FPGA Boot Camp $20 FPGA kit with full user IO, some assembly required: soldering & breadboard wiring   **Jim Brakefield** 2022

item	avail	web link	2nd web link	need	part #	high vol price	# per order	min quant price	per kit cost	# per kit	dx mm	dy mm	IO	K LUTs	Mb block RAM	MB D-RAM	MB flash	SD	vendor	mfg	comments
Seed Tang Nano-9K	no	https://www.seeedstudio.com/Tang-Nano-9k-FPGA-board-Go	https://www.cnx-software	FPGA board	Tang Nano-9K	$14.90	1	$14.90	**14.900**	1.0	25.4	60.0	36	8.6	0.48	8.0	8.0	Y	Seeed	gowinsemi	2PB, 6LED, HDMI & LCD conn, 27MHz os
8 7-seg, 8 PB, 8 LED	yes	https://handsontec.com/index.php/product/tm1638-7-segment-display-keypadled-modu		User IO	TM1638 7-Segment Dis	$2.90	1	$2.90	**2.900**	1.0	50.8	76.2	5 pins						HandsOn Tech		user IO except slide switches, used in ap
16 PCS 400 Pin Solderless Board	yes	https://www.amazon.com/MCIGICM-Breadboard-Solderless-Prototype-Protoboard/dp/B		Breadboard	MCIGICM Breadboard 4	$19.99	16	$6.69	**1.249**	1.0	58.0	83.8							amazon	MCIGICM	connectable, e.g. connect two for more s
12 position DIP switch	yes	https://www.digikey.com/en/products/detail/cts-devices/DS01C-254-L-09BE/11310839		~10 slide switches	DS01C-254-L-09BE	$2,245.80	4902	$0.88	**0.458**	1.0	10.2	30.5							digikey	CUI	bend out two pins for 2 sets of five
male-female Jumper Cables	yes	https://protosupplies.com/product/jumper-wires-malefemale-40-x-4/		(40) m/f jumpers	Jumper Wires, Male/Fei	$1.95	1	$1.95	**0.390**	5.0	2.5	100.0							protosupplies		10cm long, insulated
Seed Tang Nano-9K	yes	https://www.aliexpress.us/item/3256803695567088.html?spm=a2g0o.ppclist.product.64		FPGA board	Tang Nano-9K	$20.64	1	$20.64	**20.640**	1.0	25.4	60.0	36	8.6	0.48	8.0	8.0	Y	Aliexpres	gowinsemi	**free shipping,** several prices
Seed Tang Nano-9K	yes	https://www.pcbway.com/project/gifts_detail/Sipeed_Tang_Nano_9K_FPGA_kits_with_		FPGA board	Tang Nano-9K	$22.99	1	$20.64	**22.990**	1.0	25.4	60.0	36	8.6	0.48	8.0	8.0	Y	pcbway	gowinsemi	includes small LCD screen
iceFUN FPGA Board	yes	https://www.robotshop.com/en/icefun-fpga-board.html		iCE40				$31.46			22.9	66.0	45	7.7	0.13						includes PIC16 & 4x8 LED array
10 PCS 830 Point Solderless Board	yes	https://www.amazon.com/MCIGICM-Breadboard-Solderless-Protoboard-Electronics/dp/E		Breadboard	MCIGICM Breadboard 8	$19.99	10	$9.99	**1.999**	1.0	58.0	167.4							amazon	MCIGICM	longer board, more room for other stuff
3 PCS 830 Point Solderless Board	yes	https://www.amazon.com/MCIGICM-Breadboard-Solderless-Protoboard-Electronics/dp/E		Breadboard	MCIGICM Breadboard 8	$9.99	3	$9.99	**3.330**	1.0	58.0	167.4							amazon	MCIGICM	longer board, more room for other stuff
2+2 400 & 830 Point Solderless Boa	yes	https://www.amazon.com/dp/B086C9HK7V/ref=sspa_dk_detail_3?psc=1&pf_rd_p=dd2c		Breadboard	Deke Home	$9.99	4	$9.99	**2.498**	1.0	58.0	167.4							amazon	Deke Hom	two short & two long
8 PCS 830 Point Solderless Board	yes	https://www.amazon.com/Pcs-MCIGICM-Points-Solderless-Breadboard/dp/B07PCJP9DY/		Breadboard	MCIGICM Breadboard 8	$16.60	8	$9.99	**2.075**	1.0	58.0	167.4							amazon	MCIGICM	longer board, more room for other stuff
30 PCS 400 Pin Solderless Board	yes	https://www.amazon.com/dp/B0BRGZDTFR/ref=sr_1_1?keywords=solderless%2Bbreadb		Breadboard	VILLCASE Breadboard 4	$46.67	30	$6.69	**1.556**	1.0	58.0	83.8							amazon	VILLCASE	connectable, e.g. connect two for more s
4 PCS 400 Point Solderless Board	yes	https://www.amazon.com/Pcs-MCIGICM-Points-Solderless-Breadboard/dp/B07PCJP9DY/		Breadboard	MCIGICM Breadboard 8	$6.69	4	$6.69	**1.673**	1.0	58.0	83.8							amazon	MCIGICM	best price for quant 4
6 PCS 400 Point Solderless Board	yes	https://www.amazon.com/DEYUE-breadboard-Set-Prototype-Board/dp/B07LFD4LT6/ref=		Breadboard	DEYUE Breadboard	$9.99	6	$9.99	**1.665**	1.0	58.0	83.8							amazon	DEYUE	best price for quant 6
pico-ice		https://github.com/tinyvision-ai-inc/pico-ice	https://tinyvision.ai/	iCE40UP5K							22.9	50.8	80	5.3	0.12	8.0	4.0				RP2040 & iCE, 4 column IO, RGB LED
8 7-seg, 16 PB	yes	https://handsontec.com/index.php/product/tm1638/						$4.60													used in appliances
rotary dip switch	yes	https://www.digikey.com/en/products/detail/cts-electrocomponents/220ADC16/474385		HEX rotary switch	CT3070-ND	$5,755.75	5000	$2.28	**1.151**	1.0									digikey	ctscorp	has knob, also surface mount
5 position DIP switch	yes	https://www.mouser.com/ProductDetail/CUI-Devices/DS01C-254-L-09BE?qs=wnTfsH77X		5X slide switch	490-DS01C-254-L-05BE	$902.88	2508	$0.68	**0.720**	0.5									digikey	CUI	two per kit
5 position DIP switch	yes	https://www.digikey.com/en/products/detail/cui-devices/DS02C-254-1L-05BE/11310939		5X slide switch	DS02C-254-1L-05BE	$2,092.72	4917	$0.82	**0.851**	0.5									mouser	CUI	two per kit, piano shape
12 position DIP switch	yes	https://www.digikey.com/en/products/detail/cts-electrocomponents/210-12MS/250378		~10 slide switches	CT21012MS-ND	$2,747.45	5000	$1.06	**0.549**	1.0									digikey	ctscorp	knockout legs for 2 sets of five
100 male-female Jumper Cables	yes	https://www.digikey.com/en/products/detail/schmartboard-inc/920-0023-01/9556952?s		(100) m/f jumpers	920-0023-01-ND	$45.00	1	$7.00	**3.750**	12.0									digikey		5" long, has heatshrink covering
20 male-female Jumper Cables	yes	https://www.digikey.com/en/products/detail/adafruit-industries-llc/1954/6827087		(20) m/f jumpers	1528-1964-ND	$1.95	1	$1.95	**0.650**	3.0									digikey	adafruit	5" long, insulated
Breadboard Jumper Cables Kit	yes	https://www.amazon.com/dp/B07QXXMWRZ/ref=sspa_dk_detail_2?psc=1&pd_rd_i=B07		360 jumpers	Elegoo-EL-CP-004	$10.99	1	$6.98	**0.733**	15.0									amazon	ELEGOO	8X M/M, M/F, F/F per kit?
male-male Jumper Cables	yes	https://tinkererssupply.com/products/10-cm-40-pin-solderless-jumper-wires-male-to-ma		(40) m/m jumpers	10 CM 40 Pin Solderless	$2.49	1	$2.49	**0.623**	4.0									tinkersupply		10 per kit?
HOOK-UP 22AWG SOLID - 10 X 25FT	yes	https://www.adafruit.com/product/3174	digikey	breadboarding	3174	$2,396.00	100	$29.95	**1.997**	12.0									adafruit		100 sets cut into 2' lengths
HOOK-UP 22AWG SOLID - 6 X 25FT	yes	https://www.adafruit.com/product/1311	digikey	breadboarding	1311	$1,276.00	100	$15.95	**1.595**	8.0									adafruit		100 sets cut into 3' lengths
narrow FPGA boards		https://shop.trenz-electronic.de/en/Products/Trenz-Electronic/																			
cheap FPGA boards		https://www.joelw.id.au/FPGA/CheapFPGADevelopmentBoards																			

DIP switch mounted on breadboard spanning plugboard ground bus and rows connected to FPGA IOs   **Required parts   19.898**   DIP switch only item with high volume price break

Gowin IDE has low level placement tools, supports VHDL, Verilog and constraint files   Low volume cost, some surplus   items 27.320   FPGA board has DRAM, Flash & SD socket

Seed Tang Nano-9K includes unsoldered pins, USB cable & case; has 27MHz oscillator   PCBway version includes small LCD display

Tang Nano-9K also supported by LiteX: https://github.com/enjoy-digital/litex