RISC-V System on Chip Design
RISC-V Integer Registers

RISC-V has 32 integer registers, each 32 or 64 bits wide depending on the architecture (RV32 or RV64). These registers are denoted as `x0` to `x31`, with conventional ABI (Application Binary Interface) names.

Register	ABI Name	**Description**	**Usage**
x0	zero	Hard-wired zero	Always reads as zero, writes are ignored
x1	ra	Return Address	Holds return address for function calls
x2	sp	Stack Pointer	Points to the current top of the stack
x3	gp	Global Pointer	Points to global variables
x4	tp	Thread Pointer	Points to thread-specific data
x5	t0	Temporary Register 0	Caller-saved, temporary usage
x6	t1	Temporary Register 1	Caller-saved, temporary usage
x7	t2	Temporary Register 2	Caller-saved, temporary usage
x8	s0/fp	Saved Register 0 / Frame Pointer	Callee-saved, often used as frame pointer
x9	s1	Saved Register 1	Callee-saved register
x10	a0	Function Argument 0 / Return Value 0	First argument to functions, holds return values
x11	a1	Function Argument 1 / Return Value 1	Second argument, or holds return values
x12	a2	Function Argument 2	Third argument to functions
x13	a3	Function Argument 3	Fourth argument
x14	a4	Function Argument 4	Fifth argument
x15	a5	Function Argument 5	Sixth argument
x16	a6	Function Argument 6	Seventh argument
x17	a7	Function Argument 7	Eighth argument
x18	s2	Saved Register 2	Callee-saved register
x19	s3	Saved Register 3	Callee-saved register
x20	s4	Saved Register 4	Callee-saved register
x21	s5	Saved Register 5	Callee-saved register
x22	s6	Saved Register 6	Callee-saved register
x23	s7	Saved Register 7	Callee-saved register
x24	s8	Saved Register 8	Callee-saved register
x25	s9	Saved Register 9	Callee-saved register
x26	s10	Saved Register 10	Callee-saved register
x27	s11	Saved Register 11	Callee-saved register
x28	t3	Temporary Register 3	Caller-saved, temporary usage
x29	t4	Temporary Register 4	Caller-saved, temporary usage
x30	t5	Temporary Register 5	Caller-saved, temporary usage
x31	t6	Temporary Register 6	Caller-saved, temporary usage