RB-TA2022

CLASS-T DIGITAL AUDIO AMPLIFIER 2 CHANNEL TA2022 REFERENCE DESIGN

Technical Information – Board Rev. 2.2 **Revision 1.1 – JUNE 2005**

GENERAL DESCRIPTION

The RB TA2022 Version 2.2 is a stereo 100W per channel audio amplifier in a slim 3" X 3" footprint (including heat sink) designed to provide a simple and straightforward environment for the evaluation of the TA2022 amplifier. For additional documentation on the TA2022, see the TA2022 Data Sheet.

APPLICATIONS

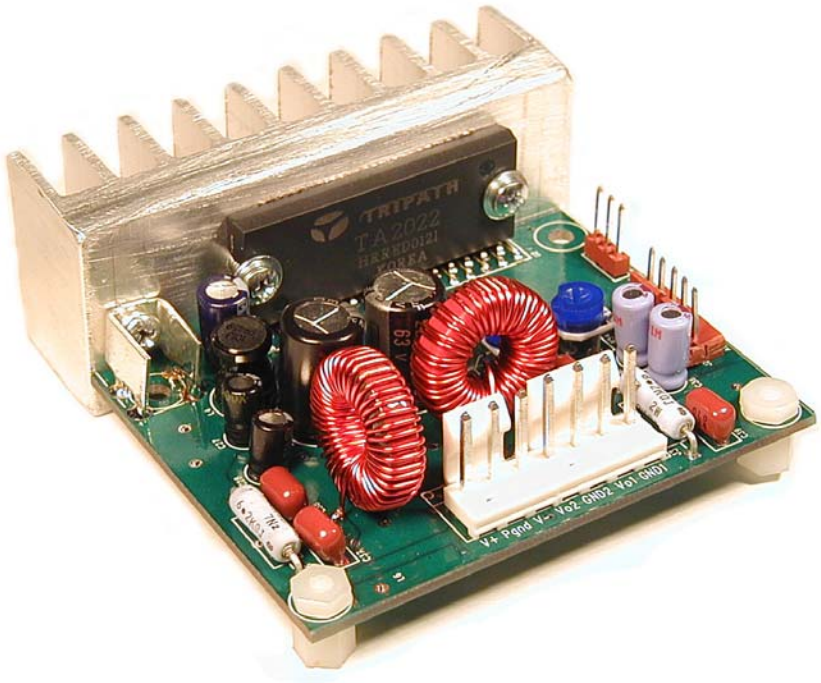
- Mini/Micro Component Systems
- Home Theater Receivers
- Car stereo head units & trunk amplifiers
- Powered DVD Systems

BENEFITS

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

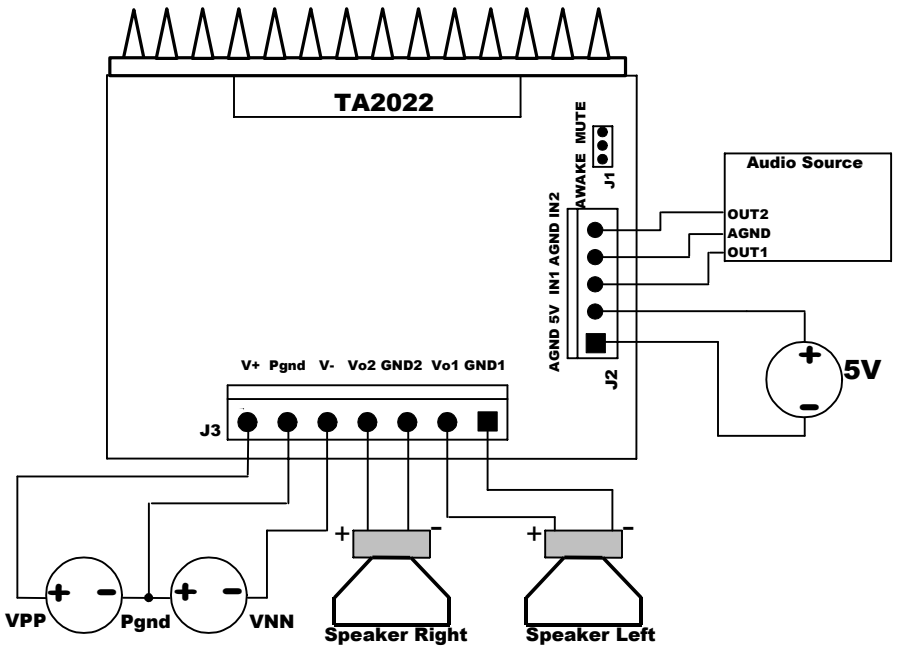
FEATURES

- 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 RB-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 RB-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 RB-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	GND1
Pin2	Vo1
Pin3	GND2
Pin4	Vo2
Pin5	VNN
Pin6	Pgnd
Pin7	VPP

OUTPUT

The output connection for each channel of the RB-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 RB-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

There are two potentiometers, R54 and R55 that are used to manually trim the output offset to 0V.

GAIN SETTING

The gain of the RBTA2022 Version 2.2 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 RBTA2022 Version 2.2

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 RB-TA2022 has a simple two-pole output filter with excellent performance in listening tests.
(See Application Note 4 for additional information on bench testing)

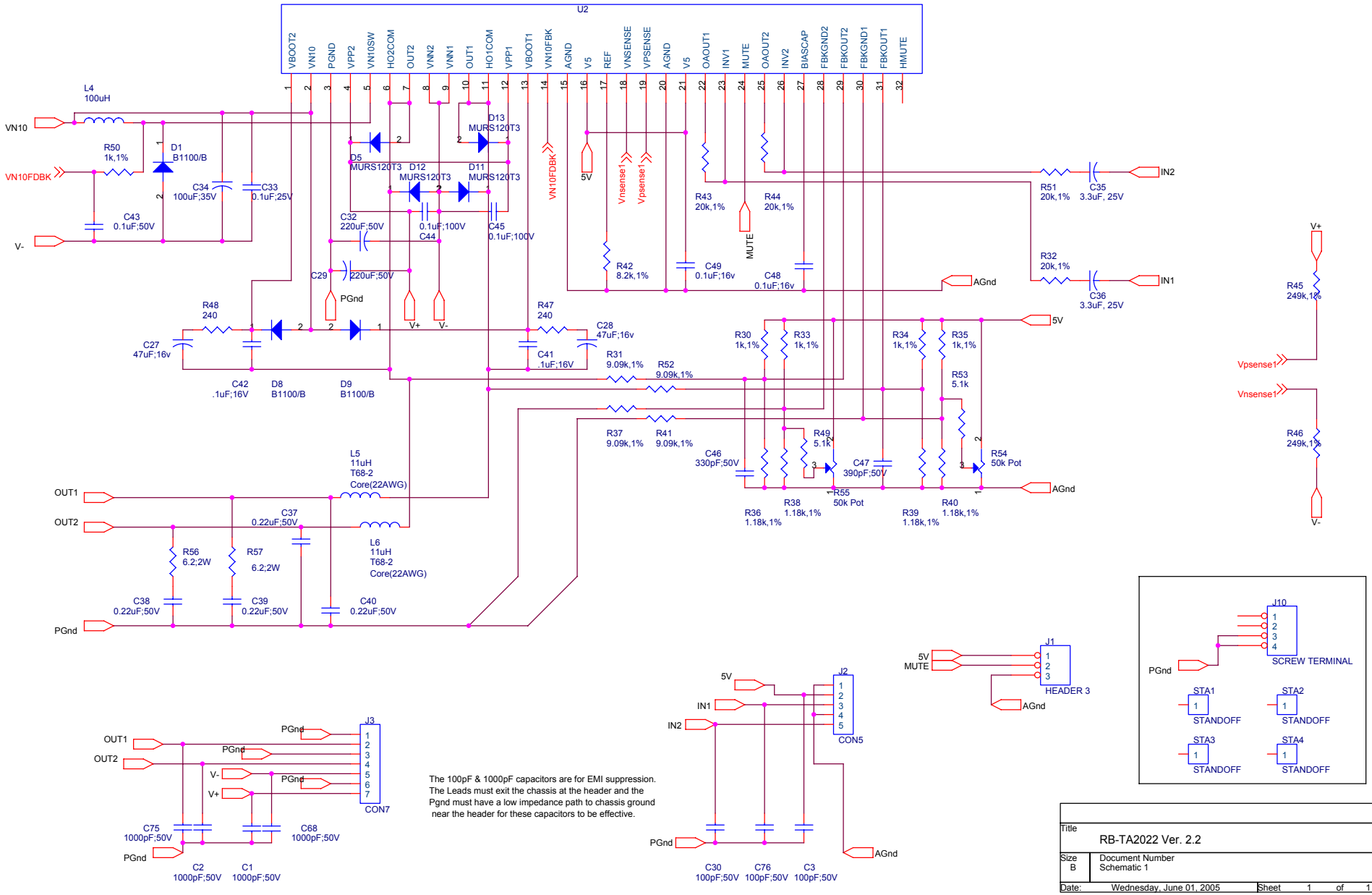
Contact Information

TRIPATH TECHNOLOGY, INC

2560 Orchard Parkway, San Jose, CA 95131
408.750.3000 - P
408.750.3001 - F

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

TA2022-100



The 100pF & 1000pF capacitors are for EMI suppression. The Leads must exit the chassis at the header and the Pgnd must have a low impedance path to chassis ground near the header for these capacitors to be effective.

Title	RB-TA2022 Ver. 2.2	
Size B	Document Number Schematic 1	Rev 2.2
Date: Wednesday, June 01, 2005	Sheet 1 of 1	

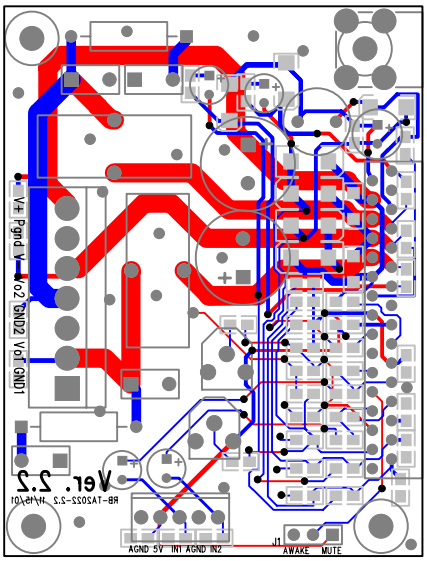
Bill Of Materials & basic costing, component sourcing (does not include TA2022, heatsink, connectors, PCB)
BOM RB-TA2022 Rev. 2.3 Revised: Tuesday, May 31, 2005
Board revision RB-TA2022 rev. 2.2

									VOLUME 1			Alternate Source				
Item	**Quantity**	**Reference**	**Value**	**Rating**	**Manufacturer**	**Manufacturer Part #**	**Source**	**Source Part #**	**unit price**	**X quantity**	**min qty**	**Unit Price**	**X quantity**	**min qty**	**Source**	**Part #**
1	4	C1,C2,C68,C75	1000pF;50V	50V	Panasonic	ECJ-2VC1H102J	Digikey	PCC102CGCT-ND	$0.026	$0.104	1000		$0.000			
2	3	C3,C30,C76	100pF;50V	50V	Panasonic	ECJ-2VC1H101J	Digikey	PCC101CGCT-ND	$0.017	$0.051	1000		$0.000			
3	2	C27,C28	47uF;16v	16V	Panasonic	ECE-A1CKA470	Digikey	P810-ND	$0.035	$0.070	1000		$0.000			
4	2	C29,C32	220uF;50V	Low ESR	Panasonic	EEU-FM1H221 *	Digikey	P12397-ND	$0.146	$0.292	1000	$0.095	$0.190	1000	Panasonic	Same
5	1	C33	0.1uF;25V	25V	Panasonic	ECJ-1VB1E104K	Digikey	PCC2277CT-ND	$0.056	$0.056	1000		$0.000			
6	1	C34	100uF;35V	35V	Panasonic	ECA-1VM101	Digikey	P5165-ND	$0.039	$0.039	1000		$0.000			
7	2	C35,C36	3.3uF, 25V	25V	Panasonic	ECE-A1EKK3R3	Digikey	P972-ND	$0.059	$0.118	1000		$0.000			
8	4	C37,C38,C39,C40	0.22uF;50V	50V	Panasonic	ECQ-V1H224JL	Digikey	P4667-ND	$0.067	$0.268	1000	$0.045	$0.180	1000	Panasonic	Same
9	2	C42,C41	.1uF;16V	16V	Panasonic	ECJ-2VB1C104K	Digikey	PCC1812CT-ND	$0.030	$0.060	1000		$0.000			
10	1	C43	0.1uF;50V	50V	Panasonic	ECJ-2YB1H104K	Digikey	PCC1840TR-ND	$0.056	$0.056	2000		$0.000			
11	2	C44,C45	0.1uF;100V	100V	AVX	12101C104KAT2A	Digikey	478-1614-2-ND	$0.180	$0.360	4000	$0.046	$0.092	4000	Avnet	Same
12	1	C46	330pF;50V	50V	Panasonic	ECJ-2VC1H331J	Digikey	PCC331CGCT-ND	$0.017	$0.017	1000		$0.000			
13	1	C47	390pF;50V	50V	Panasonic	ECJ-2VC1H391J	Digikey	PCC391CGCT-ND	$0.017	$0.017	1000		$0.000			
14	2	C48,C49	0.1uF;16v	16V	Panasonic	ECJ-2VB1C104K	Digikey	PCC1812CT-ND	$0.030	$0.060	1000		$0.000			
15	3	D1,D8,D9	B1100/B	100V	Diodes Inc	B1100-13	Digikey	B1100DITR-ND	$0.268	$0.804	5000	$0.100	$0.300	5000	Avnet	Same
16	4	D5,D11,D12,D13	MURS120	1A/200V	Diodes Inc	MURS120T3	Digikey	MURS120T3OSCT-ND	$0.116	$0.464	1000	$0.091	$0.364	2500	Avnet	Same
17	1	J1	HEADER 3							$0.000			$0.000			
18	1	J2	CON5			22-23-2051	Digikey	WM4203-ND		$0.000			$0.000			
19	1	J3	CON7			26-60-4070	Digikey	WM4625-ND		$0.000			$0.000			
20	1	J10	SCREW TERMINAL							$0.000			$0.000			
21	1	L4	100uH	200mA	Toko	#187LY-101J	Digikey	#187LY-101J-ND	$0.450	$0.450	100	$0.280	$0.280	1000	ISI	RL187-101K***
22	2	L5,L6	11uH	10A	American Cores	AW690-06-44T-22-V**	American Cores	AW690-06-44T-22-V	$0.890	$1.780	1000	$0.250	$0.500	10000	American Cores	Same
23	5	R30,R33,R34,R35,R50	1k,1%		Panasonic	ERJ-3EKF1001V	Digikey	P1.00KHCT-ND	$0.020	$0.100	1000		$0.000			
24	4	R31,R37,R41,R52	9.09k,1%		Panasonic	ERJ-6ENF9091V	Digikey	P9.09KCCT-ND	$0.019	$0.076	1000		$0.000			
25	4	R32,R43,R44,R51	20k,1%		Panasonic	ERJ-6ENF2002V	Digikey	P20.0KCCT-ND	$0.019	$0.076	1000		$0.000			
26	4	R36,R38,R39,R40	1.18k,1%		Panasonic	ERJ-3EKF1181V	Digikey	P1.18KHCT-ND	$0.019	$0.076	1000		$0.000			
27	1	R42	8.2k,1%		Panasonic	ERJ-6ENF8251V	Digikey	P8.25KCCT-ND	$0.019	$0.019	1000		$0.000			
28	2	R45,R46	249k,1%		Panasonic	ERJ-6ENF2493V	Digikey	P249KCCT-ND	$0.019	$0.038	1000		$0.000			
29	2	R48,R47	240		Panasonic	ERJ-6GEYJ241V	Digikey	P240ACT-ND	$0.016	$0.032	1000		$0.000			
30	2	R49,R53	5.1k		Panasonic	ERJ-6GEYJ512V	Digikey	P5.1KACT-ND	$0.016	$0.032	1000		$0.000			
31	2	R55,R54	50k Pot		Bourns Inc.	3306P-1-503	Digikey	3306P-503-ND	$0.247	$0.494	1000	$0.130	$0.260	2000	Avnet	Same
32	2	R56,R57	6.2;2W		Panasonic	ERX-2SJ6R2	Digikey	P6.2W-2BK-ND	$0.080	$0.160	1000	$0.039	$0.078	1000	Panasonic	Same
33	4	STA1,STA2,STA3,STA4	STANDOFF				Digikey	4801K-ND/H616-ND		$0.000			$0.000			
34	1	U2	tornado_32p_zip_6		Tripath Technology	TA2022	Tripath			$0.000			$0.000			

*Other 220uF, 100V low ESR electrolytics include Panasonic EEU-FC1H221, Nichicon UHE1H221MPD

**American Cores AW690-06-44T-22-V is a 680 Mil outer diameter Carbonyl-E toroidal core wound with 44 turns of 22 AWG. Contact Julie Yuan (714)850-4660 OR jyuan@amidon-inductive .com.
American Cores will provide quick (2 week) lead times on small volume orders which are assembled domestically. Large volume orders (2500+ piece) are assembled overseas and typically have 4-6 week lead times.
Other wound core choices include Datatronic DR77055. For info visit www.datatronics.com and type "Tripath" into the search field.
Other wound core choices include Toko C3B-A0349. Contact Bob Nau (408)432-8281 OR bnau@tokoam.com

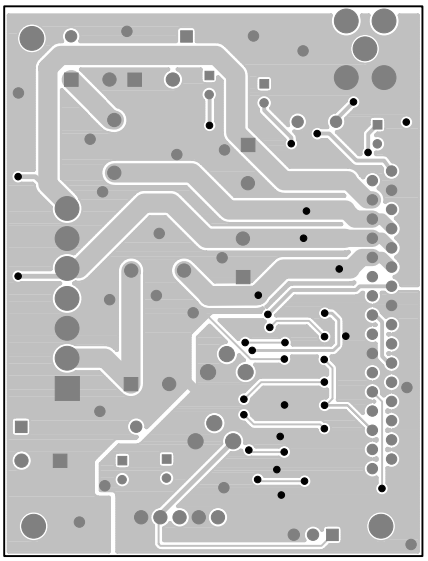
***ISI RL187-101K is equivalent to Toko 187LY-101J. For info on ISI products contact Debbie Hocker (714)999-9555 OR debbieh@inductorsupply.com.



VIEWED FROM TOP SIDE COMPOSITE DRAWING

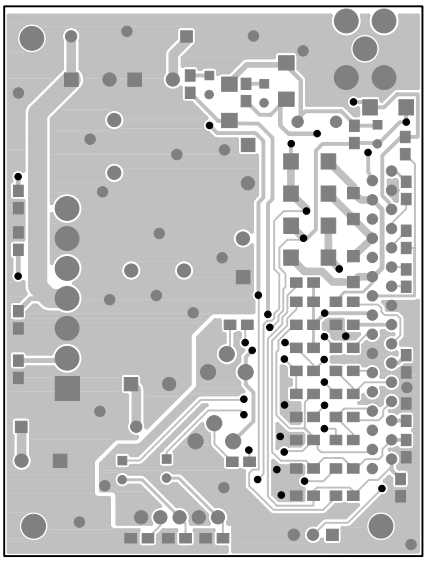
Top Trace RED
Bottom Trace BLUE
Top Component DARK GRAY
Bottom Component LIGHT GRAY

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



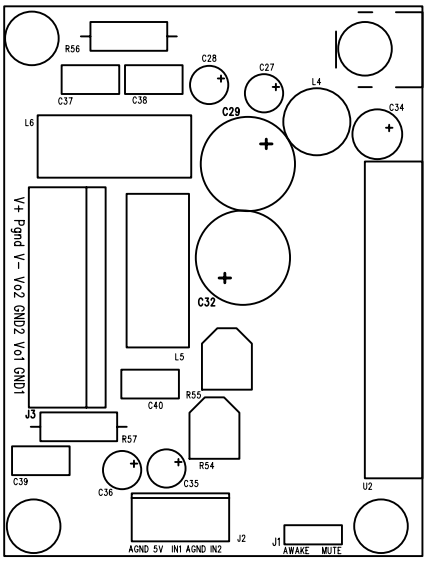
VIEWED FROM TOP SIDE
TOP SIDE ETCH

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



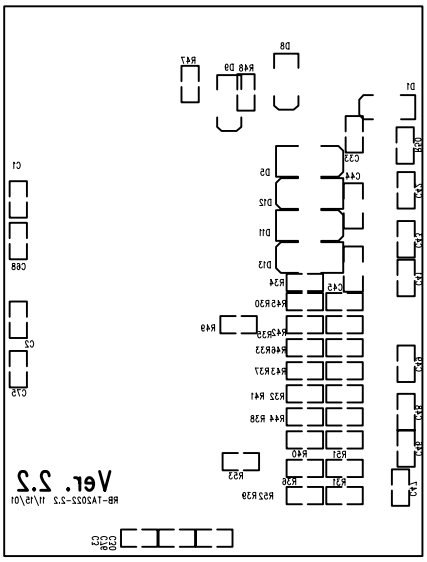
VIEWED FROM TOP SIDE
BOTTOM SIDE ETCH

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

FABRICATION NOTES
DOUBLE SIDED BOARD
MATERIAL: .062 FR-4
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