

Parts list (not including tools or experiments) for Sandwich, the line-following robot.

From the book Robot Building for Beginners - Second Edition. Apress ISBN: 978-1-4302-2748-9. Copyright 2002-2011 by David Cook. Spreadsheet updated May 2011.

You can save money by buying a "K SAND" Sandwich kit for \$49.95 from Solarbotics.

Section	Description	Schematic ID	Total Quantity	Example Supplier	Supplier Part Number	Price Each for Quantity 1	Price For 1 Robot	Quantity Needed For 50 Robots	Price Each For Quantity For 50 Robots	Price Each Robot For 50 Robots	Comments
Motherboard	150 ohm 1/2 watt resistor. 1/4 watt also fine.	R7, R8, R9, R20	4	http://www.digi-key.com/	150H	\$ 0.06	\$ 0.25	200	\$ 0.02	\$ 0.09	
Motherboard	1 kiloohm 1/2 watt resistor. 1/4 watt also fine.	R1, R17, R18	3	http://www.digi-key.com/	1.0KH	\$ 0.06	\$ 0.19	150	\$ 0.02	\$ 0.07	
Motherboard	20 kiloohm variable multiturn potentiometer	R2, R10	2	http://www.digi-key.com/	490-2881	\$ 1.36	\$ 2.72	100	\$ 0.80	\$ 1.61	Alternative: Solarbotics RT20k, Digi-Key CT94EW203
Motherboard	Cadmium-sulfide photoresistor approx 1/4" diameter	R4, R5, R6, R7	4	http://www.goldmine-elec.com/	G15177	\$ 0.50	\$ 2.00	200	\$ 0.50	\$ 2.00	Be careful here! How do you guarantee a four matched set if you only buy four? Might need to buy a couple of grab bags #G14025 to get four matching.
Motherboard	Black paint marker for backs of photoresistors		1	http://www.mcmaster.com/	16625T25	\$ 3.53	\$ 3.53	5	\$ 3.53	\$ 0.35	Alternative: Testors black paint for models can be found at local hobby and hardware stores.
Motherboard	LED white T1 3/4 (5 MM). Diffused or frosted with wide angle preferable	LED9, LED10	2	http://www.digi-key.com/	(part numbers change too often)	\$ 1.29	\$ 2.58	100	\$ 0.86	\$ 1.72	To further reduce costs, look for bags of cheap diffused or frosted LEDs on eBay.
Motherboard	1N5817 Schottky diode	D1, D2, D3	3	http://www.digi-key.com/	1N5817DICT	\$ 0.44	\$ 1.32	150	\$ 0.23	\$ 0.70	
Motherboard	2907A PNP transistor	Q7, Q8	2	http://www.digi-key.com/	PN2907ABUFS	\$ 0.49	\$ 0.98	100	\$ 0.14	\$ 0.28	Less expensive at Mouser PN2907ATFR
Motherboard	LED yellow T1 3/4 (5 MM). Diffused or frosted with wide angle preferable	LED7, LED11, LED13	3	http://www.digi-key.com/	LTL-4253	\$ 0.52	\$ 1.56	150	\$ 0.20	\$ 0.61	To further reduce costs, look for bags of cheap diffused or frosted LEDs on eBay.
Motherboard	LED green T1 3/4 (5 MM). Diffused or frosted with wide angle preferable	LED8, LED12, LED14	3	http://www.digi-key.com/	LTL-4233	\$ 0.52	\$ 1.56	150	\$ 0.20	\$ 0.61	To further reduce costs, look for bags of cheap diffused or frosted LEDs on eBay.
Motherboard	LM393 comparator chip 8-pin DIP	IC1	1	http://www.digi-key.com/	LM393N	\$ 0.40	\$ 0.40	50	\$ 0.27	\$ 0.27	Alternative: Solarbotics L393
Motherboard	8 pin DIP IC socket		1	http://www.jameco.com/	51570	\$ 0.12	\$ 0.12	50	\$ 0.09	\$ 0.09	Alternative: http://www.digikey.com/ 3M5473
Motherboard	Sandwich printed circuit board		1	http://www.solarbotics.com/	SANDPCB	\$ 12.00	\$ 12.00	50	\$ 12.00	\$ 12.00	
Motherboard	>=100 uF 16 V capacitor	C1	1	http://www.digi-key.com/	P5140	\$ 0.33	\$ 0.33	50	\$ 0.16	\$ 0.16	Optional. Not really needed. Alternative: Mouser 647-UFW1C221MED
Motherboard	0.1 uF 16 V capacitor	C2	1	http://www.digi-key.com/	BC1084CT	\$ 0.36	\$ 0.36	50	\$ 0.13	\$ 0.13	Optional. Not really needed.
Motherboard	Test point loops	TP1, TP2, TP3, TP4	4			\$ -	\$ -	200	\$ -	\$ -	Use a piece of wire. The v3.0 (and up) boards have two holes at each test point so that you can make a nice little loop.
Motherboard	2 pin Molex KK header		5	http://www.digi-key.com/	WM4200	\$ 0.44	\$ 2.20	250	\$ 0.11	\$ 0.57	
Motherboard	4 pin Molex KK header		1	http://www.digi-key.com/	WM4202	\$ 0.71	\$ 0.71	50	\$ 0.29	\$ 0.29	
Guts	2 pin Molex KK housing		5	http://www.digi-key.com/	WM2000	\$ 0.31	\$ 1.55	250	\$ 0.07	\$ 0.33	
Guts	4 pin Molex KK housing		1	http://www.digi-key.com/	WM2002	\$ 0.45	\$ 0.45	50	\$ 0.16	\$ 0.16	
Guts	Molex KK crimp		14	http://www.digi-key.com/	WM1114	\$ 0.26	\$ 3.57	700	\$ 0.09	\$ 1.22	Get bulk, not tape or reel, because they are a pain to separate
Guts	9 V battery clip holder, vertical		1	http://www.jameco.com/	105794	\$ 0.35	\$ 0.35	50	\$ 0.32	\$ 0.32	Alternative: http://www.mouser.com/ 534-080 or 534-095
Guts	9 V battery clip holder screw		1	http://www.mcmaster.com/	91772A106	\$ 0.04	\$ 0.04	50	\$ 0.03	\$ 0.03	Alternative: slotted is 91792A106. Since you only need 1, consider a local hardware store.
Guts	9 V battery snap		1	http://www.digi-key.com/	BS6I-MC	\$ 0.48	\$ 0.48	50	\$ 0.44	\$ 0.44	Alternative: Mouser 123-4016-GR, Jameco 216452
Guts	9 V alkaline battery		1	http://www.digi-key.com/	N145	\$ 2.23	\$ 2.23	50	\$ 2.00	\$ 2.00	Alternative: Any alkaline 9V brand from a local store is fine.
Guts	LED red, high brightness T1 3/4 (5 MM). Wide angle preferable	LED20, LED21, LED22	3	http://www.digi-key.com/	365-1203	\$ 0.20	\$ 0.60	150	\$ 0.16	\$ 0.48	Any type of high brightness LED will do just fine. The wider the angle the better. Can find some as low as \$0.10 each. http://www.goldmine-elec.com has a good selection.
Guts	SPST power switch	SW1	1	http://www.digi-key.com/	EG1892	\$ 3.10	\$ 3.10	50	\$ 2.57	\$ 2.57	Alternative: EG1889
Guts	DPDT center off switch	SW2	1	http://www.jameco.com/	22841	\$ 1.49	\$ 1.49	50	\$ 1.25	\$ 1.25	
Guts	225 RPM motor	M1, M2	2	http://www.jameco.com/	162191 or HNGH12-1324Y-R	\$ 17.95	\$ 35.90	100	\$ 14.35	\$ 28.70	Formerly GH12-1324Y225R (Jameco keeps changing part numbers!), formerly 162190 or GH12-1324Y (Non ROHS certified)
Body	49.6 x 28 VR LEGO tire		2	http://www.bricklink.com/		\$ 0.40	\$ 0.80	100	\$ 0.40	\$ 0.80	On BrickLink, search for "VR" and then scroll
Body	49.6 x 28 VR LEGO hub		2	http://www.bricklink.com/		\$ 0.50	\$ 1.00	100	\$ 0.50	\$ 1.00	On BrickLink, search for "VR" and then scroll
Body	Ziploc 2.5 cup square container		1	http://www.doitbest.com/	model #10878, SKU 611136	\$ 0.70	\$ 0.70	50	\$ 0.66	\$ 0.66	Need to cut holes. Sold in quantity 5.
Body	Hole template stickers for Ziploc container		2	homemade		\$ 0.00	\$ 0.00	100	\$ 0.00	\$ 0.00	
Body	Spacers 1/2-inch long #4 hex threaded		4	http://www.digi-key.com/	1902CK	\$ 0.65	\$ 2.59	200	\$ 0.55	\$ 2.19	
Body	Spacers 1/2-inch long #4 round thru-hole		4	http://www.digi-key.com/	878K	\$ 0.22	\$ 0.87	200	\$ 0.20	\$ 0.80	
Body	Nylon washers		12	http://www.digi-key.com/	3158K	\$ 0.05	\$ 0.65	600	\$ 0.04	\$ 0.43	
Body	Stainless steel #4 hex nut		5	http://www.mcmaster.com/	91841A005	\$ 0.03	\$ 0.14	250	\$ 0.03	\$ 0.14	Try nylon nuts (94812A112) as a vibration-resistant alternative.
Body	Large washer for #4 on battery holder (optional)		1	http://www.mcmaster.com/	90313A101	\$ 0.07	\$ 0.07	50	\$ 0.07	\$ 0.07	Or just use a nylon washer like the rest of the robot
Body	Circuit board mounting screws #4-40 1.5 inch		4	http://www.mcmaster.com/	91772A119	\$ 0.06	\$ 0.26	200	\$ 0.06	\$ 0.26	Choose 91792A119 for slotted head.
Body	M2.6 x 6 mm motor mounting screws		4	http://www.mcmaster.com/	90353A112	\$ 0.05	\$ 0.20	200	\$ 0.05	\$ 0.20	
Body	Mini m&m's candy mega tube		1	Walgreens drug store		\$ 0.99	\$ 0.99	50	\$ 0.99	\$ 0.99	Need to cut to length and make center hole.
Coupler	Devcon All Purpose 5 Minute Epoxy clear S-208		1	http://www.msdirect.com/	261164	\$ 4.17	\$ 4.17	5	\$ 4.17	\$ 4.17	Alternative: Pick some up at a local hardware store.
Coupler	Brass tubing 3/16" outer diameter with 0.014 inch thick wall		2	http://www.mcmaster.com/	8859K22	\$ 0.06	\$ 0.12	100	\$ 0.06	\$ 0.12	Forced to buy 12 pieces of 12 inches (304 mm) each. Try a local hardware store.
Coupler	Brass tubing 7/32" outer diameter with 0.014 inch thick wall		2	http://www.mcmaster.com/	8859K23	\$ 0.13	\$ 0.26	100	\$ 0.13	\$ 0.26	Forced to buy 10 pieces of 12 inches each. Try a local hardware store.
Coupler	Brass tubing 1/4" outer diameter with 0.014 inch thick wall		2	http://www.mcmaster.com/	8859K24	\$ 0.15	\$ 0.29	100	\$ 0.15	\$ 0.29	Forced to buy 8 pieces of 12 inches each. Try a local hardware store.
Coupler	Brass tubing 9/32" outer diameter with 0.014 inch thick wall		2	http://www.mcmaster.com/	8859K25	\$ 0.16	\$ 0.33	100	\$ 0.16	\$ 0.33	Forced to buy 8 pieces of 12 inches each. Try a local hardware store.
Coupler	3 unit LEGO cross axles		2	http://www.bricklink.com/	"black technic axle"	\$ 0.10	\$ 0.20	100	\$ 0.10	\$ 0.20	On BrickLink.com, search for "black technic axle" and then scroll
Coupler	1/8 inch #4-40 machine screw (as setscrew)		2	http://www.mcmaster.com/	91772A103	\$ 0.04	\$ 0.09	100	\$ 0.04	\$ 0.09	Sold in quantity 100. Choose 91792A103 for slotted head.
Guts	Dark/light switch label		1	homemade		\$ 0.00	\$ 0.00	50	\$ 0.00	\$ 0.00	
Guts	Various colors of heat-shrink tubing					\$ -	\$ -	0	\$ -	\$ -	
Guts	Various colors and lengths of #22, #24, or #26 gauge wire					\$ -	\$ -	0	\$ -	\$ -	
Body	Roll of Scotch Brand Long Mask 1-inch #2090		1	http://www.mcmaster.com/	7776A23	\$ 5.28	\$ 5.28	5	\$ 5.28	\$ 5.28	Alternative: http://www.officedepot.com/ #745133. Or, pick up a roll of 1" wide blue masking tape at a local store.
							\$ 101.56			\$ 68.82	If you're only making one robot, you'll end up with extra parts left over due to minimum purchase quantities. The price will be higher than shown for 1 robot, since the cost of the leftover parts is not included.