

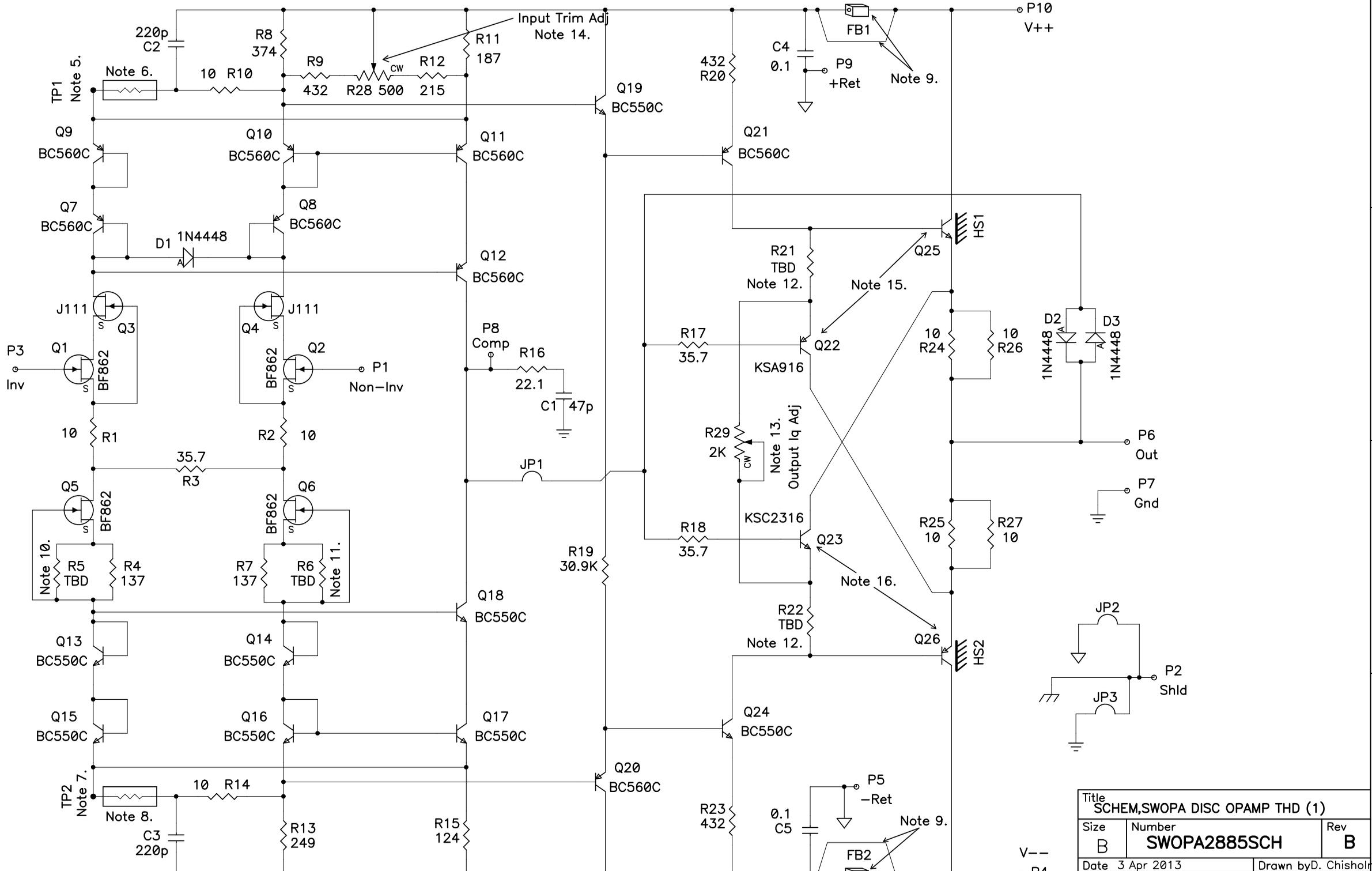
Notes (Unless Otherwise Indicated):

- 16 Provide thermal coupling between Q23 and Q26 by joining Q23 to Q26 with suitable adhesive or spring coupling device.
- 15 Provide thermal coupling between Q22 and Q25 by joining Q22 to Q25 with suitable adhesive or spring coupling device.
- 14 Input Balance Adjustment. Adjust to minimize input offset or overall THD as required by application.
- 13 Adjust for desired output stage bias current, or desired total module current. Typical adjustment values:
- | VARIANT: | Ic Q25/Q26 | Iq (Total) | Min Load Z (Ohms) |
|----------|------------|------------|-------------------|
| -0 | 6.2 mA | 25.0 mA | 600 |
| -1 | 27.8 mA | 47.5 mA | 150 |
- 12 Value sets range of output stage bias adjust. See Parts List.
- 11 Selected value.
Selection criteria: 5 mA idle current through R13
Nominal value 162 ohms. Expected range 20 ohms to 4320 ohms.
- 10 Selected value.
Selection criteria: 10 mA idle current through R15
Nominal value 162 ohms. Expected range 20 ohms to 4320 ohms.
Select after selecting R7
- 9 Cut trace or remove jumper if indicated component is installed.
- 8 For alternative compensation method install R14 in this location rather than location shown.
- 7 Locate TP2 adjacent to R14 so that R14 may be installed either as shown, or in the alternate position between TP2 and C3.
- 6 For alternative compensation method install R10 in this location rather than location shown.
- 5 Locate TP1 adjacent to R10 so that R10 may be installed either as shown, or in the alternate position between TP1 and C2.
- 4 Last Reference Designator used:
C5, D3, FB2, HS2, JU3, P10, Q26, R29
Reference Designator not used: None
- 3 Fixed resistors thin film or metal film, 250 mW min, 1% or better tol, except as noted.
Polarized capacitors aluminum electrolytic, rating as shown, tol +/-20% unless otherwise noted.
Non-polarized capacitors see parts list for construction & rating
- 2 Component values shown for reference only. Refer to parts list associated with specific variant and revision level.
- 1 VARIANTS:
SWOPA2885-0 T092 Output Devices
SWOPA2885-1 T0126 Output Devices (High Bias)

Revision Notes

- B. Schematic rev increased to synchronize with PWB rev.
- A. Preliminary development version of this dwg # and title. Not released. Circulated for comments. Circuit based on Post #2593 and #2643 in "Discrete Opamp Open Design" thread on "diyaudio.com". Available online at <
<http://www.diyaudio.com/forums/analog-line-level/218373-discrete-opa-p-open-design-260.html#post3324000> > and <
<http://www.diyaudio.com/forums/analog-line-level/218373-discrete-opa-p-open-design-265.html#post3344901> >.

Title SCHEM,SWOPA DISC OPAMP THD (1)		
Size B	Number SWOPA2885SCH	Rev B
Date 3 Apr 2013	Drawn by D. Chisholm	
Filename SWOPA_Post2885_B.SCH	Sheet 1 of 2	



Title SCHEM,SWOPA DISC OPAMP THD (1)		
Size B	Number SWOPA2885SCH	Rev B
Date 3 Apr 2013	Drawn by D. Chisholm	
File Name SWOPA_Post2885_B.SCH	Sheet 2 of 2	

Assy Dwg # SWOPA2885ASY
 Dwg Title PCB ASSY,SW-OPA DISC OPAMP THD (1)
 Rev B
 Schem Dwg # SWOPA2885SCH
 Schem Title SCHEM,SWOPA DISC OPAMP THD (1)
 Rev B

Orig Date 6-May-13
 Assy Short Name SWOPA Disc Opamp THD1
 Rev Date 6-May-13
 Orig Date 6-May-13
 Rev Date 6-May-13
 Engineer Dale Chisholm

ITEM	REF DES	DESCRIPTION	Unit of Meas	VARIANT USAGE: -0 -1	ORIGINAL COMPONENT MANUFACTURER				ALTERNATIVE COMPONENT MANUFACTURER											
					Original Part Manufacturer (Pref)		Mfr. Typical Source		Original Part Manufacturer (Alternative)		Alternative Manufacturer Typical Source		LINE COST PER VARIANT:							
					MFR	MFR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	MFR	MFR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	-0	-1		
1	<none>	SW-OPA DISC OPAMP THD(1) PWB	Ea	X X	Pending	SWOPA2885PWB1		TBD	TBD	Pending	SWOPA2885PWB1		TBD	TBD	.0000	.0000				
2	C1	Cap,Film PP 47pF	Ea	X X	WIMA	FKP20100471D00KSSD	.1900	10	Mouser	505-FKP247/1000/10	.1900	.1900	WIMA	FKP20100471D00JSSD	.2886	25	TAW Electronics	FKP20100471D00JSSD	.2886	.2886
3	C2	Cap,Film PP 220pF 100V 5mm	Ea	X X	WIMA	FKP20102201D00JSSD	.2400	10	Mouser	505-FKP2220/1000/5	.2400	.2400	WIMA	FKP20102201D00JSSD	.2821	25	TAW Electronics	FKP20102201D00JSSD	.2821	.2821
4	C3	Cap,Film PP 220pF 100V 5mm	Ea	X X	WIMA	FKP20102201D00JSSD	.2400	10	Mouser	505-FKP2220/1000/5	.2400	.2400	WIMA	FKP20102201D00JSSD	.2821	25	TAW Electronics	FKP20102201D00JSSD	.2821	.2821
5	C4	Cap,Film 0.10uF 63V 5mm	Ea	X X	WIMA	MKS2-.1/63/5	.2000	10	Mouser	505-MKS2.1/63/5	.2000	.2000	Kemet	R82DC3100AA50J	.1510	10	Digi-Key	399-5863-ND	.1510	.1510
6	C5	Cap,Film 0.10uF 63V 5mm	Ea	X X	WIMA	MKS2-.1/63/5	.2000	10	Mouser	505-MKS2.1/63/5	.2000	.2000	Kemet	R82DC3100AA50J	.1510	10	Digi-Key	399-5863-ND	.1510	.1510
7	D1	Diode,Si Switch 100V 200mA 4nSec 1N4448	Ea	X X	NXP Semiconductors	1N4448,113	.0920	1	Digi-Key	568-1361-1-ND	.0920	.0920	Vishay	1N4448TR	.0460	10	Mouser	78-1N4448	.0460	.0460
8	D2	Diode,Si Switch 100V 200mA 4nSec 1N4448	Ea	X X	NXP Semiconductors	1N4448,113	.0920	1	Digi-Key	568-1361-1-ND	.0920	.0920	Vishay	1N4448TR	.0460	10	Mouser	78-1N4448	.0460	.0460
9	D3	Diode,Si Switch 100V 200mA 4nSec 1N4448	Ea	X X	NXP Semiconductors	1N4448,113	.0920	1	Digi-Key	568-1361-1-ND	.0920	.0920	Vishay	1N4448TR	.0460	10	Mouser	78-1N4448	.0460	.0460
10	FB1	Bead,Ferrite Interference Supp 96 Ohms/25 MHz, 0.5A	Ea	X X	Fair-Rite	2743007112	.1200	1	Mouser	623-2743007112	.1200	.1200	Panasonic	EXCELSA39	.1400	1	Digi-Key	P9818NK-ND	.1400	.1400
11	FB2	Bead,Ferrite Interference Supp 96 Ohms/25 MHz, 0.5A	Ea	X X	Fair-Rite	2743007112	.1200	1	Mouser	623-2743007112	.1200	.1200	Panasonic	EXCELSA39	.1400	1	Digi-Key	P9818NK-ND	.1400	.1400
12	HS1	Heatsink,TO126 Clip On	Ea	X	Aavid Thermalloy	577500B00000G	.4000	1	Digi-Key	HS216_ND		.4000	Assmann WSW	V2110B	.4300	1	Digi-Key	A10750-ND		.4300
13	HS1	Heatsink,TO126 Clip On	Ea	X	Aavid Thermalloy	577500B00000G	.4000	1	Digi-Key	HS216_ND		.4000	Assmann WSW	V2110B	.4300	1	Digi-Key	A10750-ND		.4300
14	JP1	Jumper,Wire, 0.35" x 26AWG Solid	Ea	X X	Belden	9976 009100	.0077	100	FT Mouser	566-9976-100-09	.0077	.0077	General Cable/Carol	C2117A,12.02	.0076	100	FT Digi-Key	C2117W-100-ND	.0076	.0076
15	JP2	Jumper,Wire, 0.35" x 26AWG Solid	Ea	X X	Belden	9976 009100	.0077	100	FT Mouser	566-9976-100-09	.0077	.0077	General Cable/Carol	C2117A,12.02	.0076	100	FT Digi-Key	C2117W-100-ND	.0076	.0076
16	JP3	Jumper,Wire, 0.35" x 26AWG Solid	Ea	X X	Belden	9976 009100	.0077	100	FT Mouser	566-9976-100-09	.0077	.0077	General Cable/Carol	C2117A,12.02	.0076	100	FT Digi-Key	C2117W-100-ND	.0076	.0076
17	P1	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
18	P2	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
19	P3	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
20	P4	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
21	P5	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
22	P6	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
23	P7	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
24	P8	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
25	P9	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
26	P10	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	X X	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	.2200	.2200	Cambion	460-2627-2					.0000	.0000
27	Q1	XSTR,BF862 N-JFET Hi-Gm RF SOT23	Ea	X X	NXP Semiconductors	BF862,215	.2700	1	Mouser	771-BF862-T/R	.2700	.2700	NXP Semiconductors	BF862,215	.3790	10	Digi-Key	568-1968-1-ND	.3790	.3790
28	Q2	XSTR,BF862 N-JFET Hi-Gm RF SOT23	Ea	X X	NXP Semiconductors	BF862,215	.2700	1	Mouser	771-BF862-T/R	.2700	.2700	NXP Semiconductors	BF862,215	.3790	10	Digi-Key	568-1968-1-ND	.3790	.3790
29	Q3	XSTR,N-JFET J111 Hi-Vp Switch TO-92	Ea	X X	Fairchild	J111	.1600	1	Mouser	512-J111	.1600	.1600	Fairchild	J111	.4900	1	Digi-Key	J111FS-ND	.4900	.4900
30	Q4	XSTR,N-JFET J111 Hi-Vp Swtch TO-92	Ea	X X	Fairchild	J111	.1600	1	Mouser	512-J111	.1600	.1600	Fairchild	J111	.4900	1	Digi-Key	J111FS-ND	.4900	.4900
31	Q5	XSTR,BF862 N-JFET Hi-Gm RF SOT23	Ea	X X	NXP Semiconductors	BF862,215	.2700	1	Mouser	771-BF862-T/R	.2700	.2700	NXP Semiconductors	BF862,215	.3790	10	Digi-Key	568-1968-1-ND	.3790	.3790
32	Q6	XSTR,BF862 N-JFET Hi-Gm RF SOT23	Ea	X X	NXP Semiconductors	BF862,215	.2700	1	Mouser	771-BF862-T/R	.2700	.2700	NXP Semiconductors	BF862,215	.3790	10	Digi-Key	568-1968-1-ND	.3790	.3790
33	Q7	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
34	Q8	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
35	Q9	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
36	Q10	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
37	Q11	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
38	Q12	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
39	Q13	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
40	Q14	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
41	Q15	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
42	Q16	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
43	Q17	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
44	Q18	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
45	Q19	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712
46	Q20	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000
47	Q21	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	X X	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.1100	.1100	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.1000	.1000

ITEM	REF DES	DESCRIPTION	Unit of Meas	VARIANT USAGE:		Original Part Manufacturer (Pref)		Mfrg. Typical Source			LINE COST PER VARIANT:			Original Part Manufacturer (Alternative)		Alternative Manufacturer Typical Source			LINE COST PER VARIANT:										
				-0	-1	MFGR	MFGR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	-0	-1	MFGR	MFGR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	-0	-1								
48	Q22	XSTR_KSA918 PNP 120V 800 mA Driver TO-92L ECB Pinout	Ea	X	X	Fairchild	KSA916YTA	.1600	1	Mouser	512-KSA916YTA	.1600	.1600	Fairchild	KSA916YTA	.5600	1	Digi-Key	KSA916YTA-ND	.5600	.5600								
49	Q23	XSTR_KSC2316 NPN 120V 800 mA Driver TO-92L ECB Pinout	Ea	X	X	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0573	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0573								
50	Q24	XSTR_BC550 NPN 45V 100 mA HI-HFE Low Noise TO-92	Ea	X	X	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.0500	.0500	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	.1712	.1712								
51	Q25	XSTR_KSC2316 NPN 120V 800 mA Driver TO-92L ECB Pinout	Ea	X		Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573		Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573									
52	Q25	XSTR_KSC2690A NPN 160V 1.2 A Med Pwr TO-126	Ea	X	X	Fairchild	KSC2690AYS	.3800	1	Mouser	512-KSC2690AYS	.3800		Fairchild	KSC2690AYS	.5400	1	Digi-Key	KSC2690AYSFS-ND	.5400									
53	Q26	XSTR_KSA918 PNP 120V 800 mA Driver TO-92L ECB Pinout	Ea	X		Fairchild	KSA916YTA	.1600	1	Mouser	512-KSA916YTA	.1600		Fairchild	KSA916YTA	.5600	1	Digi-Key	KSA916YTA-ND	.5600									
54	Q26	XSTR_KSA1220A PNP 160V 1.2 A Med Pwr TO-126	Ea	X	X	Fairchild	KSA1220AYS	.3700	1	Mouser	512-KSA1220AYS	.3700		Fairchild	KSA1220AYS	.4300	1	Digi-Key	KSA1220AYSFS-ND	.4300									
55	R1	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
56	R2	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
57	R3	Res.Metal Film 1/4W 1% RN60 35.7 ohm	Ea	X	X	Vishay/Dale	RN60D35R7FB14	.1100	1	Mouser	71-RN60D35R7F	.1100	.1100	Vishay/Dale	CMF5535R700FHEB	.5890	10	Digi-Key	CMF35.7HFCT-ND	.5890	.5890								
58	R4	Res.Metal Film 1/4W 1% RN60 137 ohm	Ea	X	X	Vishay/Dale	RN60D1370FB14	.1100	1	Mouser	71-RN60D-F-137	.1100	.1100	Vishay/Dale	CMF55137R00FHEB	.5890	10	Digi-Key	CMF137HFCT-ND	.5890	.5890								
59	R5	Res.Metal Film 1/4W 1% RN60 Selected Value	Ea	X	X	Vishay/Dale	RN60D****FB14	.3300	1	Mouser	TBD	.3300	.3300	Vishay/Dale	CMF55****0FHEB	.5890	10	Digi-Key	TBD	.5890	.5890								
60	R6	Res.Metal Film 1/4W 1% RN60 Selected Value	Ea	X	X	Vishay/Dale	RN60D****FB14	.3300	1	Mouser	TBD	.3300	.3300	Vishay/Dale	CMF55****0FHEB	.5890	10	Digi-Key	TBD	.5890	.5890								
61	R7	Res.Metal Film 1/4W 1% RN60 137 ohm	Ea	X	X	Vishay/Dale	RN60D1370FB14	.1100	1	Mouser	71-RN60D-F-137	.1100	.1100	Vishay/Dale	CMF55137R00FHEB	.5890	10	Digi-Key	CMF137HFCT-ND	.5890	.5890								
62	R8	Res.Metal Film 1/4W 1% RN60 374 ohm	Ea	X	X	Vishay/Dale	RN60D3740FB14	.1100	1	Mouser	71-RN60D3740F	.1100	.1100	Vishay/Dale	CMF55374R00FHEB	.5890	10	Digi-Key	CMF374HFCT-ND	.5890	.5890								
63	R9	Res.Metal Film 1/4W 1% RN60 432 ohm	Ea	X	X	Vishay/Dale	RN60D4320FB14	.1100	1	Mouser	71-RN60D-F-432	.1100	.1100	Vishay/Dale	CMF55432R00FHEB	.5890	10	Digi-Key	CMF432HFCT-ND	.5890	.5890								
64	R10	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
65	R11	Res.Metal Film 1/4W 1% RN60 187 ohm	Ea	X	X	Vishay/Dale	RN60D1870FB14	.2000	1	Mouser	71-RN60D1870F	.2000	.2000	Vishay/Dale	CMF55187R00FHEB	.5890	10	Digi-Key	CMF187HFCT-ND	.5890	.5890								
66	R12	Res.Metal Film 1/4W 1% RN60 215 ohm	Ea	X	X	Vishay/Dale	RN60D2150FB14	.1100	1	Mouser	71-RN60D-F-215	.1100	.1100	Vishay/Dale	CMF55215R00FHEB	.5890	10	Digi-Key	CMF215HFCT-ND	.5890	.5890								
67	R13	Res.Metal Film 1/4W 1% RN60 249 ohm	Ea	X	X	Vishay/Dale	RN60D2490FB14	.1100	1	Mouser	71-RN60D-F-249	.1100	.1100	Vishay/Dale	RN60D2490FB14	.2723	100	Digi-Key	1135-1590-MIL	.2723	.2723								
68	R14	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
69	R15	Res.Metal Film 1/4W 1% RN60 124 ohm	Ea	X	X	Vishay/Dale	RN60D1240FB14	.1100	1	Mouser	71-RN60D-F-124	.1100	.1100	Vishay/Dale	CMF55124R00FHEB	.5890	10	Digi-Key	CMF124HFCT-ND	.5890	.5890								
70	R16	Res.Metal Film 1/4W 1% RN60 22.1 ohm	Ea	X	X	Vishay/Dale	RN60D22R1FB14	.1100	1	Mouser	71-RN60D-F-22.1	.1100	.1100	Vishay/Dale	CMF5522R100FHEB	.4660	10	Digi-Key	CMF22.1HGCT-ND	.4660	.4660								
71	R17	Res.Metal Film 1/4W 1% RN60 35.7 ohm	Ea	X	X	Vishay/Dale	RN60D35R7FB14	.1100	1	Mouser	71-RN60D35R7F	.1100	.1100	Vishay/Dale	CMF5535R700FHEB	.5890	10	Digi-Key	CMF35.7HFCT-ND	.5890	.5890								
72	R18	Res.Metal Film 1/4W 1% RN60 35.7 ohm	Ea	X	X	Vishay/Dale	RN60D35R7FB14	.1100	1	Mouser	71-RN60D35R7F	.1100	.1100	Vishay/Dale	CMF5535R700FHEB	.5890	10	Digi-Key	CMF35.7HFCT-ND	.5890	.5890								
73	R19	Res.Metal Film 1/4W 1% RN60 30.9K ohm	Ea	X	X	Vishay/Dale	RN60D3092FB14	.2000	1	Mouser	71-RN60D-F-30.9K	.2000	.2000	Vishay/Dale	CMF5530K900FHEB	.5890	10	Digi-Key	CMF30.9KHCT-ND	.5890	.5890								
74	R20	Res.Metal Film 1/4W 1% RN60 432 ohm	Ea	X	X	Vishay/Dale	RN60D4320FB14	.1100	1	Mouser	71-RN60D-F-432	.1100	.1100	Vishay/Dale	CMF55432R00FHEB	.5890	10	Digi-Key	CMF432HFCT-ND	.5890	.5890								
75	R21	Res.Metal Film 1/4W 1% RN60 27.4 ohm	Ea	X		Vishay/Dale	RN60D27R4FB14	.1100	1	Mouser	71-RN60D-F-27.4	.1100		Vishay/Dale	CMF5527R400FHEB	.5890	10	Digi-Key	CMF27.4HFCT-ND	.5890									
76	R21	Res.Metal Film 1/4W 1% RN60 90.9 ohm	Ea	X		Vishay/Dale	RN60D90R9FB14	.1100	1	Mouser	71-RN60D-F-90.9		.1100	Vishay/Dale	CMF5590R900FHEB	.5890	10	Digi-Key	CMF90.9HFCT-ND		.5890								
77	R22	Res.Metal Film 1/4W 1% RN60 27.4 ohm	Ea	X		Vishay/Dale	RN60D27R4FB14	.1100	1	Mouser	71-RN60D-F-27.4	.1100		Vishay/Dale	CMF5527R400FHEB	.5890	10	Digi-Key	CMF27.4HFCT-ND		.5890								
78	R22	Res.Metal Film 1/4W 1% RN60 90.9 ohm	Ea	X		Vishay/Dale	RN60D90R9FB14	.1100	1	Mouser	71-RN60D-F-90.9		.1100	Vishay/Dale	CMF5590R900FHEB	.5890	10	Digi-Key	CMF90.9HFCT-ND		.5890								
79	R23	Res.Metal Film 1/4W 1% RN60 432 ohm	Ea	X	X	Vishay/Dale	RN60D4320FB14	.1100	1	Mouser	71-RN60D-F-432	.1100	.1100	Vishay/Dale	CMF55432R00FHEB	.5890	10	Digi-Key	CMF432HFCT-ND	.5890	.5890								
80	R24	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
81	R25	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
82	R25	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
83	R27	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	X	X	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.1100	.1100	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	.2723	.2723								
84	R28	Trimpot,Multiturn, Top Adj, 3/8" Thru Hole 500 ohms	Ea	X	X	Vishay/Sfernice	T93YB501KT20	1.4400	1	Mouser	72-T93YB-500	1.4400	1.4400	BI Technologies	67YR500LF	1.4000	1	Digi-Key	987-1618-ND	1.4000	1.4000								
85	R29	Trimpot,Multiturn, Top Adj, 3/8" Thru Hole 2000 ohms	Ea	X	X	Vishay/Sfernice	T93YB202KT20	1.5800	1	Mouser	72-T93YB-2K	1.5800	1.5800	BI Technologies	67YR2KLF	1.4000	1	Digi-Key	987-1506-ND	1.4000	1.4000								
86	TB1	PWB Design Feature Only. No Physical Part.	Ea	X	X	N/A	N/A	N/A	N/A	N/A	N/A	.0000	.0000	N/A	N/A	N/A	N/A	N/A	N/A	.0000	.0000								
87	TB2	PWB Design Feature Only. No Physical Part.	Ea	X	X	N/A	N/A	N/A	N/A	N/A	N/A	.0000	.0000	N/A	N/A	N/A	N/A	N/A	N/A	.0000	.0000								
88																													
89																													
90																													
91																													
92																													
93																													
Component Parts Cost:											\$13.534	\$14.866	\$0.000	\$0.000	Component Parts Cost:											\$23.226	\$24.438	\$0.000	\$0.000

Asy Dwg # SWOPA2885ASY
 Dwg Title PCB ASSY,SW-OPA DISC OPAMP THD (1)
 Rev B
 Schem Dwg # SWOPA2885SCH
 Schem Title SCHEM,SWOPA DISC OPAMP THD (1)
 Rev B

Orig Date 6-May-13
 Asy Short Name SWOPA Disc Opamp THD1
 Rev Date 6-May-13
 Orig Date 6-May-13
 Rev Date 6-May-13
 Engineer Dale Chisholm

ITEM	REF DES	DESCRIPTION	Unit of Meas	QTY PER VER:		PREFERRED MANUFACTURER				LINE COST PER VERSION:		ALTERNATE MANUFACTURER				LINE COST PER VERSION:					
				-0	-1	Original Part MFR	Manufacturer (Pref) MFR P/N	Unit Cost	Purch Qty	Typical Source Vendor	Vendor P/N	-0	-1	Original Part MFR	Manufacturer (Alt) MFR P/N	Unit Cost	Purch Qty	Typical Source Vendor	Vendor P/N	-0	-1
1	<none>	SW-OPA DISC OPAMP THD(1) PWB	Ea	1	1	Pending	SWOPA2885PWB1			TBD	TBD	.0000	.0000	Pending	SWOPA2885PWB1			TBD	TBD	.0000	.0000
2	C1	Cap.Film PP 47pF	Ea	1	1	WIMA	FKP2O100471D00KSSD	.1900	10	Mouser	505-FKP247/1000/10	.1900	.1900	WIMA	FKP2O100471D00JSSD	.2886	25	TAW Electronics	FKP2O100471D00JSSD	.2886	.2886
3	C2, C3	Cap.Film PP 220pF 100V 5mm	Ea	2	2	WIMA	FKP2O102201D00JSSD	.2400	10	Mouser	505-FKP2220/1000/5	.4800	.4800	WIMA	FKP2O102201D00JSSD	.2821	25	TAW Electronics	FKP2O102201D00JSSD	.5642	.5642
4	C4, C5	Cap.Film 0.10uF 63V 5mm	Ea	2	2	WIMA	MKS2-.1/63/5	.2000	10	Mouser	505-MKS2.1/63/5	.4000	.4000	Kemet	R82DC3100AA50J	.1510	10	Digi-Key	399-5863-ND	.3020	.3020
5	D1, D2, D3	Diode,Si Switch 100V 200mA 4nSec 1N4448	Ea	3	3	NXP Semiconductors	1N4448,113	.0920	1	Digi-Key	568-1361-1-ND	.2760	.2760	Vishay	1N4448TR	.0460	10	Mouser	78-1N4448	.1380	.1380
6	FB1, FB2	Bead,Ferrite Interference Supp 96 Ohms/25 MHz, 0.5A	Ea	2	2	Fair-Rite	2743007112	.1200	1	Mouser	623-2743007112	.2400	.2400	Panasonic	EXCELSA39	.1400	1	Digi-Key	P9818NK-ND	.2800	.2800
7	HS1, HS2	Heatsink,TO126 Clip On	Ea	0	2	Aavid Thermalloy	577500B00000G	.4000	1	Digi-Key	HS216_ND	.0000	.8000	Assmann WSW	V2110B	.4300	1	Digi-Key	A10750-ND	.0000	.8600
8	JP1, JP2, JP3	Jumper,Wire, 0.35" x 26AWG Solid	Ea	3	3	Belden	9976 009100	.0077	100 FT	Mouser	566-9976-100-09	.0231	.0231	General Cable/Carol	C2117A.12.02	.0076	100 FT	Digi-Key	C2117W-100-ND	.0228	.0228
9	P1, P2, P3, P4, P5, P6, P7, P8, P9, P10	Pin,0.040" Contact, Staked, 0.043" Mtg Hole, 0.170" Standoff, 0.062" PWB	Ea	10	10	Mill-Max	3125-2-00-00-00-00-08-0	.2200	10	Mouser	575-3125200000000	2.2000	2.2000	Cambion	460-2627-2					.0000	.0000
10	Q1, Q2, Q5, Q6	XSTR,BF862 N-JFET Hi-Gm RF SOT23	Ea	4	4	NXP Semiconductors	BF862,215	.2700	1	Mouser	771-BF862-T/R	1.0800	1.0800	NXP Semiconductors	BF862,215	.3790	10	Digi-Key	568-1968-1-ND	1.5160	1.5160
11	Q3, Q4	XSTR,N-JFET J111 Hi-Vp Switch TO-92	Ea	2	2	Fairchild	J111	.1600	1	Mouser	512-J111	.3200	.3200	Fairchild	J111	.4900	1	Digi-Key	J111FS-ND	.9800	.9800
12	Q7, Q8, Q9, Q10, Q11, Q12, Q20, Q21	XSTR,BC560 PNP 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	8	8	Fairchild	BC560CTA	.1100	1	Mouser	512-BC560CTA	.8800	.8800	ON Semiconductor	BC560CG	.1000	1	Mouser	863-BC560CG	.8000	.8000
13	Q13, Q14, Q15, Q16, Q17, Q18, Q19, Q24	XSTR,BC550 NPN 45V 100 mA Hi-HFE Lo-Noise TO-92	Ea	8	8	Fairchild	BC550CBU	.0500	1	Mouser	512-BC550CBU	.4000	.4000	ON Semiconductor	BC550CG	.1712	25	Digi-Key	BC550CGOS-ND	1.3696	1.3696
14	Q22	XSTR,KSA916 PNP 120V 800 mA Driver TO-92L ECB Pinout	Ea	1	1	Fairchild	KSA916YTA	.1600	1	Mouser	512-KSA916YTA	.1600	.1600	Fairchild	KSA916YTA	.5600	1	Digi-Key	KSA916YTA-ND	.5600	.5600
15	Q23	XSTR,KSC2316 NPN 120V 800 mA Driver TO-92L ECB Pinout	Ea	1	1	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0573	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0573
16	Q25	XSTR,KSC2316 NPN 120V 800 mA Driver TO-92L ECB Pinout	Ea	1	0	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0000	Fairchild	KSC2316YTA	.0573	1	Arrow	KSC2316YTA	.0573	.0000
17	Q25	XSTR,KSC2690A NPN 160V 1.2 A Med Pwr TO-126	Ea	0	1	Fairchild	KSC2690AYS	.3800	1	Mouser	512-KSC2690AYS	.0000	.3800	Fairchild	KSC2690AYS	.5400	1	Digi-Key	KSC2690AYSFS-ND	.0000	.5400
18	Q26	XSTR,KSA916 PNP 120V 800 mA Driver TO-92L ECB Pinout	Ea	1	0	Fairchild	KSA916YTA	.1600	1	Mouser	512-KSA916YTA	.1600	.0000	Fairchild	KSA916YTA	.5600	1	Digi-Key	KSA916YTA-ND	.5600	.0000
19	Q26	XSTR,KSA1220A PNP 160V 1.2 A Med Pwr TO-126	Ea	0	1	Fairchild	KSA1220AYS	.3700	1	Mouser	512-KSA1220AYS	.0000	.3700	Fairchild	KSA1220AYS	.4300	1	Digi-Key	KSA1220AYSFS-ND	.0000	.4300
20	R1, R2, R10, R14, R24, R25, R26, R27	Res.Metal Film 1/4W 1% RN60 10.0 ohm	Ea	8	8	Vishay/Dale	RN60D10R0FRE6	.1100	1	Mouser	71-RN60D-F-10/R	.8800	.8800	Vishay/Dale	RN60D10R0FB14	.2723	100	Digi-Key	1135-1563-MIL	2.1784	2.1784
21	R3, R17, R18	Res.Metal Film 1/4W 1% RN60 35.7 ohm	Ea	3	3	Vishay/Dale	RN60D35R7FB14	.1100	1	Mouser	71-RN60D35R7F	.3300	.3300	Vishay/Dale	CMF5535R700FHEB	.5890	10	Digi-Key	CMF35.7HFCT-ND	1.7670	1.7670
22	R4, R7	Res.Metal Film 1/4W 1% RN60 137 ohm	Ea	2	2	Vishay/Dale	RN60D1370FB14	.1100	1	Mouser	71-RN60D-F-137	.2200	.2200	Vishay/Dale	CMF55137R00FHEB	.5890	10	Digi-Key	CMF137HFCT-ND	1.1780	1.1780
23	R5	Res.Metal Film 1/4W 1% RN60 Selected Value	Ea	1	1	Vishay/Dale	RN60D****FB14	.3300	1	Mouser	TBD	.3300	.3300	Vishay/Dale	CMF55****0FHEB	.5890	10	Digi-Key	TBD	.5890	.5890
24	R6	Res.Metal Film 1/4W 1% RN60 Selected Value	Ea	1	1	Vishay/Dale	RN60D****FB14	.3300	1	Mouser	TBD	.3300	.3300	Vishay/Dale	CMF55****0FHEB	.5890	10	Digi-Key	TBD	.5890	.5890
25	R8	Res.Metal Film 1/4W 1% RN60 374 ohm	Ea	1	1	Vishay/Dale	RN60D3740FB14	.1100	1	Mouser	71-RN60D3740F	.1100	.1100	Vishay/Dale	CMF55374R00FHEB	.5890	10	Digi-Key	CMF374HFCT-ND	.5890	.5890

ITEM	REF DES	DESCRIPTION	Unit of Meas	QTY PER VER:		Original Part Manufacturer (Pref)		Pref. Mfgr. Typical Source			LINE COST PER VERSION:		Original Part Manufacturer (Alt)		Alternate Manufacturer Typical Source				LINE COST PER VERSION:												
				-0	-1	MFGFR	MFGFR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	-0	-1	MFGFR	MFGFR P/N	Unit Cost	Purch Qty	Vendor	Vendor P/N	-0	-1										
26	R9, R20, R23	Res.Metal Film 1/4W 1% RN60 432 ohm	Ea	3	3	Vishay/Dale	RN60D4320FB14	.1100	1	Mouser	71-RN60D-F-432	.3300	.3300	Vishay/Dale	CMF55432R00FHEB	.5890	10	Digi-Key	CMF432HFCT-ND	1.7670	1.7670										
27	R11	Res.Metal Film 1/4W 1% RN60 187 ohm	Ea	1	1	Vishay/Dale	RN60D1870FB14	.2000	1	Mouser	71-RN60D1870F	.2000	.2000	Vishay/Dale	CMF55187R00FHEB	.5890	10	Digi-Key	CMF187HFCT-ND	.5890	.5890										
28	R12	Res.Metal Film 1/4W 1% RN60 215 ohm	Ea	1	1	Vishay/Dale	RN60D2150FB14	.1100	1	Mouser	71-RN60D-F-215	.1100	.1100	Vishay/Dale	CMF55215R00FHEB	.5890	10	Digi-Key	CMF215HFCT-ND	.5890	.5890										
29	R13	Res.Metal Film 1/4W 1% RN60 249 ohm	Ea	1	1	Vishay/Dale	RN60D2490FB14	.1100	1	Mouser	71-RN60D-F-249	.1100	.1100	Vishay/Dale	RN60D2490FB14	.2723	100	Digi-Key	1135-1590-MIL	.2723	.2723										
30	R15	Res.Metal Film 1/4W 1% RN60 124 ohm	Ea	1	1	Vishay/Dale	RN60D1240FB14	.1100	1	Mouser	71-RN60D-F-124	.1100	.1100	Vishay/Dale	CMF55124R00FHEB	.5890	10	Digi-Key	CMF124HFCT-ND	.5890	.5890										
31	R16	Res.Metal Film 1/4W 1% RN60 22.1 ohm	Ea	1	1	Vishay/Dale	RN60D22R1FB14	.1100	1	Mouser	71-RN60D-F-22.1	.1100	.1100	Vishay/Dale	CMF5522R100FHEB	.4660	10	Digi-Key	CMF22.1HGCT-ND	.4660	.4660										
32	R19	Res.Metal Film 1/4W 1% RN60 30.9K ohm	Ea	1	1	Vishay/Dale	RN60D3092FB14	.2000	1	Mouser	71-RN60D-F-30.9K	.2000	.2000	Vishay/Dale	CMF5530K900FHEB	.5890	10	Digi-Key	CMF30.9KHCT-ND	.5890	.5890										
33	R21, R22	Res.Metal Film 1/4W 1% RN60 27.4 ohm	Ea	2	0	Vishay/Dale	RN60D27R4FB14	.1100	1	Mouser	71-RN60D-F-27.4	.2200	.0000	Vishay/Dale	CMF5527R400FHEB	.5890	10	Digi-Key	CMF27.4HFCT-ND	1.1780	.0000										
34	R21, R22	Res.Metal Film 1/4W 1% RN60 90.9 ohm	Ea	0	2	Vishay/Dale	RN60D90R9FB14	.1100	1	Mouser	71-RN60D-F-90.9	.0000	.2200	Vishay/Dale	CMF5590R900FHEB	.5890	10	Digi-Key	CMF90.9HFCT-ND	.0000	1.1780										
35	R28	Trimpot,Multiturn, Top Adj, 3/8" Thru Hole 500 ohms	Ea	1	1	Vishay/Sfernice	T93YB501KT20	1.4400	1	Mouser	72-T93YB-500	1.4400	1.4400	BI Technologies	67YR500LF	1.4000	1	Digi-Key	987-1618-ND	1.4000	1.4000										
36	R29	Trimpot,Multiturn, Top Adj, 3/8" Thru Hole 2000 ohms	Ea	1	1	Vishay/Sfernice	T93YB202KT20	1.5800	1	Mouser	72-T93YB-2K	1.5800	1.5800	BI Technologies	67YR2KLF	1.4000	1	Digi-Key	987-1506-ND	1.4000	1.4000										
37	TB1	PWB Design Feature Only. No Physical Part.	Ea	1	1	N/A	N/A	.0000	1	N/A	N/A	.0000	.0000	N/A	N/A	.0000	1	N/A	N/A	.0000	.0000										
38	TB2	PWB Design Feature Only. No Physical Part.	Ea	1	1	N/A	N/A	.0000	1	N/A	N/A	.0000	.0000	N/A	N/A	.0000	1	N/A	N/A	.0000	.0000										
39																															
Component Parts Cost:												\$13.534	\$14.866	\$0.000	\$0.000	Component Parts Cost:												\$23.226	\$24.438	\$0.000	\$0.000