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
Seeed 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	gowinsem	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 app
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	$6.99	**1.249**	1.0	58.0	83.8							amazon	MCIGICM	connectable, e.g. connect two for more
12 position DIP switch	yes	https://www.digikey.com/en/products/detail/cui-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/Fe	$1.95	1	$1.95	**0.390**	5.0									protosupplies		10cm long, used solid wire for DIP switch
Seeed 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	gowinsem	**free shipping,** several prices
Seeed Tang Nano-9K	yes	https://www.pcbway.com/project/gifts_detail/Sipeed_Tang_Nano_9K_FPGA_kits_with_1		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	gowinsem	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/		Breadboard	MCIGICM Breadboard 8	$19.99	10	$6.99	**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/		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
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									mouser	CUI	two per kit
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
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, wonder about P&R quality   Low volume cost, some surplus items 27.620   FPGA board has DRAM, Flash & SD socket

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