EB-TA2022

CLASS-T DIGITAL AUDIO AMPLIFIER 2 CHANNEL TA2022 EVALUATION BOARD

Technical Information **Revision 1.0 – March 2002**

GENERAL DESCRIPTION

The EB-TA2022 Version 4.0 is a stereo 100W per channel audio amplifier designed to provide a simple and straightforward environment for the evaluation of the TA2022 amplifier. This evaluation board includes a circuit that will automatically trim any DC offset at the output and a relay. For additional documentation on the TA2022, see the TA2022 Data Sheet.

APPLICATIONS

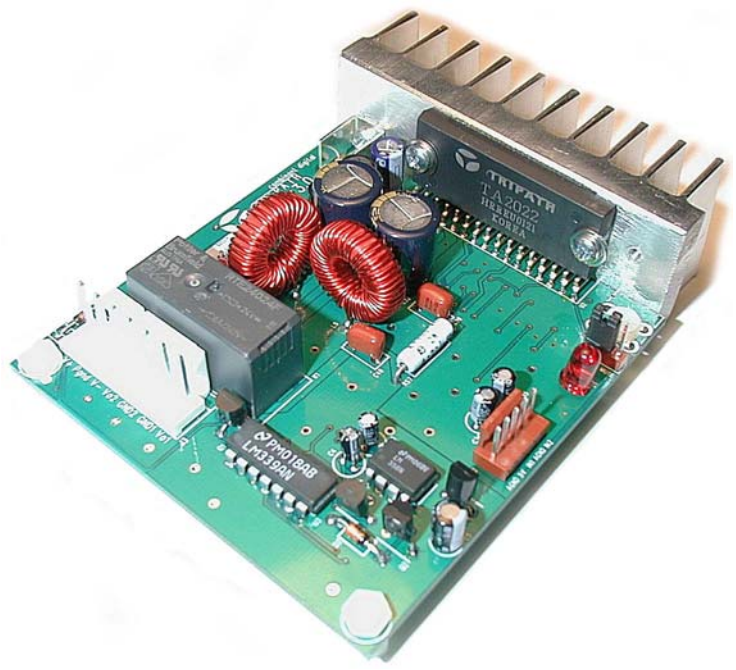
- Mini/Micro Component Systems
- Home Theater Receivers
- Car stereo head units & trunk amplifiers
- Powered DVD Systems

BENEFITS

- More power per cubic inch for 100W per channel design
- Simplifies thermal management
- Signal Quality comparable to linear amplifiers
- Simple building block for multi-channel design

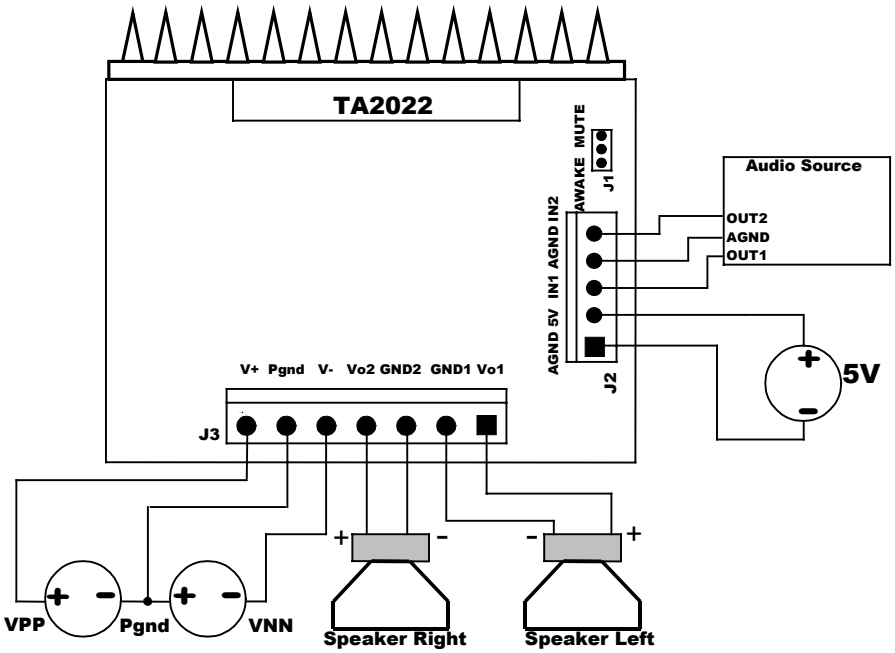
FEATURES

- High Power: 100W @ 4Ω, 1.0% THD+N
- Low Noise Floor: 150uV A-weighted
- Low Distortion: .02% THD+N @ 75W, 4Ω
- High Efficiency: 92% for 8Ω loads
  87% for 4Ω loads
- Dynamic Range = 102dB
- Over-Current Protection
- Over and Under Voltage Protection
- Over Temperature Protection
- Single Ended Outputs



OPERATING INSTRUCTIONS

BOARD CONNECTION DIAGRAM



Three external power supplies are required to operate the EB-TA2022: VPP, VNN (referenced to Pgnd), and 5V (referenced to Agnd). The VPP and VNN form a split rail supply referenced to Pgnd. The 5V ground (Agnd) must be kept separate from the VPP and VNN ground (Pgnd). Agnd and Pgnd are joined at a common point on the EB-TA2022 near headers J2 and J3.

Minimum and Maximum supply voltages are +/-20V and +/-36V, respectively, depending on the load impedance. It is not recommended that the EB-TA2022 be operated above +/-31V when driving 4Ω loads, single ended, as the internal current limit circuit may activate, causing the amplifier to mute.

The VPP and VNN power supply connection, J3, is through a 7-Pin 0.156” spaced header. The female terminal housing for this header is Molex 09-50-8071. Please see TABLE 2 for header connections.

The 5V power supply connection, J2, is through a 5-Pin 0.100” spaced header. The female terminal housing for this header is Molex 22-01-2057. Please see TABLE 1 for header connections.

TABLE 1

J2 Connector Pin#	Connection
Pin1	Agnd
Pin2	5V
Pin3	IN1
Pin4	Agnd
Pin5	IN2

TABLE 2

J3 Connector Pin#	Connection
Pin1	Vo1
Pin2	GND1
Pin3	GND2
Pin4	Vo2
Pin5	VNN
Pin6	Pgnd
Pin7	VPP

OUTPUT

The output connection for each channel of the EB-TA2022 is made at pins 1 – 4 of header J3. The output of the TA2022 is single-ended, therefore each output has a positive output (Vo1 and Vo2) and a ground (GND1 and GND2).

INPUT

The input connection for each channel of the EB-TA2022 is made at pins 3 – 5 of header J2. The left and right inputs should be connected to IN1 (pin3) and IN2 (pin5). These inputs share a common ground referenced to Agnd (pin4).

JUMPER SETTINGS

There is a 3-pin header for the MUTE control of the TA2022. With the jumper placed in the AWAKE position the part is un-muted by grounding (AGND) the mute pin. When the jumper is placed in the MUTE position the mute pin is pulled high (5V) and the amplifier is muted.

OUTPUT OFFSET NULL AND RELAY

There is an automatic offset trim circuit for each channel using an LM358 op-amp. Once the LM358 trims any DC to 0Vdc a comparator allows a relay to close.

GAIN SETTING

The gain of the EB_TA2022 Version 4.0 is set to 18V/V. The gain of the TA2022 is the product of the input stage and the modulator stage. The input stage gain is set to unity. Before changing the gain of the TA2022, please refer to the TA2022 Amplifier Gain section of the TA2022 Data Sheet.

Performing Measurements on the EB-TA2022 Version 4.0

The TA2022 operates by generating a high frequency switching signal based on the audio input. This signal is sent through a low-pass filter that recovers an amplified version of the audio input. The frequency of the switching pattern is spread spectrum in nature and typically varies between 100kHz and 1MHz, which is well above the 20Hz – 20kHz audio band. The pattern itself does not alter or distort the audio input signal, but it does introduce some inaudible components.

The measurements of certain performance parameters, particularly noise related specifications such as THD+N, are significantly affected by the design of the low-pass filter used on the output as well as the bandwidth setting of the measurement instrument used. Unless the filter has a very sharp roll-off just beyond the audio band or the bandwidth of the measurement instrument is limited, some of the inaudible noise components introduced by the TA2022 amplifier switching pattern will degrade the measurement by including out of band (audio) energy.

One feature of the TA2022 is that it does not require large multi-pole filters to achieve excellent performance in listening tests, usually a more critical factor than performance measurements. Though using a multi-pole filter may remove high-frequency noise and improve THD+N type measurements (when they are made with wide-bandwidth measuring equipment), these same filters degrade frequency response. The EB-TA2022 has a simple two-pole output filter with excellent performance in listening tests.
(See Application Note 4 for additional information on bench testing)

Contact Information

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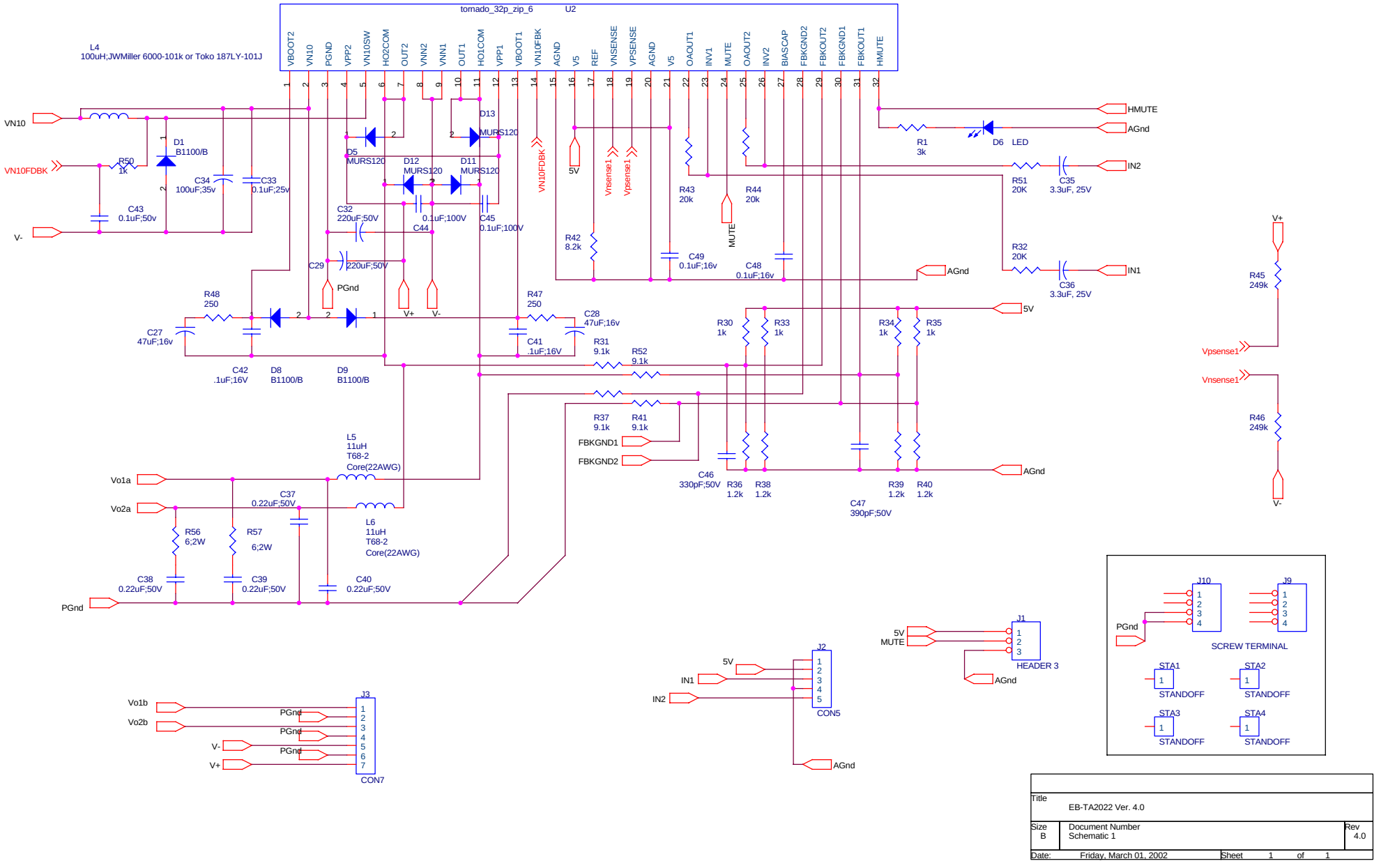
For more Technical Information, please visit us @ www.tripath.com/data.htm

EB-TA2022 Ver. 4.0 Revised: Thursday, December 09, 2004
Bill Of Materials

Item	Quantity	Reference	Value	PCB Footprint	Rating	Tolerance	Manufacturer	Manufacturer Part #	Source	Source Part #
1	4	C4,C6,C35,C36	3.3uF	cape\100\200		25V	Panasonic	ECE-A1EKK3R3	Digikey	P972-ND
2	1	C5	22uF, 10V	cape\100\200		10V	Panasonic	ECE-A1AKS220	Digikey	P960-ND
3	4	C7,C8,C9,C10	0.1uF;50V	cap0805	X7R	50V	Murata	GRM21BR71H104KA01L	Digikey	490-1666-1-ND
4	2	C28,C27	47uF;16v	cape\100\200		16V	Panasonic	ECE-A1CKA470	Digikey	P810-ND
5	2	C32,C29	220uF;50V	cape\200\400	Low ESR	50V	Panasonic	EEU-FC1H221S	Digikey	P10326-ND
6	2	C43,C33	0.1uF;50V	0805	X7R	50V	Murata	GRM21BR71H104KA01L	Digikey	490-1666-1-ND
7	1	C34	100uF;35v	cape\100\200						
8	4	C37,C38,C39,C40	0.22uF;50V	cap200		50V	Panasonic	ECQ-V1H224JL	Digikey	P4667-ND
9	4	C41,C42,C48,C49	.1uF;16V	0805	X7R	16V	Murata	GRM219R71C104KA01D	Digikey	490-1683-2-ND
10	2	C44,C45	0.1uF;100V	1206	X7R	100V	Kemet	C1206C104K1RACTU	Digikey	399-1805-2-ND
11	1	C46	330pF;50V	0805	X7R	50V	Yageo	08052R331K9B20D	Digikey	311-1192-2-ND
12	1	C47	390pF;50V	0805	X7R	50V	Yageo	08052R391K9B20D	Digikey	311-1193-2-ND
13	3	D1,D8,D9	B1100/B	SMA	1A	100V	Diodes Inc.	B1100-13	Digikey	B1100DITR-ND
14	1	D2	1N5235	do41	500mW	6.8V	Diodes Inc.	1N5235B-T	Digikey	1N5235BDICT-ND
15	1	D3	1n4148	do41			Diodes Inc.	1N4148-T	Digikey	1N4148DICT-ND
16	1	D4	1N5243	do41	500mW	13V	Diodes Inc.	1N5243B-T	Digikey	1N5243BDICT-ND
17	4	D5,D11,D12,D13	MURS120	SMB	1A	200V	ON Semi	MURS120T3	Digikey	MURS120T3OSTR-ND
18	1	D6	LED							
19	1	J1	CON3, .100" Header	SIP-3P			Molex	22-03-2031	Digikey	WM4001-ND
20	1	J2	CON5, .100" Header	5HEADER_INA			Molex	22-23-2051	Digikey	WM4203-ND
21	1	J3	CON7, .156" Header	HDR7P156-125C75C			Molex	26-60-4070	Digikey	WM4625-ND
22	2	J10,J9	SCREW TERMINAL	TERM_SCREW			Keystone	8190	Digikey	8190K-ND
23	1	K1	DPDT RELAY	RLY-RLY11-DPDT			Tyco	RTE24024F	Digikey	PB297-ND
24	1	L4	100uH	ind\200\400			Toko	187LY-101J	Digikey	TK4300-ND
25	2	L6,L5	11uH	16RHBPA		10A			American Cores	AW690-44T-22-V
26	3	Q1,Q2,Q4	2N7000	TO-92			Fairchild	2N7000	Digikey	2N7000FS-ND
27	1	Q3	2N3906	TO-92			Fairchild	2N3906BU	Digikey	2N3906FS-ND
28	1	R1	3k	0805						
29	5	R2,R10,R12,R14,R15	50K	RES0805						
30	3	R3,R11,R13	100k	RES0805						
31	1	R4	200k	RES0805						
32	1	R5	80.6k;1%	RES0805						
33	1	R6	250k	RES0805						
34	1	R7	24.9k;1%	RES0805						
35	1	R8	15.0k;1%	RES0805						
36	1	R9	35k	RES0805						
37	1	R16	300	RES0805						
38	1	R17	3k	RES0805						
39	2	R19,R18	10k	RES0805						
40	4	R30,R33,R34,R35	1k;1%	0805						
41	4	R31,R37,R41,R52	9.1k:1%	0805						
42	4	R32,R43,R44,R51	20K	0805						
43	4	R36,R38,R39,R40	1.2k;1%	0805						
44	1	R42	8.25k, 1%	0805						
45	2	R46,R45	249k;1%	0805						
46	2	R47,R48	250	0805						
47	1	R50	1k	0805						
48	1	R56	6;2W	res-1/2w	2W		Panasonic	ERX-2SJ6R2A	Digikey	P6.2W-2BK-ND
49	1	R57	6;2W	res-1/2w	2W		Panasonic	ERX-2SJ6R2A	Digikey	P6.2W-2BK-ND
50	4	STA1,STA2,STA3,STA4	STANDOFF	STANDOFF_440			Keystone	4801	Digikey	4801K-ND
51	1	U1	LM358	DIP8			TI	LM358P	Digikey	296-1395-5-ND
52	1	U2	tornado_32p_zip_6	DIP-32P-STAGGERAAAA					Tripath Technology	TA2022
53	1	U3	LM339	DIP14			TI	LM339N	Digikey	296-1393-5-ND
54	4		standoff nut						Digikey	H616-ND
55	2		screw terminal screw						Digikey	H342-ND
56	2		TA2022 washer						Digikey	H734-ND
57			TA2022 screw						Digikey	H781-ND

TA2022-100



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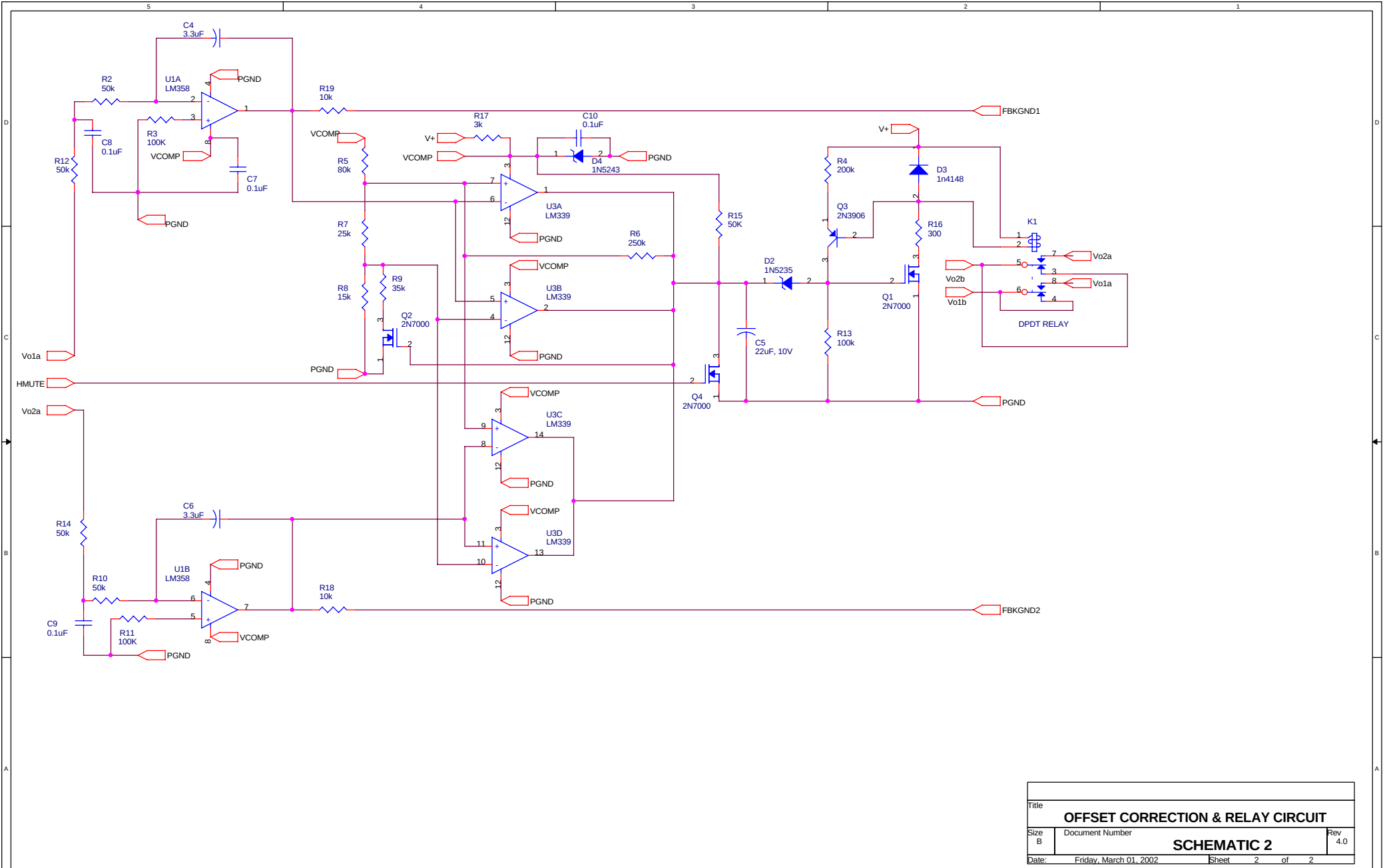
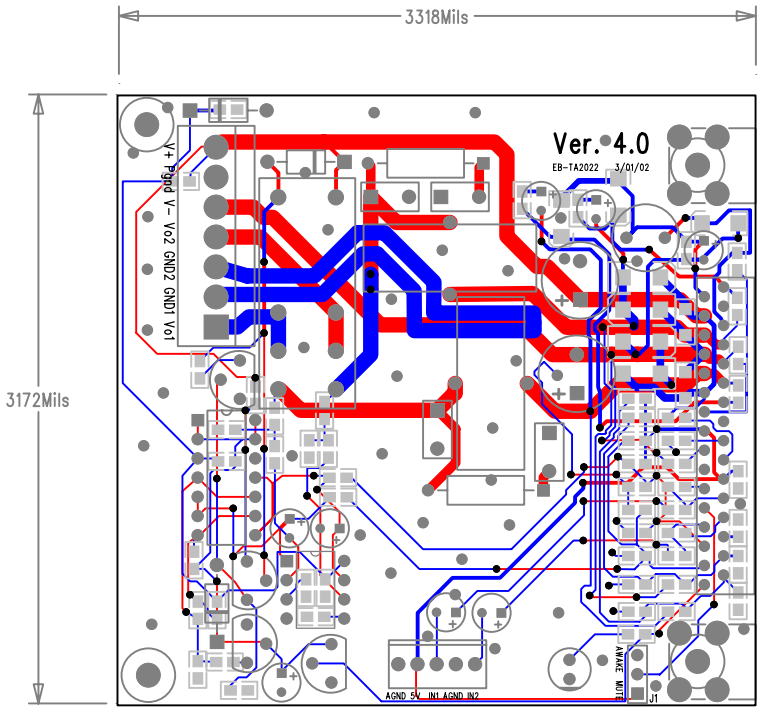
Size B	Document Number Schematic 1	Rev 4.0
Date: Friday, March 01, 2002	Sheet 1 of 1	



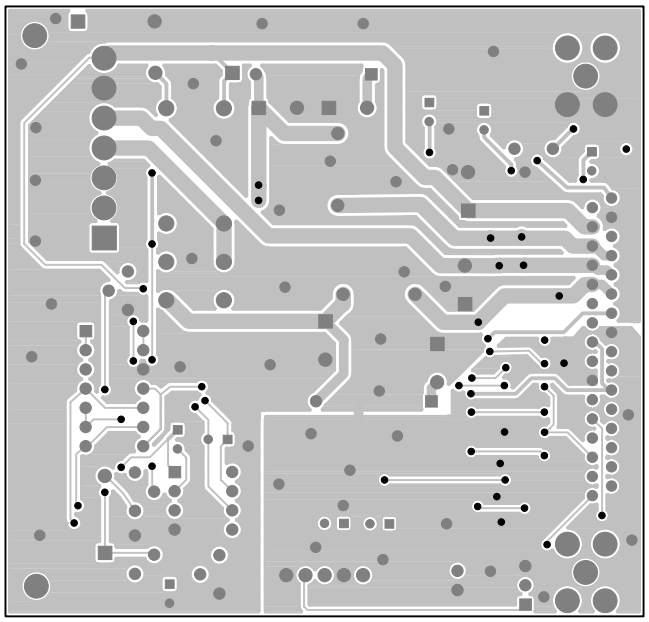
Title	OFFSET CORRECTION & RELAY CIRCUIT	
Size B	Document Number SCHEMATIC 2	Rev 4.0
Date: Friday, March 01, 2002	Sheet 2 of 2	



FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
2 OZ COPPER, ALL LAYERS

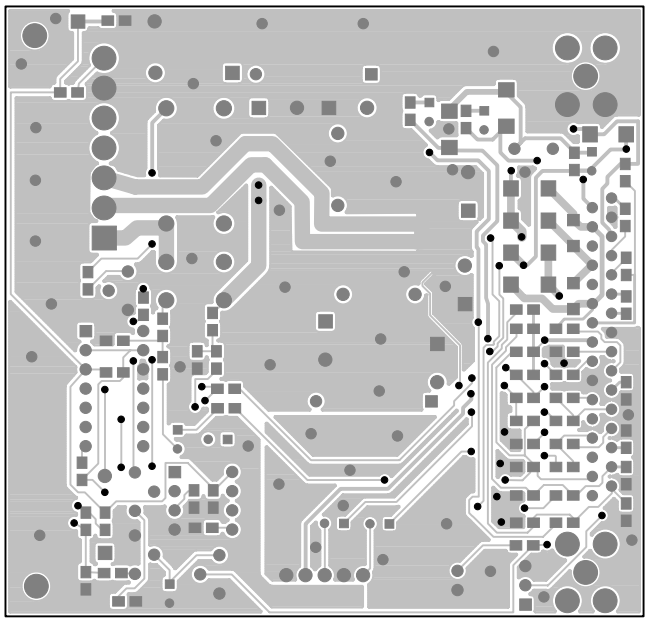
VIEWED FROM TOP SIDE
COMPOSITE DRAWING

Top Trace RED
Bottom Trace BLUE
Top Component DARK GRAY
Bottom Component LIGHT GRAY



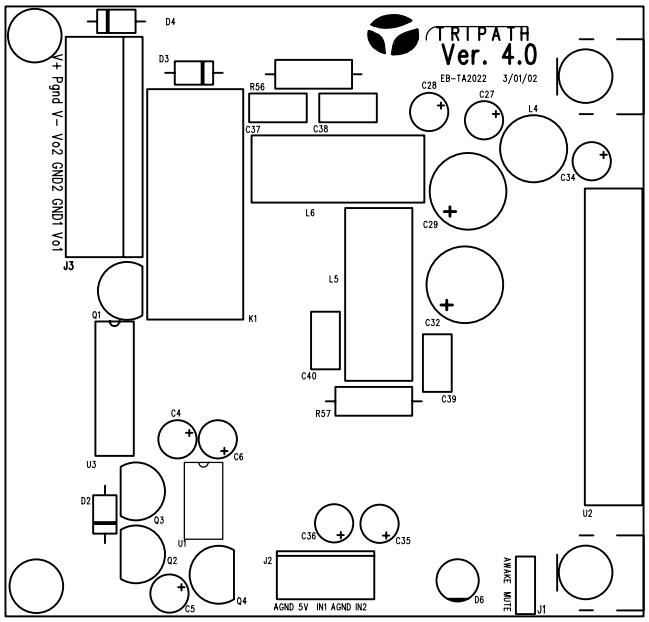
FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
2 OZ COPPER, ALL LAYERS

VIEWED FROM TOP SIDE
TOP SIDE ETCH



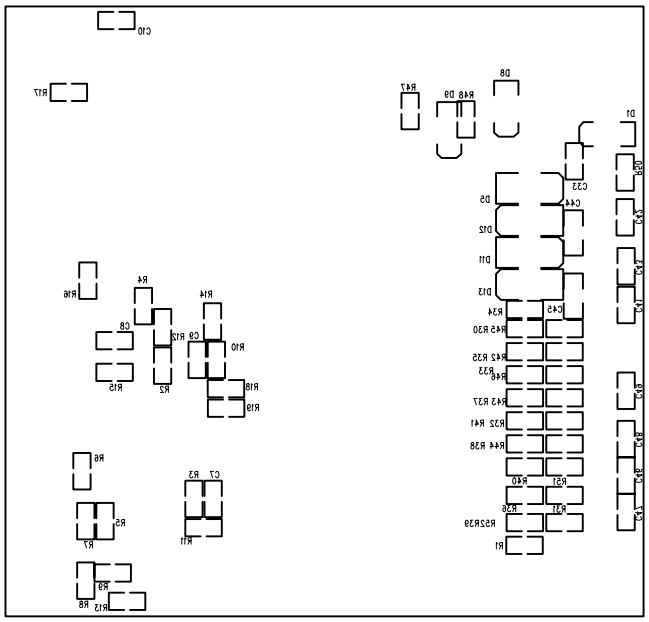
FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
2 OZ COPPER, ALL LAYERS

VIEWED FROM TOP SIDE
BOTTOM SIDE ETCH



FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
2 OZ COPPER, ALL LAYERS

VIEWED FROM TOP SIDE
SILKSCREEN TOP



FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
2 OZ COPPER, ALL LAYERS

VIEWED FROM TOP SIDE
SILKSCREEN BOTTOM