

Millett Hybrid MiniMAX - Design/Layout by Collin Toole

Last revised: 1/16/2010
BOM by Tom Blanchard

PART ID	DESCRIPTION	QTY	SOURCE	PART NO	EACH	TOTAL	SOURCE	PART NO	EACH	TOTAL
BASIC MILLETT										
RA1L/R	5K Ohm Trim Pot	2	Mouser	72-T93YA-5K	\$1.44	\$ 2.88	DigiKey	490-2888-ND	\$ 0.86	\$ 1.72
RA2L/R, RA4L/R	1K ohm	4	Mouser	71-RN55D-F-1.0K	\$0.08	\$ 0.32	DigiKey	CMF1.00KHFACT-ND	\$ 0.17	\$ 0.49
RA7L/R	1M ohm	2	Mouser	71-RN55D-F-1.0M	\$0.08	\$ 0.16	DigiKey	CMF1.00MHFACT-ND	\$ 0.17	\$ 0.49
CA2L/R*	1000uF 16V Nichicon MUSE ES	2	Beezar.com	ES-1000-16	\$1.75	\$ 3.50	Beezar.com	ES-1000-16	\$ 1.75	\$ 6.13
CA4L/R, CA5L/R	1000-1800uF 35V Electrolytic (18mm dia. max, 15mm leads max)	4	Mouser	647-UPW1V182MHD	\$1.08	\$ 4.32	DigiKey	P12410-ND	\$ 1.30	\$ 5.20
CA3L/R, CA6L/R, CA9L/R	0.22uF Film Cap 15mm leads	6	Mouser	505-M10.22/250/10	\$1.11	\$ 6.66	DigiKey	P3224-ND	\$ 1.28	\$ 7.68
CA7L/R*	470uF 35V Electrolytic* (16mm dia. Max)	2	Beezar.com	ES-470-35	\$2.00	\$ 4.00	Beezar.com	ES-470-35	\$ 2.00	\$ 4.00
CA8L/R**	0.18uf Sprague Vitamin Q PIO film cap	2	Beezar.com	VitQ-18-100	\$3.00	\$ 6.00	Beezar.com	VitQ-18-100	\$ 3.00	\$ 6.00
CCS:										
QA1L/R, QA2L/R	2N5087 PNP small signal	4	Mouser	512-2N5087 J18Z	\$0.08	\$ 0.32	DigiKey	2N5087-ND	\$ 0.19	\$ 0.76
RA8L/R	1.13K ohm		Mouser	71-RN55D1131F	\$0.16	\$ -	DigiKey	CMF1.13KHFACT-ND	\$ 0.17	\$ -
RA9L/R	11.3K ohm		Mouser	71-RN55D-F-11.3K	\$0.16	\$ -	DigiKey	CMF11.3KHFACT-ND	\$ 0.17	\$ -
Optional selection:	results in CCS current of 0.65 ma									
RA8L/R	1K ohm	2	Mouser	71-RN55D-F-1.0K	\$0.08	\$ 0.16	DigiKey	CMF1.00KHFACT-ND	\$ 0.17	\$ 0.34
RA9L/R	10K ohm	2	Mouser	71-RN55D-F-10K	\$0.08	\$ 0.16	DigiKey	CMF10.0KHFACT-ND	\$ 0.17	\$ 0.34
MISC:										
R1	10 ohm, 1W resistor	1	Mouser	282-10-RC	\$0.19	\$ 0.19	DigiKey	10W-2-ND	\$ 0.18	\$ 0.18
RA5C/L/R (RLED's)	2K ohm 1W	3	Mouser	594-5073NW2K000J	\$0.16	\$ 0.48				
	2K ohm 1/2W (alternate)		Mouser	293-2K-RC	\$0.09	\$ -	DigiKey	2.0KH-ND	\$ 0.26	\$ -
LED1	Center LED, 3mm, 4000 mcd - Color Change	1	Beezar.com	BzrLED-RGB	\$0.75	\$ 0.75	Beezar.com	BzrLED-RGB	\$ 0.75	\$ 0.75
LEDL/R	Tube LED's, 3mm SuperBrite, 4000 mcd	2	Beezar.com	Varies	\$0.25	\$ 0.50	Beezar.com	Varies	\$ 0.25	\$ 0.50
POT	50K AUDIO TAPER POT	1	Beezar.com	ALPS RK27	\$16.00	\$ 16.00	Beezar.com	ALPS RK27	\$ 16.00	\$ 16.00
VTL/R	TUBES		Beezar.com	12AE6/A (gain of 14)	\$5.00	\$ -	Beezar.com	12AE6, 12AE6A	\$ 5.00	\$ -
			Beezar.com	12FK6 (gain of 7)	\$5.00		Beezar.com	12FK6	\$ 5.00	\$ -
		2	Beezar.com	12FM6 (gain of 10)	\$7.00	\$ 14.00	Beezar.com	12FM6	\$ 6.50	\$ 13.00
SOCKET	7-PIN MINI TUBE SOCKET	2	Beezar.com	GZC7-Y-G	\$2.00	\$ 4.00	Beezar.com	GZC7-Y-G	\$ 2.00	\$ 4.00
Terminal Block 3pos	5mm (or 5.08mm)	2	Mouser	571-2828363	\$0.66	\$ 1.32	DigiKey	ED1931-ND	\$ 0.93	\$ 1.86
1/4" Stereo Jack	Neutrik NMJ6HCD2	1	Mouser	550-22302	\$1.13	\$ 1.13	DigiKey	----		\$ -
Tip Jacks	Emerson	3	Mouser	530-105-0602-1	\$1.08	\$ 3.24	DigiKey	TBD		
RCA Jacks	Philmore MTG12	1	Beezar.com	MTG-12, BL + RD	\$6.00	\$ 6.00	Beezar.com	MTG-12, BL + RD		
Fuse Clips, PCB mount	5x20 fuse clip, 0.2" horiz. lead spacing	2	Mouser	534-3519	\$0.13	\$ 0.26	DigiKey	486-1173-ND	\$ 0.15	\$ 0.30
Fuse	5x20mm - 1A slo-blo optional, your choice	1	Mouser	576-0218001.HXP	\$0.61	\$ 0.61	DigiKey			
PCB	Circuit Board	1	Beezar.com	MiniMAX PCB	\$15.00	\$ 15.00	Beezar.com	MiniMAX PCB	\$ 20.00	\$ 20.00
POWER SUPPLY										
RR1	120 ohm 1/4W	1	Mouser	71-RN55D-F-121	\$0.08	\$ 0.08	DigiKey	CMF121HFCT-ND	\$ 0.17	\$ 0.49
RR2	2K ohm 1/2W	1	Mouser	71-RN60D-F-2K/R	\$0.09	\$ 0.09	DigiKey	P2.0KW-1BK-ND	\$ 0.23	\$ 0.23
RR3	1K ohm trimmer pot	1	Mouser	72-T93YA-1K	\$1.44	\$ 1.44	DigiKey	490-2874-ND	\$ 0.86	\$ 0.86
PF1	Polyfuse, resettable radial 0.5A 72V	1	Mouser	650-RXEF050	\$0.38	\$ 0.38	DigiKey	RXEF050-ND	\$ 0.44	\$ 0.44

CR1A, CR1B	1000uF 50V Electrolytic (18mm dia max)	2	Mouser	647-UPW1H102MHD	\$0.80	\$ 1.60	DigiKey	P12393-ND	\$ 1.30	\$ 2.60
CR2	1uF 63V Box cap	1	Mouser	75-MKT1817510064	\$0.82	\$ 0.82	DigiKey	478-3367-ND	\$ 0.45	\$ 0.45
CR3A, CR3B, CR3C, CR3D	100pf C0G Axial Ceramic	4	Mouser	581-SA102A101JAR	\$0.11	\$ 0.44	DigiKey	478-3141-1-ND	\$ 0.19	\$ 0.76
	100pF NPO Ceramic Disc (alternate)		Mouser	140-50N5-101J-RC	\$0.08	\$ -	DigiKey	399-4199-ND	\$ 0.28	\$ -
CR4	82uf 35V Electrolytic (6.3mm dia max)	1	Mouser	647-UPW1V820MED	\$0.26	\$ 0.26	DigiKey	399-3579-ND	\$ 1.50	\$ 1.50
DR1A, DR1B, DR1C, DR1D	Schottky MBR360, 60V 3A Rectifier - AXIAL	4	Mouser	863-MBR360RLG	\$0.34	\$ 1.36	DigiKey	MBR360-ND	\$ 0.64	\$ 2.56
DR2, DR3	1N4002	2	Mouser	512-1N4002	\$0.07	\$ 0.14	DigiKey	1N4002/54GICT-ND	\$ 0.69	\$ 1.38
VREG	LM317T	1	Mouser	511-LM317T	\$0.64	\$ 0.64	DigiKey	LM317TFS-ND	\$ 0.48	\$ 0.48
Heat Sink	Wakefield #647-10ABP (1" h.)	1	Mouser	567-647-10ABP	\$1.39	\$ 1.39	DigiKey	345-1031-ND	\$ 1.79	\$ 1.79
Heat Sink Kit w Shldr Wshr	for LM317 Voltage Regulator	1	Beezar.com	HtSkKit-1	\$1.50	\$ 1.50	Beezar.com	HtSkKit-1	\$ 1.25	\$ 1.25
Walwart	24VAC, 750-1000ma Walwart	1	Mouser	553-WAU24-750	\$11.00	\$ 11.00	DigiKey	----		\$ -
Power Socket	2.1mm Insulated Socket (must be isolated from case)	1	Mouser	163-4302-E	\$1.38	\$ 1.38	DigiKey	CP-011A-ND	\$ 1.49	\$ 1.49
SPST Switch	Red Pushbutton w/round body & thread		Mouser	10PP422	\$2.35	\$ -	Radio Shack	275-1565	\$ 2.99	\$ -
	Red Pushbutton w/square body & thread	1	Mouser	10PP432	\$2.39	\$ 2.39				
Knob	Silver, Solid Aluminum, 30mm dia	1	ebay/Partspipe		\$5.00	\$ 5.00				
E12 DELAY										
RM1	3.32K ohm	1	Mouser	71-RN55D-F-3.32K	\$0.08	\$ 0.08	DigiKey	CMF3.32KHFACT-ND	\$ 0.17	\$ 0.49
RM2	1M ohm	1	Mouser	71-RN55D-F-1.0M	\$0.08	\$ 0.08	DigiKey	CMF1.00MHFACT-ND	\$ 0.17	\$ 0.49
CM1	47uF, 25V Electrolytic	1	Mouser	140-HTRL25V47-RC	\$0.08	\$ 0.08	DigiKey	493-1300-ND	\$ 0.14	\$ 0.14
CM3	470uF 16V Electrolytic (10mm dia. Max)	1	Mouser	140-HTRL16V470-RC	\$0.17	\$ 0.17	DigiKey	493-1286-ND	\$ 0.29	\$ 0.29
DM1	1N5242B Zener	1	Mouser	78-1N5242B	\$0.03	\$ 0.03	DigiKey	1N5242B-TPCT-ND	\$ 0.75	\$ 0.75
DM2	1N4148	1	Mouser	78-1N4148	\$0.03	\$ 0.03	DigiKey	1N4148FS-ND	\$ 0.07	\$ 0.07
QM1	BD139	1	Mouser	512-BD1396STU	\$0.30	\$ 0.30	DigiKey	BD13916STU-ND	\$ 0.42	\$ 0.42
QM2	MPSA14	1	Mouser	512-MPSA14	\$0.20	\$ 0.20	DigiKey	MPSA14-ND	\$ 0.29	\$ 0.29
G6A	Omron 12V DPDT Relay G6A-234P	1	Mouser	653-G6A-234P-DC12	\$3.67	\$ 3.67	DigiKey	Z106-ND	\$ 4.68	\$ 4.68
BJT Diamond Buffer										
RB1L/R	1K ohm	2	Mouser	71-RN55D-F-1.0K	\$0.08	\$ 0.16	DigiKey	CMF1.00KHFACT-ND	\$ 0.17	\$ 0.34
RB6L/R, RB7L/R	220 ohm	4	Mouser	71-RN55D-F-221	\$0.08	\$ 0.32	DigiKey	CMF221HFCT-ND	\$ 0.17	\$ 0.68
RB2L/R, RB3L/R	10 ohm	4	Mouser	71-RN55D-F-10.2	\$0.10	\$ 0.40	DigiKey	CMF10.2HFCT-ND	\$ 0.17	\$ 0.68
RB10L/R, RB11L/R	2.2 ohm 2W Metal Film	4	Mouser	594-5083NW2R200J	\$0.32	\$ 1.28	DigiKey	P2.2W-2BK-ND	\$ 0.28	\$ 0.98
RB12L/R	2K ohm Trimmer Pot - different value	2	Mouser	72-T93YA-2K	\$1.44	\$ 2.88	DigiKey	490-2880-ND	\$ 0.86	\$ 1.72
RB4L/R, RB5L/R, RB13L/R	100 ohm	6	Mouser	71-RN55D-F-100	\$0.08	\$ 0.48	DigiKey	CMF100HFCT-ND	\$ 0.17	\$ 1.02
RB8L/R, RB9L/R	NOT USED - for MOSFET ONLY - jumper out									
RB14L/R	jumper	2	-		\$0.00	\$ -	-		\$ -	\$ -
	Kiwame 10R (alternate)	2	Beezar.com	KOA/Kiwame 10R 2W	\$0.35	\$ 0.70	Beezar.com	KOA/Kiwame 10R 2W	\$ 0.35	\$ 0.70
QB1L/R	PN4392 Matched for current	1	Beezar.com	PN4392pr	\$2.50	\$ 2.50	DigiKey	PN4392FS-ND	\$ 0.60	\$ 0.60
QB2L/R, QB4L/R, QB6L/R	2N5087 PNP small signal	6	Mouser	512-2N5087 J18Z	\$0.11	-	DigiKey	2N5087-ND	\$ 0.19	\$ 1.14
QB3L/R, QB5L/R, QB7L/R	2N5088 NPN small signal	6	Mouser	512-2N5088TA	\$0.07	-	DigiKey	2N5088BU-ND	\$ 0.18	\$ 1.08
	Matched Small Transistors (preferred alternate)	1	Beezar.com	Matched Transistors	\$2.50	\$ 2.50				

QB8L/R	MJE243 NPN power transistor		Mouser	863-MJE243G	\$0.76	\$ -	DigiKey	MJE243GOS-ND	\$ 0.73	\$ -
(default option)	BD137 NPN power transistor		Mouser	512-BD13716STU	\$0.31	\$ -	DigiKey	non-stock	\$ 0.73	\$ -
QB9L/R	MJE253 PNP power transistor		Mouser	863-MJE253G	\$0.58	\$ -	DigiKey	MJE253GOS-ND	\$ 0.72	\$ -
(default option)	BD138 PNP power transistor		Mouser	512-BD13810STU	\$0.33	\$ -	DigiKey	non-stock	\$ 0.72	\$ -
Special Alternates for Q8/Q9										
a	2SC3421 NPN power transistor	2	Beezar.com	2SC3421	\$1.50	***				
a	2SA1358 PNP power transistor	2	Beezar.com	2SA1358	\$1.50	***				
b	2SC3422 NPN power transistor	2	Beezar.com	2SC3422	\$1.75	\$ 3.50				
b	2SA1359 PNP power transistor	2	Beezar.com	2SA1359	\$1.75	\$ 3.50				
c	2SC2344 NPN power transistor	2	Beezar.com	2SC2344	\$1.25	***				
c	2SA1011 PNP power transistor	2	Beezar.com	2SA1011	\$1.25	***				
d	2SC2238 NPN power transistor	2	Beezar.com	2SC2238	\$2.00	***				
d	2SA968 PNP power transistor	2	Beezar.com	2SA968	\$2.00	***				
Heat Sink	Aavid #531002B02500G (1"h.)	4	Mouser	532-531002B25G	\$1.06	\$ 4.24	DigiKey	HS190-ND	\$ 1.25	\$ 5.00
Heat Sink Kit w/o Shldr Wshr	for Toshiba 2SC3422/2SA1359	4	Beezar.com	HtSkKit-2	\$1.25	\$ 5.00				
ACCESSORIES										
Digital Multimeter	Centech Digital Multimeter	1	Beezar.com	Centech DMM	\$6.50	\$ 6.50	Beezar.com	Centech DMM	\$ 6.50	\$ 42.25
Trimmer Adjustment Tool	Bourns Trimpot Adjustment Tool	1	Beezar.com	H-90	\$2.00	\$ 2.00	Beezar.com	H-90	\$ 2.00	\$ 4.00
ENCLOSURE***										
PCB: approx. 5" x 6"	Lansing		Lansing-Clear	DT1A60-06A1	\$21.37	\$ -	Lansing-Black	DT1K60-06B2	\$ 23.07	\$ -
	Custom Machined Beezar/Lansing MiniMAX Case	1	Beezar.com	MiniMAX Case - Black	\$65.00	\$ 65.00	Beezar.com	MiniMAX Case - Black	\$ 65.00	\$ 65.00
Center Standoff Kit	For Custom Beezar/Lansing case	1	Beezar.com	Beezar Cskit	\$1.00	\$ 1.00			\$ 1.00	\$ 1.00
				TOTAL		\$228.47		TOTAL		(Incomplete)

* These are consensus boutique electrolytic cap positions, the selection choices are many.

** These are consensus boutique film cap positions, the selection choices are many.