User's Guide

SNOA077B–August 1999–Revised April 2013

AN–1138 CLC5506 Evaluation Board

1 Basic Description

The CLC5506PCASM is a fully assembled and tested evaluation module for CLC5506 Gain Trim Amplifier (GTA). The evaluation module simplifies the task of making frequency response and noise figure performance evaluation of the CLC5506 gain trim amplifier.

The evaluation circuit is carefully designed and laid out on an FR4 printed circuit board (PCB) (part number: CLC730102). For the schematic diagram of the CLC5506PCASM, see Figure 1.

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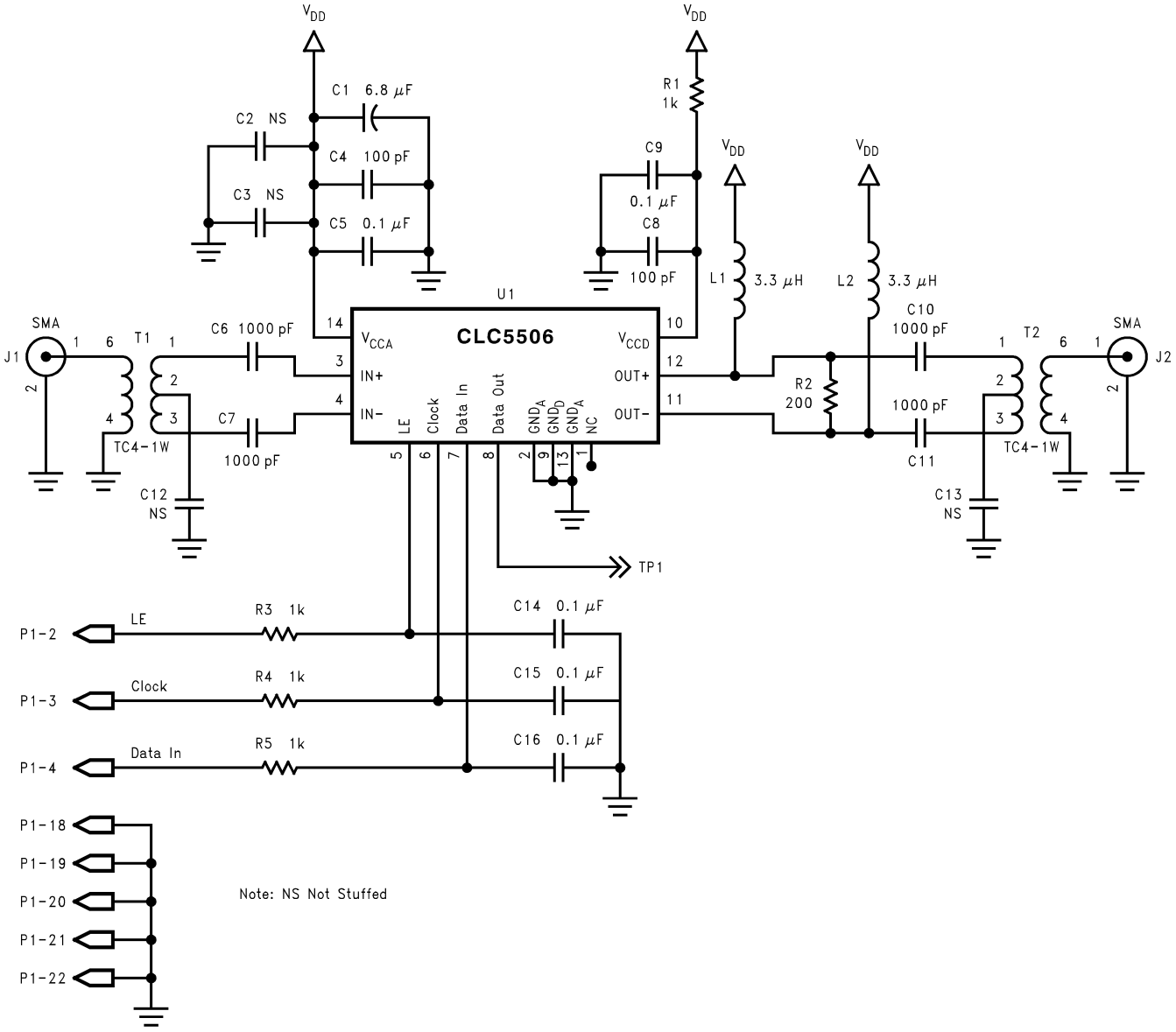

Figure 1. CLC5506PCASM Schematic Diagram

The differential input impedance of CLC5506 between pins IN^+ and IN^- is 200Ω. The differential output impedance between pins OUT_+ and OUT_- is set to 200Ω by resistor R2. Two 4:1 impedance ratio transformers (T1 and T2) are used for wide band matching to a single ended 50Ω system to simplify evaluation. The 3.3µH inductor at L1 and L2 are used as RF chokes for the open collector outputs. Resistor R1 and V_{CCD} is used to reduce noise cross-talk between the V_{CCA} and V_{CCD}. The low pass RC networks (R3, R4, R5 and C14, C15, C16) at LE, Clock and Data In pins are used to reduce AC feed-through to the RF circuitry.

Windows-95/98/NT GTA control software, developed by Texas Instruments can be used to send control data to the CLC5506 Gain Trim Amplifier. This software along with the *CLC5506 Gain Trim Amplifier (GTA) Data Sheet* (SNOS456) can be downloaded from Texas Instruments web site at http://www.ti.com.

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Figure 2 shows the typical test setup block diagram for the measurement of frequency response parameters.

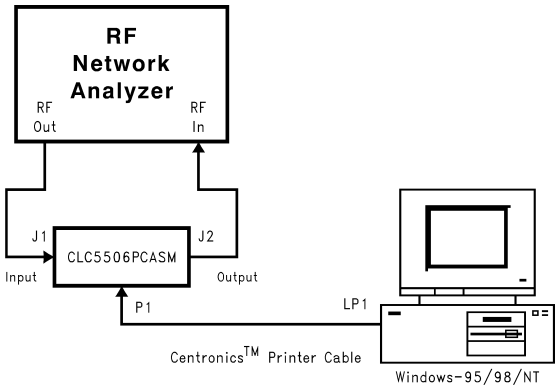

Figure 2. Test Setup Block Diagram for Frequency Response Measurement

Figure 3 shows the typical test setup block diagram for the measurement of noise figure parameter. A RF noise source was used. During the noise figure measurement, the Centronics™ printer cable connected to P1 should be disconnected from the evaluation module and removed from the measurement area to reduce PC EMI noise pick-up.

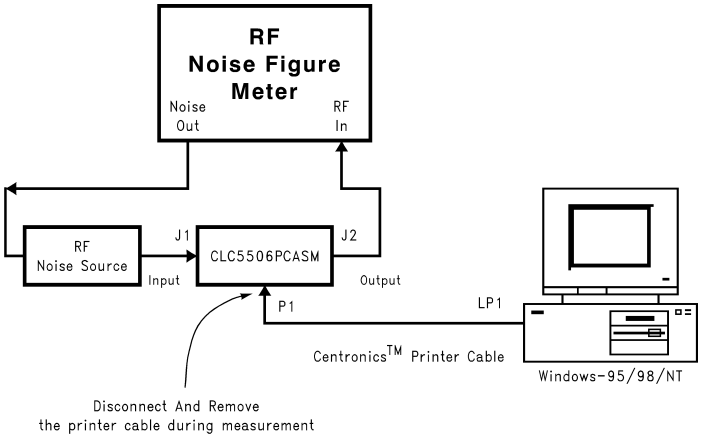

Figure 3. Test Setup Block Diagram for Noise Figure Measurement

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RF transformers T1 and T2 have intrinsic losses, the actual RF performance of the CLC5506 per se, could be calculated by accounting for T1 and T2 losses in the evaluation module. For correction factor for gain measurement and noise figure measurement based on typical losses measured on the transformers specified in Table 2, see Table 1.

Table 1. Gain and Noise Figure Correction Factor

Frequency (MHz)	Gain Measurement Correction Factor (dB)	Noise Figure Measurement Correction Factor (dB)
50	1.6	0.8
60	1.6	0.8
70	1.6	0.8
80	1.7	0.85
90	1.7	0.85
100	1.7	0.85
110	1.7	0.85
120	1.8	0.9
130	1.8	0.9
140	1.8	0.9
150	1.8	0.9
160	1.8	0.9
170	1.8	0.9
180	1.9	0.95
190	1.9	1.9
200	1.9	1.9
210	1.9	0.95
220	2.0	1.0
230	2.0	1.0
240	2.0	1.0
250	2.0	1.0
260	2.1	1.05
270	2.1	1.05
280	2.2	1.1
290	2.2	1.1
300	2.2	1.1
310	2.2	1.1
320	2.3	1.15
330	2.3	1.15
340	2.3	1.15
350	2.4	1.2
360	2.4	1.2
370	2.5	1.25
380	2.5	1.25
390	2.5	1.25
400	2.5	1.25
500	3.8	1.9
600	4.4	2.2

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Table 2. Bill of Materials for CLC5506PCASM

Qty	Reference	Description	Part No or Note	Distributor
2	T1,2	Transformer	Mini-Circuits TC4-1W	Mini-Circuits
1	P1	Connector	Norcomp, TT57-LE40360	DigiKey/ 1036RF-ND
2	J1,2	SMA connector	Femal Right Angle PCB Mount	DigiKey/ ARFX1232-ND
3	C4,8	Cap, 100pF, 5%	0805 SMD package	Generic
4	C6,7,10,11	Cap, 1000pF, 10%	1206 SMD package	Generic
6	C5,9,14,15,16	Cap, 0.1µF, 20%	0805 SMD Package	Generic
1	C1	Cap, 6.8µF, Tant., 16V	3528 SMD package	Generic
4	R1.3,4,5	Res 1K, 5%, 1/8W	1206 SMD Package	Generic
1	R2	REs, 200, 5%, 1/8W	1206 SMD Package	Generic
2	L1,2	Inductor, 3.3µH	1008 SMD Package	CoilCraft
2	VCC, GND	Single Header	0.1" header	Generic
1 1	U1	CLC5506IM PCB	14-PIN SOIC CLC730102	Texas Instruments

For insertion gain measurement of the frequency response, the correction factor is the total insertion loss of T1 and T2. This correction factor shall be added back to the insertion gain reading of network analyzer to get the actual gain performance of CLC5506.

For the noise figure measurement, the correction factor is the insertion loss of T1 (or half the total loss of T1 and T2). This correction factor shall be deducted from the noise figure reading of noise figure meter.

Figure 4 and Figure 5 on the following page, illustrate the top and bottom side layout of the CLC730102. Figure 6, also on the following page, is the assembly drawing of CLC5506PCASM.

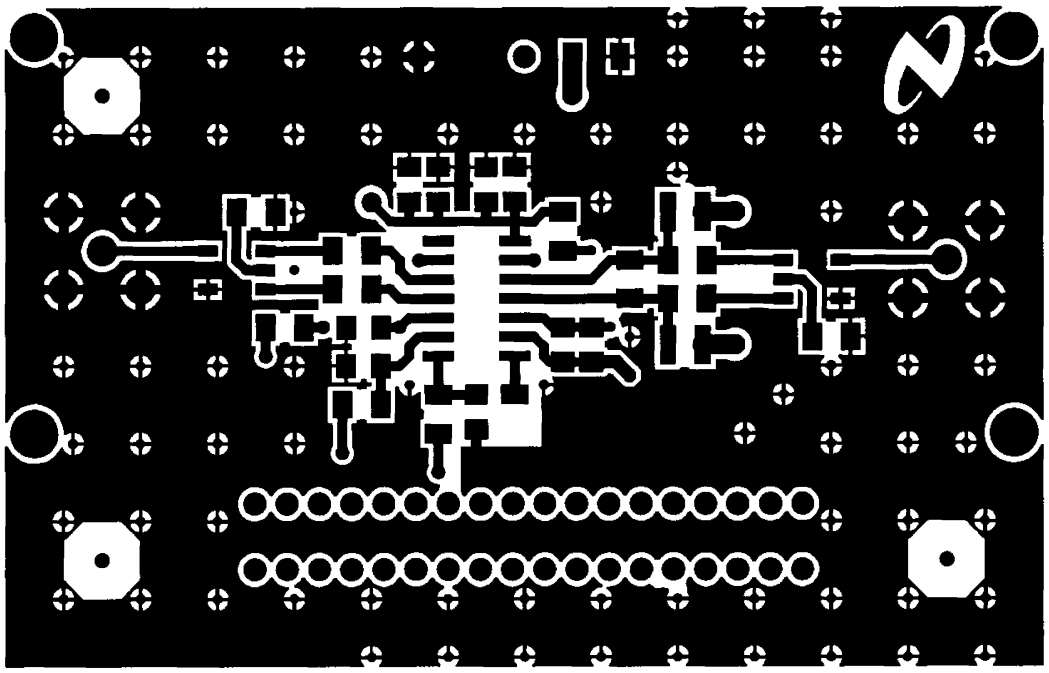

Figure 4. CLC730102 (Top Side)

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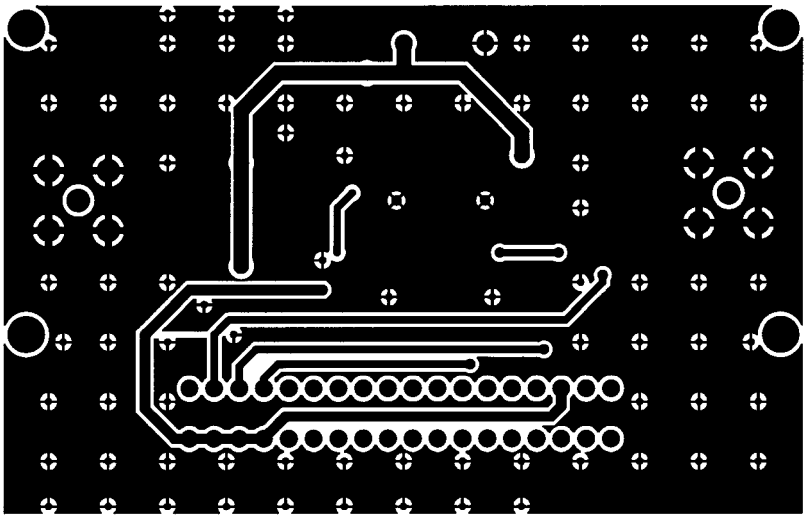

Figure 5. CLC730102 PCB (Bottom Side)

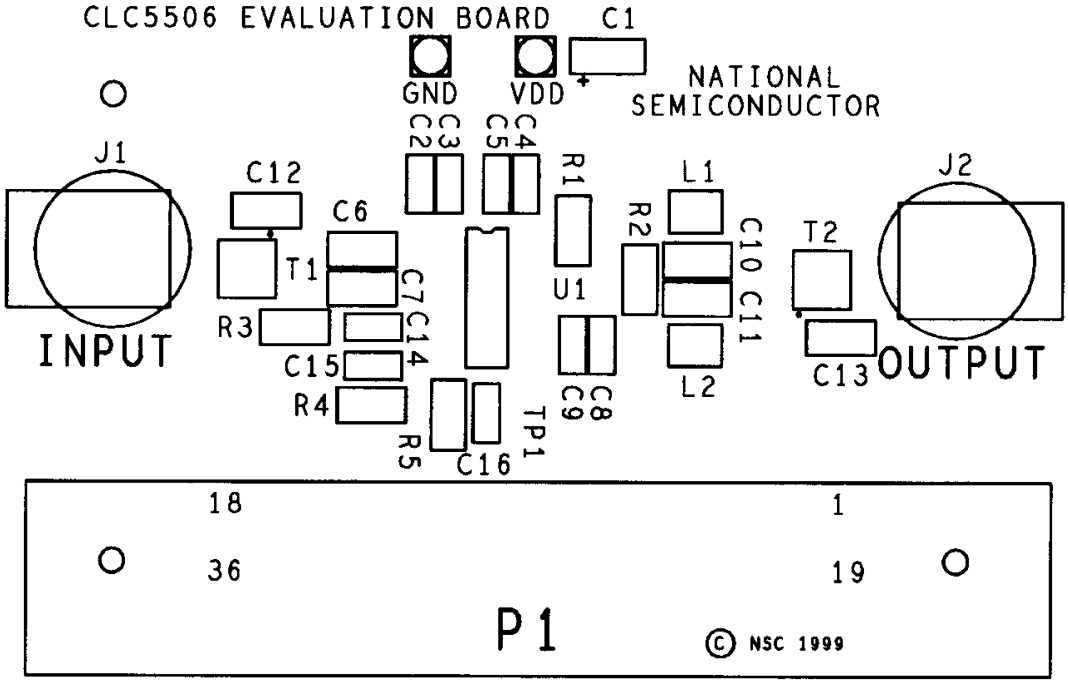

Figure 6. CLC5506PCASM Component Layout (Top Side)

In order to achieve the same performance as specified in the *CLC5506 Gain Trim Amplifier (GTA) Data Sheet* (SNOS456), components should be chosen from the bill of material attached and installed per Figure 6.

NOTE: The circuits included in this application report have been tested with Texas Instruments parts that may have been obsoleted and/or replaced with newer products. To find the appropriate replacement part for the obsolete device, see the *CLC to LMH Conversion Table* (SNOA428).

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2 References

- *CLC5506 Gain Trim Amplifier (GTA) Data Sheet* (SNOS456)
- *CLC to LMH Conversion Table* (SNOA428)

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