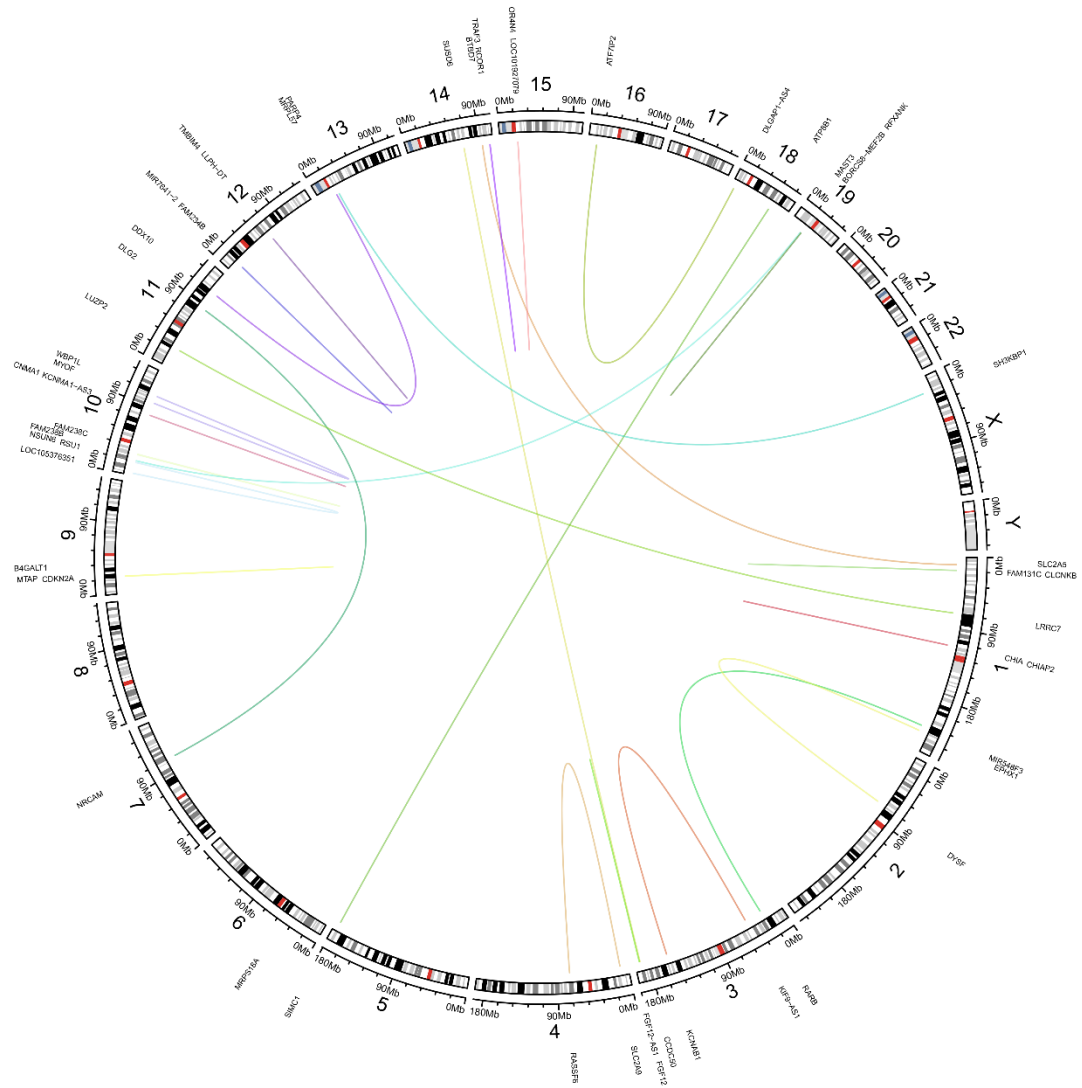
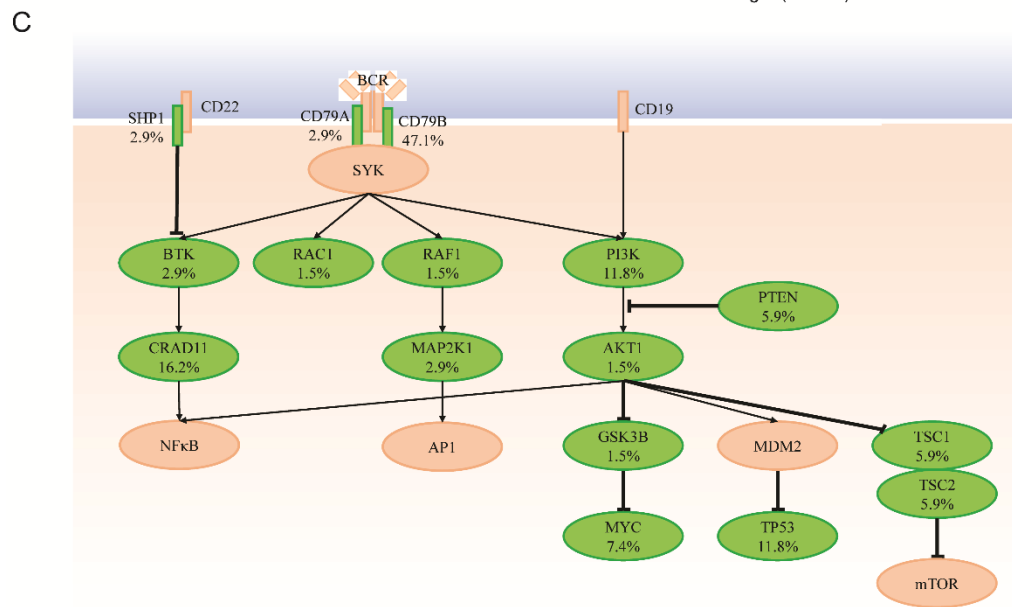
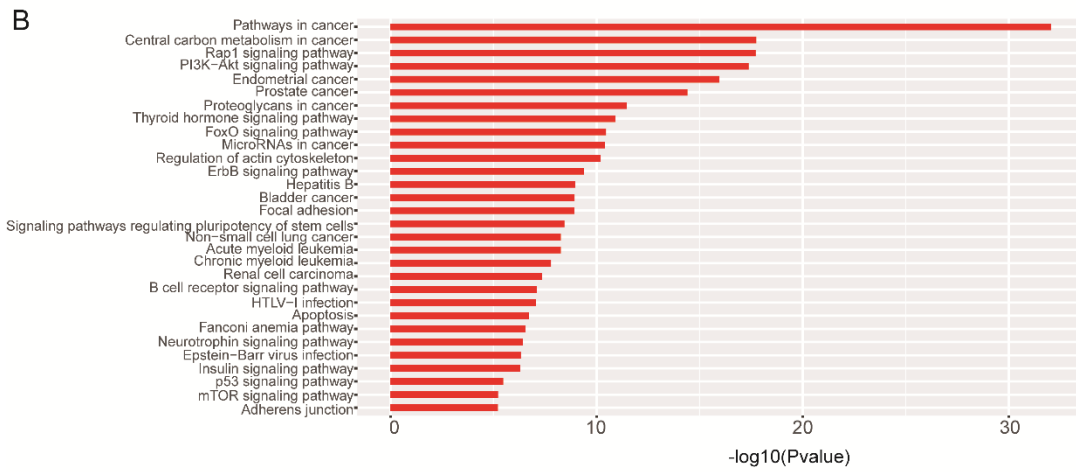
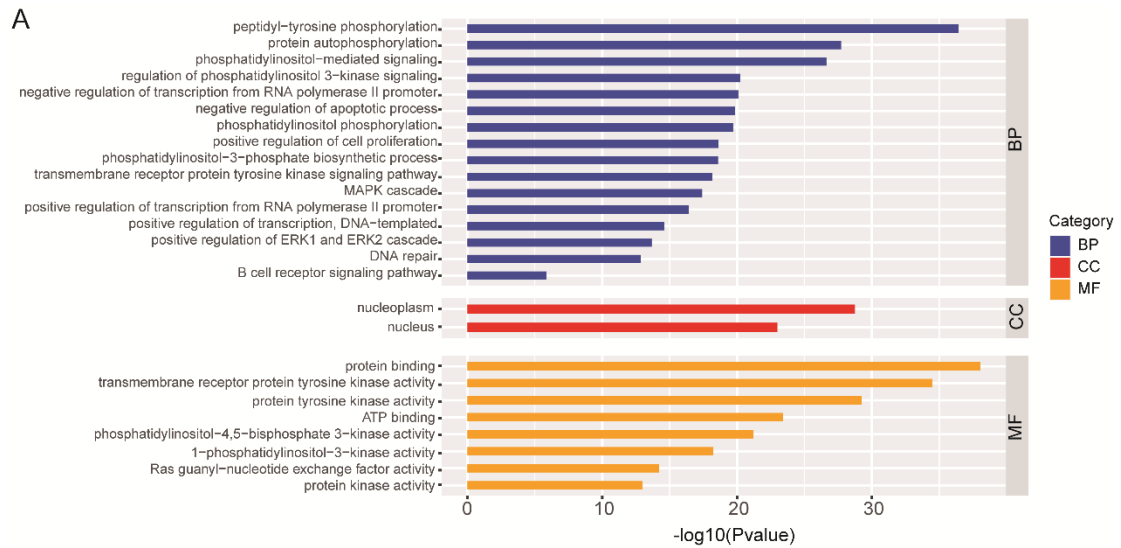


Supplemental materials

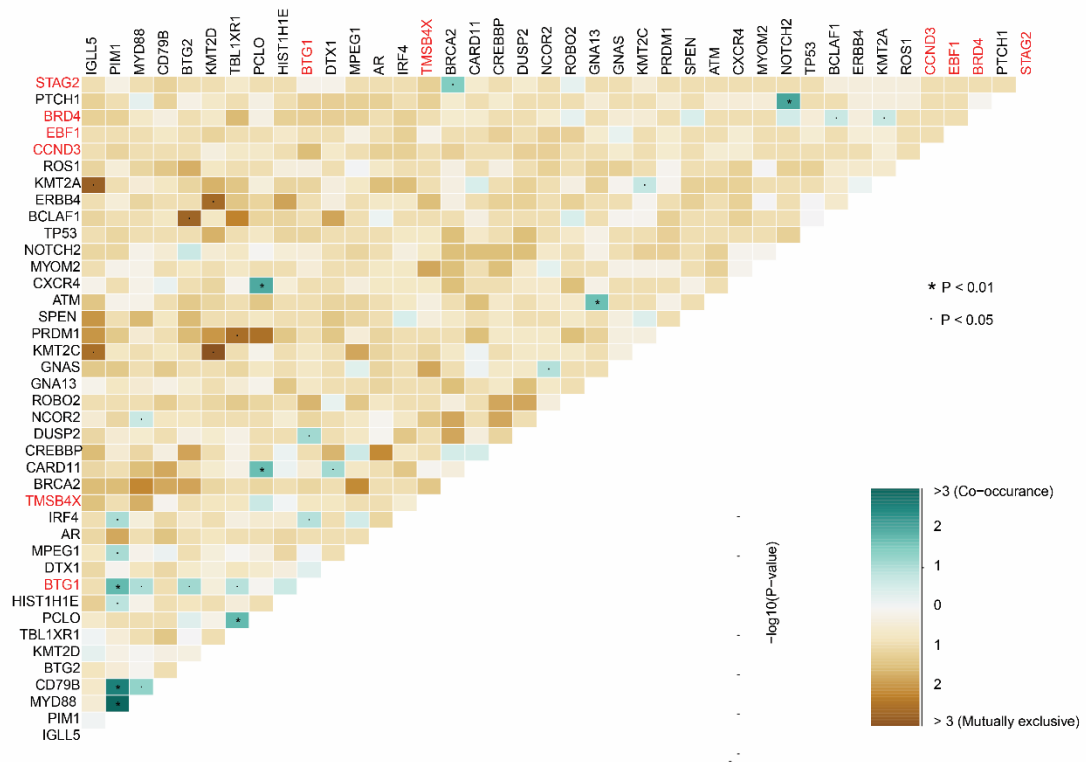


Supplemental Figure S1 Fusions of different genes occurring in ≥ 2 patients.

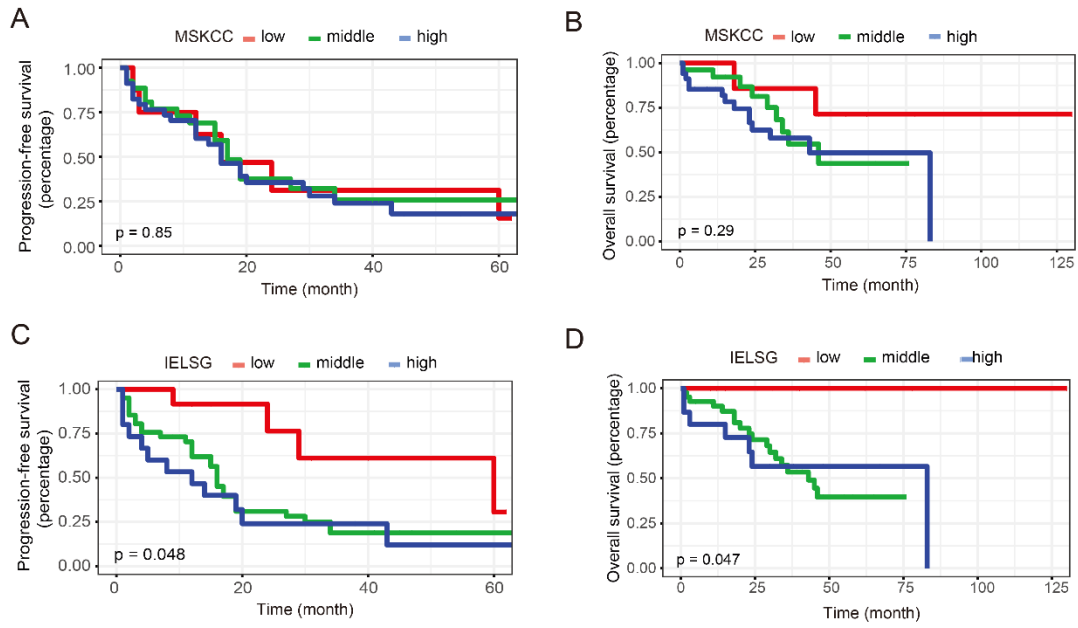


Supplemental Figure S2 GO analyses and BCR/PI3K signaling pathways of mutated genes. (A) GO pathway terms enriched by the 263 mutated genes identified in the 68 PCNSL samples. (CC, cellular component; MF, molecular function; BP, biological

process). (B) KEGG pathway analysis of the enriched pathways of the 263 mutated genes in our cohort. (C) Frequencies of mutations affecting the BCR/PI3K signaling pathways in PCNSL patients. Significantly mutated genes with nonsynonymous coding site mutations are depicted in green, and the mutation frequencies in the 68 samples are indicated.



Supplemental Figure S3 Mutational correlation of genetic alterations in PCNSL. Statistically significant mutual exclusivity or co-occurrence among the top 35 mutated genes and the genes used to establish the prognostic model (red) based on pairwise Fisher's exact test.



Supplemental Figure S4 IELSG and MSKCC value in the prognosis of PCNSL patients. K-M curves with log rank tests were used to assess the PFS and OS in patients of the low, middle and high-risk groups according to the IELSG (A, B) and (C, D) MSKCC system.

Supplemental File S1 The 571 gene list for multiple cancers.

ABL1	EPHA3	KRAS	RAB35	XPO1
ACVR1	EPHA5	LATS1	RAC1	XRCC2
AGO2	EPHA7	LATS2	RAC2	YAP1
AKT1	EPHB1	LMO1	RAD21	YES1
AKT2	ERBB2	LYN	RAD50	ZFHX3
AKT3	ERBB3	MALT1	RAD51	ACVR1B
ALK	ERBB4	MAP2K1	RAD51B	ARFRP1
ALOX12B	ERCC2	MAP2K2	RAD51C	BCL2L2
AMER1	ERCC3	MAP2K4	RAD51D	BCORL1
ANKRD11	ERCC4	MAP3K1	RAD52	BTG1
APC	ERCC5	MAP3K13	RAD54L	BTG2
AR	ERF	MAP3K14	RAF1	C11orf30
ARAF	ERG	MAPK1	RARA	CD22
ARID1A	ERRFI1	MAPK3	RASA1	CD70
ARID1B	ESR1	MAPKAP1	RB1	CDKN2A
ARID2	ETV1	MAX	RBM10	CTNNA1
ARID5B	ETV6	MCL1	RECQL	CUL4A
ASXL1	EZH1	MDC1	RECQL4	CYP17A1
ASXL2	EZH2	MDM2	REL	DDR1
ATM	FAM175A	MDM4	RET	EPHB4
ATR	FAM46C	MED12	RFWD2	FANCG
ATRX	FAM58A	MEF2B	RHEB	FANCL
AURKA	FANCA	MEN1	RHOA	FAS
AURKB	FANCC	MET	RICTOR	FGF10
AXIN1	FAT1	MGA	RIT1	FGF12
AXIN2	FBXW7	MITF	RNF43	FGF14
AXL	FGF19	MLH1	ROS1	FGF23
B2M	FGF3	MPL	RPS6KA4	FGF6
BABAM1	FGF4	MRE11A	RPS6KB2	GABRA6
BAP1	FGFR1	MSH2	RPTOR	GATA4
BARD1	FGFR2	MSH3	RRAGC	GATA6
BBC3	FGFR3	MSH6	RRAS	GID4
BCL10	FGFR4	MSI1	RRAS2	GNA13
BCL2	FH	MSI2	RTEL1	GRM3
BCL2L1	FLCN	MST1	RUNX1	HDAC1
BCL2L11	FLT1	MST1R	RXRA	HSD3B1
BCL6	FLT3	MTOR	RYBP	IRF2
BCOR	FLT4	MUTYH	SDHA	KEL
BIRC3	FOXA1	MYC	SDHAF2	KLHL6
BLM	FOXL2	MYCL1	SDHB	LTK
BMPR1A	FOXO1	MYCN	SDHC	MAF

BRAF	FOXP1	MYD88	SDHD	MERTK
BRCA1	FUBP1	MYOD1	SESN1	MKNK1
BRCA2	FYN	NBN	SESN2	MTAP
BRD4	GATA1	NCOA3	SESN3	MYCL
BRIP1	GATA2	NCOR1	SETD2	NT5C2
BTK	GATA3	NEGR1	SETD8	P2RY8
CALR	GLI1	NF1	SF3B1	PARP2
CARD11	GNA11	NF2	SH2B3	PARP3
CARM1	GNAQ	NFE2L2	SH2D1A	PDK1
CASP8	GNAS	NFKBIA	SHOC2	PIK3C2B
CBFB	GPS2	NKX2-1	SHQ1	PPP2R2A
CBL	GREM1	NKX3-1	SLX4	PTPRO
CCND1	GRIN2A	NOTCH1	SMAD2	QKI
CCND2	GSK3B	NOTCH2	SMAD3	SGK1
CCND3	H3F3A	NOTCH3	SMAD4	SNCAIP
CCNE1	H3F3B	NOTCH4	SMARCA4	TIPARP
CD274	H3F3C	NPM1	SMARCB1	TYRO3
CD276	HGF	NRAS	SMARCD1	ZNF217
CD79A	HIST1H1C	NSD1	SMO	ZNF703
CD79B	HIST1H2BD	NTHL1	SMYD3	ACTB
CDC42	HIST1H3A	NTRK1	SOCS1	BCLAF1
CDC73	HIST1H3B	NTRK2	SOS1	CD36
CDH1	HIST1H3C	NTRK3	SOX17	CD58
CDK12	HIST1H3D	NUF2	SOX2	CHD2
CDK4	HIST1H3E	NUP93	SOX9	CIITA
CDK6	HIST1H3F	PAK1	SPEN	DDX3X
CDK8	HIST1H3G	PAK7	SPOP	DTX1
CDKN1A	HIST1H3H	PALB2	SPRED1	DUSP2
CDKN1B	HIST1H3I	PARK2	SRC	EBF1
CDKN2Ap14ARF	HIST1H3J	PARP1	SRSF2	EGR2
CDKN2Ap16INK4A	HIST2H3C	PAX5	STAG2	HIST1H1E
CDKN2B	HIST2H3D	PBRM1	STAT3	HIST2H2AB
CDKN2C	HIST3H3	PDCD1	STAT5A	IGLL5
CEBPA	HLA-A	PDCD1LG2	STAT5B	IKBKB
CENPA	HLA-B	PDGFRA	STK11	IRF8
CHEK1	HNF1A	PDGFRB	STK19	ITPKB
CHEK2	HOXB13	PDPK1	STK40	KIR2DL1
CIC	HRAS	PGR	SUFU	KRT20
CREBBP	ICOSLG	PHOX2B	SUZ12	LRRN3
CRKL	ID3	PIK3C2G	SYK	MAPK7
CRLF2	IDH1	PIK3C3	TAP1	MPEG1
CSDE1	IDH2	PIK3CA	TAP2	MYOM2
CSF1R	IFNGR1	PIK3CB	TBX3	NCOR2
CSF3R	IGF1	PIK3CD	TCEB1	NFKBIE

CTCF	IGF1R	PIK3CG	TCF3	NRXN3
CTLA4	IGF2	PIK3R1	TCF7L2	NSD2
CTNNB1	IKBKE	PIK3R2	TEK	PCLO
CUL3	IKZF1	PIK3R3	TERT	POSTN
CXCR4	IL10	PIM1	TET1	POT1
CYLD	IL7R	PLCG2	TET2	PTPN6
CYSLTR2	INHA	PLK2	TGFBR1	RAG1
DAXX	INHBA	PMAIP1	TGFBR2	RAG2
DCUN1D1	INPP4A	PMS1	TMEM127	RIPK1
DDR2	INPP4B	PMS2	TMPRSS2	ROBO2
DICER1	INPPL1	PNRC1	TNFAIP3	SAMHD1
DIS3	INSR	POLD1	TNFRSF14	SIN3A
DNAJB1	IRF4	POLE	TOP1	SLITRK3
DNMT1	IRS1	PPARG	TP53	STAT6
DNMT3A	IRS2	PPM1D	TP53BP1	TBL1XR1
DNMT3B	JAK1	PPP2R1A	TP63	TGM7
DOT1L	JAK2	PPP4R2	TRAF2	TLDC2
DROSHA	JAK3	PPP6C	TRAF7	TMSB4X
DUSP4	JUN	PRDM1	TSC1	TYK2
E2F3	KDM5A	PRDM14	TSC2	UBE2A
EED	KDM5C	PREX2	TSHR	ZFP36L1
EGFL7	KDM6A	PRKAR1A	U2AF1	ZMYM3
EGFR	KDR	PRKCI	UPF1	ZNF608
EIF1AX	KEAP1	PRKD1	VEGFA	KNSTRN
EIF4A2	KIT	PTCH1	VHL	PTPRT
EIF4E	KLF4	PTEN	VTCN1	XIAP
ELF3	KMT2A	PTP4A1	WHSC1	
EP300	KMT2B	PTPN11	WHSC1L1	
EPAS1	KMT2C	PTPRD	WT1	
EPCAM	KMT2D	PTPRS	WWTR1	

Supplemental File 2 The 263 mutated genes detected in our cohort

MYD88	MYCN	RAG2	VEGFA
ROBO2	MSH6	SIN3A	CD36
KIT	PIK3CB	POLD1	FANCG
TET2	EPHB4	KDM6A	STAG2
BCLAF1	LRRN3	IDH1	CASP8
CARD11	EZH2	TBX3	FGFR3
PCLO	FANCC	POLE	AXL
KMT2C	RET	CHD2	CSF1R
KMT2A	FLT3	ASXL1	PBRM1
NCOR2	B2M	KDM5C	MLH1
TP53	AXIN1	ERBB4	KDR
SPOP	TSC2	CTNNA1	FGF10
BRD4	CIITA	SGK1	BIRC3
GNAS	BRCA1	MAF	CHEK2
IGLL5	RNF43	CD70	PIK3C2B
EP300	DOT1L	AURKA	ARID1A
DDX3X	SMARCA4	MED12	PDGFRA
NSD2	CD22	ITPKB	FAS
HIST1H1E	ARAF	FGF12	STAT3
TSC1	BTK	GABRA6	SRC
FANCA	UBE2A	ROS1	MDM4
CD58	BCORL1	ATR	MST1R
BTG2	PDK1	NTRK1	RICTOR
PARP1	SOCS1	FGFR4	AKT1
PARP3	SLITRK3	RAD54L	RAD51D
GSK3B	PRDM1	FOXL2	CIC
EBF1	TNFAIP3	MAP3K13	POT1
PIM1	TGM7	IKZF1	QKI
CDKN2A	MKNK1	KDM5A	FGF3
TEK	FUBP1	BCOR	CHEK1
PAX5	HSD3B1	ZNF608	HGF
ZFP36L1	XPO1	POSTN	NTRK3
CD79B	KLHL6	RPTOR	ERG
ZNF217	MET	EPHB1	MSH2
TMSB4X	MTAP	HNF1A	FGFR2
SPEN	SUFU	IRF8	PIK3R1
ID3	IGF1R	CCND3	BRAF
CXCR4	KEAP1	PTEN	FBXW7
TGFBR2	NOTCH3	PTPRO	PDCD1LG2
TBL1XR1	GRM3	TYK2	FGF14
SNCAIP	MYOM2	BCL6	HIST2H2AB
IRF4	TRAF2	MAP3K1	SOX2

RAG1	SOX9	MYC	RAC1
MPEG1	JAK3	STAT6	TIPARP
ATM	CD79A	FOXO1	DIS3
PIK3C2G	MCL1	CDC73	CUL3
IRS2	ESR1	DNMT3A	APC
LTK	BRCA2	ALK	PDCD1
CREBBP	HLA-B	PDGFRB	ERBB3
GNA13	EGFR	PPP2R2A	PARP2
AMER1	GATA4	PTCH1	ATRX
DUSP2	CDKN1B	FGF23	MAP2K1
SETD2	NOTCH1	PTPN6	FGF19
MSH3	BRIP1	FLT1	TYRO3
ACTB	FANCL	ERCC4	ERBB2
PMS2	REL	PALB2	PRKCI
NTRK2	BARD1	SAMHD1	RAD52
FGF4	PIK3CA	RAF1	AURKB
KMT2D	SMO	MITF	CALR
BTG1	ZNF703	NF1	TLDC2
DTX1	NRXN3	MERTK	INPP4B
AR	CDK12	WT1	ABL1
PIK3CD	BCL2	FGF6	CUL4A
NOTCH2	MEF2B	SMARCB1	CDH1
SDHC	MPL	ZMYM3	GID4
IKBKE	SF3B1	EPHA3	