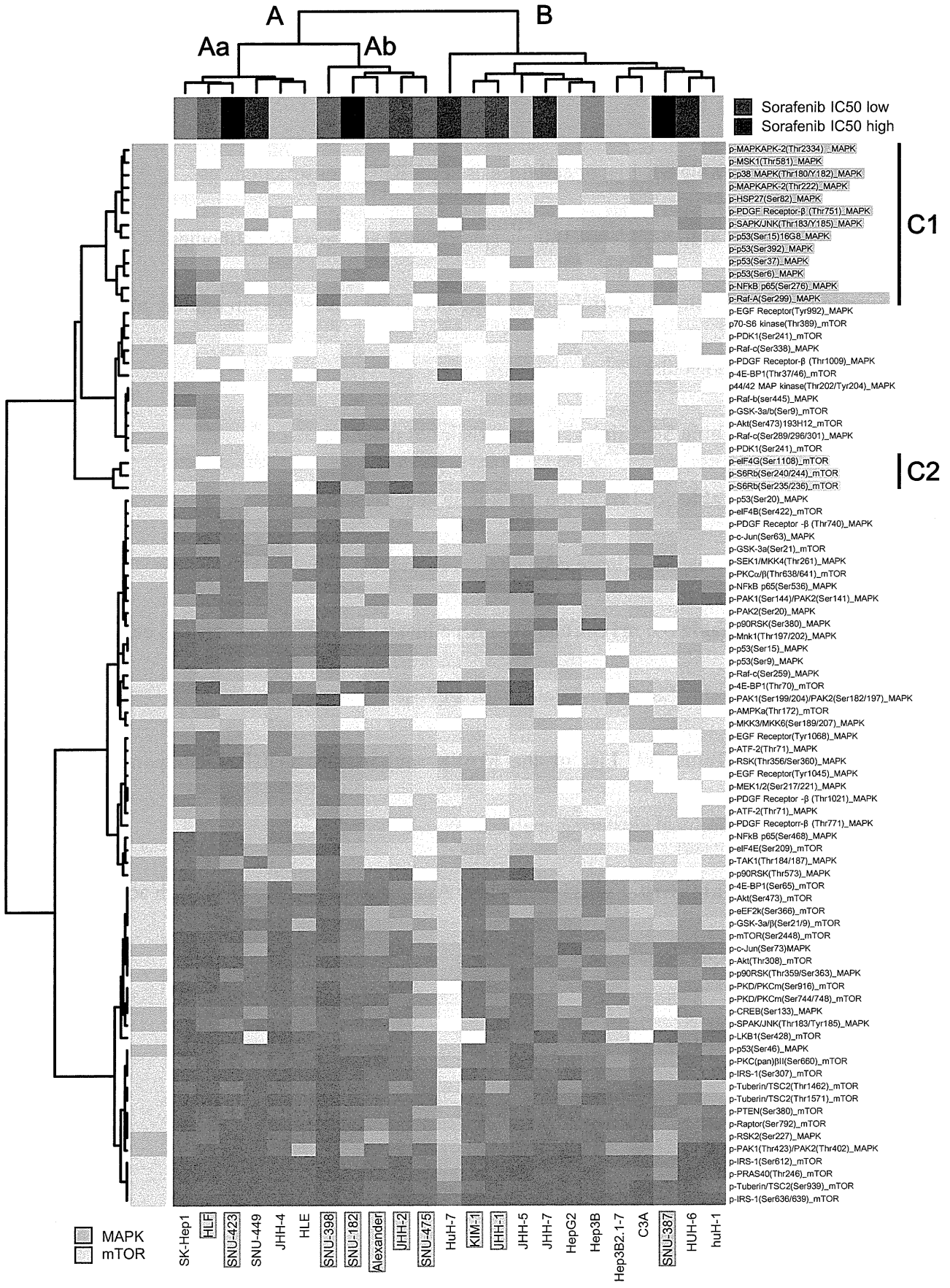
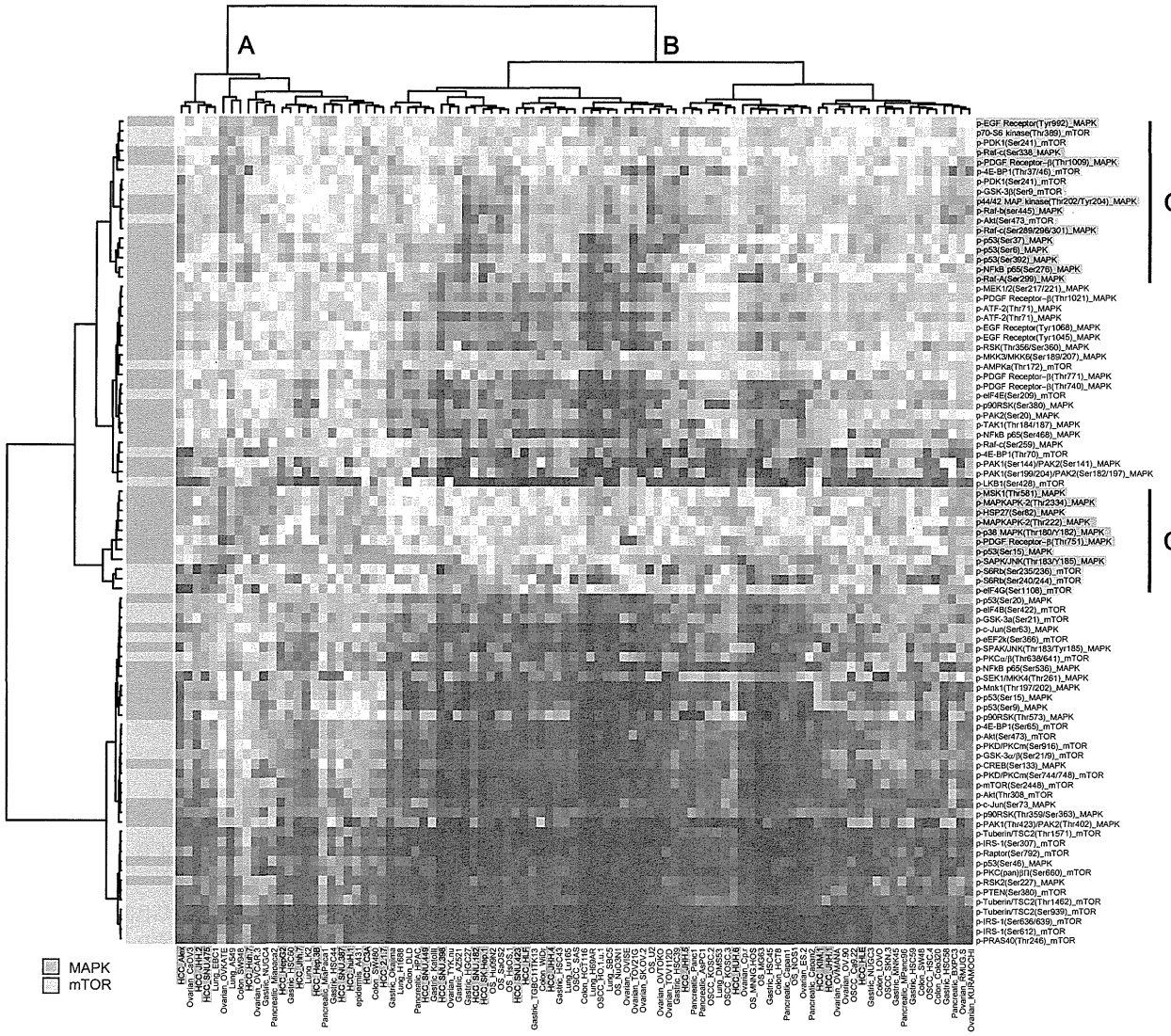


Supplementary Figure S1.



Supplementary Figure S2.

Supplementary Table S1. List of cell lines used for RPPA construction

#	Cell line	Source
Hepatocellular carcinoma (HCC): 23 cell lines		
1	HepG2	JCRB-HSRRB
2	HLE	JCRB-HSRRB
3	huH-1	JCRB-HSRRB
4	HUH-6 clone 5	JCRB-HSRRB
5	HuH-7	JCRB-HSRRB
6	JHH-7	JCRB-HSRRB
7	HLF	JCRB-HSRRB
8	C3A(HepG2/C3A)	ATCC
9	Hep 3B2.1-7	ATCC
10	JHH-1	JCRB-HSRRB
11	JHH-2	JCRB-HSRRB
12	JHH-4	JCRB-HSRRB
13	JHH-5	JCRB-HSRRB
14	Alexander	ATCC
15	Hep-3B	JCRB-HSRRB
16	KIM-1	JCRB-HSRRB
17	SK-Hep-1	ATCC
18	SNU-182	ATCC
19	SNU-387	ATCC
20	SNU-398	ATCC
21	SNU-423	ATCC
22	SNU-449	ATCC
23	SNU-475	ATCC
Ovarian cancer: 16 cell lines		
1	CaOV-3	ATCC
2	TYK-nu	JCRB-HSRRB
3	TYK-nu.CP-r	JCRB-HSRRB
4	RMUG-S	JCRB-HSRRB
5	ES-2	ATCC
6	SK-OV-3	ATCC
7	OV-90	ATCC
8	TOV-112D	ATCC
9	TOV-21G	ATCC
10	KURAMOCHI	JCRB-HSRRB
11	OVCAR-3	ATCC
12	OVISE	JCRB-HSRRB
13	OVKATE	JCRB-HSRRB
14	OVMANA	JCRB-HSRRB
15	OVSAHO	JCRB-HSRRB
16	OVTOKO	JCRB-HSRRB
Gastric cancer: 15 cell lines		
1	HSC-39	Suppl. Ref [1]
2	HSC-43	Suppl. Ref [1]
3	HSC-44	Suppl. Ref [1]
4	HSC-45	Suppl. Ref [1]
5	HSC-58	Suppl. Ref [1]
6	HSC-60	Suppl. Ref [1]
7	HSC-59	Suppl. Ref [1]
8	MKN-45	JCRB-HSRRB
9	Okajima	Suppl. Ref [2]
10	AZ521	RBCCB
11	Kato-III	RBCCB
12	NUGC-3	JCRB-HSRRB
13	NUGC-4	JCRB-HSRRB
14	HGC27	RBCCB
15	TGBC11TKB	RBCCB

#	Cell line	Source
Colon cancer: 9 cell lines		
1	DLD1	JCRB-HSRRB
2	HCT-116	ATCC
3	WiDr	JCRB-HSRRB
4	SW1116	ATCC
5	SW48	ATCC
6	SW948	ATCC
7	SW480	ATCC
8	COLO-320	RBCCB
9	Lovo	JCRB-HSRRB
Pancreatic cancer: 9 cell lines		
1	MIAPaCa-1	ATCC
2	MIAPaCa-2	ATCC
3	MPanc-96	ATCC
4	PANC-1	ATCC
5	AsPC-1	ATCC
6	BxPC-3	ATCC
7	Capan-1	ATCC
8	Capan-2	ATCC
9	HPAC	ATCC
Lung cancer: 8 cell lines		
1	A549	JCRB-HSRRB
2	EBC1	JCRB-HSRRB
3	LK-2	RBCCB
4	Lu-165	RBCCB
5	NCI-H1688	ATCC
6	H69AR	ATCC
7	SBC5	JCRB-HSRRB
8	DMS53	ATCC
Osteosarcoma: 8 cell lines		
1	U-2	ATCC
2	SaOS2	ATCC
3	NOS1	RBCCB
4	HuO 9N2	RBCCB
5	HuO-3N1	RBCCB
6	MNNG/HOS	ATCC
7	MG-63	RBCCB
8	Hs-OS-1	RBCCB
Oral cancer: 7 cell lines		
1	SAS	JCRB-HSRRB
2	Ca9-22	RBCCB
3	Ho-1-u-1	JCRB-HSRRB
4	HSC-4	RBCCB
5	KOSC-2	JCRB-HSRRB
6	KOSC-3	JCRB-HSRRB
7	SKN-3	JCRB-HSRRB
Epidermoid carcinoma: 1 cell line†		
1	A431	RBCCB

Abbreviations: JCRB-HSRPB, Japanese Collection of Research Bioresources-Human Science Research Resources Bank (Osaka, Japan); ATCC, American Type Culture Collection (Manassas, VA); RBCCB, RIKEN BioResource Center Cell Bank (Tsukuba, Japan).

†EGF treated A431 cells were included as a control.

SUPPLEMENTARY REFERENCES

1. Yanagihara K, Tanaka H, Takigahira M, Ino Y, Tamaguchi Y, Toge T, et al. Establishment of two cell lines from human gastric scirrhous carcinoma that possess the potential to metastasize spontaneously in nude mice. Cancer Sci. 2004;95:575-582.
2. Yamada Y, Yoshida T, Hayashi K, Sekiya T, Yokota J, Hirohashi S, et.al. p53 gene mutations in gastric cancer metastases and in gastric cancer cell lines derived from metastases. Cancer Res. 1991 Nov 1;51(21):5800-5.

Supplementary Table S2. List of 180 phosphorylation site-specific antibodies

Supplier	Cat. #	Ab name	Pathway	Dilution	Ab type
CST	9570	p-eNOS (Ser1177) C9C3	Angiogenesis	1:1000	Ra mAb
CST	9296	p-Bad(Ser112)	Apoptosis	1:2000	Mo mAb
CST	5286	p-Bad(Ser136) 185D10	Apoptosis	1:500	Ra mAb
CST	9297	p-Bad(Ser155)	Apoptosis	1:1000	Ra pAb
CST	2827	p-Bcl-2(Ser70) 5H2	Apoptosis	1:1000	Ra mAb
CST	2875	p-Bcl-2 (Thr56) Antibody (Human Specific)	Apoptosis	1:1000	Ra pAb
CST	4585	p-Bim (Ser69) D7E11	Apoptosis	1:1000	Ra mAb
CST	3079	p-Aurora A (Thr288) C39D8	Cell cycle	1:1000	Ra mAb
CST	2914	p-Aurora A (Thr288)/Aurora B (Thr232)/Aurora C (Thr198) D13A11	Cell cycle	1:2000	Ra mAb
CST	3300	p-Cyclin D1 (Thr286) D29B3	Cell cycle	1:1000	Ra mAb
CST	9307	p-Rb (Ser780)	Cell cycle	1:1000	Ra pAb
CST	9301	p-Rb (Ser795)	Cell cycle	1:1000	Ra pAb
CST	9308	p-Rb (Ser807/811)	Cell cycle	1:1000	Ra pAb
CST	4910	p-Wee1 (Ser642) D47G5	Cell Cycle	1:1000	Ra mAb
CST	3843	p-AP2M1	Cytoskelton	1:1000	Ra pAb
CST	3313	p-Cofilin(Ser3) 77G2	Cytoskelton	1:1000	Ra mAb
CST	3149	p-Ezrin(Thr567)/Radixin(Thr564)/Moesin(thr558) 41A3	Cytoskelton	1:1000	Ra mAb
CST	3040	p-MYPT(Ser507)	Cytoskelton	1:1000	Ra pAb
CST	3048	p-MYPT(Ser668)	Cytoskelton	1:1000	Ra pAb
CST	4563	p-MYPT(Thr853)	Cytoskelton	1:1000	Ra pAb
CST	3111	p-VASP(Ser157)	Cytoskelton	1:1000	Ra pAb
CST	3114	p-VASP(Ser239)	Cytoskelton	1:1000	Ra pAb
CST	4526	p-ATM(Ser1981) 10H11.E12	DNA damage	1:1000	Mo mAb
CST	2853	p-ATR(Ser428)	DNA damage	1:1000	Ra pAb
CST	9373	P-BAP1 (Ser592)	DNA damage	1:1000	Ra pAb
CST	9009	p-BRCA1(Ser1524)	DNA damage	1:1000	Ra pAb
CST	2349	p-Chk1 (Ser296)	DNA damage	1:1000	Ra pAb
CST	2344	p-Chk1 (Ser317)	DNA damage	1:1000	Ra pAb
CST	2341	p-Chk1 (Ser345)	DNA damage	1:1000	Ra pAb
CST	2348	p-Chk1 (Ser345) 133D3	DNA damage	1:1000	Ra mAb
CST	2666	p-Chk2 (Ser19)	DNA damage	1:1000	Ra pAb
CST	2665	p-Chk2 (Ser33/35)	DNA damage	1:1000	Ra pAb
CST	2668	p-Chk2 (Thr387)	DNA damage	1:1000	Ra pAb
CST	2661	p-Chk2 (Thr68)	DNA damage	1:1000	Ra pAb
CST	9284	p-p53(Ser15)	DNA damage	1:1000	Ra pAb
CST	9286	p-p53(Ser15) 16G8	DNA damage	1:1000	Mo mAb
CST	9287	p-p53(Ser20)	DNA damage	1:2000	Ra pAb
CST	9289	p-p53(Ser37)	DNA damage	1:1000	Ra pAb
CST	9281	p-p53(Ser392)	DNA damage	1:1000	Ra pAb
CST	2521	p-p53(Ser46)	DNA damage	1:750	Ra pAb
CST	9285	p-p53(Ser6)	DNA damage	1:1000	Ra pAb
CST	9288	p-p53(Ser9)	DNA damage	1:1000	Ra pAb
CST	9461	p-FoxO1 (Ser256)	Forkhead	1:750	Ra pAb
CST	2487	p-FoxO1 (Ser319)/FoxO4(Ser262)	Forkhead	1:1000	Ra pAb
CST	9464	p-FoxO1 (Thr24)/FoxO3a (Thr32)	Forkhead	1:750	Ra pAb
CST	2599	p-FoxO1 (Thr24)/FoxO3a (Thr32)/FoxO4 (Thr28) 4G6	Forkhead	1:1000	Ra mAb
CST	9466	p-FoxO3a (Ser253)	Forkhead	1:1000	Ra pAb
CST	9465	p-FoxO3a (Ser318/321)	Forkhead	1:750	Ra pAb
CST	3661	p-Acetyl-CoA carboxylase(Ser79)	Glucose metabolism	1:1000	Ra pAb
CST	2535	p-AMPKa(Thr172)	Glucose metabolism	1:1000	Ra pAb
CST	4181	p-AMPKb(Ser108)	Glucose metabolism	1:1000	Ra pAb
CST	3482	p-LKB1 (Ser428) C67A3	Glucose metabolism	1:1000	Ra mAb
CST	2381	p-IRS-1(Ser307)	Glucose metabolism	1:1000	Ra pAb
CST	3203	p-IRS-1(Ser612) C15H5	Glucose metabolism	1:1000	Ra mAb
CST	2388	p-IRS-1(Ser636/639)	Glucose metabolism	1:1000	Ra pAb

CST	3827	p-PKM2 (Tyr105)	Glucose metabolism	1:1000	Ra pAb
CST	3776	p-Jak2 (Tyr1007/1008) C80C3	JAK/STAT	1:1000	Ra mAb
CST	9171	p-Stat 1(Y701)	JAK/STAT	1:1000	Ra pAb
CST	4441	p-Stat 2(Y690)	JAK/STAT	1:1000	Ra pAb
CST	9134	p-Stat 3(Ser727)	JAK/STAT	1:1000	Ra pAb
CST	9145	p-Stat 3(Y705) D3A7	JAK/STAT	1:3000	Ra mAb
CST	9359	p-Stat 5(Y694) C11C5	JAK/STAT	1:1000	Ra mAb
CST	9361	p-Stat 6(Y641)	JAK/STAT	1:1000	Ra pAb
CST	9321	p-Tyk2 (Tyr1054/1055)	JAK/STAT	1:1000	Ra pAb
CST	2577	p-Histone H2A.X(Ser139)	Mitosis marker	1:1000	Ra pAb
CST	9701	p-Histone H3(Ser10)	Mitosis marker	1:1000	Ra pAb
CST	9713	p-Histone H3(Ser28)	Mitosis marker	1:1000	Ra pAb
CST	9764	p-Histone H3(Thr11)	Mitosis marker	1:1000	Ra pAb
CST	9714	p-Histone H3(Thr3)	Mitosis marker	1:1000	Ra pAb
CST	2681	p-IKKα (Ser180)/IKKβ (Ser181)	NFkB	1:1000	Ra pAb
CST	9246	p-IκB-α (Ser32/36) 5A5	NFkB	1:1000	Mo mAb
CST	3037	p-NFkB p65(Ser276)	NFkB	1:1000	Ra pAb
CST	3039	p-NFkB p65(Ser468)	NFkB	1:1000	Ra pAb
CST	3033	p-NFkB p65(Ser536)93H1	NFkB	1:1000	Ra mAb
CST	5112	p-ATF-2(Thr71)11G2	p38 MAPK	1:1000	Ra mAb
CST	2401	p-HSP27(Ser82)	p38 MAPK	1:1000	Ra pAb
CST	3316	p-MAPKAPK-2(Thr222) 9A7	p38 MAPK	1:1000	Ra mAb
CST	3007	p-MAPKAPK-2(Thr2334)27B7	p38 MAPK	1:1000	Ra mAb
CST	9236	p-MKK3/MKK6(Ser189/207) 22A8	p38 MAPK	1:1000	Ra mAb
CST	9595	p-MSK1(Thr581)	p38 MAPK	1:1000	Ra pAb
CST	4511	p-p38 MAPK(Thr180/Y182) D3F9	p38 MAPK	1:1000	Ra mAb
CST	9371	p-PKC(pan)βII (Ser660)	Phospholipase	1:1000	Ra pAb
CST	9375	p-PKCα/β(Thr638/641)	Phospholipase	1:1000	Ra pAb
CST	9374	p-PKCΔ(Thr505)	Phospholipase	1:1000	Ra pAb
CST	9376	p-PKCΔ/θ(Ser643/676)	Phospholipase	1:750	Ra pAb
CST	9378	p-PKCZ/λ(Thr410/403)	Phospholipase	1:750	Ra pAb
CST	9377	p-PKCθ(Thr538)	Phospholipase	1:750	Ra pAb
CST	3871	p-PLCg(Y1217)	Phospholipase	1:1000	Ra pAb
CST	3874	p-PLCg(Y759)	Phospholipase	1:1000	Ra pAb
CST	2821	p-PLCg(Y783)	Phospholipase	1:1000	Ra pAb
CST	4923	Non-p-4E-BP1(Thr46) 87D12	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	9451	p-4E-BP1 (Ser65)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2855	p-4E-BP1 (Thr37/46)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	9455	p-4E-BP1 (Thr70)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	9234	p70-S6 kinase(Thr389)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	4058	Phospho-Akt (Ser473) 193H12	PI3K-AKT-mTOR	1:2000	Ra mAb
CST	2965	p-Akt(Thr308)C31E5	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	3691	p-eEF2k(Ser366)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	3591	p-elF4B(Ser422)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	9741	p-elF4E(Ser209)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2441	p-elF4G(Ser1108)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	9316	p-GSK-3a(Ser21)36E9	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	9327	p-GSK-3a/β(Ser21/9)37F11 (GSK-3a preferred)	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	9323	p-GSK-3β(Ser9)5B3	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	2971	p-mTOR(Ser2448)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	3061	p-PDK1(Ser241)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2054	p-PKD/PKCm(Ser744/748)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2051	p-PKD/PKCm(Ser916)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2997	p-PRAS40(Thr246) C77D7	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	9551	p-PTEN(Ser380)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	2083	p-Raptor(Ser792)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	3556	p-RSK2 (Ser227) D53A11	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	4858	p-S6Rb(Ser235/236) D57.2.2e	PI3K-AKT-mTOR	1:2000	Ra mAb
CST	4838	p-S6Rb(Ser240/244)	PI3K-AKT-mTOR	1:1000	Ra pAb

CST	3615	p-Tuberin/TSC2 (Ser939)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	3617	p-Tuberin/TSC2 (Thr1462) 5B12	PI3K-AKT-mTOR	1:1000	Ra mAb
CST	3614	p-Tuberin/TSC2 (Thr1571)	PI3K-AKT-mTOR	1:1000	Ra pAb
CST	9101	p44/42 MAP kinase(Thr202/Tyr204)	Ras-Raf	1:1000	Ra pAb
CST	9198	p-CREB (Ser133) 87G3	Ras-Raf	1:1000	Ra mAb
CST	9154	p-MEK1/2 (Ser217/221) 41G9	Ras-Raf	1:1000	Ra mAb
CST	2111	p-Mnk1 (Thr197/202)	Ras-Raf	1:1000	Ra pAb
CST	9335	p-p90RSK(Ser380) 9D9	Ras-Raf	1:1000	Ra mAb
CST	9344	p-p90RSK(Thr359/Ser363)	Ras-Raf	1:1000	Ra pAb
CST	9346	p-p90RSK(Thr573)	Ras-Raf	1:1000	Ra pAb
CST	2606	p-PAK1(Ser144)PAK2(Ser141)	Ras-Raf	1:1000	Ra pAb
CST	2605	p-PAK1(Ser199/204)PAK2(Ser182/197)	Ras-Raf	1:1000	Ra pAb
CST	2601	p-PAK1(Thr423)/PAK2(Thr402)	Ras-Raf	1:1000	Ra pAb
CST	2607	p-PAK2(Ser20)	Ras-Raf	1:1000	Ra pAb
CST	4431	p-Raf-A (Ser299)	Ras-Raf	1:1000	Ra pAb
CST	2696	p-Raf-b(ser445)	Ras-Raf	1:1000	Ra pAb
CST	9421	p-Raf-c (Ser259)	Ras-Raf	1:1000	Ra pAb
CST	9431	p-Raf-c(Ser289/296/301)	Ras-Raf	1:1000	Ra pAb
CST	9427	p-Raf-c(Ser338)56A6	Ras-Raf	1:1000	Ra mAb
CST	9348	p-RSK(Thr356/Ser360)	Ras-Raf	1:1001	Ra pAb
CST	2102	Non-p-Src(Y416)7G9	RTK/TK	1:1000	Mo mAb
CST	2107	Non-p-Src(Y527)	RTK/TK	1:1000	Ra pAb
CST	3714	pALK (Tyr1282/1283)	RTK/TK	1:1000	Ra pAb
CST	3073	p-c-Kit(Y703)D12E12	RTK/TK	1:1000	Ra mAb
CST	2237	p-EGF Receptor (Tyr1045)	RTK/TK	1:1000	Ra pAb
CST	3777	p-EGF Receptor (Tyr1068) D7A5	RTK/TK	1:1000	Ra mAb
CST	2235	p-EGF Receptor (Tyr992)	RTK/TK	1:1000	Ra pAb
CST	3474	p-FLT3(Y591) 33G6	RTK/TK	1:1000	Ra mAb
CST	3233	p-Gab1 (Tyr627) C32H2	RTK/TK	1:1000	Ra mAb
CST	3882	p-Gab2 (Tyr452) C33G1	RTK/TK	1:1000	Ra mAb
CST	2243	p-HER2/ErbB2 (Tyr1221/1222) 6B12	RTK/TK	1:1000	Ra mAb
CST	2247	p-HER2/ErbB2 (Tyr1248)	RTK/TK	1:1000	Ra pAb
CST	3790	p-HER4/ErbB4 (Tyr984)	RTK/TK	1:1000	Ra pAb
CST	3021	p-IGF-I Receptor (Tyr1131)/Insulin Receptor (Tyr1146)	RTK/TK	1:1000	Ra pAb
CST	3024	p-IGF-I Receptor (Tyr1135/1136)	RTK/TK	1:1000	Ra pAb
CST	4568	p-IGF-I Receptor (Tyr980)	RTK/TK	1:1000	Ra pAb
CST	3077	p-Met(Thr1234/1235) D26	RTK/TK	1:1000	Ra mAb
CST	3124	p-PDGF Receptor-β(Thr1009) 42F9	RTK/TK	1:1000	Ra mAb
CST	2227	p-PDGF Receptor-β(Thr1021) 6F10	RTK/TK	1:1000	Ra mAb
CST	3168	p-PDGF Receptor-β(Thr740) 32A9	RTK/TK	1:1000	Ra mAb
CST	4549	p-PDGF Receptor-β(Thr751) C63G6	RTK/TK	1:1000	Ra mAb
CST	3173	p-PDGF Receptor-β(Thr771)	RTK/TK	1:1000	Ra mAb
CST	3221	p-Ret (Tyr905)	RTK/TK	1:1000	Ra pAb
Upstate	209	p-SHC(Y239)	RTK/TK	1:1000	Ra pAb
Upstate	206	p-SHC(Y317)	RTK/TK	1:1000	Ra pAb
CST	2007	p-SHIP2(Tyr1135)	RTK/TK	1:1000	Ra pAb
CST	2101	p-Src Family (Y416)	RTK/TK	1:1000	Ra pAb
CST	2105	p-Src(Y527)	RTK/TK	1:1000	Ra pAb
CST	2715	p-Syk (Tyr323)	RTK/TK	1:1000	Ra pAb
CST	2711	p-Syk (Tyr525/526)	RTK/TK	1:1000	Ra pAb
CST	3817	p-VEGF Receptor 2 (Tyr1059) D5A6	RTK/TK	1:1000	Ra mAb
CST	3770	p-VEGF Receptor 2 (Tyr1175) D5B11	RTK/TK	1:1000	Ra mAb
CST	4991	p-VEGF Receptor 2 (Tyr951) 15D2	RTK/TK	1:1000	Ra mAb
CST	2701	p-Zap-70 (Tyr319)/Syk (Tyr352)	RTK/TK	1:1000	Ra pAb
CST	9221	p-ATF-2(Thr71)	SAPK/JNK	1:1000	Ra pAb
CST	9261	p-c-Jun (Ser63) II	SAPK/JNK	1:1000	Ra pAb
CST	3270	p-c-Jun (Ser73) D47G9	SAPK/JNK	1:1000	Ra mAb
CST	4671	p-SAPK/JNK(Thr183/Y185) 98F2	SAPK/JNK	1:1000	Ra mAb
CST	9151	p-SEK1/MKK4(Thr261)	SAPK/JNK	1:1000	Ra pAb

CST	4668	p-SPAK/JNK(Thr183/Tyr185) 81E11	SAPK/JNK	1:1000	Ra mAb
CST	9516	p-Smad1/5(Ser463/465) 41D10	TGF-β	1:1000	Ra mAb
CST	3108	p-Smad2(Ser465/467) 138D4	TGF-β	1:1000	Ra mAb
CST	4508	p-TAK1 (Thr184/187) 90C7	TGF-β	1:1000	Ra mAb
CST	2568	p-LRP6 (Ser1490)	Wnt	1:1000	Ra pAb
CST	9561	p-β-catenin(Ser33/37/Thr41)	Wnt	1:750	Ra pAb
CST	9564	p-β-catenin(Ser45)	Wnt	1:1000	Ra pAb
Sigma	T6557	γ-Tublin	For nomalization	1:2000	Mo mAb

Abbreviations: CST, Cell Signaling Technology, Inc. (Danvers, MA); Upstate, Upstate Biotechnology, Inc. (Lake Placid, NY); Sigma, Sigma-Aldrich, Co. (St. Louis, MO); RTK/TK, Rreceptor tyrosine kinase/tyrosine kinase; Mo, mouse; Ra, rabbit; mAb, monoclonal antibody; pAb, polyconal antibody.

Supplementary Table S3.
Correlation between sensitivity to sorafenib and the phosphorylation of 180 signaling nodes

Rank	Antibody	Spearman CC	*P value*
1	p-S6Rb(Ser235/236) D57.2.2e	0.5791	0.0044
2	p-S6Rb(Ser240/244)	0.5524	0.0070
3	p-RSK2 (Ser227) D53A11	0.3370	0.1156
4	p-eIF4G(Ser1108)	0.3320	0.1213
5	p-NFkB p65(Ser536) 93H1	0.3281	0.1260
6	p-IRS-1(Ser612) C15H5	0.3093	0.1502
7	p-c-Kit(Y703) D12E12	0.2688	0.2133
8	p-Chk1 (Ser317)	0.2609	0.2274
9	p-Tuberin/TSC2 (Ser939)	0.2470	0.2537
10	p-Bad(Ser136)185D10	0.2322	0.2839
11	p-90RSK(Ser380) 9D9	0.2292	0.2902
12	p-Bim (Ser69) D7E11	0.2233	0.3031
13	p-PAK1(Thr423)/PAK2(Thr402)	0.2134	0.3254
14	Non-p-Src(Y527)	0.1937	0.3730
15	p-Cyclin D1 (Thr286) D29B3	0.1897	0.3829
16	p-Chk1 (Ser345)	0.1729	0.4270
17	p-PAK1(Ser199/204)PAK2(Ser182/197)	0.1670	0.4432
18	p-PKCZ/λ(Thr410/403)	0.1611	0.4597
19	p-PTEN(Ser380)	0.1512	0.4879
20	p-PAK1(Ser144)PAK2(Ser141)	0.1344	0.5379
21	p-ATM(Ser1981) 10H11.E12	0.1324	0.5440
22	p-PKCα/β(Thr638/641)	0.1166	0.5933
23	p-HER2/ErbB2 (Tyr1221/1222) 6B12	0.1136	0.6028
24	p-PKCθ(Thr538)	0.1136	0.6028
25	p-AMPKa(Thr172)	0.1117	0.6119
26	p-Raptor(Ser792)	0.1107	0.6123
27	p-HER2/ErbB2 (Tyr1248)	0.0988	0.6511
28	p-Chk2 (Ser19)	0.0879	0.6874
29	p-eNOS (Ser1177) C9C3	0.0800	0.7143
30	p-Ezrin(Thr567)/Radixin(Thr564)/Moesin(thr558)	0.0771	0.7245
31	p-FLT3(Y591) 33G6	0.0731	0.7381
32	p-Wee1 (Ser642) D47G5	0.0573	0.7933
33	p-EGF Receptor (Tyr992)	0.0553	0.8003
34	p-IRS-1(Ser636/639)	0.0455	0.8354
35	p-Tuberin/TSC2 (Thr1462) 5B12	0.0336	0.8780
36	p-eIF4E(Ser209)	0.0296	0.8923
37	p-GSK-3a(Ser21) 36E9	0.0267	0.9030
38	p-PAK2(Ser20)	0.0257	0.9066
39	p-Smad1/5(Ser463/465) 41D10	0.0227	0.9173
40	p-PDGF Receptor-β(Thr740)	0.0198	0.9281
41	p-MKK3/MKK6(Ser189/207) 22A8	0.0168	0.9388
42	p-PKCΔ/θ(Ser643/676)	0.0148	0.9460
43	p-Raf-A (Ser299)	0.0030	0.9892
44	p-HSP27(Ser82)	0.0020	0.9928
45	p-Raf-c(Ser338) 56A6	0.0010	0.9964
46	p-Chk1 (Ser296)	-0.0079	0.9730
47	p-AP2M1	-0.0089	0.9694
48	p-4E-BP1 (Thr37/46)	-0.0109	0.9622
49	p-Aurora A (T288)/Aurora B (T232)/Aurora C (T198)	-0.0119	0.9586
50	p-PLCg(Y783)	-0.0178	0.9370
51	p-SPAK/JNK(Thr183/Tyr185) 81E11	-0.0287	0.8976
52	p-TAK1 (Thr184/187) 90C7	-0.0356	0.8727
53	p-IGF-I R(Tyr1131)/Insulin R (Tyr1146)	-0.0366	0.8691
54	p-Cofilin(Ser3) 77G2	-0.0425	0.8478
55	p-Rb (Ser780)	-0.0435	0.8443
56	p-FoxO1 (Ser319)/FoxO4(Ser262)	-0.0445	0.8407
57	p-VASP(Ser239)	-0.0494	0.8231
58	p-GSK-3a/β(Ser21/9) 37F11	-0.0494	0.8231
59	p-VEGF Receptor 2 (Tyr1059)D5A6	-0.0494	0.8231
60	p-p53(Ser46)	-0.0504	0.8196
61	p-Ret (Tyr905)	-0.0534	0.8091
62	p-Stat 1(Y701)	-0.0613	0.7812
63	p-MSK1(Thr581)	-0.0632	0.7742
64	p-Raf-c (Ser259)	-0.0642	0.7708
65	p-β-catenin(Ser33/37/Thr41)	-0.0692	0.7535
66	p-ATR(Ser428)	-0.0702	0.7501
67	p-Smad2(Ser465/467) 138D4	-0.0731	0.7398
68	p-Tuberin/TSC2 (Thr1571)	-0.0800	0.7160
69	p-Rb (Ser807/811)	-0.0860	0.6958
70	p-PRAS40(Thr246) C77D7	-0.0870	0.6925
71	P-BAP1 (Ser592)	-0.0968	0.6593
72	p-Met(Thr1234/1235) D26	-0.1077	0.6236
73	p-Stat 5(Y694) C11C5	-0.1087	0.6203
74	p-Stat 3(Ser727)	-0.1097	0.6171
75	p-p90RSK(Thr359/Ser363)	-0.1126	0.6076
76	p-Rb (Ser795)	-0.1166	0.5949
77	p-Acetyl-CoA carboxylase(Ser79)	-0.1206	0.5824
78	p-Bcl-2(Thr56)	-0.1245	0.5699
79	p-LRP6 (Ser1490)	-0.1255	0.5669
80	p-Bad(Ser155)	-0.1275	0.5607
81	p-MEK1/2 (Ser217/221) 41G9	-0.1314	0.5485
82	p-MYPT(Ser668)	-0.1364	0.5334
83	p-Histone H3(Ser28)	-0.1374	0.5304
84	p-p53(Ser20)	-0.1443	0.5097
85	p-Src(Y527)	-0.1443	0.5097
86	p-Src Family (Y416)	-0.1443	0.5097
87	p-eEF2k(Ser366)	-0.1462	0.5039
88	p-PKD/PKCm(Ser744/748)	-0.1462	0.5039
89	p-EGF Receptor (Tyr1045)	-0.1482	0.4980
90	p-Gab2 (Tyr452) C33G1	-0.1571	0.4723
91	p-p38 MAPK(Thr180/Y182) D3F9	-0.1581	0.4695
92	p-eIF4B(Ser422)	-0.1611	0.4611
93	p-PKD/PKCm(Ser916)	-0.1611	0.4611
94	p-PKCΔ(Thr505)	-0.1640	0.4528
95	p-BRCA1(Ser1524)	-0.1650	0.4500
96	p-Chk2 (Thr68)	-0.1680	0.4418
97	p-LKB1 (Ser428) (C67A3)	-0.1680	0.4418
98	p-FoxO3a (Ser318/321)	-0.1700	0.4364
99	p-p53(Ser9)	-0.1709	0.4337
100	p-4E-BP1 (Thr70)	-0.1779	0.4151
101	p-IGF-I Receptor (Tyr1135/1136)	-0.1789	0.4124
102	p-CREB (Ser133) 87G3	-0.1818	0.4046
103	p-PLCg(Y759)	-0.1828	0.4020
104	p-IRS-1(Ser307)	-0.1877	0.3892
105	p-mTOR(Ser2448)	-0.1927	0.3767
106	p-Mnk1 (Thr197/202)	-0.1927	0.3767
107	p-VASP(Ser157)	-0.1996	0.3595
108	p-Chk2 (Ser33/35)	-0.2016	0.3547
109	p-IκB-α (Ser32/36) 5A5	-0.2036	0.3499
110	p-Zap-70 (Tyr319)/Syk (Tyr352)	-0.2036	0.3499
111	p-Chk2 (Thr387)	-0.2065	0.3428
112	Non-p-Src(Y416) 7G9	-0.2085	0.3381
113	p-Tyk2 (Tyr1054/1055)	-0.2125	0.3289
114	p-PKC(pan)βII (Ser660)	-0.2144	0.3243
115	p-VEGF Receptor 2 (Tyr1175)	-0.2164	0.3198
116	p-PDGF Receptor-β(Thr751)	-0.2174	0.3175
117	p-PKM2 (Tyr105)	-0.2174	0.3175
118	p-MAPKAPK-2(Thr2334)27B7	-0.2194	0.3131

Rank	Antibody	Spearman CC	*P value*
119	p-PDGF Receptor-β(Thr1021)	-0.2204	0.3108
120	p-PLCg(Y1217)	-0.2223	0.3064
121	p70-S6 kinase(Thr389)	-0.2233	0.3042
122	p-IGF-I Receptor (Tyr980)	-0.2253	0.2999
123	p-Bad(Ser112)	-0.2253	0.2999
124	p-MAPKAPK-2(Thr222) 9A7	-0.2273	0.2956
125	p-SHIP2(Tyr1135)	-0.2312	0.2871
126	p-p53(Ser15)	-0.2332	0.2829
127	p-Syk (Tyr323)	-0.2372	0.2746
128	p-VEGF Receptor 2 (Tyr951) 15D2	-0.2372	0.2746
129	p-p53(Ser6)	-0.2460	0.2566
130	p-NFkB p65(Ser276)	-0.2470	0.2546
131	p-IKKα (Ser180)/IKKβ (Ser181)	-0.2500	0.2488
132	p-Histone H3(Ser10)	-0.2500	0.2488
133	p-PDGF Receptor-β(Thr771)	-0.2540	0.2412
134	p-FoxO1 (Thr24)/FoxO3a (Thr32)	-0.2579	0.2338
135	p-p53(Ser15) 16G8	-0.2609	0.2283
136	p-p90RSK(Thr573)	-0.2619	0.2265
137	p-Histone H3(Thr11)	-0.2638	0.2229
138	p-FoxO1 (Thr24)/FoxO3a (Thr32)/FoxO4 (Thr28) 4G	-0.2717	0.2090
139	p-Histone H2A.X(Ser139)	-0.2737	0.2056
140	p-NFkB p65(Ser468)	-0.2757	0.2022
141	p-Syk (Tyr525/526)	-0.2866	0.1844
142	p-EGF Receptor (Tyr1068) D7A5	-0.2885	0.1813
143	p-4E-BP1 (Ser65)	-0.2895	0.1798
144	p-Chk1 (Ser345) 133D3	-0.2945	0.1722
145	p-FoxO3a (Ser253)	-0.2994	0.1649
146	p-MYPT(Thr853)	-0.3024	0.1606
147	p-Jak2 (Tyr1007/1008) C80C3	-0.3103	0.1495
148	p-ATF-2(Thr71)11G2	-0.3123	0.1468
149	p-p53(Ser392)	-0.3142	0.1442
150	p-RSK(Thr356/Ser360)	-0.3172	0.1403
151	p-Gab1 (Tyr627) C32H2	-0.3221	0.1339
152	p-Raf-c(Ser289/296/301)	-0.3271	0.1278
153	p-MYPT(Ser507)	-0.3271	0.1278
154	p-c-Jun (Ser73) D47G9	-0.3291	0.1254
155	p-GSK-3β(Ser9) 5B3	-0.3419	0.1107
156	p-FoxO1 (Ser256)	-0.3458	0.1064
157	p-AMPKb(Ser108)	-0.3518	0.1003
158	p-SHC(Y239)	-0.3557	0.0963
159	p-Histone H3(Thr3)	-0.3577	0.0944
160	p-Akt(Thr308) C31E5	-0.3597	0.0925
161	p-PDK1(Ser241)	-0.3656	0.0869
162	p-p53(Ser37)	-0.3656	0.0869
163	p44/42 MAP kinase(Thr202/Tyr204)	-0.3666	0.0860
164	p-ATF-2(Thr71)	-0.3686	0.0843
165	Non-p-4E-BP1(Thr46) 87D12	-0.3745	0.0791
166	p-Stat 2(Y690)	-0.3745	0.0791
167	p-SEK1/MKK4(Thr261)	-0.3765	0.0774
168	p-ALK (Tyr1282/1283)	-0.3844	0.0711
169	p-Raf-b(ser445)	-0.3864	0.0695
170	p-Stat 6(Y641)	-0.3962	0.0622
171	p-PDGF Receptor-β(Thr1009)	-0.3982	0.0609
172	p-Aurora A (Thr288) C39D8	-0.4051	0.0562
173	p-Bcl-2(Ser70) 5H2	-0.4101	0.0531
174	p-c-Jun (Ser63) II	-0.4111	0.0525
175	p-HER4/ErbB4 (Tyr984)	-0.4160	0.0495
176	p-β-catenin(Ser45)	-0.4298	0.0418
177	p-Akt(Ser473) 193H12	-0.4684	0.0254
178	p-Stat 3(Y705) D3A7	-0.4713	0.0244
179	p-SAPK/JNK(Thr183/Y185) 98F2	-0.5188	0.0122
180	p-SHC(Y317)	-0.5623	0.0060

Abbreviation: Spearman CC, Spearman correlation coefficient.

Supplementary Table S4. Clinical characteristics of patients

Patient	Age	Gender	Viral infection	Stage[a]	TNM[a]	Duration of Nexavar treatment (mo)	OS (mo)	AFP (ng/ml) before treatment[b]	AFP (ng/ml) after treatment[b]	Response[c]	Positivity[d]	Intensity[e]
1	62	Male	(-)	IV	cT4N0M1	24.0	27.0	1,621	816	PR	1	1
2	67	Male	HBV	IV	cT3NxM1	2.4	2.4	1,786	–	PD	4	3
3	59	Male	HBV	IV	cT3NxM1	2.4	2.4	154,470	182780	PD	3	3
4	69	Female	HCV	IV	cT3NxM1	1.2	4.0	29	412	PD	3	3
5	75	Female	(-)	IIIC	cT3NxM0	1.0	1.0	3	–	PD	4	3
6	78	Male	(-)	IIIB	cT3bN0M0	1.7	–	–	–	PD	2	3
7	60	Male	HBV	IIIA	cT3aN0M0	2.3	14.4	–	–	PD	4	3
8	51	Female	HCV	IV	cT3bN1M0	0.5	2.0	4,359	–	PD	2	3
9	90	Male	(-)	II	cT2N0M0	1.8	3.0	166	–	PD	2	3

[a]According to the International Union Against Cancer (UICC) TNM Classification of Malignant Tumours, 7th edition (2009).
[b]Measured before and a month after sorafenib treatments.
[c]According to the Response Evaluation Criteria for Solid Tumors (RECIST) guidelines.
[d]Percentage of p-RPS6 Ser235/236-positive cells (0 = 0%, 1 = 1-25%, 2 = 26-50%, 3 = 51-75% and 4 = 76-100%).
[e]Intensity of p-RPS6 Ser235/236 staining (0, absent; 1, weak; 2, moderate; and 3, strong).
Abbreviations: mo, month; OS, overall survival; AFP, α-fetoprotein; PR, partial response; PD, progressive disease

Supplementary Table S5.
List of the 511 Kinase Genes Sequenced

#	Name	Entrez_Symbol
1	AAK1	AAK1
2	LMR1	AATK
3	ABL1	ABL1
4	ABL2	ABL2
5	ALK2	ACVR1
6	ALK4	ACVR1B
7	ALK7	ACVR1C
8	ACTR2	ACVR2A
9	ACTR2B	ACVR2B
10	ALK1	ACVRL1
11	ADCK1	ADCK1
12	ADCK2	ADCK2
13	ADCK4	ADCK4
14	ADCK5	ADCK5
15	BARK1	ADRBK1
16	BARK2	ADRBK2
17	AKT1	AKT1
18	AKT2	AKT2
19	AKT3	AKT3
20	ALK	ALK
21	AlphaK3	ALPK1
22	AlphaK2	ALPK2
23	AlphaK1	ALPK3
24	STLK6	ALS2CR2
25	PFTAIRE2	ALS2CR7
26	MISR2	AMHR2
27	SgK288	ANKK1
28	ARAF	ARAF
29	ATM	ATM
30	ATR	ATR
31	AurA	AURKA
32	AurB	AURKB
33	AurC	AURKC
34	AXL	AXL
35	BCKDK	BCKDK
36	BCR	BCR
37	BLK	BLK
38	BIKE	BMP2K
39	BMPR1A	BMPR1A
40	BMPR1B	BMPR1B
41	BMPR2	BMPR2
42	BMX	BMX
43	BRAF	BRAF
44	BRD2	BRD2
45	BRD3	BRD3
46	BRD4	BRD4
47	BRDT	BRDT
48	BRSK1	BRSK1
49	BRSK2	BRSK2
50	BTK	BTK
51	BUB1	BUB1
52	BUBR1	BUB1B
53	SgK071	C9orf96
54	ADCK3	CABC1
55	CaMK1a	CAMK1
56	CaMK1d	CAMK1D
57	CaMK1g	CAMK1G
58	CaMK2a	CAMK2A
59	CaMK2b	CAMK2B
60	CaMK2d	CAMK2D
61	CaMK2g	CAMK2G
62	CaMK4	CAMK4
63	CaMKK1	CAMKK1
64	CaMKK2	CAMKK2
65	VACAMKL	CAMKV
66	CASK	CASK
67	CCRK	CCRK
68	CDC2	CDC2
69	CHED	CDC2L5
70	CDK11	CDC2L6
71	MRCKa	CDC42BPA
72	MRCKb	CDC42BPB
73	DMPK2	CDC42BPG
74	CDC7	CDC7
75	CDK10	CDK10
76	CDK2	CDK2
77	CDK3	CDK3
78	CDK4	CDK4
79	CDK5	CDK5
80	CDK6	CDK6
81	CDK7	CDK7
82	CDK8	CDK8
83	CDK9	CDK9
84	CDKL1	CDKL1
85	CDKL2	CDKL2
86	CDKL3	CDKL3
87	CDKL4	CDKL4
88	CDKL5	CDKL5
89	CHK1	CHEK1
90	CHK2	CHEK2
91	IKKa	CHUK
92	CRIK	CIT
93	CLK1	CLK1
94	CLK2	CLK2
95	CLK3	CLK3
96	CLK4	CLK4
97	CRK7	CRKRS
98	FMS	CSF1R
99	CSK	CSK
100	CK1a	CSNK1A1
101	CK1a2	CSNK1A1L
102	CK1d	CSNK1D
103	CK1e	CSNK1E
104	CK1g1	CSNK1G1
105	CK1g2	CSNK1G2
106	CK1g3	CSNK1G3
107	CK2a1	CSNK2A1
108	CK2a2	CSNK2A2
109	DAPK1	DAPK1
110	DAPK2	DAPK2
111	DAPK3	DAPK3
112	DCLK1	DCAMKL1
113	DCLK2	DCAMKL2
114	DCLK3	DCAMKL3
115	DDR1	DDR1
116	DDR2	DDR2
117	SgK223	DKFZp761P0423
118	DMPK1	DMPK
119	DYRK1A	DYRK1A
120	DYRK1B	DYRK1B
121	DYRK2	DYRK2
122	DYRK3	DYRK3
123	DYRK4	DYRK4
124	eEF2K	EEF2K
125	EGFR	EGFR
126	HRI	EIF2AK1
127	PKR	EIF2AK2
128	PEK	EIF2AK3
129	GCN2	EIF2AK4
130	EphA1	EPHA1
131	EphA10	EPHA10
132	EphA2	EPHA2
133	EphA3	EPHA3
134	EphA4	EPHA4
135	EphA5	EPHA5
136	EphA6	EPHA6
137	EphA7	EPHA7
138	EphA8	EPHA8
139	EphB1	EPHB1
140	EphB2	EPHB2
141	EphB3	EPHB3
142	EphB4	EPHB4
143	EphB6	EPHB6
144	ErbB2	ERBB2
145	ErbB3	ERBB3
146	ErbB4	ERBB4
147	IRE1	ERN1
148	IRE2	ERN2
149	FASTK	FASTK
150	FER	FER
151	FES	FES
152	FGFR1	FGFR1
153	FGFR2	FGFR2
154	FGFR3	FGFR3
155	FGFR4	FGFR4
156	FGR	FGR
157	SgK196	FLJ23356
158	SgK494	FLJ25006
159	FLT1	FLT1
160	FLT3	FLT3
161	FLT4	FLT4
162	FRAP	FRAP1
163	FRK	FRK
164	FYN	FYN
165	GAK	GAK
166	RHOK	GRK1
167	GPRK4	GRK4
168	GPRK5	GRK5

#	Name	Entrez_Symbol
169	GPRK6	GRK6
170	GPRK7	GRK7
171	Haspin	GSG2
172	GSK3A	GSK3A
173	GSK3B	GSK3B
174	HSER	GUCY2C
175	CYGD	GUCY2D
176	CYGF	GUCY2F
177	HCK	HCK
178	HIPK1	HIPK1
179	HIPK2	HIPK2
180	HIPK3	HIPK3
181	HIPK4	HIPK4
182	H11	HSPB8
183	HUNK	HUNK
184	ICK	ICK
185	IGF1R	IGF1R
186	IKKb	IKBKB
187	IKKe	IKBKE
188	ILK	ILK
189	INSR	INSR
190	IRR	INSRR
191	IRAK1	IRAK1
192	IRAK2	IRAK2
193	IRAK3	IRAK3
194	IRAK4	IRAK4
195	ITK	ITK
196	JAK1	JAK1
197	JAK2	JAK2
198	JAK3	JAK3
199	Trad	KALRN
200	KDR	KDR
201	QSK	KIAA0999
202	MLK4	KIAA1804
203	SgK269	KIAA2002
204	KIT	KIT
205	KSR1	KSR1
206	KSR2	KSR2
207	LATS1	LATS1
208	LATS2	LATS2
209	LCK	LCK
210	LIMK1	LIMK1
211	LIMK2	LIMK2
212	LMR2	LMTK2
213	MAST4	LOC375449
214	SgK069	LOC646643
215	SPEG	LOC729871
216	SgK493	LOC91461
217	LRRK1	LRRK1
218	LRRK2	LRRK2
219	LTK	LTK
220	STLK5	LYK5
221	LYN	LYN
222	MAK	MAK
223	MAP2K1	MAP2K1
224	MAP2K2	MAP2K2
225	MAP2K3	MAP2K3

#	Name	Entrez_Symbol
226	MAP2K4	MAP2K4
227	MAP2K5	MAP2K5
228	MAP2K6	MAP2K6
229	MAP2K7	MAP2K7
230	MAP3K1	MAP3K1
231	MLK2	MAP3K10
232	MLK3	MAP3K11
233	DLK	MAP3K12
234	LZK	MAP3K13
235	NIK	MAP3K14
236	MAP3K7	MAP3K15
237	MAP3K2	MAP3K2
238	MAP3K3	MAP3K3
239	MAP3K4	MAP3K4
240	MAP3K5	MAP3K5
241	MAP3K6	MAP3K6
242	TAK1	MAP3K7
243	COT	MAP3K8
244	MLK1	MAP3K9
245	HPK1	MAP4K1
246	GCK	MAP4K2
247	KHS2	MAP4K3
248	HGK	MAP4K4
249	KHS1	MAP4K5
250	Erk2	MAPK1
251	JNK3	MAPK10
252	p38b	MAPK11
253	p38g	MAPK12
254	p38d	MAPK13
255	p38a	MAPK14
256	Erk7	MAPK15
257	Erk1	MAPK3
258	Erk4	MAPK4
259	Erk3	MAPK6
260	Erk5	MAPK7
261	JNK1	MAPK8
262	JNK2	MAPK9
263	MAPKAPK2	MAPKAPK2
264	MAPKAPK3	MAPKAPK3
265	MAPKAPK5	MAPKAPK5
266	MARK1	MARK1
267	MARK2	MARK2
268	MARK3	MARK3
269	MARK4	MARK4
270	MAST1	MAST1
271	MAST2	MAST2
272	MAST3	MAST3
273	MASTL	MASTL
274	CTK	MATK
275	MELK	MELK
276	MER	MERTK
277	MET	MET
278	TBCK	MGC16169
279	NIM1	MGC42105
280	MINK	MINK1
281	MNK1	MKNK1
282	MNK2	MKNK2

#	Name	Entrez_Symbol
283	caMLCK	MLCK
284	MLKL	MLKL
285	MOS	MOS
286	RON	MST1R
287	MUSK	MUSK
288	smMLCK	MYLK
289	skMLCK	MYLK2
290	MYO3A	MYO3A
291	MYO3B	MYO3B
292	NEK1	NEK1
293	NEK10	NEK10
294	NEK11	NEK11
295	NEK2	NEK2
296	NEK3	NEK3
297	NEK4	NEK4
298	NEK5	NEK5
299	NEK6	NEK6
300	NEK7	NEK7
301	NEK8	NEK8
302	NEK9	NEK9
303	NLK	NLK
304	ANPa	NPR1
305	ANPb	NPR2
306	NRBP1	NRBP1
307	NRBP2	NRBP2
308	NRK	NRK
309	TRKA	NTRK1
310	TRKB	NTRK2
311	TRKC	NTRK3
312	NuaK1	NUAK1
313	NuaK2	NUAK2
314	Obscn	OBSCN
315	OSR1	OXSR1
316	PAK1	PAK1
317	PAK2	PAK2
318	PAK3	PAK3
319	PAK4	PAK4
320	PAK6	PAK6
321	PAK5	PAK7
322	PASK	PASK
323	PBK	PBK
324	PCTAIRE1	PCTK1
325	PCTAIRE2	PCTK2
326	PCTAIRE3	PCTK3
327	PDGFRa	PDGFRA
328	PDGFRb	PDGFRB
329	CLIK1L	PDIK1L
330	PDHK1	PDK1
331	PDHK2	PDK2
332	PDHK3	PDK3
333	PDHK4	PDK4
334	PDK1	PDPK1
335	PFTAIRE1	PFTK1
336	PHKg1	PHKG1
337	PHKg2	PHKG2
338	PIK3R4	PIK3R4
339	PIM1	PIM1

#	Name	Entrez_Symbol
340	PIM2	PIM2
341	PIM3	PIM3
342	PINK1	PINK1
343	MYT1	PKMYT1
344	PKN1	PKN1
345	PKN2	PKN2
346	PKN3	PKN3
347	PLK1	PLK1
348	PLK2	PLK2
349	PLK3	PLK3
350	PLK4	PLK4
351	CaMK1b	PNCK
352	AMPKa1	PRKAA1
353	AMPKa2	PRKAA2
354	PKACa	PRKACA
355	PKACb	PRKACB
356	PKACg	PRKACG
357	PKCa	PRKCA
358	PKCb	PRKCB1
359	PKCd	PRKCD
360	PKCe	PRKCE
361	PKCg	PRKCG
362	PKCh	PRKCH
363	PKCi	PRKCI
364	PKCt	PRKCQ
365	PKCz	PRKCZ
366	PKD1	PRKD1
367	PKD2	PRKD2
368	PKD3	PRKD3
369	DNAPK	PRKDC
370	PKG1	PRKG1
371	PKG2	PRKG2
372	PRKX	PRKX
373	PRKY	PRKY
374	PRP4	PRPF4B
375	PSKH1	PSKH1
376	PSKH2	PSKH2
377	FAK	PTK2
378	PYK2	PTK2B
379	BRK	PTK6
380	CCK4	PTK7
381	Slob	PXK
382	RAF1	RAF1
383	MOK	RAGE
384	RET	RET
385	RIOK1	RIOK1
386	RIOK2	RIOK2
387	RIOK3	RIOK3
388	RIPK1	RIPK1
389	RIPK2	RIPK2
390	RIPK3	RIPK3
391	ANKRD3	RIPK4
392	SgK496	RIPK5
393	RNAseL	RNASEL
394	ROCK1	ROCK1
395	ROCK2	ROCK2
396	ROR1	ROR1
397	ROR2	ROR2
398	ROS	ROS1
399	SgK085	RP11-145H9.1
400	MST4	RP6-213H19.1
401	RSK3	RPS6KA1
402	RSK1	RPS6KA2
403	RSK2	RPS6KA3
404	MSK2	RPS6KA4
405	MSK1	RPS6KA5
406	RSK4	RPS6KA6
407	p70S6K	RPS6KB1
408	p70S6Kb	RPS6KB2
409	RSKL1	RPS6KC1
410	RSKL2	RPS6KL1
411	RYK	RYK
412	SBK	SBK1
413	SCYL1	SCYL1
414	SCYL2	SCYL2
415	SCYL3	SCYL3
416	SGK1	SGK
417	SGK2	SGK2
418	SGK3	SGK3
419	SLK	SLK
420	SMG1	SMG1
421	SIK	SNF1LK
422	QIK	SNF1LK2
423	SNRK	SNRK
424	SRC	SRC
425	SRM	SRMS
426	SRPK1	SRPK1
427	SRPK2	SRPK2
428	MSSK1	SRPK3
429	LOK	STK10
430	LKB1	STK11
431	MPSK1	STK16
432	DRAK1	STK17A
433	DRAK2	STK17B
434	G11	STK19
435	MST3	STK24
436	YSK1	STK25
437	MST2	STK3
438	SgK396	STK31
439	YANK1	STK32A
440	YANK2	STK32B
441	YANK3	STK32C
442	STK33	STK33
443	CLIK1	STK35
444	Fused	STK36
445	NDR1	STK38
446	NDR2	STK38L
447	STLK3	STK39
448	MST1	STK4
449	SgK495	STK40
450	SuRTK106	STYK1
451	SYK	SYK
452	TAF1	TAF1
453	TAF1L	TAF1L
454	TAO1	TAOK1
455	TAO2	TAOK2
456	TAO3	TAOK3
457	TBK1	TBK1
458	TEC	TEC
459	TIE2	TEK
460	TESK1	TESK1
461	TESK2	TESK2
462	SgK307	TEX14
463	TGFbR1	TGFBR1
464	TGFbR2	TGFBR2
465	TIE1	TIE1
466	TLK1	TLK1
467	TLK2	TLK2
468	TNIK	TNIK
469	TNK1	TNK1
470	ACK	TNK2
471	HH498	TNNI3K
472	PRPK	TP53RK
473	Trb1	TRIB1
474	Trb2	TRIB2
475	Trb3	TRIB3
476	TIF1a	TRIM24
477	TIF1b	TRIM28
478	TIF1g	TRIM33
479	Trio	TRIO
480	ChaK2	TRPM6
481	ChaK1	TRPM7
482	TRRAP	TRRAP
483	TSSK1	TSSK1B
484	TSSK2	TSSK2
485	TSSK3	TSSK3
486	TSSK4	TSSK4
487	SSTK	TSSK6
488	TTBK1	TTBK1
489	TTBK2	TTBK2
490	TTK	TTK
491	TTN	TTN
492	TXK	TXK
493	TYK2	TYK2
494	TYRO3	TYRO3
495	KIS	UHMK1
496	ULK1	ULK1
497	ULK2	ULK2
498	ULK3	ULK3
499	ULK4	ULK4
500	VRK1	VRK1
501	VRK2	VRK2
502	VRK3	VRK3
503	Wee1	WEE1
504	Wnk1	WNK1
505	Wnk2	WNK2
506	Wnk3	WNK3
507	Wnk4	WNK4
508	YES	YES1
509	MAP3K8	YSK4
510	ZAK	ZAK
511	ZAP70	ZAP70

Supplementary Table S6.

Kinase gene alterations in HCC Cell Lines[a]

No.	Gene	Chr	RefSeq[b]	cDNA	Amino acid	Type	SNU449	HUH6	JHH7	HuH7	SKHep1	JHH5	C3A	HepG2	JHH4	huH1	HLE	SNU398	SNU475	HLF	Alex	KIM1	JHH1	SNU182	SNU423	SNU378
1	TTN	2	NM_133432	c.G77113A	p.D25705N	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.T71588C	p.L23863P	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.G70443A	p.W23481X	stopgain SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.G66505T	p.V22169L	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.62007_62008insG	p.R20669fs	*frameshift insertion*	-	-	-	-	○	-	-	-	-	-	-	○	-	○	-	-	-	-	○	-
	TTN	2	NM_133432	c.60574_60576del	p.20192_20192del	nonframeshift deletion	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.G60069T	p.W20023C	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
	TTN	2	NM_133432	c.C58586G	p.S19529C	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	TTN	2	NM_133432	c.C45917T	p.P15306L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	TTN	2	NM_133432	c.A40264G	p.T13422A	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.T40097C	p.I13366T	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A39550G	p.T13184A	nonsynonymous SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A32462G	p.N10821S	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.C27845G	p.T9282S	nonsynonymous SNV	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.G23632A	p.E7878K	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A18388G	p.I6130V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.G16597C	p.D5533H	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A9128G	p.Q3043R	nonsynonymous SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.T8795C	p.I2932T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	TTN	2	NM_133432	c.C7931T	p.T2644I	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A6339C	p.E2113D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A3590C	p.Q1197P	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TTN	2	NM_133432	c.A665T	p.E222V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
2	OBSCN	1	NM_001098623	c.C959T	p.T320I	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	OBSCN	1	NM_001098623	c.G1408T	p.A470S	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.G2539A	p.E847K	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.C5078T	p.A1693V	nonsynonymous SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.G5272C	p.E1758Q	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	○	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.T6816G	p.F2272L	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.C7882T	p.R2628C	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.C9473T	p.T3158I	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	OBSCN	1	NM_001098623	c.C10936T	p.R3646W	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.T12574G	p.W4192G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	OBSCN	1	NM_001098623	c.C13820T	p.P4607L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
	OBSCN	1	NM_001098623	c.G14003A	p.R4668Q	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	OBSCN	1	NM_001098623	c.C17573A	p.A5858E	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	OBSCN	1	NM_052843	c.19093_19094insC	p.T6365fs	frameshift insertion	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
3	EPHA1	7	NM_005232	c.T2743C	p.Y915H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
	EPHA1	7	NM_005232	c.G2155T	p.D719Y	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	EPHA1	7	NM_005232	c.C772G	p.P258A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	EPHA1	7	NM_005232	c.T770G	p.V257G	nonsynonymous SNV	-	○	○	○	○	○	○	○	○	-	○	○	-	○	○	○	○	○	-	○
	EPHA1	7	NM_005232	c.A701C	p.H234P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-
	EPHA1	7	NM_005232	c.A688G	p.T230A	nonsynonymous SNV	-	-	○	○	○	○	○	-	-	○	-	-	-	○	○	○	-	○	-	-
4	ROS1	6	NM_002944	c.G6878A	p.G2293D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-

	ROS1	6	NM_002944	c.C6847A	p.Q2283K	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	ROS1	6	NM_002944	c.A5689G	p.T1897A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-
	ROS1	6	NM_002944	c.T3325G	p.S1109A	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ROS1	6	NM_002944	c.C848A	p.S283Y	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ROS1	6	NM_002944	c.T397C	p.W133R	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5	KSR2	12	NM_173598	c.C2350A	p.L784M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	KSR2	12	NM_173598	c.C479T	p.P160L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	KSR2	12	NM_173598	c.C353A	p.S118Y	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	○	-	-	○	-	-	-	-	-	-
	KSR2	12	NM_173598	c.G262T	p.E88X	stopgain SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	KSR2	12	NM_173598	c.G166C	p.E56Q	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
6	MAP3K4	6	NM_005922	c.C533T	p.S178L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	MAP3K4	6	NM_005922	c.G2719A	p.G907S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
	MAP3K4	6	NM_005922	c.A2996G	p.N999S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	MAP3K4	6	NM_005922	c.3566_3568del	p.1189_1190del	nonframeshift deletion	○	○	○	○	-	○	○	○	○	-	○	○	○	○	○	○	○	○	○	○
	MAP3K4	6	NM_005922	c.G3656A	p.S1219N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
7	NTRK1	1	NM_002529	c.A748C	p.T250P	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	NTRK1	1	NM_002529	c.T902C	p.I301T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
	NTRK1	1	NM_002529	c.T2048G	p.V683G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	NTRK1	1	NM_002529	c.G2212A	p.D738N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	NTRK1	1	NM_002529	c.A2378C	p.D793A	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	ALK	2	NM_004304	c.G3630T	p.E1210D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-
	ALK	2	NM_004304	c.A3089C	p.H1030P	nonsynonymous SNV	-	○	○	○	○	-	○	○	○	○	○	○	-	○	○	○	○	○	○	○
	ALK	2	NM_004304	c.T1508G	p.V503G	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	○	-	-	○	-	-	-	○	-	-
	ALK	2	NM_004304	c.T843A	p.H281Q	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	EPHA2	1	NM_004431	c.G2845C	p.V949L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	EPHA2	1	NM_004431	c.A769C	p.I257L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
	EPHA2	1	NM_004431	c.766_767insG	p.P256fs	frameshift insertion	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	EPHA2	1	NM_004431	c.T764G	p.V255G	nonsynonymous SNV	-	○	○	○	○	○	○	○	○	○	○	○	○	○	-	○	○	○	-	○
10	INSR	19	NM_000208	c.T3661G	p.S1221A	nonsynonymous SNV	○	○	-	○	-	-	-	○	-	○	○	-	-	○	○	-	-	○	-	-
	INSR	19	NM_000208	c.G3143A	p.G1048D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	INSR	19	NM_000208	c.C1988G	p.A663G	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	○	-	-
	INSR	19	NM_000208	c.C806T	p.P269L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
11	MYLK	3	NM_053031	c.89_89del	p.30_30del	frameshift deletion	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MYLK	3	NM_053026	c.G2161C	p.G721R	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	MYLK	3	NM_053026	c.G617A	p.R206H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	MYLK	3	NM_053026	c.G455A	p.R152H	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	PRKDC	8	NM_006904	c.G11221A	p.V3741M	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PRKDC	8	NM_006904	c.C10466T	p.P3489L	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
	PRKDC	8	NM_006904	c.6337_6339del	p.2113_2113del	nonframeshift deletion	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PRKDC	8	NM_006904	c.419_430del	p.140_144del	nonframeshift deletion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
13	SPEG	2	NM_005876	c.C2282A	p.A761E	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	SPEG	2	NM_005876	c.G2971A	p.V991M	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SPEG	2	NM_005876	c.A3992G	p.Q1331R	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
	SPEG	2	NM_005876	c.C8926A	p.R2976S	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
14	ACVR2A	2	NM_001616	c.T234A	p.C78X	stopgain SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
	ACVR2A	2	NM_001616	c.C452T	p.A151V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
	ACVR2A	2	NM_001616	c.A945C	p.K315N	nonsynonymous SNV	-	○	○	○	-	-	○	○	○	-	-	-	-	-	○	-	○	-	-	○

15	ATM	11	NM_000051	c.A1223C	p.D408A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	ATM	11	NM_000051	c.C2569G	p.L857V	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ATM	11	NM_000051	c.G8716A	p.V2906I	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
16	BCKDK	16	NM_005881	c.777_778insG	p.A259fs	frameshift insertion	○	-	○	○	○	○	-	-	-	-	-	○	○	-	-	-	-	○	○	-
	BCKDK	16	NM_005881	c.C779G	p.A260G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	BCKDK	16	NM_005881	c.T784G	p.F262V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
17	CAMK2B	7	NM_172079	c.A1456C	p.T486P	nonsynonymous SNV	-	○	○	○	○	○	○	-	○	-	○	-	○	○	○	○	○	-	-	○
	CAMK2B	7	NM_172079	c.G1454C	p.R485P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	CAMK2B	7	NM_172082	c.G988T	p.A330S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
18	EPHB6	7	NM_004445	c.T682C	p.F228L	nonsynonymous SNV	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-
	EPHB6	7	NM_004445	c.C1045T	p.P349S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-
	EPHB6	7	NM_004445	c.A2852C	p.D951A	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
19	FLT4	5	NM_182925	c.C3871A	p.H1291N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	FLT4	5	NM_182925	c.C1855G	p.P619A	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	FLT4	5	NM_182925	c.G1388A	p.W463X	stopgain SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
20	INSRR	1	NM_014215	c.C3763A	p.R1255S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	INSRR	1	NM_014215	c.G1668C	p.Q556H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	INSRR	1	NM_014215	c.C320T	p.T107M	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
21	MAK	6	NM_001242957	c.A1940C	p.H647P	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	MAK	6	NM_001242957	c.T1922G	p.V641G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	MAK	6	NM_001242957	c.A1098C	p.K366N	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
22	PASK	2	NM_001252122	c.A3539C	p.H1180P	nonsynonymous SNV	-	○	○	-	-	○	○	○	○	-	○	-	-	○	-	-	-	-	-	-
	PASK	2	NM_001252122	c.G685T	p.V229L	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PASK	2	NM_001252122	c.A668G	p.E223G	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	PRKD3	2	NM_005813	c.G2465A	p.S822N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	PRKD3	2	NM_005813	c.G1153A	p.E385K	nonsynonymous SNV	-	○	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PRKD3	2	NM_005813	c.G338A	p.R113H	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	VRK3	19	NM_016440	c.384delT	p.C128X	stopgain SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
	VRK3	19	NM_016440	c.A374T	p.K125M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
	VRK3	19	NM_016440	c.A373G	p.K125E	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
25	ADCK1	14	NM_020421	c.G374C	p.S125T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-
	ADCK1	14	NM_001142545	c.G226C	p.D76H	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
26	ALPK1	4	NM_001102406	c.G1450T	p.A484S	nonsynonymous SNV	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-
	ALPK1	4	NM_001102406	c.2820_2822del	p.940_941del	nonframeshift deletion	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	ALPK3	15	NM_020778	c.C4456G	p.Q1486E	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ALPK3	15	NM_020778	c.G5539T	p.A1847S	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
28	AXL	19	NM_001699	c.C778G	p.L260V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
	AXL	19	NM_001699	c.C2082A	p.Y694X	stopgain SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
29	CIT	12	NM_007174	c.G3515A	p.R1172H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	CIT	12	NM_007174	c.C3184T	p.R1062X	stopgain SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
30	DYRK1B	19	NM_006483	c.G1076A	p.R359K	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	DYRK1B	19	NM_006483	c.A215C	p.Q72P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
31	EPHA10	1	NM_173641	c.G428T	p.R143L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	EPHA10	1	NM_173641	c.A277G	p.I93V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
32	EPHA3	3	NM_182644	c.G128T	p.G43V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
	EPHA3	3	NM_182644	c.G914A	p.R305K	nonsynonymous SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
33	EPHA4	2	NM_004438	c.C977A	p.T326N	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

	EPHA4	2	NM_004438	c.T548C	p.L183P	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
34	EPHA5	4	NM_004439	c.C1718T	p.P573L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	EPHA5	4	NM_004439	c.T851G	p.V284G	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35	EPHB2	1	NM_017449	c.T746G	p.V249G	nonsynonymous SNV	-	-	○	○	-	-	○	-	○	-	○	○	-	○	-	○	-	○	-	-	-
	EPHB2	1	NM_017449	c.G1907T	p.C636F	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
36	FLT1	13	NM_002019	c.G2365A	p.E789K	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-
	FLT1	13	NM_001160031	c.A603T	p.E201D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
37	GRK5	10	NM_005308	c.T785C	p.V262A	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	GRK5	10	NM_005308	c.T1719G	p.F573L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
38	HIPK1	1	NM_152696	c.G466C	p.A156P	nonsynonymous SNV	-	○	-	-	○	-	-	-	-	-	-	-	-	-	-	-	○	-	○	-	-
	HIPK1	1	NM_181358	c.G251A	p.G84E	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
39	LATS2	13	NM_014572	c.G578T	p.G193V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-
	LATS2	13	NM_014572	c.C173G	p.T58S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-
40	LMTK2	7	NM_014916	c.G706A	p.D236N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-
	LMTK2	7	NM_014916	c.T3742C	p.S1248P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-
41	MAP3K14	17	NM_003954	c.G1895C	p.R632T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	MAP3K14	17	NM_003954	c.G954A	p.W318X	stopgain SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
42	MAPK10	4	NM_138980	c.G971A	p.W324X	stopgain SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MAPK10	4	NM_138980	c.T839A	p.F280Y	nonsynonymous SNV	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
43	MAPK15	8	NM_139021	c.C870A	p.D290E	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	MAPK15	8	NM_139021	c.C1370T	p.S457F	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
44	MAPK7	17	NM_139034	c.G614C	p.R205P	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	MAPK7	17	NM_139034	c.A2363C	p.N788T	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
45	MAPKAPK3	3	NM_001243926	c.C82G	p.P28A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
	MAPKAPK3	3	NM_001243926	c.A206T	p.K69M	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
46	MARK4	19	NM_001199867	c.A934G	p.I312V	nonsynonymous SNV	-	○	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MARK4	19	NM_001199867	c.G1719C	p.Q573H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
47	MAST1	19	NM_014975	c.2378_2379insC	p.G793fs	frameshift insertion	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MAST1	19	NM_014975	c.T3241C	p.S1081P	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
48	MAST2	1	NM_015112	c.G2675A	p.R892Q	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MAST2	1	NM_015112	c.A5045G	p.N1682S	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
49	MET	7	NM_000245	c.C731A	p.S244Y	nonsynonymous SNV	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	MET	7	NM_000245	c.G1132A	p.V378I	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
50	NEK8	17	NM_178170	c.G284A	p.R95H	nonsynonymous SNV	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-
	NEK8	17	NM_178170	c.A433G	p.I145V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
51	PEAK1	15	NM_024776	c.T4520G	p.L1507R	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PEAK1	15	NM_024776	c.A2111G	p.Q704R	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
52	PIK3R4	3	NM_014602	c.A3099T	p.R1033S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
	PIK3R4	3	NM_014602	c.G1033T	p.V345F	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-
53	PKDCC	2	NM_138370	c.C575G	p.A192G	nonsynonymous SNV	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	PKDCC	2	NM_138370	c.A1223G	p.E408G	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
54	RIOK1	6	NM_153005	c.C53T	p.T18I	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-
	RIOK1	6	NM_153005	c.935_936del	p.312_312del	frameshift deletion	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	ROCK2	2	NM_004850	c.A3554G	p.Y1185C	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ROCK2	2	NM_004850	c.A1990T	p.K664X	stopgain SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	ROR2	9	NM_004560	c.A1472C	p.H491P	nonsynonymous SNV	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ROR2	9	NM_004560	c.G106T	p.E36X	stopgain SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

57	SGK223	8	NM_001080826	c.1051_1052insAGC(	p.A351delinsSGA	nonframeshift insertion	o	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SGK223	8	NM_001080826	c.T691G	p.S231A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-
58	STK36	2	NM_015690	c.G2938A	p.V980M	nonsynonymous SNV	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	STK36	2	NM_015690	c.A3218C	p.D1073A	nonsynonymous SNV	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
59	SYK	9	NM_003177	c.C167A	p.A56D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
	SYK	9	NM_003177	c.A397G	p.K133E	nonsynonymous SNV	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
60	TAF1	X	NM_004606	c.G551T	p.G184V	nonsynonymous SNV	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TAF1	X	NM_138923	c.G4498T	p.D1500Y	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
61	TGFBR2	3	NM_001024847	c.A136C	p.S46R	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
	TGFBR2	3	NM_001024847	c.C643G	p.R215G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
62	TRRAP	7	NM_001244580	c.A1589C	p.Q530P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o
	TRRAP	7	NM_001244580	c.C4091T	p.P1364L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
63	ULK3	15	NM_001099436	c.G1174C	p.A392P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
	ULK3	15	NM_001099436	c.1016_1020del	p.339_340del	frameshift deletion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
64	AAK1	2	NM_014911	c.1623_1625del	p.541_542del	nonframeshift deletion	o	o	-	o	o	-	-	-	o	-	-	o	o	-	-	-	o	o	o	o	-
65	ACVR1B	12	NM_020328	c.A679G	p.R227G	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-
66	ADCK4	19	NM_024876	c.C119T	p.S40F	nonsynonymous SNV	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
67	ADRBK1	11	NM_001619	c.A1745C	p.Y582S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-
68	ALPK2	18	NM_052947	c.3017_3031del	p.1006_1011del	nonframeshift deletion	o	-	o	-	o	-	o	o	-	-	o	-	o	o	-	o	-	o	o	o	-
69	ANKK1	11	NM_178510	c.A247G	p.I83V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-
70	AURKA	20	NM_198437	c.655delT	p.Y219fs	frameshift deletion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-
71	BMPR1A	10	NM_004329	c.A1549G	p.I517V	nonsynonymous SNV	-	-	-	-	-	-	o	o	-	-	-	-	-	-	-	-	-	-	-	-	-
72	BMPR2	2	NM_001204	c.C2439A	p.N813K	nonsynonymous SNV	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
73	BTK	X	NM_000061	c.T1690C	p.S564P	nonsynonymous SNV	o	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-
74	BUB1B	15	NM_001211	c.G596C	p.R199P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-
75	CAMK1D	10	NM_020397	c.A467G	p.D156G	nonsynonymous SNV	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
76	CAMK2G	10	NM_001222	c.A290G	p.E97G	nonsynonymous SNV	o	-	o	-	o	-	o	-	-	-	-	o	o	-	-	o	-	o	o	-	-
77	CAMKK2	12	NM_172214	c.51_52insC	p.Q17fs	frameshift insertion	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-
78	CDC42BPG	11	NM_017525	c.G2947A	p.A983T	nonsynonymous SNV	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
79	CDC7	1	NM_001134419	c.T410G	p.L137R	nonsynonymous SNV	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
80	CDK1	10	NM_001786	c.T371G	p.V124G	nonsynonymous SNV	-	o	-	-	-	-	-	-	-	o	-	o	o	-	-	-	-	-	o	-	-
81	CDK13	7	NM_031267	c.C3506T	p.S1169L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
82	CDK19	6	NM_015076	c.A880G	p.I294V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-
83	CDK20	9	NM_001039803	c.G517A	p.E173K	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o
84	CDKL2	4	NM_003948	c.G73A	p.D25N	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
85	CDKL4	2	NM_001009565	c.G536T	p.G179V	nonsynonymous SNV	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	CSK	15	NM_001127190	c.G475T	p.D159Y	nonsynonymous SNV	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87	CSNK1A1	5	NM_001025105	c.C166A	p.Q56K	nonsynonymous SNV	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
88	CSNK1G1	15	NM_022048	c.A529T	p.N177Y	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-
89	DCLK1	13	NM_004734	c.C266T	p.A89V	nonsynonymous SNV	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
90	DCLK2	4	NM_001040260	c.T1892G	p.M631R	nonsynonymous SNV	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
91	DMPK	19	NM_001081563	c.T1784C	p.L595P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-
92	DYRK4	12	NM_003845	c.A127C	p.K43Q	nonsynonymous SNV	o	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
93	EIF2AK4	15	NM_001013703	c.G3064A	p.V1022M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
94	EPHA8	1	NM_020526	c.G272T	p.R91L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-	-
95	EPHB1	3	NM_004441	c.T1649G	p.V550G	nonsynonymous SNV	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-	-	o	-	-	-
96	EPHB3	3	NM_004443	c.A955C	p.T319P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	o	-	-	-	-	-	-	-	-	-	-	-

97	EPHB4	7	NM_004444	c.C1096G	p.P366A	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
98	ERBB2	17	NM_001005862	c.A3083C	p.D1028A	nonsynonymous SNV	○	-	○	○	○	○	-	-	○	-	-	○	○	-	-	○	○	○	○	-
99	ERN1	17	NM_001433	c.A2732G	p.Y911C	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
100	ERN2	16	NM_033266	c.C314G	p.T105R	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
101	FES	15	NM_001143784	c.G172A	p.G58S	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
102	FLT3	13	NM_004119	c.C1295T	p.T432M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
103	GRK1	13	NM_002929	c.G880A	p.A294T	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
104	GRK7	3	NM_139209	c.G1574C	p.G525A	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
105	GSG2	17	NM_031965	c.T535A	p.S179T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
106	IKBKB	8	NM_001242778	c.C854T	p.T285M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
107	IRAK2	3	NM_001570	c.G1511A	p.R504Q	nonsynonymous SNV	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-
108	IRAK4	12	NM_001145256	c.C134T	p.S45L	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
109	KDR	4	NM_002253	c.C1325A	p.T442K	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
110	KIAA1804	1	NM_032435	c.C2084T	p.A695V	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○
111	LATS1	6	NM_004690	c.G2984A	p.R995H	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	LIMK1	7	NM_001204426	c.G1336A	p.G446R	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
113	LRRK1	15	NM_024652	c.C2351A	p.S784Y	nonsynonymous SNV	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
114	LRRK2	12	NM_198578	c.G1901C	p.S634T	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
115	MAP3K1	5	NM_005921	c.2953_2955del	p.985_985del	nonframeshift deletion	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
116	MAP3K12	12	NM_006301	c.C1789T	p.L597F	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
117	MAP3K13	3	NM_001242314	c.G1810A	p.A604T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
118	MAP3K6	1	NM_004672	c.G2096A	p.R699H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
119	MAP3K7	6	NM_145332	c.T365G	p.L122W	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
120	MAP4K3	2	NM_003618	c.C2314T	p.P772S	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
121	MAP4K4	2	NM_145686	c.T1839G	p.S613R	nonsynonymous SNV	○	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
122	MAPK12	22	NM_002969	c.C902T	p.T301M	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
123	MAPK4	18	NM_002747	c.A793C	p.S265R	nonsynonymous SNV	-	-	-	-	-	-	○	○	-	-	-	-	-	-	-	-	-	-	-	-
124	MAPK6	15	NM_002748	c.1687_1688del	p.563_563del	frameshift deletion	○	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	MAPKAPK2	1	NM_004759	c.A643C	p.T215P	nonsynonymous SNV	○	-	-	-	○	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
126	MARK1	1	NM_018650	c.T967C	p.Y323H	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
127	MARK3	14	NM_001128920	c.G1139T	p.S380I	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
128	MASTL	10	NM_032844	c.1011_1025del	p.337_342del	nonframeshift deletion	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
129	MERTK	2	NM_006343	c.T365C	p.I122T	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
130	MOS	8	NM_005372	c.A373C	p.T125P	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
131	MST1R	3	NM_002447	c.T2009G	p.V670G	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	MYLK2	20	NM_033118	c.G1536T	p.E512D	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
133	MYLK3	16	NM_182493	c.2129_2130insT	p.S710fs	frameshift insertion	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-
134	MYLK4	6	NM_001012418	c.A943G	p.I315V	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
135	MYO3A	10	NM_017433	c.A3552T	p.R1184S	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136	MYO3B	2	NM_001083615	c.G1097A	p.R366H	nonsynonymous SNV	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
137	NEK10	3	NM_199347	c.T494C	p.M165T	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
138	NEK4	3	NM_003157	c.A296C	p.K99T	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-
139	NTRK3	15	NM_002530	c.T1230A	p.F410L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-
140	NUAK1	12	NM_014840	c.G878T	p.R293L	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-
141	PDK2	17	NM_001199900	c.C526T	p.R176W	nonsynonymous SNV	-	-	-	-	-	-	-	-	-	○	-	-	-	-	-	-	-	-	-	-
142	PKN1	19	NM_002741	c.C83T	p.A28V	nonsynonymous SNV	-	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
143	PLK1	16	NM_005030	c.G671C	p.S224T	nonsynonymous SNV	-	○	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-