Nhlh2+M0216 SCL(bHLH) Tal1 Figla+M0203 Hand2(bHLH) Ptf1a(bHLH) Tcf15+M4850 Twist(bHLH) Ap4(bHLH) MNT(bHLH) Mga+M5628 MIx+M0182 Mlxip+M0211 Max(bHLH) c-Myc(bHLH)/LNCAP-cMyc-ChIP-Seq(Unpublished)c-Myc(bHLH)/mES-cMyc-ChIP-Seq(GSE11431)n-Myc(bHLH) Srebf1+M0188 Srebf2+M0190 Srebp1a(bHLH) Srebp2(bHLH) MITF(bHLH) TFE3(bHLH) Tcfeb+M0193 Tcfec+M0201 USF1(bHLH) Usf2(bHLH) ERF1(AP2EREBP) Atf4(bZIP) BATF(bZIP) BATF3+M5302  $\mathsf{CEBP}(\mathsf{bZIP})$ Cebpa+M0304 Cebpb+M5995 Cebpd+M0274 Cebpe+M0310 Cebpg+M0313 Chop(bZIP) Dbp+M5999  $\mathsf{HLF}(\mathsf{bZIP})$ NFIL3(bZIP) Tef+M0293 Atf6+M2978 Creb3l2+M0305 Creb3l3+M5323 Atf1(bZIP) Creb1+M0297 Crem+M0319 Crebzf+M0307 Atf3(bZIP) Jdp2+M0302 Fos+M2278 Fosb+M6228 Fosl1+M0296 Fosl2(bZIP) Fra1(bZIP) Fra2(bZIP) Atf2(bZIP) Atf7(bZIP) AP-1(bZIP) Jun+M0311 JunB(bZIP) JunD(bZIP) Bach1(bZIP) Bach2(bZIP) NF-E2(bZIP) NFE2L2(bZIP) Nfe2+M3617 Nfe2l1+M4030 Nrf2(bZIP) MafA(bZIP) MafB(bZIP) Nrl+M5689 MafF(bZIP) MafK(bZIP) Mafg+M0308 Xbp1+M0291 Arid2+M1536 Arid3a+M1967 Arid3c+M0105 Tfdp1+M6515 E2F1(E2F) E2F3(E2F) E2F4(E2F) E2F6(E2F) E2F7(E2F) E2f2+M0670 E2f5+M6194 FOXA1(Forkhead) Foxa2(Forkhead) Foxa3(Forkhead) Foxb1+M0737 Foxd1+M3296 Foxd2+M1863 Foxe1+M1873 Foxf1(Forkhead) Foxg1+M0723 Foxi3+M1874 Foxj1+M0728 Foxj2+M0721 Foxj3+M0726 FOXK1(Forkhead) FOXK2(Forkhead) FoxL2(Forkhead) FoxI1+M0747 FOXM1(Forkhead) Foxo1(Forkhead) Foxo3(Forkhead) Foxo4+M0730 Foxo6+M0735 FOXP1(Forkhead) Foxp2+M0724 Foxp3+M0717 Foxq1+M1872 Foxs1+M0732 Rfx1(HTH) Rfx2(HTH) Rfx3+M6077 Rfx4+M1528 Rfx5(HTH) Rfx6(HTH) Rfx7+M1529 Rfx8+M6075 Isl1(Homeobox) Lhx1(Homeobox) Lhx5+M0975 Lhx2(Homeobox) Lhx9+M0932 Lhx3(Homeobox) Lhx4+M6041 Lhx6+M0962 Lhx8+M6042 Lmx1a+M0960 Lmx1b+M1015 Six1(Homeobox) Six2(Homeobox) Six4(Homeobox) Homez+M1057 CDX4(Homeobox) Cdx2(Homeobox) Evx1+M0918 Evx2+M0916 Gbx1+M1064 Gbx2+M0995 Gsx1+M5502 Gsx2+M1002 Hoxd1+M1025 HOXA2(Homeobox) Hoxb2+M0887 Hoxa3+M1073 Hoxb3+M1040 Hoxd3+M1071 Hoxa4+M0905 Hoxb4(Homeobox) Hoxc4+M1070 Hoxa5+M1011 Hoxb5+M1013 Hoxc5+M0949 Hoxa6+M1027 Hoxa7+M1010 Hoxb7+M1014 Hoxc6+M0915 Hoxb8+M1055 Hoxc8+M0914 Hoxd8+M0964 HOXA9(Homeobox) HOXB13(Homeobox) Hoxa10(Homeobox) Hoxa11(Homeobox) Hoxa13(Homeobox) Hoxc11+M0913 Hoxc12+M1044 Hoxc13+M0912 Hoxc9(Homeobox) Hoxd10(Homeobox) Hoxd11(Homeobox) Hoxd12(Homeobox) Hoxd13(Homeobox) Hoxd9+M6036 Meox1+M0907 Meox2+M6052 Mnx1+M0911 Pdx1(Homeobox) Barhl1+M5990 Barhl2+M0993 Barx1(Homeobox) Barx2+M0990 Bsx+M1054 Dbx2+M1034 DIx1+M1024 DIx2+M6001 DIx3(Homeobox) DIx4+M0935 DIx5+M0981 DIx6+M5344 Emx1+M0892 Emx2+M1028 En1+M1058 En2+M6006 Hlx+M1018 Lbx1+M0894 Lbx2+M0998 Msx1+M1036 Msx2+M0940 Nanog(Homeobox) Nkx1-1+M1125 Nkx1-2+M1039 Nkx2-4+M1052 Nkx2-9+M1060 Nkx2.2(Homeobox) Bapx1(Homeobox) Nkx3-1+M0946 Nkx3-2+M1042 Nkx3.1(Homeobox) Nkx2-3+M1030 Nkx2-5+M2302 Nkx2-6+M1029 Nkx2.5(Homeobox) Hmx1+M1063 Nkx6-1+M0999 Nkx6.1(Homeobox) Noto+M1065 Vax1+M0921 Vax2+M0997 Hdx+M0996 Hmbox1+M0945 Hnf1a+M0974 Pit1(Homeobox) Pit1+1bp(Homeobox) Pou1f1+M1233 Oct2(POU,Homeobox) Pou2f1+M1236 Pou2f2+M6063 Pou2f3+M0989 Brn1(POU,Homeobox) Oct6(POU,Homeobox) Pou3f1+M1239 Pou3f2+M1051 Pou3f3+M1033 Pou3f4+M1056 Pou4f3+M0953 Oct4(POU,Homeobox) Pou5f1+M6133 Pou6f1+M0925 Pou6f2+M5746 Alx3+M0928 Hesx1+M1166 Isx+M0984 Otp+M0943 Prrx1+M0959 Prrx2+M1902 Rax+M0954 Sebox+M0906 Shox2+M6082 Uncx+M0972 Vsx1+M6110 Vsx2+M3059 Irx1+M6037 Meis1(Homeobox) Meis2+M6048 Meis3+M6051 PBX1(Homeobox) PBX2(Homeobox) Pbx3(Homeobox) Pknox1(Homeobox) Pknox2+M6062 Tgif1(Homeobox) Tgif2(Homeobox) PAX5(Paired,Homeobox) PAX5(Paired,Homeobox),condensed Pax2+M1895 Pax8(Paired, Homeobox) Pax3+M3713 Pax4+M1896 EHF(ETS) ELF3(ETS) ELF5(ETS) ESE1(AP2EREBP) ESE3(AP2EREBP) Etv6+M0705 ELF1(ETS) Elf2+M0708 Elf4(ETS) ETV1(ETS) ETV4(ETS) Elk1(ETS) Elk3+M0692 ERG(ETS) ETS1(ETS) Erf+M5398 Etv2(ETS) Etv3+M0689 Fev+M5429 Fli1(ETS) GABPA(ETS) SPDEF(ETS) PU.1(ETS) Sfpi1+M1907 SpiB(ETS) Spic+M6096 IRF1(IRF) IRF2(IRF) IRF3(IRF) IRF4(IRF) IRF8(IRF) Irf5+M1267 Irf6+M1266 Irf7+M1265 Irf9+M1262 AMYB(HTH) BMYB(HTH) MYB(HTH) Mybl1+M1357 Mybl2+M1355 Smarcc2+M4527 GRHL2(CP2) CBF1(AP2EREBP) Cbf1(bHLH) Nfkb1+M4444 Nfkb2+M5669 Rel+M1924 Rela+M6137 Nfat5+M1519 Nfatc1+M1521 Nfatc2+M1518 Nfatc3+M1517 RUNX1(Runt) RUNX2(Runt) RUNX3+M5791 STAT1(Stat) STAT4(Stat) STAT5(Stat) STAT6(Stat) Stat2+M4635 Stat3(Stat) Stat3+il21(Stat) Stat5a+M3985 Stat5b+M3990 T+M1843 Tbx19+M5882 Tbx10+M1628 Tbx20(T-box) Tbx2+M1626 Tbx3+M1630 Tbx4+M1627 Tbx5(T-box) Tbx6(T-box) Eomes(T-box) Tbet(T-box) Tbr1(T-box) Tbx21(T-box) p63(p53) Nfya+M1890 Cic+M1581 Sox14+M1596 Sox2(HMG) Sox21+M1599 Sox3(HMG) Sox12+M1594 Sox4(HMG) Sox5+M1914 Sox6(HMG) Sox10(HMG) Sox9(HMG) Sox17(HMG) Sox15(HMG) LEF1(HMG) Tcf3(HMG) Tcf4(HMG) Tcf7(HMG) Tcf7l1+M1598 Tcf7l2+M1585 NRF1(NRF) Bcl11a(Zf) Mecom+M1861 Hivep1+M6544 SHN3(AP2EREBP) HIC1(Zf) Maz(Zf) Patz1+M3546 Zbtb1+M0413 ZNF382(Zf) Zfp711+M0403 PRDM9(Zf) Rreb1+M1901 ZNF467(Zf) Zbtb4+M6540 Zfp128+M0438 Zkscan5+M0435 Zscan20+M0440 Bcl6(Zf) Bcl6b+M0391 BORIS(Zf) CTCF(Zf) Fezf1+M4840 Gfi1b(Zf) GLIS3(Zf) Glis2+M0393 Zic(Zf) Zic1+M0412 Zic2+M0439 Zic3(Zf) Zic5+M0422 Mtf1+M0407 Ovol1+M6402 PRDM1(Zf) SCRT1(Zf) Scrt2+M5805 Slug(Zf) Snai1+M0424 YY1(Zf) ZNF692(Zf) ZBTB18(Zf) ZNF322(Zf) ZNF652 Zfp523+M1915 MYNN(Zf) Mzf1+M0410 Osr2+M0396 WT1(Zf) ZFP3(Zf) ZNF317(Zf) ZSCAN22(Zf) Zbtb49+M5959 Zfp161+M0432 Zfp691+M0428 Znf263(Zf) ZBTB33(Zf) Osr1+M0431 Zfp740+M6112 Egr1(Zf) Egr2(Zf) Egr3+M0414 Egr4+M3630 EKLF(Zf) KLF10(Zf) KLF3(Zf) KLF5(Zf) KLF6(Zf) Klf1+M2294 Klf12+M0443 Klf4(Zf) Klf7+M0405 Klf8+M0421 KIf9(Zf) KLF14(Zf) Sp1(Zf) Sp2(Zf)Sp4+M0401 Sp5(Zf) Sp9+M5856

> Myt1I+M0574 Cxxc1+M0603 Mbd1+M0613 DMRT1(DM) Dmrt3+M0629 Dmrta1+M0641 Dmrtc2+M0635 Nr4a2+M1450 Nr4a3+M6395 Nur77(NR) COUP-TFII(NR) HNF4a(NR),DR1 Hnf4g+M2286 Nr2e1+M6057 Nr2e3+M1973 Nr2c2+M4549 Esr1+M1444 Ar+M1456 Nr3c1+M1935 PGR(NR) PR(NR) PPARa(NR),DR1 RORa(NR) RORg(NR) Rorc+M6455 GATA1(C2C2gata) GATA3(Zf) GATA3(Zf),DR4 GATA3(Zf),DR8 GATA4(C2C2gata) GATA6(C2C2gata) Gata1(Zf) Gata2(Zf) Gata4(Zf) Gata5+M0784 Gata6(Zf) Mef2a(MADS) Mef2b(MADS) Mef2c(MADS) Mef2d(MADS) Gmeb1+M1550 Gmeb2+M1551 Sp100+M1549 Gcm1+M0812 Nfix+M5664 Smad4(MAD) Smad2(MAD) Smad3(MAD) Hmga2+M0132

WT\_Tfh\_vs\_WT\_Th1.up
WT\_Tfh\_vs\_WT\_Th1.dn
DKO\_Th1\_vs\_WT\_Th1.dn
DKO\_Th1\_vs\_Bol6KO\_Th1.dn
DKO\_Tfh\_vs\_Bv\_T\_Tfh.dn

KO\_Tfh\_vs\_Prdm1KO\_Tfh.dn

Group\_IV\_dn.srt\_rmdup.csv

Arnt:Ahr(bHLH) CEBP:AP1(bZIP) CEBP:CEBP(bZIP)

ETS:RUNX(ETS,Runt)
EWS:ERG-fusion(ETS)
EWS:FLI1-fusion(ETS)
Fox:Ebox(Forkhead,bHLH)

GATA:SCL(Zf,bHLH)
IRF:BATF(IRF:bZIP)
NFAT:AP1(RHD,bZIP)
OCT:OCT-short(POU,Homeobox,HMG)

PU.1:IRF8(ETS:IRF) Pitx1:Ebox(Homeobox,bHLH) RAR:RXR(NR),DR5 Tbox:Smad(T-box,MAD) bZIP:IRF(bZIP,IRF) E2A(bHLH) E2A(bHLH),near\_PU.1 HEB(bHLH) TCF4(bHLH) Tcf12(bHLH) Id1+M0189 Id4+M5571 Hes1+M0191 Hes2+M0199 Hes5+M0215 Hes7+M0192 Hey1+M0183 bHLHE41(bHLH) Ascl1(bHLH) Ascl2+M5987 Myf5(bHLH) Myf6+M0210 MyoD(bHLH) MyoG(bHLH) Myod1+M2299 HIF-1a(bHLH) HIF1A+M6275 HIF2a(bHLH) Sim2+M5234 Arnt+M0179 Arnt2+M0180 Arntl+M0220 BMAL1(bHLH) CLOCK(bHLH) NPAS2(bHLH) Npas4+M4930 Sohlh2+M0198 Tcfl5+M0212 ABF1 Mesp1+M5627 Msc+M0195 Tcf21(bHLH) Atoh1(bHLH) Atoh8+M5116 Bhlha15+M0218 Bhlhe22+M0194 Ferd3I+M4971 NeuroD1(bHLH) NeuroG2(bHLH) Neurod2+M5652 Olig2(bHLH) Olig3+M0213 Nhlh1+M1880

PAX3:FKHR-fusion(Paired,Homeobox)

ETS:E-box(ETS,bHLH)/HPC7-Scl-ChIP-Seq(GSE22178)

80

60

40

20