



## RB-TK2050 PARALLEL CLASS-T DIGITAL AUDIO AMPLIFIER 1 CHANNEL TK2050 REFERENCE BOARD

Technical Information- Board Rev. 1.0

Revision 1.0 – November 2002

### GENERAL DESCRIPTION

The RB-TK2050 Parallel Reference is a single supply, 110W, single channel amplifier designed to provide a simple and straightforward environment for the evaluation of the TK2050 as a mono amplifier. For additional documentation on the TK2050, see the TK2050 Data Sheet.

### APPLICATIONS

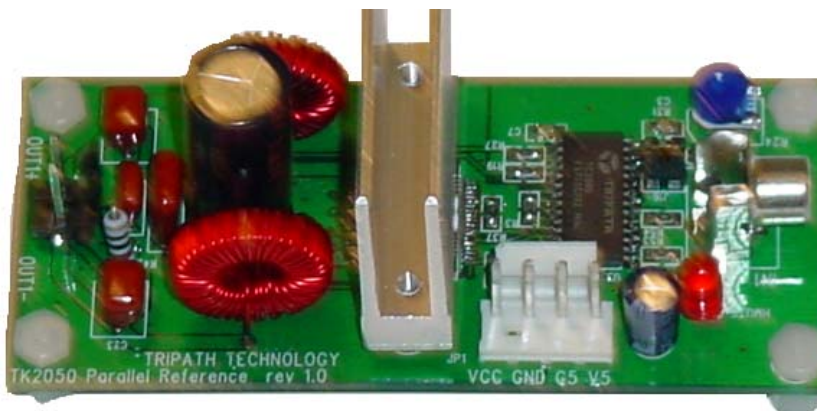
- Powered Subwoofers
- 4  $\Omega$  mono
- Home Theater Receivers
- Multi-channel Distribution
- Powered DVD Systems
- Mini/Micro Systems

### BENEFITS

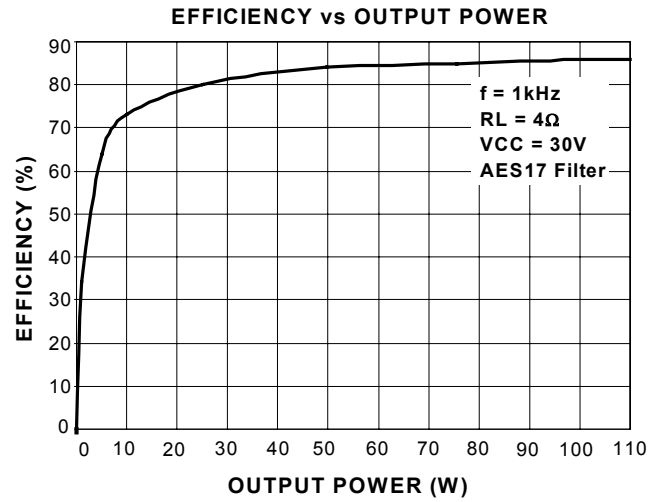
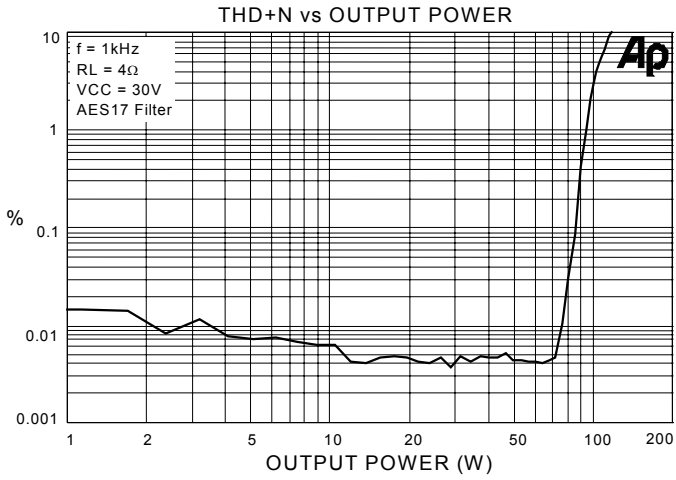
- More power per cubic inch for 110W design
- Simplifies thermal management
- Signal Quality comparable to high quality, linear amplifiers
- Simple building block for multi-channel design

### FEATURES

- High Continuous Power\*: 100W @ 4 $\Omega$   
\* 1/8 power for 1 hour followed by full power for 5 minutes.
- Low Noise Floor: <110uV A-weighted
- Low Distortion: .006% THD+N, 20W, 4 $\Omega$   
.1% THD+N, 82W, 4 $\Omega$   
1% THD+N, 90W, 4 $\Omega$
- High Efficiency: 86% @ 110W, 4 $\Omega$
- Over-Current Protection
- Over and Under Voltage Protection
- Over Temperature Protection

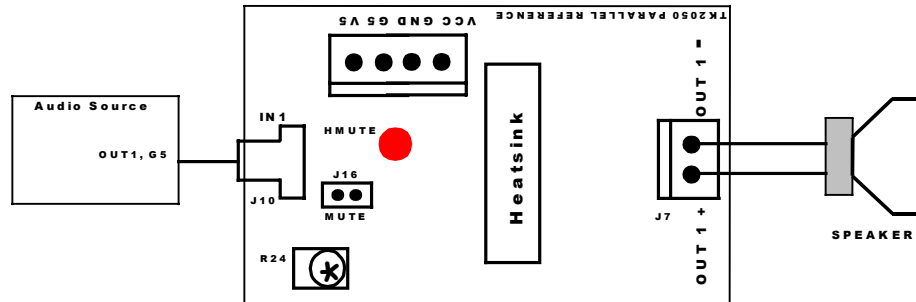


## PERFORMANCE CHARACTERISTICS



## OPERATING INSTRUCTIONS

### BOARD CONNECTION DIAGRAM



## **POWER SUPPLIES**

Two external power supplies are required to operate the RB-TK2051: VCC (referenced to GND), and V5 (referenced to G5). The V5 ground (G5) must be kept separate from the VCC ground (GND). GND and G5 are joined at a common point on the RB-TK2050 Parallel Reference Board with a 0 $\Omega$  resistor (R1).

The Minimum and Maximum VCC supply voltages are +10V and +36V, respectively.

The V5 supply voltage is 5V. Please see the TK2050 Data Sheet for Minimum and Maximum values.

The VCC and V5 power supply connection (JP1) is a standard 4 pin, .156" Molex header. Please refer to the Board Connection Diagram for the connector locations on the RB-TK2050 Parallel Reference Board.

## **OUTPUT**

The output connection (J7) for the RB-TK2050 Parallel Reference Board is a standard 2 pin, .156" Molex header. The output of the TK2050 is differential; the output has a positive output (OUT1+) and a negative output (OUT1-).

Please refer to the Board Connection Diagram for the connector locations on the RB-TK2050 Parallel Reference Board.

## **INPUT**

The input connection for the RB-TK2050 Parallel Reference Board is an RCA connector (J10). The RCA connector is labeled IN1 on the top of the PCB. The input shares a common ground referenced to G5. Please refer to the Board Connection Diagram for the connector locations on the RB-TK2050 Parallel Reference Board.

## **JUMPER SETTINGS**

There is a 2-pin header for the MUTE (J16) control of the TC2000. With the jumper in place the part is unmuted. When the jumper is removed the mute pin is pulled high (5V) and the amplifier is muted. Please refer to the Board Connection Diagram for the connector locations on the RB-TK2050 Parallel Reference Board.

## **INDICATOR LED'S**

The RB-TK2050 Parallel Reference Board has an LED labeled HMUTE (D2). The LED will glow red and the output is muted when a fault occurs or the MUTE header is set to V5. Please refer to the TK2050 Data Sheet for a complete description of HMUTE. Please refer to the Board Connection Diagram for the LED locations on the RB-TK2050 Parallel Reference Board.

## **OUTPUT OFFSET NULL**

There is a potentiometer, R24 that is used to manually trim the output offset to 0Vdc. Please refer to the Board Connection Diagram for the potentiometer location on the RB-TK2050 Parallel Reference Board. The Reference Board is shipped the output offset nulled within +/-10mV.

## **GAIN SETTING**

The gain of the RB-TK2050 Parallel Reference Board is set to 15V/V. The gain of the TK2050 is the product of the TC2000 (control stage) gain and the TP2050 (power stage) gain. The control stage gain is set to unity. Before changing the gain of the RB-TK2050 Parallel Reference Board, please refer to the Amplifier Gain section of the TK2050 Data Sheet.

## **PERFORMING MEASUREMENTS ON THE RB-TK2050 Parallel Reference Board:**

The TK2050 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 TK2050 amplifier switching pattern will degrade the measurement by including out of band (audio) energy.

One feature of the TK2050 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-TK2050 Parallel Reference Board has a simple two-pole output filter with excellent performance in listening tests. (See Application Note 4 for additional information on bench testing)

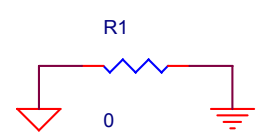
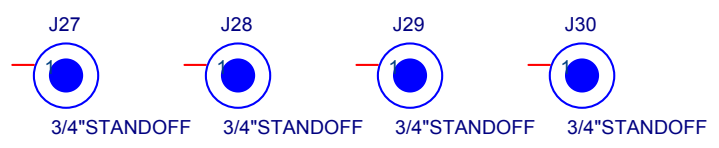
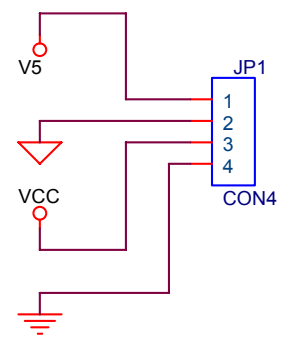
## **Contact Information**

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

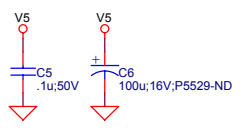
For more Sales Information, please visit us @ [www.tripath.com/contact.htm](http://www.tripath.com/contact.htm)

For more Technical Information, please visit us @ [www.tripath.com/data.htm](http://www.tripath.com/data.htm)

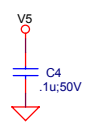


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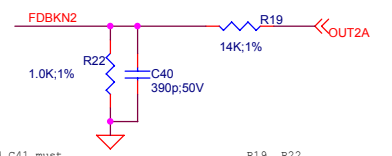
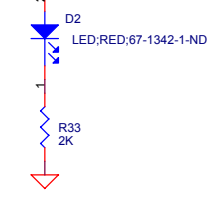
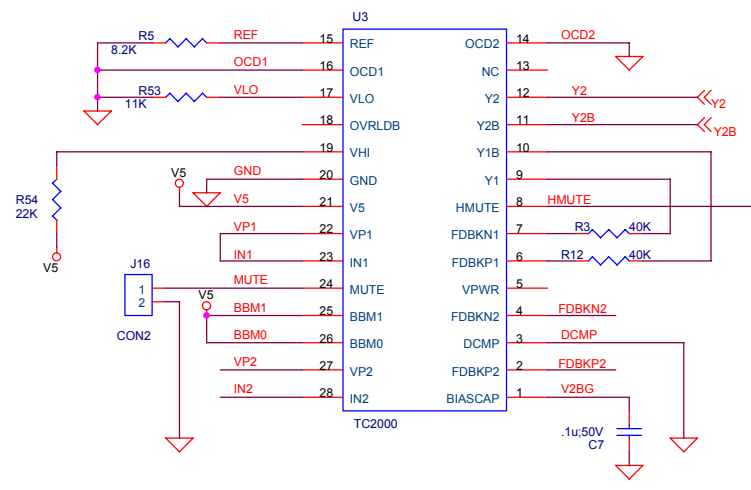
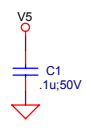
Decoupling for 5V header



Decoupling for R24

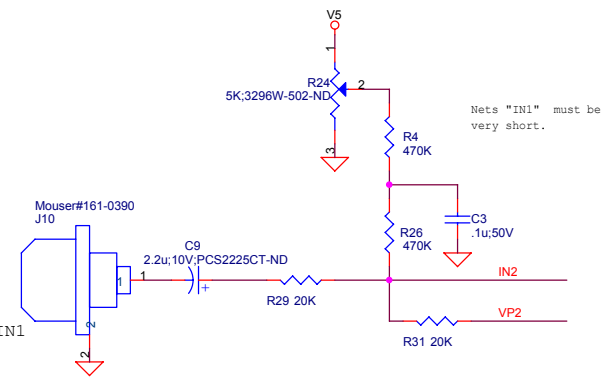
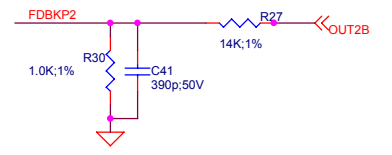


Decoupling for U3, pin 21



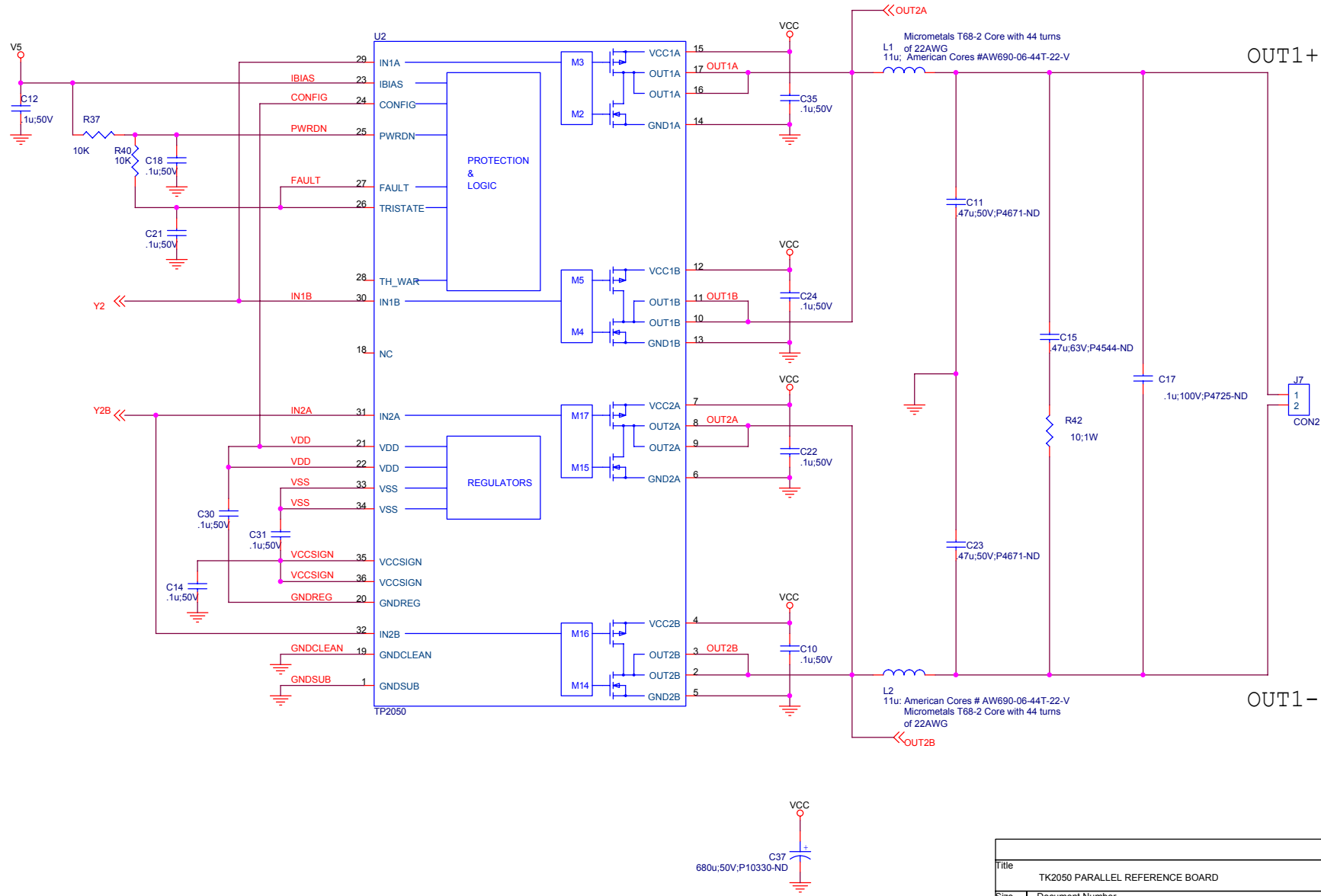
C40, and C41 must be very close to U3.

R19, R22, R27, and R30 must be close to U3.



Nets "IN1" must be very short.

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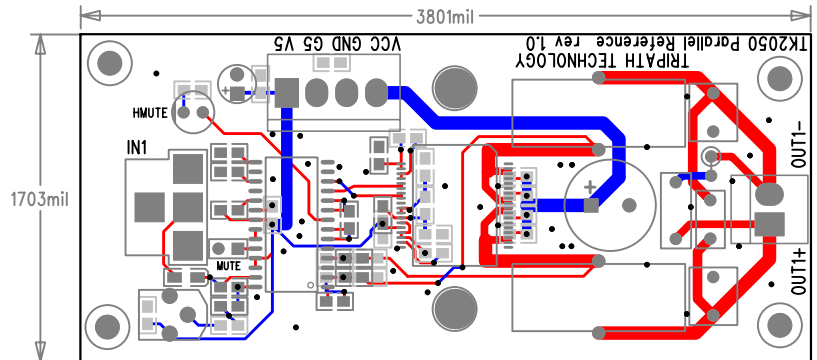


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## TK2050 PARALLEL REFERENCE BOARD rev. 1.0      Revised 11/02

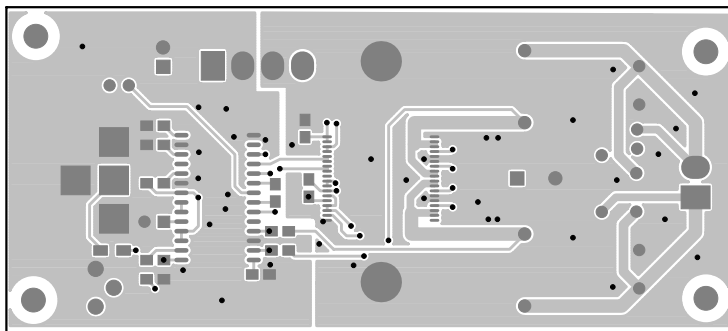
<u>Item</u>	<u>Quantity</u>	<u>Reference</u>	<u>Part;Digi-Key number</u>	<u>Package Info.</u>	<u>Notes:</u>
1	15	C1,C3,C4,C5,C7,C10,C12,C14, C18,C21,C22,C24,C30,C31,C35	.1u;50V	CAP0805	X7R MATERIAL
2	1	C6	100u;16V;P5529-ND	Thru-hole	
3	1	C9	2.2u;10V;PCS2225CT-ND	CAP3612	
4	2	C11,C23	.47u;50V;P4671-ND	Thru-hole	
5	1	C15	.47u;63V;P4544-ND	Thru-hole	
6	1	C17	.1u;100V;P4725-ND	Thru-hole	
7	1	C37	680u;50V;P10330-ND	Thru-hole	
8	2	C40,C41	390p;50V;PCC391CGCT-ND	CAP0805	
9	1	D2	LED;P300-ND	RED LED	
10	1	J10	RCA; CP-1400-ND		
11	1	JP1	CON4; WM4602-ND	4pin, 156Mil	
12	1	J7	CON2; WM4600-ND	2pin, 156Mil	
13	1	J16	B2S	2pin, 100Mil	
14	4	J27, J28,J29,J30	STANDOFF;4800K-ND	.250", 4-40	WITH HEX NUT H616-ND
15	4	L1,L2	10.4uH		Amidon/ American Cores AW690-06-44T-22-V or Micrometals T68-2 Core with 44 turns of 22AWG
16	2	R3, R12	40k	RES0805	
17	1	R1	0	RES0805	
18	2	R4,R26	470K	RES0805	
19	2	R19,R27	14K;1%	RES0805	
20	1	R5	8.2K	RES0805	
21	1	R33	2K	RES0805	
22	2	R22,R30	1.0K;1%	RES0805	
23	1	R24	5K POT;3306P-502-ND		
24	2	R29,R31	20K	RES0805	
25	2	R37,R40	10K	RES0805	
26	1	R42	10;1W;P10W-1BK-ND	Thru-hole	
27	1	R53	11K	RES0805	
28	1	R54	22K	RES0805	
29	1	U2	TP2050	PowerSO36	Slug Up
30	1	U3	TC2000	28 pin SOIC	





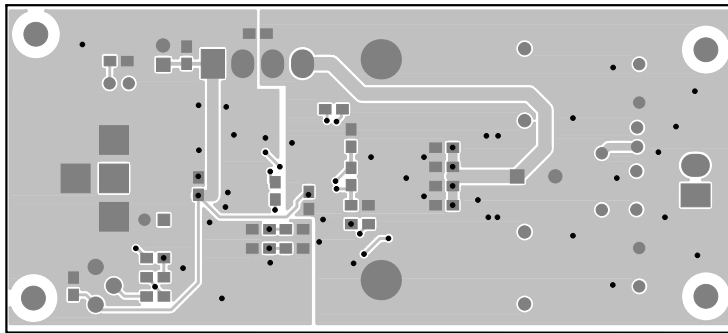
FABRICATION NOTES  
 DOUBLE SIDED BOARD  
 MATERIAL: .062 FR-4  
 2 OZ COPPER, ALL LAYERS

VIEWED FROM TOP SIDE  
 COMPOSITE DRAWING  
 Top Trace RED  
 Bottom Trace BLUE  
 Top Component DARK GRAY  
 Bottom Component LIGHT GRAY



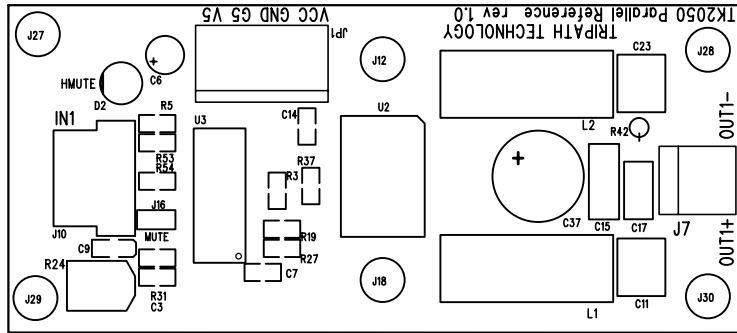
FABRICATION NOTES  
DOUBLE SIDED BOARD  
MATERIAL: .062 FR-4  
2 OZ COPPER, ALL LAYERS

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

