_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	toolchain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe line	start year	last revis	secondary web link	note worthy	comments
Small soft core uP Inventory			**©2023 James Brakefield**																																			
Opencore and other soft core processors																																						
totalcpu	https://opencor	alpha		RISC	12+	12	kintex-7-3	James Brakef		229		6	1		149	##	14.7	0.33	3.0	71.7	X		verilog	10	cpu			N						16		2007	2009		data width 12 bits and up, no data memory	
odess	https://opencor	stable	Dmytro Senyakin	RISC	##	16	stratix-5	Dmytro Senya		32978		A	72	112	192	##	q17.1	4.00	1.0	23.3	I		system v	27	CoreOneV	Y	asm	Y		4G	4G				16		2017	2017	https://opencores	Altera proj, Multicore, P&R results at	37-bit adr, quad issue, caches, 32-64-128 fltg-p
odess	https://opencor	stable	Dmytro Senyakin	RISC	##	16	stratix-5	Dmytro Senya		148078		A	72	122	184	##	q17.1	4.00	0.3	19.9	I		system v	27	CoreQuad	Y	asm	Y		4G	4G				16		2017	2017	https://opencores	Altera proj, Multicore, P&R results at	37-bit adr, quad issue, caches, 32-64-128 fltg-p
odess	https://opencor	stable	Dmytro Senyakin	RISC	##	16	stratix-5	Dmytro Senya		50814		A	72	112	180	##	q17.1	4.00	1.0	14.1	I		system v	27	CoreOneV	Y	asm	Y		4G	4G				16		2017	2017	https://opencores	Altera proj, Multicore, P&R results at	37-bit adr, quad issue, caches, 32-64-128 fltg-p
odess	https://opencor	stable	Dmytro Senyakin	RISC	##	16	cyclone-5	James	reduce	35984		A	72	112	103	##	q18.0	4.00	1.0	11.4	I		system v	27	CoreOneV	Y	asm	Y		4G	4G				16		2017	2017	https://opencores	Altera proj, Multicore, P&R results at	37-bit adr, quad issue, caches, 32-64-128 fltg-p
odess	https://opencor	stable	Dmytro Senyakin	RISC	##	16	cyclone-5	James	slow t	50135		A	72	112	90	##	q18.0	4.00	1.0	7.2	I		system v	27	CoreOneV	Y	asm	Y		4G	4G				16		2017	2017	https://opencores	Altera proj, Multicore, P&R results at	37-bit adr, quad issue, caches, 32-64-128 fltg-p
ARM_Cortex_A	https://develop	ASIC	ARM	ARM A53	64	32	asic	Xilinx		6000		A			1500			2.00	0.5	1000			asic			Y	yes	Y					Y					https://en.wikiped	uses pro-rated LC area	dual issue, includes fltg-pt & MMU & caches
legv8	https://github.c	stable	Warren Seto	AA64	64	32	kintex-7-3	James Brakef		731		6		2	154	##	14.7	1.00	1.0	210.5	X	B	verilog	2	arm_cpu	Y	yes	N		4G	4G	Y	10		32		2018	2019		coursework, limited ISA, 3 versions	pipelined, inst: LDUR, STUR, ADD, SUB, ORR, A
legv8	https://github.c	stable	Warren Seto	AA64	64	32	kintex-7-3	James Brakef		884		6		2	137	##	14.7	1.00	1.0	155.0	X	B	verilog	2	arm_cpu	Y	yes	N		4G	4G	Y	10		32		2018	2019		coursework, limited ISA, 3 versions	inst: LDUR, STUR, ADD, SUB, ORR, AND, CBZ, B
legv8	https://github.com/matto		Matthew Olsson	AA64	64	32	kintex-7-3	James Brakef		884		6		2	137	##	14.7	1.00	1.0	155.0			verilog			Y	yes	N		4G	4G	Y	10		32		2018	2019		another implementation	legv8 from Patterson & Hennessy 2017
kcp53000	https://github.c	simulatio	Samuel Falvo II	risc-v	64	32	kintex-7-3	James	trimm	2455		6			175	##	14.7	2.00	1.0	142.9	X	B	verilog	4	polaris	Y	yes	N	Y	16E	16E	Y			32		2016	2017	https://github.cor	kestrel #3, basic 64-bit RISC-V	uses state machine RTL generator
cray1	www.chrisfento	alpha	Christopher Fenton	CRAY1	64	16	kintex-7-3	James Brakef		13463		6	19	10	127	##	14.7	6.00	1.0	56.6	X		verilog	46	cray_sys_	Y	yes	Y	N	4M	4M	N	128		536		2010	2015	https://www.chris	homebrew Cray1	24-bit address registers
fisc	https://github.c	stable	Miguel Santos	RISC	64	32	cyclone-4	James Brakef		5036		4		21	66	##	q18.0	2.00	1.0	26.1	I		system v	13	fisc_core	Y	yes	Y	N			Y	85	6	32	5	2018	2018	http://www.archf	Flexible Instruction Set Computer	caches, VHDL & System Verilog versions, altera
fisa64	https://github.c	beta	Robert Finch	RISC	64	32	kintex-7-3	James Brakef		10404		6	12	7	65	##	14.7	1.50	1.0	9.4	X		verilog	1	FISA64	Y		N	Y								2015	2015	https://github.com/robfinch/Cores	need to use multi-cycle on mult	
forwardcom	https://github.c	stable	Agner Fog	cisc	64	32	atrix-7	Agner Fog		21121	7392	6			56	##	v20.1	2.00	1.0	5.3	X		system v	18	top	Y	asm	Y		64K	32K	Y			64		2016	2023	https://www.forw	x86 like, complete ISA, MMX & vector	x86 adr modes, vector inst use width of vect re
fpgammix	https://github.c	stable	Tommy Thorn	MMIX	64	32	arria-2	James Brakef		11605		A	8	10	94	##	q13.1	1.50	4.0	3.0	I		system v	3	core	Y	yes	Y	Y	16Q	16Q	Y	256		288		2006	2014	https://en.wikiped	clone of Knuth's MMIX	micro-coded
s1_core	https://opencor	stable	Fabrizio Fazzino etal	SPARC	64	32	kintex-7-3	James Brakef		52845		6	8	59	56	##	v14.1	2.00	1.0	2.1	IX		verilog	136	s1_top	Y	yes	Y	N	4G	4G	Y			32		2007	2012	https://en.wikiped	reduced version of OpenSPARC T1	Vivado run
senior-sagn-1	https://github.c	simulatio	Niranjan Ramadas	RISC	64	32	kintex-7-3	James	way to	135009		6	32		75	##	14.7	1.00	1.0	0.6	X		verilog	28	pipeline			N	Y			Y	137		32	4-8	2012	2012	nrbramadas.appsp	university ASIC project, read PDF	64-bit data paths, superscalar, branch analysis
riscv_percival	https://github.com/artecs		ArTeCS (Un Madrid)	risc-v	64	32	kintex7	ArTeC	largest	57129	27996	6			50		v20.2	1.00	2.0	0.4	X		system v	~60		Y	yes	N		16E	16E	Y			32		2017	2022	https://github.cor	Open-Source Posit RISC-V Core with Quire Capability, cav6(AKA Ariane) derivative	
ks10	http://www.tec	alpha	Rob Doyle	PDP10	36	36	spartan-6	Rob Doyle		4427		6		15	50	##	14.7	1.00	2.0	5.6	X		verilog	39	esm_ks10	Y	yes	Y	N			N					2011	2014		36-bit accum & 18-bit adrs	ucf file, most tests pass
microblaze	https://www.xil	proprietar	Xilinx	uBlaze	32	32	virtex ultr	Xilinx		563		6		1	682	##		1.03	1.0	1248	X		proprietary			Y	yes	opt		4G	4G	Y	86		32	3	2002		https://en.wikiped	MicroBlaze MCS, smallest configurati	70 configuration options, MMU optional
riscv_GRVI-pha	http://fpga.org/	beta	Jan Gray	risc-v	32	32	virtex-u-2	Jan Gray		320		6		1	375	##	v16.4	1.00	1.0	1172	X		proprietary			Y	yes	N		4G	4G	Y	45		32	3	2015	2018	https://www.yout	hand fitted & placed	"Hoplite" router, 1680 cores in XCVU9P
microblaze	https://www.xil	proprietar	Xilinx	uBlaze	32	32	kintex-7	Xilinx		546		6		1	320			1.03	1.0	603.7	X		proprietary			Y	yes	opt		4G	4G	Y	86		32	3	2002			MicroBlaze MCS, smallest configurati	70 configuration options, MMU optional
ARM_Cortex_A	https://develop	ASIC	ARM	ARM A9	32	16	arria V	altera		4500		A			1050			2.50	1.0	583.3			asic			Y	yes	Y		4G	4G	Y	80		16	10		2012	https://en.wikiped	uses pro-rated LC area	dual issue, includes fltg-pt & MMU & caches
mips-cpu	https://github.c	alpha	Jeremiah Mahler	MIPS	32	32	kintex-7-3	James	added	596		6		1	244	##	14.7	1.00	1.0	409.2	X		verilog	15	cpu	Y	yes	N		4G	4G	Y			32	5	2017	2017		Very early stage project, only implem	no outputs, missing im_data.txt
amic-0	https://github.c	stable	Alberto Moriconi	stack	32	8	**zu-3e**	James	vivado	622	357	6			250	##	v21.1	1.00	1.0	401.9			vhdl	8	processor													https://en.wikiped	based on mic-1 by Andrew Tanenbau	uCode, usually Java virtual machine
J1a32	www.excamera	stable	James Bowman	forth	32	16	kintex-7-3	James	DFF ex	930		6			358	##	14.7	1.00	1.0	384.4	X		verilog	3	j1	Y	forth	N		64K	64K		20			2	2006	2017		uCode inst, dual port block RAM	DFF used for 18 deep data & return stacks
riscv_niosv	https://www.int	proprietar	Intel	risc-v	32	32	agilex	intel	fastest	1509		A		2	566	##	q21.3	1.00	1.0	375.2	I		proprietary			Y	yes	N		4G	4G	Y			32	5		2021		free license, small inst & data mem	RV32IA spec, M20K for reg file, interrupts
riscv_vexriscv	https://github.c	beta	Charles Papon	risc-v	32	32	artix-7	Charles Papo		481		6			346			0.52	1.0	374.1	X		scala		smallest	Y	yes			4M	4M	Y					2023	https://riscv.org/2	preformance #s for 8 configurations c	"Briey" is SOC variant
riscv_rudolv	https://github.com/bobbl		Jörg Mische	risc-v	32	32	kintex-7-3	Jörg Mische		545		6			200	##		1.00	1.0	367.0	ALMX		verilog	4	pipeline	Y	yes	N		4G	4G	Y			32	5	2021		RISC-V processor for real-time system	34 clock mult & divide
riscv_picorv32	https://github.c	beta	Clifford Wolf	risc-v	32	32	xcku3p-3	Cliffor	small	761	442	6			769	##	v16.2	1.00	3.0	336.8	X		verilog	1	picorv32	Y	yes	N		4G	4G	Y			32		2016	2022	https://github.cor	mimimal features, soc options	designed for minimum LUTs
an-noc-mpsoc	https://opencor	mature	Alireza Monemi	uBlaze	32	32	**zu-3e**	James	vivado	1079		6	3	1	333	##	v21.1	1.00	1.0	308.9	X	Y	verilog	90	aeMB_top	Y	yes	N		4G	4G	Y					2014	2019		choice of lm32, aeMB, mor1kx or or1	full system has network of cores
cpugen	https://opencor	stable	Giovanni Ferrante	RISC	32	16	kintex-7-3	James Brakef		474		6			192	##	14.7	0.67	1.0	271.8	IX		verilog	14	cpu	Y	asm	N	N								2003	2009		x86 .exe generates VHDL RISC uP	using 16 bit example
nios2		proprietar	Altera	Nios II	32	32	stratix-3	Altera	consis	1020		A			290	##	q13.1	0.90	1.0	255.9	I		proprietary			Y	yes	opt		4G	4G	Y			32		2004			fltg-pt, caches & MMU options	Nios II/f: fastest version, DMIPS adj, 2.15 Core
aeMB	https://opencor	beta	Shawn Tan	uBlaze	32	32	**zu-3e**	James	vivado	997	434	6	3		250	##	v21.1	1.00	1.0	250.8	ILX		verilog	7	aeMB_cor	Y	yes	N		4G	4G	Y					2004	2009		not 100% compatable	
xthundercore	http://forum.ga	alpha	majordomo	RISC	32	16	kintex-7-3	James Brakef		793		6		2	193	##	14.7	1.00	1.0	243.7	X		vhdl	49	xtc	pr	yes	N	Y	4G	4G				16	5	2014		http://www.xthur	Gadget Factory Forum thread	in debug, no comments, mostly in simulation
opc.opc7cpu	https://github.c	stable	revaldinho	RISC	32	16	kintex-7-3	James Brakef		624		6			303	##	14.7	1.00	2.0	242.8	X		verilog	2	opc7cpu	Y	asm	N	N	1M	1M	N	32	5	16		2017	2021	https://revaldinho	OPC7 32bit, based on OPC5LS, more i	see hackaday One Page Computing Challenge
mblite	https://opencor	beta	Tamar Kranenburg	uBlaze	32	32	kintex-7-3	James Brakef		941		6		2	227	##	14.7	1.00	1.0	240.9	IX		vhdl	18	core_wb	Y	yes	N		4G	4G	Y	86		32		2009	2017		not all instructions implemented	moved everything to work library
riscv_niosv	https://www.int	proprietar	Intel	risc-v	32	32	stratix-10	intel	fastest	1580		A		2	362	##	q21.3	1.00	1.0	229.1	I		proprietary			Y	yes	N		4G	4G	Y			32	5		2021		free license, small inst & data mem	RV32IA spec, M20K for reg file, interrupts
J1b_16	www.excamera	stable	James Bowman	forth	32	16	kintex-7-3	James	DFF ex	1588		6			355	##	14.7	1.00	1.0	223.4	X		verilog	3	j1	Y	forth	N		64K	64K		20			2	2006	2017		uCode inst, dual port block RAM	DFF used for 16 deep data & return stacks
riscv_niosv	https://www.int	proprietar	Intel	risc-v	32	32	arria-10	intel	fastest	1375		A		2	306	##	q21.3	1.00	1.0	222.3	I		proprietary			Y	yes	N		4G	4G	Y			32	5		2021		free license, small inst & data mem	RV32IA spec, M20K for reg file, interrupts
riscv_orca	https://github.c	beta	VectorBlox	risc-v	32	32	stratix-5	vectorblox		1082		A		?	244	##	14.7	0.98	1.0	221.0	I		vhdl	13	orca	Y	yes	N		4G	4G	Y			32		2016			*, /, fltg-pt all optional	RV32IM
riscv_dark	https://github.c	beta	Marcelo Samsoniuk	risc-v	32	32	kintex-7-3	Marcelo Sam		1000		6			220	##	v20.1	1.00	1.0	220.0			verilog	4	darkriscv	Y	yes	N		4G	4G	Y	45		32		2018	2021	https://opencores	written in one night, low line count	builds for five fpga boards
mips_linder	https://www.sc	paper	Michael Linder	MIPS	32	32	kintex-7-3	James Brakef		1100		6			238	##	14.7	1.00	1.0	216.5		B	vhdl	39	a_mips	Y	yes	N		4G	4G				32		2007	2007		masters thesis	no LUT RAM, source code in PDF
riscv_vexriscv	https://github.c	scala	Charles Papon	risc-v	32	32	artix-7-3	Charles Papo		1399		6			295			1.00	1.0	210.9	X	Y	scala		full no cac	Y	yes	N		4G	4G	Y			32			2023	https://riscv.org/2	preformance #s for 8 configurations c	"Briey" is SOC variant
core_arm	https://opencor	beta	Konrad Eisele	ARM	32	16	kintex-7-3	James Brakef		1239		6		3	250	##	14.7	1.00	1.0	201.8	X	Y	vhdl	151	arm_proc	Y	yes	N		256M	256M				16		2004	2009	http://cfw.source	very large project with many unused	missing files found in sourceforge dir, very littl
hive	https://opencor	stable	Eric Wallin	stack	32	16	arria-2	James Brakef		1420		A	8	24	283	##	q13.1	1.00	1.0	199.4	ILX		verilog		hive_core	Y		N				N	40		10	8	2013	2015		4 symetrical stacks, eight threads via	pipeline barrel
riscv_picorv32	https://github.c	beta	Clifford Wolf	risc-v	32	32	kintex-U-3	Cliffor	small	761	442	6			454	##	v16.2	1.00	3.0	198.9	X		verilog	1	picorv32	Y	yes	N		4G	4G	Y			32		2016	2022		mimimal features, soc options	LUTs & Fmax for Kintex, Virtex & Ultrascale+
arm9-soft-cpu	https://github.com/risclit		Li Xinbing	ARM9	32	32	**zu-3e**	James	vivado	1807	736	6			357	##	v21.1	1.00	1.0	197.6			verilog	4	risclite_m	Y	yes	Y		4G	4G	Y					2020			ARMv4-compatible CPU core	no mult, interrupts or reg banks
ensilica	http://www.ens	proprietar	ensilica.com	eSi-3200	32	16	stratix-4	ensilica		2200		A			200			2.00	1.0	181.8	IX		verilog		eSi-3250	Y	yes			4G	4G	Y	104	10	16	5	2001	2016		verilog source included with license	room for 90 user inst, also as ASIC
f32c	https://github.c	beta	marko zec, vordah, Dar	risc-v/MIPS	32	32	atrix-7-3	zec & vordah		1048		6	4	33	185	##	14.7	1.00	1.0	176.5	X		vhdl	50		Y	yes	N	Y	4G	4G	Y	30		32	5	2014	2019	http://www.nxlab	MIPS or RISC-V ISA, Arduino support	https://www.youtube.com/watch?v=55MzMH
ensilica	http://www.ens	proprietar	ensilica.com	eSi-3200	32	16	stratix-4	ensilica		1800		A			200			1.50	1.0	166.7	IX		verilog		eSi-3200	Y	yes			4G	4G	Y	104	10	16	5	2001	2016		verilog source included with license	room for 90 user inst, also as ASIC
an-noc-mpsoc	https://opencor	mature	Alireza Monemi	uBlaze	32	32	kintex-7-3	James Brakef		1164		6	3	1	192	##	i14.7	1.00	1.0	165.2	X	Y	verilog	90	aeMB	Y	yes	N		4G	4G	Y					2014	2017		choice of lm32, aeMB, mor1kx or or1	full system has network of cores
p-vex	https://github.com/tvana		Thijs van As	VLIW	32	##	kintex-7-3	James Brakef	bypass	1660		6		1	233	##	14.7	1.00	1.0	140.1			vhdl	26	system	Y	yes	N					73		32	4	2005	2015	http://www.vliw.c	1, 2 or 4 issue VLIW, uses HP VEX too	probable degeneracy, LUT RAM for program m
sweet32	https://opencor	alpha	Valentin Angelovski	MIPS	32	16	kintex-7-3	James Brakef		1050		6	1		142	##	14.7	1.00	1.0	135.1	X	B	vhdl	2	Sweet32_	Y	yes	N	N	4G	4G	Y	26		16		2014	2015		targets MACHXO2, no RAM	
propeller_p8x3	https://www.pa	stable	Chip Gracey	RISC	32	16	kintex-7-3	James Brakef		9498		6		20	160	##	14.7	1.00	0.1	134.8	X		verilog	9	top	Y	yes										2014			eight propellers, clocking from ucf file	several FPGA card build files
lxp32	https://opencor	beta	Alex Kuznetsov	RISC	32	32	**zu-3e**	James Brakef		948		6	4	2	250	##	v21.1	1.00	2.0	131.9	AIX		vhdl	20	lxp32u_to	Y	asm	N	N	4G	4G	Y	30		256	3	2016	2022	https://lxp32.gith	register file in block RAM	vendor neutral source code, no div inst
sayuri_cpu	http://www.mo	stable	Toyoaki Sagawa	RISC	32	32	kintex-7-3	James Brakef		1604		6			208	##	14.7	1.00	1.0	129.9	X		vhdl	13	cpu01			Y		4G	4G				32		2000	2000		dead weblink	high number of DFF
zipcpu	https://github.c	stable	Dan Gisselquist	RISC	32	32	kintex-7-3	James Brakef		1687		6		2	218	##	14.7	1.00	1.0	128.9	X		verilog	7	zipcpu	Y		N	N	4G	4G	Y	35		16	5	2015	2023	www.librecores.o	ISA has chnaged, multiple instruction	http://zipcpu.com/zipcpu/2018/01/01/zipcpu-
aeMB	https://opencor	beta	Shawn Tan	uBlaze	32	32	kintex-7-3	James Brakef		1018		6	3		131	##	14.7	1.00	1.0	128.5	ILX		verilog	7	aeMB_cor	Y	yes	N		4G	4G	Y					2004	2009		not 100% compatable	
riscv_picorv32	https://github.c	beta	Clifford Wolf	risc-v	32	32	xcku3p-3	Cliffor	large	2019	1085	6			769	##	v16.2	1.00	3.0	127.0	X	Y	verilog	1	picorv32	Y	yes	N		4G	4G	Y			32		2016	2022	https://github.cor	mimimal features, soc options	designed for minimum LUTs
mips789	https://opencor	stable	Li Wei	MIPS	32	32	kintex-7-3	James Brakef		1432		6		1	171	##	14.7	1.00	1.0	119.1	IX		verilog	10	mips_core	Y	yes	N		4G	4G	Y			32	5	2007	2014		supports most MIPSI instructions	
riscv_minimax	https://github.com/gsmec		Graeme Smecher	risc-v	32	16	KU060	Graeme Sme		423	61	6			200	##	v22.2	1.00	4.0	118.2	X		verilog	2	minimax	Y	yes	N		4G	4G	Y			32		2022	2023		LUT count comparisons with other ris	most 32-bit insts microcoded, limited 16-bit IS
riscv_steel	https://opencores.org/pr		Rafael Calcada	risc-v	32	32	**zu-2e**	James Brakef		1775		6			208	##	v19.2	1.00	1.0	117.4			verilog	21	steel_top	Y	yes	N		4G	4G	Y			32	3		2020	https://github.cor	github version has vivado proj	under grad thesis
darkriscv	https://github.c	alpha	Marcelo Samsoniuk	risc-v	32	32	kintex-7-3	James Brakef		1422		6		1	167	##	14.7	1.00	1.0	117.2	X		verilog	2	darksocv	Y	yes	N		4G	4G	Y			32	2	2018	2018	https://blog.hacks	written in one night, low line count	readme is descriptive, uses cache
J1b	www.excamera	stable	James Bowman	forth	32	16	kintex-7-3	James	DFF ex	2612		6			302	##	14.7	1.00	1.0	115.5	X		verilog	3	j1	Y	forth	N		64K	64K		20			2	2006	2017		uCode inst, dual port block RAM	DFF used for 32 deep data & return stacks
lxp32	https://opencor	beta	Alex Kuznetsov	RISC	32	32	kintex-7-3	James Brakef		850		6	3	1	196	##	14.7	1.00	2.0	115.4	AIX		vhdl	20	lxp32u_to	Y	asm	N	N	4G	4G	Y	30		256	3	2016	2022	https://lxp32.gith	register file in block RAM	vendor neutral source code, no div inst
jam	https://github.c	stable	Johan Thelin etal	RISC	32	32	kintex-7-3	James Brakef		1396		6			159	##	14.7	1.00	1.0	113.7	X		vhdl	17	cpu_sys	Y		N	Y	128K	128K				32	5	2002	2014		serial multiply & divide	took out clock divider
arm9-soft-cpu	https://github.com/risclit		Li Xinbing	ARM9	32	32	**zu-3e**	James	vivado	2098	778	6	4		238	##	v21.1	1.00	1.0	113.5			verilog	4	risclite_m	Y	yes	Y		4G	4G	Y					2020			ARMv4-compatible CPU core	no interrupts or reg banks
risc-processor	https://github.c	stable	Jeff Bush	RISC	32	32	kintex-7-3	James Brakef		1445		6		6	161	##	14.7	1.00	1.0	111.6	X		verilog	22	fpga_top	Y	yes	N		4G	4G	Y	21		32		2008	2019	https://github.cor	two designs with same name	MIT course work
octagon	https://opencor	beta	Jon Pry	MIPS	32	32	kintex-7-3	James Brakef		3021		6	4	9	333	##	14.7	1.00	1.0	110.2	X		vhdl	46	octagon		asm			4G	4G	Y			32		2015	2015	https://github.cor	8 thread barrel processor, largely MIPS	compatible
risc5	http://www.pro	beta	Niklaus Wirth	RISC	32	32	zu-3e	James Brakef		1936	392	6	4		213	##	v21.1	1.00	1.0	109.9	ILX		verilog	8	RISC5	Y	yes	Y		4G	4G				16		2013	2017	http://www.astro	minimalist Wirth, part of Project Obe	32x32 multiplier, wikipedia entry
tiny64	https://opencor	stable	Ulrich Riedel	RISC	32	32	kintex-7-3	James Brakef		874		6			189	##	14.7	1.00	2.0	107.9	X		vhdl	6	tinyx					64K	64K		14		8		2004	2007		data size from 32 to 64 bits	micro-coded sub-ops
ion	https://opencor	mature	Jose Ruiz	MIPS	32	32	kintex-7-3	James Brakef		1533		6			163	##	14.7	1.00	1.0	106.0	IX		vhdl	12	mips_soc	Y	yes	N		4G	4G	Y			32		2011	2018	https://github.cor	new version: moving to MIPS32r1	new version not ready, keeping old numbers
ARM_Cortex_A	http://www.arm	proprietar	ARM	ARM M1	32	16	virtex-5	ARM	65nm	1900		6			200			1.00	1.0	105.3	AIX		proprietary			Y	yes	N		4G	4G	Y			16	3	2007		https://en.wikiped	ARM Cortex M0, M1 & M3 avail for FI	see xilinx Xcell64
jam	https://github.c	stable	Johan Thelin etal	RISC	32	32	kintex-7-3	James Brakef		1369		6			143	##	14.7	1.00	1.0	104.2	X		vhdl	17	cpu	Y		N	Y	128K	128K				32	5	2002	2014		serial multiply & divide	
sweet32	https://opencor	alpha	Valentin Angelovski	MIPS	32	16	kintex-7-3	James Brakef		1797		6	1	2	185	##	14.7	1.00	1.0	103.1	X	Y	vhdl	28	sweet32_	Y	yes	N	N	4G	4G	Y	26		16		2014	2015		targets MACHXO2, DDR RAM	clock divider to Sweet32_v1_core

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	toolchain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe lan	start year	last revis	secondary web link	note worthy	comments
eight32	https://github.com/robins		Alastair M. Robinson	accum	32	8	cyclone-4	Alasta	approx	1300		4			133			1.00	1.0	102.3			vhdl	17	eightthirty	Y	yes	N		500M	500M	Y	28		8		2019	2023	https://retroramb	5-bit op-code & 3-bit reg #	full tool set, see github page for ISA description
forth_kf532	https://github.c	stable	Tarasov Ilia	forth	32	6	kintex-7-3	James	no *.c	1719		6	4	4	172	##	14.7	1.00	1.0	100.3	X		vhdl	1	kf532	N		N	Y	1K	16K					2013	2013		no trace of source code on web	
sweet32	https://opencor	alpha	Valentin Angelovski	MIPS	32	16	kintex-7-3	James	Brakef	1177		6	1		116	##	14.7	1.00	1.0	98.8	X	B	vhdl	2	Sweet32_	Y	yes	N	N	4G	4G	Y	26		16		2014	2015		targets MACHX02, no RAM	
cpugen	https://opencor	stable	Giovanni Ferrante	RISC	32	16	kintex-7-3	James	Brakef	1597		6	8		154	##	14.7	1.00	1.0	96.3	IX		vhdl	14	cpuc	Y	asm	N	N							2003	2009		x86 .exe generates VHDL RISC uP	using 32 bit example
ucore	https://opencor	stable	Whitewill	MIPS	32	32	kintex-7-3	James	Brakef	2469		6		1	231	##	14.7	1.00	1.0	93.5	X		verilog	25	ucore	Y	yes	N		4G	4G	Y			32	6	2005	2010		MMU & caches	
m1_core	https://opencor	beta	Fabrizo Fazzino, Albert	MIPS?	32	32	arria-2	James	Brakef	2101		A			190	##	q13.1	1.00	1.0	90.6	IX		verilog	9	m1_core		yes	N		4G	4G	Y			32		2007	2012		GCC target?	
mais		stable	Rene Doss	MIPS	32	32	kintex-7-3	James	Brakef	2760		6	4	5	245	##	14.7	1.00	1.0	88.7	X		vhdl	22	MAIS_soc	Y	yes	N	N	4G	4G				32	5	2013		use MIPS tools	register forwarding around ALU	license req'd for commercial use
risc5	http://www.pro	beta	Niklaus Wirth	RISC	32	32	zu-2e	James	Brakef	2001	392	6	4		177	##	v20.1	1.00	1.0	88.3	ILX		verilog	8	RISC5	Y	yes	Y		4G	4G				16		2013	2017	http://www.astro	minimalist Wirth, part of Project Obe	32x32 multiplier, wikipedia entry
openfire2	https://opencor	beta	Antonio Anton	uBlaze	32	32	kintex-7-3	James	Brakef	1201		6	3	2	105	##	14.7	1.00	1.0	87.4	X	Y	verilog	27	openfire_t	Y	yes	N	N	4G	4G	Y			32		2007	2012		"FPGA Proven"	derived from Stephen Craven's OpenFire
arm_rusian	https://github.com/0xD5(		ruslan	arm	32	32	**zu-3e**	James	LUT RA	2360	4815	6			200	##	v21.1	1.00	1.0	84.7			system v	6	ARM_Mul	Y	yes	Y		4G	4G	Y			16		2019			from "Digital design and computer ar	single cycle,
mor1kx	https://github.c	stable	Julius Baxter	OpenRISC	32	32	kintex-7-3	James	Brakef	2718		6	3	3	217	##	14.7	1.00	1.0	80.0	X		verilog	48	mor1kx	Y	yes	N		4G	4G	Y			32		2012	2021	https://www.yout	lots of configuration parameters	considered best openrisc design
riscv_taiga	https://gitlab.co	stable	Eric Matthews	risc-v	32	32	zynq			1551				1	123			1.00	1.0	79.3	IX		system v	46		Y	yes	N		4G	4G	Y			32		2017	2022		TAIGA: A new RISC-V soft-processor f	33% smaller & 39% faster than LEON3
hf-risc	https://opencor	stable	Sergio Johann Filho	MIPS	32	32	kintex-7-3	James	Brakef	1446		6		4	115	##	14.7	1.00	1.0	79.2	X		vhdl	9	spartan3e_n	yes		N	N	4G	4G	Y	41		32		2016		https://github.cor	MIPS I subset, no multiplier	
tarhi	https://github.c	alpha	Dagvadorj Galbadrakh	RISC	32	32	kintex-7-3	James	everyt	396		6		1	123	##	14.7	1.00	4.0	77.9	X		verilog	4	tarhi_controller			N		16M	16M	N	11		4		2013	2013		no doc, extremely small RISC	difficulty with timing, try 7.0ns
storm_core	https://opencor	beta	Stephan Nolting	ARM7	32	32	kintex-7-3	James	Brakef	2312		6	3		179	##	14.7	1.00	1.0	77.4	IX		vhdl	16	core	Y	yes	N		4G	4G	Y			32	8	2011	2014		Storm Core (ARM7 compatible)	I & D caches not compiled
altor32	https://opencor	stable	Ultra Embedded	OpenRISC	32	32	kintex-7-3	James	Brakef	2505		6		5	192	##	14.7	1.00	1.0	76.8	ILX		verilog	16	altor32	Y	yes	N	Y	4G	4G	Y					2012	2015	https://openrisc.io	simplified OpenRISC 1000	xilinx S3 primitives
sc20	http://www.for	proprietar	Brad Eckert	forth	32	8	virtex-6	Brad Eckert		1977		6			150			1.00	1.0	75.9	X		proprietary													2010			PDF file, Forth Inc.	
myforthproces	https://opencor	stable	Gerhard Hohner	forth	32	8	SP-kintex	James	Brakef	2959		6		6	223	##	14.7	1.00	1.0	75.3	X		vhdl	58	mycpu	Y	yes	N		64M	64M		96				2004	2012		DPANS'94 32-bit Forth, masters thesi	25.15 Whetstones
nios2		proprietar	Altera	Nios II	32	32	stratix-5	Altera	consis	584		A			420	##	q16.0	0.10	1.0	71.9	I		proprietary			Y	yes	opt		4G	4G	Y			32		2004			fltg-pt, caches & MMU options	Nios II/e: min LUTs version, DMIPS adj, 1.68 Cc
aspida	https://opencor	stable	Sotiriou	DLX	32	32	kintex-7-3	James	dated	3586		6			257	##	14.7	1.00	1.0	71.7	X		verilog	10	DLX_top	Y	yes			4G	4G						2002	2009		DLX	compiled sync version
riscv_clarvi	https://github.c	stable	Robert Eady	risc-v	32	32	arria-2	James	Altera	2616		A			178	##	q18.0	1.00	1.0	68.2	I	B	system v	7	clarvi	Y	yes			4G	4G	Y			32	6	2016	2017	https://www.cl.ca	educational simple RISC-V implement	doesn't make use of block RAM RTL
zpu	https://github.c	stable	Oyvind Harboe	forth	32	8	kintex-7-3	James	Brakef	1073		6	3		283	##	14.7	1.00	4.0	65.9	X		vhdl	23	zpu_core	Y	yes	N		4G	4G	Y	37				2008	2009		zpu4: 16 & 32 bit versions, code size	ZPU the worlds smallest 32 bit CPU with GCC t
riscv_steel	https://opencores.org/pr		Rafael Calcada	risc-v	32	32	atrix-7-3	James	Brakef	1784		6			116	##	v19.2	1.00	1.0	65.0			system v	21	steel_top	Y	yes	N		4G	4G	Y			32	3		2020	https://github.cor	github version has vivado proj	under grad thesis
leon3	http://www.gai	stable	Jiri Gaisler, Jan Anders	SPARC	32	32	kintex-7-3	Jiri Gaisler		2920		6			183			1.00	1.0	62.7	AILX	Y	vhdl	100s	leon3x	Y	yes	Y		4G	4G	Y			64	7	2003	2021	https://en.wikipe	**customized for ~50 FPGA boards,**	**xls with utilization for all targets**
risc0	https://sourcefo	beta	Niklaus Wirth	RISC	32	32	kintex-7-3	James	Brakef	1186		6	4	6	110	##	14.7	0.67	1.0	61.9	X		verilog	8	RISC0	Y	yes	N		4G	4G						2011	2018	https://people.inf	minimalist Wirth, education tool	Lola: https://people.inf.ethz.ch/wirth/Lola/ind
altor32_lite	https://opencor	stable	Ultra Embedded	OpenRISC	32	32	kintex-7-3	James	Brakef	1928		6			236	##	14.7	1.00	2.0	61.3	ILX		verilog	7	altor32	Y	yes	N	Y	4G	4G	Y					2012	2014	https://openrisc.io	simplified OpenRISC 1000, no pipelin	xilinx S3 primitives
softpc	https://github.com/alread		Michael S	Nios II	32	32	cyclone-1	Micha	block I	613		4		1	180		q17.1	1.00	5.0	58.9			vhdl	13	nios2ee	Y	yes	opt		4G	4G	Y			32			2019		nine variations in attempt to improve	16-bit ALU
openscale	https://www.lirm	stable	Lyonel Barthe	uBlaze	32	32	spartan-3	Lyonel	Barthe	1563		4			91		i12.1	1.00	1.0	58.2	X	Y	vhdl	26	sb_core		yes			4G	4G	Y	86		32	5	2010	2012	www.lirmm.fr/AD	NoC secretblaze	data is for single secretblaze
secretblaze	http://www.lirm	beta	Lyonel Barthe	uBlaze	32	32	spartan-3	Lyonel	Barthe	1563		4			91		i12.1	1.00	1.0	58.2	X		vhdl	26	sb_core		yes			4G	4G	Y	86		32	5	2010	2012	www.lirmm.fr/ADAC		
or1k	https://opencor	stable	Julius Baxter, Stefan Ko	OpenRISC	32	32	kintex-7-3	James	Brakef	3299		6	3	3	189	##	14.7	1.00	1.0	57.3	IX		verilog	39	mor1kx	Y	yes	N	M	4G	4G	Y			32		2001	2018	https://opencores	no longer supported, see mor1kx	cappuccino ALU
latticemico32	http://www.latt	stable	Yann Siommeau, Mich	LM32	32	32	arria_2	James	Brakef	2166		A	4	30	149	##	q13.1	0.80	1.0	55.0	LX		verilog	24	lm32_cpu	Y	yes	N	Y	4G	4G	Y			32	6	2006	2017	https://en.wikipe	optional data & inst caches	Diamond3.10; see lm32 & misoc folders
yari	https://github.c	stable	Tommy Thorn	MIPS	32	32	kintex-7-3	James	Brakef	3610		6		15	189	##	14.7	1.00	1.0	52.3	X	Y	verilog	8	top					2M	2M				32		2004	2008		subset of MIPS R3000	
mips32	https://opencor	stable	Jin Jifang	MIPS	32	32	kintex-7-3	James	Brakef	3696		6		8	192	##	v17.4	1.00	1.0	52.0	X		verilog	17	pipelinem	Y	yes			4G	4G	y			32	5	2017			vivado project	"classic MIPS"
oberon_sdram	http://projectob	beta	Nicolae Dumitrache	RISC	32	32	kintex-7-3	James	Brakef	2103		6		1	104	##	14.7	1.00	1.0	49.5	X		verilog	16	risc5	Y	yes	Y		4G	4G				16		2013	2017		minimalist Wirth, part of Project Obe	modified to use DRAM, serial mult
moxielite	https://github.c	stable	Anthony Green	RISC	32	32	kintex-7-3	James	Brakef	3159		6	3		152	##	14.7	1.00	1.0	48.0	X		vhdl	11	moxielite_wb					4G	4G	Y			16		2009	2017	https://github.com/atgreen/moxie-cores		
table888	https://github.c	alpha	Robert Finch	RISC	32	16	kintex-7-3	James	Brakef	5756		6	9	6	137	##	14.7	2.00	1.0	47.6	X		verilog	3	table888_	ome				4G	4G	Y	130		8		2014	2016		2016 version gives same reults as 201	code for cache & mmu incomplete
s6soc	https://opencor	stable	Dan Gisselquist	RISC	32	32	spartan-6	James	sparta	2820		6	1	10	133	##	14.7	1.00	1.0	47.3	X	Y	verilog	31	toplevel			N	N	4G	4G	N	20		16	5	2015				uses ZIP CPU
riscv_potato	https://github.c	beta	Kristian Skordal	risc-v	32	32	kintex-7-3	James	Brakef	2467		6			116	##	14.7	1.00	1.0	47.1	X	B	vhdl	24	pp_core	Y	yes	N	N	4G	4G	Y	30		32		2014	2020		risc-V interger only, no mult	"rocket-core" version at risc.org
coen_316_cpu	https://github.c	alpha	G.K Yvann Monny	RISC	32	32	kintex-7-3	James	does r	897		6			127	##	14.7	1.00	3.0	47.0	X		vhdl	8	cpu_dp			N		32	32	N	20		32		2018	2018		MIPS based, simulation DO files, I&D	very small caches do not infer any RAM
qrisc32	https://opencor	alpha	Viacheslav	RISC	32	32	arria-2	James	Brakef	3075		A	4		144	##	q13.1	1.00	1.0	46.9	I		system v	8	qrisc32	Y	yes	N		4G	4G	Y			32	4	2010	2011		qrisc32 wishbone compatible risc cor	for PhD thesis
eco32	https://opencor	stable	Hellwing Geisse	RISC	32	32	kintex-7-3	James	Brakef	2339		6		1	160	##	14.7	1.00	1.5	45.5	ILX	Y	verilog	14	cpu	Y	yes	N		512M	256M	Y	61		32		2003	2014	homepages.thm.d	MIPS like, slow mul & div	
storm_soc	https://opencor	beta	Stephan Nolting	ARM7	32	32	kintex-7-3	James	Brakef	3514		6	3	4	159	##	14.7	1.00	1.0	45.2	X	Y	vhdl	40	storm_top	Y	yes	N		4G	4G	Y			32	8	2012	2015		STORM SoC	cache & no peripherals
fisa32	https://github.c	beta	Robert Finch	RISC	32	32	kintex-7-3	James	Brakef	3479		6	3	2	152	##	14.7	1.00	1.0	43.7	X		verilog	1	FISA32	Y		N	Y						32		2014	2014	https://github.com/robfinch/Cores		
temlib	http://temlib.or	stable		SPARC	32	32	kintex-7-3	James	Brakef	2579		6		32	111	##	14.7	1.00	1.0	43.1	X		vhdl	48	mcu_simple			Y	N	4G	4G	Y			64		2013	2015		copywrite: experimental use	has caches
arm9-soft-cpu	https://github.com/risclit		Li Xinbing	ARM9	32	32	**zu-3e**	James	vivado	3914	1257	6	4		167	##	v21.1	1.00	1.0	42.6			verilog	4	arm9_cor	Y	yes	Y		4G	4G	Y						2020		ARMv4-compatible CPU core	Dhrystone value: 1.2 DMIPS/MHz
aor3000	https://opencor	beta	Aleksander Osman	MIPS	32	32	**zu-3e**	James	high Fl	4199	2520	6	4	8	175	##	v21.1	1.00	1.0	41.8	IX		verilog	19	aoR3000	Y	yes	N		4G	4G	Y			32	5	2014	2015		MIPS R3000A compatible, has MMU	moved declarations forward
vscale	https://github.c	stable	UC Berkeley	risc-v	32	32	kintex-7-3	James	Brakef	3072		6			127	##	14.7	1.00	1.0	41.2	X		verilog	23	vscale_core			N							32		2016	2017			risc-v RV32IM vscale processor, depr
aquarius	https://opencor	stable	Thorn Aitch	SuperH-2	32	16	**zu-3e**	James	vivado	3563	1384	6	2	16	147	##	v21.1	1.00	1.0	41.2	ILX		verilog	21	top	Y	yes	N		4G	4G	Y					2003	2015	http://0pf.org/j-cc	clone of Hitachi SH-2	project seems to have stalled
arm_rusian	https://github.com/0xD5(		ruslan	arm	32	32	**zu-3e**	James	LUT RA	3563		6			147	##	v21.1	1.00	1.0	41.2			system verilo		ARM_Sing	Y	yes	Y		4G	4G	Y			16			2019		from "Digital design and computer ar	multi-cycle
amber	https://opencor	stable	Conor Santifort	ARM7	32	32	**zu-3e**	James	area o	3105	1857	6		10	168	##	v21.1	0.75	1.0	40.7	ILX		verilog	25	a23_core	Y	yes	N		4G	4G	Y	80		16	3	2010	2017	https://en.wikipe	no MMU, shared cache	
bst-cpu	https://github.c	stable	Yichun Ma	RISC	32	32	arria-2	James	Brakef	1439		A		2	58	##	q18.0	1.00	1.0	40.2	I		verilog	26	sc_computer			N		4G	4G				32		2016	2016		learning, single cycle uP	
minimips	https://opencor	stable	Samuel Hangouet	RISC	32	32	kintex-7-3	James	Brakef	2939		6	8		118	##	14.7	1.00	1.0	40.1	X		vhdl	12	minimips	Y	yes	N	N	4G	4G				32	5	2004	2018		based on MIPS I	
cast_ba22	http://www.cas	proprietar	CAST Inc	RISC	32	16	spartan-6	CAST Inc		1800		6		32	72			1.00	1.0	40.0	X		proprietary			Y	yes			4G	4G				32				http://www.cast-i	Cast has uP related IP	several versions, FPGA kits
riscv_lattice	https://www.lat	stable	Lattice Semi	risc-v	32	32	machXO3	Lattice Semic		1507		4		4	60	##		1.00	1.0	39.8	L	Y				Y	yes	N		4G	4G	Y			32	5		2021		RV32I ISA, 5 stage pipeline, configured & generated using Lattice Propel	
plasma	https://opencor	stable	Steve Rhoads	MIPS	32	32	kintex-7-3	James	Brakef	2462		6		3	97	##	14.7	1.00	1.0	39.5	X		vhdl	22	plasma	Y	yes	N		4G	4G	Y			32		2001	2016	http://plasmacpu.	wide outside use, opencores page has	list of related publications
riscv_reonv	https://github.com/IcbcFc		Lucas Castro	risc-v	32	32	spartan-6	Wajih Yousse		3370		6			133			1.00	1.0	39.4						Y	yes	N		4G	4G	Y	45		32			2018	https://www.hind	Lightweight Cryptographic Instructior	risc-v version on Leon3 tools
latticemico32	http://www.latt	stable	Yann Siommeau, Mich	LM32	32	32	ECP3	Lattice Semic		2370		4	4	30	115			0.80	1.0	38.8	LX		verilog	24	lm32_cpu	Y	yes	N	Y	4G	4G	Y			32	6	2006	2017	https://en.wikipe	optional data & inst caches	Diamond3.10; see lm32 & misoc folders
supersmall	http://www.eec	stable	Michael Ritchie	RISC	32	32	stratix_3	Michael Ritch		207		A		2+8	126	##	q9.0	1.00	16.0	38.1	I		verilog															2005	2009		2-bit serial, Mostly MIPS-I compliant	Copyright 2005,2006,2009 Jonathan Rose, and
risc5	http://www.pro	beta	Niklaus Wirth	RISC	32	32	kintex-7-3	James	Brakef	2441		6	4	1	92	##	14.7	1.00	1.0	37.8	ILX		verilog	8	RISC5	Y	yes	Y		4G	4G				16		2013	2017	http://www.astro	minimalist Wirth, part of Project Obe	32x32 multiplier, wikipedia entry
amber	https://opencor	stable	Conor Santifort	ARM7	32	32	**zu-3e**	James	area o	5066	2382	6		20	175	##	v21.1	1.05	1.0	36.4	ILX		verilog	25	a25_core	Y	yes	N		4G	4G	Y	80		16	5	2010	2017	https://en.wikipe	no MMU	
mipsr2000	https://github.c	stable	Lazaridis Dimitris	MIPS	32	32	kintex-7-3	James	Brakef	1971		6	4	6	71	##	14.7	1.00	1.0	36.2	X		vhdl	35	Dm	Y	yes	N		4G	4G	Y			32	5	2012	2016		supports almost all instructions of mi	course project
moxielite	https://github.c	stable	Anthony Green	RISC	32	32	arria-2	James	Brakef	2696		A	4		93	##	q18.0	1.00	1.0	34.6	X		vhdl	11	moxielite					4G	4G	Y			16		2009	2017	https://github.com/atgreen/moxie-cores		
asip38	https://aaltodoc.aalto.fi/t		Lauri Isola	accum	32	38	**zu-3e**	James	xilinx I	2962	1056	6	4	35	100	##	v22.2	1.00	1.0	33.8	X	Y	vhdl	14	top	Y	asm	N	Y	16K	16K	N	31	4	4		2018	2021	http://www.kolun	Application-Specific Instruction set Pr	missing prog & data mem, missing mult
asip38	https://aaltodoc.aalto.fi/t		Lauri Isola	accum	32	38	**zu-3e**	James	xilinx I	2962	1056	6	4	35	100	##	v22.2	1.00	1.0	33.8	X	Y	vhdl	14	asip38	Y	asm	N	Y	16K	16K	N	31	4	4		2018	2021	http://www.kolun	Application-Specific Instruction set Pr	missing prog & data mem, missing mult
or1200_hp	https://opencor	stable	Strauch Tobias	OpenRISC	32	32	virtex-5	Strauc	3 slot I	5602		6			185	##		1.00	1.0	33.1	X		verilog	39	or1200_ic	Y	yes	Y	M	4G	4G	Y			32		2010	2013	https://openrisc.io	3 slot barrel version of OR1200	numbers from published paper
riscv_neorv32	https://github.c	stable	Stephan Nolting	risc-v	32	32	cyclone-IV	Stephe	rtl fpg	848		4			111	##	q19.1	1.00	4.0	32.7	AL	Y	vhdl	25	neorv32_t	Y	yes	N		4G	4G	Y			32		2020	2021	https://opencores	**very well documented, customiza**	**many perpherals, LUT counts for all variati**
eco32f	https://github.c	stable	Stefan Kristiansson	RISC	32	32	kintex-7-3	James	Brakef	3845		6	3	4	123	##	14.7	1.00	1.0	32.1	X		verilog	12	eco32f	Y	yes	N		512M	256M	Y	61		32	6	2014	2014		pipelined version of the eco32 CPU	eco32 & mmu
riscv_vanilla	https://github.c	verified	Ben Marshall	risc-v	32	32	artix-7	Ben Marshall		2422		6			150			1.00	2.0	31.0			verilog	26	frv_cpu_a	Y	yes	N		4G	4G	Y			32	5		2019		"toy" 5 stage RISC-V CPU, implementing	the rv32imc
dlx_chiara	https://github.c	stable	Alessandro Di Chiara	DLX	32	32	kintex-7-3	James	Brakef	2915		6			90	##	14.7	1.00	1.0	30.9	X		vhdl	32	a-dlx	Y	yes	N		4G	4G				32	5	2017	2017		Course project, no RTL comments, V	HDL via instructor?
riscv_rpu	https://github.c	untested	Colin Riley	risc-v	32	32	artix-7	Colin Riley		3291		6	12	1	100	##	14.7	1.00	1.0	30.4			vhdl	14	core	Y	yes	N		4G	4G	Y			32		2015	2020	http://labs.domip	Series of 16 tutorials on uP design, w	RPU uP, TPU now discarded
temlib	http://temlib.or	stable		SPARC	32	32	kintex-7-3	James	Brakef	3730		6	5		111	##	14.7	1.00	1.0	29.8	X		vhdl	48	fpu_simple			Y	N	4G	4G	Y			64		2013	2015		copywrite: experimental use	options for fltg-pt, pipeline, mul & div configur
opa	https://github.c	stable	Wesley W. Terpstra	RISC	32	32	cyclone-5	Wesle	largest	8540		A			125		q15.0	1.00	0.5	29.3	I		vhdl												32		2013	2016		An Out-of-Order Superscalar Soft CPU	tested, incomplete
riscv_naxriscv	https://github.com/Spinal		Charles Papon?	risc-v	32	32	artix7	Charle	AKA sp	13300		6			155			1.00	0.4	29.1			scala			Y	yes	N		4G	4G	Y			32			2022	https://spinalhdl.g	OoO execution w/reg renaming, Super	scalar(2 decode, 3 execution units, 2 retire), 2.
eco32	https://opencor	stable	Hellwing Geisse	RISC	32	32	kintex-7-3	James	Brakef	3367		6		5	147	##	14.7	1.00	1.5	29.1	ILX	Y	verilog	24	eco32	Y	yes	N		512M	256M	Y	61		32		2003	2014	homepages.thm.d	MIPS like, slow mul & div	
yarvi	https://github.c	beta	Tommy Thorn	risc-v	32	32	kintex-7-3	James	Brakef	2152		6		17	122	##	14.7	1.00	2.0	28.3	X		verilog	3	yarvi_soc	Y	yes	N	N	4G	4G				32	3		2016		no multiply or divide	simple implementation of RISC-V
nige_machine	https://github.c	stable	Andrew Read	forth	32	8	kintex-7-3	James	Brakef	5033		6	8	33	123	##	14.7	1.00	1.0	24.5	X		vhdl	29	Board	Y	yes	N		16M	16M		512		512			2014		standalone Forth system	https://www.youtube.com/watch?v=PRltE8q6
aor3000	https://opencor	beta	Aleksander Osman	MIPS	32	32	kintex-7-3	James	Brakef	5307		6	4	9	129	##	14.7	1.00	1.0	24.2	IX		verilog	19	aoR3000	Y	yes	N		4G	4G	Y			32	5	2014	2015		MIPS R3000A compatible, has MMU	moved declarations forward
aquarius	https://opencor	stable	Thorn Aitch	SuperH-2	32	16	kintex-7-3	James	Brakef	4071		6	2	10	97	##	14.7	1.00	1.0	23.7	ILX		verilog	21	top	Y	yes	N		4G	4G	Y					2003	2015	http://0pf.org/j-cc	clone of Hitachi SH-2	project seems to have stalled
btsr1arch	https://github.c	beta	Brendan Bohannon	CISC	32	16	kintex-7-3	James	Brakef	4762		6		10	167	##	14.7	1.00	1.5	23.3	X		verilog	11	bsrexunit	Y	yes	Y	N	64K	64K	Y	64		32		2018	2023		is BtSR1, msp430 like, fltg-pt defined	3 data sizes, no (R++) or (--R) modes
mips_fault_tol	https://opencor	stable	Lazaridis Dimitris	MIPS	32	32	kintex-7-3	James	Brakef	2017		6	4	6	45	##	14.7	1.00	1.0	22.5	X		vhdl	40	main	Y	yes	N		4G	4G	Y			32	5	2013	2013		arithmetic includes fault detection	no external memory port?
or1200	https://github.c	stable	Damjan Lampret	OpenRISC	32	32	kintex-7-3	James	Brakef	5231		6	4	8	118	##	14.7	1.00	1.0	22.5	X		verilog	78	or1200_to	Y	yes	Y	M	4G	4G	Y			32		2010	2015	https://openrisc.io	best older openrisc implementation	no LUT RAM for reg file
or1200mp	https://github.c	stable	Stefan Wallentowitz	OpenRISC	32	32	kintex-7-3	James	Brakef	4960		6	4	8	111	##	14.7	1.00	1.0	22.4	X		verilog	104	or1200_to	Y	yes	Y	M	4G	4G	Y			32		2012	2012	https://openrisc.io	multiprocessor variant, single core	

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	toolchain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe len	start year	last revis	secondary web link	note worthy	comments
riscompatible	https://opencor	beta	Andre Soares	RISC	32	32	kintex-7-3	James	set IO	2167		6		1	145	##	14.7	1.00	3.0	22.3	X		vhdl	12	riscompat	Y	yes	N	Y	4G	4G	Y			16		2014		based on RISCO processor by Junqueira & Suzim 1993	
leon2	https://github.c	stable	Jiri Gaisler	SPARC	32	32	kintex-7-3	James	Brakef	5992		6	1	12	133	##	14.7	1.00	1.0	22.3	X		vhdl	82	leon	Y	yes	Y		4G	4G	Y			64	5	1999	2003	https://en.wikipe	large config file, rad-hard asic version	https://www.gaisler.com/index.php/products/
amber	https://opencor	stable	Conor Santifort	ARM7	32	32	kintex-7-3	James	Brakef	6103		6		18	127	##	v18.2	1.05	1.0	21.8	ILX		verilog	25	a25_core	Y	yes	N		4G	4G	Y	80		16	3	2010	2017	https://en.wikipe	no MMU	
minsoc	https://opencor	stable	Raul Fajardo etal	OpenRISC	32	32	kintex-7-3	James	Brakef	4945		6	4	8	107	##	14.7	1.00	1.0	21.7	ILX	Y	verilog	88	or1200_to	Y	yes	Y	M	4G	4G	Y			32		2009	2013	https://github.cor	minimal OR1200, vendor neutral, has caches	
mips32r1	https://opencor	stable	Grant Ayers	MIPS	32	32	arria-2	James	Brakef	3716		A	8		79	##	q13.1	1.00	1.0	21.3	IX		verilog	20	processor	Y	yes	N	Y	4G	4G	Y			32	5	2012	2015	https://github.cor	Harvard arch	complete software tool chain
altium/TSK300	http://techdocs.	proprietar	Altium	RISC	32	32	spartan-3	Altium		2426		4		4	50			1.00	1.0	20.6	AILX		proprietary			Y	yes	N	N	4G	4G	Y					2004	2017	CR0140.pdf, http:/	frozen, asm, C, C++, schem, VHDL & V	default clock: 50MHz, opt mult/div
zap	https://opencor	alpha	Revanth Kamaraj	ARM7	32	32	kintex-7-3	James	Brakef	7558		6	1	9	135	##	14.7	1.00	1.0	17.9	X		verilog	37	zap_top	Y	yes	N	N	4G	4G	Y			16		2017	2022	https://github.cor	ARMv4T & Thumbv1	has cache & mmu
armv4_uarch	https://github.com/grant		Grant Wilk	ARM9	32	32	**max10**	Grant Wilk		2860		4			50	##	q18.0	1.00	1.0	17.5	A		vhdl	18		Y	yes	N		4G	4G	Y			16			2020	https://grantwilk.(	course uarch for the ARMv4 ISA on I	course work, top level is schematic
risc5	http://www.pro	beta	Niklaus Wirth	RISC	32	32	atrix7-35	James	Brakef	2913		6		48	50	##	v20.1	1.00	1.0	17.2	ILX		verilog	8	RISC5Top	Y	yes	Y		4G	4G				16		2013	2018	https://people.inf	minimalist Wirth, part of Project Obe	32x32 multiplier, wikipedia entry
j68	https://code.go	stable	Frederic Requin	68000	32	16	stratix-2	Freder	speed	1900		4		4	180			1.00	6.0	15.8	I		verilog	1	j68	Y	yes	N		4G	4G	Y			16		2009	2014		for use with Minimig	micro-coded on stack machine
piropiro	https://github.c	stable	pandora2000	RISC	32	32	kintex-7-3	James	port m	7491		6	11	1	118	##	14.7	1.00	1.0	15.7	X		vhdl	42	top			Y	N	64K	64K	Y			32		2010	2011		five variants	no doc, xilinx constraint file
riscv_microsen	https://github.c	stable	Microsemi	risc-v	32	32	polarfire	microsemi		8614		4	2	10	122		L11.8	1.00	1.0	14.2			proprietary			Y	yes	N		4G	4G	Y			32		2016	2018	https://www.micr	is encrypted IP	has caches
klc32	https://opencor	planning	Robert Finch	RISC	32	32	kintex-7-3	James	Brakef	3790		6	4	1	200	##	14.7	1.00	4.0	13.2	X		verilog	25	KLC32	Y		N		4G	4G	Y			32		2011	2012	https://github.cor	single ported block RAM register file :(	heavy use of includes
zpuino	http://alvie.com	alpha	Alvaro Lopes	forth	32	8	spartan6-	James	Brakef	2547		6	4	12	126	##	14.7	1.00	4.0	12.3	X	Y	vhdl		papilio_pr	Y	yes	N		4G	4G	Y	37				2008	2012		SoC version of modified ZPU	pipelined, removed ucf file
nyuzi_gpu	https://github.c	stable	Jeff Bush	GPGPU	32	32	cyclone-4	Jeff Bush		74000		6			54		q18.0	16.00	1.0	11.7			system v	70	nyuzi	Y	yes	Y		4G	4G	Y	80		64		2015	2022	https://github.cor	32 scalar & 32 vector reg	
microcore	https://github.c	beta	Klaus Schleisiek	forth	32	8	XP2	Klaus	Schleisi	2864		4			33	##	3.12	1.00	1.0	11.5	AILX		vhdl	38	ucore	Y	asm	N	Y	3K	8K	Y	84				1999	2023		**easy to add op-codes, fltg-pt opt., sir**	**12, 16, 27 & 32 bit data sizes**
flexgrip	http://www.ecs	paper	Kevin Andryc	GPGPU	32	32	atrix-7	James	Brakef	72649		6	##	119	100	##	14.7	1.00	0.1	11.0	X		vhdl	46	gpgpu_ml	505_top_	level									2013	2016	http://www.ecs.u	eight GPU processors	requested & received source files
mipsfpga	https://www.m	stable	MIPS Technologies	MIPS	32	32	atrix-7-3	James	Brakef	10692		6		47	118	##	14.7	1.00	1.0	11.0	X	Y	verilog	193	mfp_syste	Y	yes	N		4G	4G	Y			32		2014	2018	https://www.yout	M14K core & mipsfpga-plus	DRAM interface, I&D caches. 8789 FF
xulalx25soc	https://github.c	mature	Dan Gisselquist	RISC	32	32	spartan6-	James	Sparta	7936		6	4	25	87	##	14.7	1.00	1.0	11.0	X	Y	verilog		toplevel			N	N	4G	4G	N	20		16	5	2015				uses ZIP CPU
zap	https://opencor	alpha	Revanth Kamaraj	ARM7	32	32	arria-2	James	high D	10284		A	2	38	111	##	q18.0	1.00	1.0	10.8	X		verilog	37	zap_top	Y	yes	N	N	4G	4G	Y			16		2017	2022	ddi0100e_armv1-	ARMv4T & Thumbv1	has cache & mmu
amber	https://opencor	stable	Conor Santifort	ARM7	32	32	kintex-7-3	James	Brakef	6409		6		2	82	##	14.7	0.75	1.0	9.6	ILX		verilog	25	a23_core	Y	yes	N		4G	4G	Y	80		16	3	2010	2017	https://en.wikipe	no MMU, shared cache	2048 LUTs used as single port RAM
riscv_rv01_cor	https://github.c	stable	Stefano Tonello	risc-v	32	32	kintex-7-3	James	Brakef	13997		6	4	62	130	##	14.7	1.00	1.0	9.3	X		vhdl	65	rv01_selft	Y	yes	N		4G	4G	Y			32		2015	2017		all files in one directory	two self test tops
mist1032	https://github.c	stable	Takahiro Ito	RISC	32	32	arria_2	James	altera	10801		A	4	125	98	##	q18.0	1.00	1.0	9.1			system v	50	mist32s10	Y								64			2014		mist32 uP: embedded version	
m32632	https://opencor	stable	Udo Moeller	N32032	32	8	kintex-7-3	James	Brakef	10167		6	19	16	83	##	14.7	1.00	1.0	8.2	IX		verilog	18	example	Y	yes	Y	Y	4G	4G	Y	200		24	3	2009	2019	http://cpu-ns32k.net/		21.97 VAX Mips at 50MHz (Cyclone IV)
leon2	https://github.c	stable	Jiri Gaisler	SPARC	32	32	cyclone-1	Klas	Westerlu	7554		4		42	50	##		1.00	1.0	6.6	I		vhdl	90	leon	Y	yes	Y		4G	4G	Y			64	5	1999	2003	https://en.wikipe	LUT #s from Nios vs Leon2 compariso	https://www.gaisler.com/index.php/products/
forwardcom	https://github.c	stable	Agner Fog	cisc	32	32	atrix-7	Agner	Fog	13248	4990	6			64	##	v20.1	1.00	1.0	4.8	X		system v	18	top	Y	asm	Y		64K	32K	Y			64		2016	2023	https://www.forw	x86 like, complete ISA, MMX & vector	x86 adr modes, vector inst use width of vect re
riscv_humming	https://github.c	stable		risc-v	32	32	kintex-7-3	James	Brakef	14119		6		32	62	##	14.7	1.00	1.0	4.4	X	Y	verilog	141	e203_soc	Y	yes	N		4G	4G	Y			32		2016	2022	https://github.cor	e200 has opensource	also have a chip
af65k	https://github.c	alpha	Andre Fachat	6502	32	8	kintex-7-3	James	Brakef	4424		6			69	##	14.7	1.00	4.0	3.9	X		vhdl	13	gecko65k	Y		N	N								2011	2019	http://www.6502	extended 6502 AKA 65K with 16, 32 or 64 bit data	
af65k	https://github.c	alpha	Andre Fachat	6502	32	8	**zu-3e**	James	vivado	4424		6			69	##	v21.1	1.00	4.0	3.9	X		vhdl	13	gecko65k	Y		N	N								2011	2019	http://www.6502	extended 6502 AKA 65K with 16, 32 or 64 bit data	
rtf65002	https://opencor	alpha	Robert Finch	accum	32	8	kintex-7-3	James	Brakef	11216		6	4	6	123	##	v14.1	0.67	2.0	3.7	X		verilog	10	rtf65002d	Y		N		4G	4G	Y			16		2013	2013	https://github.cor	32-bit 6502 + 6502 emulation	"proven"
riscv_picorv32	https://github.c	beta	Clifford Wolf	risc-v	32	32	GW1NR-9	Jean-L	small	2764	1833	4		8	27	##		1.00	3.0	3.3	X		verilog	1	picorv32	Y	yes	N		4G	4G	Y			32		2016	2022	https://www.cnx-	mimimal features, soc options	https://github.com/sipeed/TangNano-9K-exan
riscv_rsd	https://github.com/rsd-de		Susumu Mashimo	risc-v	32	32	zynq	Susumu	Mast	28166		6			90			1.00	1.0	3.2			system verilog			Y	yes	N		4G	4G	Y			32			2020		RISC-V out-of-order superscalar proc	can be synthesized for small FPGAs
ztapchip	https://github.c	stable	Vuony Nguyen	MIPS	32	32	cyclone5	James	Brakef	31331		A	43	578	100	##	q18.0	1.00	1.0	3.2	I	Y	vhdl	53	ztachip												2015	2015		multi-core with MIPS master	files no longer available, was under developme
kpu	https://github.c	alpha	Andrea Corallo	RISC	32	32	kintex-7-3	James	missin	6178		6	3		19	##	14.7	1.00	1.0	3.0	X	Y	verilog	19	kpu	Y	yes	N	Y	4G	4G				32		2016	2018	http://andreacora	KPU is a minimal system on chip written	used as testbench for the KPU core
milkymist	https://github.c	stable	Sebastien Bourdeaudu	LM32	32	32	spartan-6	James	failed	13531		6	31	78	50	##	14.7	0.80	1.0	3.0	X	Y	verilog	169	system	Y	yes	N	Y	4G	4G	Y			32	6	2007	2014		uses LM32, uses Spartan-6 IO	failed in mapper
riscv_fwrisc	https://github.c	untested	Matthew Balance	risc-v	32	32	igloo2	Matthew	Bala	1060		4			20	##		1.00	6.7	2.8	AL		system v	8	fwrisc_fpg	Y	yes	N		4G	4G	Y	45		32		2018	2018	https://opencores	featherweight entry 2018 RISC-V con	0.15 DMIPS/MHz
v586	https://opencor	beta	Jose Ristetto	x86	32	8	kintex-7-3	James	Brakef	22282		6	12	16	102	##	14.7	1.00	2.0	2.3	X		verilog	22	v586	Y	yes	N		1M	1M	Y					2014	2016	https://github.cor	MMU & caches, branch cache	www.youtube.com/channel/UCNbm8Bah54cw
edge	https://opencor	alpha	Hesham ALMatary	MIPS	32	32	spartan-6	James	Brakef	5345		6	7	1	8	##	14.7	1.00	1.0	1.5	X		verilog	30	edge_core	Y	yes	N	N	4G	4G	Y			32	5	2014	2014		Edge Processor (MIPS)	MIPS1 clone
ao486	https://opencor	beta	Aleksander Osman	x86	32	8	cyclone-4	James	Brakef	36094		4	4	47	46	##	q13.1	1.00	1.0	1.3	I	Y	system v	85	ao486	Y	yes			4G	4G	Y					2014	2014	https://www.stuff	complete 486, SoC configuration	Henry Wong thesis at U.Toronto, also youtube
lemberg	https://github.c	stable	Wolfgang Puffitsch	VLIW	32	32	cyclone-4	James	Brakef	37459		4	25	54	43	##	q13.1	1.00	1.0	1.1	I		vhdl	57	core	Y	yes	Y		4G	2M	Y			32	4	2011		http://www2.imn	upto 4 inst/clock	LPM mem & floating point
sp-i586	https://github.c	stable	Lini Mestar	x86	32	8	kintex-7-3	James	Brakef	32144		6	4	28	73	##	14.7	1.00	2.0	1.1	X		verilog	37	top_sys	Y	yes	Y		4G	4G	Y					2016	2016	http://lmeshoo.ne	gate level dsgn, vivado project also	http://img.youtube.com/vi/2W1guyhCJuE/0.jp
riscv_picorv32	https://github.c	beta	Clifford Wolf	risc-v	32	32	GW1NR-9	Jean-L	large	8594	5278	4	2	32	27	##		1.00	3.0	1.0	X	Y	verilog	1	picorv32	Y	yes	N		4G	4G	Y			32		2016	2022	https://www.cnx-	mimimal features, soc options	inclueds all peripherals
mist1032	https://github.c	errors	Takahiro Ito	RISC	32	32	cyclone-1	James	altera	33251		4	4	138	32	##	q18.0	1.00	1.0	1.0			verilog	100	mist1032isa					4G	4G	Y			64			2015		mist32 uP: inorder version	high pin count
rois	https://opencor	alpha	James Brakefield	RISC	24	24	**zu-2e**	James	no blk	627		6			382	##	v19.2	0.83	1.0	507.1	X		vhdl	2	rois24_24	min		N		16M	16M	N	30		64	1	2016	2017		single pipe stage, passes simulation	24-bit word operations only
rois	https://opencor	alpha	James Brakefield	RISC	24	24	kintex-7-3	James	Brakef	384		6		1	170	##	14.7	0.83	1.0	368.8	X		vhdl	2	rois24_24	min		N		16M	16M	N	30		64	1	2016	2017		single pipe stage, passes simulation	24-bit word operations only
rois	https://opencor	alpha	James Brakefield	RISC	24	24	kintex-7-3	James	Brakef	382		6		1	120	##	14.7	0.83	1.0	261.7	X		vhdl	2	rois24_24	up		N		16M	16M	Y	55		64	1	2016	2017		single pipe stage, pre simulation stag	8, 16 & 24-bit load/store
opc.opc8cpu	https://github.c	beta	revaldinho	RISC	24	24	kintex-7-3	James	no tes	516		6			323	##	14.7	0.80	2.0	250.1	X		verilog	1	opc8cpu	Y	asm	N	N	16M	16M	N	32	4	16		2017	2021	https://revaldinho	OPC8 24bit, based on OPC5LS, more i	see hackaday One Page Computing Challenge
ep24		stable	C.H. Ting	forth	24	6	kintex-7-3	James	substi	1020		6		3	167	##	14.7	0.83	1.0	135.6	X		vhdl	1	ep24	Y	asm	N	N		4K		27				2002	2002		room for 37 additional op-codes	removing stack clear: 503 LUT6 & 143MHz
24bit_up	https://github.c	alpha	Harshal Mittal	RISC	24	24	**zu-3e**	James	area o	3535	2166	6	1		187	##	v21.1	0.80	1.0	42.2	X		verilog	17	processor			N		16M	16M	N	17		32		2019	2019		basic 24-bit RISC, course work	big Dff count, multiple writes to register file
p24e		beta	C.H. Ting	forth	24	6	spartan_3	James	Brakef	1175		4		16	51	##	14.7	0.83	1.0	36.0	X		vhdl	1	p24c	Y	asm	N		2K	2K		28				2000			part of eForth?	data width can be expanded
rois	https://opencor	alpha	James Brakefield	RISC	24	24	**zu-2e**	James	huge I	9000		6			150	##	v19.2	0.83	1.0	13.9	X		vhdl	2	rois24_24	up		N		16M	16M	Y	55		64	1	2016	2017		single pipe stage, pre simulation stag	8, 16 & 24-bit load/store
kraken16	https://people.e	stable	Bruce R. Land	RISC	18	18	kintex-7-3	James	Brakef	281		6		1	278	##	14.7	0.67	1.0	662.3	X		verilog	1	DE2_TOP	Y	asm	N	N	256	256	N	22		16		2008	2008	https://people.ec	Cornell course material	
spartanMC	http://www.spa	stable	Falk Hassler	RISC	18	18	kintex-7-3	James	Brakef	853		6	1	2	120	##	14.7	0.67	1.0	94.6	X	Y	verilog	38	spartanmc	Y	asm										2012	2014		SPARC like register windows	
chad	https://github.com/bradle	stable	Brad Eckert	forth	18	16	**zu-3e**	James	vivado	2196	2211	6		5	250	##	v21.1	0.80	1.0	91.1	XIML		verilog	33	mcu_arty	Y	yes	N		64K	64K	N	23		16			2021		verilog, .f & .c code; fpga project files	
chad	https://github.com/bradle	stable	Brad Eckert	forth	18	16	atrix-7-3	James	option	1972		6		3	196	##	v21.1	0.80	1.0	79.5	XIML		verilog	33	mcu	Y	yes	N		64K	64K	N	23		16			2021		verilog, .f & .c code; fpga project files	min SOC, -3 speed grade
chad	https://github.com/bradle	stable	Brad Eckert	forth	18	16	atrix-7-3	James	DFF ex	1995		6		5	175	##	v21.1	0.80	1.0	70.4	XIML		verilog	33	mcu_arty	Y	yes	N		64K	64K	N	23		16			2021		verilog, .f & .c code; fpga project files	max SOC, -3 speed grade
chad	https://github.com/bradle	stable	Brad Eckert	forth	18	16	atrix-7-1	James	DFF ex	1982		6		5	127	##	v21.1	0.80	1.0	51.4	XIML		verilog	33	mcu_arty	Y	yes	N		64K	64K	N	23		16			2021		verilog, .f & .c code; fpga project files	max SOC, -1 speed grad
pdp1	https://opencor	alpha	Yann Vernier	PDP1	18	18	spartan-3	James	Brakef	1390		4		6	138	##	14.7	0.50	10.0	5.0	X		vhdl	15	top	Y	yes	N	N	4K	4K	Y	28				2011	2017	http://pdp-1.com	PDP-1 descended from MIT TX-0	uses Minimal UART from opencores
verilog-harvard	https://github.com/jaywo		Jae-Won Chung	RISC	16	16	**zu-3e**	James	multi-c	171		6			357	##	v21.1	0.67	1.0	1399	X		verilog	5	cpu01	Y		N	N	####	####	N	23		4		2019	2019		multi-driven nets	single cycle CPU that has an IPC of 1
pumpkin	https://github.com/Steve		Steve Teal	accum	16	16	**zu-3e**	James	Brakef	166	67	6			625	##	v21.2	0.67	2.0	1261			vhdl	6	hello_wor	Y	asm	N		4K	4K		14					2020		scalable, 16-bit, 16 instruction soft CP	LUT RAM inferred (small size)	
leros	https://opencor	stable	Martin Schoeberl	accum	16	16	spartan-6	Martin	Schoe	112		6		1	182			0.67	1.0	1089	IX		vhdl	5	leros	Y	yes	N	Y	256	64K				2	2	2008	2020	https://github.cor	256 word data RAM, PIC like	short LUT inst ROM
J1	www.excamera	stable	James Bowman	forth	16	16	**zu-2e**	James	area o	253		6		1	336	##	v20.1	0.80	1.0	1061	X		vhdl	1	j1	Y	forth	N		64K	64K		20			2	2006	2015	https://github.cor	uCode inst, dual port block RAM	16 deep data & return stacks
verilog-harvard	https://github.com/jaywo		Jae-Won Chung	RISC	16	16	**zu-3e**	James	multi-c	165	96	6			250	##	v21.1	0.67	1.0	1015	X		verilog	7	cpu02	Y		N	N	64K	64K	N	23		4		2019	2019		multi-driven nets	multi cycle CPU that has an IPC of 1
Lutiac		custom	David Galloway, David	reg	16	NA	stratix-4	David	Gallow	140		A	4		198			0.67	1.0	947.6	I		vhdl & verilog									64	N	64		32	3		2010	Talks at Un. Toron	synthesis maps PC into ucode	no inst mem: small state machine, ~200 inst op
hamblen_scor	http://hamblen.	stable	James O. Hamblen	accum	16	16	cyclone-1	James	altera	80		4		1	204	##	q18.0	0.67	2.0	852.7	I		verilog	1	scomp			N	N	256	256	N	4				2008		http://hamblen.ec	from Hamblen 2008 "Rapid prototypi	tiny edu, high IO count
iDEA	https://github.c	alpha	Hui Yan Cheah etal	RISC	16	32	virtex-6	Liu Ch	unable	321		6	1	2	405		13.2	0.67	1.0	845.3	X		verilog	22	cpu_top	Y	yes	N	Y	64K	64K	N	24		32	9	2011	2016	The iDEA DSP Bloc	uses DSP slice in barrel mode for ALU	from GitHub, rq'd NOPs lower actual results
octavo	http://fpgacpu.c	beta	Charles LaForest	reg	16	16	stratix-4	Charles	LaFor	500		A	1		550			0.67	1.0	737.0	I		verilog	18	Octavo	Y	asm	N					14		16	10	2012	2019	https://github.cor	8 core barrel, adjustable data width	"~= performance across word sizes, no call/rtn
cpu16	https://www.ultr	stable	C.H. Ting	forth	16	5	kintex-7-3	James	Brakef	347		6			364	##	14.7	0.67	1.0	702.1	X		vhdl	1	cpu16			N	N	64K	64K	N	28				2000	2000		P16 in VHDL	CPU24.vhd with width=16
pumpkin	https://github.com/Steve		Steve Teal	accum	16	16	**zu-3e**	James	Brakef	230	131	6		1	450	##	v21.2	0.67	2.0	656.1			vhdl	6	myco	Y	asm	N		4K	4K		14					2020		scalable, 16-bit, 16 instruction soft CP	emulates Myco, forced block RAM	
p16b		beta	C.H. Ting	forth	16	5	kintex-7-3	James	case c	367		6			355	##	14.7	0.67	1.0	648.1	X		vhdl	1	cpu16	Y	asm	N		64K	64K		28				2000			part of eForth?	data width can be expanded
xr16	https://github.c	stable	Jan Gray	RISC	16	16	kintex-7-3	James	Brakef	273		6			263	##	14.7	0.67	1.0	644.8	X		verilog	4	xr16	Y		N		64K	64K				16		1999	2001	https://github.cor	handcrafted instruction set	tool FPGA P&R, speed mode better
dspuva16	http://www.DTF	stable	Santiago de Pablo	DSP	16	16	kintex-7-3	James	Brakef	332		6			317	##	14.7	0.67	1.0	640.7	X		verilog	1	dspuva16		asm	N	Y	256	4K		40		16		2001	2004	www.1-core.com/	16 bit data memory, 24 bit regs	broken web link
J1a	www.excamera	stable	James Bowman	forth	16	16	kintex-7-3	James	DFF ex	518		6			416	##	14.7	0.80	1.0	636.1	X		verilog	3	j1	Y	forth	N		64K	64K		20			2	2006	2017	https://github.cor	uCode inst, dual port block RAM	DFF used for 18 deep data & return stacks
s16x4a	https://github.c	stable	Samuel Falvo II	forth	16	4	kintex-7-3	James	Brakef	514		6			476	##	14.7	0.67	1.0	620.7	X	B	verilog	1	s16x4a	Y		N	N	64K	64K	Y	12				2012	2017		kestrel #2, byte & word data	derived from Myron Plichota's design (streame
ipro	https://github.com/fsiddi		Fahad Siddiqui	risc	16	32	virtex-7	Fahad	Siddiqu	484	447	6	1	1	372	##		0.80	1.0	614.9	X		verilog	31			asm	N		64K	64K		30		32	5	2013	2023		16-bit RISC using DSP48	image processing, several publications
msl16		beta	Philip Leong, Tsang, Le	forth	16	4	kintex-7-3	James	Brakef	303		6			256	##	14.7	0.67	1.0	566.4	X		vhdl	13	cpu	Y	asm	N		256			16				2001			CPLD prototype	
misc16	https://github.com/Steve		Steve Teal	accum	16	16	**zu-3e**	James	Brakef	197	78	6			500	##	v21.2	0.22	1.0	558.4	X	B	vhdl	1	misc	Y	yes	N		64K	64K	N	10					2021	https://github.cor	16-bit minimal CPU, has a single instruction	'mov' & eforth
xr16	https://github.c	stable	Jan Gray	RISC	16	16	**zu-2e**	James	needs	346		6			282	##	v20.1	0.67	1.0	547.0	X		verilog	4	xr16	Y		N		64K	64K				16		1999	2001		handcrafted instruction set	tool FPGA P&R, speed mode better
xucpu	https://opencor	alpha	Jurgen Defurne	RISC	16	16	spartan6-	James	Brakef	356		6		4	187	##	14.7	1.00	1.0	524.8	X	Y	vhdl	25	system_4k					4K	4K						2015	2017		Experimental Unstable CPU	
streamer16	http://www.ultr	stable	Myron Plichota	forth	16	3	kintex-7-3	James	Brakef	143		6			417	##	14.7	0.20	1.2	485.6	X		vhdl	8	streamer	Y	yes	N	N	64K	64K	N	8	2			2001	2001	http://www3.sym	MIPS/inst reduced	2nd web adr non-functional

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	repor ter	com ents	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	ven dor	SOC	src code	#src files	top file	doc	tool chai n	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pip e lin	start year	last revis	secondary web link	note worthy	comments
atlas_core	https://opencor	beta	Stephan Nolting	RISC	16	16	**zu-3e**	James	vivado	611	285	6	1		333	##	v21.1	0.80	1.0	436.4	IX		vhdl	8	ATLAS_CP	Y	asm	N	Y	64K	64K	Y	80		8		2013	2015		ARM thumb like inst set	non-MMU version
J1	www.excamera	stable	James Bowman	forth	16	16	kintex-7-3	James	Brakef	335		6		1	180	##	14.7	0.80	1.0	431.0	X		vhdl	1	j1	Y	forth	N		64K	64K		20			2	2006	2015	https://github.cor	uCode inst, dual port block RAM	16 deep data & return stacks
fpga4_mips16	http://www.fpg	stable	Van Loi Le	RISC	16	16	kintex-7-3	James	Brakef	352		6			213	##	14.7	0.67	1.0	405.0	X		vhdl	8	mips_vhdl			N		65K	65K		8		8		2017	2017		educational, no block RAM inferred	actual prog sz=16, actual data mem sz=256
fpga4_mips16	http://www.fpg	stable	Van Loi Le	RISC	16	16	kintex-7-3	James	Brakef	369		6			200	##	14.7	0.67	1.0	363.1	X		verilog	8	mips_16			N		65K	65K		13		8		2017	2017		educational, no block RAM inferred	same prog & data mem and alu as mips16_16_
micro16b	http://members	beta	John Kent	accum	16	16	kintex-7	James	Brakef	205		6			434	##	14.7	0.33	2.0	349.0	X		vhdl	1	u16bcpu	Y	asm	N	N	64K	4K	Y	8				2002	2008	http://members.o	very limited inst set	MIPS/clk adj'd, 2 clks/inst
alwcpu	https://opencor	alpha	Andreas Hilvarsson	RISC	16	16	kintex-7-3	James	Brakef	377		6			194	##	14.7	0.67	1.0	345.5	ILX		vhdl	7	top	ome		N	N	64K	64K	Y			16		2009	2010		lightweight CPU	maximal features
risc_core_i	https://opencor	planning	Manuel Imhof	RISC	16	16	kintex-7-3	James	Brakef	349		6	1		526	##	14.7	0.67	3.0	336.8	X	B	vhdl	13	CPU	Y	asm	N		1K	1K				8	4	2001	2009		Havard arch, thesis project	derived clocks: estimated derating
ncore	https://opencor	alpha	Stefan Istvan	accum	16	8	kintex-7-3	James	Brakef	223		6			105	##	14.7	0.67	1.0	316.3	X		verilog	3	nCore	Y		N		128K	64K		16		16		2006	2018		This is a little-little processor core	
atlas_core	https://opencor	beta	Stephan Nolting	RISC	16	16	kintex-7-3	James	Brakef	559		6	1		200	##	v14.1	0.80	1.0	286.2	IX		vhdl	8	ATLAS_CP	Y	asm	N	Y	64K	64K	Y	80		8		2013	2015		ARM thumb like inst set	non-MMU version
hamblen_scor	http://hamblen.	stable	James O. Hamblen	accum	16	16	cyclone-1	James	altera	196		4		1	166	##	q18.0	0.67	2.0	283.5	I		verilog	2	DE2_TOP			N	N	256	256	N	4					2008	http://hamblen.ec	from Hamblen 2008 "Rapid prototypi	tiny eduo, high IO count
raptor16	www.spacewire	stable	Steve Haywood	CISC	16	16	kintex-7-3	James	Brakef	590		6			319	##	14.7	1.40	2.7	280.2	X		vhdl	1	raptor16	Y	yes	N	N	64K	64K	N					2004			8 data & 8 adr regs	no multiply, 8 adr modes
dgb16	see FISA64	stable	Robert Finch	RISC	16	16	kintex-7-3	James	Brakef	780		6			313	##	14.7	0.67	1.0	269.0	X		verilog	1	dbg16	Y		N	Y						8				https://github.cor	inside FISA64 project	debug uP for fisa64
yafc	https://github.c	alpha	Tim Wawrzynczak	forth	16		kintex-7-3	James	Brakef	617		6		4	247	##	14.7	0.67	1.0	268.5	X		vhdl	20	cpu		asm	N	Y	8K	8K		26					2014				influenced by J1, F16 & C18
diogenes	https://opencor	beta	Fekknhifer	RISC	16	16	kintex-7-3	James	Brakef	807		6		1	297	##	14.7	0.67	1.0	246.3	X		vhdl	11	cpu	Y	asm	N			1K						2008	2009		"student RISC system"	
digital_up	https://github.com/hneer		Helmut Neemann	mips	16	16	zu-5e	James	clockir	709	310	6	1		250	##	v22.1	0.67	1.0	236.2	X		schemat	46	processorHD	asm		N	Y	64K	64K		60		16		2016	2022	https://github.cor	uP implemented as schematic	has assembler and ISA pdf, 2Kx16 RAM?
sayeh_process	https://opencor	stable	Alireza Haghdoost, Arr	RISC	16	8	kintex-7-3	James	Brakef	479		6	1		164	##	14.7	0.67	1.0	229.7	X		verilog	13	Sayeh	Y		N		64K	64K				32		2008	2009	haghdoost.persian	gig.com	simple RISC
opc.opc3cpu	https://github.c	stable	revaldinho	accum	16	16	kintex-7-3	James	reduce	174		6			526	##	14.7	0.30	4.0	226.9	X		verilog	2	opc3cpu	Y	asm	N	N	64K	64K	N	13	3			2017	2021	https://revaldinhc	OPC3 16-bit OPC1, for XC95144 CPLD	see hackaday One Page Computing Challenge
moncky	https://gitlab.com/big-bat		Kris Demuynck	RISC	16	16	**zu-3e**	James	no me	768	280	6			250	##	v21.1	0.67	1.0	218.1	X	X	schemat	36	Moncky3	Y	yes	N		64K	64K	N	32		16		2020	2021	https://hackaday.i	bare CPU	also has verilog
table887	https://github.c	alpha	Robert Finch	RISC	16	16	kintex-7-3	James	Brakef	643		6		2	208	##	14.7	0.67	1.0	217.1	X		verilog	2	table887	Y		N	N	64K	64K		28		8		2014	2016			included with Table888 source code
ep16	https://github.c	beta	C.H. Ting	forth	16	5	kintex-7-3	James	Brakef	837		6			254	##	14.7	0.67	1.0	203.6	X		vhdl	5	ep16	Y	yes	N	N	32K	32K	N	32				2005	2012	PDF files	initialized Lattice memory blocks	5-bit instructions
pancake	https://people.e	stable	Bruce Land	stack	16	5	kintex-7-3	James	bypass	441		6	1	1	128	##	14.7	0.67	1.0	194.8	X		verilog	7	de2_minic	Y	yes	N		4K	4K		31				2010	2014	http://www.cs.hir	The Pancake Stack Machine dervied f	Cornell ECE5760
atlas_2K	https://opencor	beta	Stephan Nolting	RISC	16	16	**zu-3e**	James	vivado	1222	1160	6	1	5	262	##	v21.1	0.80	1.0	171.4	ILX		vhdl	19	ATLAS_2K	Y	asm	N	Y	64K	64K	M	80		8		2013	2015		ARM thumb like inst set	has MMU & full SOC features
digital_up	https://github.com/hneer		Helmut Neemann	mips	16	16	spartan7	James	clockir	716	309	6	1		182	##	v22.1	0.67	1.0	170.1	X		schemat	46	processorHD	asm		N	Y	64K	64K		60		16		2016	2022	https://github.cor	uP implemented as schematic	has assembler and ISA pdf, 2Kx16 RAM?
yasep	https://hackada	alpha	Yann Guidon	RISC	16	32	kintex-7-3	James	reduce	632		6			215	##	I14.7	1.00	2.0	170.0	AX		vhdl	3	microYAE	Y	asm	N	N	2G	2G		51		16		2005	2018	www.youtube.cor	JavaScript generated VHDL, revisions	ongoing
opc.opc6cpu	https://github.c	stable	revaldinho	RISC	16	16	kintex-7-3	James	Brakef	450		6			222	##	14.7	0.67	2.0	165.4	X		verilog	2	opc6cpu	Y	asm	N	N	64K	64K	N	27	4	16		2017	2021	https://revaldinhc	OPC6 based on OPC5LS, more inst	see hackaday One Page Computing Challenge
b16	www.bernd-pay	stable	Bernd Paysan	forth	16	5	spartan-6	James	Brakef	554		6			134	##	14.7	0.67	1.0	161.7	IX		verilog	15	b16	Y		N		64K	64K	N					2002	2017	https://github.cor	two versions: one/15 source files, derived from c18	
kestrel-2	kestrelcomputer	stable	Samuel Falvo II	forth	16	16	kintex-7-3	James	Brakef	735		6		8	172	##	14.7	0.67	1.0	157.2	X	Y	verilog	27	M_kestrel	Y	yes	N		64K	64K		20			2	2012	2015	https://hackaday.i	J1 with wishbone bus	M_j1a runs at 244MHz & 368 LUTs
mcip_open	https://opencor	beta	Mezzah Jbrahim	PIC18	16	24	kintex-7-3	James	Brakef	881		6	1		200	##	14.7	0.67	1.0	152.1	X		vhdl	23	MCIOopen_r	yes		N	Y	4K	1M	Y					2014	2015		light version of PIC18	
ensilica	http://www.ens	roprietar	ensilica.com	eSi-1600	16	16	virtex-5	ensilica		1100		6			160			1.00	1.0	145.5	IX		verilog		eSi-1600	Y	yes			64K	64K	Y	92	10	16	5	2001	2016		verilog source included with license	room for 90 user inst, also as ASIC
ensilica	http://www.ens	roprietar	ensilica.com	eSi-1600	16	16	virtex-5	ensilica		1100		6			160			1.00	1.0	145.5	IX		verilog		eSi-1650	Y	yes			64K	64K	Y	92	10	16	5	2001	2016		verilog source included with license	room for 90 user inst, also as ASIC
opc.opc5lscpu	https://github.c	stable	revaldinho	RISC	16	16	kintex-7-3	James	Brakef	383		6			247	##	14.7	0.67	3.0	144.0	X		verilog	2	opc5lscpu	Y	asm	N	N	64K	64K	N	18	4	16		2017	2021	https://revaldinhc	OPC5LS OPC5 with predicate inst	see hackaday One Page Computing Challenge
opc.opc5cpu	https://github.c	stable	revaldinho	RISC	16	16	kintex-7-3	James	reduce	273		6			294	##	14.7	0.40	3.0	143.6	X		verilog	7	opc5cpu	Y	asm	N	N	64K	64K	N	15	4	16		2017	2021	https://revaldinhc	OPC5 RR inst, ISA similar to OPC1	see hackaday One Page Computing Challenge
ejrh_cpu	https://github.c	stable	Edmund Horner	RISC	16	16	kintex-7-3	James	Brakef	928		6	1	2	196	##	14.7	0.67	1.0	141.6	X		verilog	17	machine	Y									16		2015	2015		see web archive for doc	
dragonfly	http://www.leo	beta	LEOX team	MISC	16	16	kintex-7-3	James	Brakef	788		6			164	##	14.7	0.67	1.0	139.3	X		vhdl	6	dgf_core	Y		N		256	2K						2001			unusual, uses FIFOs	
verilog-65C02	https://github.c	alpha	Arlet Ottens	6502	16	8	**zu-3e**	James	vivado	327	98	6			370	##	v21.1	0.33	3.0	124.6	X		verilog	26	cpu		yes	N	N	64K	64K	Y					2011	2021	https://github.cor	used in 100MHZ 6502 DIP module	rewritten for 6LUTs, spartan6 version has blacl
minicpu-s	https://github.c	stable	Michael Morris	stack	16	8	kintex-7-3	James	Brakef	147		6			741	##	14.7	0.67	28.0	120.6	X		verilog	2	both	Y		N					33				2012	2013		separate source for each CPLD chip, u	fits (2) XC9500 CPLD @ 71.4 MHz
tigli_cpu		stable	Cleiton Juffo	RISC	16	16	kintex-7-3	James	Brakef	636		6			455	##	14.7	0.67	4.0	119.7	X		verilog	24	cpu	Y		N	Y	64K	64K		16		16		2013	2013		course project, not pipelined	no LUT RAM for reg file
hpc-16	https://opencor	beta	Umair Siddiqui	RISC	16	16	kintex-7-3	James	Brakef	871		6			152	##	14.7	0.67	1.0	116.6	X		vhdl	20	cpu	Y	asm	N		64K	64K				16		2005	2015			
minicpu	http://www.cs.h	stable	Hirotsugu Nakano	stack	16	5	kintex-7-3	James	lots of	433		6	1	1	128	##	14.7	0.33	1.0	97.7	X		verilog	7	minicpu	Y	yes	N		4K	4K	N	26				2008	2018		same as tiny-cpu	uses Flex, Bison & Perl to create gcc compiler
lem16_18		alpha	James Brakefield	accum	16	18	kintex-7-3	James	Brakef	483		6		1	294	##	14.5	0.16	1.0	97.4	X		vhdl	2	lem16_18m			N		256	1K		77			1	2010	2018		variable bit-length memory read/writ	op-codes coded, untested
multicycle_risc	https://github.c	stable	Yash Sanjay Bhalgat	RISC	16	16	kintex-7-3	James	Brakef	1470		6			213	##	14.7	0.67	1.0	97.0	X		verilog	62	risc15	Y		N		64K	64K		15		8		2015	2015		multi-cycle IIT-B-RISC15 ISA	developed on Altera, course project
c16too	https://www.sc	stable	Cole Design and Devel	RISC	16	16	kintex-7-3	James	Brakef	510		6			271	##	14.7	0.67	4.0	88.9	X		vhdl	1	core	Y	asm	N		64K	64K	N	20		8		2003		coledd.com/electr	graphics capability	clock/2 and six phases
dcpu16	https://github.c	beta	Shawn Tan, Marcus Pe	RISC	16	16	kintex-7-3	James	Brakef	662		6	1		318	##	14.7	0.67	4.0	80.4	X		vhdl & v	5	dcpu16_c	Y	asm	N	N	64K	64K	N	37		8		2009	2012	https://en.wikipe	for the 0X10c game	4+ addressing modes, 4 & 5-bit reg /modefield
atlas_2K	https://opencor	beta	Stephan Nolting	RISC	16	16	kintex-7-3	James	Brakef	1595		6	1	5	151	##	14.7	0.80	1.0	75.9	ILX		vhdl	19	ATLAS_2K	Y	asm	N	Y	64K	64K	M	80		8		2013	2015		ARM thumb like inst set	has MMU & full SOC features
ep994a	https://github.c	stable	Erik Piehl	9900	16	16	kintex-7-3	James	Brakef	1340		6		5	286	##	14.7	0.83	3.0	59.0	X		vhdl	10	ep994a	Y	yes	N	N	64K	64K	Y			16		2016	2019	https://hackaday.i	TI 990 emulation	also tms9902 (uart) core by Paul Urbanus?
verilog-65C02	https://github.c	alpha	Arlet Ottens	6502	16	8	kintex-7-3	James	remov	599		6		2	204	##	14.7	0.67	4.0	57.1			verilog	5	gop16		yes	N	N	4G	4G						2011	2018	http://forum.6502	16-bit data RAM "bytes"	boot ROM mapped to LUTs?
oc54x	https://opencor	beta	Richard Herveille	DSP	16	16	kintex-7-3	James	Brakef	2225		6	1		180	##	14.7	0.67	1.0	54.1	X		verilog	10	oc54_cpu	Y	yes	N	Y	64K	64K						2002	2009		40-bit accumulator, barrel shifter	C54x clone
forth-cpu/h2	https://opencor	stable	Richard Howe	forth	16	16	kintex-7-3	James	Brakef	1858		6		9	149	##	14.7	0.67	1.0	53.8	X	Y	vhdl	11	top					64K	64K		25				2017	2020	https://github.cor	H2 Forth SoC, VHDL reads *.hex & *.b	derived from J1, hex & bin files in 2/16/2018 ta
cole_c16	https://www.sc	beta	Cole Design & Develop	RISC	16	16	spartan-6	James	Brakef	554		6			298	##	14.7	0.67	7.0	51.4	X		vhdl	1	core	Y	asm	N		64K	64K	N	20		8		2002	2012	https://blog.class	(7) clks per inst, complete SOC	
microcore	http://www.pld	beta	Klaus Schleisiek	forth	16	8	kintex-7-3	James	Brakef	1101		6			168	##	14.7	0.67	2.0	51.1	X		vhdl	17	ucore120	Y	asm	N	Y	4K	4K						1999	2023		indexing into return stack, auto inc/d	no block RAM?, uses tri-state signals
uTTA		stable	Hans Tiggeler	TTA	16	16	kintex-7-3	James	Brakef	810		6	1		57	##	14.7	0.67	1.0	47.4	X		vhdl	23	utta_struc	N	asm	N											http://www.ht-lat	time triggered arch	bad weblink
c-nit	http://www.c-n	stable	Sumit	RISC	16	16	spartan-3	James	xilinx l	752		4		3	100	##	14.7	0.67	2.0	44.5	X		verilog	6	soc	om	asm	N	N	64K	64K	Y	22		15		2003	2004		RISC with several load/store modes	
bobcat		beta	Stan Drey	DSP	16	24	kintex-7-3	James	Brakef	1622		6	1		107	##	14.7	0.67	1.0	44.0	X		vhdl	30	bobcat_co	Y		N		64K	64K						1998	2000			dead web links
moncky	https://gitlab.com/big-bat		Kris Demuynck	RISC	16	16	**zu-3e**	James	clock c	1196	523	6		33	78	##	v21.1	0.67	1.0	43.8	X	X	schemat	36	top	Y	yes	N		64K	64K	N	32		16		2020	2021	https://hackaday.i	from 16x65K to 64KB RAM	two phase clock, ALU & mem have own phase
neo430	https://opencor	alpha	Stephan Nolting	MSP430	16	16	virtex-6	Stephan	Nolt	402		6		2	204	##	14.7	0.67	8.0	42.5	IX		vhdl	19	neo430_to	Y	yes	N		28K	32K	Y			16		2015	2021	https://github.cor	website has detailed resource untiliz	minimal configuration
blue	https://opencor	stable	Al Williams	accum	16	16	spartan-3	James	remov	1025		4			63	##	14.7	0.67	1.0	41.1	X		verilog	16	topbox	web		N		4K	4K	N	16		2		2009	2010		derived from Caxton Foster's Blue	http://www.youtube.com/watch?v=dt4zezZP8
cd16	http://anycpu.o	stable	Brad Eckert	forth	16	16	spartan-3	James	Brakef	681		4			83	##	14.7	0.67	2.0	41.0	IX	B	vhdl	16	cd16			N		128K	8M						2003	2003	http://web.archiv	Spartan-3 block RAM	bare core
xgate	https://opencor	alpha	Robert Hayes	RISC	16	16	kintex-7-3	James	Brakef	2778		6			159	##	14.7	0.67	1.0	38.3	X		verilog	7	xgate_top	Y		N					42		16		2009	2013		high pin count	Freescale XGATE co-processor compatible
aap	https://github.c	stable	Simon Cook	RISC	16	16	arria-2	James	Brakef	7193		A			393	##	q18.0	0.67	1.0	36.6	I		verilog	7	de0_nano	Y	yes		Y	64K	16M	Y			64		2015	2016	http://www.embe	includes Altera project	4 to 64 reg, 24-bit pc, no status reg
jop	https://opencor	stable	Martin Schoeberl etal	forth	16	16	cyclone-1	Martin	Schoe	2000		4			100		q10.0	0.67	1.0	33.5	I		verilog	11	core	Y	yes	N		256K	256K						2004	2014		https://github.com/jop-devel/jop	java app builds some source code files
openmsp430	https://opencor	stable	Oliver Girard	MSP430	16	16	stratix-3-4	Oliver	Girard	1147		A	1		98			0.67	2.0	28.5	IX		verilog	30	openMSP4	Y	yes	N	N	64K	64K	Y			16		2009	2018		near cycle accurate	performance spreadsheet
w11	https://opencor	alpha	Walter Mueller	PDP11	16	16	kintex-7-3	James	Brakef	1760		6	1	1	147	##	14.7	0.67	2.0	28.0	X	Y	vhdl	118	pdp11_co	Y	yes	N	N	4M	4M	Y	70	13	8		2010	2022	https://github.cor	Boots UNIX, has MMU & cache, retro	PDP-11/70 CPU core and SoC
a2z	https://hackada	stable		RISC	16	24	cyclone-4	James	Brakef	1524		4	1	12	62	##	q17.0	0.67	1.0	27.4	I		verilog		top_a2z												2016	2018			
t180-cpu		stable	Leonard Brandwein	accum	16	8	kintex-7-3	James	bypass	709		6			83	##	14.7	0.67	3.0	26.2	X		vhdl	23	cpu	Y		N	N	64K	64K	Y	182				2016	2016	https://www.vtto	8-bitter with pc, sp, a, b, c & d regs	based on Viktor Toth's 4 bit microcontroller
stack_machine	http://people.ec	stable	Bruce R. Land	forth	16	5	cyclone10	James	Brakef	5101		4	6	29	66	##	q18.0	0.67	0.3	25.9	X		verilog	9	VGA_sram	Y	asm	N	N	64K	4K	N					2009	2011	https://people.ec	(3) uP cores, Cornell course material	VGA output, uses Nakano's tiny_cpu
msp430_vhdl	https://opencor	beta	Peter Szabo	MSP430	16	16	kintex-7-3	James	Brakef	1735		6			127	##	14.7	0.67	2.0	24.5	IX		vhdl	9	cpu	Y	yes	N		64K	64K	Y			16		2014	2017		Comprehensive verification was not	compiles on cyclone II
dme	https://github.c	stable	ErwinM	RISC	16	16	kintex-7-3	James	Brakef	1755		6			53	##	14.7	0.67	1.0	20.4	X		verilog	49	cpu	Y	yes	N		64K	64K	Y	40		8		2016	2017		based on magic-16	computer & computer2 null dsgns: no outputs
sub86	https://opencor	alpha	Jose Rissetto	x86	16	8	kintex-7-3	James	Brakef	1916		6			172	##	14.7	0.67	3.0	20.1	X		verilog	1	sub86	Y	yes	N	N	64K	64K	Y			7		2012	2013		very small x86 subset core	no segment registers, limited op-codes
mcl86	https://github.c	stable	Ted Fried	x86	16	8	kintex-7-3	Ted	Fried	308		6		4	180			0.67	20.0	19.6	X		verilog	3	EU	Y	yes	N	N	1M	1M	Y					2016	2021	http://www.embe	**microcoded, meets original 8088 timing**	**@100MHz**
aap	https://github.c	stable	Simon Cook	RISC	16	16	cyclone-4	James	Brakef	10630		4			306	##	q18.0	0.67	1.0	19.3	I		verilog	7	de0_nano	Y	yes		Y	64K	16M	Y			64		2015	2016	http://www.embe	includes Altera project	4 to 64 reg, 24-bit pc, no status reg
neo430	https://opencor	alpha	Stephan Nolting	MSP430	16	16	artiix-7	James	chang	947		6		2	203	##	14.7	0.67	8.0	17.9	IX	Y	vhdl	19	neo430_to	Y	yes	N		28K	32K	Y			16		2015	2021	https://github.cor	edit neo430_sysconfig.vhd to set opti	~8+ clocks for R-R inst
cd16	http://anycpu.o	stable	Brad Eckert	forth	16	16	spartan-3	James	Brakef	618		4		7	31	##	14.7	0.67	2.0	16.9	IX	Y	vhdl	16	demosocext			N		128K	8M						2003	2003	http://web.archiv	Spartan-3 block RAM	includes stack RAMs & some inst RAM
pdp11-34verilo	www.heeltoe.co	stable	Brad Parker	PDP11	16	16	artix-7	James	Brakef	2532		A			126	##	q13.1	0.67	2.0	16.7	IX	Y	verilog	24	pdp11	Y	yes	N	N	64K	64K		70	13	8		2009			boots & runs RT-11, EIS inst & MMU	
s430	https://www.p-	stable	Paul Taylor	MSP430	16	16	artix-7	Paul	Taylor	449		6			100			0.67	9.0	16.6			vhdl	1	s430					64K	64K	Y					2019	2019		msp430 subset with 8-bit alu	coded for size & not for speed
neo430	https://opencor	alpha	Stephan Nolting	MSP430	16	16	cyclone-4	Stephan	Nolt	626		6		2	117	##	14.7	0.67	8.0	15.7	IX		vhdl	19	neo430_to	Y	yes	N		28K	32K	Y			16		2015	2021	https://github.cor	**website has detailed resource unt**	minimal configuration
v1_coldfire	https://www.silv	roprietar	IPextreme	68000	16	16	cyclone-3	freescale		5000		4			80			0.89	1.0	14.2	I		verilog			Y	yes	N	N	4G	4G	Y			16		2008		https://www.silva	free for Altera	3500 LUTs on Stratix-III
pdp2011	http://pdp2011.	stable	Sytse van Slooten	PDP11	16	16	kintex-7-3	James	Brakef	5060		6	1		205	##	14.7	0.67	2.0	13.6	IX	Y	vhdl	3	cpu	Y	yes	Y	N	64K	64K		70	13	8		2008	2019	http://pdp2011.sy	SoC, build files for A&X boards	complete impl including orig IO devices
next186	https://opencor	stable	Nicolae Dumitrache	x86	16	8	arria-2	James	Brakef	1966		A	2		77	##	q13.1	0.67	2.0	13.1	IX		verilog	4	Next186_(	Y	yes	N	N	1M	1M	Y					2012	2013		boots DOS	
s80186	https://github.c	stable	Jamie Iles	x86	16	8	cyclone-V	Jamie	Iles	1750		A			60			0.67	2.0	11.5	I	Y	system v	50	core	Y		N		1M	1M	Y					2017	2021	https://www.jami	80186 binary compatible core	implementing the full 80186 ISA
microcore	https://github.c	beta	Klaus Schleisiek	forth	16	8	XP2	Klaus	Schleisi	1976		4			33	##	3.12	0.67	1.0	11.2	AILX		vhdl	38	ucore	Y	asm	N	Y	4K	8K	Y	84				1999	2023		**easy to add op-codes, fltg-pt opt., si**	**12, 16, 27 & 32 bit data sizes**
c16	https://opencor	stable	Jsauermann	accum	16	8	spartan-3	James	Brakef	1751		4		16	57	##	14.7	0.33	1.0	10.7	X		vhdl	22	Board_cpu	mi	yes	N		64K	64K	Y			5		2003	2012		8080 derivative, optional UART, 8-bit	xilinx 4K RAM primitives
s4pu	https://baioc.github.io/pc		Gabriel de Sant'Anna	forth	16	16	cyclone2	Gabriel	de Sa	3306	1622	4		86	50	##	q13.1	0.67	1.0	10.1	I		vhdl	17	s4pu	Y	asm	N		64K	64K		32				2017	2020	https://gitlab.com/baioc/s4pu		in Portuguese

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	tool chain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe lon	start year	last revis	secondary web link	note worthy	comments
marca	https://opencor	stable	Wolfgang Puffitsch	RISC	16	16	arria-2	James Brakef		1763		A		22	157	##	q13.1	0.67	6.0	10.0	I		vhdl	40	marca	Y		N		8K	16K		75		16	4	2007	2009		serial multiply & divide	clks/inst is approx
rtf8088	https://opencor	planning	Robert Finch	x86	16	8	kintex-7-3	James Brakef		4514		6	4		174	##	14.7	0.67	3.0	8.6	X		verilog	57	rtf8088	Y	yes	N	N	1M	1M	Y					2012	2013	https://github.cor	8-bit memory data, e.g. 8088	
ao68000	https://opencor	beta	Aleksander Osman	68000	16	16	arria-2	James Brakef		3479		A		6	169	##	q13.1	0.67	4.0	8.1	I	Y	verilog	1	ao68000	pm	yes	N		4G	4G	Y					2010	2012		uses microcode, instruction prefetch buffer	
j68	https://github.com/fredre		Frédéric Requin	68000	16	16	cyclone3	Frédéric Requ		1900		4		9	90			1.00	6.0	7.9			verilog	38	soc_j68		yes	N	N	64K	64K	Y			16			2018		A Size-Optimized Microcoded 68000 (	Stack based CPU with Forth-like microcode
zet86	https://opencor	alpha	Zeus Marmolejo	x86	16	8	kintex-7-3	James Brakef		3642		6	1		68	##	14.7	0.67	2.0	6.2	X		verilog	32	fpga_zet_	Y	yes	N	N	1M	1M	Y					2008	2018	https://github.cor	equivalent to 80186, boots MS-DOS	Zet The x86 (IA-32) open implementation
moncky	https://gitlab.com/big-bat		Kris Demuynck	RISC	16	16	artix-7	Kris Demuync		1376		6		33	10	##	v21	0.67	1.0	4.9	X	X	schemat	36	top	Y	yes	N		64K	64K	N	32		16		2020	2021	https://hackaday.i	intended as educational, all original	IO: VGA, PS/2, SPI, SD
tg68	https://opencor	stable	Tobias Gubener	68000	16	16	kintex-7-3	James Brakef		2331		6			44	##	14.7	0.67	4.0	3.2	X		vhdl	2	TG68_fast	Y	yes	N	N	4G	4G	Y			16		2007	2012		TG68 - execute 68000 Code	for use with Minimig
pop11-40	http://www.ip-s	simulation	Naohiko Shimizu	PDP11	16	16	ep1K	Naohiko Shim		2687		4			20	##		0.67	2.0	2.5	I		NSL	17	top	Y	yes		N	64K	64K	Y	70	13	8		2009		www.ip-arch.jp/in	Boots UNIX	various papers, no verilog or vhdl
k68	https://opencor	alpha	Shawn Tan	68000	16	16	kintex-7-3	James Brakef		2392		6			24	##	14.7	0.67	4.0	1.7	X		verilog	15	k68_cpu	Y	yes	N	N	4K	4G	Y			16		2003	2009		68K binary compatible	
suska-III	http://www.exp	beta	Wolfgang Forster	68000	16	16	arria-2	James Brakef		7388		A			55	##	q13.1	0.67	4.0	1.3	I		vhdl	11	wf68k00ip	Y	yes	N	N	4G	4G	Y			16		2003	2013		for use as an Atari ST	
aoocs	https://github.c	beta	Aleksander Osman	68000	16	16	arria-2	James Brakef		17852		A	2	43	57	##	q18.0	0.67	4.0	0.5	I	Y	verilog	22	aoOCS	pm	yes	N		4G	4G	Y					2010	2011		uses ao68000 core, Amiga chip set en	Wishbone Amiga OCS SoC
aoocs	https://github.c	beta	Aleksander Osman	68000	16	16	cyclone-1	James Brakef		26009		4	2	67	45	##	q18.0	0.67	4.0	0.3	I	Y	verilog	22	aoOCS	pm	yes	N		4G	4G	Y					2010	2011		uses ao68000 core, Amiga chip set en	Wishbone Amiga OCS SoC
acc	https://github.c	stable	Juan Gonzalez-Gomez	accum	15	15	kintex-7-3	James	rom &	88		6		1	227	##	14.7	0.67	2.0	865.2	IX		verilog	1	acc2	Y	yes	N			4K					2016	2016	https://github.cor	26 chptr course using Apollo Comma	??why LUT count different from agcnorm
agcnorm	https://opencor	beta	Dave Roberts	accum	15	15	spartan-3	James Brakef		3732		4		2	20	##	14.7	0.66	1.0	3.5	X		vhdl	5	AGC	Y		N	Y	4K	72K	N	11		1		1962	2012	http://klabs.org/h	Apollo Guidance Computer via 3-input	NOR gate emulation
cardiac	https://opencor	mature	Al Williams	accum	13	12	spartan-3	James Brakef		557		4			71	##	14.7	0.30	1.0	38.5	X		verilog	16	vtach	Y	asm	N		100	100	N	10				2013	2019	https://www.cs.d	CARDboard Illustrative Aid to Comput	3 digit BCD arithmetic
wb4pb	https://opencor	stable	Stefan Fischer	picoBlaze	13	13	spartan-3	Stefan Fische		309		4		1	102	##	14.7	0.33	3.0	36.2	X	Y	vhdl or v	14	picoblaze_wb_uart				Y							2010	2013	https://en.wikipe	software addon for picoBlazeSoftwar	kcpsm3 only works for Spartan 3
usimplez	https://opencor	stable	Pablo Salvadeo etal	accum	12	12	stratix-2	Pablo Salvade		48		4			134		q9.1	0.17	2.0	237.9	I		vhdl	3	usimplez_cpu			N		512	512		8				2011		http://www-gti.de	part of university course, simplez+i4	has an index register
pdp8verilog	www.heeltoe.co	stable	Brad Parker	PDP8	12	12	kintex-7-3	James Brakef		505		6			366	##	14.7	0.50	2.0	181.3	X		verilog	18	pdp8	Y	yes	N	N	32K	32K				8		2005	2010		boots & runs TSS/8 & Basic	
microcore	http://www.pld	beta	Klaus Schleisiek	forth	12	8	kintex-7-3	James Brakef		399		6		1	294	##	14.7	0.40	2.0	147.4	X		vhdl	30	ucore110	Y	asm	N	Y	512	2K						1999	2023	www.microcore.o	indexing into return stack, auto inc/d	only one block RAM? simplest core
the12X_12uP		alpha	James Brakefield	stack/acc	12	12	kintex-7-3	James Brakef		972		6	1	1	123	##	14.7	0.50	1.0	63.3	X		vhdl	2	the12x_12	Y		Y	N	4K	4K	N	54		64	1	2015			combo stack/accumulater design	load/store arch, not optimized
pdp8	https://opencor	alpha	Joe Manojlovick, Rob I	PDP8	12	12	kintex-7-3	James Brakef		1219		6	1		183	##	14.7	0.50	2.0	37.5	X	Y	vhdl	55	cpu	Y	yes	N	N	32K	32K				8		2012	2016		PDP-8 Processor Core and System	Boots OS/8, runs apps, several variants
pdp8l	https://opencor	beta	Ian Schofield	PDP8	12	12	cyclone-3	James Brakef		1088		4		48	63	##	q13.1	0.50	2.0	14.4	I		vhdl	11	top	Y	yes	N	N	4K	4K						2013	2013		Minimal PDP8/L implementation with	4K disk monitor system
rf6809	https://opencores.org/pr		Robert Finch	6809	12	12	artix-7	Robert Finch		6500		6		5	120	##	v21.2	0.50	4.0	2.3	X	Y	system v	21	rf6809	Y	asm	N		64G	64G	Y	44	13	8		2022	2022	http://www.finitr	Different from rtf6809: 36-bit adrs, o	12-bit version, has inst. Cache
eric5	http://www.ent	proprietar	Thomas Entner	forth	9	8	cyclone-4	entner-electr		110		4	opt		60			0.42	1.0	229.1	I		proprietary							512	1K				3-4		2005	2011		25 MIPS: ERIC5xs, ERIC5Q	
ssbcc	https://opencor	stable	Rodney Sinclair	forth	8	9	kintex-7	Rodney Sincla		196		6			474		14.7	0.33	1.0	797.9	ILX		verilog	3	core	Y	asm	N	Y	1K	8K	Y	41		3		2012	2020	https://github.cor	Python program generates the Verilo	inst after branch/call/rtn always execs
non-von-1	https://www.ch	stable	Christopher Fenton	accum	8	8	kintex-7-3	James Brakef		230		6			556	##	14.7	0.33	1.0	797.1			verilog	1	nonvontop		no	N		64		Y	30							SIMID in tree structure	A & B regs, instructions broadcast
avr8	https://opencor	beta	Nick Kovach	AVR	8	16	kintex-7-3	James Brakef		174		6			418	##	14.7	0.33	1.0	792.2	X		verilog	1	rAVR	Y	yes	N		64K	64K	Y	17		4		2010	2010		Reduced AVR Core for CPLD	not a full clone, doc is opencores page
8bit_chapman	http://www.ece	beta	Rob Chapman, Steven	forth	8	8	**zu-3e**	James	vivado	132	63	6			305	##	v21.1	0.33	1.0	762.2	ILX		vhdl	10	stack_pro	Y		N		256	256	Y	24				1998	1998		course work	
mcpu	https://opencor	stable	Tim Boscke	accum	8	8	spartan-3	James Brakef		41		6			384	##	14.7	0.08	1.0	749.0	X		vhdl	1	tb02cpu2	Y	asm	N		64	64	Y	4				2007	2018	https://github.cor	MCPU A minimal CPU for a CPLD	reduced MIPS/clk due to only 4 inst
mroell_cpu	https://bitbucke	stable	Matthias Roell	accum	8	8	kintex-7-3	James	added	185		6			357	##	14.7	0.33	1.0	637.1	X		vhdl	8	cpu	Y							10				2014	2016		university course project	
myrisc1		stable	Muza Byte	RISC	8	8	arria-2	James Brakef		121		A		2	231	##	q13.1	0.33	1.0	628.7	I		verilog	1	myRISC1	Y		N	Y	256	256	Y	16		4		2011	2011	https://en.wikipe	Verilog source included in PDF file	AKA Mano Machine, LPM macros
riscuva1	https://www.sc	stable	S. de Pablo	picoBlaze	8	14	kintex-7-3	James Brakef		109		6			370	##	14.7	0.33	2.0	560.7	X		verilog	1	riscuva1	pme		N	Y	256	1K	Y	35				2006	2006	https://github.cor	Verilog source included in PDF file	also VHDL version by Bikash Gogoi with identic
lwrisc	https://opencor	stable	Li Wu	accum	8	12	arria-2	James Brakef		88		A		1	230	##	q13.1	0.17	1.0	443.6	I		verilog	9	risc_core		asm	N	Y	256	2K	Y	16				2008	2009		ClaiRISC simplified PIC, 4 reg rtn stack	absolute addressing only, lowered MIPS/clk
popcorn	http://www.fpg	stable	Jeung Joon Lee	accum	8	8x	kintex-7-3	James Brakef		267		6			347	##	14.7	0.33	1.0	428.4	X		verilog	4	pc	Y		N		64K	64K	Y	43				1998	2000		small 8 bit uP	
td4	https://github.c	stable	cielo_ee	accum	8	8	spartan-3	James Brakef		102					200	##	14.7	0.20	1.0	392.2	X		verilog	5	td4_top												2012	2015			very small uP
cosmac	https://github.c	beta	Eric Smith	1802	8	8	kintex-7-3	James Brakef		244		6			270	##	14.7	0.33	1.0	365.5	X		vhdl	1	cosmac	Y	asm	N	N	64K	64K	Y	100		16		2009	2020		AKA COSMAC ELF of 1976	Fmax is for bare core, runs CamelForth
mcu8	https://opencor	alpha	Dimo Pepelyashev	accum	8	8	kintex-7-3	James Brakef		274		6			299	##	14.7	0.33	1.0	360.1	X		vhdl	16	processor_E		asm			256	256	Y	17				2008	2009		asm, simulated, builds?	
picoblaze	https://www.xil	stable	Ken Chapman	picoBlaze	8	18	kintex-7-3	James Brakef		110		6		2	217	##	14.7	0.33	2.0	325.5	X		vhdl	1	kcspm6	Y	asm	N		256	2K	Y					2003		https://en.wikipe	2 clocks/inst, no prog ROM	this is the original picoBlaze author
nocpu	https://github.c	beta	John Tzonevrakis	RISC	8	8	kintex-7-3	James Brakef		175		6			243	##	14.7	0.33	1.5	306.1	X		verilog	5	cpu	N	no	N		256	256	Y			4					minimal & complete	8 ALU inst, 3 port reg file
ahmes	https://github.c	stable	Fabio Pereira	accum	8	8	kintex-7-3	James Brakef		186		6			476	##	14.7	0.33	3.0	281.6	X	B	vhdl	3	ahmes			N	N	256	256	Y	15	1			2016	2017	http://embeddedsystems.io/ahmes-a-simple-8-bit-cpu-i	bare CPU with no RAM	
8bit_chapman	http://www.ece	beta	Rob Chapman, Steven	forth	8	8	kintex-7-3	James Brakef		176		6			131	##	14.7	0.33	1.0	245.5	ILX		vhdl	10	stack_pro	Y		N		256	256	Y	24				1998	1998		course work	
dapzipi8	https://github.com/ehsan		Ehsan Ali	picoBlaze	8	18	zu-5e	Ehsan	convei	305	49	6		2	224	##	v22.1	0.33	1.0	242.4	X		vhdl	20	top	Y	asm	N		256	2K	Y					2022			Deterministic Branch Prediction for R	also zipi8 starting point, PhD thessis
tinycpu	https://opencor	alpha	Jordan Earls	RISC	8	8	arria-2	James Brakef		136		A			384	##	q13.1	0.17	2.0	235.5	IX		vhdl	2	tinycpu		asm	N	N	1K	1K		12		4		2012	2012	directory contains	subset of 6502	MIPS/inst reduced due to few inst
parwan		stable	Zainalabedin Navabi	accum	8	8	kintex-7-3	James Brakef		157		6			435	##	14.7	0.33	4.0	228.5	X		verilog	16	par_beh	Y	yes	N	N	4K	4K	Y					1995	1997	2nd uP in director	from VHDL: Analysis and Modeling of	AKA cpu8, both vhdl & verilog versions
gumnut	http://digitaldes	stable	Peter Ashenden	RISC	8	18	kintex-7-3	James Brakef		388		6			259	##	14.7	0.33	1.0	220.7	IX		verilog	6	gumnut-rt	Y	yes	N	Y	256	4K	Y			8		2007			see Digital Design: An Embedded Systems Approach Using VHDL	
p16c5x	https://opencor	mature	Michael Morris	PIC16	8	14	kintex-7-3	James Brakef		378		6			252	##	14.7	0.33	1.0	220.2	IX		verilog	3	P16C5x	Y	yes	N	Y	256	4K	Y					2013	2014			
dfp	https://opencor	stable	Ron Chapman	forth	8	8	kintex-7-3	James Brakef		297		6			192	##	14.7	0.33	1.0	213.2	X		vhdl	25	DataFlow8	Y											2003	2009		8-bitter, generates a custom VHDL stack machine, compiler is in Forth	
8bit-verilog_mcu		stable	Josh Friend	accum	8	8	**zu-2e**	James	timing	392		6		1	500	##	v20.1	0.33	2.0	210.5	X		verilog	11	cpu					512	512	Y	16				2012	2012		for class project, small data stack	PB clock, students to add features
aizup/aizup_m	instruct1.cit.cor	stable	Yamin Li, Wanming Ch	RISC	8	16	arria-2	James Brakef		121		A			298	##	q13.1	0.17	2.0	205.4	IX		vhdl	1	cpu		N	N	64K	64K		16		4		1996	1998		used in Cornell EE475 course	MIPS/inst reduced due to few inst
opc.opccpu	https://github.c	stable	revaldinho	accum	8	16	kintex-7-3	James	reduce	101		6			526	##	14.7	0.15	4.0	195.4	X		verilog	2	opccpu	Y	asm	N	N	256	2K	Y	13	3			2017	2021	https://revaldinho	OPC1 one page computer for CPLD	**see hackaday One Page Computing Challe**
ppx16	https://opencor	stable	Daniel Wallner	PIC16	8	14	kintex-7-3	James	missin	409		6			238	##	14.7	0.33	1.0	192.1	X		vhdl	10	PIC16C55	Y	yes	N	Y	256	4K	Y					2002	2009		both 16C55 & 16F84	with fake instruction ROM
babyrisc	http://www.san	stable	John Rible	RISC	8	16	**zu-3e**	James	vivado	249		6			286	##	v21.1	0.33	2.0	189.3	X		verilog	1	qs5_mix	Y		N		64K	64K	Y	15		8		1997	1999	http://www.sandp	part of a three class course	memory rd/wt & ALU per clock
opc.opc2cpu	https://github.c	stable	revaldinho	accum	8	16	kintex-7-3	James	reduce	117		6			556	##	14.7	0.15	4.0	178.1	X		verilog	2	opc2cpu	Y	asm	N	N	256	1K	Y	12	3			2017	2021	https://revaldinho	OPC2 revised OPC1, for XC9572 CPLD	see hackaday One Page Computing Challenge
risc16f84	https://opencor	stable	John Clayton	PIC16	8	14	kintex-7-3	James Brakef		375		6			392	##	14.7	0.33	2.0	172.5	IX		verilog	1	risc16f84	Y	yes	N	Y	256	4K	Y					2002	2018		derived from CQPIC by Sumio Moriok	other variants with RTL
picoblaze	https://www.xil	stable	Ken Chapman	picoBlaze	8	18	spartan-3	James Brakef		178		4		1	182	##	14.7	0.33	2.0	168.9	X		vhdl	1	kcspm3	Y	asm	N		256	2K	Y					2003		https://en.wikipe	2 clocks/inst, no prog ROM	this is the original picoBlaze author
lipsi	https://github.c	stable	Martin Schoeberl	accum	8	8	cyclone4	Martin Schoe		162		4		1	162			0.17	1.0	167.0			scala	2			Y		N	N	64K	64K	Y	9	3	16		2017	2019	https://github.cor	goal is 100 LUTs, program mapped to	"Lipsi, a very tiny processor"
pic_coonan		alpha	Tom Coonan	PIC16	8	14	kintex-7-3	James Brakef		328		6		1	165	##	14.7	0.33	1.0	166.1	X		verilog	7	piccpu	Y	yes	N	Y	256	4K	Y					1999				risc8 by Tom Coonan also a PIC uP
aizup/aizup_pi	instruct1.cit.cor	stable	Yamin Li, Wanming Ch	RISC	8	16	kintex-7-3	James Brakef		198		6			375	##	14.7	0.17	2.0	157.9	IX		vhdl	1	cpu		asm	N	N	64K	64K	Y	16		4		1996	1998		used in Cornell EE475 course	MIPS/inst reduced due to few inst
brainfuckcpu	https://opencor	beta	Aleksander Kaminski	mem	8	3	kintex-7-3	James Brakef		110		6			432	##	14.7	0.08	2.0	157.2	X		verilog	1	brainfuck_cpu			N	Y				8		0		2014	2015	http://www.cliffo	Touring machine like, 2ndary link is a	adj prog & data mem size, terrible name
classy_core_17	https://github.com/classy		Andreas Schweizer	AVR	8	16	spartan-3	Andreas Schv		358		4			164	##	14.7	0.33	1.0	151.2			vhdl	8	top	Y	yes	N		64K	128K	Y	72		32			2019	https://blog.classy	adjuct to some custom logic	Implementing a CPU in VHDL parts 1..3
tisc	https://opencor	beta	Vincent Crabtree	accum	8	8	kintex-7-3	James Brakef		195		6			87	##	14.7	0.33	1.0	147.1	X		vhdl	1	TISC			N		256	1K	Y			2		2009	2009		Tiny Instruction Set Computer	minimal accumulator machine
inst_list_proce	https://opencor	planning	Mahesh Palve	accum	8	15	kintex-7-3	James	using x	786		6		1	340	##	14.7	0.33	1.0	142.6	X		verilog	34	top	Y		N		128	1K		32				2014			pipelined, state machine	UART, SPI & timer included
complete_8bit	https://www.qu	stable	Van-Lei Le		8	8	kintex-7-3	James	modifi	208		6		1	260	##	14.7	0.33	3.0	137.5	X		vhdl	6	computer	N		N		96	128	Y					2016			memory_unit uses block RAM, IO ports prunec	
synpic12		stable	Miguel Angel Ajo Pelay	PIC12	8	12	kintex-7-3	James Brakef		474		6		1	197	##	14.7	0.33	1.0	136.8	IX		vhdl	7	synpic12	Y	yes	N	N	256	2K	Y					2011	2011	http://projects.nb	CHDL to verilog	bad weblink
free_risc8	https://web.arc	stable	Thomas Coonan	PIC16	8	14	kintex-7-3	James Brakef		355		6			142	##	14.7	0.33	1.0	132.2	X		verilog	8	cpu	Y	yes	N		256	4K	Y					2002	2011	https://web.archive.org/web/20120309123835/http://www.mindspring.com/~tcoonan/index.html		
fluid_core	https://opencor	alpha	Azmathmoosa	RISC	8	12	kintex-7-3	James Brakef		956		4			381	##	14.7	0.33	1.0	131.7	X		verilog	17	FluidCore			N	Y						8		2015	2015		data width adj., mem sizes adj.	
pt13	http://www.sin	stable	Daniel Ogilvie	accum	8	8	kintex-7-3	James Brakef		301		6			357	##	14.7	0.33	3.0	130.5			verilog	1	pt13	Y	asm	N	Y	64K	8K	Y	40	3			2011	2018	https://www.edn.	PT13 is optimized to be completely e	micro-code & register updates, minimal ISA
bytemachine	https://github.c	mature	c0pperdragon	forth	8	8	kintex-7-3	James Brakef		319		6		1	250	##	14.7	0.33	2.0	129.3	IX		vhdl	7	bytemachine			N	N		4K	Y	30				2016	2017		top is Altera schematic	results are for 2016 bare core
aizup/aizup_ov	instruct1.cit.cor	stable	Yamin Li, Wanming Ch	RISC	8	16	kintex-7-3	James Brakef		138		6			318	##	14.7	0.17	3.0	128.3	IX		vhdl	1	cpu		asm	N	N	64K	64K	Y	16		4		1996	1998		used in Cornell EE475 course	MIPS/inst reduced due to few inst
open8_urisc	https://opencor	stable	Kirk Hays, Jshamlet	RISC	8	8	kintex-7-3	James Brakef		691		6	1		263	##	14.7	0.33	1.0	125.6	X		vhdl	9	Open8	Y	yes	N		64K	64K	Y			8		2006	2023		accum & 8 regs, clone of Vautomation	uRISC processor, in use
up1232	http://www.dte	stable	Santiago de Pablo	RISC	8	16	kintex-7-3	James Brakef		220		6			244	##	14.7	0.33	3.0	122.0	X		vhdl	3	up1232a			N		64K	64K	Y	33	2	32		2000	2000		bare core, prog size 4K to 64K	description in source files
verilogboy	https://hackada	alpha	Wenting Zhang	risc-v	8	8	**zu-3e**	James	vivado	872	608	6			313	##	v21.1	1.00	3.0	119.5	X		verilog	36	vbh	Y	yes	N	N	64K	64K	Y						2019	https://github.cor	Game Boy in Verilog, both CPU (SM83	uses riscv_picorv32 core
8bit_piped_pr	https://opencor	stable	Mahesh Sukhdeo Palve	RISC	8	16	kintex-7-3	James	swapp	1049		6		1	370	##	14.7	0.33	1.0	116.4	X		verilog	28	top	Y							20		16		2013	2017	https://github.cor	uses Perl as assembler	use Perl to generate ROM file
nanoblaze	https://opencor	beta	Francois Corthay	picoBlaze	8	18	kintex-7-3	James Brakef		247		6		1	169	##	14.7	0.33	2.0	113.2	X		vhdl	12	nanoblaze		asm			256	2K	Y					2015	2015		nanoBlaze compatable, adjustable data	width
8bit_piped_pr	https://opencor	stable	Mahesh Sukhdeo Palve	RISC	8	16	**zu-3e**	James	vivado	1500	1822	6		1	500	##	v21.1	0.33	2.0	110.0	X		verilog	28	top	Y							20		16		2013	2017	https://github.cor	uses Perl as assembler	use Perl to generate ROM file
pacoBlaze	www.bleyer.org	mature	Pablo Kocik	picoBlaze	8	18	spartan-3	Pablo Kocik		177		4		1	117			0.33	2.0	109.1	X		verilog	18	pacoblaze	Y	asm	N		256	2K	Y	57			2		2006		3 versions, behavioral coding		
sap	https://opencor	stable	Ahmed Shahein	accum	8	8	kintex-7-3	James	no LU	48		6			200	##	14.7	0.10	4.0	104.2	X		vhdl	15	mp_struct			N		16	16	Y	5				2012	2022	https://shirishkor	Simple as Possible Computer from M	https://www.youtube.com/watch?v=prpyEFxZ
picoblaze	https://www.xil	stable	Ken Chapman	picoBlaze	8	18	kintex-7-3	James Brakef		317		6		2	195	##	14.7	0.33	2.0	101.6	X	Y	vhdl	19	kc705_kcp	Y	asm	N		256	2K	Y					2003		https://en.wikipe	2 clocks/inst	this is the original picoBlaze author
qs5-rible	http://www.san	stable	John Rible	RISC	8	16	kintex-7-3	James Brakef		468		6			135	##	14.7	0.33	1.0	95.3	X		verilog	1	qs5_mix			N		256	32K	Y					1998	1999		used in his class, also uses eP32	
tinyfpga	https://github.c	stable	Ken Jordan	accum	8	8	kintex-7-3	James Brakef		185		6		1	175	##	14.7	0.33	3.6	86.9	X		vhdl	12	system			N	N	16	16	Y	10				2017	2017		educational 8-bitter with 4-bit addres	why use block RAM?

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	toolchain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe	start year	last revis	secondary web link	note worthy	comments
fpga4_8bit_up	http://www.fpg	stable	Van Loi Le	accum	8	8	kintex-7-3	James	Brakef	258		6		1	200	##	14.7	0.33	3.0	85.3	X		vhdl	9	computer	me		N		96	128	Y	10		2		2016	2016	book: LaMeres Int	educational	16 input & 16 output ports fill out 256 byte ad
verilog-6502	https://github.c	stable	Arlet Ottens	6502	8	8	**zu-3e**	James	vivado	475	112	6			333	##	v21.1	0.33	3.0	77.2	X		verilog	2	cpu		yes	N	N	64K	64K	Y					2007	2018	http://ladybug.xs4all.nl/arlet/fpga/6502/	sync memory, e.g. use block RAM	
ae18	https://opencor	beta	Shawn Tan	PIC18	8	16	**zu-3e**	James	vivado	954	501	6			208	##	v21.1	0.33	1.0	72.1	ILX		verilog	1	ae18_core		yes	N	Y	4K	1M						2003	2009	https://hackaday.i	not 100% compatable	negative edge reset "clock"
risc8	https://web.arc	stable	Tom Coonan	PIC16	8	12	kintex-7-3	James	Brakef	355		6			154	##	14.7	0.33	2.0	71.5	X		verilog	8	cpu	Y	yes	N	Y	256	2K	Y					1999	1999	https://github.cor	excellent HTML doc	directory contains derivative design by anothe
navre	https://opencor	stable	Sebastien Bourdeaudu	AVR	8	16	kintex-7-3	James	Brakef	990		6			207	##	14.7	0.33	1.0	69.0	AILX		verilog	1	softusb_n	Y	yes	N		64K	64K	Y	72		32	2	2010	2013	https://www.milk	AVR clone, part of www.milkymist.org	
uos	https://opencor	mature	Daniel Roggen	accum	8	16	kintex-7-3	James	Brakef	441		6			270	##	14.7	0.33	3.0	67.4	X		vhdl	14	cpu	Y							3	4		2014	2017		UoS Educational Processor	inspired by x86 ISA
latticemico8	http://www.latt	stable	Lattice Semiconductor	RISC	8	18	LFE2	Lattice	Semic	265		4		1	104			0.33	2.0	64.4	ILX		vhdl	10	isp8_core	Y	yes	N		256	4K	Y			32		2005	2010	https://en.wikipe	16 deep call stack, four configuration	tool kit: LMS for Diamond3.10
mcl65	http://www.mic	stable	Ted Fried	6502	8	8	atrix-7-3	Ted	Fried	252		6		2	196	##	14.7	0.33	4.0	64.2	X		verilog	1	mcl65	Y	yes	N	N	64K	64K	Y					2017	2021	https://github.cor	**microcoded, cycle exact**	**excellent micro-coding LUT counts**
erp	https://opencor	stable	Shahzadjk	RISC	8	16	spartan-3	James	Brakef	366		4	1	1	70	##	14.7	0.33	1.0	63.5	X		verilog	1	ERPverilog	Y								15		6	2004	2014		two report PDFs & one Verilog file	
ae18	https://opencor	beta	Shawn Tan	PIC18	8	16	arria-2	James	Brakef	1084		A	1		207	##	q13.1	0.33	1.0	63.1	ILX		verilog	1	ae18_core		yes	N	Y	4K	1M						2003	2009	https://hackaday.i	not 100% compatable	negative edge reset "clock"
mx65	https://github.com/Steve		Steve Teal	6502	8	8	**zu-3e**	James	Brakef	485	148	6		2	370	##	v21.2	0.33	4.0	63.0			vhdl	5	apple1	Y	yes	N		64K	64K	Y					2022	2022		cycle accurate, passes Klaus Dormann 6502 functional tests, has uart	
minicpu_morri	https://github.com/Morri		Michael Morris	6502	8	8	spartan-6	Michael	Morr	276		6			104			0.33	2.0	62.2	X		verilog	15	minicpu_c	Y		N		64K	64K	Y	31					2017		simplified 6502, see m65c02a	RE: 8-bit CPU challenge of Arlet Ottens
ez8	https://github.c	stable	Howard Mao	accum	8	16	kintex-7-3	James	replac	644		6		2	233	##	14.7	0.33	2.0	59.6	X		verilog	13	ez8_cpu					256	4K						2014	2014	http://zhehaomao.com/	not sure inferred RAM correct?	
light8080	https://opencor	stable	Jose Ruiz, Moti Litoche	8080	8	8	kintex-7-3	James	Brakef	154		6		1	247		14.7	0.33	9.0	58.9	IX		verilog	5	i80soc	Y	yes	N	N	64K	64K	Y					2007	2019	https://github.cor	targeted to area, includes UART, inte	older versions have both VHDL & Verilog
copyblaze	https://opencor	stable	Abdallah Ellbrahimi	picoBlaze	8	18	kintex-7-3	James	missin	622		6			217	##	14.7	0.33	2.0	57.5	IX		vhdl	16	cp_copybl	Y	asm	N		256	2K	Y					2011	2016		wishbone extras	
minirisc	https://opencor	stable	Rudolf Usselmann	PIC16	8	14	spartan-3	Rudolf	Usseln	460		4			80			0.33	1.0	57.4	X		verilog	7	risc_core	Y	yes	N	Y	256	4K	Y					2001	2012			
tinyvliw8	https://opencor	alpha	Oliver Stecklina	VLIW	8	32	kintex-7-3	James	hacke	895		6			149	##	14.7	0.33	1.0	55.0	X		vhdl	19	sysarch			N	Y	256	1K	Y					2013	2020		tinyVLIW8 soft-core processor	bare core, Altera LPM for RAMs
avrtinyx61core	https://opencor	beta	Andreas Hilvarsson	AVR	8	16	kintex-7-3	James	Brakef	1243		6			194	##	14.7	0.33	1.0	51.5	X		vhdl	1	mcu_core		yes	N		64K	128K	Y	72		32		2008	2009			
avr_core	https://opencor	stable	Rusian Lepetenok	AVR	8	16	**zu-3e**	James	vivado	1624	519	6			250	##	v21.1	0.33	1.0	50.8	X		verilog	70	avr_core	Y	yes	N		64K	128K	Y	72		32		2002	2017		VHDL core also	
babyrisc	http://www.san	stable	John Rible	RISC	8	16	kintex-7-3	James	Brakef	468		6			141	##	14.7	0.33	2.0	49.7	X		verilog	1	qs5_mix	Y		N		64K	64K	Y	15		8		1997	1999	http://www.sand	part of a three class course	memory rd/wt & ALU per clock
mcl65	http://www.mic	stable	Ted Fried	6502	8	8	kintex-7-3	James	inserte	326		6		2	196	##	14.7	0.33	4.0	49.6	X		verilog	1	mcl65	Y	yes	N	N	64K	64K	Y					2017	2021		**microcoded, cycle exact**	**excellent micro-coding LUT counts**
aizup/aizup_se	instruct1.cit.cor	stable	Yamin Li, Wanming Ch	RISC	8	16	kintex-7-3	James	Brakef	136		6			313	##	14.7	0.17	8.0	48.1	IX		vhdl	1	cpu		asm	N	N	64K	64K	Y	16		4		1996	1998		used in Cornell EE475 course	MIPS/inst reduced due to few inst
cosmac	https://github.c	beta	Eric Smith	1802	8	8	kintex-7-3	James	inferre	598		6		17	87	##	14.7	0.33	1.0	48.0	X	X	vhdl	14	elf	Y	asm	N	N	64K	64K	Y	100		16		2009	2020		uses PIXIE graphics core	modified to use block RAM
1802-pico-basi	https://github.c	beta	Steve Teal	1802	8	8	**zu-3e**	James	area o	247	136	6		2	427	##	v21.1	0.33	12.0	47.6	LX		vhdl	6	pico_basic	Y	yes	N		64K	64K	Y	52		16		2016	2016	https://wiki.forth-	VHDL 1802 Core with TinyBASIC	tiny Basic in ROM, Interrupts & DMA not imple
avr_hp	https://opencor	stable	Strauch Tobias	AVR	8	16	kintex-7-3	James	2 slot	1554		6			223	##	14.7	0.33	1.0	47.4	X		vhdl	10	avr_core_pr	Y	yes	N		64K	128K	Y	72		32		2010	2012		hyper pipelined (eg barrel) AVR	
nextz80	https://opencor	stable	Nicolae Dumitrache	Z80	8	8	kintex-7-3	James	Brakef	854		6			119	##	14.7	0.33	1.0	46.0	X	B	verilog	3	NextZ80C	Y	yes	N	N	64K	64K	Y					2011	2019			claim of 700 LUTs in Spartan-3 probably wrong
ax8	https://opencor	stable	Daniel Wallner	AVR	8	16	spartan-6	James	missin	1549		6		1	213	##	14.7	0.33	1.0	45.3	X		vhdl	14	A90S1200		yes	N		64K	128K	Y	72		32		2002	2010		both A90S1200 & A90S2313	inserted fake inst ROM
attiny_atmega	https://opencor	beta	Gheorghiu Iulian	AVR	8	16	**zu-3e**	James	vivado	1366	116	6			179	##	v21.1	0.33	1.0	43.1	X	Y	verilog	9	mega_cor	Y	yes	N		64K	128K	Y	72		32		2018	2019	https://git.morgot	configurable AVR processor w/8 configurations	
micro8a	http://members	beta	John Kent	accum	8	16	kintex-7	James	Brakef	531		6			204	##	14.7	0.33	3.0	42.3	X		vhdl	11	Micro8	Y		N	N	2K	2K	Y					2002	2002	http://members.o	derived from Tim Boscke's mcpu	also micro8 and micro8b variants
t65	https://opencor	stable	Daniel Wallner	6502	8	8	kintex-7-3	James	Brakef	575		6			291	##	14.7	0.33	4.0	41.7	IX		vhdl	7	T65	Y	yes	N	N	64K	64K	Y					2002	2010		6502, 65C02 & 65C816; wide use	
verilog-6502	https://github.c	stable	Arlet Ottens	6502	8	8	kintex-7-3	James	Brakef	407		6			200	##	14.7	0.33	4.0	40.6	X		verilog	2	cpu		yes	N	N	64K	64K	Y					2007	2018	http://ladybug.xs4all.nl/arlet/fpga/6502/		
bc6502	http://finitron.c	beta	Robert Finch	6502	8	8	**zu-3e**	James	vivado	583		6			286	##	v21.1	0.33	4.0	40.4	X		verilog	18	bc6502		yes	N	N	64K	64K	Y					2012	2012			bare source
parwan		stable	Zainalabedin Navabi	accum	8	8	kintex-7-3	James	Brakef	161		6			76	##	14.7	0.33	4.0	38.8	X		vhdl	2	parwan	Y	yes	N	N	4K	4K	Y					1995	1997	2nd uP in director	from VHDL: Analysis and Modeling of	AKA cpu8, both vhdl & verilog versions
68hc05	https://opencor	stable	Ulrich Riedel	6805	8	8	**zu-3e**	James	vivado	1106	117	6			485	##	v21.1	0.33	4.0	36.2	X		vhdl	1	6805		yes	N	N	64K	64K	Y					2007	2009			68c05 & 68c08 very different Fmax
xmega_core	https://opencor	beta	Gheorghiu Iulian	AVR	8	16	kintex-7-3	James	Brakef	1116		6			120	##	14.7	0.33	1.0	35.6	X		verilog	34	mega_cor	Y	yes	N		64K	128K	Y	72		32		2017	2018	https://git.morgot	8 AVR cores, 4 sets LUT counts poste	https://git.morgothdisk.com/VERILOG/VERILO
dp8051	https://www.do	proprietar	Digital Core Design	8051	8	8	virtex-5	Digital	Core D	1699		6			200	##	14.7	0.30	1.0	35.3	ILX		proprietary			Y	yes	N		64K	64K						1999	1999		also PIC, HC11, 68000, 680x, d32pro	full system with RAM
mxp	http://vectorblo	stable	VectorBlox Computing	vect	8		zynq45-7	vectorblox		39856		6	64	81	175	##	v17.2	1.00	0.1	35.1			proprietary			Y										2012	2017	http://www.ece.u	MXP Matrix Processor is a scalable so	LUT count for 8 lanes with custom inst
v6502	https://github.c	untested	Ryu Kojiro	6502	8	8	**zu-3e**	James	bare c	868	131	6			250	##	v21.1	0.33	3.0	31.7	X		vhdl	23	v6502	Y	yes	N	N	64K	64K	Y					2019	2020	https://opencores	6502 with extras: 16-bit stack pointer	www.youtube.com/watch?v=K3jH-f_r80E
natalius_8bit_r	https://opencor	beta	Fabio Guzman	RISC	8	16	kintex-7-3	James	Brakef	232		6		1	175	##	14.7	0.11	3.0	27.7	X		verilog	12	natalius_p	Y	asm	N	Y	256	2K	Y	29		8		2012	2012		return stack & register file	3 clocks/inst
bc6502	http://finitron.c	beta	Robert Finch	6502	8	8	kintex-7-3	James	Brakef	619		6			197	##	14.7	0.33	4.0	26.2	X		verilog	18	bc6502		yes	N	N	64K	64K	Y					2012	2012			bare source
avr_fpga	https://opencor	stable	Juergen Sauermann	AVR	8	16	kintex-7-3	James	Brakef	1606		6	1	6	120	##	14.7	0.33	1.0	24.7	X		vhdl	20	cpu_core	Y	yes	N		64K	128K	Y	72		32		2009	2010		extended lecture on FPGA uP design	
free6502	http://web.arch	stable	David Kessner	6502	8	8	kintex-7-3	James	Brakef	646		6			193	##	14.7	0.33	4.0	24.6	X		vhdl	5	free6502	Y	yes	N	N	64K	64K	Y					1999	2000	http://www.sprov	microcoded	
mcl51	http://www.mic	stable	Ted Fried	8051	8	8	artix-7-3	Ted	Fried	312		6		2	180			0.33	8.0	23.8	X		verilog	3	mcl51_TO	Y	yes	N	N	64K	64K	Y					2016	2021	https://github.cor	**micro-coded**	
68hc05	https://opencor	stable	Ulrich Riedel	6805	8	8	kintex-7-3	James	Brakef	1112		6			300	##	14.7	0.33	4.0	22.2	X		vhdl	1	6805		yes	N	N	64K	64K	Y					2007	2009			
6809_6309	https://opencor	beta	Alejandro Paz Schmidt	6809	8	8	**zu-3e**	James	vivado	1690	367	6			333	##	v21.1	0.33	3.0	21.7	AILX	B	verilog	5	MC6809_c	Y	yes	N	N	64K	64K	Y					2012	2015		6309 op-codes not implemented	does not match timing results of zynq+
m65c02	https://opencor	mature	Michael Morris	6502	8	8	spartan-6	James	Brakef	466		6		3	118	##	14.7	0.33	4.0	20.8	X	Y	verilog	13	M65C02	Y	yes	N	N	64K	64K	Y					2013	2020	https://github.cor	also a m65c02a version	micro-coded via F9408 soft sequencer
ucpuvhdl	https://github.c	stable	Reed Foster	RISC	8	16	kintex-7-3	James	512 LU	933		6			118	##	14.7	0.33	2.0	20.8	X		vhdl	29	core	Y	asm	N		256	64K	Y	12	2	7		2016	2017	https://github.cor	six tutorials on uCPUvhdl	using muCPUv2_1 of 3 upwards compatible de
avr_fpga	https://opencor	stable	Juergen Sauermann	AVR	8	16	kintex-7-3	James	Brakef	1877		6	1	6	115	##	14.7	0.33	1.0	20.2	X	Y	vhdl	20	avr_fpga	Y	yes	N		64K	128K	Y	72		32		2009	2010	https://fr.wikivers	extended lecture on FPGA uP design	missing module in atmega8_pong_vga
system05	https://opencor	beta	John Kent, David Burn	6805	8	8	kintex-7-3	James	Brakef	834		6			204	##	14.7	0.33	4.0	20.2	X	Y	vhdl	10	System05	Y	yes	N	N	64K	64K	Y					2003	2009	http://members.op	tushome.com.au/jekent/	
altium/TSK165	http://techdocs	proprietar	Altium	PIC16	8	12	spartan-3	Altium		416		4			50			0.33	2.0	19.8	AILX		proprietary			Y	yes	N	Y	256	4K	Y					2004	2017	CR0140.pdf, CR01	frozen, asm, C, C++, schem, VHDL & V	default clock speed is 50MHz
avr_core	https://opencor	stable	Rusian Lepetenok	AVR	8	16	kintex-7-3	James	Brakef	2135		6			127	##	14.7	0.33	1.0	19.7	X		verilog	15	avr_core	Y	yes	N		64K	128K	Y	72		32		2002	2017		VHDL core also	
pet_fpga	https://github.c	stable	Thomas Skibo	6502	8	8	kintex-7-3	James	Brakef	1052		6			242	##	14.7	0.33	4.0	19.0	X		verilog	1	cpu6502	Y	yes	N	N	64K	64K	Y					2007	2011	https://github.cor	for Commodore PET	
m65	www.ip-arch.jp/	stable	Naohiko Shimizu	6502	8	8	arria-2	James	Brakef	483		A			110	##	q13.1	0.33	4.0	18.8	X		sfl & TDI	8	m65cpu	Y	yes	N	N	4K	4K	Y					2001	2002			
ag_6502	https://opencor	beta	Oleg Odintsov	6502	8	8	**zu-3e**	James	vivado	824		6			176	##	v21.1	0.33	4.0	17.7	ILX		verilog	2	ag_6502		yes	N	N	64K	64K	Y					2012	2012		verilog code generation, "phase level accurate"	
ag_6502	https://opencor	beta	Oleg Odintsov	6502	8	8	kintex-7-3	James	vivado	824		6			176	##	v21.1	0.33	4.0	17.7	ILX		verilog	2	ag_6502		yes	N	N	64K	64K	Y					2012	2012		verilog code generation, "phase level accurate"	
tv80	https://opencor	mature	Guy Hutchison, Howar	Z80	8	8	kintex-7-3	James	Brakef	1207		6			182	##	14.7	0.33	3.0	16.6	IX		verilog	6	tv80n	Y	yes	N	N	64K	64K	Y					2004	2018	https://github.cor	derived from Daniel Wallner's T80, ASIC implementations	
pavr	https://opencor	alpha	Doru Cuturela	AVR	8	16	kintex-7-3	James	Brakef	2630		6		1	132	##	14.7	0.33	1.0	16.5	X		vhdl	18	pavr_cont	Y	yes	N	Y	4K	4M	Y	72		32	6	2003	2009		superset of AVR	
m16c5x	https://opencor	mature	Michael Morris	PIC16	8	14	spartan-3	Michael	Morr	1217		4		3	60	##		0.33	1.0	16.3	X	Y	verilog	3	m16C5x	Y	yes	N	Y	256	4K	Y					2013	2014		SOC LUT count	
jca		stable	John Cronin	RISC	8	32	kintex-7-3	James	replac	3287		6	3	3	157	##	14.7	0.33	1.0	15.8	IX	Y	verilog	17	soc										16				has VGA controller, plays Pong	altera memories
6809_6309	https://opencor	beta	Alejandro Paz Schmidt	6809	8	8	stratix-5	James	Brakef	1711		A			223	##	q14.0	0.33	3.0	14.3	AILX	B	verilog	5	MC6809_c	Y	yes	N	N	64K	64K	Y	44	13	8		2012	2015		6309 op-codes not implemented	
z80control	https://opencor	alpha	Tyler Pohl	Z80	8	8	kintex-7-3	James	Brakef	1483		6			189	##	14.7	0.33	3.0	14.0	X	Y	verilog	55	top_de1	Y	yes	N	N	64K	64K	Y					2010	2012		Microprocessor targeting embedded	interfaces to DRAM, based on T80 core
8051	https://opencor	alpha	Simon Teran, Jakas	8051	8	8	**zu-3e**	James	area o	1424	645	6			242	##	v21.1	0.33	4.0	14.0	ILX		verilog	32	oc8051_to	Y	yes	N		64K	64K	Y					2001	2016		8051 core includes several on-chip peripherals, like timers and counters	
apple2fpga	http://www.cs.c	stable	Stephen A Edwards	6502	8	8	**zu-3e**	James	vivado	1238	706	6		7	195	##	v21.1	0.33	4.0	13.0	IX	Y	vhdl	19	de2_top	Y	yes	N	Y	64K	64K	Y					2007	2022		emulation of Apple II computer	replaced Altera PLL with stub
t80	https://opencor	stable	Daniel Wallner	Z80	8	8	kintex-7-3	James	Z80 m	1389		6			163	##	14.7	0.33	3.0	12.9	X		vhdl	5	T80a	Y	yes	N	N	64K	64K	Y					2002	2018		Z80, 8080 & gameboy inst sets, several usages	
dalton_8051	www.cs.ucr.edu	stable	Tony Givargis	8051	8	8	kintex-7-3	James	Brakef	2725		6	1	1	105	##	14.7	0.33	1.0	12.7	X		vhdl	7	i8051_all	Y	yes	N	N	64K	64K	Y					1999	2003		ASIC	
gup	https://opencor	stable	Kevin Phillipson	68HC11	8	8	arria-2	James	Brakef	925		A	1	1	127	##	q13.1	0.33	4.0	11.3	I		vhdl	25	gator_upr	Y	yes	N	N	64K	64K	Y					2008	2011	https://www.mil.u	top level is schematic	
r8051	https://github.c	stable	Li Xinbing	8051	8	8	kintex-7-3	James	Brakef	1031		6	1		139	##	14.7	0.33	4.0	11.1	X		verilog	2	r8051	Y	yes	N	N	64K	64K	Y					2015	2019			
verilogboy	https://hackada	alpha	Wenting Zhang	SM83	8	8	**zu-3e**	James	vivado	2415	1601	6		4	238	##	v21.1	0.33	3.0	10.8	X	Y	verilog	22	boy	Y	yes	N	N	64K	64K	Y						2019	https://github.cor	Game Boy in Verilog, both CPU (SM83	also https://github.com/neildryan/GBA
system11	https://opencor	alpha	John Kent, David Burn	68HC11	8	8	kintex-7-3	James	Brakef	1218		6			153	##	14.7	0.33	4.0	10.3	X	Y	vhdl	17	cpu11	Y	yes	N	N	64K	64K	Y					2003	2009	http://members.o	known bugs & untested instructions	
6809_6309	https://opencor	beta	Alejandro Paz Schmidt	6809	8	8	kintex-7-3	James	Brakef	1996	370	6			175	##	14.7	0.33	3.0	9.7	AILX	B	verilog	5	MC6809_c	Y	yes	N	N	64K	64K	Y	44	13	8		2012	2015		6309 op-codes not implemented	
6809_6309	https://opencor	beta	Alejandro Paz Schmidt	6809	8	8	arria-2	James	Brakef	1680		A			145	##	q18.0	0.33	3.0	9.5	AILX	B	verilog	5	MC6809_c	Y	yes	N	N	64K	64K	Y	44	13	8		2012	2015		6309 op-codes not implemented	
cpu8080	https://opencor	stable	Scott Moore	8080	8	8	kintex-7-3	James	Brakef	1179		6			299	##	14.7	0.33	9.0	9.3	X		verilog	1	m8080	Y	yes	N	N	64K	64K	Y					2006	2016		includes VGA display generator, three variants	
apple2fpga	http://www.cs.c	stable	Stephen A Edwards	6502	8	8	kintex-7-3	James	uncon	1417		6		9	159	##	14.7	0.33	4.0	9.2	IX	Y	vhdl	19	de2_top	Y	yes	N	Y	64K	64K	Y					2007	2022		emulation of Apple II computer	replaced Altera PLL with stub
c88	https://github.c	alpha	Daniiel Bailey	accum	8	8	kintex-7-3	James	Brakef	3088		6	2		167	##	14.7	0.33	2.0	8.9	X		vhdl	25	C88	Y	asm	N		8	256	Y	10		8		2015	2015	https://www.yout	only 8 memory locations	used 3658 Dff, doesn't infer block or LUT RAM
light52	https://opencor	beta	Jose Ruiz	8051	8	8	kintex-7-3	James	Brakef	1022		6	1	1	154	##	14.7	0.33	6.0	8.3	IX	Y	vhdl	8	light52_m	Y	yes	N	N	64K	64K	Y					2012	2018		targeted to balanced	~ 6 clocks/inst
wb_z80	https://opencor	stable	Brewster Porcella	Z80	8	8	kintex-7-3	James	Brakef	2025		6			144	##	14.7	0.33	3.0	7.8	X		verilog	4	z80_core	Y	yes	N	N	64K	64K	Y					2004	2012		derived from Guy Hutchison TV80	Wishbone High Performance Z80
cpu6502_true	https://opencor	stable	Jens Gutschmidt	6502	8	8	kintex-7-3	James	Brakef	1678		6			159	##	14.7	0.33	4.0	7.8	X		vhdl	7	r6502_tc		yes	N	N	64K	64K	Y					2008	2018		cycle accurate	
a-z80	https://opencor	stable	Goran Devic	Z80	8	8	**zu-3e**	James	timing	1761	365	6			41	##	v21.1	0.33	1.0	7.7	IX		verilog	24	z80_top_c	Y	yes	N	N	64K	64K	Y					2014	2020	https://github.cor	gate level reverse eng'd Z80	Complete implementation of a Sinclair ZX Spec
68hc08	https://opencor	stable	Ulrich Riedel	6808	8	8	**zu-3e**	James	vivado	1875	128	6			164	##	v21.1	0.33	4.0	7.2	X		vhdl	1	x68ur08		yes	N	N	64K	64K	Y					2007	2009		68c05 & 68c08 very different Fmax	
a-z80	https://opencor	stable	Goran Devic	Z80	8	8	kintex-7-3	James	Brakef	1186		6			24	##	14.7	0.33	1.0	6.8	IX		verilog	24	z80_top_c	Y	yes	N	N	64K	64K	Y					2014	2020	https://github.cor	gate level reverse eng'd Z80	Complete implementation of a Sinclair ZX Spec
c88	https://github.c	alpha	Daniiel Bailey	accum	8	8	spartan-3	James	Dff ge	2664		4	2		54	##	14.7	0.33	1.0	6.7	X		vhdl	25	C88	Y	asm	N		8	256	Y	10		8		2015	2015	https://www.yout	only 8 memory locations	used 3785 Dff, doesn't infer block or LUT RAM
t48	https://opencor	stable	Arnim Laeuger	MCS-48	8	8	cyclone-1	Arnim	Laeuge	738		4		1	59			0.33	4.0	6.6	IX		vhdl	70	t48_core	Y	asm	N		256	1K						2004	2022		T48 uController	used in several projects

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	reporter	comments	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	vendor	SOC	src code	#src files	top file	doc	tool chain	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pipe len	start year	last revis	secondary web link	note worthy	comments
bfcpu	http://www.clif	stable	Clifford Wolf	Turing	8	3	**zu-3e**	James	vivadc	387		6			500	##	v21.1	0.02	4.0	6.5	X	B	vhdl	4	cw6671	Y	yes	N	N	64K	64K	Y	8				2003	2003	https://en.wikipec	no accum, data pointer and bracketec	internal 1-byte data cache doubles performanc
atmega8_pong	https://fr.wikive	stable	Juergen Sauermann	AVR	8	16	spartan-3	James	clock c	2767		4	1	10	53	##	14.7	0.33	1.0	6.3	X	Y	vhdl	37	avr_fpga_	Y	yes	N		64K	64K	Y	17		4		2017	2017		several projects using avr core	uses Sauermann core
t51	https://opencor	stable	Andreas Voggeneder	8051	8	8	kintex-7-3	James Brakef		1942		6	1		147	##	14.7	0.33	4.0	6.2	IX		vhdl	17	T8032	Y	yes	N	N	64K	64K	Y					2002	2010		8052 & 8032	8032 SoC
pulserain	https://github.c	stable	PulseRain Tech LLC	8051	8	8	arria-2	James	some	2376		A	2	41	130	##	q18.0	0.33	3.0	6.0	I		system v	25	FP51_fast	Y	yes	N	Y	64K	64K	Y					2017	2018	https://www.puls	1 clk/inst, intended for Max10	
atmega8_pong	https://fr.wikive	stable	Juergen Sauermann	AVR	8	16	spartan-3	James	clock c	2898		4	1	11	53	##	14.7	0.33	1.0	6.0	X	Y	vhdl	37	pacman_N	Y	yes	N		64K	64K	Y	17		4		2017	2017		several projects using avr core	uses Sauermann atmega16 core
system09	https://opencor	stable	John Kent, David Burn	6809	8	8	kintex-7-3	James Brakef		1631		6		41	88	##	14.7	0.33	3.0	6.0	IX	Y	vhdl	40	cpu09l	Y	yes	N	N	64K	64K	Y	44	13	8		2003	2021	http://members.o	from John Kent web page	opencores download URL incorrect, use col E
fpga-64	http://www.syn	stable	Peter Wendrich	6502	8	8	kintex-7-3	James Brakef		2210		6		2	156	##	14.7	0.33	4.0	5.8	X	Y	vhdl	26	fpga64_cc	Y	yes	N	N	64K	64K	Y			26		2005	2008		Rendition of Commodore 64	altera top level schematic
turbo8051	https://opencor	beta	Dinesh Annayya	8051	8	8	kintex-7-3	James Brakef		1985		6	1		127	##	14.7	0.33	4.0	5.3	IX		verilog	74	oc8051_tc	Y	yes	N	N	64K	64K	Y					2011	2016		includes perpherials	
ep8080	https://github.c	beta	C.H. Ting	8080	8	8	kintex-7-3	James Brakef		1276		6			184	##	14.7	0.33	9.0	5.3	X		vhdl	4	ep80	Y	yes	N	N	64K	64K	Y					2002	2016	8080 data sheets	initialized Lattice memory blocks	work related to eP16
8051	https://opencor	alpha	Simon Teran, Jakas	8051	8	8	kintex-7-3	James	tunrec	1744		6	1		111	##	14.7	0.33	4.0	5.3	ILX		verilog	32	oc8051_tc	Y	yes	N		64K	64K	Y					2001	2016		8051 core includes several on-chip peripherals, like timers and counters	
mycpu	http://www.my	mature	Dennis Kuschel	accum	8	8	kintex-7-3	James Brakef		3428		6	1		155	##	14.7	0.33	3.0	5.0	X		vhdl	28	cpu_top	Y		N		64M	64M	Y					2010	2023	http://mynor.org/	originally in TTL, avail. as a kit	my4th: micro-coded, bit serial, runs Forth
cast_8051	http://www.cas	proprietar	CAST Inc	8051	8	8	virtex-6	CAST I	820 sli	1800		6		2	81	##	12.1	0.33	3.0	5.0	X		proprietary			Y	yes	N		64K	64K	Y			32				http://www.cast-i	Cast has uP related IP	several versions, FPGA kits
hc11core	http://www.gm	stable	Green Mountain Comp	68HC11	8	8	kintex-7-3	James Brakef		2190		6			127	##	14.7	0.33	4.0	4.8	X		vhdl	1	hc11rtl	Y	yes	?	N	64K	64K	N	53		8	2	2000		6811 data sheets	restricted use license, with corrections	
z3	https://opencor	stable	Charles Cole	CISC	8	8	arria-2	James Brakef		3495		A	2		141	##	q18.0	0.33	3.0	4.4	I		verilog	3	boss	Y				128K	128K						2014	2014	https://en.wikipec	Infocom Z-Machine V3, youtube vide	http://inform-fiction.org/zmachine/standards/
oms8051mini	https://opencor	alpha	Simon Teran, Dinesh A	8051	8	8	kintex-7-3	James Brakef		1991		6	1	32	133	##	14.7	0.33	5.0	4.4	X	Y	verilog	66	digital_co	Y	yes	N		64K	64K	Y					2000	2018			
bfcpu	http://www.clif	stable	Clifford Wolf	Turing	8	3	**zu-3e**	James	vivadc	303		6			500	##	v21.1	0.01	4.0	4.1	X	B	vhdl	4	cw6670	Y	yes	N	N	64K	64K	Y	8				2003	2003	https://en.wikipec	no accum, data pointer and bracketec	first implementation, no data cache
df6805	www.hitechglob	proprietar	Hitech Global	6805	8	8	stratix-1	Hitech Global		1690		4			83			0.33	4.0	4.1	I		proprietary			Y	yes	N	N	64K	64K	Y							6805 data sheets		
socz80	http://sowerbut	stable	Will Sowerbutts	Z80	8	8	spartan-6	James	constr	2568		6		15	93	##	14.7	0.33	3.0	4.0	X		vhdl	25	top_level	Y	yes	N	N	64K	64K	Y					2013	2014		based on Daniel Wallner's T80, for Papillio Pro board	
system6801	https://opencor	stable	Michael L. Hasenfratz	6801	8	8	cyclone-3	James Brakef		1507		4		3	73	##	14.7	0.33	4.0	4.0	I		vhdl	15	wb_cyclor	Y	yes	N	N	64K	64K	Y					2003	2009	http://members.o	based on John Kent's 6801	tested on Apex20K, Cyclone & Straix boards
68hc08	https://opencor	stable	Ulrich Riedel	6808	8	8	kintex-7-3	James Brakef		2290		6			101	##	14.7	0.33	4.0	3.6	X		vhdl	1	x68ur08		yes	N	N	64K	64K	Y					2007	2009			
lattice6502	https://opencor	beta	Ian Chapman	6502	8	8	kintex-7-3	James Brakef		4942		6			214	##	14.7	0.33	4.0	3.6	X		vhdl	3	ghdl_proc	Y	yes	N	N	64K	64K	Y					2010	2010		targeted to LCMXO2280	
z80soc	https://opencor	stable	Ronivon Costa	Z80	8	8	spartan3e	James Brakef		2474		4	2	19	78	##	14.7	0.33	3.0	3.4	IX	Y	vhdl	19	top_s3e	Y	yes	N	N	64K	64K	Y					2008	2016		based on Daniel Wallner's T80	directory disappeared
i8051		stable	Tony Givargis	8051	8	8	kintex-7-3	James Brakef		2690		6	1	1	105	##	14.7	0.33	4.0	3.2	X		vhdl	9	i8051_all	Y	yes	N		64K	64K	Y					1999	1999		author has book & course	Embedded System Design: A Unified Hardware
cpu86	http://www.ht-l	beta	Hans Tiggeler	x86	8	8	kintex-7-3	James Brakef		3421		6	1		127	##	14.7	0.17	2.0	3.1	X		vhdl	23	cpu86_top	Y	yes	N	N	1M	1M	Y					2002	2018	http://www.ht-lab	8088 clone	ht-labs offers several uP cores
a-z80	https://opencor	stable	Goran Devic	Z80	8	8	cyclone-2	Goran Devic		2084		4		29	19	##	q11.1s	0.33	1.0	3.0	IX		verilog	24	z80_top_c	Y	yes	N	N	64K	64K	Y					2014	2020	https://github.cor	gate level reverse eng'd Z80	Complete implementation of a Sinclair ZX Spec
rf6809	https://opencores.org/pro		Robert Finch	6809	8	8	artix-7	Robert Finch		4200		6		4	120	##	v21.2	0.33	4.0	2.4	X	Y	system v	21	rf6809	Y	yes	N		16M	16M	Y	44	13	8		2022	2022	http://www.finitro	Different from rtf6809: 24-bit adrs, op	8-bit version, has inst. Cache
mc8051	http://www.ore	stable	Helmut Mayrhofer	8051	8	8	kintex-7-3	James Brakef		3022		6	1		83	##	14.7	0.33	4.0	2.3	X		vhdl	49	mc8051cc	Y	yes	N	N	256	64K	Y					1999	2013	www.oreganosyst	fast 8051, version available with floating-point by David Lundgren	
altium/TSK80x	http://techdocs.	proprietar	Altium	Z80	8	8	spartan-3	Altium		2558		4			50			0.33	3.0	2.2	AILX		proprietary			Y	yes	N	N	64K	64K	Y					2004	2017	CR0140.pdf, CR01	frozen, asm, C, C++, schem, VHDL & V	default clock speed is 50MHz
bfcpu	http://www.clif	stable	Clifford Wolf	Turing	8	3	kintex-7-3	James Brakef		422		6			345	##	14.7	0.01	4.0	2.0	X	B	vhdl	4	cw6671	Y	yes	N	N	64K	64K	Y	8				2003	2003	https://en.wikipec	no accum, data pointer and bracketec	current version & earlier version
hd63701	https://opencor	planning	Tsuyoshi Hasegawa	6801	8	8	spartan-6	James Brakef		1412		6	1	3	31	##	14.7	0.33	4.0	1.8	X		verilog	6	HD63701_CORE			N	N	64K	64K	Y					2014			Used in Atari game console, 6801 clone?	
system68	https://opencor	stable	John Kent, David Burn	6801	8	8	spartan-3	James Brakef		2235		4		4	46	##	14.7	0.33	4.0	1.7	X	Y	vhdl	21	cpu68	Y	yes	N	N	64K	64K	Y					2003	2009	http://members.optushome.com.au/jekent/		
m2cpu	https://github.com/ZakSN		Zakary Nafziger	cisc	8	8	max10	Zakary Nafzig		3504	1058	4		56	106	##	q22.1	0.33	6.0	1.7	I		vhdl	27	m2cpu_tc	Y	asm	N		64K	64K	Y	75	4	7		2016	2018		micro-coded 8-bitter with 75 instructi	Quartus project files, vga output
v65c816	https://github.com/RyuKc		Valerio Venturi	6502	8	8	cyclone-IV	Valerio Ventu		1693		4			25			0.33	3.0	1.6	I		vhdl	26	v6502	Y	yes	N	N	64K	64K	Y					2011	2023	https://opencores	6502 with extras: 16-bit stack pointer	https://www.youtube.com/watch?v=K3jH-
altium/TSK51A	http://techdocs.	proprietar	Altium	8051	8	8	spartan-3	Altium		1890		4		1	50			0.33	6.0	1.5	AILX		proprietary			Y	yes	N	N	64K	64K	Y					2004	2017	CR0140.pdf, CR01	frozen, asm, C, C++, schem, VHDL & V	default clock speed is 50MHz
rtf6809	https://github.c	alpha	Robert Finch	6809	8	8	kintex-7-3	James	many	7506		6	1	2	106	##	14.7	0.33	4.0	1.2	X		verilog	4	rtf6809	Y	yes	N	N	4G	4G	Y	44	13	8		2012	2015	http://www.finitro	6809 with 32-bit "FAR" addressing	see also rf6809 variant
cpu65c02_true	https://opencor	stable	Jens Gutschmidt	6502	8	8	spartan-6	James	latch v	4794		6			47	##	14.7	0.33	4.0	0.8	X		vhdl	8	core		yes	N	N	64K	64K	Y					2008	2021		cycle accurate	
lem4_9ptr	https://opencor	beta	James Brakefield	accum	4	9	**zu-2e**	James	1 stag	210		6		0	397	##	v20.1	0.24	1.0	453.5	IX		vhdl	2	lem1_9ptr	Y		N	Y	512	2K	N	24			1	2016			binary & BCD digit addition, speed mc	4 index registers: (ix),(--ix),(ix++),(ix+off)
lem4_9ptr	https://opencor	beta	James Brakefield	accum	4	9	kintex-7-3	James	1 stag	151		6		1	151	##	14.5	0.24	1.0	240.0	IX		vhdl	2	lem1_9ptr	Y		N	Y	512	2K	N	24			1	2016			binary & BCD digit addition, speed mc	4 index registers: (ix),(--ix),(ix++),(ix+off)
lem4_9	https://opencor	beta	James Brakefield	accum	4	9	kintex-7-3	James	1 stag	144		6		1	195	##	14.5	0.16	1.0	216.7	IX		vhdl	2	lem1_9	Y		N	Y	32	2K	N	24			1	2016			binary & BCD digit addition, speed mode	
jane_nn		stable	Suresh Devanathan	RISC	4	8	kintex-7-3	James Brakef		723		6			178	##	14.7	0.33	1.0	81.4	X		vhdl	3	Processor	Y							27		16		2002			neural network microprocessor, specialized registers	
mcs-4	https://opencor	alpha	Reece Pollack	4004	4	4	kintex-7-3	James Brakef		228		6			376	##	14.7	0.16	4.0	66.0	X		verilog	7	i4004			N		4K	4K	N					2012	2012		4004 was multi-chip	4004 CPU & MCS-4
tinycomputer	https://github.com/zpekic		Zoltan Pekic	accum	4	8	spartan3	James Brakef		643	286	4			100	##	14.7	0.17	1.0	26.0	X	Y	vhdl	29	tinycompu	Y		N			256		20		16			2017		4-bit Up via 2901 slice & micro code	no data RAM memory
t400	https://opencor	stable	Arnim Laeuger	COP400	4	8	spartan-2	Arnim Laeuge		643		3		2	60			0.16	4.0	3.7	IX		vhdl	36	t400_core	Y	yes	N	Y	64	1K	Y					2006	2009		implementation of National's 4-bit COP400 microcontroller	
lem1_9min	https://opencor	stable	James Brakefield	accum	1	9	kintex-7	James	1 stag	63		6		1	358	##	14.5	0.04	1.0	227.2	ILX		vhdl	3	lem1_9mi	Y	asm	N	Y	64	2K	N	8		64	1	2003	2009		logic emulation machine	
lem1_9	https://opencor	alpha	James Brakefield	accum	1	9	kintex-7-3	James	1 stag	75		6		1	171	##	14.5	0.04	1.0	91.2	IX		vhdl	2	lem1_9	Y		N	Y	32	2K	N	24			1	2016	2017		single bit at a time, absolute adrs	
lem1_9ptr	https://opencor	beta	James Brakefield	accum	1	9	kintex-7-3	James	1 stag	147		6		1	176	##	14.5	0.06	1.0	72.0	IX		vhdl	2	lem1_9ptr	Y		N	Y	512	2K	N	24			1	2016			use speed opt, logic emulation machi	4 index registers: (ix),(--ix),(ix++),(ix+off)

112 # usable(beta, st 0 13 37 14 blank 529 # 529 # 9 13 verilog 243 non-blank 403 41

41 "B" or "X" of lim 0 528 529 a 529 vhdl 223 asm 84 Web page DMIPS p en.wikipedia.org/wiki/Instructions_per community.freesc www.eembc.org/coremark/index.php

51 zu-3e sys verilog 24 forth 6 DMIPS per clock for many microprocessors: http://en.wikipedia.org/wiki/Instructions_per_second

proprietary 21

scala 4

schematic 5

MIPS/MHz Pro-rating for data size:

1-bit	0.04	16-bit	0.67	64-bit	2.00
4-bit	0.17	24-bit	0.80	**Silicon Area equivalents**	
8-bit	0.33	32-bit	1.00	LUTS/DSP48	16:1
12-bit	0.40	48-bit	1.50	LUTS/Block RAM	32:1

Under the assumption that the core is capable of one instuction per clock

75	_paper_only
60	educational
25	_weak_start
8	_up_cores
5	in limbo
10	planning
52	simulation
573	main+sim
521	net main
644	total

353	VHDL
399	Verilog
51	System Verilog
11	Spinal/Scala
7	VHDL & Verilog
3	MyHDL
36	proprietary
13	other
4	Schematics
877	total

418 designs with FOM (KIPs/LUT) results (some duplicates due to multiple FPGA runs)

385 designs with best FOM (likely true measure of # of usable designs)

Column Titles	Details
"A"	A: 1st choice clone, B: 2nd choice clone, W: 1st choice original, X: 2nd choice original
"B"	used to indicate best KIPS/LUT for a given design, usually using fast FPGA family
cat	main, educational, planning, simulation, paper, in limbo or weak
_uP_all_soft folder	if opencores design is their folder name, otherwise my folder name
opencores or primary link	about 200 designs in open cores, about 100 in github
status	ASIC, paper (detailed in), planning (no source), alpha, beta, stable, mature, proprietary, untested; incomplete, educational typically <16 instructions, simulation
author	First Name, Last Name or university or corporation
style / clone	part number or "forth", RISC, accumulator, etc. "asic" indicates: avail as asic & fpga, an asic netlist source or a hard core within fpga chip
data size	data register size in bits
inst size	shortest instruction size in bits
FPGA	FPGA family for compile, place, route & timing, usually using fastest part grade
reporter	First Name, Last Name
comments	compile, place, route & timing problems
LUTs ALUT	total number of LUTs, ALUTs or tiles used including route-thrus & otherwise unavailable
Dff	total number of DFFs
LUT?	4-LUT, 6-LUT, Altera ALUT, Actel Tile
mults	total number of multipliers/DSPs used; 9x9 multiplier counts divided by two and rounded up
blk RAM	total # of block RAMs used, Xilinx half block RAM counts divided by two and rounded up
Fmax	maximum primary clock speed from compile, place & route run with best clock constraint, fastest part, best die temp
date	date of compile, place & route; serves to identify source version
tool ver	Altera (**Q**uartus), Xilinx (ISE, **V**ivado), Lattice Semiconductor(**D**iamond) or MicroSemi(**L**ibero) tool version number
MIPS /inst	prorated DMIPS per instruction, reduced for data word sizes under 32-bits, greater than one for multiple issue processors

_uP_all_soft folder	opencores or prmary link	status	author	style / clone	data sz	inst sz	FPGA	repor ter	com ents	LUTs ALUT	Dff	LUT?	mults	blk ram	F max	date	tool ver	MIPS /inst	clks/ inst	KIPS /LUT	ven dor	SOC	src code	#src files	top file	doc	tool chai n	fltg pt	Hav'd	max dat	max inst	byte adrs	# inst	adr mod	# reg	pip e len	start year	last revis	secondary web link	note worthy	comments
clks/ inst	number of clocks per instruction, typically 1.0 for modern pipelined processors, subjective for older uP																																						
KIPS /LUT	figure of merit, does not include effects of memory capacity, floating point or instruction set quality																																						
Vendor	Vendors for which design builds: Actel: Libero, Intel(Altera): Quartus; Latticesemi: Diamond & iCEcube, Xilinx: ISE & Vivado																																						
SOC	B: bare core (no RAM connections or memory access delay), Y: System on a Chip (has peripherals)																																						
src code	VHDL or Verilog or System Verilog or schematic or gates or Proprietary or Scala etc																																						
# src files	number of source files for compile, place, route & timing; includes test benches																																						
top file	top file for compile, place, route & timing run, multiple versions of same design distinguished here																																						
doc	is documentation provided?																																						
tool chain	is there a compiler or assembler provided or available																																						
fltg pt	does the compile, place, route & timing run include floating point?																																						
Hav'd	H: separate instruction and data memory(s), 2C: # caches, M: MMU, N: von Neuman (single memory bus)																																						
max data	maximum data address																																						
max inst	maximum instruction address																																						
byte adrs	is byte addressing provided																																						
# inst	number of unique instructions, conditionals count as one instruction, somewhat subjective																																						
# adr modes	abs, imm, PC rel, indexed, reg-reg indexed; stack, indir, indir++, --indir; (indir), (indir++), (--indir), (indexed), abs-short/direct page, scaled																																						
# reg	number of registers in register file																																						
pipe len	number of pipeline stages																																						
start year	year of first design activity																																						
last revis	last year for revisions or web page updates																																						
secondary web link	secondary web address																																						
note worthy	anything special about the design																																						