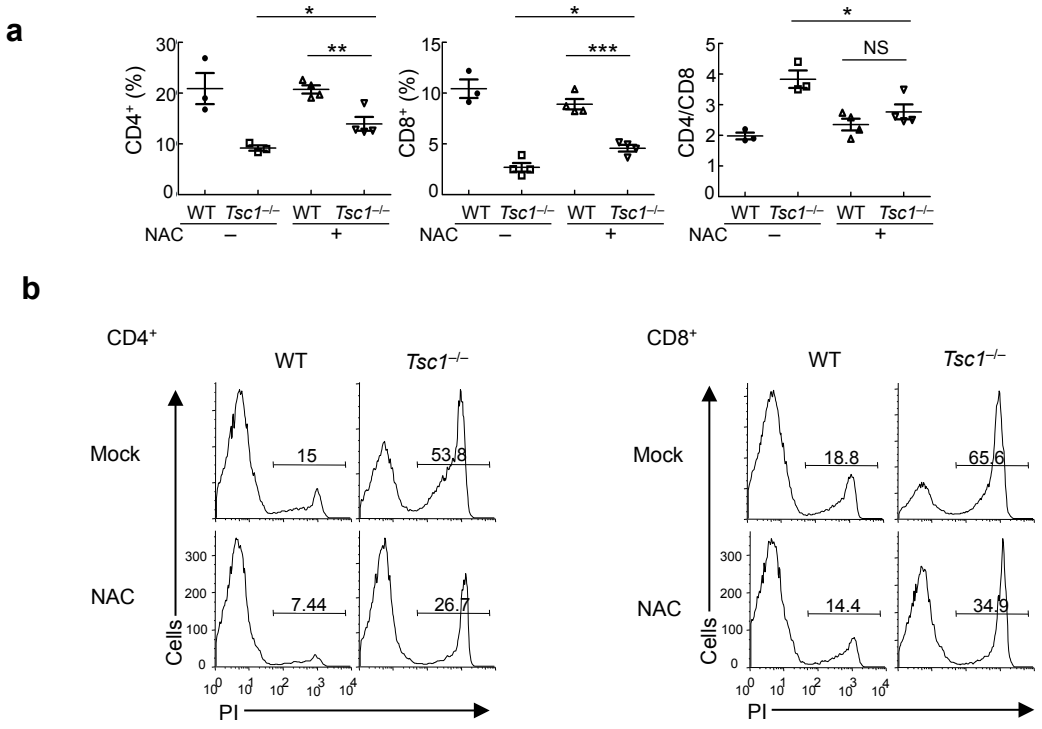

**Supplementary Figure 4. The *Bcl2* transgene rescues the diminished iNKT cells in *Tsc1*$^{-/-}$ mice.** Flow cytometry of iNKT cells (TCRβ$^{+}$CD1d-PBS57$^{+}$) in the spleens and livers of *Bcl2*-TG and *Tsc1*$^{-/-}$ *Bcl2*-TG mice. Data are representative of 3 independent experiments.

## Supplementary Figure 5



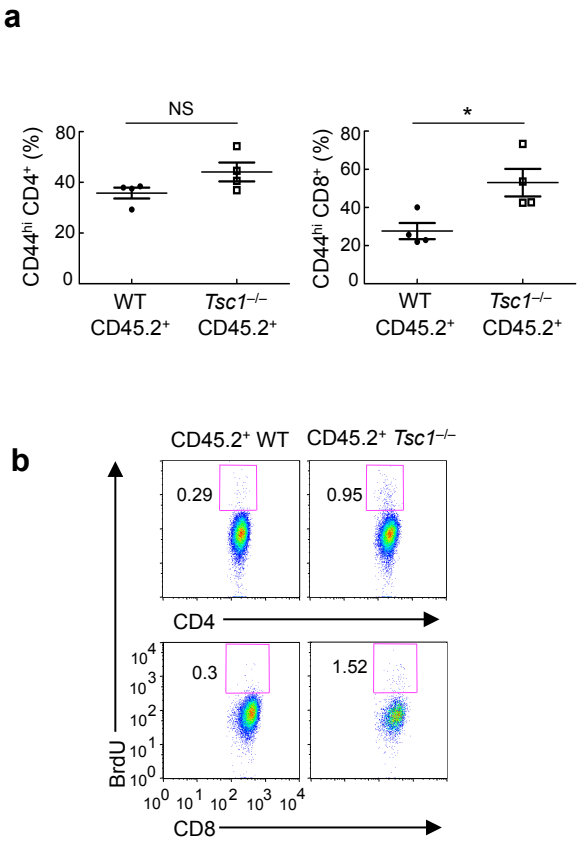

**Supplementary Figure 5. Role of Bim in apoptosis of *Tsc1*-deficient T cells. (a)** Western blot of $Bim_{EL}$ and $Bim_L$ expression in WT and *Tsc1*$^{-/-}$ CD8 T cells. A long-time exposure was shown in the middle panel to highlight $Bim_L$ levels. Numbers above ($Bim_{EL}$) and below ($Bim_L$) lanes indicate band intensity relative to that of the loading control β-actin. **(b)** Flow cytometry of CD4 and CD8 T cells in the spleens of WT, *Tsc1*$^{-/-}$, *Bcl2l11*$^{-/-}$, and *Tsc1*$^{-/-}$ *Bcl2l11*$^{-/-}$ mice. **(c)** Flow cytometry detection of $PI^+$ apoptotic cells after 16 hours of stimulation of CD4 T cells with anti-CD3-CD28. Data are representative of 2 independent experiments.

**Supplementary Figure 6**



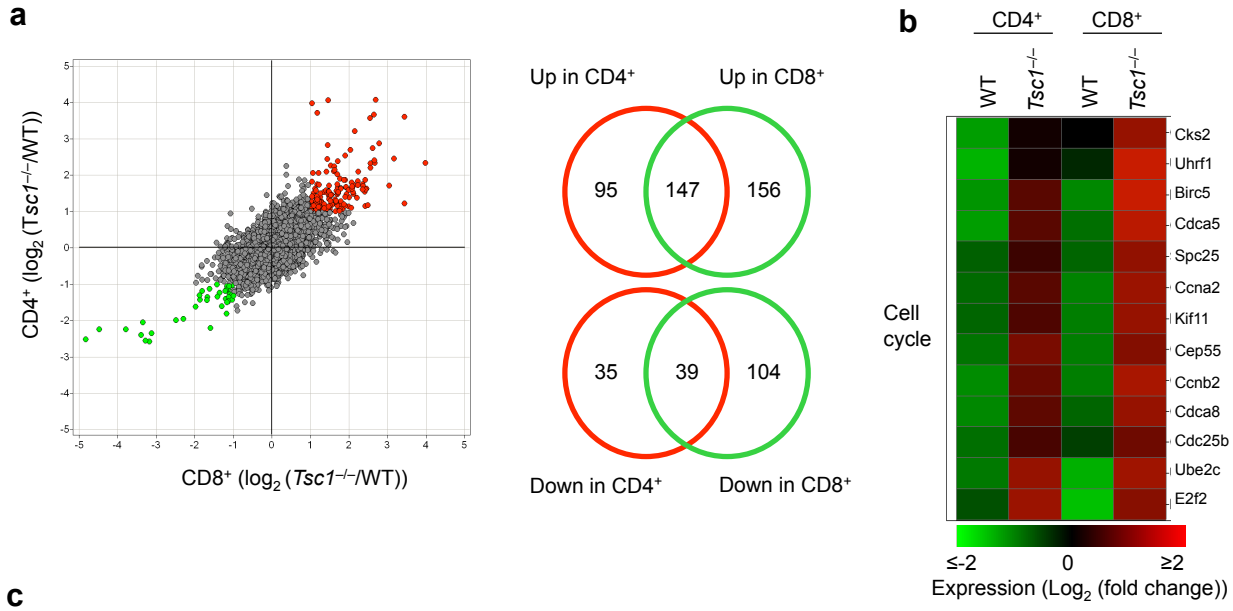

**Supplementary Figure 6. NAC treatment partially rescues the increased apoptosis of *Tsc1*$^{-/-}$ T cells. (a)** WT and *Tsc1*$^{-/-}$ mice were treated with NAC or mock for 5 weeks, followed by flow cytometry of CD4 and CD8 T cells in the spleens (n=3-4). * $P$<0.05; ** $P$<0.005; *** $P$ <0.0005; NS, not significant. **(b)** Naïve CD4 (left) and CD8 (right) T cells were purified from these mice and stimulated with anti-CD3-CD28 for 16 hours, followed by flow cytometry of PI$^+$ apoptotic cells. Data are representative of 2 independent experiments.

## Supplementary Figure 7




**Supplementary Figure 7. Analysis of T cell homeostasis and *in vivo* cycling in mixed bone marrow chimeras. (a)** Proportions of CD44$^{hi}$ populations in CD45.2$^{+}$ donor-derived CD4 (left) and CD8 (right) cells in the spleens of mixed bone marrow chimeras. * $P$<0.05; NS, not significant. **(b)** BrdU staining in CD45.2$^{+}$ donor-derived naïve cells in the mixed bone marrow chimeras 16 hours after injection with BrdU. Data are representative of 2 independent experiments.

## Supplementary Figure 8

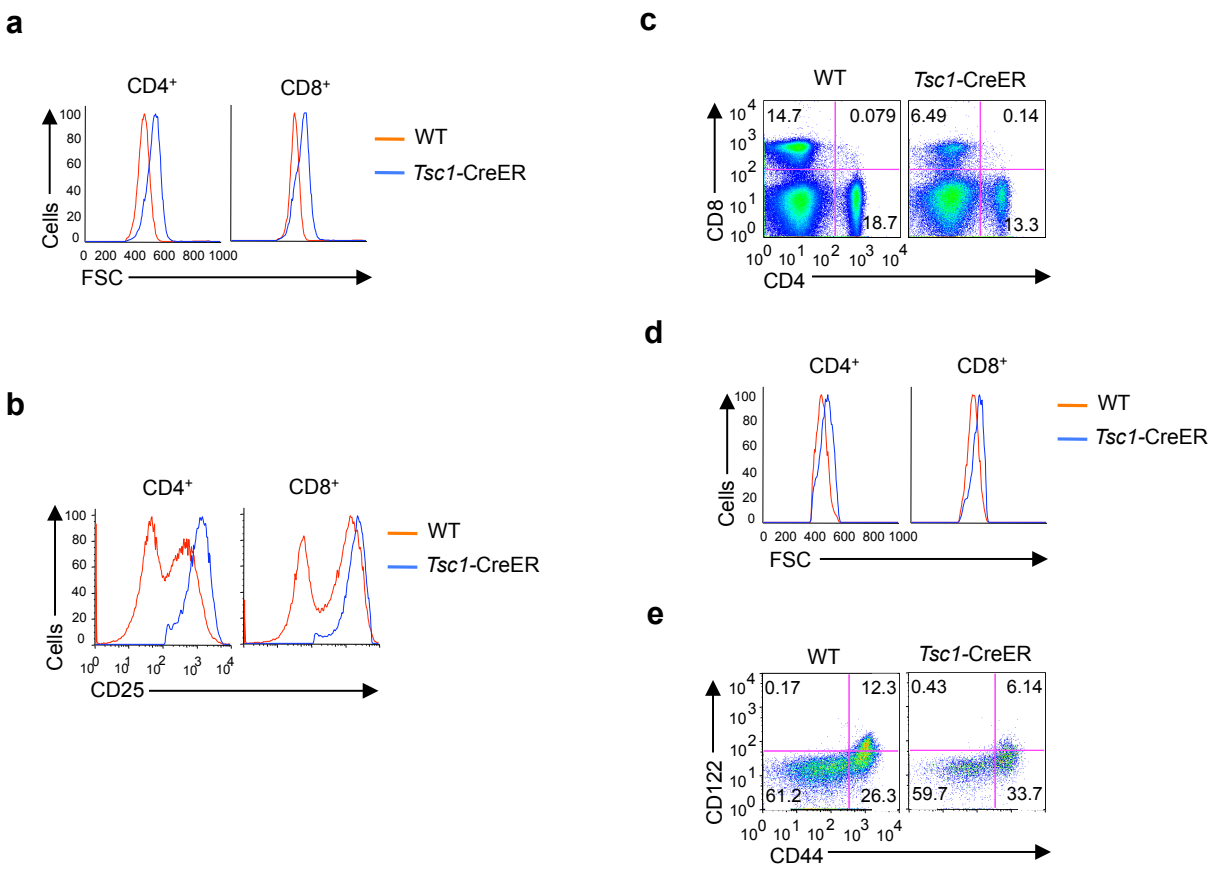



**c**

| Name | NES |
|---|---|
| Oxidative phosphorylation | 1.464 |
| Pyrimidine metabolism | 1.438 |
| Glycosaminoglycan degradation | 1.417 |
| Purine metabolism | 1.401 |
| Valine, leucine and isoleucine degradation | 1.393 |
| Fructose and mannose metabolism | 1.387 |
| Sterol biosynthesis | 1.348 |
| Apoptosis signaling | 1.347 |
| Cell cycle G2_M DNA damage checkpoint regulation | 1.346 |
| N-glycan degradation | 1.330 |
| Aminosugars metabolism | 1.323 |
| Propanoate metabolism | 1.323 |
| PTEN signaling | 1.322 |
| Amyotrophic lateral sclerosis signaling | 1.307 |
| Glycolysis_gluconeogenesis | 1.289 |
| Toll-like receptor signaling | 1.286 |
| Ubiquinone biosynthesis | 1.281 |
| Tyrosine metabolism | 1.263 |
| Tryptophan metabolism | 1.222 |
| Xenobiotic metabolism signaling | 1.217 |

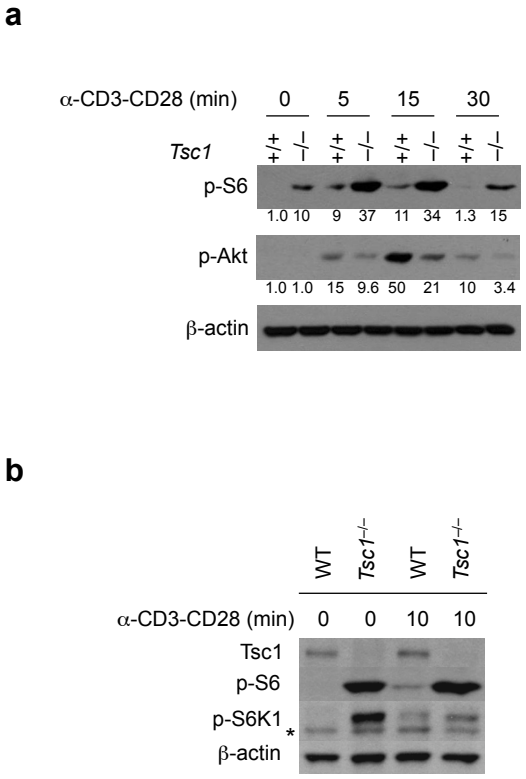
**Supplementary Figure 8. Tsc1-dependent gene expression programs in naïve T cells.** (**a**) Comparison of Tsc1-dependent expression profiles in naïve CD4 and CD8 T cells. Left, a plot comparing all expression profiles between *Tsc1*$^{-/-}$ vs WT in CD4 T cells (y-axis) with the ratios between *Tsc1*$^{-/-}$ vs WT CD8 T cells (x-axis); genes upregulated in both *Tsc1*$^{-/-}$ CD4 and CD8 naïve T cells by ≥2-fold are highlighted in red, and those downregulated in green. Right, the numbers of unique and overlapping genes regulated by Tsc1 (≥ 2-fold difference) between naïve CD4 and CD8 T cells. (**b**) Cell cycle genes co-regulated by Tsc1 in CD4 and CD8 naïve T cells. **(c)** Gene set enrichment analysis (GESA) of Tsc1 target genes in naïve CD4 T cells. All gene sets have nominal *P* values equal to zero and are ordered by Normalized Enrichment Score (NES).

## Supplementary Figure 9



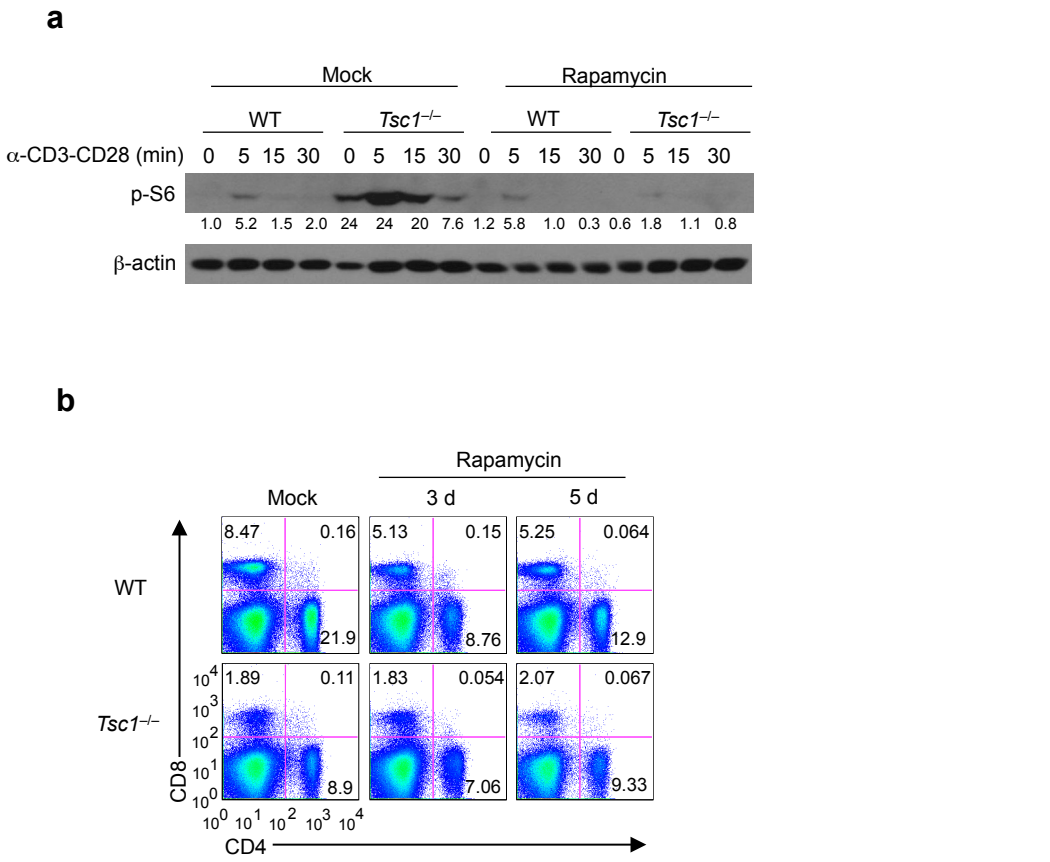

**Supplementary Figure 9. Effects of inducible deletion of *Tsc1* on T cell quiescence and homeostasis. (a,b)** WT and *Tsc1*-CreER mice were treated with tamoxifen, and 2 weeks later, naïve T cells were purified and stimulated with anti-CD3-CD28 for 16 hours. Cell size **(a)** and expression of activation marker CD25 **(b)** in stimulated cells were examined by flow cytometry. **(c-e)** WT and *Tsc1*-CreER mice were treated with tamoxifen, and analyzed 5 weeks later for the peripheral T cell populations **(c)**, cell size **(d)**, and distribution of $CD44^{hi}CD122^{+}$ and $CD44^{hi}CD122^{-}$ populations **(e)**. Data are representative of 2 independent experiments.

## Supplementary Figure 10



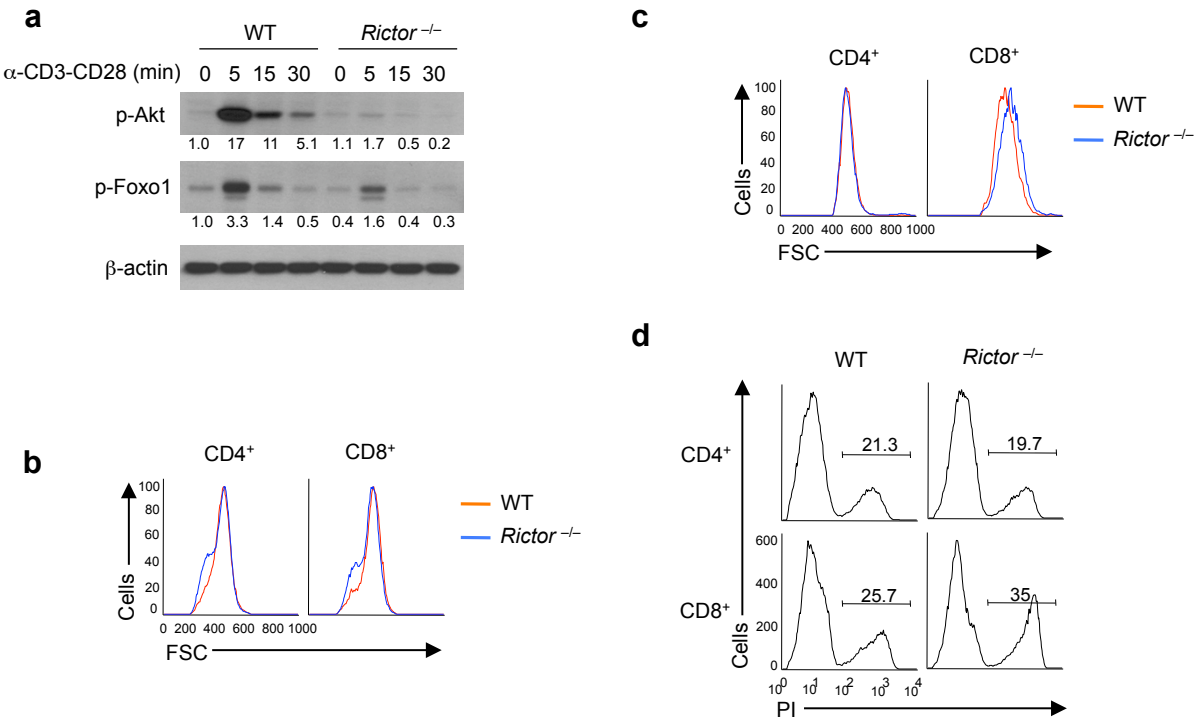

**Supplementary Figure 10. Tsc1 regulates mTOR signaling in CD8 T cells and mature thymocytes. (a)** Western blot of S6 and Akt (Ser473) phosphorylation in WT and *Tsc1*$^{-/-}$ naïve CD8 T cells before and after anti-CD3-CD28 stimulation. Numbers below lanes indicate band intensity relative to that of the loading control β-actin. **(b)** Western blot of S6 and S6K1 phosphorylation in WT and *Tsc1*$^{-/-}$ CD4SP thymocytes before and after anti-CD3-CD28 stimulation.*, non-specific bands. Data are representative of 2-3 independent experiments.

## Supplementary Figure 11



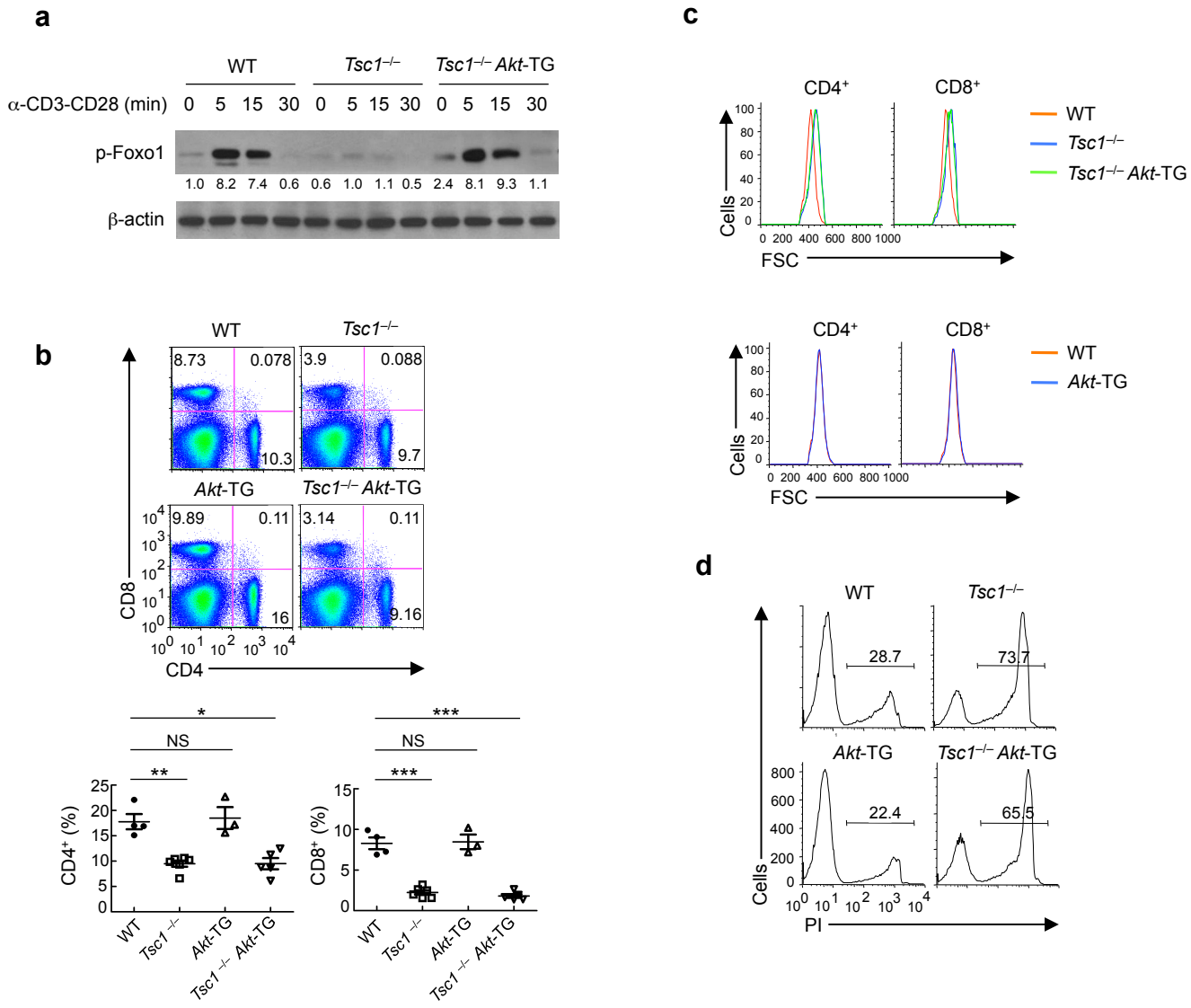

**Supplementary Figure 11. Effects of short-term rapamycin treatment on *Tsc1*$^{-/-}$ T cells. (a)** Sorted naïve T cells from WT and *Tsc1*$^{-/-}$ mice following rapamycin or mock treatment were activated with anti-CD3-CD28 for various times, and phosphorylation of S6 was examined by Western blots. Numbers below lanes indicate band intensity relative to that of the loading control β-actin. **(b)** Flow cytometry of CD4 and CD8 T cells in the spleens of rapamycin or mock treated WT and *Tsc1*$^{-/-}$ mice. Data are representative of 2-3 independent experiments.

## Supplementary Figure 12



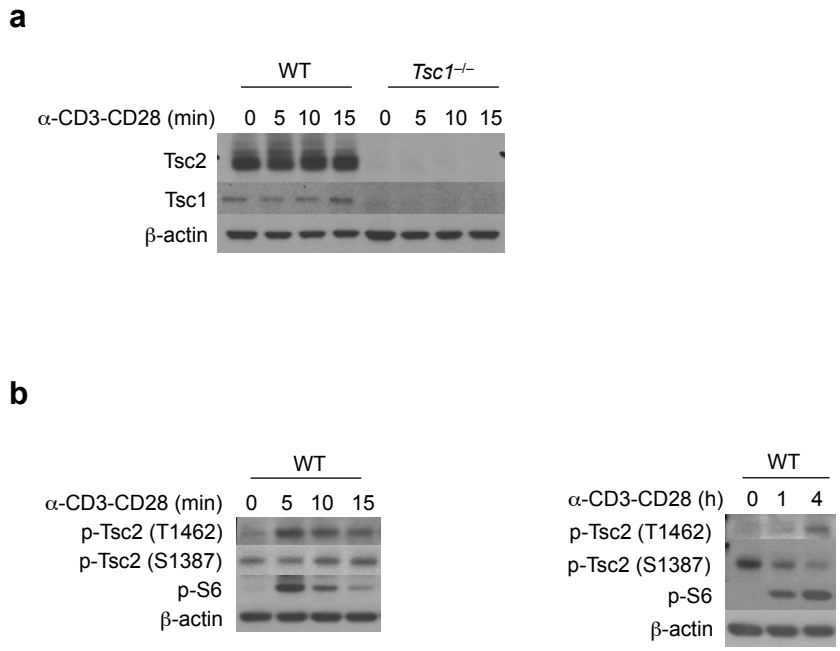

**Supplementary Figure 12. Analysis of homeostasis and activation of *Rictor*$^{-/-}$ T cells. (a)** Western blot of Akt (Ser473) and Foxo1 phosphorylation in WT and *Rictor*$^{-/-}$ naïve T cells before and after anti-CD3-CD28 stimulation. Numbers below lanes indicate band intensity relative to that of the loading control β-actin. **(b)** Flow cytometry of cell size for WT and *Rictor*$^{-/-}$ splenocytes. **(c,d)** Sorted naïve T cells from WT and *Rictor*$^{-/-}$ mice were activated with anti-CD3-CD28 for 16 hours, followed by measurements of cell size **(c)** and PI$^{+}$ apoptotic cells **(d)**. Data are representative of 2-3 independent experiments.

## Supplementary Figure 13



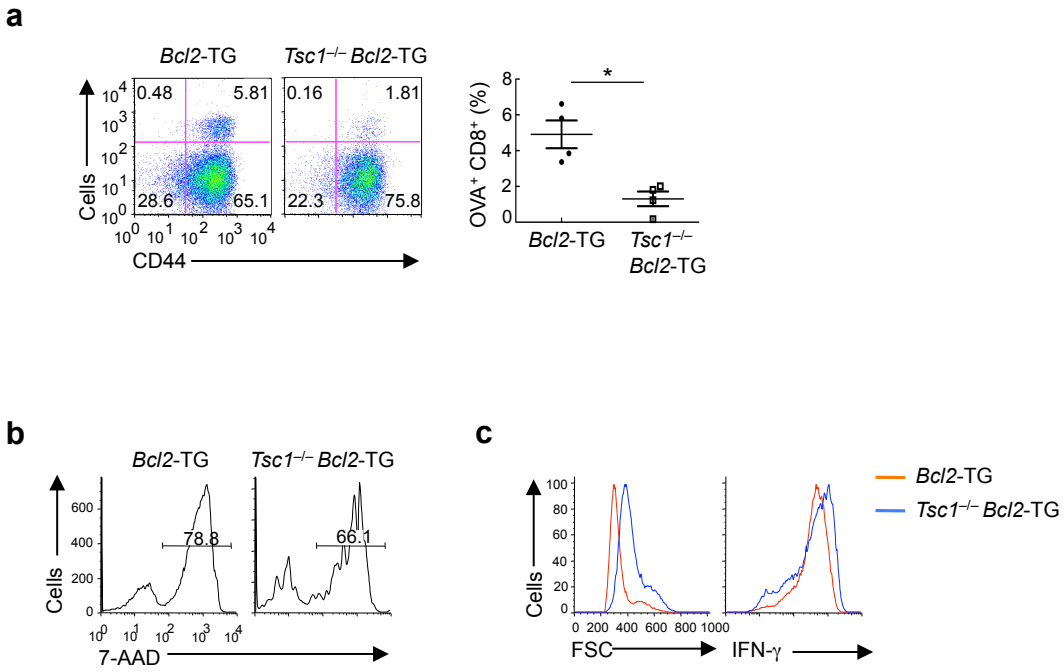

**Supplementary Figure 13. The *Akt*-transgene fails to rectify the defective homeostasis and activation of *Tsc1*$^{-/-}$ T cells. (a)** Western blot analysis of Foxo1 phosphorylation in WT, *Tsc1*$^{-/-}$, *Akt*-TG, and *Tsc1*$^{-/-}$ *Akt*-TG naïve T cells before and after anti-CD3-CD28 stimulation. Numbers below lanes indicate band intensity relative to that of the loading control β-actin. **(b)** Flow cytometry of CD4 and CD8 T cells in the spleens of WT, *Tsc1*$^{-/-}$, *Akt*-TG, and *Tsc1*$^{-/-}$ *Akt*-TG mice. Lower panels, proportions and absolute numbers of CD4$^+$ and CD8$^+$ T cells in the spleens of WT and *Tsc1*$^{-/-}$ mice (n=3-6). * $P < 0.01$; ** $P < 0.001$; *** $P < 0.001$; NS, not significant. **(c)** Flow cytometry of cell size of WT, *Tsc1*$^{-/-}$ and *Tsc1*$^{-/-}$ *Akt*-TG T cells (upper panels). For clarity, comparison between WT and *Akt*-TG T cells was shown in the lower panels. **(d)** Sorted naïve T cells from WT, *Tsc1*$^{-/-}$, *Akt*-TG, and *Tsc1*$^{-/-}$ *Akt*-TG mice were activated with anti-CD3-CD28 for 16 hours, followed by flow cytometry detection of PI$^+$ apoptotic cells. Data are representative of 3 independent experiments.

## Supplementary Figure 14




**Supplementary Figure 14. Regulation of Tsc1 and Tsc2 in T cells. (a)** Western blot of Tsc1 and Tsc2 expression in WT and *Tsc1*$^{-/-}$ naïve T cells before and after anti-CD3-CD28 stimulation. **(b)** Western blot of Tsc2 phosphorylation in WT naïve T cells after they were stimulated with anti-CD3-CD28 for short-term (left) or long-term (right) time points. Data are representative of 2-3 independent experiments.

**Supplementary Figure 15**




**Supplementary Figure 15. Effects of Tsc1 deficiency on CD8 T cell response and survival *in vivo* and differentiation *in vitro*. (a,b)** *Bcl2*-TG and *Tsc1*$^{-/-}$ *Bcl2*-TG mice were infected with LM-OVA. After 6-7 days, OVA-reactive tetramer-positive CD8 T cells were analyzed by flow cytometry **(a)**.* $P < 0.01$. Tetramer-positive CD8 T cells were purified, cultured in the medium overnight, and stained with 7-AAD to measure the extent of cell death **(b). (c)** Naïve CD8 T cells from *Bcl2*-TG and *Tsc1*$^{-/-}$ *Bcl2*-TG mice were stimulated with anti-CD3, anti-CD28 and IL-2 for 5 days, followed by brief PMA-ionomycin stimulation and analysis of cell size (left) and intracellular staining of IFN-γ (right). Data are representative of 2 (**a,b**) and 4 (**c**) independent experiments.

Table S1. 186 probe sets with ≥2-fold difference in both CD4 *Tsc1*$^{-/-}$ vs WT and CD8 *Tsc1*$^{-/-}$ vs WT naïve T cells

| HT_HG430_PM | Gene Symbol | CD4 WT 0h Average | CD4 KO 0h Average | CD8 WT 0h Average | CD8 KO 0h Average |
|---|---|---|---|---|---|
| 1419758_PM_at | Abcb1a | 4.41 | 8.49 | 6.30 | 8.99 |
| 1421920_PM_a_at | Ccr9 | 5.19 | 9.25 | 9.59 | 11.05 |
| 1427419_PM_x_at | Ccr9 | 6.66 | 10.65 | 10.77 | 11.82 |
| 1421919_PM_a_at | Ccr9 | 2.65 | 6.37 | 6.77 | 7.95 |
| 1419759_PM_at | Abcb1a | 4.66 | 8.33 | 6.27 | 8.91 |
| 1434428_PM_at | D330028D13Rik | 4.86 | 8.47 | 3.99 | 7.43 |
| 1457976_PM_at | 2010002M12Rik | 4.66 | 8.23 | 4.64 | 7.18 |
| 1421492_PM_at | Hpgds | 2.84 | 6.05 | 2.78 | 4.93 |
| 1434909_PM_at | Rragd | 3.97 | 6.85 | 3.87 | 6.66 |
| 1453748_PM_a_at | Kif23 | 3.40 | 6.23 | 5.50 | 6.95 |
| 1421396_PM_at | Pcsk1 | 2.71 | 5.46 | 3.16 | 5.77 |
| 1418722_PM_at | Ngp | 3.46 | 6.16 | 4.30 | 6.34 |
| 1419147_PM_at | Rec8 | 3.11 | 5.66 | 2.59 | 4.49 |
| 1437445_PM_at | Trpm1 | 3.67 | 6.13 | 6.12 | 9.29 |
| 1449310_PM_at | Ptger2 | 3.53 | 5.97 | 3.53 | 4.97 |
| 1430735_PM_at | Patl2 | 3.66 | 6.07 | 3.90 | 6.56 |
| 1435313_PM_at | Cd200r4 | 4.92 | 7.31 | 5.37 | 7.08 |
| 1420805_PM_at | Myl10 | 4.50 | 6.84 | 3.69 | 7.67 |
| 1425385_PM_a_at | Igh | 2.67 | 5.01 | 3.04 | 5.71 |
| 1417094_PM_at | Acot7 | 5.19 | 7.52 | 5.44 | 7.99 |
| 1419598_PM_at | Ms4a6d | 3.64 | 5.91 | 4.62 | 6.15 |
| 1419599_PM_s_at | Ms4a6d | 4.99 | 7.24 | 6.18 | 7.80 |
| 1430210_PM_at | C330024D12Rik | 4.93 | 7.14 | 5.05 | 7.61 |
| 1440666_PM_at | 4933430I17Rik | 2.17 | 4.32 | 2.20 | 3.83 |
| 1438311_PM_at | 2010002M12Rik | 2.79 | 4.90 | 2.66 | 4.27 |
| 1418025_PM_at | Bhlhe40 | 4.47 | 6.57 | 4.67 | 6.91 |
| 1439831_PM_at | --- | 3.44 | 5.53 | 3.19 | 4.60 |
| 1451335_PM_at | Plac8 | 6.96 | 9.03 | 10.54 | 11.60 |
| 1455990_PM_at | Kif23 | 6.69 | 8.75 | 8.27 | 9.48 |
| 1420375_PM_at | Kif3a | 4.54 | 6.57 | 3.68 | 5.38 |
| 1424305_PM_at | Igj | 6.13 | 8.04 | 6.07 | 7.83 |
| 1434313_PM_at | Ccdc126 | 6.44 | 8.32 | 6.11 | 7.98 |
| 1419691_PM_at | Camp | 3.42 | 5.29 | 3.30 | 5.20 |
| 1452954_PM_at | Ube2c | 3.58 | 5.45 | 3.11 | 5.53 |
| 1448944_PM_at | Nrp1 | 4.62 | 6.47 | 3.96 | 6.19 |
| 1429524_PM_at | Myo1f | 3.36 | 5.18 | 6.95 | 8.00 |
| 1424400_PM_a_at | Aldh1l1 /// LOC100047937 | 3.19 | 4.99 | 2.72 | 4.79 |
| 1434437_PM_x_at | Rrm2 | 4.86 | 6.61 | 4.87 | 7.22 |
| 1448756_PM_at | S100a9 | 5.95 | 7.70 | 6.28 | 7.98 |
| 1420505_PM_a_at | Stxbp1 | 3.66 | 5.41 | 3.91 | 5.08 |
| 1452202_PM_at | Pde2a | 7.68 | 9.42 | 8.89 | 10.11 |
| 1444040_PM_at | Lair1 | 4.49 | 6.22 | 4.27 | 6.50 |
| 1416802_PM_a_at | Cdca5 | 3.39 | 5.12 | 3.75 | 5.88 |
| 1426817_PM_at | Mki67 | 3.99 | 5.71 | 3.74 | 6.78 |
| 1422734_PM_a_at | Myb | 5.92 | 7.64 | 5.68 | 7.16 |
| 1448226_PM_at | Rrm2 | 3.62 | 5.33 | 3.63 | 5.99 |
| 1450920_PM_at | Ccnb2 | 3.15 | 4.85 | 3.26 | 5.34 |

| | | | | | |
|---|---|---|---|---|---|
| 1430447_PM_a_at | Lair1 | 4.81 | 6.49 | 4.76 | 6.68 |
| 1419394_PM_s_at | S100a8 | 5.56 | 7.23 | 5.76 | 7.68 |
| 1421317_PM_x_at | Myb | 7.87 | 9.54 | 7.61 | 9.32 |
| 1450194_PM_a_at | Myb | 7.38 | 9.03 | 7.11 | 8.89 |
| 1424278_PM_a_at | Birc5 | 3.34 | 4.98 | 3.43 | 5.88 |
| 1452242_PM_at | Cep55 | 2.86 | 4.50 | 2.79 | 4.58 |
| 1449841_PM_at | Kif3a | 4.67 | 6.31 | 3.39 | 5.47 |
| 1437602_PM_at | Fam71b | 3.30 | 4.93 | 5.22 | 6.34 |
| 1455790_PM_at | E2f2 | 5.93 | 7.55 | 4.91 | 7.26 |
| 1440627_PM_at | Atp8a2 | 3.37 | 4.97 | 3.39 | 5.82 |
| 1448943_PM_at | Nrp1 | 5.36 | 6.96 | 4.28 | 6.27 |
| 1455442_PM_at | Slc6a19 | 2.78 | 4.36 | 7.68 | 8.83 |
| 1449084_PM_s_at | Sh3d19 | 4.47 | 6.05 | 3.61 | 5.01 |
| 1416343_PM_a_at | Lamp2 | 5.12 | 6.69 | 5.15 | 6.82 |
| 1436574_PM_at | 1700029I01Rik | 5.47 | 7.03 | 6.05 | 7.52 |
| 1436434_PM_at | E2f2 | 6.05 | 7.60 | 5.15 | 7.57 |
| 1455049_PM_at | Igsf3 | 3.46 | 5.00 | 3.99 | 5.47 |
| 1436847_PM_s_at | Cdca8 | 4.36 | 5.90 | 4.63 | 6.35 |
| 1426565_PM_at | Igf1r | 5.06 | 6.60 | 4.87 | 6.98 |
| 1425702_PM_a_at | Enpp5 | 3.87 | 5.41 | 3.54 | 4.88 |
| 1435680_PM_a_at | Dpp7 | 3.42 | 4.94 | 3.63 | 5.07 |
| 1421375_PM_a_at | S100a6 | 5.08 | 6.59 | 4.84 | 6.56 |
| 1424354_PM_at | Tmem140 | 4.09 | 5.60 | 4.62 | 5.71 |
| 1451461_PM_a_at | Aldoc | 4.17 | 5.67 | 3.77 | 5.03 |
| 1418084_PM_at | Nrp1 | 4.66 | 6.15 | 3.71 | 5.83 |
| 1421014_PM_a_at | Clybl | 6.41 | 7.89 | 6.59 | 7.68 |
| 1415810_PM_at | Uhrf1 | 3.89 | 5.36 | 5.00 | 6.70 |
| 1454694_PM_a_at | Top2a | 4.61 | 6.08 | 4.47 | 6.41 |
| 1441623_PM_at | --- | 2.73 | 4.19 | 2.91 | 4.46 |
| 1457117_PM_at | Nfe2l2 | 5.91 | 7.36 | 5.76 | 7.29 |
| 1425763_PM_x_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 7.23 | 8.66 | 7.41 | 8.53 |
| 1450646_PM_at | Cyp51 | 5.77 | 7.20 | 5.22 | 6.71 |
| 1456328_PM_at | Bank1 | 5.57 | 6.99 | 5.66 | 6.71 |
| 1429381_PM_x_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 6.71 | 8.13 | 6.85 | 8.02 |
| 1421653_PM_a_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 8.15 | 9.56 | 8.26 | 9.39 |
| 1416957_PM_at | Pou2af1 | 6.03 | 7.44 | 6.37 | 7.63 |
| 1459643_PM_at | --- | 2.81 | 4.21 | 2.96 | 4.86 |
| 1436545_PM_at | Dtx4 | 5.18 | 6.57 | 5.78 | 7.27 |
| 1439255_PM_s_at | Gpr137b /// Gpr137b-ps /// LOC100044979 | 4.95 | 6.34 | 4.08 | 6.08 |
| 1417910_PM_at | Ccna2 | 3.71 | 5.09 | 3.59 | 5.79 |
| 1422567_PM_at | Fam129a | 4.34 | 5.69 | 4.80 | 6.00 |
| 1443884_PM_at | Thada | 7.12 | 8.47 | 7.11 | 8.59 |
| 1430985_PM_at | 1810027O10Rik | 7.30 | 8.64 | 7.72 | 9.36 |
| 1416441_PM_at | Pgcp | 3.06 | 4.40 | 3.24 | 4.43 |
| 1428562_PM_at | 2210403K04Rik | 3.74 | 5.07 | 3.65 | 4.83 |
| 1417300_PM_at | Smpdl3b | 2.96 | 4.29 | 3.17 | 4.81 |
| 1455048_PM_at | Igsf3 | 3.83 | 5.14 | 4.08 | 5.74 |
| 1457120_PM_at | Itk | 5.63 | 6.93 | 5.72 | 7.24 |
| 1427455_PM_x_at | Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 8.73 | 10.02 | 8.36 | 10.15 |
| 1450009_PM_at | Ltf | 3.31 | 4.59 | 3.63 | 4.78 |
| 1417457_PM_at | Cks2 | 6.64 | 7.92 | 7.76 | 8.81 |

| | | | | | |
|---|---|---|---|---|---|
| 1416046_PM_a_at | Fuca2 | 5.94 | 7.22 | 6.38 | 7.67 |
| 1449925_PM_at | Cxcr3 | 4.80 | 6.07 | 6.82 | 8.48 |
| 1448613_PM_at | Ecm1 | 6.73 | 8.00 | 5.07 | 6.29 |
| 1439259_PM_x_at | Abhd4 | 4.94 | 6.20 | 5.07 | 6.21 |
| 1455692_PM_x_at | 1700097N02Rik | 6.86 | 8.11 | 7.03 | 8.21 |
| 1424784_PM_at | OTTMUSG00000010657 | 3.93 | 5.18 | 4.29 | 5.57 |
| 1425738_PM_at | LOC100047222 /// LOC676193 | 3.53 | 4.78 | 3.30 | 4.99 |
| 1424631_PM_a_at | Ighg | 2.96 | 4.19 | 2.19 | 5.62 |
| 1421963_PM_a_at | Cdc25b | 7.02 | 8.24 | 7.40 | 8.54 |
| 1436479_PM_a_at | Dpp7 | 4.93 | 6.14 | 4.48 | 6.34 |
| 1460423_PM_x_at | Igk-V1 | 4.58 | 5.79 | 3.94 | 5.30 |
| 1417911_PM_at | Ccna2 | 3.85 | 5.04 | 3.57 | 5.33 |
| 1416344_PM_at | Lamp2 | 6.83 | 8.02 | 6.83 | 8.39 |
| 1439067_PM_at | Lair1 | 4.49 | 5.66 | 3.82 | 6.31 |
| 1448314_PM_at | Cdc2a | 3.49 | 4.67 | 3.36 | 5.06 |
| 1457915_PM_at | 4833442J19Rik | 4.04 | 5.21 | 3.80 | 4.89 |
| 1435306_PM_a_at | Kif11 | 2.83 | 4.00 | 2.63 | 4.53 |
| 1433942_PM_at | Myo6 | 7.06 | 8.23 | 3.59 | 4.67 |
| 1417898_PM_a_at | Gzma | 5.01 | 6.18 | 4.85 | 6.15 |
| 1428094_PM_at | Lamp2 | 7.23 | 8.40 | 6.98 | 8.49 |
| 1446303_PM_at | Igf1r | 3.70 | 4.86 | 3.81 | 4.98 |
| 1452583_PM_s_at | Galm | 5.74 | 6.90 | 5.67 | 6.70 |
| 1428283_PM_at | Cyp2s1 | 6.11 | 7.26 | 5.12 | 7.55 |
| 1428967_PM_at | Igf1r | 6.92 | 8.07 | 6.78 | 8.25 |
| 1417185_PM_at | Ly6a | 10.86 | 12.00 | 9.27 | 11.26 |
| 1419402_PM_at | Mns1 | 5.51 | 6.65 | 6.15 | 7.20 |
| 1429525_PM_s_at | Myo1f | 4.05 | 5.19 | 6.65 | 7.88 |
| 1455711_PM_at | Dtx4 | 3.21 | 4.35 | 3.82 | 5.03 |
| 1417976_PM_at | Ada | 5.91 | 7.04 | 6.26 | 7.31 |
| 1434503_PM_s_at | Lamp2 | 8.21 | 9.34 | 7.98 | 9.37 |
| 1436419_PM_a_at | 1700097N02Rik | 7.18 | 8.31 | 7.40 | 8.67 |
| 1419153_PM_at | 2810417H13Rik | 6.14 | 7.24 | 5.84 | 7.90 |
| 1457825_PM_x_at | Tcn2 | 4.95 | 6.05 | 4.90 | 6.26 |
| 1448143_PM_at | Aldh2 | 6.79 | 7.88 | 4.33 | 5.66 |
| 1452463_PM_x_at | Gm10883 | 8.42 | 9.50 | 8.08 | 9.51 |
| 1442183_PM_at | Gm13238 | 5.43 | 6.50 | 5.57 | 6.72 |
| 1417783_PM_at | Als2 | 5.37 | 6.44 | 5.37 | 7.20 |
| 1420394_PM_s_at | Gp49a /// Lilrb4 | 4.80 | 5.87 | 5.09 | 6.86 |
| 1427660_PM_x_at | Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 9.86 | 10.93 | 9.52 | 11.03 |
| 1439256_PM_x_at | Gpr137b-ps | 4.76 | 5.81 | 4.60 | 5.82 |
| 1448646_PM_at | Wdr12 | 7.59 | 8.63 | 7.29 | 8.31 |
| 1455065_PM_x_at | Gnpda1 | 7.73 | 8.77 | 7.44 | 8.64 |
| 1456225_PM_x_at | Trib3 | 5.43 | 6.45 | 4.64 | 5.96 |
| 1452982_PM_at | Igf1r | 6.73 | 7.75 | 6.45 | 8.20 |
| 1424118_PM_a_at | Spc25 | 3.47 | 4.48 | 3.46 | 5.11 |
| 1449048_PM_s_at | Rab4a | 3.29 | 4.30 | 3.52 | 4.76 |
| 1439293_PM_at | BC031353 | 6.78 | 7.78 | 6.77 | 7.96 |
| 1450881_PM_s_at | Gpr137b | 4.61 | 5.61 | 4.03 | 5.33 |
| 1452417_PM_x_at | 2010205A11Rik /// Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 9.71 | 10.71 | 9.36 | 10.86 |
| 1435545_PM_at | BC032203 | 7.59 | 6.59 | 6.91 | 5.49 |
| 1418989_PM_at | Ctse | 7.93 | 6.92 | 6.93 | 5.90 |

| | | | | | |
|---|---|---|---|---|---|
| 1427442_PM_a_at | App | 8.13 | 7.10 | 7.62 | 6.59 |
| 1448297_PM_a_at | Tnk2 | 7.97 | 6.93 | 7.93 | 6.77 |
| 1444005_PM_at | --- | 4.64 | 3.58 | 4.51 | 3.41 |
| 1459595_PM_at | --- | 5.84 | 4.72 | 5.53 | 3.92 |
| 1448298_PM_at | Tnk2 | 5.25 | 4.12 | 5.11 | 3.98 |
| 1433977_PM_at | Hs3st3b1 | 7.07 | 5.92 | 6.00 | 4.82 |
| 1423059_PM_at | Ptk2 | 4.86 | 3.69 | 4.10 | 2.92 |
| 1434473_PM_at | Slc16a5 | 7.80 | 6.62 | 7.91 | 6.70 |
| 1437303_PM_at | Il6st | 9.06 | 7.88 | 9.04 | 7.24 |
| 1425245_PM_a_at | Rgs11 | 5.30 | 4.08 | 5.54 | 4.18 |
| 1418210_PM_at | Pfn2 | 5.10 | 3.84 | 4.25 | 3.16 |
| 1423415_PM_at | Gpr83 | 5.52 | 4.24 | 4.28 | 3.25 |
| 1428122_PM_s_at | Fam125b | 6.44 | 5.14 | 6.34 | 4.46 |
| 1437868_PM_at | Fam46a | 7.86 | 6.54 | 8.52 | 7.52 |
| 1437064_PM_at | Ar | 5.42 | 4.09 | 5.57 | 4.16 |
| 1424455_PM_at | Gprasp1 | 7.80 | 6.46 | 7.18 | 6.05 |
| 1448485_PM_at | Ggt1 | 5.16 | 3.81 | 8.03 | 6.36 |
| 1418216_PM_at | Ggt5 | 6.60 | 5.21 | 5.59 | 4.39 |
| 1434601_PM_at | Amigo2 | 6.28 | 4.86 | 5.29 | 4.26 |
| 1421991_PM_a_at | Igfbp4 | 5.59 | 4.17 | 5.16 | 3.29 |
| 1456751_PM_x_at | A530021J07Rik | 5.68 | 4.25 | 3.78 | 2.09 |
| 1436585_PM_at | BB182297 | 5.88 | 4.42 | 5.45 | 4.32 |
| 1455647_PM_at | Ar | 5.59 | 4.10 | 5.70 | 4.53 |
| 1452714_PM_at | Tanc1 | 6.60 | 5.00 | 7.09 | 5.79 |
| 1421840_PM_at | Abca1 | 7.35 | 5.74 | 7.87 | 5.89 |
| 1455747_PM_at | Ggt5 | 6.12 | 4.32 | 4.87 | 3.69 |
| 1445450_PM_x_at | A530021J07Rik | 6.04 | 4.10 | 4.45 | 2.15 |
| 1456878_PM_at | AI646023 | 4.21 | 2.23 | 5.81 | 3.32 |
| 1437406_PM_x_at | Igfbp4 | 9.82 | 7.78 | 9.05 | 5.71 |
| 1458977_PM_at | A530021J07Rik | 6.15 | 3.95 | 3.80 | 2.21 |
| 1423757_PM_x_at | Igfbp4 | 10.28 | 8.05 | 9.45 | 5.67 |
| 1437405_PM_a_at | Igfbp4 | 11.60 | 9.37 | 10.72 | 6.23 |
| 1421992_PM_a_at | Igfbp4 | 8.88 | 6.53 | 7.94 | 4.82 |
| 1427127_PM_x_at | Hspa1b | 8.42 | 6.03 | 7.90 | 4.51 |
| 1423756_PM_s_at | Igfbp4 | 10.70 | 8.19 | 9.74 | 4.91 |
| 1452318_PM_a_at | Hspa1b | 9.11 | 6.57 | 8.71 | 5.43 |
| 1427126_PM_at | Hspa1b | 8.25 | 5.68 | 7.58 | 4.40 |

Table S2. 342 probe sets with ≥2-fold difference in CD4 *Tsc1* $^{-/-}$ vs WT cells after 4 h TCR stimulation (FDR<0.1)

| HT_HG430_PM | Gene Symbol | CD4 WT 0h Average | CD4 KO 0h Average | CD4 WT 4h Average | CD4 KO 4h Average |
|---|---|---|---|---|---|
| 1419758_PM_at | Abcb1a | 4.41 | 8.49 | 4.36 | 8.32 |
| 1419759_PM_at | Abcb1a | 4.66 | 8.33 | 4.39 | 8.08 |
| 1439831_PM_at | --- | 3.44 | 5.53 | 5.93 | 9.15 |
| 1419394_PM_s_at | S100a8 | 5.56 | 7.23 | 4.55 | 7.67 |
| 1418722_PM_at | Ngp | 3.46 | 6.16 | 3.34 | 6.35 |
| 1434909_PM_at | Rragd | 3.97 | 6.85 | 3.76 | 6.77 |
| 1448756_PM_at | S100a9 | 5.95 | 7.70 | 5.06 | 7.98 |
| 1447285_PM_at | --- | 4.01 | 5.09 | 6.94 | 9.80 |
| 1419691_PM_at | Camp | 3.42 | 5.29 | 3.02 | 5.52 |
| 1420505_PM_a_at | Stxbp1 | 3.66 | 5.41 | 4.12 | 6.46 |
| 1417094_PM_at | Acot7 | 5.19 | 7.52 | 4.86 | 7.16 |
| 1451335_PM_at | Plac8 | 6.96 | 9.03 | 5.47 | 7.75 |
| 1421396_PM_at | Pcsk1 | 2.71 | 5.46 | 2.78 | 5.02 |
| 1426817_PM_at | Mki67 | 3.99 | 5.71 | 3.36 | 5.58 |
| 1444588_PM_at | --- | 2.49 | 3.07 | 3.18 | 5.33 |
| 1449310_PM_at | Ptger2 | 3.53 | 5.97 | 4.66 | 6.80 |
| 1435172_PM_at | Eomes | 5.64 | 6.89 | 4.88 | 6.95 |
| 1427419_PM_x_at | Ccr9 | 6.66 | 10.65 | 3.83 | 5.87 |
| 1450070_PM_s_at | Pak1 | 5.25 | 5.25 | 5.15 | 7.17 |
| 1422804_PM_at | Serpinb6b | 5.58 | 6.67 | 5.25 | 7.26 |
| 1452954_PM_at | Ube2c | 3.58 | 5.45 | 2.80 | 4.80 |
| 1444103_PM_at | Epsti1 | 5.35 | 6.07 | 3.64 | 5.58 |
| 1457976_PM_at | 2010002M12Rik | 4.66 | 8.23 | 4.52 | 6.44 |
| 1427455_PM_x_at | Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 8.73 | 10.02 | 8.07 | 9.99 |
| 1425763_PM_x_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 7.23 | 8.66 | 6.60 | 8.51 |
| 1435313_PM_at | Cd200r4 | 4.92 | 7.31 | 3.08 | 4.95 |
| 1429381_PM_x_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 6.71 | 8.13 | 6.09 | 7.96 |
| 1424305_PM_at | Igj | 6.13 | 8.04 | 6.17 | 8.04 |
| 1416592_PM_at | Glrx | 7.23 | 8.33 | 5.39 | 7.25 |
| 1437502_PM_x_at | Cd24a | 4.23 | 4.87 | 4.90 | 6.75 |
| 1426001_PM_at | Eomes | 5.67 | 6.84 | 5.21 | 7.06 |
| 1421653_PM_a_at | Igh /// Igh-2 /// Igh-VJ558 /// LOC544903 | 8.15 | 9.56 | 7.38 | 9.21 |
| 1418248_PM_at | Gla | 3.90 | 4.72 | 3.31 | 5.13 |
| 1425947_PM_at | Ifng | 2.77 | 3.28 | 4.68 | 6.50 |
| 1432282_PM_a_at | Tlcd2 | 3.15 | 3.46 | 3.40 | 5.21 |
| 1440387_PM_at | 6820431F20Rik | 3.41 | 4.09 | 4.13 | 5.92 |
| 1452417_PM_x_at | 2010205A11Rik /// Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 9.71 | 10.71 | 9.04 | 10.80 |
| 1435529_PM_at | Gm14446 | 10.52 | 11.70 | 9.64 | 11.39 |
| 1427660_PM_x_at | Gm10883 /// Gm1420 /// Gm7202 /// Igk /// Igk-C /// Igk-V28 /// LOC100047628 | 9.86 | 10.93 | 9.26 | 11.01 |
| 1424354_PM_at | Tmem140 | 4.09 | 5.60 | 5.23 | 6.96 |
| 1436996_PM_x_at | Lyz1 | 7.14 | 7.83 | 4.81 | 6.53 |
| 1453851_PM_a_at | Gadd45g | 5.27 | 5.76 | 5.00 | 6.71 |

| | | | | | |
|---|---|---|---|---|---|
| 1435245_PM_at | Gls2 | 2.49 | 2.55 | 2.92 | 4.63 |
| 1452087_PM_at | Epsti1 | 10.00 | 11.03 | 7.18 | 8.87 |
| 1418191_PM_at | LOC100048346 /// Usp18 | 8.26 | 7.99 | 7.24 | 8.92 |
| 1421375_PM_a_at | S100a6 | 5.08 | 6.59 | 3.61 | 5.29 |
| 1416034_PM_at | Cd24a | 4.07 | 4.24 | 4.26 | 5.94 |
| 1417898_PM_a_at | Gzma | 5.01 | 6.18 | 3.25 | 4.92 |
| 1423547_PM_at | Lyz2 | 6.46 | 6.91 | 3.60 | 5.26 |
| 1455692_PM_x_at | 1700097N02Rik | 6.86 | 8.11 | 3.67 | 5.32 |
| 1425546_PM_a_at | Trf | 4.11 | 4.16 | 3.14 | 4.79 |
| 1449025_PM_at | Ifit3 | 8.38 | 8.13 | 7.58 | 9.21 |
| 1420979_PM_at | Pak1 | 4.21 | 4.04 | 3.64 | 5.27 |
| 1457780_PM_at | Stx11 | 2.80 | 3.50 | 5.28 | 6.90 |
| 1421571_PM_a_at | LOC100045833 /// Ly6c1 /// Ly6c2 | 10.91 | 12.16 | 9.62 | 11.24 |
| 1422734_PM_a_at | Myb | 5.92 | 7.64 | 7.15 | 8.77 |
| 1426208_PM_x_at | Plagl1 | 3.08 | 2.98 | 6.87 | 8.48 |
| 1418025_PM_at | Bhlhe40 | 4.47 | 6.57 | 6.19 | 7.80 |
| 1419647_PM_a_at | Ier3 | 3.14 | 3.10 | 4.30 | 5.90 |
| 1452463_PM_x_at | Gm10883 | 8.42 | 9.50 | 7.90 | 9.49 |
| 1439255_PM_s_at | Gpr137b /// Gpr137b-ps /// LOC100044979 | 4.95 | 6.34 | 4.28 | 5.87 |
| 1438311_PM_at | 2010002M12Rik | 2.79 | 4.90 | 2.72 | 4.30 |
| 1434437_PM_x_at | Rrm2 | 4.86 | 6.61 | 4.81 | 6.38 |
| 1454942_PM_at | Fam129a | 5.18 | 5.99 | 4.86 | 6.43 |
| 1416593_PM_at | Glrx | 6.28 | 7.45 | 4.26 | 5.82 |
| 1449864_PM_at | Il4 | 2.28 | 2.30 | 3.08 | 4.64 |
| 1434830_PM_at | Mxd1 | 5.72 | 5.92 | 7.15 | 8.68 |
| 1448226_PM_at | Rrm2 | 3.62 | 5.33 | 3.48 | 5.01 |
| 1422567_PM_at | Fam129a | 4.34 | 5.69 | 4.51 | 6.03 |
| 1428660_PM_s_at | LOC100047963 /// Tor3a | 5.00 | 5.44 | 4.46 | 5.98 |
| 1416046_PM_a_at | Fuca2 | 5.94 | 7.22 | 3.65 | 5.16 |
| 1449773_PM_s_at | Gadd45b | 6.04 | 6.17 | 8.79 | 10.31 |
| 1452426_PM_x_at | --- | 6.07 | 6.95 | 5.17 | 6.66 |
| 1415810_PM_at | Uhrf1 | 3.89 | 5.36 | 4.13 | 5.63 |
| 1424923_PM_at | Serpina3g | 3.83 | 4.92 | 3.98 | 5.47 |
| 1417910_PM_at | Ccna2 | 3.71 | 5.09 | 3.39 | 4.88 |
| 1455768_PM_at | Npc2 | 7.00 | 7.77 | 6.60 | 8.09 |
| 1419985_PM_s_at | Ccdc69 | 8.37 | 8.51 | 3.48 | 4.95 |
| 1424278_PM_a_at | Birc5 | 3.34 | 4.98 | 3.14 | 4.61 |
| 1448182_PM_a_at | Cd24a | 5.96 | 6.38 | 6.54 | 8.01 |
| 1450971_PM_at | Gadd45b | 7.06 | 7.10 | 9.59 | 11.06 |
| 1438169_PM_a_at | Frmd4b | 3.84 | 4.73 | 4.94 | 6.41 |
| 1418872_PM_at | Abcb1b | 5.58 | 6.87 | 5.87 | 7.33 |
| 1416503_PM_at | Lxn | 5.62 | 6.53 | 5.74 | 7.19 |
| 1454694_PM_a_at | Top2a | 4.61 | 6.08 | 4.66 | 6.11 |
| 1429488_PM_at | Zdhhc21 | 6.98 | 7.14 | 5.68 | 7.13 |
| 1420394_PM_s_at | Gp49a /// Lilrb4 | 4.80 | 5.87 | 5.79 | 7.23 |
| 1424638_PM_at | Cdkn1a | 3.83 | 3.91 | 4.98 | 6.42 |
| 1436574_PM_at | 1700029I01Rik | 5.47 | 7.03 | 4.16 | 5.60 |

| | | | | | |
|---|---|---|---|---|---|
| 1424067_PM_at | Icam1 | 6.65 | 7.43 | 8.67 | 10.11 |
| 1416802_PM_a_at | Cdca5 | 3.39 | 5.12 | 3.82 | 5.25 |
| 1419599_PM_s_at | Ms4a6d | 4.99 | 7.24 | 3.88 | 5.31 |
| 1422527_PM_at | H2-DMa | 7.85 | 8.96 | 6.90 | 8.33 |
| 1418930_PM_at | Cxcl10 | 3.43 | 3.15 | 8.17 | 9.59 |
| 1455104_PM_at | Mxd1 | 4.86 | 5.38 | 6.05 | 7.47 |
| 1436479_PM_a_at | Dpp7 | 4.93 | 6.14 | 3.35 | 4.76 |
| 1449874_PM_at | Ly96 | 2.95 | 4.57 | 2.92 | 4.31 |
| 1436576_PM_at | Fam26f | 8.16 | 9.33 | 7.90 | 9.29 |
| 1421998_PM_at | Tor3a | 4.72 | 5.13 | 4.59 | 5.97 |
| 1426179_PM_a_at | Twsg1 | 2.95 | 3.17 | 3.56 | 4.93 |
| 1418649_PM_at | Egln3 | 3.38 | 3.72 | 3.22 | 4.59 |
| 1421317_PM_x_at | Myb | 7.87 | 9.54 | 9.20 | 10.57 |
| 1438009_PM_at | Hist1h2ad | 9.58 | 10.33 | 8.33 | 9.69 |
| 1421679_PM_a_at | Cdkn1a | 3.44 | 3.80 | 4.82 | 6.19 |
| 1460314_PM_s_at | Hist1h3a /// Hist1h3b /// Hist1h3c /// Hist1h3d /// Hist1h3e /// Hist1h3f /// Hist1h3g /// Hist1h3h /// Hist1h3i /// Hist2h3b /// Hist2h3c1 /// Hist2h3c2 | 6.59 | 6.54 | 5.13 | 6.49 |
| 1450194_PM_a_at | Myb | 7.38 | 9.03 | 8.70 | 10.06 |
| 1422601_PM_at | Serpinb9 | 6.08 | 6.57 | 5.50 | 6.85 |
| 1453228_PM_at | Stx11 | 3.99 | 4.77 | 5.81 | 7.16 |
| 1419821_PM_s_at | Idh1 | 4.49 | 5.28 | 4.43 | 5.77 |
| 1454953_PM_at | Rnf157 | 3.73 | 4.45 | 5.24 | 6.58 |
| 1429400_PM_at | Clcn5 | 5.03 | 5.47 | 5.03 | 6.37 |
| 1455899_PM_x_at | Socs3 | 10.25 | 10.65 | 8.96 | 10.29 |
| 1448656_PM_at | Cacnb3 | 3.88 | 4.73 | 4.21 | 5.54 |
| 1423393_PM_at | Clic4 | 8.16 | 8.66 | 8.96 | 10.29 |
| 1454169_PM_a_at | Epsti1 | 8.74 | 9.97 | 6.42 | 7.75 |
| 1442183_PM_at | Gm13238 | 5.43 | 6.50 | 4.20 | 5.53 |
| 1449925_PM_at | Cxcr3 | 4.80 | 6.07 | 4.28 | 5.60 |
| 1440400_PM_at | Rnf157 | 3.27 | 4.28 | 5.93 | 7.23 |
| 1450291_PM_s_at | Ms4a4c | 8.13 | 10.00 | 7.21 | 8.51 |
| 1448314_PM_at | Cdc2a | 3.49 | 4.67 | 3.27 | 4.56 |
| 1417976_PM_at | Ada | 5.91 | 7.04 | 6.03 | 7.32 |
| 1416910_PM_at | Dnajc15 | 9.17 | 10.50 | 8.26 | 9.54 |
| 1417909_PM_at | Serpinc1 | 3.09 | 3.24 | 4.45 | 5.74 |
| 1438606_PM_a_at | Clic4 | 7.87 | 8.42 | 8.68 | 9.97 |
| 1416309_PM_at | Nusap1 | 3.46 | 4.38 | 3.33 | 4.62 |
| 1417601_PM_at | Rgs1 | 7.61 | 8.22 | 8.61 | 9.89 |
| 1434372_PM_at | AW112010 | 10.74 | 11.81 | 9.99 | 11.27 |
| 1422948_PM_s_at | Hist1h4a /// Hist1h4b /// Hist1h4c /// Hist1h4h /// Hist1h4i /// Hist1h4j /// Hist1h4k /// Hist1h4m /// LOC100041230 | 8.11 | 8.26 | 7.40 | 8.68 |
| 1450886_PM_at | Gsg2 | 5.26 | 5.71 | 5.10 | 6.38 |
| 1416832_PM_at | Slc39a8 | 4.84 | 5.46 | 4.57 | 5.85 |
| 1422979_PM_at | Suv39h2 | 2.51 | 2.61 | 3.09 | 4.36 |
| 1429049_PM_at | Nuak2 | 5.51 | 6.16 | 5.57 | 6.83 |
| 1449852_PM_a_at | Ehd4 | 3.59 | 4.30 | 4.24 | 5.50 |
| 1456212_PM_x_at | Socs3 | 9.49 | 9.86 | 8.23 | 9.49 |
| 1455106_PM_a_at | Ckb | 5.97 | 6.67 | 4.56 | 5.81 |
| 1417457_PM_at | Cks2 | 6.64 | 7.92 | 9.17 | 10.43 |

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|---|---|---|---|---|---|
| 1427429_PM_at | Csf2 | 2.54 | 2.75 | 2.80 | 4.05 |
| 1443207_PM_at | --- | 3.14 | 3.35 | 4.12 | 5.37 |
| 1434428_PM_at | D330028D13Rik | 4.86 | 8.47 | 4.89 | 6.14 |
| 1446670_PM_at | --- | 6.87 | 7.37 | 5.62 | 6.86 |
| 1424775_PM_at | Oas1a | 7.62 | 8.31 | 6.64 | 7.89 |
| 1416702_PM_at | Serpini1 | 6.11 | 6.89 | 5.55 | 6.80 |
| 1416576_PM_at | Socs3 | 7.89 | 8.30 | 6.67 | 7.92 |
| 1431776_PM_at | Tob2 | 3.79 | 3.54 | 3.90 | 5.14 |
| 1419147_PM_at | Rec8 | 3.11 | 5.66 | 2.81 | 4.04 |
| 1439680_PM_at | Tnfsf10 | 6.13 | 5.99 | 3.59 | 4.82 |
| 1455790_PM_at | E2f2 | 5.93 | 7.55 | 3.46 | 4.69 |
| 1436847_PM_s_at | Cdca8 | 4.36 | 5.90 | 5.65 | 6.88 |
| 1428306_PM_at | Ddit4 | 9.15 | 9.56 | 5.91 | 7.14 |
| 1436201_PM_x_at | Mbp | 2.52 | 3.12 | 4.34 | 5.57 |
| 1428468_PM_at | 3110043O21Rik | 5.42 | 5.00 | 6.07 | 7.27 |
| 1448148_PM_at | Grn | 5.19 | 6.17 | 4.36 | 5.56 |
| 1441242_PM_at | --- | 6.10 | 6.38 | 4.87 | 6.07 |
| 1448143_PM_at | Aldh2 | 6.79 | 7.88 | 5.87 | 7.06 |
| 1426774_PM_at | Parp12 | 6.51 | 6.82 | 6.56 | 7.75 |
| 1426073_PM_at | Twsg1 | 2.78 | 2.70 | 3.31 | 4.50 |
| 1418764_PM_a_at | Bpnt1 | 5.36 | 5.49 | 5.70 | 6.88 |
| 1429863_PM_at | Lonrf3 | 2.60 | 2.83 | 3.20 | 4.38 |
| 1449168_PM_a_at | Akap2 | 4.51 | 4.54 | 4.45 | 5.62 |
| 1427202_PM_at | 4833442J19Rik | 7.10 | 8.09 | 7.17 | 8.34 |
| 1456956_PM_at | Ikzf2 | 4.85 | 4.82 | 4.75 | 5.92 |
| 1419297_PM_at | H2-Oa | 5.65 | 6.53 | 3.55 | 4.72 |
| 1436026_PM_at | Zfp703 | 6.15 | 6.48 | 7.31 | 8.48 |
| 1421920_PM_a_at | Ccr9 | 5.19 | 9.25 | 3.34 | 4.50 |
| 1450476_PM_at | Cnr2 | 5.14 | 6.85 | 3.38 | 4.54 |
| 1418104_PM_at | Nrip3 | 2.38 | 2.47 | 3.16 | 4.32 |
| 1439790_PM_at | Serpinb9 | 3.92 | 4.21 | 3.45 | 4.61 |
| 1436297_PM_a_at | Grina | 7.91 | 8.60 | 6.63 | 7.78 |
| 1419598_PM_at | Ms4a6d | 3.64 | 5.91 | 2.83 | 3.98 |
| 1416957_PM_at | Pou2af1 | 6.03 | 7.44 | 5.70 | 6.85 |
| 1424339_PM_at | Oasl1 | 6.15 | 6.31 | 5.24 | 6.39 |
| 1423392_PM_at | Clic4 | 4.63 | 5.45 | 5.54 | 6.69 |
| 1417698_PM_at | Gtf2f1 | 7.97 | 8.74 | 7.84 | 8.99 |
| 1419042_PM_at | Iigp1 | 8.12 | 9.16 | 11.22 | 12.36 |
| 1415673_PM_at | Psph | 7.60 | 8.27 | 6.14 | 7.28 |
| 1456006_PM_at | Bcl2l11 | 6.27 | 6.62 | 7.75 | 8.88 |
| 1452837_PM_at | Lpin2 | 5.56 | 6.56 | 5.47 | 6.61 |
| 1448449_PM_at | Ripk3 | 6.69 | 7.70 | 6.83 | 7.96 |
| 1424140_PM_at | Gale | 4.56 | 5.53 | 4.88 | 6.01 |
| 1452123_PM_s_at | Frmd4b | 4.14 | 5.01 | 5.45 | 6.58 |
| 1448303_PM_at | Gpnmb | 3.72 | 5.11 | 3.73 | 4.85 |
| 1436419_PM_a_at | 1700097N02Rik | 7.18 | 8.31 | 4.23 | 5.36 |
| 1449363_PM_at | Atf3 | 3.58 | 3.50 | 4.90 | 6.02 |

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|---|---|---|---|---|---|
| 1440866_PM_at | Eif2ak2 | 5.41 | 5.41 | 5.36 | 6.48 |
| 1424118_PM_a_at | Spc25 | 3.47 | 4.48 | 3.74 | 4.86 |
| 1448944_PM_at | Nrp1 | 4.62 | 6.47 | 3.84 | 4.95 |
| 1425685_PM_at | Akr1b10 | 4.84 | 5.21 | 4.02 | 5.13 |
| 1426550_PM_at | Sidt1 | 8.09 | 8.69 | 6.31 | 7.42 |
| 1453003_PM_at | Sorl1 | 7.03 | 7.51 | 4.75 | 5.86 |
| 1429816_PM_at | Armc3 | 5.34 | 6.29 | 3.14 | 4.24 |
| 1455908_PM_a_at | Scpep1 | 5.08 | 5.95 | 4.61 | 5.71 |
| 1452836_PM_at | Lpin2 | 6.26 | 7.27 | 5.98 | 7.08 |
| 1431734_PM_a_at | Dnajb4 | 5.52 | 5.87 | 5.78 | 6.87 |
| 1420197_PM_at | Gadd45b | 2.81 | 2.87 | 3.80 | 4.89 |
| 1440047_PM_at | Socs1 | 6.37 | 6.15 | 7.79 | 8.88 |
| 1451310_PM_a_at | Ctsl | 6.57 | 7.92 | 7.64 | 8.73 |
| 1436545_PM_at | Dtx4 | 5.18 | 6.57 | 4.97 | 6.06 |
| 1457673_PM_at | 6820431F20Rik | 4.13 | 4.07 | 6.56 | 7.65 |
| 1439040_PM_at | Cenpe | 2.53 | 3.15 | 2.52 | 3.60 |
| 1456036_PM_x_at | Gsto1 | 6.37 | 6.66 | 5.76 | 6.84 |
| 1457445_PM_at | Trps1 | 6.00 | 5.81 | 6.02 | 7.10 |
| 1417654_PM_at | Sdc4 | 3.36 | 3.86 | 4.65 | 5.74 |
| 1437621_PM_x_at | Gm7669 /// Gm7901 /// Gm9347 /// Phgdh | 8.70 | 9.14 | 7.08 | 8.16 |
| 1418932_PM_at | LOC100046232 /// Nfil3 | 3.62 | 3.62 | 4.81 | 5.89 |
| 1420671_PM_x_at | Ms4a4c | 8.98 | 10.68 | 8.24 | 9.31 |
| 1452646_PM_at | Trp53inp2 | 3.34 | 4.08 | 5.45 | 6.52 |
| 1415822_PM_at | Scd2 | 8.19 | 9.17 | 5.60 | 6.66 |
| 1426258_PM_at | Sorl1 | 8.00 | 8.47 | 6.22 | 7.29 |
| 1426334_PM_a_at | Bcl2l11 | 2.62 | 3.05 | 4.36 | 5.42 |
| 1421688_PM_a_at | Ccl1 | 3.62 | 3.39 | 4.05 | 5.11 |
| 1423775_PM_s_at | Prc1 | 3.96 | 4.44 | 4.10 | 5.16 |
| 1418696_PM_at | Ttc36 | 2.98 | 3.05 | 3.81 | 4.87 |
| 1417911_PM_at | Ccna2 | 3.85 | 5.04 | 3.68 | 4.74 |
| 1448471_PM_a_at | Ctla2a | 6.13 | 6.18 | 6.72 | 7.78 |
| 1452352_PM_at | Ctla2b | 2.75 | 3.41 | 3.24 | 4.30 |
| 1429171_PM_a_at | Ncapg | 2.39 | 3.23 | 2.39 | 3.45 |
| 1460042_PM_at | Slc23a3 | 2.45 | 2.30 | 3.60 | 4.66 |
| 1454714_PM_x_at | Gm7669 /// Gm7901 /// Gm9347 /// Phgdh | 8.70 | 9.15 | 7.23 | 8.29 |
| 1449530_PM_at | Trps1 | 6.10 | 6.05 | 6.80 | 7.86 |
| 1456471_PM_x_at | EG627427 /// Gm13337 /// Gm5385 /// Gm7669 /// Gm7901 /// Gm8096 /// Gm8341 /// Gm9210 /// Gm9253 /// Gm9347 /// LOC630761 /// LOC630896 /// Phgdh | 7.39 | 7.83 | 5.95 | 7.00 |
| 1455990_PM_at | Kif23 | 6.69 | 8.75 | 5.12 | 6.18 |
| 1427364_PM_a_at | Odc1 | 4.80 | 5.00 | 7.41 | 8.46 |
| 1451828_PM_a_at | Acsl4 | 4.62 | 5.16 | 6.20 | 7.25 |
| 1436011_PM_at | Elmo2 | 4.60 | 4.66 | 5.59 | 6.64 |
| 1456228_PM_x_at | Mbp | 2.79 | 3.13 | 4.65 | 5.69 |
| 1448943_PM_at | Nrp1 | 5.36 | 6.96 | 4.34 | 5.38 |
| 1422814_PM_at | Aspm | 2.33 | 3.15 | 2.72 | 3.76 |
| 1418346_PM_at | Insl6 | 6.56 | 6.86 | 6.46 | 7.50 |
| 1451611_PM_at | Pla2g16 | 7.62 | 8.62 | 6.37 | 7.41 |
| 1435659_PM_a_at | Tpi1 | 6.79 | 7.16 | 5.47 | 6.51 |

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|---|---|---|---|---|---|
| 1426665_PM_at | Katnb1 | 5.78 | 6.41 | 4.98 | 6.02 |
| 1450626_PM_at | Manba | 6.93 | 7.66 | 5.51 | 6.55 |
| 1445597_PM_s_at | Pla2g16 | 8.84 | 9.67 | 7.58 | 8.62 |
| 1444152_PM_at | Cugbp2 | 7.06 | 7.40 | 5.67 | 6.71 |
| 1455065_PM_x_at | Gnpda1 | 7.73 | 8.77 | 6.62 | 7.66 |
| 1435517_PM_x_at | Ralb | 4.87 | 5.54 | 4.05 | 5.08 |
| 1451776_PM_s_at | Hopx | 6.40 | 6.79 | 5.03 | 6.06 |
| 1424724_PM_a_at | D16Ertd472e | 7.41 | 7.47 | 7.11 | 8.14 |
| 1416343_PM_a_at | Lamp2 | 5.12 | 6.69 | 7.19 | 8.22 |
| 1441164_PM_at | --- | 2.77 | 3.55 | 2.80 | 3.83 |
| 1457944_PM_at | --- | 6.46 | 6.61 | 7.05 | 8.08 |
| 1424050_PM_s_at | Fgfr1 | 3.89 | 4.19 | 3.42 | 4.45 |
| 1449109_PM_at | Socs2 | 3.98 | 4.21 | 4.27 | 5.29 |
| 1435028_PM_at | Wdr7 | 6.69 | 7.26 | 5.08 | 6.11 |
| 1423717_PM_at | Ak3 | 6.87 | 7.13 | 5.43 | 6.46 |
| 1417458_PM_s_at | Cks2 | 6.97 | 8.30 | 9.82 | 10.85 |
| 1416344_PM_at | Lamp2 | 6.83 | 8.02 | 8.72 | 9.75 |
| 1452540_PM_a_at | Hist1h2bc /// Hist1h2be /// Hist1h2bl /// Hist1h2bm /// Hist1h2bp /// LOC100046213 /// LOC665622 /// RP23-38E20.1 | 7.20 | 7.11 | 7.74 | 8.76 |
| 1420980_PM_at | Pak1 | 4.24 | 4.32 | 3.95 | 4.97 |
| 1450790_PM_at | Tg | 2.59 | 2.32 | 2.98 | 4.00 |
| 1417491_PM_at | Ctsb | 4.66 | 5.15 | 4.96 | 5.98 |
| 1420805_PM_at | Myl10 | 4.50 | 6.84 | 3.52 | 4.54 |
| 1434537_PM_at | Slco3a1 | 7.08 | 7.32 | 6.00 | 7.02 |
| 1425684_PM_at | Akr1b10 | 6.26 | 6.51 | 5.41 | 6.42 |
| 1428027_PM_at | --- | 2.71 | 2.75 | 5.99 | 7.00 |
| 1438910_PM_a_at | Stom | 3.79 | 3.87 | 3.83 | 4.84 |
| 1428562_PM_at | 2210403K04Rik | 3.74 | 5.07 | 7.00 | 8.01 |
| 1450272_PM_at | Tnfsf8 | 7.53 | 7.58 | 6.78 | 7.78 |
| 1452927_PM_x_at | Tpi1 | 7.53 | 7.86 | 6.28 | 7.29 |
| 1430985_PM_at | 1810027O10Rik | 7.30 | 8.64 | 6.22 | 7.23 |
| 1418084_PM_at | Nrp1 | 4.66 | 6.15 | 3.81 | 4.81 |
| 1421529_PM_a_at | Txnrd1 | 7.74 | 7.95 | 7.30 | 8.30 |
| 1416619_PM_at | 4632428N05Rik | 9.77 | 9.25 | 8.97 | 7.97 |
| 1441415_PM_at | --- | 6.34 | 6.03 | 7.28 | 6.28 |
| 1436735_PM_at | Nsun3 | 5.67 | 5.60 | 5.52 | 4.51 |
| 1434353_PM_at | Sfmbt2 | 7.15 | 6.03 | 5.00 | 4.00 |
| 1445103_PM_at | --- | 2.89 | 2.91 | 3.77 | 2.75 |
| 1425532_PM_a_at | Bin1 | 7.74 | 7.38 | 6.76 | 5.74 |
| 1428288_PM_at | Klf9 | 4.92 | 4.64 | 6.13 | 5.11 |
| 1423389_PM_at | Smad7 | 9.29 | 8.75 | 9.08 | 8.05 |
| 1444299_PM_at | A430093F15Rik | 7.92 | 8.05 | 7.15 | 6.11 |
| 1423161_PM_s_at | Spred1 | 3.04 | 2.72 | 4.29 | 3.26 |
| 1451899_PM_a_at | Gtf2ird1 | 6.43 | 5.23 | 6.34 | 5.30 |
| 1456851_PM_at | --- | 7.96 | 7.39 | 7.23 | 6.19 |
| 1448960_PM_at | Cxxc5 | 5.01 | 4.54 | 6.90 | 5.86 |
| 1417522_PM_at | Fbxo32 | 5.92 | 5.23 | 5.04 | 3.99 |
| 1455252_PM_at | Tsc1 | 7.43 | 6.62 | 7.55 | 6.49 |

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|---|---|---|---|---|---|
| 1420754_PM_at | Ttf1 | 7.44 | 6.50 | 7.29 | 6.24 |
| 1455220_PM_at | Frat2 | 8.48 | 7.65 | 8.57 | 7.51 |
| 1449520_PM_at | Ttc28 | 7.66 | 6.81 | 7.48 | 6.41 |
| 1428122_PM_s_at | Fam125b | 6.44 | 5.14 | 5.29 | 4.22 |
| 1439141_PM_at | Gpr18 | 9.36 | 8.39 | 9.40 | 8.33 |
| 1436892_PM_at | Spred2 | 5.76 | 5.24 | 7.12 | 6.04 |
| 1416107_PM_at | Nsg2 | 10.43 | 9.74 | 7.51 | 6.43 |
| 1451763_PM_at | Cnga1 | 5.98 | 5.46 | 4.56 | 3.47 |
| 1436329_PM_at | Egr3 | 7.90 | 7.66 | 9.68 | 8.59 |
| 1423059_PM_at | Ptk2 | 4.86 | 3.69 | 4.59 | 3.50 |
| 1429491_PM_s_at | Rif1 | 8.62 | 7.68 | 8.46 | 7.37 |
| 1440952_PM_at | --- | 8.49 | 7.80 | 7.59 | 6.48 |
| 1424838_PM_at | A330049M08Rik | 5.68 | 6.14 | 6.28 | 5.17 |
| 1434027_PM_at | Rcan3 | 7.41 | 7.45 | 8.40 | 7.28 |
| 1460242_PM_at | Cd55 | 7.94 | 7.97 | 6.79 | 5.67 |
| 1423162_PM_s_at | Spred1 | 3.99 | 3.09 | 5.53 | 4.41 |
| 1434581_PM_at | 2410066E13Rik | 6.54 | 5.71 | 6.00 | 4.88 |
| 1438823_PM_at | --- | 3.96 | 3.61 | 6.28 | 5.15 |
| 1437584_PM_at | --- | 10.04 | 9.59 | 9.47 | 8.34 |
| 1427766_PM_at | A130082M07Rik /// EG667677 /// ENSMUSG00000076783 /// ENSMUSG00000076785 /// Gm11046 /// LOC100044026 /// LOC677567 /// Tcra | 7.23 | 7.17 | 6.76 | 5.62 |
| 1435545_PM_at | BC032203 | 7.59 | 6.59 | 5.58 | 4.43 |
| 1426147_PM_s_at | Cldn10 | 5.23 | 4.93 | 4.85 | 3.70 |
| 1438712_PM_at | Dennd2d | 7.61 | 7.17 | 6.35 | 5.20 |
| 1443553_PM_at | --- | 3.75 | 3.47 | 5.75 | 4.57 |
| 1448328_PM_at | Sh3bp2 | 5.43 | 5.71 | 7.24 | 6.06 |
| 1434891_PM_at | Ptgfrn | 5.62 | 3.90 | 4.69 | 3.51 |
| 1460188_PM_at | Ptpn6 | 9.67 | 9.65 | 8.57 | 7.38 |
| 1450450_PM_at | Rcan3 | 5.87 | 6.00 | 6.75 | 5.56 |
| 1457549_PM_at | --- | 8.32 | 7.88 | 8.06 | 6.86 |
| 1460116_PM_s_at | Spred1 | 2.30 | 2.14 | 3.51 | 2.29 |
| 1436499_PM_at | Sgms1 | 8.87 | 8.76 | 8.13 | 6.90 |
| 1418762_PM_at | Cd55 | 8.21 | 7.96 | 7.75 | 6.52 |
| 1418836_PM_at | Qprt | 6.49 | 6.10 | 6.63 | 5.40 |
| 1424032_PM_at | Hvcn1 | 9.01 | 9.12 | 7.02 | 5.78 |
| 1438805_PM_at | Ccnd3 | 8.72 | 8.37 | 8.67 | 7.42 |
| 1421594_PM_a_at | Sytl2 | 6.87 | 6.07 | 5.34 | 4.09 |
| 1454967_PM_at | --- | 7.14 | 6.67 | 8.15 | 6.89 |
| 1426576_PM_at | Sgms1 | 7.12 | 6.88 | 6.41 | 5.14 |
| 1437390_PM_x_at | Stx1a | 7.77 | 6.86 | 8.18 | 6.91 |
| 1454745_PM_at | Arhgap29 | 7.10 | 6.59 | 6.93 | 5.66 |
| 1435265_PM_at | --- | 5.39 | 4.85 | 5.99 | 4.72 |
| 1446567_PM_at | --- | 7.91 | 7.36 | 7.48 | 6.20 |
| 1428682_PM_at | Zc3h6 | 6.77 | 6.31 | 5.55 | 4.25 |
| 1442437_PM_at | --- | 5.87 | 5.25 | 5.37 | 4.07 |
| 1423571_PM_at | S1pr1 | 10.22 | 9.83 | 10.09 | 8.79 |
| 1458802_PM_at | Hivep3 | 7.25 | 7.33 | 9.45 | 8.13 |
| 1418989_PM_at | Ctse | 7.93 | 6.92 | 6.47 | 5.14 |

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|---|---|---|---|---|---|
| 1423756_PM_s_at | Igfbp4 | 10.70 | 8.19 | 6.03 | 4.69 |
| 1448458_PM_at | Top2b | 5.12 | 4.92 | 5.31 | 3.97 |
| 1454646_PM_at | Tcp11l2 | 8.79 | 8.40 | 8.53 | 7.15 |
| 1441286_PM_at | Gm13948 | 5.77 | 5.86 | 5.46 | 4.06 |
| 1419136_PM_at | Akr1c18 | 3.24 | 2.83 | 4.33 | 2.92 |
| 1434403_PM_at | Spred2 | 7.35 | 6.71 | 8.58 | 7.11 |
| 1423689_PM_a_at | Gpsm1 | 4.17 | 2.58 | 5.10 | 3.63 |
| 1448747_PM_at | Fbxo32 | 8.05 | 7.26 | 7.67 | 6.18 |
| 1448576_PM_at | Il7r | 9.79 | 9.64 | 9.65 | 8.14 |
| 1451516_PM_at | Rhebl1 | 6.48 | 5.39 | 5.86 | 4.36 |
| 1436491_PM_at | Gm11346 | 9.57 | 9.11 | 8.17 | 6.67 |
| 1456509_PM_at | 1110032F04Rik | 4.81 | 3.79 | 4.65 | 3.11 |
| 1416630_PM_at | Id3 | 7.84 | 7.57 | 7.04 | 5.41 |
| 1421840_PM_at | Abca1 | 7.35 | 5.74 | 6.35 | 4.70 |
| 1448575_PM_at | Il7r | 11.65 | 11.47 | 11.51 | 9.86 |
| 1417930_PM_at | Nab2 | 6.77 | 6.58 | 7.34 | 5.69 |
| 1433977_PM_at | Hs3st3b1 | 7.07 | 5.92 | 6.94 | 5.19 |
| 1436585_PM_at | BB182297 | 5.88 | 4.42 | 6.34 | 4.37 |