RISC-V Encoding Details

This document describes the RISC-V instruction encodings, CSR names, causes, and instruction field arguments.

Instruction Encodings

Instruction	Encoding Details
ADD	MATCH = 0x33, MASK = 0xfe00707f
ADD_UW	MATCH = 0x800003b, MASK = 0xfe00707f
ADDI	MATCH = 0x13, MASK = 0x707f
ADDIW	MATCH = 0x1b, MASK = 0x707f
ADDW	MATCH = 0x3b, MASK = 0xfe00707f
AES32DSI	MATCH = 0x2a000033, MASK = 0x3e00707f
AES32DSMI	MATCH = 0x2e000033, MASK = 0x3e00707f
AES32ESI	MATCH = 0x22000033, MASK = 0x3e00707f
AES32ESMI	MATCH = 0x26000033, MASK = 0x3e00707f
AES64DS	MATCH = 0x3a000033, MASK = 0xfe00707f
AES64DSM	MATCH = 0x3e000033, MASK = 0xfe00707f
AES64ES	MATCH = 0x32000033, MASK = 0xfe00707f
AES64ESM	MATCH = 0x36000033, MASK = 0xfe00707f
AES64IM	MATCH = 0x30001013, MASK = 0xfff0707f
AES64KS1I	MATCH = 0x31001013, MASK = 0xff00707f
AES64KS2	MATCH = 0x7e000033, MASK = 0xfe00707f
AMOADD_B	MATCH = 0x2f, MASK = 0xf800707f
AMOADD_D	MATCH = 0x302f, MASK = 0xf800707f
AMOADD_H	MATCH = 0x102f, MASK = 0xf800707f
AMOADD_W	MATCH = 0x202f, MASK = 0xf800707f
AMOAND_B	MATCH = 0x6000002f, MASK = 0xf800707f
AMOAND_D	MATCH = 0x6000302f, MASK = 0xf800707f
AMOAND_H	MATCH = 0x6000102f, MASK = 0xf800707f
AMOAND_W	MATCH = 0x6000202f, MASK = 0xf800707f
AMOCAS_B	MATCH = 0x2800002f, MASK = 0xf800707f
AMOCAS_D	MATCH = 0x2800302f, MASK = 0xf800707f
AMOCAS_H	MATCH = 0x2800102f, MASK = 0xf800707f

AMOCAS_Q	MATCH = 0x2800402f, MASK = 0xf800707f
AMOCAS_W	MATCH = 0x2800202f, MASK = 0xf800707f
AMOMAX_B	MATCH = 0xa000002f, MASK = 0xf800707f
AMOMAX_D	MATCH = 0xa000302f, MASK = 0xf800707f
AMOMAX_H	MATCH = 0xa000102f, MASK = 0xf800707f
AMOMAX_W	MATCH = 0xa000202f, MASK = 0xf800707f
AMOMAXU_B	MATCH = 0xe000002f, MASK = 0xf800707f
AMOMAXU_D	MATCH = 0xe000302f, MASK = 0xf800707f
AMOMAXU_H	MATCH = 0xe000102f, MASK = 0xf800707f
AMOMAXU_W	MATCH = 0xe000202f, MASK = 0xf800707f
AMOMIN_B	MATCH = 0x8000002f, MASK = 0xf800707f
AMOMIN_D	MATCH = 0x8000302f, MASK = 0xf800707f
AMOMIN_H	MATCH = 0x8000102f, MASK = 0xf800707f
AMOMIN_W	MATCH = 0x8000202f, MASK = 0xf800707f
AMOMINU_B	MATCH = 0xc000002f, MASK = 0xf800707f
AMOMINU_D	MATCH = 0xc000302f, MASK = 0xf800707f
AMOMINU_H	MATCH = 0xc000102f, MASK = 0xf800707f
AMOMINU_W	MATCH = 0xc000202f, MASK = 0xf800707f
AMOOR_B	MATCH = 0x4000002f, MASK = 0xf800707f
AMOOR_D	MATCH = 0x4000302f, MASK = 0xf800707f
AMOOR_H	MATCH = 0x4000102f, MASK = 0xf800707f
AMOOR_W	MATCH = 0x4000202f, MASK = 0xf800707f
AMOSWAP_B	MATCH = 0x800002f, MASK = 0xf800707f
AMOSWAP_D	MATCH = 0x800302f, MASK = 0xf800707f
AMOSWAP_H	MATCH = 0x800102f, MASK = 0xf800707f
AMOSWAP_W	MATCH = 0x800202f, MASK = 0xf800707f
AMOXOR_B	MATCH = 0x2000002f, MASK = 0xf800707f
AMOXOR_D	MATCH = 0x2000302f, MASK = 0xf800707f
AMOXOR_H	MATCH = 0x2000102f, MASK = 0xf800707f
AMOXOR_W	MATCH = 0x2000202f, MASK = 0xf800707f
AND	MATCH = 0x7033, MASK = 0xfe00707f
ANDI	MATCH = 0x7013, MASK = 0x707f
ANDN	MATCH = 0x40007033, MASK = 0xfe00707f
AUIPC	MATCH = 0x17, MASK = 0x7f

BCLR	MATCH = 0x48001033, MASK = 0xfe00707f
BCLRI	MATCH = 0x48001013, MASK = 0xfc00707f
BEQ	MATCH = 0x63, MASK = 0x707f
BEXT	MATCH = 0x48005033, MASK = 0xfe00707f
BEXTI	MATCH = 0x48005013, MASK = 0xfc00707f
BGE	MATCH = 0x5063, MASK = 0x707f
BGEU	MATCH = 0x7063, MASK = 0x707f
BINV	MATCH = 0x68001033, MASK = 0xfe00707f
BINVI	MATCH = 0x68001013, MASK = 0xfc00707f
BLT	MATCH = 0x4063, MASK = 0x707f
BLTU	MATCH = 0x6063, MASK = 0x707f
BNE	MATCH = 0x1063, MASK = 0x707f
BSET	MATCH = 0x28001033, MASK = 0xfe00707f
BSETI	MATCH = 0x28001013, MASK = 0xfc00707f
C_ADD	MATCH = 0x9002, MASK = 0xf003
C_ADDI	MATCH = 0x1, MASK = 0xe003
C_ADDI16SP	MATCH = 0x6101, MASK = 0xef83
C_ADDI4SPN	MATCH = 0x0, MASK = 0xe003
C_ADDIW	MATCH = 0x2001, MASK = 0xe003
C_ADDW	MATCH = 0x9c21, MASK = 0xfc63
C_AND	MATCH = 0x8c61, MASK = 0xfc63
C_ANDI	MATCH = 0x8801, MASK = 0xec03
C_BEQZ	MATCH = 0xc001, MASK = 0xe003
C_BNEZ	MATCH = 0xe001, MASK = 0xe003
C_EBREAK	MATCH = 0x9002, MASK = 0xffff
C_FLD	MATCH = 0x2000, MASK = 0xe003
C_FLDSP	MATCH = 0x2002, MASK = 0xe003
C_FLW	MATCH = 0x6000, MASK = 0xe003
C_FLWSP	MATCH = 0x6002, MASK = 0xe003
C_FSD	MATCH = 0xa000, MASK = 0xe003
C_FSDSP	MATCH = 0xa002, MASK = 0xe003
C_FSW	MATCH = 0xe000, MASK = 0xe003
C_FSWSP	MATCH = 0xe002, MASK = 0xe003
C_J	MATCH = 0xa001, MASK = 0xe003

C_JAL	MATCH = 0x2001, MASK = 0xe003
C_JALR	MATCH = 0x9002, MASK = 0xf07f
C_JR	MATCH = 0x8002, MASK = 0xf07f
C_LBU	MATCH = 0x8000, MASK = 0xfc03
C_LD	MATCH = 0x6000, MASK = 0xe003
C_LDSP	MATCH = 0x6002, MASK = 0xe003
C_LH	MATCH = 0x8440, MASK = 0xfc43
C_LHU	MATCH = 0x8400, MASK = 0xfc43
C_LI	MATCH = 0x4001, MASK = 0xe003
C_LUI	MATCH = 0x6001, MASK = 0xe003
C_LW	MATCH = 0x4000, MASK = 0xe003
C_LWSP	MATCH = 0x4002, MASK = 0xe003
C_MOP_N	MATCH = 0x6081, MASK = 0xf8ff
C_MUL	MATCH = 0x9c41, MASK = 0xfc63
C_MV	MATCH = 0x8002, MASK = 0xf003
C_NOP	MATCH = 0x1, MASK = 0xef83
C_NOT	MATCH = 0x9c75, MASK = 0xfc7f
C_OR	MATCH = 0x8c41, MASK = 0xfc63
C_SB	MATCH = 0x8800, MASK = 0xfc03
C_SD	MATCH = 0xe000, MASK = 0xe003
C_SDSP	MATCH = 0xe002, MASK = 0xe003
C_SEXT_B	MATCH = 0x9c65, MASK = 0xfc7f
C_SEXT_H	MATCH = 0x9c6d, MASK = 0xfc7f
C_SH	MATCH = 0x8c00, MASK = 0xfc43
C_SLLI	MATCH = 0x2, MASK = 0xe003
C_SRAI	MATCH = 0x8401, MASK = 0xec03
C_SRLI	MATCH = 0x8001, MASK = 0xec03
C_SUB	MATCH = 0x8c01, MASK = 0xfc63
C_SUBW	MATCH = 0x9c01, MASK = 0xfc63
C_SW	MATCH = 0xc000, MASK = 0xe003
C_SWSP	MATCH = 0xc002, MASK = 0xe003
C_XOR	MATCH = 0x8c21, MASK = 0xfc63
C_ZEXT_B	MATCH = 0x9c61, MASK = 0xfc7f
C_ZEXT_H	MATCH = 0x9c69, MASK = 0xfc7f

C_ZEXT_W	MATCH = 0x9c71, MASK = 0xfc7f
CBO_CLEAN	MATCH = 0x10200f, MASK = 0xfff07fff
CBO_FLUSH	MATCH = 0x20200f, MASK = 0xfff07fff
CBO_INVAL	MATCH = 0x200f, MASK = 0xfff07fff
CBO_ZERO	MATCH = 0x40200f, MASK = 0xfff07fff
CLMUL	MATCH = 0xa001033, MASK = 0xfe00707f
CLMULH	MATCH = 0xa003033, MASK = 0xfe00707f
CLMULR	MATCH = 0xa002033, MASK = 0xfe00707f
CLZ	MATCH = 0x60001013, MASK = 0xfff0707f
CLZW	MATCH = 0x6000101b, MASK = 0xfff0707f
CM_JALT	MATCH = 0xa002, MASK = 0xfc03
CM_MVA01S	MATCH = 0xac62, MASK = 0xfc63
CM_MVSA01	MATCH = 0xac22, MASK = 0xfc63
CM_POP	MATCH = 0xba02, MASK = 0xff03
CM_POPRET	MATCH = 0xbe02, MASK = 0xff03
CM_POPRETZ	MATCH = 0xbc02, MASK = 0xff03
CM_PUSH	MATCH = 0xb802, MASK = 0xff03
CPOP	MATCH = 0x60201013, MASK = 0xfff0707f
CPOPW	MATCH = 0x6020101b, MASK = 0xfff0707f
CSRRC	MATCH = 0x3073, MASK = 0x707f
CSRRCI	MATCH = 0x7073, MASK = 0x707f
CSRRS	MATCH = 0x2073, MASK = 0x707f
CSRRSI	MATCH = 0x6073, MASK = 0x707f
CSRRW	MATCH = 0x1073, MASK = 0x707f
CSRRWI	MATCH = 0x5073, MASK = 0x707f
CTZ	MATCH = 0x60101013, MASK = 0xfff0707f
CTZW	MATCH = 0x6010101b, MASK = 0xfff0707f
CZERO_EQZ	MATCH = 0xe005033, MASK = 0xfe00707f
CZERO_NEZ	MATCH = 0xe007033, MASK = 0xfe00707f
DIV	MATCH = 0x2004033, MASK = 0xfe00707f
DIVU	MATCH = 0x2005033, MASK = 0xfe00707f
DIVUW	MATCH = 0x200503b, MASK = 0xfe00707f
DIVW	MATCH = 0x200403b, MASK = 0xfe00707f
DRET	MATCH = 0x7b200073, MASK = 0xffffffff

EBREAK	MATCH = 0x100073, MASK = 0xffffffff
ECALL	MATCH = 0x73, MASK = 0xffffffff
FADD_D	MATCH = 0x2000053, MASK = 0xfe00007f
FADD_H	MATCH = 0x4000053, MASK = 0xfe00007f
FADD_Q	MATCH = 0x6000053, MASK = 0xfe00007f
FADD_S	MATCH = 0x53, MASK = 0xfe00007f
FCLASS_D	MATCH = 0xe2001053, MASK = 0xfff0707f
FCLASS_H	MATCH = 0xe4001053, MASK = 0xfff0707f
FCLASS_Q	MATCH = 0xe6001053, MASK = 0xfff0707f
FCLASS_S	MATCH = 0xe0001053, MASK = 0xfff0707f
FCVT_BF16_S	MATCH = 0x44800053, MASK = 0xfff0007f
FCVT_D_H	MATCH = 0x42200053, MASK = 0xfff0007f
FCVT_D_L	MATCH = 0xd2200053, MASK = 0xfff0007f
FCVT_D_LU	MATCH = 0xd2300053, MASK = 0xfff0007f
FCVT_D_Q	MATCH = 0x42300053, MASK = 0xfff0007f
FCVT_D_S	MATCH = 0x42000053, MASK = 0xfff0007f
FCVT_D_W	MATCH = 0xd2000053, MASK = 0xfff0007f
FCVT_D_WU	MATCH = 0xd2100053, MASK = 0xfff0007f
FCVT_H_D	MATCH = 0x44100053, MASK = 0xfff0007f
FCVT_H_L	MATCH = 0xd4200053, MASK = 0xfff0007f
FCVT_H_LU	MATCH = 0xd4300053, MASK = 0xfff0007f
FCVT_H_Q	MATCH = 0x44300053, MASK = 0xfff0007f
FCVT_H_S	MATCH = 0x44000053, MASK = 0xfff0007f
FCVT_H_W	MATCH = 0xd4000053, MASK = 0xfff0007f
FCVT_H_WU	MATCH = 0xd4100053, MASK = 0xfff0007f
FCVT_L_D	MATCH = 0xc2200053, MASK = 0xfff0007f
FCVT_L_H	MATCH = 0xc4200053, MASK = 0xfff0007f
FCVT_L_Q	MATCH = 0xc6200053, MASK = 0xfff0007f
FCVT_L_S	MATCH = 0xc0200053, MASK = 0xfff0007f
FCVT_LU_D	MATCH = 0xc2300053, MASK = 0xfff0007f
FCVT_LU_H	MATCH = 0xc4300053, MASK = 0xfff0007f
FCVT_LU_Q	MATCH = 0xc6300053, MASK = 0xfff0007f
FCVT_LU_S	MATCH = 0xc0300053, MASK = 0xfff0007f
FCVT_Q_D	MATCH = 0x46100053, MASK = 0xfff0007f

FCVT_Q_H	MATCH = 0x46200053, MASK = 0xfff0007f
FCVT_Q_L	MATCH = 0xd6200053, MASK = 0xfff0007f
FCVT_Q_LU	MATCH = 0xd6300053, MASK = 0xfff0007f
FCVT_Q_S	MATCH = 0x46000053, MASK = 0xfff0007f
FCVT_Q_W	MATCH = 0xd6000053, MASK = 0xfff0007f
FCVT_Q_WU	MATCH = 0xd6100053, MASK = 0xfff0007f
FCVT_S_BF16	MATCH = 0x40600053, MASK = 0xfff0007f
FCVT_S_D	MATCH = 0x40100053, MASK = 0xfff0007f
FCVT_S_H	MATCH = 0x40200053, MASK = 0xfff0007f
FCVT_S_L	MATCH = 0xd0200053, MASK = 0xfff0007f
FCVT_S_LU	MATCH = 0xd0300053, MASK = 0xfff0007f
FCVT_S_Q	MATCH = 0x40300053, MASK = 0xfff0007f
FCVT_S_W	MATCH = 0xd0000053, MASK = 0xfff0007f
FCVT_S_WU	MATCH = 0xd0100053, MASK = 0xfff0007f
FCVT_W_D	MATCH = 0xc2000053, MASK = 0xfff0007f
FCVT_W_H	MATCH = 0xc4000053, MASK = 0xfff0007f
FCVT_W_Q	MATCH = 0xc6000053, MASK = 0xfff0007f
FCVT_W_S	MATCH = 0xc0000053, MASK = 0xfff0007f
FCVT_WU_D	MATCH = 0xc2100053, MASK = 0xfff0007f
FCVT_WU_H	MATCH = 0xc4100053, MASK = 0xfff0007f
FCVT_WU_Q	MATCH = 0xc6100053, MASK = 0xfff0007f
FCVT_WU_S	MATCH = 0xc0100053, MASK = 0xfff0007f
FCVTMOD_W_D	MATCH = 0xc2801053, MASK = 0xfff0707f
FDIV_D	MATCH = 0x1a000053, MASK = 0xfe00007f
FDIV_H	MATCH = 0x1c000053, MASK = 0xfe00007f
FDIV_Q	MATCH = 0x1e000053, MASK = 0xfe00007f
FDIV_S	MATCH = 0x18000053, MASK = 0xfe00007f
FENCE	MATCH = 0xf, MASK = 0x707f
FENCE_I	MATCH = 0x100f, MASK = 0x707f
FEQ_D	MATCH = 0xa2002053, MASK = 0xfe00707f
FEQ_H	MATCH = 0xa4002053, MASK = 0xfe00707f
FEQ_Q	MATCH = 0xa6002053, MASK = 0xfe00707f
FEQ_S	MATCH = 0xa0002053, MASK = 0xfe00707f
FLD	MATCH = 0x3007, MASK = 0x707f

FLE_D	MATCH = 0xa2000053, MASK = 0xfe00707f
FLE_H	MATCH = 0xa4000053, MASK = 0xfe00707f
FLE_Q	MATCH = 0xa6000053, MASK = 0xfe00707f
FLE_S	MATCH = 0xa0000053, MASK = 0xfe00707f
FLEQ_D	MATCH = 0xa2004053, MASK = 0xfe00707f
FLEQ_H	MATCH = 0xa4004053, MASK = 0xfe00707f
FLEQ_Q	MATCH = 0xa6004053, MASK = 0xfe00707f
FLEQ_S	MATCH = 0xa0004053, MASK = 0xfe00707f
FLH	MATCH = 0x1007, MASK = 0x707f
FLI_D	MATCH = 0xf2100053, MASK = 0xfff0707f
FLI_H	MATCH = 0xf4100053, MASK = 0xfff0707f
FLI_Q	MATCH = 0xf6100053, MASK = 0xfff0707f
FLI_S	MATCH = 0xf0100053, MASK = 0xfff0707f
FLQ	MATCH = 0x4007, MASK = 0x707f
FLT_D	MATCH = 0xa2001053, MASK = 0xfe00707f
FLT_H	MATCH = 0xa4001053, MASK = 0xfe00707f
FLT_Q	MATCH = 0xa6001053, MASK = 0xfe00707f
FLT_S	MATCH = 0xa0001053, MASK = 0xfe00707f
FLTQ_D	MATCH = 0xa2005053, MASK = 0xfe00707f
FLTQ_H	MATCH = 0xa4005053, MASK = 0xfe00707f
FLTQ_Q	MATCH = 0xa6005053, MASK = 0xfe00707f
FLTQ_S	MATCH = 0xa0005053, MASK = 0xfe00707f
FLW	MATCH = 0x2007, MASK = 0x707f
FMADD_D	MATCH = 0x2000043, MASK = 0x600007f
FMADD_H	MATCH = 0x4000043, MASK = 0x600007f
FMADD_Q	MATCH = 0x6000043, MASK = 0x600007f
FMADD_S	MATCH = 0x43, MASK = 0x600007f
FMAX_D	MATCH = 0x2a001053, MASK = 0xfe00707f
FMAX_H	MATCH = 0x2c001053, MASK = 0xfe00707f
FMAX_Q	MATCH = 0x2e001053, MASK = 0xfe00707f
FMAX_S	MATCH = 0x28001053, MASK = 0xfe00707f
FMAXM_D	MATCH = 0x2a003053, MASK = 0xfe00707f
FMAXM_H	MATCH = 0x2c003053, MASK = 0xfe00707f
FMAXM_Q	MATCH = 0x2e003053, MASK = 0xfe00707f

FMAXM_S	MATCH = 0x28003053, MASK = 0xfe00707f
FMIN_D	MATCH = 0x2a000053, MASK = 0xfe00707f
FMIN_H	MATCH = 0x2c000053, MASK = 0xfe00707f
FMIN_Q	MATCH = 0x2e000053, MASK = 0xfe00707f
FMIN_S	MATCH = 0x28000053, MASK = 0xfe00707f
FMINM_D	MATCH = 0x2a002053, MASK = 0xfe00707f
FMINM_H	MATCH = 0x2c002053, MASK = 0xfe00707f
FMINM_Q	MATCH = 0x2e002053, MASK = 0xfe00707f
FMINM_S	MATCH = 0x28002053, MASK = 0xfe00707f
FMSUB_D	MATCH = 0x2000047, MASK = 0x600007f
FMSUB_H	MATCH = 0x4000047, MASK = 0x600007f
FMSUB_Q	MATCH = 0x6000047, MASK = 0x600007f
FMSUB_S	MATCH = 0x47, MASK = 0x600007f
FMUL_D	MATCH = 0x12000053, MASK = 0xfe00007f
FMUL_H	MATCH = 0x14000053, MASK = 0xfe00007f
FMUL_Q	MATCH = 0x16000053, MASK = 0xfe00007f
FMUL_S	MATCH = 0x10000053, MASK = 0xfe00007f
FMV_D_X	MATCH = 0xf2000053, MASK = 0xfff0707f
FMV_H_X	MATCH = 0xf4000053, MASK = 0xfff0707f
FMV_W_X	MATCH = 0xf0000053, MASK = 0xfff0707f
FMV_X_D	MATCH = 0xe2000053, MASK = 0xfff0707f
FMV_X_H	MATCH = 0xe4000053, MASK = 0xfff0707f
FMV_X_W	MATCH = 0xe0000053, MASK = 0xfff0707f
FMVH_X_D	MATCH = 0xe2100053, MASK = 0xfff0707f
FMVH_X_Q	MATCH = 0xe6100053, MASK = 0xfff0707f
FMVP_D_X	MATCH = 0xb2000053, MASK = 0xfe00707f
FMVP_Q_X	MATCH = 0xb6000053, MASK = 0xfe00707f
FNMADD_D	MATCH = 0x200004f, MASK = 0x600007f
FNMADD_H	MATCH = 0x400004f, MASK = 0x600007f
FNMADD_Q	MATCH = 0x600004f, MASK = 0x600007f
FNMADD_S	MATCH = 0x4f, MASK = 0x600007f
FNMSUB_D	MATCH = 0x200004b, MASK = 0x600007f
FNMSUB_H	MATCH = 0x400004b, MASK = 0x600007f
FNMSUB_Q	MATCH = 0x600004b, MASK = 0x600007f

FNMSUB_S	MATCH = 0x4b, MASK = 0x600007f
FROUND_D	MATCH = 0x42400053, MASK = 0xfff0007f
FROUND_H	MATCH = 0x44400053, MASK = 0xfff0007f
FROUND_Q	MATCH = 0x46400053, MASK = 0xfff0007f
FROUND_S	MATCH = 0x40400053, MASK = 0xfff0007f
FROUNDNX_D	MATCH = 0x42500053, MASK = 0xfff0007f
FROUNDNX_H	MATCH = 0x44500053, MASK = 0xfff0007f
FROUNDNX_Q	MATCH = 0x46500053, MASK = 0xfff0007f
FROUNDNX_S	MATCH = 0x40500053, MASK = 0xfff0007f
FSD	MATCH = 0x3027, MASK = 0x707f
FSGNJ_D	MATCH = 0x22000053, MASK = 0xfe00707f
FSGNJ_H	MATCH = 0x24000053, MASK = 0xfe00707f
FSGNJ_Q	MATCH = 0x26000053, MASK = 0xfe00707f
FSGNJ_S	MATCH = 0x20000053, MASK = 0xfe00707f
FSGNJN_D	MATCH = 0x22001053, MASK = 0xfe00707f
FSGNJN_H	MATCH = 0x24001053, MASK = 0xfe00707f
FSGNJN_Q	MATCH = 0x26001053, MASK = 0xfe00707f
FSGNJN_S	MATCH = 0x20001053, MASK = 0xfe00707f
FSGNJX_D	MATCH = 0x22002053, MASK = 0xfe00707f
FSGNJX_H	MATCH = 0x24002053, MASK = 0xfe00707f
FSGNJX_Q	MATCH = 0x26002053, MASK = 0xfe00707f
FSGNJX_S	MATCH = 0x20002053, MASK = 0xfe00707f
FSH	MATCH = 0x1027, MASK = 0x707f
FSQ	MATCH = 0x4027, MASK = 0x707f
FSQRT_D	MATCH = 0x5a000053, MASK = 0xfff0007f
FSQRT_H	MATCH = 0x5c000053, MASK = 0xfff0007f
FSQRT_Q	MATCH = 0x5e000053, MASK = 0xfff0007f
FSQRT_S	MATCH = 0x58000053, MASK = 0xfff0007f
FSUB_D	MATCH = 0xa000053, MASK = 0xfe00007f
FSUB_H	MATCH = 0xc000053, MASK = 0xfe00007f
FSUB_Q	MATCH = 0xe000053, MASK = 0xfe00007f
FSUB_S	MATCH = 0x8000053, MASK = 0xfe00007f
FSW	MATCH = 0x2027, MASK = 0x707f
GORCI	MATCH = 0x28005013, MASK = 0xfc00707f

GREVI	MATCH = 0x68005013, MASK = 0xfc00707f
HFENCE_GVMA	MATCH = 0x62000073, MASK = 0xfe007fff
HFENCE_VVMA	MATCH = 0x22000073, MASK = 0xfe007fff
HINVAL_GVMA	MATCH = 0x66000073, MASK = 0xfe007fff
HINVAL_VVMA	MATCH = 0x26000073, MASK = 0xfe007fff
HLV_B	MATCH = 0x60004073, MASK = 0xfff0707f
HLV_BU	MATCH = 0x60104073, MASK = 0xfff0707f
HLV_D	MATCH = 0x6c004073, MASK = 0xfff0707f
HLV_H	MATCH = 0x64004073, MASK = 0xfff0707f
HLV_HU	MATCH = 0x64104073, MASK = 0xfff0707f
HLV_W	MATCH = 0x68004073, MASK = 0xfff0707f
HLV_WU	MATCH = 0x68104073, MASK = 0xfff0707f
HLVX_HU	MATCH = 0x64304073, MASK = 0xfff0707f
HLVX_WU	MATCH = 0x68304073, MASK = 0xfff0707f
HSV_B	MATCH = 0x62004073, MASK = 0xfe007fff
HSV_D	MATCH = 0x6e004073, MASK = 0xfe007fff
HSV_H	MATCH = 0x66004073, MASK = 0xfe007fff
HSV_W	MATCH = 0x6a004073, MASK = 0xfe007fff
JAL	MATCH = 0x6f, MASK = 0x7f
JALR	MATCH = 0x67, MASK = 0x707f
LB	MATCH = 0x3, MASK = 0x707f
LB_AQ	MATCH = 0x3400002f, MASK = 0xfdf0707f
LBU	MATCH = 0x4003, MASK = 0x707f
LD	MATCH = 0x3003, MASK = 0x707f
LD_AQ	MATCH = 0x3400302f, MASK = 0xfdf0707f
LH	MATCH = 0x1003, MASK = 0x707f
LH_AQ	MATCH = 0x3400102f, MASK = 0xfdf0707f
LHU	MATCH = 0x5003, MASK = 0x707f
LR_D	MATCH = 0x1000302f, MASK = 0xf9f0707f
LR_W	MATCH = 0x1000202f, MASK = 0xf9f0707f
LUI	MATCH = 0x37, MASK = 0x7f
LW	MATCH = 0x2003, MASK = 0x707f
LW_AQ	MATCH = 0x3400202f, MASK = 0xfdf0707f
LWU	MATCH = 0x6003, MASK = 0x707f

MAX	MATCH = 0xa006033, MASK = 0xfe00707f
MAXU	MATCH = 0xa007033, MASK = 0xfe00707f
MIN	MATCH = 0xa004033, MASK = 0xfe00707f
MINU	MATCH = 0xa005033, MASK = 0xfe00707f
MNRET	MATCH = 0x70200073, MASK = 0xffffffff
MOP_R_N	MATCH = 0x81c04073, MASK = 0xb3c0707f
MOP_RR_N	MATCH = 0x82004073, MASK = 0xb200707f
MRET	MATCH = 0x30200073, MASK = 0xffffffff
MUL	MATCH = 0x2000033, MASK = 0xfe00707f
MULH	MATCH = 0x2001033, MASK = 0xfe00707f
MULHSU	MATCH = 0x2002033, MASK = 0xfe00707f
MULHU	MATCH = 0x2003033, MASK = 0xfe00707f
MULW	MATCH = 0x200003b, MASK = 0xfe00707f
OR	MATCH = 0x6033, MASK = 0xfe00707f
ORI	MATCH = 0x6013, MASK = 0x707f
ORN	MATCH = 0x40006033, MASK = 0xfe00707f
PACK	MATCH = 0x8004033, MASK = 0xfe00707f
PACKH	MATCH = 0x8007033, MASK = 0xfe00707f
PACKW	MATCH = 0x800403b, MASK = 0xfe00707f
REM	MATCH = 0x2006033, MASK = 0xfe00707f
REMU	MATCH = 0x2007033, MASK = 0xfe00707f
REMUW	MATCH = 0x200703b, MASK = 0xfe00707f
REMW	MATCH = 0x200603b, MASK = 0xfe00707f
ROL	MATCH = 0x60001033, MASK = 0xfe00707f
ROLW	MATCH = 0x6000103b, MASK = 0xfe00707f
ROR	MATCH = 0x60005033, MASK = 0xfe00707f
RORI	MATCH = 0x60005013, MASK = 0xfc00707f
RORIW	MATCH = 0x6000501b, MASK = 0xfe00707f
RORW	MATCH = 0x6000503b, MASK = 0xfe00707f
SB	MATCH = 0x23, MASK = 0x707f
SB_RL	MATCH = 0x3a00002f, MASK = 0xfa007fff
SC_D	MATCH = 0x1800302f, MASK = 0xf800707f
SC_W	MATCH = 0x1800202f, MASK = 0xf800707f
SCTRCLR	MATCH = 0x10400073, MASK = 0xffffffff

SD	MATCH = 0x3023, MASK = 0x707f
SD_RL	MATCH = 0x3a00302f, MASK = 0xfa007fff
SEXT_B	MATCH = 0x60401013, MASK = 0xfff0707f
SEXT_H	MATCH = 0x60501013, MASK = 0xfff0707f
SFENCE_INVAL_IR	MATCH = 0x18100073, MASK = 0xffffffff
SFENCE_VMA	MATCH = 0x12000073, MASK = 0xfe007fff
SFENCE_W_INVAL	MATCH = 0x18000073, MASK = 0xffffffff
SH	MATCH = 0x1023, MASK = 0x707f
SH1ADD	MATCH = 0x20002033, MASK = 0xfe00707f
SH1ADD_UW	MATCH = 0x2000203b, MASK = 0xfe00707f
SH2ADD	MATCH = 0x20004033, MASK = 0xfe00707f
SH2ADD_UW	MATCH = 0x2000403b, MASK = 0xfe00707f
SH3ADD	MATCH = 0x20006033, MASK = 0xfe00707f
SH3ADD_UW	MATCH = 0x2000603b, MASK = 0xfe00707f
SH_RL	MATCH = 0x3a00102f, MASK = 0xfa007fff
SHA256SIG0	MATCH = 0x10201013, MASK = 0xfff0707f
SHA256SIG1	MATCH = 0x10301013, MASK = 0xfff0707f
SHA256SUM0	MATCH = 0x10001013, MASK = 0xfff0707f
SHA256SUM1	MATCH = 0x10101013, MASK = 0xfff0707f
SHA512SIG0	MATCH = 0x10601013, MASK = 0xfff0707f
SHA512SIG0H	MATCH = 0x5c000033, MASK = 0xfe00707f
SHA512SIG0L	MATCH = 0x54000033, MASK = 0xfe00707f
SHA512SIG1	MATCH = 0x10701013, MASK = 0xfff0707f
SHA512SIG1H	MATCH = 0x5e000033, MASK = 0xfe00707f
SHA512SIG1L	MATCH = 0x56000033, MASK = 0xfe00707f
SHA512SUM0	MATCH = 0x10401013, MASK = 0xfff0707f
SHA512SUM0R	MATCH = 0x50000033, MASK = 0xfe00707f
SHA512SUM1	MATCH = 0x10501013, MASK = 0xfff0707f
SHA512SUM1R	MATCH = 0x52000033, MASK = 0xfe00707f
SHFLI	MATCH = 0x8001013, MASK = 0xfe00707f
SINVAL_VMA	MATCH = 0x16000073, MASK = 0xfe007fff
SLL	MATCH = 0x1033, MASK = 0xfe00707f
SLLI	MATCH = 0x1013, MASK = 0xfc00707f
SLLI_UW	MATCH = 0x800101b, MASK = 0xfc00707f

SLLIW	MATCH = 0x101b, MASK = 0xfe00707f
SLLW	MATCH = 0x103b, MASK = 0xfe00707f
SLT	MATCH = 0x2033, MASK = 0xfe00707f
SLTI	MATCH = 0x2013, MASK = 0x707f
SLTIU	MATCH = 0x3013, MASK = 0x707f
SLTU	MATCH = 0x3033, MASK = 0xfe00707f
SM3P0	MATCH = 0x10801013, MASK = 0xfff0707f
SM3P1	MATCH = 0x10901013, MASK = 0xfff0707f
SM4ED	MATCH = 0x30000033, MASK = 0x3e00707f
SM4KS	MATCH = 0x34000033, MASK = 0x3e00707f
SRA	MATCH = 0x40005033, MASK = 0xfe00707f
SRAI	MATCH = 0x40005013, MASK = 0xfc00707f
SRAIW	MATCH = 0x4000501b, MASK = 0xfe00707f
SRAW	MATCH = 0x4000503b, MASK = 0xfe00707f
SRET	MATCH = 0x10200073, MASK = 0xffffffff
SRL	MATCH = 0x5033, MASK = 0xfe00707f
SRLI	MATCH = 0x5013, MASK = 0xfc00707f
SRLIW	MATCH = 0x501b, MASK = 0xfe00707f
SRLW	MATCH = 0x503b, MASK = 0xfe00707f
SSAMOSWAP_D	MATCH = 0x4800302f, MASK = 0xf800707f
SSAMOSWAP_W	MATCH = 0x4800202f, MASK = 0xf800707f
SUB	MATCH = 0x40000033, MASK = 0xfe00707f
SUBW	MATCH = 0x4000003b, MASK = 0xfe00707f
SW	MATCH = 0x2023, MASK = 0x707f
SW_RL	MATCH = 0x3a00202f, MASK = 0xfa007fff
UNSHFLI	MATCH = 0x8005013, MASK = 0xfe00707f
VAADD_VV	MATCH = 0x24002057, MASK = 0xfc00707f
VAADD_VX	MATCH = 0x24006057, MASK = 0xfc00707f
VAADDU_VV	MATCH = 0x20002057, MASK = 0xfc00707f
VAADDU_VX	MATCH = 0x20006057, MASK = 0xfc00707f
VADC_VIM	MATCH = 0x40003057, MASK = 0xfe00707f
VADC_VVM	MATCH = 0x40000057, MASK = 0xfe00707f
VADC_VXM	MATCH = 0x40004057, MASK = 0xfe00707f
VADD_VI	MATCH = 0x3057, MASK = 0xfc00707f

VADD_VV	MATCH = 0x57, MASK = 0xfc00707f
VADD_VX	MATCH = 0x4057, MASK = 0xfc00707f
VAESDF_VS	MATCH = 0xa600a077, MASK = 0xfe0ff07f
VAESDF_VV	MATCH = 0xa200a077, MASK = 0xfe0ff07f
VAESDM_VS	MATCH = 0xa6002077, MASK = 0xfe0ff07f
VAESDM_VV	MATCH = 0xa2002077, MASK = 0xfe0ff07f
VAESEF_VS	MATCH = 0xa601a077, MASK = 0xfe0ff07f
VAESEF_VV	MATCH = 0xa201a077, MASK = 0xfe0ff07f
VAESEM_VS	MATCH = 0xa6012077, MASK = 0xfe0ff07f
VAESEM_VV	MATCH = 0xa2012077, MASK = 0xfe0ff07f
VAESKF1_VI	MATCH = 0x8a002077, MASK = 0xfe00707f
VAESKF2_VI	MATCH = 0xaa002077, MASK = 0xfe00707f
VAESZ_VS	MATCH = 0xa603a077, MASK = 0xfe0ff07f
VAND_VI	MATCH = 0x24003057, MASK = 0xfc00707f
VAND_VV	MATCH = 0x24000057, MASK = 0xfc00707f
VAND_VX	MATCH = 0x24004057, MASK = 0xfc00707f
VANDN_VV	MATCH = 0x4000057, MASK = 0xfc00707f
VANDN_VX	MATCH = 0x4004057, MASK = 0xfc00707f
VASUB_VV	MATCH = 0x2c002057, MASK = 0xfc00707f
VASUB_VX	MATCH = 0x2c006057, MASK = 0xfc00707f
VASUBU_VV	MATCH = 0x28002057, MASK = 0xfc00707f
VASUBU_VX	MATCH = 0x28006057, MASK = 0xfc00707f
VBREV8_V	MATCH = 0x48042057, MASK = 0xfc0ff07f
VBREV_V	MATCH = 0x48052057, MASK = 0xfc0ff07f
VCLMUL_VV	MATCH = 0x30002057, MASK = 0xfc00707f
VCLMUL_VX	MATCH = 0x30006057, MASK = 0xfc00707f
VCLMULH_VV	MATCH = 0x34002057, MASK = 0xfc00707f
VCLMULH_VX	MATCH = 0x34006057, MASK = 0xfc00707f
VCLZ_V	MATCH = 0x48062057, MASK = 0xfc0ff07f
VCOMPRESS_VM	MATCH = 0x5e002057, MASK = 0xfe00707f
VCPOP_M	MATCH = 0x40082057, MASK = 0xfc0ff07f
VCPOP_V	MATCH = 0x48072057, MASK = 0xfc0ff07f
VCTZ_V	MATCH = 0x4806a057, MASK = 0xfc0ff07f
VDIV_VV	MATCH = 0x84002057, MASK = 0xfc00707f

VDIV_VX	MATCH = 0x84006057, MASK = 0xfc00707f
VDIVU_VV	MATCH = 0x80002057, MASK = 0xfc00707f
VDIVU_VX	MATCH = 0x80006057, MASK = 0xfc00707f
VFADD_VF	MATCH = 0x5057, MASK = 0xfc00707f
VFADD_VV	MATCH = 0x1057, MASK = 0xfc00707f
VFCLASS_V	MATCH = 0x4c081057, MASK = 0xfc0ff07f
VFCVT_F_X_V	MATCH = 0x48019057, MASK = 0xfc0ff07f
VFCVT_F_XU_V	MATCH = 0x48011057, MASK = 0xfc0ff07f
VFCVT_RTZ_X_F_V	MATCH = 0x48039057, MASK = 0xfc0ff07f
VFCVT_RTZ_XU_F_V	MATCH = 0x48031057, MASK = 0xfc0ff07f
VFCVT_X_F_V	MATCH = 0x48009057, MASK = 0xfc0ff07f
VFCVT_XU_F_V	MATCH = 0x48001057, MASK = 0xfc0ff07f
VFDIV_VF	MATCH = 0x80005057, MASK = 0xfc00707f
VFDIV_VV	MATCH = 0x80001057, MASK = 0xfc00707f
VFIRST_M	MATCH = 0x4008a057, MASK = 0xfc0ff07f
VFMACC_VF	MATCH = 0xb0005057, MASK = 0xfc00707f
VFMACC_VV	MATCH = 0xb0001057, MASK = 0xfc00707f
VFMADD_VF	MATCH = 0xa0005057, MASK = 0xfc00707f
VFMADD_VV	MATCH = 0xa0001057, MASK = 0xfc00707f
VFMAX_VF	MATCH = 0x18005057, MASK = 0xfc00707f
VFMAX_VV	MATCH = 0x18001057, MASK = 0xfc00707f
VFMERGE_VFM	MATCH = 0x5c005057, MASK = 0xfe00707f
VFMIN_VF	MATCH = 0x10005057, MASK = 0xfc00707f
VFMIN_VV	MATCH = 0x10001057, MASK = 0xfc00707f
VFMSAC_VF	MATCH = 0xb8005057, MASK = 0xfc00707f
VFMSAC_VV	MATCH = 0xb8001057, MASK = 0xfc00707f
VFMSUB_VF	MATCH = 0xa8005057, MASK = 0xfc00707f
VFMSUB_VV	MATCH = 0xa8001057, MASK = 0xfc00707f
VFMUL_VF	MATCH = 0x90005057, MASK = 0xfc00707f
VFMUL_VV	MATCH = 0x90001057, MASK = 0xfc00707f
VFMV_F_S	MATCH = 0x42001057, MASK = 0xfe0ff07f
VFMV_S_F	MATCH = 0x42005057, MASK = 0xfff0707f
VFMV_V_F	MATCH = 0x5e005057, MASK = 0xfff0707f
VFNCVT_F_F_W	MATCH = 0x480a1057, MASK = 0xfc0ff07f

VFNCVT_F_X_W	MATCH = 0x48099057, MASK = 0xfc0ff07f
VFNCVT_F_XU_W	MATCH = 0x48091057, MASK = 0xfc0ff07f
VFNCVT_ROD_F_F_W	MATCH = 0x480a9057, MASK = 0xfc0ff07f
VFNCVT_RTZ_X_F_W	MATCH = 0x480b9057, MASK = 0xfc0ff07f
VFNCVT_RTZ_XU_F_W	MATCH = 0x480b1057, MASK = 0xfc0ff07f
VFNCVT_X_F_W	MATCH = 0x48089057, MASK = 0xfc0ff07f
VFNCVT_XU_F_W	MATCH = 0x48081057, MASK = 0xfc0ff07f
VFNCVTBF16_F_F_W	MATCH = 0x480e9057, MASK = 0xfc0ff07f
VFNMACC_VF	MATCH = 0xb4005057, MASK = 0xfc00707f
VFNMACC_VV	MATCH = 0xb4001057, MASK = 0xfc00707f
VFNMADD_VF	MATCH = 0xa4005057, MASK = 0xfc00707f
VFNMADD_VV	MATCH = 0xa4001057, MASK = 0xfc00707f
VFNMSAC_VF	MATCH = 0xbc005057, MASK = 0xfc00707f
VFNMSAC_VV	MATCH = 0xbc001057, MASK = 0xfc00707f
VFNMSUB_VF	MATCH = 0xac005057, MASK = 0xfc00707f
VFNMSUB_VV	MATCH = 0xac001057, MASK = 0xfc00707f
VFRDIV_VF	MATCH = 0x84005057, MASK = 0xfc00707f
VFREC7_V	MATCH = 0x4c029057, MASK = 0xfc0ff07f
VFREDMAX_VS	MATCH = 0x1c001057, MASK = 0xfc00707f
VFREDMIN_VS	MATCH = 0x14001057, MASK = 0xfc00707f
VFREDOSUM_VS	MATCH = 0xc001057, MASK = 0xfc00707f
VFREDUSUM_VS	MATCH = 0x4001057, MASK = 0xfc00707f
VFRSQRT7_V	MATCH = 0x4c021057, MASK = 0xfc0ff07f
VFRSUB_VF	MATCH = 0x9c005057, MASK = 0xfc00707f
VFSGNJ_VF	MATCH = 0x20005057, MASK = 0xfc00707f
VFSGNJ_VV	MATCH = 0x20001057, MASK = 0xfc00707f
VFSGNJN_VF	MATCH = 0x24005057, MASK = 0xfc00707f
VFSGNJN_VV	MATCH = 0x24001057, MASK = 0xfc00707f
VFSGNJX_VF	MATCH = 0x28005057, MASK = 0xfc00707f
VFSGNJX_VV	MATCH = 0x28001057, MASK = 0xfc00707f
VFSLIDE1DOWN_VF	MATCH = 0x3c005057, MASK = 0xfc00707f
VFSLIDE1UP_VF	MATCH = 0x38005057, MASK = 0xfc00707f
VFSQRT_V	MATCH = 0x4c001057, MASK = 0xfc0ff07f
VFSUB_VF	MATCH = 0x8005057, MASK = 0xfc00707f

VFSUB_VV	MATCH = 0x8001057, MASK = 0xfc00707f
VFWADD_VF	MATCH = 0xc0005057, MASK = 0xfc00707f
VFWADD_VV	MATCH = 0xc0001057, MASK = 0xfc00707f
VFWADD_WF	MATCH = 0xd0005057, MASK = 0xfc00707f
VFWADD_WV	MATCH = 0xd0001057, MASK = 0xfc00707f
VFWCVT_F_F_V	MATCH = 0x48061057, MASK = 0xfc0ff07f
VFWCVT_F_X_V	MATCH = 0x48059057, MASK = 0xfc0ff07f
VFWCVT_F_XU_V	MATCH = 0x48051057, MASK = 0xfc0ff07f
VFWCVT_RTZ_X_F_V	MATCH = 0x48079057, MASK = 0xfc0ff07f
VFWCVT_RTZ_XU_F_V	MATCH = 0x48071057, MASK = 0xfc0ff07f
VFWCVT_X_F_V	MATCH = 0x48049057, MASK = 0xfc0ff07f
VFWCVT_XU_F_V	MATCH = 0x48041057, MASK = 0xfc0ff07f
VFWCVTBF16_F_F_V	MATCH = 0x48069057, MASK = 0xfc0ff07f
VFWMACC_VF	MATCH = 0xf0005057, MASK = 0xfc00707f
VFWMACC_VV	MATCH = 0xf0001057, MASK = 0xfc00707f
VFWMACCBF16_VF	MATCH = 0xec005057, MASK = 0xfc00707f
VFWMACCBF16_VV	MATCH = 0xec001057, MASK = 0xfc00707f
VFWMSAC_VF	MATCH = 0xf8005057, MASK = 0xfc00707f
VFWMSAC_VV	MATCH = 0xf8001057, MASK = 0xfc00707f
VFWMUL_VF	MATCH = 0xe0005057, MASK = 0xfc00707f
VFWMUL_VV	MATCH = 0xe0001057, MASK = 0xfc00707f
VFWNMACC_VF	MATCH = 0xf4005057, MASK = 0xfc00707f
VFWNMACC_VV	MATCH = 0xf4001057, MASK = 0xfc00707f
VFWNMSAC_VF	MATCH = 0xfc005057, MASK = 0xfc00707f
VFWNMSAC_VV	MATCH = 0xfc001057, MASK = 0xfc00707f
VFWREDOSUM_VS	MATCH = 0xcc001057, MASK = 0xfc00707f
VFWREDUSUM_VS	MATCH = 0xc4001057, MASK = 0xfc00707f
VFWSUB_VF	MATCH = 0xc8005057, MASK = 0xfc00707f
VFWSUB_VV	MATCH = 0xc8001057, MASK = 0xfc00707f
VFWSUB_WF	MATCH = 0xd8005057, MASK = 0xfc00707f
VFWSUB_WV	MATCH = 0xd8001057, MASK = 0xfc00707f
VGHSH_VV	MATCH = 0xb2002077, MASK = 0xfe00707f
VGMUL_VV	MATCH = 0xa208a077, MASK = 0xfe0ff07f
VID_V	MATCH = 0x5008a057, MASK = 0xfdfff07f

VIOTA_M	MATCH = 0x50082057, MASK = 0xfc0ff07f
VL1RE16_V	MATCH = 0x2805007, MASK = 0xfff0707f
VL1RE32_V	MATCH = 0x2806007, MASK = 0xfff0707f
VL1RE64_V	MATCH = 0x2807007, MASK = 0xfff0707f
VL1RE8_V	MATCH = 0x2800007, MASK = 0xfff0707f
VL2RE16_V	MATCH = 0x22805007, MASK = 0xfff0707f
VL2RE32_V	MATCH = 0x22806007, MASK = 0xfff0707f
VL2RE64_V	MATCH = 0x22807007, MASK = 0xfff0707f
VL2RE8_V	MATCH = 0x22800007, MASK = 0xfff0707f
VL4RE16_V	MATCH = 0x62805007, MASK = 0xfff0707f
VL4RE32_V	MATCH = 0x62806007, MASK = 0xfff0707f
VL4RE64_V	MATCH = 0x62807007, MASK = 0xfff0707f
VL4RE8_V	MATCH = 0x62800007, MASK = 0xfff0707f
VL8RE16_V	MATCH = 0xe2805007, MASK = 0xfff0707f
VL8RE32_V	MATCH = 0xe2806007, MASK = 0xfff0707f
VL8RE64_V	MATCH = 0xe2807007, MASK = 0xfff0707f
VL8RE8_V	MATCH = 0xe2800007, MASK = 0xfff0707f
VLE16_V	MATCH = 0x5007, MASK = 0xfdf0707f
VLE16FF_V	MATCH = 0x1005007, MASK = 0xfdf0707f
VLE32_V	MATCH = 0x6007, MASK = 0xfdf0707f
VLE32FF_V	MATCH = 0x1006007, MASK = 0xfdf0707f
VLE64_V	MATCH = 0x7007, MASK = 0xfdf0707f
VLE64FF_V	MATCH = 0x1007007, MASK = 0xfdf0707f
VLE8_V	MATCH = 0x7, MASK = 0xfdf0707f
VLE8FF_V	MATCH = 0x1000007, MASK = 0xfdf0707f
VLM_V	MATCH = 0x2b00007, MASK = 0xfff0707f
VLOXEI16_V	MATCH = 0xc005007, MASK = 0xfc00707f
VLOXEI32_V	MATCH = 0xc006007, MASK = 0xfc00707f
VLOXEI64_V	MATCH = 0xc007007, MASK = 0xfc00707f
VLOXEI8_V	MATCH = 0xc000007, MASK = 0xfc00707f
VLSE16_V	MATCH = 0x8005007, MASK = 0xfc00707f
VLSE32_V	MATCH = 0x8006007, MASK = 0xfc00707f
VLSE64_V	MATCH = 0x8007007, MASK = 0xfc00707f
VLSE8_V	MATCH = 0x8000007, MASK = 0xfc00707f

VLUXEI16_V	MATCH = 0x4005007, MASK = 0xfc00707f
VLUXEI32_V	MATCH = 0x4006007, MASK = 0xfc00707f
VLUXEI64_V	MATCH = 0x4007007, MASK = 0xfc00707f
VLUXEI8_V	MATCH = 0x4000007, MASK = 0xfc00707f
VMACC_VV	MATCH = 0xb4002057, MASK = 0xfc00707f
VMACC_VX	MATCH = 0xb4006057, MASK = 0xfc00707f
VMADC_VI	MATCH = 0x46003057, MASK = 0xfe00707f
VMADC_VIM	MATCH = 0x44003057, MASK = 0xfe00707f
VMADC_VV	MATCH = 0x46000057, MASK = 0xfe00707f
VMADC_VVM	MATCH = 0x44000057, MASK = 0xfe00707f
VMADC_VX	MATCH = 0x46004057, MASK = 0xfe00707f
VMADC_VXM	MATCH = 0x44004057, MASK = 0xfe00707f
VMADD_VV	MATCH = 0xa4002057, MASK = 0xfc00707f
VMADD_VX	MATCH = 0xa4006057, MASK = 0xfc00707f
VMAND_MM	MATCH = 0x66002057, MASK = 0xfe00707f
VMANDN_MM	MATCH = 0x62002057, MASK = 0xfe00707f
VMAX_VV	MATCH = 0x1c000057, MASK = 0xfc00707f
VMAX_VX	MATCH = 0x1c004057, MASK = 0xfc00707f
VMAXU_VV	MATCH = 0x18000057, MASK = 0xfc00707f
VMAXU_VX	MATCH = 0x18004057, MASK = 0xfc00707f
VMERGE_VIM	MATCH = 0x5c003057, MASK = 0xfe00707f
VMERGE_VVM	MATCH = 0x5c000057, MASK = 0xfe00707f
VMERGE_VXM	MATCH = 0x5c004057, MASK = 0xfe00707f
VMFEQ_VF	MATCH = 0x60005057, MASK = 0xfc00707f
VMFEQ_VV	MATCH = 0x60001057, MASK = 0xfc00707f
VMFGE_VF	MATCH = 0x7c005057, MASK = 0xfc00707f
VMFGT_VF	MATCH = 0x74005057, MASK = 0xfc00707f
VMFLE_VF	MATCH = 0x64005057, MASK = 0xfc00707f
VMFLE_VV	MATCH = 0x64001057, MASK = 0xfc00707f
VMFLT_VF	MATCH = 0x6c005057, MASK = 0xfc00707f
VMFLT_VV	MATCH = 0x6c001057, MASK = 0xfc00707f
VMFNE_VF	MATCH = 0x70005057, MASK = 0xfc00707f
VMFNE_VV	MATCH = 0x70001057, MASK = 0xfc00707f
VMIN_VV	MATCH = 0x14000057, MASK = 0xfc00707f

VMIN_VX	MATCH = 0x14004057, MASK = 0xfc00707f
VMINU_VV	MATCH = 0x10000057, MASK = 0xfc00707f
VMINU_VX	MATCH = 0x10004057, MASK = 0xfc00707f
VMNAND_MM	MATCH = 0x76002057, MASK = 0xfe00707f
VMNOR_MM	MATCH = 0x7a002057, MASK = 0xfe00707f
VMOR_MM	MATCH = 0x6a002057, MASK = 0xfe00707f
VMORN_MM	MATCH = 0x72002057, MASK = 0xfe00707f
VMSBC_VV	MATCH = 0x4e000057, MASK = 0xfe00707f
VMSBC_VVM	MATCH = 0x4c000057, MASK = 0xfe00707f
VMSBC_VX	MATCH = 0x4e004057, MASK = 0xfe00707f
VMSBC_VXM	MATCH = 0x4c004057, MASK = 0xfe00707f
VMSBF_M	MATCH = 0x5000a057, MASK = 0xfc0ff07f
VMSEQ_VI	MATCH = 0x60003057, MASK = 0xfc00707f
VMSEQ_VV	MATCH = 0x60000057, MASK = 0xfc00707f
VMSEQ_VX	MATCH = 0x60004057, MASK = 0xfc00707f
VMSGT_VI	MATCH = 0x7c003057, MASK = 0xfc00707f
VMSGT_VX	MATCH = 0x7c004057, MASK = 0xfc00707f
VMSGTU_VI	MATCH = 0x78003057, MASK = 0xfc00707f
VMSGTU_VX	MATCH = 0x78004057, MASK = 0xfc00707f
VMSIF_M	MATCH = 0x5001a057, MASK = 0xfc0ff07f
VMSLE_VI	MATCH = 0x74003057, MASK = 0xfc00707f
VMSLE_VV	MATCH = 0x74000057, MASK = 0xfc00707f
VMSLE_VX	MATCH = 0x74004057, MASK = 0xfc00707f
VMSLEU_VI	MATCH = 0x70003057, MASK = 0xfc00707f
VMSLEU_VV	MATCH = 0x70000057, MASK = 0xfc00707f
VMSLEU_VX	MATCH = 0x70004057, MASK = 0xfc00707f
VMSLT_VV	MATCH = 0x6c000057, MASK = 0xfc00707f
VMSLT_VX	MATCH = 0x6c004057, MASK = 0xfc00707f
VMSLTU_VV	MATCH = 0x68000057, MASK = 0xfc00707f
VMSLTU_VX	MATCH = 0x68004057, MASK = 0xfc00707f
VMSNE_VI	MATCH = 0x64003057, MASK = 0xfc00707f
VMSNE_VV	MATCH = 0x64000057, MASK = 0xfc00707f
VMSNE_VX	MATCH = 0x64004057, MASK = 0xfc00707f
VMSOF_M	MATCH = 0x50012057, MASK = 0xfc0ff07f

VMUL_VV	MATCH = 0x94002057, MASK = 0xfc00707f
VMUL_VX	MATCH = 0x94006057, MASK = 0xfc00707f
VMULH_VV	MATCH = 0x9c002057, MASK = 0xfc00707f
VMULH_VX	MATCH = 0x9c006057, MASK = 0xfc00707f
VMULHSU_VV	MATCH = 0x98002057, MASK = 0xfc00707f
VMULHSU_VX	MATCH = 0x98006057, MASK = 0xfc00707f
VMULHU_VV	MATCH = 0x90002057, MASK = 0xfc00707f
VMULHU_VX	MATCH = 0x90006057, MASK = 0xfc00707f
VMV1R_V	MATCH = 0x9e003057, MASK = 0xfe0ff07f
VMV2R_V	MATCH = 0x9e00b057, MASK = 0xfe0ff07f
VMV4R_V	MATCH = 0x9e01b057, MASK = 0xfe0ff07f
VMV8R_V	MATCH = 0x9e03b057, MASK = 0xfe0ff07f
VMV_S_X	MATCH = 0x42006057, MASK = 0xfff0707f
VMV_V_I	MATCH = 0x5e003057, MASK = 0xfff0707f
VMV_V_V	MATCH = 0x5e000057, MASK = 0xfff0707f
VMV_V_X	MATCH = 0x5e004057, MASK = 0xfff0707f
VMV_X_S	MATCH = 0x42002057, MASK = 0xfe0ff07f
VMXNOR_MM	MATCH = 0x7e002057, MASK = 0xfe00707f
VMXOR_MM	MATCH = 0x6e002057, MASK = 0xfe00707f
VNCLIP_WI	MATCH = 0xbc003057, MASK = 0xfc00707f
VNCLIP_WV	MATCH = 0xbc000057, MASK = 0xfc00707f
VNCLIP_WX	MATCH = 0xbc004057, MASK = 0xfc00707f
VNCLIPU_WI	MATCH = 0xb8003057, MASK = 0xfc00707f
VNCLIPU_WV	MATCH = 0xb8000057, MASK = 0xfc00707f
VNCLIPU_WX	MATCH = 0xb8004057, MASK = 0xfc00707f
VNMSAC_VV	MATCH = 0xbc002057, MASK = 0xfc00707f
VNMSAC_VX	MATCH = 0xbc006057, MASK = 0xfc00707f
VNMSUB_VV	MATCH = 0xac002057, MASK = 0xfc00707f
VNMSUB_VX	MATCH = 0xac006057, MASK = 0xfc00707f
VNSRA_WI	MATCH = 0xb4003057, MASK = 0xfc00707f
VNSRA_WV	MATCH = 0xb4000057, MASK = 0xfc00707f
VNSRA_WX	MATCH = 0xb4004057, MASK = 0xfc00707f
VNSRL_WI	MATCH = 0xb0003057, MASK = 0xfc00707f
VNSRL_WV	MATCH = 0xb0000057, MASK = 0xfc00707f

VNSRL_WX	MATCH = 0xb0004057, MASK = 0xfc00707f
VOR_VI	MATCH = 0x28003057, MASK = 0xfc00707f
VOR_VV	MATCH = 0x28000057, MASK = 0xfc00707f
VOR_VX	MATCH = 0x28004057, MASK = 0xfc00707f
VREDAND_VS	MATCH = 0x4002057, MASK = 0xfc00707f
VREDMAX_VS	MATCH = 0x1c002057, MASK = 0xfc00707f
VREDMAXU_VS	MATCH = 0x18002057, MASK = 0xfc00707f
VREDMIN_VS	MATCH = 0x14002057, MASK = 0xfc00707f
VREDMINU_VS	MATCH = 0x10002057, MASK = 0xfc00707f
VREDOR_VS	MATCH = 0x8002057, MASK = 0xfc00707f
VREDSUM_VS	MATCH = 0x2057, MASK = 0xfc00707f
VREDXOR_VS	MATCH = 0xc002057, MASK = 0xfc00707f
VREM_VV	MATCH = 0x8c002057, MASK = 0xfc00707f
VREM_VX	MATCH = 0x8c006057, MASK = 0xfc00707f
VREMU_VV	MATCH = 0x88002057, MASK = 0xfc00707f
VREMU_VX	MATCH = 0x88006057, MASK = 0xfc00707f
VREV8_V	MATCH = 0x4804a057, MASK = 0xfc0ff07f
VRGATHER_VI	MATCH = 0x30003057, MASK = 0xfc00707f
VRGATHER_VV	MATCH = 0x30000057, MASK = 0xfc00707f
VRGATHER_VX	MATCH = 0x30004057, MASK = 0xfc00707f
VRGATHEREI16_VV	MATCH = 0x38000057, MASK = 0xfc00707f
VROL_VV	MATCH = 0x54000057, MASK = 0xfc00707f
VROL_VX	MATCH = 0x54004057, MASK = 0xfc00707f
VROR_VI	MATCH = 0x50003057, MASK = 0xf800707f
VROR_VV	MATCH = 0x50000057, MASK = 0xfc00707f
VROR_VX	MATCH = 0x50004057, MASK = 0xfc00707f
VRSUB_VI	MATCH = 0xc003057, MASK = 0xfc00707f
VRSUB_VX	MATCH = 0xc004057, MASK = 0xfc00707f
VS1R_V	MATCH = 0x2800027, MASK = 0xfff0707f
VS2R_V	MATCH = 0x22800027, MASK = 0xfff0707f
VS4R_V	MATCH = 0x62800027, MASK = 0xfff0707f
VS8R_V	MATCH = 0xe2800027, MASK = 0xfff0707f
VSADD_VI	MATCH = 0x84003057, MASK = 0xfc00707f
VSADD_VV	MATCH = 0x84000057, MASK = 0xfc00707f

VSADD_VX	MATCH = 0x84004057, MASK = 0xfc00707f
VSADDU_VI	MATCH = 0x80003057, MASK = 0xfc00707f
VSADDU_VV	MATCH = 0x80000057, MASK = 0xfc00707f
VSADDU_VX	MATCH = 0x80004057, MASK = 0xfc00707f
VSBC_VVM	MATCH = 0x48000057, MASK = 0xfe00707f
VSBC_VXM	MATCH = 0x48004057, MASK = 0xfe00707f
VSE16_V	MATCH = 0x5027, MASK = 0xfdf0707f
VSE32_V	MATCH = 0x6027, MASK = 0xfdf0707f
VSE64_V	MATCH = 0x7027, MASK = 0xfdf0707f
VSE8_V	MATCH = 0x27, MASK = 0xfdf0707f
VSETIVLI	MATCH = 0xc0007057, MASK = 0xc000707f
VSETVL	MATCH = 0x80007057, MASK = 0xfe00707f
VSETVLI	MATCH = 0x7057, MASK = 0x8000707f
VSEXT_VF2	MATCH = 0x4803a057, MASK = 0xfc0ff07f
VSEXT_VF4	MATCH = 0x4802a057, MASK = 0xfc0ff07f
VSEXT_VF8	MATCH = 0x4801a057, MASK = 0xfc0ff07f
VSHA2CH_VV	MATCH = 0xba002077, MASK = 0xfe00707f
VSHA2CL_VV	MATCH = 0xbe002077, MASK = 0xfe00707f
VSHA2MS_VV	MATCH = 0xb6002077, MASK = 0xfe00707f
VSLIDE1DOWN_VX	MATCH = 0x3c006057, MASK = 0xfc00707f
VSLIDE1UP_VX	MATCH = 0x38006057, MASK = 0xfc00707f
VSLIDEDOWN_VI	MATCH = 0x3c003057, MASK = 0xfc00707f
VSLIDEDOWN_VX	MATCH = 0x3c004057, MASK = 0xfc00707f
VSLIDEUP_VI	MATCH = 0x38003057, MASK = 0xfc00707f
VSLIDEUP_VX	MATCH = 0x38004057, MASK = 0xfc00707f
VSLL_VI	MATCH = 0x94003057, MASK = 0xfc00707f
VSLL_VV	MATCH = 0x94000057, MASK = 0xfc00707f
VSLL_VX	MATCH = 0x94004057, MASK = 0xfc00707f
VSM3C_VI	MATCH = 0xae002077, MASK = 0xfe00707f
VSM3ME_VV	MATCH = 0x82002077, MASK = 0xfe00707f
VSM4K_VI	MATCH = 0x86002077, MASK = 0xfe00707f
VSM4R_VS	MATCH = 0xa6082077, MASK = 0xfe0ff07f
VSM4R_VV	MATCH = 0xa2082077, MASK = 0xfe0ff07f
VSM_V	MATCH = 0x2b00027, MASK = 0xfff0707f

VSMUL_VV	MATCH = 0x9c000057, MASK = 0xfc00707f
VSMUL_VX	MATCH = 0x9c004057, MASK = 0xfc00707f
VSOXEI16_V	MATCH = 0xc005027, MASK = 0xfc00707f
VSOXEI32_V	MATCH = 0xc006027, MASK = 0xfc00707f
VSOXEI64_V	MATCH = 0xc007027, MASK = 0xfc00707f
VSOXEI8_V	MATCH = 0xc000027, MASK = 0xfc00707f
VSRA_VI	MATCH = 0xa4003057, MASK = 0xfc00707f
VSRA_VV	MATCH = 0xa4000057, MASK = 0xfc00707f
VSRA_VX	MATCH = 0xa4004057, MASK = 0xfc00707f
VSRL_VI	MATCH = 0xa0003057, MASK = 0xfc00707f
VSRL_VV	MATCH = 0xa0000057, MASK = 0xfc00707f
VSRL_VX	MATCH = 0xa0004057, MASK = 0xfc00707f
VSSE16_V	MATCH = 0x8005027, MASK = 0xfc00707f
VSSE32_V	MATCH = 0x8006027, MASK = 0xfc00707f
VSSE64_V	MATCH = 0x8007027, MASK = 0xfc00707f
VSSE8_V	MATCH = 0x8000027, MASK = 0xfc00707f
VSSRA_VI	MATCH = 0xac003057, MASK = 0xfc00707f
VSSRA_VV	MATCH = 0xac000057, MASK = 0xfc00707f
VSSRA_VX	MATCH = 0xac004057, MASK = 0xfc00707f
VSSRL_VI	MATCH = 0xa8003057, MASK = 0xfc00707f
VSSRL_VV	MATCH = 0xa8000057, MASK = 0xfc00707f
VSSRL_VX	MATCH = 0xa8004057, MASK = 0xfc00707f
VSSUB_VV	MATCH = 0x8c000057, MASK = 0xfc00707f
VSSUB_VX	MATCH = 0x8c004057, MASK = 0xfc00707f
VSSUBU_VV	MATCH = 0x88000057, MASK = 0xfc00707f
VSSUBU_VX	MATCH = 0x88004057, MASK = 0xfc00707f
VSUB_VV	MATCH = 0x8000057, MASK = 0xfc00707f
VSUB_VX	MATCH = 0x8004057, MASK = 0xfc00707f
VSUXEI16_V	MATCH = 0x4005027, MASK = 0xfc00707f
VSUXEI32_V	MATCH = 0x4006027, MASK = 0xfc00707f
VSUXEI64_V	MATCH = 0x4007027, MASK = 0xfc00707f
VSUXEI8_V	MATCH = 0x4000027, MASK = 0xfc00707f
VWADD_VV	MATCH = 0xc4002057, MASK = 0xfc00707f
VWADD_VX	MATCH = 0xc4006057, MASK = 0xfc00707f

VWADD_WV	MATCH = 0xd4002057, MASK = 0xfc00707f
VWADD_WX	MATCH = 0xd4006057, MASK = 0xfc00707f
VWADDU_VV	MATCH = 0xc0002057, MASK = 0xfc00707f
VWADDU_VX	MATCH = 0xc0006057, MASK = 0xfc00707f
VWADDU_WV	MATCH = 0xd0002057, MASK = 0xfc00707f
VWADDU_WX	MATCH = 0xd0006057, MASK = 0xfc00707f
VWMACC_VV	MATCH = 0xf4002057, MASK = 0xfc00707f
VWMACC_VX	MATCH = 0xf4006057, MASK = 0xfc00707f
VWMACCSU_VV	MATCH = 0xfc002057, MASK = 0xfc00707f
VWMACCSU_VX	MATCH = 0xfc006057, MASK = 0xfc00707f
VWMACCU_VV	MATCH = 0xf0002057, MASK = 0xfc00707f
VWMACCU_VX	MATCH = 0xf0006057, MASK = 0xfc00707f
VWMACCUS_VX	MATCH = 0xf8006057, MASK = 0xfc00707f
VWMUL_VV	MATCH = 0xec002057, MASK = 0xfc00707f
VWMUL_VX	MATCH = 0xec006057, MASK = 0xfc00707f
VWMULSU_VV	MATCH = 0xe8002057, MASK = 0xfc00707f
VWMULSU_VX	MATCH = 0xe8006057, MASK = 0xfc00707f
VWMULU_VV	MATCH = 0xe0002057, MASK = 0xfc00707f
VWMULU_VX	MATCH = 0xe0006057, MASK = 0xfc00707f
VWREDSUM_VS	MATCH = 0xc4000057, MASK = 0xfc00707f
VWREDSUMU_VS	MATCH = 0xc0000057, MASK = 0xfc00707f
VWSLL_VI	MATCH = 0xd4003057, MASK = 0xfc00707f
VWSLL_VV	MATCH = 0xd4000057, MASK = 0xfc00707f
VWSLL_VX	MATCH = 0xd4004057, MASK = 0xfc00707f
VWSUB_VV	MATCH = 0xcc002057, MASK = 0xfc00707f
VWSUB_VX	MATCH = 0xcc006057, MASK = 0xfc00707f
VWSUB_WV	MATCH = 0xdc002057, MASK = 0xfc00707f
VWSUB_WX	MATCH = 0xdc006057, MASK = 0xfc00707f
VWSUBU_VV	MATCH = 0xc8002057, MASK = 0xfc00707f
VWSUBU_VX	MATCH = 0xc8006057, MASK = 0xfc00707f
VWSUBU_WV	MATCH = 0xd8002057, MASK = 0xfc00707f
VWSUBU_WX	MATCH = 0xd8006057, MASK = 0xfc00707f
VXOR_VI	MATCH = 0x2c003057, MASK = 0xfc00707f
VXOR_VV	MATCH = 0x2c000057, MASK = 0xfc00707f

VXOR_VX	MATCH = 0x2c004057, MASK = 0xfc00707f
VZEXT_VF2	MATCH = 0x48032057, MASK = 0xfc0ff07f
VZEXT_VF4	MATCH = 0x48022057, MASK = 0xfc0ff07f
VZEXT_VF8	MATCH = 0x48012057, MASK = 0xfc0ff07f
WFI	MATCH = 0x10500073, MASK = 0xffffffff
WRS_NTO	MATCH = 0xd00073, MASK = 0xffffffff
WRS_STO	MATCH = 0x1d00073, MASK = 0xffffffff
XNOR	MATCH = 0x40004033, MASK = 0xfe00707f
XOR	MATCH = 0x4033, MASK = 0xfe00707f
XORI	MATCH = 0x4013, MASK = 0x707f
XPERM16	MATCH = 0x28006033, MASK = 0xfe00707f
XPERM32	MATCH = 0x28000033, MASK = 0xfe00707f
XPERM4	MATCH = 0x28002033, MASK = 0xfe00707f
XPERM8	MATCH = 0x28004033, MASK = 0xfe00707f

Control and Status Registers (CSRs)

CSR Name	Hex Value
FFLAGS	0x1
FRM	0x2
FCSR	0x3
VSTART	0x8
VXSAT	0x9
VXRM	0xa
VCSR	0xf
SSP	0x11
SEED	0x15
JVT	0x17
CYCLE	0xc00
TIME	0xc01
INSTRET	0xc02
HPMCOUNTER3	0xc03
HPMCOUNTER4	0xc04
HPMCOUNTER5	0xc05
HPMCOUNTER6	0xc06

HPMCOUNTER7	0xc07
HPMCOUNTER8	0xc08
HPMCOUNTER9	0xc09
HPMCOUNTER10	0xc0a
HPMCOUNTER11	0xc0b
HPMCOUNTER12	0xc0c
HPMCOUNTER13	0xc0d
HPMCOUNTER14	0xc0e
HPMCOUNTER15	0xc0f
HPMCOUNTER16	0xc10
HPMCOUNTER17	0xc11
HPMCOUNTER18	0xc12
HPMCOUNTER19	0xc13
HPMCOUNTER20	0xc14
HPMCOUNTER21	0xc15
HPMCOUNTER22	0xc16
HPMCOUNTER23	0xc17
HPMCOUNTER24	0xc18
HPMCOUNTER25	0xc19
HPMCOUNTER26	0xc1a
HPMCOUNTER27	0xc1b
HPMCOUNTER28	0xc1c
HPMCOUNTER29	0xc1d
HPMCOUNTER30	0xc1e
HPMCOUNTER31	0xc1f
VL	0xc20
VTYPE	0xc21
VLENB	0xc22
SSTATUS	0x100
SEDELEG	0x102
SIDELEG	0x103
SIE	0x104
STVEC	0x105
SCOUNTEREN	0x106

SENVCFG	0x10a
SSTATEEN0	0x10c
SSTATEEN1	0x10d
SSTATEEN2	0x10e
SSTATEEN3	0x10f
SCOUNTINHIBIT	0x120
SSCRATCH	0x140
SEPC	0x141
SCAUSE	0x142
STVAL	0x143
SIP	0x144
STIMECMP	0x14d
SCTRCTL	0x14e
SCTRSTATUS	0x14f
SISELECT	0x150
SIREG	0x151
SIREG2	0x152
SIREG3	0x153
SIREG4	0x155
SIREG5	0x156
SIREG6	0x157
STOPEI	0x15c
SCTRDEPTH	0x15f
SATP	0x180
SRMCFG	0x181
SCONTEXT	0x5a8
VSSTATUS	0x200
VSIE	0x204
VSTVEC	0x205
VSSCRATCH	0x240
VSEPC	0x241
VSCAUSE	0x242
VSTVAL	0x243
VSIP	0x244

VSTIMECMP	0x24d
VSCTRCTL	0x24e
VSISELECT	0x250
VSIREG	0x251
VSIREG2	0x252
VSIREG3	0x253
VSIREG4	0x255
VSIREG5	0x256
VSIREG6	0x257
VSTOPEI	0x25c
VSATP	0x280
HSTATUS	0x600
HEDELEG	0x602
HIDELEG	0x603
HIE	0x604
HTIMEDELTA	0x605
HCOUNTEREN	0x606
HGEIE	0x607
HVIEN	0x608
HVICTL	0x609
HENVCFG	0x60a
HSTATEEN0	0x60c
HSTATEEN1	0x60d
HSTATEEN2	0x60e
HSTATEEN3	0x60f
HTVAL	0x643
HIP	0x644
HVIP	0x645
HVIPRIO1	0x646
HVIPRIO2	0x647
HTINST	0x64a
HGATP	0x680
HCONTEXT	0x6a8
HGEIP	0xe12

VSTOPI	0xeb0
SCOUNTOVF	0xda0
STOPI	0xdb0
UTVT	0x7
UNXTI	0x45
UINTSTATUS	0x46
USCRATCHCSW	0x48
USCRATCHCSWL	0x49
STVT	0x107
SNXTI	0x145
SINTSTATUS	0x146
SSCRATCHCSW	0x148
SSCRATCHCSWL	0x149
MTVT	0x307
MNXTI	0x345
MINTSTATUS	0x346
MSCRATCHCSW	0x348
MSCRATCHCSWL	0x349
MSTATUS	0x300
MISA	0x301
MEDELEG	0x302
MIDELEG	0x303
MIE	0x304
MTVEC	0x305
MCOUNTEREN	0x306
MVIEN	0x308
MVIP	0x309
MENVCFG	0x30a
MSTATEEN0	0x30c
MSTATEEN1	0x30d
MSTATEEN2	0x30e
MSTATEEN3	0x30f
MCOUNTINHIBIT	0x320
MSCRATCH	0x340

MEPC	0x341
MCAUSE	0x342
MTVAL	0x343
MIP	0x344
MTINST	0x34a
MTVAL2	0x34b
MCTRCTL	0x34e
MISELECT	0x350
MIREG	0x351
MIREG2	0x352
MIREG3	0x353
MIREG4	0x355
MIREG5	0x356
MIREG6	0x357
MTOPEI	0x35c
PMPCFG0	0x3a0
PMPCFG1	0x3a1
PMPCFG2	0x3a2
PMPCFG3	0x3a3
PMPCFG4	0x3a4
PMPCFG5	0x3a5
PMPCFG6	0x3a6
PMPCFG7	0x3a7
PMPCFG8	0x3a8
PMPCFG9	0x3a9
PMPCFG10	0x3aa
PMPCFG11	0x3ab
PMPCFG12	0x3ac
PMPCFG13	0x3ad
PMPCFG14	0x3ae
PMPCFG15	0x3af
PMPADDR0	0x3b0
PMPADDR1	0x3b1
PMPADDR2	0x3b2

PMPADDR3	`0x3b3`
PMPADDR4	`0x3b4`
PMPADDR5	`0x3b5`
PMPADDR6	`0x3b6`
PMPADDR7	`0x3b7`
PMPADDR8	`0x3b8`
PMPADDR9	`0x3b9`
PMPADDR10	`0x3ba`
PMPADDR11	`0x3bb`
PMPADDR12	`0x3bc`
PMPADDR13	`0x3bd`
PMPADDR14	`0x3be`
PMPADDR15	`0x3bf`
PMPADDR16	`0x3c0`
PMPADDR17	`0x3c1`
PMPADDR18	`0x3c2`
PMPADDR19	`0x3c3`
PMPADDR20	`0x3c4`
PMPADDR21	`0x3c5`
PMPADDR22	`0x3c6`
PMPADDR23	`0x3c7`
PMPADDR24	`0x3c8`
PMPADDR25	`0x3c9`
PMPADDR26	`0x3ca`
PMPADDR27	`0x3cb`
PMPADDR28	`0x3cc`
PMPADDR29	`0x3cd`
PMPADDR30	`0x3ce`
PMPADDR31	`0x3cf`
PMPADDR32	`0x3d0`
PMPADDR33	`0x3d1`
PMPADDR34	`0x3d2`
PMPADDR35	`0x3d3`
PMPADDR36	`0x3d4`

PMPADDR37	0x3d5
PMPADDR38	0x3d6
PMPADDR39	0x3d7
PMPADDR40	0x3d8
PMPADDR41	0x3d9
PMPADDR42	0x3da
PMPADDR43	0x3db
PMPADDR44	0x3dc
PMPADDR45	0x3dd
PMPADDR46	0x3de
PMPADDR47	0x3df
PMPADDR48	0x3e0
PMPADDR49	0x3e1
PMPADDR50	0x3e2
PMPADDR51	0x3e3
PMPADDR52	0x3e4
PMPADDR53	0x3e5
PMPADDR54	0x3e6
PMPADDR55	0x3e7
PMPADDR56	0x3e8
PMPADDR57	0x3e9
PMPADDR58	0x3ea
PMPADDR59	0x3eb
PMPADDR60	0x3ec
PMPADDR61	0x3ed
PMPADDR62	0x3ee
PMPADDR63	0x3ef
MSECCFG	0x747
TSELECT	0x7a0
TDATA1	0x7a1
TDATA2	0x7a2
TDATA3	0x7a3
TINFO	0x7a4
TCONTROL	0x7a5

MCONTEXT	0x7a8
MSCONTEXT	0x7aa
DCSR	0x7b0
DPC	0x7b1
DSCRATCH0	0x7b2
DSCRATCH1	0x7b3
MCYCLE	0xb00
MINSTRET	0xb02
MHPMCOUNTER3	0xb03
MHPMCOUNTER4	0xb04
MHPMCOUNTER5	0xb05
MHPMCOUNTER6	0xb06
MHPMCOUNTER7	0xb07
MHPMCOUNTER8	0xb08
MHPMCOUNTER9	0xb09
MHPMCOUNTER10	0xb0a
MHPMCOUNTER11	0xb0b
MHPMCOUNTER12	0xb0c
MHPMCOUNTER13	0xb0d
MHPMCOUNTER14	0xb0e
MHPMCOUNTER15	0xb0f
MHPMCOUNTER16	0xb10
MHPMCOUNTER17	0xb11
MHPMCOUNTER18	0xb12
MHPMCOUNTER19	0xb13
MHPMCOUNTER20	0xb14
MHPMCOUNTER21	0xb15
MHPMCOUNTER22	0xb16
MHPMCOUNTER23	0xb17
MHPMCOUNTER24	0xb18
MHPMCOUNTER25	0xb19
MHPMCOUNTER26	0xb1a
MHPMCOUNTER27	0xb1b
MHPMCOUNTER28	0xb1c

MHPMCOUNTER29	`0xb1d`
MHPMCOUNTER30	`0xb1e`
MHPMCOUNTER31	`0xb1f`
MCYCLECFG	`0x321`
MINSTRETCFG	`0x322`
MHPMEVENT3	`0x323`
MHPMEVENT4	`0x324`
MHPMEVENT5	`0x325`
MHPMEVENT6	`0x326`
MHPMEVENT7	`0x327`
MHPMEVENT8	`0x328`
MHPMEVENT9	`0x329`
MHPMEVENT10	`0x32a`
MHPMEVENT11	`0x32b`
MHPMEVENT12	`0x32c`
MHPMEVENT13	`0x32d`
MHPMEVENT14	`0x32e`
MHPMEVENT15	`0x32f`
MHPMEVENT16	`0x330`
MHPMEVENT17	`0x331`
MHPMEVENT18	`0x332`
MHPMEVENT19	`0x333`
MHPMEVENT20	`0x334`
MHPMEVENT21	`0x335`
MHPMEVENT22	`0x336`
MHPMEVENT23	`0x337`
MHPMEVENT24	`0x338`
MHPMEVENT25	`0x339`
MHPMEVENT26	`0x33a`
MHPMEVENT27	`0x33b`
MHPMEVENT28	`0x33c`
MHPMEVENT29	`0x33d`
MHPMEVENT30	`0x33e`
MHPMEVENT31	`0x33f`

MVENDORID	0xf11
MARCHID	0xf12
MIMPID	0xf13
MHARTID	0xf14
MCONFIGPTR	0xf15
MTOPI	0xfb0
SIEH	0x114
SIPH	0x154
STIMECMPH	0x15d
VSIEH	0x214
VSIPH	0x254
VSTIMECMPH	0x25d
HTIMEDELTAH	0x615
HIDELEGH	0x613
HVIENH	0x618
HENVCFGH	0x61a
HVIPH	0x655
HVIPRIO1H	0x656
HVIPRIO2H	0x657
HSTATEEN0H	0x61c
HSTATEEN1H	0x61d
HSTATEEN2H	0x61e
HSTATEEN3H	0x61f
CYCLEH	0xc80
TIMEH	0xc81
INSTRETH	0xc82
HPMCOUNTER3H	0xc83
HPMCOUNTER4H	0xc84
HPMCOUNTER5H	0xc85
HPMCOUNTER6H	0xc86
HPMCOUNTER7H	0xc87
HPMCOUNTER8H	0xc88
HPMCOUNTER9H	0xc89
HPMCOUNTER10H	0xc8a

HPMCOUNTER11H	0xc8b
HPMCOUNTER12H	0xc8c
HPMCOUNTER13H	0xc8d
HPMCOUNTER14H	0xc8e
HPMCOUNTER15H	0xc8f
HPMCOUNTER16H	0xc90
HPMCOUNTER17H	0xc91
HPMCOUNTER18H	0xc92
HPMCOUNTER19H	0xc93
HPMCOUNTER20H	0xc94
HPMCOUNTER21H	0xc95
HPMCOUNTER22H	0xc96
HPMCOUNTER23H	0xc97
HPMCOUNTER24H	0xc98
HPMCOUNTER25H	0xc99
HPMCOUNTER26H	0xc9a
HPMCOUNTER27H	0xc9b
HPMCOUNTER28H	0xc9c
HPMCOUNTER29H	0xc9d
HPMCOUNTER30H	0xc9e
HPMCOUNTER31H	0xc9f
MSTATUSH	0x310
MIDELEGH	0x313
MIEH	0x314
MVIENH	0x318
MVIPH	0x319
MENVCFGH	0x31a
MSTATEEN0H	0x31c
MSTATEEN1H	0x31d
MSTATEEN2H	0x31e
MSTATEEN3H	0x31f
MIPH	0x354
MCYCLECFGH	0x721
MINSTRETCFGH	0x722

MHPMEVENT3H	0x723
MHPMEVENT4H	0x724
MHPMEVENT5H	0x725
MHPMEVENT6H	0x726
MHPMEVENT7H	0x727
MHPMEVENT8H	0x728
MHPMEVENT9H	0x729
MHPMEVENT10H	0x72a
MHPMEVENT11H	0x72b
MHPMEVENT12H	0x72c
MHPMEVENT13H	0x72d
MHPMEVENT14H	0x72e
MHPMEVENT15H	0x72f
MHPMEVENT16H	0x730
MHPMEVENT17H	0x731
MHPMEVENT18H	0x732
MHPMEVENT19H	0x733
MHPMEVENT20H	0x734
MHPMEVENT21H	0x735
MHPMEVENT22H	0x736
MHPMEVENT23H	0x737
MHPMEVENT24H	0x738
MHPMEVENT25H	0x739
MHPMEVENT26H	0x73a
MHPMEVENT27H	0x73b
MHPMEVENT28H	0x73c
MHPMEVENT29H	0x73d
MHPMEVENT30H	0x73e
MHPMEVENT31H	0x73f
MNSCRATCH	0x740
MNEPC	0x741
MNCAUSE	0x742
MNSTATUS	0x744
MSECCFGH	0x757

MCYCLEH	0xb80
MINSTRETH	0xb82
MHPMCOUNTER3H	0xb83
MHPMCOUNTER4H	0xb84
MHPMCOUNTER5H	0xb85
MHPMCOUNTER6H	0xb86
MHPMCOUNTER7H	0xb87
MHPMCOUNTER8H	0xb88
MHPMCOUNTER9H	0xb89
MHPMCOUNTER10H	0xb8a
MHPMCOUNTER11H	0xb8b
MHPMCOUNTER12H	0xb8c
MHPMCOUNTER13H	0xb8d
MHPMCOUNTER14H	0xb8e
MHPMCOUNTER15H	0xb8f
MHPMCOUNTER16H	0xb90
MHPMCOUNTER17H	0xb91
MHPMCOUNTER18H	0xb92
MHPMCOUNTER19H	0xb93
MHPMCOUNTER20H	0xb94
MHPMCOUNTER21H	0xb95
MHPMCOUNTER22H	0xb96
MHPMCOUNTER23H	0xb97
MHPMCOUNTER24H	0xb98
MHPMCOUNTER25H	0xb99
MHPMCOUNTER26H	0xb9a
MHPMCOUNTER27H	0xb9b
MHPMCOUNTER28H	0xb9c
MHPMCOUNTER29H	0xb9d
MHPMCOUNTER30H	0xb9e
MHPMCOUNTER31H	0xb9f

Causes

Cause Name	Hex Value

MISALIGNED_FETCH	0x0
FETCH_ACCESS	0x1
ILLEGAL_INSTRUCTION	0x2
BREAKPOINT	0x3
MISALIGNED_LOAD	0x4
LOAD_ACCESS	0x5
MISALIGNED_STORE	0x6
STORE_ACCESS	0x7
USER_ECALL	0x8
SUPERVISOR_ECALL	0x9
VIRTUAL_SUPERVISOR_ECALL	0xa
MACHINE_ECALL	0xb
FETCH_PAGE_FAULT	0xc
LOAD_PAGE_FAULT	0xd
STORE_PAGE_FAULT	0xf
DOUBLE_TRAP	0x10
SOFTWARE_CHECK_FAULT	0x12
HARDWARE_ERROR_FAULT	0x13
FETCH_GUEST_PAGE_FAULT	0x14
LOAD_GUEST_PAGE_FAULT	0x15
VIRTUAL_INSTRUCTION	0x16
STORE_GUEST_PAGE_FAULT	0x17

Instruction Field Arguments

Field Name	Mask
RD	0xf80
RT	0xf8000
RS1	0xf8000
RS2	0x1f00000
RS3	0xf8000000
AQRL	0x6000000
AQ	0x4000000
RL	0x2000000
FM	0xf0000000

PRED	`0xf000000`
SUCC	`0xf00000`
RM	`0x7000`
FUNCT3	`0x7000`
FUNCT2	`0x6000000`
IMM20	`0xfffff000`
JIMM20	`0xfffff000`
IMM12	`0xfff00000`
CSR	`0xfff00000`
IMM12HI	`0xfe000000`
BIMM12HI	`0xfe000000`
IMM12LO	`0xf80`
BIMM12LO	`0xf80`
SHAMTQ	`0x7f00000`
SHAMTW	`0x1f00000`
SHAMTW4	`0xf00000`
SHAMTD	`0x3f00000`
BS	`0xc0000000`
RNUM	`0xf00000`
RC	`0x3e000000`
IMM2	`0x300000`
IMM3	`0x700000`
IMM4	`0xf00000`
IMM5	`0x1f00000`
IMM6	`0x3f00000`
ZIMM	`0xf8000`
OPCODE	`0x7f`
FUNCT7	`0xfe000000`
VD	`0xf80`
VS3	`0xf80`
VS1	`0xf8000`
VS2	`0x1f00000`
VM	`0x2000000`
WD	`0x4000000`

AMOOP	`0xf8000000`
NF	`0xe0000000`
SIMM5	`0xf8000`
ZIMM5	`0xf8000`
ZIMM10	`0x3ff00000`
ZIMM11	`0x7ff00000`
ZIMM6HI	`0x4000000`
ZIMM6LO	`0xf8000`
C_NZUIMM10	`0x1fe0`
C_UIMM7LO	`0x60`
C_UIMM7HI	`0x1c00`
C_UIMM8LO	`0x60`
C_UIMM8HI	`0x1c00`
C_UIMM9LO	`0x60`
C_UIMM9HI	`0x1c00`
C_NZIMM6LO	`0x7c`
C_NZIMM6HI	`0x1000`
C_IMM6LO	`0x7c`
C_IMM6HI	`0x1000`
C_NZIMM10HI	`0x1000`
C_NZIMM10LO	`0x7c`
C_NZIMM18HI	`0x1000`
C_NZIMM18LO	`0x7c`
C_IMM12	`0x1ffc`
C_BIMM9LO	`0x7c`
C_BIMM9HI	`0x1c00`
C_NZUIMM5	`0x7c`
C_NZUIMM6LO	`0x7c`
C_NZUIMM6HI	`0x1000`
C_UIMM8SPLO	`0x7c`
C_UIMM8SPHI	`0x1000`
C_UIMM8SP_S	`0x1f80`
C_UIMM10SPLO	`0x7c`
C_UIMM10SPHI	`0x1000`

C_UIMM9SPLO	0x7c
C_UIMM9SPHI	0x1000
C_UIMM10SP_S	0x1f80
C_UIMM9SP_S	0x1f80
C_UIMM2	0x60
C_UIMM1	0x20
C_RLIST	0xf0
C_SPIMM	0xc
C_INDEX	0x3fc
RS1_P	0x380
RS2_P	0x1c
RD_P	0x1c
RD_RS1_N0	0xf80
RD_RS1_P	0x380
RD_RS1	0xf80
RD_N2	0xf80
RD_N0	0xf80
RS1_N0	0xf80
C_RS2_N0	0x7c
C_RS1_N0	0xf80
C_RS2	0x7c
C_SREG1	0x380
C_SREG2	0x1c
MOP_R_T_30	0x40000000
MOP_R_T_27_26	0xc000000
MOP_R_T_21_20	0x300000
MOP_RR_T_30	0x40000000
MOP_RR_T_27_26	0xc000000
C_MOP_T	0x700
RS2_EQ_RS1	0x1f00000