APPLICATION NOTE

SDH/SONET STM 16/OC48 transimpedance amplifier

AN99059

Philips Semiconductors

TP97036.2/F5.5

PHILIPS

SDH/SONET STM 16/OC48 transimpedance amplifier

Application Note AN99059

Abstract

This application note describes demoboard OM5807. This demoboard is designed for customer demonstration of Philips Semiconductors' TZA3013 IC. The application note is limited to information not described in the data sheets. Application information includes schematics and layouts.

APPLICATION NOTE

SDH/SONET STM 16/OC48 transimpedance amplifier

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Keywords

Telecom
Optical networks
SDH/SONET
STM16/OC48
AGC
TIA
Photo detector
Receiver
Non-clipping

Number of pages: 24

Date: 99-10-18

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Introduction

This application note is a short description of the OM5807 demoboard.

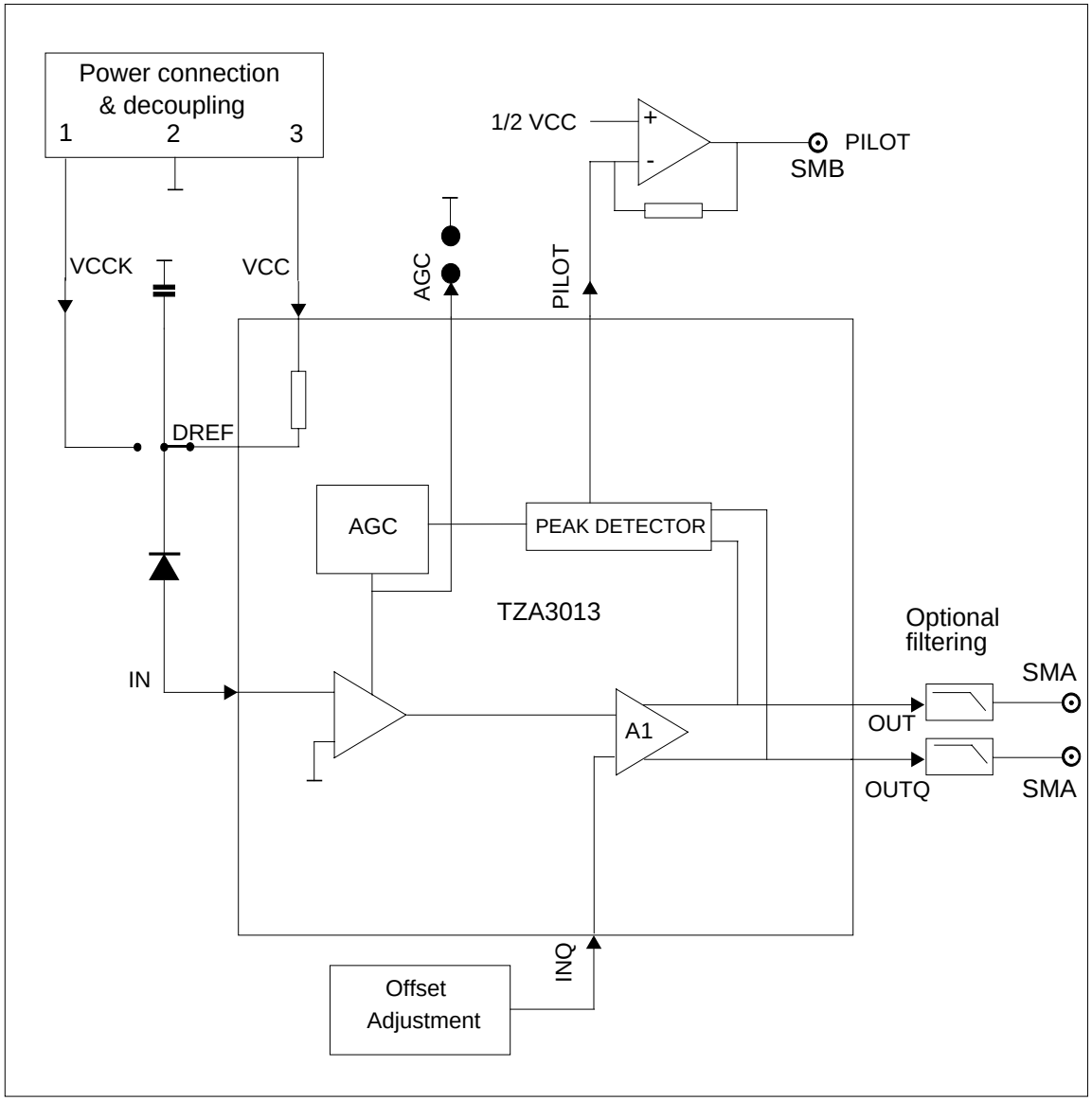
The OM5807 demoboard can be used to evaluate the function of TZA3013 transimpedance amplifier at 2.5 Gb/s.

The application note consists of the following sections:

1. Getting started (block schematic, test possibilities)
2. General (used acronyms, PCB cross section)
3. Schematic, descriptions
4. Bill of material
5. Layout and component placement

1. Getting started

1.1 Block diagram



1.2 Demoboard description

The OM5807 demoboard is designed to evaluate the transimpedance ampifier (TZA3013A).

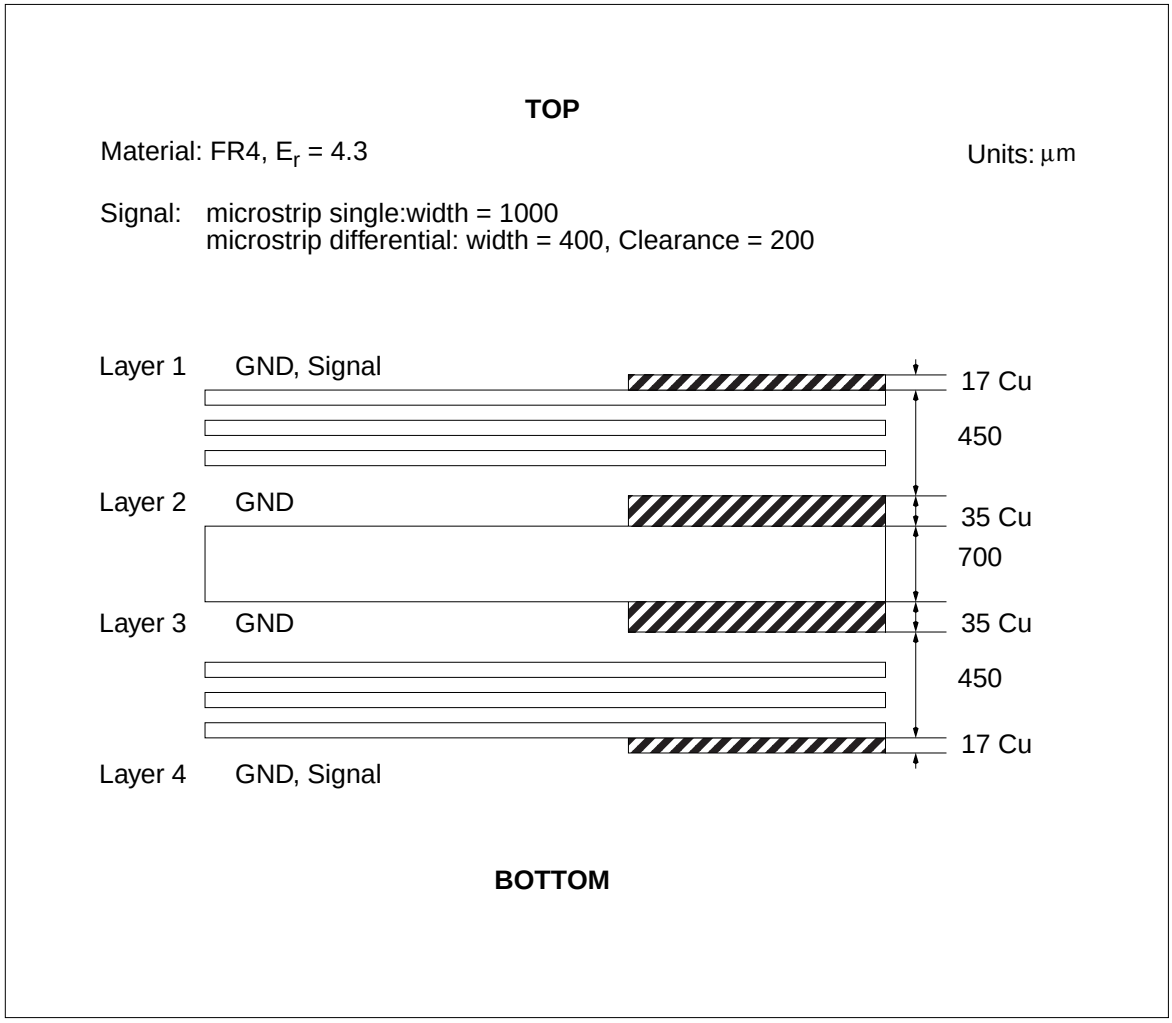
1. On the left hand side, opposite of OUT & OUTQ, there is space to connect a PIN (or avalanche) photo detector. This diode should be connected as close as possible to the TIA.
2. The OM5807 needs only a 3.3 volt supply voltage, to be connected to P1-3.
3. It is possible to supply a different voltage to the cathode of the photo detector, this voltage should be connected to P1-1 (VCCK) and jumper J2 has to be set in the VCCK - DIODE position.
4. For proper setting of the output stage, the output voltage between OUT and OUTQ should be 0 volt. This should be measured when there is no input signal present. The offset can be adjusted by R7.
   If pin 5 is not connected the setting of R7 is irrelevant.

2. General

2.1 Acronyms

- 2.5 Gbps 2,488,320 kbps
- 2.5 GHz 2,488,320 kHz
- AGC Automatic Gain Control
- Cu Copper
- GND Ground
- IC Integrated Circuit
- PCB Printed Circuit Board
- Pxxx Identification label for Pins, buses and connectors
- ..Q indication for inverted signal
- SDH Synchronous Digital Hierarchy
- SMD Surface Mounted Device
- SMA RF connector 50 ohm system impedance
- SMB Small outline DC connectors
- SONET Synchronous Optical Networks
- STM 16 Synchronous Transport Module no. 16
- TIA Trans Impedance Amplifier
- TZA Type number indication

2.2 Cross section of multi layer PCB



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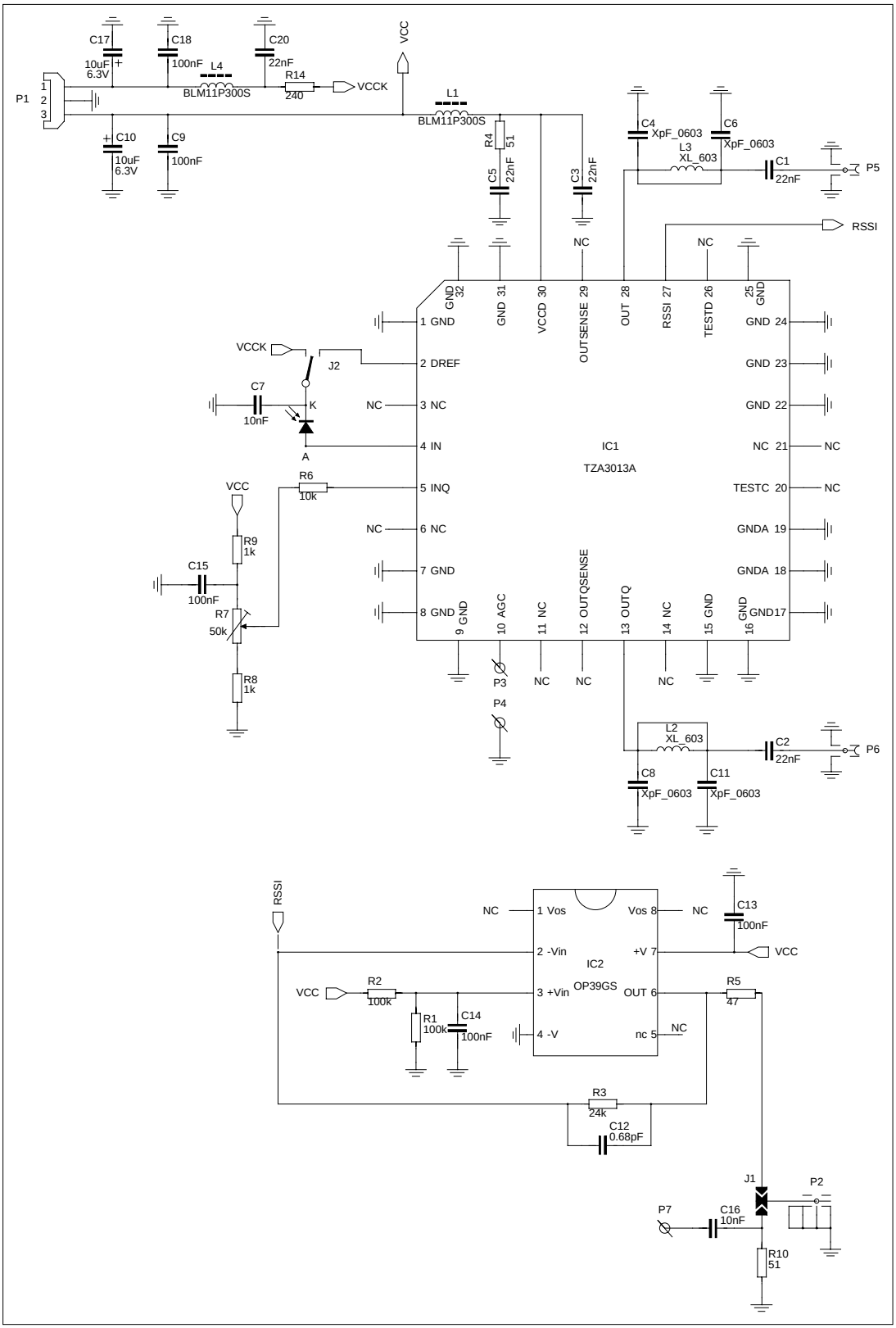
3. Schematic

For reading convenience the schematic of the OM5807 demoboard is printed on the next page.


C17
10uF
6.3V
C18
100nF
C20
22nF
L4
BLM11P300S
R14
240
VCCK
VCC
P1
C10
10uF
6.3V
C9
100nF
L1
BLM11P300S
R4
51
C5
22nF
C3
22nF
C4
XpF_0603
C6
XpF_0603
L3
XL_603
C1
22nF
P5
RSSI
NC
NC
GND 32
GND 31
VCCD 30
OUTSENSE 29
OUT 28
RSSI 27
TESTD 26
GND 25
1 GND
2 DREF
3 NC
4 IN
5 INQ
6 NC
7 GND
8 GND
GND 24
GND 23
GND 22
NC 21
TESTC 20
GNDA 19
GNDA 18
GND17
IC1
TZA3013A
9 GND
10 AGC
11 NC
12 OUTQSENSE
13 OUTQ
14 NC
15 GND
16 GND
VCCK
J2
C7
10nF
K
A
R6
10k
VCC
R9
1k
C15
100nF
R7
50k
R8
1k
P3
P4
NC
NC
NC
L2
XL_603
C2
22nF
P6
C8
XpF_0603
C11
XpF_0603
RSSI
NC
1 Vos
Vos 8
NC
C13
100nF
2 -Vin
+V 7
VCC
IC2
OP39GS
VCC
R2
100k
3 +Vin
OUT 6
R5
47
R1
100k
C14
100nF
4 -V
nc 5
NC
R3
24k
C12
0.68pF
J1
P2
P7
C16
10nF
R10
51

3.1 Description

3.1.1 Power supply

P1-1: VCCK optional connection with voltage different from VCC.

P1-2: GND.

P1-3: VCC = 3.3 volt.

3.1.2 Decoupling

C3, C5, C9, C10, C13, C17, C18, C20, R4, R14 and L1, L4 are decoupling networks.

C7 is especially required for power supply rejection ratio.

3.1.3 J2 setting

If J2 is set in DIODE - DREF position, the DREF pin provides a bias voltage for the PIN diode, derived from the VCC by a lowpass filter.

By setting J2 in VCCK - DIODE position it is possible to supply a different voltage on the cathode of the photo detector. This voltage should be connected to P1-3.

3.1.4 Decision level adjustment

The circuit around (R6, R7, R8, R9, C10) is used to adjust the DC offset on the output level.

3.1.5 Pilot tone detection

P2 can be connected to the output of IC2 using solder joint J1. If the input signal is modulated with a pilot tone, this can be observed at P2.

3.1.6 TZA3013 test without photo detector

If P2 is connected to the RC network, by using solder joint J1, the transimpedance amplifier can be tested without photo detector. P7 has to be connected to the input, pin 4 on IC1 via a 300 Ohm resistor.

3.1.7 AGC voltage

The AGC voltage can be monitored at P3. P4 is connected to GND. When the AGC voltage is monitored the capacitive load should be < 1pF.

3.1.8 Noise filtering

The components for noise filtering C4, C6, L3 and C8, C11, L2 are not mounted on the OM5807.

If this noise filter is required on board, the pads for these components are prepared.

Note: if L2, L3 are placed, the stripline underneath has to be removed.

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4. Bill of material

TABLE 1 Bill of material, sorted after reference number. nm = not mounted

REF	nm	Part number	Comp	Series	Vendor	Tolerance	Rating	Geom
C1		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C2		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C3		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C4	x	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C5		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C6	x	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C7		2222-596-16627	10nF	X7R	PHILIPS	10%	50V	C0603
C8	x	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C9		2222-786-16749	100nF	X7R	PHILIPS	20%	16V	C0603
C10		B45196E1106M9	10uF	B45196	SIEMENS	20%	6.3V	B45_b
C11	x	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C12		2222-867-12687	0.68pF	NP0	PHILIPS	0.25pF	50V	C0603
C13		2222-786-16749	100nF	X7R	PHILIPS	20%	16V	C0603
C14		2222-786-16749	100nF	X7R	PHILIPS	20%	16V	C0603
C15		2222-786-16749	100nF	X7R	PHILIPS	20%	16V	C0603
C16		2222-596-16627	10nF	X7R	PHILIPS	10%	50V	C0603
C17		B45196E1106M9	10uF	B45196	SIEMENS	20%	6.3V	B45_b
C18		2222-786-16749	100nF	X7R	PHILIPS	20%	16V	
C19		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C20		2222-916-16741	22nF	X7R	PHILIPS	20%	25V	C0603
C21		2222-596-16627	10nF	X7R	PHILIPS	10%	50V	C0603
IC1		PN-TZA3013A	TZA3013A	IC_Universal	UNKNOWN			SOT401
IC2		PN-OP39GS	OP39GS	IC_Universal	UNKNOWN			SOT96
J2		2422-021-98731	JUMPER_3p	print_switch	PHILIPS			JUMPER
L1		BLM11P300S	BLM11P300S	CBD	muRata			BLM11
L2	x	L-0603CS	XL_603	0603CS	*			L0603cs
L3	x	L-0603CS	XL_603	0603CS	*			L0603cs
L4		BLM11P300S	BLM11P300S	CBD	muRata			BLM11
P2		R114426	SMB	COAX	RADIALL			SMB
P3		4022-007-45420	SOLDER-PIN		PHILIPS			
P4		4022-007-45420	SOLDER-PIN		PHILIPS			
P5		142-0701-851	SMA	COAX	EF.Johnson			SMA
P6		142-0701-851	SMA	COAX	EF.Johnson			SMA
P7		4022-007-45420	SOLDER-PIN		PHILIPS			
P8		142-0701-851	SMA	COAX	EF.Johnson			SMA
R1		2322-702-60104	100k	RC21	PHILIPS	5%	0.063W	R0603
R2		2322-702-60104	100k	RC21	PHILIPS	5%	0.063W	R0603
R3		2322-704-62403	24k	RC22H	PHILIPS	1%	0.063W	R0603
R4		2322-702-60519	51	RC21	PHILIPS	5%	0.063W	R0603

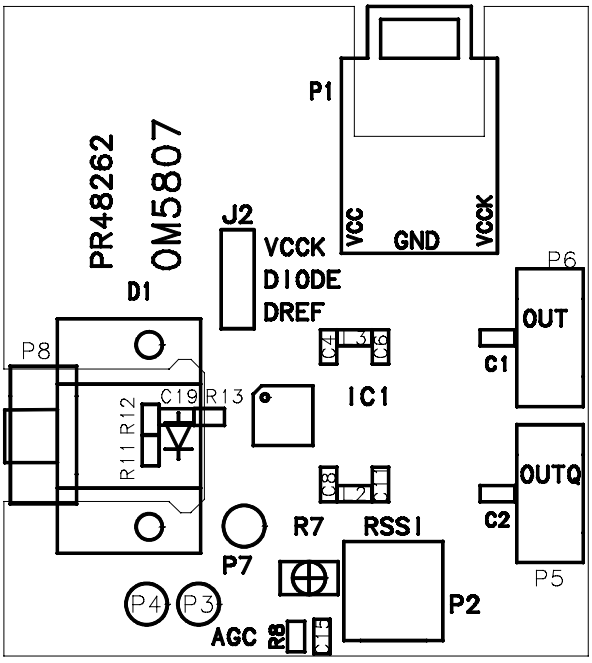
TABLE 1 Bill of material, sorted after reference number. nm = not mounted

REF	nm	Part number	Comp	Series	Vendor	Tolerance	Rating	Geom
R5		2322-702-60479	47	RC21	PHILIPS	5%	0.063W	R0603
R6		2322-702-60103	10k	RC21	PHILIPS	5%	0.063W	R0603
R7		3314J-50K	50k	Typ3314	BOURNS	+-20%	0.25W	3314J
R8		2322-702-60102	1k	RC21	PHILIPS	5%	0.063W	R0603
R9		2322-702-60102	1k	RC21	PHILIPS	5%	0.063W	
R10		2322-702-60519	51	RC21	PHILIPS	5%	0.063W	R0603
R11		2322-702-60121	120	RC21	PHILIPS	5%	0.063W	R0603
R12		2322-702-60121	120	RC21	PHILIPS	5%	0.063W	R0603
R13		2322-702-60331	330	RC21	PHILIPS	5%	0.063W	R0603
R14		2322-702-60241	240	RC21	PHILIPS	5%	0.063W	R0603
		8222-411-48262	BOARDPR48262		PS-SLE			BOARD

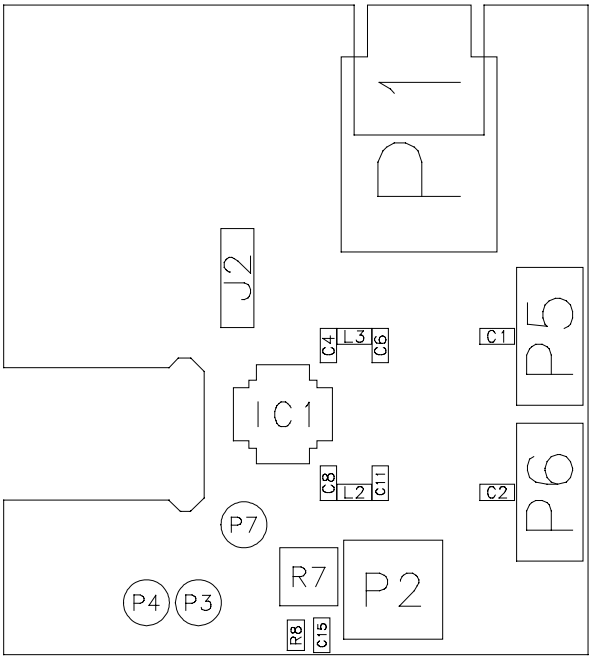
5. Layouts

5.1 Top layer silkscreen (A) and component placement (B)

A

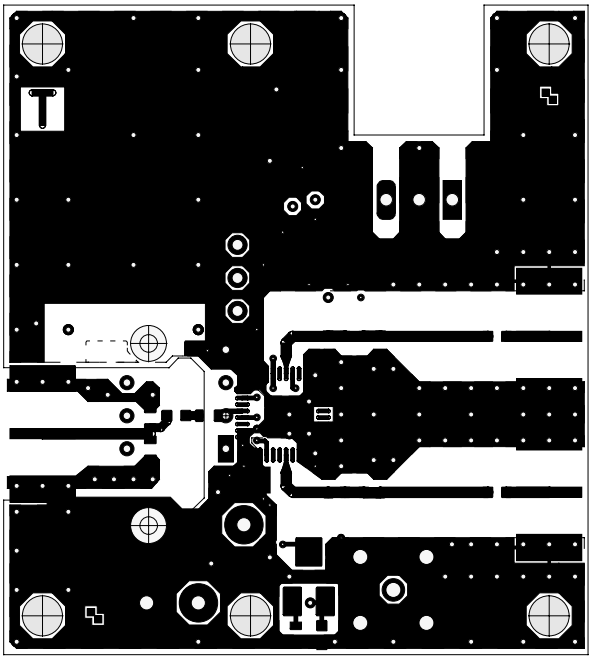


B

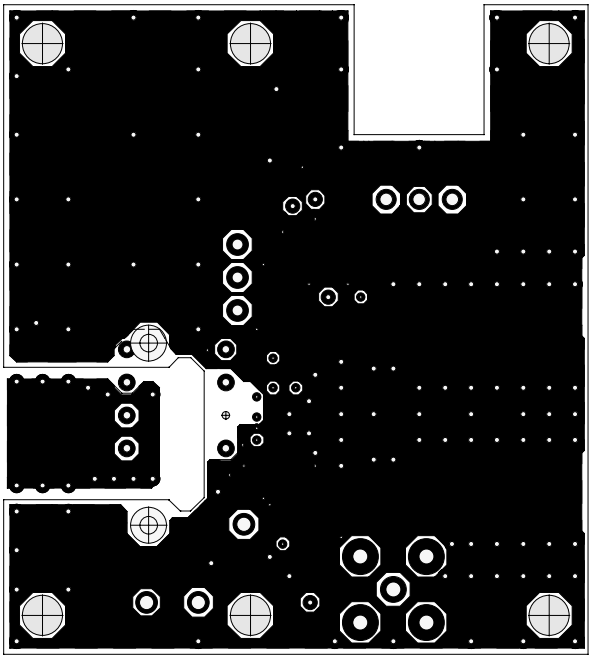


5.2 Top layer (A) and first inner layer (B) copper

A

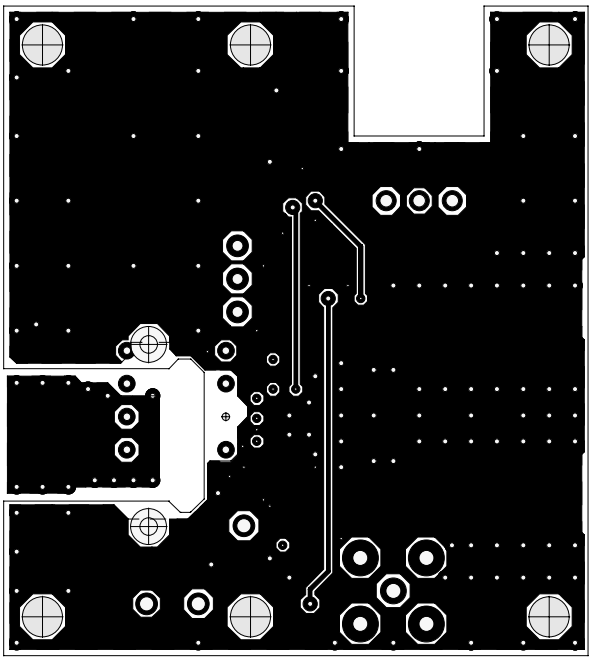


B

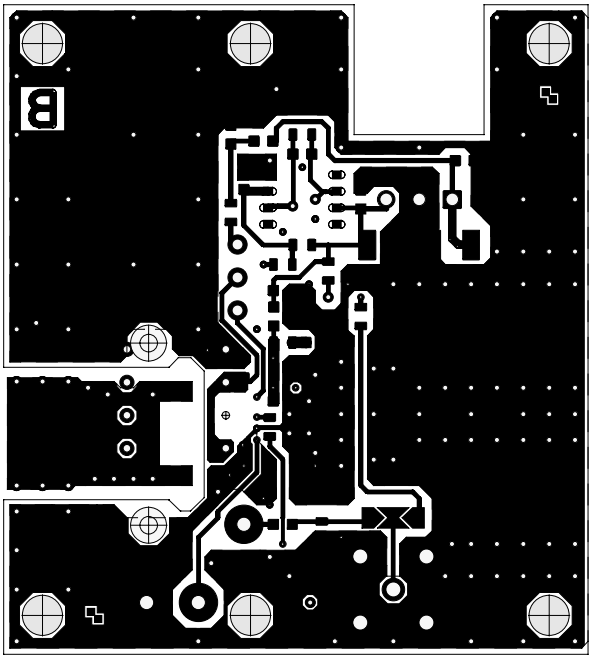


5.3 Second inner layer (A) and bottom layer (B) copper

A

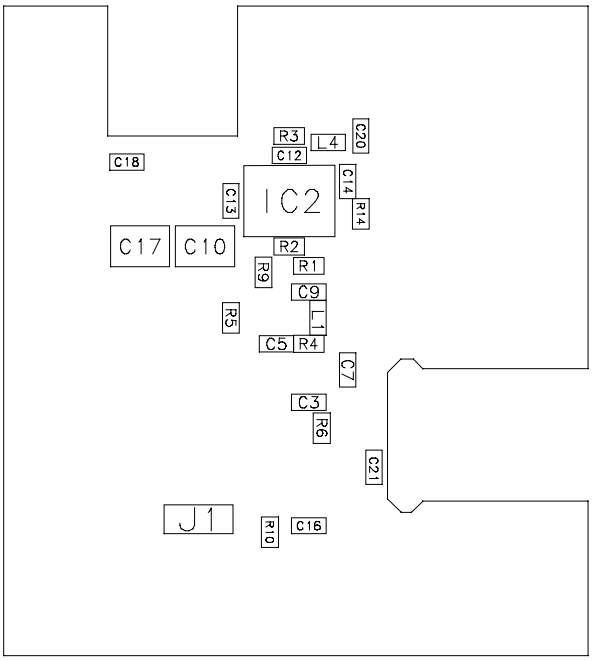


B



5.4 Component placement (A) and silkscreen (B) bottom layer (bottom view)

A



B