



RB-TDA2500-1

CLASS-T DIGITAL AUDIO AMPLIFIER REFERENCE BOARD USING DIGITAL POWER PROCESSING (DPP™) TECHNOLOGY

Technical Information

Rev. 1.1 June 2005

GENERAL DESCRIPTION

The RB-TDA2500 reference board is based on the TDA2500 digital audio power amplifier driver from Tripath Technology. This board is designed to provide a simple and straightforward environment for the evaluation of the Tripath stereo TDA2500 amplifier driver.

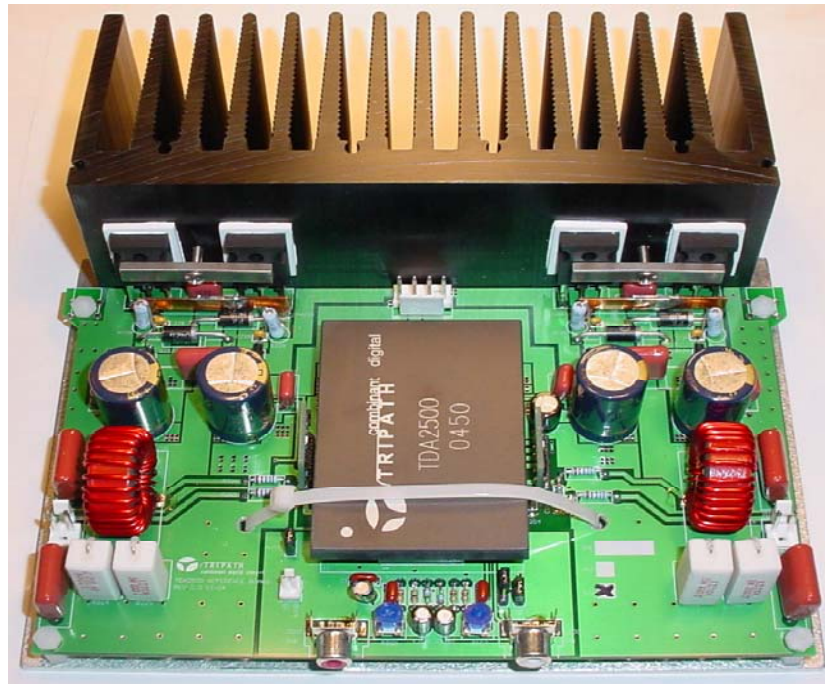
RB-TDA2500-1 – “LV” Version - Nominal supply voltage +/-60V to +/-93V

FEATURES

- RB-TDA2500-1: 2 x 500W continuous output power @ 0.1% THD+N, 4Ω, ±90V
- RB-TDA2500-1: 1000W continuous output power @ 0.1% THD+N, bridged 4Ω, ±75V
- Outputs short circuit protected

BENEFITS

- Quick and easy evaluation of the TDA2500 in multiple applications
- Uses only N-channel power MOSFETs
- Ready to use in many applications:
 - Pro-audio Amplifiers
 - High-end Audio Amplifiers
 - Distribution Amplifiers



OPERATING INSTRUCTIONS

Power Supply Description

There are four external power supplies required to operate this board: VPP, VNN, V12 and V5 (see Figures 1 and 2). VPP and VNN power the load and so must each be able to provide half of the desired output power, plus about 20% for overhead and margin. The TDA2500 amplifier also requires a supply, VN12, that is 12V more positive than VNN and tracks VNN. This VN12 power supply should be a regulated, positive 12V supply. Output and power supply connections are supplied using cable harnesses (not shown in picture). Typical current draw from the VN12 is 200mADC. The V5 draws about 50mA assuming the mute pin is connected to AGND (Mute jumper is shorted on RB-TDA2500-1 board).

Though not required from a device reliability standpoint, the following powering-up sequence is usually adhered to during bench evaluations: 1st) V5 and V10 2nd) VNN and 3rd) VPP. Please refer to the Turn-on/off Pop section for additional discussion on power supply sequencing

The positive and negative supply voltages do not have to match or track each other, but distortion or clipping levels will be determined by the lowest (absolute) supply voltage. Figure 1 shows the proper supply configuration for the RB-TDA2500.

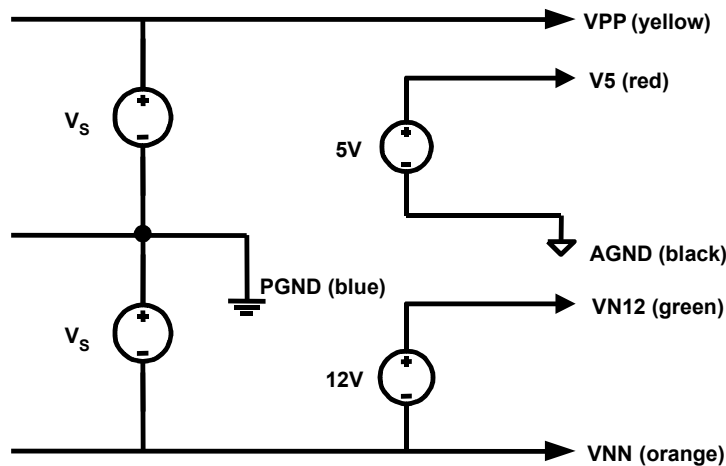


Figure 1

Note: To avoid signal degradation, AGND (Analog Ground) and PGND (Power Ground) should be kept separate at the power supply. They are connected internally on the TDA2500 module.

Connector	Power Supply
J5 (Yellow)	VPP
J5 (Blue)	PGND
J5 (Orange)	VNN
J5 (Green)	VN12
J2 (Red)	V5
J2 (Black)	AGND

Table 1

Input Connections

Audio input to the board is located at IN1 (J100) and CH2 IN2 (J200) (see Figures 2 and 3). The input can be a test signal or music source. The connectors are standard RCA types.

Output Connections

There are two output connectors on the reference board for the speaker outputs. Channel 1 output and associated Power Ground 1 is located at J101. Channel 2 output and associated Power Ground 2 is located at J201. A two-wire harness for each output is provided. See Table 2 for the output connector wire colors. The TDA2500 can be operated as a two-channel single-ended amplifier, bridged mono output amplifier (see Figure 9) or with a passive crossover for a 2.1 channel application (refer to Application Note 13). Outputs can be any passive speaker(s) or test measurement equipment with resistive load (see Application Note 4 for more information on bench testing).

Connector Name	Output	Ground
J101	Red	Blue
J201	White	Blue

Table 2

Turn-on/off Pop

To avoid turn-on pops, bring the mute from a high to a low state after all power supplies have settled. To avoid turn-off pops, bring the mute from a low to a high state before turning off the supplies. The only issue with bringing up the V5 last, or turning it off first, is clicks/pops. If the mute line is properly toggled (slow turn-on, quick turn-off), then any power up sequence is acceptable. In practice, the V5 will usually collapse before VPP and VNN. The same discussion holds true for the VN10 supply. It can collapse before VPP or VNN though this may cause a larger turn-off pop than if the mute had been activated before either the VN10 or V5 supply have collapsed. No damage will occur to the TDA2500 chipset if either the V5 or VN10 collapse before VPP or VNN, assuming the mute is asserted before the supplies start to discharge.

RB-TDA2500 Board

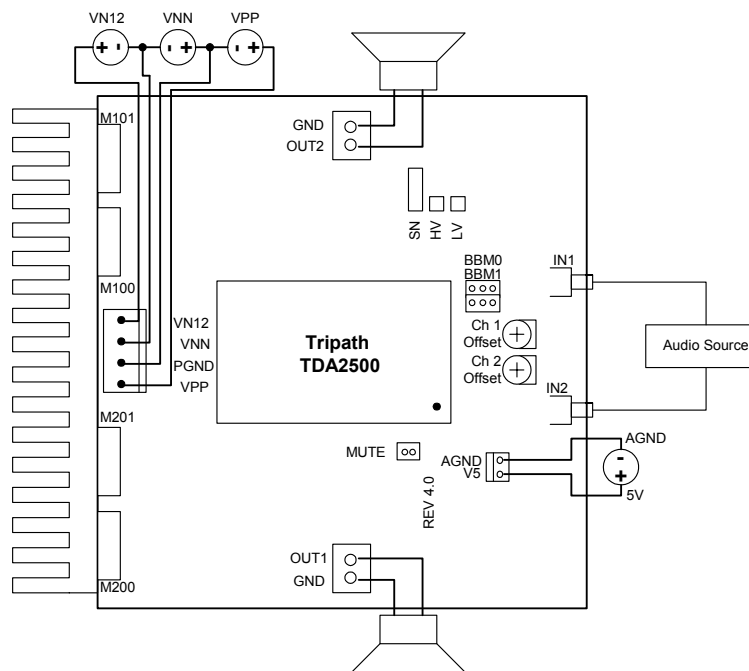


Figure 2

ARCHITECTURE

A block diagram of one channel of the reference board is shown in Figure 3. The major functional blocks of the amplifier are described below.

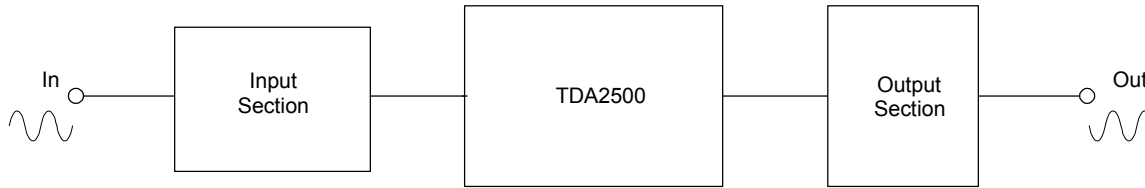


Figure 3

Note: The TDA2500 is an inverting amplifier.

TDA2500 Amplifier Gain

The TDA2500 amplifier gain is the product of the input stage gain and the modulator gain. Additional information is available in the TDA2500 datasheet available at www.tripath.com.

$$A_{VTDA2500} = A_{VINPSTAGE} * A_{VMODULATOR}$$

$$A_{VTA0105A} \approx -\frac{20k\ \Omega}{4.99k\ \Omega + R_I} \left(\frac{(1.0k\ \Omega + R_{FB}) * 2.02}{1020} + 1 \right)$$

For the RB-TDA2500-1 board;

$$R_I (R_{100}, R_{200}) = 49.9k\ \Omega$$

$$R_{FBC} (R_{106}, R_{206}) = 18.7k\ \Omega$$

$$A_{VTA0105A} \approx -\frac{20k\ \Omega}{54.89k\ \Omega} \left(\frac{19.7k\ \Omega * 2.02}{1020} + 1 \right) = -14.58 \frac{V}{V}$$

Input Stage

Figure 5 shows one channel of the Input Stage. The TDA2500 amplifier is designed to accept unbalanced inputs. For the RB-TDA2500-1, the gain is -14.58V/V, or approximately 23.28 dB. Please note that the input stage of the TDA2500 is biased at approximately 2.5VDC. Therefore, for an input signal centered around ground (0VDC), the polarity of the coupling capacitor, C_{IN} , shown in Figure 4 is correct. In addition, the TDA2500 amplifier is an inverting amplifier.

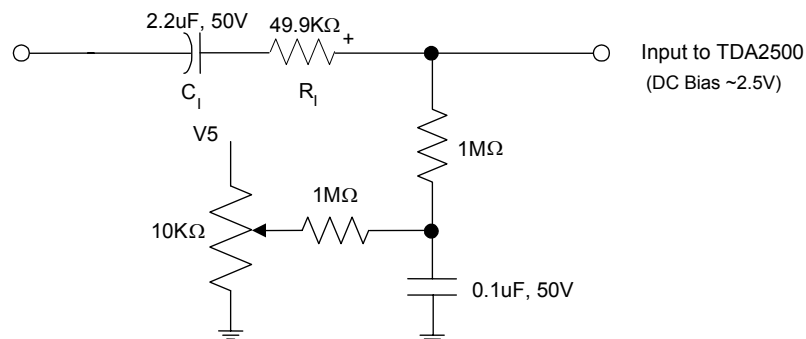


Figure 4

The value of the input capacitor, C_i , in Figure 5 (labeled C100 and C200 on the schematic), and the input resistor, R_{IN} (labeled R100 and R200), set the -3dB point of the input high-pass filter. The frequency of the input high pass pole, F_P , -3dB point can be calculated as follows:

$$F_P = 1/(2\pi \times C_i \times R_i)$$

where: C_i = input capacitor value in Farads
 R_i = input resistor value in Ohms

Output offset voltages can be nulled by adjusting the $10\text{K}\Omega$ potentiometer shown in Figure 4. Once set, and the TDA2500 reaches equilibrium, the offset does not typically drift. R103 is used to adjust the offset of CH1, and R203 is used to adjust the offset of CH2. If a different TDA2500 is placed in the RB-TDA2500 reference board, the offset of each channel will need to be re-trimmed.

RB-TDA2500 Control Circuitry

The MUTE pin is brought out to an external 2-pin header, J1 (Figure 4). When a jumper is installed from Pin 1 to 2 of J4, the MUTE line is pulled to ground and the outputs are enabled. Note that if the MUTE jumper is removed, the MUTE pin floats high, and the amplifier is muted.

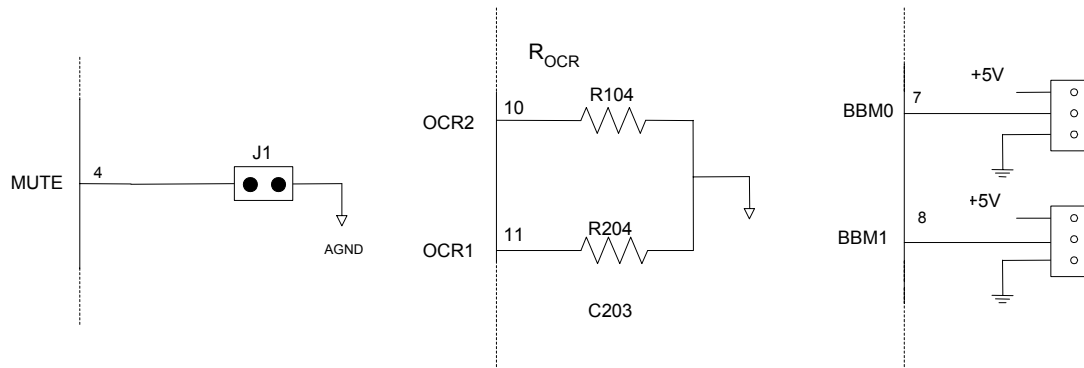


Figure 4

The resistors, R_{OCR} in Figure 4 (labeled R104 and R204 in the schematic), set the overcurrent threshold for the output devices. Note that these are NOT the sense resistors (the overcurrent sense resistors, R_S , are in the output stage). By adjusting the R_{OCR} resistor values, the threshold at which the amplifier “trips” can be changed. The range that the overcurrent trip point can be adjusted (by changing R_{OCR}) is determined by the value of the sense resistors.

R_{OCR} can be reduced, though if set too low of a value, this may result in an overcurrent threshold that is so high the amplifier will try to drive a short circuit, possibly damaging the output FETs. In addition, the power dissipation when driving lower impedances may become prohibitive resulting in reduced efficiency and possible FET damage.

Finally, the Break-Before-Make (or “BBM”) lines are used to control the “dead time” of the output FETs. The “dead time” is the period of time between the turn-off of one device and the turn-on of the opposite device on the same channel. If the two devices are both on at the same time, current “shoots through” from one supply to the other, bypassing the load altogether. Obviously, this will have a great impact on the overall efficiency of the amplifier. However, if the dead time is too long, linearity suffers. The optimum BBM setting will change with different output FETs, different operating voltages, different layouts and different performance requirements. For this reason, Tripath has provided a means to adjust the BBM0 (via J3) and BBM1 (via J4) settings. The stock setting for BBM is 65nS for the RB-TDA2500-1 board. These settings should be verified over the full temperature and load range of the application to ensure that any thermal rise of the output FETs and TDA2500 does not impact the performance of the amplifier.

BBM1	BBM0	DELAY
0	0	145nS
0	1	105nS
1	0	65nS
1	1	25nS

Note: The default delay jumper setting is 65nS for the RB-TDA2500-1

Figure 5

RB-TDA2500 Over-current Circuitry

One advantage of the TDA2500 hybrid over previous Tripath modules is direct access to the internal over-current comparator inputs. The RB-TDA2500 takes advantage of this feature with the addition of an external circuit mounted on a small daughter card for each channel. This circuit is included at the end of this document.

The RB-TDA2500 comes with these daughter cards populated and enabled. The daughter cards are located at CD100 and CD200. In addition, the resistors labeled RFW100, RFW101, RFW200, and RFW201 are populated with zero ohm shorts.

With the RFWxxx resistors populated with zero ohm shorts, the internal half-wave circuit is actually converted into a full-wave detection circuit for the negative supply (VNN). The small discrete circuit on the daughter card is a full-wave detection circuit for the positive supply (VPP).

Full-wave detection ensures that the over-current trip point is consistent across all ranges of duty cycle and switching frequency. Thus, it is much easier to maximize the output current capability of the output stage without fear of exceeding the MOSFET current rating at intermediate load impedance.

Due to the external full-wave daughter card, the bias level is roughly twice that of the TDA2500 by itself. The bias level will cause more variation of the current trip point versus supply voltage magnitude as opposed to the TDA2500 using only the half-wave detection circuit. For the RB-TDA2500, the bias current is about 50 μ A for +/-60V and 60 μ A for +/-90V.

In many applications, the full-wave circuit will not be needed. By removing the daughter cards and shorting RHW100, RHW101, RHW200, and RHW201, the internal half-wave circuit can be used. For proper operation of half-wave detection, RFW100, RFW101, RFW200, and RFW201 must be removed.

Output Section

The output section includes the gate resistors, output diodes, FETs, output filters, the previously mentioned overcurrent sense resistors, clamping diodes, a Zobel Network, and various bypass capacitors.

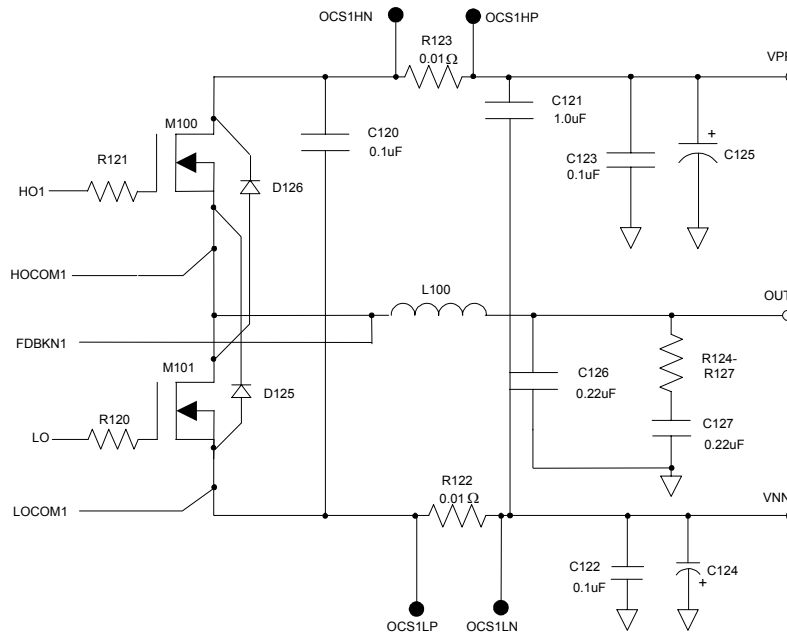


Figure 6

The gate resistors (labeled R120 and R121 in Figure 6 and the attached schematic) are used to control MOSFET switching rise/fall times and thereby minimize voltage overshoots. They also dissipate a portion of the power resulting from moving the gate charge each time the MOSFET is switched. If R_G is too small, excessive heat can be generated in the driver. Large gate resistors lead to slower gate transitions resulting in longer rise/fall times and thus requiring a larger BBM setting.

The output MOSFETs (M100 and M101) provide the switching function required of a Class-T design. They are driven directly by the TDA2500 through the gate resistors. The devices used on the RB-TDA2500-1 board are ST STW34NB20 MOSFETs. The TDA2500 data sheet contains information on output FET selection as well as Tripath application note AN16, "Output Mosfet Selection Guide For Tripath Drivers."

The bypass capacitors C120/C121 are critical to the reduction of ringing on the output MOSFETs. These parts are placed as closely as possible to the leads of the MOSFETs, and the leads of the capacitors themselves are as short as practical. Their values will not change with different output MOSFETs.

The output diodes D125/D126 are also critical to the reduction of ringing on the outputs of the FETs. They shunt the inductive energy if the output exceeds VPP or goes below VNN. The proper connection of these diodes are "drain to drain" and "source to source" as shown in the schematic diagrams.

The output filter, L100/C126, is a second order low-pass filters that recovers the analog audio signal. One of the benefits of the Class-T design is the ability to use output filters with relatively high cutoff frequencies. This greatly reduces the speaker interactions that can occur with the use of lower-frequency filters common in Class-D designs. Also, the higher-frequency operation means that the filter can be of a lower order (simpler and less costly).

The OEM may benefit from some experimentation in the filter design, but the values provided in the RB-TDA2500-1 reference design, 11.3uH and 0.22uF (nominal resonant frequency of 101kHz), provide excellent results for most loads between 4Ω and 8Ω. The inductor value can have an effect on amplifier efficiency especially as the supply voltage is increased. If the inductor is increased in value, the efficiency performance should be re-evaluated to ensure that the amplifier design goals are still being met.

As important as the values themselves, the material used in the core is important to the performance of the filter. Core materials that saturates too easily will not provide acceptable distortion or efficiency figures. Tripath recommends a low-mu core, like type 2, iron powder cores. Micrometals, (www.micrometals.com), is a main supplier of iron powder cores. The core part number used on the RB-TDA2500-1 is T106-2 and is wound with 29 turns of 16AWG wire.

The Zobel circuits R124-R127/C127 are there in case an amplifier is powered up with no load attached as well as terminating the amplifier with typical, “inductive” loudspeakers. The Q of the LC output filter, with no load attached, rises quickly out to 80kHz. Resonant currents in the filter and ringing on the output could reduce the reliability of the amplifier. The Zobel eliminates these problems by reducing the Q of the network significantly above 50kHz. Modifying the LC output filter should not require a recalculation of the Zobel components, though depending on application, the power capability of the Zobel resistor may need to be increased. The components used on the reference board should be quite adequate for almost all applications. The amplifier should never be operated without a zobel filter attached even if an output load is always present.

Connection Diagram for Bridge Mode Operation

The amplifier is connected to the power supplies and load as shown in Figure 7. Note that an opamp inverter has been added in front of one of the channel inputs (i.e. Channel 2). The main reason for processing the channels out of phase is to avoid potential problems with switching power supplies, but it also simplifies the connections for bridged-mode operation. For bridged operation, simply connect the “-“ terminal to the output of the inverted channel (Channel 1 output, J100 pin 1) and the “+“ terminal to the output of the non-inverted channel with respect to the input signal (Channel 2 output, J200 pin 1). The opamp inverter shown in Figure 7 is not needed if the audio generator used for testing has 2 separate outputs with a phase switch.

There are tradeoffs to bridging an amplifier. For a given supply voltage, the output capability is theoretically increased by a factor of four. But this increased potential power comes at the expense of lower efficiency. Thus, the power supply voltage used for bridged operation is usually reduced such that the power dissipation in the output mosfets is not increased to a potentially damaging level. This usually results in twice the output power as compared to the single ended case.

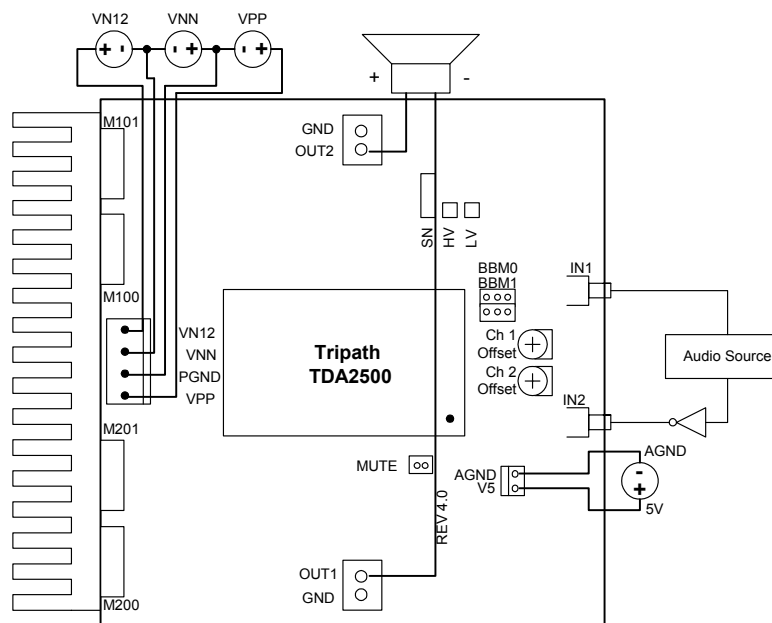


Figure 7

Circuit Board Layout

The TDA2500 is a power (high current) amplifier that operates at relatively high switching frequencies. The output of the amplifier switches between V_{PP} and V_{NN} at high speeds while driving large currents. This high-frequency digital signal is passed through an LC low-pass filter to recover the amplified audio signal. Since the amplifier must drive the inductive LC output filter and speaker loads, the amplifier outputs can be pulled above the supply voltage and below ground by the energy in the output inductance. To avoid subjecting the TDA2500 and external mosfets to potentially damaging voltage stress, it is critical to have a good printed circuit board layout. It is recommended that Tripath's layout and application circuit be used for all applications and only be deviated from after careful analysis of the effects of any changes.

The following components are important to place near either their associated TDA2500 or output MOSFET pins. The recommendations are ranked in order of layout importance, either for proper device operation or performance considerations.

- The impedance of the output node (the connection between the top side MOSFET source to bottom side MOSFET drain) must be minimized. Reducing the parasitic trace inductance is the most effective way of limiting output node ringing. A flat, bar conductor, in parallel with the PCB output node trace, is quite effective at minimizing the inductance thereby reducing output transients due to the switching architecture.
- The capacitors, C_{HBR} , provide high frequency bypassing of the amplifier power supplies and will serve to reduce spikes and modulation of the power supply rails. Please note that both mosfet half-bridges must be decoupled separately. In addition, the voltage rating for C_{HBR} should be at least 400V as this capacitor is exposed to the full supply range, V_{PP} - V_{NN} .
- The output diodes, D_O , are used to minimize overshoots/undershoots on the output node. Please note that the proper connection of these is "Drain to Drain" and "Source to Source" as shown in the Application/Test Circuit. Improper routing of these diodes will render them useless due to PCB trace inductance.
- The gate resistors, R_G , should be located as close to the output MOSFET gates leads as possible. In addition, the trace length from the pins LOx/HOx to the gate resistor should be minimized. To reduce the loop area, a parallel trace from LOxCOM/HOxCOM should be routed directly to the respective MOSFET source lead.
- C_{FB} removes very high frequency components from the amplifier feedback signals and lowers the output switching frequency by delaying the feedback signals. The value of C_{FB} , in conjunction with internal processors delays, keeps the average switching frequency for channel 1 and channel 2 separated by 40kHz. This minimizes in-band audio noise. Locate these capacitors as close to their respective TDA2500 pin as possible.

Some components are not sensitive to location but are very sensitive to layout and trace routing.

- The routing of the sense resistors, R_S , must be Kelvin connected. This implies a direct trace from the respective TDA2500 pin to the sense resistor lead without interruption. If additional connections are made to the TDA2500 overcurrent sense pins or the traces, the overcurrent sense circuit may prematurely trigger. In no instance, should a sense pin on the TDA2500 be connected to other equal potential pins on the TDA2500. For instance, one should not connect LOxCOM to OCSxLP at the TDA2500.
- To maximize the damping factor and reduce distortion and noise, the modulator feedback connections should be routed directly from the pins of the output inductors. L_O .
- The output filter capacitor, C_O , and zobel capacitor, C_Z , should be star connected with the load return. The output ground feedback signal should be taken from this star point.
- To minimize the possibility of any noise pickup, the trace lengths of IN1 and IN2 should be kept as short as possible. This is most easily accomplished by locating the input resistors, R_I as close to the TDA2500 as possible. In addition, the offset trim resistor, R_{OFB} , which connects to either IN1, or IN2, should be located close to the TDA2500 input section.

TDA2500 Grounding

Proper grounding techniques are required to maximize TDA2500 functionality and performance. Parametric parameters such as THD+N, Noise Floor and Crosstalk can be adversely affected if proper grounding techniques are not implemented on the PCB layout. The following discussion highlights some recommendations about grounding both with respect to the TDA2500 as well as general “audio system” design rules.

The TDA2500 is divided into two sections: the input section, which spans pins 1-12 and pins 35-38 and the output (high voltage) section, which spans pins 13 through pin 34. On the TDA2500 evaluation board, the ground is also divided into distinct sections, one for the input and one for the output. To minimize ground loops and keep the audio noise floor as low as possible, the input and output ground should not be externally connected. They are already connected internally via a ferrite bead between pin 1 and pin 28. Additionally, any external input circuitry such as preamps, or active filters, should be referenced to pin 1.

For the power section, Tripath has traditionally used a “star” grounding scheme. Thus, the load ground returns and the power supply decoupling traces are routed separately back to the power supply. In addition, any type of shield or chassis connection would be connected directly to the ground star located at the power supply. These precautions will both minimize audible noise and enhance the crosstalk performance of the TDA2500.

The TDA2500 incorporates a differential feedback system to minimize the effects of ground bounce and cancel out common mode ground noise. As such, the feedback from the output ground for each channel needs to be properly sensed. This can be accomplished by connecting the output ground “sensing” trace directly to the star formed by the output ground return, output capacitor, C_O , and the zobel capacitor, C_Z . Refer to the Application / Test Circuit for a schematic description.

Performing Measurements on the RB-TDA2500

The TDA2500 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.

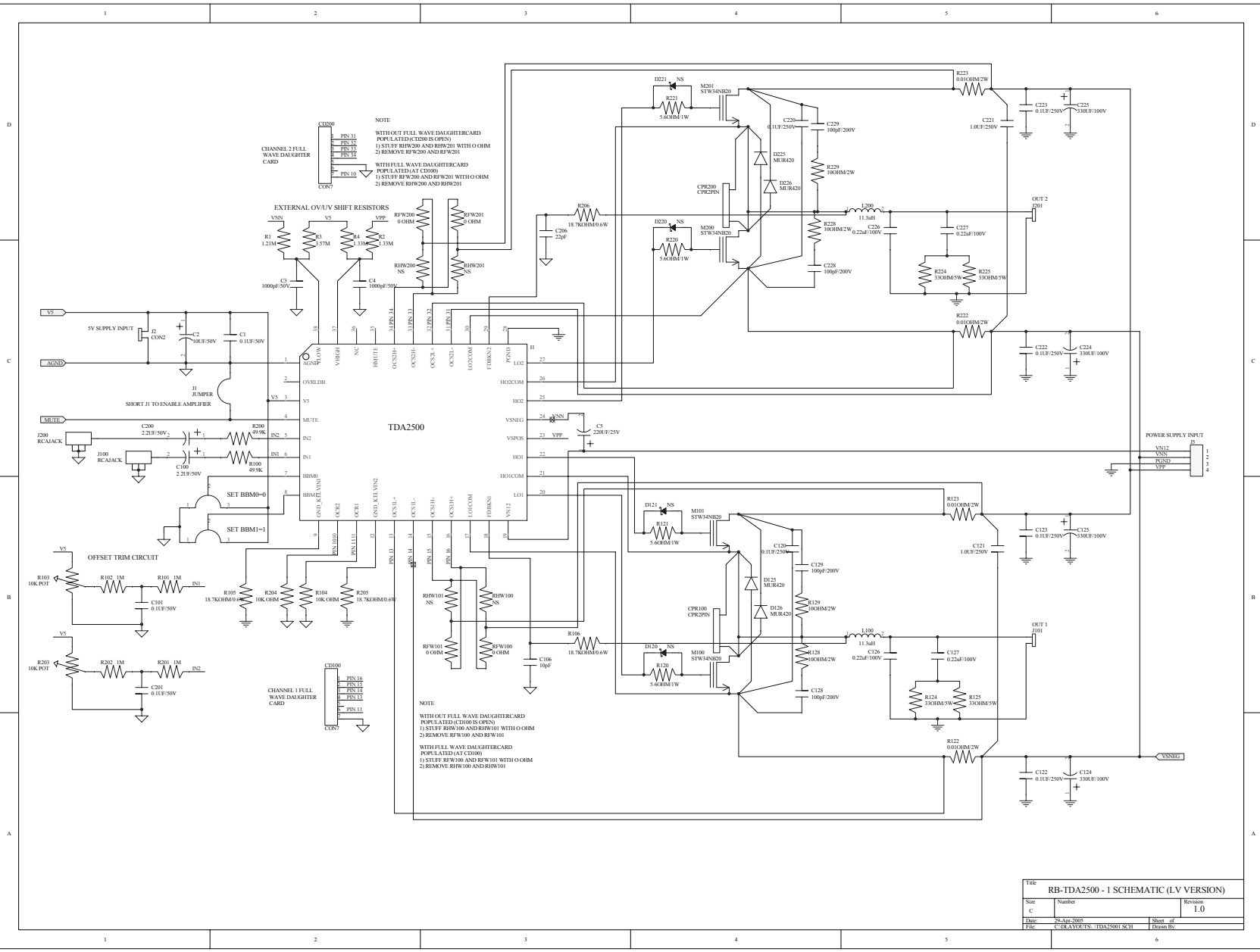
The measurements of certain performance parameters, particularly noise related specifications such as THD+N, are significantly affected by the design of the low-pass filter used on the output as well as the bandwidth setting of the measurement instrument used. Unless the filter has a very sharp roll-off just beyond the audio band or the bandwidth of the measurement instrument is limited, some of the inaudible noise components introduced by the TDA2500 amplifier switching pattern will degrade the measurement.

One feature of the TDA2500 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-TDA2500 Reference Board has a simple two-pole output filter with excellent performance in listening tests.

(See Application Note 4 for more information on bench testing)

Documentation

Soft copies of the schematics and layout can be provided upon request (available in Protel 2.8 format). Gerber files, with embedded apertures, are also available.



NOTE
 WITH OUT FULL WAVE DAUGHTERCARD
 POPULATED (CD200 IS OPEN)
 1) STUFF R1W200 AND R1W201 WITH 0 OHM
 2) REMOVE R1W200 AND R1W201
 WITH FULL WAVE DAUGHTERCARD
 POPULATED (AT CD100)
 1) STUFF R1W200 AND R1W201 WITH 0 OHM
 2) REMOVE R1W200 AND R1W201

EXTERNAL OV/LV SHIFT RESISTORS
 V25N
 R1 121M
 R2 121M
 R3 121M
 R4 121M
 R5 121M
 R6 121M
 R7 121M
 R8 121M
 R9 121M
 R10 121M
 R11 121M
 R12 121M
 R13 121M
 R14 121M
 R15 121M
 R16 121M
 R17 121M
 R18 121M
 R19 121M
 R20 121M
 R21 121M
 R22 121M
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 R24 121M
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 R86 121M
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 R88 121M
 R89 121M
 R90 121M
 R91 121M
 R92 121M
 R93 121M
 R94 121M
 R95 121M
 R96 121M
 R97 121M
 R98 121M
 R99 121M
 R100 121M

NOTE
 WITH OUT FULL WAVE DAUGHTERCARD
 POPULATED (CD100 IS OPEN)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101
 WITH FULL WAVE DAUGHTERCARD
 POPULATED (AT CD200)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101

NOTE
 WITH OUT FULL WAVE DAUGHTERCARD
 POPULATED (CD100 IS OPEN)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101
 WITH FULL WAVE DAUGHTERCARD
 POPULATED (AT CD200)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101

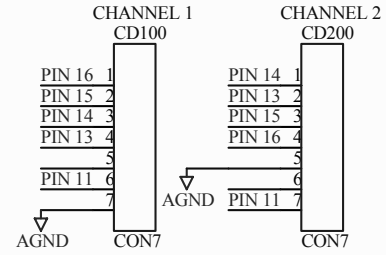
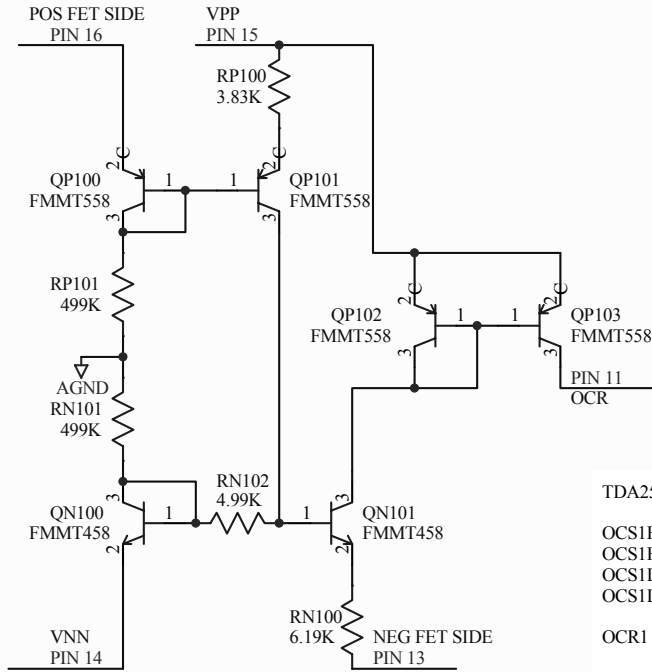
NOTE
 WITH OUT FULL WAVE DAUGHTERCARD
 POPULATED (CD100 IS OPEN)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101
 WITH FULL WAVE DAUGHTERCARD
 POPULATED (AT CD200)
 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101

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 POPULATED (AT CD200)
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 2) REMOVE R1W100 AND R1W101

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 2) REMOVE R1W100 AND R1W101
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 1) STUFF R1W100 AND R1W101 WITH 0 OHM
 2) REMOVE R1W100 AND R1W101

Title		
RB-TDA2500 - 1 SCHEMATIC (LV VERSION)		
Rev	Number	Revision
C		1.0
Date:	25 Jun 2007	Sheet of
File:	C:\E:\AV\TS_TDA250001 SCH	1 of 1



CONNECT TO TDA2500 BOARD FOR FULLWAVE CURRENT DETECTION

TDA2500 PINOUT

- OCS1HP - 16
- OCS1HN - 15
- OCS1LP - 13
- OCS1LN - 14
- OCR1 - 11
- OCS2HP - 34
- OCS2HN - 33
- OCS2LP - 32
- OCS2LN - 31
- OCR2 - 10

NOTE:

- 1) MAKE SURE RFW100, RFW101, RFW200, AND RFW201 ARE POPULATED WITH ZERO OHM RESISTORS ON THE RB-TDA2500 BOARD
- 2) MAKE SURE RHW100, RHW101, RHW200, AND RHW201 ARE OPEN ON THE RB-TDA2500 BOARD

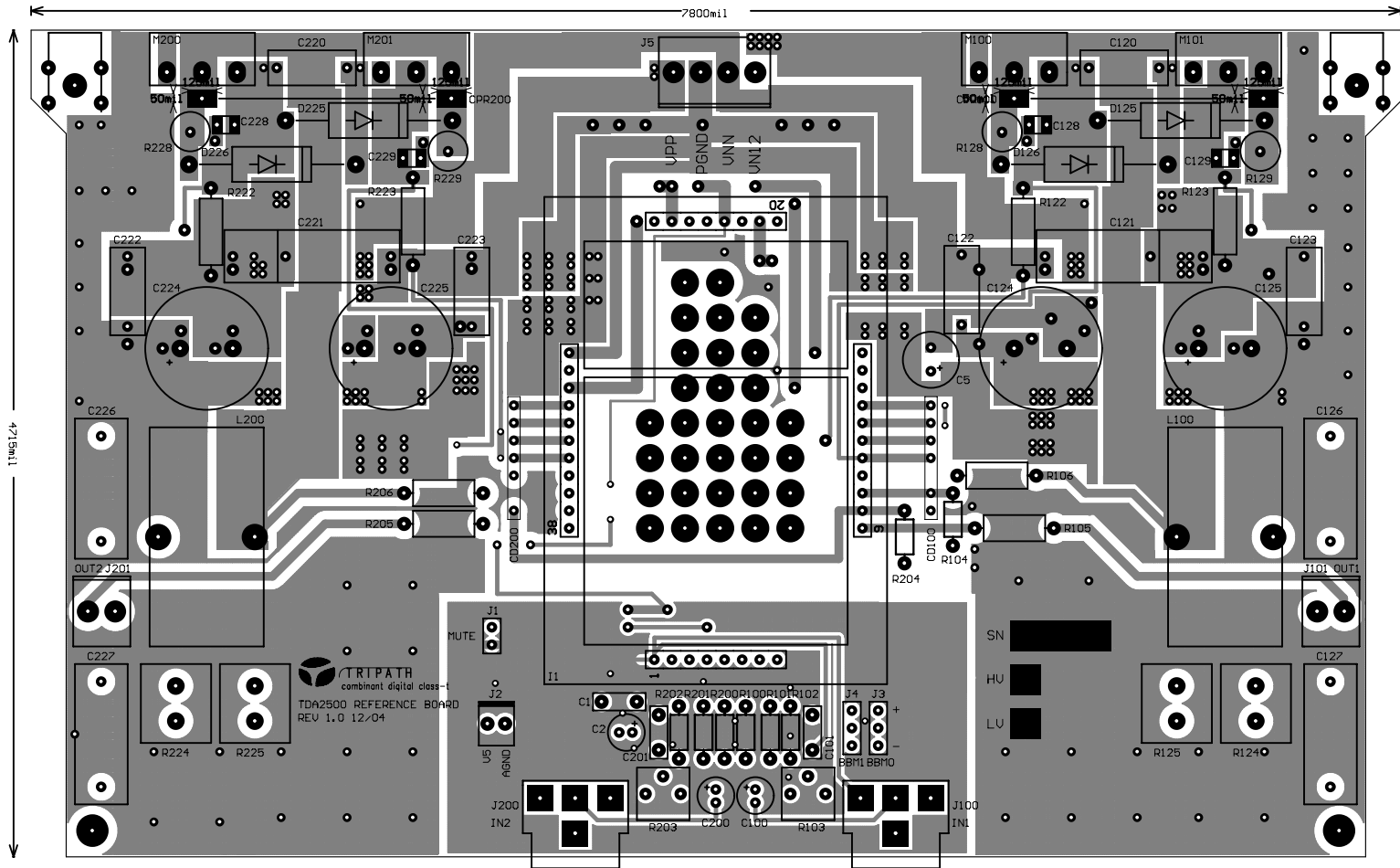
Title		
POSITIVE SIDE FULLWAVE CURRENT DETECTION CIRCUIT		
Size	Number	Revision
A		0.2
Date:	29-Apr-2005	Sheet of
File:	CADLAYOUTS\...\PSFW1_R1.SCH	Drawn By:

Bill of Material for C:\DLAYOUTS\TDA2500\RB2500R1\TDA25001.Sch

Used	Part Type	Designator	Footprint	Part Field 1	Part Field 2	Part Field 3
4	0 OHM	RFW100 RFW101 RFW200	0805	1/8W, 1%	*	*
		RFW201				
4	0.01OHM/2W	R122 R123 R222 R223	RESLVR1	OHMITE	12FR010	DK 12FR010-ND
6	0.1UF/250V	C120 C122 C123 C220	C0U1MF40	PANASONIC	ECQ-E2104KF	DK EF2104-ND
		C222 C223				
3	0.1UF/50V	C1 C101 C201	C0U1MF05	PANASONIC	ECQ-V1H104JL	DK P4525-ND
4	0.22uF/100V	C126 C127 C226 C227	C0U033MF40	PANASONIC	ECH-S1224JZ	DK PS1224J-ND
2	1.0UF/250V	C121 C221	C1U0MF40	PANASONIC	ECQ-E2105KF	DK EF2105-ND
1	1.21M	R1	0805	1/8W, 1%	*	*
2	1.33M	R2 R4	0805	1/8W, 1%	*	*
2	1000pF/50V	C3 C4	0805	10% NPO	*	*
4	100pF/200V	C128 C129 C228 C229	CGLDMAX	KEMET	C315C101J2G5CA	DK 399-1895-ND
2	10K OHM	R104 R204	RES50	1/8W, 1%	*	*
2	10K POT	R103 R203	POTSTURN	PANASONIC	3306P-1-103	DK 3306P-103-ND
4	100HM/2W	R128 R129 R228 R229	R3WVERT	PANASONIC	ERG-2SJ100	DK P10W-2BK-ND
1	10pF	C106	0805	5% NPO, 50V	*	*
1	10UF/50V	C2	C10UEL05	PANASONIC	ECA-1HHG100	DK P5567-ND
2	11.3uH	L100 L200	IND33UH	MICROMETALS	T106-2 CORE	29 turns, 16awg wire
1	150W DRVR	I1	DRV150 2	TRIPATH TECHNOLOGY, INC.	*	*
4	18.7KOHM/0.6W	R105 R106 R205 R206	RES1W045	BC Components	B0207C18K70F5T	DK BC18.7KZCT-ND
4	1M	R101 R102 R201 R202	RES50	1/8W, 5%	*	*
2	2.2UF/50V	C100 C200	C10UEL05	PANASONIC	ECA-1HHG2R2	DK P5564-ND
1	220UF/25V	C5	C10UEL05	PANASONIC	EEU-FM1E221	DK P12383-ND
1	22pF	C206	0805	5% NPO, 50V	*	*
1	3.57M	R3	0805	1/8W, 1%	*	*
4	330UF/100V	C124 C125 C224 C225	C330UEL16	PANASONIC	EEU-FC2A331S	DK P10783-ND
4	330HM/5W	R124 R125 R224 R225	PWR5WRT	XICON	PRM5-33	MSR 280-PRM5-33
2	49.9K	R100 R200	RES50	1/8W, 1%	*	*
4	5.6OHM/1W	R120 R121 R220 R221	2512	PANASONIC	ERJ-1TYJ5R6U	DK PT5.6XCT-ND
1	CON2	J2	CON2B	WALDOM	22-23-2021	DK WM4200-ND
1	CON4	J5	PWR4	WALDOM	26-60-4040	DK WM4622-ND
2	CON7	CD100 CD200	CON7_100MIL	*	*	*
2	CPR2PIN	CPR100 CPR200		*	*	*
1	JUMPER	J1	GJMPR001	*	*	*
2	JUMPER3	J3 J4	GJMP3001	*	*	*
4	MUR420	D125 D126 D225 D226	267 03	ON SEMICONDUCTOR	MUR420	NWK - 08F2106
8	NS	D120 D121 D220 D221	0805	1/8W, 5%	*	*
		RHW100 RHW101 RHW200				
		RHW201				
2	PWR2	J101 J201	PWR2	WALDOM	26-60-4020	DK WM4620-ND
2	RCAJACK	J100 J200	RCAJACK	DGS PRO AUDIO	*	MSR 161-0390
4	STW34NB20	M100 M101 M200 M201	TO3PMSFT	ST MICROELECTRONICS	STW34NB20	*

Bill of Material for C:\DLAYOUTS\TDA2500\PSFWCH1\PSFW1_R1.Sch

Used	Part Type	Designator	Footprint	Part Field 1	Part Field 2	Part Field 3
1	3.83K	RP100	0603	1/10W, 1%	*	*
1	4.99K	RN102	0603	1/10W, 1%	*	*
2	499K	RN101 RP101	1206	1/8W, 1%	*	*
1	6.19K	RN100	0603	1/10W, 1%	*	*
2	CON7	CD100 CD200	CON7 100MIL	*	*	*
2	FMMT458	QN100 QN101	SOT23	ZETEX	FMMT458TA	FMMT458CT-ND
4	FMMT558	QP100 QP101 QP102 QP103	SOT23	ZETEX	FMMT558TA	FMMT558CT-ND



FABRICATION NOTES

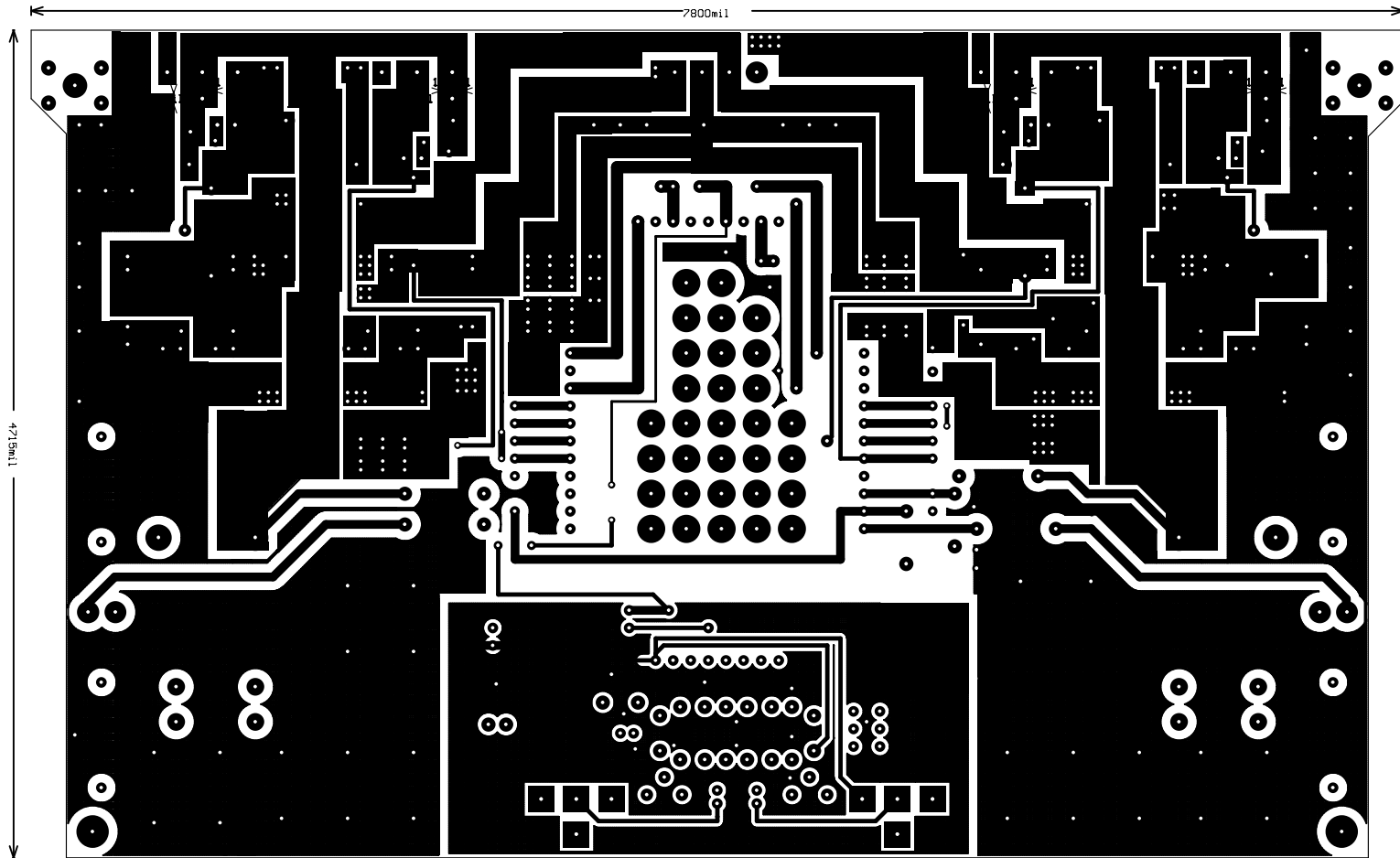
- MATERIAL: FR-4 OR EQUIVALENT
- 0.062 +/- 0.007 THICKNESS
- 2 OZ COPPER, ALL LAYERS
- SOLDERMASK OVER BARE COPPER, USE BLUE
- SILKSCREEN TO BE WHITE
- ALL HOLES PLATE THRU
- FABRICATE PER IPC STANDARDS

NOTE: THERE ARE SLOTS ON THIS BOARD

125mm x 50mm

PLACE SLOTS AS SHOWN ON THIS LAYER

SLOTS SHOULD BE PLATED THRU

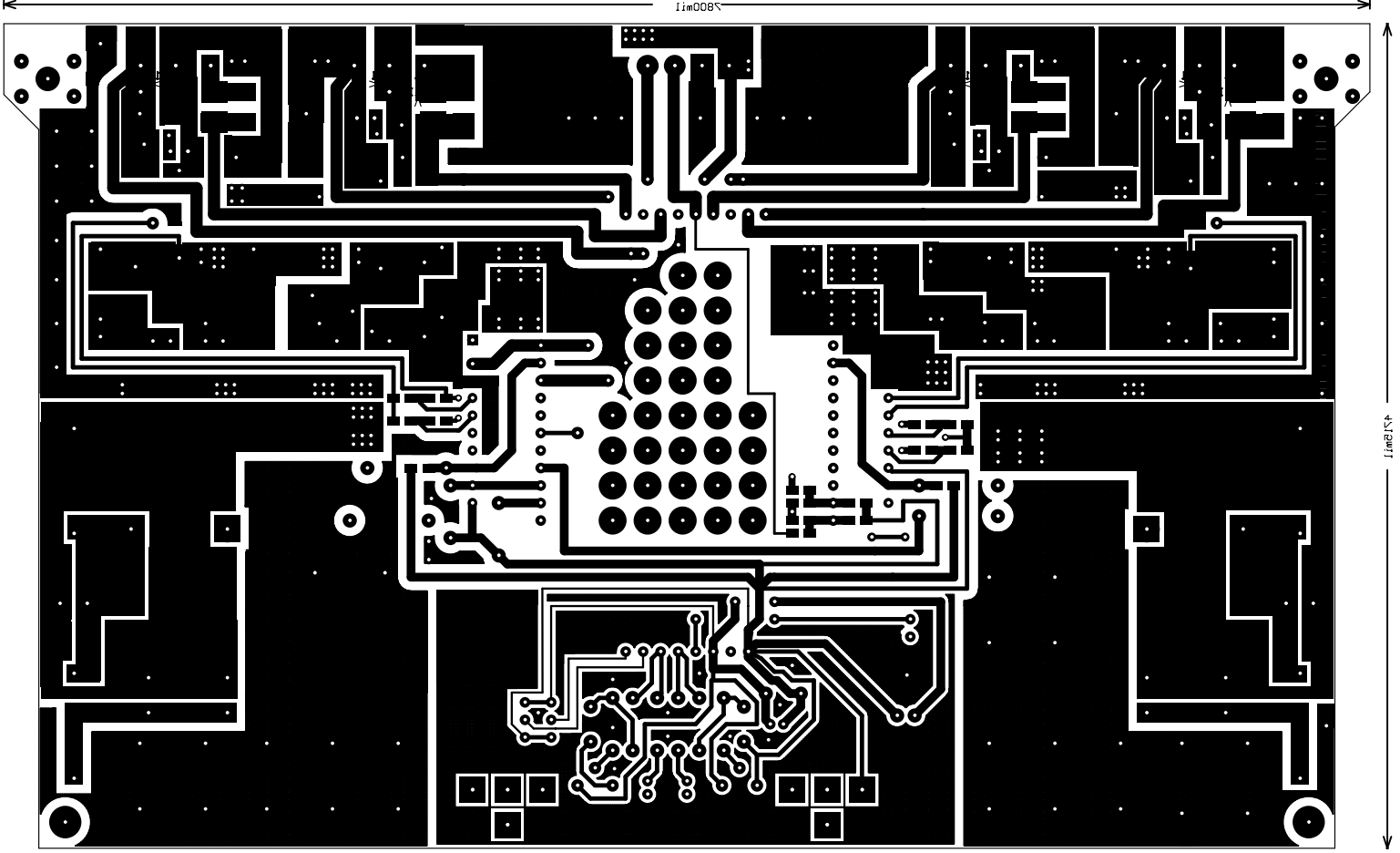


FABRICATION NOTES
MATERIAL: FR-4 OR EQUIVALENT
0.062 +/- 0.002 THICKNESS
2 OZ COPPER, ALL LAYERS
SOLDMASK OVER BARE COPPER, USE BLUE
SILKSCREEN TO BE WHITE
ALL HOLES PLATE THRU
FABRICATE PER IPC STANDARDS

NOTE: THERE ARE SLOTS ON THIS BOARD

125mil x 50mil

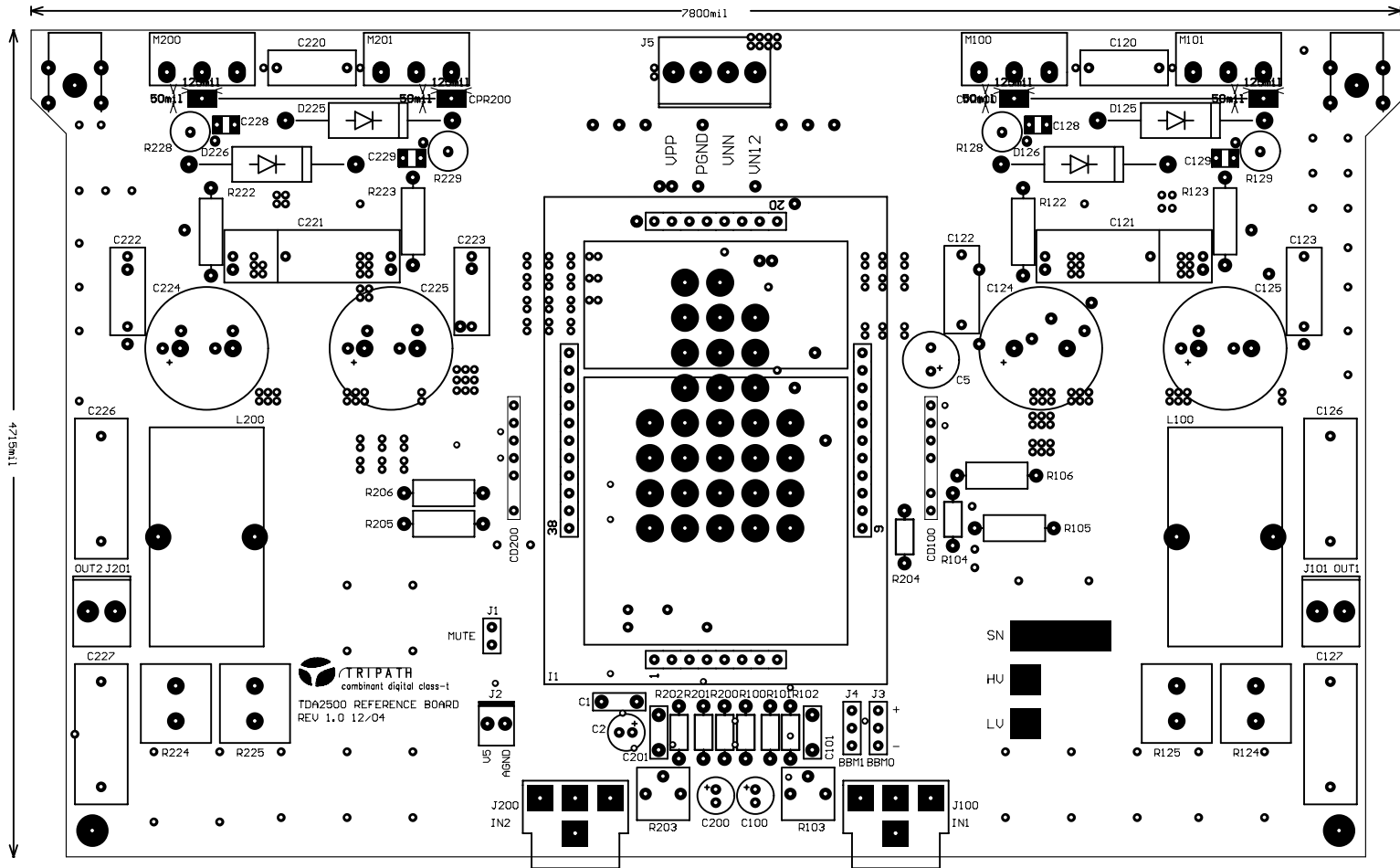
PLACE SLOTS AS SHOWN ON THIS LAYER
SLOTS SHOULD BE PLATED THRU



FABRICATE PER IPC STANDARDS
 ALL HOLES PLATE THRU
 SILKSCREEN TO BE WHITE
 SOLDERMASK OVER BARE COPPER, USE BLUE
 3 OZ COPPER, ALL LAYERS
 0.002 +/- 0.002 THICKNESS
 MATERIAL: FR-4 OR EQUIVALENT
 FABRICATION NOTES

PLATE HOLES PER IPC STANDARDS
 ALL HOLES PLATE THRU
 SILKSCREEN TO BE WHITE
 SOLDERMASK OVER BARE COPPER, USE BLUE
 3 OZ COPPER, ALL LAYERS
 0.002 +/- 0.002 THICKNESS
 MATERIAL: FR-4 OR EQUIVALENT
 FABRICATION NOTES

NOTE: THERE ARE SLOTS ON THIS BOARD
 12mil x 80mil
 SLOTS SHOULD BE PLATED THRU
 PLACE SLOTS AS SHOWN ON THIS LAYER

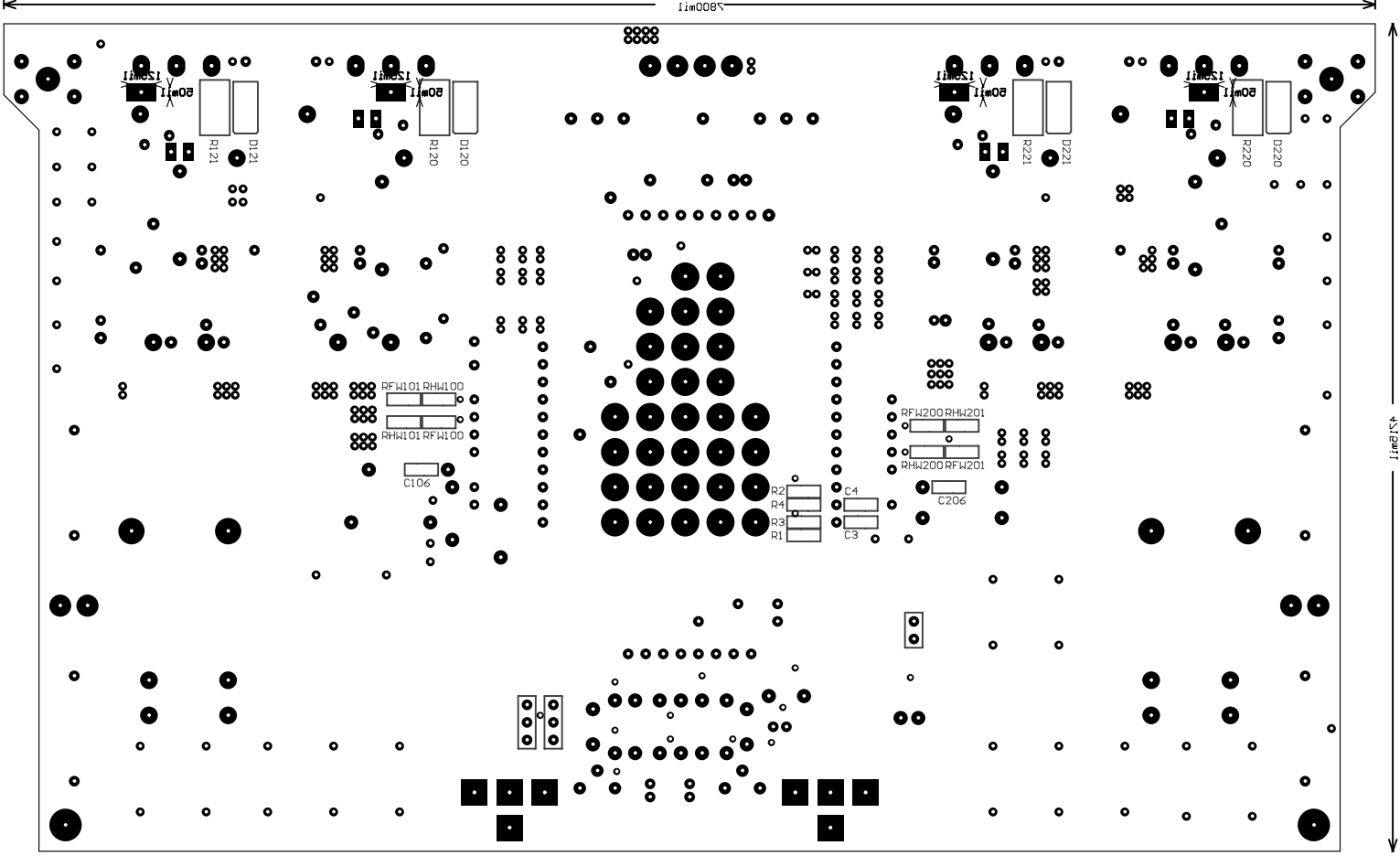


FABRICATION NOTES
 MATERIAL: FR-4 OR EQUIVALENT
 0.062 +/- 0.007 THICKNESS
 2 OZ COPPER, ALL LAYERS
 SOLDERMASK OVER BARE COPPER, USE BLUE
 SILKSCREEN TO BE WHITE
 ALL HOLES PLATE THRU
 FABRICATE PER IPC STANDARDS

NOTE: THERE ARE SLOTS ON THIS BOARD

125mm x 50mm

PLACE SLOTS AS SHOWN ON THIS LAYER
 SLOTS SHOULD BE PLATED THRU



FABRICATE PER IPC STANDARDS
 ALL HOLES PLATE THRU
 SILKSCREEN TO BE WHITE
 SOLDERMASK OVER BARE COPPER, USE BLUE
 3 OZ COPPER, ALL LAYERS
 0.025 +/- 0.0025 THICKNESS
 MATERIAL: FR-4 OR EQUIVALENT
 FABRICATION NOTES

NOTE: THERE ARE SLOTS ON THIS BOARD
 1.25m x 80mm
 SLOTS SHOULD BE PLATED THRU
 PLACE SLOTS AS SHOWN ON THIS LAYER