APPLICATION NOTE

OM5814 demo board for TZA3010 laserdriver 30-3200 Mb/s

AN01018

Philips
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Abstract

This application note describes demo board OM5814. This demo board is designed for customer demonstration of Philips Semiconductors' TZA3010 IC. The application note is limited to information not described in the data sheets. Application information includes schematics and layouts.

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OM5814 demo board for TZA3010 laserdriver 30-3200 Mb/s

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INTRODUCTION

This application note is a short description of the OM5814 demo board for minidil laser. The OM5814 demo board can be used to evaluate the functionality of the TZA3010A or TZA3010B laserdriver at speeds up to 3.125 Gb/s with single 3.3 V positive power supply.

Global board functionality:

Single positive power supply voltage for TZA3010 and additional power supply voltage possible for the laser.

Over-voltage and reverse polarity protection at power supply connector.

Possibility for AC and DC coupling at data and clock inputs. DC coupling at LA & LAQ only with TZA3010B.

Suitable for 8-pin minidil laser.

TZA3010 operation with or without retiming functionality (CIN/CINQ).

Average control loop operation:

- Average loop operation with internal temperature compensation.
- Average loop operation with external temperature sensor.

Adjustable control settings:

- Bias and modulation current.
- Average power.
- Pulse width adjust.

Enable for bias and modulation current.

The application note consists of the following sections:

1. Getting started.
2. General information.
3. demo board functionality description.
4. Operation modes.
5. Bill of materials.
6. Schematics.
7. Layouts.

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1. Getting started

1.1 Block diagram

Figure 1 shows the block diagram of the demo board.

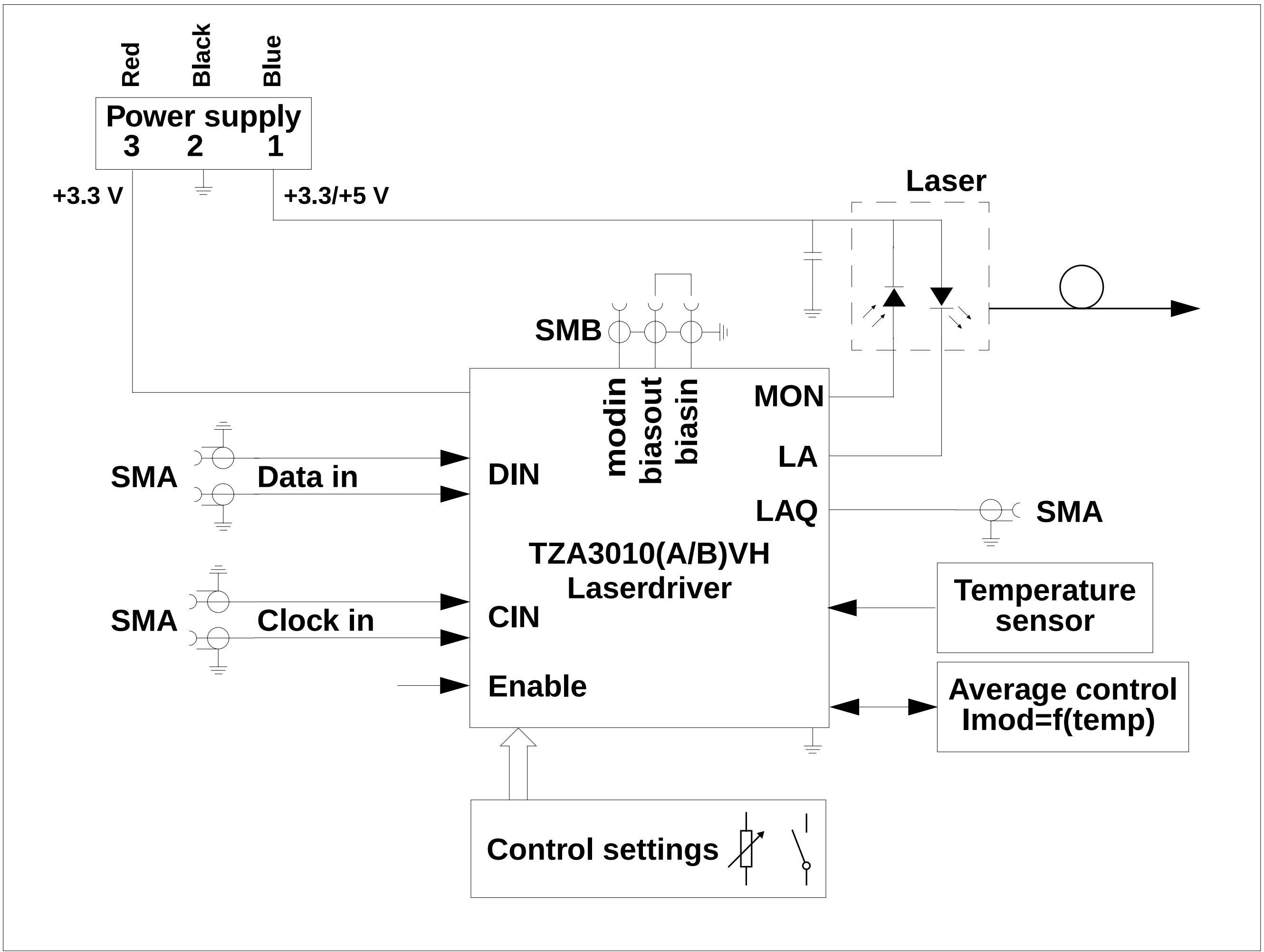

Fig.1 Block diagram of demo board OM5814

1.2 Demo board description

The demo board is designed to evaluate the TZA3010 laserdriver in combination with a minidil laser.

One electrical output is available to have the possibility to do electrical measurements.

1.2.1 Power supply

Only one supply voltage is needed for the OM5814, optional two when the TZA3010B is mounted.

Two supply voltages are possible only when solderpad J1 is open.

The demo board is protected against over voltage and wrong voltage polarity.

Connect the OM5814 power supply cable to connector P9.

1.2.1.1 PCB board with IC TZA3010AVH

This demo board needs only a single +3.3 V supply voltage, to be connected to P9.3.

No alternative voltage can be applied on this demo board.

Check if solder joint J1 is closed.

If J1 is not closed, a +3.3 V supply voltage needs to be applied also on P9.1.

1.2.1.2 PCB board with IC TZA3010BVH

Two supply voltages are used:

+3.3 V at P9.3 supply for the TZA3010B and other IC’s.

+3.3 V or +5.0 V at P9.1 supply for the TZA3010B output stage and laserdiode.

No alternative voltage can be applied on this demo board.

Check if solder joint J1 is open.

1.2.2 Jumper J2

Not available in customer boards.

1.2.3 D1 Minidil laser

The board is suitable for use with a minidil laser. The minidil laser should be placed at position D1 on the top layer of the PCB.

1.2.4 Electro Static Discharge

The IC’s on the demo board are ESD sensitive devices.

Standard ESD handling precautions should be followed while using the demo board.

This contains minimal the use of wrist straps and ESD floor mats.

1.3 Jumper & header symbol definition

1.3.1 Jumper / Solderjoint

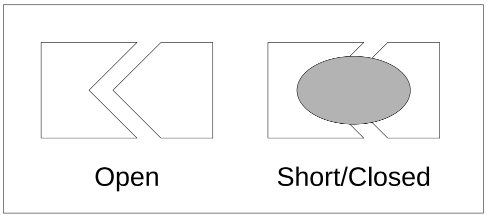

Fig.2 Jumper Solderjoint, open/closed definition

1.3.2 Jumper / Header 2p

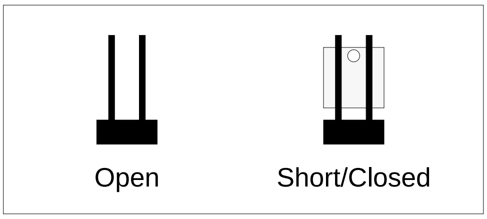

Fig.3 Jumper / Header 2p, open/closed definition

1.3.3 Measurement points

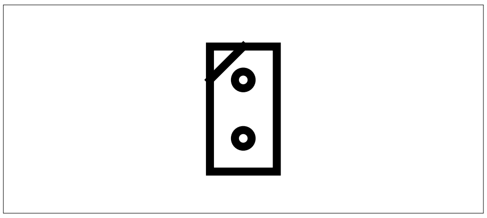

Fig.4 Measurement point for voltages and currents

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2. General information

2.1 Acronyms

- AVR Average
- CML Current Mode Logic
- Cu Copper
- DC Direct current
- ESD Electro Static Discharge
- FR4 Fire Resistant 4. Type of PCB material
- GND Ground
- IC Integrated Circuit
- Jxx Identification label for jumpers
- OC48 Optical Carrier no. 48
- OP-AMP Operational Amplifier
- P(0) Optical ‘zero’ level
- P(1) Optical ‘one’ level
- PCB Printed Circuit Board
- PECL Positive Emitter Coupled Logic
- PRBS Pseudo Random Bit Sequence
- PWADJ Pulse Width ADJust
- Pxx Identification label for Pins, buses and connectors
- ..Q Indication for inverted signal
- RF Radio Frequency
- SDH Synchronous Digital Hierarchy
- SMA RF connector 50 ohm system impedance
- SMB Small outline DC connectors
- SMD Surface Mount Device
- SONET Synchronous Optical Network
- STM16 Synchronous Transport Module no. 16
- T-line Transmission line
- TZA Type number indication
- VCC Power supply voltage
- VT See VTEMP
- VTEMP Temperature dependent voltage source
- W Width
- 0402 SMD component size indication
- 0603 SMD component size indication

- 1206 SMD component size indication

2.2 Layout considerations

2.2.1 Layout definitions

The layout for the demo board is designed on a 6 layer PCB. The layers are numbered:

layer 1: top layer,

layer 2: 1^{st} inner layer,

layer 3: 2^{nd} inner layer,

layer 4: 3^{rd} inner layer,

layer 5: 4^{rd} inner layer,

layer 6: bottom layer.

The PCB material is FR4, 1.6 mm thick, 6 layer with relative dielectric constant ε_r=4.7. No buried or blind vias are used in this design. Chosen is for a 6 layer design to be able to design the 25 ohm and 50 ohm impedance RF traces properly with a total PCB thickness of 1.6 mm.

The use of the layers is ordered as follows (from top to bottom), see table 1.

TABLE 1 Layer definitions

Layer	Layer name	Function
1	top layer	RF & Signal
2	1^{st} inner layer	GND
3	2^{nd} inner layer	GND
4	3^{rd} inner layer	GND
5	4^{rd} inner layer	GND
6	bottom layer	Signal

2.2.2 PCB specifications

PCB dimensions: 85 x 110 mm

PCB Material: glass epoxy FR4

Number of layers: 6

Laminate thickness: 1.6 mm

Smallest via holes used 0.2 mm

Copper thickness: 17.7 um, start value for layer 1 and 6. After PCB-production process copper thickness is 35 um.

2.2.3 Cross section of multi layer PCB

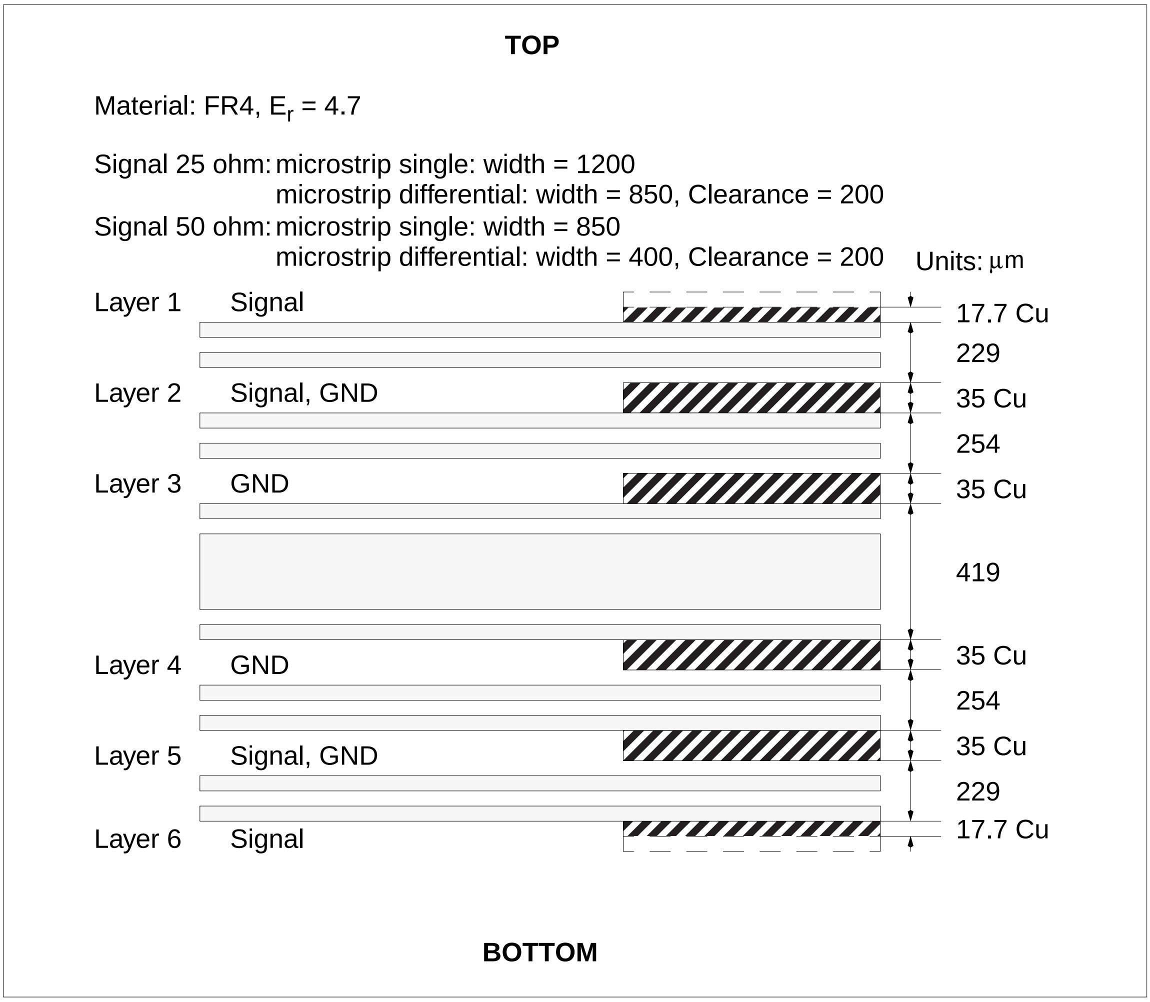


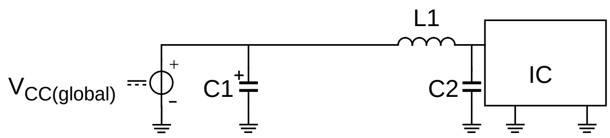
Fig.5 Cross section of multi layer PCB

2.2.4 Decoupling issues

Under all high speed IC's the GND layers are connected with multiple as-large-as-possible vias, to reduce parasitic inductance between the GND planes. This ground connections also functions as heatsink for the IC.

The supply lines of the board are configured as star from the connector to IC/blocks.

The decoupling of all ICs/blocks is done with a two stage PI-network: from the connector an individual line goes to the first PI-network near the IC/block. Then all the voltage domains are individually decoupled by a PI-filter. This PI-filter is placed near the voltage domain pin. The last capacitor is placed as close as possible to the IC/block.



General setup of power supply decoupling network:
From the global domain a PI-filter provides the voltage for the local voltage domains. Capacitor C2 is placed as close as possible to the IC to reduce parasitic inductances.

Fig.6 General setup of power supply decoupling networks

Detailed information about the used FR4 PCB is given in chapter 2.2.2 and figure 5.

2.2.5 Design rules for PCB routing

For a design the component placement and routing of traces is very important. The following design aspects should be considered carefully.

- Threat data and clock lines as much as possible differential. The impedance should be 100 ohm differential and 50 ohm for single ended traces.
- The transmission line between MON and the photodiode should have the same impedance as pin MON.
- Make line DIN and DINQ at the same electrical length, same for CLK and CLKQ.
- Make all RF connections as short as possible.
- Use ground planes. Do not use VCC planes.
- Use as much as possible via holes under the TZA3010 die pad for good low ohmic and low inductance GND connection.
- With laser at LA, balance LAQ with 24 or 25 ohm resistor for same load as presented at pin LA.
- Decouple the laser as short as possible.
- Design a small capacitor position at input MONIN so that the input capacitance at pin MONIN can be tuned. The tuning might be needed for optimizing the application for a specific datarate.
- Use decoupling filters for VCC lines. Use starpoint connection.
- Do not route RF lines close to laserdriver control line, to prevent coupling between the lines.

2.3 Board interfacing

2.3.1 Optical

The PCB board is designed for use of minidil laser diodes with backfacet diode at position D1.

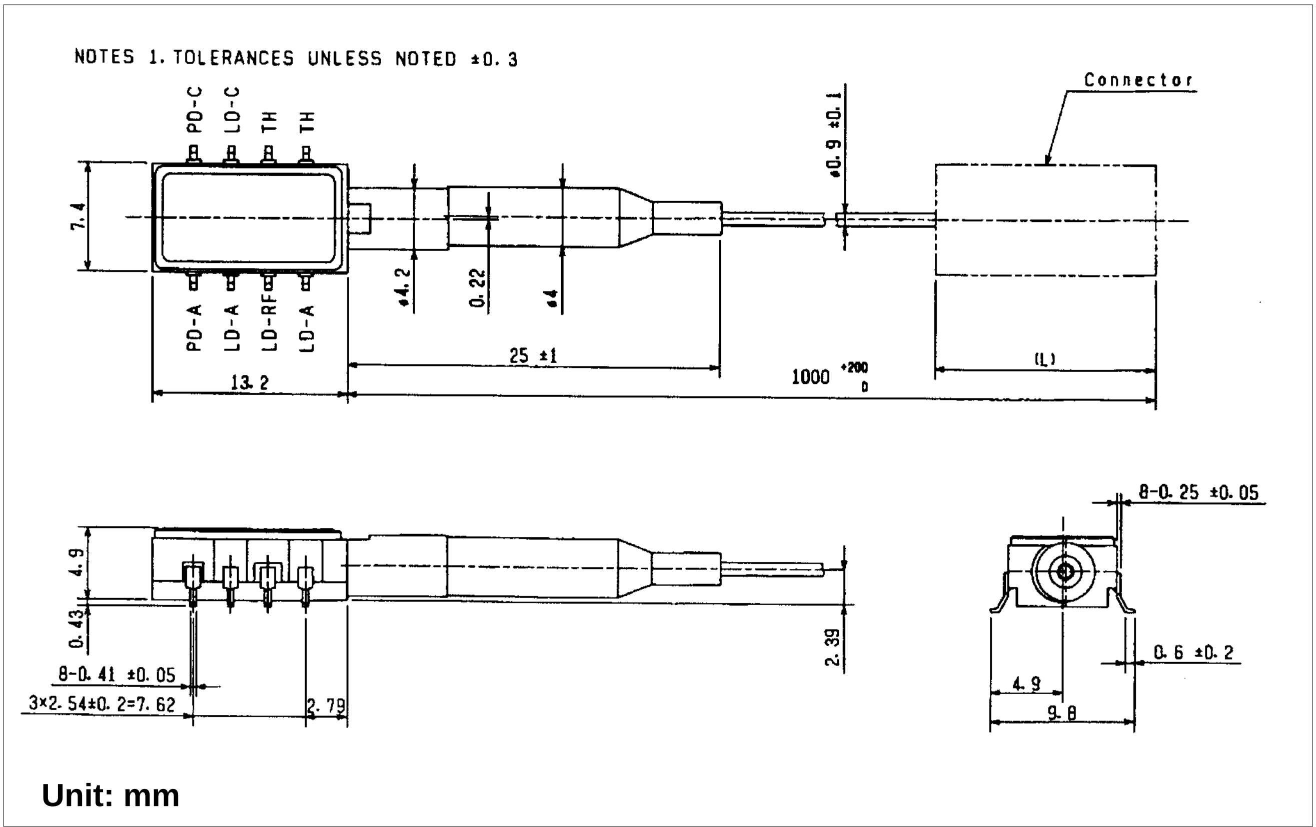


Fig.7 Mechanical dimensions minidil laser

Table 2 shows the test report of the used minidil laser given by the manufacturer.

TABLE 2 Specifications Misubishi laser FU-445SDF-W1M1B, S/N: 99B482

Parameters	Symbols	Conditions	values	Units
Threshold Current	Ith	@ 25 deg C	10.1	mA
Threshold Current	Ith	@ 85 deg C	29.9	mA
Operating Current	Iop	@ 25 deg C 2.0 mW	33.9	mA
Operating Current	Iop	@ 85 deg C 2.0 mW	66.3	mA
Operating Voltage	Vop	@ 25 deg C 2.0 mW	1.201	V
Central Wavelength	Ramda	@ 25 deg C 2.0 mW	1308.2	nm
Monitor Current	Imon2	@ 25 deg C 2.0 mW	0.601	mA
Optical output	Pf	@ 25 deg C Im=Imon	2.0	mW

2.3.2 Electrical

The PCB board has one 50 ohm output at LAQ for electrical testing.

Electrical differential inputs for clock and data via 50 ohm SMA connectors.

SMA type connectors are used for all RF-signals.

SMB type connectors are used for all DC-control signals.

Stocko type connector is used for power supply connection.

Jumper / headers are used for programming and measurement points.

2.4 Typical measurement setup

Figure 8 shows a typical measurement setup to perform optical measurements on the TZA3010 with demo board OM5814.

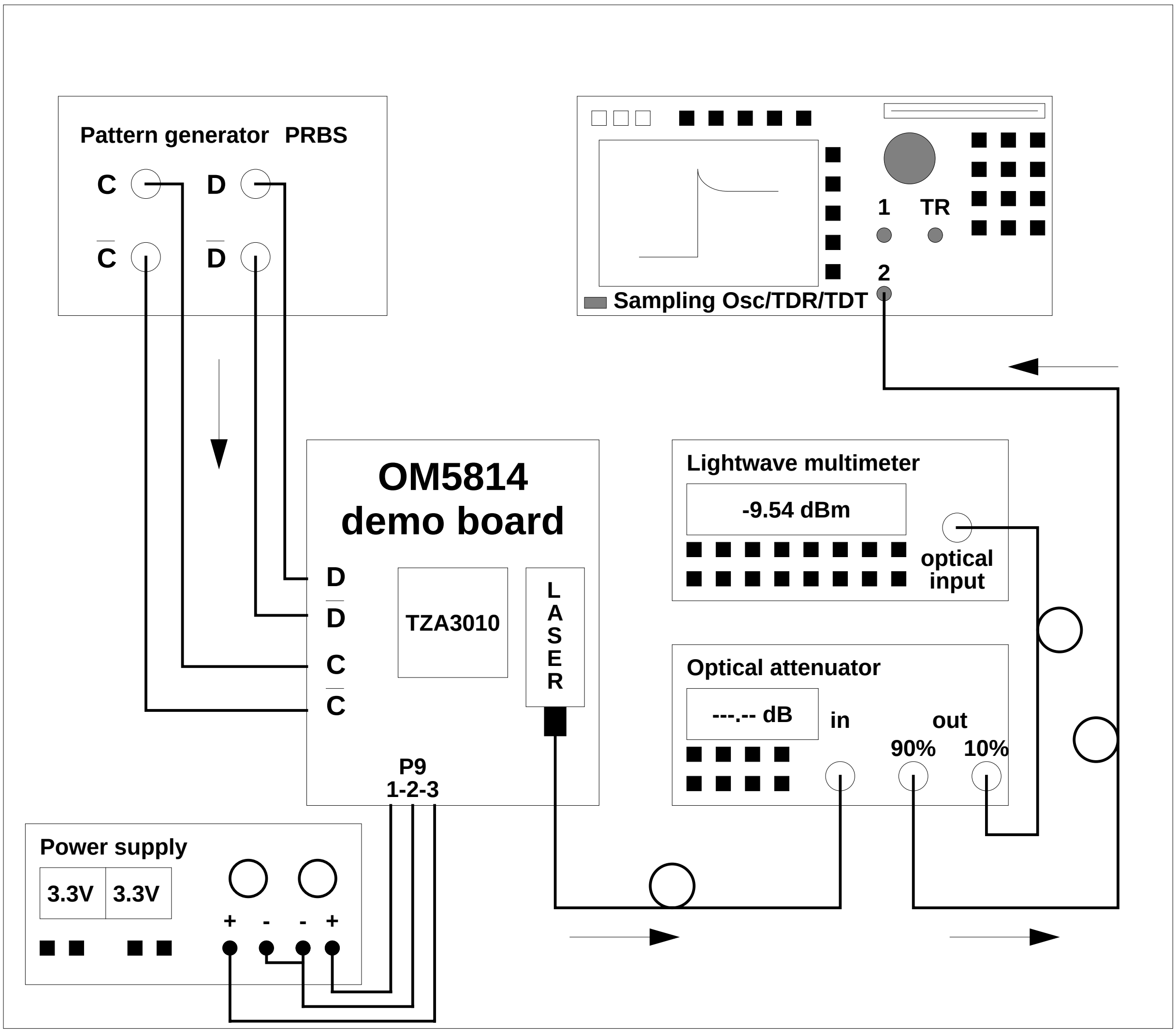


Fig.8 Optical measurement setup for TZA3010 with demo board OM5814

3. Demo board functionality description

The settings and configurations that are possible with the OM5814 are described in the following sections.

3.1 Power supply

The demo board is powered by connector P9 for both, the laserdriver and the laserdiode. Connect the power supply cable (OM5814) to connector P9.

From P9 the voltage is filtered and separated in three voltage domains; VCCA,VCCD,VCCO, see figure 9.

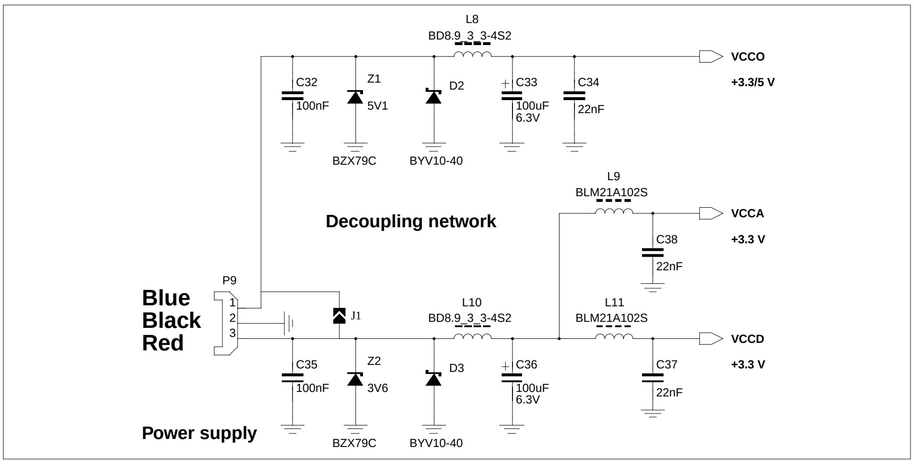


Fig.9 Power supply unit

- **<u>Version with TZA3010AVH</u>**

P9-1: +3.3 V. This pin has the same voltage as P9.3 if J1 is closed.

P9-2: GND, ground connection.

P9-3: Vcc=+3.3 V.

Z2: Protects the circuit against over voltage of the power supply.

D3: Protects the circuit against reverse polarity of the power supply.

- **<u>Version with TZA3010BVH</u>**

P9-1: +3.3 V or +5 V for TZA3010BVH output stage (VCCO) and the laser.

P9-2: GND, ground connection.

P9-3: Vcc=+3.3 V.

Z1: Protects the circuit against over-voltage, TZA3010BVH VCCO and laserdiode.

D2: Protects the circuit, TZA3010BVH VCCO and laserdiode, against reverse polarity of the power supply.

Z2: Protects the circuit against over voltage of the power supply.

D3: Protects the circuit against reverse polarity of the power supply.

3.2 Filtering and decoupling

The following parts are used for decoupling.

3.2.1 Power supply filtering and decoupling general

Capacitors: C32, C33, C34, C35, C36, C37, C38.

Inductors: L8, L9, L10, L11.

3.2.2 Supply filtering and decoupling for IC TZA3010

Capacitors: C5, C6, C12, C15.

Inductors: L1, L2, L3.

3.2.3 Pin terminal decoupling TZA3010

Capacitors: C7, C8, C9, C14, C17, C18, C19.

3.2.4 Supply filtering and decoupling laser

Capacitors: C22, C24, C25, C27, C28.

Inductors: L6, L7.

3.2.5 Supply decoupling others sub-circuits

Capacitors: C29, C30, C31, C23.

3.3 SMD spare parts

Spare parts (C39, C40, R31, R32) are available at the bottom layer of the PCB. These parts can be used to optimize the circuit behaviour. This depends on the laser characteristics and the application.

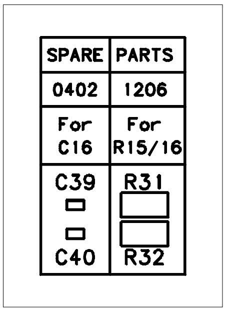


Fig.10 Spare parts at bottom layer

- **C39, C40; 0402 SMD type capacitor:**

These two values can be used at position C16 for tuning the TZA3010 MON input (pin 26 TZA3010).

- **R31, R32; 1206 SMD type resistor:**

These 1206 SMD type 0 ohm resistors can be used at resistor position R15, R16 at the clock input CIN/CINQ to disable the retiming function of the TZA3010.

- Position R15, R16 both left open: clock retiming with CIN/CINQ enabled.
- Position R15, R16 both with 0 ohm resistor (R31/32): clock retiming function with CIN/CINQ disabled.

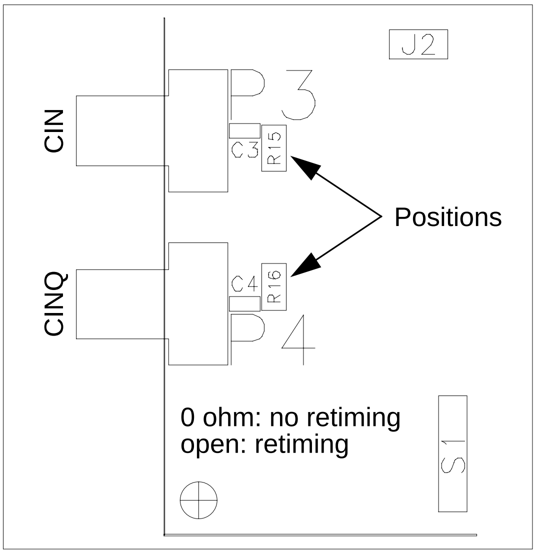


Fig.11 Positions on top layer to enable or disable the retiming function

3.4 Jumpers & headers & measuring points

3.4.1 Jumper J1 (Solderjoint)

This jumper connects P9-1 with P9-3 (power supply connector). Closing this jumper programs the demo board for single +3.3 V supply voltage. J1 is located at the bottom layer.

J1 closed: Evaluating TZA3010AVH, with single power supply, VCCA=VCCD=VCCO=+3.3 V.

J1 open: Evaluating TZA3010BVH, two separate power supply domains; VCCA(D)=+3.3 V & VCCO=+3.3/+5 V.

3.4.2 Jumper J2

Not available for customer boards. Is closed with a PCB-track.

3.4.3 Measuring point J3

Measuring point to measure the voltage over R4 to determine the current programmed with R1 in pin 32 AVR (TZA3010) for the average setting. $I_{AVR}=V_{(J3)}/R4$.

3.4.4 Jumper J4 (Solderjoint)

Connects IC3 and IC4 to the voltage supply domain VCCA.

Solder this connection if the application is to be tested with the external temperature sensor IC3.

$I_{mod}=f(V_{ext\_temperature\_sensors(IC3)})$.

Default: open.

3.4.5 Jumper J5 (Solderjoint)

Selection jumper for biasing the thermistor of the minidil laser when an additional temperature control circuit is connected to J5. With the jumper a selection can be made between VCCD (3.3 V) or ground. See schematic figure 22 & 23.

Default: open. (thermistor floating)

3.4.6 Jumper J6 (Solderjoint)

Connects IC2 to the voltage supply VCCA.

Solder this connection if the application is to be tested with the average control loop functionality with temperature compensation. I_{mod} as function of temperature. $I_{mod}=f(V_T)$.

Default: open.

3.4.7 Measuring point P10

This is a measurement point for V_{temp}. measurement equipment should have a high ohmic input.

Warning: Do not place a jumper at position P10, this will damage the TZA3010.

3.4.8 Measuring point P11

Measuring point to measure the resistance at pin 17 PWADJ (TZA3010) for the PWADJ programming.

3.4.9 Header P12

4 pin header for connecting an external temperature control circuit for measuring the laserdiode temperature.

The header contains: 2 terminals from the thermistor in the minidil housing, ground connection and VCCD.

3.4.10 Measuring point P13

Measuring point to measure the voltage over R8 to determine the photodiode current. When this is required resistor R8 can be replaced with a value between 0-100 ohm. $I_{pd}=V_{(P13)}/R8$.

3.4.11 Measuring point P14

Measuring point to measure the voltage over R7 to determine the laser BIAS current, pin 24 BIAS (TZA3010).

$I_{BIAS}=V_{(P14)}/R7$.

3.5 Switches

3.5.1 Switch S1

ENABLE control input for modulation and bias current.

Position OFF: Disabled. No modulation and bias current.

Position ON: Enabled (default).

3.5.2 Switch S2

Connects pin V_{temp} of the TZA3010 with the external circuitry for average control operation with temperature compensation. This is only used when average control with temperature compensation is used.

Position OFF: Disconnects AVR control circuit from the laserdriver (default).

Position ON: Connects external AVR control circuit (IC2) to the laserdriver.

3.5.3 Switch S3

Enables or disables the pulse width adjust function (PWADJ).

Position OFF: Disables pulse width adjust function (Pin 17 TZA3010 to ground).

Position ON: Enables pulse width adjust setting with R19 (default).

3.5.4 Switch S4

Selection for bias current setting manual or controlled by the average loop mode function.

Position MANUAL: Manual bias current programming with R3 enabled, or with additional voltage on P8.

Position AVR: Connects TZA3010 pin BIASOUT with BIASIN for average loop control.

3.5.5 Switch S5

Selection switch for modulation input MODIN between external AVR control circuit with temperature compensation and external temperature sensor. Both used for temperature compensated average loop control.

Position 1: Selects IC2, external AVR control circuit with temperature compensation for MODIN (default).

Position 2: Selects IC3/IC4, external temperature sensor for MODIN.

3.6 Connectors

3.6.1 P1, P2, Data input

Data input for the TZA3010. P1=DIN, P2=DINQ. Connector impedance for each connector: 50 ohm.

3.6.2 P3, P4, Clock input

Clock input for the TZA3010. P3=CIN, P4=CINQ. Connector impedance for each connector: 50 ohm.

P3 and P4 are not used when clock retiming of the TZA3010 is disabled with use of resistor position R15 & R16.

3.6.3 P5, Data output OUTQ

Data output OUTQ of the TZA3010 laserdriver LAQ with SMA connector. The impedance SMA connector P5 is 50 ohm suitable for standard 50 ohm measurement equipment. The output is measured via the 10:1 probe network formed by R12, C10 and R13. Terminate P5 with 50 ohm when not used.

3.6.4 P6, MODIN

SMB connector for applying input voltage MODIN for the TZA3010.

3.6.5 P7, BIASOUT

SMB connector with output voltage MODOUT for the TZA3010. Part of the control loop.

Can be connected directly to P8, with or without additional circuitry between.

3.6.6 P8, BIASIN

SMB connector with input voltage MODOUT for the TZA3010. Part of the control loop.

3.6.7 P9, Power supply

Power supply connector for OM5814 demo board.

See paragraph 3.1 “Power supply”.

3.7 Variable and fixed resistors

3.7.1 Function R1

Average optical power level setting, AVR.

3.7.2 Function R2

Modulation current setting, MODIN.

Can also be used for slope adjustment for temperature compensated modulation of the two external circuits:

- Average control with temperature compensation (IC2). S5 position 1.
- Temperature sensor IC3 with OP-AMP IC4. S5 position 2.

3.7.3 Function R3

Bias current setting, BIASIN.

Sets the bias current when S4 in position manual.

3.7.4 Function R7

This resistor can be used for laserdiode bias current measurement with use of P14. This resistor also limits the maximum bias current.

3.7.5 Function R8

The value is 0 ohm default at the demo board. When replaced with a value between 0-100 ohm this resistor can be used for photodiode current measurement with use of P13.

3.7.6 Function R11

Load for output LAQ which simulates the load at LA caused by the laser. For best laserdriver performance the load at LA should be the same as the load at LAQ. The value for R12 can be found in the used laserdiode specifications.

3.7.7 Function R12 & R13

R12 and R13 and C10 forms a measurement 10:1 probe at LAQ of the laserdriver. Intend for electrical monitoring the output signal. DC voltages are blocked by C10.

3.7.8 Function R19

Pulse width adjust setting, PWADJ.

Set’s the on-time of the laser current if S3 in position ON. See paragraph 4.3.

3.7.9 Function R22

Adjustment point for the input reference voltage of OP-AMP IC2 as voltage divider network. This voltage is needed when the average loop with temperature compensation is required. Set the voltage at the positive input of IC2 to 1.2 V.

3.8 IC description

3.8.1 IC1, TZA3010

TZA3010AVH laserdriver chip for AC coupled lasers.

TZA3010BVH laserdriver chip for DC coupled lasers.

3.8.2 IC3, TMP39GS

Temperature sensor for measuring the temperature of the laserdiode. Used, with IC4, for average loop with temperature compensation.

3.8.3 IC2, OP186

OP-AMP used for average loop control with temperature compensation. This OP-AMP inverts the sign of the temperature dependent voltage source of the TZA3010, V_{temp}. The resistors around IC2 determines the amplification and the output slope of the temperature dependent voltage.

3.8.4 IC4, OP186

OP-AMP used for average loop control with temperature compensation. This OP-AMP amplifies the output signal of the temperature sensor IC3. The resistors around IC4 determines the amplification and the output slope of the temperature dependent voltage created by IC3.

3.9 Laser

3.9.1 D1, 2.5 Gb/s minidil laser

D1 is minidil laser with monitor diode suitable for STM16/OC48 applications. The laser diodes as well as the monitor diode are used in the application. The internal thermistor at pins “TH” is available at connector P12.

The laser is connected with 25 ohm transmission lines to the laserdriver. The connection between LA and the laserdiode is optimized for minimum distance.

3.9.2 Laser package compensation network

Position R14 and C26 are left open on the PCB and are intended to optimize the circuit by tuning out the package influence on the optical signal. For compensating resonance caused by the minidil package the values have to be determined after resonance frequency has been measurement. f_{osc}=1/(2*Pi*R14*C26).

Pi=3.14159

This network influence also the risetime of the pulses.

3.9.3 Increasing the monitor diode capacitance

Capacitor C16 can be used to optimize the TZA3010 MON circuit behaviour by adding some capacitance. This extra capacitor increases the total input capacitance of MON input. C_{tot}=C11+$C_{monitor\_diode}$. See also paragraph 3.3 “SMD spare parts”.

For average loop mode this value can have any value and for no loop control (fixed mode, manual setting) the MON input is not used.

3.9.4 Limiting the laser bias current

Fixed SMD resistor R7 can be used to limit the bias current of the laser or to prevent that V_{bias} (pin 24, bias, TZA3010) will not exceed it’s maximum allowed voltage. The value of this resistor depend on the type of laser and the applied voltage. Resistor R7 filters in combination with C20 the remaining RF signal coming out of the laser package. R7 should be placed close to the laser package.

Maximum bias current: Imax=(VCCO-Vop-Vbias(min))/R7

VCCO = voltage VCCO.

Vop = laser operating voltage (see laserdiode datasheet).

Vbias(min) = minimum voltage on pin BIAS (see TZA3010 datasheet).

4. Operation modes

The TZA3010 supports two modes of operation average loop and manual control (no control/fixed setting). In the average loop mode, variants in extra temperature compensation are possible. The jumper and switch settings for each mode of operation are described in the following paragraphs.

4.1 Average loop control

Several kind of average loop control configurations are possible to create with the OM5814 and are described in the following paragraphs. For all average loop control modes, switch S4 is in position AVR.

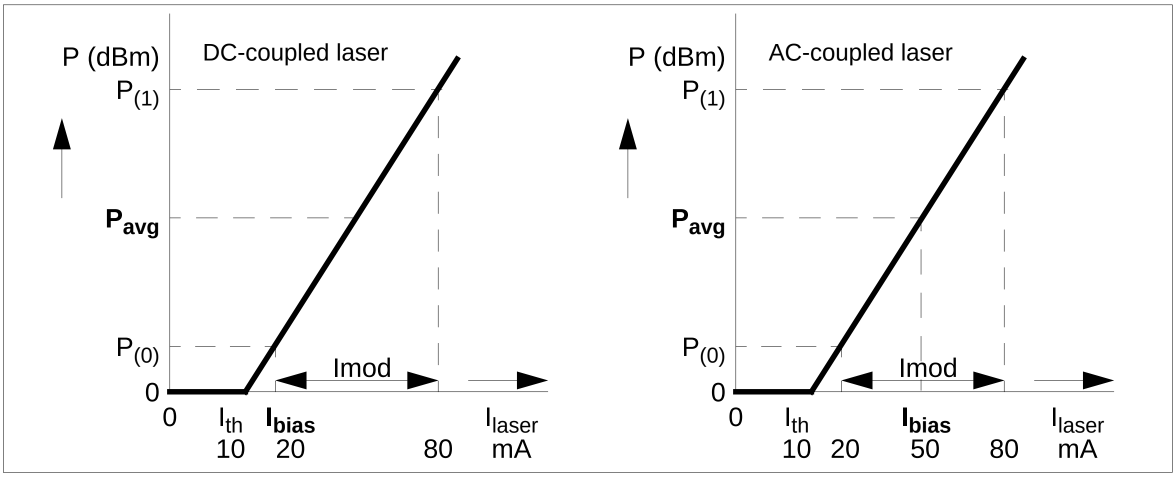


Fig.12 Laserdiode, average control

4.1.1 Constant modulation setting. I_{mod}=constant

For average loop control with constant modulation current setting a laserdiode with backfacet diode is required.

In this operation mode the TZA3010 only controls the bias current of the laserdiode for controlling the average optical power, while the modulation current is held at constant value with external resistor value setting R2+R5.

$P_{AVG}=\{P_{(0)}+P_{(1)}\}/2$

$I_{MOD} = (R_{MODIN} * I_{MODIN} - 0.5\ V) * g_{m(MOD)} + 5\ mA.$

Where: I_{MODIN} = 100 uA; g_m = 90 mA/V. See TZA3010 datasheet.

The laserdriver determines the average level from the signal of the monitor diode provided to pin MON.

See table 3 for OM5814 average loop control setting.

TABLE 3 Jumper and switch setting for average loop control

Jumper & Switches	Position	Remove parts	Remark
S1	ON		Enables bias and modulation current of output stage
S2	OFF		Disconnect average temp-compensation circuit
S3	-		Has no influence
S4	AVR		Connects BIASOUT to BIASIN for AVR loop mode
S5	1		External temperature sensor IC3 disabled
J2	closed		Default closed by PCB track
J4	-		Has no influence
J6	-		Has no influence

Adjust R1 for proper fixed average optical power setting.

Adjust R2 for proper fixed modulation current setting.

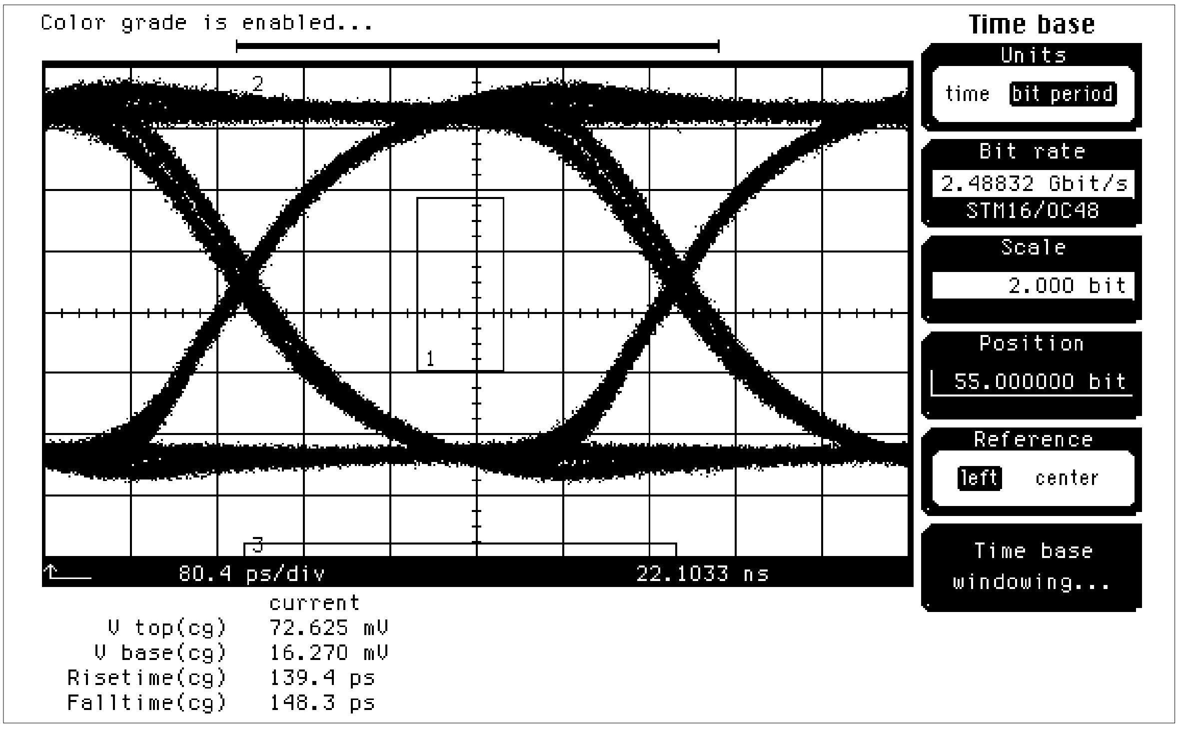


Fig.13 STM16 optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

Condition for figure 13, 14, and 15:

VCCA=VCCD=3.3 V, VCCO=5 V; V_{MODIN}=1.3 V; $V_{(J3)}$= -0.512 V, I_{AVR}= -0.512/4k7= -109 uA.

Fig 13: $V_{(P14)}$= 0.32 V, I_{BIAS}= 0.32/10= 32 mA.

Fig 14: $V_{(P14)}$= 0.34 V, I_{BIAS}= 0.34/10= 34 mA.

Fig 15: $V_{(P14)}$= 0.37 V, I_{BIAS}= 0.37/10= 37 mA.

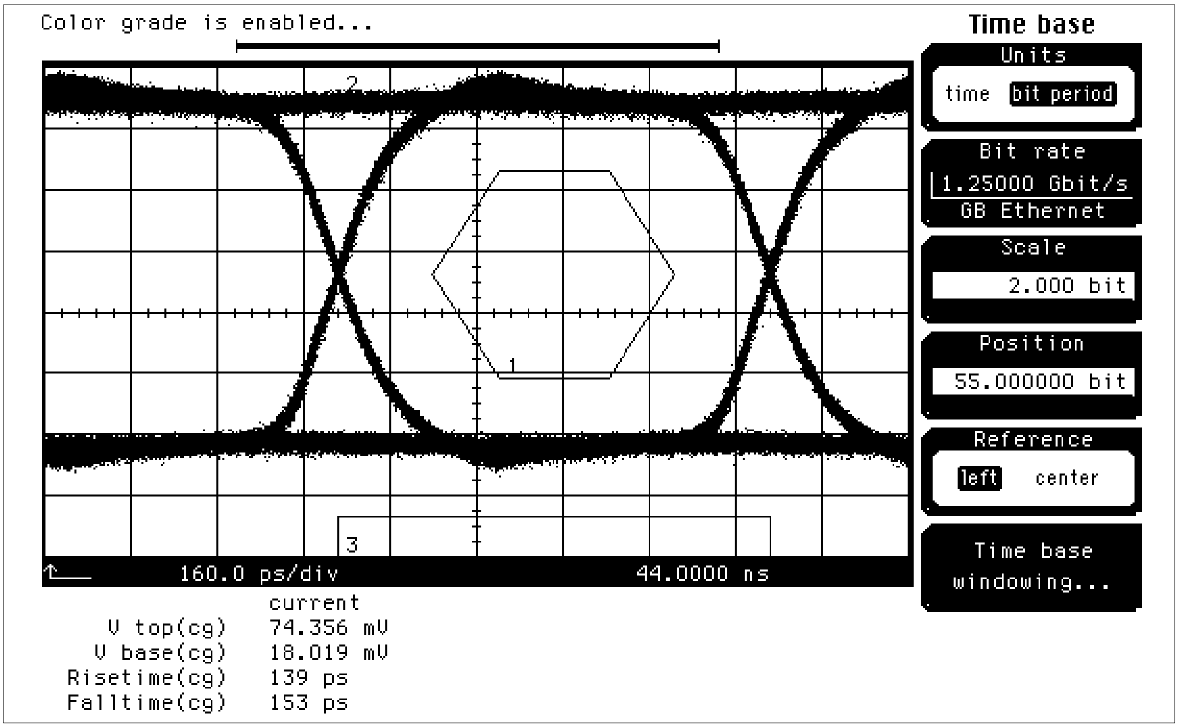


Fig.14 GE optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

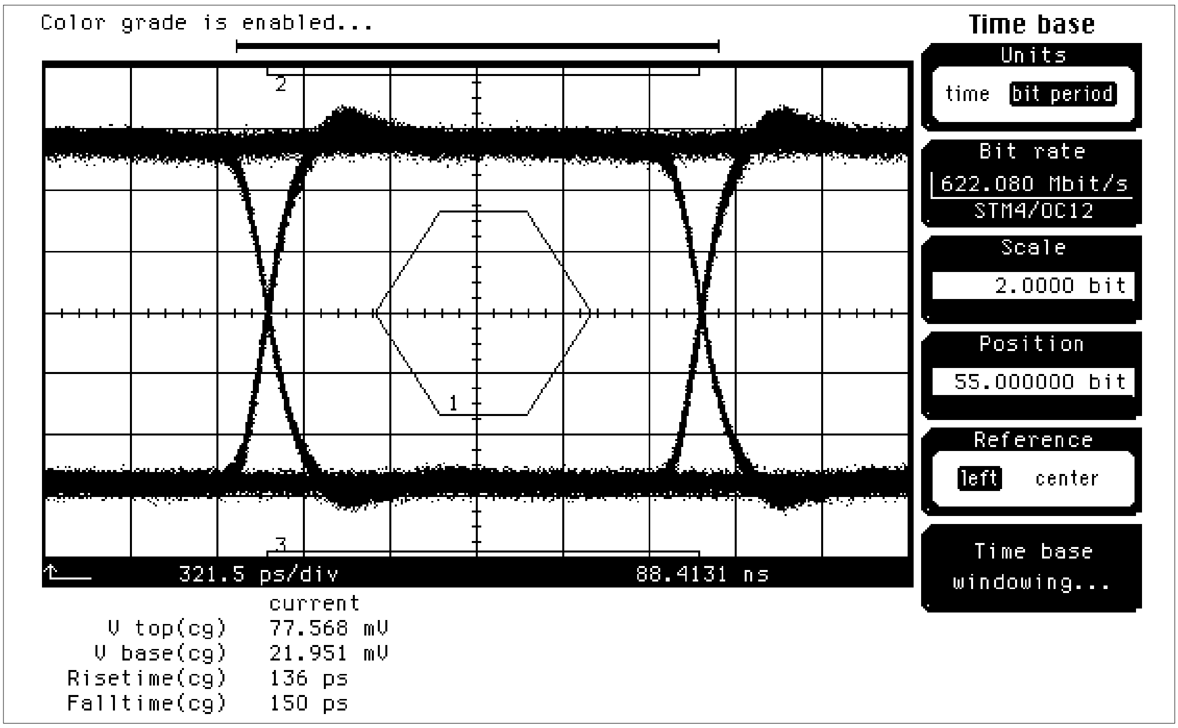


Fig.15 STM4 optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

4.1.2 Average control I_{mod}=f(I_{bias})

For average loop control a laserdiode with backfacet diode is required.

See table 4 for OM5814 average loop control setting I_{mod}=f(I_{bias}).

TABLE 4 Jumper and switch setting for average loop control I_{mod}=f(I_{bias})

Jumper & Switches	Position	Remove parts	Remark
S1	ON		Enables bias and modulation current of output stage
S2	OFF		Disconnect average temp-compensation circuit
S3	-		Has no influence
S4	OFF		Place resistor between P6 and P7
S5	1		External temperature sensor IC3 disabled
J2	closed		Default closed by PCB track
J4	-		Has no influence
J6	-		Has no influence

Place a resistor between SMB connector P6 and P7. This resistor value and the total resistance of R2+R5 depends on the laser and has therefore to be defined by the customer.

Adjust R1 for proper fixed average optical power setting.

The modulation current is now a function of the bias current due to BIASOUT.

4.1.3 AVR control with internal temperature compensation I_{mod}=f(V_T)

For average loop control a laserdiode with backfacet diode is required.

The bias current is controlled and the modulation current is a function of the TZA3010 junction temperature.

The slope for temperature compensation and the voltage level for MODIN can be determined with use of the circuit around: IC2, R23, R24, R25, R26.

See table 5 for OM5814 average loop control setting I_{mod}=f(V_T).

TABLE 5 Jumper and switch setting for average loop control I_{mod}=f(V_T)

Jumper & Switches	Position	Remove parts	Remark
S1	ON		Enables bias and modulation current of output stage
S2	ON	R5	See note 1
S3	-		Has no influence
S4	AVR		Enables IC5, average temp-compensation circuit
S5	1		Connects AVR-temp-compensation circuit to modin
J2	closed		Default closed by PCB track
J4	-		Has no influence
J6	closed		Has no influence

Adjust R1 for proper fixed average optical power setting.

Note 1: Remove R5 when the total resistance value combination R2 + R5 is not suitable for the correct slope and use instead a proper value at position R26.

Resistors that have to be defined by the customer themselves for proper temperature slope (mV/C): R23, R24, R25, R26.

4.1.4 With external temperature compensation. I_{mod}=f($V_{tempsensor(IC3)}$)

For average loop control with constant bias current setting a laserdiode with backfacet diode is required.

Only the modulation current of the laserdiode is controlled with use of the external temperature sensor IC3, while the bias current is held at constant value. Temperature sensor IC3 has placed close to the laser for measuring the temperature. The slope of the temperature sensor and the voltage level can be determined with use of the circuit around IC4.

See table 6 for OM5814 average loop control setting I_{mod}=f($V_{tempsensor(IC3)}$).

TABLE 6 Jumper and switch setting for average loop control I_{mod}=f($V_{tempsensor(IC3)}$)

Jumper & Switches	Position	Remove parts	Remark
S1	ON		Enables bias and modulation current of output stage
S2	OFF	R5	See note 2
S3	-		Has no influence
S4	AVR		Disable circuit around IC2
S5	2		Connects external temp. sensor circuit to modin
J2	closed		Default closed by PCB track
J4	closed		Has no influence
J6	-		Has no influence

Adjust R1 for proper fixed average optical power setting.

Note 2: Remove R5 when the total resistance value of combination R2 + R5 is not suitable for the correct slope and use instead a proper value at position R27.

Resistors that have to be defined by the customer themselves for proper temperature slope (mV/C): R27, R28, R29, R30.

4.2 Manual control, fixed settings

When no control is required, a laser with backfacet diode is not necessary. If the laser contains no backfacet diode the MON input can be left unconnected. Only the pins BIASIN and MODIN of the TZA3010 are used for a fixed setting.

See table 7 for OM5814 no control, fixed setting.

TABLE 7 Jumper and switch setting for no control, fixed setting

Jumper & Switches	Position	Remove parts	Remark
S1	ON		Enables bias and modulation current of output stage
S2	OFF		Disconnect average temp-compensation circuit
S3	-		Has no influence

TABLE 7 Jumper and switch setting for no control, fixed setting

Jumper & Switches	Position	Remove parts	Remark
S4	MANUAL		Enables R3 for bias current setting
S5	1		External temperature sensor IC4 disabled
J2	closed		Default closed by PCB track
J4	-		Has no influence
J6	-		Has no influence

Adjust R2 for proper fixed modulation current setting.

Adjust R3 for proper fixed bias current setting.

Before operation the bias current can be programmed by calculation of R3 or by defining V_{BIASIN} and measuring the voltage at pin biasin (at P8), and tune R3 until the required setting is achieved.

Example:

DC coupled laser with TZA3010B.

I_{th} from laser is 10 mA. Wanted $I_{ZERO} = I_{BIAS} = 20$ mA. $I_{mod} = 60$ mA.

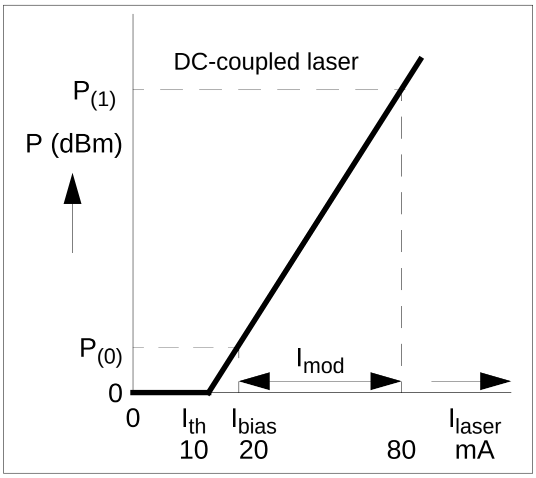


Fig.16 Laserdiode characteristic

$I_{BIAS} = V_{BIASIN}{*}g_{m(BIAS)}{-}0.05$. => V_{BIASIN} = (20 mA+0.05) / 110 mA/V = 636 mV.

The current through the external resistor at pin BIASIN is 100 uA, from internal current source at pin BIASIN, see block diagram in the datasheet. R_{BIAS} = (R5+R10) = V_{BIASIN}/100 uA = 636 mV/100 uA = 6.36 kohm.

$I_{MOD} = (R_{MODIN} * I_{MODIN} - 0.5\ V) * g_{m(MOD)} + 5$ mA.

Where: I_{MODIN} = 100 uA; g_m = 90 mA/V (see TZA3010 datasheet)

I_{MOD} = 60 mA => R_{MODIN} = 11.1 kohm

The resistance can be adjusted with R2 for modulation current and R3 for bias current and measured with a ohm meter between P6 respectively P8 and ground when no supply voltage is applied to the demo board.

Condition for figure 17, 18, 19 and 20:

VCCA=VCCD= 3.3 V, VCCO= 5 V.

V_{MODIN}=1.3 V.

$V_{(P14)}$= 0.252 V, I_{BIAS}= 0.252/10= 25.2 mA.

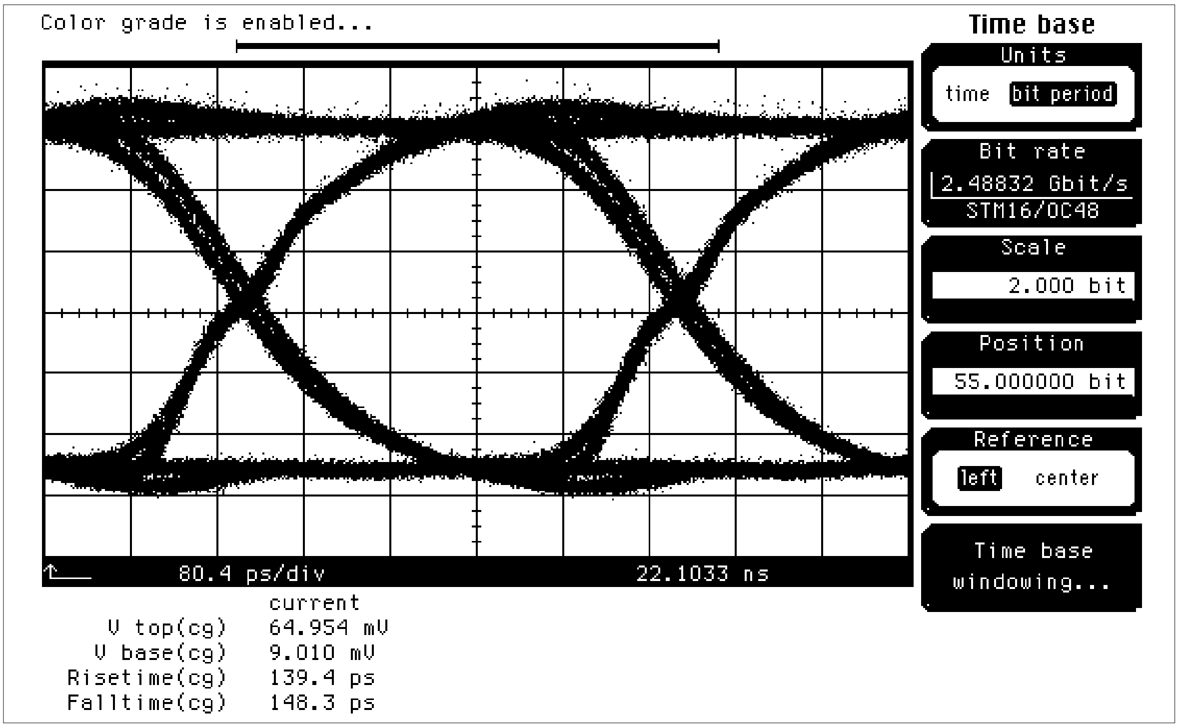


Fig.17 STM16 optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

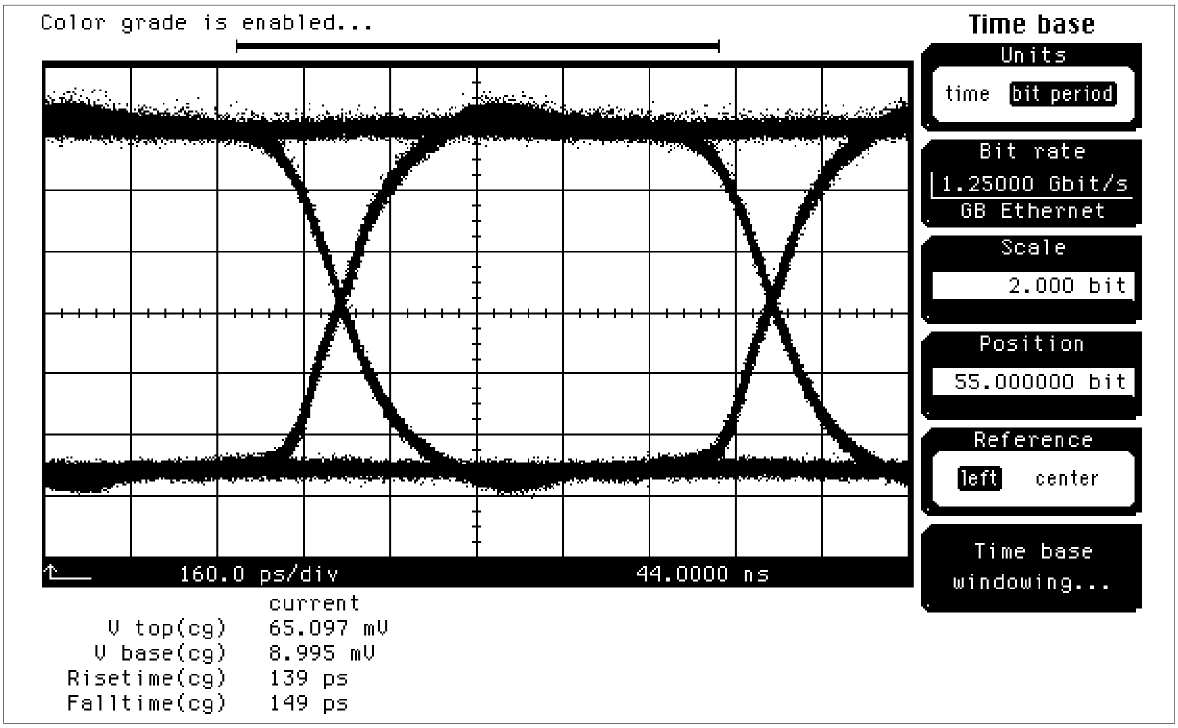


Fig.18 GE optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

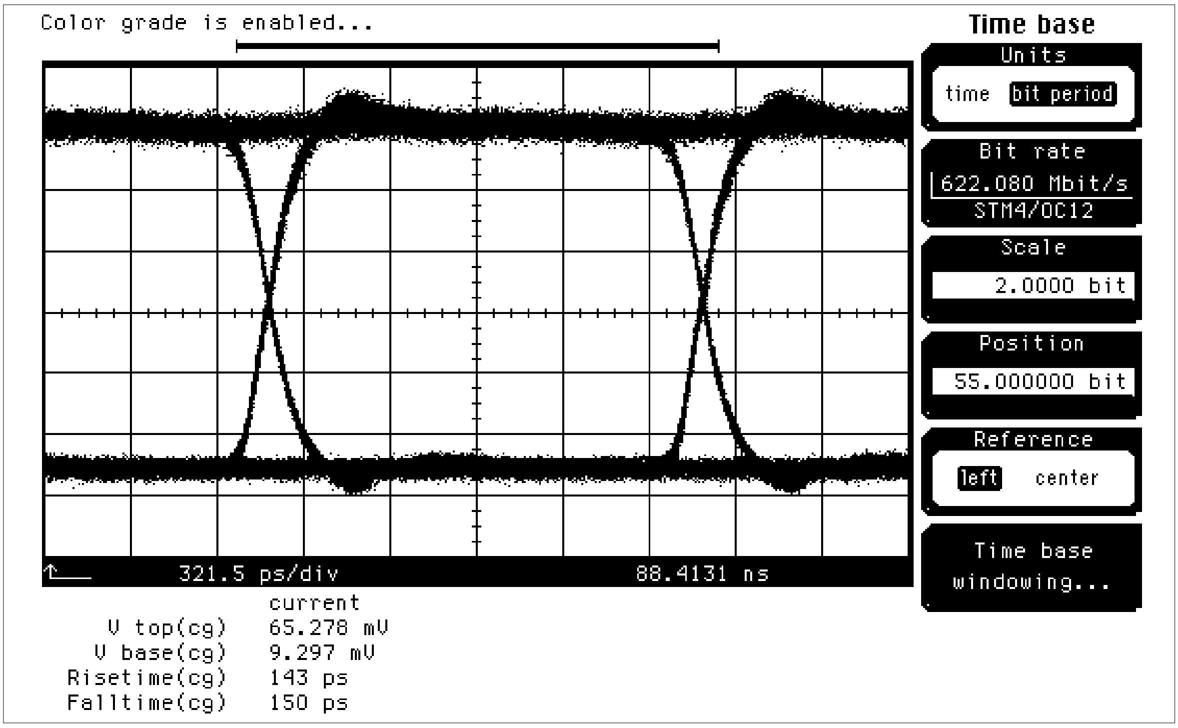


Fig.19 STM4 optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

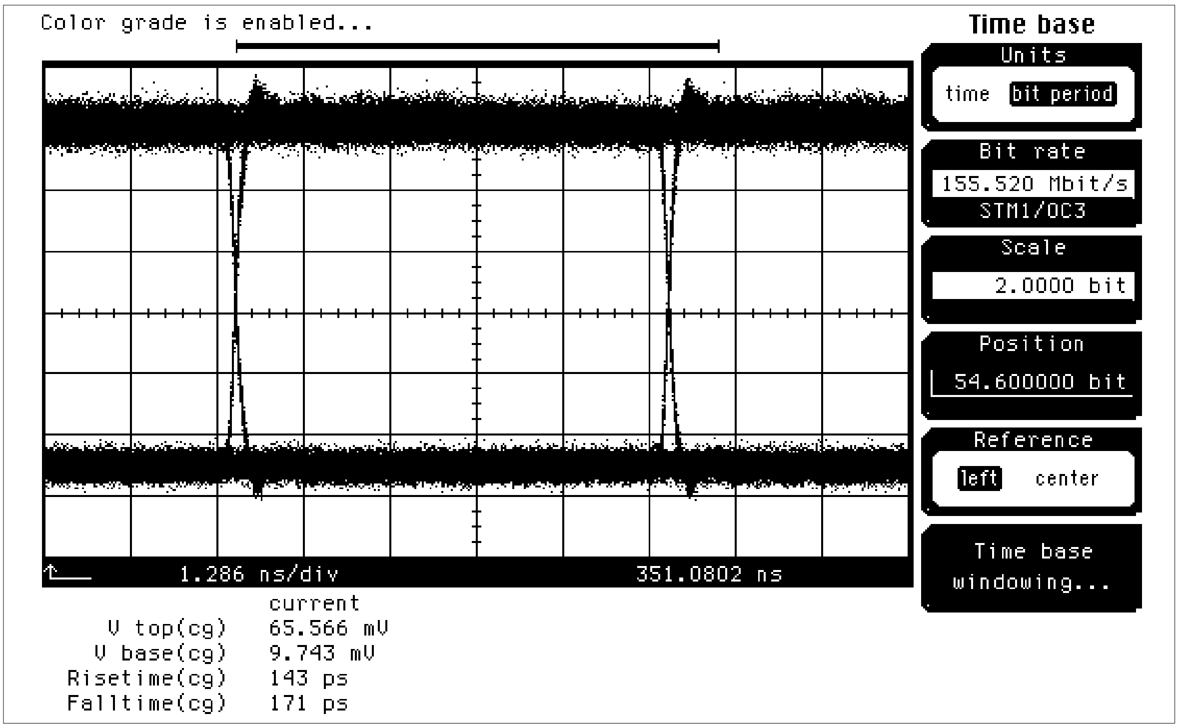
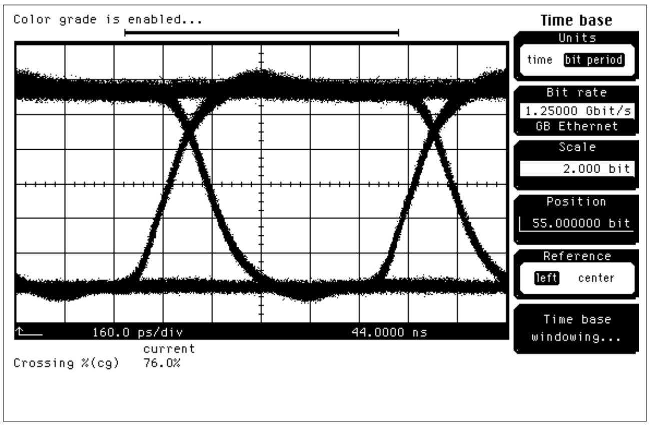
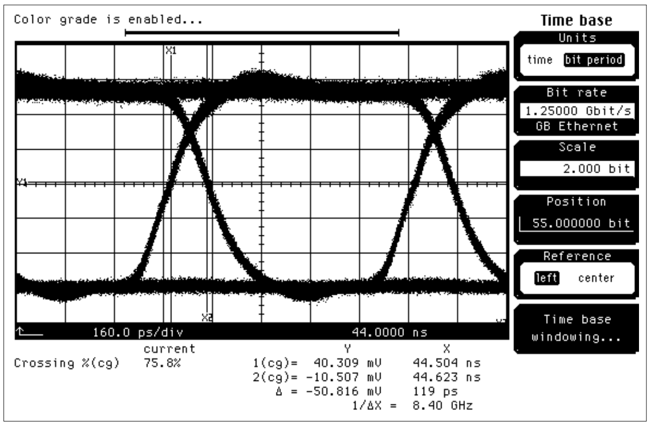


Fig.20 STM1 optical eye of DC-coupled laser, with retiming, no optical filter. PRBS 2^31-1

4.3 Pulse Width Adjust

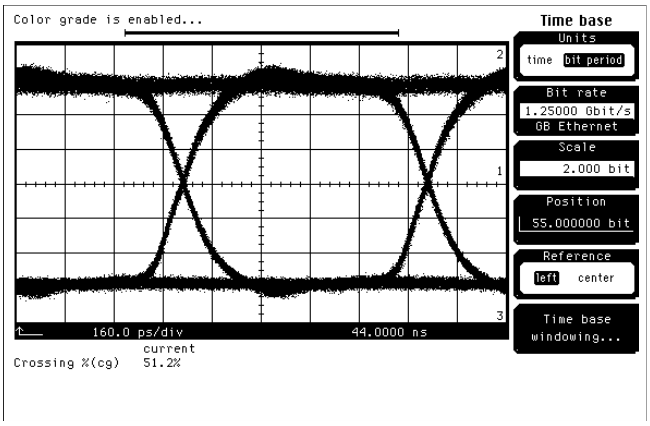
The next pictures shows the influence of the setting of R_{PWA} on the eye diagram. The setting of R_{PWA} is done with R19 and switch S3. All other demo board settings are unchanged.

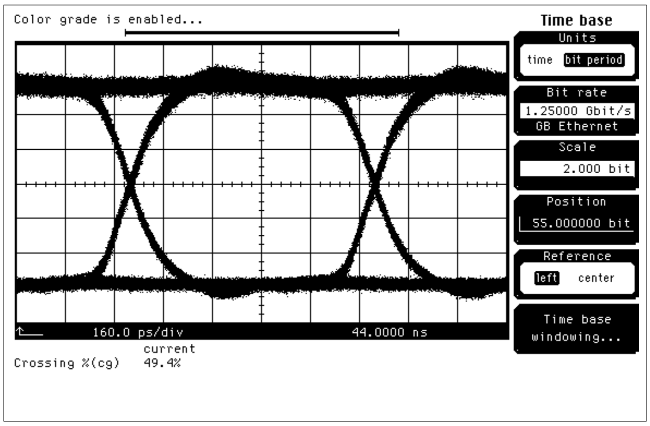




Left picture: Setting Rpwa=6.7 k.

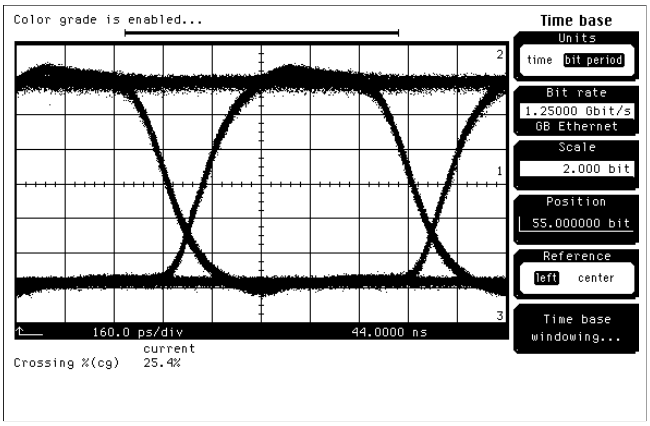
Right picture: Measured time difference between RPWA setting: R_{PWA}= 6.7 k and R_{PWA}= 10 k.





Left picture: Setting R_{PWA}= 10 k.

Right picture: S3 in position OFF, RPWA function disabled.



Left picture: Setting R_{PWA}= 20 k.

Fig.21 Eye diagram for various Pulse Width Adjust setting with R19, R_{PWA}

5. Bill of materials

5.1 Bill of materials for TZA3010A

TABLE 8 PR71941 TZA3010A, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
C1	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C2	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C3	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C4	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C5	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C6	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C7	2222-787-16636	10nF	12NC_update	PHYCOMP	10%	16V	C0402
C8	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C9	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C10	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C11	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C12	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C13	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C14	CAP-CER-402	XpF_0402	C0603-X7R	PHILIPS	10%	63V	C0402
C15	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C16	CAP-CER-402	XpF_0402	-	PHILIPS	10%	63V	C0402
C17	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C18	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C19	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C20	2238-786-15649	100nF	X7R	PHYCOMP	20%	16V	C0603
C21	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C22	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C23	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C24	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C25	2238-596-15618	470pF	X7R	PHYCOMP	10%	50V	C0603
C26	CAP-CER-402	XpF_0402	-	PHILIPS	10%	63V	C0402
C27	2222-787-16636	10nF	12NC_update	PHYCOMP	10%	16V	C0402
C28	B45196E1106M9	10uF	B45196	SIEMENS	20%	6.3V	B45_b
C29	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C30	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C31	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C32	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C33	B45196H1107M9	100uF	B45196	SIEMENS	20%	6.3V	B45_d
C34	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C35	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C36	B45196H1107M9	100uF	B45196	SIEMENS	20%	6.3V	B45_d
C37	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C38	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C39	2238-869-15109	10pF	NP0	PHYCOMP	5%	50V	C0402

TABLE 8 PR71941 TZA3010A, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
C40	2238-787-11345	470pF	NP0	PHYCOMP	1%	16V	C0402
D1	FU-445sdf-w1m1b	DFB_laser_2.5Gb	Laser	MITSUBISHI			FU-445sdf-w1m1b
D3	9337-432-70113	BYV10-40	Schottky	PHILIPS			SOD81
IC1	PN-TZA3010	TZA3010	PHILIPS	PHILIPS			SOT560
IC2	PN-OP186	OP186	Amplifiers	Analog Device			SOT23-5
IC3	PN-TMP36GS	TMP36GS	Sensor	Analog Device			SOT96
IC4	PN-OP186	OP186	Amplifiers	Analog Device			SOT23-5
J3	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
L1	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L2	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L3	BLM11P600S	BLM11P600S	CBD	muRata			BLM11
L4	1008CS-472	4.7uH	1008CS	COILCRAFT			L1008cs
L5	1008CS-472	4.7uH	1008CS	COILCRAFT			L1008cs
L6	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L7	BLM11P300S	BLM11P300S	CBD	muRata			BLM11
L8	4330-030-36301	BD8.9_3_3-4S2	CBD	PHILIPS			CBD8.9
L9	BLM21A102S	BLM21A102S	CBD	muRata			BLM21
L10	4330-030-36301	BD8.9_3_3-4S2	CBD	PHILIPS			CBD8.9
L11	BLM21A102S	BLM21A102S	CBD	muRata			BLM21
P1	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P2	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P3	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P4	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P5	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P6	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P7	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P8	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P9	MKS3803-1-0-303	MKS3830_3p	MKS3830	STOCKO			MKS3830_3p
P10	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P11	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P12	05-88-1236	ARRAY_2x2p	Single_array	DISPLAY			ARRAY_2x2p
P13	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P14	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
R1	3006P-7-104-BRN	100k	3006P	BOURNS	10%	0.75W	BO3006P
R2	3006P-7-103-BRN	10k	3006P	BOURNS	10%	0.75W	BO3006P
R3	3006P-7-103-BRN	10k	3006P	BOURNS	10%	0.75W	BO3006P
R4	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R5	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R6	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R7	2322-730-61109	10	RC11	PHYCOMP	5%	0.1W	R0805
R8	2322-702-96001	0	RC21	PHYCOMP	5%	0.063W	R0603
R11	2322-702-60249	24	RC21	PHYCOMP	5%	0.063W	R0603
R12	2322-705-70431	430	RC31	PHYCOMP	5%	0.063W	R0402

TABLE 8 PR71941 TZA3010A, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
R13	2322-702-60569	56	RC21	PHYCOMP	5%	0.063W	R0603
R14	RES-R0402	XR_0402	-	PHILIPS	1%	0.1W	R0402
R15	RES-711-R1206	XR_1206	RC11	PHILIPS	1%	0.1W	R1206
R16	RES-711-R1206	XR_1206	RC11	PHILIPS	1%	0.1W	R1206
R17	2322-706-70103	10k	RC32	PHYCOMP	1%	0.063W	R0402
R18	2322-702-60473	47k	RC21	PHYCOMP	5%	0.063W	R0603
R19	3006P-7-203-BRN	20k	3006P	BOURNS	10%	0.75W	BO3006P
R20	2322-702-60622	6.2k	RC21	PHYCOMP	5%	0.063W	R0603
R21	2322-702-60103	10k	RC21	PHYCOMP	5%	0.063W	R0603
R22	3314J-10K	10k	Typ3314	BOURNS	+-20%	0.25W	3314J
R23	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R24	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R25	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R26	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R27	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R28	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R29	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R30	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R31	2322-711-91032	0	RC01	PHYCOMP	5%	0.25W	R1206
R32	2322-711-91032	0	RC01	PHYCOMP	5%	0.25W	R1206
S1	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S2	FARNELL-219-447	DPDT	print_switch	MORS			DPDT
S3	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S4	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S5	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
Z2	9331-176-80153	BZX79C	BZX79C	PHILIPS			SOD27

5.2 Bill of materials for TZA3010B

TABLE 9 PR71941 TZA3010B, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
C1	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C2	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C3	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C4	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C5	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C6	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C7	2222-787-16636	10nF	12NC_update	PHYCOMP	10%	16V	C0402
C8	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C9	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C10	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C12	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C14	CAP-CER-402	XpF_0402	C0603-X7R	PHILIPS	10%	63V	C0402
C15	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C16	CAP-CER-402	XpF_0402	-	PHILIPS	10%	63V	C0402
C17	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C18	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C19	2222-869-15109	10pF	12NC_update	PHYCOMP	5%	50V	C0402
C20	2238-786-15649	100nF	X7R	PHYCOMP	20%	16V	C0603
C21	CAP-CER-603-pF	XpF_0603	C0603-X7R	PHILIPS	10%	63V	C0603
C22	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C23	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C24	2222-787-16641	22nF	12NC_update	PHYCOMP	10%	16V	C0402
C25	2238-596-15618	470pF	X7R	PHYCOMP	10%	50V	C0603
C26	CAP-CER-402	XpF_0402	-	PHILIPS	10%	63V	C0402
C27	2222-787-16636	10nF	12NC_update	PHYCOMP	10%	16V	C0402
C28	B45196E1106M9	10uF	B45196	SIEMENS	20%	6.3V	B45_b
C29	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C30	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C31	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C32	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C33	B45196H1107M9	100uF	B45196	SIEMENS	20%	6.3V	B45_d
C34	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C35	2222-786-16749	100nF	12NC_update	PHYCOMP	20%	16V	C0603
C36	B45196H1107M9	100uF	B45196	SIEMENS	20%	6.3V	B45_d
C37	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C38	2222-916-16741	22nF	12NC_update	PHYCOMP	20%	25V	C0603
C39	2238-869-15109	10pF	NP0	PHYCOMP	5%	50V	C0402
C40	2238-787-11345	470pF	NP0	PHYCOMP	1%	16V	C0402
D1	FU-445sdf-w1m1b	DFB_laser_2.5Gb	Laser	MITSUBISHI			FU-445sdf-w1m1b
D2	9337-432-70113	BYV10-40	Schottky	PHILIPS			SOD81
D3	9337-432-70113	BYV10-40	Schottky	PHILIPS			SOD81

TABLE 9 PR71941 TZA3010B, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
IC1	PN-TZA3010	TZA3010	PHILIPS	PHILIPS			SOT560
IC2	PN-OP186	OP186	Amplifiers	Analog Device			SOT23-5
IC3	PN-TMP36GS	TMP36GS	Sensor	Analog Device			SOT96
IC4	PN-OP186	OP186	Amplifiers	Analog Device			SOT23-5
J3	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
L1	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L2	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L3	BLM11P600S	BLM11P600S	CBD	muRata			BLM11
L6	BLM11A102S	BLM11A102S	CBD	muRata			BLM11
L7	BLM11P300S	BLM11P300S	CBD	muRata			BLM11
L8	4330-030-36301	BD8.9_3_3-4S2	CBD	PHILIPS			CBD8.9
L9	BLM21A102S	BLM21A102S	CBD	muRata			BLM21
L10	4330-030-36301	BD8.9_3_3-4S2	CBD	PHILIPS			CBD8.9
L11	BLM21A102S	BLM21A102S	CBD	muRata			BLM21
P1	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P2	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P3	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P4	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P5	142-0701-851	SMA_pcb_mount	COAX	EF.Johnson			SMA_pcb_mount
P6	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P7	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P8	R114426	SMB_CLICK_str	COAX	RADIALL			SMB_str
P9	MKS3803-1-0-303	MKS3830_3p	MKS3830	STOCKO			MKS3830_3p
P10	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P11	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P12	05-88-1236	ARRAY_2x2p	Single_array	DISPLAY			ARRAY_2x2p
P13	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
P14	05-88-1136	ARRAY_1x2p	Single_array	DISPLAY			ARRAY_1x2p
R1	3006P-7-104-BRN	100k	3006P	BOURNS	10%	0.75W	BO3006P
R2	3006P-7-103-BRN	10k	3006P	BOURNS	10%	0.75W	BO3006P
R3	3006P-7-103-BRN	10k	3006P	BOURNS	10%	0.75W	BO3006P
R4	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R5	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R6	2322-702-60472	4.7k	RC21	PHYCOMP	5%	0.063W	R0603
R7	2322-730-61109	10	RC11	PHYCOMP	5%	0.1W	R0805
R8	2322-702-96001	0	RC21	PHYCOMP	5%	0.063W	R0603
R9	2322-702-96001	0	RC21	PHYCOMP	5%	0.063W	R0603
R10	2322-702-96001	0	RC21	PHYCOMP	5%	0.063W	R0603
R11	2322-702-60249	24	RC21	PHYCOMP	5%	0.063W	R0603
R12	2322-705-70431	430	RC31	PHYCOMP	5%	0.063W	R0402
R13	2322-702-60569	56	RC21	PHYCOMP	5%	0.063W	R0603
R14	RES-R0402	XR_0402	-	PHILIPS	1%	0.1W	R0402
R15	RES-711-R1206	XR_1206	RC11	PHILIPS	1%	0.1W	R1206

TABLE 9 PR71941 TZA3010B, bill of materials

REF	Part number	Component	Series	Vendor	Tolerance	Rating	Geometry
R16	RES-711-R1206	XR_1206	RC11	PHILIPS	1%	0.1W	R1206
R17	2322-706-70103	10k	RC32	PHYCOMP	1%	0.063W	R0402
R18	2322-702-60473	47k	RC21	PHYCOMP	5%	0.063W	R0603
R19	3006P-7-203-BRN	20k	3006P	BOURNS	10%	0.75W	BO3006P
R20	2322-702-60622	6.2k	RC21	PHYCOMP	5%	0.063W	R0603
R21	2322-702-60103	10k	RC21	PHYCOMP	5%	0.063W	R0603
R22	3314J-10K	10k	Typ3314	BOURNS	+-20%	0.25W	3314J
R23	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R24	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R25	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R26	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R27	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R28	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R29	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R30	RES-704-R0603	XR_0603	RC11	PHILIPS	1%	0.1W	R0603
R31	2322-711-91032	0	RC01	PHYCOMP	5%	0.25W	R1206
R32	2322-711-91032	0	RC01	PHYCOMP	5%	0.25W	R1206
S1	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S2	FARNELL-219-447	DPDT	print_switch	MORS			DPDT
S3	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S4	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
S5	09-03-201-02	SPDT_low_profile	print_switch	Spoele Electr			SPDT_low_profile
Z1	9331-177-20153	BZX79C	BZX79C	PHILIPS			SOD27
Z2	9331-176-80153	BZX79C	BZX79C	PHILIPS			SOD27

6. Schematics

6.1 Schematic for TZA3010A

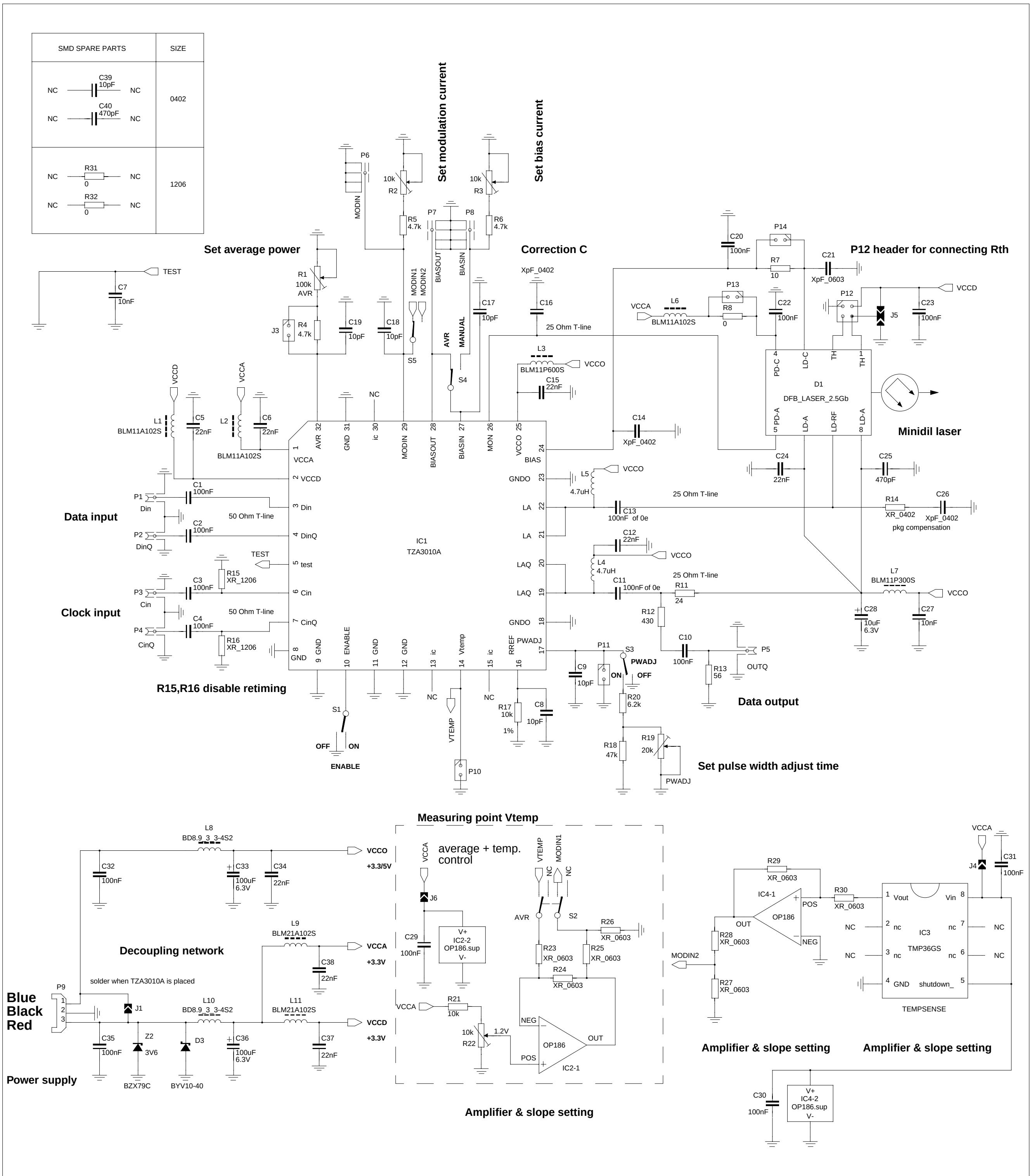


Fig.22 Schematic OM5814 with TZA3010AVH

6.2 Schematic for TZA3010B

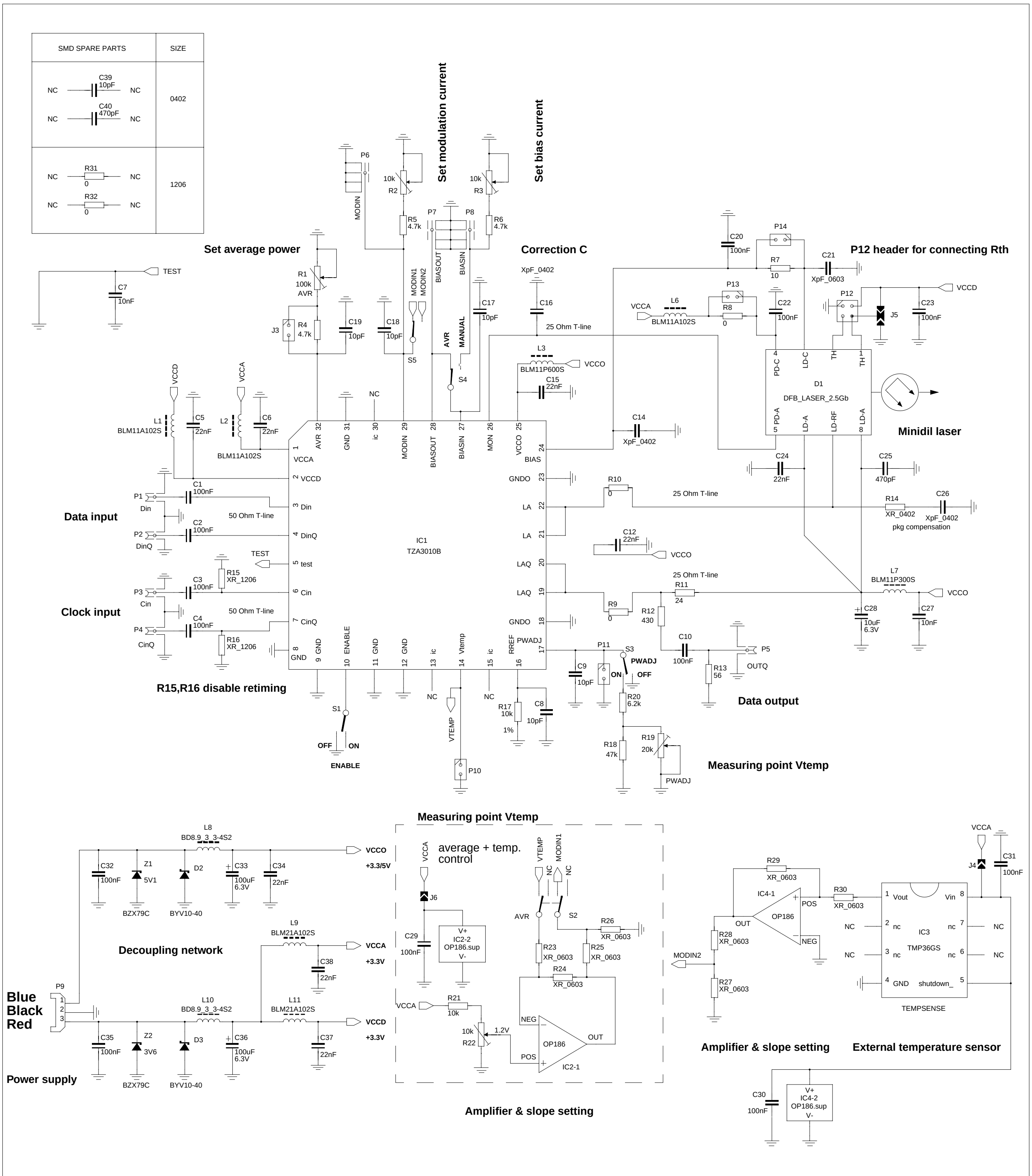
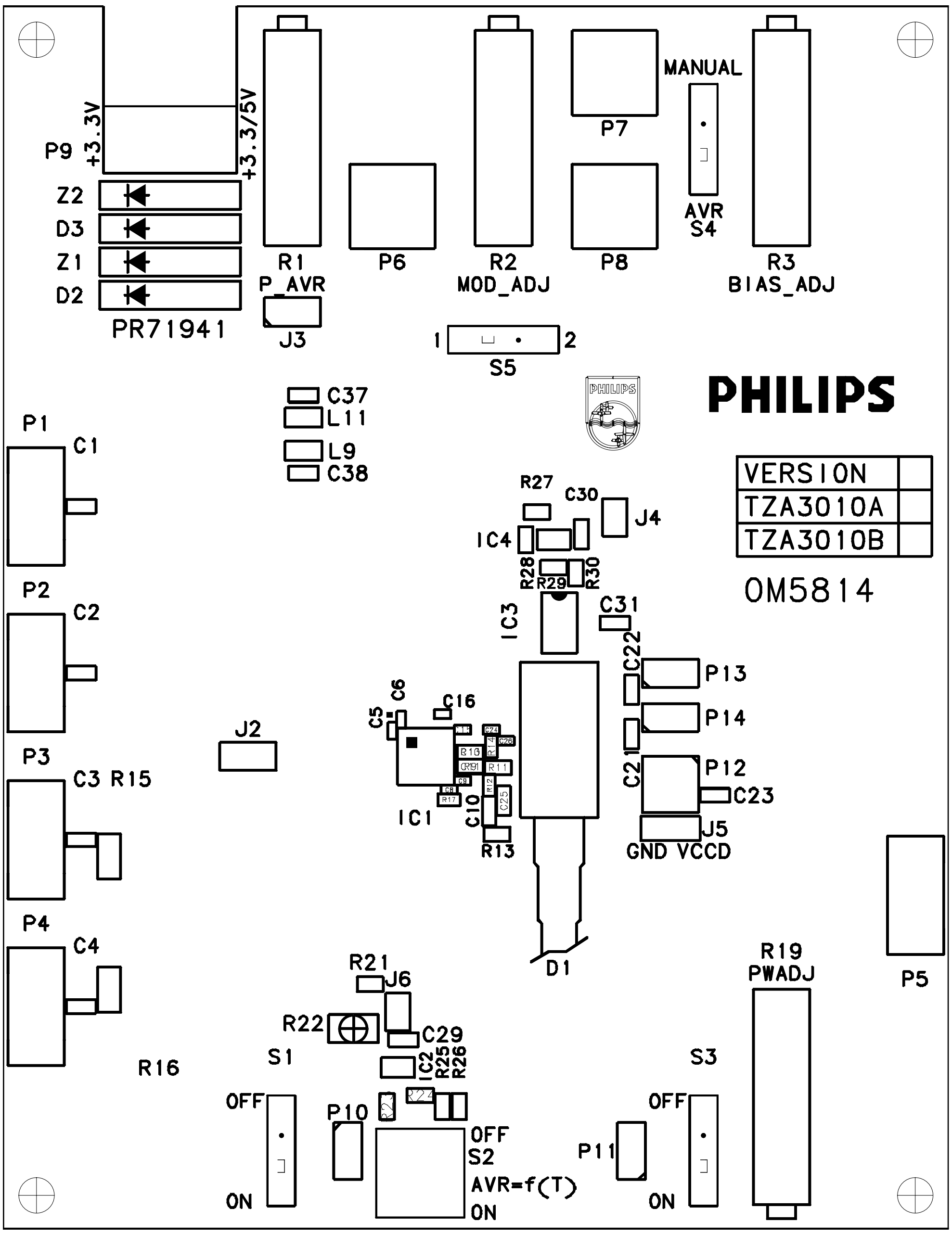


Fig.23 Schematic OM5814 with TZA3010BVH

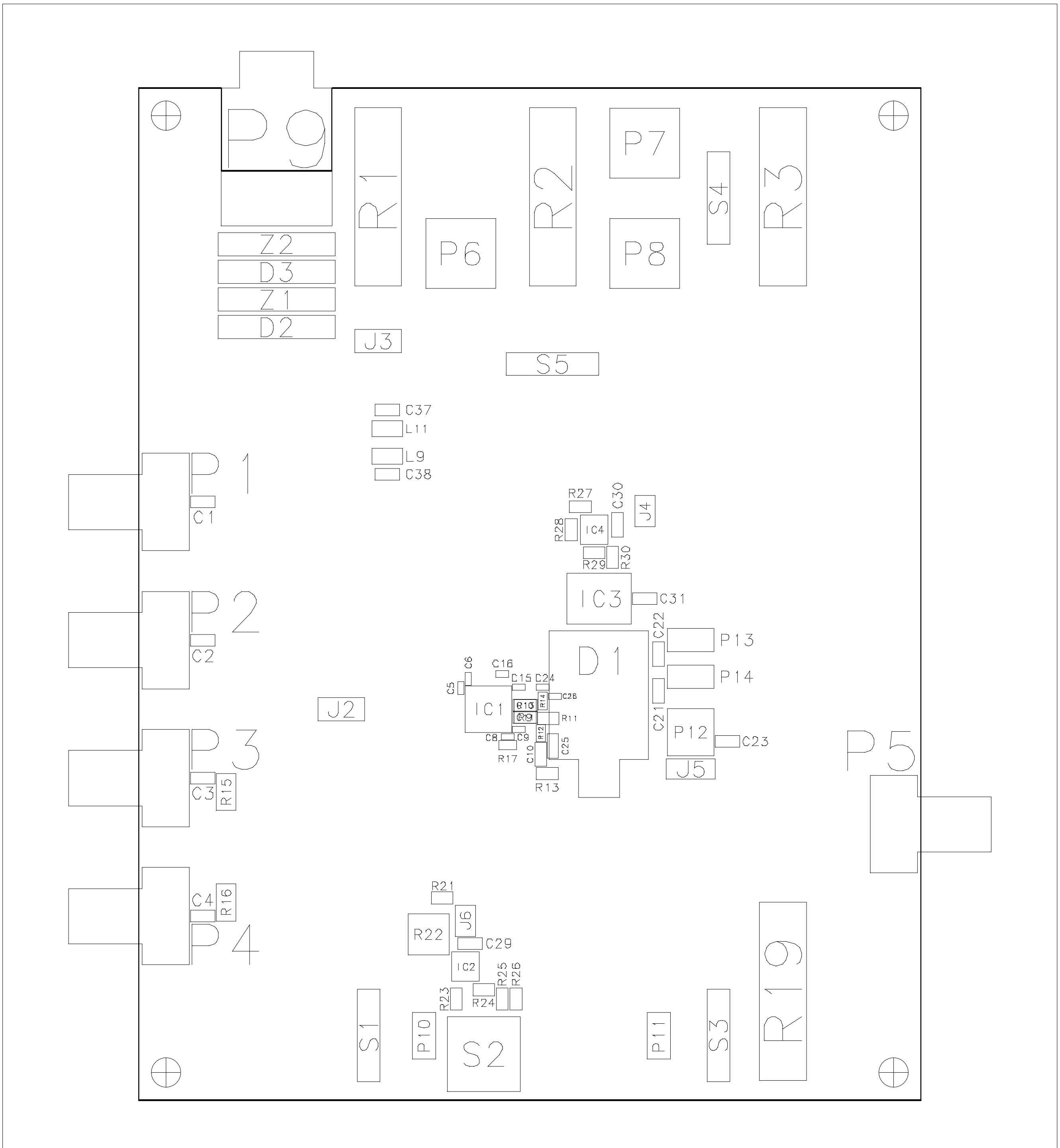
7. Layouts

7.1 Layout for OM5814 with TZA3010A & TZA3010B

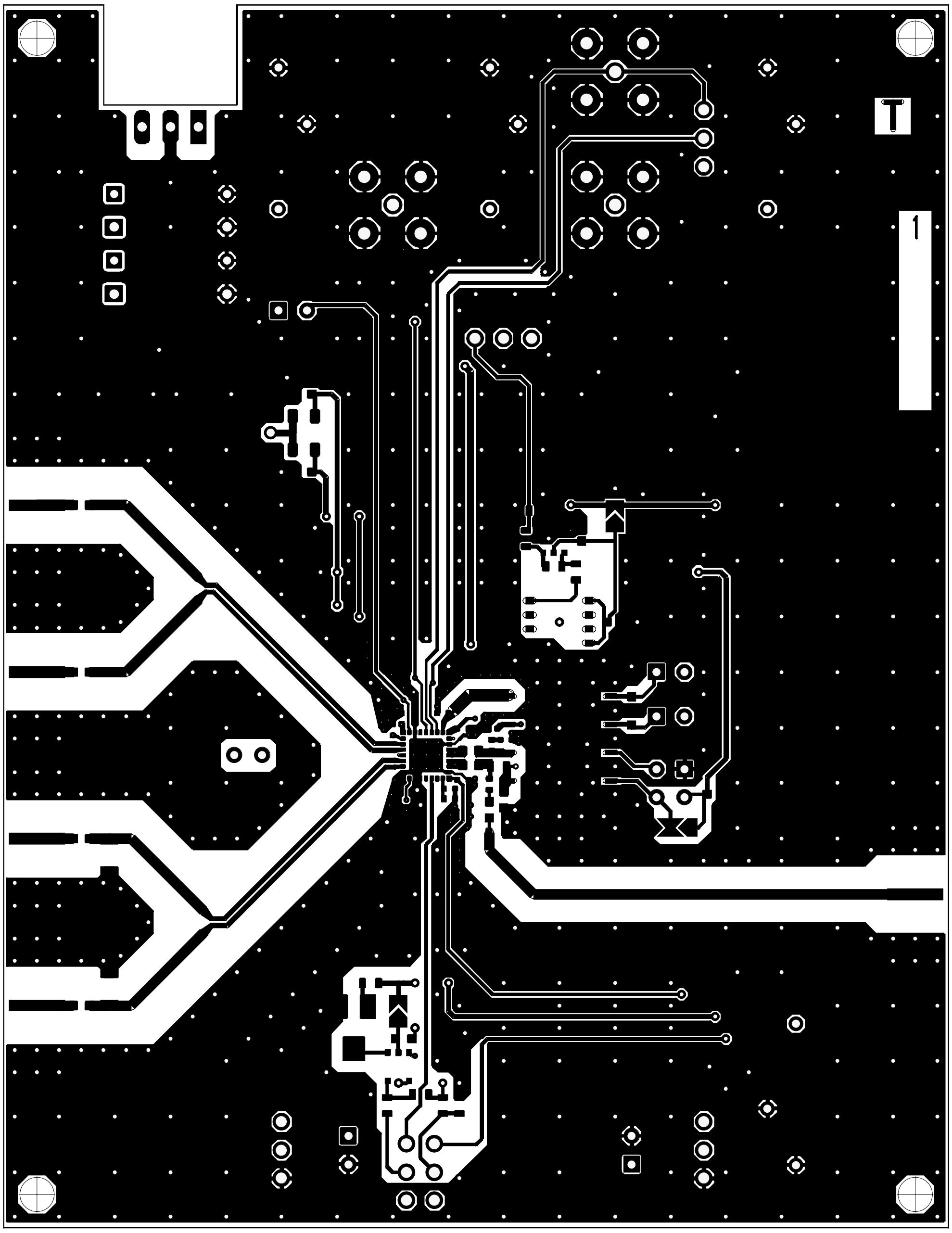
7.1.1 Top layer, Silkscreen



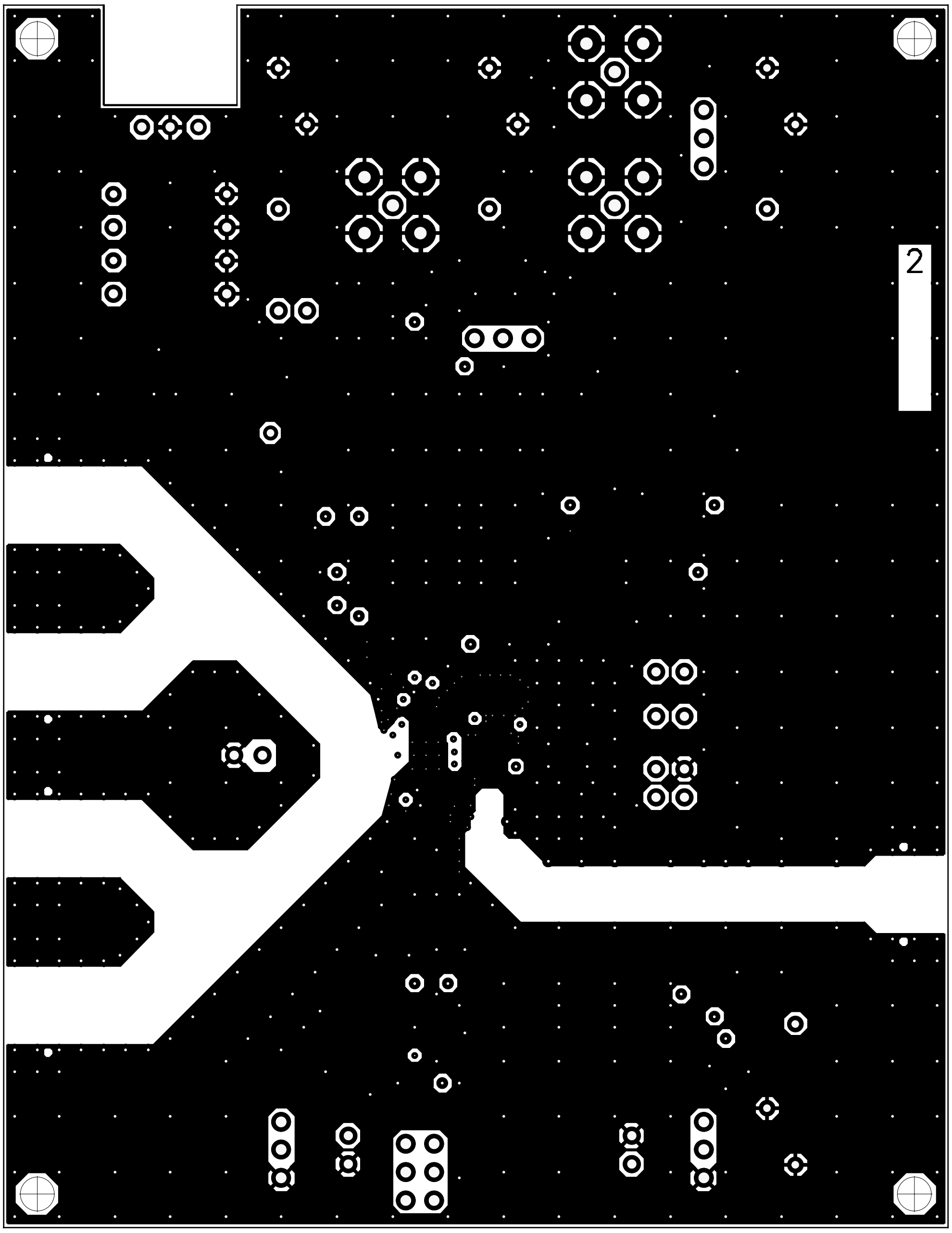
7.1.2 Top layer, Component placement



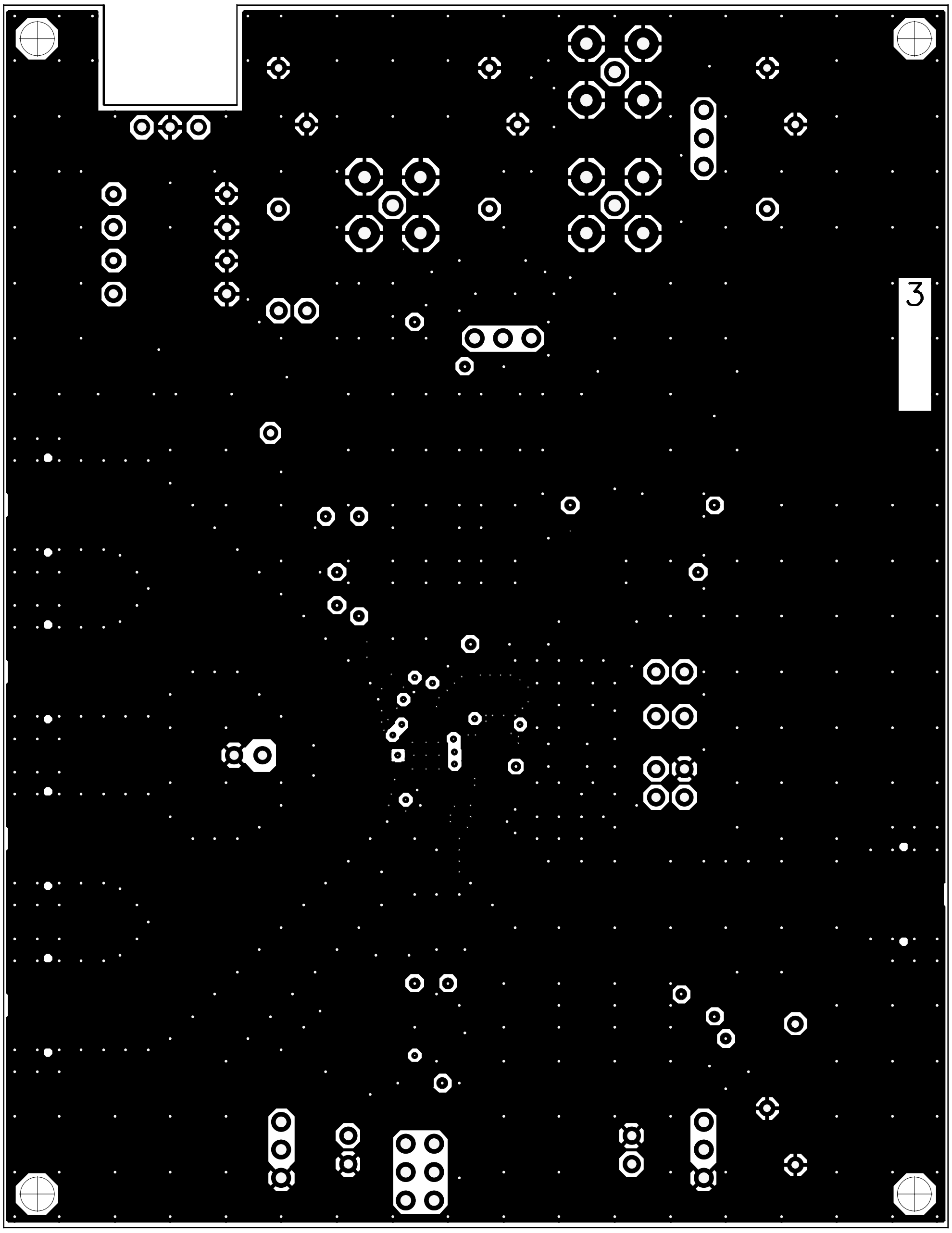
7.1.3 Top layer, SIGNAL & GND



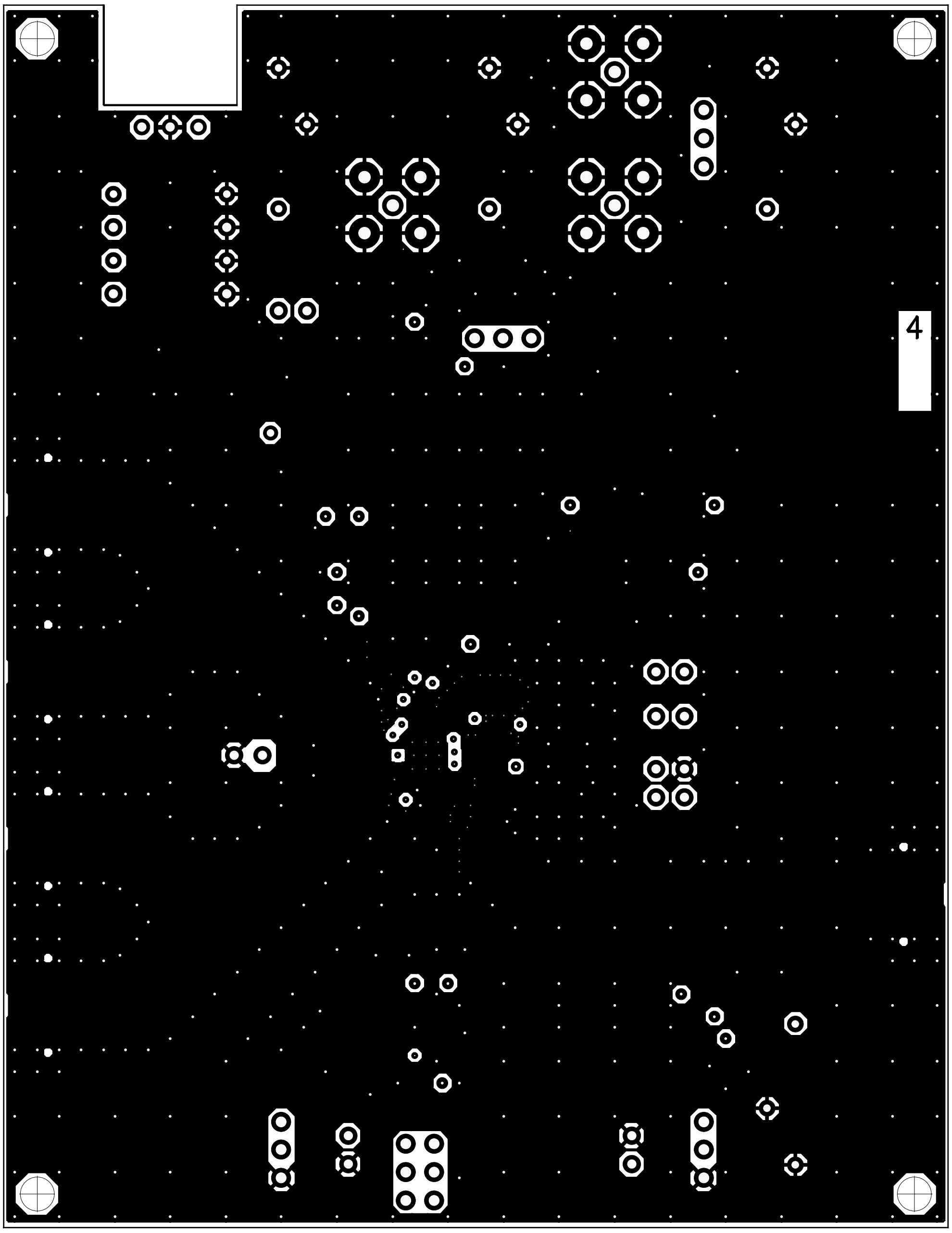
7.1.4 Layer 2, GND



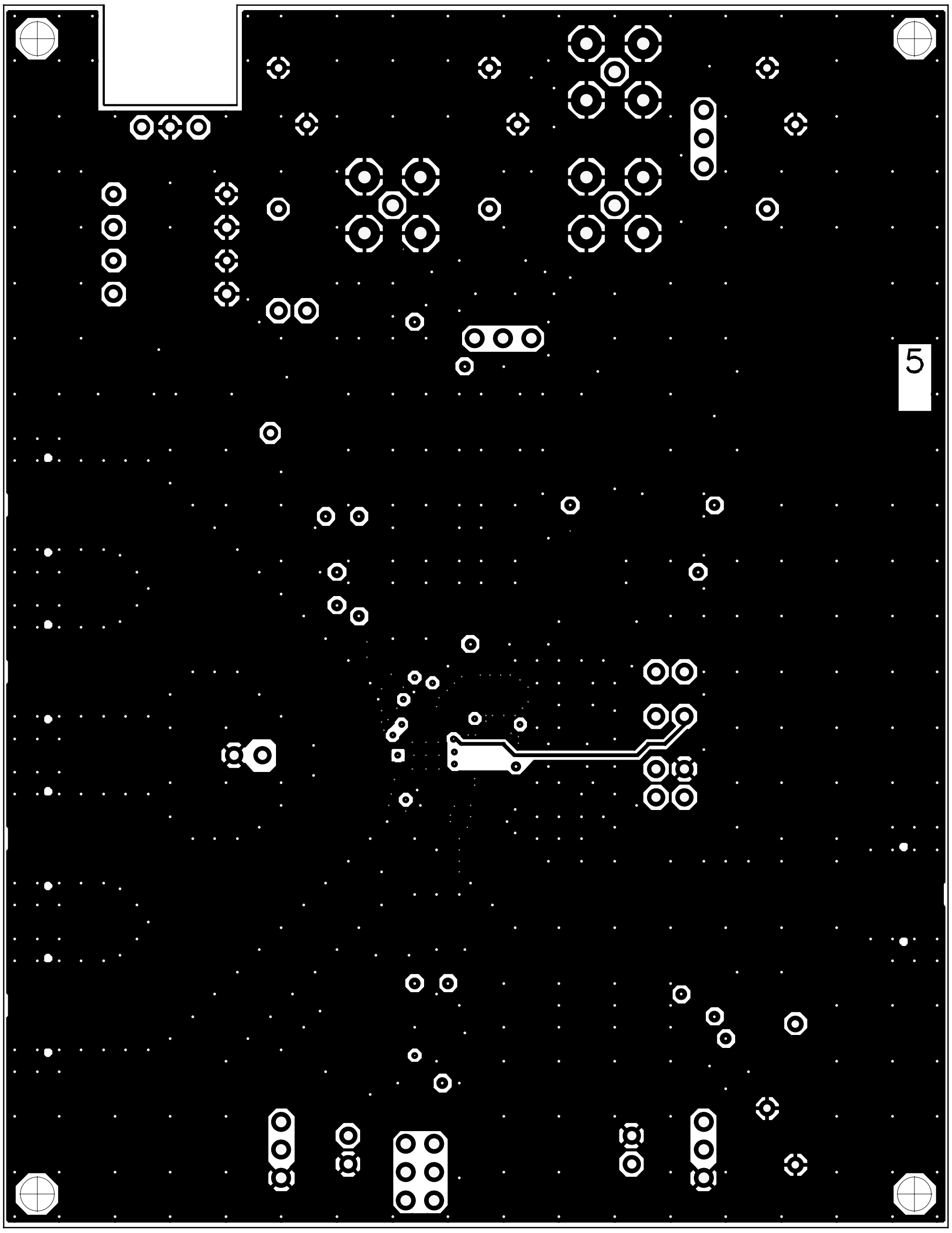
7.1.5 Layer 3, GND



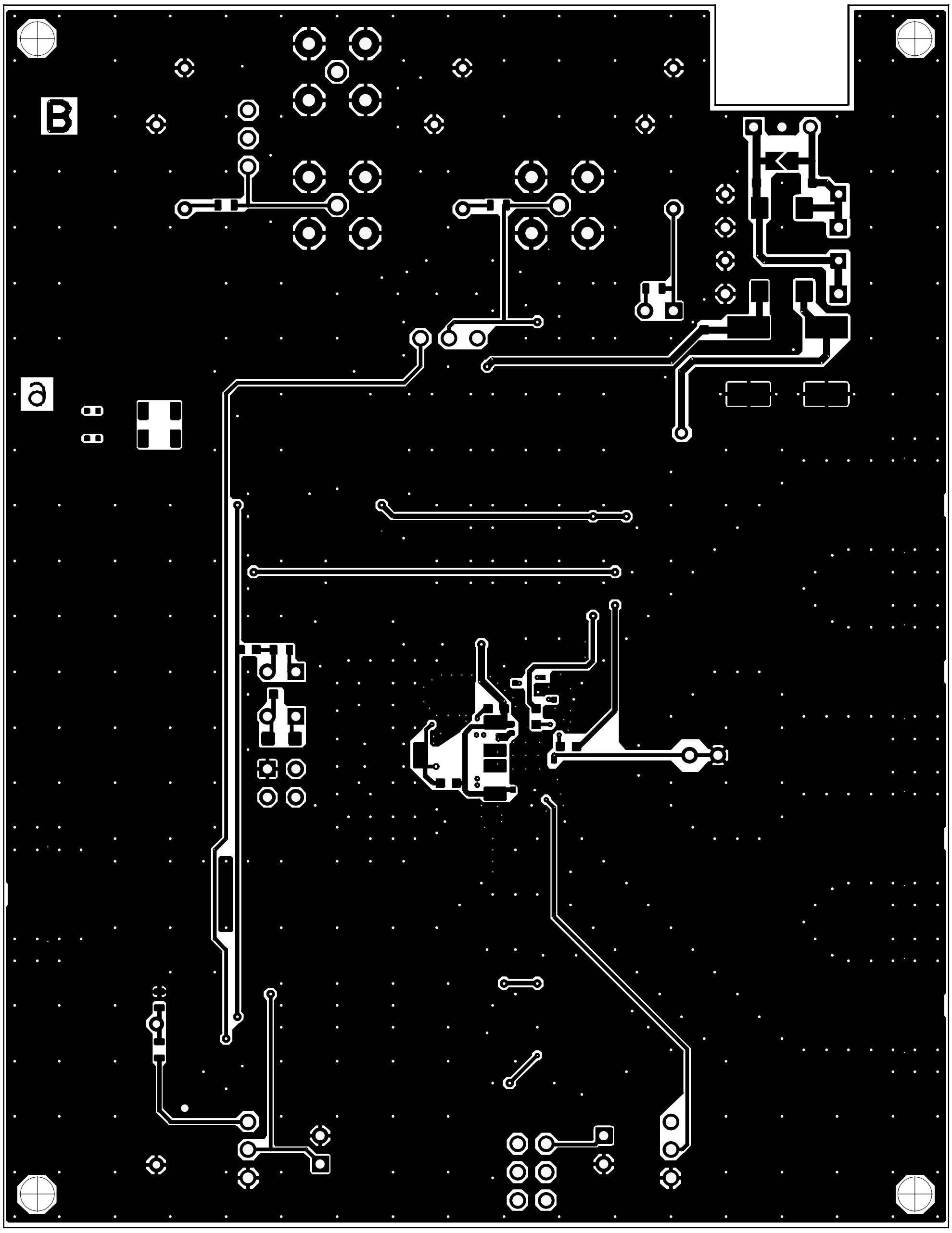
7.1.6 Layer 4, GND



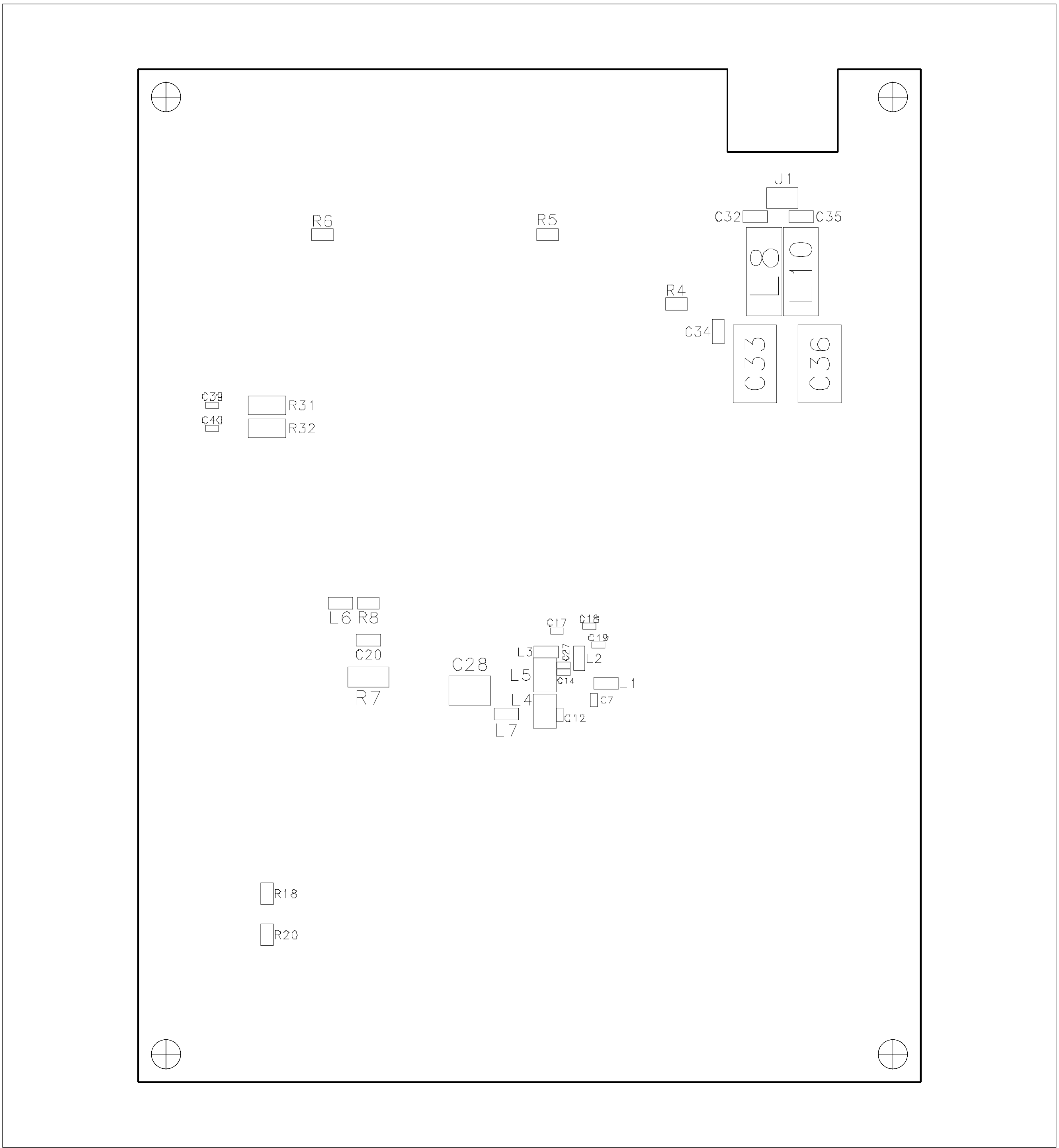
7.1.7 Layer 5, GND



7.1.8 Bottom layer, SIGNAL & GND, Bottom view



7.1.9 Bottom layer, Component placement, Bottom view



7.1.10 Bottom layer, Silkscreen, Bottom view