31 25	24 20	19 15	14 12	11 7	6 0	
imm[31:12]				rd	opcode	**Type-U**
imm[20|10:1|11|19:12]				rd	opcode	**Type-UJ**
imm[11:0]		rs1	funct3	rd	opcode	**Type-I**
imm[12|10:5]	rs2	rs1	funct3	imm[4:1|11]	opcode	**Type-SB**
imm[11:5]	rs2	rs1	funct3	imm[4:0]	opcode	**Type-S**
funct5 | funct2	rs2	rs1	funct3	rd	opcode	**Type-R**

RV32I Base Integer Instruction Set

imm[31:12]				rd	0110111	LUI rd, imm
imm[31:12]				rd	0010111	AUIPC rd, imm
imm[20|10:1|11|19:12]				rd	1101111	JAL rd, disp
imm[11:0]		rs1	000	rd	1100111	JALR rd, rs1, imm
imm[12|10:5]	rs2	rs1	000	imm[4:1|11]	1100011	BEQ rs1, rs2, disp
imm[12|10:5]	rs2	rs1	001	imm[4:1|11]	1100011	BNE rs1, rs2, disp
imm[12|10:5]	rs2	rs1	100	imm[4:1|11]	1100011	BLT rs1, rs2, disp
imm[12|10:5]	rs2	rs1	101	imm[4:1|11]	1100011	BGE rs1, rs2, disp
imm[12|10:5]	rs2	rs1	110	imm[4:1|11]	1100011	BLTU rs1, rs2, disp
imm[12|10:5]	rs2	rs1	111	imm[4:1|11]	1100011	BGEU rs1, rs2, disp
imm[11:0]		rs1	000	rd	0000011	LB rd, imm(rs1)
imm[11:0]		rs1	001	rd	0000011	LH rd, imm(rs1)
imm[11:0]		rs1	010	rd	0000011	LW rd, imm(rs1)
imm[11:0]		rs1	100	rd	0000011	LBU rd, imm(rs1)
imm[11:0]		rs1	101	rd	0000011	LHU rd, imm(rs1)
imm[11:5]	rs2	rs1	000	imm[4:0]	0100011	SB rs2, imm(rs1)
imm[11:5]	rs2	rs1	001	imm[4:0]	0100011	SH rs2, imm(rs1)
imm[11:5]	rs2	rs1	010	imm[4:0]	0100011	SW rs2, imm(rs1)
imm[11:0]		rs1	000	rd	0010011	ADDI rd, rs1, imm
imm[11:0]		rs1	010	rd	0010011	SLTI rd, rs1, imm
imm[11:0]		rs1	011	rd	0010011	SLTIU rd, rs1, imm
imm[11:0]		rs1	100	rd	0010011	XORI rd, rs1, imm
imm[11:0]		rs1	110	rd	0010011	ORI rd, rs1, imm
imm[11:0]		rs1	111	rd	0010011	ANDI rd, rs1, imm
000000 | 0	shamt5	rs1	001	rd	0010011	SLLI rd, rs1, imm
000000 | 0	shamt5	rs1	101	rd	0010011	SRLI rd, rs1, imm
010000 | 0	shamt5	rs1	101	rd	0010011	SRAI rd, rs1, imm
00000 | 00	rs2	rs1	000	rd	0110011	ADD rd, rs1, rs2
01000 | 00	rs2	rs1	000	rd	0110011	SUB rd, rs1, rs2
00000 | 00	rs2	rs1	001	rd	0110011	SLL rd, rs1, rs2
00000 | 00	rs2	rs1	010	rd	0110011	SLT rd, rs1, rs2
00000 | 00	rs2	rs1	011	rd	0110011	SLTU rd, rs1, rs2
00000 | 00	rs2	rs1	100	rd	0110011	XOR rd, rs1, rs2
00000 | 00	rs2	rs1	101	rd	0110011	SRL rd, rs1, rs2
01000 | 00	rs2	rs1	101	rd	0110011	SRA rd, rs1, rs2
00000 | 00	rs2	rs1	110	rd	0110011	OR rd, rs1, rs2
00000 | 00	rs2	rs1	111	rd	0110011	AND rd, rs1, rs2
0000 | pred	pred | succ	00000	000	00000	0001111	FENCE none
0000000	00000	00000	001	00000	0001111	FENCE.I none

RV64I Base Integer Instruction Set (in addition to RV32I)

imm[11:0]		rs1	110	rd	0000011	LWU rd, imm(rs1)
imm[11:0]		rs1	011	rd	0000011	LD rd, imm(rs1)
imm[11:5]	rs2	rs1	011	imm[4:0]	0100011	SD rs2, imm(rs1)
000000 | shamt6		rs1	001	rd	0010011	SLLI rd, rs1, imm
000000 | shamt6		rs1	101	rd	0010011	SRLI rd, rs1, imm
010000 | shamt6		rs1	101	rd	0010011	SRAI rd, rs1, imm
imm[11:0]		rs1	000	rd	0011011	ADDIW rd, rs1, imm
0000000	shamt5	rs1	001	rd	0011011	SLLIW rd, rs1, imm

31 25	24 20	19 15	14 12	11 7	6 0	
imm[11:0]		rs1	funct3	rd	opcode	**Type-I**
funct5	funct2	rs2	rs1	funct3	rd	opcode	**Type-R**

RV64I Base Integer Instruction Set (in addition to RV32I) contd

0000000		shamt5	rs1	101	rd	0011011	SRLIW rd, rs1, imm
0100000		shamt5	rs1	101	rd	0011011	SRAIW rd, rs1, imm
00000	00	rs2	rs1	000	rd	0111011	ADDW rd, rs1, rs2
01000	00	rs2	rs1	000	rd	0111011	SUBW rd, rs1, rs2
00000	00	rs2	rs1	001	rd	0111011	SLLW rd, rs1, rs2
00000	00	rs2	rs1	101	rd	0111011	SRLW rd, rs1, rs2
01000	00	rs2	rs1	101	rd	0111011	SRAW rd, rs1, rs2

RV32M Standard Extension for Integer Multiply and Divide

00000	01	rs2	rs1	000	rd	0110011	MUL rd, rs1, rs2
00000	01	rs2	rs1	001	rd	0110011	MULH rd, rs1, rs2
00000	01	rs2	rs1	010	rd	0110011	MULHSU rd, rs1, rs2
00000	01	rs2	rs1	011	rd	0110011	MULHU rd, rs1, rs2
00000	01	rs2	rs1	100	rd	0110011	DIV rd, rs1, rs2
00000	01	rs2	rs1	101	rd	0110011	DIVU rd, rs1, rs2
00000	01	rs2	rs1	110	rd	0110011	REM rd, rs1, rs2
00000	01	rs2	rs1	111	rd	0110011	REMU rd, rs1, rs2

RV64M Standard Extension for Integer Multiply and Divide (in addition to RV32M)

00000	01	rs2	rs1	000	rd	0111011	MULW rd, rs1, rs2
00000	01	rs2	rs1	100	rd	0111011	DIVW rd, rs1, rs2
00000	01	rs2	rs1	101	rd	0111011	DIVUW rd, rs1, rs2
00000	01	rs2	rs1	110	rd	0111011	REMW rd, rs1, rs2
00000	01	rs2	rs1	111	rd	0111011	REMUW rd, rs1, rs2

RV32A Standard Extension for Atomic Instructions

00010	aqrl	00000	rs1	010	rd	0101111	LR.W aqrl, rd, (rs1)
00011	aqrl	rs2	rs1	010	rd	0101111	SC.W aqrl, rd, rs2, (rs1)
00001	aqrl	rs2	rs1	010	rd	0101111	AMOSWAP.W aqrl, rd, rs2, (rs1)
00000	aqrl	rs2	rs1	010	rd	0101111	AMOADD.W aqrl, rd, rs2, (rs1)
00100	aqrl	rs2	rs1	010	rd	0101111	AMOXOR.W aqrl, rd, rs2, (rs1)
01000	aqrl	rs2	rs1	010	rd	0101111	AMOOR.W aqrl, rd, rs2, (rs1)
01100	aqrl	rs2	rs1	010	rd	0101111	AMOAND.W aqrl, rd, rs2, (rs1)
10000	aqrl	rs2	rs1	010	rd	0101111	AMOMIN.W aqrl, rd, rs2, (rs1)
10100	aqrl	rs2	rs1	010	rd	0101111	AMOMAX.W aqrl, rd, rs2, (rs1)
11000	aqrl	rs2	rs1	010	rd	0101111	AMOMINU.W aqrl, rd, rs2, (rs1)
11100	aqrl	rs2	rs1	010	rd	0101111	AMOMAXU.W aqrl, rd, rs2, (rs1)

RV64A Standard Extension for Atomic Instructions (in addition to RV32A)

00010	aqrl	00000	rs1	011	rd	0101111	LR.D aqrl, rd, (rs1)
00011	aqrl	rs2	rs1	011	rd	0101111	SC.D aqrl, rd, rs2, (rs1)
00001	aqrl	rs2	rs1	011	rd	0101111	AMOSWAP.D aqrl, rd, rs2, (rs1)
00000	aqrl	rs2	rs1	011	rd	0101111	AMOADD.D aqrl, rd, rs2, (rs1)
00100	aqrl	rs2	rs1	011	rd	0101111	AMOXOR.D aqrl, rd, rs2, (rs1)
01000	aqrl	rs2	rs1	011	rd	0101111	AMOOR.D aqrl, rd, rs2, (rs1)
01100	aqrl	rs2	rs1	011	rd	0101111	AMOAND.D aqrl, rd, rs2, (rs1)
10000	aqrl	rs2	rs1	011	rd	0101111	AMOMIN.D aqrl, rd, rs2, (rs1)
10100	aqrl	rs2	rs1	011	rd	0101111	AMOMAX.D aqrl, rd, rs2, (rs1)
11000	aqrl	rs2	rs1	011	rd	0101111	AMOMINU.D aqrl, rd, rs2, (rs1)
11100	aqrl	rs2	rs1	011	rd	0101111	AMOMAXU.D aqrl, rd, rs2, (rs1)

31 25	24 20	19 15	14 12	11 7	6 0	
imm[11:0]		rs1	funct3	rd	opcode	**Type-I**
imm[11:5]	rs2	rs1	funct3	imm[4:0]	opcode	**Type-S**
rs3 funct2	rs2	rs1	funct3	rd	opcode	**Type-R4**
funct5 funct2	rs2	rs1	funct3	rd	opcode	**Type-R**

RV32S Standard Extension for Supervisor-level Instructions

0000000	00000	00000	000	00000	1110011	ECALL none
0000000	00001	00000	000	00000	1110011	EBREAK none
0000000	00010	00000	000	00000	1110011	URET none
0001000	00000	00000	000	00000	1110011	SRET none
0010000	00010	00000	000	00000	1110011	HRET none
0011000	00010	00000	000	00000	1110011	MRET none
0111101	10010	00000	000	00000	1110011	DRET none
0001000	00001	rs1	000	00000	1110011	SFENCE.VM none
0001000	00010	00000	000	00000	1110011	WFI none
imm[11:0]		rs1	001	rd	1110011	CSRRW rd, csr, rs1
imm[11:0]		rs1	010	rd	1110011	CSRRS rd, csr, rs1
imm[11:0]		rs1	011	rd	1110011	CSRRC rd, csr, rs1
imm[11:0]		imm5	101	rd	1110011	CSRRWI rd, csr, imm5
imm[11:0]		imm5	110	rd	1110011	CSRRSI rd, csr, imm5
imm[11:0]		imm5	111	rd	1110011	CSRRCI rd, csr, imm5

RV32F Standard Extension for Single-Precision Floating-Point

imm[11:0]		rs1	010	frd	0000111	FLW frd, imm(rs1)
imm[11:5]	frs2	rs1	010	imm[4:0]	0100111	FSW frs2, imm(rs1)
frs3	00 frs2	frs1	rm	frd	1000011	FMADD.S rm, frd, frs1, frs2, frs3
frs3	00 frs2	frs1	rm	frd	1000111	FMSUB.S rm, frd, frs1, frs2, frs3
frs3	00 frs2	frs1	rm	frd	1001011	FNMSUB.S rm, frd, frs1, frs2, frs3
frs3	00 frs2	frs1	rm	frd	1001111	FNMADD.S rm, frd, frs1, frs2, frs3
00000	00 frs2	frs1	rm	frd	1010011	FADD.S rm, frd, frs1, frs2
00001	00 frs2	frs1	rm	frd	1010011	FSUB.S rm, frd, frs1, frs2
00010	00 frs2	frs1	rm	frd	1010011	FMUL.S rm, frd, frs1, frs2
00011	00 frs2	frs1	rm	frd	1010011	FDIV.S rm, frd, frs1, frs2
00100	00 frs2	frs1	000	frd	1010011	FSGNJ.S rm, frd, frs1, frs2
00100	00 frs2	frs1	001	frd	1010011	FSGNJN.S rm, frd, frs1, frs2
00100	00 frs2	frs1	010	frd	1010011	FSGNJX.S rm, frd, frs1, frs2
00101	00 frs2	frs1	000	frd	1010011	FMIN.S rm, frd, frs1, frs2
00101	00 frs2	frs1	001	frd	1010011	FMAX.S rm, frd, frs1, frs2
01011	00 00000	rs1	rm	rd	1010011	FSQRT.S rm, frd, frs1, frs2
10100	00 frs2	frs1	000	rd	1010011	FLE.S rd, frs1, frs2
10100	00 frs2	frs1	001	rd	1010011	FLT.S rd, frs1, frs2
10100	00 frs2	frs1	010	rd	1010011	FEQ.S rd, frs1, frs2
11000	00 00000	frs1	rm	rd	1010011	FCVT.W.S rm, rd, frs1
11000	00 00001	frs1	rm	rd	1010011	FCVT.WU.S rm, rd, frs1
11010	00 00000	rs1	rm	frd	1010011	FCVT.S.W rm, frd, rs1
11010	00 00001	rs1	rm	frd	1010011	FCVT.S.WU rm, frd, rs1
11100	00 00000	frs1	000	rd	1010011	FMV.X.S rd, frs1
11100	00 00000	frs1	001	rd	1010011	FCLASS.S rd, frs1
11110	00 00000	rs1	000	frd	1010011	FMV.S.X frd, rs1
000000000011		00000	010	rd	1110011	FRCSR rd, csr, rs1
000000000010		00000	010	rd	1110011	FRRM rd, csr, rs1
000000000001		00000	010	rd	1110011	FRFLAGS rd, csr, rs1
000000000011		rs1	001	rd	1110011	FSCSR rd, csr, rs1
000000000010		rs1	001	rd	1110011	FSRM rd, csr, rs1

31 25	24 20	19 15	14 12	11 7	6 0	
imm[11:0]		rs1	funct3	rd	opcode	**Type-I**
funct5	funct2	rs2	rs1	funct3	rd	opcode	**Type-R**
imm[11:5]		rs2	rs1	funct3	imm[4:0]	opcode	**Type-S**
rs3	funct2	rs2	rs1	funct3	rd	opcode	**Type-R4**

RV32F Standard Extension for Single-Precision Floating-Point contd

000000000001	rs1	001	rd	1110011	FSFLAGS rd, csr, rs1
000000000010	imm5	101	rd	1110011	FSRMI rd, csr, imm5
000000000001	imm5	101	rd	1110011	FSFLAGSI rd, csr, imm5

RV64F Standard Extension for Single-Precision Floating-Point (in addition to RV32F)

11000	00	00010	frs1	rm	rd	1010011	FCVT.L.S rm, rd, frs1
11000	00	00011	frs1	rm	rd	1010011	FCVT.LU.S rm, rd, frs1
11010	00	00010	rs1	rm	frd	1010011	FCVT.S.L rm, frd, rs1
11010	00	00011	rs1	rm	frd	1010011	FCVT.S.LU rm, frd, rs1

RV32D Standard Extension for Double-Precision Floating-Point

imm[11:0]			rs1	011	frd	0000111	FLD frd, imm(rs1)
imm[11:5]		frs2	rs1	011	imm[4:0]	0100111	FSD frs2, imm(rs1)
frs3	01	frs2	frs1	rm	frd	1000011	FMADD.D rm, frd, frs1, frs2, frs3
frs3	01	frs2	frs1	rm	frd	1000111	FMSUB.D rm, frd, frs1, frs2, frs3
frs3	01	frs2	frs1	rm	frd	1001011	FNMSUB.D rm, frd, frs1, frs2, frs3
frs3	01	frs2	frs1	rm	frd	1001111	FNMADD.D rm, frd, frs1, frs2, frs3
00000	01	frs2	frs1	rm	frd	1010011	FADD.D rm, frd, frs1, frs2
00001	01	frs2	frs1	rm	frd	1010011	FSUB.D rm, frd, frs1, frs2
00010	01	frs2	frs1	rm	frd	1010011	FMUL.D rm, frd, frs1, frs2
00011	01	frs2	frs1	rm	frd	1010011	FDIV.D rm, frd, frs1, frs2
00100	01	frs2	frs1	000	frd	1010011	FSGNJ.D rm, frd, frs1, frs2
00100	01	frs2	frs1	001	frd	1010011	FSGNJN.D rm, frd, frs1, frs2
00100	01	frs2	frs1	010	frd	1010011	FSGNJX.D rm, frd, frs1, frs2
00101	01	frs2	frs1	000	frd	1010011	FMIN.D rm, frd, frs1, frs2
00101	01	frs2	frs1	001	frd	1010011	FMAX.D rm, frd, frs1, frs2
01000	00	00001	frs1	rm	frd	1010011	FCVT.S.D rm, frd, frs1
01000	01	00000	frs1	rm	frd	1010011	FCVT.D.S rm, frd, frs1
01011	01	00000	frs1	rm	frd	1010011	FSQRT.D rm, frd, frs1
10100	01	frs2	frs1	000	rd	1010011	FLE.D rd, frs1, frs2
10100	01	frs2	frs1	001	rd	1010011	FLT.D rd, frs1, frs2
10100	01	frs2	frs1	010	rd	1010011	FEQ.D rd, frs1, frs2
11000	01	00000	frs1	rm	rd	1010011	FCVT.W.D rm, rd, frs1
11000	01	00001	frs1	rm	rd	1010011	FCVT.WU.D rm, rd, frs1
11010	01	00000	rs1	rm	frd	1010011	FCVT.D.W rm, frd, rs1
11010	01	00001	rs1	rm	frd	1010011	FCVT.D.WU rm, frd, rs1
11100	01	00000	frs1	001	rd	1010011	FCLASS.D rd, frs1

RV64D Standard Extension for Double-Precision Floating-Point (in addition to RV32D)

11000	01	00010	frs1	rm	rd	1010011	FCVT.L.D rm, rd, frs1
11000	01	00011	frs1	rm	rd	1010011	FCVT.LU.D rm, rd, frs1
11100	01	00000	frs1	000	rd	1010011	FMV.X.D rd, frs1
11010	01	00010	rs1	rm	frd	1010011	FCVT.D.L rm, frd, rs1
11010	01	00011	rs1	rm	frd	1010011	FCVT.D.LU rm, frd, rs1
11110	01	00000	rs1	000	frd	1010011	FMV.D.X frd, rs1

15 13	12 10	9 7	6 5	4 2	1 0	
funct3	imm8			rd’	op	**Type-CIW**
funct3	imm3	rs1’	imm2	rd’	op	**Type-CL**
funct3	imm3	rs1’	imm2	rs2’	op	**Type-CS**
funct3	imm1	rd/rs1	imm5		op	**Type-CI**
funct3	imm11				op	**Type-CJ**
funct3	imm3	rs1’	imm5		op	**Type-CB**
funct4	rd/rs1		rs2		op	**Type-CR**
funct3	imm6		rs2		op	**Type-CSS**

RV32C Standard Extension for Compressed Instructions

000	imm[5:4|9:6|2|3]			rd’	00	C.ADDI4SPN rd, rs1, imm
001	imm[5:3]	rs1’	imm[7:6]	rd’	00	C.FLD frd, imm(rs1)
010	imm[5:3]	rs1’	imm[2|6]	rd’	00	C.LW rd, imm(rs1)
011	imm[5:3]	rs1’	imm[2|6]	rd’	00	C.FLW frd, imm(rs1)
101	imm[5:3]	rs1’	imm[7:6]	rs2’	00	C.FSD frs2, imm(rs1)
110	imm[5:3]	rs1’	imm[2|6]	rs2’	00	C.SW rs2, imm(rs1)
111	imm[5:3]	rs1’	imm[2|6]	rs2’	00	C.FSW frs2, imm(rs1)
000	0	00000	00000		01	C.NOP none
000	imm[5]	rs1/rd	imm[4:0]		01	C.ADDI rd, rs1, imm
001	imm[11|4|9:8|10|6|7|3:1|5]				01	C.JAL rd, disp
010	imm[5]	rs1/rd	imm[4:0]		01	C.LI rd, rs1, imm
011	imm[17]	rd	imm[16:12]		01	C.LUI rd, imm
011	imm[9]	rs1/rd	imm[4|6|8:7|5]		01	C.ADDI16SP rd, rs1, imm
100	imm[5]	00 rs1’/rd’	imm[4:0]		01	C.SRLI rd, rs1, imm
100	imm[5]	01 rs1’/rd’	imm[4:0]		01	C.SRAI rd, rs1, imm
100	imm[5]	10 rs1’/rd’	imm[4:0]		01	C.ANDI rd, rs1, imm
100	011	rs1’/rd’	00	rs2’	01	C.SUB rd, rs1, rs2
100	011	rs1’/rd’	01	rs2’	01	C.XOR rd, rs1, rs2
100	011	rs1’/rd’	10	rs2’	01	C.OR rd, rs1, rs2
100	011	rs1’/rd’	11	rs2’	01	C.AND rd, rs1, rs2
100	111	rs1’/rd’	00	rs2’	01	C.SUBW rd, rs1, rs2
100	111	rs1’/rd’	01	rs2’	01	C.ADDW rd, rs1, rs2
101	imm[11|4|9:8|10|6|7|3:1|5]				01	C.J rd, disp
110	imm[8|4:3]	rs1’	imm[7:6|2:1|5]		01	C.BEQZ rs1, rs2, disp
111	imm[8|4:3]	rs1’	imm[7:6|2:1|5]		01	C.BNEZ rs1, rs2, disp
000	imm[5]	rs1/rd	imm[4:0]		10	C.SLLI rd, rs1, imm
001	imm[5]	rd	imm[4:3|8:6]		10	C.FLDSP frd, imm(rs1)
010	imm[5]	rd	imm[4:2|7:6]		10	C.LWSP rd, imm(rs1)
011	imm[5]	rd	imm[4:2|7:6]		10	C.FLWSP frd, imm(rs1)
1000	rs1	00000			10	C.JR rd, rs1, imm
1000	rd	rs2			10	C.MV rd, rs1, rs2
100	1	00000	00000		10	C.EBREAK none
1001	rs1	00000			10	C.JALR rd, rs1, imm
1001	rd	rs2			10	C.ADD rd, rs1, rs2
101	imm[5:3|8:6]	rs2			10	C.FSDSP frs2, imm(rs1)
110	imm[5:2|7:6]	rs2			10	C.SWSP rs2, imm(rs1)
111	imm[5:2|7:6]	rs2			10	C.FSWSP frs2, imm(rs1)

RV64C Standard Extension for Compressed Instructions (in addition to RV32C)

011	imm[5:3]	rs1’	imm[7:6]	rd’	00	C.LD rd, imm(rs1)
111	imm[5:3]	rs1’	imm[7:6]	rs2’	00	C.SD rs2, imm(rs1)
001	imm[5]	rs1/rd	imm[4:0]		01	C.ADDIW rd, rs1, imm
011	imm[5]	rd	imm[4:3|8:6]		10	C.LDSP rd, imm(rs1)
111	imm[5:3|8:6]	rs2			10	C.SDSP rs2, imm(rs1)